Programmer Manual

Tektronix

CTS 750
SDH Test Set

070-8925-03

This document applies to firmware version 1.40 and above.

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Preface

The CTS 750 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 750.

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* starting on page 1–1
How the programming model for this instrument is structured	*Programming Model* starting on page 1–7
How to perform simple tasks such as generating a normal or modified signal	*Examples of Command Usage* starting on page 1–13
How the command language syntax is structured	*Syntax* starting on page 2–1
What the functional command groups are	*Functional Command Groups* starting on page 2–7
What the commands and queries are	*Transmit Commands* section on page 2–13 through the *Common Commands* section
What the error and event messages are	*Status and Events* section contains the primary error and event messages starting on page 3–8 The commands and queries in *Syntax and Commands* starting on page 2–13 list the primary and secondary error and event messages for most commands
How to structure a program containing commands and queries	*Examples* starting on page 4–1
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 750 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 750 SDH Test Set.

■ The *CTS 750 User Manual* (Tektronix part number 070-8852-XX) is the primary source of information about how the CTS 750 functions.

■ The *CTS 710 SONET Test Set & CTS 750 SDH Test Set Reference* (Tektronix part number 070-8854-XX) provides a quick overview of the instrument programming commands.

■ The *CTS 750 SDH Test Set Reference* (Tektronix part number 070-9337-XX) provides a quick overview of the menu structure and alarms.

■ The *CTS 710 SONET Test Set & CTS 750 SDH Test Set Service Manual* (Tektronix part number 070-8853-XX) provides information on maintaining and servicing your instrument to the module level.

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Setting Up for Remote Communication

With a computer (controller), you can control the CTS 750 SDH Test Set 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 750 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 750 and the other end to the computer.

3. Connect both the CTS 750 and the computer to the line voltage.

4. Turn on the instrument.

5. Turn on the computer.
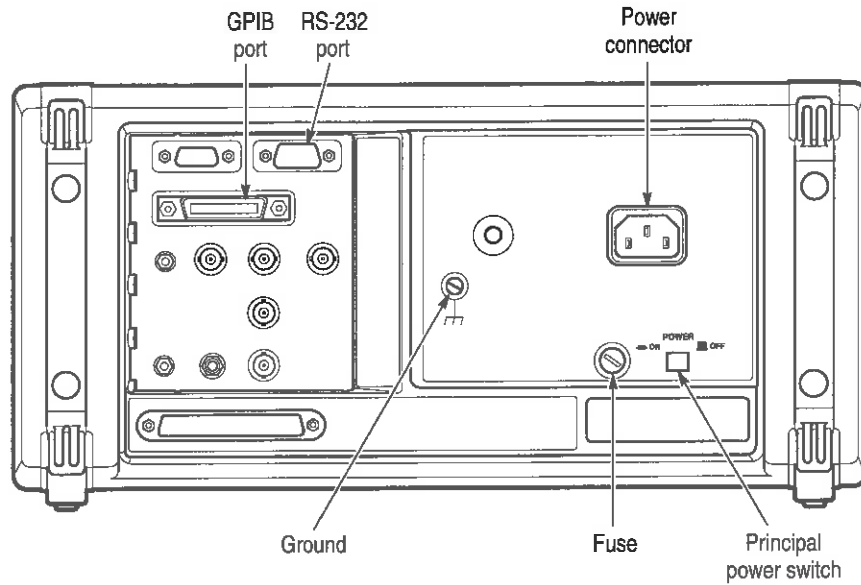
Figure 1–1: Rear-panel communication ports

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

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Figure 1–2 is a display of the UTILITY Menu showing the GPIB Address.
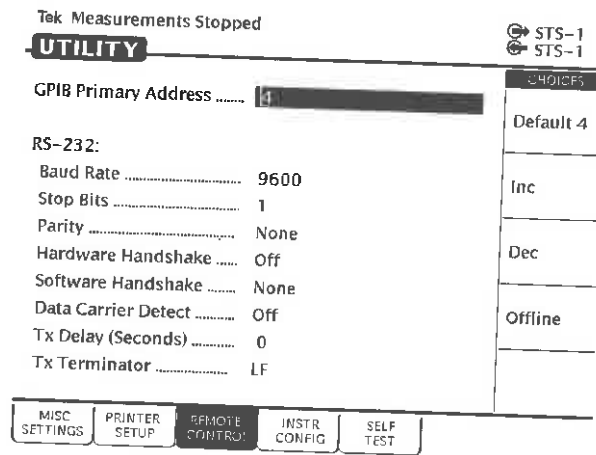
Figure 1–2: GPIB address in the UTILITY menu

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 750", respectively.

RS-232 Connection

The RS-232 port of the CTS 750 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 750 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 750. 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 the 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 750 SDH Test Set, the subsystems of each functional block, and the two modes in which the instrument operates.

Functional Blocks

The CTS 750 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: OUTPUT1 and SOURCE. The OUTPUT1 subsystem commands determine *how* the signal is transmitted and sets 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: INPUT1 and SENSE. The INPUT1 subsystem commands determine *how* a signal is received and sets 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 750 operates in normal or through mode. Figure 1–3 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 750 to operate in normal mode.

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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 750 to operate in through mode; the instrument continues to measure the received signal.
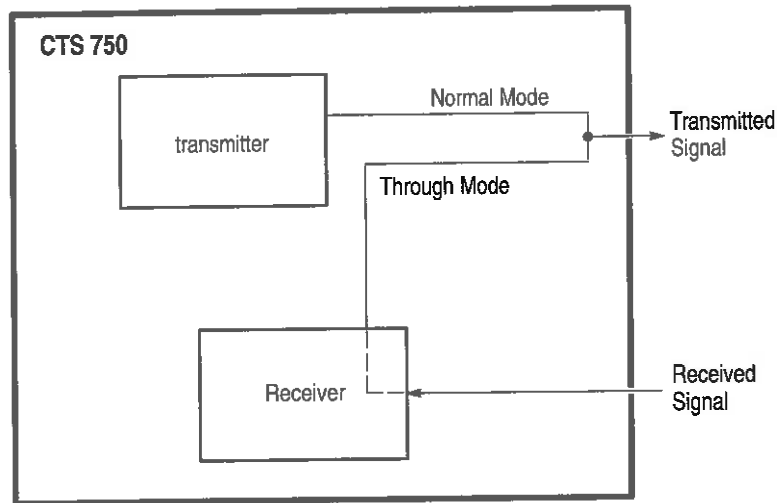
Figure 1–3: Modes of operation

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 1–4. 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.

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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.
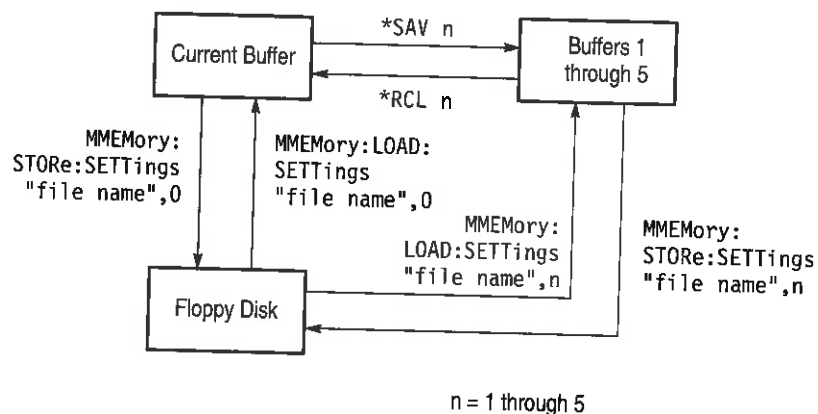
Figure 1–4: How instrument setups are stored

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 1–5. 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.
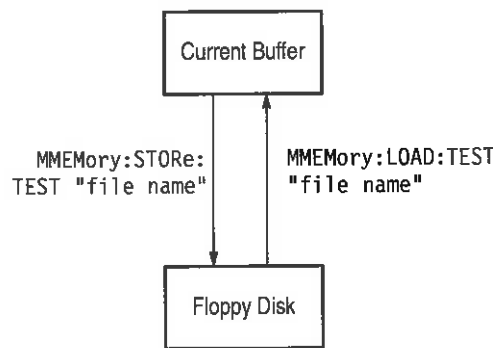
Figure 1–5: How pass/fail tests are stored

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 1–6).

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.

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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.
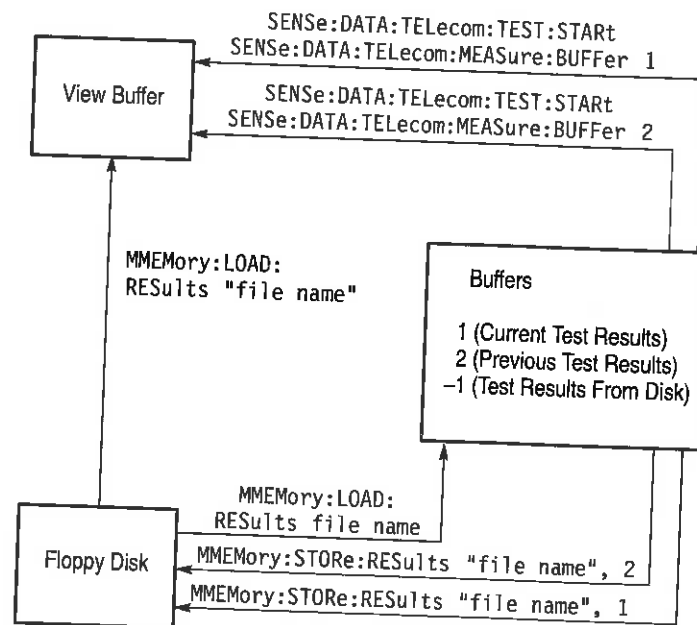
Figure 1–6: How test results are stored

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

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.

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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.

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Receiving Signals

This section shows you how to set up the CTS 750 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 D* 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 2–113 for list of possible responses. Figure 2–6 on page 2–11 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 2–163 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. The *Storage of Test Results* section starting on page 1–10 describes how test results are stored in the instrument.

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. Keep in mind that while the test is running, pointer 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. To access the pointer adjustment measurements, send the following commands:

■ 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 (Add/Drop Test Option Only)

This section discusses five ways to use the Add/Drop/Test Option of your CTS 750 to test the viability of a network element (NE) and portions of the network.

CTS 750 as a Stand-Alone Tributary Test Set

You can use the CTS 750 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 750 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 750 as shown in Figure 1–7.
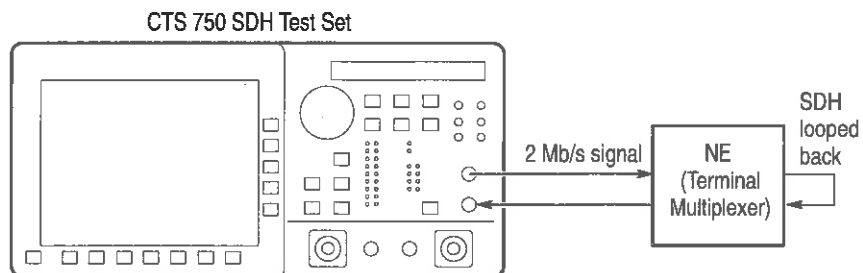
Figure 1–7: Setup for the CTS 750 as a stand-alone tributary test set

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 750 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 750 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 750 maps a pattern into the tributary payload of a SDH signal. This signal is then generated by the CTS 750 and transmitted to an NE. The CTS 750 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 750 receives the signal and measures the demapped 2 Mb/s tributary signal.

1. Configure your CTS 750 as shown in Figure 1–8.

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CTS 750 SDH Test Set

SDH signal

NE
(SDH Add/Drop
Multiplexer)

2 Mb/s signal looped back

Channel one out looped back
to channel one in
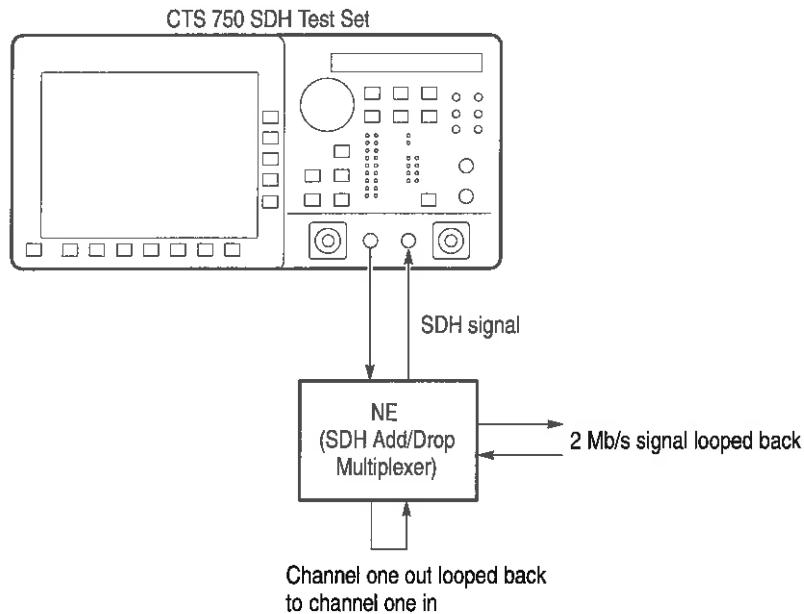
Figure 1–8: Setup for testing the SDH tributary payload mapping

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 750 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.

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Testing the Mapping Capability of a Network Element

You can use the CTS 750 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 750 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 750 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 750 as shown in Figure 1–9.
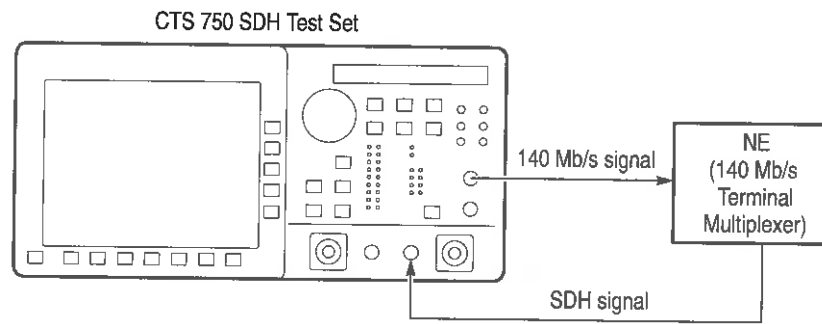
Figure 1–9: Setup for testing the mapping capability of a network element

2. Send the following commands to set up the CTS 750 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 750 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 750 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 750 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 750 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 750 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 750 as shown in Figure 1–10.

