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# Signal Integrity Analyzer 3000

## GPIB Programming Guide

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*WAVECREST* Corporation
*A Technologies Company*
7626 Golden Triangle Drive
Eden Prairie, Minnesota 55344
(952) 831-0030
(800) 733-7128
www.wavecrest.com



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## Section 7 Binary Packet Measurements

 

The *WAVECREST* SIA-3000 and *GigaView*™ software have the ability to run automated tests or control the SIA remotely through a workstation or PC. There are several programming methods for achieving this: GPIB, Production API (PAPI), LabVIEW™, *Remote GigaView*™ and Visual Basic Macros.

Each approach has advantages or disadvantages depending on the situation in which the technique will be used. For example, a low level GPIB command set may require more time to understand and program—a negative—but provides extremely fast measurements that are used in a production environment—a benefit. On the other hand, Visual Basic Script Macros provide ease of use from the front panel, but would not typically be used in a production environment.

This manual is divided into sections describing the purpose and general implementation of each method including detailed GPIB command definitions and examples. Additionally, example code is provided and some general applications of each implementation are described. This manual also provides command references/definitions for all tools, commands or structures.

It is assumed that the user has some familiarity with GPIB usage. The user should be familiar with the concepts of selecting an interface, device addressing, interface initialization as well as the command structure and format for programming an instrument over the GPIB.

The manual has been organized as follows:

### SECTION 1 – GPIB INTERFACE

Introduction to Remote Programming of the SIA-3000 including general syntax and protocols.

### SECTION 2 – SUMMARY OF GPIB COMMANDS

This section lists the common, root, bus and subsystem commands and gives an overview of the basic structure of commands.

### SECTION 3 – COMMON COMMANDS AND STATUS

This section provides in-depth definitions of the common commands, including example code, and how they are used during status reporting,

### SECTION 4 – ROOT COMMANDS

This section provides in-depth definitions of the root commands including example code.

### SECTION 5 – BASIC MEASURES GPIB COMMANDS

The Basic Measures command set is the "lowest" level of the three GPIB command sets that can be implemented. It provides essential signal measurements such as Period/Pk-Pk/1-sigma and skew. It is also the fastest method and is used mostly in ATE or production environments.

### SECTION 6 – TOOL ORIENTED GPIB COMMANDS

The Tool Oriented GPIB commands provide a larger command set of measurement tools that go beyond the 'Basic Measures GPIB'. When a certain functionality of a tool needs to be accessed or set up, these commands provide that capability.

### SECTION 7 – BINARY PACKET STRUCTURES AND COMMANDS

This command set allows you to perform measurements from all of the tools while minimizing GPIB bus traffic. It optimizes speed but is more machine friendly than user friendly.

**APPENDIX A** contains internal and deskew calibration instructions including example programs.

**APPENDIX B** describes the programming steps for taking and reading measurement values.

**APPENDIX C** describes the data formats used for transferring data from the SIA-3000 over the GPIB bus for **:MEAS**`ure` commands.

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# SECTION 1 - GPIB INTERFACE BASICS

## 1-1 INTRODUCTION TO REMOTE PROGRAMMING OF THE SIA-3000™

You can program the SIA-3000 to:

- Set up the SIA-3000 and start a measurement.
- Return the setup parameters and measurements to the GPIB controller.

Other tasks are accomplished by combining the basic functions.

It is assumed that you are familiar with the usage of the GPIB. If you are not, please consult your GPIB documentation. In particular, you should be familiar with the concepts of selecting an interface, device addressing, interface initialization as well as the command structure and format for programming an instrument over the GPIB.

## 1-2 SIA-3000 SYNTAX

The mnemonic representing the operation to be performed by the instrument is known as the "command header." There are different types of command headers that are discussed in more detail in the following paragraphs. Commands may be simple or compound. The simple command headers consist of a single mnemonic, while a compound command header contains two or more program mnemonics. The first mnemonic of a compound header selects a subsystem and the last mnemonic selects the desired function within the subsystem. Mnemonics, within a compound message, are separated by colons.

- To execute a simple command, the syntax is:
  **<mnemonic><terminator>**

  Example: "`:RUN`"

- To execute a simple command with data:
  **<mnemonic><separator><data><terminator>**

  Example: "`*SAV 1`"

- To execute a single function in a subsystem (a compound command):
  **<Subsystem>:<function><separator><data><terminator>**

  Example: "`SYSTem:CHANnel 1`"

In addition to the simple and compound command headers, there are also common command headers to control generic functions in the SIA-3000. An example of a common command function is "reset." The syntax for common command headers is:

***<command header><terminator>**

Example: "`*RST`"

Note that no space or other separator is allowed between the asterisk and the command header.

If a command header is immediately followed by a question mark, then the command is a query.

After a query is received, the SIA-3000™ responds by placing a response in the GPIB output queue. The response will stay in the queue until either the controller reads the response or another command is issued by the controller.

The program commands from the controller are case insensitive: either lower or uppercase letters may be used. The SIA-3000 will always respond using upper case. Either the long form (the complete spelling of a command) or the short form (abbreviated spelling) may be used.

The terminator for a message can be a NL (new line, ASCII 10) character, asserting the GPIB EOI (End-Or-Identify) signal or a combination of both. All three ways are equivalent.

It is possible to send multiple commands and queries to different subsystems in the same command by separating each command with a semicolon. Multiple commands may be any combination of compound and simple commands.

## 1-3 IEEE-488.2 BUS COMMANDS

IEEE-488.2 defines the action of the SIA-3000 for certain bus commands. A device clear (DCL) or selected device clear (SDR) command clears both the input and output buffers. The parser is reset, and any pending commands are cleared.

The group execute trigger (GET) command causes the same action as the RUN/GO command.

The interface clear (IFC) command halts any bus activity. Control is returned to the system controller, and any command in progress is terminated.

The following commands are IEEE-488.1 bus commands (hardware line ATN true).

**Clear Interface** (IFC) - Halts all bus activity.

**Device Clear** - The device clear (DCL) command causes the device to perform a clear.

**Group Execute** - Performs the same action as the trigger **GET**, **RUN** and ***TRG** commands. (The device will acquire data.)

## 1-4 IEEE-488.2 PROTOCOL

The IEEE-488.2 standard defines the overall scheme for communication with the SIA-3000. Please consult the IEEE-488.2 standard for further clarification of the protocol.

The communications subsystem of the SIA-3000 consists of an input buffer and an output buffer.

The input buffer is a memory area where commands and queries from the controller are stored and processed. The input buffer holds 274 characters or bytes of data.

The output buffer is a memory area where data for the controller is stored until read. The output area is large enough to hold 510 characters or bytes of data. Larger blocks of data are handled by breaking the data into a series of blocks smaller than 510 bytes in size.

The SIA-3000's command parser interprets commands from the controller and determines what action to take in response.

After power up, or after receiving a device clear command, both the input and output buffers are cleared and the parser is reset. The controller and the SIA-3000 communicate by exchanging program and response messages. The controller should always terminate a program message before reading a response from the SIA-3000.

If the controller sends a query message to the SIA-3000, the next message from the controller should be a response message. The controller should read the entire response from the SIA-3000 before sending another query message.

Execution of commands by the SIA-3000 is in the order that the commands are received. This also includes reception of the group execute trigger (GET) bus command. The controller should not send a group execute trigger command in the middle of a program message.

It is possible to send multiple queries in a query message ("compound query") by use of semicolon message separators. The SIA-3000 responses to a multiple query will also be separated by semicolons.

### 1-4.1 PROTOCOL EXCEPTIONS

If the SIA-3000 is addressed to talk before the controller sent it a query, it will indicate a query error and not transmit any data bytes over the GPIB. If the SIA-3000 has no response because it was unable to execute the query because of an error, the SIA-3000 will not indicate a query error, and waits for the next message from the controller.

If a command error occurs, it is reported to the controller. An example of a command error would be a syntax error or an unrecognized command. A group execute trigger in the middle of a program message is also considered a command error.

If a parameter is out of range, or the current settings of the SIA-3000 will not allow execution of a requested command or query, then an execution error is reported to the controller.

A device-specific error will be reported by the SIA-3000 if it is unable to execute a command for a strictly SIA-3000 dependent reason.

A query error will be reported if the proper protocol for a query is not followed. Query errors include both "unterminated" and "interrupted" conditions.

If the controller attempts to read a response message before the program message has been terminated (an "unterminated" condition), the SIA-3000 reports a query error. The parser is reset, and any response is cleared from the output buffer, without being sent back to the controller.

If the controller fails to read the entire response message and attempts to send another program message, the SIA-3000 responds with a query error. The unread portion of the response is discarded by the SIA-3000. The program message from the controller is not affected, and will be processed normally by the SIA-3000.

It is possible for the SIA-3000 to become deadlocked in a condition where both the input and output buffers are full. This can occur if the controller sends a very long program message which contains queries that generate a large number of data bytes in response. The SIA-3000 is unable to accept any more program message bytes under this condition, but the controller cannot read any of the response data bytes until the entire program message has been sent to the SIA-3000. If this situation occurs, the SIA-3000 detects the condition, clears the output queue, and discards responses until it reaches the end of the program message. A query error bit is also set under this condition.

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## 2-1 SUMMARY OF SIA-3000 COMMANDS

In addition to the **Common** commands (see section 2.3) defined for all instruments by IEEE-488.2, the instrument subsystem commands used in the SIA-3000 are:

**Acquire** - Provides access to the parameters for acquiring and storing data.

**Calibrate** - Provides for the selection of different calibrate functions and retrieves data generated by these functions.

**Channel** - Provides access to the parameters associated with the different channels.

**Display** - Provides access to the parameters for controlling how or what information will be displayed.

**Measure** - Selects the measurements to be made.

**Plot** - Provides access to the plot data recorded from a previously called :ACQ:<API structure> command.

**System** - Controls some basic functions of the SIA-3000.

**Trigger** - Controls the trigger modes and parameters for each trigger mode.

The following legend is used in the instrument subsystem commands:

<n> - Represents any single channel number between 1 and 10 (required)

<a> - Represents any single arming input between ARM1 and ARM10 (required)

(@ <n,m,x,…>|<n:m>) - Represents an optional channel list/range of channels between 1 and 10

- For single channel measurements, valid commands include:

  `:ACQ:ALL PER (@10), :ACQ:ALL PER (@ 1,3,5) and :ACQ:ALL PER (@7:10)`

- For dual channel (parallel) measurements, the ampersand symbol appears between the reference channel and multiple measurement channels. Only one set of parallel measurements can be sent in a single command. For example:

  `:ACQ:ALL TPD++ (@ 1&2,4,5)`
  (TPD ++ measurements on reference channel 1, data channels 2, 4 and 5)

  `:ACQ:ALL TPD++ (@ 2&3:8)`
  (TPD++ measurements on reference channel 2, data channels 3 through 8)

### Rules for Using a Channel List or Range:

- If the channel list is absent, the command is executed using the current measurement channel
- The channels must be entered in ascending order
- If the range of channels specified includes an inactive channel, the device will report an error
- If a measurement error occurs on one of the requested channels, values that indicate a bad measurement will be returned/displayed and the device will attempt to measure the remaining channels in the list

### Rules for Using the Group (Pseudo-Parallel) Commands:

- To create a group of commands, send the `:SYST:GROUP<`*n*`>ON` command, where *n* represents a group between 1 and 20
- Any commands sent after this command will now be queued inside the device as a group until the `:SYST:GROUP<`*n*`>OFF` is sent. **Only one group will be queued at a time.**
- When the `:ACQ:GROUP<`*n*`>` command is sent, all of the queued commands within that group will be executed in the order they were received. If any of the commands in the group request data to be sent back, the data will be sent back in the order requested
- All of the commands described in this document can be included in a group except for the following:
  - Common and Root commands listed in Sections 2-3 and 2-4
  - `:SYSTem:HEADer, :SYSTem:LONGform, :SYSTem:COMPatible, :SYSTem:ADDRess, :SYSTem:ENDian, :SYSTem:TEST, :SYSTem:GO, :SYSTem:NOGO, :SYSTem:STROBeCAL` (Section 2-5)
  - `:CALIBRATE` commands (Section 2-7)

## 2-2 IEEE-488.1 BUS COMMANDS (HARDWARE)

The following commands are IEEE-488.1 bus commands (hardware line ATN true).

**Clear Interface** (`IFC`) - Halts all bus activity.

**Device Clear** - The device clear (`DCL`) command causes the device to perform a clear.

**Group Execute** - Performs the same action as the trigger **`GET`**, **`RUN`** and **`*TRG`** commands. (The device will acquire data.)

## 2-3 COMMON COMMANDS

The following are common commands defined by IEEE-488.2 and supported by the SIA-3000.

***CLS**.....Clear Status.

***ESE**.....Event Status Enable.

***ESE**.....Query.

***ESR**.....Event Status Register Query.

***IDN**.....Identification Query.

***OPC**.....Operation Complete.

***OPC?**.....Query.

***OPT**.....Returns the list of instrument options.

***RCL**.....<0-10>.....Recall.

***RST**.....Reset. Resets the input and output buffers, resets the parser and clears any pending commands.

***SAV**.....<0-10>.....Save.

***SRE** .....Service Request Enable.

***SRE?**.....Query.

***STB?**.....Status Byte Query.

***TRG**.....Causes the SIA-3000 to initiate a measurement.

***TST?**.....Test Instrument Query.

## 2-4 ROOT COMMANDS

**:RUN** - Causes the SIA-3000 to initiate measurement. Does the same function as the *TRG.

**:TER?** - This query will read the identified TRG Event Register. When the register is read, it is cleared. A one (1) informs the program that the trigger has occurred. Monitor this bit to know when a take sample (burst), pulse find, cable measure or an internal/external calibration is complete.

**:LER?** - This query will read the Local Event Register. When the query is received and the register is read, it is cleared. A non-zero indicates that a reset is in progress.

**:SDS?** - This query reads the Special Device Register. When the query is received and the register is read, it is cleared. This register is used to indicate when some commands are complete when they don't set a TRG or MAV bit. Same as bit 3 of a serial poll.

## 3-1 DESCRIPTION OF THE COMMON COMMANDS & STATUS

IEEE-488.2 defines a set of common commands. These commands perform functions that are common to any type of instrument. They can therefore be implemented in a standard way across a wide variety of instrumentation. All the common commands of IEEE-488.2 begin with an asterisk. There is one key difference between the IEEE-488.2 common commands and the rest of the commands found in this instrument. The IEEE-488.2 common commands do not affect the parser's position within the command tree. Many of these commands are used for status.

| COMMAND | COMMAND NAME |
|---|---|
| ***CLS** | Clear Status. |
| ***ESE** | Event Status Enable. |
| ***ESE?** | Event Status Enable Query. |
| ***ESR?** | Event Status Register Query. |
| ***IDN?** | Identification Query. |
| ***OPC** | Operation Complete. |
| ***OPC?** | Operation Complete Query. |
| ***OPT** | Returns the list of installed options. |
| ***RCL** <0-10> | Recall. |
| ***RST** | Reset. Resets the input and output buffers, resets the parser and clears any pending commands. |
| ***SAV** <0-10> | Save. |
| ***SRE** | Service Request Enable. |
| ***SRE?** | Service Request Query. |
| ***STB?** | Status Byte Query. |
| ***TRG** | Causes the SIA-3000 to initiate a measurement. |
| ***TST?** | Test Instrument Query. |

The bits in the status byte act as summary bits for the data structures residing behind them. In the case of queues, the summary bit is set if the queue is not empty. For registers, the summary bit is set if any enabled bit in the event register is set. The events are enabled via the corresponding event enable register. Events captured by an event register remain set until the register is read or cleared. Registers are read with their associated commands. The "*CLS" command clears all event registers and all queues except the output queue. If "*CLS" is sent immediately following a <program message terminator>, the output queue will also be cleared.

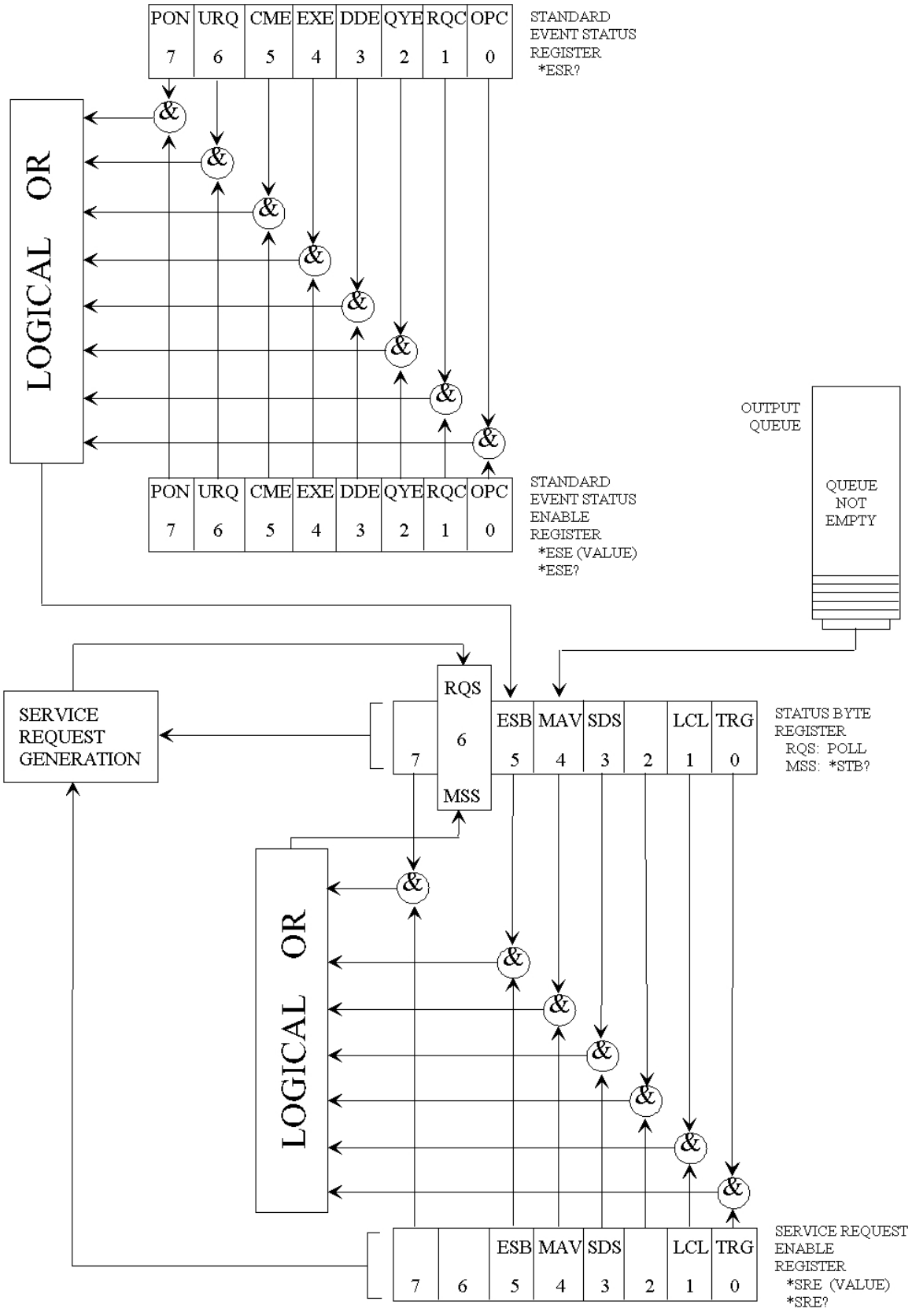


**Figure 3-1 STATUS REPORTING**

### 3-1.1 BIT DEFINITIONS

**CME** - Command error. Indicates whether the parser detected an error.

**DDE** - Device specific error. Indicates whether the device was unable to complete an operation for device dependent reasons.

**ESB** - Event status bit. Indicates if any of the conditions in the Standard Event Status Register are set and enabled.

**EXE** - Execution error. Indicates whether a parameter was out of range, or inconsistent with current settings.

**LCL** - Indicates whether a remote to local transition has occurred. Indicates when a Device Clear (DCL) is complete.

**MAV** - Message available. Indicates whether there is a response in the output queue.

**MSS** - Master summary status. Indicates whether the device has a reason for requesting service. This bit is returned for the `*STB?` query.

**OPC** - Operation complete. Indicates whether the device has completed all pending operations.

**OPT** – Options. Returns a list of installed options.

**PON** - Power on. Always 1.

**QYE** - Query error. Indicates whether the protocol for queries has been violated.

**RQC** - Request control. Indicates whether the device is requesting control. Asking for a simulated GO key to be executed.

**RQS** - Indicates if the device is requesting service. This bit is returned during a serial poll. `RQS` will be set to 0 after being read via a serial poll (MSS is not reset by *STB?).

**SDS** - Special device status.

**TRG** - Indicates whether a trigger has been received.

**URQ** - User request. Indicates whether a front panel key has been pressed.

## 3-1.2 KEY FEATURES

A few of the most important features of Status Reporting are shown below.

**Operation Complete -** The IEEE-488.2 structure provides one technique that can be used to find out if any operation is finished. The "OPC" command, when sent to the instrument after the operation of interest, will set the OPC bit in the Standard Event Status Register. If the OPC bit and the RQS bit have been enabled, a service request will be generated.

```
Send(0,5,"*SRE;*ESE1",11,EOI);     !enables an OPC service request.
Send(0,5,"*TRG;*OPC",9,EOI);       !initiates data acquisition.
                                   !will generate a SRQ when the
                                   !acquisition is complete.
```

**The Trigger Bit -** The TRG bit indicates if the device has received a trigger. The TRG event register will stay set after receiving a trigger until it is cleared by reading it or using the *CLS command. If your application needs to detect multiple triggers, the TRG event register must be cleared after each one.

```
Send(0,5,"*SRE1",6,EOI);           !enables a trigger service request.
                                   !the next trigger will generate an SRQ.
Send(0,5,":TER?",5,EOI);           !queries the TRG event register, thus
Send(0,5,"*TRG",4,EOI);            !clearing it.
                                   !the next trigger can now generate an
Wait SRQ(0,result);                !SRQ.
```

**Status Byte -** If the device is requesting service (RQS set), and the controller serial polls the device, the RQS bit is cleared. The MSS bit (read with *STB?) will not be cleared by reading it. The status byte is not cleared when read, except for the RQS bit.

**Serial Poll -** The SIA-3000™ supports the IEEE-488.1 serial poll feature. When a serial poll of the instrument is requested, the RQS bit is returned on bit 6 of the status byte.

**Using Serial Poll -** This example will show how to use the service request by conducting a serial poll of all instruments on the bus. In this example, assume that there are two instruments on the bus; a DTS at address 5 and a printer at address 1. These address assumptions are made throughout this manual, and it is also assumed that we are operating on GPIB controller board address 0.

The program command for serial poll using IEEE-488.2 in "C" is `ReadStatusByte (0,5,result);`. The address 005 is the address of the SIA-3000 in this example. The command for checking the printer is `ReadStatusByte (0,1,result);` because the address of that instrument is 01 on bus address 0. This command reads the contents of the GPIB Status Register into the variable called result. At that time bit 6 of the variable result can be tested to see if it is set (bit 6=1).

The serial poll operation can be conducted in the following manner.

1. Enable interrupts on the bus. This allows the controller to "see" the SRQ line.
2. If the SRQ line is high (some instrument is requesting service) then check the instrument at address 1 to see if bit 6 of its status register is high.
3. Disable interrupts on the bus.
4. To check whether bit 6 of an instruments status register is high, use the following command line:

```
If (result & 0x40){
   then
   }
```

5. If bit 6 of the instrument at address 1 is not high, then check the instrument at address 5 to see if bit 6 of its status register is high.
6. As soon as the instrument with status bit 6 high is found, check the rest of the status bits to determine what is required.

The `ReadStatusByte (0,5,result);` command causes much more to happen on the bus than simply reading the register. This command clears the bus, automatically addresses the talker and listener, sends `SPE` (serial poll enable) and `SPD` (serial poll disable) bus commands, and reads the data. For more information about serial poll, refer to your controller manual, and programming language reference manuals.

After the serial poll is completed, the RQS bit in the SIA-3000 Status Byte Register will be reset if it was set. Once a bit in the Status Byte Register is set, it will remain set until the status is cleared with a `*CLS` command, or the instrument is reset.

**Parallel Poll** - The SIA-3000 does not support the parallel poll feature.

## 3-2 *CLS (Clear Status) command

The `*CLS` (clear status) common command clears the Event Status Register, the Status Byte Register, the trigger bit, the local bit and the error queue.

The Event Status Register is read by the `*ESR?` query. The Status Byte Register is read by the `*STB?` command or a serial poll.

### Command syntax- *CLS

Example: `Send(0,5,"*CLS",4,EOI);`

### Query Syntax- None

## 3-3 *ESE (Event Status Enable) command/query

The *ESE command sets the Standard Event Status Enable Register bits. The Standard Event Status Enable Register contains a mask value for the bits to be enabled in the Standard Event Status Register. A one (1) in the Standard Event Status Enable Register will enable the corresponding bit in the Standard Event Status Register, a zero will disable the bit. Refer to Table 3-1 for information about the Standard Event Status Enable Register bits, bit weights, and what each bit masks.

The *ESE query returns the current contents of the register.

### Command Syntax - *ESE <mask>

<mask>::=0 to 255

Example: `Send(0,5,"*ESE 64",7,EOI);`

In this example, the *ESE 64 command will enable URQ, user request, bit 6 of the Standard Event Status Enable Register. Therefore, when a front-panel key is pressed, the event summary bit (ESB) in the Status Byte Register will also be set.

Event Status Enable Register
(High - Enables the ESR bit)

| Bit | Weight | Enables |
|---|---|---|
| 7 | 128 | PON-Power On |
| 6 | 64 | URQ-User Request |
| 5 | 32 | CME-Command Error |
| 4 | 16 | EXE-Execution Error |
| 3 | 8 | DDE-Device Dependent Error |
| 2 | 4 | QYE-Query Error |
| 1 | 2 | RQC-Request Control |
| 0 | 1 | OPC-Operation Complete |

**Table 3-1 Standard Event Status Enable Register**

### Query Syntax - *ESE?

Returned Format: <mask><NL>

<mask>::=0 to 255

Example:
```
Send(0,5,"*ESE?",5,EOI);
Received(0,5,Event,1,EOI);
Printf("%d\n",Event);
```

## 3-4 *ESR? (Event Status Register) query

This ***ESR** query returns the contents of the Standard Event Status Register.

**NOTE:** Reading the register clears the Standard Event Status Register and the ESB bit in the STB register.

**Query Syntax**: ***ESR?**

Returned Format: <status><NL>
<status>::=0 to 255

Example:
```
Send(0,5,"*ESR?",5,EOI);
Receive(0,5,Event,1,EOI);
Printf("%d\n",Event);
```

With the example (`*ESE=64`), if a front-panel key has been pressed, the variable "event" will contain 64, the URQ (User Request bit).

Table 3-2 shows the Standard Event Status Register. The table shows each bit in the Standard Event Status Register as well as the bit weight. When you read Standard Event Status Register, the value returned is the total bit weights of all bits that are high at the time you read the byte.

Event Status Register

| Bit | Bit Weight | Bit Name | Condition |
|---|---|---|---|
| 7 | 128 | PON | 0=not used-always zero |
| 6 | 64 | URQ | 0=no front panel key has been pressed<br>1=front panel key has been pressed |
| 5 | 32 | CME | 0=no command errors<br>1=a command error has been detected |
| 4 | 16 | EXE | 0=no execution error<br>1=an execution error has been detected |
| 3 | 8 | DDE | 0=no device dependent errors<br>1=a device dependent error has been detected |
| 2 | 4 | QYE | 0-no query errors<br>1=a query error has been detected |
| 1 | 2 | RQC | 0=request control |
| 0 | 1 | OPC | 0=operation is not complete<br>1=operation is complete |

0 = False = Low
1 = True = High

**Table 3-2 Standard Event Status Register**

## 3-5 *IDN? (Identification Number) query

The ***IDN?** query allows the instrument to identify itself. It returns the string:

"WAVECREST, SIA-3000, VERSION MAJOR, VERSION MINOR, REVISION LEVEL."
VERSION MAJOR = Major version of software release.
VERSION MINOR = Minor version of software release.
REVISION LEVEL = Updates to current software release.

An ***IDN?** query must be the last query in a message. Any queries after the ***IDN?** in this program message will be ignored.

### Query Syntax- *IDN?

Returned Format: `WAVECREST, SIA-3000, v NN.NN.NN`

Example:
```
CHAR MESSAGE[50];
Send(0,5,"*IDN?",5,EOI);
Receive(0,5,MESSAGE,50,EOI);
Printf("%s\n",MESSAGE);
```

## 3-6 *OPC (Operation Complete) command/query

The ***OPC** (operation complete) command will cause the instrument to set the operation complete bit in the Standard Event Status Register when all pending device operations have finished. The *OPC? query places an ASCII "1" in the output queue when all pending device operations have finished.

### Command Syntax- *OPC

Example:
```
Send(0,5,"*OPC",4,EOI);
```

### Query Syntax- *OPC?

Example:
```
Send(0,5,"*OPC?",5,EOI);
Receive(0,5,data,1,EOI);
Returned format: "1"
```

## 3-7 *OPT? (Options) query

The *OPT (options) query will return the current options, in text format, available/installed in the SIA-3000.

### Query Syntax- *OPT?

Example:
```
Send(0,5,"*OPT?",5,EOI);
Receive(0,5,data,1,EOI);
```

## 3-8 *RCL (Recall) command

The ***RCL** command restores the state of the SIA-3000 from a specified set of saved setups. There can be ten (10) different setups (1 through 10).

### Command Syntax- *RCL<specific setup>#

Example:
```
Send(0,5,"*RCL1",6.EOI);
```

### Query Syntax- None

**NOTE:** See common command ***SAV** for specific information recalled/saved.

## 3-9 *RST (Reset) command

The ***RST** command place the instrument in a known state. The output buffer is cleared as well as the ESR and serial poll status registers. Use the interface clear (IFC) bus command to perform a hardware reset.

### Command Syntax- *RST

Example:
```
int result;
Send(0,5,"*CLS",4,EOI);
Send(0,5,"*RST;*OPC",9,EOI);
result=0
while ((result&0X20 !=0){ /*wait for reset to finish*/
   ReadStatusByte(0,5,&result);
   }
/*reset complete*/
```

### Query Syntax- None

## 3-10 *SAV (Save) command

The ***SAV** command stores the current settings of the SIA-3000 in non-volatile memory. This setup is saved and recalled by specifying a specific setup from 1 to 10. See the list below for the parameters saved. Notice that for each setting (1-10), each of the ten (10) functions has a number of settings saved.

### Command Syntax- *SAV<specific setup>#

Example: `Send(0,5,"*SAV6",5,EOI);`

### Query Syntax- None

During a SAVE or RECALL, the following parameters are saved for later recall or recalled and used as SIA-3000 parameters:

**Arming Source**
**Filter maximum DC Channel**
**Filter minimum Strobe delay**
**Filter On/Off Strobe input channel**
**Function Selection** (defines edge direction)
- Channel selection (Ch1/Ch2/…/Ch*n*)
- Arming event arming sequence
- Start reference voltage
- Stop reference voltage
- External Arm reference voltage
- External Arm edge direction
- Pulse find levels (percentages)
- Start/Stop edge (rising or falling)
- Start/Stop arm on *n*th count

**Gating on/off**
**Sample size**
**Sets size**
**Start/Stop external arming inputs**
**Start/Stop VOH (max peak) voltage**
**Start/Stop VOL (min peak) voltage**
**Strobe arming channel**
**Strobe increment value**
**Strobe number of points**
**Strobe start point**
**Strobe stop point**

Notes: The external calibration values are not saved on a SAVE.

## 3-11 *SRE (Service Request Enable) command/query

The ***SRE** command sets the Service Request Enable Register bits. The Service Request Enable Register contains a mask value for the bits to be enabled in the Status Byte Register. A one in the Service Request Enable Register will enable the corresponding bit in the Status Byte Register, a zero will disable the bit. Refer to table 3-3 for the bits in the Service Requst Enable Register and what they mask.

The ***SRE** query returns the current value.

### Command Syntax- *SRE <mask>

<mask>::=0 to 255

Example: `Send(0,5,"*SRE16",7,EOI);`

**NOTE**: This example enables a service request to be generated when a message is available in the output queue. When a message is available, the MAV bit will be high.

### Query Syntax- *SRE?

Returned Format: <mask><NL>

<mask>::=sum of all bits that are set - 0 through 255

Example:
```
Send(0,5,"*SRE?",5,EOI);
Receive(0,5,ENABLE,1,EOI);
Printf("%d\n",ENABLE);
```

Event Status Enable Register
(High - Enables the ESR bit)

| Bit | Weight | Enables |
|---|---|---|
| 7 | 128 | not used |
| 6 | 64 | RQS-Request Service |
| 5 | 32 | ESR-Event Status Register |
| 4 | 16 | MAV-Message Available |
| 3 | 8 | SDS-Sub-Device Status |
| 2 | 4 | MSG-Message - Not Used |
| 1 | 2 | LCL-Local |
| 0 | 1 | TRG-Trigger |

**Table 3-3 Standard Event Status Enable Register**

## 3-12 *STB? (Status Byte) query

The ***STB** query returns the current value of the instrument's status byte. The **MSS** (Master Summary Status) bit and not **RQS** is reported on bit 6. The **MSS** indicates whether or not the device has at least one reason for requesting service. Refer to table 3-4 for the meaning of the bits in the status byte.

**Note**: To read the instrument's status byte with RQS reported on bit 6, use the GPIB Serial Poll.

**Command Syntax-** None

**Query Syntax- *STB?**

Returned Format: <value><NL>
<value>::= 0 through 255

Example:
```
Send(0,5,"*STB?",5,EOI);
Receive(0,5,STATUS,1,EOI);
Printf("%d\n",STATUS);
```

| Bit | Bit Weight | Bit Name | Condition |
|---|---|---|---|
| 7 | 128 | ------- | 0=not used |
| 6 | 64 | RQS/MSS | 0=instrument has no reason for service<br>1=instrument is requesting service |
| 5 | 32 | ESR | 0=no event status conditions have occurred<br>1=an enabled event status condition has occurred |
| 4 | 16 | MAV | 0=no output messages are ready<br>1=an output message is ready |
| 3 | 8 | SDS | 0=special device status |
| 2 | 4 | MSG Not Used | 0=no message has been displayed<br>1=message has been displayed |
| 1 | 2 | LCL | 0=a remote to local transition has not occurred<br>1=a remote to local transition has occurred |
| 0 | 1 | TRG | 0=no trigger has occurred<br>1=a trigger has occurred |

**Table 3-4 Status Byte Register**

## 3-13 *TRG (Trigger Event Register) command

The ***TRG** command initiates the DTS to take a measurement. This is the same effect as a Group Execute Trigger (GET) or sending the root command **RUN**. Use the root query, **:TER?**, to indicate when a measurement is complete.

### Command Syntax- *TRG

Example:
```
int result, event_status;
Send (0,5,":TER?",5,EOI); /*clears the TRG Event Register*/
result = 0
while((result & 0x01) !=0){
   ReadStatusByte(0,5,& result);
   }
Send(0,5,"*CLS",4,EOI);
Send(0,5,"*TRG",4,EOI);
while((result & 0x01) !=1){ /*wait for TRG bit of serial poll*/
   ReadStatusByte(0,5,& result);
   }
event_status = 0;
if((result & ESB) = = 1) /*if ESB set*/
   {
   Send(0,5,"*ESR?",5,EOI);
   Receive(0,5,event_status,1,EOI);
   if((event_status & DDE) !=0) /*if measurement bad*/
   Printf("failed measurement");
   }
```

### Query Syntax- None

## 3-14 *TST? (Test Instrument) query

The ***TST?** query initiates a series of tests to be executed.

### Command Syntax- None

Returned value: 0 = passed
Non-zero = failed

### Query syntax- *TST?

Example:
```
Send(0,5,"*TST?",5,EOI);
Receive(0,5,status,1,EOI);
```

## 4-1 DESCRIPTION OF THE ROOT COMMANDS

The **ROOT** commands are used to do a few basic instrument functions or read status.

Root commands: **:LER?** **:RUN**
**:SDS?** **:TER?**

## 4-2 LER?

The **LER?** query reads the Local Event Register. When the query is received and the register is read, it is also cleared. The status of the Local Event Register (0 or 1) is indicated by a serial poll status bit 1. When the LCL bit of a serial poll is a 1, the Device Clear (DCL) is complete. See the common command ***RST** for use with the **LER?** query.

**Command syntax -** None

**Query syntax - :LER?**

Example:
```
int result;
Send(0,5,":LER?",5,EOI);
ReadStatusByte(0,5,& result);
Printf("%d\n",result);
```

## 4-3 RUN

The **RUN** command initiates a measurement to be started in the SIA-3000. Performs the same function as common command ***TRG**.

**Command syntax - :RUN**

Example:
```
Send(0,5,":RUN",4,EOI);
```

**Query syntax-** None

## 4-4 SDS?

The **SDS?** query reads the Special Device Status register. When the query is received the register value is returned and the register is cleared. The status of the Special Device Status register (0 or 1) is indicated by a serial poll or STB command on bit 3. This bit is used differently by specific instrument commands.

Recall storage.....1 = command complete
Display panel ON.....1 = command complete

**Command syntax-** None

**Query syntax- :SDS?**

Example:
```
int result
Send(0,5,":SDS?",5,EOI);
result = 1;
   while((result&0x08) !=0) {
   ReadStatusByte(0,5,& result) ;
   }
Send(0,5,"*RCL5",5,EOI);
result = 0,
   while((result&0x08 = =0) {
   ReadStatusByte(0,5,& result);
   }
/*command complete*/
```

## 4-5 TER?

The **TER?** query enables the TRG Event Register to be read. Once the TRG Event Register is read, it is cleared. A one (1) indicates a trigger has occurred. A zero (0) indicates a trigger has not occurred.

**Command syntax-** None

**Query syntax- :TER?**

Returned Format: Bit 1 of a serial poll will indicate the value of the TRG Event Register.

Example:
```
int result;
Send(0,5,":TER?",5,EOI); /*clear TRG bit*/
while((result & 0x01) !=0){
   ReadStatusByte(0,5, & result);
   }
Send(0,5,"*TRG",4,EOI);
while((result & 0x01) !=1){
   ReadStatusByte(0,5, & result);
   }
/*command complete*/
```

Use the TER query to indicate when the following commands are complete:

Burst (*TRG)
Pulse Finder (:ACQ:LEV)
Internal Calibration
External Calibration
Strobe Calibration
Cable Measure

## 5-1 Introduction

Of the three GPIB command sets that can be implemented, Basic Measures is the "lowest" level. It provides essential signal measurements such as Period/Pk-Pk/1-sigma and skew. It is also the fastest method and is used mostly in ATE or production environments where very basic tests and fast test times are required. While this method is fast, it is not comprehensive.

### Example code

The following example is typical of a simple measurement of the period of a clock signal. It is pseudo code because different operating systems and programming languages may have different requirements for some instructions. In general, this example should serve as a useful example.

```
// Pseudo - code to set up a period measurement - assumes channel 1
Send(0,5,":ACQ:FUNC PER",13,EOI);          //  Period measurement
Send(0,5,":ACQ:COUN 1000(@1)",18,EOI);     //  Set the sample count
Send(0,5,":CHAN1START:COUNT 1",19,EOI);    //  First rising edge
Send(0,5,":CHAN1STOP:COUNT 2",18,EOI);     //  To next rising edge
Send(0,5,":TRIG:SOURCE INTERNAL",21,EOI); //  Arm off the signal itself
Send(0,5,":DISP:LEV 5050",14,EOI);         //  50% voltage threshold

// Pseudo-code to sample the signal to establish the voltage threshold
// This takes about 130ms, otherwise user voltages can be used
Send(0,5,":ACQ:LEV(@1)?",13,EOI);          //  Request the "pulsefind"
Receive(0,5,Buffer,sizeof(Buffer),EOI);    //  Go get the results

// The buffer will hold results (min voltage, max voltage) similar to the following:
:ACQUIRE:LEVEL -0.1082758 +0.8043081

// To establish user voltages use the following:
Send(0,5,":DISP:LEV USER",14,EOI);         //  USER voltage threshold
Send(0,5,":CHANSTART:LEV -0.125",21,EOI); //  First measurement edge
Send(0,5,":CHANSTOP:LEV -0.125",20,EOI);  //  Next measurement edge

// To take the measurement use the following command
Send(0,5,":ACQ:ALL PER(@1)",16,EOI);       //  Request the measurement
Receive(0,5,Buffer,sizeof(Buffer),EOI);    //  Go get the results

// The buffer will hold results (avg, stdev, min, max) similar to the following:
:ACQUIRE:ALL +1.1082758e-009 +2.8043081e-12 +1.1006245e-009 +1.1163601e-009

//For skew measurements similar commands are used, except substitute the following:
Send(0,5,":ACQ:FUNC TPD++",13,EOI);        //  TPD from rising to rising edge
Send(0,5,":ACQ:COUN 1000(@1,2)",20,EOI);  //  Set the sample count, both channels
Send(0,5,":CHAN1START:COUNT 1",19,EOI);    //  First rising edge, channel 1
Send(0,5,":CHAN2STOP:COUNT 1",18,EOI);     //  First rising edge, channel 2
Send(0,5,":TRIG:SOURCE INTERNAL",21,EOI); //  Arm off the signal itself
Send(0,5,":DISP:LEV 5050",14,EOI);         //  50% voltage threshold

// Pseudo-code to sample the signal to establish the voltage threshold
// This takes about 130ms, otherwise user voltages can be used
Send(0,5,":ACQ:LEV(@1,2)?",13,EOI);        //  Request the "pulsefind", both channels
Receive(0,5,Buffer,sizeof(Buffer),EOI);    //  Go get the results

// The buffer will hold results (min voltage, max voltage) similar to the following:
:ACQUIRE:LEVEL -0.1082758 +0.8043081 -0.1006245 +0.1163601

// To take the measurement use the following command
Send(0,5,":ACQ:ALL TPD++(@1&2)",16,EOI);   //  Measurement from Chan1 to Chan2
Receive(0,5,Buffer,sizeof(Buffer),EOI);    //  Go get the results
```

## 5-2 ACQUIRE COMMANDS

The **ACQUIRE** commands are used to set parameters used during a measure command.

**:ACQ**uire:<command syntax>

Acquire commands:

| | | |
|---|---|---|
| **ALL** | **FUNC**tion | **TIMEOUT** |
| **ANAL**ysis | **GRO**up | **RUN** |
| **COMP**lete | **LEV**el | **WIND**ow |
| **COUN**t | **MEAS**ure | |
| **DUTY** | **SET**s**COUN**t | |

- **ALL**

The **ALL** command will select 1 of 11 functions, take a measurement and return the average, standard deviation, minimum and maximum. The function selected will force the following parameters to defaults:

Edges - Rising or falling

Channel - Single or both (if a single channel function, start or stop will be selected based on last single channel selected).

Arming - Auto-on-start, auto-on-stop, start first or stop first, based on the last arming sequence selected for that function.

**Command syntax- :ACQ**uire**:ALL**<TT+|TT-|PW+|PW-|PERiod+|PERiod-|TPD++|TPD- -|TPD+-|TPD-+|FREQ>

Example:
```
Send(0,5,":ACQuire:ALLTT+",15,EOI);
Receive(0,5,data,4,EOI);
```

- **ANALYSIS:CLOCK**

The **ANALYSISCLOCK** command will run a preset macro to initiate and return four measurements of four functions (PW+, PW-, Per+, Per-; Avg, Min, Max, standard deviation) for a total of 16 measurements based on the channel list selected.

**Command syntax- :ACQ**uire**:ANAL**ysis**CLOC**k(@<n,m,x,...>|<n:m>)

Example:
```
Send(0,5,":ACQuire:ANALysisCLOCk200",25,EOI);
Receive(0,5,data,4,EOI)
```

- **ANALYSIS:FUNCTION**

The **ANALYSISFUNCTION** command selects 1 of 10 functions and takes a measurement for the number of counts. The returned values are the mean of the measure, standard deviation, minimum and maximum in binary for each event where event is defined as a measurement. The returned values are in picoseconds except for frequency that returns the values in kilohertz.

**Command syntax- :ACQ**uire**:ANAL**ysis**FUNC**tion</**FUNC**/LowStartCount/HighStartCount/StopCountDesignator/Increment/DataDes>(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":ACQuire:ANALysisFUNCtion/PW+/1/1/100/=/10/4",44,EOI);`

Example: `Send(0,5,":ACQuire:ANALysisFUNCtion/PER/2/1/100/+/10/4",44,EOI);`

If StopCount Designator = "+", Returns Stop Event
= "=", Returns Start Event

If DataDes = 2
Returns: Mean and standard deviation in binary

If DataDes = 4
Returns: The mean, standard deviation, minimum and maximum in binary.

Default: DataDes = 4

- **ANALYSIS:JITTER**

The **ANALYSISJITTER** command selects 1 of 10 functions and takes a measurement for the number of counts. The returned values are jitter, standard deviation, minimum and maximum in binary for each event where event is defined as a measurement. The returned value is in picoseconds, except for frequency that returns the values in kilohertz.

**Command syntax- ACQuire:ANALysisJITTer</FUNC/CHAN/StartCount/LowStopCount /HighStopCount/Increment/DataDes>**

Example: `Send(0,5,":ACQuire:ANALysisJITTer/PW+/1/1/1/100/10/3",42,EOI);`
Example: `Send(0,5,":ACQuire:ANALysisJITTer/PER/2/1/2/100/10/3",42,EOI);`

If DataDes = 3
Returns: Jitter, i.e., standard deviation, min, max in binary.
If DataDes = 2
Returns: Jitter, i.e., standard deviation and mean.

Default: DataDes = 3

- **ANALYSIS:RANGE**

The **ANALYSISRANGE** command is similar to the **ANALYSISJITTER** command except the returned value is the range, (Max –Min)/2, with minimum and maximum in binary for each event where event is defined as a measurement.

**Command syntax- :ACQuire:ANALysisRANGe</FUNC/CHAN/StartCount/LowStopCount /HighStopCount/Increment/DataDes>**

Example: `Send(0,5,":ACQuire:ANALysisRANGe/PW+/1/1/1/100/10/3",41,EOI);`
Example: `Send(0,5,":ACQuire:ANALysisRANGe/PER/2/1/2/100/10/3",41,EOI);`

If DataDes = 3
Returns: Range, min, max in binary.
If DataDes = 2
Returns: Range, standard deviation and mean.
Default: DataDes = 3

- **COMPLETE**

The **COMPLETE** query returns the number of measurements completed for the specified channels. The returned value will be an ASCII integer value.

**Command syntax- NONE**

**Query syntax- :ACQuire:COMPlete(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":ACQuire:COMPlete?",18,EOI);`
`Receive(0,5,data,1,EOI);`
Response: <ASCII count>

- **COUNT**

The **COUNT** command sets the number of measurements used to develop the statistics, average, minimum, maximum, range and standard deviation for the specified channels. The number of measurements can range from 1 to 1,000,000. The **COUNT** query returns the present setting of the count value.

**Command syntax- :ACQuire:COUNt<ASCII integer value>(@<n,m,x,…>|<n:m>)**

Example: `Send(0,5,":ACQuire:COUNt200",17,EOI);`

**Query syntax- :ACQuire:COUNt(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5":ACQuire:COUNt?",15,EOI);`
`Receive(0,5,data,1,EOI);`
Response: <ASCII integer>

- **DUTY**

The **DUTY** command will calculate the duty cycle of the signal and return a three digit ASCII number. The percent will be of the positive pulse width in a format of xx.x%.

**Command syntax- :ACQuire:DUTY**(@ <n,m,x,…>|<n:m>)

Example: `Send(0,5,":ACQuire:DUTY",12,EOI);`
Response: `49.8` (49.8%)

- **FUNCTION**

The **FUNCTION** command will select 1 of 11 functions that will guide the instrument during time measurements. The function selected will force the follow parameters to defaults:

Edges - Rising or falling

Channel - Single or both (if a single channel function, start or stop will be selected based on last single channel selected).

Arming - Auto-on-start, auto-on-stop, start first or stop first, based on the last arming sequence selected for that function.

The **FUNCTION** query will return the currently selected function.

**Command syntax- :ACQuire:FUNCtion**<TT+|TT-|PW+|PW-|PERiod+|PERiod-|TPD++|TPD- -|TPD+-|TPD-+|FREQ>

Example: `Send(0,5,"ACQuire:FUNCtionTT+",19,EOI);`

**Query syntax- :ACQuire:FUNCtion?**

Example: `Send(0,5,":ACQuire:FUNCtion?",18,EOI);`
Response: <TT+|TT-|PW+|PW-|PER|TPD++|TPD—|TPD+-|TPD-+|FREQ>

- **GROUP**

After a user has defined a group (see Section 5-11, :SYSTem:GROUP<ON|OFF>), this command is called to execute all the commands that had been queued up in that particular group.

**Command syntax- :ACQuire:GROUP**<1-20>

Example: `Send(0,5,":ACQuire:GROUP5", 17, EOI);`

- **LEVEL**

The **LEVEL** command causes the instrument to find the pulse levels on the start and/or stop channels depending on the channel selection. If the arming source selected is external, the levels of the arming channels are found as selected.

The levels are stored and can later be read by using the channel commands. The percent of the peak level found will be displayed and returned as the new start and stop references.

The levels found for each channel are the minimum and maximum peak and the selected percentage of these peaks.

**Command syntax- :ACQuire:LEVel**(@ <n,m,x,…>|<n:m>)

Example: `Send(0,5,":ACQuire:LEVel@",14,EOI);`

**Query syntax- :ACQuire:LEVel**(@ <n,m,x,…>|<n:m>)**?**

- **MEASURE**

The **MEASURE** command will take a time measurement and return the average and standard deviation. The present function and reference voltages are used. This is a fast method of performing the acquire run command repetitively.

**Command syntax- :ACQuire:MEASure**

Example:
```
Send(0,5,":ACQuire:MEASure",16,EOI);
Receive(0,5,data,2,EOI);
```

- **RUN**

The **RUN** command will select 1 of 10 functions, take a measurement and return the average and standard deviation. The function selected will force the following parameters to defaults:

Edges - Rising or falling

Channel - Single or both (if a single channel function, start or stop will be selected based on last single channel selected.

Arming - Auto-on-start, auto-on-stop, start first or stop first, based on the last arming sequence selected for that function.

**Command syntax- :ACQuire:RUN**<TT+|TT-|PW+|PW-|PERiod+|PERiod-|TPD++|TPD- -|TPD+-|TPD- +|FREQ>(@<n,m,x,…>|<n:m>)

Example:
```
Send(0,5,":ACQuire:RUNTT+",15,EOI);
Receive(0,5,data,1,EOI);
```

- **SETSCOUNT**

The **SETSCOUNT** command sets the count of a set of measurements that will create an average. This average is used with other set averages of sample size, to create the statistics available for return over the GPIB interface. The sets size value can range from 1 to 950000.

As an example, a sets size of a 100 and sample size of 1000 means that the statistics are of 10000 measurements of size 100.

The **SETSCOUNT** query returns the present setting of the sets size.

**Command syntax- :ACQuire:SETsCOUNt**<1 to 950000>(@ <n,m,x,…>|<n:m>)

Example:
```
Send(0,5,":ACQuire:SETsCOUNt100",21,EOI);
```

**Query syntax- :ACQuire:SETsCOUNt(@ <n,m,x,…>|<n:m>)?**

Example:
```
Send(0,5,":ACQuire:SETsCOUNt?",19,EOI);
```
Response: <ASCII setscount>

- ## TIMEOUT

The **TIMEOUT** command configures the maximum time that is allowed for a measurement set as a whole to be completed. The :SYSTEM:TIMEOUT command is used to set the timeout for one individual measurement, regardless of the sample size. Even if the :SYSTEM:TIMEOUT command is set to a sufficient value, the measurement may fail due to a large sample size, intermittent arming, or in the event of an :ACQUIRE:ANALYSIS command which may span a range of start and stop counts. The :ACQUIRE:TIMEOUT command is used to set a maximum timeout for the measurement set as a whole, the allowable values are from 1 to 10,000 seconds, and the default is 16 seconds.

**Command syntax-** `:ACQuire:TIMEOUT<1 to 10000>`

Example: `Send(0,5,":ACQuire:TIMEOUT100",19,EOI);`

**Query syntax-** `:ACQuire:TIMEOUT?`

Example: `Send(0,5,":ACQuire:TIMEOUT?",17,EOI);`
Response: 16

- ## WINDOW

The **WINDOW** command is a macro to set parameters and return the average (mean) voltage of the window. The window can be of a delay from 20,000ps to 100,000,000ps.

To describe a window, three (3) parameters can be given. If any parameter is omitted the forward slash (/) must be placed in the command to indicate the proper spacing.

The three parameters are:

start delay value.....20,000ps to 100,000,000ps
stop delay value.....20,000ps to 100,000,000ps
increment between points.....see system strobe increment command
or
number of measurement points.....see system strobe points command

**Command syntax-** `:ACQuire:WINDow/start value/stop value/<step increment|#of points>`

Example 1:
```
Send(0,5,":ACQuire:WINDow/25000/50000/1000",32,EOI);
Receive(0,5,voltage level,5,EOI);
```

Example 2:
```
Send(0,5,":ACQuire:WINDow/25000/50000/#100",32,EOI);
Receive(0,5,voltage level,5,EOI);
```

## 5-3 CALIBRATE COMMANDS

The **CALIBRATE** commands enables the host to perform an internal or external calibration and set or read the external calibration values.

**:CAL**ibrate**:**<command syntax>

Calibrate commands:

| | | | |
|---|---|---|---|
| **DATA** | **DESKEWDC** | **SIG**nal | **XINT**ernal |
| **DESKEW** | **INT**ernal | **STAT**us | |

- **DATA**

The **DATA** command can be used to enable the host to write the individual channel skew values to the instrument. There are 10 skew values (one value per possible SIA channel) that must be sent to the device from the host in the following format (ANSI/IEEE Std. 754-1985 floating-point standard):

#xy..ddddddddd.., where:
x = an ASCII digit representing the number of digits in y
y = a string of digits, of x length, which represents the number of bytes of information to be sent.
d = calibration data

The DATA query command is used to read the 10 values that are returned in the same floating-point format (ANSI/IEEE Std. 754-1985).

**Command Syntax- :CAL**ibrate**:DATA**<#xy..ddddddddd..>

Example: Send(0,5, ":CALibrate:DATA#280<80 bytes of data (10 skew values - 10x8)>", 99, EOI);

**Query Syntax- :CAL**ibrate**:DATA?**

Example: Send(0,5, ":CALibrate:DATA?", 20, EOI);
Response: #280<80 bytes of data(10 skew values - 10x8)>

- **DESKEW**

The **DESKEW** command permits the user to perform the Deskew calibration remotely over GPIB rather than on the SIA-3000 front panel (*GigaView*™).

**Command syntax- :CAL**ibrate**:DESKEW**

Example: Send(0,5,":CALibrate:DESKEW",17,EOI);

- **DESKEWDC**

The **DESKEWDC** command permits the user to perform the Deskew with DC calibration remotely over GPIB rather than using the SIA3000™ front panel (*GigaView*).

**Command syntax- :CAL**ibrate**:DESKEWDC**

Example: Send(0,5,":CALibrate:DESKEWDC",19,EOI);

- **INTERNAL**

The **INTERNAL** command permits the user to perform the internal (Timer) calibration remotely over GPIB rather than using the SIA3000 front panel (*GigaView*). The internal calibration function will process 20,000,000 samples while taking 11 minutes to complete.

**Command syntax- :CAL**ibrate**:INT**ernal

Example: Send(0,5,":CALibrate:INTernal",19,EOI);

See Appendix A for a more complete example.

- ## XINTERNAL

The **EXTENDED INTERNAL CALIBRATION** allows the user to possibly reduce jitter due to the noise floor of the instrument through the use of longer internal calibration periods. The multiplier, from 1 to 25, extends the base calibration period of approximately 5.5 minutes by the selected multiplier. A setting of 6 is recommended.

**Command Syntax- :CAL**ibrate**:XINT**ernal<ASCII VALUE>

Example: `Send(0,5,":CALibrate:XINTernal6",21,EOI");`

- ## SIGNAL

The **SIGNAL** command will set the calibration signal to the specified parameter.

**Command Syntax- :CAL**ibrate**:SIG**nal<OFF|10M|900MOUTP|900INP>

Example: `Send(0,5,":CALibrate:SIGnal1M",19,EOI);`

**Query syntax- :CAL**ibrate**:SIG**nal**?**

Example: `Send(0,5,":CALibrate:SIGnal?",18,EOI);`
Response: 10M

- ## STATUS

The **STATus** query will return the current status of the calibration tests. (0 = pass, 1 = fail):

**Command Syntax-** None

**Query syntax- :CAL**ibrate**:STATUS?**

Example: `Send(0,5,":CALibrate:STATUS?",15,EOI);`

| Bit Pos. | Hex Value | Description |
|---|---|---|
| 0 | 1 | Internal Calibration |
| 1 | 2 | Deskew Calibration |
| 3 | 4 | DeskewDC Calibration |
| 4 | 8 | Strobe Calibration |

## 5-4 CDR COMMANDS

The **CDR** commands are used to do a few basic instrument functions or to read the instrument status.

**:CDR:**<command syntax>

CDR commands: **CORR**ection
**COUNT**
**LOCKED**
**RATE**

In all of the following commands the "n" in (@n) should be replaced with the channel number of the CDR. The numbering for the CDR's begins at 1 more than the number of measurement channels in the system. For example, if there are 5 measurement channels in the system, the first CDR would be specified (@6).

### • CORRECTION

The **CORRECTION** command enables/disables the voltage correction for a particular CDR.

Note: The voltage correction is only applied to oscilloscope measurements on the measurement channel associated with the CDR.

The **CORRECTION** query determines if the channel voltage correction is enabled.

Returns: 0 if disabled,
1 if enabled
-1 if an error was encountered.

**Command syntax - :CDR:CORR**ection<ON|OFF|1|0>(@n)

Example: Send(0,5,":CDR:CORRectionON@3",19,EOI);

**Query syntax - :CDR:CORR**ection(@n)**?**

Example: Send(0,5,":CDR:CORRection@3?",18,EOI);
Response: <-1|0|1>
Example: 1

### • COUNT?

The **COUNT** query determines the number of CDRs in the system.

Returns: 0,1,2,3,4,or 5 on success
-1 if an error was encountered

**Command syntax -** None

**Query syntax - :CDR:COUNT?**

Example: Send(0,5,":CDR:COUNT?",11,EOI);
Response: <-1|0|1|2|3|4|5>
Example: 2

### • LOCKED?

The **LOCKED** query determines the lock state of a specified CDR.

Returns: 0 if locked or
-29 if unlocked; an error was encountered

**Command syntax-** NONE

**Query syntax- :CDR:LOCKED**(@n)**?**

Example: Send(0,5,":CDR:LOCKED@3?",14,EOI);
Response: <-29|0>
Example: 0

- **RATE**

The **RATE** command sets the current bit rate for a specified CDR.

NOTE: The bit rate specified should be in the range 25e6 - 3.18e9 bits/sec.

The **RATE** query determines the current bit rate setting for a specified CDR.

Returns: A bit rate in the range 25e6 - 3.18e9 bits/sec.
-1 if an error was encountered

**Command syntax - :CDR:RATE**><bit rate>(@n)

Example: `Send(0,5,":CDR:RATE2.500e9@3",18,EOI);`

**Query syntax - :CDR:RATE**(@n)**?**

Example: `Send(0,5,":CDR:RATE@3?",18,EOI);`
Response: <25e6 - 3.18e9 bits/sec>

Example: `2500000000.000000`

## 5-5 CHANNEL COMMANDS

The **CHANNEL** commands write and read the channel start and stop reference voltages, the arm-on-*n*th counts and external arming selections. Multiple DSMs can be configured using the **SWITCH** command Mux address (@n) from 1 to 8.

**:CHAN**nel<n><**STAR**t|**STOP**>**:**<command syntax>

Channel commands:

| | |
|---|---|
| **COUN**t | **LEV**el |
| **EXT**ernalarm | **MIN**imum/**MAX**imum |
| **FREQ**uency | **SWIT**ch |

### • COUNT

The **COUNT** command sets the arm-on-*n*th-event count for either the start or stop event. The range of the *n*th event is from 1 to 10000000.

The **COUNT** query returns the count of either the start or stop event.

**Command syntax- :CHAN**nel<n><**STAR**t|**STOP**>**:COUN**t<value>

Example: `Send(0,5,":CHANnel4STARt:COUNt100",23,EOI);`

**Query syntax- :CHAN**nel<n><**STAR**t|**STOP**>**:COUN**t**?**

Example: `Send(0,5,":CHANnel4STOP:COUNt?",20,EOI);`
Response: <ASCII count>

### • EXTERNALARM

The **EXTERNALARM** command selects which arming channel is associated with the start and stop events.

The **EXTERNALARM** query returns the arming selected for a specific (start/stop) event.

**Command syntax- :CHAN**nel<n>**:EXT**ernalarm<a>

Example: `Send(0,5,":CHANnel4:EXTernalarmARM1",25,EOI);`

**Query syntax- :CHAN**nel<n>**:EXT**ernalarm**?**

Example: `Send(0,5,":CHANnel4:EXTernalarm?",22,EOI);`
Response: <ARM1|ARM2>

### • LEVEL

The **LEVEL** command sets the start/stop reference levels. The range is ±2 volts in 150-microvolt resolution.

The **LEVEL** query returns the start/stop levels. The level returned is an integer value.

**Command syntax- :CHAN**nel<n><**STAR**t|**STOP**>**:LEV**el<value>

Example: `Send(0,5,":CHANnel4STARt:LEVel+1.5",24,EOI);`

**Query syntax- :CHAN**nel<n>**STAR**t**:LEV**el**?**

Example: `Send(0,5,":CHANnel4STARt:LEVel?",21,EOI);`
Response: <value>
Example: `+1.50000`

See Appendix C for more information regarding returned data formats.

- ## MINIMUM/MAXIMUM

The **MINIMUM/MAXIMUM** query returns the minimum or maximum peak levels of the start or stop reference levels. The peak values measured when the last pulse find was initiated. This pulsefind could have been initiated from the front panel or with the `:Acquire:Level` command.

**Command syntax-** None

**Query syntax- :CHAN**nel<n><**STAR**t|**STOP**>:<MIN|MAX>**?**

Example: `Send(0,5,":CHANnel4STARt:MIN?",19,EOI);`
Response: <ASCII MIN or MAX peak level>
Example: `-1.01890`

- ## SWITCH ON/OFF

The **SWITCH ON/OFF** command enables or disables the switches on the front panel of the DSM-16.

**Command syntax- :CHAN**nel**:SWIT**ch(@n)<ON|OFF>

Example: `Send(0,5,":CHANnel:SWITch4ON",17,EOI);`

**Query syntax**- NONE

- ## SWITCH IDN

The **SWITCH IDN** query returns the version number of the DSM–16. The returned value is an ASCII number representing the version major and minor (i.e. 1.1).

**Command syntax-** None

**Query syntax- :CHAN**nel**:SWIT**ch(@n)**IDN?**

Example: `Send(0,5,":CHANnel:SWITch4IDN?",19,EOI);`
Response: <ASCII number 1-8>

- ## SWITCH number

The **SWITCH** number command identifies the instrument's input channel to be selected. The DSM–16 was designed to be used as a 1 of 8 matrix to the instrument's channel (1 of 8 to channel X, and 1 of 8 to channel Y). The matrix inputs are assigned channel numbers 11-18 and 21-28.

**NOTE**: A small number of units are labeled 1 through 16.

**Command syntax- :CHAN**nel**:SWIT**ch(@n)<11...18|21...28>

Example: `Send(0,5,":CHANnel:SWITch215",17,EOI);`

This will select the left bank of eight, fifth input from the left of the DSM with Mux address 2.

**NOTE**: The DSM-16 can be configured as a 1 of 15 matrix by connecting the eighth input from the left bank to the Channel 2 output.

**Query syntax- :CHAN**nel**:SWIT**ch(@n)**?**

Example: `Send(0,5,":CHANnel:SWITch2?",16,EOI);`

Response: <ASCII digits>

The returned format is ASCII digits representing the Mux address of the DSM, followed by both channel and switch numbers and separated by a space.

Example: `2 2 3`

## 5-6 DISPLAY COMMANDS

The **DISPLAY** commands control the displaying of information on the front panel and if filtering is used in developing the statistics.

**:DISP**lay:<command syntax>

Display commands: **FILT**er – ON/OFF/0/1 **LEV**el
MIN/MAX (Limits) **USER**

- **FILTER (ON/OFF)**

The **FILTER** (ON/OFF) command is used to select whether filtering will be used in calculating the statistics.

The **FILTER** query returns the current ON|OFF|0|1 selection.

**Command syntax- :DISP**lay**:FILT**er<ON|OFF>

Example: Send(0,5,":DISPlay:FILTerON",17,EOI);

**Query syntax- :DISP**lay**:FILT**er**?**

Example: Send(0,5,":DISPlay:FILTer?",16,EOI);
Response: <ON|OFF>

- **FILTER (Limits)**

The **FILTER** (limits) query commands return the ASCII floating point value of the presently set limits. Limits are ±2.5 seconds. Maximum setting must be greater than Minimum setting. A value of -999,999,999 is returned by the measure deviation query command if there were not any measurements within the limits.

**Command syntax- :DISP**lay**:FILT**er<**MIN**imum|**MAX**imum><signed ASCII floating point>
Example: Send(0,5,":DISPlay:FILTerMINimum+0.000000000500",37,EOI);

**Query syntax- :DISP**lay**:FILT**er<**MIN**imum|**MAX**imum>**?**

Example: Send(0,5,":DISPlay:FILTerMINimum?",23,EOI);
Response: <Signed ASCII floating point>
Example: -5.000000e+001 (-0.5)

- **LEVEL**

The **LEVEL** command sets the start and stop percentage level of peaks that the start and stop references will be set to. This percentage of peak will also be what the front panel start and stop references will be displaying.

The **LEVEL** query will return a start and stop percentage setting in two ASCII integers.

**Command syntax- :DISP**lay**:LEV**el<5050|1090|9010|2080|8020>

Example: Send(0,5,":DISPlay:LEVel2080",18,EOI);

**Query syntax- :DISP**lay**:LEV**el**?**

Example: Send(0,5,":DISPlay:LEVel?",15,EOI);
Response: <valuevalue>
Example: 2080

- ## USER

The **USER** command selects the user set of references of the current function.

The instrument is capable of having the reference voltages set by two (2) methods.

1. Doing a pulse find and setting the references to a percentage of the peaks found.
2. Setting the start and stop voltage trip reference to a value.

When the user set the reference voltages directly, this is defined as a USER setting and is later selected by the display user command.

The **USER** query returns the setting of the user reference voltages.

**Command syntax- :DISP**lay**:USER**<ON|OFF|0|1>

Example: `Send(0,5,":DISPlay:USERON",15,EOI);`

**Query syntax- :DISP**lay**:USER?**

Example: `Send(0,5,":DISPlay:USER?",14,EOI);`
Response: <ON|OFF|0|1>

## 5-7 FILE COMMANDS

The **FILE** commands are used to transfer files to and from the SIA3000 using the GPIB interface.

**:FILE:**<command syntax>

File commands: **APPEND** **LIST** **READ** **SAVE**

- ### APPEND

The **APPEND** command is used to upload files from a host computer to the SIA3000. The GPIB input buffer is of limited size; so large files must be uploaded in chunks. The first block should be written using the **:FILE:SAVE** command, then subsequent blocks should be sent using the **:FILE:APPEND** command. Individual chunks should be no larger than 10,000 bytes in size. An ASCII header that specifies the size of the data in bytes precedes the data chunk.

**Command syntax- :FILE:APPEND**<filename><#xyy…ddddddd…>

Example: `Send(0,5,":FILE:APPEND K285.PTN#280…",105,EOI);`

- ### LIST

The **LIST** command is used to obtain a tab delimited list of the files present in a directory on the SIA3000. Folders within the directory requested are returned with their names enclosed in brackets.

**Command syntax- :FILE:LIST**<directory>

Example: `Send(0,5,":FILE:LIST C:",18,EOI);`
Response: <ASCII string><tab><ASCII string>…
Example: [Drivers] [Temp] [Visi] [WinNT] autoexec.bat boot.ini config.sys

- ### READ

The **READ** command is used to download a file from the SIA3000 to the host computer. An ASCII header that specifies the size of the data in bytes precedes the data chunk.

**Command syntax- :FILE:READ**<filename>

Example: `Send(0,5,":FILE:READ K285.PTN",19,EOI);`
Response: #xy…ddddddd…

- ### SAVE

The **SAVE** command is used to upload files from a host computer to the SIA3000. The GPIB input buffer is of limited size; so large files must be uploaded in chunks. The first block should be written using the **:FILE:SAVE** command, then subsequent blocks should be sent using the **:FILE:APPEND** command. Individual chunks should be no larger than 10,000 bytes in size. The data chunk is preceded by an ASCII header which specifies the size of the data in bytes. If the target files already exists, the file will be truncated to zero length before the data chuck is written to it.

**Command syntax- :FILE:SAVE**<filename><#xyy…ddddddd…>

Example: `Send(0,5,":FILE:SAVE K285.PTN#280…",103,EOI)`

## 5-8 GLOBAL COMMANDS

The **GLOBAL** commands are used to set some parameters which are global across all tools.

**:GLOBAL:**<command syntax>

Global commands: **CHAN**nel**<N>:ATTEN**uation **RISEFALL**

- ### CHANNEL:ATTENUATION

The **CHANNEL:ATTENUATION** command is used to scale the scope output to compensate for scope probes, or some other external scaling factor. This scaling factor is applied before any analysis is performed on the scope data. The amount of attenuation can be specified by a multiplier or in dB's.

The **CHANNEL:ATTENUATION** query returns the current scope output scaling factor.

**Command syntax- :GLOB**al**:CHAN**nel**<N>:ATTEN**uation<-40 to 40>DB

Example: Send(0,5,":GLOB:CHAN4:ATTEN 3DB",21,EOI);

**Command syntax- :GLOB**al**:CHAN**nel**<N>:ATTEN**uation<0.01 to 100>X

Example: Send(0,5,":GLOB:CHAN4:ATTEN 0.01X",24,EOI);

**Query syntax- :GLOB**al**:CHAN**nel**<N>:ATTEN**uation**?**

Example: Send(0,5,":GLOB:CHAN4:ATTEN?",18,EOI);
Response: <ASCII floating point>dB/<ASCII floating point>X
Example: 0.000dB/1.000X

- ### RISEFALL

The **RISEFALL** command is used to specify the voltage thresholds for calculating Rise Time and Fall Time. The input can either be in percentage or in absolute voltage. If specified in percentage, it is assumed to be symmetrical about the 50% threshold, so the second term is effectively ignored. Both terms are respected if the value is entered in absolute voltage.

The **RISEFALL** query returns the current voltage thresholds for calculating Rise Time and Fall Time.

**Command syntax- GLOB**al**:RISEFALL**<1 to 49>/<51 to 99>

Example: Send(0,5,":GLOB:RISEFALL 10/90",20,EOI);

**Command syntax- GLOB**al**:RISEFALL**<-2000 to 2000>MV/<-2000 to 2000>MV

Example: Send(0,5,":GLOB:RISEFALL -200MV/200MV",27,EOI);

**Query syntax- GLOB**al**:RISEFALL?**

Example: Send(0,5,":GLOB:RISEFALL?",15,EOI);
Response: <ASCII integer>/<ASCII integer>
Example: 10/90
-OR-
Response: <ASCII integer>mV/<ASCII integer>mV
Example: -150mV/250mV

## 5-9 MARKER COMMANDS

The **MARKER<n>** commands are used to configure the pattern marker and read basic pattern marker statistics.

**:MARKER<n>:**<command syntax>

| | | | |
|---|---|---|---|
| MARKER commands: | **BEC?** | **OUT**put | **RESET** |
| | **EDGE**count | **PATT**ern | **STAT**us |
| | **MODE** | **PROT**ocol | |

In all of the following commands, the "n" in <n> should be replaced with the channel number of the pattern marker.

### • BEC?

The **BEC?** query returns the specified pattern marker's bit error count when the SIA-3000 is in pattern match mode.

**Query syntax - :MARK**er<**n**>**:BEC?**

Example: Send(0,5,":MARKER1:BEC?",13,EOI);
Response: <ASCII strings>
Example: (FrameNo1) (ExpBits1) (ErrBits1) (LoopCnt1)
(FrameNo2) (ExpBits2) (ErrBits2) (LoopCnt2)
…
(FrameNo63) (ExpBits63) (ErrBits63) (LoopCnt63)
(FrameNo64) (ExpBits64) (ErrBits64) (LoopCnt64)

### • EDGECOUNT

The **EDGECOUNT** command sets the count of rising or falling edges.

The **EDGECOUNT** query returns the current count of rising or falling edges.

**Command syntax - :MARK**er<n>**:EDGE**count<2-2147483647>

Example: Send(0,5,":MARKer2:EDGEcount6",19,EOI);

**Query syntax - :MARK**er<n>**:EDGE**count**?**
Example: Send(0,5,":MARKer2:EDGEcount?",19,EOI);
Response: <2-2147483647>
Example: 6

### • MODE

The **MODE** command selects the pattern marker measurement mode. Select either Pattern Match or Edge Count. In Pattern Match mode, the pattern marker card will generate a Pattern Marker when matching a unique 40-bit sequence of a pattern. The **PROTOCOL** also needs to be selected accordingly. In Edge Count mode, the pattern marker card will generate a pattern marker upon repetition of a user-specified number of positive or negative edges. For PRBS patterns use Edge Count mode only.

The **MODE** query returns the currently selected mode.

**Command syntax - :MARK**er<n>**:MODE**<EDGEcount|PATTernmatch>

Example: Send(0,5,":MARKer3:MODEEDGE",17,EOI);

**Query syntax - :MARK**er<n>**:MODE?**

Example: Send(0,5,":MARKer3:MODE?",14,EOI);
Response: <EDGEcount|PATTernmatch>
Example: EDGE

- **OUTPUT**

The **OUTPUT** command enables or disables the pattern marker output.

The **OUTPUT** query returns the current state of the pattern marker. (1=Selected, 0=Bypassed)

**Command syntax - :MARKer<n>:OUTPut<SELect|BYPass>**

Example: `Send(0,5,":MARKer3:OUTPutSEL",18,EOI);`

**Query syntax - :MARKer<n>OUTPut?**

Example: `Send(0,5,":MARKer3:OUTPut?",16,EOI);`
Response: <0|1>
Example: 1

- **PATTERN**

The **PATTERN** command sets the pattern that is matched against when Pattern Match Mode is selected. The pattern is also used as the master reference to detect errors when the Bit Error Counter is being used.

The **PATTERN** query returns the current pattern selected.

**Command syntax - :MARKer<n>:PATTern<CJTPAT.PTN|CLOCK.PTN|CRPAT.PTN|IDLE.PTN|K285.PTN|etc…>**

Example: `Send(0,5,":MARKer3:PATTernCLOCK.PTN",25,EOI);`

**Query syntax - :MARKer<n>:PATTern?**

Example: `Send(0,5,":MARKer3:PATTern?",17,EOI);`
Response: <CJTPAT.PTN|CLOCK.PTN|CRPAT.PTN|IDLE.PTN|K285.PTN|etc…>
Example: CLOCK.PTN

- **PROTOCOL**

The **PROTOCOL** command selects the measurement protocol. Not applicable for Edge Count Mode.

The **PROTOCOL** query returns the current protocol selected.

**Command syntax - :MARKer<n>:PROTocol<FC1X|GB1X|SATA|FC2X|GB2X|SATA2|XAUI|FC3X>**

Example: `Send(0,5,":MARKer2:PROTocolFC1X",21,EOI);`

**Query syntax - :MARKer<n>:PROTocol?**

Example: `Send(0,5,":MARKer2:PROTocol?",18,EOI);`
Response: <FC1X|GB1X|SATA|FC2X|GB2X|SATA2|XAUI|FC3X>
Example: FC1X

- **RESET**

The **RESET** command resets the BEC error count to zero.

**Command syntax - :MARKer<n>:RESET**

Example: `Send(0,5,":MARKER1:RESET",14,EOI);`

- **STATUS**

The **STATUS** query returns the whether or not the pattern marker card is currently detecting a signal and outputting a marker. If a signal is currently being detected and a marker is being generated, this command returns a 1. If no marker is currently being generated, this command returns a 0.

**Query syntax - :MARKer<n>:STATus?**

Example: `Send(0,5,":MARKER1:STATus?",13,EOI);`
Response: <0|1>
Example: 1

## 5-10 MEASURE COMMANDS

The **MEASURE** query returns the measurement statistics from the instrument to a host.

**:MEAS**ure:<command syntax>

MEASURE commands:

| Time Measurement | DC Measurement |
|---|---|
| **AVER**age | **Single** - |
| **DATA** (Float or Double) | **DC**level |
| **DATA4** | **NOTDC**vlevel |
| **DATAT** | **STRO**be**VLEV**el |
| **EVEN**t | **Multiple** - |
| **JITT**er | **VDATA** |
| **MAX**imum | **VDATA4** |
| **MIN**imum | **VMAX**imum |
| **RANG**e | **VMIN**imum |
| **S**tandard **DEV**iation | **VSDEV**iation |
| **STAT4** | **WIND**ow |
| **XDATA** | |

### • AVERAGE

The **AVERAGE** command returns the measured average of 1 to 1,000,000 measurements. The returned value is an ASCII floating point number.

**Command syntax-** None

**Query syntax- :MEAS**ure**:AVER**age(@ <n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":MEASure:AVERage?",17,EOI);
Response: <ASCII floating point>
Example: -8.4566284e-011

### • DATA/DATA4

The **DATA** query returns a selected number of measured values. These measured data values can be analyzed or used to provide a presentation. The Measure Data query supports two sizes of data types (See Appendix C) using IEEE standards for floating-point arithmetic (ANSI/IEEE Std. 754-1985). The returned data stream is of the following format:

**:MEAS**ure**:DATAT**<xy...ddddddddd...>
x = an ASCII digit representing the number of digits in y
y = a string of digits, of x length, which represents the number of bytes of information to be returned.
d=data

**Command syntax-** None

**Query syntax**-

Float — **:MEAS**ure**:DATA4**(@ <n,m,x,…>|<n:m>)**?**

:MEASure:Data#43200<200 bytes of data (50 measurements – 50x4)>

Double — **:MEAS**ure**:DATA**(@ <n,m,x,…>|<n:m>)**?**

:MEASure:Data#3400<400 bytes of data (50 measurements – 50x8)>

Example:
```
char data[2048]
Send(0,5,:MEASure:DATA4?,15,EOI);
Receive(0,5,data,205,EOI);
```

Example:
```
char data[2048]
Send(0,5,:MEASure:DATA?,14,EOI);
Receive(0,5,data,405,EOI);
```

- **DATAT**

The **DATAT** query command returns the elapsed time measurements from a previous burst after the elapsed time counter has been turned on. With a sample size of 100 there will be 100 floating-point time measurements returned.

The **DATAT** query returns a selected number of measured values. These measured data values can be analyzed or used to provide a presentation. See Appendix C for the returned data stream format types:

**:MEAS**ure**:DATAT**<xy...ddddddd...>
x = an ASCII digit representing the number of digits in y
y = a string of digits, of x length, which represents the number of bytes of information to be returned.
d=data

**Query syntax- :MEAS**ure**:DATAT**(@ <n,m,x,…>|<n:m>)**?**

Float — **:MEAS**ure**:DATAT?**

Example:
```
char data[2048]
Send(0,5,":MEASure:DATAT?",15,EOI);
Receive(0,5,data,205,EOI);
```

- **DCVLEVEL**

The **DCVLEVEL** command returns the dc voltage measured on the selected input channel. The returned value is an ASCII string of five digits preceded by a (+) or (-) sign. The value is a signed integer with 100 microvolt resolution.

**Command syntax- :MEAS**ure**:DC**vlevel(@ <n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":MEASure:DCvlevel?",18,EOI);`
Response: `-1.1444092e-004`

- **JITTER**

The **JITTER** query returns the standard deviation of the selected sample size.

**Command syntax-** None

**Query syntax- :MEASure:JITT**er(@ <n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":MEASure:JITTer?",16,EOI);`
Response: <ASCII floating point>
Example: `+7.3441603e-012`

- **MAX**

The **MAX** query command returns the maximum measured value of a set of measurements.

**Command syntax-** None

**Query syntax- :MEAS**ure**:MAX**(@ <n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":MEASure:MAX?",13,EOI);`
Response: <ASCII floating point>
Example: `-6.5307617e-011`

- **MIN**

The **MIN** query command returns the minimum measured value of a set of measurements.

**Command syntax-** None

**Query syntax- :MEAS**ure**:MIN**(@ <n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":MEASure:MIN?",13,EOI);`
Response: <ASCII floating point>
Example: `-1.1169434e-010`

- **RANGE**

The **RANGE** query command returns the plus or minus difference between the maximum and minimum values of a set of measurements.

**Command syntax-** None

**Query syntax-** **:MEAS**ure**:RANG**e(@ <n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":MEASure:RANGe?",15,EOI);
Response: <ASCII floating point>

- **SDEVIATION**

The **SDEVIATION** query returns the standard deviation of the selected sample size.

**Command syntax-** None

**Query syntax-** **:MEAS**ure**:SDEV**iation(@ <n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":MEASure:SDEViation?",20,EOI);
Response: <ASCII floating point>
Example: +7.3441603e-012

- **STAT(istics)4**

The **STAT4** query returns statistical data defined by :SYST:STAT for multiple SETS of measurements as float. The :SYST:STAT/ON command must be executed prior to using the **STAT4** command. Statistics are always returned in the order of AV, JI, MN and MX, depending on which ones are selected.

**Command syntax-** **:MEAS**ure**:STAT4**(@ <n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":MEASure:STAT4?",15,EOI);
Response: <4-Byte float (Intel)>
Example: <ON|OFF><AV><JI><MN><MX>

- **STROBEVLEVEL**

The **STROBEVLEVEL** query returns the strobed dc voltage measured on the input channel selected. The strobing is provided through the arming channel. The strobing arm point can be be controlled by the strobe delay or by external moving the arming signal.

The returned value is an ASCII string of five (5) digits preceded by a (+) or (-) sign. The value is a signed integer with 100 microvolt resolution.

To perform a strobed measurement, set up the following parameters:

**STRO**be **CHAN**nel
**STRO**be **ARM**ing
**STRO**be **DEL**ay

**Command syntax-** None

**Query syntax-** **:MEAS**ure**:STRO**be**VLEV**el(@ <n,m,x,…>|<n:m>)**?**

```
Example:  Send(0,5,":SYSTem:STRObeCHANnel1",22,EOI);
          Send(0,5,":SYSTem:STRObeARMARM1",21,EOI);
          Send(0,5,":SYSTem:STRObeDELay25000",24,EOI);
          Send(0,5,":MEASure:STRObeVLEVel?",21,EOI);
          Receive(0,5,voltage level,5,EOI);
```

Response: <ASCII floating point>
Example: -2.1731481e-003

**To perform multiple measurements that are averaged, see the :MEASure:WINDow command.**

- ## VDATA

The **VDATA** query returns the voltage measurement points acquired in the previous measure window or acquire window command. The measured data values can be analyzed or used to provide a presentation.

Each voltage value is returned in 5 digits preceded by a (+) or (-) sign. The returned voltage is an ASCII integer string of 100 microvolt resolution.

Example: `+0.0001` (+100 uv) would be +1
`-1.0` (-1 v) would be -1000

The returned data stream is of the following format:

**:MEAS**ure**:VDATA**<xy...ddddddddd...>

x = an ASCII digit representing the number of digits in y
y = an ASCII string of digits, of x length, which represents the number of bytes of information to be returned.

d=data

**Command syntax-** None

**Query syntax-** **:MEAS**ure**:VDATA**(@ <n,m,x,…>|<n:m>)**?**

Example:
```
char data [2048];
Send(0,5,":MEASure:VDATA?",15,EOI);
Receive(0,5,data,60,EOI);
```

- ## VDATA4

The **VDATA4** query is the same as the VDATA command except that the data is returned as float for throughput. (See VDATA, Section 10-14.) See Appendix C for returned formats.

**Command syntax-** None

**Query syntax-** **:MEAS**ure**:VDATA4**(@ <n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":MEASure:VDATA4?",16,EOI);`

- ## VMAXIMUM

The **VMAXIMUM** query returns the maximum voltage value measured in the previous measure window or acquire window command.

**Command syntax-** None

**Query syntax-** **:MEAS**ure**:VMAX**imum(@ <n,m,x,…>|<n:m>)**?**

Example:
```
Send(0,5,":MEASure:VMAXimum?",18,EOI);
Receive(0,5,voltage level,5, EOI);
```
Response: <Signed ASCII value>
Example: `-0.00758`

- ## VMINIMUM

The **VMINIMUM** query returns the minimum voltage value measured in the previous measure window or acquire window command.

**Command syntax-** None

**Query syntax-** **:MEAS**ure**:VMIN**imum(@ <n,m,x,…>|<n:m>)**?**

Example:
```
Send(0,5,":MEASure:VMINimum?",18,EOI);
Receive(0,5,voltage level,5,EOI);
```
Response: <Signed ASCII value>
Example: `-0.00821`

- ## VSDEVIATION

The **VSDEVIATION** query returns the voltage standard deviation of the previous measure window or acquire window command. The returned value is a 6-digit ASCII string of a decimal number.

**Command syntax-** None

**Query syntax- :MEAS**ure**:VSDEV**iation(@ <n,m,x,…>|<n:m>)**?**

Example:
```
char data [10];
Send(0,5,":MEASure:VSDEViation?",21,EOI);
Receive(0,5,data,7,EOI);
```
Response: <Signed ASCII value>

- ## WINDOW

The **WINDOW** query instructs the instrument to take a series of strobed voltage measurements and then returns the average (mean) voltage. The following statistics are also available upon completion of the command.

VMAXIMUM .....Maximum voltage measured
VMINIMUM.....Minimum voltage measured
VSDEVIATION.....Standard deviation of voltages measured

The following parameters must be set up prior to sending a measure window query:

**STRO**be **CHAN**nel .....Select channel to be strobed
**STRO**be **ARM**ing channel .....Select strobing (arming) input
**STRO**be **STAR**ting point delay .....Set delay for the first strobed point
**STRO**be **STOP**ping point delay .....Set delay for the last strobed point
**STRO**be **INCR**ement between points .....Set increment between strobed points. (the instrument will calculate the number of points between start and stop)
**MEAS**ure **WIN**dow**?** .....Takes measurements and returns average

**NOTE**: Strobe increment defines a delay between each measurement. The instrument determines how many points to measure. An alternate method is to define the number of points between the first and last delayed points (**:SYST**em**:STRO**be**#**) and the instrument will determine the delay increment between measured points.

Example:
```
Send(0,5,":SYSTem:STRObeCHANnel1",22,EOI);
Send(0,5,":SYSTem:STRObeARMARM1",21,EOI);
Send(0,5,":SYSTem:STRObeSTArt25000",24,EOI);
Send(0,5,":SYSTem:STRObeSTOP50000",23,EOI);
Send(0,5,":SYSTem:STRObeINCRememt1000",27,EOI);
Send(0,5,":MEASure:WINdow?",16,EOI);
Receive(0,5,voltage level,6,EOI);
```

To measure a single strobe point, see the STROBEVLEVEL command.

To use a macro type of command to set up delays, take the measurements and return the voltage average, see the **:ACQ**uire**:WIN**dow command.

**Command syntax-** None

**Query syntax- :MEAS**ure**:WIND**ow(@ <n,m,x,…>|<n:m>)**?**

Example:
```
Send(0,5,":MEASure:WINDow?",16,EOI);
Receive(0,5,data,5,EOI);
```
Response: <Signed ASCII value>
Example: -0.00758

## 5-11 SYSTEM COMMANDS

The **SYSTEM** commands control the way channels are selected, messages are formatted, front panel keys are simulated and how voltage measurement will be taken.

**:SYST**em:<command syntax>

| | | | |
|---|---|---|---|
| **ADDR**ess | **GO** | **RESET** | **STRO**be**STEP**s |
| **ARM**ing | **GRO**up | **SKIPCNT** | **STRO**be**STOP** |
| **BWE** | **HEAD**er | **STAT**istics | **TEST** |
| **CHAN**nel | **INPUTS** | **STRO**be**ARM** | **TEMP**erature |
| **COMP**atible | **LOCKEDPLL** | **STRO**be**CAL** | **TIM**eout |
| **DCCHAN**nel | **LONG**form | **STROB**e**CHAN**nel | **WAV**e |
| **ELAP**sed | **MAC**ro | **STRO**be**DEL**ay | **WAIT** |
| **END**ian | **MIN**imum | **STRO**be**INCR**ement | **WIND**ow |
| **FLAG** | **NOGO** | **STRO**be**MIN**imum | |
| **GAT**ing | **REFER**ence | **STRO**be**STAR**t | |

### • ADDRESS

The **ADDRESS** command permits the user to change the address assigned to the SIA-3000 when it is communicating over GPIB. For example, the default address for the SIA-3000 is 5, but a user may have already connected an oscilloscope to his/her test system that has the same address. The user could then change the address of the SIA-3000 to any number between 0 and 30 (except 5!) so that a host computer could communicate to both the 3000 and the oscilloscope at the same time.

NOTE: Once the user changes the GPIB address of the SIA-3000 using `:SYST:ADDRess`, they need to follow the call with a system reset (`:SYSTem:RESET`) command in order for the change to take effect. (See `:SYSTem:RESET` command.)

**Command syntax** - **:SYSTem:ADDR**ess<0-30>

Example: `Send(0,5,":SYSTem:ADDRess5",16,EOI);`

**Query syntax- :SYSTem:ADDR**ess**?**

### • ARMING

The **ARMING** command is a macro command to allow the sending of all commands related to arming the instrument in one command.

The parameters that can be sent are:

| | |
|---|---|
| Trigger source | EXTernal/AUTomatic |
| Trigger sequence | STARt/STOP |
| Arming channel input | <a> |
| Arming reference | ±1.1 |
| Arming slope (edge) | RISe/FALl |
| Start arm on count | 1 to 131072 |
| Stop arm on count | 1 to 131072 |

The parameter's position is defined by a forward slash (/). If a parameter is not being set the forward slash must be used.

**Command syntax** - **:SYST**em**:ARM**ing/trigger source/trigger sequence/arming channel<a>/ arming ref/arming slope/start count/stop count

Example 1: `Send(0,5,":SYSTem:ARMing/EXT/STAR/2/+0.0001/RIS/2/256",43,EOI);`

The following example only sets the arming reference voltage and slope.

Example 2: `Send(0,5,":SYSTem:ARMing/ / / /+0/FAL/ /",26,EOI);`

- **BWE**

The **BWE** command enables the bandwidth extension option. When enabled this will apply a DSP algorithm to all oscilloscope measurements, which increases the apparent bandwidth of the front end (see the SIA-3000 User Manual for additional information.)

**Command syntax** - **:SYST**em**:BWE**<ON|OFF>

Example: Send(0,5,":SYSTem:BWE ON",14,EOI);

**Query syntax** - **:SYST**em**:BWE?**

- **CHANNEL**

The **CHANNEL** command selects the input channel that will be measured.

The **CHANNEL** query returns the presently selected channel.

**Command syntax - :SYST**em**:CHAN**nel<n>

Example: Send(0,5,":SYSTem:CHANnel1",16,EOI);

**Query syntax - :SYST**em**:CHAN**nel**?**

Example: Send(0,5,":SYSTem:CHANnel?",16,EOI);
Response: <1-10>

- **COMPATIBLE**

The **COMPATIBLE** command permits the operator to use the DTS Compatible set of GPIB commands when the :SYSTem:COMPatible ON command is sent. If the operator wants to switch and use the new SIA-3000 GPIB command set, the operator would send the :SYSTem:COMPatible OFF command.

**Command syntax** - **:SYST**em**:COMP**atible<ON|OFF>

Example: Send(0,5,":SYSTem:COMPatible ON",21,EOI);

**Query syntax** - **:SYST**em**:COMP**atible**?**

- **DCCHANNEL**

The **DCCHANNEL** command selects a DC measurement and the input channel that will be measured.

The **DCCHANNEL** query returns the channel presently selected.

**Command syntax - :SYST**em**:DCCHAN**nel<n>

Example: Send(0,5,":SYSTem:DCCHANnel1",18,EOI);

**Query syntax - :SYST**em**:DCCHAN**nel**?**

Example: Send(0,5,":SYSTem:DCCHANnel?",18,EOI);
Response: <1-10>

- **ELAPSED**

The **ELAPSED** command enables the elapsed time counter to be initialized and it will be started when the proper edge gate is received on the designated ARM channel input(s).

**Command syntax- :SYST**em**:ELAP**sed<OFF|ON>(@<n,m,x,…>|<n:m>)

Example: Send(0,5":SYSTem:ELAPsedON",16,EOI);

**Query syntax- :SYST**em**:ELAP**sed**?**

Example: Send(0,5,":SYSTem:ELAPsed?",15,EOI);
Response: <"ON"|"OFF">

- **ENDIAN**

The **ENDIAN** command is only applicable for operators who use UNIX to communicate with the SIA-3000 over GPIB. In UNIX systems, numerical data is packaged the opposite of Windows 98 (which the SIA-3000 uses). In order for UNIX users to receive numerica ldata in a format they can understand, "byte-swapping" of the data must be performed.

If the user sends the `:SYSTem:ENDian BIG` command, the SIA-3000 will perform "byte-swapping" on all numerical data before sending it back to the user. To return to regular data packaging, the user would send the `:SYSTem:ENDian LITtle` command.

**Command syntax- :SYSTem:ENDian<BIG|LITtle>**

Example: `Send(0,5":SYSTem:ENDian BIG",17,EOI);`

**Query syntax- :SYSTem:ENDian?**

Example: `Send(0,5":SYSTem:ENDian?",17,EOI);`
Response: <BIG|LITTLE>

- **FLAG**

The **FLAG** command allows the system flag to be set indicating some special purpose options are in effect. The value of the flag is determined by adding together the following values:

1 - Enable Time Stamping
2 – Enable Adjacent Cycle Measurement
16 – Use Pattern Marker for External Arm
64 – Disable parallel timer measurements
128 – Timer select by Stop Channel

The **FLAG** query returns the current setting of the system flag.

**Command syntax- :SYSTem:FLAG<0-255>**

Example: `Send(0,5,":SYSTem:FLAG 16",15,EOI);`

**Query syntax- :SYSTem:FLAG?**

Example: `Send(0,5,":SYSTem:FLAG?",13,EOI);`
Response: <ASCII integer>
Response: 16

- **GATING**

The **GATING** command turns gating mode on or off. The selection of gating excludes the use of the current ARM input. When gating is selected, the current ARM edge and reference voltage is associated with gating.

The **GATING** query returns the present setting of gating.

**Command syntax- :SYSTem:GATing<ON|OFF>**

Example: `Send(0,5,":SYSTem:GATingON",16,EOI);`

**Query syntax- :SYSTem:GATing?**

Example: `Send(0,5,":SYSTem:GATing?",15,EOI);`
Response: <ON|OFF>

- **GO**

The **GO** command simulates the user responding to a request for input from the SIA-3000 front panel. This command would be used in conjunction with two (2) status bits of the Event Status Register (*ESR?). The host would look for the event status register bit 1, Request Control (asking for the GO key to be pressed). The host would then send the system go command and wait for the event status register bit 6, User Request, to be set to a one (1) indicating the simulated response from the user was completed.

**Command syntax- :SYSTem:GO**

Example: `Send(0,5,":SYSTem:GO",10,EOI);`

- **GROUP**

The **GROUP** command permits the user to place the SIA-3000 in GROUP mode (:SYSTem:GROUP ON). When the SIA-3000 is in GROUP mode, any GPIB commands it receives are recorded but not executed (no measurements are made). When the user turns GROUP mode OFF and sends the :ACQuire:GROUP<n> command, all the commands that where recorded earlier are executed automatically without any additional input required from the user. The advantage to this method is that the user can instruct the instrument to perform a series of lengthy and complicated measurements before the measurements are actually made, then simply wait for the data at the end. This results in a shorter execution time then if the user asked for the first measurement, waited for the measurement to finish, retrieve the data, ask for the second measurement, wait, etc., etc.

**Command syntax** - **:SYST**em**:GRO**up<1-20><ON|OFF>

Example: Send(0,5,":SYSTem:GROUP ON",15,EOI);

- **HEADER**

The **HEADER** command allow the option of not having the header returned on a response from the instrument.

The **HEADER** query returns the type of header presently selected.

**Command syntax- :SYST**em**:HEAD**er<OFF|ON>

Example: Send(0,5,":SYSTem:HEADerOFF",17,EOI);

**Query syntax- :SYST**em**:HEAD**er**?**

Example: Send(0,5,":SYSTem:HEADer?",15,EOI);
Response: <"0"|"1"> (OFF or ON)

- **INPUTS**

The **INPUTS** query returns the number of input channel cards detected in the system.

**Query syntax- :SYST**em**:INPUTS?**

Example: Send(0,5,":SYSTem:INPUTS?",15,EOI);
Response: <ASCII integer>
Example: 6

- **LOCKEDPLL**

The **LOCKEDPLL** query returns a 1 if the internal reference PLL is locked, or a 0 if it is not locked.

**Query syntax- :SYST**em**:LOCKEDPLL?**

Example: Send(0,5,":SYSTem:LOCKEDPLL?",18,EOI);
Response: <0|1>
Example: 1

- **LONGFORM**

The **LONGFORM** command selects whether a header is returned from the instrument is of a long form or short form. This command works with the **HEADER** command.

The **LONGFORM** query returns the presently selected long or short form.

**Command syntax- :SYST**em**:LONG**form<OFF|ON>

Example: Send(0,5,":SYSTem:LONGformOFF",19,EOI);

**Query syntax- :SYST**em**:LONG**form**?**

Example: Send(0,5,":SYSTem:LONGform?",17,EOI);

- ## MACRO

The **MACRO** command can be used to send multiple commands for a few settings that usually change frequently. The parameters that can be sent are:

Function..... TPD++/TPD—/TPD+-/TPD-+/TT+/TT-/PW+/PW-/PER/FREQ
Trigger Source ..... EXT/AUT
Arming Enable Sequence ..... STAR/STOP
Peak Percentage..... 50 50/80 20/20 80/90 10/10 90

**Note**: Any combination greater than zero (0) and less than 100 is valid over the GPIB interface.

Start Input Voltage Reference..... ±1.1
Stop Input Voltage Reference..... ±1.1
Start Count ..... 1 to 131072
Stop Count ..... 1 to 131072

**Command syntax- :SYST**em**:MAC**ro/Function/Trigger source/Trigger sequence /percent/start reference voltage/stop reference voltage/start count /stop count

Example: `Send(0,5,":SYSTem:MACro/TT+/AUT/STOP/80 20/+0.003/-0.001/2/256",51,EOI);`

If a parameter is not used, that location can be left blank.

Example: `Send(0,5,":SYST:MAC/TPD++/ / / / / / /",25,EOI);`

- ## NOGO

The **NOGO** command simulates a user response to skip an operation after a request for input from the front panel. This command would be used in conjunction of two (2) status bits of the Event Status Register (`*ESR?`).

The host would look for the event status register bit 1, Request Control (asking for the GO key to be pressed). The host would then send the system nogo command and wait for the event status register bit 6, User Request to be set to a one (1) indicating the simulated pressing of the go key was completed.

**Command syntax- :SYST**em**:NOGO**

Example: `Send(0,5,":SYSTem:NOGO",12,EOI);`

- ## REFERENCE

The **REFERENCE** command selects whether the internal 10MHz reference signal is used, or an externally supplied reference signal for the timebase.

The **REFERENCE** query returns whether an internal or external reference signal is being used for the timebase.

**Command syntax- :SYST**em**:REF**erence<EXTernal|INTernal>

Example: `Send(0,5,":SYSTem:REFerence INTernal",19,EOI);`

**Query syntax- :SYST**em**:REF**erence**?**

Example: `Send(0,5,":SYSTem:REFerence?",17,EOI);`
Response: <EXTERNAL>|<INTERNAL>

- ## RESET

The **RESET** command reboots *GigaView; GigaView* closes and restarts again automatically. This also happens when the user presses the HW Reset button in the *GigaView* Configuration screen.

**Command syntax- :SYST**em**:RESET**

Example: `Send(0,5,":SYST:RESET",11,EOI);`

- ## STAT

The **STAT** command saves a selected group of statistics for each measurement: Average, Jitter, Minimum and Maximum for the desired number of channels.

The **STAT** query returns the selected group of statistics in ASCII form in the same order every time regardless of what order they were selected. The order is AV, JI, MN, MX.

**Command syntax- :SYST**em**:STAT/**<ON|OFF>**/**<AV><JI><MN><MX>(@<n,m,x,…>**|**<n:m>)

Example: Send(0,5,":SYST:STAT/ON/JIAVMXMN",22,EOI);

**Query syntax- :SYST**em**:STAT**(@ <n,m,x,…>**|**<n:m>)**?**

Example: Send(0,5,":SYST:STAT?",11,EOI);
Response: <ON|OFF><AV><JI><MN><MX>

- ## STROBEARM

The **STROBEARM** command selects how a voltage measurement is taken. and selects the signal and edge controlling a strobed voltage measurement. The strobed point on a waveform can be controlled by moving the strobe signal, when not using the signal being strobed, or use the **STROBEDELAY** command.

If the strobe arm is not selected, the default "DC measurement without strobing" is used.

The **STROBEARM** query returns the strobe arm selected or DC if strobing is not selected.

**Command syntax- :SYSTem:STRObeARM<n><RISe|FALl>**
Example: Send(0,5,":SYSTem:STRObe3RISe",19,EOI);
**Query syntax- :SYST**em**:STRO**be**ARM<n>?**

Example: Send(0,5,":SYSTem:STRObe3?",16,EOI);
Response: <n>

- ## STROBECAL

The **STRObeCAL** command initiates an Oscilloscope Strobe calibration.

**Command syntax- :SYSTem:STRObeCAL**

Example: Send(0,5,":SYSTem:STRObeCAL",17,EOI);

- ## STROBECHANNEL

The **STROBECHANNEL** command selects which input channel waveform will be strobed.

The **STROBECHANNEL** query returns the presently selected strobe channel.

**Command syntax- :SYST**em**:STRO**be**CHAN**nel<n>

Example: Send(0,5,":SYSTem:STRObeCHANnel1",22,EOI);

**Query syntax- ::SYST**em**:STRO**be**CHAN**nel<n>**?**

Example: Send(0,5,":SYSTem:STRObeCHANnel?",22,EOI);

- ## STROBEDELAY

The **STRObeDELay** command is used to allow strobed voltage measurements along the pulses of a selected channel. Strobing is armed from External Arm.

With the same signal on a selected channel and on the selected arm channel, the strobed voltage value read will be 20ns from the beginning of the signal.

**NOTE**: To strobe at the beginning of a signal, delay the signal 20ns.

The **STRObeDELay** query returns the present strobe delay setting.

The range of delay settings is from 20,000ps to 100,000,000ps.

**Command syntax- :SYST**em**:STRO**be**DEL**ay<value>(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":SYSTem:STRObeDELay20000",14,EOI);`

**Query syntax- :SYST**em**:STRO**be**DEL**ay(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":SYSTem:STRObeDELay?",13,EOI);`

- ## STROBEINCREMENT

The **STROBEINCREMENT** command sets the increment between strobe points. The increment is set in picoseconds. The **STROBEINCREMENT** query returns the present strobe delay increment.

NOTE: For any given delay, resolution at that delay is better than 0.2% of the delay.

**Command syntax- :SYST**em**:STRO**be**INC**rement<value>(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":SYSTemSTRObeINCrement10000",27,EOI);`

**Query syntax- :SYST**em**:STRO**be**INC**rement(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":SYSTem:STRObeINCrement?",24,EOI);`

- ## STROBEMINIMUM

The **STROBEMINIMUM** query returns the minimum start delay for the measure window command. The delay is returned in units of picoseconds.

**Query syntax- :SYST**em**:STRO**be**MIN**imum**?**

Example: `Send(0,5,":SYSTem:STRObeMINimum?",22,EOI);`
Response: <ASCII integer>
Example: 24000

- ## STROBESTART

The **STROBESTART** command sets the start delay for the measure window command. The delay can be from 20,000ps to 100,000,000ps.

The **STROBESTART** query returns the present window start delay.

**Command syntax- :SYST**em**:STRO**be**STAR**t<value>(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,"SYSTem:STRObeSTARt20000",25,EOI);`

**Query syntax- :SYST**em**:STRO**be**STAR**t(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":SYSTem:STRObeSTARt?",20,EOI);`

- ## STROBESTEPS

The **STRO**be**STEP**s command sets the number of voltage measurement steps. The first measurement will be at the start value. The **STRO**be**STEP**s query will return the present window number of steps value.

**Command syntax- :SYST**em**:STRO**be**STEP**s<value>(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":SYSTem:STRObeSTEPs20",17,EOI);`

**Query syntax- :SYST**em**:STRO**be**STEP**s(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":SYSTem:STRObeSTEPs?",16,EOI);`
Response: <ASCII integer>

- **STROBESTOP**

  The **STROBESTOP** command sets the stop delay for the measure window command. The delay can be from 20,000ps to 100,000,000ps.

  The **STROBESTOP** query returns the present window start delay.

  **Command syntax- :SYST**em**:STRO**be**STOP**<value>(@<n,m,x,…>**|**<n:m>)

  Example: `Send(0,5,":SYSTem:STRObeSTOP100000",24,EOI);`

  **Query syntax- :SYST**em**:STRO**be**STOP**(@<n,m,x,…>**|**<n:m>)**?**

  Example: `Send(0,5,":SYSTem:STRObeSTOP?,19,EOI);`

- **TEMPERATURE**

  The **TEMPERATURE** query returns the temperature of the system in degrees Celsius.

  **Query syntax - :SYST**em**:TEMPerature?**

  Example: `Send(0,5,":SYSTem:TEMPerature?",21,EOI);`
  Response: <Signed ASCII value>
  Example: +2.600e+001

- **TIMEOUT**

  The **TIMEOUT** command sets the timeout value, in seconds, to wait before reporting "No Pulses Found", during a measurement.

  The default, which is set at power up, is 10 seconds (floating point value).

  **Command syntax- :SYST**em**:TIM**eout<value>

  Example: `Send(0,5,":SYSTem:TIMeout15",17,EOI);`

  **Query syntax- :SYST**em**:TIM**eout**?**

  Example: `Send(0,5,":SYSTem:TIMe?",13,EOI);`

- **WAIT**

  The **WAIT** command allows a pause to occur in the midst of a series of acquisitions in order to provide a means for synchronizing the measurements with some external action such as switching a mux or resetting a device. Whenever the **WAIT** command is read in the GPIB command queue, the **SDS** bit in the **ESR** register is immediately set to high. By conducting a status poll and monitoring this bit, the host controller can detect when the SIA3000 has encountered the **WAIT** command, and is ready for the mux switching or other external activity to take place.

  Once the **SDS** bit has been set to high, the SIA3000 system will wait the time that is specified in the **WAIT** command. This time is specified in milliseconds, and a value from 10 to 100,000 is acceptable. This time should be set long enough for the host controller to recognize that the **SDS** bit has gone high, complete it's external action, and wait for any settle time to occur.

  If even faster response times are desired, the latency can be reduced through additional handshaking of the GPIB bus. Once the **SDS** bit has been set high, the SIA3000 will also begin looking for a **TRIGGER** event. (The **TRIGGER** event can be generated by using the **ibtrg()** command for National Instruments GPIB cards and libraries, or by using the **itrigger()** command for HPIB cards and SICL libraries.)

  If a **TRIGGER** event is detected prior to the wait time having expired, the SIA3000 will set the **SDS** bit back to low once more. Once the host system has detected the **SDS** bit going low through continued status polling, it should send a second **TRIGGER** event to acknowledge that the wait period should be terminated. Once the second **TRIGGER** event is detected by the SIA3000, it will abort waiting and continue processing the next command in the GPIB input buffer. Using this method the total handshaking time can be reduced to less than one millisecond.

**Command syntax - :SYSTem:WAIT**<10 to 100000>

Example: `Send(0,5,":ACQ:ALLPER;:SYST:WAIT10;:ACQ:ALLPER",36,EOI);`

```
status = 0;
while ((status & 0x08) == 0)          //Wait for the SDS bit to go high
  ReadStatusByte(0, 5, &status);
SendTrigger();                        //Acknowledge the SDS bit having gone high
ChangeMuxSetting();                   //Perform our external activity
while (status & 0x08)                 //Wait for the SDS bit to go low
  ReadStatusByte(0, 5, &status);
SendTrigger();                        //Acknowledge the SDS bit having gone low
```

- ## WAVE

The **WAVE** command selects the mode of pulsefind. Use FLAT to locate the flatspot of a square wave and use PEAK to find the peaks of a sine waveform.

The **WAVE** query returns the presently selected mode.

**Command syntax- :SYSTem:WAVe**<PEAK|FLAT|STRObe>

Example: `Send(0,5,":SYSTem:WAVePEAK",16,EOI);`

**Query syntax- :SYSTem:WAVe?**

Example: `Send(0,5,":SYSTem:WAVe?",13,EOI);`

**NOTE**: Use the `:ACQuire:LEVel(@ <n,m,x,…>|<n:m>)` command to perform the pulsefind.

- ## WINDOW

The **WINDOW** command is a macro command to allow the parameter setup for the measure window command. A window can be from 20ns to100µs given in picoseconds.

To describe a window three (3) parameters must be given, window start delay, window stop delay and either the measure point increment or the number of points to make a measurement.

To set the parameters and return an average voltage measurement of the window, see the acquire window command.

**Command syntax- :SYSTem:WINDow/start value/stop value/**<step increment
|**N**umber of steps>(@<n,m,x,…>|<n:m>)

Example 1: `Send(0,5,":SYSTem:WINDow/20000/100000/10000",33,EOI);`
Example 2: `Send(0,5,":SYSTem:WINDow/20000/100000/N10",31,EOI);`

## 5-12 TRIGGER COMMANDS

The **TRIGGER** commands control the source and the level of the arming signal.

**:TRIG**ger**:**<command syntax>

Trigger commands:

| | |
|---|---|
| **DEL**ay | **SEQ**uence (start/stop) |
| **DIV**ider | Arm **SLOP**e (Edge) |
| **LEV**el | **SOUR**ce (external/automatic) |
| **MIN**imum/**MAX**imum | |

- ### DELAY

The **DELAY** command gives the remote operator the ability to set the Arming Delay just like on the SIA3000 front panel. Instead of the user entering a time value between 19 to 21 ns, the user sends a positive or negative increment value from the nominal arming delay to achieve the same effect.

**Command syntax- :TRIG**ger**:DEL**ay<step value>

Example: `Send(0,5,":TRIGger:DELay1 0.1",21,EOI);`

**Query syntax- :TRIG**ger**:DEL**ay**?**

Example: `Send(0,5,":TRIGger:DELay2?",19,EOI);`

- ### DIVIDER

The **DIVIDER** command allows the operator the ability to specify the number of arming events that are required to arm the system. Multiple arming events are utilized by the system in order to synchronize the system to the arm source.

By default this divider is automatically determined by the system based on the frequency of the signal at the time the last pulse-find was conducted. If a frequency below 100MHz was detected at the arming source during the last pulse-find, the arming divider is set to a value of two. If a frequency at or above 100MHz was detected at the arming source during the last pulse-find, the arming divider is set to a value of sixteen.

**Command syntax- :TRIG**ger**:DIV**ider<AUTO | 2 | 16>

Example: Send(0,5,":TRIGger:DIVider 2",18,EOI);

**Query syntax- :TRIG**ger**:DIV**ider**?**

Example: Send(0,5,":TRIGger:DIVider?",17,EOI);
Response: <AUTO | 2 | 16>
Example: 2

- ### LEVEL

The **LEVEL** command sets the trip level of the arming input. The levels that can be selected are ±1.11 volts.

The **LEVEL** query returns the present trip setting of the specific arming input. The value is a 5-digit ASCII floating point number.

**Command syntax- :TRIG**ger**:LEV**el<value>

Example: `Send(0,5,":TRIGger:LEVel1 0.1",21,EOI);`

**Query syntax- :TRIG**ger**:LEV**el<n>**?**

Example: `Send(0,5,":TRIGger:LEVel2?",19,EOI);`
Response: <value>
Example: +1.11000

- ### MINIMUM/MAXIMUM

The **MINIMUM/MAXIMUM** query returns the minimum or maximum peak levels of the ARM reference levels. The peak values were measured when the last pulse find was initiated. This pulse find could have been initiated with the **:ACQ**uire**:LEV**el command.

**Command syntax-** None

**Query syntax- :TRIG**ger**:**<MAXimum|MINimum><n>**?**

Example: `Send(0,5,":TRIGger:MINimum1?",17,EOI);`
Response: <ASCII value>
Example: +1.00123

- ## SEQUENCE

The **SEQUENCE** command selects the arming sequence between the START and STOP path. The two sequences are:

Arm on start
Arm on stop

The **SEQUENCE** query returns the presently selected arming sequence.

**Command syntax- :TRIG**ger**:SEQ**uence<STARt|STOp>

Example: `Send(0,5,":TRIGger:SEQuenceSTARt",22,EOI);`

**Query syntax- :TRIG**ger**:SEQ**uence**?**

Example: `Send(0,5,":TRIGger:SEQuence?",18,EOI);`
Response: <Start|Stop>

- ## SLOPE

The **SLOPE** command sets the edge of a specific arming input. This edge can be a positive going (rising) edge or a negative going (falling) edge.

The **SLOPE** query returns the present setting of the specific external edge.

**Command syntax- :TRIG**ger**:SLOP**e<RISe|FALl>

Example: `Send(0,5,":TRIGger:SLOPeRIS",17,EOI);`

**Query syntax- :TRIG**ger**:SLOP**e**?**

Example: `Send(0,5,":TRIGger:SLOPe?",15,EOI) ;`
Response: <RISe|FALl>

- ## SOURCE

The **SOURCE** command selects the arming signal that will initiate a measurement.

The **SOURCE** query returns the presently selected arming signal source.

