# Programmer Manual

**Tektronix**
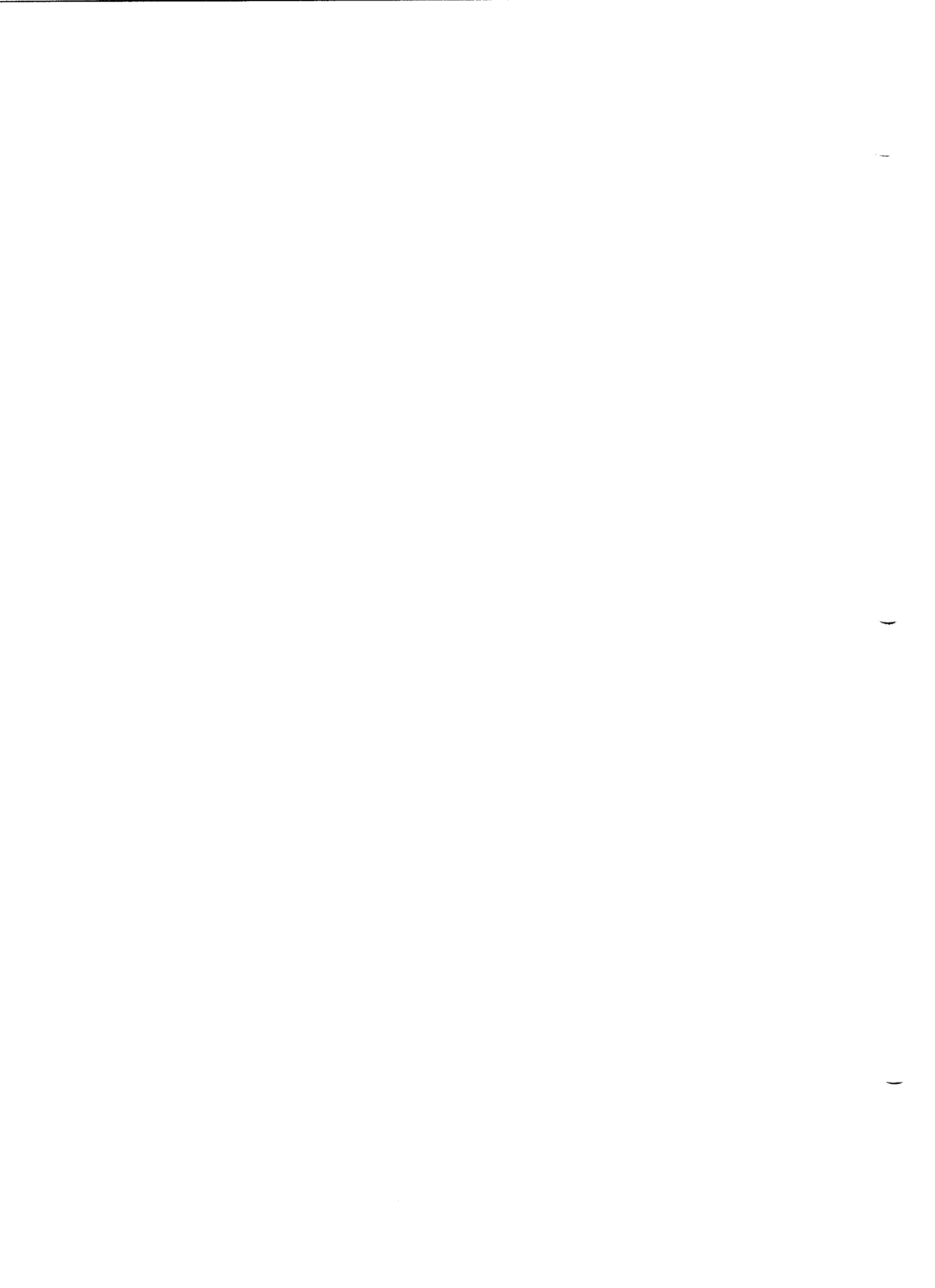/

CTS 850
Test Set
SDH/PDH, Jitter & Wander

070-9990-01

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

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CTS 850 SDH/PDH Test Set Programmer Manual

# Preface

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

## About This Manual

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

### Where To Find Information in This Manual

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

# Conventions

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

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

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

# Related Manuals

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

- The *CTS 850 User Manual* (Tektronix part number 070-9988-XX) is the primary source of information about how the CTS 850 functions.

- The CTS850 SDH/PDH *Reference Manual on CD* (Tektronix part number 063-3013-00) contains all the user manual information, in a portable electronic document format.

- *Wander Analyst User Manual* (Tektronix part number 070-9784-02) and Wander Analyst 5.0 PC software (Tektronix part number 063-2955-01) for TDEV/MTIE analyis. This PC application software is bundled with Option 14- Jitter/Wander.

- The *CTS850 SDH/PDH Test Set Service Manual* (Tektronix part number 070-9991-XX) provides information on maintaining and servicing your instrument to the module level.

# Setting Up for Remote Communication

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

■ Connect the instrument to the computer

■ Set the communication parameters

■ Test the communication

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**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.*

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## GPIB Connection

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

1. Locate the GPIB port on the rear-panel (see Figure 1–1).

2. Connect one end of the GPIB cable to the CTS 850 and the other end to the computer.

3. Connect both the CTS 850 and the computer to the line voltage.

4. Turn on the instrument.

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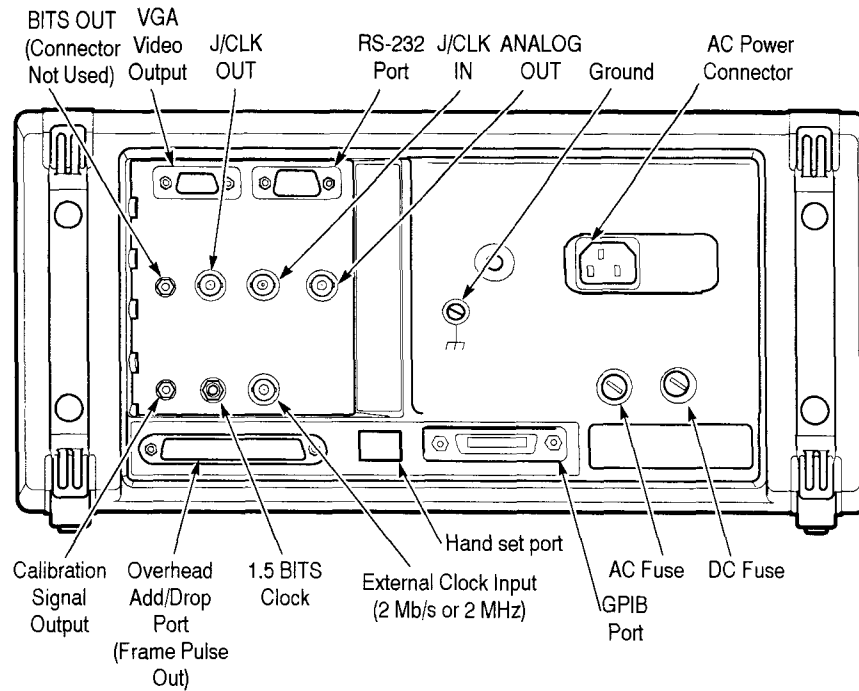
**Figure 1-1: Rear-panel communication ports**

# GPIB Parameter Setup

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

**Table 1-1: Setting GPIB address**

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

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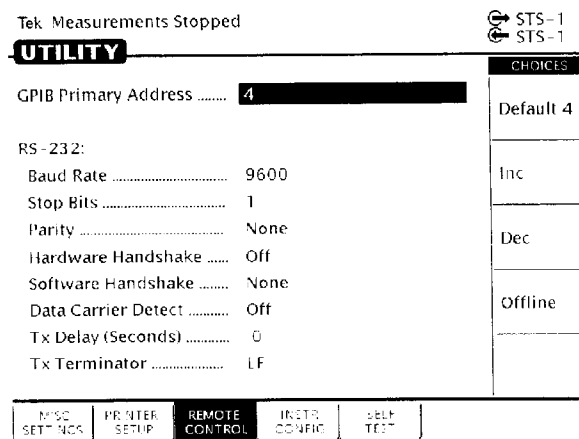


**Figure 1-2: GPIB address in the UTILITY menu**

# GPIB Connection Test

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

# RS-232 Connection

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

**Table 1-2: RS-232 pin assignments**

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

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

| Pin number | Description |
|---|---|
| 8 | Clear to Send |
| 9 | Ring Indicator |

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

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

1. Locate the RS-232 port on the rear-panel (see Figure 1-1).

2. Connect one end of the RS-232 cable to the instrument and the other end to the computer.

3. Connect both the CTS 850 and the computer to the power system.

4. Turn on the instrument.

5. Turn on the computer.

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

# RS-232 Parameter Setup

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

**Table 1-3: Default RS-232 parameter values**

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

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

**Table 1-4: Setting RS-232 parameters**

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

# RS-232 Connection Test

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

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

**Table 1-5: RS-232 connection problems**

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

CTS 850 SDH Test Set Programmer Manual

# Programming Model

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

## Functional Blocks

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

### Transmitter

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

### Receiver

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

## Modes of Operation

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

### Normal Mode

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

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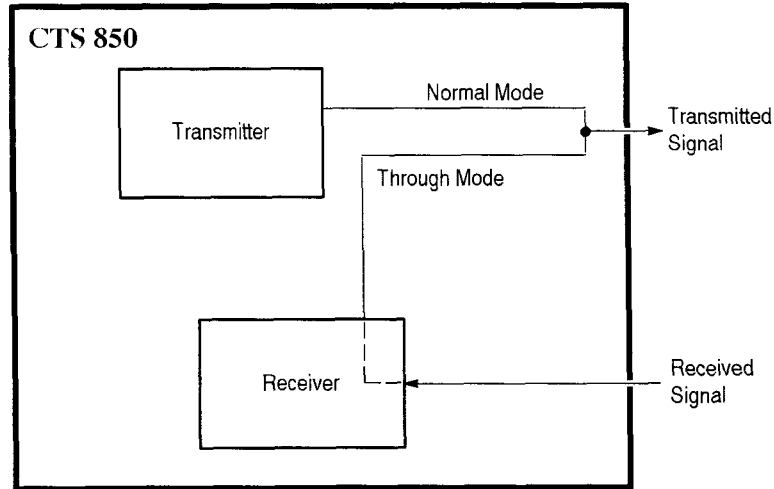


**Figure 1–5: Modes of operation**

# Information Storage in the Instrument

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

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

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

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

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

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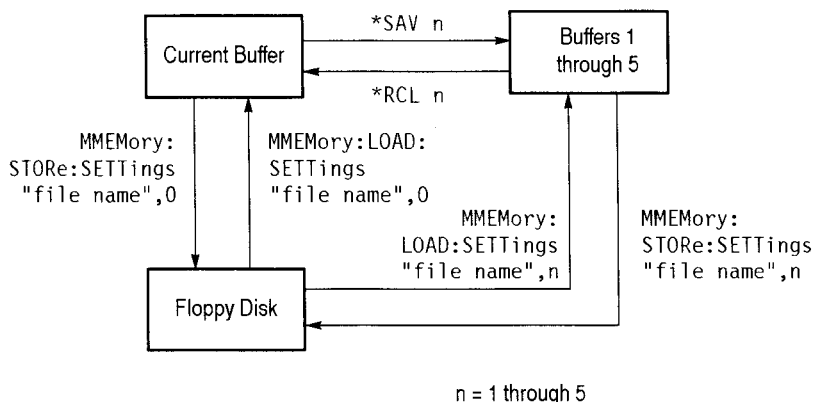


Figure 1-6: How instrument setups are stored

**Storage of Pass/Fail Tests**

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

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

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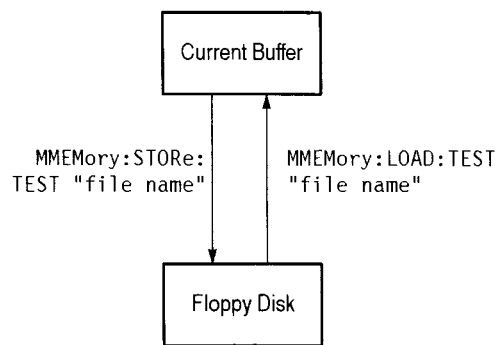


**Figure 1-7: How pass/fail tests are stored**

## Storage of Test Results

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

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

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

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

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

```
                          SENSe:DATA:TELecom:TEST:STARt
┌──────────────┐         SENSe:DATA:TELecom:MEASure:BUFFer 1
│              │◄────────────────────────────────────────────────┐
│              │          SENSe:DATA:TELecom:TEST:STARt            │
│  View Buffer │         SENSe:DATA:TELecom:MEASure:BUFFer 2       │
│              │◄─────────────────────────────────────────┐       │
│              │                                           │       │
└──────────────┘                                           │       │
       ▲                                 ┌─────────────────────────┐
       │         MMEMory:LOAD:           │     Buffers             │
       │         RESults "file name"     │                         │
       │                                 │  1 (Current Test Results)│
       │                                 │  2 (Previous Test Results)│
       │                                 │  -1 (Test Results From Disk)│
       │                                 └─────────────────────────┘
       │                                           ▲       │
       │              MMEMory:LOAD:                │       │
       │              RESults file name            │       │
┌──────────────┐◄─────────────────────────────────┘       │
│              │   MMEMory:STORe:RESults  "file name", 2   │
│  Floppy Disk │◄──────────────────────────────────────────┘
│              │   MMEMory:STORe:RESults  "file name", 1
│              │◄──────────────────────────────────────────
└──────────────┘
```

**Figure 1-8: 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 850 to a known state by sending the *RST command.

2. Set up the signal physical characteristics by sending the following commands:
   OUTPUT1:TELecom:RATE STM1
   OUTPUT1:TELecom:TYPE ELECtrical

3. Set the instrument to normal mode by sending the SOURce:DATA: TELecom:SOURce OUTPUT1 command.

4. Set up to test on channel one by sending the SOURce:DATA:TELecom: CHANnel 1 command.

5. Select mapping by sending the SOURce:DATA:TELecom:PAYLoad: MAPPing EQUIpped command; this command sets the C2 byte to 01.

6. Select a payload test pattern of PRBS 2E23-1 by sending the SOURce:DATA:TELecom:PAYLoad:PATTern PRBS23 command.

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

## Generating Signals in Through Mode

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

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

## Generating Modified Signals

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

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

- Insert overhead data into the Section DCC (bytes D1 and D2) from an external protocol analyzer by sending the SOURce:DATA:TELecom: OVERhead:INSert SDCC command. You can also insert data into the line DCC (bytes D4 through D12) or the F1 byte by using LDCC or F1 as the parameter value.

- Change the A1 byte on channel one by sending the SOURce:DATA: TELecom:OVERhead:DATA 1,A1,0,246 command. This command sets the A1 byte to a value of 246 (binary 11110110). The table included with the command description on page 2-33 lists the bytes available for selection.

- You can change the APS bytes in two ways:

  - Send the SOURce:DATA:TELecom:OVERhead:DATA 1,K1,0,#H0 command to set the K1 byte to zero. Use this command in the same way to set the K2 byte.

  - Send the SOURce:DATA:TELecom:OVERhead:APS command to set the K1 and K2 bytes together. For example, sending the SOURce:DATA: TELecom:OVERhead:APS #HFFFF command sets both K1 and K2 to decimal 255 (all ones in binary).

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

To create a manual pointer adjustment, follow these steps:

1. Send the SOURce:DATA:TELecom:POINter:MODE MANual command.

2. Send the SOURce:DATA:TELecom:POINter:VALue 590 command to create a pointer with a value 590. (If you use a value greater than 782, an illegal pointer is created.)

3. To generate a new data flag every time a pointer changes, send the SOURce:DATA:TELecom:POINter:NDFLag ON command.

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

1. Send the SOURce:DATA:TELecom:POINter:MODE SINGle command.

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

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

1. Send the SOURce:DATA:TELecom:POINter:MODE BURSt command.

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

3. Send the SOURce:DATA:TELecom:POINter:ACTion command to initiate a burst of pointer adjustments.

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

1. Send the SOURce:DATA:TELecom:POINter:DIRection ALTernate command (you can also specify UP or DOWN as the parameter value).

2. Send the SOURce:DATA:TELecom:POINter:MODE CONTinuous command to initiate the continuous pointer adjustments.

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

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

---

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

---

**Inserting Errors.** Follow these steps to insert errors:

1.  Enable error insertion by sending the SOURce:DATA:TELecom:ERRor: ENABle ON command.

2.  Insert a B1 section code violation by sending the SOURce:DATA:TELecom: ERRor:TYPE SCV command. You can also specify LCV, PCV, PFEBE, or DATA as the parameter value to insert a B2 line code violation, B3 active path code violation, path far end block error, or payload data bit error, respectively.

3.  You can insert errors at a continuous rate or immediately, upon command:

    ■ Insert continuous errors at a rate of 1E–5 by sending the SOURce: DATA:TELecom:ERRor:RATE 1E–5 command. You can select a variety of error rates depending on the signal rate and error type.

    ■ Force an immediate error insertion by sending the SOURce:DATA: TELecom:ERRor:IMMediate command.

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

1.  Select frequency offset pointer adjustments by sending the SOURce:DATA: TELecom:POINter:MODE FOFFset command.

2.  Set the clock source to the internal clock by sending the SOURce:CLOCk: SOURce INTernal command.

3.  Select line offset with no pointer adjustments by sending the SOURce:CLOCk:OFFSet:MODE LOFFset command.

4.  Set the line offset value to –55.1 ppm by sending the SOURce:CLOCk: OFFSet:LVALue –55.1 command. The payload clock offset value will automatically be set to –55.1.

# Receiving Signals

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

## Receiving a Signal Using a Manual Setup

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

1. Reset the instrument to a known state by sending the *RST command. *Appendix NO TAG* lists the default parameter values.

2. Set up the signal physical characteristics by sending the following commands:
   INPUT1:TELecom:RATE STM1
   INPUT1:TELecom:TYPE ELECtrical

3. Set the source of the signal by sending the SENSe:DATA:TELecom: SOURce INPUT1 command.

4. Receive the signal through channel one by sending the SENSe:DATA: TELecom:CHANnel 1 command.

## Receiving a Signal Using Autoscan

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

## Checking the Physical Status of a Signal

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

1. To check if you are receiving the signal, send the INPUT1:TELecom: STATus? query. If you get a response of LOSIGNAL, try another setup to receive the signal (refer to the *Receiving a Signal Using a Manual Setup* or *Receiving a Signal Using Autoscan* descriptions in this section). If you get a response of MONITOR, you are receiving a monitor signal of low amplitude.

2. Check the optical signal level of the incoming signal by sending the INPUT1:TELecom:OPWR? query. Values for a valid signal are -32 dBm to -5 dBm.

3. If you still are unable to find the proper settings for the incoming signal, check to see if the level is set properly by sending the INPUT1:TELecom: LEVel? query.

**Checking Signal Status**

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

**Dropping the Overhead**

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

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

■ Drop the F2 byte to an external protocol analyzer by sending the SENSe:DATA:TELecom:POVerhead:DROP F2 command.

**Viewing the Overhead**

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

1. Start acquiring the overhead by sending the INITiate command.

2. To cause a trigger and stop acquiring overhead, send the TRIGger: IMMediate command.

3. Determine the value of the A1 overhead byte on channel one by sending the SENSe:DATA:TELecom:OVERhead DATA? 1,A1,0 query. The table included with the query description on page 2-147 lists the bytes available for selection.

4. To start acquiring overhead again, send the INITiate command.

# SDH Signal Testing

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

**Taking BER Measurements**

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

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

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

3. Set the test duration to five minutes by sending the SENSe:DATA:TELecom: TEST:DURation 0,0,5,0 command.

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

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

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

   ■ The SENSe:DATA:TELecom:TEST:MEASure:ERRor:ECOUnt:SCV? query returns the number of B1 errors.

   ■ The SENSe:DATA:TELecom:TEST:MEASure:ERRor:ECOUnt:LCV? query returns the number of B2 errors.

   ■ The SENSe:DATA:TELecom:TEST:MEASure:ERRor:ECOUnt:PCV? query returns the number of B3 errors.

## Measuring Continuous Pointer Adjustments

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

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

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

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

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

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

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

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

- The SENSe:DATA:TELecom:MEASure:POINter:PPTR? query returns the number of positive (up) pointer adjustments.

- The SENSe:DATA:TELecom:MEASure:POINter:NPTR? query returns the number of negative (down) pointer adjustments.

- The SENSe:DATA:TELecom:MEASure:POINter:ICOUNt? query returns the total number of invalid pointers.

# Tributary Signal Testing

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

**CTS 850 as a Stand-Alone Tributary Test Set**

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

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

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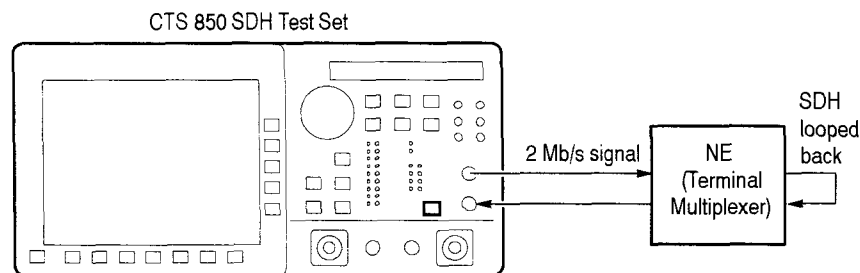


**Figure 1-13: Setup for the CTS 850 as a stand-alone tributary test set**

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

3. Send the following commands to set up to receive the tributary signal:
SENSe:DATA:TELecom:SOURce INPUT2

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

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

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

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

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

## Testing the SDH Tributary Payload Mapping

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

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

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

1. Configure your CTS 850 as shown in Figure 1–14.
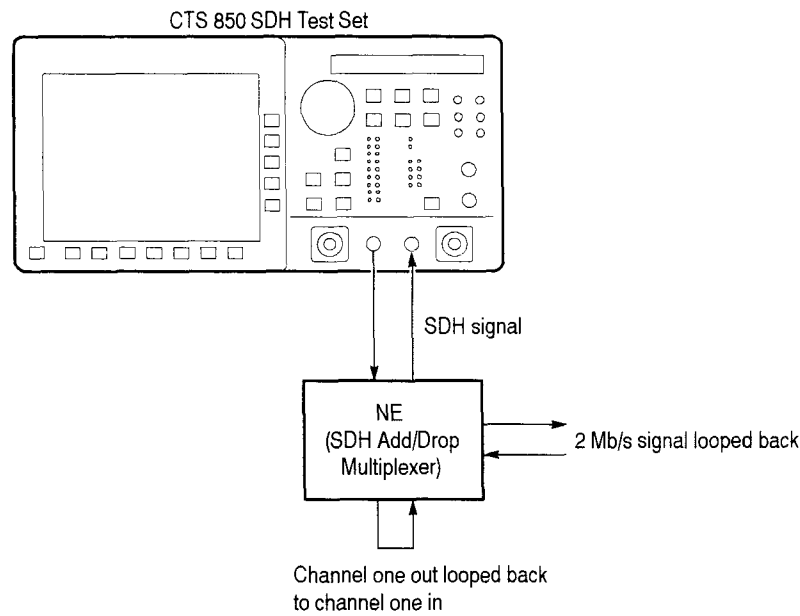
**Figure 1-14: Setup for testing the SDH tributary payload mapping**

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

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

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

**Testing the Mapping Capability of a Network Element**

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

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

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

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

CTS 850 SDH Test Set
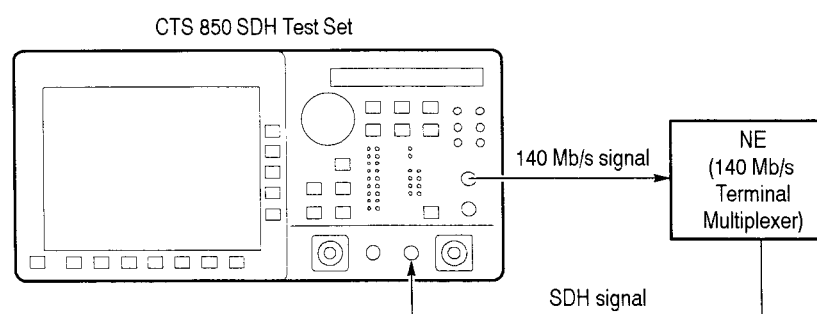


**Figure 1-15: Setup for testing the mapping capability of an ne**

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

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

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

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

## Testing the Demapping Capability of a Network Element

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

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

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

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



CTS 850 SDH Test Set

SDH signal

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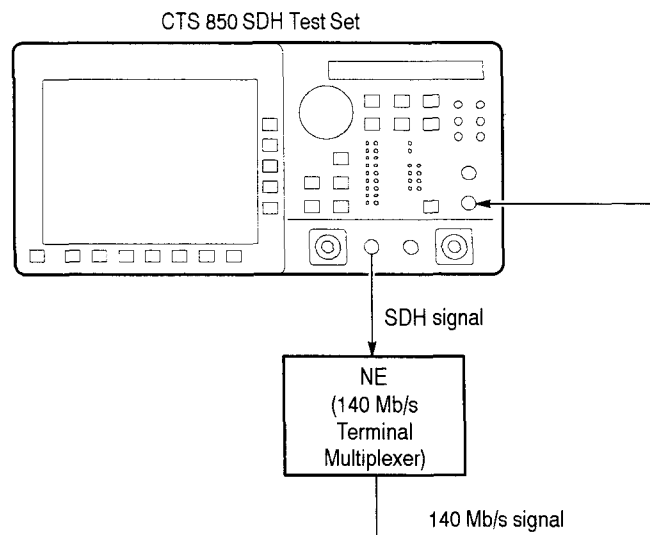
140 Mb/s signal

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

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

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

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

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

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

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

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

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

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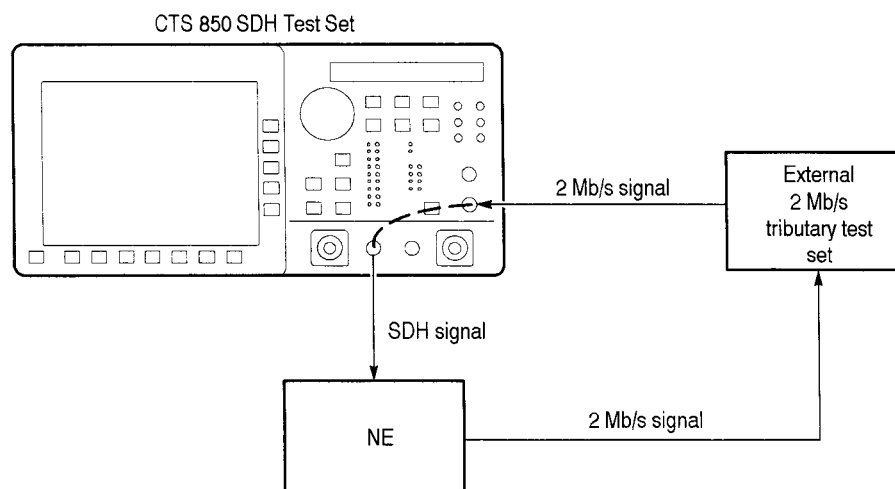


Figure 1-17: Setup for testing the external connection of an Add/Drop/Test set

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

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

# Syntax

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

## SCPI Commands and Queries

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

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

```
OUTPUT1  ◄─────────── Root node
   │
TELecom ◄───────────  Lower-level
   │              ╱    nodes
┌──┴──┐           ╱
│  │  │          ↙
RATE  TYPE  LEVel
```
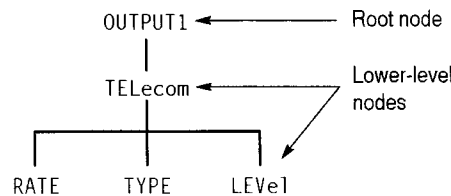
**Figure 2–1: Example of SCPI subsystem hierarchy tree**

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

**Creating Commands**

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

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

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

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

## Creating Queries

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

## Parameter Types

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

**Table 2-1: Parameter types used in syntax descriptions**

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

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

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

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

[2] An ANSI/IEEE 488.2-1987-defined parameter type.

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

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

## Abbreviating Commands, Queries, and Parameters

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

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
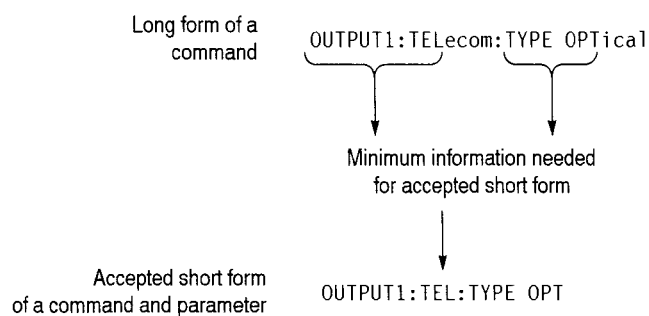
**Figure 2-2: Example of abbreviating a command**

*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.*

## 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
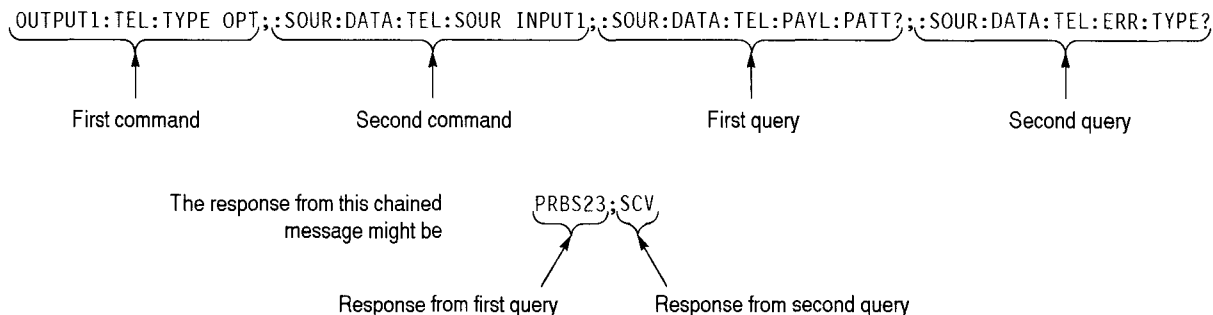
**Figure 2-3: Example of chaining commands and queries**

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.

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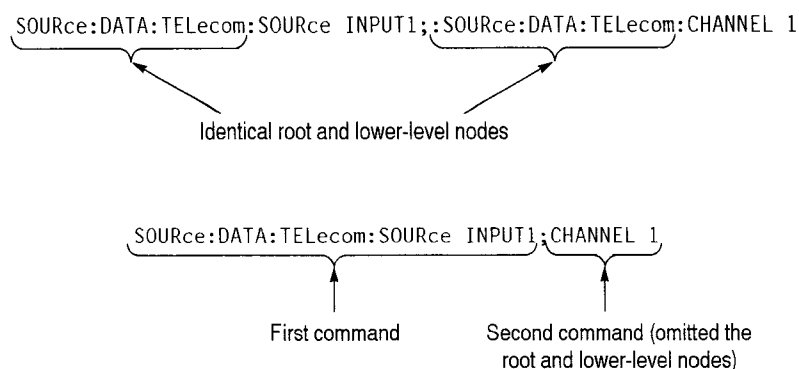
**Figure 2-4: Example of omitting root and lower-level nodes in chained message**

## 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 850 complies with this standard.

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

- *ESE 16

- *CLS

The following are examples of common queries:

- *ESR?

- *IDN?

# Functional Command Groups

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

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

**Table 2-5: Functional groups and their subsystems**

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

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

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

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

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

**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 ◄——— ELECtrical.

Commands or settings that affect the behavior of this command (or query)

**Errors and Events**      221. "Setting Conflict: Level is not available with current TYPE. must ◄——— be electrical"

Special conditions in the instrument as a result of this command (or query); use *ESR? and SYSTem:ERRor?

**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 2–9: Example of command listing**

---

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

---

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

**Table X–X: Response Table**

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

**1** A response of 9216 is received.

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

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

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

# Transmit Commands

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

- OUTPUT1:TELecom

- OUTPUT2:TELecom

- OUTPUT3:TELecom

- SOURce:CLOCk

- SOURce:DATA:TELecom

- SOURce:DATA:TELecom:OVERhead and POVerhead

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

- SOURce:DATA:TELecom:POINter

- SOURce:DATA:TELecom:TRIButary

- SOURce:DATA:TELecom:TRIButary:payload

- SOURce:DATA:TELecom:TRIButary:ERRor, ALARm, and FAILure

- SOURce:DATA:TELecom:Tributary:POINter

- SOURce:DATA:TELecom:JITter

# OUTPUT1 Subsystem

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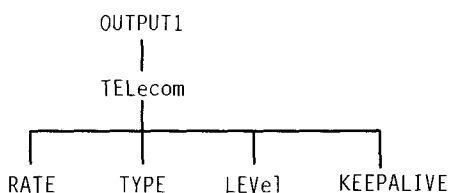


**Figure 2–13: OUTPUT1 subsystem**

# OUTPUT1:TELecom:RATE

This command sets or queries the transmitter signal output rate.

**Syntax**
OUTPUT1:TELecom:RATE <rate>
OUTPUT1:TELecom:RATE?

**Parameters**

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

**Dependencies**    None

**Errors and Events**    221, "Settings conflict; Rate is not available with current Line Interface module or operating mode"

221, "Settings conflict; Optical module required"

**Examples**   Set:        OUTPUT1:TELECOM:RATE STM1

Query:      OUTPUT1:TELECOM:RATE?

Response:   STM11

**Related Commands**   OUTPUT1:TELecom:TYPE
SOURce:DATA:TELecom:SOURce

# OUTPUT1:TELecom:TYPE

This command sets or queries the output transmitter signal type.

**Syntax**   OUTPUT1:TELecom:TYPE <type>
OUTPUT1:TELecom:TYPE?

**Parameters**

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

**Dependencies**   None

**Errors and Events**   221, "Settings conflict; Type is not available with current Line Interface module"

**Examples**   Set:        OUTPUT1:TELECOM:TYPE ELECTRICAL

Query:      OUTPUT1:TELECOM:TYPE?

Response:   OPTICAL

**Related Commands**   OUTPUT1:TELecom:RATE

# OUTPUT1:TELecom:LEVel

This command sets or queries the transmitted electrical signal level.

**Syntax**    OUTPUT1:TELecom:LEVel <level>
              OUTPUT1:TELecom:LEVel?

**Parameters**

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

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

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

**Examples**    Set:        OUTPUT1:TELECOM:LEVEL HIGH

                Query:      OUTPUT1:TELECOM:LEVEL?

                Response:   HIGH

# SOURCE: DATA: TELecom: OUTPUT1:KEEPalive

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

**Syntax**    OUTPUT1:TELecom:KEEPALIVE <state>

**Parameters**

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

**Dependencies**    None

**Examples**    OUTPUT1:TELecom:KEEPalive ON

# OUTPUT2 Subsystem

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

```
          OUTPUT2
             |
          TELecom
        ┌────┴────┐
      CODE    TERMinator
```
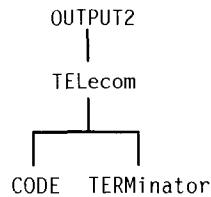
**Figure 2-14: OUTPUT2 subsystem**

# OUTPUT2:TELecom:CODE

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

**Syntax**   OUTPUT2:TELecom:CODE <signal encoding>
OUTPUT2:TELecom:CODE?

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

| | | |
|---|---|---|
| **Examples** | Set: | OUTPUT2:TELECOM:CODE HDB3 |
| | Query: | OUTPUT2:TELECOM:CODE? |
| | Response: | HDB3 |

**Related Commands**  SOURce:DATA:TELecom:SOURce
SENSe:DATA:TELecom:TRIButary:DROP

# OUTPUT2:TELecom:TERMinator

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

**Syntax**  OUTPUT2:TELecom:TERMinator <trib1 output termin>
OUTPUT2:TELecom:TERMinator?

**Parameters**

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

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

**Errors and Events**  None

| | | |
|---|---|---|
| **Examples** | Set: | OUTPUT2:TELECOM:TERMINATOR BALANCED |
| | Query: | OUTPUT2:TELECOM:TERMINATOR? |
| | Response: | BALANCED |

**Related Commands**  SOURce:DATA:TELecom:SOURce
SENSe:DATA:TELecom:TRIButary:DROP

# OUTPUT3 Subsystem

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

```
OUTPUT3
  |
TELecom
  |───────────┐
RATE        CODE
```
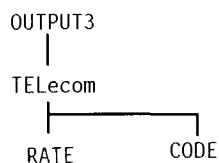
Figure 2-15: OUTPUT3 subsystem

# OUTPUT3:TELecom:RATE

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

**Syntax**   OUTPUT3:TELecom:RATE <trib2 output rate>
OUTPUT3:TELecom:RATE?

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:        OUTPUT3:TELECOM:RATE M34

Query:      OUTPUT3:TELECOM:RATE?

Response:   M34

**Related Commands**   SOURce:DATA:TELecom:SOURce

# OUTPUT3:TELecom:CODE

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

**Syntax**

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

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**

| Set: | OUTPUT3:TELecom:CODE AMI |
|---|---|
| Query: | OUTPUT3:TELEcom:CODE? |
| Response: | AMI |

**Related Commands**    SOURce:DATA:TELecom:SOURce
SENSE:DATA:TELecom:TRIButary:DROP

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# SOURce:CLOCk Subsystem

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

```
                    SOURce
                       |
                    CLOCk
          ┌────────────┼────────────┐
      SOURce        STATus?       OFFSet
                              ┌──────┼──────┐
                            MODE  LVALue  PVALue
```
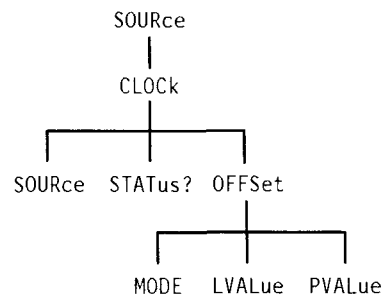
**Figure 2-16: SOURce:CLOCk subsystem**

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

**Table 2-7: Interaction Between SOURce:CLOCk Commands**

| To control: | Set SOURce:CLOCk: SOURce to: | Set SOURce:CLOCk: OFFSet:MODE to: | Set SOURce:CLOCk: OFFSet:LVALue to: | Set SOURce:CLOCk: OFFSet:PVALue to: |
|---|---|---|---|---|
| Pointer movements | INTernal, E2MB, or RE-Covered | 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<br><br>2 Mb/s rate: -50 ppm to +50 ppm<br><br>34 Mb/s rate: -130 ppm to +130 ppm<br><br>140 Mb/s rate: -100 ppm to +100 ppm<br><br>All ranges in increments of 0.1 ppm | Automatically set to the same value as LVALue; you can not directly change PVALue |

# SOURce:CLOCk:SOURce

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

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

**Parameters**

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

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

**Errors and Events**
None

**Examples**

Set:        SOURCE:CLOCK:SOURCE INTERNAL

Query:      SOURCE:CLOCK:SOURCE?

Response:   INTERNAL

**Related Commands**
None

# SOURce:CLOCk:STATus?

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

**Syntax**    SOURce:CLOCk:STATus?

**Response**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SOURCE:CLOCK:STATUS?

Response:  1

**Related Commands**    SOURCe:CLOCk:OFFSet:MODE

# SOURce:CLOCk:OFFSet:MODE

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

**Syntax**    SOURce:CLOCk:OFFSet:MODE <clock offset mode>
SOURce:CLOCk:OFFSet:MODE?

**Parameters**

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

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

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

**Errors and Events**     None

**Examples**     Set:          SOURCE:CLOCK:OFFSET:MODE LOFFSET

Query:        SOURCE:CLOCK:OFFSET:MODE?

Response:  POINTERS

**Related Commands**     SOURce:CLOCk:OFFSet:LVALue
SOURce:CLOCk:OFFSet:PVALue

# SOURce:CLOCk:OFFSet:LVALue

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

**Syntax**    SOURce:CLOCk:OFFSet:LVALue <line clock offset>
SOURce:CLOCk:OFFSet:LVALue?

**Parameters**

| <line clock offset> (NR2-numeric) | Description |
|---|---|
| SDH rates: -100 ppm to +100 ppm | 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 2–17 shows the hierarchy tree for this subsystem.

```
                            SOURce
                              |
                            DATA
                              |
                           TELecom
                              |
    ┌────────┬────────┬────────┬────────┐
  SECTion  SOURce  STRUcture  CHANnel  PAYLoad
    |                                     |
  TRACe                          ┌────────┬────────┐
                              MAPPing  PATTern    PRBS
                                          |        |
                                        UBYTe    INVert
```
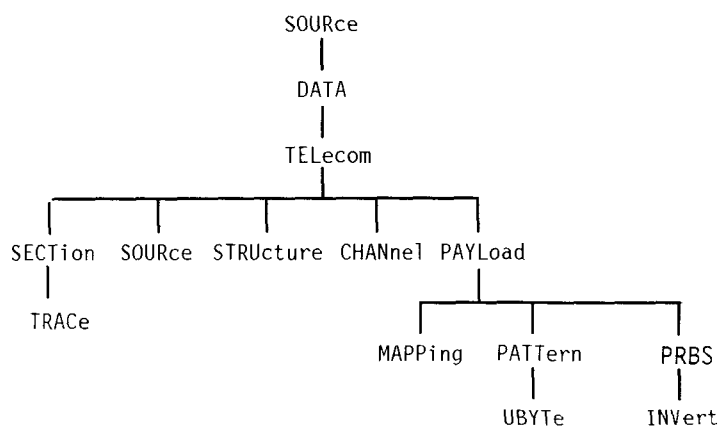
**Figure 2–17: SOURce:DATA:TELecom subsystem**

# SOURce:DATA:TELecom:SOURce

This command sets or queries the output signal source.

**Syntax**   SOURce:DATA:TELecom:SOURce <source>
SOURce:DATA:TELecom:SOURce?

**Parameters**

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

**Dependencies**   None

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

**Examples**   Set:       SOURCE:DATA:TELECOM:SOURCE OUTPUT1

Query:     SOURCE:DATA:TELECOM:SOURCE?

Response:  OUTPUT1

**Related Commands**   OUTPUT1:TELecom:RATE

# SOURce:DATA:TELecom:STRUcture

This command sets or queries the structure of a signal.

**Syntax**   SOURce:DATA:TELecom:STRUcture <output structure>
SOURce:DATA:TELecom:STRUcture?

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

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

**Errors and Events**   None

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

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

Response:   `AU3`

**Related Commands**   OUTPUT1:TELecom:RATE

# SOURce:DATA:TELecom:CHANnel

This command sets or queries the active channel.

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

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

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

**Errors and Events**   221, "Settings conflict; Only one channel is available"

500, "Execution warning; Numeric value greater than maximum limit"

**Examples**  Set:  SOURCE:DATA:TELECOM:CHANNEL 1

Query:  SOURCE:DATA:TELECOM:CHANNEL?

Response:  1

**Related Commands**  OUTPUT1:TELecom:RATE
SOURce:DATA:TELecom:STRUcture

# SOURce:DATA:TELecom:PAYLoad:MAPPing

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

**Syntax**  SOURce:DATA:TELecom:PAYLoad:MAPPing <mapping>
SOURce:DATA:TELecom:PAYLoad:MAPPing?

**Parameters**

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

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

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

**Examples**  Set:  SOURCE:DATA:TELECOM:PAYLOAD:MAPPING EQUIPPED

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

Response:  EQUIPPED

**Related Commands**  None

# SOURce:DATA:TELecom:PAYLoad:PATTern

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

**Syntax**
SOURce:DATA:TELecom:PAYLoad:PATTern <pattern>
SOURce:DATA:TELecom:PAYLoad:PATTern?

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SOURCE:DATA:TELECOM:PAYLOAD:PATTERN PRBS23

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

Response:   PRBS15

**Related Commands**    SOURce:DATA:TELecom:PAYLoad
SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe

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

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

**Syntax**

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

**Parameters**

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

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

**Dependencies**

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

**Errors and Events**

None

**Examples**

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

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

Response:  88

**Related Commands**

SOURce:DATA:TELecom:PAYLoad:PATTern

# SOURce:DATA:TELecom:PAYLoad:PRBS:INVert

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

**Syntax**

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

**Parameters**

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

**Examples**

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

**Related Commands**

SENSe:DATA:TELecom:PAYLoad:PRBS:INVert

# SOURce:DATA:TELecom:SECTion:TRACe:MODE

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

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

**Parameters**

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

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

**Related Commands**  None

# SOURce:DATA:TELecom:OVERhead and POVerhead Subsystem

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

```
                        SOURce
                          |
                        DATA
                          |
                       TELecom
              ┌───────────┴───────────┐
           OVERhead                POVerhead
              |                        |
  ┌────┬────┬────┬────┬────┬────┐  ┌──────┬────┬────┬──────┐
 PRBS PRESet DATA ALLDATA INSert APS PRESet DATA INSert TRACe
                                                          |
                                                        FORMAT
```
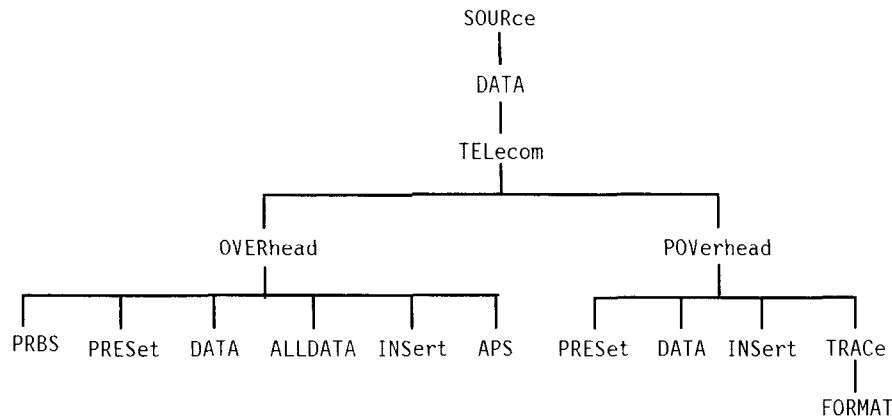
**Figure 2–23: SOURce:DATA:TELecom:OVERhead and POVerhead subsystem**

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

Overhead Byte      See Legend for Additional Information

A1 ①
F6 ◄──── Hexadecimal value after a *RST or
         SOURce:DATA:TELecom:OVERhead:
         PRESet command is sent, or when a
         rate change occurs
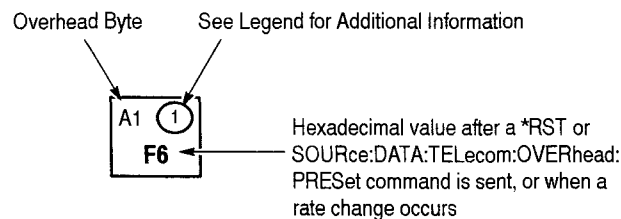
**Figure 2–24: How to read the overhead default values table**

### 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 (8) 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.

(8) Controlled by injecting Path FEBEs.

## Notes

■ All values are in hexadecimal.

■ "NU" indicates a National Use Byte.

■ "–" indicates an unnamed byte.

■ "HW" indicates that the hexadecimal value is determined dynamically by the hardware.

■ The offset value at the bottom of each column is used with the SOURce:DATA: TELecom:OVERhead:DATA and SENSe: DATA:TELecom:OVERhead:DATA commands (concatenated structures only).

■ For multiplexed signals, all bytes except B1, C1, and possibly M1 are duplicated.

■ Only one path overhead exists for all SDH rates.

■ When a rate change occurs, the overhead will be reset to the above default values.

**Figure 2–25: SDH Overhead Default Values**

# SOURce:DATA:TELecom:OVERhead:PRESet

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

**Syntax**  SOURce:DATA:TELecom:OVERhead:PRESet

**Parameters**  None

**Dependencies**  None

**Errors and Events**  None

**Examples**  SOURCE:DATA:TELECOM:OVERHEAD:PRESET

**Related Commands**  SOURce:DATA:TELecom:OVERhead:DATA

# SOURce:DATA:TELecom:OVERhead:DATA

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

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

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

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

**Parameters**

| <channel> (NR1-numeric) | description |
|---|---|
| 1 | Rate is STM-0 or STM-1 |
| 1 to 4 | Rate is STM-4 |

| <byte> (discrete) | description |
|---|---|
| A1, A2, C1, E1, F1, D1, D2, D3, K1, K2, D4, D5, D6, D7, D8, D9, D10, D11, D12, S1, M1, E2 | Only the bytes listed are available for selection |

| <offset> (NR1-numeric) | description |
|---|---|
| 0 to 2 | See the previous table listing the bytes in the Transport and Path Overhead; STM-1, STM-4 |

| <value> (NR1-numeric)[6] | description |
|---|---|
| Any integer in the range 0 to 255 (hexadecimal 00 to FF) | The byte is set to this value |

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

**Dependencies**  None

**Errors and Events**  None

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

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

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

Response: 255

**Related Commands**  None

# SOURce:DATA:TELecom:OVERhead:ALLData

The command form sets all overhead bytes at one time.

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

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

**Parameters**

| <channel> (NR1-numeric) | description |
| --- | --- |
| Any integer in the range 1 to12 | This value indicates the desired channel setting |

| <offset> (NR1-numeric) | description |
| --- | --- |
| Any integer in the range 0 to 2 | This value indicates the desired offset |

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

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

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

**Errors and Events**   221, "Settings conflict; Parameter out of range"

118, "Query not allowed"

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

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

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

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

**Related Commands**   SOURce:DATA:TELecom:OVERhead:DATA

# SOURce:DATA:TELecom:OVERhead:INSert

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

**Syntax**   SOURce:DATA:TELecom:OVERhead:INSert <insert>
SOURce:DATA:TELecom:OVERhead:INSert?

**Parameters**

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

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

**Errors and Events**   None

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

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

Response:  `F1`

**Related Commands**  None

# SOURce:DATA:TELecom:OVERhead:APS

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

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

**Parameters**

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

[1]  A hexadecimal value is also acceptable.

**Dependencies**  None

**Errors and Events**  None

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

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

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

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

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

Response:  `65535`

**Related Commands**  None

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

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

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

**Parameters**

| byte name | Description |
|-----------|-------------|
| E1 | E1 byte |
| E2 | E2 byte |
| F3 | F1 byte |

**Parameters**

| pattern | Description |
|---------|-------------|
| PRBS15 | A pseudo-random binary sequence of length $2^{15}$ |
| PRBS20 | A pseudo-random binary sequence of length $2^{20}$ |
| PRBS23 | A pseudo-random binary sequence of length $2^{23}$ |

**Parameters**

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

**Dependencies**     None

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

**Related Commands**     None

# SOURce:DATA:TELecom:POVerhead:PRESet

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

**Syntax**   SOURce:DATA:TELecom:POVerhead:PRESet

**Parameters**   None

**Dependencies**   None

**Errors and Events**   None

**Examples**   SOURCE:DATA:TELECOM:POVERHEAD:PRESET

**Related Commands**   SOURce:DATA:TELecom:POVerhead:DATA

# SOURce:DATA:TELecom:POVerhead:DATA

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

**Syntax**   SOURce:DATA:TELecom:POVerhead:DATA <byte>,<value>
SOURce:DATA:TELecom:POVerhead:DATA? <byte>

**Parameters**

| <byte> (discrete) | description |
|---|---|
| C2, F2, F3, K3, N1 | Only the bytes listed are available for selection[1] |

| <value> (NR1-numeric)[2] | description |
|---|---|
| Any integer in the range 0 to 255 (hexadecimal 00 to FF) | The selected byte is set to this value |

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

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

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

**Errors and Events**      None

**Examples**      Set:      SOURCE:DATA:TELECOM:POVERHEAD:DATA C2,#H55

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

Response:   255

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

# SOURce:DATA:TELecom:POVerhead:INSert

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

**Syntax**      SOURce:DATA:TELecom:POVerhead:INSert <path insert>
SOURce:DATA:TELecom:POVerhead:INSert?

**Parameters**

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

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

**Errors and Events**      None

**Examples**      Set:      SOURCE:DATA:TELECOM:POVERHEAD:INSERT F2

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

Response:   NONE

**Related Commands**      None

# SOURce:DATA:TELecom:POVerhead:TRACe

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

**Syntax**

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

**Parameters**

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

**Dependencies**      None

**Errors and Events**      223, "Too much data; Path trace string truncated"

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

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

Response:      "THIS IS A TEST"

**Related Commands**      SOURce:DATA:TELecom:POVerhead:DATA?

# SOURce:DATA:TELecom:POVerhead:TRACe:FORMAT

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

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

**Parameters**

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

**Dependencies**     None

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

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

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

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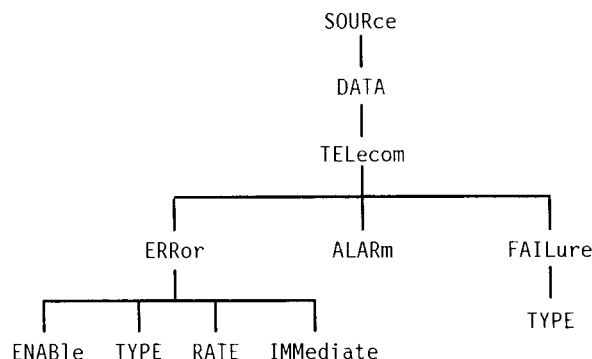


**Figure 2-29: SOURce:DATA:TELecom:ERRor, ALARm, and FAILure subsystem**

## SOURce:DATA:TELecom:ERRor:ENABle

This command sets or queries output signal error insertion.

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

**Parameters**

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

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:    SOURCE:DATA:TELECOM:ERROR:ENABLE 0

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

Response: 1

**Related Commands**  SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:ERRor:MODE

# SOURce:DATA:TELecom:ERRor:TYPE

This command sets or queries the error type.

**Syntax**  SOURce:DATA:TELecom:ERRor:TYPE <error type>
SOURce:DATA:TELecom:ERRor:TYPE?

**Parameters**

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

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:      SOURCE:DATA:TELECOM:ERROR:TYPE SCV

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

Response: DATA

**Related Commands**  SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:TRIButary:ERRor

# SOURce:DATA:TELecom:ERRor:RATE

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

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

**Syntax**  SOURce:DATA:TELecom:ERRor:RATE <error rate>
SOURce:DATA:TELecom:ERRor:RATE?
(see Tables 2–9 and 2–10 for <error rate> limits)

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

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

The table lists the minimum and maximum rates.

All error rates are NR3-numeric.

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

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

The table lists the minimum and maximum rates.

All error rates are NR3-numeric.

**Dependencies**  None

**Errors and Events**     500, "Execution warning; Numeric value greater than maximum limit"

500, "Execution warning; Numeric value less than minimum limit"

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

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

Response:     `1E-10`

**Related Commands**     SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:ERRor:TYPE
SOURce:DATA:TELecom:TRIButary:ERRor

# SOURce:DATA:TELecom:ERRor:IMMediate

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

**Syntax**     `SOURce:DATA:TELecom:ERRor:IMMediate`

**Parameters**     None

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

**Errors and Events**     None

**Examples**     `SOURCE:DATA:TELECOM:ERROR:IMMEDIATE`

**Related Commands**     SOURce:DATA:TELecom:ERRor:TYPE
SOURce:DATA:TELecom:TRIButary:ERRor

# SOURce:DATA:TELecom:ALARm

This command sets or queries the transmit alarm type.