CTS 750 SDH Test Set

SDH signal

NE
(140 Mb/s Terminal Multiplexer)
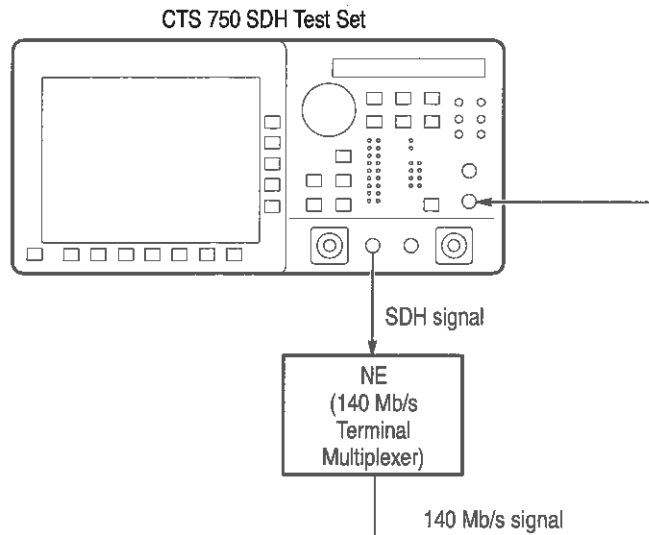
140 Mb/s signal

Figure 1–10: Setup for testing the demapping capability of a network element

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 750 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 750 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 750 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 750 as shown in Figure 1–11.
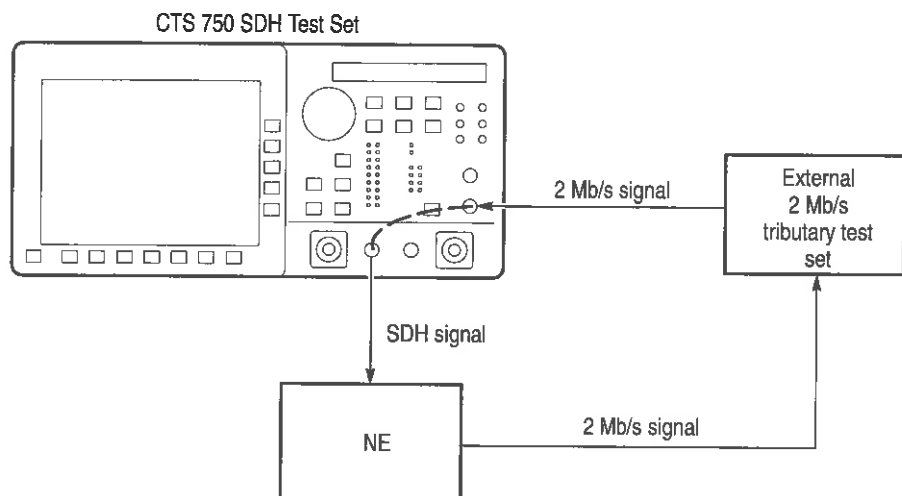
Figure 1–11: Setup for testing the external connection of an Add/Drop/Test set

2. Send the following commands to set up the CTS 750 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 750.

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 750 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.
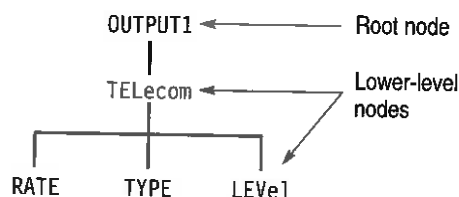
Figure 2–1: Example of SCPI subsystem hierarchy tree

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. The commands sections starting on page 2–13 list the valid values for all parameters.

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 750 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

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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.

Long form of a command
OUTPUT1:TELecom:TYPE OPTical

Minimum information needed
for accepted short form

Accepted short form
of a command and parameter
OUTPUT1:TEL:TYPE OPT
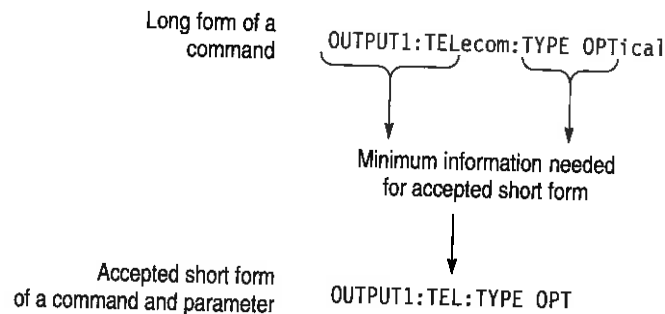
Figure 2–2: Example of abbreviating a command

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.

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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.

```
OUTPUT1:TEL:TYPE OPT;:SOUR:DATA:TEL:SOUR INPUT1;:SOUR:DATA:TEL:PAYL:PATT?;:SOUR:DATA:TEL:ERR:TYPE?
```

First command   Second command   First query   Second query

The response from this chained message might be   PRBS23;SCV

Response from first query   Response from second query
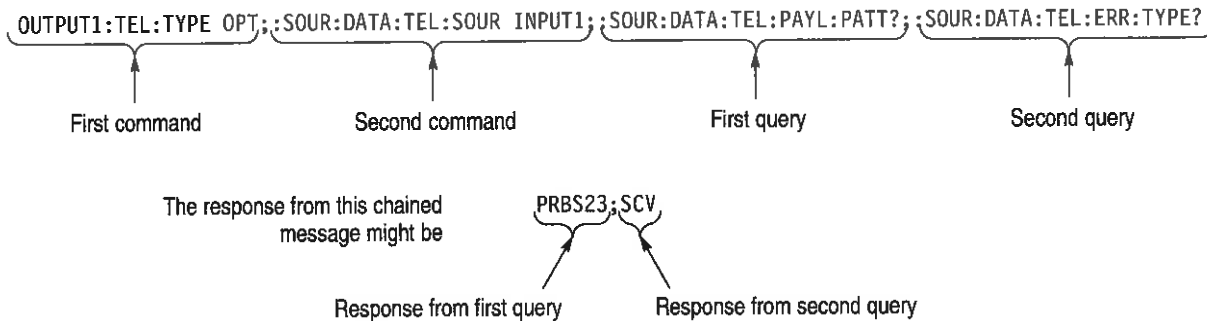
Figure 2–3: Example of chaining commands and queries

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.

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SOURce:DATA:TELecom:SOURce INPUT1;:SOURce:DATA:TELecom:CHANNEL 1

Identical root and lower-level nodes

SOURce:DATA:TELecom:SOURce INPUT1;CHANNEL 1

First command   Second command (omitted the
root and lower-level nodes)
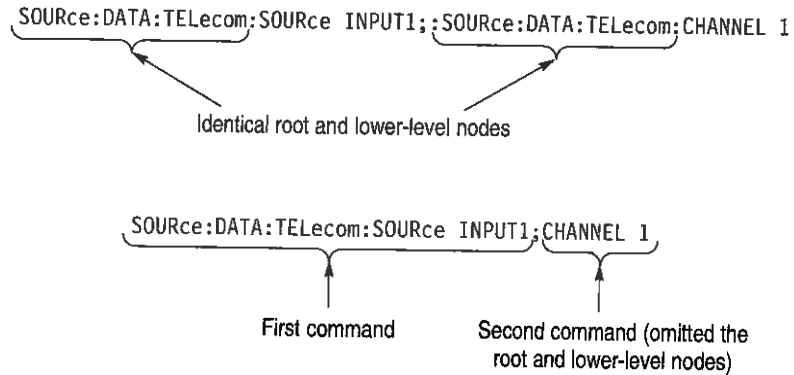
Figure 2–4: Example of omitting root and lower-level nodes in chained message

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 750 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?

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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 subsystems. For example, within *Transmit Commands* are subsystems that allow you to set the physical characteristics of a signal (the OUTPUT1 subsystem) and pointer adjustments (the SOURce:DATA:TELecom: POINter subsystem).

The functional groups and their subsystems are listed in Table 2–3.

Table 2–3: Functional groups and their subsystems

Functional group	Subsystem	Description	Starts on page
Transmit Commands	OUTPUT1	Controls physical setup of transmitted SDH signal	2–14
	OUTPUT2	Sets the characteristics of the transmitted or dropped 2 Mb/s tributary signal (Add/Drop Test Option Only)	2–17
	OUTPUT3	Sets the characteristics of the transmitted or dropped 34 Mb/s or 140 Mb/s tributary signal (Add/Drop Test Option Only)	2–19
	SOURce:CLOCk	Controls transmitter clock	2–20
	SOURce:DATA:TELecom	Controls transmitter setup	2–25
	SOURce:DATA:TELecom:OVERhead and POVerhead	Controls transmitter overheads	2–31
	SOURce:DATA:TELecom:ERRor, ALARm, and FAILure	Controls transmitter abnormalities	2–41
	SOURce:DATA:TELecom:POINter	Controls transmitter pointers	2–47
	SOURce:DATA:TELecom:TRIButary	Controls transmitted or dropped tributary signal (Add/Drop Test Option Only)	2–63
	SOURce:DATA:TELecom:TRIButary: ERRor, ALARm, and FAILure	Controls abnormal conditions in the transmitted or dropped tributary signal (Add/Drop Test Option Only)	2–73
	SOURce:DATA:TELecom:TRIButary: POINter	Controls pointers in the transmitted or dropped tributary signal (Add/Drop Test Option Only)	2–76
	SOURce:DATA:TELecom:JITter	Controls the jitter/wander generator	2–92

Table 2–3: Functional groups and their subsystems (Cont.)

Functional group	Subsystem	Description	Starts on page
Receive Commands	INPUT1	Sets up physical connection of received SDH signal	2–100
	INPUT2	Sets the characteristics of the received or added 2 Mb/s tributary signal (Add/Drop Test Option Only)	2–105
	INPUT3	Sets the characteristics of the received or added 34 Mb/s or 140 Mb/s tributary signal (Add/Drop Test Option Only)	2–108
	SENSe:DATA:TELecom	Sets up receiver	2–111
	SENSe:DATA:TELecom:TEST	Starts and stops measurements	2–118
	SENSe:DATA:TELecom:TEST: JITter	Sets/queries jitter compliance tests	2–124
	SENSe:DATA:TELecom:OVERhead and POVerhead	Allows access to receiver overheads	2–163
	SENSe:DATA:TELecom:MEASure	Allows access to measurements	2–169
	SENSe:DATA:TELecom:MEASure: STESts	Controls pass/fail tests	2–187
	SENSe:DATA:TELecom:MEASure: JITter	Access to jitter measurements	2–195
	SENSe:DATA:TELecom:MEASure: WANDer	Allows access to wander measurements (Add/Drop Test Option Only)	2–211
	SENSe:DATA:TELecom:MEASure: TRIButary	Allows access to measurements of tributary signals (Add/Drop Test Option Only)	2–217
	SENSe:DATA:TELecom:AUTOscan	Automatically sets up receiver	2–228
	SENSe:DATA:TELecom:TRIButary	Controls viewing of tributary signal (Add/Drop Test Option Only)	2–229
	SENSe:DATA:TELecom:JITter	Jitter input signal setup	2–241
Transmitter and Receiver Setup Commands	INSTrument	Controls transmitter and receiver settings	2–251
Trigger and Capture Commands	INITiate	Starts overhead capture	2–253
	TRIGger:IMMediate	Stops overhead capture	2–253

Table 2–3: Functional groups and their subsystems (Cont.)

Functional group	Subsystem	Description	Starts on page
Input/Output Commands	MMEMory	Controls disk drive	2–257
	MMEMory Jitter	Controls disk drive for jitter data	2–265
	DISPlay	Sets display intensity	2–275
	HCOPy	Controls printer	2–276
	SYSTem:COMMunicate	Controls RS-232 setups	2–280
Instrument Control Commands	SYSTem	Controls general instrument functions	2–289
Diagnostic Commands	DIAGnostic	Controls self tests	2–301
	CALibrate	Controls jitter self tests	2–308
IEEE 488.2 Common Commands	(no subsystems; every command and query begins with *)	Allows access to generic commands	2–311

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 2–5. For the sake of clarity, two tables are always given even though the parameters may be identical.

OUTPUT1:TELecom:LEVel ◄————————————————— Command (or query)

This command selects the level of the transmitted electrical signal.
The Operation Complete bit in the Standard Event Status Register ◄———— Description
is set when this command is sent.

Syntax   OUTPUT1:TELecom:LEVel <level> ◄——————————— Syntax and parameters

Parameters

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

Description of each parameter value (or response value)

Valid values for each parameter (or response)

Dependencies   Level control is only available when OUTPUT1:TELecom:TYPE is set to ◄———— Commands or settings that affect the behavior of this command (or query)
ELECtrical.

Errors and Events   221, "Setting Conflict; Level is not available with current TYPE, must ◄———— Special conditions in the instrument as a result of this command (or query); use *ESR? and SYSTem:ERRor?
be electrical"

Examples   OUTPUT1:TELECOM:LEVEL HIGH

Example of command (or query and response)

Related Commands   OUTPUT1:TELecom:LEVel?

Other commands (or queries) that can interact with or influence this command (or query)

Figure 2–5: Example of command listing

*NOTE. Some commands and queries follow a different format than shown in
Figure 2–5 (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 2–6 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.

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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).
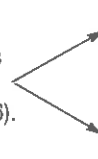
3 Read across the selected decimal values to the bit and definition columns to interpret the response. In this example, bits 10 and 13 are set indicating a path yellow and pattern lock.
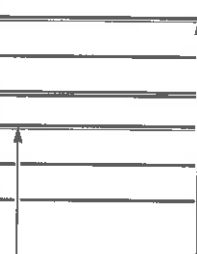
Figure 2–6: How to interpret a <decimal value> parameter or response

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 Transmit subsystems:

- OUTPUT1

- OUTPUT2 (Add/Drop Test Option Only)

- OUTPUT3 (Add/Drop Test Option Only)

- 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 (Add/Drop Test Option Only)

- SOURce:DATA:TELecom:TRIButary:ERRor, ALARm, and FAILure (Add/Drop Test Option Only)

- SOURce:DATA:TELecom:TRIButary:POINter (Add/Drop Test Option Only)

- SOURce:DATA:TELecom:TRIButary:POVerhead (Add/Drop Test Option Only)

- SOURce:DATA:TELecom:JITter (SDH/PDH Jitter/Wander Test Option Only)

OUTPUT1 Subsystem

This section describes the commands and queries that set the rate, type, and level of the signal to be transmitted. Figure 2–7 shows the hierarchy tree for this subsystem.

```
                 OUTPUT1
                    |
                 TELecom
        ┌───────────┼───────────┐
      RATE        TYPE        LEVel
```
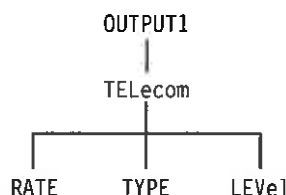
Figure 2–7: OUTPUT1 subsystem

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"

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Examples   Set: `OUTPUT1:TELECOM:RATE STM1`

Query: `OUTPUT1:TELECOM:RATE?`

Response: STM14

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`

Related Commands

None

OUTPUT2 Subsystem

Add/Drop Test Option Only

This section describes the commands and queries that set the characteristics of the transmitted or dropped 2 Mb/s tributary signal. Figure 2–8 shows the hierarchy tree for this subsystem.

```
        OUTPUT2
           |
        TELecom
           |
      ┌────┴────┐
     CODE   TERMinator
```
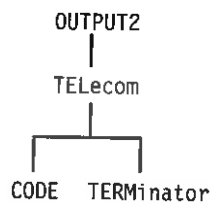
Figure 2–8: OUTPUT2 subsystem

OUTPUT2:TELecom:CODE

Add/Drop Test Option Only

This command sets or queries the signal coding of the 2 Mb/s tributary signal.