The three source selections are **EXT**ernal, **AUT**omatic, or **HOT**. "External" allows another channel to be selected as the arming source. "Automatic" selects the measurement channel as the arming source. "Hot" selects an internal source that is always running as the trigger source, and also enable Single-Shot measurement mode.

**Command syntax- :TRIG**ger**:SOUR**ce<EXTernal|AUTomatic|HOT>

Example: `Send (0,5,":TRIGger:SOURceEXTernal",23,EOI);`

**Query syntax- :TRIG**ger**:SOUR**ce**?**

Example: `Send (0,5,":TRIGger:SOURce?",16,EOI);`
Response: <EXT|AUT|HOT>

## • APPLICATIONS OF TOOL ORIENTATED GPIB COMMANDS

The Tool Oriented GPIB commands provide access to results from Wavecrest's many algorithm based tools. When using this approach a series of ASCII commands are used to setup the tool, take the measurements, and retrieve the results. As such the performance tends to be slower than the 'Binary Packet Measurements'. However, the ASCII commands tend to be easier to use, and programs utilizing these commands are less susceptible to changes made to the SIA-3000 software.

## • EXAMPLE CODE

The following example shows a GPIB command sequence for the SIA-3000 that will use the Histogram tool for acquiring Mean, Minimum, and Maximum Values. The basic process for conducting a measurement is as follows:

1. Initialize the Instrument
2. Configure the Tool Settings
3. Request a Measurement & Poll until Complete
4. Retrieve and use the Results

```
int GetHistogram()
  {
  long status;
  char buffer[256];

  // Step 1. Initialize the Instrument, only needs to be done once
  Send(0,5,":SYST:COMPOFF;:SYST:HEADOFF;:SYST:ENDLIT;*ESE255;*SRE255");

  // Step 2. Configure the Tool Settings, only needs to be done once
  Send(0,5,":HIST:DEFAULT");              // Start with default settings
  Send(0,5,":HIST:PARAM:CHAN1");          // Select channel 1
  Send(0,5,":HIST:PARAM:FUNC PER+");      // Rising edge to rising edge
  Send(0,5,":HIST:PARAM:SAMP 10000);      // Samples per acquisition
  Send(0,5,":HIST:PARAM:ARM:MODE STOP");  // Automatic arming
  Send(0,5,":HIST:PARAM:THRESHOLD 5050"); // Automatic voltage threshold

  // Step 3. Request a Measurement & Poll until Complete
  Send(0,5,":HISTOGRAM:ACQUIRE;*OPC");
  status = 0;
  while ((status & ESB_BIT) == 0)
    ReadStatusByte(0, 5, &status);

  // Step 4. Retrieve and use the Results
  Send(0,5,":HIST:MEAN?");                // Request a result
  Receive(0, 5, &buffer, sizeof(buffer)); // Then read it
  printf("Average: %s\n", buffer);        // Then print it
  Send(0,5,":HIST:MINIMUM?");             // Request a result
  Receive(0, 5, &buffer, sizeof(buffer)); // Then read it
  printf("Minimum: %s\n", buffer);        // Then print it
  Send(0,5,":HIST:MAXIMUM?");             // Request a result
  Receive(0, 5, &buffer, sizeof(buffer)); // Then read it
  printf("Maximum: %s\n", buffer);        // Then print it

  return 0;
  }
```

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## • DESCRIPTION OF THE SERIAL ATA GEN2I & GEN2M COMMANDS

The **ATA2** commands are used to obtain results using the Serial ATA GEN2I & GEN2M Tool. This tool requires a data signal, and a pattern marker. If your system has a PM-50 Card installed, you can use it to obtain a pattern marker.

**:ATA2:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **PARAM**eter**:TIME**out | **PLOTINFO:BATHTUB1667** |
| **ARMFIND** | **PATT**ern | **PLOTINFO:DCDISI10** |
| **BITRATE** | **PLOTDATA:BATHTUB10** | **PLOTINFO:DCDISI500** |
| **CLE**ar | **PLOTDATA:BATHTUB500** | **PLOTINFO:DCDISI1667** |
| **COMP**liance | **PLOTDATA:BATHTUB1667** | **PLOTINFO:DCDISIRAW** |
| **DEF**ault | **PLOTDATA:DCDISI10** | **PLOTINFO:FALL** |
| **DJ10** | **PLOTDATA:DCDISI500** | **PLOTINFO:FFT10** |
| **DJ500** | **PLOTDATA:DCDISI1667** | **PLOTINFO:FFT500** |
| **DJ1667** | **PLOTDATA:DCDISIRAW** | **PLOTINFO:FFT1667** |
| **PARAM**eter**:ARM**ing**:CHAN**nel | **PLOTDATA:FALL** | **PLOTINFO:RIS** |
| **PARAM**eter**:ARM**ing**:DEL**ay | **PLOTDATA:FFT10** | **PLOTINFO:SCOPE-** |
| **PARAM**eter**:ARM**ing**:MARK**er | **PLOTDATA:FFT500** | **PLOTINFO:SCOPE+** |
| **PARAM**eter**:ARM**ing**:MODE** | **PLOTDATA:FFT1667** | **PLOTINFO:SIGM**a |
| **PARAM**eter**:ARM**ing**:SLOP**e | **PLOTDATA:RISE** | **RJ10** |
| **PARAM**eter**:ARM**ing**:VOLT**age | **PLOTDATA:SCOPE-** | **RJ500** |
| **PARAM**eter**:CHAN**nel | **PLOTDATA:SCOPE+** | **RJ1667** |
| **PARAM**eter**:STAR**t**:VOLT**age | **PLOTDATA:SIGM**a | **TJ10** |
| **PARAM**eter**:STOP:VOLT**age | **PLOTINFO:BATHTUB10** | **TJ500** |
| **PARAM**eter**:THR**eshold | **PLOTINFO:BATHTUB500** | **TJ1667** |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new SERIAL ATA GEN2I & GEN2M Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :ATA2:ACQ**uire

Example: `Send(0,5,":ATA2:ACQ;*OPC",9,EOI);`

## • ARMFIND

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. This command performs an optimization and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :ATA2:ARMFIND**

Example: `Send(0,5,":ATA2:ARMFIND",14,EOI);`
Response: <ASCII integer>
Example: -16

- ## BITRATE

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Query syntax- :ATA2:BITRATE?**

Example: `Send(0,5,":ATA2:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +1.0625e9

- ## CLEAR

The **CLEAR** command provides a means to flush any previous data.

**Command syntax- :ATA2:CLE**ar

Example: `Send(0,5,":ATA2:CLE",9,EOI);`

- ## COMPLIANCE

The **COMPLIANCE** command selects the current SERIAL ATA GEN2I & GEN2M standard to test against.

The **COMPLIANCE** query returns the currently selected SERIAL ATA GEN2I & GEN2M standard.

**Command syntax- :ATA2:COMP**liance<RX-GEN2I|TX-GEN2I|RX-GEN2M|TX-GEN2M>

Example: `Send(0,5,":ATA2:COMP RX-GEN2I",19,EOI);`

**Query syntax- :ATA2:COMP**liance**?**

Example: `Send(0,5,":ATA2:COMP?",11,EOI);`
Response: <RX-GEN2I|TX-GEN2I|RX-GEN2M|TX-GEN2M>
Example: RX-GEN2I

- ## DEFAULT

The **DEFAULT** command is used to reset all the SERIAL ATA GEN2I & GEN2M Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :ATA2:DEF**ault

Example: `Send(0,5,":ATA2:DEF",9,EOI);`

- ## DJ10

The **DJ10** query returns the Deterministic Jitter when Bitrate/10 High Pass Filter is applied.

**Query syntax- :ATA2:DJ10?**

Example: `Send(0,5,":ATA2:DJ10?",11,EOI);`
Response: <ASCII floating point>
Example: 21.357e-12

- ## DJ500

The **DJ500** query returns the Deterministic Jitter when Bitrate/500 High Pass Filter is applied.

**Query syntax- :ATA2:DJ500?**

Example: `Send(0,5,":ATA2:DJ500?",12,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **DJ1667**

The **DJ1667** query returns the Deterministic Jitter when Bitrate/1667 High Pass Filter is applied.

**Query syntax- :ATA2:DJ1667?**

Example: `Send(0,5,":ATA2:DJ1667?",12,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :ATA2:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":ATA2:PARAM:ARM:CHAN 1",23,EOI);`

**Query syntax- :ATA2:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":ATA2:PARAM:ARM:CHAN?",22,EOI);`
Response: <ASCII integer>
Example: 1

- **PARAMETER:ARMING:DELAY**

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :ATA2:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":ATA2:PARAM:ARM:DEL -40",24,EOI);`

**Query syntax- :ATA2:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":ATA2:PARAM:ARM:DEL?",21,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :ATA2:PARAMeter:ARMing:MARKer**<OFF|ON>

Example: `Send(0,5,":ATA2:PARAM:ARM:MARK OFF",25,EOI);`

**Query syntax- :ATA2:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":ATA2:PARAM:ARM:MARK?",22,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :ATA2:PARAMeter:ARMing:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":ATA2:PARAM:ARM:MODE EXTERNAL",30,EOI);`

**Query syntax- :ATA2:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":ATA2:PARAM:ARM:MODE?",22,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :ATA2:PARAMeter:ARMing:SLOPe**<FALL|RISE>

Example: `Send(0,5,":ATA2:PARAM:ARM:SLOP FALL",26,EOI);`

**Query syntax- :ATA2:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":ATA2:PARAM:ARM:SLOP?",22,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :ATA2:PARAMeter:ARMing:VOLTage**<-2 to 2>

Example: `Send(0,5,":ATA2:PARAM:ARM:VOLT -2",24,EOI);`

**Query syntax- :ATA2:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":ATA2:PARAM:ARM:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

 

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :ATA2:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":ATA2:PARAM:CHAN4",18,EOI);`

**Query syntax- :ATA2:PARAMeter:CHANnel?**

Example: `Send(0,5,":ATA2:PARAM:CHAN?",18,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :ATA2:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":ATA2:PARAM:STAR:VOLT -2",25,EOI);`

**Query syntax- :ATA2:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":ATA2:PARAM:STAR:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :ATA2:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":ATA2:PARAM:STOP:VOLT -2",25,EOI);`

**Query syntax- :ATA2:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":ATA2:PARAM:STOP:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :ATA2:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":ATA2:PARAM:THR 5050",21,EOI);`

**Query syntax- :ATA2:PARAMeter:THReshold?**

Example: `Send(0,5,":ATA2:PARAM:THR?",17,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :ATA2:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":ATA2:PARAM:TIME 10",22,EOI);`

**Query syntax- :ATA2:PARAMeter:TIMEout?**

Example: `Send(0,5,":ATA2:PARAM:TIME?",18,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PATTERN

The **PATTERN** command selects the current pattern file to be used. The specified pattern file must exist on the SIA3000.

The **PATTERN** query returns the currently selected pattern file.

**Command syntax- :ATA2:PATTern<filename>**

Example: `Send(0,5,":ATA2:PATT K285.PTN",20,EOI);`

**Query syntax- :ATA2:PATTern?**

Example: `Send(0,5,":ATA2:PATT?",12,EOI);`
Response: <ASCII string>
Example: CJTPAT.PTN

- ## PLOTDATA:BATHTUB10

The **PLOTDATA:BATHTUB10** query returns the plot data associated with the BATHTUB plot with a Bitrate/10 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:BATHTUB10?**

Example: `Send(0,5,":ATA2:PLOTDATA:BATHTUB10?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:BATHTUB500

The **PLOTDATA:BATHTUB500** query returns the plot data associated with the BATHTUB plot with a Bitrate/500 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:BATHTUB500?**

Example: `Send(0,5,":ATA2:PLOTDATA:BATHTUB500?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:BATHTUB1667

The **PLOTDATA:BATHTUB1667** query returns the plot data associated with the BATHTUB plot with a Bitrate/1667 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:BATHTUB1667?**

Example: `Send(0,5,":ATA2:PLOTDATA:BATHTUB1667?",20,EOI);`
Response: #xy…dddddddd…

 

- **PLOTDATA:DCDISI10**

The **PLOTDATA:DCDISI10** query returns the plot data associated with the DCD+ISI VS SPAN plot with a Bitrate/10 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:DCDISI10?**

Example: `Send(0,5,":ATA2:PLOTDATA:DCDISI10?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:DCDISI500**

The **PLOTDATA:DCDISI500** query returns the plot data associated with the DCD+ISI VS SPAN plot with a Bitrate/500 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:DCDISI500?**

Example: `Send(0,5,":ATA2:PLOTDATA:DCDISI500?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:DCDISI1667**

The **PLOTDATA:DCDISI1667** query returns the plot data associated with the DCD+ISI VS SPAN plot with a Bitrate/1667 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:DCDISI1667?**

Example: `Send(0,5,":ATA2:PLOTDATA:DCDISI1667?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:DCDISIRAW**

The **PLOTDATA:DCDISIRAW** query returns the plot data associated with the DCD+ISI VS SPAN plot with no HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:DCDISIRAW?**

Example: `Send(0,5,":ATA2:PLOTDATA:DCDISIRAW?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:FALL?**

Example: `Send(0,5,":ATA2:PLOTDATA:FALL?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FFT10**

The **PLOTDATA:FFT10** query returns the plot data of an FFT plot with a Bitrate/10 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:FFT10?**

Example: `Send(0,5,":ATA2:PLOTDATA:FFT10?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FFT500**

The **PLOTDATA:FFT500** query returns the plot data of an FFT plot with a Bitrate/500 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:FFT500?**

Example: `Send(0,5,":ATA2:PLOTDATA:FFT500?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FFT1667**

The **PLOTDATA:FFT1667** query returns the plot data of an FFT plot with a Bitrate/1667 HPF applied as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:FFT1667?**

Example: `Send(0,5,":ATA2:PLOTDATA:FFT1667?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:RISE**

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:RISE?**

Example: `Send(0,5,":ATA2:PLOTDATA:RISE?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE-**

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:SCOPE-?**

Example: `Send(0,5,":ATA2:PLOTDATA:SCOPE-?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:SCOPE+?**

Example: `Send(0,5,":ATA2:PLOTDATA:SCOPE+?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATA2:PLOTDATA:SIGMa?**

Example: `Send(0,5,":ATA2:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…dddddddd…

 

- **PLOTINFO:BATHTUB10**

The **PLOTINFO:BATHTUB10** query returns the BATHTUB plot information with a Bitrate/10 HPF applied.

**Query syntax- :ATA2:PLOTINFO:BATHTUB10?**

Example: `Send(0,5,":ATA2:PLOTINFO:BATHTUB10?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:BATHTUB500**

The **PLOTINFO:BATHTUB500** query returns the BATHTUB plot information with a Bitrate/500 HPF applied.

**Query syntax- :ATA2:PLOTINFO:BATHTUB500?**

Example: `Send(0,5,":ATA2:PLOTINFO:BATHTUB500?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:BATHTUB1667**

The **PLOTINFO:BATHTUB1667** query returns the BATHTUB plot associated with a Bitrate/1667 HPF applied.

**Query syntax- :ATA2:PLOTINFO:BATHTUB1667?**

Example: `Send(0,5,":ATA2:PLOTINFO:BATHTUB1667?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISI10**

The **PLOTINFO:DCDISI10** query returns the DCD+ISI VS SPAN plot information with a Bitrate/10 HPF applied.

**Query syntax- :ATA2:PLOTINFO:DCDISI10?**

Example: `Send(0,5,":ATA2:PLOTINFO:DCDISI10?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISI500**

The **PLOTINFO:DCDISI500** query returns the DCD+ISI VS SPAN plot information with a Bitrate/500 HPF applied.

**Query syntax- :ATA2:PLOTINFO:DCDISI500?**

Example: `Send(0,5,":ATA2:PLOTINFO:DCDISI500?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISI1667**

The **PLOTINFO:DCDISI1667** query returns the DCD+ISI VS SPAN plot info with a Bitrate/1667 HPF applied.

**Query syntax- :ATA2:PLOTINFO:DCDISI1667?**

Example: `Send(0,5,":ATA2:PLOTINFO:DCDISI1667?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISIRAW**

The **PLOTINFO:DCDISIRAW** query returns the DCD+ISI VS SPAN plot information with no HPF applied.

**Query syntax- :ATA2:PLOTINFO:DCDISIRAW?**

Example: `Send(0,5,":ATA2:PLOTINFO:DCDISIRAW?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALL**

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :ATA2:PLOTINFO:FALL?**

Example: `Send(0,5,":ATA2:PLOTINFO:FALL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT10**

The **PLOTINFO:FFT10** query returns the FFT plot information with a Bitrate/10 HPF applied.

**Query syntax- :ATA2:PLOTINFO:FFT10?**

Example: `Send(0,5,":ATA2:PLOTINFO:FFT10?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT500**

The **PLOTINFO:FFT500** query returns the FFT plot information with a Bitrate/500 HPF applied.

**Query syntax- :ATA2:PLOTINFO:FFT500?**

Example: `Send(0,5,":ATA2:PLOTINFO:FFT500?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT1667**

The **PLOTINFO:FFT1667** query returns the FFT plot information with a Bitrate/1667 HPF applied.

**Query syntax- :ATA2:PLOTINFO:FFT1667?**

Example: `Send(0,5,":ATA2:PLOTINFO:FFT1667?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :ATA2:PLOTINFO:RISE?**

Example: `Send(0,5,":ATA2:PLOTINFO:RISE?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIMENTARY SCOPE INPUT plot.

**Query syntax- :ATA2:PLOTINFO:SCOPE-?**

Example: `Send(0,5,":ATA2:PLOTINFO:SCOPE-?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :ATA2:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":ATA2:PLOTINFO:SCOPE+?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :ATA2:PLOTINFO:SIGMa?**

Example: `Send(0,5,":ATA2:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RJ10**

The **RJ10** query returns the Random Jitter when Bitrate/10 High Pass Filter is applied.

**Query syntax- :ATA2:RJ10?**

Example: `Send(0,5,":ATA2:RJ10?",11,EOI);`
Response: <ASCII floating point>
Example: 12.267e-12

- **RJ500**

The **RJ500** query returns the Random Jitter when Bitrate/500 High Pass Filter is applied.

**Query syntax- :ATA2:RJ500?**

Example: `Send(0,5,":ATA2:RJ500?",11,EOI);`
Response: <ASCII floating point>
Example: 12.267e-12

- **RJ1667**

The **RJ1667** query returns the Random Jitter when Bitrate/1667 High Pass Filter is applied.

**Query syntax- :ATA2:RJ1667?**

Example: `Send(0,5,":ATA2:RJ1667?",12,EOI);`
Response: <ASCII floating point>
Example: 13.637e-12

- **TJ10**

The **TJ10** query returns the Total Jitter when Bitrate/10 High Pass Filter is applied.

**Query syntax- :ATA2:TJ10?**

Example: `Send(0,5,":ATA2:TJ10?",11,EOI);`
Response: <ASCII floating point>
Example: 62.267e-12

- **TJ500**

The **TJ500** query returns the Total Jitter when Bitrate/500 High Pass Filter is applied.

**Query syntax- :ATA2:TJ500?**

Example: `Send(0,5,":ATA2:TJ500?",11,EOI);`
Response: <ASCII floating point>
Example: 62.267e-12

- **TJ1667**

The **TJ1667** query returns the Total Jitter when Bitrate/1667 High Pass Filter is applied.

**Query syntax- :ATA2:TJ1667?**

Example: `Send(0,5,":ATA2:TJ1667?",12,EOI);`
Response: <ASCII floating point>
Example: 63.637e-12

## • DESCRIPTION OF THE SERIAL ATA GEN1X & GEN2X COMMANDS

The **SERIAL ATAX** commands are used to obtain results using the Serial ATA GEN1X & GEN2X Tool. This tool requires a data signal, and a bit clock derived from a Multirate Clock Recovery Card. This tool is based on the same algorithm as the Random Data With Bit Clock (RDBC) commands.

**:ATAX:**<command syntax>

**ACQ**uire
**ARMFIND**
**CLE**ar
**CROSS**point
**DEF**ault
**DJ**
**MINSPAN**
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PLOTDATA:BATH**tub
**PLOTDATA:FALL**
**PLOTDATA:RISE**
**PLOTDATA:SCOPE-**
**PLOTDATA:SCOPE+**
**PLOTDATA:SCOPECOMM**
**PLOTDATA:SCOPEDIFF**
**PLOTDATA:TOTAL**
**PLOTINFO:BATH**tub
**PLOTINFO:FALL**
**PLOTINFO:RISE**
**PLOTINFO:SCOPE-**
**PLOTINFO:SCOPE+**
**PLOTINFO:SCOPECOMM**
**PLOTINFO:SCOPEDIFF**
**PLOTINFO:TOTAL**
**REFEDGE**
**TAIL**fit**:COMP**lete
**TAIL**fit**:FILTERSAMPLES**
**TAIL**fit**:MINHITS**
**TAIL**fit**:MODE**
**TAIL**fit**:PROB**ability
**TJ**
**UI**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new SERIAL ATA GEN1X & GEN2X Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :ATAX:ACQ**uire

Example: `Send(0,5,":ATAX:ACQ;*OPC",9,EOI);`

## • ARMFIND

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. This command performs an optimization and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :ATAX:ARMFIND**

Example: `Send(0,5,":ATAX:ARMFIND",14,EOI);`
Response: <ASCII integer>
Example: -16

## • CLEAR

The **CLEAR** command provides a means to flush any previous data.

**Command syntax- :ATAX:CLE**ar

Example: `Send(0,5,":ATAX:CLE",9,EOI);`

- ## CROSSPOINT

The **CROSSPOINT** command is used to optimize the voltage threshold used to measure the signal. The algorithm varies the voltage threshold over a range of values near the midpoint and leaves it set to the one that yields the narrowest eye histogram width. The resulting voltage can be obtained by calling the **PARAMETER:START:VOLTAGE** query.

**Command syntax- :ATAX:CROSS**point

Example: `Send(0,5,":ATAX:CROSS",11,EOI);`

- ## DEFAULT

The **DEFAULT** command is used to reset all the SERIAL ATA GEN1X & GEN2X Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :ATAX:DEF**ault

Example: `Send(0,5,":ATAX:DEF",9,EOI);`

- ## DJ

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :ATAX:DJ?**

Example: `Send(0,5,":ATAX:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## MINSPAN

The **MINSPAN** command allows a time delay to be introduced between data edges and the reference clock edges used to assess them. By default the instrument uses immediately adjacent clock edges for reference. However, oscilloscopes have an inherent trigger delay, which can cause a correlation issue. If the desire is to correlate to a particular oscilloscope, this value can be used to instruct the instrument to make measurements on the same basis. This value corresponds to the nominal trigger delay on an oscilloscope.

The **MINSPAN** query returns the current minimum time delay from data edges to their reference clock edges.

**Command syntax- :ATAX:MINSPAN**<0 to 2.5>

Example: `Send(0,5,":ATAX:MINSPAN 0",15,EOI);`

**Query syntax- :ATAX:MINSPAN?**

Example: `Send(0,5,":ATAX:MINSPAN?",14,EOI);`
Response: <ASCII floating point>
Example: 2.4e-008

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :ATAX:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":ATAX:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :ATAX:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":ATAX:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :ATAX:PARAMeter:CHANnel<n&m>**

Example: `Send(0,5,":ATAX:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :ATAX:PARAMeter:CHANnel?**

Example: `Send(0,5,":ATAX:PARAM:CHAN?",17,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued. Since filters are used to only include data edges within +/- 0.5 UI of the randomly selected clock edges, a smaller number of samples is actually returned than is requested.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :ATAX:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":ATAX:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :ATAX:PARAMeter:SAMPles?**

Example: `Send(0,5,":ATAX:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the data channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :ATAX:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":ATAX:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :ATAX:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":ATAX:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the clock channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected clock channel user voltage.

**Command syntax- :ATAX:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":ATAX:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :ATAX:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":ATAX:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent **:MEASURE:LEVEL** (pulsefind) command. If USER is selected the voltage levels will be taken from the **PARAMETER:START:VOLTAGE** and **:PARAMETER:STOP:VOLTAGE** commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :ATAX:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":ATAX:PARAM:THR 5050",20,EOI);`

**Query syntax- :ATAX:PARAMeter:THReshold?**

Example: `Send(0,5,":ATAX:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

 

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :ATAX:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":ATAX:PARAM:TIME 10",19,EOI);`

**Query syntax- :ATAX:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":ATAX:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PLOTDATA:BATHTUB

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:BATH**tub**?**

Example: `Send(0,5,":ATAX:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:FALL

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:FALL?**

Example: `Send(0,5,":ATAX:PLOTDATA:FALL?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:RISE

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:RISE?**

Example: `Send(0,5,":ATAX:PLOTDATA:RISE?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SCOPE-

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:SCOPE-?**

Example: `Send(0,5,":ATAX:PLOTDATA:SCOPE-?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:SCOPE+?**

Example: `Send(0,5,":ATAX:PLOTDATA:SCOPE+?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPECOMM**

The **PLOTDATA:SCOPECOMM** query returns the plot data associated with the COMMON MODE SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:SCOPECOMM?**

Example: `Send(0,5,":ATAX:PLOTDATA:SCOPECOMM?",25,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPEDIFF**

The **PLOTDATA:SCOPEDIFF** query returns the plot data associated with the DIFFERENTIAL MODE SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:SCOPEDIFF?**

Example: `Send(0,5,":ATAX:PLOTDATA:SCOPEDIFF?",25,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:TOTAL**

The **PLOTDATA:TOTAL** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :ATAX:PLOTDATA:TOTAL?**

Example: `Send(0,5,":ATAX:PLOTDATA:TOTAL?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :ATAX:PLOTINFO:BATH**`tub`**?**

Example: `Send(0,5,":ATAX:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALL**

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :ATAX:PLOTINFO:FALL?**

Example: `Send(0,5,":ATAX:PLOTINFO:FALL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

 

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :ATAX:PLOTINFO:RISE?**

Example: `Send(0,5,":ATAX:PLOTINFO:RISE?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIMENTARY SCOPE INPUT plot.

**Query syntax- :ATAX:PLOTINFO:SCOPE-?**

Example: `Send(0,5,":ATAX:PLOTINFO:SCOPE-?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :ATAX:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":ATAX:PLOTINFO:SCOPE+?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPECOMM**

The **PLOTINFO:SCOPECOMM** query returns the plot information associated with the COMMON MODE SCOPE INPUT plot.

**Query syntax- :ATAX:PLOTINFO:SCOPECOMM?**

Example: `Send(0,5,":ATAX:PLOTINFO:SCOPECOMM?",25,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPEDIFF**

The **PLOTINFO:SCOPEDIFF** query returns the plot information associated with the DIFFERENTIAL MODE SCOPE INPUT plot.

**Query syntax- :ATAX:PLOTINFO:SCOPEDIFF?**

Example: `Send(0,5,":ATAX:PLOTINFO:SCOPEDIFF?",25,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TOTAL**

The **PLOTINFO:TOTAL** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :ATAX:PLOTINFO:TOTAL?**

Example: `Send(0,5,":ATAX:PLOTINFO:TOTAL?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## REFEDGE

The **REFEDGE** command selects whether a rising or falling clock edge is used as reference to measure the data jitter.

The **REFEDGE** query returns whether a rising or falling clock edge is selected as reference.

**Command syntax- :ATAX:REFEDGE**<FALL|RISE>

Example: `Send(0,5,":ATAX:REFEDGE FALL",18,EOI);`

**Query syntax- :ATAX:REFEDGE?**

Example: `Send(0,5,":ATAX:REFEDGE?",14,EOI);`
Response: <FALL|RISE>
Example: RISE

- ## TAILFIT:COMPLETE

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before DJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :ATAX:TAIL**fit**:COMP**lete**?**

Example: `Send(0,5,":ATAX:TAIL:COMP?",16,EOI);`
Response: <0|1>

- ## TAILFIT:FILTERSAMPLES

The **TAILFIT:FILTERSAMPLES** command selects the sample size for establishing filter limits during the first pass. The filter limits are used on subsequent acquisition passes to generate a single histogram of data with measurements assessed relative to adjacent reference clock edges.

The **TAILFIT:FILTERSAMPLES** query returns the number of samples currently used to establish the filter limits.

**Command syntax- :ATAX:TAIL**fit**:FILTERSAMPLES**<0 to 10000>

Example: `Send(0,5,":ATAX:TAIL:FILTERSAMPLES 0",26,EOI);`

**Query syntax- :ATAX:TAIL**fit**:FILTERSAMPLES?**

Example: `Send(0,5,":ATAX:TAIL:FILTERSAMPLES?",25,EOI);`
Response: <ASCII integer>
Example: 1000

- ## TAILFIT:MINHITS

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :ATAX:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":ATAX:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :ATAX:TAIL**fit**:MINHITS?**

Example: `Send(0,5,":ATAX:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- ## TAILFIT:MODE

The **TAILFIT:MODE** command selects whether a Tail-Fit will be performed or not. It also allows the special Force-Fit mode to be enabled. The Force-Fit mode circumvents some of the criteria that is used to ensure the quality of the result, and forces a result to be returned.

The **TAILFIT:MODE** query returns the currently selected Tail-Fit mode.

**Command syntax- :ATAX:TAIL**fit**:MODE**<OFF|ON|FORCEFIT>

Example: `Send(0,5,":ATAX:TAIL:MODE OFF",19,EOI);`

**Query syntax- :ATAX:TAIL**fit**:MODE?**

Example: `Send(0,5,":ATAX:TAIL:MODE?",16,EOI);`
Response: <OFF|ON|FORCEFIT>

- ## TAILFIT:PROBABILITY

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

**Command syntax- :ATAX:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":ATAX:TAIL:PROB -16",19,EOI);`

**Query syntax- :ATAX:TAIL**fit**:PROB**ability**?**

Example: `Send(0,5,":ATAX:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- ## TJ

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :ATAX:TJ?**

Example: `Send(0,5,":ATAX:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

- ## UI

The **UI** query returns the unit interval that was measured.

**Query syntax- :ATAX:UI?**

Example: `Send(0,5,":ATAX:UI?",11,EOI);`
Response: <ASCII floating point>
Example: 1.000637e-9

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## • DESCRIPTION OF THE BIT CLOCK AND MARKER COMMANDS

The **BCAM** commands are used to obtain results using the Known Pattern with Bit Clock and Marker Tool. This tool requires a data signal, a pattern marker, and a bit clock. If your system has a PM-50 Card installed, you can use it to obtain a pattern marker. If your system has a Clock Recovery Card installed, you may use it to obtain a bit clock.

**:BCAM:**<command syntax>

**ACQ**uire
**BITRATE**
**CLE**ar
**CORN**erfreq
**DEF**ault
**DJ**
**FFT**
**HEAD**eroffset
**HITS**
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PATT**ern
**PJFREQ**uency
**PJVALU**e
**PLOTDATA:BATH**tub
**PLOTDATA:DDJT**
**PLOTDATA:FALL**
**PLOTDATA:FFT**
**PLOTDATA:HIST**ogram
**PLOTDATA:RISE**
**PLOTDATA:SIGM**a
**PLOTINFO:BATH**tub
**PLOTINFO:DDJT**
**PLOTINFO:FALL**
**PLOTINFO:FFT**
**PLOTINFO:HIST**ogram
**PLOTINFO:RISE**
**PLOTINFO:SIGM**a
**RJ**
**SPIKE**s
**TAIL**fit**:COMP**lete
**TAIL**fit**:MINHITS**
**TAIL**fit**:PROB**ability
**TJ**
**TOL**erance

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Bit Clock and Marker Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :BCAM:ACQ**uire

Example: `Send(0,5,":BCAM:ACQ;*OPC",9,EOI);`

## • BITRATE

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Query syntax- :BCAM:BITRATE?**

Example: `Send(0,5,":BCAM:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +1.0625e9

## • CLEAR

The **CLEAR** command provides a means to flush any previous data. Since the Bit Clock and Marker Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :BCAM:CLE**ar

Example: `Send(0,5,":BCAM:CLE",9,EOI);`

- ## CORNERFREQ

The **CORNERFREQ** command provides a means to configure the corner frequency that is used. The Corner Frequency is used to determine the maximum measurement interval used in sampling and is entered in Hz. A low corner frequency extends the time required to acquire the measurement set because histograms over many more periods must be acquired. Below the corner frequency, a natural roll-off of approximately 20dB per decade is observed. This command is only effective if the **:BCAM:FFT USER** command has been sent.

The **CORNERFREQ** query is used to determine what the current corner frequency is configured as.

**Command syntax- :BCAM:CORN**erfreq<10 to 1e+010>

Example: `Send(0,5,":BCAM:CORN 637e3",13,EOI);`

**Query syntax- :BCAM:CORN**erfreq**?**

Example: `Send(0,5,":BCAM:CORN?",11,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

- ## DEFAULT

The **DEFAULT** command is used to reset all the Bit Clock and Marker Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :BCAM:DEF**ault

Example: `Send(0,5,":BCAM:DEF",9,EOI);`

- ## DJ

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :BCAM:DJ?**

Example: `Send(0,5,":BCAM:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## FFT

The **FFT** command allows the FFT diagnostics mode to be enabled. By default no FFT is available. If DEFAULT is selected the corner frequency is set to Fc/1667. If USER is selected the value that was configured using the :BCAM:CORNERFREQ command is used.

The **FFT** query obtains the current FFT diagnostics mode.

**Command syntax- :BCAM:FFT**<OFF|DEFAULT|USER>

Example: `Send(0,5,":BCAM:FFT OFF",13,EOI);`

**Query syntax- :BCAM:FFT?**

Example: `Send(0,5,":BCAM:FFT?",10,EOI);`
Response: <OFF|DEFAULT|USER>

- ## HEADEROFFSET

The **HEADEROFFSET** command provides a means to start the measurements a given number of edges away from the pattern marker. This feature is helpful in the case of hard drive testing where an initial header proceeds the repeating data that has been loaded onto the drive.

The **HEADEROFFSET** query returns the current value of the header offset. The default value for the header offset is 0.

**Command syntax- :BCAM:HEAD**eroffset<0 to 10000>

Example: `Send(0,5,":BCAM:HEAD 0",12,EOI);`

**Query syntax- :BCAM:HEAD**eroffset**?**

Example: `Send(0,5,":BCAM:HEAD?",11,EOI);`
Response: <ASCII integer>
Example: 0

- ## HITS

The **HITS** query returns the number of accumulated hits in the total jitter histogram.

**Query syntax- :BCAM:HITS?**

Example: `Send(0,5,":BCAM:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- ## PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :BCAM:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":BCAM:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :BCAM:PARAM**eter**:ARM**ing**:CHAN**nel**?**

Example: `Send(0,5,":BCAM:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :BCAM:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":BCAM:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :BCAM:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":BCAM:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :BCAM:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":BCAM:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :BCAM:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":BCAM:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :BCAM:PARAMeter:ARMing:MODE<EXTERNAL|START|STOP>**

Example: `Send(0,5,":BCAM:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :BCAM:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":BCAM:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

- **PARAMETER:ARMING:SLOPE**

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :BCAM:PARAMeter:ARMing:SLOPe<FALL|RISE>**

Example: `Send(0,5,":BCAM:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :BCAM:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":BCAM:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

- **PARAMETER:ARMING:VOLTAGE**

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :BCAM:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":BCAM:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :BCAM:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":BCAM:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **PARAMETER:CHANNEL**

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :BCAM:PARAMeter:CHANnel<n&m>**

Example: `Send(0,5,":BCAM:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :BCAM:PARAMeter:CHANnel?**

Example: `Send(0,5,":BCAM:PARAM:CHAN?",17,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken of each data edge in the pattern every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken of each data edge in the pattern every time the ACQUIRE command is issued.

**Command syntax- :BCAM:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":BCAM:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :BCAM:PARAMeter:SAMPles?**

Example: `Send(0,5,":BCAM:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the data channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :BCAM:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":BCAM:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :BCAM:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":BCAM:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the clock channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected clock channel user voltage.

**Command syntax- :BCAM:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":BCAM:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :BCAM:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":BCAM:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :BCAM:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":BCAM:PARAM:THR 5050",20,EOI);`

**Query syntax- :BCAM:PARAMeter:THReshold?**

Example: `Send(0,5,":BCAM:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :BCAM:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":BCAM:PARAM:TIME 10",19,EOI);`

**Query syntax- :BCAM:PARAMeter:TIMEout?**

Example: `Send(0,5,":BCAM:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PATTERN

The **PATTERN** command selects the current pattern file to be used. The specified pattern file must exist on the SIA3000.

The **PATTERN** query returns the currently selected pattern file.

**Command syntax- :BCAM:PATTern<filename>**

Example: `Send(0,5,":BCAM:PATT K285.PTN",19,EOI);`

**Query syntax- :BCAM:PATTern?**

Example: `Send(0,5,":BCAM:PATT?",11,EOI);`
Response: <ASCII string>
Example: CJTPAT.PTN

- ## PJFREQUENCY

The **PJFREQUENCY** query returns the frequency at which the peak FFT spike was located. In order for this command to succeed, the FFT capabilities must have been enabled by issuing the FFT command. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :BCAM:PJFREQuency?**

Example: `Send(0,5,":BCAM:PJFREQ?",13,EOI);`
Response: <ASCII floating point>
Example: 1.678e+006

- **PJVALUE**

The **PJVALUE** query returns the jitter value at which the peak FFT spike was located. In order for this command to succeed, the FFT capabilities must have been enabled by issuing the FFT command. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :BCAM:PJVALUe?**

Example: `Send(0,5,":BCAM:PJVALU?",13,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :BCAM:PLOTDATA:BATHtub?**

Example: `Send(0,5,":BCAM:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:DDJT**

The **PLOTDATA:DDJT** query returns the plot data associated with the DDJT VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :BCAM:PLOTDATA:DDJT?**

Example: `Send(0,5,":BCAM:PLOTDATA:DDJT?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :BCAM:PLOTDATA:FALL?**

Example: `Send(0,5,":BCAM:PLOTDATA:FALL?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FFT**

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :BCAM:PLOTDATA:FFT?**

Example: `Send(0,5,":BCAM:PLOTDATA:FFT?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:HISTOGRAM**

The **PLOTDATA:HISTOGRAM** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :BCAM:PLOTDATA:HISTogram?**

Example: `Send(0,5,":BCAM:PLOTDATA:HIST?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:RISE

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :BCAM:PLOTDATA:RISE?**

Example: `Send(0,5,":BCAM:PLOTDATA:RISE?",20,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:SIGMA

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :BCAM:PLOTDATA:SIGMa?**

Example: `Send(0,5,":BCAM:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…ddddddddd…

- ## PLOTINFO:BATHTUB

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :BCAM:PLOTINFO:BATHtub?**

Example: `Send(0,5,":BCAM:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:DDJT

The **PLOTINFO:DDJT** query returns the plot information associated with the DDJT VS SPAN plot.

**Query syntax- :BCAM:PLOTINFO:DDJT?**

Example: `Send(0,5,":BCAM:PLOTINFO:DDJT?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:FALL

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :BCAM:PLOTINFO:FALL?**

Example: `Send(0,5,":BCAM:PLOTINFO:FALL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:FFT

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :BCAM:PLOTINFO:FFT?**

Example: `Send(0,5,":BCAM:PLOTINFO:FFT?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:HISTOGRAM**

The **PLOTINFO:HISTOGRAM** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :BCAM:PLOTINFO:HISTogram?**

Example: `Send(0,5,":BCAM:PLOTINFO:HIST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :BCAM:PLOTINFO:RISE?**

Example: `Send(0,5,":BCAM:PLOTINFO:RISE?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :BCAM:PLOTINFO:SIGMa?**

Example: `Send(0,5,":BCAM:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :BCAM:RJ?**

Example: `Send(0,5,":BCAM:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **SPIKES**

The **SPIKES** query returns the spike list of the FFT plot. This query returns the count of returned spikes followed by the spikes themselves. The spikes each consist of a magnitude and a frequency separated by the '/' character.

**Query syntax- :BCAM:SPIKES?**

Example: `Send(0,5,":BCAM:SPIKES?",12,EOI);`
Response: <Spikes> <Mag1/Freq1> <Mag2/Freq2> <Mag3/Freq3> …
Example: 3 2.956e-12/2.003e8 1.803e-12/1.556e8 1.193e-12/2.501e8

- **TAILFIT:COMPLETE**

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :BCAM:TAILfit:COMPlete?**

Example: `Send(0,5,":BCAM:TAIL:COMP?",16,EOI);`
Response: <0|1>

- ## TAILFIT:MINHITS

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :BCAM:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":BCAM:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :BCAM:TAIL**fit**:MINHITS?**

Example: `Send(0,5,":BCAM:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- ## TAILFIT:PROBABILITY

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

The **TAILFIT:PROBABILITY** query returns the currently selected Bit Error Rate.

**Command syntax- :BCAM:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":BCAM:TAIL:PROB -16",19,EOI);`

**Query syntax- :BCAM:TAIL**fit**:PROB**ability**?**

Example: `Send(0,5,":BCAM:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- ## TJ

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :BCAM:TJ?**

Example: `Send(0,5,":BCAM:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

- ## TOLERANCE

The **TOLERANCE** command selects the error tolerance. Measurements of an edge that exceed this value will cause an error. This value is specified in Unit Intervals, and the default value is 0.5 UI.

The **TOLERANCE** query returns the currently allowed error tolerance.

**Command syntax- :BCAM:TOL**erance<0 to 1000>

Example: `Send(0,5,":BCAM:TOL 0",11,EOI);`

**Query syntax- :BCAM:TOL**erance**?**

Example: `Send(0,5,":BCAM:TOL?",10,EOI);`
Response: <ASCII floating point>
Example: 0.5

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## • DESCRIPTION OF THE CHAN-TO-CHAN LOCKTIME COMMANDS

The **CHTOCHLOCKTIME** commands measure the skew between a reference clock and a clock under test. These measurements are made with respect to an external arming signal which is synchronized to some event such as a PLL reset. A histogram of time measurements is created from the first edge of the reference clock to the first edge of the clock under test. The edges being measured are then incremented relative to the external arming signal, and a histogram is then created from the second edge of the reference clock to the second edge of the clock under test. This process is continued in order to build a profile of the skew from a clock under test to a reference clock with respect to the external arning event.

**:CHTOCHLOCK**time:<command syntax>

**ACQ**uire
**AVGMEAS**
**AVGPKPK**
**AVGSDEV**
**COUN**t
**DEF**ault
**FFT:ALPH**afactor
**FFT:MULT**iplier
**FFT:WIND**owtype
**MAXMEAS**
**MAXNEGDELTAEDGE**
**MAXNEGDELTATIME**
**MAXPKPK**
**MAXPOSDELTAEDGE**
**MAXPOSDELTATIME**
**MAXSDEV**
**MINMEAS**
**MINPKPK**
**MINSDEV**
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:FILT**er**:ENAB**le
**PARAM**eter**:FILT**er**:MAX**imum
**PARAM**eter**:FILT**er**:MIN**imum
**PARAM**eter**:FUNC**tion
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:COUN**t
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:COUN**t
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PLOTDATA:FFT**
**PLOTDATA:PEAK**
**PLOTDATA:SIGM**a
**PLOTDATA:TIME**
**PLOTINFO:FFT**
**PLOTINFO:PEAK**
**PLOTINFO:SIGM**a
**PLOTINFO:TIME**
**RANG**e

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Channel-ToChannel Locktime Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :CHTOCHLOCK**time**:ACQ**uire

Example: `Send(0,5,":CHTOCHLOCK:ACQ",15,EOI);`

## • AVGMEAS

The **AVGMEAS** query returns the average of all measurements across the entire range of measurements made.

**Query syntax- :CHTOCHLOCK**time**:AVGMEAS?**

Example: `Send(0,5,":CHTOCHLOCK:AVGMEAS?",20,EOI);`
Response: <ASCII floating point>
Example: 1.103637e-009

- ## AVGPKPK

The **AVGPKPK** query returns the average of the (maximum – minimum) across the entire range of measurements made.

**Query syntax- :CHTOCHLOCK**time**:AVGPKPK?**

Example: `Send(0,5,":CHTOCHLOCK:AVGPKPK?",20,EOI);`
Response: <ASCII floating point>
Example: 3.303687e-012

- ## AVGSDEV

The **AVGSDEV** query returns the average of the standard deviations across the entire range of measurements made.

**Query syntax- :CHTOCHLOCK**time**:AVGSDEV?**

Example: `Send(0,5,":CHTOCHLOCK:AVGSDEV?",20,EOI);`
Response: <ASCII floating point>
Example: 2.013677e-012

- ## COUNT

The **COUNT** command determines the number of data points to sample across the **RANGE** specified. The number specified should not be greater than the **RANGE**. By specifying a smaller number intervals will be skipped, resulting in faster test times.

The **COUNT** query returns the number of data points that are currently selected to be sampled.

**Command syntax- :CHTOCHLOCK**time**:COUN**t<10 to 10000>

Example: `Send(0,5,":CHTOCHLOCK:COUN 10",19,EOI);`

**Query syntax- :CHTOCHLOCK**time**:COUN**t**?**

Example: `Send(0,5,":CHTOCHLOCK:COUN?",17,EOI);`
Response: <ASCII integer>
Example: 100

- ## DEFAULT

The **DEFAULT** command is used to reset all the Channel-To-Channel Locktime Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :CHTOCHLOCK**time**:DEF**ault

Example: `Send(0,5,":CHTOCHLOCK:DEF",15,EOI);`

- ## FFT:ALPHAFACTOR

The **FFT:ALPHAFACTOR** command is used to vary the sidelobe rejection of the Kaiser-Bessel window. As the Alpha Factor increases, the spectral peak widens and the sidelobes shrink. As the Alpha Factor decreases, the spectral peak narrows and the sidelobes increase in amplitude.

The **FFT:ALPHAFACTOR** query returns the currently selected Kaiser-Bessel Alpha factor.

**Command syntax- :CHTOCHLOCK**time**:FFT:ALPH**afactor<2 to 100>

Example: `Send(0,5,":CHTOCHLOCK:FFT:ALPH 2",22,EOI);`

**Query syntax- :CHTOCHLOCK**time**:FFT:ALPH**afactor**?**

Example: `Send(0,5,":CHTOCHLOCK:FFT:ALPH?",21,EOI);`
Response: <ASCII floating point>
Example: 1.000e+002

- **FFT:MULTIPLIER**

The **FFT:MULTIPLIER** command selects the amount of zero padding to be applied to the measured data prior to the FFT being applied. Padding increases the frequency resolution of the FFT. Generally, a higher padding value will increase transformation processing time.

The **FFT:MULTIPLIER** query returns the currently selected multiplier value.

**Command syntax- :CHTOCHLOCK**time**:FFT:MULT**iplier<1|2|4|8|16|32>

Example: `Send(0,5,":CHTOCHLOCK:FFT:MULT 1",22,EOI);`

**Query syntax- :CHTOCHLOCK**time**:FFT:MULT**iplier**?**

Example: `Send(0,5,":CHTOCHLOCK:FFT:MULT?",21,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- **FFT:WINDOWTYPE**

The **FFT:WINDOWTYPE** command selects the window type used to reduce the spectral information distortion of an FFT. The time domain signal is multiplied by a window weighting function before the transform is performed. The choice of window will determine which spectral components will be isolated, or separated, from the dominant frequency(s).

The **FFT:WINDOWTYPE** query returns the currently selected window type.

**Command syntax- :CHTOCHLOCK**time**:FFT:WIND**owtype<RECTANGULAR|KAISER-BESSEL|TRIANGULAR|HAMMING|HANNING|BLACKMAN|GAUSSIAN>

Example: `Send(0,5,":CHTOCHLOCK:FFT:WIND RECTANGULAR",32,EOI);`

**Query syntax- :CHTOCHLOCK**time**:FFT:WIND**owtype**?**

Example: `Send(0,5,":CHTOCHLOCK:FFT:WIND?",21,EOI);`
Response: <RECTANGULAR|KAISER-BESSEL|TRIANGULAR|
HAMMING|HANNING|BLACKMAN|GAUSSIAN>
Example: RECTANGULAR

- **MAXMEAS**

The **MAXMEAS** query returns the maximum measurement across all measurements made.

**Query syntax- :CHTOCHLOCK**time**:MAXMEAS?**

Example: `Send(0,5,":CHTOCHLOCK:MAXMEAS?",20,EOI);`
Response: <ASCII floating point>
Example: 1.107964e-009

- **MAXNEGDELTAEDGE**

The **MAXNEGDELTAEDGE** query returns the index of the interval which has the largest negative gradient.

**Query syntax- :CHTOCHLOCK**time**:MAXNEGDELTAEDGE?**

Example: `Send(0,5,":CHTOCHLOCK:MAXNEGDELTAEDGE?",28,EOI);`
Response: <ASCII integer>
Example: 12

- **MAXNEGDELTATIME**

The **MAXNEGDELTATIME** query returns the value of the largest negative gradient between two average measurements.

**Query syntax- :CHTOCHLOCK**time**:MAXNEGDELTATIME?**

Example: `Send(0,5,":CHTOCHLOCK:MAXNEGDELTATIME?",28,EOI);`
Response: <ASCII floating point>
Example: 8.5678132e-012

- **MAXPKPK**

The **MAXPKPK** query returns the maximum Pk-Pk measurement across all periods measured.

**Query syntax- :CHTOCHLOCK**time**:MAXPKPK?**

Example: `Send(0,5,":CHTOCHLOCK:MAXPKPK?",20,EOI);`
Response: <ASCII floating point>
Example: 7. 964107e-012

- **MAXPOSDELTAEDGE**

The **MAXPOSDELTAEDGE** query the index of the interval which has the largest positive gradient.

**Query syntax- :CHTOCHLOCK**time**:MAXPOSDELTAEDGE?**

Example: `Send(0,5,":CHTOCHLOCK:MAXPOSDELTAEDGE?",28,EOI);`
Response: <ASCII integer>
Example: 17

- **MAXPOSDELTATIME**

The **MAXPOSDELTATIME** query returns the value of the largest positive gradient between two average measurements.

**Query syntax- :CHTOCHLOCK**time**:MAXPOSDELTATIME?**

Example: `Send(0,5,":CHTOCHLOCK:MAXPOSDELTATIME?",28,EOI);`
Response: <ASCII floating point>
Example: 8.5678132e-012

- **MAXSDEV**

The **MAXSDEV** query returns the maximum 1-sigma measurement across all periods measured.

**Query syntax- :CHTOCHLOCK**time**:MAXSDEV?**

Example: `Send(0,5,":CHTOCHLOCK:MAXSDEV?",20,EOI);`
Response: <ASCII floating point>
Example: 3. 794167e-012

- **MINMEAS**

The **MINMEAS** query returns the minimum measurement across all periods measured.

**Query syntax- :CHTOCHLOCK**time**:MINMEAS?**

Example: `Send(0,5,":CHTOCHLOCK:MINMEAS?",20,EOI);`
Response: <ASCII floating point>
Example: 9.907964e-010

- **MINPKPK**

The **MINPKPK** query returns the minimum Pk-Pk measurement across all periods measured.

**Query syntax- :CHTOCHLOCK**time**:MINPKPK?**

Example: `Send(0,5,":CHTOCHLOCK:MINPKPK?",20,EOI);`
Response: <ASCII floating point>
Example: 5. 096407e-012

- **MINSDEV**

The **MINSDEV** query returns the minimum 1-sigma measurement across all periods measured.

**Query syntax- :CHTOCHLOCK**time**:MINSDEV?**

Example: `Send(0,5,":CHTOCHLOCK:MINSDEV?",20,EOI);`
Response: <ASCII floating point>
Example: 2. 941467e-012

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:CHAN 1",28,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:CHAN**nel**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:CHAN?",27,EOI);`
Response: <ASCII integer>
Example: 1

- **PARAMETER:ARMING:DELAY**

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:DEL -40",29,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:DEL**ay**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:DEL?",26,EOI);`
Response: <ASCII integer>
Example: -10

- ## PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:MARK OFF",30,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:MARK**er**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:MARK?",27,EOI);`
Response: <OFF|ON>

- ## PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:MODE EXTERNAL",35,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:MODE?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:MODE?",27,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:SLOP FALL",31,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:SLOP**e**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:SLOP?",27,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:VOLT -2",29,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:ARM**ing**:VOLT**age**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:ARM:VOLT?",27,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

 

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the measurement and reference input channels that will be used by this tool. The channels are specified by first providing the integer number of the measurement channel, then an '&' character, and finally the integer number of the reference channel: <measurement channel>&<reference channel>

The **PARAMETER:CHANNEL** query returns the currently selected measurement and reference channels for this tool.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:CHAN**nel<n&m>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:CHAN1&4",23,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:CHAN**nel**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:CHAN?",23,EOI);`
Response: <measurement channel> & <reference channel>
Example: 1&7

- ## PARAMETER:FILTER:ENABLE

The **PARAMETER:FILTER:ENABLE** command enables a post-processing filter that ignores measurements acquired outside of the filter region. The statistics are calculated from only the measurements within the filter region, and the plots will display only data from within the filtered region. With filters enabled the number of hits acquired may be less than the number of hits requested as a result of the filtered values being thrown away.

The **PARAMETER:FILTER:ENABLE** query returns whether the filters are currently enabled.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:FILT**er**:ENAB**le<OFF|ON>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FILT:ENAB OFF",31,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:FILT**er**:ENAB**le**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FILT:ENAB?",28,EOI);`
Response: <OFF|ON>
Example: OFF

- ## PARAMETER:FILTER:MAXIMUM

The **PARAMETER:FILTER:MAXIMUM** command selects the maximum filter time in seconds.

The **PARAMETER:FILTER:MAXIMUM** query returns the maximum filter value.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:FILT**er**:MAX**imum<-2.5 to 2.5>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FILT:MAX -2.5",31,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:FILT**er**:MAX**imum**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FILT:MAX?",27,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- ## PARAMETER:FILTER:MINIMUM

The **PARAMETER:FILTER:MINIMUM** command selects the minimum filter time in seconds.

The **PARAMETER:FILTER:MINIMUM** query returns the minimum filter value.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:FILT**er**:MIN**imum<-2.5 to 2.5>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FILT:MIN -2.5",31,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:FILT**er**:MIN**imum**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FILT:MIN?",27,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

## • PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:FUNC**tion<TPD++|TPD--|TPD+-|TPD-+>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FUNC TPD++",28,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:FUNC**tion**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:FUNC?",23,EOI);`
Response: <TPD++|TPD--|TPD+-|TPD-+>

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:SAMP**les<1 to 950000>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:SAMP 1000",24,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:SAMP**les**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:SAMP?",23,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:STAR**t**:COUN**t<1 to 10000000>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STAR:COUN 1",29,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:STAR**t**:COUN**t**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STAR:COUN?",28,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STAR:VOLT -2",30,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:STAR**t**:VOLT**age**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STAR:VOLT?",28,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

 

- ## PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:STOP:COUN**t<1 to 10000000>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STOP:COUN 1",29,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:STOP:COUN**t**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STOP:COUN?",28,EOI);`
Response: <ASCII integer>
Example: 2

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STOP:VOLT -2",30,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:STOP:VOLT**age**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:STOP:VOLT?",28,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:THR 5050",26,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:THR**eshold**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:THR?",22,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :CHTOCHLOCK**time**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":CHTOCHLOCK:PARAM:TIME 10",27,EOI);`

**Query syntax- :CHTOCHLOCK**time**:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":CHTOCHLOCK:PARAM:TIME?",23,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PLOTDATA:FFT

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CHTOCHLOCK**time**:PLOTDATA:FFT?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTDATA:FFT?",25,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:PEAK

The **PLOTDATA:PEAK** query returns the plot data associated with the PK-PK VS DELAY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CHTOCHLOCK**time**:PLOTDATA:PEAK?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTDATA:PEAK?",26,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SIGMA

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS DELAY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CHTOCHLOCK**time**:PLOTDATA:SIGM**a**?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTDATA:SIGM?",26,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:TIME

The **PLOTDATA:TIME** query returns the plot data associated with the MEASUREMENT VS DELAY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CHTOCHLOCK**time**:PLOTDATA:TIME?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTDATA:TIME?",26,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :CHTOCHLOCK**time**:PLOTINFO:FFT?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTINFO:FFT?",25,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:PEAK**

The **PLOTINFO:PEAK** query returns the plot information associated with the PK-PK VS DELAY plot.

**Query syntax- :CHTOCHLOCK**time**:PLOTINFO:PEAK?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTINFO:PEAK?",26,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS DELAY plot.

**Query syntax- :CHTOCHLOCK**time**:PLOTINFO:SIGM**a**?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTINFO:SIGM?",26,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TIME**

The **PLOTINFO:TIME** query returns the plot information associated with the MEASUREMENT VS DELAY plot.

**Query syntax- :CHTOCHLOCK**time**:PLOTINFO:TIME?**

Example: `Send(0,5,":CHTOCHLOCK:PLOTINFO:TIME?",26,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RANGE**

The **RANGE** command selects the number of periods over which measurements are acquired.

The **RANGE** query returns the currently selected number of periods over which measurements are acquired.

**Command syntax- :CHTOCHLOCK**time**:RANG**e<10 to 100000>

Example: `Send(0,5,":CHTOCHLOCK:RANG 10",19,EOI);`

**Query syntax- :CHTOCHLOCK**time**:RANG**e**?**

Example: `Send(0,5,":CHTOCHLOCK:RANG?",17,EOI);`
Response: <ASCII integer >
Example: 1000

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## • DESCRIPTION OF THE CLOCK ANALYSIS COMMANDS

The **CLKANALYSIS** commands combine a few different measurement tools into a single tool (Scope, Histogram, and High Frequency Modulation). By doing this, a large number of useful results can be obtained quickly. The measurement settings are predefined to provide the best configuration for a variety of users. This ease of use means that there is less control over individual settings. There may be instances where there is the need to have more control over a specific measurement. An example would be changing the trigger delay on the oscilloscope, or measuring a histogram over two periods rather than single period jitter. Another example would be to find very low frequency jitter below the (clock/1667) low cutoff frequency of this tool. In these cases the specific tool should be used instead of this more general tool.

**:CLKANALYSIS:**<command syntax>

**ACQ**uire
**CLE**ar
**DEF**ault
**HITS**
**INPUT**
**OVERUNDER**
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PERIODIC**
**PLOTDATA:BOTH**jitter
**PLOTDATA:FFT**
**PLOTDATA:HIST**ogram
**PLOTDATA:LONG**jitter
**PLOTDATA:SCOPE-**
**PLOTDATA:SCOPE+**
**PLOTDATA:SCOPECOMM**
**PLOTDATA:SCOPEDIFF**
**PLOTDATA:SHORT**jitter
**PLOTINFO:BOTH**jitter
**PLOTINFO:FFT**
**PLOTINFO:HIST**ogram
**PLOTINFO:LONG**jitter
**PLOTINFO:SCOPE-**
**PLOTINFO:SCOPE+**
**PLOTINFO:SCOPECOMM**
**PLOTINFO:SCOPEDIFF**
**PLOTINFO:SHORT**jitter
**RISEFALL**
**SCOPE:FALLTIME**
**SCOPE:OVERSHOOT**
**SCOPE:RISETIME**
**SCOPE:UNDERSHOOT**
**SCOPE:VAMP**
**SCOPE:VAVG**
**SCOPE:VBASE**
**SCOPE:VMAX**
**SCOPE:VMID**
**SCOPE:VMIN**
**SCOPE:VPKTOPK**
**SCOPE:VRMS**
**SCOPE:VTOP**
**TAIL**fit**:COMP**lete
**TFITS**
**TIM**e**:CORN**erfreq
**TIM**e**:DJ**
**TIM**e**:DUTY**cycle
**TIM**e**:FREQ**uency
**TIM**e**:MEAN**
**TIM**e**:PJ**
**TIM**e**:PJFREQ**uency
**TIM**e**:PKTOPK**
**TIM**e**:PW-**
**TIM**e**:PW+**
**TIM**e**:RJ**
**TIM**e**:STD**dev
**TIM**e**:TJ**
**TIMEPARM**
**VEXTREME**
**VTYPICAL**
**WAVEMATH**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Clock Analysis Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :CLKANALYSIS:ACQ**uire

Example: `Send(0,5,":CLKANALYSIS:ACQ",16,EOI);`

- ## CLEAR

The **CLEAR** command provides a means to flush any previous data. Since the Clock Analysis Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :CLKANALYSIS:CLE**ar

Example: `Send(0,5,":CLKANALYSIS:CLE",16,EOI);`

- ## DEFAULT

The **DEFAULT** command is used to reset all the Clock Analysis Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :CLKANALYSIS:DEF**ault

Example: `Send(0,5,":CLKANALYSIS:DEF",16,EOI);`

- ## HITS

The **HITS** query returns the number of accumulated hits in the Clock Analysis histogram.

**Query syntax- :CLKANALYSIS:HITS?**

Example: `Send(0,5,":CLKANALYSIS:HITS?",18,EOI);`
Response: <ASCII integer>
Example: 35000

- ## INPUT

The **INPUT** command selects which scope data queried results are drawn from.

The **INPUT** query returns the currently selected scope data.

**Command syntax- :CLKANALYSIS:INPUT**<NORM|COMP|DIFF|BOTH|COMM>

Example: `Send(0,5,":CLKANALYSIS:INPUT NORM",23,EOI);`

**Query syntax- :CLKANALYSIS:INPUT?**

Example: `Send(0,5,":CLKANALYSIS:INPUT?",19,EOI);`
Response: <NORM|COMP|DIFF|BOTH|COMM>

- ## OVERUNDER

The **OVERUNDER** command selects whether overshoot and undershoot are to be measured.

The **OVERUNDER** query returns whether or not overshoot and undershoot are currently measured.

**Command syntax- :CLKANALYSIS:OVERUNDER**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:OVERUNDER OFF",26,EOI);`

**Query syntax- :CLKANALYSIS:OVERUNDER?**

Example: `Send(0,5,":CLKANALYSIS:OVERUNDER?",23,EOI);`
Response: <OFF|ON>

- ## PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :CLKANALYSIS:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":CLKANALYSIS:PARAM:ARM:DEL -40",30,EOI);`

**Query syntax- :CLKANALYSIS:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":CLKANALYSIS:PARAM:ARM:DEL?",27,EOI);`
Response: <ASCII integer>
Example: -10

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :CLKANALYSIS:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":CLKANALYSIS:PARAM:CHAN4",24,EOI);`

**Query syntax- :CLKANALYSIS:PARAMeter:CHANnel?**

Example: `Send(0,5,":CLKANALYSIS:PARAM:CHAN?",24,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :CLKANALYSIS:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":CLKANALYSIS:PARAM:SAMP 1000",25,EOI);`

**Query syntax- :CLKANALYSIS:PARAMeter:SAMPles?**

Example: `Send(0,5,":CLKANALYSIS:PARAM:SAMP?",24,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CLKANALYSIS:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":CLKANALYSIS:PARAM:STAR:VOLT -2",31,EOI);`

**Query syntax- :CLKANALYSIS:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":CLKANALYSIS:PARAM:STAR:VOLT?",29,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CLKANALYSIS:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":CLKANALYSIS:PARAM:STOP:VOLT -2",31,EOI);`

**Query syntax- :CLKANALYSIS:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":CLKANALYSIS:PARAM:STOP:VOLT?",29,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :CLKANALYSIS:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":CLKANALYSIS:PARAM:THR 5050",27,EOI);`

**Query syntax- :CLKANALYSIS:PARAMeter:THReshold?**

Example: `Send(0,5,":CLKANALYSIS:PARAM:THR?",23,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :CLKANALYSIS:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":CLKANALYSIS:PARAM:TIME 10",28,EOI);`

**Query syntax- :CLKANALYSIS:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":CLKANALYSIS:PARAM:TIME?",24,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PERIODIC

The **PERIODIC** command selects whether or not data is measured and an FFT calculated to obtain information about periodic jitter sources. Turning this measurement off can reduce measurement time.

The **PERIODIC** query returns whether or not periodic jitter is currently being measured and calculated.

**Command syntax- :CLKANALYSIS:PERIODIC**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:PERIODIC OFF",25,EOI);`

**Query syntax- :CLKANALYSIS:PERIODIC?**

Example: `Send(0,5,":CLKANALYSIS:PERIODIC?",22,EOI);`
Response: <OFF|ON>

- ## PLOTDATA:BOTHJITTER

The **PLOTDATA:BOTHJITTER** query returns the plot data associated with the TOTAL JITTER VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:BOTH**jitter**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:BOTH?",27,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:FFT

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:FFT?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:FFT?",26,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:HISTOGRAM

The **PLOTDATA:HISTOGRAM** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:HIST**ogram**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:HIST?",27,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:LONGJITTER**

The **PLOTDATA:LONGJITTER** query returns the plot data associated with the LONG CYCLE JITTER VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:LONG**jitter**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:LONG?",27,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE-**

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:SCOPE-?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:SCOPE-?",29,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:SCOPE+?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:SCOPE+?",29,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPECOMM**

The **PLOTDATA:SCOPECOMM** query returns the plot data associated with the COMMON MODE SCOPE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:SCOPECOMM?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:SCOPECOMM?",32,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPEDIFF**

The **PLOTDATA:SCOPEDIFF** query returns the plot data associated with the DIFFERENTIAL MODE SCOPE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:SCOPEDIFF?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:SCOPEDIFF?",32,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SHORTJITTER**

The **PLOTDATA:SHORTJITTER** query returns the plot data associated with the SHORT CYCLE JITTER VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CLKANALYSIS:PLOTDATA:SHORT**jitter**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTDATA:SHORT?",28,EOI);`
Response: #xy…dddddddd…

 

- **PLOTINFO:BOTHJITTER**

The **PLOTINFO:BOTHJITTER** query returns the plot information associated with the TOTAL JITTER VS TIME plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:BOTH**jitter**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:BOTH?",27,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:FFT?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:FFT?",26,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:HISTOGRAM**

The **PLOTINFO:HISTOGRAM** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:HIST**ogram**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:HIST?",27,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:LONGJITTER**

The **PLOTINFO:LONGJITTER** query returns the plot information associated with the LONG CYCLE JITTER VS TIME plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:LONG**jitter**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:LONG?",27,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIMENTARY SCOPE INPUT plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:SCOPE-?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:SCOPE-?",29,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:SCOPE+?",29,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPECOMM**

The **PLOTINFO:SCOPECOMM** query returns the plot information associated with the COMMON MODE SCOPE plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:SCOPECOMM?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:SCOPECOMM?",32,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPEDIFF**

The **PLOTINFO:SCOPEDIFF** query returns the plot information associated with the DIFFERENTIAL MODE SCOPE plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:SCOPEDIFF?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:SCOPEDIFF?",32,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SHORTJITTER**

The **PLOTINFO:SHORTJITTER** query returns the plot information associated with the SHORT CYCLE JITTER VS TIME plot.

**Query syntax- :CLKANALYSIS:PLOTINFO:SHORT**jitter**?**

Example: `Send(0,5,":CLKANALYSIS:PLOTINFO:SHORT?",28,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RISEFALL**

The **RISEFALL** command selects whether or not risetime and falltime are measured.

The **RISEFALL** query returns whether or not risetime and falltime are currently being measured.

**Command syntax- :CLKANALYSIS:RISEFALL**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:RISEFALL OFF",25,EOI);`

**Query syntax- :CLKANALYSIS:RISEFALL?**

Example: `Send(0,5,":CLKANALYSIS:RISEFALL?",22,EOI);`
Response: <OFF|ON>

- **SCOPE:FALLTIME**

The **SCOPE:FALLTIME** query returns the falltime that was measured on the previous acquisition for the specified channel(s). A successful measurement is dependent on having a scope waveform in the acquisition window that is correctly identified as a falling edge. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:SCOPE:FALLTIME?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:FALLTIME?",28,EOI);`
Response: <ASCII floating point>
Example: 7.896283e-011

 

- ## SCOPE:OVERSHOOT

The **SCOPE:OVERSHOOT** query returns the overshoot (Vmax – Vtop) calculated on the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:SCOPE:OVERSHOOT?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:OVERSHOOT?",29,EOI);`
Response: <ASCII floating point>
Example: 1.654e-002

- ## SCOPE:RISETIME

The **SCOPE:RISETIME** query returns the risetime that was measured on the previous acquisition for the specified channel(s). A successful measurement is dependent on having a scope waveform in the acquisition window that is correctly identified as a rising edge. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:SCOPE:RISETIME?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:RISETIME?",28,EOI);`
Response: <ASCII floating point>
Example: 8.012948e-011

- ## SCOPE:UNDERSHOOT

The **SCOPE:UNDERSHOOT** query returns the undershoot (Vbase – Vmin) calculated on the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:SCOPE:UNDERSHOOT?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:UNDERSHOOT?",30,EOI);`
Response: <ASCII floating point>
Example: 1.654e-002

- ## SCOPE:VAMP

The **SCOPE:VAMP** query returns the amplitude (Vtop – Vbase) calculated on the previous acquisition.

**Query syntax- :CLKANALYSIS:SCOPE:VAMP?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VAMP?",24,EOI);`
Response: <ASCII floating point>
Example: 1.654e-001

- ## SCOPE:VAVG

The **SCOPE:VAVG** query returns the average voltage across the acquisition window, calculated on the previous acquisition.

**Query syntax- :CLKANALYSIS:SCOPE:VAVG?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VAVG?",24,EOI);`
Response: <ASCII floating point>
Example: 1.764e-002

- ## SCOPE:VBASE

The **SCOPE:VBASE** query returns the voltage of the flat area on the base (0 logic level) of a data waveform.

**Query syntax- :CLKANALYSIS:SCOPE:VBASE?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VBASE?",25,EOI);`
Response: <ASCII floating point>
Example: -1.654e-001

- ## SCOPE:VMAX

The **SCOPE:VMAX** query returns the maximum voltage that was measured.

**Query syntax- :CLKANALYSIS:SCOPE:VMAX?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VMAX?",24,EOI);`
Response: <ASCII floating point>
Example: 1.815e-001

- ## SCOPE:VMID

The **SCOPE:VMID** query midpoint voltage (Vtop + Vbase) / 2 obtained on the previous acquisition.

**Query syntax- :CLKANALYSIS:SCOPE:VMID?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VMID?",24,EOI);`
Response: <ASCII floating point>
Example: 1.764e-002

- ## SCOPE:VMIN

The **SCOPE:VMIN** query returns the minimum voltage that was measured.

**Query syntax- :CLKANALYSIS:SCOPE:VMIN?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VMIN?",24,EOI);`
Response: <ASCII floating point>
Example: -1.967e-001

- ## SCOPE:VPKTOPK

The **SCOPE:VPKTOPK** query returns the Pk-Pk voltage (Vmax – Vmin) obtained on the previous acquisition.

**Query syntax- :CLKANALYSIS:SCOPE:VPKTOPK?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VPKTOPK?",27,EOI);`
Response: <ASCII floating point>
Example: 2.485e-001

- ## SCOPE:VRMS

The **SCOPE:VRMS** query return the root mean square voltage across the acquisition window, from on the previous acquisition.

**Query syntax- :CLKANALYSIS:SCOPE:VRMS?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VRMS?",24,EOI);`
Response: <ASCII floating point>
Example: 3.345e-002

- ## SCOPE:VTOP

The **SCOPE:VTOP** query returns the voltage of the flat area on the top (1 logic level) of a data waveform.

**Query syntax- :CLKANALYSIS:SCOPE:VTOP?**

Example: `Send(0,5,":CLKANALYSIS:SCOPE:VTOP?",24,EOI);`
Response: <ASCII floating point>
Example: 1.654e-001

- **TAILFIT:COMPLETE**

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :CLKANALYSIS:TAILfit:COMPlete?**

Example: `Send(0,5,":CLKANALYSIS:TAIL:COMP?",23,EOI);`
Response: <0|1>

- **TFITS**

The **TFITS** command selects if the Tail-Fit will be enabled to calculate DJ, RJ, and TJ.

The **TFITS** query returns whether or not the Tail-Fit is enabled.

**Command syntax- :CLKANALYSIS:TFITS**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:TFITS OFF",22,EOI);`

**Query syntax- :CLKANALYSIS:TFITS?**

Example: `Send(0,5,":CLKANALYSIS:TFITS?",19,EOI);`
Response: <OFF|ON>

- **TIME:CORNERFREQ**

The **TIME:CORNERFREQ** query returns the corener frequency that was used to obtain the periodic components.

**Query syntax- :CLKANALYSIS:TIMe:CORNerfreq?**

Example: `Send(0,5,":CLKANALYSIS:TIM:CORN?",22,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

- **TIME:DJ**

The **TIME:DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:TIMe:DJ?**

Example: `Send(0,5,":CLKANALYSIS:TIM:DJ?",20,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **TIME:DUTYCYCLE**

The **TIME:DUTYCYCLE** query returns the duty cycle obtained for the previous acquisition.

**Query syntax- :CLKANALYSIS:TIMe:DUTYcycle?**

Example: `Send(0,5,":CLKANALYSIS:TIM:DUTY?",22,EOI);`
Response: <ASCII floating point>
Example: 5.036e001

- **TIME:FREQUENCY**

The **TIME:FREQUENCY** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :CLKANALYSIS:TIMe:FREQuency?**

Example: `Send(0,5,":CLKANALYSIS:TIM:FREQ?",22,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- ## TIME:MEAN

The **TIME:MEAN** query returns the average of all measurement values obtained across all accumulated passes.

**Query syntax- :CLKANALYSIS:TIMe:MEAN?**

Example: `Send(0,5,":CLKANALYSIS:TIM:MEAN?",22,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- ## TIME:PJ

The **TIME:PJ** query returns the Periodic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:TIMe:PJ?**

Example: `Send(0,5,":CLKANALYSIS:TIM:PJ?",20,EOI);`
Response: <ASCII floating point>
Example: 20.3162387e-12

- ## TIME:PJFREQUENCY

The **TIME:PJFREQUENCY** query returns the frequency at which the peak FFT spike was located.

**Query syntax- :CLKANALYSIS:TIMe:PJFREQuency?**

Example: `Send(0,5,":CLKANALYSIS:TIM:PJFREQ?",24,EOI);`
Response: <ASCII floating point>
Example: 1.678e+006

- ## TIME:PKTOPK

The **TIME:PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all measurement values obtained.

**Query syntax- :CLKANALYSIS:TIMe:PKTOPK?**

Example: `Send(0,5,":CLKANALYSIS:TIM:PKTOPK?",24,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- ## TIME:PW-

The **TIME:PW-** query returns the average PW- that was measured.

**Query syntax- :CLKANALYSIS:TIMe:PW-?**

Example: `Send(0,5,":CLKANALYSIS:TIM:PW-?",21,EOI);`
Response: <ASCII floating point>
Example: 1.6646345e-012

- ## TIME:PW+

The **TIME PW+** query returns the average PW+ that was measured.

**Query syntax- :CLKANALYSIS:TIMe:PW+?**

Example: `Send(0,5,":CLKANALYSIS:TIM:PW+?",21,EOI);`
Response: <ASCII floating point>
Example: 1.5467345e-012

- **TIME:RJ**

The **TIME:RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:TIMe:RJ?**

Example: `Send(0,5,":CLKANALYSIS:TIM:RJ?",20,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **TIME:STDDEV**

The **TIME:STDDEV** query returns the standard deviation of all measurements across all accumulated histogram passes.

**Query syntax- :CLKANALYSIS:TIMe:STDdev?**

Example: `Send(0,5,":CLKANALYSIS:TIM:STD?",21,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **TIME:TJ**

The **TIME:TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CLKANALYSIS:TIMe:TJ?**

Example: `Send(0,5,":CLKANALYSIS:TIM:TJ?",20,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

- **TIMEPARM**

The **TIMEPARM** command selects whether or not the timing parameters are measured.

The **TIMEPARM** query returns whether or not timing parameters are currently being measured.

**Command syntax- :CLKANALYSIS:TIMEPARM**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:TIMEPARM OFF",25,EOI);`

**Query syntax- :CLKANALYSIS:TIMEPARM?**

Example: `Send(0,5,":CLKANALYSIS:TIMEPARM?",22,EOI);`
Response: <OFF|ON>

- **VEXTREME**

The **VEXTREME** command selects whether or not Vmin, Vmax, and Vpp are measured.

The **VEXTREME** query returns whether or not Vmin, Vmax, and Vpp are currently being measured.

**Command syntax- :CLKANALYSIS:VEXTREME**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:VEXTREME OFF",25,EOI);`

**Query syntax- :CLKANALYSIS:VEXTREME?**

Example: `Send(0,5,":CLKANALYSIS:VEXTREME?",22,EOI);`
Response: <OFF|ON>

- **VTYPICAL**

The **VTYPICAL** command selects whether or not Vtop, Vbase, Vampl, and Vmid are measured.

The **VTYPICAL** query returns whether or not Vtop, Vbase, Vampl, and Vmid are currently being measured.

**Command syntax- :CLKANALYSIS:VTYPICAL**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:VTYPICAL OFF",25,EOI);`

**Query syntax- :CLKANALYSIS:VTYPICAL?**

Example: `Send(0,5,":CLKANALYSIS:VTYPICAL?",22,EOI);`
Response: <OFF|ON>

- **WAVEMATH**

The **WAVEMATH** command selects whether or not Vavg and Vrms are measured.

The **WAVEMATH** query returns whether or not Vavg and Vrms are currently being measured.

**Command syntax- :CLKANALYSIS:WAVEMATH**<OFF|ON>

Example: `Send(0,5,":CLKANALYSIS:WAVEMATH OFF",25,EOI);`

**Query syntax- :CLKANALYSIS:WAVEMATH?**

Example: `Send(0,5,":CLKANALYSIS:WAVEMATH?",22,EOI);`
Response: <OFF|ON>

## • DESCRIPTION OF THE CLOCK STATISTICS COMMANDS

The **CLKSTATISTICS** commands provide access to the basic clock statistics of Period+, Period-, PW+, PW-, Frequency and Duty Cycle. Also displayed are the measured Vstart, Vstop as well as the Vp-p, Vmax and Vmin of the input channels.

**:CLKSTAT**istics:<command syntax>

**ACQ**uire
**AUTO**pulsefind
**DEF**ault
**DUTY**cycle
**FREQSPAN**
**FREQ**uency
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PER-:MAX**imum
**PER-:MEAN**
**PER-:MIN**imum
**PER-:PK**topk
**PER-:STDD**ev
**PER+:MAX**imum
**PER+:MEAN**
**PER+:MIN**imum
**PER+:PK**topk
**PER+:STDD**ev
**PW-:MAX**imum
**PW-:MEAN**
**PW-:MIN**imum
**PW-:PK**topk
**PW-:STDD**ev
**PW+:MAX**imum
**PW+:MEAN**
**PW+:MIN**imum
**PW+:PK**topk
**PW+:STDD**ev
**QUICK**meas
**VMAX**
**VMIN**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Clock Statistics Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :CLKSTAT**istics**:ACQ**uire

Example: `Send(0,5,":CLKSTAT:ACQ",12,EOI);`

## • AUTOPULSEFIND

The **AUTOPULSEFIND** command enables performing a pulsefind before each measurement set.

The **AUTOPULSEFIND** query returns whether a pulsefind will be performed before each measurement set.

**Command syntax- :CLKSTAT**istics**:AUTO**pulsefind<OFF|ON>

Example: `Send(0,5,":CLKSTAT:AUTO OFF",17,EOI);`

**Query syntax- :CLKSTAT**istics**:AUTO**pulsefind**?**

Example: `Send(0,5,":CLKSTAT:AUTO?",14,EOI);`
Response: <OFF|ON>
Example: OFF

- ## DEFAULT

The **DEFAULT** command is used to reset all the Clock Statistics Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :CLKSTAT**istics**:DEF**ault

Example: `Send(0,5,":CLKSTAT:DEF",12,EOI);`

- ## DUTYCYCLE

The **DUTYCYCLE** query returns the duty cycle obtained for the previous acquisition.

**Query syntax- :CLKSTAT**istics**:DUTY**cycle**?**

Example: `Send(0,5,":CLKSTAT:DUTY?",14,EOI);`
Response: <ASCII floating point>
Example: 5.036e001

- ## FREQSPAN

The **FREQSPAN** command allows you to set across how many periods the carrier frequency will be measured. A higher number will yield a more precise number, while a lower number will result in a quicker measurement time.

**Query syntax- :STAT**istics**:FREQSPAN**<1 to 10000000>

Example: `Send(0,5,":STAT:FREQSPAN10",16,EOI);`

- ## FREQUENCY

The **FREQUENCY** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :CLKSTAT**istics**:FREQ**uency**?**

Example: `Send(0,5,":CLKSTAT:FREQ?",14,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- ## PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:CHAN 1",25,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:CHAN**nel**?**

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:CHAN?",24,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:DEL -40",26,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:DEL**ay**?**

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:DEL?",23,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:MARK OFF",27,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:MARK**er**?**

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:MARK?",24,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:MODE EXTERNAL",32,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:MODE?**

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:MODE?",24,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:SLOP FALL",28,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:SLOP**e**?**

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:SLOP?",24,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:VOLT -2",26,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:ARM**ing**:VOLT**age**?**

Example: `Send(0,5,":CLKSTAT:PARAM:ARM:VOLT?",24,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:CHAN**nel<1-10>

Example: `Send(0,5,":CLKSTAT:PARAM:CHAN4",20,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:CHAN**nel**?**

Example: `Send(0,5,":CLKSTAT:PARAM:CHAN?",20,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:SAMP**les<1 to 950000>

Example: `Send(0,5,":CLKSTAT:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:SAMP**les**?**

Example: `Send(0,5,":CLKSTAT:PARAM:SAMP?",20,EOI);`
Response: <ASCII integer>
Example: 100

 

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":CLKSTAT:PARAM:STAR:VOLT -2",27,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:STAR**t**:VOLT**age**?**

Example: `Send(0,5,":CLKSTAT:PARAM:STAR:VOLT?",25,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":CLKSTAT:PARAM:STOP:VOLT -2",27,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:STOP:VOLT**age**?**

Example: `Send(0,5,":CLKSTAT:PARAM:STOP:VOLT?",25,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":CLKSTAT:PARAM:THR 5050",23,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:THR**eshold**?**

Example: `Send(0,5,":CLKSTAT:PARAM:THR?",19,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :CLKSTAT**istics**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":CLKSTAT:PARAM:TIME 10",24,EOI);`

**Query syntax- :CLKSTAT**istics**:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":CLKSTAT:PARAM:TIME?",20,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PER-:MAXIMUM

The **PER-:MAXIMUM** query returns the maximum Period- measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PER-:MAX**imum**?**

Example: `Send(0,5,":CLKSTAT:PER-:MAX?",18,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- ## PER-:MEAN

The **PER-:MEAN** query returns the average of all Period- measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PER-:MEAN?**

Example: `Send(0,5,":CLKSTAT:PER-:MEAN?",19,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- ## PER-:MINIMUM

The **PER-:MINIMUM** query returns the minimum Period- measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PER-:MIN**imum**?**

Example: `Send(0,5,":CLKSTAT:PER-:MIN?",18,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- ## PER-:PKTOPK

The **PER-:PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all Period- values obtained.

**Query syntax- :CLKSTAT**istics**:PER-:PK**topk**?**

Example: `Send(0,5,":CLKSTAT:PER-:PK?",17,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- ## PER-:STDDEV

The **PER-:STDDEV** query returns the standard deviation of all Period- measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PER-:STDD**ev**?**

Example: `Send(0,5,":CLKSTAT:PER-:STDD?",19,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PER+:MAXIMUM**

The **PER+:MAXIMUM** query returns the maximum Period+ measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PER+:MAX**imum**?**

Example: `Send(0,5,":CLKSTAT:PER+:MAX?",18,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **PER+:MEAN**

The **PER+:MEAN** query returns the average of all Period+ measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PER+:MEAN?**

Example: `Send(0,5,":CLKSTAT:PER+:MEAN?",19,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **PER+:MINIMUM**

The **PER+:MINIMUM** query returns the minimum Period+ measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PER+:MIN**imum**?**

Example: `Send(0,5,":CLKSTAT:PER+:MIN?",18,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **PER+:PKTOPK**

The **PER+:PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all Period+ values obtained.

**Query syntax- :CLKSTAT**istics**:PER+:PK**topk**?**

Example: `Send(0,5,":CLKSTAT:PER+:PK?",17,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PER+:STDDEV**

The **PER+:STDDEV** query returns the standard deviation of all Period+ measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PER+:STDD**ev**?**

Example: `Send(0,5,":CLKSTAT:PER+:STDD?",19,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PW-:MAXIMUM**

The **PW-:MAXIMUM** query returns the maximum PW- measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PW-:MAX**imum**?**

Example: `Send(0,5,":CLKSTAT:PW-:MAX?",17,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **PW-:MEAN**

The **PW-:MEAN** query returns the average of all PW- measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PW-:MEAN?**

Example: `Send(0,5,":CLKSTAT:PW-:MEAN?",18,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **PW-:MINIMUM**

The **PW-:MINIMUM** query returns the minimum PW- measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PW-:MIN**imum**?**

Example: `Send(0,5,":CLKSTAT:PW-:MIN?",17,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **PW-:PKTOPK**

The **PW-:PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all PW- values obtained.

**Query syntax- :CLKSTAT**istics**:PW-:PK**topk**?**

Example: `Send(0,5,":CLKSTAT:PW-:PK?",16,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PW-:STDDEV**

The **PW-:STDDEV** query returns the standard deviation of all PW- measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PW-:STDD**ev**?**

Example: `Send(0,5,":CLKSTAT:PW-:STDD?",18,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PW+:MAXIMUM**

The **PW+:MAXIMUM** query returns the maximum PW+ measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PW+:MAX**imum**?**

Example: `Send(0,5,":CLKSTAT:PW+:MAX?",17,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **PW+:MEAN**

The **PW+:MEAN** query returns the average of all PW+ measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PW+:MEAN?**

Example: `Send(0,5,":CLKSTAT:PW+:MEAN?",18,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **PW+:MINIMUM**

The **PW+:MINIMUM** query returns the minimum PW+ measurement value obtained.

**Query syntax- :CLKSTAT**istics**:PW+:MIN**imum**?**

Example: `Send(0,5,":CLKSTAT:PW+:MIN?",17,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **PW+:PKTOPK**

The **PW+:PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all PW+ values obtained.

**Query syntax- :CLKSTAT**istics**:PW+:PK**topk**?**

Example: `Send(0,5,":CLKSTAT:PW+:PK?",16,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PW+:STDDEV**

The **PW+:STDDEV** query returns the standard deviation of all PW+ measurement values obtained.

**Query syntax- :CLKSTAT**istics**:PW+:STDD**ev**?**

Example: `Send(0,5,":CLKSTAT:PW+:STDD?",18,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **QUICKMEAS**

The **QUICKMEAS** command disables the precision frequency measurement and returns 1/Period for the frequency.

The **QUICKMEAS** query returns whether the 1/period frequency mode is enabled.

**Command syntax- :CLKSTAT**istics**:QUICK**meas<OFF|ON>

Example: `Send(0,5,":CLKSTAT:QUICK OFF",18,EOI);`

**Query syntax- :CLKSTAT**istics**:QUICK**meas**?**

Example: `Send(0,5,":CLKSTAT:QUICK?",15,EOI);`
Response: <OFF|ON>

- **VMAX**

The **VMAX** query returns the maximum voltage that was measured.

**Query syntax- :CLKSTAT**istics**:VMAX?**

Example: `Send(0,5,":CLKSTAT:VMAX?",14,EOI);`
Response: <ASCII floating point>
Example: 1.815e-001

- **VMIN**

The **VMIN** query returns the minimum voltage that was measured.

**Query syntax- :CLKSTAT**istics**:VMIN?**

Example: `Send(0,5,":CLKSTAT:VMIN?",14,EOI);`
Response: <ASCII floating point>
Example: -1.967e-001

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## • DESCRIPTION OF THE CYCLE-TO-CYCLE COMMANDS

The **CYCLETOCYCLE** commands are used to make adjacent cycle measurements. These measurements consist of a histogram of the difference between two adjacent cycles of a clock.

**:CYCL**etocycle:<command syntax>

**ACQ**uire
**AVGCYCL**
**AVGDUTY**
**AVGMEAS**
**CHISQLEFT**
**CHISQRIGHT**
**CLE**ar
**DEF**ault
**DJ**
**DUTY**cycle
**HITMEAS**
**HITS**
**LATE**st:**AVGMEAS**
**LATE**st:**HITMEAS**
**LATE**st:**HITS**
**LATE**st:**MAX**imum
**LATE**st:**MAXMEAS**
**LATE**st:**MEAN**
**LATE**st:**MIN**imum
**LATE**st:**MINMEAS**
**LATE**st:**P**ktopk
**LATE**st:**PKTOPKMEAS**
**LATE**st:**STDD**ev
**LATE**st:**STDMEAS**
**LEFTRJ**
**MAXCYCL**
**MAXDUTY**
**MAXMEAS**
**MINCYCL**
**MINDUTY**
**MINMEAS**
**NUMPASS**es
**PKTOPKCYCL**
**PKTOPKMEAS**
**PARAM**eter:**ARM**ing:**CHAN**nel
**PARAM**eter:**ARM**ing:**DEL**ay
**PARAM**eter:**ARM**ing:**MARK**er
**PARAM**eter:**ARM**ing:**MODE**
**PARAM**eter:**ARM**ing:**SLOP**e
**PARAM**eter:**ARM**ing:**VOLT**age
**PARAM**eter:**CHAN**nel
**PARAM**eter:**FILT**er:**ENAB**le
**PARAM**eter:**FILT**er:**MAX**imum
**PARAM**eter:**FILT**er:**MIN**imum
**PARAM**eter:**FUNC**tion
**PARAM**eter:**SAMP**les
**PARAM**eter:**STAR**t:**COUN**t
**PARAM**eter:**STAR**t:**VOLT**age
**PARAM**eter:**STOP**:**COUN**t
**PARAM**eter:**STOP**:**VOLT**age
**PARAM**eter:**THR**eshold
**PARAM**eter:**TIME**out
**PLOTDATA**:**ACCUM**ulated
**PLOTDATA**:**BATH**tub
**PLOTDATA**:**LAST**
**PLOTDATA**:**MAX**imum
**PLOTINFO**:**ACCUM**ulated
**PLOTINFO**:**BATH**tub
**PLOTINFO**:**LAST**
**PLOTINFO**:**MAX**imum
**RIGHTRJ**
**RJ**
**STDCYCL**
**STDMEAS**
**TAIL**fit:**COMP**lete
**TAIL**fit:**MINHITS**
**TAIL**fit:**MODE**
**TAIL**fit:**PROB**ability
**TAIL**fit:**SPEC**ification
**TJ**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Cycle To Cycle Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :CYCL**etocycle**:ACQ**uire

Example: `Send(0,5,":CYCL:ACQ;*OPC",9,EOI);`

## • AVGCYCL

The **AVGCYCL** query returns the accumulated average Cycle-To-Cycle measurement. This is the average difference between adjacent measurements across all passes. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:AVGCYCL?**

Example: `Send(0,5,":CYCL:AVGCYCL?",14,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## AVGDUTY

The **AVGDUTY** query returns the accumulated average Duty Cycle measurement. This is the average ratio of PW+ to PER+ measurements across all passes. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:AVGDUTY?**

Example: `Send(0,5,":CYCL:AVGDUTY?",14,EOI);`
Response: <ASCII floating point>
Example: +5.037e+001

- ## AVGMEAS

The **AVGMEAS** query returns the accumulated average measurement. This is NOT the average difference between adjacent measurements, but the value of the measurements themselves. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:AVGMEAS?**

Example: `Send(0,5,":CYCL:AVGMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.103637e-9

- ## CHISQLEFT

The **CHISQLEFT** query returns the $\chi 2$ value for the left side of the histogram obtained from the previous acquisition. This is a qualitative measure of the goodness-of-fit from the Tail-Fit to the actual histogram data. A value less than 2 is normally considered to be a "good" fit. Since this value is based on the Tail-Fit, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- : CYCL**etocycle**:CHISQLEFT?**

Example: `Send(0,5,":CYCL:CHISQLEFT?",16,EOI);`
Response: <ASCII floating point>
Example: 1.697e+000

- ## CHISQRIGHT

The **CHISQRIGHT** query returns the $\chi 2$ value for the right side of the histogram obtained from the previous acquisition. This is a qualitative measure of the goodness-of-fit from the Tail-Fit to the actual histogram data. A value less than 2 is normally considered to be a "good" fit. Since this value is based on the Tail-Fit, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- : CYCL**etocycle**:CHISQRIGHT?**

Example: `Send(0,5,":CYCL:CHISQRIGHT?",17,EOI);`
Response: <ASCII floating point>
Example: 2.069e+000

- ## CLEAR

The **CLEAR** command provides a means to flush any previous data. Since the Cycle To Cycle Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :CYCL**etocycle**:CLE**ar

Example: `Send(0,5,":CYCL:CLE",9,EOI);`

- **DEFAULT**

The **DEFAULT** command is used to reset all the Cycle To Cycle Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :CYCL**etocycle**:DEF**ault

Example: `Send(0,5,":CYCL:DEF",9,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:DJ?**

Example: `Send(0,5,":CYCL:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **DUTYCYCLE**

The **DUTYCYCLE** command enables the measurement of duty cycle across adjacent cycles. Enabling this option will result in slightly longer measurement times.

The **DUTYCYCLE** query returns whether the duty cycle measurement is currently enabled.

**Command syntax- :CYCL**etocycle**:DUTY**cycle<OFF|ON>

Example: `Send(0,5,":CYCL:DUTY OFF",14,EOI);`

**Query syntax- :CYCL**etocycle**:DUTY**cycle**?**

Example: `Send(0,5,":CYCL:DUTY?",11,EOI);`
Response: <OFF|ON>

- **HITMEAS**

The **HITMEAS** query returns the number of raw measurements accumulated in the measurement statistics. This is NOT the based on the differences between adjacent measurements, but the value of the measurements themselves.

**Query syntax- :CYCL**etocycle**:HITMEAS?**

Example: `Send(0,5,":CYCL:HITMEAS?",14,EOI);`
Response: <ASCII integer>
Example: 70000

- **HITS**

The **HITS** query returns the number of adjacent cycle differences accumulated in the Cycle To Cycle histogram.

**Query syntax- :CYCL**etocycle**:HITS?**

Example: `Send(0,5,":CYCL:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- ## LATEST:AVGMEAS

The **LATEST:AVGMEAS** query returns the average measurement on the latest pass. This is NOT the average difference between adjacent measurements, but the value of the measurements themselves. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:LATE**st**:AVGMEAS?**

Example: `Send(0,5,":CYCL:LATE:AVGMEAS?",19,EOI);`
Response: <ASCII floating point>
Example: 1.103637e-9

- ## LATEST:HITMEAS

The **LATEST:HITMEAS** query returns the number of raw measurements in the latest measurement statistics. This is NOT based on the difference between adjacent measurements, but the value of the measurements themselves.

**Query syntax- :CYCL**etocycle**:LATE**st**:HITMEAS?**

Example: `Send(0,5,":CYCL:LATE:HITMEAS?",19,EOI);`
Response: <ASCII integer>
Example: 10000

- ## LATEST:HITS

The **LATEST:HITS** query returns the number of adjacent cycle differences in the latest Cycle To Cycle histogram.

**Query syntax- :CYCL**etocycle**:LATE**st**:HITS?**

Example: `Send(0,5,":CYCL:LATE:HITS?",16,EOI);`
Response: <ASCII integer>
Example: 5000

- ## LATEST:MAXIMUM

The **LATEST:MAXIMUM** query returns the maximum adjacent cycle difference obtained on the latest histogram pass.

**Query syntax- :CYCL**etocycle**:LATE**st**:MAX**imum**?**

Example: `Send(0,5,":CYCL:LATE:MAX?",15,EOI);`
Response: <ASCII floating point>
Example: +1.23578e-011

- ## LATEST:MAXMEAS

The **LATEST:MAXMEAS** query returns the maximum raw measurements obtained on the latest pass. This is NOT the maximum difference between adjacent measurements, but the maximum value of the measurements themselves.

**Query syntax- :CYCL**etocycle**:LATE**st**:MAXMEAS?**

Example: `Send(0,5,":CYCL:LATE:MAXMEAS?",19,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- ## LATEST:MEAN

The **LATEST:MEAN** query returns the average of all adjacent cycle differences obtained on the latest histogram pass.

**Query syntax- :CYCL**etocycle**:LATE**st**:MEAN?**

Example: `Send(0,5,":CYCL:LATE:MEAN?",16,EOI);`
Response: <ASCII floating point>
Example: +1.927345e-012

- **LATEST:MINIMUM**

The **LATEST:MINIMUM** query returns the minimum adjacent cycle difference obtained on the latest histogram pass.

**Query syntax- :CYCL**etocycle**:LATE**st**:MIN**imum**?**

Example: `Send(0,5,":CYCL:LATE:MIN?",15,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **LATEST:MINMEAS**

The **LATEST:MINMEAS** query returns the minimum raw measurement obtained on the latest pass. This is NOT the minimum difference between adjacent measurements, but the minimum value of the measurements themselves.

**Query syntax- :CYCL**etocycle**:LATE**st**:MINMEAS?**

Example: `Send(0,5,":CYCL:LATE:MINMEAS?",19,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **LATEST:PKTOPK**

The **LATEST:PKTOPK** query returns the maximum adjacent cycle difference minus the minimum adjacent cycle difference obtained on the latest histogram pass.

**Query syntax- :CYCL**etocycle**:LATE**st**:PK**topk**?**

Example: `Send(0,5,":CYCL:LATE:PK?",14,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

- **LATEST:PKTOPKMEAS**

The **LATEST:PKTOPKMEAS** query returns the maximum raw measurement minus the minimum raw measurement obtained on the latest histogram pass. This is NOT based on the difference between adjacent measurements, but the value of the measurements themselves.

**Query syntax- :CYCL**etocycle**:LATE**st**:PKTOPKMEAS?**

Example: `Send(0,5,":CYCL:LATE:PKTOPKMEAS?",22,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

- **LATEST:STDDEV**

The **LATEST:STDDEV** query returns the standard deviation of the adjacent cycle differences obtained on the latest histogram pass.

**Query syntax- :CYCL**etocycle**:LATE**st**:STDD**ev**?**

Example: `Send(0,5,":CYCL:LATE:STDD?",16,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **LATEST:STDMEAS**

The **LATEST:STDMEAS** query returns the standard deviation of the raw measurements obtained on the latest histogram pass. This is NOT based on the difference between adjacent measurements, but the value of the measurements themselves.

**Query syntax- :CYCL**etocycle**:LATE**st**:STDMEAS?**

Example: `Send(0,5,":CYCL:LATE:STDMEAS?",19,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **LEFTRJ**

The **LEFTRJ** query returns the Random Jitter on the Left Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:LEFTRJ?**

Example: `Send(0,5,":CYCL:LEFTRJ?",13,EOI);`
Response: <ASCII floating point>
Example: 3.637e-012

- **MAXCYCL**

The **MAXCYCL** query returns the maximum difference between adjacent measurements across all passes. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:MAXCYCL?**

Example: `Send(0,5,":CYCL:MAXCYCL?",14,EOI);`
Response: <ASCII floating point>
Example: +1.23578e-011

- **MAXDUTY**

The **MAXDUTY** query returns the maximum Duty Cycle measurement. This is the maximum ratio of PW+ to PER+ measurements across all passes. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:MAXDUTY?**

Example: `Send(0,5,":CYCL:MAXDUTY?",14,EOI);`
Response: <ASCII floating point>
Example: +5.173e+001

- **MAXMEAS**

The **MAXMEAS** query returns the maximum measurement. This is NOT the maximum difference between adjacent measurements, but the maximum value of the measurements themselves. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:MAXMEAS?**

Example: `Send(0,5,":CYCL:MAXMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.134637e-009

- **MINCYCL**

The **MINCYCL** query returns the minimum difference between adjacent measurements across all passes. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:MINCYCL?**

Example: `Send(0,5,":CYCL:MINCYCL?",14,EOI);`
Response: <ASCII floating point>
Example: -1.03687e-011

- **MINDUTY**

The **MINDUTY** query returns the minimum Duty Cycle measurement. This is the minimum ratio of PW+ to PER+ measurements across all passes. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:MINDUTY?**

Example: `Send(0,5,":CYCL:MINDUTY?",14,EOI);`
Response: <ASCII floating point>
Example: +4.937e+001

- **MINMEAS**

The **MINMEAS** query returns the minimum measurement. This is NOT the minimum difference between adjacent measurements, but the minimum value of the measurements themselves. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:MINMEAS?**

Example: `Send(0,5,":CYCL:MINMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.000637e-9

- **NUMPASSES**

The **NUMPASSES** query returns the number of passes of data that have been accumulated into the histogram.

**Query syntax- :CYCL**etocycle**:NUMPASS**es**?**

Example: `Send(0,5,":CYCL:NUMPASS?",14,EOI);`
Response: <ASCII integer>
Example: 16

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":CYCL:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:CHAN**nel**?**

Example: `Send(0,5,":CYCL:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":CYCL:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:DEL**ay**?**

Example: `Send(0,5,":CYCL:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":CYCL:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:MARK**er**?**

Example: `Send(0,5,":CYCL:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":CYCL:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:MODE?**

Example: `Send(0,5,":CYCL:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":CYCL:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:SLOP**e**?**

Example: `Send(0,5,":CYCL:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":CYCL:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:ARM**ing**:VOLT**age**?**

Example: `Send(0,5,":CYCL:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:CHAN**nel<1-10>

Example: `Send(0,5,":CYCL:PARAM:CHAN4",17,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:CHAN**nel**?**

Example: `Send(0,5,":CYCL:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:FILTER:ENABLE

The **PARAMETER:FILTER:ENABLE** command enables a post-processing filter that ignores measurements acquired outside of the filter region. The statistics are calculated from only the measurements within the filter region, and the plots will display only data from within the filtered region. With filters enabled the number of hits acquired may be less than the number of hits requested as a result of the filtered values being thrown away.

The **PARAMETER:FILTER:ENABLE** query returns whether the filters are currently enabled.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:FILT**er**:ENAB**le<OFF|ON>

Example: `Send(0,5,":CYCL:PARAM:FILT:ENAB OFF",25,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:FILT**er**:ENAB**le**?**

Example: `Send(0,5,":CYCL:PARAM:FILT:ENAB?",22,EOI);`
Response: <OFF|ON>
Example: OFF

## • PARAMETER:FILTER:MAXIMUM

The **PARAMETER:FILTER:MAXIMUM** command selects the maximum filter time in seconds.

The **PARAMETER:FILTER:MAXIMUM** query returns the maximum filter value.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:FILT**er**:MAX**imum<-2.5 to 2.5>

Example: `Send(0,5,":CYCL:PARAM:FILT:MAX -2.5",25,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:FILT**er**:MAX**imum**?**

Example: `Send(0,5,":CYCL:PARAM:FILT:MAX?",21,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

## • PARAMETER:FILTER:MINIMUM

The **PARAMETER:FILTER:MINIMUM** command selects the minimum filter time in seconds.

The **PARAMETER:FILTER:MINIMUM** query returns the minimum filter value.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:FILT**er**:MIN**imum<-2.5 to 2.5>

Example: `Send(0,5,":CYCL:PARAM:FILT:MIN -2.5",25,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:FILT**er**:MIN**imum**?**

Example: `Send(0,5,":CYCL:PARAM:FILT:MIN?",21,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

## • PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:FUNC**tion<PW+|PW-|PER+|PER->

Example: `Send(0,5,":CYCL:PARAM:FUNC PER+",22,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:FUNC**tion**?**

Example: `Send(0,5,":CYCL:PARAM:FUNC?",17,EOI);`
Response: <PW+|PW-|PER+|PER->

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of Cycle-To-Cycle measurement pairs that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of Cycle-To-Cycle measurement pairs that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:SAMP**les<1 to 475000>

Example: `Send(0,5,":CYCL:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:SAMP**les**?**

Example: `Send(0,5,":CYCL:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:STAR**t**:COUN**t<1 to 10000000>

Example: `Send(0,5,":CYCL:PARAM:STAR:COUN 1",23,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:STAR**t**:COUN**t**?**

Example: `Send(0,5,":CYCL:PARAM:STAR:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":CYCL:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:STAR**t**:VOLT**age**?**

Example: `Send(0,5,":CYCL:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:STOP:COUN**t<1 to 10000000>

Example: `Send(0,5,":CYCL:PARAM:STOP:COUN 1",23,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:STOP:COUN**t**?**

Example: `Send(0,5,":CYCL:PARAM:STOP:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 2

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":CYCL:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:STOP:VOLT**age**?**

Example: `Send(0,5,":CYCL:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :CYCL**etocycle**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":CYCL:PARAM:THR 5050",20,EOI);`

**Query syntax- :CYCL**etocycle**:PARAM**eter**:THR**eshold**?**

Example: `Send(0,5,":CYCL:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

## • PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :CYCL**etocycle**:TIME**out<0.01 to 50>

Example: `Send(0,5,":CYCL:PARAM:TIME 10",19,EOI);`

**Query syntax- :CYCL**etocycle**:TIME**out**?**

Example: `Send(0,5,":CYCL:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

## • PKTOPKCYCL

The **PKTOPKCYCL** query returns the maximum adjacent cycle difference minus the minimum adjacent cycle difference in the accumulated Cycle to Cycle histogram.

**Query syntax- :CYCL**etocycle**:LATE**st**:PKTOPKCYCL?**

Example: `Send(0,5,":CYCL:LATE:PKTOPKCYCL?",17,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

## • PKTOPKMEAS

The **PKTOPKMEAS** query returns the maximum raw measurement minus the minimum raw measurement obtained accumulated across all passes. This is NOT based on the difference between adjacent measurements, but the value of the measurements themselves.

**Query syntax- :CYCL**etocycle**:PKTOPKMEAS?**

Example: `Send(0,5,":CYCL:PKTOPKMEAS?",17,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

- **PLOTDATA:ACCUMULATED**

The **PLOTDATA:ACCUMULATED** query returns the plot data associated with the ACCUMULATED HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CYCL**etocycle**:PLOTDATA:ACCUM**ulated**?**

Example: `Send(0,5,":CYCL:PLOTDATA:ACCUM?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CYCL**etocycle**:PLOTDATA:BATH**tub**?**

Example: `Send(0,5,":CYCL:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:LAST**

The **PLOTDATA:LAST** query returns the plot data associated with the LATEST HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CYCL**etocycle**:PLOTDATA:LAST?**

Example: `Send(0,5,":CYCL:PLOTDATA:LAST?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:MAXIMUM**

The **PLOTDATA:MAXIMUM** query returns the plot data associated with the MAXIMUM HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :CYCL**etocycle**:PLOTDATA:MAX**imum**?**

Example: `Send(0,5,":CYCL:PLOTDATA:MAX?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:ACCUMULATED**

The **PLOTINFO:ACCUMULATED** query returns the plot information associated with the ACCUMULATED HISTOGRAM plot.

**Query syntax- :CYCL**etocycle**:PLOTINFO:ACCUM**ulated**?**

Example: `Send(0,5,":CYCL:PLOTINFO:ACCUM?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :CYCL**etocycle**:PLOTINFO:BATH**tub**?**

Example: `Send(0,5,":CYCL:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:LAST**

The **PLOTINFO:LAST** query returns the plot information associated with the LATEST HISTOGRAM plot.

**Query syntax- :CYCL**etocycle**:PLOTINFO:LAST?**

Example: `Send(0,5,":CYCL:PLOTINFO:LAST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:MAXIMUM**

The **PLOTINFO:MAXIMUM** query returns the plot information associated with the MAXIMUM HISTOGRAM plot.

**Query syntax- :CYCL**etocycle**:PLOTINFO:MAX**imum**?**

Example: `Send(0,5,":CYCL:PLOTINFO:MAX?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RIGHTRJ**

The **RIGHTRJ** query returns the Random Jitter on the Right Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:RIGHTRJ?**

Example: `Send(0,5,":CYCL:RIGHTRJ?",14,EOI);`
Response: <ASCII floating point>
Example: 3.637e-012

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:RJ?**

Example: `Send(0,5,":CYCL:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **STDCYCL**

The **STDCYCL** query returns the standard deviation of all accumulated Cycle-To-Cycle measurements. This is the standard deviation of the differences between adjacent measurements across all passes. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:STDCYCL?**

Example: `Send(0,5,":CYCL:STDCYCL?",14,EOI);`
Response: <ASCII floating point>
Example: 1.789456e-012

- ## STDMEAS

The **STDMEAS** query returns the standard deviation of all accumulated measurements. This is NOT based on the difference between adjacent measurements, but the value of the measurements themselves. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:STDMEAS?**

Example: `Send(0,5,":CYCL:STDMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.978494e-012

- ## TAILFIT:COMPLETE

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :CYCL**etocycle**:TAIL**fit**:COMP**lete**?**

Example: `Send(0,5,":CYCL:TAIL:COMP?",16,EOI);`
Response: <0|1>

- ## TAILFIT:MINHITS

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :CYCL**etocycle**:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":CYCL:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :CYCL**etocycle**:TAIL**fit**:MINHITS?**

Example: `Send(0,5,":CYCL:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- ## TAILFIT:MODE

The **TAILFIT:MODE** command selects whether a Tail-Fit will be performed or not. It also allows the special Force-Fit mode to be enabled. The Force-Fit mode circumvents some of the criteria that is used to ensure the quality of the result, and forces a result to be returned.

The **TAILFIT:MODE** query returns the currently selected Tail-Fit mode.

**Command syntax- :CYCL**etocycle**:TAIL**fit**:MODE**<OFF|ON|FORCEFIT>

Example: `Send(0,5,":CYCL:TAIL:MODE OFF",19,EOI);`

**Query syntax- :CYCL**etocycle**:TAIL**fit**:MODE?**

Example: `Send(0,5,":CYCL:TAIL:MODE?",16,EOI);`
Response: <OFF|ON|FORCEFIT>

- ## TAILFIT:PROBABILITY

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

**Command syntax- :CYCL**etocycle**:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":CYCL:TAIL:PROB -16",19,EOI);`

**Query syntax- :CYCL**etocycle**:TAIL**fit**:PROB**ability**?**

Example: `Send(0,5,":CYCL:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- ## TAILFIT:SPECIFICATION

The **TAILFIT:SPECIFICATION** command selects the time in seconds between the two sides of the Bathtub Plot. It will effect the prediction of the Error Probability resulting in the two Bathtub Curves converging, indicting Eye Closure.

The **TAILFIT:SPECIFICATION** query returns the currently selected Tail-Fit specification.

**Command syntax- :CYCL**etocycle**:TAIL**fit**:SPEC**ification<0 to 2.5>

Example: `Send(0,5,":CYCL:TAIL:SPEC 0",17,EOI);`

**Query syntax- :CYCL**etocycle**:TAIL**fit**:SPEC**ification**?**

Example: `Send(0,5,":CYCL:TAIL:SPEC?",16,EOI);`
Response: <ASCII floating point>
Example: 1.000e-009

- ## TJ

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :CYCL**etocycle**:TJ?**

Example: `Send(0,5,":CYCL:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

## • DESCRIPTION OF THE DATABUS COMMANDS

The **DBUS** commands are used to characterize single-ended and differential clock and data signals for timing, clock and data jitter, clock-to-data skew, channel-to-channel skew and Bit Error Rate (BER) on up to ten channels in parallel. The analysis is done using one reference clock and up to nine data channels. Users can input the setup and hold specifications and violations can be measured based on the actual mean of the data histogram referenced to the clock edge. For each data lane there are two histograms: one showing the transitions before the clock edge and one showing the transitions after the clock edge.

**:DBUS:**<command syntax>

**ACQ**uire
**ARMFIND**
**AVGSKEW**
**CLE**ar
**CLOCK:DJ**
**CLOCK:HITS**
**CLOCK:LEFTRJ**
**CLOCK:MAX**imum
**CLOCK:MEANRJ**
**CLOCK:MIN**imum
**CLOCK:PK**topk
**CLOCK:RIGHTRJ**
**CLOCK:STDD**ev
**CLOCK:TJ**
**CLOCK:UI**
**DDR**
**DEF**ault
**DJ**
**DUTY**cycle
**EYE**spec
**FILTEROFF**set
**HITS**
**HOLD**time
**LEFTRJ**
**MAX**imum
**MEANRJ**
**MIN**imum
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PK**topk
**PLOTDATA:BATH**tub
**PLOTDATA:CLKBATH**tub
**PLOTDATA:CLKEFF**ective
**PLOTDATA:CLKHIST**ogram
**PLOTDATA:EFF**ective
**PLOTDATA:FALL**
**PLOTDATA:RISE**
**PLOTDATA:TOTAL**
**PLOTINFO:BATH**tub
**PLOTINFO:CLKBATH**tub
**PLOTINFO:CLKEFF**ective
**PLOTINFO:CLKHIST**ogram
**PLOTINFO:EFF**ective
**PLOTINFO:FALL**
**PLOTINFO:RISE**
**PLOTINFO:TOTAL**
**REFEDGE**
**REF**erence
**RIGHTRJ**
**SETUP**time
**STDD**ev
**TAIL**fit**:COMP**lete
**TAIL**fit**:MINHITS**
**TAIL**fit**:MODE**
**TAIL**fit**:PROB**ability
**TJ**
**UI**
**VOLT**age

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Databus Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :DBUS:ACQ**uire(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":DBUS:ACQ(@4)",13,EOI);`

- ## ARMFIND

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. The problem is exacerbated when measurements are to be conducted across multiple channels. This command performs an optimization across one or more channels, and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :DBUS:ARMFIND**(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":DBUS:ARMFIND(@4)",17,EOI);`
Response: <ASCII integer>
Example: -16

- ## AVGSKEW

The **AVGSKEW** query returns the average skew from the Reference Bit Clock to the Data that was measured.

**Query syntax- :DBUS:AVGSKEW**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:AVGSKEW(@4)?",14,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## CLEAR

The **CLEAR** command provides a means to flush any previous data. Since the Databus Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :DBUS:CLE**ar

Example: `Send(0,5,":DBUS:CLE",9,EOI);`

- ## CLOCK:DJ

The **CLOCK:DJ** query returns the Reference Bit Clock Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:CLOCK:DJ?**

Example: `Send(0,5,":DBUS:CLOCK:DJ?",15,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## CLOCK:HITS

The **CLOCK:HITS** query returns the number of accumulated hits in the Databus Reference Clock histogram.

**Query syntax- :DBUS:CLOCK:HITS?**

Example: `Send(0,5,":DBUS:CLOCK:HITS?",17,EOI);`
Response: <ASCII integer>
Example: 35000

- **CLOCK:LEFTRJ**

The **CLOCK:LEFTRJ** query returns the Random Jitter on the Left Side of the Total Jitter Histogram obtained from Reference Bit Clock on the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:CLOCK:LEFTRJ?**

Example: `Send(0,5,":DBUS:CLOCK:LEFTRJ?",19,EOI);`
Response: <ASCII floating point>
Example: 3.637e-012

- **CLOCK:MAXIMUM**

The **CLOCK:MAXIMUM** query returns the maximum clock value obtained across all accumulated histogram passes.

