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HP E1676B SONET/SDH
Transport Overhead Analyzer

User's Manual

SERIAL NUMBERS

This manual applies directly to modules with serial numbers GB00000101 and above. for additional information about serial numbers, see Module Identification in Chapter 1.

HEWLETT PACKARD

HP Part No. E1676-90005

Printed in UK, June 1996

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Declaration of Conformity

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Ltd.
Manufacturer's Address:	Queensferry Telecom Operation South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name :	Sonet/SDH Transport Overhead Analyser
Model Numbers:	HP E1676B
Product Options:	This declaration covers all options of the above product.

Conforms to the following Product Specifications:

Safety:	EN 61010-1 (1993)/IEC 1010-1(1990) + A1(1992) CSA C-22.2 No. 1010.1-92
EMC:	EN 55011 :1991, Group 1, Class A EN 50082-1:1992

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

The product meets the listed specifications when installed in a HP75000 series C, E1401A mainframe with all unused slots covered using single blanking plates with triple gaskets.

South Queensferry, Scotland	2 May 96	W R Pearson
Location	**Date**	**W.R.Pearson / Quality Manager**

European Contact:
Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department ZQ/Standards Europe
Herrenberger Strasse 130, D-7030 Boblingen (FAX: +49-7031-143143)

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Warranty

This Hewlett-Packard product is warranted against defects in materials and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from:

1 Improper or inadequate maintenance, adjustment, calibration, or operation by Buyer;

2 Buyer-supplied software, hardware, interfacing or consumables;

3 Unauthorized modification or misuse;

4 Operation outside of the environmental and electrical specifications for the product;

5 Improper site preparation and maintenance; or

6 Customer induced contamination or leaks.

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Responsibilities of the Customer

The customer shall provide:

1. Access to the products during the specified periods of coverage to perform maintenance.
2. Adequate working space around the products for servicing by Hewlett-Packard personnel.
3. Access to and use of all information and facilities determined necessary by Hewlett-Packard to service and/or maintain the products. (Insofar as these items may contain proprietary or classified information, the customer shall assume full responsibility for safeguarding and protection from wrongful use.)
4. Routine operator maintenance and cleaning as specified in the Hewlett-Packard Operating and Service Manuals.
5. Consumables such as paper, disks, magnetic tapes, ribbons, inks, pens, gases, solvents, columns, syringes, lamps, septa, needles, filters, frits, fuses, seals, detector flow cell windows, etc.

Certification

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility and to the calibration facilities of other International Standards Organization members!

Assistance

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

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Statement of Compliance

This instrument has been designed and tested in accordance with IEC Publication 1010-1 + A1:1992 Safety requirements for Electrical Equipment for Measurement, Control and Laboratory Use, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

Electromagnetic Compatibility (EMC) Information

This product has been designed to meet the protection requirements of the European Communities Electromagnetic Compatibility (EMC) directive 89/336/EEC. In order to preserve the EMC performance of the product, any cable which becomes worn or damaged must be replaced with the same type and specification.

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Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

General

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gasses or fumes.

DO NOT use repaired fuses or short-circuited fuseholders: For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type.

DO NOT perform procedures involving cover or shield removal unless you are qualified to do so: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only.

DO NOT service if you are the user - no operator servicable parts. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

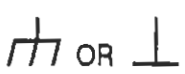
DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure the safety features are maintained.

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure the safety features are maintained.

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Safety Symbols

The following symbols on the instrument and in the manual indicate precautions which must be taken to maintain safe operation of the instrument.

Safety Symbols	
	The Instruction Documentation Symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the supplied documentation.
	Indicates the field wiring terminal that must be connected to earth ground before operating the equipment - protects against electrical shock in case of fault.
	Frame or chassis ground terminal - typically connects to the equipment's metal frame.
	Alternating current (AC)
	Direct current (DC)
	Indicates hazardous voltages
WARNING	Warning denotes a hazard. It calls attention to a procedure, which if not correctly performed or adhered to could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.
CAUTION	Caution denotes a hazard. It calls attention to a procedure, which if not correctly performed or adhered to could result in damage to or destruction of the instrument. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.
CE	The CE mark shows that the product complies with all relevant European legal Directives(if accompanied by a year, it's when the design was proven).
ISM 1-A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.
	The CSA mark is a registered trademark of the Canadian Standards Association.
	This label indicates that radiant energy is present during normal operation of the instrument.

Laser Safety

To avoid hazardous exposure to laser radiation, it is recommended that the following practices are observed during system operation:

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- **ALWAYS DEACTIVATE THE LASER BEFORE CONNECTING OR DISCONNECTING OPTICAL CABLES.**
- When connecting or disconnecting optical cables between the module and device-under-test. observe the connection sequences given below:

  Connecting: Connect the optical cable to the input of the device-under-test **before** connecting to the module's *Optical Out* connector.

  Disconnecting: Disconnect the optical cable from the module's *Optical Out* connector **before** disconnecting from the device-under-test. Always ensure the shutter (if fitted) closes properly and covers the laser aperture.
- NEVER examine or stare into the open end of a broken, severed, or disconnected optical cable when it is connected to the module's *Optical Out* connector.
- Arrange for service-trained personnel, who are aware of the hazards involved, to repair optical cables.

CAUTION

1. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

2. Always leave the fibreoptic connector dust caps on each connector when not in use. Before connection is made, *always* clean the connector ferrule tip with acetone or alcohol and a cotton swab. Dry the connector with compressed air. Failure to maintain cleanliness of connectors is liable to cause excessive insertion loss.

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Module Overview

The HP E1676B Transport Overhead Analyzer is part of the HP 75000 Series 90 Modular SONET/SDH Analyzer - a measurement system dedicated to testing and evaluating equipment used in synchronous telecommunication networks. It addresses the 52 Mb/s,155 Mb/s, 622 Mb/s and 2.488 Gb/s level in the SONET/SDH standards.

The HP E1676B is a message-based C-size triple slot VXI module which provides transport overhead transmit and receive functions for STS-1/STM-0, STS-12/STM-1, STS-3/STM-4 and STS-48/STM-16 frame formats, and concatenated payloads.

The HP E1676B has two primary operating modes

- **MULTIrate Mode**
  The module performs processing for SONET and SDH signals operating at 52 Mb/s,155 Mb/s, 622 Mb/s and 2.488 Gb/s. The module can provide the payload, or the payload (applied along the backplane) can be derived from an external Payload Generator. Data from an external source can also be directly embedded into a specific overhead channel when the data is applied to the module's serial data port.

  A payload can be added to/dropped from any channel within the SONET/SDH signal, or it can be bulk loaded into all channels simultaneously. Channels not loaded from an externally generated payload can be filled with simple background data patterns provided by the module.

- **TRIButary Mode**
  The module performs processing for SONET and SDH signals operating at 2.488 Gb/s. The module can provide the data, or it can be derived from a tributary signal applied to the channel add port. Data from an external source can also be directly embedded into a specific overhead channel when the data is applied to the module's serial data port.

  A tributary signal can be added to/dropped from any channel within the STS-48/ STM-16 signal, or it can be bulk loaded into all channels simultaneously. Channels not loaded from the tributary can be filled with simple background data patterns, provided by the module.

  The module can also perform ATM testing by adding an internally generated PRBS payload to a concatenated STS-48c/STM-16c line signal. An external ATM payload provided by an HP E1615A can also be used. This is applied through the module's payload ports (option 001 only). Multi-rate signals can also be provided at the module's line clock and data ports without recabling by routing lower rate signals from the tributary add ports.

A list of the other HP E1676B operating features is given beow:

- Payload add/drop capability at 52/155 Mb/s (MULTIrate mode only).
- Tributary add/drop capability at 52/155/622 Mb/s, allows connection to other Series 90 modules for the comprehensive testing of payloads carried in the STS-48/STM-16 and STS-48c/STM-16c

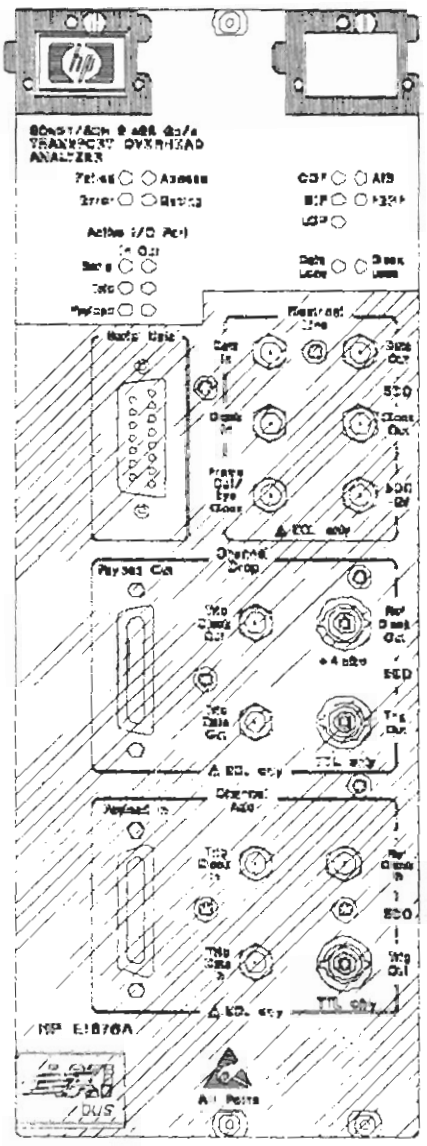
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signals (TRIButary mode only).

- Frameword error stressing capability.
- Alarm stressing for AIS and FERF.
- Ability to program all overhead byte values.
- B1, B2, B3 and Data error add capability.
- Detection of AIS, FERF, Out of Frame (OOF), Loss of Signal (LOS), Loss of Pointer (LOP).
- Pointer adjustment and stressing.
- Programmable overhead sequencing.
- Trigger outputs for a range of events and alarm conditions.
- PRBS bulk filled concatenated payload generation/measurement.
- Frame and byte capture.

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Front-Panel Features



ANNUNCIATORS

FAILED - This LED indicates a failure has been detected during module self-test. It turns ON for the duration of the self-test, and turns OFF after successful completion

ACCESS - This LED indicates the module is being accessed over the VXIbus backplane.

ERROR - This LED indicates the presence of error messages in the module's SCPI command error queue. It turns OFF when all error messages have been read via the VXI control bus.

GATING - This LED indicates the module is performing measurements. It flashes approximately once every 200 ms for the duration of the measurement.

SERIAL IN/OUT - The Serial In LED is active when the module is configured to accept TOH/POH data through the *Serial Data* port. The Serial Out LED is active when TOH/POH data dropped from the received line signal is at the *Serial Data* port.

TRIB IN/OUT - The Trib In LED is active when the module is configured to accept tributary data through the *Trib Data In* port. The Trib Out LED is active when a tributary signal dropped from the received line signal is at the *Trib Data Out* port.

PAYLOAD IN/OUT (OPTION 001) - The Payload In LED is active when the module is configured to accept ATM payload data through the *Payload In* port. The Payload Out LED is active when an ATM payload dropped from the received line signal is at the *Payload Out* port.

OOF - This LED indicates an Out of Frame (OOF) or Loss of Frame (LOF) condition.

BIP - This LED indicates a BIP error (B1, B2 or B3).

AIS - This LED indicates a received Line/MS-AIS alarm signal.

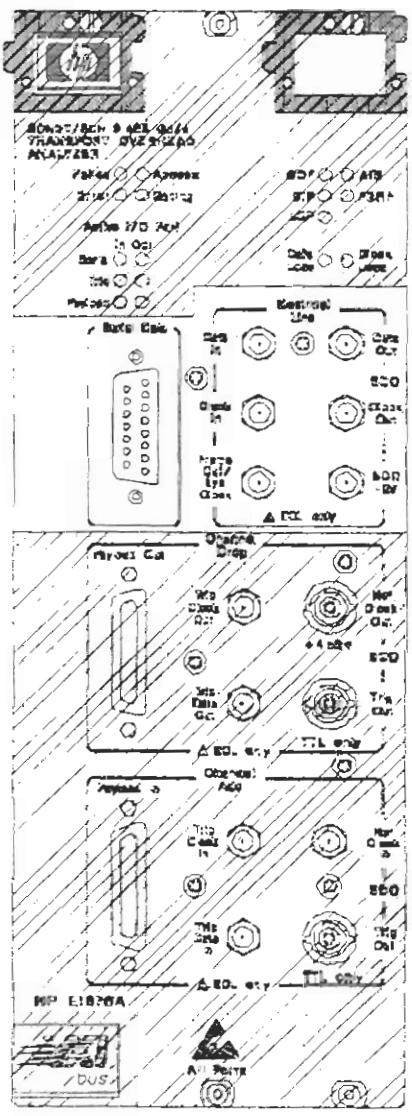
FERF - This LED indicates a received Line/MS-FERF alarm signal.

LOP - This LED indicates a received Loss of Pointer condition.

Data Loss - This LED indicates that an invalid SONET/SDH data input is present at the *Line Data In* port.

Clock Loss - This LED indicates that an invalid SONET/SDH clock input is present at the *Line Clock In* port.

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SERIAL DATA PORT (15-pin D-type Connector)

This port adds or drops TOH/POH data operating at 64, 128, 192 or 576 kb/s. This port uses RS-422 levels.

ELECTRICAL LINE PORTS

CLOCK IN (SMA Connector) - This port accepts a 52 Mb/s,155 Mb/s, 622 Mb/s or 2.488 Gb/s clock input from the system-under-test. It is an ECL input, and is terminated in 50Ω to –2 V dc (nominal).

DATA IN (SMA Connector) - This port accepts a 52 Mb/s,155 Mb/s, 622 Mb/s or 2.488 Gb/s SONET/ SDH signal (in binary NRZ scrambled, or unscrambled format) from the system-under-test. It is an ECL input, and is terminated in 50Ω to –2 V dc (nominal).