Syntax
```
OUTPUT2:TELecom:CODE <trib1 output code>
OUTPUT2:TELecom:CODE?
```

Parameters

<trib1 output code> (discrete)	Description
HDB3	High Density Bipolar 3 (default)

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

Errors and Events
None

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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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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.

```
OUTPUT3
   |
TELecom
   |
 RATE
```

Figure 2–9: OUTPUT3 subsystem

OUTPUT3:TELecom:RATE

Add/Drop Test Option Only

This command sets or queries the 34 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

Dependencies   None

Errors and Events   None

Examples   Set: `OUTPUT3:TELECOM:RATE M34`

Query: `OUTPUT3:TELECOM:RATE?`

Response: `M34`

Related Commands   SOURce:DATA:TELecom:SOURce

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 2–10 shows the hierarchy tree for this subsystem.
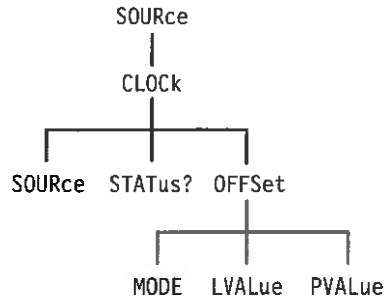
Figure 2–10: SOURce:CLOCk subsystem

Table 2–4 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 2–4: 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

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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

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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 2–4 on page 2–20 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	Changes to LVALue are tracked in PVALue
	POINter	Changes to PVALue are allowed

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	The line clock offset is set to this value (default = 0)
	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	

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 2–11 shows the hierarchy tree for this subsystem.
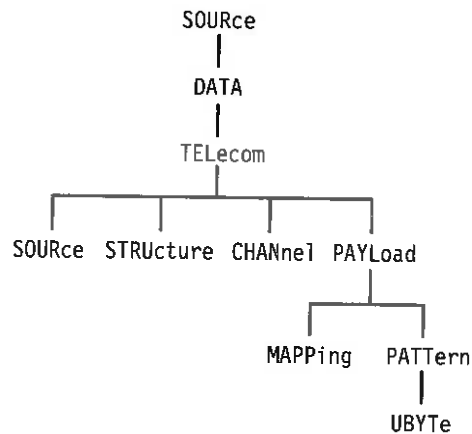
Figure 2–11: SOURce:DATA:TELecom subsystem

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) (STM0 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

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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:OVERhead and POVerhead Subsystem

This section describes the commands and queries that set up the transport overhead and path overhead. Figure 2–12 shows the hierarchy tree for this subsystem.
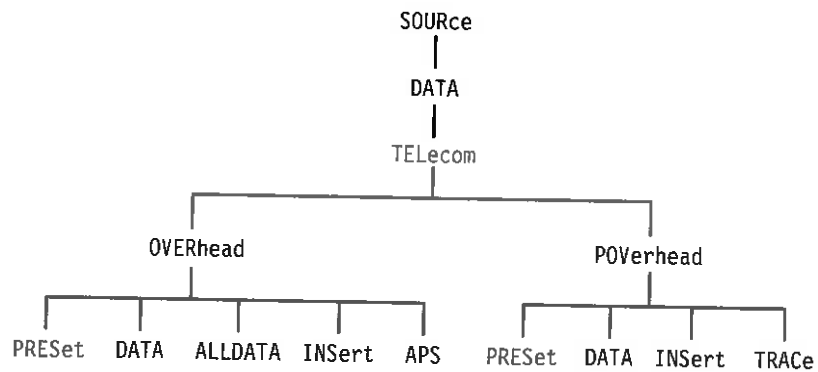
Figure 2–12: SOURce:DATA:TELecom:OVERhead and POVerhead subsystem

Figure 2–14 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 2–13, 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.
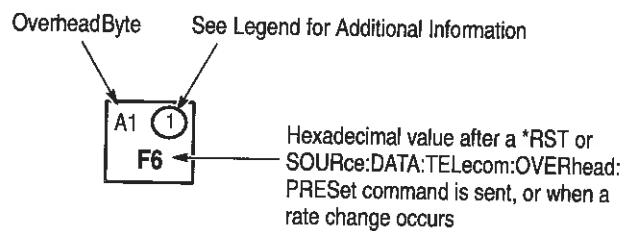
Figure 2–13: How to read the overhead default values table

STM-1 Transport Overhead

A1 F6	A1 F6	A1 F6	A2 28	A2 28	A2 28	C1 ① 01	NU 00	NU 00
B1 HW	– 00	– 00	E1 00	– 00	– 00	F1 00	NU 00	NU 00
D1 00	– 00	– 00	D2 00	– 00	– 00	D3 00	– 00	– 00
H1 ② HW	H1 93	H1 93	H2 ② HW	H2 FF	H2 FF	H3 HW	H3 HW	H3 HW
B2 HW	B2 HW	B2 HW	K1 00	– 00	– 00	K2 00	– 00	– 00
D4 00	– 00	– 00	D5 00	– 00	– 00	D6 00	– 00	– 00
D7 00	– 00	– 00	D8 00	– 00	– 00	D9 00	– 00	– 00
D10 00	– 00	– 00	D11 00	– 00	– 00	D12 00	– 00	– 00
S1 00	– 00	– 00	– 00	– 00	M1 ③ 00	E2 00	NU 00	NU 00

Offset Value: 0 1 2 0 1 2 0 1 2

STM-0 Transport Overhead

A1 F6	A2 28	C1 ⑥ 01
B1 ⑦ HW	E1 00	F1 00
D1 00	D2 00	D3 00
H1 ③ HW	H2 ③ HW	H3 HW
B2 HW	K1 00	K2 00
D4 00	D5 00	D6 00
D7 00	D8 00	D9 00
D10 00	D11 00	D12 00
S1 00	M1 00	E2 00

Path Overhead

J1 ④ 00
B3 HW
C2 ⑤ 00
G1 00
F2 00
H4 00
F3 00
K3 00
N1 00

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-1 can 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.

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 2–14: SDH Overhead Default Values

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SOURce:DATA:TELecom:OVERhead:PRESet

This command resets the entire overhead to the default (see Figure 2–14 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 2–14 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	All SDH rates
<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 overhead 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`

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
LDCC	MS DCC
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

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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 16-bit bytes in the same 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:POVerhead:PRESet

This command resets the path overhead to the default (see Figure 2–14 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.

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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 D1,#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

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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?

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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 2–15 shows the hierarchy tree for this subsystem.
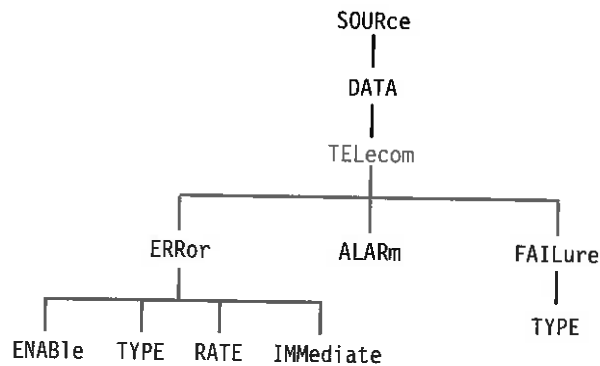
Figure 2–15: SOURce:DATA:TELecom:ERRor, ALARm, and FAILure subsystem

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

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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 2–5 and 2–6 for <error rate> parameters)

Table 2–5: 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 2–6: 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

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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

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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

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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

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SOURce:DATA:TELecom:POINter Subsystem

This section describes the commands and queries that adjust pointers. Figure 2–16 shows the hierarchy tree for this subsystem.
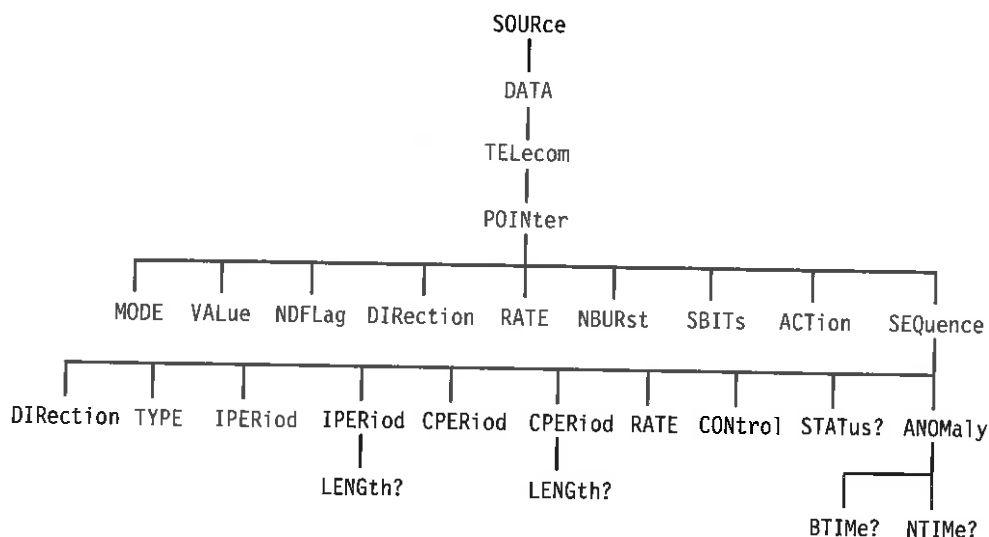
Figure 2–16: SOURce:DATA:TELecom:POINter subsystem

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

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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

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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

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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

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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"

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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

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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

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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

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SOURce:DATA:TELecom:TRIButary Subsystem

Add/Drop Test Option Only

This section describes the commands and queries that control the tributary signals. Figure 2–17 shows the hierarchy tree for this subsystem.

```
                          SOURce
                            |
                          DATA
                            |
                         TELecom
                            |
                        TRIButary
    ┌────────┬─────────┬────────┬────────┬─────────┬───────────┬──────────┐
   ADD    CHANnel   MAPPing  FRAMing  PATTern  BACKground   POVerhead
                                         |        |          ┌────┴────┐
                                       UWORd   PATTern      DATA    TRACe
                                         |
                                      LENGth
```

Figure 2–17: SOURce:DATA:TELecom:TRIButary subsystem

SOURce:DATA:TELecom:TRIButary:ADD

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

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SOURce:DATA:TELecom:TRIButary:MAPPing

Add/Drop Test Option Only

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

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SOURce:DATA:TELecom:TRIButary:FRAMing

Add/Drop Test Option Only

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

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SOURce:DATA:TELecom:TRIButary:PATTern

Add/Drop Test Option Only

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)
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
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)

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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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 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)
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

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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

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

This section describes subsystem commands that control abnormal conditions in the transmitted tributary signal. Figure 2–18 shows the hierarchy tree for this subsystem.

```
                    SOURce
                      |
                    DATA
                      |
                   TELecom
                      |
                  TRIButary
                      |
        ┌─────────────┼─────────────┐
      ERRor         ALARm         FAILure
```
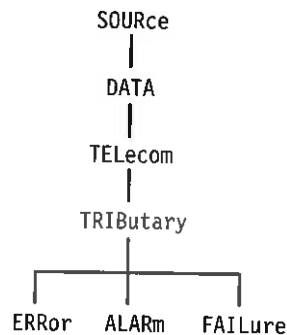
Figure 2–18: SOURce:DATA:TELecom:TRIButary:ERRor, ALARm, FAILure subsystem

SOURce:DATA:TELecom:TRIButary:ERRor

Add/Drop Test Option Only

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

Syntax

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

Parameters

<trib error> (discrete)	Description
NONE	No error transmitted
DATA	Error in pattern
FRAMe	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

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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:ALARm

Add/Drop Test Option Only

This command sets or queries a tributary alarm to transmit.

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

Parameters

<trib alarm> (discrete)	Description
NONE	No alarm transmitted (default)
AIS	Tributary AIS
TUFErf	TU FERF
TUAis	TU AIS
RAI	Remote Alarm Indication

Dependencies None

Errors and Events None

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Examples Set: SOURCE:DATA:TELECOM:TRIBUTARY:ALARM NONE

Query: SOURCE:DATA:TELECOM:TRIBUTARY:ALARM?

Response: RAI

Related Commands None

SOURce:DATA:TELecom:TRIButary:FAILure

Add/Drop Test Option Only

This command sets or queries a tributary failure to transmit.

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

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SOURce:DATA:TELecom:TRIButary:POINter Subsystem

Add/Drop Test Option Only

This section describes the commands and queries that adjust pointers for the transmitted TU mapped signal. Figure 2–19 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.*

```
                          SOURce
                            |
                          DATA
                            |
                         TELecom
                            |
                        TRIButary
                            |
                         POINter
                            |
   +--------+--------+--------+----------+--------+--------+
 MODE    VALue   NDFLag   DIRection  NBURst    RATE   SEQuence
                                                          |
        +----------+------+---------+---------+--------+--------+------+
    DIRection   TYPE  IPERiod   IPERiod   CPERiod  CPERiod  RATE  ANOMaly
                                   |                   |              |
                                LENGth?             LENGth?       +-------+
                                                                BTIMe?  NTIMe?
```
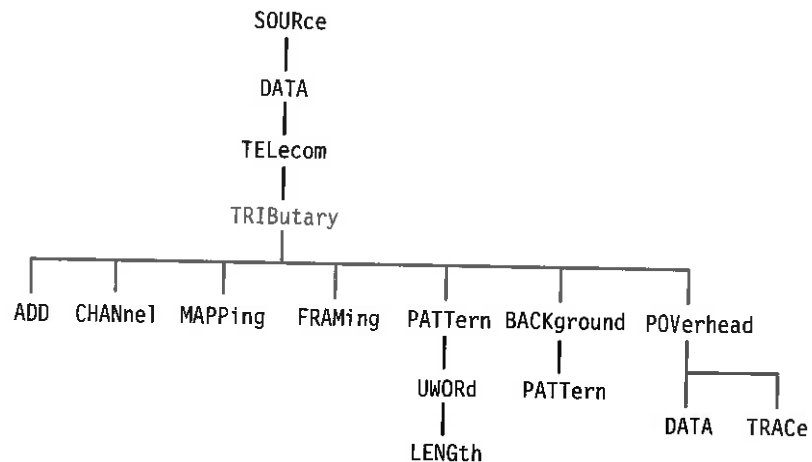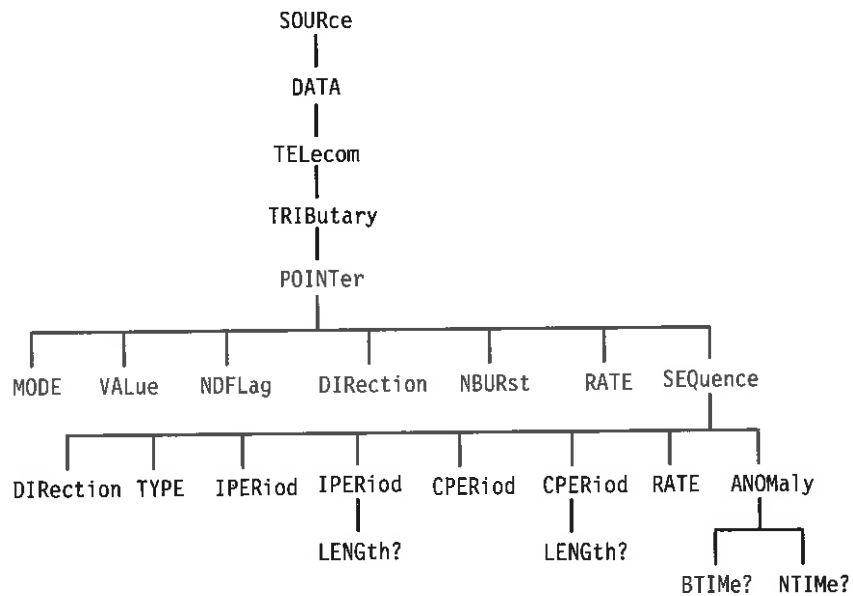
Figure 2–19: SOURce:DATA:TELecom:TRIButary:POINter subsystem

SOURce:DATA:TELecom:TRIButary:POINter:MODE

Add/Drop Test Option Only

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

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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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

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SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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"

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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?

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

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

Add/Drop Test Option Only

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

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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

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SOURce:DATA:TELecom:JITter Subsystem

This section describes the commands and queries that control the jitter and wander settings. Figure 2–20 shows the hierarchy tree for this subsystem.

```
                          SOURce
                            |
                          DATA
                            |
                          TELecom
                            |
                          JITter
        ┌─────────┬──────────┼──────────┬──────────┐
      MODE     SOUrce     CLOCk     FREQuency   AMPLitude
                        ┌────┴────┐
                      RATE     OFFSet
```
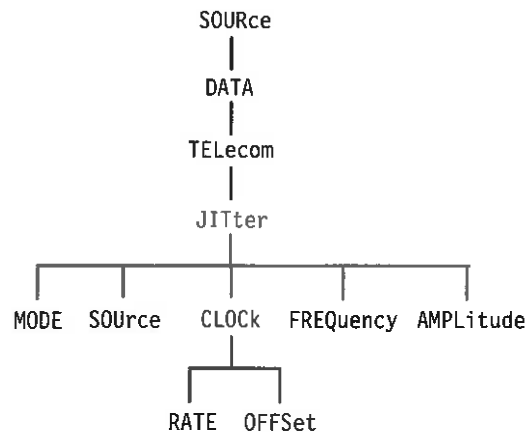
Figure 2–20: SOURce:DATA:TELecom:JITter subsystem

SOURce:DATA:TELecom:JITter:MODE

SDH/PDH Jitter/Wander Test Option Only

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.