**Syntax**
SOURce:DATA:TELecom:ALARm <alarm>
SOURce:DATA:TELecom:ALARm?

**Parameters**

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

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

**Errors and Events**
None

**Examples**
Set:        SOURCE:DATA:TELECOM:ALARM LAIS

Query:      SOURCE:DATA:TELECOM:ALARM?

Response:   PFERF

**Related Commands**
SOURce:DATA:TELecom:TRIButary:ALARm

# SOURce:DATA:TELecom:FAILure:TYPE

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

**Syntax**  SOURce:DATA:TELecom:FAILure:TYPE <failure>
SOURce:DATA:TELecom:FAILure:TYPE?

**Parameters**

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

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:       SOURCE:DATA:TELECOM:FAILURE:TYPE LOS

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

Response:  NONE

**Related Commands**  SOURce:DATA:TELecom:TRIButary:FAILure

# SOURce:DATA:TELecom:POINter Subsystem

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

```
                          SOURce
                            |
                          DATA
                            |
                         TELecom
                            |
                         POINter
                            |
    ┌──────┬──────┬───────┬──────┬──────┬──────┬──────┬─────────┐
  MODE  VALue  NDFLag  DIRection  RATE  NBURst  SBITs  ACTion  SEQuence
                                                                   |
      ┌──────┬───────┬──────┬───────┬───────┬──────┬───────┬───────┬────────┐
  DIRection TYPE  IPERiod  IPERiod  CPERiod  CPERiod  RATE  CONtrol  STATus?  ANOMaly
                             |                 |                               |
                          LENGth?           LENGth?                       ┌───────┴───┐
                                                                        BTIMe?    NTIMe?
```
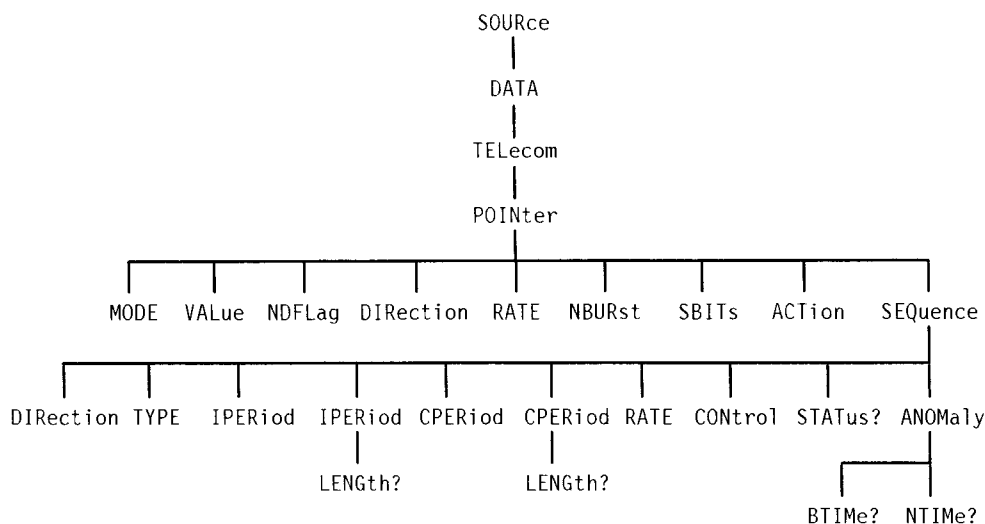
Figure 2-30: SOURce:DATA:TELecom:POINter subsystem

# SOURce:DATA:TELecom:POINter:MODE

This command sets or queries the pointer manipulation modes.

**Syntax**    SOURce:DATA:TELecom:POINter:MODE <mode>
              SOURce:DATA:TELecom:POINter:MODE?

**Parameters**

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

*(continued on next page)*

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

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:        SOURCE:DATA:TELECOM:POINTER:MODE FOFFSET

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

Response:   SEQUENCE

**Related Commands**  None

# SOURce:DATA:TELecom:POINter:VALue

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

**Syntax**
SOURce:DATA:TELecom:POINter:VALue <pointer value>
SOURce:DATA:TELecom:POINter:VALue?

**Parameters**

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

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

**Errors and Events**
None

**Examples**
Set:        SOURCE:DATA:TELECOM:POINTER:VALUE 10

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

Response:   412

**Related Commands**
SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:NDFlag

# SOURce:DATA:TELecom:POINter:NDFLag

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

**Syntax**
SOURce:DATA:TELecom:POINter:NDFLag <NDF state>

**Parameters**

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

| | |
|---|---|
| **Dependencies** | SOURce:DATA:TELecom:POINter:MODE must be set to MANual for this command to apply. |
| **Errors and Events** | None |
| **Examples** | Set:       `SOURCE:DATA:TELECOM:POINTER:NDFLag ON` |
| | Query:    `SOURCE:DATA:TELECOM:POINTER:NDFLag?` |
| | Response: 1 |
| **Related Commands** | SOURce:DATA:TELecom:POINter:VALue |

## SOURce:DATA:TELecom:POINter:DIRection

This command sets or queries the continuous pointer adjustment direction.

| | |
|---|---|
| **Syntax** | `SOURce:DATA:TELecom:POINter:DIRection <direction>` |
| | `SOURce:DATA:TELecom:POINter:DIRection?` |

**Parameters**

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

| | |
|---|---|
| **Dependencies** | SOURce:DATA:TELecom:POINTer:MODE must be set to CONTinuous for this command to apply. |
| **Errors and Events** | None |
| **Examples** | Set:       `SOURCE:DATA:TELECOM:POINTER:DIRECTION UP` |
| | Query:    `SOURCE:DATA:TELECOM:POINTER:DIRECTION?` |
| | Response: DOWN |
| **Related Commands** | SOURce:DATA:TELecom:POINter:RATE |

# SOURce:DATA:TELecom:POINter:RATE

This command sets or queries the continuous pointer adjustment rate.

**Syntax**    SOURce:DATA:TELecom:POINter:RATE <rate>
SOURce:DATA:TELecom:POINter:RATE?

**Parameters**

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

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

**Errors and Events**    None

**Examples**    Set:    SOURCE:DATA:TELECOM:POINTER:RATE 10

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

Response:    4

**Related Commands**    SOURce:DATA:TELecom:POINter:DIRection
SOURce:DATA:TELecom:POINter:MODE

# SOURce:DATA:TELecom:POINter:NBURst

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

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

**Parameters**

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

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

**Errors and Events**   None

**Examples**   Set:   SOURCE:DATA:TELECOM:POINTER:NBURST 2

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

Response:   4

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

# SOURce:DATA:TELecom:POINter:SBITs

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

**Syntax**   SOURce:DATA:TELecom:POINter:SBITs <pointer sbits>
SOURce:DATA:TELecom:POINter:SBITs?

**Parameters**

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

**Dependencies**   None

**Errors and Events**   500, "Execution warning; Numeric value greater than maximum limit"

**Examples**   Set:   SOURCE:DATA:TELECOM:POINTER:SBITS 0

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

Response:   2

**Related Commands**   None

# SOURce:DATA:TELecom:POINter:ACTion

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

**Syntax**  SOURce:DATA:TELecom:POINter:ACTion

**Parameters**  None

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

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

**Examples**  SOURCE:DATA:TELECOM:POINTER:ACTION

**Related Commands**  SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:NBURst
SOURce:DATA:TELecom:TRIButary:POINter:MODE
SOURce:DATA:TELecom:TRIButary:POINter:NBURst

# SOURce:DATA:TELecom:POINter:SEQuence:DIRection

This command sets or queries the pointer sequence movement direction.

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

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

**Parameters**

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

**Dependencies**  Pointer sequences must not be running.

**Errors and Events**   221, "Settings conflict"

**Examples**   Set:        SOURCE:DATA:TELECOM:POINTER:SEQUENCE:DIRECTION UP

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

Response:   DOWN

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

# SOURce:DATA:TELecom:POINter:SEQuence:RATE

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

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

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

**Parameters**

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

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

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

**Examples**   Set:        SOURCE:DATA:TELECOM:POINTER:SEQUENCE:RATE 50

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

Response:   34

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

# SOURce:DATA:TELecom:POINter:SEQuence:TYPE

This command sets or queries the pointer sequence type.

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

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

**Parameters**

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

**Dependencies**   Pointer sequences must not be running.

G.783 applies only to SDH rates.

**Errors and Events**   221, "Settings conflict; stop sequences before setting the type"

**Examples**      Set:      SOURCE:DATA:TELECOM:POINTER:SEQUENCE:TYPE BURST

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

Response:  SINALT

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

# SOURce:DATA:TELecom:POINter:SEQuence:IPERiod

This command sets or queries the pointer sequence initialization period.

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

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

**Parameters**

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

**Dependencies**      Pointer sequences must not be running.

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

**Examples**      Set:      SOURCE:DATA:TELECOM:POINTER:SEQUENCE:IPERIOD ON

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

Response:  0

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

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

This query returns the pointer sequence initialization period in seconds.

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

**Response**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:      SOURCE:DATA:TELECOM:POINTER:SEQUENCE:IPERIOD:LENGTH?

Response:   30

**Related Commands**   SOURce:DATA:TELecom:POINter:SEQuence:IPERiod
SOURce:DATA:TELecom:POINter:SEQuence:RATE
SOURce:DATA:TELecom:POINter:SEQuence:TYPE

# SOURce:DATA:TELecom:POINter:SEQuence:CPERiod

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

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

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

**Parameters**

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

**Dependencies**        Pointer sequences must not be running.

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

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

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

Response:  1

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

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

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

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

**Response**

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

**Dependencies**        None

**Errors and Events**        None

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

Response:  675

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

# SOURce:DATA:TELecom:POINter:SEQuence:CONTrol

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

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

**Syntax**

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

**Parameters**

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

**Dependencies**

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

**Errors and Events**

221, "Settings conflict; Not available without jitter option"

**Examples**

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

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

Response:   STOP

**Related Commands**

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

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

This query returns the pointer sequence status.

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

**Response**

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

**Dependencies**  None

**Errors and Events**  None

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

Response:  INIT

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

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

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

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

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

**Response**

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

**Dependencies**  None

**Errors and Events**  None

**Examples**  Query:  SOURCE:DATA:TELECOM:POINTER:SEQUENCE:ANOMALY:BTIME?

Response:  30

**Related Commands**  SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:POINter:SEQuence:RATE

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

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

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

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

**Response**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:    SOURCE:DATA:TELECOM:POINTER:SEQUENCE:ANOMALY:NTIME?

Response:  4

**Related Commands**   SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:POINter:SEQuence:RATE

# SOURce:DATA:TELecom:TRIButary Subsystem

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

```
SOURce --> DATA --> TELecom --> TRIButary    | --> ADD

                                             --> CHANnel

                                             --> MAPPing

                                             --> FRAMing

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

                                             --> BACKground --> PATTern

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

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

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

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

                                             -->MUX34       --> CHANnel
                                                            --> BACKground --> PATTern
```
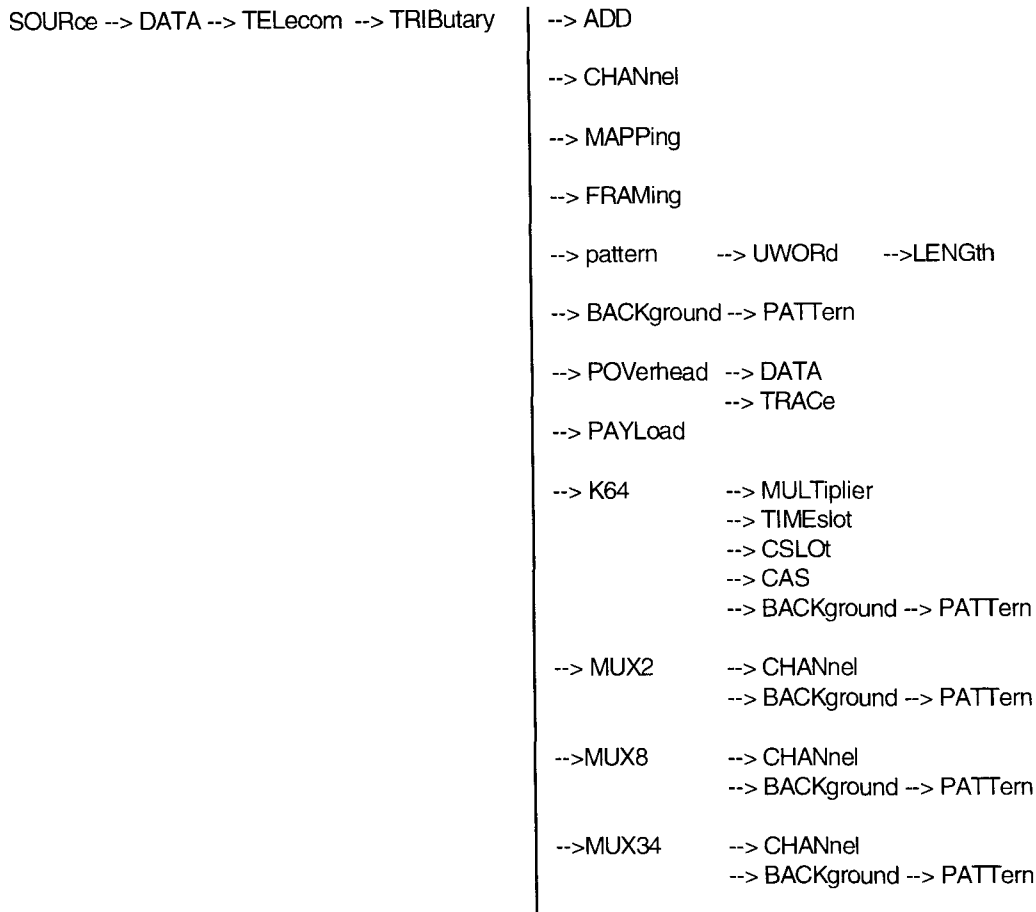
Figure 2-33: SOURce:DATA:TELecom:TRIButary subsystem

# SOURce:DATA:TELecom:TRIButary:ADD

This command sets or queries the tributary payload data source.

**Syntax**    SOURce:DATA:TELecom:TRIButary:ADD <trib add>
SOURce:DATA:TELecom:TRIButary:ADD?

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:       SOURCE:DATA:TELECOM:TRIBUTARY:ADD ON

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

Response:  1

**Related Commands**    INPUT2 and INPUT3 subsystems

# SOURce:DATA:TELecom:TRIButary:CHANnel

This command sets or queries the TUASYNC channel.

**Syntax**    SOURce:DATA:TELecom:TRIButary:CHANnel <trib channel>
SOURce:DATA:TELecom:TRIButary:CHANnel?

**Parameters**

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

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

**Errors and Events** None

**Examples** Set:       SOURCE:DATA:TELECOM:TRIBUTARY:CHANNEL 1

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

Response: 3

**Related Commands** SOURce:DATA:TELecom:TRIButary:MAPPing

# SOURce:DATA:TELecom:TRIButary:MAPPing

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

**Syntax** SOURce:DATA:TELecom:TRIButary:MAPPing <trib mapping>
SOURce:DATA:TELecom:TRIButary:MAPPing?

**Parameters**

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

**Dependencies** None

**Errors and Events**   None

**Examples**   Set:       SOURCE:DATA:TELECOM:TRIBUTARY:MAPPING TUASYNC

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

Response:  TUASYNC

**Related Commands**   SOURce:DATA:TELecom:PAYLoad:CHANnel

# SOURce:DATA:TELecom:TRIButary:FRAMing

This command sets or queries the transmitted tributary signal framing.

**Syntax**

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

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**

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

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

Response:   FRAMed

**Related Commands**    None

# SOURce:DATA:TELecom:TRIButary:PATTern

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

**Syntax**        SOURce:DATA:TELecom:TRIButary:PATTern <trib pattern>
                  SOURce:DATA:TELecom:TRIButary:PATTern?

**Parameters**

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

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

**Errors and Events**    None

**Examples**    Set:        SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN PRBS15

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

                Response:   AONES

**Related Commands**    SOURce:DATA:TELecom:TRIButary:PATTern:UWORd

# SOURce:DATA:TELecom:TRIButary:PATTern:UWORd

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

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

**Parameters**

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

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

**Errors and Events**   None

**Examples**   Set:        SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD #HAA5500

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

Response:   #HAA5500

**Related Commands**   SOURce:DATA:TELecom:TRIButary:PATTern
SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth

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

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

**Syntax**

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

**Parameters**

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

**Dependencies**

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

**Errors and Events**    None

**Examples**    Set:      SOURCE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD:LENGTH 3

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

Response: 2

**Related Commands**    SOURce:DATA:TELecom:TRIButary:PATTern:UWORd

# SOURce:DATA:TELecom:TRIButary:BACKground:PATTern

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

**Syntax**

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

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:       SOURCE:DATA:TELECOM:TRIBUTARY:BACKGROUND:PATTERN IDLE

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

Response:  IDLE

**Related Commands**   None

# SOURce:DATA:TELecom:TRIButary:POVerhead:DATA

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

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

**Parameters**

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

| <byte name> (discrete) | Description |
|---|---|
| N1 | (TU3) |
| N2 | (TU12) |
| V5 | (TU12) |

| <value> (NR1-numeric)[3] | Description |
|---|---|
| Any integer in the range 0 to 255 (hexadecimal 00 to FF) | The selected byte is set to this value |

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

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SOURCE:DATA:TELECOM:TRIBUTARY:POVERHEAD:DATA V5,#H55

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

Response:    245

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

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

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

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

**Response**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**   Query:    SOURCE:DATA:TELECOM:TRIBUTARY:POVERHEAD:TRACE?

Response:  "TEK CTS750"

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

## SOURce:DATA:TELecom:TRIButary:PAYLoad

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

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

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:      SOURce:DATA:TELecom:TRIButary:PAYLoad M34
Query:   SOURce:DATA:TELEcom:TRIButary:PAYLoad?

Response:  M34

**Related Commands**   SENSe:DATA:TELecom:TRIButary:PAYLoad

# SOURce:DATA:TELecom:TRIButary:K64:MULTiplier

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

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

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:       SOURCE:DATA:TELECOM:TRIBUTARY:K64:MULTiplier 3
Query:    SOURCE:DATA:TELECOM:TRIBUTARY:K64:MULTiplier?

Response:  3

**Related Commands**    SENSe:DATA:TELecom:TRIButary:K64:MULTiplier

# SOURce:DATA:TELecom:TRIButary:K64:TIMEslot

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

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

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

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

Response:   15

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

# SOURce:DATA:TELecom:TRIButary:K64:CSLOT

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

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

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

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

Response:   14

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

# SOURce:DATA:TELecom:TRIButary:K64:CAS

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

**Syntax**
SOURce:DATA:TELecom:TRIButary:K64:CAS <value>
SOURce:DATA:TELecom:TRIButary:K64:CAS?

**Parameters**

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

**Dependencies** None

**Errors and Events** None

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

Response: #B0101

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

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

This command sets the background pattern for Nx64k payload.

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

**Parameters**

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

**Dependencies** None

**Errors and Events**   None

**Examples**   Set:   SOURce:DATA:TELecom:TRIButary:K64:BACKground:PATTern
IDLE
Query:   SOURCE:DATA:TELECOM:TRIBUTARY:K64:background:pattern?

Response:   IDLE

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

# SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel

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

**Syntax**   SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel <channel>
SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel?

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SOURce:DATA:TELecom:TRIButary:MUX2:CHANnel 4
Query:   SOURCE:DATA:TELECOM:TRIBUTARY:MUX2:CHANnel?

Response:   CHAN4

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

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

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

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

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:          SOURce:DATA:TELecom:TRIButary:MUX2:BACKground:PATTern
PRBS15
Query:        SOURCE:DATA:TELECOM:TRIBUTARY:mux2:background:pattern?

Response:  PRBS15

**Related Commands**   SENSe:DATA:TELecom:TRIButary:DMUX2:BACKground:PATTern

# SOURce:DATA:TELecom:TRIButary:MUX8:CHANnel

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

**Syntax**    SOURce:DATA:TELecom:TRIButary:MUX8:CHANnel <channel>
SOURce:DATA:TELecom:TRIButary:MUX8:CHANnel?

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

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

Response:  ALL

**Related Commands**    SENSe:DATA:TELecom:TRIButary:DMUX8:CHANnel


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

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

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

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SOURce:DATA:TELecom:TRIButary:MUX8:BACKground:
PATTern  PRBS20
Query:     `SOURCE:DATA:TELECOM:TRIBUTARY:mux8:background:pattern?`

Response:  PRBS20

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

# SOURce:DATA:TELecom:TRIButary:MUX34:CHANnel

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

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

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

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

Response:   CHAN 4

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

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

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

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

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**  Set:  SOURce:DATA:TELecom:TRIButary:MUX34:BACKground:PATTern
AONES

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

Response:  AONES

**Related Commands**  SENSe:DATA:TELecom:TRIButary:DMUX34:BACKground:PATTern

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

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

```
SOURce --> DATA --> TELecom --> TRIButary    --> ANOMaly    --> LAYER

                                             --> DEFEct     --> LAYER

                                             --> FAILure    --> LAYER

                                             --> ERRor      --> FAWperiod
                                                            --> FAWcount

                                             --> ALARm

                                             --> FAILure
```
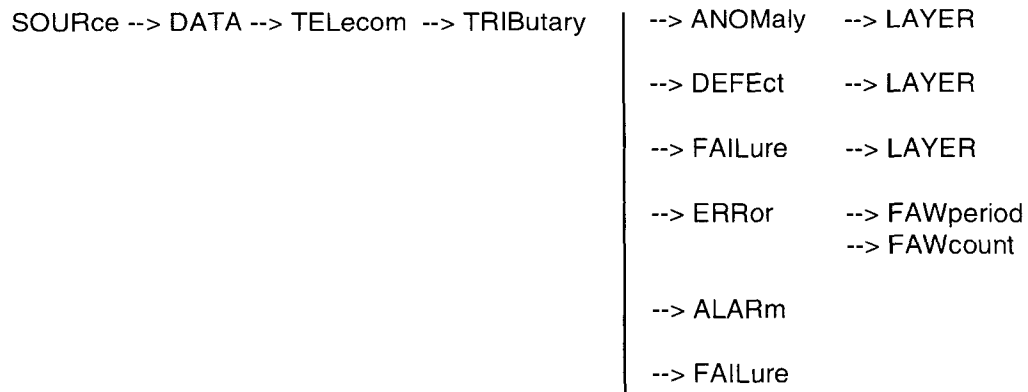
**Figure 2–35: SOURce:DATA:TELecom:TRIButary:ERRor, ALARm, FAILure subsystem**

# SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER

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

**Syntax**
SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER <layer>
SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER?

**Parameters**

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

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

**Errors and Events**
None

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

Response: M34

**Related Commands**
SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER
SOURce:DATA:TELecom:TRIButary:FAILure:LAYER

# SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER

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

**Syntax**

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

**Parameters**

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

**Dependencies**

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

**Errors and Events**

None

**Examples**

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

Response:  M8

**Related Commands**

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

# SOURce:DATA:TELecom:TRIButary:FAILure:LAYER

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

**Syntax**   SOURce:DATA:TELecom:TRIButary:FAILure:LAYER <layer>
SOURce:DATA:TELecom:TRIButary:FAILure:LAYER?

**Parameters**

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

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

**Errors and Events**   None

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

Response:  M2

**Related Commands**   SOURce:DATA:TELecom:TRIButary:ANOMaly:LAYER
SOURce:DATA:TELecom:TRIButary:DEFEct:LAYER

# SOURce:DATA:TELecom:TRIButary:ERRor

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

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

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

**Parameters**

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

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

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

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

**Errors and Events**    None

**Examples**    Set:        SOURCE:DATA:TELECOM:ERROR DATA

Query:      SOURCE:DATA:TELECOM:ERROR?

Response:   CRC

**Related Commands**    SOURce:DATA:TELecom:ERRor:TYPE
SOURce:DATA:TELecom:ERRor:RATE
SOURce:DATA:TELecom:ERRor:IMMediate

# SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod

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

**Syntax**

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

**Parameters**

| <layer> (discrete) | Description |
|---|---|
| 0-1023 | M frames |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:       SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod 755

Query:     SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod?

Response:  755

**Related Commands**    SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount
SOURce:DATA:TELecom:TRIButary:ERRor:FAWframe

# SOURce:DATA:TELecom:TRIButary:Error:FAWcount

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

**Syntax**

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

| Parameters | <layer> (discrete) | Description |
|---|---|---|
| | $0 \leq M \leq 1023$<br>M set by FAWperiod | N consecutive frames to error |

**Errors and Events**    None

**Examples**    Query:    SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount 466
Query:    SOURce:DATA:TELecom:TRIButary:ERRor:FAWcount?

Response:   466

**Related Commands**    SOURce:DATA:TELecom:TRIButary:ERRor:FAWperiod
SOURce:DATA:TELecom:TRIButary:ERRor:FAWframe

# SOURce:DATA:TELecom:TRIButary:ALARm

This command sets or queries a tributary alarm to transmit.

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

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

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

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

| | |
|---|---|
| **Dependencies** | None |
| **Errors and Events** | None |
| **Examples** | Set:        SOURce:DATA:TELecom:TRIButary:ALARM NONE |
| | Query:     SOURce:DATA:TELecom:TRIButary:ALARM? |
| | Response:   RAI |
| **Related Commands** | SOURce:DATA:TELecom:DEFEct:LAYER. |

## SOURce:DATA:TELecom:TRIButary:FAILure

This command sets or queries a tributary failure to transmit.

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

**Syntax**     SOURce:DATA:TELecom:TRIButary:FAILure <trib failure>
SOURce:DATA:TELecom:TRIButary:FAILure?

**Parameters**

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

| | |
|---|---|
| **Dependencies** | None |
| **Errors and Events** | None |
| **Examples** | Set:        SOURce:DATA:TELecom:TRIButary:FAILURE NONE |
| | Query:     SOURce:DATA:TELecom:TRIButary:FAILURE? |
| | Response:   TULOP |
| **Related Commands** | None |

# SOURce:DATA:TELecom:TRIButary:POINter Subsystem

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

---

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

---
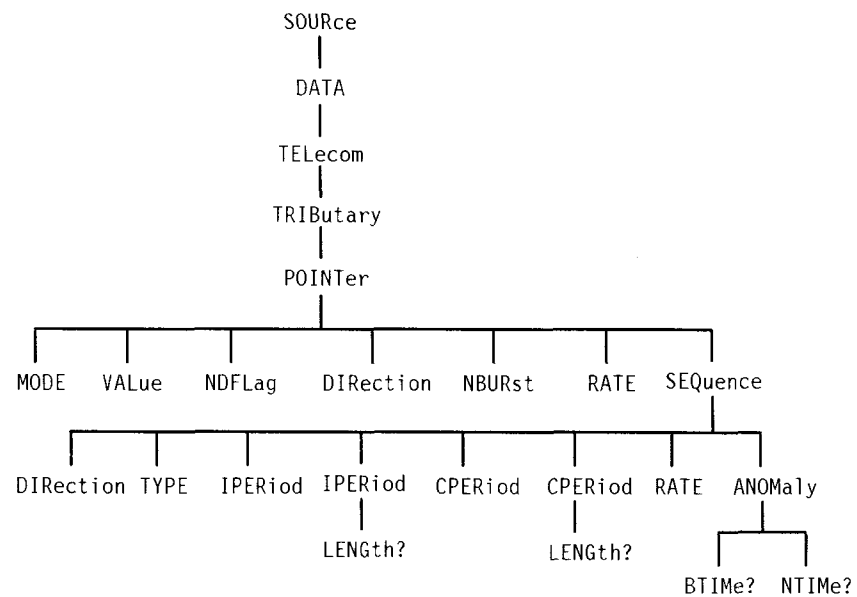


**Figure 2-36: SOURce:DATA:TELecom:TRIButary:POINTer subsystem**

# SOURce:DATA:TELecom:TRIButary:POINter:MODE

This command sets or queries the TU pointer manipulation modes.

**Syntax**

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

**Parameters**

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

**Dependencies**

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

**Errors and Events**

None

**Examples**

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

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

Response: BURSt

**Related Commands**

SOURce:DATA:TELecom:POINter:MODE

# SOURce:DATA:TELecom:TRIButary:POINter:VALue

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

**Syntax**

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

**Parameters**

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

**Dependencies**

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

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

**Errors and Events**

None

**Examples**

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

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

Response:   26

**Related Commands**

SOURce:DATA:TELecom:TRIButary:POINter:MODE

# SOURce:DATA:TELecom:TRIButary:POINter:NDFLag

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

**Syntax**

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

**Parameters**

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

**Dependencies**

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

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

**Errors and Events**

None

**Examples**

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

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

Response:   0

**Related Commands**

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

# SOURce:DATA:TELecom:TRIButary:POINter:DIRection

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

**Syntax**

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

**Parameters**

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

**Dependencies**

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

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

**Errors and Events**

None

**Examples**

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

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

Response: UP

**Related Commands**

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

# SOURce:DATA:TELecom:TRIButary:POINter:NBURst

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

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

**Parameters**

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

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

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

**Errors and Events**
None

**Examples**
Set:       SOURce:DATA:TELecom:TRIButary:POINTER:NBURST 2

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

Response:  6

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

# SOURce:DATA:TELecom:TRIButary:POINter:RATE

Add/Drop Test Option Only

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

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

**Parameters**

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

**Dependencies**

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

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

**Errors and Events**

None

**Examples**

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

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

Response: 10

**Related Commands**

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

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

This command sets or queries the pointer movement direction.

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

**Syntax**

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

**Parameters**

| <ptr seq direction> (discrete) | Description |
|---|---|
| DOWN | |
| UP | (default) |

**Dependencies**    Pointer sequences must not be running.

**Errors and Events**    221, "Settings conflict"

**Examples**

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

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

Response:   UP

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

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

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

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

**Syntax**    SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE
              <ptr seq rate>
              SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE?

**Parameters**

| <ptr seq rate> (NR1-numeric) | Description |
|---|---|
| Any integer from 34 to 30,000 ms | Resolution is 1 ms<br>(default depends on mapping and type) |

**Dependencies**    Pointer sequences must not be running.

Some sequence types (like single, burst, phase, sinalt, and dblalt) set the rate to 30,000 ms. With these types, you cannot change the rate.

**Errors and Events**    221, "Settings conflict; stop sequences before setting the rate"

**Examples**    Set:        SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
                         :RATE 2000

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

                Response:   10000

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

# SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE

This command sets or queries the pointer sequence type.

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

**Syntax**   SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE
             <ptr seq type>
             SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE?

**Parameters**

| <ptr seq type> (discrete) | Description |
|---|---|
| SINGle | Single pointer adjustment (G.783 e) |
| BURSt | Burst pointer adjustment (G.783 f) |
| PHASe | Phase transient pointer adjustment |
| P351 | Periodic 35-1 pointer adjustment (TU-12 only) |
| P351CAN | Periodic 35-1 with cancel (TU-12 only) |
| P351ADD | Periodic 35-1 with add (TU-12 only) |
| P855 | Periodic 85-5 pointer adjustment (TU-3 only) |
| P855CAN | Periodic 85-5 with cancel (TU-3 only) |
| P855ADD | Periodic 85-5 with add (TU-3 only) |
| PCONtinuous | Periodic continuous pointer adjustment (G.783 h1) |
| PCONCAN | Periodic continuous with cancel (G.783 h3) |
| PCONADD | Periodic continuous with add (G.783 h2) |
| REGDBL | Regular pointer plus one double (G.783 b) |
| REGMIS | Regular pointer with one missing (G.783 c) |
| SINALT | Single alternating pointer (G.783 a) (default) |
| DBLALT | Double alternating pointer (G.783 d) |

**Dependencies**   Pointer sequences must not be running.

G.783 only applies to TU mappings.

**Errors and Events**   221, "Settings conflict; stop sequences before setting type"

**Examples**   Set:        SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:TYPE
                           BURST

              Query:      SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:TYPE?

              Response:   PHASe

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

**Errors and Events**   None

# SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod

This command sets or queries the pointer sequence initialization period.

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

**Syntax**   SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod
             <ptr seq init>
             SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod?

**Parameters**

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

**Dependencies**   Pointer sequences must not be running.

**Errors and Events**   221, "Settings conflict; stop sequences before setting the period"

**Examples**   Set:   SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
:IPERIOD ON

Query:   SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:IPERIOD?

Response:   1

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


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

This query returns the pointer sequence initialization period in seconds.

**Syntax**   SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod:LENGth?

**Response**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:   SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:IPER-
IOD:LENGTH

Response:   30

**Related Commands**   SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE

# SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod

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

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

**Syntax**

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

**Parameters**

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

**Dependencies**

Pointer sequences must not be running.

**Errors and Events**

221, "Settings conflict; stop sequences before setting the period"

**Examples**

Set: SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE
:CPERIOD OFF

Query: SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:CPERIOD?

Response: 1

**Related Commands**

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

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

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

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

**Response**

| <pointer seq init> (NR1-numeric) | Description |
|---|---|
| Any integer:<br>    for TU12 mapping — from 360 to 60<br>    for TU3 mapping — from 900 to 60 | Pointer sequence cool down period in seconds |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:
CPERIOD:LENGTH

Response:    320

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

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

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

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

**Syntax**  SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:ANOMaly:BTIMe?

**Response**

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

**Dependencies**  None

**Errors and Events**  None

**Examples**  Query:  SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE: ANOMALY:BTIME?

Response:  30

**Related Commands**  SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE

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

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

This query is only meaningful if sequences are running.

**Syntax**     SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:ANOMaly:NTIMe?

**Response**

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

**Dependencies**     None

**Errors and Events**     None

**Examples**     Query:      SOURce:DATA:TELecom:TRIButary:POINTER:SEQUENCE:
ANOMALY:NTIME?

Response:   4

**Related Commands**     SOURce:DATA:TELecom:POINter:MODE
SOURce:DATA:TELecom:POINter:SEQuence:CONTrol
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE
SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE

# SOURce:DATA:TELecom:JITter Subsystem

This section describes the commands and queries that control the jitter and wander settings. Figure 2-39 shows the hierarchy tree for this subsystem. CTS 850

```
                        SOURce
                          |
                        DATA
                          |
                       TELecom
                          |
                        JITter
                          |
    ┌──────┬─────────┬────┴────┬──────────┬──────────┐
  MODE   SOURce    CLOCk    FREQuency  AMPLitude

                          ┌────┴────┐
                        RATE    OFFSet
```
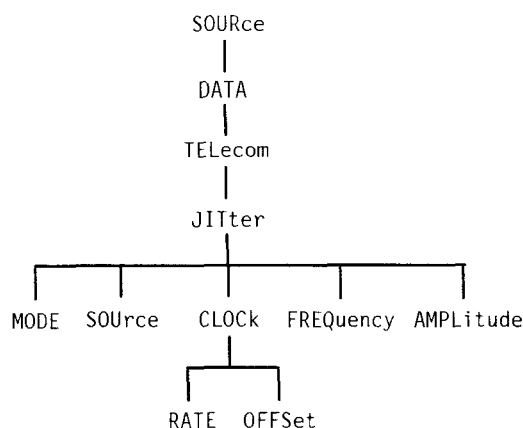
Figure 2-39: SOURce:DATA:TELecom:JITter subsystem

# SOURce:DATA:TELecom:JITter:MODE

This command sets or queries the jitter/wander generation mode.

**Syntax**  SOURce:DATA:TELecom:JITter:MODE <jitter mode>
SOURce:DATA:TELecom:JITter:MODE?

**Parameters**

| <jitter mode> (discrete) | Description |
|---|---|
| OFF | No jitter or wander generation (default) |
| ON | Turn jitter/wander generation ON |

**Dependencies**  Requires installation of Option 14 jitter module.

*RST sets jitter mode to OFF (default).

**Errors and Events**  221, "Settings conflict; Not available without jitter option" if the jitter/wander test option is not installed and ON is selected.

**Examples**    Set:        SOURCE:DATA:TELECOM:JITTER:MODE ON

Query:      SOURCE:DATA:TELECOM:JITTER:MODE?

Response:   ON

**Related Commands**    None

# SOURce:DATA:TELecom:JITter:SOURce

This command sets or queries the jitter or wander generation output destination.

**Syntax**    SOURce:DATA:TELecom:JITter:SOURce <jitter output>
SOURce:DATA:TELecom:JITter:SOURce?

**Parameters**

| <jitter output> (discrete) | Description |
|---|---|
| LINE | Jitter the line (default) |
| CLOCk | Jitter the clock (0.8V) |
| G703 | Jitter the clock (2 MHz G703; requires add/drop/test module) |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets jitter mode to LINE (default).

**Errors and Events**    None

**Examples**    Set:        SOURCE:DATA:TELECOM:JITTER:SOURCE LINE

Query:      SOURCE:DATA:TELECOM:JITTER:SOURCE?

Response:   LINE

**Related Commands**    SOURce:DATA:TELecom:JITter:MODE

# SOURce:DATA:TELecom:JITter:CLOCk:RATE

This command sets or queries the jitter or wander transmit clock rate.

**Syntax**
SOURce:DATA:TELecom:JITter:CLOCk:RATE <clock rate>
SOURce:DATA:TELecom:JITter:CLOCk:RATE?

**Parameters**

| <clock rate> (discrete) | Description |
|---|---|
| M52 | 52 Mb/s rate |
| M155 | 155 Mb/s rate |
| M622 | 622 Mb/s rate |
| M2 | 2 Mb/s rate (default) |
| M34 | 34 Mb/s rate |
| M45 | 45 Mb/s rate |
| M140 | 140 Mb/s rate |

**Dependencies**
Requires installation of Option 14 jitter module.

*RST sets the clock rate to M2 (default).

**Errors and Events**
None

**Examples**
Set: SOURCE:DATA:TELECOM:JITTER:CLOCK:RATE M140

Query: SOURCE:DATA:TELECOM:JITTER:CLOCK:RATE?

Response: M2

**Related Commands**
SOURce:DATA:TELecom:JITter:MODE
SOURce:DATA:TELecom:JITter:SOURce

# SOURce:DATA:TELecom:JITter:CLOCk:OFFSet

This command sets or queries the output jitter clock frequency offset.

**Syntax**  SOURce:DATA:TELecom:JITter:CLOCk:OFFSet <clock offset>
SOURce:DATA:TELecom:JITter:CLOCk:OFFSet?

**Parameters**

| <clock offset> (NR3-numeric) | Description |
|---|---|
| −100.0 to 100.0 | Frequency offset value in ppm (default is 0). Accuracy to 1 place after the decimal point. |

**Dependencies**  Requires installation of Option 14 jitter module.

*RST sets clock offset to 0 (default).

**Errors and Events**  500, "Execution warning"
if the entered value is out of range for the command.

**Examples**  Set:  SOURCE:DATA:TELECOM:JITTER:CLOCK:OFFSET 34

Query:  SOURCE:DATA:TELECOM:JITTER:CLOCK:OFFSET?

Response: 20.0

**Related Commands**  SOURce:DATA:TELecom:JITter:MODE
SOURce:DATA:TELecom:JITter:SOURce

# SOURce:DATA:TELecom:JITter:FREQuency

This command sets the output jitter frequency.

**Syntax**
```
SOURce:DATA:TELecom:JITter:FREQuency <jitter frequency>
SOURce:DATA:TELecom:JITter:FREQuency?
```

**Parameters**

| <jitter frequency> (NR3-numeric) | Description |
|---|---|
| 12 µHz to 400 KHz | Output jitter frequency range at 155 Mb |
| 12 µHz to 5 MHz | Output jitter frequency range at 622 Mb |
| 12 µHz to 100 kHz | Output jitter frequency range at 2 Mb |
| 12 µHz to 800 kHz | Output jitter frequency range at 34 Mb |
| 12 µHz to 3.5 MHz | Output jitter frequency range at 140 Mb |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets the jitter frequency to 10 Hz (default).

**Errors and Events**    500, "Execution warning"
if the entered value is out range for the command.

**Examples**    Set:    `SOURCE:DATA:TELECOM:JITTER:FREQUENCY 1000.0`

Query:    `SOURCE:DATA:TELECOM:JITTER:FREQUENCY?`

Response:    `250.0`

**Related Commands**    SOURce:DATA:TELecom:JITter:MODE
SOURce:DATA:TELecom:JITter:AMPLitude

# SOURce:DATA:TELecom:JITter:AMPLitude

This command sets or queries the output jitter amplitude range.

**Syntax**

```
SOURce:DATA:TELecom:JITter:AMPLitude <jitter ampl>
SOURce:DATA:TELecom:JITter:AMPLitude?
```

**Parameters**

| Rate | Amplitude scale in $UI_{p-p}$ | | | |
|------|------|------|------|------|
| | $A_0$ | $A_1$ | $A_2$ | $A_3$ |
| 52 Mb/s rate | 1000 | 200 | 20 | 2 |
| 155 Mb/s rate | 1000 | 200 | 20 | 2 |
| 622 Mb/s rate | 1000 | 200 | 20 | 2 |

| Rate | Frequency scale in Hz | | | | | |
|------|------|------|------|------|------|------|
| | $f_0$ | $f_1$ | $f_2$ | $f_3$ | $f_4$ | $f_5$ |
| 52 Mb/s rate | 12 μ | 10 | 1 k | 10 k | 130 k | 400 k |
| 155 Mb/s rate | 12 μ | 10 | 1 k | 35 k | 430 k | 1.3 M |
| 622 Mb/s rate | 12 μ | 10 | 1 k | 125 k | 1.7 M | 5 M |
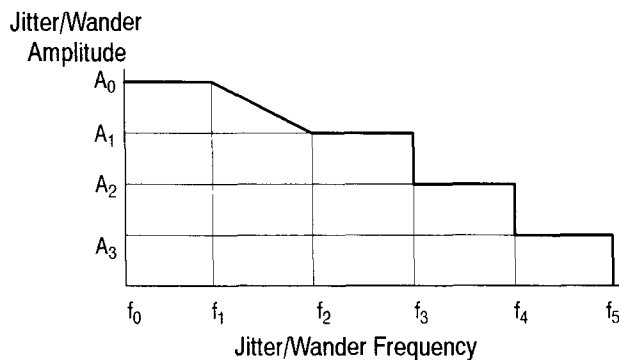


**Figure 2-40: Jitter/Wander amplitude and frequency limits**

**Dependencies**

Ranges at each rate depend on current jitter frequency. Refer to the parameters table and Figure 2-40 to determine amplitude ranges for each frequency range

*RST sets jitter amplitude to 1.00 UI (default value).

**Errors and Events**

500, "Execution warning"
if the entered value is out range for the command.

**Examples**   Set:      SOURCE:DATA:TELECOM:JITTER:AMPLITUDE 1.6

               Query:   SOURCE:DATA:TELECOM:JITTER:AMPLITUDE?

               Response:  16.4

**Related Commands**   SOURce:DATA:TELecom:JITter:MODE
                     SOURce:DATA:TELecom:JITter:FREQuency

# Receive Commands

The Receive Commands allow you to set up the physical connections of a received signal and measure the signal. This section contains all of the commands and queries for each of the following CTS 850 Receive subsystems:

- INPUT1:TELecom

- INPUT2:TELecom

- INPUT3:TELecom

- SENSe:DATA:TELecom

- SENSe:DATA:TELecom:TEST

- SENSe:DATA:TELecom:OVERhead and POVerhead

- SENSe:DATA:TELecom:MEASure

- SENSe:DATA:TELecom:STESTs

- SENSe:DATA:TELecom:AUTOscan

- SENSe:DATA:TELecom:TRIButary

- SENSE:DATA:TELecom:TRIButary:POVerhead

- SENSe:DATA:TELecom:MEASure:TRIButary

- SENSe:DATA:TELecom:JITter

- SENSe:DATA:TELecom:MEASure:JITter

- SENSe:DATA:TELecom:TEST:JITter

- SENSe:DATA:TELecom:MEASure:WANDer

- CALibrate

# INPUT1 Subsystem

This section describes the commands and queries that allow you to set the rate, type, and level of the incoming signal. Figure 2–43 shows the hierarchy tree for this subsystem.

```
                        INPUT1
                          |
                       TELecom
                          |
        ┌──────┬──────────┼──────────┬──────────┐
      RATE    TYPE      LEVel      OPWR?    PVOLtage?
```
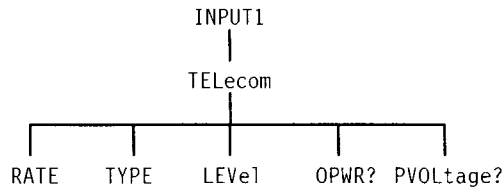
**Figure 2-43: INPUT1 subsystem**

# INPUT1:TELecom:RATE

This command sets or queries the signal rate of the receiver. The signal connected to INPUT1 is passed to the receiver by the SENSe:DATA:TELecom:SOURce INPUT1 command.

**Syntax**     INPUT1:TELecom:RATE <rate>
              INPUT1:TELecom:RATE?

**Parameters**

| <rate> (discrete) | Description |
|---|---|
| STM0 | 51.84 MHz |
| STM1 | 155.52 MHz (default) |
| STM4 | 622.08 MHz |

**Dependencies**   None

**Errors and Events**   221, "Settings conflict; Rate is not available with current Line Interface module or operating mode"

**Examples**      Set:        INPUT1:TELECOM:RATE STM1

Query:      INPUT1:TELECOM:RATE?

Response:  STM1

**Related Commands**      SENSe:DATA:TELecom:SOURce

# INPUT1:TELecom:TYPE

This command sets or queries the input signal type. The Operation Complete bit in the Standard Event Status Register is set to 1 when this command is executed.

**Syntax**      INPUT1:TELecom:TYPE <type>
INPUT1:TELecom:TYPE?

**Parameters**

| <type> (discrete) | Description |
|---|---|
| ELECtrical | Electrical output (default) |
| OPTical | Optical output |

**Dependencies**      None

**Errors and Events**      221, "Settings conflict; Type is not available with current Line Interface module"

**Examples**      Set:        INPUT1:TELECOM:TYPE ELECTRICAL

Query:      INPUT1:TELECOM:TYPE?

Response:  OPTICAL

**Related Commands**      None

# INPUT1:TELecom:LEVel

This command sets or queries the expected level of the received electrical signal.

Some optical and electrical modules do not support all levels. Check the status event register to verify valid settings.

**Syntax**

INPUT1:TELecom:LEVel <level>
INPUT1:TELecom:LEVel?

**Parameters**

| <level> (discrete) | Description |
|---|---|
| XCONnect | Simulates cross connect level (–6 dB) (default) |
| LOW | Input level is low (–12 dB) |
| HIGH | High level (0 dB) |
| MONITOR | Monitor level |

**Dependencies**

INPUT1:TELecom:TYPE must be set to ELECtrical for this command to apply.

**Errors and Events**

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

**Examples**

Set:        INPUT1:TELECOM:LEVEL XCON

Query:      INPUT1:TELECOM:LEVEL?

Response:   HIGH

**Related Commands**

INPUT1:TELecom:TYPE

# INPUT1:TELecom:STATus?

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

**Syntax**  INPUT1:TELecom:STATus?

**Response**

| <trib1 input status> (discrete) | Description |
|---|---|
| NORMal | Signal is of acceptable quality |
| LOSignal | Loss of Signal (no signal connected) |

**Dependencies**  SENSe:DATA:TELecom:SOURce must be set to INPUT1 for this command to apply.

**Errors and Events**  None

**Examples**  Query:  INPUT1:TELECOM:STATUS?

Response:  NORMAL

**Related Commands**  SENSe:DATA:TELecom:SOURce

# INPUT1:TELecom:OPWR?

This query returns the optical signal level in dBm.

**Syntax**  INPUT1:TELecom:OPWR?

**Response**

| <optical level> (NR3-numeric) | Description |
|---|---|
| Any floating point number | The optical signal level of the received signal in dBm |

**Dependencies**  INPUT1:TELecom:TYPE must be set to OPTical.

**Errors and Events**   None

**Examples**   Query:        INPUT1:TELECOM:OPWR?

Response:   -25.0

**Related Commands**   INPUT1:TELecom:TYPE

# INPUT1:TELecom:PVOLtage?

This query returns the peak electrical voltage in volts.

**Syntax**   INPUT1:TELecom:PVOLtage?

**Response**

| <peak voltage> (NR3-numeric) | Description |
|---|---|
| Any floating point number | The peak voltage of the received signal in volts |

**Dependencies**   INPUT1:TELecom:TYPE must be set to ELECtrical.

**Errors and Events**   None

**Examples**   Query:        INPUT1:TELECOM:PVOLTAGE?

Response:   0.52

**Related Commands**   INPUT1:TELecom:TYPE

# INPUT2 Subsystem

This section describes the commands and queries that set the characteristics of the received or added 2 Mb/s tributary signal. Figure 2–44 shows the hierarchy tree for this subsystem.
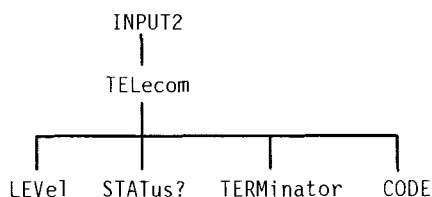


**Figure 2-44: INPUT2 subsystem**

# INPUT2:TELecom:LEVel

This command sets or queries the expected signal level at the 2 Mb/s receive connector.

**Syntax**

```
INPUT2:TELecom:LEVel <trib1 input level>
INPUT2:TELecom:LEVel?
```

**Parameters**

| <trib1 input level> (discrete) | Description |
| --- | --- |
| NORMal | Normal input levels (default) |
| MONitor | Monitor level |
| BRIDge | Bridged input |
| PROTECTED | Protected monitor mode, -30db |

**Dependencies**

The instrument must be set up to receive or add a 2 Mb/s tributary signal for this command to apply.

**Errors and Events**

None

**Examples**  Set:      INPUT2:TELECOM:LEVEL NORMAL

Query:     INPUT2:TELECOM:LEVEL?

Response:  MONITOR

**Related Commands**  SENSe:DATA:TELecom:SOURce
SOURce:DATA:TELecom:TRIButary:ADD

# INPUT2:TELecom:STATus?

This query returns the status of the received or added 2 Mb/s tributary signal.

**Syntax**  INPUT2:TELecom:STATus?

**Response**

| <trib1 input status> (discrete) | Description |
|---|---|
| NORMal | Signal is of acceptable quality |
| LOSignal | Loss of Signal (no signal connected) |

**Dependencies**  SENSe:DATA:TELecom:SOURce must be set to INPUT2 for this command to apply.

**Errors and Events**  None

**Examples**  Query:     INPUT2:TELECOM:STATUS?

Response:  NORMAL

**Related Commands**  SENSe:DATA:TELecom:SOURce

# INPUT2:TELecom:TERMinator

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

**Syntax**
```
INPUT2:TELecom:TERMinator <trib1 input termin>
INPUT2:TELecom:TERMinator?
```

**Parameters**

| <trib1 input termin> (discrete) | Description |
|---|---|
| BALanced | 120 Ω connector (default) |
| UNBALanced | 75 Ω connector |

**Dependencies**
The instrument must be set up to receive or add a 2 Mb/s tributary signal for this command to apply.

**Errors and Events**
None

**Examples**
Set:        INPUT2:TELECOM:TERMINATOR BALANCED

Query:      INPUT2:TELECOM:TERMINATOR?

Response:   STM1

Response:   M155

**Related Commands**
SENSe:DATA:TELecom:SENSe
SOURce:DATA:TELecom:TRIButary:ADD

# INPUT2:TELecom:CODE

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

**Syntax**

```
Input2:telecom:CODE <signal encoding>
INPUT2:TELecom:CODE?
```

**Parameters**

| <signal encoding> (discrete) | Description |
|---|---|
| HDB3 | Set expected encoding to HDB3 |
| AMI | Set or expected encoding to AMI |

**Dependencies**   None

**Errors and Events**   None

**Examples**

Query:       INPUT2:TELECOM:CODE AMI
Query:       INPUT2:TELECOM:CODE?
Response:    AMI

**Related Commands**   OUTPUT2:TELecom:CODE

# INPUT3 Subsystem

This section describes the commands and queries that set the characteristics of the received or added 34 Mb/s or 140 Mb/s tributary signal. Figure 2–45 shows the hierarchy tree for this subsystem.

```
                    INPUT3
                      |
                   TELecom
                      |
        ┌──────────┬──┴──────┬──────────┐
      LEVel       RATE     STATus?      CODE
```
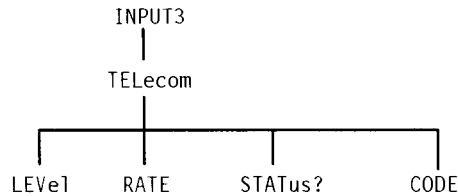
**Figure 2–45: INPUT3 subsystem**

# INPUT3:TELecom:LEVel

This command sets or queries the expected signal level at the 34 Mb/s or 140 Mb/s receive connector.

**Syntax**

```
INPUT3:TELecom:LEVel <trib2 input level>
INPUT3:TELecom:LEVel?
```

**Parameters**

| <trib2 input level> (discrete) | Description |
|---|---|
| NORMal | Normal input level |
| MONitor | Monitor level |
| PROTECTED | Protected monitor mode, –30db (future) |

**Dependencies**

The instrument must be set up to receive or add a 34 Mb/s or 140 Mb/s tributary signal for this command to apply.

**Errors and Events**

None

**Examples**      Set:        INPUT3:TELECOM:LEVEL NORMAL

Query:      INPUT3:TELECOM:LEVEL?

Response:  NORMAL

**Related Commands**      None

# INPUT3:TELecom:RATE

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

**Syntax**      INPUT3:TELecom:RATE <trib2 input rate>
INPUT3:TELecom:RATE?

**Parameters**

| <trib2 input rate> (discrete) | Description |
|---|---|
| M34 | 34.368 Mb/s (default) |
| M140 | 139.264 Mb/s |
| M45 | 45 Mb/s Receive rate |

**Dependencies**      The instrument must be set up to receive or add a 34 Mb/s or 140 Mb/s tributary signal for this command to apply.

**Errors and Events**      None

**Examples**      Set:        INPUT3:TELECOM:RATE M34

Query:      INPUT3:TELECOM:RATE?

Response:  M140

**Related Commands**      SENSe:DATA:TELecom:SOURce

# INPUT3:TELecom:STATus?

This query returns the status of the received or added 34 Mb/s or 140 Mb/s tributary signal.

