Programmer Manual

Tektronix

CTS 850
Test Set
SDH/PDH, Jitter & Wander

070-9990-01

This document applies to firmware version 2.8
and above.

Printed in the U.S.A.

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of three (3) years from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; or c) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

THIS WARRANTY IS GIVEN BY TEKTRONIX WITH RESPECT TO THIS PRODUCT IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Table of Contents

Syntax and Commands

Status and Events

Examples

Appendices

Glossary and Index

List of Figures

List of Tables

Preface

The CTS 850 SDH Test Set can be controlled remotely through the use of SCPI-derived commands (Standard Commands for Programmable Instruments) and IEEE 488.2 Common Commands. This manual describes how to use these commands to access information generated by or stored in the instrument.

About This Manual

The following table shows you where to find information on the more common subjects related to programming your CTS 850.

Where To Find Information in This Manual

If you want to know:	Look in this part of the manual:
How to set up the instrument for remote communication	*Setting Up for Remote Communication* (Chapter 1)
How the programming model for this instrument is structured	*Programming Model* (Chapter 1)
How to perform simple tasks such as generating a normal or modified signal	*Examples of Command Usage* (Chapter 1)
How the command language syntax is structured	*Syntax* (Chapter 2)
What the functional command groups are	*Functional Command Groups* (Chapter 2)
What the commands and queries are	*Transmit Commands* section through the *Common Commands* section (Chapter 2)
What the error and event messages are	*Status and Events* section contains the primary error and event messages (Chapter 3) The commands and queries in *Syntax and Commands* list the primary and secondary error and event messages for most commands
How to structure a program containing commands and queries	*Examples* (Chapter 4)
What the default values for the instrument are	*Appendix D*

Conventions

The procedures in the *Setting Up for Remote Communication* section that require the use of the front panel are presented in table format. Perform the procedures by reading from left to right in the table (see example below). The word *none* in a cell indicates that no action is required.

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
Begin here with Step 1	Step 2	Step 3	Step 4
		Step 5	Step 6
		Step 7	Step 8, CTS 850 instruction is complete

Some procedures require several iterations of highlighting parameters and selecting choices. Some procedures may require more than one menu button or menu page selection as well.

Related Manuals

The following documents are also available for the CTS 850 SDH Test Set.

- The *CTS 850 User Manual* (Tektronix part number 070-9988-XX) is the primary source of information about how the CTS 850 functions.
- The CTS850 SDH/PDH *Reference Manual on CD* (Tektronix part number 063–3013–00) contains all the user manual information, in a portable electronic document format.
- *Wander Analyst User Manual* (Tektronix part number 070–9784–02) and Wander Analyst 5.0 PC software (Tektronix part number 063–2955–01) for TDEV/MTIE analyis. This PC application software is bundled with Option 14– Jitter/Wander.
- The *CTS850 SDH/PDH Test Set Service Manual* (Tektronix part number 070-9991-XX) provides information on maintaining and servicing your instrument to the module level.

Setting Up for Remote Communication

With a computer (controller), you can control the CTS 850 over GPIB or RS-232. This section shows you how to do the following:

- Connect the instrument to the computer
- Set the communication parameters
- Test the communication

***NOTE**. In order for data communication to take place, the computer should have the proper communication hardware (either GPIB or RS-232) and software drivers already installed. Consult the manufacturer's manuals for detailed information.*

GPIB Connection

To connect the CTS 850 to a computer using a GPIB cable, perform the following procedure:

1. Locate the GPIB port on the rear-panel (see Figure 1–1).
2. Connect one end of the GPIB cable to the CTS 850 and the other end to the computer.
3. Connect both the CTS 850 and the computer to the line voltage.
4. Turn on the instrument.
5. Turn on the computer.

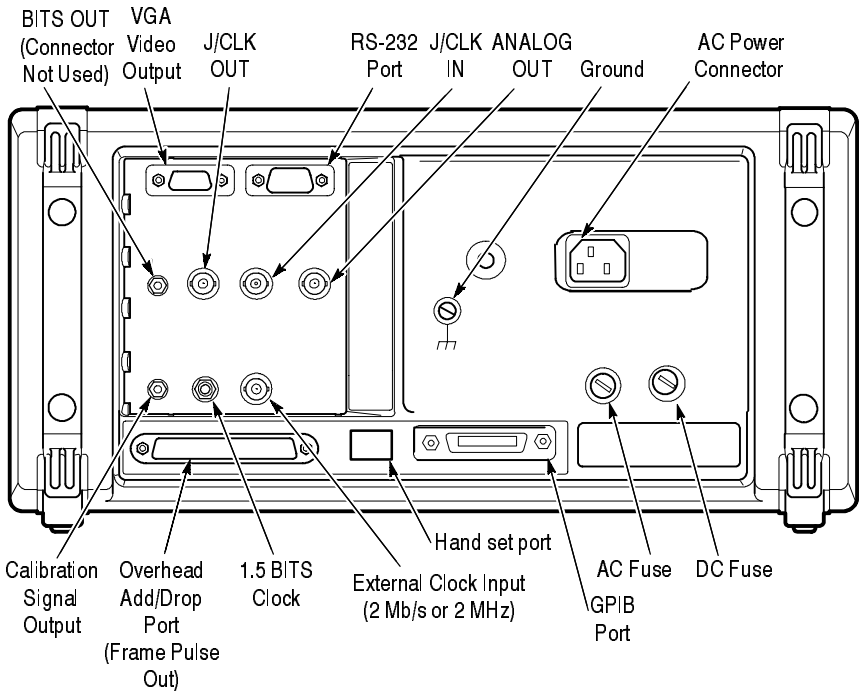


Figure 1–1: Rear-panel communication ports

GPIB Parameter Setup

The only parameter you may need to set is the GPIB address; the default address set at the factory is 4. To change the GPIB address to other values, perform the steps indicated in Table 1–1.

Table 1–1: Setting GPIB address

Press Menu Button	Select Menu Page	Highlight Parameter	Select Choice
UTILITY	REMOTE CONTROL	GPIB Primary Address	Inc, Dec, or Offline

Figure 1–2 is a display of the UTILITY Menu showing the GPIB Address.

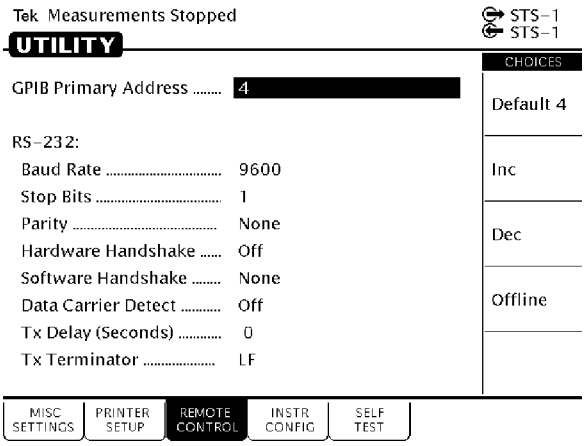


Figure 1–2: GPIB address in the UTILITY menu

GPIB Connection Test

To test whether the GPIB connection is working, send a GPIB query from the computer. The *Examples* section shows how to send the *IDN? query command to check the identity of the instrument. The first two terms of the response should be "TEKTRONIX" and "CTS 850", respectively.

RS-232 Connection

The RS-232 port of the CTS 850 is a DB-9 male connector. Table 1–2 lists the pin assignments of the connector.

Table 1–2: RS-232 pin assignments

Pin number	Description
1	Data Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to Send

Table 1–2: RS-232 pin assignments (Cont.)

Pin number	Description
8	Clear to Send
9	Ring Indicator

The instrument is configured as a DTE (Data Terminal Equipment).

To connect the instrument to a computer via RS-232:

1. Locate the RS-232 port on the rear-panel (see Figure 1–1).
2. Connect one end of the RS-232 cable to the instrument and the other end to the computer.
3. Connect both the CTS 850 and the computer to the power system.
4. Turn on the instrument.
5. Turn on the computer.

***NOTE**. If you use the RS-232 port for the computer, you cannot use it for the printer.*

RS-232 Parameter Setup

Table 1–3 shows the default RS-232 parameter values.

Table 1–3: Default RS-232 parameter values

Parameter	Default value
Baud Rate	9600
Stop Bits	1
Parity	None
Hardware Handshake	Off
Software Handshake	None
Data Carrier Detect	Off
Tx Delay (seconds)	0
Tx Terminator	LF

To change the RS-232 parameters to other values, perform the steps indicated in Table 1–4.

Table 1–4: Setting RS-232 parameters

Press menu button	Select menu page	Highlight parameter	Select choice
UTILITY	REMOTE CONTROL	Baud Rate	1200, 2400, 4800, or 9600
		Stop Bits	1 or 2
		Parity	None, Odd, or Even
		Hardware Handshake	Off or On
		Software Handshake	None or Xon/Xoff
		Tx Delay (seconds)	0, 1, 5, Inc, or Dec
		Tx Terminator	LF, CR, CR/LF, or LF/CR

RS-232 Connection Test

To verify that the RS-232 connection works, run a terminal emulation program on the computer. Configure the terminal settings to be the same values as those you have selected on the CTS 850. Turn on the instrument, and a one-line identification message should appear on the computer screen.

If the message does not appear or is unreadable, it is an indication that connection is not set up properly. Table 1–5 shows some common problems and their possible solutions.

Table 1–5: RS-232 connection problems

Symptom	Probable cause	Solution
No communication	Defective cable	Replace the cable
Garbled characters	Incompatible baud setting	Set the RS-232 parameters on computer to be the same as those on the instrument
Missing characters	Incorrect flow control	Use a null modem or set the software handshaking to Xon/Xoff

Programming Model

This section explains the two functional blocks of the CTS 850 SDH Test Set, the subsystems of each functional block, and the two modes in which the instrument operates.

Functional Blocks

The CTS 850 is made up of two independent functional blocks: a Transmitter and a Receiver. The Transmitter generates an SDH signal of known characteristics for testing. The Receiver accepts a telecommunications signal, breaks it apart to see what has gone wrong or been modified, and displays measurements for that signal.

Transmitter

The Transmitter consists of two major subsystems: OUTPUT and SOURCE. The OUTPUT subsystem commands determine *how* the signal is transmitted and set characteristics such as the signal type and transmission rate. The SOURCE subsystem commands determine *what* signal is transmitted. Use the SOURCE subsystem commands to set errors, alarms, failures, pointers, overhead, and the payload. These two subsystems correspond to the functions in the **TRANSMIT** menu of your instrument.

Receiver

The Receiver is made up of two major subsystems: INPUT and SENSE. The INPUT subsystem commands determine *how* a signal is received and set characteristics such as the signal type and rate. The SENSE subsystem commands determine *what* signal is received. Use the SENSE subsystem commands to set up tests, capture overhead, and access measurements. These two subsystems correspond to the functions in the **RECEIVE** and **RESULTS** menus of your instrument.

Modes of Operation

The CTS 850 operates in normal or through mode. Figure 1–5 illustrates how the modes of operation work within the two functional blocks.

Normal Mode

Use normal mode to generate a signal of known characteristics and to measure a received signal. You can generate a normal or modified signal in this mode. The SOURce:DATA:TELecom:SOURce OUTPUT1 command instructs the CTS 850 to operate in normal mode.

Through Mode

Use through mode to transmit a received signal without modifying it. The rate and content of the transmitted signal are matched to that of the received signal. The SOURce:DATA:TELecom:SOURce INPUT1 command instructs the CTS 850 to operate in through mode; the instrument continues to measure the received signal.

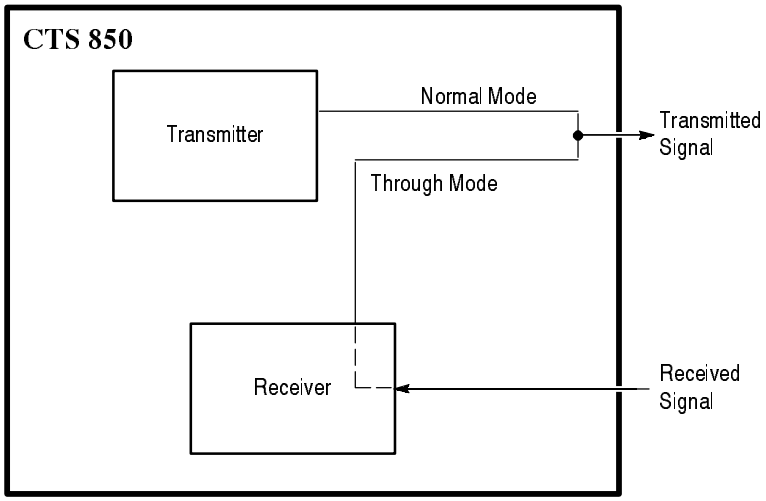


Figure 1–5: Modes of operation

Information Storage in the Instrument

Instrument setups, pass/fail tests, and test results are stored in several types of internal buffers and on floppy disk. The number and type of buffers available depend on the type of information stored. The following sections detail the storage locations available for setups, tests, and results.

Storage of Instrument Setups

Instrument setups contain all information necessary to set the instrument operation. These setups are stored in internal buffers and on floppy disk as shown in Figure 1–6. The lines and arrows in the illustration show the direction that information is moved. The commands you use to move the setups from one location to another are shown near the lines.

The current buffer (buffer number 0) contains the current instrument setups. Buffers 1 through 5 contain additional instrument setups. The floppy disk can contain any instrument setups.

You can move information between the current buffer and buffers 1 through 5 by using the *SAV and *RCL commands. Specify the buffer number with these commands. For example, use the *SAV 3 command to save the current buffer information in buffer 3 and the *RCL 3 command to move information from buffer 3 to the current buffer.

You can also move instrument setups between the floppy disk and the buffers. Use the MMEMory:STORe:SETTings command to move information from the buffers to the floppy disk. Specify the file name and buffer number with this command (the current buffer is buffer number 0). For example, use the MMEMory:STORe:SETTings "SET001",2 command to store the information in buffer number 2 to a file named SET001. Use the MMEMory:STORe:SETTings "SET001",0 command to store information in the current buffer to a disk file.

Use the MMEMory:LOAD:SETTings command to move information from the disk to the buffers. For example, use the MMEMory:LOAD:SETTings "SET001",4 command to move information from a file named SET001 on disk to buffer 4. Use the MMEMory:LOAD:SETTings "SET001",0 command to move information from a disk file to the current buffer.

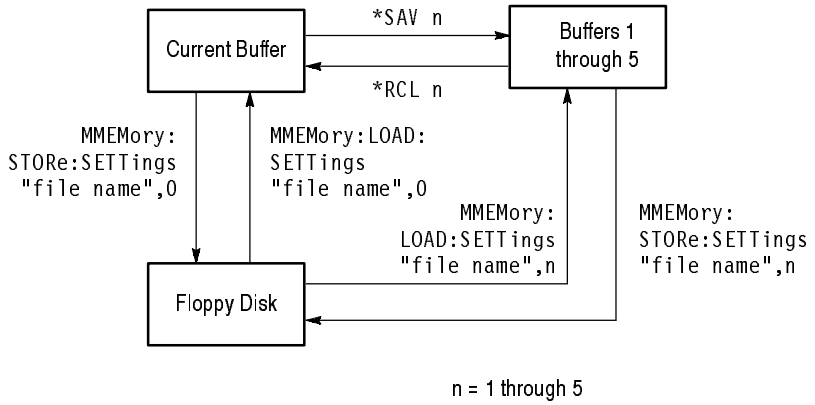


Figure 1–6: How instrument setups are stored

Storage of Pass/Fail Tests

Pass/fail tests allow you to apply predefined criteria to test results and determine if the tests passed or failed. The pass/fail tests are stored in a current buffer and on floppy disk as shown in Figure 1–7. The lines and arrows in the illustration show the direction that information is moved. The commands you use to move the pass/fail tests from one location to another are shown near the lines. The current buffer contains the current pass/fail test. The floppy disk can contain any pass/fail tests.

Use the MMEMory:STORe:TEST command to move information from the current buffer to the disk. Specify the file name with this command. For example, the MMEMory:STORe:TEST "TEST001" command will store the current pass/fail test in a file named TEST001 on the disk.

Use the MMEMory:LOAD:TEST command to move information from the disk to the current buffer. Specify the file name with this command. For example, the MMEMory:LOAD:TEST "TEST002" will copy the pass/fail test in a file named TEST002 on disk to the current buffer.

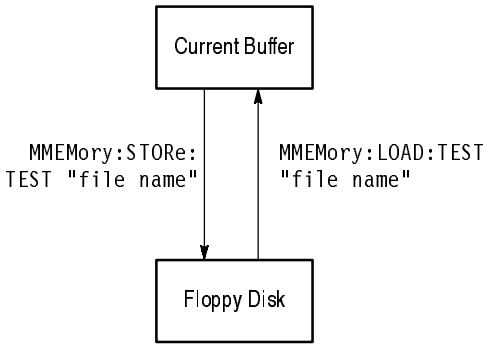


Figure 1–7: How pass/fail tests are stored

Storage of Test Results

Test results contain measurement obtained from the Receiver and are initiated by the SENSe:DATA:TELecom:TEST:STARt, SENSe:DATA:TELecom:TEST:STOP, and SENSe:DATA:TELecom:TEST:DURation commands. Test results are stored in a different way than the instrument setups and pass/fail tests. The test results are stored in a current and previous buffer, on floppy disk, and in two additional buffers: buffer number –1 and the view buffer (see Figure 1–8).

Buffer number –1 contains only test results that have been copied from disk. The view buffer is a view-only buffer that contains test results from any buffer or from disk. Note that information can be copied only to the view buffer and not from it. The lines in the illustration show the direction that information is moved. The commands you use to move the test results from one location to another are shown near these lines.

The view buffer and disk can contain current or previous test results. Buffer 1 contains current test results, buffer 2 contains previous test results, and buffer number –1 contains test results from disk.

You can move information to the view buffer in three ways. The MMEMory:LOAD:RESUlts moves test results from the disk to this buffer (test results are automatically moved to buffer number –1 when you send this command). The SENSe:DATA:TELecom:MEASure:BUFFer 2 command moves test results from buffer 2 (previous test results) to the view buffer. And the SENSe:DATA:TELecom:MEASure:BUFFer 1 command moves test results from buffer 1 (current test results) to the view buffer. When the SENSe:DATA:TELecom:TEST:STARt command is sent, the test results in buffer 1 are automatically moved to the view buffer.

You can move information from buffers 1 and 2 to disk by using the MMEMory:STORe:RESUlts command. Specify the file name and buffer number 1 or 2 with this command. For example, the MMEMory:STORe:RESUlts “RES001”, 2 command stores the test results from buffer 2 to a file named RES001 on the disk.

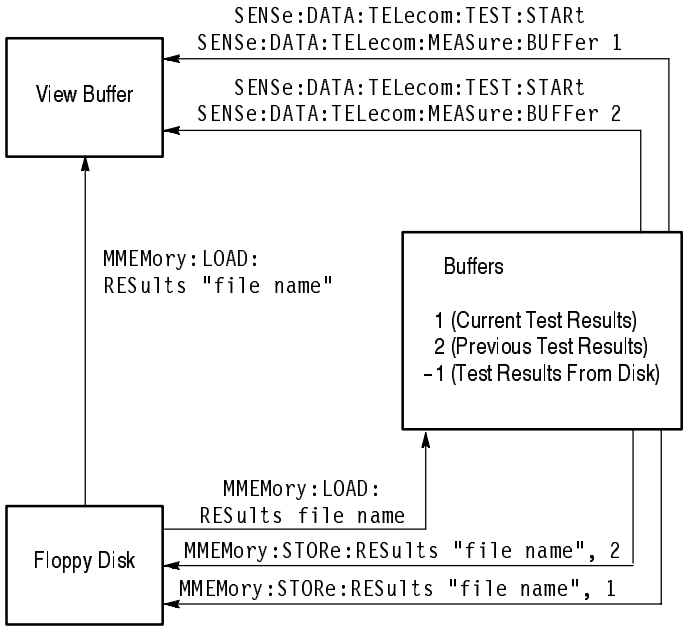


Figure 1–8: How test results are stored

Examples of Command Usage

This section shows you how to use the commands and queries together to do such things as setting up normal or modified signals, generating errors, and accessing measurements. Use this section to learn about the command language before you start writing programs. Be sure to refer to the *Syntax and Commands* section for more details on how to construct commands and queries correctly.

***NOTE**. The commands and queries in this section are shown as a combination of uppercase and lowercase letters. The uppercase letters signify the accepted abbreviation of the command or query.*

Generating Signals

This section shows you how to generate normal and modified signals.

Generating Signals in Normal Mode

The following example shows you how to set up a normal electrical signal at an STM-1 rate, using channel one, and which contains a PRBS 2E23–1 test pattern:

1. Reset the CTS 850 to a known state by sending the *RST command.
2. Set up the signal physical characteristics by sending the following commands:
   OUTPUT1:TELecom:RATE STM1
   OUTPUT1:TELecom:TYPE ELECtrical
3. Set the instrument to normal mode by sending the SOURce:DATA:TELecom:SOURce OUTPUT1 command.
4. Set up to test on channel one by sending the SOURce:DATA:TELecom:CHANnel 1 command.
5. Select mapping by sending the SOURce:DATA:TELecom:PAYLoad:MAPPing EQUIpped command; this command sets the C2 byte to 01.
6. Select a payload test pattern of PRBS 2E23–1 by sending the SOURce:DATA:TELecom:PAYLoad:PATTern PRBS23 command.

At this point the instrument is generating a normal signal. You can now modify the signal or insert errors or alarms; the *Generating Modified Signals* section shows you how.

Generating Signals in Through Mode

When the instrument is operating in through mode, the received signal is transmitted without modification.

Set the instrument to through mode by sending the SOURce:DATA:TELecom:SOURce INPUT1 command.

Generating Modified Signals

This section shows you a few of the many ways to create modified signals.

Changing the Overhead. Use the following methods to insert information into the overhead to create a modified signal:

- Insert overhead data into the Section DCC (bytes D1 and D2) from an external protocol analyzer by sending the SOURce:DATA:TELecom:OVERhead:INSert SDCC command. You can also insert data into the line DCC (bytes D4 through D12) or the F1 byte by using LDCC or F1 as the parameter value.
- Change the A1 byte on channel one by sending the SOURce:DATA:TELecom:OVERhead:DATA 1,A1,0,246 command. This command sets the A1 byte to a value of 246 (binary 11110110). The table included with the command description on page 2–33 lists the bytes available for selection.
- You can change the APS bytes in two ways:
  - Send the SOURce:DATA:TELecom:OVERhead:DATA 1,K1,0,#H0 command to set the K1 byte to zero. Use this command in the same way to set the K2 byte.
  - Send the SOURce:DATA:TELecom:OVERhead:APS command to set the K1 and K2 bytes together. For example, sending the SOURce:DATA:TELecom:OVERhead:APS #HFFFF command sets both K1 and K2 to decimal 255 (all ones in binary).

Changing Pointers. Use one of the following methods to adjust pointers.

To create a manual pointer adjustment, follow these steps:

1. Send the SOURce:DATA:TELecom:POINter:MODE MANual command.
2. Send the SOURce:DATA:TELecom:POINter:VALue 590 command to create a pointer with a value 590. (If you use a value greater than 782, an illegal pointer is created.)
3. To generate a new data flag every time a pointer changes, send the SOURce:DATA:TELecom:POINter:NDFLag ON command.

To create pointer adjustments that alternately increment and decrement, follow these steps:

1. Send the SOURce:DATA:TELecom:POINter:MODE SINGle command.
2. Send the SOURce:DATA:TELecom:POINter:ACTion command to initiate the pointer adjustment.

To create a burst of pointer adjustments, follow these steps:

1. Send the SOURce:DATA:TELecom:POINter:MODE BURSt command.
2. To create three pointer adjustments with each burst of pointers, send the SOURce:DATA:TELecom:POINter:NBURst 3 command (if you do not specify the number of pointer adjustments, the instrument assumes you want two pointer adjustments for each burst).
3. Send the SOURce:DATA:TELecom:POINter:ACTion command to initiate a burst of pointer adjustments.

To create continuous pointer adjustments that alternate between up and down, follow these steps:

1. Send the SOURce:DATA:TELecom:POINter:DIRection ALTernate command (you can also specify UP or DOWN as the parameter value).
2. Send the SOURce:DATA:TELecom:POINter:MODE CONTinuous command to initiate the continuous pointer adjustments.

Generating a Failure. Generate a loss of frame failure by sending the SOURce:DATA:TELecom:FAILure:TYPE LOFrame command. You can also specify LOSignal or LOPointer as the parameter value to generate a loss of signal or loss of pointer.

Generating an Alarm. Generate a path alarm indication by sending the SOURce:DATA:TELecom:ALARm PAIS command. You can also specify a variety of other alarms.

***NOTE**. You must send the SOURce:DATA:TELecom:FAILure:TYPE NONE command before you generate any alarm. Failures and alarms cannot be generated simultaneously.*

Inserting Errors. Follow these steps to insert errors:

1. Enable error insertion by sending the SOURce:DATA:TELecom:ERRor:ENABle ON command.
2. Insert a B1 section code violation by sending the SOURce:DATA:TELecom:ERRor:TYPE SCV command. You can also specify LCV, PCV, PFEBE, or DATA as the parameter value to insert a B2 line code violation, B3 active path code violation, path far end block error, or payload data bit error, respectively.
3. You can insert errors at a continuous rate or immediately, upon command:
   - Insert continuous errors at a rate of 1E−5 by sending the SOURce:DATA:TELecom:ERRor:RATE 1E−5 command. You can select a variety of error rates depending on the signal rate and error type.
   - Force an immediate error insertion by sending the SOURce:DATA:TELecom:ERRor:IMMediate command.

Creating a Line Frequency Offset. Follow these steps to create a line frequency offset:

1. Select frequency offset pointer adjustments by sending the SOURce:DATA:TELecom:POINter:MODE FOFFset command.
2. Set the clock source to the internal clock by sending the SOURce:CLOCk:SOURce INTernal command.
3. Select line offset with no pointer adjustments by sending the SOURce:CLOCk:OFFSet:MODE LOFFset command.
4. Set the line offset value to −55.1 ppm by sending the SOURce:CLOCk:OFFSet:LVALue −55.1 command. The payload clock offset value will automatically be set to −55.1.

Receiving Signals

This section shows you how to set up the CTS 850 to receive a signal, how to check the status of the signal, and how to drop and view overhead data.

Receiving a Signal Using a Manual Setup

The following example shows you how to manually set up your instrument to receive a normal electrical signal at an STM-1 rate on channel one:

1. Reset the instrument to a known state by sending the *RST command. *Appendix NO TAG* lists the default parameter values.
2. Set up the signal physical characteristics by sending the following commands:
   INPUT1:TELecom:RATE STM1
   INPUT1:TELecom:TYPE ELECtrical
3. Set the source of the signal by sending the SENSe:DATA:TELecom: SOURce INPUT1 command.
4. Receive the signal through channel one by sending the SENSe:DATA: TELecom:CHANnel 1 command.

Receiving a Signal Using Autoscan

If you do not know what kind of signal you are going to receive, send the SENSe:DATA:TELecom:AUTOscan command. The instrument scans the incoming signal and sets up the receiver to the proper signal rate and payload mapping. The OPC bit is set when autoscan completes execution. To check if the autoscan was able to set up the receiver properly, first send the*ESR? query, and then send the SYSTem:ERRor? query. You will see an error number and description. If the autoscan failed, check to see if a signal is connected.

Checking the Physical Status of a Signal

The following steps show you how to check the physical status of a signal:

1. To check if you are receiving the signal, send the INPUT1:TELecom: STATus? query. If you get a response of LOSIGNAL, try another setup to receive the signal (refer to the *Receiving a Signal Using a Manual Setup* or *Receiving a Signal Using Autoscan* descriptions in this section). If you get a response of MONITOR, you are receiving a monitor signal of low amplitude.
2. Check the optical signal level of the incoming signal by sending the INPUT1:TELecom:OPWR? query. Values for a valid signal are –32 dBm to –5 dBm.
3. If you still are unable to find the proper settings for the incoming signal, check to see if the level is set properly by sending the INPUT1:TELecom: LEVel? query.

Checking Signal Status

To check the status of the received signal, send the SENSe:DATA:TELecom:STATus? query. A response of 8192 indicates a pattern lock on the received signal with no alarms or failures detected. Refer to the description for this query on page 2–133 for list of possible responses. Figure 2–10 on page 2–10 describes how to interpret this type of response.

Dropping the Overhead

Use one of the following ways to drop the overhead to an external protocol analyzer:

- Drop the Section DCC overhead (bytes D1 and D2) to an external protocol analyzer by sending the SENSe:DATA:TELecom:OVERhead:DROP SDCC command. You can also drop Line DCC (bytes D4 through D12) or the F1 byte by using LDCC or F1 as the parameter value.
- Drop the F2 byte to an external protocol analyzer by sending the SENSe:DATA:TELecom:POVerhead:DROP F2 command.

Viewing the Overhead

Follow these steps to freeze the overhead and to query specific overhead bytes:

1. Start acquiring the overhead by sending the INITiate command.
2. To cause a trigger and stop acquiring overhead, send the TRIGger:IMMediate command.
3. Determine the value of the A1 overhead byte on channel one by sending the SENSe:DATA:TELecom:OVERhead DATA? 1,A1,0 query. The table included with the query description on page 2–147 lists the bytes available for selection.
4. To start acquiring overhead again, send the INITiate command.

SDH Signal Testing

This section shows you how to set up several types of tests, how to run these tests, and then how to view the results. How to Store Test Results in the Instrument appeared earlier in this chapter.

Taking BER Measurements

This example shows you how to run a five-minute BER test and view the test results:

1. Connect a cable from the TRANSMIT output to the RECEIVE input.
2. Reset the instrument to a known state by sending the *RST command. *Appendix D* lists the default parameter values.
3. Set the test duration to five minutes by sending the SENSe:DATA:TELecom:TEST:DURation 0,0,5,0 command.

4. Start the test by sending the SENSe:DATA:TELecom:TEST:STARt command.

5. Check whether the test is done by sending the SENSe:DATA:TELecom:TEST:STATus? query. If the first number in the response is 0, the test is done. If the first number is 1, look at the other numbers in the response string to see how long the test has been running. For example, a response of 1,0,0,4,50 indicates that the test has been running for 4 minutes and 50 seconds and is still running. If you had previously set a test duration of 5 minutes, you know that the test will be done in 10 seconds.

6. After the test has completed, send the following queries to view the error measurements:

   - The SENSe:DATA:TELecom:TEST:MEASure:ERRor:ECOUnt:SCV? query returns the number of B1 errors.
   - The SENSe:DATA:TELecom:TEST:MEASure:ERRor:ECOUnt:LCV? query returns the number of B2 errors.
   - The SENSe:DATA:TELecom:TEST:MEASure:ERRor:ECOUnt:PCV? query returns the number of B3 errors.

Measuring Continuous Pointer Adjustments

The following example shows you how to run a test that initiates continuous pointer adjustments, and then view the measurements:

1. Connect a cable from the TRANSMIT output to the RECEIVE input.

2. Reset the instrument to a known state by sending the *RST command. *Appendix D* lists the default parameter values.

3. Set the test duration by sending the SENSe:DATA:TELecom:TEST:DURation 0,0,0,0 command. This test will run continuously.

4. Set up continuous pointer adjustments that alternate between up and down by sending the SENSe:DATA:TELecom:POINter:MODE CONTinuous and SENSe:DATA:TELecom:POINter:DIRection ALTernate commands.

5. Set the pointer adjustment rate to 10 ms by sending the SENSe:DATA:TELecom:POINter:RATE 10 command.

6. Start the test by sending the SENSe:DATA:TELecom:TEST:STARt command.

7. To access the pointer adjustment measurements, send the commands listed below. Keep in mind that while the test is running, these measurements do not represent the final pointer adjustment measurements. Send the SENSe:DATA:TELecom:TEST:STOP command to stop the test, and then the SENSe:DATA:TELecom:MEASure:POINter: queries to access the final pointer adjustment measurements.

- The SENSe:DATA:TELecom:MEASure:POINter:PPTR? query returns the number of positive (up) pointer adjustments.
- The SENSe:DATA:TELecom:MEASure:POINter:NPTR? query returns the number of negative (down) pointer adjustments.
- The SENSe:DATA:TELecom:MEASure:POINter:ICOUNt? query returns the total number of invalid pointers.

Tributary Signal Testing

This section discusses five ways to use the Add/Drop/Test Option of your CTS 850 to test the viability of a network element (NE) and portions of the network.

CTS 850 as a Stand-Alone Tributary Test Set

You can use the CTS 850 as a stand-alone tributary test set without using any SDH features. You can verify PDH path connection, test path quality, and verify responses to faults. The CTS 850 can both generate and receive PDH signals.

The following example generates a 2 Mb/s tributary signal and then inserts an alarm:

1. Configure your CTS 850 as shown in the following figure.

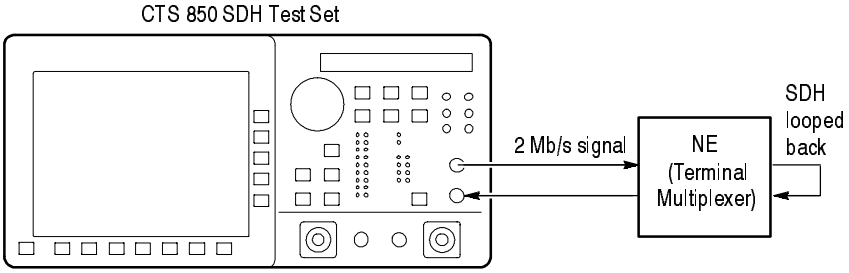


Figure 1–13: Setup for the CTS 850 as a stand-alone tributary test set

2. Send the following commands to set up to generate a 2 Mb/s tributary signal with a defined framing and pattern:
   SOURce:DATA:TELecom:SOURce OUTPUT2
   SOURce:DATA:TELecom:TRIButary:FRAMing UNFRamed
   SOURce:DATA:TELecom:TRIButary:PATTern UWORd
   SOURce:DATA:TELecom:TRIButary:PATTern:UWORd #HAA55
   SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth 2
3. Send the following commands to set up to receive the tributary signal:
   SENSe:DATA:TELecom:SOURce INPUT2

```
SENSe:DATA:TELecom:TRIButary:FRAMing UNFRamed
SENSe:DATA:TELecom:TRIButary:PATTern UWORd
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd #HAA55
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth 2
```

4. Verify that the CTS 850 is receiving the tributary signal correctly by sending the SENSe:DATA:TELecom:TRIButary:STATus? query. You should receive a response of 8192 indicating a pattern lock on the tributary signal.

5. Now verify the response to faults by inserting an alarm as follows:

   a. Send the SENSe:DATA:TELecom:TRIButary:ALARm AIS command to insert an AIS alarm.

   b. Then send the SENSe:DATA:TELecom:TRIButary:STATus? query. You should receive a response of 64 indicating a 2 Mb/s AIS alarm.

Testing the SDH Tributary Payload Mapping

You can use the CTS 850 to create and monitor SDH tributary payloads. This test can verify error events and alarms in the demapped tributary signal, and can measure multiple layer signal quality.

The CTS 850 maps a pattern into the tributary payload of a SDH signal. This signal is then generated by the CTS 850 and transmitted to an NE. The CTS 850 receives the SDH signal and measures both the SDH and mapped tributary signals.

The following example generates an SDH signal with a 2 Mb/s tributary mapped into it. Then, after the signal has been transmitted through an NE, the CTS 850 receives the signal and measures the demapped 2 Mb/s tributary signal.

1. Configure your CTS 850 as shown in Figure 1–14.

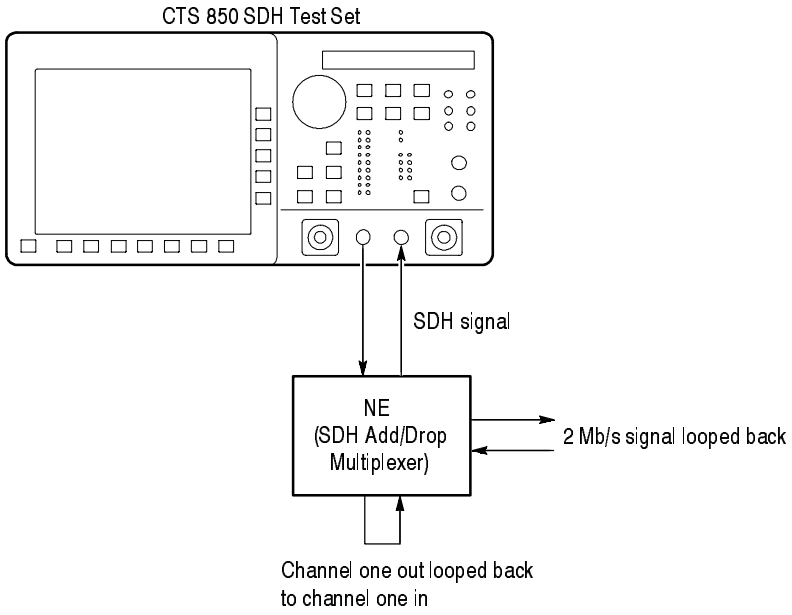


Figure 1–14: Setup for testing the SDH tributary payload mapping

2. Send the following commands to set up to generate an SDH signal with a defined tributary payload in channel 1:
   SOURce:DATA:TELecom:SOURce OUTPUT1
   OUTPUT1:TELecom:RATE STM1
   SOURce:DATA:TELecom:PAYLoad:MAPPing TRIButary
   SOURce:DATA:TELecom:TRIButary:CHANnel 1
   SOURce:DATA:TELecom:TRIButary:MAPPing TUASync
   SOURce:DATA:TELecom:TRIButary:FRAMing PCM31
   SOURce:DATA:TELecom:TRIButary:PATTern PRBS20
   SOURce:DATA:TELecom:TRIButary:BACKground:PATTern PRBS

3. Send the following commands to set up to receive and demap the tributary signal:
   SENSe:DATA:TELecom:SOURce INPUT1
   INPUT1:TELecom:RATE STM1
   SENSe:DATA:TELecom:PAYLoad:MAPPing TRIButary
   SENSe:DATA:TELecom:TRIButary:CHANnel 1
   SENSe:DATA:TELecom:TRIButary:FRAMing PCM31
   SENSe:DATA:TELecom:TRIButary:MAPPing TUASync
   SENSe:DATA:TELecom:TRIButary:PATTern PRBS20

4. Verify that the CTS 850 is receiving the tributary signal correctly by sending the SENSe:DATA:TELecom:TRIButary:STATus? query. You should receive a response of 8192 indicating a pattern lock on the demapped tributary signal.

Testing the Mapping Capability of a Network Element

You can use the CTS 850 to test the mapping capability of an NE. This test can introduce timing variations in the tributary signal and check for error-free mapping, verify mapping for correct channel assignments, and verify responses to errors, alarms, and failures.

The CTS 850 generates a tributary signal which is sent to an NE. The NE maps this tributary signal into the SDH signal. This signal is received by the CTS 850 which then demaps the tributary signal and measures it.

The following example generates a 140 Mb/s tributary signal and then inserts an error:

1. Configure your CTS 850 as shown in Figure 1–15.

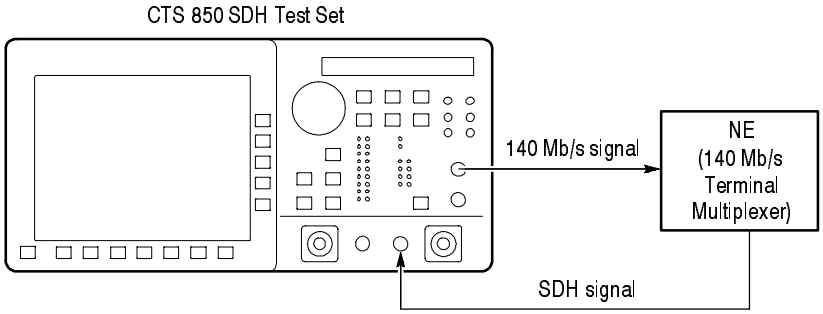


Figure 1–15: Setup for testing the mapping capability of an ne

2. Send the following commands to set up the CTS 850 to generate an unframed 140 Mb/s tributary signal:
   OUTPUT3:TELecom:RATE M140
   SOURce:DATA:TELecom:SOURce OUTPUT3
   SOURce:DATA:TELecom:TRIButary:FRAMing UNFRamed
   SOURce:DATA:TELecom:TRIButary:PATTern PRBS23

3. Send the following commands to set up the CTS 850 to receive the SDH signal with a tributary signal mapped into it:
   SENSe:DATA:TELecom:SOURce INPUT1
   SENSe:DATA:TELecom:PAYLoad:MAPPing TRIButary
   SENSe:DATA:TELecom:TRIButary:MAPPing M140
   SENSe:DATA:TELecom:TRIButary:FRAMing UNFRamed
   SENSe:DATA:TELecom:TRIButary:PATTern PRBS23

4. Send the following commands to verify the NE response to faults; these commands insert a payload bit error into the tributary signal:
   SOURce:DATA:TELecom:ERRor:TYPE TRIButary
   SOURce:DATA:TELecom:TRIButary:ERRor DATA
   SOURce:DATA:TELecom:ERRor:IMMediate

5. Verify that the CTS 850 is receiving and demapping the tributary signal correctly by sending the SENSe:DATA:TELecom:TRIButary:STATus? query. You should receive a response of 8704 indicating a 140 Mb/s bit error and pattern lock in the demapped tributary signal.

Testing the Demapping Capability of a Network Element

You can use the CTS 850 to test the demapping capability of an NE. This test can introduce pointer adjustments, test signal quality, verify correct channel assignments, and verify responses to errors, alarms, and failures.

The CTS 850 generates a tributary signal with a known pattern and maps this signal into the SDH signal. The signal is then sent to an NE, which demaps the tributary signal from the SDH signal. The CTS 850 receiver monitors and measures the demapped tributary signal.

The following example maps a 140 Mb/s tributary signal into an SDH signal, receives the demapped 140 Mb/s signal from the NE, and then initiates pointer adjustments:

1. Configure your CTS 850 as shown in Figure 1–16.

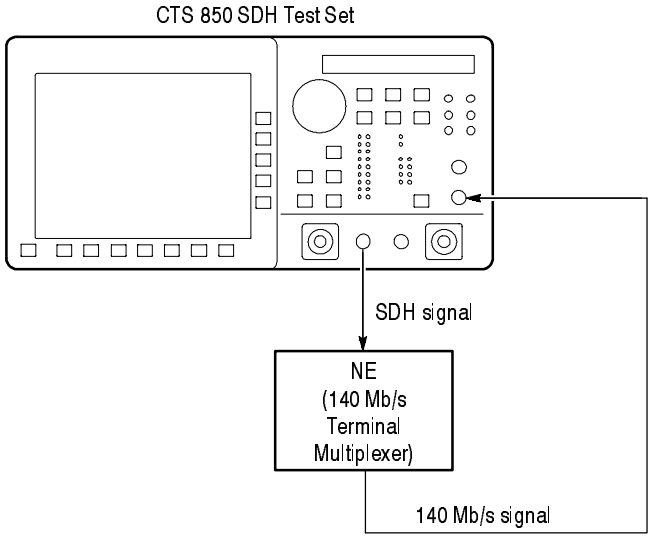


Figure 1–16: Setup for testing the demapping capability of an ne

2. Send the following commands to set up to map a 140 Mb/s tributary signal into an SDH signal:
   SOURce:DATA:TELecom:SOURce OUTPUT1
   SOURce:DATA:TELecom:PAYLoad:MAPPing TRIButary
   SOURce:DATA:TELecom:TRIButary:MAPPing M140
   SOURce:DATA:TELecom:TRIButary:FRAMing FRAMed
   SOURce:DATA:TELecom:TRIButary:PATTern PRBS23

3. Send the following commands to set up to receive the demapped tributary signal:
   INPUT3:TELecom:RATE M140
   SENSe:DATA:TELecom:SOURce INPUT3
   SENSe:DATA:TELecom:TRIButary:FRAMing FRAMed
   SENSe:DATA:TELecom:TRIButary:PATTern PRBS23

4. Send the following commands to set up continuous pointer adjustments at a 50 ms rate:
   SOURce:DATA:TELecom:POINter:MODE TRIButary
   SOURce:DATA:TELecom:TRIButary:POINter:MODE CONTinuous
   SOURce:DATA:TELecom:TRIButary:POINter:DIRection ALTernate
   SOURce:DATA:TELecom:TRIButary:POINter:RATE 50

5. Verify that the CTS 850 is receiving the demapped tributary signal correctly by sending the SENSe:DATA:TELecom:TRIButary:STATus? query. You should receive a response of 8192 indicating a pattern lock and no errors.

Testing the External Connection of an Add/Drop/Test Set

You can use the CTS 850 to add an external tributary signal into the SDH signal. The testing is controlled by the external tributary test set that generates the tributary signal.

The external tributary test set generates a nonstandard tributary signal. The CTS 850 receives this tributary signal and maps it directly into the SDH signal. The NE receives the SDH signal and demaps the tributary signal. The external tributary test set verifies that the NE demapped the tributary signal correctly.

Follow these steps to map a 2 Mb/s tributary signal into an SDH signal.

1. Configure your CTS 850 as shown in Figure 1–17.

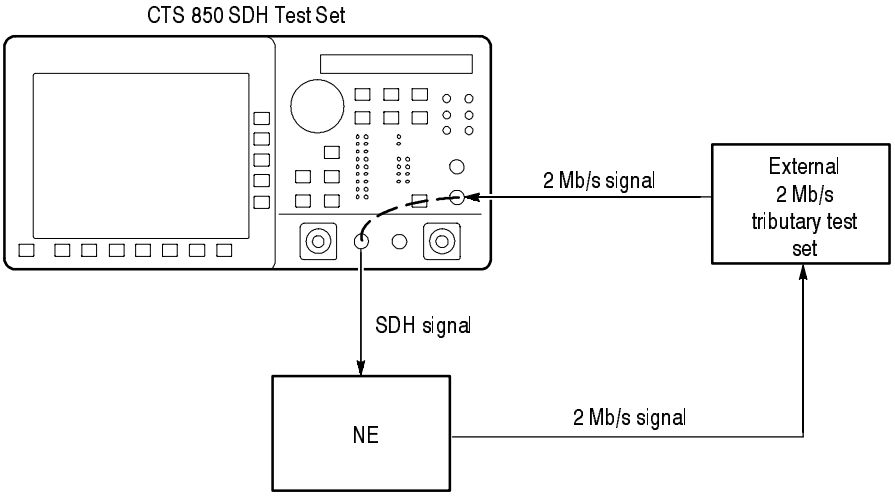


Figure 1–17: Setup for testing the external connection of an Add/Drop/Test set

2. Send the following commands to set up the CTS 850 to map the tributary signal directly into an SDH signal, and then generate the SDH signal (the tributary signal is not measured):
   SOURce:DATA:TELecom:SOURce OUTPUT1
   SOURce:DATA:TELecom:PAYLoad:MAPPing TRIButary
   SOURce:DATA:TELecom:TRIButary:ADD ON
   SOURce:DATA:TELecom:TRIButary:MAPPing TUASYNC

3. The external tributary test set should verify that the NE demapped the tributary signal correctly.

Syntax

This section contains information on the Standard Commands for Programmable Instruments (SCPI) and IEEE 488.2 Common Commands you can use to program your CTS 850.

SCPI Commands and Queries

SCPI is a standard that provides guidelines for remote programming of instruments. These guidelines provide a consistent programming environment for instrument control and data usage. This environment uses defined programming messages, instrument responses, and data format across all SCPI instruments, regardless of manufacturer. The CTS 850 uses a command language derived from this SCPI standard.

The SCPI language is based on a hierarchical tree structure (see Figure 2–1) that represents a subsystem. The top level of the tree is the root node; it is followed by one or more lower-level nodes.

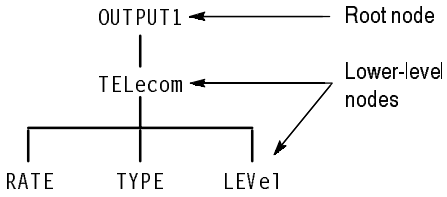


Figure 2–1: Example of SCPI subsystem hierarchy tree

You can create commands and queries from these subsystem hierarchy trees. Commands specify actions for the instrument to perform. Queries return information about the state of the instrument.

Creating Commands

SCPI commands are created by stringing together the nodes of a subsystem hierarchy tree and separating each node by a colon.

In Figure 2–1, OUTPUT1 is the root node and TELecom, RATE, TYPE, and LEVel are the lower-level nodes. To create a SCPI command, start with the root node OUTPUT1 and move down the tree structure adding nodes until you reach the end of a branch.

Most commands and some queries have parameters; you must include a value for these parameters. If you specify a parameter value that is out of range, the parameter will be set to the default.

OUTPUT1:TELecom:LEVel HIGH is an example of a valid SCPI command using the hierarchy tree in Figure 2–1.

Creating Queries

To create a query, start at the root node of a tree structure, move down to the end of a branch, and then add a question mark. OUTPUT1:TELecom:LEVel? is an example of a valid SCPI query using the hierarchy tree in Figure 2–1.

Parameter Types

Parameter types are given for every parameter in the command and query descriptions. The parameters are enclosed in brackets, for example, <pattern>. The parameter type is listed after the parameter and is enclosed in parentheses, for example, (discrete). Some parameter types are defined specifically for the CTS 850 command set and some are defined by ANSI/IEEE 488.2-1987 (refer to Table 2–1).

Table 2–1: Parameter types used in syntax descriptions

Parameter Type	Description	Example
binary	Binary numbers	#B0110
binary block[1]	A specified length of binary data	#512234xxxxx . . . where 5 indicates that the following 5 digits (12234) specify the length of the data in bits; xxxxx ... indicates the binary data
boolean	Boolean numbers or values	ON or 1 OFF or 0
discrete	A list of specific values	HIGH, LOW, MID, PRBS23
hexadecimal[2]	Hexadecimal numbers (0–9, A, B, C, D, E, F)	#HAA, #H1

Table 2–1: Parameter types used in syntax descriptions (Cont.)

Parameter Type	Description	Example
NR1-numeric[2,3]	Integers	0, 1, 15, –1
NR2-numeric[2]	Decimal numbers	1.2, 3.141516, –6.5
NR3-numeric[2]	Floating point numbers	3.1415E–9, –16.1E5
string[4]	Alphanumeric characters (must be within quotation marks)	"Testing 1, 2, 3"

1 **Defined in ANSI/IEEE 488.2 as "Definite Length Arbitrary Block Response Data."**

2 **An ANSI/IEEE 488.2–1987-defined parameter type.**

3 **Some commands and queries will accept a hexadecimal value even though the parameter type is defined as NR1-numeric.**

4 **Defined in ANSI/IEEE 488.2 as "String Response Data."**

Abbreviating Commands, Queries, and Parameters

You can abbreviate most SCPI commands, queries, and parameters to an accepted short form. This manual shows these short forms as a combination of upper and lower case letters. The upper case letters tell you what the accepted short form should consist of. As shown in Figure 2–2, you can create a short form by using only the upper case letters. The accepted short form and long form are equivalent and request the same action of the instrument.

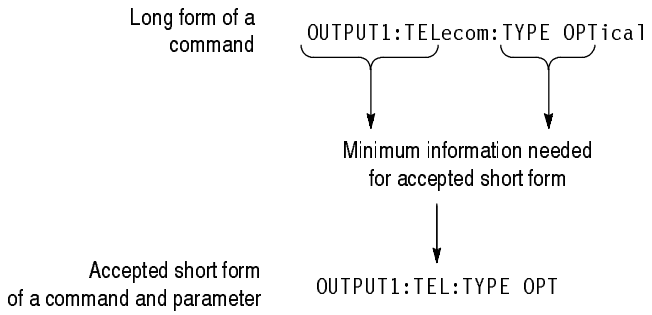


Figure 2–2: Example of abbreviating a command

***NOTE**. The numeric part of a command or query must always be included in the accepted short form. In Figure 2–2, the "1" of "OUTPUT1" is always included in the command or query.*

Controlling Responses to Queries

You can control the form of responses returned by queries by changing the parameter values of SYSTem:HEADers and SYSTem:VERBose. These two commands control whether the query nodes are returned with the response, and, if the query nodes are returned, whether they are in the long or short form. SYSTem:HEADers controls the presence of the query nodes, and SYSTem:VERBose controls the length of these nodes. Table 2–2 shows the possible combinations of these commands and an example of a query response.

Table 2–2: Using commands to control the response to a query

SYSTem:HEADers set to:	SYSTem:VERBose set to:	Example of a response
1 or ON	1 or ON	OUTPUT1:TELECOM:TYPE OPTICAL
1 or ON	0 or OFF	OUTPUT1:TEL:TYPE OPT
0 or OFF	0 or OFF	OPT
0 or OFF	1 or ON	OPTICAL

Chaining Commands and Queries

You can chain several commands or queries together into a single message. To create a chained message, first create a command or query, add a semicolon (;), and then add more commands or queries and semicolons until you are done. Figure 2–3 illustrates a chained message consisting of several commands and queries. The single chained message should end in a command or query, not a semicolon. Responses to any queries in your message are separated by semicolons.

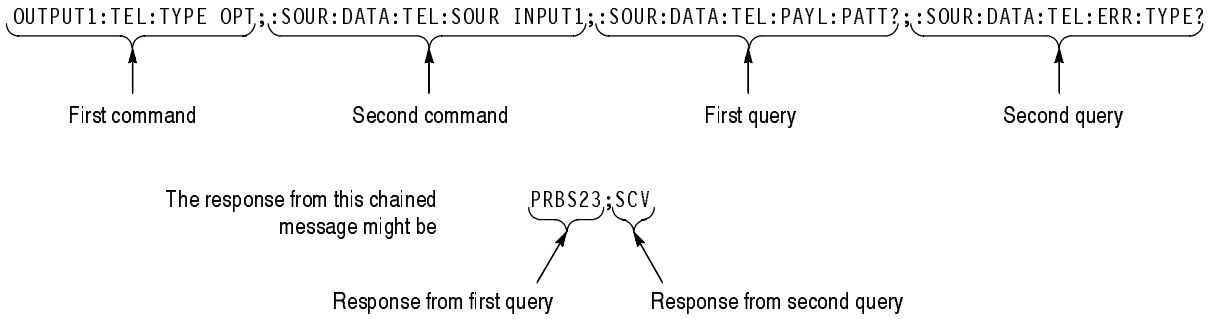


Figure 2–3: Example of chaining commands and queries

If a command or query has the same root and lower-level nodes as the previous command or query, you can omit these nodes. In Figure 2–4, the second command has the same root and lower-level nodes (SOURce:DATA:TELecom) as the first command, so these nodes can be omitted.

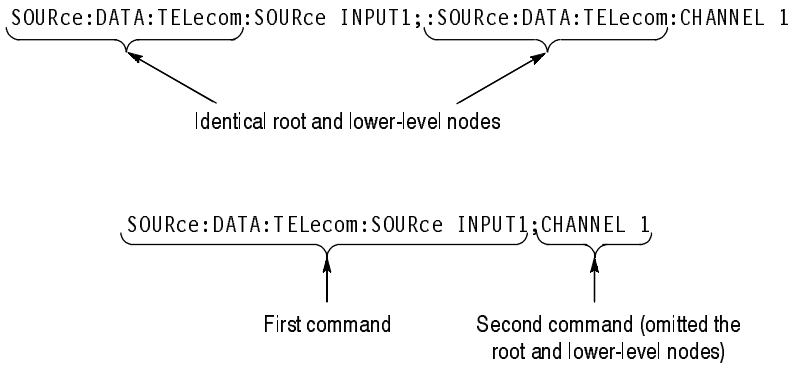


Figure 2–4: Example of omitting root and lower-level nodes in chained message

General Rules

Here are some general rules for using SCPI commands, queries, and parameters:

- You can use single (‘ ’) or double (“ ”) quotation marks for quoted strings, but you cannot use both types of quotation marks for the same string.

  correct: “This string uses quotation marks correctly.”

  correct: ‘This string also uses quotation marks correctly.’

  incorrect: “This string does not use quotation marks correctly.’

- You can use upper case, lower case, or a mixture of both cases for all commands, queries, and parameters.

  ```
  INPUT1:TELECOM:TYPE ELECTRICAL
  ```

  is the same as

  ```
  input1:telecom:type electrical
  ```

  and

  ```
  INPUT1:telecom:Type ELECTRICAL
  ```

- No embedded spaces are allowed between or within nodes.

  correct: `OUTPUT1:TELecom:TYPE OPTical`

  incorrect: `OUTPUT1: TELecom: TYPE OPTical`

  incorrect: `OU TPUT1:TELe com:TYPE OPTical`

IEEE 488.2 Common Commands

Description

ANSI/IEEE Standard 488.2 defines the codes, formats, protocols, and usage of common commands and queries used on the GPIB interface between the controller and the instruments. The CTS 850 complies with this standard.

Command and Query Structure

The syntax for an IEEE 488.2 common command is an asterisk (*) followed by a command and, optionally, a space and parameter value. The syntax for an IEEE 488.2 common query is an asterisk (*) followed by a query and a question mark. All of the common commands and queries are listed in the last part of the *Syntax and Commands* section. The following are examples of common commands:

- `*ESE 16`
- `*CLS`

The following are examples of common queries:

- `*ESR?`
- `*IDN?`

Functional Command Groups

All of the commands and queries in *Syntax and Commands* are organized into functional groups. Each section covers one functional group. For example, *Transmit Commands* contains all commands and queries that allow you to set up and transmit a signal. The commands and queries within each functional group are further organized into CTS 850 subsystems.

The functional groups and their subsystems are listed in Table 2–5.

Table 2–5: Functional groups and their subsystems

Functional group	Subsystem	Description	Starts on page
Transmit Commands	OUTPUT1:TELecom	Controls physical setup of transmitted SDH signal	2–12
	OUTPUT2:TELecom	Sets the characteristics of the transmitted or dropped 2 Mb/s tributary signal	2–15
	OUTPUT3:TELecom	Sets the characteristics of the transmitted or dropped 34 Mb/s or 140 Mb/s tributary signal	2–17
	SOURce:CLOCk	Controls transmitter clock	2–19
	SOURce:DATA:TELecom	Controls transmitter setup	2–24
	SOURce:DATA:TELecom:OVERhead and POVerhead	Controls transmitter overheads	2–31
	SOURce:DATA:TELecom:ERRor, ALARm, and FAILure	Controls transmitter abnormalities	2–43
	SOURce:DATA:TELecom:POINter	Controls transmitter pointers	2–49
	SOURce:DATA:TELecom:TRIButary	Controls transmitted or dropped tributary signal	2–65
	SOURce:DATA:TELecom:TRIButary: ERRor, ALARm, and FAILure	Controls abnormal conditions in the transmitted or dropped tributary signal	2–85
	SOURce:DATA:TELecom:TRIButary: POINter	Controls pointers in the transmitted or dropped tributary signal	2–93
	SOURce:DATA:TELecom:JITter	Controls the jitter/wander generator	2–109
Receive Commands	INPUT1:TELecom	Sets up physical connection of received SDH signal	2–118
	INPUT2:TELecom	Sets the characteristics of the received or added 2 Mb/s tributary signal	2–123

Table 2–5: Functional groups and their subsystems (Cont.)

Functional group	Subsystem	Description	Starts on page
	INPUT3:TELecom	Sets the characteristics of the received or added 34 Mb/s or 140 Mb/s tributary signal	2–127
	SENSe:DATA:TELecom	Sets up receiver	2–131
	SENSe:DATA:TELecom:TEST	Starts and stops measurements	2–141
	SENSe:DATA:TELecom:OVERhead and POVerhead	Allows access to receiver overheads	2–147
	SENSe:DATA:TELecom:MEASure	Allows access to measurements	2–159
	SENSe:DATA:TELecom:MEASure: ANALYsis	Allows access to B1, B2, B3, G.826 and M.2101.1 Verdict Analysis	2–183
	SENSe:DATA:TELecom:MEASure: STESTs	Controls pass/fail tests	2–207
	SENSe:DATA:TELecom:AUTOscan	Automatically sets up receiver	2–215
	SENSe:DATA:TELecom:TRIButary	Controls viewing of tributary signal	2–217
	SENSE:DATA:TELecom:MEASure: TRIButary	Access tributary error, alarm, failure and pointer measurements	2–239
	SENSE:DATA:TELecom:JITter	Jitter input signal setup	2–271
	SENSE:DATA:TELecom:MEASure: JITter	Access to jitter measurements	2–281
	SENSE:DATA:TELecom:TEST:JITter	Sets/queries jitter compliance tests	2–297
	SENSE:DATA:TELecom:MEASure: WANDer	Access to wander measurements	2–335
	CALIBRATE	Sets/queries jitter calibration routines	2–341
Transmitter and Receiver Setup Commands	INSTrument	Controls transmitter and receiver settings	2–345
Trigger and Capture Commands	TRIGger	Starts and stops overhead capture	2–347
Input/Output Commands	MMRMory MMEMory:JITter DISPlay HCOPy SYSTem:COMMunicate:SERial	Allows operator to write files to disk, control the instrument display, print reports and communicate with instrument over RS–232 port	2–351
Instrument Control Commands	SYSTEM	Controls general instrument functions	2–383
Diagnostic Commands	DIAGnostic	Controls self–tests	2–395
IEEE 488.2 Common Commands	every command and query beings with *	Allows access to generic commands	2–403

Each functional group section begins with a description of the functional group and is followed by a list of the subsystems included in the functional group. Then, for each of the subsystems, a description and hierarchy tree are given.

Each command and query within each subsystem are listed in the functional group sections in the format illustrated in Figure 2–9. For the sake of clarity, two tables are always given even though the parameters may be identical.