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Examples	Set:	SOURCE:DATA:TELECOM:JITTER:MODE ON
	Query:	SOURCE:DATA:TELECOM:JITTER:MODE?
	Response:	ON

Related Commands None

SOURce:DATA:TELecom:JITter:SOURce

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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
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

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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	100 k	10	3	1
155 Mb/s rate	100 k	10	3	1
622 Mb/s rate	100 k	10	3	1

Rate	Frequency scale in Hz					
	f_0	f_1	f_2	f_3	f_4	f_5
52 Mb/s rate	12 μ	30	300	10 k	130 k	400 k
155 Mb/s rate	12 μ	30	300	35 k	430 k	1.3 M
622 Mb/s rate	12 μ	30	300	125 k	1.7 M	5 M
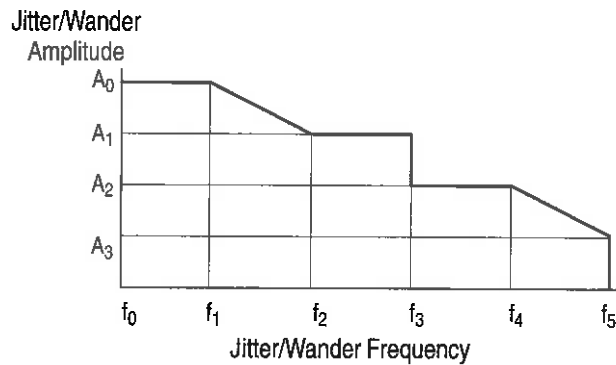
Figure 2–21: Jitter/Wander amplitude and frequency limits

Dependencies   Ranges at each rate depend on current jitter frequency. Refer to the parameters table and Figure 2–21 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 Receive subsystems:

- INPUT1

- INPUT2 (Add/Drop Test Option Only)

- INPUT3 (Add/Drop Test Option Only)

- SENSe:DATA:TELecom

- SENSe:DATA:TELecom:TEST

- SENSe:DATA:TELecom:TEST:JITter

- SENSe:DATA:TELecom:OVERhead and POVerhead

- SENSe:DATA:TELecom:MEASure

- SENSe:DATA:TELecom:MEASure:STESts

- SENSe:DATA:TELecom:MEASure:JITter
  (SDH/PDH Jitter/Wander Test Option Only)

- SENSe:DATA:TELecom:MEASure:WANDer

- SENSe:DATA:TELecom:MEASure:TRIButary
  (Add/Drop Test Option Only)

- SENSe:DATA:TELecom:AUTOscan

- SENSe:DATA:TELecom:TRIButary (Add/Drop Test Option Only)

- SENSe:DATA:TELecom:JITter (SDH/PDH Jitter/Wander Test Option Only)

INPUT1 Subsystem

This section describes the commands and queries that allow you to set the rate, type, and level of the incoming signal. Figure 2–22 shows the hierarchy tree for this subsystem.
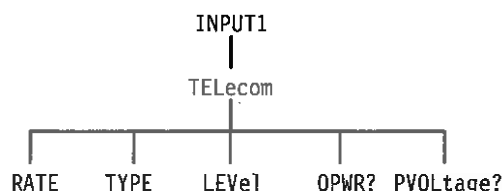
Figure 2–22: INPUT1 subsystem

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"

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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

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INPUT1:TELecom:STATus?

This query returns the status of the received signal connected to INPUT1. The response is valid only when the receiver is set up to receive signals.

Syntax   `INPUT1:TELecom:STATus?`

Response Dependencies   None

Errors and Events   None

Examples   Query: `INPUT1:TELECOM:STATUS?`

Response: `MONITOR`

Related Commands   INPUT1:TELecom:LEVel

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

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INPUT2 Subsystem

Add/Drop Test Option Only

This section describes the commands and queries that set the characteristics of the received or added 2 Mb/s tributary signal. Figure 2–23 shows the hierarchy tree for this subsystem.

```
                    INPUT2
                      |
                   TELecom
          ┌───────────┼───────────┐
        LEVel      STATus?     TERMinator
```
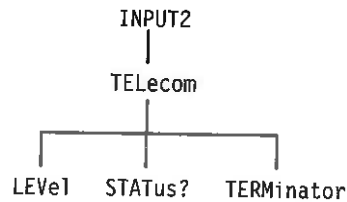
Figure 2–23: INPUT2 subsystem

INPUT2:TELecom:LEVel

Add/Drop Test Option Only

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

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

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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?

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

INPUT3 Subsystem

Add/Drop Test Option Only

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 2–24 shows the hierarchy tree for this subsystem.
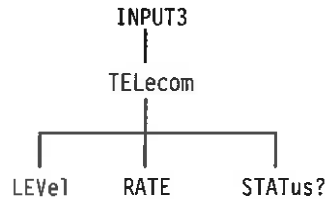
Figure 2–24: INPUT3 subsystem

INPUT3:TELecom:LEVel

Add/Drop Test Option Only

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

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

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Examples	Set:	INPUT3:TELECOM:LEVEL NORMAL
	Query:	INPUT3:TELECOM:LEVEL?
	Response:	NORMAL

Related Commands None

INPUT3:TELecom:RATE

Add/Drop Test Option Only

This command sets or queries the 34 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

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?

Add/Drop Test Option Only

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

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SENSe:DATA:TELecom Subsystem

This section describes the commands and queries that set up the structure of the signal to be received. Figure 2–25 shows the hierarchy tree for this subsystem.
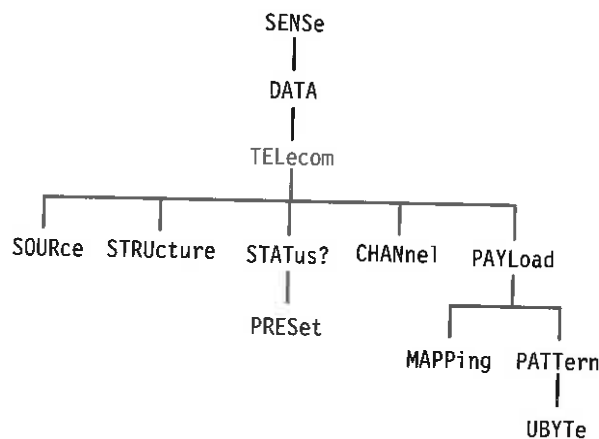
Figure 2–25: SENSe:DATA:TELecom subsystem

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"

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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: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

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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

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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 pattern>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:TEST Subsystem

This section describes each of the commands and queries used to control measurements. Figure 2–26 shows the hierarchy tree for this subsystem.

```
                              SENSe
                                |
                              DATA
                                |
                            TELecom
                                |
                              TEST
        ┌───────┬──────┬─────────┬─────────┬────────┬─────────┐
      MODE   STARt   STOP   STATus?  DURation   STIMe?   HISTory
                                                             |
                                                         RESolution
```
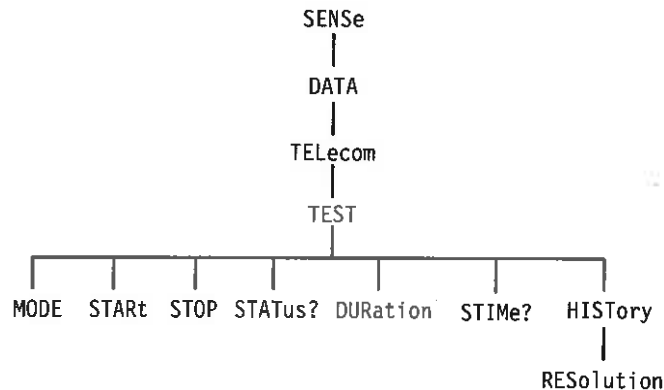
Figure 2–26: SENSe:DATA:TELecom:TEST subsystem

SENSe:DATA:TELecom:TEST:MODE

SDH/PDH Jitter/Wander Test Option Only

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.

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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:TELe-com: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

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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

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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

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SENSe:DATA:TELecom:TEST:JITter Subsystem

This section describes the commands and queries that control the jitter and wander measurements. Figure 2–27 shows the hierarchy tree for this subsystem.
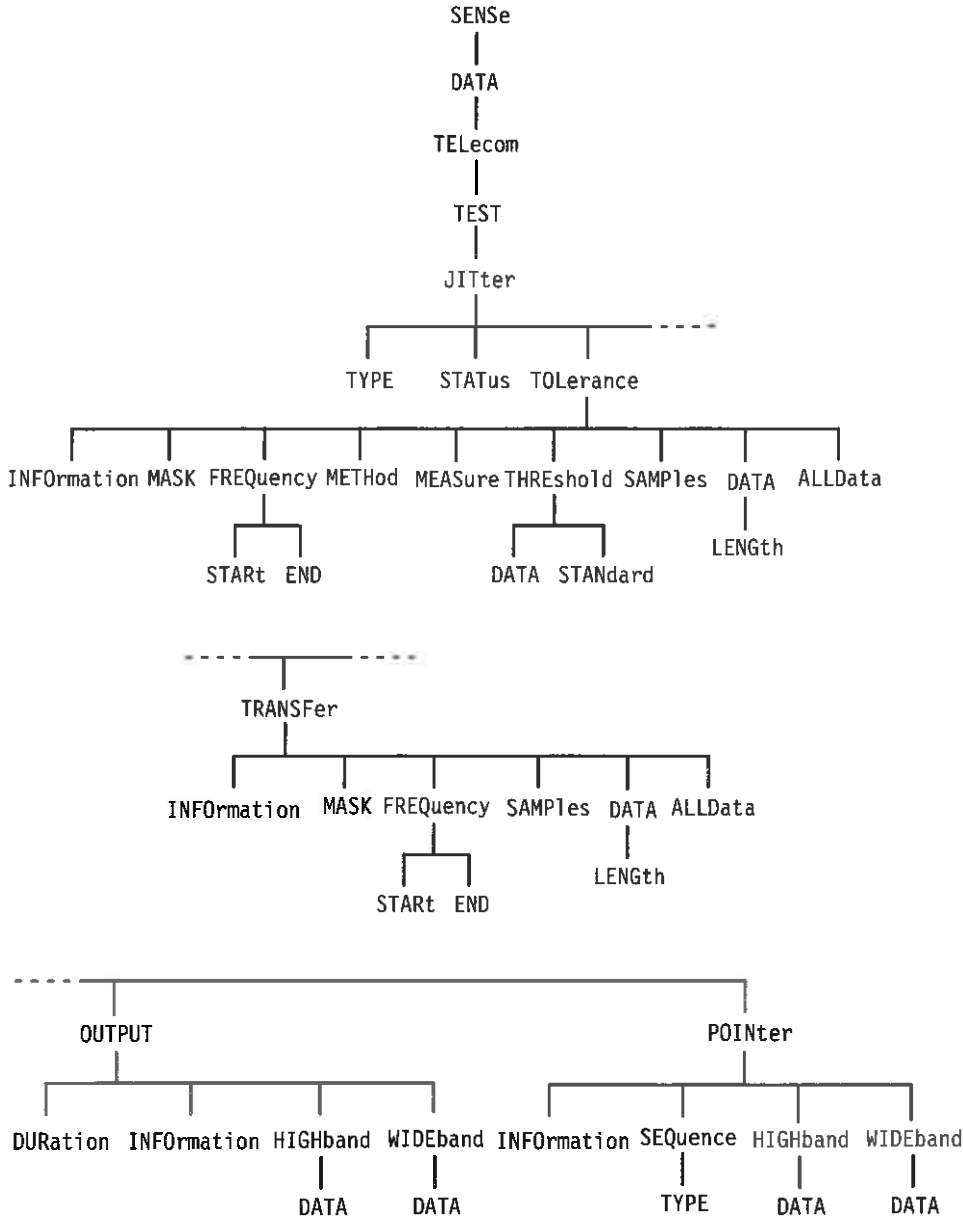
Figure 2–27: SENSe:DATA:TELecom:TEST:JITter subsystem

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)

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<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

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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

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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

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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

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<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,VAL-
ID,100E+2,20.0,18.2,OOR

Related Commands   SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA:LENGth?

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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	Received 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.

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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

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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:STATE

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the action to perform when starting the jitter transfer test.

Syntax

```
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE <trans state>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE?
```

Parameters

<trans state> (<discrete>)	Description
TEST	Test the network element (default).
CALibrate	Run the instrument transfer calibration routine. To determine if the instrument needs calibration,, execute SENSE:DATA:TELECOM:TEST:JITTER :TRANSFER:CALIBRATE:STATUS?

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 set 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

Set: SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:STATE CAL

Query: SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:STATE?

Response: TEST

Related Commands

SENSe:DATA:TELecom:TEST:JITter:TRANSfer:CALibrate:STATus?

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SENSe:DATA:TELecom:TEST:JITter:TRANSFer:CALibrate:STATus?

SDH/PDH Jitter/Wander Test Option Only

This command queries the jitter transfer calibration status.

Syntax   SENSe:DATA:TELecom:TEST:JITter:TRANSFer:CALibrate:STATus?

Parameters

<cal state> (<discrete>)	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 set 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: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?

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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>	Frequency (Hz) of point 1
<x1-ampl>	Amplitude (UI) of point 1
<x1-mask>	Mask amplitude (UI) of point 1
<x1-status>	Data status of point 1
...	...
<xn-freq>	Frequency (Hz) of point n
<xn-ampl>	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 :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>

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<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	Received signal rate

Response

SOURce	Description
NONE	Results not available
MEMory	Results read from instrument memory
DISK	Results read from disk

(continued on next page)

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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

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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>	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	Received 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

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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>	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

(continued on next page)

<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: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>	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

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<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:POINTER:WIDEBAND:DATA?`

Response: `1,2, 2.0, VALID`

Related Commands   SENSe:DATA:TELecom:TEST:JITter:POINter?

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 2–28 shows the hierarchy tree for this subsystem.
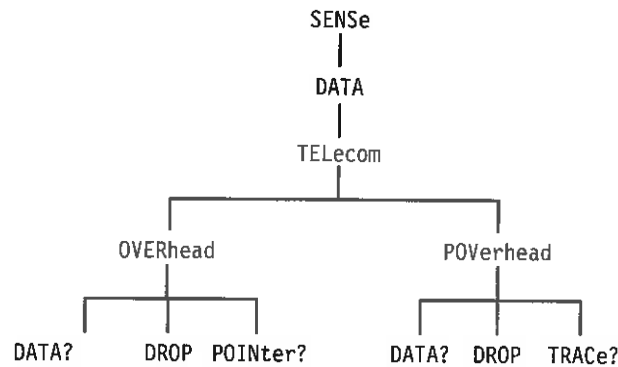
Figure 2–28: SENSe:DATA:TELecom:OVERhead and POVerhead subsystem

SENSe:DATA:TELecom:OVERhead:DATA?

This query returns the value in the transport overhead byte of the specified channel. See Figure 2–14 on page 2–32 for the definition of offset values.