**Syntax**    INPUT3:TELecom:STATus?

**Response**

| <trib2 input status> (discrete) | Description |
|---|---|
| NORMal | Signal is of acceptable quality |
| LOSignal | Loss of Signal (no signal connected) |

**Dependencies**    SENSe:DATA:TELecom:SOURce must be set to INPUT3 for this query to apply.

**Errors and Events**    None

**Examples**    Query:    INPUT3:TELECOM:STATUS?

Response:  NORMAL

**Related Commands**    SENSe:DATA:TELecom:SOURce

# INPUT3:TELecom:CODE

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

**Syntax**  
Input3:telecom:CODE <signal encoding>  
INPUT3:TELecom:CODE?

**Parameters**

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

**Dependencies**  
None

**Errors and Events**  
None

**Examples**  
Set: INPUT3:TELECOM:CODE HDB3  
Query: INPUT3:TELECOM:CODE?  
Response: HDB3

**Related Commands**  
OUTPUT3:TELecom:CODE

# SENSe:DATA:TELecom Subsystem

This section describes the commands and queries that set up the structure of the signal to be received. Figure 2–46 shows the hierarchy tree for this subsystem.
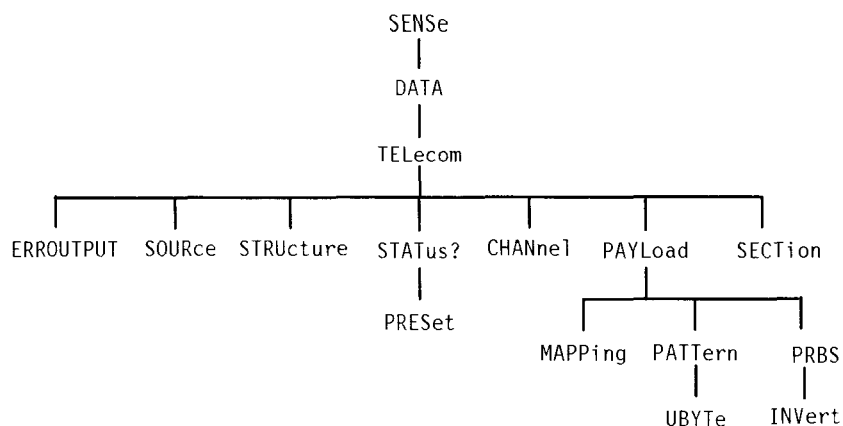


Figure 2-46: SENSe:DATA:TELecom subsystem

# SENSe:DATA:TELecom:SOURce

This command sets or queries the input signal source.

**Syntax**

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

**Parameters**

| <source> (discrete) | Description |
|---|---|
| INPUT1 | SDH rates (default) |
| INPUT2 | 2 Mb/s rate (Add/Drop Test Option Only) |
| INPUT3 | 34 Mb/s or 140 Mb/s rate (Add/Drop Test Option Only) |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SENSE:DATA:TELECOM:SOURCE INPUT1

Query:    SENSE:DATA:TELECOM:SOURCE?

Response:  INPUT2

**Related Commands**    INPUT1:TELecom:RATE

# SENSe:DATA:TELecom:STRUcture

This command sets or queries the input signal structure.

**Syntax**    SENSe:DATA:TELecom:STRUcture <input structure>
SENSe:DATA:TELecom:STRUcture?

**Parameters**

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

**Dependencies**    AU3 is only available for the STM-0 rate

**Errors and Events**    221, "Settings conflict; Argument not valid in current instrument state"

**Examples**    Set:        SENSE:DATA:TELECOM:STRUCTURE AU4

Query:    SENSE:DATA:TELECOM:STRUCTURE?

Response:  AU3

**Related Commands**    OUTPUT1:TELecom:RATE

# SENSe:DATA:TELecom:STATus?

This query returns the historical or accumulated status of the received signal.

**Syntax**     SENSe:DATA:TELecom:STATus?

**Response**

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

**Dependencies**     None

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:STATUS?

Response:   1024

**Related Commands**     SENSe:DATA:TELecom:STATus:PRESet

# SENSe:DATA:TELecom:STATus:PRESet

This command clears the status of the received SDH and tributary signals by setting each status bit to 0. After this command is given, the status information is accumulated until another SENSe:DATA:TELecom:STATus:PRESet command is given. To get the current signal status without any history information, send the SENSe:DATA:TELecom:STATus:PRESet;:SENSe:DATA:TELecom:STATus? chained command.

**Syntax**   SENSe:DATA:TELecom:STATus:PRESet

**Parameters**   None

**Dependencies**   None

**Errors and Events**   None

**Examples**   SENSE:DATA:TELECOM:STATUS:PRESET

**Related Commands**   SENSe:DATA:TELecom:STATus?

# SENSe:DATA:TELecom:CHANnel

This command sets or queries the active channel to test (a VC structure).

**Syntax**   SENSe:DATA:TELecom:CHANnel <channel>
             SENSe:DATA:TELecom:CHANnel?

**Parameters**

| <channel> (NR1-numeric) | Description |
|---|---|
| 1 | STM-0, STM-1 (default) |
| 1 to 4 | STM-4 rate |

**Dependencies**   Selection of a <channel> greater than 1 implies a rate and structure with multiple VCs.

**Errors and Events**   221, "Settings conflict; Channel is out of range"

**Examples**   Set:        SENSE:DATA:TELECOM:CHANNEL 1

Query:       SENSE:DATA:TELECOM:CHANNEL?

Response:   3

**Related Commands**   INPUT1:TELecom:RATE
SENSe:DATA:TELecom:STRUcture

# SENSe:DATA:TELecom:ERROUTPUT:SOURce

This command sets the trigger conditions for the pulse output on the back of the test set.

**Syntax**   SENSe:DATA:TELecom:ERROUTPUT:SOURce

**Parameters**

| source | Description |
|---|---|
| NONE | Disables the selected error trigger output |
| B1, B2, B3, PATTERN | Selects the specified error trigger output and enables it |

**Dependencies**   None

**Examples**   SENSe:DATA:TELecom:ERROUTPUT:SOURce B1

**Related Commands**   None

# SENSe:DATA:TELecom:PAYLoad:MAPPing

This command sets or queries the payload mapping of the received structure.

**Syntax**
SENSe:DATA:TELecom:PAYLoad:MAPPing <payload_mapping>
SENSe:DATA:TELecom:PAYLoad:MAPPing?

**Parameters**

| <mapping> (discrete) | Description |
|---|---|
| EQUipped | Expecting equipped payload mapping (default) |
| UNEQuipped | Expecting unequipped payload mapping |
| TRIButary | Expecting tributary payload mapping (Add/ Drop Test Option Only) |

**Dependencies**
Select EQUipped or UNEQuipped to use the SENSe:DATA:TELecom: PAYLoad:PATTern command. Selection of TRIButary is not allowed for the STM-0 rate. TRIButary is invalid for an AU-3 structure.

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

**Examples**
Set:       SENSE:DATA:TELECOM:PAYLOAD:MAPPing EQUIPPED

Query:     SENSE:DATA:TELECOM:PAYLOAD:MAPPing?

Response:  TRIBUTARY

**Related Commands**
SENSe:DATA:TELecom:PAYLoad:PATTern

# SENSe:DATA:TELecom:PAYLoad:PATTern

This command sets or queries the payload pattern that will be used to calculate the payload BER of the incoming data.

**Syntax**
SENSe:DATA:TELecom:PAYLoad:PATTern <pattern>
SENSe:DATA:TELecom:PAYLoad:PATTern?

| Parameters | <pattern> (discrete) | Description |
|---|---|---|
| | PRBS23 | A pseudo-random binary sequence of length $2^{23}-1$ (default) |
| | PRBS9 | A pseudo-random binary sequence of length $2^9-1$ |
| | PRBS15 | A pseudo-random binary sequence of length $2^{15}-1$ |
| | PRBS20 | A pseudo-random binary sequence of length $2^{20}-1$ |
| | AZERos | All zeros |
| | AONEs | All ones |
| | UBYTe | A user-defined byte |
| | UNKNown | Disable BER calculations on incoming data |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:       SENSE:DATA:TELECOM:PAYLOAD:PATTERN PRBS23

Query:     SENSE:DATA:TELECOM:PAYLOAD:PATTERN?

Response:  PRBS9

**Related Commands**  SENSe:DATA:TELecom:CHANnel
SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe

# SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe

This command sets or queries the internally generated payload fixed pattern to be detected in the incoming signal.

**Syntax**  SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe <fixed 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:PAYLoad:PRBS:INVert

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

**Syntax**     SENSe:DATA:TELecom:PAYLoad:PRBS:INVert <state>

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

**Examples**     SENSe:DATA:TELecom:PAYLoad:PRBS:INVert ON

**Related Commands**     SOURce:DATA:TELecom:PAYLoad:PRBS:INVert

# SENSe:DATA:TELecom:SECTion:TRACe:MISmatch

This command sets the J0 trace mismatch reporting state.

**Syntax**    SENSe:DATA:TELecom:SECTion:TRACe:MISmatch <state>

**Parameters**

| State | Description |
|-------|-------------|
| ON | Sets the state of reporting J0 trace mismatch |
| OFF | Turns off the state of reporting of J0 trace mismatch |

**Examples**    SENSe:DATA:TELecom:SECTion:TRACe:MISmatch OFF

**Related Commands**    None

# SENSe:DATA:TELecom:TEST Subsystem

This section describes each of the commands and queries used to control measurements. Figure 2-51 shows the hierarchy tree for this CTS 850 subsystem.

```
                        SENSe
                          |
                        DATA
                          |
                       TELecom
                          |
                        TEST
    ┌─────┬─────┬──────┬─────┬──────────┬──────────┬────────┐
  MODE  STARt  STOP  STATus? DURation  STIMe?   HISTory
                                                     |
                                                RESolution
```
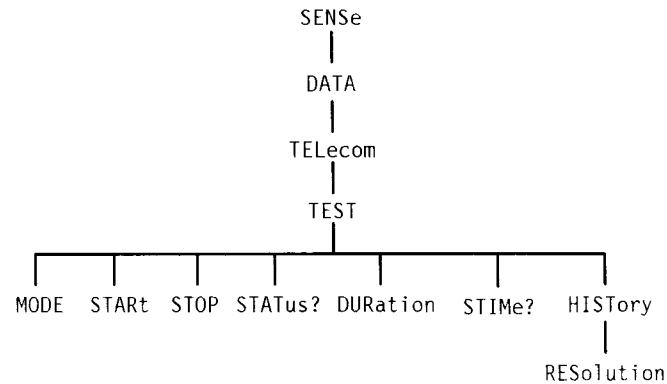
**Figure 2-51: SENSe:DATA:TELecom:TEST subsystem**

# SENSe:DATA:TELecom:TEST:MODE

This command sets or queries the measurement test mode (normal or jitter).

**Syntax**  SENSe:DATA:TELecom:TEST:MODE <mode>
SENSe:DATA:TELecom:TEST:MODE?

**Parameters**

| <mode> (discrete) | Description |
|---|---|
| NORMal | Normal operation jitter measurements (default) |
| JITter | Enable compliance tests |

**Dependencies**  Requires installation of Option 14 jitter module.

*RST sets mode to normal (default).

**Errors and Events**  221, "Settings conflict; Not available without jitter option" if the jitter/wander test option is not installed and JITter is specified.

**Examples**    Set:         SENSE:DATA:TELECOM:TEST:MODE JITTER

Query:       SENSE:DATA:TELECOM:TEST:MODE?

Response:    NORMAL

**Related Commands**    None


# SENSe:DATA:TELecom:TEST:STARt

This command starts normal test measurements if SENSe:DATA: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 |

**Dependencies** None

**Errors and Events** None

**Examples** Query: SENSE:DATA:TELECOM:TEST:STATUS?

Response: 1,0,0,13,5

This response indicates that the test has been running for 13 minutes and 5 seconds and is still running.

**Related Commands** None

# SENSe:DATA:TELecom:TEST:DURation

This command sets or queries the length of the test. If all four parameters are set to 0, the test will run continuously.

**Syntax** SENSe:DATA:TELecom:TEST:DURation <d>,<hrs>,<min>,<sec>
SENSe:DATA:TELecom:TEST:DURation?

**Parameters**

| <days> (NR1-numeric) | Description |
|---|---|
| Any number in the range 0 to 99 | Specifies the number of days the test is to be run (default = 0) |

| <hours> (NR1-numeric) | Description |
|---|---|
| Any number in the range 0 to 23 | Specifies the number of hours the test is to be run (default = 0) |

| <minutes> (NR1-numeric) | Description |
|---|---|
| Any number in the range 0 to 59 | Specifies the number of minutes the test is to be run (default = 0) |

| <seconds> (NR1-numeric) | Description |
|---|---|
| Any number in the range 0 to 59 | Specifies the number of seconds the test is to be run (default = 0) |

**Dependencies** None

**Errors and Events** None

**Examples**     Set:          SENSE:DATA:TELECOM:TEST:DURATION 1,12,30,0

The above example sets the test duration to 1 day, 12 hours, 30 minutes, and 0 seconds.

Query:       SENSE:DATA:TELECOM:TEST:DURATION?

Response:    0,2,0,0

**Related Commands**     None

## SENSe:DATA:TELecom:TEST:STIMe?

This query returns the date and time the test was started.

**Syntax**     SENSe:DATA:TELecom:TEST:STIMe?

**Response**

| <year> (NR1-numeric) | Description |
|---|---|
| Any number in the range 00 to 99 | Specifies the year the test was started; "92" indicates that the test was started in 1992, "01" indicates the year 2001 |
| **<month> (NR1-numeric)** | **Description** |
| Any number in the range 1 to 12 | Specifies the month the test was started; "09" indicates that the test was started in September |
| **<day> (NR1-numeric)** | **Description** |
| Any number in the range 1 to 31 | Specifies the day of the month the test was started |
| **<hours> (NR1-numeric)** | **Description** |
| Any number in the range 0 to 23 | Specifies the hour the test was started |
| **<minutes> (NR1-numeric)** | **Description** |
| Any number in the range 0 to 59 | Specifies the minute the test was started |
| **<seconds> (NR1-numeric)** | **Description** |
| Any number in the range 0 to 59 | Specifies the seconds the test was started |

**Dependencies**     None

**Errors and Events**     None

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:STIME?

             Response:   93,10,25,22,15,00

             This test was started on October 25, 1993 at 10:15 pm.

**Related Commands**    SENSe:DATA:TELecom:TEST:STARt

# SENSe:DATA:TELecom:TEST:HISTory:RESolution

This command sets or queries the resolution of the history data.

This command does not affect previously acquired history data. This command assigns the size of data "buckets" prior to starting a new test.

**Syntax**    SENSe:DATA:TELecom:TEST:HISTory:RESolution <hist res>
            SENSe:DATA:TELecom:TEST:HISTory:RESolution?

**Parameters**

| <hist res> (discrete) | Description |
|---|---|
| SEC1 | 1 second resolution |
| MIN1 | 1 minute resolution (default) |
| MIN15 | 15 minute resolution |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:      SENSE:DATA:TELECOM:TEST:HISTORY:RESOLUTION MIN15

            Query:    SENSE:DATA:TELECOM:TEST:HISTORY:RESOLUTION?

            Response:   MIN1

**Related Commands**    SENSe:DATA:TELecom:TEST:START
                              SENSe:DATA:TELecom:MEASURE:HISTORY

# SENSe:DATA:TELecom:OVERhead and POVerhead Subsystem

This section describes each of the commands and queries used to analyze the transport overhead and path overhead. Figure 2–53 shows the hierarchy tree for this CTS 850 subsystem.
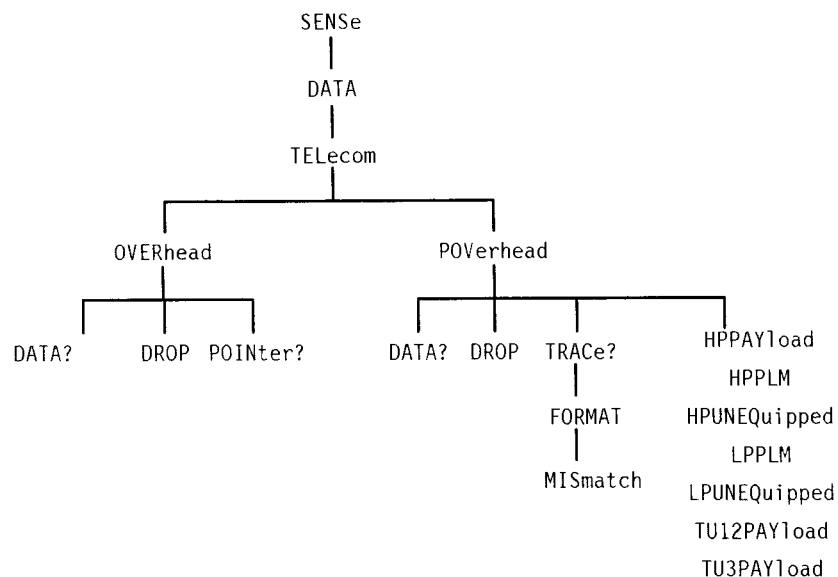


Figure 2-53: SENSe:DATA:TELecom:OVERhead and POVerhead subsystem

## SENSe:DATA:TELecom:OVERhead:DATA?

This query returns the value in transport overhead byte of the specified channel.

**Syntax**    SENSe:DATA:TELecom:OVERhead:DATA? <channel>,<byte>,<offset>

**Parameters**

| <channel> (NR1-numeric) | Description |
|---|---|
| 1 | Rate is STM-1 |
| 1 to 4 | Rate is STM-4 |

| <byte> (discrete) | Description |
|---|---|
| A1, A2, B1, B2, H1, H2, H3, C1, D1, F1, D1, D2, D3, K1, K2, D4, D5, D6, D7, D8, D9, D10, D11, D12, S1, M1, E2 | Only the bytes listed return a valid response |

| <offset> (NR1-numeric) | Description |
|---|---|
| 0 to 2 | Any SDH rate |

**Response**

| <value> (NR1-numeric) | Description |
|---|---|
| Any number in the range 0 to 255 | The byte is set to this value |
| -1 | No signal received |

**Dependencies**     None

**Errors and Events**     221, "Settings conflict; Channel is out of range"

**Examples**     Query:     SENSE:DATA:TELECOM:OVERHEAD:DATA? 1,C1,0

Response:     123

**Related Commands**     INITiate
TRIGger:IMMediate

# SENSe:DATA:TELecom:OVERhead:DROP

This command sets or queries the transport overhead bytes to be dropped to an external protocol analyzer.

**Syntax**     SENSe:DATA:TELecom:OVERhead:DROP <dropped overhead>
SENSe:DATA:TELecom:OVERhead:DROP?

**Parameters**

| <dropped overhead> (discrete) | Description |
|---|---|
| NONE | No overhead bytes dropped (default) |
| SDCC | Regenerator section DCC (D1-D3) |
| LDCC | Multiplexer section DCC (D4-D12) |
| F1 | F1 User Byte |

**Dependencies**     You can drop the transport overhead or the path overhead by using the
SENSe:DATA:TELecom:OVERhead:DROP and SENSe:DATA:TELecom:
POVerhead:DROP commands. The last command sent applies.

**Errors and Events**     None

**Examples**     Set:        SENSE:DATA:TELECOM:OVERHEAD:DROP SDCC

Query:       SENSE:DATA:TELECOM:OVERHEAD:DROP?

Response:  SDCC

**Related Commands**     None

# SENSe:DATA:TELecom:OVERhead:POINter?

This query returns the current value of the H1 and H2 overhead bytes of the active channel. If the instrument is receiving a LOS, LOF, or LOP, the last valid pointer value will be returned.

**Syntax**     SENSe:DATA:TELecom:OVERhead:POINter?

**Response**

| <pointer value> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 1023 | H1 and H2 are set to this value |

**Dependencies**     You must have a test running for a valid pointer value to be returned (use the SENSe:DATA:TELecom:TEST:STARt command to start a test).

**Errors and Events**     None

**Examples**     Query:      SENSE:DATA:TELECOM:OVERHEAD:POINTER?

Response:  123

**Related Commands**     SENSe:DATA:TELecom:OVERhead:DATA?
SENSe:DATA:TELecom:TEST:STARt

# SENSe:DATA:TELecom:POVerhead:DATA?

This query returns the value in the specified path overhead byte.

**Syntax**  SENSe:DATA:TELecom:POVerhead:DATA? <byte>

**Parameters**

| <byte> (discrete) | Description |
|---|---|
| J1, B3, C2, G1, F2, H4, F3, K3, N1 | Only the bytes listed are available for selection |

**Response**

| <value> (NR1-numeric) | Description |
|---|---|
| Any number in the range 0 to 255 | The byte is set to this value (the value for J1 is the ASCII representation of the string value) |

**Dependencies**  Use the SENSe:DATA:TELecom:CHANNel command to specify which path trace to query.

**Errors and Events**  None

**Examples**  Query:     SENSE:DATA:TELECOM:POVERHEAD:DATA? C2

Response:  123

**Related Commands**  INITiate
TRIGger:IMMediate

# SENSe:DATA:TELecom:POVerhead:DROP

This command sets or queries the path overhead channels to be dropped to an external protocol analyzer.

**Syntax**   SENSe:DATA:TELecom:POVerhead:DROP <dropped overhead>
SENSe:DATA:TELecom:POVerhead:DROP?

**Parameters**

| <dropped overhead> (discrete) | Description |
|---|---|
| NONE | Nothing is dropped (default) |
| F2 | F2 User Byte |

**Dependencies**   You can drop the transport overhead or the path overhead by using the SENSe:DATA:TELecom:OVERhead:DROP and SENSe:DATA:TELecom: POVerhead:DROP commands. The last command sent applies.

**Errors and Events**   None

**Examples**   Set:      SENSE:DATA:TELECOM:POVERHEAD:DROP F2

Query:    SENSE:DATA:TELECOM:POVERHEAD:DROP?

Response: F2

**Related Commands**   None

# SENSe:DATA:TELecom:POVerhead:TRACe?

This query returns the current path trace string that repeats in the J1 byte as a repeating byte sequence. The response is created in the following way: the first character after a null is read as the first byte and is followed by 63 J1 bytes from consecutive frames.

**Syntax**      SENSe:DATA:TELecom:POVerhead:TRACe?

**Response**

| <path trace> (string) | Description |
|---|---|
| Length is a maximum of 64 bytes; if length is less than 64 bytes, the buffer is padded with nulls | The J1 byte is set to this value |

**Dependencies**      The SENSe:DATA:TELecom:CHANnel command specifies which path trace to query.

**Errors and Events**      None

**Examples**      Query:      SENSE:DATA:TELECOM:POVERHEAD:TRACE?

Response:   "THIS IS THE FIRST RUN OF TEST ABC"

**Related Commands**      SENSe:DATA:TELecom:POVerhead:DATA?
INITiate
TRIGger:IMMediate

# SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT

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

**Syntax**     SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT <format>

**Parameters**

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

**Dependencies**     None

**Examples**     SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT LONG

**Related Commands**     SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT

# SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch

This command sets the state of mismatch reporting for AU–N J1 trace strings.

**Syntax**     SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch <state>

**Parameters**

| format | description |
|--------|-------------|
| ON | Sets the state of reporting J1 trace mismatch |
| OFF | Turns off the state of reporting of J1 trace mismatch |

**Dependencies**     None

**Examples**     SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch OFF

**Related Commands**     SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch

# SENSe:DATA:TELecom:POVerhead:HPPAYload:VALue

This command sets the high order payload value to be checked for.

**Syntax**    SENSe:DATA:TELecom:POVerhead:HPPAYload:VALue <number>
SENSe:DATA:TELecom:POVerhead:HPPAYload:VALue?

**Parameters**

| number | description |
|---|---|
| A number in the range 0 to 255 | Sets the high order path payload value to be checked for |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:POVERHEAD:HPPAYLOAD:VALUE 5

Query:    SENSE:DATA:TELECOM:POVERHEAD:HPPAYLOAD:VALUE?

Response:    SENSE:DATA:TELECOM:POVERHEAD:HPPAYLOAD:VALUE 5

**Related Commands**    None

# SENSe:DATA:TELecom:POVerhead:HPPLM

This command enables and disables the high order payload mismatch detection.

**Syntax**    SENSe:DATA:TELecom:POVerhead:HPPLM <action>
SENSe:DATA:TELecom:POVerhead:HPPLM?

**Parameters**

| number | description |
|---|---|
| Enable | Turns the high order payload mismatch detection ON |
| Disable | Turns the high order payload mismatch detection OFF |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    `SENSE:DATA:TELECOM:POVERHEAD:HPPLM ENABLE`

Query:    `SENSE:DATA:TELECOM:POVERHEAD:HPPLM?`

Response:    `SENSE:DATA:TELECOM:POVERHEAD:HPPLM ENABLE`

**Related Commands**    None

# SENSe:DATA:TELecom:POVerhead:HPUNEQuipped

This command enables and disables the high order path unequipped detection.

**Syntax**    `SENSe:DATA:TELecom:POVerhead:HPUNEQuippped <action>`
`SENSe:DATA:TELecom:POVerhead:HPUNEQuipped?`

**Parameters**

| number | description |
|---|---|
| Enable | Turns the high order path unequipped detection ON |
| Disable | Turns the high order path unequipped detection OFF |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    `SENSE:DATA:TELECOM:POVERHEAD:HPUNEQUIPPED ENABLE`

Query:    `SENSE:DATA:TELECOM:POVERHEAD:HPUNEQUIPPED?`

Response:    `SENSE:DATA:TELECOM:POVERHEAD:HPUNEQUIPPED ENABLE`

**Related Commands**    None

# SENSe:DATA:TELecom:POVerhead:LPPLM

This command enables and disables the low order payload mismatch detection.

**Syntax**
SENSe:DATA:TELecom:POVerhead:LPPLM <action>
SENSe:DATA:TELecom:POVerhead:LPPLM?

**Parameters**

| number | description |
|--------|-------------|
| Enable | Turns the high order payload mismatch detection ON |
| Disable | Turns the high order payload mismatch detection OFF |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:POVERHEAD:LPPLM ENABLE

Query:    SENSE:DATA:TELECOM:POVERHEAD:LPPLM?

Response:    SENSE:DATA:TELECOM:POVERHEAD:LPPLM ENABLE

**Related Commands**    None

# SENSe:DATA:TELecom:POVerhead:LPUNEQuipped

This command enables and disables the low order path unequipped detection.

**Syntax**
SENSe:DATA:TELecom:POVerhead:LPUNEQuippped <action>
SENSe:DATA:TELecom:POVerhead:LPUNEQuipped?

**Parameters**

| number | description |
|--------|-------------|
| Enable | Turns the high order path unequipped detection ON |
| Disable | Turns the high order path unequipped detection OFF |

**Dependencies** None

**Errors and Events** None

**Examples** Set: SENSE:DATA:TELECOM:POVERHEAD:LPUNEQUIPPED ENABLE

Query: SENSE:DATA:TELECOM:POVERHEAD:LPUNEQUIPPED?

Response: SENSE:DATA:TELECOM:POVERHEAD:LPUNEQUIPPED ENABLE

**Related Commands** None

# SENSe:DATA:TELecom:POVerhead:TU12PAYload:VALue

This command sets the low order payload value to be checked for.

**Syntax** SENSe:DATA:TELecom:POVerhead:TU12PAYload:VALue <number>
SENSe:DATA:TELecom:POVerhead:TU12PAYload:VALue?

**Parameters**

| number | description |
|---|---|
| A number in the range 0 to 255 | Sets the high order path payload value to be checked for |

**Dependencies** None

**Errors and Events** None

**Examples** Set: SENSE:DATA:TELECOM:POVERHEAD:TU12PAYLOAD:VALUE 5

Query: SENSE:DATA:TELECOM:POVERHEAD:TU12PAYLOAD:VALUE?

Response: SENSE:DATA:TELECOM:POVERHEAD:TU12PAYLOAD:VALUE 5

**Related Commands** None

# SENSe:DATA:TELecom:POVerhead:TU3PAYload:VALue

This command sets the low order payload value to be checked for.

**Syntax**    SENSe:DATA:TELecom:POVerhead:TU3PAYload:VALue <number>
SENSe:DATA:TELecom:POVerhead:TU3PAYload:VALue?

**Parameters**

| number | description |
|---|---|
| A number in the range 0 to 255 | Sets the high order path payload value to be checked for |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:POVERHEAD:TU3PAYLOAD:VALUE 5

Query:    SENSE:DATA:TELECOM:POVERHEAD:TU3PAYLOAD:VALUE?

Response:    SENSE:DATA:TELECOM:POVERHEAD:TU3PAYLOAD:VALUE 5

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure Subsystem

This section describes the commands and queries that access error, alarm, failure, and pointer measurements for current and previous tests. Figures 2–55 through 2–59 show the hierarchy trees for this CTS 850 subsystem.

```
                              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 2–55: 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?
```
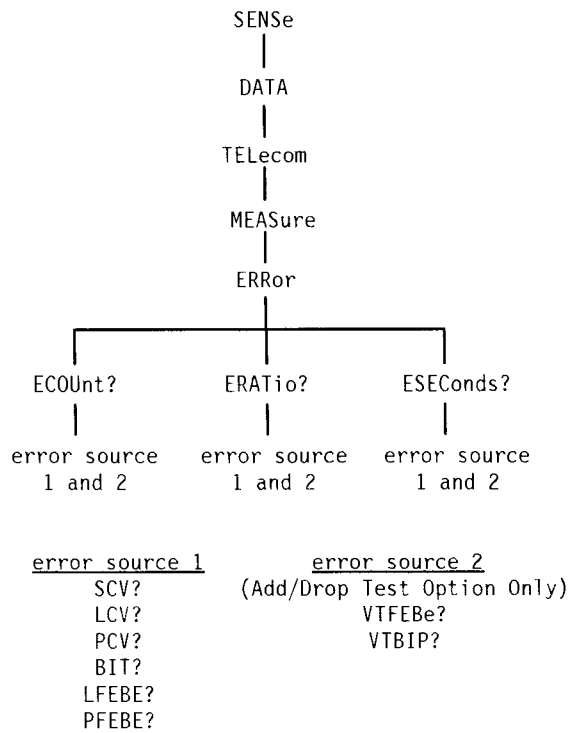
**Figure 2–56: SENSe:DATA:TELecom:MEASure:ERRor subsystem**

```
                           SENSe
                             |
                           DATA
                             |
                         TELecom
                             |
                         MEASure
                             |
                         POINter              Add/Drop Test Option Only
  ┌──────┬──────┬──────────┬────────────┬──────────┬─────────┬─────────┬──────────┬───────────────┬──────────────┐
PPTR?  NPTR?  ICOunt?  NDFSeconds?  IPSeconds? │VTPPTR?  VTNPTR?  VTICOunt?  VTNDFSeconds?  VTIPSeconds?│
```
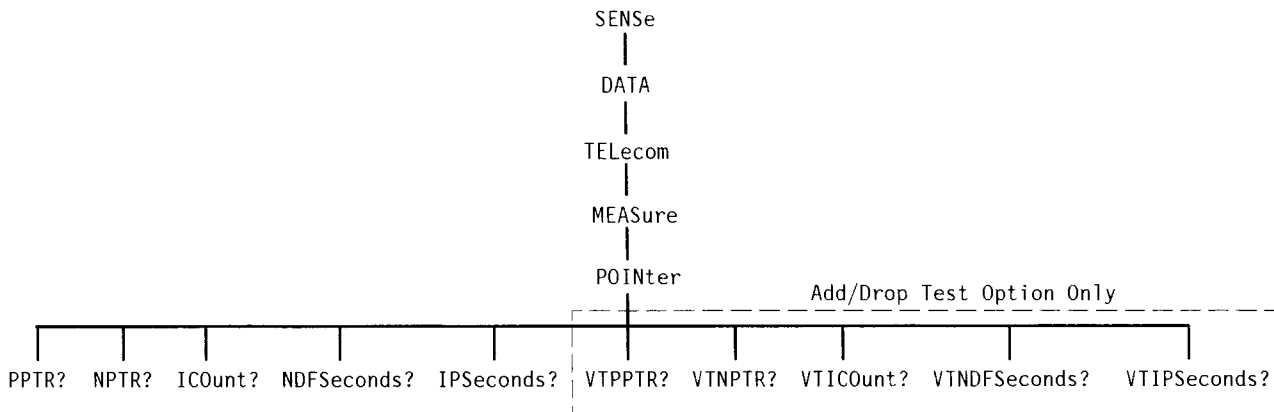
**Figure 2–57: SENSe:DATA:TELecom:MEASure:POINter subsystem**

```
                              SENSe
                                |
                              DATA
                                |
                             TELecom
                                |
                             MEASure
                                |
                              ALARm                    Add/Drop Test Option Only
                                                  ┌─────────────────────────┐
        ┌──────┬──────┬──────┬──────┬──────┬─────┼──────┬──────┐           │
        │      │      │      │      │      │     │      │      │           │
    LOSignal? OOFrame?   LAIS?   PAIS?   LPWR?       VTAIS?   VTLOM?       │
                                                  │                        │
        LOFrame?  LOPointer?  LFERF?   PFERF?   │ VTLOP?   VTFERF?         │
                                                  └─────────────────────────┘
```
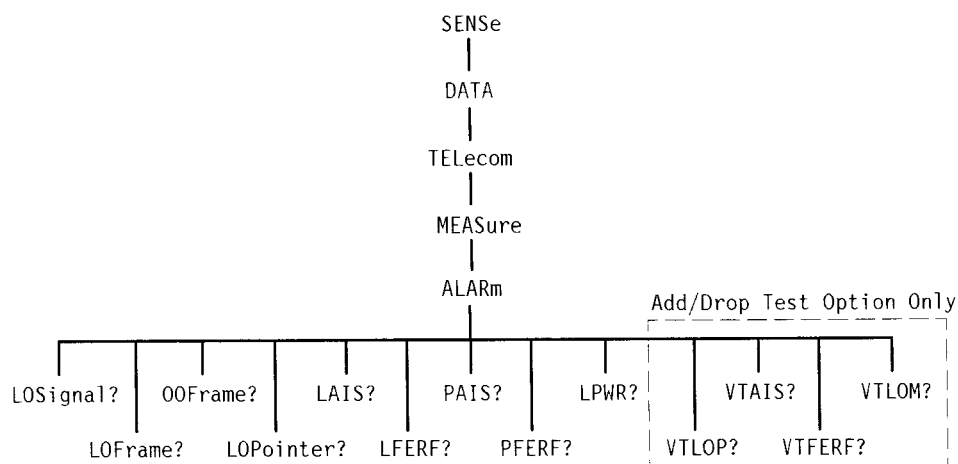
**Figure 2–58: SENSe:DATA:TELecom:MEASure:ALARm subsystem**

```
                              SENSe
                                |
                              DATA
                                |
                             TELecom
                                |
                             MEASure
        ┌───────────┬───────────┬───────────┬───────────┐
     HIStory      BUFFer    INFOrmation?   TSCAn?      CONFig
  ┌─────────┐       │                                 ┌FASthreshold
  │         │       │                                 ├CRCthreshold
E4FRame  PDH:ALarm  AVAIlable?                         ├POINter
E3FRame                                               └TRACe --> MISmatch
E2FRame
E1FRame
E4BLock
E3BLock          ┌──────┬──────┬──────┬───────────┬──────────┬───────────┐
E2BLock        STATus?  DATE?  USER?  DESCription?  MAPPing?   STRUcture?
E1BLock
                 TIME?   LENGth?   OWNer?        SOURce?    RATE?
```

**Figure 2–59: SENSe:DATA:TELecom:MEASure:BUFFer and INFOrmation subsystems**

A variety of error, alarm, failure, and pointer measurements are reported through this subsystem. Table 2–13 shows how error, alarm, and failure measurements

are calculated. Tables 2–14 and 2–15 show how the analysis measurements are calculated. These calculations are based on CCITT G.821 specifications.

**Table 2–13: How error, alarm, and pointer measurements are calculated**

| Type of Measurement | Method of Calculation |
|---|---|
| Error count | Number of bit errors that were errored in the signal |
| Bit Error Ratio (BER) | Ratio of error count to the total number of received bits |
| Errored seconds | Number of seconds that had any error counts or failures such as Loss of Signal (LOS) or Severely Errored Frame (SEF) |
| Pointer measurements | Number of events that occur in the H1 and H2 pointer bytes |
|    New Data Flag Seconds | Number of one-second intervals that contain new data flags |
|    Illegal Pointer Seconds | Number of one-second intervals that contain illegal pointers |
|    Positive Pointer Justifications | Number of times the pointer value is incremented |
|    Negative Pointer Justifications | Number of times the pointer value is decremented |
| Alarms | Number of one-second intervals that contained a specific alarm such as Loss of Signal (LOS), Loss of Pointer (LOP), and Path Alarm Indication Signal (PAIS) |

**Table 2–14: How analysis measurements are calculated**

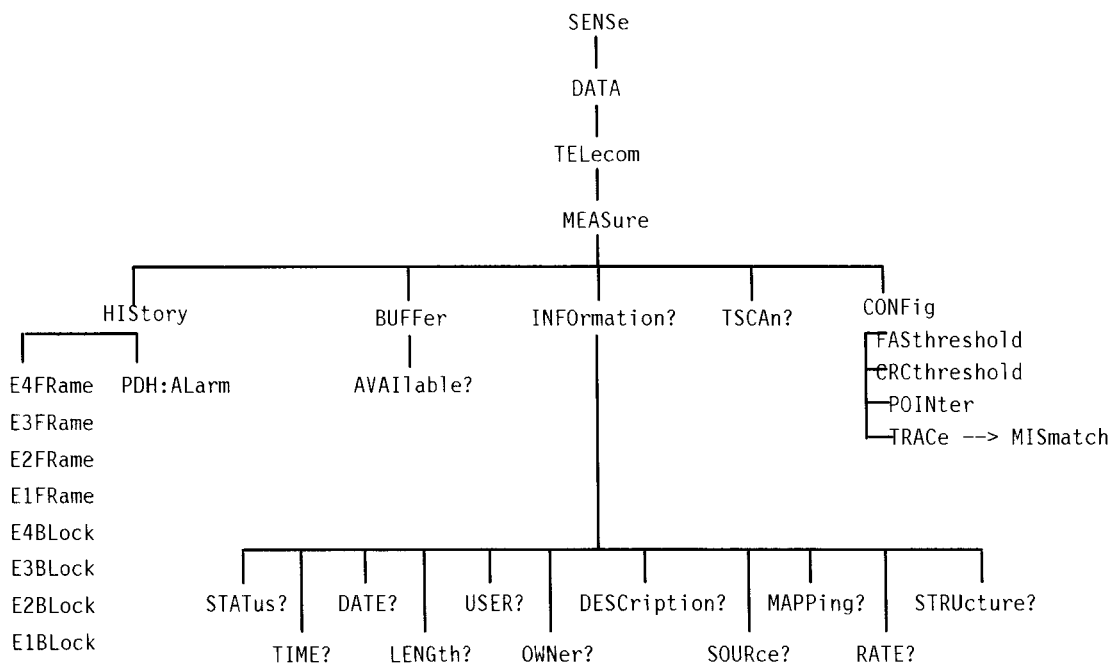| Type of Measurement | Method of Calculation |
|---|---|
| Error count | Number of bit errors not occurring during periods of unavailability (see Unavailable seconds) |
| Errored seconds | Total number of severely errored seconds not occurring during a period of unavailability (see Unavailable seconds) |
| Severely errored seconds | Number of seconds with more than N errors (see Table 2–15) |
| Severely errored framing seconds | Number of seconds where the incoming signal could not be framed (applies only to the Section layer) |
| Unavailable seconds | Number of seconds that the signal had too many errors to be available for use; unavailability starts at the onset of ten contiguous severely errored seconds |
| Error free seconds | Number of seconds that contained zero errors |

**Table 2-15: Value of N for analysis measurements**

| Rate | N (Section B1 Errors) | N (Line B2 Errors) |
|------|----------------------|--------------------|
| STM-1 | 2500 | 2500 |
| STM-4 | 8800 | 10000 |

Some of the queries in this section have their information presented in a way that is different from queries in the rest of the manual. The syntax and examples are in table format. Figure 2-60 shows you how to read the Syntax Tables in this section. Follow the step numbers to create any query. Table 2-16 explains the acronyms used in the SENSe:DATA:TELecom:MEASure Syntax Tables.

**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 2-60: How to read the syntax tables in the SENSe:DATA:TELecom:MEASure subsystem section**

**Table 2-16: Acronyms used in the SENSe:DATA:TELecom:MEASure queries**

| Acronym | Meaning |
|---------|---------|
| SCV | Section/RS Code Violation |
| LCV | Line/MS Code Violation |
| PCV | Path Code Violation |
| BIT error (not an acronym) | Pattern bit error |
| LFEBE | Line/MS Far End Block Error |
| PFEBE | Path Far End Block Error |
| VTBIP | TU BIP (Add/Drop Test Option Only) |
| VTFEBE | TU FEBE (Add/Drop Test Option Only) |

Figure 2-61 shows you how to read the Example Tables in this section.

**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 2-61: How to read the example tables in the SENSe:DATA:TELecom:MEASure subsystem section**

# SENSe:DATA:TELecom:MEASure:ERRor Queries

These queries return error measurements. When you use the high-level queries (for example, SENSe:DATA:TELecom:MEASure:ERRor? or SENSe:DATA:TELecom:MEASure:ERRor:ECOUnt?), it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

**Syntax**    SENSe:DATA:TELecom:MEASure:ERRor?

SENSe:DATA:TELecom:MEASure:ERRor:[measurement]:[error source]
(see Tables 2-17 and 2-18 to complete the query)

Table 2-17: Syntax table for SENSe:DATA:TELecom:MEASure:ERRor queries

| Select a measurement from the left column | Then select an error source from the top row | | | | | | |
|---|---|---|---|---|---|---|---|
| | ? | :SCV? | :LCV? | :PCV? | :BIT? | :LFEBE? | :PFEBE? |
| ECOUnt | all error counts | error count | error count | error count | error count | error count | error count |
| ERATio | all bit error ratios | bit error ratio | bit error ratio | bit error ratio | bit error ratio | bit error ratio | bit error ratio |
| ESEConds | all errored seconds | errored seconds | errored seconds | errored seconds | errored seconds | errored seconds | errored seconds |

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

**All bit error ratios return NR1-numeric responses.**

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

| Select a measurement from the left column | Then select an error source from the top row | |
|---|---|---|
| | :VTFEBe? | :VTBIP? |
| ECOUnt: | error count | error count |
| ERATio | bit error ratio | bit error ratio |
| ESEConds | errored seconds | errored seconds |

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

**All bit error ratios return NR1-numeric responses.**

**Response**     See Tables 2–17 and 2–18.

**Dependencies**     These measurement queries can be sent at any time. But, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**     None

**Examples**   See Table 2-19.

**Table 2-19: Example table for SENSe:DATA:TELecom:MEASure:ERRor queries**

| Query | Response |
|---|---|
| SENSE:DATA:TELECOM:MEASURE:ERROR:ECOUNT:SCV? | 60904 |
| SENSE:DATA:TELECOM:MEASURE:ERROR:ERATIO:PCV? | 9.23E-6 |
| SENSE:DATA:TELECOM:MEASURE:ERROR:ESECONDS:PFEBE? | 6 |

**Related Commands**   SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

# SENSe:DATA:TELecom:MEASure:ANALysis Queries

These queries return an analysis of section, line, path, and payload errors. When you use the high-level queries (for example, SENSe:DATA:TELecom: MEASure:ANALysis? or SENSe:DATA:TELecom:MEASure: ANALysis:ECOUnt?), it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

**Syntax**   SENSe:DATA:TELecom:MEASure:ANALysis?

SENSe:DATA:TELecom:MEASure:ANALysis:[measurement]:[error source] (see Tables 2-20 and 2-21 to complete the query)

**Table 2-20: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries**

| Select a measurement from the left column | Then select an error source from the top row | | | | | | |
|---|---|---|---|---|---|---|---|
| | ? | :SCV? | :LCV? | :PCV? | :BIT? | :LFEBE? | :PFEBE? |
| ECOUnt | all error counts | no query | no query | no query | all error counts | no query | no query |
| ESEConds | all errored seconds | errored seconds | errored seconds | errored seconds | errored seconds | errored seconds | errored seconds |
| PESeconds | all ratio errored seconds | ratio errored seconds | ratio errored seconds | ratio errored seconds | percent errored seconds | ratio errored seconds | ratio errored seconds |
| SESeconds | all severely errored seconds | severely errored seconds | severely errored seconds | severely errored seconds | severely errored seconds | severely errored seconds | severely errored seconds |
| PSESeconds | all ratio severely errored seconds | ratio severely errored seconds | ratio severely errored seconds | ratio severely errored seconds | percent severely errored seconds | ratio severely errored seconds | ratio severely errored seconds |

**Table 2-20: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries (Cont.)**

| Select a measurement from the left column | Then select an error source from the top row | | | | | | |
|---|---|---|---|---|---|---|---|
| | ? | :SCV? | :LCV? | :PCV? | :BIT? | :LFEBE? | :PFEBE? |
| UASeconds | all unavailable seconds | unavailable seconds | unavailable seconds | unavailable seconds | unavailable seconds | unavailable seconds | unavailable seconds |
| PUASeconds | all ratio unavailable seconds | ratio unavailable seconds | ratio unavailable seconds | ratio unavailable seconds | percent unavailable seconds | ratio unavailable seconds | ratio unavailable seconds |
| EFSeconds | all error free seconds | no query | no query | no query | error free seconds | no query | no query |
| PEFSeconds | all percent error free seconds | no query | no query | no query | percent error free seconds | no query | no query |
| DMINutes | all degraded minutes | no query | no query | no query | degraded minutes | no query | no query |
| PDMINutes | all percent degraded minutes | no query | no query | no query | percent degraded minutes | no query | no query |
| EBLock | all block errors | block errors | block errors | block errors | no query | block errors | block errors |
| BBError | all background block errors | background block errors | background block errors | background block errors | no query | background block errors | background block errors |
| PBBError | all ratio background block errors | ratio background block errors | ratio background block errors | ratio background block errors | no query | ratio background block errors | ratio background block errors |
| PTHUaseconds | path unavailable seconds | no query | path unavailable seconds | path unavailable seconds | path unavailable seconds | path unavailable seconds | path unavailable seconds |
| PPTHUaseconds | path unavailable seconds ratio | no query | path unavailable seconds ratio | path unavailable seconds ratio | path unavailable seconds ratio | path unavailable seconds ratio | path unavailable seconds ratio |

**All percent measurements return NR1-numeric responses.**

**All other measurements return NR1-numeric responses.**

**Table 2-21: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries (SDH and Add/Drop Test Option Only)**

| Select a measurement from the left column | Then select an error source from the top row | |
|---|---|---|
| | :VTFEBe? | :VTBIP? |
| ESEConds | errored seconds | errored seconds |
| PESeconds | ratio errored seconds | ratio errored seconds |
| EBLock | block errors | block errors |

**Table 2-21: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis queries (SDH and Add/Drop Test Option Only) (Cont.)**

| Select a measurement from the left column | Then select an error source from the top row | |
| --- | --- | --- |
| | :VTFEBe? | :VTBIP? |
| BBError | background block errors | background block errors |
| PBBError | ratio background block errors | ratio background block errors |
| SESeconds | severely errored seconds | severely errored seconds |
| PSESeconds | ratio severely errored seconds | ratio severely errored seconds |
| UASeconds | unavailable seconds | unavailable seconds |
| PUASeconds | ratio unavailable seconds | ratio unavailable seconds |

**All bit error ratios and percent measurements return NR1-numeric responses.**

**All other measurements return NR1-numeric responses.**

**Response**  See Tables 2–20 and 2–21.

**Dependencies**  These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**  None

**Examples**  See Table 2–22.

**Table 2-22: Example table for SENSe:DATA:TELecom:MEASure:ANALysis queries (SDH)**

| Query | Response |
| --- | --- |
| SENSE:DATA:TELECOM:MEASURE:ANALYSIS:SESECONDS:LCV? | 23 |
| SENSE:DATA:TELECOM:MEASURE:ANALYSIS:BBERROR:SCV? | 103 |
| SENSE:DATA:TELECOM:MEASURE:ANALYSIS:PUASECONDS:LFEBE? | 1.2E-1 |

**Related Commands**  SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

Table 2-23: Syntax table for SENSe:DATA:TELecom:MEASure:ANALysis:2101
*queries*

| Select a measurement from the left column | Then select an error source | |
| --- | --- | --- |
| | :B1, | :B1, :B2, :B3, :TUBIP, :MSREI, :HPREI, or :LPREI |
| ECOUnt | error block count | error block count |
| ESEConds | error second count | error second count |
| PESeconds | ratio errored seconds | ratio errored seconds |
| BBError | background block error | background block error |
| PBBError | background block error ratio | background block error ratio |
| SESeconds | severely errored seconds count | severely errored seconds count |
| PSESeconds | ratio severely errored seconds count | ratio severely errored seconds count |
| CSES | consecutively severely errored seconds period count | consecutively severely errored seconds period count |
| UASeconds | unavailable seconds count | unavailable seconds count |
| PUASeconds | unavailable seconds ratio | unavailable seconds ratio |
| PTHUaseconds | does not apply for B1 | path unavailable seconds |
| PPTHUasecond | does not apply for B1 | path unavailable seconds ratio |
| VERDict | pass or fail verdict | pass or fail verdict |

# SENSe:DATA:TELecom:MEASure:ALARm Queries

These queries return alarm measurements. When you use the SENSe:DATA:
TELecom:MEASure:ALARm? query, it is helpful to turn the headers on
(SYSTem:HEADers ON) so you can identify each response value in the response
string.

**Syntax**    All valid queries are listed in the Syntax column of Tables 2–24 and 2–25.

Table 2-24: Syntax table for SENSe:DATA:TELecom:MEASure:ALARm queries

| Syntax | Response |
| --- | --- |
| SENSe:DATA:TELecom:MEASure:ALARm? | All alarm measurements |
| SENSe:DATA:TELecom:MEASure:ALARm:LOSignal? | Number of seconds of Loss of Signal |
| SENSe:DATA:TELecom:MEASure:ALARm:LOFrame? | Number of seconds of Loss of Frame |
| SENSe:DATA:TELecom:MEASure:ALARm:OOFrame? | Number of seconds of Out of Frame |

**Table 2-24: Syntax table for SENSe:DATA:TELecom:MEASure:ALARm queries (Cont.)**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:ALARm:LOPointer? | Number of seconds of Loss of Pointer |
| SENSe:DATA:TELecom:MEASure:ALARm:LAIS? | Number of seconds of MS AIS |
| SENSe:DATA:TELecom:MEASure:ALARm:LFERf? | Number of seconds of MS FERF |
| SENSe:DATA:TELecom:MEASure:ALARm:PFERf? | Number of seconds of Path FERF |
| SENSe:DATA:TELecom:MEASure:ALARm:PAIS? | Number of seconds of Path AIS |
| SENSe:DATA:TELecom:MEASure:ALARm:LPWR? | Number of seconds of instrument power loss during a test |
| SENSe:DATA:TELecom:MEASure:ALARm:LPRFI? | Number of seconds of low order path remote failure indication |
| SENSe:DATA:TELecom:MEASure:ALARm:HPUNEQuipped? | Number of seconds of high order path unequipped |
| SENSe:DATA:TELecom:MEASure:ALARm:LPUNEQuipped? | Number of seconds of low order path unequipped |
| SENSe:DATA:TELecom:MEASure:ALARm:HPPLM? | Number of seconds of high order payload mismatch |
| SENSe:DATA:TELecom:MEASure:ALARm:LPPLM? | Number of seconds of low order payload mismatch |

**All responses are in NR1-numeric format.**

**Table 2-25: Syntax table for SENSe:DATA:TELecom:MEASure:ALARm queries**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:ALARm:VTLOP? | Number of seconds of tributary Loss of Pointer |
| SENSe:DATA:TELecom:MEASure:ALARm:VTAIS? | Number of seconds of tributary AIS |
| SENSe:DATA:TELecom:MEASure:ALARm:VTFERF? | Number of seconds of tributary FERF |
| SENSe:DATA:TELecom:MEASure:ALARm:VTLOM? | Number of seconds of tributary Loss of Multiframe |

**All responses are in NR1-numeric format.**

**Response**    See the Response column of Tables 2–24 and 2–25.

**Dependencies**    These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**    None

**Examples**    See Table 2-26.

**Table 2-26: Example table for SENSe:DATA:TELecom:MEASure:ALARm queries**

| Query | Response |
|---|---|
| SENSE:DATA:TELECOM:MEASURE:ALARM:LOPOINTER? | 20 |
| SENSE:DATA:TELECOM:MEASURE:ALARM:OOFRAME? | 13 |

**Related Commands**    SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

# SENSe:DATA:TELecom:MEASure:POINter Queries

These queries return pointer-related measurements. When you use the SENSe:
DATA:TELecom:MEASure:POINter? query, it is helpful to turn the headers on
(SYSTem:HEADers ON) so you can identify each response value in the response
string.

**Syntax**    All valid queries are listed in the Syntax column of Tables 2-27 and 2-28.

**Table 2-27: Syntax table for SENSe:DATA:TELecom:MEASure:POINter queries**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:POINter? | All pointer measurements |
| SENSe:DATA:TELecom:MEASure:POINter:NDFSeconds? | Number of seconds in which one or more NDFs (new data flags) occurred |
| SENSe:DATA:TELecom:MEASure:POINter:IPSeconds? | Number of seconds in which one or more illegal pointer adjustments occurred |
| SENSe:DATA:TELecom:MEASure:POINter:PPTR? | Number of positive pointer justifications |
| SENSe:DATA:TELecom:MEASure:POINter:NPTR? | Number of negative pointer justifications |
| SENSe:DATA:TELecom:MEASure:POINter:ICOunt? | Number of invalid pointers |

All responses are in NR1-numeric format.

**Table 2-28: Syntax table for SENSe:DATA:TELecom:MEASure:POINter queries (Add/Drop Test Option Only)**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:POINter:VTPPTR? | Number of tributary positive pointer justifications |
| SENSe:DATA:TELecom:MEASure:POINter:VTNPTR? | Number of tributary negative pointer justifications |

**Table 2-28: Syntax table for SENSe:DATA:TELecom:MEASure:POINter queries (Add/Drop Test Option Only) (Cont.)**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:POINter:VTICOunt? | Number of tributary invalid pointers |
| SENSe:DATA:TELecom:MEASure:POINter:VTNDFSeconds? | Number of seconds in which one or more tributary NDFs (new data flags) occurred |
| SENSe:DATA:TELecom:MEASure:POINter:VTIPSec? | Number of seconds in which one or more illegal tributary pointer adjustments occurred |

**All responses are in NR1-numeric format.**

**Response**     See the Response column of Tables 2–27 and 2–28.

**Dependencies**     These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**     None

**Examples**     See Table 2–29.

**Table 2-29: Example table for SENSe:DATA:TELecom:MEASure:POINter queries**

| Query | Response |
|---|---|
| SENSE:DATA:TELECOM:MEASURE:POINTER:PPTR? | 12 |
| SENSE:DATA:TELECOM:MEASURE:POINTER:ICOUNT? | 0 |

**Related Commands**     SENSe:DATA:TELecom:TEST:STARt
SENSe:DATA:TELecom:TEST:STOP

# SENSe:DATA:TELecom:MEASure:BUFFer

This command sets or queries the buffer that is read with the measurement queries. The following buffers are available for use: buffer number 1 contains results from the most recent test, and buffer number 2 contains results from the previous test. The current test results might overflow into the previous test results buffer (buffer number 2). In that case, only buffer number 1 is available for use. Use the SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable? query to determine the oldest available buffer.

Buffer number -1 contains results that have been accessed from disk. After you give the MMEMory:LOAD:RESUlts command, the buffer number is set to -1.