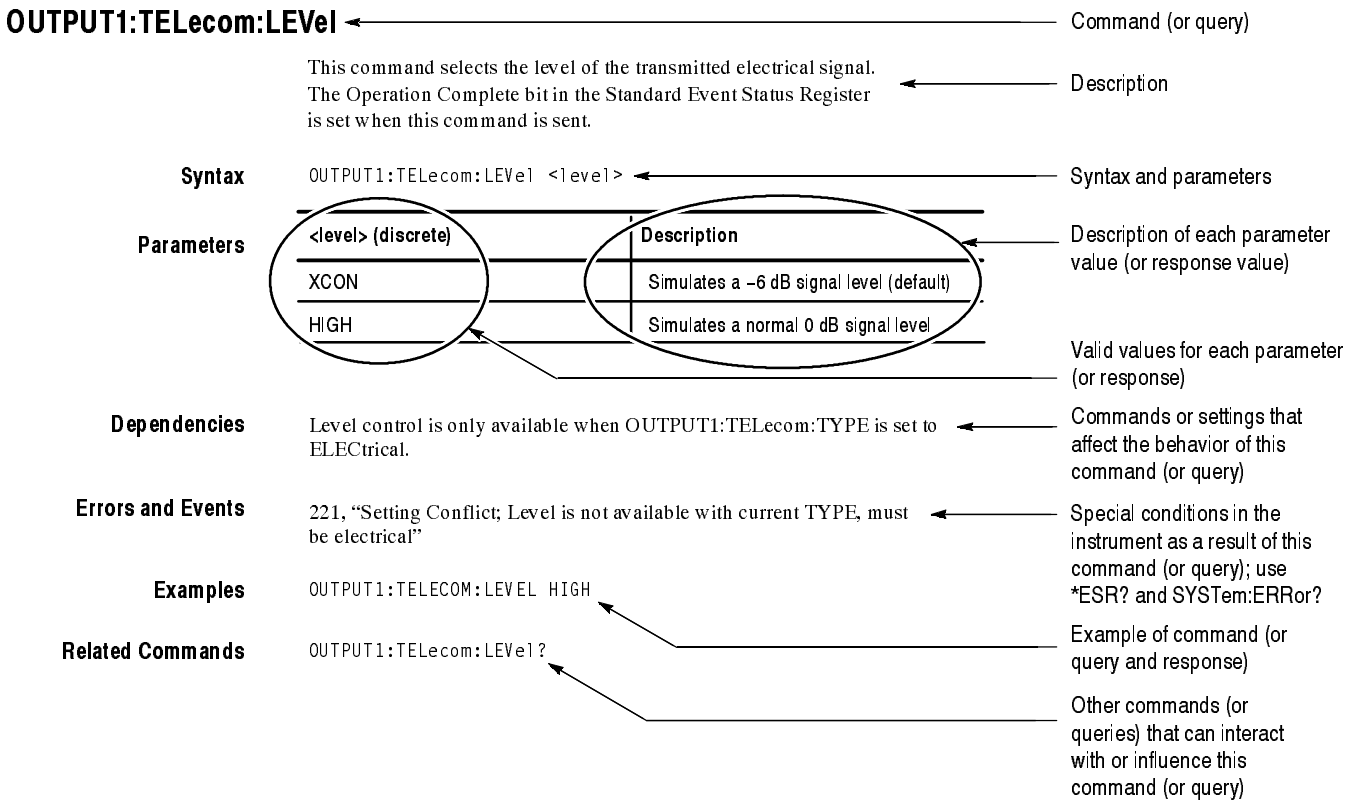


Figure 2–9: Example of command listing

***NOTE**. Some commands and queries follow a different format than shown in Figure 2–9 (for example, the* SENSe:DATA:TELecom:MEASure *queries). An explanation of this format is found at the beginning of the section containing the commands and queries.*

In the *Syntax and Commands* section you will see a different kind of Parameter or Response table for a few commands or queries. Figure 2–10 shows you an example of a <decimal value> response table. The parameter or response value returned is the sum of the decimal values listed in the left column and depends on which bits are set. Follow the step numbers in the example to interpret a <decimal value> parameter or response.

Table X-X: Response Table

<decimal value> (NR1-numeric)	bit	definition
1	0	LOS
2	1	LOF
4	2	OOF
8	3	LOP
16	4	Line AIS
32	5	Path AIS
64	6	Error
128	7	Undefined
256	8	K1/K2 change
512	9	Line FERF
1024	10	Path FERF
2048	11	Pointer adjust
4096	12	NDF
8192	13	Pattern lock
16384	14	Not used
32768	15	Not used

1 A response of 9216 is received.

2 Find which decimal values add up to the response of 9216 (1024 + 8192 = 9216).

3 Read across the selected decimal values to the bit and definition columns to interpret the response. In this example, bits 10 and 13 are set indicating a path yellow and pattern lock.

Figure 2–10: How to interpret a <decimal value> parameter or response

Transmit Commands

The Transmit Commands allow you to set the conditions for the signal to be transmitted, including abnormal conditions. This section contains all of the commands and queries for each of the following CTS 850 Transmit subsystems:

- OUTPUT1:TELecom
- OUTPUT2:TELecom
- OUTPUT3:TELecom
- SOURce:CLOCk
- SOURce:DATA:TELecom
- SOURce:DATA:TELecom:OVERhead and POVerhead
- SOURce:DATA:TELecom:ERRor, ALARm, and FAILure
- SOURce:DATA:TELecom:POINter
- SOURce:DATA:TELecom:TRIButary
- SOURce:DATA:TELecom:TRIButary:payload
- SOURce:DATA:TELecom:TRIButary:ERRor, ALARm, and FAILure
- SOURce:DATA:TELecom:Tributary:POINter
- SOURce:DATA:TELecom:JITter

OUTPUT1 Subsystem

This section describes the commands and queries that set the rate, type, and level of the signal to be transmitted. Figure 2–13 shows the hierarchy tree for this subsystem.

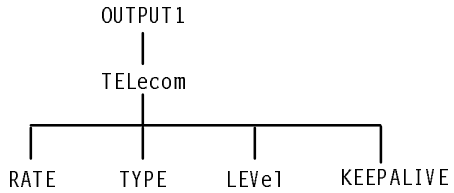


Figure 2–13: OUTPUT1 subsystem

OUTPUT1:TELecom:RATE

This command sets or queries the transmitter signal output rate.

Syntax

```
OUTPUT1:TELecom:RATE <rate>
OUTPUT1:TELecom:RATE?
```

Parameters

<rate> (discrete)	Description
STM0	51.84 MHz
STM1	155.52 MHz (default)
STM4	622.08 MHz (requires the optical option)

Dependencies

None

Errors and Events

221, “Settings conflict; Rate is not available with current Line Interface module or operating mode”

221, “Settings conflict; Optical module required”

Examples

Set: `OUTPUT1:TELECOM:RATE STM1`

Query: `OUTPUT1:TELECOM:RATE?`

Response: `STM11`

Related Commands

OUTPUT1:TELecom:TYPE
SOURce:DATA:TELecom:SOURce

OUTPUT1:TELecom:TYPE

This command sets or queries the output transmitter signal type.

Syntax

```
OUTPUT1:TELecom:TYPE <type>
OUTPUT1:TELecom:TYPE?
```

Parameters

<type> (discrete)	Description
ELECtrical	Electrical signal output (default)
OPTical	Optical signal output (requires the optical option)

Dependencies

None

Errors and Events

221, “Settings conflict; Type is not available with current Line Interface module”

Examples

Set: `OUTPUT1:TELECOM:TYPE ELECTRICAL`

Query: `OUTPUT1:TELECOM:TYPE?`

Response: `OPTICAL`

Related Commands

OUTPUT1:TELecom:RATE

OUTPUT1:TELecom:LEVel

This command sets or queries the transmitted electrical signal level.

Syntax

```
OUTPUT1:TELecom:LEVel <level>
OUTPUT1:TELecom:LEVel?
```

Parameters

<level> (discrete)	Description
XCONnect	Simulates a –6dB signal level (default)
HIGH	Simulates a normal 0 dB signal level

Dependencies

This command applies only when OUTPUT1:TELecom:TYPE is set to ELECtrical.

Errors and Events

221, "Settings conflict; Level is not available with current type, must be electrical"

Examples

Set: `OUTPUT1:TELECOM:LEVEL HIGH`

Query: `OUTPUT1:TELECOM:LEVEL?`

Response: `HIGH`

SOURCE: DATA: TELecom: OUTPUT1:KEEPalive

This command turns the SDH keep–alive function on and off.

Syntax

```
OUTPUT1:TELecom:KEEPALIVE <state>
```

Parameters

State	Description
ON	Turns on SDH keep–alive
OFF	Turns off SDH keep–alive

Dependencies

None

Examples

OUTPUT1:TELecom:KEEPalive ON

OUTPUT2 Subsystem

This section describes the commands and queries that set the characteristics of the transmitted or dropped 2 Mb/s tributary signal. Figure 2–14 shows the hierarchy tree for this subsystem.

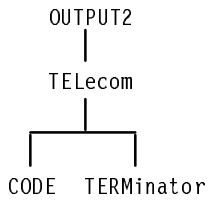


Figure 2–14: OUTPUT2 subsystem

OUTPUT2:TELecom:CODE

Select AMI or HDB3 encoding for the line input and output. HDB3 is the default value.

Syntax

```
OUTPUT2:TELecom:CODE <signal encoding>
OUTPUT2:TELecom:CODE?
```

Parameters

<signal encoding> (discrete)	Description
HDB3	Set transmitted encoding to HDB3 (default)
AMI	Set transmitted or encoding to AMI

Dependencies

None

Errors and Events

None

Examples

Set: `OUTPUT2:TELECOM:CODE HDB3`

Query: `OUTPUT2:TELECOM:CODE?`

Response: `HDB3`

Related Commands

SOURce:DATA:TELecom:SOURce
SENSe:DATA:TELecom:TRIButary:DROP

OUTPUT2:TELecom:TERMinator

This command sets or queries the signal terminator for the 2 Mb/s transmit connector.

Syntax

```
OUTPUT2:TELecom:TERMinator <trib1 output termin>
OUTPUT2:TELecom:TERMinator?
```

Parameters

<trib1 output termin> (discrete)	Description
BALanced	120 Ω connector (default)
UNBALanced	75 Ω connector

Dependencies

The instrument must be transmitting or dropping a 2 Mb/s tributary signal for this command to apply.

Errors and Events

None

Examples

Set: `OUTPUT2:TELECOM:TERMINATOR BALANCED`

Query: `OUTPUT2:TELECOM:TERMINATOR?`

Response: `BALANCED`

Related Commands

SOURce:DATA:TELecom:SOURce
SENSe:DATA:TELecom:TRIButary:DROP

OUTPUT3 Subsystem

This section describes the commands and queries that set the characteristics of the transmitted or dropped 34 Mb/s or 140 Mb/s tributary signal.

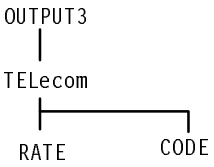


Figure 2–15: OUTPUT3 subsystem

OUTPUT3:TELecom:RATE

This command sets or queries the 34 Mb/s, 45 Mb/s or 140 Mb/s tributary output rate.

Syntax

```
OUTPUT3:TELecom:RATE <trib2 output rate>
OUTPUT3:TELecom:RATE?
```

Parameters

<trib2 output rate> (discrete)	Description
M34	34.368 Mb/s (default)
M140	139.264 Mb/s
M45	45 Mb/s TX line rate

Dependencies

None

Errors and Events

None

Examples

Set: `OUTPUT3:TELECOM:RATE M34`

Query: `OUTPUT3:TELECOM:RATE?`

Response: `M34`

Related Commands

SOURce:DATA:TELecom:SOURce

OUTPUT3:TELecom:CODE

Select AMI or HDB3 encoding for the line input. HDB3 is the default value. Select B3ZS encoding for 45 Mb/s.

Syntax

```
OUTPUT3:TELecom:CODE <signal encoding>
OUTPUT3:TELecom:CODE?
```

Parameters

<signal encoding> (discrete)	Description
HDB3	Set transmitted encoding to HDB3 (default)
AMI	Set transmitted expected encoding to AMI
B3ZS	Set transmitted expected encoding to b3zs (for 45 Mb/s only)

Dependencies

None

Errors and Events

None

Examples

Set: OUTPUT3:TELecom:CODE AMI
Query: `OUTPUT3:TELecom:CODE?`
Response: AMI

Related Commands

SOURce:DATA:TELecom:SOURce
SENSE:DATA:TELecom:TRIButary:DROP

SOURce:CLOCk Subsystem

This section describes the commands and queries that control the transmitter clock. You must set the SOURce:DATA:TELecom:POINter:MODE command to FOFFset for any of the SOURce:CLOCk subsystem commands to be valid. Figure 2–16 shows the hierarchy tree for this subsystem.

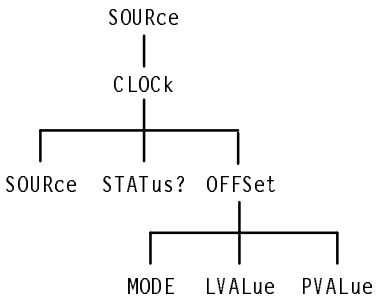


Figure 2–16: SOURce:CLOCk subsystem

Table 2–7 shows the interaction between the major commands of this subsystem. Refer to this table to see which combinations of commands and parameters are valid.

Table 2–7: Interaction Between SOURce:CLOCk Commands

To control:	Set SOURce:CLOCk: SOURce to:	Set SOURce:CLOCk: OFFSet:MODE to:	Set SOURce:CLOCk: OFFSet:LVALue to:	Set SOURce:CLOCk: OFFSet:PVALue to:
Pointer movements	INTernal, E2MB, or RECovered	POINters	Set to 0; no changes allowed	Any value from –100 ppm to +100 ppm in increments of 0.1 ppm
Line offset, no pointers	INTernal or RECovered	LOFFset	SDH rates: –100 ppm to +100 ppm 2 Mb/s rate: –50 ppm to +50 ppm 34 Mb/s rate: –130 ppm to +130 ppm 140 Mb/s rate: –100 ppm to +100 ppm All ranges in increments of 0.1 ppm	Automatically set to the same value as LVALue; you can not directly change PVALue

SOURce:CLOCk:SOURce

This command sets or queries the transmitter clock source. The OPC bit in the Standard Event Status Register is set when this command has completed execution.

Syntax

```
SOURce:CLOCk:SOURce <clock source>
SOURce:CLOCk:SOURce?
```

Parameters

<clock source> (discrete)	Description
INTernal	Internal clock (default)
E2MB	External 2 Mb
RECovered	Recovered from the received signal
TEXTernal	Tributary external clock (Add/Drop Test Option Only)

Dependencies

RECovered is not allowed if you are set up to receive a tributary signal at the same time you are set up to transmit a SDH signal.

Errors and Events

None

Examples

Set: `SOURCE:CLOCK:SOURCE INTERNAL`

Query: `SOURCE:CLOCK:SOURCE?`

Response: `INTERNAL`

Related Commands

None

SOURce:CLOCk:STATus?

This query returns the status of the clock phase locked loop. Use this query to determine if you have a lock on an external clock source or after you change the clock source.

Syntax

```
SOURce:CLOCk:STATus?
```

Response

<clock status> (boolean)	Description
0	Unlocked
1	Locked

Dependencies

None

Errors and Events

None

Examples

Query: `SOURCE:CLOCK:STATUS?`

Response: `1`

Related Commands

SOURCe:CLOCk:OFFSet:MODE

SOURce:CLOCk:OFFSet:MODE

This command sets or queries the clock offset mode and determines how the commands SOURce:CLOCk:OFFSet:MODE:LVALue and SOURce:CLOCk:OFFSet:MODE:PVALue interact. When you send the SOURce:CLOCk:OFFSet:MODE command, the values of LVALue and PVALue are reset to 0 which might create a discontinuity in the output signal for a brief time. Then you can change LVALue and PVALue to valid values (Table 2–7 on page 2–19 describes the interaction between the major SOURce:CLOCk commands).

Syntax

```
SOURce:CLOCk:OFFSet:MODE <clock offset mode>
SOURce:CLOCk:OFFSet:MODE?
```

Parameters

<clock offset mode> (discrete)	Description
LOFFset	Specified offset affects SONET/SDH line rate, changing the output frequency and keeping the relationship of payload to line rate constant.
POINters	Specified offset affects payload only. Line rate is fixed at nominal; payload offset is accomodated with AU pointer movements. SOURce:DATA:POINter:MODe must be set to FOFFset for this function to work.
MAPPing	Specified offset affects the tributary clock only. The offset results in bit stuffing at the tributary level, and no pointer movements occur. This clock mode uses a different assignment of clock resources to system clocks. Disruptions in the output signal may occur when switching to or from this offset mode. If SOURce:DATA:OFFSet:MODe is set to MAPPing, the programmed tributary clock offest is applied and remains applied while pointer sequences are active.

Dependencies

POINters is valid only for SDH rates and when SOURce:CLOCk:SOURce is set to INTernal, E2MB, or RECovered.

LOFFset is valid only when SOURce:CLOCk:SOURce is set to INTernal, E2MB, or RECovered. LOFFset does not apply when transmitting a tributary signal while using a RECovered clock source.

Errors and Events

None

Examples

Set: `SOURCE:CLOCK:OFFSET:MODE LOFFSET`

Query: `SOURCE:CLOCK:OFFSET:MODE?`

Response: `POINTERS`

Related Commands

SOURce:CLOCk:OFFSet:LVALue
SOURce:CLOCk:OFFSet:PVALue

SOURce:CLOCk:OFFSet:LVALue

This command sets or queries the line clock offset value in ppm (parts per million).

Syntax

```
SOURce:CLOCk:OFFSet:LVALue <line clock offset>
SOURce:CLOCk:OFFSet:LVALue?
```

Parameters

<line clock offset> (NR2-numeric)	Description
SDH rates: –100 ppm to +100 ppm 2 Mb/s rate: –50 ppm to +50 ppm 34 Mb/s rate: –130 ppm to +130 ppm 140 Mb/s rate: –100 ppm to +100 ppm All ranges in increments of 0.1 ppm	The line clock offset is set to this value (default = 0)

Dependencies

This command applies only when SOURce:CLOCK:SOURce is set to INTernal or RECovered and SOURce:CLOCk:OFFSet:MODE is set to LOFFset.

Errors and Events

221, “Settings conflict; Frequency offset disabled with current transmit clock”

Examples

Set: `SOURCE:CLOCK:OFFSET:LVALUE 20`

Query: `SOURCE:CLOCK:OFFSET:LVALUE?`

Response: `10.1`

Related Commands

SOURce:CLOCk:OFFSet:MODE

SOURce:CLOCk:OFFSet:PVALue

This command sets or queries the payload clock offset value in ppm (parts per million).

Syntax

```
SOURce:CLOCk:OFFSet:PVALue <payload clock offset>
SOURce:CLOCk:OFFSet:PVALue?
```

Parameters

<payload clock offset> (NR2-numeric)	Description
Any decimal number in the range –100 ppm to +100 ppm in increments of 0.1 ppm	The payload clock offset is set to this value (default = 0)

Dependencies

This command is valid only when SOURce:CLOCk:OFFSet:MODE is set to POINters and when transmitting or receiving a SDH signal.

Errors and Events

None

Examples

Set: `SOURCE:CLOCK:OFFSET:PVALUE 20`

Query: `SOURCE:CLOCK:OFFSET:PVALUE?`

Response: `12.4`

Related Commands

SOURce:CLOCk:OFFSet:MODE
SOURce:CLOCk:OFFSet:LVALue

SOURce:DATA:TELecom Subsystem

This section describes the commands and queries that set up the structure of the signal to be transmitted for both active and inactive channels. Figure 2–17 shows the hierarchy tree for this subsystem.

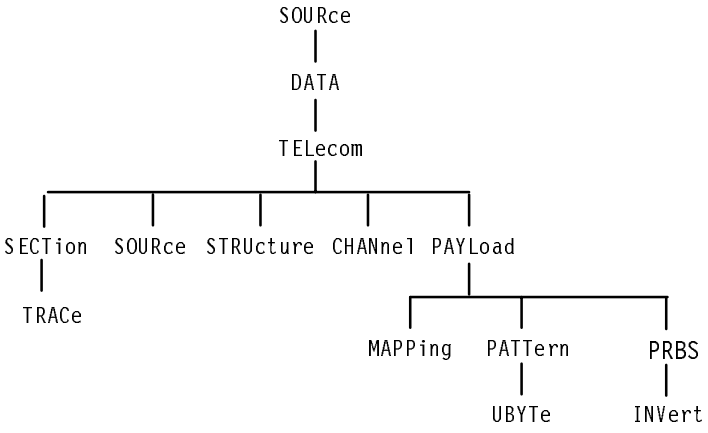


Figure 2–17: SOURce:DATA:TELecom subsystem

SOURce:DATA:TELecom:SOURce

This command sets or queries the output signal source.

Syntax

```
SOURce:DATA:TELecom:SOURce <source>
SOURce:DATA:TELecom:SOURce?
```

Parameters

<source> (discrete)	Description
OUTPUT1	All SDH rates; normal mode (default)
OUTPUT2	2 Mb/s tributary signal (Add/Drop Test Option Only)
OUTPUT3	34 Mb/s or 140 Mb/s tributary signal (Add/Drop Test Option Only)
INPUT1	Through mode

Dependencies None

Errors and Events 221, "Settings conflict; Not available without tributary option"

Examples

Set: `SOURCE:DATA:TELECOM:SOURCE OUTPUT1`

Query: `SOURCE:DATA:TELECOM:SOURCE?`

Response: `OUTPUT1`

Related Commands OUTPUT1:TELecom:RATE

SOURce:DATA:TELecom:STRUcture

This command sets or queries the structure of a signal.

Syntax

```
SOURce:DATA:TELecom:STRUcture <output structure>
SOURce:DATA:TELecom:STRUcture?
```

Parameters

<output structure> (discrete)	Description
AU3	AU-3 structure (STM0 only)
AU4	AU-4 structure (default) (STM1 and STM4 only)

Dependencies AU-3 is only available for the STM-0 rate.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:STRUCTURE AU4`

Query: `SOURCE:DATA:TELECOM:STRUCTURE?`

Response: `AU3`

Related Commands OUTPUT1:TELecom:RATE

SOURce:DATA:TELecom:CHANnel

This command sets or queries the active channel.

Syntax

```
SOURce:DATA:TELecom:CHANnel <channel>
SOURce:DATA:TELecom:CHANnel?
```

Parameters

<channel> (NR1-numeric)	Description
1	STM0 or STM-1 rate (default)
1 to 4	STM-4 rate

Dependencies OUTPUT1:TELecom:RATE must be set to STM4 if you choose a channel value greater than one.

Errors and Events 221, “Settings conflict; Only one channel is available”

500, “Execution warning; Numeric value greater than maximum limit”

Examples

Set: `SOURCE:DATA:TELECOM:CHANNEL 1`

Query: `SOURCE:DATA:TELECOM:CHANNEL?`

Response: `1`

Related Commands

OUTPUT1:TELecom:RATE
SOURce:DATA:TELecom:STRUcture

SOURce:DATA:TELecom:PAYLoad:MAPPing

This command sets or queries the payload mapping. The parameter changes the value in the C2 byte and fills the AU with the pattern selected by the SOURce:DATA:TELecom:PAYLoad:PATTern command. Or, the AU can be filled with a tributary payload.

Syntax

```
SOURce:DATA:TELecom:PAYLoad:MAPPing <mapping>
SOURce:DATA:TELecom:PAYLoad:MAPPing?
```

Parameters

<mapping> (discrete)	Description
EQUipped	C2 Path Overhead byte is set to 01 (default)
UNEQuipped	C2 Path Overhead byte is set to 00
TRIButary	Allows tributary payload mapping (Add/Drop Test Option Only)

Dependencies

Select EQUipped or UNEQuipped to use the SOURce:DATA:PAYLoad:PATTern command. TRIButary is invalid for an AU-3 structure.

Errors and Events

221, “Settings conflict; Not available without tributary option”

Examples

Set: `SOURCE:DATA:TELECOM:PAYLOAD:MAPPING EQUIPPED`

Query: `SOURCE:DATA:TELECOM:PAYLOAD:MAPPING?`

Response: `EQUIPPED`

Related Commands

None

SOURce:DATA:TELecom:PAYLoad:PATTern

This command sets or queries the test pattern to be placed in the payload of the active channel.

Syntax

```
SOURce:DATA:TELecom:PAYLoad:PATTern <pattern>
SOURce:DATA:TELecom:PAYLoad:PATTern?
```

Parameters

<pattern> (discrete)	Description
PRBS23	A pseudo-random binary sequence of length $2^{23}-1$ is placed in the payload (default)
PRBS9	A pseudo-random binary sequence of length $2^{9}-1$ is placed in the payload
PRBS15	A pseudo-random binary sequence of length $2^{15}-1$ is placed in the payload
PRBS20	A pseudo-random binary sequence of length $2^{20}-1$ is placed in the payload
AZEROs	All zeros are placed in the payload
AONEs	All ones are placed in the payload
UBYTe	A user-defined byte is placed in the payload

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:PAYLOAD:PATTERN PRBS23`

Query: `SOURCE:DATA:TELECOM:PAYLOAD:PATTERN?`

Response: `PRBS15`

Related Commands

SOURce:DATA:TELecom:PAYLoad
SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe

SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe

This command sets or queries the internally generated payload fixed pattern.

Syntax

```
SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe <fixed pattern>
SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe?
```

Parameters

<fixed pattern> (NR1-numeric)[5]	Description
Any integer in the range 0 to 255 (hexadecimal 00 to FF)	The payload pattern is set to this value (default = 0)

[5] **A hexadecimal value is also acceptable.**

Dependencies SOURce:DATA:TELecom:PAYLoad:PATTern must be set to UBYTE for this command to apply.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:PAYLOAD:PATTERN:UBYTE 104`

Query: `SOURCE:DATA:TELECOM:PAYLOAD:PATTERN:UBYTE?`

Response: 88

Related Commands SOURce:DATA:TELecom:PAYLoad:PATTern

SOURce:DATA:TELecom:PAYLoad:PRBS:INVert

This command sets whether the TX pattern is normal or inverted.

Syntax SOURce:DATA:TELecom:PAYLoad:PRBS:INVert <state>

Parameters

State	Description
ON	Inverts the previously selected pattern
OFF	Pattern invert is off

Examples SOURce:DATA:TELecom:PAYLoad:PRBS:INVert ON

Related Commands SENSe:DATA:TELecom:PAYLoad:PRBS:INVert

SOURce:DATA:TELecom:SECTion:TRACe:MODE

This command sets the mode to J0 or C1 for Section Trace.

Syntax SOURce:DATA:TELecom:SECTion:TRACe:MODE <mode>

Parameters

State	Description
J0	Sets J0 byte to be a trace string
C1	Sets J0 byte to a user-programmable 8-bit value

Examples SOURce:DATA:TELecom:SECTion:TRACe:MODE J0

Related Commands None

SOURce:DATA:TELecom:OVERhead and POVerhead Subsystem

This section describes the commands and queries that set up the transport overhead and path overhead. Figure 2–23 shows the hierarchy tree for this subsystem.

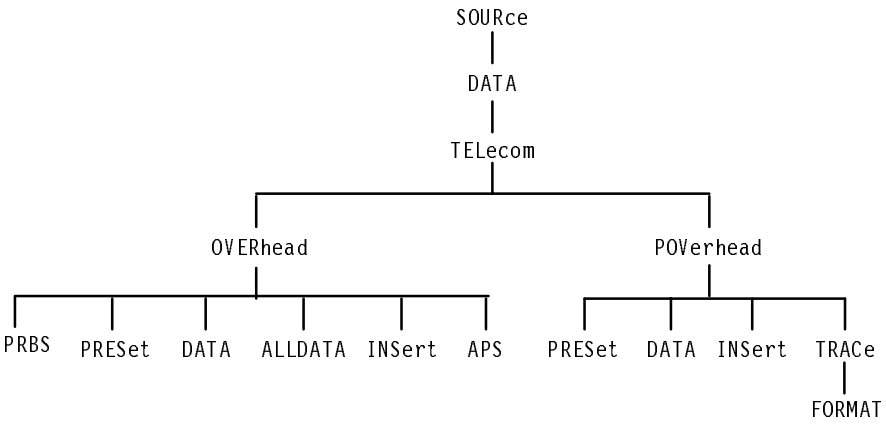


Figure 2–23: SOURce:DATA:TELecom:OVERhead and POVerhead subsystem

Figure 2–25 lists the bytes in the Transport and Path Overhead and the value of each byte after a *RST command is sent or a rate change occurs. As shown in Figure 2–24, each box can contain as many as three numbers: the overhead byte name in the upper left corner, the hexadecimal value of the byte at the bottom, and a circled number in the upper right corner. More information about these circled numbers is shown in the legend. General information is listed below the table in Notes. CTS 850

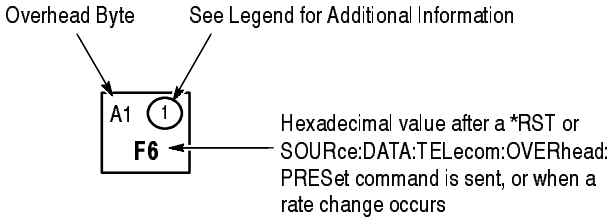


Figure 2–24: How to read the overhead default values table

STM-1 Transport Overhead									STM-0 Transport Overhead			Path Overhead
A1 **F6**	A1 **F6**	A1 **F6**	A2 **28**	A2 **28**	A2 **28**	C1 (1) **01**	NU **00**	NU **00**	A1 **F6**	A2 **28**	C1 (6) **01**	J1 (4) **00**
B1 **HW**	– **00**	– **00**	E1 **00**	– **00**	– **00**	F1 **00**	NU **00**	NU **00**	B1 (7) **HW**	E1 **00**	F1 **00**	B3 **HW**
D1 **00**	– **00**	– **00**	D2 **00**	– **00**	– **00**	D3 **00**	– **00**	– **00**	D1 **00**	D2 **00**	D3 **00**	C2 (5) **00**
H1 (2) **HW**	H1 **93**	H1 **93**	H2 (2) **HW**	H2 **FF**	H2 **FF**	H3 **HW**	H3 **HW**	H3 **HW**	H1 (3) **HW**	H2 (3) **HW**	H3 **HW**	G1 (8) **00**
B2 **HW**	B2 **HW**	B2 **HW**	K1 **00**	– **00**	– **00**	K2 **00**	– **00**	– **00**	B2 **HW**	K1 **00**	K2 **00**	F2 **00**
D4 **00**	– **00**	– **00**	D5 **00**	– **00**	– **00**	D6 **00**	– **00**	– **00**	D4 **00**	D5 **00**	D6 **00**	H4 **00**
D7 **00**	– **00**	– **00**	D8 **00**	– **00**	– **00**	D9 **00**	– **00**	– **00**	D7 **00**	D8 **00**	D9 **00**	F3 **00**
D10 **00**	– **00**	– **00**	D11 **00**	– **00**	– **00**	D12 **00**	– **00**	– **00**	D10 **00**	D11 **00**	D12 **00**	K3 **00**
S1 **00**	– **00**	– **00**	– **00**	– **00**	M1 (3) **00**	E2 **00**	NU **00**	NU **00**	S1 **00**	M1 **00**	E2 **00**	N1 **00**
Offset Value 0	1	2	0	1	2	0	1	2				

Legend

(1) C1 in STM-4 indicates the order of appearance of the STM-1 within the STM-4 frame. (SDH only)

(2) Default pointer value for H1 and H2 is hexadecimal 20A. The s-bits of H1 are set to 10. The n-bits of H1 are set to 0110. The default for H1 is 01101010. The default for H2 is 00001010.

(3) The third M1 of an STM-1can be set by hardware Line FEBE (determined by error rate and type).

(4) The default for J1 is 64 nulls.

(5) The C2 value is set by mapping.

(6) See Bellcore Specification TR-NWT-000253 for a description.

(7) Only the B1 byte in the first channel will be set by the hardware; the rest will be set to 0.

(8) Controlled by injecting Path FEBEs.

Notes

- All values are in hexadecimal.
- "NU" indicates a National Use Byte.
- "–" indicates an unnamed byte.
- "HW" indicates that the hexadecimal value is determined dynamically by the hardware.
- The offset value at the bottom of each column is used with the SOURce:DATA:TELecom:OVERhead:DATA and SENSe:DATA:TELecom:OVERhead:DATA commands (concatenated structures only).
- For multiplexed signals, all bytes except B1, C1, and possibly M1 are duplicated.
- Only one path overhead exists for all SDH rates.
- When a rate change occurs, the overhead will be reset to the above default values.

Figure 2–25: SDH Overhead Default Values

SOURce:DATA:TELecom:OVERhead:PRESet

This command resets the entire overhead to the default (see Figure 2–25 on page 2–32 for the default values).

Syntax

```
SOURce:DATA:TELecom:OVERhead:PRESet
```

Parameters None

Dependencies None

Errors and Events None

Examples

```
SOURCE:DATA:TELECOM:OVERHEAD:PRESET
```

Related Commands SOURce:DATA:TELecom:OVERhead:DATA

SOURce:DATA:TELecom:OVERhead:DATA

This command sets or queries the bytes in the transport overhead. Bytes B1, B2, B3, H1, H2, and H3 are not accessible because they are controlled directly by the hardware.

Use <channel>, <byte>, and <offset> to address all named and unnamed bytes in the concatenated structures.

Use the <offset> parameter to set unnamed or ambiguous bytes in concatenated structures (STM-1). See Figure 2–25 for the offset values.

Syntax

```
SOURce:DATA:TELecom:OVERhead:DATA <channel>,<byte>,<offset>,
<value>
SOURce:DATA:TELecom:OVERhead:DATA? <channel>,<byte>,<offset>
```

Parameters

<channel> (NR1-numeric)	description
1	Rate is STM-0 or STM-1
1 to 4	Rate is STM-4
<byte> (discrete)	**description**
A1, A2, C1, E1, F1, D1, D2, D3, K1, K2, D4, D5, D6, D7, D8, D9, D10, D11, D12, S1, M1, E2	Only the bytes listed are available for selection
<offset> (NR1-numeric)	**description**
0 to 2	See the previous table listing the bytes in the Transport and Path Overhead; STM–1, STM–4
<value> (NR1-numeric)[6]	**description**
Any integer in the range 0 to 255 (hexadecimal 00 to FF)	The byte is set to this value

[6] **A hexadecimal value is also acceptable.**

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:OVERHEAD:DATA 4,D5,2,#H55`

Sets the D5 byte in the fourth channel, offset column of an STM-4 signal to hexadecimal 55.

Query: `SOURCE:DATA:TELECOM:OVERHEAD:DATA? 1,C1,0`

Response: `255`

Related Commands

None

SOURce:DATA:TELecom:OVERhead:ALLData

The command form sets all overhead bytes at one time.

This query form returns overhead data in a command form that can be used to set the available overhead bytes. One command with 24 parameters is produced. The first two parameters indicate channel and offset. The remaining 22 parameters are the data values for the overhead bytes in decimal number form.

Syntax

```
SOURce:DATA:TELecom:OVERhead:ALLDATA <channel>,<offset>,<A1>,
<A2>,<C1>,<E1>,<F1>,<D1>,<D2>,<D3>,<K1>,<K2>,<D4>,<D5>,<D6>,<D7>,
<D8>,<D9>,<D10>,<D11>,<D12>,<S1>,<M1>,<E2>
SOURce:DATA:TELecom:OVERhead:ALLData? <channel>,<offset>
```

Parameters

<channel> (NR1-numeric)	**description**
Any integer in the range 1 to12	This value indicates the desired channel setting
<offset> (NR1-numeric)	**description**
Any integer in the range 0 to 2	This value indicates the desired offset
<A1>,<A2>,<C1>,<B1>,<E1>,<F1>,<D1>, <D2>,<D3>,<H1>,<H2>,<H3>,<B2>,<K1>, <K2>,<D4>,<D5>,<D6>,<D7>,<D8>,<D9>, <D10>,<D11>,<D12>,<S1>,<M1>,<E2> (NR1-numeric)[1]	**description**
Any integer in the range 0 to 255 for each parameter (hexadecimal 00 to FF)	These values indicate the desired setting for each overhead byte

1 **A hexadecimal value is also acceptable.**

Dependencies

<channel> and <offset> must be compatible with the current rate and structure settings.

Errors and Events

221, “Settings conflict; Parameter out of range”

118, “Query not allowed”

Examples

Set:
```
SOURCE:DATA:TELECOM:OVER:ALLDATA
1,0,92,123,1,0,23,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0
```

The above example sets the A1 byte to 92, the A2 byte to 123, the C1 byte to 1, the E1 byte to 23, and the rest of the bytes to 0 for channel 1.

Query:
```
SOURCE:DATA:TELECOM:OVERHEAD:ALLDATA? 1,0
```

Response:
```
SOURCE:DATA:TELECOM:OVERHEAD:ALLDATA 1, 0, 92, 123, 1,
0, 23, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0
```

Related Commands SOURce:DATA:TELecom:OVERhead:DATA

SOURce:DATA:TELecom:OVERhead:INSert

This command sets or queries the insertion of data into the overhead from an external protocol analyzer into the specific overhead bytes.

Syntax

```
SOURce:DATA:TELecom:OVERhead:INSert <insert>
SOURce:DATA:TELecom:OVERhead:INSert?
```

Parameters

<insert> (discrete)	description
NONE	Off (default)
SDCC	RS DCC (D1–D3)
LDCC	MS DCC (D4–D12)
F1	F1 byte

Dependencies You can insert data into the overhead or the path overhead by using the SOURce:DATA:TELecom:OVERhead:INSert and SOURce:DATA:TELecom:POVerhead:INSert commands. The last command sent applies.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:OVERHEAD:INSERT SDCC`

Query: `SOURCE:DATA:TELECOM:OVERHEAD:INSERT?`

Response: `F1`

Related Commands None

SOURce:DATA:TELecom:OVERhead:APS

This command sets or queries the K1 and K2 bytes in the same transmit frame. Use the SENSe:DATA:TELecom:OVERhead:DATA? query to find out the value of the K1 and K2 bytes in the received signal.

Syntax

```
SOURce:DATA:TELecom:OVERhead:APS <APS value>
SOURce:DATA:TELecom:OVERhead:APS?
```

Parameters

<APS value> (NR1-numeric)[1]	description
Any integer in the range 0 to 65535 (hexadecimal 0 to FFFF)	The 16-bit value of the K1 and K2 MSP bytes

1 **A hexadecimal value is also acceptable.**

Dependencies None

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:OVERHEAD:APS #HFFFF`

The above example sets both K1 and K2 bytes to the maximum value (binary 1111111111111111).

Set: `SOURCE:DATA:TELECOM:OVERHEAD:APS #HFF00`

The above example sets the K1 byte to the maximum value (binary 11111111) and the K2 byte to 0 (binary 00000000).

Query: `SOURCE:DATA:TELECOM:OVERHEAD:APS?`

Response: `65535`

Related Commands None

SOURce:DATA:TELecom:OVERhead:PRBS <byte name> <pattern> <state>

This command sets the active PRBS test byte name, sets the active PRBS test pattern, and sets whether the TXed pattern is normal or inverted

Syntax SOURce:DATA:TELecom:OVERhead:PRBS <byte name> <pattern> <state>

Parameters

byte name	Description
E1	E1 byte
E2	E2 byte
F3	F1 byte

Parameters

pattern	Description
PRBS15	A pseudo–random binary sequence of length 2^15
PRBS20	A pseudo–random binary sequence of length 2^20
PRBS23	A pseudo–random binary sequence of length 2^23

Parameters

state	Description
ON	Inverts the previously selected pattern
OFF	Pattern invert is off

Dependencies None

Examples SOURce:DATA:TELecom:OVERhead:PRBS F1, PRBS15, ON

Related Commands None

SOURce:DATA:TELecom:POVerhead:PRESet

This command resets the path overhead to the default (see Figure 2–25 on page 2–32 for the default values).

Syntax

```
SOURce:DATA:TELecom:POVerhead:PRESet
```

Parameters

None

Dependencies

None

Errors and Events

None

Examples

```
SOURCE:DATA:TELECOM:POVERHEAD:PRESET
```

Related Commands

SOURce:DATA:TELecom:POVerhead:DATA

SOURce:DATA:TELecom:POVerhead:DATA

This command sets or queries the bytes in the path overhead.

Syntax

```
SOURce:DATA:TELecom:POVerhead:DATA <byte>,<value>
SOURce:DATA:TELecom:POVerhead:DATA? <byte>
```

Parameters

<byte> (discrete)	description
C2, F2, F3, K3, N1	Only the bytes listed are available for selection[1]
<value> (NR1-numeric)[2]	**description**
Any integer in the range 0 to 255 (hexadecimal 00 to FF)	The selected byte is set to this value

1 **The J1 path trace overhead byte is controlled through the SOURce:DATA:TELecom:POVerhead:TRACe command.**

2 **A hexadecimal value is also acceptable.**

Dependencies This command is ignored if SOURce:DATA:TELecom:POVerhead:INSert is set to F2.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:POVERHEAD:DATA C2,#H55`

Query: `SOURCE:DATA:TELECOM:POVERHEAD:DATA? C2`

Response: `255`

Related Commands SOURce:DATA:TELecom:POVerhead:TRACe
SOURce:DATA:TELecom:PAYLoad:MAPPing (sets the C2 byte)

SOURce:DATA:TELecom:POVerhead:INSert

This command sets or queries the path overhead data from an external protocol analyzer into the specific overhead bytes.

Syntax

```
SOURce:DATA:TELecom:POVerhead:INSert <path insert>
SOURce:DATA:TELecom:POVerhead:INSert?
```

Parameters

<path insert> (discrete)	description
NONE	Off
F2	F2 byte

Dependencies You can insert data into the overhead or the path overhead by using the SOURce:DATA:TELecom:OVERhead:INSert and SOURce:DATA:TELecom:POVerhead:INSert commands. The last command sent applies.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:POVERHEAD:INSERT F2`

Query: `SOURCE:DATA:TELECOM:POVERHEAD:INSERT?`

Response: `NONE`

Related Commands None

SOURce:DATA:TELecom:POVerhead:TRACe

This command sets or queries the path trace overhead bytes that appear in J1 as a repeating 64-byte sequence. The string must not exceed 64 ASCII characters in length. Unprintable characters will be accepted and inserted directly.

Syntax

```
SOURce:DATA:TELecom:POVerhead:TRACe <path trace>
SOURce:DATA:TELecom:POVerhead:TRACe?
```

Parameters

<path trace> (string)	description
Length is a maximum of 64 bytes; if length is less than 64 bytes, the buffer is padded with nulls to a length of 64 bytes; the string will be terminated with a CR/LF (carriage return/line feed)	The J1 byte is set to this value (default is 64 null characters)

Dependencies

None

Errors and Events

223, “Too much data; Path trace string truncated”

Examples

Set: `SOURCE:DATA:TELECOM:POVERHEAD:TRACE "TESTING 1 . 2 . 3"`

Query: `SOURCE:DATA:TELECOM:POVERHEAD:TRACE?`

Response: `"THIS IS A TEST"`

Related Commands

SOURce:DATA:TELecom:POVerhead:DATA?

SOURce:DATA:TELecom:POVerhead:TRACe:FORMAT

This command sets the type of J1 string for AU–N J1 trace strings.

Syntax `SOURce:DATA:TELecom:POVerhead:TRACe <format>`

Parameters

format	description
LONG	64 J1 byte trace
SHORT	16 J1 byte trace

Dependencies None

Examples SOURce:DATA:TELecom:POVerhead:TRACe:FORMAT LONG

Related Commands SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT

SOURce:DATA:TELecom:ERRor, ALARm, and FAILure Subsystem

This section describes the commands and queries that control abnormal conditions such as errors, alarms, and failures in the transmitted signal. Figure 2–29 shows the hierarchy tree for this subsystem. CTS 850

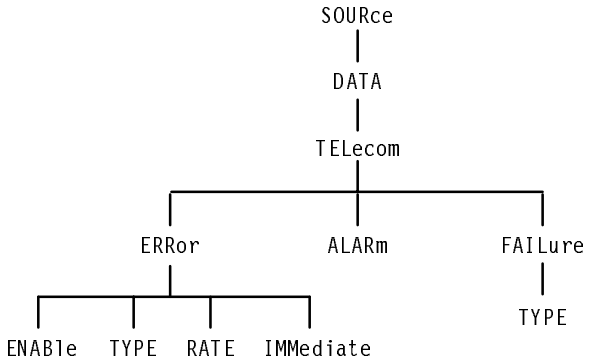


Figure 2–29: SOURce:DATA:TELecom:ERRor, ALARm, and FAILure subsystem

SOURce:DATA:TELecom:ERRor:ENABle

This command sets or queries output signal error insertion.

Syntax

```
SOURce:DATA:TELecom:ERRor:ENABle <error rate state>
SOURce:DATA:TELecom:ERRor:ENABle?
```

Parameters

<error rate state> (boolean)	Description
0 or OFF	Error rate disabled (default)
1 or ON	Errors specified by rate

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:ERROR:ENABLE 0`

Query: `SOURCE:DATA:TELECOM:ERROR:ENABLE?`

Response: `1`

Related Commands

SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:ERRor:MODE

SOURce:DATA:TELecom:ERRor:TYPE

This command sets or queries the error type.

Syntax

```
SOURce:DATA:TELecom:ERRor:TYPE <error type>
SOURce:DATA:TELecom:ERRor:TYPE?
```

Parameters

<error type> (discrete)	Description
SCV	RS B1 BIP error; B1 will be errored across all bits (default)
LCV	MS B2 BIP error; B2 will be errored across all bits
PCV	Path B3 BIP error; the active channel B3 will be errored across all bits
PFEBe	Path Far End Block Error (path FEBE at specified rate); a value of 1 is inserted in the G1 byte when the SOURce:DATA:TELecom: ERRor:IMMediate command is given
DATA	Payload data bit error (payload data will be errored but B3 will not)
TRIButary	Allows selection of tributary errors (Add/Drop Test Option Only)

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:ERROR:TYPE SCV`

Query: `SOURCE:DATA:TELECOM:ERROR:TYPE?`

Response: `DATA`

Related Commands

SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:TRIButary:ERRor

SOURce:DATA:TELecom:ERRor:RATE

This command sets or queries the error rate. Resolution is limited to one digit. For example, 1E-6, 2E-9, and 1E-3 are valid values; 1.43E-4 and 2.7E-9 are not valid values. Invalid error rates will be changed to the nearest valid value. For example, 1.25E-5 (too many digits) will be changed to 1E-5, 1E-20 (below minimum) will be changed to 1E-10 (minimum), and 1 (above maximum) will be changed to 1E-3 (maximum).

To disable error generation at any specified rate, use the SOURce:DATA: TELecom:ERRor:ENABle OFF command.

Syntax

```
SOURce:DATA:TELecom:ERRor:RATE <error rate>
SOURce:DATA:TELecom:ERRor:RATE?
```

(see Tables 2–9 and 2–10 for <error rate> limits)

Table 2–9: Error insertion rate limits for SOURce:DATA:TELecom:ERRor:RATE

If rate set to:	If error type set to SCV	If error type set to LCV	If error type set to PCV	If error type set to PFEBE	If error type set to DATA
STM0	1E–10 to 1E–3	1E–10 to 1E–3	1E–10 to 1E–3	1E–10 to 1E–3	1E–10 to 1E–3
STM1	1E–10 to 1E–4	1E–10 to 1E–4	1E–10 to 1E–4	1E–10 to 1E–4	1E–10 to 1E–3
STM4	1E–10 to 1E–5	1E–10 to 1E–4	1E–10 to 1E–4	1E–10 to 1E–4	1E–10 to 1E–3

The table lists the minimum and maximum rates.

All error rates are NR3-numeric.

Table 2–10: Error insertion rate limits for SOURce:DATA:TELecom:ERRor:RATE (Add/Drop Test Option Only)

If rate set to:	If error type set to TUBIP	If error type set to TUFEBE	If error type set to CRC	If error type set to FRAME	If error type set to DATA
M2	1E–10 to 1E–4	1E–10 to 1E–4	1E–8 to 1E–4	1E–7 to 1E–2	1E–8 to 1E–2
M34	1E–10 to 1E–4	1E–10 to 1E–4	not applicable	1E–7 to 1E–2	1E–9 to 1E–2
M140	not applicable	not applicable	not applicable	1E–8 to 1E–2	1E–9 to 1E–2

The table lists the minimum and maximum rates.

All error rates are NR3-numeric.

Dependencies None

Errors and Events

500, “Execution warning; Numeric value greater than maximum limit”

500, “Execution warning; Numeric value less than minimum limit”

Examples

Set: `SOURCE:DATA:TELECOM:ERROR:RATE 1E-6`

Query: `SOURCE:DATA:TELECOM:ERROR:RATE?`

Response: `1E-10`

Related Commands

SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:ERRor:TYPE
SOURce:DATA:TELecom:TRIButary:ERRor

SOURce:DATA:TELecom:ERRor:IMMediate

This command is used to force an error insertion. The error is defined by SOURce:DATA:TELecom:DATA:ERRor:TYPE.

Syntax

`SOURce:DATA:TELecom:ERRor:IMMediate`

Parameters

None

Dependencies

SOURce:DATA:TELecom:ERRor:ENABle must be set to ON.

Errors and Events

None

Examples

`SOURCE:DATA:TELECOM:ERROR:IMMEDIATE`

Related Commands

SOURce:DATA:TELecom:ERRor:TYPE
SOURce:DATA:TELecom:TRIButary:ERRor

SOURce:DATA:TELecom:ALARm

This command sets or queries the transmit alarm type.

Syntax

```
SOURce:DATA:TELecom:ALARm <alarm>
SOURce:DATA:TELecom:ALARm?
```

Parameters

<alarm> (discrete)	Description
NONE	No alarms (default)
LAIS	MS AIS
PAIS	Path AIS
LFERf	MS FERF
PFERf	Path FERF
TRIButary	Allows selection of tributary alarms (Add/Drop Test Option Only)

Dependencies

SOURce:DATA:TELecom:FAILure:TYPE must be set to NONE for this command to apply.

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:ALARM LAIS`

Query: `SOURCE:DATA:TELECOM:ALARM?`

Response: `PFERF`

Related Commands

SOURce:DATA:TELecom:TRIButary:ALARm

SOURce:DATA:TELecom:FAILure:TYPE

This command sets or queries the transmit failure type. Selecting a failure type overrides all errors and alarms.

Syntax

```
SOURce:DATA:TELecom:FAILure:TYPE <failure>
SOURce:DATA:TELecom:FAILure:TYPE?
```

Parameters

<failure> (discrete)	Description
NONE	No failures (default)
LOSignal	Loss of Signal (disconnects the output signal)
LOFrame	Loss of Frame (changes the most significant bit of A1 resulting in a hexadecimal value of 76)
LOPointer	Loss of Pointer (generates continuous NDFs)
TRIButary	Allows selection of tributary failures (Add/Drop Test Option Only)

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:FAILURE:TYPE LOS`

Query: `SOURCE:DATA:TELECOM:FAILURE:TYPE?`

Response: `NONE`

Related Commands

SOURce:DATA:TELecom:TRIButary:FAILure

SOURce:DATA:TELecom:POINter Subsystem

This section describes the commands and queries that adjust pointers. Figure 2–30 shows the hierarchy tree for this subsystem.

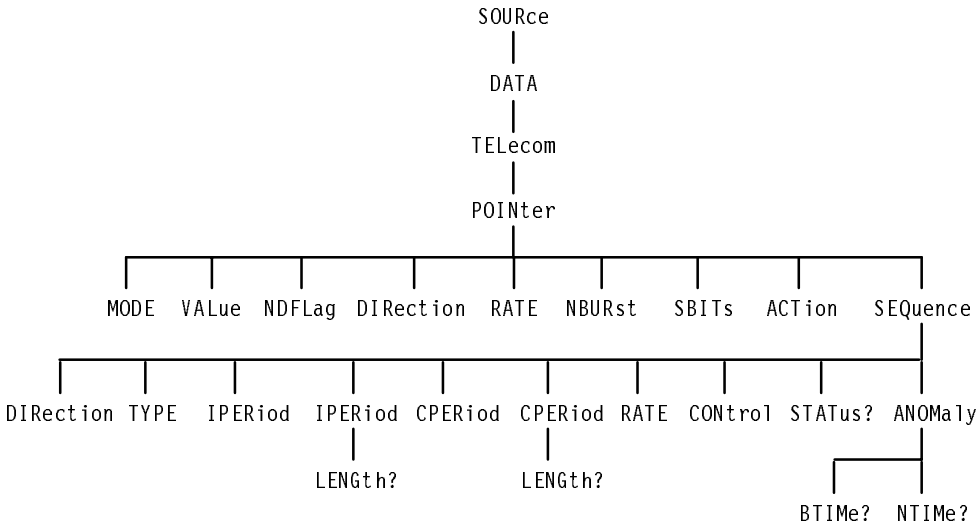


Figure 2–30: SOURce:DATA:TELecom:POINter subsystem

SOURce:DATA:TELecom:POINter:MODE

This command sets or queries the pointer manipulation modes.

Syntax

```
SOURce:DATA:TELecom:POINter:MODE <mode>
SOURce:DATA:TELecom:POINter:MODE?
```

Parameters

<mode> (discrete)	Description
MANual	Pointers are controlled by SOURce:DATA: TELecom:POINter:VALue and SOURce:DATA: TELecom:NDFlag (default)
SINGle	When the SOURce:DATA:TELecom: POINter:ACTion command is given, pointer adjustments will alternately increment and decrement

(continued on next page)

<mode> (discrete)	Description
BURSt	When the SOURce:DATA:TELecom:POINter:ACTion command is given, a burst of pointer adjustments is sent at the maximum rate (1 in 4 frames) and with a count defined by SOURce:DATA:TELecom:POINter:NBURst
FOFFset	Frequency offset pointers are controlled by the SOURce:CLOCk:OFFSet: commands
CONTinuous	Pointers are continuously adjusted according to the SOURce:DATA:TELecom:POINter:RATE and SOURce:DATA:TELecom:POINter:DIRection commands
TRIButary	Pointers are controlled by the SOURce:DATA:TELecom:TRIButary:POINter subsystem (Add/Drop Test Option Only)
SEQuence	Pointers are stressed according to sequences defined in T1.105.03–1994 or G.783.

Dependencies None

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:MODE FOFFSET`

Query: `SOURCE:DATA:TELECOM:POINTER:MODE?`

Response: `SEQUENCE`

Related Commands None

SOURce:DATA:TELecom:POINter:VALue

This command sets or queries the pointer value. To obtain an illegal pointer value, use a value greater than 782. If SOURce:DATA:TELecom:POINter:NDFlag is set to ON, a New Data Flag (NDF) is sent with each new value received.

Syntax

```
SOURce:DATA:TELecom:POINter:VALue <pointer value>
SOURce:DATA:TELecom:POINter:VALue?
```

Parameters

<pointer value> (NR1-numeric)	Description
Any integer in the range 0 to 1023	Pointer set to this value (default = 522)

Dependencies

SOURce:DATA:TELecom:POINter:MODE must be set to MANual for this command to apply.

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:VALUE 10`

Query: `SOURCE:DATA:TELECOM:POINTER:VALUE?`

Response: `412`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:NDFlag

SOURce:DATA:TELecom:POINter:NDFLag

This command sets or queries the generation of a New Data Flag (NDF) when pointer adjustments occur.

Syntax

```
SOURce:DATA:TELecom:POINter:NDFLag <NDF state>
```

Parameters

<NDF state> (boolean)	Description
1 or ON	On (default)
0 or OFF	Off

Dependencies SOURce:DATA:TELecom:POINter:MODE must be set to MANual for this command to apply.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:NDFLag ON`

Query: `SOURCE:DATA:TELECOM:POINTER:NDFLag?`

Response: `1`

Related Commands SOURce:DATA:TELecom:POINter:VALue

SOURce:DATA:TELecom:POINter:DIRection

This command sets or queries the continuous pointer adjustment direction.

Syntax

```
SOURce:DATA:TELecom:POINter:DIRection <direction>
SOURce:DATA:TELecom:POINter:DIRection?
```

Parameters

<direction> (discrete)	Description
ALTernate	Pointer adjustments alternate between up and down (default)
DOWN	Pointers adjusted down
UP	Pointers adjusted up

Dependencies SOURce:DATA:TELecom:POINTer:MODE must be set to CONTinuous for this command to apply.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:DIRECTION UP`

Query: `SOURCE:DATA:TELECOM:POINTER:DIRECTION?`

Response: `DOWN`

Related Commands SOURce:DATA:TELecom:POINter:RATE

SOURce:DATA:TELecom:POINter:RATE

This command sets or queries the continuous pointer adjustment rate.

Syntax

```
SOURce:DATA:TELecom:POINter:RATE <rate>
SOURce:DATA:TELecom:POINter:RATE?
```

Parameters

<rate> (NR1-numeric)	Description
Any integer in the range 2 to 10,000 ms (resolution of 1 ms)	The pointer adjustment rate is set to this value

Dependencies

SOURce:DATA:TELecom:POINTer:MODE must be set to CONTinuous for this command to apply.

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:RATE 10`

Query: `SOURCE:DATA:TELECOM:POINTER:RATE?`

Response: `4`

Related Commands

SOURce:DATA:TELecom:POINter:DIRection
SOURce:DATA:TELecom:POINter:MODE

SOURce:DATA:TELecom:POINter:NBURst

This command sets or queries the number of pointer adjustments in a burst of pointer adjustments. The SOURce:DATA:TELecom:POINTer:ACTion command controls when the burst occurs.

Syntax

```
SOURce:DATA:TELecom:POINter:NBURst <pointer burst number>
SOURce:DATA:TELecom:POINter:NBURst?
```

Parameters

<pointer burst number> (NR1-numeric)	Description
Any integer in the range 2 to 8	This value determines the number of pointer adjustments in a burst of pointer adjustments (default = 2)

Dependencies SOURce:DATA:TELecom:POINter:MODE must be set for BURSt for this command to apply.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:NBURST 2`

Query: `SOURCE:DATA:TELECOM:POINTER:NBURST?`

Response: `4`

Related Commands SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:ACTion

SOURce:DATA:TELecom:POINter:SBITs

This command sets or queries the static value of the S-bits (bits 5 and 6) in the H1 byte.

Syntax

```
SOURce:DATA:TELecom:POINter:SBITs <pointer sbits>
SOURce:DATA:TELecom:POINter:SBITs?
```

Parameters

<pointer sbits> (NR1-numeric)	Description
Any integer in the range 0 to 3	This value is the S-bit in the H1 byte (default = binary 10)

Dependencies None

Errors and Events 500, “Execution warning; Numeric value greater than maximum limit”

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:SBITS 0`

Query: `SOURCE:DATA:TELECOM:POINTER:SBITS?`

Response: `2`

Related Commands None

SOURce:DATA:TELecom:POINter:ACTion

This command invokes a pointer adjustment for SDH or tributary signals.

Syntax

```
SOURce:DATA:TELecom:POINter:ACTion
```

Parameters

None

Dependencies

SOURce:DATA:TELecom:POINter:MODE or if the SOURce:DATA:TELecom:POINter:MODE is TRIButary, SOURce:DATA:TELecom:TRIButary:POINter:MODE must be set to SINGle or BURst for this command to apply.

Errors and Events

221, "Settings conflict; Mode must be single or burst"
200, "Execution error; Pointer burst active, request ignored"

Examples

```
SOURCE:DATA:TELECOM:POINTER:ACTION
```

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:NBURst
SOURce:DATA:TELecom:TRIButary:POINter:MODE
SOURce:DATA:TELecom:TRIButary:POINter:NBURst

SOURce:DATA:TELecom:POINter:SEQuence:DIRection

This command sets or queries the pointer sequence movement direction.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:DIRection <ptr seq dir>
SOURce:DATA:TELecom:POINter:SEQuence:DIRection?
```

Parameters

<ptr seq dir> (discrete)	Description
DOWN	
UP	(default)

Dependencies

Pointer sequences must not be running.

Errors and Events 221, "Settings conflict"

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:DIRECTION UP`

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:DIRECTION?`

Response: `DOWN`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

SOURce:DATA:TELecom:POINter:SEQuence:RATE

This command sets or queries the pointer sequence movement rate in milliseconds.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:RATE <ptr seq rate>
SOURce:DATA:TELecom:POINter:SEQuence:RATE?
```

Parameters

<ptr seq rate> (NR1-numeric)	Description
Any integer in the range 34 to 30,000 ms	Resolution is 1 ms (default = 34 ms)

Dependencies Pointer sequences must not be running. Some sequence types (such as single, burst, phase, sinalt, and dblalt) set the rate to 30,000 ms. With these types, you cannot change the rate.

Errors and Events 221, "Settings conflict; Not available without jitter option"

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:RATE 50`

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:RATE?`

Response: `34`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:POINter:SEQuence:TYPE

SOURce:DATA:TELecom:POINter:SEQuence:TYPE

This command sets or queries the pointer sequence type.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:TYPE <ptr seq type>
SOURce:DATA:TELecom:POINter:SEQuence:TYPE?
```

Parameters

<pointer seq type> (discrete)	Description
SINGle	Single pointer adjustment (G.783 e)
BURSt	Burst pointer adjustment (G.783 f)
PHASE	Phase transient pointer adjustment
P873	Periodic 87-3 pointer adjustment (G.783 g1)
P873CAN	Periodic 87-3 with cancel (G.783 g3)
P873ADD	Periodic 87-3 with add (G.783 g2)
PCONtinuous	Periodic continuous pointer adjustment (G.783 h1)
PCONCAN	Periodic continuous with cancel (G.783 h3)
PCONADD	Periodic continuous with add (G.783 h2)
REGDBL	Regular pointer plus one double (G.783 b)
REGMIS	Regular pointer with one missing (G.783 c)
SINALT	Single alternating pointer (G.783 a)
DBLALT	Double alternating pointer (G.783 d)

Dependencies

Pointer sequences must not be running.

G.783 applies only to SDH rates.

Errors and Events

221, “Settings conflict; stop sequences before setting the type”

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:TYPE BURST`

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:TYPE?`

Response: `SINALT`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

SOURce:DATA:TELecom:POINter:SEQuence:IPERiod

This command sets or queries the pointer sequence initialization period.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:IPERiod <ptr seq init>
SOURce:DATA:TELecom:POINter:SEQuence:IPERiod?
```

Parameters

<ptr seq init> (discrete)	Description
0 (or OFF)	Disables the pointer sequence initialization period
1 (or ON)	Enables the pointer sequence initialization period (default)

Dependencies

Pointer sequences must not be running.

Errors and Events

221, “Settings conflict; Not available without jitter option”

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:IPERIOD ON`

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:IPERIOD?`

Response: `0`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

SOURce:DATA:TELecom:POINter:SEQuence:IPERiod:LENGth?

This query returns the pointer sequence initialization period in seconds.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:IPERiod:LENGth?
```

Response

<pointer seq init> (NR1-numeric)	Description
Any integer	Pointer sequence initialization period in seconds

Dependencies

None

Errors and Events

None

Examples

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:IPERIOD:LENGTH?`

Response: 30

Related Commands

SOURce:DATA:TELecom:POINter:SEQuence:IPERiod
SOURce:DATA:TELecom:POINter:SEQuence:RATE
SOURce:DATA:TELecom:POINter:SEQuence:TYPE

SOURce:DATA:TELecom:POINter:SEQuence:CPERiod

This command sets or queries the pointer sequence cool down period.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:CPERiod <ptr seq init>
SOURce:DATA:TELecom:POINter:SEQuence:CPERiod?
```

Parameters

<pointer seq init> (discrete)	Description
0 (or OFF)	Disables the pointer sequence cool down period
1 (or ON)	Enables the pointer sequence cool down period (default)

Dependencies Pointer sequences must not be running.

Errors and Events 221, "Settings conflict; Not available without jitter option"

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:CPERIOD OFF`

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:CPERIOD?`

Response: `1`

Related Commands SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

SOURce:DATA:TELecom:POINter:SEQuence:CPERiod:LENGth?

This query returns the pointer sequence cool down period in seconds.

Syntax `SOURce:DATA:TELecom:POINter:SEQuence:CPERiod:LENGth?`

Response

<pointer seq init> (NR1-numeric)	Description
Any integer	Pointer sequence cool down period in seconds

Dependencies None

Errors and Events None

Examples

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:CPERIOD:LENGTH`

Response: `675`

Related Commands SOURce:DATA:TELecom:POINter:SEQuence:CPERiod
SOURce:DATA:TELecom:POINter:SEQuence:RATE
SOURce:DATA:TELecom:POINter:SEQuence:TYPE

SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

This command sets or queries the pointer sequences and tributary pointer sequences.

A sequence begins with an initialization or cool down period, if enabled, and then enters operation. You may stop a pointer sequence at any time.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol <ptr seq ctrl>
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol?
```

Parameters

<pointer seq control> (discrete)	Description
STARt	Starts a pointer sequence
STOP	Stops a pointer sequence

Dependencies

POINTer:MODE SEQuence or POINter:MODE TRIButary and TRIButary:POINter:MODE SEQuence must be selected.

Errors and Events

221, “Settings conflict; Not available without jitter option”

Examples

Set: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:CONTROL START`

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:CONTROL?`

Response: `STOP`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:STATUS?

SOURce:DATA:TELecom:POINter:SEQuence:STATus?

This query returns the pointer sequence status.

Syntax `SOURce:DATA:TELecom:POINter:SEQuence:STATus?`

Response

<pointer seq status> (discrete)	Description
STOPPED	Not running sequences
INITIALizing	Initialization period
COOLdown	Cool down period
OPERating	Running sequences

Dependencies None

Errors and Events None

Examples Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:STATUS?`

Response: `INIT`

Related Commands SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol?

SOURce:DATA:TELecom:POINter:SEQuence:ANOMaly:BTIMe?

This query returns the pointer sequence time between anomalies in seconds.

Sequences do not have to be running. This calculation is based upon sequence type and rate.

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:ANOMaly:BTIMe?
```

Response

<pointer seq btime> (NR1-numeric)	Description
Any positive integer	Time between anomalies in seconds
-1	Returned for sequences with an invalid BTIME. Example: continuous without anomalies

Dependencies

None

Errors and Events

None

Examples

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:ANOMALY:BTIME?`

Response: `30`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:POINter:SEQuence:RATE

SOURce:DATA:TELecom:POINter:SEQuence:ANOMaly:NTIMe?