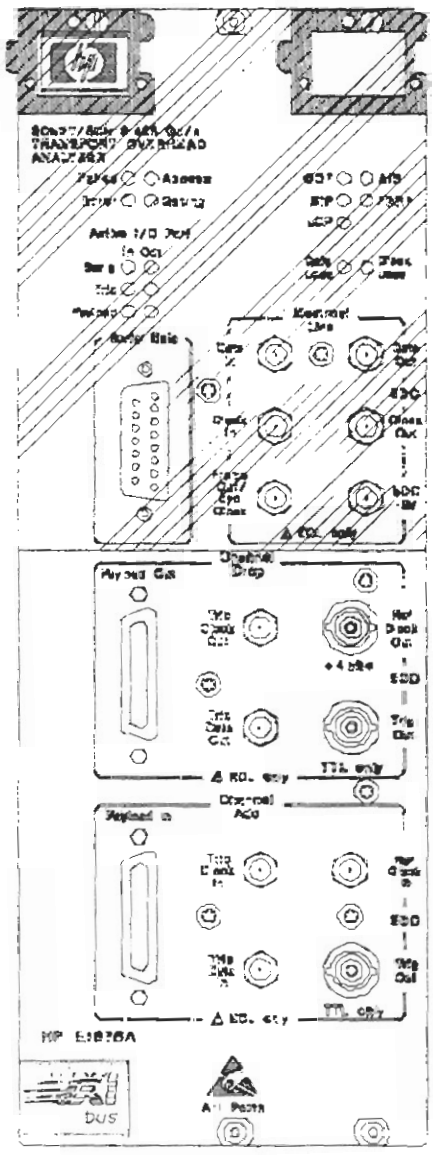
CLOCK OUT (SMA Connector) - This port provides a 52 Mb/s,155 Mb/s, 622 Mb/s and 2.488 Gb/s clock signal for the system-under-test. It is a low-impedance output giving nominal ECL levels, and requires a 50Ω to –2 V dc termination.

DATA OUT (SMA Connector) - This port provides a 52 Mb/s,155 Mb/s, 622 Mb/s and 2.488 Gb/s SONET/ SDH signal (in binary NRZ scrambled, or unscrambled format) for the system-under-test. It is a low-impedance output giving nominal ECL levels, and requires a 50Ω to –2 V dc termination.

FRAME OUT/EYE CLOCK (SMA Connector) - This port provides an output for either an 8 kHz frame synchronization pulse, or a 155 Mb/s clock signal to trigger eye diagram displays. It is a low-impedance output giving nominal ECL levels, and requires a 50Ω to –2 V dc termination.

50Ω –2V (SMA Connector) - This port provides a 50Ω –2V reference termination specifically for terminating the 2.4 Gb/s Clock Line Out when the system-under-test only uses the 2.4 Gb/s Data Line Out. (The Clock Line Out must be correctly terminated under these conditions.)

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CHANNEL ADD PORTS

TRIB CLOCK IN (SMA Connector) - This port (active only in TRIB mode) accepts a 52, 155 or 622 Mb/s clock signal. It is an ECL input, and is terminated in 50Ω to –2 V dc (nominal).

TRIB DATA IN (SMA Connector) - This port (active only in TRIB mode) accepts a 52, 155 or 622 Mb/s SONET/ SDH tributary signal (in binary NRZ scrambled format). It is an ECL input, and is terminated in 50Ω to –2 V dc (nominal).

TRIG OUT TTL (BNC Connector) - This port provides TTL trigger signals when terminated (externally) with 50Ω to ground. It allows external test equipment to be triggered on events detected by the module for time delay measurements.

REF CLOCK IN (SMA Connector) - This port accepts a 155 Mb/s clock input from an external timing source. It is an ECL input, and is terminated in 50Ω to –2 V dc (nominal).

PAYLOAD IN (36-pin D-type Connector) - OPTION 001- This port (active only in TRIB mode) accepts ATM payload (STS-48c/STM-16c operation only) from an HP E1615A Payload Module.

CHANNEL DROP PORTS

TRIB CLOCK OUT (SMA Connector) - This port (active only in TRIB mode) provides a 52, 155 or 622 Mb/s clock signal. It is a low-impedance output giving nominal ECL levels, and requires a 50Ω to –2 V dc termination.

TRIB DATA OUT (SMA Connector) - This port (active only in TRIB mode) provides a 52, 155 or 622 Mb/s SONET/SDH tributary signal (in binary NRZ scrambled format). It is a low-impedance output giving nominal ECL levels, and requires a 50Ω to –2 V dc termination.

REF CLOCK OUT (BNC Connector) - This port 155 Mb/s clock signal derived from the 2.4 Gb/s Line Clock Out signal. It is a low impedance output, with a nominal amplitude of 800 mV to drive an ac coupled 50Ω load.

TRIG OUT TTL (BNC Connector) - This port provides TTL trigger signals when terminated (externally) with 50Ω to ground. It allows external test equipment to be triggered on events detected by the module for time delay measurements.

PAYLOAD OUT (36-pin D-type Connector) - OPTION 001- This port (active only in TRIB mode) drops ATM payload (STS-48c/STM-16c operation only) to an HP E1615A Payload Module.

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1

General Information

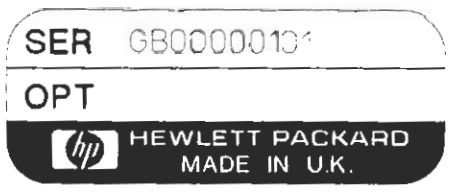
About this Chapter

This chapter contains general information about the HP E1676B, and comprises the following sections:

- **Module Identification**
  Explains module serial numbering for identification purposes.
- **Options**
  Lists options which are available with the module, and gives a brief description of each.
- **Accessories**
  Lists supplied accessories and those which may have been ordered with the module.
- **Safety Considerations** Provides information about warnings and cautions in this manual.
- **ESD Precautions**
  Provides electrostatic discharge (ESD) information, and procedures to prevent ESD damage to the module.
- **Returning the Module for Service**
  Describes the service strategy, and how to obtain a replacement module using the Hewlett-Packard assembly-exchange program.
- **Storage and Shipment**
  Provides information about storing the module, and packaging for shipment.

Module Identification

An identification label is attached to the module clamshell enclosure. The serial number on this label is in the form "GB00000101".



The contents of this manual apply to instrument(s) with serial number GB00000501 and above.

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Options

Option 001 described below is available with this module. For detailed information on this option, refer to Chapter 3.

Option 001

Allows an external ATM payload to be added to the module's STS-48c/STM-16c concatenated line signal, or can drop an ATM payload (from a received concatenated line signal) to an HP E1615A module for analysis.

Accessories

The following accessories are supplied with the module:

- HP E1676B ITG Driver Disk (DOS format)

SMA Adapters (HP P/N 1250-1462) are available for use with the module. These adapters screw onto the front-panel *Clock In/Out* connectors to protect the connector threads.

Safety Considerations

To prevent personal injury, refer to the safety requirements provided in your Mainframe User's Manual before installing the module in the Mainframe.

Warnings and Cautions in the Manual

This manual contains WARNINGS and CAUTIONS which must be observed by the user to ensure safe operation and retain serviceability of the module.

WARNING **A WARNING calls attention to a condition or possible situation that could cause injury to the user.**

CAUTION A CAUTION calls attention to a condition or possible situation that could damage or destroy the product or the user's work.

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ESD Precautions

CAUTION The module contains components sensitive to electrostatic discharge. To prevent component damage, carefully follow the handling precautions presented below.

The smallest static voltage most people can feel is about 3500 volts. It takes less than one tenth of that (about 300 volts) to destroy or severely damage static sensitive circuits. Often, static damage does not immediately cause a malfunction but significantly reduces the component's life. Adhering to the following precautions will reduce the risk of static discharge damage.

- Keep the module in its conductive plastic bag when not installed in the Mainframe. Save the bag for future storage of the module.
- Before handling the module, select a work area where potential static sources are minimized. Avoid working in carpeted areas and non-conductive chairs. Keep body movement to a minimum. Hewlett-Packard recommends that you use a controlled static workstation.
- Handle the module by its front-panel. Avoid touching any components or edge connectors. When you are ready to configure the module, remove it from its protective bag and lay it on top of the bag while keeping your free hand in contact with the bag. While configuring the module, keep one hand in contact with the bag. This technique maintains your body and the module at the same static potential.
- When you install the module, keep one hand in contact with the protective bag as you pick up the module with your other hand. Then, before installing the module, make contact with the metal surface of the Mainframe with your free hand to bring you, the module, and the mainframe to the same static potential. **This also applies whenever you connect/disconnect cables on the front-panel.**

CAUTION The connectors on the front-panel of the module remain susceptible to ESD damage while the module is installed in the Mainframe, as indicated by the label:



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Returning the Module for Service

Servicing the module consists of verifying its operation using the performance tests provided in Chapter 6. The performance tests should be carried out on a yearly basis, or when the module is suspected faulty.

If any of the performance tests fail, and adjustment is not possible or fails to bring the module into specification, return the module to Hewlett-Packard using the assembly-exchange program outlined below. A defective module is not customer-repairable.

If it is necessary to return the module to Hewlett-Packard, ensure the following information is sent with the module:

- Description of the problem (include error messages or specific performance data related to the problem).
- Whether the problem is constant or intermittent.
- Name and phone number of technical contact person.
- Return address.
- Model and option number of returned module.
- Full serial number of returned module.

Exchange Program

A defective module can be quickly replaced using the Hewlett-Packard assembly-exchange program. This program allows you to obtain a fully tested and guaranteed restored-exchange module at a reduced price. (The reduced price is contingent upon return of the defective module to Hewlett-Packard.)

The procedure for replacing a faulty module using the assembly-exchange program is as follows:

1 Order the replacement module through your nearest HP Sales and Service Office. A list of sales and service offices is given at the rear of this manual.

NOTE Do NOT return the faulty module to Hewlett-Packard until you receive the restored-exchange module.

2 Complete the Exchange Failure Report which accompanied the restored-exchange module.

3 Return the faulty module and the Exchange Failure Report to Hewlett-Packard; re-use the special (exchange assembly) carton.

NOTE Remove all accessories attached to the module before it enters the assembly-exchange program. Accessories are NOT exchangeable.

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Storage and Shipment

The module may be stored or shipped in environments within the following limits:

Temperature : –20°C to +70°C

Humidity : 95% Relative Humidity to 40°C

Altitude : Up to 4600 m (15,000 ft)

The module should also be protected from temperature extremes which may cause condensation within the clamshell enclosure.

Packaging Requirements

To prevent damage to the module during transit, original shipping or equivalent materials should be used to package the module. Containers and material identical to those used in the factory packaging are available through Hewlett-Packard offices. If the original or equivalent shipping material cannot be obtained, instructions for repackaging with commercially available materials are as follows:

1 Wrap the module in anti-static plastic to reduce the possibility of damage caused by ESD.

2 Use a double walled, corrugated cardboard carton of 90 kg (200 lb) test strength. The carton must be large enough to allow 5 to 8 cm (2 to 3 in) on all sides of the module for packing material, and strong enough to accommodate the weight of the module.

3 Surround the module with 5 to 8 cm (2 to 3 in) of packing material to protect the module and prevent it from moving in the carton.

CAUTION NEVER use styrene pellets as packaging material. They do not adequately cushion the module, or prevent the module from moving in the carton. They also cause damage by generating static electricity.

If packing foam is not available, the best alternative is S.D.-240 Air Cap from Sealed Air Corporation (Commerce, California 90001). Air Cap looks like a plastic sheet with air buhbles. Wrap the module with several layers of pink (anti-static) Air Cap to protect the module, and prevent the module from moving within the carton.

4 Seal the carton with strong, nylon, adhesive tape.

5 Mark the carton "FRAGILE, HANDLE WITH CARE".

6 Retain copies of all shipping papers.

7 In any correspondence, refer to the module by model number and full serial number.

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2

Installation

About this Chapter

This chapter contains information to enable you to install the HP E1676B ready for use, and comprises the following sections:

- **Initial Inspection**
  Describes how to inspect the module for damage, how to ensure its electrical performance is correct, and who to notify if it is faulty.
- **Operating Environment**
  Reviews the module's operating temperature range and humidity.

WARNING **If this instrument is not used as specified, the protection provided by the equipment could be impaired. This instrument must be used in a normal condition only (in which all means for protection are intact).**

- **Preparation for Use**
  Provides address settings and installation details, and describes the various connections to other modules prior to operation.
- **Verification**
  Describes how to check that the module is configured and installed correctly.

Initial Inspection

WARNING **To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any part of the module.**

CAUTION This module contains components sensitive to electrostatic discharge (ESD). To prevent component damage, carefully follow the handling precautions contained in Chapter 1.

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the module has been checked mechanically and electrically. If the contents are incomplete, if there is any mechanical damage or defect, or if the module does not pass the Performance Tests, notify your local HP Sales and Service Office. If the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as the HP office. Keep the shipping materials for the carriers inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

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Operating Environment

The module is for indoor use (unless specified differently) and may be operated at temperatures from 5°C to 40°C at altitudes up to 4600 m (15,000 ft). The module may be operated in environments up to 95% relative humidity to 40°C, but it should be protected from temperature extremes which may cause condensation within the clamshell enclosure.

To ensure adequate cooling for the module, do not obstruct the air vents in your Mainframe.

CAUTION This instrument is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 644 respectively.

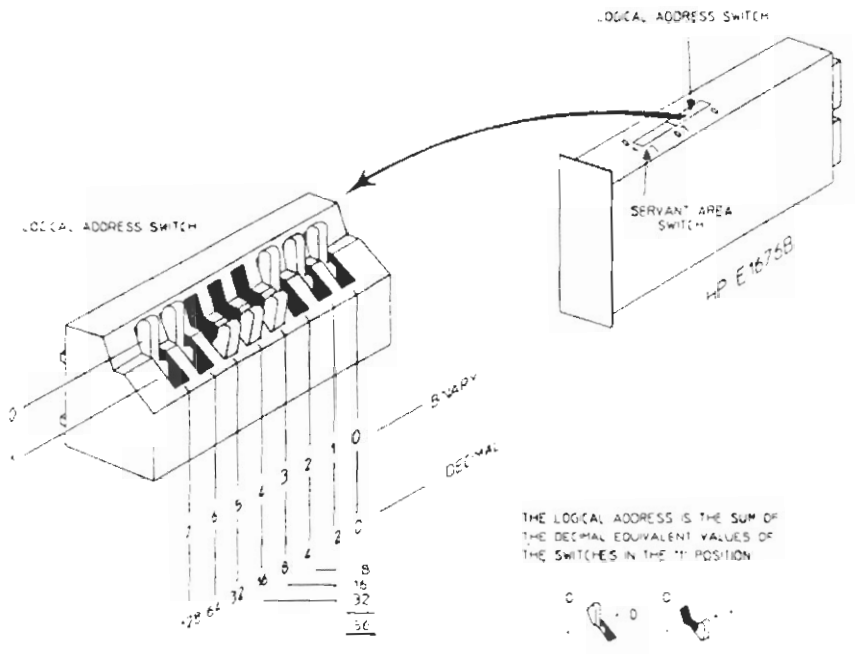
Preparation for Use

Addressing

This module is message-based and can be a commander; its logical address, therefore, must be a multiple of 8.