**Query syntax- :DBUS:CLOCK:MAX**imum**?**

Example: `Send(0,5,":DBUS:CLOCK:MAX?",16,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **CLOCK:MEANRJ**

The **CLOCK:MEANRJ** query returns the Random Jitter obtained from Reference Bit Clock on the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:CLOCK:MEANRJ?**

Example: `Send(0,5,":DBUS:CLOCK:MEANRJ?",19,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **CLOCK:MINIMUM**

The **CLOCK:MINIMUM** query returns the minimum clock value obtained across all accumulated histogram passes.

**Query syntax- :DBUS:CLOCK:MIN**imum**?**

Example: `Send(0,5,":DBUS:CLOCK:MIN?",16,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **CLOCK:PKTOPK**

The **CLOCK:PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all Reference Bit Clock values obtained.

**Query syntax- :DBUS:CLOCK:PK**topk**?**

Example: `Send(0,5,":DBUS:CLOCK:PK?",15,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **CLOCK:RIGHTRJ**

The **CLOCK:RIGHTRJ** query returns the Random Jitter on the Right Side of the Total Jitter Histogram obtained from the Reference Bit Clock on the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:CLOCK:RIGHTRJ?**

Example: `Send(0,5,":DBUS:CLOCK:RIGHTRJ?",20,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- ## CLOCK:STDDEV

The **CLOCK:STDDEV** query returns the standard deviation of all Reference Bit Clock measurement values obtained.

**Query syntax- :DBUS:CLOCK:STDDev?**

Example: `Send(0,5,":DBUS:CLOCK:STDD?",17,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- ## CLOCK:TJ

The **CLOCK:TJ** query returns the Reference Bit Clock Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:CLOCK:TJ?**

Example: `Send(0,5,":DBUS:CLOCK:TJ?",15,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

- ## CLOCK:UI

The **CLOCK:UI** query returns the unit interval that was measured.

**Query syntax- :DBUS:CLOCK:UI?**

Example: `Send(0,5,":DBUS:CLOCK:UI?",15,EOI);`
Response: <ASCII floating point>
Example: 1.000637e-9

- ## DDR

The **DDR** command is used to enable the Double Data Rate Mode. When this mode is enabled both rising and falling reference clock edges are used as to assess data integrity

The **DDR** query returns whether Double Data Rate Mode is currently enabled or not.

**Command syntax- :DBUS:DDR**<OFF|ON>

Example: `Send(0,5,":DBUS:DDR OFF",13,EOI);`

**Query syntax- :DBUS:DDR?**

Example: `Send(0,5,":DBUS:DDR?",10,EOI);`
Response: <OFF|ON>
Example: ON

- ## DEFAULT

The **DEFAULT** command is used to reset all the Databus Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :DBUS:DEFault**

Example: `Send(0,5,":DBUS:DEF",9,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:DJ**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:DJ(@4)?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **DUTYCYCLE**

The **DUTYCYCLE** query returns the duty cycle obtained for the previous acquisition.

**Query syntax- :DBUS:DUTY**cycle(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:DUTY(@4)?",11,EOI);`
Response: <ASCII floating point>
Example: 5.036e001

- **EYESPEC**

The **EYESPEC** command specifies the Eye Opening that is used as a pass/fall criteria, entered in UI.

The **EYESPEC** query returns the currently specified Eye Opening used as a pass/fall criteria in UI.

**Command syntax- :DBUS:EYE**spec<0 to 5>

Example: `Send(0,5,":DBUS:EYE 0",11,EOI);`

**Query syntax- :DBUS:EYE**spec**?**

Example: `Send(0,5,":DBUS:EYE?",10,EOI);`
Response: <ASCII floating point>
Example: 4.320e-001

- **FILTEROFFSET**

The **FILTEROFFSET** command allows an offset to be made to the filter that is used to isolate histogram data to within 1 UI of the bit clock. The filter is established on the first pass by the instrument, and can normally be left alone. However, in the presence of large amounts of jitter it may be necessary to tweak this value slightly. The offset is entered as a percentage of UI, and a value in the range of +/-100 is valid.

The **FILTEROFFSET** query returns the current filter offset used to isolate histogram data within 1 UI of the bit clock.

**Command syntax- :DBUS:FILTEROFF**set<-100 to 100>

Example: `Send(0,5,":DBUS:FILTEROFF 20",15,EOI);`

**Query syntax- :DBUS:FILTEROFF**set**?**

Example: `Send(0,5,":DBUS:FILTEROFF?",14,EOI);`
Response: <ASCII integer>
Example: 20

- **HITS**

The **HITS** query returns the number of accumulated hits in the Databus histogram.

**Query syntax- :DBUS:HITS**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:HITS(@4)?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- **HOLDTIME**

The **HOLDTIME** command specifies the pass/fail threshold in seconds from the reference clock to the next data edge.

The **HOLDTIME** query returns the currently specified hold time in seconds.

**Command syntax- :DBUS:HOLD**time<0 to 1>

Example: `Send(0,5,":DBUS:HOLD 0",12,EOI);`

**Query syntax- :DBUS:HOLD**time**?**

Example: `Send(0,5,":DBUS:HOLD?",11,EOI);`
Response: <ASCII floating point>
Example: 3.637e-010

- **LEFTRJ**

The **LEFTRJ** query returns the Random Jitter on the Left Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:LEFTRJ**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:LEFTRJ(@4)?",13,EOI);`
Response: <ASCII floating point>
Example: 3.637e-012

- **MAXIMUM**

The **MAXIMUM** query returns the maximum measurement value obtained across all accumulated histogram passes.

**Query syntax- :DBUS:MAX**imum(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:MAX(@4)?",10,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **MEANRJ**

The **MEANRJ** query returns the Random Jitter obtained on the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:MEANRJ**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:MEANRJ(@4)?",13,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all accumulated histogram passes.

**Query syntax- :DBUS:MIN**imum(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:MIN(@4)?",10,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :DBUS:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":DBUS:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :DBUS:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":DBUS:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued. Since filters are used to only include data edges within +/- 0.5 UI of the randomly selected clock edges, a smaller number of samples is actually returned than is requested.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :DBUS:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":DBUS:PARAM:SAMP 1000",18,EOI);`

**Query syntax- :DBUS:PARAMeter:SAMPles?**

Example: `Send(0,5,":DBUS:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :DBUS:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":DBUS:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :DBUS:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":DBUS:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :DBUS:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":DBUS:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :DBUS:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":DBUS:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :DBUS:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":DBUS:PARAM:THR 5050",20,EOI);`

**Query syntax- :DBUS:PARAMeter:THReshold?**

Example: `Send(0,5,":DBUS:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

## • PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :DBUS:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":DBUS:PARAM:TIME 10",21,EOI);`

**Query syntax- :DBUS:PARAMeter:TIMEout?**

Example: `Send(0,5,":DBUS:PARAM:TIME?",17,EOI);`
Response: <floating point ASCII value>
Example: 10

## • PKTOPK

The **PKTOPK** query returns the maximum measurement value minus the minimum measurement value accumulated across all histogram passes.

**Query syntax- :DBUS:PKtopk(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":DBUS:PK(@4)?",9,EOI);`
Response: <ASCII floating point>
Example: 8.397e-12

 

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:BATH**tub(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:PLOTDATA:BATH(@4)?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:CLKBATHTUB**

The **PLOTDATA:CLKBATHTUB** query returns the plot data associated with the REFERENCE CLOCK BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:CLKBATH**tub**?**

Example: `Send(0,5,":DBUS:PLOTDATA:CLKBATH?",23,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:CLKEFFECTIVE**

The **PLOTDATA:CLKEFFECTIVE** query returns the plot data associated with the REFERENCE CLOCK EFFECTIVE BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:CLKEFF**ective**?**

Example: `Send(0,5,":DBUS:PLOTDATA:CLKEFF?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:CLKHISTOGRAM**

The **PLOTDATA:CLKHISTOGRAM** query returns the plot data associated with the REFERENCE CLOCK TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:CLKHIST**ogram**?**

Example: `Send(0,5,":DBUS:PLOTDATA:CLKHIST?",23,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:EFFECTIVE**

The **PLOTDATA:EFFECTIVE** query returns the plot data associated with the EFFECTIVE BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:EFF**ective(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:PLOTDATA:EFF(@4)?",19,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING DATA EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:FALL**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:PLOTDATA:FALL(@4)?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:RISE**

The **PLOTDATA:RISE** query returns the plot data associated with the RISING DATA EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:RISE**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:PLOTDATA:RISE(@4)?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:TOTAL**

The **PLOTDATA:TOTAL** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DBUS:PLOTDATA:TOTAL**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:PLOTDATA:TOTAL(@4)?",21,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :DBUS:PLOTINFO:BATH**tub(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:PLOTINFO:BATH(@4)?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:CLKBATHTUB**

The **PLOTINFO:CLKBATHTUB** query returns the plot information associated with the REFERENCE CLOCK BATHTUB plot.

**Query syntax- :DBUS:PLOTINFO:CLKBATH**tub**?**

Example: `Send(0,5,":DBUS:PLOTINFO:CLKBATH?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:CLKEFFECTIVE**

The **PLOTINFO:CLKEFFECTIVE** query returns the plot information associated with the REFERENCE CLOCK EFFECTIVE BATHTUB plot.

**Query syntax- :DBUS:PLOTINFO:CLKEFF**ective**?**

Example: `Send(0,5,":DBUS:PLOTINFO:CLKEFF?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:CLKHISTOGRAM**

The **PLOTINFO:CLKHISTOGRAM** query returns the plot information associated with the REFERENCE CLOCK TOTAL JITTER HISTOGRAM plot.

**Query syntax- :DBUS:PLOTINFO:CLKHIST**ogram**?**

Example: `Send(0,5,":DBUS:PLOTINFO:CLKHIST?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:EFFECTIVE

The **PLOTINFO:EFFECTIVE** query returns the plot information associated with the EFFECTIVE BATHTUB plot.

**Query syntax- :DBUS:PLOTINFO:EFF**ective(@<n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":DBUS:PLOTINFO:EFF(@4)?",19,EOI);
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:FALL

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING DATA EDGE HISTOGRAM plot.

**Query syntax- :DBUS:PLOTINFO:FALL**(@<n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":DBUS:PLOTINFO:FALL(@4)?",20,EOI);
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:RISE

The **PLOTINFO:RISE** query returns the plot information associated with the RISING DATA EDGE HISTOGRAM plot.

**Query syntax- :DBUS:PLOTINFO:RISE**(@<n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":DBUS:PLOTINFO:RISE(@4)?",20,EOI);
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:TOTAL

The **PLOTINFO:TOTAL** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :DBUS:PLOTINFO:TOTAL**(@<n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":DBUS:PLOTINFO:TOTAL(@4)?",21,EOI);
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## REFEDGE

The **REFEDGE** command selects whether a rising or falling Reference Bit Clock edge is used.

The **REFEDGE** query returns whether a rising or falling Reference Bit Clock edge is currently being used.

**Command syntax- :DBUS:REFEDGE**<FALL|RISE>

Example: Send(0,5,":DBUS:REFEDGE FALL",18,EOI);

**Query syntax- :DBUS:REFEDGE?**

Example: Send(0,5,":DBUS:REFEDGE?",14,EOI);
Response: <FALL|RISE>

- ## REFERENCE

The **REFERENCE** command selects the channel number to be used for the Reference Bit Clock.

The **REFERENCE** query returns the channel number currently selected to be used for the Reference Bit Clock.

**Command syntax- :DBUS:REF**erence<1 to 10>

Example: Send(0,5,":DBUS:REF 1",11,EOI);

**Query syntax- :DBUS:REF**erence**?**

Example: Send(0,5,":DBUS:REF?",10,EOI);
Response: <ASCII integer>
Example: 4

- ## RIGHTRJ

The **RIGHTRJ** query returns the Random Jitter on the Right Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:RIGHTRJ**(@<n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":DBUS:RIGHTRJ(@4)?",14,EOI);
Response: <ASCII floating point>
Example: 3.637e-12

- ## SETUPTIME

The **SETUPTIME** command specifies the pass/fail threshold in seconds from the data edge to the next reference clock.

The **SETUPTIME** query returns the currently specified setup time in seconds.

**Command syntax- :DBUS:SETUP**time<0 to 1>

Example: Send(0,5,":DBUS:SETUP 0",13,EOI);

**Query syntax- :DBUS:SETUP**time**?**

Example: Send(0,5,":DBUS:SETUP?",12,EOI);
Response: <ASCII floating point>
Example: 4.387e-010

- ## STDDEV

The **STDDEV** query returns the standard deviation of all measurements across all accumulated histogram passes.

**Query syntax- :DBUS:STDD**ev(@<n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":DBUS:STDD(@4)?",11,EOI);
Response: <ASCII floating point>
Example: 3.216345e-012

- ## TAILFIT:COMPLETE

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :DBUS:TAIL**fit**:COMP**lete**?**

Example: Send(0,5,":DBUS:TAIL:COMP?",16,EOI);
Response: <0|1>

 

- ## TAILFIT:MINHITS

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :DBUS:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":DBUS:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :DBUS:TAIL**fit**:MINHITS?**

Example: `Send(0,5,":DBUS:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- ## TAILFIT:MODE

The **TAILFIT:MODE** command selects whether a Tail-Fit will be performed or not. It also allows the special Force-Fit mode to be enabled. The Force-Fit mode circumvents some of the criteria that is used to ensure the quality of the result, and forces a result to be returned.

The **TAILFIT:MODE** query returns the currently selected Tail-Fit mode.

**Command syntax- :DBUS:TAIL**fit**:MODE**<OFF|ON|FORCEFIT>

Example: `Send(0,5,":DBUS:TAIL:MODE OFF",19,EOI);`

**Query syntax- :DBUS:TAIL**fit**:MODE?**

Example: `Send(0,5,":DBUS:TAIL:MODE?",16,EOI);`
Response: <OFF|ON|FORCEFIT>

- ## TAILFIT:PROBABILITY

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

The **TAILFIT:PROBABILITY** query returns the currently selected Bit Error Rate.

**Command syntax- :DBUS:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":DBUS:TAIL:PROB -16",19,EOI);`

**Query syntax- :DBUS:TAIL**fit**:PROB**ability**?**

Example: `Send(0,5,":DBUS:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- ## TJ

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :DBUS:TJ**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:TJ(@4)?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

- **UI**

The **UI** query returns the unit interval that was measured.

**Query syntax- :DBUS:UI**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":DBUS:UI(@4)?",9,EOI);`
Response: <ASCII floating point>
Example: 1.000637e-9

- **VOLTAGE**

The **VOLTAGE** command selects the data edge threshold voltage.

The **VOLTAGE** query returns the currently selected data edge threshold voltage.

**Command syntax- :DBUS:VOLT**age(@<n,m,x,...>|<n:m>)<-2 to 2>

Example: `Send(0,5,":DBUS:VOLT(@4) -2",13,EOI);`

**Query syntax- :DBUS:VOLT**age(@<n,m,x,...>|<n:m>)**?**

Example: `Send(0,5,":DBUS:VOLT(@4)?",11,EOI);`
Response: <ASCII floating point>
Example: 1.000e-001

## • DESCRIPTION OF THE DRCG COMMANDS

The **DRCG** commands are used to characterize the effect of the second phase aligner stage of the DRCG on a cycle by cycle basis as specified in the Rambus DRCG specification.

**:DRCG:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **PARAM**eter:**SAMP**les | **PLOTDATA:SPECMIN** |
| **AVGDUTY** | **PARAM**eter:**STAR**t:**VOLT**age | **PLOTINFO:FALLMAX** |
| **CAR**rierfreq | **PARAM**eter:**STOP:VOLT**age | **PLOTINFO:FALLMIN** |
| **DEF**ault | **PARAM**eter:**THR**eshold | **PLOTINFO:RISEMAX** |
| **DUTY**cycle | **PARAM**eter:**TIME**out | **PLOTINFO:RISEMIN** |
| **FALLMAX** | **PASS** | **PLOTINFO:SPECMAX** |
| **FALLMIN** | **PLOTDATA:FALLMAX** | **PLOTINFO:SPECMIN** |
| **MAXDUTY** | **PLOTDATA:FALLMIN** | **RISEMAX** |
| **MINDUTY** | **PLOTDATA:RISEMAX** | **RISEMIN** |
| **PARAM**eter:**ARM**ing:**DEL**ay | **PLOTDATA:RISEMIN** | **SPECLIM**it |
| **PARAM**eter:**CHAN**nel | **PLOTDATA:SPECMAX** | **SPECMODE** |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new DRCG Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :DRCG:ACQ**uire

Example: `Send(0,5,":DRCG:ACQ",9,EOI);`

## • AVGDUTY

The **AVGDUTY** query returns the average duty cycle obtained during the previous acquisition.

**Query syntax- :DRCG:AVGDUTY?**

Example: `Send(0,5,":DRCG:AVGDUTY?",14,EOI);`
Response: <ASCII floating point>
Example: 5.062521e-001

## • CARRIERFREQ

The **CARRIERFREQ** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :DRCG:CAR**rierfreq**?**

Example: `Send(0,5,":DRCG:CAR?",10,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- **DEFAULT**

The **DEFAULT** command is used to reset all the DRCG Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :DRCG:DEF**ault

Example: `Send(0,5,":DRCG:DEF",9,EOI);`

- **DUTYCYCLE**

The **DUTYCYCLE** command enables the measurement of duty cycle across adjacent cycles. Enabling this option will result in slightly longer measurement times.

The **DUTYCYCLE** query returns whether the duty cycle measurement is currently enabled.

**Command syntax- :DRCG:DUTY**cycle<OFF|ON>

Example: `Send(0,5,":DRCG:DUTY OFF",14,EOI);`

**Query syntax- :DRCG:DUTY**cycle**?**

Example: `Send(0,5,":DRCG:DUTY?",11,EOI);`
Response: <OFF|ON >

- **FALLMAX**

The **FALLMAX** query provides access to the individual maximum Period- Cycle-To-Cycle measurements. The first required argument is the desired number of periods spanned. The second required argument is sweep number.

**Query syntax- :DRCG:FALLMAX**<1 to 6>,<1 to 4>**?**

Example: `Send(0,5,":DRCG:FALLMAX4,2?",17,EOI);`
Response: <ASCII floating point>
Example: 8.417398e-012

- **FALLMIN**

The **FALLMIN** query provides access to the individual minimum Period- Cycle-To-Cycle measurements. The first required argument is the desired number of periods spanned. The second required argument is sweep number.

**Query syntax- :DRCG:FALLMIN**<1 to 6>,<1 to 4>**?**

Example: `Send(0,5,":DRCG:FALLMIN4,2?",17,EOI);`
Response: <ASCII floating point>
Example: 6.346197e-012

- **MAXDUTY**

The **MAXDUTY** query returns the maximum duty cycle obtained during the previous acquisition.

**Query syntax- :DRCG:MAXDUTY?**

Example: `Send(0,5,":DRCG:MAXDUTY?",14,EOI);`
Response: <ASCII floating point>
Example: 5.138951e-001

- **MINDUTY**

The **MINDUTY** query returns the minimum duty cycle obtained during the previous acquisition.

**Query syntax- :DRCG:MINDUTY?**

Example: `Send(0,5,":DRCG:MINDUTY?",14,EOI);`
Response: <ASCII floating point>
Example: 4.987221e-001

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :DRCG:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":DRCG:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :DRCG:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":DRCG:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :DRCG:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":DRCG:PARAM:CHAN4",17,EOI);`

**Query syntax- :DRCG:PARAMeter:CHANnel?**

Example: `Send(0,5,":DRCG:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :DRCG:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":DRCG:PARAM:SAMP 1000",18,EOI);`

**Query syntax- :DRCG:PARAMeter:SAMPles?**

Example: `Send(0,5,":DRCG:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :DRCG:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":DRCG:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :DRCG:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":DRCG:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :DRCG:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":DRCG:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :DRCG:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":DRCG:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :DRCG:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":DRCG:PARAM:THR 5050",20,EOI);`

**Query syntax- :DRCG:PARAMeter:THReshold?**

Example: `Send(0,5,":DRCG:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :DRCG:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":DRCG:PARAM:TIME 10",21,EOI);`

**Query syntax- :DRCG:PARAMeter:TIMEout?**

Example: `Send(0,5,":DRCG:PARAM:TIME?",17,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PASS

The **PASS** query returns a pass fail staus for the last acquisition. A positive value indicates the test was passed, a value of zero indicates a failure.

**Query syntax- :DRCG:PASS?**

Example: `Send(0,5,":DRCG:PASS?",11,EOI);`
Response: <ASCII integer>
Example: 0

- ## PLOTDATA:FALLMAX

The **PLOTDATA:FALLMAX** query returns the plot data associated with the MAXIMUM PERIOD- CYCLE-TO-CYCLE VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DRCG:PLOTDATA:FALLMAX?**

Example: `Send(0,5,":DRCG:PLOTDATA:FALLMAX?",23,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:FALLMIN

The **PLOTDATA:FALLMIN** query returns the plot data associated with the MINIMUM PERIOD- CYCLE-TO-CYCLE VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DRCG:PLOTDATA:FALLMIN?**

Example: `Send(0,5,":DRCG:PLOTDATA:FALLMIN?",23,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:RISEMAX

The **PLOTDATA:RISEMAX** query returns the plot data associated with the MAXIMUM PERIOD+ CYCLE-TO-CYCLE VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DRCG:PLOTDATA:RISEMAX?**

Example: `Send(0,5,":DRCG:PLOTDATA:RISEMAX?",23,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:RISEMIN**

The **PLOTDATA:RISEMIN** query returns the plot data associated with the MINIMUM PERIOD+ CYCLE-TO-CYCLE VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DRCG:PLOTDATA:RISEMIN?**

Example: `Send(0,5,":DRCG:PLOTDATA:RISEMIN?",23,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SPECMAX**

The **PLOTDATA:SPECMAX** query returns the plot data associated with the MAXIMUM SPECIFICATION VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DRCG:PLOTDATA:SPECMAX?**

Example: `Send(0,5,":DRCG:PLOTDATA:SPECMAX?",23,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SPECMIN**

The **PLOTDATA:SPECMIN** query returns the plot data associated with the MINIMUM SPECIFICATION VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :DRCG:PLOTDATA:SPECMIN?**

Example: `Send(0,5,":DRCG:PLOTDATA:SPECMIN?",23,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:FALLMAX**

The **PLOTINFO:FALLMAX** query returns the plot information associated with the MAXIMUM PERIOD- CYCLE-TO-CYCLE VS SPAN plot.

**Query syntax- :DRCG:PLOTINFO:FALLMAX?**

Example: `Send(0,5,":DRCG:PLOTINFO:FALLMAX?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALLMIN**

The **PLOTINFO:FALLMIN** query returns the plot information associated with the MINIMUM PERIOD- CYCLE-TO-CYCLE VS SPAN plot.

**Query syntax- :DRCG:PLOTINFO:FALLMIN?**

Example: `Send(0,5,":DRCG:PLOTINFO:FALLMIN?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISEMAX**

The **PLOTINFO:RISEMAX** query returns the plot information associated with the MAXIMUM PERIOD+ CYCLE-TO-CYCLE VS SPAN plot.

**Query syntax- :DRCG:PLOTINFO:RISEMAX?**

Example: `Send(0,5,":DRCG:PLOTINFO:RISEMAX?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISEMIN**

The **PLOTINFO:RISEMIN** query returns the plot information associated with the MINIMUM PERIOD+ CYCLE-TO-CYCLE VS SPAN plot.

**Query syntax- :DRCG:PLOTINFO:RISEMIN?**

Example: `Send(0,5,":DRCG:PLOTINFO:RISEMIN?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SPECMAX**

The **PLOTINFO:SPECMAX** query returns the plot information associated with the MAXIMUM SPECIFICATION VS SPAN plot.

**Query syntax- :DRCG:PLOTINFO:SPECMAX?**

Example: `Send(0,5,":DRCG:PLOTINFO:SPECMAX?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SPECMIN**

The **PLOTINFO:SPECMIN** query returns the plot information associated with the MINIMUM SPECIFICATION VS SPAN plot.

**Query syntax- :DRCG:PLOTINFO:SPECMIN?**

Example: `Send(0,5,":DRCG:PLOTINFO:SPECMIN?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RISEMAX**

The **RISEMAX** query provides access to the individual maximum Period+ Cycle-To-Cycle measurements. The first required argument is the desired number of periods spanned. The second required argument is sweep number.

**Query syntax- :DRCG:RISEMAX**<1 to 6>,<1 to 4>**?**

Example: `Send(0,5,":DRCG:RISEMAX4,2?",17,EOI);`
Response: <ASCII floating point>
Example: 8.417398e-012

- **RISEMIN**

The **RISEMIN** query provides access to the individual minimum Period+ Cycle-To-Cycle measurements. The first required argument is the desired number of periods spanned. The second required argument is sweep number.

**Query syntax- :DRCG:RISEMIN**<1 to 6>,<1 to 4>**?**

Example: `Send(0,5,":DRCG:RISEMIN4,2?",17,EOI);`
Response: <ASCII floating point>
Example: 3.249137e-012

- **SPECLIMIT**

The **SPECLIMIT** command specifies the user limit in picoseconds. The :DRCG:SPECMODE command must also be used to select user specified limits.

The **SPECLIMIT** query returns the currently specified user limits in picoseconds.

**Command syntax- :DRCG:SPECLIM**it<1 to 100>

Example: `Send(0,5,":DRCG:SPECLIM 50",15,EOI);`

**Query syntax- :DRCG:SPECLIM**it**?**

Example: `Send(0,5,":DRCG:SPECLIM?",14,EOI);`
Response: <ASCII floating point>
Example: 5.000000e+001

- **SPECMODE**

The **SPECMODE** command determines if pass/fail criteria is based on the DRCG specification, or a user specified value. The user limit can be specified with the :DRCG:SPECLIMIT command.

The **SPECMODE** query returns whether the pass/fail criteria is based on the DRCG specification, or a user value.

**Command syntax- :DRCG:SPECMODE**<AUTO|USER>

Example: `Send(0,5,":DRCG:SPECMODE AUTO",19,EOI);`

**Query syntax- :DRCG:SPECMODE?**

Example: `Send(0,5,":DRCG:SPECMODE?",15,EOI);`
Response: <AUTO|USER>

# 6-10 PCI EXPRESS 1.1 WITH SOFTWARE CLOCK COMMANDS

## • DESCRIPTION OF PCI EXPRESS 1.1 W/SOFTWARE CLOCK COMMANDS

The **EXPR** commands are used to obtain results for PCI Express 1.1 using the Known Pattern with Marker Tool. It applies the correct High Pass Filters to measure to this standard, and includes amplitude testing to meet the specification requirements. This tool requires a data signal and a pattern marker. If your system has a PM-50 Card installed, you can use it to obtain a pattern marker.

**:EXPR:**<command syntax>

**ACQ**uire
**ATTEN**uation
**BITRATE**
**CLE**ar
**COM**mon**:AC**p
**COM**mon**:DC**
**COM**mon**:DCACT**ive
**COM**mon**:DCDM**inus
**COM**mon**:DCDP**lus
**COM**mon**:DCLINE**
**COM**mon**:IDLEDC**
**COM**mon**:IDLEDIFF**
**COMP**liance
**DEF**ault
**DJ**
**HITS**
**IDLE**
**MEDTOMAX**jitter
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PATT**ern
**PLOTDATA:BATH**tub
**PLOTDATA:DCDISI**
**PLOTDATA:FALL**
**PLOTDATA:FFT**
**PLOTDATA:HIST**ogram
**PLOTDATA:HPFDCDISI**
**PLOTDATA:LPFDCDISI**
**PLOTDATA:RISE**
**PLOTDATA:SCOPE-**
**PLOTDATA:SCOPE+**
**PLOTDATA:SIGM**a
**PLOTINFO:BATH**tub
**PLOTINFO:DCDISI**
**PLOTINFO:FALL**
**PLOTINFO:FFT**
**PLOTINFO:HIST**ogram
**PLOTINFO:HPFDCDISI**
**PLOTINFO:LPFDCDISI**
**PLOTINFO:RISE**
**PLOTINFO:SCOPE-**
**PLOTINFO:SCOPE+**
**PLOTINFO:SIGM**a
**RJ**
**SCOPE:FALL-**
**SCOPE:FALL+**
**SCOPE:RISE-**
**SCOPE:RISE+**
**SCOPE:VDIFF**
**SCOPE:VDRATIO**
**SPIKE**s
**TOPEN**eye**:10E-12**
**TOPEN**eye**:10E-6**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new PCI Express 1.1 w/Software Clock Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :EXPR:ACQ**uire

Example: `Send(0,5,":EXPR:ACQ;*OPC",9,EOI);`

## • ATTENUATION

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :EXPR:ATTEN**uation**?**

Example: `Send(0,5,":EXPR:ATTEN?",12,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

- **BITRATE**

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Query syntax- :EXPR:BITRATE?**

Example: `Send(0,5,":EXPR:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +2.506e9

- **CLEAR**

The **CLEAR** command provides a means to flush any previous data.

**Command syntax- :EXPR:CLE**ar

Example: `Send(0,5,":EXPR:CLE",9,EOI);`

- **COMMON:ACP**

The **COMMON:ACP** query returns the AC Peak Common Mode Input Voltage.

**Query syntax- :EXPR:COM**mon**:AC**p**?**

Example: `Send(0,5,":EXPR:COM:AC?",13,EOI);`
Response: <ASCII floating point>
Example: 2.800000e-005

- **COMMON:DC**

The **COMMON:DC** query returns the DC Common Mode Input Voltage.

**Query syntax- :EXPR:COM**mon**:DC?**

Example: `Send(0,5,":EXPR:COM:DC?",13,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-006

- **COMMON:DCACTIVE**

The **COMMON:DCACTIVE** query returns the Absolute Delta of DC Common Mode Voltage During L0 and Electrical Idle.

**Query syntax- :EXPR:COM**mon**:DCACT**ive**?**

Example: `Send(0,5,":EXPR:COM:DCACT?",16,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-006

- **COMMON:DCDMINUS**

The **COMMON:DCDMINUS** query returns the DC Common Mode Voltage of D-.

**Query syntax- :EXPR:COM**mon**:DCDM**inus**?**

Example: `Send(0,5,":EXPR:COM:DCDM?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCDPLUS**

T he **COMMON:DCDMINUS** query returns the DC Common Mode Voltage of D+.

**Query syntax- :EXPR:COM**mon**:DCDP**lus**?**

Example: `Send(0,5,":EXPR:COM:DCDP?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCLINE**

The **COMMON:DCLINE** query returns the Absolute Delta of DC Common Mode Voltage between D+ and D-.

**Query syntax- :EXPR:COM**mon**:DCLINE?**

Example: `Send(0,5,":EXPR:COM:DCLINE?",17,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMMON:IDLEDC**

The **COMMON:IDLEDC** query returns the Electrical Idle Common Mode DC Output Voltage.

**Query syntax- :EXPR:COM**mon**:IDLEDC?**

Example: `Send(0,5,":EXPR:COM:IDLEDC?",17,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMMON:IDLEDIFF**

The **COMMON:IDLEDIFF** query returns the Electrical Idle Differential Peak Output Voltage.

**Query syntax- :EXPR:COM**mon**:IDLEDIFF?**

Example: `Send(0,5,":EXPR:COM:IDLEDIFF?",19,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMPLIANCE**

The **COMPLIANCE** command selects the current PCI Express standard to test against.

The **COMPLIANCE** query returns the currently selected PCI Express standard.

**Command syntax- :EXPR:COMP**liance<RX-SPEC|TX-SPEC|RX-ADDIN|
TX-ADDIN|RX-SYSTEM|TX-SYSTEM>

Example: `Send(0,5,":EXPR:COMP RX-SPEC",18,EOI);`

**Query syntax- :EXPR:COMP**liance**?**

Example: `Send(0,5,":EXPR:COMP?",11,EOI);`
Response: <RX-SPEC|TX-SPEC|RX-ADDIN|TX-ADDIN|RX-SYSTEM|TX-SYSTEM>
Example: RX-SPEC

- **DEFAULT**

The **DEFAULT** command is used to reset all the PCI Express Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :EXPR:DEF**ault

Example: `Send(0,5,":EXPR:DEF",9,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :EXPR:DJ?**

Example: `Send(0,5,":EXPR:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **HITS**

The **HITS** query returns the number of accumulated hits in the total jitter histogram.

**Query syntax- :EXPR:HITS?**

Example: `Send(0,5,":EXPR:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- **IDLE**

The **IDLE** query instructs the instrument to measure the parts of the common mode measurements in the PCI Express specifications that are required to be performed in the Electrical Idle State. Make sure the transmitter is in its Electrical Idle State prior to issuing this command. In the Electrical Idle State, both differential lines of a PCI Express link are driven to their common mode level. A non-zero value in the Idle OK flag indicates a successful measurement. Once this measurement has been taken it will be cached and applied to future PCI Express measurements until the **:EXPR:CLEAR** command is sent or the **:EXPR:IDLE** command is once again sent.

**Query syntax- :EXPR:IDLE?**

Example: `Send(0,5,":EXPR:IDLE?",11,EOI);`
Response: <ASCII integer>, <ASCII floating point>, <ASCII floating point>, <ASCII floating point>
Description: <Idle OK flag>, <CmDcActvDelta>, <CmIdleDc>, <IdleDiff p>
Example: 1, 0.003, -0.028, 0.012

- **MEDTOMAXJITTER**

The **MEDTOMAXJITTER** query returns TTX-EYEMEDIAN-to-MAXJITTER, Maximum time between the jitter median and maximum deviation from the median.

**Query syntax- :EXPR:MEDTOMAX**`jitter`**?**

Example: `Send(0,5,":EXPR:MEDTOMAX?",15,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

 

## • PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :EXPR:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":EXPR:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :EXPR:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":EXPR:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :EXPR:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":EXPR:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :EXPR:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":EXPR:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :EXPR:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":EXPR:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :EXPR:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":EXPR:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :EXPR:PARAMeter:ARMing:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":EXPR:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :EXPR:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":EXPR:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :EXPR:PARAMeter:ARMing:SLOPe**<FALL|RISE>

Example: `Send(0,5,":EXPR:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :EXPR:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":EXPR:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :EXPR:PARAMeter:ARMing:VOLTage**<-2 to 2>

Example: `Send(0,5,":EXPR:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :EXPR:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":EXPR:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :EXPR:PARAMeter:CHANnel<n&m>**

Example: `Send(0,5,":EXPR:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :EXPR:PARAMeter:CHANnel?**

Example: `Send(0,5,":EXPR:PARAM:CHAN?",17,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

**Command syntax- :EXPR:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":EXPR:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :EXPR:PARAMeter:SAMPles?**

Example: `Send(0,5,":EXPR:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the data channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :EXPR:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":EXPR:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :EXPR:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":EXPR:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the clock channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected clock channel user voltage.

**Command syntax- :EXPR:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":EXPR:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :EXPR:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":EXPR:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :EXPR:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":EXPR:PARAM:THR 5050",20,EOI);`

**Query syntax- :EXPR:PARAMeter:THReshold?**

Example: `Send(0,5,":EXPR:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

## • PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :EXPR:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":EXPR:PARAM:TIME 10",19,EOI);`

**Query syntax- :EXPR:PARAMeter:TIMEout?**

Example: `Send(0,5,":EXPR:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PATTERN**

The **PATTERN** command selects the current pattern file to be used. The specified pattern file must exist on the SIA3000.

The **PATTERN** query returns the currently selected pattern file.

**Command syntax- :EXPR:PATT**ern<filename>

Example: `Send(0,5,":EXPR:PATT K285.PTN",19,EOI);`

**Query syntax- :EXPR:PATT**ern**?**

Example: `Send(0,5,":EXPR:PATT?",11,EOI);`
Response: <ASCII string>
Example: CJTPAT.PTN

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:BATH**tub**?**

Example: `Send(0,5,":EXPR:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:DCDISI**

The **PLOTDATA:DCDISI** query returns the plot data associated with the DCD+ISI VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:DCDISI?**

Example: `Send(0,5,":EXPR:PLOTDATA:DCDISI?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:FALL?**

Example: `Send(0,5,":EXPR:PLOTDATA:FALL?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FFT**

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:FFT?**

Example: `Send(0,5,":EXPR:PLOTDATA:FFT?",19,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:HISTOGRAM

The **PLOTDATA:HISTOGRAM** query returns the plot data associated with the MEDIAN TO MAX JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:HIST**ogram**?**

Example: `Send(0,5,":EXPR:PLOTDATA:HIST?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:HPFDCDISI

The **PLOTDATA:HPFDCDISI** query returns the plot data associated with the HIGH PASS FILTERED DCD+ISI VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:HPFDCDISI?**

Example: `Send(0,5,":EXPR:PLOTDATA:HPFDCDISI?",25,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:LPFDCDISI

The **PLOTDATA:LPFDCDISI** query returns the plot data associated with the LOW PASS FILTERED DCD+ISI VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:LPFDCDISI?**

Example: `Send(0,5,":EXPR:PLOTDATA:LPFDCDISI?",25,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:RISE

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:RISE?**

Example: `Send(0,5,":EXPR:PLOTDATA:RISE?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SCOPE-

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:SCOPE-?**

Example: `Send(0,5,":EXPR:PLOTDATA:SCOPE-?",22,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SCOPE+

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:SCOPE+?**

Example: `Send(0,5,":EXPR:PLOTDATA:SCOPE+?",22,EOI);`
Response: #xy…dddddddd…

 

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :EXPR:PLOTDATA:SIGM**a**?**

Example: `Send(0,5,":EXPR:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :EXPR:PLOTINFO:BATH**tub**?**

Example: `Send(0,5,":EXPR:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISI**

The **PLOTINFO:DCDISI** query returns the plot information associated with the DCD+ISI VS SPAN plot.

**Query syntax- :EXPR:PLOTINFO:DCDISI?**

Example: `Send(0,5,":EXPR:PLOTINFO:DCDISI?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALL**

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :EXPR:PLOTINFO:FALL?**

Example: `Send(0,5,":EXPR:PLOTINFO:FALL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :EXPR:PLOTINFO:FFT?**

Example: `Send(0,5,":EXPR:PLOTINFO:FFT?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:HISTOGRAM**

The **PLOTINFO:HISTOGRAM** query returns the plot information associated with the MEDIAN TO MAX JITTER HISTOGRAM plot.

**Query syntax- :EXPR:PLOTINFO:HIST**ogram**?**

Example: `Send(0,5,":EXPR:PLOTINFO:HIST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:HPFDCDISI**

The **PLOTINFO:HPFDCDISI** query returns the plot information associated with the HIGH PASS FILTERED DCD+ISI VS SPAN plot.

**Query syntax- :EXPR:PLOTINFO:HPFDCDISI?**

Example: `Send(0,5,":EXPR:PLOTINFO:HPFDCDISI?",25,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:LPFDCDISI**

The **PLOTINFO:LPFDCDISI** query returns the plot information associated with the LOW PASS FILTERED DCD+ISI VS SPAN plot.

**Query syntax- :EXPR:PLOTINFO:LPFDCDISI?**

Example: `Send(0,5,":EXPR:PLOTINFO:LPFDCDISI?",25,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :EXPR:PLOTINFO:RISE?**

Example: `Send(0,5,":EXPR:PLOTINFO:RISE?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIMENTARY SCOPE INPUTplot.

**Query syntax- :EXPR:PLOTINFO:SCOPE-?**

Example: `Send(0,5,":EXPR:PLOTINFO:SCOPE-?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :EXPR:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":EXPR:PLOTINFO:SCOPE+?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :EXPR:PLOTINFO:SIGMa?**

Example: `Send(0,5,":EXPR:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :EXPR:RJ?**

Example: `Send(0,5,":EXPR:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **SCOPE:FALL-**

The **SCOPE:FALL-** query returns the negative differential input fall time in seconds.

**Query syntax- :EXPR:SCOPE:FALL-?**

Example: `Send(0,5,":EXPR:SCOPE:FALL-?",18,EOI);`
Response: <ASCII floating point>
Example: 5.678273e-011

- **SCOPE:FALL+**

The **SCOPE:FALL+** query returns the positive differential input fall time in seconds.

**Query syntax- :EXPR:SCOPE:FALL+?**

Example: `Send(0,5,":EXPR:SCOPE:FALL+?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266798e-011

- **SCOPE:RISE-**

The **SCOPE:RISE-** query returns the negative differential input rise time in seconds.

**Query syntax- :EXPR:SCOPE:RISE-?**

Example: `Send(0,5,":EXPR:SCOPE:RISE-?",18,EOI);`
Response: <ASCII floating point>
Example: 5.169737e-011

- **SCOPE:RISE+**

The **SCOPE:RISE+** query returns the positive differential input rise time in seconds.

**Query syntax- :EXPR:SCOPE:RISE+?**

Example: `Send(0,5,":EXPR:SCOPE:RISE+?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266788e-011

- **SCOPE:VDIFF**

The **SCOPE:VDIFF** query returns the Differential Peak to Peak Output Voltage.

**Query syntax- :EXPR:SCOPE:VDIFF?**

Example: `Send(0,5,":EXPR:SCOPE:VDIFF?",18,EOI);`
Response: <ASCII floating point>
Example: 1.327696e-001

- ## SCOPE:VDRATIO

The **SCOPE:VDRATIO** query returns VtxDeRatio in dB's. This is the ratio of the amplitude of the emphasized and the non-emphasized edges in the pattern. It is only valid when measuring the TX-SPEC mode.

**Query syntax- :EXPR:SCOPE:VDRATIO?**

Example: `Send(0,5,":EXPR:SCOPE:VDRATIO?",20,EOI);`
Response: <ASCII floating point>
Example: -3.327696e-000

- ## SPIKES

The **SPIKES** query returns the spike list of the FFT plot. This query returns the count of returned spikes followed by the spikes themselves. The spikes each consist of a magnitude and a frequency separated by the '/' character.

**Query syntax- :EXPR:SPIKES?**

Example: `Send(0,5,":EXPR:SPIKES?",12,EOI);`
Response: <Spikes> <Mag1/Freq1> <Mag2/Freq2> <Mag3/Freq3> …
Example: 3 2.956e-12/2.003e8 1.803e-12/1.556e8 1.193e-12/2.501e8

- ## TOPENEYE:10E-12

The **TOPENEYE:10E-12** query returns the Minimum TX Eye Width at 10e-12 Bit Error Rate.

**Query syntax- :EXPR:TOPENeye:10E-12?**

Example: `Send(0,5,":EXPR:TOPEN:10E-12?",19,EOI);`
Response: <ASCII floating point>
Example: 3.637e-010

- ## TOPENEYE:10E-6

The **TOPENEYE:10E-6** query returns the Minimum TX Eye Width at 10e-6 Bit Error Rate.

**Query syntax- :EXPR:TOPENeye:10E-6?**

Example: `Send(0,5,":EXPR:TOPEN:10E-6?",18,EOI);`
Response: <ASCII floating point>
Example: 3.637e-010

## • DESCRIPTION OF THE FEATURE ANALYSIS COMMANDS

The **FEATUREANALYSIS** commands are specifically designed to analyze the amplitude portions of the PCI Express specification. They can be used to provide feature analysis of other serial data communications signals as well.

**:FEAT**ureanalysis:<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **COM**mon:**DCLINE** | **RES**olution |
| **ATTEN**uation | **DEF**ault | **SCOPE:FALL-** |
| **AVE**rages | **LEN**gth | **SCOPE:FALL+** |
| **BITRATE** | **PARAM**eter:**THR**eshold | **SCOPE:RISE-** |
| **CLE**ar | **PARAM**eter:**TIME**out | **SCOPE:RISE+** |
| **COM**mon:**AC**p | **PLOTDATA:SCOPE-** | **SCOPE:VDIFF** |
| **COM**mon:**DC** | **PLOTDATA:SCOPE+** | **TRIG**ger:**CHAN**nel |
| **COM**mon:**DCDM**inus | **PLOTINFO:SCOPE-** | **TRIG**ger:**LEV**el |
| **COM**mon:**DCDP**lus | **PLOTINFO:SCOPE+** | **TRIG**ger:**SLOP**e |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Feature Analysis Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :FEAT**ureanalysis**:ACQ**uire(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":FEAT:ACQ(@4)",13,EOI);`

## • ATTENUATION

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :FEAT**ureanalysis**:ATTEN**uation(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:ATTEN(@4)?",12,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

## • AVERAGES

The **AVERAGES** command selects the number of passes to average the output. Averaging will reduce the noise on the signal when multiple passes are acquired.

The **AVERAGES** query returns the number of currently selected averaging passes.

**Command syntax- :FEAT**ureanalysis**:AVE**rages<1|2|4|8|16|32>

Example: `Send(0,5,":FEAT:AVE 1",11,EOI);`

**Query syntax- :FEAT**ureanalysis**:AVE**rages**?**

Example: `Send(0,5,":FEAT:AVE?",10,EOI);`
Response: <1|2|4|8|16|32>

- **BITRATE**

The **BITRATE** command specifies the bitrate of the current signal in bits/sec.

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Command syntax- :FEAT**ureanalysis**:BITRATE**<10 to 1e+010>

Example: `Send(0,5,":FEAT:BITRATE 10",16,EOI);`

**Query syntax- :FEAT**ureanalysis**:BITRATE?**

Example: `Send(0,5,":FEAT:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: 1.0625e+009

- **CLEAR**

The **CLEAR** command provides a means to flush any previous data, since the Feature Analysis Tool continues to accumulate data across successive acquisitions.

**Command syntax- :FEAT**ureanalysis**:CLE**ar

Example: `Send(0,5,":FEAT:CLE",9,EOI);`

- **COMMON:ACP**

The **COMMON:ACP** query returns the the AC Peak Common Mode Input Voltage.

**Query syntax- :FEAT**ureanalysis**:COM**mon**:AC**p(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:COM:AC(@4)?",13,EOI);`
Response: <ASCII floating point>
Example: 2.800000e-005

- **COMMON:DC**

The **COMMON:DC** query returns the DC Common Mode Input Voltage.

**Query syntax- :FEAT**ureanalysis**:COM**mon**:DC**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:COM:DC(@4)?",13,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-006

- **COMMON:DCDMINUS**

The **COMMON:DCDMINUS** query returns the DC Common Mode Voltage of D-.

**Query syntax- :FEAT**ureanalysis**:COM**mon**:DCDM**inus(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:COM:DCDM(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCDPLUS**

The **COMMON:DCDPLUS** query returns the DC Common Mode Voltage of D+.

**Query syntax- :FEAT**ureanalysis**:COM**mon**:DCDP**lus(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:COM:DCDP(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCLINE**

The **COMMON:DCLINE** query returns the Absolute Delta of DC Common Mode Voltage between D+ and D-.

**Query syntax- :FEAT**ureanalysis**:COM**mon**:DCLINE**(@<n,m,x,…>|<n:m>)**?**

Example: Send(0,5,":FEAT:COM:DCLINE(@4)?",17,EOI);
Response: <ASCII floating point>
Example: 3.000000e-006

- **DEFAULT**

The **DEFAULT** command is used to reset all the Feature Analysis Tool settings back to their default values.

**Command syntax- :FEAT**ureanalysis**:DEF**ault

Example: Send(0,5,":FEAT:DEF",9,EOI);

- **LENGTH**

The **LENGTH** command sets the length of the pattern being measured in units of bit periods

The **LENGTH** query returns the currently selected pattern length in units of bit periods.

**Command syntax- :FEAT**ureanalysis**:LEN**gth<1 to 10000000>

Example: Send(0,5,":FEAT:LEN 1",11,EOI);

**Query syntax- :FEAT**ureanalysis**:LEN**gth**?**

Example: Send(0,5,":FEAT:LEN?",10,EOI);
Response: <ASCII integer>
Example: 20

- **PARAMETER:THRESHOLD**

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax-**
**:FEAT**ureanalysis**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: Send(0,5,":FEAT:PARAM:THR 5050",20,EOI);

**Query syntax- :FEAT**ureanalysis**:PARAM**eter**:THR**eshold**?**

Example: Send(0,5,":FEAT:PARAM:THR?",16,EOI);
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :FEAT**ureanalysis**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":FEAT:PARAM:TIME 10",21,EOI);`

**Query syntax- :FEAT**ureanalysis**:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":FEAT:PARAM:TIME?",17,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PLOTDATA:SCOPE-**

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FEAT**ureanalysis**:PLOTDATA:SCOPE-**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:PLOTDATA:SCOPE-(@4)?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FEAT**ureanalysis**:PLOTDATA:SCOPE+**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:PLOTDATA:SCOPE+(@4)?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIEMNTARY SCOPE INPUT plot.

**Query syntax- :FEAT**ureanalysis**:PLOTINFO:SCOPE-**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:PLOTINFO:SCOPE-(@4)?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :FEAT**ureanalysis**:PLOTINFO:SCOPE+**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:PLOTINFO:SCOPE+(@4)?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

 

- **RESOLUTION**

The **RESOLUTION** command selects the feature analysis resolution in units of picoseconds. A smaller number yields a more precise result, but takes more time to acquire.

The **RESOLUTION** query returns the currently selected resolution.

**Command syntax- :FEAT**ureanalysis**:RES**olution<1 to 1000>

Example: `Send(0,5,":FEAT:RES 4",12,EOI);`

**Query syntax- :FEAT**ureanalysis**:RES**olution**?**

Example: `Send(0,5,":FEAT:RES?",10,EOI);`
Response: <ASCII integer>
Example: 8

- **SCOPE:FALL-**

The **SCOPE:FALL-** query returns the negative differential input fall time in seconds.

**Query syntax- :FEAT**ureanalysis**:SCOPE:FALL-**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:SCOPE:FALL-(@4)?",18,EOI);`
Response: <ASCII floating point>
Example: 5.678273e-011

- **SCOPE:FALL+**

The **SCOPE:FALL+** query returns the positive differential input fall time in seconds.

**Query syntax- :FEAT**ureanalysis**:SCOPE:FALL+**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:SCOPE:FALL+(@4)?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266798e-011

- **SCOPE:RISE-**

The **SCOPE:RISE-** query returns the negative differential input rise time in seconds.

**Query syntax- :FEAT**ureanalysis**:SCOPE:RISE-**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:SCOPE:RISE-(@4)?",18,EOI);`
Response: <ASCII floating point>
Example: 5.169737e-011

- **SCOPE:RISE+**

The **SCOPE:RISE+** query returns the positive differential input rise time in seconds.

**Query syntax- :FEAT**ureanalysis**:SCOPE:RISE+**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:SCOPE:RISE+(@4)?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266788e-011

- **SCOPE:VDIFF**

The **SCOPE:VDIFF** query returns the Differential Peak to Peak Output Voltage.

**Query syntax- :FEAT**ureanalysis**:SCOPE:VDIFF**(@<n,m,x,…>|<n:m>)**?**

Example: `Send(0,5,":FEAT:SCOPE:VDIFF(@4)?",18,EOI);`
Response: <ASCII floating point>
Example: 1.327696e-001

## • TRIGGER:CHANNEL

The **TRIGGER:CHANNEL** command selects the channel to be used as the trigger source. If you want to use a Pattern Marker Card as the trigger source, select the channel that is associated with the Pattern Marker Card, and then activate the Pattern marker Card using the **PARAMETER:ARMING:MARKER** command.

The **TRIGGER:CHANNEL** query returns the current trigger source channel.

**Command syntax- :FEAT**ureanalysis**:TRIG**ger**:CHAN**nel<1 to 10>

Example: `Send(0,5,":FEAT:TRIG:CHAN 1",17,EOI);`

**Query syntax- :FEAT**ureanalysis**:TRIG**ger**:CHAN**nel**?**

Example: `Send(0,5,":FEAT:TRIG:CHAN?",16,EOI);`
Response: <ASCII integer>
Example: 3

## • TRIGGER:LEVEL

The **TRIGGER:LEVEL** command selects the voltage threshold for the trigger source. The **AUTO** selection sets the trigger threshold voltage to the 50% voltage point of the pulsefind values on the selected trigger channel.

The **TRIGGER:LEVEL** query returns the current trigger voltage threshold.

**Command syntax- :FEAT**ureanalysis**:TRIG**ger**:LEV**el<AUTO|value>

Example: `Send(0,5,":FEAT:TRIG:LEV AUTO",19,EOI);`

**Query syntax- :FEAT**ureanalysis**:TRIG**ger**:LEV**el**?**

Example: `Send(0,5,":FEAT:TRIG:LEV?",15,EOI);`
Response: <AUTO|ASCII floating point>
Example: AUTO

## • TRIGGER:SLOPE

The **TRIGGER:SLOPE** command selects the rising or falling edge to trigger the instrument.

The **TRIGGER:SLOPE** query returns the currently selected trigger edge.

**Command syntax- :FEAT**ureanalysis**:TRIG**ger**:SLOP**e<POSitive|NEGative>

Example: `Send(0,5,":FEAT:TRIG:SLOP POSitive",24,EOI);`

**Query syntax- :FEAT**ureanalysis**:TRIG**ger**:SLOP**e**?**

Example: `Send(0,5,":FEAT:TRIG:SLOP?",16,EOI);`
Response: <POSitive|NEGative>
Example: POSITIVE

## • DESCRIPTION OF THE FIBRECHANNEL COMMANDS

The **FIBRECHANNEL** commands offer simplified ease of use, when analyzing serial data communications signals over the more full featured Known Pattern With Marker (KPWM) commands.

**:FIBRE**channel:<command syntax>

**ACQ**uire
**ARMFIND**
**ATTEN**uation
**BITRATE**
**DCDISI**
**DEF**ault
**DJ**
**PARAM**eter:**ARM**ing:**CHAN**nel
**PARAM**eter:**ARM**ing:**DEL**ay
**PARAM**eter:**ARM**ing:**MARK**er
**PARAM**eter:**ARM**ing:**MODE**
**PARAM**eter:**ARM**ing:**SLOP**e
**PARAM**eter:**ARM**ing:**VOLT**age
**PARAM**eter:**CHAN**nel
**PARAM**eter:**STAR**t:**VOLT**age
**PARAM**eter:**STOP:VOLT**age
**PARAM**eter:**THR**eshold
**PARAM**eter:**TIME**out
**PATT**ern
**PJ**
**PLOTDATA:BATH**tub
**PLOTDATA:DCDISI**
**PLOTDATA:FALL**
**PLOTDATA:FFT**
**PLOTDATA:RISE**
**PLOTDATA:SIGM**a
**PLOTINFO:BATH**tub
**PLOTINFO:DCDISI**
**PLOTINFO:FALL**
**PLOTINFO:FFT**
**PLOTINFO:RISE**
**PLOTINFO:SIGM**a
**RJ**
**TJ**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Fibrechannel Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :FIBRE**channel**:ACQ**uire

Example: `Send(0,5,":FIBRE:ACQ",10,EOI);`

## • ARMFIND

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. This command performs an optimization and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :FIBRE**channel**:ARMFIND**

Example: `Send(0,5,":FIBRE:ARMFIND",14,EOI);`
Response: <ASCII integer>
Example: -16

- **ATTENUATION**

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :FIBRE**channel**:ATTEN**uation**?**

Example: `Send(0,5,":FIBRE:ATTEN?",13,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

- **BITRATE**

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Query syntax- :FIBRE**channel**:BITRATE?**

Example: `Send(0,5,":FIBRE:BITRATE?",15,EOI);`
Response: <ASCII floating point>
Example: +1.0625e9

- **DCDISI**

The **DCDISI** query returns the DCD+ISI obtained from the previous acquisition.

**Query syntax- :FIBRE**channel**:DCDISI?**

Example: `Send(0,5,":FIBRE:DCDISI?",14,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **DEFAULT**

The **DEFAULT** command is used to reset all the Fibre Channel Compliance Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :FIBRE**channel**:DEF**ault

Example: `Send(0,5,":FIBRE:DEF",10,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition.

**Query syntax- :FIBRE**channel**:DJ?**

Example: `Send(0,5,":FIBRE:DJ?",10,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

## • PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":FIBRE:PARAM:ARM:CHAN 1",23,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:CHAN**nel**?**

Example: `Send(0,5,":FIBRE:PARAM:ARM:CHAN?",22,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":FIBRE:PARAM:ARM:DEL -40",24,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:DEL**ay**?**

Example: `Send(0,5,":FIBRE:PARAM:ARM:DEL?",21,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":FIBRE:PARAM:ARM:MARK OFF",25,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:MARK**er**?**

Example: `Send(0,5,":FIBRE:PARAM:ARM:MARK?",22,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":FIBRE:PARAM:ARM:MODE EXTERNAL",30,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:MODE?**

Example: `Send(0,5,":FIBRE:PARAM:ARM:MODE?",22,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":FIBRE:PARAM:ARM:SLOP FALL",26,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:SLOP**e**?**

Example: `Send(0,5,":FIBRE:PARAM:ARM:SLOP?",22,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":FIBRE:PARAM:ARM:VOLT -2",24,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:ARM**ing**:VOLT**age**?**

Example: `Send(0,5,":FIBRE:PARAM:ARM:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :FIBRE**channel**:PARAM**eter**:CHAN**nel<1-10>

Example: `Send(0,5,":FIBRE:PARAM:CHAN4",18,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:CHAN**nel**?**

Example: `Send(0,5,":FIBRE:PARAM:CHAN?",18,EOI);`
Response: <ASCII integer>
Example: 4

 

- **PARAMETER:START:VOLTAGE**

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :FIBRE**channel**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":FIBRE:PARAM:STAR:VOLT -2",25,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:STAR**t**:VOLT**age**?**

Example: `Send(0,5,":FIBRE:PARAM:STAR:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **PARAMETER:STOP:VOLTAGE**

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :FIBRE**channel**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":FIBRE:PARAM:STOP:VOLT -2",25,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:STOP:VOLT**age**?**

Example: `Send(0,5,":FIBRE:PARAM:STOP:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **PARAMETER:THRESHOLD**

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :FIBRE**channel**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":FIBRE:PARAM:THR 5050",21,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:THR**eshold**?**

Example: `Send(0,5,":FIBRE:PARAM:THR?",17,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :FIBRE**channel**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":FIBRE:PARAM:TIME 10",22,EOI);`

**Query syntax- :FIBRE**channel**:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":FIBRE:PARAM:TIME?",18,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PATTERN

The **PATTERN** command selects the current pattern file to be used. The specified pattern file must exist on the SIA3000.

The **PATTERN** query returns the currently selected pattern file.

**Command syntax- :FIBRE**channel**:PATT**ern<filename>

Example: `Send(0,5,":FIBRE:PATT K285.PTN",20,EOI);`

**Query syntax- :FIBRE**channel**:PATT**ern**?**

Example: `Send(0,5,":FIBRE:PATT?",12,EOI);`
Response: <ASCII string>
Example: CJTPAT.PTN

- ## PJ

The **PJ** query returns the Periodic Jitter obtained from the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :FIBRE**channel**:PJ?**

Example: `Send(0,5,":FIBRE:PJ?",10,EOI);`
Response: <ASCII floating point>
Example: 20.3162387e-12

- ## PLOTDATA:BATHTUB

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FIBRE**channel**:PLOTDATA:BATH**tub**?**

Example: `Send(0,5,":FIBRE:PLOTDATA:BATH?",21,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:DCDISI

The **PLOTDATA:DCDISI** query returns the plot data associated with the DCD+ISI VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FIBRE**channel**:PLOTDATA:DCDISI?**

Example: `Send(0,5,":FIBRE:PLOTDATA:DCDISI?",23,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE DCD+ISI HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FIBRE**channel**:PLOTDATA:FALL?**

Example: `Send(0,5,":FIBRE:PLOTDATA:FALL?",21,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:FFT**

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FIBRE**channel**:PLOTDATA:FFT?**

Example: `Send(0,5,":FIBRE:PLOTDATA:FFT?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:RISE**

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE DCD+ISI HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FIBRE**channel**:PLOTDATA:RISE?**

Example: `Send(0,5,":FIBRE:PLOTDATA:RISE?",21,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FIBRE**channel**:PLOTDATA:SIGM**a**?**

Example: `Send(0,5,":FIBRE:PLOTDATA:SIGM?",21,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :FIBRE**channel**:PLOTINFO:BATH**tub**?**

Example: `Send(0,5,":FIBRE:PLOTINFO:BATH?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISI**

The **PLOTINFO:DCDISI** query returns the plot information associated with the DCD+ISI VS SPAN plot.

**Query syntax- :FIBRE**channel**:PLOTINFO:DCDISI?**

Example: `Send(0,5,":FIBRE:PLOTINFO:DCDISI?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:FALL

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE DCD+ISI HISTOGRAM plot.

**Query syntax- :FIBRE**channel**:PLOTINFO:FALL?**

Example: `Send(0,5,":FIBRE:PLOTINFO:FALL?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:FFT

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :FIBRE**channel**:PLOTINFO:FFT?**

Example: `Send(0,5,":FIBRE:PLOTINFO:FFT?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:RISE

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE DCD+ISI HISTOGRAM plot.

**Query syntax- :FIBRE**channel**:PLOTINFO:RISE?**

Example: `Send(0,5,":FIBRE:PLOTINFO:RISE?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:SIGMA

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :FIBRE**channel**:PLOTINFO:SIGM**a**?**

Example: `Send(0,5,":FIBRE:PLOTINFO:SIGM?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## RJ

The **RJ** query returns the Random Jitter obtained from the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :FIBRE**channel**:RJ?**

Example: `Send(0,5,":FIBRE:RJ?",10,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- ## TJ

The **TJ** query returns the Total Jitter obtained from the previous acquisition.

**Query syntax- :FIBRE**channel**:TJ?**

Example: `Send(0,5,":FIBRE:TJ?",10,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

 

## • DESCRIPTION OF THE FOLDED EYE COMMANDS

The **FOLDEDEYE** commands are designed to provide an eye mask test to be applied to a repeating pattern. This allows a DSP Bandwidth Extension algorithm to be applied to improve the apparent front end performance. See the SIA3000 User Manual for additional information concerning the Bandwidth Extension.

**:FOLD**edeye:<command syntax>

**ACQ**uire
**ATTEN**uation
**AUTO**
**BITRATE**
**CLE**ar
**DEF**ault
**DISP**lay**:DIFF**offset
**DISP**lay**:INP**uts
**DISP**lay**:OFFS**et
**LEN**gth
**MASK:BTMFAIL**ures
**MASK:COMP**arisons
**MASK:FAIL**ures
**MASK:MARG**in
**MASK:MIDFAIL**ures
**MASK:PCT0**level
**MASK:PCT1**level
**MASK:PCTI**nside
**MASK:SCAL**e
**MASK:TAMP**litude
**MASK:TFLA**t
**MASK:TOFF**set
**MASK:TOPFAIL**ures
**MASK:UIFLA**t
**MASK:UIWID**th
**MASK:VAMP**litude
**MASK:VOFF**set
**MASK:VPASS0**
**MASK:VPASS1**
**PARAM**eter**:CHAN**nel
**PARAM**eter**:TIME**out
**PLOTDATA:SCOPE-**
**PLOTDATA:SCOPE+**
**PLOTDATA:SCOPEDIFF**
**PLOTINFO:SCOPE-**
**PLOTINFO:SCOPE+**
**PLOTINFO:SCOPEDIFF**
**RES**olution
**TRIG**ger**:CHAN**nel
**TRIG**ger**:LEV**el
**TRIG**ger**:SLOP**e

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Folded Eye Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :FOLD**edeye**:ACQ**uire

Example: `Send(0,5,":FOLD:ACQ",13,EOI);`

## • ATTENUATION

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :FOLD**edeye**:ATTEN**uation**?**

Example: `Send(0,5,":FOLD:ATTEN?",12,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

## • AUTO

The **AUTO** command automatically sets the trigger voltage, voltage offset, and bitrate based on the current signal.

**Command syntax- :FOLD**edeye**:AUTO**

Example: `Send(0,5,":FOLD:AUTO",14,EOI);`

- **BITRATE**

The **BITRATE** command specifies the bitrate of the current signal in bits/sec.

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Command syntax- :FOLD**edeye**:BITRATE**<10 to 1e+010>

Example: `Send(0,5,":FOLD:BITRATE 10",16,EOI);`

**Query syntax- :FOLD**edeye**:BITRATE?**

Example: `Send(0,5,":FOLD:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: 1.0625e+009

- **CLEAR**

The **CLEAR** command provides a means to flush any previous data, since the Folded Eye Tool continues to accumulate data across successive acquisitions.

**Command syntax- :FOLD**edeye**:CLE**ar

Example: `Send(0,5,":FOLD:CLE",9,EOI);`

- **DEFAULT**

The **DEFAULT** command is used to reset all the Folded Eye Tool settings back to their default values.

**Command syntax- :FOLD**edeye**:DEF**ault

Example: `Send(0,5,":FOLD:DEF",9,EOI);`

- **DISPLAY:DIFFOFFSET**

The **DISPLAY:DIFFOFFSET** command sets the differential offset voltage in millivolts. This is only required when using the differential waveform. It is separate from the channel offset used to to set the voltage offset at the front end, and is normally near zero.

The **DISPLAY:DIFFOFFSET** query returns the current differential offset voltage in millivolts.

**Command syntax- :FOLD**edeye**:DISP**lay**:DIFF**offset<-2000 to 2000>

Example: `Send(0,5,":FOLD:DISP:DIFF 500",18,EOI);`

**Query syntax- :FOLD**edeye**:DISP**lay**:DIFF**offset?

Example: `Send(0,5,":FOLD:DISP:DIFF?",17,EOI);`
Response: <ASCII integer>
Example: 500

- **DISPLAY:INPUTS**

The **DISPLAY:INPUTS** command sets which inputs are currently active: Positive, negative, or differential.

The **DISPLAY:INPUTS** query returns which inputs are currently active.

**Command syntax- :FOLD**edeye**:DISP**lay**:INP**uts<POSitive|NEGative|DIFFerential>

Example: `Send(0,5,":FOLD:DISP:INP POSitive",23,EOI);`

**Query syntax- :FOLD**edeye**:DISP**lay**:INP**uts?

Example: `Send(0,5,":FOLD:DISP:INP?",15,EOI);`
Response: <POSitive|NEGative|DIFFerential >
Example: POSITIVE

- **DISPLAY:OFFSET**

The **DISPLAY:OFFSET** command sets the channel offset voltage in millivolts. The instrument has a limited voltage range, so it is necessary to have the offset set to the approximate DC voltage level of the input signal.

The **DISPLAY:OFFSET** query returns the current channel offset voltage in millivolts.

**Command syntax- :FOLD**edeye**:DISP**lay**:OFFS**et<-2000 to 2000>

Example: `Send(0,5,":FOLD:DISP:OFFS 500",18,EOI);`

**Query syntax- :FOLD**edeye**:DISP**lay**:OFFS**et?

Example: `Send(0,5,":FOLD:DISP:OFFS?",17,EOI);`
Response: <ASCII integer>
Example: 500

- **LENGTH**

The **LENGTH** command sets the length of the pattern being measured in units of bit periods

The **LENGTH** query returns the currently selected pattern length in units of bit periods.

**Command syntax- :FOLD**edeye**:LEN**gth<1 to 10000000>

Example: `Send(0,5,":FOLD:LEN 1",11,EOI);`

**Query syntax- :FOLD**edeye**:LEN**gth**?**

Example: `Send(0,5,":FOLD:LEN?",10,EOI);`
Response: <ASCII integer>
Example: 20

- **MASK:BTMFAILURES**

The **MASK:BTMFAILURES** query returns the number of hits which land in the bottom keep out region.

**Query syntax- :FOLD**edeye**:MASK:BTMFAIL**ures?

Example: `Send(0,5,":FOLD:MASK:BTMFAIL?",23,EOI);`
Response: <ASCII integer>
Example: 7

- **MASK:COMPARISONS**

The **MASK:COMPARISONS** query returns the total number of hits which were compared to determine if they were within one of the three mask keep out regions.

**Query syntax- :FOLD**edeye**:MASK:COMP**arisons?

Example: `Send(0,5,":FOLD:MASK:COMP?",20,EOI);`
Response: <ASCII integer>
Example: 35000

- **MASK:FAILURES**

The **MASK:FAILURES** query returns the number of hits which land in all three of the keep out regions combined.

**Query syntax- :FOLD**edeye**:MASK:FAIL**ures?

Example: `Send(0,5,":FOLD:MASK:FAIL?",20,EOI);`
Response: <ASCII integer>
Example: 39

- ## MASK:MARGIN

The **MASK:MARGIN** command allows additional guard band to be added to or subtracted from the mask definition.

The **MASK:MARGIN** query returns the currently selected mask margin.

**Command syntax- :FOLD**edeye**:MASK:MARG**in<-100 to 100>

Example: `Send(0,5,":FOLD:MASK:MARG -100",20,EOI);`

**Query syntax- :FOLD**edeye**:MASK:MARG**in?

Example: `Send(0,5,":FOLD:MASK:MARG?",16,EOI);`
Response: <ASCII integer>
Example: 10

- ## MASK:MIDFAILURES

The **MASK:MIDFAILURES** query returns the number of hits which land in the middle keep out region.

**Query syntax- :FOLD**edeye**:MASK:MIDFAIL**ures?

Example: `Send(0,5,":FOLD:MASK:MIDFAIL?",23,EOI);`
Response: <ASCII integer>
Example: 17

- ## MASK:PCT0LEVEL

The **MASK:PCT0LEVEL** command specifies the distance from the bottom of the middle keep out region to the top of the bottom keep out region as a percentages of the amplitude of the current data signal. This value has no immediate effect, but is used when the **:FOLD**edeye**:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions based on the current data signal.

The **MASK:PCT0LEVEL** query returns the currently selected value.

**Command syntax- :FOLD**edeye**:MASK:PCT0**level<0 to 100>

Example: `Send(0,5,":FOLD:MASK:PCT0 0",17,EOI);`

**Query syntax- :FOLD**edeye**:MASK:PCT0**level?

Example: `Send(0,5,":FOLD:MASK:PCT0?",16,EOI);`
Response: <ASCII floating point>
Example: 2.0000e+001

- ## MASK:PCT1LEVEL

The **MASK:PCT1LEVEL** command specifies the distance from the top of the middle keep out region to the bottom of the top keep out region as a percentages of the amplitude of the current data signal. This value has no immediate effect, but is used when the **:FOLD**edeye**:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions based on the current data signal.

The **MASK:PCT1LEVEL** query returns the currently selected value.

**Command syntax- :FOLD**edeye**:MASK:PCT1**level<0 to 100>

Example: `Send(0,5,":FOLD:MASK:PCT1 0",17,EOI);`

**Query syntax- :FOLD**edeye**:MASK:PCT1**level?

Example: `Send(0,5,":FOLD:MASK:PCT1?",16,EOI);`
Response: <ASCII floating point>
Example: 2.0000e+001

- ## MASK:PCTINSIDE

The **MASK:PCTINSIDE** command specifies the height of the middle keep out regions as a percentages of the amplitude of the current data signal. This value has no immediate effect, but is used when the **:FOLD**edeye**:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions based on the current data signal.

The **MASK:PCTINSIDE** query return the currently selected value.

**Command syntax- :FOLD**edeye**:MASK:PCTI**nside<0 to 100>

Example: Send(0,5,":FOLD:MASK:PCTI 0",17,EOI);

**Query syntax- :FOLD**edeye**:MASK:PCTI**nside?

Example: Send(0,5,":FOLD:MASK:PCTI?",16,EOI);
Response: <ASCII floating point>
Example: 6.0000e+001

- ## MASK:SCALE

The **MASK:SCALE** command scales the absolute mask dimensions based on the relative mask dimensions and the current data signal. An appropriate Eye Diagram should be centered in the window before issuing this command.

**Command syntax- :FOLD**edeye**:MASK:SCAL**e

Example: Send(0,5,":FOLD:MASK:SCAL",19,EOI);

- ## MASK:TAMPLITUDE

The **MASK:TAMPLITUDE** command selects the absolute mask width in units of time (seconds).

The **MASK:TAMPLITUDE** query returns the absolute mask width.

**Command syntax- :FOLD**edeye**:MASK:TAMP**litude<0 to 0.0001>

Example: Send(0,5,":FOLD:MASK:TAMP 0",17,EOI);

**Query syntax- :FOLD**edeye**:MASK:TAMP**litude?

Example: Send(0,5,":FOLD:MASK:TAMP?",16,EOI);
Response: <ASCII floating point>
Example: 1.000000e-009

- ## MASK:TFLAT

The **MASK:TFLAT** command selects the absolute mask flat width in units of time (seconds). The flat width is the flat region on the top and bottom of the mask.

The **MASK:TFLAT** query returns the currently selected flat mask width.

**Command syntax- :FOLD**edeye**:MASK:TFLA**t<0 to 0.0001>

Example: Send(0,5,":FOLD:MASK:TFLA 0",17,EOI);

**Query syntax- :FOLD**edeye**:MASK:TFLA**t?

Example: Send(0,5,":FOLD:MASK:TFLA?",16,EOI);
Response: <ASCII floating point>
Example: 5.000000e-010

- ## MASK:TOFFSET

The **MASK:TOFFSET** query returns the horizontal center of the mask, and is expressed in seconds. It is based on the mask being centered in the current scope window.

**Command syntax- :FOLD**edeye**:MASK:TOFF**set<2.4e-008 to 0.0001>

Example: Send(0,5,":FOLD:MASK:TOFF 2.4e-008",24,EOI);

**Query syntax- :FOLD**edeye**:MASK:TOFF**set?

Example: Send(0,5,":FOLD:MASK:TOFF?",16,EOI);
Response: <ASCII floating point>
Example: 2.600000e-008

- ## MASK:TOPFAILURES

The **MASK:TOPFAILURES** query returns the number of hits which land in the top keep out region.

**Query syntax- :FOLD**edeye**:MASK:TOPFAIL**ures?

Example: Send(0,5,":FOLD:MASK:TOPFAIL?",23,EOI);
Response: <ASCII integer>
Example: 3

- ## MASK:UIFLAT

The **MASK:UIFLAT** command specifies the distance across the top and bottom flat faces of the mask. It is expressed as a percentage of the Unit Interval of the current data signal. This value has no immediate effect, but is used when the **:FOLD**edeye**:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions.

The **MASK:UIFLAT** query returns the current percentage used to scale the flat mask width.

**Command syntax- :FOLD**edeye**:MASK:UIFLA**t<0.0 to 1.0>

Example: Send(0,5,":FOLD:MASK:UIFLA 0",18,EOI);

**Query syntax- :FOLD**edeye**:MASK:UIFLA**t?

Example: Send(0,5,":FOLD:MASK:UIFLA?",17,EOI);
Response: <ASCII floating point>
Example: 2.000000e-010

- ## MASK:UIWIDTH

The **MASK:UIWIDTH** command specifies the mask width as a function of a percentage of the Unit Interval of the current data signal. This value has no immediate effect, but is used when the **:FOLD**edeye**:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions.

The **MASK:UIWIDTH** query returns the current percentage used to scale the mask width.

**Command syntax- :FOLD**edeye**:MASK:UIWID**th<0.0 to 1.0>

Example: Send(0,5,":FOLD:MASK:UIWID 0",18,EOI);

**Query syntax- :FOLD**edeye**:MASK:UIWID**th?

Example: Send(0,5,":FOLD:MASK:UIWID?",17,EOI);
Response: <ASCII floating point>
Example: 4.000000e-010

- **MASK:VAMPLITUDE**

The **MASK:VAMPLITUDE** command sets the current mask vertical height, and is expressed in Volts.

The **MASK:VAMPLITUDE** query returns the currently selected vertical mask height.

**Command syntax- :FOLD**edeye**:MASK:VAMP**litude<0 to 4>

Example: Send(0,5,":FOLD:MASK:VAMP 0",17,EOI);

**Query syntax- :FOLD**edeye**:MASK:VAMP**litude?

Example: Send(0,5,":FOLD:MASK:VAMP?",16,EOI);
Response: <ASCII floating point>
Example: 5.000000e-001

- **MASK:VOFFSET**

The **MASK:VOFFSET** query returns the vertical center of the mask, and is expressed in Volts. It is based on the mask being centered in the current scope window.

**Command syntax- :FOLD**edeye**:MASK:VOFF**set<-2 to 2>

Example: Send(0,5,":FOLD:MASK:VOFF -2",18,EOI);

**Query syntax- :FOLD**edeye**:MASK:VOFF**set?

Example: Send(0,5,":FOLD:MASK:VOFF?",16,EOI);
Response: <ASCII floating point>
Example: 5.000000e-001

- **MASK:VPASS0**

The **MASK:VPASS0** command specifies the distance from the bottom of the middle keep out region to the top of the bottom keep out region, and is expressed in Volts.

The **MASK:VPASS0** query returns the currently selected value.

**Command syntax- :FOLD**edeye**:MASK:VPASS0**<0 to 2>

Example: Send(0,5,":FOLD:MASK:VPASS0 0",19,EOI);

**Query syntax- :FOLD**edeye**:MASK:VPASS0**?

Example: Send(0,5,":FOLD:MASK:VPASS0?",18,EOI);
Response: <ASCII floating point>
Example: 2.000000e-001

- **MASK:VPASS1**

The **MASK:VPASS1** command specifies the distance from the top of the middle keep out region to the bottom of the top keep out region, and is expressed in Volts.

The **MASK:VPASS1** query returns the currently selected value.

**Command syntax- :FOLD**edeye**:MASK:VPASS1**<0 to 2>

Example: Send(0,5,":FOLD:MASK:VPASS1 0",19,EOI);

**Query syntax- :FOLD**edeye**:MASK:VPASS1**?

Example: Send(0,5,":FOLD:MASK:VPASS1?",18,EOI);
Response: <ASCII floating point>
Example: 2.000000e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :FOLD**edeye**:PARAM**eter**:CHAN**nel<1-10>

Example: `Send(0,5,":FOLD:PARAM:CHAN4",17,EOI);`

**Query syntax- :FOLD**edeye**:PARAM**eter**:CHAN**nel**?**

Example: `Send(0,5,":FOLD:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :FOLD**edeye**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":FOLD:PARAM:TIME 10",21,EOI);`

**Query syntax- :FOLD**edeye**:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":FOLD:PARAM:TIME?",17,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PLOTDATA:SCOPE-

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FOLD**edeye**:PLOTDATA:SCOPE-?**

Example: `Send(0,5,":FOLD:PLOTDATA:SCOPE-?",22,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SCOPE+

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FOLD**edeye**:PLOTDATA:SCOPE+?**

Example: `Send(0,5,":FOLD:PLOTDATA:SCOPE+?",22,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SCOPEDIFF

The **PLOTDATA:SCOPEDIFF** query returns the plot data associated with the DIFFERENTIAL SCOPE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :FOLD**edeye**:PLOTDATA:SCOPEDIFF?**

Example: `Send(0,5,":FOLD:PLOTDATA:SCOPEDIFF?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIEMNTARY SCOPE INPUT plot.

**Query syntax- :FOLD**edeye**:PLOTINFO:SCOPE-?**

Example: `Send(0,5,":FOLD:PLOTINFO:SCOPE-?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :FOLD**edeye**:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":FOLD:PLOTINFO:SCOPE+?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPEDIFF**

The **PLOTINFO:SCOPEDIFF** query returns the plot information associated with the DIFFERENTIAL SCOPE plot.

**Query syntax- :FOLD**edeye**:PLOTINFO:SCOPEDIFF?**

Example: `Send(0,5,":FOLD:PLOTINFO:SCOPEDIFF?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RESOLUTION**

The **RESOLUTION** command selects the folded eye resolution in units of picoseconds. A smaller number yields a more precise result, but takes more time to acquire.

The **RESOLUTION** query returns the currently selected resolution.

**Command syntax- :FOLD**edeye**:RES**olution<1 to 1000>

Example: `Send(0,5,":FOLD:RES 4",12,EOI);`

**Query syntax- :FOLD**edeye**:RES**olution**?**

Example: `Send(0,5,":FOLD:RES?",10,EOI);`
Response: <ASCII integer>
Example: 8

- **TRIGGER:CHANNEL**

The **TRIGGER:CHANNEL** command selects the channel to be used as the trigger source. If you want to use a Pattern Marker Card as the trigger source, select the channel that is associated with the Pattern Marker Card, and then activate the Pattern marker Card using the **PARAMETER:ARMING:MARKER** command.

The **TRIGGER:CHANNEL** query returns the current trigger source channel.

**Command syntax- :FOLD**edeye**:TRIG**ger**:CHAN**nel<1 to 10>

Example: `Send(0,5,":FOLD:TRIG:CHAN 1",17,EOI);`

**Query syntax- :FOLD**edeye**:TRIG**ger**:CHAN**nel**?**

Example: `Send(0,5,":FOLD:TRIG:CHAN?",16,EOI);`
Response: <ASCII integer>
Example: 3

- ## TRIGGER:LEVEL

The **TRIGGER:LEVEL** command selects the voltage threshold for the trigger source. The **AUTO** selection sets the trigger threshold voltage to the 50% voltage point of the pulsefind values on the selected trigger channel.

The **TRIGGER:LEVEL** query returns the current trigger voltage threshold.

**Command syntax- :FOLD**edeye**:TRIG**ger**:LEV**el<AUTO|value>

Example: `Send(0,5,":FOLD:TRIG:LEV AUTO",19,EOI);`

**Query syntax- :FOLD**edeye**:TRIG**ger**:LEV**el**?**

Example: `Send(0,5,":FOLD:TRIG:LEV?",15,EOI);`
Response: <AUTO|ASCII floating point>
Example: AUTO

- ## TRIGGER:SLOPE

The **TRIGGER:SLOPE** command selects the rising or falling edge to trigger the instrument.

The **TRIGGER:SLOPE** query returns the currently selected trigger edge.

**Command syntax- :FOLD**edeye**:TRIG**ger**:SLOP**e<POSitive|NEGative>

Example: `Send(0,5,":FOLD:TRIG:SLOP POSitive",24,EOI);`

**Query syntax- :FOLD**edeye**:TRIG**ger**:SLOP**e**?**

Example: `Send(0,5,":FOLD:TRIG:SLOP?",16,EOI);`
Response: <POSitive|NEGative>
Example: POSITIVE

## • DESCRIPTION OF THE HIGH FREQUENCY MODULATION COMMANDS

The **HFM** commands are used to make measurements using the High Frequency Modulation Tool. This allows the user to see jitter accumulation or spectral content of the jitter. HF Modulation Analysis compiles histograms of incrementally increasing consecutive period measurements. These measurements can be between rising or falling edges.

**:HFM:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **MINSIGMA** | **PJFREQN**clock |
| **AVER**ages | **PARAM**eter**:ARM**ing**:CHAN**nel | **PJN**clock |
| **AVGPEAK** | **PARAM**eter**:ARM**ing**:DEL**ay | **PKTOPKPEAK** |
| **AVGSIGMA** | **PARAM**eter**:ARM**ing**:MARK**er | **PKTOPKSIGMA** |
| **CORN**erfreq | **PARAM**eter**:ARM**ing**:MODE** | **PLOTDATA:FFT1** |
| **DEF**ault | **PARAM**eter**:ARM**ing**:SLOP**e | **PLOTDATA:FFTN** |
| **DIV**ider | **PARAM**eter**:ARM**ing**:VOLT**age | **PLOTDATA:PEAK** |
| **FFT:ALPH**afactor | **PARAM**eter**:CHAN**nel | **PLOTDATA:SIGM**a |
| **FFT:MULT**iplier | **PARAM**eter**:FUNC**tion | **PLOTINFO:FFT1** |
| **FFT:WIND**owtype | **PARAM**eter**:SAMP**les | **PLOTINFO:FFTN** |
| **FMAX** | **PARAM**eter**:STAR**t**:VOLT**age | **PLOTINFO:PEAK** |
| **FMIN** | **PARAM**eter**:STOP:VOLT**age | **PLOTINFO:SIGM**a |
| **FREQ**uency | **PARAM**eter**:THR**eshold | **RJ1**clock |
| **MAXPEAK** | **PARAM**eter**:TIME**out | **RJN**clock |
| **MAXSIGMA** | **PJ1**clock | **SPIKES1**clock |
| **MINPEAK** | **PJFREQ1**clock | **SPIKESN**clock |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new High Frequency Modulation Analysis Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :HFM:ACQ**uire

Example: `Send(0,5,":HFM:ACQ;*OPC",8,EOI);`

## • AVERAGES

The **AVERAGES** command selects the number of passes to average for the FFT output. Averaging will generally reduce the noise floor of the FFT but increase measurement time.

The **AVERAGES** query returns the number of currently selected averaging passes.

**Command syntax- :HFM:AVER**ages<1|2|4|8|16|32>

Example: `Send(0,5,":HFM:AVER 1",11,EOI);`

**Query syntax- :HFM:AVER**ages**?**

Example: `Send(0,5,":HFM:AVER?",10,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- ## AVGPEAK

The **AVGPEAK** query returns the average Peak-to-Peak (max – min) measurement across all spans.

**Query syntax- :HFM:AVGPEAK?**

Example: `Send(0,5,":HFM:AVGPEAK?",13,EOI);`
Response: <ASCII floating point>
Example: 9.673067e-012

- ## AVGSIGMA

The **AVGSIGMA** query returns the average 1-Sigma measurement across all spans.

**Query syntax- :HFM:AVGSIGMA?**

Example: `Send(0,5,":HFM:AVGSIGMA?",14,EOI);`
Response: <ASCII floating point>
Example: 3.064763e-012

- ## CORNERFREQ

The **CORNERFREQ** command provides a means to configure the corner frequency (-3dB Freq) that is used. The Corner Frequency is used to determine the maximum measurement interval used in sampling and is entered in Hz. A low corner frequency extends the time required to acquire the measurement set because histograms over many more periods must be acquired. Below the corner frequency, a natural roll-off of approximately 20dB per decade is observed.

The **CORNERFREQ** query is used to determine what the current corner frequency is configured as.

**Command syntax- :HFM:CORN**`erfreq<10 to 1e+010>`

Example: `Send(0,5,":HFM:CORN 10",12,EOI);`

**Query syntax- :HFM:CORN**`erfreq`**?**

Example: `Send(0,5,":HFM:CORN?",10,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

- ## DEFAULT

The **DEFAULT** command is used to reset all the High Frequency Modulation Analysis Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :HFM:DEF**`ault`

Example: `Send(0,5,":HFM:DEF",8,EOI);`

- ## DIVIDER

The **DIVIDER** command allows scaling of the FFT by dividing the upper frequency limit of the FFT. The default is 1 which shows frequencies of jitter up to 50% of the clock rate (also known as the Nyquist frequency). Increasing this value allows faster analysis of lower frequency information by skipping edges and ignoring high frequency effects. However, any high frequency jitter content will be aliased down, increasing the jitter values that are returned.

The **DIVIDER** query returns the currently selected frequency divider.

**Command syntax- :HFM:DIV**`ider<1 to 10000>`

Example: `Send(0,5,":HFM:DIV 1",10,EOI);`

**Query syntax- :HFM:DIV**`ider`**?**

Example: `Send(0,5,":HFM:DIV?",9,EOI);`
Response: <ASCII integer>
Example: 1

 

- ## FFT:ALPHAFACTOR

The **FFT:ALPHAFACTOR** command is used to vary the sidelobe rejection of the Kaiser-Bessel window. As the Alpha Factor increases, the spectral peak widens and the sidelobes shrink. As the Alpha Factor decreases, the spectral peak narrows and the sidelobes increase in amplitude.

The **FFT:ALPHAFACTOR** query returns the currently selected Kaiser-Bessel Alpha factor.

**Command syntax- :HFM:FFT:ALPH**afactor<2 to 100>

Example: `Send(0,5,":HFM:FFT:ALPH 2",15,EOI);`

**Query syntax- :HFM:FFT:ALPH**afactor**?**

Example: `Send(0,5,":HFM:FFT:ALPH?",14,EOI);`
Response: <ASCII floating point>
Example: 1.000e+002

- ## FFT:MULTIPLIER

The **FFT:MULTIPLIER** command selects the amount of zero padding to be applied to the measured data prior to the FFT being applied. Padding increases the frequency resolution of the FFT. Generally, a higher padding value will increase transformation processing time.

The **FFT:MULTIPLIER** query returns the currently selected multiplier value.

**Command syntax- :HFM:FFT:MULT**iplier<1|2|4|8|16|32>

Example: `Send(0,5,":HFM:FFT:MULT 1",15,EOI);`

**Query syntax- :HFM:FFT:MULT**iplier**?**

Example: `Send(0,5,":HFM:FFT:MULT?",14,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- ## FFT:WINDOWTYPE

The **FFT:WINDOWTYPE** command selects the window type used to reduce the spectral information distortion of an FFT. The time domain signal is multiplied by a window weighting function before the transform is performed. The choice of window will determine which spectral components will be isolated, or separated, from the dominant frequency(s).

The **FFT:WINDOWTYPE** query returns the currently selected window type.

**Command syntax- :HFM:FFT:WIND**owtype<RECTANGULAR|KAISER-BESSEL|TRIANGULAR|HAMMING|HANNING|BLACKMAN|GAUSSIAN>

Example: `Send(0,5,":HFM:FFT:WIND RECTANGULAR",25,EOI);`

**Query syntax- :HFM:FFT:WIND**owtype**?**

Example: `Send(0,5,":HFM:FFT:WIND?",14,EOI);`
Response: <RECTANGULAR|KAISER-BESSEL|TRIANGULAR|
HAMMING|HANNING|BLACKMAN|GAUSSIAN>
Example: RECTANGULAR

- ## FMAX

The **FMAX** command selects the upper frequency limit for the window over which RJ and PJ is calculated. Above this frequency a first order roll off of 20dB/decade is applied. A negative value disables this feature, and the full spectrum to the Nyquist frequency is evaluated. The default is value is to disable the first order roll off.

The **FMAX** query returns the current selection for the upper frequency limit.

**Command syntax- :HFM:FMAX**<-1e+010 to 1e+010>

Example: `Send(0,5,":HFM:FMAX -1e+010",17,EOI);`

**Query syntax- :HFM:FMAX?**

Example: `Send(0,5,":HFM:FMAX?",10,EOI);`
Response: <ASCII floating point>
Example: 5.000e+007

- ## FMIN

The **FMIN** command selects the lower frequency limit for the window over which RJ and PJ is calculated. Below this frequency a brick wall filter is applied. A negative value disables this feature, and the full spectrum resulting from the current corner frequency (-3dB frequency) is evaluated. The default value is to disable the brick wall filter.

The **FMIN** query returns the current selection for the lower frequency limit.

**Command syntax- :HFM:FMIN**<-1e+010 to 1e+010>

Example: `Send(0,5,":HFM:FMIN -1e+010",17,EOI);`

**Query syntax- :HFM:FMIN?**

Example: `Send(0,5,":HFM:FMIN?",10,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

- ## FREQUENCY

The **FREQUENCY** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :HFM:FREQ**uency**?**

Example: `Send(0,5,":HFM:FREQ?",10,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- ## MAXPEAK

The **MAXPEAK** query returns the maximum Peak-to-Peak (max – min) measurement across all spans.

**Query syntax- :HFM:MAXPEAK?**

Example: `Send(0,5,":HFM:MAXPEAK?",13,EOI);`
Response: <ASCII floating point>
Example: 9.969797e-012

- ## MAXSIGMA

The **MAXSIGMA** query returns the maximum 1-Sigma measurement across all spans.

**Query syntax- :HFM:MAXSIGMA?**

Example: `Send(0,5,":HFM:MAXSIGMA?",14,EOI);`
Response: <ASCII floating point>
Example: 3.664763e-012

 

- **MINPEAK**

The **MINPEAK** query returns the minimum Peak-to-Peak (max – min) measurement across all spans.

**Query syntax- :HFM:MINPEAK?**

Example: `Send(0,5,":HFM:MINPEAK?",13,EOI);`
Response: <ASCII floating point>
Example: 9.003067e-012

- **MINSIGMA**

The **MINSIGMA** query returns the minimum 1-Sigma measurement across all spans.

**Query syntax- :HFM:MINSIGMA?**

Example: `Send(0,5,":HFM:MINSIGMA?",14,EOI);`
Response: <ASCII floating point>
Example: 3.000763e-012

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :HFM:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":HFM:PARAM:ARM:CHAN 1",21,EOI);`

**Query syntax- :HFM:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":HFM:PARAM:ARM:CHAN?",20,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :HFM:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":HFM:PARAM:ARM:DEL -40",22,EOI);`

**Query syntax- :HFM:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":HFM:PARAM:ARM:DEL?",19,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :HFM:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":HFM:PARAM:ARM:MARK OFF",23,EOI);`

**Query syntax- :HFM:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":HFM:PARAM:ARM:MARK?",20,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :HFM:PARAMeter:ARMing:MODE<EXTERNAL|START|STOP>**

Example: `Send(0,5,":HFM:PARAM:ARM:MODE EXTERNAL",28,EOI);`

**Query syntax- :HFM:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":HFM:PARAM:ARM:MODE?",20,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :HFM:PARAMeter:ARMing:SLOPe<FALL|RISE>**

Example: `Send(0,5,":HFM:PARAM:ARM:SLOP FALL",24,EOI);`

**Query syntax- :HFM:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":HFM:PARAM:ARM:SLOP?",20,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :HFM:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":HFM:PARAM:ARM:VOLT -2",22,EOI);`

**Query syntax- :HFM:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":HFM:PARAM:ARM:VOLT?",20,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :HFM:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":HFM:PARAM:CHAN4",17,EOI);`

**Query syntax- :HFM:PARAMeter:CHANnel?**

Example: `Send(0,5,":HFM:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :HFM:PARAMeter:FUNCtion<PER+|PER->**

Example: `Send(0,5,":HFM:PARAM:FUNC PER+",21,EOI);`

**Query syntax- :HFM:PARAMeter:FUNCtion?**

Example: `Send(0,5,":HFM:PARAM:FUNC?",16,EOI);`
Response: <PER+|PER->

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :HFM:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":HFM:PARAM:SAMP 1000",20,EOI);`

**Query syntax- :HFM:PARAMeter:SAMPles?**

Example: `Send(0,5,":HFM:PARAM:SAMP?",16,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :HFM:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":HFM:PARAM:STAR:VOLT -2",23,EOI);`

**Query syntax- :HFM:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":HFM:PARAM:STAR:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :HFM:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":HFM:PARAM:STOP:VOLT -2",23,EOI);`

**Query syntax- :HFM:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":HFM:PARAM:STOP:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

 

- **PARAMETER:THRESHOLD**

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :HFM:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":HFM:PARAM:THR 5050",19,EOI);`

**Query syntax- :HFM:PARAMeter:THReshold?**

Example: `Send(0,5,":HFM:PARAM:THR?",15,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :HFM:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":HFM:PARAM:TIME 10",19,EOI);`

**Query syntax- :HFM:PARAMeter:TIMEout?**

Example: `Send(0,5,":HFM:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PJ1CLOCK**

The **PJ1CLOCK** query returns the jitter value at which the peak FFT spike was located. This value is scaled to represent the jitter on a 1-clock basis.

**Query syntax- :HFM:PJ1clock?**

Example: `Send(0,5,":HFM:PJ1?",9,EOI);`
Response: <ASCII floating point>
Example: 4.367e-12

- **PJFREQ1CLOCK**

The **PJFREQ1CLOCK** query returns the frequency at which the peak FFT 1-clock basis spike was located.

**Query syntax- :HFM:PJFREQ1clock?**

Example: `Send(0,5,":HFM:PJFREQ1?",13,EOI);`
Response: <ASCII floating point>
Example: 1.678e+006

- **PJFREQNCLOCK**

The **PJFREQNCLOCK** query returns the frequency at which the peak FFT N-clock basis spike was located.

**Query syntax- :HFM:PJFREQN**clock**?**

Example: `Send(0,5,":HFM:PJFREQN?",13,EOI);`
Response: <ASCII floating point>
Example: 1.678e+006

- **PJNCLOCK**

The **PJNCLOCK** query returns the jitter value at which the peak FFT spike was located. This value is scaled to represent the jitter on an N-clock basis.

**Query syntax- :HFM:PJN**clock**?**

Example: `Send(0,5,":HFM:PJN?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **PKTOPKPEAK**

The **PKTOPKPEAK** query returns the Peak-to-Peak (max – min) of the Peak-to-Peak (max – min) measurements across all spans.

**Query syntax- :HFM:PKTOPKPEAK?**

Example: `Send(0,5,":HFM:PKTOPKPEAK?",16,EOI);`
Response: <ASCII floating point>
Example: 9.969963e-012

- **PKTOPKSIGMA**

The **PKTOPKSIGMA** query returns the 1-Sigma of the Peak-to-Peak (max – min) measurements across all spans.

**Query syntax- :HFM:PKTOPKSIGMA?**

Example: `Send(0,5,":HFM:PKTOPKSIGMA?",17,EOI);`
Response: <ASCII floating point>
Example: 3.664763e-012

- **PLOTDATA:FFT1**

The **PLOTDATA:FFT1** query returns the plot data associated with the FFT 1-CLOCK plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HFM:PLOTDATA:FFT1?**

Example: `Send(0,5,":HFM:PLOTDATA:FFT1?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FFTN**

The **PLOTDATA:FFTN** query returns the plot data associated with the FFT N-CLOCK plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HFM:PLOTDATA:FFTN?**

Example: `Send(0,5,":HFM:PLOTDATA:FFTN?",19,EOI);`
Response: #xy…dddddddd…

 

- **PLOTDATA:PEAK**

The **PLOTDATA:PEAK** query returns the plot data associated with the PK-PK VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HFM:PLOTDATA:PEAK?**

Example: `Send(0,5,":HFM:PLOTDATA:PEAK?",19,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HFM:PLOTDATA:SIGMa?**

Example: `Send(0,5,":HFM:PLOTDATA:SIGM?",19,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:FFT1**

The **PLOTINFO:FFT1** query returns the plot information associated with the FFT 1-CLOCK plot.

**Query syntax- :HFM:PLOTINFO:FFT1?**

Example: `Send(0,5,":HFM:PLOTINFO:FFT1?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFTN**

The **PLOTINFO:FFTN** query returns the plot information associated with the FFT N-CLOCK plot.

**Query syntax- :HFM:PLOTINFO:FFTN?**

Example: `Send(0,5,":HFM:PLOTINFO:FFTN?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:PEAK**

The **PLOTINFO:PEAK** query returns the plot information associated with the PK-PK VS SPAN plot.

**Query syntax- :HFM:PLOTINFO:PEAK?**

Example: `Send(0,5,":HFM:PLOTINFO:PEAK?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :HFM:PLOTINFO:SIGMa?**

Example: `Send(0,5,":HFM:PLOTINFO:SIGM?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RJ1CLOCK**

The **RJ1CLOCK** query returns the Random Jitter expressed on a 1-Clock basis obtained from the previous acquisition.

**Query syntax- :HFM:RJ1**clock**?**

Example: `Send(0,5,":HFM:RJ1?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **RJNCLOCK**

The **RJNCLOCK** query returns the Random Jitter expressed on a N-Clock basis obtained from the previous acquisition.

**Query syntax- :HFM:RJN**clock**?**

Example: `Send(0,5,":HFM:RJN?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **SPIKES1CLOCK**

The **SPIKES1CLOCK** query returns the spike list of the FFT 1-clock plot. This query returns the count of returned spikes followed by the spikes themselves. The spikes each consist of a magnitude and a frequency separated by the '/' character.

**Query syntax- :HFM:SPIKES1**clock**?**

Example: `Send(0,5,":HFM:SPIKES1?",13,EOI);`
Response: <Spikes> <Mag1/Freq1> <Mag2/Freq2> <Mag3/Freq3> …
Example: 3 2.956e-12/2.003e8 1.803e-12/1.556e8 1.193e-12/2.501e8

- **SPIKESNCLOCK**

The **SPIKESNCLOCK** query returns the spike list of the FFT N-clock plot. This query returns the count of returned spikes followed by the spikes themselves. The spikes each consist of a magnitude and a frequency separated by the '/' character.

**Query syntax- :HFM:SPIKESN**clock**?**

Example: `Send(0,5,":HFM:SPIKESN?",13,EOI);`
Response: <Spikes> <Mag1/Freq1> <Mag2/Freq2> <Mag3/Freq3> …
Example: 3 2.956e-12/2.003e8 1.803e-12/1.556e8 1.193e-12/2.501e8

## • DESCRIPTION OF THE HISTOGRAM COMMANDS

The **HISTOGRAM** commands are used to make measurements using the Histogram Tool, providing the user with statistical analysis of time measurements of different clock features such as Period, Rise time, Fall time, Positive Pulse Width, and Negative Pulse Width. The time measurements are asynchronously sampled at random intervals to give a solid, statistical set displayed as a Histogram. The values of Mean, Maximum, Minimum, Peak-to-Peak and 1-sigma are reported. Proprietary software algorithms separate deterministic and random jitter components allowing the calculation of total jitter. These values are used to create a Bathtub Curve to predict long-term reliability.

**:HIST**ogram:<command syntax>

**ACQ**uire
**ARMFIND**
**CHISQLEFT**
**CHISQRIGHT**
**CLE**ar
**DEF**ault
**DJ**
**HITS**
**LATE**st:**HITS**
**LATE**st:**MAX**imum
**LATE**st:**MEAN**
**LATE**st:**MIN**imum
**LATE**st:**PK**topk
**LATE**st:**STDD**ev
**LEFTDJ**
**LEFTRJ**
**MAX**imum
**MEAN**
**MIN**imum
**NUMPASS**es
**PARAM**eter:**ARM**ing:**CHAN**nel
**PARAM**eter:**ARM**ing:**DEL**ay
**PARAM**eter:**ARM**ing:**MARK**er
**PARAM**eter:**ARM**ing:**MODE**
**PARAM**eter:**ARM**ing:**SLOP**e
**PARAM**eter:**ARM**ing:**VOLT**age
**PARAM**eter:**CHAN**nel
**PARAM**eter:**FILT**er:**ENAB**le
**PARAM**eter:**FILT**er:**MAX**imum
**PARAM**eter:**FILT**er:**MIN**imum
**PARAM**eter:**FUNC**tion
**PARAM**eter:**SAMP**les
**PARAM**eter:**STAR**t:**COUN**t
**PARAM**eter:**STAR**t:**VOLT**age
**PARAM**eter:**STOP**:**COUN**t
**PARAM**eter:**STOP**:**VOLT**age
**PARAM**eter:**THR**eshold
**PARAM**eter:**TIME**out
**PK**topk
**PLOTDATA**:**ACCUM**ulated
**PLOTDATA**:**BATH**tub
**PLOTDATA**:**COMB**inedcycle
**PLOTDATA**:**LAST**
**PLOTDATA**:**LONG**cycle
**PLOTDATA**:**MAX**imum
**PLOTDATA**:**SHORT**cycle
**PLOTINFO**:**ACCUM**ulated
**PLOTINFO**:**BATH**tub
**PLOTINFO**:**COMB**inedcycle
**PLOTINFO**:**LAST**
**PLOTINFO**:**LONG**cycle
**PLOTINFO**:**MAX**imum
**PLOTINFO**:**SHORT**cycle
**RIGHTDJ**
**RIGHTRJ**
**RJ**
**STDD**ev
**TAIL**fit:**COMP**lete
**TAIL**fit:**MINHITS**
**TAIL**fit:**MODE**
**TAIL**fit:**PROB**ability
**TAIL**fit:**SPEC**ification
**TJ**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Histogram Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :HIST**ogram:**ACQ**uire

Example: `Send(0,5,":HIST:ACQ;*OPC",9,EOI);`

- **ARMFIND**

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. The problem is exacerbated when measurements are to be conducted across multiple channels. This command performs an optimization across one or more channels, and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :HIST**ogram**:ARMFIND**(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":HIST:ARMFIND(@4)",17,EOI);`
Response: <ASCII integer>
Example: -16

- **CHISQLEFT**

The **CHISQLEFT** query returns the $\chi 2$ value for the left side of the histogram obtained from the previous acquisition. This is a qualitative measure of the goodness-of-fit from the Tail-Fit to the actual histogram data. A value less than 2 is normally considered to be a "good" fit. Since this value is based on the Tail-Fit, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:CHISQLEFT?**

Example: `Send(0,5,":HIST:CHISQLEFT?",16,EOI);`
Response: <ASCII floating point>
Example: 1.697e+000

- **CHISQRIGHT**

The **CHISQRIGHT** query returns the $\chi 2$ value for the right side of the histogram obtained from the previous acquisition. This is a qualitative measure of the goodness-of-fit from the Tail-Fit to the actual histogram data. A value less than 2 is normally considered to be a "good" fit. Since this value is based on the Tail-Fit, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:CHISQRIGHT?**

Example: `Send(0,5,":HIST:CHISQRIGHT?",17,EOI);`
Response: <ASCII floating point>
Example: 2.069e+000

- **CLEAR**

The **CLEAR** command provides a means to flush any previous data. Since the Histogram Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :HIST**ogram**:CLE**ar

Example: `Send(0,5,":HIST:CLE",9,EOI);`

- **DEFAULT**

The **DEFAULT** command is used to reset all the Histogram Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :HIST**ogram**:DEF**ault

Example: `Send(0,5,":HIST:DEF",9,EOI);`

 

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:DJ?**

Example: `Send(0,5,":HIST:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **HITS**

The **HITS** query returns the number of accumulated hits in the histogram.

**Query syntax- :HIST**ogram**:HITS?**

Example: `Send(0,5,":HIST:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- **LATEST:HITS**

The **LATEST:HITS** query returns the number of hits in the latest histogram pass.

**Query syntax- :HIST**ogram**:LATE**st**:HITS?**

Example: `Send(0,5,":HIST:LATE:HITS?",16,EOI);`
Response: <ASCII integer>
Example: 5000

- **LATEST:MAXIMUM**

The **LATEST:MAXIMUM** query returns the maximum measurement value obtained on the latest histogram pass.

**Query syntax- :HIST**ogram**:LATE**st**:MAX**imum**?**

Example: `Send(0,5,":HIST:LATE:MAX?",15,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **LATEST:MEAN**

The **LATEST:MEAN** query returns the average of all measurement values obtained on the latest histogram pass.

**Query syntax- :HIST**ogram**:LATE**st**:MEAN?**

Example: `Send(0,5,":HIST:LATE:MEAN?",16,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **LATEST:MINIMUM**

The **LATEST:MINIMUM** query returns the minimum measurement value obtained on the latest histogram pass.

**Query syntax- :HIST**ogram**:LATE**st**:MIN**imum**?**

Example: `Send(0,5,":HIST:LATE:MIN?",15,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- ## LATEST:PKTOPK

The **LATEST:PKTOPK** query returns the maximum measurement value minus the minimum measurement value obtained on the latest histogram pass.

**Query syntax- :HIST**ogram**:LATE**st**:PK**topk**?**

Example: `Send(0,5,":HIST:LATE:PK?",14,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

- ## LATEST:STDDEV

The **LATEST:STDDEV** query returns the standard deviation of all measurements obtained on the latest histogram pass.

**Query syntax- :HIST**ogram**:LATE**st**:STDD**ev**?**

Example: `Send(0,5,":HIST:LATE:STDD?",16,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- ## LEFTDJ

The **LEFTDJ** query returns the center of the Gaussian Tail-Fit on the Left Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:LEFTDJ?**

Example: `Send(0,5,":HIST:LEFTDJ?",13,EOI);`
Response: <ASCII floating point>
Example: 1.113245e-009

- ## LEFTRJ

The **LEFTRJ** query returns the Random Jitter on the Left Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:LEFTRJ?**

Example: `Send(0,5,":HIST:LEFTRJ?",13,EOI);`
Response: <ASCII floating point>
Example: 3.637e-012

- ## MAXIMUM

The **MAXIMUM** query returns the maximum measurement value obtained across all accumulated histogram passes.

**Query syntax- :HIST**ogram**:MAX**imum**?**

Example: `Send(0,5,":HIST:MAX?",10,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- ## MEAN

The **MEAN** query returns the average of all measurement values obtained across all accumulated histogram passes.

**Query syntax- :HIST**ogram**:MEAN?**

Example: `Send(0,5,":HIST:MEAN?",11,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

 

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all accumulated histogram passes.

**Query syntax- :HIST**ogram**:MIN**imum**?**

Example: `Send(0,5,":HIST:MIN?",10,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **NUMPASSES**

The **NUMPASSES** query returns the number of passes of data that have been accumulated into the histogram.

**Query syntax- :HIST**ogram**:NUMPASS**es**?**

Example: `Send(0,5,":HIST:NUMPASS?",14,EOI);`
Response: <ASCII integer>
Example: 16

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":HIST:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:CHAN**nel**?**

Example: `Send(0,5,":HIST:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":HIST:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:DEL**ay**?**

Example: `Send(0,5,":HIST:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":HIST:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:MARK**er**?**

Example: `Send(0,5,":HIST:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":HIST:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:MODE?**

Example: `Send(0,5,":HIST:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":HIST:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:SLOP**e**?**

Example: `Send(0,5,":HIST:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":HIST:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:ARM**ing**:VOLT**age**?**

Example: `Send(0,5,":HIST:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :HIST**ogram**:PARAM**eter**:CHAN**nel<1-10>

Example: `Send(0,5,":HIST:PARAM:CHAN4",17,EOI);`

**Query syntax- : HIST**ogram**:PARAM**eter**:CHAN**nel**?**

Example: `Send(0,5,":HIST:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:FILTER:ENABLE

The **PARAMETER:FILTER:ENABLE** command enables a post-processing filter that ignores measurements acquired outside of the filter region. The statistics are calculated from only the measurements within the filter region, and the plots will display only data from within the filtered region. With filters enabled the number of hits acquired may be less than the number of hits requested as a result of the filtered values being thrown away.

The **PARAMETER:FILTER:ENABLE** query returns whether the filters are currently enabled.

**Command syntax- :HIST**ogram**:PARAM**eter**:FILT**er**:ENAB**le<OFF|ON>

Example: `Send(0,5,":HIST:PARAM:FILT:ENAB OFF",25,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:FILT**er**:ENAB**le**?**

Example: `Send(0,5,":HIST:PARAM:FILT:ENAB?",22,EOI);`
Response: <OFF|ON>
Example: OFF

- ## PARAMETER:FILTER:MAXIMUM

The **PARAMETER:FILTER:MAXIMUM** command selects the maximum filter time in seconds.

The **PARAMETER:FILTER:MAXIMUM** query returns the maximum filter value.

**Command syntax- :HIST**ogram**:PARAM**eter**:FILT**er**:MAX**imum<-2.5 to 2.5>

Example: `Send(0,5,":HIST:PARAM:FILT:MAX -2.5",25,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:FILT**er**:MAX**imum**?**

Example: `Send(0,5,":HIST:PARAM:FILT:MAX?",21,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- ## PARAMETER:FILTER:MINIMUM

The **PARAMETER:FILTER:MINIMUM** command selects the minimum filter time in seconds.

The **PARAMETER:FILTER:MINIMUM** query returns the minimum filter value.

**Command syntax- :HIST**ogram**:PARAM**eter**:FILT**er**:MIN**imum<-2.5 to 2.5>

Example: `Send(0,5,":HIST:PARAM:FILT:MIN -2.5",25,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:FILT**er**:MIN**imum**?**

Example: `Send(0,5,":HIST:PARAM:FILT:MIN?",21,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- ## PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :HIST**ogram**:PARAM**eter**:FUNC**tion<PW+|PW-|PER+|PER->

Example: `Send(0,5,":HIST:PARAM:FUNC PER+",22,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:FUNC**tion**?**

Example: `Send(0,5,":HIST:PARAM:FUNC?",17,EOI);`
Response: <PW+|PW-|PER+|PER->

 

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :HIST**ogram**:PARAM**eter**:SAMP**les<1 to 950000>

Example: `Send(0,5,":HIST:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:SAMP**les**?**

Example: `Send(0,5,":HIST:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :HIST**ogram**:PARAM**eter**:STAR**t**:COUN**t<1 to 10000000>

Example: `Send(0,5,":HIST:PARAM:STAR:COUN 1",23,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:STAR**t**:COUN**t**?**

Example: `Send(0,5,":HIST:PARAM:STAR:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :HIST**ogram**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":HIST:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:STAR**t**:VOLT**age**?**

Example: `Send(0,5,":HIST:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :HIST**ogram**:PARAM**eter**:STOP:COUN**t<1 to 10000000>

Example: `Send(0,5,":HIST:PARAM:STOP:COUN 1",23,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:STOP:COUN**t**?**

Example: `Send(0,5,":HIST:PARAM:STOP:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 2

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :HIST**ogram**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":HIST:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:STOP:VOLT**age**?**

Example: `Send(0,5,":HIST:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :HIST**ogram**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":HIST:PARAM:THR 5050",20,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:THR**eshold**?**

Example: `Send(0,5,":HIST:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :HIST**ogram**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":HIST:PARAM:TIME 10",19,EOI);`

**Query syntax- :HIST**ogram**:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":HIST:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PKTOPK**

The **PKTOPK** query returns the maximum measurement value minus the minimum measurement value accumulated across all histogram passes.

**Query syntax- :HIST**ogram**:PK**topk**?**

Example: `Send(0,5,":HIST:PK?",9,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

- **PLOTDATA:ACCUMULATED**

The **PLOTDATA:ACCUMULATED** query returns the plot data associated with the ACCUMULATED HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HIST**ogram**:PLOTDATA:ACCUM**ulated**?**

Example: `Send(0,5,":HIST:PLOTDATA:ACCUM?",21,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HIST**ogram**:PLOTDATA:BATH**tub**?**

Example: `Send(0,5,":HIST:PLOTDATA:BATH?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:COMBINEDCYCLE**

The **PLOTDATA:COMBINEDCYCLE** query returns the plot data associated with the TOTAL JITTER VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HIST**ogram**:PLOTDATA:COMB**inedcycle**?**

Example: `Send(0,5,":HIST:PLOTDATA:COMB?",20,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:LAST

The **PLOTDATA:LAST** query returns the plot data associated with the LATEST HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HIST**ogram**:PLOTDATA:LAST?**

Example: `Send(0,5,":HIST:PLOTDATA:LAST?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:LONGCYCLE

The **PLOTDATA:LONGCYCLE** query returns the plot data associated with the LONG CYCLE VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HIST**ogram**:PLOTDATA:LONG**cycle**?**

Example: `Send(0,5,":HIST:PLOTDATA:LONG?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:MAXIMUM

The **PLOTDATA:MAXIMUM** query returns the plot data associated with the MAXIMUM HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HIST**ogram**:PLOTDATA:MAX**imum**?**

Example: `Send(0,5,":HIST:PLOTDATA:MAX?",19,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SHORTCYCLE

The **PLOTDATA:SHORTCYCLE** query returns the plot data associated with the SHORT CYCLE VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :HIST**ogram**:PLOTDATA:SHORT**cycle**?**

Example: `Send(0,5,":HIST:PLOTDATA:SHORT?",21,EOI);`
Response: #xy…dddddddd…

- ## PLOTINFO:ACCUMULATED

The **PLOTINFO:ACCUMULATED** query returns the plot information associated with the ACCUMULATED HISTOGRAM plot.