**Syntax**  SENSe:DATA:TELecom:MEASure:BUFFer <results buffer>
SENSe:DATA:TELecom:MEASure:BUFFer?

**Parameters**

| <results buffer> (NR1-numeric) | description |
|---|---|
| 1 or 2 | Buffer number read with the measurement queries (default = 1) |
| -1 | Information from the MMEMory:LOAD: RESUlts command is stored in this buffer |

**Dependencies**  None

**Errors and Events**  200, "Execution error; Temporary buffer is empty"

**Examples**  Set:  SENSE:DATA:TELECOM:MEASURE:BUFFER 2

Query:  SENSE:DATA:TELECOM:MEASURE:BUFFER?

Response:  2

**Related Commands**  SENSe:DATA:TELecom:MEASure:INFOrmation?
SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable
MMEMory:LOAD:RESUlts

# SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable?

This query returns the oldest buffer accessible with the measurement and history queries. The value returned by this query is the maximum value you can use in the SENSe:DATA:TELecom:MEASure:BUFFer command.

Buffer number 1 contains results from the most recent test. Buffer number 2 contains results from the previous test. The current results might overflow into the previous test results buffer (buffer number 2). In that case, only buffer number 1 is available for use.

While a test is running, the response to this query is always 1 because only current test results can be displayed at that time.

**Syntax**    SENSe:DATA:TELecom:MEASure:BUFFer:AVAIlable?

**Response**

| <oldest buffer> (NR1-numeric) | description |
|---|---|
| 1 or 2 | Oldest buffer number read with the measurement queries (default = 1) |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:BUFFER?

Response:  2

**Related Commands**    SENSe:DATA:TELecom:MEASure:BUFFer

# SENSe:DATA:TELecom:MEASure:INFOrmation Queries

This query returns information on the buffer accessed with the measurement and history queries. This query returns information about the current test (could be in progress, or could be recalled from memory or disk).

**Syntax**    All valid queries are listed in the Syntax column of Table 2–30.

**Table 2–30: Syntax table for SENSe:DATA:TELecom:MEASure:INFOrmation queries**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:INFOrmation? | [All measurement information] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:DATE? | year,month,day<br>[the date the test starts] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:DESCription? | [Description of the test] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:FRAMing? | [Tributary framing] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:INSTrument? | [Instrument identity] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:CLOCk:RATE? | [Jitter measurement clock rate] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:FILTer? | [Jitter measurement band filter setting] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:FILTer:FULLband:JPASS | [Jitter fullband Hpass] |

**Table 2-30: Syntax table for SENSe:DATA:TELecom:MEASure:INFOrmation queries (Cont.)**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:MODE? | [Jitter measurement mode] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:RANGe? | [Jitter measurement range] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:JITter:SOURce? | [Jitter measurement source] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:LAYER? | Returns the active layer |
| SENSe:DATA:TELecom:MEASure:INFOrmation:LENGth? | [Length of the test information in "buckets"] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:MAPPing? | EQUIpped, UNEQuipped, TUASYNC, TU3, M140 |
| SENSe:DATA:TELecom:MEASure:INFOrmation:OPTIons? | [Instrument options] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:OWNer? | [Same information as the SYSTem:OWNer? query] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:PAYLoad? | Returns the active payload rate for the test |
| SENSe:DATA:TELecom:MEASure:INFOrmation:RATE? | STM0, STM1, STM4 M2, M34, M45, M140 |
| SENSe:DATA:TELecom:MEASure:INFOrmation:RESolution? | MIN1, MIN15, SEC1 [Resolution of acquired data] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:SOURce? | INPUT1, INPUT2, INPUT3 [SDH or tributary signal] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:STATus? | EMPTY, RECORDING, COMPLETE |
| SENSe:DATA:TELecom:MEASure:INFOrmation:STRUcture? | AU3, AU4 |
| SENSe:DATA:TELecom:MEASure:INFOrmation:TIME? | hour,minute [the time the test starts] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:USER? | [Same information as the SYSTem:USER? query] |
| SENSe:DATA:TELecom:MEASure:INFOrmation:PAYLoad? | Returns the active payload rate for the test |
| SENSe:DATA:TELecom:MEASure:INFOrmation:PDHpath? | The PDH analysis linking in effect during the test – linked or independent |
| SENSe:DATA:TELecom:MEASure:INFOrmation:FASthreshold? | FAS error threshold active during the test |
| SENSe:DATA:TELecom:MEASure:INFOrmation:CRCthreshold? | 2 MB/s CRC4 error threshold used to classify a severely errored second |
| SENSe:DATA:TELecom:MEASure:INFOrmation:DMX2:CHANnel? | Active 2 Mb/s channel demuxed from 8 Mb/s signal |
| SENSe:DATA:TELecom:MEASure:INFOrmation:DMX8:CHANnel? | Active 8 Mb/s channel demuxed from 34 Mb/s signal |
| SENSe:DATA:TELecom:MEASure:INFOrmation:DMX34:CHANnel? | Active 34 Mb/s channel demuxed from 140 Mb/s signal |

**Table 2-30: Syntax table for SENSe:DATA:TELecom:MEASure:INFOrmation queries (Cont.)**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:INFOrmation:K64:MULTiplier? | Number of contiguous timeslots in 64k payload |
| SENSe:DATA:TELecom:MEASure:INFOrmation:K64:TIMEslot? | Starting timeslot in a 1x64k or Nx64k payload |

**The status, time, date, and length responses are in NR1-numeric format.**

**All other responses are in string format.**

**If structure, mapping, and framing do not apply to the received signal, the response is NONE.**

**Response**     See the Response column of Table 2-30.

**Dependencies**     Information is valid only when a test is completed. Set SENSe:DATA:TELecom:MEASure:BUFFer to the buffer for which you want information.

**Errors and Events**     200, "Execution error; Test is still running"

**Examples**     See Table 2-31.

**Table 2-31: Example table for SENSe:DATA:TELecom:MEASure:INFOrmation queries**

| Query | Response |
|---|---|
| SENSE:DATA:TELECOM:MEASURE:INFORMATION:TIME? | 14,22,0 |
| SENSE:DATA:TELECOM:MEASURE:INFORMATION:DESCRIPTION? | "PORTLAND TO SEATTLE NETWORK TEST" |
| SENSE:DATA:TELECOM:MEASURE:INFORMATION:MAPPING? | EQUIPPED |

**Related Commands**     SENSe:DATA:TELecom:MEASure:BUFFer

**Table 2-32: Syntax table for SENSe:DATA:TELecom:MEASure:HIStory queries**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:HIStory:E4FRame, E3FRame, E2FRame, E1FRame, E4BLock, E3BLock, E2BLock, E1BLock | New queries for ECOunt and ESEconds |
| SENSe:DATA:TELecom:MEASure:HIStory:PDH:ALArm | Returns bit-coded value for PDH alarms in the specified history period |

# SENSe:DATA:TELecom:MEASure:TSCAn?

This query returns Trouble Scan Information to help you determine the severity of errors during a test. The information in the response is for human interpretation only and is highly variable depending upon the signal being tested and whether or not the test is complete.

**Syntax**   SENSe:DATA:TELecom:MEASure:TSCAn?

**Response**

| <tscan information> (string) | description |
|---|---|
| A string, maximum length of 256 bytes | Information about a test currently running or complete |

**Dependencies**   None

**Examples**   Query:      SENSE:DATA:TELECOM:MEASURE:TSCAN?

Response:   "NO ALARMS, BER: 1.2E-8"

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:CONFig:FASthreshold

The measurment configuration commands (SENSe:DATA:TELecom:
MEASure:CONFig:) set values for the parameters found in the receive config
folder.

This command sets the number of consecutive errored frame alignment blocks
that are detected before an error is reported. The valid range for this parameter is
1 through 7, which would be set by the operator to match the provisioning of the
equipment being tested. The command permits the operator to select different
thresholds for different layers in the demux path.

**Syntax**    SENSe:DATA:TELecom:MEASure:CONFig:FASthreshold

**Response**

| <threshold> | setting |
|---|---|
| 1 through 7 | Number of consecutive FAS errors detected before an error is reported |

**Dependencies**    Nopne

**Examples**    Set :    SENSE:DATA:TELECOM:MEASURE:CONFig:FASthreshold 7

Response:   7

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:CONFig:CRCthreshold

Previous versions of ITU-T standard M.2100 required that an SES be declared
when 805 CRC4 or E-bit errors were detected in 1-second. The latest verion of
the M.2100 standard sets this threshold at 300 errors. This selection permits
backwards-compatible measurements.

**Syntax**    SENSe:DATA:TELecom:MEASure:CONFig:CRCthreshold

**Response**

| <threshold>discrete | description |
|---|---|
| 300 | M.2100 SES declared after detection of 300 CRC errors in one second (This is the default.) |
| 805 | M.2100 SES declared after detection of 805 CRC errors in one second, backwards-compatible |

**Dependencies**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:CONFig:CRCthreshold 300

Response: 300

# SENSe:DATA:TELecom:MEASure:CONFig:POINter:MISmatch

By definition, the pointer S–bits should be 10–binary. This option lets the operator choose to declare a loss of pointer error when the bits are incorrect, or ignore the error altogether.

**Syntax**   SENSe:DATA:TELecom:MEASure:pointer:mismatch <action>

**Response**

| <action>discrete | description |
|---|---|
| TULOP | If the detected S–bits do not match the G.707 specification (10–binary) declare a loss of pointer. This is the default. |
| IGNORE | Ignore an error if the S–bits do not match the specification. |

**Dependencies**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:CONFig:POINter:MISmatch IGNORE

Response:   IGNORE

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:CONFig:TRACe:MISmatch

This command enables or disables the trace mismatch.

**Syntax**   SENSe:DATA:TELecom:MEASure:CONfig:TRACe:MISmatch <status>

**Response**

| status | description |
|--------|-------------|
| DISABLE | Turns mismatch off |
| ENABLE | Turns mismatch on |

**Dependencies**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:CONFig:TRACe:MISmatch ENABLE

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:ANALysis Subsystem

This section describes the commands and queries that access B1, B2, B3, G.826 and M2101.1 verdict analysis. Figure 2-69 shows the hierarchy tree for this CTS 850 subsystem.
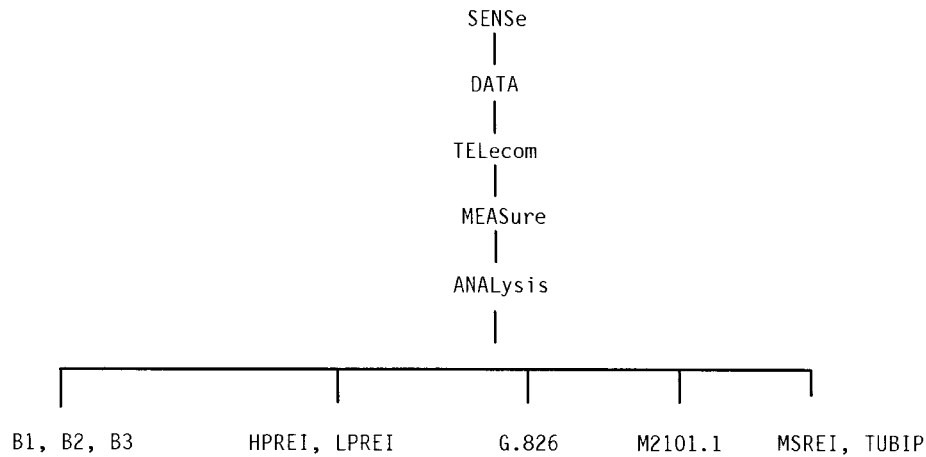
```
                              SENSe
                                |
                              DATA
                                |
                             TELecom
                                |
                             MEASure
                                |
                             ANALysis
                                |
    ┌─────────────┬──────────────┬──────────────┬──────────────┐
  B1, B2, B3   HPREI, LPREI     G.826       M2101.1     MSREI, TUBIP
```

**Figure 2-69: SENSe:DATA:TELecom:MEASure:ANALysis subsystems**

# SENSe:DATA:TELecom:MEASure:ANALysis:B1:VERDict

This command sets the Verdict Analysis.

**Syntax**
SENSe:DATA:TELecom:MEASure:ANALysis:B1:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:B1:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**    None

**Errors and Events**    None

**Examples**  Set:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B1:VERDICT
ACCEPTABLE

Query:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B1:VERDICT?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B1:VERDICT
ACCEPTABLE

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:ANALysis:B2:VERDict

This command sets the Verdict Analysis.

**Syntax**  SENSe:DATA:TELecom:MEASure:ANALysis:B2:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:B2:VERDict?

**Parameters**

| <status> | description |
|---|---|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B2:VERDICT
ACCEPTABLE

Query:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B2:VERDICT?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B2:VERDICT
ACCEPTABLE

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:ANALysis:B3:VERDict

This command sets the Verdict Analysis.

**Syntax**
SENSe:DATA:TELecom:MEASure:ANALysis:B3:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:B3:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B3:VERDICT
ACCEPTABLE

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B3:VERDICT?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:B3:VERDICT
ACCEPTABLE

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:G826:ALLOcation

This command sets or queries the numeric allocation percentage for the SDH
section and path.

**Syntax**
SENSe:DATA:TELecom:MEASure:ANALysis:G826:ALLOcation <number>
SENSe:DATA:TELecom:MEASure:ANALysis:G826:ALLOcation?

**Parameters**

| <number> | description |
|----------|-------------|
| a number in the range of 0.1 to 200 | Sets the numeric allocation percentage |

|  |  |
|---|---|
| **Dependencies** | None |

|  |  |
|---|---|
| **Errors and Events** | None |

| | | |
|---|---|---|
| **Examples** | Set: | SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:ALLOCATION<br>1.5E6 |
| | Query: | SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G825:ALLOCATION? |
| | Response: | SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:ALLOCATION<br>1.5E6 |

|  |  |
|---|---|
| **Related Commands** | None |

# SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:ENABle

This command enables or disables the consideration of unavailable seconds in determining the test results for G.826 performance analysis.

| **Syntax** | SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:ENABle <boolean><br>SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:ENABle? |
|---|---|

**Parameters**

| <boolen> | description |
|---|---|
| ON/OFF or YES/NO or TRUE/FALSE | Enable or disable consideration of unavailable time in determining test outcome for G.826 performance analysis |

|  |  |
|---|---|
| **Dependencies** | None |

|  |  |
|---|---|
| **Errors and Events** | None |

| | | |
|---|---|---|
| **Examples** | Set: | SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:ENABle ON |
| | Query: | SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G825:UAS:ENABle? |
| | Response: | SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:ENABle ON |

|  |  |
|---|---|
| **Related Commands** | None |

# SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:LIMIT

This command set the numeric threshold value for unavailable seconds. If G.826 UAS threshold evaluation is enabled and the UAS count exceeds this value, test results are declared as a FAIL.

Note: The lower limit is ten seconds because that is the minimum time period that can be declared unavailable.

**Syntax**    SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:LIMIT <number>
SENSe:DATA:TELecom:MEASure:ANALysis:G826:UAS:LIMIT?

**Parameters**

| <boolen> | description |
|----------|-------------|
| 0-1000000 | Set the numeric threshold value for unavailable seconds at which to declare a failure |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:      SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:LIMIT 5

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G825:UAS:LIMIT?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:G826:UAS:LIMIT 5

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:HPREI:VERDict

This command sets the G826 HPREI Verdict Analysis.

**Syntax**   SENSe:DATA:TELecom:MEASure:ANALysis:HPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:HPREI:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:HPREI:VERDICT
ACCEPTABLE

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:HPREI:VERDICT?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:HPREI:VERDICT
ACCEPTABLE

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:ANALysis:LPREI:VERDict

This command sets the G826 LPREI Verdict Analysis.

**Syntax**
SENSe:DATA:TELecom:MEASure:ANALysis:LPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:LPREI:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:LPREI:VERDICT
ACCEPTABLE

Query:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:LPREI:VERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:LPREI:VERDICT
ACCEPTABLE

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:ANALysis:MSREI:VERDict

This command sets the G826 MSREI Verdict Analysis.

**Syntax**  SENSe:DATA:TELecom:MEASure:ANALysis:MSREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:MSREI:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:MSREI:VERDICT
ACCEPTABLE

Query:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:MSREI:VERDICT?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:MSREI:VERDICT
ACCEPTABLE

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:ANALysis:TUBIP:VERDict

This command sets the G826 TUBIP Verdict Analysis.

**Syntax**  SENSe:DATA:TELecom:MEASure:ANALysis:TUBIP:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:TUBIP:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:TUBIP:VERDICT
ACCEPTABLE

Query:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:TUBIP:VERDICT?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:TUBIP:VERDICT
ACCEPTABLE

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:ALLOcation

This command sets or queries the numeric allocation percentage.

**Syntax**
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:ALLOcation <number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:ALLOcation?

**Parameters**

| <number> | description |
|---|---|
| a number in the range of 0.1 to 200 | Sets the numeric allocation percentage |

**Dependencies**  None

**Errors and Events**  None

**Examples**

Set:       SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:ALLOCATION
1.5E6

Query:     SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:ALLOCATION?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:ALLOCATION
1.5E6

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B1:VERDict

This command sets the M2101 B1 Analysis Result.

**Syntax**

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B1:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:B1:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Acceptable | Analysis result is acceptable |
| Degraded | Analysis result is degraded |
| Unacceptable | Analysis result is unacceptable |
| Provisional | Analysis result is provisional |
| Nodata | Not enough data to decide |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B1:VERDICT ACCEPTABLE

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:B1:VERDICT?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B1:VERDICT ACCEPTABLE

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B2:VERDict

This command sets the M2101 B2 Analysis Result.

**Syntax**   SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B2:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:B2:VERDict?

**Parameters**

| <status> | description |
|---|---|
| Acceptable | Analysis result is acceptable |
| Degraded | Analysis result is degraded |
| Unacceptable | Analysis result is unacceptable |
| Provisional | Analysis result is provisional |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:        SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B2:VERDICT
ACCEPTABLE

Query:      SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:B2:VERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B2:VERDICT
ACCEPTABLE

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B3:VERDict

This command sets the M2101 B3 Analysis Result.

**Syntax**      SENSe:DATA:TELecom:MEASure:ANALysis:M2101:B3:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:B3:VERDict?

**Parameters**

| <status> | description |
|---|---|
| Acceptable | Analysis result is acceptable |
| Degraded | Analysis result is degraded |
| Unacceptable | Analysis result is unacceptable |
| Provisional | Analysis result is provisional |
| Nodata | Not enough data to decide |

**Dependencies**      None

**Errors and Events**      None

**Examples**      Set:      SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B3:VERDICT ACCEPTABLE

Query:      SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:B3:VERDICT?

Response:      SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:B3:VERDICT ACCEPTABLE

**Related Commands**      None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:HPREI:VERDict

This command sets the M2101 HPREI Analysis Result.

**Syntax**   SENSe:DATA:TELecom:MEASure:ANALysis:M2101:HPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:HPREI:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Acceptable | Analysis result is acceptable |
| Degraded | Analysis result is degraded |
| Unacceptable | Analysis result is unacceptable |
| Provisional | Analysis result is provisional |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:HPREI:VERDICT
ACCEPTABLE

Query:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:HPREI:VERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:HPREI:VERDICT
ACCEPTABLE

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:LPREI:VERDict

This command sets the M2101 LPREI Analysis Result.

**Syntax**   SENSe:DATA:TELecom:MEASure:ANALysis:M2101:LPREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:LPREI:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Acceptable | Analysis result is acceptable |
| Degraded | Analysis result is degraded |
| Unacceptable | Analysis result is unacceptable |
| Provisional | Analysis result is provisional |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:LPREI:VERDICT ACCEPTABLE

Query:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:LPREI:VERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:LPREI:VERDICT ACCEPTABLE

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:MSREI:VERDict

This command sets the M2101 MSREI Analysis Result.

**Syntax**    SENSe:DATA:TELecom:MEASure:ANALysis:M2101:MSREI:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:MSREI:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Acceptable | Analysis result is acceptable |
| Degraded | Analysis result is degraded |
| Unacceptable | Analysis result is unacceptable |
| Provisional | Analysis result is provisional |
| Nodata | Not enough data to decide |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:MSREI:VERDICT
ACCEPTABLE

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:MSREI:VERDICT?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:MSREI:VERDICT
ACCEPTABLE

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TUBIP:VERDict

This command sets the M2101 TUBIP Analysis Result.

**Syntax**    SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TUBIP:VERDict <status>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:TUBIP:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Acceptable | Analysis result is acceptable |
| Degraded | Analysis result is degraded |
| Unacceptable | Analysis result is unacceptable |
| Provisional | Analysis result is provisional |
| Nodata | Not enough data to decide |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TUBIP:VERDICT
ACCEPTABLE

Query:        SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:TUBIP:VERDICT?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TUBIP:VERDICT
ACCEPTABLE

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:ESEConds:APOM

This command sets the numeric performance objective multiplier for errored seconds in the path layer.

**Syntax**

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:ESEConds:APOM
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:ESEConds:APOM?

**Parameters**

| <number> | description |
|---|---|
| a number in the range of 0.0 to 200 | Sets the numeric performance objective multiplier |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:
ESEConds:APOM   1.5E6

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:
ESEConds:APOM?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:
ESEConds:APOM   1.5E6

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:SESeconds:APOM

This command sets the numeric performance objective multiplier for severely errored seconds in the path layer.

**Syntax**

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:SESeconds:APOM <number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:PATH:SESeconds:APOM?

**Parameters**

| <number> | description |
|---|---|
| a number in the range of 0.0 to 200 | Sets the numeric performance objective multiplier |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:
SESeconds:APOM   1.5E6

Query:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:
SESeconds:APOM?

Response:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:PATH:
SESeconds:APOM   1.5E6

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:ESEConds:APOM

This command sets the numeric performance objective multiplier for errored seconds in the section layer.

**Syntax**  SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:ESEConds:APOM
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:ESEConds:APOM?

**Parameters**

| <number> | description |
|----------|-------------|
| a number in the range of 0.0 to 200 | Sets the numeric performance objective multiplier |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:     SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:
ESEConds:APOM  1.5E6

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:
ESEConds:APOM?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:
ESEConds:APOM  1.5E6

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:SESeconds:APOM

This command sets the numeric performance objective multiplier for severely errored seconds in the section layer.

**Syntax**

SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:SESeconds:APOM
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:SECTion:SESeconds:APOM?

**Parameters**

| <number> | description |
|---|---|
| a number in the range of 0.0 to 200 | Sets the numeric performance objective multiplier |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:
SESeconds:APOM  1.5E6

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:
SESeconds:APOM?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:SECTion:
SESeconds:APOM  1.5E6

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TEST:TYPE

This command sets the M2101 Test Type.

**Syntax**
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:TEST:TYPE <test type>
SENSe:DATA:TELecom:MEASure:ANALysis:M201:TEST:TYPE?

**Parameters**

| <test type> | description |
|---|---|
| BIS | Bring into service |
| MAINT | Maintenance |
| PAREpair | Performance after repair |
| MANual | Manual |

**Dependencies**    None

**Errors and Events**    None

**Examples**

Set:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TEST:TYPE BIS

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M201:TEST:TYPE?

Response:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:TEST:TYPE BIS

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:ENABle

This command enables or disables the consideration of unavailable seconds in determining the test results for M.2101.1 performance analysis. The ITU–T standard has not yet been determined about what to do with periods of unavailability. This command lets the user decide what to do with periods of unavailability.

**Syntax**
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:ENABle
<boolean>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:ENABle?

| Parameters | <boolen> | description |
|---|---|---|
| | ON/OFF or YES/NO or TRUE/FALSE | Enable or disable consideration of unavailable time in determining test outcome |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:     SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds: ENABle YES

Query:    SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds: ENABle?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds: ENABle YES

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:LIMIT

This command set the numeric threshold value for unavailable seconds. If M.2101.1 UAS threshold evaluation is enabled and the UAS count exceeds this value, test results are declared as a UNACCEPTABLE.

Note: The lower limit is ten seconds because that is the minimum time period that can be declared unavailable.

**Syntax**  SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:LIMIT
<number>
SENSe:DATA:TELecom:MEASure:ANALysis:M2101:UASeconds:LIMIT?

| Parameters | <boolen> | description |
|---|---|---|
| | 0-1000000 | Set the numeric threshold value for unavailable seconds at which to declare a failure |

**Dependencies**  None

**Errors and Events**     None

**Examples**     Set:      SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:
UASeconds:LIMIT 5

Query:   SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:
LIMIT?

Response:  SENSE:DATA:TELECOM:MEASURE:ANALYSIS:M2101:UASeconds:
LIMIT 5

**Related Commands**     None

# SENSe:DATA:TELecom:MEASure:STESts Subsystem

This section describes each of the commands and queries that allow you to apply predefined criteria to test results and determine if the tests passed or failed. Figure 2–71 shows the hierarchy tree for this CTS 850 subsystem.

```
                    SENSe
                      |
                    DATA
                      |
                   TELecom
                      |
                   MEASure
                      |
                   STESts
        ┌───────┬──────┴──┬──────────┬───────┐
     ENABle  DESCription THREshold  RESUlts?  DONE
```
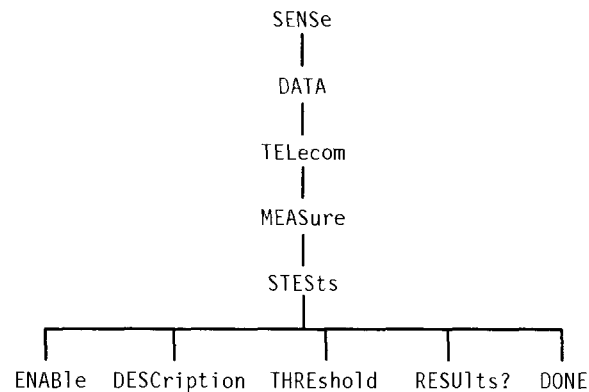
**Figure 2–71: SENSe:DATA:TELecom:MEASure:STESts subsystem**

# SENSe:DATA:TELecom:MEASure:STESts:ENABle

This command sets or queries the evaluation of pass/fail tests. The enable will revert to OFF (0) after the pass/fail test is evaluated.

**Syntax**

SENSe:DATA:TELecom:MEASure:STESts:ENABle <stests enable>
SENSe:DATA:TELecom:MEASure:STESts:ENABle?

**Parameters**

| <stests enable> (boolean) | Description |
|---|---|
| OFF or 0 | No evaluation (default) |
| ON or 1 | Measurements evaluated |

**Dependencies**     None

**Errors and Events**     None

**Examples**    Set:        SENSE:DATA:TELECOM:MEASURE:STESTS:ENABLE ON

Query:      SENSE:DATA:TELECOM:MEASURE:STESTS:ENABLE?

Response:   1

**Related Commands**    SENSe:DATA:TELecom:MEASure:STESTs:THREshold

# SENSe:DATA:TELecom:MEASure:STESts:DESCription

This command sets the pass/fail test description. This description is stored on the disk with the pass/fail test. The start and end prompts appear in the SAVE PASS/FAIL TESTS menu.

**Syntax**    SENSe:DATA:TELecom:MEASure:STESts:DESCription <descr>,
<start prompt>,<end prompt>
SENSe:DATA:TELecom:MEASure:STESts:DESCription?

**Parameters**

| <description> (string) | Description |
|---|---|
| An ASCII string, maximum length of 25 bytes | The pass/fail test description |

| <start prompt> (string) | Description |
|---|---|
| An ASCII string, maximum length of 75 bytes | Text to prompt the operator at the start of the test |

| <end prompt> (string) | Description |
|---|---|
| An ASCII string, maximum length of 75 bytes | Text to prompt the operator at the end of the test |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SENSE:DATA:TELECOM:MEASURE:STESTS:DESCRIPTION
"REMEMBER TO DISCONNECT FROM EQUIPMENT"

Query:      SENSE:DATA:TELECOM:MEASURE:STESTS:DESCRIPTION?

Response:   "CONNECT TO EQUIPMENT"

**Related Commands**    SENSe:DATA:TELecom:MEASure:STESTs:THREshold

# SENSe:DATA:TELecom:MEASure:STESts:THREshold

This command sets or queries the pass/fail test criteria. The pass/fail result is determined by applying the criteria given by this command after the current test is completed. You can set up a maximum of four sets of pass/fail criteria.

**Syntax**     SENSe:DATA:TELecom:MEASure:STESts:THREshold <criteria number>, <type>,<source>,<threshold>
SENSe:DATA:TELecom:MEASure:STESts:THREshold?

**Parameters**

| <criteria number> (discrete) | Description |
|---|---|
| 1 | First set of pass/fail criteria |
| 2 | Second set of pass/fail criteria |
| 3 | Third set of pass/fail criteria |
| 4 | Fourth set of pass/fail criteria |

| <type> (discrete) | Description |
|---|---|
| NONE | No pass/fail criteria |
| ALARm | Alarms are the pass/fail criteria |
| FAILure | Failures are the pass/fail criteria |
| ERATio | Bit error ratio is the pass/fail criterion |
| ECOUnt | Error count is the pass/fail criterion |
| ESEConds | Errored seconds are the pass/fail criteria |
| POINter | Pointer movements are the pass/fail criteria |
| JITter | Jitter is the pass/fail criteria |

**if <type> = NONE**

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

| <threshold> (discrete) | Description |
|---|---|
| 0 | No threshold |

**if <type> = ALARm**

| <source> (discrete) | Description |
|---|---|
| ANY | Any alarm |
| LAIS | MS alarm indication signal |
| PAIS | Path AIS |
| VTAIS | TU AIS (Add/Drop Test Option Only) |
| VTFErf | TU FERF (Add/Drop Test Option Only) |
| AIS | PDH AIS (Add/Drop Test Option Only) |
| RAI | PDH RAI (Add/Drop Test Option Only) |
| <threshold> (discrete) | Description |
| DETected | Threshold is detected |
| NDETected | Threshold is not detected |

**if <type> = FAILure**

| <source> (discrete) | Description |
|---|---|
| LOSignal | Loss of Signal |
| LOFrame | Loss of Frame |
| LOPointer | AU Loss of Pointer |
| LOPS | PDH loss of pattern sync (Add/Drop Test Option Only) |
| VTLOPointer | TU Loss of Pointer (Add/Drop Test Option Only) |
| VTLOM | TU Loss of Multiframe (Add/Drop Test Option Only) |
| <threshold> (discrete) | Description |
| DETected | Threshold is detected |
| NDETected | Threshold is not detected |

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

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

*(continued on next page)*

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**if &lt;type&gt; = ERATio, ECOUnt, or ESEConds**

| &lt;source&gt; (discrete) | Description |
|---|---|
| LCV | B2 error |
| PCV | B3 error |
| BIT | BIT error |
| CRC | Cyclic redundancy check (2 Mb/s PCM30CRC or PCM31CRC only) |
| VTBIP | TU BIP (Add/Drop Test Option Only) |
| VTFEBe | TU far end block error (Add/Drop Test Option Only) |
| **&lt;threshold&gt; (NR3-numeric)** | **Description** |
| Any number | The test will fail for any level greater than this value |

**if &lt;type&gt; = POINter**

| &lt;source&gt; (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) |
| **&lt;threshold&gt; (NR3-numeric)** | **Description** |
| Any number | The test will fail for any level greater than this value |

**if &lt;type&gt; = JITter**

| &lt;source&gt; (discrete) | Description |
|---|---|
| HSEConds | Jitter hit seconds |
| **&lt;threshold&gt; (NR3-numeric)** | **Description** |
| Any number | The test will fail for any level greater than this value |

**Dependencies**    SENSe:DATA:TELecom:STESts:ENABle must be set to ON for this command to apply.

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:STESTS:THRESHOLD
1,ALARM,ANY,DETECTED

Query:    SENSE:DATA:TELECOM:MEASURE:STESTS:THRESHOLD? 1

Response:    ALARM,ANY,DETECTED

**Related Commands**    SENSe:DATA:TELecom:STESts:ENABle

# SENSe:DATA:TELecom:MEASure:STESts:RESUlts?

This query returns the results of applying the pass/fail criteria to the pass/fail test measurements.

**Syntax**    SENSe:DATA:TELecom:MEASure:STESts:RESUlts?

**Response**

| <test results> (discrete) | Description |
|---|---|
| NONE | Test is still running or no pass/fail test measurements have been requested |
| PASSED | Test passed |
| FAILED | Test failed |

**Dependencies**    The test must be completed for the results to be valid.

**Errors and Events**    200, "Execution error; Results not available"

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:STESTS:RESULTS?

Response:    PASSED

**Related Commands**    SENSe:DATA:TELecom:MEASure:STESts:THREshold

# SENSe:DATA:TELecom:MEASure:STESts:DONE

This command sets or queries what action the instrument takes when the pass/fail test calculations complete.

---

**NOTE**. *The pass/fail test results are written to the file name specified by the MMEMory:STORe:TESTs command. So, if you run consecutive pass/fail tests, remember to send the MMEMory:STORe:TESTs command with unique file names in between each pass/fail test run so the pass/fail test results files are not overwritten.*

---

**Syntax**

SENSe:DATA:TELecom:MEASure:STESts:DONE <action>
SENSe:DATA:TELecom:MEASure:STESts:DONE?

**Parameters**

| <action> (discrete) | Description |
|---|---|
| NONE | Take no action when pass/fail tests calculations complete |
| PRINT | Print the pass/fail tests results |
| DISK | Save the pass/fail tests results to disk; the file name is specified by the MMEMory: STORe:TESTs command |

**Dependencies**    None

**Errors and Events**    None

**Examples**

Set:        SENSE:DATA:TELECOM:MEASURE:STESTS:DONE NONE

Query:      SENSE:DATA:TELECOM:MEASURE:STESTS:DONE?

Response:   DISK

**Related Commands**

SENSe:DATA:TELecom:MEASure:STESTs:ENABle
SENSe:DATA:TELecom:MEASure:STESTs:THREshold
MMEMory:STORe:TESTs

# SENSe:DATA:TELecom:AUTOscan Subsystem

This section describes the command that automatically configures the receiver to the attached signal on any of the input connectors. Figure 2–73 shows the hierarchy tree for this CTS 850 subsystem.
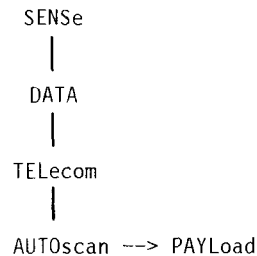
```
SENSe
  |
DATA
  |
TELecom
  |
AUTOscan --> PAYLoad
```

**Figure 2-73: SENSe:DATA:TELecom:AUTOscan subsystem**

# SENSe:DATA:TELecom:AUTOscan

This command starts the autoscan function which sets up the receiver based on the connected signal. The Operation Complete bit is set when this command has completed. Use the SYSTem:ERRor? query to see if the autoscan completed successfully.

**Note:** The user must wait for the Autoscan command to finish before inputing any further commands or queries. The user must issue a *OPC and wait for the response following the Autoscan command.

**Syntax**    SENSe:DATA:TELecom:AUTOscan

**Parameters**    None

**Dependencies**    A valid signal should be connected.

**Errors and Events**    361, "Autoscan failed; Instrument returned to previous setup"
361, "Autoscan failed; Autoscan already in progress"
402, "Operation complete; Autoscan complete"
200, "Execution error; Autoscan incomplete — no signals connected"

**Examples**    SENSE:DATA:TELECOM:AUTOSCAN

**Related Commands**    SYSTem:ERRor?

# SENSe:DATA:TELecom:AUTOscan:PAYLoad

This command starts the scan for payload identification.

**Syntax**          SENSe:DATA:TELecom:AUTOscan:PAYLoad

**Parameters**      None

**Dependencies**    None

**Examples**        SENSE:DATA:TELECOM:AUTOscan:PAYLoad

**Related Commands**  None

# SENSe:DATA:TELecom:TRIButary Subsystem

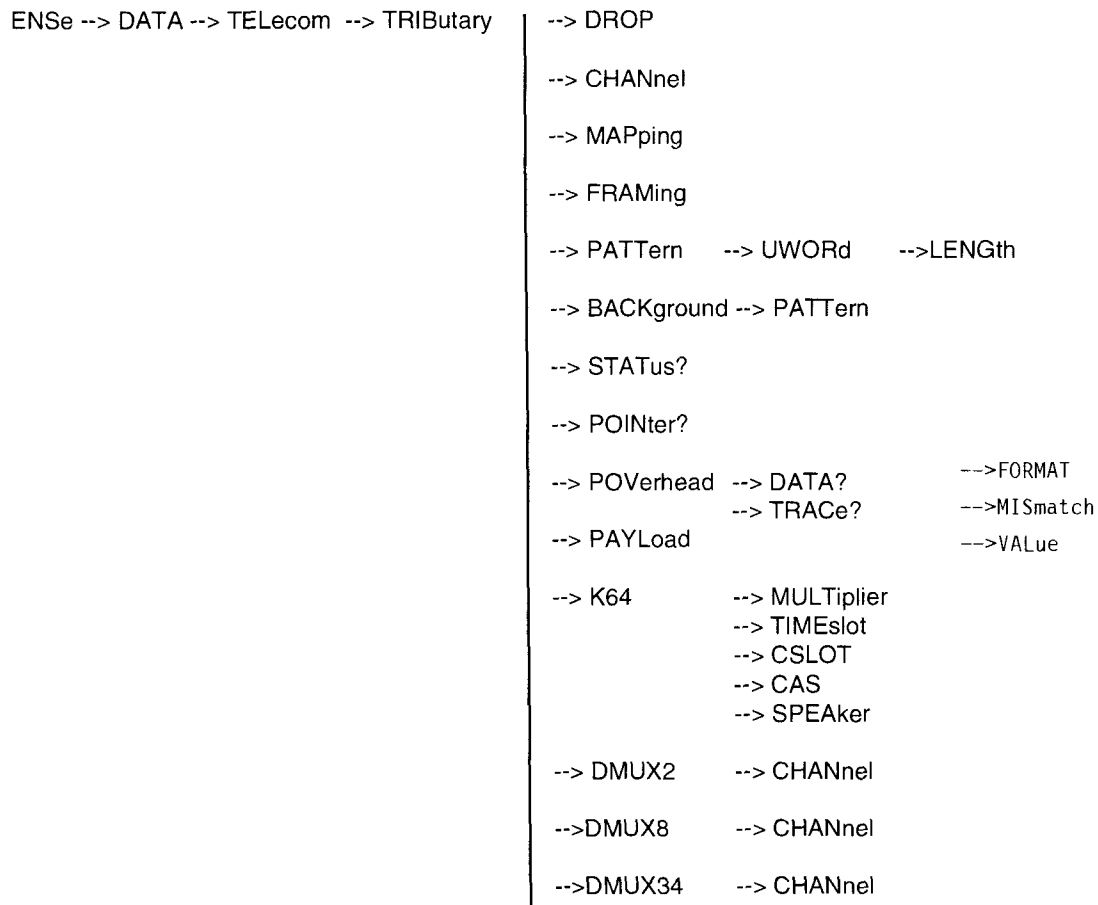This section describes the commands and queries that allow you to view a dropped tributary signal. Figure 2–75 shows the hierarchy tree for this CTS 850 subsystem.

ENSe --> DATA --> TELecom --> TRIButary

--> DROP

--> CHANnel

--> MAPping

--> FRAMing

--> PATTern --> UWORd -->LENGth

--> BACKground --> PATTern

--> STATus?

--> POINter?

--> POVerhead --> DATA? -->FORMAT
--> TRACe? -->MISmatch
--> PAYLoad -->VALue

--> K64 --> MULTiplier
--> TIMEslot
--> CSLOT
--> CAS
--> SPEAker

--> DMUX2 --> CHANnel

-->DMUX8 --> CHANnel

-->DMUX34 --> CHANnel

Figure 2–75: SENSe:DATA:TELecom:TRIButary subsystem

# SENSe:DATA:TELecom:TRIButary:DROP

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

**Syntax**

SENSe:DATA:TELecom:TRIButary:DROP <trib drop>
SENSe:DATA:TELecom:TRIButary:DROP?

**Parameters**

| <trib drop> (boolean) | Description |
|---|---|
| OFF or 0 | Tributary signal not available on output connector (default) |
| ON or 1 | Tributary signal available on output connector |

**Dependencies**

SENSe:DATA:TELecom:SOURce must be set to INPUT1.
SENSe:DATA:TELecom:MAPPing must be set to TRIButary.

**Errors and Events**

221, "Settings conflict; Instrument unable to drop signal while transmitting current rate"
221, "Settings conflict"

**Examples**

Set:        SENSE:DATA:TELECOM:TRIBUTARY:DROP ON

Query:      SENSE:DATA:TELECOM:TRIBUTARY:DROP?

Response:   0

**Related Commands**

SOURce:DATA:TELecom:SOURce
SENSe:DATA:TELecom:SOURce
SENSe:DATA:TELecom:MAPPing

# SENSe:DATA:TELecom:TRIButary:CHANnel

This command sets or queries the TUASYNC channel. Use the SENSe:DATA:TELecom:TRIButary:MAPPing command to set the tributary demapping.

**Syntax**
SENSe:DATA:TELecom:TRIButary:CHANnel <trib channel>
SENSe:DATA:TELecom:TRIButary:CHANnel?

**Parameters**

| <trib channel> (NR1-numeric) | Description |
|---|---|
| Any integer between 1 and 63 | TUASYNC mapping for the active channel (default = 1) |
| Any integer between 1 and 3 | TU3 mapping for the active channel |
| 1 | M140 mapping for the active channel |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:TRIBUTARY:CHANNEL 1

Query:    SENSE:DATA:TELECOM:TRIBUTARY:CHANNEL?

Response:    24

**Related Commands**    SENSe:DATA:TELecom:TRIButary:MAPPing

# SENSe:DATA:TELecom:TRIButary:MAPPing

This command sets or queries the tributary payload demapping. When you are actively mapping and demapping a tributary signal, the SOURce:DATA:TELecom:TRIButary:MAPPing and SENSe:DATA:TELecom:TRIButary:MAPPing functions are coupled; a change to one causes the same change to the other.

**Syntax**

SENSe:DATA:TELecom:TRIButary:MAPPing <trib mapping>
SENSe:DATA:TELecom:TRIButary:MAPPing?

**Parameters**

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

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:         SENSE:DATA:TELECOM:TRIBUTARY:MAPPING TUASYNC

Query:      SENSE:DATA:TELECOM:TRIBUTARY:MAPPING?

Response:  TU3

**Related Commands**    SOURce:DATA:TELecom:TRIButary:MAPPing

# SENSe:DATA:TELecom:TRIButary:FRAMing

This command sets or queries the framing of the received tributary signal.

**Syntax**
SENSe:DATA:TELecom:TRIButary:FRAMing <trib framing>
SENSe:DATA:TELecom:TRIButary:FRAMing?

**Parameters**

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

**Dependencies**    For DS3_DEMUX mapping only CBIT and M13 are allowed

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:TRIBUTARY:FRAMING UNFRAMED

Query:    SENSE:DATA:TELECOM:TRIBUTARY:FRAMING?

Response:    PCM31

**Related Commands**    None

# SENSe:DATA:TELecom:TRIButary:PATTern

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

**Syntax**    SENSe:DATA:TELecom:TRIButary:PATTern <trib pattern>
SENSe:DATA:TELecom:TRIButary:PATTern?

**Parameters**

| <trib pattern> (discrete) | Description |
|---|---|
| PRBS23 | A pseudo-random binary sequence of length $2^{23}-1$ is placed in the tributary payload (default) |
| PRBS15 | A pseudo-random binary sequence of length $2^{15}-1$ is placed in the tributary payload |
| PRBS20 | A pseudo-random binary sequence of length $2^{20}-1$ is placed in the tributary payload |
| PRBS11 | A pseudo-random binary sequence of length $2^{11}-1$ is placed in the tributary payload |
| PRBS9 | A pseudo-random binary sequence of length $2^{9}-1$ is placed in the tributary payload |
| AZEROs | All zeros are placed in the payload |
| AONEs | All ones are placed in the payload |
| UWORd | A user-defined pattern is placed in the payload |
| UNKNown | Unknown pattern |
| FIXED_1_8 | 1 bit in 8 (Add/Drop Test Option Only) |
| AUDIO | 1020 Hz audio tone (64k only) |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SENSE:DATA:TELECOM:TRIBUTARY:PATTERN PRBS15

Query:      SENSE:DATA:TELECOM:TRIBUTARY:PATTERN?

Response:   PRBS20

**Related Commands**    None

# SENSe:DATA:TELecom:TRIButary:PATTern:UWORd

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

**Syntax**   SENSe:DATA:TELecom:TRIButary:PATTern:UWORd <trib user pattern>
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd?

**Parameters**

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

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

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD #HAA5500

Query:   SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD?

Response:   #HAA5500

**Related Commands**   SENSe:DATA:TELecom:TRIButary:PATTern
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth

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

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

**Syntax**
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENGth <trib user pattern length>

**Parameters**

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

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

**Errors and Events**
None

**Examples**

Set:        SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD:LENGTH 3

Query:      SENSE:DATA:TELECOM:TRIBUTARY:PATTERN:UWORD:LENGTH?

Response:   2

**Related Commands**
SENSe:DATA:TELecom:TRIButary:PATTern
SENSe:DATA:TELecom:TRIButary:PATTern:UWORd

# SENSe:DATA:TELecom:TRIButary:POINter?

This query returns the current tributary pointer value.

**Syntax**  SENSe:DATA:TELecom:TRIButary:POINter?

**Response**

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

**Dependencies**  None

**Errors and Events**  None

**Examples**  Query:  SENSE:DATA:TELECOM:TRIBUTARY:POINTER?

Response: 12

**Related Commands**  None

# SENSe:DATA:TELecom:TRIButary:STATus?

This query returns the status of the received tributary signal. The returned status is not an accumulated status; the response reflects only the status of the tributary signal at the time the query is sent.

**Syntax**  SENSe:DATA:TELecom:TRIButary:STATus?

**Response**

| <decimal value> (NR1-numeric) | bit | definition |
|---|---|---|
| 1 | 0 | INPUT2/INPUT3 LOS |
| 2 | 1 | INPUT2/INPUT3 LOF |
| 4 | 2 | Unused |
| 8 | 3 | Unused |
| 16 | 4 | TU LOP |
| 32 | 5 | TU AIS |
| 64 | 6 | 2 Mb/s, 34 Mb/s, 140 Mb/s AIS |
| 128 | 7 | 2 Mb/s, 34 Mb/s, 140 Mb/s RAI |
| 256 | 8 | Frame error |
| 512 | 9 | 2 Mb/s, 34 Mb/s, 140 Mb/s error |
| 1024 | 10 | TU FERF |
| 2048 | 11 | TU pointer adjustment |
| 4096 | 12 | TU NDF |
| 8192 | 13 | Pattern lock |
| 16384 | 14 | Not used |
| 32768 | 15 | TU LOM |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:      SENSE:DATA:TELECOM:TRIBUTARY:STATUS?

Response:   32

**Related Commands**   SENSe:DATA:TELecom:TRIButary:STATus

# SENSe:DATA:TELecom:TRIButary:POVerhead:DATA?

This query returns the value in the specified TU3 or TU12 path overhead byte.

**Syntax**    SENSe:DATA:TELecom:TRIButary:POVerhead:DATA? <byte name>

**Parameters**

| <byte> (discrete) | Description |
|---|---|
| C2 | Signal label (TU3) |
| F2 | User channel (TU3) |
| H4 | Indicator (TU3) |
| F3 | Growth bytes (TU3) |
| K3 | (TU3) |
| K4 | (TU12) |
| N1 | (TU3) |
| N2 | (TU12) |
| V5 | (TU12) |

**Response**

| <value> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 255 | The selected byte is set to this value |

**Dependencies**    Use the SENSe:DATA:TELecom:TRIButary:CHANNel command to specify which path trace to query. INITiate and TRIGGer:IMMediate affect these bytes.

**Errors and Events**    None

**Examples**    Query:      SENSE:DATA:TELECOM:TRIBUTARY:POVERHEAD:DATA? V5

Response:    123

**Related Commands**    INITiate
TRIGger:IMMediate

# SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe?

This query returns the current tributary path trace string that repeats in the J1 byte, for TU3 mapping, and the J2 byte, for TU12 mapping, as a 16 character repeating sequence. The response is created in the following way: the first character after a null is read as the first byte and is followed by 15 J1/J2 bytes from consecutive frames.

**Syntax**    SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe?

**Response**

| <path trace> (string) | Description |
|---|---|
| A 16 character string | The current tributary path trace string |

**Dependencies**    The SENSe:DATA:TELecom:CHANnel command specifies which path trace to query.

**Errors and Events**    None

**Examples**    Query:      SENSE:DATA:TELECOM:TRIBUTARY:POVERHEAD:TRACE?

Response:   "TEK CTS750"

**Related Commands**    SENSe:DATA:TELecom:TRIButary:POVerhead:DATA?
INITiate
TRIGger:IMMediate

# SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT

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

**Syntax**   SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT <format>

**Parameters**

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

**Dependencies**   None

**Examples**   SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:FORMAT LONG

**Related Commands**   SENSe:DATA:TELecom:POVerhead:TRACe:FORMAT

# SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch

This command sets the state of mismatch reporting for AU–N J1 trace strings.

**Syntax**   SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch <state>

**Parameters**

| format | description |
|--------|-------------|
| ON | Sets the state of reporting J1 trace mismatch |
| OFF | Turns off the state of reporting of J1 trace mismatch |

**Dependencies**   None

**Examples**   SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:MISmatch OFF

**Related Commands**   SENSe:DATA:TELecom:POVerhead:TRACe:MISmatch

# SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:VALue "string"

This command sets the string to be checked for mismatch as J0 trace info.

**Syntax**   SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:VALue "string"

**Parameters**

| string | description |
|--------|-------------|
| 15 byte string | This is the string to be checked for mismatch as J0 trace |

**Dependencies**   None

**Examples**   SENSe:DATA:TELecom:TRIButary:POVerhead:TRACe:VALue "J0string"

**Related Commands**   SENSe:DATA:TELecom:POVerhead:TRACe:VALue

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# Sense:DATA:TELecom:TRIButary:PAYLoad

This command specifies the tributary payload rate. This rate can be different from the receive or demapping rate, in which case it sets the the final analyis rate. TRIB (the default) will set the payload rate to the demapping or receive rate, whichever is appropriate.

**Syntax**

```
Sense:DATA:TELecom:TRIButary:PAYLoad <payload rate>
Sense:DATA:TELecom:TRIButary:PAYLoad?
```

**Parameters**

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

**Dependencies**

The payload rate must be less than or equal to the receive rate.

**Errors and Events**

None

**Examples**

Set:  `Sense:DATA:TELECOM:TRIBUTARY:PAYLoad M34`
Query:  `Sense:DATA:TELECOM:TRIBUTARY:PAYLoad?`

Response: M34

**Related Commands**

SOURce:DATA:TELecom:TRIButary:PAYload
SENSe:DATA:TELecom:TRIButary:DMUX2
SENSe:DATA:TELecom:TRIButary:DMUX8
SENSe:DATA:TELecom:TRIButary:DMUX34

# Sense:DATA:TELecom:TRIButary:K64:MULTIplier

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

**Syntax**

Sense:DATA:TELecom:TRIButary:K64:MULTIplier <multiplier>
Sense:DATA:TELecom:TRIButary:K64:MULTIplier?

**Parameters**

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

**Dependencies**

Allowable range on 2 Mb/s framing. For PCM30 or PCM30 CRC (with CAS), range is 1-30. For PCM31 or PCM31 CRC (without CAS), range is 1-31.

**Errors and Events**

None

**Examples**

Set:      Sense:DATA:TELECOM:TRIBUTARY:K64:MULTiplier? 14
Query:    Sense:DATA:TELECOM:TRIBUTARY:K64:MULTiplier?

Response: 14

**Related Commands**

SOURce:DATA:TELecom:TRIButary:K64:MULTiplier
SENSe:DATA:TELecom:TRIButary:FRAMing

# Sense:DATA:TELecom:TRIButary:K64:TIMEslot

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

**Syntax**

Sense:DATA:TELecom:TRIButary:K64:timeslot <starting timeslot>
Sense:DATA:TELecom:TRIButary:K64:timeslot?

**Parameters**

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

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:        Sense:DATA:TELECOM:TRIBUTARY:K64:TIMEslot? 12
Query:      Sense:DATA:TELECOM:TRIBUTARY:K64:TIMEslot?

Response:   12

**Related Commands**   SOURce:DATA:TELecom:TRIButary:K64:TIMEslot
SENSe:DATA:TELecom:TRIButary:K64:MULTiplier

# Sense:DATA:TELecom:TRIButary:K64:CSLOT

This command selects a timeslot for monitoring the Channel Associated
Signaling or speaker data.

**Syntax**   Sense:DATA:TELecom:TRIButary:K64:CSLOT
Sense:DATA:TELecom:TRIButary:K64:CSLOT?

**Parameters**

| <slot> | Description |
|--------|-------------|
| 1..31  | Slot can be any valid timeslot in the 2 MB/s signal |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:        Sense:DATA:TELECOM:TRIBUTARY:K64:CSLOT
Query:      Sense:DATA:TELECOM:TRIBUTARY:K64:CSLOT?

Response:   Current CAS data timeslot

**Related Commands**   SOURce:DATA:TELecom:TRIButary:K64:CSLOT

# Sense:DATA:TELecom:TRIButary:K64:CAS

This query returns the received Channel Associated Signaling data value in the selected timeslot. The response will show as a binary value in the form #Babcd where abcd are the CAS bit values.

**Syntax**    Sense:DATA:TELecom:TRIButary:K64:CAS?

| **Parameters** | **<value>** | **Description** |
|---|---|---|
| | | |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    Sense:DATA:TELECOM:TRIBUTARY:K64:cas?

Response:    CAS data value for selected timeslot

**Related Commands**    SENSe:DATA:TELecom:TRIButary:K64:CAS

# Sense:DATA:TELecom:TRIButary:K64:SPEAker

This command sets the output volume for the speaker on the selected timeslot.

**Syntax**    Sense:DATA:TELecom:TRIButary:K64:SPEAker <volume>
Sense:DATA:TELecom:TRIButary:K64:SPEAker?

| **Parameters** | **<volume> discrete** | **Description** |
|---|---|---|
| | OFF | quiet, no volume |
| | LOW | low volume |
| | MED | Somewhat louder than low |
| | HIGH | LOUD |

**Dependencies**    None

**Errors and Events**   None

**Examples**   Set:        Sense:DATA:TELECOM:TRIBUTARY:K64:SPEAker  LOW
               Query:      Sense:DATA:TELECOM:TRIBUTARY:K64:SPEAker?

               Response:  LOW

**Related Commands**   None

# Sense:DATA:TELecom:TRIButary:DMUX2:CHANnel

This command selects an active 2 Mb/s channel from the 8 Mb/s demux. Other channels are ignored.

**Syntax**   Sense:DATA:TELecom:TRIButary:DMUX2:CHANnel <channel>
             Sense:DATA:TELecom:TRIButary:DMUX2:CHANnel?

**Parameters**

| <channel> | Description |
|---|---|
| CHAN1, CHAN2, CHAN3, CHAN4 | Selects a single active channel from the four possible 2 Mb/s channels demuxed from 8 Mb/s. Other channels are not analyzed. |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:        SENSe:DATA:TELecom:TRIButary:DMUX2:CHANnel  3
               Query:      SENSe:DATA:TELecom:TRIButary:DMUX2:CHANnel?