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
LDCC	Multiplexer section DCC
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

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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

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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

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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 2–29 through 2–33 show the hierarchy trees for this subsystem.

```
                              SENSe
                                |
                              DATA
                                |
                             TELecom
                                |
                             MEASure
                                |
                             ANALysis
    ┌──────┬──────────┬───────────┬──────────┬──────────┬──────────┬──────────┐
  ECOUnt?  PESeconds?  PSESeconds?  PDMINutes?  PUASeconds?  PEFSeconds?  PBBError?
    |         |           |           |           |           |           |
  error     error       error       error       error       error       error
 source 3  source 1    source 1    source 3    source 1    source 3    source 2
           and 4       and 4                   and 4                   and 4
     ESEConds?    SESeconds?     DMINutes?    UASeconds?   EFSeconds?    BBError      EBlock?
        |            |              |            |            |            |            |
   error source  error source    error      error source   error     error source  error source
    1 and 4       1 and 4       source 3     1 and 4      source 3     2 and 4       2 and 4

  error source 1    error source 2    error source 3    error source 4              error source 5
    SCV?              SCV?              BIT?            (Add/Drop Test Option Only)   (Add/Drop Test Option Only)
    LCV?              LCV?                                VTFEBe?                       VTBIP?
    PCV?              PCV?                                VTBIP?
    BIT?              LFEBE?
    LFEBE?            PFEBE?
    PFEBE?
```

Figure 2–29: SENSe:DATA:TELecom:MEASure:ANALysis subsystem (SDH)

```
                            SENSe
                              |
                            DATA
                              |
                          TELecom
                              |
                          MEASure
                              |
                           ERRor
                              |
          +-------------------+-------------------+
          |                   |                   |
       ECOUnt?             ERATio?            ESEConds?
          |                   |                   |
     error source        error source        error source
        1 and 2             1 and 2             1 and 2


          error source 1              error source 2
              SCV?              (Add/Drop Test Option Only)
              LCV?                        VTFEBe?
              PCV?                        VTBIP?
              BIT?
              LFEBE?
              PFEBE?
```
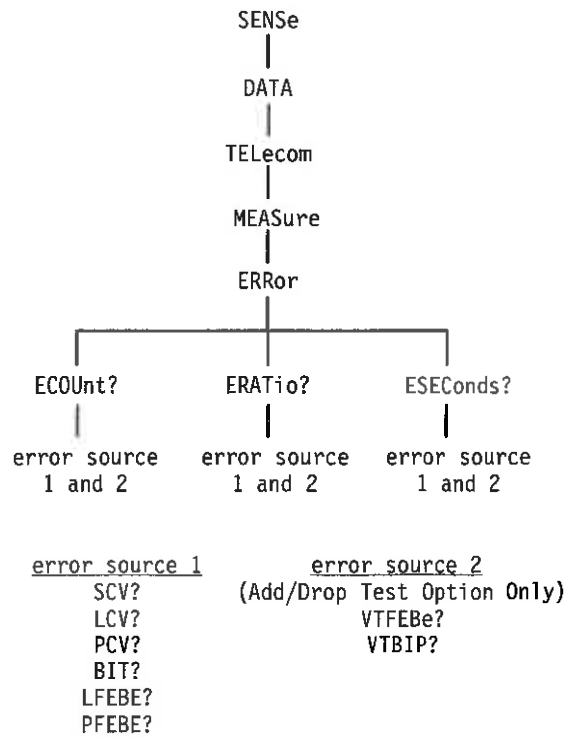
Figure 2–30: SENSe:DATA:TELecom:MEASure:ERRor subsystem

```
                           SENSe
                             |
                           DATA
                             |
                         TELecom
                             |
                         MEASure
                             |
                         POINter              Add/Drop Test Option Only
                             |            +--------------------------------------+
   +-------+-------+---------+----------+  |       |        |         |          |
   |       |       |         |          |  |       |        |         |          |
 PPTR?  NPTR?  ICOunt?  NDFSeconds? IPSeconds? VTPPTR? VTNPTR? VTICOunt? VTNDFSeconds? VTIPSeconds?
```
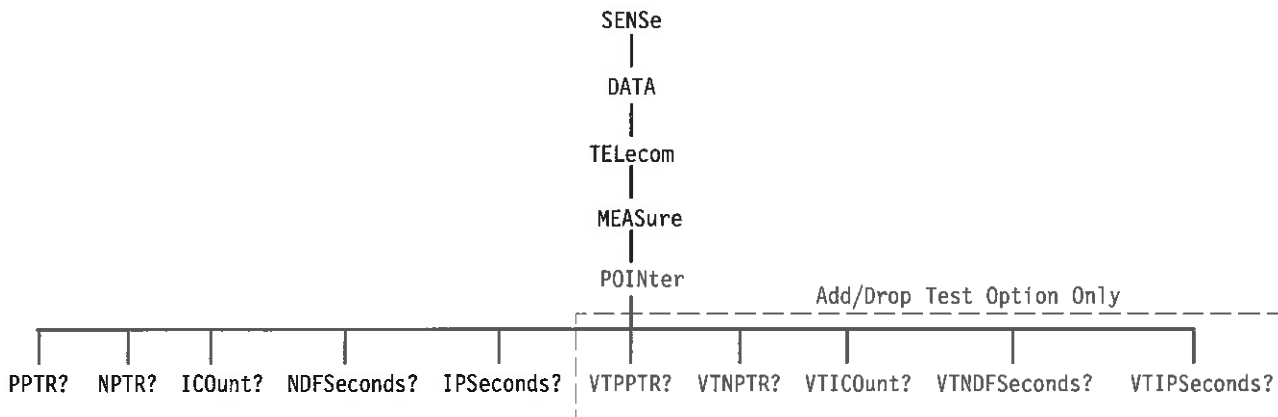
Figure 2–31: SENSe:DATA:TELecom:MEASure:POINter subsystem

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SENSe
|
DATA
|
TELecom
|
MEASure
|
ALARm

Add/Drop Test Option Only

| LOSignal? | OOFrame? | LAIS? | PAIS? | LPWR? | VTAIS? | VTLOM? |

| LOFrame? | LOPointer? | LFERF? | PFERF? | VTLOP? | VTFERF? |
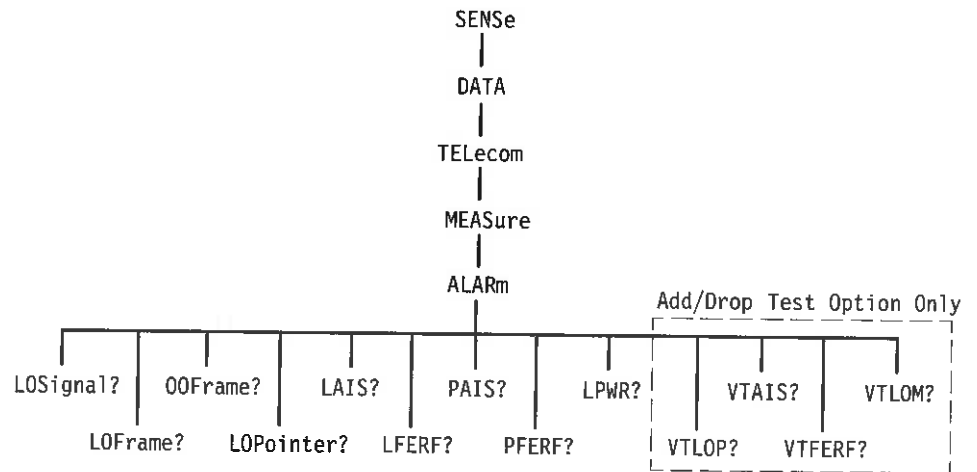
Figure 2–32: SENSe:DATA:TELecom:MEASure:ALARm subsystem

SENSe
|
DATA
|
TELecom
|
MEASure

BUFFer   INFOrmation?   TSCAn?

AVAIlable?

| STATus? | DATE? | USER? | DESCription? | MAPPing? | STRUcture? |

| TIME? | LENGth? | OWNer? | SOURce? | RATE? |
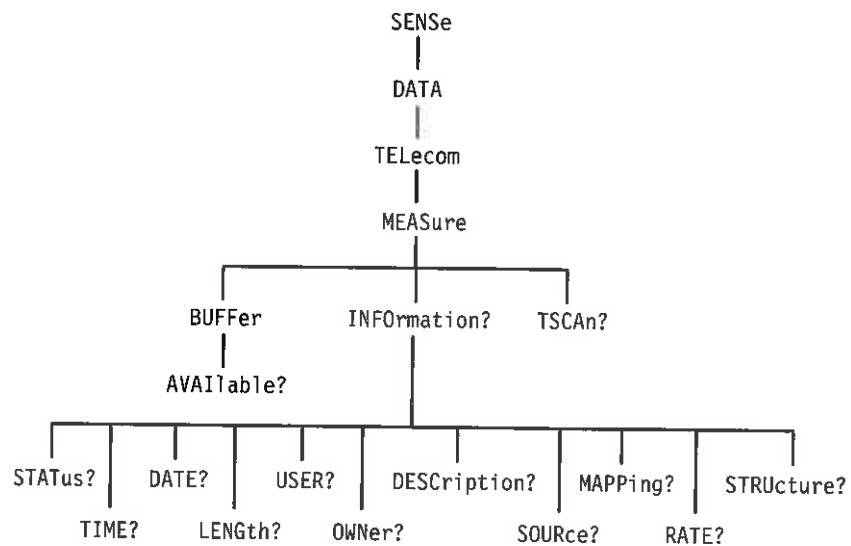
Figure 2–33: SENSe:DATA:TELecom:MEASure:BUFFer and INFOrmation subsystems

A variety of error, alarm, failure, and pointer measurements are reported through this subsystem. Table 2–7 shows how error, alarm, and failure measurements are calculated. Tables 2–8 and 2–9 show how the analysis measurements are calculated. These calculations are based on CCITT G.821 specifications.

Table 2–7: 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 2–8: 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 2–9)
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

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Table 2–9: 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 2–34 shows you how to read the Syntax Tables in this section. Follow the step numbers to create any query. Table 2–10 explains the acronyms used in the SENSe:DATA:TELecom:MEASure Syntax Tables.

1 Start with the syntax statement listed under Syntax.

3 Add a question mark or one of these items (remember to keep the colon in front of this item).

2 Add one of these items to the end of the syntax statement.

Table X–X: 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?**
ECOUNnt	error count	error count	error count	error count	error count	error count	error count
ERATio	bit error ratio	bit error ratio	bit error ratio	bit error ratio	bit error ratio	bit error ratio	bit error ratio
ESEconds	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 NR3-numeric responses.

4 The response type is listed in the footnote.

5 The response description for each combination of items is listed in each cell of the table. If no query exists for a particular combination of items, "no query" is listed in the cell.

Figure 2–34: How to read the syntax tables in the SENSe:DATA:TELecom:MEASure subsystem section

Table 2–10: 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 2–35 shows you how to read the Example Tables in this section.

Table X–X: 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

Selected examples of queries
are shown in the left column

A typical response is shown in the right
column for each example

Figure 2–35: 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 2–11 and 2–12 to complete the query)

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Table 2–11: 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 errored seconds return NR1-numeric responses.

All error counts and error bit ratios return NR3-numeric responses.

Table 2–12: 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 NR3-numeric responses.

Response   See Tables 2–11 and 2–12.

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

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Examples   See Table 2–13.

Table 2–13: 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 2–14 and 2–15 to complete the query)

Table 2–14: 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

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Table 2–14: 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?
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
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

All percent measurements return NR3-numeric responses.

All other measurements return NR1-numeric responses.

Table 2–15: 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
BBError	background block errors	background block errors

Table 2–15: 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?**
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 NR3-numeric responses.

All other measurements return NR1-numeric responses.

Response   See Tables 2–14 and 2–15.

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 2–16.

Table 2–16: 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

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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 2–17 and 2–18.

Table 2–17: 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
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

All responses are in NR3-numeric format.

Table 2–18: Syntax table for SENSe:DATA:TELecom:MEASure:ALARm queries (Add/Drop Test Option Only)

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 NR3-numeric format.

Response   See the Response column of Tables 2–17 and 2–18.

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 2–19.

Table 2–19: 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 2–20 and 2–21.

Table 2–20: 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.

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Table 2–21: 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
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 2–20 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: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

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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

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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.

Syntax   All valid queries are listed in the Syntax column of Table 2–23.

Table 2–23: 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:HPASs?	U_1, U1, U10
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: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:RATE?	STM0, STM1, STM4 M2, M34, M140 (Add/Drop Test Option Only)
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

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Table 2–23: Syntax table for SENSe:DATA:TELecom:MEASure:INFOrmation queries (Cont.)

Syntax	Response
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]

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 2–23.

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 2–24.

Table 2–24: 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

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

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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 2–36 shows the hierarchy tree for this subsystem.

```
                        SENSe
                          |
                        DATA
                          |
                       TELecom
                          |
                       MEASure
                          |
                        STESts
     ┌────────┬──────────┼──────────┬─────────┐
  ENABle  DESCription  THREshold  RESUlts?  DONE
```
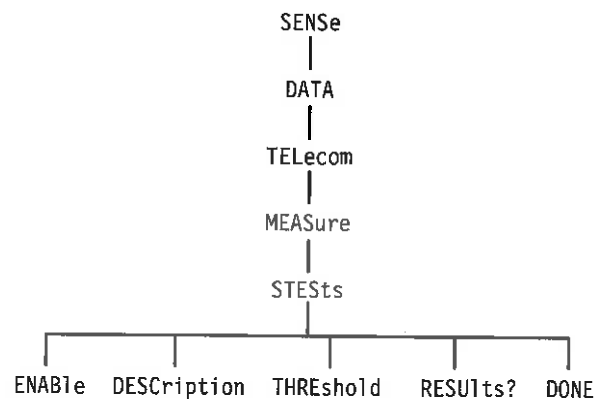
Figure 2–36: SENSe:DATA:TELecom:MEASure:STESts subsystem

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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?

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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

<type> = NONE

<source> (discrete)	Description
NONE	No pass/fail criteria

<threshold> (discrete)	Description
0	No threshold

<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)

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\<type\> = ALARm

\<threshold\> (discrete)	Description
DETected	Threshold is detected
NDETected	Threshold is not detected

\<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

**\<type\> = ERATio, ECOUnt,
or ESEConds**

\<source\> (discrete)	Description
ANY	Any of the errors below
SCV	B1 error
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)

\<type\> = ERATio, ECOUnt,
or ESEConds (cont.)

\<threshold\> (NR3-numeric)	Description
Any number	The test will fail for any level greater than this value

\<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

\<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

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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

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SENSe:DATA:TELecom:MEASure:JITter Subsystem

This section describes the SENSe:DATA:TELEcom:MEASure:JITter susbsystem commands and queries. Figure 2–37 shows the hierarchy tree for this subsystem.
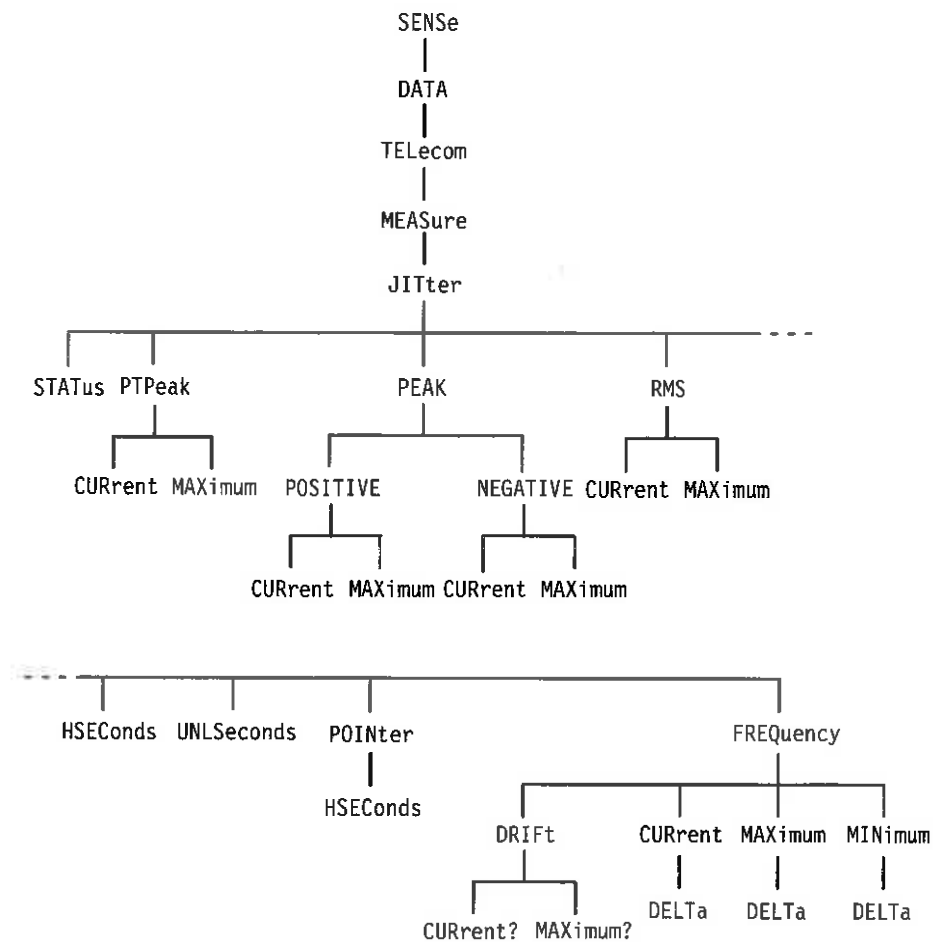

Figure 2–37: SENSe:DATA:TELecom:MEASure:JITter subsystem

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SENSe:DATA:TELecom:MEASure:JITter:STATus?