**Query syntax- :HIST**ogram**:PLOTINFO:ACCUM**ulated**?**

Example: `Send(0,5,":HIST:PLOTINFO:ACCUM?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:BATHTUB

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :HIST**ogram**:PLOTINFO:BATH**tub**?**

Example: `Send(0,5,":HIST:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

 

- **PLOTINFO:COMBINEDCYCLE**

The **PLOTINFO:COMBINEDCYCLE** query returns the plot information associated with the TOTAL JITTER VS TIME plot.

**Query syntax- :HIST**ogram**:PLOTINFO:COMB**inedcycle**?**

Example: `Send(0,5,":HIST:PLOTINFO:COMB?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:LAST**

The **PLOTINFO:LAST** query returns the plot information associated with the LATEST HISTOGRAM plot.

**Query syntax- :HIST**ogram**:PLOTINFO:LAST?**

Example: `Send(0,5,":HIST:PLOTINFO:LAST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:LONGCYCLE**

The **PLOTINFO:LONGCYCLE** query returns the plot information associated with the LONG CYCLE VS TIME plot.

**Query syntax- :HIST**ogram**:PLOTINFO:LONG**cycle**?**

Example: `Send(0,5,":HIST:PLOTINFO:LONG?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:MAXIMUM**

The **PLOTINFO:MAXIMUM** query returns the plot information associated with the MAXIMUM HISTOGRAM plot.

**Query syntax- :HIST**ogram**:PLOTINFO:MAX**imum**?**

Example: `Send(0,5,":HIST:PLOTINFO:MAX?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SHORTCYCLE**

The **PLOTINFO:SHORTCYCLE** query returns the plot information associated with the SHORT CYCLE VS TIME plot.

**Query syntax- :HIST**ogram**:PLOTINFO:SHORT**cycle**?**

Example: `Send(0,5,":HIST:PLOTINFO:SHORT?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RIGHTDJ**

The **RIGHTDJ** query returns the center of the Gaussian Tail-Fit on the Right Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:RIGHTDJ?**

Example: `Send(0,5,":HIST:RIGHTDJ?",13,EOI);`
Response: <ASCII floating point>
Example: 1.134005e-009

- **RIGHTRJ**

The **RIGHTRJ** query returns the Random Jitter on the Right Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:RIGHTRJ?**

Example: `Send(0,5,":HIST:RIGHTRJ?",14,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:RJ?**

Example: `Send(0,5,":HIST:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **STDDEV**

The **STDDEV** query returns the standard deviation of all measurements across all accumulated histogram passes.

**Query syntax- :HIST**ogram**:STDD**ev**?**

Example: `Send(0,5,":HIST:STDD?",11,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **TAILFIT:COMPLETE**

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :HIST**ogram**:TAIL**fit**:COMP**lete**?**

Example: `Send(0,5,":HIST:TAIL:COMP?",16,EOI);`
Response: <0|1>

- **TAILFIT:MINHITS**

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :HIST**ogram**:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":HIST:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :HIST**ogram**:TAIL**fit**:MINHITS?**

Example: `Send(0,5,":HIST:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- **TAILFIT:MODE**

The **TAILFIT:MODE** command selects whether a Tail-Fit will be performed or not. It also allows the special Force-Fit mode to be enabled. The Force-Fit mode circumvents some of the criteria that is used to ensure the quality of the result, and forces a result to be returned.

The **TAILFIT:MODE** query returns the currently selected Tail-Fit mode.

**Command syntax- :HIST**ogram**:TAIL**fit**:MODE**<OFF|ON|FORCEFIT>

Example: `Send(0,5,":HIST:TAIL:MODE OFF",19,EOI);`

**Query syntax- :HIST**ogram**:TAIL**fit**:MODE?**

Example: `Send(0,5,":HIST:TAIL:MODE?",16,EOI);`
Response: <OFF|ON|FORCEFIT>

- **TAILFIT:PROBABILITY**

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

**Command syntax- :HIST**ogram**:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":HIST:TAIL:PROB -16",19,EOI);`

**Query syntax- :HIST**ogram**:TAIL**fit**:PROB**ability**?**

Example: `Send(0,5,":HIST:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- **TAILFIT:SPECIFICATION**

The **TAILFIT:SPECIFICATION** command selects the time in seconds between the two sides of the Bathtub Plot. It will effect the prediction of the Error Probability resulting in the two Bathtub Curves converging, indicting Eye Closure.

The **TAILFIT:SPECIFICATION** query returns the currently selected Tail-Fit specification.

**Command syntax- :HIST**ogram**:TAIL**fit**:SPEC**ification<0 to 2.5>

Example: `Send(0,5,":HIST:TAIL:SPEC 0",17,EOI);`

**Query syntax- :HIST**ogram**:TAIL**fit**:SPEC**ification**?**

Example: `Send(0,5,":HIST:TAIL:SPEC?",16,EOI);`
Response: <ASCII floating point>
Example: 1.000e-009

- **TJ**

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :HIST**ogram**:TJ?**

Example: `Send(0,5,":HIST:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

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## • DESCRIPTION OF THE INFINIBAND COMMANDS

The **INFINIBAND** commands automate measurements and provides pass/fail results for SERDES, Host Channel Adaptors, Target Channel Adaptors, and Switches. It based on the same algorithm as the Random Data With Bit Clock (RDBC) commands.

**:INFINI**band:<command syntax>

**ACQ**uire
**ARMFIND**
**ATTEN**uation
**CLE**ar
**DEF**ault
**DJ**
**MINSPAN**
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PLOTDATA:BATH**tub
**PLOTDATA:FALL**
**PLOTDATA:RISE**
**PLOTDATA:SCOPE-**
**PLOTDATA:SCOPE+**
**PLOTDATA:SCOPECOMM**
**PLOTDATA:SCOPEDIFF**
**PLOTDATA:TOTAL**
**PLOTINFO:BATH**tub
**PLOTINFO:FALL**
**PLOTINFO:RISE**
**PLOTINFO:SCOPE-**
**PLOTINFO:SCOPE+**
**PLOTINFO:SCOPECOMM**
**PLOTINFO:SCOPEDIFF**
**PLOTINFO:TOTAL**
**REFEDGE**
**TAIL**fit**:COMP**lete
**TAIL**fit**:FILTERSAMPLES**
**TAIL**fit**:MINHITS**
**TAIL**fit**:MODE**
**TAIL**fit**:PROB**ability
**TJ**
**UI**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Infiniband Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :INFINI**band**:ACQ**uire

Example: `Send(0,5,":INFINI:ACQ",11,EOI);`

## • ARMFIND

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. This command performs an optimization and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :INFINI**band**:ARMFIND**

Example: `Send(0,5,":INFINI:ARMFIND",15,EOI);`
Response: <ASCII integer>
Example: -16

- **ATTENUATION**

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :INFINI**band**:ATTEN**uation**?**

Example: `Send(0,5,":INFINI:ATTEN?",14,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

- **CLEAR**

The **CLEAR** command provides a means to flush any previous data. Since the Infiniband Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :INFINI**band**:CLE**ar

Example: `Send(0,5,":INFINI:CLE",11,EOI);`

- **DEFAULT**

The **DEFAULT** command is used to reset all the Infiniband Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :INFINI**band**:DEF**ault

Example: `Send(0,5,":INFINI:DEF",11,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :INFINI**band**:DJ?**

Example: `Send(0,5,":INFINI:DJ?",11,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **MINSPAN**

The **MINSPAN** command allows a time delay to be introduced between data edges and the reference clock edges used to assess them. By default the instrument uses immediately adjacent clock edges for reference. However, oscilloscopes have an inherent trigger delay, which can cause a correlation issue. If the desire is to correlate to a particular oscilloscope, this value can be used to instruct the instrument to make measurements on the same basis. This value corresponds to the nominal trigger delay on an oscilloscope.

The **MINSPAN** query returns the current minimum time delay from data edges to their reference clock edges.

**Command syntax- :INFINI**band**:MINSPAN**<0 to 2.5>

Example: `Send(0,5,":INFINI:MINSPAN 0",17,EOI);`

**Query syntax- :INFINI**band**:MINSPAN?**

Example: `Send(0,5,":INFINI:MINSPAN?",16,EOI);`
Response: <ASCII floating point>
Example: 2.4e-008

 

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :INFINI**band**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":INFINI:PARAM:ARM:DEL -40",25,EOI);`

**Query syntax- :INFINI**band**:PARAM**eter**:ARM**ing**:DEL**ay**?**

Example: `Send(0,5,":INFINI:PARAM:ARM:DEL?",22,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :INFINI**band**:PARAM**eter**:CHAN**nel<n&m>

Example: `Send(0,5,":INFINI:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :INFINI**band**:PARAM**eter**:CHAN**nel**?**

Example: `Send(0,5,":INFINI:PARAM:CHAN?",19,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued. Since filters are used to only include data edges within +/- 0.5 UI of the randomly selected clock edges, a smaller number of samples is actually returned than is requested.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :INFINI**band**:PARAM**eter**:SAMP**les<1 to 950000>

Example: `Send(0,5,":INFINI:PARAM:SAMP 1000",20,EOI);`

**Query syntax- :INFINI**band**:PARAM**eter**:SAMP**les**?**

Example: `Send(0,5,":INFINI:PARAM:SAMP?",19,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :INFINI**band**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":INFINI:PARAM:STAR:VOLT -2",26,EOI);`

**Query syntax- :INFINI**band**:PARAM**eter**:STAR**t**:VOLT**age**?**

Example: `Send(0,5,":INFINI:PARAM:STAR:VOLT?",24,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :INFINI**band**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":INFINI:PARAM:STOP:VOLT -2",26,EOI);`

**Query syntax- :INFINI**band**:PARAM**eter**:STOP:VOLT**age**?**

Example: `Send(0,5,":INFINI:PARAM:STOP:VOLT?",24,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :INFINI**band**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":INFINI:PARAM:THR 5050",22,EOI);`

**Query syntax- :INFINI**band**:PARAM**eter**:THR**eshold**?**

Example: `Send(0,5,":INFINI:PARAM:THR?",18,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

 

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :INFINI**band**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":INFINI:PARAM:TIME 10",23,EOI);`

**Query syntax- :INFINI**band**:PARAM**eter**:TIME**out**?**

Example: `Send(0,5,":INFINI:PARAM:TIME?",19,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:BATH**tub**?**

Example: `Send(0,5,":INFINI:PLOTDATA:BATH?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING DATA EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:FALL?**

Example: `Send(0,5,":INFINI:PLOTDATA:FALL?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:RISE**

The **PLOTDATA:RISE** query returns the plot data associated with the RISING DATA EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:RISE?**

Example: `Send(0,5,":INFINI:PLOTDATA:RISE?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE-**

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:SCOPE-?**

Example: `Send(0,5,":INFINI:PLOTDATA:SCOPE-?",24,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:SCOPE+?**

Example: `Send(0,5,":INFINI:PLOTDATA:SCOPE+?",24,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SCOPECOMM**

The **PLOTDATA:SCOPECOMM** query returns the plot data associated with the COMMON MODE SCOPE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:SCOPECOMM?**

Example: `Send(0,5,":INFINI:PLOTDATA:SCOPECOMM?",27,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SCOPEDIFF**

The **PLOTDATA:SCOPEDIFF** query returns the plot data associated with the DIFFERENTIAL MODE SCOPE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:SCOPEDIFF?**

Example: `Send(0,5,":INFINI:PLOTDATA:SCOPEDIFF?",27,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:TOTAL**

The **PLOTDATA:TOTAL** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :INFINI**band**:PLOTDATA:TOTAL?**

Example: `Send(0,5,":INFINI:PLOTDATA:TOTAL?",23,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :INFINI**band**:PLOTINFO:BATH**tub**?**

Example: `Send(0,5,":INFINI:PLOTINFO:BATH?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALL**

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING DATA EDGE HISTOGRAM plot.

**Query syntax- :INFINI**band**:PLOTINFO:FALL?**

Example: `Send(0,5,":INFINI:PLOTINFO:FALL?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING DATA EDGE HISTOGRAM plot.

**Query syntax- :INFINI**band**:PLOTINFO:RISE?**

Example: `Send(0,5,":INFINI:PLOTINFO:RISE?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIEMNTARY SCOPE INPUT plot.

**Query syntax- :INFINI**band**:PLOTINFO:SCOPE-?**

Example: `Send(0,5,":INFINI:PLOTINFO:SCOPE-?",24,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :INFINI**band**:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":INFINI:PLOTINFO:SCOPE+?",24,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPECOMM**

The **PLOTINFO:SCOPECOMM** query returns the plot information associated with the COMMMON MODE SCOPE plot.

**Query syntax- :INFINI**band**:PLOTINFO:SCOPECOMM?**

Example: `Send(0,5,":INFINI:PLOTINFO:SCOPECOMM?",27,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPEDIFF**

The **PLOTINFO:SCOPEDIFF** query returns the plot information associated with the DIFFERENTIAL MODE SCOPE plot.

**Query syntax- :INFINI**band**:PLOTINFO:SCOPEDIFF?**

Example: `Send(0,5,":INFINI:PLOTINFO:SCOPEDIFF?",27,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TOTAL**

The **PLOTINFO:TOTAL** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :INFINI**band**:PLOTINFO:TOTAL?**

Example: `Send(0,5,":INFINI:PLOTINFO:TOTAL?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## REFEDGE

The **REFEDGE** command selects whether a rising or falling clock edge is used as reference to measure the data jitter.

The **REFEDGE** query returns whether a rising or falling clock edge is selected as reference.

**Command syntax- :INFINI**band**:REFEDGE**<FALL|RISE>

Example: `Send(0,5,":INFINI:REFEDGE FALL",20,EOI);`

**Query syntax- :INFINI**band**:REFEDGE?**

Example: `Send(0,5,":INFINI:REFEDGE?",16,EOI);`
Response: <FALL|RISE>
Example: RISE

- ## TAILFIT:COMPLETE

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :INFINI**band**:TAIL**fit**:COMP**lete**?**

Example: `Send(0,5,":INFINI:TAIL:COMP?",18,EOI);`
Response: <0|1>

- ## TAILFIT:FILTERSAMPLES

The **TAILFIT:FILTERSAMPLES** command selects the sample size for establishing filter limits during the first pass. The filter limits are used on subsequent acquisition passes to generate a single histogram of data with measurements assessed relative to adjacent reference clock edges.

The **TAILFIT:FILTERSAMPLES** query returns the number of samples currently used to establish the filter limits.

**Command syntax- :INFINI**band**:TAIL**fit**:FILTERSAMPLES**<0 to 950000>

Example: `Send(0,5,":INFINI:TAIL:FILTERSAMPLES 0",28,EOI);`

**Query syntax- :INFINI**band**:TAIL**fit**:FILTERSAMPLES?**

Example: `Send(0,5,":INFINI:TAIL:FILTERSAMPLES?",27,EOI);`
Response: <ASCII integer>
Example: 1000

- ## TAILFIT:MINHITS

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :INFINI**band**:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":INFINI:TAIL:MINHITS 0",22,EOI);`

**Query syntax- :INFINI**band**:TAIL**fit**:MINHITS?**

Example: `Send(0,5,":INFINI:TAIL:MINHITS?",21,EOI);`
Response: <ASCII integer>
Example: 50

 

- **TAILFIT:MODE**

The **TAILFIT:MODE** command selects whether a Tail-Fit will be performed or not. It also allows the special Force-Fit mode to be enabled. The Force-Fit mode circumvents some of the criteria that is used to ensure the quality of the result, and forces a result to be returned.

The **TAILFIT:MODE** query returns the currently selected Tail-Fit mode.

**Command syntax- :INFINI**band**:TAIL**fit**:MODE**<OFF|ON|FORCEFIT>

Example: `Send(0,5,":INFINI:TAIL:MODE OFF",21,EOI);`

**Query syntax- :INFINI**band**:TAIL**fit**:MODE?**

Example: `Send(0,5,":INFINI:TAIL:MODE?",18,EOI);`
Response: <OFF|ON|FORCEFIT>

- **TAILFIT:PROBABILITY**

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

The **TAILFIT:PROBABILITY** query returns the currently selected Bit Error Rate.

**Command syntax- :INFINI**band**:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":INFINI:TAIL:PROB -16",21,EOI);`

**Query syntax- :INFINI**band**:TAIL**fit**:PROB**ability**?**

Example: `Send(0,5,":INFINI:TAIL:PROB?",18,EOI);`
Response: <ASCII integer>
Example: -12

- **TJ**

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :INFINI**band**:TJ?**

Example: `Send(0,5,":INFINI:TJ?",11,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

- **UI**

The **UI** query returns the unit interval that was measured.

**Query syntax- :INFINI**band**:UI?**

Example: `Send(0,5,":INFINI:UI?",11,EOI);`
Response: <ASCII floating point>
Example: 1.000637e-9

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# 6-17 KNOWN PATTERN WITH MARKER COMMANDS

## • DESCRIPTION OF KNOWN PATTERN WITH MARKER COMMANDS

The **KPWM** commands are used to make measurements on a serial data signal using the Known Pattern With Marker Tool. A pattern marker is required to use this tool, and may either be supplied to an Input Card from an external source, or if a PM50 is installed on your system it may be used to create a pattern marker. This tool provides the fastest, most complete measurements for compliance testing. Histograms of every edge in the pattern are made in order to determine DCD+ISI. Spectral content is measured to determine PJ contribution and in the presence of significant PJ, Tail-Fit can be enabled to determine a more accurate RJ. TJ is based on the convolution of DJ and RJ values.

**:KPWM:**<command syntax>

**ACQ**uire
**ARMFIND**
**BITRATE**
**CORN**erfreq
**DCDISI**
**DEF**ault
**DJ**
**HEAD**eroffset
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PASSESTOAVG**
**PATT**ern
**PJFREQ**uency
**PJVALU**e
**PLOTDATA:BATH**tub
**PLOTDATA:DCDISI**
**PLOTDATA:FALL**
**PLOTDATA:FFT**
**PLOTDATA:RISE**
**PLOTDATA:SIGM**a
**PLOTINFO:BATH**tub
**PLOTINFO:DCDISI**
**PLOTINFO:FALL**
**PLOTINFO:FFT**
**PLOTINFO:RISE**
**PLOTINFO:SIGM**a
**PROB**ability
**QUICKMODE**
**QUICKTJIT**
**RJ**
**SETUP:BITRATE:MEAS**ured
**SETUP:BITRATE:PATT**erns
**SETUP:BITRATE:SAMP**les
**SETUP:BITRATE:STDERR**
**SETUP:DCDISI:FMAX**
**SETUP:DCDISI:FMIN**
**SETUP:DCDISI:PATT**erns
**SETUP:DCDISI:SAMP**les
**SETUP:DCDISI:STDERR**
**SETUP:RJPJ:CALC**ulation
**SETUP:RJPJ:CONV**ergence
**SETUP:RJPJ:FMAX**
**SETUP:RJPJ:FMIN**
**SETUP:RJPJ:HALFUI**
**SETUP:RJPJ:INTER**polation
**SETUP:RJPJ:SAMP**les
**SETUP:RJPJ:STDERR**
**SETUP:RJPJ:TAILFITSAMPLES**
**SPIKE**s
**TJ**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Known Pattern With Marker Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :KPWM:ACQ**uire

Example: `Send(0,5,":KPWM:ACQ;*OPC",9,EOI);`

- **ARMFIND**

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. The problem is exacerbated when measurements are to be conducted across multiple channels. This command performs an optimization across one or more channels, and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :KPWM:ARMFIND**(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":KPWM:ARMFIND(@4)",17,EOI);`
Response: <ASCII integer>
Example: -16

- **BITRATE**

The **BITRATE** command allows the bit rate that is used for jitter calculations to be set. It only has an effect if the :KPWM:SETUP:BITRATE:MEASURED command is set to OFF.

The **BITRATE** query normally returns the data rate that was determined from the last ACQUIRE command. If the :KPWM:SETUP:BITRATE:MEASURED command is set to OFF, it returns the value set using the :KPWM:BITRATE command.

**Command syntax- :KPWM:BITRATE**<10 to 1e+010>

Example: `Send(0,5,":KPWM:BITRATE 1.0625e9",16,EOI);`

**Query syntax- :KPWM:BITRATE**?

Example: `Send(0,5,":KPWM:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +1.0625e9

- **CORNERFREQ**

The **CORNERFREQ** command provides a means to configure the corner frequency (-3dB Freq) that is used. The Corner Frequency is used to determine the maximum measurement interval used in sampling and is entered in Hz. A low corner frequency extends the time required to acquire the measurement set because histograms over many more periods must be acquired. Below the corner frequency, a natural roll-off of approximately 20dB per decade is observed.

The **CORNERFREQ** query is used to determine what the current corner frequency is configured as.

**Command syntax- :KPWM:CORN**erfreq<10 to 1e+010>

Example: `Send(0,5,":KPWM:CORN 10",13,EOI);`

**Query syntax- :KPWM:CORN**erfreq?

Example: `Send(0,5,":KPWM:CORN?",11,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

- **DCDISI**

The **DCDISI** query returns the DCD+ISI obtained from the previous acquisition.

**Query syntax- :KPWM:DCDISI**?

Example: `Send(0,5,":KPWM:DCDISI?",13,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## DEFAULT

The **DEFAULT** command is used to reset all the Known Pattern With Marker Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :KPWM:DEF**ault

Example: `Send(0,5,":KPWM:DEF",9,EOI);`

- ## DJ

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition.

**Query syntax- :KPWM:DJ**?

Example: `Send(0,5,":KPWM:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## HEADEROFFSET

The **HEADEROFFSET** command provides a means to start the measurements a given number of edges away from the pattern marker. This feature is helpful in the case of hard drive testing where an initial header proceeds the repeating data that has been loaded onto the drive.

The **HEADEROFFSET** query returns the current value of the header offset. The default value for the header offset is 0.

**Command syntax- :KPWM:HEAD**eroffset<0 to 10000>

Example: `Send(0,5,":KPWM:HEAD 0",12,EOI);`

**Query syntax- :KPWM:HEAD**eroffset?

Example: `Send(0,5,":KPWM:HEAD?",11,EOI);`
Response: <ASCII integer>
Example: 0

- ## PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :KPWM:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":KPWM:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :KPWM:PARAM**eter**:ARM**ing**:CHAN**nel?

Example: `Send(0,5,":KPWM:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :KPWM:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":KPWM:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :KPWM:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":KPWM:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :KPWM:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":KPWM:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :KPWM:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":KPWM:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :KPWM:PARAMeter:ARMing:MODE<EXTERNAL|START|STOP>**

Example: `Send(0,5,":KPWM:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :KPWM:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":KPWM:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :KPWM:PARAMeter:ARMing:SLOPe<FALL|RISE>**

Example: `Send(0,5,":KPWM:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :KPWM:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":KPWM:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :KPWM:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":KPWM:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :KPWM:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":KPWM:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :KPWM:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":KPWM:PARAM:CHAN4",17,EOI);`

**Query syntax- :KPWM:PARAMeter:CHANnel?**

Example: `Send(0,5,":KPWM:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :KPWM:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":KPWM:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :KPWM:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":KPWM:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :KPWM:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":KPWM:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :KPWM:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":KPWM:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :KPWM:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":KPWM:PARAM:THR 5050",20,EOI);`

**Query syntax- :KPWM:PARAMeter:THReshold?**

Example: `Send(0,5,":KPWM:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

 

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :KPWM:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":KPWM:PARAM:TIME 10",19,EOI);`

**Query syntax- :KPWM:PARAM**eter**:TIME**out?

Example: `Send(0,5,":KPWM:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PASSESTOAVG

The **PASSESTOAVG** command selects the number of passes to average the FFT output. Averaging will generally reduce the noise floor of the results, but increase measurement time.

The **PASSESTOAVG** query returns the number of currently selected averaging passes.

**Command syntax- :KPWM:PASSESTOAVG**<1|2|4|8|16|32>

Example: `Send(0,5,":KPWM:PASSESTOAVG 1",19,EOI);`

**Query syntax- :KPWM:PASSESTOAVG**?

Example: `Send(0,5,":KPWM:PASSESTOAVG?",18,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- ## PATTERN

The **PATTERN** command selects the current pattern file to be used. The specified pattern file must exist on the SIA3000.

The **PATTERN** query returns the currently selected pattern file.

**Command syntax- :KPWM:PATT**ern<filename>

Example: `Send(0,5,":KPWM:PATT K285.PTN",19,EOI);`

**Query syntax- :KPWM:PATT**ern?

Example: `Send(0,5,":KPWM:PATT?",11,EOI);`
Response: <ASCII string>
Example: CJTPAT.PTN

- ## PJFREQUENCY

The **PJFREQUENCY** query returns the frequency at which the peak FFT spike was located.

**Query syntax- :KPWM:PJFREQ**uency?

Example: `Send(0,5,":KPWM:PJFREQ?",13,EOI);`
Response: <ASCII floating point>
Example: 1.678e+006

- **PJVALUE**

The **PJVALUE** query returns the jitter value at which the peak FFT spike was located.

**Query syntax- :KPWM:PJVALU**e?

Example: `Send(0,5,":KPWM:PJVALU?",13,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :KPWM:PLOTDATA:BATH**tub?

Example: `Send(0,5,":KPWM:PLOTDATA:BATH?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:DCDISI**

The **PLOTDATA:DCDISI** query returns the plot data associated with the DCD+ISI VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :KPWM:PLOTDATA:DCDISI**?

Example: `Send(0,5,":KPWM:PLOTDATA:DCDISI?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :KPWM:PLOTDATA:FALL**?

Example: `Send(0,5,":KPWM:PLOTDATA:FALL?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:FFT**

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :KPWM:PLOTDATA:FFT**?

Example: `Send(0,5,":KPWM:PLOTDATA:FFT?",19,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:RISE**

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :KPWM:PLOTDATA:RISE**?

Example: `Send(0,5,":KPWM:PLOTDATA:RISE?",20,EOI);`
Response: #xy…ddddddddd…

 

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :KPWM:PLOTDATA:SIGM**a?

Example: `Send(0,5,":KPWM:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :KPWM:PLOTINFO:BATH**tub?

Example: `Send(0,5,":KPWM:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISI**

The **PLOTINFO:DCDISI** query returns the plot information associated with the DCD+ISI VS SPAN plot.

**Query syntax- :KPWM:PLOTINFO:DCDISI**?

Example: `Send(0,5,":KPWM:PLOTINFO:DCDISI?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALL**

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :KPWM:PLOTINFO:FALL**?

Example: `Send(0,5,":KPWM:PLOTINFO:FALL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :KPWM:PLOTINFO:FFT**?

Example: `Send(0,5,":KPWM:PLOTINFO:FFT?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :KPWM:PLOTINFO:RISE**?

Example: `Send(0,5,":KPWM:PLOTINFO:RISE?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :KPWM:PLOTINFO:SIGM**a?

Example: `Send(0,5,":KPWM:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PROBABILITY**

The **PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

The **PROBABILITY** query returns the currently selected Bit Error Rate.

**Command syntax- :KPWM:PROB**ability<-16 to -1>

Example: `Send(0,5,":KPWM:PROB -16",14,EOI);`

**Query syntax- :KPWM:PROB**ability?

Example: `Send(0,5,":KPWM:PROB?",11,EOI);`
Response: <ASCII integer>
Example: -12

- **QUICKMODE**

The **QUICKMODE** command enables a sparse sampling protocol for RJ+PJ data acquisition which reduces the time required to obtain data. This method is appropriate for use only when there is insignificant higher-frequency jitter present. In the presence of high frequency jitter, the standard sampling protocol will reduce the amount of harmonic distortion which can occur.

The **QUICKMODE** query returns whether the sparse sampling protocol is currently selected or not.

**Command syntax- :KPWM:QUICKMODE**<OFF|ON>

Example: `Send(0,5,":KPWM:QUICKMODE OFF",19,EOI);`

**Query syntax- :KPWM:QUICKMODE**?

Example: `Send(0,5,":KPWM:QUICKMODE?",16,EOI);`
Response: <OFF|ON>

- **QUICKTJIT**

The **QUICKTJIT** command enables a fast total jitter calculation using simple linear calculation of Total Jitter instead of convolving the DJ Probability Density Functions and the RJ Probability Density Functions. This calculation is based on the formula (TJ = DJ + n*RJ) where DJ and RJ are measured, and n is the multiplier based on a theoretical Gaussian distribution.

The **QUICKTJIT** query returns whether the fast total jitter calculation is enabled or not.

**Command syntax- :KPWM:QUICKTJIT**<OFF|ON>

Example: `Send(0,5,":KPWM:QUICKTJIT OFF",19,EOI);`

**Query syntax- :KPWM:QUICKTJIT**?

Example: `Send(0,5,":KPWM:QUICKTJIT?",16,EOI);`
Response: <OFF|ON>

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition.

**Query syntax- :KPWM:RJ?**

Example: `Send(0,5,":KPWM:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **SETUP:BITRATE:MEASURED**

The **SETUP:BITRATE:MEASURED** command enables measuring the Bit Rate based on a correctly defined pattern. The bit rate is derived by measuring the total time over a number of pattern repeats and calculating an ideal unit interval.

The **SETUP:BITRATE:MEASURED** query returns whether or not Bit Rate measurement is currently enabled.

**Command syntax- :KPWM:SETUP:BITRATE:MEASured<OFF|ON>**

Example: `Send(0,5,":KPWM:SETUP:BITRATE:MEAS OFF",28,EOI);`

**Query syntax- :KPWM:SETUP:BITRATE:MEASured?**

Example: `Send(0,5,":KPWM:SETUP:BITRATE:MEAS?",25,EOI);`
Response: <OFF|ON>

- **SETUP:BITRATE:PATTERNS**

The **SETUP:BITRATE:PATTERNS** command determines the number of patterns over which the Bit Rate measurement is made. A larger number effectively increases the amount of averaging that is used in measuring the Bit Rate.

The **SETUP:BITRATE:PATTERNS** query returns the number of patterns across which the Bit Rate is measured.

**Command syntax- :KPWM:SETUP:BITRATE:PATTerns<1 to 1000>**

Example: `Send(0,5,":KPWM:SETUP:BITRATE:PATT 1",26,EOI);`

**Query syntax- :KPWM:SETUP:BITRATE:PATTerns?**

Example: `Send(0,5,":KPWM:SETUP:BITRATE:PATT?",25,EOI);`
Response: <ASCII integer>
Example: 10

- **SETUP:BITRATE:SAMPLES**

The **SETUP:BITRATE:SAMPLES** command determines the number of samples acquired for the Bit Rate measurement.

The **SETUP:BITRATE:SAMPLES** query returns the number of samples acquired for the Bit Rate measurement.

**Command syntax- :KPWM:SETUP:BITRATE:SAMPles<100 to 950000>**

Example: `Send(0,5,":KPWM:SETUP:BITRATE:SAMP 100",28,EOI);`

**Query syntax- :KPWM:SETUP:BITRATE:SAMPles?**

Example: `Send(0,5,":KPWM:SETUP:BITRATE:SAMP?",25,EOI);`
Response: <ASCII integer>
Example: 100

- ## SETUP:BITRATE:STDERR

The **SETUP:BITRATE:STDERR** command sets the threshold that indicates when suspect measurements have been taken, usually as a result of improper pattern selection. This is specified in UI, and the default value is 0.5 UI. Any measurements deviating from the ideal by more than this value will produce an error message and the test will stop. This value may need to be increased if the signal has more than 0.5 UI of jitter (such as during tolerance testing).

The **SETUP:BITRATE:STDERR** query returns the current threshold for suspect measurements.

**Command syntax- :KPWM:SETUP:BITRATE:STDERR**<0 to 1000>

Example: `Send(0,5,":KPWM:SETUP:BITRATE:STDERR 0",28,EOI);`

**Query syntax- :KPWM:SETUP:BITRATE:STDERR**?

Example: `Send(0,5,":KPWM:SETUP:BITRATE:STDERR?",27,EOI);`
Response: <ASCII floating point>
Example: 0.5

- ## SETUP:DCDISI:FMAX

The **SETUP:DCDISI:FMAX** command enables application of a Low Pass Filter on the DCD+ISI data. The resulting, filtered data is plotted on top of the raw DCD+ISI data in the DCD+ISI vs. Edge plot. This feature provides the modeling of receiver performance given the measured (transmitted) data pattern if the characteristics of the receiver are known. A negative value disables this feature, the default is to disable this filter.

The **SETUP:DCDISI:FMAX** query returns the currently selected DCD+ISI Low Pass Filter value.

**Command syntax- :KPWM:SETUP:DCDISI:FMAX**<-1e+010 to 1e+010>

Example: `Send(0,5,":KPWM:SETUP:DCDISI:FMAX -1e+010",31,EOI);`

**Query syntax- :KPWM:SETUP:DCDISI:FMAX**?

Example: `Send(0,5,":KPWM:SETUP:DCDISI:FMAX?",24,EOI);`
Response: <ASCII floating point>
Example: 5.000e+007

- ## SETUP:DCDISI:FMIN

The **SETUP:DCDISI:FMIN** command enables application of a High Pass Filter on the DCD+ISI data. The resulting, filtered data is plotted on top of the raw DCD+ISI data in the DCD+ISI vs. Edge plot. This feature provides the modeling of receiver performance given the measured (transmitted) data pattern if the characteristics of the receiver are known. A negative value disables this feature, the default is to disable this filter.

The **SETUP:DCDISI:FMAX** query returns the currently selected DCD+ISI High Pass Filter value.

**Command syntax- :KPWM:SETUP:DCDISI:FMIN**<-1e+010 to 1e+010>

Example: `Send(0,5,":KPWM:SETUP:DCDISI:FMIN -1e+010",31,EOI);`

**Query syntax- :KPWM:SETUP:DCDISI:FMIN**?

Example: `Send(0,5,":KPWM:SETUP:DCDISI:FMIN?",24,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

 

- **SETUP:DCDISI:PATTERNS**

The **SETUP:DCDISI:PATTERNS** command determines the number of patterns over which the DCD+ISI measurement is made. A larger number effectively increases the amount of averaging that is used in measuring the DCD+ISI.

The **SETUP:DCDISI:PATTERNS** query returns the number of patterns across which the DCD+ISI is measured.

**Command syntax- :KPWM:SETUP:DCDISI:PATT**erns<1 to 1000>

Example: Send(0,5,":KPWM:SETUP:DCDISI:PATT 1",26,EOI);

**Query syntax- :KPWM:SETUP:DCDISI:PATT**erns?

Example: Send(0,5,":KPWM:SETUP:DCDISI:PATT?",25,EOI);
Response: <ASCII integer>
Example: 10

- **SETUP:DCDISI:SAMPLES**

The **SETUP:DCDISI:SAMPLES** command determines the number of samples acquired for the DCD+ISI measurement.

The **SETUP:DCDISI:SAMPLES** query returns the number of samples acquired for the DCD+ISI measurement.

**Command syntax- :KPWM:SETUP:DCDISI:SAMP**les<100 to 950000>

Example: Send(0,5,":KPWM:SETUP:DCDISI:SAMP 100",28,EOI);

**Query syntax- :KPWM:SETUP:DCDISI:SAMP**les?

Example: Send(0,5,":KPWM:SETUP:DCDISI:SAMP?",25,EOI);
Response: <ASCII integer>
Example: 100

- **SETUP:DCDISI:STDERR**

The **SETUP:DCDISI:STDERR** command sets the threshold that indicates when suspect measurements have been taken, usually as a result of improper pattern selection. This is specified in UI, and the default value is 0.5 UI. Any measurements deviating from the ideal by more than this value will produce an error message and the test will stop. This value may need to be increased if the signal has more than 0.5 UI of jitter (such as during tolerance testing).

The **SETUP:DCDISI:STDERR** query returns the current threshold for suspect measurements.

**Command syntax- :KPWM:SETUP:DCDISI:STDERR**<0 to 1000>

Example: Send(0,5,":KPWM:SETUP:DCDISI:STDERR 0",28,EOI);

**Query syntax- :KPWM:SETUP:DCDISI:STDERR**?

Example: Send(0,5,":KPWM:SETUP:DCDISI:STDERR?",27,EOI);
Response: <ASCII floating point>
Example: 0.5

## • SETUP:RJPJ:CALCULATION

The **SETUP:RJPJ:CALCULATION** command specifies how the RJ will be calculated in the Known Pattern with Marker tool. There are essentially three different methods: FFT, Tail-Fit, and 1-sigma based, and the Tail-Fit method has several different options. See the GigaView documentation for further information concerning each of the methods.

The **SETUP:RJPJ:CALCULATION** query returns the currently selected RJ calculation method.

**Command syntax- :KPWM:SETUP:RJPJ:CALC**ulation<FFT|TFITAUTO|TFIT3|TFIT5|TFIT9|TFIT17|TFITALL|1SIGMA>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:CALC FFT",25,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:CALC**ulation?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:CALC?",22,EOI);`
Response: <FFT|TFITAUTO|TFIT3|TFIT5|TFIT9|TFIT17|TFITALL|1SIGMA>
Example: FFT

## • SETUP:RJPJ:CONVERGENCE

The **SETUP:RJPJ:CONVERGENCE** command determines the percentage within which consecutive tail-fits must comply in order to insure reasonable frequency coverage from the corner frequency. The default setting is 10%. This setting is only active when the **SETUP:RJPJ:CALCULATION** command if set to TFITAUTO.

The **SETUP:RJPJ:CONVERGENCE** query returns the currently selected convergence setting.

**Command syntax- :KPWM:SETUP:RJPJ:CONV**ergence<5|10|25|50>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:CONV 5",23,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:CONV**ergence?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:CONV?",22,EOI);`
Response: <5|10|25|50>
Example: 5

## • SETUP:RJPJ:FMAX

The **SETUP:RJPJ:FMAX** command selects the upper frequency limit for the window over which RJ and PJ is calculated. Above this frequency a first order roll off of 20dB/decade is applied. A negative value disables this feature, and the full spectrum to the Nyquist frequency is evaluated. The default is value is to disable the first order roll off.

The **FMAX** query returns the current selection for the upper frequency limit.

**Command syntax- :KPWM:SETUP:RJPJ:FMAX**<-1e+010 to 1e+010>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:FMAX -1e+010",29,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:FMAX**?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:FMAX?",22,EOI);`
Response: <ASCII floating point>
Example: 5.000e+007

- ## SETUP:RJPJ:FMIN

The **SETUP:RJPJ:FMIN** command selects the lower frequency limit for the window over which RJ and PJ is calculated. Below this frequency a brick wall filter is applied. A negative value disables this feature, and the full spectrum resulting from the current corner frequency (-3dB frequency) is evaluated. The default value is to disable the brick wall filter.

**Command syntax- :KPWM:SETUP:RJPJ:FMIN**<-1e+010 to 1e+010>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:FMIN -1e+010",29,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:FMIN**?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:FMIN?",22,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

- ## SETUP:RJPJ:HALFUI

The **SETUP:RJPJ:HALFUI** command eliminates stray errors due to the insertion of extra IDLE characters which compensate for device re-clocking which disrupts standard Fibre Channel test patterns. Filters are automatically calculated and applied to throw away any measurements which are more then +/- 0.5 UI away from their expected positions. If more than 5% of the edges are filtered, an error will be reported. This filter is available when a pattern marker is being used, and quick-mode is not enabled.

The **SETUP:RJPJ:HALFUI** query returns whether the HalfUI idle insertion filter is enabled or not.

**Command syntax- :KPWM:SETUP:RJPJ:HALFUI**<OFF|ON>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:HALFUI OFF",27,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:HALFUI**?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:HALFUI?",24,EOI);`
Response: <OFF|ON>
Example: OFF

- ## SETUP:RJPJ:INTERPOLATION

The **SETUP:RJPJ:INTERPOLATION** command selects the means of filling the gaps in the autocorrelation function that naturally occur in a pattern. Generally, the Cubic interpolation will produce the best results in the presence of periodic jitter. Selection of Linear interpolation may be preferred in the presence of purely random jitter. In which case, the presumption of a smooth autocorrelation function cannot be made.

The **SETUP:RJPJ:INTERPOLATION** query returns the currently selected interpolation method.

**Command syntax- :KPWM:SETUP:RJPJ:INTER**polation<CUBIC|LINEAR>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:INTER CUBIC",28,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:INTER**polation?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:INTER?",23,EOI);`
Response: <CUBIC|LINEAR>
Example: CUBIC

## • SETUP:RJPJ:SAMPLES

The **SETUP:RJPJ:SAMPLES** command determines the number of samples acquired for each span of the RJ+PJ measurement.

The **SETUP:RJPJ:SAMPLES** query returns the number of samples acquired for each span of the RJ+PJ measurement.

**Command syntax- :KPWM:SETUP:RJPJ:SAMP**les<100 to 950000>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:SAMP 100",28,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:SAMP**les?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:SAMP?",25,EOI);`
Response: <ASCII integer>
Example: 100

## • SETUP:RJPJ:STDERR

The **SETUP:RJPJ:STDERR** command sets the threshold that indicates when suspect measurements have been taken, usually as a result of improper pattern selection. This is specified in UI, and the default value is 0.5 UI. Any measurements deviating from the ideal by more than this value will produce an error message and the test will stop. This value may need to be increased if the signal has more than 0.5 UI of jitter (such as during tolerance testing).

The **SETUP:RJPJ:STDERR** query returns the current threshold for suspect measurements.

**Command syntax- :KPWM:SETUP:RJPJ:STDERR**<0 to 1000>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:STDERR 0",28,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:STDERR**?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:STDERR?",27,EOI);`
Response: <ASCII floating point>
Example: 0.5

## • SETUP:RJPJ:TAILFITSAMPLES

The **SETUP:RJPJ:TAILFITSAMPLES** command will specifiy the minimum number of samples to be acquired before the Tail-Fit is performed when the **SETUP:RJPJ:CALCULATION** command has been set to one of the TFIT options.

The **SETUP:RJPJ:TAILFITSAMPLES** query returns the number of Tail-Fit samples that are currently selected.

**Command syntax- :KPWM:SETUP:RJPJ:TAILFITSAMPLES**<100 to 950000>

Example: `Send(0,5,":KPWM:SETUP:RJPJ:TAILFITSAMPLES 100",35,EOI);`

**Query syntax- :KPWM:SETUP:RJPJ:TAILFITSAMPLES**?

Example: `Send(0,5,":KPWM:SETUP:RJPJ:TAILFITSAMPLES?",32,EOI);`
Response: <ASCII integer>
Example: 10000

- **SPIKES**

The **SPIKES** query returns the spike list of the FFT plot. This query returns the count of returned spikes followed by the spikes themselves. The spikes each consist of a magnitude and a frequency separated by the '/' character.

**Query syntax- :KPWM:SPIKES?**

Example: `Send(0,5,":KPWM:SPIKES?",12,EOI);`
Response: <Spikes> <Mag1/Freq1> <Mag2/Freq2> <Mag3/Freq3> …
Example: 3 2.956e-12/2.003e8 1.803e-12/1.556e8 1.193e-12/2.501e8

- **TJ**

The **TJ** query returns the Total Jitter obtained from the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :KPWM:TJ?**

Example: `Send(0,5,":KPWM:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

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# 6-18 LOW FREQUENCY MODULATION COMMANDS

## • DESCRIPTION OF THE LOW FREQUENCY MODULATION COMMANDS

The **LFM** commands are used to make measurements on clock signals using the Low Frequency Modulation Tool. The Low Frequency Modulation Tool is useful for power-up testing of PLL circuits or measuring low frequency jitter problems (<128kHz), both synchronously and asynchronously.

**:LFM**:<command syntax>

**ACQ**uire
**DEF**ault
**FFT:ALPH**afactor
**FFT:MULT**iplier
**FFT:WIND**owtype
**FREQ**uency
**MAXFREQ**
**MAX**imum
**MEAN**
**MIN**imum
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:FUNC**tion
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:COUN**t
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:COUN**t
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PASSESTOAVG**
**PJ1**clock
**PJFREQ1**clock
**PJFREQN**clock
**PJN**clock
**P**ktopk
**PLOTDATA:FFT1**
**PLOTDATA:FFTN**
**PLOTDATA:TIME**
**PLOTINFO:FFT1**
**PLOTINFO:FFTN**
**PLOTINFO:TIME**
**STDD**ev

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Low Frequency Modulation Analysis Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :LFM:ACQ**uire

Example: `Send(0,5,":LFM:ACQ;*OPC",8,EOI);`

## • DEFAULT

The **DEFAULT** command is used to reset all the Low Frequency Modulation Analysis Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :LFM:DEF**ault

Example: `Send(0,5,":LFM:DEF",8,EOI);`

- ## FFT:ALPHAFACTOR

The **FFT:ALPHAFACTOR** command is used to vary the sidelobe rejection of the Kaiser-Bessel window. As the Alpha Factor increases, the spectral peak widens and the sidelobes shrink. As the Alpha Factor decreases, the spectral peak narrows and the sidelobes increase in amplitude.

The **FFT:ALPHAFACTOR** query returns the currently selected Kaiser-Bessel Alpha factor.

**Command syntax- :LFM:FFT:ALPH**afactor<2 to 100>

Example: `Send(0,5,":LFM:FFT:ALPH 2",15,EOI);`

**Query syntax- :LFM:FFT:ALPH**afactor?

Example: `Send(0,5,":LFM:FFT:ALPH?",14,EOI);`
Response: <ASCII floating point>
Example: 1.000e+002

- ## FFT:MULTIPLIER

The **FFT:MULTIPLIER** command selects the amount of zero padding to be applied to the measured data prior to the FFT being applied. Padding increases the frequency resolution of the FFT. Generally, a higher padding value will increase transformation processing time.

The **FFT:MULTIPLIER** query returns the currently selected multiplier value.

**Command syntax- :LFM:FFT:MULT**iplier<1|2|4|8|16|32>

Example: `Send(0,5,":LFM:FFT:MULT 1",15,EOI);`

**Query syntax- :LFM:FFT:MULT**iplier?

Example: `Send(0,5,":LFM:FFT:MULT?",14,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- ## FFT:WINDOWTYPE

The **FFT:WINDOWTYPE** command selects the window type used to reduce the spectral information distortion of an FFT. The time domain signal is multiplied by a window weighting function before the transform is performed. The choice of window will determine which spectral components will be isolated, or separated, from the dominant frequency(s).

The **FFT:WINDOWTYPE** query returns the currently selected window type.

**Command syntax- :LFM:FFT:WIND**owtype<RECTANGULAR|KAISER-BESSEL|TRIANGULAR|HAMMING|HANNING|BLACKMAN|GAUSSIAN>

Example: `Send(0,5,":LFM:FFT:WIND RECTANGULAR",25,EOI);`

**Query syntax- :LFM:FFT:WIND**owtype?

Example: `Send(0,5,":LFM:FFT:WIND?",14,EOI);`
Response: <RECTANGULAR|KAISER-BESSEL|TRIANGULAR|
HAMMING|HANNING|BLACKMAN|GAUSSIAN>
Example: RECTANGULAR

- ## FREQUENCY

The **FREQUENCY** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :LFM:FREQ**uency?

Example: `Send(0,5,":LFM:FREQ?",10,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- **MAXFREQ**

The **MAXFREQ** command determines the resolution of the plot in the FFT view, or the time between measurements in the Time Domain. Decreasing the Maximum Frequency effectively increases the time between measurements allowing lower jitter frequencies to be captured.

The **MAXFREQ** query returns the currently selected maximum frequency.

**Command syntax- :LFM:MAXFREQ**<10 to 128200>

Example: `Send(0,5,":LFM:MAXFREQ 10",15,EOI);`

**Query syntax- :LFM:MAXFREQ**?

Example: `Send(0,5,":LFM:MAXFREQ?",13,EOI);`
Response: <ASCII floating point>
Example: 1.000e+003

- **MAXIMUM**

The **MAXIMUM** query returns the maximum measurement value obtained across all measurements.

**Query syntax- :LFM:MAX**imum?

Example: `Send(0,5,":LFM:MAX?",9,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **MEAN**

The **MEAN** query returns the average value obtained across all measurements.

**Query syntax- :LFM:MEAN**?

Example: `Send(0,5,":LFM:MEAN?",10,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all measurements.

**Query syntax- :LFM:MIN**imum?

Example: `Send(0,5,":LFM:MIN?",9,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

## • PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :LFM:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":LFM:PARAM:ARM:CHAN 1",21,EOI);`

**Query syntax- :LFM:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":LFM:PARAM:ARM:CHAN?",20,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :LFM:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":LFM:PARAM:ARM:DEL -40",22,EOI);`

**Query syntax- :LFM:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":LFM:PARAM:ARM:DEL?",19,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :LFM:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":LFM:PARAM:ARM:MARK OFF",23,EOI);`

**Query syntax- :LFM:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":LFM:PARAM:ARM:MARK?",20,EOI);`
Response: <OFF|ON>

- ## PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :LFM:PARAMeter:ARMing:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":LFM:PARAM:ARM:MODE EXTERNAL",28,EOI);`

**Query syntax- :LFM:PARAMeter:ARMing:MODE**?

Example: `Send(0,5,":LFM:PARAM:ARM:MODE?",20,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :LFM:PARAMeter:ARMing:SLOPe**<FALL|RISE>

Example: `Send(0,5,":LFM:PARAM:ARM:SLOP FALL",24,EOI);`

**Query syntax- :LFM:PARAMeter:ARMing:SLOPe**?

Example: `Send(0,5,":LFM:PARAM:ARM:SLOP?",20,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :LFM:PARAMeter:ARMing:VOLTage**<-2 to 2>

Example: `Send(0,5,":LFM:PARAM:ARM:VOLT -2",22,EOI);`

**Query syntax- :LFM:PARAMeter:ARMing:VOLTage**?

Example: `Send(0,5,":LFM:PARAM:ARM:VOLT?",20,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :LFM:PARAMeter:CHANnel**<1-10>

Example: `Send(0,5,":LFM:PARAM:CHAN4",17,EOI);`

**Query syntax- :LFM:PARAMeter:CHANnel**?

Example: `Send(0,5,":LFM:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :LFM:PARAMeter:FUNCtion<PER+|PER->**

Example: `Send(0,5,":LFM:PARAM:FUNC PER+",21,EOI);`

**Query syntax- :LFM:PARAMeter:FUNCtion?**

Example: `Send(0,5,":LFM:PARAM:FUNC?",16,EOI);`
Response: <PER+|PER->

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :LFM:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":LFM:PARAM:SAMP 1000",20,EOI);`

**Query syntax- :LFM:PARAMeter:SAMPles?**

Example: `Send(0,5,":LFM:PARAM:SAMP?",16,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :LFM:PARAMeter:STARt:COUNt<1 to 10000000>**

Example: `Send(0,5,":LFM:PARAM:STAR:COUN 1",22,EOI);`

**Query syntax- :LFM:PARAMeter:STARt:COUNt?**

Example: `Send(0,5,":LFM:PARAM:STAR:COUN?",21,EOI);`
Response: <ASCII integer>
Example: 1

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :LFM:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":LFM:PARAM:STAR:VOLT -2",23,EOI);`

**Query syntax- :LFM:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":LFM:PARAM:STAR:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

 

## • PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :LFM:PARAMeter:STOP:COUNt<1 to 10000000>**

Example: `Send(0,5,":LFM:PARAM:STOP:COUN 1",22,EOI);`

**Query syntax- :LFM:PARAMeter:STOP:COUNt?**

Example: `Send(0,5,":LFM:PARAM:STOP:COUN?",21,EOI);`
Response: <ASCII integer>
Example: 2

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :LFM:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":LFM:PARAM:STOP:VOLT -2",23,EOI);`

**Query syntax- :LFM:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":LFM:PARAM:STOP:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :LFM:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":LFM:PARAM:THR 5050",19,EOI);`

**Query syntax- :LFM:PARAMeter:THReshold?**

Example: `Send(0,5,":LFM:PARAM:THR?",15,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :LFM:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":LFM:PARAM:TIME 10",19,EOI);`

**Query syntax- :LFM:PARAM**eter**:TIME**out?

Example: `Send(0,5,":LFM:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PASSESTOAVG

The **PASSESTOAVG** command selects the number of passes to average the FFT output. Averaging will generally reduce the noise floor of the results, but increase measurement time.

The **PASSESTOAVG** query returns the number of currently selected averaging passes.

**Command syntax- :LFM:PASSESTOAVG**<1|2|4|8|16|32>

Example: `Send(0,5,":LFM:PASSESTOAVG 1",18,EOI);`

**Query syntax- :LFM:PASSESTOAVG**?

Example: `Send(0,5,":LFM:PASSESTOAVG?",17,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- ## PJ1CLOCK

The **PJ1CLOCK** query returns the jitter value at which the peak FFT spike was located. This value is scaled to represent the jitter on a 1-clock basis.

**Query syntax- :LFM:PJ1**clock?

Example: `Send(0,5,":LFM:PJ1?",9,EOI);`
Response: <ASCII floating point>
Example: 4.367e-12

- ## PJFREQ1CLOCK

The **PJFREQ1CLOCK** query returns the frequency at which the peak FFT 1-clock basis spike was located.

**Query syntax- :LFM:PJFREQ1**clock?

Example: `Send(0,5,":LFM:PJFREQ1?",13,EOI);`
Response: <ASCII floating point>
Example: 1.678e+006

- ## PJFREQNCLOCK

The **PJFREQNCLOCK** query returns the frequency at which the peak FFT N-clock basis spike was located.

**Query syntax- :LFM:PJFREQN**clock?

Example: `Send(0,5,":LFM:PJFREQN?",13,EOI);`
Response: <ASCII floating point>
Example: 1.678e+006

 

- **PJNCLOCK**

The **PJNCLOCK** query returns the jitter value at which the peak FFT spike was located. This value is scaled to represent the jitter on an N-clock basis.

**Query syntax- :LFM:PJN**clock?

Example: `Send(0,5,":LFM:PJN?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **PKTOPK**

The **PKTOPK** query returns the Peak to Peak (maximum – minimum) value obtained across all measurements.

**Query syntax- :LFM:PK**topk?

Example: `Send(0,5,":LFM:PK?",8,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **PLOTDATA:FFT1**

The **PLOTDATA:FFT1** query returns the plot data associated with the FFT 1-CLOCK plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :LFM:PLOTDATA:FFT1**?

Example: `Send(0,5,":LFM:PLOTDATA:FFT1?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:FFTN**

The **PLOTDATA:FFTN** query returns the plot data associated with the FFT N-CLOCK plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :LFM:PLOTDATA:FFTN**?

Example: `Send(0,5,":LFM:PLOTDATA:FFTN?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:TIME**

The **PLOTDATA:TIME** query returns the plot data associated with the MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :LFM:PLOTDATA:TIME**?

Example: `Send(0,5,":LFM:PLOTDATA:TIME?",19,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:FFT1**

The **PLOTINFO:FFT1** query returns the plot information associated with the FFT 1-CLOCK plot.

**Query syntax- :LFM:PLOTINFO:FFT1**?

Example: `Send(0,5,":LFM:PLOTINFO:FFT1?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFTN**

The **PLOTINFO:FFTN** query returns the plot information associated with the FFT N-CLOCK plot.

**Query syntax- :LFM:PLOTINFO:FFTN?**

Example: `Send(0,5,":LFM:PLOTINFO:FFTN?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TIME**

The **PLOTINFO:TIME** query returns the plot information associated with the MEASUREMENT VS TIME plot.

**Query syntax- :LFM:PLOTINFO:TIME?**

Example: `Send(0,5,":LFM:PLOTINFO:TIME?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **STDDEV**

The **STDDEV** query returns the standard deviation of all measurements obtained.

**Query syntax- :LFM:STDDev?**

Example: `Send(0,5,":LFM:STDD?",10,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

## • DESCRIPTION OF THE LOCKTIME COMMANDS

The **LOCKTIME** commands are used for making synchronous time measurements with an external arm signal used as a point of reference. This allows the user to view locktime, or settling time. This tool uses the Arm for synchronization to a signal such as a frequency lock or power-up signal. A histogram of time measurements is created of the period following the arm. The period being measured is then incremented to the 2nd period following the arm and a histogram is created. Then the 3rd period is measured to create a histogram and this process repeats until the Span (edges) value has been reached. Statistical information from these histograms is then plotted relative to the corresponding period.

**:LOCK**time**:**<command syntax>

**ACQ**uire
**AVGMEAS**
**AVGPKPK**
**AVGSDEV**
**COUN**t
**DEF**ault
**FFT:ALPH**afactor
**FFT:MULT**iplier
**FFT:WIND**owtype
**MAXMEAS**
**MAXNEGDELTAEDGE**
**MAXNEGDELTATIME**
**MAXPKPK**
**MAXPOSDELTAEDGE**
**MAXPOSDELTATIME**
**MAXSDEV**
**MINMEAS**
**MINPKPK**
**MINSDEV**
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:FILT**er**:ENAB**le
**PARAM**eter**:FILT**er**:MAX**imum
**PARAM**eter**:FILT**er**:MIN**imum
**PARAM**eter**:FUNC**tion
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:COUN**t
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:COUN**t
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PKTOPKMEAS**
**PKTOPKPKPK**
**PKTOPKSDEV**
**PLOTDATA:FFT**
**PLOTDATA:PEAK**
**PLOTDATA:SIGM**a
**PLOTDATA:TIME**
**PLOTINFO:FFT**
**PLOTINFO:PEAK**
**PLOTINFO:SIGM**a
**PLOTINFO:TIME**
**RANG**e

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Locktime Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :LOCK**time**:ACQ**uire

Example: `Send(0,5,":LOCK:ACQ;*OPC",9,EOI);`

## • AVGMEAS

The **AVGMEAS** query returns the average of all measurements across the entire range of periods measured. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :LOCK**time**:AVGMEAS**?

Example: `Send(0,5,":LOCK:AVGMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.103637e-009

- ## AVGPKPK

The **AVGPKPK** query returns the average of the (maximum – minimum) across the entire range of periods measured.

**Query syntax- :LOCK**time**:AVGPKPK**?

Example: `Send(0,5,":LOCK:AVGPKPK?",14,EOI);`
Response: <ASCII floating point>
Example: 3.303687e-012

- ## AVGSDEV

The **AVGSDEV** query returns the average of the standard deviations across the entire range of periods measured.

**Query syntax- :LOCK**time**:AVGSDEV**?

Example: `Send(0,5,":LOCK:AVGSDEV?",14,EOI);`
Response: <ASCII floating point>
Example: 2.013677e-012

- ## COUNT

The **COUNT** command determines the number of data points to sample across the **RANGE** specified. The number specified should not be greater than the **RANGE**. By specifying a smaller number intervals will be skipped, resulting in faster test times.

The **COUNT** query returns the number of data points that are currently selected to be sampled.

**Command syntax- :LOCK**time**:COUN**t<10 to 10000>

Example: `Send(0,5,":LOCK:COUN 10",13,EOI);`

**Query syntax- :LOCK**time**:COUN**t?

Example: `Send(0,5,":LOCK:COUN?",11,EOI);`
Response: <ASCII integer>
Example: 100

- ## DEFAULT

The **DEFAULT** command is used to reset all the Locktime Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :LOCK**time**:DEF**ault

Example: `Send(0,5,":LOCK:DEF",9,EOI);`

- ## FFT:ALPHAFACTOR

The **FFT:ALPHAFACTOR** command is used to vary the sidelobe rejection of the Kaiser-Bessel window. As the Alpha Factor increases, the spectral peak widens and the sidelobes shrink. As the Alpha Factor decreases, the spectral peak narrows and the sidelobes increase in amplitude.

The **FFT:ALPHAFACTOR** query returns the currently selected Kaiser-Bessel Alpha factor.

**Command syntax- :LOCK**time**:FFT:ALPH**afactor<2 to 100>

Example: `Send(0,5,":LOCK:FFT:ALPH 2",16,EOI);`

**Query syntax- :LOCK**time**:FFT:ALPH**afactor?

Example: `Send(0,5,":LOCK:FFT:ALPH?",15,EOI);`
Response: <ASCII floating point>
Example: 1.000e+002

- ## FFT:MULTIPLIER

The **FFT:MULTIPLIER** command selects the amount of zero padding to be applied to the measured data prior to the FFT being applied. Padding increases the frequency resolution of the FFT. Generally, a higher padding value will increase transformation processing time.

The **FFT:MULTIPLIER** query returns the currently selected multiplier value.

**Command syntax- :LOCK**time**:FFT:MULT**iplier<1|2|4|8|16|32>

Example: `Send(0,5,":LOCK:FFT:MULT 1",16,EOI);`

**Query syntax- :LOCK**time**:FFT:MULT**iplier?

Example: `Send(0,5,":LOCK:FFT:MULT?",15,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- ## FFT:WINDOWTYPE

The **FFT:WINDOWTYPE** command selects the window type used to reduce the spectral information distortion of an FFT. The time domain signal is multiplied by a window weighting function before the transform is performed. The choice of window will determine which spectral components will be isolated, or separated, from the dominant frequency(s).

The **FFT:WINDOWTYPE** query returns the currently selected window type.

**Command syntax- :LOCK**time**:FFT:WIND**owtype<RECTANGULAR|KAISER-BESSEL|TRIANGULAR|HAMMING|HANNING|BLACKMAN|GAUSSIAN>

Example: `Send(0,5,":LOCK:FFT:WIND RECTANGULAR",26,EOI);`

**Query syntax- :LOCK**time**:FFT:WIND**owtype?

Example: `Send(0,5,":LOCK:FFT:WIND?",15,EOI);`
Response: <RECTANGULAR|KAISER-BESSEL|TRIANGULAR|
HAMMING|HANNING|BLACKMAN|GAUSSIAN>
Example: RECTANGULAR

- ## MAXMEAS

The **MAXMEAS** query returns the maximum measurement across all periods measured.

**Query syntax- :LOCK**time**:MAXMEAS**?

Example: `Send(0,5,":LOCK:MAXMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.107964e-009

- ## MAXNEGDELTAEDGE

The **MAXNEGDELTAEDGE** query returns the index of the interval which has the largest negative gradient.

**Query syntax- :LOCK**time**:MAXNEGDELTAEDGE**?

Example: `Send(0,5,":LOCK:MAXNEGDELTAEDGE?",22,EOI);`
Response: <ASCII integer>
Example: 12

- **MAXNEGDELTATIME**

The **MAXNEGDELTATIME** query returns the value of the largest negative gradient between two average measurements.

**Query syntax- :LOCK**time**:MAXNEGDELTATIME**?

Example: `Send(0,5,":LOCK:MAXNEGDELTATIME?",22,EOI);`
Response: <ASCII floating point>
Example: 8.5678132e-012

- **MAXPKPK**

The **MAXPKPK** query returns the maximum Pk-Pk measurement across all periods measured.

**Query syntax- :LOCK**time**:MAXPKPK**?

Example: `Send(0,5,":LOCK:MAXPKPK?",14,EOI);`
Response: <ASCII floating point>
Example: 7. 964107e-012

- **MAXPOSDELTAEDGE**

The **MAXPOSDELTAEDGE** query the index of the interval which has the largest positive gradient.

**Query syntax- :LOCK**time**:MAXPOSDELTAEDGE**?

Example: `Send(0,5,":LOCK:MAXPOSDELTAEDGE?",22,EOI);`
Response: <ASCII integer>
Example: 17

- **MAXPOSDELTATIME**

The **MAXPOSDELTATIME** query returns the value of the largest positive gradient between two average measurements.

**Query syntax- :LOCK**time**:MAXPOSDELTATIME**?

Example: `Send(0,5,":LOCK:MAXPOSDELTATIME?",22,EOI);`
Response: <ASCII floating point>
Example: 8.5678132e-012

- **MAXSDEV**

The **MAXSDEV** query returns the maximum 1-sigma measurement across all periods measured.

**Query syntax- :LOCK**time**:MAXSDEV**?

Example: `Send(0,5,":LOCK:MAXSDEV?",14,EOI);`
Response: <ASCII floating point>
Example: 3. 794167e-012

- **MINMEAS**

The **MINMEAS** query returns the minimum measurement across all periods measured.

**Query syntax- :LOCK**time**:MINMEAS**?

Example: `Send(0,5,":LOCK:MINMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 9.907964e-010

- **MINPKPK**

The **MINPKPK** query returns the minimum Pk-Pk measurement across all periods measured.

**Query syntax- :LOCK**time**:MINPKPK**?

Example: `Send(0,5,":LOCK:MINPKPK?",14,EOI);`
Response: <ASCII floating point>
Example: 5. 096407e-012

- **MINSDEV**

The **MINSDEV** query returns the minimum 1-sigma measurement across all periods measured.

**Query syntax- :LOCK**time**:MINSDEV**?

Example: `Send(0,5,":LOCK:MINSDEV?",14,EOI);`
Response: <ASCII floating point>
Example: 2. 941467e-012

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":LOCK:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:CHAN**nel?

Example: `Send(0,5,":LOCK:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":LOCK:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:DEL**ay?

Example: `Send(0,5,":LOCK:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":LOCK:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:MARK**er?

Example: `Send(0,5,":LOCK:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":LOCK:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:MODE**?

Example: `Send(0,5,":LOCK:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":LOCK:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:SLOP**e?

Example: `Send(0,5,":LOCK:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":LOCK:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:ARM**ing**:VOLT**age?

Example: `Send(0,5,":LOCK:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :LOCK**time**:PARAM**eter**:CHAN**nel<1-10>

Example: `Send(0,5,":LOCK:PARAM:CHAN4",17,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:CHAN**nel?

Example: `Send(0,5,":LOCK:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:FILTER:ENABLE

The **PARAMETER:FILTER:ENABLE** command enables a post-processing filter that ignores measurements acquired outside of the filter region. The statistics are calculated from only the measurements within the filter region, and the plots will display only data from within the filtered region. With filters enabled the number of hits acquired may be less than the number of hits requested as a result of the filtered values being thrown away.

The **PARAMETER:FILTER:ENABLE** query returns whether the filters are currently enabled.

**Command syntax- :LOCK**time**:PARAM**eter**:FILT**er**:ENAB**le<OFF|ON>

Example: `Send(0,5,":LOCK:PARAM:FILT:ENAB OFF",25,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:FILT**er**:ENAB**le?

Example: `Send(0,5,":LOCK:PARAM:FILT:ENAB?",22,EOI);`
Response: <OFF|ON>
Example: OFF

## • PARAMETER:FILTER:MAXIMUM

The **PARAMETER:FILTER:MAXIMUM** command selects the maximum filter time in seconds.

The **PARAMETER:FILTER:MAXIMUM** query returns the maximum filter value.

**Command syntax- :LOCK**time**:PARAM**eter**:FILT**er**:MAX**imum<-2.5 to 2.5>

Example: `Send(0,5,":LOCK:PARAM:FILT:MAX -2.5",25,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:FILT**er**:MAX**imum?

Example: `Send(0,5,":LOCK:PARAM:FILT:MAX?",21,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

## • PARAMETER:FILTER:MINIMUM

The **PARAMETER:FILTER:MINIMUM** command selects the minimum filter time in seconds.

The **PARAMETER:FILTER:MINIMUM** query returns the minimum filter value.

**Command syntax- :LOCK**time**:PARAM**eter**:FILT**er**:MIN**imum<-2.5 to 2.5>

Example: `Send(0,5,":LOCK:PARAM:FILT:MIN -2.5",25,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:FILT**er**:MIN**imum?

Example: `Send(0,5,":LOCK:PARAM:FILT:MIN?",21,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

## • PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :LOCK**time**:PARAM**eter**:FUNC**tion<PW+|PW-|PER+|PER->

Example: `Send(0,5,":LOCK:PARAM:FUNC PER+",22,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:FUNC**tion?

Example: `Send(0,5,":LOCK:PARAM:FUNC?",17,EOI);`
Response: <PW+|PW-|PER+|PER->

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :LOCK**time**:PARAM**eter**:SAMP**les<1 to 950000>

Example: `Send(0,5,":LOCK:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:SAMP**les?

Example: `Send(0,5,":LOCK:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :LOCK**time**:PARAM**eter**:STAR**t**:COUN**t<1 to 10000000>

Example: `Send(0,5,":LOCK:PARAM:STAR:COUN 1",23,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:STAR**t**:COUN**t?

Example: `Send(0,5,":LOCK:PARAM:STAR:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 1

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :LOCK**time**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":LOCK:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:STAR**t**:VOLT**age?

Example: `Send(0,5,":LOCK:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :LOCK**time**:PARAM**eter**:STOP:COUN**t<1 to 10000000>

Example: `Send(0,5,":LOCK:PARAM:STOP:COUN 1",23,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:STOP:COUN**t?

Example: `Send(0,5,":LOCK:PARAM:STOP:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 2

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :LOCK**time**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":LOCK:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:STOP:VOLT**age?

Example: `Send(0,5,":LOCK:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :LOCK**time**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":LOCK:PARAM:THR 5050",20,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:THR**eshold?

Example: `Send(0,5,":LOCK:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :LOCK**time**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":LOCK:PARAM:TIME 10",19,EOI);`

**Query syntax- :LOCK**time**:PARAM**eter**:TIME**out?

Example: `Send(0,5,":LOCK:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PKTOPKMEAS

The **PKTOPKMEAS** query returns the Peak to Peak (maximum – minimum) across all periods measured.

**Query syntax- :LOCK**time**:PKTOPKMEAS**?

Example: `Send(0,5,":LOCK:PKTOPKMEAS?",17,EOI);`
Response: <ASCII floating point>
Example: 9.907964e-010

- ## PKTOPKPKPK

The **PKTOPKPKPK** query returns the Peak to Peak (maximum – minimum) Pk-Pk across all periods measured.

**Query syntax- :LOCK**time**:PKTOPKPKPK**?

Example: `Send(0,5,":LOCK:PKTOPKPKPK?",17,EOI);`
Response: <ASCII floating point>
Example: 5. 096407e-012

- ## PKTOPKSDEV

The **PKTOPKSDEV** query returns the Peak to Peak (maximum – minimum) 1-sigma across all periods measured.

**Query syntax- :LOCK**time**:PKTOPKSDEV**?

Example: `Send(0,5,":LOCK:PKTOPKSDEV?",17,EOI);`
Response: <ASCII floating point>
Example: 2. 941467e-012

- ## PLOTDATA:FFT

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :LOCK**time**:PLOTDATA:FFT**?

Example: `Send(0,5,":LOCK:PLOTDATA:FFT?",19,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:PEAK**

The **PLOTDATA:PEAK** query returns the plot data associated with the PK-PK VS DELAY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :LOCK**time**:PLOTDATA:PEAK**?

Example: `Send(0,5,":LOCK:PLOTDATA:PEAK?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS DELAY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :LOCK**time**:PLOTDATA:SIGM**a?

Example: `Send(0,5,":LOCK:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:TIME**

The **PLOTDATA:TIME** query returns the plot data associated with the MEASUREMENT VS DELAY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :LOCK**time**:PLOTDATA:TIME**?

Example: `Send(0,5,":LOCK:PLOTDATA:TIME?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :LOCK**time**:PLOTINFO:FFT**?

Example: `Send(0,5,":LOCK:PLOTINFO:FFT?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:PEAK**

The **PLOTINFO:PEAK** query returns the plot information associated with the PK-PK VS DELAY plot.

**Query syntax- :LOCK**time**:PLOTINFO:PEAK**?

Example: `Send(0,5,":LOCK:PLOTINFO:PEAK?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS DELAY plot.

**Query syntax- :LOCK**time**:PLOTINFO:SIGM**a?

Example: `Send(0,5,":LOCK:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TIME**

The **PLOTINFO:TIME** query returns the plot information associated with the MEASUREMENT VS DELAY plot.

**Query syntax- :LOCK**time**:PLOTINFO:TIME**?

Example: `Send(0,5,":LOCK:PLOTINFO:TIME?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RANGE**

The **RANGE** command selects the number of periods over which measurements are acquired.

The **RANGE** query returns the currently selected number of periods over which measurements are acquired.

**Command syntax- :LOCK**time**:RANG**e<10 to 100000>

Example: `Send(0,5,":LOCK:RANG 10",13,EOI);`

**Query syntax- :LOCK**time**:RANG**e?

Example: `Send(0,5,":LOCK:RANG?",11,EOI);`
Response: <ASCII integer >
Example: 1000

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# 6-20 PCI EXPRESS 1.1 WITH HARDWARE CLOCK COMMANDS

## • DESCRIPTION OF PCI EXPRESS 1.1 W/HARDWARE CLOCK COMMANDS

The **PCIM** commands are used to obtain results for PCI Express 1.1 using the Known Pattern with Bit Clock and Marker Tool. It applies the correct High Pass Filters to measure to this standard, and includes amplitude testing to meet the specification requirements. This tool requires a data signal, a pattern marker, and a Multirate Clock Recovery Card. If your system has a PM-50 Card installed, you can use it to obtain a pattern marker.

**:PCIM:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **MEDTOMAX**jitter | **PLOTDATA:SCOPE+** |
| **ATTEN**uation | **PARAM**eter:**ARM**ing:**CHAN**nel | **PLOTINFO:BATH**tub |
| **BITRATE** | **PARAM**eter:**ARM**ing:**DEL**ay | **PLOTINFO:HIST**ogram |
| **CLE**ar | **PARAM**eter:**ARM**ing:**MARK**er | **PLOTINFO:SCOPE-** |
| **COM**mon:**AC**p | **PARAM**eter:**ARM**ing:**MODE** | **PLOTINFO:SCOPE+** |
| **COM**mon:**DC** | **PARAM**eter:**ARM**ing:**SLOP**e | **RJ** |
| **COM**mon:**DCACT**ive | **PARAM**eter:**ARM**ing:**VOLT**age | **SCOPE:FALL-** |
| **COM**mon:**DCDM**inus | **PARAM**eter:**CHAN**nel | **SCOPE:FALL+** |
| **COM**mon:**DCDP**lus | **PARAM**eter:**SAMP**les | **SCOPE:RISE-** |
| **COM**mon:**DCLINE** | **PARAM**eter:**STAR**t:**VOLT**age | **SCOPE:RISE+** |
| **COM**mon:**IDLEDC** | **PARAM**eter:**STOP:VOLT**age | **SCOPE:VDIFF** |
| **COM**mon:**IDLEDIFF** | **PARAM**eter:**THR**eshold | **SCOPE:VDRATIO** |
| **COMP**liance | **PARAM**eter:**TIME**out | **SPIKE**s |
| **DEF**ault | **PATT**ern | **TAIL**fit:**COMP**lete |
| **DJ** | **PLOTDATA:BATH**tub | **TAIL**fit:**MINHITS** |
| **HITS** | **PLOTDATA:HIST**ogram | **TOPEN**eye:**10E-12** |
| **IDLE** | **PLOTDATA:SCOPE-** | **TOPEN**eye:**10E-6** |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new PCI Express 1.1 w/Hardware Clock Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :PCIM:ACQ**uire

Example: `Send(0,5,":PCIM:ACQ;*OPC",9,EOI);`

## • ATTENUATION

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :PCIM:ATTEN**uation?

Example: `Send(0,5,":PCIM:ATTEN?",12,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

- **BITRATE**

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Query syntax- :PCIM:BITRATE?**

Example: `Send(0,5,":PCIM:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +2.506e9

- **CLEAR**

The **CLEAR** command provides a means to flush any previous data.

**Command syntax- :PCIM:CLEar**

Example: `Send(0,5,":PCIM:CLE",9,EOI);`

- **COMMON:ACP**

The **COMMON:ACP** query returns the V?X-CM-Acp, the AC Peak Common Mode Input Voltage.

**Query syntax- :PCIM:COMmon:ACp?**

Example: `Send(0,5,":PCIM:COM:AC?",13,EOI);`
Response: <ASCII floating point>
Example: 2.800000e-005

- **COMMON:DC**

The **COMMON:DC** query returns V?X-CM-DC, the DC Common Mode Input Voltage.

**Query syntax- :PCIM:COMmon:DC?**

Example: `Send(0,5,":PCIM:COM:DC?",13,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-006

- **COMMON:DCACTIVE**

The **COMMON:DCACTIVE** query returns V?X-CM-DCACTIVE-IDLEDELTA, the Absolute Delta of DC Common Mode Voltage During L0 and Electrical Idle.

**Query syntax- :PCIM:COMmon:DCACTive?**

Example: `Send(0,5,":PCIM:COM:DCACT?",16,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-006

- **COMMON:DCDMINUS**

The **COMMON:DCDMINUS** query returns V?X-CM-DC-D-, the DC Common Mode Voltage of D-.

**Query syntax- :PCIM:COMmon:DCDMinus?**

Example: `Send(0,5,":PCIM:COM:DCDM?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCDPLUS**

T he **COMMON:DCDMINUS** query returns V?X-CM-DC-D+, the DC Common Mode Voltage of D+.

**Query syntax- :PCIM:COM**mon**:DCDP**lus?

Example: `Send(0,5,":PCIM:COM:DCDP?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCLINE**

The **COMMON:DCLINE** query returns V?X-CM-DCLINE-DELTA, the Absolute Delta of DC Common Mode Voltage between D+ and D-.

**Query syntax- :PCIM:COM**mon**:DCLINE**?

Example: `Send(0,5,":PCIM:COM:DCLINE?",17,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMMON:IDLEDC**

The **COMMON:IDLEDC** query returns V?X-CM-Idle-DC, the Electrical Idle Common Mode DC Output Voltage.

**Query syntax- :PCIM:COM**mon**:IDLEDC**?

Example: `Send(0,5,":PCIM:COM:IDLEDC?",17,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMMON:IDLEDIFF**

The **COMMON:IDLEDIFF** query returns V?X-IDLE-DIFFp, the Electrical Idle Differential Peak Output Voltage.

**Query syntax- :PCIM:COM**mon**:IDLEDIFF**?

Example: `Send(0,5,":PCIM:COM:IDLEDIFF?",19,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMPLIANCE**

The **COMPLIANCE** command selects the current PCI Express standard to test against.

The **COMPLIANCE** query returns the currently selected PCI Express standard.

**Command syntax- :PCIM:COMP**liance<RX-SPEC|TX-SPEC|RX-ADDIN|
TX-ADDIN|RX-SYSTEM|TX-SYSTEM>

Example: `Send(0,5,":PCIM:COMP RX-SPEC",18,EOI);`

**Query syntax- :PCIM:COMP**liance?

Example: `Send(0,5,":PCIM:COMP?",11,EOI);`
Response: <RX-SPEC|TX-SPEC|RX-ADDIN|TX-ADDIN|RX-SYSTEM|TX-SYSTEM>
Example: RX-SPEC

- **DEFAULT**

The **DEFAULT** command is used to reset all the PCI Express Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :PCIM:DEF**ault

Example: `Send(0,5,":PCIM:DEF",9,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCIM:DJ**?

Example: `Send(0,5,":PCIM:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **HITS**

The **HITS** query returns the number of accumulated hits in the total jitter histogram.

**Query syntax- :PCIM:HITS**?

Example: `Send(0,5,":PCIM:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- **IDLE**

The **IDLE** query instructs the instrument to measure the parts of the common mode measurements in the PCI Express specifications that are required to be performed in the Electrical Idle State. Make sure the transmitter is in its Electrical Idle State prior to issuing this command. In the Electrical Idle State, both differential lines of a PCI Express link are driven to their common mode level. A non-zero value in the Idle OK flag indicates a successful measurement. Once this measurement has been taken it will be cached and applied to future PCI Express measurements until the **:PCIM:CLEAR** command is sent, or the **:PCIM:IDLE** command is once again sent.

**Query syntax- :PCIM:IDLE**?

Example: `Send(0,5,":PCIM:IDLE?",11,EOI);`
Response: <ASCII integer>, <ASCII floating point>, <ASCII floating point>, <ASCII floating point>
Description: <Idle OK flag>, <V?xCmDcActvDelta>, <V?xCmIdleDc>, <V?xIdleDiff p>
Example: 1, 0.003, -0.028, 0.012

- **MEDTOMAXJITTER**

The **MEDTOMAXJITTER** query returns TTX-EYEMEDIAN-to-MAXJITTER, Maximum time between the jitter median and maximum deviation from the median.

**Query syntax- :PCIM:MEDTOMAX**jitter?

Example: `Send(0,5,":PCIM:MEDTOMAX?",15,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

 

## • PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :PCIM:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":PCIM:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :PCIM:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":PCIM:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :PCIM:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":PCIM:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :PCIM:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":PCIM:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :PCIM:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":PCIM:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :PCIM:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":PCIM:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

- ## PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :PCIM:PARAMeter:ARMing:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":PCIM:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :PCIM:PARAMeter:ARMing:MODE**?

Example: `Send(0,5,":PCIM:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :PCIM:PARAMeter:ARMing:SLOPe**<FALL|RISE>

Example: `Send(0,5,":PCIM:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :PCIM:PARAMeter:ARMing:SLOPe**?

Example: `Send(0,5,":PCIM:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :PCIM:PARAMeter:ARMing:VOLTage**<-2 to 2>

Example: `Send(0,5,":PCIM:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :PCIM:PARAMeter:ARMing:VOLTage**?

Example: `Send(0,5,":PCIM:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :PCIM:PARAMeter:CHANnel<n&m>**

Example: `Send(0,5,":PCIM:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :PCIM:PARAMeter:CHANnel?**

Example: `Send(0,5,":PCIM:PARAM:CHAN?",17,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

**Command syntax- :PCIM:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":PCIM:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :PCIM:PARAMeter:SAMPles?**

Example: `Send(0,5,":PCIM:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the data channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :PCIM:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":PCIM:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :PCIM:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":PCIM:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the clock channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected clock channel user voltage.

**Command syntax- :PCIM:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":PCIM:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :PCIM:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":PCIM:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :PCIM:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":PCIM:PARAM:THR 5050",20,EOI);`

**Query syntax- :PCIM:PARAMeter:THReshold?**

Example: `Send(0,5,":PCIM:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

## • PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :PCIM:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":PCIM:PARAM:TIME 10",19,EOI);`

**Query syntax- :PCIM:PARAMeter:TIMEout?**

Example: `Send(0,5,":PCIM:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PATTERN**

The **PATTERN** command selects the current pattern file to be used. The specified pattern file must exist on the SIA3000.

The **PATTERN** query returns the currently selected pattern file.

**Command syntax- :PCIM:PATT**ern<filename>

Example: `Send(0,5,":PCIM:PATT K285.PTN",19,EOI);`

**Query syntax- :PCIM:PATT**ern?

Example: `Send(0,5,":PCIM:PATT?",11,EOI);`
Response: <ASCII string>
Example: CJTPAT.PTN

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIM:PLOTDATA:BATH**tub?

Example: `Send(0,5,":PCIM:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:HISTOGRAM**

The **PLOTDATA:HISTOGRAM** query returns the plot data associated with the MEDIAN TO MAX JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIM:PLOTDATA:HIST**ogram?

Example: `Send(0,5,":PCIM:PLOTDATA:HIST?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE-**

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIM:PLOTDATA:SCOPE-**?

Example: `Send(0,5,":PCIM:PLOTDATA:SCOPE-?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIM:PLOTDATA:SCOPE+**?

Example: `Send(0,5,":PCIM:PLOTDATA:SCOPE+?",22,EOI);`
Response: #xy…dddddddd…

- ## PLOTINFO:BATHTUB

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :PCIM:PLOTINFO:BATH**tub?

Example: `Send(0,5,":PCIM:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:HISTOGRAM

The **PLOTINFO:HISTOGRAM** query returns the plot information associated with the MEDIAN TO MAX JITTER HISTOGRAM plot.

**Query syntax- :PCIM:PLOTINFO:HIST**ogram?

Example: `Send(0,5,":PCIM:PLOTINFO:HIST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:SCOPE-

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIMENTARY SCOPE INPUT plot.

**Query syntax- :PCIM:PLOTINFO:SCOPE-**?

Example: `Send(0,5,":PCIM:PLOTINFO:SCOPE-?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:SCOPE+

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :PCIM:PLOTINFO:SCOPE+**?

Example: `Send(0,5,":PCIM:PLOTINFO:SCOPE+?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## RJ

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCIM:RJ**?

Example: `Send(0,5,":PCIM:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- ## SCOPE:FALL-

The **SCOPE:FALL-** query returns the negative differential input fall time in seconds.

**Query syntax- :PCIM:SCOPE:FALL-**?

Example: `Send(0,5,":PCIM:SCOPE:FALL-?",18,EOI);`
Response: <ASCII floating point>
Example: 5.678273e-011

- **SCOPE:FALL+**

The **SCOPE:FALL+** query returns the positive differential input fall time in seconds.

**Query syntax- :PCIM:SCOPE:FALL+**?

Example: `Send(0,5,":PCIM:SCOPE:FALL+?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266798e-011

- **SCOPE:RISE-**

The **SCOPE:RISE-** query returns the negative differential input rise time in seconds.

**Query syntax- :PCIM:SCOPE:RISE-**?

Example: `Send(0,5,":PCIM:SCOPE:RISE-?",18,EOI);`
Response: <ASCII floating point>
Example: 5.169737e-011

- **SCOPE:RISE+**

The **SCOPE:RISE+** query returns the positive differential input rise time in seconds.

**Query syntax- :PCIM:SCOPE:RISE+**?

Example: `Send(0,5,":PCIM:SCOPE:RISE+?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266788e-011

- **SCOPE:VDIFF**

The **SCOPE:VDIFF** query returns V?X-DIFFp-p, the Differential Peak to Peak Output Voltage.

**Query syntax- :PCIM:SCOPE:VDIFF**?

Example: `Send(0,5,":PCIM:SCOPE:VDIFF?",18,EOI);`
Response: <ASCII floating point>
Example: 1.327696e-001

- **SCOPE:VDRATIO**

The **SCOPE:VDRATIO** query returns VtxDeRatio in dB's. This is the ratio of the amplitude of the emphasized and the non-emphasized edges in the pattern. It is only valid when measuring the TX-SPEC mode.

**Query syntax- :PCIM:SCOPE:VDRATIO**?

Example: `Send(0,5,":PCIM:SCOPE:VDRATIO?",20,EOI);`
Response: <ASCII floating point>
Example: -3.327696e-000

- **SPIKES**

The **SPIKES** query returns the spike list of the FFT plot. This query returns the count of returned spikes followed by the spikes themselves. The spikes each consist of a magnitude and a frequency separated by the '/' character.

**Query syntax- :PCIM:SPIKES**?

Example: `Send(0,5,":PCIM:SPIKES?",12,EOI);`
Response: <Spikes> <Mag1/Freq1> <Mag2/Freq2> <Mag3/Freq3> …
Example: 3 2.956e-12/2.003e8 1.803e-12/1.556e8 1.193e-12/2.501e8

- ## TAILFIT:COMPLETE

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before DJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :PCIM:TAIL**fit**:COMP**lete?

Example: `Send(0,5,":PCIM:TAIL:COMP?",16,EOI);`
Response: <0|1>

- ## TAILFIT:MINHITS

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :PCIM:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":PCIM:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :PCIM:TAIL**fit**:MINHITS**?

Example: `Send(0,5,":PCIM:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- ## TOPENEYE:10E-12

The **TOPENEYE:10E-12** query returns T?X-EYE, the Minimum TX Eye Width at 10e-12 Bit Error Rate.

**Query syntax- :PCIM:TOPEN**eye**:10E-12**?

Example: `Send(0,5,":PCIM:TOPEN:10E-12?",19,EOI);`
Response: <ASCII floating point>
Example: 3.637e-010

- ## TOPENEYE:10E-6

The **TOPENEYE:10E-6** query returns T?X-EYE, the Minimum TX Eye Width at 10e-6 Bit Error Rate.

**Query syntax- :PCIM:TOPEN**eye**:10E-6**?

Example: `Send(0,5,":PCIM:TOPEN:10E-6?",18,EOI);`
Response: <ASCII floating point>
Example: 3.637e-010

## • DESCRIPTION OF THE PCI EXPRESS COMMANDS

The **PCIX** commands are used to take measurements using the PCI Express Tool. This provides both timing and amplitude compliance measurements.

**:PCIX:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **IDLE** | **PLOTDATA:HIST**ogram |
| **ATTEN**uation | **MEDTOMAX**jitter | **PLOTDATA:SCOPE-** |
| **BITRATE** | **PARAM**eter**:ARM**ing**:CHAN**nel | **PLOTDATA:SCOPR+** |
| **CLE**ar | **PARAM**eter**:ARM**ing**:DEL**ay | **PLOTINFO:BATH**tub |
| **COM**mon**:A**cp | **PARAM**eter**:ARM**ing**:MARK**er | **PLOTINFO:HIST**ogram |
| **COM**mon**:DC** | **PARAM**eter**:ARM**ing**:MODE** | **PLOTINFO:SCOPE-** |
| **COM**mon**:DCACT**ive | **PARAM**eter**:ARM**ing**:SLOP**e | **PLOTINFO:SCOPE+** |
| **COM**mon**:DCDM**inus | **PARAM**eter**:ARM**ing**:VOLT**age | **RJ** |
| **COM**mon**:DCDP**lus | **PARAM**eter**:CHAN**nel | **SCOPE:FALL-** |
| **COM**mon**:DCLINE** | **PARAM**eter**:SAMP**les | **SCOPE:FALL+** |
| **COM**mon**:IDLEDC** | **PARAM**eter**:STAR**t**:VOLT**age | **SCOPE:RISE-** |
| **COM**mon**:IDLEDIFF** | **PARAM**eter**:STOP:VOLT**age | **SCOPE:RISE+** |
| **COMP**liance | **PARAM**eter**:THR**eshold | **SCOPE:VDIFF** |
| **DEF**ault | **PARAM**eter**:TIME**out | **SCOPE:VDRATIO** |
| **DJ** | **PATT**ern | **TAIL**fit**:COMP**lete |
| **HITS** | **PLOTDATA:BATH**tub | **TOPEN**eye |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new PCI Express Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :PCIX:ACQ**uire

Example: `Send(0,5,":PCIX:ACQ;*OPC",9,EOI);`

## • ATTENUATION

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :PCIX:ATTEN**uation?

Example: `Send(0,5,":PCIX:ATTEN?",12,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

- ## BITRATE

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Query syntax- :PCIX:BITRATE?**

Example: `Send(0,5,":PCIX:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +1.0625e9

- ## CLEAR

The **CLEAR** command provides a means to flush any previous data. Since the PCI Express Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :PCIX:CLEar**

Example: `Send(0,5,":PCIX:CLE",9,EOI);`

- ## COMMON:ACP

The **COMMON:ACP** query returns the V?X-CM-Acp, the AC Peak Common Mode Input Voltage.

**Query syntax- :PCIX:COMmon:ACp?**

Example: `Send(0,5,":PCIX:COM:AC?",13,EOI);`
Response: <ASCII floating point>
Example: 2.800000e-005

- ## COMMON:DC

The **COMMON:DC** query returns V?X-CM-DC, the DC Common Mode Input Voltage.

**Query syntax- :PCIX:COMmon:DC?**

Example: `Send(0,5,":PCIX:COM:DC?",13,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-006

- ## COMMON:DCACTIVE

The **COMMON:DCACTIVE** query returns V?X-CM-DCACTIVE-IDLEDELTA, the Absolute Delta of DC Common Mode Voltage During L0 and Electrical Idle.

**Query syntax- :PCIX:COMmon:DCACTive?**

Example: `Send(0,5,":PCIX:COM:DCACT?",16,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-006

- ## COMMON:DCDMINUS

The **COMMON:DCDMINUS** query returns V?X-CM-DC-D-, the DC Common Mode Voltage of D-.

**Query syntax- :PCIX:COMmon:DCDMinus?**

Example: `Send(0,5,":PCIX:COM:DCDM?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCDPLUS**

T he **COMMON:DCDMINUS** query returns V?X-CM-DC-D+, the DC Common Mode Voltage of D+.

**Query syntax- :PCIX:COM**mon**:DCDP**lus?

Example: `Send(0,5,":PCIX:COM:DCDP?",15,EOI);`
Response: <ASCII floating point>
Example: 1.620000e-004

- **COMMON:DCLINE**

The **COMMON:DCLINE** query returns V?X-CM-DCLINE-DELTA, the Absolute Delta of DC Common Mode Voltage between D+ and D-.

**Query syntax- :PCIX:COM**mon**:DCLINE**?

Example: `Send(0,5,":PCIX:COM:DCLINE?",17,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMMON:IDLEDC**

The **COMMON:IDLEDC** query returns V?X-CM-Idle-DC, the Electrical Idle Common Mode DC Output Voltage.

**Query syntax- :PCIX:COM**mon**:IDLEDC**?

Example: `Send(0,5,":PCIX:COM:IDLEDC?",17,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMMON:IDLEDIFF**

The **COMMON:IDLEDIFF** query returns V?X-IDLE-DIFFp, the Electrical Idle Differential Peak Output Voltage.

**Query syntax- :PCIX:COM**mon**:IDLEDIFF**?

Example: `Send(0,5,":PCIX:COM:IDLEDIFF?",19,EOI);`
Response: <ASCII floating point>
Example: 3.000000e-006

- **COMPLIANCE**

The **COMPLIANCE** command selects the current PCI Express standard to test against.

The **COMPLIANCE** query returns the currently selected PCI Express standard.

**Command syntax- :PCIX:COMP**liance<RX-SPEC|TX-SPEC|RX-ADDIN|
TX-ADDIN|RX-SYSTEM|TX-SYSTEM>

Example: `Send(0,5,":PCIX:COMP RX-SPEC",18,EOI);`

**Query syntax- :PCIX:COMP**liance?

Example: `Send(0,5,":PCIX:COMP?",11,EOI);`
Response: <RX-SPEC|TX-SPEC|RX-ADDIN|TX-ADDIN|RX-SYSTEM|TX-SYSTEM>
Example: RX-SPEC

- **DEFAULT**

The **DEFAULT** command is used to reset all the PCI Express Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :PCIX:DEF**ault

Example: `Send(0,5,":PCIX:DEF",9,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCIX:DJ**?

Example: `Send(0,5,":PCIX:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **HITS**

The **HITS** query returns the number of accumulated hits in the total jitter histogram.

**Query syntax- :PCIX:HITS**?

Example: `Send(0,5,":PCIX:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- **IDLE**

The **IDLE** query instructs the instrument to measure the parts of the common mode measurements in the PCI Express specifications that are required to be performed in the Electrical Idle State. Make sure the transmitter is in its Electrical Idle State prior to issuing this command. In the Electrical Idle State, both differential lines of a PCI Express link are driven to their common mode level. A non-zero value in the Idle OK flag indicates a successful measurement. Once this measurement has been taken it will be cached and applied to future PCI Express measurements until the **:PCIX:CLEAR** command is sent, or the **:PCIX:IDLE** command is once again sent.

**Query syntax- :PCIX:IDLE**?

Example: `Send(0,5,":PCIX:IDLE?",11,EOI);`
Response: <ASCII integer>, <ASCII floating point>, <ASCII floating point>, <ASCII floating point>
Description: <Idle OK flag>, <V?xCmDcActvDelta>, <V?xCmIdleDc>, <V?xIdleDiff p>
Example: 1, 0.003, -0.028, 0.012

- **MEDTOMAXJITTER**

The **MEDTOMAXJITTER** query returns TTX-EYEMEDIAN-to-MAXJITTER, Maximum time between the jitter median and maximum deviation from the median.

**Query syntax- :PCIX:MEDTOMAX**jitter?

Example: `Send(0,5,":PCIX:MEDTOMAX?",15,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :PCIX:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":PCIX:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :PCIX:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":PCIX:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

- **PARAMETER:ARMING:DELAY**

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :PCIX:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":PCIX:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :PCIX:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":PCIX:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

- **PARAMETER:ARMING:MARKER**

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :PCIX:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":PCIX:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :PCIX:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":PCIX:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

- ## PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :PCIX:PARAMeter:ARMing:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":PCIX:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :PCIX:PARAMeter:ARMing:MODE**?

Example: `Send(0,5,":PCIX:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :PCIX:PARAMeter:ARMing:SLOPe**<FALL|RISE>

Example: `Send(0,5,":PCIX:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :PCIX:PARAMeter:ARMing:SLOPe**?

Example: `Send(0,5,":PCIX:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :PCIX:PARAMeter:ARMing:VOLTage**<-2 to 2>

Example: `Send(0,5,":PCIX:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :PCIX:PARAMeter:ARMing:VOLTage**?

Example: `Send(0,5,":PCIX:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :PCIX:PARAMeter:CHANnel**<n&m>

Example: `Send(0,5,":PCIX:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :PCIX:PARAMeter:CHANnel**?

Example: `Send(0,5,":PCIX:PARAM:CHAN?",17,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

**Command syntax- :PCIX:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":PCIX:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :PCIX:PARAMeter:SAMPles?**

Example: `Send(0,5,":PCIX:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the data channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :PCIX:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":PCIX:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :PCIX:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":PCIX:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the clock channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected clock channel user voltage.

**Command syntax- :PCIX:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":PCIX:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :PCIX:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":PCIX:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :PCIX:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":PCIX:PARAM:THR 5050",20,EOI);`

**Query syntax- :PCIX:PARAMeter:THReshold?**

Example: `Send(0,5,":PCIX:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :PCIX:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":PCIX:PARAM:TIME 10",19,EOI);`

**Query syntax- :PCIX:PARAMeter:TIMEout?**

Example: `Send(0,5,":PCIX:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PATTERN

The **PATTERN** command selects the current pattern file to be used. The specified pattern file must exist on the SIA3000.

The **PATTERN** query returns the currently selected pattern file.

**Command syntax- :PCIX:PATTern<filename>**

Example: `Send(0,5,":PCIX:PATT K285.PTN",19,EOI);`

**Query syntax- :PCIX:PATTern?**

Example: `Send(0,5,":PCIX:PATT?",11,EOI);`
Response: <ASCII string>
Example: CJTPAT.PTN

- ## PLOTDATA:BATHTUB

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIX:PLOTDATA:BATHtub?**

Example: `Send(0,5,":PCIX:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:HISTOGRAM**

The **PLOTDATA:HISTOGRAM** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIX:PLOTDATA:HIST**ogram?

Example: `Send(0,5,":PCIX:PLOTDATA:HIST?",20,EOI);`
Response: #xy…ddddddd…

- **PLOTDATA:SCOPE-**

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIX:PLOTDATA:SCOPE-**?

Example: `Send(0,5,":PCIX:PLOTDATA:SCOPE-?",22,EOI);`
Response: #xy…ddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCIX:PLOTDATA:SCOPE+**?

Example: `Send(0,5,":PCIX:PLOTDATA:SCOPE+?",22,EOI);`
Response: #xy…ddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :PCIX:PLOTINFO:BATH**tub?

Example: `Send(0,5,":PCIX:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:HISTOGRAM**

The **PLOTINFO:HISTOGRAM** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :PCIX:PLOTINFO:HIST**ogram?

Example: `Send(0,5,":PCIX:PLOTINFO:HIST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIMENTARY SCOPE INPUT plot.

**Query syntax- :PCIX:PLOTINFO:SCOPE-**?

Example: `Send(0,5,":PCIX:PLOTINFO:SCOPE-?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE+**

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :PCIX:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":PCIX:PLOTINFO:SCOPE+?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCIX:RJ?**

Example: `Send(0,5,":PCIX:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **SCOPE:FALL-**

The **SCOPE:FALL-** query returns the negative differential input fall time in seconds.

**Query syntax- :PCIX:SCOPE:FALL-?**

Example: `Send(0,5,":PCIX:SCOPE:FALL-?",18,EOI);`
Response: <ASCII floating point>
Example: 5.678273e-011

- **SCOPE:FALL+**

The **SCOPE:FALL+** query returns the positive differential input fall time in seconds.

**Query syntax- :PCIX:SCOPE:FALL+?**

Example: `Send(0,5,":PCIX:SCOPE:FALL+?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266798e-011

- **SCOPE:RISE-**

The **SCOPE:RISE-** query returns the negative differential input rise time in seconds.

**Query syntax- :PCIX:SCOPE:RISE-?**

Example: `Send(0,5,":PCIX:SCOPE:RISE-?",18,EOI);`
Response: <ASCII floating point>
Example: 5.169737e-011

- **SCOPE:RISE+**

The **SCOPE:RISE+** query returns the positive differential input rise time in seconds.

**Query syntax- :PCIX:SCOPE:RISE+?**

Example: `Send(0,5,":PCIX:SCOPE:RISE+?",18,EOI);`
Response: <ASCII floating point>
Example: 5.266788e-011

- ## SCOPE:VDIFF

The **SCOPE:VDIFF** query returns V?X-DIFFp-p, the Differential Peak to Peak Output Voltage.

**Query syntax- :PCIX:SCOPE:VDIFF**?

Example: `Send(0,5,":PCIX:SCOPE:VDIFF?",18,EOI);`
Response: <ASCII floating point>
Example: 1.327696e-001

- ## SCOPE:VDRATIO

The **SCOPE:VDRATIO** query returns VtxDeRatio in dB's. This is the ratio of the amplitude of the emphasized and the non-emphasized edges in the pattern. It is only valid when measuring the TX-SPEC mode.

**Query syntax- :PCIX:SCOPE:VDRATIO**?

Example: `Send(0,5,":PCIX:SCOPE:VDRATIO?",20,EOI);`
Response: <ASCII floating point>
Example: -3.327696e-000

- ## TAILFIT:COMPLETE

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :PCIX:TAIL**fit**:COMP**lete?

Example: `Send(0,5,":PCIX:TAIL:COMP?",16,EOI);`
Response: <0|1>

- ## TOPENEYE

The **TOPENEYE** query returns T?X-EYE, the Minimum TX Eye Width.

**Query syntax- :PCIX:TOPEN**eye?

Example: `Send(0,5,":PCIX:TOPEN?",12,EOI);`
Response: <ASCII floating point>
Example: 3.637e-010

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## • DESCRIPTION OF THE PCI EXPRESS CLOCK ANALYSIS COMMANDS

The **PCLK** commands are used to obtain results using the PCI Express Clock Analysis Tool. This tool requires a data signal and a pattern marker. If your system has a PM-50 Card installed, you can use it to obtain a pattern marker.

**:PCLK:**<command syntax>

| | | |
|---|---|---|
| **ACC**uracy | **PARAM**eter**:SAMP**les | **PLOTINFO:BPFDCDISI** |
| **ACQ**uire | **PARAM**eter**:STAR**t**:VOLT**age | **PLOTINFO:DCDISI** |
| **ARMFIND** | **PARAM**eter**:STOP:VOLT**age | **PLOTINFO:FALL** |
| **ATTEN**uation | **PARAM**eter**:THR**eshold | **PLOTINFO:FFT** |
| **CYCL**etocycle | **PARAM**eter**:TIME**out | **PLOTINFO:RISE** |
| **DDJ** | **PHASE**jitter**:10E-12** | **PLOTINFO:SCOPE-** |
| **DEF**ault | **PHASE**jitter**:10E-6** | **PLOTINFO:SCOPE+** |
| **DJ** | **PJ** | **PLOTINFO:SCOPEDIFF** |
| **DUTY**cycle | **PLOTDATA:BATH**tub | **PLOTINFO:SIGM**a |
| **EDGE** | **PLOTDATA:BPFDCDISI** | **RJ** |
| **MAXPER**iod | **PLOTDATA:DCDISI** | **SCOPE:ABSVMAX** |
| **MINPER**iod | **PLOTDATA:FALL** | **SCOPE:ABSVMIN** |
| **PARAM**eter**:ARM**ing**:CHAN**nel | **PLOTDATA:FFT** | **SCOPE:DIFFHI**gh |
| **PARAM**eter**:ARM**ing**:DEL**ay | **PLOTDATA:RISE** | **SCOPE:DIFFLO**w |
| **PARAM**eter**:ARM**ing**:MARK**er | **PLOTDATA:SCOPE-** | **SCOPE:FALL**rate |
| **PARAM**eter**:ARM**ing**:MODE** | **PLOTDATA:SCOPE+** | **SCOPE:MATCH**risefall |
| **PARAM**eter**:ARM**ing**:SLOP**e | **PLOTDATA:SCOPEDIFF** | **SCOPE:RISE**rate |
| **PARAM**eter**:ARM**ing**:VOLT**age | **PLOTDATA:SIGM**a | **SPIKE**s |
| **PARAM**eter**:CHAN**nel | **PLOTINFO:BATH**tub | |

## • ACCURACY

The **ACCURACY** query returns the accuracy of the clock period from the previous acquire measured in Parts Per Million.

**Query syntax- :PCLK:ACC**uracy?

Example: `Send(0,5,":PCLK:ACC?",10,EOI);`
Response: <ASCII floating point>
Example: 3.156e+003

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new PCI Express 1.1 Clock Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :PCLK:ACQ**uire

Example: `Send(0,5,":PCLK:ACQ;*OPC",9,EOI);`

- **ARMFIND**

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. This command performs an optimization and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :PCLK:ARMFIND**

Example: `Send(0,5,":PCLK:ARMFIND",14,EOI);`
Response: <ASCII integer>
Example: -16

- **ATTENUATION**

The **ATTENUATION** query returns the attenuation value in dB's that was specified for the previous acquisition. The attenuation value is set using the :GLOBal:CHANnel:ATTENuation command.

**Query syntax- :EXPR:ATTEN**uation?

Example: `Send(0,5,":EXPR:ATTEN?",12,EOI);`
Response: <ASCII floating point>
Example: 3.0000e+000

- **CYCLETOCYCLE**

The **CYCLETOCYCLE** query returns the Cycle-To-Cycle period variation measured on the last acquisition.

**Query syntax- :PCLK:CYCL**etocycle?

Example: `Send(0,5,":PCLK:CYCL?",11,EOI);`
Response: <ASCII floating point>
Example: 3.785e-012

- **DDJ**

The **DDJ** query returns the Data Dependant Jitter associated with the previous measurement.

**Query syntax- :PCLK:DDJ**?

Example: `Send(0,5,":PCLK:DDJ?",10,EOI);`
Response: <ASCII floating point>
Example: 31.567e-012

- **DEFAULT**

The **DEFAULT** command is used to reset all the PCI EXPRESS CLOCK Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :PCLK:DEF**ault

Example: `Send(0,5,":PCLK:DEF",9,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter measured on the last acquisition.

**Query syntax- :PCLK:DJ**?

Example: `Send(0,5,":PCLK:DJ?",11,EOI);`
Response: <ASCII floating point>
Example: 21.357e-12

- **DUTYCYCLE**

The **DUTYCYCLE** query returns the duty cycle obtained for the previous acquisition.

**Query syntax- :PCLK:DUTY**cycle?

Example: `Send(0,5,":PCLK:DUTY?",11,EOI);`
Response: <ASCII floating point>
Example: 5.036e001

- **EDGE**

The **EDGE** command selects whether the rising or falling edge is used for measurements.

The **EDGE** query returns the currently selected measurement edge.

**Command syntax- :PCLK:EDGE** <FALL|RISE>

Example: `Send(0,5,":PCLK:EDGE FALL",15,EOI);`

**Query syntax- :PCLK:EDGE**?

Example: `Send(0,5,":PCLK:EDGE?",11,EOI);`
Response: <RISE|FALL>

- **MAXPERIOD**

The **MAXPERIOD** query returns the maximum period obtained from the previous acquisition.

**Query syntax- :PCLK:MAXPER**iod?

Example: `Send(0,5,":PCLK:MAXPER?",13,EOI);`
Response: <ASCII floating point>
Example: 1.036e-008

- **MINPERIOD**

The **MINPERIOD** query returns the minimum period obtained from the previous acquisition.

**Query syntax- :PCLK:MINPER**iod?

Example: `Send(0,5,":PCLK:MINPER?",13,EOI);`
Response: <ASCII floating point>
Example: 9.99036e-009

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :PCLK:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":PCLK:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :PCLK:PARAM**eter**:ARM**ing**:CHAN**nel?

Example: `Send(0,5,":PCLK:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :PCLK:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":PCLK:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :PCLK:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":PCLK:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :PCLK:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":PCLK:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :PCLK:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":PCLK:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :PCLK:PARAMeter:ARMing:MODE<EXTERNAL|START|STOP>**

Example: `Send(0,5,":PCLK:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :PCLK:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":PCLK:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :PCLK:PARAMeter:ARMing:SLOPe<FALL|RISE>**

Example: `Send(0,5,":PCLK:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :PCLK:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":PCLK:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :PCLK:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":PCLK:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :PCLK:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":PCLK:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :PCLK:PARAMeter:CHANnel<n&m>**

Example: `Send(0,5,":PCLK:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :PCLK:PARAMeter:CHANnel?**

Example: `Send(0,5,":PCLK:PARAM:CHAN?",17,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each data edge in the pattern every time the ACQUIRE command is issued.

**Command syntax- :PCLK:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":PCLK:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :PCLK:PARAMeter:SAMPles?**

Example: `Send(0,5,":PCLK:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the data channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :PCLK:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":PCLK:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :PCLK:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":PCLK:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the clock channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected clock channel user voltage.

**Command syntax- :PCLK:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":PCLK:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :PCLK:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":PCLK:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

 

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :PCLK:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":PCLK:PARAM:THR 5050",20,EOI);`

**Query syntax- :PCLK:PARAMeter:THReshold?**

Example: `Send(0,5,":PCLK:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :PCLK:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":PCLK:PARAM:TIME 10",19,EOI);`

**Query syntax- :PCLK:PARAMeter:TIMEout?**

Example: `Send(0,5,":PCLK:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PHASEJITTER:10E-12

The **PHASEJITTER:10E-12** query returns the Phase Jitter obtained from the previous acquisition at a Bit Error Rate of 10e-12. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCLK:PHASEjitter:10E-12?**

Example: `Send(0,5,":PCLK:PHASE:10E-12?",19,EOI);`
Response: <ASCII floating point>
Example: 21.156387e-12

- ## PHASEJITTER:10E-6

The **PHASEJITTER:10E-6** query returns the Phase Jitter obtained from the previous acquisition at a Bit Error Rate of 10e-6. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCLK:PHASEjitter:10E-6?**

Example: `Send(0,5,":PCLK:PHASE:10E-6?",18,EOI);`
Response: <ASCII floating point>
Example: 20.3162387e-12

- **PJ**

The **PJ** query returns the Periodic Jitter obtained from the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCLK:PJ?**

Example: `Send(0,5,":PCLK:PJ?",10,EOI);`
Response: <ASCII floating point>
Example: 20.3162387e-12

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:BATH**tub?

Example: `Send(0,5,":PCLK:PLOTDATA:BATH?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:BPFDCDISI**

The **PLOTDATA:BPFDCDISI** query returns the plot data associated with the BAND PASS FILTERED DCD+ISI VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:BPFDCDISI?**

Example: `Send(0,5,":PCLK:PLOTDATA:BPFDCDISI?",25,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:DCDISI**

The **PLOTDATA:DCDISI** query returns the plot data associated with the DCD+ISI VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:DCDISI?**

Example: `Send(0,5,":PCLK:PLOTDATA:DCDISI?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:FALL**

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:FALL?**

Example: `Send(0,5,":PCLK:PLOTDATA:FALL?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:FFT**

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:FFT?**

Example: `Send(0,5,":PCLK:PLOTDATA:FFT?",19,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:RISE**

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:RISE**?

Example: `Send(0,5,":PCLK:PLOTDATA:RISE?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SCOPE-**

The **PLOTDATA:SCOPE-** query returns the plot data associated with the COMPLIMENTARY SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:SCOPE-**?

Example: `Send(0,5,":PCLK:PLOTDATA:SCOPE-?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SCOPE+**

The **PLOTDATA:SCOPE+** query returns the plot data associated with the NORMAL SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:SCOPE+**?

Example: `Send(0,5,":PCLK:PLOTDATA:SCOPE+?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SCOPEDIFF**

The **PLOTDATA:SCOPEDIFF** query returns the plot data associated with the DIFFERENTIAL MODE SCOPE INPUT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:SCOPEDIFF**?

Example: `Send(0,5,":PCLK:PLOTDATA:SCOPEDIFF?",25,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PCLK:PLOTDATA:SIGM**a?

Example: `Send(0,5,":PCLK:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :PCLK:PLOTINFO:BATH**tub?

Example: `Send(0,5,":PCLK:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISI**

The **PLOTINFO:DCDISI** query returns the plot information associated with the DCD+ISI VS SPAN plot.

**Query syntax- :PCLK:PLOTINFO:DCDISI**?

Example: `Send(0,5,":PCLK:PLOTINFO:DCDISI?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALL**

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :PCLK:PLOTINFO:FALL**?

Example: `Send(0,5,":PCLK:PLOTINFO:FALL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :PCLK:PLOTINFO:FFT**?

Example: `Send(0,5,":PCLK:PLOTINFO:FFT?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:HPFDCDISI**

The **PLOTINFO:HPFDCDISI** query returns the plot information associated with the BAND PASS FILTERED DCD+ISI VS SPAN plot.

**Query syntax- :PCLK:PLOTINFO:HPFDCDISI**?

Example: `Send(0,5,":PCLK:PLOTINFO:HPFDCDISI?",25,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :PCLK:PLOTINFO:RISE**?

Example: `Send(0,5,":PCLK:PLOTINFO:RISE?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SCOPE-**

The **PLOTINFO:SCOPE-** query returns the plot information associated with the COMPLIMENTARY SCOPE INPUT plot.

**Query syntax- :PCLK:PLOTINFO:SCOPE-**?

Example: `Send(0,5,":PCLK:PLOTINFO:SCOPE-?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:SCOPE+

The **PLOTINFO:SCOPE+** query returns the plot information associated with the NORMAL SCOPE INPUT plot.

**Query syntax- :PCLK:PLOTINFO:SCOPE+?**

Example: `Send(0,5,":PCLK:PLOTINFO:SCOPE+?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:SCOPEDIFF

The **PLOTINFO:SCOPEDIFF** query returns the plot information associated with the DIFFERENTIAL MODE SCOPE INPUT plot.

**Query syntax- :PCLK:PLOTINFO:SCOPEDIFF?**

Example: `Send(0,5,":PCLK:PLOTINFO:SCOPEDIFF?",25,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:SIGMA

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :PCLK:PLOTINFO:SIGM**a?