               Response:  3

**Related Commands**   SOURce:DATA:TELecom:TRIButary:DMUX2:CHANnel
                       SENSe:DATA:TELecom:TRIbutary:PAYLoad

# Sense:DATA:TELecom:TRIButary:DMUX8:CHANnel

This command selects an active 8 Mb/s channel from the 34 Mb/s demux. Other channels are ignored.

**Syntax**

```
Sense:DATA:TELecom:TRIButary:DMUX8:CHANnel <channel>
Sense:DATA:TELecom:TRIButary:DMUX8:CHANnel?
```

**Parameters**

| <channel> | Description |
|---|---|
| CHAN1, CHAN2, CHAN3, CHAN4 | Selects a single active channel from the four possible 8 Mb/s channels demuxed from 34 Mb/s. Other channels are not analyzed. |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    `Sense:DATA:TELECOM:TRIBUTARY:DMUX8:CHANnel  2`

Query:    `Sense:DATA:TELECOM:TRIBUTARY:DMUX8:CHANnel?`

Response:  2

**Related Commands**    SOURce:DATA:TELecom:TRIButary:DMUX8:CHANnel
SENSe:DATA:TELecom:TRIbutary:PAYLoad

# Sense:DATA:TELecom:TRIButary:DMUX34:channel

This command selects an active 34 Mb/s channel from the 140 Mb/s demux.
Other channels are ignored.

**Syntax**    Sense:DATA:TELecom:TRIButary:DMUX34:CHANnel <channel>
Sense:DATA:TELecom:TRIButary:DMUX34:CHANnel?

**Parameters**

| <channel> | Description |
|---|---|
| CHAN1, CHAN2, CHAN3, CHAN4 | Selects a single active channe from the four possible 34 Mb/s channels demuxed from 140 Mb/s. Other channels are not analyzed. |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        Sense:DATA:TELECOM:TRIBUTARY:DMUX34:CHANnel   2
Query:      Sense:DATA:TELECOM:TRIBUTARY:DMUX34:CHANnel?

Response:   2

**Related Commands**    SOURce:DATA:TELecom:TRIButary:DMUX34:CHANnel
SENSe:DATA:TELecom:TRIbutary:PAYLoad

# SENSe:DATA:TELecom:MEASure:TRIButary Subsystem

This section describes the commands and queries that access tributary error, alarm, failure, and pointer measurements for current and previous tests. Figures 2-77, 2-78, and 2-79 show the hierarchy trees for this CTS 850 subsystem.

```
SENSe --> DATA --> TELecom --MEASure --> TRIButary    -->LAYER

                                                       -->ANALysis    --> PATH
                                                                      --> M2100      --> IN
                                                                                     --> OUT
                                                                      --> G826
                                                                      --> G821

                                                       --> ERRor      --> ECOUnt    --> error source *
                                                                      --> eratio    --> error source *
                                                                      --> ESEConds  --> error source *

                                                       --> SLIP       --> LAS
                                                                      --> LES
                                                                      --> CONTrolled

                             * error source                           --> JRATio
                               BIT?
                               FRAMe?
                               CRC?                    --> RTDElay    --> MEASure    -->STATus
                               CODE?                                  --> CALibrate
                               EBIT?                                                 -->OFFSet

                                                       --> FREQuency

                                                         -> ALARm
```
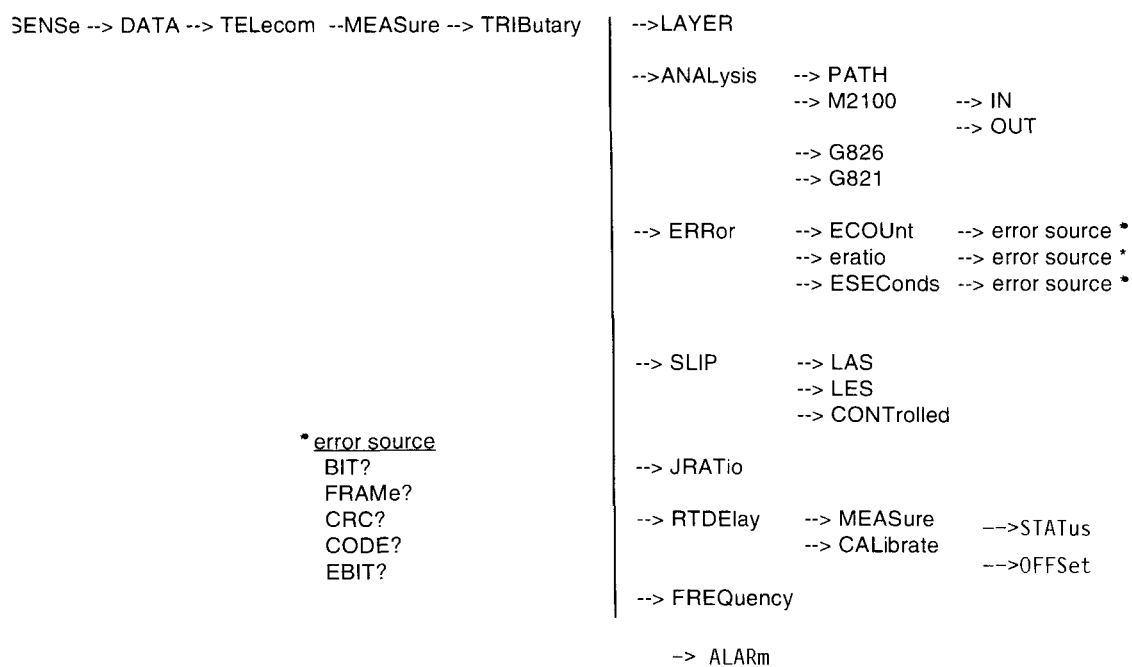
**Figure 2-77: SENSe:DATA:TELecom:MEASure:TRIButary subsystem (PDH)**

```
                              SENSe
                                |
                              DATA
                                |
                            TELecom
                                |
                            MEASure
                                |
                            TRIButary
                                |
                            ANALysis
                                |
        ┌───────────────────────┼────────────────────┐
     M2100?                   G821?                 G826
        |                       |                     |
   ┌────┴────┐            error source 2        error source 3
  IN?       OUT?
   |          |
error source 1   error source 1
```

```
                                              error source 3

                                              EBLock
                                              ESEConds
                                              SESeconds
                                              BBERRor
                                              UASeconds
                            error source 2    TXESeconds
                              ECOUnt?          TXSESeconds
                              ESEConds?        TXUASeconds
         error source 1       PESeconds?       PUNASeconds
          ESEConds?           UASeconds?       PESEConds
          PESeconds?          PUASeconds?      PSESeconds
          SESeconds?          EFSeconds?       PBBERRor
          PSESeconds?         PEFSeconds?      PUASeconds
          UASeconds?          SESeconds?       PTXESeconds
          PUASeconds?         PSESeconds?      PTXSESeconds
          EFSeconds?          DMINutes?        PTXUASeconds
          PEFSeconds?         PDMinutes?       PPUNASeconds
                                              CSES
```

**Figure 2-78: SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis subsystem (PDH)**

```
                          SENSe
                            |
                          DATA
                            |
                         TELecom
                            |
                         MEASure
                            |
                        TRIButary
                            |
                          ALARm
                            |
           ┌────────────────┼────────────────┐
           |                |                 |

      LOSignal?         TS16AIS          LOFrame
      LOFrame?          TSNAIS             AIS
        AIS?             LOMF              RAI
        RAI?            FEMFAS             Idle
        LOPS?
```
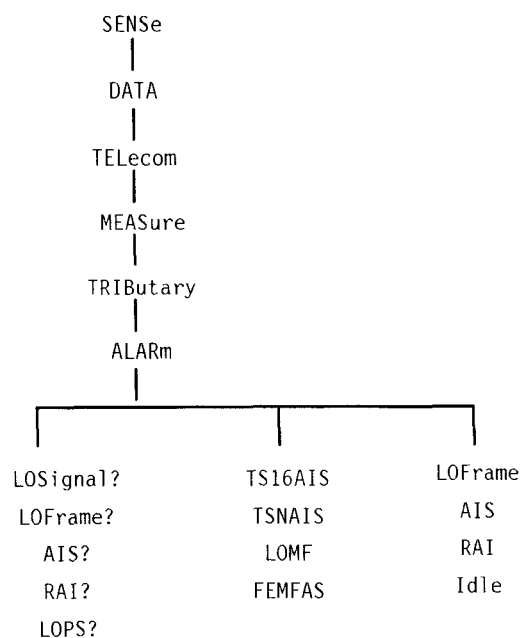
**Figure 2-79: SENSe:DATA:TELecom:MEASure:TRIButary:ALARm subsystems (PDH)**

A variety of tributary error, alarm, and failure measurements are reported through this subsystem. Table 2–53 shows how error, alarm, and failure measurements are calculated. Tables 2–54 and 2–55 show how the analysis measurements are calculated. These calculations are based on ITU–T G.821 specifications.

**Table 2-53: How error and alarm measurements are calculated**

| Type of Measurement | Method of Calculation |
|---|---|
| Error count | Number of bit errors that were errored in the signal |
| Bit Error Ratio (BER) | Ratio of error count to the total number of received bits |
| Errored seconds | Number of seconds that had any error counts |
| Alarms | Number of one-second intervals that contained a specific alarm such as Loss of Signal (LOS) and Loss of Frame (LOF) |

**Table 2-54: How analysis measurements are calculated**

| Type of Measurement | Method of Calculation |
|---|---|
| Error count | Number of bit errors not occurring during periods of unavailability (see Unavailable seconds) |
| Errored seconds | Total number of seconds that had any error count; does not include any period of unavailability (see Unavailable seconds) |
| Degraded minutes | Number of minutes that had a bit error ratio (BER) in the range $1x10^{-6}$ to $1x10^{-3}$; degraded minutes do not accumulate during periods of unavailability |
| Severely errored seconds | Number of seconds with more than N errors (see Table 2-55) |
| Unavailable seconds | Number of seconds that the signal had too many errors to be available for use; unavailability starts at the onset of ten contiguous severely errored seconds |
| Error free seconds | Number of seconds that contained zero errors |

**Table 2-55: Value of N for Severely Errored Seconds analysis measurements (PDH)**

| Tributary Rate | Type of Error | N |
|---|---|---|
| 2 Mb/s | Bit error | > 1E-3 |
| | Frame error | 28 |
| | CRC error | 830 |
| 34 Mb/s | Bit error | > 1E-3 |
| | Frame error | 223 |
| 140 Mb/s | Bit error | > 1E-3 |
| | Frame error | 568 |

Some of queries in this section have their information presented in a way that is different from queries in the rest of the manual. The syntax and examples are in table format. Figure 2-80 shows you how to read the Syntax Tables in this section. Follow the step numbers to create any query. Table 2-56 explains the terms used in the SENSe:DATA:TELecom:MEASure Syntax Tables.

**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:TRIBuary: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 2-80: How to read the syntax tables in the SENSe:DATA:TELecom:MEASure:TRIButary subsystem section**

**Table 2-56: Terms used in the SENSe:DATA: TELecom:MEASure:TRIButary queries**

| Term | Meaning |
|---|---|
| BIT | Pattern bit error |
| FRAME | Frame bit error |
| CRC | CRC error |
| PARITY | Parity error |

Figure 2-81 shows you how to read the Example Tables in this section.

**Table X-X: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:Queries**

| Query | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ECOUNT:BIT? | 714 |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ERATIO:FRAME? | 1.0E-8 |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ESECONDS:CRC? | 3 |

Selected examples of queries
are shown in the left column

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

**Figure 2-81: How to read the example tables in the SENSe:DATA:TELecom:MEASure:TRIButary subsystem section**

## SENSe:DATA:TELecom:MEASure:TRIButary:LAYER

The addition of the demux capability can duplicate measurements at multiple layers in the demux path. Rather than add a discrete command for each possible measurement at each rate, the layer command will select a layer from which measurement results will be returned.

The default value "Trib" will return data for the current, active analysis rate, making it the same as existing remote commands for compatibility purposes. The value set with this command affects the following commands:

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

**Syntax**

SENSe:DATA:TELecom:MEASure:TRIButary:LAYER <layer>
SENSe:DATA:TELecom:MEASure:TRIButary:LAYER?

**Parameters**

| <layer>discrete | description |
|---|---|
| TRIB | Demap or receive rate (default) if PDH demux is inactive, analysis rate if PDH demux is active |
| M140 | Set the current layer to 140 Mb/s |
| M34 | Set the current layer to 34 Mb/s |
| M8 | Set the current layer to 8 Mb/s |
| M2 | Set the current layer to 2 Mb/s |
| K64 | Set the current layer to 64 Kb/s |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSe:DATA:TELecom:MEASure:TRIButary:LAYER M140

Query:    SENSe:DATA:TELecom:MEASure:TRIButary:LAYER?

Response:    M140

**Related Commands**    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826

SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:PATH

Future Function

**Syntax**    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:PATH <path type>

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

**Parameters**

| <path type>discrete | description |
| --- | --- |
| UNI | TX and RX unavailable times do not affect each other, nor is Path unavailable time calculated. |
| BI | TX and RX unavailable times interact as defined in G.826. Path unavailable time is calculated and will be used in calculations referencing available time. |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:PATH UNI

Query:    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:Path?

Response:    UNI

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN and M2100: OUT Queries (PDH)

This command returns the calculated M.2100 parameters. The values returned are affected by the SENSe:DATA:TELecom:MEASure:TRIButary:LAYER command. M2100:IN returns IN-SERVICE analysis results. M2100:OUT returns OUT-OF-SERVICE analysis results. M2100:IN:M45 returns IN-SERVICE analysis results for 45 Mbps line rate.

Note: Out-of-Service analysis includes data bit error analysis on expected PRBS pattern. In-Service analysis includes Frame errors, code violations, and/or CRC errors depending on tributary rate being analyzed.

**Syntax**     SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:IN <item>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:M2100:OUT <item>?

**Parameters**

| <item> | description |
|---|---|
| ? | All M2100 in-or out-of-service analysis responses below |
| ESEConds? | Errored Seconds |
| SESeconds? | Severely Errored Seconds |
| UASeconds? | Unavailable Seconds |
| EFSeconds? | Error-Free Seconds |
| TXESeconds? | TX errored seconds (future) |
| TXSESeconds? | TX severely errored seconds (future) |
| TXUASeconds? | TX unavailable seconds (future) |
| PTHUaseconds? | Path unavailable seconds |
| PESEConds? | Errored Seconds ratio (%) |
| PSESeconds? | Severely Errored Seconds ratio (%) |
| PUASeconds? | Unavailable seconds ratio (%) |
| PEFSeconds? | Error-free seconds ratio (%) |
| PTXESeconds? | TX errored seconds ratio (%) (future) |
| PTXSESeconds? | TX severely errored seconds ratio (%) (future) |
| PTXUASeconds? | TX Unavailable seconds ratio (%) (future) |
| PPTHUaseconds? | Path unavailable seconds ratio (%) |

**Dependencies**     These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error

measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**    None

**Examples**    Query:    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis: M2100:IN<item>?

Response:

**Table 2-57: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis: Queries**

| Query | Response |
|---|---|
| SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: UASeconds | 23 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: PSESeconds | 1.2E-1 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:G821:DMINutes | 103 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:G826:EBLock | 10 |

**Related Commands**    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:m2100:in
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826
SENSe:DATA:TELecom:MEASure:TRIButary:slip

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

This command returns the calculated G.821 parameters. The values returned are affected by the SENSe:DATA:TELecom:MEASure:TRIButary:LAYER command.

**Syntax**

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821 <item>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821 <item>?

**Parameters**

| <cmdspec>part of command structure | description |
|---|---|
| ECOUnt | Error Count |
| ESEConds | Errored seconds |
| PESeconds | Percent errored seconds |
| UASeconds | Unavailable seconds |
| PUASeconds | Percent unavailable seconds |
| EFSeconds | Error free seconds |
| PEFSeconds | Percent error free seconds |
| SESeconds | Severely errored seconds |
| PSESeconds | Percent severely errored seconds |
| DMINutes | Degraded minutes |
| PDMinutes | Percent degraded minutes |

**Dependencies**

These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**

None

**Examples**

Query:     SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G821
<item>?

Response:

**Table 2-58: Example Table for**
**SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis: Queries**

| Query | Response |
|---|---|
| SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: UASeconds | 23 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN: PSESeconds | 1.2E-1 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:G821:DMINutes | 103 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:G826:EBLock | 10 |

**Related Commands**     SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:m2100:IN
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826

This command returns the calculated G.826 parameters. The values returned are affected by the SENSe:DATA:TELecom:MEASure:TRIButary:layer command. G826:M45 returns analysis results for 45 Mbps line rate.

**Syntax**

SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826 <item>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826 <item>?

**Parameters**

| <cmdspec>part of command structure | description |
|---|---|
| CSES | Consecutive Severly Errored Seconds |
| EBLock | Errored block count |
| ESEConds | Errored seconds |
| SESeconds | Severely Errored seconds |
| BBERRor | Background Block Errors |
| UASeconds | Unavailable seconds |
| TXESeconds | TX errored seconds (future) |
| TXSESeconds | TX severely errored seconds (future) |
| TXUASeconds | TX unavailable seconds (future) |
| PUNASeconds | Path unavailable seconds |
| PESEConds | Errored Seconds ratio (%) |
| PSESeconds | Severely Errored Seconds ratio (%) |
| PBBERRor | Background Block Errors ratio 9%) |
| PUASeconds | Unavailable seconds ratio (%) |
| PTXESeconds | TX errored seconds ratio (%) (future) |
| PTXSESeconds | TX severely errored seconds ratio (%) (future) |
| PTXUASeconds | TX unavailable seconds ratio (%) (future) |
| PPUNASeconds | Path unavailable seconds ratio (%) |

**Dependencies**

These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**

None

**Examples**  Query:  SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826
<item>?

Response:

**Table 2-59: Example Table for
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis: Queries**

| Query | Response |
|-------|----------|
| SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN:UASeconds | 23 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:M2100:IN:PSESeconds | 1.2E-1 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:G821:DMINutes | 103 |
| SENSe:DATA:TELecom:TRIButary:ANALysis:G826:EBLock | 10 |

**Related Commands**  SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:m2100:IN
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:ALLOcation

This command sets or queries the numeric allocation percentage for the PDH hierarchy.

**Syntax**  SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:ALLOcation
<number>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:ALLOcation?

**Parameters**

| <number> | description |
|----------|-------------|
| a number in the range of 0.1 to 200 | Sets the numeric allocation percentage |

**Dependencies**  None

**Errors and Events**  None

**Examples**      Set:       SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:
ALLOCATION 1.5E6

Query:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G825:AL-
LOCATION?

Response:  SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:
ALLOCATION  1.5E6

**Related Commands**      None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:VERDict

This command sets the G826 Verdict Analysis for 2 Mb/s.

**Syntax**      SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**      None

**Errors and Events**      None

**Examples**      Set:       SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
VERDICT PASS

Query:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
VERDICT?

Response:  SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
VERDICT PASS

**Related Commands**      None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:TXVERDict

This command sets the G826 Verdict Analysis for 2 Mb/s.

**Syntax**
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M2:TXVERDict?

**Parameters**

| <status> | description |
|---|---|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
TXVERDICT PASS

Query:    SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
TXVERDICT?

Response:    SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M2:
TXVERDICT PASS

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:VERDict

This command sets the G826 Verdict Analysis for 8 Mb/s.

**Syntax**
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:VERDict?

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Parameters**

**Dependencies**    None

**Errors and Events**    None

**Examples**

Set:    SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:
VERDICT PASS

Query:    SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:
VERDICT?

Response:    SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:
VERDICT PASS

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:TXVERDict

This command sets the G826 Verdict Analysis for 8 Mb/s.

**Syntax**    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M8:TXVERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**    None

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:
TXVERDICT PASS

Query:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:
TXVERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M8:
TXVERDICT PASS

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:VERDict

This command sets the G826 Verdict Analysis for 34 Mb/s.

**Syntax**   SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
VERDICT PASS

Query:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
VERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
VERDICT PASS

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:TXVERDict

This command sets the G826 Verdict Analysis for 34 Mb/s.

**Syntax**   SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M34:TXVERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:        SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
TXVERDICT PASS

Query:      SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
TXVERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M34:
TXVERDICT PASS

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:VERDict

This command sets the G826 Verdict Analysis for 45 Mb/s.

**Syntax**   SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:VERDict?

**Parameters**

| <status> | description |
|---|---|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
VERDICT PASS

Query:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
VERDICT?

Response:   SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
VERDICT PASS

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:TXVERDict

This command sets the G826 Verdict Analysis for 45 Mb/s.

**Syntax**   SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M45:TXVERDict?

**Parameters**

| <status> | description |
|---|---|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**     None

**Examples**     Set:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
TXVERDICT PASS

Query:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
TXVERDICT?

Response:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:ANALYSIS:G826:M45:
TXVERDICT PASS

**Related Commands**     None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:VERDict

This command sets the G826 Verdict Analysis for 140 Mb/s.

**Syntax**     SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:VERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:VERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Set:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:VERDICT PASS

Query:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:VERDICT?

Response:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:VERDICT PASS

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:TXVERDict

This command sets the G826 Verdict Analysis for 140 Mb/s.

**Syntax**   SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:TXVERDict
<status>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:M140:
TXVERDict?

**Parameters**

| <status> | description |
|----------|-------------|
| Pass | The Verdict Analysis is Pass |
| Fail | The Verdict Analysis is Fail |
| Nodata | Not enough data to decide |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:       SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:TXVERDICT PASS

Query:     SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140: TXVERDICT?

Response:  SENSE:DATA:TELECOM:MEASURE:TRIBUTARY:
ANALYSIS:G826:M140:TXVERDICT PASS

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:THREshold:M2:SES

This command selects the threshold to be used to determine a severely errored second for the 2 Mbps receive line rate.

**Syntax**
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES <threshold>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES ?

**Parameters**

| <threshold> | description |
|---|---|
| THR300 | Sets the threshold to 300 blocks in accordance with G.826 |
| THR805 | Sets the threshold to 805 blocks in accordance with G.821 |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES THR300

Query:    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES?

Response:    SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M2:SES THR300

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:THREshold:M45:SES

This command selects the threshold to be used to determine a severely errored second for the 45 Mbps receive line rate.

**Syntax**  SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES <threshold>
SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES ?

**Parameters**

| <threshold> | description |
|---|---|
| THR300 | Sets the threshold to 2444 blocks in accordance with G.826 |
| THR805 | Sets the threshold to 45 blocks in accordance with G.821 |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:  SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES THR300

Query:  SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES?

Response:  SENSe:DATA:TELecom:MEASure:TRIButary:ANALysis:G826:
THREshold:M45:SES THR300

**Related Commands**  None

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

These queries return tributary error measurements. When you use the high-level queries (for example, SENSe:DATA:TELecom:MEASure:TRIButary:ERRor? or SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt?), it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string.

**Syntax**    SENSe:DATA:TELecom:MEASure:TRIButary:ERRor?

SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:[measurement]:[error source] (see Table 2-60 to complete the query)

**Table 2-60: Syntax table for SENSe:DATA:TELecom:MEASure:TRIButary:ERRor queries (PDH)**

| Select a measurement from the left column | Then select an error source from the top row | | | | | |
|---|---|---|---|---|---|---|
| | ? | :BIT?[1] | :FRAME?[2] | :CRC?[3] | :CODE[4] | :EBIT[3] |
| ECOUnt | all error counts | logic errors | frame errors | CRC errors | code violation count | Far end CRC4 Err block count |
| ERATio | all bit error ratios | logic errors | frame errors | CRC errors | code violation count | Far end CRC4 Err block count |
| ESEConds | all errored seconds | logic errors | frame errors | CRC errors | code violation count | Far end CRC4 Err block count |

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

All bit error ratios return NR3-numeric responses.

[1]   The ESEConds:BIT error source reports M2100 out-of-service and G.821 measurements.

[2]   The FRAME error source is valid only for PDH framed signals.

[3]   The CRC and EBIT error source is valid only for 2 Mb/s rate and PCM30CRC or PCM31CRC framing

[4]   CODE error source is valid only for 2,8,34 Mb/s rate with AMI or HDB3 line coding

**Response**    See Table 2-60.

**Dependencies**    These measurement queries can be sent at any time. But, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

Do not set SENSe:DATA:TELecom:TRIButary:PAYLoad:PATTern to UNKNown if you want to use these queries.

**Errors and Events**    None

**Examples**    See Table 2-61.

**Table 2-61: Example table for SENSe:DATA:TELecom:MEASure:TRIButary:ERRor queries**

| Query | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ECOUNT:BIT? | 714 |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt:CODE? | Returns the number of line code error violations on the active PDH signal. This command is invalid for 140 Mb/s. |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt:EDIT? | Returns the number of far-end CRC4 errored blocks detected on the active 2 Mb/s signal |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ECOUnt:M2:FRAME | This query returns frame errors ecount for M2 |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ERATIO:FRAME? | 1.0E-8 |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERROR:ESECONDS:CRC? | 3 |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ESEConds:CODE? | Returns the number of seconds in which line code error violations were detected on the active PDH input signal |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:ESEConds:EBIT? | Returns the number of seconds in which far-end CRC4 errored blocks were detected on the active 2 Mb/s signal |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:FRAME? | Returns the THE ECOUnt FRAME error, ERATio FRAME error, or ESEConds FRAME errors for 45 Mbps line rate |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:PARITY? | Returns the THE ECOUnt PARITY error, ERATio PARITY error, or ESEConds PARITY errors for 45 Mbps line rate |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:CPARITY? | Returns the THE ECOUnt C-PARITY error, ERATio C-PARITY error, or ESEConds C-PARITY errors for 45 Mbps line rate |
| SENSe:DATA:TELecom:MEASure:TRIButary:ERRor:<ECOUnt>, <ERATio>,<ESECcond>:M45:REI? | Returns the THE ECOUnt REI error, ERATio REI error, or ESEConds REI errors for 45 Mbps line rate |

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

# SENSe:DATA:TELecom:MEASure:TRIButary:ALARm Queries

These queries return tributary alarm measurements. When you use the SENSe:DATA:TELecom:MEASure:TRIButary:ALARm? query, it is helpful to turn the headers on (SYSTem:HEADers ON) so you can identify each response value in the response string. ALARm:M45 <alarm type>sets and ALARm:M45? queries the alarm type for the 45 Mbps line rate.

**Syntax**　　All valid queries are listed in the Syntax column of Table 2–62.

**Table 2-62: Syntax Table for SENSe:DATA:TELecom:MEASure:TRIButary:ALARm Queries**

| Syntax | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm? | All tributary alarm measurements |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOSignal? | Number of seconds of tributary Loss of Signal |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOFrame? | Number of seconds of tributary Loss of Frame |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:AIS? | Number of seconds of tributary AIS |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:RAI? | Number of seconds of tributary RAI (PDH only) |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOPS? | Number of seconds of loss of pattern sync |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:TS16AIS? | Errored second count for AIS in TS16 of an Nx64 CAS-enabled signal |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:IDLE? | Number of idle seconds |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOMF? | Errored second count for Loss of Multiframe (2 Mb/s or Nx64k PCM30 or PCM30 CRC) |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:FEMFAS? | Errored second count for far-end Loss of Multiframe (2 Mb/s or Nx64k PCM30 or PCM30 CRC) |

**All responses are in NR1-numeric format.**

**Response**　　See the Response column of Table 2–62.

**Dependencies**　　These measurement queries can be sent at any time. However, if a test is currently running, the responses to the queries might not represent the final error measurements. After a test has been stopped or the test duration has expired, you can send these measurement queries again to get the final error measurements.

**Errors and Events**　　None

**Examples**  See Table 2–63.

**Table 2-63: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:ALARm Queries**

| Query | Response |
|-------|----------|
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:LOSIGNAL? | 20 |
| SENSe:DATA:TELecom:MEASure:TRIButary:ALARm:AIS? | 13 |

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

# SENSe:DATA:TELecom:MEASure:TRIButary:SLIP Queries

These queries return tributary alarm measurements. When you use the
SENSe:DATA:TELecom:MEASure:TRIButary:SLIP? query, it is helpful to turn
the headers on (SYSTem:HEADers ON) so you can identify each response value
in the response string.

**Syntax**   All valid queries are listed in the Syntax column of the following table.

**Table 2-64: Syntax Table for SENSe:DATA:TELecom:MEASure:TRIButary:Slip Queries**

| Syntax | Response |
|--------|----------|
| SENSe:DATA:TELecom:MEASure:TRIButary:SLIP? | Returns all slip measurements |
| SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LAS? | Returns lagging bit slip (FAS 1-bit late) seconds for the layer selected |
| SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LES? | Returns Lagging bit slip (FAS 1-bit early) seconds for the selected layer |
| SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:CONTrolled? | Returns controlled slip (1-frame) seconds for the Nx64k signal selected (future) |

**All responses are in NR1-numeric format.**

**Response**   See the Response column of the previous table.

**Dependencies**   Layer selected in the SENSe:DATA:TELecom:MEASure:TRIButary:layer
command

**Errors and Events**   None

**Examples**   See the following table.

**Table 2-65: Example Table for SENSe:DATA:TELecom:MEASure:TRIButary:Slip Queries**

| Query | Response |
|---|---|
| SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LAS? | 27 |
| SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:LES? | 13 |
| SENSe:DATA:TELecom:MEASure:TRIButary:SLIP:CONTrolled? | 5 |

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:JRATio

This command returns the Justification Ratio (Stuff frames/ Tx frames) for the current active PDH analysis rate. This command will be implemented in the future.

**Syntax**   SENSe:DATA:TELecom:MEASure:TRIButary:JRATio?

**Dependencies**   Not available when rount-trip delay being measured.

**Errors and Events**   None

**Examples**   Query:   SENSe:DATA:TELecom:MEASure:TRIButary:JRATio?

Response:   Justification ration as a decimal

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure

This command will be implemented in the future. This command initiates a round trip delay test if no test is in progress. The query will return the measured round trip in ms, or an error indicating that measurement is in progress or that the measurement failed too long to measure. This commands cannot be executed when measurements are running. It will change the PRBS pattern to 2E29–1 and disable calcuation of received clock offset.

**Syntax**

SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure <action>
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?

**Parameters**

| <action>discrete | Description |
|---|---|
| ON | Changes the PRBS pattern to 2E29–1 and starts the round trip delay measurement |
| OFF | Restores the test pattern to its previous value. Round trip delay measurement is disabled. Clock offset calculation resumed. |

| Return Values | Description |
|---|---|
| ON | Round trip delay measurement is in progress and returned values are valid |
| OFF | Round trip delay measurement is disabled |
| WORKING | Measurement is in progress, return values are not valid |
| UNKNOWN | Measurement in progress, delay exceeds measurable range |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:   SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?

Response:   Round trip delay measurement status.

**Related Commands**   SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay?

# SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:CALIbrate

This command will be implemented in the future. This command takes the current round trip delay as a calibration offset, and substracts it from subsequent round trip delay calculations. A calibration value may also be set with this command. Round trip delay measurement must be in progress for this command to work.

**Syntax**    SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:CALIbrate
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:CALibrate?

**Parameters**

| <value>long integer | Description |
|---|---|
| 0... | Sets the calibration value in microseconds |

**Dependencies**    None

**Examples**    Query:    SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?

Response:   Round trip delay measurement status.

**Related Commands**    SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay?
SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:MEASure?

# SENSe:DATA:TELecom:MEASure:TRIButary:FREQuency

The clock frequency offset in ppm from nominal rate of the PDH payload is available when round trip delay is not being calculated.

**Syntax**    SENSe:DATA:TELecom:MEASure:TRIButary:FREQuency?

**Dependencies**    Not available when rount–trip delay being measured.

**Errors and Events**    None

**Examples**    Query:    SENSe:DATA:TELecom:MEASure:TRIButary::FREQuency?

Response:   Clock frequency offset in ppm of incoming direct or demultiplexed PDH streams

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset

This command sets the value of the delay offset parameter used in relative round-trip delay measurements.

**Syntax**     SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset <value>

**Parameters**

| value | Description |
|---|---|
| Decimal number | 1 to 5200 |

**Dependencies**     None

**Examples**     Query:     SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFSet 2

**Related Commands**     None

# SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset:ENAble

This command enables the value of the delay offset parameter used in relative round-trip delay measurements.

**Syntax**     SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFset:ENAble <state>

**Parameters**

| state | Description |
|---|---|
| ON | The round-trip delay value is expressed relative to the delay offset value. |
| OFF | The round-trip delay value represents an absolute delay |

**Dependencies**     Meaningful only when round-trip delay measurements are enabled.

**Examples**     Query:     SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:OFFSet:ENAble

**Related Commands**     None

# SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:STATus?

This command queries the status of the delay offset parameter used in relative round-trip delay measurements.

**Syntax**    SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay:STATus?

**Parameters**

| state | Description |
|---|---|
| OFF | The test unit is not measuring round-trip delay. |
| WAIT | The test unit is making its first round-trip delay measurement after delay measurement was enabled, and does not yet have valid data. |
| INVALID | The result of the most recent round-trip delay measurement was beyond the range the test unit can measure. |
| VALID | The round-trip delay number represetns the result of a valid measurement. |

**Dependencies**    the transmitted and received PDH payloads must be set to the same rate.

**Examples**    SENSe:DATA:TELecom:MEAsure:TRIButary:RTDElay:STATus?

**Related Commands**    All SENSe:DATA:TELecom:MEASure:TRIButary:RTDElay commands.

# SENSe:DATA:TELecom:JITter Subsystem

This section describes the commands and queries that control the jitter and wander measurements. Figure 2–87 shows the hierarchy tree for this CTS 850 subsystem.
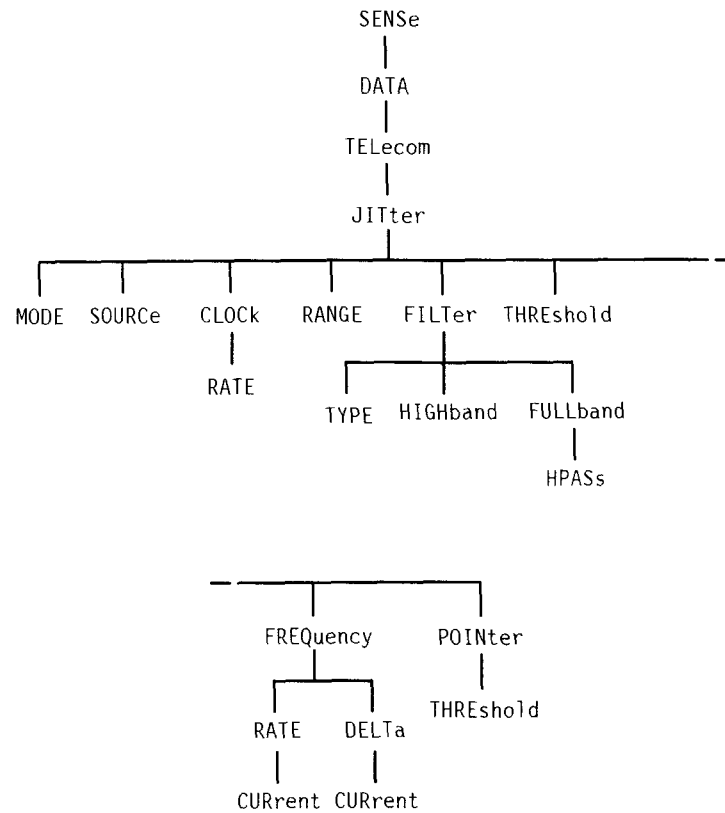


Figure 2–87: SENSe:DATA:TELecom:JITter subsystem

# SENSe:DATA:TELecom:JITter:MODE

This command sets or queries the jitter/wander generation mode.

**Syntax**    SENSe:DATA:TELecom:JITter:MODE <jitter mode>
SENSe:DATA:TELecom:JITter:MODE?

**Parameters**

| <jitter mode> (discrete) | Description |
|---|---|
| PTPeak | Measure peak-to-peak jitter (default) |
| RMS | Measure RMS jitter |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets jitter mode to PTPeak (default).

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:JITTER:MODE RMS

Query:    SENSE:DATA:TELECOM:JITTER:MODE?

Response:    PTPEAK

**Related Commands**    None

# SENSe:DATA:TELecom:JITter:SOURce

This command sets or queries the jitter measurement source.

**Syntax**

```
SENSe:DATA:TELecom:JITter:SOURce <jitter source>
SENSe:DATA:TELecom:JITter:SOURce?
```

**Parameters**

| <jitter source> (discrete) | Description |
|---|---|
| LINE | Measure jitter on receive line signal (default) |
| CLOCk | Measure jitter on the clock |

**Dependencies**

Requires installation of Option 14 jitter module.

*RST sets jitter source to LINE (default).

**Errors and Events**

None

**Examples**

Set:        SENSe:DATA:TELECOM:JITTER:SOURCE LINE

Query:      SENSe:DATA:TELECOM:JITTER:SOURCE?

Response:   CLOCK

**Related Commands**

None

# SENSe:DATA:TELecom:JITter:CLOCk:RATE

This command sets or queries the jitter or wander receive clock rate.

**Syntax**

```
SENSe:DATA:TELecom:JITter:CLOCk:RATE <clock rate>
```

| <clock rate> (discrete) | Description |
|---|---|
| M52 | 52 Mb/s rate |
| M155 | 155 Mb/s rate |
| M622 | 622 Mb/s rate |
| M2 | 2 Mb/s rate (default) |
| M34 | 34 Mb/s rate |
| M45 | 45 Mb/s rate |
| M140 | 140 Mb/s rate |

**Parameters** (label at left of table)

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets the clock rate to M52 (default).

**Errors and Events**    None

**Examples**    Set:    SENSe:DATA:TELECOM:JITTER:CLOCK:RATE M2

Query:    SENSe:DATA:TELECOM:JITTER:CLOCK:RATE?

Response:    M155

**Related Commands**    None

# SENSe:DATA:TELecom:JITter:RANGe

This command sets or queries the jitter measurement amplitude range. The entered value is the maximum UI that can be measured within the range.

**Syntax**    SENSe:DATA:TELecom:JITter:RANGe <jitter range>
SENSe:DATA:TELecom:JITter:RANGe?

**Parameters**

| <jitter range> (discrete) | Description |
|---|---|
| NORMal | Normal range 0–6 UI (default) |
| EXTENded | Extended range 0–16 or 0–200 UI. The instrument selects range based on jitter source rate:<br>■ 0 Hz to 30 Hz the maximum amplitude is 200<br>■ 30 Hz to 375 Hz the maximum amplitude drops linearly from 200 to 16<br>■ 375 Hz to the filter cutoff the maximum amplitude stays at 16 |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets the jitter range to NORMal (default).

**Errors and Events**    None

**Examples**    Set:    SENSE:DATA:TELECOM:JITTER:RANGE NORMAL

Query:    SENSE:DATA:TELECOM:JITTER:RANGE?

Response:    EXTENDED

**Related Commands**    None

# SENSe:DATA:TELecom:JITter:FILTer:TYPE

This command sets or queries the input signal jitter filter.

**Syntax**    SENSe:DATA:TELecom:JITter:FILTer:TYPE <jitter filter>
SENSe:DATA:TELecom:JITter:FILTer:TYPE?

**Parameters**

| <jitter filter> (discrete) | Description |
|---|---|
| WIDEband | Input filter (default) |
| HIGHBand | Input filter |
| FULLband | Tektronix-defined input filter |

**Dependencies**  Requires installation of Option 14 jitter module.

The frequency range for each filter type is defined by the standards. Frequency ranges also vary depending on the clock rate.

*RST sets the jitter filter type to WIDEband (default).

**Errors and Events**  None

**Examples**  Set:       SENSE:DATA:TELECOM:JITTER:FILTER:TYPE HIGHBAND

Query:     SENSE:DATA:TELECOM:JITTER:FILTER:TYPE?

Response:  HIGHBAND

**Related Commands**  None

# SENSe:DATA:TELecom:JITter:FILTer:HIGHBand

This command sets or queries the highband jitter filter mask.

**Syntax**  SENSe:DATA:TELecom:JITter:FILTer:HIGHBand <select Q>
SENSe:DATA:TELecom:JITter:FILTer:HIGHBand?

**Parameters**

| <select Q> (discrete) | Description |
|---|---|
| STANDard | Standards-defined mask (valid for all but 2MB; default for all but 2MB) |
| LOWQ | LOWQ mask (valid for 2MB; default for 2MB) |
| HIGHQ | HIGHQ mask (valid for 2MB) |

**Dependencies**  Requires installation of Option 14 jitter module.

*RST sets select Q to STANDard.

**Errors and Events**  221, "Settings conflict"
if the entered value is incorrect for the current receive rate.

**Examples**  Set:       SENSE:DATA:TELECOM:JITTER:FILTER:HIGHBAND LOWQ

Query:     SENSE:DATA:TELECOM:JITTER:FILTER:HIGHBAND?

Response:  STANDARD

**Related Commands**    NONE

# SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the fullband filter's high-pass filter range.

**Syntax**    SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs <fullband hpass>
SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs?

**Parameters**

| <fullband hpass> (discrete) | Description |
|---|---|
| U_1 | 0.1 Hz (default) |
| U1 | 1 Hz |
| U10 | 10 Hz |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets fullband hpass to U_1 (default).

**Errors and Events**    None

**Examples**    Set:        SENSE:DATA:TELECOM:JITTER:FILTER:FULLBAND:HPASS U1

Query:      SENSE:DATA:TELECOM:JITTER:FILTER:FULLBAND:HPASS?

Response:  U1

**Related Commands**    None

# SENSe:DATA:TELecom:JITter:THREshold

This command sets or queries the jitter hit threshold value.

**Syntax**    SENSe:DATA:TELecom:JITter:THREshold <jitter threshold>
SENSe:DATA:TELecom:JITter:THREshold?

**Parameters**

| <jitter threshold> (NR3-numeric) | Description |
|---|---|
| 0-200 | Threshold hit, in UI (default is 0.00) |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets jitter threshold to 0.00 (default).

**Errors and Events**    500, "Execution warning"
if the entered value is out of range for the command.

**Examples**    Set:        SENSE:DATA:TELECOM:JITTER:THRESHOLD 12.5

Query:      SENSE:DATA:TELECOM:JITTER:THRESHOLD?

Response:   15.5

**Related Commands**    None

# SENSe:DATA:TELecom:JITter:FREQuency:RATE:CURrent?

This query returns the receive rate frequency. This status is always available.

**Syntax**    SENSe:DATA:TELecom:JITter:FREQuency:RATE:CURrent?

**Response**

| <frequency rate> (NR3-numeric) | Description |
|---|---|
| 0-~622 MHz | Receive rate frequency, in Hz |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:JITTER:FREQUENCY:RATE:CURRENT?

Response:    139.264E+6

**Related Commands**    None

# SENSe:DATA:TELecom:JITter:FREQuency:DELTa:CURrent?

This query returns the difference between the receive rate and an ideal frequency. This status is always available.

**Syntax**    SENSe:DATA:TELecom:JITter:FREQuency:DELTa:CURrent?

**Response**

| <frequency DELTA> (NR3-numeric) | Description |
|---|---|
| –100.0 to 100.0 | Delta frequency in ppm. Resolution is 0.01 ppm. |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:JITTER:FREQUENCY:DELTA:CURRENT?

Response:    10.01

**Related Commands**    None

# SENSe:DATA:TELecom:JITter:POINter:THREshold

This command sets or queries the pointer hit threshold value. This value is the absolute allowable frequency drift rate. A pointer hit second event is recorded if the positive or negative frequency drift rate exceeds the pointer threshold value during a one second period.

**Syntax**

SENSe:DATA:TELecom:JITter:POINter:THREshold <jitter threshold>
SENSe:DATA:TELecom:JITter:POINter:THREshold?

**Parameters**

| <jitter threshold> (NR3-numeric) | Description |
|---|---|
| 0-10 | Pointer threshold in ppm/sec (default is 10) |

**Dependencies**

Requires installation of Option 14 jitter module.

*RST sets jitter threshold to 10 (default).

**Errors and Events**

500, "Execution warning"
if the entered value is out of range for the command.

**Examples**

Set: SENSE:DATA:TELECOM:JITTER:POINTER:THRESHOLD 0.5

Query: SENSE:DATA:TELECOM:JITTER:POINTER:THRESHOLD?

Response: 5

**Related Commands**

SENSe:DATA:TELecom:MEASure:JITter:POINter:HSEConds?

# SENSe:DATA:TELecom:MEASure:JITter Subsystem

This section describes the SENSe:DATA:TELEcom:MEASure:JITter susbsystem commands and queries. Figure 2–89 shows the hierarchy tree for this CTS 850 subsystem.

```
                              SENSe
                                |
                              DATA
                                |
                            TELecom
                                |
                            MEASure
                                |
                             JITter
                                |
        ┌──────────┬───────────┼──────────────────┬────────── - - -
        │          │           │                  │
     STATus     PTPeak        PEAK               RMS
                   │            │                  │
                ┌──┴──┐   ┌─────┴──────┐        ┌──┴──┐
            CURrent MAXimum POSITIVE      NEGATIVE CURrent MAXimum
                              │              │
                           ┌──┴──┐        ┌──┴──┐
                       CURrent MAXimum CURrent MAXimum


  - - ┬─────────┬───────────┬──────────────────────────────┐
      │         │           │                              │
   HSEConds UNLSeconds   POINter                        FREQuency
                            │                              │
                         HSEConds            ┌─────────────┼────────────┐
                                          DRIFt      CURrent MAXimum MINimum
                                             │           │       │       │
                                          ┌──┴──┐     DELTa   DELTa   DELTa
                                      CURrent? MAXimum?
```
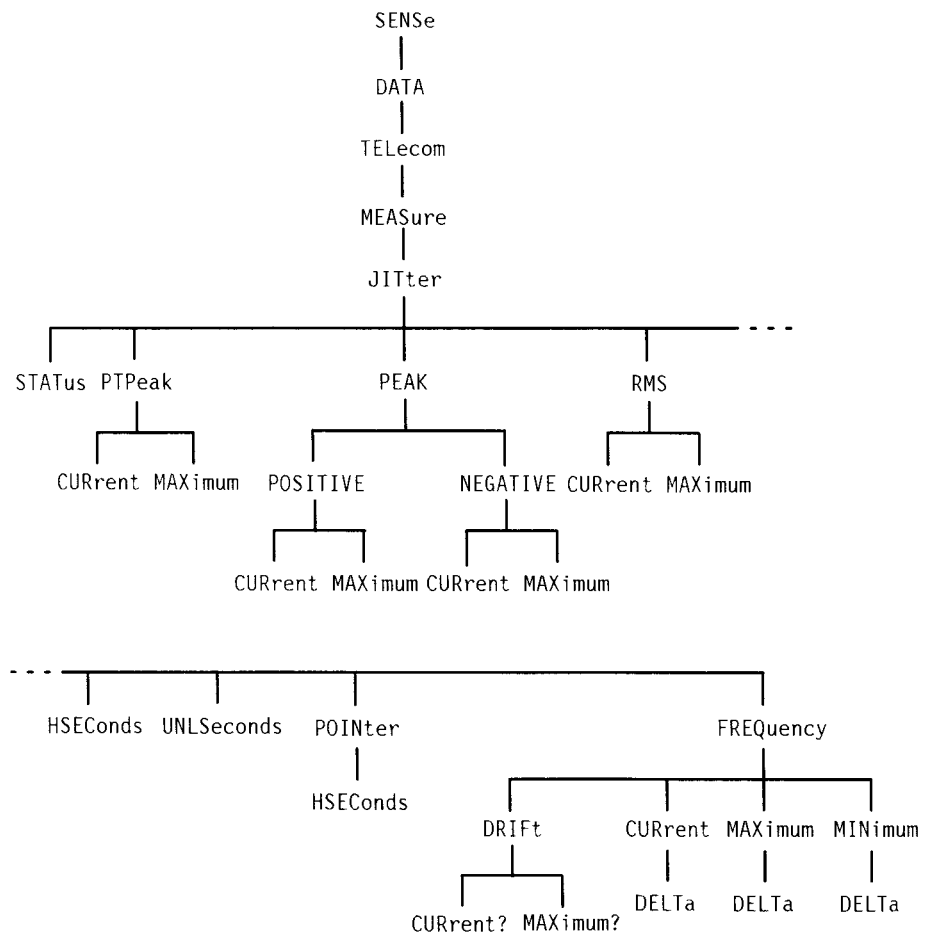
**Figure 2–89: SENSe:DATA:TELecom:MEASure:JITter subsystem**

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

This query returns the status of jitter test measurements.

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

**Response**

| <jit stat> (discrete) | Description |
|---|---|
| VALID | Measurements valid |
| UNLOcked | Measurements invalid due to loss of signal lock or out-of-range jitter measurement |
| WAIT | Measurements not valid because hardware is initializing |

**Dependencies**     Requires installation of Option 14 jitter module.

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:MEASURE:JITTER:STATUS?

Response:  VALID

**Related Commands**     None

# SENSe:DATA:TELecom:MEASure:JITter:PTPeak:CURrent?

This query returns the jitter peak-to-peak amplitude. When a test is running, this command returns the current peak-to-peak jitter amplitude of the running test. When a test is not running, this command returns the last-measured peak-to-peak jitter amplitude.

**Syntax**     SENSe:DATA:TELecom:MEASure:JITter:PTPeak:CURrent?

**Response**

| <jitter ptp> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Jitter peak-to-peak amplitude in UI |

**Dependencies**    Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:PTPEAK:CURRENT?

Response:    1.6

**Related Commands**    SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:PTPeak:MAXimum?

This query returns the maximum peak-to-peak jitter amplitude since the beginning of the current test.

**Syntax**    SENSe:DATA:TELecom:MEASure:JITter:PTPeak:MAXimum?

**Response**

| <jitter ptp max> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Maximum jitter peak-to-peak amplitude in UI |

**Dependencies**    Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:PTPEAK:MAXIMUM?

Response:    1.6

**Related Commands**    SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:CURrent?

This query returns the jitter positive peak amplitude. When a test is running, this command returns the current jitter positive peak amplitude of the running test. When a test is not running, this command returns the last-measured jitter positive peak amplitude.

**Syntax**  SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:CURrent?

**Response**

| <jitter pmax> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Jitter positive peak amplitude in UI |

**Dependencies**  Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

**Errors and Events**  None

**Examples**  Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:POSITIVE:
CURrent?

Response:  0.6

**Related Commands**  SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:MAXimum?

This query returns the jitter maximum positive peak amplitude since the beginning of the current test.

**Syntax**  SENSe:DATA:TELecom:MEASure:JITter:PEAK:POSITIVE:MAXimum?

**Response**

| <jitter ppmax> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Maximum jitter positive peak amplitude in UI |

**Dependencies**    Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:POSITIVE:
MAXIMUM?

Response:  0.6

**Related Commands**    SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:CURrent?

This query returns the jitter negative peak amplitude. When a test is running, this command returns the current jitter negative peak amplitude of the running test. When a test is not running, this command returns the last-measured jitter negative peak amplitude.

**Syntax**    SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:CURrent?

**Response**

| <jitter pmax> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Jitter negative peak amplitude in UI |

**Dependencies**    Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:NEGATIVE:
CURrent?

Response:  -0.6

**Related Commands**    SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:MAXimum?

This query returns the jitter maximum negative peak amplitude since the beginning of the current test.

**Syntax**  SENSe:DATA:TELecom:MEASure:JITter:PEAK:NEGATIVE:MAXimum?

**Response**

| \<jitter pnmax\> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Maximum jitter negative peak amplitude in UI |

**Dependencies**  Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to PTP

**Errors and Events**  None

**Examples**  Query:      SENSE:DATA:TELECOM:MEASURE:JITTER:PEAK:NEGATIVE:
MAXIMUM?

Response:  -0.6

**Related Commands**  SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:RMS:CURrent?

SDH/PDH Jitter/Wander Test Option Only

This query returns the jitter RMS value. When a test is running, this command returns the current jitter RMS value of the running test. When a test is not running, this command returns the last-measured jitter RMS value.

**Syntax**  SENSe:DATA:TELecom:MEASure:JITter:RMS:CURrent?

**Response**

| \<jitter rms\> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 5.0 | Jitter RMS value in UI |

**Dependencies**     Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to RMS

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:MEASURE:JITTER:RMS:CURRENT?

Response:  1.6

**Related Commands**     SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:RMS:MAXimum?

This query returns the jitter maximum jitter RMS since the beginning of the current test.

**Syntax**     SENSe:DATA:TELecom:MEASure:JITter:RMS:MAXimum?

**Response**

| <jitter rms max> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 5.0 | Maximum jitter RMS in UI |

**Dependencies**     Requires installation of Option 14 jitter module.

SENSe:DATA:TELecom:JITter:MODE must be set to RMS

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:MEASURE:JITTER:RMS:MAXIMUM?

Response:  1.4

**Related Commands**     SENSe:DATA:TELecom:JITter:MODE

# SENSe:DATA:TELecom:MEASure:JITter:HSEConds?

This query returns the number of jitter hit seconds since the beginning of the test.

**Syntax**     SENSe:DATA:TELecom:MEASure:JITter:HSEConds?

**Response**

| <jitter hsecs> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to number of seconds in the test | Number of jitter hit seconds |

**Dependencies**     Requires installation of Option 14 jitter module.

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:MEASURE:JITTER:HSECONDS?

Response:  2

**Related Commands**     None

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

This query returns the number of jitter unlock seconds since the beginning of the test. This is the number of seconds that jitter could not be measured because the jitter signal was out of measurement range.

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

**Response**

| <jitter unls> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to number of seconds in the test | Number of jitter unlock seconds |

**Dependencies**     Requires installation of Option 14 jitter module.

**Errors and Events**     None

**Examples**   Query:   SENSE:DATA:TELECOM:MEASURE:JITTER:UNLSECONDS?

Response:   2

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:JITter:POINter:HSEConds?

This query returns the number of jitter pointer hit seconds since the beginning of the test.

**Syntax**   SENSe:DATA:TELecom:MEASure:JITter:POINter:HSEConds?

**Response**

| <jitter evs> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to the number of seconds in the test | Number of jitter pointer hit seconds |

**Dependencies**   Requires installation of Option 14 jitter module.

PDH mapping must be selected.

Does not apply when the jitter source is set to clock, 52, 155, or 622 mB rates.

Use SENSe:DATA:TELecom:JITter:POINter:THREshold to set the hit second threshold.

**Errors and Events**   None

**Examples**   Query:   SENSE:DATA:TELECOM:MEASURE:JITTER:POINTER:HSECONDS?

Response:   2

**Related Commands**   SENSe:DATA:TELecom:JITter:POINter:THREshold

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

SDH/PDH Jitter/Wander Test Option Only

This query returns the video-related jitter frequency drift rate. When a test is running, this command returns the current jitter frequency drift rate value of the

running test. When a test is not running, this command returns the last-measured jitter frequency drift rate value.

**Syntax**   SENSe:DATA:TELecom:MEASure:JITter:FREQuency:DRIFt:CURrent?

**Response**

| <jitter drift> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 100.0 | Video-related jitter frequency drift rate, in ppm/sec |

**Dependencies**   Requires installation of Option 14 jitter module.

**Errors and Events**   None

**Examples**   Query:   SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:DRIFT:
CURRENT?

Response:   10.6

**Related Commands**   None

# SENSe:DATA:TELecom:MEASure:JITter:FREQuency:DRIFt:MAXimum?

This query returns the maximum video-related jitter frequency drift since the beginning of the current test.