SDH/PDH Jitter/Wander Test Option Only

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 invalid 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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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

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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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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

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SENSe:DATA:TELecom:MEASure:JITter:UNLSeconds?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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

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SENSe:DATA:TELecom:MEASure:JITter:FREQuency:CURrent?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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

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SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MINimum?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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:MEASure:WANDer Subsystem

This section describes the SENSe:DATA:TELEcom:MEASure:WANDer susbsystem commands and queries. Figure 2–38 shows the hierarchy tree for this subsystem.
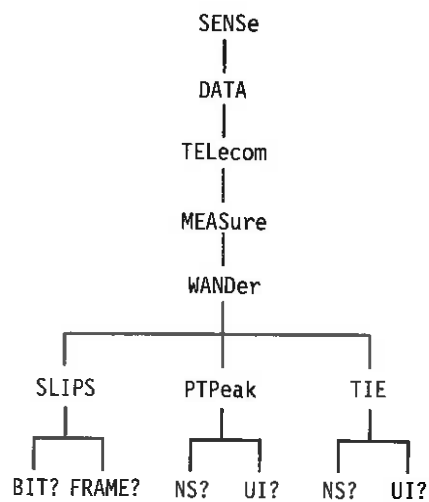
```
                    SENSe
                      |
                    DATA
                      |
                   TELecom
                      |
                   MEASure
                      |
                   WANDer
          ┌───────────┼───────────┐
        SLIPS       PTPeak        TIE
        ┌──┴──┐     ┌──┴──┐     ┌──┴──┐
      BIT? FRAME?  NS?  UI?    NS?   UI?
```

Figure 2–38: SENSe:DATA:TELecom:MEASure:WANDer subsystem

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SENSe:DATA:TELecom:MEASure:WANDer:SLIPS:BIT?

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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:NS?

SDH/PDH Jitter/Wander Test Option Only

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

<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.

Errors and Events   None

Examples   Query: SENSE:DATA:TELECOM:MEASURE:WANDER:PTPEAK:NS?

Response: 10

Related Commands   None

SENSe:DATA:TELecom:MEASure:WANDer:PTPeak:UI?

SDH/PDH Jitter/Wander Test Option Only

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

<wander ptp> (NR3-numeric)	Description
Floating Point value in the range of 0 to 1000.0, with a resolution of 0.01	Maximum peak-to-peak wander amplitude in UI

Dependencies   Requires installation of Option 14 jitter module.

Errors and Events   None

Examples   Query: SENSE:DATA:TELECOM:MEASURE:WANDER:PTPEAK:UI?

Response: 10.5

Related Commands   None

SENSe:DATA:TELecom:MEASure:WANDer:TIE:NS?

SDH/PDH Jitter/Wander Test Option Only

This query returns the TIE value in nanoseconds at the current time in the test.

Syntax   SENSe:DATA:TELecom:MEASure:WANDer:TIE:NS?

Response

<wander tie> (NR1-numeric)	Description
Integer in the range of 0 to 4294767295	Current TIE value in nanoseconds

Dependencies   Requires installation of Option 14 jitter module.

This measurement is valid while SENSe:DATA:TELecom:MEASure:JITter
:STATus? returns VALID.

Errors and Events   None

Examples   Query: SENSE:DATA:TELECOM:MEASURE:WANDER:TIE:NS?

Response: 10

Related Commands   None

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SENSe:DATA:TELecom:MEASure:WANDer:TIE:UI?

SDH/PDH Jitter/Wander Test Option Only

This query returns the TIE value at the current time in the test.

Syntax   SENSe:DATA:TELecom:MEASure:WANDer:TIE:UI?

Response

<wander tie> (NR3-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 while SENSe:DATA:TELecom:MEASure:JITter:STATus? returns VALID.

Errors and Events   None

Examples   Query: SENSE:DATA:TELECOM:MEASURE:WANDER:TIE:UI?

Response: 20.5

Related Commands   None

SENSe:DATA:TELecom:MEASure:TRIButary Subsystem

Add/Drop Test Option Only

This section describes the commands and queries that access tributary error, alarm, failure, and pointer measurements for current and previous tests. Figures 2–39, 2–40, and 2–41 show the hierarchy trees for this subsystem.
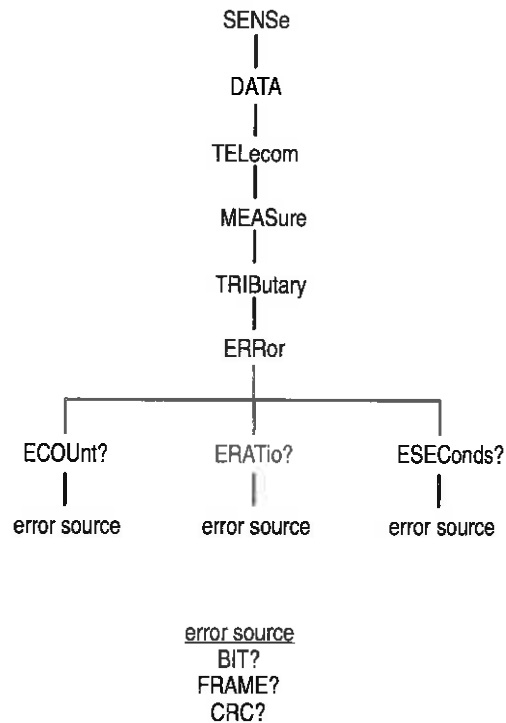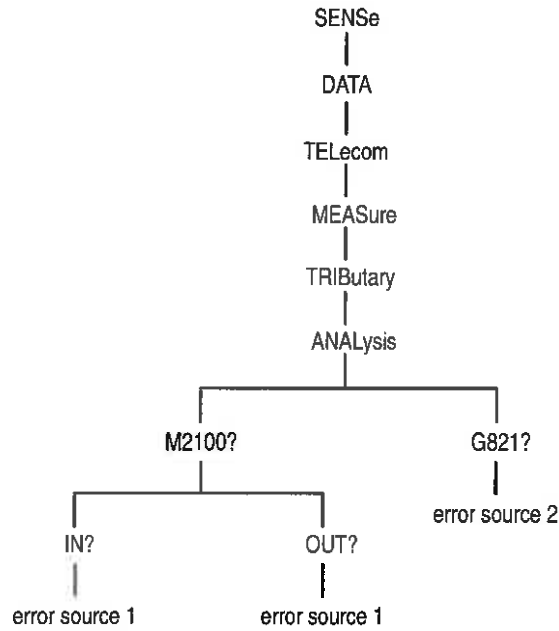
```
                              SENSe
                                |
                              DATA
                                |
                             TELecom
                                |
                             MEASure
                                |
                            TRIButary
                                |
                              ERRor
                                |
         ┌──────────────────────┼──────────────────────┐
      ECOUnt?                 ERATio?               ESEConds?
         |                       |                      |
    error source            error source           error source


                            error source
                               BIT?
                              FRAME?
                               CRC?
```
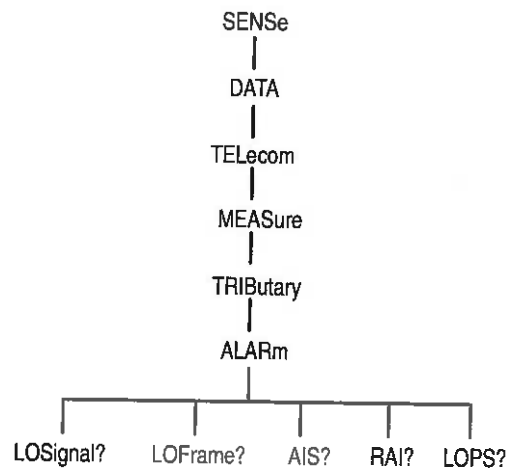
Figure 2–39: SENSe:DATA:TELecom:MEASure:TRIButary:ERRor subsystem (PDH)

```
                          SENSe
                            |
                          DATA
                            |
                         TELecom
                            |
                         MEASure
                            |
                        TRIButary
                            |
                         ANALysis
                            |
            +---------------+---------------+
            |                               |
         M2100?                          G821?
            |                               |
      +-----+-----+                         |
      |           |                    error source 2
     IN?        OUT?
      |           |
 error source 1  error source 1
```

error source 1
ESEConds?
PESeconds?
SESeconds?
PSESeconds?
UASeconds?
PUASeconds?
EFSeconds?
PEFSeconds?

error source 2
ECOUnt?
ESEConds?
PESeconds?
UASeconds?
PUASeconds?
EFSeconds?
PEFSeconds?
SESeconds?
PSESeconds?
DMINutes?
PDMinutes?

Figure 2–40: SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis subsystem (PDH)

```
                        SENSe
                          |
                        DATA
                          |
                       TELecom
                          |
                       MEASure
                          |
                       TRIButary
                          |
                        ALARm
          ┌──────────┬──────┬──────┬──────┐
       LOSignal?  LOFrame?  AIS?  RAI?  LOPS?
```

Figure 2–41: SENSe:DATA:TELecom:MEASure:TRIButary:ALARm subsystems (PDH)

A variety of tributary error, alarm, and failure measurements are reported through this subsystem. Table 2–25 shows how error, alarm, and failure measurements are calculated. Tables 2–26 and 2–27 show how the analysis measurements are calculated. These calculations are based on CCITT G.821 specifications.

Table 2–25: 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)

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Table 2–26: 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 1×10^{-6} to 1×10^{-3}; degraded minutes do not accumulate during periods of unavailability
Severely errored seconds	Number of seconds with more than N errors (see Table 2–27)
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 2–27: Value of N for 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 2–42 shows you how to read the Syntax Tables in this section. Follow the step numbers to create any query. Table 2–28 explains the terms used in the SENSe:DATA:TELecom:MEASure Syntax Tables.

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1 Start with the syntax statement listed under Syntax.

3 Add a question mark or one of these items (remember to keep the colon in front of this item).

2 Add one of these items to the end of the syntax statement.

Table X–X: Syntax Table for SENSe:DATA:TELecom:MEASure:TRIBtary:ERRor Queries

Select a measurement from the left column	Then select an error source from the top row				
	?	:BIT?	:FRAME?	:CRC?	:PARITY?
ECOUnt	all error counts	logic errors	frame errors	CRC errors	parity errors
ERATio	all bit error ratios	logic errors	frame errors	CRC errors	parity errors
ESEConds	all errored seconds	logic errors	frame errors	CRC errors	parity errors

All error counts and errored seconds return NR1-numeric responses.

All bit error ratios return NR3-numeric responses.

4 The response type is listed in the footnote.

5 The response description for each combination of items is listed in each cell of the table. If no query exists for a particular combination of items, "no query" is listed in the cell.

Figure 2–42: How to read the syntax tables in the SENSe:DATA:TELecom:MEASure:TRIButary subsystem section

Table 2–28: 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 2–43 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 2-43: How to read the example tables in the SENSe:DATA:TELecom:MEASure:TRIButary subsystem section

SENSe:DATA:TELecom:MEASure:TRIButary:ERRor Queries

Add/Drop Test Option Only

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 2-29 to complete the query)

Table 2-29: 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]
ECOUnt	all error counts	logic errors	frame errors	CRC errors
ERATio	all bit error ratios	logic errors	frame errors	CRC errors
ESEConds	all errored seconds	logic errors	frame errors	CRC errors

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 error source is valid only for 2 Mb/s rate and PCM30CRC or PCM31CRC framing.

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Response   See Table 2–29.

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 2–30.

Table 2–30: 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

Related Commands   SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP
SENSe:DATA:TELecom:TRIButary:PAYLoad:PATTern
SYSTem:HEADers

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SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis Queries

Add/Drop Test Option Only

These queries return an analysis of section, line, path, and payload errors for tributary signals. When you use the high-level queries (for example, SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis? or SENSe:DATA: TELecom:MEASure:TRIButary: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:TRIButary:ANALysis?

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100?

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN:[error source] (see Table 2–31 to complete the query)

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:OUT:[error source] (see Table 2–31 to complete the query)

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821?

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821:[error source] (see Table 2–32 to complete the query)

Table 2–31: SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN and M2100:OUT Queries (PDH)

Select one of these error sources	Response
?	All M2100 in- and out-of-service analysis responses below
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

All percent measurements return NR3-numeric responses.

All other measurements return NR1-numeric responses.

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Table 2–32: SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821 Queries (PDH)

Select one of these error sources	Response
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

All percent measurements return NR3-numeric responses.

All other measurements return NR1-numeric responses.

Response   See Tables 2–31 and 2–32.

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.

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 2–33.

Table 2–33: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis Queries (PDH)

Query	Response
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:M2100:IN: UASECONDS?	23
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:M2100:OUT: PSESECONDS?	1.2E–1
SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G821:DMINUTES?	103

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

Add/Drop Test Option Only

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.

Syntax All valid queries are listed in the Syntax column of Table 2–34.

Table 2–34: 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

All responses are in NR1-numeric format.

Response See the Response column of Table 2–34.

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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 2–35.

Table 2–35: 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:AUTOscan Subsystem

This section describes the command that automatically configures the receiver to the attached signal on any of the input connectors. Figure 2–44 shows the hierarchy tree for this subsystem.

```
SENSe
  |
DATA
  |
TELecom
  |
AUTOscan
```

Figure 2–44: 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.

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:TRIButary Subsystem

Add/Drop Test Option Only

This section describes the commands and queries that allow you to view a dropped tributary signal. Figure 2–45 shows the hierarchy tree for this subsystem.
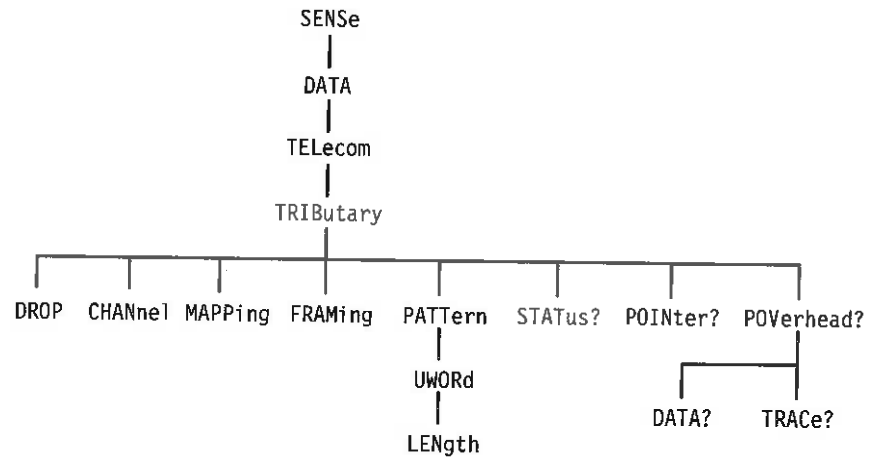
Figure 2–45: SENSe:DATA:TELecom:TRIButary subsystem

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SENSe:DATA:TELecom:TRIButary:DROP

Add/Drop Test Option Only

This command sets or queries the tributary drop capability. If enabled, the demapped signal is available on the output connector specified by mapping. DS3_DEMUX mapping drops a DS3 signal.