Example: `Send(0,5,":PCLK:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## RJ

The **RJ** query returns the Random Jitter obtained from the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :PCLK:RJ?**

Example: `Send(0,5,":PCLK:RJ?",10,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- ## SCOPE:ABSVMAX

The **SCOPE:ABSVMAX** query returns the maximum single ended voltage from the previous acquisition.

**Query syntax- :PCLK:SCOPE:ABSVMAX?**

Example: `Send(0,5,":PCLK:SCOPE:ABSVMAX?",20,EOI);`
Response: <ASCII floating point>
Example: 3.164e-001

- ## SCOPE:ABSVMIN

The **SCOPE:ABSVMIN** query returns the maximum single ended voltage from the previous acquisition.

**Query syntax- :PCLK:SCOPE:ABSVMIN?**

Example: `Send(0,5,":PCLK:SCOPE:ABSVMIN?",20,EOI);`
Response: <ASCII floating point>
Example: -3.589e-001

- **SCOPE:DIFFHIGH**

The **SCOPE:DIFFHIGH** query returns the high differential voltage from the previous acquisition.

**Query syntax- :PCLK:SCOPE:DIFFHI**gh?

Example: `Send(0,5,":PCLK:SCOPE:DIFFHI?",19,EOI);`
Response: <ASCII floating point>
Example: 3.164e-001

- **SCOPE:DIFFLOW**

The **SCOPE:DIFFLOW** query returns the low differential voltage from the previous acquisition.

**Query syntax- :PCLK:SCOPE:DIFFLO**w?

Example: `Send(0,5,":PCLK:SCOPE:DIFFLO?",19,EOI);`
Response: <ASCII floating point>
Example: -3.589e-001

- **SCOPE:FALLRATE**

The **SCOPE:FALLRATE** query returns the falling edge rate from the previous acquisition in Volt/ns.

**Query syntax- :PCLK:SCOPE:FALL**rate?

Example: `Send(0,5,":PCLK:SCOPE:FALL?",17,EOI);`
Response: <ASCII floating point>
Example: 4.688e-001

- **SCOPE:MATCHRISEFALL**

The **SCOPE:MATCHRISEFALL** query returns the percent difference between the rising and falling edge rates from the previous acquisition.

**Query syntax- :PCLK:SCOPE:MATCH**risefall?

Example: `Send(0,5,":PCLK:SCOPE:MATCH?",18,EOI);`
Response: <ASCII floating point>
Example: 2.671e+000

- **SCOPE:RISERATE**

The **SCOPE:RISERATE** query returns the rising edge rate from the previous acquisition in Volt/ns.

**Query syntax- :PCLK:SCOPE:RISE**rate?

Example: `Send(0,5,":PCLK:SCOPE:RISE?",17,EOI);`
Response: <ASCII floating point>
Example: 5.994e-001

- **SPIKES**

The **SPIKES** query returns the spike list of the FFT plot. This query returns the count of returned spikes followed by the spikes themselves. The spikes each consist of a magnitude and a frequency separated by the '/' character.

**Query syntax- :PCLK:SPIKES**?

Example: `Send(0,5,":PCLK:SPIKES?",12,EOI);`
Response: <Spikes> <Mag1/Freq1> <Mag2/Freq2> <Mag3/Freq3> …
Example: 3 2.956e-12/2.003e8 1.803e-12/1.556e8 1.193e-12/2.501e8

 

## • DESCRIPTION OF THE PHASE NOISE COMMANDS

The **PHASE** commands are used to measure phase noise in clock/oscillator sources. By simply choosing the highest frequency to be displayed and the frequency resolution, these commands will measure and display the phase noise spectrum. It also reports the phase noise values at common offset frequencies.

**:PHASE**:<command syntax>

**ACQ**uire
**AVER**ages
**CAR**rierfreq
**DEC**ade**:10**
**DEC**ade**:100**
**DEC**ade**:10K**
**DEC**ade**:1K**
**DEC**ade**:FMAX**
**DEF**ault
**FFT:ALPH**afactor
**FFT:MULT**iplier
**FFT:WIND**owtype
**FREQRES**
**MAXFREQ**
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:FUNC**tion
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:COUN**t
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:COUN**t
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PLOTDATA:FFT**
**PLOTDATA:PHAS**e
**PLOTDATA:TIME**
**PLOTINFO:FFT**
**PLOTINFO:PHAS**e
**PLOTINFO:TIME**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Phase Noise Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :PHASE:ACQ**uire

Example: `Send(0,5,":PHASE:ACQ",10,EOI);`

## • AVERAGES

The **AVERAGES** command selects the number of passes to average the output. Averaging will reduce the noise on the signal when multiple passes are acquired.

The **AVERAGES** query returns the number of currently selected averaging passes.

**Command syntax- :PHASE:AVER**ages<1|2|4|8|16|32>

Example: `Send(0,5,":PHASE:AVER 0",13,EOI);`

**Query syntax- :PHASE:AVER**ages?

Example: `Send(0,5,":PHASE:AVER?",12,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- **CARRIERFREQ**

The **CARRIERFREQ** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :PHASE:CAR**rierfreq?

Example: `Send(0,5,":PHASE:CAR?",11,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- **DECADE:10**

The **DECADE:10** query returns the phase noise in dBc/Hz at an offset frequency of 10Hz.

**Query syntax- :PHASE:DEC**ade**:10**?

Example: `Send(0,5,":PHASE:DEC:10?",14,EOI);`
Response: <ASCII floating point>
Example: -2.956892e+001

- **DECADE:100**

The **DECADE:100** query returns the phase noise in dBc/Hz at an offset frequency of 100Hz.

**Query syntax- :PHASE:DEC**ade**:100**?

Example: `Send(0,5,":PHASE:DEC:100?",15,EOI);`
Response: <ASCII floating point>
Example: -2.956892e+001

- **DECADE:10K**

The **DECADE:10K** query returns the phase noise in dBc/Hz at an offset frequency of 10kHz.

**Query syntax- :PHASE:DEC**ade**:10K**?

Example: `Send(0,5,":PHASE:DEC:10K?",15,EOI);`
Response: <ASCII floating point>
Example: -2.956892e+001

- **DECADE:1K**

The **DECADE:1K** query returns the phase noise in dBc/Hz at an offset frequency of 1kHz.

**Query syntax- :PHASE:DEC**ade**:1K**?

Example: `Send(0,5,":PHASE:DEC:1K?",14,EOI);`
Response: <ASCII floating point>
Example: -2.956892e+001

- **DECADE:FMAX**

The **DECADE:FMAX** query returns the phase noise in dBc/Hz at the maximum offset frequency available.

**Query syntax- :PHASE:DEC**ade**:FMAX**?

Example: `Send(0,5,":PHASE:DEC:FMAX?",16,EOI);`
Response: <ASCII floating point>
Example: -2.956892e+001

- **DEFAULT**

The **DEFAULT** command is used to reset all the Phase Noise Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :PHASE:DEF**ault

Example: `Send(0,5,":PHASE:DEF",10,EOI);`

- **FFT:ALPHAFACTOR**

The **FFT:ALPHAFACTOR** command is used to vary the sidelobe rejection of the Kaiser-Bessel window. As the Alpha Factor increases, the spectral peak widens and the sidelobes shrink. As the Alpha Factor decreases, the spectral peak narrows and the sidelobes increase in amplitude.

The **FFT:ALPHAFACTOR** query returns the currently selected Kaiser-Bessel Alpha factor.

**Command syntax- :PHASE:FFT:ALPH**afactor<2 to 100>

Example: `Send(0,5,":PHASE:FFT:ALPH 2",17,EOI);`

**Query syntax- :PHASE:FFT:ALPH**afactor?

Example: `Send(0,5,":PHASE:FFT:ALPH?",16,EOI);`
Response: <ASCII floating point>
Example: 1.000e+002

- **FFT:MULTIPLIER**

The **FFT:MULTIPLIER** command selects the amount of zero padding to be applied to the measured data prior to the FFT being applied. Padding increases the frequency resolution of the FFT. Generally, a higher padding value will increase transformation processing time.

The **FFT:MULTIPLIER** query returns the currently selected multiplier value.

**Command syntax- :PHASE:FFT:MULT**iplier<1|2|4|8|16|32>

Example: `Send(0,5,":PHASE:FFT:MULT 1",17,EOI);`

**Query syntax- :PHASE:FFT:MULT**iplier?

Example: `Send(0,5,":PHASE:FFT:MULT?",16,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- **FFT:WINDOWTYPE**

The **FFT:WINDOWTYPE** command selects the window type used to reduce the spectral information distortion of an FFT. The time domain signal is multiplied by a window weighting function before the transform is performed. The choice of window will determine which spectral components will be isolated, or separated, from the dominant frequency(s).

The **FFT:WINDOWTYPE** query returns the currently selected window type.

**Command syntax- :PHASE:FFT:WIND**owtype<RECTANGULAR|KAISER-BESSEL|TRIANGULAR|HAMMING|HANNING|BLACKMAN|GAUSSIAN>

Example: `Send(0,5,":PHASE:FFT:WIND RECTANGULAR",27,EOI);`

**Query syntax- :PHASE:FFT:WIND**owtype?

Example: `Send(0,5,":PHASE:FFT:WIND?",16,EOI);`
Response: <RECTANGULAR|KAISER-BESSEL|TRIANGULAR|
HAMMING|HANNING|BLACKMAN|GAUSSIAN>
Example: RECTANGULAR

- ## FREQRES

The **FREQRES** command sets the frequency resolution. This determines the number of data points displayed in the spectrum plot. The minimum number of data points required to generate a plot is 1000. Thus the frequency resolution must be less than 2000 times the maximum frequency. A small value for the frequency resolution will increase the measurement time.

The **FREQRES** query returns currently selected frequency resolution in Hertz.

**Command syntax- :PHASE:FREQRES**<0.05 to 10.0>

Example: `Send(0,5,":PHASE:FREQRES 1.0",16,EOI);`

**Query syntax- :PHASE:FREQRES**?

Example: `Send(0,5,":PHASE:FREQRES?",15,EOI);`
Response: <ASCII floating point>
Example: 2.000000e+000

- ## MAXFREQ

The **MAXFREQ** command determines the maximum frequency of the FFT plot or indirectly the time between measurements in the time domain. Decreasing the Maximum Frequency increases the time between measurements allowing lower jitter frequencies to be captured. The allowed values are between 100Hz and 10kHz.

The **MAXFREQ** query returns the currently selected maximum frequency, units are in Hertz.

**Command syntax- :PHASE:MAXFREQ**<100.0 to 10000.0>

Example: `Send(0,5,":PHASE:MAXFREQ 0",16,EOI);`

**Query syntax- :PHASE:MAXFREQ**?

Example: `Send(0,5,":PHASE:MAXFREQ?",15,EOI);`
Response: <ASCII floating point>
Example: 1.000000e+002

- ## PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :PHASE:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":PHASE:PARAM:ARM:CHAN 1",23,EOI);`

**Query syntax- :PHASE:PARAM**eter**:ARM**ing**:CHAN**nel?

Example: `Send(0,5,":PHASE:PARAM:ARM:CHAN?",22,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :PHASE:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":PHASE:PARAM:ARM:DEL -40",24,EOI);`

**Query syntax- :PHASE:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":PHASE:PARAM:ARM:DEL?",21,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :PHASE:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":PHASE:PARAM:ARM:MARK OFF",25,EOI);`

**Query syntax- :PHASE:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":PHASE:PARAM:ARM:MARK?",22,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :PHASE:PARAMeter:ARMing:MODE<EXTERNAL|START|STOP>**

Example: `Send(0,5,":PHASE:PARAM:ARM:MODE EXTERNAL",30,EOI);`

**Query syntax- :PHASE:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":PHASE:PARAM:ARM:MODE?",22,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :PHASE:PARAMeter:ARMing:SLOPe<FALL|RISE>**

Example: `Send(0,5,":PHASE:PARAM:ARM:SLOP FALL",26,EOI);`

**Query syntax- :PHASE:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":PHASE:PARAM:ARM:SLOP?",22,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :PHASE:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":PHASE:PARAM:ARM:VOLT -2",24,EOI);`

**Query syntax- :PHASE:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":PHASE:PARAM:ARM:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :PHASE:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":PHASE:PARAM:CHAN4",18,EOI);`

**Query syntax- :PHASE:PARAMeter:CHANnel?**

Example: `Send(0,5,":PHASE:PARAM:CHAN?",18,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :PHASE:PARAMeter:FUNCtion<PW+|PW-|PER+|PER->**

Example: `Send(0,5,":PHASE:PARAM:FUNC PER+",23,EOI);`

**Query syntax- :PHASE:PARAMeter:FUNCtion?**

Example: `Send(0,5,":PHASE:PARAM:FUNC?",18,EOI);`
Response: <PW+|PW-|PER+|PER->

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :PHASE:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":PHASE:PARAM:SAMP 1000",19,EOI);`

**Query syntax- :PHASE:PARAMeter:SAMPles?**

Example: `Send(0,5,":PHASE:PARAM:SAMP?",18,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :PHASE:PARAMeter:STARt:COUNt<1 to 10000000>**

Example: `Send(0,5,":PHASE:PARAM:STAR:COUN 1",24,EOI);`

**Query syntax- :PHASE:PARAMeter:STARt:COUNt?**

Example: `Send(0,5,":PHASE:PARAM:STAR:COUN?",23,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :PHASE:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":PHASE:PARAM:STAR:VOLT -2",25,EOI);`

**Query syntax- :PHASE:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":PHASE:PARAM:STAR:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :PHASE:PARAMeter:STOP:COUNt<1 to 10000000>**

Example: `Send(0,5,":PHASE:PARAM:STOP:COUN 1",24,EOI);`

**Query syntax- :PHASE:PARAMeter:STOP:COUNt?**

Example: `Send(0,5,":PHASE:PARAM:STOP:COUN?",23,EOI);`
Response: <ASCII integer>
Example: 2

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :PHASE:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":PHASE:PARAM:STOP:VOLT -2",25,EOI);`

**Query syntax- :PHASE:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":PHASE:PARAM:STOP:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :PHASE:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":PHASE:PARAM:THR 5050",21,EOI);`

**Query syntax- :PHASE:PARAMeter:THReshold?**

Example: `Send(0,5,":PHASE:PARAM:THR?",17,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :PHASE:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":PHASE:PARAM:TIME 10",22,EOI);`

**Query syntax- :PHASE:PARAMeter:TIMEout?**

Example: `Send(0,5,":PHASE:PARAM:TIME?",18,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PLOTDATA:FFT**

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PHASE:PLOTDATA:FFT?**

Example: `Send(0,5,":PHASE:PLOTDATA:FFT?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:PHASE**

The **PLOTDATA:PHASE** query returns the plot data associated with the PHASE NOISE VS FREQUENCY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PHASE:PLOTDATA:PHASe?**

Example: `Send(0,5,":PHASE:PLOTDATA:PHAS?",21,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:TIME**

The **PLOTDATA:TIME** query returns the plot data associated with the MEASEUREMENT VS DELAY plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PHASE:PLOTDATA:TIME?**

Example: `Send(0,5,":PHASE:PLOTDATA:TIME?",21,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :PHASE:PLOTINFO:FFT?**

Example: `Send(0,5,":PHASE:PLOTINFO:FFT?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:PHASE**

The **PLOTINFO:PHASE** query returns the plot information associated with the PHASE NOISE VS FREQUENCY plot.

**Query syntax- :PHASE:PLOTINFO:PHASE?**

Example: `Send(0,5,":PHASE:PLOTINFO:PHAS?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TIME**

The **PLOTINFO:TIME** query returns the plot information associated with the MEASUREMENT VS DELAY plot.

**Query syntax- :PHASE:PLOTINFO:TIME?**

Example: `Send(0,5,":PHASE:PLOTINFO:TIME?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

## • DESCRIPTION OF THE PLL ANALYSIS COMMANDS

The **PLL** commands are used to study the characteristics and parameters of a 2nd-order PLL. With a simple set of variance measurements, the tool can extract information such as damping factor, natural frequency, input noise level, lock range, lock-in time, pull-in time, pull-out range and noise bandwidth. The tool also presents a transfer function and Bode plots up to the natural frequency, as well as a plot of the poles and zero for a 2nd-order PLL.

**:PLL:**<command syntax>

**ACQ**uire
**CAR**rierfreq
**CHISQ**uare
**DAMPFACT**
**DEF**ault
**INIT**ial**:CALC**
**INIT**ial**:DAMPFACT**
**INIT**ial**:NATFREQ**
**INIT**ial**:OFF**setfreq
**INIT**ial**:PSD**
**LOCKIN**time
**LOCKRANG**e
**MAXSTD**dev
**MINSTD**dev
**NATFREQ**
**NOISE**bw
**OPT**imize
**P1IMAG**
**P1REAL**
**P2IMAG**
**P2REAL**
**PARAM**eter**:ARM**ing**:CHAN**nel
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:ARM**ing**:MODE**
**PARAM**eter**:ARM**ing**:SLOP**e
**PARAM**eter**:ARM**ing**:VOLT**age
**PARAM**eter**:CHAN**nel
**PARAM**eter**:FUNC**tion
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PKTOPKSTD**dev
**PLOTDATA:BODEMAG**nitude
**PLOTDATA:BODEPHAS**e
**PLOTDATA:INIT**ial
**PLOTDATA:SIGM**a
**PLOTDATA:TRANS**fer
**PLOTDATA:VAR**iance
**PLOTINFO:BODEMAG**nitude
**PLOTINFO:BODEPHAS**e
**PLOTINFO:INIT**ial
**PLOTINFO:SIGM**a
**PLOTINFO:TRANS**fer
**PLOTINFO:VAR**iance
**PSD**
**PULLIN**time
**PULLOUT**range
**RECLEN**gth**:CORN**erfreq
**RECLEN**gth**:STOPMAX**
**RECLEN**gth**:TIM**e
**RECLEN**gth**:UNI**t
**STD**dev
**STOPINC**
**ZIMAG**
**ZREAL**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new PLL Analysis Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :PLL:ACQ**uire

Example: `Send(0,5,":PLL:ACQ",8,EOI);`

## • CARRIERFREQ

The **CARRIERFREQ** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :PLL:CAR**rierfreq?

Example: `Send(0,5,":PLL:CAR?",9,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- ## CHISQUARE

The **CHISQUARE** query returns the $\chi 2$ measure of goodness-of-fit, relating the theoretical curve fit to the 1-SIGMA VS SPAN plot. A value less than 2 is normally considered to be a "good" fit.

**Query syntax- :PLL:CHISQ**uare?

Example: `Send(0,5,":PLL:CHISQ?",11,EOI);`
Response: <ASCII floating point>
Example: 1.764291e+000

- ## DAMPFACT

The **DAMPFACT** query returns the damping factor that was determined by the curve fit. This is a unitless value.

**Query syntax- :PLL:DAMPFACT**?

Example: `Send(0,5,":PLL:DAMPFACT?",14,EOI);`
Response: <ASCII floating point>
Example: 1.997491e-001

- ## DEFAULT

The **DEFAULT** command is used to reset all the PLL Analysis Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :PLL:DEF**ault

Example: `Send(0,5,":PLL:DEF",8,EOI);`

- ## INITIAL:CALC

The **INITIAL:CALC** command selects whether or not the initial conditions should be automatically determined by the software. The default is to automatically calculate the initial conditions. If you disable this calculation, you will be responsible for supplying reasonable initial estimates of the damping factor, natural frequency, and power spectral density.

The **INITIAL:CALC** query returns whether or not initial conditions are automatically calculated by the software.

**Command syntax- :PLL:INIT**ial**:CALC**<OFF|ON>

Example: `Send(0,5,":PLL:INIT:CALC OFF",18,EOI);`

**Query syntax- :PLL:INIT**ial**:CALC**?

Example: `Send(0,5,":PLL:INIT:CALC?",15,EOI);`
Response: <OFF|ON>
Example: ON

- ## INITIAL:DAMPFACT

The **INITIAL:DAMPFACT** command selects the initial guess of the damping factor. This is only used if the **INITIAL:CALC** command has been set to **OFF.**

The **INITIAL:DAMPFACT** query returns the currently selected intial guess of the damping factor.

**Command syntax- :PLL:INIT**ial**:DAMPFACT**<0.001 to 10>

Example: `Send(0,5,":PLL:INIT:DAMPFACT 0.001",24,EOI);`

**Query syntax- :PLL:INIT**ial**:DAMPFACT**?

Example: `Send(0,5,":PLL:INIT:DAMPFACT?",19,EOI);`
Response: <ASCII floating point>
Example: 1.997491e-001

- **INITIAL:NATFREQ**

The **INITIAL:NATFREQ** command selects the initial guess of the natural frequency. This is only used if the **INITIAL:CALC** command has been set to **OFF**.

The **INITIAL:NATFREQ** query returns the currently selected intial guess of the natural frequency.

**Command syntax- :PLL:INIT**ial**:NATFREQ**<10 to 1e+010>

Example: `Send(0,5,":PLL:INIT:NATFREQ 10",20,EOI);`

**Query syntax- :PLL:INIT**ial**:NATFREQ**?

Example: `Send(0,5,":PLL:INIT:NATFREQ?",18,EOI);`
Response: <ASCII floating point>
Example: 3.019691e+005

- **INITIAL:OFFSETFREQ**

The **INITIAL:OFFSETFREQ** command selects the initial offset frequency $\Delta\omega_o$. This value is used in the calculation of the Pull-In time.

The **INITIAL:OFFSETFREQ** query returns the currently selected initial offset frequency $\Delta\omega_o$ in units of Hertz.

**Command syntax- :PLL:INIT**ial**:OFF**setfreq<0 to 1e+007>

Example: `Send(0,5,":PLL:INIT:OFF 0",15,EOI);`

**Query syntax- :PLL:INIT**ial**:OFF**setfreq?

Example: `Send(0,5,":PLL:INIT:OFF?",14,EOI);`
Response: <ASCII floating point>
Example: 1.000000e+003

- **INITIAL:PSD**

The **INITIAL:PSD** command selects the initial guess of the power spectral density. This is only used if the **INITIAL:CALC** command has been set to **OFF**. Specified in units of dBc/Hz.

The **INITIAL:PSD** query returns the currently selected intial guess of the power spectral density.

**Command syntax- :PLL:INIT**ial**:PSD**<-120 to -40>

Example: `Send(0,5,":PLL:INIT:PSD -90",18,EOI);`

**Query syntax- :PLL:INIT**ial**:PSD**?

Example: `Send(0,5,":PLL:INIT:PSD?",14,EOI);`
Response: <ASCII floating point>
Example: -8.813641e+001

- **LOCKINTIME**

The **LOCKINTIME** query returns the Lock-In time obtained from the previous acquisition.

**Query syntax- :PLL:LOCKIN**time?

Example: `Send(0,5,":PLL:LOCKIN?",12,EOI);`
Response: <ASCII floating point>
Example: 4.887123e-006

- **LOCKRANGE**

The **LOCKRANGE** query returns the Lock Range obtained from the previous acquisition in units of Hertz.

**Query syntax- :PLL:LOCKRANG**e?

Example: `Send(0,5,":PLL:LOCKRANG?",14,EOI);`
Response: <ASCII floating point>
Example: 1.224813e+005

- **MAXSTDDEV**

The **MAXSTDDEV** query returns the maximum standard deviation returned across the range of spans measured.

**Query syntax- :PLL:MAXSTD**dev?

Example: `Send(0,5,":PLL:MAXSTD?",12,EOI);`
Response: <ASCII floating point>
Example: 3.912365e-012

- **MINSTDDEV**

The **MINSTDDEV** query returns the minimum standard deviation returned across the range of spans measured.

**Query syntax- :PLL:MINSTD**dev?

Example: `Send(0,5,":PLL:MINSTD?",12,EOI);`
Response: <ASCII floating point>
Example: 3.016643e-012

- **NATFREQ**

The **NATFREQ** query returns the natural frequency that was determined by the curve fit. This is in units of Hertz.

**Query syntax- :PLL:NATFREQ**?

Example: `Send(0,5,":PLL:NATFREQ?",13,EOI);`
Response: <ASCII floating point>
Example: 3.019691e+005

- **NOISEBW**

The **NOISEBW** query returns the noise bandwidth that was determined by the curve fit. This is in units of Hertz.

**Query syntax- :PLL:NOISE**bw?

Example: `Send(0,5,":PLL:NOISE?",11,EOI);`
Response: <ASCII floating point>
Example: 2.259691e+005

- **OPTIMIZE**

The **OPTIMIZE** command will re-run the variance fit and recompute all the resultant values. This would normally be done in the event new initial conditions were to be specified in order to obtain a better fit.

**Command syntax- :PLL:OPT**imize

Example: `Send(0,5,":PLL:OPT",8,EOI);`

- ## P1IMAG

The **P1IMAG** query returns the imaginary coordinate of the first transfer function pole.

**Query syntax- :PLL:P1IMAG?**

Example: `Send(0,5,":PLL:P1IMAG?",12,EOI);`
Response: <ASCII floating point>
Example: 9.798032e-001

- ## P1REAL

The **P1REAL** query returns the real coordinate of the first transfer function pole.

**Query syntax- :PLL:P1REAL?**

Example: `Send(0,5,":PLL:P1REAL?",12,EOI);`
Response: <ASCII floating point>
Example: -1.997693e-001

- ## P2IMAG

The **P2IMAG** query returns the imaginary coordinate of the second transfer function pole.

**Query syntax- :PLL:P2IMAG?**

Example: `Send(0,5,":PLL:P2IMAG?",12,EOI);`
Response: <ASCII floating point>
Example: -9.798032e-001

- ## P2REAL

The **P2REAL** query returns the real coordinate of the second transfer function pole.

**Query syntax- :PLL:P2REAL?**

Example: `Send(0,5,":PLL:P2REAL?",12,EOI);`
Response: <ASCII floating point>
Example: -1.997693e-001

- ## PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :PLL:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":PLL:PARAM:ARM:CHAN 1",21,EOI);`

**Query syntax- :PLL:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":PLL:PARAM:ARM:CHAN?",20,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :PLL:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":PLL:PARAM:ARM:DEL -40",22,EOI);`

**Query syntax- :PLL:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":PLL:PARAM:ARM:DEL?",19,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :PLL:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":PLL:PARAM:ARM:MARK OFF",23,EOI);`

**Query syntax- :PLL:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":PLL:PARAM:ARM:MARK?",20,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :PLL:PARAMeter:ARMing:MODE<EXTERNAL|START|STOP>**

Example: `Send(0,5,":PLL:PARAM:ARM:MODE EXTERNAL",28,EOI);`

**Query syntax- :PLL:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":PLL:PARAM:ARM:MODE?",20,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :PLL:PARAMeter:ARMing:SLOPe<FALL|RISE>**

Example: `Send(0,5,":PLL:PARAM:ARM:SLOP FALL",24,EOI);`

**Query syntax- :PLL:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":PLL:PARAM:ARM:SLOP?",20,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :PLL:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":PLL:PARAM:ARM:VOLT -2",22,EOI);`

**Query syntax- :PLL:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":PLL:PARAM:ARM:VOLT?",20,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :PLL:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":PLL:PARAM:CHAN4",16,EOI);`

**Query syntax- :PLL:PARAMeter:CHANnel?**

Example: `Send(0,5,":PLL:PARAM:CHAN?",16,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :PLL:PARAMeter:FUNCtion<PW+|PW-|PER+|PER->**

Example: `Send(0,5,":PLL:PARAM:FUNC PER+",21,EOI);`

**Query syntax- :PLL:PARAMeter:FUNCtion?**

Example: `Send(0,5,":PLL:PARAM:FUNC?",16,EOI);`
Response: <PW+|PW-|PER+|PER->

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :PLL:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":PLL:PARAM:SAMP 1000",17,EOI);`

**Query syntax- :PLL:PARAMeter:SAMPles?**

Example: `Send(0,5,":PLL:PARAM:SAMP?",16,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :PLL:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":PLL:PARAM:STAR:VOLT -2",23,EOI);`

**Query syntax- :PLL:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":PLL:PARAM:STAR:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :PLL:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":PLL:PARAM:STOP:VOLT -2",23,EOI);`

**Query syntax- :PLL:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":PLL:PARAM:STOP:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **PARAMETER:THRESHOLD**

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :PLL:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":PLL:PARAM:THR 5050",19,EOI);`

**Query syntax- :PLL:PARAMeter:THReshold?**

Example: `Send(0,5,":PLL:PARAM:THR?",15,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :PLL:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":PLL:PARAM:TIME 10",20,EOI);`

**Query syntax- :PLL:PARAMeter:TIMEout?**

Example: `Send(0,5,":PLL:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PKTOPKSTDDEV**

The **PKTOPKSTDDEV** query returns the (maximum standard deviation – minimum standard deviation) across the range of spans measured for the variance fit.

**Query syntax- :PLL:PKTOPKSTDdev?**

Example: `Send(0,5,":PLL:PKTOPKSTD?",15,EOI);`
Response: <ASCII floating point>
Example: 5.120456e-012

- **PLOTDATA:BODEMAGNITUDE**

The **PLOTDATA:BODEMAGNITUDE** query returns the plot data associated with the BODE MAGNITUDE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PLL:PLOTDATA:BODEMAGnitude?**

Example: `Send(0,5,":PLL:PLOTDATA:BODEMAG?",22,EOI);`
Response: #xy…ddddddd…

- ## PLOTDATA:BODEPHASE

The **PLOTDATA:BODEPHASE** query returns the plot data associated with the BODE PHASE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PLL:PLOTDATA:BODEPHASe?**

Example: `Send(0,5,":PLL:PLOTDATA:BODEPHAS?",23,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:INITIAL

The **PLOTDATA:INITIAL** query returns the plot data associated with the INITIAL CONDITIONS VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PLL:PLOTDATA:INITial?**

Example: `Send(0,5,":PLL:PLOTDATA:INIT?",19,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:SIGMA

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PLL:PLOTDATA:SIGMa?**

Example: `Send(0,5,":PLL:PLOTDATA:SIGM?",19,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:TRANSFER

The **PLOTDATA:TRANSFER** query returns the plot data associated with the TRANSFER FUNCTION plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PLL:PLOTDATA:TRANSfer?**

Example: `Send(0,5,":PLL:PLOTDATA:TRANS?",20,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:VARIANCE

The **PLOTDATA:VARIANCE** query returns the plot data associated with the VARIANCE plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :PLL:PLOTDATA:VARiance?**

Example: `Send(0,5,":PLL:PLOTDATA:VAR?",18,EOI);`
Response: #xy…ddddddddd…

- ## PLOTINFO:BODEMAGNITUDE

The **PLOTINFO:BODEMAGNITUDE** query returns the plot information associated with the BODE MAGNITUDE plot.

**Query syntax- :PLL:PLOTINFO:BODEMAGnitude?**

Example: `Send(0,5,":PLL:PLOTINFO:BODEMAG?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:BODEPHASE**

The **PLOTINFO:BODEPHASE** query returns the plot information associated with the BODE PHASE plot.

**Query syntax- :PLL:PLOTINFO:BODEPHASe?**

Example: `Send(0,5,":PLL:PLOTINFO:BODEPHAS?",23,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:INITIAL**

The **PLOTINFO:INITIAL** query returns the plot information associated with the INITIAL CONDITIONS VS TIME plot.

**Query syntax- :PLL:PLOTINFO:INITial?**

Example: `Send(0,5,":PLL:PLOTINFO:INIT?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS TIME plot.

**Query syntax- :PLL:PLOTINFO:SIGMa?**

Example: `Send(0,5,":PLL:PLOTINFO:SIGM?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TRANSFER**

The **PLOTINFO:TRANSFER** query returns the plot information associated with the TRANSFER FUNCTION plot.

**Query syntax- :PLL:PLOTINFO:TRANSfer?**

Example: `Send(0,5,":PLL:PLOTINFO:TRANS?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:VARIANCE**

The **PLOTINFO:VARIANCE** query returns the plot information associated with the VARIANCE plot.

**Query syntax- :PLL:PLOTINFO:VARiance?**

Example: `Send(0,5,":PLL:PLOTINFO:VAR?",18,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PSD**

The **PSD** query returns the Power Spectral Density that was determined by the curve fit. This is in units of dBc/Hz.

**Query syntax- :PLL:PSD?**

Example: `Send(0,5,":PLL:PSD?",9,EOI);`
Response: <ASCII floating point>
Example: -8.824166e+001

- **PULLINTIME**

The **PULLINTIME** query returns the Pull-In time that was determined by the curve fit. This is in units of seconds.

**Query syntax- :PLL:PULLIN**time?

Example: `Send(0,5,":PLL:PULLIN?",12,EOI);`
Response: <ASCII floating point>
Example: 8.115426e-003

- **PULLOUTRANGE**

The **PULLOUTRANGE** query returns the Pull-Out time that was determined by the curve fit. This is in units of Hertz.

**Query syntax- :PLL:PULLOUT**range?

Example: `Send(0,5,":PLL:PULLOUT?",13,EOI);`
Response: <ASCII floating point>
Example: 6.702536e+005

- **RECLENGTH:CORNERFREQ**

The **RECLENGTH:CORNERFREQ** command selects the record length as a function of the corner frequency of the measurement set. The **RECLENGTH:UNIT** command should have been set to **CORNERFREQ** before this command is issued. This value is specified in units of Hertz.

The **RECLENGTH:CORNERFREQ** query returns the current corner frequency being used to establish the record length.

**Command syntax- :PLL:RECLEN**gth**:CORN**erfreq<10 to 1e+008>

Example: `Send(0,5,":PLL:RECLEN:CORN 10",19,EOI);`

**Query syntax- :PLL:RECLEN**gth**:CORN**erfreq?

Example: `Send(0,5,":PLL:RECLEN:CORN?",17,EOI);`
Response: <ASCII floating point>
Example: 6.370000e+005

- **RECLENGTH:STOPMAX**

The **RECLENGTH:STOPMAX** command selects the record length by the maximum number of edges across which to measure. The **RECLENGTH:UNIT** command should have been set to **STOPMAX** before this command is isssued.

The **RECLENGTH:STOPMAX** query returns the maximum number of edges to make the measurement across.

**Command syntax- :PLL:RECLEN**gth**:STOPMAX**<1 to 10000000>

Example: `Send(0,5,":PLL:RECLEN:STOPMAX 1",21,EOI);`

**Query syntax- :PLL:RECLEN**gth**:STOPMAX**?

Example: `Send(0,5,":PLL:RECLEN:STOPMAX?",20,EOI);`
Response: <ASCII integer>
Example: 10000

- **RECLENGTH:TIME**

The **RECLENGTH:TIME** command selects the record length in units of time. The **RECLENGTH:UNIT** command should have been set to **TIME** before this command is isssued.

The **RECLENGTH:TIME** query returns the current record length in units of time.

**Command syntax- :PLL:RECLEN**gth**:TIM**e<1e-008 to 0.1>

Example: `Send(0,5,":PLL:RECLEN:TIM 1e-008",22,EOI);`

**Query syntax- :PLL:RECLEN**gth**:TIM**e?

Example: `Send(0,5,":PLL:RECLEN:TIM?",16,EOI);`
Response: <ASCII floating point>
Example: 3.200000e-006

- **RECLENGTH:UNIT**

The **RECLENGTH:UNIT** command selects the units for establishing the record length.

The **RECLENGTH:UNIT** query returns the current units for selecting the record length.

**Command syntax- :PLL:RECLEN**gth**:UNI**t<STOP|CORNERFREQ|TIME>

Example: `Send(0,5,":PLL:RECLEN:UNI STOP",20,EOI);`

**Query syntax- :PLL:RECLEN**gth**:UNI**t?

Example: `Send(0,5,":PLL:RECLEN:UNI?",16,EOI);`
Response: <STOP|CORNERFREQ|TIME>
Example: CORNER

- **STDDEV**

The **STDDEV** query returns the average standard deviation of measurements across all spans.

**Query syntax- :PLL:STD**dev?

Example: `Send(0,5,":PLL:STD?",9,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **STOPINC**

The **STOPINC** command selects the amount by which the stop count is incremented between measurements. By increasing this number the measurement time is reduced, but the effective resolution is decreased.

The **STOPINC** query returns the currently selected stop count increment.

**Command syntax- :PLL:STOPINC**<1 to 100000>

Example: `Send(0,5,":PLL:STOPINC 1",14,EOI);`

**Query syntax- :PLL:STOPINC**?

Example: `Send(0,5,":PLL:STOPINC?",13,EOI);`
Response: <ASCII integer>
Example: 10

- **ZIMAG**

The **ZIMAG** query returns the imaginary coordinate of the transfer function zero.

**Query syntax- :PLL:ZIMAG?**

Example: `Send(0,5,":PLL:ZIMAG?",11,EOI);`
Response: <ASCII floating point>
Example: 0.000000e+000

- **ZREAL**

The **ZREAL** query returns the real coordinate of the transfer function zero.

**Query syntax- :PLL:ZREAL?**

Example: `Send(0,5,":PLL:ZREAL?",11,EOI);`
Response: <ASCII floating point>
Example: -2.500737e+000

## • DESCRIPTION OF THE RANDOM DATA NO MARKER COMMANDS

The **RANDOM** commands are used to take measurements with the Random Data With No Marker Tool. This tool is useful for diagnostics, but cannot be used for compliance testing. This tool analyzes a single data signal. Because there is no bit clock or marker, the bit rate must be entered in this tool very accurately. The measurement then assumes that this is the ideal bit rate and measures the data relative to that ideal time. The tool must therefore make assumptions. The reported DCD+DDJ value is the pk-to-pk of the histogram of Rising and Falling data edges rather than the worst case pk-pk values of the histograms of each edge(as it is in dataCOM with Marker). The PJ components can be seen on the FFT but the actual value of PJ is not displayed due to the presence of frequency components from the data in addition to jitter. TJ is then only composed of the DJ from the histogram and the 1-sigma RJ.

**:RAND**om:<command syntax>

**ACQ**uire
**BITRATE**
**CORN**erfreq
**DCDISI:PATT**erns
**DCDISI:SAMP**les
**DCDISI:STDERR**
**DDJ**
**DEF**ault
**PARAM**eter**:ARM**ing**:DEL**ay
**PARAM**eter**:CHAN**nel
**PARAM**eter**:SAMP**les
**PARAM**eter**:STAR**t**:VOLT**age
**PARAM**eter**:STOP:VOLT**age
**PARAM**eter**:THR**eshold
**PARAM**eter**:TIME**out
**PLOTDATA:BATH**tub
**PLOTDATA:DCDISIFALL**
**PLOTDATA:DCDISIRISE**
**PLOTDATA:FFT**
**PLOTDATA:SIGM**a
**PLOTDATA:TAIL**fit
**PLOTINFO:BATH**tub
**PLOTINFO:DCDISIFALL**
**PLOTINFO:DCDISIRISE**
**PLOTINFO:FFT**
**PLOTINFO:SIGM**a
**PLOTINFO:TAIL**fit
**RJ**
**TAIL**fit**:CONV**ergence
**TAIL**fit**:COUN**t
**TAIL**fit**:PROB**ability
**TJ**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Random Data No Marker Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :RAND**om**:ACQ**uire

Example: `Send(0,5,":RAND:ACQ;*OPC",9,EOI);`

## • BITRATE

The **BITRATE** command specifies the bitrate of the current signal in bits/sec.

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Command syntax- :RAND**om**:BITRATE**<10 to 1e+010>

Example: `Send(0,5,":RAND:BITRATE 1.062e9",16,EOI);`

**Query syntax- :RAND**om**:BITRATE**?

Example: `Send(0,5,":RAND:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +1.0625e9

- ## CORNERFREQ

The **CORNERFREQ** command provides a means to configure the corner frequency (-3dB Freq) that is used. The Corner Frequency is used to determine the maximum measurement interval used in sampling and is entered in Hz. A low corner frequency extends the time required to acquire the measurement set because histograms over many more periods must be acquired. Below the corner frequency, a natural roll-off of approximately 20dB per decade is observed.

The **CORNERFREQ** query is used to determine what the current corner frequency is configured as.

**Command syntax- :RAND**om**:CORN**erfreq<10 to 1e+010>

Example: `Send(0,5,":RAND:CORN 10",13,EOI);`

**Query syntax- :RAND**om**:CORN**erfreq?

Example: `Send(0,5,":RAND:CORN?",11,EOI);`
Response: <ASCII floating point>
Example: 6.370e+005

- ## DCDISI:PATTERNS

The **DCDISI:PATTERNS** command determines the number of patterns over which the DCD+ISI measurement is made. A larger number effectively increases the amount of averaging that is used in measuring the DCD+ISI.

The **DCDISI:PATTERNS** query returns the number of patterns across which the DCD+ISI is measured.

**Command syntax- :RAND**om**:DCDISI:PATT**erns<1 to 1000>

Example: `Send(0,5,":RAND:DCDISI:PATT 1",19,EOI);`

**Query syntax- :RAND**om**:DCDISI:PATT**erns?

Example: `Send(0,5,":RAND:DCDISI:PATT?",18,EOI);`
Response: <ASCII integer>
Example: 10

- ## DCDISI:SAMPLES

The **DCDISI:SAMPLES** command determines the number of samples acquired for the DCD+ISI measurement.

The **DCDISI:SAMPLES** query returns the number of samples acquired for the DCD+ISI measurement.

**Command syntax- :RAND**om**:DCDISI:SAMP**les<100 to 950000>

Example: `Send(0,5,":RAND:DCDISI:SAMP 100",21,EOI);`

**Query syntax- :RAND**om**:DCDISI:SAMP**les?

Example: `Send(0,5,":RAND:DCDISI:SAMP?",18,EOI);`
Response: <ASCII integer>
Example: 100

- ## DCDISI:STDERR

The **DCDISI:STDERR** command sets the threshold that indicates when suspect measurements have been taken, usually as a result of improper pattern selection. This is specified in UI, and the default value is 0.5 UI. Any measurements deviating from the ideal by more than this value will produce an error message and the test will stop. This value may need to be increased if the signal has more than 0.5 UI of jitter (such as during tolerance testing).

The **DCDISI:STDERR** query returns the current threshold for suspect measurements.

**Command syntax- :RAND**om**:DCDISI:STDERR**<0 to 1000>

Example: `Send(0,5,":RAND:DCDISI:STDERR 0",21,EOI);`

**Query syntax- :RAND**om**:DCDISI:STDERR**?

Example: `Send(0,5,":RAND:DCDISI:STDERR?",20,EOI);`
Response: <ASCII floating point>
Example: 0.5

- ## DDJ

The **DDJ** query returns the Data Dependent Jitter (DCD+ISI) from the previous measurement.

**Query syntax- :RAND**om**:DDJ**?

Example: `Send(0,5,":RAND:DDJ?",10,EOI);`
Response: <ASCII floating point>
Example: 5.984572e-012

- ## DEFAULT

The **DEFAULT** command is used to reset all the Random Data No Marker Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :RAND**om**:DEF**ault

Example: `Send(0,5,":RAND:DEF",9,EOI);`

- ## PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :RAND**om**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":RAND:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :RAND**om**:PARAM**eter**:ARM**ing**:DEL**ay?

Example: `Send(0,5,":RAND:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :RANDom:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":RAND:PARAM:CHAN4",17,EOI);`

**Query syntax- :RANDom:PARAMeter:CHANnel?**

Example: `Send(0,5,":RAND:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each data edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each data edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :RANDom:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":RAND:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :RANDom:PARAMeter:SAMPles?**

Example: `Send(0,5,":RAND:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :RANDom:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":RAND:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :RANDom:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":RAND:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :RAND**om**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":RAND:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :RAND**om**:PARAM**eter**:STOP:VOLT**age?

Example: `Send(0,5,":RAND:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :RAND**om**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":RAND:PARAM:THR 5050",20,EOI);`

**Query syntax- :RAND**om**:PARAM**eter**:THR**eshold?

Example: `Send(0,5,":RAND:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :RAND**om**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":RAND:PARAM:TIME 10",19,EOI);`

**Query syntax- :RAND**om**:PARAM**eter**:TIME**out?

Example: `Send(0,5,":RAND:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PLOTDATA:BATHTUB

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RAND**om**:PLOTDATA:BATH**tub?

Example: `Send(0,5,":RAND:PLOTDATA:BATH?",20,EOI);`
Response: #xy…ddddddd…

- ## PLOTDATA:DCDISIFALL

The **PLOTDATA:DCDISIFALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RAND**om**:PLOTDATA:DCDISIFALL**?

Example: `Send(0,5,":RAND:PLOTDATA:DCDISIFALL?",26,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:DCDISIRISE

The **PLOTDATA:DCDISIRISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RAND**om**:PLOTDATA:DCDISIRISE**?

Example: `Send(0,5,":RAND:PLOTDATA:DCDISIRISE?",26,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:FFT

The **PLOTDATA:FFT** query returns the plot data associated with the FFT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RAND**om**:PLOTDATA:FFT**?

Example: `Send(0,5,":RAND:PLOTDATA:FFT?",19,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:SIGMA

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RAND**om**:PLOTDATA:SIGM**a?

Example: `Send(0,5,":RAND:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…ddddddddd…

- ## PLOTDATA:TAILFIT

The **PLOTDATA:TAILFIT** query returns the plot data associated with the TAILFIT VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RAND**om**:PLOTDATA:TAIL**fit?

Example: `Send(0,5,":RAND:PLOTDATA:TAIL?",20,EOI);`
Response: #xy…ddddddddd…

- ## PLOTINFO:BATHTUB

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :RAND**om**:PLOTINFO:BATH**tub?

Example: `Send(0,5,":RAND:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

 

- **PLOTINFO:DCDISIFALL**

The **PLOTINFO:DCDISIFALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :RAND**om**:PLOTINFO:DCDISIFALL**?

Example: `Send(0,5,":RAND:PLOTINFO:DCDISIFALL?",26,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:DCDISIRISE**

The **PLOTINFO:DCDISIRISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :RAND**om**:PLOTINFO:DCDISIRISE**?

Example: `Send(0,5,":RAND:PLOTINFO:DCDISIRISE?",26,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FFT**

The **PLOTINFO:FFT** query returns the plot information associated with the FFT plot.

**Query syntax- :RAND**om**:PLOTINFO:FFT**?

Example: `Send(0,5,":RAND:PLOTINFO:FFT?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :RAND**om**:PLOTINFO:SIGM**a?

Example: `Send(0,5,":RAND:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TAILFIT**

The **PLOTINFO:TAILFIT** query returns the plot information associated with the TAILFIT VS SPAN plot.

**Query syntax- :RAND**om**:PLOTINFO:TAIL**fit?

Example: `Send(0,5,":RAND:PLOTINFO:TAIL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition.

**Query syntax- :RAND**om**:RJ**?

Example: `Send(0,5,":RAND:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- ## TAILFIT:CONVERGENCE

The **TAILFIT:CONVERGENCE** command determines the percentage within which consecutive tail-fits must comply in order to insure reasonable frequency coverage from the corner frequency. The default setting is 10%. This setting is only active when the **TAILFIT:COUNT** command if set to AUTO.

The **TAILFIT:CONVERGENCE** query returns the currently selected convergence setting.

**Command syntax- :RAND**om**:TAIL**fit**:CONV**ergence<5|10|25|50>

Example: `Send(0,5,":RAND:TAIL:CONV 5",17,EOI);`

**Query syntax- :RAND**om**:TAIL**fit**:CONV**ergence?

Example: `Send(0,5,":RAND:TAIL:CONV?",16,EOI);`
Response: <5|10|25|50>
Example: 5

- ## TAILFIT:COUNT

The **TAILFIT:COUNT** command determines the number of spans across which measurements are made in order to calculate random jitter. The default mode will automatically determine the number of tail-fits that are necessary to insure no frequency bias exists. When using this mode, three tail-fits are initially performed and an RMS jitter is calculated. Additional tail-fits are then performed between the initial tail-fits. If the resulting RMS jitter is not within the accuracy percentage specified, this same process is repeated. The percentage can be specified using the Accuracy option. Optionally the number of tail-fits to perform can be explicitly set.

The **TAILFIT:COUNT** query returns the current setting for the number of spans across which measurements are made.

**Command syntax- :RAND**om**:TAIL**fit**:COUN**t<AUTO|3|5|9|17>

Example: `Send(0,5,":RAND:TAIL:COUN AUTO",20,EOI);`

**Query syntax- :RAND**om**:TAIL**fit**:COUN**t?

Example: `Send(0,5,":RAND:TAIL:COUN?",16,EOI);`
Response: <AUTO|3|5|9|17>
Example: 9

- ## TAILFIT:PROBABILITY

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

**Command syntax- :RAND**om**:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":RAND:TAIL:PROB -16",19,EOI);`

**Query syntax- :RAND**om**:TAIL**fit**:PROB**ability?

Example: `Send(0,5,":RAND:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- ## TJ

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :RAND**om**:TJ**?

Example: `Send(0,5,":RAND:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

 

## • DESCRIPTION OF THE RANDOM DATA WITH BIT CLOCK COMMANDS

The **RDBC** commands are used to make measurements using the Random Data With Bit Clock Tool. This tool makes measurements on a data signal relative to a bit-clock. Therefore modulation or PJ cannot be determined. Similarly because the histogram is composed of many different data transitions, the DCD+DDJ value is not directly determined. The DJ, RJ and TJ values are determined from a Tail-Fit on the histogram of Rising and Falling data edges.

**:RDBC:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **PARAM**eter**:ARM**ing**:DEL**ay | **PLOTINFO:FALL** |
| **ARMFIND** | **PARAM**eter**:CHAN**nel | **PLOTINFO:RISE** |
| **CLE**ar | **PARAM**eter**:SAMP**les | **PLOTINFO:TOTAL** |
| **DDR** | **PARAM**eter**:STAR**t**:VOLT**age | **REFEDGE** |
| **DEF**ault | **PARAM**eter**:STOP:VOLT**age | **RJ** |
| **DJ** | **PARAM**eter**:THR**eshold | **STDD**ev |
| **FILTEROFF**set | **PARAM**eter**:TIME**out | **TAIL**fit**:COMP**lete |
| **HITS** | **PLOTDATA:BATH**tub | **TAIL**fit**:FILTERSAMPLES** |
| **MAX**imum | **PLOTDATA:FALL** | **TAIL**fit**:MINHITS** |
| **MEAN** | **PLOTDATA:RISE** | **TAIL**fit**:MODE** |
| **MIN**imum | **PLOTDATA:TOTAL** | **TAIL**fit**:PROB**ability |
| **MINSPAN** | **PLOTINFO:BATH**tub | **TJ** |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Random Data With Bit Clock Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :RDBC:ACQ**uire

Example: `Send(0,5,":RDBC:ACQ;*OPC",9,EOI);`

## • ARMFIND

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. The problem is exacerbated when measurements are to be conducted across multiple channels. This command performs an optimization across one or more channels, and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :RDBC:ARMFIND**(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":RDBC:ARMFIND(@4)",17,EOI);`
Response: <ASCII integer>
Example: -16

- ## CLEAR

The **CLEAR** command provides a means to flush any previous data. Since the Random Data With Bit Clock Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :RDBC:CLE**ar

Example: `Send(0,5,":RDBC:CLE",9,EOI);`

- ## DDR

The **DDR** command is used to enable the Double Data Rate Mode. When this mode is enabled both rising and falling reference clock edges are used as to assess data integrity

The **DDR** query returns whether Double Data Rate Mode is currently enabled or not.

**Command syntax- :RDBC:DDR**<OFF|ON>

Example: `Send(0,5,":RDBC:DDR OFF",13,EOI);`

**Query syntax- :RDBC:DDR**?

Example: `Send(0,5,":RDBC:DDR?",10,EOI);`
Response: <OFF|ON>
Example: ON

- ## DEFAULT

The **DEFAULT** command is used to reset all the Random Data With Bit Clock Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :RDBC:DEF**ault

Example: `Send(0,5,":RDBC:DEF",9,EOI);`

- ## DJ

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :RDBC:DJ**?

Example: `Send(0,5,":RDBC:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## FILTEROFFSET

The **FILTEROFFSET** command allows an offset to be made to the filter that is used to isolate histogram data to within 1 UI of the bit clock. The filter is established on the first pass by the instrument, and can normally be left alone. However, in the presence of large amounts of jitter it may be necessary to tweak this value slightly. The offset is entered as a percentage of UI, and a value in the range of +/-100 is valid.

The **FILTEROFFSET** query returns the current filter offset used to isolate histogram data within 1 UI of the bit clock.

**Command syntax- :RDBC:FILTEROFF**set<-100 to 100>

Example: `Send(0,5,":RDBC:FILTEROFF 20",15,EOI);`

**Query syntax- :RDBC:FILTEROFF**set?

Example: `Send(0,5,":RDBC:FILTEROFF?",14,EOI);`
Response: <ASCII integer>
Example: 20

- **HITS**

The **HITS** query returns the number of accumulated hits in the total jitter histogram.

**Query syntax- :RDBC:HITS?**

Example: `Send(0,5,":RDBC:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35937

- **MAXIMUM**

The **MAXIMUM** query returns the maximum measurement value obtained across all accumulated histogram passes.

**Query syntax- :RDBC:MAX**imum?

Example: `Send(0,5,":RDBC:MAX?",10,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **MEAN**

The **MEAN** query returns the average of all measurement values obtained across all accumulated histogram passes.

**Query syntax- :RDBC:MEAN?**

Example: `Send(0,5,":RDBC:MEAN?",11,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all accumulated histogram passes.

**Query syntax- :RDBC:MIN**imum?

Example: `Send(0,5,":RDBC:MIN?",10,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **MINSPAN**

The **MINSPAN** command allows a time delay to be introduced between data edges and the reference clock edges used to assess them. By default the instrument uses immediately adjacent clock edges for reference. However, oscilloscopes have an inherent trigger delay, which can cause a correlation issue. If the desire is to correlate to a particular oscilloscope, this value can be used to instruct the instrument to make measurements on the same basis. This value corresponds to the nominal trigger delay on an oscilloscope.

The **MINSPAN** query returns the current minimum time delay from data edges to their reference clock edges.

**Command syntax- :RDBC:MINSPAN**<0 to 2.5>

Example: `Send(0,5,":RDBC:MINSPAN 0",15,EOI);`

**Query syntax- :RDBC:MINSPAN?**

Example: `Send(0,5,":RDBC:MINSPAN?",14,EOI);`
Response: <ASCII floating point>
Example: 2.4e-008

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :RDBC:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":RDBC:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :RDBC:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":RDBC:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the data and clock input channels that will be used by this tool. The channels are specified by first providing the integer number of the data channel, then an '&' character, and finally the integer number of the clock channel: <data channel>&<clock channel>

The **PARAMETER:CHANNEL** query returns the currently selected data and clock channels for this tool.

**Command syntax- :RDBC:PARAMeter:CHANnel<n&m>**

Example: `Send(0,5,":RDBC:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :RDBC:PARAMeter:CHANnel?**

Example: `Send(0,5,":RDBC:PARAM:CHAN?",17,EOI);`
Response: <data channel> & <clock channel>
Example: 1&7

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued. Since filters are used to only include data edges within +/- 0.5 UI of the randomly selected clock edges, a smaller number of samples is actually returned than is requested.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :RDBC:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":RDBC:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :RDBC:PARAMeter:SAMPles?**

Example: `Send(0,5,":RDBC:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the data channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected data channel user voltage.

**Command syntax- :RDBC:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":RDBC:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :RDBC:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":RDBC:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the clock channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected clock channel user voltage.

**Command syntax- :RDBC:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":RDBC:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :RDBC:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":RDBC:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :RDBC:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":RDBC:PARAM:THR 5050",20,EOI);`

**Query syntax- :RDBC:PARAMeter:THReshold?**

Example: `Send(0,5,":RDBC:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :RDBC:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":RDBC:PARAM:TIME 10",19,EOI);`

**Query syntax- :RDBC:PARAM**eter**:TIME**out?

Example: `Send(0,5,":RDBC:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PLOTDATA:BATHTUB

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RDBC:PLOTDATA:BATH**tub?

Example: `Send(0,5,":RDBC:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:FALL

The **PLOTDATA:FALL** query returns the plot data associated with the FALLING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RDBC:PLOTDATA:FALL**?

Example: `Send(0,5,":RDBC:PLOTDATA:FALL?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:RISE

The **PLOTDATA:RISE** query returns the plot data associated with the RISING EDGE HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RDBC:PLOTDATA:RISE**?

Example: `Send(0,5,":RDBC:PLOTDATA:RISE?",20,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:TOTAL

The **PLOTDATA:TOTAL** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :RDBC:PLOTDATA:TOTAL**?

Example: `Send(0,5,":RDBC:PLOTDATA:TOTAL?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:BATHTUB**

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :RDBC:PLOTINFO:BATH**tub?

Example: `Send(0,5,":RDBC:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:FALL**

The **PLOTINFO:FALL** query returns the plot information associated with the FALLING EDGE HISTOGRAM plot.

**Query syntax- :RDBC:PLOTINFO:FALL**?

Example: `Send(0,5,":RDBC:PLOTINFO:FALL?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:RISE**

The **PLOTINFO:RISE** query returns the plot information associated with the RISING EDGE HISTOGRAM plot.

**Query syntax- :RDBC:PLOTINFO:RISE**?

Example: `Send(0,5,":RDBC:PLOTINFO:RISE?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TOTAL**

The **PLOTINFO:TOTAL** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :RDBC:PLOTINFO:TOTAL**?

Example: `Send(0,5,":RDBC:PLOTINFO:TOTAL?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **REFEDGE**

The **REFEDGE** command selects whether a rising or falling clock edge is used as reference to measure the data jitter.

The **REFEDGE** query returns whether a rising or falling clock edge is selected as reference.

**Command syntax- :RDBC:REFEDGE**<FALL|RISE>

Example: `Send(0,5,":RDBC:REFEDGE FALL",18,EOI);`

**Query syntax- :RDBC:REFEDGE**?

Example: `Send(0,5,":RDBC:REFEDGE?",14,EOI);`
Response: <FALL|RISE>
Example: RISE

- ## RJ

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :RDBC:RJ?**

Example: `Send(0,5,":RDBC:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- ## STDDEV

The **STDDEV** query returns the standard deviation of all measurements across all accumulated histogram passes.

**Query syntax- :RDBC:STDDev?**

Example: `Send(0,5,":RDBC:STDD?",11,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- ## TAILFIT:COMPLETE

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :RDBC:TAILfit:COMPlete?**

Example: `Send(0,5,":RDBC:TAIL:COMP?",16,EOI);`
Response: <0|1>

- ## TAILFIT:FILTERSAMPLES

The **TAILFIT:FILTERSAMPLES** command selects the sample size for establishing filter limits during the first pass. The filter limits are used on subsequent acquisition passes to generate a single histogram of data with measurements assessed relative to adjacent reference clock edges.

The **TAILFIT:FILTERSAMPLES** query returns the number of samples currently used to establish the filter limits.

**Command syntax- :RDBC:TAILfit:FILTERSAMPLES<0 to 950000>**

Example: `Send(0,5,":RDBC:TAIL:FILTERSAMPLES 0",26,EOI);`

**Query syntax- :RDBC:TAILfit:FILTERSAMPLES?**

Example: `Send(0,5,":RDBC:TAIL:FILTERSAMPLES?",25,EOI);`
Response: <ASCII integer>
Example: 1000

- **TAILFIT:MINHITS**

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :RDBC:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":RDBC:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :RDBC:TAIL**fit**:MINHITS**?

Example: `Send(0,5,":RDBC:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- **TAILFIT:MODE**

The **TAILFIT:MODE** command selects whether a Tail-Fit will be performed or not. It also allows the special Force-Fit mode to be enabled. The Force-Fit mode circumvents some of the criteria that is used to ensure the quality of the result, and forces a result to be returned.

The **TAILFIT:MODE** query returns the currently selected Tail-Fit mode.

**Command syntax- :RDBC:TAIL**fit**:MODE**<OFF|ON|FORCEFIT>

Example: `Send(0,5,":RDBC:TAIL:MODE OFF",19,EOI);`

**Query syntax- :RDBC:TAIL**fit**:MODE**?

Example: `Send(0,5,":RDBC:TAIL:MODE?",16,EOI);`
Response: <OFF|ON|FORCEFIT>

- **TAILFIT:PROBABILITY**

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

**Command syntax- :RDBC:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":RDBC:TAIL:PROB -16",19,EOI);`

**Query syntax- :RDBC:TAIL**fit**:PROB**ability?

Example: `Send(0,5,":RDBC:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- **TJ**

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :RDBC:TJ**?

Example: `Send(0,5,":RDBC:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

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## • DESCRIPTION OF THE SERIAL ATA COMMANDS

The **SATA** commands are used to make measurements per the Serial ATA specification. The SATA Specification requires that jitter measurements be made from Data edge to Data edge across varying spans. The spans are from 0 to 5 UI, and then from 6 to 250 UI. This tool automates these measurements and provides pass/fail results. This tool requires no knowledge of the data stream prior to making a measurement. It simply measures data edge to data edge and places the measurements in their relative bins. The bin size is based on the Bit Rate specified +/- 0.5 UI. For example, if a span of 1.12UI is measured, it is placed in the 1UI bin. Some random time later another measurement is made and is 2.34 UI, so it is placed in the 2UI bin. After each bin has sufficient data, a tail-fit is performed on each UI span to get RJ, DJ and TJ at 10-12 BER.

**:SATA:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **PARAM**eter**:ARM**ing**:DEL**ay | **PARAM**eter**:TIME**out |
| **BITRATE** | **PARAM**eter**:CHAN**nel | **TAIL**fit**:COMP**lete |
| **CLE**ar | **PARAM**eter**:SAMP**les | **TJ250** |
| **DEF**ault | **PARAM**eter**:STAR**t**:VOLT**age | **TJ5** |
| **DJ250** | **PARAM**eter**:STOP:VOLT**age | |
| **DJ5** | **PARAM**eter**:THR**eshold | |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Serial ATA Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :SATA:ACQ**uire

Example: `Send(0,5,":SATA:ACQ",9,EOI);`

## • BITRATE

The **BITRATE** command specifies the bitrate of the current signal in bits/sec.

The **BITRATE** query returns the data rate that was determined from the last ACQUIRE command.

**Command syntax- :SATA:BITRATE**<10 to 1e+010>

Example: `Send(0,5,":SATA:BITRATE 10",16,EOI);`

**Query syntax- :SATA:BITRATE**?

Example: `Send(0,5,":SATA:BITRATE?",14,EOI);`
Response: <ASCII floating point>
Example: +1.0625e9

## • CLEAR

The **CLEAR** command provides a means to flush any previous data, since the Serial ATA Tool continues to accumulate data across successive acquisitions.

**Command syntax- :SATA:CLE**ar

Example: `Send(0,5,":SATA:CLE",11,EOI);`

- ## DEFAULT

The **DEFAULT** command is used to reset all the Serial ATA Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :SATA:DEFault**

Example: `Send(0,5,":SATA:DEF",9,EOI);`

- ## DJ250

The **DJ250** query returns the Deterministic Jitter obtained across 250 periods from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SATA:DJ250?**

Example: `Send(0,5,":SATA:DJ250?",12,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## DJ5

The **DJ5** query returns the Deterministic Jitter obtained across 5 periods from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SATA:DJ5?**

Example: `Send(0,5,":SATA:DJ5?",10,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- ## PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :SATA:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":SATA:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :SATA:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":SATA:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :SATA:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":SATA:PARAM:CHAN4",17,EOI);`

**Query syntax- :SATA:PARAMeter:CHANnel?**

Example: `Send(0,5,":SATA:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :SATA:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":SATA:PARAM:SAMP 1000",18,EOI);`

**Query syntax- :SATA:PARAMeter:SAMPles?**

Example: `Send(0,5,":SATA:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :SATA:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":SATA:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :SATA:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":SATA:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **PARAMETER:STOP:VOLTAGE**

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :SATA:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":SATA:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :SATA:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":SATA:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **PARAMETER:THRESHOLD**

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :SATA:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":SATA:PARAM:THR 5050",20,EOI);`

**Query syntax- :SATA:PARAMeter:THReshold?**

Example: `Send(0,5,":SATA:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :SATA:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":SATA:PARAM:TIME 10",21,EOI);`

**Query syntax- :SATA:PARAMeter:TIMEout?**

Example: `Send(0,5,":SATA:PARAM:TIME?",17,EOI);`
Response: <floating point ASCII value>
Example: 10

- **TAILFIT:COMPLETE**

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :SATA:TAILfit:COMPlete?**

Example: `Send(0,5,":SATA:TAIL:COMP?",16,EOI);`
Response: <0|1>

- **TJ250**

The **TJ250** query returns the Total Jitter obtained across 250 periods from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SATA:TJ250?**

Example: `Send(0,5,":SATA:TJ250?",12,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

- **TJ5**

The **TJ5** query returns the Total Jitter obtained across 5 periods from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SATA:TJ5?**

Example: `Send(0,5,":SATA:TJ5?",10,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

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## • DESCRIPTION OF THE SCOPE COMMANDS

The **SCOPE** commands are used to access the Oscilloscope Tool to capture the waveform, measure voltage parameters, and create eye masks and histograms based on the waveform data.

**:SCOP**e**:**<command syntax>

**ACQ**uire
**AUTO**
**CHAN**nel**:OFFS**et
**CLE**ar
**DISP**lay**:AVER**ages
**DISP**lay**:INP**uts
**FALL**time
**HIST**ogram**:DEL**ay
**HIST**ogram**:HEI**ght
**HIST**ogram**:HITS**
**HIST**ogram**:MAX**imum
**HIST**ogram**:MEAN**
**HIST**ogram**:MIN**imum
**HIST**ogram**:MODE**
**HIST**ogram**:STDD**ev
**HIST**ogram**:VOLT**age
**HIST**ogram**:WID**th
**MASK:BTMFAIL**ures
**MASK:COMP**arisons
**MASK:ENAB**le
**MASK:FAIL**ures
**MASK:MARG**in
**MASK:MIDFAIL**ures
**MASK:PCT0**level
**MASK:PCT1**level
**MASK:PCTI**nside
**MASK:SCAL**e
**MASK:TAMP**litude
**MASK:TFLA**t
**MASK:TOFF**set
**MASK:TOPFAIL**ures
**MASK:UIFLA**t
**MASK:UIWID**th
**MASK:VAMP**litude
**MASK:VOFF**set
**MASK:VPASS0**
**MASK:VPASS1**
**OVER**shoot
**PARAM**eter**:ARM**ing**:MARK**er
**PARAM**eter**:TIME**out
**RIS**etime
**TIM**ebase**:DEL**ay
**TIM**ebase**:RANG**e
**TRIG**ger**:CHAN**nel
**TRIG**ger**:LEV**el
**TRIG**ger**:SLOP**e
**UND**ershoot
**VAMP**litude
**VAV**erage
**VBAS**e
**VMAX**imum
**VMID**dle
**VMIN**imum
**VPP**
**VRMS**
**VTOP**
**WAVE**form**:COMM**
**WAVE**form**:COMP**
**WAVE**form**:DIFF**
**WAVE**form**:NORM**
**WAVE**form

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Scope Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :SCOP**e**:ACQ**uire<Passes>(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":SCOP:ACQ16(@4);*OPC",15,EOI);`

## • AUTO

The **AUTO** command automatically sets the trigger voltage, trigger delay, time/division, voltage offset, and volts/division to view the signal on the selected channel.

**Command syntax- :SCOP**e**:AUTO**(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":SCOP:AUTO(@4)",14,EOI);`

- ## CHANNEL:OFFSET

The **CHANNEL:OFFSET** command sets the channel offset voltage in millivolts. The instrument has a limited voltage range, so it is necessary to have the offset set to the approximate DC voltage level of the input signal.

The **CHANNEL:OFFSET** query returns the current channel offset voltage in millivolts.

**Command syntax- :SCOPe:CHANnel<N>:OFFSet<-2000 to 2000>**

Example: `Send(0,5,":SCOP:CHAN4:OFFS 500",18,EOI);`

**Query syntax- :SCOPe:CHANnel<N>:OFFSet?**

Example: `Send(0,5,":SCOP:CHAN4:OFFS?",17,EOI);`
Response: <ASCII integer>
Example: 500

- ## CLEAR

The **CLEAR** command provides a means to flush any previous data, since the Scope Tool continues to accumulate data across successive acquisitions.

**Command syntax- :SCOPe:CLEar**

Example: `Send(0,5,":SCOP:CLE",9,EOI);`

- ## DISPLAY:AVERAGES

The **DISPLAY:AVERAGES** command selects the number of passes to average the scope output. Averaging will generally reduce the noise floor of the results, but increase measurement time.

The **DISPLAY:AVERAGES** query returns the number of currently selected averaging passes.

**Command syntax-**
**:SCOPe:DISPlay:AVERages<1|2|4|8|16|32|64|128|256|512|1024|2048|4096>**

Example: `Send(0,5,":SCOP:DISP:AVER 1",17,EOI);`

**Query syntax- :SCOPe:DISPlay:AVERages?**

Example: `Send(0,5,":SCOP:DISP:AVER?",16,EOI);`
Response: <1|2|4|8|16|32|64|128|256|512|1024|2048|4096>
Example: 1

- ## DISPLAY:INPUTS

The **DISPLAY:INPUTS** command sets which inputs are currently active: Positive, negative, differential, or common.

The **DISPLAY:INPUTS** query returns which inputs are currently active.

**Command syntax- :SCOPe:DISPlay:INPuts<POSitive|NEGative|DIFFerential|COMMon>**

Example: `Send(0,5,":SCOP:DISP:INP POSitive",23,EOI);`

**Query syntax- :SCOPe:DISPlay:INPuts?**

Example: `Send(0,5,":SCOP:DISP:INP?",15,EOI);`
Response: <POSitive|NEGative|DIFFerential|COMMon>
Example: POSITIVE

- **FALLTIME**

The **FALLTIME** query returns the falltime that was measured on the previous acquisition for the specified channel(s). A successful measurement is dependent on having a scope waveform in the acquisition window that is correctly identified as a falling edge. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SCOP**e**:FALL**time(@<n,m,x,…>|<n:m>)?

Example: Send(0,5,":SCOP:FALL(@4)?",15,EOI);
Response: <ASCII floating point>
Example: 7.896283e-011

- **HISTOGRAM:DELAY**

The **HISTOGRAM:DELAY** command selects the horizontal center of the histogram keep-in box in seconds.

The **HISTOGRAM:DELAY** query returns the currently selected histogram box center.

**Command syntax- :SCOP**e**:HIST**ogram**:DEL**ay<2.4e-008 to 0.0001>

Example: Send(0,5,":SCOP:HIST:DEL 2.4e-008",23,EOI);

**Query syntax- :SCOP**e**:HIST**ogram**:DEL**ay?

Example: Send(0,5,":SCOP:HIST:DEL?",15,EOI);
Response: <ASCII floating point>
Example: 2.4e-008

- **HISTOGRAM:HEIGHT**

The **HISTOGRAM:HEIGHT** command selects the vertical height of the histogram keep-in box in Volts.

The **HISTOGRAM:HEIGHT** query returns the currently selected histogram height.

**Command syntax- :SCOP**e**:HIST**ogram**:HEI**ght<0.0 to 4.0>

Example: Send(0,5,":SCOP:HIST:HEI 0",16,EOI);

**Query syntax- :SCOP**e**:HIST**ogram**:HEI**ght?

Example: Send(0,5,":SCOP:HIST:HEI?",15,EOI);
Response: <ASCII floating height>
Example: 5.000e-001

- **HISTOGRAM:HITS**

The **HISTOGRAM:HITS** query returns the number of hits currently contained the histogram.

**Query syntax- :SCOP**e**:HIST**ogram**:HITS**(@<n,m,x,…>|<n:m>)?

Example: Send(0,5,":SCOP:HIST:HITS(@4)?",20,EOI);
Response: <ASCII integer>
Example: 3741

- **HISTOGRAM:MAXIMUM**

The **HISTOGRAM:MAXIMUM** query returns the maximum value contained within the histogram.

**Query syntax- :SCOP**e**:HIST**ogram**:MAX**imum(@<n,m,x,…>|<n:m>)?

Example: Send(0,5,":SCOP:HIST:MAX(@4)?",19,EOI);
Response: <ASCII floating point>
Example: 3.741529e-009

- ## HISTOGRAM:MEAN

The **HISTOGRAM:MEAN** query returns the average of all values contained in the histogram.

**Query syntax- :SCOPe:HISTogram:MEAN**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:HIST:MEAN(@4)?",20,EOI);`
Response: <ASCII floating point>
Example: 3.237129e-009

- ## HISTOGRAM:MINIMUM

The **HISTOGRAM:MINIMUM** query returns the minimum value contained within the histogram.

**Query syntax- :SCOPe:HISTogram:MINimum**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:HIST:MIN(@4)?",19,EOI);`
Response: <ASCII floating point>
Example: 3.027419e-009

- ## HISTOGRAM:MODE

The **HISTOGRAM:MODE** command set whether or not the histogram feature is enabled, and if enabled whether a horizontal or vertical histogram is created.

The **HISTOGRAM:MODE** query returns the currently selected histogram mode.

**Command syntax- :SCOPe:HISTogram:MODE**<OFF|HORizontal|VERtical>

Example: `Send(0,5,":SCOP:HIST:MODE OFF",19,EOI);`

**Query syntax- :SCOPe:HISTogram:MODE**?

Example: `Send(0,5,":SCOP:HIST:MODE?",16,EOI);`
Response: <OFF|HORizontal|VERtical>
Example: HORIZONTAL

- ## HISTOGRAM:STDDEV

The **HISTOGRAM:STDDEV** query returns the standard deviation of all values contained in the histogram.

**Query syntax- :SCOPe:HISTogram:STDDev**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:HIST:STDD(@4)?",20,EOI);`
Response: <ASCII floating point>
Example: 4.327419e-012

- ## HISTOGRAM:VOLTAGE

The **HISTOGRAM:VOLTAGE** command selects the vertical center of the histogram keep-in box in Volts.

The **HISTOGRAM:VOLTAGE** query returns the currently selected histogram vertical center.

**Command syntax- :SCOPe:HISTogram:VOLTage**<-2 to 2>

Example: `Send(0,5,":SCOP:HIST:VOLT -2",18,EOI);`

**Query syntax- :SCOPe:HISTogram:VOLTage**?

Example: `Send(0,5,":SCOP:HIST:VOLT?",16,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **HISTOGRAM:WIDTH**

The **HISTOGRAM:WIDTH** command selects the horizontal width of the histogram keep-in box in seconds.

The **HISTOGRAM:WIDTH** query returns the currently selected histogram width.

**Command syntax- :SCOPe:HISTogram:WIDth<0 to 0.0001>**

Example: `Send(0,5,":SCOP:HIST:WID 0",16,EOI);`

**Query syntax- :SCOPe:HISTogram:WIDth?**

Example: `Send(0,5,":SCOP:HIST:WID?",15,EOI);`
Response: <ASCII floating point>
Example: 1.000e-009

- **MASK:BTMFAILURES**

The **MASK:BTMFAILURES** query returns the number of hits which land in the bottom keep out region.

**Query syntax- :SCOPe:MASK:BTMFAILures(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:MASK:BTMFAIL(@4)?",23,EOI);`
Response: <ASCII integer>
Example: 7

- **MASK:COMPARISONS**

The **MASK:COMPARISONS** query returns the total number of hits which were compared to determine if they were within one of the three mask keep out regions.

**Query syntax- :SCOPe:MASK:COMParisons(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:MASK:COMP(@4)?",20,EOI);`
Response: <ASCII integer>
Example: 35000

- **MASK:ENABLE**

The **MASK:ENABLE** command is used to select whether or not the mask test is conducted.

The **MASK:ENABLE** query returns the currently selected state of the mask test.

**Command syntax- :SCOPe:MASK:ENABle<OFF|ON>**

Example: `Send(0,5,":SCOP:MASK:ENAB OFF",19,EOI);`

**Query syntax- :SCOPe:MASK:ENABle?**

Example: `Send(0,5,":SCOP:MASK:ENAB?",16,EOI);`
Response: <OFF|ON>
Example: ON

- **MASK:FAILURES**

The **MASK:FAILURES** query returns the number of hits which land in all three of the keep out regions combined.

**Query syntax- :SCOPe:MASK:FAILures(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:MASK:FAIL(@4)?",20,EOI);`
Response: <ASCII integer>
Example: 39

- ## MASK:MARGIN

The **MASK:MARGIN** command allows additional guard band to be added to or subtracted from the mask definition.

The **MASK:MARGIN** query returns the currently selected mask margin.

**Command syntax- :SCOPe:MASK:MARGin<-100 to 100>**

Example: `Send(0,5,":SCOP:MASK:MARG -100",20,EOI);`

**Query syntax- :SCOPe:MASK:MARGin?**

Example: `Send(0,5,":SCOP:MASK:MARG?",16,EOI);`
Response: <ASCII integer>
Example: 10

- ## MASK:MIDFAILURES

The **MASK:MIDFAILURES** query returns the number of hits which land in the middle keep out region.

**Query syntax- :SCOPe:MASK:MIDFAILures(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:MASK:MIDFAIL(@4)?",23,EOI);`
Response: <ASCII integer>
Example: 17

- ## MASK:PCT0LEVEL

The **MASK:PCT0LEVEL** command specifies the distance from the bottom of the middle keep out region to the top of the bottom keep out region as a percentages of the amplitude of the current data signal. This value has no immediate effect, but is used when the **:SCOPE:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions based on the current data signal.

The **MASK:PCT0LEVEL** query returns the currently selected value.

**Command syntax- :SCOPe:MASK:PCT0level<0 to 100>**

Example: `Send(0,5,":SCOP:MASK:PCT0 0",17,EOI);`

**Query syntax- :SCOPe:MASK:PCT0level?**

Example: `Send(0,5,":SCOP:MASK:PCT0?",16,EOI);`
Response: <ASCII floating point>
Example: 2.0000e+001

- ## MASK:PCT1LEVEL

The **MASK:PCT1LEVEL** command specifies the distance from the top of the middle keep out region to the bottom of the top keep out region as a percentages of the amplitude of the current data signal. This value has no immediate effect, but is used when the **:SCOPE:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions based on the current data signal.

The **MASK:PCT1LEVEL** query returns the currently selected value.

**Command syntax- :SCOPe:MASK:PCT1level<0 to 100>**

Example: `Send(0,5,":SCOP:MASK:PCT1 0",17,EOI);`

**Query syntax- :SCOPe:MASK:PCT1level?**

Example: `Send(0,5,":SCOP:MASK:PCT1?",16,EOI);`
Response: <ASCII floating point>
Example: 2.0000e+001

- ## MASK:PCTINSIDE

The **MASK:PCTINSIDE** command specifies the height of the middle keep out regions as a percentages of the amplitude of the current data signal. This value has no immediate effect, but is used when the **:SCOPE:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions based on the current data signal.

The **MASK:PCTINSIDE** query return the currently selected value.

**Command syntax- :SCOP**e**:MASK:PCTI**nside<0 to 100>

Example: Send(0,5,":SCOP:MASK:PCTI 0",17,EOI);

**Query syntax- :SCOP**e**:MASK:PCTI**nside?

Example: Send(0,5,":SCOP:MASK:PCTI?",16,EOI);
Response: <ASCII floating point>
Example: 6.0000e+001

- ## MASK:SCALE

The **MASK:SCALE** command scales the absolute mask dimensions based on the relative mask dimensions and the current data signal. An appropriate Eye Diagram should be centered in the window before issuing this command.

**Command syntax- :SCOP**e**:MASK:SCAL**e(@<n,m,x,…>|<n:m>)

Example: Send(0,5,":SCOP:MASK:SCAL(@4)",19,EOI);

- ## MASK:TAMPLITUDE

The **MASK:TAMPLITUDE** command selects the absolute mask width in units of time (seconds).

The **MASK:TAMPLITUDE** query returns the absolute mask width.

**Command syntax- :SCOP**e**:MASK:TAMP**litude<0 to 0.0001>

Example: Send(0,5,":SCOP:MASK:TAMP 0",17,EOI);

**Query syntax- :SCOP**e**:MASK:TAMP**litude?

Example: Send(0,5,":SCOP:MASK:TAMP?",16,EOI);
Response: <ASCII floating point>
Example: 1.000000e-009

- ## MASK:TFLAT

The **MASK:TFLAT** command selects the absolute mask flat width in units of time (seconds). The flat width is the flat region on the top and bottom of the mask.

The **MASK:TFLAT** query returns the currently selected flat mask width.

**Command syntax- :SCOP**e**:MASK:TFLA**t<0 to 0.0001>

Example: Send(0,5,":SCOP:MASK:TFLA 0",17,EOI);

**Query syntax- :SCOP**e**:MASK:TFLA**t?

Example: Send(0,5,":SCOP:MASK:TFLA?",16,EOI);
Response: <ASCII floating point>
Example: 5.000000e-010

- ## MASK:TOFFSET

The **MASK:TOFFSET** query returns the horizontal center of the mask, and is expressed in seconds. It is based on the mask being centered in the current scope window.

**Command syntax- :SCOPe:MASK:TOFFset<2.4e-008 to 0.0001>**

Example: `Send(0,5,":SCOP:MASK:TOFF 2.4e-008",24,EOI);`

**Query syntax- :SCOPe:MASK:TOFFset?**

Example: `Send(0,5,":SCOP:MASK:TOFF?",16,EOI);`
Response: <ASCII floating point>
Example: 2.600000e-008

- ## MASK:TOPFAILURES

The **MASK:TOPFAILURES** query returns the number of hits which land in the top keep out region.

**Query syntax- :SCOPe:MASK:TOPFAILures(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:MASK:TOPFAIL(@4)?",23,EOI);`
Response: <ASCII integer>
Example: 3

- ## MASK:UIFLAT

The **MASK:UIFLAT** command specifies the distance across the top and bottom flat faces of the mask. It is expressed as a percentage of the Unit Interval of the current data signal. This value has no immediate effect, but is used when the **:SCOPE:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions.

The **MASK:UIFLAT** query returns the current percentage used to scale the flat mask width.

**Command syntax- :SCOPe:MASK:UIFLAt<0.0 to 1.0>**

Example: `Send(0,5,":SCOP:MASK:UIFLA 0",18,EOI);`

**Query syntax- :SCOPe:MASK:UIFLAt?**

Example: `Send(0,5,":SCOP:MASK:UIFLA?",17,EOI);`
Response: <ASCII floating point>
Example: 2.000000e-010

- ## MASK:UIWIDTH

The **MASK:UIWIDTH** command specifies the mask width as a function of a percentage of the Unit Interval of the current data signal. This value has no immediate effect, but is used when the **:SCOPE:MASK:SCALE** command is issued in order to calculate new absolute mask dimensions.

The **MASK:UIWIDTH** query returns the current percentage used to scale the mask width.

**Command syntax- :SCOPe:MASK:UIWIDth<0.0 to 1.0>**

Example: `Send(0,5,":SCOP:MASK:UIWID 0",18,EOI);`

**Query syntax- :SCOPe:MASK:UIWIDth?**

Example: `Send(0,5,":SCOP:MASK:UIWID?",17,EOI);`
Response: <ASCII floating point>
Example: 4.000000e-010

- **MASK:VAMPLITUDE**

The **MASK:VAMPLITUDE** command sets the current mask vertical height, and is expressed in Volts.

The **MASK:VAMPLITUDE** query returns the currently selected vertical mask height.

**Command syntax- :SCOPe:MASK:VAMPlitude<0 to 4>**

Example: `Send(0,5,":SCOP:MASK:VAMP 0",17,EOI);`

**Query syntax- :SCOPe:MASK:VAMPlitude?**

Example: `Send(0,5,":SCOP:MASK:VAMP?",16,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-001

- **MASK:VOFFSET**

The **MASK:VOFFSET** query returns the vertical center of the mask, and is expressed in Volts. It is based on the mask being centered in the current scope window.

**Command syntax- :SCOPe:MASK:VOFFset<-2 to 2>**

Example: `Send(0,5,":SCOP:MASK:VOFF -2",18,EOI);`

**Query syntax- :SCOPe:MASK:VOFFset?**

Example: `Send(0,5,":SCOP:MASK:VOFF?",16,EOI);`
Response: <ASCII floating point>
Example: 5.000000e-001

- **MASK:VPASS0**

The **MASK:VPASS0** command specifies the distance from the bottom of the middle keep out region to the top of the bottom keep out region, and is expressed in Volts.

The **MASK:VPASS0** query returns the currently selected value.

**Command syntax- :SCOPe:MASK:VPASS0<0 to 2>**

Example: `Send(0,5,":SCOP:MASK:VPASS0 0",19,EOI);`

**Query syntax- :SCOPe:MASK:VPASS0?**

Example: `Send(0,5,":SCOP:MASK:VPASS0?",18,EOI);`
Response: <ASCII floating point>
Example: 2.000000e-001

- **MASK:VPASS1**

The **MASK:VPASS1** command specifies the distance from the top of the middle keep out region to the bottom of the top keep out region, and is expressed in Volts.

The **MASK:VPASS1** query returns the currently selected value.

**Command syntax- :SCOPe:MASK:VPASS1<0 to 2>**

Example: `Send(0,5,":SCOP:MASK:VPASS1 0",19,EOI);`

**Query syntax- :SCOPe:MASK:VPASS1?**

Example: `Send(0,5,":SCOP:MASK:VPASS1?",18,EOI);`
Response: <ASCII floating point>
Example: 2.000000e-001

- ## OVERSHOOT

The **OVERSHOOT** query returns the overshoot (Vmax – Vtop) calculated on the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SCOPe:OVERshoot(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:OVER(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 1.654e-002

- ## PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :SCOPe:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":SCOP:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :SCOPe:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":SCOP:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :SCOPe:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":SCOP:PARAM:TIME 10",19,EOI);`

**Query syntax- :SCOPe:PARAMeter:TIMEout?**

Example: `Send(0,5,":SCOP:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## RISETIME

The **RISETIME** query returns the risetime that was measured on the previous acquisition for the specified channel(s). A successful measurement is dependent on having a scope waveform in the acquisition window that is correctly identified as a rising edge. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SCOPe:RISetime(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:RIS(@4)?",14,EOI);`
Response: <ASCII floating point>
Example: 8.012948e-011

- ## TIMEBASE:DELAY

The **TIMEBASE:DELAY** command selects the current delay from the trigger to the left edge of the acquisition window, this is entered in units of picoseconds.

The **TIMEBASE:DELAY** query returns the current delay from the trigger to the left edge of the acquisition window.

**Command syntax- :SCOPe:TIMebase:DELay<24000 to 100000000>**

Example: `Send(0,5,":SCOP:TIM:DEL 24000",19,EOI);`

**Query syntax- :SCOPe:TIMebase:DELay?**

Example: `Send(0,5,":SCOP:TIM:DEL?",14,EOI);`
Response: <ASCII integer>
Example: 24000

- ## TIMEBASE:RANGE

The **TIMEBASE:RANGE** command selects the acquisition window width, this value is entered in units of picoseconds.

The **TIMEBASE:RANGE** query returns the current acquisition window width.

**Command syntax- :SCOPe:TIMebase:RANGe<50|100|200|500|1000|2000|5000|10000|20000|50000|100000|200000|500000|1000000|2000000|5000000>**

Example: `Send(0,5,":SCOP:TIM:RANG 50",17,EOI);`

**Query syntax- :SCOPe:TIMebase:RANGe?**

Example: `Send(0,5,":SCOP:TIM:RANG?",15,EOI);`
Response: <50|100|200|500|1000|2000|5000|10000|20000|50000|100000|200000|500000|1000000|2000000|5000000>
Example: 50

- ## TRIGGER:CHANNEL

The **TRIGGER:CHANNEL** command selects the channel to be used as the trigger source. If you want to use a Pattern Marker Card as the trigger source, select the channel that is associated with the Pattern Marker Card, and then activate the Pattern marker Card using the **PARAMETER:ARMING:MARKER** command.

The **TRIGGER:CHANNEL** query returns the current trigger source channel.

**Command syntax- :SCOPe:TRIGger:CHANnel<1 to 7>**

Example: `Send(0,5,":SCOP:TRIG:CHAN 1",17,EOI);`

**Query syntax- :SCOPe:TRIGger:CHANnel?**

Example: `Send(0,5,":SCOP:TRIG:CHAN?",16,EOI);`
Response: <ASCII integer>
Example: 3

- ## TRIGGER:LEVEL

The **TRIGGER:LEVEL** command selects the voltage threshold for the trigger source. The **AUTO** selection sets the trigger threshold voltage to the 50% voltage point of the pulsefind values on the selected trigger channel.

The **TRIGGER:LEVEL** query returns the current trigger voltage threshold.

**Command syntax- :SCOPe:TRIGger:LEVel<AUTO|value>**

Example: `Send(0,5,":SCOP:TRIG:LEV AUTO",19,EOI);`

**Query syntax- :SCOPe:TRIGger:LEVel?**

Example: `Send(0,5,":SCOP:TRIG:LEV?",15,EOI);`
Response: <AUTO|ASCII floating point>
Example: AUTO

- ## TRIGGER:SLOPE

The **TRIGGER:SLOPE** command selects the rising or falling edge to trigger the instrument.

The **TRIGGER:SLOPE** query returns the currently selected trigger edge.

**Command syntax- :SCOPe:TRIGger:SLOPe<POSitive|NEGative>**

Example: `Send(0,5,":SCOP:TRIG:SLOP POSitive",24,EOI);`

**Query syntax- :SCOPe:TRIGger:SLOPe?**

Example: `Send(0,5,":SCOP:TRIG:SLOP?",16,EOI);`
Response: <POSitive|NEGative>
Example: POSITIVE

- ## UNDERSHOOT

The **UNDERSHOOT** query returns the undershoot (Vbase – Vmin) calculated on the previous acquisition. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SCOPe:UNDershoot(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:UND(@4)?",14,EOI);`
Response: <ASCII floating point>
Example: 1.654e-002

- ## VAMPLITUDE

The **VAMPLITUDE** query returns the amplitude (Vtop – Vbase) calculated on the previous acquisition.

**Query syntax- :SCOPe:VAMPlitude(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:VAMP(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 1.654e-001

- ## VAVERAGE

The **VAVERAGE** query returns the average voltage across the acquisition window, calculated on the previous acquisition.

**Query syntax- :SCOPe:VAVerage(@<n,m,x,…>|<n:m>)?**

Example: `Send(0,5,":SCOP:VAV(@4)?",14,EOI);`
Response: <ASCII floating point>
Example: 1.764e-002

- **VBASE**

The **VBASE** query returns the voltage of the flat area on the base (0 logic level) of a data waveform.

**Query syntax- :SCOP**e**:VBAS**e(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:VBAS(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: -1.654e-001

- **VMAXIMUM**

The **VMAXIMUM** query returns the maximum voltage across the previous acquisition window.

**Query syntax- :SCOP**e**:VMAX**imum(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:VMAX(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 1.815e-001

- **VMIDDLE**

The **VMIDDLE** query midpoint voltage (Vtop + Vbase) / 2 obtained on the previous acquisition.

**Query syntax- :SCOP**e**:VMID**dle(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:VMID(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 1.764e-002

- **VMINIMUM**

The **VMINIMUM** query returns the minimum voltage across the previous acquisition window.

**Query syntax- :SCOP**e**:VMIN**imum(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:VMIN(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: -1.967e-001

- **VPP**

The **VPP** query returns the Pk-Pk voltage (Vmax – Vmin) obtained on the previous acquisition.

**Query syntax- :SCOP**e**:VPP**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:VPP(@4)?",14,EOI);`
Response: <ASCII floating point>
Example: 2.485e-001

- **VRMS**

The **VRMS** query return the root mean square voltage across the acquisition window, from on the previous acquisition.

**Query syntax- :SCOP**e**:VRMS**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:VRMS(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 3.345e-002

- **VTOP**

The **VTOP** query returns the voltage of the flat area on the top (1 logic level) of a data waveform.

**Query syntax- :SCOP**e**:VTOP**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:VTOP(@4)?",15,EOI);`
Response: <ASCII floating point>
Example: 1.654e-001

- **WAVEFORM:COMM**

The **WAVEFORM:COMM** query returns the common mode waveform as a block of IEEE double precision values. The block of data is preceded by a header in the following format:

x – The number of digits needed to specify the raw data block size
yy… – The raw data block size in bytes
dddd… - The raw data block in IEEE double precision values

**Query syntax- :SCOP**e**:WAVE**form**:COMM**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:WAVE:COMM(@4)?",15,EOI);`
Response: <#xyy…ddddddd…>

- **WAVEFORM:COMP**

The **WAVEFORM:COMP** query returns the complimentary input waveform as a block of IEEE double precision values. The block of data is preceded by a header in the following format:

x – The number of digits needed to specify the raw data block size
yy… – The raw data block size in bytes
dddd… - The raw data block in IEEE double precision values

**Query syntax- :SCOP**e**:WAVE**form**:COMP**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:WAVE:COMP(@4)?",15,EOI);`
Response: <#xyy…ddddddd…>

- **WAVEFORM:DIFF**

The **WAVEFORM:DIFF** query returns the differential waveform as a block of IEEE double precision values. The block of data is preceded by a header in the following format:

x – The number of digits needed to specify the raw data block size
yy… – The raw data block size in bytes
dddd… - The raw data block in IEEE double precision values

**Query syntax- :SCOP**e**:WAVE**form**:DIFF**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:WAVE:DIFF(@4)?",15,EOI);`
Response: <#xyy…ddddddd…>

- **WAVEFORM:NORM**

The **WAVEFORM:NORM** query returns the normal input waveform as a block of IEEE double precision values. The block of data is preceded by a header in the following format:

x – The number of digits needed to specify the raw data block size
yy… – The raw data block size in bytes
dddd… - The raw data block in IEEE double precision values

**Query syntax- :SCOP**e**:WAVE**form**:NORM**(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:WAVE:NORM(@4)?",15,EOI);`
Response: <#xyy…ddddddd…>

- **WAVEFORM**

The **WAVEFORM** query returns the waveform that is currently selected via the **:SCOPE:DISPLAY:INPUTS** command as a block of IEEE double precision values. The block of data is preceded by a header in the following format:

x – The number of digits needed to specify the raw data block size
yy… – The raw data block size in bytes
dddd… - The raw data block in IEEE double precision values

**Query syntax-** **:SCOP**e**:WAVE**form(@<n,m,x,…>|<n:m>)?

Example: `Send(0,5,":SCOP:WAVE(@4)?",15,EOI);`
Response: <#xyy…ddddddd…>

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## • DESCRIPTION OF THE SIMPLE COMMANDS

The **SIMPLE** commands are used to make basic time measurements. The time measurements are asynchronously sampled (without a trigger) at random intervals.

**:SIMPLE:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **PARAM**eter**:CHAN**nel | **PARAM**eter**:STOP:COUN**t |
| **DEF**ault | **PARAM**eter**:FILT**er**:ENAB**le | **PARAM**eter**:STOP:VOLT**age |
| **PARAM**eter**:ARM**ing**:CHAN**nel | **PARAM**eter**:FILT**er**:MAX**imum | **PARAM**eter**:THR**eshold |
| **PARAM**eter**:ARM**ing**:DEL**ay | **PARAM**eter**:FILT**er**:MIN**imum | **PARAM**eter**:TIME**out |
| **PARAM**eter**:ARM**ing**:MARK**er | **PARAM**eter**:FUNC**tion | **PLOTDATA:DATA** |
| **PARAM**eter**:ARM**ing**:MODE** | **PARAM**eter**:SAMP**les | **PLOTDATA:TIME**stamp |
| **PARAM**eter**:ARM**ing**:SLOP**e | **PARAM**eter**:STAR**t**:COUN**t | **PLOTINFO:DATA** |
| **PARAM**eter**:ARM**ing**:VOLT**age | **PARAM**eter**:STAR**t**:VOLT**age | **PLOTINFO:TIME**stamp |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Simple Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :SIMP**le**:ACQ**uire

Example: `Send(0,5,":SIMP:ACQ",9,EOI);`

## • DEFAULT

The **DEFAULT** command is used to reset all the Simple Tool settings back to their default values.

**Command syntax- :SIMP**le**:DEF**ault

Example: `Send(0,5,":SIMP:DEF",9,EOI);`

## • PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 0>

Example: `Send(0,5,":SIMP:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:CHAN**nel?

Example: `Send(0,5,":SIMP:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":SIMP:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:DEL**ay?

Example: `Send(0,5,":SIMP:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":SIMP:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:MARK**er?

Example: `Send(0,5,":SIMP:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":SIMP:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:MODE**?

Example: `Send(0,5,":SIMP:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

- **PARAMETER:ARMING:SLOPE**

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":SIMP:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:SLOP**e?

Example: `Send(0,5,":SIMP:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

- **PARAMETER:ARMING:VOLTAGE**

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":SIMP:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:ARM**ing**:VOLT**age?

Example: `Send(0,5,":SIMP:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- **PARAMETER:CHANNEL**

The **PARAMETER:CHANNEL** command selects the input channel(s) that will be used by this tool. For Channel-To-Channel measurements this command selects both the measurement and reference input channels that will be used. The channels are specified by first providing the integer number of the measurement channel, then an '&' character, and finally the integer number of the reference channel: <measurement channel>&<reference channel>.

The **PARAMETER:CHANNEL** query returns the currently selected input channel(s) for this tool.

**Command syntax- :SIMP**le**:PARAM**eter**:CHAN**nel<n>|<n&m>

Example: `Send(0,5,":SIMP:PARAM:CHAN4",17,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:CHAN**nel?

Example: `Send(0,5,":SIMP:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:FILTER:ENABLE

The **PARAMETER:FILTER:ENABLE** command enables a post-processing filter that ignores measurements acquired outside of the filter region. The statistics are calculated from only the measurements within the filter region, and the plots will display only data from within the filtered region. With filters enabled the number of hits acquired may be less than the number of hits requested as a result of the filtered values being thrown away.

The **PARAMETER:FILTER:ENABLE** query returns whether the filters are currently enabled.

**Command syntax- :SIMPle:PARAMeter:FILTer:ENABle<OFF|ON>**

Example: `Send(0,5,":SIMP:PARAM:FILT:ENAB OFF",25,EOI);`

**Query syntax- :SIMPle:PARAMeter:FILTer:ENABle?**

Example: `Send(0,5,":SIMP:PARAM:FILT:ENAB?",22,EOI);`
Response: <OFF|ON>
Example: OFF

## • PARAMETER:FILTER:MAXIMUM

The **PARAMETER:FILTER:MAXIMUM** command selects the maximum filter time in seconds.

The **PARAMETER:FILTER:MAXIMUM** query returns the maximum filter value.

**Command syntax- :SIMPle:PARAMeter:FILTer:MAXimum<-2.5 to 2.5>**

Example: `Send(0,5,":SIMP:PARAM:FILT:MAX -2.5",25,EOI);`

**Query syntax- :SIMPle:PARAMeter:FILTer:MAXimum?**

Example: `Send(0,5,":SIMP:PARAM:FILT:MAX?",21,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

## • PARAMETER:FILTER:MINIMUM

The **PARAMETER:FILTER:MINIMUM** command selects the minimum filter time in seconds.

The **PARAMETER:FILTER:MINIMUM** query returns the minimum filter value.

**Command syntax- :SIMPle:PARAMeter:FILTer:MINimum<-2.5 to 2.5>**

Example: `Send(0,5,":SIMP:PARAM:FILT:MIN -2.5",25,EOI);`

**Query syntax- :SIMPle:PARAMeter:FILTer:MINimum?**

Example: `Send(0,5,":SIMP:PARAM:FILT:MIN?",21,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

## • PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :SIMPle:PARAMeter:FUNCtion<TPD++|TPD--|TPD+-|TPD-+|TT+|TT-|PW+|PW-|PER+|FREQ|PER->**

Example: `Send(0,5,":SIMP:PARAM:FUNC TPD++",22,EOI);`

**Query syntax- :SIMPle:PARAMeter:FUNCtion?**

Example: `Send(0,5,":SIMP:PARAM:FUNC?",17,EOI);`
Response: <TPD++|TPD--|TPD+-|TPD-+|TT+|TT-|PW+|PW-|PER+|FREQ|PER->
Example: PER+

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :SIMPle:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":SIMP:PARAM:SAMP 1",18,EOI);`

**Query syntax- :SIMPle:PARAMeter:SAMPles?**

Example: `Send(0,5,":SIMP:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER START COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :SIMPle:PARAMeter:STARt:COUNt<1 to 10000000>**

Example: `Send(0,5,":SIMP:PARAM:STAR:COUN 1",23,EOI);`

**Query syntax- :SIMPle:PARAMeter:STARt:COUNt?**

Example: `Send(0,5,":SIMP:PARAM:STAR:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 1

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the measurement channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected measurement channel user voltage.

**Command syntax- :SIMPle:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":SIMP:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :SIMPle:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":SIMP:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :SIMPle:PARAMeter:STOP:COUNt<1 to 10000000>**

Example: `Send(0,5,":SIMP:PARAM:STOP:COUN 1",23,EOI);`

**Query syntax- :SIMPle:PARAMeter:STOP:COUNt?**

Example: `Send(0,5,":SIMP:PARAM:STOP:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 2

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the reference channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected reference channel user voltage.

**Command syntax- :SIMPle:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":SIMP:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :SIMPle:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":SIMP:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :SIMPle:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":SIMP:PARAM:THR 5050",20,EOI);`

**Query syntax- :SIMPle:PARAMeter:THReshold?**

Example: `Send(0,5,":SIMP:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :SIMP**le**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":SIMP:PARAM:TIME 0.01",21,EOI);`

**Query syntax- :SIMP**le**:PARAM**eter**:TIME**out?

Example: `Send(0,5,":SIMP:PARAM:TIME?",17,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PLOTDATA:DATA**

The **PLOTDATA:DATA** query returns the plot data associated with the raw measurements as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SIMP**le**:PLOTDATA:DATA**?

Example: `Send(0,5,":SIMP:PLOTDATA:DATA?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:TIMESTAMP**

The **PLOTDATA:TIMESTAMP** query returns the timestamp data associated with the raw measurements as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SIMP**le**:PLOTDATA:TIME**stamp?

Example: `Send(0,5,":SIMP:PLOTDATA:TIME?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTINFO:DATA**

The **PLOTINFO:DATA** query returns the plot information associated with the raw measurements.

**Query syntax- :SIMP**le**:PLOTINFO:DATA**?

Example: `Send(0,5,":SIMP:PLOTINFO:DATA?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TIMESTAMP**

The **PLOTINFO:TIMESTAMP** query returns the timestamp information associated with the raw measurements.

**Query syntax- :SIMP**le**:PLOTINFO:TIME**stamp?

Example: `Send(0,5,":SIMP:PLOTINFO:TIME?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

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## • DESCRIPTION OF SKEW AND PROPAGATION DELAY COMMANDS

The **SKEW** commands are used to make time measurements of different clock signals with respect to one another. The time measurements are asynchronously sampled (without a trigger) at random intervals. The time measurements are used to develop a histogram; measured values are on the x-axis and number of hits are on the y-axis. This histogram can then have the Tail-Fit™ algorithm applied, which separates the jitter into random and deterministic components (RJ and DJ). When operating in Tail-Fit mode, a "Bathtub Curve" provides an accurate estimation of Total Jitter (TJ), or long-term signal integrity.

**:SKEW:**<command syntax>

**ACQ**uire
**ARMFIND**
**CHISQLEFT**
**CHISQRIGHT**
**CLE**ar
**DEF**ault
**DJ**
**HITS**
**LATE**st:**HITS**
**LATE**st:**MAX**imum
**LATE**st:**MEAN**
**LATE**st:**MIN**imum
**LATE**st:**PK**topk
**LATE**st:**STDD**ev
**LEFTRJ**
**MAX**imum
**MEAN**
**MIN**imum
**NUMPASS**es
**PARAM**eter:**ARM**ing:**CHAN**nel
**PARAM**eter:**ARM**ing:**DEL**ay
**PARAM**eter:**ARM**ing:**MARK**er
**PARAM**eter:**ARM**ing:**MODE**
**PARAM**eter:**ARM**ing:**SLOP**e
**PARAM**eter:**ARM**ing:**VOLT**age
**PARAM**eter:**CHAN**nel
**PARAM**eter:**FILT**er:**ENAB**le
**PARAM**eter:**FILT**er:**MAX**imum
**PARAM**eter:**FILT**er:**MIN**imum
**PARAM**eter:**FUNC**tion
**PARAM**eter:**SAMP**les
**PARAM**eter:**STAR**t:**COUN**t
**PARAM**eter:**STAR**t:**VOLT**age
**PARAM**eter:**STOP:COUN**t
**PARAM**eter:**STOP:VOLT**age
**PARAM**eter:**THR**eshold
**PARAM**eter:**TIME**out
**PK**topk
**PLOTDATA:ACCUM**ulated
**PLOTDATA:BATH**tub
**PLOTDATA:COMB**inedcycle
**PLOTDATA:LAST**
**PLOTDATA:LONG**cycle
**PLOTDATA:MAX**imum
**PLOTDATA:SHORT**cycle
**PLOTINFO:ACCUM**ulated
**PLOTINFO:BATH**tub
**PLOTINFO:COMB**inedcycle
**PLOTINFO:LAST**
**PLOTINFO:LONG**cycle
**PLOTINFO:MAX**imum
**PLOTINFO:SHORT**cycle
**RIGHTRJ**
**RJ**
**STDD**ev
**TAIL**fit:**COMP**lete
**TAIL**fit:**MINHITS**
**TAIL**fit:**MODE**
**TAIL**fit:**PROB**ability
**TAIL**fit:**SPEC**ification
**TJ**

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Skew Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :SKEW:ACQ**uire

Example: `Send(0,5,":SKEW:ACQ;*OPC",9,EOI);`

- **ARMFIND**

The **ARMFIND** command will optimize the placement of the arm (pattern marker) with respect to the data. An improperly placed marker can cause failures due to the creation of a Meta-Stable condition. This happens when the delay after the arming event (19-21ns) is synchronized to a data edge. When this happens, even small amounts of jitter can cause the edge to be measured or missed, resulting in large measurement errors. The problem is exacerbated when measurements are to be conducted across multiple channels. This command performs an optimization across one or more channels, and returns the result in the same format as is described by the **PARAMETER:ARMING:DELAY** command.

**Command syntax- :SKEW:ARMFIND**(@<n,m,x,…>|<n:m>)

Example: `Send(0,5,":SKEW:ARMFIND(@4)",17,EOI);`
Response: <ASCII integer>
Example: -16

- **CHISQLEFT**

The **CHISQLEFT** query returns the $\chi 2$ value for the left side of the histogram obtained from the previous acquisition. This is a qualitative measure of the goodness-of-fit from the Tail-Fit to the actual histogram data. A value less than 2 is normally considered to be a "good" fit. Since this value is based on the Tail-Fit, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SKEW:CHISQLEFT**?

Example: `Send(0,5,":SKEW:CHISQLEFT?",16,EOI);`
Response: <ASCII floating point>
Example: 1.697e+000

- **CHISQRIGHT**

The **CHISQRIGHT** query returns the $\chi 2$ value for the right side of the histogram obtained from the previous acquisition. This is a qualitative measure of the goodness-of-fit from the Tail-Fit to the actual histogram data. A value less than 2 is normally considered to be a "good" fit. Since this value is based on the Tail-Fit, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SKEW:CHISQRIGHT**?

Example: `Send(0,5,":SKEW:CHISQRIGHT?",17,EOI);`
Response: <ASCII floating point>
Example: 2.069e+000

- **CLEAR**

The **CLEAR** command provides a means to flush any previous data. Since the Skew Tool employs a Tail-Fit, it continues to accumulate data across successive acquisitions.

**Command syntax- :SKEW:CLE**ar

Example: `Send(0,5,":SKEW:CLE",9,EOI);`

- **DEFAULT**

The **DEFAULT** command is used to reset all the Skew Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :SKEW:DEF**ault

Example: `Send(0,5,":SKEW:DEF",9,EOI);`

- **DJ**

The **DJ** query returns the Deterministic Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SKEW:DJ**?

Example: `Send(0,5,":SKEW:DJ?",9,EOI);`
Response: <ASCII floating point>
Example: 23.637e-12

- **HITS**

The **HITS** query returns the number of accumulated hits in the histogram.

**Query syntax- :SKEW:HITS**?

Example: `Send(0,5,":SKEW:HITS?",11,EOI);`
Response: <ASCII integer>
Example: 35000

- **LATEST:HITS**

The **LATEST:HITS** query returns the number of hits in the latest histogram pass.

**Query syntax- :SKEW:LATE**st**:HITS**?

Example: `Send(0,5,":SKEW:LATE:HITS?",16,EOI);`
Response: <ASCII integer>
Example: 5000

- **LATEST:MAXIMUM**

The **LATEST:MAXIMUM** query returns the maximum measurement value obtained on the latest histogram pass.

**Query syntax- :SKEW:LATE**st**:MAX**imum?

Example: `Send(0,5,":SKEW:LATE:MAX?",15,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **LATEST:MEAN**

The **LATEST:MEAN** query returns the average of all measurement values obtained on the latest histogram pass.

**Query syntax- :SKEW:LATE**st**:MEAN**?

Example: `Send(0,5,":SKEW:LATE:MEAN?",16,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **LATEST:MINIMUM**

The **LATEST:MINIMUM** query returns the minimum measurement value obtained on the latest histogram pass.

**Query syntax- :SKEW:LATE**st**:MIN**imum?

Example: `Send(0,5,":SKEW:LATE:MIN?",15,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **LATEST:PKTOPK**

The **LATEST:PKTOPK** query returns the maximum measurement value minus the minimum measurement value obtained on the latest histogram pass.

**Query syntax- :SKEW:LATEst:PKtopk?**

Example: `Send(0,5,":SKEW:LATE:PK?",14,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

- **LATEST:STDDEV**

The **LATEST:STDDEV** query returns the standard deviation of all measurements obtained on the latest histogram pass.

**Query syntax- :SKEW:LATEst:STDDev?**

Example: `Send(0,5,":SKEW:LATE:STDD?",16,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **LEFTRJ**

The **LEFTRJ** query returns the Random Jitter on the Left Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SKEW:LEFTRJ?**

Example: `Send(0,5,":SKEW:LEFTRJ?",13,EOI);`
Response: <ASCII floating point>
Example: 3.637e-012

- **MAXIMUM**

The **MAXIMUM** query returns the maximum measurement value obtained across all accumulated histogram passes.

**Query syntax- :SKEW:MAXimum?**

Example: `Send(0,5,":SKEW:MAX?",10,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **MEAN**

The **MEAN** query returns the average of all measurement values obtained across all accumulated histogram passes.

**Query syntax- :SKEW:MEAN?**

Example: `Send(0,5,":SKEW:MEAN?",11,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all accumulated histogram passes.

**Query syntax- :SKEW:MINimum?**

Example: `Send(0,5,":SKEW:MIN?",10,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **NUMPASSES**

The **NUMPASSES** query returns the number of passes of data that have been accumulated into the histogram.

**Query syntax- :SKEW:NUMPASSes?**

Example: `Send(0,5,":SKEW:NUMPASS?",14,EOI);`
Response: <ASCII integer>
Example: 16

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :SKEW:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":SKEW:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :SKEW:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":SKEW:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

- **PARAMETER:ARMING:DELAY**

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :SKEW:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":SKEW:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :SKEW:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":SKEW:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :SKEW:PARAMeter:ARMing:MARKer**<OFF|ON>

Example: `Send(0,5,":SKEW:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :SKEW:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":SKEW:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :SKEW:PARAMeter:ARMing:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":SKEW:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :SKEW:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":SKEW:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :SKEW:PARAMeter:ARMing:SLOPe**<FALL|RISE>

Example: `Send(0,5,":SKEW:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :SKEW:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":SKEW:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :SKEW:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":SKEW:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :SKEW:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":SKEW:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the measurement and reference input channels that will be used by this tool. The channels are specified by first providing the integer number of the measurement channel, then an '&' character, and finally the integer number of the reference channel: <measurement channel>&<reference channel>

The **PARAMETER:CHANNEL** query returns the currently selected measurement and reference channels for this tool.

**Command syntax- :SKEW:PARAMeter:CHANnel<n&m>**

Example: `Send(0,5,":SKEW:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :SKEW:PARAMeter:CHANnel?**

Example: `Send(0,5,":SKEW:PARAM:CHAN?",17,EOI);`
Response: <measurement channel> & <reference channel>
Example: 1&7

## • PARAMETER:FILTER:ENABLE

The **PARAMETER:FILTER:ENABLE** command enables a post-processing filter that ignores measurements acquired outside of the filter region. The statistics are calculated from only the measurements within the filter region, and the plots will display only data from within the filtered region. With filters enabled the number of hits acquired may be less than the number of hits requested as a result of the filtered values being thrown away.

The **PARAMETER:FILTER:ENABLE** query returns whether the filters are currently enabled.

**Command syntax- :SKEW:PARAMeter:FILTer:ENABle<OFF|ON>**

Example: `Send(0,5,":SKEW:PARAM:FILT:ENAB OFF",25,EOI);`

**Query syntax- :SKEW:PARAMeter:FILTer:ENABle?**

Example: `Send(0,5,":SKEW:PARAM:FILT:ENAB?",22,EOI);`
Response: <OFF|ON>
Example: OFF

- ## PARAMETER:FILTER:MAXIMUM

The **PARAMETER:FILTER:MAXIMUM** command selects the maximum filter time in seconds.

The **PARAMETER:FILTER:MAXIMUM** query returns the maximum filter value.

**Command syntax- :SKEW:PARAMeter:FILTer:MAXimum<-2.5 to 2.5>**

Example: `Send(0,5,":SKEW:PARAM:FILT:MAX -2.5",25,EOI);`

**Query syntax- :SKEW:PARAMeter:FILTer:MAXimum?**

Example: `Send(0,5,":SKEW:PARAM:FILT:MAX?",21,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- ## PARAMETER:FILTER:MINIMUM

The **PARAMETER:FILTER:MINIMUM** command selects the minimum filter time in seconds.

The **PARAMETER:FILTER:MINIMUM** query returns the minimum filter value.

**Command syntax- :SKEW:PARAMeter:FILTer:MINimum<-2.5 to 2.5>**

Example: `Send(0,5,":SKEW:PARAM:FILT:MIN -2.5",25,EOI);`

**Query syntax- :SKEW:PARAMeter:FILTer:MINimum?**

Example: `Send(0,5,":SKEW:PARAM:FILT:MIN?",21,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- ## PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :SKEW:PARAMeter:FUNCtion<TPD++|TPD--|TPD+-|TPD-+>**

Example: `Send(0,5,":SKEW:PARAM:FUNC TPD++",22,EOI);`

**Query syntax- :SKEW:PARAMeter:FUNCtion?**

Example: `Send(0,5,":SKEW:PARAM:FUNC?",17,EOI);`
Response: <TPD++|TPD--|TPD+-|TPD-+>

- ## PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :SKEW:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":SKEW:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :SKEW:PARAMeter:SAMPles?**

Example: `Send(0,5,":SKEW:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

- ## PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :SKEW:PARAMeter:STARt:COUNt<1 to 10000000>**

Example: `Send(0,5,":SKEW:PARAM:STAR:COUN 1",23,EOI);`

**Query syntax- :SKEW:PARAMeter:STARt:COUNt?**

Example: `Send(0,5,":SKEW:PARAM:STAR:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 1

- ## PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the measurement channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected measurement channel user voltage.