This query returns the pointer sequence time until the next anomaly in seconds.

This query is only meaningful if sequences are running (STATus? is "OPERATING").

Syntax

```
SOURce:DATA:TELecom:POINter:SEQuence:ANOMaly:NTIMe?
```

Response

<pointer seq ntime> (NR1-numeric)	Description
Any positive integer	Time until the next anomaly in seconds
–1	Returned for sequences with an invalid NTIME (Example: continuous without anomalies) or if in the following states: STOPPED, INITIALizing, or COOLdown

Dependencies

None

Errors and Events

None

Examples

Query: `SOURCE:DATA:TELECOM:POINTER:SEQUENCE:ANOMALY:NTIME?`

Response: 4

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:POINter:SEQuence:RATE

SOURce:DATA:TELecom:TRIButary Subsystem

This section describes the commands and queries that control the tributary signals. Figure 2–33 shows the hierarchy tree for this subsystem. CTS 850

SOURce --> DATA --> TELecom --> TRIButary

--> ADD

--> CHANnel

--> MAPPing

--> FRAMing

--> pattern --> UWORd -->LENGth

--> BACKground --> PATTern

--> POVerhead --> DATA
--> TRACe

--> PAYLoad

--> K64 --> MULTiplier
--> TIMEslot
--> CSLOt
--> CAS
--> BACKground --> PATTern

--> MUX2 --> CHANnel
--> BACKground --> PATTern

-->MUX8 --> CHANnel
--> BACKground --> PATTern

-->MUX34 --> CHANnel
--> BACKground --> PATTern

Figure 2–33: SOURce:DATA:TELecom:TRIButary subsystem

SOURce:DATA:TELecom:TRIButary:ADD

This command sets or queries the tributary payload data source.

Syntax

```
SOURce:DATA:TELecom:TRIButary:ADD <trib add>
SOURce:DATA:TELecom:TRIButary:ADD?
```

Parameters

<trib add> (boolean)	Description
OFF or 0	Internal source; an internally generated data pattern is placed in the payload (default)
ON or 1	External tributary signal mapped into the signal; signal mapping is determined by the SOURce:DATA:TELecom:TRIButary: MAPPing command; if no signal is present, AIS is mapped into the payload

Dependencies None

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:ADD ON`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:ADD?`

Response: `1`

Related Commands INPUT2 and INPUT3 subsystems

SOURce:DATA:TELecom:TRIButary:CHANnel

This command sets or queries the TUASYNC channel.

Syntax

```
SOURce:DATA:TELecom:TRIButary:CHANnel <trib channel>
SOURce:DATA:TELecom:TRIButary:CHANnel?
```

Parameters

<trib channel> (NR1-numeric)	Description
Any integer between 1 and 63	TUASYNC (TU-12) mapping (default = 1)
Any integer between 1 and 3	TU-3 mapping (default = 1)
1	M140 mapping

Dependencies SOURce:DATA:TELecom:TRIButary:MAPPing determines the number of channels available for selection.

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:CHANNEL 1`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:CHANNEL?`

Response: 3

Related Commands SOURce:DATA:TELecom:TRIButary:MAPPing

SOURce:DATA:TELecom:TRIButary:MAPPing

This command sets or queries the tributary payload mapping. When you are actively mapping and demapping a tributary signal, the SOURce:DATA:TELecom:TRIButary:MAPPing and SENSe:DATA:TELecom:TRIButary:MAPPing functions are coupled; a change to one causes the same change to the other. When this command is sent, the C2 byte of the path overhead is set.

Syntax

```
SOURce:DATA:TELecom:TRIButary:MAPPing <trib mapping>
SOURce:DATA:TELecom:TRIButary:MAPPing?
```

Parameters

<trib mapping> (discrete)	Description
TUASYNC	Mapped 2 Mb/s signal into TU-12 floating async (default)
TU3	Mapped 34 Mb/s signal
M140	Mapped 140 Mb/s signal

Dependencies None

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:MAPPING TUASYNC`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:MAPPING?`

Response: `TUASYNC`

Related Commands SOURce:DATA:TELecom:PAYLoad:CHANnel

SOURce:DATA:TELecom:TRIButary:FRAMing

This command sets or queries the transmitted tributary signal framing.

Syntax

```
SOURce:DATA:TELecom:TRIButary:FRAMing <trib framing>
SOURce:DATA:TELecom:TRIButary:FRAMing?
```

Parameters

<trib framing> (discrete)	Description
UNFRamed	No framing (default)
PCM30	2 Mb/s, PCM, 30 channels, no CRC checking
PCM31	2 Mb/s, PCM, 31 channels, no CRC checking
PCM30CRC	2 Mb/s, PCM, 30 channels, with CRC checking
PCM31CRC	2 Mb/s, PCM 31 channels, with CRC checking
FRAMED	34 Mb/s or 140 Mb/s framing

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:FRAMING UNFRAMED`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:FRAMING?`

Response: `FRAMed`

Related Commands

None

SOURce:DATA:TELecom:TRIButary:PATTern

This command sets or queries the internally generated pattern that is placed in the tributary payload.

Syntax

```
SOURce:DATA:TELecom:TRIButary:PATTern <trib pattern>
SOURce:DATA:TELecom:TRIButary:PATTern?
```

Parameters

<trib pattern> (discrete)	Description
PRBS23	A pseudo-random binary sequence of length $2^{23}-1$ is placed in the tributary payload (default)
QRSS	A quasi–random sequence is placed in the tributary payload
PRBS15	A pseudo-random binary sequence of length $2^{15}-1$ is placed in the tributary payload
PRBS20	A pseudo-random binary sequence of length $2^{20}-1$ is placed in the tributary payload
PRBS9	A pseudo-random binary sequence of length $2^{9}-1$ is placed in the tributary payload
PRBS11	A pseudo-random binary sequence of length $2^{11}-1$ is placed in the tributary payload
AZEROs	All zeros are placed in the payload
AONEs	All ones are placed in the payload
UWORd	A user-defined pattern is placed in the payload
FIXED_1_8	1 bit in 8 set; #H80 (all PDH rates)
FIXED_3_24	3 bits in 24 set
AUDIO	1020 Hz audio tone (64k only)

Dependencies

SOURce:DATA:TELecom:TRIButary:ADD must be set to OFF for this command to apply.

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN PRBS15`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN?`

Response: `AONES`

Related Commands

SOURce:DATA:TELecom:TRIButary:PATTern:UWORd

SOURce:DATA:TELecom:TRIButary:PATTern:UWORd

This command sets or queries the user-defined pattern that is placed in the tributary payload.

Syntax

```
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd <trib user pat>
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd?
```

Parameters

<trib user pat> (hexadecimal)	Description
Any 8, 16, or 24 bit hexadecimal number in the range #H00 to #HFFFFFF	Repeating pattern is placed in the tributary payload (default = #H00)

Dependencies

SOURce:DATA:TELecom:TRIButary:PATTern must be set to UWORd for this command to apply. Use the SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth command to set the length of the repeating pattern.

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD #HAA5500`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD?`

Response: `#HAA5500`

Related Commands

SOURce:DATA:TELecom:TRIButary:PATTern
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth

SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENGth

This command sets or queries the number of bytes of the user-defined pattern that are repeated in the tributary payload.

Syntax

```
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENGth <patrn len>
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENGth?
```

Parameters

<patrn len> (NR1-numeric)	Description
Any integer in the range 1 to 3	Number of bytes of user-defined pattern that are repeated in the tributary payload (default = 1)

Dependencies

SOURce:DATA:TELecom:TRIButary:PATTern must be set to UWORd for this command to apply. Use the SOURce:DATA:TELecom:TRIButary:PATTern: UWORd command to set the repeating pattern.

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD:LENGTH 3`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD:LENGTH?`

Response: `2`

Related Commands

SOURce:DATA:TELecom:TRIButary:PATTern:UWORd

SOURce:DATA:TELecom:TRIButary:BACKground:PATTern

This command sets or queries the internally generated pattern that is placed in the tributary payload for inactive channels.

Syntax

```
SOURce:DATA:TELecom:TRIButary:BACKground:PATTern <trib bkgnd pat>
SOURce:DATA:TELecom:TRIButary:BACKground:PATTern?
```

Parameters

<trib background pattern> (discrete)	Description
PRBS	A pseudo-random binary sequence of length $2^{15}-1$ is placed in the tributary payload of inactive channels (TUASYNC only) (default)
IDLE	An idle pattern (alternating 01) is placed in the tributary payload of inactive channels

Dependencies None

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:BACKGROUND:PATTERN IDLE`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:BACKGROUND:PATTERN?`

Response: `IDLE`

Related Commands None

SOURce:DATA:TELecom:TRIButary:POVerhead:DATA

This command sets or queries the bytes in the tributary path overhead.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POVerhead:DATA <byte name>,<value>
SOURce:DATA:TELecom:TRIButary:POVerhead:DATA? <byte>
```

Parameters

<byte name> (discrete)	Description
C2	Signal label (TU3)
F2	User channel (TU3)
H4	Indicator (TU3)
F3	Growth bytes (TU3)
K3	(TU3)
K4	(TU12)

(continued on next page)

<byte name> (discrete)	Description
N1	(TU3)
N2	(TU12)
V5	(TU12)
<value> (NR1-numeric)[3]	**Description**
Any integer in the range 0 to 255 (hexadecimal 00 to FF)	The selected byte is set to this value

[3] **A hexadecimal value is also acceptable.**

Dependencies None

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:POVERHEAD:DATA V5,#H55`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:POVERHEAD:DATA? V5`

Response: `245`

Related Commands SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe

SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe?

This query returns the current path trace string that repeats in the J1 byte, for TU3, and the J2 byte for TU12 mapping, as a 16 character repeating sequence.

Syntax `SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe?`

Response

<path trace> (string)	Description
A 16 character string	The J1 or J2 path trace string

Dependencies None

Errors and Events None

Examples

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:POVERHEAD:TRACE?`

Response: `"TEK CTS750"`

Related Commands

SOURce:DATA:TELecom:POVerhead:TRACe

SOURce:DATA:TELecom:TRIButary:PAYLoad

This command specifies the tributary payload rate. This rate can be different from the transmit or mapping rate, in which case it sets the base rate for multiplexing. TRIB (the default) will set the payload rate to the mapping or transmit rate, whichever is appropriate.

Syntax

```
SOURce:DATA:TELecom:TRIButary:PAYLoad <payload rate>
SOURce:DATA:TELecom:TRIButary:POVerhead:PAYLoad?
```

Parameters

<payload rate> (discrete)	Description
TRIB	default – transmit or mapping rate
M140	140 Mb/s
M45	45 Mb/s base transmit rate
M34	34 Mb/s base transmit rate
M8	8 Mb/s base transmit rate
M2	2 Mb/s base transmit rate
K64	N x 64k base transmit rate

Dependencies

None

Errors and Events

None

Examples

Set: SOURce:DATA:TELecom:TRIButary:PAYLoad M34

Query: `SOURce:DATA:TELEcom:TRIButary:PAYLoad?`

Response: M34

Related Commands

SENSe:DATA:TELecom:TRIButary:PAYLoad

SOURce:DATA:TELecom:TRIButary:K64:MULTiplier

This command sets the number of contiguous 64k timeslots forming an Nx64k payload. To set up a single active 64k channel, the value should be 1.

Syntax

```
SOURce:DATA:TELecom:TRIButary:K64:MULTIplier <multiplier>
SOURce:DATA:TELecom:TRIButary:K64:MULTiplier?
```

Parameters

<multipler>	Valid when
1..30	CAS enabled
1..31	No CAS

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:TRIBUTARY:K64:MULTiplier 3`
Query: `SOURCE:DATA:TELECOM:TRIBUTARY:K64:MULTiplier?`

Response: 3

Related Commands

SENSe:DATA:TELecom:TRIButary:K64:MULTiplier

SOURce:DATA:TELecom:TRIButary:K64:TIMEslot

This command sets the starting timeslot for an Nx64k payload. This commands sets the active timeslot if the current configuration is 64k.

Syntax

```
SOURce:DATA:TELecom:TRIButary:K64:TIMEslot <starting timeslot>
SOURce:DATA:TELecom:TRIButary:K64:TIMEslot?
```

Parameters

<starting timeslot>	Description
1..32	Starting timeslot must be low enough to allow N contiguous timeslots (TS16 excepted)
16 is invalid if CAS enabled	

Dependencies None

Errors and Events None

Examples

Set: SOURce:DATA:TELecom:TRIButary:K64:TIMEslot 15
Query: `SOURCE:DATA:TELECOM:TRIBUTARY:K64:timeslot?`

Response: 15

Related Commands Sense:data:telecom:tributary:K64:timeslot

SOURce:DATA:TELecom:TRIButary:K64:CSLOT

This command selects a timeslot for setting the Channel Associated Signaling data.

Syntax

```
SOURce:DATA:TELecom:TRIButary:K64:CSLOT
SOURce:DATA:TELecom:TRIButary:K64:CSLOT?
```

Parameters

<slot>	Description
1..15, 17..30	Slot can be any valid timeslot in the 2 MB/s signal

Dependencies None

Errors and Events None

Examples

Set: SOURce:DATA:TELecom:TRIButary:K64:CSLOT 14
Query: `SOURCE:DATA:TELECOM:TRIBUTARY:K64:cslot?`

Response: 14

Related Commands SOURce:DATA:TELecom:TRIButary:K64:CAS

SOURce:DATA:TELecom:TRIButary:K64:CAS

This command sets the Channel Associated Signaling data value for the selected timeslot.

Syntax

```
SOURce:DATA:TELecom:TRIButary:K64:CAS <value>
SOURce:DATA:TELecom:TRIButary:K64:CAS?
```

Parameters

<value>	Description
4–bit binary #B000 – #B111, CAS bit positions are #Babcd	0000 is not recommended as it may interfere with the multi–frame alignment

Dependencies

None

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:K64:CAS? #B0101`
Query: `SOURCE:DATA:TELECOM:TRIBUTARY:K64:cas?`

Response: #B0101

Related Commands

SOURce:DATA:TELecom:TRIButary:K64:CAS

SOURce:DATA:TELecom:TRIButary:K64:BACKground:PATTern

This command sets the background pattern for Nx64k payload.

Syntax

```
SOURce:DATA:TELecom:TRIButary:K64:BACKground:PATTern <pattern>
SOURce:DATA:TELecom:TRIButary:K64:BACKground:PATTern?
```

Parameters

<pattern>	Description
IDLE	Idle pattern 0101 0101 is the only supported 64K background pattern in this release

Dependencies

None

Errors and Events None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:K64:BACKground:PATTern IDLE`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:K64:background:pattern?`

Response: IDLE

Related Commands SENSe:DATA:TELecom:TRIButary:K64:BACKground:PATTern

SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel

This command selects an active 2 Mb/s channel for the 8 Mb/s mux, unless "All" is selected.

Syntax

```
SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel <channel>
SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel?
```

Parameters

<channel>	Description
ALL	The 2 Mb/s signal is copied into all 4 channels of the 8 Mb/s signal
CHAN1, CHAN2, CHAN3, CHAN4	Selects a single active channel, other channels will be unframed and filled with the 2 Mb/s background pattern

Dependencies None

Errors and Events None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel 4`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:MUX2:CHANnel?`

Response: CHAN4

Related Commands SENSe:DATA:TELecom:TRIButary:DMUX2:CHANnel

SOURce:DATA:TELecom:TRIButary:MUX2:BACKground:PATTern

This command sets the background pattern to be loaded into inactive 2 Mb/s channels forwarded to the 8 Mb/s mux. The pattern is not injected when the active channel is set to "All". Each inactive channel is an unframed copy of the PRBS pattern, and may be analyzed as such by a receiver.

Syntax

```
SOURce:DATA:TELecom:TRIButary:MUX2:BACKground:PATTern <pattern>
SOURce:DATA:TELecom:TRIButary:MUX2:BACKground:PATTern?
```

Parameters

<pattern>	Description
PRBS15	2E15–1 PRBS pattern
AONES	All ones fixed pattern
AZEROS	All zeros fixed pattern
ALT01	01010101 fixed pattern

Dependencies

None

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:MUX2:BACKground:PATTern PRBS15`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:mux2:background:pattern?`

Response: PRBS15

Related Commands

SENSe:DATA:TELecom:TRIButary:DMUX2:BACKground:PATTern

SOURce:DATA:TELecom:TRIButary:MUX8:CHANnel

This command selects an active 8 Mb/s channel for the 34 Mb/s mux. Other channels will be unframed and filled with the 8 Mb/s background pattern unless "All" is selected.

Syntax

```
SOURce:DATA:TELecom:TRIButary:MUX8:CHANnel <channel>
SOURce:DATA:TELecom:TRIButary:MUX8:CHANnel?
```

Parameters

<channel>	Description
ALL	The 8 Mb/s signal is copied into all 4 channels of the 34 Mb/s signal
CHAN1, CHAN2, CHAN3, CHAN4	Selects a single active channel, other channels will be unframed and filled with the 8 Mb/s background pattern

Dependencies

None

Errors and Events

None

Examples

Set: `SOURCe:DATA:TELecom:TRIButary:MUX8:CHANnel ALL`
Query: `SOURCE:DATA:TELECOM:TRIBUTARY:MUX8:CHANnel?`

Response: ALL

Related Commands

SENSe:DATA:TELecom:TRIButary:DMUX8:CHANnel

SOURce:DATA:TELecom:TRIButary:MUX8:BACKground:PATTern

This command sets the background pattern to be loaded into inactive 8 Mb/s channels forwarded to the 34 Mb/s mux. The pattern is not injected when the active channel is set to "All".

Syntax

```
SOURce:DATA:TELecom:TRIButary:MUX8:BACKground:PATTern <pattern>
SOURce:DATA:TELecom:TRIButary:MUX8:BACKground:PATTern?
```

Parameters

<pattern>	Description
PRBS15	2E15–1 PRBS pattern
PRBS20	2E20–1 PRBS pattern
PRBS23	2E23–1 PRBS pattern
AONES	All ones fixed pattern
AZEROS	All zeros fixed pattern
ALT01	01010101 fixed pattern

Dependencies None

Errors and Events None

Examples Set: SOURce:DATA:TELecom:TRIButary:MUX8:BACKground:PATTern PRBS20

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:mux8:background:pattern?`

Response: PRBS20

Related Commands SENSe:DATA:TELecom:TRIButary:DMUX8:BACKground:PATTern

SOURce:DATA:TELecom:TRIButary:MUX34:CHANnel

This command selects an active 34 Mb/s channel for the 140 Mb/s mux. Other channels will be unframed and filled with the 34 Mb/s background pattern unless "All" is selected.

Syntax

```
SOURce:DATA:TELecom:TRIButary:MUX34:CHANnel <channel>
SOURce:DATA:TELecom:TRIButary:MUX34:CHANnel?
```

Parameters

<channel>	Description
ALL	The 34 Mb/s signal is copied into all 4 channels of the 140 Mb/s signal
CHAN1, CHAN2, CHAN3, CHAN4	Selects a single active channel, other channels will be unframed and filled with the 34 Mb/s background pattern

Dependencies None

Errors and Events None

Examples

sET: SOURce:DATA:TELecom:TRIButary:MUX34:CHANnel 4
Query: SOURCE:DATA:TELECOM:TRIBUTARY:mux34:channel?

Response: CHAN 4

Related Commands SENSe:DATA:TELecom:TRIButary:DMUX34:CHANnel

SOURce:DATA:TELecom:TRIButary:MUX34:BACKground:PATTern

This command sets the background pattern to be loaded into inactive 34 Mb/s channels forwarded to the 140 Mb/s mux. The pattern is not injected when the active channel is set to "All".

Syntax

```
SOURce:DATA:TELecom:TRIButary:MUX34:BACKground:PATTern <pattern>
SOURce:DATA:TELecom:TRIButary:MUX34:BACKground:PATTern?
```

Parameters

<pattern>	Description
PRBS15	2E15–1 PRBS pattern
PRBS20	2E20–1 PRBS pattern
PRBS23	2E23–1 PRBS pattern
AONES	All ones fixed pattern
AZEROS	All zeros fixed pattern
ALT01	01010101 fixed pattern

Dependencies None

Errors and Events None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:MUX34:BACKground:PATTern AONES`

Query: `SOURCE:DATA:TELECOM:TRIBUTARY:MUX34:BACKground:PATTern?`

Response: AONES

Related Commands

SENSe:DATA:TELecom:TRIButary:DMUX34:BACKground:PATTern

SOURce:DATA:TELecom:TRIButary:ERRor, ALARm, FAILure Subsystem

This section describes subsystem commands that control abnormal conditions in the transmitted tributary signal. Figure 2–35 shows the hierarchy tree for this subsystem. CTS 850

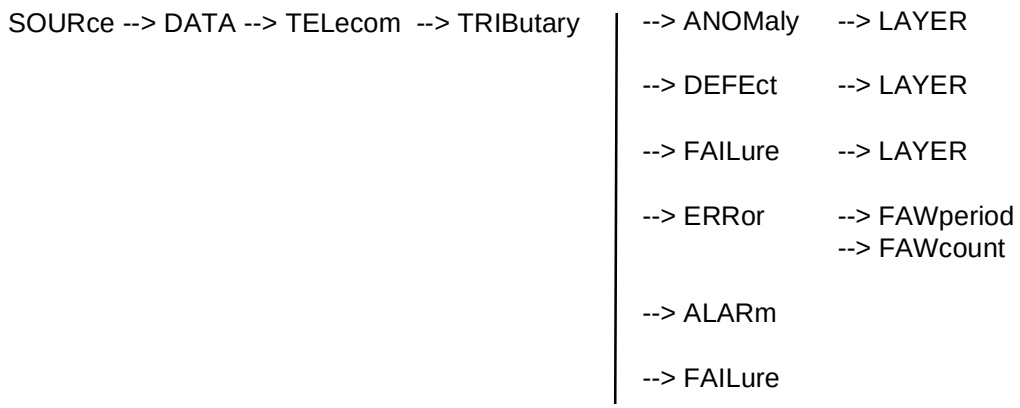


Figure 2–35: SOURce:DATA:TELecom:TRIButary:ERRor, ALARm, FAILure subsystem

SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER

This command sets the layer in the mux chain where errors, alarms, and failures will be inserted. Some errors, like CRC, are specific to a particular layer. Insertion of a layer–specific error will not change the insertion layer. Layer selection is limited to active tributary rates. The default value "TRIB" will inject at the current, active base rate.

Syntax

```
SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER <layer>
SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER?
```

Parameters

<layer> (discrete)	Description
TRIB	default – transmit or mapping rate
M140	Inject at 140 Mb/s layer
M45	Inject at 45 Mb/s layer
M34	Inject at 34 Mb/s layer
M8	Inject at 8 Mb/s layer
M2	Inject at 2 Mb/s layer
K64	Inject at Nx64k layer

Dependencies

See SOURce:DATA:TELecom:TRIButary:ERRor for changes due to this command.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:ANOMaly:Layer M34`
Query: `SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER?`

Response: M34

Related Commands

SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER
SOURce:DATA:TELecom:TRIButary:FAILure:LAYER

SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER

This command sets the LAYER in the mux chain where alarms will be inserted. Layer selection is limited to active tributary rates. The default value "TRIB" will inject at the current, active base rate.

Syntax

```
SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER <layer>
SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER?
```

Parameters

<layer> (discrete)	Description
TRIB	default – transmit or mapping rate
M140	Inject at 140 Mb/s layer
M45	Inject at 45 Mb/s layer
M34	Inject at 34 Mb/s layer
M8	Inject at 8 Mb/s layer
M2	Inject at 2 Mb/s layer
K64	Inject at Nx64k layer

Dependencies

See SOURce:DATA:TELecom:TRIButary:error for changes due to this command.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:DEFEct:Layer M8`
Query: `SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER?`

Response: M8

Related Commands

SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER
SOURce:DATA:TELecom:TRIButary:FAILure:LAYER

SOURce:DATA:TELecom:TRIButary:FAILure:LAYER

This command sets the layer in the mux chain where failures will be inserted. Layer selection is limited to active tributary rates. The default value "TRIB" will inject at the current, active base rate.

Syntax

```
SOURce:DATA:TELecom:TRIButary:FAILure:LAYER <layer>
SOURce:DATA:TELecom:TRIButary:FAILure:LAYER?
```

Parameters

<layer> (discrete)	Description
TRIB	default – transmit or mapping rate
M140	Inject at 140 Mb/s layer
M45	Inject at 45 Mb/s layer
M34	Inject at 34 Mb/s layer
M8	Inject at 8 Mb/s layer
M2	Inject at 2 Mb/s layer
K64	Inject at Nx64k layer

Dependencies

See SOURce:DATA:TELecom:TRIButary:ERRor for changes due to this command.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:FAILure:Layer M2`
Query: `SOURce:DATA:TELecom:TRIButary:failure:LAYER?`

Response: M2

Related Commands

SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER
SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER

SOURce:DATA:TELecom:TRIButary:ERRor

This command sets or queries the type of tributary error that is injected individually or transmitted at a rate specified by SOURce:DATA:TELecom: ERRor:RATE. Use the SOURce: DATA:TELecom:ERRor:IMMediate command to insert the single errors.

The command SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER, sets the layer in the mux chain where errors will be inserted. Some errors, like CRC, are specific to a particular layer. Insertion of a layer–specific error will not change the insertion layer.

Syntax

```
SOURce:DATA:TELecom:TRIButary:ERRor <trib error>
SOURce:DATA:TELecom:TRIButary:ERRor?
```

Parameters

<trib error> (discrete)	Description
NONE	No error transmitted
DATA (1)	Error in pattern
FRAMe (2)	Frame error
CRC	CRC error; you must be transmitting a 2 Mb/s tributary signal (PCM30CRC and PCM31CRC framing only)
TUFEbe	TU FEBE
TUBIP	TU BIP
EBIT	Remote far-end CRC erros (E-bit errors) (PCM30 CRC and PCM31CRC framing only)
FEMfas (1)	Remote far-end loss of MFAS errors
FAWframe (1)	Insert N consecutive frame alignment word errors in M frames

(1) Data errors may only be injected at payload rate set by SOURce.DATA. TELecom:TRIButary:PAYLoad.

(2) Layer at which this error is injected is controlled by the SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER command.

Dependencies

SOURce:DATA:TELecom:ERRor:TYPE must be set to TRIButary for this query to apply.

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:ERROR DATA`

Query: `SOURCE:DATA:TELECOM:ERROR?`

Response: `CRC`

Related Commands

SOURce:DATA:TELecom:ERRor:TYPE
SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:ERRor:IMMediate

SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod

When frame alignment word errors insertion is enabled, it will insert N consecutive errors into M frames. This command sets the value for M. If the value set in the SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount command is greater it will be changed to the value set in this command.

Syntax

```
SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod <count>>
SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod?
```

Parameters

<layer> (discrete)	Description
0–1023	M frames

Dependencies

None

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod 755`
Query: `SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod?`

Response: 755

Related Commands

```
SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount
SOURce:DATA:TELecom:TRIButary:ERRor:FAWframe
```

SOURce:DATA:TELecom:TRIButary:Error:FAWcount

This command selects the number of consecutive frames to insert frame alignment word errors into. The insertion count must be less than the value set in the SOURce:DATA:TELecom:TRIButary:ERRor:FAWframes command. If it is not, the value for the frame period will be changed to the FAWperiod value set in this command.

Syntax

```
SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount <count>>
SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount?
```

Parameters

<layer> (discrete)	Description
0 ≤ M ≤ 1023 M set by FAWperiod	N consecutive frames to error

Errors and Events None

Examples

Query: `SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount 466`
Query: `SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount?`

Response: 466

Related Commands

`SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod`
`SOURce:DATA:TELecom:TRIButary:ERRor:FAWframe`

SOURce:DATA:TELecom:TRIButary:ALARm

This command sets or queries a tributary alarm to transmit.

The command SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER sets the layer in the mux chain where alarms will be inserted. Layer selection is limited to active tributary rates.

Syntax

`SOURce:DATA:TELecom:TRIButary:ALARm <trib alarm>`
`SOURce:DATA:TELecom:TRIButary:ALARm?`

Parameters

<trib alarm> (discrete)	Description
NONE	No alarm transmitted (default)
AIS (1)	Tributary AIS
TUFErf	TU FERF
TUAis	TU AIS
RAI (1)	Remote Alarm Indication
LPRFI	Low order path remote failure indication

(1) Layer at which this alarm is injected is controlled by SOURce:DATA: TELecom:DEFEct:LAYER.

Dependencies None

Errors and Events None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:ALARM NONE`

Query: `SOURce:DATA:TELecom:TRIButary:ALARM?`

Response: `RAI`

Related Commands `SOURce:DATA:TELecom:DEFEct:LAYER.`

SOURce:DATA:TELecom:TRIButary:FAILure

This command sets or queries a tributary failure to transmit.

The commands SOURce:DATA:TELecom:TRIButary:FAILure.LAYER set the layer in the mux chain where failures will be inserted.

Syntax

```
SOURce:DATA:TELecom:TRIButary:FAILure <trib failure>
SOURce:DATA:TELecom:TRIButary:FAILure?
```

Parameters

<trib failure> (discrete)	Description
NONE	No failure transmitted (default)
TULOP	TU Loss of Pointer
TULOM	TU Loss of Multiframe

Dependencies None

Errors and Events None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:FAILURE NONE`

Query: `SOURce:DATA:TELecom:TRIButary:FAILURE?`

Response: `TULOP`

Related Commands None

SOURce:DATA:TELecom:TRIButary:POINter Subsystem

This section describes the commands and queries that adjust pointers for the transmitted TU mapped signal. Figure 2–36 shows the hierarchy tree for this subsystem.

***NOTE**. SOURce:DATA:TELecom:POINter:MODE must be set to TRIButary for any command or query in this section to apply.*

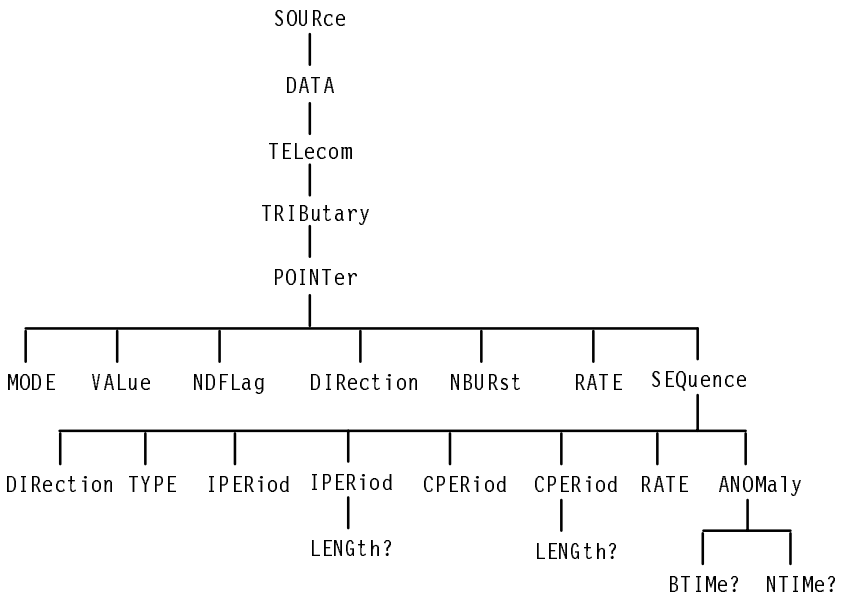


Figure 2–36: SOURce:DATA:TELecom:TRIButary:POINTer subsystem

SOURce:DATA:TELecom:TRIButary:POINter:MODE

This command sets or queries the TU pointer manipulation modes.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:MODE <trib ptr mode>
SOURce:DATA:TELecom:TRIButary:POINter:MODE?
```

Parameters

<trib ptr mode> (discrete)	Description
MANual	Pointers are controlled by SOURce:DATA:TRIButary:POINter:VALue and SOURce:DATA:TRIButary:POINter:NDFLag (default)
SINGle	Pointer adjustments are controlled by the SOURce:DATA:TELecom:POINter:ACTion and SOURce:DATA:TELecom:POINter:DIRection commands
BURSt	When the SOURce:DATA:TELecom:POINter:ACTion command is given, a burst of pointer adjustments is sent at the maximum rate (1 in 4 frames) with a count defined by SOURce:DATA:TRIButary:POINter:NBURst
FOFFset	Tributary pointers are controlled by the SOURce:CLOCk:OFFSet subsystem.
CONTinuous	Pointers are continuously adjusted according to the SOURce:DATA:TRIButary:POINter:DIRection and SOURce:DATA:TRIButary:POINter:RATE commands
SEQuence	Pointers are stressed according to sequences defined in T1.105.03–1994 or G.783

Dependencies

SOURce:DATA:TELecom:POINter:MODE must be set to TRIButary for this command to apply. You can control only AU or TU pointer adjustments at any one time.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:MODE MANUAL`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:MODE?`

Response: `BURSt`

Related Commands

SOURce:DATA:TELecom:POINter:MODE

SOURce:DATA:TELecom:TRIButary:POINter:VALue

This command sets or queries the TU pointer value. If SOURce:DATA:TELecom:TRIButary:POINter:NDFLag is set to ON, a New Data Flag (NDF) is sent with each new value received.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:VALue <trib ptr value>
SOURce:DATA:TELecom:TRIButary:POINter:VALue?
```

Parameters

<trib ptr value> (NR1-numeric)	Description
Any integer in the range 0 to 1023	TUASYNC (default = 105, illegal > 139) TU3 (default = 595, illegal > 764)

Dependencies

SOURce:DATA:TELecom:POINter:MODE must be set to TRIButary for this command to apply. You can control only AU or TU pointer adjustments at any one time.

SOURce:DATA:TELecom:TRIButary:POINter:MODE must be set to MANual for this command to apply.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:VALUE 10`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:VALUE?`

Response: `26`

Related Commands

SOURce:DATA:TELecom:TRIButary:POINter:MODE

SOURce:DATA:TELecom:TRIButary:POINter:NDFLag

This command sets or queries the generation of a New Data Flag (NDF) when TU pointer adjustments occur.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:NDFLag <trib NDF state>
SOURce:DATA:TELecom:TRIButary:POINter:NDFLag?
```

Parameters

<trib NDF state> (boolean)	Description
1 or ON	On (default)
0 or OFF	Off

Dependencies

SOURce:DATA:TELecom:POINter:MODE must be set to TRIButary for this command to apply. You can control only AU or TU pointer adjustments at any one time.

SOURce:DATA:TELecom:TRIButary:POINter must be set to MANual for this command to apply.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:NDFLAG ON`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:NDFLAG?`

Response: `0`

Related Commands

SOURce:DATA:TELecom:TRIButary:POINter:VALue
SOURce:DATA:TELecom:TRIButary:POINter:MODE

SOURce:DATA:TELecom:TRIButary:POINter:DIRection

This command sets or queries the direction of continuous TU pointer adjustments.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:DIRection <trib ptr dir>
SOURce:DATA:TELecom:TRIButary:POINter:DIRection?
```

Parameters

<trib ptr dir> (discrete)	Description
ALTernate	Pointer adjustments alternate between up and down (default)
DOWN	Pointers adjusted down
UP	Pointers adjusted up

Dependencies

SOURce:DATA:TELecom:POINter:MODE must be set to TRIButary for this command to apply. You can control only AU or TU pointer adjustments at any one time.

SOURce:DATA:TELecom:TRIButary:POINTer:MODE must be set to CONTinuous for this command to apply.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:DIRECTION UP`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:DIRECTION?`

Response: `UP`

Related Commands

SOURce:DATA:TELecom:TRIButary:POINter:MODE
SOURce:DATA:TELecom:TRIButary:POINter:RATE

SOURce:DATA:TELecom:TRIButary:POINter:NBURst

This command sets or queries the number of pointer adjustments in a burst of TU pointer adjustments. Send the SOURce:DATA:TELecom:POINter:ACTion command to create the burst of pointer adjustments.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:NBURst <trib ptr burst>
SOURce:DATA:TELecom:TRIButary:POINter:NBURst?
```

Parameters

<trib ptr burst> (NR1-numeric)	Description
Any integer in the range 2 to 8	This value determines the number of pointer adjustments in a burst of pointer adjustments (default = 2)

Dependencies

SOURce:DATA:TELecom:POINter:MODE must be set to TRIButary for this command to apply. You can control only AU or TU pointer adjustments at any one time.

SOURce:DATA:TELecom:TRIButary:POINter:MODE must be set to BURSt for this command to apply.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:NBURST 2`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:NBURST?`

Response: 6

Related Commands

SOURce:DATA:TELecom:TRIButary:POINter:MODE
SOURce:DATA:TELecom:POINter:ACTion
SOURce:DATA:TELecom:POINter:MODE

SOURce:DATA:TELecom:TRIButary:POINter:RATE

Add/Drop Test Option Only

This command sets or queries the continuous TU pointer adjustment rate.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:RATE <trib ptr rate>
SOURce:DATA:TELecom:TRIButary:POINter:RATE?
```

Parameters

<trib ptr rate> (NR1-numeric)	Description
An integer in the range 2 to 10,000	The pointer adjustment rate, in milliseconds

Dependencies

SOURce:DATA:TELecom:POINter:MODE must be set to TRIButary for this command to apply. You can control only AU or TU pointer adjustments at any one time.

SOURce:DATA:TELecom:TRIButary:POINter:MODE must be set to CONTinuous for this command to apply.

Errors and Events

None

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:RATE 9`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:RATE?`

Response: `10`

Related Commands

SOURce:DATA:TELecom:TRIButary:POINter:DIRection
SOURce:DATA:TELecom:TRIButary:POINter:MODE
SOURce:DATA:TELecom:POINter:MODE

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection

This command sets or queries the pointer movement direction.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection
<ptr seq direction>
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection?
```

Parameters

<ptr seq direction> (discrete)	Description
DOWN	
UP	(default)

Dependencies

Pointer sequences must not be running.

Errors and Events

221, “Settings conflict”

Examples

Set:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
:DIRECTION UP
```

Query:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
:DIRECTION?
```

Response: `UP`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE

This command sets or queries the pointer sequence movement rate in milliseconds.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE
<ptr seq rate>
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE?
```

Parameters

<ptr seq rate> (NR1-numeric)	Description
Any integer from 34 to 30,000 ms	Resolution is 1 ms (default depends on mapping and type)

Dependencies

Pointer sequences must not be running.

Some sequence types (like single, burst, phase, sinalt, and dblalt) set the rate to 30,000 ms. With these types, you cannot change the rate.

Errors and Events

221, "Settings conflict; stop sequences before setting the rate"

Examples

Set:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
:RATE 2000
```

Query:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
:RATE?
```

Response:
```
10000
```

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:POINter:SEQuence:TYPE

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE

This command sets or queries the pointer sequence type.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE
<ptr seq type>
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE?
```

Parameters

<ptr seq type> (discrete)	Description
SINGle	Single pointer adjustment (G.783 e)
BURSt	Burst pointer adjustment (G.783 f)
PHASe	Phase transient pointer adjustment
P351	Periodic 35-1 pointer adjustment (TU-12 only)
P351CAN	Periodic 35-1 with cancel (TU-12 only)
P351ADD	Periodic 35-1 with add (TU-12 only)
P855	Periodic 85-5 pointer adjustment (TU-3 only)
P855CAN	Periodic 85-5 with cancel (TU-3 only)
P855ADD	Periodic 85-5 with add (TU-3 only)
PCONtinuous	Periodic continuous pointer adjustment (G.783 h1)
PCONCAN	Periodic continuous with cancel (G.783 h3)
PCONADD	Periodic continuous with add (G.783 h2)
REGDBL	Regular pointer plus one double (G.783 b)
REGMIS	Regular pointer with one missing (G.783 c)
SINALT	Single alternating pointer (G.783 a) (default)
DBLALT	Double alternating pointer (G.783 d)

Dependencies

Pointer sequences must not be running.

G.783 only applies to TU mappings.

Errors and Events

221, “Settings conflict; stop sequences before setting type”

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:TYPE BURST`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:TYPE?`

Response: `PHASe`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

Errors and Events

None

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod

This command sets or queries the pointer sequence initialization period.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod
<ptr seq init>
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod?
```

Parameters

<ptr seq init> (discrete)	Description
0 (or OFF)	Disables the pointer sequence initialization period
1 (or ON)	Enables the pointer sequence initialization period (default)

Dependencies

Pointer sequences must not be running.

Errors and Events

221, “Settings conflict; stop sequences before setting the period”

Examples

Set: `SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE :IPERIOD ON`

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:IPERIOD?`

Response: `1`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod:LENGth?

This query returns the pointer sequence initialization period in seconds.

Syntax

`SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod:LENGth?`

Response

<pointer seq init> (NR1-numeric)	Description
Any integer	Pointer sequence initialization period in seconds

Dependencies

None

Errors and Events

None

Examples

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:IPER-IOD:LENGTH`

Response: `30`

Related Commands

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod

This command sets or queries the pointer sequence cool down period.

Setting this parameter when a sequence is running returns an error.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod
<ptr seq init>
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod?
```

Parameters

<ptr seq init> (discrete)	Description
0 (or OFF)	Disables the pointer sequence cool down period
1 (or ON)	Enables the pointer sequence cool down period (default)

Dependencies

Pointer sequences must not be running.

Errors and Events

221, “Settings conflict; stop sequences before setting the period”

Examples

Set:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
:CPERIOD OFF
```

Query:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:CPERIOD?
```

Response: 1

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod:LENGth?

This query returns the pointer sequence cool down period in seconds.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod:LENGth?
```

Response

<pointer seq init> (NR1-numeric)	Description
Any integer: for TU12 mapping — from 360 to 60 for TU3 mapping — from 900 to 60	Pointer sequence cool down period in seconds

Dependencies

None

Errors and Events

None

Examples

Query:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:
CPERIOD:LENGTH
```

Response:
```
320
```

Related Commands

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:ANOMaly:BTIMe?

This query returns the pointer sequence time between anomalies in seconds.

Sequences do not have to be running. This calculation is based upon sequence type and rate.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:ANOMaly:BTIMe?
```

Response

<pointer seq btime> (NR1-numeric)	Description
Any positive integer	Time between anomalies in seconds
–1	Returned for sequences with an invalid BTIME. Example: continuous without anomalies

Dependencies

None

Errors and Events

None

Examples

Query: `SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:ANOMALY:BTIME?`

Response: `30`

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE

SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:ANOMaly:NTIMe?

This query returns the pointer sequence time until the next anomaly in seconds.

This query is only meaningful if sequences are running.

Syntax

```
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:ANOMaly:NTIMe?
```

Response

<pointer seq ntime> (NR1-numeric)	Description
Any positive integer	Time until the next anomaly in seconds
–1	Returned for sequences with an invalid NTIME (Example: continuous without anomalies) or if in the following states: STOPPED, INITIALizing, or COOLdown

Dependencies

None

Errors and Events

None

Examples

Query:
```
SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:
ANOMALY:NTIME?
```

Response: 4

Related Commands

SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE

SOURce:DATA:TELecom:JITter Subsystem

This section describes the commands and queries that control the jitter and wander settings. Figure 2–39 shows the hierarchy tree for this subsystem.
CTS 850

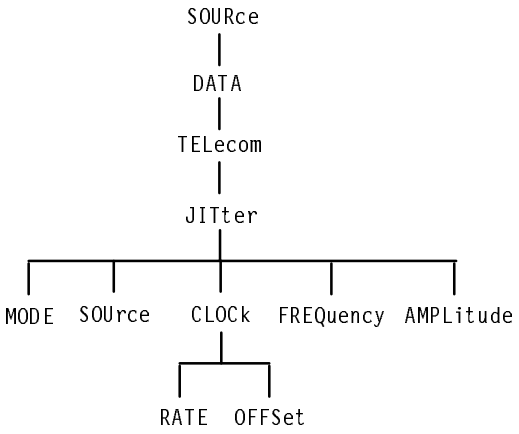


Figure 2–39: SOURce:DATA:TELecom:JITter subsystem

SOURce:DATA:TELecom:JITter:MODE

This command sets or queries the jitter/wander generation mode.

Syntax

```
SOURce:DATA:TELecom:JITter:MODE <jitter mode>
SOURce:DATA:TELecom:JITter:MODE?
```

Parameters

<jitter mode> (discrete)	Description
OFF	No jitter or wander generation (default)
ON	Turn jitter/wander generation ON

Dependencies

Requires installation of Option 14 jitter module.

*RST sets jitter mode to OFF (default).

Errors and Events

221, “Settings conflict; Not available without jitter option”
if the jitter/wander test option is not installed and ON is selected.

Examples

Set: `SOURCE:DATA:TELECOM:JITTER:MODE ON`

Query: `SOURCE:DATA:TELECOM:JITTER:MODE?`

Response: `ON`

Related Commands None

SOURce:DATA:TELecom:JITter:SOURce

This command sets or queries the jitter or wander generation output destination.

Syntax

```
SOURce:DATA:TELecom:JITter:SOURce <jitter output>
SOURce:DATA:TELecom:JITter:SOURce?
```

Parameters

<jitter output> (discrete)	Description
LINE	Jitter the line (default)
CLOCk	Jitter the clock (0.8V)
G703	Jitter the clock (2 MHz G703; requires add/drop/test module)

Dependencies Requires installation of Option 14 jitter module.

*RST sets jitter mode to LINE (default).

Errors and Events None

Examples

Set: `SOURCE:DATA:TELECOM:JITTER:SOURCE LINE`

Query: `SOURCE:DATA:TELECOM:JITTER:SOURCE?`

Response: `LINE`

Related Commands SOURce:DATA:TELecom:JITter:MODE

SOURce:DATA:TELecom:JITter:CLOCk:RATE

This command sets or queries the jitter or wander transmit clock rate.

Syntax

```
SOURce:DATA:TELecom:JITter:CLOCk:RATE <clock rate>
SOURce:DATA:TELecom:JITter:CLOCk:RATE?
```

Parameters

<clock rate> (discrete)	Description
M52	52 Mb/s rate
M155	155 Mb/s rate
M622	622 Mb/s rate
M2	2 Mb/s rate (default)
M34	34 Mb/s rate
M45	45 Mb/s rate
M140	140 Mb/s rate

Dependencies

Requires installation of Option 14 jitter module.

*RST sets the clock rate to M2 (default).

Errors and Events

None

Examples

Set: `SOURCE:DATA:TELECOM:JITTER:CLOCK:RATE M140`

Query: `SOURCE:DATA:TELECOM:JITTER:CLOCK:RATE?`

Response: `M2`

Related Commands

SOURce:DATA:TELecom:JITter:MODE
SOURce:DATA:TELecom:JITter:SOURce

SOURce:DATA:TELecom:JITter:CLOCk:OFFSet

This command sets or queries the output jitter clock frequency offset.

Syntax

```
SOURce:DATA:TELecom:JITter:CLOCk:OFFSet <clock offset>
SOURce:DATA:TELecom:JITter:CLOCk:OFFSet?
```

Parameters

<clock offset> (NR3-numeric)	Description
–100.0 to 100.0	Frequency offset value in ppm (default is 0). Accuracy to 1 place after the decimal point.

Dependencies

Requires installation of Option 14 jitter module.

*RST sets clock offset to 0 (default).

Errors and Events

500, “Execution warning”
if the entered value is out of range for the command.

Examples

Set: `SOURCE:DATA:TELECOM:JITTER:CLOCK:OFFSET 34`

Query: `SOURCE:DATA:TELECOM:JITTER:CLOCK:OFFSET?`

Response: `20.0`

Related Commands

SOURce:DATA:TELecom:JITter:MODE
SOURce:DATA:TELecom:JITter:SOURce

SOURce:DATA:TELecom:JITter:FREQuency

This command sets the output jitter frequency.

Syntax

```
SOURce:DATA:TELecom:JITter:FREQuency <jitter frequency>
SOURce:DATA:TELecom:JITter:FREQuency?
```

Parameters

<jitter frequency> (NR3-numeric)	Description
12 μHz to 400 KHz	Output jitter frequency range at 155 Mb
12 μHz to 5 MHz	Output jitter frequency range at 622 Mb
12 μHz to 100 kHz	Output jitter frequency range at 2 Mb
12 μHz to 800 kHz	Output jitter frequency range at 34 Mb
12 μHz to 3.5 MHz	Output jitter frequency range at 140 Mb

Dependencies

Requires installation of Option 14 jitter module.

*RST sets the jitter frequency to 10 Hz (default).

Errors and Events

500, “Execution warning”
if the entered value is out range for the command.

Examples

Set: `SOURCE:DATA:TELECOM:JITTER:FREQUENCY 1000.0`

Query: `SOURCE:DATA:TELECOM:JITTER:FREQUENCY?`

Response: `250.0`

Related Commands

SOURce:DATA:TELecom:JITter:MODE
SOURce:DATA:TELecom:JITter:AMPLitude

SOURce:DATA:TELecom:JITter:AMPLitude

This command sets or queries the output jitter amplitude range.

Syntax

```
SOURce:DATA:TELecom:JITter:AMPLitude <jitter ampl>
SOURce:DATA:TELecom:JITter:AMPLitude?
```

Parameters

Rate	Amplitude scale in UI_{p-p} A_0	A_1	A_2	A_3
52 Mb/s rate	1000	200	20	2
155 Mb/s rate	1000	200	20	2
622 Mb/s rate	1000	200	20	2

Rate	Frequency scale in Hz f_0	f_1	f_2	f_3	f_4	f_5
52 Mb/s rate	12 µ	10	1 k	10 k	130 k	400 k
155 Mb/s rate	12 µ	10	1 k	35 k	430 k	1.3 M
622 Mb/s rate	12 µ	10	1 k	125 k	1.7 M	5 M

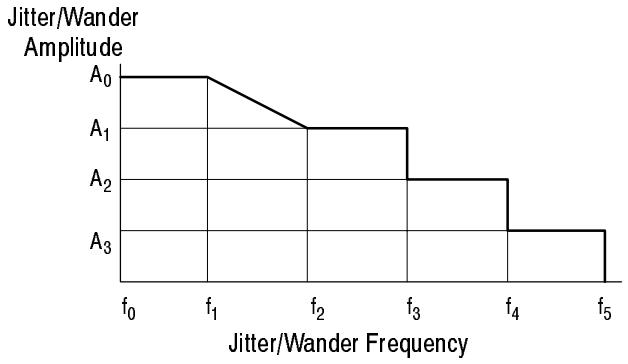


Figure 2–40: Jitter/Wander amplitude and frequency limits

Dependencies

Ranges at each rate depend on current jitter frequency. Refer to the parameters table and Figure 2–40 to determine amplitude ranges for each frequency range

*RST sets jitter amplitude to 1.00 UI (default value).

Errors and Events

500, “Execution warning”
if the entered value is out range for the command.

Examples

Set: `SOURCE:DATA:TELECOM:JITTER:AMPLITUDE 1.6`

Query: `SOURCE:DATA:TELECOM:JITTER:AMPLITUDE?`

Response: `16.4`

Related Commands

SOURce:DATA:TELecom:JITter:MODE
SOURce:DATA:TELecom:JITter:FREQuency

Receive Commands

The Receive Commands allow you to set up the physical connections of a received signal and measure the signal. This section contains all of the commands and queries for each of the following CTS 850 Receive subsystems:

- INPUT1:TELecom
- INPUT2:TELecom
- INPUT3:TELecom
- SENSe:DATA:TELecom
- SENSe:DATA:TELecom:TEST
- SENSe:DATA:TELecom:OVERhead and POVerhead
- SENSe:DATA:TELecom:MEASure
- SENSe:DATA:TELecom:STESTs
- SENSe:DATA:TELecom:AUTOscan
- SENSe:DATA:TELecom:TRIButary
- SENSE:DATA:TELecom:TRIButary:POVerhead
- SENSe:DATA:TELecom:MEASure:TRIButary
- SENSe:DATA:TELecom:JITter
- SENSe:DATA:TELecom:MEASure:JITter
- SENSe:DATA:TELecom:TEST:JITter
- SENSe:DATA:TELecom:MEASure:WANDer
- CALibrate

INPUT1 Subsystem

This section describes the commands and queries that allow you to set the rate, type, and level of the incoming signal. Figure 2–43 shows the hierarchy tree for this subsystem.

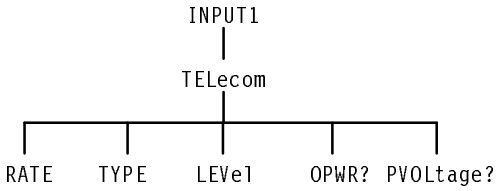


Figure 2–43: INPUT1 subsystem

INPUT1:TELecom:RATE

This command sets or queries the signal rate of the receiver. The signal connected to INPUT1 is passed to the receiver by the SENSe:DATA:TELecom:SOURce INPUT1 command.

Syntax

```
INPUT1:TELecom:RATE <rate>
INPUT1:TELecom:RATE?
```

Parameters

<rate> (discrete)	Description
STM0	51.84 MHz
STM1	155.52 MHz (default)
STM4	622.08 MHz

Dependencies

None

Errors and Events

221, “Settings conflict; Rate is not available with current Line Interface module or operating mode”

Examples

Set: `INPUT1:TELECOM:RATE STM1`

Query: `INPUT1:TELECOM:RATE?`

Response: `STM1`

Related Commands SENSe:DATA:TELecom:SOURce

INPUT1:TELecom:TYPE

This command sets or queries the input signal type. The Operation Complete bit in the Standard Event Status Register is set to 1 when this command is executed.

Syntax

```
INPUT1:TELecom:TYPE <type>
INPUT1:TELecom:TYPE?
```

Parameters

<type> (discrete)	Description
ELECtrical	Electrical output (default)
OPTical	Optical output

Dependencies None

Errors and Events 221, “Settings conflict; Type is not available with current Line Interface module”

Examples

Set: `INPUT1:TELECOM:TYPE ELECTRICAL`

Query: `INPUT1:TELECOM:TYPE?`

Response: `OPTICAL`

Related Commands None

INPUT1:TELecom:LEVel

This command sets or queries the expected level of the received electrical signal.

Some optical and electrical modules do not support all levels. Check the status event register to verify valid settings.

Syntax

```
INPUT1:TELecom:LEVel <level>
INPUT1:TELecom:LEVel?
```

Parameters

<level> (discrete)	Description
XCONnect	Simulates cross connect level (–6 dB) (default)
LOW	Input level is low (–12 dB)
HIGH	High level (0 dB)
MONITOR	Monitor level

Dependencies

INPUT1:TELecom:TYPE must be set to ELECtrical for this command to apply.

Errors and Events

221, “Settings conflict; Level is not available with current type, must be electrical”

Examples

Set: `INPUT1:TELECOM:LEVEL XCON`

Query: `INPUT1:TELECOM:LEVEL?`

Response: `HIGH`

Related Commands

INPUT1:TELecom:TYPE

INPUT1:TELecom:STATus?

This query returns the status of the received signal connected to INPUT1. The response is valid only when the receiverr is set up to receive signals.

Syntax `INPUT1:TELecom:STATus?`

Response

<trib1 input status> (discrete)	Description
NORMal	Signal is of acceptable quality
LOSignal	Loss of Signal (no signal connected)

Dependencies SENSe:DATA:TELecom:SOURce must be set to INPUT1 for this command to apply.

Errors and Events None

Examples Query: `INPUT1:TELECOM:STATUS?`

Response: `NORMAL`

Related Commands SENSe:DATA:TELecom:SOURce

INPUT1:TELecom:OPWR?

This query returns the optical signal level in dBm.

Syntax `INPUT1:TELecom:OPWR?`

Response

<optical level> (NR3-numeric)	Description
Any floating point number	The optical signal level of the received signal in dBm

Dependencies INPUT1:TELecom:TYPE must be set to OPTical.

Errors and Events None

Examples Query: `INPUT1:TELECOM:OPWR?`

Response: `-25.0`

Related Commands INPUT1:TELecom:TYPE

INPUT1:TELecom:PVOLtage?

This query returns the peak electrical voltage in volts.

Syntax `INPUT1:TELecom:PVOLtage?`

Response

<peak voltage> (NR3-numeric)	Description
Any floating point number	The peak voltage of the received signal in volts

Dependencies INPUT1:TELecom:TYPE must be set to ELECtrical.

Errors and Events None

Examples Query: `INPUT1:TELECOM:PVOLTAGE?`

Response: `0.52`

Related Commands INPUT1:TELecom:TYPE

INPUT2 Subsystem

This section describes the commands and queries that set the characteristics of the received or added 2 Mb/s tributary signal. Figure 2–44 shows the hierarchy tree for this subsystem.

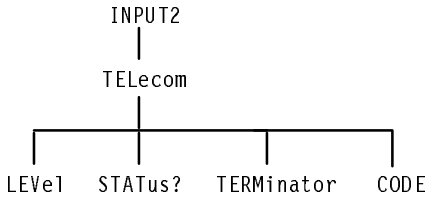


Figure 2–44: INPUT2 subsystem

INPUT2:TELecom:LEVel

This command sets or queries the expected signal level at the 2 Mb/s receive connector.

Syntax

```
INPUT2:TELecom:LEVel <trib1 input level>
INPUT2:TELecom:LEVel?
```

Parameters

<trib1 input level> (discrete)	Description
NORMal	Normal input levels (default)
MONitor	Monitor level
BRIDge	Bridged input
PROTECTED	Protected monitor mode, –30db

Dependencies

The instrument must be set up to receive or add a 2 Mb/s tributary signal for this command to apply.

Errors and Events

None

Examples

Set: `INPUT2:TELECOM:LEVEL NORMAL`

Query: `INPUT2:TELECOM:LEVEL?`

Response: `MONITOR`

Related Commands

SENSe:DATA:TELecom:SOURce
SOURce:DATA:TELecom:TRIButary:ADD

INPUT2:TELecom:STATus?

This query returns the status of the received or added 2 Mb/s tributary signal.

Syntax

`INPUT2:TELecom:STATus?`

Response

<trib1 input status> (discrete)	Description
NORMal	Signal is of acceptable quality
LOSignal	Loss of Signal (no signal connected)

Dependencies

SENSe:DATA:TELecom:SOURce must be set to INPUT2 for this command to apply.

Errors and Events

None

Examples

Query: `INPUT2:TELECOM:STATUS?`

Response: `NORMAL`

Related Commands

SENSe:DATA:TELecom:SOURce

INPUT2:TELecom:TERMinator

This command sets or queries the signal terminator for the 2 Mb/s receive connector.

Syntax

```
INPUT2:TELecom:TERMinator <trib1 input termin>
INPUT2:TELecom:TERMinator?
```

Parameters

<trib1 input termin> (discrete)	Description
BALanced	120 Ω connector (default)
UNBALanced	75 Ω connector

Dependencies

The instrument must be set up to receive or add a 2 Mb/s tributary signal for this command to apply.

Errors and Events

None

Examples

Set: `INPUT2:TELECOM:TERMINATOR BALANCED`

Query: `INPUT2:TELECOM:TERMINATOR?`

Response: `STM1`

Response: `M155`

Related Commands

SENSe:DATA:TELecom:SENSe
SOURce:DATA:TELecom:TRIButary:ADD

INPUT2:TELecom:CODE

Select AMI or HDB3 encoding for the line input and output. HDB3 is the default value.

Syntax

```
Input2:telecom:CODE <signal encoding>
INPUT2:TELecom:CODE?
```

Parameters

<signal encoding> (discrete)	Description
HDB3	Set expected encoding to HDB3
AMI	Set or expected encoding to AMI

Dependencies

None

Errors and Events

None

Examples

Query: `INPUT2:TELECOM:CODE AMI`
Query: `INPUT2:TELECOM:CODE?`
Response: AMI

Related Commands

OUTPUT2:TELecom:CODE

INPUT3 Subsystem

This section describes the commands and queries that set the characteristics of the received or added 34 Mb/s or 140 Mb/s tributary signal. Figure 2–45 shows the hierarchy tree for this subsystem.

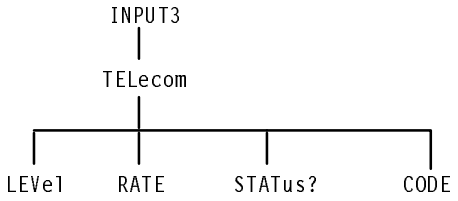


Figure 2–45: INPUT3 subsystem

INPUT3:TELecom:LEVel

This command sets or queries the expected signal level at the 34 Mb/s or 140 Mb/s receive connector.

Syntax

```
INPUT3:TELecom:LEVel <trib2 input level>
INPUT3:TELecom:LEVel?
```

Parameters

<trib2 input level> (discrete)	Description
NORMal	Normal input level
MONitor	Monitor level
PROTECTED	Protected monitor mode, –30db (future)

Dependencies

The instrument must be set up to receive or add a 34 Mb/s or 140 Mb/s tributary signal for this command to apply.

Errors and Events

None

Examples

Set: `INPUT3:TELECOM:LEVEL NORMAL`

Query: `INPUT3:TELECOM:LEVEL?`

Response: `NORMAL`

Related Commands None

INPUT3:TELecom:RATE

This command sets or queries the34 Mb/s, 45 Mb/s or 140 Mb/s tributary input rate.

Syntax

```
INPUT3:TELecom:RATE <trib2 input rate>
INPUT3:TELecom:RATE?
```

Parameters

<trib2 input rate> (discrete)	Description
M34	34.368 Mb/s (default)
M140	139.264 Mb/s
M45	45 Mb/s Receive rate

Dependencies The instrument must be set up to receive or add a 34 Mb/s or 140 Mb/s tributary signal for this command to apply.

Errors and Events None

Examples

Set: `INPUT3:TELECOM:RATE M34`

Query: `INPUT3:TELECOM:RATE?`

Response: `M140`

Related Commands SENSe:DATA:TELecom:SOURce

INPUT3:TELecom:STATus?

This query returns the status of the received or added 34 Mb/s or 140 Mb/s tributary signal.

Syntax `INPUT3:TELecom:STATus?`

Response

<trib2 input status> (discrete)	Description
NORMal	Signal is of acceptable quality
LOSignal	Loss of Signal (no signal connected)

Dependencies SENSe:DATA:TELecom:SOURce must be set to INPUT3 for this query to apply.

Errors and Events None

Examples Query: `INPUT3:TELECOM:STATUS?`

Response: `NORMAL`

Related Commands SENSe:DATA:TELecom:SOURce

INPUT3:TELecom:CODE

Select AMI or HDB3 encoding for the line input and output. HDB3 is the default value. Select B3ZS encoding for the 45 Mb/s line input.

Syntax