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

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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

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SENSe:DATA:TELecom:TRIButary:FRAMing

Add/Drop Test Option Only

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

Add/Drop Test Option Only

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
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)

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

Add/Drop Test Option Only

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

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SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENGth

Add/Drop Test Option Only

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?

Add/Drop Test Option Only

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?

Add/Drop Test Option Only

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

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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:JITter Subsystem

This section describes the commands and queries that control the jitter and wander measurements. Figure 2–46 shows the hierarchy tree for this subsystem.
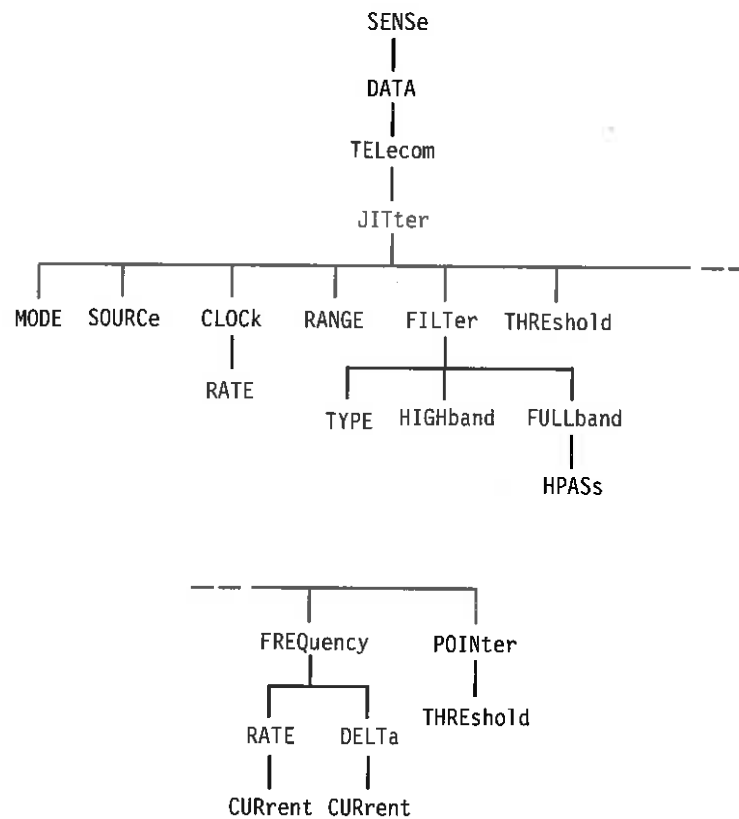
Figure 2–46: SENSe:DATA:TELecom:JITter subsystem

SENSe:DATA:TELecom:JITter:MODE

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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
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

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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.

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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

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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

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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?

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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?

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 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 2–47 shows the hierarchy tree for this subsystem.

```
INSTrument
    |
COUPling
```
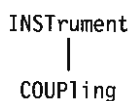
Figure 2–47: INSTrument:COUPling Subsystem

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 2–36 with the transmitter governing the *initial* Receiver setup. RXTX establishes interaction between the transmitter and Receiver parameters shown in Table 2–36 with the Receiver governing the *initial* transmitter setup.

Table 2–36: 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
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 2–36 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 the Trigger and Capture subsystem:

- INITiate

- 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 2–48 shows the hierarchy tree for this subsystem.

```
INITiate        TRIGger
                   |
                IMMediate
```
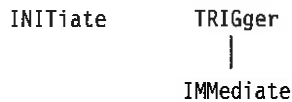
Figure 2–48: TRIGger subsystem

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

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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 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 2–49 shows the hierarchy tree for this subsystem. All MMEMory commands set the OPC bit in the Standard Event Status Register.
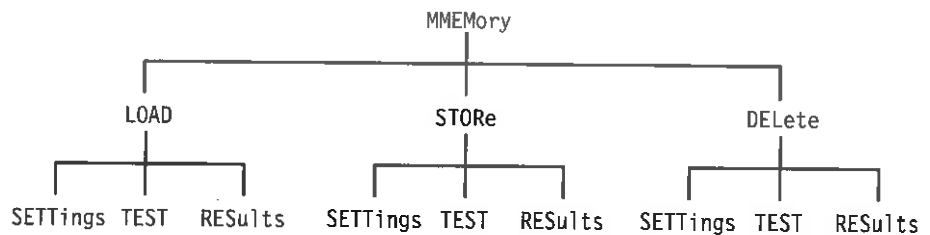
Figure 2–49: MMEMory subsystem

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

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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"

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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 2–50 shows the hierarchy tree for this subsystem. All MMEMory commands set the OPC bit in the Standard Event Status Register.
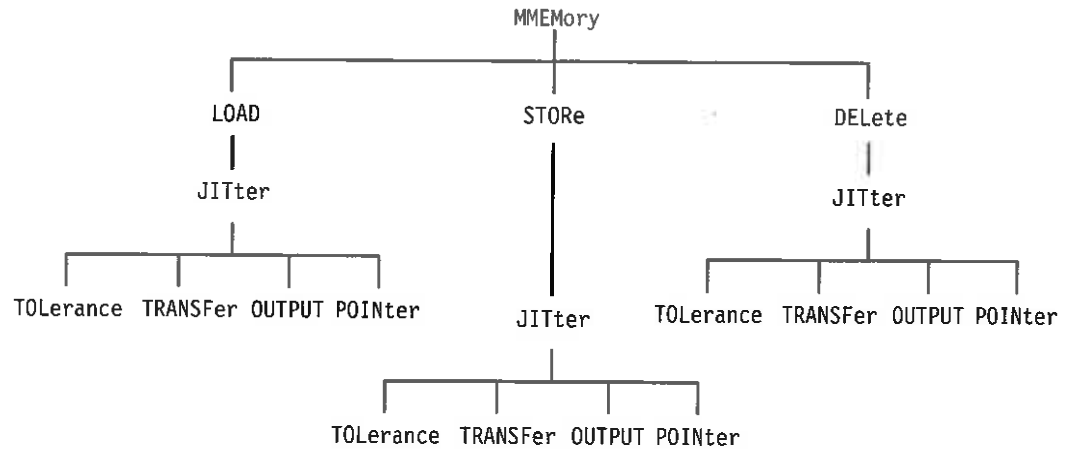
Figure 2–50: MMEMory:JITter subsystem

> **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 "JTOLO001"`

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

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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

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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

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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 2–51 shows the hierarchy tree for this subsystem.

```
DISPlay
   |
BRIGhtness
```
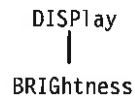
Figure 2–51: DISPlay subsystem

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 2–52 shows the hierarchy tree for this subsystem.
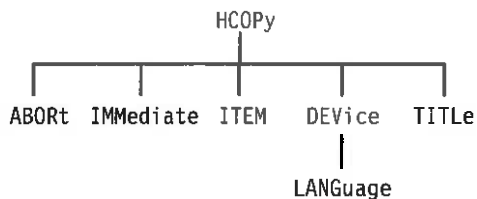
Figure 2–52: HCOPy subsystem

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

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 2–53 shows the hierarchy tree for this subsystem.
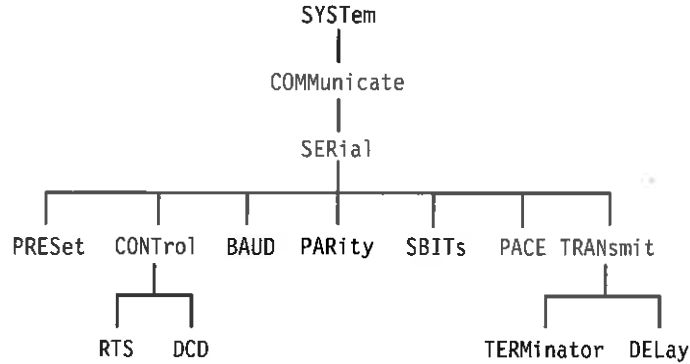
Figure 2–53: SYSTem:COMMunicate:SERial subsystem

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 2–37.

Table 2–37: 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

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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 750). 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 750; 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

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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

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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

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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

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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

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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 SYSTem subsystem.

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 2–54 shows the hierarchy tree for this subsystem.

```
                                       SYSTem
                                         │
  ┌─────┬─────┬─────┬──────┬──────┬──────┬──────┬──────┬──────┬─────┬─────┬──────────┬─────┐
ERRor?  DATE  TIME MODE? HEADers VERBose SERial OWNer USER BEEPer KLOCk SET? SDEScription ABStouch
                                                            │
                                                      ┌─────┴─────┐
                                                  IMMediate   CONTrol
```
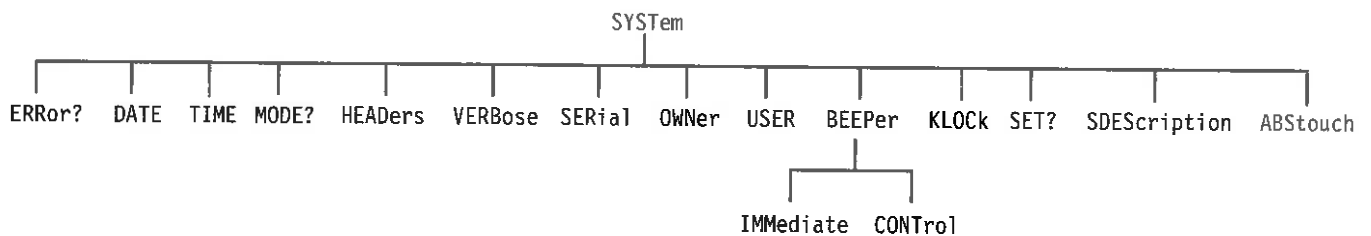
Figure 2–54: SYSTem subsystem

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?

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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 (;) (see *Appendix C* for a complete list).

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 and Calibrate Commands

This section contains all of the commands and queries for the diagnostic and calibrate subsystems.

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 2–55 shows the hierarchy tree for this subsystem.
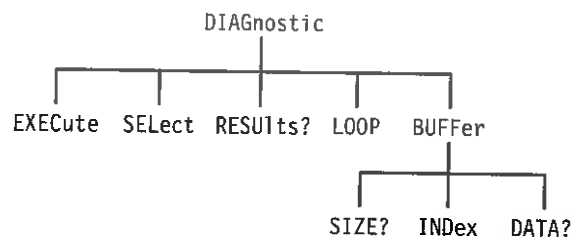
Figure 2–55: DIAGnostic subsystem

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

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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

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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.

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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

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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

CALibrate Subsystem

This section describes the calibrate commands and queries. Figure 2–20 shows the hierarchy tree for this subsystem.

```
                CALibrate
                    |
        ┌───────────┼───────────┐
    EXECute    RESults?    Select
```
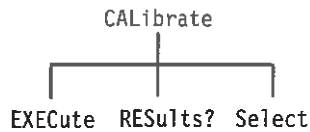
Figure 2–56: CALibrate subsystem

Calibrate:EXECute

SDH/PDH Jitter/Wander Test Option Only

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?

SDH/PDH Jitter/Wander Test Option Only

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

SDH/PDH Jitter/Wander Test Option Only

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

Common Commands

This section describes each of the IEEE 488.2 Common Commands in detail. See page 2–10 for information on reading the <decimal value> tables contained in this section.

*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 C* 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 O;: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. *Appendix D* summarizes the effect of *RST on the instrument. 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

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*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?

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*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

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*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.

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

Dependencies   None

Errors and Events   None

Examples   `*SAV 1`

Related Commands   *RCL

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*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

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Status and Events

The Status and Event Reporting System reports asynchronous events and errors that occur in the CTS 750 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 750 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.

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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 750. 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 750 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 750 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 750 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 750 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 750 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 750 was executing a command or query. Table 3–6 on page 3–9 lists the execution error messages.

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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 750 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 750 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 750 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 750 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 750 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.
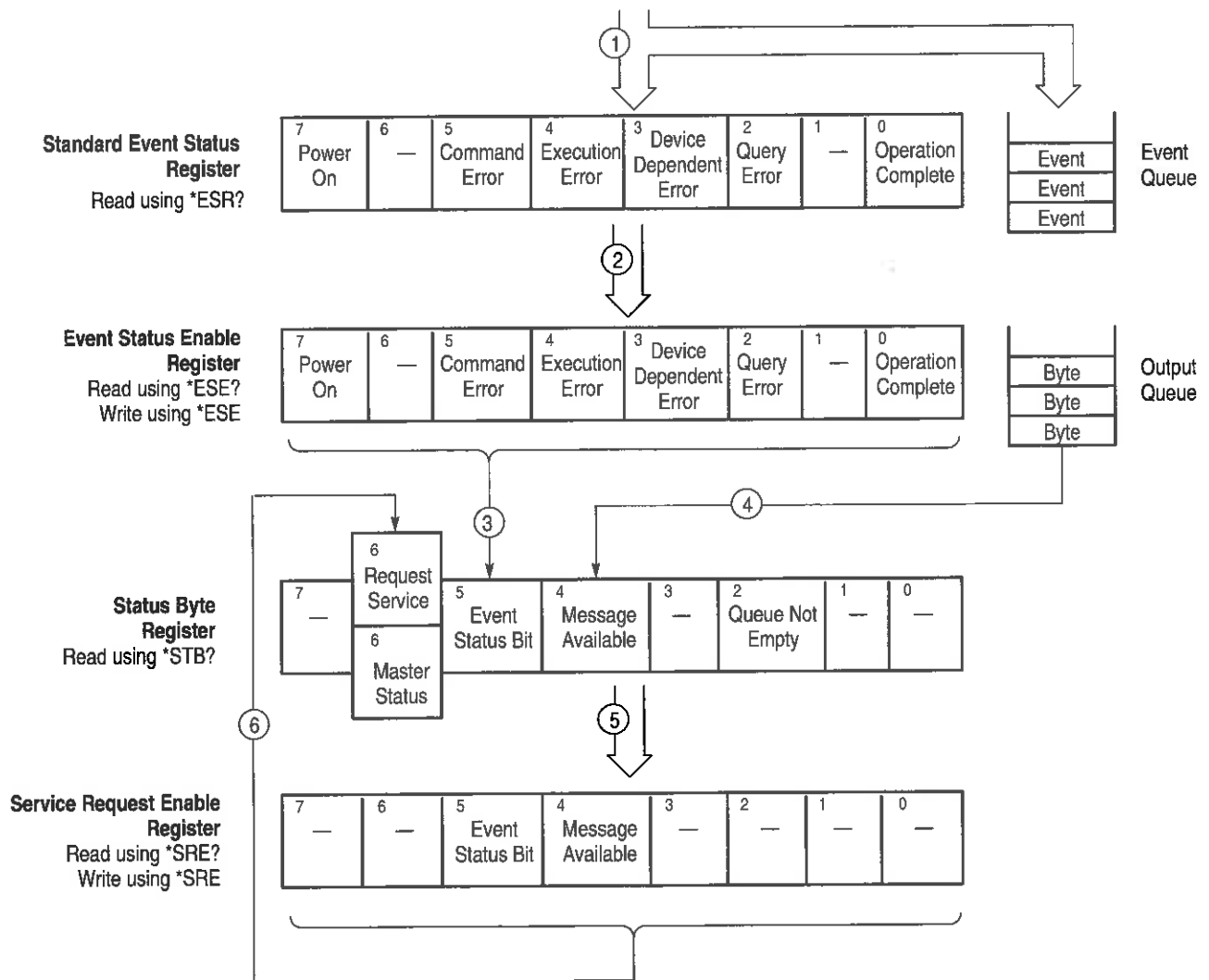
Figure 3–1: Status and Event Reporting Process

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).