**Command syntax- :SKEW:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":SKEW:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :SKEW:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":SKEW:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :SKEW:PARAMeter:STOP:COUNt<1 to 10000000>**

Example: `Send(0,5,":SKEW:PARAM:STOP:COUN 1",23,EOI);`

**Query syntax- :SKEW:PARAMeter:STOP:COUNt?**

Example: `Send(0,5,":SKEW:PARAM:STOP:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 2

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the reference channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected reference channel user voltage.

**Command syntax- :SKEW:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":SKEW:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :SKEW:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":SKEW:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :SKEW:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":SKEW:PARAM:THR 5050",20,EOI);`

**Query syntax- :SKEW:PARAMeter:THReshold?**

Example: `Send(0,5,":SKEW:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :SKEW:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":SKEW:PARAM:TIME 10",19,EOI);`

**Query syntax- :SKEW:PARAMeter:TIMEout?**

Example: `Send(0,5,":SKEW:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PKTOPK

The **PKTOPK** query returns the maximum measurement value minus the minimum measurement value accumulated across all histogram passes.

**Query syntax- :SKEW:PKtopk?**

Example: `Send(0,5,":SKEW:PK?",9,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

 

- **PLOTDATA:ACCUMULATED**

The **PLOTDATA:ACCUMULATED** query returns the plot data associated with the ACCUMULATED HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SKEW:PLOTDATA:ACCUM**ulated?

Example: `Send(0,5,":SKEW:PLOTDATA:ACCUM?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:BATHTUB**

The **PLOTDATA:BATHTUB** query returns the plot data associated with the BATHTUB plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SKEW:PLOTDATA:BATH**tub?

Example: `Send(0,5,":SKEW:PLOTDATA:BATH?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:COMBINEDCYCLE**

The **PLOTDATA:COMBINEDCYCLE** query returns the plot data associated with the TOTAL JITTER VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SKEW:PLOTDATA:COMB**inedcycle?

Example: `Send(0,5,":SKEW:PLOTDATA:COMB?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:LAST**

The **PLOTDATA:LAST** query returns the plot data associated with the LATEST HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SKEW:PLOTDATA:LAST**?

Example: `Send(0,5,":SKEW:PLOTDATA:LAST?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:LONGCYCLE**

The **PLOTDATA:LONGCYCLE** query returns the plot data associated with the LONG CYCLE VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SKEW:PLOTDATA:LONG**cycle?

Example: `Send(0,5,":SKEW:PLOTDATA:LONG?",20,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:MAXIMUM**

The **PLOTDATA:MAXIMUM** query returns the plot data associated with the MAXIMUM HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SKEW:PLOTDATA:MAX**imum?

Example: `Send(0,5,":SKEW:PLOTDATA:MAX?",19,EOI);`
Response: #xy…dddddddd…

- ## PLOTDATA:SHORTCYCLE

The **PLOTDATA:SHORTCYCLE** query returns the plot data associated with the SHORT CYCLE VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SKEW:PLOTDATA:SHORT**cycle?

Example: `Send(0,5,":SKEW:PLOTDATA:SHORT?",21,EOI);`
Response: #xy…ddddddddd…

- ## PLOTINFO:ACCUMULATED

The **PLOTINFO:ACCUMULATED** query returns the plot information associated with the ACCUMULATED HISTOGRAM plot.

**Query syntax- :SKEW:PLOTINFO:ACCUM**ulated?

Example: `Send(0,5,":SKEW:PLOTINFO:ACCUM?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:BATHTUB

The **PLOTINFO:BATHTUB** query returns the plot information associated with the BATHTUB plot.

**Query syntax- :SKEW:PLOTINFO:BATH**tub?

Example: `Send(0,5,":SKEW:PLOTINFO:BATH?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:COMBINEDCYCLE

The **PLOTINFO:COMBINEDCYCLE** query returns the plot information associated with the TOTAL JITTER VS TIME plot.

**Query syntax- :SKEW:PLOTINFO:COMB**inedcycle?

Example: `Send(0,5,":SKEW:PLOTINFO:COMB?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:LAST

The **PLOTINFO:LAST** query returns the plot information associated with the LATEST HISTOGRAM plot.

**Query syntax- :SKEW:PLOTINFO:LAST**?

Example: `Send(0,5,":SKEW:PLOTINFO:LAST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- ## PLOTINFO:LONGCYCLE

The **PLOTINFO:LONGCYCLE** query returns the plot information associated with the LONG CYCLE VS TIME plot.

**Query syntax- :SKEW:PLOTINFO:LONG**cycle?

Example: `Send(0,5,":SKEW:PLOTINFO:LONG?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:MAXIMUM**

The **PLOTINFO:MAXIMUM** query returns the plot information associated with the MAXIMUM HISTOGRAM plot.

**Query syntax- :SKEW:PLOTINFO:MAX**imum?

Example: `Send(0,5,":SKEW:PLOTINFO:MAX?",19,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SHORTCYCLE**

The **PLOTINFO:SHORTCYCLE** query returns the plot information associated with the SHORT CYCLE VS TIME plot.

**Query syntax- :SKEW:PLOTINFO:SHORT**cycle?

Example: `Send(0,5,":SKEW:PLOTINFO:SHORT?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **RIGHTRJ**

The **RIGHTRJ** query returns the Random Jitter on the Right Side of the Total Jitter Histogram obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SKEW:RIGHTRJ**?

Example: `Send(0,5,":SKEW:RIGHTRJ?",14,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **RJ**

The **RJ** query returns the Random Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SKEW:RJ**?

Example: `Send(0,5,":SKEW:RJ?",9,EOI);`
Response: <ASCII floating point>
Example: 3.637e-12

- **STDDEV**

The **STDDEV** query returns the standard deviation of all measurements across all accumulated histogram passes.

**Query syntax- :SKEW:STDD**ev?

Example: `Send(0,5,":SKEW:STDD?",11,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **TAILFIT:COMPLETE**

The **TAILFIT:COMPLETE** query provides a means to determine if the Tail-Fit has been completed. The Tail-Fit operation is an iterative process, and multiple acquires will be required before RJ, PJ, & TJ results are available. A value if 1 indicates the Tail-Fit is complete, a value of 0 indicates additional acquires are required.

**Query syntax- :SKEW:TAIL**fit**:COMP**lete?

Example: `Send(0,5,":SKEW:TAIL:COMP?",16,EOI);`
Response: <0|1>

- ## TAILFIT:MINHITS

The **TAILFIT:MINHITS** command selects the number of hits which must be accumulated before a Tail-Fit is attempted. This can be used to speed acquisition times if some minimum number of hits is required. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

The **TAILFIT:MINHITS** query returns the currently selected number of minimum hits. This value is specified in 1,000's of hits, so a value of 1 means 1,000 hits.

**Command syntax- :SKEW:TAIL**fit**:MINHITS**<0 to 10000>

Example: `Send(0,5,":SKEW:TAIL:MINHITS 0",20,EOI);`

**Query syntax- :SKEW:TAIL**fit**:MINHITS**?

Example: `Send(0,5,":SKEW:TAIL:MINHITS?",19,EOI);`
Response: <ASCII integer>
Example: 50

- ## TAILFIT:MODE

The **TAILFIT:MODE** command selects whether a Tail-Fit will be performed or not. It also allows the special Force-Fit mode to be enabled. The Force-Fit mode circumvents some of the criteria that is used to ensure the quality of the result, and forces a result to be returned.

The **TAILFIT:MODE** query returns the currently selected Tail-Fit mode.

**Command syntax- :SKEW:TAIL**fit**:MODE**<OFF|ON|FORCEFIT>

Example: `Send(0,5,":SKEW:TAIL:MODE OFF",19,EOI);`

**Query syntax- :SKEW:TAIL**fit**:MODE**?

Example: `Send(0,5,":SKEW:TAIL:MODE?",16,EOI);`
Response: <OFF|ON|FORCEFIT>

- ## TAILFIT:PROBABILITY

The **TAILFIT:PROBABILITY** command selects the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12. This value is specified by the exponent of the error rate.

**Command syntax- :SKEW:TAIL**fit**:PROB**ability<-16 to -1>

Example: `Send(0,5,":SKEW:TAIL:PROB -16",19,EOI);`

**Query syntax- :SKEW:TAIL**fit**:PROB**ability?

Example: `Send(0,5,":SKEW:TAIL:PROB?",16,EOI);`
Response: <ASCII integer>
Example: -12

- ## TAILFIT:SPECIFICATION

The **TAILFIT:SPECIFICATION** command selects the time in seconds between the two sides of the Bathtub Plot. It will effect the prediction of the Error Probability resulting in the two Bathtub Curves converging, indicting Eye Closure.

The **TAILFIT:SPECIFICATION** query returns the currently selected Tail-Fit specification.

**Command syntax- :SKEW:TAIL**fit**:SPEC**ification<0 to 2.5>

Example: `Send(0,5,":SKEW:TAIL:SPEC 0",17,EOI);`

**Query syntax- :SKEW:TAIL**fit**:SPEC**ification?

Example: `Send(0,5,":SKEW:TAIL:SPEC?",16,EOI);`
Response: <ASCII floating point>
Example: 1.000e-009

 

- **TJ**

The **TJ** query returns the Total Jitter obtained from the previous acquisition. Since this tool uses a Tail-Fit to compute this value, a valid value may not always be available. If no current value is available, 9.99999E+37 is returned as the measurement result.

**Query syntax- :SKEW:TJ?**

Example: `Send(0,5,":SKEW:TJ?",9,EOI);`
Response: <ASCII floating point>
Example: 73.637e-12

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# 6-31 SPREAD SPECTRUM CLOCK ANALYSIS COMMANDS

## • DESCRIPTION OF SPREAD SPECTRUM CLOCK ANALYSIS

The **SSCA** commands are used to automatically measure SSC effects on signals. The frequency of the SSC will be measured, as well as the plus and minus parts per million (ppm) delta from a nominal frequency.

**:SSCA:**<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **PARAM**eter**:ARM**ing**:CHAN**nel | **PATTERN** |
| **AVGMEAS** | **PARAM**eter**:ARM**ing**:DEL**ay | **PKTOPK** |
| **CAR**rierfreq | **PARAM**eter**:ARM**ing**:MARK**er | **PLOTDATA:HIST**ogram |
| **DATASTD** | **PARAM**eter**:ARM**ing**:MODE** | **PLOTDATA:SIGM**a |
| **DEF**ault | **PARAM**eter**:ARM**ing**:SLOP**e | **PLOTINFO:HIST**ogram |
| **MAXFREQ** | **PARAM**eter**:ARM**ing**:VOLT**age | **PLOTINFO:SIGM**a |
| **MAXMEAS** | **PARAM**eter**:CHAN**nel | **PPM-** |
| **MAXSPAN** | **PARAM**eter**:SAMP**les | **PPM+** |
| **MINFREQ** | **PARAM**eter**:STAR**t**:VOLT**age | **PPMAVE**rages |
| **MINMEAS** | **PARAM**eter**:STOP:VOLT**age | **PPMSAMP**les |
| **MODFREQ** | **PARAM**eter**:THR**eshold | **STD**dev |
| **NOMFREQ** | **PARAM**eter**:TIME**out | **UI** |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Spread Spectrum Clock Analysis Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :SSCA:ACQ**uire

Example: `Send(0,5,":SSCA:ACQ",9,EOI);`

## • AVGMEAS

The **AVGMEAS** query returns the average measurement obtained for the previous histogram acquisition. This should be across the number of periods that was determined in the first phase of the measurement.

**Query syntax- :SSCA:AVGMEAS**?

Example: `Send(0,5,":SSCA:AVGMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.618865e-005

## • CARRIERFREQ

The **CARRIERFREQ** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :SSCA:CAR**rierfreq?

Example: `Send(0,5,":SSCA:CAR?",10,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- **DATASTD**

The **DATASTD** command selects the current standard to test against. If **USER** is selected, values for **MINFREQ**, **MAXFREQ**, and **NOMFREQ** will need to be supplied.

The **DATASTD** query returns the standard that is currently selected.

**Command syntax- :SSCA:DATASTD**<USER|SATA1|SATA2|PCIX>

Example: `Send(0,5,":SSCA:DATASTD USER",18,EOI);`

**Query syntax- :SSCA:DATASTD**?

Example: `Send(0,5,":SSCA:DATASTD?",14,EOI);`
Response: <USER|SATA1|SATA2|PCIX>
Example: SATA1

- **DEFAULT**

The **DEFAULT** command is used to reset all the Spread Spectrum Clock Analysis Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :SSCA:DEF**ault

Example: `Send(0,5,":SSCA:DEF",9,EOI);`

- **MAXFREQ**

The **MAXFREQ** command selects the maximum modulation frequency to be used in the search for the peak modulation frequency. The data standard should have previously been set to **USER** with the **:SSCA:DATASTD** command or this command will have no effect.

The **MAXFREQ** query returns the currently selected maximum modulation frequency. The units are in Hertz.

**Command syntax- :SSCA:MAXFREQ**<1000 to 1e+006>

Example: `Send(0,5,":SSCA:MAXFREQ 1000",18,EOI);`

**Query syntax- :SSCA:MAXFREQ**?

Example: `Send(0,5,":SSCA:MAXFREQ?",14,EOI);`
Response: <ASCII floating point>
Example: 3.300000e+006

- **MAXMEAS**

The **MAXMEAS** query returns the maximum measurement obtained for the previous histogram acquisition. This should be across the number of periods that was determined in the first phase of the measurement.

**Query syntax- :SSCA:MAXMEAS**?

Example: `Send(0,5,":SSCA:MAXMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.767893e-005

- **MAXSPAN**

The **MAXSPAN** query returns the span across which the peak jitter is observed. This value is calculated in the first measurement phase, and is based on the measurement span which produced the largest 1-Sigma vs Span value.

**Query syntax- :SSCA:MAXSPAN**?

Example: `Send(0,5,":SSCA:MAXSPAN?",14,EOI);`
Response: <ASCII integer>
Example: 11950

 

- **MINFREQ**

The **MINFREQ** command selects the minimum modulation frequency to be used in the search for the peak modulation frequency. The data standard should have previously been set to **USER** with the **:SSCA:DATASTD** command or this command will have no effect.

The **MINFREQ** query returns the currently selected minimum modulation frequency. The units are in Hertz.

**Command syntax- :SSCA:MINFREQ**<1000 to 1e+006>

Example: `Send(0,5,":SSCA:MINFREQ 1000",18,EOI);`

**Query syntax- :SSCA:MINFREQ**?

Example: `Send(0,5,":SSCA:MINFREQ?",14,EOI);`
Response: <ASCII floating point>
Example: 3.000000e+006

- **MINMEAS**

The **MINMEAS** query returns the maximum measurement obtained for the previous histogram acquisition. This should be across the number of periods that was determined in the first phase of the measurement.

**Query syntax- :SSCA:MINMEAS**?

Example: `Send(0,5,":SSCA:MINMEAS?",14,EOI);`
Response: <ASCII floating point>
Example: 1.6037692-005

- **MODFREQ**

The **MODFREQ** query returns the peak modulation frequency. This value is calculated in the first measurement phase, and is based on the measurement span which produced the largest 1-Sigma vs Span value.

**Query syntax- :SSCA:MODFREQ**?

Example: `Send(0,5,":SSCA:MODFREQ?",14,EOI);`
Response: <ASCII floating point>
Example: 3.103225e+006

- **NOMFREQ**

The **NOMFREQ** command selects the nominal carrier frequency to be used for all calculations. The data standard should have previously been set to **USER** with the **:SSCA:DATASTD** command or this command will have no effect.

The **NOMFREQ** query returns the currently selected nominal carrier frequecny.

**Command syntax- :SSCA:NOMFREQ**<1e+006 to 1e+010>

Example: `Send(0,5,":SSCA:NOMFREQ 1e+006",20,EOI);`

**Query syntax- :SSCA:NOMFREQ**?

Example: `Send(0,5,":SSCA:NOMFREQ?",14,EOI);`
Response: <ASCII floating point>
Example: 1.250000e+006

## • PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :SSCA:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":SSCA:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :SSCA:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":SSCA:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :SSCA:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":SSCA:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :SSCA:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":SSCA:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :SSCA:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":SSCA:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :SSCA:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":SSCA:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

 

- ## PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :SSCA:PARAMeter:ARMing:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":SSCA:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :SSCA:PARAMeter:ARMing:MODE**?

Example: `Send(0,5,":SSCA:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

- ## PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :SSCA:PARAMeter:ARMing:SLOPe**<FALL|RISE>

Example: `Send(0,5,":SSCA:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :SSCA:PARAMeter:ARMing:SLOPe**?

Example: `Send(0,5,":SSCA:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

- ## PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :SSCA:PARAMeter:ARMing:VOLT**age<-2 to 2>

Example: `Send(0,5,":SSCA:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :SSCA:PARAMeter:ARMing:VOLT**age?

Example: `Send(0,5,":SSCA:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :SSCA:PARAMeter:CHAN**nel<1-10>

Example: `Send(0,5,":SSCA:PARAM:CHAN4",17,EOI);`

**Query syntax- :SSCA:PARAMeter:CHAN**nel?

Example: `Send(0,5,":SSCA:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements taken on each clock edge across all spans every time the ACQUIRE command is issued.

**Command syntax- :SSCA:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":SSCA:PARAM:SAMP 1000",18,EOI);`

**Query syntax- :SSCA:PARAMeter:SAMPles?**

Example: `Send(0,5,":SSCA:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :SSCA:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":SSCA:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :SSCA:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":SSCA:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :SSCA:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":SSCA:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :SSCA:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":SSCA:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :SSCA:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":SSCA:PARAM:THR 5050",20,EOI);`

**Query syntax- :SSCA:PARAM**eter**:THR**eshold?

Example: `Send(0,5,":SSCA:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :SSCA:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":SSCA:PARAM:TIME 10",21,EOI);`

**Query syntax- :SSCA:PARAM**eter**:TIME**out?

Example: `Send(0,5,":SSCA:PARAM:TIME?",17,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PATTERN

The **PATTERN** command selects the number of 1's and 0's that occur consecutively. For example 1010 represents a pattern of one, 11001100 represents a pattern of two, and 111000111000 represents a pattern of three.

The **PATTERN** query returns the consecutive 1's and 0's that occur in the currently selected pattern.

**Command syntax- :SSCA:PATTERN**<1 to 5>

Example: `Send(0,5,":SSCA:PATTERN 1",15,EOI);`

**Query syntax- :SSCA:PATTERN**?

Example: `Send(0,5,":SSCA:PATTERN?",14,EOI);`
Response: <ASCII integer>
Example: 3

- ## PKTOPK

The **PKTOPK** query returns the (maximum measurement – minimum measurement) obtained for the previous histogram acquisition. This should be across the number of periods that was determined in the first phase of the measurement.

**Query syntax- :SSCA:PKTOPK**?

Example: `Send(0,5,":SSCA:PKTOPK?",13,EOI);`
Response: <ASCII floating point>
Example: 6.618865e-010

- **PLOTDATA:HISTOGRAM**

The **PLOTDATA:HISTOGRAM** query returns the plot data associated with the TOTAL JITTER HISTOGRAM plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SSCA:PLOTDATA:HIST**ogram?

Example: `Send(0,5,":SSCA:PLOTDATA:HIST?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:SIGMA**

The **PLOTDATA:SIGMA** query returns the plot data associated with the 1-SIGMA VS SPAN plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :SSCA:PLOTDATA:SIGM**a?

Example: `Send(0,5,":SSCA:PLOTDATA:SIGM?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:HISTOGRAM**

The **PLOTINFO:HISTOGRAM** query returns the plot information associated with the TOTAL JITTER HISTOGRAM plot.

**Query syntax- :SSCA:PLOTINFO:HIST**ogram?

Example: `Send(0,5,":SSCA:PLOTINFO:HIST?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:SIGMA**

The **PLOTINFO:SIGMA** query returns the plot information associated with the 1-SIGMA VS SPAN plot.

**Query syntax- :SSCA:PLOTINFO:SIGM**a?

Example: `Send(0,5,":SSCA:PLOTINFO:SIGM?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PPM-**

The **PPM-** query returns the number of parts-per-million of jitter that is observed below the modulation frequency.

**Query syntax- :SSCA:PPM-**?

Example: `Send(0,5,":SSCA:PPM-?",11,EOI);`
Response: <ASCII floating point>
Example: 2.298185e+001

- **PPM+**

The **PPM+** query returns the number of parts-per-million of jitter that is observed above the modulation frequency.

**Query syntax- :SSCA:PPM+**?

Example: `Send(0,5,":SSCA:PPM+?",11,EOI);`
Response: <ASCII floating point>
Example: 1.976345e+001

- ## PPMAVERAGES

The **PPMAVERAGES** command sets how many of the PPM histograms are measured. The PPM plus and PPM minus are then the average of these histograms.

The **PPMAVERAGES** query returns the number of histograms that are currently selected to be averaged together.

**Command syntax- :SSCA:PPMAVE**rages<1|2|4|8|16|32>

Example: `Send(0,5,":SSCA:PPMAVE 1",14,EOI);`

**Query syntax- :SSCA:PPMAVE**rages?

Example: `Send(0,5,":SSCA:PPMAVE?",13,EOI);`
Response: <1|2|4|8|16|32>
Example: 1

- ## PPMSAMPLES

The **PPMSAMPLES** command selects the number of samples taken when acquiring the histogram used for calculating the PPM deltas (PPM plus and PPM minus).

The **PPMSAMPLES** query returns the currently selected number of samples taken in each histogram.

**Command syntax- :SSCA:PPMSAMP**les<1 to 950000>

Example: `Send(0,5,":SSCA:PPMSAMP 1",15,EOI);`

**Query syntax- :SSCA:PPMSAMP**les?

Example: `Send(0,5,":SSCA:PPMSAMP?",14,EOI);`
Response: <ASCII integer>
Example: 32000

- ## STDDEV

The **STDDEV** query returns the average standard deviation measurements across all spans.

**Query syntax- :SSCA:STD**dev?

Example: `Send(0,5,":SSCA:STD?",10,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- ## UI

The **UI** query returns the unit interval that was measured.

**Query syntax- :SSCA:UI**?

Example: `Send(0,5,":SSCA:UI?",9,EOI);`
Response: <ASCII floating point>
Example: 1.000637e-9

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## • DESCRIPTION OF THE STATISTICS COMMANDS

The **STATISTICS** commands are used to obtain a summary of the statistics from a single histogram of measurements of the chosen function (period, rise-time, fall-time, positive pulse width and negative pulse width). The tool reports the clock frequency with 9 digits of precision. The duty cycle is also available when using this tool.

**:STAT**istics:<command syntax>

| | | |
|---|---|---|
| **ACQ**uire | **PARAM**eter:**ARM**ing:**MARK**er | **PARAM**eter:**STAR**t:**VOLT**age |
| **AUTO**pulsefind | **PARAM**eter:**ARM**ing:**MODE** | **PARAM**eter:**STOP**:**COUN**t |
| **DEF**ault | **PARAM**eter:**ARM**ing:**SLOP**e | **PARAM**eter:**STOP**:**VOLT**age |
| **DUTY**cycle | **PARAM**eter:**ARM**ing:**VOLT**age | **PARAM**eter:**THR**eshold |
| **FREQSPAN** | **PARAM**eter:**CHAN**nel | **PARAM**eter:**TIME**out |
| **FREQ**uency | **PARAM**eter:**FILT**er:**ENAB**le | **PK**topk |
| **MAX**imum | **PARAM**eter:**FILT**er:**MAX**imum | **STDD**ev |
| **MEAN** | **PARAM**eter:**FILT**er:**MIN**imum | **VMAXSTAR**t |
| **MIN**imum | **PARAM**eter:**FUNC**tion | **VMAXSTOP** |
| **PARAM**eter:**ARM**ing:**CHAN**nel | **PARAM**eter:**SAMP**les | **VMINSTAR**t |
| **PARAM**eter:**ARM**ing:**DEL**ay | **PARAM**eter:**STAR**t:**COUN**t | **VMINSTOP** |

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Statistics Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :STAT**istics:**ACQ**uire

Example: `Send(0,5,":STAT:ACQ;*OPC",9,EOI);`

## • AUTOPULSEFIND

The **AUTOPULSEFIND** command enables performing a pulsefind before each measurement set.

The **AUTOPULSEFIND** query returns whether a pulsefind will be performed before each measurement set.

**Command syntax- :STAT**istics:**AUTO**pulsefind<OFF|ON>

Example: `Send(0,5,":STAT:AUTO OFF",14,EOI);`

**Query syntax- :STAT**istics:**AUTO**pulsefind?

Example: `Send(0,5,":STAT:AUTO?",11,EOI);`
Response: <OFF|ON>
Example: OFF

## • DEFAULT

The **DEFAULT** command is used to reset all the Statistics Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :STAT**istics:**DEF**ault

Example: `Send(0,5,":STAT:DEF",9,EOI);`

- **DUTYCYCLE**

The **DUTYCYCLE** query returns the duty cycle obtained for the previous acquisition.

**Query syntax- :STAT**istics**:DUTY**cycle?

Example: `Send(0,5,":STAT:DUTY?",11,EOI);`
Response: <ASCII floating point>
Example: 5.036e001

- **FREQSPAN**

The **FREQSPAN** command allows you to set across how many periods the carrier frequency will be measured. A higher number will yield a more precise number, while a lower number will result in a quicker measurement time.

**Query syntax- :STAT**istics**:FREQSPAN**<1 to 10000000>

Example: `Send(0,5,":STAT:FREQSPAN10",16,EOI);`

- **FREQUENCY**

The **FREQUENCY** query returns the carrier frequency obtained for the previous acquisition.

**Query syntax- :STAT**istics**:FREQ**uency?

Example: `Send(0,5,":STAT:FREQ?",11,EOI);`
Response: <ASCII floating point>
Example: 1.062521e+006

- **MAXIMUM**

The **MAXIMUM** query returns the maximum measurement value obtained across all measurements.

**Query syntax- :STAT**istics**:MAX**imum?

Example: `Send(0,5,":STAT:MAX?",10,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **MEAN**

The **MEAN** query returns the average value obtained across all measurements.

**Query syntax- :STAT**istics**:MEAN**?

Example: `Send(0,5,":STAT:MEAN?",11,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all measurements.

**Query syntax- :STAT**istics**:MIN**imum?

Example: `Send(0,5,":STAT:MIN?",10,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

## • PARAMETER:ARMING:CHANNEL

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":STAT:PARAM:ARM:CHAN 1",22,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:CHAN**nel?

Example: `Send(0,5,":STAT:PARAM:ARM:CHAN?",21,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":STAT:PARAM:ARM:DEL -40",23,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:DEL**ay?

Example: `Send(0,5,":STAT:PARAM:ARM:DEL?",20,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":STAT:PARAM:ARM:MARK OFF",24,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:MARK**er?

Example: `Send(0,5,":STAT:PARAM:ARM:MARK?",21,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":STAT:PARAM:ARM:MODE EXTERNAL",29,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:MODE**?

Example: `Send(0,5,":STAT:PARAM:ARM:MODE?",21,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":STAT:PARAM:ARM:SLOP FALL",25,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:SLOP**e?

Example: `Send(0,5,":STAT:PARAM:ARM:SLOP?",21,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":STAT:PARAM:ARM:VOLT -2",23,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:ARM**ing**:VOLT**age?

Example: `Send(0,5,":STAT:PARAM:ARM:VOLT?",21,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :STAT**istics**:PARAM**eter**:CHAN**nel<1-10>

Example: `Send(0,5,":STAT:PARAM:CHAN4",17,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:CHAN**nel?

Example: `Send(0,5,":STAT:PARAM:CHAN?",17,EOI);`
Response: <ASCII integer>
Example: 4

- ## PARAMETER:FILTER:ENABLE

The **PARAMETER:FILTER:ENABLE** command enables a post-processing filter that ignores measurements acquired outside of the filter region. The statistics are calculated from only the measurements within the filter region, and the plots will display only data from within the filtered region. With filters enabled the number of hits acquired may be less than the number of hits requested as a result of the filtered values being thrown away.

The **PARAMETER:FILTER:ENABLE** query returns whether the filters are currently enabled.

**Command syntax- :STAT**istics**:PARAM**eter**:FILT**er**:ENAB**le<OFF|ON>

Example: `Send(0,5,":STAT:PARAM:FILT:ENAB OFF",25,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:FILT**er**:ENAB**le?

Example: `Send(0,5,":STAT:PARAM:FILT:ENAB?",22,EOI);`
Response: <OFF|ON>
Example: OFF

- ## PARAMETER:FILTER:MAXIMUM

The **PARAMETER:FILTER:MAXIMUM** command selects the maximum filter time in seconds.

The **PARAMETER:FILTER:MAXIMUM** query returns the maximum filter value.

**Command syntax- :STAT**istics**:PARAM**eter**:FILT**er**:MAX**imum<-2.5 to 2.5>

Example: `Send(0,5,":STAT:PARAM:FILT:MAX -2.5",25,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:FILT**er**:MAX**imum?

Example: `Send(0,5,":STAT:PARAM:FILT:MAX?",21,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- ## PARAMETER:FILTER:MINIMUM

The **PARAMETER:FILTER:MINIMUM** command selects the minimum filter time in seconds.

The **PARAMETER:FILTER:MINIMUM** query returns the minimum filter value.

**Command syntax- :STAT**istics**:PARAM**eter**:FILT**er**:MIN**imum<-2.5 to 2.5>

Example: `Send(0,5,":STAT:PARAM:FILT:MIN -2.5",25,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:FILT**er**:MIN**imum?

Example: `Send(0,5,":STAT:PARAM:FILT:MIN?",21,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- ## PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :STAT**istics**:PARAM**eter**:FUNC**tion<PW+|PW-|PER+|PER->

Example: `Send(0,5,":STAT:PARAM:FUNC PER+",22,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:FUNC**tion?

Example: `Send(0,5,":STAT:PARAM:FUNC?",17,EOI);`
Response: <PW+|PW-|PER+|PER->

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :STATistics:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":STAT:PARAM:SAMP 1000",21,EOI);`

**Query syntax- :STATistics:PARAMeter:SAMPles?**

Example: `Send(0,5,":STAT:PARAM:SAMP?",17,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :STATistics:PARAMeter:STARt:COUNt<1 to 10000000>**

Example: `Send(0,5,":STAT:PARAM:STAR:COUN 1",23,EOI);`

**Query syntax- :STATistics:PARAMeter:STARt:COUNt?**

Example: `Send(0,5,":STAT:PARAM:STAR:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :STATistics:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":STAT:PARAM:STAR:VOLT -2",24,EOI);`

**Query syntax- :STATistics:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":STAT:PARAM:STAR:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :STAT**istics**:PARAM**eter**:STOP:COUN**t<1 to 10000000>

Example: `Send(0,5,":STAT:PARAM:STOP:COUN 1",23,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:STOP:COUN**t?

Example: `Send(0,5,":STAT:PARAM:STOP:COUN?",22,EOI);`
Response: <ASCII integer>
Example: 2

## • PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :STAT**istics**:PARAM**eter**:STOP:VOLT**age<-2 to 2>

Example: `Send(0,5,":STAT:PARAM:STOP:VOLT -2",24,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:STOP:VOLT**age?

Example: `Send(0,5,":STAT:PARAM:STOP:VOLT?",22,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :STAT**istics**:PARAM**eter**:THR**eshold<5050|1090|9010|USER|2080|8020>

Example: `Send(0,5,":STAT:PARAM:THR 5050",20,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:THR**eshold?

Example: `Send(0,5,":STAT:PARAM:THR?",16,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

- ## PARAMETER:TIMEOUT

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :STAT**istics**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":STAT:PARAM:TIME 10",19,EOI);`

**Query syntax- :STAT**istics**:PARAM**eter**:TIME**out?

Example: `Send(0,5,":STAT:PARAM:TIME?",16,EOI);`
Response: <floating point ASCII value>
Example: 10

- ## PKTOPK

The **PKTOPK** query returns the maximum measurement value minus the minimum measurement value.

**Query syntax- :STAT**istics**:PK**topk?

Example: `Send(0,5,":STAT:PK?",9,EOI);`
Response: <ASCII floating point>
Example: 8.106345e-012

- ## STDDEV

The **STDDEV** query returns the standard deviation of all measurements.

**Query syntax- :STAT**istics**:STDD**ev?

Example: `Send(0,5,":STAT:STDD?",11,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- ## VMAXSTART

The **VMAXSTART** query returns the maximum voltage obtained from the previous pulsefind. For Channel-To-Channel measurements, the result is from the first measurement channel. For single channel measurements, the result is from the only channel, and returns the same result as the **VMAXSTOP** command.

**Query syntax- :STAT**istics**:VMAXSTAR**t?

Example: `Send(0,5,":STAT:VMAXSTAR?",15,EOI);`
Response: <ASCII floating point>
Example: 1.135e-001

- ## VMAXSTOP

The **VMAXSTOP** query returns the maximum voltage obtained from the previous pulsefind. For Channel-To-Channel measurements, the result is from the second measurement channel. For single channel measurements, the result is from the only channel, and returns the same result as the **VMAXSTART** command.

**Query syntax- :STAT**istics**:VMAXSTOP**?

Example: `Send(0,5,":STAT:VMAXSTOP?",15,EOI);`
Response: <ASCII floating point>
Example: 1.135e-001

- ## VMINSTART

The **VMINSTART** query returns the minimum voltage obtained from the previous pulsefind. For Channel-To-Channel measurements, the result is from the first measurement channel. For single channel measurements, the result is from the only channel, and returns the same result as the **VMINSTOP** command.

**Query syntax- :STAT**istics**:VMINSTAR**t?

Example: `Send(0,5,":STAT:VMINSTAR?",15,EOI);`
Response: <ASCII floating point>
Example: -1.135e-001

- ## VMINSTOP

The **VMINSTOP** query returns the minimum voltage obtained from the previous pulsefind. For Channel-To-Channel measurements, the result is from the second measurement channel. For single channel measurements, the result is from the only channel, and returns the same result as the **VMINSTART** command.

**Query syntax- :STAT**istics**:VMINSTOP**?

Example: `Send(0,5,":STAT:VMINSTOP?",15,EOI);`
Response: <ASCII floating point>
Example: -1.135e-001

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## • DESCRIPTION OF THE STRIPCHART CHAN-TO-CHAN COMMANDS

The **STRIPSKEW** commands are used to develop histogram statistics for channel to channel measurements at regular intervals defined by the user. This allows long-term effects, such as environmental effects of long-term drift, to be measured. For example, histograms of TPD++ measurements could be made at some interval, and the mean, 1-sigma, pk-pk, and max/min values captured over a long time such as overnight.

**:STRIPS**kew:<command syntax>

**ACQ**uire
**CLE**ar
**DEF**ault
**HITS**
**MAX**imum
**MEAN**
**MIN**imum
**PARAM**eter:**ARM**ing:**CHAN**nel
**PARAM**eter:**ARM**ing:**DEL**ay
**PARAM**eter:**ARM**ing:**MARK**er
**PARAM**eter:**ARM**ing:**MODE**
**PARAM**eter:**ARM**ing:**SLOP**e
**PARAM**eter:**ARM**ing:**VOLT**age
**PARAM**eter:**CHAN**nel
**PARAM**eter:**FUNC**tion
**PARAM**eter:**SAMP**les
**PARAM**eter:**STAR**t:**COUN**t
**PARAM**eter:**STAR**t:**VOLT**age
**PARAM**eter:**STOP**:**COUN**t
**PARAM**eter:**STOP**:**VOLT**age
**PARAM**eter:**THR**eshold
**PARAM**eter:**TIME**out
**PK**topk
**PLOTDATA**:**MAX**imum
**PLOTDATA**:**MEAN**
**PLOTDATA**:**MIN**imum
**PLOTDATA**:**PK**topk
**PLOTDATA**:**STDD**ev
**PLOTDATA**:**TIME**
**PLOTINFO**:**MAX**imum
**PLOTINFO**:**MEAN**
**PLOTINFO**:**MIN**imum
**PLOTINFO**:**PK**topk
**PLOTINFO**:**STDD**ev
**PLOTINFO**:**TIME**
**SPAN**
**STDD**ev

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Channel-To-Channel Stripchart Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :STRIPS**kew**:ACQ**uire

Example: `Send(0,5,":STRIPS:ACQ",11,EOI);`

## • CLEAR

The **CLEAR** command provides a means to flush any previous data, since the Channel-To-Channel Stripchart Tool continues to accumulate data across successive acquisitions.

**Command syntax- :STRIPS**kew**:CLE**ar

Example: `Send(0,5,":STRIPS:CLE",13,EOI);`

## • DEFAULT

The **DEFAULT** command is used to reset all the Channel-To-Channel Stripchart Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :STRIPS**kew**:DEF**ault

Example: `Send(0,5,":STRIPS:DEF",11,EOI);`

- **HITS**

The **HITS** query returns the total number of accumulated hits.

**Query syntax- :STRIPS**kew**:HITS**?

Example: `Send(0,5,":STRIPS:HITS?",13,EOI);`
Response: <ASCII integer>
Example: 35000

- **MAXIMUM**

The **MAXIMUM** query returns the maximum measurement value obtained across all accumulated passes.

**Query syntax- :STRIPS**kew**:MAX**imum?

Example: `Send(0,5,":STRIPS:MAX?",12,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **MEAN**

The **MEAN** query returns the average of all measurement values obtained across all accumulated passes.

**Query syntax- :STRIPS**kew**:MEAN**?

Example: `Send(0,5,":STRIPS:MEAN?",13,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all accumulated passes.

**Query syntax- :STRIPS**kew**:MIN**imum?

Example: `Send(0,5,":STRIPS:MIN?",12,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:CHAN**nel<1 to 10>

Example: `Send(0,5,":STRIPS:PARAM:ARM:CHAN 1",24,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:CHAN**nel?

Example: `Send(0,5,":STRIPS:PARAM:ARM:CHAN?",23,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:DEL**ay<-40 to 40>

Example: `Send(0,5,":STRIPS:PARAM:ARM:DEL -40",25,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:DEL**ay?

Example: `Send(0,5,":STRIPS:PARAM:ARM:DEL?",22,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:MARK**er<OFF|ON>

Example: `Send(0,5,":STRIPS:PARAM:ARM:MARK OFF",26,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:MARK**er?

Example: `Send(0,5,":STRIPS:PARAM:ARM:MARK?",23,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:MODE**<EXTERNAL|START|STOP>

Example: `Send(0,5,":STRIPS:PARAM:ARM:MODE EXTERNAL",31,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:MODE**?

Example: `Send(0,5,":STRIPS:PARAM:ARM:MODE?",23,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:SLOP**e<FALL|RISE>

Example: `Send(0,5,":STRIPS:PARAM:ARM:SLOP FALL",27,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:SLOP**e?

Example: `Send(0,5,":STRIPS:PARAM:ARM:SLOP?",23,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:VOLT**age<-2 to 2>

Example: `Send(0,5,":STRIPS:PARAM:ARM:VOLT -2",25,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:ARM**ing**:VOLT**age?

Example: `Send(0,5,":STRIPS:PARAM:ARM:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the measurement and reference input channels that will be used by this tool. The channels are specified by first providing the integer number of the measurement channel, then an '&' character, and finally the integer number of the reference channel: <measurement channel>&<reference channel>

The **PARAMETER:CHANNEL** query returns the currently selected measurement and reference channels for this tool.

**Command syntax- :STRIPS**kew**:PARAM**eter**:CHAN**nel<n&m>

Example: `Send(0,5,":STRIPS:PARAM:CHAN1&4",19,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:CHAN**nel?

Example: `Send(0,5,":STRIPS:PARAM:CHAN?",19,EOI);`
Response: <measurement channel> & <reference channel>
Example: 1&7

## • PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :STRIPS**kew**:PARAM**eter**:FUNC**tion<TPD++|TPD--|TPD+-|TPD-+>

Example: `Send(0,5,":STRIPS:PARAM:FUNC TPD++",24,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:FUNC**tion?

Example: `Send(0,5,":STRIPS:PARAM:FUNC?",19,EOI);`
Response: <TPD++|TPD--|TPD+-|TPD-+>

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :STRIPS**kew**:PARAM**eter**:SAMP**les<1 to 950000>

Example: `Send(0,5,":STRIPS:PARAM:SAMP 1000",20,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:SAMP**les?

Example: `Send(0,5,":STRIPS:PARAM:SAMP?",19,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :STRIPS**kew**:PARAM**eter**:STAR**t**:COUN**t<1 to 10000000>

Example: `Send(0,5,":STRIPS:PARAM:STAR:COUN 1",25,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:STAR**t**:COUN**t?

Example: `Send(0,5,":STRIPS:PARAM:STAR:COUN?",24,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :STRIPS**kew**:PARAM**eter**:STAR**t**:VOLT**age<-2 to 2>

Example: `Send(0,5,":STRIPS:PARAM:STAR:VOLT -2",26,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:STAR**t**:VOLT**age?

Example: `Send(0,5,":STRIPS:PARAM:STAR:VOLT?",24,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :STRIPSkew:PARAMeter:STOP:COUNt<1 to 10000000>**

Example: `Send(0,5,":STRIPS:PARAM:STOP:COUN 1",25,EOI);`

**Query syntax- :STRIPSkew:PARAMeter:STOP:COUNt?**

Example: `Send(0,5,":STRIPS:PARAM:STOP:COUN?",24,EOI);`
Response: <ASCII integer>
Example: 2

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :STRIPSkew:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":STRIPS:PARAM:STOP:VOLT -2",26,EOI);`

**Query syntax- :STRIPSkew:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":STRIPS:PARAM:STOP:VOLT?",24,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :STRIPSkew:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":STRIPS:PARAM:THR 5050",22,EOI);`

**Query syntax- :STRIPSkew:PARAMeter:THReshold?**

Example: `Send(0,5,":STRIPS:PARAM:THR?",18,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

 

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :STRIPS**kew**:PARAM**eter**:TIME**out<0.01 to 50>

Example: `Send(0,5,":STRIPS:PARAM:TIME 10",23,EOI);`

**Query syntax- :STRIPS**kew**:PARAM**eter**:TIME**out?

Example: `Send(0,5,":STRIPS:PARAM:TIME?",19,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PKTOPK**

The **PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all values obtained across all accumulated passes.

**Query syntax- :STRIPS**kew**:PK**topk?

Example: `Send(0,5,":STRIPS:PK?",11,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PLOTDATA:MAXIMUM**

The **PLOTDATA:MAXIMUM** query returns the plot data associated with the MAXIMUM MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPS**kew**:PLOTDATA:MAX**imum?

Example: `Send(0,5,":STRIPS:PLOTDATA:MAX?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:MEAN**

The **PLOTDATA:MEAN** query returns the plot data associated with the AVERAGE MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPS**kew**:PLOTDATA:MEAN**?

Example: `Send(0,5,":STRIPS:PLOTDATA:MEAN?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:MINIMUM**

The **PLOTDATA:MINIMUM** query returns the plot data associated with the MINIMUM MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPS**kew**:PLOTDATA:MIN**imum?

Example: `Send(0,5,":STRIPS:PLOTDATA:MIN?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:PKTOPK**

The **PLOTDATA:PKTOPK** query returns the plot data associated with the PK-PK MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPS**kew**:PLOTDATA:PK**topk?

Example: `Send(0,5,":STRIPS:PLOTDATA:PK?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:STDDEV**

The **PLOTDATA:STDDEV** query returns the plot data associated with the 1-SIGMA VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPS**kew**:PLOTDATA:STDD**ev?

Example: `Send(0,5,":STRIPS:PLOTDATA:STDD?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:TIME**

The **PLOTDATA:TIME** query returns the plot data associated with the TIME DURATION VS MEASUREMENT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPS**kew**:PLOTDATA:TIME**?

Example: `Send(0,5,":STRIPS:PLOTDATA:TIME?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:MAXIMUM**

The **PLOTINFO:MAXIMUM** query returns the plot information associated with the MAXIMUM MEASUREMENT VS TIME plot.

**Query syntax- :STRIPS**kew**:PLOTINFO:MAX**imum?

Example: `Send(0,5,":STRIPS:PLOTINFO:MAX?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:MEAN**

The **PLOTINFO:MEAN** query query returns the plot information associated with the AVERAGE MEASUREMENT VS TIME plot.

**Query syntax- :STRIPS**kew**:PLOTINFO:MEAN**?

Example: `Send(0,5,":STRIPS:PLOTINFO:MEAN?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:MINIMUM**

The **PLOTINFO:MINIMUM** query returns the plot information associated with the MINIMUM MEASUREMENT VS TIME plot.

**Query syntax- :STRIPS**kew**:PLOTINFO:MIN**imum?

Example: `Send(0,5,":STRIPS:PLOTINFO:MIN?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:PKTOPK**

The **PLOTINFO:PKTOPK** query returns the plot information associated with the PK-PK MEASUREMENT VS TIME plot.

**Query syntax- :STRIPS**kew**:PLOTINFO:PK**topk?

Example: `Send(0,5,":STRIPS:PLOTINFO:PK?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:STDDEV**

The **PLOTINFO:STDDEV** query returns the plot information associated with the 1-SIGMA VS TIME plot.

**Query syntax- :STRIPS**kew**:PLOTINFO:STDD**ev?

Example: `Send(0,5,":STRIPS:PLOTINFO:STDD?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TIME**

The **PLOTINFO:TIME** query returns the plot information associated with the TIME DURATION VS MEASUREMENT plot.

**Query syntax- :STRIPS**kew**:PLOTINFO:TIME**?

Example: `Send(0,5,":STRIPS:PLOTINFO:TIME?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **SPAN**

The **SPAN** command set the interval between measurements in units of seconds.

The **SPAN** query returns the currently selected interval between measurements.

**Command syntax- :STRIPS**kew**:SPAN**<0 to 100000>

Example: `Send(0,5,":STRIPS:SPAN 0.1",14,EOI);`

**Query syntax- :STRIPS**kew**:SPAN**?

Example: `Send(0,5,":STRIPS:SPAN?",13,EOI);`
Response: <ASCII floating point>
Example: 1.000e-002

- **STDDEV**

The **STDDEV** query returns the average standard deviation of measurements across all accumulated passes.

**Query syntax- :STRIPS**kew**:STDD**ev?

Example: `Send(0,5,":STRIPS:STDD?",13,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

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## • DESCRIPTION OF THE STRIPCHART COMMANDS

The **STRIPTIME** commands are used to develop histogram statistics at regular intervals defined by the user. This allows long-term effects, such as environmental effects of long-term drift, to be measured. For example, histograms of period measurements could be made at some interval, and the mean, 1-sigma, pk-pk, and max/min values captured over a long time such as overnight.

**:STRIPT**ime:<command syntax>

**ACQ**uire
**CLE**ar
**DEF**ault
**HITS**
**MAX**imum
**MEAN**
**MIN**imum
**PARAM**eter:**ARM**ing:**CHAN**nel
**PARAM**eter:**ARM**ing:**DEL**ay
**PARAM**eter:**ARM**ing:**MARK**er
**PARAM**eter:**ARM**ing:**MODE**
**PARAM**eter:**ARM**ing:**SLOP**e
**PARAM**eter:**ARM**ing:**VOLT**age
**PARAM**eter:**CHAN**nel
**PARAM**eter:**FUNC**tion
**PARAM**eter:**SAMP**les
**PARAM**eter:**STAR**t:**COUN**t
**PARAM**eter:**STAR**t:**VOLT**age
**PARAM**eter:**STOP**:**COUN**t
**PARAM**eter:**STOP**:**VOLT**age
**PARAM**eter:**THR**eshold
**PARAM**eter:**TIME**out
**PK**topk
**PLOTDATA**:**MAX**imum
**PLOTDATA**:**MEAN**
**PLOTDATA**:**MIN**imum
**PLOTDATA**:**PK**topk
**PLOTDATA**:**STDD**ev
**PLOTDATA**:**TIME**
**PLOTINFO**:**MAX**imum
**PLOTINFO**:**MEAN**
**PLOTINFO**:**MIN**imum
**PLOTINFO**:**PK**topk
**PLOTINFO**:**STDD**ev
**PLOTINFO**:**TIME**
**SPAN**
**STDD**ev

## • ACQUIRE

The **ACQUIRE** command is used to instruct the instrument to take a new Stripchart Tool measurement using the current configuration settings. No results are actually returned from this command.

To insure this command is successfully completed, the following sequence may be used. First check if a serial poll returns a value of zero. If it returns a non-zero value, send the *CLS command and then poll until it does return zero. The *OPC command should be appended to the ACQUIRE command before it is sent so the operation completion state can be determined. A serial poll can then be conducted until the ESB (bit 5) has been set. Once this bit has been detected, the ESR? command can be used to determine if an error has occurred. If only the OPC bit is set, the command was successful. If the CME, EXE, or DDE bits are set, an error has occurred.

**Command syntax- :STRIPT**ime**:ACQ**uire

Example: `Send(0,5,":STRIPT:ACQ",11,EOI);`

## • CLEAR

The **CLEAR** command provides a means to flush any previous data, since the Stripchart Tool continues to accumulate data across successive acquisitions.

**Command syntax- :STRIPT**ime**:CLE**ar

Example: `Send(0,5,":STRIPT:CLE",13,EOI);`

## • DEFAULT

The **DEFAULT** command is used to reset all the Stripchart Tool settings back to their default values. These are the same settings as are viewed from the GUI when a new tool is opened.

**Command syntax- :STRIPT**ime**:DEF**ault

Example: `Send(0,5,":STRIPT:DEF",11,EOI);`

- **HITS**

The **HITS** query returns the total number of accumulated hits.

**Query syntax- :STRIPTime:HITS?**

Example: `Send(0,5,":STRIPT:HITS?",13,EOI);`
Response: <ASCII integer>
Example: 35000

- **MAXIMUM**

The **MAXIMUM** query returns the maximum measurement value obtained across all accumulated passes.

**Query syntax- :STRIPTime:MAXimum?**

Example: `Send(0,5,":STRIPT:MAX?",12,EOI);`
Response: <ASCII floating point>
Example: 1.106345e-009

- **MEAN**

The **MEAN** query returns the average of all measurement values obtained across all accumulated passes.

**Query syntax- :STRIPTime:MEAN?**

Example: `Send(0,5,":STRIPT:MEAN?",13,EOI);`
Response: <ASCII floating point>
Example: 1.003645e-009

- **MINIMUM**

The **MINIMUM** query returns the minimum measurement value obtained across all accumulated passes.

**Query syntax- :STRIPTime:MINimum?**

Example: `Send(0,5,":STRIPT:MIN?",12,EOI);`
Response: <ASCII floating point>
Example: 9.941615e-010

- **PARAMETER:ARMING:CHANNEL**

The **PARAMETER:ARMING:CHANNEL** command selects the channel that will be used to synchronize measurements to a pattern marker or other synchronous event. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached should be selected using this command, and the PARAMETER:ARMING:MARKER command should be set to ON.

The **PARAMETER:ARMING:CHANNEL** query returns the currently selected arming signal source.

**Command syntax- :STRIPTime:PARAMeter:ARMing:CHANnel<1 to 10>**

Example: `Send(0,5,":STRIPT:PARAM:ARM:CHAN 1",24,EOI);`

**Query syntax- :STRIPTime:PARAMeter:ARMing:CHANnel?**

Example: `Send(0,5,":STRIPT:PARAM:ARM:CHAN?",23,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:ARMING:DELAY

The **PARAMETER:ARMING:DELAY** command controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of –40 to 40 are acceptable (each step represents a 25ps delay from nominal). The following table reflects that range of values and resulting delays:

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |
| Default: | -10 |

The **PARAMETER:ARMING:DELAY** query returns the current arming delay value.

**Command syntax- :STRIPTime:PARAMeter:ARMing:DELay<-40 to 40>**

Example: `Send(0,5,":STRIPT:PARAM:ARM:DEL -40",25,EOI);`

**Query syntax- :STRIPTime:PARAMeter:ARMing:DELay?**

Example: `Send(0,5,":STRIPT:PARAM:ARM:DEL?",22,EOI);`
Response: <ASCII integer>
Example: -10

## • PARAMETER:ARMING:MARKER

The **PARAMETER:ARMING:MARKER** command is used to select a Pattern Marker Card as the arming source. This value is only used if the PARAMETER:ARMING:MODE has been set to EXTERNAL. If a Pattern Marker Card is to be used as the arming source, the channel number to which the Pattern Marker Card is attached also should be selected by using the PARAMETER:ARMING:CHANNEL command.

The **PARAMETER:ARMING:MARKER** query returns whether a Pattern Marker Card is the current arming source or not.

**Command syntax- :STRIPTime:PARAMeter:ARMing:MARKer<OFF|ON>**

Example: `Send(0,5,":STRIPT:PARAM:ARM:MARK OFF",26,EOI);`

**Query syntax- :STRIPTime:PARAMeter:ARMing:MARKer?**

Example: `Send(0,5,":STRIPT:PARAM:ARM:MARK?",23,EOI);`
Response: <OFF|ON>

## • PARAMETER:ARMING:MODE

The **PARAMETER:ARMING:MODE** command selects whether measurements are armed by an external channel, or automatically armed by the measurement channel itself. If auto-arming and a Channel-To-Channel measurement is being made, this command will also select whether the start channel or stop channel is used as the arming source.

The **PARAMETER:ARMING:MODE** query may be used to determine the currently selected arming mode.

**Command syntax- :STRIPTime:PARAMeter:ARMing:MODE<EXTERNAL|START|STOP>**

Example: `Send(0,5,":STRIPT:PARAM:ARM:MODE EXTERNAL",31,EOI);`

**Query syntax- :STRIPTime:PARAMeter:ARMing:MODE?**

Example: `Send(0,5,":STRIPT:PARAM:ARM:MODE?",23,EOI);`
Response: <EXTERNAL|START|STOP>

## • PARAMETER:ARMING:SLOPE

The **PARAMETER:ARMING:SLOPE** command selects whether the rising or falling edge is used when external arming is selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, this command has no effect.

The **PARAMETER:ARMING:SLOPE** query returns the currently selected external arming slope.

**Command syntax- :STRIPTime:PARAMeter:ARMing:SLOPe<FALL|RISE>**

Example: `Send(0,5,":STRIPT:PARAM:ARM:SLOP FALL",27,EOI);`

**Query syntax- :STRIPTime:PARAMeter:ARMing:SLOPe?**

Example: `Send(0,5,":STRIPT:PARAM:ARM:SLOP?",23,EOI);`
Response: <RISE|FALL>

## • PARAMETER:ARMING:VOLTAGE

The **PARAMETER:ARMING:VOLTAGE** command selects the arming voltage to be used when external arming and user voltages have been selected. If EXTERNAL arming has not been selected using the PARAMETER:ARMING:MODE command, and USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:ARMING:VOLTAGE** query returns the currently selected external arming user voltage.

**Command syntax- :STRIPTime:PARAMeter:ARMing:VOLTage<-2 to 2>**

Example: `Send(0,5,":STRIPT:PARAM:ARM:VOLT -2",25,EOI);`

**Query syntax- :STRIPTime:PARAMeter:ARMing:VOLTage?**

Example: `Send(0,5,":STRIPT:PARAM:ARM:VOLT?",23,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

## • PARAMETER:CHANNEL

The **PARAMETER:CHANNEL** command selects the input channel that will be used by this tool.

The **PARAMETER:CHANNEL** query returns the currently selected input channel for this tool.

**Command syntax- :STRIPTime:PARAMeter:CHANnel<1-10>**

Example: `Send(0,5,":STRIPT:PARAM:CHAN4",19,EOI);`

**Query syntax- :STRIPTime:PARAMeter:CHANnel?**

Example: `Send(0,5,":STRIPT:PARAM:CHAN?",19,EOI);`
Response: <ASCII integer>
Example: 4

## • PARAMETER:FUNCTION

The **PARAMETER:FUNCTION** command selects the current measurement function.

The **PARAMETER:FUNCTION** query returns the currently selected measurement function.

**Command syntax- :STRIPTime:PARAMeter:FUNCtion<PW+|PW-|PER+|PER->**

Example: `Send(0,5,":STRIPT:PARAM:FUNC PER+",24,EOI);`

**Query syntax- :STRIPTime:PARAMeter:FUNCtion?**

Example: `Send(0,5,":STRIPT:PARAM:FUNC?",19,EOI);`
Response: <PW+|PW-|PER+|PER->

## • PARAMETER:SAMPLES

The **PARAMETER:SAMPLES** command sets the number of measurements that are accumulated each time the ACQUIRE command is issued.

The **PARAMETER:SAMPLES** query returns the number of measurements that are accumulated each time the ACQUIRE command is issued.

**Command syntax- :STRIPTime:PARAMeter:SAMPles<1 to 950000>**

Example: `Send(0,5,":STRIPT:PARAM:SAMP 1000",20,EOI);`

**Query syntax- :STRIPTime:PARAMeter:SAMPles?**

Example: `Send(0,5,":STRIPT:PARAM:SAMP?",19,EOI);`
Response: <ASCII integer>
Example: 100

## • PARAMETER:START:COUNT

The **PARAMETER:START:COUNT** command selects which edge is used for the start of the measurement, once the arming event has occurred. The first edge (1) is selected by default.

The **PARAMETER:START:COUNT** query returns the count of the edge that is currently selected to start a measurement.

**Command syntax- :STRIPTime:PARAMeter:STARt:COUNt<1 to 10000000>**

Example: `Send(0,5,":STRIPT:PARAM:STAR:COUN 1",25,EOI);`

**Query syntax- :STRIPTime:PARAMeter:STARt:COUNt?**

Example: `Send(0,5,":STRIPT:PARAM:STAR:COUN?",24,EOI);`
Response: <ASCII integer>
Example: 1

## • PARAMETER:START:VOLTAGE

The **PARAMETER:START:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:START:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :STRIPTime:PARAMeter:STARt:VOLTage<-2 to 2>**

Example: `Send(0,5,":STRIPT:PARAM:STAR:VOLT -2",26,EOI);`

**Query syntax- :STRIPTime:PARAMeter:STARt:VOLTage?**

Example: `Send(0,5,":STRIPT:PARAM:STAR:VOLT?",24,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:STOP:COUNT

The **PARAMETER:STOP:COUNT** command selects which edge is used for the end of the measurement, once the arming event has occurred. The second edge (2) is selected by default.

The **PARAMETER:STOP:COUNT** query returns the count of the edge that is currently selected to end a measurement.

**Command syntax- :STRIPTime:PARAMeter:STOP:COUNt<1 to 10000000>**

Example: `Send(0,5,":STRIPT:PARAM:STOP:COUN 1",25,EOI);`

**Query syntax- :STRIPTime:PARAMeter:STOP:COUNt?**

Example: `Send(0,5,":STRIPT:PARAM:STOP:COUN?",24,EOI);`
Response: <ASCII integer>
Example: 2

- ## PARAMETER:STOP:VOLTAGE

The **PARAMETER:STOP:VOLTAGE** command selects the channel voltage to be used when user voltages have been selected. If USER voltages have not been selected using the PARAMETER:THRESHOLD command, then this command has no effect.

The **PARAMETER:STOP:VOLTAGE** query returns the currently selected channel user voltage.

**Command syntax- :STRIPTime:PARAMeter:STOP:VOLTage<-2 to 2>**

Example: `Send(0,5,":STRIPT:PARAM:STOP:VOLT -2",26,EOI);`

**Query syntax- :STRIPTime:PARAMeter:STOP:VOLTage?**

Example: `Send(0,5,":STRIPT:PARAM:STOP:VOLT?",24,EOI);`
Response: <ASCII floating point>
Example: -5.105e-001

- ## PARAMETER:THRESHOLD

The **PARAMETER:THRESHOLD** command selects the percentage levels that are used to establish the voltage threshold levels for this tool, based on the minimum and maximum levels found during the most recent :MEASURE:LEVEL (pulsefind) command. If USER is selected the voltage levels will be taken from the PARAMETER:START:VOLTAGE and :PARAMETER:STOP:VOLTAGE commands.

The **PARAMETER:THRESHOLD** query returns the currently selected threshold levels.

**Command syntax- :STRIPTime:PARAMeter:THReshold<5050|1090|9010|USER|2080|8020>**

Example: `Send(0,5,":STRIPT:PARAM:THR 5050",22,EOI);`

**Query syntax- :STRIPTime:PARAMeter:THReshold?**

Example: `Send(0,5,":STRIPT:PARAM:THR?",18,EOI);`
Response: <5050|1090|9010|USER|2080|8020>
Example: 5050

 

- **PARAMETER:TIMEOUT**

The **PARAMETER:TIMEOUT** command selects the time that is allowed before a measurement is canceled and an error is returned. A large value allows slow signals with intermittent arming to be measured, a small value can be used to receive more responsive feedback to error conditions. The command receives and returns a floating point ASCII value in the range of 0.01 to 50 in units of seconds.

The **PARAMETER:TIMOUT** query returns the currently selected measurement timeout.

**Command syntax- :STRIPTime:PARAMeter:TIMEout<0.01 to 50>**

Example: `Send(0,5,":STRIPT:PARAM:TIME 10",23,EOI);`

**Query syntax- :STRIPTime:PARAMeter:TIMEout?**

Example: `Send(0,5,":STRIPT:PARAM:TIME?",19,EOI);`
Response: <floating point ASCII value>
Example: 10

- **PKTOPK**

The **PKTOPK** query returns the Pk-Pk (Maximum – Minimum) of all values obtained across all accumulated passes.

**Query syntax- :STRIPTime:PKtopk?**

Example: `Send(0,5,":STRIPT:PK?",11,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

- **PLOTDATA:MAXIMUM**

The **PLOTDATA:MAXIMUM** query returns the plot data associated with the MAXIMUM MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPTime:PLOTDATA:MAXimum?**

Example: `Send(0,5,":STRIPT:PLOTDATA:MAX?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:MEAN**

The **PLOTDATA:MEAN** query returns the plot data associated with the AVERAGE MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPTime:PLOTDATA:MEAN?**

Example: `Send(0,5,":STRIPT:PLOTDATA:MEAN?",22,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:MINIMUM**

The **PLOTDATA:MINIMUM** query returns the plot data associated with the MINIMUM MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPTime:PLOTDATA:MINimum?**

Example: `Send(0,5,":STRIPT:PLOTDATA:MIN?",21,EOI);`
Response: #xy…dddddddd…

- **PLOTDATA:PKTOPK**

The **PLOTDATA:PKTOPK** query returns the plot data associated with the PK-PK MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPTime:PLOTDATA:PKtopk?**

Example: `Send(0,5,":STRIPT:PLOTDATA:PK?",20,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:STDDEV**

The **PLOTDATA:STDDEV** query returns the plot data associated with the 1-SIGMA MEASUREMENT VS TIME plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPTime:PLOTDATA:STDDev?**

Example: `Send(0,5,":STRIPT:PLOTDATA:STDD?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTDATA:TIME**

The **PLOTDATA:TIME** query returns the plot data associated with the TIME DURATION VS MEASUREMENT plot as an array of IEEE 8-byte doubles. The array of doubles is preceded by an ASCII header which specifies the size of the array in bytes.

**Query syntax- :STRIPTime:PLOTDATA:TIME?**

Example: `Send(0,5,":STRIPT:PLOTDATA:TIME?",22,EOI);`
Response: #xy…ddddddddd…

- **PLOTINFO:MAXIMUM**

The **PLOTINFO:MAXIMUM** query returns the plot information associated with the MAXIMUM MEASUREMENT VS TIME plot.

**Query syntax- :STRIPTime:PLOTINFO:MAXimum?**

Example: `Send(0,5,":STRIPT:PLOTINFO:MAX?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:MEAN**

The **PLOTINFO:MEAN** query returns the plot information associated with the AVERAGE MEASUREMENT VS TIME plot.

**Query syntax- :STRIPTime:PLOTINFO:MEAN?**

Example: `Send(0,5,":STRIPT:PLOTINFO:MEAN?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:MINIMUM**

The **PLOTINFO:MINIMUM** query returns the plot information associated with the MINIMUM MEASUREMENT VS TIME plot.

**Query syntax- :STRIPTime:PLOTINFO:MINimum?**

Example: `Send(0,5,":STRIPT:PLOTINFO:MIN?",21,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:PKTOPK**

The **PLOTINFO:PKTOPK** query returns the plot information associated with the PK-PK MEASUREMENT VS TIME plot.

**Query syntax- :STRIPTime:PLOTINFO:PKtopk?**

Example: `Send(0,5,":STRIPT:PLOTINFO:PK?",20,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:STDDEV**

The **PLOTINFO:STDDEV** query returns the plot information associated with the 1-SIGMA MEASUREMENT VS TIME plot.

**Query syntax- :STRIPTime:PLOTINFO:STDDev?**

Example: `Send(0,5,":STRIPT:PLOTINFO:STDD?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **PLOTINFO:TIME**

The **PLOTINFO:TIME** query returns the plot information associated with the TIME DURATION VS MEASUREMENT plot.

**Query syntax- :STRIPTime:PLOTINFO:TIME?**

Example: `Send(0,5,":STRIPT:PLOTINFO:TIME?",22,EOI);`
Response: <Points> <Xmin> <Xmax> <Ymin> <Ymax> <Xlabel> <Ylabel>
Example: 38 1.103e-009 1.107e-009 0.0e+000 5.710e+002 Time(s) Hits

- **SPAN**

The **SPAN** command set the interval between measurements in units of seconds.

The **SPAN** query returns the currently selected interval between measurements.

**Command syntax- :STRIPTime:SPAN<0 to 100000>**

Example: `Send(0,5,":STRIPT:SPAN 0.1",14,EOI);`

**Query syntax- :STRIPTime:SPAN?**

Example: `Send(0,5,":STRIPT:SPAN?",13,EOI);`
Response: <ASCII floating point>
Example: 1.000e-002

- **STDDEV**

The **STDDEV** query returns the average standard deviation of measurements across all accumulated passes.

**Query syntax- :STRIPTime:STDDev?**

Example: `Send(0,5,":STRIPT:STDD?",13,EOI);`
Response: <ASCII floating point>
Example: 3.216345e-012

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## 7-1 INTRODUCTION

All **BINARY PACKET** measurements are handled by sending a measurement structure containing all input parameters to the instrument. The measurement is then performed based on these settings. Once the measurement has been successfully completed, the results are returned in the output section of the same binary packet structure.

This command set allows you to perform measurements from all of the tools and the binary packet minimizes GPIB bus traffic. It optimizes speed but is more machine friendly than user friendly. This GPIB set is not often used in its 'raw' form but is the layer that underlies the Production Application Programming Interface (PAPI).

The basic process for conducting a measurement is as follows:

1. Allocate storage space for the binary packet structure. The structure may be located in the local stack, the global memory space, or memory may be dynamically allocated. If the memory is dynamically allocated the programmer is responsible for freeing the memory when it is no longer needed.
2. Initialize the variables in the input section of the binary packet structure. The structure should normally be cleared using the memset() function first. The structure elements should then be configured as needed for the given measurement. Typical modifications include channel number, pattern file name (if data), number of measurements, and triggering information. Reasonable default values are listed along with the structure definitions.
3. Create the GPIB command packet. The GPIB command packet consists of the command, the binary packet header to specify the packet size, and then the binary packet data itself.
4. Send the binary command packet to the instrument. Then poll the instrument status until the measurement is complete, or an error has occurred.
5. Read the binary packet back from the instrument. Validate the binary packet header to insure a valid packet was returned.
6. Use the results that were returned in the output section of the binary packet. What you do with these results will depend on your specific application.

EXAMPLE:

```
int GetClockStats()
  {
  // Step 1. Allocate storage space on the local stack
  CLOK clok;
  char buffer[8192];
  long length, status;

  // Step 2. Clear the structure first, then initialize input section
  memset(&clok, 0, sizeof(CLOK));
  clok.tParm.lFuncNum = FUNC_PER;
  clok.tParm.lChanNum = 1;
  clok.tParm.lStrtCnt = 1;
  clok.tParm.lStopCnt = 2;
  clok.tParm.lSampCnt = 100;
  clok.tParm.lAutoArm = ARM_STOP;
  clok.tParm.lArmEdge = EDGE_RISE;
```

```
clok.tParm.lFndMode = PFND_PEAK;
clok.tParm.lFndPcnt = PCNT_5050;
clok.tParm.lTimeOut = 2;

// Step 3. Create the GPIB command packet
sprintf(buffer, "%i", sizeof(CLOK));
length = strlen(buffer);
sprintf(buffer, ":ACQ:CLKSTAT #%i%i", length, sizeof(CLOK));
length = strlen(buffer);
memcpy(&buffer[length], &clok, sizeof(CLOK));

// Step 4. Send binary command packet, poll until complete
Send(0, 5, buffer, length + sizeof(CLOK), EOI);
status = 0;
while ((status & 0x10) == 0)
  ReadStatusByte(0, 5, &status);

// Step 5. Read the binary packet back from the instrument
Receive(0, 5, &clok, sizeof(CLOK), EOI);

// Step 6. Use the results in the output section of the binary packet
printf("Per+ : %lf ns\n", clok.dPerPavg * 1e9);
printf("Per- : %lf ns\n", clok.dPerMavg * 1e9);
printf("PW+ : %lf ns\n", clok.dPwPavg * 1e9);
printf("PW- : %lf ns\n", clok.dPwMavg * 1e9);

return 0;
}
```

## 7-2 BINARY PACKET STRUCTURE OVERVIEW

Please note that many of the binary packet structures contain padding fields. These fields are usually called lPad1, lPad2, … or lPadLoc1, lPadLoc2, … and are used to insure that variables are placed in the same absolute locations within the structure regardless of compiler padding which varies from system to system. These fields are only used to take up space, and can be safely ignored.

Each of the binary packet structures is specific to one of the standard acquisition tools contained in the GigaView software. Additional structures are also defined that are used within these standard binary packet structures. In the following sections the additional structures are first defined, and then the binary packet structures are detailed for the standard acquisition tools.

## 7-3 PLOT DATA STRUCTURE

This is an output structure used to hold the necessary information to construct a view of the measurement that was performed. For example, the histogram tool can return a histogram plot.

In order to optimize performance the plot data itself is not actually returned in the binary packet structure. The plot statistics are valid, but the pointer dData will be invalid. In order to obtain the actual plot data, a command of the form :PLOT:<toolname> can be used. This data along with the statistics returned in the PLOT structure can then be used by a plotting utility to display the plot information.

The data is organized by linear indexing of the x-axis and assignment of one element of X for each element in the y-axis data array. The y-coordinate is extracted from the dData array, while the x-coordinate may be calculated using the number of points in the array and the x-axis extents. This formula is used to calculate an X value for a given index (0 <= index < plot.lNumb):

X = (plot.dXmax – plot.dXmin) * (double) index / (double) (plot.lNumb - 1) + plot.dXmin;

```
typedef struct
  {
  double *dData;              /* Pointer to y-axis data array          */
  long    lNumb;              /* Number of valid data points           */
  long    lRsvd;              /* Used to track memory allocation       */
  long    lPad1;
  double  dXmin, dXmax;       /* X-axis values for ends of data array  */
  double  dYmin, dYmax;       /* Min/Max values in y-axis data array   */
  double  dYavg, dYstd;       /* Average/1-Sigma values for data array */

  long    lXminIndx;          /* Used by histograms to indicate        */
  long    lXmaxIndx;          /* location of first and last valid bins */

  long    lYminIndx;          /* Indicates the location where the      */
  long    lYmaxIndx;          /* min/max values occur in data array    */

  double  dAltXmin, dAltXmax; /* Alternate X-axis values, if applicable */
  } PLOT;
```

**dData** Pointer to y-axis data array.
**LNumb** Number of valid data points.
**LRsvd** Used to track memory allocation.
**dXmin,dXmax** X-axis values for ends of data array.
**dYmin,dYmax** Min & Max values in Y-axis data array.
**dYavg,dYstd** Average & 1-Sigma values for data array.
**lXminIndx,lXmaxIndx** Used by histograms to indicate location of first and last valid bins.
**lYminIndx,lYmaxIndx** Indicates the location where the Min & Max values occur in data array.
**dAltXmin,dAltXmax** Alternate X-axis values, if applicable. For graphs where it makes sense an alternate X-axis unit may be calculated. Examples include time or index on a Clock High Frequency Modulation Analysis 1-sigma plot, or unit interval or time on a Datacom Known Pattern With marker bathtub plot. If no applicable alternate unit is defined these variables will both be set to zero.

## 7-4 ACQUISITION PARAMETER STRUCTURE

An acquisition parameter structure is contained in every binary packet structure. It is in input structure that holds common information for the measurement such as channel number, voltage, and sample size. For some simple tools, information such as start and stop counts will also be drawn from this structure. While for more algorithm-based tools these values may be computed as needed.

```
typedef struct
  {
  long    lFuncNum;         /* Function to measure                    */
  long    lChanNum;         /* Channel to measure                     */
  long    lStrtCnt;         /* Channel start count                    */
  long    lStopCnt;         /* Channel stop count                     */
  long    lSampCnt;         /* Sample size                            */
  long    lPadLoc1;
  double  dStrtVlt;         /* Start voltage                          */
  double  dStopVlt;         /* Stop voltage                           */
  long    lExtnArm;         /* Arm when external is selected          */
  long    lPadLoc2;

  long    lOscTrig;         /* O-scope trigger                        */
  long    lOscEdge;         /* O-scope rise/fall trig                 */

  long    lFiltEnb;         /* Filter enable                          */
  long    lPadLoc3;
  double  dFiltMin;         /* Filter minimum                         */
  double  dFiltMax;         /* Filter maximum                         */

  long    lAutoArm;         /* Auto arm enable/mode                   */
  long    lArmEdge;         /* Arm rise/fall edge                     */
  long    lGatEdge;         /* Gate rise/fall edge                    */
  long    lPadLoc4;
  double  dArmVolt;         /* Arm user voltage                       */
  double  dGatVolt;         /* Gate voltage                           */
  long    lGateEnb;         /* Enable gating                          */
  long    lCmdFlag;         /* Command flag for timestamping, etc..   */

  long    lFndMode;         /* Pulse find mode                        */
  long    lFndPcnt;         /* Pulse find percent                     */
  long    lPadLoc5;
  long    lPadLoc6;
  long    lPadLoc7[2][6];

  long    lTimeOut;         /* Timeout in sec's, if negative it's ms  */
  long    lArmMove;         /* Arming delay in steps [can be +/-]     */
  long    lNotUsed[2];
  } PARM;
```

**lFuncNum** Function to measure, use any of the following:

| | | |
|---|---|---|
| 2-Channel: | FUNC_TPD_PP | TPD +/+ |
| | FUNC_TPD_MM | TPD -/- |
| | FUNC_TPD_PM | TPD +/- |
| | FUNC_TPD_MP | TPD -/+ |
| 1-Channel: | FUNC_TT_P | Rising edge time |
| | FUNC_TT_M | Falling edge time |
| | FUNC_PW_P | Positive pulse width |
| | FUNC_PW_M | Negative pulse width |
| | FUNC_PER | Period |
| | FUNC_FREQ | Frequency |
| | FUNC_PER_M | Period Minus |

Default: FUNC_PER

**lChanNum** Channel to measure, the minimum value is 1, the maximum is based on the system configuration. For two channel TPD measurements, the lower 16 bits define the start channel and the upper 16 bits defines the stop channel. In the Oscilloscope tool, channels are designated by a bitfield, implying that multiple channels can be measured at the same time. (example: If 1ChanNum=3, channels 1 and 2 will be measured)

Default: 1

**lStrtCnt** Channel start count; the valid range is from 1 to 10,000,000.

Default: 1

**lStopCnt** Channel stop count; the valid range is from 1 to 10,000,000.

Default: 2

**lSampCnt** Sample size; the valid range is from 1 to 950,000.

Default: 300

**dStrtVlt** Start voltage sets the reference voltage used to initiate the time measurement. The valid range is +/-2.0 volts.

Default: 0.0

**dStopVlt** Stop voltage sets the reference voltage used to terminate the time measurement. The valid range is +/-2.0 volts.

Default: 0.0

**lExtnArm** Channel to use for external arming. Only used if lAutoArm is set to ARM_EXTRN. The minimum is 1, the maximum is based on the system configuration.

Default: 1

**lOscTrig** Channel to use for oscilloscope trigger.

Default: 1

**lOscEdge** Edge to use to trigger oscilloscope, use any of the following: EDGE_FALL, EDGE_RISE.

Default: EDGE_RISE

**lFiltEnb** Filter enable, any non-zero value enables filters.

Default: 0

**dFiltMin** Filter minimum in seconds, only used if lFiltEnb is non-zero; valid range is +/-2.49 seconds.

Default: -2.49

**dFiltMax** Filter maximum in seconds, only used if lFiltEnb is non-zero; valid range is +/-2.49 seconds.

Default: +2.49

**lAutoArm** Auto arm enable and mode, use any of the following:

| | |
|---|---|
| ARM_EXTRN | Arm using one of the external arms |
| ARM_START | Auto-arm on next start event |
| ARM_STOP | Auto-arm on next stop event |

Default: ARM_STOP

**lArmEdge** Arming edge to use, only used if lAutoArm is set to ARM_EXTRN and may be either EDGE_FALL or EDGE_RISE.

Default: EDGE_RISE

**lGateEdge** Edge to use when external arming gate is enabled; only used if lAutoArm is set to ARM_EXTRN and may be either EDGE_FALL or EDGE_RISE.

Default: EDGE_RISE

**dArmVolt** Arm1 voltage, the valid range is +/-2.0 volts and is only used if lAutoArm is set to ARM_EXTRN.

Default: 0.0

**dGatVolt** Arm2 voltage, the valid range is +/-2.0 volts and is only used if lAutoArm is set to ARM_EXTRN.

Default: 0.0

**lGateEnb** Enable external arm gating on the currently selected external arming channel; any non-zero value enables gating.
When gating is enabled, the arming edge and reference voltages of the current external arm channel are associated with gating.

Default: 0

**lFndMode** Pulse find mode, may be one of the following:

| | |
|---|---|
| PFND_FLAT | Use flat algorithm for pulse-find calculation. |
| PFND_PEAK | Use peak value for pulse-find calculation. |

Default: PFND_PEAK

**lFndPcnt** Pulse find percentage, may be one of the following:

| | |
|---|---|
| PCNT_5050 | Use 50/50 level for pulse-find calculation. |
| PCNT_1090 | Use 10/90 level for pulse-find calculation. |
| PCNT_9010 | Use 90/10 level for pulse-find calculation. |
| PCNT_USER | Do NOT perform pulse-find, manual mode. When this mode is selected, valid voltages must be loaded in the dStrtVlt, dStopVlt, dArmVolt and dGatVolt parameters. |
| PCNT_2080 | Use 20/80 level for pulse-find calculation. |
| PCNT_8020 | Use 80/20 level for pulse-find calculation. |

Default: PCNT_5050

**lTimeOut** Seconds for timeout before returning an error. A positive number is used to indicate a value in seconds, a negative number is used to indicate a value in milliseconds (Ex: -100 indicates 100ms.) The range of valid times is 10ms to 50s.

Default: 2

**lArmMove** This variable controls an arming delay that can be applied to either an external arm source, or the channel itself if auto-arming is enabled. Values in the range of -40 to 40 are acceptable (each step represents a 25ps delay from nominal).

| Arm Delay (ns) | Index Value |
|---|---|
| 19.0 | -40 |
| ... | ... |
| 19.75 | -10 |
| ... | ... |
| 20.0 | 0 |
| ... | ... |
| 21.0 | 40 |

Default: -10

**lNotUsed[n]** Formerly DSM channel select, no longer used.

## 7-5 TAILFIT RESULT STRUCTURE

This output structure holds the results of a TailFit algorithm execution. This structure is imbedded in all of the measurement structures that use the TailFit algorithm to separate Random Jitter and Deterministic Jitter from a histogram of measurements. Should the measurement come to completion without a successful TailFit, re-execute the measurement to acquire more data.

```
typedef struct
  {
  long    lGood;              /* Flag to indicate successful tail-fit   */
  long    lPad1;
  SIDE    tL, tR;             /* Individual left/right tail-fit data    */
  double  dDjit;              /* Deterministic jitter, from both sides  */
  double  dRjit;              /* Random jitter, average from both sides */
  double  dTjit;              /* Total jitter, calculated from bathtub  */
  } TFIT;
```

**lGood** Flag to indicate successful tail-fit. This flag will be set to a one if the TailFit algorithm successfully separated RJ and DJ from within the histogram of measurements.
**tL, tR** Structures of type SIDE, defined below, containg individual left & right tail-fit data.
**dDjit** Total Deterministic jitter, from both sides.
**dRjit** Total Random jitter, average from both sides.
**dTjit** Total jitter, calculated from bathtub curve.

## 7-6 SINGLE SIDE OF TAILFIT STRUCTURE

This output structure is used within the TFIT structure to contain all of the results of a Tail-Fit pertaining to one side of the measurement histogram. This structure contains side specific RJ and DJ information as well as Chi-squared data defining the “goodness of fit” criteria.

```
typedef struct
  {
  double  dCoef[ 3 ];         /* Used by WavGetTfit() to generate       */
                              /* idealized tail-fit curves              */
  double  dDjit;              /* Deterministic jitter, this side only   */
  double  dRjit;              /* Random jitter, this side only          */
  double  dChsq;              /* ChiSquare indicator, goodness of fit   */
  double  dLoValu, dHiValu;   /* Xval range over which tail was fitted  */
  double  dMuValu;            /* Projected Xval where mu was determined */
  double  dEftvDj, dEftvRj;   /* Effective jitter if calculated         */
  double  dTjit;              /* Total jitter, calculated from bathtub  */
  } SIDE;
```

**dCoef** Coefficient used to generate idealized tail-fit curves.
**dDjit** Deterministic jitter, this side only.
**dRjit** Random jitter, this side only.
**dChsq** ChiSquare indicator, goodness of fit.
**dLoValu,dHiValu** range over which tail was fitted.
**dMuValu** Projected dXval where mu was determined.
**dEftvDj,dEftvRj** Holds the effective jitter values if calculated. To calculate the effective jitter, lFndEftv must contain a non-zero value. Since the effective jitter is calculated by optimizing a curve-fit, a result is not guaranteed. If the curve-fit fails, a negative value will be returned in these variables.

## 7-7 SPECIFICATION LIMIT STRUCTURE

This input structure is used by the Datacom Known Pattern With Marker Tool to contain the parameters for **tRateInf**, **tDdjtInf** and **tRjpjInf.** This tool uses these specifications when setting up the measurement for capturing bit rate, DDJ and RJ/PJ spectra respectively.

```
typedef struct
  {
  long    lSampCnt;           /* Sample size to use                    */
  long    lPad1;
  double  dMaxSerr;           /* LIM_ERROR if this std. error exceeded  */
  long    lPtnReps;           /* Patterns to sample across             */
  long    lPad2;
  } SPEC;
```

**lSampCnt** Sample size to use when acquiring data
Valid Entries: 1 to 10,000,000
Default: 100

**dMaxSerr** Value of standard error which is tolerated, used to identify wrong pattern or other setup error.
Valid Entries: any integer greater than or equal to 0
Default: 0.5

**lPtnReps** Patterns to sample across. The larger this number is the more accurate the measurement will be with regards to absolute time measurements. This is due to the effect of aver
Valid Entries: 1 –
Default: rRateInf - 10
dDdjtInf - 1
dRjpjInf - 1

**lPad1,lPad2** Internal parameters, do not modify.

## 7-8 DDJ+DCD DATA STRUCTURE

This output structure contains all of the measurement data used to calculate DDJ+DCD in the Datacom Known Pattern With Marker Tool. This tool contains a pointer to an array of DDJT structures with an element for each transition in the pattern.

```
typedef struct
  {
  double  dMean;              /* Average value for this span           */
  double  dVars;              /* Variance value for this span          */
  double  dMini;              /* Minimum value for this span           */
  double  dMaxi;              /* Maximum value for this span           */
  double  dDdjt;              /* Static displacement for this span (UI) */
  double  dFilt;              /* DDJT after LPF is applied (UI)        */
  long    lNumb;              /* Number of measures in this span       */
  long    lPad1;
  } DDJT;
```

**dMean** Average value for this span. This is the time elapsed from the first edge in the pattern to transition associated with this structure. In an ideal signal (one which contains no jitter), this value would be an integer multiple of the bit period. Any deviation there of is considered jitter and becomes an element of the DDJ+DCD histogram.

**dVars** Variance value for this span. This is net deviation of the mean to the ideal bit transition.

**dMini** Minimum value for this span. This is the earliest transition for this bit period. It defines the earliest transition for this location in the pattern.

**dMaxi** Maximum value for this span. This is the latest transition for this bit period. It defines the latest transition for this location in the pattern.

**dDdjt** Static displacement for this span (UI).

**dFilt** DDJT after HPF is applied (UI).

**lNumb** Number of measures in this span.

## 7-9 PATTERN STRUCTURE

The pattern structure is used internally by the system as part of the measurement process. When tools are used that reference a pattern, they have a member called sPtnName in their binary packet. This field holds the name of the pattern file that is to be used. Whenever a binary packet is sent which contains a new value in sPtnName, a new internal representation is loaded.

```
typedef struct
  {
  char    *bHex;            /* Pointer to raw hex data                */
  short   *iPos;            /* Pointer to run length encoded data     */
  short   *iCnt;            /* Pointer to start/stop counts to use    */
  double  *dCal;            /* Pointer to calibration data if present */
  long    lLpat;            /* The length of pattern in UI            */
  long    lEpat;            /* The edge count of pattern pos or neg   */
  double  dCalUI;           /* Cal data taken at this unit interval   */
  } PATN;
```

## 7-10 FFT WINDOW AND ANALYSIS STRUCTURE

This is an input structure used to specify the type of windowing function to use when generating an FFT. It also contains information for an average calculation that is performed on the resulting FFT for some specific tools such as Low Frequency Modulation Analysis.

```
typedef struct
  {
  long    lWinType;           /* Window type, use FFT constants above   */
  long    lPadMult;           /* Power of 2 to use for padding (0 - 5)  */
  double  dCtrFreq;           /* Frequency to assess yavg in plot array */
  double  dRngWdth;           /* Width over which to assess yavg        */
  double  dAlphFct;           /* Alpha factor for Kaiser-Bessel window  */
  } FFTS;
```

**lWinType** Window type, use one of the following:

| | |
|---|---|
| FFT_RCT | Rectangular window |
| FFT_KAI | Kaiser-Bessel window |
| FFT_TRI | Triangular window |
| FFT_HAM | Hamming window |
| FFT_HAN | Hanning window |
| FFT_BLK | Blackman window |
| FFT_GAU | Gaussian window |
| Default: | FFT_KAI |

**lPadMult** Power of 2 to use for padding (0 - 5)
Default: 4

**dCtrFreq** Frequency over which to assess dYavg in plot array (Hz)
Default: 100.0

**dRngWdth** Width over which to assess dYavg (Hz)
Default: 10.0

**dAlphFct** Alpha factor when using Kaiser-Bessel window
Default: 8.0

## 7-11 QTYS STRUCTURE

QTYS is an output structure used to return scope results.

```
typedef struct
  {
  double  dMaxVolts;
  double  dMinVolts;
  double  dAvgVolts;
  double  dPkPkVolt;
  double  dRmsVolts;
  double  dTopVolts;
  double  dBtmVolts;
  double  dMidVolts;
  double  dAmplVolt;
  double  dOvrShoot;
  double  dUndShoot;
  double  dMaskFail;
  double  dMaskRgn1;
  double  dMaskRgn2;
  double  dMaskRgn3;
  double  dMaskTotl;
  MEAS    mRiseTime;
  MEAS    mFallTime;
  } QTYS;
```

**dMaxVolts** Vmax in Volts
**dMinVolts** Vmin in Volts
**dAvgVolts** Vavg in Volts
**dPkPkVolt** Vpk-pk (Vmax – Vmin) in Volts
**dRmsVolts** Vrms in Volts
**dTopVolts** Vtop in Volts, flat top
**dBtmVolts** Vbase in Volts, flat base
**dMidVolts** Vmid (Vtop + Vbase) / 2 in Volts
**dAmplVolt** (Vtop – Vbase) in Volts
**dOvrShoot** Vovershoot in Volts
**dUndShoot** Vundershoot in Volts
**dMaskFail** Total Mask violations
**dMaskRgn1** Mask Violations in Region 1
**dMaskRgn2** Mask Violations in Region 2
**dMaskRgn3** Mask Violations in Region 3
**dMaskTotl** Total Mask hits, both In and Outside the Mask
**mRiseTime** Structure holding Risetime information
**mFallTime** Structure holding Falltime information

## 7-12 MEAS STRUCTURE

MEAS is an output structure used to return scope rise/fall time results.

```
typedef struct
  {
  long    lGood;
  long    lPad1;
  double  dValu;
  double  dXpnt[2];
  double  dYpnt[2];
  } MEAS;
```

**lGood** Flag indicates valid output data in structure.
**DValu** Field holds rise or fall time result
**dXpnt[2]** The starting and ending threshold location in secs.
**dYpnt[2]** The starting and ending threshold location in Volts.

## 7-13 OHIS STRUCTURE

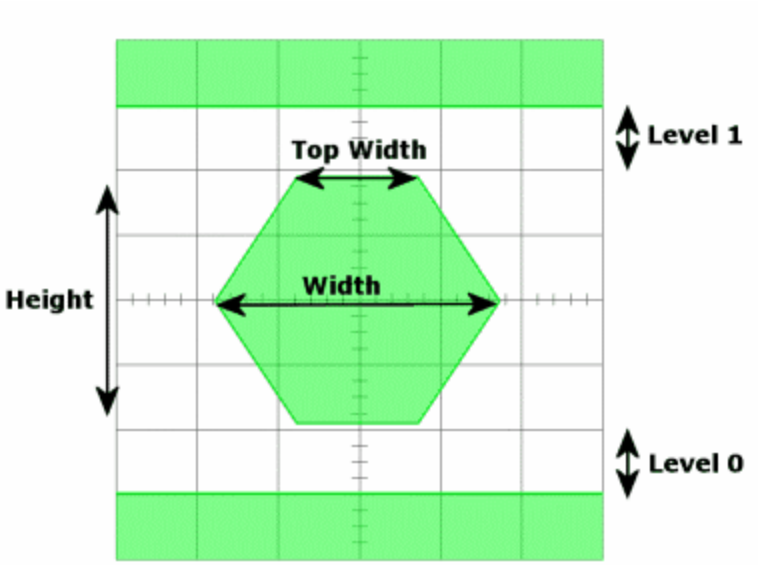
OHIS is an output structure used to return oscilloscope histogram results.

```
typedef struct
  {
  PLOT    tPlot;
  long    lCoun;
  long    lPad1;
  double  dAver;
  double  dMini;
  double  dMaxi;
  double  dSdev;
  double  dEpsl;
  double  dVars;
  } OHIS;
```

| | |
|---|---|
| **tPlot** | Plot structure that holds the histogram representation |
| **lCoun** | Count of the total number of hits in the histogram |
| **dAver** | Average of all the data contained in the histogram |
| **dMini** | Minimum of all the data contained in the histogram |
| **dMaxi** | Maximum of all the data contained in the histogram |
| **dSdev** | Standard deviation of all the data contained in the histogram |
| **dEpsl,dVars** | Used internally, DO NOT ALTER! |

## 7-14 MASK STRUCTURE

MASK is an input structure that is used to specify an Eye Mask to be used in the Scope Tool.




```
typedef struct
  {
  /* Absolute voltages */
  double  dVmask;
  double  dVoffs; /* No longer used */
  double  dV1pas;
  double  dTmask;
  double  dToffs; /* No longer used */
  double  dTflat;
  double  dV0pas;
  /* Relative voltages */
  double  dXwdUI;
  double  dXflUI;
  double  dYiPct;
  double  dV1Rel;
  double  dV0Rel;
  } MASK;
```

| | |
|---|---|
| **dVmask** | Absolute width of mask in secs. |
| **dVoffs** | No longer used, this field can be ignored |
| **dV1pas** | Distance from the top of the mask to the upper region in Volts. |
| **dTmask** | Absolute position of the center of the mask in secs. |
| **dToffs** | No longer used, this field can be ignored |
| **dTflat** | Width of the top and bottom flats of the mask in secs. |
| **dV0pas** | Distance from the bottom of mask to the lower region in Volts. |
| **dXwdUI** | Relative width of mask in UI |
| **dXflUI** | Relative width of the top and bottom flats of the mask in UI |
| **dYiPct** | Height of inner region of mask relative to the data, expressed as % |
| **dV1Rel** | Distance from top of inner region to top region expressed as a % of data height |
| **dV0Rel** | Distance from bottom of inner region to bottom region expressed as a % of data height |

## 7-15 KPWM STRUCTURE

KPWM is a measurement structure used by some of the PCI Express and Serial ATA tools.

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  FFTS    tFfts;              /* FFT window and analysis parameters     */
  char    sPtnName[ 128 ];    /* Name of pattern file to be used        */
  long    lAcqEdge;           /* Reference Edge and RJ+PJ measure edge  */
                              /* Could be: EDGE_FALL or EDGE_RISE       */
  long    lOneEdge;           /* If true, DCD+ISI is rise or fall only  */
  long    lQckMode;           /* Enable quick mode, external arm only   */
  long    lIntMode;           /* Interpolation mode, non-zero is linear */
  long    lErrProb;           /* Error probability for Total Jitter     */
                              /* Valid range is ( -1 to -16 )           */
  long    lHeadOff;           /* Header offset, external arming only    */
  double  dCornFrq;           /* Corner Frequency for RJ+PJ             */
  long    lTailFit;           /* Count of tailfits, see constants above */
  long    lFitPcnt;           /* Automode suceed %, see constants above */
  long    lTfitCnt;           /* Sample count per pass when tailfitting */
  long    lPad0;
  SPEC    tRateInf;           /* Parameters to acquire Bit Rate         */
  SPEC    tDdjtInf;           /* Parameters to acquire DCD+DDJ          */
  SPEC    tRjpjInf;           /* Parameters to acquire RJ+PJ            */
  double  dLpfFreq;           /* Low pass filter corner frequency       */
  double  dHpfFreq;           /* High pass filter corner frequency      */
  double  dLpfDamp;           /* Low pass filter 2nd order damp_factor  */
  double  dHpfDamp;           /* High pass filter 2nd order damp_factor */
  long    lLpfMode;           /* LPF mode, see constants above          */
  long    lHpfMode;           /* HPF mode, see constants above          */
  long    lFndEftv;           /* Flag to attempt effective jitter calc  */
  long    lMinEftv;           /* Min probability for effective fit: -4  */
  long    lMaxEftv;           /* Max probability for effective fit: -12 */
  long    lFiltEnb;           /* Enable IDLE character insertion filter */
  long    lQckTjit;           /* Fast total jitter calc - no bathtubs!  */
  long    lPllComp;           /* Enable PLL Curve Spike Compensation    */
  long    lPad1;
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  PATN    tPatn;              /* Internal representation of pattern     */
  double  dWndFact;           /****************************************/
  long    lMaxStop;           /*  These values are all used internally  */
  long    lPtnRoll;           /*             DO NOT ALTER!              */
  long    lAdjustPW;          /****************************************/
  long    lPad2;
  double  dBitRate;           /* Bit Rate that was measured             */
  DDJT   *tDdjtData;          /* Raw DCD+DDJ measurements               */
  long    lDdjtRsvd;          /* Used to track memory allocation        */
  double *dRjpjData;          /* Raw variance data                      */
  long    lRjpjRsvd;          /* Used to track memory allocation        */
  long   *lPeakData;          /* Tracks detected spikes in RJ+PJ data   */
  long    lPeakNumb;          /* Count of detected spikes               */
  long    lPeakRsvd;          /* Used to track memory allocation        */

  long    lHits;              /* Total samples for DDJT+RJ+PJ combined  */
  double  dDdjt;              /* DCD+DDJ jitter                         */
  double  dDjit;              /* Deterministic jitter                   */
```

```
  double  dRjit;              /* Random jitter                          */
  double  dPjit;              /* Periodic jitter                        */
  double  dTjit;              /* Total jitter                           */
  double  dEftvLtDj;          /* Effective jitter when enabled          */
  double  dEftvLtRj;
  double  dEftvRtDj;
  double  dEftvRtRj;
  PLOT    tRiseHist;          /* DCD+DDJ histogram of rising edges      */
  PLOT    tFallHist;          /* DCD+DDJ histogram of falling edges     */
  PLOT    tNormDdjt;          /* DCD+DDJvsUI for external arming only   */
  PLOT    tHipfDdjt;          /* High Pass Filtered DCD+DDJvsUI         */
  PLOT    tLopfDdjt;          /* Low  Pass filtered DCD+DDJvsUI         */
  PLOT    tBathPlot;          /* Bathtub plot                           */
  PLOT    tEftvPlot;          /* Effective Bathtub plots, if enabled    */
  PLOT    tSigmNorm;          /* 1-Sigma plots                          */
  PLOT    tSigmTail;          /* 1-Sigma tail-fits, for enabled modes   */
  PLOT    tFreqNorm;          /* Frequency plots                        */
  PLOT    tFreqTail;          /* Tail-fit FFT plots, for enabled modes  */
  } KPWM;
```

**tParm** A structure of type PARM that contains acquisition parameters. The PARM structure is discussed in full detail in Section 7-4.

**tFfts** A structure of type FFTS that contains the setup parameters for the FFT. See Section 7-10 for further details on FFTS structures.

**sPtnName** A character array containing the name of pattern file to be used, the file must exist in the pattern directory (C:\VISI\) on the SIA3000 or else an error will be returned. The first time a measurement is performed the pattern is loaded in structure tPatn.
Valid Entries: a valid file name (including extension)
Default: "k285.ptn"

**lAcqEdge** Reference Edge and RJ+PJ measure edge: EDGE_FALL or EDGE_RISE.
Default: EDGE_RISE

**lOneEdge** This parameter is used to enable a special mode where only rising or falling edges are used to access DCD+ISI, as is the case for the special PCI Express Clock Tool. Setting this parameter to 1 will enable this special mode.
Valid Entries: 0 – disable single edge mode
1 – enable single edge mode
Default: 0

**lQckMode** Parameter used to enable Quick Mode. QuickMode uses a sparse sample of data points for the PJ and RJ estimates. In this mode, the accuracy of these estimates is greatly reduced depending on the application. Setting this structure element to 1 enables quick mode, valid with external arm only.
Valid Entries: 0 – disable quick capture mode
1 – enable quick capture mode
Default: 0

**lIntMode** Parameter used to enable linear Interpolation mode for RJ & PJ estimate. RJ & PJ are calculated based on the frequency data of the noise. Since data points are captured only on the single polarity transitions, interpolation must be performed between sample points. There are two types of interpolation available in the SIA3000: linear and cubic. Setting this parameter to 1 will enable linear interpolation; otherwise, cubic interpolation will be used.
Valid Entries: 0 – use cubic interpolation in FFT data
1 – use linear interpolation in FFT data
Default: 0

**lErrProb** Error probability level for Total Jitter. Total Jitter is calculated based on the desired Error Probability level. This value is used in conjunction with the bathtub curve after the successful completion of a tail-fit in order to project the value of Total Jitter.
Valid Entries: -1 to -16
Default: -12

**lHeadOff** Header offset parameter, for use in packet-ized data which may have a frame header before the test pattern. This offset value can be used to skip past header information and into the repeating data pattern stream. This can be useful when analyzing data from disk drives when the pattern marker may be synchronized with the start of frame data.
Valid Entries: 0 to 10,000,000-pattern length I
Default: 0 (indicating no header present)

**dCornFrq** Corner Frequency for RJ & PJ estimate in Hertz. This value is used in conjunction with the Bit Rate and pattern to determine the maximum stop count to be used to acquire RJ & PJ data. A lower value increase acquisition time.
Valid Entries: Bit-Rate /10,000,000 to Bit-Rate I
Default: 637e3 (637kHz – Fibre Channel 1X)

**lTailFit** Parameter used to enable TailFit algorithm for RJ estimate. The TailFit algorithm yields the highest level of accuracy when calculating an RJ estimate. However, millions of samples must be taken in order to perform an accurate TailFit. The number of TailFits to be performed is based on the value assigned to this parameter. In practice, only a small sampling of edges need to be analyzed for RJ content. The smallest sample is three. The edges selected are the first edge in the pattern, the middle edge and the last edge. This allows a reasonable span of frequency content. It is assumed that the noise components can be approximated by a continuous function (as is generally the case.) If the RJ changes over frequency, there will be a delta between the different samples. A change in value of less than 5% between adjacent points is considered acceptable. If the delta is larger, more TailFit points should be taken.

Valid Entries:

| | |
|---|---|
| KPWM_NONE | Do not perform a TailFit |
| KPWM_AUTO | Perform TailFits until the delta Between successive fits < 5%. |
| KPWM_FIT3 | Perform 3 TailFits |
| KPWM_FIT5 | Perform 5 TailFits |
| KPWM_FIT9 | Perform 9 TailFits |
| KPWM_FIT17 | Perform 17 TailFits |

Default: KPWM_NONE

**lFitPcnt** Automode suceed %, should be one of the constants KPWM_PCNT5, KPWM_PCNT10, KPWM_PCNT25. This specifies the threshold within which successive tailfits must converge before success when lTailFit is set the KPWM_AUTO

**lTfitCnt** Sample count per pass when tailfitting

**tRateInf** A structure of type SPEC used by the Bit Rate measurement. The structure holds measurement specific parameters such as sample count, pattern repeats and maximum standard error. See Section 7-7 for a description of the SPEC structure and its elements.

**tDdjtInf** A structure of type SPEC used by the Data Dependant Jitter (DDJ) measurement. The structure holds measurement specific parameters such as sample count, pattern repeats and maximum standard error. See Section 7-7 for a description of the SPEC structure and its elements.

**tRjpjInf** A structure of type SPEC used by RJ & PJ estimate. The structure holds measurement specific parameters such as sample count, pattern repeats and maximum standard error. See Section 7-7 for a description of the SPEC structure and it's elements.

**dLpfFreq** Low pass filter frequency in Hertz. This is only valid when lLpfMode is enabled.

**dHpfFreq** High pass filter frequency in Hertz. This is only valid when lHpfMode is enabled.

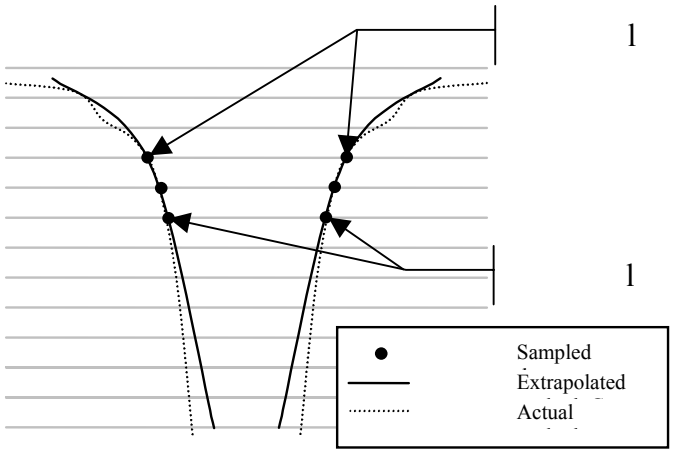
**dLpfDamp** Low pass damping factor. This is only valid when lLpfMode is enabled, and a 2nd order filter is selected.

**dHpfDamp** High pass damping factor. This is only valid when lHpfMode is enabled, and a 2nd order filter is selected.

**lLpfMode** Low pass filter mode. One of the following may be used:
Valid Entries: FILTERS_DISABLED
BRICKWALL_FILTER
ROLLOFF_1STORDER
ROLLOFF_2NDORDER
PCIX_CLOK_FILTER
Default: FILTERS_DISABLED

**lHpfMode** High pass filter mode. One of the following may be used:
Valid Entries: FILTERS_DISABLED
BRICKWALL_FILTER
ROLLOFF_1STORDER
ROLLOFF_2NDORDER
PCIX_CLOK_FILTER
Default: FILTERS_DISABLED

**lFndEftv** Flag to indicate that an effective jitter calculation is to be attempted. Effective Jitter is a means of estimating the effective deterministic jitter as it relates to a .5 error probability. This is done by first capturing the bathtub curve using conventional RJ & DJ estimation techniques; then, extrapolating from a few points in the bathtub curve to the .5 error probability level to estimate effective DJ. Effective RJ is extracted based on the curve that was fitted to the sample points. These values should only be used to correlate to a BERT Scan measurement and should not be used as a vehicle for quantifying jitter. This technique was developed to allow BERT systems to correlate with SIA3000 results.



Extrapolated Bathtub curve versus real bathtub curve as seen by BERT

Valid Entries: 0 – disable effective jitter estimate
1 – enable effective jitter estimate
Default: 0

**lMinEftv, lMaxEftv** Defines the error rates at which the eye width calculation will be used in the estimating effective jitter components. lMinEftv and lMaxEftv define points on the bathtub curve from which the extrapolated RJ curve is traced. Then, where this extrapolated curve intersects the .5 error probability, the effective DJ is calculated.
Valid Entries: -1 to -16 (indicating $10^{-1}$ to $10^{-16}$ error rate)
Default: -4 and –12 (lMaxEftv: $10^{-4}$ BER, lMinEftv: $10^{-12}$ BER)

**lFiltEnb** Flag to enable IDLE character insertion filter. When enabled any edge measurements that are not within ± 0.5 UI will be discarded. This filter is used in systems, which may insert an idle character from time to time to compensate for buffer under-run/overrun issues. In those instances where an idle character was inserted during a measurement, the edge selection may be off. If this parameter is greater than or equal to one, the filter is enabled and measurements that differ from the mean by ± 0.5 UI will be discarded.
Valid Entries: 0 – disable idle character filter
1 – enable idle character filter
Default: 0

**lQckTjit** Flag to indicate a fast total jitter calculation will be performed using simple linear calculation of Total Jitter instead of convolving the DJ Probability Density Functions and the RJ Probability Density Functions. This calculation is based on the formula [TJ = DJ + n*RJ] where DJ and RJ are measured, and n is the multiplier based on a theoretical Gaussian distribution
Valid Entries: 0 do not use convolution for TJ est.
1 Convolve DJ and RJ for TJ est.
Default: 0

**lPllComp** Enable PLL Curve Spike Compensation. If a low frequency spike is detected in the Power Spectral Density (FFT) plot, it is automatically removed and it's energy is dispersed evenly across the rest of the Power Spectral Density.
Default: 0

**lGood** Flag indicates valid output data in structure. A positive value in this parameter indicates that the measurement was completed successfully, and, valid data can be extracted from this structure.

**tPatn** Structure of type PATN which holds all of the pattern information with regards to pattern length, pattern content, marker placement relative to location in pattern and other pattern specific metrics. (See Section 7-9 for a detailed description of the PATN structure elements.) This is an internal structure that the system uses to store pattern information and does not need to be altered by the user. The first time a measurement is performed the pattern is loaded into tPatn which is used internally for all subsequent acquisition and analysis.

**dBitRate** The bit rate is measured and placed in this field (Hertz).

**lHits** Total samples taken to calculate DDJ, RJ, and PJ values combined. Gives an indication of the actual data to support the calculated total jitter number.

**dDdjt** DCD+DDJ measurement in seconds. This measurement is taken from the mean deviation of each pattern edge from it's ideal location. All deviations are placed in a histogram and the peak-peak value from this histogram is placed in this structure location.

**dDjit** Deterministic jitter measurement, in seconds. This is the DCD+DDJ summed with the Periodic Jitter.

**dRjit** Random jitter estimate, in seconds.

**dPjit** Periodic jitter measurement, in seconds.

**dTjit** Total jitter estimate, in seconds.

**dEftvLtDj** Effective Deterministic(eDJ) jitter estimate, in seconds, for the left side of the bathtub curve. Total effective DJ is calculated by adding dEftvLtDj to dEftvRtDj. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in this variable.

**dEftvLtRj** Effective Random(eRJ) jitter estimate, in seconds, for the left side of the bathtub curve. Total effective RJ is calculated by averaging dEftvLtRj and dEftvRtRj. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in these variables.

**dEftvRtDj** Effective Deterministic(eDJ) jitter estimate, in seconds, for the right side of the bathtub curve. Total effective DJ is calculated by adding dEftvLtDj to dEftvRtDj. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in this variable.

**dEftvRtRj** Effective Random(eRJ) jitter estimate, in seconds, for the right side of the bathtub curve. Total effective RJ is calculated by averaging dEftvLtRj and dEftvRtRj. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in this variable.

**tRiseHist** Structure of type PLOT which contains all of the plot information for generating a DCD+DDJ histogram of rising edges. See Section 7-3 for details concerning the PLOT structure and its elements.

**tFallHist** Structure of type PLOT which contains all of the plot information for generating a DCD+DDJ histogram of falling edges. See Section 7-3 for details concerning the PLOT structure and its elements.

**tNormDdjt** Structure of type PLOT which contains all of the plot information for generating a DCD+DDJ versus UI plot. This plot is only valid in Pattern Marker mode. See Section 7-3 for details concerning the PLOT structure and its elements.

**tHipfDdjt** Structure of type PLOT which contains all of the plot information for generating an DCD+DDJ versus UI plot with the DCD+DDJ High Pass Filter enabled. This plot is only valid in Pattern Marker Mode and dDdjtHpf is a non-negative number. *(For a discussion on the High Pass Filter Function for DCD+DDJ data, see dDdjtHpf above.)* When dDdjtHpf is enabled, the dDdjt value is calculated based on applying the dDdjtHpf filter. See Section 7-3 for details concerning the PLOT structure and its elements.

**tLopfDdjt** Structure of type PLOT \which contains all of the plot information for generating an DCD+DDJ versus UI plot with the DCD+DDJ Low Pass Filter enabled. This plot is only valid in Pattern Marker Mode and dDdjtLpf is a non-negative number. *(For a discussion on the Low Pass Filter Function for DCD+DDJ data, see dDdjtLpf above.)* See Section 7-3 for details concerning the PLOT structure and its elements.

**tBathPlot** Structure of type PLOT which contains all of the plot information for generating a Bathtub curve. See Section 7-3 for details concerning the PLOT structure and its elements.

**tEftvPlot** Structure of type PLOT which contains all of the plot information for generating an Bathtub curve based on Effective Jitter if lFndEftv is set and a valid fit is obtained. *(For a detailed description of Effective Jitter, see lFndEftv above.)* See Section 7-3 for details concerning the PLOT structure and its elements.

**tSigmNorm** Structure of type PLOT which contains all of the plot information for generating an 1-Sigma versus UI plot. *(x-axis can be converted to time from UI based on dBitRate value.)* This plot describes the standard deviation for each accumulated time sample. See Section 7-3 for details concerning the PLOT structure and its elements.

**tSigmTail** Structure of type PLTD which contains all of the plot information for generating an tailfit versus UI plot.

**tFreqNorm** Structure of type PLOT which contains all of the plot information for generating a Jitter versus Frequency plot. See Section 7-3 for details concerning the PLOT structure and its elements.

**tFreqTail** Structure of type PLTD which contains all of the plot information for generating a Tailfit versus Frequency plot.

*The following parameters are for internal use only. They are presented for reference only. Do not try to read the values or parse the structures nor try to write the various locations.*

**dWndFact, lMaxStop, lPtnRoll, lAdjustPW** These values are for internal use only, DO NOT ALTER or try to use.

**tDdjtData** Structure which contains the raw DCD+DDJ measurements. This value is for internal use only, DO NOT ALTER or try to use.

**lDdjtRsvd** Used to track memory allocation for tDdjtData structures. This value is for internal use only, DO NOT ALTER or try to use.

**dRjpjData** Raw variance data used for the calculation of RJ and PJ. This structure is for internal use only, DO NOT ALTER or try to use.

**lRjpjRsvd** Used to track memory allocation for dRjpjData values. This value is for internal use only, DO NOT ALTER or try to use.

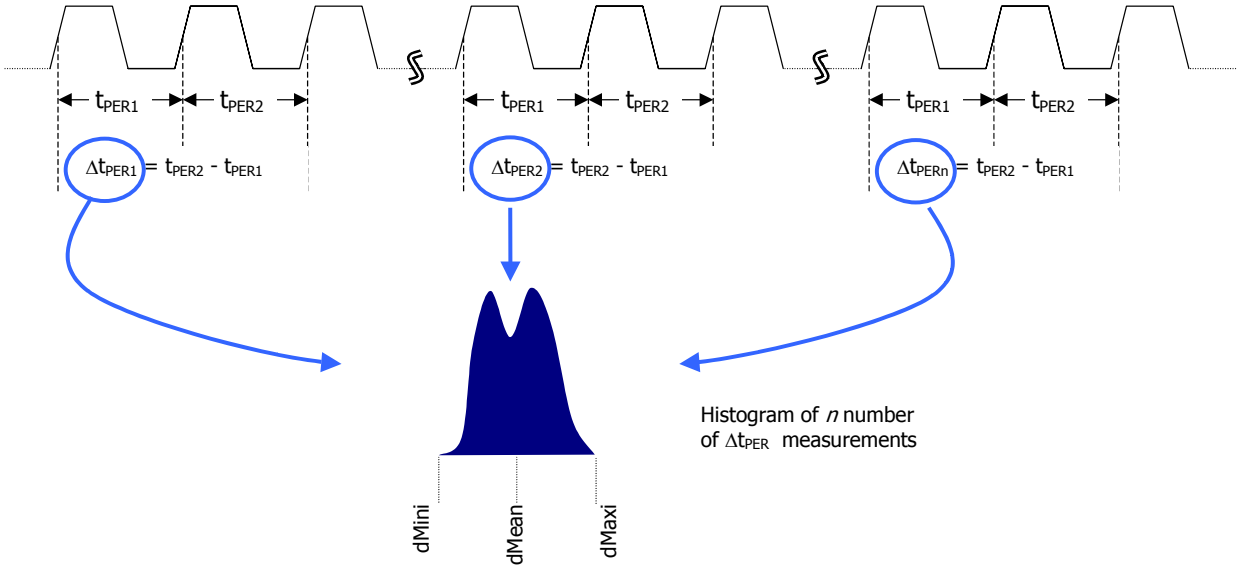
**lPeakData** Tracks detected spikes in RJ+PJ data. This value is for internal use only, DO NOT ALTER or try to use.

**lPeakNumb** Count of detected spikes, indicates the number of values in the lPeakData array.

**lPeakRsvd** Used to track memory allocation for lPeakData values. This value is for internal use only, DO NOT ALTER or try to use.

## 7-16 ADJACENT CYCLE JITTER TOOL

The Adjacent Cycle Jitter tool is used to capture period deviation information for two adjacent cycles. This measurement is called out in a few standards as a means to estimate short-term jitter. Although this metric has limited value in the physical world, it is a required measurement in many PLL test standards.




**Command syntax-** `:ACQuire:Adjacent CYCle(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>`

Example: `Send(0,5,":ACQ:ACYC(@4)#41232…",1251,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  double  dUnitInt;           /* Unit Interval to assess Total Jitter   */
  long    lPassCnt;           /* Acquisitions so far, set to 0 to reset */
  long    lErrProb;           /* Error probability for Total Jitter     */
                              /* Valid range is ( -1 to -16 )           */
  long    lTailFit;           /* If non-zero a tail-fit will be tried   */
  long    lForcFit;           /* If non-zero use the force-fit method   */
  long    lMinHits;           /* Minimum hits before trying tail-fit    */
  long    lFndEftv;           /* Flag to attempt effective jitter calc  */
  long    lMinEftv;           /* Min probability for effective fit: -4  */
  long    lMaxEftv;           /* Max probability for effective fit: -12 */
  long    lAutoFix;           /* If true perform a pulsefind as req'd   */
  long    lDutCycl;           /* If non-zero make duty cycle measurement*/
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */

  long    lMeasCnt;           /* Number of hits in measured normal data */
  double  dMeasMin;           /* Minimum value in measured normal data  */
  double  dMeasMax;           /* Maximum value in measured normal data  */
  double  dMeasAvg;           /* Average value of measured normal data  */
  double  dMeasSig;           /* 1-Sigma value of measured normal data  */

  long    lNormCnt;           /* Hits in adjacent cycle normal data     */
  long    lPad1;
  double  dNormMin;           /* Min. in adjacent cycle normal data     */
```

```
  double  dNormMax;           /* Max. in adjacent cycle normal data     */
  double  dNormAvg;           /* Avg. of adjacent cycle normal data     */
  double  dNormSig;           /* 1-Sig of adjacent cycle normal data    */

  long    lTotlCnt;           /* # of hits in measured accumulated data */
  long    lPad2;
  double  dTotlMin;           /* Min. in measured accumulated data      */
  double  dTotlMax;           /* Max. in measured accumulated data      */
  double  dTotlAvg;           /* Avg. of measured accumulated data      */
  double  dTotlSig;           /* 1-Sig of measured accumulated data     */

  long    lAcumCnt;           /* Hits in adjacent cycle accumulated data*/
  long    lPad3;
  double  dAcumMin;           /* Min. in adj. cycle accumulated data    */
  double  dAcumMax;           /* Max. in adj. cycle accumulated data    */
  double  dAcumAvg;           /* Avg. of adj. cycle accumulated data    */
  double  dAcumSig;           /* 1-Sig of adj. cycle accumulated data   */

  double  dDutyMax;           /* Maximum value of duty cycle measurement*/
  double  dDutyMin;           /* Minimum value of duty cycle measurement*/
  double  dDutyAvg;           /* Average value of duty cycle measurement*/

  long    lBinNumb;           /****************************************/
  long    lPad4;              /*  These values are all used internally  */
  double  dLtSigma[PREVSIGMA];/*   as part of the measurement process   */
  double  dRtSigma[PREVSIGMA];/*             DO NOT ALTER!              */
  double  dFreq;              /****************************************/

  PLOT    tNorm;              /* Histogram of prev. adj. cycles         */
  PLOT    tAcum;              /* Histogram of all adj. cycles combined  */
  PLOT    tMaxi;              /* Histogram of max across all adj. cycles*/
  PLOT    tBath;              /* Bathtub curves determined from PDF     */
  PLOT    tEftv;              /* Effective Bathtub curves if enabled    */
  TFIT    tTfit;              /* Structure containing tail-fit info     */
  } ACYC;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**dUnitInt** Unit Interval (UI) in seconds to assess Total Jitter as a percent of UI. Set this parameter as the metric against which TJ will be evaluated as a percentage. It is displayed as the span of the x-axis in a bathtub curve. This parameter is only used if tail-fit is enabled.

Valid Entries: any number greater than 0 which represents the time (in secs) of a bit period or unit interval.

Default: 1e-9 (1ns)

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an exectution. Setting this parameter to 0 essentially resets this register. A measurement can be performed repeatedly with the same HIST structure. In this case, data is then accumulated in the tAcum and tMaxi plot structures. When lPassCnt is set to 0 the tAcum and tMaxi plot structures are flushed. It will be automatically incremented by the next measurement.

Valid Entries: any integer greater than or equal to 0

Default: 0

**lErrProb** Error probability level for Total Jitter. Total Jitter is calculated based on the desired Error Probability level. This value is used in conjunction with the bathtub curve after the

successful completion of a tail-fit in order to project the value of Total Jitter.
Valid Entries: -1 to -16
Default: -12

**lTailFit** Flag to indicate whether to perform a TailFit on data in tAcum data array. If non-zero, a tail-fit will be attempted on the tAcum data array. The lGood element of the tTfit structure will indicate if the TailFit was successful. Any positive interger for this parameter will initiate the TailFit algorithm.
Valid Entries: 0 – disable TailFit
1 – enable TailFit
Default: 0

**lForcFit** If non-zero uses the force-fit method. If set to zero, the measurement will continue to loop until a reasonably accurate TailFit can be achieved.
Valid Entries: 0 – do not use force fit.
1 – force a fit using lMinHits number of hits.
Default: 0

**lMinHits** Minimum hits before attempting a tail-fit in 1000's; the default is 50. The larger the number the more likely a valid tailfit will be found.
Valid Entries: any integer ≥ 50
Default: 50

**lFndEftv** Flag to indicate that an effective jitter calculation is to be attempted. This is necessary for those instances in which correlation to a BERT scan is necessary. In all other practical applications, this parameter and it's resultant measurement should be ignored.
Valid Entries: 0 – do not estimate effective jitter values
1 – calculate effective jitter values
Default: 0

**lMinEftv, lMaxEftv** Defines the range of the bathtub curve that is to be used to calculate an effective jitter value.
Valid Entries: -1 to –16 with lMinEftv < lMaxEftv
Default: -4 for MaxEftv and –12 for MinEftv

**lAutoFix** Flag indicating whether to perform a pulse-find as required. Setting this value to any integer greater than zero tells the measurement to perform a pulse find if needed. The system will know if a measurement was recently performed and if a pulse find is necessary.
Valid Entries: 0 – No pulsefind prior to measurement
1 – Pulsefind if the measurement mode changed.
Default: 0

**lDutCycl** Flag to indicate whether to perform a duty cycle measurement. This measurement is done using three time measurement markers. It measures the time elapsed from a rising edge to falling edge to rising edge. This measurement is performed tParm.SampCnt number of times.
Valid Entries: 0 – do not perform a Duty Cycle measurement
1 – perform a Duty Cycle measurement.
Default: 0

**lGood** Flag indicates valid output data in structure.

**lMeasCnt** Number of hits in measured normal data.

**dMeasMin** Minimum period measurement as captured from the latest execution of adjacent cycle jitter measurement.

**dMeasMax** Maximum period measurement as captured from the latest execution of adjacent cycle jitter measurement.

| | |
|---|---|
| **dMeasAvg** | Average period measurement as captured from the latest execution of adjacent cycle jitter measurement. |
| **dMeasSig** | Standard deviation (1σ) of period measurements as captured from the latest execution of the measurement. |
| **lNormCnt** | Number of measurements captured in latest adjacent cycle jitter execution. |
| **dNormMin** | Minimum measured value of adjacent cycle period deviation. This value indicates the smallest amplitude of period change between two adjacent periods. This value is most likely a negative number indicating that the measurement is actually the largest decrease in period between two adjacent periods. |
| **dNormMax** | Maximum measured value of adjacent cycle period deviation. This value indicates the largest amplitude of period change between two adjacent periods. This value is most likely a positive value indicating that this register contains the largest increase in periods between two adjacent periods. To identify the overall largest change in periods, compare the absolute value of dNormMin and dNormMax. |
| **dNormAvg** | Average value of adjacent cycle period deviation. This value should be zero indicating that the period amplitude on average is remaining fixed. If this value is something other than zero, the period was shifting during the measurement. In most cases, the period of a clock signal will have instantaneous amplitude deviations (also known as jitter) but on average, the periods tend toward the same amplitude. |
| **dNormSig** | Standard deviation (1σ) of adjacent cycle jitter measurements as captured from the latest execution of the measurement. |
| **lTotlCnt** | Number of hits in measured accumulated period measurement data. This accumulation is of the absolute period measurements and not the adjacent cycle jitter measurements. |
| **dTotlMin** | Minimum period measurement found in the accumulated data. |
| **dTotlMax** | Maximum period measurement found in the accumulated data. |
| **dTotlAvg** | Average period measurement found in the accumulated data. |
| **dTotlSig** | Standard deviation (1σ)of period measurements found in the accumulated data. |
| **lAcumCnt** | Number of measurements in adjacent cycle jitter accumulated data. |
| **dAcumMin** | Minimum adjacent cycle jitter measurement found in accumulated data. |
| **dAcumMax** | Maximum adjacent cycle jitter measurement found in accumulated data. |
| **dAcumAvg** | Average value of adjacent cycle jitter found in accumulated data. |
| **dAcumSig** | Standard deviation (1σ) of **accumulated** adjacent cycle jitter data. |
| **tNorm** | Structure of type PLOT containing all of the necessary information to draw a Histogram of latest adjacent cycle jitter measurements from most recent execution. See Section 7-3 for details of the PLOT structure and its elements. |
| **tAcum** | Structure of type PLOT containing all of the necessary information to draw a Histogram of accumulated data from all adjacent cycle acquisitions. See Section 7-3 for details of the PLOT structure and its elements. |
| **tMaxi** | Structure of type PLOT containing all of the necessary information to draw a Histogram with the maximum number of occurrences of a given measurement in all previous executions of adjacent cycle jitter. See Section 7-3 for details of the PLOT structure and its elements. |

**tBath** Structure of type PLOT containing all of the necessary information to draw a Bathtub curve based on the Probability Density Function (PDF) of DJ and RJ as measured by the TailFit routine (if enabled.) The data in this structure is only valid when a successful tail-fit has been performed. See Section 7-3 for details of the PLOT structure and its elements.

**tEftv** Structure of type PLOT containing all of the necessary information to draw an Effective Jitter Bathtub curve based on the amplitude of effective DJ and effective RJ. The data in this structure is only valid if lFndEftv is set and a valid fit is obtained. See Section 7-3 for details of the PLOT structure and its elements.

**tTfit** Structure of type TFIT containing all of the TailFit information (including plot and limits.) This structure is only valid when a successful tail-fit has been performed. See Section 7-3 for details of the TFIT structure and its elements.

**lBinNumb, dLtSigma, dRtSigma, dFreq** Used internally, DO NOT ALTER!

## 7-17 CLOCK ANALYSIS TOOL

This tool combines a few different measurement tools in the SIA-3000. By doing this, a large number of useful results can be displayed quickly. The lMeas parameter allows you to toggle on or off certain measurements. The measurement settings provide the best configuration to a variety of users.

This ease of use means that there is less control over individual settings. There may be instances where there is the need to have more control over a specific measurement. An example would be changing the trigger delay on the oscilloscope, or measuring a histogram over two periods rather than single period jitter. Another example would be to find very low frequency jitter below the (clock/1667) low cutoff frequency of this tool. If you need access to more configuration settings, use one of the individual tools instead.

**Command syntax - :ACQuire:CLKANALysis<#xyy…ddddddd…>**

Example: `Send(0,5,":ACQ:CLKANAL#522992…",23011,EOI);`