The logical address of this module is factory preset to 56.

The logical address is set using a series of switches. These switches are accessed through a slot in the module's clamshell enclosure, and are binary weighted. The weightings *0* (LSB) to *7* (MSB) are marked on the clamshell enclosure. If you want to change the module's logical address, select a value which does not conflict with the logical address of any other module in the Mainframe. The logical and factory preset switch settings are shown in the following diagram.

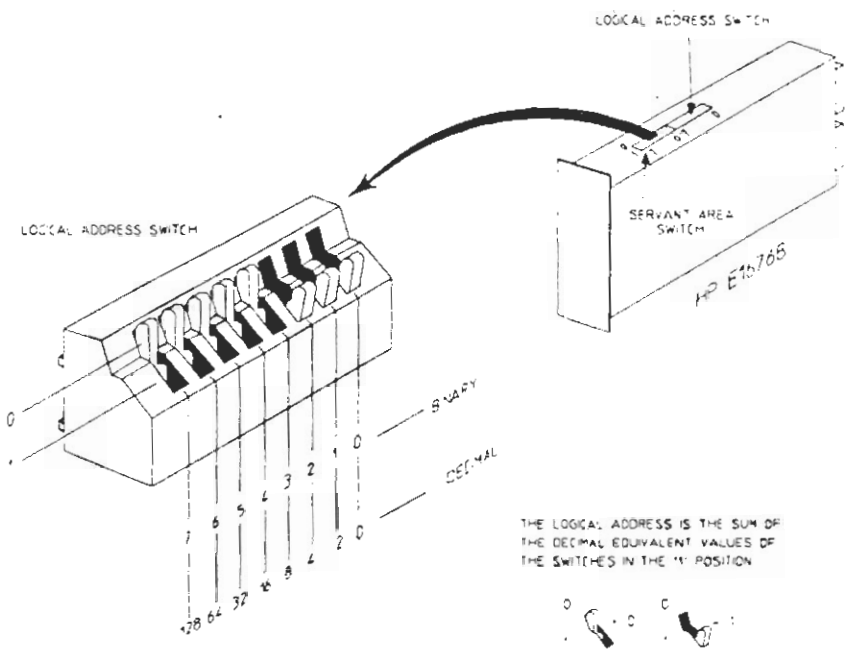


For more details on addressing, see *Appendix C*.

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Servant Area

The servant area is set using a series of switches. These switches are accessed through a slot in the module's clamshell enclosure, and are binary weighted. The weightings *0* (LSB) to *7* (MSB) are marked on the clamshell enclosure. The location and factory preset switch settings are shown in the following diagram:



The servant area switches should be set to 7 (the switches with binary weightings 0, 2 and 4 must be set to their "1" position) when the HP E1679A Timing Reference is used along with the HP E1676B.

For more details on servant area, see *Appendix C*.

Module Slot Location

When the module is operating in the *TRIButary* mode it must be located to the right of any receiver module. It can be located either to the left or right of any line interface module but left is recommended. The precise slot you use is not important, within the constraints of your cabling requirements.

When the module is operating in the *MULTIrate* mode it must be located between the HP E1683A and HP E1684A.

For more details on module slot locations, see *Appendix C*.

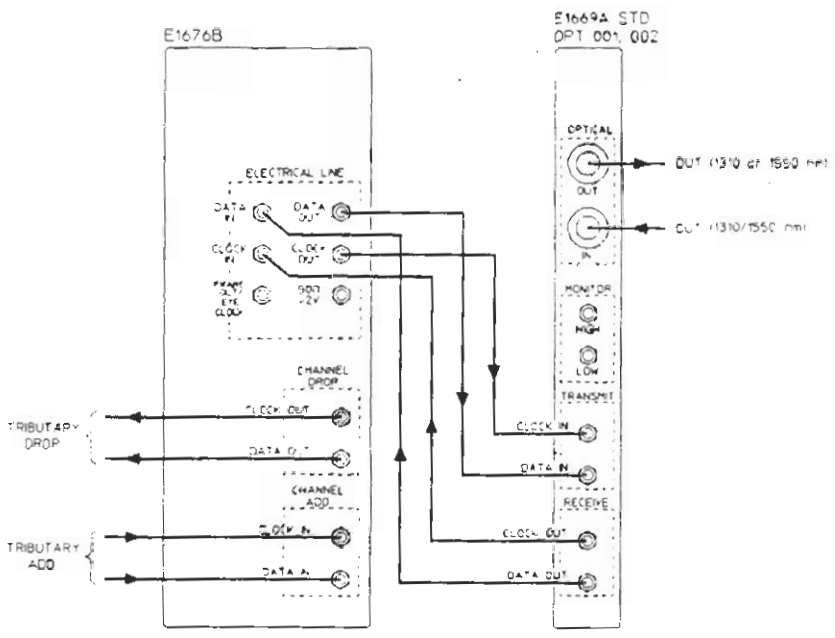
WARNING **To comply with the safety specifications of this module, the Mainframe must be fitted with a disconnect device to remove the power supply to the module.**

If an HP E1676B Option 001 is used along with an HP E1615A and HP E1679A (optional) refer to *Appendix D* for more slot location information.

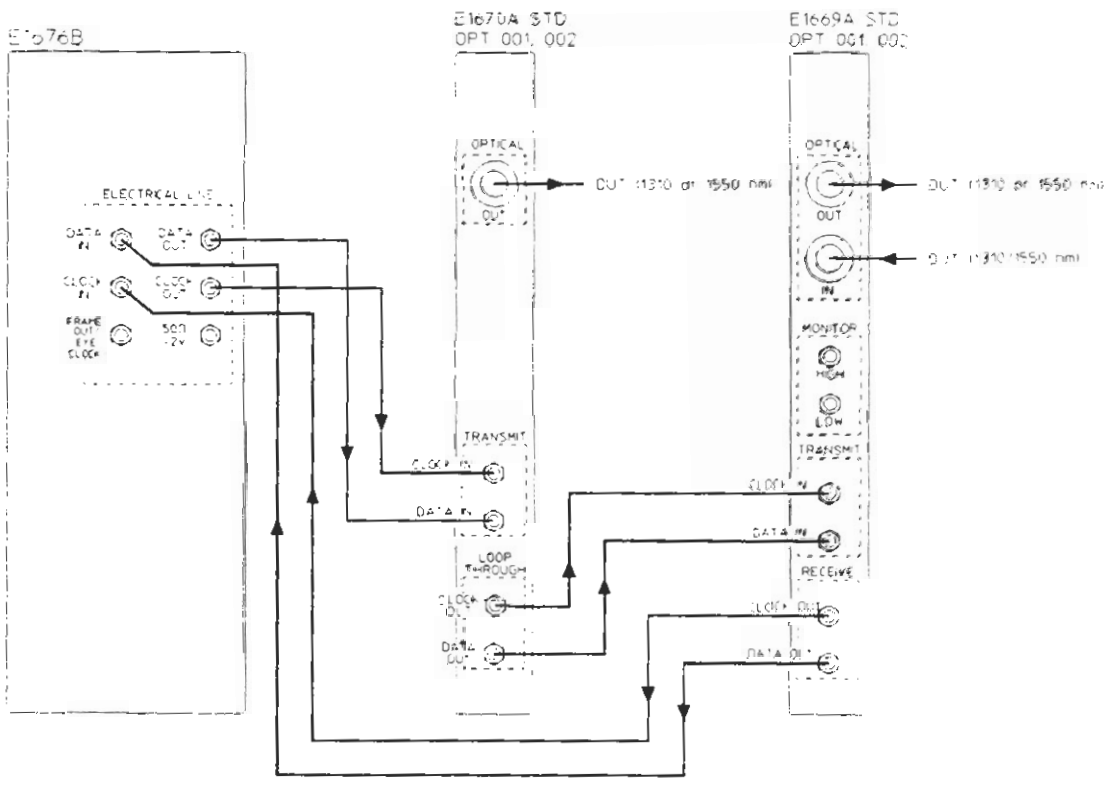
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Cabling Configurations

Typical cabling configurations for the HP E1676B are shown in the following diagrams:

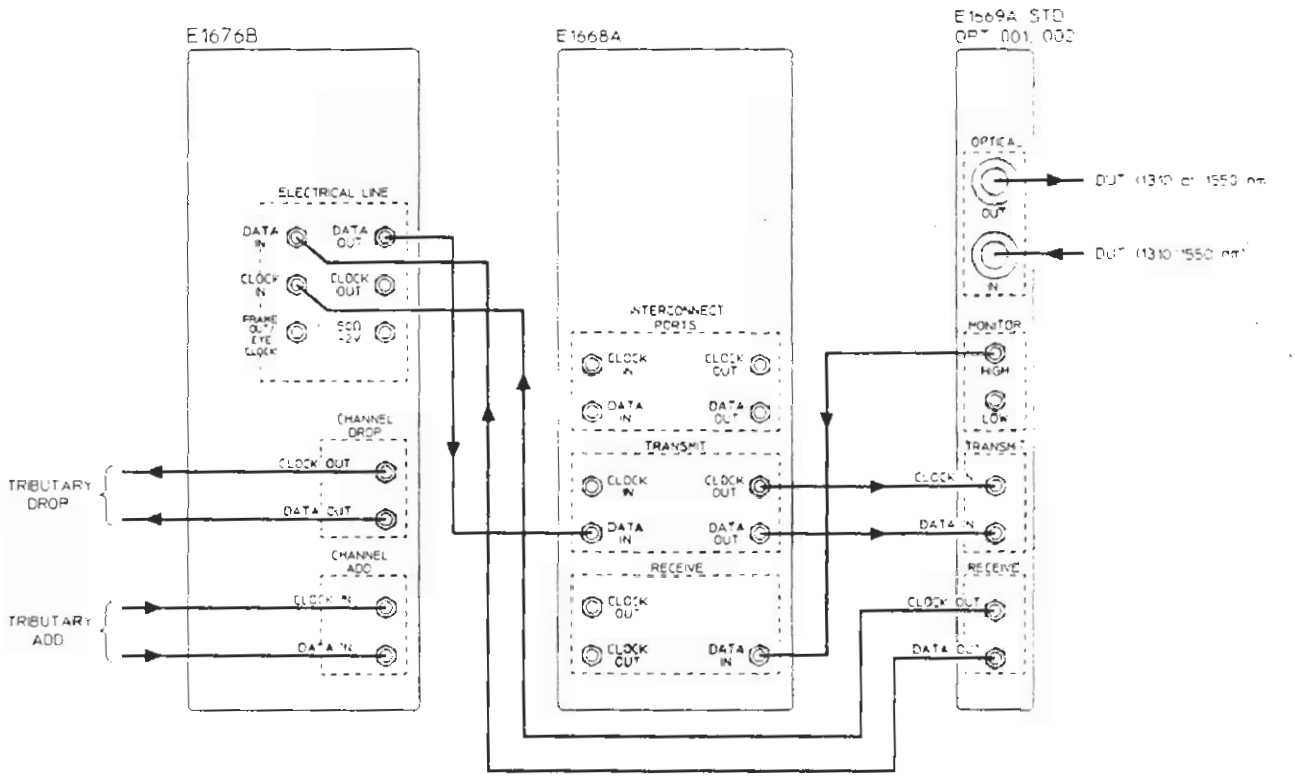


Single Wavelength Optical I/F for the HP E1676B

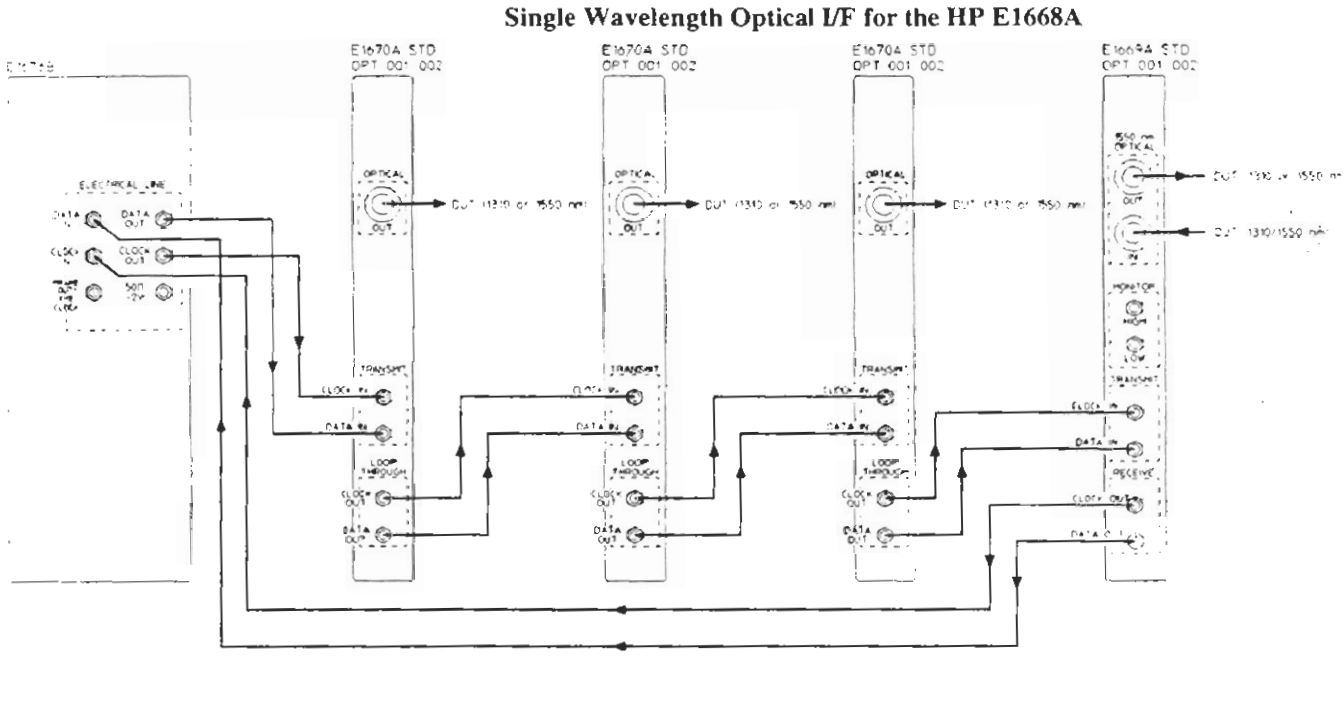


Dual Wavelength Optical I/F for the HP E1676B

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Single Wavelength Optical I/F for the HP E1668A



Multiple Transmit I/F for the HP E1676B

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Installing, Removing and Cleaning the Module

- Review the ESD precautions in Chapter 1 before installing or removing the module.
- Do not install or remove the module while the Mainframe is powered-up. Doing so may cause irreparable damage to the module and/or Mainframe.
- To comply with EMC and safety specifications, blanking panels (HP E1400-00202) must be fitted to any unused slots in the Mainframe.