```
Input3:telecom:CODE <signal encoding>
INPUT3:TELecom:CODE?
```

Parameters

<signal encoding> (discrete)	Description
HDB3	Set expected encoding to HDB3 (default)
AMI	Set expected encoding to AMI
B3ZS	Set expected encoding to B3ZS (for 45 Mb/s only)

Dependencies

None

Errors and Events

None

Examples

Set: `INPUT3:TELECOM:CODE HDB3`
Query: `INPUT3:TELECOM:CODE?`
Response: HDB3

Related Commands

OUTPUT3:TELecom:CODE

SENSe:DATA:TELecom Subsystem

This section describes the commands and queries that set up the structure of the signal to be received. Figure 2–46 shows the hierarchy tree for this subsystem.

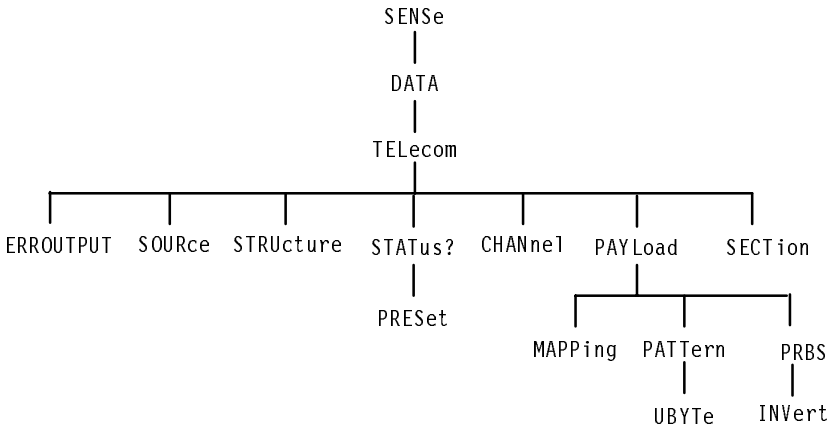


Figure 2–46: SENSe:DATA:TELecom subsystem

SENSe:DATA:TELecom:SOURce

This command sets or queries the input signal source.

Syntax

```
SENSe:DATA:TELecom:SOURce <source>
SENSe:DATA:TELecom:SOURce?
```

Parameters

<source> (discrete)	Description
INPUT1	SDH rates (default)
INPUT2	2 Mb/s rate (Add/Drop Test Option Only)
INPUT3	34 Mb/s or 140 Mb/s rate (Add/Drop Test Option Only)

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:SOURCE INPUT1`

Query: `SENSE:DATA:TELECOM:SOURCE?`

Response: `INPUT2`

Related Commands INPUT1:TELecom:RATE

SENSe:DATA:TELecom:STRUcture

This command sets or queries the input signal structure.

Syntax

```
SENSe:DATA:TELecom:STRUcture <input structure>
SENSe:DATA:TELecom:STRUcture?
```

Parameters

<input structure> (discrete)	Description
AU3	AU-3 structure (STM0 only)
AU4	AU-4 structure (default) (STM1 and STM4 only)

Dependencies AU3 is only available for the STM-0 rate

Errors and Events 221, “Settings conflict; Argument not valid in current instrument state”

Examples

Set: `SENSE:DATA:TELECOM:STRUCTURE AU4`

Query: `SENSE:DATA:TELECOM:STRUCTURE?`

Response: `AU3`

Related Commands OUTPUT1:TELecom:RATE

SENSe:DATA:TELecom:STATus?

This query returns the historical or accumulated status of the received signal.

Syntax `SENSe:DATA:TELecom:STATus?`

Response

<decimal value> (NR1-numeric)	bit	definition
1	0	LOS
2	1	LOF
4	2	OOF
8	3	LOP
16	4	MS AIS
32	5	Path AIS
64	6	Error
128	7	Undefined
256	8	K1/K2 change
512	9	MS FERF
1024	10	Path FERF
2048	11	Pointer adjust
4096	12	NDF
8192	13	Pattern lock
16384	14	Not used
32768	15	Not used

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:STATUS?`

Response: `1024`

Related Commands SENSe:DATA:TELecom:STATus:PRESet

SENSe:DATA:TELecom:STATus:PRESet

This command clears the status of the received SDH and tributary signals by setting each status bit to 0. After this command is given, the status information is accumulated until another SENSe:DATA:TELecom:STATus:PRESet command is given. To get the current signal status without any history information, send the SENSe:DATA:TELecom:STATus:PRESet;:SENSe:DATA:TELecom:STATus? chained command.

Syntax

```
SENSe:DATA:TELecom:STATus:PRESet
```

Parameters None

Dependencies None

Errors and Events None

Examples

```
SENSE:DATA:TELECOM:STATUS:PRESET
```

Related Commands SENSe:DATA:TELecom:STATus?

SENSe:DATA:TELecom:CHANnel

This command sets or queries the active channel to test (a VC structure).

Syntax

```
SENSe:DATA:TELecom:CHANnel <channel>
SENSe:DATA:TELecom:CHANnel?
```

Parameters

<channel> (NR1-numeric)	Description
1	STM-0, STM-1 (default)
1 to 4	STM-4 rate

Dependencies Selection of a <channel> greater than 1 implies a rate and structure with multiple VCs.

Errors and Events 221, “Settings conflict; Channel is out of range”

Examples

Set: `SENSE:DATA:TELECOM:CHANNEL 1`

Query: `SENSE:DATA:TELECOM:CHANNEL?`

Response: `3`

Related Commands

INPUT1:TELecom:RATE
SENSe:DATA:TELecom:STRUcture

SENSe:DATA:TELecom:ERROUTPUT:SOURce

This command sets the trigger conditions for the pulse output on the back of the test set.

Syntax

SENSe:DATA:TELecom:ERROUTPUT:SOURce

Parameters

source	Description
NONE	Disables the selected error trigger output
B1, B2, B3, PATTERN	Selects the specified error trigger output and enables it

Dependencies

None

Examples

SENSe:DATA:TELecom:ERROUTPUT:SOURce B1

Related Commands

None

SENSe:DATA:TELecom:PAYLoad:MAPPing

This command sets or queries the payload mapping of the received structure.

Syntax

```
SENSe:DATA:TELecom:PAYLoad:MAPPing <payload_mapping>
SENSe:DATA:TELecom:PAYLoad:MAPPing?
```

Parameters

<mapping> (discrete)	Description
EQUipped	Expecting equipped payload mapping (default)
UNEQuipped	Expecting unequipped payload mapping
TRIButary	Expecting tributary payload mapping (Add/ Drop Test Option Only)

Dependencies

Select EQUipped or UNEQuipped to use the SENSe:DATA:TELecom: PAYLoad:PATTern command. Selection of TRIButary is not allowed for the STM-0 rate. TRIButary is invalid for an AU-3 structure.

Errors and Events

221, “Settings conflict; Not available without tributary option”

Examples

Set: `SENSE:DATA:TELECOM:PAYLOAD:MAPPing EQUIPPED`

Query: `SENSE:DATA:TELECOM:PAYLOAD:MAPPing?`

Response: `TRIBUTARY`

Related Commands

SENSe:DATA:TELecom:PAYLoad:PATTern

SENSe:DATA:TELecom:PAYLoad:PATTern

This command sets or queries the payload pattern that will be used to calculate the payload BER of the incoming data.

Syntax

```
SENSe:DATA:TELecom:PAYLoad:PATTern <pattern>
SENSe:DATA:TELecom:PAYLoad:PATTern?
```

Parameters

<pattern> (discrete)	Description
PRBS23	A pseudo-random binary sequence of length $2^{23}-1$ (default)
PRBS9	A pseudo-random binary sequence of length $2^{9}-1$
PRBS15	A pseudo-random binary sequence of length $2^{15}-1$
PRBS20	A pseudo-random binary sequence of length $2^{20}-1$
AZERos	All zeros
AONEs	All ones
UBYTe	A user-defined byte
UNKNown	Disable BER calculations on incoming data

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:PAYLOAD:PATTERN PRBS23`

Query: `SENSE:DATA:TELECOM:PAYLOAD:PATTERN?`

Response: `PRBS9`

Related Commands

SENSe:DATA:TELecom:CHANnel
SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe

SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe

This command sets or queries the internally generated payload fixed pattern to be detected in the incoming signal.

Syntax

```
SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe <fixed pat-
tern>SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe?
```

Parameters

<fixed pattern> (NR1-numeric)[4]	Description
A number in the range 0 to 255 (hexadecimal 00 to FF)	The payload pattern to be detected is set to this value (default = 0)

[4] **A hexadecimal value is also acceptable.**

Dependencies SENSe:DATA:TELecom:PAYLoad:PATTern must be set to UBYTe for this command to apply.

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:PAYLOAD:PATTERN:UBYTE 01`
`SENSE:DATA:TELECOM:PAYLOAD:PATTERN:UBYTE #HA5`

Query: `SENSE:DATA:TELECOM:PAYLOAD:PATTERN:UBYTE?`

Response: `128`

Related Commands SENSe:DATA:TELecom:PAYLoad:PATTern

SENSe:DATA:TELecom:PAYLoad:PRBS:INVert

This command sets whether the TX pattern is normal or inverted.

Syntax SENSe:DATA:TELecom:PAYLoad:PRBS:INVert <state>

Parameters

State	Description
ON	Inverts the previously selected pattern
OFF	Pattern invert is off

Examples SENSe:DATA:TELecom:PAYLoad:PRBS:INVert ON

Related Commands SOURce:DATA:TELecom:PAYLoad:PRBS:INVert

SENSe:DATA:TELecom:SECTion:TRACe:MISmatch

This command sets the J0 trace mismatch reporting state.

Syntax SENSe:DATA:TELecom:SECTion:TRACe:MISmatch <state>

Parameters

State	Description
ON	Sets the state of reporting J0 trace mismatch
OFF	Turns off the state of reporting of J0 trace mismatch

Examples SENSe:DATA:TELecom:SECTion:TRACe:MISmatch OFF

Related Commands None

SENSe:DATA:TELecom:TEST Subsystem

This section describes each of the commands and queries used to control measurements. Figure 2–51 shows the hierarchy tree for this CTS 850 subsystem.

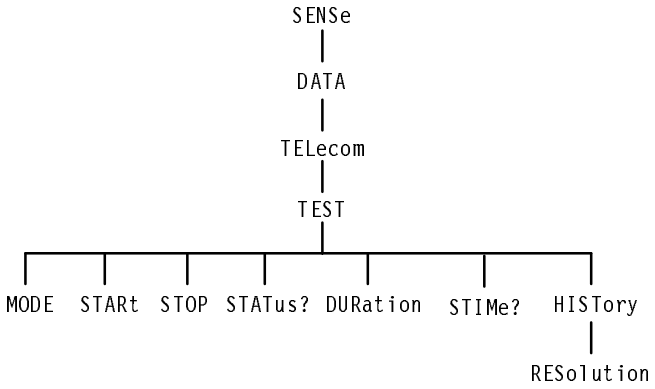


Figure 2–51: SENSe:DATA:TELecom:TEST subsystem

SENSe:DATA:TELecom:TEST:MODE

This command sets or queries the measurement test mode (normal or jitter).

Syntax

```
SENSe:DATA:TELecom:TEST:MODE <mode>
SENSe:DATA:TELecom:TEST:MODE?
```

Parameters

<mode> (discrete)	Description
NORMal	Normal operation jitter measurements (default)
JITter	Enable compliance tests

Dependencies

Requires installation of Option 14 jitter module.

*RST sets mode to normal (default).

Errors and Events

221, “Settings conflict; Not available without jitter option”
if the jitter/wander test option is not installed and JITter is specified.

Examples

Set: `SENSE:DATA:TELECOM:TEST:MODE JITTER`

Query: `SENSE:DATA:TELECOM:TEST:MODE?`

Response: `NORMAL`

Related Commands None

SENSe:DATA:TELecom:TEST:STARt

This command starts normal test measurements if SENSe:DATA:TELecom:TEST:MODE is set to NORMal. This command starts specified jitter compliance tests if SENSe:DATA:TELecom:TEST:MODE is set to JITter.

Syntax `SENSe:DATA:TELecom:TEST:STARt`

Parameters None

Dependencies Any instrument settings can be changed after a test is started, but the measurements are restarted when any change is made to the receiver rate, level, structure, or pattern.

Errors and Events None

Examples `SENSE:DATA:TELECOM:TEST:START`

Related Commands SENSe:DATA:TELecom:TEST:STOP
SENSe:DATA:TELecom:TEST:MODE

SENSe:DATA:TELecom:TEST:STOP

This command stops normal or compliance measurements.

Syntax `SENSe:DATA:TELecom:TEST:STOP`

Parameters None

Dependencies None

Errors and Events None

Examples `SENSE:DATA:TELECOM:TEST:STOP`

Related Commands SENSe:DATA:TELecom:TEST:STARt

SENSe:DATA:TELecom:TEST:STATus?

This query returns the state of the measurement process and how long the test has been running.

Syntax `SENSe:DATA:TELecom:TEST:STATus?`

Response

<status>(boolean)	Description
1	Test is running
0	Test is stopped
<days> (NR1-numeric)	**Description**
Any number in the range 0 to 999	Number of days the test has been running
<hours> (NR1-numeric)	**Description**
Any number in the range 0 to 23	Number of hours the test has been running
<minutes> (NR1-numeric)	**Description**
Any number in the range 0 to 59	Number of minutes the test has been running
<seconds> (NR1-numeric)	**Description**
Any number in the range 0 to 59	Number of seconds the test has been running

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:STATUS?`

Response: `1,0,0,13,5`

This response indicates that the test has been running for 13 minutes and 5 seconds and is still running.

Related Commands None

SENSe:DATA:TELecom:TEST:DURation

This command sets or queries the length of the test. If all four parameters are set to 0, the test will run continuously.

Syntax

```
SENSe:DATA:TELecom:TEST:DURation <d>,<hrs>,<min>,<sec>
SENSe:DATA:TELecom:TEST:DURation?
```

Parameters

<days> (NR1-numeric)	Description
Any number in the range 0 to 99	Specifies the number of days the test is to be run (default = 0)
<hours> (NR1-numeric)	**Description**
Any number in the range 0 to 23	Specifies the number of hours the test is to be run (default = 0)
<minutes> (NR1-numeric)	**Description**
Any number in the range 0 to 59	Specifies the number of minutes the test is to be run (default = 0)
<seconds> (NR1-numeric)	**Description**
Any number in the range 0 to 59	Specifies the number of seconds the test is to be run (default = 0)

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:TEST:DURATION 1,12,30,0`

The above example sets the test duration to 1 day, 12 hours, 30 minutes, and 0 seconds.

Query: `SENSE:DATA:TELECOM:TEST:DURATION?`

Response: `0,2,0,0`

Related Commands None

SENSe:DATA:TELecom:TEST:STIMe?

This query returns the date and time the test was started.

Syntax `SENSe:DATA:TELecom:TEST:STIMe?`

Response

<year> (NR1-numeric)	Description
Any number in the range 00 to 99	Specifies the year the test was started; "92" indicates that the test was started in 1992, "01" indicates the year 2001
<month> (NR1-numeric)	**Description**
Any number in the range 1 to 12	Specifies the month the test was started; "09" indicates that the test was started in September
<day> (NR1-numeric)	**Description**
Any number in the range 1 to 31	Specifies the day of the month the test was started
<hours> (NR1-numeric)	**Description**
Any number in the range 0 to 23	Specifies the hour the test was started
<minutes> (NR1-numeric)	**Description**
Any number in the range 0 to 59	Specifies the minute the test was started
<seconds> (NR1-numeric)	**Description**
Any number in the range 0 to 59	Specifies the seconds the test was started

Dependencies None

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:TEST:STIME?`

Response: `93,10,25,22,15,00`

This test was started on October 25, 1993 at 10:15 pm.

Related Commands

SENSe:DATA:TELecom:TEST:STARt

SENSe:DATA:TELecom:TEST:HISTory:RESolution

This command sets or queries the resolution of the history data.

This command does not affect previously acquired history data. This command assigns the size of data "buckets" prior to starting a new test.

Syntax

```
SENSe:DATA:TELecom:TEST:HISTory:RESolution <hist res>
SENSe:DATA:TELecom:TEST:HISTory:RESolution?
```

Parameters

<hist res> (discrete)	Description
SEC1	1 second resolution
MIN1	1 minute resolution (default)
MIN15	15 minute resolution

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TEST:HISTORY:RESOLUTION MIN15`

Query: `SENSE:DATA:TELECOM:TEST:HISTORY:RESOLUTION?`

Response: `MIN1`

Related Commands

SENse:DATA:TELecom:TEST:START
SENse:DATA:TELecom:MEASURE:HISTORY

SENSe:DATA:TELecom:OVERhead and POVerhead Subsystem

This section describes each of the commands and queries used to analyze the transport overhead and path overhead. Figure 2–53 shows the hierarchy tree for this CTS 850 subsystem.

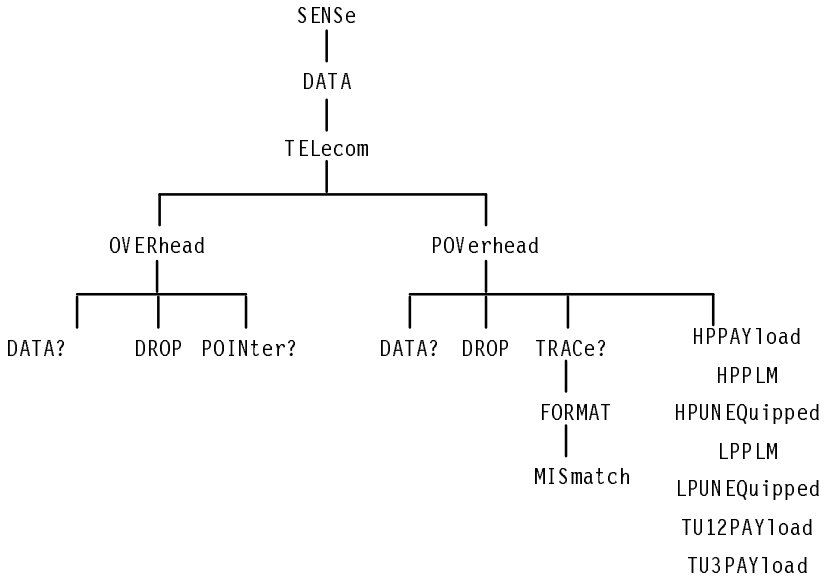


Figure 2–53: SENSe:DATA:TELecom:OVERhead and POVerhead subsystem

SENSe:DATA:TELecom:OVERhead:DATA?

This query returns the value in transport overhead byte of the specified channel.

Syntax `SENSe:DATA:TELecom:OVERhead:DATA? <channel>,<byte>,<offset>`

Parameters

<channel> (NR1-numeric)	Description
1	Rate is STM-1
1 to 4	Rate is STM-4
<byte> (discrete)	**Description**
A1, A2, B1, B2, H1, H2, H3, C1, D1, F1, D1, D2, D3, K1, K2, D4, D5, D6, D7, D8, D9, D10, D11, D12, S1, M1, E2	Only the bytes listed return a valid response
<offset> (NR1-numeric)	**Description**
0 to 2	Any SDH rate

Response

<value> (NR1-numeric)	Description
Any number in the range 0 to 255	The byte is set to this value
–1	No signal received

Dependencies None

Errors and Events 221, "Settings conflict; Channel is out of range"

Examples Query: `SENSE:DATA:TELECOM:OVERHEAD:DATA? 1,C1,0`

Response: `123`

Related Commands INITiate
TRIGger:IMMediate

SENSe:DATA:TELecom:OVERhead:DROP

This command sets or queries the transport overhead bytes to be dropped to an external protocol analyzer.

Syntax

```
SENSe:DATA:TELecom:OVERhead:DROP <dropped overhead>
SENSe:DATA:TELecom:OVERhead:DROP?
```

Parameters

<dropped overhead> (discrete)	Description
NONE	No overhead bytes dropped (default)
SDCC	Regenerator section DCC (D1–D3)
LDCC	Multiplexer section DCC (D4–D12)
F1	F1 User Byte

Dependencies You can drop the transport overhead or the path overhead by using the SENSe:DATA:TELecom:OVERhead:DROP and SENSe:DATA:TELecom:POVerhead:DROP commands. The last command sent applies.

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:OVERHEAD:DROP SDCC`

Query: `SENSE:DATA:TELECOM:OVERHEAD:DROP?`

Response: `SDCC`

Related Commands None

SENSe:DATA:TELecom:OVERhead:POINter?

This query returns the current value of the H1 and H2 overhead bytes of the active channel. If the instrument is receiving a LOS, LOF, or LOP, the last valid pointer value will be returned.

Syntax `SENSe:DATA:TELecom:OVERhead:POINter?`

Response

<pointer value> (NR1-numeric)	Description
Any integer in the range 0 to 1023	H1 and H2 are set to this value

Dependencies You must have a test running for a valid pointer value to be returned (use the SENSe:DATA:TELecom:TEST:STARt command to start a test).

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:OVERHEAD:POINTER?`

Response: `123`

Related Commands SENSe:DATA:TELecom:OVERhead:DATA?
SENSe:DATA:TELecom:TEST:STARt

SENSe:DATA:TELecom:POVerhead:DATA?

This query returns the value in the specified path overhead byte.

Syntax

```
SENSe:DATA:TELecom:POVerhead:DATA? <byte>
```

Parameters

<byte> (discrete)	Description
J1, B3, C2, G1, F2, H4, F3, K3, N1	Only the bytes listed are available for selection

Response

<value> (NR1-numeric)	Description
Any number in the range 0 to 255	The byte is set to this value (the value for J1 is the ASCII representation of the string value)

Dependencies

Use the SENSe:DATA:TELecom:CHANNel command to specify which path trace to query.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:POVERHEAD:DATA? C2`

Response: `123`

Related Commands

INITiate
TRIGger:IMMediate

SENSe:DATA:TELecom:POVerhead:DROP

This command sets or queries the path overhead channels to be dropped to an external protocol analyzer.

Syntax

```
SENSe:DATA:TELecom:POVerhead:DROP <dropped overhead>
SENSe:DATA:TELecom:POVerhead:DROP?
```

Parameters

<dropped overhead> (discrete)	Description
NONE	Nothing is dropped (default)
F2	F2 User Byte

Dependencies

You can drop the transport overhead or the path overhead by using the SENSe:DATA:TELecom:OVERhead:DROP and SENSe:DATA:TELecom: POVerhead:DROP commands. The last command sent applies.

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:DROP F2`

Query: `SENSE:DATA:TELECOM:POVERHEAD:DROP?`

Response: `F2`

Related Commands

None

SENSe:DATA:TELecom:POVerhead:TRACe?

This query returns the current path trace string that repeats in the J1 byte as a repeating byte sequence. The response is created in the following way: the first character after a null is read as the first byte and is followed by 63 J1 bytes from consecutive frames.

Syntax

```
SENSe:DATA:TELecom:POVerhead:TRACe?
```

Response

<path trace> (string)	Description
Length is a maximum of 64 bytes; if length is less than 64 bytes, the buffer is padded with nulls	The J1 byte is set to this value

Dependencies

The SENSe:DATA:TELecom:CHANnel command specifies which path trace to query.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:POVERHEAD:TRACE?`

Response: `"THIS IS THE FIRST RUN OF TEST ABC"`

Related Commands

SENSe:DATA:TELecom:POVerhead:DATA?
INITiate
TRIGger:IMMediate

SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT

This command sets the type of J1 string for AU–N J1 trace strings.

Syntax `SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT <format>`

Parameters

format	description
LONG	64 J1 byte trace
SHORT	16 J1 byte trace

Dependencies None

Examples SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT LONG

Related Commands SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT

SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch

This command sets the state of mismatch reporting for AU–N J1 trace strings.

Syntax `SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch <state>`

Parameters

format	description
ON	Sets the state of reporting J1 trace mismatch
OFF	Turns off the state of reporting of J1 trace mismatch

Dependencies None

Examples SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch OFF

Related Commands SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch

SENSe:DATA:TELecom:POVerhead:HPPAYload:VALue

This command sets the high order payload value to be checked for.

Syntax

```
SENSe:DATA:TELecom:POVerhead:HPPAYload:VALue <number>
SENSe:DATA:TELecom:POVerhead:HPPAYload:VALue?
```

Parameters

number	description
A number in the range 0 to 255	Sets the high order path payload value to be checked for

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:HPPAYLOAD:VALUE 5`

Query: `SENSE:DATA:TELECOM:POVERHEAD:HPPAYLOAD:VALUE?`

Response: `SENSE:DATA:TELECOM:POVERHEAD:HPPAYLOAD:VALUE 5`

Related Commands None

SENSe:DATA:TELecom:POVerhead:HPPLM

This command enables and disables the high order payload mismatch detection.

Syntax

```
SENSe:DATA:TELecom:POVerhead:HPPLM <action>
SENSe:DATA:TELecom:POVerhead:HPPLM?
```

Parameters

number	description
Enable	Turns the high order payload mismatch detection ON
Disable	Turns the high order payload mismatch detection OFF

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:HPPLM ENABLE`

Query: `SENSE:DATA:TELECOM:POVERHEAD:HPPLM?`

Response: `SENSE:DATA:TELECOM:POVERHEAD:HPPLM ENABLE`

Related Commands None

SENSe:DATA:TELecom:POVerhead:HPUNEQuipped

This command enables and disables the high order path unequipped detection.

Syntax

```
SENSe:DATA:TELecom:POVerhead:HPUNEQuippped <action>
SENSe:DATA:TELecom:POVerhead:HPUNEQuipped?
```

Parameters

number	description
Enable	Turns the high order path unequipped detection ON
Disable	Turns the high order path unequipped detection OFF

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:HPUNEQUIPPED ENABLE`

Query: `SENSE:DATA:TELECOM:POVERHEAD:HPUNEQUIPPED?`

Response: `SENSE:DATA:TELECOM:POVERHEAD:HPUNEQUIPPED ENABLE`

Related Commands None

SENSe:DATA:TELecom:POVerhead:LPPLM

This command enables and disables the low order payload mismatch detection.

Syntax

```
SENSe:DATA:TELecom:POVerhead:LPPLM <action>
SENSe:DATA:TELecom:POVerhead:LPPLM?
```

Parameters

number	description
Enable	Turns the high order payload mismatch detection ON
Disable	Turns the high order payload mismatch detection OFF

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:LPPLM ENABLE`

Query: `SENSE:DATA:TELECOM:POVERHEAD:LPPLM?`

Response: `SENSE:DATA:TELECOM:POVERHEAD:LPPLM ENABLE`

Related Commands None

SENSe:DATA:TELecom:POVerhead:LPUNEQuipped

This command enables and disables the low order path unequipped detection.

Syntax

```
SENSe:DATA:TELecom:POVerhead:LPUNEQuippped <action>
SENSe:DATA:TELecom:POVerhead:LPUNEQuipped?
```

Parameters

number	description
Enable	Turns the high order path unequipped detection ON
Disable	Turns the high order path unequipped detection OFF

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:LPUNEQUIPPED ENABLE`

Query: `SENSE:DATA:TELECOM:POVERHEAD:LPUNEQUIPPED?`

Response: `SENSE:DATA:TELECOM:POVERHEAD:LPUNEQUIPPED ENABLE`

Related Commands None

SENSe:DATA:TELecom:POVerhead:TU12PAYload:VALue

This command sets the low order payload value to be checked for.

Syntax

```
SENSe:DATA:TELecom:POVerhead:TU12PAYload:VALue <number>
SENSe:DATA:TELecom:POVerhead:TU12PAYload:VALue?
```

Parameters

number	description
A number in the range 0 to 255	Sets the high order path payload value to be checked for

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:TU12PAYLOAD:VALUE 5`

Query: `SENSE:DATA:TELECOM:POVERHEAD:TU12PAYLOAD:VALUE?`

Response: `SENSE:DATA:TELECOM:POVERHEAD:TU12PAYLOAD:VALUE 5`

Related Commands None

SENSe:DATA:TELecom:POVerhead:TU3PAYload:VALue

This command sets the low order payload value to be checked for.

Syntax

```
SENSe:DATA:TELecom:POVerhead:TU3PAYload:VALue <number>
SENSe:DATA:TELecom:POVerhead:TU3PAYload:VALue?
```

Parameters

number	description
A number in the range 0 to 255	Sets the high order path payload value to be checked for

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:POVERHEAD:TU3PAYLOAD:VALUE 5`

Query: `SENSE:DATA:TELECOM:POVERHEAD:TU3PAYLOAD:VALUE?`

Response: `SENSE:DATA:TELECOM:POVERHEAD:TU3PAYLOAD:VALUE 5`

Related Commands

None

SENSe:DATA:TELecom:MEASure Subsystem

This section describes the commands and queries that access error, alarm, failure, and pointer measurements for current and previous tests. Figures 2–55 through 2–59 show the hierarchy trees for this CTS 850 subsystem.

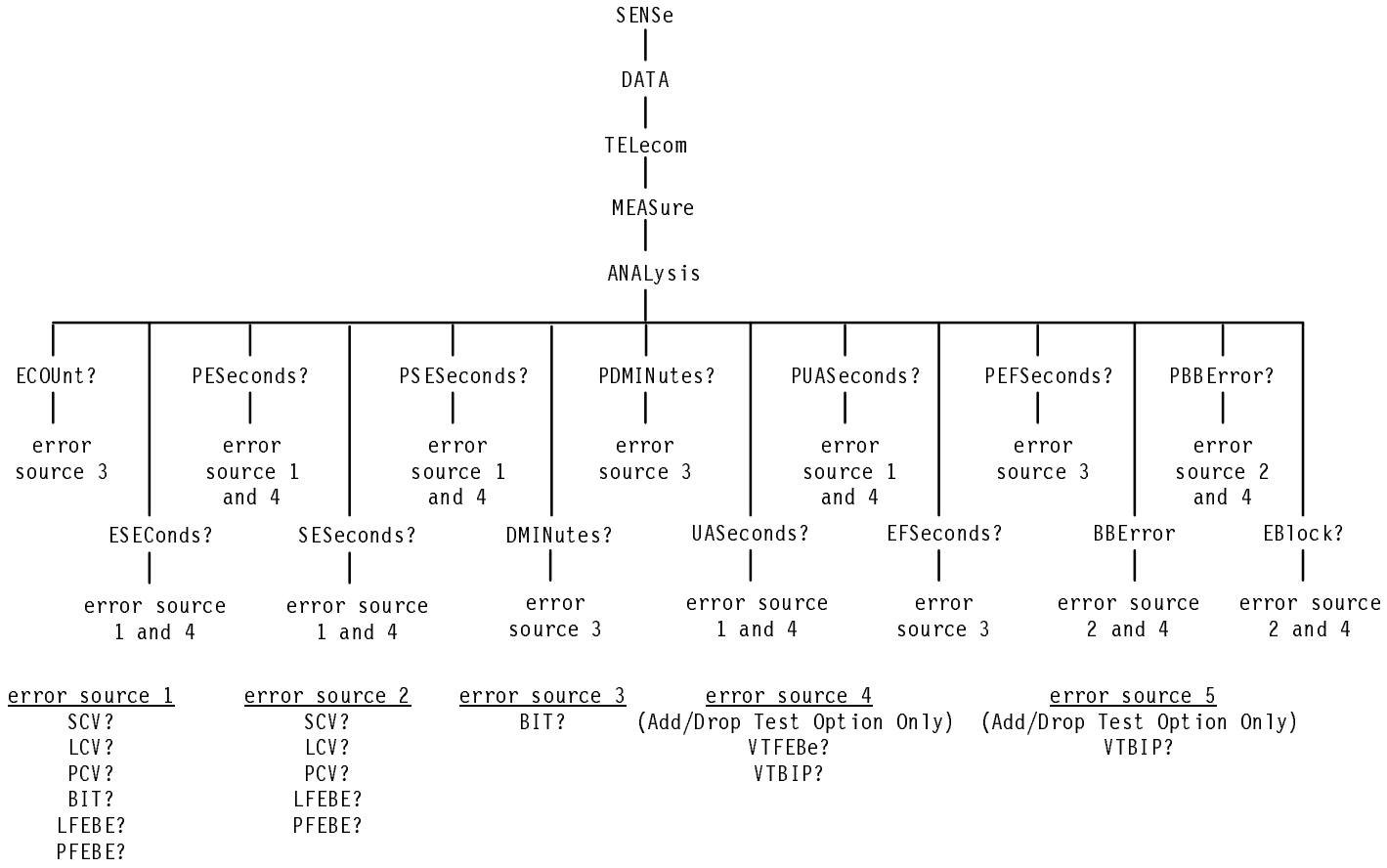


Figure 2–55: SENSe:DATA:TELecom:MEASure:ANALysis subsystem (SDH)

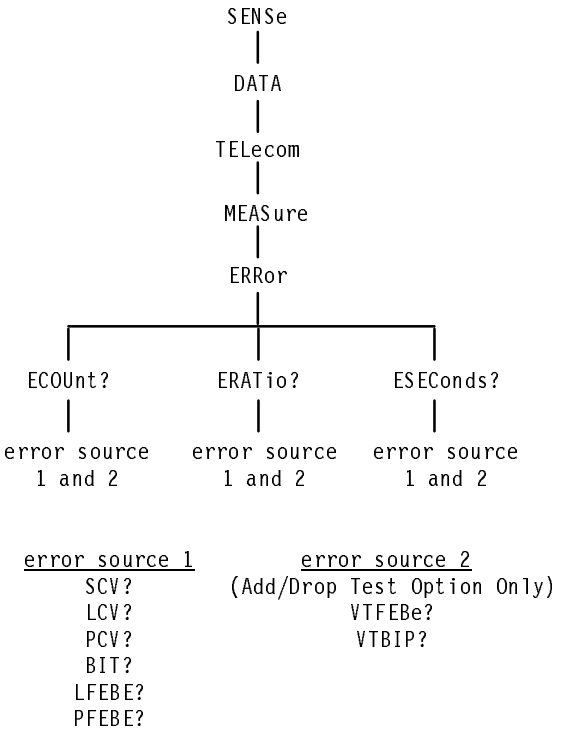


Figure 2–56: SENSe:DATA:TELecom:MEASure:ERRor subsystem

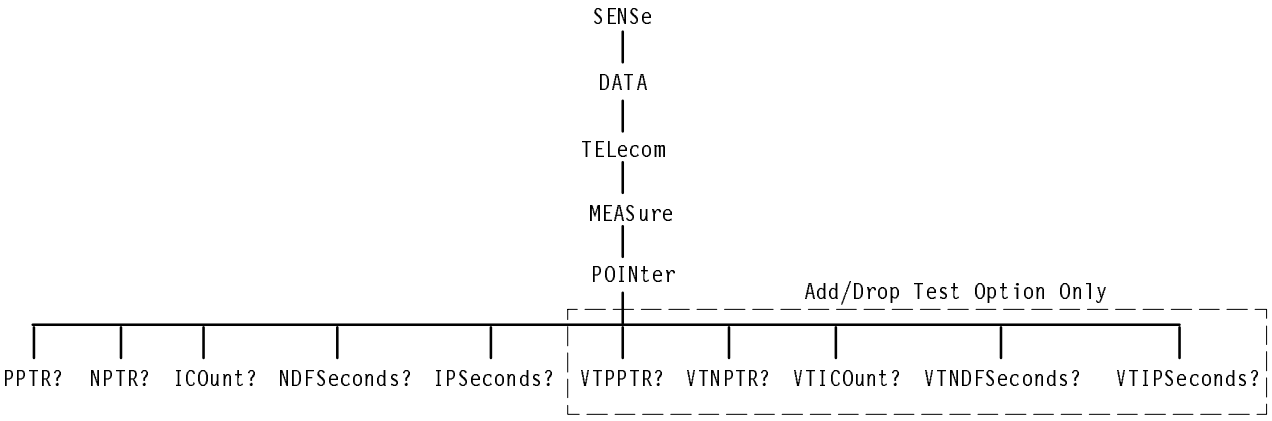


Figure 2–57: SENSe:DATA:TELecom:MEASure:POINter subsystem

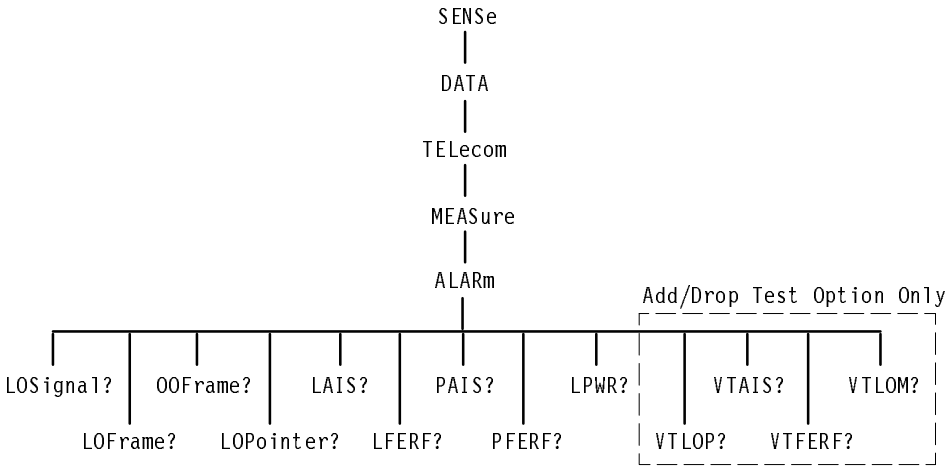


Figure 2–58: SENSe:DATA:TELecom:MEASure:ALARm subsystem

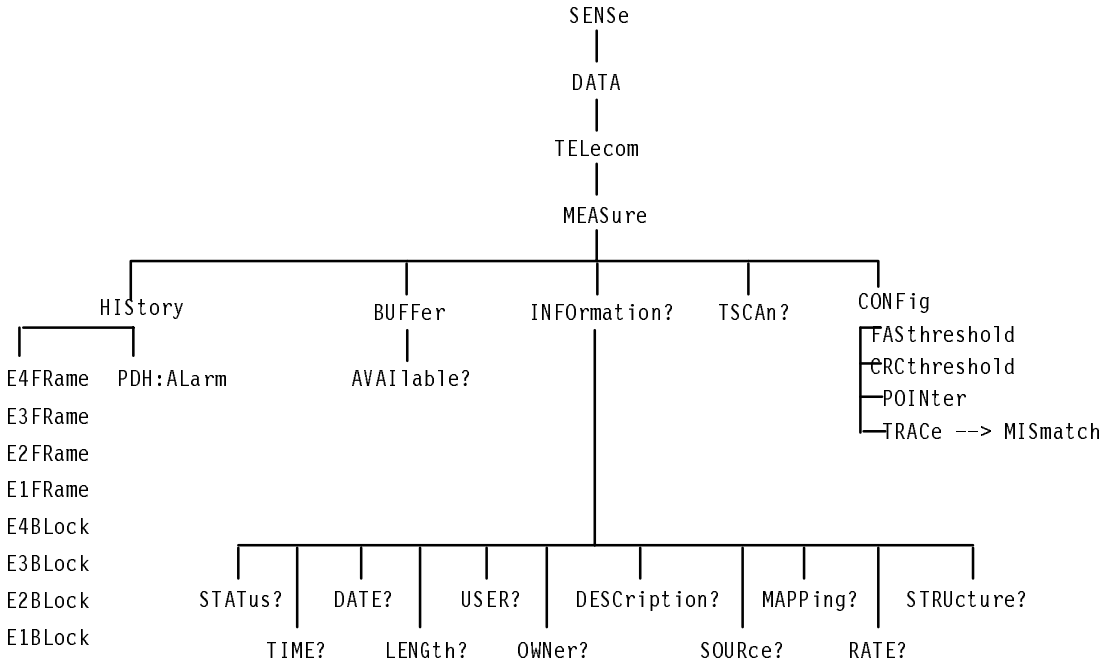


Figure 2–59: SENSe:DATA:TELecom:MEASure:BUFFer and INFOrmation subsystems

A variety of error, alarm, failure, and pointer measurements are reported through this subsystem. Table 2–13 shows how error, alarm, and failure measurements

are calculated. Tables 2–14 and 2–15 show how the analysis measurements are calculated. These calculations are based on CCITT G.821 specifications.

Table 2–13: How error, alarm, and pointer measurements are calculated

Type of Measurement	Method of Calculation
Error count	Number of bit errors that were errored in the signal
Bit Error Ratio (BER)	Ratio of error count to the total number of received bits
Errored seconds	Number of seconds that had any error counts or failures such as Loss of Signal (LOS) or Severely Errored Frame (SEF)
Pointer measurements	Number of events that occur in the H1 and H2 pointer bytes
New Data Flag Seconds	Number of one-second intervals that contain new data flags
Illegal Pointer Seconds	Number of one-second intervals that contain illegal pointers
Positive Pointer Justifications	Number of times the pointer value is incremented
Negative Pointer Justifications	Number of times the pointer value is decremented
Alarms	Number of one-second intervals that contained a specific alarm such as Loss of Signal (LOS), Loss of Pointer (LOP), and Path Alarm Indication Signal (PAIS)

Table 2–14: How analysis measurements are calculated

Type of Measurement	Method of Calculation
Error count	Number of bit errors not occurring during periods of unavailability (see Unavailable seconds)
Errored seconds	Total number of severely errored seconds not occurring during a period of unavailability (see Unavailable seconds)
Severely errored seconds	Number of seconds with more than N errors (see Table 2–15)
Severely errored framing seconds	Number of seconds where the incoming signal could not be framed (applies only to the Section layer)
Unavailable seconds	Number of seconds that the signal had too many errors to be available for use; unavailability starts at the onset of ten contiguous severely errored seconds
Error free seconds	Number of seconds that contained zero errors

Table 2–15: Value of N for analysis measurements

Rate	N (Section B1 Errors)	N (Line B2 Errors)
STM-1	2500	2500
STM-4	8800	10000

Some of the queries in this section have their information presented in a way that is different from queries in the rest of the manual. The syntax and examples are in table format. Figure 2–60 shows you how to read the Syntax Tables in this section. Follow the step numbers to create any query. Table 2–16 explains the acronyms used in the SENSe:DATA:TELecom:MEASure Syntax Tables.

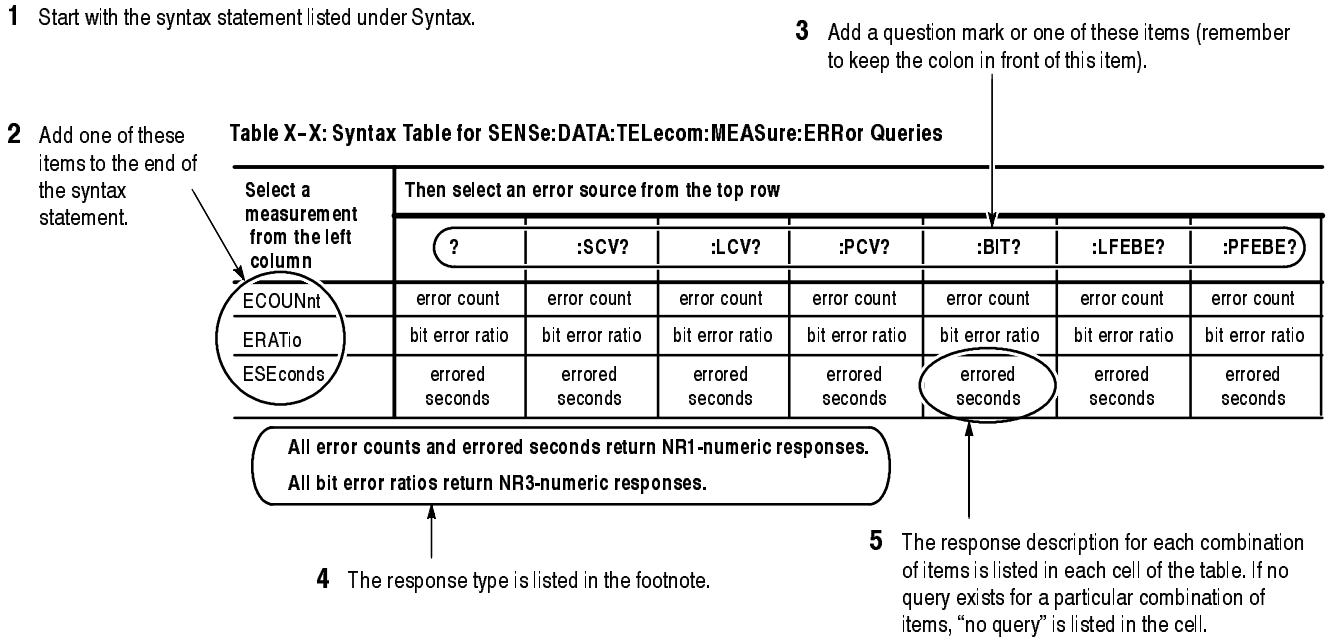


Figure 2–60: How to read the syntax tables in the SENSe:DATA:TELecom:MEASure subsystem section

Table 2–16: Acronyms used in the SENSe:DATA:TELecom:MEASure queries

Acronym	Meaning
SCV	Section/RS Code Violation
LCV	Line/MS Code Violation
PCV	Path Code Violation
BIT error (not an acronym)	Pattern bit error
LFEBE	Line/MS Far End Block Error
PFEBE	Path Far End Block Error
VTBIP	TU BIP (Add/Drop Test Option Only)
VTFEBE	TU FEBE (Add/Drop Test Option Only)

Figure 2–61 shows you how to read the Example Tables in this section.

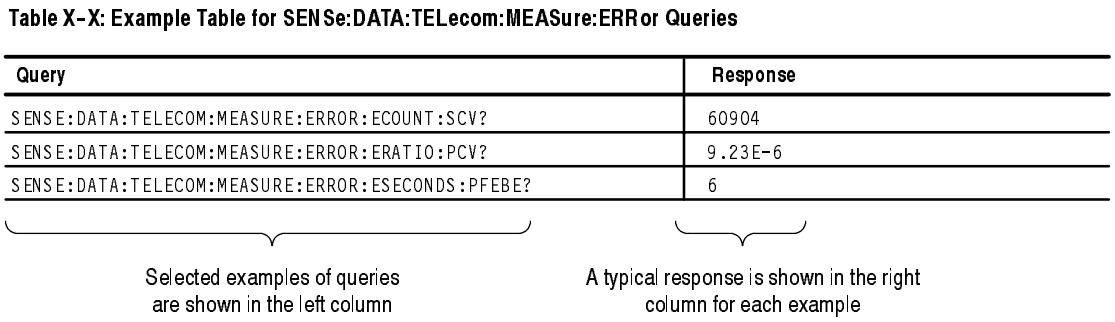


Figure 2–61: How to read the example tables in the SENSe:DATA:TELecom:MEASure subsystem section

SENSe:DATA:TELecom:MEASure:ERRor Queries

These queries return error measurements. When you use the high-level queries (for example, SENSe:DATA:TELecom:MEASure:ERRor? or SENSe:DATA:TELecom:MEASure:ERRor:ECOUnt?), it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

Syntax

```
SENSe:DATA:TELecom:MEASure:ERRor?
```

```
SENSe:DATA:TELecom:MEASure:ERRor:[measurement]:[error source]
```

(see Tables 2–17 and 2–18 to complete the query)

Table 2–17: Syntax table for SENSe:DATA:TELecom:MEASure:ERRor queries

Select a measurement from the left column	Then select an error source from the top row						
	?	:SCV?	:LCV?	:PCV?	:BIT?	:LFEBE?	:PFEBE?
ECOUnt	all error counts	error count	error count	error count	error count	error count	error count
ERATio	all bit error ratios	bit error ratio	bit error ratio	bit error ratio	bit error ratio	bit error ratio	bit error ratio
ESEConds	all errored seconds	errored seconds	errored seconds	errored seconds	errored seconds	errored seconds	errored seconds

All error counts and errored seconds return NR1-numeric responses.

All bit error ratios return NR1-numeric responses.

Table 2–18: Syntax table for SENSe:DATA:TELecom:MEASure:ERRor queries (Add/Drop Test Option Only)

Select a measurement from the left column	Then select an error source from the top row	
	:VTFEBe?	:VTBIP?
ECOUnt:	error count	error count
ERATio	bit error ratio	bit error ratio
ESEConds	errored seconds	errored seconds

All error counts and errored seconds return NR1-numeric responses.

All bit error ratios return NR1-numeric responses.

Response See Tables 2–17 and 2–18.

Dependencies These measurement queries can be sent at any time. But, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events None

Examples See Table 2–19.

Table 2–19: Example table for SENSe:DATA:TELecom:MEASure:ERRor queries

Query	Response
SENSE:DATA:TELECOM:MEASURE:ERROR:ECOUNT:SCV?	60904
SENSE:DATA:TELECOM:MEASURE:ERROR:ERATIO:PCV?	9.23E-6
SENSE:DATA:TELECOM:MEASURE:ERROR:ESECONDS:PFEBE?	6

Related Commands SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

SENSe:DATA:TELecom:MEASure:ANALysis Queries

These queries return an analysis of section, line, path, and payload errors. When you use the high-level queries (for example, SENSe:DATA:TELecom: MEASure:ANALysis? or SENSe:DATA:TELecom:MEASure: ANALysis:ECOUnt?), it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

Syntax `SENSe:DATA:TELecom:MEASure:ANALysis?`

`SENSe:DATA:TELecom:MEASure:ANALysis:[measurement]:[error source]` (see Tables 2–20 and 2–21 to complete the query)

Table 2–20: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries

Select a measurement from the left column	Then select an error source from the top row						
	?	:SCV?	:LCV?	:PCV?	:BIT?	:LFEBE?	:PFEBE?
ECOUnt	all error counts	no query	no query	no query	all error counts	no query	no query
ESEConds	all errored seconds	errored seconds	errored seconds	errored seconds	errored seconds	errored seconds	errored seconds
PESeconds	all ratio errored seconds	ratio errored seconds	ratio errored seconds	ratio errored seconds	percent errored seconds	ratio errored seconds	ratio errored seconds
SESeconds	all severely errored seconds	severely errored seconds	severely errored seconds	severely errored seconds	severely errored seconds	severely errored seconds	severely errored seconds
PSESeconds	all ratio severely errored seconds	ratio severely errored seconds	ratio severely errored seconds	ratio severely errored seconds	percent severely errored seconds	ratio severely errored seconds	ratio severely errored seconds

Table 2–20: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries (Cont.)

Select a measurement from the left column	Then select an error source from the top row						
	?	:SCV?	:LCV?	:PCV?	:BIT?	:LFEBE?	:PFEBE?
UASeconds	all unavailable seconds	unavailable seconds	unavailable seconds	unavailable seconds	unavailable seconds	unavailable seconds	unavailable seconds
PUASeconds	all ratio unavailable seconds	ratio unavailable seconds	ratio unavailable seconds	ratio unavailable seconds	percent unavailable seconds	ratio unavailable seconds	ratio unavailable seconds
EFSeconds	all error free seconds	no query	no query	no query	error free seconds	no query	no query
PEFSeconds	all percent error free seconds	no query	no query	no query	percent error free seconds	no query	no query
DMINutes	all degraded minutes	no query	no query	no query	degraded minutes	no query	no query
PDMINutes	all percent degraded minutes	no query	no query	no query	percent degraded minutes	no query	no query
EBLock	all block errors	block errors	block errors	block errors	no query	block errors	block errors
BBError	all background block errors	background block errors	background block errors	background block errors	no query	background block errors	background block errors
PBBError	all ratio background block errors	ratio background block errors	ratio background block errors	ratio background block errors	no query	ratio background block errors	ratio background block errors
PTHUaseconds	path unavailable seconds	no query	path unavailable seconds	path unavailable seconds	path unavailable seconds	path unavailable seconds	path unavailable seconds
PPTHUaseconds	path unavailable seconds ratio	no query	path unavailable seconds ratio	path unavailable seconds ratio	path unavailable seconds ratio	path unavailable seconds ratio	path unavailable seconds ratio

All percent measurements return NR1-numeric responses.

All other measurements return NR1-numeric responses.

Table 2–21: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries (SDH and Add/Drop Test Option Only)

Select a measurement from the left column	Then select an error source from the top row	
	:VTFEBe?	:VTBIP?
ESEConds	errored seconds	errored seconds
PESeconds	ratio errored seconds	ratio errored seconds
EBLock	block errors	block errors

Table 2–21: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries (SDH and Add/Drop Test Option Only) (Cont.)

Select a measurement from the left column	Then select an error source from the top row	
	:VTFEBe?	:VTBIP?
BBError	background block errors	background block errors
PBBError	ratio background block errors	ratio background block errors
SESeconds	severely errored seconds	severely errored seconds
PSESeconds	ratio severely errored seconds	ratio severely errored seconds
UASeconds	unavailable seconds	unavailable seconds
PUASeconds	ratio unavailable seconds	ratio unavailable seconds

All bit error ratios and percent measurements return NR1-numeric responses.

All other measurements return NR1-numeric responses.

Response See Tables 2–20 and 2–21.

Dependencies These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events None

Examples See Table 2–22.

Table 2–22: Example table for SENSe:DATA:TELecom:MEASure:ANALysis queries (SDH)

Query	Response
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:SESECONDS:LCV?	23
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:BBERROR:SCV?	103
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:PUASECONDS:LFEBE?	1.2E-1

Related Commands SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

Table 2–23: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis:2101 *queries*

Select a measurement from the left column	Then select an error source	
	:B1,	:B1, :B2, :B3, :TUBIP, :MSREI, :HPREI, or :LPREI
ECOUnt	error block count	error block count
ESEConds	error second count	error second count
PESeconds	ratio errored seconds	ratio errored seconds
BBError	background block error	background block error
PBBError	background block error ratio	background block error ratio
SESeconds	severely errored seconds count	severely errored seconds count
PSESeconds	ratio severely errored seconds count	ratio severely errored seconds count
CSES	consecutively severely errored seconds period count	consecutively severely errored seconds period count
UASeconds	unavailable seconds count	unavailable seconds count
PUASeconds	unavailable seconds ratio	unavailable seconds ratio
PTHUaseconds	does not apply for B1	path unavailable seconds
PPTHUasecond	does not apply for B1	path unavailable seconds ratio
VERDict	pass or fail verdict	pass or fail verdict

SENSe:DATA:TELecom:MEASure:ALARm Queries

These queries return alarm measurements. When you use the SENSe:DATA:TELecom:MEASure:ALARm? query, it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

Syntax

All valid queries are listed in the Syntax column of Tables 2–24 and 2–25.

Table 2–24: Syntax table for SENSe:DATA:TELecom:MEASure:ALARm queries

Syntax	Response
`SENSe:DATA:TELecom:MEASure:ALARm?`	All alarm measurements
`SENSe:DATA:TELecom:MEASure:ALARm:LOSignal?`	Number of seconds of Loss of Signal
`SENSe:DATA:TELecom:MEASure:ALARm:LOFrame?`	Number of seconds of Loss of Frame
`SENSe:DATA:TELecom:MEASure:ALARm:OOFrame?`	Number of seconds of Out of Frame

Table 2–24: Syntax table for SENSe:DATA:TELecom:MEASure:ALARm queries (Cont.)

Syntax	Response
SENSe:DATA:TELecom:MEASure:ALARm:LOPointer?	Number of seconds of Loss of Pointer
SENSe:DATA:TELecom:MEASure:ALARm:LAIS?	Number of seconds of MS AIS
SENSe:DATA:TELecom:MEASure:ALARm:LFERf?	Number of seconds of MS FERF
SENSe:DATA:TELecom:MEASure:ALARm:PFERf?	Number of seconds of Path FERF
SENSe:DATA:TELecom:MEASure:ALARm:PAIS?	Number of seconds of Path AIS
SENSe:DATA:TELecom:MEASure:ALARm:LPWR?	Number of seconds of instrument power loss during a test
SENSe:DATA:TELecom:MEASure:ALARm:LPRFI?	Number of seconds of low order path remote failure indication
SENSe:DATA:TELecom:MEASure:ALARm:HPUNEQuipped?	Number of seconds of high order path unequipped
SENSe:DATA:TELecom:MEASure:ALARm:LPUNEQuipped?	Number of seconds of low order path unequipped
SENSe:DATA:TELecom:MEASure:ALARm:HPPLM?	Number of seconds of high order payload mismatch
SENSe:DATA:TELecom:MEASure:ALARm:LPPLM?	Number of seconds of low order payload mismatch

All responses are in NR1-numeric format.

Table 2–25: Syntax table for SENSe:DATA:TELecom:MEASure:ALARm queries

Syntax	Response
SENSe:DATA:TELecom:MEASure:ALARm:VTLOP?	Number of seconds of tributary Loss of Pointer
SENSe:DATA:TELecom:MEASure:ALARm:VTAIS?	Number of seconds of tributary AIS
SENSe:DATA:TELecom:MEASure:ALARm:VTFERF?	Number of seconds of tributary FERF
SENSe:DATA:TELecom:MEASure:ALARm:VTLOM?	Number of seconds of tributary Loss of Multiframe

All responses are in NR1-numeric format.

Response See the Response column of Tables 2–24 and 2–25.

Dependencies These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events None

Examples See Table 2–26.

Table 2–26: Example table for SENSe:DATA:TELecom:MEASure:ALARm queries

Query	Response
SENSE:DATA:TELECOM:MEASURE:ALARM:LOPOINTER?	20
SENSE:DATA:TELECOM:MEASURE:ALARM:OOFRAME?	13

Related Commands SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

SENSe:DATA:TELecom:MEASure:POINter Queries

These queries return pointer-related measurements. When you use the SENSe:DATA:TELecom:MEASure:POINter? query, it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

Syntax All valid queries are listed in the Syntax column of Tables 2–27 and 2–28.

Table 2–27: Syntax table for SENSe:DATA:TELecom:MEASure:POINter queries

Syntax	Response
SENSe:DATA:TELecom:MEASure:POINter?	All pointer measurements
SENSe:DATA:TELecom:MEASure:POINter:NDFSeconds?	Number of seconds in which one or more NDFs (new data flags) occurred
SENSe:DATA:TELecom:MEASure:POINter:IPSeconds?	Number of seconds in which one or more illegal pointer adjustments occurred
SENSe:DATA:TELecom:MEASure:POINter:PPTR?	Number of positive pointer justifications
SENSe:DATA:TELecom:MEASure:POINter:NPTR?	Number of negative pointer justifications
SENSe:DATA:TELecom:MEASure:POINter:ICOunt?	Number of invalid pointers

All responses are in NR1-numeric format.

Table 2–28: Syntax table for SENSe:DATA:TELecom:MEASure:POINter queries (Add/Drop Test Option Only)

Syntax	Response
SENSe:DATA:TELecom:MEASure:POINter:VTPPTR?	Number of tributary positive pointer justifications
SENSe:DATA:TELecom:MEASure:POINter:VTNPTR?	Number of tributary negative pointer justifications

Table 2–28: Syntax table for SENSe:DATA:TELecom:MEASure:POINter queries (Add/Drop Test Option Only) (Cont.)

Syntax	Response
SENSe:DATA:TELecom:MEASure:POINter:VTICOunt?	Number of tributary invalid pointers
SENSe:DATA:TELecom:MEASure:POINter:VTNDFSeconds?	Number of seconds in which one or more tributary NDFs (new data flags) occurred
SENSe:DATA:TELecom:MEASure:POINter:VTIPSec?	Number of seconds in which one or more illegal tributary pointer adjustments occurred

All responses are in NR1-numeric format.

Response See the Response column of Tables 2–27 and 2–28.

Dependencies These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events None

Examples See Table 2–29.

Table 2–29: Example table for SENSe:DATA:TELecom:MEASure:POINter queries

Query	Response
SENSE:DATA:TELECOM:MEASURE:POINTER:PPTR?	12
SENSE:DATA:TELECOM:MEASURE:POINTER:ICOUNT?	0

Related Commands SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

SENSe:DATA:TELecom:MEASure:BUFFer

This command sets or queries the buffer that is read with the measurement queries. The following buffers are available for use: buffer number 1 contains results from the most recent test, and buffer number 2 contains results from the previous test. The current test results might overflow into the previous test results buffer (buffer number 2). In that case, only buffer number 1 is available for use. Use the SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable? query to determine the oldest available buffer.

Buffer number –1 contains results that have been accessed from disk. After you give the MMEMory:LOAD:RESUlts command, the buffer number is set to –1.

Syntax

```
SENSe:DATA:TELecom:MEASure:BUFFer <results buffer>
SENSe:DATA:TELecom:MEASure:BUFFer?
```

Parameters

<results buffer> (NR1-numeric)	description
1 or 2	Buffer number read with the measurement queries (default = 1)
–1	Information from the MMEMory:LOAD: RESUlts command is stored in this buffer

Dependencies

None

Errors and Events

200, "Execution error; Temporary buffer is empty"

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:BUFFER 2`

Query: `SENSE:DATA:TELECOM:MEASURE:BUFFER?`

Response: 2

Related Commands

SENSe:DATA:TELecom:MEASure:INFOrmation?
SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable
MMEMory:LOAD:RESUlts

SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable?

This query returns the oldest buffer accessible with the measurement and history queries. The value returned by this query is the maximum value you can use in the SENSe:DATA:TELecom:MEASure:BUFFer command.

Buffer number 1 contains results from the most recent test. Buffer number 2 contains results from the previous test. The current results might overflow into the previous test results buffer (buffer number 2). In that case, only buffer number 1 is available for use.

While a test is running, the response to this query is always 1 because only current test results can be displayed at that time.

Syntax SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable?

Response

<oldest buffer> (NR1-numeric)	description
1 or 2	Oldest buffer number read with the measurement queries (default = 1)

Dependencies None

Errors and Events None

Examples Query: SENSE:DATA:TELECOM:MEASURE:BUFFER?

Response: 2

Related Commands SENSe:DATA:TELecom:MEASure:BUFFer

SENSe:DATA:TELecom:MEASure:INFOrmation Queries

This query returns information on the buffer accessed with the measurement and history queries. This query returns information about the current test (could be in progress, or could be recalled from memory or disk).

Syntax All valid queries are listed in the Syntax column of Table 2–30.

Table 2–30: Syntax table for SENSe:DATA:TELecom:MEASure:INFOrmation queries

Syntax	Response
SENSe:DATA:TELecom:MEASure:INFOrmation?	[All measurement information]
SENSe:DATA:TELecom:MEASure:INFOrmation:DATE?	year,month,day [the date the test starts]
SENSe:DATA:TELecom:MEASure:INFOrmation:DESCription?	[Description of the test]
SENSe:DATA:TELecom:MEASure:INFOrmation:FRAMing?	[Tributary framing]
SENSe:DATA:TELecom:MEASure:INFOrmation:INSTrument?	[Instrument identity]
SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:CLOCk:RATE?	[Jitter measurement clock rate]
SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:FILTer?	[Jitter measurement band filter setting]
SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:FILTer:FULLband:JPASS	[Jitter fullband Hpass]

Table 2–30: Syntax table for SENSe:DATA:TELecom:MEASure:INFOrmation queries (Cont.)

Syntax	Response
SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:MODE?	[Jitter measurement mode]
SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:RANGe?	[Jitter measurement range]
SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:SOURce?	[Jitter measurement source]
SENSe:DATA:TELecom:MEASure:INFOrmation:LAYER?	Returns the active layer
SENSe:DATA:TELecom:MEASure:INFOrmation:LENGth?	[Length of the test information in “buckets”]
SENSe:DATA:TELecom:MEASure:INFOrmation:MAPPing?	EQUIpped, UNEQuipped, TUASYNC, TU3, M140
SENSe:DATA:TELecom:MEASure:INFOrmation:OPTIons?	[Instrument options]
SENSe:DATA:TELecom:MEASure:INFOrmation:OWNer?	[Same information as the SYSTem:OWNer? query]
SENSe:DATA:TELecom:MEASure:INFOrmation:PAYLoad?	Returns the active payload rate for the test
SENSe:DATA:TELecom:MEASure:INFOrmation:RATE?	STM0, STM1, STM4 M2, M34, M45, M140
SENSe:DATA:TELecom:MEASure:INFOrmation:RESolution?	MIN1 , MIN15, SEC1 [Resolution of acquired data]
SENSe:DATA:TELecom:MEASure:INFOrmation:SOURce?	INPUT1, INPUT2, INPUT3 [SDH or tributary signal]
SENSe:DATA:TELecom:MEASure:INFOrmation:STATus?	EMPTY, RECORDING, COMPLETE
SENSe:DATA:TELecom:MEASure:INFOrmation:STRUcture?	AU3, AU4
SENSe:DATA:TELecom:MEASure:INFOrmation:TIME?	hour,minute [the time the test starts]
SENSe:DATA:TELecom:MEASure:INFOrmation:USER?	[Same information as the SYSTem:USER? query]
SENSe:DATA:TELecom:MEASure:INFOrmation:PAYLoad?	Returns the active payload rate for the test
SENSe:DATA:TELecom:MEASure:INFOrmation:PDHpath?	The PDH analysis linking in effect during the test – linked or independent
SENSe:DATA:TELecom:MEASure:INFOrmation:FASthreshold?	FAS error threshold active during the test
SENSe:DATA:TELecom:MEASure:INFOrmation:CRCthreshold?	2 MB/s CRC4 error threshold used to classify a severely errored second
SENSe:DATA:TELecom:MEASure:INFOrmation:DMX2:CHANnel?	Active 2 Mb/s channel demuxed from 8 Mb/s signal
SENSe:DATA:TELecom:MEASure:INFOrmation:DMX8:CHANnel?	Active 8 Mb/s channel demuxed from 34 Mb/s signal
SENSe:DATA:TELecom:MEASure:INFOrmation:DMX34:CHANnel?	Active 34 Mb/s channel demuxed from 140 Mb/s signal

Table 2–30: Syntax table for SENSe:DATA:TELecom:MEASure:INFOrmation queries (Cont.)

Syntax	Response
SENSe:DATA:TELecom:MEASure:INFOrmation:K64:MULTiplier?	Number of contiguous timeslots in 64k payload
SENSe:DATA:TELecom:MEASure:INFOrmation:K64:TIMEslot?	Starting timeslot in a 1x64k or Nx64k payload

The status, time, date, and length responses are in NR1-numeric format.

All other responses are in string format.

If structure, mapping, and framing do not apply to the received signal, the response is NONE.

Response See the Response column of Table 2–30.

Dependencies Information is valid only when a test is completed. Set SENSe:DATA:TELecom:MEASure:BUFFer to the buffer for which you want information.

Errors and Events 200, "Execution error; Test is still running"

Examples See Table 2–31.

Table 2–31: Example table for SENSe:DATA:TELecom:MEASure:INFOrmation queries

Query	Response
SENSE:DATA:TELECOM:MEASURE:INFORMATION:TIME?	14,22,0
SENSE:DATA:TELECOM:MEASURE:INFORMATION:DESCRIPTION?	"PORTLAND TO SEATTLE NETWORK TEST"
SENSE:DATA:TELECOM:MEASURE:INFORMATION:MAPPING?	EQUIPPED

Related Commands SENSe:DATA:TELecom:MEASure:BUFFer

Table 2–32: Syntax table for SENSe:DATA:TELecom:MEASure:HIStory queries

Syntax	Response
SENSe:DATA:TELecom:MEASure:HIStory:E4FRame, E3FRame, E2FRame, E1FRame, E4BLock, E3BLock, E2BLock, E1BLock	New queries for ECOunt and ESEconds
SENSe:DATA:TELecom:MEASure:HIStory:PDH:ALArm	Returns bit-coded value for PDH alarms in the specified history period

SENSe:DATA:TELecom:MEASure:TSCAn?

This query returns Trouble Scan Information to help you determine the severity of errors during a test. The information in the response is for human interpretation only and is highly variable depending upon the signal being tested and whether or not the test is complete.

Syntax