```
typedef struct
  {
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lPass;              /* Acquisitions so far, set to 0 to reset */
  long    lPcnt;              /* Amount +/- 50% to calc. rise/fall time */
  long    lHiRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lLoRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lMeas;              /* Measure flag, see defines above        */
  long    lInps;              /* Input selection, see defines above     */
  double  dAttn[POSS_CHNS];   /* Attenuation factor (dB) - per channel  */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad0;
  long    lHistCnt[POSS_CHNS];/* Number of hits in accumulated edge data*/
  double  dHistMin[POSS_CHNS];/* Minimum value in accumulated edge data */
  double  dHistMax[POSS_CHNS];/* Maximum value in accumulated edge data */
  double  dHistAvg[POSS_CHNS];/* Average value of accumulated edge data */
  double  dHistSig[POSS_CHNS];/* 1-Sigma value of accumulated edge data */
  double  dPwPl[POSS_CHNS];   /* Pulsewidth plus                        */
  double  dPwMn[POSS_CHNS];   /* Pulsewidth minus                       */
  double  dFreq[POSS_CHNS];   /* Carrier frequency                      */
  double  dDuty[POSS_CHNS];   /* Duty Cycle                             */
  double  dPjit[POSS_CHNS];   /* Periodic jitter on N-clk basis         */
  double  dCorn[POSS_CHNS];   /* Corner Frequency used for measurement  */

  long    lBinNumb[POSS_CHNS];/****************************************/
  double  dWndFact[POSS_CHNS];/*  These values are all used internally  */
  double  dLtSigma[POSS_CHNS][PREVSIGMA];/*  DO NOT ALTER!              */
  double  dRtSigma[POSS_CHNS][PREVSIGMA];/******************************/

  QTYS    qNorm[POSS_CHNS];   /* Normal channel quantities              */
  QTYS    qComp[POSS_CHNS];   /* Complimentary channel  quantities      */
  QTYS    qDiff[POSS_CHNS];   /* Differential quantities                */
  QTYS    qComm[POSS_CHNS];   /* Common (A+B) quantities                */
  TFIT    tTfit[POSS_CHNS];   /* Structure containing tail-fit info     */

  long    lPeakNumb[POSS_CHNS];/* Count of detected spikes              */
  long    lPeakRsvd[POSS_CHNS];/* Used to track memory allocation       */
  long   *lPeakData[POSS_CHNS];/* Tracks detected spikes in RJ+PJ data  */

  PLOT    tNorm[POSS_CHNS];   /* Normal channel voltage data            */
  PLOT    tComp[POSS_CHNS];   /* Complimentary channel voltage data     */
  PLOT    tDiff[POSS_CHNS];   /* Differential voltage data              */
```

```
  PLOT    tComm[POSS_CHNS];   /* Common (A+B) voltage data              */
  PLOT    tHist[POSS_CHNS];   /* Histogram of all acquires combined     */
  PLOT    tShrt[POSS_CHNS];   /* Total Jitter for SHORT Cycles          */
  PLOT    tLong[POSS_CHNS];   /* Total Jitter for LONG Cycles           */
  PLOT    tBoth[POSS_CHNS];   /* Total Jitter for LONG & SHORT Cycles   */
  PLOT    tFftN[POSS_CHNS];   /* Frequency plot data on 1-clock basis   */
  PLOT    tSave[POSS_CHNS];   /* Average Frequency plot before scaling  */
  } CANL;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets this register. It will be automatically incremented when a measurement is performed.
Valid Entries: any integer greater than or equal to 0
Default: 0

**lPcnt** This field specifies the voltage thresholds to be used when calculating rise and fall times. The voltage thresholds are assumed to be symmetrical about the 50% threshold, and this is the distance from the 50% threshold to the starting and ending thresholds. For example if this field is equal to 30, then 20% and 80% thresholds are used. If this field is equal to 40, then 10% and 90% thresholds are used. The absolute voltage levels used are based on the previous pulsefind minimum and maximum voltages. If this field is negative, then the absolute rise and fall thresholds are taken from the following fields lHiRFmV and lLoRFmv.
Default: 30

**lHiRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: +250

**lLoRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: -250

**lMeas** Measure flag, this is a bitfield which may be created by combining any or all of the following constants:
CANL_MEAS_RISEFALL – Rise and Fall times are calculated
CANL_MEAS_VTYPICAL – Vtop and Vbase are calculated
CANL_MEAS_VEXTREME – Vmin and Vmax are calculated
CANL_MEAS_OVERUNDR – Overshoot and Undershoot are calculated
CANL_MEAS_WAVEMATH – Vavg and Vrms are calculated
CANL_MEAS_TAILFITS – Enables Histogram tailfits
CANL_MEAS_PERIODIC – Yields Hi-Freq Mod. results
Default: All of the above are included

**dAttn[n]** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**lGood** Flag indicates valid data in structure

**lHistCnt[n]** Number of hits in accumulated edge data, per channel

**dHistMin[n]** Minimum value in accumulated edge data, per channel

**dHistMax[n]** Maximum value in accumulated edge data, per channel

**dHistAvg[n]** Average value of accumulated edge data, per channel

**dHistSig[n]** 1-Sigma value of accumulated edge data, per channel

**dPwPl[n]** Pulsewidth plus, per channel

**dPwMn[n]** Pulsewidth minus, per channel

**dFreq[n]** Carrier frequency, per channel

**dDuty[n]** Duty Cycle, per channel

**dPjit[n]** Periodic jitter on N-clk basis, per channel
**dCorn[n]** Corner Frequency used for measurement, per channel
**lBinNumb[n],dWndFact[n],dLtSigma[n][m],dRtSigma[n][m]** These values are for internal use only, DO NOT ALTER or try to use.

**qNorm[n]** + Input channel quantities, per channel
**qComp[n]** - Input channel quantities, per channel
**qDiff[n]** Differential quantities, per channel
**qComm[n]** Common (A+B) quantities, per channel
**tTfit[n]** Structure containing tail-fit info, per channel

**lPeakNumb[n]** Count of detected spikes, per channel
**lPeakRsvd[n]** Used to track memory allocation, per channel
**lPeakData[n]** Tracks detected spikes in RJ+PJ data, per channel

**tNorm[n]** Normal channel voltage data, per channel
**tComp[n]** Complimentary channel voltage data, per channel
**tDiff[n]** Differential voltage data, per channel
**tComm[n]** Common (A+B) voltage data, per channel
**tHist[n]** Histogram of all acquires combined, per channel
**tShrt[n]** Total Jitter for SHORT Cycles, per channel
**tLong[n]** Total Jitter forCycles, per channel
**tBoth[n]** Total Jitter for& SHORT Cycles, per channel
**tFftN[n]** Frequency data on 1-clock basis, per channel
**tSave[n]** Average Frequency before scaling, per channel

## 7-18 CLOCK STATISTICS TOOL

The Statistics panel displays the results of several basic clock parameters: mean, minimum, maximum, 1-sigma, peak-to-peak, hits, frequency and duty cycle. Also displayed are the measured Vstart, Vstop as well as the Vp-p, Vmax and Vmin of the input channels.

The Statistics panel provides a summary of the statistics from a single histogram of measurements of the chosen function (period, rise-time, fall-time, positive pulse width and negative pulse width). The tool reports the clock frequency with 9 digits of precision. Duty cycle is displayed in this tool.

**Command syntax- :ACQuire:CLKSTATistics(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:CLKSTAT(@4)#3376…",397,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lPfnd;              /* Force a pulse-find before each measure */
  long    lQckMeas;           /* If true skip frequency and voltages    */
  long    lFrqSpan;           /* Period spans to measure freq. across   */
/* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  double  dPwPavg;            /* Contains the PW+ average value         */
  double  dPwPdev;            /* Contains the PW+ 1-Sigma value         */
  double  dPwPmin;            /* Contains the PW+ minimum value         */
  double  dPwPmax;            /* Contains the PW+ maximum value         */
  double  dPwMavg;            /* Contains the PW- average value         */
  double  dPwMdev;            /* Contains the PW- 1-Sigma value         */
  double  dPwMmin;            /* Contains the PW- minimum value         */
  double  dPwMmax;            /* Contains the PW- maximum value         */
  double  dPerPavg;           /* Contains the PER+ average value        */
  double  dPerPdev;           /* Contains the PER+ 1-Sigma value        */
  double  dPerPmin;           /* Contains the PER+ minimum value        */
  double  dPerPmax;           /* Contains the PER+ maximum value        */
  double  dPerMavg;           /* Contains the PER- average value        */
  double  dPerMdev;           /* Contains the PER- 1-Sigma value        */
  double  dPerMmin;           /* Contains the PER- minimum value        */
  double  dPerMmax;           /* Contains the PER- maximum value        */

  double  dDuty;              /* Contains the returned duty cycle       */
  double  dFreq;              /* Contains the carrier frequency         */
  double  dVmin;              /* Pulse-find Min voltage                 */
  double  dVmax;              /* Pulse-find Max voltage                 */
  } CLOK;
```

| | |
|---|---|
| **tParm** | A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4. |
| **lPfnd** | If true force a pulse-find before each measure |
| **lQckMeas** | If true skip frequency and voltages |
| **lFrqSpan** | Period spans to measure freq. across |
| **lGood** | Flag indicates valid output data in structure. |
| **dPwPavg** | Contains the PW+ average value |
| **dPwPdev** | Contains the PW+ 1-Sigma value |
| **dPwPmin** | Contains the PW+ minimum value |
| **dPwPmax** | Contains the PW+ maximum value |
| **dPwMavg** | Contains the PW- average value |
| **dPwMdev** | Contains the PW- 1-Sigma value |
| **dPwMmin** | Contains the PW- minimum value |
| **dPwMmax** | Contains the PW- maximum value |
| **dPerPavg** | Contains the PER+ average value |
| **dPerPdev** | Contains the PER+ 1-Sigma value |
| **dPerPmin** | Contains the PER+ minimum value |
| **dPerPmax** | Contains the PER+ maximum value |
| **dPerMavg** | Contains the PER- average value |
| **dPerMdev** | Contains the PER- 1-Sigma value |
| **dPerMmin** | Contains the PER- minimum value |
| **dPerMmax** | Contains the PER- maximum value |
| **dDuty** | Contains the returned duty cycle |
| **dFreq** | Contains the carrier frequency |
| **dVmin** | Pulse-find Min voltage |
| **dVmax** | Pulse-find Max voltage |

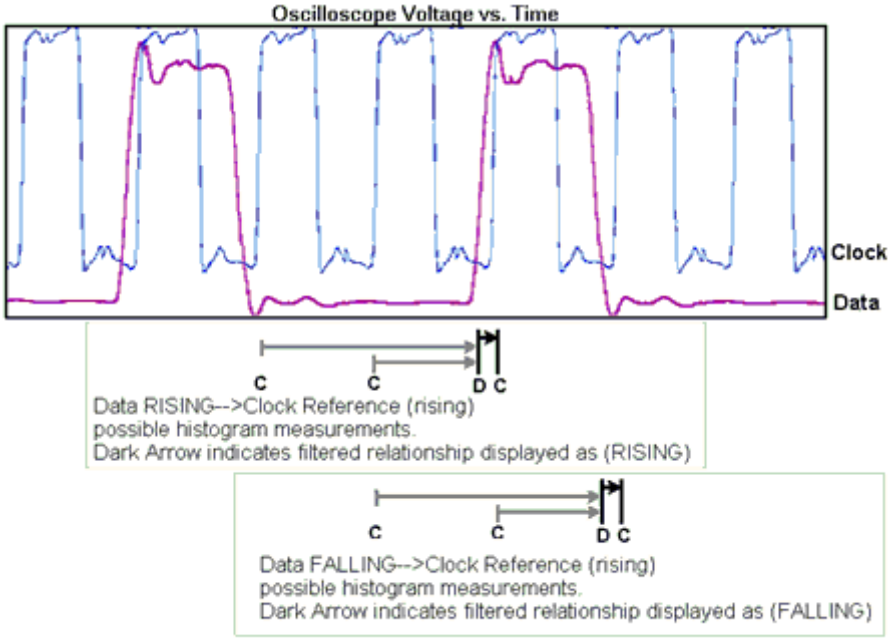
## 7-19 DATABUS TOOL

With the SIA-3000 Signal Integrity Analyzer and GigaView Databus software, single-ended and differential clock and data signals can be characterized for timing, clock and data jitter, clock-to-data skew, channel-to-channel skew and Bit Error Rate (BER) on up to ten channels in parallel. The analysis is done using one reference clock and up to nine data channels. Users can input the setup and hold specifications. Setup and Hold violations can be measured based on the actual mean of the data histogram referenced to the clock edge.

For each data lane there are two histograms: one showing the transitions before the clock edge and one showing the transitions after the clock edge. The tool also applies statistical long term BER in the form of a bathtub curve. This measurement is used to determine long-term system reliability. If the jitter is too high, the tool will indicate a failure.

The following example shows the Data signal connected to Channel 1 and Bit Clock Signal connected to Channel 2. Therefore, two histograms can be made. One histogram represents a measurement of Data RISING edges to clock reference edge, the other represents Data FALLING edges to the clock reference edge.

These histograms would show many modes or distributions because there are many possible relationships between clock and data edges. These histograms are filtered to show only those times that relate to the measured Data edges closest in time to the Reference Clock Edge.




**Command syntax - :ACQuire:DATABUS**<#xyy…ddddddd…>

Example: `Send(0,5,":ACQ:DATABUS#517696…",17715,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lClokChn;           /* Reference Clock channel                */
  long    lChanNum;           /* Bitfield indicating channels to measure*/
  double  dSetTime;           /* Setup time to assess PASS/FAIL         */
  double  dHldTime;           /* Hold time to assess PASS/FAIL          */
  double  dEyeSpec;           /* Eye opening size to assess PASS/FAIL   */
  double  dUserVlt[POSS_CHNS];/* Array of user voltages                 */
```

```
EYEH    tDbus;              /* Contains acquisition parameters       */
/* Output parameters */
long    lGood;              /* Flag indicates valid data in structure */
long    lPad1;
double  dDutCycl;           /* Duty cycle measurement of clock signal */
HIST    tHist;              /* Contains output data for clock channel */
EYEH    tEyeh[POSS_CHNS];   /* Contains output data for enabled chans */
                            /* The following are bitfields indicating */
                            /* PASS/FAIL [0/1] for each channel       */
long    lTypclSetHldPF;     /* Means of histograms to setup/hold time */
long    lEyeOpenSpecPF;     /* Eye opening spec (jitter only)         */
long    lWorstSetHldPF;     /* Histogram means w/jitter to setup/hold */
                            /* The following indicate PASS only if all*/
                            /* selected channels PASS [Pass=1;Fail=0] */
long    lTypclSetHldAll;    /* Means of histograms to setup/hold time */
long    lEyeOpenSpecAll;    /* Eye opening spec (jitter only)         */
long    lWorstSetHldAll;    /* Histogram means w/jitter to setup/hold */
} DBUS;
```

**lClokChn** Reference Clock channel
Default: 2

**lChanNum** Bitfield indicating channels to measure
Default: 1

**dSetTime** Setup time to assess PASS/FAIL
Default: 5e-10

**dHldTime** Hold time to assess PASS/FAIL
Default: 5e-10

**dEyeSpec** Eye opening size to assess PASS/FAIL, in UI
Default: 0.6

**dUserVlt[n]** Array of user voltages
Default: 0.0

**tDbus** This is the same structure as is defined in the Random Data With Bitclock tool. It contains all the acquisition parameters that are used for the measurement, with the exception of those defined directly above.
Default: See Random Data With Bitclock Tool

**lGood** Flag indicates valid data in structure

**dDutCycl** Duty cycle measurement of clock signal

**tHist** This is the same structure as is defined for the Histogram Tool. It contains all the output data for the clock channel.

**tEyeh[n]** This is an array of the same structures as are defined in the Random Data With Bitclock tool. It contains all the output data for each of the channels which a measurement is performed on.

**lTypclSetHldPF** Means of histograms to setup/hold time, this is a bitfield indicating PASS/FAIL [0/1] for each channel

**lEyeOpenSpecPF** Eye opening spec, this is a bitfield indicating PASS/FAIL [0/1] for each channel

**lWorstSetHldPF** Histogram means w/jitter to setup/hold, this is a bitfield indicating PASS/FAIL [0/1] for each channel

**lTypclSetHldAll** Means of histograms to setup/hold time, this is a bitfield indicating PASS/FAIL [0/1] for each channel

**lEyeOpenSpecAll** Eye opening spec (jitter only) , this is a bitfield indicating PASS/FAIL [0/1] for each channel

**lWorstSetHldAll** Histogram means w/jitter to setup/hold, this is a bitfield indicating PASS/FAIL [0/1] for each channel

## 7-20 DATACOM BIT CLOCK AND MARKER TOOL

This tool can operate either with the Clock Recovery option installed or with an external bit clock applied to another input. A pattern marker is necessary and is possibly derived from the data pattern generator. But, in many cases, this signal is not externally available and it is useful to have the SIA-3000 Pattern Marker (PM50) option. The pattern requirements are such that it needs to be a repeating pattern.

**Command syntax - :ACQuire:CLKANDMARKer(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:CLKANDMARK(@4)#41680…",1705,EOI);`

```
typedef struct
  {
  PARM    tParm;              /* Contains acquisition parameters        */
  char    sPtnName[ 128 ];    /* Name of pattern file to be used        */
  long    lPassCnt;           /* Acquisitions so far, set to 0 to reset */
  long    lHeadOff;           /* Header offset, external arming only    */
  long    lFftMode;           /* 0=NoFFT, 1=Fc/1667, 2=Use dCornFrq     */
  long    lMinHits;           /* Minimum hits before trying tail-fit    */
  long    lTailFit;           /* If non-zero a tail-fit will be tried   */
  long    lErrProb;           /* Error probability for Total Jitter     */
                              /* Valid range is ( -1 to -16 )           */
  double  dBitRate;           /* Bit Rate, may be specified or measured */
  double  dCornFrq;           /* Corner Frequency for RJ+PJ             */
  double  dMaxSerr;           /* LIM_ERROR if this std. error exceeded  */
  long    lGood;              /* Flag indicates valid data in structure */

  long    lBinNumb;           /****************************************/
  long    lMaxStop;           /*                                      */
  long    lPtnRoll;           /*                                      */
  long    lFallAdj;           /*  These values are all used internally  */
  long    lClokAdj;           /*   as part of the measurement process   */
  long    lLeftCnt;           /*             DO NOT ALTER!            */
  long    lRghtCnt;           /*                                      */
  double  dWndFact;           /*                                      */
  double  dDdjMove;           /*                                      */
  double  dLtSigma[PREVSIGMA];/*                                      */
  double  dRtSigma[PREVSIGMA];/****************************************/

  double  dHistMed;           /* Total Jitter Histogram median location */
  double  dLeftMed;           /* Left Edge Histogram median location    */
  double  dRghtMed;           /* Right Edge Histogram median location   */
  long    lAcumHit;           /* Accumulated Histogram hits             */
  long    lPassHit;           /* Histogram hits for this pass only      */
  TFIT    tTfit;              /* Structure containing tail-fit info     */

  PATN    tPatn;              /* Internal representation of pattern     */
  long    lPeakNumb;          /* Count of detected spikes               */
  long    lPeakRsvd;          /* Used to track memory allocation        */
  long   *lPeakData;          /* Tracks detected spikes in RJ+PJ data   */
  long    lDdjtRsvd;          /* Used to track memory allocation        */
  DDJT   *tDdjtData;          /* Raw DCD+DDJ measurements               */
  long    lPad1;

  PLOT    tRiseHist;          /* DCD+DDJ histogram of rising edges      */
  PLOT    tFallHist;          /* DCD+DDJ histogram of falling edges     */
  PLOT    tNormDdjt;          /* DCD+DDJvsUI for external arming only   */
  PLOT    tTotlHist;          /* Histogram of all acquires combined     */
  PLOT    tLeftHist;          /* Leftmost Histogram                     */
  PLOT    tRghtHist;          /* Rightmost Histogram                    */
  PLOT    tBathPlot;          /* Bathtub curves determined from PDF     */
```

```
  PLOT    tSigmPlot;          /* 1-Sigma vs. span plot                  */
  PLOT    tFreqPlot;          /* Jitter vs. frequency plot              */
  } RCPM;
```

**tParm** A structure of type PARM that contains acquisition parameters. The PARM structure is discussed in full detail in Section 7-4.

**sPtnName** A character array containing the name of pattern file to be used, the file must exist in the pattern directory (C:\VISI\) on the SIA3000 or else an error will be returned. The first time a measurement is performed the pattern is loaded into structure tPatn.
Valid Entries: a valid file name (including extension)
Default: "k285.ptn"

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets this register. It will be automatically incremented when a measurement is performed.
Valid Entries: any integer greater than or equal to 0
Default: 0

**lHeadOff** Header offset parameter, for use in packet-ized data which may have a frame header before the test pattern. This offset value can be used to skip past header information and into the repeating data pattern stream. This can be useful when analyzing data from disk drives when the pattern marker may be synchronized with the start of frame data.
Valid Entries: 0 to 10,000,000-pattern length I
Default: 0 (indicating no header present)

**lFftMode** 0=NoFFT, 1=Fc/1667, 2=Use dCornFrq
Default: 0

**lMinHits** Minimum hits before trying tail-fit
Default: 0

**lTailFit** If non-zero a tail-fit will be tried
Default: 1

**lErrProb** Error probability level for Total Jitter. Total Jitter is calculated based on the desired Error Probability level. This value is used in conjunction with the bathtub curve after the successful completion of a tail-fit in order to project the value of Total Jitter.
Valid Entries: -1 to -16
Default: -12

**dBitRate** Bit Rate, may be specified or measured
Default: 2.5e9

**dCornFrq** Corner Frequency for RJ & PJ estimate in Hertz. This value is used in conjunction with the Bit Rate and pattern to determine the maximum stop count to be used to acquire RJ & PJ data. A lower value increase acquisition time.
Valid Entries: Bit-Rate /10,000,000 to Bit-Rate I
Default: 637e3 (637kHz – Fibre Channel 1X)

**dMaxSerr** An error is returned if this std. error is exceeded
Default: 0.5

**lGood** Flag indicates valid data in structure

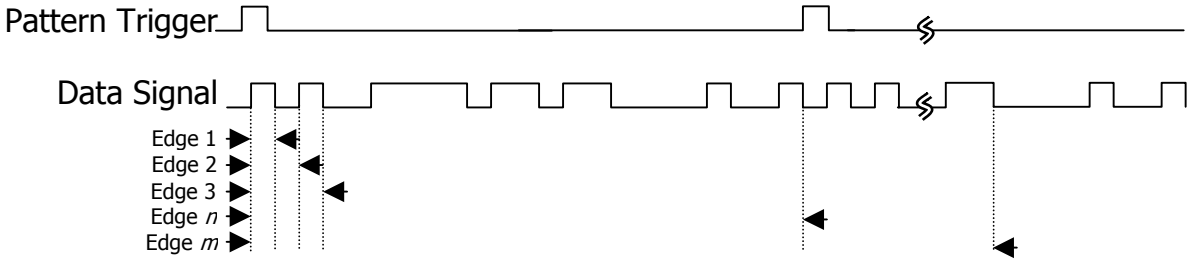
**lBinNumb,lMaxStop,lPtnRoll,lFallAdj,lClokAdj,lLeftCnt,lRghtCnt**
**dWndFact,dDdjMove,dLtSigma[n],dRtSigma[n]** These values are for internal use only, DO NOT ALTER or try to use.

**dHistMed** Total Jitter Histogram median location

| | |
|---|---|
| **dLeftMed** | Left Edge Histogram median location |
| **dRghtMed** | Right Edge Histogram median location |
| **lAcumHit** | Accumulated Histogram hits |
| **lPassHit** | Histogram hits for this pass only |
| **tTfit** | Structure containing tail-fit info |
| **tPatn** | Internal representation of pattern |
| **lPeakNumb** | Count of detected spikes |
| **lPeakRsvd** | Used to track memory allocation |
| **lPeakData** | Tracks detected spikes in RJ+PJ data |
| **lDdjtRsvd** | Used to track memory allocation |
| **tDdjtData** | Raw DCD+DDJ measurements |
| **tRiseHist** | DCD+DDJ histogram of rising edges |
| **tFallHist** | DCD+DDJ histogram of falling edges |
| **tNormDdjt** | DCD+DDJvsUI for external arming only |
| **tTotlHist** | Histogram of all acquires combined |
| **tLeftHist** | Leftmost Histogram |
| **tRghtHist** | Rightmost Histogram |
| **tBathPlot** | Bathtub curves determined from PDF |
| **tSigmPlot** | 1-Sigma vs. span plot |
| **tFreqPlot** | Jitter vs. frequency plot |

## 7-21 DATACOM KNOWN PATTERN WITH MARKER TOOL

The Datacom Known Pattern With Marker Tool is used to measure jitter on serial communication signals. This tool is not protocol specific and works with all communication standards that rely on jitter separation to define jitter limits for compliance. Such standards include: Fibre Channel, Gigabit Ethernet, the XAUI layer of 10G Ethernet, SFI 4, SFI 5, XFP, RapidIO, PCI Express and Serial ATA. This tool requires that a pattern trigger be available either externally from the test environment or internally from the PM50. Measurements are made based on this diagram. Each measurement is from the first edge after the pattern trigger to each subsequent edge in the pattern. DDJ is based on edges 1 through *n*, where *n* is the last edge in the pattern. PJ and RJ estimates are based on edges 1 through *m* where *m* is last edge measured based on the prescribed cutoff frequency.




**Command syntax - :ACQuire:DATacom(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:DAT(@4)#44008…",4026,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  char    sPtnName[ 128 ];    /* Name of pattern file to be used        */
  long    lAcqMode;           /* Mask defining modes for RJ+PJ acquire  */
                              /* Bit3:PW- Bit2:PW+ Bit1:Per- Bit0:Per+  */
  long    lRndMode;           /* Enable random mode, auto-arming only   */
  long    lQckMode;           /* Enable quick mode, external arm only   */
  long    lIntMode;           /* Interpolation mode, non-zero is linear */
  long    lGetRate;           /* If non-zero Bit Rate will be measured  */
                              /* Not valid for random mode              */
  long    lTailFit;           /* Count of tailfits, see constants above */
                              /* Not valid when auto-arming             */
  long    lErrProb;           /* Error probability for Total Jitter     */
                              /* Valid range is ( -1 to -16 )           */
  long    lPassCnt;           /* Acquisitions so far, set to 0 to reset */
  long    lFftAvgs;           /* 2^fft_avgs averages used to smooth FFT */
  long    lFitPcnt;           /* Automode suceed %, see constants above */

  SPEC    tRateInf;           /* Parameters to acquire Bit Rate         */
  SPEC    tDdjtInf;           /* Parameters to acquire DCD+DDJ          */
  SPEC    tRjpjInf;           /* Parameters to acquire RJ+PJ            */
                              /* Negative values disable these filters  */
  double  dDdjtLpf;           /* Low pass DCD+DDJ filter frequency      */
  double  dDdjtHpf;           /* High pass DCD+DDJ filter frequency     */
  double  dRjpjFmn;           /* Minimum integration limit for RJ+PJ    */
  double  dRjpjFmx;           /* Maximum integration limit for RJ+PJ    */

  double  dBitRate;           /* Bit Rate, may be specified or measured */
  double  dCornFrq;           /* Corner Frequency for RJ+PJ             */
  long    lHeadOff;           /* Header offset, external arming only    */
```

```
long    lFndEftv;           /* Flag to attempt effective jitter calc  */
long    lMinEftv;           /* Min probability for effective fit: -4  */
long    lMaxEftv;           /* Max probability for effective fit: -12 */

long    lFiltEnb;           /* Enable IDLE character insertion filter */
long    lQckTjit;           /* Fast total jitter calc - no bathtubs!  */
long    lTfitCnt;           /* Sample count per pass when tailfitting */
/* Output parameters */
long    lGood;              /* Flag indicates valid data in structure */
PATN    tPatn;              /* Internal representation of pattern     */

double  dWndFact;           /****************************************/
long    lMaxStop;           /*  These values are all used internally  */
long    lCmpMode;           /*                                        */
long    lPosRoll;           /*             DO NOT ALTER!              */
long    lNegRoll;           /*                                        */
long    lAdjustPW[ 2 ];     /****************************************/

DDJT   *tDdjtData;          /* Raw DCD+DDJ measurements               */
long    lDdjtRsvd;          /* Used to track memory allocation        */
double *dMeasData[ 2 ];     /* Raw allmeas histogram when auto-arming */
long    lMeasRsvd[ 2 ];     /* Used to track memory allocation        */
double *dRjpjData[ 4 ];     /* Raw variance data                      */
long    lRjpjRsvd[ 4 ];     /* Used to track memory allocation        */
double *dTfitData[ 4 ];     /* Raw tail-fit data if used              */
long    lTfitRsvd[ 4 ];     /* Used to track memory allocation        */
long   *lPeakData[ 4 ];     /* Tracks detected spikes in RJ+PJ data   */
long    lPeakNumb[ 4 ];     /* Count of detected spikes               */
long    lPeakRsvd[ 4 ];     /* Used to track memory allocation        */
double *dFreqData[ 4 ];     /* Raw FFT output when averaging          */
long    lFreqRsvd[ 4 ];     /* Used to track memory allocation        */
double *dTailData[ 4 ];     /* Raw tailfit FFT output when averaging  */
long    lTailRsvd[ 4 ];     /* Used to track memory allocation        */

long    lHits;              /* Total samples for DDJT+RJ+PJ combined  */
long    lPad2;
double  dDdjt;              /* DCD+DDJ jitter                         */
double  dRang;              /* Pk-Pk of allmeas histogram for auto-arm*/
double  dRjit[ 4 ];         /* Random jitter, for enabled modes       */
double  dPjit[ 4 ];         /* Periodic jitter, for enabled modes     */
double  dTjit[ 4 ];         /* Total jitter, for enabled modes        */
double  dEftvLtDj[ 4 ];     /* Effective jitter when enabled          */
double  dEftvLtRj[ 4 ];
double  dEftvRtDj[ 4 ];
double  dEftvRtRj[ 4 ];

PLOT    tRiseHist;          /* DCD+DDJ histogram of rising edges      */
PLOT    tFallHist;          /* DCD+DDJ histogram of falling edges     */
PLOT    tRiseMeas;          /* Rising  allmeas histo. auto-arm only   */
PLOT    tFallMeas;          /* Falling allmeas histo. auto-arm only   */
PLOT    tNormDdjt;          /* DCD+DDJvsUI for external arming only   */
PLOT    tHipfDdjt;          /* High Pass Filtered DCD+DDJvsUI         */
PLOT    tLopfDdjt;          /* Low  Pass filtered DCD+DDJvsUI         */
PLOT    tBathPlot[ 4 ];     /* Bathtub plots, for enabled modes       */
PLOT    tEftvPlot[ 4 ];     /* Effective Bathtub plots, if enabled    */
PLOT    tSigmNorm[ 4 ];     /* 1-Sigma plots, for enabled modes       */
PLOT    tSigmTail[ 4 ];     /* 1-Sigma tail-fits, for enabled modes   */
PLOT    tFreqNorm[ 4 ];     /* Frequency plots, for enabled modes     */
PLOT    tFreqTail[ 4 ];     /* Tail-fit FFT plots, for enabled modes  */
} DCOM;
```

**tParm** A structure of type PARM that contains acquisition parameters. The PARM structure is discussed in full detail in Section 7-4.

**sPtnName** A character array containing the name of pattern file to be used, the file must exist in the pattern directory (C:\VISI\) on the SIA3000 or else an error will be returned. The first time a measurement is performed the pattern is loaded into structure tPatn.

Valid Entries: a valid file name (including extension)

Default: "k285.ptn"

**lAcqMode** Measurement mode for Random Jitter (RJ) and Periodic Jitter (PJ) estimate. To calculate RJ and PJ, variance data for each transition must be captured. This variance data is then passed through an FFT to create the frequency response. Since rise time and fall time may be asymmetrical, bogus frequency components could be inserted into the RJ & PJ records if both rising and falling edges were used in the data records. Since the frequency response will be calculated based on the records, the slew rate effect must be eliminated from the data. To do this, we force the measurement to either capture only rising edges or falling edges for this data record. For completeness, the start of the measurement could be either a rising or a falling edge. This parameter allows the user to select the polarity of both the reference edge and the measured edge in the data signal. The user can select all permutations of rising and falling edges. This parameter is parsed as a 4-bit binary value with each bit representing a possible permutation. A value of b1111 would indicate that the measurement is to be run using all permutations.

Valid Entries: b0001 – rising edge to rising edge
b0010 – falling edge to falling edge
b0100 – rising edge to falling edge
b1000 – falling edge to rising edge

Default: b0001 – rising edge to rising edge

**lRndMode** Parameter used to enable Random Mode. This parameter is only used in conjunction with RAND structures as used in the Random Data Tool. This parameter enables random mode, valid when auto-arming only. Setting this parameter to 1 will enable Random Mode.

Valid Entries: 0 – disable random data mode
1 – enable random data mode

Default: 0

**lQckMode** Parameter used to enable Quick Mode. QuickMode uses a sparse sample of data points for the PJ and RJ estimates. In this mode, the accuracy of these estimates is greatly reduced depending on the application. Setting this structure element to 1 enables quick mode, valid with external arm only.

Valid Entries: 0 – disable quick capture mode
1 – enable quick capture mode

Default: 0

**lIntMode** Parameter used to enable linear Interpolation mode for RJ & PJ estimate. RJ & PJ are calculated based on the frequency data of the noise. Since data points are captured only on the single polarity transitions, interpolation must be performed between sample points. There are two types of interpolation available in the SIA3000: linear and cubic. Setting this parameter to 1 will enable linear interpolation; otherwise, cubic interpolation will be used.

Valid Entries: 0 – use cubic interpolation in FFT data
1 – use linear interpolation in FFT data

Default: 0

**lGetRate** Parameter used to enable Bit Rate measurement. Knowledge of the pattern enables the instrument to measure from one transition in the pattern to the same edge several pattern repeats later. If this function is disabled, an appropriate value must be supplied in dBitRate variable. This function is NOT available when using random mode.

Valid Entries: 0 – use user specified bit rate
1 – measure bit rate from data

Default: 0

**lTailFit** Parameter used to enable TailFit algorithm for RJ estimate. The TailFit algorithm yields the highest level of accuracy when calculating an RJ estimate. However, millions of samples must be taken in order to perform an accurate TailFit. Valid with external arm only. The number of TailFits to be performed is based on the value assigned to this parameter. In practice, only a small sampling of edges need to be analyzed for RJ content. The smallest sample is three. The edges selected are the first edge in the pattern, the middle edge and the last edge. This allows a reasonable span of frequency content. It is assumed that the noise components can be approximated by a continuous function (as is generally the case.) If the RJ changes over frequency, there will be a delta between the different samples. A change in value of less than 5% between adjacent points is considered acceptable. If the delta is larger, more TailFit points should be taken.

Valid Entries:

| | |
|---|---|
| DCOM_NONE | Do not perform a TailFit |
| DCOM_AUTO | Perform TailFits until the delta Between successive fits < 5%. |
| DCOM_FIT3 | Perform 3 TailFits |
| DCOM_FIT5 | Perform 5 TailFits |
| DCOM_FIT9 | Perform 9 TailFits |
| DCOM_FIT17 | Perform 17 TailFits |
| DCOM_ALL | Perform TailFit on every edge |

Default: DCOM_NONE

**lErrProb** Error probability level for Total Jitter. Total Jitter is calculated based on the desired Error Probability level. This value is used in conjunction with the bathtub curve after the successful completion of a tail-fit in order to project the value of Total Jitter.

Valid Entries: -1 to -16

Default: -12

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets this register. It will be automatically incremented when a measurement is performed.

Valid Entries: any integer greater than or equal to 0

Default: 0

**lFftAvgs** This variable is used to calculate the number of averages to use in the FFT. Increasing the number of averages reduces the background noise associated with the FFT algorithm. The number of averages is calculated based on the equation:

AVERAGES = $2^n$ where n = lFftAvgs

Valid Entries: any integer greater than or equal to 0

Default: 0 (indicating $2^0$ averages = 1 execution.)

**tRateInf** A structure of type SPEC used by the Bit Rate measurement. The structure holds measurement specific parameters such as sample count, pattern repeats and maximum standard error. See Section 7-7 for a description of the SPEC structure and its elements.

**tDdjtInf** A structure of type SPEC used by the Data Dependant Jitter (DDJ) measurement. The structure holds measurement specific parameters such as sample count, pattern repeats and maximum standard error. See Section 7-7 for a description of the SPEC structure and its elements.

**tRjpjInf** A structure of type SPEC used by RJ & PJ estimate. The structure holds measurement specific parameters such as sample count, pattern repeats and maximum standard error. See Section 7-7 for a description of the SPEC structure and it's elements.

**dDdjtLpf** Low pass DCD+DDJ filter frequency in Hertz, negative value disables filter. This filter allows the user to apply a low pass filter function to the DCD+DDJ data to approximate the low pass filtering effects that would be present on the receiver or in the transmission line. The low pass filter is basically the bandwidth of the transmission line and the input bandwidth of the receiver. This is only valid when external arming is enabled.
Valid Entries: 0 to the Carrier Frequency ($F_c$) or –1 to disable.
Default: -1 (indicating the filter is off.)

**dDdjtHpf** High pass DCD+DDJ filter frequency in Hertz, a negative value disables filter. This filter allows the user to apply a high pass filter function to the DCD+DDJ data to approximate the high pass filtering effects that would be present on the receiver or in the transmission line. The High Pass filter is basically the PLL's response to the DCD+DDJ. Since the data will be clocked into the de-serializer by the PLL, the response of the PLL to the DCD+DDJ will become apparent as a function of the PLL to the de-serializer. This is only valid when external arming is enabled.
Valid Entries: 0 to the Carrier Frequency ($F_c$) or –1 to disable.
Default: -1 (indicating the filter is off.)

**dRjpjFmn** Minimum integration limit for RJ+PJ in Hertz, a negative value disables filter. This filter is used post-measurement as a means of focusing the RJ & PJ estimates on specific frequency bands with in the FFT. This filter is not normally used in a production program and should be left disabled.
Valid Entries: 0 to the Carrier Frequency ($F_c$) or –1 to disable.
Default: -1 (indicating the filter is off.)

**dRjpjFmx** Maximum integration limit for RJ+PJ in Hertz, a negative value disables filter. This filter is used post-measurement as a means of focusing the RJ & PJ estimates on specific frequency bands with in the FFT. This filter is not normally used in a production program and should be left disabled.
Valid Entries: 0 to the Carrier Frequency ($F_c$) or –1 to disable.
Default: -1 (indicating the filter is off.)

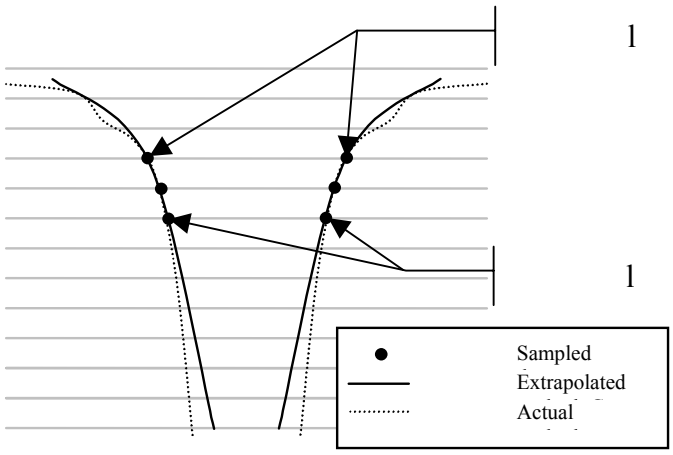
**dBitRate** A bi-directional variable that allows the user to specify the bit rate or read back what the SIA3000 measured as the bit rate. If lGetRate is non-zero the bit rate is measured and placed in this field. If lGetRate is set to zero an the bit rate is read by the software from this field. This value must be supplied when Random mode is being used.
Valid Entries: 0 to the maximum bit rate of channel card
Default: 0 (indicating bit rate will be measured.)

**dCornFrq** Corner Frequency for RJ & PJ estimate in Hertz. This value is used in conjunction with the Bit Rate and pattern to determine the maximum stop count to be used to acquire RJ & PJ data. A lower value increase acquisition time.
Valid Entries: Bit-Rate /10,000,000 to Bit-Rate I
Default: 637e3 (637kHz – Fibre Channel 1X)

**lHeadOff** Header offset parameter, for use in packet-ized data which may have a frame header before the test pattern. This offset value

can be used to skip past header information and into the repeating data pattern stream. This can be useful when analyzing data from disk drives when the pattern marker may be synchronized with the start of frame data.
Valid Entries: 0 to 10,000,000-pattern length I
Default: 0 (indicating no header present)

**lFndEftv** Flag to indicate that an effective jitter calculation is to be attempted. Effective Jitter is a means of estimating the effective deterministic jitter as it relates to a .5 error probability. This is done by first capturing the bathtub curve using conventional RJ & DJ estimation techniques; then, extrapolating from a few points in the bathtub curve to the .5 error probability level to estimate effective DJ. Effective RJ is extracted based on the curve that was fitted to the sample points. These values should only be used to correlate to a BERT Scan measurement and should not be used as a vehicle for quantifying jitter. This technique was developed to allow BERT systems to correlate with SIA3000 results.



Extrapolated Bathtub curve versus real bathtub curve as seen by BERT

Valid Entries: 0 – disable effective jitter estimate
1 – enable effective jitter estimate
Default: 0

**lMinEftv, lMaxEftv** Defines the error rates at which the eye width calculation will be used in the estimating effective jitter components. lMinEftv and lMaxEftv define points on the bathtub curve from which the extrapolated RJ curve is traced. Then, where this extrapolated curve intersects the .5 error probability, the effective DJ is calculated.
Valid Entries: -1 to –16 (indicating $10^{-1}$ to $10^{-16}$ error rate)
Default: -4 and –12 (lMaxEftv: $10^{-4}$ BER, lMinEftv: $10^{-12}$ BER)

**lFiltEnb** Flag to enable IDLE character insertion filter. When enabled any edge measurements that are not within ± 0.5 UI will be discarded. This filter is used in systems, which may insert an idle character from time to time to compensate for buffer under-run/overrun issues. In those instances where an idle character was inserted during a measurement, the edge selection may be off. If this parameter is greater than or equal to one, the filter is enabled and measurements that differ from the mean by ± 0.5 UI will be discarded.
Valid Entries: 0 – disable idle character filter
1 – enable idle character filter
Default: 0

**lQckTjit** Flag to indicate a fast total jitter calculation will be performed using simple linear calculation of Total Jitter instead of convolving the DJ Probability Density Functions and the RJ Probability Density Functions. This calculation is based on the

formula [TJ = DJ + n*RJ] where DJ and RJ are measured, and n is the multiplier based on a theoretical Gaussian distribution
Valid Entries: 0 do not use convolution for TJ est.
2 Convolve DJ and RJ for TJ est.
Default: 0

**lGood** Flag indicates valid output data in structure. A positive value in this parameter indicates that the measurement was completed successfully, and, valid data can be extracted from this structure.

**tPatn** Structure of type PATN which holds all of the pattern information with regards to pattern length, pattern content, marker placement relative to location in pattern and other pattern specific metrics. (See Section 7-9 for a detailed description of the PATN structure elements.) This is an internal structure that the system uses to store pattern information and does not need to be altered by the user. The first time a measurement is performed the pattern is loaded into tPatn which is used internally for all subsequent acquisition and analysis.

**dHits** Total samples taken to calculate DDJ, RJ, and PJ values combined. Gives an indication of the actual data to support the calculated total jitter number.

**dDdjt** DCD+DDJ measurement in seconds. This measurement is taken from the mean deviation of each pattern edge from it's ideal location. All deviations are placed in a histogram and the peak-peak value from this histogram is placed in this structure location.

**dRang** Peak-to-peak of "All-Measurements" histogram. This histogram is part of the random data analysis package and should not be used as a metric of jitter measurement. Numbers captured in this tool are for comparison purposes only and only coincidentally share some terminology with jitter measurements.

**dRjit[n]** Random jitter estimate, in seconds, for each of the enabled acquire modes. Each mode's RJ estimate is kept separate since the data came from frequency information derived from different FFTs.

**dPjit[n]** Periodic jitter measurement, in seconds, for each of the enabled acquire modes. Each enabled acquire mode's PJ measurement is kept separate since the data came from frequency information derived from different FFTs.

**dTjit[n]** Total jitter estimate, in seconds, for each of the enabled acquire modes. Each mode's TJ estimate is kept separate since the data came from frequency information derived from different FFTs.

**dEftvLtDj[n]** Effective Deterministic(eDJ) jitter estimate, in seconds, for the left side of the bathtub curve. Total eDJ is calculated by adding dEftvLtDj to dEftvRtDj. Each of the enabled acquire modes is stored in the appropriate array location as specified in the table below. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in this variable.

**dEftvLtRj[n]** Effective Random(eRJ) jitter estimate, in seconds, for the left side of the bathtub curve. Total eRJ is calculated by averaging dEftvLtRj and dEftvRtRj. Each of the enabled acquire modes is stored in the appropriate array location as specified in the table below. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in these variables.

**dEftvRtDj[n]** Effective Deterministic(eDJ) jitter estimate, in seconds, for the right side of the bathtub curve. Total eDJ is calculated by adding dEftvLtDj to dEftvRtDj. Each of the enabled acquire modes is stored in the appropriate array location as specified in the table below. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in this variable.

**dEftvRtRj[n]** Effective Random(eRJ) jitter estimate, in seconds, for the right side of the bathtub curve. Total eRJ is calculated by averaging dEftvLtRj and dEftvRtRj. Each of the enabled acquire modes is stored in the appropriate array location as specified in the table below. In order to calculate the effective jitter the flag lFndEftv must be enabled. Since the effective jitter is calculated by optimizing a curve-fit to the bathtub curve, a result is not guaranteed. If the curve-fit is unsuccessful, a negative value will be returned in this variable.

**tRiseHist** Structure of type PLOT which contains all of the plot information for generating a DCD+DDJ histogram of rising edges. See Section 7-3 for details concerning the PLOT structure and its elements.

**tFallHist** Structure of type PLOT which contains all of the plot information for generating a DCD+DDJ histogram of falling edges. See Section 7-3 for details concerning the PLOT structure and its elements.

**tRiseMeas** Structure of type PLOT (See Section 7-3) which contains all of the plot information for generating an all-measurements histogram of rising edges. This plot is only valid when using random mode. This histogram is for informational use and qualitative assessment. Numbers originating from this measurement methodology are not to be confused with jitter measurements.

**tFallMeas** Structure of type PLOT which contains all of the plot information for generating an all-measurements histogram of falling edges. This plot is only valid when using random mode. This histogram is for informational use and qualitative assessment. Numbers originating from this measurement methodology are not to be confused with jitter measurements. See Section 7-3 for details concerning the PLOT structure and its elements.

**tNormDdjt** Structure of type PLOT which contains all of the plot information for generating a DCD+DDJ versus UI plot. This plot is only valid in Pattern Marker mode. See Section 7-3 for details concerning the PLOT structure and its elements.

**tHipfDdjt** Structure of type PLOT which contains all of the plot information for generating an DCD+DDJ versus UI plot with the DCD+DDJ High Pass Filter enabled. This plot is only valid in Pattern Marker Mode and dDdjtHpf is a non-negative number. *(For a discussion on the High Pass Filter Function for DCD+DDJ data, see dDdjtHpf above.)* When dDdjtHpf is enabled, the dDdjt value is calculated based on applying the dDdjtHpf filter. See Section 7-3 for details concerning the PLOT structure and its elements.

**tLopfDdjt** Structure of type PLOT \which contains all of the plot information for generating an DCD+DDJ versus UI plot with the DCD+DDJ Low Pass Filter enabled. This plot is only valid in Pattern Marker Mode and dDdjtLpf is a non-negative number. *(For a discussion on the Low Pass Filter Function for DCD+DDJ data, see dDdjtLpf above.)* See Section 7-3 for details concerning the PLOT structure and its elements.

**tBathPlot[n]** Structure of type PLOT which contains all of the plot information for generating a Bathtub curve. There is one structure and

associated plot for each of the acquisition modes specified in lAcqMode. See Section 7-3 for details concerning the PLOT structure and its elements.

**tEftvPlot[n]** Structure of type PLOT which contains all of the plot information for generating an Bathtub curve based on Effective Jitter if lFndEftv is set and a valid fit is obtained. *(For a detailed description of Effective Jitter, see lFndEftv above.)* There is one structure and associated plot for each of the acquisition modes specified in lAcqMode. See Section 7-3 for details concerning the PLOT structure and its elements.

**tSigmNorm[n]** Structure of type PLOT which contains all of the plot information for generating an 1-Sigma versus UI plot. *(x-axis can be converted to time from UI based on dBitRate value.)* This plot describes the standard deviation for each accumulated time sample. There is one structure and associated plot for each of the acquisition modes specified in lAcqMode. See Section 7-3 for details concerning the PLOT structure and its elements.

**tSigmTail[n]** Structure of type PLOT which contains all of the plot information for generating a 1σ TailFit results versus UI plot. *(x-axis can be converted to time from UI based on dBitRate value.)* Each successful TailFit will be displayed as a data point and connected to adjacent TailFit samples. The plot value represents the overall RJ for the given amount of accumulated UI. This plot is only valid if tail-fit is enabled. . There is one structure and associated plot for each of the acquisition modes specified in lAcqMode. See Section 7-3 for details concerning the PLOT structure and its elements.

**tFreqNorm[n]** Structure of type PLOT which contains all of the plot information for generating a Jitter versus Frequency plot. There is one structure and associated plot for each of the acquisition modes specified in lAcqMode. See Section 7-3 for details concerning the PLOT structure and its elements.

**tFreqTail[n]** Structure of type PLOT which contains all of the plot information for generating a 1σ TailFit results versus frequency plot. This plot is only valid if tail-fit is enabled. There is one structure and associated plot for each of the acquisition modes specified in lAcqMode. See Section 7-3 for details concerning the PLOT structure and its elements.

*The following parameters are for internal use only. They are presented for reference only. Do not try to read the values or parse the structures nor try to write the various locations.*

**dWndFact, lMaxStop, lCmpMode, lPosRoll, lNegRoll, lAdjustPW** These values are for internal use only, DO NOT ALTER or try to use.

**tDdjtData** Structure which contains the raw DCD+DDJ measurements. This value is for internal use only, DO NOT ALTER or try to use.

**lDdjtRsvd** Used to track memory allocation for tDdjtData structures. This value is for internal use only, DO NOT ALTER or try to use.

**dMeasData** Raw all-measurements histogram data, only valid when auto-arming is used. This structure is for internal use only, DO NOT ALTER or try to use.

**lMeasRsvd** Used to track memory allocation for dMeasData values. This value is for internal use only, DO NOT ALTER or try to use.

**dRjpjData** Raw variance data used for the calculation of RJ and PJ. This structure is for internal use only, DO NOT ALTER or try to use.

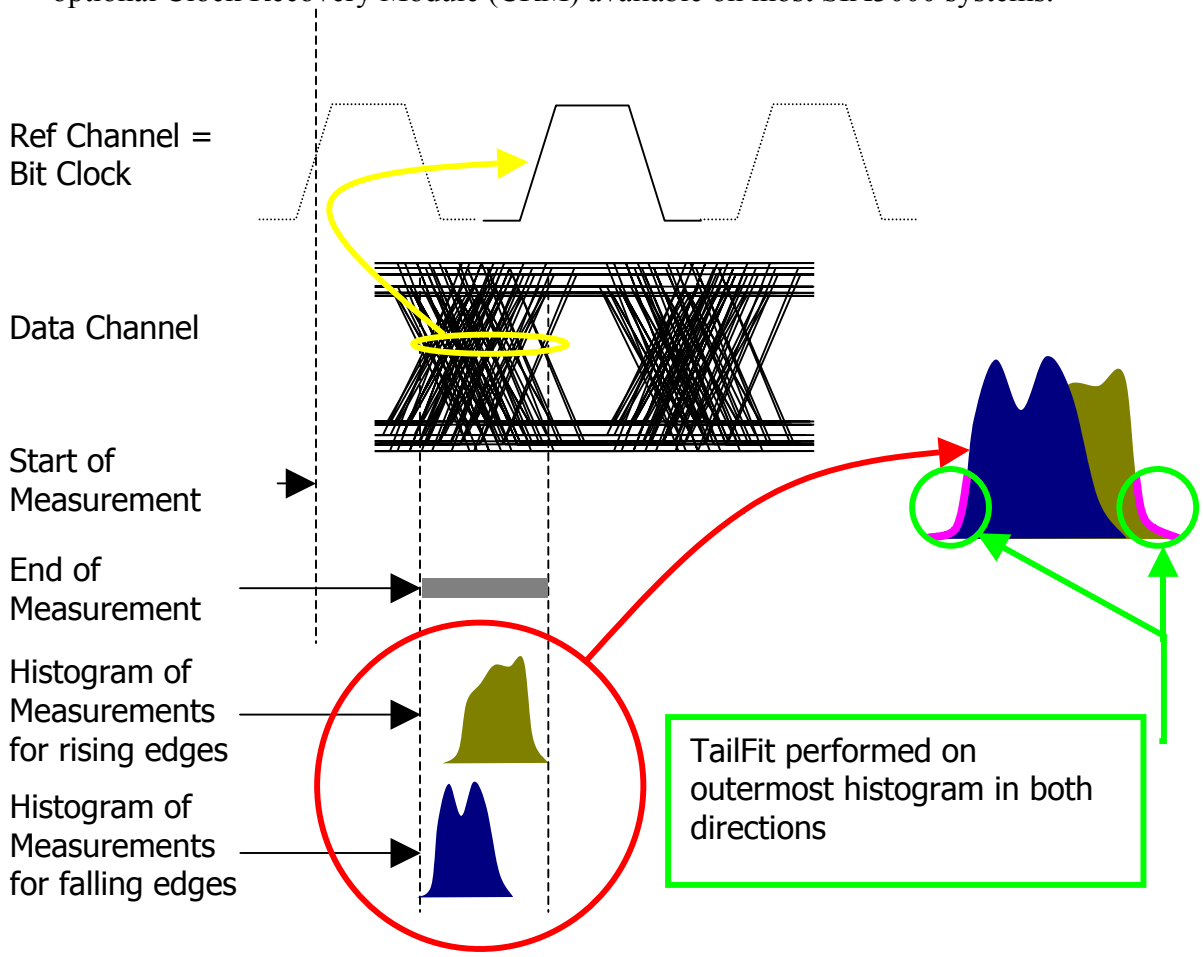
**lRjpjRsvd** Used to track memory allocation for dRjpjData values. This value is for internal use only, DO NOT ALTER or try to use.

| | |
|---|---|
| **dTfitData** | Raw tail-fit data if tail-fit data is enabled and successful, as indicated by the lGood variable in the tTfit structure being non-zero. This structure is for internal use only, DO NOT ALTER or try to use. |
| **lTfitRsvd** | Used to track memory allocation for dTfitData values. This value is for internal use only, DO NOT ALTER or try to use. |
| **lPeakData** | Tracks detected spikes in RJ+PJ data. This value is for internal use only, DO NOT ALTER or try to use. |
| **lPeakNumb** | Count of detected spikes, indicates the number of values in the lPeakData array. |
| **lPeakRsvd** | Used to track memory allocation for lPeakData values. This value is for internal use only, DO NOT ALTER or try to use. |
| **dFreqData** | Raw FFT output when averaging is enabled. This structure is not normally directly access by an application program. This value is for internal use only, DO NOT ALTER or try to use. |
| **lFreqRsvd** | Used to track memory allocation for dFreqData values. This value is for internal use only, DO NOT ALTER or try to use. |
| **dTailData** | Raw tail-fit FFT output when tail-fit and averaging are both enabled. This structure is not normally directly access by an application program. This value is for internal use only, DO NOT ALTER or try to use. |
| **lTailRsvd** | Used to track memory allocation for dTailData values. This value is for internal use only, DO NOT ALTER or try to use. |

## 7-22 DATACOM RANDOM DATA WITH BIT CLOCK TOOL

The Datacom Random Data With Bit Clock Tool is used to measure jitter from a reference clock to a data signal. This measurement setup is the same as the setup used by an oscilloscope when generating an Eye Diagram or for Eye Mask testing. The measurement starts out with a quick frequency measurement for the reference clock. Based on this information, the algorithm finds the next clock transition and establishes data filters that limit the data to only those transitions that are within a ± 0.5 UI window of the expected clock. This means that the software will throw out any measurements that are not valid and belong to a different location in the pattern. Then, the instrument measures from the bit clock to the data channel and generates two histograms of measurements, one for each polarity of the data signal. Then, the histograms are overlaid and the right most and left most edges are used to perform a TailFit for RJ/DJ separation.

Eye Histogram Tool is used primarily for long data patterns (greater than 2k in length) or for fully random data streams in which no repeating pattern is available. The bit clock for this measurement could be placed on any one of the other input channels or may come from the optional Clock Recovery Module (CRM) available on most SIA3000 systems.




Measurement methodology for Eye Histogram Measurements.

**Command syntax - :ACQuire:EYEHistogram(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:EYEH(@4)#41464…",1483,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lPassCnt;           /* Acquisitions so far, set to 0 to reset */
  long    lRefEdge;           /* Referenced to: EDGE_FALL or EDGE_RISE  */
  long    lErrProb;           /* Error probability used Total Jitter    */
                              /* Valid range is ( -1 to -16 )           */
  long    lClokSmp;           /* Sample size while acquiring clock rate */
  long    lFiltSmp;           /* Sample size when finding filter limits */
  long    lTailFit;           /* If non-zero a tail-fit will be tried   */
  long    lForcFit;           /* If non-zero use the force-fit method   */
  long    lMinHits;           /* Minimum hits before trying tail-fit    */
  long    lFndEftv;           /* Flag to attempt effective jitter calc  */
  long    lMinEftv;           /* Min probability for effective fit: -4  */
  long    lMaxEftv;           /* Max probability for effective fit: -12 */
  long    lDdrClok;           /* Non-zero for double data rate clocks   */
  double  dMinSpan;           /* Minimum span between edges in seconds  */
  long    lFiltOff;           /* Filter offset in %UI (100 to -100)     */
  long    lKeepOut;           /* If non-zero use tailfit keep out below */
  double  dKpOutLt;           /* Keep out value for left side           */
  double  dKpOutRt;           /* Keep out value for right side          */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lRiseCnt;           /* Number of hits in rising edge data     */
  long    lFallCnt;           /* Number of hits in falling edge data    */
  long    lPad2;
  double  dDataMin;           /* Minimum value relative to clock edge   */
  double  dDataMax;           /* Maximum value relative to clock edge   */
  double  dDataSig;           /* 1-Sigma of all values relative to clock*/
  double  dAvgSkew;           /* Average of all values relative to clock*/
  double  dUnitInt;           /* Measured Unit Interval                 */

  long    lUnitOff;           /****************************************/
  long    lSpanCnt;           /*                                      */
  double  dRiseMin;           /*  These values are all used internally  */
  double  dRiseMax;           /*   as part of the measurement process   */
  double  dFallMin;           /*                                      */
  double  dFallMax;           /*                                      */
  long    lRiseBin;           /*             DO NOT ALTER!            */
  long    lFallBin;           /*                                      */
  double  dLtSigma[PREVSIGMA];/*                                      */
  double  dRtSigma[PREVSIGMA];/*                                      */
  double  dAltMean;           /****************************************/

  PLOT    tRise;              /* Histogram of rising edge data          */
  PLOT    tFall;              /* Histogram of falling edge data         */
  PLOT    tBoth;              /* Histogram of combined edge data        */
  PLOT    tRiseProb;          /* Probability Histogram of rising edges  */
  PLOT    tFallProb;          /* Probability Histogram of falling edges */
  PLOT    tBothProb;          /* Probability Histogram of combined edges*/
  PLOT    tBath;              /* Bathtub curves determined from PDF     */
  PLOT    tEftv;              /* Effective Bathtub curves if enabled    */
  TFIT    tTfit;              /* Structure containing tail-fit info     */
  } EYEH;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4. Be sure to either set the following parameters in tParm for a successful EyeHistogram Tool execution or review the default settings:

**lChanNum** This is a 32 bit word that represents the channel for this measurement. The upper 16 bits define which channel will be used as the reference edge (or bit clock) the lower 16 bits are used for identifying the channel to be measured. It is best to manipulate the channel selection field using HEX format or by using binary shift functions. ***See sample code at the end of this section for an example of using binary shift function in the channel declaration.*** in HEX format, simply enter the reference channel number in the first two bytes and the measured channel in the last two bytes such that 0x000m000n would indicate a reference channel of m and a measured channel of n (in hexadecimal format) where m and n are elements of the set {1,2,3,4,5,6,7,8,9,a}. For example, 0x00050003 would indicate that channel 5 was the channel with the bit clock signal and channel 3 was the channel with the data signal. The default for tParm.lChanNum within a EYEH structure is 0x00010002 indicating that the reference channel is defaulted to channel 1 and the measured channel is set to 2.

**dStrtVlt** Since measurements are made from the data signal to the next clock signal, the start of measurement is the data signal and thus dStrtVlt controls the threshold level for the data channel. It is typically best to leave this variable at the default and allow Pulse Find to establish the 50% level at which to test the device. However, there are two cases in which this may not be desirable. First, in a production environment, it may be too time-consuming to perform a Pulse Find each time the test is to be executed. All of the parts should have roughly the same voltage characteristics (if they are passing parts) and will most likely have the same threshold settings. Second, in some cases, it might be desirable to account for any slew rate issues by adjusting the threshold voltage to the cross point. A simple script can be written to identify the cross point prior to testing.

**dStopVlt** Since measurements are made from the data signal to the next clock signal, the stop of measurement is the reference clock signal and thus dStopVlt controls the threshold level for the clock channel. It is typically best to leave this variable at the default and allow Pulse Find to establish the 50% level at which to test the device. In a production environment, this value can be forced by turning pulse find off and setting this parameter.

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets this register. It will be automatically incremented when a measurement is performed.
Valid Entries: any integer greater than or equal to 0
Default: 0

**lRefEdge** Parameter to define the polarity of the clock edge which will be used as the reference.
Valid Entries: EDGE_FALL reference clock to data measurements to the falling edge of the clock signal.
EDGE_RISE reference clock to data measurements to the rising edge of the clock signal.
Default: EDGE_RISE

**lErrProb** Exponent of Bit Error Probability (BER) to which Total Jitter will be calculated if TailFit is enabled. TJ is calculated based on the convolution of DJ and RJ out to $10^n$ BER where $n$ = lErrProb.,
Valid Entries: Any integer from –1 to –16
Default: -12

**lClokSmp** Sample size while acquiring clock rate.
Valid Entries: Any integer less than or equal to 1,000,000
Default: 10000.

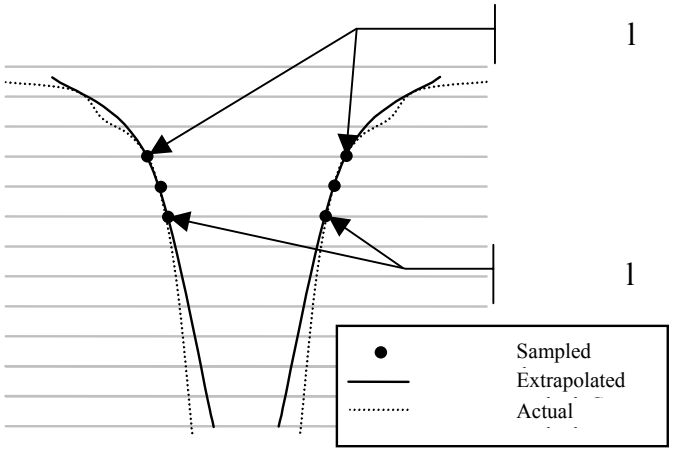
**lFltSmp** Sample size when finding filter limits
Valid Entries: Any integer less than or equal to 1,000,000
Default: 1000.

**lTailFit** Flag to indicate whether to perform a TailFit on data in the rising and falling data histograms. If non-zero, a tail-fit will be attempted. The lGood element of the tTfit structure will indicate if the TailFit was successful. Setting this structure element to 1 will initiate the TailFit algorithm.
Valid Entries: 0 – disable TailFit algorithm
1 – enable TailFit algorithm
Default: 0

**lForcFit** Flag to indicate whether to force a TailFit on a fixed sample size or to continue acquiring data until a sufficient amount of data has been collected resulting in a high level of confidence in the accuracy of the TailFit on the given sample. If selected, the TailFit algorithm will make a single attempt at fitting Gaussian tails to the tail regions of the histograms after acquiring the minimum number of samples as defined by lMinHits.
Valid Entries: 0 continue acquiring data until chi squared ($X^2$) estimate indicates a good TailFit was accomplished.
1 perform tail fit on only lMinHits amount of data.
Default: 0

**lMinHits** Minimum number of samples (in thousands) to acquire prior to attempting a TailFit.
Valid Entries: any positive integer less than or equal to 100,000
Default: 50

**lFndEftv** Flag to indicate that an effective jitter calculation is to be attempted. Effective Jitter is a means of estimating the effective deterministic jitter as it relates to a .5 error probability. This is done by first capturing the bathtub curve using conventional RJ & DJ estimation techniques; then, extrapolating from a few points in the bathtub curve to the .5 error probability level to estimate effective DJ. Effective RJ is extracted based on the curve that was fitted to the sample points. These values should only be used to correlate to a BERT Scan measurement and should not be used as a vehicle for quantifying jitter. This technique was




Extrapolated Bathtub curve versus real bathtub curve as seen by BERT

developed to allow BERT systems to correlate with SIA3000 results.
Valid Entries: 0 – disable effective jitter estimate
1 – enable effective jitter estimate
Default: 0

**lMinEftv, lMaxEftv** Defines the error rates at which the eye width calculation will be used in the estimating effective jitter components. lMinEftv and lMaxEftv define points on the bathtub curve from which the extrapolated RJ curve is traced. Then, where this extrapolated curve intersects the .5 error probability, the effective DJ is calculated.
Valid Entries: -1 to –16 (indicating $10^{-1}$ to $10^{-16}$ error rate)
Default: -4 and –12 (lMaxEftv: $10^{-4}$ BER, lMinEftv: $10^{-12}$ BER)

**dMinSpan** Minimum delay between reference clock and measured edges. This parameter will skip a sufficient number of edges to measure the data transitions that are at least dMinSpan (in seconds) away from the reference clock. This parameter is used to correlate with oscilloscopes, which have a trigger delay of at least 20ns (typ.). It is not typically used in a production environment.
Valid Entries: 0 to 1.0
Default: 0

**lFiltOff** This allows an offset to be made to the filter that is used to isolate histogram data to within 1 UI of the bit clock. The filter is established on the first pass by the instrument, and can normally be left alone. However, in the presence of large amounts of jitter it may be necessary to tweak this value slightly. The offset is entered as a percentage of UI, and a value in the range of +/-100 is valid.
Valid Entries: -100 to +100
Default: 0

**lGood** Flag indicates valid output data in structure.

**lRiseCnt** Number of hits in rising edge data.

**lFallCnt** Number of hits in falling edge data.

**dDataMin** Minimum value relative to clock edge.

**dDataMax** Maximum value relative to clock edge.

**dDataSig** 1-Sigma of all values relative to clock.

**dAvgSkew** Average of all values relative to clock.

**dUnitInt** Measured Unit Interval, this is based on the clock.

**tRise** Structure of type PLOT which contains all of the plot information to generate a Histogram of rising-edge data to next reference clock measurements. See Section 7-3 for details of the PLOT structure and its elements.

**tFall** Structure of type PLOT which contains all of the plot information to generate a Histogram of falling-edge data to next reference clock measurements. See Section 7-3 for details of the PLOT structure and its elements.

**tRiseProb** Structure of type PLOT which contains all of the plot information to generate a probability histogram of rising-edge data to next reference clock measurements. The amplitude of each point in the probability histogram is normalized to the probability of a given measurement occurring as opposed to the total number of measurements made with the given result. See Section 7-3 for details of the PLOT structure and its elements.

**tFallProb** Structure of type PLOT which contains all of the plot information to generate a probability histogram of falling-edge data to next reference clock measurements. The amplitude of each point in the probability histogram is normalized to the probability of a given measurement occurring as opposed to the total number of measurements made with the given result. See Section 7-3 for details of the PLOT structure and its elements.

**tBath** Structure of type PLOT which contains all of the plot information to generate a bathtub curve based on Probability Density Function derived from histogram data and RJ estimate from TailFit algorithm. . See Section 7-3 for details of the PLOT structure and its elements.

**tEftv** Structure of type PLOT which contains all of the plot information to generate a bathtub curve based on the estimate of effective Deterministic Jitter (eDJ) and effective Random Jitter (eRJ) derived from the true data bathtub curve. This plot is only available when lFndEftv is set and a valid fit is obtained. See Section 7-3 for details of the PLOT structure and its elements.

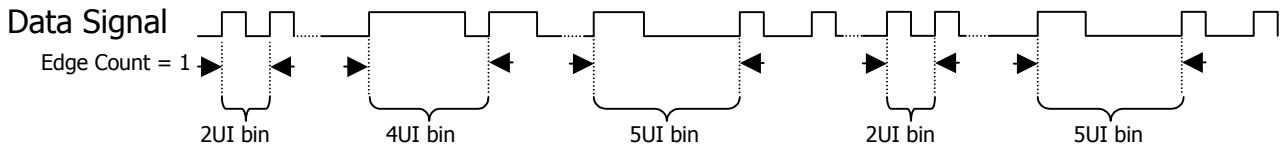
**tTfit** A structure of type TFIT containing tail-fit info. See Section 7-5 for details of the TFIT structure and its elements.

**lUnitOff, dRiseMin, dRiseMax, dFallMin, dFallMax, lRiseBin, lFallBin, dLtSigma, dRtSigma, lSpanCnt**

These values are all used internally, DO NOT ALTER!

## 7-23 DATACOM RANDOM DATA WITH NO MARKER TOOL

The Datacom Random Data With No Marker Tool is used to estimate jitter components on random data signals without the benefit of a repeating data pattern or access to a bit clock. This tool is used primarily to capture relative jitter amplitudes and is not considered an accepted means of accurately measuring jitter components on a data signal. For accurate jitter measurements on data signals, it is imperative to have a repeating pattern and a pattern trigger or have access to a bit clock. This tool, the Random Data Tool, is prone to inaccuracies when periodic jitter is present and data dependent jitter is present on the signal. This tool does not take into account any PJ amplitude when estimating Total Jitter. Secondly, this tool may underestimate the amplitude of DDJ due to data binning errors.




Example of Random Data utility when edge count equals 1. In a complete execution of the random data utility, edge count will range from 1 to FC/(4*FM) where FC is the carrier frequency and FM is the modulation cutoff frequency.

To capture jitter information, this tool measures time from randomly selected transitions in the pattern to a subsequent edge in the pattern some "n" number of transitions after the start of the measurement. "n" is swept from a count of 1 to a count as defined by the carrier frequency and the desired cutoff frequency. Once all of the measurements are captured, the data is binned according to their proximity to integer multiples of the bit period. (For example, all measurements within ± .5UI of 5xbit-period are placed in the 5UI bin.) Then, each bin is parsed for statistical information including jitter and mean offset from ideal. The mean offset is used to estimate Data Dependent Jitter (DDJ). As such, the location of the mean for a given bin's histogram could be artificially inflated based on combining measurements from transitions which are not from the same point in the data pattern. The above example shows a given burst of measurements where the edge count was equal to 1. During the course of the complete measurement, the edge count will be varied from an initial value of 1 to a final value determined based on the bit rate and the intended cutoff frequency. Each is bin is also sorted based on edge count and polarity in an attempt to maximize accuracy of DDJ estimate. Once all of the data is captured, the mean of each histogram for each sub-bin is compared to an ideal bit clock and the deviation is taken as Data Dependant Jitter. All DDJ estimates are combined to determine the peak to peak spread of DDJ. Then, the algorith selects appropriate edge counts to create a histogram from which to capture TailFit information in an attempt to estimate RJ. Based on the users selection of the structure element tDcom.lTailFit.

The structure used in this tool incorporates a Datacom Known Pattern With Marker structure. In other words, this tool basically creates a "wrapper" structure around the dataCOM structure which has settings unique to the random data tool.

To estimate Random Jitter (RJ) on a random signal without the benefit of a reference clock, the random data tool uses TailFit on sampled data histograms from various amounts of accumulated bit periods. The precision of the measurement is increased as the number of different

accumulations used is increased. There is a significant increase in test time for increasing the number of tailfit points. As such, the user can specify 4 different setting selections or have the instrument dynamically decide which to use (AUTO). In AUTO mode, the tool first performs 3 tailfits (maximum count, minimum count and middle count) and checked to see if the deviation between adjacent RJ measurements is less than the percentage specified in lPcnt. If the deviation is greater, the instrument will perform two more TailFit measurements between the three already taken. Again, the instrument will check adjacent RJ estimates and decide whether to capture additional interstitial samples.

**Command syntax - :ACQuire:RANDomDATa(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:RANDDAT(@4)#44144…",4166,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lCoun;              /* Count of tailfits, see constants above */
  long    lPcnt;              /* Automode suceed %, see constants above */
  DCOM    tDcom;              /* DCOM structure holds most information  */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad1;
  double  dDjit;              /* Deterministic jitter value             */
  double  dRjit;              /* Random jitter value                    */
  double  dTjit;              /* Total jitter value                     */
  PLOT    tSigmTail;          /* 1-Sigma plot using tail-fits           */
  } RAND;
```

**lCoun** This parameter selects the number TailFit iterations to be captured. This number can be any of 3, 5, 9 or 17. In RAND_AUTO mode, the user can choose to have the instrument dynamically decide the number based on the deviation of adjacent RJ estimates. The instrument will start with 3 TailFits and increase the count based on the value specified in lPcnt.

Valid Entries:
- RAND_AUTO - Continue to perform tailfits until RJ is within some percentage of the previous pass.
- RAND_FIT3 - Perform 3 tailfits
- RAND_FIT5 - Perform 5 tailfits
- RAND_FIT9 - Perform 9 tailfits
- RAND_FIT17 – Perform 17 tailfits

**lPcnt** Target maximum amount of deviation between adjacent RJ estimates. Each RJ estimate is calculated based on a histogram of accumulated bit periods. Then, each RJ is compared with the RJ estimate of the adjacent accumulations. The percentage difference is compared with this entry to determine if the RJ estimate is valid.

- RAND_PCNT5 RJ within 5% of adjacent estimates
- RAND_PCNT10 RJ within 10% of adjacent estimates
- RAND_PCNT25 RJ within 25% of adjacent estimates
- RAND_PCNT50 RJ within 50% of adjacent estimates

**tDcom** Structure of type DCOM which specifies most of the input and output parameters necessary for a data signal analysis. *See D-3 for more details on the DCOM structure and the elements described below.* The user will need to review all of the default parameters of the DCOM structure and decide which to change. The following entities from the DCOM structure are valid for use with the random data tool:

**tDcom.tParm** Acquisition parameter sub structure.
**tDcom.AcqMode** Acquire Mode (rise-rise, rise-fall, fall-rise, fall-fall)
**tDcom.lRndMode** Enable/Disable Random Mode
**tDcom.lErrProb** Error Probably level to which TJ is to be calculated.
**tDcom.lPassCnt** Number of passes using same RAND structure since
**tDcom.lFftAvgs** Number of FFTs to capture and average
**tDcom.tDdjtInf** SPEC structure used to set up DDJ measurement.
**tDcom.dBitRate** Bit Rate of data signal under test.
**tDcom.dCornFrq** Corner Frequency as specified by given standard
**tDcom.lFndEftv** Enable/Disable Effective Jitter measurements
**tDcom.lMinEftv** Minimum BER point in Bathtub curve used for Effective Jitter.
**tDcom.lMaxEftv** Maximum BER point in Bathtub curve used for Effective Jitter.
**tDcom.lQckTjit** Enable Quick TJ estimate rather than convolving RJ+DDJ for TJ.
**tDcom.lGood** Flag to indicate valid data results exist in structure.
**tDcom.dHits** total number of measurements made
**tDcom.dDdJt** peak-peak amplitude of DDJ
**tDcom.dRang** peak-peal of all measurements histogram.
**tDcom.dRjit[n]** RJ estimate for each possible mode.
**tDcom.dPjit[n]** PJ estimate for each possible mode.
**tDcom.dTjit[n]** TJ estimate for each possible mode.
**tDcom.dEftvLtDj[n]** Effective DJ estimate for left or short cycle side.
**tDcom.dEftvLtRj[n]** Effective RJ estimate for left or short cycle side.
**tDcom.dEftvRtDj[n]** Effective DJ estimate for right or long cycle side.
**tDcom.dEftvRtRJ[n]** Effective RJ estimate for right or long cycle side.
**tDcom.tRiseHist** PLOT structure of DDJ histogram for rising edges
**tDcom.tFallHist** PLOT structure of DDJ histogram for falling edges
**tDcom.tRiseMeas** PLOT structure of "All Measurements" of rising edges.
**tDcom.tFallMeas** PLOT structure of "All Measurements" of falling edges.
**tDcom.tBathPlot[n]** PLOT structure of bathtub curves for each measurement mode.
**tDcom.tEftvPlot[n]** PLOT structure of Effective Jitter for each measurement mode.
**tDcom.tSigmNorm[n]** PLOT structure of standard Deviation (1σ) versus time.
**tDcom.tSigmTail[n]** PLOT structure of 1σ versus time using TailFit for RJ.
**tDcom.tFreqNorm[n]** PLOT structure of 1σ versus frequency.
**tDcom.tFreqTail[n]** PLOT structure of 1σ versus frequency using TailFit for RJ.

**lGood** Flag indicates valid output data in structure.

**dDjit** Deterministic Jitter estimate. This value is based strictly on the Data Dependant Jitter calculation and does not account for any Periodic Jitter since it is impossible to accurately separate Periodic Jitter in the FFT results when DDJ is present.

**dRjit** Random Jitter estimate. This value comes from the series of TailFits that were performed on the accumulated jitter data.

**dTjit** Total Jitter estimate. This value is the convolution of the DDJ probability density function captured in dDjit and the RJ estimate captured in dRjit.

**tSigmTail** Structure of type PLOT containing information necessary to create a plot of RJ (based on the TailFit results) and 1-σ (standard deviation) as a function of accumulated bit periods. See Section 7-3 for details of the PLOT structure and its elements.

## 7-24 FIBRECHANNEL COMPLIANCE TOOL

The Fibre Channel Compliance Tool utilizes the Datacom Known Pattern with Marker Tool for the measurements. In addition to the data signal to be analyzed, this tool requires a pattern marker to be connected to the Arm Channel. If your SIA-3000 is equipped with the PM-50 option, the marker signal will be generated on the card and no additional input signals are required for making a measurement. The Marker signal has an edge relative to the same bit of the pattern each time the marker occurs. Since no bit-clock is used, analysis of jitter is independent of clock-jitter effects, and because the Arm is not a trigger, any jitter on the marker will not transfer to the measurement of the Data.

For an in depth description on Known Pattern With Marker measurement theory, refer to the Known Pattern With Marker quick reference guide.

### Command syntax - :ACQuire:FIBREchannel<#xyy…ddddddd…>

Example: `Send(0,5,":ACQ:FIBRE#44216…",4232,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  double  dAttn;              /* Attenuation factor (dB)                */
  DCOM    tDcom;              /* DCOM structure holds most information  */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad0;
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  } FCMP;
```

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**tDcom** Structure of type DCOM which specifies most of the input and output parameters necessary for a data signal analysis. The user will need to review all of the default parameters of the DCOM structure and decide which to change.

**lGood** Flag indicates valid data in structure

**tNrmScop** Normal channel voltage data

**tCmpScop** Complimentary channel voltage data

## 7-25 FOLDED EYE TOOL

The Folded Eye Tool is designed to provide an eye mask test to be applied to a repeating pattern. This allows a DSP Bandwidth Extension algorithm to be applied to improve the apparent front end performance. See the SIA3000 User Manual for additional information concerning the Bandwidth Extension.

**Command syntax - :ACQuire:FOLDedeye<#xyy…ddddddd…>**

Example: `Send(0,5,":ACQ:FOLD#44216…",4232,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lPassCnt;           /* Acquisitions so far, set to 0 to reset */
  long    lPatnLen;           /* Pattern length in bit periods          */
  long    lScopRes;           /* Scope resolution in ps increments      */
  long    lInps;              /* Input selection, see defines above     */
  long    lVoff;              /* Voltage offset (mV)     - per channel  */
  long    lVdif;              /* Differential offset (mV)- per channel  */
  MASK    tMask;              /* Structure which holds mask definition  */
  double  dMargin;            /* Margin in percentage [-1.0 to 1.0]     */
  double  dBitRate;           /* Bit Rate, must be specified            */
  double  dAttn;              /* Attenuation factor (dB)                */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad2;
  double  d1stEdge;           /* This value is used internally          */
  double  dNrmPkpk;           /* Vpp for Normal Channel Eye Diagrams    */
  double  dCmpPkpk;           /* Vpp for Complimentary Eye Diagrams     */
  double  dDifPkpk;           /* Vpp for Differential Eye Diagrams      */
  QTYS    qNorm;              /* Normal channel quantities              */
  QTYS    qComp;              /* Complimentary channel  quantities      */
  QTYS    qDiff;              /* Differential channel  quantities       */
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  PLOT    tDifScop;           /* Differential voltage data              */
  char   *bNrmData;           /* Eye diagram of normal data             */
  long    lNrmRsvd;           /* This value is used internally          */
  char   *bCmpData;           /* Eye diagram of complimentary data      */
  long    lCmpRsvd;           /* This value is used internally          */
  char   *bDifData;           /* Eye diagram of differential data       */
  long    lDifRsvd;           /* This value is used internally          */
  } FEYE;
```

**tParm** A structure of type PARM that contains acquisition parameter. tParm is discussed in full detail in Section 7-4.

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions in the data set. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets the accumulated data on the instrument. The value in the returned structure will be automatically incremented by the instrument.
Valid Entries: any integer greater than or equal to 0
Default: 0

**lPatnLen** This parameter configures the number of UI that are measured and folded into the Eye Mask.
Valid Entries: any integer greater than or equal to 1
Default: 40

**lScopRes** This parameter configures the sample interval and is entered in units of picoseconds.
Valid Entries: any integer greater than or equal to 1
Default: 2

**lInps** Input selection, can be any of the following:
SCOP_INPS_NORM +Input Only
SCOP_INPS_COMP –Input Only
SCOP_INPS_DIFF +Input minus -Input
Default: SCOP_INPS_DIFF

**lVoff** Offset voltage used for scope acquire, specified in mV
Default: 0

**lVdif** Differential offset voltage used for display, specified in mV
Default: 0

**tMask** MASK Structure which holds mask definition. See the definition above.
Defaults:
```
tMask.dXwdUI = 0.40
tMask.dXflUI = 0.20
tMask.dYiPct = 0.60
tMask.dV1Rel = 0.20
tMask.dV0Rel = 0.20
tMask.dVmask = 64e-3
tMask.dTmask = 700e-12
tMask.dV1pas = feye->tMask.dVmask * 0.75
feye->tMask.dV0pas = feye->tMask.dVmask * 0.75
tMask.dTflat = feye->tMask.dTmask * 3.0 / 7.0
```

**dMargin** Margin in percentage for Eye Mask [-1.0 to 1.0]
Default: 0

**dBitRate** Bit Rate, must be specified
Default: 2.5e9

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**lGood** Flag indicates valid data in structure

**d1stEdge** Used internally, DO NOT ALTER!

**dNrmPkpk** Vpp for normal Channel scope data

**dCmpPkpk** Vpp for complimentary Channel scope data

**dDifPkpk** Vpp for differential Channel scope data

**qNorm** Normal channel quantities

**qComp** Complimentary channel quantities

**qDiff** Differential channel quantities

**tNrmScop** Normal channel voltage data, last pass only

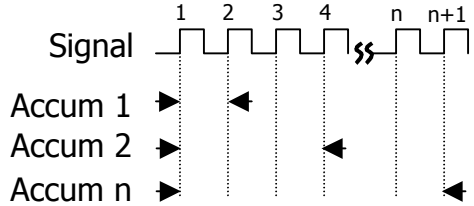
**tCmpScop** Complimentary channel voltage data, last pass only

**tDifScop** Differential channel voltage data, last pass only

**bNrmData, lNrmRsvd, bCmpData, lCmpRsvd, bDifData, lDifRsvd** for internal use only, DO NOT ALTER or try to use.

## 7-26 HIGH FREQUENCY MODULATION ANALYSIS TOOL

The High Frequency Modulation Analysis Tool is used typically for frequency analysis of noise on clock and clock-like signals (101010…). The controls for the tool deal primarily with measurement setup, corner frequency selection and normalization technique.




This tool will take several randomly selected time measurements using Accumulated Time Analysis (ATA). The data can be displayed in the time domain (accumulated jitter versus time) or in the frequency domain (jitter versus frequency). This latter plot is used to identify spectral peaks in the noise which may indicate modulation and can typically be attributed to crosstalk or EMI effects.

The Jitter Analysis Tool can be set up to calculate RJ and DJ of a clock signal over a specified frequency band (typically the corner frequency to ½ the clock rate) and separate the DJ by frequency content. The DJ measured in this tool is strictly Periodic Jitter.

**Command syntax - :ACQuire:JITTer(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:JITT(@4)#3752…",770,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  FFTS    tFfts;              /* FFT window and analysis parameters     */
  long    lIncStop;           /* Increase stop count by this value      */
  long    lMaxStop;           /* Maximum stop count to collect data     */
  long    lAutoFix;           /* If true calculate the above parameters */
  long    lPad1;
  double  dCornFrq;           /* Corner Frequency for RJ+PJ             */
  double  dRjpjFmn;           /* Minimum integration limit for RJ+PJ    */
  double  dRjpjFmx;           /* Maximum integration limit for RJ+PJ    */
  long    lFftAvgs;           /* 2^fft_avgs averages used to smooth FFT */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
                              /****************************************/
  double  dWndFact1Clk;       /* These values are used internally       */
  double  dWndFactNClk;       /*             DO NOT ALTER!              */
                              /****************************************/
  PLOT    tSigm;              /* Contains the 1-Sigma plot array        */
  PLOT    tPeak;              /* Contains the ( max - min ) plot array  */
  PLOT    tFft1;              /* Frequency plot data on 1-clock basis   */
  double  dPjit1Clk;          /* Periodic jitter on 1-clk basis         */
  double  dRjit1Clk;          /* Random jitter on 1-clk basis           */
  long   *lPeakData1Clk;      /* Tracks detected spikes in RJ+PJ data   */
  long    lPeakNumb1Clk;      /* Count of detected spikes               */
  long    lPeakRsvd1Clk;      /* Used to track memory allocation        */
  long    lPad2;
  PLOT    tFftN;              /* Frequency plot data on N-clock basis   */
  double  dPjitNClk;          /* Periodic jitter on N-clk basis         */
  double  dRjitNClk;          /* Random jitter on N-clk basis           */
```

```
long   *lPeakDataNClk;      /* Tracks detected spikes in RJ+PJ data   */
long    lPeakNumbNClk;      /* Count of detected spikes               */
long    lPeakRsvdNClk;      /* Used to track memory allocation        */
long    lPad3;
double  dFreq;              /* Carrier frequency                      */
} JITT;
```

**tParm** A structure of type PARM that contains acquisition parameter. tParm is discussed in full detail in Section 7-4.

**tFfts** A structure of type FFTS that contains the setup parameters for the FFT. See Section 7-10 for further details on FFTS structures.

**lIncStop** Timing resolution of Accumulated Time Analysis. This value will define the highest frequency component that will be observed (low-pass filter function approximated by a brick wall)
Valid Entries: tParm.lStopCnt to lMaxStop.
Default: 1

**lMaxStop** Maximum number of accumulated periods to acquire. This value defines the low frequency cut off for this measurement. The larger this number is, the more lower-frequency modulation content can be observed. Furthermore, the larger this number is, the more data that is taken and the longer the test time.
Valid Entries: tParm.StopCnt to 10,000,000
Default: 256

**lAutoFix** Flag to indicate whether to use dCornFrq or lMaxStop to indicate the low-frequency cutoff. If the value is of this parameter is greater than zero, dCornFrq will be used to calculate the stop count. If this parameter is equal to zero, lMaxStop will be used.
Valid Entries: 0 – no pulsefind prior to measurement
1 –pulsefind if the measurement mode changed.
Default: 0

**dCornFrq** Corner Frequency for RJ & PJ estimate in Hertz. This value is used in conjunction with the measured clock frequency ($F_{CM}$) to determine the maximum number of accumulated periods used to acquire. A lower value increases acquisition time while capturing more low frequency data.
Valid Entries: $F_{CM}$ /10,000,000 to $F_{CM}$ I
Default: 637e3 (637kHz – Fibre Channel 1X)

**dRjpjFmn** High-pass digital filter function in Hertz for calculating RJ and DJ. A negative value disables filter. The accuracy of low frequency modulation measurements can be improved by setting the measurement corner frequency lower than the desired corner frequency and then using this filter for the RJ and PJ estimate.
Valid Entries: -1 to dCornFreq or Clock Frequency ÷ lMaxStop
Default: -1

**dRjpjFmx** Low-pass Digital filter function in Hertz for calculating RJ and DJ. A negative value disables filter. This filter is used as a post-processing filter applied to the measured data to limit high frequency information present in the data when calculating RJ-DJ estimate.
Valid Entries: -1 to Clock Frequency ÷ lIncStop
Default: -1

**lFftAvgs** This variable is used to calculate the number of averages to use in the FFT. Increasing the number of averages reduces the background noise associated with the FFT algorithm. The number of averages is calculated based on the equation:
AVERAGES = $2^n$ where n = lFftAvgs
Valid Entries: any integer greater than or equal to 0
Default: 0 (indicating $2^0$ averages = 1 execution.)

**lGood** Flag indicates valid output data in structure. A positive value in this parameter indicates that the measurement was completed successfully, and, valid data can be extracted from this structure.

**dWndFact1Clk, dWndFactNClk** These values are for internal use only, DO NOT ALTER or try to use.

**tSigm** A structure of type PLOT containing the 1-Sigma plot array. This plot is used to observe the standard deviation (1σ) of accumulated jitter versus time. See Section 7-3 for details of the PLOT structure elements.

**tPeak** A structure of type PLOT containing the peak-to-peak Accumulated jitter versus time plot array. See Section 7-3 for details of the PLOT structure elements.

**tFft1** A structure of type PLOT containing the Accumulated jitter versus frequency with amplitudes normalized to their effect on 1-clock. This is sometimes referred to as accumulated period jitter. See Section 7-3 for details of the PLOT structure elements.

**dPjit1Clk** Amplitude of the largest spectral component in the normalized accumulated jitter versus frequency (1-clock PJ estimate).

**dRjit1Clk** Random jitter calculated based on filter functions (if enabled) and Normalized Accumulated Jitter versus frequency plot (RJ as a function of 1-clock FFT).

**lPeakData1Clk** For internal use only, DO NOT ALTER or attempt to interpret.

**lPeakNumb1Clk** Count of detected spikes observed in the normalized Accumulated Jitter versus frequency plot. (spectral peaks in 1-clock FFT)

**lPeakRsvd1Clk** for internal use only, DO NOT ALTER or try to use.

**tFftN** A structure of type PLOT containing the Accumulated Jitter versus Frequency plot data. The amplitudes show the total amplitude of the modulation and is referred to as "N-clock" mode in reference to edge deviation due to a given modulation tone relative to an ideal clock. This is sometimes referred to as accumulated edge jitter. See Section 7-3 for details of the PLOT structure elements.

**dPjitNClk** Amplitude of the largest spectral component in the accumulated jitter versus frequency plot. (N-clock PJ estimate).

**dRjitNClk** Random jitter calculated based on filter functions (if enabled) and Accumulated Jitter versus frequency plot (RJ as a function of n-clock FFT).

**lPeakDataNClk** For internal use only, DO NOT ALTER or attempt to interpret.

**lPeakNumbNClk** Count of detected spikes observed in the accumulated jitter versus frequency plot. (spectral peaks in n-clock FFT)

**lPeakRsvdNClk** for internal use only, DO NOT ALTER or try to use.

**dFreq** Measured clock frequency.

## 7-27 HISTOGRAM TOOL

The histogram tool is used for displaying the statistical distribution of a given measurement. Measurements made with this tool are limited to repetitive signal measurements such as clock period, duty cycle, pulse width, rise time, fall time, propagation delay and frequency. This tool is typically used for displaying the statistical distribution of thousands of measurements. Important distribution parameters can be calculated based on the data including: RMS, peak to peak, Random Jitter (RJ), Deterministic Jitter (DJ) and Total Jitter (TJ).

**Command syntax - :ACQuire:HISTogram(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:HIST(@4)#41440…",1459,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  double  dUnitInt;           /* Unit Interval to assess Total Jitter   */
  long    lPassCnt;           /* Acquisitions so far, set to 0 to reset */
  long    lErrProb;           /* Error probability for Total Jitter     */
                              /* Valid range is ( -1 to -16 )           */
  long    lTailFit;           /* If non-zero a tail-fit will be tried   */
  long    lForcFit;           /* If non-zero use the force-fit method   */
  long    lMinHits;           /* Minimum hits before trying tail-fit    */
  long    lFndEftv;           /* Flag to attempt effective jitter calc  */
  long    lMinEftv;           /* Min probability for effective fit: -4  */
  long    lMaxEftv;           /* Max probability for effective fit: -12 */
  long    lAutoFix;           /* If true perform a pulsefind as req'd   */
  long    lKeepOut;           /* If non-zero use tailfit keep out below */
  double  dKpOutLt;           /* Keep out value for left side           */
  double  dKpOutRt;           /* Keep out value for right side          */
  long    lPad0;
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */

  long    lPad1;
  long    lNormCnt;           /* Number of hits in normal edge data     */
  double  dNormMin;           /* Minimum value in normal edge data      */
  double  dNormMax;           /* Maximum value in normal edge data      */
  double  dNormAvg;           /* Average value of normal edge data      */
  double  dNormSig;           /* 1-Sigma value of normal edge data      */

  long    lPad2;
  long    lAcumCnt;           /* Number of hits in accumulated edge data*/
  double  dAcumMin;           /* Minimum value in accumulated edge data */
  double  dAcumMax;           /* Maximum value in accumulated edge data */
  double  dAcumAvg;           /* Average value of accumulated edge data */
  double  dAcumSig;           /* 1-Sigma value of accumulated edge data */

  long    lBinNumb;           /****************************************/
  long    lPad3;              /*  These values are all used internally  */
  double  dLtSigma[PREVSIGMA];/*   as part of the measurement process   */
  double  dRtSigma[PREVSIGMA];/*             DO NOT ALTER!              */
  double  dFreq;              /****************************************/

  PLOT    tNorm;              /* Histogram of previous acquisition      */
  PLOT    tAcum;              /* Histogram of all acquires combined     */
  PLOT    tMaxi;              /* Histogram of max across all acquires   */
  PLOT    tBath;              /* Bathtub curves determined from PDF     */
  PLOT    tEftv;              /* Effective Bathtub curves if enabled    */
```

```
  PLOT    tShrt;              /* Total Jitter for SHORT Cycles          */
  PLOT    tLong;              /* Total Jitter for LONG Cycles           */
  PLOT    tBoth;              /* Total Jitter for LONG & SHORT Cycles   */
  TFIT    tTfit;              /* Structure containing tail-fit info     */
  } HIST;
```

**tParm** A structure of type PARM that contains acquisition parameters. tParm is discussed in full detail in Section 7-4.

**dUnitInt** Unit Interval (UI) in seconds to assess Total Jitter as a percent of UI. Set this parameter as the metric against which TJ will be evaluated as a percentage. It is displayed as the span of the x-axis in a bathtub curve. This parameter is only used if tail-fit is enabled.
Valid Entries: any number greater than 0 which represents the time (in seconds) of a bit period or unit interval.
Default: 1e-9 (1ns)

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions in the data set. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets the accumulated data on the instrument. The value in the returned structure will be automatically incremented by the instrument.
Valid Entries: any integer greater than or equal to 0
Default: 0

**lErrProb** Error probability level for Total Jitter. Total Jitter is calculated based on the desired Error Probability level. This value is used in conjunction with the bathtub curve after the successful completion of a tail-fit in order to project the value of Total Jitter.
Valid Entries: -1 to -16
Default: -12

**lTailFit** Flag to indicate whether to perform a TailFit on data in tAcum data array. If non-zero, a tail-fit will be attempted on the **tAcum** data array. The lGood element of the tTfit structure will indicate if the TailFit was successful. Any positive interger for this parameter will initiate the TailFit algorithm.
Valid Entries: 0 – disable TailFit
1 – enable TailFit
Default: 0

**lForcFit** If non-zero uses the force-fit method. If set to zero, the measurement will continue to loop until a reasonably accurate TailFit can be achieved.
Valid Entries: 0 – do not use force fit.
1 – force a fit using lMinHits number of hits.
Default: 0

**lMinHits** Minimum hits before attempting a tail-fit in 1000's; the default is 50. The larger the number the more likely a valid tailfit will be found.
Valid Entries: any integer ≥ 50
Default: 50

**lFndEftv** Flag to indicate that an effective jitter calculation is to be attempted. This is necessary for those instances in which correlation to a BERT scan is necessary. In all other practical applications, this parameter and it's resultant measurement should be ignored.
Valid Entries: 0 – do not estimate effective jitter values
1 – calculate effective jitter values
Default: 0

**lMinEftv, lMaxEftv** Defines the range of the bathtub curve that is to be used to calculate an effective jitter value.
Valid Entries: -1 to –16 with lMinEftv < lMaxEftv
Default: -4 for MaxEftv and –12 for MinEftv

**lAutoFix** Flag indicating whether to perform a pulse-find as required. Setting this value to any integer greater than zero tells the measurement to perform a pulse find if needed. The system will know if a measurement was recently performed and if a pulse find is necessary.
Valid Entries: 0 – no pulsefind prior to measurement
1 –pulsefind if the measurement mode changed.
Default: 0

**lGood** Flag indicates valid output data in structure. This parameter does not indicate success of TailFit measurement only whether a valid time measurement was performed and valid measurement data was placed in tNorm, tAcum and tMaxi.

**lNormCnt** Number of measurements in tNorm plot array.

**dNormMin, dNormMax** Minimum and maximum values in tNorm plot array.

**dNormAvg** Average value of distribution in tNorm plot array.

**dNormSig** Standard Deviation (1-Sigma (1σ)) value of distribution in tNorm plot array.

**lAcumCnt** Number of hits of distribution in tAcum plot array.

**dAcumMin, dAcumMax** Minimum and maximum values of distribution in tAcum plot array.

**dAcumAvg** Average value of distribution in tAcum plot array.

**dAcumSig** 1-Sigma value of distribution in tAcum plot array.

**lBinNumb, dLtSigma, dRtSigma** These values are for internal use only, DO NOT ALTER or try to use.

**tNorm** A structure of type PLOT containing a Histogram of data from latest acquisition only. See Section 7-3 for further details on PLOT structures.

**tAcum** A structure of type PLOT containing Histogram of data from all acquisitions combined. See Section 7-3 for further details on PLOT structures.

**tMaxi** A structure of type PLOT containing Histogram with the maximum value obtained for every particular bin across all of the acquisitions performed so far. See Section 7-3 for further details on PLOT structures.

**tBath** A structure of type PLOT containing Bathtub curves determined from PDF, only valid when a successful tail-fit has been performed. See Section 7-3 for further details on PLOT structures.

**tEftv** A structure of type PLOT containing Effective Bathtub curves if lFndEftv is set and a valid fit is obtained. Effective Bathtub curves are used for correlation to BERT scan only. See Section 7-3 for further details on PLOT structures.

**tTfit** A structure of type TFIT containing tail-fit info; only valid when a successful tail-fit has been performed. See end of chapter for additional details. See Section 7-3 for further details on TFIT structures.

## 7-28 INFINIBAND TOOL

This tool is similar to the Random Data With Bitclock Tool, but also provides voltage information.

### Command syntax - :ACQuire:INFINIband<#xyy…ddddddd…>

Example: Send(0,5,":ACQ:INFINI#41872…",1889,EOI);

```
typedef struct
  {
  /* Input parameters  */
  long    lVoff;              /* Offset voltage used for scope acquire  */
  long    lPad1;
  double  dAttn;              /* Attenuation factor (dB)                */
  EYEH    tEyeh;              /* EYEH structure holds most information  */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad2;
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  PLOT    tDifScop;           /* Differential voltage data              */
  PLOT    tComScop;           /* Common (A+B) voltage data              */
  } INFI;
```

**lVoff** Offset voltage used for scope acquire, specified in mV

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**tEyeh** This is the same structure as is defined in the Random Data With Bitclock tool. It contains all the acquisition parameters and all the output results associated with this measurement, with the exception of those defined directly above.
Default: See Random Data With Bitclock Tool

**lGood** Flag indicates valid data in structure

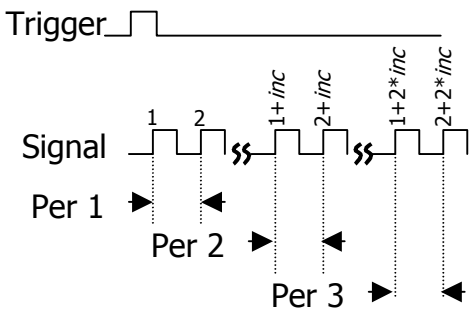
**tNrmScop** Normal channel voltage data

**tCmpScop** Complimentary channel voltage data

**tDifScop** Differential voltage data

**tComScop** Common (A+B) voltage data

## 7-29 LOCKTIME ANALYSIS TOOL




The Locktime Analysis tool is used to analyze timing measurement variation as a function of location in pattern. This is important when measuring periods, pulse widths, slew rates and propagation delay right after an event such as a reset, power-up, data bus read/write, chip enable, ref clock enable etc. Common measurements include PLL lock time and cross talk sensitivity to specific functionalities occurring on the DUT. The Locktime Analysis Tool makes several measurements of the same event after a trigger and then can increment to the next event. For example, a period measurement could be made on the first clock pulse after a trigger occurs. This measurement could be made hundreds of times. Then, this tool automatically will increment to the next clock period and measure that one hundred times. This is repeated for as many sequential periods as desired. The increment and the number of measurements is programmed by the user.