To install the module into the Mainframe:

1 Locate the module in the slot guides.

2 Slide the module along the guides until it just touches the connectors on the mainframe backplane.

3 Press the module firmly into the backplane connector. If there are modules in adjacent slots, care must be taken not to damage the springs located to the front left side of the module.

4 Secure the module to the Mainframe using the screws located at the top and bottom of the module (do not overtighten screws).

To remove the module from the Mainframe:

1 Undo the screws located at the top and bottom of the module.

2 Extract the module from the mainframe backplane connector by simultaneously pressing up on the top "hp" logo handle, while pressing down on the bottom "VXIbus" logo handle.

3 Slide the module along the guides and out of the Mainframe.

4 Fit blanking panels (HP E1400-00202) to the Mainframe if you intend using the Mainframe without this module. Ensure the remaining modules comply with the slot location conventions.

To clean the module: Use a soft, clean damp cloth to clean the front-panel and side covers.

Mating Connectors

The mating connectors for the front-panel ports are listed below.

Port	Connector Type	Mating Connector Part Number
Electrical Line:		
Clock In/Out	SMA, 50Ω	HP 1250-1227
Data In/Out	SMA, 50Ω	HP 1250-1227
Frame Out/Eye Clock,	SMA, 50Ω	HP 1250-1227
50Ω –2V	SMA, 50Ω	HP 1250-1227
Serial Data:	15-pin D-type Connector	HP 1252-0415
Channel Drop:		
Trib Clock/Data Out	SMA, 50Ω	HP 1250-1227
Ref Clock Out, Trig Out	BNC, 50Ω	HP 1250-1448
Payload Out	36-pin D-type Connector	-
Ref Clock Out, Trig Out	BNC, 50Ω	HP 1250-1448

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Port	Connector Type	Mating Connector Part Number
Channel Add:		
Trib Clock/Data In, Ref Clock In	SMA, 50Ω	HP 1250-1227
Trig Out	BNC, 50Ω	HP 1250-1448
Payload In *	36-pin D-type Connector	-

* Option 001 modules only.

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Verification

A short HP BASIC program can be used to verify that the module has been correctly configured and installed. The program instructs the module to identify its manufacturer, product number, serial number, and firmware revision number.

Equipment Required

The equipment required to verify correct installation is listed below.

Mainframe HP E1401A
Slot 0 Command Module HP E1406A
Controller *HP-IB compatible
HP-IB Cable HP 10833B

* Any controller which can address HP-IB instruments using a programming language such as BASIC or C can be used. Refer to your controller's documentation for details.

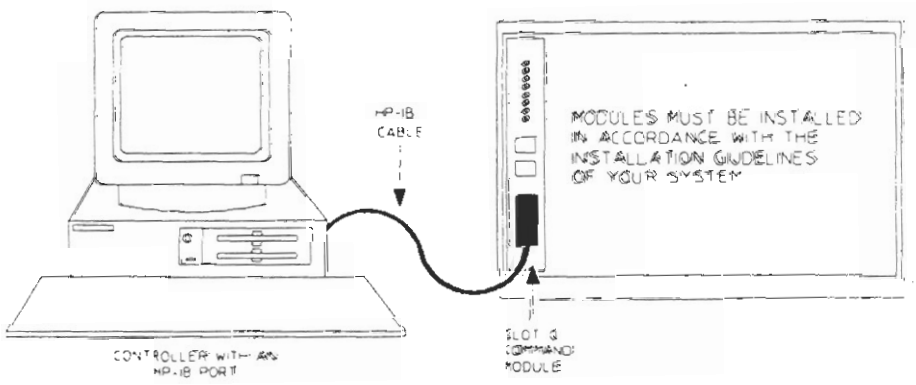
Procedure

1 Ensure the Controller's HP-IB Interface Select Code is set to 7.

2 Ensure the Slot 0 Command Module's HP-IB primary address is set to 9.

3 Ensure the logical address of the module you are verifying is set to 56.

4 Connect the equipment as shown:



5 Enter the following program into the Controller:

```
10 ! Declare array to contain module response
20 DIM module_id$[41]
30 ! Send identify command
40 OUTPUT 70907;"*IDN?"
50 ! Read response into controller
60 ENTER 70907;module_id$
70 ! Display response
80 PRINT module_id$
90 END
```


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6 Execute the program. A message in the following format will be displayed.

```
HEWLETT-PACKARD,E1676B,GB00000501,A.01.00
```

This indicates the module is configured and installed correctly.

If the program fails to run:

Check that the Slot 0 Command Module and the HP E1676B *Access* indicators flash once.

- If the *Access* indicator on the HP E1676B does not flash:
  - Check its logical address switch is set to 56.
  - Check that the commands lines in your program match exactly those listed above.
- If the *Access* indicator on the Slot 0 Command Module does not flash:
  - Re-check steps 1, 2 and 4 in the above procedure are correct.
  - Check that the commands lines in your program match exactly those listed above.
  - Check that the HP-IB cable is connected properly.

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3

Module Description

About this Chapter

This chapter describes the HP E1676B operating functions listed below. For an explanation of the module's indicators and connectors, refer to "Front-Panel Features" at the beginning of this manual.

Modes	Description	Page Ref
MULTIrate or TRIButary Operation	The module operates in one of two basic operating configurations. In MULTIrate mode, the module can analyze SONET or SDH signals operating at 51 Mb/s, 155 Mb/s, 622 Mb/s or 2.4 Gb/s. The module can also provide simple payloads, or the payloads can be provided from an external source. In TRIButary mode, the module can analyze SONET or SDH signals operating at 2.4 Gb/s. The module can also add/drop a tributary to/from the 2.4 Gb/s signal.	3-3
SONET Transmit Operation	The module generates a SONET framed signal and also provides the transport overhead (TOH) bytes, and the payload. During SONET (MULTIrate) operation, the module can provide STS-1, STS-3c, STS-12c or STS-48c payloads filled with simple byte patterns, or an externally sourced STS-1 or STS-3c payload can be used. If a concatenated signal is selected (ie, when an STS-nc payload is mapped into STS-n signal) the entire payload can be filled with a PRBS. During SONET (TRIButary) operation, a STS-1, STS-3c or STS-12c payload mapping filled with simple byte patterns can be selected. An externally generated STS-1, STS-3 or STS-12 tributary can also be added to one or all channels. During STS-48c operation the entire SPE is filled with a 2^{23}- 1 PRBS, 2^{15}-1 PRBS, or an externally generated ATM signal from an HP E1615A (Option 001 modules only).	3-4

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Modes	Description	Page Ref
SONET Receive Operation	The module can receive a framed signal, detect alarms, and perform error measurements - such as measuring errors in the B1, B2, and B3 (STS-48c only) bytes. During SONET (MULTIrate) operation, an STS-1 or STS-3c, payload can be dropped to an external analyzer for analysis. During SONET (TRIButary) operation, an STS-1, STS-3 or STS-12 tributary signal can be dropped from the 2.4 Gb/s signal for analysis by a TOH Receiver module. During STS-48c operation (Option 001 modules only), an ATM payload can be dropped from a concatenated 2.4 Gb/s signal for analysis by an HP E1615A.	3-26
SDH Transmit Operation	The module generates a SDH framed signal and also provides the transport overhead (TOH) bytes, and the payload. During SDH (MULTIrate) operation, the module can provide AU-3, AU-4 or AU4-4c payloads filled with simple byte patterns, or an externally sourced AU-3 or AU-4 payload can be used. If a concatenated signal is selected (ie, when an STM-nc payload is mapped into STM-n signal) the entire payload can be filled with a PRBS. During SDH (TRIButary) operation, an AU-3 or AU-4 payload mapping filled with simple byte patterns can be selected.An externally generated STM-0, STM-1 or STM-4 tributary can also be added to one or all payload channels. During STM-16c operation the entire VC is filled with a 2^{23}- 1 PRBS, 2^{15}-1 PRBS, or an externally generated ATM signal from an HP E1615A (Option 001 modules only).	3-34
SDH Receive Operation	The module can receive a framed signal, detect alarms, and perform error measurements - such as measuring errors in the B1, B2, and B3 (STM-16c only) bytes. During SDH (MULTIrate) operation, an AU-3 or AU-4 payload can be dropped to an external analyzer for analysis. During SDH (TRIButary) operation, an STM-0, STM-1 or STM-4 tributary signal can be dropped from the 2.4 Gb/s signal for analysis by a TOH Receiver module. During STM-16c operation (Option 001 modules only), an ATM payload can be dropped from a concatenated 2.4 Gb/s signal for analysis by an HP E1615A.	3-56
Through/Repeater Mode Operation	The transmit and receive sections of the module operate together in Through Mode and Repeater/Regenerator operation. In both modes the module retransmits the signal received at the *Electrical Line Data In* port. Note, the transmitter's timing is derived from a clock recovered from the received signal.	3-63
Tributary Routing Operation	The tributary routing feature allows STS-1/STM-0, STS-3/STM-1 or STS-12/STM-4 tributary signals to be routed though to the *Electrical Line* ports.	3-65

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MULTIrate or TRIButary Operation

The module has two basic operating modes:

- **MULTIrate**
  In this mode, the module can analyze SONET or SDH signals operating at 51 Mb/s, 155 Mb/s, 622 Mb/s or 2.4 Gb/s. The module also provides simple payloads, or the payloads can be provided from an external source (see the table below).

	Line Rate			
	51 Mb/s	**155 Mb/s**	**622 Mb/s**	**2.4 Gb/s**
SONET Payload	STS-1	STS-1, STS-3c	STS-1, STS-3c, STS-12c*	STS-1, STS-3c, STS-48c*
SDH Payload	AU3	AU3, AU4	AU3, AU4, AU4-4c*	AU3, AU4, AU4-16c*

*Internally generated payloads only

The module can provide any of the following byte patterns for internally generated payloads:

all 0s, all 1s, AA55, Incrementing, Alternating or User programmable.

If concatenated, the payload can be fully loaded with one of the above patterns or one of two PRBS patterns.

- **TRIButary**
  In this mode, the module can analyze SONET or SDH signals with payload mappings operating at 2.4 Gb/s. The module can also add/drop a tributary to/from the 2.4 Gb/s signal (see the following table).

	Mapping	Tributary Add/Drop
SONET	STS-1, STS-3c, STS-12c, STS-48c*	STS-1, STS-3, STS12
SDH	AU3, AU4, AU4, AU4-4c*	STM-0, STM-1, STM-4

*Internally generated payloads only or Option 001 with HP E1615A

The module also provides the background channel loading for channels not loaded from the tributary input. The available byte patterns are listed below:

all 0s, all 1s, AA55, 00FF, Incrementing, Alternating or User programmable.

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SONET Transmit Operation

This section describes the modules functions when configured for SONET signal transmission. The functions which are described in detail are listed below.

- Generating a SONET Framed Signal
- Selecting the Transmitter's Clock Source
- Generating Transport Overhead (TOH)
- Generating Section Overhead (SOH)
  - Generating Errors to test Out of Frame (OOF) Alarms
  - Generating Loss of Frame (LOF) Alarms
  - Generating Section BIP-8 Errors
  - Generating a Section Trace Message
- Generating Line Overhead (LOH)
  - Generating Line BIP-8 Errors
  - Generating Line AIS (Alarm Indication Signal) Alarms
  - Generating Line FERF (Far End Receive Failure) Alarms
  - Generating Automatic or Ring Protection Switching (APS/RPS) Conditions
  - Generating Alternate APS/RPS Conditions
- Accessing EOC Data Channels
- Generating Overhead Bit Errors (OHBER)
- Editing Transport Overhead (TOH) Bytes
- Generating a TOH Sequence
- Controlling SPE Pointers
  - Generating Incr/Decrementing SPE Pointer Movements
  - Generating SPE Pointer Movements Manually
  - Generating a SPE Pointer Sequence
  - Generating SPE Pointer Errors
- Stressing
- Generating SPE Path Overhead (POH)
  - Generating a Path Trace Message
  - Generating Path BIP-8 Errors (concatenated operation only)
  - Assigning a Signal Label
  - Generating Path FEBE Errors (concatenated operation only)
  - Generating Path AIS Alarms
  - Generating Path Yellow Alarms
  - Programming the F2, H4, Z3, Z4 and Z5 SPE POH Bytes
- Generating SPE Payloads (MULTIrate mode only)
- Generating Clock Durability Test Patterns
- Generating Data Errors
- Activating a Trigger Source

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Generating a SONET Framed Signal

The module can transmit a SONET framed signal (overhead and payload) when it is configured for one of the following operating modes:

- **Terminal Mode:**
  In this mode the module emulates a SONET Terminal, a network element which has independent transmit and receive paths.

  The module's transmitter provides the transport overhead (TOH) bytes (which support the transmission of a 51 Mb/s, 155 Mb/s, 622 Mb/s or 2.4 Gb/s framed signal across a network) and the payload information.

  The payloads provided by the module can have the following mappings: STS-1, STS-3c, STS-12c or STS-48c. If the module is configured for MULTIrate operation, STS-1 and STS-3 payloads can also be provided from an external source.The transport overhead (TOH) bytes which support the transmission of the framed signal across a network and the payload information are provided by the module's transmitter.

  If the module is Option 001 and in TRIButary (STS-48c) mode, then an externally sourced ATM signal from an HP E1615A can be inserted into the concatenated payload. The external ATM signal is applied to the module through the front-panel *Channel Add Payload In* port.

  Alarms and errors can also be inserted into the transmitted SONET signal.

- **Through Mode:**
  This mode is only available when the transmit and receive line rates are the same. When this mode is selected, the received SONET signal can be monitored for alarms and errors before being passed to the transmit section. All receiver function operate as specified, but the transmit section operates in the modes listed below:

  - **Transparent Mode:** Normal receiver operation is permitted but the received SONET signal is retransmitted without alteration. No changes are allowed to the data before retransmission except for Data Error Add. No recalculation will be performed on the B1, B2 or B3.