```
SENSe:DATA:TELecom:MEASure:TSCAn?
```

Response

<tscan information> (string)	description
A string, maximum length of 256 bytes	Information about a test currently running or complete

Dependencies

None

Examples

Query:

```
SENSE:DATA:TELECOM:MEASURE:TSCAN?
```

Response:

```
"NO ALARMS, BER: 1.2E-8"
```

Related Commands

None

SENSe:DATA:TELecom:MEASure:CONFig:FASthreshold

The measurment configuration commands (SENse:DATA:TELecom: MEASure:CONFig:) set values for the parameters found in the receive config folder.

This command sets the number of consecutive errored frame alignment blocks that are detected before an error is reported. The valid range for this parameter is 1 through 7, which would be set by the operator to match the provisioning of the equipment being tested. The command permits the operator to select different thresholds for different layers in the demux path.

Syntax

```
SENSe:DATA:TELecom:MEASure:CONFig:FASthreshold
```

Response

<threshold>	setting
1 through 7	Number of consecutive FAS errors detected before an error is reported

Dependencies

Nopne

Examples

Set : `SENSE:DATA:TELECOM:MEASURE:CONFig:FASthreshold 7`

Response: 7

Related Commands

None

SENSe:DATA:TELecom:MEASure:CONFig:CRCthreshold

Previous versions of ITU–T standard M.2100 required that an SES be declared when 805 CRC4 or E–bit errors were detected in 1–second. The latest verion of the M.2100 standard sets this threshold at 300 errors. This selection permits backwards–compatible measurements.

Syntax `SENSe:DATA:TELecom:MEASure:CONFig:CRCthreshold`

Response

<threshold>discrete	description
300	M.2100 SES declared after detection of 300 CRC errors in one second (This is the default.)
805	M.2100 SES declared after detection of 805 CRC errors in one second, backwards–compatible

Dependencies None

Examples Set: `SENSE:DATA:TELECOM:MEASURE:CONFig:CRCthreshold 300`

Response: 300

SENSe:DATA:TELecom:MEASure:CONFig:POINter:MISmatch

By definition, the pointer S–bits should be 10–binary. This option lets the operator choose to declare a loss of pointer error when the bits are incorrect, or ignore the error altogether.

Syntax `SENSe:DATA:TELecom:MEASure:pointer:mismatch <action>`

Response

<action>discrete	description
TULOP	If the detected S–bits do not match the G.707 specification (10–binary) declare a loss of pointer. This is the default.
IGNORE	Ignore an error if the S–bits do not match the specification.

Dependencies None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:CONFig:POINter:MISmatch IGNORE`

Response: `IGNORE`

Related Commands None

SENSe:DATA:TELecom:MEASure:CONFig:TRACe:MISmatch

This command enables or disables the trace mismatch.

Syntax `SENSe:DATA:TELecom:MEASure:CONfig:TRACe:MISmatch <status>`

Response

status	description
DISABLE	Turns mismatch off
ENABLE	Turns mismatch on

Dependencies None

Examples Set: `SENSE:DATA:TELECOM:MEASURE:CONFig:TRACe:MISmatch ENABLE`

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis Subsystem

This section describes the commands and queries that access B1, B2, B3, G.826 and M2101.1 verdict analysis. Figure 2–69 shows the hierarchy tree for this CTS 850 subsystem.

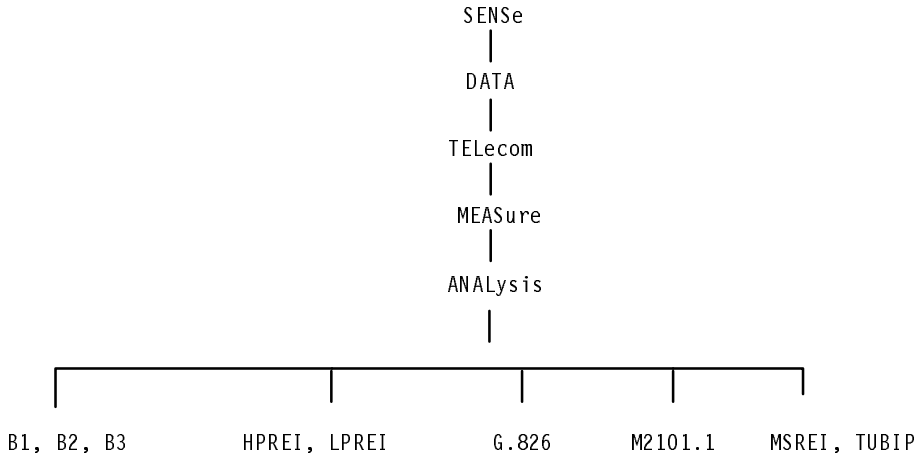


Figure 2–69: SENSe:DATA:TELecom:MEASure:ANALysis subsystems

SENSe:DATA:TELecom:MEASure:ANALysis:B1:VERDict

This command sets the Verdict Analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:B1:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:B1:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B1:VERDICT
ACCEPTABLE
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B1:VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B1:VERDICT
ACCEPTABLE
```

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis:B2:VERDict

This command sets the Verdict Analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:B2:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:B2:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B2:VERDICT
ACCEPTABLE
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B2:VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B2:VERDICT
ACCEPTABLE
```

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis:B3:VERDict

This command sets the Verdict Analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:B3:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:B3:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B3:VERDICT
ACCEPTABLE
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B3:VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B3:VERDICT
ACCEPTABLE
```

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis:G826:ALLOcation

This command sets or queries the numeric allocation percentage for the SDH section and path.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:G826:ALLOcation <number>
SENSe:DATA:TELecom:MEASure:ANALysis:G826:ALLOcation?
```

Parameters

<number>	description
a number in the range of 0.1 to 200	Sets the numeric allocation percentage

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:ALLOCATION 1.5E6`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G825:ALLOCATION?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:ALLOCATION 1.5E6`

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:ENABle

This command enables or disables the consideration of unavailable seconds in determining the test results for G.826 performance analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:ENABle <boolean>
SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:ENABle?
```

Parameters

<boolen>	description
ON/OFF or YES/NO or TRUE/FALSE	Enable or disable consideration of unavailable time in determining test outcome for G.826 performance analysis

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:ENABle ON`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G825:UAS:ENABle?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:ENABle ON`

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:LIMIT

This command set the numeric threshold value for unavailable seconds. If G.826 UAS threshold evaluation is enabled and the UAS count exceeds this value, test results are declared as a FAIL.

Note: The lower limit is ten seconds because that is the minimum time period that can be declared unavailable.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:LIMIT <number>
SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:LIMIT?
```

Parameters

<boolen>	description
0–1000000	Set the numeric threshold value for unavailable seconds at which to declare a failure

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:LIMIT 5`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G825:UAS:LIMIT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:LIMIT 5`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:HPREI:VERDict

This command sets the G826 HPREI Verdict Analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:HPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:HPREI:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:HPREI:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:HPREI:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:HPREI:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:LPREI:VERDict

This command sets the G826 LPREI Verdict Analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:LPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:LPREI:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:LPREI:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:LPREI:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:LPREI:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:MSREI:VERDict

This command sets the G826 MSREI Verdict Analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:MSREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:MSREI:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:MSREI:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:MSREI:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:MSREI:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:TUBIP:VERDict

This command sets the G826 TUBIP Verdict Analysis.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:TUBIP:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:TUBIP:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:TUBIP:VERDICT
ACCEPTABLE
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:TUBIP:VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:TUBIP:VERDICT
ACCEPTABLE
```

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:ALLOcation

This command sets or queries the numeric allocation percentage.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:ALLOcation <number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:ALLOcation?
```

Parameters

<number>	description
a number in the range of 0.1 to 200	Sets the numeric allocation percentage

Dependencies

None

Errors and Events

None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:ALLOCATION
 1.5E6
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:ALLOCATION?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:ALLOCATION
1.5E6
```

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B1:VERDict

This command sets the M2101 B1 Analysis Result.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B1:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:B1:VERDict?
```

Parameters

<status>	description
Acceptable	Analysis result is acceptable
Degraded	Analysis result is degraded
Unacceptable	Analysis result is unacceptable
Provisional	Analysis result is provisional
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B1:VERDICT
ACCEPTABLE
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:B1:VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B1:VERDICT
ACCEPTABLE
```

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B2:VERDict

This command sets the M2101 B2 Analysis Result.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B2:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:B2:VERDict?
```

Parameters

<status>	description
Acceptable	Analysis result is acceptable
Degraded	Analysis result is degraded
Unacceptable	Analysis result is unacceptable
Provisional	Analysis result is provisional
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B2:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:B2:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B2:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B3:VERDict

This command sets the M2101 B3 Analysis Result.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B3:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:B3:VERDict?
```

Parameters

<status>	description
Acceptable	Analysis result is acceptable
Degraded	Analysis result is degraded
Unacceptable	Analysis result is unacceptable
Provisional	Analysis result is provisional
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B3:VERDICT
ACCEPTABLE
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:B3:VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B3:VERDICT
ACCEPTABLE
```

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:HPREI:VERDict

This command sets the M2101 HPREI Analysis Result.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:HPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:HPREI:VERDict?
```

Parameters

<status>	description
Acceptable	Analysis result is acceptable
Degraded	Analysis result is degraded
Unacceptable	Analysis result is unacceptable
Provisional	Analysis result is provisional
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:HPREI:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:HPREI:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:HPREI:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:LPREI:VERDict

This command sets the M2101 LPREI Analysis Result.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:LPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:LPREI:VERDict?
```

Parameters

<status>	description
Acceptable	Analysis result is acceptable
Degraded	Analysis result is degraded
Unacceptable	Analysis result is unacceptable
Provisional	Analysis result is provisional
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:LPREI:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:LPREI:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:LPREI:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:MSREI:VERDict

This command sets the M2101 MSREI Analysis Result.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:MSREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:MSREI:VERDict?
```

Parameters

<status>	description
Acceptable	Analysis result is acceptable
Degraded	Analysis result is degraded
Unacceptable	Analysis result is unacceptable
Provisional	Analysis result is provisional
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:MSREI:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:MSREI:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:MSREI:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TUBIP:VERDict

This command sets the M2101 TUBIP Analysis Result.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TUBIP:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:TUBIP:VERDict?
```

Parameters

<status>	description
Acceptable	Analysis result is acceptable
Degraded	Analysis result is degraded
Unacceptable	Analysis result is unacceptable
Provisional	Analysis result is provisional
Nodata	Not enough data to decide

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TUBIP:VERDICT ACCEPTABLE`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:TUBIP:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TUBIP:VERDICT ACCEPTABLE`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:ESEConds:APOM

This command sets the numeric performance objective multiplier for errored seconds in the path layer.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:ESEConds:APOM
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:ESEConds:APOM?
```

Parameters

<number>	description
a number in the range of 0.0 to 200	Sets the numeric performance objective multiplier

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:ESEConds:APOM 1.5E6`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:ESEConds:APOM?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:ESEConds:APOM 1.5E6`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:SESeconds:APOM

This command sets the numeric performance objective multiplier for severely errored seconds in the path layer.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:SESeconds:APOM
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:SESeconds:APOM?
```

Parameters

<number>	description
a number in the range of 0.0 to 200	Sets the numeric performance objective multiplier

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:SESeconds:APOM 1.5E6`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:SESeconds:APOM?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:SESeconds:APOM 1.5E6`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:ESEConds:APOM

This command sets the numeric performance objective multiplier for errored seconds in the section layer.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:ESEConds:APOM
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:ESEConds:APOM?
```

Parameters

<number>	description
a number in the range of 0.0 to 200	Sets the numeric performance objective multiplier

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:ESEConds:APOM 1.5E6`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:ESEConds:APOM?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:ESEConds:APOM 1.5E6`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:SESeconds:APOM

This command sets the numeric performance objective multiplier for severely errored seconds in the section layer.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:SESeconds:APOM
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:SESeconds:APOM?
```

Parameters

<number>	description
a number in the range of 0.0 to 200	Sets the numeric performance objective multiplier

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:SESeconds:APOM 1.5E6`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:SESeconds:APOM?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:SESeconds:APOM 1.5E6`

Related Commands

None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TEST:TYPE

This command sets the M2101 Test Type.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TEST:TYPE <test type>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:TEST:TYPE?
```

Parameters

<test type>	description
BIS	Bring into service
MAINT	Maintenance
PAREpair	Performance after repair
MANual	Manual

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TEST:TYPE BIS`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:TEST:TYPE?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TEST:TYPE BIS`

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:ENABle

This command enables or disables the consideration of unavailable seconds in determining the test results for M.2101.1 performance analysis. The ITU–T standard has not yet been determined about what to do with periods of unavailability. This command lets the user decide what to do with periods of unavailability.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:ENABle
<boolean>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:ENABle?
```

Parameters

<boolen>	description
ON/OFF or YES/NO or TRUE/FALSE	Enable or disable consideration of unavailable time in determining test outcome

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:ENABle YES`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:ENABle?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:ENABle YES`

Related Commands None

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:LIMIT

This command set the numeric threshold value for unavailable seconds. If M.2101.1 UAS threshold evaluation is enabled and the UAS count exceeds this value, test results are declared as a UNACCEPTABLE.

Note: The lower limit is ten seconds because that is the minimum time period that can be declared unavailable.

Syntax

```
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:LIMIT <number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:LIMIT?
```

Parameters

<boolen>	description
0–1000000	Set the numeric threshold value for unavailable seconds at which to declare a failure

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:LIMIT 5`

Query: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:LIMIT?`

Response: `SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:LIMIT 5`

Related Commands None

SENSe:DATA:TELecom:MEASure:STESts Subsystem

This section describes each of the commands and queries that allow you to apply predefined criteria to test results and determine if the tests passed or failed. Figure 2–71 shows the hierarchy tree for this CTS 850 subsystem.

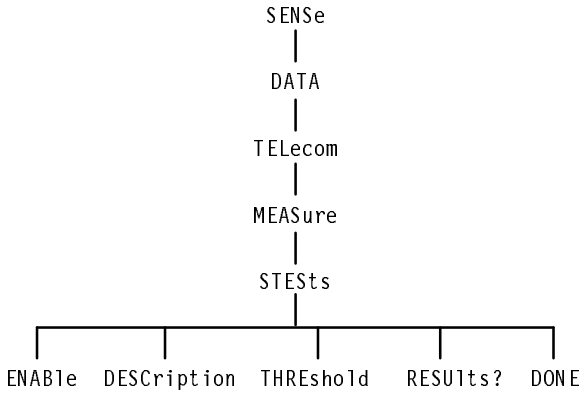


Figure 2–71: SENSe:DATA:TELecom:MEASure:STESts subsystem

SENSe:DATA:TELecom:MEASure:STESts:ENABle

This command sets or queries the evaluation of pass/fail tests. The enable will revert to OFF (0) after the pass/fail test is evaluated.

Syntax

```
SENSe:DATA:TELecom:MEASure:STESts:ENABle <stests enable>
SENSe:DATA:TELecom:MEASure:STESts:ENABle?
```

Parameters

<stests enable> (boolean)	Description
OFF or 0	No evaluation (default)
ON or 1	Measurements evaluated

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:STESTS:ENABLE ON`

Query: `SENSE:DATA:TELECOM:MEASURE:STESTS:ENABLE?`

Response: `1`

Related Commands SENSe:DATA:TELecom:MEASure:STESTs:THREshold

SENSe:DATA:TELecom:MEASure:STESts:DESCription

This command sets the pass/fail test description. This description is stored on the disk with the pass/fail test. The start and end prompts appear in the SAVE PASS/FAIL TESTS menu.

Syntax

```
SENSe:DATA:TELecom:MEASure:STESts:DESCription <descr>,
<start prompt>,<end prompt>
SENSe:DATA:TELecom:MEASure:STESts:DESCription?
```

Parameters

<description> (string)	Description
An ASCII string, maximum length of 25 bytes	The pass/fail test description
<start prompt> (string)	**Description**
An ASCII string, maximum length of 75 bytes	Text to prompt the operator at the start of the test
<end prompt> (string)	**Description**
An ASCII string, maximum length of 75 bytes	Text to prompt the operator at the end of the test

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:STESTS:DESCRIPTION
"REMEMBER TO DISCONNECT FROM EQUIPMENT"
```

Query: `SENSE:DATA:TELECOM:MEASURE:STESTS:DESCRIPTION?`

Response: `"CONNECT TO EQUIPMENT"`

Related Commands SENSe:DATA:TELecom:MEASure:STESTs:THREshold

SENSe:DATA:TELecom:MEASure:STESts:THREshold

This command sets or queries the pass/fail test criteria. The pass/fail result is determined by applying the criteria given by this command after the current test is completed. You can set up a maximum of four sets of pass/fail criteria.

Syntax

```
SENSe:DATA:TELecom:MEASure:STESts:THREshold <criteria number>,
<type>,<source>,<threshold>
SENSe:DATA:TELecom:MEASure:STESts:THREshold?
```

Parameters

<criteria number> (discrete)	Description
1	First set of pass/fail criteria
2	Second set of pass/fail criteria
3	Third set of pass/fail criteria
4	Fourth set of pass/fail criteria
<type> (discrete)	**Description**
NONE	No pass/fail criteria
ALARm	Alarms are the pass/fail criteria
FAILure	Failures are the pass/fail criteria
ERATio	Bit error ratio is the pass/fail criterion
ECOUnt	Error count is the pass/fail criterion
ESEConds	Errored seconds are the pass/fail criteria
POINter	Pointer movements are the pass/fail criteria
JITter	Jitter is the pass/fail criteria

if <type> = NONE

<source> (discrete)	Description
NONE	No pass/fail criteria
<threshold> (discrete)	**Description**
0	No threshold

if <type> = ALARm

<source> (discrete)	Description
ANY	Any alarm
LAIS	MS alarm indication signal
PAIS	Path AIS
VTAIS	TU AIS (Add/Drop Test Option Only)
VTFErf	TU FERF (Add/Drop Test Option Only)
AIS	PDH AIS (Add/Drop Test Option Only)
RAI	PDH RAI (Add/Drop Test Option Only)
<threshold> (discrete)	**Description**
DETected	Threshold is detected
NDETected	Threshold is not detected

if <type> = FAILure

<source> (discrete)	Description
LOSignal	Loss of Signal
LOFrame	Loss of Frame
LOPointer	AU Loss of Pointer
LOPS	PDH loss of pattern sync (Add/Drop Test Option Only)
VTLOPointer	TU Loss of Pointer (Add/Drop Test Option Only)
VTLOM	TU Loss of Multiframe (Add/Drop Test Option Only)
<threshold> (discrete)	**Description**
DETected	Threshold is detected
NDETected	Threshold is not detected

if <type> = ERATio, ECOUnt, or ESEConds

<source> (discrete)	Description
ANY	Any of the errors below
SCV	B1 error

(continued on next page)

if <type> = ERATio, ECOUnt, or ESEConds

<source> (discrete)	Description
LCV	B2 error
PCV	B3 error
BIT	BIT error
CRC	Cyclic redundancy check (2 Mb/s PCM30CRC or PCM31CRC only)
VTBIP	TU BIP (Add/Drop Test Option Only)
VTFEBe	TU far end block error (Add/Drop Test Option Only)
<threshold> (NR3-numeric)	**Description**
Any number	The test will fail for any level greater than this value

if <type> = POINter

<source> (discrete)	Description
SPENdf	AU new data flag
SPEJust	AU pointer justification
VTNdf	TU new data flag (Add/Drop Test Option Only)
VTJUst	TU pointer justification (Add/Drop Test Option Only)
<threshold> (NR3-numeric)	**Description**
Any number	The test will fail for any level greater than this value

if <type> = JITter

<source> (discrete)	Description
HSEConds	Jitter hit seconds
<threshold> (NR3-numeric)	**Description**
Any number	The test will fail for any level greater than this value

Dependencies SENSe:DATA:TELecom:STESts:ENABle must be set to ON for this command to apply.

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:STESTS:THRESHOLD 1,ALARM,ANY,DETECTED`

Query: `SENSE:DATA:TELECOM:MEASURE:STESTS:THRESHOLD? 1`

Response: `ALARM,ANY,DETECTED`

Related Commands SENSe:DATA:TELecom:STESts:ENABle

SENSe:DATA:TELecom:MEASure:STESts:RESUlts?

This query returns the results of applying the pass/fail criteria to the pass/fail test measurements.

Syntax `SENSe:DATA:TELecom:MEASure:STESts:RESUlts?`

Response

<test results> (discrete)	Description
NONE	Test is still running or no pass/fail test measurements have been requested
PASSED	Test passed
FAILED	Test failed

Dependencies The test must be completed for the results to be valid.

Errors and Events 200, “Execution error; Results not available”

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:STESTS:RESULTS?`

Response: `PASSED`

Related Commands SENSe:DATA:TELecom:MEASure:STESts:THREshold

SENSe:DATA:TELecom:MEASure:STESts:DONE

This command sets or queries what action the instrument takes when the pass/fail test calculations complete.

***NOTE**. The pass/fail test results are written to the file name specified by the MMEMory:STORe:TESTs command. So, if you run consecutive pass/fail tests, remember to send the MMEMory:STORe:TESTs command with unique file names in between each pass/fail test run so the pass/fail test results files are not overwritten.*

Syntax

```
SENSe:DATA:TELecom:MEASure:STESts:DONE <action>
SENSe:DATA:TELecom:MEASure:STESts:DONE?
```

Parameters

<action> (discrete)	Description
NONE	Take no action when pass/fail tests calculations complete
PRINT	Print the pass/fail tests results
DISK	Save the pass/fail tests results to disk; the file name is specified by the MMEMory:STORe:TESTs command

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:STESTS:DONE NONE`

Query: `SENSE:DATA:TELECOM:MEASURE:STESTS:DONE?`

Response: `DISK`

Related Commands

SENSe:DATA:TELecom:MEASure:STESTs:ENABle
SENSe:DATA:TELecom:MEASure:STESTs:THREshold
MMEMory:STORe:TESTs

SENSe:DATA:TELecom:AUTOscan Subsystem

This section describes the command that automatically configures the receiver to the attached signal on any of the input connectors. Figure 2–73 shows the hierarchy tree for this CTS 850 subsystem.

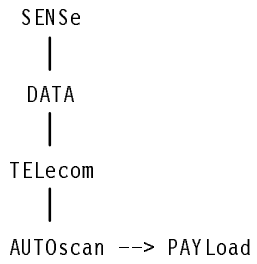


Figure 2–73: SENSe:DATA:TELecom:AUTOscan subsystem

SENSe:DATA:TELecom:AUTOscan

This command starts the autoscan function which sets up the receiver based on the connected signal. The Operation Complete bit is set when this command has completed. Use the SYSTem:ERRor? query to see if the autoscan completed successfully.

Note: The user must wait for the Autoscan command to finish before inputing any further commands or queries. The user must issue a *OPC and wait for the response following the Autoscan command.

Syntax `SENSe:DATA:TELecom:AUTOscan`

Parameters None

Dependencies A valid signal should be connected.

Errors and Events
361, “Autoscan failed; Instrument returned to previous setup”
361, “Autoscan failed; Autoscan already in progress”
402, “Operation complete; Autoscan complete”
200, “Execution error; Autoscan incomplete — no signals connected”

Examples `SENSE:DATA:TELECOM:AUTOSCAN`

Related Commands SYSTem:ERRor?

SENSe:DATA:TELecom:AUTOscan:PAYLoad

This command starts the scan for payload identification.

Syntax `SENSe:DATA:TELecom:AUTOscan:PAYLoad`

Parameters None

Dependencies None

Examples `SENSE:DATA:TELECOM:AUTOscan:PAYLoad`

Related Commands None

SENSe:DATA:TELecom:TRIButary Subsystem

This section describes the commands and queries that allow you to view a dropped tributary signal. Figure 2–75 shows the hierarchy tree for this CTS 850 subsystem.

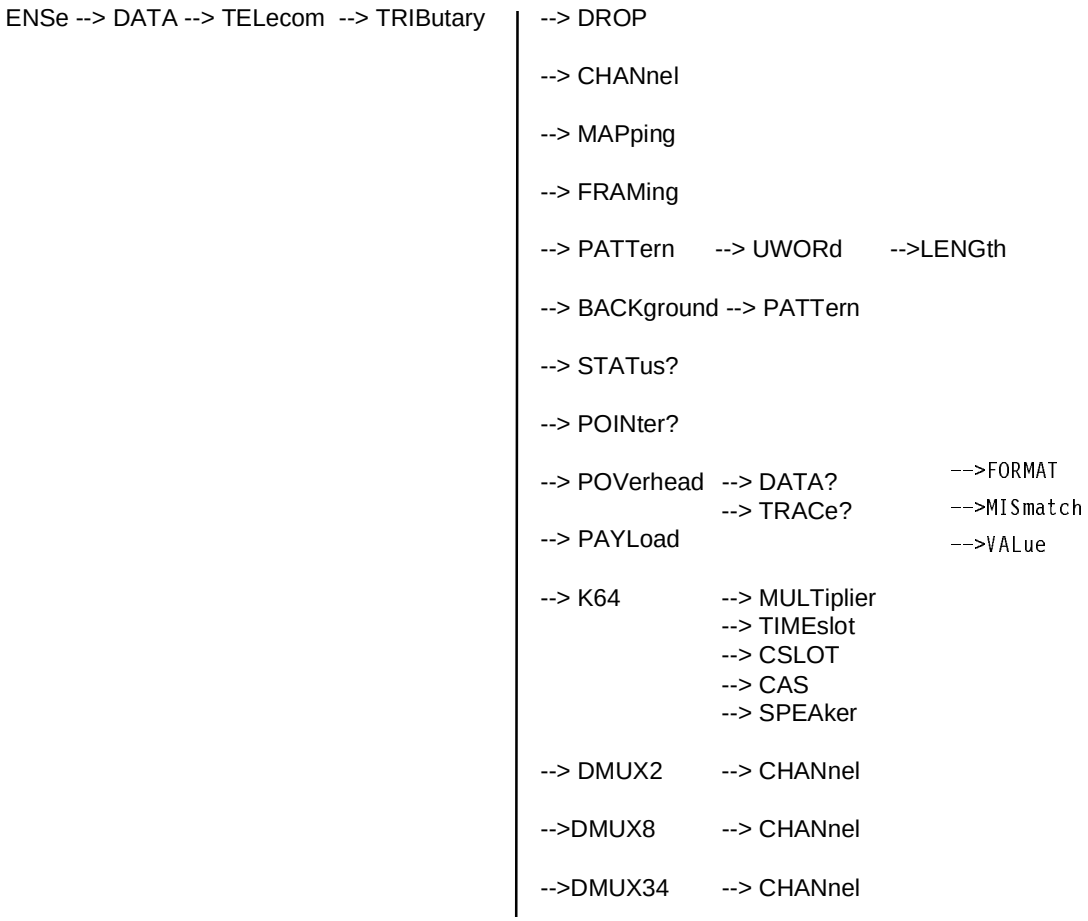


Figure 2–75: SENSe:DATA:TELecom:TRIButary subsystem

SENSe:DATA:TELecom:TRIButary:DROP

This command sets or queries the tributary drop capability. If enabled, the demapped signal is available on the output connector specified by mapping.

Syntax

```
SENSe:DATA:TELecom:TRIButary:DROP <trib drop>
SENSe:DATA:TELecom:TRIButary:DROP?
```

Parameters

<trib drop> (boolean)	Description
OFF or 0	Tributary signal not available on output connector (default)
ON or 1	Tributary signal available on output connector

Dependencies

SENSe:DATA:TELecom:SOURce must be set to INPUT1.
SENSe:DATA:TELecom:MAPPing must be set to TRIButary.

Errors and Events

221, “Settings conflict; Instrument unable to drop signal while transmitting current rate”
221, “Settings conflict”

Examples

Set: `SENSE:DATA:TELECOM:TRIBUTARY:DROP ON`

Query: `SENSE:DATA:TELECOM:TRIBUTARY:DROP?`

Response: `0`

Related Commands

SOURce:DATA:TELecom:SOURce
SENSe:DATA:TELecom:SOURce
SENSe:DATA:TELecom:MAPPing

SENSe:DATA:TELecom:TRIButary:CHANnel

This command sets or queries the TUASYNC channel. Use the SENSe:DATA:TELecom:TRIButary:MAPPing command to set the tributary demapping.

Syntax

```
SENSe:DATA:TELecom:TRIButary:CHANnel <trib channel>
SENSe:DATA:TELecom:TRIButary:CHANnel?
```

Parameters

<trib channel> (NR1-numeric)	Description
Any integer between 1 and 63	TUASYNC mapping for the active channel (default = 1)
Any integer between 1 and 3	TU3 mapping for the active channel
1	M140 mapping for the active channel

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TRIBUTARY:CHANNEL 1`

Query: `SENSE:DATA:TELECOM:TRIBUTARY:CHANNEL?`

Response: `24`

Related Commands

SENSe:DATA:TELecom:TRIButary:MAPPing

SENSe:DATA:TELecom:TRIButary:MAPPing

This command sets or queries the tributary payload demapping. When you are actively mapping and demapping a tributary signal, the SOURce:DATA:TELecom:TRIButary:MAPPing and SENSe:DATA:TELecom:TRIButary:MAPPing functions are coupled; a change to one causes the same change to the other.

Syntax

```
SENSe:DATA:TELecom:TRIButary:MAPPing <trib mapping>
SENSe:DATA:TELecom:TRIButary:MAPPing?
```

Parameters

<trib mapping> (discrete)	Description
TUASync	Demapped 2 Mb/s signal into TU-12 floating async (default)
TU3	Demapped 34 Mb/s signal
M140	Demapped 140 Mb/s signal

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TRIBUTARY:MAPPING TUASYNC`

Query: `SENSE:DATA:TELECOM:TRIBUTARY:MAPPING?`

Response: `TU3`

Related Commands

SOURce:DATA:TELecom:TRIButary:MAPPing

SENSe:DATA:TELecom:TRIButary:FRAMing

This command sets or queries the framing of the received tributary signal.

Syntax

```
SENSe:DATA:TELecom:TRIButary:FRAMing <trib framing>
SENSe:DATA:TELecom:TRIButary:FRAMing?
```

Parameters

<trib framing> (discrete)	Description
UNFRamed	No framing (default)
PCM30	2 Mb/s, PCM, 30 channels, no CRC checking
PCM31	2 Mb/s, PCM, 31 channels, no CRC checking
PCM30CRC	2 Mb/s, PCM, 30 channels, with CRC checking
PCM31CRC	2 Mb/s, PCM 31 channels, with CRC checking
FRAMED	34 Mb/s or 140 Mb/s framing

Dependencies

For DS3_DEMUX mapping only CBIT and M13 are allowed

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TRIBUTARY:FRAMING UNFRAMED`

Query: `SENSE:DATA:TELECOM:TRIBUTARY:FRAMING?`

Response: `PCM31`

Related Commands

None

SENSe:DATA:TELecom:TRIButary:PATTern

This command sets or queries the internally generated pattern that is placed in the tributary payload.

Syntax

```
SENSe:DATA:TELecom:TRIButary:PATTern <trib pattern>
SENSe:DATA:TELecom:TRIButary:PATTern?
```

Parameters

<trib pattern> (discrete)	Description
PRBS23	A pseudo-random binary sequence of length $2^{23}-1$ is placed in the tributary payload (default)
PRBS15	A pseudo-random binary sequence of length $2^{15}-1$ is placed in the tributary payload
PRBS20	A pseudo-random binary sequence of length $2^{20}-1$ is placed in the tributary payload
PRBS11	A pseudo-random binary sequence of length $2^{11}-1$ is placed in the tributary payload
PRBS9	A pseudo-random binary sequence of length $2^{9}-1$ is placed in the tributary payload
AZEROs	All zeros are placed in the payload
AONEs	All ones are placed in the payload
UWORd	A user-defined pattern is placed in the payload
UNKNown	Unknown pattern
FIXED_1_8	1 bit in 8 (Add/Drop Test Option Only)
AUDIO	1020 Hz audio tone (64k only)

Dependencies

None

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TRIBUTARY:PATTERN PRBS15`

Query: `SENSE:DATA:TELECOM:TRIBUTARY:PATTERN?`

Response: `PRBS20`

Related Commands

None

SENSe:DATA:TELecom:TRIButary:PATTern:UWORd

This command sets or queries the user-defined pattern that is placed in the tributary payload.

Syntax

```
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd <trib user pattern>
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd?
```

Parameters

<trib user pattern> (hexadecimal)	Description
Any 8, 16, or 24 bit hexadecimal number in the range #H00 to #HFFFFFF	Repeating pattern is placed in the tributary payload (default = #H00)

Dependencies

SENSe:DATA:TELecom:TRIButary:PATTern must be set to UWORd for this command to apply. Use the SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth command to set the length of the repeating pattern.

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD #HAA5500`

Query: `SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD?`

Response: `#HAA5500`

Related Commands

SENSe:DATA:TELecom:TRIButary:PATTern
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth

SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENGth

This command sets or queries the number of bytes of the user-defined pattern that are repeated in the tributary payload.

Syntax

```
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENGth <trib user pattern length>
```

Parameters

<trib user pattern length> (NR1-numeric)	Description
Any integer in the range 1 to 3	Number of bytes of user-defined pattern that are repeated in the tributary payload (default = 1)

Dependencies

SENSe:DATA:TELecom:TRIButary:PATTern must be set to UWORd for this command to apply. Use the SENSe:DATA:TELecom:TRIButary:PATTern:UWORd command to set the repeating pattern.

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD:LENGTH 3`

Query: `SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD:LENGTH?`

Response: `2`

Related Commands

SENSe:DATA:TELecom:TRIButary:PATTern
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd

SENSe:DATA:TELecom:TRIButary:POINter?

This query returns the current tributary pointer value.

Syntax SENSe:DATA:TELecom:TRIButary:POINter?

Response

<trib pointer> (NR1-numeric)	Description
Any integer in the range 0 to 1023	Tributary pointer value for TUASYNC mapping (default = 105, illegal > 139) Tributary pointer value for TU3 mapping (default = 595, illegal > 764)

Dependencies None

Errors and Events None

Examples Query: SENSE:DATA:TELECOM:TRIBUTARY:POINTER?

Response: 12

Related Commands None

SENSe:DATA:TELecom:TRIButary:STATus?

This query returns the status of the received tributary signal. The returned status is not an accumulated status; the response reflects only the status of the tributary signal at the time the query is sent.

Syntax SENSe:DATA:TELecom:TRIButary:STATus?

Response

<decimal value> (NR1-numeric)	bit	definition
1	0	INPUT2/INPUT3 LOS
2	1	INPUT2/INPUT3 LOF
4	2	Unused
8	3	Unused
16	4	TU LOP
32	5	TU AIS
64	6	2 Mb/s, 34 Mb/s, 140 Mb/s AIS
128	7	2 Mb/s, 34 Mb/s, 140 Mb/s RAI
256	8	Frame error
512	9	2 Mb/s, 34 Mb/s, 140 Mb/s error
1024	10	TU FERF
2048	11	TU pointer adjustment
4096	12	TU NDF
8192	13	Pattern lock
16384	14	Not used
32768	15	TU LOM

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TRIBUTARY:STATUS?`

Response: `32`

Related Commands

SENSe:DATA:TELecom:TRIButary:STATus

SENSe:DATA:TELecom:TRIButary:POVerhead:DATA?

This query returns the value in the specified TU3 or TU12 path overhead byte.

Syntax

```
SENSe:DATA:TELecom:TRIButary:POVerhead:DATA? <byte name>
```

Parameters

<byte> (discrete)	Description
C2	Signal label (TU3)
F2	User channel (TU3)
H4	Indicator (TU3)
F3	Growth bytes (TU3)
K3	(TU3)
K4	(TU12)
N1	(TU3)
N2	(TU12)
V5	(TU12)

Response

<value> (NR1-numeric)	Description
Any integer in the range 0 to 255	The selected byte is set to this value

Dependencies

Use the SENSe:DATA:TELecom:TRIButary:CHANNel command to specify which path trace to query. INITiate and TRIGGer:IMMediate affect these bytes.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TRIBUTARY:POVERHEAD:DATA? V5`

Response: `123`

Related Commands

INITiate
TRIGger:IMMediate

SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe?

This query returns the current tributary path trace string that repeats in the J1 byte, for TU3 mapping, and the J2 byte, for TU12 mapping, as a 16 character repeating sequence. The response is created in the following way: the first character after a null is read as the first byte and is followed by 15 J1/J2 bytes from consecutive frames.

Syntax

```
SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe?
```

Response

<path trace> (string)	Description
A 16 character string	The current tributary path trace string

Dependencies

The SENSe:DATA:TELecom:CHANnel command specifies which path trace to query.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TRIBUTARY:POVERHEAD:TRACE?`

Response: `"TEK CTS750"`

Related Commands

SENSe:DATA:TELecom:TRIButary:POVerhead:DATA?
INITiate
TRIGger:IMMediate

SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT

This command sets the type of J1 string for AU–N J1 trace strings.

Syntax `SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT <format>`

Parameters

format	description
LONG	64 J1 byte trace
SHORT	16 J1 byte trace

Dependencies None

Examples SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT LONG

Related Commands SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT

SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch

This command sets the state of mismatch reporting for AU–N J1 trace strings.

Syntax `SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch <state>`

Parameters

format	description
ON	Sets the state of reporting J1 trace mismatch
OFF	Turns off the state of reporting of J1 trace mismatch

Dependencies None

Examples SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch OFF

Related Commands SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch

SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:VALue “string”

This command sets the string to be checked for mismatch as J0 trace info.

Syntax `SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:VALue "string"`

Parameters

string	description
15 byte string	This is the string to be checked for mismatch as J0 trace

Dependencies None

Examples SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:VALue “J0string”

Related Commands SENSe:DATA:TELecom:POVerhead:TRACe:VALue

Sense:DATA:TELecom:TRIButary:PAYLoad

This command specifies the tributary payload rate. This rate can be different from the receive or demapping rate, in which case it sets the the final analyis rate. TRIB (the default) will set the payload rate to the demapping or receive rate, whichever is appropriate.

Syntax

```
Sense:DATA:TELecom:TRIButary:PAYLoad <payload rate>
Sense:DATA:TELecom:TRIButary:PAYLoad?
```

Parameters

<payload rate> (discrete)	Description
TRIB	default – PDH receive or demapping rate
M140	140 Mb/s
M45	45 Mb/s base transmit rate
M34	34 Mb/s base transmit rate
M8	8 Mb/s base transmit rate
M2	2 Mb/s base transmit rate
K64	N x 64k base transmit rate

Dependencies

The payload rate must be less than or equal to the receive rate.

Errors and Events

None

Examples

Set: `Sense:DATA:TELECOM:TRIBUTARY:PAYLoad M34`
Query: `Sense:DATA:TELECOM:TRIBUTARY:PAYLoad?`

Response: M34

Related Commands

SOURce:DATA:TELecom:TRIButary:PAYload
SENSe:DATA:TELecom:TRIButary:DMUX2
SENSe:DATA:TELecom:TRIButary:DMUX8
SENSe:DATA:TELecom:TRIButary:DMUX34

Sense:DATA:TELecom:TRIButary:K64:MULTIplier

This command sets the number of contiguous 64k timeslots forming an Nx64k payload. To set up a single active 64k channel, the value should be 1.

Syntax

```
Sense:DATA:TELecom:TRIButary:K64:MULTIplier <multiplier>
Sense:DATA:TELecom:TRIButary:K64:MULTIplier?
```

Parameters

<multipler>	Valid when
1..30	CAS enabled
1..31	No CAS

Dependencies

Allowable range on 2 Mb/s framing. For PCM30 or PCM30 CRC (with CAS), range is 1–30. For PCM31 or PCM31 CRC (without CAS), range is 1–31.

Errors and Events

None

Examples

Set: `Sense:DATA:TELECOM:TRIBUTARY:K64:MULTiplier? 14`
Query: `Sense:DATA:TELECOM:TRIBUTARY:K64:MULTiplier?`

Response: 14

Related Commands

SOURce:DATA:TELecom:TRIButary:K64:MULTiplier
SENSe:DATA:TELecom:TRIButary:FRAMing

Sense:DATA:TELecom:TRIButary:K64:TIMEslot

This command sets the starting timeslot for an Nx64k payload. This commands sets the active timeslot if the current configuration is 64k.

Syntax

```
Sense:DATA:TELecom:TRIButary:K64:timeslot <starting timeslot>
Sense:DATA:TELecom:TRIButary:K64:timeslot?
```

Parameters

<starting timeslot>	Description
1..32	Starting timeslot must be low enough to allow N contiguous timeslots (TS16 excepted)
16 is invalid if CAS enabled	

Dependencies None

Errors and Events None

Examples

Set: `Sense:DATA:TELECOM:TRIBUTARY:K64:TIMEslot? 12`
Query: `Sense:DATA:TELECOM:TRIBUTARY:K64:TIMEslot?`

Response: 12

Related Commands

SOURce:DATA:TELecom:TRIButary:K64:TIMEslot
SENSe:DATA:TELecom:TRIButary:K64:MULTiplier

Sense:DATA:TELecom:TRIButary:K64:CSLOT

This command selects a timeslot for monitoring the Channel Associated Signaling or speaker data.

Syntax

```
Sense:DATA:TELecom:TRIButary:K64:CSLOT
Sense:DATA:TELecom:TRIButary:K64:CSLOT?
```

Parameters

<slot>	Description
1..31	Slot can be any valid timeslot in the 2 MB/s signal

Dependencies None

Errors and Events None

Examples

Set: `Sense:DATA:TELECOM:TRIBUTARY:K64:CSLOT`
Query: `Sense:DATA:TELECOM:TRIBUTARY:K64:CSLOT?`

Response: Current CAS data timeslot

Related Commands

SOURce:DATA:TELecom:TRIButary:K64:CSLOT

Sense:DATA:TELecom:TRIButary:K64:CAS

This query returns the received Channel Associated Signaling data value in the selected timeslot. The response will show as a binary value in the form #Babcd where abcd are the CAS bit values.

Syntax

```
Sense:DATA:TELecom:TRIButary:K64:CAS?
```

Parameters

<value>	Description

Dependencies None

Errors and Events None

Examples Query: `Sense:DATA:TELECOM:TRIBUTARY:K64:cas?`

Response: CAS data value for selected timeslot

Related Commands SENSe:DATA:TELecom:TRIButary:K64:CAS

Sense:DATA:TELecom:TRIButary:K64:SPEAker

This command sets the output volume for the speaker on the selected timeslot.

Syntax

```
Sense:DATA:TELecom:TRIButary:K64:SPEAker <volume>
Sense:DATA:TELecom:TRIButary:K64:SPEAker?
```

Parameters

<volume> discrete	Description
OFF	quiet, no volume
LOW	low volume
MED	Somewhat louder than low
HIGH	LOUD

Dependencies None

Errors and Events None

Examples

Set: `Sense:DATA:TELECOM:TRIBUTARY:K64:SPEAker LOW`
Query: `Sense:DATA:TELECOM:TRIBUTARY:K64:SPEAker?`

Response: LOW

Related Commands None

Sense:DATA:TELecom:TRIButary:DMUX2:CHANnel

This command selects an active 2 Mb/s channel from the 8 Mb/s demux. Other channels are ignored.

Syntax

```
Sense:DATA:TELecom:TRIButary:DMUX2:CHANnel <channel>
Sense:DATA:TELecom:TRIButary:DMUX2:CHANnel?
```

Parameters

<channel>	Description
CHAN1, CHAN2, CHAN3, CHAN4	Selects a single active channel from the four possible 2 Mb/s channels demuxed from 8 Mb/s. Other channels are not analyzed.

Dependencies None

Errors and Events None

Examples

Set: `SENSe:DATA:TELecom:TRIButary:DMUX2:CHANnel 3`
Query: `SENSe:DATA:TELecom:TRIButary:DMUX2:CHANnel?`

Response: 3

Related Commands SOURce:DATA:TELecom:TRIButary:DMUX2:CHANnel
SENSe:DATA:TELecom:TRIbutary:PAYLoad

Sense:DATA:TELecom:TRIButary:DMUX8:CHANnel

This command selects an active 8 Mb/s channel from the 34 Mb/s demux. Other channels are ignored.

Syntax

```
Sense:DATA:TELecom:TRIButary:DMUX8:CHANnel <channel>
Sense:DATA:TELecom:TRIButary:DMUX8:CHANnel?
```

Parameters

<channel>	Description
CHAN1, CHAN2, CHAN3, CHAN4	Selects a single active channel from the four possible 8 Mb/s channels demuxed from 34 Mb/s. Other channels are not analyzed.

Dependencies

None

Errors and Events

None

Examples

Set: `Sense:DATA:TELECOM:TRIBUTARY:DMUX8:CHANnel 2`
Query: `Sense:DATA:TELECOM:TRIBUTARY:DMUX8:CHANnel?`

Response: 2

Related Commands

SOURce:DATA:TELecom:TRIButary:DMUX8:CHANnel
SENSe:DATA:TELecom:TRIbutary:PAYLoad

Sense:DATA:TELecom:TRIButary:DMUX34:channel

This command selects an active 34 Mb/s channel from the 140 Mb/s demux. Other channels are ignored.

Syntax

```
Sense:DATA:TELecom:TRIButary:DMUX34:CHANnel <channel>
Sense:DATA:TELecom:TRIButary:DMUX34:CHANnel?
```

Parameters

<channel>	Description
CHAN1, CHAN2, CHAN3, CHAN4	Selects a single active channe from the four possible 34 Mb/s channels demuxed from 140 Mb/s. Other channels are not analyzed.

Dependencies

None

Errors and Events

None

Examples

Set: `Sense:DATA:TELECOM:TRIBUTARY:DMUX34:CHANnel 2`
Query: `Sense:DATA:TELECOM:TRIBUTARY:DMUX34:CHANnel?`

Response: 2

Related Commands

SOURce:DATA:TELecom:TRIButary:DMUX34:CHANnel
SENSe:DATA:TELecom:TRIbutary:PAYLoad

SENSe:DATA:TELecom:MEASure:TRIButary Subsystem

This section describes the commands and queries that access tributary error, alarm, failure, and pointer measurements for current and previous tests. Figures 2–77, 2–78, and 2–79 show the hierarchy trees for this CTS 850 subsystem.

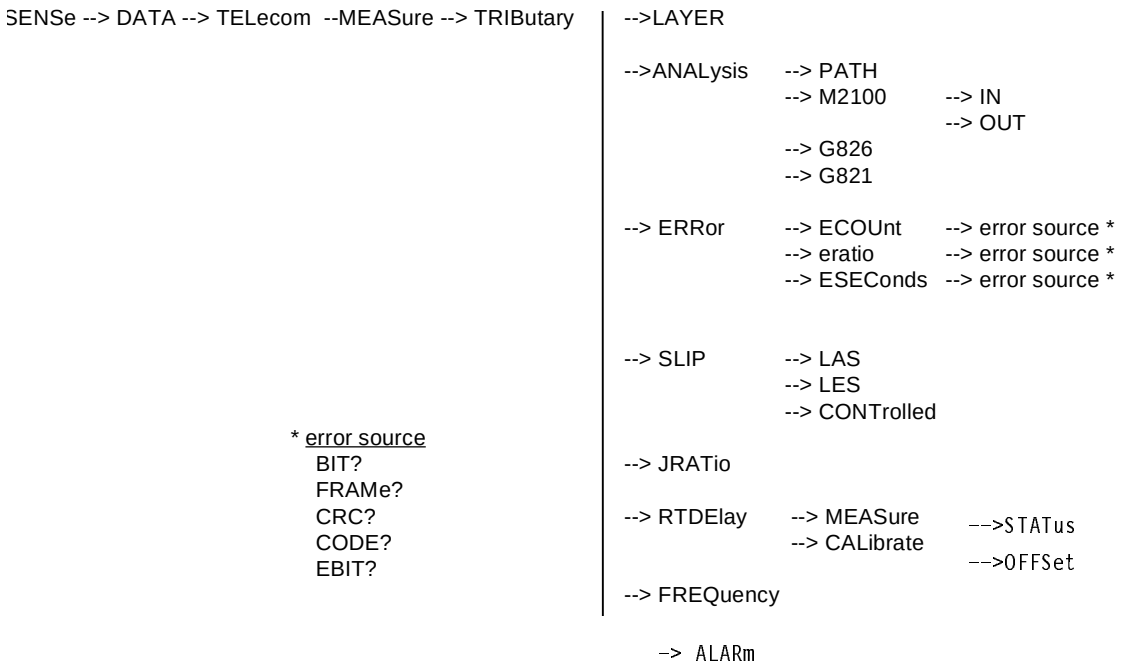


Figure 2–77: SENSe:DATA:TELecom:MEASure:TRIButary subsystem (PDH)

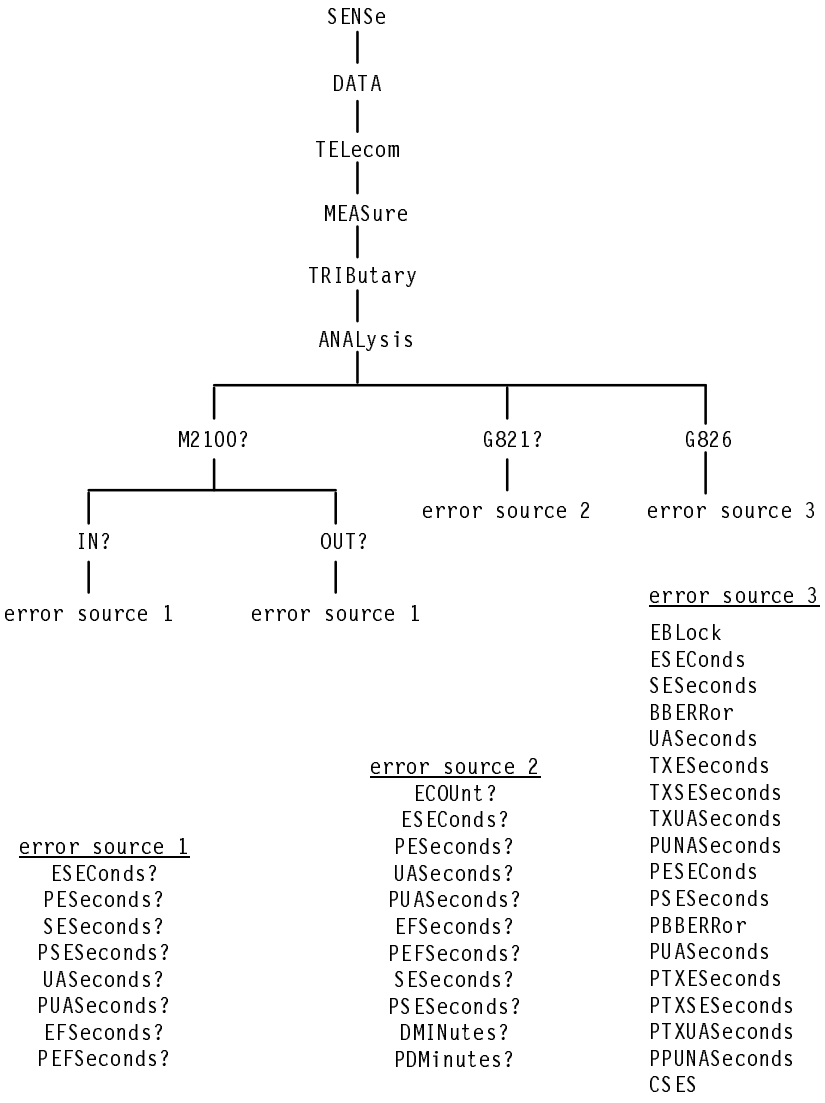


Figure 2–78: SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis subsystem (PDH)

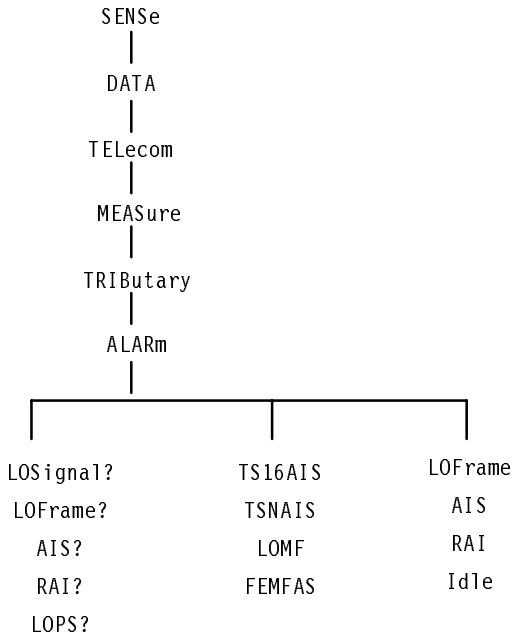


Figure 2–79: SENSe:DATA:TELecom:MEASure:TRIButary:ALARm subsystems (PDH)

A variety of tributary error, alarm, and failure measurements are reported through this subsystem. Table 2–53 shows how error, alarm, and failure measurements are calculated. Tables 2–54 and 2–55 show how the analysis measurements are calculated. These calculations are based on ITU–T G.821 specifications.

Table 2–53: How error and alarm measurements are calculated

Type of Measurement	Method of Calculation
Error count	Number of bit errors that were errored in the signal
Bit Error Ratio (BER)	Ratio of error count to the total number of received bits
Errored seconds	Number of seconds that had any error counts
Alarms	Number of one-second intervals that contained a specific alarm such as Loss of Signal (LOS) and Loss of Frame (LOF)

Table 2–54: How analysis measurements are calculated

Type of Measurement	Method of Calculation
Error count	Number of bit errors not occurring during periods of unavailability (see Unavailable seconds)
Errored seconds	Total number of seconds that had any error count; does not include any period of unavailability (see Unavailable seconds)
Degraded minutes	Number of minutes that had a bit error ratio (BER) in the range $1x10^{-6}$ to $1x10^{-3}$; degraded minutes do not accumulate during periods of unavailability
Severely errored seconds	Number of seconds with more than N errors (see Table 2–55)
Unavailable seconds	Number of seconds that the signal had too many errors to be available for use; unavailability starts at the onset of ten contiguous severely errored seconds
Error free seconds	Number of seconds that contained zero errors

Table 2–55: Value of N for Severely Errored Seconds analysis measurements (PDH)

Tributary Rate	Type of Error	N
2 Mb/s	Bit error	> 1E–3
	Frame error	28
	CRC error	830
34 Mb/s	Bit error	> 1E–3
	Frame error	223
140 Mb/s	Bit error	> 1E–3
	Frame error	568

Some of queries in this section have their information presented in a way that is different from queries in the rest of the manual. The syntax and examples are in table format. Figure 2–80 shows you how to read the Syntax Tables in this section. Follow the step numbers to create any query. Table 2–56 explains the terms used in the SENSe:DATA:TELecom:MEASure Syntax Tables.

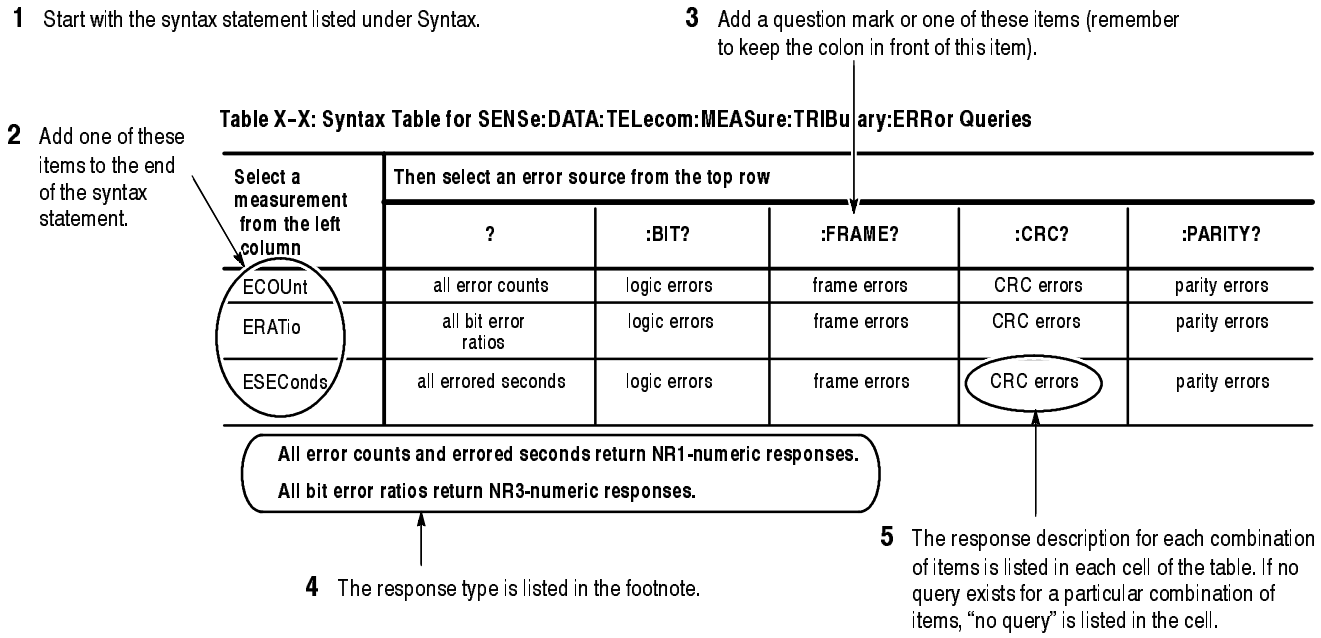


Figure 2–80: How to read the syntax tables in the SENSe:DATA:TELecom:MEASure:TRIButary subsystem section

Table 2–56: Terms used in the SENSe:DATA: TELecom:MEASure:TRIButary queries

Term	Meaning
BIT	Pattern bit error
FRAME	Frame bit error
CRC	CRC error
PARITY	Parity error

Figure 2–81 shows you how to read the Example Tables in this section.

Table X–X: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:Queries

Query	Response
SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ECOUNT:BIT?	714
SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ERATIO:FRAME?	1.0E-8
SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ESECONDS:CRC?	3

Selected examples of queries are shown in the left column

A typical response is shown in the right column for each example

Figure 2–81: How to read the example tables in the SENSe:DATA:TELecom:MEASure:TRIButary subsystem section

SENSe:DATA:TELecom:MEASure:TRIButary:LAYER

The addition of the demux capability can duplicate measurements at multiple layers in the demux path. Rather than add a discrete command for each possible measurement at each rate, the layer command will select a layer from which measurement results will be returned.