**Command syntax - :ACQ**uire**:LOCK**time(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>
Example: Send(0,5,":ACQ:LOCK(@4)#41112…",1131,EOI);

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  FFTS    tFfts;              /* FFT window and analysis parameters     */
  long    lIncStrt;           /* Increase start count by this value     */
  long    lMaxStrt;           /* Maximum start count to collect data    */
  long    lAnlMode;           /* Relationship of start and stop counts  */
                              /* Use one of:  ANL_FNC_FIRST             */
                              /*              ANL_FNC_PLUS1             */
                              /*              ANL_FNC_START             */
  long    lAutoFix;           /* If true calculate the above parameters */
  long    lSpanCnt;           /* The span across which to measure       */
  long    lDataPts;           /* The data points within span to measure */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad1;
  PLOT    tTime;              /* Time domain plot data                  */
  PLOT    tDerv;              /* 1st derivative of time domain plot data*/
  PLOT    tFftT;              /* Frequency domain plot data             */
  PLOT    tFftD;              /* Frequency domain of 1st derivative     */
  PLOT    tSigm;              /* Contains the 1-Sigma plot array        */
  PLOT    tPeak;              /* Contains the ( max - min ) plot array  */
  PLOT    tMini;              /* Contains the Minimum plot array        */
  PLOT    tMaxi;              /* Contains the Maximum plot array        */
  double  dSigmAvg;           /* Average 1-Sigma value                  */
  double  dSigmMin;           /* Minimum 1-Sigma value                  */
  double  dSigmMax;           /* Maximum 1-Sigma value                  */

  double  dTimePos;           /* Maximum increase between time values   */
  double  dTimeNeg;           /* Maximum decrease between time values   */
  long    lTimePosLoc;        /* Index to max increase between values   */
  long    lTimeNegLoc;        /* Index to max decrease between values   */

  double  dDervPos;           /* Maximum increase between 1st deriv's   */
  double  dDervNeg;           /* Maximum decrease between 1st deriv's   */
```

```
  long    lDervPosLoc;        /* Index to max incr. between 1st deriv's */
  long    lDervNegLoc;        /* Index to max decr. between 1st deriv's */

  double  dFreq;              /* Carrier frequency                      */
  } FUNC;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM structure is discussed in full detail in Section 7-4.

**tFfts** A structure of type FFTS that contains the setup parameters for the FFT. See Section 7-10 for further details on FFTS structures.

**lIncStrt** Resolution of successive time measurements. This parameter defines the number edges to skip between successive measurements. Increase start count by this value, the default is 1. Data is collected for start counts ranging from tParm.lStrtCnt to lMaxStrt.
Valid Entries: 1 to lMaxStrt
Default: 1

**lMaxStrt** Maximum start count used. The start count will be incremented from the value in tParm.lStrtCnt to lMaxStrt in step size of lIncStrt.
Valid Entries: tParm.StrtCnt to 10,000,000
Default: 250

**lAnlMode** Relationship of start and stop counts. In general, this measurement is done either on a single channel measuring successive cycles' slew rate, period or pulse width. As such, the stop count will always be either equal to the start count or one more than the start count in the case of period measurements.
Valid Entries: ANL_FNC_PLUS1 Stop Count = Start Count + 1
Use this for period measurements
ANL_FNC_START Stop Count = Start Count
Use this for skew, slew rate and pulse width
Default: ANL_FNC_PLUS1

**lAutoFix** If set to 1, calculate the number of measurements skipped and the total number of measurements based on lSpanCnt and lDataPts plus information measured on the live data signal.
Valid Entries: 0 use lMaxStrt, tParm.lStrtCnt & lIncStrt to calculate the stop counts for each measurement.
1 use lSpanCnt, DataPts and measured data from signal to calculate the stop counts for each measurement.
Default: 0

**lSpanCnt** The total number of edges across which to measure. This is the maximum delay count for a measurement and is synonymous with lMaxStrt.
Valid Entries: 1 to 10,000,000-tParm.StrCnt
Default: 1000

**lDataPts** The total data points within span to measure. If every data point is to be measured such that the start and stop counters are incremented by one, then lDataPts must equal lSpanCnt. The
Valid Entries: 1 to lSpanCnt
Default: 100

**lGood** Flag indicates valid output data in structure.

**tTime** A structure of type PLOT containing the time domain plot data. See Section 7-3 for details on the PLOT structure elements.

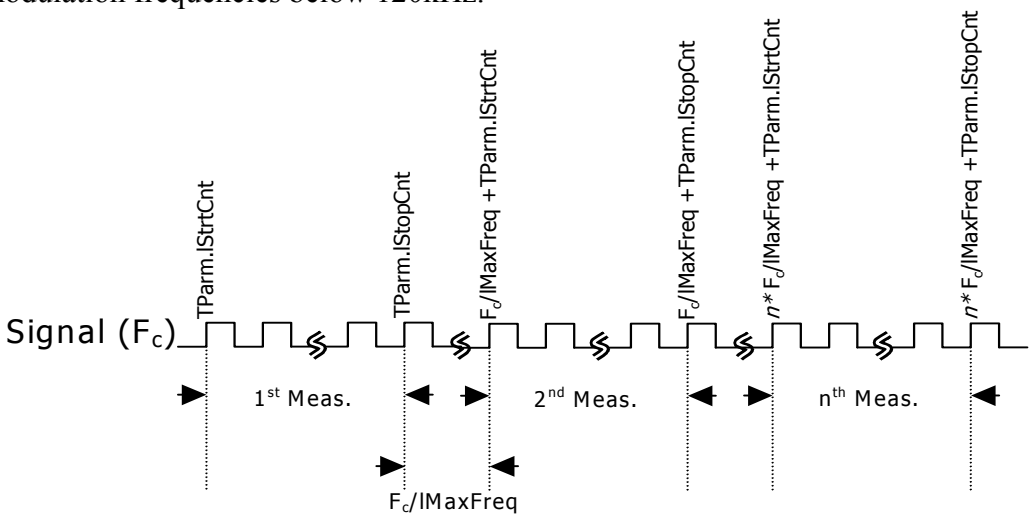
**tDerv** A structure of type PLOT containing 1st derivative of time domain plot data. See Section 7-3 for details on the PLOT structure elements.

**tFftT** A structure of type PLOT containing Frequency domain plot data. See Section 7-3 for details on the PLOT structure elements.

| | |
|---|---|
| **tFftD** | A structure of type PLOT containing Frequency domain of 1st derivative plot data. See Section 7-3 for details on the PLOT structure elements. |
| **tSigm** | A structure of type PLOT containing 1-Sigma plot array. See Section 7-3 for details on the PLOT structure elements. |
| **tPeak** | A structure of type PLOT containing the ( max - min ) plot array. See Section 7-3 for details on the PLOT structure elements. |
| **tMini** | A structure of type PLOT containing the Minimum plot array. See Section 7-3 for details on the PLOT structure elements. |
| **tMaxi** | A structure of type PLOT containing the Maximum plot array. See Section 7-3 for details on the PLOT structure elements. |
| **dSigmAvg** | Average 1-Sigma value. |
| **dSigmMin** | Minimum 1-Sigma value. |
| **dSigmMax** | Maximum 1-Sigma value. |
| **dTimePos** | Maximum increase between time values. |
| **dTimeNeg** | Maximum decrease between time values. |
| **lTimePosLoc** | Index to maximum increase between values. |
| **lTimeNegLoc** | Index to maximum decrease between values. |
| **dDervPos** | Maximum increase between 1st derivative values. |
| **dDervNeg** | Maximum decrease between 1st derivative values. |
| **lDervPosLoc** | Index to maximum increase between 1st derivative values. |
| **lDervNegLoc** | Index to maximum decrease between 1st derivative values. |
| **dFreq** | Carrier frequency. |

## 7-30 LOW FREQUENCY MODULATION ANALYSIS TOOL

The Low Frequency Modulation Analysis tool is used to analyze low frequency modulation on clock signals. It uses its internal time stamp capability to identify when a given measurement is made. This tool combines the actual time measurements with the relative time each measurement was made to identify low frequency modulation components. This tool can be used for modulation frequencies below 120kHz.




**Command syntax- :ACQuire:TIMeDIGitizer(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:TIMDIG(@4)#3664…",684,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  FFTS    tFfts;              /* FFT window and analysis parameters     */
  long    lAutoFix;           /* If true calculate the above parameters */
  long    lPad1;
  double  dMaxFreq;           /* Maximum Frequency that is desired      */
  long    lFftAvgs;           /* 2^fft_avgs averages used to smooth FFT */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  PLOT    tTime;              /* Time domain plot data                  */
  PLOT    tStmp;              /* Time stamp array, not normally plotted */
  PLOT    tFft1;              /* Frequency plot data on 1-clock basis   */
  PLOT    tFftN;              /* Frequency plot data on N-clock basis   */
  double  dCarFreq;           /* Carrier frequency                      */
  double  dSmpRate;           /* Sampling rate                          */
  double  dFftNdBc;           /* dBc assessed on 1-clock FFT data       */
  } TDIG;
```

**tParm** A structure of type PARM that contains acquisition parameters. The PARM structure is discussed in full detail in Section 7-4. tParm.lStampTm is enabled for this tool by default. All other defaults listed in Section 7-4 apply.

**tFfts** A structure of type FFTS that contains the FFT setup parameters such as window type and padding factor. See Section 7-10 for further details.

**lAutoFix** This tool uses tParm.lSampCnt to define the number of measurements to make and the span of tParm.lStrCnt to tParm.lStopCnt to define the maximum frequency observed in the FFT plots. If this structure element is set to 1, then tParm.StrCnt and tParm.lStopCnt will be calculated based on dMaxFreq plus information measured on the live data signal.
Valid Entries: 0 – use tParm data
1 – calculate tParm data using dMaxFreq
Default: 0

**dMaxFreq** Maximum Frequency information that is desired.

**lFftAvgs** This variable is used to calculate the number of averages to use in the FFT. Increasing the number of averages reduces the background noise associated with the FFT algorithm. The number of averages is calculated based on the equation:
AVERAGES = $2^n$ where n = lFftAvgs
Valid Entries: any integer greater than or equal to 0
Default: 0 (indicating $2^0$ averages = 1 execution.)

**lGood** Flag to indicate valid output data is in structure.

**tTime** A structure of type PLOT containing the time domain plot data. See Section 7-3 for details on the PLOT structure elements.

**tStmp** A structure of type PLOT containing time stamp data plot data. This is not normally plotted. See Section 7-3 for details on the PLOT structure elements.

**tFft1** A structure of type PLOT containing the Frequency plot data with frequency amplitude roll off of 20dB/decade from the sampling Nyquist Frequency. This plot is typically used for debug purposes only. See Section 7-3 for details on the PLOT structure elements.

**tFftN** A structure of type PLOT containing the Frequency plot data with amplitudes representing the cumulative effect of the frequency component. See Section 7-3 for details on the PLOT structure elements.

**dCarFreq** Carrier frequency.

**dSmpRate** Sampling rate.

**dFftNdBc** dBc assessed on 1-clock FFT data.

## 7-31 OSCILLOSCOPE TOOL

The Oscilloscope Tool is typically used to view the waveform of a signal relative to a trigger. This is the original binary packet command for conducting an oscilloscope measurement, and was later replaced by the :ACQ:SCOPE command, but is still supported for legacy operations.

**Command syntax - :ACQuire:OSCilloscope<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:OSC#44088…",4102,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  FFTS    tFfts;              /* FFT window and analysis parameters     */
  long    lStrt;              /* Start time (ps), 20,000 to 100,000,000 */
  long    lStop;              /* Stop time (ps),  20,000 to 100,000,000 */
  long    lIncr;              /* Time increment (ps), minimum is 10     */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  PLOT    tTime[ POSS_CHNS ]; /* Time domain plot of voltage data       */
  PLOT    tFreq[ POSS_CHNS ]; /* Frequency domain plot of voltage data  */
  PLOT    tNorm[ POSS_CHNS ]; /* Normal channel voltage data (3000 only)*/
  PLOT    tComp[ POSS_CHNS ]; /* Complimentary  voltage data (3000 only)*/
  } OSCI;
```

**tParm** A structure of type PARM that contains acquisition parameter. See Section 7-4 for further details concerning this structure.

**tFfts** A structure of type FFTS that contains setup parameters for the FFT window. These parameters needs to be set if the user is interested in capturing the spectrum analysis on the waveform. See Section 7-10 for further details concerning this structure.

**lStrt** Start time in picoseconds.
Valid Entries: (24,000 to 100,000,000)
Default: 24,000

**lStop** Stop time in picoseconds
Valid Entries: (24,000 to 100,000,000)
Default: 100,000

**lIncr** Resolution of time base in picoseconds. Maximum Resolution is equal to the window width (lStop - lStrt), such that only 2 data points would be captured.
Valid Entries: (10 to *window width*)
Default: 500

**lGood** Flag indicates waveform capture was successful and valid output data is in the structure.

**tTime[*n*]** A structure of type PLOT which contains the differential time domain plot of voltage data for channel *n*. See Section 7-3 for further details on PLOT structures.

**tFreq[*n*]** A structure of type PLOT which contains the differential frequency domain plot of voltage data for channel *n*. See Section 7-3 for further details on PLOT structures.

**tNorm[*n*]** A structure of type PLOT which contains the single ended time domain plot of the positive channel voltage information for channel *n*. See Section 7-3 for further details on PLOT structures.

**tComp[*n*]** A structure of type PLOT which contains the single ended time domain plot of the negative channel voltage information for channel *n*. See Section 7-3 for further details on PLOT structures.

## 7-32 PCI EXPRESS 1.1 WITH HARDWARE CLOCK RECOVERY TOOL

The PCI Express 1.1 with Hardware Clock Recovery Tool provides both timing and amplitude compliance measurements using the SIA3000 Multirate Clock Recovery Option. This tool accurately determines device performance by quantifying both random and deterministic jitter components.

### Command syntax - :ACQuire:PCIM<#xyy…ddddddd…>

Example: `Send(0,5,":ACQ:PCIM#42520…",2535,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lCompPnt;           /* Compliance Point 0-RX 1-TX             */
  long    lPcnt;              /* Amount +/- 50% to calc. rise/fall time */
  long    lHiRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lLoRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lIdleOk;            /* Common mode idle voltages are valid    */
  long    lPad0;
  double  dAttn;              /* Attenuation factor (dB)                */
  RCPM    tRcpm;              /* Contains acquisition parameters        */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad1;
  double  dEyeOffs;
  double  dXmnDiff;
  double  dXmxDiff;
  double  dVdiffPP;           /* Pk-pk differential voltage             */
  double  dVdRatio;           /* De-emphaisis voltage ratio             */
  double  dOpnEyeT;           /* Eye opening                            */
  double  dMedEyeT;           /* Median to max jitter                   */
  double  dOpnEyeT1M;         /* Eye opening @ 10^-6 BER                */
  double  dTranVolts;         /* Vpp for Transition Eye                 */
  double  dDeemVolts;         /* Vpp for De-Emphasis Eye                */

  double  dVcommonAc;         /* V?x-cm-acp                             */
  double  dVcommonDc;         /* V?x-cm-dc                              */
  double  dVcmDcActv;         /* V?x-cm-dc-active-idle-delta            */
  double  dVcmIdleDc;         /* V?x-cm-idle-dc                         */
  double  dVcmDcLine;         /* V?x-cm-dc-line-delta                   */
  double  dVcmDcDpls;         /* V?x-cm-dc-d+                           */
  double  dVcmDcDmin;         /* V?x-cm-dc-d-                           */
  double  dVIdleDiff;         /* V?x-idle-diffp                         */

  QTYS    qNorm;              /* Normal channel quantities              */
  QTYS    qComp;              /* Complimentary channel  quantities      */
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  char   *bTranEye;
  long    lTranRsv;
  char   *bDeemEye;
  long    lDeemRsv;
  } PCIM;
```

**lCompPnt** Compliance Point, may be one of the following constants:
PCIX_RX_MODE – Receive Mode
PCIX_TX_MODE – Transmit Mode
PCIX_RX_CARD – Receive Add-In Card Mode
PCIX_TX_CARD – Transmit Add-In Card Mode

PCIX_RX_SYST – Receive System Card Mode
PCIX_TX_SYST – Transmit System Card Mode
Default: PCIX_RX_MODE

**lPcnt** This field specifies the voltage thresholds to be used when calculating rise and fall times. The voltage thresholds are assumed to be symmetrical about the 50% threshold, and this is the distance from the 50% threshold to the starting and ending thresholds. For example if this field is equal to 30, then 20% and 80% thresholds are used. If this field is equal to 40, then 10% and 90% thresholds are used. The absolute voltage levels used are based on the previous pulsefind minimum and maximum voltages. If this field is negative, then the absolute rise and fall thresholds are taken from the following fields lHiRFmV and lLoRFmv.
Default: 30

**lHiRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: +250

**lLoRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: -250

**lIdleOk** This flag is set by the system when an Idle Mode measurement is successfully made. The results are then applied in subsequent measurements. Set this flag to zero to invalidate the previous Idle Mode measurement results, and force a new Idle measurement to be made using the command :PCIM:IDLE? Before the common mode idle voltages are applied once again.
Default: 0

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**tRcpm** Datacom With Bitclock and Marker Tool which specifies most of the input and output parameters necessary for a data signal analysis. The user will need to review all of the default parameters of the Datacom With Bitclock and Marker Tool and decide which to change.

**lGood** Flag indicates valid data in structure

**dEyeOffs, dXmnDiff, dXmxDiff** Used internally, DO NOT ALTER!

**dVdiffPP** Pk-pk differential voltage

**dVdRatio** De-emphaisis voltage ratio

**dOpnEyeT** Eye opening at Bit Error rate 10e-12

**dMedEyeT** Median to max jitter based on 1 million samples

**dOpnEyeT1M** Eye opening at Bit Error rate 10e-6

**dTranVolts** Vpp for Transition Eye

**dDeemVolts** Vpp for De-Emphasis Eye

**dVcommonAc** V?x-cm-acp

**dVcommonDc** V?x-cm-dc

**dVcmDcActv** V?x-cm-dc-active-idle-delta

**dVcmIdleDc** V?x-cm-idle-dc

**dVcmDcLine** V?x-cm-dc-line-delta

**dVcmDcDpls** V?x-cm-dc-d+

**dVcmDcDmin** V?x-cm-dc-d-

**dVIdleDiff** V?x-idle-diffp

**qNorm** Normal channel quantities

**qComp** Complimentary channel quantities

**tNrmScop** Normal channel voltage data

**tCmpScop** Complimentary channel voltage data

**bTranEye,lTranRsv, bDeemEye,lDeemRsv** Used internally, DO NOT ALTER!

## 7-33 PCI EXPRESS 1.1 WITH SOFTWARE CLOCK RECOVERY TOOL

The PCI Express 1.1 with Software Clock Recovery Tool provides both timing and amplitude compliance measurements using the SIA3000. This tool accurately determines device performance by quantifying both random and deterministic jitter components.

### Command syntax - :ACQuire:EXPR<#xyy…ddddddd…>

Example: `Send(0,5,":ACQ:EXPR#42480…",2495,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lCompPnt;           /* Compliance Point 0-RX 1-TX             */
  long    lPcnt;              /* Amount +/- 50% to calc. rise/fall time */
  long    lHiRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lLoRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lIdleOk;            /* Common mode idle voltages are valid    */
  long    lPass;              /* Acquisitions so far, set to 0 to reset */
  double  dAttn;              /* Attenuation factor (dB)                */
  KPWM    tKpwm;              /* Contains acquisition parameters        */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lTtlHits;
  double  dEyeOffs;
  double  dHistMed;
  double  dXmnDiff;
  double  dXmxDiff;
  double  dVdiffPP;           /* Pk-pk differential voltage             */
  double  dVdRatio;           /* De-emphaisis voltage ratio             */
  double  dOpnEyeT;           /* Eye opening                            */
  double  dMedEyeT;           /* Median to max jitter                   */
  double  dOpnEyeT1M;         /* Eye opening @ 10^-6 BER                */
  double  dTranVolts;         /* Vpp for Transition Eye                 */
  double  dDeemVolts;         /* Vpp for De-Emphasis Eye                */

  double  dVcommonAc;         /* V?x-cm-acp                             */
  double  dVcommonDc;         /* V?x-cm-dc                              */
  double  dVcmDcActv;         /* V?x-cm-dc-active-idle-delta            */
  double  dVcmIdleDc;         /* V?x-cm-idle-dc                         */
  double  dVcmDcLine;         /* V?x-cm-dc-line-delta                   */
  double  dVcmDcDpls;         /* V?x-cm-dc-d+                           */
  double  dVcmDcDmin;         /* V?x-cm-dc-d-                           */
  double  dVIdleDiff;         /* V?x-idle-diffp                         */

  QTYS    qNorm;              /* Normal channel quantities              */
  QTYS    qComp;              /* Complimentary channel  quantities      */
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  PLOT    tTtlHist;           /* Total Histogram of median-to-max data  */
  char   *bTranEye;
  long    lTranRsv;
  char   *bDeemEye;
  long    lDeemRsv;
  } EXPR;
```

**lCompPnt** Compliance Point, may be one of the following constants:
PCIX_RX_MODE – Receive Mode
PCIX_TX_MODE – Transmit Mode
PCIX_RX_CARD – Receive Add-In Card Mode

PCIX_TX_CARD – Transmit Add-In Card Mode
PCIX_RX_SYST – Receive System Card Mode
PCIX_TX_SYST – Transmit System Card Mode
Default: PCIX_RX_MODE

**lPcnt** This field specifies the voltage thresholds to be used when calculating rise and fall times. The voltage thresholds are assumed to be symmetrical about the 50% threshold, and this is the distance from the 50% threshold to the starting and ending thresholds. For example if this field is equal to 30, then 20% and 80% thresholds are used. If this field is equal to 40, then 10% and 90% thresholds are used. The absolute voltage levels used are based on the previous pulsefind minimum and maximum voltages. If this field is negative, then the absolute rise and fall thresholds are taken from the following fields lHiRFmV and lLoRFmv.
Default: 30

**lHiRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: +250

**lLoRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: -250

**lIdleOk** This flag is set by the system when an Idle Mode measurement is successfully made. The results are then applied in subsequent measurements. Set this flag to zero to invalidate the previous Idle Mode measurement results, and force a new Idle measurement to be made using the command :EXPR:IDLE? Before the common mode idle voltages are applied once again.
Default: 0

**lPass** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets this register. It will be automatically incremented when a measurement is performed.
Valid Entries: any integer greater than or equal to 0
Default: 0

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**tKpwm** Known Pattern With Marker Tool which specifies most of the input and output parameters necessary for a data signal analysis. The user will need to review all of the default parameters of the Known Pattern With Tool and decide which to change.

**lGood** Flag indicates valid data in structure

**lTtlHits** Total hits collected in the Total Jitter Histogram

**dHistMed** Median location for the Total Jitter Histogram

**dEyeOffs, dXmnDiff, dXmxDiff** Used internally, DO NOT ALTER!

**dVdiffPP** Pk-pk differential voltage

**dVdRatio** De-emphaisis voltage ratio

**dOpnEyeT** Eye opening at Bit Error rate 10e-12

**dMedEyeT** Median to max jitter based on 1 million samples

**dOpnEyeT1M** Eye opening at Bit Error rate 10e-6

**dTranVolts** Vpp for Transition Eye

**dDeemVolts** Vpp for De-Emphasis Eye

**dVcommonAc** V?x-cm-acp

**dVcommonDc** V?x-cm-dc

**dVcmDcActv** V?x-cm-dc-active-idle-delta

**dVcmIdleDc** V?x-cm-idle-dc

**dVcmDcLine** V?x-cm-dc-line-delta
**dVcmDcDpls** V?x-cm-dc-d+
**dVcmDcDmin** V?x-cm-dc-d-
**dVIdleDiff** V?x-idle-diffp
**qNorm** Normal channel quantities
**qComp** Complimentary channel quantities
**tNrmScop** Normal channel voltage data
**tCmpScop** Complimentary channel voltage data
**tTtlHist** Total Jitter Histogram data
**bTranEye,lTranRsv, bDeemEye,lDeemRsv** Used internally, DO NOT ALTER!

## 7-34 PCI EXPRESS 1.1 CLOCK ANALYSIS TOOL

The PCI Express 1.1 Clock Analysis Tool provides both timing and amplitude compliance measurements for PCI Express Reference Clocks using the SIA3000. This tool accurately determines device performance by quantifying both random and deterministic jitter components.

**Command syntax - :ACQuire:PCLK**<#xyy…ddddddd…>

Example: `Send(0,5,":ACQ:PCLK#42632…",2647,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lPcnt;              /* Amount +/- 50% to calc. rise/fall time */
  long    lHiRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lLoRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lPad0;
  double  dAttn;              /* Attenuation factor (dB)                */
  KPWM    tKpwm;              /* Contains acquisition parameters        */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad1;
  double  dRiseRate;          /* Rising edge rate (V/ns)                */
  double  dFallRate;          /* Falling edge rate (V/ns)               */
  double  dDifMaxVin;         /* Differential Input High Voltage        */
  double  dDifMinVin;         /* Differential Input Low Voltage         */

  double  dPeriodPpm;         /* Average Clock Period Accuracy          */
  double  dPeriodMin;         /* Absolute Period Minimum                */
  double  dPeriodMax;         /* Absolute Period Maximum                */
  double  dCycl2Cycl;         /* Cycle to Cycle Jitter                  */
  double  dVmaxSingl;         /* Absolute Max input voltage             */
  double  dVminSingl;         /* Absolute Min input voltage             */
  double  dDutyCycle;         /* Duty Cycle                             */
  double  dRFMatches;         /* Rising Rate to Falling Rate Matching   */
  double  dMaxJitt1M;         /* Maximum Pk-Pk Jitter @ 10^-6 BER       */

  QTYS    qNorm;              /* Normal channel quantities              */
  QTYS    qComp;              /* Complimentary channel  quantities      */
  QTYS    qDiff;              /* Differential channel  quantities       */
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  PLOT    tDifScop;           /* Differential channel voltage data      */
  } PCLK;
```

**lPcnt** This field specifies the voltage thresholds to be used when calculating rise and fall times. The voltage thresholds are assumed to be symmetrical about the 50% threshold, and this is the distance from the 50% threshold to the starting and ending thresholds. For example if this field is equal to 30, then 20% and 80% thresholds are used. If this field is equal to 40, then 10% and 90% thresholds are used. The absolute voltage levels used are based on the previous pulsefind minimum and maximum voltages. If this field is negative, then the absolute rise and fall thresholds are taken from the following fields lHiRFmV and lLoRFmv.

Default: 30

**lHiRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV

Default: +250

| | |
|---|---|
| **lLoRFmV** | Absolute rise/fall voltage if lPcnt<0, in units of mV<br>Default: -250 |
| **lPad0** | Used internally, DO NOT ALTER! |
| **dAttn** | Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.<br>Default: 0 |
| **tKpwm** | Known Pattern With Marker Tool which specifies most of the input and output parameters necessary for a data signal analysis. The user will need to review all of the default parameters of the Known Pattern With Marker Tool and decide which to change. |
| **lGood** | Flag indicates valid data in structure |
| **lPad1** | Used internally, DO NOT ALTER! |
| **dRiseRate** | Rising edge rate (V/ns) |
| **dFallRate** | Falling edge rate (V/ns) |
| **dDifMaxVin** | Differential Input High Voltage |
| **dDifMinVin** | Differential Input Low Voltage |
| **dPeriodPpm** | Average Clock Period Accuracy expressed in Parts Per Million |
| **dPeriodMin** | Absolute Period Minimum in seconds |
| **dPeriodMax** | Absolute Period Maximum in seconds |
| **dCycl2Cycl** | Cycle-To-Cycle Jitter in seconds |
| **dVmaxSingl** | Absolute Max Single-Ended input voltage |
| **dVminSingl** | Absolute Min Single-Ended input voltage |
| **dDutyCycle** | Duty Cycle expressed as a percentage |
| **dRFMatches** | Rising Rate to Falling Rate Matching expressed as a Percentage |
| **dMaxJitt1M** | Maximum Pk-Pk Jitter @ 10^-6 BER |
| **qNorm** | Normal channel quantities |
| **qComp** | Complimentary channel quantities |
| **qDiff** | Differential (IN - /IN) channel quantities |
| **tNrmScop** | Normal channel voltage data |
| **tCmpScop** | Complimentary channel voltage data |
| **tDifScop** | Differential (IN - /IN) channel voltage data |

## 7-35 PCI EXPRESS 1.0a TOOL

The PCI Express Tool provides both timing and amplitude compliance measurements in any environment, system or IC, electrical or optical. Compliance tests can be completed in seconds with a simple pass/fail indication for each test parameter. It is the most comprehensive and easy to use signal integrity test solution on the market today.

The PCI Express Tool accurately determines device performance by quantifying random and deterministic jitter components. In addition, the PCI Express Tool can quickly isolate and quantify unwanted deterministic jitter due to crosstalk and EMI with a spectral view of jitter as well as perform Eye Diagram analysis for a quick qualitative view of device performance.

**Command syntax - :ACQuire:PCIEXpress<#xyy…ddddddd…>**

Example: `Send(0,5,":ACQ:PCIEX#42496…",2512,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lCompPnt;           /* Compliance Point 0-RX 1-TX             */
  long    lPcnt;              /* Amount +/- 50% to calc. rise/fall time */
  long    lHiRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lLoRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lIdleOk;            /* Common mode idle voltages are valid    */
  long    lPad0;
  double  dAttn;              /* Attenuation factor (dB)                */
  RCPM    tRcpm;              /* Contains acquisition parameters        */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad1;
  double  dEyeOffs;
  double  dXmnDiff;
  double  dXmxDiff;
  double  dVdiffPP;           /* Pk-pk differential voltage             */
  double  dVdRatio;           /* De-emphaisis voltage ratio             */
  double  dOpnEyeT;           /* Eye opening                            */
  double  dMedEyeT;           /* Median to max jitter                   */

  double  dVcommonAc;         /* V?x-cm-acp                             */
  double  dVcommonDc;         /* V?x-cm-dc                              */
  double  dVcmDcActv;         /* V?x-cm-dc-active-idle-delta           */
  double  dVcmIdleDc;         /* V?x-cm-idle-dc                         */
  double  dVcmDcLine;         /* V?x-cm-dc-line-delta                   */
  double  dVcmDcDpls;         /* V?x-cm-dc-d+                           */
  double  dVcmDcDmin;         /* V?x-cm-dc-d-                           */
  double  dVIdleDiff;         /* V?x-idle-diffp                         */

  QTYS    qNorm;              /* Normal channel quantities              */
  QTYS    qComp;              /* Complimentary channel  quantities      */
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  char   *bTranEye;
  long    lTranRsv;
  char   *bDeemEye;
  long    lDeemRsv;
  } PCIX;
```

**lCompPnt** Compliance Point, may be one of the following constants:
PCIX_RX_MODE – Receive Mode

PCIX_TX_MODE – Transmit Mode
PCIX_RX_CARD – Receive Add-In Card Mode
PCIX_TX_CARD – Transmit Add-In Card Mode
PCIX_RX_SYST – Receive System Card Mode
PCIX_TX_SYST – Transmit System Card Mode
Default: PCIX_RX_MODE

**lPcnt** This field specifies the voltage thresholds to be used when calculating rise and fall times. The voltage thresholds are assumed to be symmetrical about the 50% threshold, and this is the distance from the 50% threshold to the starting and ending thresholds. For example if this field is equal to 30, then 20% and 80% thresholds are used. If this field is equal to 40, then 10% and 90% thresholds are used. The absolute voltage levels used are based on the previous pulsefind minimum and maximum voltages. If this field is negative, then the absolute rise and fall thresholds are taken from the following fields lHiRFmV and lLoRFmv.
Default: 30

**lHiRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: +250

**lLoRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: -250

**lIdleOk** This flag is set by the system when an Idle Mode measurement is successfully made. The results are then applied in subsequent measurements. Set this flag to zero to invalidate the previous Idle Mode measurement results, and force a new Idle measurement to be made using the command :PCIX:IDLE? Before the common mode idle voltages are applied once again.
Default: 0

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**tRcpm** Datacom With Bitclock and Marker Tool which specifies most of the input and output parameters necessary for a data signal analysis. The user will need to review all of the default parameters of the Datacom With Bitclock and Marker Tool and decide which to change.

**lGood** Flag indicates valid data in structure

**dEyeOffs, dXmnDiff, dXmxDiff** Used internally, DO NOT ALTER!

**dVdiffPP** Pk-pk differential voltage

**dVdRatio** De-emphaisis voltage ratio

**dOpnEyeT** Eye opening

**dMedEyeT** Median to max jitter

**dVcommonAc** V?x-cm-acp

**dVcommonDc** V?x-cm-dc

**dVcmDcActv** V?x-cm-dc-active-idle-delta

**dVcmIdleDc** V?x-cm-idle-dc

**dVcmDcLine** V?x-cm-dc-line-delta

**dVcmDcDpls** V?x-cm-dc-d+

**dVcmDcDmin** V?x-cm-dc-d-

**dVIdleDiff** V?x-idle-diffp

**qNorm** Normal channel quantities

**qComp** Complimentary channel quantities

**tNrmScop** Normal channel voltage data

**tCmpScop** Complimentary channel voltage data

**bTranEye,lTranRsv, bDeemEye,lDeemRsv** Used internally, DO NOT ALTER!

## 7-36 PHASE NOISE TOOL

The Phase Noise tool allows users to measure phase noise in clock/oscillator sources. By simply choosing the highest frequency to be displayed and the frequency resolution, the tool will measure and display the phase noise spectrum. This tool reports the phase noise values at common offset frequencies.

The Phase Noise tool is used to show the amplitude and frequency of phase noise relative to the carrier signal frequency. This tool measures the fluctuations in the phase of a signal caused by time domain instabilities. Fast and easy phase noise measurements of oscillators and PLL devices can be easily correlated to other noise effects on the signal.

The sensitivity of the tool is limited by hardware and is dependent on f0 and Maximum Freq. Alternate methods of characterizing random noise in clock sources are available in the SIA-3000.

**Command syntax - :ACQuire:PHASEnoise(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:PHASE(@4)#3728…",747,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  FFTS    tFfts;              /* FFT window and analysis parameters     */
  long    lAutoFix;           /* If true calculate the above parameters */
  long    lPad1;
  double  dMaxFreq;           /* Maximum Frequency that is desired      */
  double  dFreqRes;           /* Frequency resolution that is desired   */
  long    lFftAvgs;           /* 2^fft_avgs averages used to smooth FFT */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  PLOT    tTime;              /* Time domain plot data                  */
  PLOT    tStmp;              /* Time stamp array, not normally plotted */
  PLOT    tFft1;              /* Frequency plot data on 1-clock basis   */
  PLOT    tPhas;              /* Phase noise plot in dBc/Hz             */
  double  dCarFreq;           /* Carrier frequency                      */
  double  dSmpRate;           /* Sampling rate                          */
  double  dValByDec[DECADES]; /* Phase Noise by Decade, first is 10Hz   */
                              /* last is fMax, zero means illegal value */
  } PHAS;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM structure is discussed in full detail in Section 7-4.

**tFfts** A structure of type FFTS that contains the FFT setup parameters such as window type and padding factor. See Section 7-10 for further details.

**lAutoFix** If true calculate some of the above tParm parameters
Default: 0

**dMaxFreq** Maximum Frequency that is desired
Default: 1000.0

**dFreqRes** Frequency resolution that is desired
Default: 1.0

**lFftAvgs** 2^fft_avgs averages used to smooth FFT
Default: 2

**lGood** Flag indicates valid data in structure

**tTime** Time domain plot data

**tStmp** Time stamp array, not normally plotted

| | |
|---|---|
| **tFft1** | Frequency plot data on 1-clock basis |
| **tPhas** | Phase noise plot in dBc/Hz |
| **dCarFreq** | Carrier frequency |
| **dSmpRate** | Sampling rate |
| **dValByDec[n]** | Phase Noise by Decade, first is 10Hz<br>last is fMax, zero means illegal value |

## 7-37 PLL ANALYSIS TOOL

The PLL Analysis tool permits users to study characteristics and parameters of a 2nd-order PLL. With a simple set of variance measurements, the tool can extract information such as damping factor, natural frequency, input noise level, lock range, lock-in time, pull-in time, pull-out range and noise bandwidth. The tool also presents a transfer function and Bode plots up to the natural frequency, as well as a plot of the poles and zero for a 2nd-order PLL.

**Command syntax - :ACQuire:PLLANALysis(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:PLLANAL(@4)#3976…",997,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  double  dXiGuess;           /* Initial value for damping factor       */
  double  dWnGuess;           /* Initial value for natural frequency    */
  double  dS0Guess;           /* Initial power spectral density dBc/Hz  */
  double  dInitOff;           /* Initial offset frequency - delta W0    */
  long    lIncStop;           /* Increase stop count by this value      */
  long    lMaxStop;           /* Maximum stop count to collect data     */
  double  dCornFrq;           /* Corner Frequency for Record Length     */
  double  dRecTime;           /* Record Length in units of time (s)     */
  long    lRecUnit;           /* Record length units, must be one of:   */
                              /* 0=lMaxStop, 1=dCornFreq, 2=dRecTime    */
  long    lIniCond;           /* Calc. initial conditions if non-zero   */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lVfit;              /* Indicates if the variance fit was good */
  double  dDampFct;           /* Damping factor from variance fit       */
  double  dNatFreq;           /* Natural frequency from fit (rad/s)     */
  double  dS0Noise;           /* Noise process power spectral density   */
  double  dChSquar;           /* Chi-square of variance fit             */
  double  dFreq;              /* Carrier frequency                      */
  complex dPole[2], dZero;    /* Poles and zero                         */
  double  dLockRng;           /* Lock Range (rad/s)                     */
  double  dLockInT;           /* Lock-in Time (s)                       */
  double  dPullInT;           /* Pull-in Time (s)                       */
  double  dPullOut;           /* Pull-out Range (rad/s)                 */
  double  dNoiseBW;           /* Noise Bandwidth (rad/s)                */
  PLOT    tSigm;              /* Contains the 1-Sigma plot array        */
  PLOT    tVfit;              /* Resulting variance fit plot array      */
  PLOT    tInit;              /* Initial Conditions variance plot array */
  PLOT    tXfer;              /* PLL Transfer Function plot array       */
  PLOT    tBodeMag;           /* Bode plot magnitude/gain response      */
  PLOT    tBodePha;           /* Bode plot phase response               */
  } APLL;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM structure is discussed in full detail in Section 7-4.

**dXiGuess** Initial value for damping factor
Default: 0.25

**dWnGuess** Initial value for natural frequency
Default: 315e3

**dS0Guess** Initial power spectral density dBc/Hz
Default: -90.0

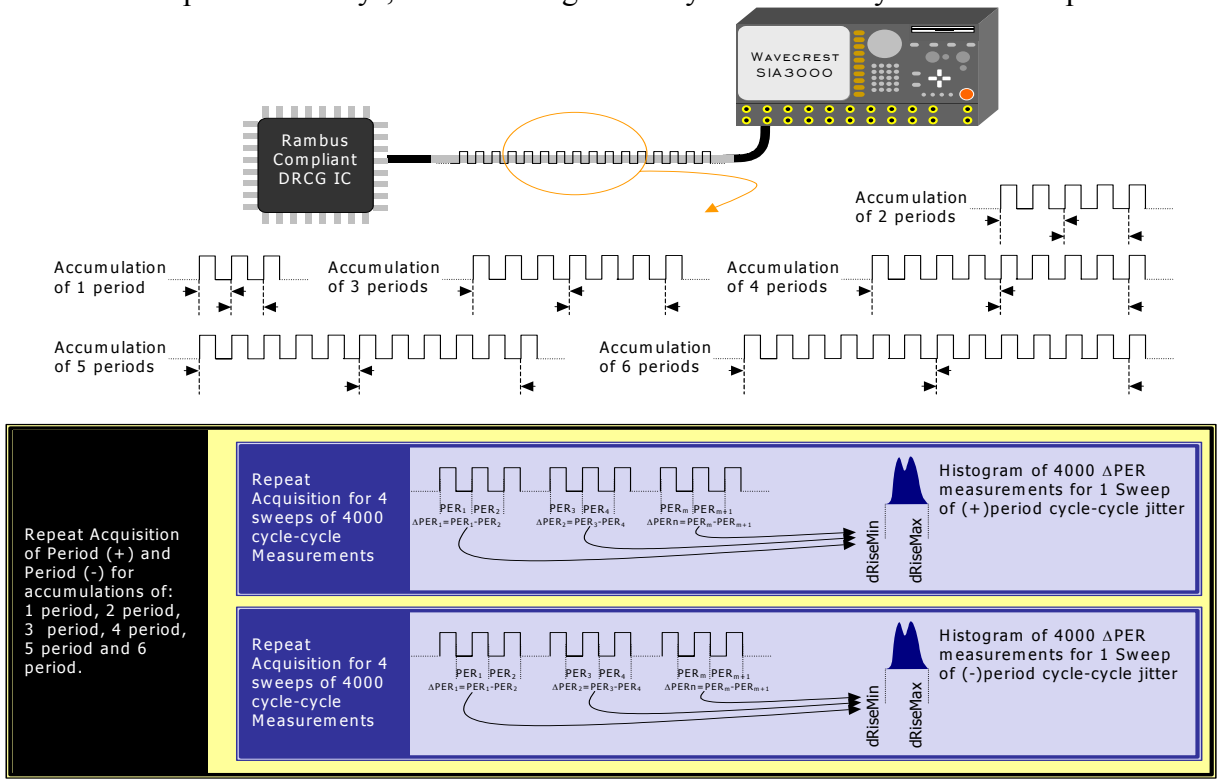
**dInitOff** Initial offset frequency - delta W0
Default: 1000.0

| | |
|---|---|
| **lIncStop** | Increase stop count by this value<br>Default: 1 |
| **lMaxStop** | Maximum stop count to collect data<br>Default: 1000 |
| **dCornFrq** | Corner Frequency for Record Length<br>Default: 50e3 |
| **dRecTime** | Record Length in units of time (s)<br>Default: 10e-6 |
| **lRecUnit** | Record length units, must be one of:<br>0=lMaxStop, 1=dCornFreq, 2=dRecTime<br>Default: 2 |
| **lIniCond** | Calc. initial conditions if non-zero<br>Default: 1 |
| **lGood** | Flag indicates valid data in structure |
| **lVfit** | Indicates if the variance fit was good |
| **dDampFct** | Damping factor from variance fit |
| **dNatFreq** | Natural frequency from fit (rad/s) |
| **dS0Noise** | Noise process power spectral density |
| **dChSquar** | Chi-square of variance fit |
| **dFreq** | Carrier frequency |
| **dPole[2]** | Location of Poles of transfer function |
| **dZero** | Location of zero of transfer function |
| **dLockRng** | Lock Range (rad/s) |
| **dLockInT** | Lock-in Time (s) |
| **dPullInT** | Pull-in Time (s) |
| **dPullOut** | Pull-out Range (rad/s) |
| **dNoiseBW** | Noise Bandwidth (rad/s) |
| **tSigm** | Contains the 1-Sigma plot array |
| **tVfit** | Resulting variance fit plot array |
| **tInit** | Initial Conditions variance plot array |
| **tXfer** | PLL Transfer Function plot array |
| **tBodeMag** | Bode plot magnitude/gain response |
| **tBodePha** | Bode plot phase response |

## 7-38 RAMBUS DRCG TOOL

The Rambus DRCG tool was developed specifically to test Rambus® clock generator chips which have a compliance test that includes adjacent cycle jitter at 6 incremental accumulations for both period polarities. This tool is a true compliance tool such that the specification, as defined by Rambus Corporation, has been incorporated into this tool to validate a DRCG's performance relative to the standard.

The measurement consists of accumulated adjacent cycle jitter measurements (cycle to cycle) for both rising edges and falling edges. The measurement algorithm is depicted above. Each measurement configuration is executed in 4 "sweeps". Each sweep is a burst of 4000 measurements. For a given execution, 4 sweeps of 4000 measurements for both rising and falling edges at 6 different amplitudes of accumulation results in 4x4000x2x6=192,000 measurements. The results are placed in arrays, which are organized by cumulative cycles and sweep number.




DRCG Utility's measurement algorithm

**Command syntax - :ACQuire:DRCG**(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>

Example: `Send(0,5,":ACQ:DRCG(@4)#41608…",1627,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lAutoFix;           /* If true perform a pulsefind as req'd   */
  long    lDutCycl;           /* If non-zero make duty cycle measurement*/
  long    lUsrSpec;           /* If non-zero use the specified TJ value */
  long    lPad1;
  double  dSpecVal;           /* User-defined TJ specification          */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPass;
  double  dDutyMax;           /* Maximum value of duty cycle measurement*/
  double  dDutyMin;           /* Minimum value of duty cycle measurement*/
```

```
double  dDutyAvg;           /* Average value of duty cycle measurement*/
PLOT    tRiseMax;           /* Minimum deltaT of rising adj. periods  */
PLOT    tRiseMin;           /* Maximum deltaT of rising adj. periods  */
PLOT    tFallMax;           /* Minimum deltaT of falling adj. periods */
PLOT    tFallMin;           /* Maximum deltaT of falling adj. periods */
PLOT    tMaxiLim;           /* Maximum limit per specification        */
PLOT    tMiniLim;           /* Minimum limit per specification        */
double  dRiseMax[DRCG_CYCLES][DRCG_SWEEPS];
double  dRiseMin[DRCG_CYCLES][DRCG_SWEEPS];
double  dFallMax[DRCG_CYCLES][DRCG_SWEEPS];
double  dFallMin[DRCG_CYCLES][DRCG_SWEEPS];
double  dFreq;              /* Carrier frequency                      */
} DRCG;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**lAutoFix** Flag indicating whether to perform a pulse-find as required. Setting this value to any integer greater than zero tells the measurement to perform a pulse find if needed. The system will know if a measurement was recently performed and if a pulse find is necessary.
Valid Entries: 0 – No pulsefind prior to measurement
1 – Pulsefind if the measurement mode changed.
Default: 0

**lDutCycl** Flag indicating whether to perform a duty cycle measurement. Measuring three successive transitions, this measurement represents the absolute duty cycle and allows the user to identify the maximum, minimum and average duty cycle.
Valid Entries: 0 – do not perform a duty cycle measurement
1 – perform a duty cycle measurement
Default: 0

**lUsrSpec** Flag to indicate whether to use a user specified limit for maximum/minimum cycle to cycle jitter or to use the Rambus defined specification. If this flag is set, the parameter specified in dSpecVal will be used as the pass/fail limit for this test.
Valid Entries: 0 – Use Rambus defined specification
1 – Use limit defined in dSpecVal
Default: 0

**dSpecVal** Test limit used by this tool, depending on the state of lUsrSpec, indicate a pass/fail condition based on the measured cycle to cycle jitter for each pass, polarity and accumulation.

**lGood** Flag used to indicate valid output data in structure.

**dDutyMax, dDutyMin, dDutyAvg** Maximum, minimum and average values of duty cycle measurement.

**tRiseMax** Structure of type PLOT containing all of the necessary information to draw a histogram of data containing the maximum increase in period of adjacent positive periods (periods characterized by a rising edges). See Section 7-3 for details of the PLOT structure and its elements.

**tRiseMin** Structure of type PLOT containing all of the necessary information to draw a histogram of data containing the maximum decrease in period of adjacent positive periods. See Section 7-3 for details of the PLOT structure and its elements.

**tFallMax** Structure of type PLOT containing all of the necessary information to draw a histogram of data containing the maximum increase in period of adjacent negative periods (periods characterized by a falling edges). See Section 7-3 for details of the PLOT structure and its elements.

**tFallMin** Structure of type PLOT containing all of the necessary information to draw a histogram of data containing the minimum deltaT of falling adjacent periods. See Section 7-3 for details of the PLOT structure and its elements.

**tMaxiLim** Structure of type PLOT containing all of the necessary information to draw a histogram of maximum limits per specification. See Section 7-3 for details of the PLOT structure and its elements.

**tMiniLim** Structure of type PLOT containing all of the necessary information to draw a histogram of minimum limits per specification. See Section 7-3 for details of the PLOT structure and its elements.

**dRiseMax[m][n]** A 6x4 array of maximum period increase between two adjacent positive periods organized by the number of accumulated periods and the sweep number. Each execution of this structure results in 6 accumulations and 4 sweeps. (Each sweep is a burst of 4000 measurements.)

**dRiseMin[m][n]** A 6x4 array of maximum period decrease between two adjacent positive periods organized by the number of accumulated periods and the sweep number. Each execution of this structure results in 6 accumulations and 4 sweeps. (Each sweep is a burst of 4000 measurements.)

**dFallMax[m][n]** A 6x4 array of maximum period increase between two adjacent negative periods organized by the number of accumulated periods and the sweep number. Each execution of this structure results in 6 accumulations and 4 sweeps. (Each sweep is a burst of 4000 measurements.)

**dFallMin[m][n]** A 6x4 array of maximum period decrease between two adjacent negative periods organized by the number of accumulated periods and the sweep number. Each execution of this structure results in 6 accumulations and 4 sweeps. (Each sweep is a burst of 4000 measurements.)

**dFreq** Measured carrier frequency.

## 7-39 SCOPE TOOL

The Oscilloscope tool provides a quick and easy display of the signal to be analyzed. The Oscilloscope has many different capabilities. It can capture a waveform, measure voltage parameters, and create eye masks.

### Command syntax - :ACQuire:SCOPe<#xyy…ddddddd…>

Example: Send(0,5,":ACQ:SCOP#516520…",16536,EOI);

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lVoff[POSS_CHNS];   /* Voltage offset (mV)     - per channel  */
  long    lVdif[POSS_CHNS];   /* Differential offset (mV)- per channel  */
  long    lVcom[POSS_CHNS];   /* Common offset (mV)      - per channel  */
  long    lTper;              /* Time per division (ps)  - all channels */
  long    lTdel;              /* Delay time (ps)         - all channels */
  long    lPcnt;              /* Amount +/- 50% to calc. rise/fall time */
  long    lHiRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lLoRFmV;            /* Absolute rise/fall voltage if lPcnt<0  */
  long    lInps;              /* Input selection, see defines above     */
  long    lMeas;              /* Measure flag, see defines above        */
  long    lPass;              /* Acquisitions so far, set to 0 to reset */
  long    lAvgs;              /* 2^lAvgs = averages used to smooth data */
  long    lPad1;
  MASK    tMask;              /* Structure which holds mask definition  */
  double  dMargin;            /* Margin in percentage [-1.0 to 1.0]     */
  double  dHistDly;           /* Histogram horizontal location, seconds */
  double  dHistWid;           /* Histogram horizontal width, seconds    */
  double  dHistVlt;           /* Histogram vertical location, volts     */
  double  dHistHgt;           /* Histogram vertical height, volts       */
  double  dAttn[POSS_CHNS];   /* Attenuation factor (dB) - per channel  */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad2;
  QTYS    qNorm[ POSS_CHNS ]; /* Normal channel quantities              */
  QTYS    qComp[ POSS_CHNS ]; /* Complimentary channel  quantities      */
  QTYS    qDiff[ POSS_CHNS ]; /* Differential quantities                */
  QTYS    qComm[ POSS_CHNS ]; /* Common (A+B) quantities                */
  PLOT    tXval;              /* Xaxis data to go with the voltage data */
  PLOT    tNorm[ POSS_CHNS ]; /* Normal channel voltage data            */
  PLOT    tComp[ POSS_CHNS ]; /* Complimentary channel voltage data     */
  PLOT    tDiff[ POSS_CHNS ]; /* Differential voltage data              */
  PLOT    tComm[ POSS_CHNS ]; /* Common (A+B) voltage data              */
  OHIS    tHorz[ POSS_CHNS ]; /* Horizontal histogram data              */
  OHIS    tVert[ POSS_CHNS ]; /* Vertical histogram data                */
  } SCOP;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**lVoff[n]** Offset voltage used for scope acquire, specified in mV, one per channel

**lVdif[n]** Differential offset voltage used for scope acquire, specified in mV, one per channel

**lVcom[n]** Common mode offset voltage used for scope acquire, specified in mV, one per channel

**lTper** Time per division specified in ps – applies to all channels, any of the following are valid values:
5000000, 2000000, 1000000, 500000, 200000, 100000,
50000, 20000, 10000, 5000, 2000, 1000, 500, 200, 100, 50
Default: 10000

**lTdel** Delay time to start specified in ps – applies to all channels
Valid Range: 24,000 to 100,000,000
Default: 24,000

**lPcnt** This field specifies the voltage thresholds to be used when calculating rise and fall times. The voltage thresholds are assumed to be symmetrical about the 50% threshold, and this is the distance from the 50% threshold to the starting and ending thresholds. For example if this field is equal to 30, then 20% and 80% thresholds are used. If this field is equal to 40, then 10% and 90% thresholds are used. The absolute voltage levels used are based on the previous pulsefind minimum and maximum voltages. If this field is negative, then the absolute rise and fall thresholds are taken from the following fields lHiRFmV & lLoRFmv.
Default: 30

**lHiRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: +250

**lLoRFmV** Absolute rise/fall voltage if lPcnt<0, in units of mV
Default: -250

**lInps** Input selection, can be any of the following:
SCOP_INPS_NORM +Input Only
SCOP_INPS_COMP –Input Only
SCOP_INPS_DIFF +Input minus -Input
SCOP_INPS_BOTH +Input and -Input
SCOP_INPS_COMM +Input plus –Input
Default: SCOP_INPS_NORM

**lMeas** Measure flag, this is a bitfield which may be created by combining any or all of the following constants:
SCOP_MEAS_RISEFALL – Rise and Fall times are calculated
SCOP_MEAS_VTYPICAL – Vtop and Vbase are calculated
SCOP_MEAS_VEXTREME – Vmin and Vmax are calculated
SCOP_MEAS_OVERUNDR – Overshoot and Undershoot are calculated
SCOP_MEAS_WAVEFORM – Vavg and Vrms are calculated
SCOP_MEAS_VERTHIST – Create a vertical histogram
SCOP_MEAS_HORZHIST – Create a horizontal histogram
SCOP_MEAS_EYEMASKS – Apply an Eye Mask Keep In/Out Region
Default: None of the above are included

**lPass** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets this register. It will be automatically incremented when a measurement is performed.
Valid Entries: any integer greater than or equal to 0
Default: 0

**lAvgs** This variable is used to calculate the number of averages to use. Increasing the number of averages reduces the background noise associated with the algorithms. The number of averages is calculated based on the equation:
AVERAGES = $2^n$ where n = lAvgs
Valid Entries: any integer greater than or equal to 0
Default: 0 (indicating $2^0$ averages = 1 execution.)

**tMask** MASK Structure which holds mask definition. See the definition above.

Defaults:
```
tMask.dXwdUI = 0.40
tMask.dXflUI = 0.20
tMask.dYiPct = 0.60
tMask.dV1Rel = 0.20
tMask.dV0Rel = 0.20
tMask.dVmask = 64e-3
tMask.dTmask = 700e-12
tMask.dV1pas = scop->tMask.dVmask * 0.75
scop->tMask.dV0pas = scop->tMask.dVmask * 0.75
tMask.dTflat = scop->tMask.dTmask * 3.0 / 7.0
```

**dMargin** Margin in percentage for Eye Mask [-1.0 to 1.0]
Default: 0

**dHistDly** Histogram Box center horizontal location, seconds
Default: 120e-9

**dHistWid** Histogram Box horizontal width, seconds
Default: 160e-9

**dHistVlt** Histogram Box center vertical location, volts
Default: 0.0

**dHistHgt** Histogram Box vertical height, volts
Default: 1.6

**dAttn[n]** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**lGood** Flag indicates valid data in structure

**qNorm[n]** Normal channel quantities, one for each channel

**qComp[n]** Complimentary channel quantities, one for each channel

**qDiff[n]** Differential quantities, one for each channel

**qComm[n]** Common (A+B) quantities, one for each channel

**tXval** Xaxis data to go with the voltage data

**tNorm[n]** Normal channel voltage data, one for each channel

**tComp[n]** Complimentary channel voltage data, one for each channel

**tDiff[n]** Differential voltage data, one for each channel

**tComm[n]** Common (A+B) voltage data, one for each channel

**tHorz[n]** Horizontal histogram data, one for each channel

**tVert[n]** Vertical histogram data, one for each channel

## 7-40 SERIAL ATA GEN2I & GEN2M TOOL

The SERIAL ATA GEN2I & GEN2M Tool provides both timing and amplitude compliance measurements. It accurately determines device performance by quantifying both random and deterministic jitter components.

### Command syntax - :ACQuire:ATA2<#xyy...ddddddd...>

Example: `Send(0,5,":ACQ:ATA2#41976…",1991,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lCompPnt;           /* Compliance Point 0-Gen2i 1-Gen2m       */
  long    lVoff;              /* Offset voltage used for scope acquire  */
  double  dAttn;              /* Attenuation factor (dB)                */
  KPWM    tKpwm;              /* KPWM structure holds most information  */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad2;
  double  dTjit10;            /* TJ @ Fbaud / 10                        */
  double  dRjit10;            /* RJ @ Fbaud / 10                        */
  double  dDjit10;            /* DJ @ Fbaud / 10                        */
  double  dTjit500;           /* TJ @ Fbaud / 500                       */
  double  dRjit500;           /* RJ @ Fbaud / 500                       */
  double  dDjit500;           /* DJ @ Fbaud / 500                       */
  double  dTjit1667;          /* TJ @ Fbaud / 1667                      */
  double  dRjit1667;          /* RJ @ Fbaud / 1667                      */
  double  dDjit1667;          /* DJ @ Fbaud / 1667                      */
  PLOT    tDdjt10;            /* DCD+DDJvsUI @ Fbaud / 10               */
  PLOT    tFreq10;            /* Frequency PLOT @ Fbaud / 10            */
  PLOT    tTail10;            /* Tailfit Frequency PLOT @ Fbaud / 10    */
  PLOT    tBath10;            /* Bathtub PLOT @ Fbaud / 10              */
  PLOT    tDdjt500;           /* DCD+DDJvsUI @ Fbaud / 500              */
  PLOT    tFreq500;           /* Frequency PLOT @ Fbaud / 500           */
  PLOT    tTail500;           /* Tailfit Frequency PLOT @ Fbaud / 500   */
  PLOT    tBath500;           /* Bathtub PLOT @ Fbaud / 500             */
  PLOT    tDdjt1667;          /* DCD+DDJvsUI @ Fbaud / 1667             */
  PLOT    tFreq1667;          /* Frequency PLOT @ Fbaud / 1667          */
  PLOT    tTail1667;          /* Tailfit Frequency PLOT @ Fbaud / 1667  */
  PLOT    tBath1667;          /* Bathtub PLOT @ Fbaud / 1667            */
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  PLOT    tDifScop;           /* Differential voltage data              */
  PLOT    tComScop;           /* Common (A+B) voltage data              */
} ATA2;
```

**lCompPnt** Compliance Point, may be one of the following constants:
0 – GEN2I Specification
1 – GEN2M Specification
Default: 0

**lVoff** Offset voltage used for scope acquire, specified in mV
Default: 0

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**tKpwm** Known Pattern With Marker Tool which specifies most of the input and output parameters necessary for a data signal analysis. The

| | |
|---|---|
| | user will need to review all of the default parameters of the Known Pattern With Marker Tool and decide which to change. |
| **lGood** | Flag indicates valid data in structure |
| **lPad2** | Internal parameter, do not modify. |
| **dTjit10** | Total Jitter with Fbaud/10 High Pass Filter Applied |
| **dRjit10** | Random Jitter with Fbaud/10 High Pass Filter Applied |
| **dDjit10** | Deterministic Jitter with Fbaud/10 High Pass Filter Applied |
| **dTjit500** | Total Jitter with Fbaud/500 High Pass Filter Applied |
| **dRjit500** | Random Jitter with Fbaud/500 High Pass Filter Applied |
| **dDjit500** | Deterministic Jitter with Fbaud/500 High Pass Filter Applied |
| **dTjit1667** | Total Jitter with Fbaud/1667 High Pass Filter Applied |
| **dRjit1667** | Random Jitter with Fbaud/1667 High Pass Filter Applied |
| **dDjit1667** | Deterministic Jitter with Fbaud/1667 High Pass Filter Applied |
| **tDdjt10** | DCD+DDJvsUI @ Fbaud/10 |
| **tFreq10** | Frequency plot @ Fbaud/10 |
| **tTail10** | Tailfit Frequency plot @ Fbaud/10 |
| **tBath10** | Bathtub plot @ Fbaud/10 |
| **tDdjt500** | DCD+DDJvsUI @ Fbaud/500 |
| **tFreq500** | Frequency plot @ Fbaud/500 |
| **tTail500** | Tailfit Frequency plot @ Fbaud/500 |
| **tBath500** | Bathtub plot @ Fbaud/500 |
| **tDdjt1667** | DCD+DDJvsUI @ Fbaud/1667 |
| **tFreq1667** | Frequency plot @ Fbaud/1667 |
| **tTail1667** | Tailfit Frequency plot @ Fbaud/1667 |
| **tBath1667** | Bathtub plot @ Fbaud/1667 |
| **tNrmScop** | Normal channel voltage data |
| **tCmpScop** | Complimentary channel voltage data |
| **tDifScop** | Differential mode (IN - /IN) voltage data |
| **tComScop** | Common mode (IN + /IN) voltage data |

## 7-41 SERIAL ATA GEN1X & GEN2X TOOL

The SERIAL ATA GEN1X & GEN2X Tool provides both timing and amplitude compliance measurements. It accurately determines device performance by quantifying both random and deterministic jitter components.

**Command syntax - :ACQuire:ATAX**<#xyy...ddddddd...>

Example: `Send(0,5,":ACQ:ATAX#41872…",1887,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  long    lCompPnt;           /* Compliance Point, see defines above    */
  long    lVoff;              /* Offset voltage used for scope acquire  */
  double  dAttn;              /* Attenuation factor (dB)                */
  EYEH    tEyeh;              /* EYEH structure holds most information  */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lPad2;
  PLOT    tNrmScop;           /* Normal channel voltage data            */
  PLOT    tCmpScop;           /* Complimentary channel voltage data     */
  PLOT    tDifScop;           /* Differential voltage data              */
  PLOT    tComScop;           /* Common (A+B) voltage data              */
  } ATAX;
```

**lCompPnt** Compliance Point, may be one of the following constants:
ATAX_RX_1X_MODE – 1X Receive Mode
ATAX_TX_1X_MODE – 1X Transmit Mode
ATAX_RX_2X_MODE – 2X Receive Mode
ATAX_TX_2X_MODE – 2X Transmit Mode
Default: 0

**lVoff** Offset voltage used for scope acquire, specified in mV
Default: 0

**dAttn** Attenuation factor in dB, this is provided to allow the results to be scaled to compensate for external attenuation from sources such as probes.
Default: 0

**tEyeh** Random Data With Bit Clock Tool which specifies most of the input and output parameters necessary for a data signal analysis. The user will need to review all of the default parameters of the Random Data With Bit Clock Tool and decide which to change.

**lGood** Flag indicates valid data in structure

**lPad2** Internal parameter, do not modify.

**tNrmScop** Normal channel voltage data

**tCmpScop** Complimentary channel voltage data

**tDifScop** Differential mode (IN - /IN) voltage data

**tComScop** Common mode (IN + /IN) voltage data

## 7-42 SERIAL ATA 1.0 TOOL

The SATA 1.0 Specification requires that jitter measurements be made from Data edge to Data edge across varying spans. The spans are from 0 to 5 UI, and then from 6 to 250 UI. This tool automates these measurements and provides pass/fail results. For the specification point A2, or 25,000 UI, a 1010 pattern is used and the Low frequency modulation tool can be used.

This tool requires no knowledge of the data stream prior to making a measurement. It simply measures data edge to data edge and places the measurements in their relative bins. The bin size is base on the "Bit Rate (Gb/s)" entered into the tool plus or minus 0.5 UI. For example, if a span of 1.12UI is measured, it is placed in the 1UI bin. Some random time later (see SIA-3000 measurement theory) another measurement is made and is 2.34 UI, so it is placed in the 2UI bin. After each bin has sufficient data, a tail-fit is performed on each UI span to get RJ, DJ and TJ at 10-12 BER.

**Command syntax - :ACQuire:SERIALata(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:SERIAL(@4)#45000…",5021,EOI);`

```
typedef struct
  {
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lPassCnt;
  long    lPad1;
  double  dBitRate;           /* Bit Rate, must be specified            */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lTfit;              /* Flag indicates all tailfits are good   */
  long    lMinHits;           /* Min hits across all DJ spans           */
  long    lPad2;

  long    lSetSave[SATA_TFITS];/*****************************************/
  long    lPad3;               /*                                        */
  long    lBinNumb[SATA_TFITS];/*  These values are all used internally */
  long    lPad4;               /*                                        */
  double  dLtSigma[SATA_TFITS][PREVSIGMA];/*  DO NOT ALTER!              */
  double  dRtSigma[SATA_TFITS][PREVSIGMA];/*****************************/

  double  dDjit5, dDjit250;   /* DJ at 5 and 250 spans                  */
  double  dTjit5, dTjit250;   /* TJ at 5 and 250 spans                  */
  long    lHits[SATA_TFITS];  /* Contains count of histogram hits       */
  long    lPad5;               /*                                        */
  TFIT    tTfit[SATA_TFITS];  /* Structure containing tail-fit info     */
  PLOT    tDjit;              /* Determinstic Jitter plot               */
  PLOT    tTjit;              /* Total Jitter plot                      */
  PLOT    tHist[SATA_TFITS];  /* Histograms for specific spans          */
  } SATA;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**lPassCnt** This parameter is a bi-directional structure element that tracks the number of acquisitions since last reset. This flag can be read after an execution or set prior to an execution. Setting this parameter to 0 essentially resets the accumulated data. A measurement can be performed repeatedly with the same structure. It will be automatically incremented by the next measurement.
Valid Entries: any integer greater than or equal to 0
Default: 0

**dBitRate** Bit Rate, must be specified
Default: 1.5e9

**lGood** Flag indicates valid data in structure

**lTfit** Flag indicates all tailfits are good

**lMinHits** Min hits across all DJ spans

**lSetSave[n],lBinNumb[n],dLtSigma[n][m],dRtSigma[n][m]** These values are all used internally, DO NOT ALTER!

**dDjit5** DJ at 5 spans

**dDjit250** DJ at 250 spans

**dTjit5** TJ at 5 spans

**dTjit250** TJ at 250 spans

**lHits[n]** Contains count of histogram hits

**tTfit[n]** Structure containing tail-fit info

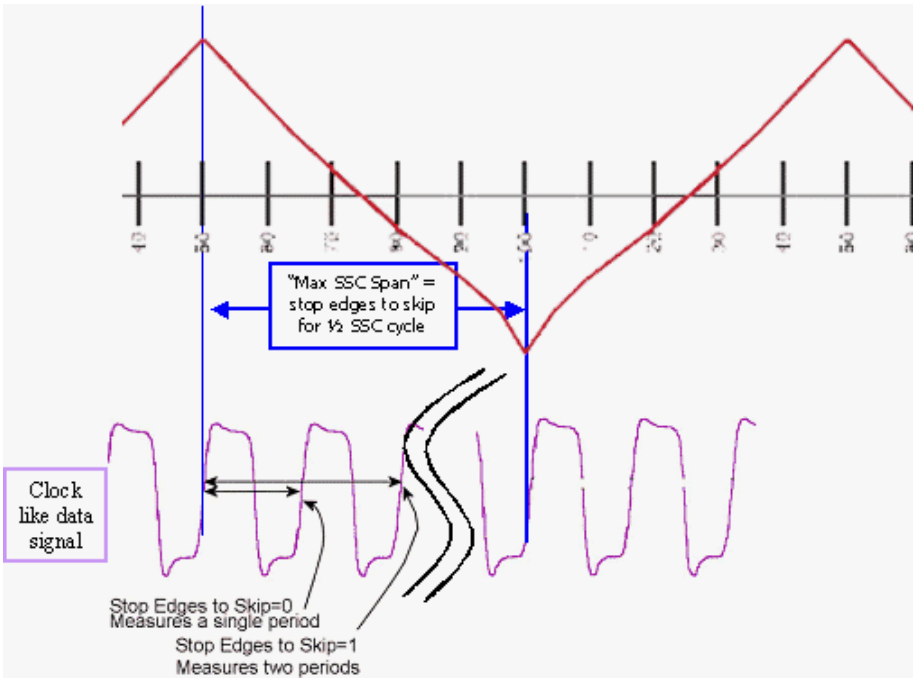
**tDjit** Determinstic Jitter

**tTjit** Total Jitter

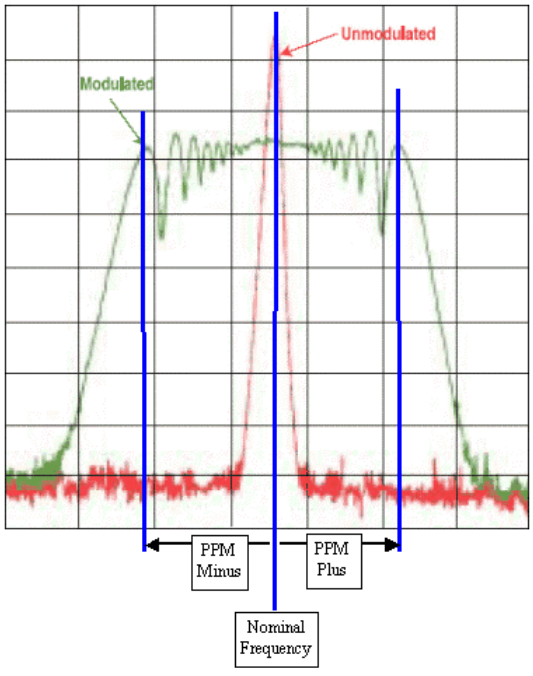
**tHist[n]** Histograms for specific spans

## 7-43 SPREAD SPECTRUM TOOL

The SSC tool will measure the appropriate number of the input clock cycles to see the maximum peak-to-peak deviation due to the SSC profile (see figure below). This will be equal to the fundamental frequency divided by the frequency of ½ the SSC cycle. The tool will search for this maximum deviation within the range of possible SSC frequencies entered in the "Max. SSC Freq. (kHz)" and "Min. SSC Freq. (kHz)" inputs.




The SSC tool will then measure a histogram of this span and determine the PPM deviation form the input "Nominal Freq. (MHz)". The figure below shows what this corresponds to in the frequency domain.



**Command syntax - :ACQuire:SPREADspectrum(@<n,m,x,…>|<n:m>)**
**<#xyy…ddddddd…>**

Example: `Send(0,5,":ACQ:SPREAD(@4)#3512…",532,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  double  dBegFreq;           /* Starting freq to find peak jitter span */
  double  dEndFreq;           /* Ending freq to find peak jitter span   */
  double  dNomFreq;           /* Nominal frequency                      */
  long    lClokDiv;           /* Scaling factor for divided clock       */
  long    lHstSamp;           /* Samples for histogram at peak span     */
  long    lPpmAvgs;           /* 2^lPpmAvgs used to average results     */
  long    lSscStds;           /* Standard used, see above defines       */
  /* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  long    lMaxSpan;           /* Span across which max jitter is found  */
  double  dCarFreq;           /* Measured carrier frequency             */
  double  dModFreq;           /* Apparent jitter modulation frequency   */
  double  dPpmPstv;           /* Parts per million positive             */
  double  dPpmNgtv;           /* Parts per million negative             */
  double  dMeasMin;           /* Minimum value in measured normal data  */
  double  dMeasMax;           /* Maximum value in measured normal data  */
  double  dMeasAvg;           /* Average value of measured normal data  */
  double  dMeasSig;           /* 1-Sigma value of measured normal data  */
  double  dUnitInt;           /* Unit Interval of data signal           */
  PLOT    tHist;              /* Histogram of results for peak freq.    */
  PLOT    tSigm;              /* 1-Sigma data to find max jitter span   */
  } SSCA;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**dBegFreq** Starting freq to find peak jitter span
Valid Range: 1e3 to 1e6
Default: 30e3

**dEndFreq** Ending freq to find peak jitter span
Valid Range: 1e3 to 1e6
Default: 33e3

**dNomFreq** Nominal frequency
Valid Range: 1e6 to 10e9
Default: 750e6

**lClokDiv** Scaling factor for divided clock
Valid Range: 1 to 5
Default: 1

**lHstSamp** Samples for histogram at peak span
Valid Range: 1 to 950,000
Default: 100,000

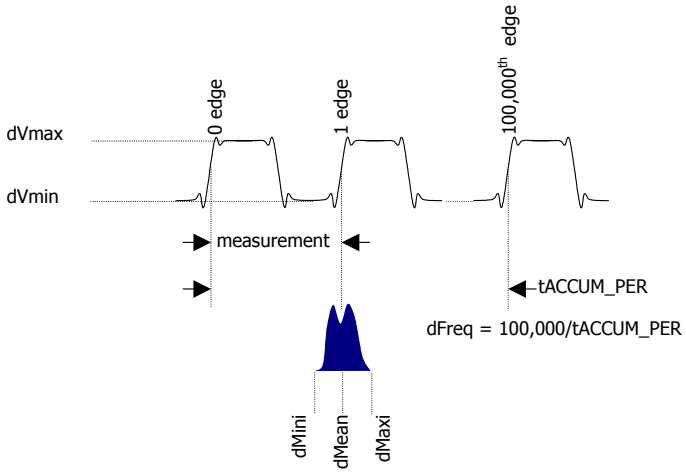
**lPpmAvgs** This variable is used to calculate the number of averages to use. Increasing the number of averages reduces the background noise associated with the algorithm. The number of averages is calculated based on the equation:
$AVERAGES = 2^n$ where n = lFftAvgs
Valid Entries: any integer greater than or equal to 0
Default: 0 (indicating $2^0$ averages = 1 execution.)

**lSscStds** Standard used, the following defines apply:
SSCA_USER, SSCA_SATA1, SSCA_SATA2, SSCA_PCIX
Default: SSCA_SATA1

| | |
|---|---|
| **lGood** | Flag indicates valid data in structure |
| **lMaxSpan** | Span across which max jitter is found |
| **dCarFreq** | Measured carrier frequency |
| **dModFreq** | Apparent jitter modulation frequency |
| **dPpmPstv** | Parts per million positive |
| **dPpmNgtv** | Parts per million negative |
| **dMeasMin** | Minimum value in measured normal data |
| **dMeasMax** | Maximum value in measured normal data |
| **dMeasAvg** | Average value of measured normal data |
| **dMeasSig** | 1-Sigma value of measured normal data |
| **dUnitInt** | Unit Interval of data signal |
| **tHist** | Histogram of results for peak freq. |
| **tSigm** | 1-Sigma data to find max jitter span |

## 7-44 STATISTICS TOOL

The statistics tool is used to capture a few basic parameters of a measurement that the user selected in the tParm structure. The statistics tool will also return voltage parameters of the signal under test. As seen in the accompanying example for a simple period measurement, the number of parameters returned may be more extensive than is typically desired in a production program. For a simple time measurement, it is best to use the histogram tool which can be set to return just the statistics of the interest and not any of the voltage information nor the extra timing measurements as is captured in this tool. There is added test time to capture duty cycle, frequency and the voltage parameters.



Example of a period measurement using the Statistics Utility

**Command syntax - :ACQuire:STATistics(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:STAT(@4)#3296…",314,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters        */
  long    lPfnd;              /* Force a pulse-find before each measure */
  long    lAutoFix;           /* If true perform a pulsefind as req'd   */
  long    lFrqSpan;           /* Period spans to measure freq. across   */
/* Output parameters */
  long    lGood;              /* Flag indicates valid data in structure */
  double  dMean;              /* Contains the returned average value    */
  double  dMaxi;              /* Contains the returned maximum value    */
  double  dMini;              /* Contains the returned minimum value    */
  double  dSdev;              /* Contains the returned 1-Sigma value    */
  double  dDuty;              /* Contains the returned duty cycle       */
  double  dFreq;              /* Contains the carrier frequency         */
  double  dVmin[ 2 ];         /* Pulse-find Min voltage for Start&Stop  */
  double  dVmax[ 2 ];         /* Pulse-find Max voltage for Start&Stop  */
  } STAT;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**lPfnd** A flag used to force the execution of a pulse find execution. In normal operation, the SIA3000 dynamically decides whether a pulsefind is necessary based on previous test conditions. In may cases, this is sufficient. However, in a production environment, the previous test may have the same type of voltage settings, however, the devices are different and may have different voltage characteristics and would thus require a pulse find on each device. Be aware that most production test have specified amplitudes at which measurements are to be made such that the programmer must specify the amplitude in tPARM rather than use pulse find to establish test conditions.

Valid Entries: 0 – No pulsefind prior to measurement
1 – perform a pulse find.

Default: 0

**lAutoFix** Flag to indicate to the system whether pulse find should be performed if needed. This flag essentially enables the "automatic pulse find" capability which will execute a pulsefind based on the previous test setup and not with any regard to device-device variations in amplitude.

Valid Entries: 0 – No pulsefind prior to measurement
1 – Pulsefind if the measurement mode changed.

Default: 0

**lFrqSpan** Period spans to measure freq. across

**lGood** Flag used to indicate valid output data in structure.

**dMean** Contains the returned average value.

**dMaxi** Contains the returned maximum value.

**dMini** Contains the returned minimum value.

**dSdev** Contains the returned 1-Sigma value.

**dDuty** Contains the returned duty cycle of the signal being measured. This is not measured if a two channel measurement is being performed.

**dFreq** Contains the frequency of the signal being measured. This is not measured if a two channel measurement is being performed.

**dVmin** Min voltage returned from last pulse-find. ***It is important to note that the accuracy of this voltage measurement is severely bandwidth limited. For accurate amplitude measurements, use the oscilloscope tool.***

**dVmax** Max voltage returned from last pulse-find. ***It is important to note that the accuracy of this voltage measurement is severely bandwidth limited. For accurate amplitude measurements, use the oscilloscope tool.***

## 7-45 STRIPCHART TOOL

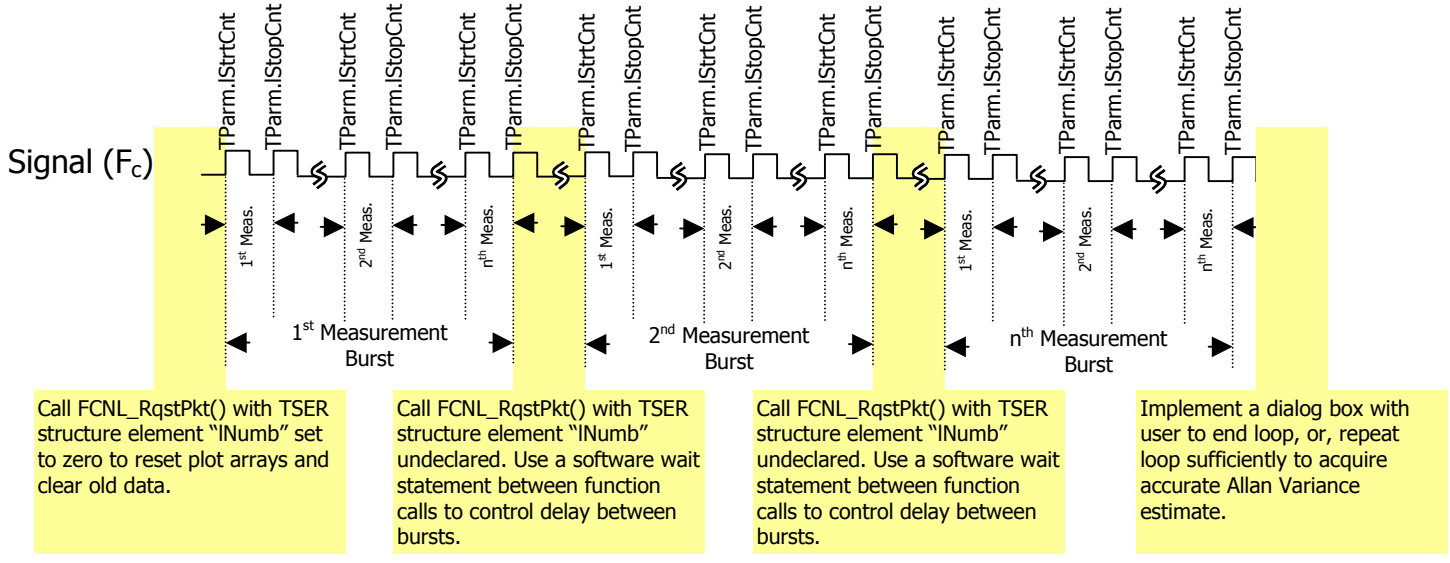
The Time Series Tool is used to capture timing issues that are occurring at sub Hertz rates. This tool performs a measurement, extracts the statistical information from the measurement burst then waits a defined interval and performs the measurement again. This type of measurement is used in Allan Variance measurements and in real time debugging of various environment parameters (such as VDD, VIL/VIH, timing skew, etc.) and their impact on various time measurements (such as period, jitter, slew rate and modulation). To use this tool, the user must initiate a measurement with the TSER structure in a loop that includes the wait time between measurements.

If this tool is to be used as a debug tool, it is recommended that the plot be redrawn between measurements so as to allow the user to see a real-time display of the successive measurements. It is also recommended that this routine be placed in a user-aborted infinite loop such that the user can initiate and stop a Time Series measurement session.

If this tool is used to simply gather a fixed number of successive measurements and to analyze the variance of the mean/peak-peak/1s/min/max over the said number of successive iterations, then the last execution's plot structures will contain all of the combined results.

In both cases, be sure to initialize the TSER structure element lNumb to zero when a measurement is performed. On subsequent calls, be sure to leave the lNumb parameter undeclared so that the tool will continue to accumulate measurements on each successive measurement burst. Measurements are acquired as follows:

Time Series of Period Measurements Example




**Command syntax - :ACQuire:TIMeSERies(@<n,m,x,…>|<n:m>)<#xyy…ddddddd…>**
Example: `Send(0,5,":ACQ:TIMSER(@4)#3832…",852,EOI);`

```
typedef struct
  {
  /* Input parameters  */
  PARM    tParm;              /* Contains acquisition parameters       */
  long    lNumb;              /* Measurements so far, set to 0 to reset */
  long    lPad1;
```

```
double  dSpan;              /* Span between measurements in seconds   */
long    lAutoFix;           /* If true perform a pulsefind as req'd   */
/* Output parameters */
long    lGood;              /* Flag indicates valid data in structure */
double  dYstd;              /* 1-Sigma value calculated on all data   */
double  dAvar;              /* Allan variance calculation             */
                            /****************************************/
double  dSumm;              /*  These values are all used internally  */
double  dTyme;              /*   as part of the measurement process   */
                            /*            DO NOT ALTER!               */
                            /****************************************/
PLOT    tMean;              /* Contains the average plot array        */
PLOT    tMini;              /* Contains the minimum plot array        */
PLOT    tMaxi;              /* Contains the maximum plot array        */
PLOT    tTime;              /* Contains the time samples were taken   */
PLOT    tSdev;              /* Contains the 1-Sigma plot array        */
PLOT    tPeak;              /* Contains the ( max - min ) plot array  */
} TSER;
```

**tParm** A structure of type PARM that contains acquisition parameter. The PARM is discussed in full detail in Section 7-4.

**lNumb** When implemented correctly, a measurement is performed repeatedly with the TSER structure to generate a Time Series plot of a given measurement. *(User defines measurement parameters in tParm.)*. For the first execution, set lNumb to zero to reset the plot arrays. All subsequent measurements should not assign any value to this structure element. This parameter is automatically incremented by the next measurement and can be read after execution to determine the number of times this structure has been called.
Valid Entries: 0 reset counter and clear all plot data.
Default: Increment previous value.

**lAutoFix** Flag indicating whether to perform a pulse-find as required. Setting this value to any integer greater than zero tells the measurement to perform a pulse find if needed. The system will know if a measurement was recently performed and if a pulse find is necessary.
Valid Entries: 0 – no pulsefind prior to measurement
1 – pulsefind if the measurement mode changed.
Default: 0

**lGood** Flag indicates valid output data in structure.

**dYstd** 1-Sigma, or standard deviation of all data.

**dAvar** Allan variance estimate.

**tMean** Structure of type PLOT which contains all of the plot information to generate a diagram of mean values versus iteration number. Use this in PLOT structure in conjunction with the structure tTime to generate a Maximum measurement versus time plot. See Section 7-3 for details of the PLOT structure and its elements.

**tMini** Structure of type PLOT which contains all of the plot information to generate a diagram of minimum measurement of a given burst versus iteration number. Use this in PLOT structure in conjunction with the structure tTime to generate a Maximum measurement versus time plot. See Section 7-3 for details of the PLOT structure and its elements.

**tMaxi** Structure of type PLOT which contains all of the plot information to generate a diagram of maximum measurement of a given burst versus iteration number. Use this in PLOT structure in conjunction with the structure tTime to generate a Maximum measurement versus time plot. See Section 7-3 for details of the PLOT structure and its elements.

**tTime** Structure of type PLOT which contains all of the time values at which measurements were taken. Use this structure in conjunction with tMini, tMaxi, tSdev, tPeak & tMean to plot said structures as a function of time. . See Section 7-3 for details of the PLOT structure and its elements.

**tSdev** Structure of type PLOT which contains all of the plot information to generate a diagram of 1-Sigma values of a given burst versus iteration number. Use this in PLOT structure in conjunction with the structure tTime to generate a Maximum measurement versus time plot. See Section 7-3 for details of the PLOT structure and its elements.

**tPeak** Structure of type PLOT which contains all of the plot information to generate a diagram of peak to peak (maximum measurement – minimum measurement) of a given burst versus iteration number. Use this in PLOT structure in conjunction with the structure tTime to generate a Maximum measurement versus time plot. See Section 7-3 for details of the PLOT structure and its elements.

**dSumm, dTyme, dSpan** These values are all used internally, DO NOT ALTER!

## 7-46 RETRIEVING SPIKELISTS

Many of the tools that contain FFT's have the ability to detect and characterize spikes by their frequency and amplitude from within the GUI. The commands used to retrieve the spikelists were designed to remain flexible, and if used properly will adapt from release to release with a simple recompile of your source code. The spikelist commands take the following form:

### Command syntax - :SPIKelist:<toolname>(@n)<offset>

Example: `Send(0,5,":SPIK:CLKANDMARKER(@4)1468",21,EOI);`

```
<toolname>  is replaced with the same name used with the :ACQUIRE command
(@n)        is used to specify the channel which the spikelist is taken from
<offset>    is the length in bytes from the start of a binary packet to the
            pointer to the spikelist to be returned in the same binary
            packet, it is normally calculated from the structure definition
```

The correct way to obtain the spikelist is shown in the following example:

```
// Code to allocate and initialize RCPM packet is omitted from this example
// Send binary command packet, poll until complete
Send(0, 5, buffer, length + sizeof(RCPM), EOI);
status = 0;
while ((status & 0x10) == 0)
  ReadStatusByte(0, 5, &status);

// Read the binary packet back from the instrument
Receive(0, 5, &rcpm, sizeof(RCPM), EOI);

// Create the command to get the spikelist
sprintf(buffer, ":SPIK:CLKANDMARK(@1)%i", (long)&rcpm.lPeakData-(long)&rcpm);

// Send spikelist request, poll until complete
Send(0, 5, buffer, strlen(buffer), EOI);
status = 0;
while ((status & 0x10) == 0)
  ReadStatusByte(0, 5, &status);

// Read the spikelist back from the instrument
Receive(0, 5, buffer, sizeof(buffer), EOI);

// Use the spikelist as required
```

## 7-47 RETRIEVING PLOT DATA

In order to make the measurements as efficient as possible, plot data is not transferred back along with the Binary Packets. However, if this data is desired, it can be requested once a measurement has been successfully completed. The commands used to retrieve the plot data were designed to remain flexible, and if used properly will adapt from release to release with a simple recompile of your source code. The plot data commands take the following form:

**Command syntax - :PL0T:**<toolname>(@n)<offset>

Example: `Send(0,5,":PLOT:HISTOGRAM (@4)1468",21,EOI);`

```
<toolname>  is replaced with the same name used with the :ACQUIRE command
(@n)        is used to specify the channel which the plot data is taken from
<offset>    is the length in bytes from the start of a binary packet to the
            plot which is to be returned, it is normally calculated from the
            structure definition

The correct way to obtain the plot data is shown in the following example:

// Code to allocate and initialize HIST packet is omitted from this example
// Send binary command packet, poll until complete
Send(0, 5, buffer, length + sizeof(HIST), EOI);
status = 0;
while ((status & 0x10) == 0)
  ReadStatusByte(0, 5, &status);

// Read the binary packet back from the instrument
Receive(0, 5, &hist, sizeof(HIST), EOI);

// Allocate the memory to hold the plot data
hist.tNorm.dData = malloc ( hist.tNorm.lNumb * sizeof ( double ) );
// Handle an allocation error gracefully
if ( hist.tNorm.dData == NULL ) exit( -1 );

// Create the command to get the plot data
sprintf ( buffer, ":PLOT:HIST(@1)%i", (long) &hist.tNorm – (long) &hist );

// Send plot data request, poll until complete
Send(0, 5, buffer, strlen(buffer), EOI);
status = 0;
while ((status & 0x10) == 0)
  ReadStatusByte(0, 5, &status);

// Read the plot data back from the instrument
Receive(0, 5, &clok, sizeof(CLOK), EOI);

// Use the plot data as required
// Your program is responsible for freeing the memory that was
// allocated to hold the plot data when it is done using it
```

## 7-48 EXAMPLE OF HOW TO DRAW USING A PLOT STRUCTURE:

```
/*****************************************************************************/
/* DrawPlot() is a function that will plot a graph based on the variables defined */
/* in the PLOT structure passed into this function.                           */
/* (1)  get initial (x,y) coordinates within diagram to start plot.          */
/* (2)  Normalize (x,y) coordinates to amplitudes between 0 and 1 to represent    */
/*      their relative location between [xmin,xmax] or [ymin,ymax] for       */
/*      x coordinates and y coordinates respectively                         */
/* (3)  Initialize the pointer pCdc to the start of the plot in units of pixels   */
/* (4)  step through the data array, normalize the coordinates and pass them to   */
/*      the pCdc function to draw a line to from the previous pCdc location.     */
/* (5) repeat step 4 for all coordinates.                                    */
/* The variables passed into the function are:                               */
/* CDC *pCdc – Windows® pointer to communicate cursor location during plot.       */
/* Crect *wind – Windows® pointer to indicate window size and location in the     */
/*               display. the parameters are in units of pixels top, bottom, left */
/*               and right define the boundaries for the display window. The      */
/*               origin is set to the upper left hand corner with increasing      */
/*               amplitude to the lower right hand corner.                        */
/* PLOT *pldt – Wavecrest plot structure                                     */
/* double xmax – user specified maximum x value for x-axis. This may be larger    */
/*               than pltd.dXmax if a margin is desired. Xmax is in same units as */
/*               the pldt structure's x axis elements.                            */
/* double xmin - user specified minimum x value for x-axis. This may be smaller   */
/*               than pltd.dXmin if a margin is desired. Xmin is in same units as */
/*               the pldt structure's x axis elements.                            */
/* double ymax – user specified maximum y value for y-axis. This may be larger    */
/*               than pltd.dYmax if a margin is desired. Ymax is in same units    */
/*               as the pldt structure's y axis elements.                         */
/* double ymin - user specified minimum x value for x-axis. This may be larger    */
/*               than pltd.dYmin if a margin is desired. Ymin is in same units    */
/*               as the pldt structure's y axis elements.                         */
/*****************************************************************************/


void DrawPlot(CDC *pCdc, CRect *rect, PLOT *plot,
              double xmin, double xmax, double ymin, double ymax)
  {
  long i;
  double x, y;
  double xrange = xmax-xmin;
  double yrange = ymax-ymin;

  x = (plot->dXmin - xmin) / xrange; //normalize first X plot point
  x = (double)(rect.right-rect.left)*x+(double)rect.left; //convert first plot point to Windows®
                                                          //coordinates in pixels
  y = (plot.dData[0]-ymin)/yrange; //normalize first Y plot point
  y = (double)(rect.bottom-rect.top)*(1.0-y) //convert first plot point to Windows®
    + (double) rect.top;                     //coordinates in pixels. Note, the
                                             //(1.0-y) function is used to account for
                                             //the reverse direction of the coordinate
                                             //system between pixels and the plot elements
  pCdc.MoveTo ((int)x,(int)y); //move display cursor to start of plot

  for ( i = 1; i < plot.lNumb; i++ )
    {
    x = ((plot.dXmax-plot.dXmin)*(double)i //find next x-coordinate
      / (double)(plot.lNumb-1)+plot.dXmin );

    x = (x-xmin)/xrange; //normalize new x-coordinate

    x = (double)(rect.right-rect.left)*x+(double)rect.left; //convert new x-coord to Windows®
                                                            //coordinates in pixels.
    y = ( plot.dData[ i ]-ymin)/yrange; //find next y-coordinate and normalize it

    y = (double)(rect.bottom-rect.top)*(1.0-y) //convert y-coord to Windows® pixel
      + (double) rect.top;                     //coordinates

    pCdc.LineTo((int)x,(int)y); //draw a line from previous cursor
                                //location to new (x,y) coordinates.
    }
  return 0;
  }
```

## 7-49 DEFINES FOR VALUES IN BINARY PACKET STRUCTURES

The following defines were created to aid in assigning values to various fields in the binary packet structure. They would have been referenced in the above definitions.

```
/* Standard acquire functions */
#define FUNC_TPD_PP   1     /* TPD +/+                2-Chan          */
#define FUNC_TPD_MM   2     /* TPD -/-                2-Chan          */
#define FUNC_TPD_PM   3     /* TPD +/-                2-Chan          */
#define FUNC_TPD_MP   4     /* TPD -/+                2-Chan          */
#define FUNC_TT_P     5     /* Rising edge            1-Chan          */
#define FUNC_TT_M     6     /* Falling Edge           1-Chan          */
#define FUNC_PW_P     7     /* Positive pulse width   1-Chan          */
#define FUNC_PW_M     8     /* Negative pulse width   1-Chan          */
#define FUNC_PER      9     /* Period                 1-Chan          */
#define FUNC_FREQ     10    /* Frequency              1-Chan          */
#define FUNC_PER_M    11    /* Period minus           1-Chan          */
/* Available analysis macros */
#define ANAL_FUNC     0     /* Function analysis macro                */
#define ANAL_JITT     1     /* Jitter analysis macro                  */
#define ANAL_RANG     2     /* Range analysis macro                   */
#define ANAL_CLOK     3     /* PW+/PW-/PER+/PER- macro                */
/* Stop count designators specific to ANAL_FUNC macro */
#define ANL_FNC_FIRST 0     /* Arm start first                        */
#define ANL_FNC_PLUS1 1     /* Start + 1                              */
#define ANL_FNC_START 2     /* Start                                  */
/* Rise/Fall edge designators */
#define EDGE_FALL     0     /* Measurement reference is falling edge  */
#define EDGE_RISE     1     /* Measurement reference is rising edge   */
#define EDGE_BOTH     2     /* Used for DDR in EYEH, DBUS, & FCMP     */
/* Pulsefind mode designators */
#define PFND_FLAT     0     /* Use flat algorithm for pulse-find calc */
#define PFND_PEAK     1     /* Use peak value for pulse-find calc     */
/* Pulsefind percentage designators */
#define PCNT_5050     0     /* Use 50/50 level for pulse-find calc    */
#define PCNT_1090     1     /* Use 10/90 level for pulse-find calc    */
#define PCNT_9010     2     /* Use 90/10 level for pulse-find calc    */
#define PCNT_USER     3     /* Do NOT perform pulse-find; manual mode */
#define PCNT_2080     4     /* Use 20/80 level for pulse-find calc    */
#define PCNT_8020     5     /* Use 80/20 level for pulse-find calc    */
/* Arming mode designators */
#define ARM_EXTRN     0     /* Arm using one of the external arms     */
#define ARM_START     1     /* Auto-arm on next start event           */
#define ARM_STOP      2     /* Auto-arm on next stop event            */
/* Valid lCmdFlag values for special features */
#define CMD_TIMESTAMP       1
#define CMD_ADJCYCLE        2
#define CMD_PATNMARK        16
/* Constants to assist in setting lArmMove                            */
#define ARMMOVE_MAX_STEP       40
#define ARMMOVE_MIN_STEP      -40
#define ARMMOVE_PICO_PER_STEP  25
/* Used for structure definitions below */
#define POSS_CHNS     10
/* Constants used to identify FFT window type                          */
#define FFT_RCT       0       /* Rectangular window                   */
#define FFT_KAI       1       /* Kaiser-Bessel window                 */
#define FFT_TRI       2       /* Triangular window                    */
#define FFT_HAM       3       /* Hamming window                       */
#define FFT_HAN       4       /* Hanning window                       */
```

```
#define FFT_BLK       5       /* Blackman window                          */
#define FFT_GAU       6       /* Gaussian window                          */
/* Constants used by new scope tool to identify which plot to show */
#define SCOP_INPS_NORM  0
#define SCOP_INPS_COMP  1
#define SCOP_INPS_DIFF  2
#define SCOP_INPS_BOTH  3
#define SCOP_INPS_COMM  4
/* Constants used by new scope tool for measures to calculate */
#define SCOP_MEAS_VEXTREME  (1<<0)
#define SCOP_MEAS_VTYPICAL  (1<<1)
#define SCOP_MEAS_WAVEFORM  (1<<2)
#define SCOP_MEAS_OVERUNDR  (1<<3)
#define SCOP_MEAS_RISEFALL  (1<<4)
#define SCOP_MEAS_VERTHIST  (1<<5)
#define SCOP_MEAS_HORZHIST  (1<<6)
#define SCOP_MEAS_EYEMASKS  (1<<7)
/* Used internally for tailfit algorithm */
#define PREVSIGMA 5
/* Used by Advanced PLL tool */
#define MIN_APLL_INI_DAMP_FCT 1e-3
#define MAX_APLL_INI_DAMP_FCT 10.0
#define MIN_APLL_INI_NAT_FREQ 10.0
#define MAX_APLL_INI_NAT_FREQ 10e9
#define MIN_APLL_INI_NOISEPSD -120
#define MAX_APLL_INI_NOISEPSD -40
/* Used by Phase Noise tool for number of decades to span */
#define DECADES 8
/* Constants for: lTailFit the number of dataCOM tailfits to perform */
#define DCOM_NONE   0
#define DCOM_AUTO   1
#define DCOM_FIT3   2
#define DCOM_FIT5   3
#define DCOM_FIT9   4
#define DCOM_FIT17  5
#define DCOM_ALL    6
#define DCOM_1SIGMA 7
/* Constants for: lFitPcnt the auto-mode percentage to converge within */
#define DCOM_PCNT5   0
#define DCOM_PCNT10  1
#define DCOM_PCNT25  2
#define DCOM_PCNT50  3
/* Constance used for PCI Express mode */
#define PCIX_SCOP_AVG 8
#define PCIX_RX_MODE 0
#define PCIX_TX_MODE 1
#define PCIX_RX_CARD 2
#define PCIX_TX_CARD 3
#define PCIX_RX_SYST 4
#define PCIX_TX_SYST 5
#define PCIX_SPECS 6
#define PCIX_EYE_XDOTS 408
#define PCIX_EYE_YDOTS 630
/* Constants used for Serial ATA tool */
#define SATA_SPANS 250
#define SATA_TFITS 11
/* Constants used to identify which clock analysis measures to calculate */
#define CANL_MEAS_RISEFALL  (1<<0)
#define CANL_MEAS_VTYPICAL  (1<<1)
#define CANL_MEAS_VEXTREME  (1<<2)
#define CANL_MEAS_OVERUNDR  (1<<3)
```

```
#define CANL_MEAS_WAVEMATH  (1<<4)
#define CANL_MEAS_TIMEPARM  (1<<5)
#define CANL_MEAS_TAILFITS  (1<<6)
#define CANL_MEAS_PERIODIC  (1<<7)
/* Constants to define the number of random data tailfits to perform */
#define RAND_AUTO   0
#define RAND_FIT3   1
#define RAND_FIT5   2
#define RAND_FIT9   3
#define RAND_FIT17  4
/* Constants for percentage to succeed when Random Data using auto-mode */
#define RAND_PCNT5   0
#define RAND_PCNT10  1
#define RAND_PCNT25  2
#define RAND_PCNT50  3
/* Constants used for Rambus DRCG adjacent cycle tool */
#define DRCG_SWEEPS 4
#define DRCG_CYCLES 6
/* Constants used for Spread Spectrum tool */
#define SSCA_USER  0
#define SSCA_SATA1 1
#define SSCA_SATA2 2
#define SSCA_PCIX  3
/* Constants used for filter selection */
#define FILTERS_DISABLED 0
#define BRICKWALL_FILTER 1
#define ROLLOFF_1STORDER 2
#define ROLLOFF_2NDORDER 3
#define PCIX_CLOK_FILTER 10
```

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# Appendix A – Internal, Deskew & Strobe Calibration

This appendix describes all the programming steps to perform an Internal, Deskew and Strobe calibration from an host computer.

## INTERNAL

The events required to perform an internal calibration:

Send the command to start internal calibration.
Respond with GO for message, "Ready to begin, select OK to continue…".
Wait for TRG bit of a serial poll to indicate completion.
Check DDE bit of the ESR register to determine if an error occurred.

The code to implement the above events follows:

```
long perform_int_calibration (void)
   {
   char event_status;
   char poll_status;
   Send(0,5,"*CLS",4,EOI);
   Send(0,5,":CAL:INT",8,EOI);
   respond_to_go_request(1);   /*continue int cal*/
   poll_status = 0;
   while ((poll_status&TRG) ==0)   {
      ReadStatusByte(0,5,&poll_status);
      }
   Send(0,5,"*ESR?",5,EOI);
   Receive(0,5,event_status,1,EOI);
   if((event_status& DDE)!=Ø)
      {
      printf("InternalCalibrationFailed");
      return(-1);
      }
   else
      {
      printf("InternalCalibrationPassed");
      return(0);
      }
   }
```

## DESKEW

The events required to perform an deskew calibration are:

Send command to start the deskew calibration
As prompted, respond with GO to swap cables between individual channels and between channel pairs or with NOGO to skip individual channels and/or channel pairs
Wait for TRG bit of a serial poll to indicate completion
Check DDE bit of the ESR register to determine if an error occurred

The code to implement the above events follows:

```
long perform_deskew (void)
   {
   /* Requires a timeout of 10 seconds (minimum) on the GPIB card */
   pMesg = (char **) 1; /* Deskew */

   char event_status;
   char poll_status;

   Send(0,5,"*CLS",4,EOI);
   Send(0,5,":CAL:DESKEW",11,EOI);

   /* Loop through and deskew each individual channel */
   for ( chan = MIN_CHAN; chan <= MAX_CHAN; chan++ )
      {
      if ( respond_to_prompt ( 0, next ) )
         {
         printf("Deskew Calibration Failed");
         return(-1);
         }
      }

   /* Now do the channel to channel deskews */
   for ( chan = MIN_CHAN; chan <= (MAX_CHAN - 1); chan++ )
      {
      for ( pair = chan + 1; pair <= MAX_CHAN; pair++ )
         {
         if ( respond_to_prompt ( 0, next ) )
            {
            printf("Deskew Calibration Failed");
            return(-1);
            }
         }
      }
   poll_status = 0;
   while ((poll_status & TRG) == 0 )
```

 

```
   ReadStatusByte(0,5,&poll_status);
Send(0,5,"*ESR?",5,EOI);
Receive(0,5,event_status,1,EOI);
if ( (event_status & DDE) != 0) )
   {
   printf("Deskew Calibration Failed");
   return(-1);
   }
else
   {
   printf("Deskew Calibration Passed");
   return(0);
   }
}
```

## DESKEW WITH DC OFFSET

The events required to perform an deskew calibration with DC offset are:

Send command to start the deskew calibration with DC offset
As prompted, respond with GO to perform the DC offset portion, swap cables between individual channels/channel pairs or with NOGO to skip individual channels and/or channel pairs
Wait for TRG bit of a serial poll to indicate completion
Check DDE bit of the ESR register to determine if an error occurred

The code to implement the above events follows:

```
long perform_deskew_with_dc (void)
   {
   /* Requires a timeout of 100 seconds (minimum) on the GPIB card */
   pMesg = (char **) 2; /* Deskew with DC calibration */

   char event_status;
   char poll_status;

   Send(0,5,"*CLS",4,EOI);
   Send(0,5,":CAL:DESKEWDC",11,EOI);

   /* Loop through and deskew each individual channel */
   for ( chan = MIN_CHAN; chan <= MAX_CHAN; chan++ )
      {
      /* Perform DC portion of individual channel deskew */
      if ( respond_to_prompt ( 0, next ) )
           {
           printf("Deskew (with DC) Calibration Failed");
           return(-1);
        }
```

```
      if ( respond_to_prompt ( 0, next ) )
         {
         printf("Deskew (with DC) Calibration Failed");
         return(-1);
         }
      }

   /* Now do the channel to channel deskew */
   for ( chan = MIN_CHAN; chan <= (MAX_CHAN - 1); chan++ )
      {
      for ( pair = chan + 1; pair <= MAX_CHAN; pair++ )
         {
         if ( respond_to_prompt ( 0, next ) )
            {
            printf("Deskew (with DC) Calibration Failed");
            return(-1);
            }
         }
      }

   poll_status = 0;
   while ((poll_status & TRG) == 0 )
      ReadStatusByte(0,5,&poll_status);
   Send(0,5,"*ESR?",5,EOI);
   Receive(0,5,event_status,1,EOI);
   if ( (event_status & DDE) != 0) )
      {
      printf("Deskew (with DC) Calibration Failed");
      return(-1);
      }
   else
      {
      printf("Deskew (with DC) Calibration Passed");
      return(0);
      }
   }


#define MIN_CHAN  1  /* These values depend upon how many channels
#define MAX_CHAN  5     have been installed in the SIA-3000     */

static char **pMesg;
static long nStep, nChan1, nChan2;

long pPrompt ( void )
   {
```

 

```
int  rqst;
long retn;
char sPrompt[BUF_SIZ] = {0};

if (pMesg == (char **) 1)
   {
   /* This is the deskew calibration */
   if (nStep < MAX_CHAN)
      sprintf(sPrompt, "\n\nConnect the TOP Calibration Output to  the
                        TOP Ch%d Input,\nand the BOTTOM Calibration
                        output to the BOTTOM Ch%d Input.\nPress Y to
                        continue, N to skip. ", nStep + 1, nStep + 1);
   else
      {
      nChan2++;
      if (nChan2 == MAX_CHAN)
         {
         nChan1++;
         nChan2 = nChan1 + 1;
         }
         sprintf(sPrompt, "\n\nConnect the TOP Calibration Output to
                           the TOP Ch%d Input,\nand the BOTTOM Calibra
                           tion Output to the TOP Ch%d Input.\nPress Y
                           to continue, N to skip. ", nChan1 + 1, nChan2
                           + 1);
      }
   }
   else if (pMesg == (char **) 2)
      {
      /* This is the deskew calibration with DC */
      if (nStep < MAX_CHAN * 2)
         {
         if (nStep & 1)
            sprintf(sPrompt, "\n\nConnect the TOP Calibration Output to
                              the TOP Ch%d Input,\nand the BOTTOM Cali
                              bration Output to the BOTTOM Ch%d Input.
                              \nPress Y to continue, N to skip. ",
                     nStep / 2 + 1, nStep / 2 + 1);
         else
            sprintf(sPrompt, "\n\nEnsure nothing is connected to Ch%d
                              inputs.\nPress Y to continue, N to skip. ",
                      nStep / 2 + 1);
         }
      else
         {
         nChan2++;
```

```
      if (nChan2 == MAX_CHAN)
         {
         nChan1++;
         nChan2 = nChan1 + 1;
         }
      sprintf(sPrompt, "\n\nConnect the TOP Calibration Output to the TOP
                        Ch%d Input\nand the BOTTOM Calibration Output to the
                        TOP Ch%d Input.\nPress Y to continue, N to skip. ",
                        nChan1 + 1, nChan2 + 1);
      }
   }
else
   sprintf(sPrompt, "\n\nError occurred during sequence. Press Q to
                        abort. ");

printf(sPrompt);
rqst = getch();
rqst = toupper(rqst);
printf("%c", rqst);

/* Continue or skip? */
if ( rqst == 'Y' )
   retn = 1;
else
   retn = 0;

/* This is for the deskew calibration with DC */
if (pMesg == (char **) 2)
   {
   /* If we cancel on the first message skip the second */
   if (nStep < MAX_CHAN * 2)
      {
      if (retn == 0 && !(nStep & 1))
         nStep++;
      }
   }
nStep++;
return retn;
}
```

 

```
long respond_to_prompt (long ( *next )( void ))
   {
   char poll_status;
   char event_status;

   event_status = 0;
   while ( (event_status & RQC) == 0 )
      {
      poll_status = 0;
      while ( (poll_status & ESB) == 0 )
         ReadStatusByte(0,5,&poll_status);
      Send(0,5,"*ESR?",5,EOI);
      Receive(0,5,event_status,1,EOI);
      }

   if ( next )
      {
      if ( !next() )
         Send(0,5,":SYST:NOGO",10,EOI);
      else
         Send(0,5,":SYST:GO",8,EOI);
      }
   return(0);
   }
```

## STROBE

The events required to perform a strobe calibration are:

Ensure nothing is connected to any inputs.
Send the command to start strobe calibration.
Respond with GO for message, "Ensure nothing is connected to any inputs".
Wait for TRG bit of a serial poll to indicate completion.
Check DDE bit of the ESR register to determine if an error occurred.

The code to implement the above events is as follows:

```
long perform_strobe_calibration (void)
   {
   char event_status;
   char poll_status;

   Send(0,5,"*CLS",4,EOI);
   Send(0,5,":SYST:STROCAL",13,EOI);

   /*start strobe cal*/
   respond_to_go_request(1);
```

```
      poll_status = 0;
      while ((poll_status&TRG) ==0)
         ReadStatusByte(0,5,&poll_status);
      Send(0,5,"*ESR?",5,EOI);
   Receive(0,5,event_status,1,EOI);
   if((event_status& DDE)!=Ø)
      {
      printf("Strobe Cal Failed");
      return(-1);
      }
   else
      {
      printf("Strobe Cal Passed");
      return(0);
      }
   }

long respond_to_go_request (long go)
   {
   char poll_status;
   char event_status;

   event_status = 0;
   while ( (event_status & RQC) == 0 )
      {
      poll_status = 0;
      while ( (poll_status & ESB) == 0 )
           ReadStatusByte(0,5,&poll_status);
   Send(0,5,"*ESR?",5,EOI);
   Receive(0,5,event_status,1,EOI);
   }

   if ( !go )
      Send(0,5,":SYST:NOGO",10,EOI);
   else
      Send(0,5,":SYST:GO",8,EOI);
   return(0);
   }
```

 

This appendix describes the programming steps to take a measurement and read back the values of the measurement. In this example a burst of 100 measurements is taken and the data read back in a 32-bit floating format.

```
void main (void)
   {
      int i;
      int no_of_bytes;
      char temp_string[2048];
      int c;
      int header;
      float this_reading[100];
      char *ptr;
      int result;
/*488 is initialized for controller and instrument*/
   no_of_bytes=100;
   Send(0,5,"*CLS",4,EOI);
   Send(0,5,":ACQ:COUN100",12,EOI)
   Send(0,5,"*TRG",4,EOI);
   result=0;
   while((result & 0x01) ==0)      /*Wait for TRG bit*/
      {
      ReadStatusByte(0,5,&result);
      }
   sprintf(temp_string,"%i",number_of_bytes*4);
   c=strlen(temp_string);
   header=c+2;                     /*# of characters in header*/
   Send(0,5,":MEAS:DATA4?",12,EOI);
   result=0;
   while((result & 0x10) ==0)      /*Wait for MAV bit*/
      {
      ReadStatusByte(0,5,&result);
      }
   Receive(0,5,temp_string,(no_of_bytes*4)+header,EOI);
                                   /*convert char string to floating point*/
   ptr=&temp_string [header];
   for(i=0; i<no_of bytes; i++)
      {
      this_reading [i] = *((float*)ptr);
      ptr = ptr+4;
      }
   }                               /*end of main*/
```

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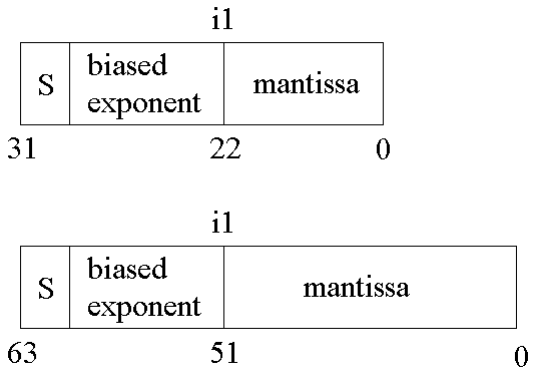
# Appendix C – Data Types

This appendix describes the data formats used for transferring data from the SIA-3000 over the GPIB for **:MEAS**ure commands.

The **:MEAS**ure**:DATA, :MEAS**ure**:DATA4** and **:MEAS**ure**:DATAT** queries support two sizes of data types using IEEE standards for floating-point arithmetic (ANSI/IEEE Std. 754-1985):

| Type | Size (bits) | Smallest Absolute value | Largest Absolute value | Number of Digit Accuracy |
|---|---|---|---|---|
| float | 32 | $1.1 \times 10^{-38}$ | $3.4 \times 10^{38}$ Scientific | 6-digit precision |
| double | 64 | $2.2 \times 10^{-308}$ | $1.7 \times 10^{308}$ Scientific | 15-digit precision |

Data Representation:




s = Signbit (0 = positive, 1 = negative)
i = Position of implicit binary point (always 1)
1 = integer bit of mantissa
Exponent bias (normalized values)
float: 127(7FH)
double: 1023(3FFH)

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WAVECREST Corporation

**World Headquarters:**
7626 Golden Triangle Drive
Eden Prairie, MN 55344
TEL: (952) 831-0030
FAX: (952) 831-4474
Toll Free: 1-800-733-7128
www.wavecrest.com

**West Coast Office:**
1735 Technology Drive, Ste. 400
San Jose, CA 95110
TEL: (408) 436-9000
FAX: (408) 436-9001
1-800-821-2272

**Europe Office:**
Lilenthalalle 25
D-80939 Munchen
TEL: 011-49-89-32225330
FAX: 011-49-89-32225333

**Japan Office:**
Otsuka Sentcore Building, 6F
3-46-3 Minami-Otsuka
Toshima-Ku, Tokyo
170-0005, Japan
TEL: +81-03-5960-5770
Fax: +81-03-5960-5773

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