  - **Recalc Mode:** Normal receiver operation is permitted. All available transmitter stressing functions are allowed before the SONET signal is retransmitted. If the module is in MULTIrate mode, a payload (from the module or from an external source) can be added into the signal before retransmission. New values will be calculated for B1, B2 or B3.

- **Repeater Mode:**
  This mode is only available when the transmit and receive line rates are the same. It operates similar to Through Mode except the complete SOH is regenerated. The Repeater/Regenerator section operates in the modes listed below:

  - **Transparent Mode:** Normal receiver operation is permitted but the received SONET signal is retransmitted with a regenerated SOH. No changes are allowed to the remainder of the data before retransmission except for Data Error Add. No recalculation will be performed on the B2 or B3.

  - **Recalc Mode:** Normal receiver operation is permitted. All available transmitter stressing functions are allowed before the SONET signal is retransmitted. The SOH will be regenerated before transmission. If the module is in MULTIrate mode, a payload (from the module or from an external source) can be added into the signal before retransmission. New values will be calculated for B1, B2 or B3 (where applicable).

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See the *Through Mode or Repeater/Regenerator* section for more detail.

- **Trib Add Mode (TRIButary mode only):**
  An externally sourced STS-1, STS-3 or STS-12 tributary signal can be inserted into the payload using the module's "Tributary Add" function. The tributary signal (applied to the front-panel *Channel Add Trib Data In* port) can be inserted into a specific "foreground tributary" channel (all other channels are filled with a background pattern supplied by the module), or it can be inserted into all channels to simulate full loading, see the *Generating SPE Payloads* section for more information. The module also monitors the incoming tributary signal for Data Loss, Clock Loss, OOF, LOF, B1 errors.
  If the tributary signal is inserted into channel #1, then some TOH bytes of the tributary are copied into the corresponding locations of the STS-48 TOH. This is covered in more detail in the *Generating Transport Overhead* section.
  The modules three "Tributary Add" modes are described below:

  - The STS-48 TOH and SPE can be filled with an internally generated pattern, see the *Generating Transport Overhead* and *Generating SPE Payloads* sections in this chapter.
  - An externally sourced tributary signal can be inserted into a specific "foreground tributary" channel. All other channels in the frame are filled with a background pattern. To select a background pattern, see the *Generating Transport Overhead* and *Generating SPE Payloads* sections in this chapter.
  - The externally sourced tributary signal can be inserted into all channels in the frame.

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Selecting the Transmitter's Clock Source

The transmitter's timing is derived from one of the sources listed below.

Mode	External Clock Source
`Trib Clk In`*	A 51, 155 or 622 Mb/s tributary signal applied to the *Channel Add Trib Clock In* port.
`Ref Clk In`	A 155 Mb/s reference signal applied to the *Channel Add Ref Clock In* port.
`Recovered Clk`	A 2.4 Gb/s clock received at the *Electrical Line Clock In* ports.
`Internal`	A 155 Mb/s clock signal derived from the module's internal clock reference.
`Timing Ref`**	A 20 Mb/s clock derived from an HP E1679A Timing Reference which must be located immediately to the left of the module. This clock is applied to the module along the VXI Mainframe's backplane.

*Only available in TRIButary mode.

The **`Timing Ref` mode is not available if the Timing Reference module is not present. If one of the above external source is selected, the appropriate clock signal must be connected to the module for the transmitter to operate correctly.

Generating Transport Overhead (TOH)

The module generates the TOH part of a SONET signal. The TOH is made up of Section overhead bytes and Line overhead bytes. Refer to the *Generating Section Overhead* and *Generating Line Overhead* sections in this chapter for detailed information.

In TRIButary mode, the module can accept overhead bytes from an external source using the module's "Tributary Add" function. When the external tributary is inserted into channel #1 of the payload, some tributary TOH bytes are copied into the module, then loaded into the appropriate locations in the SONET signal.

The module can also overwrite TOH bytes:

- By using the module's "Embedded Operation Channel" EOC function. The TOH bytes are applied to the module through the front panel *Serial Data* port.
- By inserting a PRBS pattern in to selectable channels, except for the BIP and pointer bytes. Single errors can also be inserted into the pattern.

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Generating Section Overhead (SOH)

The module generates the overhead bytes which support the transmission of a SONET signal across the Section span of a network. The Section overhead bytes are described below.

Byte	Label	Description
A1, A2	Framing	Provides frame alignment for the SONET signal. There are "n" A1 bytes followed by "n" A2 bytes in an STS-n frame.
J0	Section Trace	The module can set this byte up to be the C1Identification byte or the J0 Section Trace byte. C1 Identification Byte Enables all channels in a SONET signal to be identified. Each STS-1 channel is assigned an identification number corresponding to its order of appearance in the SONET frame. J0 Section Trace Byte This byte allows you to transmit a message in the Section overhead to verify the continued connection between the transmitting and receiving ends of a Section span.
Z0		These bytes are reserved for function not yet defined.
B1	Section BIP-8	Provides Section error performance monitoring. The B1 byte contains an 8-bit wide bit-interleaved parity (BIP-8) computation calculated for all bits of the previous SONET frame. This byte is defined only for STS-1 #1 of a SONET frame.
E1	Orderwire	Provides a local orderwire channel for voice communication between regenerators, hubs and remote terminal locations. This byte is defined only for STS-1 #1 of a SONET frame.
F1	User Channel	Provides a 64 kbit/s proprietary data communications channel for the network operator. It is terminated at each Section terminating equipment.
D1 to D3	Data Comm. Channel	Provides a 192 kbit/s data communications channel (DCC). Enables message-based network management and maintenance information to be exchanged between Section terminating equipment. These bytes are defined only for STS-1 #1 of a SONET frame.

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Default Settings

The default values assigned to the Section overhead are listed in the following table. These values can be modified by the user, unless stated otherwise.

Byte	Label	Description
A1, A2	Framing	A1 is assigned F6 hex (11110110), and A2 is assigned 28 hex (00101000).
J0	Section Trace	J0 and Z0 are assigned the C1 Identification byte values. Each STS-1 channel is assigned an identification number corresponding to its order of appearance in the SONET STS-n frame.
Z0		See J0.
B1	Section BIP-8	This value is always calculated by the module. It cannot be modified by the user.
E1	Orderwire	E1 is assigned the value zero by the module. However, when the module is in TRIButary mode and an external tributary signal is inserted into channel #1 of the SONET frame, the module overwrites the current E1 byte value with the E1 byte value from the external tributary Section overhead. This value can be modified through the appropriate HP E1671A or HP E1673A module. Note that the E1 byte value is only defined for channel #1 of the SONET frame. The *Serial Data* port can also be used to assign a value to this byte.
F1	User Channel	F1 is assigned the value zero by the module. However, when the module is in TRIButary mode and an external tributary signal is inserted into channel #1 of the SONET frame, the module overwrites the current F1 byte value with the F1 byte value from the external tributary Section overhead. This value can be modified through the appropriate HP E1671A or HP E1673A module. Note that the F1 byte value is only defined for channel #1 of the SONET frame.The *Serial Data* port can also be used to assign a value to this byte.
D1 to D3	Data Comm. Channel	D1 to D3 are each assigned the value zero by the module. However, when the module is in TRIButary mode and an external tributary signal is inserted into channel #1 of the SONET frame, the module overwrites the current D1 to D3 byte values with the D1 to D3 byte values from the external tributary Section overhead. These values can be modified through the appropriate HP E1671A or HP E1673A module. Note that the D1 to D3 byte values are only defined for channel #1 of the SONET frame. The *Serial Data* port can also be used to assign a value to this byte.

Generating Errors to test Out of Frame (OOF) Alarms

The module can check a network equipment's ability to detect an OOF alarm by inserting errors into the A1 and A2 framing bytes for at least five consecutive SONET frames. Framing bytes can be errored in the following four ways:

- By erroring all framing bytes in a SONET frame using the module's **`FW On/Off`** function. An 8-bit pattern (a user-defined mask set through the "Stressing" subpanel) is inserted into all A1 and A2 bytes.
- By erroring individual framing bytes in a SONET frame by editing the byte values using

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the module's **TOH Byte Access** function. For more information on TOH byte access, see the *Editing TOH Bytes* section.

- By erroring all framing bytes in the selected SONET frames using the module's "Stressing" **Fword Loss** function. An 8-bit pattern (user-defined using mask) is inserted into all A1 and A2 bytes of the selected frame.
- By erroring individual framing bytes using the module's "Stressing" **Fword Err** function. The user defines the error mask for the A1 and A2 bytes. This is typically used to stress the boundary of the A1 and A2 bytes.

NOTE The "Stressing" **Fword Loss** and **Fword Err** functions can also be used to generate signals that check network equipment's ability to regain frame alignment. This is done using the "Stressing" **Norm On** function.

Two stress states can be selected when using the module's "Stressing" function:

- **Single**
  The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.
- **Sequence**
  The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

  The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

NOTE An LOF alarm is generated:

- When an OOF signal is present for 3 ms or more and the alarm threshold of the receiver's LOF Timer is set to **Fixed**.
- When an OOF signal is present for 24 frames and the alarm threshold of the receiver's LOF Timer is set to **Integrating**.

Generating Loss of Frame (LOF) Alarms

The module can check a network equipment's ability to detect a LOF alarm by generating Out of Frame (OOF) alarms for 3 ms, or when 24 frames with OOF have been received. For more information on OOF alarms, see the *Generating Out of Frame (OOF) Alarms* section.

Generating Section BIP-8 Errors

"Bit Interleaved Parity" (BIP) errors can be inserted into the transmitted B1 byte. Errors are inserted after the B1 byte value has been calculated. They can be inserted as single errors, or at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 5 to 10.

If you are inserting single errors, you can select which bits in the B1 byte you want to error.

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Generating a Section Trace Message

The module can check the continued connection between the transmitting and receiving ends of a section span by transmitting a message in the J0 byte.

- **16 bytes repeating sequence mode:** The first byte contains a frame start marker (bit 1 set to 1), and the result of a CRC-7 calculation over the previous frame (bits 2 to 8). The remaining 15 bytes are user defined and take the binary form 0XXX XXXX. These byte values will be cycled over 16 consecutive frames.
- **64 byte repeating sequence mode:** The 16 byte sequence defined above repeated four times.
- **Single byte repeating sequence mode:** The J0 value is 01 Hex which is consistent with older equipment and should be interpreted by new NE as "Section Trace unspecified".

Alternatively, the J0 byte may be used as an identifier for each channel in a SONET signal.

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Generating Line Overhead (LOH)

The module generates the overhead bytes which support the transmission of a SONET signal across the Line span of a network. The Line overhead bytes are described below.

Byte	Label	Description
H1 to H3	Pointers	Provides the linkage between the transport overhead (TOH) and the synchronous payload envelope (SPE). There are payload pointers for each STS-1 in a SONET frame. Bytes H1 and H2 indicate the offset in bytes between the pointer and the first byte of an STS-1 SPE. They perform frequency justification, and are used to identify STS Path Alarm Indication Signal (AIS). Byte H3 is the pointer action byte and is allocated for STS-1 SPE justification purposes.
B2	Line BIP-8	Provides Line error performance monitoring. There is a B2 byte for each STS-1 in a SONET frame. The B2 byte contains an 8-bit wide bit-interleaved parity (BIP-8) computation calculated for all bits of the line overhead and payload envelope capacity of the previous STS-1 frame.
K1, K2	APS Channel	Provides automatic protection switching (APS) signaling between line terminating equipment. The K2 byte is also used to identify Line AIS and Line Far End Receive Failure (FERF). These bytes are defined only for STS-1 #1 of a SONET frame.
D4 to D12	Data Comm. Channel	Provides a 576 kbit/s data communications channel (DCC). Enables message-based network management and maintenance information to be exchanged between Line terminating equipment. These bytes are defined only for STS-1 #1 of a SONET frame.
Z1	Sync Status	Provides information on the synchronization status of a Network Element.
Z2	Line FEBE	Provides Line Far End Block Error indication.
E2	Orderwire	Provides an express orderwire channel for voice communication between Line terminating equipment. This byte is defined only for STS-1 #1 of a SONET frame.

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Default Settings

The default values assigned to the Line overhead are listed in the following table. These values can be modified by the user, unless stated otherwise.

Byte	Label	Description
H1 to H3	Pointers	The module assigns the following pointer default values at power-on or after a module reset. H1 is assigned 60 in hex H2 is assigned 00 in hex H3 is assigned 00 in hex Pointer values can be modified using the module's *TOH Byte Access* or *Pointer Action* functions. When the module is in TRIButary mode and an external tributary signal is inserted into a specific channel in the SONET frame, the module copies the H1 to H3 byte values from the external tributary Line overhead to the H1 to H3 bytes associated with the selected channel. The module continues to assign the values to the remaining background channels (see default values shown above). If the external tributary signal is inserted into all channels in the SONET frame, the module copies the H1 to H3 byte values from the external tributary Line overhead to all H1 to H3 bytes.
B2	Line BIP-8	This value is always calculated by the module. It cannot be modified by the user.
K1, K2	APS Channel	K1 and K2 are each assigned the value zero by the module.
D4 to D12	Data Comm. Channel	D4 to D12 are each assigned the value zero by the module.
Z1	Sync Status	Bits 5 to 8 assigned the value zero by the module.
Z2	Line FEBE	Z2 assigned the value zero by the module.
E2	Orderwire	E2 is assigned the value zero by the module.

Generating Line BIP-8 Errors

Single "Bit Interleaved Parity" (BIP) errors can be inserted into the SONET framed signal by erroring specific bits in any one of the transmitted STS-1 B2 bytes. Errors can also be added at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 3 to 10. Errors are evenly distributed over all bits of all B2 bytes, and are inserted after the B2 byte value has been calculated.

Generating Line AIS Alarms

The module can test a Line Terminating Equipment's ability to detect Line AIS alarms by inserting Line AIS into the K2 byte, or by overwriting all Line overhead and SPE bytes with all 1's. Line AIS can be generated in the following three ways:

- By clicking the mouse on the AIS Off control to AIS On.
- By editing the K2 byte value using the modules **`TOH Byte Access`** function. For more

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information on TOH byte access, see the *Editing TOH Bytes* section.

- Using the module's "Stressing" **Line AIS** function. This function allows you to apply the Line AIS alarm to consecutive SONET frames in a specified frame sequence. Two stress states can be selected:

  - Single
    The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.

  - Sequence
    The alarm is applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

    The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

Generating Line FERF Alarms

The module can test a Line Terminating Equipment's ability to detect Line FERF alarms by inserting Line FERF into the K2 byte.