**Syntax**   SENSe:DATA:TELecom:MEASure:JITter:FREQuency:DRIFt:MAXimum?

**Response**

| <jitter drift max> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 100.0 | Maximum video-related jitter frequency drift rate, in ppm/sec |

**Dependencies**   Requires installation of Option 14 jitter module.

**Errors and Events**   None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:DRIFT
:MAXIMUM?

Response:  10.8

**Related Commands**    None

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

This query returns the jitter source (line or clock) receive-rate frequency. When a
test is running, this command returns the current receive-rate frequency of the
running test. When a test is not running, this command returns the last-measured
receive-rate frequency.

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

**Response**

| <jitter rcv> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 Hz to 622 MHz | Current jitter receive frequency in Hz |

**Dependencies**    Requires installation of Option 14 jitter module.

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:CURRENT?

Response:  34.367999E+6

**Related Commands**    None

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

This query returns the delta of the current frequency from the ideal frequency.
When a test is running, this command returns the current receive-rate frequency
delta of the running test. When a test is not running, this command returns the
last-measured receive-rate delta frequency.

**Syntax**    SENSe:DATA:TELecom:MEASure:JITter:FREQuency:CURrent:DELTa?

| Response | <jitter rcv> (NR3-numeric) | Description |
|---|---|---|
| | Floating point number in the range of –100.0 to 100.0 | Delta of the current frequency in ppm. Resolution is 0.01 ppm |

**Dependencies**  Requires installation of Option 14 jitter module.

**Errors and Events**  None

**Examples**  Query:  SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY: CURRENT:DELTA?

Response:  10.01

**Related Commands**  None

# SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum?

This query returns the maximum jitter source (line or clock) receive-rate frequency since the beginning of the current test.

**Syntax**  SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum?

| Response | <Jit recfreq max> (NR3-numeric) | Description |
|---|---|---|
| | Floating point number in the range of 0 Hz to 622 MHz | Maximum receive rate frequency in Hz |

**Dependencies**  Requires installation of Option 14 jitter module.

**Errors and Events**  None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:
                          MAXIMUM?

                Response:  34.368E+6

**Related Commands**    None


# SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum:DELTa?

This query returns the maximum jitter source (line or clock) receive-rate frequency delta since the beginning of the current test.

**Syntax**    SENSe:DATA:TELecom:MEASure:JITter:FREQuency:MAXimum:DELTa?

**Response**

| <freq max delta> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of –100 to 100 | Maximum receive rate frequency delta in ppm |

**Dependencies**    Requires installation of Option 14 jitter module.

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:
                          MAXIMUM:DELTA?

                Response:  10.2

**Related Commands**    None


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

This query returns the minimum jitter source (line or clock) receive-rate frequency since the beginning of the current test.

**Syntax**    SENSe:DATA:TELecom:MEASure:JITter:FREQuency:Minimum?

**Response**

| <jitter freq min> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 Hz to 622 MHz | Minimum receive rate frequency in Hz |

**Dependencies**     Requires installation of Option 14 jitter module.

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:
MINIMUM?

Response:     34.367998E+6

**Related Commands**     None

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

This query returns the minimum jitter source (line or clock) receive-rate frequency delta since the beginning of the current test.

**Syntax**

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

**Response**

| <min freq delta> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of –100.0 to 100.0 | Minimum receive rate frequency delta in ppm |

**Dependencies**

Requires installation of Option 14 jitter module.

**Errors and Events**

None

**Examples**

Query:   SENSE:DATA:TELECOM:MEASURE:JITTER:FREQUENCY:
         MINIMUM:DELTA?

Response: 10.2

**Related Commands**

None

## SENSe:DATA:TELecom:TEST:JITter Subsystem

This section describes the commands and queries that control the jitter and wander measurements. Figure 2-91 shows the hierarchy tree for this CTS 850 subsystem.
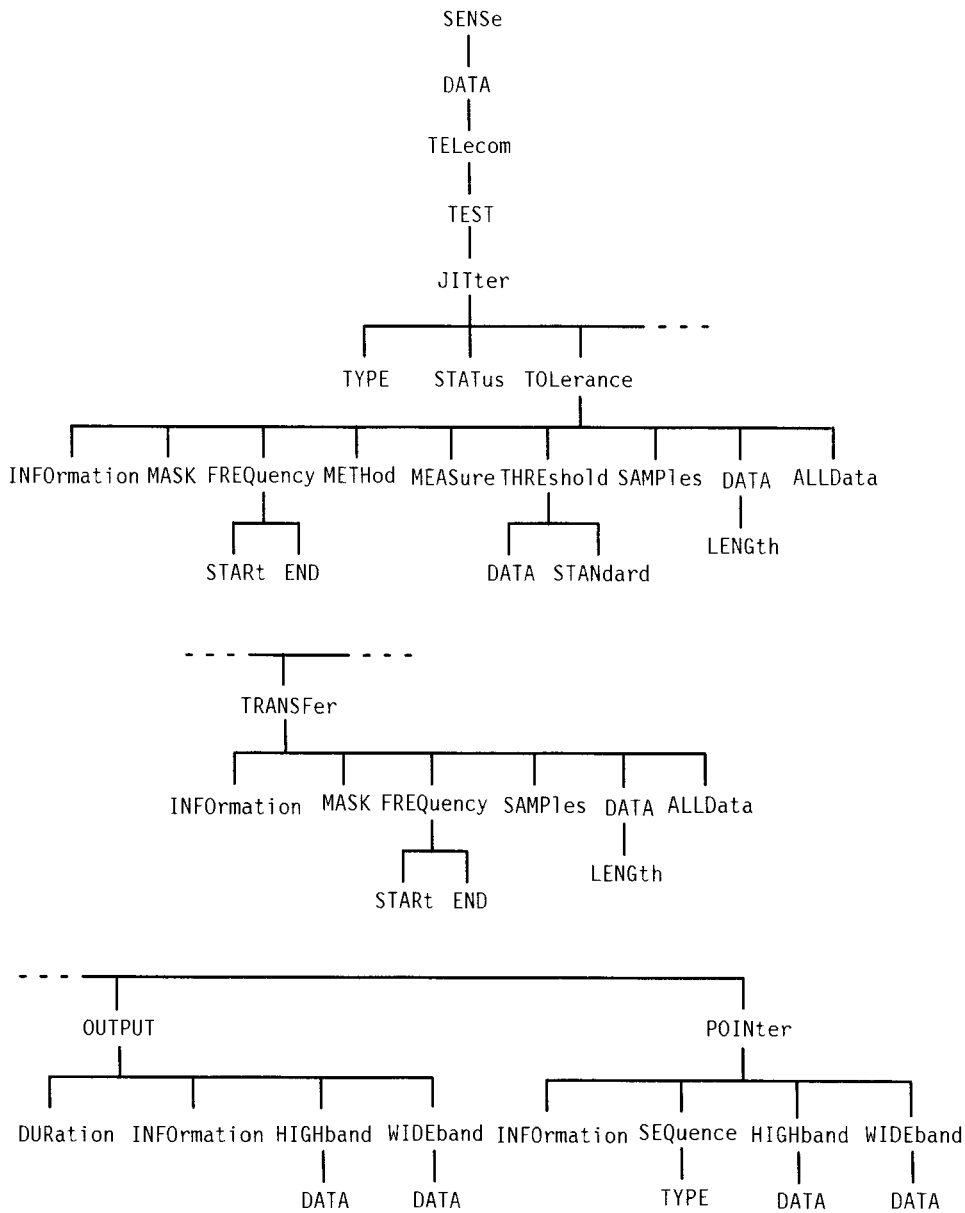


Figure 2-91: SENSe:DATA:TELecom:TEST:JITter subsystem

# SENSe:DATA:TELecom:TEST:JITter:TYPE

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries a pre-defined jitter compliance test.

**Syntax**
SENSe:DATA:TELecom:TEST:JITter:TYPE <jitter test>
SENSe:DATA:TELecom:TEST:JITter:TYPE?

**Parameters**

| <jitter test> (discrete) | Description |
|---|---|
| TOLerance | Maximum tolerable jitter test |
| TRANSFer | Transfer jitter line-to-line test or jitter synchronization source-to-line test |
| OUTPUT | Output jitter test (default) |
| POINter | Pointer jitter test |

**Dependencies**
Requires installation of Option 14 jitter module.

*RST sets jitter test to OUTPUT (default).

**Errors and Events**
None

**Examples**
Set:       SENSE:DATA:TELECOM:TEST:JITTER:TYPE OUTPUT

Query:     SENSE:DATA:TELECOM:TEST:JITTER:TYPE?

Response:  TRANSFER

**Related Commands**
None

# SENSe:DATA:TELecom:TEST:JITter:STATus?

SDH/PDH Jitter/Wander Test Option Only

This query returns the current jitter compliance test status.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:STATus?

**Response**

| <jitter stat> (discrete) | Description |
|---|---|
| STOP | Jitter test is not running |
| RUN | Jitter test is running |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:STATUS?

Response:  STOP

**Related Commands**    SENSe:DATA:TELecom:TEST:STARt

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns jitter tolerance test settings.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TOLerance:INFOrmation:<info>?

**Parameters**

| <info> (discrete) | Description |
|---|---|
| SOURce | Results source |
| TIME | Test start time |
| DATE | Test start date |
| TXRate | Transmitted signal rate |
| RXRate | Received signal rate |

| <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 |

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| TXMask | Description |
|--------|------------|
| GR253 | GR-253 Standard mask (valid for 52 Mb/s) |
| G825 | G.825 Standard mask (valid for 155 and 622 Mb/s) |
| TYPEA | G.958 Type A equipment mask (valid for 155 and 622 Mb/s) |
| TYPEB | G.958 Type B equipment mask (valid for 155 and 622 Mb/s) |
| LOWQ | G.823 Low Q mask (valid for 2 Mb/s) |
| HIGHQ | G.823 High Q mask (valid for 2 Mb/s) |
| G823 | G.823 Standard mask (valid for 34 and 144 Mb/s) |

| FREQStart | Description |
|-----------|------------|
| Floating point value in Hz | Frequency start |

| FREQEnd | Description |
|---------|------------|
| Floating point value in Hz | Frequency end |

| SAMPles | Description |
|---------|------------|
| Integer value | Maximum number of samples |

**Dependencies**      None

**Errors and Events**      None

**Examples**      Query:      SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:
INFORMATION:RXRATE?

Response:   M155

**Related Commands**      None

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance test mask.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK <jitter mask>
SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK?

**Parameters**

| <jitter mask> (discrete) | Description |
|---|---|
| GR253 | GR-253 Standard mask (valid for 52 Mb/s, default for 52 Mb/s) |
| G825 | G.825 Standard mask (valid for 155 and 622 Mb/s) |
| TYPEA | G.958 Type A equipment mask (valid for 155 and 622 Mb/s, default for 155 and 622 Mb/s) |
| TYPEB | G.958 Type B equipment mask (valid for 155, and 622 Mb/s) |
| LOWQ | G.823 Low Q mask (valid for 2 Mb/s, default for 2 Mb/s) |
| HIGHQ | G.823 High Q mask (valid for 2 Mb/s) |
| G823 | G.823 Standard mask (valid for 34 and 144 Mb/s, default for 34 and 144 Mb/s) |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets the jitter mask to default.

**Errors and Events**    221, "Settings conflict"
if the value entered is not valid for the current receive rate.

**Examples**    Set:    SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MASK TYPEA

Query:    SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MASK?

Response:    TYPEA

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance test start frequency.

**Syntax**  SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt
<tol freq start>
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt?

**Parameters**

| <tol freq start> (NR3-numeric) | Description |
|---|---|
| Floating point number in range from 0 to the end frequency | Start frequency in Hz |

**Dependencies**  *RST sets the tolerance frequency start point to 125 µHz (default).

Value must be less than end frequency.

**Errors and Events**  500, "Execution warning"
if the entered value is out of range for the command.

**Examples**  Set:      SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE
:FREQUENCY:START 1000.0

Query:    SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE
:FREQUENCY:START?

Response: 1200.0

**Related Commands**  SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance test end frequency.

**Syntax**  SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END
<tol freq end>
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END?

| Parameters | <tol freq end> (NR3-numeric) | Description |
|---|---|---|
| | Floating point number in range of greater than start frequency to 5 MHz | End frequency in Hz |

**Dependencies**
Requires installation of Option 14 jitter module.

*RST sets the tolerance end frequency to 19.3 Hz (default).

Value must be greater than starting frequency.

**Errors and Events**
500, "Execution warning"
if the entered value is out of range for the command.

**Examples**
Set:　　SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE
　　　　:FREQUENCY:END 100000.0

Query:　SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:FREQUENCY:END?

Response:　120000.0

**Related Commands**
SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter tolerance compliance test error criteria method.

**Syntax**
SENSe:DATA:TELecom:TEST:JITter:Tolerance:METHod <test method>
SENSe:DATA:TELecom:TEST:JITter:Tolerance:METHod?

| Parameters | <test method> (discrete) | Description |
|---|---|---|
| | ONSET_ERR | Onset of Errors method (default) |
| | BER | BER method |

**Dependencies**
Requires installation of Option 14 jitter module.

**Errors and Events**     None.

**Examples**     Set:     SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE
                          :METHOD ONSET_ERR

                 Query:   SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:METHOD?

                 Response: BER

**Related Commands**     None

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:MEASure

SDH/PDH Jitter/Wander Test Option Only

This command starts or stops the BER measurement threshold. When the instrument receives a stop command, it uses the last measured value as the threshold for the jitter tolerance calculations.

**Syntax**     SENSe:DATA:TELecom:TEST:JITter:Tolerance:MEASure <meas ctrl>
               SENSe:DATA:TELecom:TEST:JITter:Tolerance:MEASure?

**Parameters**

| <meas ctrl> (discrete) | Description |
|---|---|
| START | Start BER measurement |
| STOP | Stop and record BER measurement |

**Dependencies**     Requires installation of Option 14 jitter module.

You can only use this command if the jitter tolerance error criteria is set to BER.

**Errors and Events**     None

**Examples**     Set:     SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MEASURE START

                 Query:   SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:MEASURE?

                 Response: STOP

**Related Commands**     SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the last measured BER value to use as the threshold for the jitter tolerance BER compliance test.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:DATA?

**Response**

| <BER value> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 1.0E-3 to 1.0E-9, or zero | Last measured BER value. A zero means that no BER value was measured (the JITter:TOLerance:MEASure test was not run or not stopped) |

**Dependencies**    This query only applies if the jitter tolerance error criteria is set to BER.

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:
THRESHOLD:DATA?

Response:    4.89E-8

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod
SENSe:DATA:TELecom:TEST:JITter:TOLerance:MEASure

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:STANdard?

SDH/PDH Jitter/Wander Test Option Only

This query returns the recommended BER value (from 0.171) to use as the threshold for the jitter tolerance BER compliance test.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TOLerance:THREshold:STANdard?

**Response**

| <BER std> (NR3-numeric) | Description |
|---|---|
| Floating point number in the approximate range of 1.0E–3 to 1.0E–9 | Recommended BER value |

**Dependencies**    This query only applies if the jitter tolerance error criteria is set to BER.

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:THRESHOLD:
STANDARD?

Response:  5.25E-6

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:SAMPles

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the number of samples, including the corner frequencies for the jitter tolerance test mask.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:Tolerance:SAMPles <tol samples>
SENSe:DATA:TELecom:TEST:JITter:Tolerance:SAMPles?

**Parameters**

| <tol samples> (NR1-numeric) | Description |
|---|---|
| An integer in the range of 4 to 26 | Number of samples including corner frequencies |

**Dependencies**     Requires installation of Option 14 jitter module.

*RST sets tolerance samples to 4 (default).

**Errors and Events**     500, "Execution warning"
if the entered value is out of range for the command.

**Examples**     Set:     SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:SAMPLES 4

Query:     SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:SAMPLES?

Response:     32

**Related Commands**     None

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA:LENGth?

SDH/PDH Jitter/Wander Test Option Only

This query returns the actual number of measurement samples in the jitter tolerance test.

**Syntax**     SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA:LENGth?

**Response**

| <data length> (discrete) | Description |
|---|---|
| An integer in the range of 0 to 26 | Number of samples in the jitter tolerance test. A zero means that the instrument acquired no data or did not run the JITter:TOLerance test. |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:DATA:LENGTH?

Response:     7

**Related Commands**     None

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the status (frequency, amplitude, and mask values) of the specified jitter tolerance test sample. The response is a comma-separated list of values, in the order listed in the response table.

**Syntax**     SENSe:DATA:TELecom:TEST:JITter:TOLerance:DATA? <N>

**Response**

| <N> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 1 to 26 | Data sample number |

| <freq> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 12 µHz to 5 MHz | Sample jitter frequency in Hz |

| <amplitude> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Computed jitter tolerance, in UI, for frequency <freq> |

| <mask> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Mask value, in UI, for frequency <freq> |

| <data status> (discrete) | Description |
|---|---|
| NONE | Measurement data empty |
| VALID | Measurement data meets mask specifications |
| FAILure | Measurement data fails mask specifications |
| UNLOcked | Measurement invalid due to loss of signal (LOS), jitter over range, or pattern loss |

**Dependencies**     None

**Errors and Events**     None

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:DATA? 1

Response:  1, 500.0, 46.7, 39.0, VALID

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

# SENSe:DATA:TELecom:TEST:JITter:TOLerance:ALLData?

SDH/PDH Jitter/Wander Test Option Only

This query returns the complete status (frequency, amplitude, and mask values) of the jitter tolerance test. The response is a comma-separated list of values, in the order listed in the response table.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TOLerance:ALLData?

**Response**

| <N><data–points> | Description |
|---|---|
| <x1-freq> | Jitter frequency (Hz) of point 1 |
| <x1-ampl> | Jitter amplitude (UI) of point 1 |
| <x1-mask> | Mask amplitude (UI) of point 1 |
| <x1-status> | Data status of point 1 |
| ... | ... |
| <xn-freq> | Jitter frequency (Hz) of point n |
| <xn-ampl> | Jitter amplitude (UI) of point n |
| <xn-mask> | Mask amplitude (UI) of point n |
| <xn-status> | Data status of point n |

Where n is the number of points returned by the SENSe:DATA:TELecom:TEST:JITter :TOLerance:DATA:LENGth? command

| <freq> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 125 µHZ to 5 MHz | Sample frequency in Hz |

| <amplitude> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Computed jitter tolerance, in UI, for frequency <freq> |

| <mask> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Mask value, in UI, for frequency <freq> |

| <data status> (discrete) | Description |
|---|---|
| NONE | No measurement data |
| VALID | Measurement data meets mask specifications |
| FAILure | Measurement data fails mask specifications |
| UNLOcked | Measurement invalid due to loss of signal (LOS), jitter over range, or pattern loss |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Query:      SENSE:DATA:TELECOM:TEST:JITTER:TOLERANCE:ALLDATA?

Response:  20,1.2,1.8,VALID,100,2.0,2.8,VALID,100E+1,3.0,3.2,VAL-
ID,100E+2,20.0,18.2,OOR

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

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns jitter transfer test settings.

**Syntax**     SENSe:DATA:TELecom:TEST:JITter:TRANSFer:INFOrmation:<info>?

**Parameters**

| <info> (discrete) | Description |
|---|---|
| SOURce | Results source |
| TIME | Test start time |
| DATE | Test start date |
| TXSource | Transmitted signal source |
| TXRate | Transmitted signal rate |
| RXRate | Transmitted signal rate |
| TXMask | Transmit signal mask |
| FREQStart | Start frequency |
| FREQEnd | End frequency |
| SAMPles | Number of sample points |

**Response**

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

| TIME | Description |
|---|---|
| HH:MM:SS | Test start time (hr, min, sec) |

| DATE | Description |
|---|---|
| YY:MM:DD | Test start date (yr, mo, day) |

| TXSource | Description |
|---|---|
| LINE | Transmit jitter source is line |
| CLOCK | Transmit jitter source is clock |

| TXRate | Description |
|--------|-------------|
| M52 | 52 Mb/s (STM-0) |
| M155 | 155 Mb/s (STM-1) |
| M622 | 622 Mb/s (STM-4) |
| M2 | 2 Mb/s |
| M34 | 34 Mb/s |
| M140 | 140 Mb/s |

| RXRate | Description |
|--------|-------------|
| M52 | 52 Mb/s (STM-0) |
| M155 | 155 Mb/s (STM-1) |
| M622 | 622 Mb/s (STM-4) |
| M2 | 2 Mb/s |
| M34 | 34 Mb/s |
| M140 | 140 Mb/s |

| TXMask | Description |
|--------|-------------|
| GR253 | GR-253 Standard mask (valid for 52 Mb/s) |
| TYPEA | G.958 Type A equipment mask (valid for 155 and 622 Mb/s) |
| TYPEB | G.958 Type B equipment mask (valid for 155 and 622 Mb/s) |
| G735 | G.735 Standard mask (valid for 2 Mb/s) |
| G751 | G.751 Standard mask (valid for 34 Mb/s) |
| UNDEFined | Undefined Standard mask (valid for 144 Mb/s) |

| FREQStart | Description |
|-----------|-------------|
| Floating point value in Hz | Frequency start |

| FREQEnd | Description |
|---------|-------------|
| Floating point value in Hz | Frequency end |

| SAMPles | Description |
|---------|-------------|
| Integer value | Maximum number of samples |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:INFO:TXS?

Response:  LINE

**Related Commands**    None

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the mask for the jitter transfer test.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK <jitter mask>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK?

**Parameters**

| <jitter mask> (discrete) | Description |
|---|---|
| GR253 | GR-253 Standard mask (valid for 52 Mb/s, default for 52 Mb/s) |
| TYPEA | G.958 Type A equipment mask (valid for 155 and 622 Mb/s, default for 155 and 622 Mb/s) |
| TYPEB | G.958 Type B equipment mask (valid for 155 and 622 Mb/s) |
| G735 | G.735 Standard mask (valid for 2 Mb/s, default for 2 Mb/s) |
| G751 | G.751 Standard mask (valid for 34 Mb/s, default for 34 Mb/s) |
| UNDEFined | Undefined Standard mask (valid for 144 Mb/s, default for144 Mb/s) |

**Dependencies**    Requires installation of Option 14 jitter module.

*RST sets jitter mask to default.

**Errors and Events**  221, "Settings conflict"
if the specified parameter is not correct for the current jitter receive rate.

**Examples**  Set:  SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:MASK TYPEA

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

Response:  TYPEB

**Related Commands**  None

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter transfer test start frequency.

**Syntax**  SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt
<tran freq start>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt?

**Parameters**

| <tran freq start> (NR3-numeric) | Description |
|---|---|
| Floating point number in range from 0 to less than end frequency | Start frequency in Hz |

**Dependencies**  Requires installation of Option 14 jitter module.

*RST sets the transfer frequency start point to 10.0 Hz (default).

Value must be less than end frequency.

**Errors and Events**  500, "Execution warning"
if the entered value is out of range for the command.

**Examples**    Set:            SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:FREQUENCY
:START 10.0

               Query:       SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER
:FREQUENCY:START?

               Response:  15.5

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the jitter transfer test end frequency.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END
      &lt;trans freq end&gt;
    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END?

**Parameters**

| <tol freq end> (NR3-numeric) | Description |
|---|---|
| Floating point number in range of greater than start frequency to 5 MHz | End frequency in Hz |

**Dependencies**    Requires installation of Option 14 jitter module.

                   *RST sets transfer frequency end to 130 KHz (default).

                   Value must be greater than starting frequency.

**Errors and Events**    500, "Execution warning"
if the entered value is out of range for the command.

**Examples**    Set:            SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:FREQUENCY
:END 100000.0

               Query:       SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:FREQUENCY
:END?

               Response:  130000.0

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the number of samples, including the corner frequencies defined by the jitter transfer test mask.

**Syntax**
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles <trans samples>
SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles?

**Parameters**

| <trans samples> (NR1-numeric) | Description |
|---|---|
| An integer in the range of 4 to 16 | Number of samples including corner frequencies. Default is the number of corner frequencies. |

**Dependencies**
Requires installation of Option 14 jitter module.

*RST sets transfer samples to the default.

**Errors and Events**
500, "Execution warning"
if the entered value is out of range for the command.

**Examples**
Set:       SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:SAMPLES 4

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

Response:  8

**Related Commands**
None

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA:LENGth?

SDH/PDH Jitter/Wander Test Option Only

This query returns the actual number of measurement samples in the jitter transfer test.

**Syntax**   SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA:LENGth?

**Response**

| <data length> (discrete) | Description |
|---|---|
| An integer in the range of 1 to 16 | Number of samples in the jitter transfer test. A zero means that the JITter:TRANSfer test acquired no data (the test was not run or not stopped). |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:     SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:DATA:LENGTH?

Response:  6

**Related Commands**   SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA?

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the status (frequency, amplitude, and mask values) of the specified jitter transfer test data sample. The response is a comma-separated list of values, in the order listed in the response table.

**Syntax**   SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA? <N>

**Response**

| <N> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 1 to 16 | Data sample number |

| <freq> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of 12 µHz to 5 MHz | Sample frequency in Hz |

| <amplitude> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of +3 to -5 | Computed jitter transfer, in dB, for frequency <freq> |

| <mask> (NR3-numeric) | Description |
|---|---|
| Floating point number in the range of +3 to -5 | Mask value, in dB, for frequency <freq> |

| <data status> (discrete) | Description |
|---|---|
| NONE | Measurement data empty |
| VALID | Measurement data meets mask specifications |
| FAILure | Measurement data fails mask specifications |
| UNLOcked | Measurement invalid due to loss of signal (LOS), jitter over range, or pattern loss |

**Dependencies**      None

**Errors and Events**      None

**Examples**      Query:      `SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:DATA? 1`

Response:   `1, 500.0, -2.3, -5.0, VALID`

**Related Commands**      SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA:LENGth?

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE

This command selects which action to perform when the Jitter Transfer test is started.

**Syntax**      `SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE <tran_state>`

| <tran_state> | Description |
|---|---|
| TEST | Test network element (default) |
| Calibrate | Calibrate CTS for transfer test |

**Dependencies**    None

**Comments**    *RST will set tran_state to default.

CAL can only be performed if the Jitter Generation Source and Jitter Measurement Source are both LINE and the Tx/Rx rates are identical.

To determine if CAL is needed, use query:
sense:data:telecom:test:jitter:transfer:cal:status?

**Errors and Events**    −221, "Setting Conflict" If the Jitter Generation Source and Jitter Measurement Source are not both LINE or the Tx/Rx rates are not identical and CAL is selected.

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:STATE TEST

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:CAL:Status?

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE?

This command returns which action is performed in response to running a Jitter Transfer test.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE?

| <tran_state> | Description |
|---|---|
| TEST | Test network element (default) |
| Calibrate | Calibrate CTS for transfer test |

**Dependencies**    None

**Comments**    None

**Errors and Events**    None

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

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:STATE

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:Calibrate:STATus?

This query returns the status of the Jitter Transfer calibration data.

**Syntax**    SENSe:DATA:TELecom:TEST:JITter:TRANSFer:Calibrate:Status?

**Response**

| <cal_status> | Description |
|---|---|
| NONE | Not applicable with current instrument settings |
| UNCAL | Jitter transfer is not calibrated |
| RUNNING | Jitter transfer calibration in progress |
| COMPLETE | Jitter Transfer is calibrated |

**Dependencies**    Requires installation of Option 14 jitter module
*RST sets transfer samples to TEST (default)
CAL only executes if both jitter generation and measurement sources are set to LINE and the TX/RX values are st to the same rate.

**Errors and Events**    221, "Settings conflict"
if the jitter generation source and jitter measurement source are not both LINE, or the TX/RX rates are not identical and CAL is specified.

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:CALIbrate:
STATus?
Response: COMPLETE

**Related Commands**    SENSe:DATA:TELecom:TEST:JITter:TRANSfer:STATE

# SENSe:DATA:TELecom:TEST:JITter:TRANSFer:ALLData?

SDH/PDH Jitter/Wander Test Option Only

This query returns the complete status (frequency, amplitude, and mask values) of the jitter transfer test data samples. The response is a comma-separated list of values, in the order listed in the response table.

**Syntax**  SENSe:DATA:TELecom:TEST:JITter:TRANSFer:ALLData

**Response**

| <N> (NR1-numeric) | Description |
|---|---|
| <x1-freq> | 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> |

| <data status> (discrete) | Description |
|---|---|
| NONE | No measurement data |
| VALID | Measurement data valid |
| FAILure | Measurement data failed (data greater than mask) |
| UNLOcked | Measurement invalid due to loss of signal (LOS) or jitter over range |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:   SENSE:DATA:TELECOM:TEST:JITTER:TRANSFER:ALLDATA?

Response:   20,1.2,1.8,VALID,100,-2.0,6.0,VALID,100.E+1,-3.0,6.0, VALID,100.E+3,0.0,10.0,LOS

**Related Commands**   SENSe:DATA:TELecom:TEST:JITter:TRANSFer:DATA?

# SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the length of the ouput jitter test.

**Syntax**   SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation <tmin>, <tsec>
SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation?

**Parameters**

| <tmin> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to 15 (default is 1) | Output jitter test time, in minutes |

| <tsec> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to 59 (default is 0) | Output jitter test time, in seconds |

**Dependencies**  Requires installation of Option 14 jitter module.

*RST sets the test duration to 1 minute, zero seconds

The maximum output jitter test duration is 15 minutes, zero seconds

**Errors and Events**  500, "Execution warning"
if the entered value is out of range for the command.

**Examples**  Set:  SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:DURATION 1,0

Query:  SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:DURATION?

Response:  2,5

**Related Commands**  None

# SENSe:DATA:TELecom:TEST:JITter:OUTPUT:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns the settings of the output jitter test.

**Syntax**  SENSe:DATA:TELecom:TEST:JITter:OUTPUT:INFOrmation:<info>?

**Parameters**

| <info> (discrete) | Description |
|---|---|
| SOURce | Results source |
| TIME | Test start time |
| DATE | Test start date |
| RXSource | Received signal source |
| RXRate | Transmitted signal rate |

**Response**

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

| TIME | Description |
|---|---|
| HH:MM:SS | Test start time (hr, min, sec) |

| DATE | Description |
|---|---|
| YY:MM:DD | Test start date (yr, mo, day) |

| RXSource | Description |
|---|---|
| LINE | Receive measurement source is line |
| CLOCK | Receive measurement source is clock |

| RXRate | Description |
|---|---|
| M52 | 52 Mb/s (STM-0) |
| M155 | 155 Mb/s (STM-1) |
| M622 | 622 Mb/s (STM-4) |
| M2 | 2 Mb/s |
| M34 | 34 Mb/s |
| M140 | 140 Mb/s |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:      SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:INFOrmation:RXS?

Response:    CLOCK

**Related Commands**    None

# SENSe:DATA:TELecom:TEST:JITter:OUTPUT:HIGHBand:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the highband filter output compliance test status.

**Syntax**     SENSe:DATA:TELecom:TEST:JITter:OUTPUT:HIGHBand:DATA?

**Response**

| <output data>, <output max>, <output stat> | Description |
|---|---|
| | |

| <output data> | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Peak-to-peak jitter, in UI |

| <output max> | Description |
|---|---|
| Floating point number | Maximum allowed jitter for the selected standard |

| <output stat> | Description |
|---|---|
| NONE | No measurement data |
| VALID | Measurement data valid |
| LOSignal | Measurement data invalid due to LOS |
| UNLOcked | Measurement data invalid due to jitter over range |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:HIGHBAND:DATA?

Response:     12.6, 4.1, VALID

**Related Commands**     None

# SENSe:DATA:TELecom:TEST:JITter:OUTPUT:WIDEband:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the wideband filter output compliance test status.

**Syntax**     SENSe:DATA:TELecom:TEST:JITter:OUTPUT:WIDEband:DATA?

**Response**

| <output data>, <output max>, <output stat> | Description |
|---|---|
| | |

| <output data> | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Peak-to-peak jitter, in UI |

| <output max> | Description |
|---|---|
| Floating point number | Maximum allowed jitter for the selected standard |

| <output stat> | Description |
|---|---|
| NONE | No measurement data |
| VALID | Measurement data valid |
| LOSignal | Measurement data invalid due to LOS |
| UNLOcked | Measurement data invalid due to jitter over range |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Query:     SENSE:DATA:TELECOM:TEST:JITTER:OUTPUT:WIDEBAND:DATA?

Response:     12.6, 4.1, VALID

**Related Commands**     None

# SENSe:DATA:TELecom:TEST:JITter:POINter:INFOrmation?

SDH/PDH Jitter/Wander Test Option Only

This query returns jitter pointer test settings.

**Syntax**  SENSe:DATA:TELecom:TEST:JITter:POINter:INFOrmation:<info>?

**Parameters**

| <info> (discrete) | Description |
|---|---|
| SOURce | Results source |
| TIME | Test start time |
| DATE | Test start date |
| TXRate | Transmitted signal rate |
| RXRate | Transmitted signal rate |
| MODE | Normal or custom mode |
| PTRType | Pointer type |
| SEQType | Sequence type |
| PTRDir | Pointer direction |
| PTRRate | Pointer rate |

**Response**

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

| TIME | Description |
|---|---|
| HH:MM:SS | Test start time (hr, min, sec) |

| DATE | Description |
|---|---|
| YY:MM:DD | Test start date (yr, mo, day) |

| TXRate | Description |
|---|---|
| M52 | 52 Mb/s (STM-0) |
| M155 | 155 Mb/s (STM-1) |
| M622 | 622 Mb/s (STM-4) |

| RXRate | Description |
|--------|-------------|
| M2 | 2 Mb/s (E1) |
| M34 | 34 Mb/s (E3) |
| M140 | 140 Mb/s (E4) |
| M52 | 52 Mb/s (STM-0) |
| M155 | 155 Mb/s (STM-1) |
| M622 | 622 Mb/s (STM-4) |

| MODE | Description |
|------|-------------|
| NORMal | Default sequence selections |
| CUSTom | Custom sequence selections |

| PTRType | Description |
|---------|-------------|
| AU | AU pointer |
| TU | TU pointer |

| SEQType | Description |
|---------|-------------|
| SINGle | Single pointer adjustment |
| BURSt | Burst pointer adjustment |
| PHASE | Phase transient pointer adjustment |
| P873 | Periodic 87-3 pointer adjustment |
| P873CAN | Periodic 87-3 with cancel pointer adjustment |
| P873ADD | Periodic 87-3 with add pointer adjustment |
| P351 | Periodic 35-1 pointer adjustment (TU-12 only) |
| P351CAN | Periodic 35-1 with cancel pointer adjustment (TU-12 only) |
| P351ADD | Periodic 35-1 with add pointer adjustment (TU-12 only) |
| P855 | Periodic 85-5 pointer adjustment (TU-3 only) |
| P855CAN | Periodic 85-5 with cancel pointer adjustment (TU-3 only) |
| P855ADD | Periodic 85-5 with add pointer adjustment (TU-3 only) |
| PCONtinuous | Periodic continuous pointer adjustment |

| PCONCAN | Periodic continuous with cancel pointer adjustment |
|---------|----------------------------------------------------|
| PCONADD | Periodic continuous with add pointer adjustment |
| REGDBL | Regular pointer plus one double |
| REGMIS | Regular pointer with one missing |
| SINALT | Single alternating pointer adjustment |
| DBLALT | Double alternating pointer adjustment |
| CUSTom | Use the transmitter pointer sequence setup |

| PTRDir | Description |
|--------|-------------|
| UP | Increment |
| DOWN | Decrement |

| PTRRate (NR1-numeric) | Description |
|-----------------------|-------------|
| Integer in the range of 2 to 10000 | Pointer rate in ms |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:TEST:JITTER:POINTER:
INFORMATION:MODE?

Response:    CUSTOM

**Related Commands**    None

# SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE

SDH/PDH Jitter/Wander Test Option Only

This command sets or queries the pointer sequence type for the jitter pointer test.

**Syntax**

```
SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE
<ptr seq type>
SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE?
```

**Parameters**

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

**Dependencies**   Requires installation of Option 14 jitter module.

Pointer test must not be running. Setting this parameter during a pointer test returns an error.

**Errors and Events**   None

**Examples**   Set:   SENSE:DATA:TELECOM:TEST:JITTER:POINTER:SEQUENCE
:TYPE BURST

Query:   SENSE:DATA:TELECOM:TEST:JITTER:POINTER:SEQUENCE
:TYPE?

Response:   P873ADD

**Related Commands**   None

# SENSe:DATA:TELecom:TEST:JITter:POINter:HIGHBand:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the highband filter pointer compliance test status.

**Syntax**   SENSe:DATA:TELecom:TEST:JITter:POINter:HIGHBand:DATA?

**Response**

| <output data>, <output max>, <output stat> |
| --- |

| <output data> | Description |
| --- | --- |
| Floating point number in the range of 0 to 200 | Peak-to-peak jitter, in UI |

| <output max> | Description |
| --- | --- |
| Floating point number | Maximum allowed jitter for the selected standard |

| <output stat> | Description |
| --- | --- |
| NONE | No measurement data |
| VALID | Measurement data valid |

*(continued on next page)*

| <output data>, <output max>, <output stat> | |
|---|---|
| LOSignal | Measurement data invalid due to LOS |
| UNLOcked | Measurement data invalid due to jitter over range |

**Dependencies**      None

**Errors and Events**      None

**Examples**      Query:      SENSE:DATA:TELECOM:TEST:JITTER:POINTER:HIGHBAND:DATA?

Response:      1.2, 2.0, VALID

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

# SENSe:DATA:TELecom:TEST:JITter:POINter:WIDEband:DATA?

SDH/PDH Jitter/Wander Test Option Only

This query returns the maximum peak-to-peak jitter amplitude, the maximum jitter allowed value, and the wideband filter pointer compliance test status.

**Syntax**      SENSe:DATA:TELecom:TEST:JITter:POINter:WIDEband:DATA?

**Response**

| <output data>, <output max>, <output stat> | |
|---|---|

| <output data> | Description |
|---|---|
| Floating point number in the range of 0 to 200 | Peak-to-peak jitter, in UI |

| <output max> | Description |
|---|---|
| Floating point number | Maximum allowed jitter for the selected standard |

| <output stat> | Description |
|---|---|
| NONE | No measurement data |

| <output data>, <output max>, <output stat> | |
|---|---|
| VALID | Measurement data valid |
| LOSignal | Measurement data invalid due to LOS |
| UNLOcked | Measurement data invalid due to jitter over range |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Query:  `SENSE:DATA:TELECOM:TEST:JITTER:POINTER:WIDEBAND:DATA?`

Response:  `1,2, 2.0, VALID`

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

# SENSe:DATA:TELecom:MEASure:WANDer Subsystem

This section describes the SENSe:DATA:TELEcom:MEASure:WANDer susbsystem commands and queries. Figure 2–93 shows the hierarchy tree for this CTS 850 subsystem.

```
                         SENSe
                           |
                         DATA
                           |
                       TELecom
                           |
                       MEASure
                           |
                        WANDer
                           |
        ┌──────────┬──────────┬──────────┬──────────────┐
      SLIPs      PTPeak?     TIE?      AVAIlable      CLEAr
        |          |          |
     ┌──────┐   ┌─────┐    ┌─────┐
   BIT? FRAME?  NS?  UI?   NS?  UI?
```
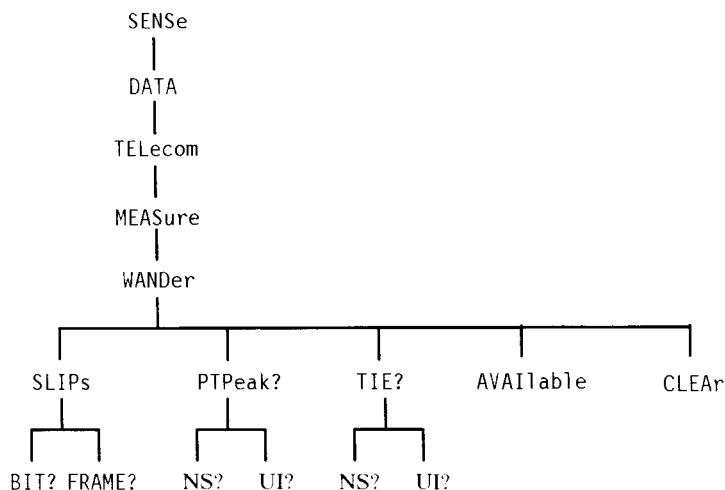
Figure 2-93: SENSe:DATA:TELecom:MEASure:WANDer subsystem

# SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:BIT?

This query returns the estimated bit slips since the beginning of the test. This result is only valid for 2Mb rate.

**Syntax**    SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:BIT?

**Response**

| <bit slips> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to 4294767295 | Estimated number of bit slips |

**Dependencies**    Requires installation of Option 14 jitter module.

Receive rate must be 2Mb.

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:WANDER:SLIPS:BIT?

Response:    12

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:FRAME?

This query returns the estimated frame slips since the beginning of the test. This result is only valid for 2Mb rate.

**Syntax**    SENSe:DATA:TELecom:MEASure:WANDer:SLIPs:FRAME?

**Response**

| <frame slips> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to 4294767295 | Estimated number of frame slips |

**Dependencies**    Requires installation of Option 14 jitter module.

Receive rate must be 2Mb.

**Errors and Events**    None

**Examples**    Query:    SENSE:DATA:TELECOM:MEASURE:WANDER:SLIPS:FRAME?

Response:    10

**Related Commands**    None

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

This query returns the estimated maximum peak-to-peak wander amplitude since the beginning of the test.

**Syntax**    SENSe:DATA:TELecom:MEASure:WANDer:PTPeak?

**Response**

| <wander ptp> (NR1-numeric) | Description |
|---|---|
| Integer in the range of 0 to 4294767295 | Maximum peak-to-peak wander amplitude in nanoseconds |

**Dependencies**    Requires installation of Option 14 jitter module.

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

Response:    10

**Related Commands**    None

# SENSe:DATA:TELecom:MEASure:WANDer:PTPeak:NS?

This query returns the estimated maximum peak-to-peak wander amplitude in nanoseconds since the beginning of the test.

**Syntax**    SENSe:DATA:TELecom:MEASure:WANDer:PTPeak:NS?

**Response**

| SDH <wander ptp> | Description |
|---|---|
| Integer in the range of 0 to 4294767295 | Maximum peak-to-peak wander amplitude in nanoseconds |

**Dependencies**    Jitter option 14 must be installed for valid results.

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

Response:    10

**Related Commands**    None

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

This query returns the maximum peak-to-peak wander amplitude in UI since the beginning of the test.

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

**Response**

| SDH <wander ptp> | Description |
|---|---|
| Integer in the range of 0 to 4294767295 | Maximum peak-to-peak wander amplitude in UI (with resolution of 0.01) |

**Dependencies**        Jitter option must be installed for valid results.

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

Response:   10.5

**Related Commands**        None

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

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

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

**Response**

| <wander tie> (NR1-numeric) | Description |
|---|---|
| Floating point value in the range of 0 to 1000.0, with a resolution of 0.01 | Current TIE value in UI |

**Dependencies**        Requires installation of Option 14 jitter module. This measurement is valid when SENSE:DAT:TELecom:MEASure:JITter:STATus? returns VALID.

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

Response:  20.5

**Related Commands**    None

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

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

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

**Response**

| SDH <wander tie> | Description |
|---|---|
| Integer in the range of 0 to 42947667295 | current TIE in nanoseconds |

**Dependencies**    Jitter option 14 must be installed for valid results. This measurement is valid when SENSE:DAT:TELecom:MEASure:JITter:STATus? returns VALID.

**Errors and Events**    None

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

Response:  10

**Related Commands**    None

# WANDer:AVAIlable?

This query returns the number of available wander records.

**Syntax**    WANDer:AVAIlable?

**Dependencies**    None

**Examples**    Query:    WANDer:AVAIlable?

Response:    the number of available wander records

**Related Commands**    None

# WANDer:CLEAr

This command clear stored wander data.

**Syntax**    WANDer:CLEAr

**Dependencies**    None

**Examples**    Query:    WANDer:CLEAr

**Related Commands**    None

# CALibrate Subsystem

This section describes the calibrate commands and queries. The following figure shows the hierarchy tree for this CTS 850 subsystem.

```
                CALibrate
                    |
        ┌───────────┼───────────┐
     EXECute    RESults?    Select
```
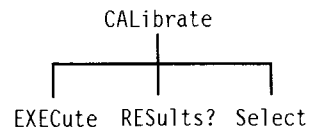
**Figure 2-95: CALibrate subsystem**

# Calibrate:EXECute

This command runs a selected calibration routine.

**Syntax**        CALibrate:EXECute

**Dependencies**     Requires installation of Option 14 jitter module.

CALibrate:SELect sets which calibration routines to run.

This command sets the Operation Complete bit in the Standard Event Status Register (SESR).

**Errors and Events**     None

**Examples**     CALIBRATE:EXECUTE

**Related Commands**     CALibrate:SELect, *CAL?

# CALibrate:RESults?

This query returns the results from CALibrate:EXECute or power-up self-test calibration routines.

**Syntax**   CALibrate:RESults?

**Response**

| <cal results> (discrete) | Description |
|---|---|
| PASSED | Selected or self-test calibration tests passed |
| FAILED | Selected or self-test calibration tests failed |
| ABORTED | Selected or self-test calibration tests stopped before completed |
| RUNNING | Calibration is running |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:     CALIBRATE:RESULTS?

Response:   PASSED

**Related Commands**   CALibrate:EXECute, CALibrate:SELect

# Calibrate:SELect

This command sets or queries the calibration routine to run when executing CALibrate:EXECute.

**Syntax**

```
CALibrate:SELect <cal select>
CALibrate:SELect?
```

**Parameters**

| <cal select> (discrete) | Description |
|---|---|
| JGEN | Run all jitter generation system calibration routines |
| JMEAS | Run all jitter measurement system calibration routines (default) |

**Dependencies**

Requires installation of Option 14 jitter module.

*RST sets to JMEAS (default).

**Errors and Events**

None

**Examples**

Set: `CALIBRATE:SELECT JGEN`

Query: `CALIBRATE:SELECT?`

Response: `JGEN`

**Related Commands**

CALibrate:EXECute

# Transmitter/Receiver Setup Commands

The Transmitter/Receiver Setup Commands allow you to control the interaction between Transmitter and Receiver settings.

This section contains all of the commands and queries for the following CTS 850 Transmitter/Receiver Setup subsystem:

■ INSTrument

## INSTrument Subsystem

This section describes the command and query that control the coupling between the Transmitter and Receiver setups. Figure 2-97 shows the hierarchy tree for this subsystem.

```
INSTrument
    |
COUPling
```
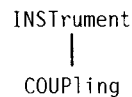
**Figure 2-97: INSTrument:COUPling Subsystem**

## INSTrument:COUPling

This command sets or queries the Transmitter and Receiver setup coupling. NONE allows the Transmitter and Receiver to be independently controlled. TXRX establishes interaction between the Transmitter and Receiver parameters shown in Table 2-79 with the Transmitter governing the *initial* Receiver setup. RXTX establishes interaction between the Transmitter and Receiver parameters shown in Table 2-79 with the Receiver governing the *initial* Transmitter setup.

**Table 2-79: Parameters Interacting Through Instrument Coupling**

| Receiver | Transmitter |
|---|---|
| INPUT1:RATE | OUTPUT1:RATE |
| INPUT1:TYPE | OUTPUT1:TYPE |
| SENSE:DATA:TELecom:SOURce | SOURce:DATA:TELecom:SOURce |
| SENSe:DATA:TELecom:CHANnel | SOURce:DATA:TELecom:CHANnel |
| SENSe:DATA:TELecom:PAYLoad:MAPPing | SOURce:DATA:TELecom:PAYLoad:MAPPing |

**Table 2-79: Parameters Interacting Through Instrument Coupling (Cont.)**

| Receiver | Transmitter |
|---|---|
| SENSe:DATA:TELecom:PAYLoad:PATTern | SOURce:DATA:TELecom:PAYLoad:PATTern |
| SENSe:DATA:TELecom:PAYLoad:UBYTe | SOURce:DATA:TELecom:PAYLoad:UBYTe |

*NOTE. A change to one of the parameters listed in Table 2-79 might cause a change to the INSTrument:COUPling parameter value. For example, if you set INSTrument:COUPling to TXRX then change OUTPUT1:RATE, the value of INSTrument:COUPling is changed to RXTX.*

**Syntax**

```
INSTrument:COUPling <coupling>
INSTrument:COUPling?
```

**Parameters**

| <coupling> (discrete) | description |
|---|---|
| NONE | Setups are independent |
| TXRX | Transmitter sets initial condition of the Receiver |
| RXTX | Receiver sets initial condition of the Transmitter |

**Dependencies** None

**Errors and Events** None

**Examples**

Set: INSTRUMENT:COUPLING TXRX

Query: INSTRUMENT:COUPLING?

Response: RXTX

**Related Commands** None

# Trigger and Capture Commands

The Trigger and Capture commands allow you to capture overhead and payload data.

This section contains all of the commands and queries for each of the following CTS 850 Trigger and Capture subsystems:

■ TRIGger

## TRIGger Subsystem

This section describes each of the commands and queries that allow you to arm the trigger system and force an immediate trigger. Figure 2-99 shows the hierarchy tree for this subsystem.

```
INITiate        TRIGger
                   |
                IMMediate
```
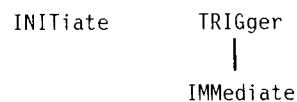
**Figure 2-99: TRIGger subsystem**

## INITiate

This command causes the capture mechanism to start and the trigger system to arm. After receiving this command, the instrument will acquire data until the programmed trigger event occurs or the capture is stopped manually with the TRIGger:IMMediate command.

**Syntax**    INITiate

**Parameters**    None

**Dependencies**    None

**Errors and Events**    None

**Examples**    `INITIATE`

**Related Commands**    TRIGger:IMMediate
SENSe:DATA:TELecom:OVERhead:DATA?
SENSe:DATA:TELecom:POVerhead:DATA?

# TRIGger:IMMediate

This command forces a trigger to occur, which stops the capture of data.

**Syntax**    `TRIGger:IMMediate`

**Parameters**    None

**Dependencies**    Before the TRIGger:IMMediate command is sent, an INITiate command must be sent first to arm the trigger system.

**Errors and Events**    None

**Examples**    `TRIGGER:IMMEDIATE`

**Related Commands**    INITiate
SENSe:DATA:TELecom:OVERhead:DATA?
SENSe:DATA:TELecom:POVerhead:DATA?

# TRIGger:STATus?

SDH/PDH Jitter/Wander Test Option Only

This query returns the instrument trigger status.

**Syntax**     TRIGger:STATus?

**Response**

| <frequency rate> (NR3-numeric) | Description |
|---|---|
| RUN | Instrument is waiting for a trigger |
| STOP | Instrument has been triggered |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Query:     TRIGger:STATus?

Response:     STOP

**Related Commands**     TRIGger:IMMediate

# Input/Output Commands

The Input/Output commands allow you to write files to disk, control the display of the instrument, print reports, and communicate with the instrument over an RS-232 port

This section contains all of the commands and queries for each of the following CTS 850 Input/Output subsystems:

■ MMEMory

■ DISPlay

■ HCOPy

■ SYSTem:COMMunicate:SERial

## MMEMory Subsystem

This section describes each of the commands and queries that control access to the disk. Figure 2–101 shows the hierarchy tree for this subsystem. All MMEMory commands set the OPC bit in the Standard Event Status Register.

```
                          MMEMory
            ┌────────────────┼────────────────┐
          LOAD            STORe            DELete
       ┌────┼────┐     ┌────┼────┐      ┌────┼────┐
  SETTings TEST RESults SETTings TEST RESults SETTings TEST RESults
```
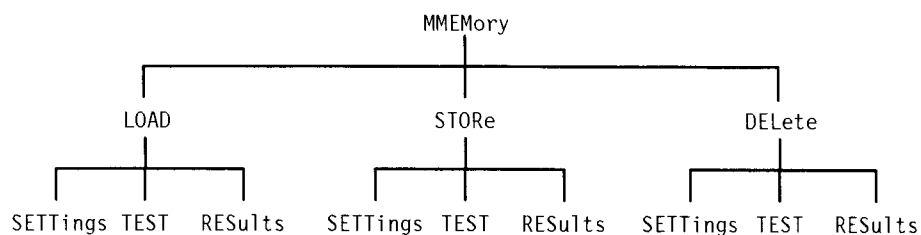
**Figure 2–101: MMEMory subsystem**

*NOTE. Do not specify the file name extension for any of these commands. Extensions are added automatically by the system.*

# MMEMory:STORe:SETTings

This command stores the current instrument state or stored setups to a disk file.

**Syntax**   MMEMory:STORe:SETTings <file name>,<buffer>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | File name you want to save the setups to; the extension ".SET" is added by the software. |

| <buffer> (NR1-numeric) | Description |
|---|---|
| Valid values are 0 through 5 | Buffer 0 contains the current setups, buffers 1 through 5 contain the previous setups |

**Dependencies**   A disk must be in the disk drive.

**Errors and Events**
402, "Operation complete; Save of instrument setup complete"
252, "Missing media; Disk not present in drive"
254, "Media full; Disk is full"
257, "File name error; File name required"
258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**   MMEMORY:STORe:SETTings "TEMP0001",1

**Related Commands**   *SAV

# MMEMory:DELEte:SETTings

This command deletes a setup file from the disk.

**Syntax**   MMEMory:DELEte:SETTings <file name>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | Name of the setups file you want deleted |

**Dependencies**   A disk must be in the disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"
256, "File name not found; Could not open disk file"
258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**    MMEMORY:DELETE:SETTINGS "FILEONE"

**Related Commands**    None

# MMEMory:LOAD:SETTings

This command restores the instrument state from a disk file into a stored setup location (buffers 1 through 5) or the current instrument state (buffer 0). Once settings have been loaded into one of the stored setup buffers (buffers 1 through 5), you can give a *RCL command to place them into buffer 0 (current instrument state).

**Syntax**    MMEMory:LOAD:SETTings <file name>, <buffer>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | File name you want to load the setups from |

| <buffer> (NR1-numeric) | Description |
|---|---|
| Valid values are 0 through 5 | Buffer 0 contains the current setups; buffers 1 through 5 contain the previous setups |

**Dependencies**    A disk must be in the disk drive.

**Errors and Events**    402, "Operation complete; Recall of instrument setup complete"
252, "Missing media; Disk not present in drive"

**Examples**    MMEMORY:LOAD:SETTINGS "TEMP0001",0

**Related Commands**    *RCL

# MMEMory:STORe:TEST

This command stores the current instrument test to a disk file.

**Syntax**    MMEMory:STORe:TEST <file name>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | File name you want to save the test to; the extension ".TST" is added by the software |

**Dependencies**    A disk must be in the disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"
254, "Media full; Disk is full"
257, "File name error; File name required"
258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**    MMEMORY:STORe:TEST "TEMP0001"

**Related Commands**    *SAV

# MMEMory:DELEte:TEST

This command deletes a test file from the disk.