The default value “Trib’ will return data for the current, active analysis rate, making it the same as existing remote commands for compatibility purposes. The value set with this command affects the following commands:

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:LAYER <layer>
SENSe:DATA:TELecom:MEASure:TRIButary:LAYER?
```

Parameters

<layer>discrete	description
TRIB	Demap or receive rate (default) if PDH demux is inactive, analysis rate if PDH demux is active
M140	Set the current layer to 140 Mb/s
M34	Set the current layer to 34 Mb/s
M8	Set the current layer to 8 Mb/s
M2	Set the current layer to 2 Mb/s
K64	Set the current layer to 64 Kb/s

Dependencies None

Errors and Events None

Examples

Set: `SENSe:DATA:TELecom:MEASure:TRIButary:LAYER M140`
Query: `SENSe:DATA:TELecom:MEASure:TRIButary:LAYER?`

Response: M140

Related Commands

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:PATH

Future Function

Syntax

`SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:PATH <path type>`
`SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:PATH?`

Parameters

<path type>discrete	description
UNI	TX and RX unavailable times do not affect each other, nor is Path unavailable time calculated.
BI	TX and RX unavailable times interact as defined in G.826. Path unavailable time is calculated and will be used in calculations referencing available time.

Dependencies None

Errors and Events None

Examples

Set: `SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:PATH UNI`
Query: `SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:Path?`

Response: UNI

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN and M2100: OUT Queries (PDH)

This command returns the calculated M.2100 parameters. The values returned are affected by the SENSe:DATA:TELecom:MEASure:TRIButary:LAYER command. M2100:IN returns IN–SERVICE analysis results. M2100:OUT returns OUT–OF–SERVICE analysis results. M2100:IN:M45 returns IN–SERVICE analysis results for 45 Mbps line rate.

Note: Out–of–Service analysis includes data bit error analysis on expected PRBS pattern. In–Service analysis includes Frame errors, code violations, and/or CRC errors depending on tributary rate being analyzed.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN <item>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:OUT <item>?
```

Parameters

<item>	description
?	All M2100 in–or out–of–service analysis responses below
ESEConds?	Errored Seconds
SESeconds?	Severely Errored Seconds
UASeconds?	Unavailable Seconds
EFSeconds?	Error–Free Seconds
TXESeconds?	TX errored seconds (future)
TXSESeconds?	TX severely errored seconds (future)
TXUASeconds?	TX unavailable seconds (future)
PTHUaseconds?	Path unavailable seconds
PESEConds?	Errored Seconds ratio (%)
PSESeconds?	Severely Errored Seconds ratio (%)
PUASeconds?	Unavailable seconds ratio (%)
PEFSeconds?	Error–free seconds ratio (%)
PTXESeconds?	TX errored seconds ratio (%) (future)
PTXSESeconds?	TX severely errored seconds ratio (%) (future)
PTXUASeconds?	TX Unavailable seconds ratio (%) (future)
PPTHUaseconds?	Path unavailable seconds ratio (%)

Dependencies

These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error

measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events

None

Examples

Query: `SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN<item>?`

Response:

Table 2–57: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis: Queries

Query	Response
SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN:UASeconds	23
SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN:PSESeconds	1.2E–1
SENSe:DATA:TELecom:TRIButary:ANALysis:G821:DMINutes	103
SENSe:DATA:TELecom:TRIButary:ANALysis:G826:EBLock	10

Related Commands

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:m2100:in
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826
SENSe:DATA:TELecom:MEASure:TRIButary:slip

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821

This command returns the calculated G.821 parameters. The values returned are affected by the SENSe:DATA:TELecom:MEASure:TRIButary:LAYER command.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821 <item>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821 <item>?
```

Parameters

<cmdspec>part of command structure	description
ECOUnt	Error Count
ESEConds	Errored seconds
PESeconds	Percent errored seconds
UASeconds	Unavailable seconds
PUASeconds	Percent unavailable seconds
EFSeconds	Error free seconds
PEFSeconds	Percent error free seconds
SESeconds	Severely errored seconds
PSESeconds	Percent severely errored seconds
DMINutes	Degraded minutes
PDMinutes	Percent degraded minutes

Dependencies

These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events

None

Examples

Query: `SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821 <item>?`

Response:

Table 2–58: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis: Queries

Query	Response
SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: UASeconds	23
SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: PSESeconds	1.2E–1
SENSe:DATA:TELecom:TRIButary:ANALysis:G821:DMINutes	103
SENSe:DATA:TELecom:TRIButary:ANALysis:G826:EBLock	10

Related Commands

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:m2100:IN
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826

This command returns the calculated G.826 parameters. The values returned are affected by the SENSe:DATA:TELecom:MEASure:TRIButary:layer command. G826:M45 returns analysis results for 45 Mbps line rate.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826 <item>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826 <item>?
```

Parameters

<cmdspec>part of command structure	description
CSES	Consecutive Severly Errored Seconds
EBLock	Errored block count
ESEConds	Errored seconds
SESeconds	Severely Errored seconds
BBERRor	Background Block Errors
UASeconds	Unavailable seconds
TXESeconds	TX errored seconds (future)
TXSESeconds	TX severely errored seconds (future)
TXUASeconds	TX unavailable seconds (future)
PUNASeconds	Path unavailable seconds
PESEConds	Errored Seconds ratio (%)
PSESeconds	Severely Errored Seconds ratio (%)
PBBERRor	Background Block Errors ratio 9%)
PUASeconds	Unavailable seconds ratio (%)
PTXESeconds	TX errored seconds ratio (%) (future)
PTXSESeconds	TX severely errored seconds ratio (%) (future)
PTXUASeconds	TX unavailable seconds ratio (%) (future)
PPUNASeconds	Path unavailable seconds ratio (%)

Dependencies

These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events

None

Examples

Query: `SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826 <item>?`

Response:

Table 2–59: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis: Queries

Query	Response
SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: UASeconds	23
SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: PSESeconds	1.2E–1
SENSe:DATA:TELecom:TRIButary:ANALysis:G821:DMINutes	103
SENSe:DATA:TELecom:TRIButary:ANALysis:G826:EBLock	10

Related Commands

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:m2100:IN
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:ALLOcation

This command sets or queries the numeric allocation percentage for the PDH hierarchy.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:ALLOcation <number>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:ALLOcation?
```

Parameters

<number>	description
a number in the range of 0.1 to 200	Sets the numeric allocation percentage

Dependencies

None

Errors and Events

None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:
ALLOCATION 1.5E6
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G825:AL-
LOCATION?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:
ALLOCATION  1.5E6
```

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:VERDict

This command sets the G826 Verdict Analysis for 2 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
VERDICT PASS
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
VERDICT PASS
```

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:TXVERDict

This command sets the G826 Verdict Analysis for 2 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:TXVERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:TXVERDICT PASS`

Query: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:TXVERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:TXVERDICT PASS`

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:VERDict

This command sets the G826 Verdict Analysis for 8 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:VERDICT PASS`

Query: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:VERDICT PASS`

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:TXVERDict

This command sets the G826 Verdict Analysis for 8 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:TXVERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:TXVERDICT PASS`

Query: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:TXVERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:TXVERDICT PASS`

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:VERDict

This command sets the G826 Verdict Analysis for 34 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:VERDICT PASS`

Query: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:VERDICT PASS`

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:TXVERDict

This command sets the G826 Verdict Analysis for 34 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:TXVERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
TXVERDICT PASS
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
TXVERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
TXVERDICT PASS
```

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:VERDict

This command sets the G826 Verdict Analysis for 45 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:VERDICT PASS`

Query: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:VERDICT?`

Response: `SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:VERDICT PASS`

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:TXVERDict

This command sets the G826 Verdict Analysis for 45 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:TXVERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
TXVERDICT PASS
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
TXVERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
TXVERDICT PASS
```

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:VERDict

This command sets the G826 Verdict Analysis for 140 Mb/s.

Syntax
```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:VERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:VERDICT PASS
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:VERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:VERDICT PASS
```

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:TXVERDict

This command sets the G826 Verdict Analysis for 140 Mb/s.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:
TXVERDict?
```

Parameters

<status>	description
Pass	The Verdict Analysis is Pass
Fail	The Verdict Analysis is Fail
Nodata	Not enough data to decide

Dependencies None

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:TXVERDICT PASS
```

Query:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140: TXVERDICT?
```

Response:
```
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:TXVERDICT PASS
```

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:THREshold:M2:SES

This command selects the threshold to be used to determine a severely errored second for the 2 Mbps receive line rate.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES <threshold>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES ?
```

Parameters

<threshold>	description
THR300	Sets the threshold to 300 blocks in accordance with G.826
THR805	Sets the threshold to 805 blocks in accordance with G.821

Dependencies

None

Errors and Events

None

Examples

Set:
```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES THR300
```

Query:
```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES?
```

Response:
```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES THR300
```

Related Commands

None

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:THREshold:M45:SES

This command selects the threshold to be used to determine a severely errored second for the 45 Mbps receive line rate.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES <threshold>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES ?
```

Parameters

<threshold>	description
THR300	Sets the threshold to 2444 blocks in accordance with G.826
THR805	Sets the threshold to 45 blocks in accordance with G.821

Dependencies

None

Errors and Events

None

Examples

Set:
```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES THR300
```

Query:
```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES?
```

Response:
```
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES THR300
```

Related Commands

None

SENSe:DATA:TELecom:MEASure:TRIButary:ERRor Queries

These queries return tributary error measurements. When you use the high-level queries (for example, SENSe:DATA:TELecom:MEASure:TRIButary:ERRor? or SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt?), it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

Syntax

`SENSe:DATA:TELecom:MEASure:TRIButary:ERRor?`

`SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:[measurement]:[error source]` (see Table 2–60 to complete the query)

Table 2–60: Syntax table for SENSe:DATA:TELecom:MEASure:TRIButary:ERRor queries (PDH)

Select a measurement from the left column	Then select an error source from the top row					
	?	:BIT?[1]	:FRAME?[2]	:CRC?[3]	:CODE[4]	:EBIT[3]
ECOUnt	all error counts	logic errors	frame errors	CRC errors	code violation count	Far end CRC4 Err block count
ERATio	all bit error ratios	logic errors	frame errors	CRC errors	code violation count	Far end CRC4 Err block count
ESEConds	all errored seconds	logic errors	frame errors	CRC errors	code violation count	Far end CRC4 Err block count

All error counts and errored seconds return NR1-numeric responses.

All bit error ratios return NR3-numeric responses.

1 **The ESEConds:BIT error source reports M2100 out-of-service and G.821 measurements.**

2 **The FRAME error source is valid only for PDH framed signals.**

3 **The CRC and EBIT error source is valid only for 2 Mb/s rate and PCM30CRC or PCM31CRC framing**

4 **CODE error source is valid only for 2,8,34 Mb/s rate with AMI or HDB3 line coding**

Response

See Table 2–60.

Dependencies

These measurement queries can be sent at any time. But, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Do not set SENSe:DATA:TELecom:TRIButary:PAYLoad:PATTern to UNKNown if you want to use these queries.

Errors and Events

None

Examples See Table 2–61.

Table 2–61: Example table for SENSe:DATA:TELecom:MEASure:TRIButary:ERRor queries

Query	Response
SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ECOUNT:BIT?	714
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt:CODE?	Returns the number of line code error violations on the active PDH signal. This command is invalid for 140 Mb/s.
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt:EDIT?	Returns the number of far–end CRC4 errored blocks detected on the active 2 Mb/s signal
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt:M2:FRAME	This query returns frame errors ecount for M2
SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ERATIO:FRAME?	1.0E–8
SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ESECONDS:CRC?	3
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ESEConds:CODE?	Returns the number of seconds in which line code error violations were detected on the active PDH input signal
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ESEConds:EBIT?	Returns the number of seconds in which far–end CRC4 errored blocks were detected on the active 2 Mb/s signal
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:FRAME?	Returns the THE ECOUnt FRAME error, ERATio FRAME error, or ESEConds FRAME errors for 45 Mbps line rate
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:PARITY?	Returns the THE ECOUnt PARITY error, ERATio PARITY error, or ESEConds PARITY errors for 45 Mbps line rate
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:CPARITY?	Returns the THE ECOUnt C–PARITY error, ERATio C–PARITY error, or ESEConds C–PARITY errors for 45 Mbps line rate
SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:REI?	Returns the THE ECOUnt REI error, ERATio REI error, or ESEConds REI errors for 45 Mbps line rate

Related Commands
SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP
SENSe:DATA:TELecom:TRIButary:PAYLoad:PATTern
SYSTem:HEADers

SENSe:DATA:TELecom:MEASure:TRIButary:ALARm Queries

These queries return tributary alarm measurements. When you use the SENSe:DATA:TELecom:MEASure:TRIButary:ALARm? query, it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string. ALARm:M45 <alarm type>sets and ALARm:M45? queries the alarm type for the 45 Mbps line rate.

Syntax All valid queries are listed in the Syntax column of Table 2–62.

Table 2–62: Syntax Table for SENSe:DATA:TELecom:MEASure:TRIButary:ALARm Queries

Syntax	Response
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm?	All tributary alarm measurements
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOSignal?	Number of seconds of tributary Loss of Signal
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOFrame?	Number of seconds of tributary Loss of Frame
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:AIS?	Number of seconds of tributary AIS
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:RAI?	Number of seconds of tributary RAI (PDH only)
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOPS?	Number of seconds of loss of pattern sync
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:TS16AIS?	Errored second count for AIS in TS16 of an Nx64 CAS-enabled signal
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:IDLE?	Number of idle seconds
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOMF?	Errored second count for Loss of Multiframe (2 Mb/s or Nx64k PCM30 or PCM30 CRC)
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:FEMFAS?	Errored second count for far-end Loss of Multiframe (2 Mb/s or Nx64k PCM30 or PCM30 CRC)

All responses are in NR1-numeric format.

Response See the Response column of Table 2–62.

Dependencies These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Errors and Events None

Examples See Table 2–63.

Table 2–63: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ALARm Queries

Query	Response
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOSIGNAL?	20
SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:AIS?	13

Related Commands SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP
SENSe:DATA:TELecom:TRIButary:PAYLoad:PATTern
SYSTem:HEADers

SENSe:DATA:TELecom:MEASure:TRIButary:SLIP Queries

These queries return tributary alarm measurements. When you use the SENSe:DATA:TELecom:MEASure:TRIButary:SLIP? query, it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

Syntax All valid queries are listed in the Syntax column of the following table.

Table 2–64: Syntax Table for SENSe:DATA:TELecom:MEASure:TRIButary:Slip Queries

Syntax	Response
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP?	Returns all slip measurements
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LAS?	Returns lagging bit slip (FAS 1–bit late) seconds for the layer selected
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LES?	Returns Lagging bit slip (FAS 1–bit early) seconds for the selected layer
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:CONTrolled?	Returns controlled slip (1–frame) seconds for the Nx64k signal selected (future)

All responses are in NR1-numeric format.

Response See the Response column of the previous table.

Dependencies Layer selected in the SENSe:DATA:TELecom:MEASure:TRIButary:layer command

Errors and Events None

Examples See the following table.

Table 2–65: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:Slip Queries

Query	Response
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LAS?	27
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LES?	13
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:CONTrolled?	5

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:JRATio

This command returns the Justification Ratio (Stuff frames/ Tx frames) for the current active PDH analysis rate. This command will be implemented in the future.

Syntax SENSe:DATA:TELecom:MEASure:TRIButary:JRATio?

Dependencies Not available when rount–trip delay being measured.

Errors and Events None

Examples Query: SENSe:DATA:TELecom:MEASure:TRIButary:JRATio?

Response: Justification ration as a decimal

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure

This command will be implemented in the future. This command initiates a round trip delay test if no test is in progress. The query will return the measured round trip in ms, or an error indicating that measurement is in progress or that the measurement failed too long to measure. This commands cannot be executed when measurements are running. It will change the PRBS pattern to 2E29–1 and disable calcuation of received clock offset.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure <action>
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?
```

Parameters

<action>discrete	Description
ON	Changes the PRBS pattern to 2E29–1 and starts the round trip delay measurement
OFF	Restores the test pattern to its previous value. Round trip delay measurement is disabled. Clock offset calculation resumed.
Return Values	Description
ON	Round trip delay measurement is in progress and returned values are valid
OFF	Round trip delay measurement is disabled
WORKING	Measurement is in progress, return values are not valid
UNKNOWN	Measurement in progress, delay exceeds measurable range

Dependencies

None

Errors and Events

None

Examples

Query: `SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?`

Response: Round trip delay measurement status.

Related Commands

SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay?

SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:CALIbrate

This command will be implemented in the future. This command takes the current round trip delay as a calibration offset, and substracts it from subsequent round trip delay calculations. A calibration value may also be set with this command. Round trip delay measurement must be in progress for this command to work.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:CALIbrate
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:CALibrate?
```

Parameters

<value>long integer	Description
0...	Sets the calibration value in microseconds

Dependencies None

Examples Query: `SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?`

Response: Round trip delay measurement status.

Related Commands SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay?
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?

SENSe:DATA:TELecom:MEASure:TRIButary:FREQuency

The clock frequency offset in ppm from nominal rate of the PDH payload is available when round trip delay is not being calculated.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:FREQuency?
```

Dependencies Not available when rount–trip delay being measured.

Errors and Events None

Examples Query: `SENSe:DATA:TELecom:MEASure:TRIButary::FREQuency?`

Response: Clock frequency offset in ppm of incoming direct or demultiplexed PDH streams

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset

This command sets the value of the delay offset parameter used in relative round–trip delay measurements.

Syntax `SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset <value>`

Parameters

value	Description
Decimal number	1 to 5200

Dependencies None

Examples Query: `SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFSet 2`

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset:ENAble

This command enables the value of the delay offset parameter used in relative round–trip delay measurements.

Syntax `SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset:ENAble <state>`

Parameters

state	Description
ON	The round–trip delay value is expressed relative to the delay offset value.
OFF	The round–trip delay value represents an absolute delay

Dependencies Meaningful only when round–trip delay measurements are enabled.

Examples Query: `SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFSet:ENAble`

Related Commands None

SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:STATus?

This command queries the status of the delay offset parameter used in relative round–trip delay measurements.

Syntax

```
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:STATus?
```

Parameters

state	Description
OFF	The test unit is not measuring round–trip delay.
WAIT	The test unit is making its first round–trip delay measurement after delay measurement was enabled, and does not yet have valid data.
INVALID	The result of the most recent round–trip delay measurement was beyond the range the test unit can measure.
VALID	The round–trip delay number represetns the result of a valid measurement.

Dependencies

the transmitted and received PDH payloads must be set to the same rate.

Examples

SENSe:DATA:TELecom:MEAsure:TRIButary:RTDElay:STATus?

Related Commands

All SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay commands.

SENSe:DATA:TELecom:JITter Subsystem

This section describes the commands and queries that control the jitter and wander measurements. Figure 2–87 shows the hierarchy tree for this CTS 850 subsystem.

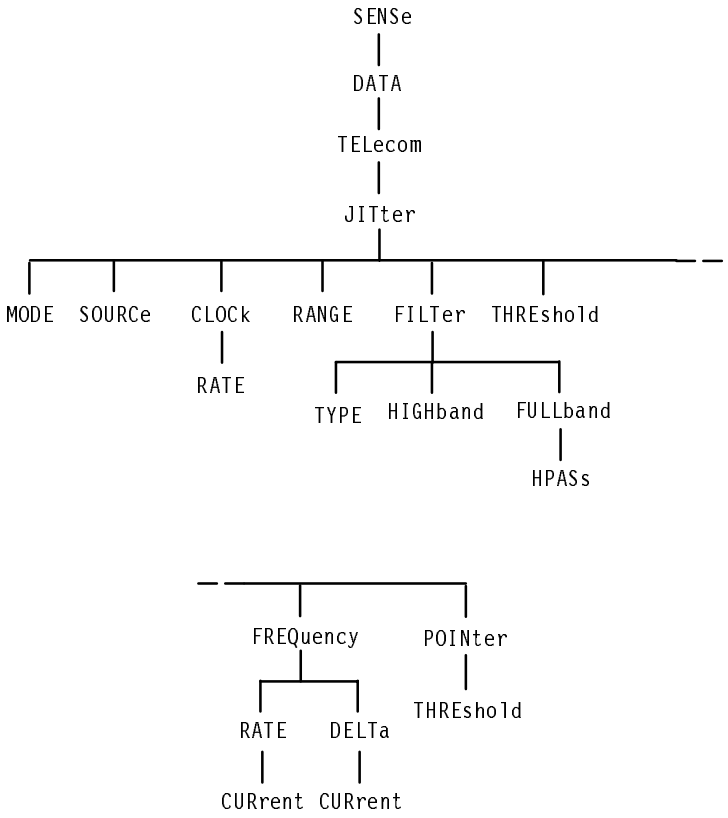


Figure 2–87: SENSe:DATA:TELecom:JITter subsystem

SENSe:DATA:TELecom:JITter:MODE

This command sets or queries the jitter/wander generation mode.

Syntax

```
SENSe:DATA:TELecom:JITter:MODE <jitter mode>
SENSe:DATA:TELecom:JITter:MODE?
```

Parameters

<jitter mode> (discrete)	Description
PTPeak	Measure peak-to-peak jitter (default)
RMS	Measure RMS jitter

Dependencies

Requires installation of Option 14 jitter module.

*RST sets jitter mode to PTPeak (default).

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:JITTER:MODE RMS`

Query: `SENSE:DATA:TELECOM:JITTER:MODE?`

Response: `PTPEAK`

Related Commands

None

SENSe:DATA:TELecom:JITter:SOURce

This command sets or queries the jitter measurement source.

Syntax

```
SENSe:DATA:TELecom:JITter:SOURce <jitter source>
SENSe:DATA:TELecom:JITter:SOURce?
```

Parameters

<jitter source> (discrete)	Description
LINE	Measure jitter on receive line signal (default)
CLOCk	Measure jitter on the clock

Dependencies

Requires installation of Option 14 jitter module.

*RST sets jitter source to LINE (default).

Errors and Events

None

Examples

Set: `SENSe:DATA:TELECOM:JITTER:SOURCE LINE`

Query: `SENSe:DATA:TELECOM:JITTER:SOURCE?`

Response: `CLOCK`

Related Commands

None

SENSe:DATA:TELecom:JITter:CLOCk:RATE

This command sets or queries the jitter or wander receive clock rate.

Syntax

```
SENSe:DATA:TELecom:JITter:CLOCk:RATE <clock rate>
```

Parameters

<clock rate> (discrete)	Description
M52	52 Mb/s rate
M155	155 Mb/s rate
M622	622 Mb/s rate
M2	2 Mb/s rate (default)
M34	34 Mb/s rate
M45	45 Mb/s rate
M140	140 Mb/s rate

Dependencies

Requires installation of Option 14 jitter module.

*RST sets the clock rate to M52 (default).

Errors and Events

None

Examples

Set: `SENSe:DATA:TELECOM:JITTER:CLOCK:RATE M2`

Query: `SENSe:DATA:TELECOM:JITTER:CLOCK:RATE?`

Response: `M155`

Related Commands

None

SENSe:DATA:TELecom:JITter:RANGe

This command sets or queries the jitter measurement amplitude range. The entered value is the maximum UI that can be measured within the range.

Syntax

```
SENSe:DATA:TELecom:JITter:RANGe <jitter range>
SENSe:DATA:TELecom:JITter:RANGe?
```

Parameters

<jitter range> (discrete)	Description
NORMal	Normal range 0–6 UI (default)
EXTENded	Extended range 0–16 or 0–200 UI. The instrument selects range based on jitter source rate: ■ 0 Hz to 30 Hz the maximum amplitude is 200 ■ 30 Hz to 375 Hz the maximum amplitude drops linearly from 200 to 16 ■ 375 Hz to the filter cutoff the maximum amplitude stays at 16

Dependencies

Requires installation of Option 14 jitter module.

*RST sets the jitter range to NORMal (default).

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:JITTER:RANGE NORMAL`

Query: `SENSE:DATA:TELECOM:JITTER:RANGE?`

Response: `EXTENDED`

Related Commands

None

SENSe:DATA:TELecom:JITter:FILTer:TYPE

This command sets or queries the input signal jitter filter.

Syntax

```
SENSe:DATA:TELecom:JITter:FILTer:TYPE <jitter filter>
SENSe:DATA:TELecom:JITter:FILTer:TYPE?
```

Parameters

<jitter filter> (discrete)	Description
WIDEband	Input filter (default)
HIGHBand	Input filter
FULLband	Tektronix-defined input filter

Dependencies

Requires installation of Option 14 jitter module.

The frequency range for each filter type is defined by the standards. Frequency ranges also vary depending on the clock rate.

*RST sets the jitter filter type to WIDEband (default).

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:JITTER:FILTER:TYPE HIGHBAND`

Query: `SENSE:DATA:TELECOM:JITTER:FILTER:TYPE?`

Response: `HIGHBAND`

Related Commands

None

SENSe:DATA:TELecom:JITter:FILTer:HIGHBand

This command sets or queries the highband jitter filter mask.

Syntax

```
SENSe:DATA:TELecom:JITter:FILTer:HIGHBand <select Q>
SENSe:DATA:TELecom:JITter:FILTer:HIGHBand?
```

Parameters

<select Q> (discrete)	Description
STANDard	Standards-defined mask (valid for all but 2MB; default for all but 2MB)
LOWQ	LOWQ mask (valid for 2MB; default for 2MB)
HIGHQ	HIGHQ mask (valid for 2MB)

Dependencies

Requires installation of Option 14 jitter module.

*RST sets select Q to STANDard.

Errors and Events

221, “Settings conflict”
if the entered value is incorrect for the current receive rate.

Examples

Set: `SENSE:DATA:TELECOM:JITTER:FILTER:HIGHBAND LOWQ`

Query: `SENSE:DATA:TELECOM:JITTER:FILTER:HIGHBAND?`

Response: STANDARD

Related Commands NONE

SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the fullband filter's high-pass filter range.

Syntax

```
SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs <fullband hpass>
SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs?
```

Parameters

<fullband hpass> (discrete)	Description
U_1	0.1 Hz (default)
U1	1 Hz
U10	10 Hz

Dependencies Requires installation of Option 14 jitter module.

*RST sets fullband hpass to U_1 (default).

Errors and Events None

Examples

Set: SENSE:DATA:TELECOM:JITTER:FILTER:FULLBAND:HPASS U1

Query: SENSE:DATA:TELECOM:JITTER:FILTER:FULLBAND:HPASS?

Response: U1

Related Commands None

SENSe:DATA:TELecom:JITter:THREshold

This command sets or queries the jitter hit threshold value.

Syntax

```
SENSe:DATA:TELecom:JITter:THREshold <jitter threshold>
SENSe:DATA:TELecom:JITter:THREshold?
```

Parameters

<jitter threshold> (NR3-numeric)	Description
0-200	Threshold hit, in UI (default is 0.00)

Dependencies

Requires installation of Option 14 jitter module.

*RST sets jitter threshold to 0.00 (default).

Errors and Events

500, "Execution warning"
if the entered value is out of range for the command.

Examples

Set: `SENSE:DATA:TELECOM:JITTER:THRESHOLD 12.5`

Query: `SENSE:DATA:TELECOM:JITTER:THRESHOLD?`

Response: `15.5`

Related Commands

None

SENSe:DATA:TELecom:JITter:FREQuency:RATE:CURrent?

This query returns the receive rate frequency. This status is always available.

Syntax

```
SENSe:DATA:TELecom:JITter:FREQuency:RATE:CURrent?
```

Response

<frequency rate> (NR3-numeric)	Description
0–~622 MHz	Receive rate frequency, in Hz

Dependencies

None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:JITTER:FREQUENCY:RATE:CURRENT?`

Response: `139.264E+6`

Related Commands None

SENSe:DATA:TELecom:JITter:FREQuency:DELTa:CURrent?

This query returns the difference between the receive rate and an ideal frequency. This status is always available.

Syntax `SENSe:DATA:TELecom:JITter:FREQuency:DELTa:CURrent?`

Response

<frequency DELTA> (NR3-numeric)	Description
–100.0 to 100.0	Delta frequency in ppm. Resolution is 0.01 ppm.

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:JITTER:FREQUENCY:DELTA:CURRENT?`

Response: `10.01`

Related Commands None

SENSe:DATA:TELecom:JITter:POINter:THREshold

This command sets or queries the pointer hit threshold value. This value is the absolute allowable frequency drift rate. A pointer hit second event is recorded if the positive or negative frequency drift rate exceeds the pointer threshold value during a one second period.

Syntax

```
SENSe:DATA:TELecom:JITter:POINter:THREshold <jitter threshold>
SENSe:DATA:TELecom:JITter:POINter:THREshold?
```

Parameters

<jitter threshold> (NR3-numeric)	Description
0-10	Pointer threshold in ppm/sec (default is 10)

Dependencies

Requires installation of Option 14 jitter module.

*RST sets jitter threshold to 10 (default).

Errors and Events

500, “Execution warning”
if the entered value is out of range for the command.

Examples

Set: `SENSE:DATA:TELECOM:JITTER:POINTER:THRESHOLD 0.5`

Query: `SENSE:DATA:TELECOM:JITTER:POINTER:THRESHOLD?`

Response: `5`

Related Commands

SENSe:DATA:TELecom:MEASure:JITter:POINter:HSEConds?

SENSe:DATA:TELecom:MEASure:JITter Subsystem

This section describes the SENSe:DATA:TELEcom:MEASure:JITter susbsystem commands and queries. Figure 2–89 shows the hierarchy tree for this CTS 850 subsystem.

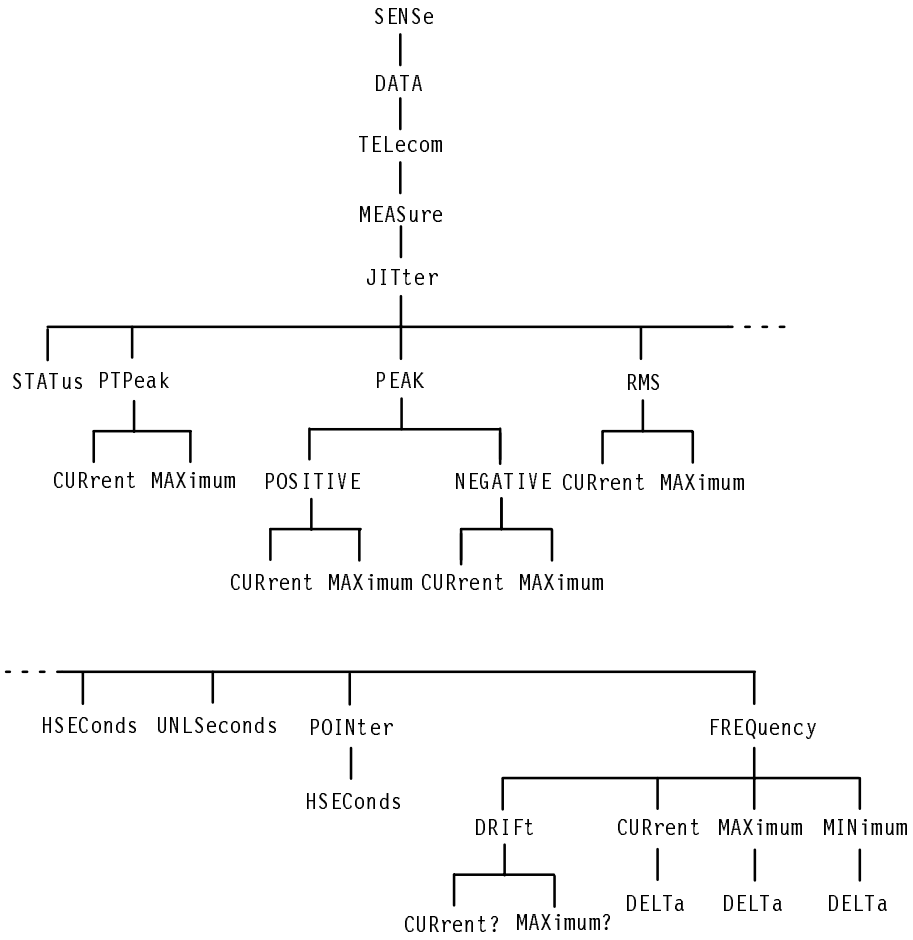


Figure 2–89: SENSe:DATA:TELecom:MEASure:JITter subsystem

SENSe:DATA:TELecom:MEASure:JITter:STATus?

This query returns the status of jitter test measurements.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:STATus?`

Response

<jit stat> (discrete)	Description
VALID	Measurements valid
UNLOcked	Measurements invalid due to loss of signal lock or out-of-range jitter measurement
WAIT	Measurements not valid because hardware is initializing

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:STATUS?`

Response: `VALID`

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:PTPeak:CURrent?

This query returns the jitter peak-to-peak amplitude. When a test is running, this command returns the current peak-to-peak jitter amplitude of the running test. When a test is not running, this command returns the last-measured peak-to-peak jitter amplitude.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:PTPeak:CURrent?`

Response

<jitter ptp> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Jitter peak-to-peak amplitude in UI

Dependencies Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:PTPEAK:CURRENT?`

Response: `1.6`

Related Commands SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:PTPeak:MAXimum?

This query returns the maximum peak-to-peak jitter amplitude since the beginning of the current test.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:PTPeak:MAXimum?`

Response

<jitter ptp max> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Maximum jitter peak-to-peak amplitude in UI

Dependencies Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:PTPEAK:MAXIMUM?`

Response: `1.6`

Related Commands SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:CURrent?

This query returns the jitter positive peak amplitude. When a test is running, this command returns the current jitter positive peak amplitude of the running test. When a test is not running, this command returns the last-measured jitter positive peak amplitude.

Syntax

```
SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:CURrent?
```

Response

<jitter pmax> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Jitter positive peak amplitude in UI

Dependencies

Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:POSITIVE:CURrent?`

Response: `0.6`

Related Commands

SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:MAXimum?

This query returns the jitter maximum positive peak amplitude since the beginning of the current test.

Syntax

```
SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:MAXimum?
```

Response

<jitter ppmax> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Maximum jitter positive peak amplitude in UI

Dependencies Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:POSITIVE:MAXIMUM?`

Response: `0.6`

Related Commands SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:CURrent?

This query returns the jitter negative peak amplitude. When a test is running, this command returns the current jitter negative peak amplitude of the running test. When a test is not running, this command returns the last-measured jitter negative peak amplitude.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:CURrent?`

Response

<jitter pmax> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Jitter negative peak amplitude in UI

Dependencies Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:NEGATIVE:CURrent?`

Response: `-0.6`

Related Commands SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:MAXimum?

This query returns the jitter maximum negative peak amplitude since the beginning of the current test.

Syntax

```
SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:MAXimum?
```

Response

<jitter pnmax> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Maximum jitter negative peak amplitude in UI

Dependencies

Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

Errors and Events

None

Examples

Query:
```
SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:NEGATIVE:
MAXIMUM?
```

Response:
```
-0.6
```

Related Commands

SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:RMS:CURrent?

SDH/PDH Jitter/Wander Test Option Only

This query returns the jitter RMS value. When a test is running, this command returns the current jitter RMS value of the running test. When a test is not running, this command returns the last-measured jitter RMS value.

Syntax

```
SENSe:DATA:TELecom:MEASure:JITter:RMS:CURrent?
```

Response

<jitter rms> (NR3-numeric)	Description
Floating point number in the range of 0 to 5.0	Jitter RMS value in UI

Dependencies Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to RMS

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:RMS:CURRENT?`

Response: `1.6`

Related Commands SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:RMS:MAXimum?

This query returns the jitter maximum jitter RMS since the beginning of the current test.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:RMS:MAXimum?`

Response

<jitter rms max> (NR3-numeric)	Description
Floating point number in the range of 0 to 5.0	Maximum jitter RMS in UI

Dependencies Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to RMS

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:RMS:MAXIMUM?`

Response: `1.4`

Related Commands SENSe:DATA:TELecom:JITter:MODE

SENSe:DATA:TELecom:MEASure:JITter:HSEConds?

This query returns the number of jitter hit seconds since the beginning of the test.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:HSEConds?`

Response

<jitter hsecs> (NR1-numeric)	Description
Integer in the range of 0 to number of seconds in the test	Number of jitter hit seconds

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:HSECONDS?`

Response: 2

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:UNLSeconds?

This query returns the number of jitter unlock seconds since the beginning of the test. This is the number of seconds that jitter could not be measured because the jitter signal was out of measurement range.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:UNLSeconds?`

Response

<jitter unls> (NR1-numeric)	Description
Integer in the range of 0 to number of seconds in the test	Number of jitter unlock seconds

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:UNLSECONDS?`

Response: 2

Related Commands

None

SENSe:DATA:TELecom:MEASure:JITter:POINter:HSEConds?

This query returns the number of jitter pointer hit seconds since the beginning of the test.

Syntax

`SENSe:DATA:TELecom:MEASure:JITter:POINter:HSEConds?`

Response

<jitter evs> (NR1-numeric)	Description
Integer in the range of 0 to the number of seconds in the test	Number of jitter pointer hit seconds

Dependencies

Requires installation of Option 14 jitter module.

PDH mapping must be selected.

Does not apply when the jitter source is set to clock, 52, 155, or 622 mB rates.

Use SENSe:DATA:TELecom:JITter:POINter:THREshold to set the hit second threshold.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:POINTER:HSECONDS?`

Response: 2

Related Commands

SENSe:DATA:TELecom:JITter:POINter:THREshold

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:DRIFt:CURrent?

SDH/PDH Jitter/Wander Test Option Only

This query returns the video-related jitter frequency drift rate. When a test is running, this command returns the current jitter frequency drift rate value of the

running test. When a test is not running, this command returns the last-measured jitter frequency drift rate value.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:FREQuency:DRIFt:CURrent?`

Response

<jitter drift> (NR3-numeric)	Description
Floating point number in the range of 0 to 100.0	Video-related jitter frequency drift rate, in ppm/sec

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:DRIFT:CURRENT?`

Response: `10.6`

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:DRIFt:MAXimum?

This query returns the maximum video-related jitter frequency drift since the beginning of the current test.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:FREQuency:DRIFt:MAXimum?`

Response

<jitter drift max> (NR3-numeric)	Description
Floating point number in the range of 0 to 100.0	Maximum video-related jitter frequency drift rate, in ppm/sec

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:DRIFT :MAXIMUM?`

Response: `10.8`

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:CURrent?

This query returns the jitter source (line or clock) receive-rate frequency. When a test is running, this command returns the current receive-rate frequency of the running test. When a test is not running, this command returns the last-measured receive-rate frequency.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:FREQuency:CURrent?`

Response

<jitter rcv> (NR3-numeric)	Description
Floating point number in the range of 0 Hz to 622 MHz	Current jitter receive frequency in Hz

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:CURRENT?`

Response: `34.367999E+6`

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:CURrent:DELTa?

This query returns the delta of the current frequency from the ideal frequency. When a test is running, this command returns the current receive-rate frequency delta of the running test. When a test is not running, this command returns the last-measured receive-rate delta frequency.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:FREQuency:CURrent:DELTa?`

Response

<jitter rcv> (NR3-numeric)	Description
Floating point number in the range of –100.0 to 100.0	Delta of the current frequency in ppm. Resolution is 0.01 ppm

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:CURRENT:DELTA?`

Response: `10.01`

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum?

This query returns the maximum jitter source (line or clock) receive-rate frequency since the beginning of the current test.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum?`

Response

<Jit recfreq max> (NR3-numeric)	Description
Floating point number in the range of 0 Hz to 622 MHz	Maximum receive rate frequency in Hz

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:MAXIMUM?`

Response: `34.368E+6`

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum:DELTa?

This query returns the maximum jitter source (line or clock) receive-rate frequency delta since the beginning of the current test.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum:DELTa?`

Response

<freq max delta> (NR3-numeric)	Description
Floating point number in the range of –100 to 100	Maximum receive rate frequency delta in ppm

Dependencies Requires installation of Option 14 jitter module.

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:MAXIMUM:DELTA?`

Response: `10.2`

Related Commands None

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MINimum?

This query returns the minimum jitter source (line or clock) receive-rate frequency since the beginning of the current test.

Syntax `SENSe:DATA:TELecom:MEASure:JITter:FREQuency:Minimum?`

Response

<jitter freq min> (NR3-numeric)	Description
Floating point number in the range of 0 Hz to 622 MHz	Minimum receive rate frequency in Hz

Dependencies

Requires installation of Option 14 jitter module.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:MINIMUM?`

Response: `34.367998E+6`

Related Commands

None

SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MINimum:DELTa?

This query returns the minimum jitter source (line or clock) receive-rate frequency delta since the beginning of the current test.

Syntax

```
SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MINimum:DELTa?
```

Response

<min freq delta> (NR3-numeric)	Description
Floating point number in the range of –100.0 to 100.0	Minimum receive rate frequency delta in ppm

Dependencies

Requires installation of Option 14 jitter module.

Errors and Events

None

Examples

Query:
```
SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:
MINIMUM:DELTA?
```

Response:
```
10.2
```

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter Subsystem

This section describes the commands and queries that control the jitter and wander measurements. Figure 2–91 shows the hierarchy tree for this CTS 850 subsystem.

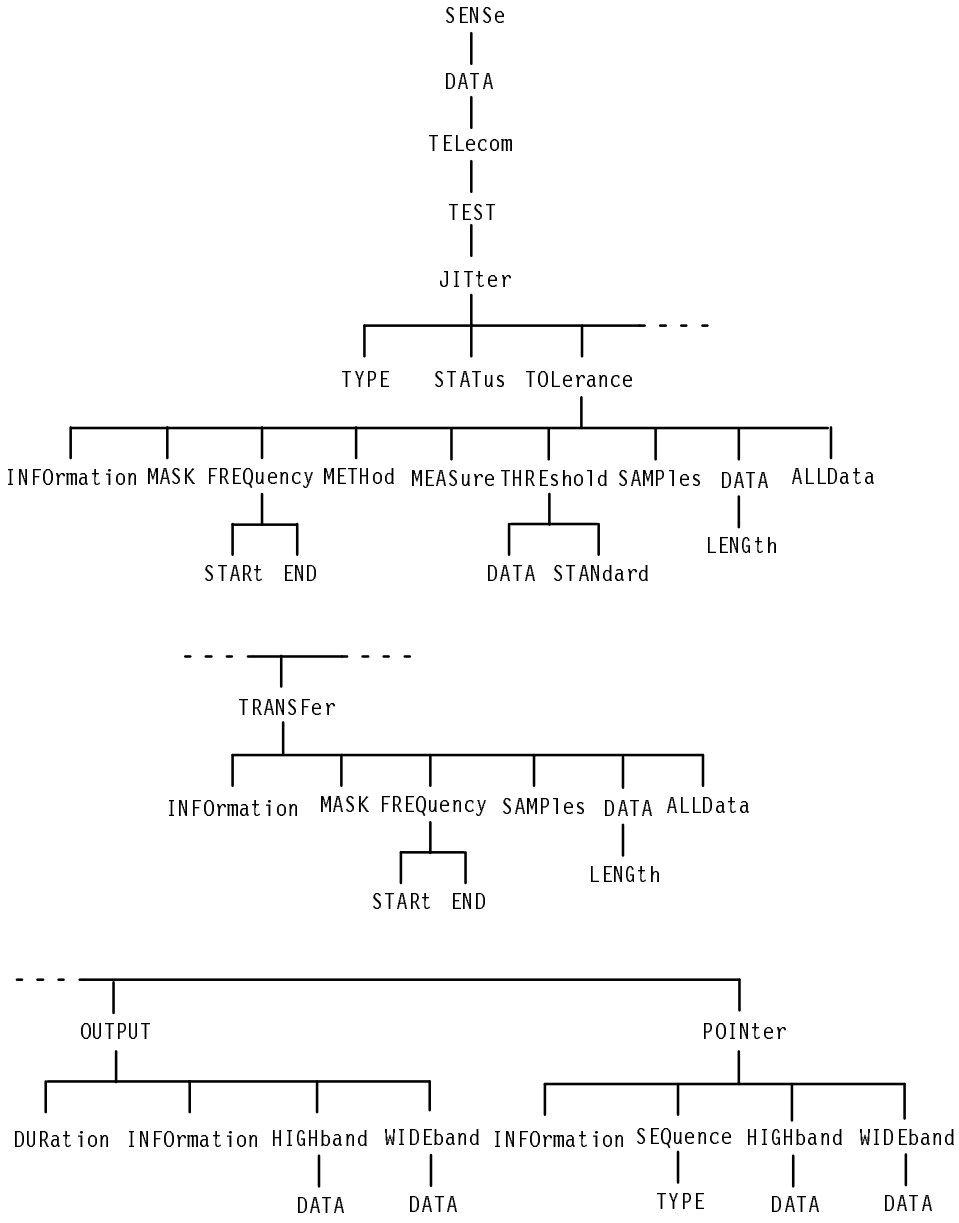


Figure 2–91: SENSe:DATA:TELecom:TEST:JITter subsystem

SENSe:DATA:TELecom:TEST:JITter:TYPE

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries a pre-defined jitter compliance test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TYPE <jitter test>
SENSe:DATA:TELecom:TEST:JITter:TYPE?
```

Parameters

<jitter test> (discrete)	Description
TOLerance	Maximum tolerable jitter test
TRANSFer	Transfer jitter line-to-line test or jitter synchronization source-to-line test
OUTPUT	Output jitter test (default)
POINter	Pointer jitter test

Dependencies

Requires installation of Option 14 jitter module.

*RST sets jitter test to OUTPUT (default).

Errors and Events

None

Examples

Set: `SENSE:DATA:TELECOM:TEST:JITTER:TYPE OUTPUT`

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TYPE?`

Response: `TRANSFER`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:STATus?

SDH/PDH Jitter/Wander Test Option Only

This query returns the current jitter compliance test status.

Syntax `SENSe:DATA:TELecom:TEST:JITter:STATus?`

Response

<jitter stat> (discrete)	Description
STOP	Jitter test is not running
RUN	Jitter test is running

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:STATUS?`

Response: `STOP`

Related Commands SENSe:DATA:TELecom:TEST:STARt

SENSe:DATA:TELecom:TEST:JITter:TOLerance:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns jitter tolerance test settings.

Syntax `SENSe:DATA:TELecom:TEST:JITter:TOLerance:INFOrmation:<info>?`

Parameters

<info> (discrete)	Description
SOURce	Results source
TIME	Test start time
DATE	Test start date
TXRate	Transmitted signal rate
RXRate	Received signal rate

(continued on next page)

<info> (discrete)	Description
TXMask	Transmitted signal mask
FREQStart	Mask start frequency
FREQEnd	Mask end frequency
SAMPles	Maximum number of samples in mask

Response

SOURce	Description
NONE	Results not available
MEMory	Results read from instrument memory
DISK	Results read from disk

TIME	Description
HH:MM:SS	Test start time (hr, min, sec)

DATE	Description
YY:MM:DD	Test start date (yr, mo, day)

TXRate	Description
M52	52 Mb/s (STM-0)
M155	155 Mb/s (STM-1)
M622	622 Mb/s (STM-4)
M2	2 Mb/s
M34	34 Mb/s
M140	140 Mb/s

RXRate	Description
M52	52 Mb/s (STM-0)
M155	155 Mb/s (STM-1)
M622	622 Mb/s (STM-4)
M2	2 Mb/s
M34	34 Mb/s
M140	140 Mb/s

TXMask	Description
GR253	GR-253 Standard mask (valid for 52 Mb/s)
G825	G.825 Standard mask (valid for 155 and 622 Mb/s)
TYPEA	G.958 Type A equipment mask (valid for 155 and 622 Mb/s)
TYPEB	G.958 Type B equipment mask (valid for 155 and 622 Mb/s)
LOWQ	G.823 Low Q mask (valid for 2 Mb/s)
HIGHQ	G.823 High Q mask (valid for 2 Mb/s)
G823	G.823 Standard mask (valid for 34 and 144 Mb/s)

FREQStart	Description
Floating point value in Hz	Frequency start

FREQEnd	Description
Floating point value in Hz	Frequency end

SAMPles	Description
Integer value	Maximum number of samples

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:INFORMATION:RXRATE?`

Response: `M155`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance test mask.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK <jitter mask>
SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK?
```

Parameters

<jitter mask> (discrete)	Description
GR253	GR-253 Standard mask (valid for 52 Mb/s, default for 52 Mb/s)
G825	G.825 Standard mask (valid for 155 and 622 Mb/s)
TYPEA	G.958 Type A equipment mask (valid for 155 and 622 Mb/s, default for 155 and 622 Mb/s)
TYPEB	G.958 Type B equipment mask (valid for 155, and 622 Mb/s)
LOWQ	G.823 Low Q mask (valid for 2 Mb/s, default for 2 Mb/s)
HIGHQ	G.823 High Q mask (valid for 2 Mb/s)
G823	G.823 Standard mask (valid for 34 and 144 Mb/s, default for 34 and 144 Mb/s)

Dependencies

Requires installation of Option 14 jitter module.

*RST sets the jitter mask to default.

Errors and Events

221, “Settings conflict”
if the value entered is not valid for the current receive rate.

Examples

Set: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MASK TYPEA`

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MASK?`

Response: `TYPEA`

Related Commands

SENSe:DATA:TELecom:TEST:JITter

SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance test start frequency.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt
<tol freq start>
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt?
```

Parameters

<tol freq start> (NR3-numeric)	Description
Floating point number in range from 0 to the end frequency	Start frequency in Hz

Dependencies

*RST sets the tolerance frequency start point to 125 μHz (default).

Value must be less than end frequency.

Errors and Events

500, "Execution warning"
if the entered value is out of range for the command.

Examples

Set:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE
:FREQUENCY:START 1000.0
```

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE
:FREQUENCY:START?
```

Response: `1200.0`

Related Commands

SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END

SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance test end frequency.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END
 <tol freq end>
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END?
```

Parameters

<tol freq end> (NR3-numeric)	Description
Floating point number in range of greater than start frequency to 5 MHz	End frequency in Hz

Dependencies

Requires installation of Option 14 jitter module.

*RST sets the tolerance end frequency to 19.3 Hz (default).

Value must be greater than starting frequency.

Errors and Events

500, "Execution warning"
if the entered value is out of range for the command.

Examples

Set: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE :FREQUENCY:END 100000.0`

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:FREQUENCY:END?`

Response: `120000.0`

Related Commands

SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt

SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance compliance test error criteria method.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:Tolerance:METHod <test method>
SENSe:DATA:TELecom:TEST:JITter:Tolerance:METHod?
```

Parameters

<test method> (discrete)	Description
ONSET_ERR	Onset of Errors method (default)
BER	BER method

Dependencies

Requires installation of Option 14 jitter module.

Errors and Events None.

Examples

Set:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE
:METHOD ONSET_ERR
```

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:METHOD?
```

Response:
```
BER
```

Related Commands None

SENSe:DATA:TELecom:TEST:JITter:TOLerance:MEASure

SDH/PDH Jitter/Wander Test Option Only

This command starts or stops the BER measurement threshold. When the instrument receives a stop command, it uses the last measured value as the threshold for the jitter tolerance calculations.

Syntax
```
SENSe:DATA:TELecom:TEST:JITter:Tolerance:MEASure <meas ctrl>
SENSe:DATA:TELecom:TEST:JITter:Tolerance:MEASure?
```

Parameters

<meas ctrl> (discrete)	Description
START	Start BER measurement
STOP	Stop and record BER measurement

Dependencies Requires installation of Option 14 jitter module.

You can only use this command if the jitter tolerance error criteria is set to BER.

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MEASURE START
```

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MEASURE?
```

Response:
```
STOP
```

Related Commands SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod

SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the last measured BER value to use as the threshold for the jitter tolerance BER compliance test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:DATA?
```

Response

<BER value> (NR3-numeric)	Description
Floating point number in the range of 1.0E–3 to 1.0E–9, or zero	Last measured BER value. A zero means that no BER value was measured (the JITter:TOLerance:MEASure test was not run or not stopped)

Dependencies

This query only applies if the jitter tolerance error criteria is set to BER.

Errors and Events

None

Examples

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:
THRESHOLD:DATA?
```

Response:
```
4.89E-8
```

Related Commands

SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod
SENSe:DATA:TELecom:TEST:JITter:TOLerance:MEASure

SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:STANdard?

SDH/PDH Jitter/Wander Test Option Only

This query returns the recommended BER value (from 0.171) to use as the threshold for the jitter tolerance BER compliance test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:STANdard?
```

Response

<BER std> (NR3-numeric)	Description
Floating point number in the approximate range of 1.0E–3 to 1.0E–9	Recommended BER value

Dependencies

This query only applies if the jitter tolerance error criteria is set to BER.

Errors and Events

None

Examples

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:THRESHOLD:
STANDARD?
```

Response:
```
5.25E-6
```

Related Commands

SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod

SENSe:DATA:TELecom:TEST:JITter:TOLerance:SAMPles

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the number of samples, including the corner frequencies for the jitter tolerance test mask.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:Tolerance:SAMPles <tol samples>
SENSe:DATA:TELecom:TEST:JITter:Tolerance:SAMPles?
```

Parameters

<tol samples> (NR1-numeric)	Description
An integer in the range of 4 to 26	Number of samples including corner frequencies

Dependencies Requires installation of Option 14 jitter module.

*RST sets tolerance samples to 4 (default).

Errors and Events 500, "Execution warning"
if the entered value is out of range for the command.

Examples Set: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:SAMPLES 4`

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:SAMPLES?`

Response: `32`

Related Commands None

SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA:LENGth?

SDH/PDH Jitter/Wander Test Option Only

This query returns the actual number of measurement samples in the jitter tolerance test.

Syntax `SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA:LENGth?`

Response

<data length> (discrete)	Description
An integer in the range of 0 to 26	Number of samples in the jitter tolerance test. A zero means that the instrument acquired no data or did not run the JITter:TOLerance test.

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:DATA:LENGTH?`

Response: `7`

Related Commands None

SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the status (frequency, amplitude, and mask values) of the specified jitter tolerance test sample. The response is a comma-separated list of values, in the order listed in the response table.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA? <N>
```

Response

<N> (NR1-numeric)	Description
Integer in the range of 1 to 26	Data sample number

<freq> (NR3-numeric)	Description
Floating point number in the range of 12 μHz to 5 MHz	Sample jitter frequency in Hz

<amplitude> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Computed jitter tolerance, in UI, for frequency <freq>

<mask> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Mask value, in UI, for frequency <freq>

<data status> (discrete)	Description
NONE	Measurement data empty
VALID	Measurement data meets mask specifications
FAILure	Measurement data fails mask specifications
UNLOcked	Measurement invalid due to loss of signal (LOS), jitter over range, or pattern loss

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:DATA? 1`

Response: `1, 500.0, 46.7, 39.0, VALID`

Related Commands

SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA:LENGth?

SENSe:DATA:TELecom:TEST:JITter:TOLerance:ALLData?

SDH/PDH Jitter/Wander Test Option Only

This query returns the complete status (frequency, amplitude, and mask values) of the jitter tolerance test. The response is a comma-separated list of values, in the order listed in the response table.

Syntax

`SENSe:DATA:TELecom:TEST:JITter:TOLerance:ALLData?`

Response

<N><data-points>	Description
<x1-freq>	Jitter frequency (Hz) of point 1
<x1-ampl>	Jitter amplitude (UI) of point 1
<x1-mask>	Mask amplitude (UI) of point 1
<x1-status>	Data status of point 1
...	...
<xn-freq>	Jitter frequency (Hz) of point n
<xn-ampl>	Jitter amplitude (UI) of point n
<xn-mask>	Mask amplitude (UI) of point n
<xn-status>	Data status of point n

Where n is the number of points returned by the SENSe:DATA:TELecom:TEST:JITter :TOLerance:DATA:LENGth? command

<freq> (NR3-numeric)	Description
Floating point number in the range of 125 μHZ to 5 MHz	Sample frequency in Hz

<amplitude> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Computed jitter tolerance, in UI, for frequency <freq>

<mask> (NR3-numeric)	Description
Floating point number in the range of 0 to 200	Mask value, in UI, for frequency <freq>

<data status> (discrete)	Description
NONE	No measurement data
VALID	Measurement data meets mask specifications
FAILure	Measurement data fails mask specifications
UNLOcked	Measurement invalid due to loss of signal (LOS), jitter over range, or pattern loss

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:ALLDATA?`

Response: `20,1.2,1.8,VALID,100,2.0,2.8,VALID,100E+1,3.0,3.2,VALID,100E+2,20.0,18.2,OOR`

Related Commands SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA:LENGth?

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns jitter transfer test settings.

Syntax `SENSe:DATA:TELecom:TEST:JITter:TRANSFer:INFOrmation:<info>?`

Parameters

<info> (discrete)	Description
SOURce	Results source
TIME	Test start time
DATE	Test start date
TXSource	Transmitted signal source
TXRate	Transmitted signal rate
RXRate	Transmitted signal rate
TXMask	Transmit signal mask
FREQStart	Start frequency
FREQEnd	End frequency
SAMPles	Number of sample points

Response

SOURce	Description
NONE	Results not available
MEMory	Results read from instrument memory
DISK	Results read from disk

TIME	Description
HH:MM:SS	Test start time (hr, min, sec)
DATE	**Description**
YY:MM:DD	Test start date (yr, mo, day)

TXSource	Description
LINE	Transmit jitter source is line
CLOCK	Transmit jitter source is clock

TXRate	Description
M52	52 Mb/s (STM-0)
M155	155 Mb/s (STM-1)
M622	622 Mb/s (STM-4)
M2	2 Mb/s
M34	34 Mb/s
M140	140 Mb/s

RXRate	Description
M52	52 Mb/s (STM-0)
M155	155 Mb/s (STM-1)
M622	622 Mb/s (STM-4)
M2	2 Mb/s
M34	34 Mb/s
M140	140 Mb/s

TXMask	Description
GR253	GR-253 Standard mask (valid for 52 Mb/s)
TYPEA	G.958 Type A equipment mask (valid for 155 and 622 Mb/s)
TYPEB	G.958 Type B equipment mask (valid for 155 and 622 Mb/s)
G735	G.735 Standard mask (valid for 2 Mb/s)
G751	G.751 Standard mask (valid for 34 Mb/s)
UNDEFined	Undefined Standard mask (valid for 144 Mb/s)

FREQStart	Description
Floating point value in Hz	Frequency start

FREQEnd	Description
Floating point value in Hz	Frequency end

SAMPles	Description
Integer value	Maximum number of samples

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:INFO:TXS?`

Response: `LINE`

Related Commands None

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the mask for the jitter transfer test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK <jitter mask>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK?
```

Parameters

<jitter mask> (discrete)	Description
GR253	GR-253 Standard mask (valid for 52 Mb/s, default for 52 Mb/s)
TYPEA	G.958 Type A equipment mask (valid for 155 and 622 Mb/s, default for 155 and 622 Mb/s)
TYPEB	G.958 Type B equipment mask (valid for 155 and 622 Mb/s)
G735	G.735 Standard mask (valid for 2 Mb/s, default for 2 Mb/s)
G751	G.751 Standard mask (valid for 34 Mb/s, default for 34 Mb/s)
UNDEFined	Undefined Standard mask (valid for 144 Mb/s, default for144 Mb/s)

Dependencies Requires installation of Option 14 jitter module.

*RST sets jitter mask to default.

Errors and Events 221, "Settings conflict"
if the specified parameter is not correct for the current jitter receive rate.

Examples

Set: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:MASK TYPEA`

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:MASK?`

Response: `TYPEB`

Related Commands None

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter transfer test start frequency.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt
<tran freq start>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt?
```

Parameters

<tran freq start> (NR3-numeric)	Description
Floating point number in range from 0 to less than end frequency	Start frequency in Hz

Dependencies Requires installation of Option 14 jitter module.

*RST sets the transfer frequency start point to 10.0 Hz (default).

Value must be less than end frequency.

Errors and Events 500, "Execution warning"
if the entered value is out of range for the command.

Examples

Set:
```
SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:FREQUENCY
:START 10.0
```

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER
:FREQUENCY:START?
```

Response: `15.5`

Related Commands SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter transfer test end frequency.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END
 <trans freq end>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END?
```

Parameters

<tol freq end> (NR3-numeric)	Description
Floating point number in range of greater than start frequency to 5 MHz	End frequency in Hz

Dependencies

Requires installation of Option 14 jitter module.

*RST sets transfer frequency end to 130 KHz (default).

Value must be greater than starting frequency.

Errors and Events

500, “Execution warning”
if the entered value is out of range for the command.

Examples

Set:
```
SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:FREQUENCY
:END 100000.0
```

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:FREQUENCY
:END?
```

Response: `130000.0`

Related Commands SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the number of samples, including the corner frequencies defined by the jitter transfer test mask.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles <trans samples>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles?
```

Parameters

<trans samples> (NR1-numeric)	Description
An integer in the range of 4 to 16	Number of samples including corner frequencies. Default is the number of corner frequencies.

Dependencies

Requires installation of Option 14 jitter module.

*RST sets transfer samples to the default.

Errors and Events

500, “Execution warning”
if the entered value is out of range for the command.

Examples

Set: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:SAMPLES 4`

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:SAMPLES?`

Response: `8`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA:LENGth?

SDH/PDH Jitter/Wander Test Option Only

This query returns the actual number of measurement samples in the jitter transfer test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA:LENGth?
```

Response

<data length> (discrete)	Description
An integer in the range of 1 to 16	Number of samples in the jitter transfer test. A zero means that the JITter:TRANSfer test acquired no data (the test was not run or not stopped).

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:DATA:LENGTH?`

Response: `6`

Related Commands

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA?

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the status (frequency, amplitude, and mask values) of the specified jitter transfer test data sample. The response is a comma-separated list of values, in the order listed in the response table.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA? <N>
```

Response

<N> (NR1-numeric)	Description
Integer in the range of 1 to 16	Data sample number

<freq> (NR3-numeric)	Description
Floating point number in the range of 12 μHz to 5 MHz	Sample frequency in Hz

<amplitude> (NR3-numeric)	Description
Floating point number in the range of +3 to –5	Computed jitter transfer, in dB, for frequency <freq>

<mask> (NR3-numeric)	Description
Floating point number in the range of +3 to –5	Mask value, in dB, for frequency <freq>

<data status> (discrete)	Description
NONE	Measurement data empty
VALID	Measurement data meets mask specifications
FAILure	Measurement data fails mask specifications
UNLOcked	Measurement invalid due to loss of signal (LOS), jitter over range, or pattern loss

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:DATA? 1`

Response: `1, 500.0, -2.3, -5.0, VALID`

Related Commands SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA:LENGth?

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE

This command selects which action to perform when the Jitter Transfer test is started.

Syntax `SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE <tran_state>`

Response

<tran_state>	Description
TEST	Test network element (default)
Calibrate	Calibrate CTS for transfer test

Dependencies None

Comments *RST will set tran_state to default.

CAL can only be performed if the Jitter Generation Source and Jitter Measurement Source are both LINE and the Tx/Rx rates are identical.

To determine if CAL is needed, use query:
sense:data:telecom:test:jitter:transfer:cal:status?

Errors and Events –221, "Setting Conflict" If the Jitter Generation Source and Jitter Measurement Source are not both LINE or the Tx/Rx rates are not identifical and CAL is selected.

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:STATE TEST`

Related Commands SENSe:DATA:TELecom:TEST:JITter:TRANSFer:CAL:Status?

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE?

This command returns which action is performed in response to running a Jitter Transfer test.

Syntax `SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE?`

Response

<tran_state>	Description
TEST	Test network element (default)
Calibrate	Calibrate CTS for transfer test

Dependencies None

Comments None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:STATE?`

Related Commands SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:Calibrate:STATus?

This query returns the status of the Jitter Transfer calibration data.

Syntax `SENSe:DATA:TELecom:TEST:JITter:TRANSFer:Calibrate:Status?`

Response

<cal_status>	Description
NONE	Not applicable with current instrument settings
UNCAL	Jitter transfer is not calibrated
RUNNING	Jitter transfer calibration in progress
COMPLETE	Jitter Transfer is calibrated

Dependencies Requires installation of Option 14 jitter module
*RST sets transfer samples to TEST (default)
CAL only executes if both jitter generation and measurement sources are set to LINE and the TX/RX values are st to the same rate.

Errors and Events 221, “Settings conflict”
if the jitter generation source and jitter measurement source are not both LINE, or the TX/RX rates are not identical and CAL is specified.

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:CALIbrate:STATus?`
Response: COMPLETE

Related Commands SENSe:DATA:TELecom:TEST:JITter:TRANSfer:STATE

SENSe:DATA:TELecom:TEST:JITter:TRANSFer:ALLData?