Line FERF can be generated in the following three ways:

- Using the mouse to set the FERFoff control button to FERFon.

- By editing the K2 byte value using the modules **TOH Byte Access** function. For more information on TOH byte access, see the *Editing TOH Bytes* section.

- Using the module's "Stressing" **Line FERF** function. This function allows you to apply the Line FERF alarm to consecutive SONET frames in a specified frame sequence. Two stress states can be selected:

  - Single
    The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.

  - Sequence
    The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

    The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

Typically, 5 frames are required for Line FERF to be detected by receiving equipment.

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Generating Automatic or Ring Protection Switching (APS/RPS) Conditions

You can check the APS/RPS capability of Line Terminating Equipment by transmitting the appropriate APS/RPS information in the K1 and K2 bytes. These bytes are generated internally by the HP E1676B or externally using the "EOC add" capability, or when the module is in TRIButary mode they can be supplied externally in a tributary signal from a Transport Overhead Generator (such as the HP E1671A or HP E1673A).

When the module is in TRIButary mode, and you are using the HP E1676B to control the K1 and K2 bytes and intend inserting an external tributary signal into the SONET framed signal, then the HP E1676B "Trib Add" function must be used to locate the tributary signal in the STS-1 #2 to #48, STS-3 #2 to #16 or STS-12 #2 to #4 locations in the SONET framed signal.

If you use an external tributary to control K1 and K2, then the HP E1676B "Trib Add" function must be used to locate the tributary signal in the STS-1 #1, STS-3 #1 or STS-12 #1 of the SONET framed signal.

Generating Alternate APS/RPS Conditions

The module can test a Line Terminating Equipment's ability to detect changes in APS/RPS conditions by inserting alternate APS/RPS values into the K1 and K2 bytes.

Alternate APS/RPS values can be generated in the following two ways:

- By editing the byte values using the modules **TOH Byte Access** function. For more information on TOH byte access, see the *Editing TOH Bytes* section.
- Using the module's "Stressing" **APS** function the module can be programmed to switch between two different sets of K1K2 byte values.

NOTE With an internal payload both values of K1K2 are set in the module. In "TRIButary - Trib Add" mode, if the tributary is added to channel #1 then the initial value of K1K2 is derived from the tributary.

- Single new K1K2 value
  The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.
- Sequence values of K1K2
  The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (initial K1K2 value user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the 2nd and last value durations within the holding pattern. *n* and *m* both have the range 1 to 64.
  The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

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Accessing EOC Data Channels

Data applied to the module's *Serial Data* port may be inserted into specific TOH bytes of the SONET signal at the *Electrical Line Data Out* port.

Generating Overhead Bit Errors (OHBER)

Errors can be injected and detected in a single overhead channel or in groups of overhead bytes carrying PRBS.

Editing Transport Overhead (TOH) Bytes

New values can be assigned to internally generated transport overhead bytes with values in the range 00 to FF in hex.

You cannot, however, assign new values to:

a The B1 and B2 BIP-8 bytes - these are always calculated by the module.

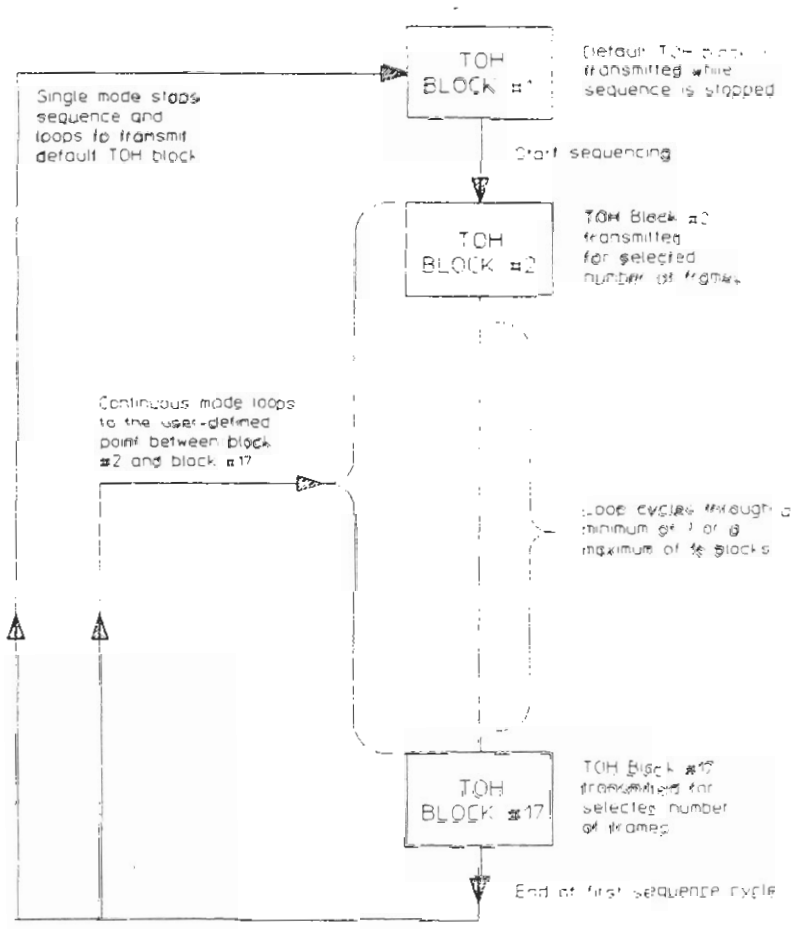
b When the module is in TRIButary mode, the byte values copied from an externally applied tributary when the tributary is inserted into a channel of the SONET frame. These values can only be accessed through the module supplying the external tributary signal (modules such as the HP E1671A and HP E1673A).

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Generating a TOH Sequence

The module provides programmable sequencing of up to 16 transport overhead blocks for stressing network equipment. All bytes are programmable except the B1 and B2 bytes which are automatically calculated.

Three modes of sequencing are available, single, continuous and start/stop operation. Refer to the following diagram.



Each block, with the exception of the first (default block), has a selectable repetition length of 0 to 65535 frames per block. Each block is repeated for the defined number of counts before the next block begins. If a block is set to zero, that block is skipped and the next block is started. When all blocks have been transmitted, the sequence either returns to the default overhead block (single mode), or loops back to a user defined point in the sequence between blocks # 2 to # 17 (continuous mode) to continue looping until stopped.

The value of each transport overhead byte for TOH blocks 2 to 17 is user-definable.

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Controlling SPE Pointers

The SPE pointer payload value contained in the H1H2 bytes indicate the offset between the pointer and the first byte of the SPE in a SONET frame.

By generating SPE payload pointer movements the module can check a Network Element's ability to maintain payload integrity, for example during frequency offset conditions. The module produces pointer movements by byte justification of the administration units relative to the SONET frame.

Bits 5 and 6 (SS bits) of the H1 byte indicate the SPE type. They can be set to their default value, or to other values (00, 10 or 11) to check that the network equipment can detect a mismatch between the SS bit value and the SPE type.

There are five ways to control the movement of payload pointers, and these are described in the table below. Note, you cannot control externally generated pointers which appear in the payload when the module's TRIButary-"Tributary Add" function is used, or when an external ATM signal is inserted into a concatenated payload.

Mode	Description
Decrement/ Increment	The SPE pointer value can be decremented or incremented by one. Payload integrity (such as PRBS patterns) is maintained throughout the movement.
Manual	The SPE pointer can be assigned any value in the range 0 to 782, with or without the New Data Flag (NDF) set. When initiated, a discontinuity in the payload for the duration of the movement will occur, which may cause PRBS patterns to lose sync.
Sequence	The SPE pointer can be programmed to provide the maximum rate of pointer change, which is 1 pointer movement every four frames in either a positive or negative direction.
Periodic	The SPE pointer can be programmed to make periodic movements in either a positive or negative direction. The movement rate can be set to 1, 2, 5, or 10 movements/sec. Payload integrity (such as PRBS patterns) is maintained throughout all movements.
Timing Ref	If you are using a HP E1679A (with this module) then its pointer control features can be used to provide pointer movements, refer to the *HP E1679 User's Manual* for more information.

An invalid pointer value facility is also available which overrides the selected pointer movement. When enabled, the SPE pointer is set to 783 (maximum valid pointer value+1).

Generating Incr/Decrementing SPE Pointer Movements

The SPE pointer value can be manually incremented or decremented in steps of one.

Generating SPE Pointer Movements Manually

The SPE pointer can be assigned any value in the range 0 to 782, with or without the New Data Flag (NDF) set.

Generating a SPE Pointer Sequence

The SPE pointer can be programmed to provide the maximum rate of pointer change, which is 1 pointer movement every four frames in either a positive or negative direction.

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Generating a Periodic SPE Pointer Sequence

The SPE pointer can be programmed to make periodic movements in either a positive or negative direction. The movement rate can be set to either 1, 2, 5, or 10 movements per second.

Generating SPE Pointer Errors

The module can generate SPE pointer errors to test the behavior of network equipment.

To generate pointer errors, the 16 bits which make up the H1H2 pointer bytes can be errored as follows:

- Pulsed On/Off:
  In "Pulsed On" mode, the module can be programmed to inject errors into the H1H2 bytes in consecutive frames (user-selectable in the range 1 to 63). Error injection is turned Off for consecutive frames (user-selectable in the range 1 to 63) when "Pulsed Off".
- Sequence:
  The H1H2 pointer bytes can be errored in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.
- Pointer Action:
  The H1H2 pointer bytes can be errored according to a 16-bit user set mask. The bits specified by the mask are errored every time a pointer adjustment (increment, decrement, new pointer with or without NDF or invalid pointer) occurs.

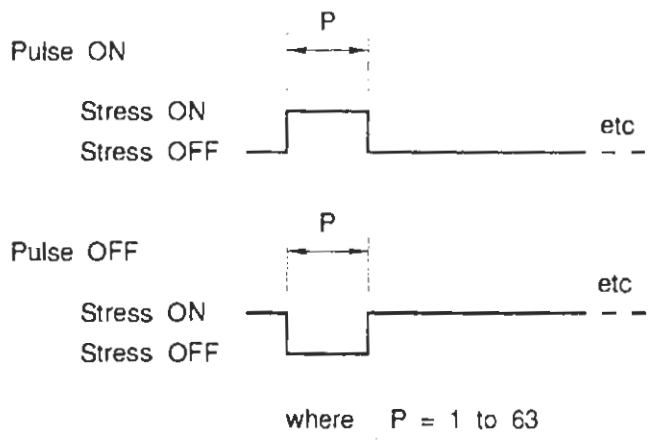
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Stressing

The module provides a stressing facility to allow you to assert alarms and to error particular overhead bytes for specific numbers of consecutive frames.

Two modes of signal stressing are available, single and sequence. Both modes of operation are available when stressing Line AIS/FERF alarms, stressing APS/RPS, stressing Frame-word Loss, and injecting Frameword errors.

Single Pulse Mode. The single pulse on/off mode produces the following:

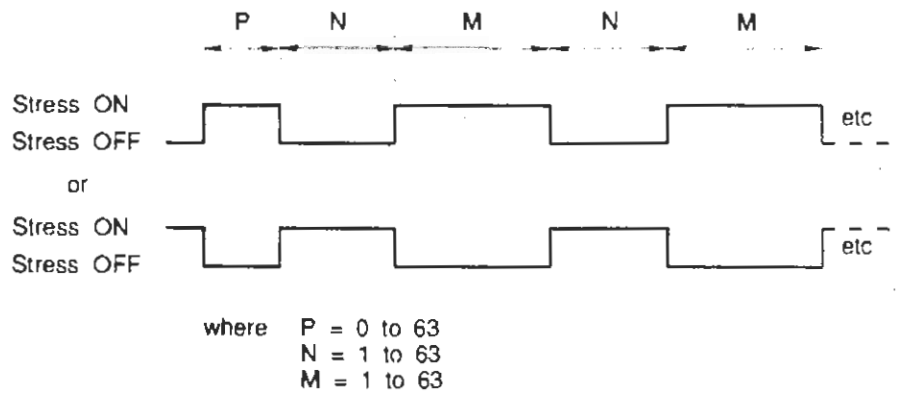


Single Pulse Stressing

If the initial state is "off", this mode produces a single "on" pulse. Conversely, if the initial state is "on", this mode produces a single "off" pulse.

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Sequence Mode. The sequence mode produces a *p+n+m* function as shown by the following figure:



Sequence Pulse Stressing

If the initial state was "off", this mode produces an initial "on" pre-stress pulse (*p*) and then an "off-on" repeated sequence (*n+m*). Conversely, if the initial state is "on", this mode produces an initial "off" pre-stress pulse (*p*) and then an "on-off" sequence (*n+m*). After the initial stress, the values of *n* and *m* can be changed and will take effect synchronously at the end of the *m* stress period.

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Generating SPE Path Overhead (POH)

The module generates the "n" POHs required for a SPE made up of "n" STS-1 tributaries (where n = 1, 3, 12 or 48). The nine bytes of the 1st POH can be generated by the module or can be user defined. The remaining (2nd to nth) POHs are automatically assigned the values defined for the 1st POH.

Byte	Label	Description
J1	Path Trace	This is the first byte in the SPE. Its location is indicated by the associated SPE pointer. This byte allows you to transmit a message in the transmitted payload to verify the path connection between the source of the path signal and the receiving terminal.
B3	Path BIP-8	This byte provides path error performance monitoring. It contains an 8-bit wide bit-interleaved parity (BIP-8) computation calculated for all bits of the previous SPE. *You can insert Path BIP errors into the transmitted B3 byte at a specified error rate or as single errors.*
C2	Signal Label	This byte indicates the structure of the SPE. *You can assign a specific label (8-bit byte) to the transmitted payload.*
G1	Path Status	This byte reports back to the originating path terminating equipment the path-terminating status and performance. The value in this byte is dependent on the status of the path alarms and the "Far End Block Error" (FEBE) value. Bits 1 to 4 of this byte contain the FEBE count. Bit 5 is the Path FERF. Bits 6, 7 and 8 are unassigned. *You can insert FEBE errors into the transmitted G1 byte at a specific error rate or as single errors, or generate a FERF alarm.*
H4	Multiframe	This byte provides a multiframe phase indication for VT payloads and can be payload specific.
F2, Z3, Z4, Z5	Spare	Each byte can be programmed with a sequence of 8 bytes.

Generating a Path Trace Message

A path trace message (J1 byte) can be created or edited. Two formats are available depending on whether a cyclic redundancy check (CRC) is required for frame alignment/bit error monitoring.