**Syntax**    MMEMory:DELEte:TEST <file name>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | Name of the test file you want deleted |

**Dependencies**    A disk must be in the disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"
256, "File name not found; Could not open disk file"
258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**     MMEMORY:DELETE:TEST "FILEONE"

**Related Commands**     None

# MMEMory:LOAD:TEST

This command restores a test from a disk file into the current instrument test (buffer 0).

**Syntax**     MMEMory:LOAD:TEST <file name>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | File name you want to load the test from |

**Dependencies**     Disk must be in the disk drive.

**Errors and Events**     252, "Missing media; Disk not present in drive"

**Examples**     MMEMORY:LOAD:TEST "TEMP0001"

**Related Commands**     *RCL

# MMEMory:STORe:RESults

This command stores the current or stored test results to a disk file. If the current test results are of great length, only buffer number 1 may be available to store to disk. Use the SENSe:DATA:TELecom:MEASurement:BUFFer:AVAIlable? query to determine if buffer 2 exists.

**Syntax**    MMEMory:STORe:RESults <file name>,<buffer>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | File name you want to save the test results to; the extension ".RES" is added by the software |

| <buffer> (NR1-numeric) | Description |
|---|---|
| Valid values are 1 and 2 | Buffer 1 contains the current test results; buffer 2 contains the previous test results |

**Dependencies**    A disk must be in the disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"
254, "Media full; Disk is full"
257, "File name error; File name required"
258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**    MMEMORY:STORE:RESULTS "TEMP0001",1

**Related Commands**    *SAV

# MMEMory:DELEte:RESults

This command deletes a test results file from the disk.

**Syntax**    MMEMory:DELEte:RESults <file name>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | Name of the test results file you want deleted |

**Dependencies**    A disk must be in the disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"
256, "File name not found; Could not open disk file"
258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**    MMEMORY:DELETE:RESULTS "FILEONE"

**Related Commands**    None

# MMEMory:LOAD:RESults

This command restores the instrument state from a disk file into a read only buffer (buffer number – 1).

**Syntax**  MMEMory:LOAD:RESults <file name>

**Parameters**

| <file name> (string) | Description |
|---|---|
| A maximum of eight characters in the form "file name" | File name you want to load the test results from |

**Dependencies**  Disk must be in the disk drive.

**Errors and Events**  252, "Missing media; Disk not present in drive"

**Examples**  MMEMORY:LOAD:RESULTS "TEMP0001"

**Related Commands**  *RCL

# MMEMory:JITter Subsystem

This section describes each of the commands and queries that let you load, store, and delete floppy disk jitter data. Figure 2–102 shows the hierarchy tree for this subsystem. All MMEMory commands set the OPC bit in the Standard Event Status Register.
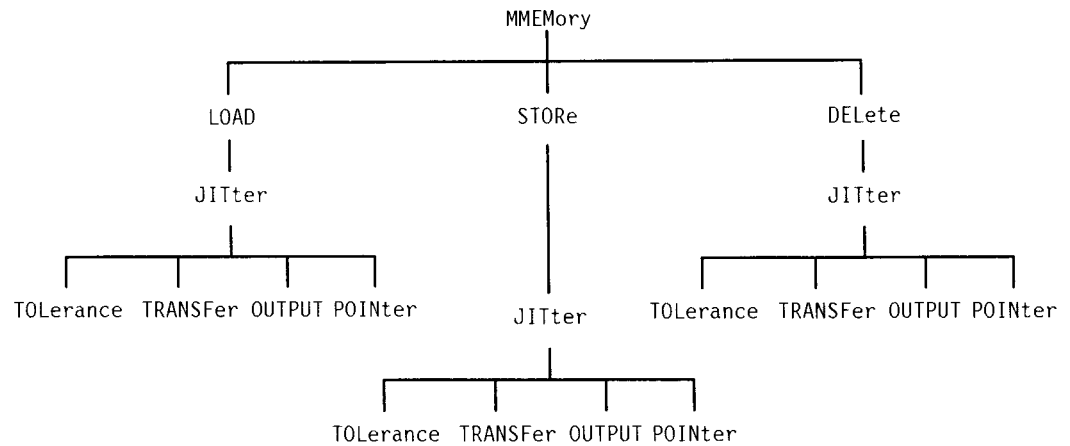


**Figure 2-102: MMEMory:JITter subsystem**

---

**NOTE.** *Do not specify a file name extension for any of these commands. Extensions are added automatically by the system.*

---

# MMEMory:LOAD:JITter:TOLerance

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter tolerance test data from a disk file into a view-only compliance test page. Jitter tolerance files use the extension .JTL.

**Syntax**  MMEMory:LOAD:JITter:TOLerance <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1–8 characters | File name |

**Dependencies**    Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"

**Examples**    `MMEMORY:LOAD:JITTER:TOLERANCE "JTOL0001"`

**Related Commands**    MMEMory:STORe:JITter:TOLerance

# MMEMory:LOAD:JITter:TRANSFer

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter transfer test data from a disk file into a view-only compliance test page. Jitter transfer files use the extension .JTR.

**Syntax**    `MMEMory:LOAD:JITter:TRANSFer <filename>`

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1–8 characters | File name |

**Dependencies**    Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"

**Examples**    `MMEMORY:LOAD:JITTER:TRANSFER "TRAN0001"`

**Related Commands**    MMEMory:STORe:JITter:TRANSFer

# MMEMory:LOAD:JITter:OUTPUT

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter output test data from a disk file into a view-only compliance test page. Jitter output files use the extension .OUT.

**Syntax**  MMEMory:LOAD:JITter:OUTPUT <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1-8 characters | File name |

**Dependencies**  Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**  252, "Missing media; Disk not present in drive"

**Examples**  MMEMORY:LOAD:JITTER:OUTPUT "OUT0001"

**Related Commands**  MMEMory:STORe:JITter:OUTPUT

# MMEMory:LOAD:JITter:POINter

SDH/PDH Jitter/Wander Test Option Only

This command restores jitter pointer test data from a disk file into a view-only compliance test page. Jitter pointer files use the extension .PTR.

**Syntax**  MMEMory:LOAD:JITter:POINter <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1-8 characters | File name |

**Dependencies**  Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"

**Examples**    MMEMORY:LOAD:JITTER:POINTER "PTR0001"

**Related Commands**    MMEMory:STORe:JITter:POINter

# MMEMory:STORe:JITter:TOLerance

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter tolerance test data to a disk file. Jitter tolerance files use the extension .JTL and .XTL. .XTL files contain the test data in a comma-separated format for use with spreadsheet programs.

**Syntax**    MMEMory:STORe:JITter:TOLerance <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1–8 characters | File name |

**Dependencies**    Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

**Errors and Events**    252, "Missing media; Disk not present in drive"

254, "Media full; Disk is full"

257, "File name error; File name required"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**    MMEMORY:STORe:JITTER:TOLERANCE "JTOL0001"

**Related Commands**    MMEMory:LOAD:JITter:TOLerance

# MMEMory:STORe:JITter:TRANSFer

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter transfer test data to a disk file. Jitter transfer files use the extensions .JTR and .XTR. .XTR files contain the test data in a comma-separated format for use with spreadsheet programs.

**Syntax**      MMEMory:STORe:JITter:TRANSFer <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1–8 characters | File name |

**Dependencies**      Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

**Errors and Events**      252, "Missing media; Disk not present in drive"

254, "Media full; Disk is full"

257, "File name error; File name required"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**      MMEMORY:STORe:JITTER:TRANSFER "TRAN0001"

**Related Commands**      MMEMory:LOAD:JITter:TRANSFer

# MMEMory:STORe:JITter:OUTPUT

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter output test data to a disk file. Jitter output files use the extension .OUT.

**Syntax**    MMEMory:STORe:JITter:OUTPUT <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1-8 characters | File name |

**Dependencies**    Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

**Errors and Events**    252, "Missing media; Disk not present in drive"

254, "Media full; Disk is full"

257, "File name error; File name required"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**    MMEMORY:STORE:JITTER:OUTPUT "TRAN0001"

**Related Commands**    MMEMory:LOAD:JITter:OUTPUT

# MMEMory:STORe:JITter:POINter

SDH/PDH Jitter/Wander Test Option Only

This command writes jitter pointer test data to a disk file. Jitter pointer files use the extension .PTR.

**Syntax**     MMEMory:STORe:JITter:POINter <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1–8 characters | File name |

**Dependencies**     Requires installation of Option 14 jitter module.

Disk must be in disk drive.

There must be room on the disk to store the file.

**Errors and Events**     252, "Missing media; Disk not present in drive"

254, "Media full; Disk is full"

257, "File name error; File name required"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**     MMEMORY:STORE:JITTER:POINTER "PTR0001"

**Related Commands**     MMEMory:LOAD:JITter:POINter

# MMEMory:DELEte:JITter:TOLerance

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter tolerance test data file from a disk. Jitter tolerance files use the extension .JTL.

**Syntax**     MMEMory:STORe:JITter:TOLerance <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1-8 characters | File name |

**Dependencies**     Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**     252, "Missing media; Disk not present in drive"

256, "File name not found; Could not open disk file"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**     MMEMORY:STORe:JITTER:TOLERANCE "JTOL0001"

**Related Commands**     MMEMory:LOAD:JITter:TOLerance

# MMEMory:DELEte:JITter:TRANSFer

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter transfer test data file from a disk. Jitter transfer files use the extension .JTL.

**Syntax**     MMEMory:DELEte:JITter:TRANSFer <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1-8 characters | File name |

**Dependencies**  Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**  252, "Missing media; Disk not present in drive"

256, "File name not found; Could not open disk file"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**  MMEMORY:DELETE:JITTER:TRANSFER "TRAN0001"

**Related Commands**  None

# MMEMory:DELEte:JITter:OUTPUT

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter output test data file from a disk. Jitter OUTPUT files use the extension .JTL.

**Syntax**  MMEMory:DELEte:JITter:OUTPUT <filename>

**Parameters**

| <filename> (string) | Description |
|---|---|
| 1–8 characters | File name |

**Dependencies**  Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**  252, "Missing media; Disk not present in drive"

256, "File name not found; Could not open disk file"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**  MMEMORY:DELETE:JITTER:OUTPUT "OUT0001"

**Related Commands**  None

# MMEMory:DELEte:JITter:POINter

SDH/PDH Jitter/Wander Test Option Only

This command removes a jitter pointer test data file from a disk. Jitter pointer files use the extension .PTR.

**Syntax**    MMEMory:DELEte:JITter:POINter <filename>

**Parameters**

| <filename> (string) | Description |
|---------------------|-------------|
| 1-8 characters | File name |

**Dependencies**    Requires installation of Option 14 jitter module.

Disk must be in disk drive.

**Errors and Events**    252, "Missing media; Disk not present in drive"

256, "File name not found; Could not open disk file"

258, "Media protected; Disk is write-protected, cannot write to file"

**Examples**    MMEMORY:DELETE:JITTER:POINTER "OUT0001"

**Related Commands**    None

# DISPlay Subsystem

This section describes each of the commands and queries that control aspects of the front panel display. Figure 2–103 shows the hierarchy tree for this subsystem.

```
DISPlay
   |
BRIGhtness
```

**Figure 2-103: DISPlay subsystem**

# DISPlay:BRIGhtness

This command sets or queries the display brightness.

**Syntax**  
DISPlay:BRIGhtness <display brightness>  
DISPlay:BRIGhtness?

**Parameters**

| <display brightness> (NR3-numeric) | Description |
|---|---|
| Any number between 0 and 1 | 0 indicates minimum brightness, 0.5 indicates medium brightness, and 1 indicates maximum brightness (default = 1.00) |

**Dependencies**  None

**Errors and Events**  None

**Examples**  Set:  DISPLAY:BRIGHTNESS .8

Query:  DISPLAY:BRIGHTNESS?

Response:  0.75

**Related Commands**  None

# HCOPy Subsystem

This section describes the commands and queries that control the printer. Figure 2-104 shows the hierarchy tree for this subsystem.

```
                            HCOPy
                              |
    ┌─────────┬──────────┬────┴────┬─────────┐
  ABORt   IMMediate    ITEM     DEVice     TITLe
                                  |
                               LANGuage
```
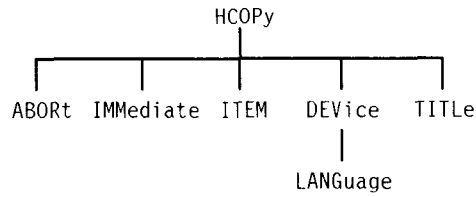
**Figure 2-104: HCOPy subsystem**

# HCOPy:ABORt

This command stops the current printout.

| | |
|---|---|
| **Syntax** | HCOPy:ABORt |
| **Parameters** | None |
| **Dependencies** | None |
| **Errors and Events** | None |
| **Examples** | HCOPY:ABORT |
| **Related Commands** | HCOPy:IMMediate |

# HCOPy:IMMediate

This command starts the printout. The type of report to be printed is controlled with the HCOPY:ITEM command. The OPC bit will be set when the report has printed.

**Syntax**  HCOPy:IMMediate

**Parameters**  None

**Dependencies**  Your printer type must match the HCOPy:DEVice:LANGuage setting

**Errors and Events**  402, "Operation complete; Hardcopy complete"
200, "Execution error; Hardcopy already in progress"

**Examples**  HCOPY:IMMEDIATE

**Related Commands**  HCOPy:ABORt

# HCOPy:ITEM

This command sets or queries the information to be printed.

**Syntax**  HCOPy:ITEM <hcopy item>
HCOPy:ITEM?

**Parameters**

| <hcopy item> (discrete) | Description |
|---|---|
| SUMMary | Summary of test results is printed (default) |
| ALLRESULTS | Summary of all measurement test results is printed |
| SCREEN | The current screen is printed |
| Jitter | Hardcopy printing of the Jitter Results |

**Dependencies**  None

**Errors and Events**  None

**Examples**     Set:        HCOPY:ITEM SUMMARY

Query:      HCOPY:ITEM?

Response:  SCREEN

**Related Commands**     HCOPy:IMMediate

# HCOPy:DEVice:LANGuage

This command sets or queries the printer language.

**Syntax**     HCOPy:DEVice:LANGuage <printer language>
HCOPy:DEVice:LANGuage?

**Parameters**

| <printer language> (discrete) | Description |
|---|---|
| TEK | Tektronix DPU-411 printer (default) |
| EPSOn | Epson printer |
| PCL | Printer Control Language (Hewlett-Packard Thinkjet) |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Set:        HCOPY:DEVICE:LANGUAGE EPSON

Query:      HCOPY:DEVICE:LANGUAGE?

Response:  PCL

**Related Commands**     None

## HCOPy:TITLe

This command sets or queries the title printing capability. If the HCOPy:TITLe is set to ON, the system owner and system user values will be printed as the title.

**Syntax**
HCOPy:TITLe <title enabled>
HCOPy:TITLe?

**Parameters**

| <title enabled> (boolean) | Description |
|---|---|
| 0 or OFF | Title not printed (default) |
| 1 or ON | Title printed |

**Dependencies**      None

**Errors and Events**      None

**Examples**      Set:      HCOPY:TITLE ON

Query:      HCOPY:TITLE?

Response:      0

**Related Commands**      None

# SYSTem:COMMunicate:SERial Subsystem

This section describes the commands and queries that control communication over the serial port. Figure 2-105 shows the hierarchy tree for this subsystem.

```
                          SYSTem
                            |
                        COMMunicate
                            |
                          SERial
                            |
  ┌──────────┬──────────┬──────────┬──────────┬──────────┬──────────┐
PRESet    CONTrol     BAUD     PARity    SBITs     PACE    TRANsmit
            |                                                  |
        ┌───────┐                                         ┌────────┐
       RTS     DCD                                    TERMinator  DELay
```
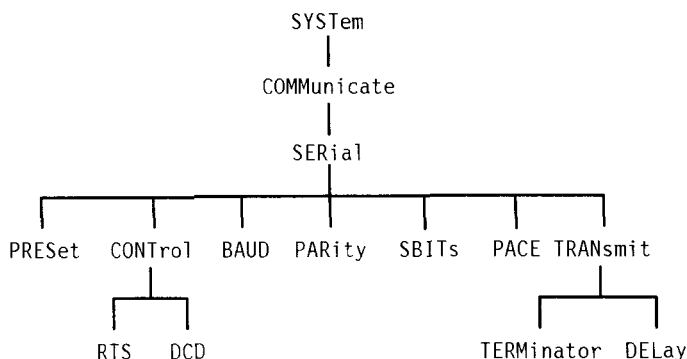
Figure 2-105: SYSTem:COMMunicate:SERial subsystem

# SYSTem:COMMunicate:SERial:PRESet

This command sets all parameters in the serial subsystem to default values.

**Syntax**    SYSTem:COMMunicate:SERial:PRESet

**Parameters**    There are no parameters for this command. The resulting defaults for each command are shown in Table 2-81.

Table 2-81: Commands and Default Values Set by the SYSTem:COMMunicate: SERial:PRESet Command

| Command | Default value |
| --- | --- |
| SYSTem:COMMunicate:SERial:CONtrol:DCD | 0 |
| SYSTem:COMMunicate:SERial:CONTrol:RTS | RFR |
| SYSTem:COMMunicate:SERial:PACE | NONE |
| SYSTem:COMMunicate:SERial:BAUD | 9600 |
| SYSTem:COMMunicate:SERial:PARITY | NONE |
| SYSTem:COMMunicate:SERial:SBITs | 1 |
| SYSTem:COMMunicate:SERial:TRANsmit:TERMinator | LF |
| SYSTem:COMMunicate:SERial:TRANsmit:DELay | 0 |

**Dependencies**    None

**Errors and Events**    None

**Examples**    SYSTEM:COMMUNICATE:SERIAL:PRESET

**Related Commands**    None

# SYSTem:COMMunicate:SERial:CONTrol:DCD

This command sets or queries Data Carrier Detect (DCD) sensitivity on and off.

**Syntax**    SYSTem:COMMunicate:SERial:CONTrol:DCD <DCD mode>
SYSTem:COMMunicate:SERial:CONTrol:DCD?

**Parameters**

| <DCD mode> (boolean) | Description |
|---|---|
| 1 or ON | DCD on (default) |
| 0 or OFF | DCD off |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SYSTEM:COMMUNICATE:SERIAL:CONTROL:DCD OFF

Query:    SYSTEM:COMMUNICATE:SERIAL:CONTROL:DCD?

Response:    1

**Related Commands**    None

# SYSTem:COMMunicate:SERial:CONTrol:RTS

This command sets or queries the hardware handshaking scheme. When set to ON, handshaking is off (the instrument is not sensitive to the CTS 850). When set to RFR or IBFULL, the normal RTS/CTS hardware handshaking is on (the instrument indicates ready to receive with the RTS line).

**Syntax**    SYSTem:COMMunicate:SERial:CONTrol:RTS <serial RTS>
SYSTem:COMMunicate:SERial:CONTrol:RTS?

**Parameters**

| <serial RTS> (discrete) | Description |
|---|---|
| ON | Not sensitive to the CTS 850; RTS line always asserted (handshaking is off) |
| RFR | Ready For Receiving (handshaking is on) |
| IBFULL | same as RFR |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SYSTEM:COMMUNICATE:SERIAL:CONTROL:RTS RFR

Query:        SYSTEM:COMMUNICATE:SERIAL:CONTROL:RTS?

Response:    RFR

**Related Commands**    None

# SYSTem:COMMunicate:SERial:BAUD

This command sets or queries the baud rate (both transmit and receive) of the serial port.

**Syntax**

SYSTem:COMMunicate:SERial:BAUD <serial baud>
SYSTem:COMMunicate:SERial:BAUD?

**Parameters**

| <serial baud> (NR1-numeric) | Description |
|---|---|
| 9600 | 9600 baud (default) |
| 1200 | 1200 baud |
| 2400 | 2400 baud |
| 4800 | 4800 baud |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SYSTEM:COMM:SER:BAUD 1200

Query:    SYSTEM:COMM:SER:BAUD?

Response:    2400

**Related Commands**    None

# SYSTem:COMMunicate:SERial:PARity

This command sets or queries the parity of the serial port.

**Syntax**    SYSTem:COMMunicate:SERial:PARity <serial parity>
SYSTem:COMMunicate:SERial:PARity?

**Parameters**

| <serial parity> (discrete) | Description |
|---|---|
| NONE | No parity is sent or received (default) |
| EVEN | Even parity is sent and received |
| ODD | Odd parity is sent and received |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SYSTEM:COMMUNICATE:SERIAL:PARITY EVEN

Query:      SYSTEM:COMMUNICATE:SERIAL:PARITY?

Response:   EVEN

**Related Commands**    None

# SYSTem:COMMunicate:SERial:SBITs

This command sets or queries the number of stop bit used by the serial port.

**Syntax**    SYSTem:COMMunicate:SERial:SBITs <serial sbits>
SYSTem:COMMunicate:SERial:SBITs?

**Parameters**

| <serial sbits> (NR1-numeric) | Description |
|---|---|
| 1 or 2 | Number of stop bits used by the serial port |

**Dependencies**    None

**Errors and Events**   None

**Examples**   Set:   SYSTEM:COMMUNICATE:SERIAL:SBITS 1

Query:   SYSTEM:COMMUNICATE:SERIAL:SBITS?

Response:   2

**Related Commands**   None

# SYSTem:COMMunicate:SERial:PACE

This command sets or queries the software pacing scheme.

**Syntax**   SYSTem:COMMunicate:SERial:PACE <serial pace>
SYSTem:COMMunicate:SERial:PACE?

**Parameters**

| <serial pace> (discrete) | Description |
|---|---|
| NONE | Software pacing disabled (default) |
| XON | Software pacing on using control-S and control-Q |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SYSTEM:COMMUNICATE:SERIAL:PACE NONE

Query:   SYSTEM:COMMUNICATE:SERIAL:PACE?

Response:   XON

**Related Commands**   None

# SYSTem:COMMunicate:SERial:TRANsmit:DELay

This command sets or queries the delay, in seconds, that the instrument waits after receiving a query and before issuing a response.

**Syntax**

SYSTem:COMMunicate:SERial:TRANsmit:DELay <transmit delay>
SYSTem:COMMunicate:SERial:TRANsmit:DELay?

**Parameters**

| <transmit delay> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 60 | Delay in seconds that instrument waits after receiving a query before issuing a response (default= 0) |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:DELAY 5

Query:    SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:DELAY?

Response:    3

**Related Commands**    None

# SYSTem:COMMunicate:SERial:TRANsmit:TERMinator

This command sets or queries the character or characters sent with the response message.

**Syntax**

SYSTem:COMMunicate:SERial:TRANsmit:TERMinator <terminator>
SYSTem:COMMunicate:SERial:TRANsmit:TERMinator?

**Parameters**

| <terminator> (discrete) | Description |
|---|---|
| LF | Line feed (default) |
| CR | Carriage return |
| CRLF | CR/LF |
| LFCR | LF/CR |

**Dependencies**   None

**Errors and Events**   None

**Examples**

Set:        SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:TERMINATOR CRLF

Query:      SYSTEM:COMMUNICATE:SERIAL:TRANSMIT:TERMINATOR?

Response:   CRLF

**Related Commands**   None

# Instrument Control Commands

The Instrument Control commands allow you to access utility functions and settings such as errors, query headers, serial number, system time, date, owner, and operator.

This section contains all of the commands and queries for the following CTS 850 Instrument Control subsystem:

■ SYSTem

## SYSTem Subsystem

This section describes each of the commands and queries that allow you to access general utility functions and settings in the instrument. Figure 2-111 shows the hierarchy tree for this subsystem.

```
                                        SYSTem
                                          |
  ┌──────┬──────┬──────┬──────────┬──────────┬────────┬───────┬──────┬────────┬───────┬──────┬────────────┬──────────┐
ERRor?  DATE  TIME  MODE?  HEADers  VERBose  SERial  OWNer  USER  BEEPer  KLOCk  SET?  SDEScription  ABStouch
                                                                    |
                                                              ┌─────┴─────┐
                                                          IMMediate   CONTrol
```
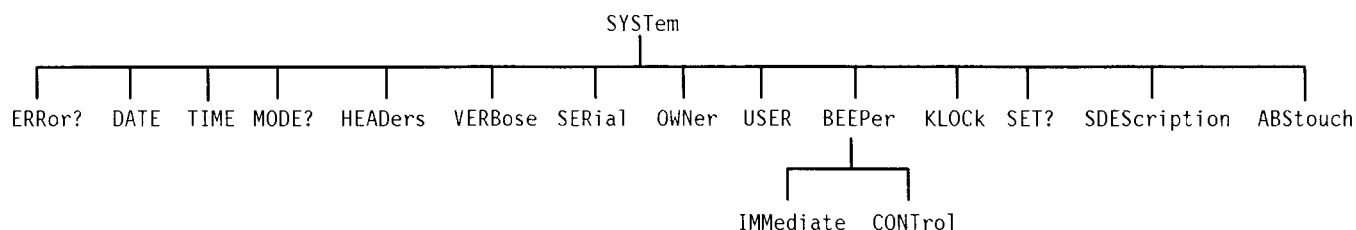
**Figure 2-111: SYSTem subsystem**

## SYSTem:ERRor?

This query returns the errors and events that have accumulated in the instrument. If no errors are present in the instrument, the response is: 0,"No Error".

**Syntax**   SYSTem:ERRor?

**Response**

| <error number> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 999 | This value indicates the error number |

| <error description> (string) | Description |
|---|---|
| Primary error message and, optionally, a secondary error message | This string describes the error |

**Dependencies**     None

**Errors and Events**     See the *Messages* tables in the *Status and Events* section.

**Examples**     Query:     SYSTEM:ERROR?

Response:     200, "Execution error; Pointer burst active, request ignored"

**Related Commands**     None

# SYSTem:DATE

This command sets or queries the date for the instrument.

**Syntax**     SYSTem:DATE <year>,<month>,<day>
SYSTem:DATE?

**Parameters**

| <year> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 99 | The system year is set to this value |

| <month> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 1 to 12 | The system month is set to this value |

| <day> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 1 to 31 | The system day is set to this value |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Set:     SYSTEM:DATE 97,5,1

Query:     SYSTEM:DATE?

Response:     97,5,26

**Related Commands**     SYSTem:TIME

# SYSTem:TIME

This command sets or queries the time for the instrument. Time is kept in a 24-hour format.

**Syntax**
```
SYSTem:TIME <hour>,<minute>,<second>
SYSTem:TIME?
```

**Parameters**

| <hour> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 23 | The system hour is set to this value |

| <minute> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 59 | The system minute is set to this value |

| <second> (NR1-numeric) | Description |
|---|---|
| Any integer in the range 0 to 59 | The system second is set to this value |

**Dependencies**    None

**Errors and Events**    None

**Examples**    

Set:    `SYSTEM:TIME 13,7,56`

Query:    `SYSTEM:TIME?`

Response:    `22,15,00`

**Related Commands**    SYSTem:DATE

# SYSTem:MODE?

This query returns the mode of the instrument.

**Syntax**    `SYSTem:MODE?`

**Response**

| <system mode>  (discrete) | Description |
|---|---|
| SDH | Instrument is set to SDH mode |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:   SYSTEM:MODE?

Response:   SDH

**Related Commands**   SYSTem:MODE

# SYSTem:HEADers

This command sets or queries the presence of headers in query responses.

**Syntax**   SYSTem:HEADers <system headers>
SYSTem:HEADers?

**Parameters**

| <system headers> (boolean) | Description |
|---|---|
| 0 or OFF | No system headers are returned (default) |
| 1 or ON | System headers are returned |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SYSTEM:HEADERS OFF

Query:   SYSTEM:HEADERS?

Response:   0

**Related Commands**   None

# SYSTem:VERBose

This command sets or queries the length of headers in query responses. If verbose is ON, the long form of headers is returned. If verbose is OFF, the short form is returned.

**Syntax**
```
SYSTem:VERBose <system verbose>
SYSTem:VERBose?
```

**Parameters**

| <system verbose> (boolean) | Description |
|---|---|
| 0 or OFF | Short form of headers (default) |
| 1 or ON | Long form of headers |

**Dependencies**     SYSTem:HEADers must be set to ON for headers to be returned.

**Errors and Events**     None

**Examples**     Set:        SYSTEM:VERBOSE OFF

Query:      SYSTEM:VERBOSE?

Response:   0

**Related Commands**     None

# SYSTem:SERial

This command sets or queries the instrument serial number. The factory assigns the serial number; however, you may alter the serial number. Only ASCII alphanumeric characters are accepted.

**Syntax**
```
SYSTem:SERIal <serial number>
SYSTem:SERIal?
```

**Parameters**

| <serial number> (string) | Description |
|---|---|
| Any ASCII string, maximum length of 16 | The instrument serial number is set to this value |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Set:          SYSTEM:SERIAL "B010100"

Query:          SYSTEM:SERIAL?

Response:     B010345

**Related Commands**     *IDN?

# SYSTem:OWNer

This command sets or queries the instrument owner. This information is saved in the results buffer and printed in hardcopy reports.

**Syntax**     SYSTem:OWNer <system owner>
SYSTem:OWNer?

**Parameters**

| <system owner> (string) | Description |
|---|---|
| Any ASCII string, maximum length of 64 | The instrument system owner is set to this value |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Set:          SYSTEM:OWNER "The ABC TELECOM COMPANY"

Query:          SYSTEM:OWNER?

Response:     "THE XYZ TELECOM COMPANY"

**Related Commands**     None

# SYSTem:USER

This command sets or queries the instrument operator name. This information is saved in the results buffer and printed in hardcopy reports.

**Syntax**    SYSTem:USER <operator name>
SYSTem:USER?

**Parameters**

| <operator name> (string) | Description |
|---|---|
| Any ASCII string, maximum length of 64 | The instrument operator name is set to this value |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:        SYSTEM:USER "JOHN DOE"

Query:      SYSTEM:USER?

Response:   "JOHN TECHNICIAN"

**Related Commands**    SYSTem:OWNer

# SYSTem:BEEPer:IMMediate

This command is used to sound the beeper in the instrument.

**Syntax**    SYSTem:BEEPer:IMMediate

**Parameters**    None

**Dependencies**    None

**Errors and Events**   None

**Examples**   SYSTEM:BEEPER:IMMEDIATE

**Related Commands**   SYSTem:BEEPer:CONTrol

# SYSTem:BEEPer:CONTrol

This command sets or queries the beeper control.

**Syntax**   SYSTem:BEEPer:CONTrol <beeper control>
SYSTem:BEEPer:CONTrol?

**Parameters**

| <beeper control> (boolean) | Description |
|---|---|
| 0 or OFF | Use SYSTem:BEEPer:IMMediate to sound the beeper (default) |
| 1 or ON | The beeper sounds when any error, alarm, or failure is detected |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Set:   SYSTEM:BEEPER:CONTROL ON

Query:   SYSTEM:BEEPER:CONTROL?

Response:   1

**Related Commands**   None

# SYSTem:KLOCk

This command sets or queries the front panel lock setting. (KLOCk stands for keyboard lock.)

**Syntax**

SYSTem:KLOCk <front panel control>
SYSTem:KLOCk?

**Parameters**

| <front panel control> (boolean) | Description |
|---|---|
| 0 or OFF | Front panel enabled (default) |
| 1 or ON | Front panel disabled |

**Dependencies**    None

**Errors and Events**    None

**Examples**

Set:        SYSTEM:KLOCK ON

Query:      SYSTEM:KLOCK?

Response:   1

**Related Commands**    None

# SYSTem:SET?

This query returns the current instrument state and performs the same function as the *LRN? query.

**Syntax**    SYSTem:SET?

**Response**    A list of commands and their parameter values separated by semicolons (;).

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    SYSTEM:SET?

Response:    :OUTPUT1:TELECOM:RATE STM1;TYPE ELECTRICAL;LEVEL
XCONNECT;:SOURCE:CLOCK:SOURCE INTERNAL;OFFSET:MODE
LOFFSET;LVALUE 0;:SOURCE:DATA:TELECOM:SOURCE OUTPUT1;
...

**Related Commands**    *LRN?

# SYSTem:SDEScription

This command sets or queries the description for the stored settings in the
current buffer.

**Syntax**    SYSTem:SDEScription <description>
SYSTem:SDEScription?

**Parameters**

| <description> (string) | Description |
|---|---|
| Any string, maximum length of 24 characters | Description of the stored strings in the current buffer |

**Dependencies**    After you set the description with this command, use the *SAV command to save
the description and settings in memory or the MMEMory:STORe:SETTings
command to save the description and settings to disk.

**Errors and Events**    None

**Examples**    Set:    SYSTEM:SDESCRIPTION "PASS/FAIL TEST A001"

Query:    SYSTEM:SDESCRIPTION?

Response:    "PASS/FAIL TEST T001"

**Related Commands**    *SAV
*RCL
MMEMory:STORe:SETTings

# SYSTem:ABStouch

This command simulates front panel button presses and knob turns.

**Syntax**    SYSTem:ABStouch <abstouch>

**Parameters**

| <abstouch> (discrete) | Description |
|---|---|
| HB1 | Horizontal bezel #1 (left-most button) |
| HB2 | Horizontal bezel #2 |
| HB3 | Horizontal bezel #3 |
| HB4 | Horizontal bezel #4 |
| HB5 | Horizontal bezel #5 |
| HB6 | Horizontal bezel #6 |
| HB7 | Horizontal bezel #7 (right-most button) |
| VB1 | Vertical bezel #1 (top button) |
| VB2 | Vertical bezel #2 |
| VB3 | Vertical bezel #3 |
| VB4 | Vertical bezel #4 |
| VB5 | Vertical bezel #5 (bottom button) |
| STESTs | Stored tests menu |
| TRANsmit | Transmitter setup menu |
| RECEiver | Receiver setup menu |
| RESults | Results menu |
| UTILity | Utility menu |
| STARTSTOP | Start/Stop button |
| STOP | Start/Stop button |
| IERRor | Error insert button |
| POINter | Pointer Action button |
| RHIStory | Reset history button |
| INCKnob | Increment knob |
| DECKnob | Decrement knob |
| HELP | Help dialog button |
| AUTOscan | Autoscan dialog button |
| PRINT | Print dialog button |

**Dependencies**    None

**Errors and Events**    None

**Examples**    SYSTEM:ABSTOUCH VB1

**Related Commands**    None

# Diagnostic Commands

The Diagnostic commands allow control of the diagnostic self tests provided with your instrument.

This section contains all of the commands and queries for the following CTS 850 Diagnostic subsystem:

■ DIAGnostic

## DIAGnostic Subsystem

This section describes each of the commands and queries that allow access and control of the diagnostic self tests provided with your instrument. Figure 2–113 shows the hierarchy tree for this subsystem.

```
                    DIAGnostic
                        |
   ┌────────┬───────┬───┴───┬──────────┐
EXECute  SELect  RESUlts?  LOOP    BUFFer
                                       |
                            ┌──────────┼──────────┐
                          SIZE?     INDex      DATA?
```
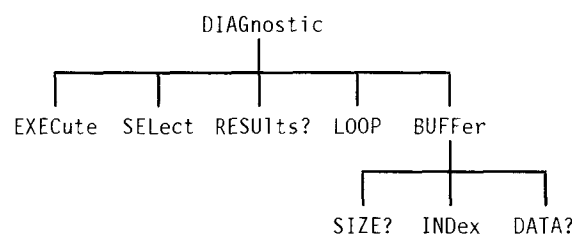
**Figure 2-113: DIAGnostic subsystem**

## DIAGnostic:EXECute

This command executes the selected diagnostic routines and sets the OPC bit when completed.

**Syntax**  DIAGnostic:EXECute

**Parameters**  None

**Dependencies**  The routines executed are determined by the DIAGnostic:SELect command.

**Errors and Events**  200, "Execution error; Diagnostics invalid while disk or autoscan busy"
402, "Operation complete; Internal diagnostics completed – passed"
402, "Operation complete; Internal diagnostics completed – failed"

**Examples**    DIAGNOSTIC:EXECUTE

**Related Commands**    DIAGnostic:SELect
*TST?

# DIAGnostic:SELect

This command sets or queries the specified diagnostic routine that are run when the DIAGnostic:EXECute command is sent.

**Syntax**    DIAGnostic:SELect <diagnostic group>
DIAGnostic:SELect?

**Parameters**

| <diagnostic group> (discrete) | Description |
| --- | --- |
| STANdard | Standard self test; same as the *TST? query (default) |
| PROCessor | Processor board |
| PROTocol | Protocol board |
| CLOCk | Clock generator board |
| DISK | Disk drive |
| DISPlay | Display board |
| TRIButary | Tributary board (Add/Drop Test Option Only) |
| INTERFACE | Line interface module |
| FPANel | Front Panel |
| SYSINTERNAL | Complete system (internal loopback) |
| SYSEXTERNAL | Complete system (external loopback) |
| JITter | Jitter module |

**Dependencies**    None

**Errors and Events**    None

| | | |
|---|---|---|
| **Examples** | Set: | DIAGNOSTIC:SELECT STANDARD |
| | Query: | DIAGNOSTIC:SELECT? |
| | Response: | JITTER |

**Related Commands**    DIAGnostic:EXECute

# DIAGnostic:RESults?

This query returns the results from the last diagnostics execution. These diagnostics could have been run at the power-on self test or as a result of sending the DIAGnostic:EXECute command or *TST? query.

If any SCPI-derived or IEEE 488.2 Common Command is sent while the diagnostics are running, the diagnostics will stop. The DIAGnostic:RESults? query can then be used to determine if the selected diagnostic test passed or failed.

**Syntax**    DIAGnostic:RESults?

**Response**

| <diagnostic results> (discrete) | Description |
|---|---|
| PASSED | Test passed |
| FAILED | Test failed |
| ABORTED | Test aborted |

**Dependencies**    None

**Errors and Events**    None

| | | |
|---|---|---|
| **Examples** | Query: | DIAGNOSTIC:RESULTS? |
| | Response: | PASSED |

**Related Commands**    DIAGnostic:SELect
DIAGnostic:EXECute

# DIAGnostic:LOOP

This command sets or queries the looping control used for diagnostic routines when the DIAGnostics:EXECute command is given.

**Syntax**

```
DIAGnostic:LOOP <loop control>
DIAGnostic:LOOP?
```

**Parameters**

| <loop control> (discrete) | Description |
| --- | --- |
| ONCE | One pass (default) |
| TEN | Loop ten times |
| THOUSAND | Loop one thousand times |
| ERRor | Loop until error detected |
| FOREVER | Loop until any command is sent |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Set:    `DIAGNOSTIC:LOOP TEN`

Query:    `DIAGNOSTIC:LOOP?`

Response:    `ONCE`

**Related Commands**    DIAGnostic:EXECute

This query returns the current setting of the looping control used for diagnostic routines when the DIAGnostics:EXECute command is given.

# DIAGnostic:BUFFer:SIZE?

This query returns the number of entries in the diagnostics results buffer. The <buffer size> is the maximum value you can use in the DIAGnostic:BUFFer:INDex command.

**Syntax**    DIAGnostic:BUFFer:SIZE?

**Response**

| <buffer size> (NR1-numeric) | Description |
|---|---|
| Any integer | The number of entries in the results buffer (0 indicates that no errors were found in the diagnostics) |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:      DIAGNOSTIC:BUFFER:SIZE?

Response:  5

**Related Commands**    DIAGnostic:BUFFer:INDex

# DIAGnostic:BUFFer:INDex

This command sets or queries the buffer that is used by the DIAGnostic:
BUFFer:DATA? query. The <buffer number> must be less than or equal to the
<buffer size> value returned from the DIAGnostic:BUFFer:SIZE? query. When
the DIAGnostic:EXECute command is given, the <buffer number> is reset to 1.

**Syntax**      DIAGnostic:BUFFer:INDex <buffer number>

**Parameters**

| <buffer number> (NR1-numeric) | Description |
|---|---|
| Any integer; must be less than or equal to the integer returned from the DIAGnostic:BUFFer: SIZE? query | Buffer used by the DIAGnostic:BUFFer: DATA? query (default = 1) |

**Dependencies**      None

**Errors and Events**      None

**Examples**      Set:        DIAGNOSTIC:BUFFER:INDEX 1

Query:      DIAGNOSTIC:BUFFER:INDEX?

Response:   12

**Related Commands**      DIAGnostic:BUFFer:SIZE?
DIAGnostic:BUFFer:DATA?
DIAGnostic:BUFFer:EXECute

# DIAGnostic:BUFFer:DATA?

This query returns detailed description of the diagnostic results. Use the DIAGnostic:BUFFer:INDex command to select the buffer to view.

**Syntax**    `DIAGnostic:BUFFer:DATA?`

**Response**

| <diagnostic description> (string) | Description |
|---|---|
| An ASCII string, maximum length 160 | A detailed description of the diagnostic results |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:      `DIAGNOSTIC:BUFFER:DATA?`

Response:   `"MEMORY TEST FAILED - WROTE AA READ 55"`

**Related Commands**    DIAGnostic:BUFFer:INDex
DIAGnostic:SELect
DIAGnostic:EXECute

# Common Commands

This section describes each of the IEEE 488.2 Common Commands in detail.
CTS 850

## *CLS

This command clears all status registers and error queues.

| | |
|---|---|
| **Syntax** | *CLS |
| **Parameters** | None |
| **Dependencies** | None |
| **Errors and Events** | None |
| **Examples** | *CLS |
| **Related Commands** | None |

# *ESE

This command sets the contents of the Event Status Enable Register. This register controls the reporting of specific errors through the status register and the interrupt mechanism.

**Syntax**     *ESE <decimal value>

**Parameters**

| <decimal value> (NR1-numeric) | bit | Description |
|---|---|---|
| 1 | 0 | Operation complete |
| 2 | 1 | Not used |
| 4 | 2 | Query error |
| 8 | 3 | Device dependent error |
| 16 | 4 | Execution error |
| 32 | 5 | Command error |
| 64 | 6 | Not used |
| 128 | 7 | Power on |

**Dependencies**     None

**Errors and Events**     None

**Examples**     *ESE 16

**Related Commands**     *ESE?

# *ESE?

This query returns the contents of the Event Status Enable Register.

**Syntax**   *ESE?

**Response**

| <decimal value> (NR1-numeric) | bit | Description |
|---|---|---|
| 1 | 0 | Operation complete |
| 2 | 1 | Not used |
| 4 | 2 | Query error |
| 8 | 3 | Device dependent error |
| 16 | 4 | Execution error |
| 32 | 5 | Command error |
| 64 | 6 | Not used |
| 128 | 7 | Power on |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:       *ESE?

Response:   64

**Related Commands**   *ESE

# *ESR?

This query returns the contents of the Standard Event Status Register. This register shows the status of general instrument-related events as bits encoded into a number.

**Syntax**     *ESR?

**Response**

| <decimal value> (NR1-numeric) | bit | Description |
|---|---|---|
| 1 | 0 | Operation complete |
| 2 | 1 | Not used |
| 4 | 2 | Query error |
| 8 | 3 | Device dependent error |
| 16 | 4 | Execution error |
| 32 | 5 | Command error |
| 64 | 6 | Not used |
| 128 | 7 | Power on |

**Dependencies**     None

**Errors and Events**     None

**Examples**     Query:     *ESR?

Response:   64

**Related Commands**     *ESE

# *IDN?

This query returns the identity of the instrument.

**Syntax**   *IDN?

**Response**   <manufacturer>,<model>,<serial number>,<firmware version>

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:   *IDN?

Response:   "TEKTRONIX,CTS750,000000000,CF:91.1C FV1.20"

**Related Commands**   None

# *LRN?

This query returns an ASCII representation of the current instrument setup.

**Syntax**   *LRN?

**Response**   A list of commands and their parameter values separated by semicolons (;) (see *Appendix NO TAG* for a complete list).

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:   *LRN?

Response:   ":OUTPUT1:TELECOM:RATE STM1;TYPE ELECTRICAL;LEVEL
XCONNECT;:SOURCE:CLOCK:SOURCE INTERNAL;OFFSET:MODE
LOFFSET;LVALUE 0;:SOURCE:DATA:TELECOM:SOURCE OUTPUT1;
..."

**Related Commands**   None

# *RST

This command resets the instrument and puts it into a default state, which is independent of past historical setups. This command sets the Operation Complete bit in the Standard Event Status Register.

| | |
|---|---|
| **Syntax** | *RST |
| **Parameters** | None |
| **Dependencies** | None |
| **Errors and Events** | 402, "Operation complete; Instrument factory reset complete" |
| **Examples** | *RST |
| **Related Commands** | None |

# *SRE

This command sets the contents of the Service Request Enable Register. This register controls the reporting of specific errors through the status register and the interrupt mechanism.

**Syntax**  \*SRE <decimal value>

**Parameters**

| <decimal value> (NR1-numeric) | bit | Description |
| --- | --- | --- |
| 1 | 0 | Not used |
| 2 | 1 | Not used |
| 4 | 2 | Not used |
| 8 | 3 | Not used |
| 16 | 4 | Message available |
| 32 | 5 | Event status summary |
| 64 | 6 | Not used |
| 128 | 7 | Not used |

**Dependencies**  None

**Errors and Events**  None

**Examples**  \*SRE 64

**Related Commands**  \*SRE?

# *SRE?

This query returns the contents of the Service Request Enable Register.

**Syntax**   *SRE?

**Response**

| <decimal value> (NR1-numeric) | bit | Description |
|---|---|---|
| 1 | 0 | Not used |
| 2 | 1 | Not used |
| 4 | 2 | Not used |
| 8 | 3 | Not used |
| 16 | 4 | Message available |
| 32 | 5 | Event status summary |
| 64 | 6 | Not used |
| 128 | 7 | Not used |

**Dependencies**   None

**Errors and Events**   None

**Examples**   Query:      *SRE?

Response:   64

**Related Commands**   *SRE

# *STB?

This query returns the contents of the Status Byte Register.

**Syntax**    *STB?

**Response**

| <decimal value> (NR1-numeric) | bit | Description |
|---|---|---|
| 1 | 0 | Not used |
| 2 | 1 | Not used |
| 4 | 2 | Error/event queue not empty |
| 8 | 3 | Not used |
| 16 | 4 | Message available |
| 32 | 5 | Event status summary |
| 64 | 6 | Request service/Master status summary |
| 128 | 7 | Not used |

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    *STB?

Response:   64

**Related Commands**    *SRE
*SRE?

# *OPC

This command causes the instrument to generate the Operation Complete message in the Standard Event Status Register when all pending instrument operations have been finished.

**Syntax**          *OPC

**Parameters**      None

**Dependencies**    None

**Errors and Events**   None

**Examples**        *OPC

**Related Commands**    *OPC?

# *OPC?

This query returns a 1 when all pending device operations have finished.

**Syntax**          *OPC?

**Response**        1

**Dependencies**    None

**Errors and Events**   None

**Examples**        Query:      *OPC?

                    Response:   1

**Related Commands**    None

# *OPT?

This query returns the installed hardware options and the instrument and option configuration information. <option name> is repeated for each option; <instrument configuration> and <option configuration> are listed only once.

Two new fields have been added to the "Option Revision" information. The string is as follows:  [Inn:Tnn:TXnnn:Jnn:JGnn:JDnnLTEnn:T2Xnn], where

| | |
|---|---|
| I | I/O (O/E) module |
| T | Tributary board |
| TX | Tributary Xilinx |
| J | Jitter Analyzer |
| JG | Jitter Generator |
| JD | Jitter DSP firmware |
| TE | Tributary E4 board |
| T2X | Tributary Xilinx, second page |

**Syntax**    *OPT?

**Response**    <option name>,<instrument configuration>,<option configuration>

**Dependencies**    None

**Errors and Events**    None

**Examples**    Query:    *OPT?

Response:    "OPT/ELEC 1310nm: 55/155/622,2/34/140: ADD/DROP/TEST, [C18:PO:HO:KO:DO:F8:X2.93],[I1:T3:TX0.318:J-]"

**Related Commands**    None

# *RCL

This command recalls the instrument state from an internal storage buffer. Five buffers are available for use. This command sets the Operation Complete bit in the Standard Event Status Register.

**Syntax**   *RCL <buffer number>

**Parameters**

| <buffer number> (NR1-numeric) | description |
| --- | --- |
| 1 to 5 | Storage buffers 1 to 5 |

**Dependencies**   None

**Errors and Events**   230, "Data corrupt or stale; Recall buffer is empty"
221, "Settings conflict; Internal buffer is empty"

**Examples**   *RCL 1

**Related Commands**   *SAV

# *SAV

This command saves the instrument state into an internal storage buffer. Five buffers are available for use. This command sets the Operation Complete bit in the Standard Event Status Register.

**Syntax**   *SAV <buffer number>

**Parameters**

| <buffer number> (NR1-numeric) | description |
| --- | --- |
| 1 to 5 | Storage buffers 1 to 5 |

**Examples**   *SAV 1

**Related Commands**   *RCL

# *TST?

This query invokes the instrument self-test routines and returns the result when they complete. The OPC bit in the Standard Event Status Register is set when the self-test routines are complete.

**Syntax**　　*TST?

**Response**

| <test results> (NR1-numeric) | description |
|---|---|
| 0 | Test complete and successful |
| 1 | Test complete and failed |

**Dependencies**　　None

**Errors and Events**　　402, "Operation complete; Internal diagnostics completed – passed"
402, "Operation complete; Internal diagnostics completed – failed"

**Examples**　　Query:　　*TST?

Response:　0

**Related Commands**　　DIAGnostics:RESults?
DIAGnostics:EXECute

# *WAI

This command prevents any commands or queries from executing until the command that is currently executing sets the OPC bit.

**Syntax**          *WAI

**Parameters**      None

**Dependencies**    None

**Errors and Events**  None

**Examples**        *WAI

**Related Commands**  None

# Status and Events

The Status and Event Reporting System reports asynchronous events and errors that occur in the CTS 850 SDH Test Set. This system consists of four 8-bit registers and two queues that you access through the command language. You can use these registers and queues to query the instrument status and control the interrupts that report events.

In general, after an interrupt occurs, first conduct a serial poll, query the registers to see why the interrupt occurred, and then send the SYSTem:ERROr? query to see a descriptive error message.

This section describes the four registers and two queues of the Status and Event Reporting System. For each register, you are given a description, a table describing all of the bits, and an example of how to use the register. Also described in this section is the Status and Event Reporting process, synchronizing programming commands, and the system messages.

## Status and Event Reporting System

The Status and Event Reporting System monitors and reports such events as an error occurring or the availability of a response to a query. This system includes descriptions of the following registers and queues:

- Status Byte Register

- Service Request Enable Register

- Standard Event Status Register

- Event Status Enable Register

- Output Queue

- System Error and Event Queue

**Status Byte Register**   The Status Byte Register, shown in Table 3-1, summarizes information from other registers. Use a serial poll or a *STB? query to read the contents of the Status Byte Register. The response is the sum of the decimal values for all bits set. When you use a serial poll, bit 6 shows Request Service information. When you use the *STB? query, bit 6, the Master Status Summary bit, indicates that bits 4 or 5 may be set. Using the *STB? query clears all bits in the Status Byte Register.

### Table 3-1: The Status Byte Register

| Bit | Decimal Value | Function |
|-----|---------------|----------|
| 0-1 | – | Not used |
| 2 | 4 | **Error/Event Queue not empty** indicates that information is contained in the error/event queue and is waiting to be read. |
| 3 | – | Not used |
| 4 | 16 | **Message Available** shows that output is available in the Output Queue. |
| 5 | 32 | **Event Status Bit** indicates that one or more events have occurred and the corresponding bits in the Standard Event Status Register have been set. |
| 6 | 64 | **Request Service** (obtained from a serial poll) shows that the CTS 850 has requested service from the GPIB controller.<br><br>**Master Status Summary** (obtained from *STB? query) summarizes the event status bit and message available bits in the Status Byte Register. |
| 7 | – | Not used |

A common example of using the Status Byte Register is to enable only the Event Status and Request Service bits. Enable bits 5 and 6 using the Service Request Enable Register (see the next section for information about this register). If the *STB? query returns a value of 96, bit 5 (decimal value of 32) and bit 6 (decimal value of 64) have been set (giving a decimal value sum of 96). Bit 5 indicates that information is available in the Standard Event Status Register, and bit 6 indicates that bits 4 or 5 are set in the Status Byte Register.

## Service Request Enable Register

The Service Request Enable Register, shown in Table 3-2, controls which bits in the Status Byte Register will generate a service request. Use the *SRE command to set bits in the Service Request Enable Register. Use the *SRE? query to see which bits in this register are enabled. The response from this query is the sum of the decimal values for all bits set.

### Table 3-2: The Service Request Enable Register

| Bit | Decimal Value | Function |
|-----|---------------|----------|
| 0-3 | – | Not used |
| 4 | 16 | **Message Available** indicates that a message available will generate a service request. |

**Table 3-2: The Service Request Enable Register (Cont.)**

| Bit | Decimal Value | Function |
|-----|---------------|----------|
| 5 | 32 | **Event Status Bit** indicates that events summarized in bit 5 of the Status Byte Register will generate a service request. |
| 6-7 | – | Not used |

If, for example, the \*SRE? query returns a value of 48, bits 4 and 5 are set in the Service Request Enable Register. Any event that causes the Message Available bit (bit 4) or Event Status bit (bit 5) to be set in the Status Byte Register now generates an interrupt. If you want an interrupt to be generated only when the Event Status bit (bit 5) is set, use the \*SRE 32 command.

**Standard Event Status Register**

The Standard Event Status Register, shown in Table 3-3, records many types of events that can occur in the CTS 850. Use the \*ESR? query to read the contents of this register. The response is the sum of the decimal values for all bits set. Reading this register clears all bits so the register can accumulate information about new events.

**Table 3-3: The Standard Event Status Register**

| Bit | Decimal Value | Function |
|-----|---------------|----------|
| 0 | 1 | **Operation Complete** shows that the operation is complete. This bit is set when all pending operations complete following a \*OPC command. Table B-1 in the Appendix lists the commands and queries that set the OPC bit upon completion of execution. |
| 1 | – | Not used |
| 2 | 4 | **Query Error** shows that the CTS 850 attempted to read the Output Queue when no data was present or pending, or that data in the Output Queue was lost. |
| 3 | 8 | **Device Dependent Error** shows that a device error occurred. Table 3-7 on page 3-10 lists the device error messages. |
| 4 | 16 | **Execution Error** shows that an error occurred while the CTS 850 was executing a command or query. Table 3-6 on page 3-9 lists the execution error messages. |
| 5 | 32 | **Command Error** shows that an error occurred while the CTS 850 was parsing a command or query. Table 3-5 on page 3-8 lists the command error messages. |

**Table 3-3: The Standard Event Status Register (Cont.)**

| Bit | Decimal Value | Function |
|-----|---------------|----------|
| 6 | – | Not used |
| 7 | 128 | **Power On** shows that the CTS 850 was powered on. The completion of the diagnostic tests also sets this bit. |

The following example assumes that all bits have been enabled using the Event Status Enable Register (see the next section for information about this register). If a *ESR? query returns a value of 128, bit 7 (decimal value of 128) is set indicating that the instrument is in the initial power-on state.

Table B-1 in the Appendix lists the commands and queries that set the OPC bit (bit 0 of the Standard Event Status Register) upon completion of execution. Some of these commands and queries may require more than 200 ms to complete execution.