SDH/PDH Jitter/Wander Test Option Only

This query returns the complete status (frequency, amplitude, and mask values) of the jitter transfer test data samples. The response is a comma-separated list of values, in the order listed in the response table.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:ALLData
```

Response

<N> (NR1-numeric)	Description
<x1-freq> <x1-ampl> <x1-mask> <x1-status> ... <xn-freq> <xn-ampl> <xn-mask> <xn-status>	Frequency (Hz) of point 1 Amplitude (UI) of point 1 Mask amplitude (UI) of point 1 Data status of point 1 ... Frequency (Hz) of point n Amplitude (UI) of point n Mask amplitude (UI) of point n Data status of point n
Where n is the number of points returned by the SENSe:DATA:TELecom:TEST:JITter :TRANSFer:DATA:LENGth? command	

<freq> (NR3-numeric)	Description
Floating point number in the range of 12 μHz to 5 MHz	Sample frequency in Hz

<amplitude> (NR3-numeric)	Description
Floating point number in the range of +3 to −5	Computed jitter transfer, in dB, for frequency <freq>

<mask> (NR3-numeric)	Description
Floating point number in the range of +3 to −5	Mask value, in dB, for frequency <freq>

<data status> (discrete)	Description
NONE	No measurement data
VALID	Measurement data valid
FAILure	Measurement data failed (data greater than mask)
UNLOcked	Measurement invalid due to loss of signal (LOS) or jitter over range

Dependencies None

Errors and Events None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:ALLDATA?`

Response: `20,1.2,1.8,VALID,100,-2.0,6.0,VALID,100.E+1,-3.0,6.0, VALID,100.E+3,0.0,10.0,LOS`

Related Commands SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA?

SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the length of the ouput jitter test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation <tmin>, <tsec>
SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation?
```

Parameters

<tmin> (NR1-numeric)	Description
Integer in the range of 0 to 15 (default is 1)	Output jitter test time, in minutes

<tsec> (NR1-numeric)	Description
Integer in the range of 0 to 59 (default is 0)	Output jitter test time, in seconds

Dependencies

Requires installation of Option 14 jitter module.

*RST sets the test duration to 1 minute, zero seconds

The maximum output jitter test duration is 15 minutes, zero seconds

Errors and Events

500, "Execution warning"
if the entered value is out of range for the command.

Examples

Set: `SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:DURATION 1,0`

Query: `SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:DURATION?`

Response: `2,5`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:OUTPUT:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns the settings of the output jitter test.

Syntax

`SENSe:DATA:TELecom:TEST:JITter:OUTPUT:INFOrmation:<info>?`

Parameters

<info> (discrete)	Description
SOURce	Results source
TIME	Test start time
DATE	Test start date
RXSource	Received signal source
RXRate	Transmitted signal rate

Response

SOURce	Description
NONE	Results not available
MEMory	Results read from instrument memory
DISK	Results read from disk

(continued on next page)

TIME	Description
HH:MM:SS	Test start time (hr, min, sec)

DATE	Description
YY:MM:DD	Test start date (yr, mo, day)

RXSource	Description
LINE	Receive measurement source is line
CLOCK	Receive measurement source is clock

RXRate	Description
M52	52 Mb/s (STM-0)
M155	155 Mb/s (STM-1)
M622	622 Mb/s (STM-4)
M2	2 Mb/s
M34	34 Mb/s
M140	140 Mb/s

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:INFOrmation:RXS?`

Response: `CLOCK`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:OUTPUT:HIGHBand:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the highband filter output compliance test status.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:OUTPUT:HIGHBand:DATA?
```

Response

<output data>, <output max>, <output stat>	**Description**
<output data>	**Description**
Floating point number in the range of 0 to 200	Peak-to-peak jitter, in UI
<output max>	**Description**
Floating point number	Maximum allowed jitter for the selected standard
<output stat>	**Description**
NONE	No measurement data
VALID	Measurement data valid
LOSignal	Measurement data invalid due to LOS
UNLOcked	Measurement data invalid due to jitter over range

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:HIGHBAND:DATA?`

Response: `12.6, 4.1, VALID`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:OUTPUT:WIDEband:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the wideband filter output compliance test status.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:OUTPUT:WIDEband:DATA?
```

Response

<output data>, <output max>, <output stat>	**Description**
<output data>	**Description**
Floating point number in the range of 0 to 200	Peak-to-peak jitter, in UI
<output max>	**Description**
Floating point number	Maximum allowed jitter for the selected standard
<output stat>	**Description**
NONE	No measurement data
VALID	Measurement data valid
LOSignal	Measurement data invalid due to LOS
UNLOcked	Measurement data invalid due to jitter over range

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:WIDEBAND:DATA?`

Response: `12.6, 4.1, VALID`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:POINter:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns jitter pointer test settings.

Syntax `SENSe:DATA:TELecom:TEST:JITter:POINter:INFOrmation:<info>?`

Parameters

<info> (discrete)	Description
SOURce	Results source
TIME	Test start time
DATE	Test start date
TXRate	Transmitted signal rate
RXRate	Transmitted signal rate
MODE	Normal or custom mode
PTRType	Pointer type
SEQType	Sequence type
PTRDir	Pointer direction
PTRRate	Pointer rate

Response

SOURce	Description
NONE	Results not available
MEMory	Results read from instrument memory
DISK	Results read from disk

TIME	Description
HH:MM:SS	Test start time (hr, min, sec)

DATE	Description
YY:MM:DD	Test start date (yr, mo, day)

TXRate	Description
M52	52 Mb/s (STM-0)
M155	155 Mb/s (STM-1)
M622	622 Mb/s (STM-4)

RXRate	Description
M2	2 Mb/s (E1)
M34	34 Mb/s (E3)
M140	140 Mb/s (E4)
M52	52 Mb/s (STM-0)
M155	155 Mb/s (STM-1)
M622	622 Mb/s (STM-4)

MODE	Description
NORMal	Default sequence selections
CUSTom	Custom sequence selections

PTRType	Description
AU	AU pointer
TU	TU pointer

SEQType	Description
SINGle	Single pointer adjustment
BURSt	Burst pointer adjustment
PHASE	Phase transient pointer adjustment
P873	Periodic 87-3 pointer adjustment
P873CAN	Periodic 87-3 with cancel pointer adjustment
P873ADD	Periodic 87-3 with add pointer adjustment
P351	Periodic 35-1 pointer adjustment (TU-12 only)
P351CAN	Periodic 35-1 with cancel pointer adjustment (TU-12 only)
P351ADD	Periodic 35-1 with add pointer adjustment (TU-12 only)
P855	Periodic 85-5 pointer adjustment (TU-3 only)
P855CAN	Periodic 85-5 with cancel pointer adjustment (TU-3 only)
P855ADD	Periodic 85-5 with add pointer adjustment (TU-3 only)
PCONtinuous	Periodic continuous pointer adjustment

PCONCAN	Periodic continuous with cancel pointer adjustment
PCONADD	Periodic continuous with add pointer adjustment
REGDBL	Regular pointer plus one double
REGMIS	Regular pointer with one missing
SINALT	Single alternating pointer adjustment
DBLALT	Double alternating pointer adjustment
CUSTom	Use the transmitter pointer sequence setup

PTRDir	**Description**
UP	Increment
DOWN	Decrement

PTRRate (NR1-numeric)	**Description**
Integer in the range of 2 to 10000	Pointer rate in ms

Dependencies

None

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:TEST:JITTER:POINTER:INFORMATION:MODE?`

Response: `CUSTOM`

Related Commands

None

SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the pointer sequence type for the jitter pointer test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE
<ptr seq type>
SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE?
```

Parameters

<ptr seq type> (discrete)	Description
SINGle	Single pointer adjustment (G.783 e)
BURSt	Burst pointer adjustment (G.783 f)
PHASE	Phase transient pointer adjustment
P873	Periodic 87-3 pointer adjustment (G.783 g1)
P873CAN	Periodic 87-3 with cancel pointer adjustment (G.783 g3)
P873ADD	Periodic 87-3 with add pointer adjustment (G.783 g2)
PCONtinuous	Periodic continuous pointer adjustment (G.783 h1)
PCONCAN	Periodic continuous with cancel pointer adjustment (G.783 h3)
PCONADD	Periodic continuous with add pointer adjustment (G.783 h2)
REGDBL	Regular pointer plus one double (G.783 b)
REGMIS	Regular pointer with one missing (G.783 c)
SINALT	Single alternating pointer adjustment
SINALT	Single alternating pointer adjustment (G.783 a)
DBLALT	Double alternating pointer adjustment (G.783 d)
CUSTom	Use the transmitter pointer sequence setup

Dependencies Requires installation of Option 14 jitter module.

Pointer test must not be running. Setting this parameter during a pointer test returns an error.

Errors and Events None

Examples

Set:
```
SENSE:DATA:TELECOM:TEST:JITTER:POINTER:SEQUENCE
:TYPE BURST
```

Query:
```
SENSE:DATA:TELECOM:TEST:JITTER:POINTER:SEQUENCE
:TYPE?
```

Response: `P873ADD`

Related Commands None

SENSe:DATA:TELecom:TEST:JITter:POINter:HIGHBand:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the highband filter pointer compliance test status.

Syntax
```
SENSe:DATA:TELecom:TEST:JITter:POINter:HIGHBand:DATA?
```

Response

<output data>, <output max>, <output stat>	
<output data>	**Description**
Floating point number in the range of 0 to 200	Peak-to-peak jitter, in UI
<output max>	**Description**
Floating point number	Maximum allowed jitter for the selected standard
<output stat>	**Description**
NONE	No measurement data
VALID	Measurement data valid

(continued on next page)

<output data>, <output max>, <output stat>	
LOSignal	Measurement data invalid due to LOS
UNLOcked	Measurement data invalid due to jitter over range

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:POINTER:HIGHBAND:DATA?`

Response: `1.2, 2.0, VALID`

Related Commands SENSe:DATA:TELecom:TEST:JITter:POINter?

SENSe:DATA:TELecom:TEST:JITter:POINter:WIDEband:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the wideband filter pointer compliance test status.

Syntax `SENSe:DATA:TELecom:TEST:JITter:POINter:WIDEband:DATA?`

Response

<output data>, <output max>, <output stat>	
<output data>	**Description**
Floating point number in the range of 0 to 200	Peak-to-peak jitter, in UI
<output max>	**Description**
Floating point number	Maximum allowed jitter for the selected standard
<output stat>	**Description**
NONE	No measurement data

(continued on next page)

<output data>, <output max>, <output stat>	
VALID	Measurement data valid
LOSignal	Measurement data invalid due to LOS
UNLOcked	Measurement data invalid due to jitter over range

Dependencies None

Errors and Events None

Examples Query: `SENSE:DATA:TELECOM:TEST:JITTER:POINTER:WIDEBAND:DATA?`

Response: `1,2, 2.0, VALID`

Related Commands SENSe:DATA:TELecom:TEST:JITter:POINter?

SENSe:DATA:TELecom:MEASure:WANDer Subsystem

This section describes the SENSe:DATA:TELEcom:MEASure:WANDer susbsystem commands and queries. Figure 2–93 shows the hierarchy tree for this CTS 850 subsystem.

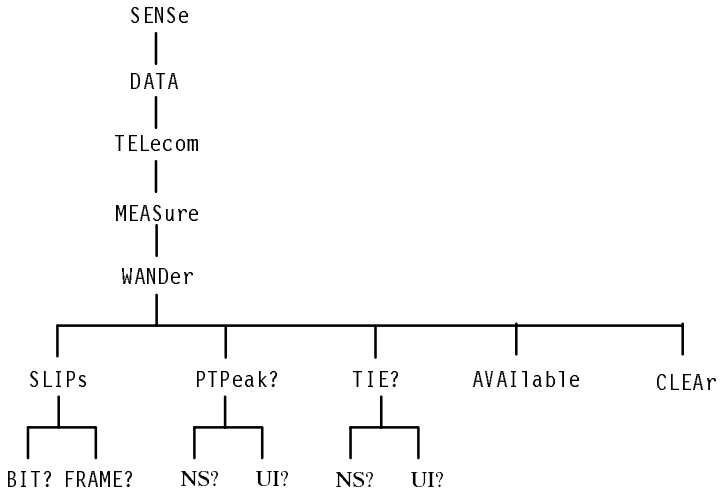


Figure 2–93: SENSe:DATA:TELecom:MEASure:WANDer subsystem

SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:BIT?

This query returns the estimated bit slips since the beginning of the test. This result is only valid for 2Mb rate.

Syntax

```
SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:BIT?
```

Response

<bit slips> (NR1-numeric)	Description
Integer in the range of 0 to 4294767295	Estimated number of bit slips

Dependencies

Requires installation of Option 14 jitter module.

Receive rate must be 2Mb.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:WANDER:SLIPS:BIT?`

Response: `12`

Related Commands

None

SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:FRAME?

This query returns the estimated frame slips since the beginning of the test. This result is only valid for 2Mb rate.

Syntax

`SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:FRAME?`

Response

<frame slips> (NR1-numeric)	Description
Integer in the range of 0 to 4294767295	Estimated number of frame slips

Dependencies

Requires installation of Option 14 jitter module.

Receive rate must be 2Mb.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:WANDER:SLIPS:FRAME?`

Response: `10`

Related Commands

None

SENSe:DATA:TELecom:MEASure:WANDer:PTPeak?

This query returns the estimated maximum peak-to-peak wander amplitude since the beginning of the test.

Syntax `SENSe:DATA:TELecom:MEASure:WANDer:PTPeak?`

Response

<wander ptp> (NR1-numeric)	Description
Integer in the range of 0 to 4294767295	Maximum peak-to-peak wander amplitude in nanoseconds

Dependencies Requires installation of Option 14 jitter module.

Examples Query: `SENSE:DATA:TELECOM:MEASURE:WANDER:PTPEAK?`

Response: `10`

Related Commands None

SENSe:DATA:TELecom:MEASure:WANDer:PTPeak:NS?

This query returns the estimated maximum peak-to-peak wander amplitude in nanoseconds since the beginning of the test.

Syntax `SENSe:DATA:TELecom:MEASure:WANDer:PTPeak:NS?`

Response

SDH <wander ptp>	Description
Integer in the range of 0 to 4294767295	Maximum peak-to-peak wander amplitude in nanoseconds

Dependencies Jitter option 14 must be installed for valid results.

Examples Query: `SENSE:DATA:TELECOM:MEASURE:WANDER:PTPEAK:NS?`

Response: `10`

Related Commands None

SENSe:DATA:TELecom:MEASure:WANDer:PTPeak:UI?

This query returns the maximum peak-to-peak wander amplitude in UI since the beginning of the test.

Syntax `SENSe:DATA:TELecom:MEASure:WANDer:PTPeak:UI?`

Response

SDH <wander ptp>	Description
Integer in the range of 0 to 4294767295	Maximum peak-to-peak wander amplitude in UI (with resolution of 0.01)

Dependencies Jitter option must be installed for valid results.

Examples Query: `SENSE:DATA:TELECOM:MEASURE:WANDER:PTPEAK:UI?`

Response: 10.5

Related Commands None

SENSe:DATA:TELecom:MEASure:WANDer:TIE:UI?

This query returns the TIE value at the current time in the test.

Syntax `SENSe:DATA:TELecom:MEASure:WANDer:TIE:UI?`

Response

<wander tie> (NR1-numeric)	Description
Floating point value in the range of 0 to 1000.0, with a resolution of 0.01	Current TIE value in UI

Dependencies Requires installation of Option 14 jitter module. This measurement is valid when SENSE:DAT:TELecom:MEASure:JITter:STATus? returns VALID.

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:WANDER:TIE?`

Response: `20.5`

Related Commands

None

SENSe:DATA:TELecom:MEASure:WANDer:TIE:NS?

This query returns the TIE value in UI at the current time in the test.

Syntax

`SENSe:DATA:TELecom:MEASure:WANDer:TIE:UI?`

Response

SDH <wander tie>	Description
Integer in the range of 0 to 42947667295	current TIE in nanoseconds

Dependencies

Jitter option 14 must be installed for valid results. This measurement is valid when SENSE:DAT:TELecom:MEASure:JITter:STATus? returns VALID.

Errors and Events

None

Examples

Query: `SENSE:DATA:TELECOM:MEASURE:WANDER:TIE:NS?`

Response: 10

Related Commands

None

WANDer:AVAIlable?

This query returns the number of available wander records.

Syntax `WANDer:AVAIlable?`

Dependencies None

Examples Query: `WANDer:AVAIlable?`

Response: the number of available wander records

Related Commands None

WANDer:CLEAr

This command clear stored wander data.

Syntax `WANDer:CLEAr`

Dependencies None

Examples Query: `WANDer:CLEAr`

Related Commands None

CALibrate Subsystem

This section describes the calibrate commands and queries. The following figure shows the hierarchy tree for this CTS 850 subsystem.

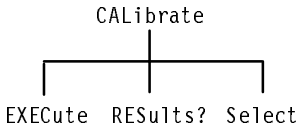


Figure 2–95: CALibrate subsystem

Calibrate:EXECute

This command runs a selected calibration routine.

Syntax

```
CALibrate:EXECute
```

Dependencies

Requires installation of Option 14 jitter module.

CALibrate:SELect sets which calibration routines to run.

This command sets the Operation Complete bit in the Standard Event Status Register (SESR).

Errors and Events

None

Examples

```
CALIBRATE:EXECUTE
```

Related Commands

CALibrate:SELect, *CAL?

CALibrate:RESults?

This query returns the results from CALibrate:EXECute or power-up self-test calibration routines.

Syntax `CALibrate:RESults?`

Response

<cal results> (discrete)	Description
PASSED	Selected or self-test calibration tests passed
FAILED	Selected or self-test calibration tests failed
ABORTED	Selected or self-test calibration tests stopped before completed
RUNNING	Calibration is running

Dependencies None

Errors and Events None

Examples Query: `CALIBRATE:RESULTS?`

Response: `PASSED`

Related Commands CALibrate:EXECute, CALibrate:SELect

Calibrate:SELect

This command sets or queries the calibration routine to run when executing CALibrate:EXECute.

Syntax

```
CALibrate:SELect <cal select>
CALibrate:SELect?
```

Parameters

<cal select> (discrete)	Description
JGEN	Run all jitter generation system calibration routines
JMEAS	Run all jitter measurement system calibration routines (default)

Dependencies

Requires installation of Option 14 jitter module.

*RST sets to JMEAS (default).

Errors and Events

None

Examples

Set: `CALIBRATE:SELECT JGEN`

Query: `CALIBRATE:SELECT?`

Response: `JGEN`

Related Commands

CALibrate:EXECute

Transmitter/Receiver Setup Commands

The Transmitter/Receiver Setup Commands allow you to control the interaction between Transmitter and Receiver settings.

This section contains all of the commands and queries for the following CTS 850 Transmitter/Receiver Setup subsystem:

- INSTrument

INSTrument Subsystem

This section describes the command and query that control the coupling between the Transmitter and Receiver setups. Figure 2–97 shows the hierarchy tree for this subsystem.

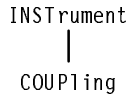


Figure 2–97: INSTrument:COUPling Subsystem

INSTrument:COUPling

This command sets or queries the Transmitter and Receiver setup coupling. NONE allows the Transmitter and Receiver to be independently controlled. TXRX establishes interaction between the Transmitter and Receiver parameters shown in
Table 2–79 with the Transmitter governing the *initial* Receiver setup. RXTX establishes interaction between the Transmitter and Receiver parameters shown in Table 2–79 with the Receiver governing the *initial* Transmitter setup.

Table 2–79: Parameters Interacting Through Instrument Coupling

Receiver	Transmitter
INPUT1:RATE	OUTPUT1:RATE
INPUT1:TYPE	OUTPUT1:TYPE
SENSE:DATA:TELecom:SOURce	SOURce:DATA:TELecom:SOURce
SENSe:DATA:TELecom:CHANnel	SOURce:DATA:TELecom:CHAnnel
SENSe:DATA:TELecom:PAYLoad:MAPPing	SOURce:DATA:TELecom:PAYLoad:MAPPing

Table 2–79: Parameters Interacting Through Instrument Coupling (Cont.)

Receiver	Transmitter
SENSe:DATA:TELecom:PAYLoad:PATTern	SOURce:DATA:TELecom:PAYLoad:PATTern
SENSe:DATA:TELecom:PAYLoad:UBYTe	SOURce:DATA:TELecom:PAYLoad:UBYTe

***NOTE**. A change to one of the parameters listed in Table 2–79 might cause a change to the INSTrument:COUPling parameter value. For example, if you set INSTrument:COUPling to TXRX then change OUTPUT1:RATE, the value of INSTrument:COUPling is changed to RXTX.*

Syntax

```
INSTrument:COUPling <coupling>
INSTrument:COUPling?
```

Parameters

<coupling> (discrete)	description
NONE	Setups are independent
TXRX	Transmitter sets initial condition of the Receiver
RXTX	Receiver sets initial condition of the Transmitter

Dependencies

None

Errors and Events

None

Examples

Set: `INSTRUMENT:COUPLING TXRX`

Query: `INSTRUMENT:COUPLING?`

Response: `RXTX`

Related Commands

None

Trigger and Capture Commands

The Trigger and Capture commands allow you to capture overhead and payload data.

This section contains all of the commands and queries for each of the following CTS 850 Trigger and Capture subsystems:

- TRIGger

TRIGger Subsystem

This section describes each of the commands and queries that allow you to arm the trigger system and force an immediate trigger. Figure 2–99 shows the hierarchy tree for this subsystem.

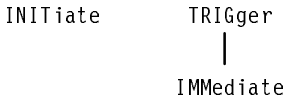


Figure 2–99: TRIGger subsystem

INITiate

This command causes the capture mechanism to start and the trigger system to arm. After receiving this command, the instrument will acquire data until the programmed trigger event occurs or the capture is stopped manually with the TRIGger:IMMediate command.

Syntax `INITiate`

Parameters None

Dependencies None

Errors and Events None

Examples

```
INITIATE
```

Related Commands

TRIGger:IMMediate
SENSe:DATA:TELecom:OVERhead:DATA?
SENSe:DATA:TELecom:POVerhead:DATA?

TRIGger:IMMediate

This command forces a trigger to occur, which stops the capture of data.

Syntax

```
TRIGger:IMMediate
```

Parameters

None

Dependencies

Before the TRIGger:IMMediate command is sent, an INITiate command must be sent first to arm the trigger system.

Errors and Events

None

Examples

```
TRIGGER:IMMEDIATE
```

Related Commands

INITiate
SENSe:DATA:TELecom:OVERhead:DATA?
SENSe:DATA:TELecom:POVerhead:DATA?

TRIGger:STATus?

SDH/PDH Jitter/Wander Test Option Only

This query returns the instrument trigger status.

Syntax

```
TRIGger:STATus?
```

Response

<frequency rate> (NR3-numeric)	Description
RUN	Instrument is waiting for a trigger
STOP	Instrument has been triggered

Dependencies

None

Errors and Events

None

Examples

Query: `TRIGger:STATus?`

Response: `STOP`

Related Commands

TRIGger:IMMediate

Input/Output Commands

The Input/Output commands allow you to write files to disk, control the display of the instrument, print reports, and communicate with the instrument over an RS-232 port

This section contains all of the commands and queries for each of the following CTS 850 Input/Output subsystems:

- MMEMory
- DISPlay
- HCOPy
- SYSTem:COMMunicate:SERial

MMEMory Subsystem

This section describes each of the commands and queries that control access to the disk. Figure 2–101 shows the hierarchy tree for this subsystem. All MMEMory commands set the OPC bit in the Standard Event Status Register.

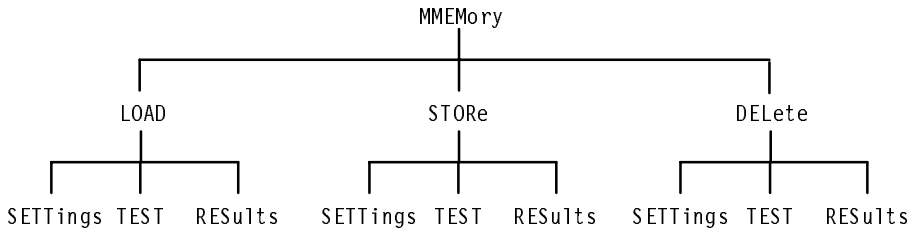


Figure 2–101: MMEMory subsystem

***NOTE**. Do not specify the file name extension for any of these commands. Extensions are added automatically by the system.*

MMEMory:STORe:SETTings

This command stores the current instrument state or stored setups to a disk file.

Syntax

```
MMEMory:STORe:SETTings <file name>,<buffer>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	File name you want to save the setups to; the extension ".SET" is added by the software.
<buffer> (NR1-numeric)	**Description**
Valid values are 0 through 5	Buffer 0 contains the current setups, buffers 1 through 5 contain the previous setups

Dependencies

A disk must be in the disk drive.

Errors and Events

402, "Operation complete; Save of instrument setup complete"
252, "Missing media; Disk not present in drive"
254, "Media full; Disk is full"
257, "File name error; File name required"
258, "Media protected; Disk is write-protected, cannot write to file"

Examples

```
MMEMORY:STORe:SETTings "TEMP0001",1
```

Related Commands

*SAV

MMEMory:DELEte:SETTings

This command deletes a setup file from the disk.

Syntax

```
MMEMory:DELEte:SETTings <file name>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	Name of the setups file you want deleted

Dependencies

A disk must be in the disk drive.

Errors and Events

252, “Missing media; Disk not present in drive”
256, “File name not found; Could not open disk file”
258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:DELETE:SETTINGS "FILEONE"
```

Related Commands

None

MMEMory:LOAD:SETTings

This command restores the instrument state from a disk file into a stored setup location (buffers 1 through 5) or the current instrument state (buffer 0). Once settings have been loaded into one of the stored setup buffers (buffers 1 through 5), you can give a *RCL command to place them into buffer 0 (current instrument state).

Syntax

```
MMEMory:LOAD:SETTings <file name>, <buffer>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form “file name”	File name you want to load the setups from

<buffer> (NR1-numeric)	Description
Valid values are 0 through 5	Buffer 0 contains the current setups; buffers 1 through 5 contain the previous setups

Dependencies

A disk must be in the disk drive.

Errors and Events

402, “Operation complete; Recall of instrument setup complete”
252, “Missing media; Disk not present in drive”

Examples

```
MMEMORY:LOAD:SETTINGS "TEMP0001",0
```

Related Commands

*RCL

MMEMory:STORe:TEST

This command stores the current instrument test to a disk file.

Syntax

```
MMEMory:STORe:TEST <file name>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	File name you want to save the test to; the extension ".TST" is added by the software

Dependencies

A disk must be in the disk drive.

Errors and Events

252, "Missing media; Disk not present in drive"
254, "Media full; Disk is full"
257, "File name error; File name required"
258, "Media protected; Disk is write-protected, cannot write to file"

Examples

```
MMEMORY:STORe:TEST "TEMP0001"
```

Related Commands

*SAV

MMEMory:DELEte:TEST

This command deletes a test file from the disk.

Syntax

```
MMEMory:DELEte:TEST <file name>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	Name of the test file you want deleted

Dependencies

A disk must be in the disk drive.

Errors and Events

252, "Missing media; Disk not present in drive"
256, "File name not found; Could not open disk file"
258, "Media protected; Disk is write-protected, cannot write to file"

Examples `MMEMORY:DELETE:TEST "FILEONE"`

Related Commands None

MMEMory:LOAD:TEST

This command restores a test from a disk file into the current instrument test (buffer 0).

Syntax `MMEMory:LOAD:TEST <file name>`

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	File name you want to load the test from

Dependencies Disk must be in the disk drive.

Errors and Events 252, "Missing media; Disk not present in drive"

Examples `MMEMORY:LOAD:TEST "TEMP0001"`

Related Commands *RCL

MMEMory:STORe:RESults

This command stores the current or stored test results to a disk file. If the current test results are of great length, only buffer number 1 may be available to store to disk. Use the SENSe:DATA:TELecom:MEASurement:BUFFer:AVAIlable? query to determine if buffer 2 exists.

Syntax

```
MMEMory:STORe:RESults <file name>,<buffer>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	File name you want to save the test results to; the extension ".RES" is added by the software
<buffer> (NR1-numeric)	**Description**
Valid values are 1 and 2	Buffer 1 contains the current test results; buffer 2 contains the previous test results

Dependencies

A disk must be in the disk drive.

Errors and Events

252, "Missing media; Disk not present in drive"
254, "Media full; Disk is full"
257, "File name error; File name required"
258, "Media protected; Disk is write-protected, cannot write to file"

Examples

```
MMEMORY:STORE:RESULTS "TEMP0001",1
```

Related Commands

*SAV

MMEMory:DELEte:RESults

This command deletes a test results file from the disk.

Syntax

```
MMEMory:DELEte:RESults <file name>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	Name of the test results file you want deleted

Dependencies

A disk must be in the disk drive.

Errors and Events

252, "Missing media; Disk not present in drive"
256, "File name not found; Could not open disk file"
258, "Media protected; Disk is write-protected, cannot write to file"

Examples

```
MMEMORY:DELETE:RESULTS "FILEONE"
```

Related Commands

None

MMEMory:LOAD:RESults

This command restores the instrument state from a disk file into a read only buffer (buffer number –1).

Syntax

```
MMEMory:LOAD:RESults <file name>
```

Parameters

<file name> (string)	Description
A maximum of eight characters in the form "file name"	File name you want to load the test results from

Dependencies

Disk must be in the disk drive.

Errors and Events

252, "Missing media; Disk not present in drive"

Examples

```
MMEMORY:LOAD:RESULTS "TEMP0001"
```

Related Commands

*RCL

MMEMory:JITter Subsystem

This section describes each of the commands and queries that let you load, store, and delete floppy disk jitter data. Figure 2–102 shows the hierarchy tree for this subsystem. All MMEMory commands set the OPC bit in the Standard Event Status Register.

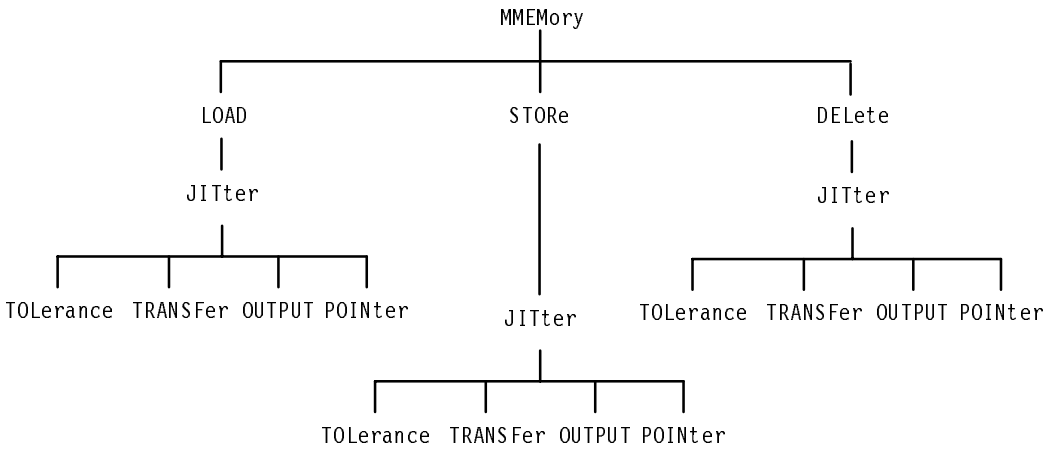


Figure 2–102: MMEMory:JITter subsystem

***NOTE**. Do not specify a file name extension for any of these commands. Extensions are added automatically by the system.*

MMEMory:LOAD:JITter:TOLerance

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter tolerance test data from a disk file into a view-only compliance test page. Jitter tolerance files use the extension .JTL.

Syntax `MMEMory:LOAD:JITter:TOLerance <filename>`

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events 252, “Missing media; Disk not present in drive”

Examples

```
MMEMORY:LOAD:JITTER:TOLERANCE "JTOL0001"
```

Related Commands MMEMory:STORe:JITter:TOLerance

MMEMory:LOAD:JITter:TRANSFer

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter transfer test data from a disk file into a view-only compliance test page. Jitter transfer files use the extension .JTR.

Syntax

```
MMEMory:LOAD:JITter:TRANSFer <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events 252, “Missing media; Disk not present in drive”

Examples

```
MMEMORY:LOAD:JITTER:TRANSFER "TRAN0001"
```

Related Commands MMEMory:STORe:JITter:TRANSFer

MMEMory:LOAD:JITter:OUTPUT

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter output test data from a disk file into a view-only compliance test page. Jitter output files use the extension .OUT.

Syntax

```
MMEMory:LOAD:JITter:OUTPUT <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies

Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events

252, “Missing media; Disk not present in drive”

Examples

```
MMEMORY:LOAD:JITTER:OUTPUT "OUT0001"
```

Related Commands

MMEMory:STORe:JITter:OUTPUT

MMEMory:LOAD:JITter:POINter

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter pointer test data from a disk file into a view-only compliance test page. Jitter pointer files use the extension .PTR.

Syntax

```
MMEMory:LOAD:JITter:POINter <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies

Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events 252, “Missing media; Disk not present in drive”

Examples

```
MMEMORY:LOAD:JITTER:POINTER "PTR0001"
```

Related Commands MMEMory:STORe:JITter:POINter

MMEMory:STORe:JITter:TOLerance

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter tolerance test data to a disk file. Jitter tolerance files use the extension .JTL and .XTL. .XTL files contain the test data in a comma-separated format for use with spreadsheet programs.

Syntax

```
MMEMory:STORe:JITter:TOLerance <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

Errors and Events 252, “Missing media; Disk not present in drive”

254, “Media full; Disk is full”

257, “File name error; File name required”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:STORe:JITTER:TOLERANCE "JTOL0001"
```

Related Commands MMEMory:LOAD:JITter:TOLerance

MMEMory:STORe:JITter:TRANSFer

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter transfer test data to a disk file. Jitter transfer files use the extensions .JTR and .XTR. .XTR files contain the test data in a comma-separated format for use with spreadsheet programs.

Syntax

```
MMEMory:STORe:JITter:TRANSFer <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies

Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

Errors and Events

252, “Missing media; Disk not present in drive”

254, “Media full; Disk is full”

257, “File name error; File name required”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:STORe:JITTER:TRANSFER "TRAN0001"
```

Related Commands

MMEMory:LOAD:JITter:TRANSFer

MMEMory:STORe:JITter:OUTPUT

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter output test data to a disk file. Jitter output files use the extension .OUT.

Syntax

```
MMEMory:STORe:JITter:OUTPUT <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies

Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

Errors and Events

252, “Missing media; Disk not present in drive”

254, “Media full; Disk is full”

257, “File name error; File name required”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:STORE:JITTER:OUTPUT "TRAN0001"
```

Related Commands

MMEMory:LOAD:JITter:OUTPUT

MMEMory:STORe:JITter:POINter

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter pointer test data to a disk file. Jitter pointer files use the extension .PTR.

Syntax

```
MMEMory:STORe:JITter:POINter <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies

Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

Errors and Events

252, “Missing media; Disk not present in drive”

254, “Media full; Disk is full”

257, “File name error; File name required”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:STORE:JITTER:POINTER "PTR0001"
```

Related Commands

MMEMory:LOAD:JITter:POINter

MMEMory:DELEte:JITter:TOLerance

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter tolerance test data file from a disk. Jitter tolerance files use the extension .JTL.

Syntax

```
MMEMory:STORe:JITter:TOLerance <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies

Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events

252, “Missing media; Disk not present in drive”

256, “File name not found; Could not open disk file”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:STORe:JITTER:TOLERANCE "JTOL0001"
```

Related Commands

MMEMory:LOAD:JITter:TOLerance

MMEMory:DELEte:JITter:TRANSFer

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter transfer test data file from a disk. Jitter transfer files use the extension .JTL.

Syntax

```
MMEMory:DELEte:JITter:TRANSFer <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events 252, “Missing media; Disk not present in drive”

256, “File name not found; Could not open disk file”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:DELETE:JITTER:TRANSFER "TRAN0001"
```

Related Commands None

MMEMory:DELEte:JITter:OUTPUT

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter output test data file from a disk. Jitter OUTPUT files use the extension .JTL.

Syntax

```
MMEMory:DELEte:JITter:OUTPUT <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events 252, “Missing media; Disk not present in drive”

256, “File name not found; Could not open disk file”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:DELETE:JITTER:OUTPUT "OUT0001"
```

Related Commands None

MMEMory:DELEte:JITter:POINter

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter pointer test data file from a disk. Jitter pointer files use the extension .PTR.

Syntax

```
MMEMory:DELEte:JITter:POINter <filename>
```

Parameters

<filename> (string)	Description
1–8 characters	File name

Dependencies

Requires installation of Option 14 jitter module.

Disk must be in disk drive.

Errors and Events

252, “Missing media; Disk not present in drive”

256, “File name not found; Could not open disk file”

258, “Media protected; Disk is write-protected, cannot write to file”

Examples

```
MMEMORY:DELETE:JITTER:POINTER "OUT0001"
```

Related Commands

None

DISPlay Subsystem

This section describes each of the commands and queries that control aspects of the front panel display. Figure 2–103 shows the hierarchy tree for this subsystem.

Figure 2–103: DISPlay subsystem

DISPlay:BRIGhtness

This command sets or queries the display brightness.

Syntax

```
DISPlay:BRIGhtness <display brightness>
DISPlay:BRIGhtness?
```

Parameters

<display brightness> (NR3-numeric)	Description
Any number between 0 and 1	0 indicates minimum brightness, 0.5 indicates medium brightness, and 1 indicates maximum brightness (default = 1.00)

Dependencies

None

Errors and Events

None

Examples

Set: `DISPLAY:BRIGHTNESS .8`

Query: `DISPLAY:BRIGHTNESS?`

Response: `0.75`

Related Commands

None

HCOPy Subsystem

This section describes the commands and queries that control the printer. Figure 2–104 shows the hierarchy tree for this subsystem.

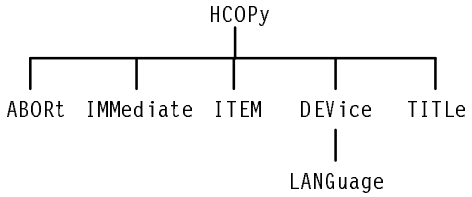


Figure 2–104: HCOPy subsystem

HCOPy:ABORt

This command stops the current printout.

Syntax `HCOPy:ABORt`

Parameters None

Dependencies None

Errors and Events None

Examples `HCOPY:ABORT`

Related Commands HCOPy:IMMediate

HCOPy:IMMediate

This command starts the printout. The type of report to be printed is controlled with the HCOPY:ITEM command. The OPC bit will be set when the report has printed.

Syntax

```
HCOPy:IMMediate
```

Parameters

None

Dependencies

Your printer type must match the HCOPy:DEVice:LANGuage setting

Errors and Events

402, “Operation complete; Hardcopy complete”
200, “Execution error; Hardcopy already in progress”

Examples

```
HCOPY:IMMEDIATE
```

Related Commands

HCOPy:ABORt

HCOPy:ITEM

This command sets or queries the information to be printed.

Syntax

```
HCOPy:ITEM <hcopy item>
HCOPy:ITEM?
```

Parameters

<hcopy item> (discrete)	Description
SUMMary	Summary of test results is printed (default)
ALLRESULTS	Summary of all measurement test results is printed
SCREEN	The current screen is printed
Jitter	Hardcopy printing of the Jitter Results

Dependencies

None

Errors and Events

None

Examples

Set: `HCOPY:ITEM SUMMARY`

Query: `HCOPY:ITEM?`

Response: `SCREEN`

Related Commands HCOPy:IMMediate

HCOPy:DEVice:LANGuage

This command sets or queries the printer language.

Syntax

```
HCOPy:DEVice:LANGuage <printer language>
HCOPy:DEVice:LANGuage?
```

Parameters

<printer language> (discrete)	Description
TEK	Tektronix DPU-411 printer (default)
EPSOn	Epson printer
PCL	Printer Control Language (Hewlett-Packard Thinkjet)

Dependencies None

Errors and Events None

Examples

Set: `HCOPY:DEVICE:LANGUAGE EPSON`

Query: `HCOPY:DEVICE:LANGUAGE?`

Response: `PCL`

Related Commands None

HCOPy:TITLe

This command sets or queries the title printing capability. If the HCOPy:TITLe is set to ON, the system owner and system user values will be printed as the title.

Syntax

```
HCOPy:TITLe <title enabled>
HCOPy:TITLe?
```

Parameters

<title enabled> (boolean)	Description
0 or OFF	Title not printed (default)
1 or ON	Title printed

Dependencies

None

Errors and Events

None

Examples

Set: `HCOPY:TITLE ON`

Query: `HCOPY:TITLE?`

Response: `0`

Related Commands

None

SYSTem:COMMunicate:SERial Subsystem

This section describes the commands and queries that control communication over the serial port. Figure 2–105 shows the hierarchy tree for this subsystem.

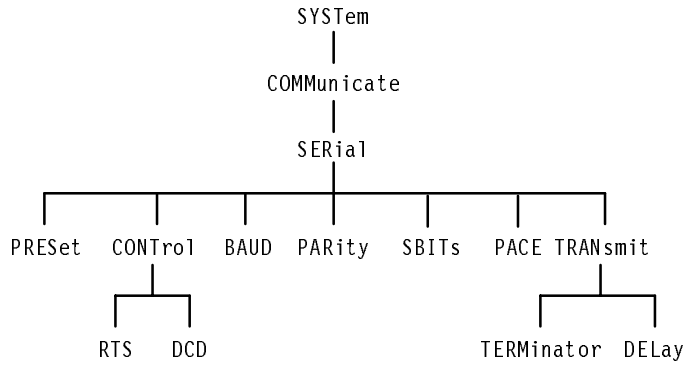


Figure 2–105: SYSTem:COMMunicate:SERial subsystem

SYSTem:COMMunicate:SERial:PRESet

This command sets all parameters in the serial subsystem to default values.

Syntax `SYSTem:COMMunicate:SERial:PRESet`

Parameters There are no parameters for this command. The resulting defaults for each command are shown in Table 2–81.

Table 2–81: Commands and Default Values Set by the SYSTem:COMMunicate: SERial:PRESet Command

Command	Default value
SYSTem:COMMunicate:SERial:CONtrol:DCD	0
SYSTem:COMMunicate:SERial:CONTrol:RTS	RFR
SYSTem:COMMunicate:SERial:PACE	NONE
SYSTem:COMMunicate:SERial:BAUD	9600
SYSTem:COMMunicate:SERial:PARITY	NONE
SYSTem:COMMunicate:SERial:SBITs	1
SYSTem:COMMunicate:SERial:TRANsmit:TERMinator	LF
SYSTem:COMMunicate:SERial:TRANsmit:DELay	0

Dependencies None

Errors and Events None

Examples `SYSTEM:COMMUNICATE:SERIAL:PRESET`

Related Commands None

SYSTem:COMMunicate:SERial:CONTrol:DCD

This command sets or queries Data Carrier Detect (DCD) sensitivity on and off.

Syntax

```
SYSTem:COMMunicate:SERial:CONTrol:DCD <DCD mode>
SYSTem:COMMunicate:SERial:CONTrol:DCD?
```

Parameters

<DCD mode> (boolean)	Description
1 or ON	DCD on (default)
0 or OFF	DCD off

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:COMMUNICATE:SERIAL:CONTROL:DCD OFF`

Query: `SYSTEM:COMMUNICATE:SERIAL:CONTROL:DCD?`

Response: `1`

Related Commands None

SYSTem:COMMunicate:SERial:CONTrol:RTS

This command sets or queries the hardware handshaking scheme. When set to ON, handshaking is off (the instrument is not sensitive to the CTS 850). When set to RFR or IBFULL, the normal RTS/CTS hardware handshaking is on (the instrument indicates ready to receive with the RTS line).

Syntax

```
SYSTem:COMMunicate:SERial:CONTrol:RTS <serial RTS>
SYSTem:COMMunicate:SERial:CONTrol:RTS?
```

Parameters

<serial RTS> (discrete)	Description
ON	Not sensitive to the CTS 850; RTS line always asserted (handshaking is off)
RFR	Ready For Receiving (handshaking is on)
IBFULL	same as RFR

Dependencies

None

Errors and Events

None

Examples

Set: `SYSTEM:COMMUNICATE:SERIAL:CONTROL:RTS RFR`

Query: `SYSTEM:COMMUNICATE:SERIAL:CONTROL:RTS?`

Response: `RFR`

Related Commands

None

SYSTem:COMMunicate:SERial:BAUD

This command sets or queries the baud rate (both transmit and receive) of the serial port.

Syntax

```
SYSTem:COMMunicate:SERial:BAUD <serial baud>
SYSTem:COMMunicate:SERial:BAUD?
```

Parameters

<serial baud> (NR1-numeric)	Description
9600	9600 baud (default)
1200	1200 baud
2400	2400 baud
4800	4800 baud

Dependencies

None

Errors and Events

None

Examples

Set: `SYSTEM:COMM:SER:BAUD 1200`

Query: `SYSTEM:COMM:SER:BAUD?`

Response: `2400`

Related Commands

None

SYSTem:COMMunicate:SERial:PARity

This command sets or queries the parity of the serial port.

Syntax

```
SYSTem:COMMunicate:SERial:PARity <serial parity>
SYSTem:COMMunicate:SERial:PARity?
```

Parameters

<serial parity> (discrete)	Description
NONE	No parity is sent or received (default)
EVEN	Even parity is sent and received
ODD	Odd parity is sent and received

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:COMMUNICATE:SERIAL:PARITY EVEN`

Query: `SYSTEM:COMMUNICATE:SERIAL:PARITY?`

Response: `EVEN`

Related Commands None

SYSTem:COMMunicate:SERial:SBITs

This command sets or queries the number of stop bit used by the serial port.

Syntax

```
SYSTem:COMMunicate:SERial:SBITs <serial sbits>
SYSTem:COMMunicate:SERial:SBITs?
```

Parameters

<serial sbits> (NR1-numeric)	Description
1 or 2	Number of stop bits used by the serial port

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:COMMUNICATE:SERIAL:SBITS 1`

Query: `SYSTEM:COMMUNICATE:SERIAL:SBITS?`

Response: `2`

Related Commands None

SYSTem:COMMunicate:SERial:PACE

This command sets or queries the software pacing scheme.

Syntax

```
SYSTem:COMMunicate:SERial:PACE <serial pace>
SYSTem:COMMunicate:SERial:PACE?
```

Parameters

<serial pace> (discrete)	Description
NONE	Software pacing disabled (default)
XON	Software pacing on using control-S and control-Q

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:COMMUNICATE:SERIAL:PACE NONE`

Query: `SYSTEM:COMMUNICATE:SERIAL:PACE?`

Response: `XON`

Related Commands None

SYSTem:COMMunicate:SERial:TRANsmit:DELay

This command sets or queries the delay, in seconds, that the instrument waits after receiving a query and before issuing a response.

Syntax

```
SYSTem:COMMunicate:SERial:TRANsmit:DELay <transmit delay>
SYSTem:COMMunicate:SERial:TRANsmit:DELay?
```

Parameters

<transmit delay> (NR1-numeric)	Description
Any integer in the range 0 to 60	Delay in seconds that instrument waits after receiving a query before issuing a response (default= 0)

Dependencies

None

Errors and Events

None

Examples

Set: `SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:DELAY 5`

Query: `SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:DELAY?`

Response: 3

Related Commands

None

SYSTem:COMMunicate:SERial:TRANsmit:TERMinator

This command sets or queries the character or characters sent with the response message.

Syntax

```
SYSTem:COMMunicate:SERial:TRANsmit:TERMinator <terminator>
SYSTem:COMMunicate:SERial:TRANsmit:TERMinator?
```

Parameters

<terminator> (discrete)	Description
LF	Line feed (default)
CR	Carriage return
CRLF	CR/LF
LFCR	LF/CR

Dependencies

None

Errors and Events

None

Examples

Set: `SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:TERMINATOR CRLF`

Query: `SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:TERMINATOR?`

Response: `CRLF`

Related Commands

None

Instrument Control Commands

The Instrument Control commands allow you to access utility functions and settings such as errors, query headers, serial number, system time, date, owner, and operator.

This section contains all of the commands and queries for the following CTS 850 Instrument Control subsystem:

- SYSTem

SYSTem Subsystem

This section describes each of the commands and queries that allow you to access general utility functions and settings in the instrument. Figure 2–111 shows the hierarchy tree for this subsystem.

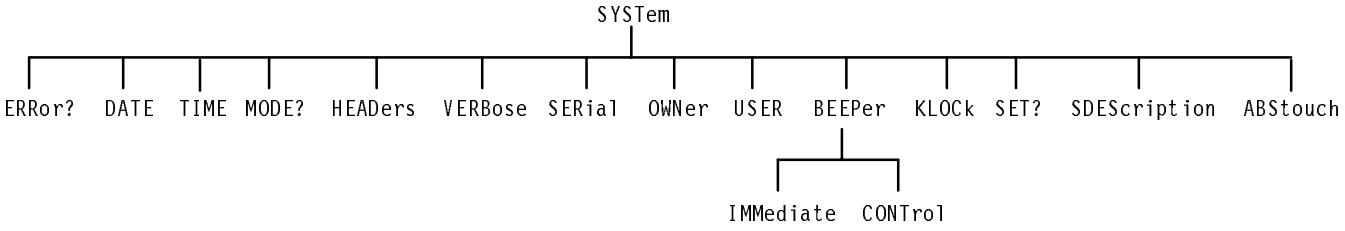


Figure 2–111: SYSTem subsystem

SYSTem:ERRor?

This query returns the errors and events that have accumulated in the instrument. If no errors are present in the instrument, the response is: 0,“No Error”.

Syntax `SYSTem:ERRor?`

Response

<error number> (NR1-numeric)	Description
Any integer in the range 0 to 999	This value indicates the error number
<error description> (string)	**Description**
Primary error message and, optionally, a secondary error message	This string describes the error

Dependencies None

Errors and Events See the *Messages* tables in the *Status and Events* section.

Examples Query: `SYSTEM:ERROR?`

Response: 200, "Execution error; Pointer burst active, request ignored"

Related Commands None

SYSTem:DATE

This command sets or queries the date for the instrument.

Syntax

```
SYSTem:DATE <year>,<month>,<day>
SYSTem:DATE?
```

Parameters

<year> (NR1-numeric)	Description
Any integer in the range 0 to 99	The system year is set to this value
<month> (NR1-numeric)	**Description**
Any integer in the range 1 to 12	The system month is set to this value
<day> (NR1-numeric)	**Description**
Any integer in the range 1 to 31	The system day is set to this value

Dependencies None

Errors and Events None

Examples Set: `SYSTEM:DATE 97,5,1`

Query: `SYSTEM:DATE?`

Response: `97,5,26`

Related Commands SYSTem:TIME

SYSTem:TIME

This command sets or queries the time for the instrument. Time is kept in a 24-hour format.

Syntax

```
SYSTem:TIME <hour>,<minute>,<second>
SYSTem:TIME?
```

Parameters

<hour> (NR1-numeric)	Description
Any integer in the range 0 to 23	The system hour is set to this value
<minute> (NR1-numeric)	**Description**
Any integer in the range 0 to 59	The system minute is set to this value
<second> (NR1-numeric)	**Description**
Any integer in the range 0 to 59	The system second is set to this value

Dependencies

None

Errors and Events

None

Examples

Set: `SYSTEM:TIME 13,7,56`

Query: `SYSTEM:TIME?`

Response: `22,15,00`

Related Commands

SYSTem:DATE

SYSTem:MODE?

This query returns the mode of the instrument.

Syntax

```
SYSTem:MODE?
```

Response

<system mode> (discrete)	Description
SDH	Instrument is set to SDH mode

Dependencies None

Errors and Events None

Examples Query: `SYSTEM:MODE?`

Response: `SDH`

Related Commands SYSTem:MODE

SYSTem:HEADers

This command sets or queries the presence of headers in query responses.

Syntax

```
SYSTem:HEADers <system headers>
SYSTem:HEADers?
```

Parameters

<system headers> (boolean)	Description
0 or OFF	No system headers are returned (default)
1 or ON	System headers are returned

Dependencies None

Errors and Events None

Examples Set: `SYSTEM:HEADERS OFF`

Query: `SYSTEM:HEADERS?`

Response: `0`

Related Commands None

SYSTem:VERBose

This command sets or queries the length of headers in query responses. If verbose is ON, the long form of headers is returned. If verbose is OFF, the short form is returned.

Syntax

```
SYSTem:VERBose <system verbose>
SYSTem:VERBose?
```

Parameters

<system verbose> (boolean)	Description
0 or OFF	Short form of headers (default)
1 or ON	Long form of headers

Dependencies

SYSTem:HEADers must be set to ON for headers to be returned.

Errors and Events

None

Examples

Set: `SYSTEM:VERBOSE OFF`

Query: `SYSTEM:VERBOSE?`

Response: `0`

Related Commands

None

SYSTem:SERial

This command sets or queries the instrument serial number. The factory assigns the serial number; however, you may alter the serial number. Only ASCII alphanumeric characters are accepted.

Syntax

```
SYSTem:SERIal <serial number>
SYSTem:SERIal?
```

Parameters

<serial number> (string)	Description
Any ASCII string, maximum length of 16	The instrument serial number is set to this value

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:SERIAL "B010100"`

Query: `SYSTEM:SERIAL?`

Response: `B010345`

Related Commands *IDN?

SYSTem:OWNer

This command sets or queries the instrument owner. This information is saved in the results buffer and printed in hardcopy reports.

Syntax

```
SYSTem:OWNer <system owner>
SYSTem:OWNer?
```

Parameters

<system owner> (string)	Description
Any ASCII string, maximum length of 64	The instrument system owner is set to this value

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:OWNER "The ABC TELECOM COMPANY"`

Query: `SYSTEM:OWNER?`

Response: `"THE XYZ TELECOM COMPANY"`

Related Commands None

SYSTem:USER

This command sets or queries the instrument operator name. This information is saved in the results buffer and printed in hardcopy reports.

Syntax

```
SYSTem:USER <operator name>
SYSTem:USER?
```

Parameters

<operator name> (string)	Description
Any ASCII string, maximum length of 64	The instrument operator name is set to this value

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:USER "JOHN DOE"`

Query: `SYSTEM:USER?`

Response: `"JOHN TECHNICIAN"`

Related Commands SYSTem:OWNer

SYSTem:BEEPer:IMMediate

This command is used to sound the beeper in the instrument.

Syntax

```
SYSTem:BEEPer:IMMediate
```

Parameters None

Dependencies None

Errors and Events None

Examples
```
SYSTEM:BEEPER:IMMEDIATE
```

Related Commands SYSTem:BEEPer:CONTrol

SYSTem:BEEPer:CONTrol

This command sets or queries the beeper control.

Syntax
```
SYSTem:BEEPer:CONTrol <beeper control>
SYSTem:BEEPer:CONTrol?
```

Parameters

<beeper control> (boolean)	Description
0 or OFF	Use SYSTem:BEEPer:IMMediate to sound the beeper (default)
1 or ON	The beeper sounds when any error, alarm, or failure is detected

Dependencies None

Errors and Events None

Examples

Set:
```
SYSTEM:BEEPER:CONTROL ON
```

Query:
```
SYSTEM:BEEPER:CONTROL?
```

Response:
```
1
```

Related Commands None

SYSTem:KLOCk

This command sets or queries the front panel lock setting. (KLOCk stands for keyboard lock.)

Syntax

```
SYSTem:KLOCk <front panel control>
SYSTem:KLOCk?
```

Parameters

<front panel control> (boolean)	Description
0 or OFF	Front panel enabled (default)
1 or ON	Front panel disabled

Dependencies None

Errors and Events None

Examples

Set: `SYSTEM:KLOCK ON`

Query: `SYSTEM:KLOCK?`

Response: `1`

Related Commands None

SYSTem:SET?

This query returns the current instrument state and performs the same function as the *LRN? query.

Syntax

```
SYSTem:SET?
```

Response A list of commands and their parameter values separated by semicolons (;).

Dependencies None

Errors and Events None

Examples

Query: `SYSTEM:SET?`

Response:
```
:OUTPUT1:TELECOM:RATE STM1;TYPE ELECTRICAL;LEVEL
XCONNECT;:SOURCE:CLOCK:SOURCE INTERNAL;OFFSET:MODE
LOFFSET;LVALUE 0;:SOURCE:DATA:TELECOM:SOURCE OUTPUT1;
...
```

Related Commands

*LRN?

SYSTem:SDEScription

This command sets or queries the description for the stored settings in the current buffer.

Syntax

```
SYSTem:SDEScription <description>
SYSTem:SDEScription?
```

Parameters

<description> (string)	Description
Any string, maximum length of 24 characters	Description of the stored strings in the current buffer

Dependencies

After you set the description with this command, use the *SAV command to save the description and settings in memory or the MMEMory:STORe:SETTings command to save the description and settings to disk.

Errors and Events

None

Examples

Set: `SYSTEM:SDESCRIPTION "PASS/FAIL TEST A001"`

Query: `SYSTEM:SDESCRIPTION?`

Response: `"PASS/FAIL TEST T001"`

Related Commands

*SAV
*RCL
MMEMory:STORe:SETTings

SYSTem:ABStouch

This command simulates front panel button presses and knob turns.

Syntax `SYSTem:ABStouch <abstouch>`

Parameters

<abstouch> (discrete)	Description
HB1	Horizontal bezel #1 (left-most button)
HB2	Horizontal bezel #2
HB3	Horizontal bezel #3
HB4	Horizontal bezel #4
HB5	Horizontal bezel #5
HB6	Horizontal bezel #6
HB7	Horizontal bezel #7 (right-most button)
VB1	Vertical bezel #1 (top button)
VB2	Vertical bezel #2
VB3	Vertical bezel #3
VB4	Vertical bezel #4
VB5	Vertical bezel #5 (bottom button)
STESTs	Stored tests menu
TRANsmit	Transmitter setup menu
RECEiver	Receiver setup menu
RESults	Results menu
UTILity	Utility menu
STARTSTOP	Start/Stop button
STOP	Start/Stop button
IERRor	Error insert button
POINter	Pointer Action button
RHIStory	Reset history button
INCKnob	Increment knob
DECKnob	Decrement knob
HELP	Help dialog button
AUTOscan	Autoscan dialog button
PRINT	Print dialog button

Dependencies None

Errors and Events None

Examples

```
SYSTEM:ABSTOUCH VB1
```

Related Commands None

Diagnostic Commands

The Diagnostic commands allow control of the diagnostic self tests provided with your instrument.

This section contains all of the commands and queries for the following CTS 850 Diagnostic subsystem:

- DIAGnostic

DIAGnostic Subsystem

This section describes each of the commands and queries that allow access and control of the diagnostic self tests provided with your instrument. Figure 2–113 shows the hierarchy tree for this subsystem.

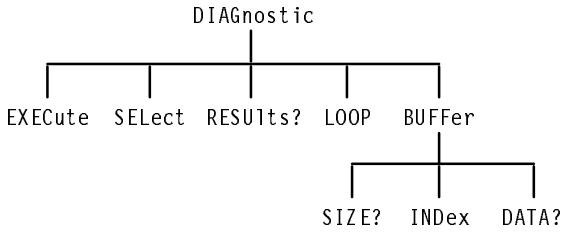


Figure 2–113: DIAGnostic subsystem

DIAGnostic:EXECute

This command executes the selected diagnostic routines and sets the OPC bit when completed.

Syntax `DIAGnostic:EXECute`

Parameters None

Dependencies The routines executed are determined by the DIAGnostic:SELect command.

Errors and Events 200, “Execution error; Diagnostics invalid while disk or autoscan busy”
402, “Operation complete; Internal diagnostics completed – passed”
402, “Operation complete; Internal diagnostics completed – failed”

Examples

```
DIAGNOSTIC:EXECUTE
```

Related Commands

DIAGnostic:SELect
*TST?

DIAGnostic:SELect

This command sets or queries the specified diagnostic routine that are run when the DIAGnostic:EXECute command is sent.

Syntax

```
DIAGnostic:SELect <diagnostic group>
DIAGnostic:SELect?
```

Parameters

<diagnostic group> (discrete)	Description
STANdard	Standard self test; same as the *TST? query (default)
PROCessor	Processor board
PROTocol	Protocol board
CLOCk	Clock generator board
DISK	Disk drive
DISPlay	Display board
TRIButary	Tributary board (Add/Drop Test Option Only)
INTERFACE	Line interface module
FPANel	Front Panel
SYSINTERNAL	Complete system (internal loopback)
SYSEXTERNAL	Complete system (external loopback)
JITter	Jitter module

Dependencies

None

Errors and Events

None

Examples

Set: `DIAGNOSTIC:SELECT STANDARD`

Query: `DIAGNOSTIC:SELECT?`

Response: `JITTER`

Related Commands

DIAGnostic:EXECute

DIAGnostic:RESults?

This query returns the results from the last diagnostics execution. These diagnostics could have been run at the power-on self test or as a result of sending the DIAGnostic:EXECute command or *TST? query.

If any SCPI-derived or IEEE 488.2 Common Command is sent while the diagnostics are running, the diagnostics will stop. The DIAGnostic:RESults? query can then be used to determine if the selected diagnostic test passed or failed.

Syntax

`DIAGnostic:RESults?`

Response

<diagnostic results> (discrete)	Description
PASSED	Test passed
FAILED	Test failed
ABORTED	Test aborted

Dependencies

None

Errors and Events

None

Examples

Query: `DIAGNOSTIC:RESULTS?`

Response: `PASSED`

Related Commands

DIAGnostic:SELect
DIAGnostic:EXECute

DIAGnostic:LOOP

This command sets or queries the looping control used for diagnostic routines when the DIAGnostics:EXECute command is given.

Syntax

```
DIAGnostic:LOOP <loop control>
DIAGnostic:LOOP?
```

Parameters

<loop control> (discrete)	Description
ONCE	One pass (default)
TEN	Loop ten times
THOUSAND	Loop one thousand times
ERRor	Loop until error detected
FOREVER	Loop until any command is sent

Dependencies

None

Errors and Events

None

Examples

Set: `DIAGNOSTIC:LOOP TEN`

Query: `DIAGNOSTIC:LOOP?`

Response: `ONCE`

Related Commands

DIAGnostic:EXECute

This query returns the current setting of the looping control used for diagnostic routines when the DIAGnostics:EXECute command is given.

DIAGnostic:BUFFer:SIZE?

This query returns the number of entries in the diagnostics results buffer. The <buffer size> is the maximum value you can use in the DIAGnostic:BUFFer:INDex command.

Syntax

```
DIAGnostic:BUFFer:SIZE?
```

Response

<buffer size> (NR1-numeric)	Description
Any integer	The number of entries in the results buffer (0 indicates that no errors were found in the diagnostics)

Dependencies

None

Errors and Events

None

Examples

Query: `DIAGNOSTIC:BUFFER:SIZE?`

Response: 5

Related Commands

DIAGnostic:BUFFer:INDex

DIAGnostic:BUFFer:INDex

This command sets or queries the buffer that is used by the DIAGnostic:BUFFer:DATA? query. The <buffer number> must be less than or equal to the <buffer size> value returned from the DIAGnostic:BUFFer:SIZE? query. When the DIAGnostic:EXECute command is given, the <buffer number> is reset to 1.

Syntax

```
DIAGnostic:BUFFer:INDex <buffer number>
```

Parameters

<buffer number> (NR1-numeric)	Description
Any integer; must be less than or equal to the integer returned from the DIAGnostic:BUFFer:SIZE? query	Buffer used by the DIAGnostic:BUFFer:DATA? query (default = 1)

Dependencies

None

Errors and Events

None

Examples

Set: `DIAGNOSTIC:BUFFER:INDEX 1`

Query: `DIAGNOSTIC:BUFFER:INDEX?`

Response: `12`

Related Commands

DIAGnostic:BUFFer:SIZE?
DIAGnostic:BUFFer:DATA?
DIAGnostic:BUFFer:EXECute

DIAGnostic:BUFFer:DATA?

This query returns detailed description of the diagnostic results. Use the DIAGnostic:BUFFer:INDex command to select the buffer to view.

Syntax

```
DIAGnostic:BUFFer:DATA?
```

Response

<diagnostic description> (string)	Description
An ASCII string, maximum length 160	A detailed description of the diagnostic results

Dependencies

None

Errors and Events

None

Examples

Query: `DIAGNOSTIC:BUFFER:DATA?`

Response: `"MEMORY TEST FAILED - WROTE AA READ 55"`

Related Commands

DIAGnostic:BUFFer:INDex
DIAGnostic:SELect
DIAGnostic:EXECute

Common Commands

This section describes each of the IEEE 488.2 Common Commands in detail.
CTS 850

*CLS

This command clears all status registers and error queues.