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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 750, 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 750 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 750 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 character 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

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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 750 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

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Examples

The following sample program sets up the CTS 750 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 750 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);
```

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```c
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

B4 B3 B2 B1	CONTROL (000)	CONTROL (001)	NUMBERS SYMBOLS (010)	NUMBERS SYMBOLS (011)	UPPER CASE (100)	UPPER CASE (101)	LOWER CASE (110)	LOWER CASE (111)
0 0 0 0	NUL — oct 0, hex 0, dec 0	DLE — oct 20, hex 10, dec 16	SP — LA0, oct 40, hex 20, dec 32	0 — LA16, oct 60, hex 30, dec 48	@ — TA0, oct 100, hex 40, dec 64	P — TA16, oct 120, hex 50, dec 80	` — SA0, oct 140, hex 60, dec 96	p — SA16, oct 160, hex 70, dec 112
0 0 0 1	SOH — GTL, oct 1, hex 1, dec 1	DC1 — LLO, oct 21, hex 11, dec 17	! — LA1, oct 41, hex 21, dec 33	1 — LA17, oct 61, hex 31, dec 49	A — TA1, oct 101, hex 41, dec 65	Q — TA17, oct 121, hex 51, dec 81	a — SA1, oct 141, hex 61, dec 97	q — SA17, oct 161, hex 71, dec 113
0 0 1 0	STX — oct 2, hex 2, dec 2	DC2 — oct 22, hex 12, dec 18	" — LA2, oct 42, hex 22, dec 34	2 — LA18, oct 62, hex 32, dec 50	B — TA2, oct 102, hex 42, dec 66	R — TA18, oct 122, hex 52, dec 82	b — SA2, oct 142, hex 62, dec 98	r — SA18, oct 162, hex 72, dec 114
0 0 1 1	ETX — oct 3, hex 3, dec 3	DC3 — oct 23, hex 13, dec 19	# — LA3, oct 43, hex 23, dec 35	3 — LA19, oct 63, hex 33, dec 51	C — TA3, oct 103, hex 43, dec 67	S — TA19, oct 123, hex 53, dec 83	c — SA3, oct 143, hex 63, dec 99	s — SA19, oct 163, hex 73, dec 115
0 1 0 0	EOT — SDC, oct 4, hex 4, dec 4	DC4 — DCL, oct 24, hex 14, dec 20	$ — LA4, oct 44, hex 24, dec 36	4 — LA20, oct 64, hex 34, dec 52	D — TA4, oct 104, hex 44, dec 68	T — TA20, oct 124, hex 54, dec 84	d — SA4, oct 144, hex 64, dec 100	t — SA20, oct 164, hex 74, dec 116
0 1 0 1	ENQ — PPC, oct 5, hex 5, dec 5	NAK — PPU, oct 25, hex 15, dec 21	% — LA5, oct 45, hex 25, dec 37	5 — LA21, oct 65, hex 35, dec 53	E — TA5, oct 105, hex 45, dec 69	U — TA21, oct 125, hex 55, dec 85	e — SA5, oct 145, hex 65, dec 101	u — SA21, oct 165, hex 75, dec 117
0 1 1 0	ACK — oct 6, hex 6, dec 6	SYN — oct 26, hex 16, dec 22	& — LA6, oct 46, hex 26, dec 38	6 — LA22, oct 66, hex 36, dec 54	F — TA6, oct 106, hex 46, dec 70	V — TA22, oct 126, hex 56, dec 86	f — SA6, oct 146, hex 66, dec 102	v — SA22, oct 166, hex 76, dec 118
0 1 1 1	BEL — oct 7, hex 7, dec 7	ETB — oct 27, hex 17, dec 23	' — LA7, oct 47, hex 27, dec 39	7 — LA23, oct 67, hex 37, dec 55	G — TA7, oct 107, hex 47, dec 71	W — TA23, oct 127, hex 57, dec 87	g — SA7, oct 147, hex 67, dec 103	w — SA23, oct 167, hex 77, dec 119
1 0 0 0	BS — GET, oct 10, hex 8, dec 8	CAN — SPE, oct 30, hex 18, dec 24	(— LA8, oct 50, hex 28, dec 40	8 — LA24, oct 70, hex 38, dec 56	H — TA8, oct 110, hex 48, dec 72	X — TA24, oct 130, hex 58, dec 88	h — SA8, oct 150, hex 68, dec 104	x — SA24, oct 170, hex 78, dec 120
1 0 0 1	HT — TCT, oct 11, hex 9, dec 9	EM — SPD, oct 31, hex 19, dec 25	) — LA9, oct 51, hex 29, dec 41	9 — LA25, oct 71, hex 39, dec 57	I — TA9, oct 111, hex 49, dec 73	Y — TA25, oct 131, hex 59, dec 89	i — SA9, oct 151, hex 69, dec 105	y — SA25, oct 171, hex 79, dec 121
1 0 1 0	LF — oct 12, hex A, dec 10	SUB — oct 32, hex 1A, dec 26	* — LA10, oct 52, hex 2A, dec 42	: — LA26, oct 72, hex 3A, dec 58	J — TA10, oct 112, hex 4A, dec 74	Z — TA26, oct 132, hex 5A, dec 90	j — SA10, oct 152, hex 6A, dec 106	z — SA26, oct 172, hex 7A, dec 122
1 0 1 1	VT — oct 13, hex B, dec 11	ESC — oct 33, hex 1B, dec 27	+ — LA11, oct 53, hex 2B, dec 43	; — LA27, oct 73, hex 3B, dec 59	K — TA11, oct 113, hex 4B, dec 75	[— TA27, oct 133, hex 5B, dec 91	k — SA11, oct 153, hex 6B, dec 107	{ — SA27, oct 173, hex 7B, dec 123
1 1 0 0	FF — oct 14, hex C, dec 12	FS — oct 34, hex 1C, dec 28	, — LA12, oct 54, hex 2C, dec 44	< — LA28, oct 74, hex 3C, dec 60	L — TA12, oct 114, hex 4C, dec 76	\ — TA28, oct 134, hex 5C, dec 92	l — SA12, oct 154, hex 6C, dec 108	| — SA28, oct 174, hex 7C, dec 124
1 1 0 1	CR — oct 15, hex D, dec 13	GS — oct 35, hex 1D, dec 29	- — LA13, oct 55, hex 2D, dec 45	= — LA29, oct 75, hex 3D, dec 61	M — TA13, oct 115, hex 4D, dec 77	] — TA29, oct 135, hex 5D, dec 93	m — SA13, oct 155, hex 6D, dec 109	} — SA29, oct 175, hex 7D, dec 125
1 1 1 0	SO — oct 16, hex E, dec 14	RS — oct 36, hex 1E, dec 30	. — LA14, oct 56, hex 2E, dec 46	> — LA30, oct 76, hex 3E, dec 62	N — TA14, oct 116, hex 4E, dec 78	^ — TA30, oct 136, hex 5E, dec 94	n — SA14, oct 156, hex 6E, dec 110	~ — SA30, oct 176, hex 7E, dec 126
1 1 1 1	SI — oct 17, hex F, dec 15	US — oct 37, hex 1F, dec 31	/ — LA15, oct 57, hex 2F, dec 47	? — UNL, oct 77, hex 3F, dec 63	O — TA15, oct 117, hex 4F, dec 79	_ — UNT, oct 137, hex 5F, dec 95	o — SA15, oct 157, hex 6F, dec 111	RUBOUT (DEL) — oct 177, hex 7F, dec 127

Column footers: ADDRESSED COMMANDS | UNIVERSAL COMMANDS | LISTEN ADDRESSES | | TALK ADDRESSES | | SECONDARY ADDRESSES OR COMMANDS |

KEY
octal → 5
hex → 5
ENQ (ASCII character)
PPC → GPIB code (with ATN asserted)
5 → decimal
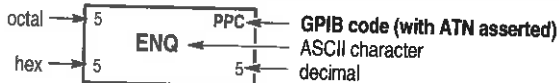
Tektronix
REF: ANSI STD X3.4-1977
IEEE STD 488.1-1987
ISO STD 646-2973

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Appendix B: Commands and Queries that set OPC Bit

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 set OPC bit

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: Commands Returned by *LRN?

Table C–1 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–1: 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
SOURce:DATA:TELecom:ERRor:ENABle

Table C–1: Commands returned by *LRN? (Cont.)

Command
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)
SOURce:DATA:TELecom:TRIButary:FAILure (Add/Drop Test Option Only)

Table C–1: Commands returned by *LRN? (Cont.)

Command
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)
SENSe:DATA:TELecom:TRIButary:DROP (Add/Drop Test Option Only)

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Table C–1: Commands returned by *LRN? (Cont.)

Command
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

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Appendix D: Default Parameter Values After *RST

Table D–1 lists the default parameter values after the *RST command is sent.

Table D–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 Figure 2–14 in *Syntax and Commands* on page 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
SOURce:DATA:TELecom:FAILure:TYPE	NONE

Table D–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
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)
SOURce:DATA:TELecom:TRIButary:POINter:RATE	100 (Add/Drop Test Option Only)

Table D-1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
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
SENSe:DATA:TELecom:CHANnel	1

Table D–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
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)
SENSe:DATA:TELecom:JITter:THREshold	0.0 (SDH/PDH Jitter/Wander Test Option Only)

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Table D–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
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
HCOPy:DEVice:LANGuage	TEK

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Table D–1: Default parameter values after *RST (Cont.)

Command	Default Parameter Values
HCOPy:ITEM	SUMMary
HCOPy:TITle	0

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Glossary

AIS

An acronym for Alarm Indication Signal. An AIS is used to alert downstream equipment that an upstream failure has been detected.

APS

An acronym for Automatic Protection Switching.

ASCII

An acronym for American Standard Code for Information Interchange.

AU

An acronym for Administrative Unit.

AU-4

Virtual Container (VC) plus the Transport Overhead pointers.

BBE

An acronym for Background Block Error. A Background Block Error is an errored block that occurs outside of a Severely Errored Second.

BER

An acronym for Bit Error Ratio (or Rate). The principal measure of quality of a digital transmission system. BER is defined as:

$$BER = \frac{Number\ of\ Errors}{Total\ Number\ of\ Bits}$$

BER is usually expressed as a negative exponent. For example, a BER of 10^{-7} means that 1 bit out of 10^7 bits is in error.

BIP

An acronym for Bit Interleaved Parity. A method used to monitor errors in the transmitted signal.

Bit Error

An incorrect bit. Also known as a coding violation.

BITS

An acronym for Building Integrated Timing Supply.

Chained Commands and Queries

Commands and queries grouped together into a single message to be sent to the instrument. Each command and query in the chained message must be separated by a semicolon (;).

COFA

An acronym for Change of Frame Alignment.

Command

Specifies an action for the instrument to perform.

Common Commands

See IEEE 488.2 Common Commands.

CV

An acronym for Coding Violation.

dB

The symbol for decibels.

dBm

The symbol for power level in decibels relative to 1 mW.

DM

An acronym for Degraded Minute. A minute with a BER greater than 10^{-6}.

EB

An acronym for Errored Block. An Errored Block is a block with one or more bit errors, usually applied to a single SDH frame.

EFS

An acronym for Error Free Seconds.

Equipped

An interpretation of mapping; the C2 byte in the path overhead is set to one.

ES

An acronym for Errored Second. A second with at least one error.

Event Status Enable Register

The register that controls which events are summarized in the event status bit (bit 5) of the Status Byte Register.

E1, E2, E3, E4

The preferred names for the ITU 2 Mb/s, 8 Mb/s, 32 Mb/s, and 140 Mb/s tributary signals.

FEBE

An acronym for Far End Block Error. An indication returned to the transmitting LTE that an errored block has been detected at the receiving LTE.

FERF

An acronym for Far End Receive Failure. A FERF indicates to the transmitting LTE that the receiving LTE has detected an incoming line failure or is receiving a Line AIS.

Functional Block

A part of the instrument that performs a specific function. Examples are the Transmitter and Receiver.

IEEE 488.21 Common Commands

The set of commands and queries defined by the ANSI/IEEE Standard 488.2.

ITU

An acronym for the International Telecommunication Union.

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 (CV)

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 Far End Receive Failure (FERF)

An indication returned to a transmitting LTE from the receiving LTE that a Line AIS or incoming line failure has been detected.

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.

LOF

An acronym for Loss of Frame.

LOP

An acronym for Loss of Pointer.

LOS

An acronym for Loss of Signal.

LTE

An acronym for Line Terminating Equipment.

Mapping

The process of placing a tributary signal into an SDH AU.

Mb/s

Megabits per second.

MS

An acronym for Multiplexer Section.

NE

An acronym for Network Element.

Normal Mode

A mode of operation in which the Transmitter and the Receiver operate independently.

OOF

An acronym for Out of Frame.

OPC Bit (Operation Complete Bit)

A bit in the Standard Event Status Register that is set when certain commands and queries complete execution.

Output Queue

The queue that stores query responses from the instrument.

Pass/Fail Test

A test measurement that is compared to predefined thresholds to determine a pass or fail condition of the test.

Path Overhead (POH)

A set of bytes allocated within the information payload to carry status and maintenance information between two network elements.

Path Trace

A 64-character sequence used to identify the communication path. The path trace is carried in the J1 byte over 64 repeating frames.

POH

An acronym for Path Overhead.

PTE

An acronym for Path Terminating Equipment.

Query

A message sent to the instrument that returns information about the state of the instrument.

Receiver

The functional block of the instrument that measures an incoming signal.

RS

An acronym for Regenerator Section.

Rx

An abbreviation for Receive.

SCPI

An acronym for Standard Commands for Programmable Instruments. A standard that provides guidelines for remote programming of instruments.

SDH

An acronym for Synchronous Digital Hierarchy.

Section

The portion of a transmission line between a Network Element (NE) and a Line Terminating Equipment (LTE) or two LTEs.

Section Errored Second (ES)

A second during which at least one Section CV or OOF/COFA event occurred, or a second during which the NE was (at any point during the second) in the LOS state.

Section Overhead (SOH)

A set of bytes allocated within each frame to carry framing and error monitoring information between an NE and LTE or between two LTEs. Part of the transport overhead.

Service Request Enable Register

The register that controls which bits in the Status Byte Register generate a service request

SES

An acronym for Severely Errored Seconds.

Severely Errored Seconds (SES)

A second with more than N CVs. N varies with the transmit rate but corresponds to a BER of 2×10^{-7}.

SOH

An acronym for Section Overhead.

Standard Event Status Register

The register that records many types of events that occur in the instrument such as execution error and operation complete.

Status Byte Register

The register that summarizes information from other registers in the Status and Event Reporting System.

STE

An acronym for Section Terminating Equipment.

STM

An acronym for Synchronous Transport Module.

STM-N

An acronym for Synchronous Transport Module-N (STM-1, -4, -16). The different STM-N rates for the SDH Signal Hierarchy are listed in the following table:

Electrical Signal	Data Rate (Mb/s)
STM-1	155.52
STM-4	622.08
STM-8	1244.16
STM-16	2488.32

Subsystem Hierarchy Tree

A graphical representation of a subsystem of commands and queries.

System Error and Event Queue

The queue that stores error and event messages.

TE

An acronym for Terminal Equipment.

Through Mode

The ability to retransmit the incoming signal and manipulate its contents.

TOH

An acronym for Transport Overhead.

Transmitter

The functional block of the instrument that generates a signal.

Transport Overhead (TOH)

A set of bytes allocated within each frame to carry operation, administration, and maintenance information from one end of the system to the other.

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.

TU

An acronym for Tributary Unit. A structure (not a signal) designed for transport and switching of sub-AU-4 payloads. The TU sizes currently in use are TU-11, TU-12, and TU-3.

TUG

An acronym for Tributary Unit Group.

Tx

An abbreviation for Transmit.

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Unequipped

An interpretation of mapping; the C2 byte in the path overhead is set to zero.

VC

An acronym for Virtual Container.

Yellow Signal

A code sent upstream to indicate that a failure condition has been declared downstream.

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