**Event Status Enable Register**

The Event Status Enable Register, shown in Table 3-4, controls which events are summarized in the event status bit (bit 5) of the Status Byte Register. Note that the Event Status Enable Register has the same content as the Standard Event Status Register. Use the *ESE command to set bits in the Event Status Enable Register. Use the *ESE? query to see what bits in the Event Status Enable Register are set. The response from this query is the sum of the decimal values for all bits summarized in the event status bit of the Status Byte Register.

**Table 3-4: The Event Status Enable Register**

| Bit | Decimal Value | Function |
|-----|---------------|----------|
| 0 | 1 | **Operation Complete** shows that the operation is complete. This bit is set when all pending operations complete following a *OPC command. Table B-1 in the Appendix lists the commands and queries that set the OPC bit upon completion of execution. |
| 1 | – | Not used |
| 2 | 4 | **Query Error** shows that the CTS 850 attempted to read the Output Queue when no data was present or pending, or that data in the Output Queue was lost. |
| 3 | 8 | **Device Dependent Error** shows that a device error occurred. Table 3-7 on page 3-10 lists the device error messages. |
| 4 | 16 | **Execution Error** shows that an error occurred while the CTS 850 was executing a command or query. Table 3-6 on page 3-9 lists the execution error messages. |

**Table 3-4: The Event Status Enable Register (Cont.)**

| Bit | Decimal Value | Function |
|---|---|---|
| 5 | 32 | **Command Error** shows that an error occurred while the CTS 850 was parsing a command or query. Table 3-5 on page 3-8 lists the command error messages. |
| 6 | – | Not used |
| 7 | 128 | **Power On** shows that the CTS 850 was powered on. The completion of the diagnostic tests also sets this bit. |

If, for example, the *ESE? query returns a value of 255, all bits are set indicating that all events will set the event status bit (bit 5) of the Status Byte Register.

**The Output Queue**

The CTS 850 stores query responses in the Output Queue. It empties this queue each time it receives a new command or query message after an End Of Message (EOM). The controller must read a query response before it sends the next command (or query) or it loses responses to earlier queries.

> **NOTE.** *When a controller sends a query, an EOM, and a second query, the CTS 850 normally clears the first response and outputs the second while reporting a Query Error (bit 2 in the Standard Event Status Register) to indicate the lost response.*

**The System Error and Event Queue**

The CTS 850 error and event messages are stored in the System Error and Event Queue. Use the SYSTem:ERRor? query to get the event number and a text description of the event. Reading an event removes it from the queue. The Event Queue stores detailed information for up to 20 events; the events are stored in first-in first-out order.

Before reading an event from the Event Queue, use the *ESR? query to read the summary of the event from the Standard Event Status Register. The events summarized by the *ESR? query are made available to the SYSTem:ERRor? query, and the Standard Event Status Register is emptied.

Reading the Standard Event Status Register erases any events that were summarized by previous *ESR? queries but not read from the Event Queue. Events that follow an *ESR? query are put in the Event Queue but are not available until *ESR? is given again.

# Status and Event Reporting Process

Figure 3-1 shows how to use the Status and Event Reporting system. In the explanation that follows, numbers in parentheses refer to the circled numbers in Figure 3-1.
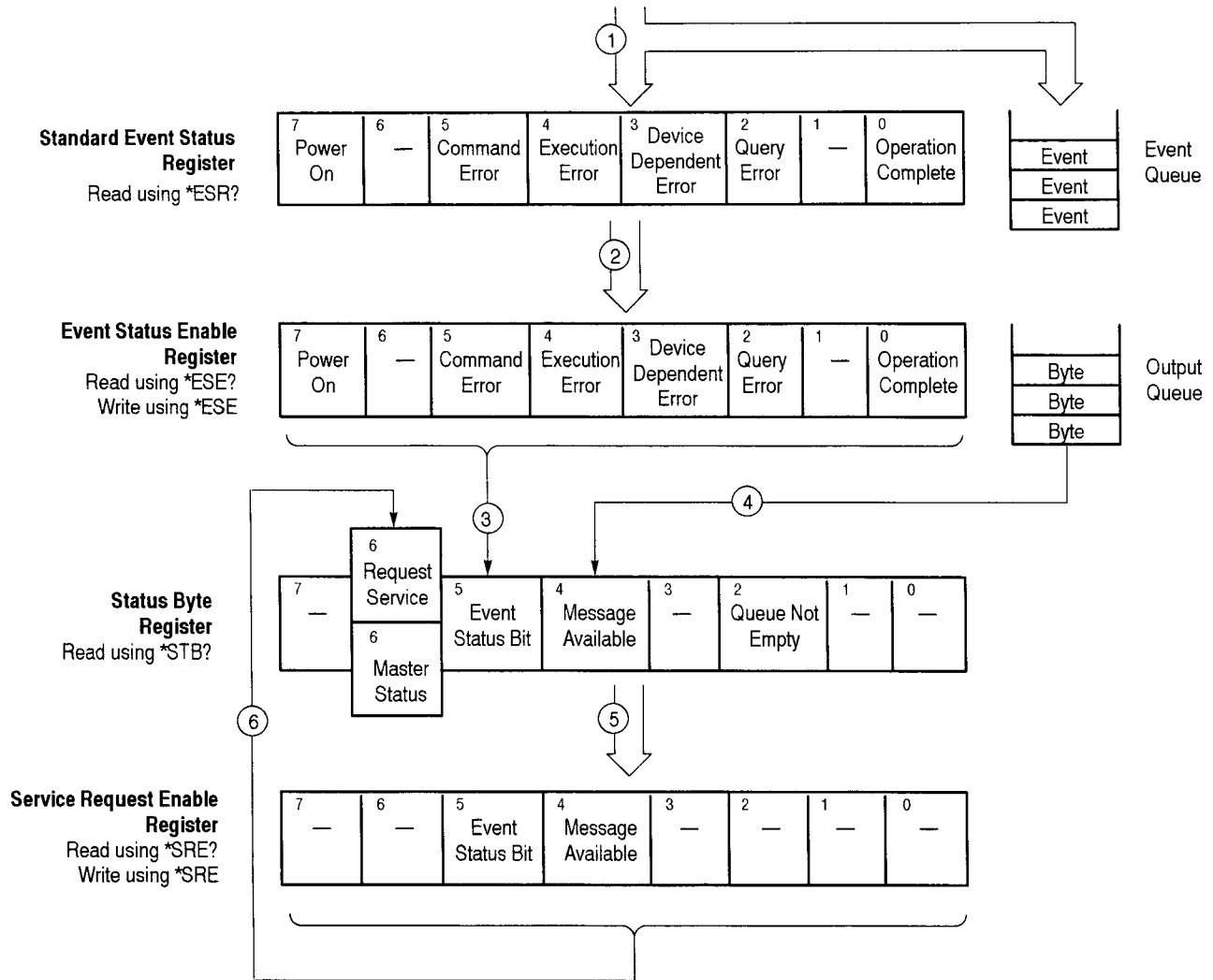


**Figure 3-1: Status and Event Reporting Process**

When an event occurs the appropriate bit in the Standard Event Status Register is set to one and the event is recorded in the Event Queue (1). If the corresponding bit in the Event Status Enable Register is also enabled (2), then the event status bit in the Status Byte Register is set to one (3).

When output is sent to the Output Queue (for example, a response to a query), the message available bit in the Status Byte Register is set to one (4).

When a bit in the Status Byte Register is set to one and the corresponding bit in the Service Request Enable Register is enabled (5), the master status summary bit in the Status Byte Register is set to one and a service request is generated (6).

# Synchronization Methods

Although most GPIB commands are completed almost immediately after being received by the CTS 850, some commands initiate processes requiring additional time. For example, after you send a SENSe:DATA:TELecom:AUTOscan command, you must wait until it has completed execution before you give another command or query.

Sometimes the result of an operation depends on the result of an earlier operation (the first operation must be completed before the next one is initiated). The status and event reporting system of the CTS 850 provides this capability.

### Using the *OPC? Query

Use the *OPC? query to synchronize commands. The *OPC? query places a 1 in the Output Queue once an operation is complete. A timeout could occur if you try to read the output queue before there is any data in it.

The same command sequence using the *OPC? query for synchronization looks like this:

```
/* Set up a chained message */
SENSE:DATA:TELECOM:AUTOSCAN;*OPC?
```

# Messages

The CTS 850 generates error messages in response to events caused by commands or queries. Each type of event sets a specific bit in the Standard Event Status Register. Thus, each message is associated with a specific Standard Event Status Register bit. In the message tables that follow, the associated Standard Event Status Register bit is specified in the table title. Not shown in the tables are secondary messages giving more detail about the cause of the error or the meaning of the message. These secondary messages are shown for each command and query in *Syntax and Commands*.

Table 3–5 shows the error messages generated by improper command syntax. Check to see that the command is properly formatted and that it follows the rules in *Syntax and Commands*.

**Table 3–5: Command Error Messages (Bit 5 in Standard Event Status Register)**

| Code | Message |
|------|---------|
| 100 | Command error |
| 101 | Invalid character |
| 102 | Syntax error |
| 103 | Invalid separator |
| 104 | Data type error |
| 105 | Get not allowed |
| 106 | Invalid program data separator |
| 108 | Parameter not allowed |
| 109 | Missing parameter |
| 110 | Command header error |
| 111 | Header separator error |
| 112 | Mnemonic too long |
| 113 | Undefined header |
| 118 | Query not allowed |
| 120 | Numeric data error |
| 121 | Invalid char in number |
| 123 | Exponent too large |
| 124 | Too many digits |
| 128 | Numeric data not allowed |
| 130 | Suffix error |
| 131 | Invalid suffix |
| 134 | Suffix too long |

**Table 3-5: Command Error Messages (Bit 5 in Standard Event Status Register) (Cont.)**

| Code | Message |
|------|---------|
| 138 | Suffix not allowed |
| 140 | Character data error |
| 141 | Invalid character data |
| 144 | Character data too long |
| 148 | Character data not allowed |
| 150 | String data error |
| 151 | Invalid string data |
| 158 | String data not allowed |
| 160 | Block data error |
| 161 | Invalid block data |
| 168 | Block data not allowed |

Table 3-6 lists the execution error messages that can occur during execution of a command.

**Table 3-6: Execution Error Messages (Bit 4 in Standard Event Status Register)**

| Code | Message |
|------|---------|
| 200 | Execution error |
| 220 | Parameter error |
| 221 | Settings conflict |
| 222 | Data out of range |
| 223 | Too much data |
| 224 | Illegal parameter value |
| 230 | Data corrupt or stale |
| 240 | Hardware error |
| 241 | Hardware missing |
| 250 | Mass storage error |
| 252 | Missing mass storage |
| 252 | Missing media |
| 253 | Corrupt media |
| 254 | Media full |
| 255 | Directory full |

**Table 3-6: Execution Error Messages (Bit 4 in Standard Event Status Register) (Cont.)**

| Code | Message |
|------|---------|
| 256 | File name not found |
| 257 | File name error |
| 258 | Media protected |

Table 3-7 lists the device dependent error messages that can occur during CTS 850 operation.

**Table 3-7: Device Dependent Error Messages (Bit 3 in Standard Event Status Register)**

| Code | Message |
|------|---------|
| 300 | Device specific error |
| 310 | System error |
| 361 | Autoscan failed |

Table 3-8 lists the system events.

**Table 3-8: System Events**

| Code | Message |
|------|---------|
| 401 | Power on[1] |
| 402 | Operation complete[2] |

[1]   **Sets bit 7 in the Standard Event Status Register.**

[2]   **Sets bit 0 in the Standard Event Status Register.**

Table 3-9 lists the execution warnings that can occur during execution of a command.

**Table 3-9: Execution Warning Messages (Bit 3 in Standard Event Status Register)**

| Code | Message |
|------|---------|
| 500 | Execution warnings |

# Examples

The following sample program sets up the CTS 850 to perform a one minute bit error rate test. The program is written in Microsoft C and uses a National Instruments GPIB driver. Note that the program verifies communication with the instrument, inserts section code violation errors at a rate of $10^{-5}$, loops until the test completes, and prints the BER for the section code violations. Use this program as a basis for programs that perform more advanced tasks. This example program assumes that the instrument is configured to device 4.

```
/*---------------------------------------------------------
* Program: BER.C
* Description: This program will set up the instrument to perform
*              a 1 minute BER test. The generator may be looped
*              back to the receiver. Errors will be inserted
*              during the test. The results will be printed at
*              the completion of the test.
* Prerequisites:
*              The instrument must be configured at device 4 in
*              IBCONF.
*              The language is Microsoft C using National
*              Instruments GPIB drivers.
*---------------------------------------------------------
*/
#include "stdio.h"
#include "string.h"
#include "decl.h"
main()
{
    char buffer[255];
    int  count = 0;
```

```
int  status = 0;

int device;

/* announce start of program */

printf("CTS 850 BER Program Starting\n");

/* verify instrument is connected */

device = ibfind ("DEV4");

ibclr( device);

buffer[0] = 0;                    /* initialize the string */

ibwrt(device,"*IDN?",5);    /* send query to instrument */

ibrd(device, buffer, 255); /* get response from instrument */

buffer[ibcnt-1] = 0;          /* add null to terminate string */

if( ibcnt > 1 )

{

    printf("Instrument at Address 4\n %s\n ", buffer);

}

else

{

    printf("Instrument at Address 4 did not respond");

    return( 1 ); /* error and exit */

}

/* initialize instrument */

ibwrt( device,"SYSTEM:MODE SDH",17);

ibwrt( device "*RST",4);

ibwrt( device "*OPC?",5);

ibrd(device,buffer,255);

/* setup transmitter - B1 errors at 1e-5 rate */

ibwrt( device,"SYSTEM:HEADER 0", 15);

ibwrt( device,"INPUT1:TEL:RATE STM1", 20);
```

```
ibwrt( device,"OUTPUT1:TEL:RATE STM1", 21);

ibwrt( device, "SOURCE:DATA:TEL:ERROR:ENABLE ON", 31);

ibwrt( device, "SOURCE:DATA:TEL:ERROR:TYPE SCV", 30);

ibwrt( device, "SOURCE:DATA:TEL:ERROR:RATE 1E-5", 31);

/* setup receiver - test duration of 1 minute */

ibwrt( device, "SENSE:DATA:TEL:TEST:DURATION 0,0,1,0", 36);

/* start test */

ibwrt( device, "SENSE:DATA:TEL:TEST:START", 25);

/* wait until test is complete */

do

{

    ibwrt( device, "SENSE:DATA:TEL:TEST:STATUS?", 27 );

    ibrd( device, buffer, 255 );

    buffer[ibcnt-1] = 0;    /* add null to terminate string */

    printf(">> Elapsed Time =  %s        \r", buffer );

    sscanf( buffer, "%d", &status );

}while( status == 1 );

/* query and print results */

ibwrt( device, "SENSE:DATA:TEL:MEAS:ERROR:ERATIO:SCV?", 37 );

ibrd( device, buffer, 255 );

buffer[ibcnt+1] = 0;        /* add null to terminate string */

printf( "\n>> BER =  %s\n", buffer );

/* announce end of program */

printf("End of Test\n");

/* exit */

return(0);

}
```

# Appendix A: ASCII & GPIB Code Chart

| B7 B6 B5 → | 0 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1 0 0 | 1 0 1 | 1 1 0 | 1 1 1 |
|---|---|---|---|---|---|---|---|---|
| BITS B4 B3 B2 B1 | CONTROL | | NUMBERS SYMBOLS | | UPPER CASE | | LOWER CASE | |
| 0 0 0 0 | 0 NUL 0 / 0 | 20 DLE 10 / 16 | 40 LA0 SP 20 / 32 | 60 LA16 0 30 / 48 | 100 TA0 @ 40 / 64 | 120 TA16 P 50 / 80 | 140 SA0 ` 60 / 96 | 160 SA16 p 70 / 112 |
| 0 0 0 1 | 1 GTL SOH 1 / 1 | 21 LL0 DC1 11 / 17 | 41 LA1 ! 21 / 33 | 61 LA17 1 31 / 49 | 101 TA1 A 41 / 65 | 121 TA17 Q 51 / 81 | 141 SA1 a 61 / 97 | 161 SA17 q 71 / 113 |
| 0 0 1 0 | 2 STX 2 / 2 | 22 DC2 12 / 18 | 42 LA2 " 22 / 34 | 62 LA18 2 32 / 50 | 102 TA2 B 42 / 66 | 122 TA18 R 52 / 82 | 142 SA2 b 62 / 98 | 162 SA18 r 72 / 114 |
| 0 0 1 1 | 3 ETX 3 / 3 | 23 DC3 13 / 19 | 43 LA3 # 23 / 35 | 63 LA19 3 33 / 51 | 103 TA3 C 43 / 67 | 123 TA19 S 53 / 83 | 143 SA3 c 63 / 99 | 163 SA19 s 73 / 115 |
| 0 1 0 0 | 4 SDC EOT 4 / 4 | 24 DCL DC4 14 / 20 | 44 LA4 $ 24 / 36 | 64 LA20 4 34 / 52 | 104 TA4 D 44 / 68 | 124 TA20 T 54 / 84 | 144 SA4 d 64 / 100 | 164 SA20 t 74 / 116 |
| 0 1 0 1 | 5 PPC ENQ 5 / 5 | 25 PPU NAK 15 / 21 | 45 LA5 % 25 / 37 | 65 LA21 5 35 / 53 | 105 TA5 E 45 / 69 | 125 TA21 U 55 / 85 | 145 SA5 e 65 / 101 | 165 SA21 u 75 / 117 |
| 0 1 1 0 | 6 ACK 6 / 6 | 26 SYN 16 / 22 | 46 LA6 & 26 / 38 | 66 LA22 6 36 / 54 | 106 TA6 F 46 / 70 | 126 TA22 V 56 / 86 | 146 SA6 f 66 / 102 | 166 SA22 v 76 / 118 |
| 0 1 1 1 | 7 BEL 7 / 7 | 27 ETB 17 / 23 | 47 LA7 ' 27 / 39 | 67 LA23 7 37 / 55 | 107 TA7 G 47 / 71 | 127 TA23 W 57 / 87 | 147 SA7 g 67 / 103 | 167 SA23 w 77 / 119 |
| 1 0 0 0 | 10 GET BS 8 / 8 | 30 SPE CAN 18 / 24 | 50 LA8 ( 28 / 40 | 70 LA24 8 38 / 56 | 110 TA8 H 48 / 72 | 130 TA24 X 58 / 88 | 150 SA8 h 68 / 104 | 170 SA24 x 78 / 120 |
| 1 0 0 1 | 11 TCT HT 9 / 9 | 31 SPD EM 19 / 25 | 51 LA9 ) 29 / 41 | 71 LA25 9 39 / 57 | 111 TA9 I 49 / 73 | 131 TA25 Y 59 / 89 | 151 SA9 i 69 / 105 | 171 SA25 y 79 / 121 |
| 1 0 1 0 | 12 LF A / 10 | 32 SUB 1A / 26 | 52 LA10 * 2A / 42 | 72 LA26 : 3A / 58 | 112 TA10 J 4A / 74 | 132 TA26 Z 5A / 90 | 152 SA10 j 6A / 106 | 172 SA26 z 7A / 122 |
| 1 0 1 1 | 13 VT B / 11 | 33 ESC 1B / 27 | 53 LA11 + 2B / 43 | 73 LA27 ; 3B / 59 | 113 TA11 K 4B / 75 | 133 TA27 [ 5B / 91 | 153 SA11 k 6B / 107 | 173 SA27 { 7B / 123 |
| 1 1 0 0 | 14 FF C / 12 | 34 FS 1C / 28 | 54 LA12 , 2C / 44 | 74 LA28 < 3C / 60 | 114 TA12 L 4C / 76 | 134 TA28 \ 5C / 92 | 154 SA12 l 6C / 108 | 174 SA28 ¦ 7C / 124 |
| 1 1 0 1 | 15 CR D / 13 | 35 GS 1D / 29 | 55 LA13 - 2D / 45 | 75 LA29 = 3D / 61 | 115 TA13 M 4D / 77 | 135 TA29 ] 5D / 93 | 155 SA13 m 6D / 109 | 175 SA29 } 7D / 125 |
| 1 1 1 0 | 16 SO E / 14 | 36 RS 1E / 30 | 56 LA14 . 2E / 46 | 76 LA30 > 3E / 62 | 116 TA14 N 4E / 78 | 136 TA30 ^ 5E / 94 | 156 SA14 n 6E / 110 | 176 SA30 ~ 7E / 126 |
| 1 1 1 1 | 17 SI F / 15 | 37 US 1F / 31 | 57 LA15 / 2F / 47 | 77 UNL ? 3F / 63 | 117 TA15 O 4F / 79 | 137 UNT _ 5F / 95 | 157 SA15 o 6F / 111 | 177 RUBOUT (DEL) 7F / 127 |
| | ADDRESSED COMMANDS | UNIVERSAL COMMANDS | LISTEN ADDRESSES | | TALK ADDRESSES | | SECONDARY ADDRESSES OR COMMANDS | |

**KEY**

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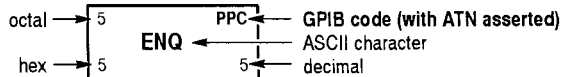
**Tektronix**
REF: ANSI STD X3.4-1977
IEEE STD 488.1-1987
ISO STD 646-2973

CTS 850 SDH Test Set

# Appendix B: Commands and Queries Posting OPC

CTS 850 SDH Test Set

The commands and queries listed in Table B-1 set the OPC bit after execution. Some of these commands and queries may require more than 200 ms to complete execution.

**Table B-1: Commands and Queries that Post OPC**

| Command or Query |
| --- |
| *RST |
| *RCL |
| *SAV |
| *TST? |
| HCOPy:IMMediate |
| DIAGnostic:EXECute |
| all MMEMory: commands |
| INPUT1:TELecom:TYPE |
| SOURce:CLOCk:SOURce |
| SENSe:DATA:TELecom:AUTOscan |

# Appendix C: *LRN? Response

CTS 850 SDH Test Set

Table C-2 lists the commands that are returned by the *LRN? and SYSTem: SET? queries. The response consists of these commands and their parameter values separated by semicolons (;).

## Table C-2: Commands returned by *LRN?

| Command |
| --- |
| SYSTem:MODE |
| SYSTem:SDEScription |
| SYSTem:BEEPer:CONTrol |
| SYSTem:HEADers |
| SYSTem:VERBose |
| OUTPUT1:TELecom:RATE |
| OUTPUT1:TELecom:TYPE |
| OUTPUT1:TELecom:LEVel |
| OUTPUT2:TELecom:TERMinator (Add/Drop Test Option Only) |
| OUTPUT2:TELecom:CODE (Add/Drop Test Option Only) |
| OUTPUT3:TELecom:RATE (Add/Drop Test Option Only) |
| SOURce:CLOCk:SOURce |
| SOURce:CLOCk:OFFSet:MODE |
| SOURce:CLOCk:OFFSet:LVALue |
| SOURce:CLOCk:OFFSet:PVALue (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:SOURce |
| SOURce:DATA:TELecom:STRUcture |
| SOURce:DATA:TELecom:CHANnel |
| SOURce:DATA:TELecom:PAYLoad:MAPPing |
| SOURce:DATA:TELecom:PAYLoad:PATTern |
| SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe |
| SOURce:DATA:TELecom:OVERhead:APS |
| SOURce:DATA:TELecom:OVERhead:INSert |
| SOURce:DATA:TELecom:POVerhead:INSert |
| SOURce:DATA:TELecom:POVerhead:TRAce |

**Table C-2: Commands returned by *LRN? (Cont.)**

| Command |
|---|
| SOURce:DATA:TELecom:ERRor:ENABle |
| SOURce:DATA:TELecom:ERRor:TYPE |
| SOURce:DATA:TELecom:ERRor:RATE |
| SOURce:DATA:TELecom:ALARm |
| SOURce:DATA:TELecom:FAILure:TYPE |
| SOURce:DATA:TELecom:POINter:MODE |
| SOURce:DATA:TELecom:POINter:NDFlag |
| SOURce:DATA:TELecom:POINter:DIRection |
| SOURce:DATA:TELecom:POINter:RATE |
| SOURce:DATA:TELecom:POINter:NBURst |
| SOURce:DATA:TELecom:POINter:SBITs |
| SOURce:DATA:TELecom:POINter:SEQuence:TYPE |
| SOURce:DATA:TELecom:POINter:SEQuence:DIRection |
| SOURce:DATA:TELecom:POINter:SEQuence:IPERiod |
| SOURce:DATA:TELecom:POINter:SEQuence:CPERiod |
| SOURce:DATA:TELecom:POINter:SEQuence:RATE |
| SOURce:DATA:TELecom:JITter:MODE (jitter/wander option 14 only) |
| SOURce:DATA:TELecom:JITter:SOURce (jitter/wander option 14 only) |
| SOURce:DATA:TELecom:JITter:CLOCk:RATE (jitter/wander option 14 only) |
| SOURce:DATA:TELecom:JITter:CLOCk:OFFSet (jitter/wander option 14 only) |
| SOURce:DATA:TELecom:JITter:AMPLitude (jitter/wander option 14 only) |
| SOURce:DATA:TELecom:JITter:FREQuency (jitter/wander option 14 only) |
| SOURce:DATA:TELecom:TRIButary:CHANnel (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:MAPPing (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:FRAMing (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:PATTern (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:PATTern:UWORD (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:BACKground:PATTern (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:ADD (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:ERRor (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:ALARm (Add/Drop Test Option Only) |

**Table C-2: Commands returned by *LRN? (Cont.)**

| Command |
| --- |
| SOURce:DATA:TELecom:TRIButary:FAILure (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:MODE (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:NDFLag (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:DIRection (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:RATE (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:NBURst (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE (Add/Drop Test Option Only) |
| INPUT1:TELecom:RATE |
| INPUT1:TELecom:TYPE |
| INPUT1:TELecom:LEVel |
| INPUT2:TELecom:TERMinator (Add/Drop Test Option Only) |
| INPUT2:TELecom:LEVel (Add/Drop Test Option Only) |
| INPUT3:TELecom:RATE (Add/Drop Test Option Only) |
| INPUT3:TELecom:LEVel (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:SOURce |
| SENSe:DATA:TELecom:STRUcture |
| SENSe:DATA:TELecom:CHANnel |
| SENSe:DATA:TELecom:PAYLoad:MAPPing |
| SENSe:DATA:TELecom:PAYLoad:PATTern |
| SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe |
| SENSe:DATA:TELecom:TRIButary:CHANnel (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:MAPPing (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:FRAMing (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:DEMULtiplex:CHANnel (Performs no operation) |
| SENSe:DATA:TELecom:TRIButary:DEMULtiplex:FRAMing (Performs no operation) |
| SENSe:DATA:TELecom:TRIButary:PATTern (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:PATTern:UWORd (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth (Add/Drop Test Option Only) |

**Table C-2: Commands returned by *LRN? (Cont.)**

| Command |
| --- |
| SENSe:DATA:TELecom:TRIButary:DROP (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TEST:DURation |
| SENSe:DATA:TELecom:TEST:HISTory:RESolution |
| SENSe:DATA:TELecom:OVERhead:DROP |
| SENSe:DATA:TELecom:POVerhead:DROP |
| SENSe:DATA:TELecom:TEST:MODE (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TYPE TOLerance (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:SAMPles (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:MODE (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:SOURce (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:CLOCk:RATE (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:FILTer:TYPE (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:FILTer:HIGHBand (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:RANGe (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:THREshold (jitter/wander option 14 only) |
| SENSe:DATA:TELecom:JITter:POINter:THREshold (jitter/wander option 14 only) |
| INSTrument:COUPling |
| HCOPY:ITEM |
| HCOPy:TITle |
| HCOPy:DEVice:LANGuage |

# Appendix D: Default Parameter Values After *RST

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Table E-1 lists the default parameter values after the *RST command is sent.

**Table E-1: Default parameter values after *RST**

| Command | Default Parameter Values |
|---|---|
| OUTPUT1:TELecom:RATE | STM1 |
| OUTPUT1:TELecom:TYPE | ELECtrical |
| OUTPUT1:TELecom:LEVel | XCONnect |
| OUTPUT2:TELecom:TERMinator | BALanced (Add/Drop Test Option Only) |
| OUTPUT2:TELecom:CODE | HDB3 (Add/Drop Test Option Only) |
| OUTPUT3:TELecom:RATE | M34 (Add/Drop Test Option Only) |
| SOURce:CLOCk:SOURce | INTernal |
| SOURce:CLOCk:OFFSet:MODE | LOFFset |
| SOURce:CLOCk:OFFSet:LVALue | 0.00 |
| SOURce:CLOCk:OFFSet:PVALue | 0.00 |
| SOURce:DATA:TELecom:SOURce | OUTPUT1 |
| SOURce:DATA:TELecom:STRUcture | AU4 |
| SOURce:DATA:TELecom:CHANnel | 1 |
| SOURce:DATA:TELecom:PAYLoad:MAPPing | EQUIPPED |
| SOURce:DATA:TELecom:PAYLoad:PATTern | PRBS23 |
| SOURce:DATA:TELecom:PAYLoad:PATTern:UBYTe | 0 |
| SOURce:DATA:TELecom:OVERhead:PRESet | (sets overhead to values listed in *Syntax and Commands2-32* |
| SOURce:DATA:TELecom:OVERhead:APS | 0 |
| SOURce:DATA:TELecom:OVERhead:INSert | NONE |
| SOURce:DATA:TELecom:POVerhead:INSert | NONE |
| SOURce:DATA:TELecom:POVerhead:TRAce | " "    (64 null characters) |
| SOURce:DATA:TELecom:ERRor:ENABle | 0 |
| SOURce:DATA:TELecom:ERRor:TYPE | SCV |
| SOURce:DATA:TELecom:ERRor:RATE | 1E-10 |
| SOURce:DATA:TELecom:ALARm | NONE |

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

| Command | Default Parameter Values |
|---|---|
| SOURce:DATA:TELecom:FAILure:TYPE | NONE |
| SOURce:DATA:TELecom:POINter:MODE | SINGle |
| SOURce:DATA:TELecom:POINter:VALue | 522 |
| SOURce:DATA:TELecom:POINter:NDFlag | 1 |
| SOURce:DATA:TELecom:POINter:DIRection | ALTernate |
| SOURce:DATA:TELecom:POINter:RATE | 100 |
| SOURce:DATA:TELecom:POINter:NBURst | 2 |
| SOURce:DATA:TELecom:POINter:SBITs | 0 |
| SOURce:DATA:TELecom:POINter:Sequence:TYPE | SINGle |
| SOURce:DATA:TELecom:POINter:Sequence:DIRection | UP |
| SOURce:DATA:TELecom:POINter:Sequence:IPERiod | 1 |
| SOURce:DATA:TELecom:POINter:Sequence:CPERiod | 1 |
| SOURce:DATA:TELecom:POINter:Sequence:RATE | 30000 |
| SOURce:DATA:TELecom:TRIButary:CHANnel | 1 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:MAPPing | TUASYNC (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:FRAMing | UNFRamed (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:PATTern | PRB15PRBS23 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:PATTern:UWORd | 0 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:PATTern:UWORd:LENgth | 1 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:BACKground:PATTern | PRBS (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:ADD | 0 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POVerhead:TRACe | TEK CTS750 |
| SOURce:DATA:TELecom:TRIButary:ERRor | NONE (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:ALARM | NONE (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:FAILure | NONE (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:MODE | SINGle (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:NDFLag | 1 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:DIRection | ALTernate (Add/Drop Test Option Only) |

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

| Command | Default Parameter Values |
|---|---|
| SOURce:DATA:TELecom:TRIButary:POINter:RATE | 100 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:Nburst | 2 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:TYPE | SINGle (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection | UP (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:IPERiod | 1 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:CPERiod | 1 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:POINter:SEQuence:RATE | 30000 (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:TRIButary:MODE | MANual (Add/Drop Test Option Only) |
| SOURce:DATA:TELecom:JITter:MODE | OFF (SDH/PDH Jitter/Wander Test Option Only) |
| SOURce:DATA:TELecom:JITter:SOURce | LINE (SDH/PDH Jitter/Wander Test Option Only) |
| SOURce:DATA:TELecom:JITter:CLOCk:RATE | M2 (SDH/PDH Jitter/Wander Test Option Only) |
| SOURce:DATA:TELecom:JITter:CLOCk:OFFSet | 0.0 (SDH/PDH Jitter/Wander Test Option Only) |
| SOURce:DATA:TELecom:JITter:AMPLitude | 1.00 (SDH/PDH Jitter/Wander Test Option Only) |
| SOURce:DATA:TELecom:JITter:FREQuency | 10.0 (SDH/PDH Jitter/Wander Test Option Only) |
| INPUT1:TELecom:RATE | STM1 |
| INPUT1:TELecom:TYPE | ELECtrical |
| INPUT1:TELecom:LEVel | XCONnect |
| INPUT2:TELecom:TERMinator | BALanced (Add/Drop Test Option Only) |
| INPUT2:TELecom:LEVel | NORMal (Add/Drop Test Option Only) |
| INPUT3:TELecom:RATE | M34 (Add/Drop Test Option Only) |
| INPUT3:TELecom:LEVel | NORMal (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:SOURce | INPUT1 |
| SENSe:DATA:TELecom:STRUcture | AU4 |

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

| Command | Default Parameter Values |
|---|---|
| SENSe:DATA:TELecom:CHANnel | 1 |
| SENSe:DATA:TELecom:PAYLoad:MAPPing | EQUIPPed |
| SENSe:DATA:TELecom:PAYLoad:PATTern | PRBS23 |
| SENSe:DATA:TELecom:PAYLoad:PATTern:UBYTe | 0 |
| SENSe:DATA:TELecom:TRIButary:CHANnel | 1 (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:MAPPing | TUASYNC (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:FRAMing | UNFRamed (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:Demultiplex:CHANnel | 1 (Performs no operation) |
| SENSe:DATA:TELecom:TRIButary:Demultiplex:FRAMing | UNFramed (Performs no operation) |
| SENSe:DATA:TELecom:TRIButary:PATTern | PRBS23 (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:PATTern:UWORd | 0 (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:PATTern: UWORd:LENgth | 1 (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TRIButary:DROP | 0 (Add/Drop Test Option Only) |
| SENSe:DATA:TELecom:TEST:DURation | 0,0,0,0 |
| SENSe:DATA:TELecom:TEST:HISTory:RESolution | MIN1 |
| SENSe:DATA:TELecom:OVERhead:DROP | NONE |
| SENSe:DATA:TELecom:POVerhead:DROP | NONE |
| SENSe:DATA:TELecom:MEASure:STESts: | (all four commands set to NONE) |
| SENSe:DATA:TELecom:JITter:SOURce | LINE (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:JITter:MODE | PTP (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:JITter:CLOCk:RATE | M2 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:JITter:FILTer:TYPE | WIDE (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:JITter:FILTer:HIGHBand | STAN (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:JITter:FILTer:FULLband:HPASs | U10 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:JITter:RANGe | NORM (SDH/PDH Jitter/Wander Test Option Only) |

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

| Command | Default Parameter Values |
|---|---|
| SENSe:DATA:TELecom:JITter:THREshold | 0.0 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:JITter:POINter:THREshold | 10.0 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:MODE | NORM (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TYPE | OUTPUT (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:MASK | G825 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:STARt | 1.25E-1 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:FREQuency:END | 130E+4 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:SAMPles | 4 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TOLerance:METHod | ONSET_ERR (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:MASK | TYPEA (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:STARt | 10.0 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:FREQuency:END | 130.E+3 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:TRANSFer:SAMPles | 4 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:OUTPUT:DURation | 1,0 (SDH/PDH Jitter/Wander Test Option Only) |
| SENSe:DATA:TELecom:TEST:JITter:POINter:SEQuence:TYPE | SINALT (SDH/PDH Jitter/Wander Test Option Only) |
| INSTrument:COUPling | NONE |
| INITiate | (executed) |
| SYSTem:BEEPer:CONTrol | 0 |
| SYSTem:HEADers | 1 (ON) |
| SYSTem:MODE | SDH |
| SYSTem:SDEScription | " " |
| SYSTem:VERBose | 1 (ON) |
| DISPlay:BRIGhtness | 1.00 |

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

| Command | Default Parameter Values |
|---|---|
| HCOPy:DEVice:LANGuage | TEK |
| HCOPy:ITEM | SUMMary |
| HCOPy:TITle | 0 |

# Glossary & ITU-T Standards

CT850 SDH/PDH Test Set

Included in this section along with the glossary of terms is a listing of ITU-T standards for SDH and PDH.

Three sets of terms are arranged at the beginning of this section because it is important to see that they are not equivalent terms, which is how they get used in normal discussions. They are:

**Add/ Drop**
The process where a part of the information carried in a transmission system is extracted (dropped) at an intermediate point and different information is inserted (added) for subsequent transmission. The remaining traffic passes straight through the multiplexer without additional processing.

**Map/ Demap**
A term for multiplexing, implying more visibility inside the resultant multiplexed bit stream than available with conventional asynchronous techniques.

**Multiplex/ Demultiplex**
Multiplex (MUX) – To transmit two or more signals over a single channel. Demultiplex (DEMUX) – To separate two or more signals previously combined by compatible multiplexing equipment. Demultiplexing – A process applied to a multiplex signal for recovering signals combined within it and for restoring the distinct individual channels of the signals.

An alphabetical list of glossary terms follows.

**Add/Drop Multiplexer (ADM)**
A multiplexer capable of extracting and inserting lower-rate signals from a higher-rate multiplexed signal without completely demultiplexing the signal.

**Administrative Unit (AU)**
An Administrative Unit is the information structure which provides adaptation between the higher order path layer and the Multiplex Section layer. The Virtual Container (VC) plus the pointers (H1, H2, H3 bytes) is called the Administrative Unit (AU).

**AIS (Alarm Indicating Signal)**
A code sent downstream indicating an upstream failure has occurred.

**AMI**
Alternate Mark Inversion. The line–coding format in transmission systems where successive ones (marks) are alternatively inverted (sent with polarity opposite that of the preceding mark).

**Analog Jitter Out**
A signal that contains the demodulated jitter from a line or clock input.

**ANSI**
American National Standards Institute. A standards–setting, non–government organization, which develops and publishes standards for "voluntary" use in the United States.

**Asynchronous**
A network where transmission system payloads are not synchronized and each network terminal runs on its own clock.

**Asynchronous Transfer Mode (ATM)**
A multiplexing/switching technique in which information is organized into fixed–length cells with each cell consisting of an identification header field and an information field. The transfer mode is asynchronous in the sense that the use of the cells depends on the required or instantaneous bit rate.

**Attenuation**
Reduction of signal magnitude or signal loss, usually expressed in decibels.

**AU-4**
Virtual Container (VC) plus the Transport Overhead pointers.

**AU–N**
Administrative Unit–N; a discrete unit of the SDH payload carrying one or more VC–N

**Automatic Protection Switching (APS)**
The ability of a network element to detect a failed working line and switch the service to a spare (protection) line. 1+1 APS pairs a protection line with each working line. 1:N APS provides one protection line for every N working lines.

**Backhauling**
Cumbersome traffic management technique used to reduce the expense of multiplexing/demultiplexing.

**Bandwidth**
Information–carrying capacity of a communication channel. Analog bandwidth is the range of signal frequencies that can be transmitted by a communication channel or network.

**Bidirectional**

Operating in both directions. Bi-directional APS allows protection switching to be initiated by either end of the line.

**Binary N-Zero Suppression (BNZS)**

Line coding system that replaces N number of zeros with a special code to maintain pulse density required for clock recovery. N is typically 3, 6, or 8.

**BIP-8 (Bit Interleaved Parity-8)**

A method of error checking in SDH which allows in-service performance monitoring. For example, a BIP-8 creates eight-bit (one-byte) groups, then does a parity check for each of the eight bit positions in the byte.

**B-ISDN (Broadband Integrated Services Digital Network)**

A single ISDN network which can handle voice, data, and eventually video services.

**Bit**

One binary digit; a pulse of data.

**Bit Error vs. Block Error**

Error rate statistics play a key role in measuring the performance of a network. As errors increase, user payload (especially data) must be re-transmitted, or lost entirely.

**Bit Error Rate** (BER) – The number of bit errors detected in a unit of time, usually one second. Bit Error rate (BER) is calculated with this formula:

*BER = errored bits received/ total bits sent.*

**Block Error Rate** (BLER) – One of the underlying concepts of error performance is the notion of Errored Blocks, i.e., blocks in which one or more bits are in error. A block is a set of consecutive bits associated with the path or section monitored by means of an Error Detection Code (EDC), such as Bit Interleaved Parity (BIP). Block Error rate (BLER) is calculated with this formula:

*BLER = errored blocks received/ total blocks sent.*

**Bit-Interleaved Parity (BIP)**

A parity check that groups all the bits in a block into units (such as byte), then performs a parity check for each bit position in the group.

**Bit-Stuffing**

In asynchronous systems, a technique used to synchronize asynchronous signals to a common rate before multiplexing.

**Bits per second (bit/s)**

The number of bits passing a point every second. The transmission rate for digital information.

**Broadband**

Services requiring over 2 Mbit/s transport capacity.

**CCITT**

See ITU.

**Channel**

The smallest subdivision of a circuit that provides a type of communication service; usually a path with only one direction.

**Circuit**

A communications path or network; usually a pair of channels providing bi–directional communication.

**Circuit Switching**

Basic switching process whereby a circuit between two users is opened on demand and maintained for their exclusive use for the duration of the transmission.

**Coding Violation (CV)**

A transmission error detected by the difference between the transmitted line code and that expected at the receive end by the logical coding rules.

**Concatenation**

The linking together of various data structures, for example two channels joined to form a single channel. In SDH, a number (M) of TUs can be linked together to produce a concatenated container, M times the size of the TU. An example of this is the concatenation of five TU–2s to carry a 32 Mbit/s video signal, known as VC–2–5c. Once assembled, any concatenated VC structure is multiplexed, switched and transported through the network as a single entity.

**Conformance Tests**

Conformance Tests (also know as Standards Conformance Tests) are predefined tests that measure the impact of jitter or wander on networks or network elements. They are defined in the ITU-T Recommendations.

**Cyclic Redundancy Check (CRC)**

A technique for using overhead bits to detect transmission errors.

**Data Communications Channel (DCC)**

Data channels in SDH that enable OAM communications between intelligent controllers and individual network nodes as well as inter–node communications.

**dB**

The symbol for decibels.

**dBm**

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

**Defect**

A limited interruption in the ability of an item to perform a required function. Persistence of a defect can cause a failure.

**Digital Cross–connect (DCS)**

An electronic cross–connect which has access to lower–rate channels in higher–rate multiplexed signals and can electronically rearrange (cross–connect) those channels.

**Digital Signal**

An electrical or optical signal that varies in discrete steps. Electrical signals are coded as voltages, optical signals are coded as pulses of light.

**E1, E2, E3, E4**
Alternative names for the ITU-T 2 Mb/s, 8 Mb/s, 32 Mb/s, and 140 Mb/s tributary signals.

**ES**
Errored Second; measure of network or equipment performance

**ETSI (European Telecommunications Standards Institute)**
Organization responsible for defining and maintaining European standards, including SDH.

**Failure**
A termination of the ability of an item to perform a required function. A failure is caused by the persistence of a defect.

**FEBE (Far End Block Error)**
See Remote Error Indication (REI).

**FERF (Far End Receive Failure)**
See Remote Defect Indication (RDI).

**FIFO**
First-In First-Out; a type of data buffer

**Fixed Stuff**
A bit or byte whose function is reserved. Fixed stuff locations, sometimes called reserved locations, do not carry overhead or payload.

**Floating mode**
A virtual tributary mode that allows the VC synchronous payload envelope to begin anywhere in the VC.

**Framing**
Method of distinguishing digital channels that have been multiplexed together.

**Frequency**
The number of cycles of periodic activity that occur in a discrete amount of time.

**Frequency Drift Rate**
The rate of change of a line or clock frequency, measured in ppm/sec. A new measure of tining quality.

**Fullband**
A jitter filter range that includes the wideband range but extends the low-frequency cutoff to 10 Hz or below. This filter is useful when analyzing video timing quality.

**Grooming**
Consolidating or segregating traffic for efficiency.

**HDB3**
High Density Bipolar 3. A bipolar coding method that does not allow more than three consecutive zeros.

**Highband**
A jitter filter range that measures high-frequency jitter. The band pass filters are defined in ITU-T standards (where they are sometimes referred to as HP2 – LP1).

**Highpass**
The lower –3 dB corner frequency of a filter. The filter passes frequencies higher than this frequency.

**Interleave**

The ability of SDH to mix together and transport different types of input signals in an efficient manner, thus allowing higher-transmission rates.

**ITU (International Telecommunications Union)**

An agency of the United Nations responsible for the regulation, standardization, co-ordination and development of international telecommunications as well as the harmonization of national policies. It functions through international committees of telecommunications administrations, operators, manufacturers and scientific/industrial organizations.

**Jitter**

The short term variations of the significant instants of a timing signal from their ideal positions in time (where short term implies that these variations are of frequency greater than or equal to 10 Hz).

**Jitter Hit**

When peak-to-peak jitter crosses a predetermined threshold.

**Jitter Tolerance**

A conformance test that measures the susceptability of a network element input to incoming jitter.

**Jitter Transfer**

A conformance test that measures the transfer of jitter from the input to the output of a network element.

**Jitter Transfer Function**

A graph that shows jitter gain as a function of jitter frequency.

**Line Alarm Indication Signal (AIS)**

A Line AIS is generated by Section Terminating Equipment upon Loss of Signal or Loss of Frame.

**Line Coding Violation (LCV)**

The sum of the BIP errors detected at the Line layer. Line CVs are collected using the BIP codes in the B2 bytes of the Line Overhead.

**Line Errored Second (ES)**

A second during which at least one Line CV occurred, or a second during which the line was in the Line AIS state.

**Line Overhead (LOH)**

Controls the payload information using the section layer and provides alarm indications, error monitoring, and message signalling between two LTEs.

**Line Severely Errored Second (SES)**

A second with N or more Line CVs, or a second during which the line was in the Line AIS state. The value of N varies with the transmit rate, but corresponds to a $2 \times 10^{-7}$ BER.

**Locked Mode**

A virtual tributary mode that fixes the starting location of the VC. Locked mode has less pointer processing than floating mode.

**LOF**

An acronym for Loss of Frame.

**LOP**

An acronym for Loss of Pointer.

**LOS**

An acronym for Loss of Signal.

**Low Frequency Jitter**

Jitter that crosses the wander threshold (approximately 0.1 Hz to 500 Hz). Low frequency jitter is often the result of pointer movement.

**Lowpass**

The upper −3 dB corner frequency of a filter. The filter passes frequencies lower than this frequency.

**LTE**

An acronym for Line Terminating Equipment.

**Mapping**

The process of associating each bit transmitted by a service into the SDH payload structure that carries the service. For example, mapping a E1 service into a SDH VC-12 associates each bit of the E1 with a location in the VC-12.

**MTIE**

Maximum Time Interval Error − Related to Peak−to−Peak Wander.

**Multiframe**

Any structure made of multiple frames. SDH has facilities to recognize multiframes at the E1 level and at the VC-n level.

**Multiplex Section Alarm Indication Signal (MS-AIS)**

MS−AIS is generated by Section Terminating Equipment (STE) upon the detection of a Loss of Signal or Loss of Frame defect, on an equipment failure. MS−AIS maintains operation of the downstream regenerators, and therefore prevents generation of unnecessary alarms. At the same time, data and orderwire communication is retained with the downstream Line Terminating Equipment (LTE).

**Multiplex Section Remote Defect Indication (MS-RDI)**

A signal returned to the transmitting Line Terminating Equipment (LTE) upon detecting a Loss of Signal, Loss of Frame, or MS−AIS defect. MS−RDI was previously known as Multiplex Section FERF.

**Multiplex Section Overhead (MSOH)**

18 bytes of overhead accessed, generated, and processed by MS terminating equipment. This overhead supports functions such as locating the payload in the frame, multiplexing or concatenating signals, performance monitoring, automatic protection switching and line maintenance.

**Multiplexer**

A device for combining several channels to be carried by a single physical channel.

**Narrowband**

Services requiring up to 2−Mbit/s transport capacity.

**Network Element (NE)** – In SDH, the five basic network elements are:
add/drop multiplexer;
broadband digital cross–connect;
wideband digital cross–connect;
flexible multiplexer; and,
regenerator.

Any device which is part of a SDH transmission path and serves one or more of the section, line and path–terminating functions.

**OAM**
Operations, Administration, and Maintenance. Also called OAM&P.

**OAM&P** (Operations, Administration, Maintenance, and Provisioning)
Provides the facilities and personnel required to manage a network.

**Orderwire**
A dedicated voice channel used by installers to expedite the provisioning of lines.

**OOF**
An acronym for Out of Frame.

**OS** (Operations System)
Sophisticated applications software that manages operation of the entire network.

**OSI Seven–layer Model**
A standard architecture for data communications. Layers define hardware and software required for multi–vendor information processing equipment to be mutually compatible. The seven layers from lowest to highest are: physical, link, network, transport, session, presentation, and application.

**Output Jitter**
A compliance test the measures the output jitter of a network or network element.

**Overhead**
Extra bits in a digital stream used to carry information besides traffic signals. Orderwire, for example, would be considered overhead information.

**Packet Switching**
An efficient method for breaking down and handling high–volume traffic in a network. A transmission technique that segments and routes information into discrete units. Packet switching allows for efficient sharing of network resources as packets from different sources can all be sent over the same channel in the same bitstream.

**Parity check**
An error–checking scheme which examines the number of transmitted bits in a block which hold the value of "one". For even parity, an overhead parity bit is set to either one or zero to make the total number of transmitted ones in the data block plus parity bit an even number. For odd parity, the parity bit is set to make the total number of ones in the block an odd number.

**Path**
A logical connection between a point where a service in a VC is multiplexed to the point where it is demultiplexed.

**Path Overhead (POH)**

Overhead accessed, generated, and processed by path-terminating equipment.

**Path Terminating Equipment (PTE)**

Network elements such as fibre optic terminating systems which can access, generate, and process Path Overhead.

**Payload**

The portion of the SDH signal available to carry service signals such as E1 and E3. The contents of a VC.

**Payload Pointer**

Indicates the beginning of a Virtual Container.

**Payload capacity**

The number of bytes the payload of a single frame can carry.

**Plesiochronous**

A network with nodes timed by separate clock sources with almost the same timing.

**PLL**

Phase-Locked Loop; method of timing recovery

**Pointer**

A part of the SDH overhead that locates a floating payload structure. AU-n pointers locate the payload. TU-m Pointers locate floating mode virtual tributaries. All SDH frames use AU pointers; only floating mode virtual containers use TU pointers.

**Pointer Hit**

When the line or clock frequency drift crosses a predetermined threshold.

**Pointer Jitter**

A measure of the jitter output of a network when specified pointer test sequences are applied to its input.

**ppTIE**

Peak-to-Peak Time Interval Error, a measure of wander

**PRC (Primary Reference Clock)**

In a synchronous network, all the clocks are traceable to one highly stable reference supply, the Primary Reference Clock (PRC). The accuracy of the PRC is better than $\pm 1$ in $10^{11}$ and is derived from a cesium atomic standard.

**Remote Alarm Indication (RAI)**

A code sent upstream in a E-$n$ network as a notification that a failure condition has been declared downstream. (RAI signals were previously referred to as Yellow signals.)

**Remote Defect Indication (RDI)**

A signal returned to the transmitting Terminating Equipment when the receiving Terminating Equipment detects a Loss of Signal, Loss of Frame, or AIS defect. RDI was previously known as FERF.

**Remote Error Indication (REI)**

An indication returned to a transmitting node (source) that an errored block has been detected at the receiving node (sink). This indication was formerly known as Far End Block Error (FEBE).

**Remote Failure Indication (RFI)**
A failure is a defect that persists beyond the maximum time allocated to the transmission system protection mechanisms. When this situation occurs, an RFI is sent to the far end and will initiate a protection switch if this function has been enabled.

**Regenerator**
Device that restores a degraded digital signal for continued transmission; also called a repeater.

**rms**
Root Mean Square; calculation often applied to power and noise measurements

**SDH (Synchronous Digital Hierarchy)**
The ITU–defined international networking standard whose base transmission level is 155 Mbit/s (STM–1). SDH standards were first published in 1989 to address interworking between the ITU and ANSI transmission hierarchies.

**SEC (Synchronous Equipment Clock)**
G.813 slave clock contained within a SDH network element.

**Section**
The span between two SDH network elements capable of accessing, generating, and processing only SDH Section overhead.

**Section Overhead**
Nine columns of overhead accessed, generated, and processed by section terminating equipment. This overhead supports functions such as framing the signal and performance monitoring.

**Section Terminating Equipment (STE)**
Equipment that terminates the SDH Section layer. STE interprets and modifies or creates the Section Overhead.

**SES**
Severely Errored Second; measure of network performance

**Slip**
An overflow (deletion) or underflow (repetition) of one frame of a signal in a receiving buffer.

**SONET (Synchronous Optical Network)**
A standard for optical transport in the United, States, Canada, Japan, Korea and Hong Kong that defines optical carrier levels and their electrically equivalent synchronous transport signals. SONET allows for a multi–vendor environment and positions the network for transport of new services, synchronous networking, and enhanced OAM&P.

**SSM (Synchronisation Status Message)**
Bits 5 to 8 of SDH overhead byte S1 are allocated for Synchronisation Status Messages. See further details on the assignment of bit patterns for byte S1 in the section of this primer on Multiplex Section Overhead.

**Stuffing**

see bit-stuffing

**Synchronous**

A network where transmission system payloads are synchronized to a master (network) clock and traced to a reference clock. A network where all clocks have the same long term accuracy under normal operating conditions.

**Synchronous Equipment Timing Source (SETS)**

A network equipment clock.

**Synchronous Transport Module (STM)**

A structure in the SDH transmission hierarchy. STM-1 is SDH's base-level transmission rate equal to 155 Mbit/s. Higher rates of STM-4, STM-16, and STM-64 are also defined.

**TDEV**

Time Deviation; a measure of wander

**Through Mode**

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

**TIE**

Time Interval Error is the time difference in nanoseconds between the nominal value of a line or clock period and the actual received period.

**Tributary**

The lower rate signal that is input to a multiplexer for combination (multiplexing) with other low rate signals to form a higher rate signal.

**Tributary Unit (TU)**

A Tributary Unit is an information structure which provides adaptation between the lower order path layer and the higher order path layer. It contains the Virtual Container (VC) plus a tributary unit pointer.

**Tributary Unit Group (TUG)**

Contains several Tributary Units.

**UI**

Unit Interval; a measure of jitter

**UIpp**

Unit Interval Peak-to-Peak; a common measure of jitter

**UIrms**

Unit Interval rms; a measure of jitter in line systems

**Virtual Container (VC)**

A signal designed for transport and switching of sub-SDH payloads.

**Wander**

The long term variations of the significant instants of a digital signal from their ideal position in time (where long term implies that these variations are of frequency less than 10 Hz).

**Wideband**

A jitter filter range that measures jitter over a wide range. The band pass filters are defined in ITU-T standards (where they are sometimes referred to as HP1 – LP1).

**Yellow Signal**

See Remote Alarm Indication (RAI).

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