- **Non-CRC mode:** Up to 64-bytes in length of the path trace can be transmitted as a message, which includes the carriage return (<CR>) and line feed (<LF>) terminating characters. Each character is 8-bits long.
- **CRC Mode:** Up to 16-bytes in length of the path trace message can be transmitted. One byte is reserved for a CRC-7 value which also acts as the message frame marker.

Generating Path BIP-8 Errors (concatenated payloads only)

Path "Bit Interleaved Parity" (BIP) errors can be inserted into selected bits of the transmitted B3 byte as single groups of errors, or at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 5 to 10. Errors are evenly distributed.

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Assigning a Signal Label

The following labels can be assigned to the C2 byte to reflect the current SPE payload mapping:

Signal Label	Signal Label
Unequipped	Async 139M
Equ-Non Spec	T1S1-BISDN
Trib float	IEEE 802.6
Trib Locked	Async FDDI
Async DS3	Equipped
Syntran	

Generating Path FEBE Errors (concatenated payloads only)

Path "Far End Block Errors" (FEBE) can be inserted into the transmitted G1 byte as single groups of errors, or at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 3 to 10. Errors at these rates are evenly distributed. When single is selected, an error rate count (user-selectable in the range 1 to 15) is transmitted in the FEBE bits.

Generating Path AIS Alarms

The module can test a Path Terminating Equipment's ability to detect Path AIS alarms by overwriting all SPE pointer bytes (H1, H2, H3), and all SPE bytes with an all 1's pattern.

Three alarm control modes can be selected:

- On/Off
- Pulsed On/Off
  In "Pulsed On" mode, the alarm state is inverted for consecutive frames (user-selectable in the range 1 to 63). The alarm reverts to its original pattern when "Pulsed Off".
- Sequence
  The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

Generating Path Yellow Alarms

The module can test a Path Terminating Equipment's ability to detect Path Yellow alarms by setting bit 5 of the G1 byte to 1.

Three alarm control modes can be selected as described in "Generating Path AIS Alarms".

Programming the F2, H4, Z3, Z4 and Z5 SPE POH Bytes

These bytes can be programmed with different values. Note that with tributary payloads, the H4 byte is generated in normal or simplified format.

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Generating SPE Payloads (MULTIrate mode only)

The module provides SPE mappings and payloads for different line rates:

- **STS-48 Line Rate:**
  Up to three externally generated STS-1 SPEs can be mapped into a STS-3c SPE. This STS-3c SPE can then be mapped into any combination of 16 possible channels. All other channels are filled with simple (internally generated) byte patterns.

  One externally generated STS-3c SPE can be mapped into any combination of 16 possible channels. All other channels are filled with simple byte patterns.

  Four STS-12c SPEs can be filled with simple byte patterns.

  A STS-48c concatenated payload can be filled with a PRBS or a simple byte pattern.

- **STS-12 Line Rate:**
  Up to three externally generated STS-1 SPEs can be mapped into a STS-3c SPE. This STS-3c SPE can then be mapped into any combination of 4 possible channels. All other channels are filled with simple byte patterns.

  One externally generated STS-3c SPE can be mapped into any combination of 4 possible channels. All other channels are filled with simple byte patterns.

  A STS-12c concatenated payload can be filled with a PRBS or a simple byte pattern.

- **STS-3c Line Rate:**
  Up to three externally generated STS-1 SPEs can be mapped into the STS-3c SPE. All other channels are filled with simple byte patterns

  An externally generated STS-3c payload can be mapped into the STS-3c concatenated SPE, or the STS-3c concatenated SPE can be filled with a PRBS or a simple byte pattern

- **STS-1 Line Rate:**
  An externally generated STS-1 payload can be mapped into a STS-1 SPE, or the STS-1 SPE can be filled with a PRBS or a simple byte pattern.

The STS-1, STS-3c payloads can be generated by the module or from an external payload generator (applied to the module along the VXI Mainframe backplane), the STS-12c and STS-48c payloads can only be generated by the module.

- **STS-48 Line Rate - Tributary Add (TRIButary mode only):**
  An externally generated STS-1, STS-3 or STS-12 tributary signal (applied to the module's *Channel Add Tributary* ports) can be inserted into a single channel, or all channels in an STS-48 framed signal using the module's "Tributary Add" function. When the external signal is inserted into a single (foreground) channel, all other (background) channel payloads are provided by the module. Note, the SPE format for the background is normally STS-1, but can be set to either STS-3c or STS-12c by the user. If the "Tributary Add" function is not being used, the payload is provided by the module.

  If you select the STS-12c format then B3 error correction is also available.

  During STS-48c operation the module provides a bulk filled concatenated payload. If the

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module is Option 001, an externally generated ATM signal from an HP E1615A can be inserted into the payload. The external ATM signal is applied to the module through the front-panel *Channel Add Payload In* port.

Generating Clock Durability Test Patterns

The module can test the clock recovery capability of a network receiver by using an all 1's or all 0's substitution pattern in the first row of the SONET framed signal. Up to 4176 bytes can contain the substitution pattern. Alternatively, the module can generate a CID pattern which is a repeating block of all 1s or all 0s (programmable in the range 1 to 200 bytes) alternating each frame starting at the first byte of the payload. The remainder of the payload is an all 0s scrambled payload with scrambler synchronized to the frame.

Generating Data Errors

Data errors can be inserted into the transmitted SONET framed signal, either as single errors, or at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 3 to 10.

Activating a Trigger Source

The *Transmit Trig Out (TTL)* port on the front-panel of the module enables you to synchronize external test equipment to events detected by the module for time delay measurements.

The trigger sources are listed in the table below.

Trigger Source (TTL)	Trigger Source (ECL)
None	Frame Pulse
Frame Pulse	Eye Clock
Scrambler	
Line FERF	
Line AIS	
APS/RPS Change	
Frameword Off	
Err Frameword	
Err B1	
Err B2	
Err B3	
Err PRBS	
Err FEBE	
Err Path FEBE	
Err STS Data	
Pointer Action	
Pointer Stressing	
Sequence	
OH BER	

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SONET Receive Operation

This section describes the modules functions when configured for SONET line signal monitoring. The functions which are described in detail are listed below.

- Receiving a SONET Framed Signal
- Monitoring Alarms
- Selecting Alarm Thresholds
- Monitoring Errors
- Viewing G.826 Error Analysis
- Monitoring Section BIP-8 Errors
- Monitoring Line BIP-8 Errors
- Monitoring Line FEBE Errors
- Monitoring Path BIP-8 Errors (concatenated operation only)
- Monitoring Path FEBE Errors (concatenated operation only)
- Monitoring Overhead Bit Errors (OH BER)
- Monitoring Automatic Protection Switching (APS/RPS) Conditions
- Monitoring SPE Pointer Movements
- Capturing Data from the Received Signal
- Dropping a Payload from the Received Signal (MULTIrate mode only)
- Dropping a Tributary from the Received Signal (TRIButary mode only)
- Dropping an ATM Payload to an HP E1615A (STS-48c & Option 001 only)
- Dropping an EOC from the Received Signal
- Activating a Trigger Source

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Receiving a SONET Framed Signal

The module can accept a scrambled or unscrambled electrical STS-1, STS-3, STS-12 or STS-48 framed signal.

Monitoring Alarms

The module monitors the incoming SONET framed signal for the following alarm conditions:

- Signal Loss (LOS)
- Loss of Frame
- Out of Frame (OOF)
- Line AIS (L-AIS)
- Line FERF (L-FERF)
- Path AIS (PAIS)
- Loss of Pointer (LOP)
- Path Yellow (PYEL)
- PRBS not detected - concatenated operation only
- OH BER Sync

The alarm indicators can be updated manually by clicking the mouse on the appropriate alarm indicator, or alarm indicators can be automatically updated by asserting the module panel "automatic update" function. An indicator will change from *green* to *red* when an alarm condition is detected.

The module can also measure the duration (in seconds) of Signal Loss, Loss of Frame, Out Of Frame, Line AIS, Line FERF, Loss of Pointer, Path AIS, Path Yellow and OH BER alarm conditions and PRBS Sync Loss, and displays the results as:

Cumulative Results: Results accumulated from the start of the measurement period to the most recent 100 ms sampling period.
Integration Period Results: Results accumulated during the most recent complete measurement period.

Selecting Alarm Thresholds

An alarm indicator is asserted when the alarm threshold is exceeded. The alarm threshold is a specified number of consecutive frames with the alarm condition. You can specify when the alarm indicator is to be negated by specifying the number of consecutive frames that must be detected with no alarm condition.

Monitoring Errors

The module can monitor a SONET signal for the following errors:

- Section BIP-8 (B1)
- Line BIP-8 (B2)
- Line FEBE (M1)
- Path BIP-8 (B3) - concatenated operation only
- Path FEBE (G1) - concatenated operation only
- PRBS - concatenated operation only
- OH BER

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Results can be presented as follows:

Cumulative Results: Results accumulated from the start of the measurement period to the most recent 100 ms sampling period.
Integration Period Results: Results accumulated during the most recent complete measurement period.
Relative Period Results: Bit errors counted during the most recent 100 ms sampling period.

Errors are measured simultaneously and can be displayed as follows:

Count: Displays the total number of bit errors detected in the *N* byte(s) during the measurement period.
Ratio: Displays the *N* error count divided by the total number of bits over which all received *N* bytes were calculated.
Seconds: Displays the number of seconds in the measurement period during which a *N* error occurred. This is not applicable for "Relative Period" measurements.

Note, *N* can be B1, B2, B3, Path FEBE, Line FEBE, OH BER or PRBS.

Viewing G.826 Error Analysis

G.826 error analysis is also available for B1, B2 and B3 bytes when the module is configured for cumulative and period results. The results which are available are listed below:

Errored Block Count (EBC): Displays the total number of blocks in which one or more bits are in error.
Errored Seconds Count (ESEC): Displays the total number of one second periods containing one or more errored blocks.
Severely Errored Seconds Count (SES): Displays the total number of one second periods each containing a number of errored blocks, equal to or greater than 30% of blocks in 1 second, or at least one Severely Disturbed Period (SDP). In an network environment an SDP is defined as the occurrence of a network defect lasting for at least 1 ms or four blocks, whichever is the longest. LOS, OOF, LOF and AIS can cause such a defect.
Unavailable Seconds Count (UAS): A period of unavailable time begins at the onset of 10 consecutive SES events. These 10 seconds are considered part of the unavailable time. A new period of available time begins at the onset of 10 consecutive non-SES events. These 10 seconds are considered part of the available time.
Errored Seconds Ratio (ESR): Displays the ratio of errored seconds to the total seconds in available time.
Severely Errored Seconds Ratio (SESR): Displays the ratio of severely errored seconds to the total seconds in available time.
Background Block Error Ratio (BBER): Displays the ratio of Background Block Errors to the total block errors in available time. The count of total blocks excludes all blocks during Severely Errored Seconds.

Monitoring Section BIP-8 Errors

The module can monitor the B1 byte for errors. The B1 byte contains an 8-bit wide "Bit Interleaved Parity" (BIP-8) computation calculated for all bits of the previous SONET frame. This byte is defined only for STS-1 #1 of an STS-n frame (the byte location is the same in an STS-nc frame).

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Monitoring Line BIP-8 Errors

The module monitors the "Bit Interleaved Parity" (BIP) B2 byte for errors. The B2 byte contains an 8-bit wide "Bit Interleaved Parity" (BIP-8) computation. This computation is calculated for all bits of the line overhead and payload envelope capacity of the corresponding STS-1 in the previous SONET frame. There are "n" Line BIP-8 (B2) bytes in the STS-n/STS-nc frame.

Monitoring Line FEBE Errors

The module monitors the Line "Far End Block Error" M1 byte for errors. The M1 byte contains the number of interleaved bit block errors that have been detected by the far end Line Terminating Equipment.

Monitoring Path BIP-8 Errors (concatenated operation only)

The module monitors the "Bit Interleaved Parity" (BIP) B3 byte for errors. The B3 byte contains an 8-bit wide "Bit Interleaved Parity" (BIP-8) computation. This computation is calculated for all bits of the payload envelope capacity of the previous SPE before scrambling.

Monitoring Path FEBE Errors (concatenated operation only)

The module monitors the Path "Far End Block Error" G1 byte (bits 1 to 4) for errors. The G1 byte contains the number of interleaved bit block errors that have been detected by the far end Path Terminating Equipment.

Monitoring Overhead Bit Errors (OH BER)

The module can monitor errors in a PRBS test pattern inserted into any of the transport overhead bytes (except for the B1 and B2 bytes).

Monitoring Automatic or Ring Protection Switching (APS/RPS) Conditions

You can check the APS/RPS capability of Line Terminating Equipment by monitoring the appropriate APS/RPS information in the K1 and K2 bytes.

You can use the HP E1676B to continuously monitor the K1 and K2 byte values (at a 100 ms sample rate) or capture the values when a specific event occurs.

Monitoring SPE Pointer Movements

The module can monitor SPE pointer movements which occur for example during frequency offset conditions. The module tracks pointer movements as they occur, and displays the current pointer value(s).

Loss of pointer is also detected and displayed. The LOP alarm indicator changes from green (no alarm) to red (active alarm) if the module is unable to track pointer movements. The indicator changes back to green when the pointer is recovered.

The module can monitor the current SPE pointer value as the module tracks pointer movements.

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Status information about pointer activity can also be monitored. The pointer status information displayed is described in the table below:

Pointer Status	Description
New Data Flag	Displays the number of new pointer values containing a valid new data flag.
No New Data Flag	Displays the number of new pointer values not accompanied by a valid new data flag.
Decrement Adjustments	Displays the quantity of decrementing pointer movements which have occurred since the start of the measurement period.
Increment Adjustments	Displays the number of incrementing pointer movements which have occurred since the start of the measurement period.

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Capturing Data from the Received Signal

The module can provide two types of data capture:

Snapshot Capture: This enables the module to capture and store the TOH bytes for 201 frames, or all bytes for 6 complete frames. The module can also capture the 16-byte (CRC) or 64-byte Path Trace message, or can capture the 16-byte (CRC) or single byte Section Trace message. There are no duration measurements associated with this type of capture. The bytes that are available for capture are listed below:

Pointer bytes (H1, H2)
APS bytes (K1, K2)
All TOH bytes
All POH bytes (J1 to Z5)

Any transmit trigger (TTL) signal can also be used to trigger a capture (except Scrambler). The receive trigger (TTL) signals can also be used to trigger a capture (except Descrambler, Memory Capture - single and repetitive).