Syntax *CLS

Parameters None

Dependencies None

Errors and Events None

Examples *CLS

Related Commands None

*ESE

This command sets the contents of the Event Status Enable Register. This register controls the reporting of specific errors through the status register and the interrupt mechanism.

Syntax

```
*ESE <decimal value>
```

Parameters

<decimal value> (NR1-numeric)	bit	Description
1	0	Operation complete
2	1	Not used
4	2	Query error
8	3	Device dependent error
16	4	Execution error
32	5	Command error
64	6	Not used
128	7	Power on

Dependencies

None

Errors and Events

None

Examples

```
*ESE 16
```

Related Commands

*ESE?

*ESE?

This query returns the contents of the Event Status Enable Register.

Syntax *ESE?

Response

<decimal value> (NR1-numeric)	bit	Description
1	0	Operation complete
2	1	Not used
4	2	Query error
8	3	Device dependent error
16	4	Execution error
32	5	Command error
64	6	Not used
128	7	Power on

Dependencies None

Errors and Events None

Examples Query: *ESE?

Response: 64

Related Commands *ESE

*ESR?

This query returns the contents of the Standard Event Status Register. This register shows the status of general instrument-related events as bits encoded into a number.

Syntax *ESR?

Response

<decimal value> (NR1-numeric)	bit	Description
1	0	Operation complete
2	1	Not used
4	2	Query error
8	3	Device dependent error
16	4	Execution error
32	5	Command error
64	6	Not used
128	7	Power on

Dependencies None

Errors and Events None

Examples Query: *ESR?

Response: 64

Related Commands *ESE

*IDN?

This query returns the identity of the instrument.

Syntax `*IDN?`

Response `<manufacturer>,<model>,<serial number>,<firmware version>`

Dependencies None

Errors and Events None

Examples Query: `*IDN?`

Response: `"TEKTRONIX,CTS750,000000000,CF:91.1C FV1.20"`

Related Commands None

*LRN?

This query returns an ASCII representation of the current instrument setup.

Syntax `*LRN?`

Response A list of commands and their parameter values separated by semicolons (;) (see *Appendix NO TAG* for a complete list).

Dependencies None

Errors and Events None

Examples Query: `*LRN?`

Response:
```
":OUTPUT1:TELECOM:RATE STM1;TYPE ELECTRICAL;LEVEL
XCONNECT;:SOURCE:CLOCK:SOURCE INTERNAL;OFFSET:MODE
LOFFSET;LVALUE 0;:SOURCE:DATA:TELECOM:SOURCE OUTPUT1;
..."
```

Related Commands None

*RST

This command resets the instrument and puts it into a default state, which is independent of past historical setups. This command sets the Operation Complete bit in the Standard Event Status Register.

Syntax *RST

Parameters None

Dependencies None

Errors and Events 402, “Operation complete; Instrument factory reset complete”

Examples *RST

Related Commands None

*SRE

This command sets the contents of the Service Request Enable Register. This register controls the reporting of specific errors through the status register and the interrupt mechanism.

Syntax `*SRE <decimal value>`

Parameters

<decimal value> (NR1-numeric)	bit	Description
1	0	Not used
2	1	Not used
4	2	Not used
8	3	Not used
16	4	Message available
32	5	Event status summary
64	6	Not used
128	7	Not used

Dependencies None

Errors and Events None

Examples `*SRE 64`

Related Commands *SRE?

*SRE?

This query returns the contents of the Service Request Enable Register.

Syntax *SRE?

Response

<decimal value> (NR1-numeric)	bit	Description
1	0	Not used
2	1	Not used
4	2	Not used
8	3	Not used
16	4	Message available
32	5	Event status summary
64	6	Not used
128	7	Not used

Dependencies None

Errors and Events None

Examples Query: *SRE?

Response: 64

Related Commands *SRE

*STB?

This query returns the contents of the Status Byte Register.

Syntax *STB?

Response

<decimal value> (NR1-numeric)	bit	Description
1	0	Not used
2	1	Not used
4	2	Error/event queue not empty
8	3	Not used
16	4	Message available
32	5	Event status summary
64	6	Request service/Master status summary
128	7	Not used

Dependencies None

Errors and Events None

Examples Query: *STB?

Response: 64

Related Commands *SRE
*SRE?

*OPC

This command causes the instrument to generate the Operation Complete message in the Standard Event Status Register when all pending instrument operations have been finished.

Syntax `*OPC`

Parameters None

Dependencies None

Errors and Events None

Examples `*OPC`

Related Commands *OPC?

*OPC?

This query returns a 1 when all pending device operations have finished.

Syntax `*OPC?`

Response `1`

Dependencies None

Errors and Events None

Examples Query: `*OPC?`

Response: `1`

Related Commands None

*OPT?

This query returns the installed hardware options and the instrument and option configuration information. <option name> is repeated for each option; <instrument configuration> and <option configuration> are listed only once.

Two new fields have been added to the "Option Revision" information. The string is as follows: [Inn:Tnn:TXnnn:Jnn:JGnn:JDnnLTEnn:T2Xnn], where

I	I/O (O/E) module
T	Tributary board
TX	Tributary Xilinx
J	Jitter Analyzer
JG	Jitter Generator
JD	Jitter DSP firmware
TE	Tributary E4 board
T2X	Tributary Xilinx, second page

Syntax `*OPT?`

Response `<option name>,<instrument configuration>,<option configuration>`

Dependencies None

Errors and Events None

Examples Query: `*OPT?`

Response: `"OPT/ELEC 1310nm: 55/155/622,2/34/140: ADD/DROP/TEST, [C18:P0:H0:K0:D0:F8:X2.93],[I1:T3:TX0.318:J-]"`

Related Commands None

*RCL

This command recalls the instrument state from an internal storage buffer. Five buffers are available for use. This command sets the Operation Complete bit in the Standard Event Status Register.

Syntax

```
*RCL <buffer number>
```

Parameters

<buffer number> (NR1-numeric)	description
1 to 5	Storage buffers 1 to 5

Dependencies

None

Errors and Events

230, “Data corrupt or stale; Recall buffer is empty”
221, “Settings conflict; Internal buffer is empty”

Examples

```
*RCL 1
```

Related Commands

*SAV

*SAV

This command saves the instrument state into an internal storage buffer. Five buffers are available for use. This command sets the Operation Complete bit in the Standard Event Status Register.

Syntax

```
*SAV <buffer number>
```

Parameters

<buffer number> (NR1-numeric)	description
1 to 5	Storage buffers 1 to 5

Examples

```
*SAV 1
```

Related Commands

*RCL

*TST?

This query invokes the instrument self-test routines and returns the result when they complete. The OPC bit in the Standard Event Status Register is set when the self-test routines are complete.

Syntax

```
*TST?
```

Response

<test results> (NR1-numeric)	description
0	Test complete and successful
1	Test complete and failed

Dependencies

None

Errors and Events

402, “Operation complete; Internal diagnostics completed – passed”
402, “Operation complete; Internal diagnostics completed – failed”

Examples

Query: `*TST?`

Response: `0`

Related Commands

DIAGnostics:RESults?
DIAGnostics:EXECute

*WAI

This command prevents any commands or queries from executing until the command that is currently executing sets the OPC bit.

Syntax `*WAI`

Parameters None

Dependencies None

Errors and Events None

Examples `*WAI`

Related Commands None

Status and Events

The Status and Event Reporting System reports asynchronous events and errors that occur in the CTS 850 SDH Test Set. This system consists of four 8-bit registers and two queues that you access through the command language. You can use these registers and queues to query the instrument status and control the interrupts that report events.

In general, after an interrupt occurs, first conduct a serial poll, query the registers to see why the interrupt occurred, and then send the SYSTem:ERROr? query to see a descriptive error message.

This section describes the four registers and two queues of the Status and Event Reporting System. For each register, you are given a description, a table describing all of the bits, and an example of how to use the register. Also described in this section is the Status and Event Reporting process, synchronizing programming commands, and the system messages.

Status and Event Reporting System

The Status and Event Reporting System monitors and reports such events as an error occurring or the availability of a response to a query. This system includes descriptions of the following registers and queues:

- Status Byte Register
- Service Request Enable Register
- Standard Event Status Register
- Event Status Enable Register
- Output Queue
- System Error and Event Queue

Status Byte Register

The Status Byte Register, shown in Table 3–1, summarizes information from other registers. Use a serial poll or a *STB? query to read the contents of the Status Byte Register. The response is the sum of the decimal values for all bits set. When you use a serial poll, bit 6 shows Request Service information. When you use the *STB? query, bit 6, the Master Status Summary bit, indicates that bits 4 or 5 may be set. Using the *STB? query clears all bits in the Status Byte Register.

Table 3–1: The Status Byte Register

Bit	Decimal Value	Function
0–1	–	Not used
2	4	**Error/Event Queue not empty** indicates that information is contained in the error/event queue and is waiting to be read.
3	–	Not used
4	16	**Message Available** shows that output is available in the Output Queue.
5	32	**Event Status Bit** indicates that one or more events have occurred and the corresponding bits in the Standard Event Status Register have been set.
6	64	**Request Service** (obtained from a serial poll) shows that the CTS 850 has requested service from the GPIB controller. **Master Status Summary** (obtained from *STB? query) summarizes the event status bit and message available bits in the Status Byte Register.
7	–	Not used

A common example of using the Status Byte Register is to enable only the Event Status and Request Service bits. Enable bits 5 and 6 using the Service Request Enable Register (see the next section for information about this register). If the *STB? query returns a value of 96, bit 5 (decimal value of 32) and bit 6 (decimal value of 64) have been set (giving a decimal value sum of 96). Bit 5 indicates that information is available in the Standard Event Status Register, and bit 6 indicates that bits 4 or 5 are set in the Status Byte Register.

Service Request Enable Register

The Service Request Enable Register, shown in Table 3–2, controls which bits in the Status Byte Register will generate a service request. Use the *SRE command to set bits in the Service Request Enable Register. Use the *SRE? query to see which bits in this register are enabled. The response from this query is the sum of the decimal values for all bits set.

Table 3–2: The Service Request Enable Register

Bit	Decimal Value	Function
0–3	–	Not used
4	16	**Message Available** indicates that a message available will generate a service request.

Table 3–2: The Service Request Enable Register (Cont.)

Bit	Decimal Value	Function
5	32	**Event Status Bit** indicates that events summarized in bit 5 of the Status Byte Register will generate a service request.
6–7	–	Not used

If, for example, the *SRE? query returns a value of 48, bits 4 and 5 are set in the Service Request Enable Register. Any event that causes the Message Available bit (bit 4) or Event Status bit (bit 5) to be set in the Status Byte Register now generates an interrupt. If you want an interrupt to be generated only when the Event Status bit (bit 5) is set, use the *SRE 32 command.

Standard Event Status Register

The Standard Event Status Register, shown in Table 3–3, records many types of events that can occur in the CTS 850. Use the *ESR? query to read the contents of this register. The response is the sum of the decimal values for all bits set. Reading this register clears all bits so the register can accumulate information about new events.

Table 3–3: The Standard Event Status Register

Bit	Decimal Value	Function
0	1	**Operation Complete** shows that the operation is complete. This bit is set when all pending operations complete following a *OPC command. Table B–1 in the Appendix lists the commands and queries that set the OPC bit upon completion of execution.
1	–	Not used
2	4	**Query Error** shows that the CTS 850 attempted to read the Output Queue when no data was present or pending, or that data in the Output Queue was lost.
3	8	**Device Dependent Error** shows that a device error occurred. Table 3–7 on page 3–10 lists the device error messages.
4	16	**Execution Error** shows that an error occurred while the CTS 850 was executing a command or query. Table 3–6 on page 3–9 lists the execution error messages.
5	32	**Command Error** shows that an error occurred while the CTS 850 was parsing a command or query. Table 3–5 on page 3–8 lists the command error messages.

Table 3–3: The Standard Event Status Register (Cont.)

Bit	Decimal Value	Function
6	–	Not used
7	128	**Power On** shows that the CTS 850 was powered on. The completion of the diagnostic tests also sets this bit.

The following example assumes that all bits have been enabled using the Event Status Enable Register (see the next section for information about this register). If a *ESR? query returns a value of 128, bit 7 (decimal value of 128) is set indicating that the instrument is in the initial power-on state.

Table B–1 in the Appendix lists the commands and queries that set the OPC bit (bit 0 of the Standard Event Status Register) upon completion of execution. Some of these commands and queries may require more than 200 ms to complete execution.

Event Status Enable Register

The Event Status Enable Register, shown in Table 3–4, controls which events are summarized in the event status bit (bit 5) of the Status Byte Register. Note that the Event Status Enable Register has the same content as the Standard Event Status Register. Use the *ESE command to set bits in the Event Status Enable Register. Use the *ESE? query to see what bits in the Event Status Enable Register are set. The response from this query is the sum of the decimal values for all bits summarized in the event status bit of the Status Byte Register.

Table 3–4: The Event Status Enable Register

Bit	Decimal Value	Function
0	1	**Operation Complete** shows that the operation is complete. This bit is set when all pending operations complete following a *OPC command. Table B–1 in the Appendix lists the commands and queries that set the OPC bit upon completion of execution.
1	–	Not used
2	4	**Query Error** shows that the CTS 850 attempted to read the Output Queue when no data was present or pending, or that data in the Output Queue was lost.
3	8	**Device Dependent Error** shows that a device error occurred. Table 3–7 on page 3–10 lists the device error messages.
4	16	**Execution Error** shows that an error occurred while the CTS 850 was executing a command or query. Table 3–6 on page 3–9 lists the execution error messages.

Table 3–4: The Event Status Enable Register (Cont.)

Bit	Decimal Value	Function
5	32	**Command Error** shows that an error occurred while the CTS 850 was parsing a command or query. Table 3–5 on page 3–8 lists the command error messages.
6	–	Not used
7	128	**Power On** shows that the CTS 850 was powered on. The completion of the diagnostic tests also sets this bit.

If, for example, the *ESE? query returns a value of 255, all bits are set indicating that all events will set the event status bit (bit 5) of the Status Byte Register.

The Output Queue

The CTS 850 stores query responses in the Output Queue. It empties this queue each time it receives a new command or query message after an End Of Message (EOM). The controller must read a query response before it sends the next command (or query) or it loses responses to earlier queries.

***NOTE**. When a controller sends a query, an EOM, and a second query, the CTS 850 normally clears the first response and outputs the second while reporting a Query Error (bit 2 in the Standard Event Status Register) to indicate the lost response.*

The System Error and Event Queue

The CTS 850 error and event messages are stored in the System Error and Event Queue. Use the SYSTem:ERRor? query to get the event number and a text description of the event. Reading an event removes it from the queue. The Event Queue stores detailed information for up to 20 events; the events are stored in first-in first-out order.

Before reading an event from the Event Queue, use the *ESR? query to read the summary of the event from the Standard Event Status Register. The events summarized by the *ESR? query are made available to the SYSTem:ERRor? query, and the Standard Event Status Register is emptied.

Reading the Standard Event Status Register erases any events that were summarized by previous *ESR? queries but not read from the Event Queue. Events that follow an *ESR? query are put in the Event Queue but are not available until *ESR? is given again.

Status and Event Reporting Process

Figure 3–1 shows how to use the Status and Event Reporting system. In the explanation that follows, numbers in parentheses refer to the circled numbers in Figure 3–1.

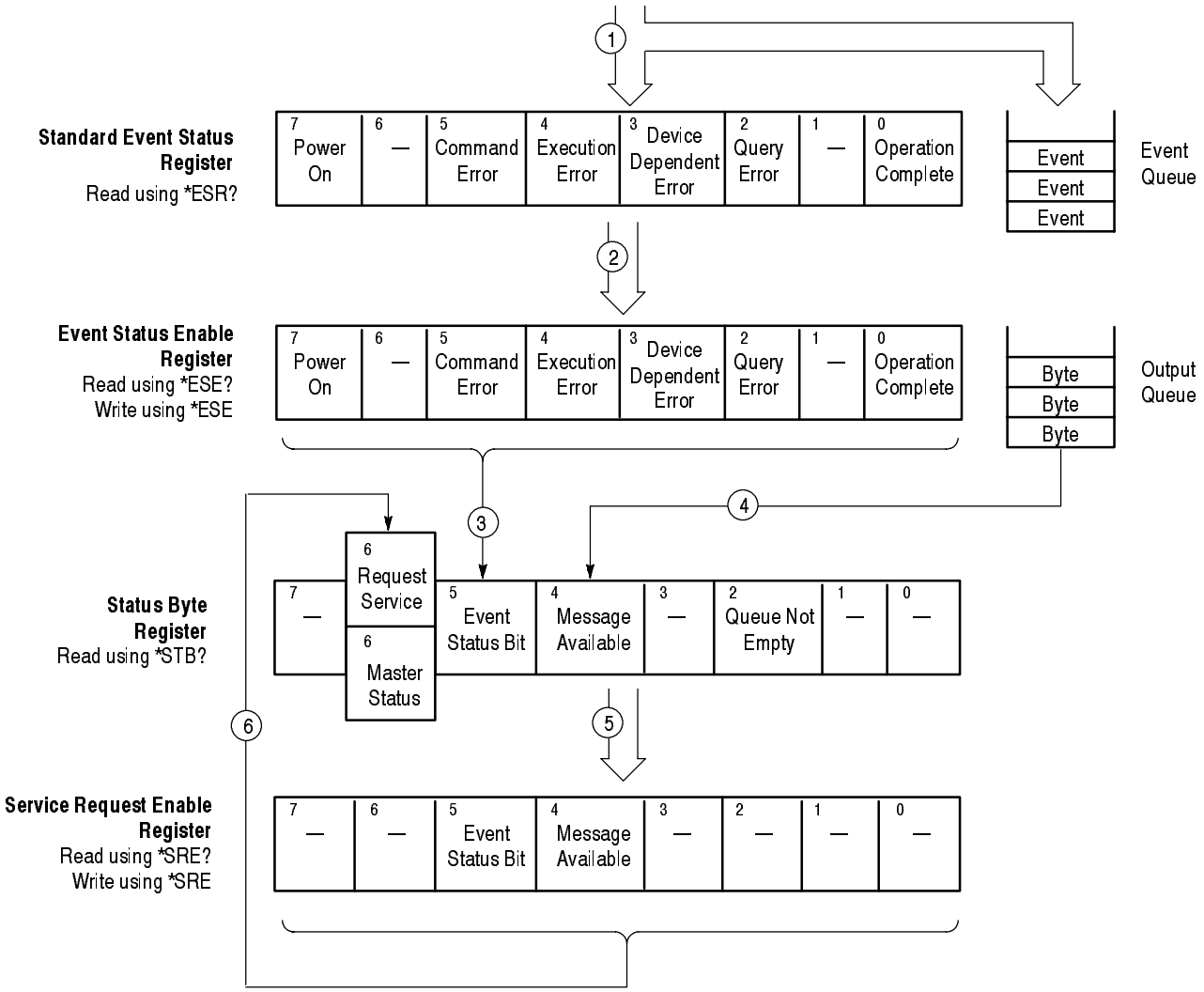


Figure 3–1: Status and Event Reporting Process

When an event occurs the appropriate bit in the Standard Event Status Register is set to one and the event is recorded in the Event Queue (1). If the corresponding bit in the Event Status Enable Register is also enabled (2), then the event status bit in the Status Byte Register is set to one (3).

When output is sent to the Output Queue (for example, a response to a query), the message available bit in the Status Byte Register is set to one (4).

When a bit in the Status Byte Register is set to one and the corresponding bit in the Service Request Enable Register is enabled (5), the master status summary bit in the Status Byte Register is set to one and a service request is generated (6).

Synchronization Methods

Although most GPIB commands are completed almost immediately after being received by the CTS 850, some commands initiate processes requiring additional time. For example, after you send a SENSe:DATA:TELecom:AUTOscan command, you must wait until it has completed execution before you give another command or query.

Sometimes the result of an operation depends on the result of an earlier operation (the first operation must be completed before the next one is initiated). The status and event reporting system of the CTS 850 provides this capability.

Using the *OPC? Query

Use the *OPC? query to synchronize commands. The *OPC? query places a 1 in the Output Queue once an operation is complete. A timeout could occur if you try to read the output queue before there is any data in it.

The same command sequence using the *OPC? query for synchronization looks like this:

```
/* Set up a chained message */
SENSE:DATA:TELECOM:AUTOSCAN;*OPC?
```

Messages

The CTS 850 generates error messages in response to events caused by commands or queries. Each type of event sets a specific bit in the Standard Event Status Register. Thus, each message is associated with a specific Standard Event Status Register bit. In the message tables that follow, the associated Standard Event Status Register bit is specified in the table title. Not shown in the tables are secondary messages giving more detail about the cause of the error or the meaning of the message. These secondary messages are shown for each command and query in *Syntax and Commands*.

Table 3–5 shows the error messages generated by improper command syntax. Check to see that the command is properly formatted and that it follows the rules in *Syntax and Commands*.

Table 3–5: Command Error Messages (Bit 5 in Standard Event Status Register)

Code	Message
100	Command error
101	Invalid character
102	Syntax error
103	Invalid separator
104	Data type error
105	Get not allowed
106	Invalid program data separator
108	Parameter not allowed
109	Missing parameter
110	Command header error
111	Header separator error
112	Mnemonic too long
113	Undefined header
118	Query not allowed
120	Numeric data error
121	Invalid char in number
123	Exponent too large
124	Too many digits
128	Numeric data not allowed
130	Suffix error
131	Invalid suffix
134	Suffix too long

Table 3–5: Command Error Messages (Bit 5 in Standard Event Status Register) (Cont.)

Code	Message
138	Suffix not allowed
140	Character data error
141	Invalid character data
144	Character data too long
148	Character data not allowed
150	String data error
151	Invalid string data
158	String data not allowed
160	Block data error
161	Invalid block data
168	Block data not allowed

Table 3–6 lists the execution error messages that can occur during execution of a command.

Table 3–6: Execution Error Messages (Bit 4 in Standard Event Status Register)

Code	Message
200	Execution error
220	Parameter error
221	Settings conflict
222	Data out of range
223	Too much data
224	Illegal parameter value
230	Data corrupt or stale
240	Hardware error
241	Hardware missing
250	Mass storage error
252	Missing mass storage
252	Missing media
253	Corrupt media
254	Media full
255	Directory full

Table 3–6: Execution Error Messages (Bit 4 in Standard Event Status Register) (Cont.)

Code	Message
256	File name not found
257	File name error
258	Media protected

Table 3–7 lists the device dependent error messages that can occur during CTS 850 operation.

Table 3–7: Device Dependent Error Messages (Bit 3 in Standard Event Status Register)

Code	Message
300	Device specific error
310	System error
361	Autoscan failed

Table 3–8 lists the system events.

Table 3–8: System Events

Code	Message
401	Power on[1]
402	Operation complete[2]

[1] **Sets bit 7 in the Standard Event Status Register.**

[2] **Sets bit 0 in the Standard Event Status Register.**

Table 3–9 lists the execution warnings that can occur during execution of a command.

Table 3–9: Execution Warning Messages (Bit 3 in Standard Event Status Register)

Code	Message
500	Execution warnings

Examples

The following sample program sets up the CTS 850 to perform a one minute bit error rate test. The program is written in Microsoft C and uses a National Instruments GPIB driver. Note that the program verifies communication with the instrument, inserts section code violation errors at a rate of 10^{-5}, loops until the test completes, and prints the BER for the section code violations. Use this program as a basis for programs that perform more advanced tasks. This example program assumes that the instrument is configured to device 4.

```
/*-----------------------------------------------------------------

* Program: BER.C

* Description: This program will set up the instrument to perform

*            a 1 minute BER test. The generator may be looped

*            back to the receiver. Errors will be inserted

*            during the test. The results will be printed at

*            the completion of the test.

* Prerequisites:

*            The instrument must be configured at device 4 in

*            IBCONF.

*            The language is Microsoft C using National

*            Instruments GPIB drivers.

*-----------------------------------------------------------------

*/

#include "stdio.h"

#include "string.h"

#include "decl.h"

main()

{

   char buffer[255];

   int  count = 0;
```

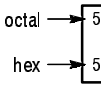
```
int  status = 0;
int device;
/* announce start of program */
printf("CTS 850 BER Program Starting\n");
/* verify instrument is connected */
device = ibfind ("DEV4");
ibclr( device);
buffer[0] = 0;             /* initialize the string */
ibwrt(device,"*IDN?",5);   /* send query to instrument */
ibrd(device, buffer, 255); /* get response from instrument */
buffer[ibcnt-1] = 0;       /* add null to terminate string */
if( ibcnt > 1 )
{
   printf("Instrument at Address 4\n %s\n ", buffer);
}
else
{
   printf("Instrument at Address 4 did not respond");
   return( 1 ); /* error and exit */
}
/* initialize instrument */
ibwrt( device,"SYSTEM:MODE SDH",17);
ibwrt( device "*RST",4);
ibwrt( device "*OPC?",5);
ibrd(device,buffer,255);
/* setup transmitter - B1 errors at 1e-5 rate */
ibwrt( device,"SYSTEM:HEADER 0", 15);
ibwrt( device,"INPUT1:TEL:RATE STM1", 20);
```

```
    ibwrt( device,"OUTPUT1:TEL:RATE STM1", 21);
    ibwrt( device, "SOURCE:DATA:TEL:ERROR:ENABLE ON", 31);
    ibwrt( device, "SOURCE:DATA:TEL:ERROR:TYPE SCV", 30);
    ibwrt( device, "SOURCE:DATA:TEL:ERROR:RATE 1E-5", 31);
    /* setup receiver - test duration of 1 minute */
    ibwrt( device, "SENSE:DATA:TEL:TEST:DURATION 0,0,1,0", 36);
    /* start test */
    ibwrt( device, "SENSE:DATA:TEL:TEST:START", 25);
    /* wait until test is complete */
    do
    {
       ibwrt( device, "SENSE:DATA:TEL:TEST:STATUS?", 27 );
       ibrd( device, buffer, 255 );
       buffer[ibcnt-1] = 0;    /* add null to terminate string */
       printf(">> Elapsed Time =  %s       \r", buffer );
       sscanf( buffer, "%d", &status );
    }while( status == 1 );
    /* query and print results */
    ibwrt( device, "SENSE:DATA:TEL:MEAS:ERROR:ERATIO:SCV?", 37 );
    ibrd( device, buffer, 255 );
    buffer[ibcnt+1] = 0;       /* add null to terminate string */
    printf( "\n>> BER =  %s\n", buffer );
    /* announce end of program */
    printf("End of Test\n");
    /* exit */
    return(0);
}
```

Appendix A: ASCII & GPIB Code Chart

B7 B6 B5 BITS B4 B3 B2 B1	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 LA0 SP 20 32	60 LA16 0 30 48	100 TA0 @ 40 64	120 TA16 P 50 80	140 SA0 ` 60 96	160 SA16 p 70 112
0 0 0 1	1 GTL SOH 1 1	21 LL0 DC1 11 17	41 LA1 ! 21 33	61 LA17 1 31 49	101 TA1 A 41 65	121 TA17 Q 51 81	141 SA1 a 61 97	161 SA17 q 71 113
0 0 1 0	2 STX 2 2	22 DC2 12 18	42 LA2 " 22 34	62 LA18 2 32 50	102 TA2 B 42 66	122 TA18 R 52 82	142 SA2 b 62 98	162 SA18 r 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 LA3 # 23 35	63 LA19 3 33 51	103 TA3 C 43 67	123 TA19 S 53 83	143 SA3 c 63 99	163 SA19 s 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 LA4 $ 24 36	64 LA20 4 34 52	104 TA4 D 44 68	124 TA20 T 54 84	144 SA4 d 64 100	164 SA20 t 74 116
0 1 0 1	5 PPC ENQ 5 5	25 PPU NAK 15 21	45 LA5 % 25 37	65 LA21 5 35 53	105 TA5 E 45 69	125 TA21 U 55 85	145 SA5 e 65 101	165 SA21 u 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 LA6 & 26 38	66 LA22 6 36 54	106 TA6 F 46 70	126 TA22 V 56 86	146 SA6 f 66 102	166 SA22 v 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 LA7 ' 27 39	67 LA23 7 37 55	107 TA7 G 47 71	127 TA23 W 57 87	147 SA7 g 67 103	167 SA23 w 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 LA8 (28 40	70 LA24 8 38 56	110 TA8 H 48 72	130 TA24 X 58 88	150 SA8 h 68 104	170 SA24 x 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51 LA9) 29 41	71 LA25 9 39 57	111 TA9 I 49 73	131 TA25 Y 59 89	151 SA9 i 69 105	171 SA25 y 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 LA10 * 2A 42	72 LA26 : 3A 58	112 TA10 J 4A 74	132 TA26 Z 5A 90	152 SA10 j 6A 106	172 SA26 z 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 LA11 + 2B 43	73 LA27 ; 3B 59	113 TA11 K 4B 75	133 TA27 [5B 91	153 SA11 k 6B 107	173 SA27 { 7B 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 LA12 , 2C 44	74 LA28 < 3C 60	114 TA12 L 4C 76	134 TA28 \ 5C 92	154 SA12 l 6C 108	174 SA28 ¦ 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 LA13 - 2D 45	75 LA29 = 3D 61	115 TA13 M 4D 77	135 TA29] 5D 93	155 SA13 m 6D 109	175 SA29 } 7D 125
1 1 1 0	16 SO E 14	36 RS 1E 30	56 LA14 . 2E 46	76 LA30 > 3E 62	116 TA14 N 4E 78	136 TA30 ^ 5E 94	156 SA14 n 6E 110	176 SA30 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 LA15 / 2F 47	77 UNL ? 3F 63	117 TA15 O 4F 79	137 UNT _ 5F 95	157 SA15 o 6F 111	177 RUBOUT (DEL) 7F 127
	ADDRESSED COMMANDS	UNIVERSAL COMMANDS	LISTEN ADDRESSES		TALK ADDRESSES		SECONDARY ADDRESSES OR COMMANDS	

KEY



GPIB code (with ATN asserted)
ASCII character
decimal

Tektronix

REF: ANSI STD X3.4-1977
IEEE STD 488.1-1987
ISO STD 646-2973

CTS 850 SDH Test Set

Appendix B: Commands and Queries Posting OPC

CTS 850 SDH Test Set

The commands and queries listed in Table B–1 set the OPC bit after execution. Some of these commands and queries may require more than 200 ms to complete execution.

Table B–1: Commands and Queries that Post OPC

Command or Query
*RST
*RCL
*SAV
*TST?
HCOPy:IMMediate
DIAGnostic:EXECute
all MMEMory: commands
INPUT1:TELecom:TYPE
SOURce:CLOCk:SOURce
SENSe:DATA:TELecom:AUTOscan

Appendix C: *LRN? Response

CTS 850 SDH Test Set

Table C–2 lists the commands that are returned by the *LRN? and SYSTem:SET? queries. The response consists of these commands and their parameter values separated by semicolons (;).

Table C–2: Commands returned by *LRN?

Command
SYSTem:MODE
SYSTem:SDEScription
SYSTem:BEEPer:CONTrol
SYSTem:HEADers
SYSTem:VERBose
OUTPUT1:TELecom:RATE
OUTPUT1:TELecom:TYPE
OUTPUT1:TELecom:LEVel
OUTPUT2:TELecom:TERMinator (Add/Drop Test Option Only)
OUTPUT2:TELecom:CODE (Add/Drop Test Option Only)
OUTPUT3:TELecom:RATE (Add/Drop Test Option Only)
SOURce:CLOCk:SOURce
SOURce:CLOCk:OFFSet:MODE
SOURce:CLOCk:OFFSet:LVALue
SOURce:CLOCk:OFFSet:PVALue (Add/Drop Test Option Only)
SOURce:DATA:TELecom:SOURce
SOURce:DATA:TELecom:STRUcture
SOURce:DATA:TELecom:CHANnel
SOURce:DATA:TELecom:PAYLoad:MAPPing
SOURce:DATA:TELecom:PAYLoad:PATTern
SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe
SOURce:DATA:TELecom:OVERhead:APS
SOURce:DATA:TELecom:OVERhead:INSert
SOURce:DATA:TELecom:POVerhead:INSert
SOURce:DATA:TELecom:POVerhead:TRAce

Table C–2: Commands returned by *LRN? (Cont.)

Command
SOURce:DATA:TELecom:ERRor:ENABle
SOURce:DATA:TELecom:ERRor:TYPE
SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:ALARm
SOURce:DATA:TELecom:FAILure:TYPE
SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:NDFlag
SOURce:DATA:TELecom:POINter:DIRection
SOURce:DATA:TELecom:POINter:RATE
SOURce:DATA:TELecom:POINter:NBURst
SOURce:DATA:TELecom:POINter:SBITs
SOURce:DATA:TELecom:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:POINter:SEQuence:DIRection
SOURce:DATA:TELecom:POINter:SEQuence:IPERiod
SOURce:DATA:TELecom:POINter:SEQuence:CPERiod
SOURce:DATA:TELecom:POINter:SEQuence:RATE
SOURce:DATA:TELecom:JITter:MODE (jitter/wander option 14 only)
SOURce:DATA:TELecom:JITter:SOURce (jitter/wander option 14 only)
SOURce:DATA:TELecom:JITter:CLOCk:RATE (jitter/wander option 14 only)
SOURce:DATA:TELecom:JITter:CLOCk:OFFSet (jitter/wander option 14 only)
SOURce:DATA:TELecom:JITter:AMPLitude (jitter/wander option 14 only)
SOURce:DATA:TELecom:JITter:FREQuency (jitter/wander option 14 only)
SOURce:DATA:TELecom:TRIButary:CHANnel (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:MAPPing (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:FRAMing (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:PATTern (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:PATTern:UWORD (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:BACKground:PATTern (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:ADD (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:ERRor (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:ALARm (Add/Drop Test Option Only)

Table C–2: Commands returned by *LRN? (Cont.)

Command
SOURce:DATA:TELecom:TRIButary:FAILure (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:MODE (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:NDFLag (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:DIRection (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:RATE (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:NBURst (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE (Add/Drop Test Option Only)
INPUT1:TELecom:RATE
INPUT1:TELecom:TYPE
INPUT1:TELecom:LEVel
INPUT2:TELecom:TERMinator (Add/Drop Test Option Only)
INPUT2:TELecom:LEVel (Add/Drop Test Option Only)
INPUT3:TELecom:RATE (Add/Drop Test Option Only)
INPUT3:TELecom:LEVel (Add/Drop Test Option Only)
SENSe:DATA:TELecom:SOURce
SENSe:DATA:TELecom:STRUcture
SENSe:DATA:TELecom:CHANnel
SENSe:DATA:TELecom:PAYLoad:MAPPing
SENSe:DATA:TELecom:PAYLoad:PATTern
SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe
SENSe:DATA:TELecom:TRIButary:CHANnel (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:MAPPing (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:FRAMing (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:DEMULtiplex:CHANnel (Performs no operation)
SENSe:DATA:TELecom:TRIButary:DEMULtiplex:FRAMing (Performs no operation)
SENSe:DATA:TELecom:TRIButary:PATTern (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth (Add/Drop Test Option Only)

Table C–2: Commands returned by *LRN? (Cont.)

Command
SENSe:DATA:TELecom:TRIButary:DROP (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TEST:DURation
SENSe:DATA:TELecom:TEST:HISTory:RESolution
SENSe:DATA:TELecom:OVERhead:DROP
SENSe:DATA:TELecom:POVerhead:DROP
SENSe:DATA:TELecom:TEST:MODE (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TYPE TOLerance (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance:SAMPles (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation (jitter/wander option 14 only)
SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:MODE (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:SOURce (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:CLOCk:RATE (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:FILTer:TYPE (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:FILTer:HIGHBand (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:RANGe (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:THREshold (jitter/wander option 14 only)
SENSe:DATA:TELecom:JITter:POINter:THREshold (jitter/wander option 14 only)
INSTrument:COUPling
HCOPY:ITEM
HCOPy:TITle
HCOPy:DEVice:LANGuage

Appendix D: Default Parameter Values After *RST

CTS 850 SDH Test Set

Table E–1 lists the default parameter values after the *RST command is sent.

Table E–1: Default parameter values after *RST

Command	Default Parameter Values
OUTPUT1:TELecom:RATE	STM1
OUTPUT1:TELecom:TYPE	ELECtrical
OUTPUT1:TELecom:LEVel	XCONnect
OUTPUT2:TELecom:TERMinator	BALanced (Add/Drop Test Option Only)
OUTPUT2:TELecom:CODE	HDB3 (Add/Drop Test Option Only)
OUTPUT3:TELecom:RATE	M34 (Add/Drop Test Option Only)
SOURce:CLOCk:SOURce	INTernal
SOURce:CLOCk:OFFSet:MODE	LOFFset
SOURce:CLOCk:OFFSet:LVALue	0.00
SOURce:CLOCk:OFFSet:PVALue	0.00
SOURce:DATA:TELecom:SOURce	OUTPUT1
SOURce:DATA:TELecom:STRUcture	AU4
SOURce:DATA:TELecom:CHANnel	1
SOURce:DATA:TELecom:PAYLoad:MAPPing	EQUIPPED
SOURce:DATA:TELecom:PAYLoad:PATTern	PRBS23
SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe	0
SOURce:DATA:TELecom:OVERhead:PRESet	(sets overhead to values listed in *Syntax and Commands*2–32
SOURce:DATA:TELecom:OVERhead:APS	0
SOURce:DATA:TELecom:OVERhead:INSert	NONE
SOURce:DATA:TELecom:POVerhead:INSert	NONE
SOURce:DATA:TELecom:POVerhead:TRAce	“” (64 null characters)
SOURce:DATA:TELecom:ERRor:ENABle	0
SOURce:DATA:TELecom:ERRor:TYPE	SCV
SOURce:DATA:TELecom:ERRor:RATE	1E–10
SOURce:DATA:TELecom:ALARm	NONE

Table E–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
SOURce:DATA:TELecom:FAILure:TYPE	NONE
SOURce:DATA:TELecom:POINter:MODE	SINGle
SOURce:DATA:TELecom:POINter:VALue	522
SOURce:DATA:TELecom:POINter:NDFlag	1
SOURce:DATA:TELecom:POINter:DIRection	ALTernate
SOURce:DATA:TELecom:POINter:RATE	100
SOURce:DATA:TELecom:POINter:NBURst	2
SOURce:DATA:TELecom:POINter:SBITs	0
SOURce:DATA:TELecom:POINter:Sequence:TYPE	SINGle
SOURce:DATA:TELecom:POINter:Sequence:DIRection	UP
SOURce:DATA:TELecom:POINter:Sequence:IPERiod	1
SOURce:DATA:TELecom:POINter:Sequence:CPERiod	1
SOURce:DATA:TELecom:POINter:Sequence:RATE	30000
SOURce:DATA:TELecom:TRIButary:CHANnel	1 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:MAPPing	TUASYNC (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:FRAMing	UNFRamed (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:PATTern	PRB15PRBS23 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd	0 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth	1 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:BACKground:PATTern	PRBS (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:ADD	0 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe	TEK CTS750
SOURce:DATA:TELecom:TRIButary:ERRor	NONE (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:ALARM	NONE (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:FAILure	NONE (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:MODE	SINGle (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:NDFLag	1 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:DIRection	ALTernate (Add/Drop Test Option Only)

Table E–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
SOURce:DATA:TELecom:TRIButary:POINter:RATE	100 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:Nburst	2 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE	SINGle (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection	UP (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod	1 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod	1 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE	30000 (Add/Drop Test Option Only)
SOURce:DATA:TELecom:TRIButary:MODE	MANual (Add/Drop Test Option Only)
SOURce:DATA:TELecom:JITter:MODE	OFF (SDH/PDH Jitter/Wander Test Option Only)
SOURce:DATA:TELecom:JITter:SOURce	LINE (SDH/PDH Jitter/Wander Test Option Only)
SOURce:DATA:TELecom:JITter:CLOCk:RATE	M2 (SDH/PDH Jitter/Wander Test Option Only)
SOURce:DATA:TELecom:JITter:CLOCk:OFFSet	0.0 (SDH/PDH Jitter/Wander Test Option Only)
SOURce:DATA:TELecom:JITter:AMPLitude	1.00 (SDH/PDH Jitter/Wander Test Option Only)
SOURce:DATA:TELecom:JITter:FREQuency	10.0 (SDH/PDH Jitter/Wander Test Option Only)
INPUT1:TELecom:RATE	STM1
INPUT1:TELecom:TYPE	ELECtrical
INPUT1:TELecom:LEVel	XCONnect
INPUT2:TELecom:TERMinator	BALanced (Add/Drop Test Option Only)
INPUT2:TELecom:LEVel	NORMal (Add/Drop Test Option Only)
INPUT3:TELecom:RATE	M34 (Add/Drop Test Option Only)
INPUT3:TELecom:LEVel	NORMal (Add/Drop Test Option Only)
SENSe:DATA:TELecom:SOURce	INPUT1
SENSe:DATA:TELecom:STRUcture	AU4

Table E–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
SENSe:DATA:TELecom:CHANnel	1
SENSe:DATA:TELecom:PAYLoad:MAPPing	EQUIPPed
SENSe:DATA:TELecom:PAYLoad:PATTern	PRBS23
SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe	0
SENSe:DATA:TELecom:TRIButary:CHANnel	1 (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:MAPPing	TUASYNC (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:FRAMing	UNFRamed (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:Demultiplex:CHANnel	1 (Performs no operation)
SENSe:DATA:TELecom:TRIButary:Demultiplex:FRAMing	UNFramed (Performs no operation)
SENSe:DATA:TELecom:TRIButary:PATTern	PRBS23 (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd	0 (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:PATTern: UWORd:LENgth	1 (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TRIButary:DROP	0 (Add/Drop Test Option Only)
SENSe:DATA:TELecom:TEST:DURation	0,0,0,0
SENSe:DATA:TELecom:TEST:HISTory:RESolution	MIN1
SENSe:DATA:TELecom:OVERhead:DROP	NONE
SENSe:DATA:TELecom:POVerhead:DROP	NONE
SENSe:DATA:TELecom:MEASure:STESts:	(all four commands set to NONE)
SENSe:DATA:TELecom:JITter:SOURce	LINE (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:JITter:MODE	PTP (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:JITter:CLOCk:RATE	M2 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:JITter:FILTer:TYPE	WIDE (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:JITter:FILTer:HIGHBand	STAN (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs	U10 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:JITter:RANGe	NORM (SDH/PDH Jitter/Wander Test Option Only)

Table E–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
SENSe:DATA:TELecom:JITter:THREshold	0.0 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:JITter:POINter:THREshold	10.0 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:MODE	NORM (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TYPE	OUTPUT (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK	G825 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance: FREQuency:STARt	1.25E–1 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance: FREQuency:END	130E+4 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance: SAMPles	4 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod	ONSET_ERR (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK	TYPEA (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer: FREQuency:STARt	10.0 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer: FREQuency:END	130.E+3 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles	4 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation	1,0 (SDH/PDH Jitter/Wander Test Option Only)
SENSe:DATA:TELecom:TEST:JITter:POINter: SEQuence:TYPE	SINALT (SDH/PDH Jitter/Wander Test Option Only)
INSTrument:COUPling	NONE
INITiate	(executed)
SYSTem:BEEPer:CONTrol	0
SYSTem:HEADers	1 (ON)
SYSTem:MODE	SDH
SYSTem:SDEScription	""
SYSTem:VERBose	1 (ON)
DISPlay:BRIGhtness	1.00

Table E–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
HCOPy:DEVice:LANGuage	TEK
HCOPy:ITEM	SUMMary
HCOPy:TITle	0

Glossary & ITU-T Standards

CT850 SDH/PDH Test Set

Included in this section along with the glossary of terms is a listing of ITU-T standards for SDH and PDH.

Three sets of terms are arranged at the beginning of this section because it is important to see that they are not equivalent terms, which is how they get used in normal discussions. They are:

Add/ Drop

The process where a part of the information carried in a transmission system is extracted (dropped) at an intermediate point and different information is inserted (added) for subsequent transmission. The remaining traffic passes straight through the multiplexer without additional processing.

Map/ Demap

A term for multiplexing, implying more visibility inside the resultant multiplexed bit stream than available with conventional asynchronous techniques.

Multiplex/ Demultiplex

Multiplex (MUX) – To transmit two or more signals over a single channel. Demultiplex (DEMUX) – To separate two or more signals previously combined by compatible multiplexing equipment. Demultiplexing – A process applied to a multiplex signal for recovering signals combined within it and for restoring the distinct individual channels of the signals.

An alphabetical list of glossary terms follows.

Add/Drop Multiplexer (ADM)
A multiplexer capable of extracting and inserting lower−rate signals from a higher−rate multiplexed signal without completely demultiplexing the signal.

Administrative Unit (AU)
An Administrative Unit is the information structure which provides adaptation between the higher order path layer and the Multiplex Section layer. The Virtual Container (VC) plus the pointers (H1, H2, H3 bytes) is called the Administrative Unit (AU).

AIS (Alarm Indicating Signal)
A code sent downstream indicating an upstream failure has occurred.

AMI
Alternate Mark Inversion. The line−coding format in transmission systems where successive ones (marks) are alternatively inverted (sent with polarity opposite that of the preceding mark).

Analog Jitter Out
A signal that contains the demodulated jitter from a line or clock input.

ANSI
American National Standards Institute. A standards−setting, non−government organization, which develops and publishes standards for ”voluntary” use in the United States.

Asynchronous
A network where transmission system payloads are not synchronized and each network terminal runs on its own clock.

Asynchronous Transfer Mode (ATM)
A multiplexing/switching technique in which information is organized into fixed−length cells with each cell consisting of an identification header field and an information field. The transfer mode is asynchronous in the sense that the use of the cells depends on the required or instantaneous bit rate.

Attenuation
Reduction of signal magnitude or signal loss, usually expressed in decibels.

AU-4
Virtual Container (VC) plus the Transport Overhead pointers.

AU−N
Administrative Unit−N; a discrete unit of the SDH payload carrying one or more VC−N

Automatic Protection Switching (APS)
The ability of a network element to detect a failed working line and switch the service to a spare (protection) line. 1+1 APS pairs a protection line with each working line. 1:N APS provides one protection line for every N working lines.

Backhauling
Cumbersome traffic management technique used to reduce the expense of multiplexing/demultiplexing.

Bandwidth
Information−carrying capacity of a communication channel. Analog bandwidth is the range of signal frequencies that can be transmitted by a communication channel or network.

Bidirectional
Operating in both directions. Bi–directional APS allows protection switching to be initiated by either end of the line.

Binary N–Zero Suppression (BNZS)
Line coding system that replaces N number of zeros with a special code to maintain pulse density required for clock recovery. N is typically 3, 6, or 8.

BIP–8 (Bit Interleaved Parity–8)
A method of error checking in SDH which allows in–service performance monitoring. For example, a BIP–8 creates eight–bit (one–byte) groups, then does a parity check for each of the eight bit positions in the byte.

B–ISDN (Broadband Integrated Services Digital Network)
A single ISDN network which can handle voice, data, and eventually video services.

Bit
One binary digit; a pulse of data.

Bit Error vs. Block Error

Error rate statistics play a key role in measuring the performance of a network. As errors increase, user payload (especially data) must be re–transmitted, or lost entirely.

Bit Error Rate (BER) – The number of bit errors detected in a unit of time, usually one second. Bit Error rate (BER) is calculated with this formula:

BER = errored bits received/ total bits sent.

Block Error Rate (BLER) – One of the underlying concepts of error performance is the notion of Errored Blocks, i.e., blocks in which one or more bits are in error. A block is a set of consecutive bits associated with the path or section monitored by means of an Error Detection Code (EDC), such as Bit Interleaved Parity (BIP). Block Error rate (BLER) is calculated with this formula:

BLER = errored blocks received/ total blocks sent.

Bit–Interleaved Parity (BIP)
A parity check that groups all the bits in a block into units (such as byte), then performs a parity check for each bit position in the group.

Bit–Stuffing
In asynchronous systems, a technique used to synchronize asynchronous signals to a common rate before multiplexing.

Bits per second (bit/s)
The number of bits passing a point every second. The transmission rate for digital information.

Broadband
Services requiring over 2 Mbit/s transport capacity.

CCITT
See ITU.

Channel
The smallest subdivision of a circuit that provides a type of communication service; usually a path with only one direction.

Circuit
A communications path or network; usually a pair of channels providing bi–directional communication.

Circuit Switching
Basic switching process whereby a circuit between two users is opened on demand and maintained for their exclusive use for the duration of the transmission.

Coding Violation (CV)
A transmission error detected by the difference between the transmitted line code and that expected at the receive end by the logical coding rules.

Concatenation
The linking together of various data structures, for example two channels joined to form a single channel. In SDH, a number (M) of TUs can be linked together to produce a concatenated container, M times the size of the TU. An example of this is the concatenation of five TU–2s to carry a 32 Mbit/s video signal, known as VC–2–5c. Once assembled, any concatenated VC structure is multiplexed, switched and transported through the network as a single entity.

Conformance Tests
Conformance Tests (also know as Standards Conformance Tests) are predefined tests that measure the impact of jitter or wander on networks or network elements. They are defined in the ITU-T Recommendations.

Cyclic Redundancy Check (CRC)
A technique for using overhead bits to detect transmission errors.

Data Communications Channel (DCC)
Data channels in SDH that enable OAM communications between intelligent controllers and individual network nodes as well as inter–node communications.

dB
The symbol for decibels.

dBm
The symbol for power level in decibels relative to 1 mW.

Defect
A limited interruption in the ability of an item to perform a required function. Persistence of a defect can cause a failure.

Digital Cross–connect (DCS)
An electronic cross–connect which has access to lower–rate channels in higher–rate multiplexed signals and can electronically rearrange (cross–connect) those channels.

Digital Signal
An electrical or optical signal that varies in discrete steps. Electrical signals are coded as voltages, optical signals are coded as pulses of light.

E1, E2, E3, E4
Alternative names for the ITU–T 2 Mb/s, 8 Mb/s, 32 Mb/s, and 140 Mb/s tributary signals.

ES
Errored Second; measure of network or equipment performance

ETSI (European Telecommunications Standards Institute)
Organization responsible for defining and maintaining European standards, including SDH.

Failure
A termination of the ability of an item to perform a required function. A failure is caused by the persistence of a defect.

FEBE (Far End Block Error)
See Remote Error Indication (REI).

FERF (Far End Receive Failure)
See Remote Defect Indication (RDI).

FIFO
First–In First–Out; a type of data buffer

Fixed Stuff
A bit or byte whose function is reserved. Fixed stuff locations, sometimes called reserved locations, do not carry overhead or payload.

Floating mode
A virtual tributary mode that allows the VC synchronous payload envelope to begin anywhere in the VC.

Framing
Method of distinguishing digital channels that have been multiplexed together.

Frequency
The number of cycles of periodic activity that occur in a discrete amount of time.

Frequency Drift Rate
The rate of change of a line or clock frequency, measured in ppm/sec. A new measure of tining quality.

Fullband
A jitter filter range that includes the wideband range but extends the low-frequency cutoff to 10 Hz or below. This filter is useful when analyzing video timing quality.

Grooming
Consolidating or segregating traffic for efficiency.

HDB3
High Density Bipolar 3. A bipolar coding method that does not allow more than three consecutive zeros.

Highband
A jitter filter range that measures high-frequency jitter. The band pass filters are defined in ITU-T standards (where they are sometimes referred to as HP2 – LP1).

Highpass
The lower –3 dB corner frequency of a filter. The filter passes frequencies higher than this frequency.

Interleave
The ability of SDH to mix together and transport different types of input signals in an efficient manner, thus allowing higher−transmission rates.

ITU (International Telecommunications Union)
An agency of the United Nations responsible for the regulation, standardization, co−ordination and development of international telecommunications as well as the harmonization of national policies. It functions through international committees of telecommunications administrations, operators, manufacturers and scientific/industrial organizations.

Jitter
The short term variations of the significant instants of a timing signal from their ideal positions in time (where short term implies that these variations are of frequency greater than or equal to 10 Hz).

Jitter Hit
When peak-to-peak jitter crosses a predetermined threshold.

Jitter Tolerance
A conformance test that measures the susceptability of a network element input to incoming jitter.

Jitter Transfer
A conformance test that measures the transfer of jitter from the input to the output of a network element.

Jitter Transfer Function
A graph that shows jitter gain as a function of jitter frequency.

Line Alarm Indication Signal (AIS)
A Line AIS is generated by Section Terminating Equipment upon Loss of Signal or Loss of Frame.

Line Coding Violation (LCV)
The sum of the BIP errors detected at the Line layer. Line CVs are collected using the BIP codes in the B2 bytes of the Line Overhead.

Line Errored Second (ES)
A second during which at least one Line CV occurred, or a second during which the line was in the Line AIS state.

Line Overhead (LOH)
Controls the payload information using the section layer and provides alarm indications, error monitoring, and message signalling between two LTEs.

Line Severely Errored Second (SES)
A second with N or more Line CVs, or a second during which the line was in the Line AIS state. The value of N varies with the transmit rate, but corresponds to a 2×10^{-7} BER.

Locked Mode
A virtual tributary mode that fixes the starting location of the VC. Locked mode has less pointer processing than floating mode.

LOF
An acronym for Loss of Frame.

LOP
An acronym for Loss of Pointer.

LOS
An acronym for Loss of Signal.

Low Frequency Jitter
Jitter that crosses the wander threshold (approximately 0.1 Hz to 500 Hz). Low frequency jitter is often the result of pointer movement.

Lowpass
The upper −3 dB corner frequency of a filter. The filter passes frequencies lower than this frequency.

LTE
An acronym for Line Terminating Equipment.

Mapping
The process of associating each bit transmitted by a service into the SDH payload structure that carries the service. For example, mapping a E1 service into a SDH VC−12 associates each bit of the E1 with a location in the VC−12.

MTIE
Maximum Time Interval Error − Related to Peak−to−Peak Wander.

Multiframe
Any structure made of multiple frames. SDH has facilities to recognize multiframes at the E1 level and at the VC−n level.

Multiplex Section Alarm Indication Signal (MS−AIS)
MS−AIS is generated by Section Terminating Equipment (STE) upon the detection of a Loss of Signal or Loss of Frame defect, on an equipment failure. MS−AIS maintains operation of the downstream regenerators, and therefore prevents generation of unnecessary alarms. At the same time, data and orderwire communication is retained with the downstream Line Terminating Equipment (LTE).

Multiplex Section Remote Defect Indication (MS−RDI)
A signal returned to the transmitting Line Terminating Equipment (LTE) upon detecting a Loss of Signal, Loss of Frame, or MS−AIS defect. MS−RDI was previously known as Multiplex Section FERF.

Multiplex Section Overhead (MSOH)
18 bytes of overhead accessed, generated, and processed by MS terminating equipment. This overhead supports functions such as locating the payload in the frame, multiplexing or concatenating signals, performance monitoring, automatic protection switching and line maintenance.

Multiplexer
A device for combining several channels to be carried by a single physical channel.

Narrowband
Services requiring up to 2−Mbit/s transport capacity.

Network Element (NE) – In SDH, the five basic network elements are:
add/drop multiplexer;
broadband digital cross–connect;
wideband digital cross–connect;
flexible multiplexer; and,
regenerator.

Any device which is part of a SDH transmission path and serves one or more of the section, line and path–terminating functions.

OAM
Operations, Administration, and Maintenance. Also called OAM&P.

OAM&P (Operations, Administration, Maintenance, and Provisioning)
Provides the facilities and personnel required to manage a network.

Orderwire
A dedicated voice channel used by installers to expedite the provisioning of lines.

OOF
An acronym for Out of Frame.

OS (Operations System)
Sophisticated applications software that manages operation of the entire network.

OSI Seven–layer Model
A standard architecture for data communications. Layers define hardware and software required for multi–vendor information processing equipment to be mutually compatible. The seven layers from lowest to highest are: physical, link, network, transport, session, presentation, and application.

Output Jitter
A compliance test the measures the output jitter of a network or network element.

Overhead
Extra bits in a digital stream used to carry information besides traffic signals. Orderwire, for example, would be considered overhead information.

Packet Switching
An efficient method for breaking down and handling high–volume traffic in a network. A transmission technique that segments and routes information into discrete units. Packet switching allows for efficient sharing of network resources as packets from different sources can all be sent over the same channel in the same bitstream.

Parity check
An error–checking scheme which examines the number of transmitted bits in a block which hold the value of ”one”. For even parity, an overhead parity bit is set to either one or zero to make the total number of transmitted ones in the data block plus parity bit an even number. For odd parity, the parity bit is set to make the total number of ones in the block an odd number.

Path
A logical connection between a point where a service in a VC is multiplexed to the point where it is demultiplexed.

Path Overhead (POH)
Overhead accessed, generated, and processed by path–terminating equipment.

Path Terminating Equipment (PTE)
Network elements such as fibre optic terminating systems which can access, generate, and process Path Overhead.

Payload
The portion of the SDH signal available to carry service signals such as E1 and E3. The contents of a VC.

Payload Pointer
Indicates the beginning of a Virtual Container.

Payload capacity
The number of bytes the payload of a single frame can carry.

Plesiochronous
A network with nodes timed by separate clock sources with almost the same timing.

PLL
Phase–Locked Loop; method of timing recovery

Pointer
A part of the SDH overhead that locates a floating payload structure. AU–n pointers locate the payload. TU–m Pointers locate floating mode virtual tributaries. All SDH frames use AU pointers; only floating mode virtual containers use TU pointers.

Pointer Hit
When the line or clock frequency drift crosses a predetermined threshold.

Pointer Jitter
A measure of the jitter output of a network when specified pointer test sequences are applied to its input.

ppTIE
Peak–to–Peak Time Interval Error , a measure of wander

PRC (Primary Reference Clock)
In a synchronous network, all the clocks are traceable to one highly stable reference supply, the Primary Reference Clock (PRC). The accuracy of the PRC is better than ±1 in 10^{11} and is derived from a cesium atomic standard.

Remote Alarm Indication (RAI)
A code sent upstream in a E–*n* network as a notification that a failure condition has been declared downstream. (RAI signals were previously referred to as Yellow signals.)

Remote Defect Indication (RDI)
A signal returned to the transmitting Terminating Equipment when the receiving Terminating Equipment detects a Loss of Signal, Loss of Frame, or AIS defect. RDI was previously known as FERF.

Remote Error Indication (REI)
An indication returned to a transmitting node (source) that an errored block has been detected at the receiving node (sink). This indication was formerly known as Far End Block Error (FEBE).

Remote Failure Indication (RFI)
A failure is a defect that persists beyond the maximum time allocated to the transmission system protection mechanisms. When this situation occurs, an RFI is sent to the far end and will initiate a protection switch if this function has been enabled.

Regenerator
Device that restores a degraded digital signal for continued transmission; also called a repeater.

rms
Root Mean Square; calculation often applied to power and noise measurements

SDH (Synchronous Digital Hierarchy)
The ITU–defined international networking standard whose base transmission level is 155 Mbit/s (STM–1). SDH standards were first published in 1989 to address interworking between the ITU and ANSI transmission hierarchies.

SEC (Synchronous Equipment Clock)
G.813 slave clock contained within a SDH network element.

Section
The span between two SDH network elements capable of accessing, generating, and processing only SDH Section overhead.

Section Overhead
Nine columns of overhead accessed, generated, and processed by section terminating equipment. This overhead supports functions such as framing the signal and performance monitoring.

Section Terminating Equipment (STE)
Equipment that terminates the SDH Section layer. STE interprets and modifies or creates the Section Overhead.

SES
Severely Errored Second; measure of network performance

Slip
An overflow (deletion) or underflow (repetition) of one frame of a signal in a receiving buffer.

SONET (Synchronous Optical Network)
A standard for optical transport in the United, States, Canada, Japan, Korea and Hong Kong that defines optical carrier levels and their electrically equivalent synchronous transport signals. SONET allows for a multi–vendor environment and positions the network for transport of new services, synchronous networking, and enhanced OAM&P.

SSM (Synchronisation Status Message)
Bits 5 to 8 of SDH overhead byte S1 are allocated for Synchronisation Status Messages. See further details on the assignment of bit patterns for byte S1 in the section of this primer on Multiplex Section Overhead.

Stuffing
see bit−stuffing

Synchronous
A network where transmission system payloads are synchronized to a master (network) clock and traced to a reference clock. A network where all clocks have the same long term accuracy under normal operating conditions.

Synchronous Equipment Timing Source (SETS)
A network equipment clock.

Synchronous Transport Module (STM)
A structure in the SDH transmission hierarchy. STM−1 is SDH's base−level transmission rate equal to 155 Mbit/s. Higher rates of STM−4, STM−16, and STM−64 are also defined.

TDEV
Time Deviation; a measure of wander

Through Mode
The ability to retransmit the incoming signal and manipulate its contents.

TIE
Time Interval Error is the time difference in nanoseconds between the nominal value of a line or clock period and the actual received period.

Tributary
The lower rate signal that is input to a multiplexer for combination (multiplexing) with other low rate signals to form a higher rate signal.

Tributary Unit (TU)
A Tributary Unit is an information structure which provides adaptation between the lower order path layer and the higher order path layer. It contains the Virtual Container (VC) plus a tributary unit pointer.

Tributary Unit Group (TUG)
Contains several Tributary Units.

UI
Unit Interval; a measure of jitter

UIpp
Unit Interval Peak−to−Peak; a common measure of jitter

UIrms
Unit Interval rms; a measure of jitter in line systems

Virtual Container (VC)
A signal designed for transport and switching of sub−SDH payloads.

Wander
The long term variations of the significant instants of a digital signal from their ideal position in time (where long term implies that these variations are of frequency less than 10 Hz).

Wideband
A jitter filter range that measures jitter over a wide range. The band pass filters are defined in ITU-T standards (where they are sometimes referred to as HP1 – LP1).

Yellow Signal
See Remote Alarm Indication (RAI).

SDH & PDH Standards for ITU-T

G.701
Vocabulary of digital transmission and multiplexing and PCM terms

G.702
Digital Hierarchy bit rates

G.703
Physical/ electrical characteristics of hierarchical digital interfaces – PDH/SDH

G.704
Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44736 kbit/s hierarchical levels

G.706
Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704

G.707
SDH Framing & Multiplexing; PDH Mapping/Demapping; Network Node Interface for the SDH

G.772
PDH Monitor Mode Levels – Protected monitoring points provided on digital transmission systems

G.780
Vocabulary of terms for SDH networks and equipment

G.782
Types and general characteristics of SDH equipment

G.783
SDH Pointer Sequences; Characteristics of SDH equipment functional blocks

G.784
SDH management

G.802
Interworking between networks based on different and speech coding laws

G.803
Architectures of transport networks based on the SDH

G.821
PDH/SDH Error Analysis

G.823
PDH Jitter Tolerance

G.825
Control of jitter and wander in SDH

G.826
Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate

G.831
Management capabilities of transport network based on SDH

G.841
Types and characteristics of SDH network protection architectures

G.861
Principles and guidelines for the integration of satellite and radio systems in SDH

G.957
Optical interfaces for equipment and systems relating to SDH

G.958
SDH Jitter Tolerance; Digital line systems based on SDH for use on optical fibre cables

I.432
B–ISDN User –network interface – Physical layer specification

M.2100
PDH Error Analysis

M.2101
Performance Limits for BIS and Maintenance of Int' SDH Paths and Multiplex Sections

O.150
General requirements for instrumentation for performance measurements on digital transmission equipment

O.151, O.152, O.153
PRBS Test Patterns

O.171
Specifications for Measuring Equipment

O.181
Equipment to assess error performance on STM–N interfaces

F.750 (ITU–R)
Architectures and functional aspects of radio–relay systems for SDH–based networks

Index

M

O

P

Q

R

S

T

W

CTS 850