Sequenced Capture: This enables the module to capture and store the value of a single byte or a pairs of bytes and the number of frames that the value remained unchanged. Note, if the frame count exceeds 80,000 the count on the display changes to show the length of time that the value has remained unchanged. The bytes that are available for capture are listed below:

Pointer bytes (H1, H2)
APS bytes (K1, K2)
Single TOH byte (A1 to E2)
Single POH byte (J1 to Z5)

The data capture process also requires a trigger which can be manually initiated by the user, or when one of the bytes listed below changes value or has a specific value.

Pointer bytes (H1, H2)
APS bytes (K1, K2)
Single TOH byte (A1 to E2)
Single POH byte (J1 to Z5)

When the "Manual" trigger action is selected in both snapshot and sequence captures, the captured results are available as soon as you click the mouse on the Capture Data button. Note a manual capture can also be triggered using the Capt button on the capture Display subpanel.

When the "On Change" or "On Value" trigger action is selected, the captured results will be with reference to the trigger point:

- For a TOH byte snapshot capture, 201 frames are captured (up to 100 frames before the trigger and the remainder are after the trigger point). For a Frame snapshot capture, 6 frames are captured (up to 3 frames before the trigger and the remainder are after the trigger point). Note, that during a snapshot capture results are not available for display prior to a trigger being received (the capture Display button only appears after a trigger has been received).

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- For a sequenced capture there are up to 16384 samples before the trigger point and 32767 after the trigger point. Note, that during a sequence capture results are available for display prior to a trigger being received (the capture Display button appears as soon as you click the mouse on the Capture Data button).

If you want to stop a capture or want to change settings (these cannot be changed while a capture is in progress), then click the mouse on the Capture Data button. The button momentarily displays **`Force Capture`** as it terminates the capture, then displays **`Capture Data`** again.

Dropping a Payload from the Received Signal (MULTIrate mode only)

The module can drop payloads for different line rates:

- **STS-48 Line Rate:**
  One of 16 groups of three STS-1 SPEs can be dropped from the SONET signal.

  One of 16 STS-3c SPEs can be dropped from the SONET signal.
- **STS-12 Line Rate:**
  One of 4 groups of three STS-1 SPE can be dropped from SONET signal.

  One of 4 STS-3c SPEs can be dropped from the SONET signal.
- **STS-3c Line Rate:**
  Three STS-1 SPEs are dropped from the SONET signal.

  One STS-3c SPEs can be dropped from the SONET signal.
- **STS-1 Line Rate:**
  The STS-1 payload can be dropped from the SONET signal.

Payloads which are dropped can be applied to external payload receivers (via the VXI Mainframe backplane) for analysis. STS-12c and STS-48c payloads cannot be dropped.

Dropping a Tributary from the Received Signal (TRIButary mode only)

The STS-48 framed signal received by the module is made up of either 48 STS-1 channels, 16 STS-3 channels, or 4 STS-12 channels.

The module's "drop channel" function allows you to demultiplex a tributary signal from one of the STS-1, STS-3 or STS-12 channels in the frame. The dropped tributary can then be applied to an external Transport Overhead Receiver such as an HP E1672A or HP E1674A for further processing. The tributary signal and its timing signal are outputted through the module's front-panel *Channel Drop Trib Data Out* and *Channel Drop Trib Clock Out* ports.

Dropping an ATM Payload to an HP E1615A (STS-48c & Option 001 only)

The module can drop an ATM signal to an HP E1615A (through the *Channel Drop Payload Out* port) when it is the payload of an STS-48c signal received at the *Electrical Line Data In* port.

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Dropping an EOC from the Received Signal

The module can drop an overhead byte to external equipment for analysis.

Activating a Trigger Source

The *Trig Out (TTL)* ports on the front-panel of the module enable you to synchronize external test equipment to events detected by the module for time delay measurements. The trigger sources are listed below.

- None
- Out of Frame
- Loss of Frame
- Frame Pulse
- Descrambler
- Line FERF
- Line AIS
- Memory Capture - single
- Memory Capture - repetitive
- B1 Er
- B2 Err
- B3 Err
- Path FEBE Err
- Line FEBE Err
- PRBS Err
- Ptr Action
- Ptr Realign
- J1 Position
- OH BER

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SDH Transmit Operation

This section describes the modules functions when configured for SDH signal transmission. The functions which are described in detail are listed below.

- Generating a SDH Framed Signal
- Selecting the Transmitter's Clock Source
- Generating Section Overhead
- Generating Regenerator Section Overhead (RSOH)
  - Generating Errors to test Out of Frame (OOF) Alarms
  - Generating Loss of Frame (LOF) Alarms
  - Generating Regenerator Section (RS) BIP-8 Errors
  - Generating a Regenerator Section (RS) Trace Message
- Generating Multiplexer Section Overhead (MSOH)
  - Generating Multiplexer Section (MS) BIP-24 Errors
  - Generating MS AIS Alarms
  - Generating MS RDI (Remote Defect Indication) Alarms
  - Generating Multiplexer Section Protection (MSP) Conditions
  - Generating Alternate MSP Conditions
- Accessing EOC Data Channels
- Generating Overhead Bit Errors (OHBER)
- Editing Section Overhead (SOH) Bytes
- Generating a SOH Sequence
- Controlling AU Pointers
  - Generating Incr/Decrementing AU-4 Pointer Movements
  - Generating AU Pointer Movements Manually
  - Generating a AU Pointer Sequence
  - Generating AU Pointer Errors
- Stressing
- Generating VC Path Overhead (POH)
  - Generating a Path Trace Message
  - Generating Path BIP-8 Errors (concatenated operation only)
  - Assigning a Signal Label
  - Generating Path REI (Remote Error Indicator) Errors (concatenated operation only)
  - Generating Path AIS Alarms
  - Generating Path RDI Alarms
  - Programming the F2, H4, Z3, Z4 and Z5 SPE POH Bytes
- Generating VC Payloads (MULTIrate mode only)
- Generating Clock Durability Test Patterns
- Generating Data Errors
- Activating a Trigger Source

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Generating a SDH Framed Signal

The module can transmit a SDH framed signal (overhead and payload) when it is configured for one of the operating modes listed below:

- **Terminal Mode:**
  In this mode the module emulates a SDH Terminal, a network element which has independent transmit and receive paths.

  The module's transmitter provides the transport overhead (TOH) bytes (which support the transmission of a 51 Mb/s, 155 Mb/s, 622 Mb/s or 2.4 Gb/s framed signal across a network) and the payload information.

  The payloads provided by the module can have the following mappings: AU3, AU4, U4-4c or AU4-16c. If the module is configured for MULTIrate operation, AU3 and AU4 payloads can also be provided from an external source. The section overhead (SOH) bytes which support the transmission of the framed signal across a network and the payload information are provided by the module's transmitter.

  If the module is Option 001 and in TRIButary (STM-16c) mode, then an externally sourced ATM signal from an HP E1615A can be inserted into the concatenated payload. The external ATM signal is applied to the module through the front-panel *Channel Add Payload In* port.

  Alarms and errors can also be inserted into the transmitted SDH signal.

- **Through Mode:**
  This mode is only available when the transmit and receive line rates are the same. When this mode is selected, the received SDH signal can be monitored for alarms and errors before being passed to the transmit section. All receiver function operate as specified, but the transmit section operates in the modes listed below:

  Transparent Mode: Normal receiver operation is permitted but the received SDH signal is retransmitted without alteration. No changes are allowed to the data before retransmission except for Data Error Add. No recalculation will be performed on the B1, B2 or B3.

  Recalc Mode: Normal receiver operation is permitted. All available transmitter stressing functions are allowed before the SDH is retransmitted. If the module is in MULTIrate mode, a payload (from the module or from an external source) can be added into the signal before retransmission. New values will be calculated for B1, B2 or B3.

- **Regenerator Mode:**
  This mode is only available when the transmit and receive line rates are the same. It operates similar to Through Mode but the complete RSOH is regenerated. The Regenerator section operates in the modes listed below:

  Transparent Mode: Normal receiver operation is permitted but the received SDH signal is retransmitted with a regenerated RSOH. No changes are allowed to the remainder of the data before retransmission except for Data Error Add. No recalculation will be performed on the B2 or B3.

  Recalc Mode: Normal receiver operation is permitted. All available transmitter stressing functions are allowed before the SDH is retransmitted. The RSOH will be regenerated before transmission. If the module is in MULTIrate mode, a payload (from the module or from an external source) can be added into the signal before retransmission. New values will be calculated for B1, B2 or B3 (where applicable).

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See the *Through Mode or Repeater/Regenerator* section for more detail.

- **Trib Add Mode (TRIButary mode only):**
  An externally sourced STM-0, STM-1 or STM-4 tributary signal can be inserted into the payload using the module's "Tributary Add" function. The tributary signal (applied to the front-panel *Channel Add Trib Data In* port) can be inserted into a specific "foreground tributary" channel (all other channels are filled with a background pattern supplied by the module), or it can be inserted into all channels to simulate bulk loading. The module also monitors the incoming tributary signal for Data Loss, Clock Loss, OOF, LOF, B1 errors.

  If the tributary signal is inserted into channel #1, then some SOH bytes of the tributary are copied into the corresponding locations of the STM-16 SOH. This is covered in more detail in the *Generating Transport Overhead* section.

  The modules three "Tributary Add" modes are described below:

  - The STM-16 SOH and VC can be filled with an internally generated pattern, see the *Generating Section Overhead* and *Generating VC Payloads* sections in this chapter.
  - An externally sourced tributary signal can be inserted into a specific "foreground tributary" channel. All other channels in the frame are filled with a background pattern. To select a background pattern, see the *Generating Section Overhead* and *Generating VC Payloads* sections in this chapter.
  - The externally sourced tributary signal can be inserted into all channels in the frame.

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Selecting the Transmitter's Clock Source

The transmitter's timing is derived from one of the sources listed below.

Mode	External Clock Source
Trib Clk In*	A 52, 155 or 622 Mb/s tributary signal applied to.the *Channel Add Trib Clock In* port.
Ref Clk In	A 155 Mb/s reference signal applied to the *Channel Add Ref Clock In* port.
Recovered Clk	A 2.4 Gb/s clock received at the *Electrical Line Clock In* port.
Internal	A 155 Mb/s clock signal derived from the module's 2.4 Gb/s internal clock reference.
Timing Ref**	A 20 Mb/s clock derived from an HP E1679A Timing Reference which must be located immediately to the left of the module. This clock is applied to the module along the VXI Mainframe's backplane.

*Only available in TRIButary mode.

** The **Timing Ref** mode is not available if the Timing Reference module is not present. If one of the above external source is selected, the appropriate clock signal must be connected to the module for the transmitter to operate correctly.

Generating Section Overhead (SOH)

The module generates the SOH part of a SDH framed signal. The SOH is made up of Regenerator Section overhead bytes and Multiplexer Section overhead bytes. Refer to the *Generating Regenerator Section Overhead* and *Generating Multiplexer Section Overhead* sections in this chapter for detailed information.

In TRIButary mode, the module can also accept overhead bytes from an external source using the module's "Tributary Add" function. When the external tributary is inserted into channel #1 of the payload, some tributary SOH bytes are copied into the corresponding locations in the SDH frame signal.

The module can also overwrite SOH bytes:

- By using the module's "Embedded Operation Channel" EOC function. The SOH bytes are applied to the module through the front panel *Serial Data* port.
- By inserting a PRBS pattern in to selectable channels, except for the BIP and pointer bytes. Single errors can also be inserted into the pattern.

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Generating Regenerator Section Overhead (RSOH)

The module generates the overhead bytes which support the transmission of an SDH signal across the Regenerator Section span of a network. The Regenerator Section overhead (RSOH) bytes are described below.

Byte	Label	Description
A1, A2	Framing	Provides framing for the SDH signal. There are "n" A1 bytes followed by "n" A2 bytes in an STM-16 frame.
J0	RS Trace	The module can set this byte up to be the C1 Identification byte or the J0 Regenerator Section Trace byte. C1 Identification Byte Enables all channels in a SDH signal to be identified. Each STM-1 channel is assigned an identification number corresponding to its order of appearance in the SDH frame. J0 Regenerator Section Trace Byte This byte allows you to transmit a message in the RSOH to verify the continued connection between the transmitting and receiving ends of a Section span.
Z0		These bytes are reserved for function not yet defined.
B1	RS BIP-8	Provides regenerator section error performance monitoring. The B1 byte contains an 8-bit wide bit-interleaved parity (BIP-8) computation calculated for all bits of the previous SDH frame. This byte is defined only for STM-1 #1a of a SDH frame.
E1	Orderwire	Provides a local orderwire channel for voice communication between regenerators, hubs and remote terminal locations. This byte is defined only for STM-1 #1a of a SDH frame.
F1	User Channel	Provides an 64 kbit/s proprietary data communications channel for the network operator. It is terminated at each regenerator section terminating equipment.
D1 to D3	Data Comm. Channel	Provides a 192 kbit/s data communications channel (DCC). Enables message-based network management and maintenance information to be exchanged between RS terminating equipment. These bytes are defined only for STM-1 #1a of a SDH frame.

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Default Settings

The default values assigned to the RSOH are listed in the following table. These values can be modified by the user, unless stated otherwise.

Byte	Label	Description
A1, A2	Framing	A1 is assigned F6 in hex (11110110), and A2 is assigned 28 in hex (00101000).
J0	RS Trace	J0 and Z0 are assigned the C1 Identification byte values. Each STM-1 channel is assigned an identification number corresponding to its order of appearance in the SDH STM-n frame.
Z0		See J0.
B1	RS BIP-8	This value is always calculated by the module. It cannot be modified by the user.
E1	Orderwire	E1 is assigned the value zero by the module. However, when the module is in TRIButary mode and an external tributary signal is inserted into channel #1 of the SDH frame, the module overwrites the current E1 byte value with the E1 byte value from the external tributary RSOH. This value can be modified through the appropriate HP E1671A or HP E1673A module. Note that the E1 byte value is only defined for channel #1 of the SDH frame.The *Serial Data* port can also be used to assign a value to this byte.
F1	User Channel	F1 is assigned the value zero by the module. However, when the module is in TRIButary mode and an external tributary signal is inserted into channel #1 of the SDH frame, the module overwrites the current F1 byte value with the F1 byte value from the external tributary RSOH. This value can be modified through the appropriate HP E1671A or HP E1673A module. Note that the F1 byte value is only defined for channel #1 of the SDH frame.The *Serial Data* port can also be used to assign a value to this byte.
D1 to D3	Data Comm. Channel	D1 to D3 are each assigned the value zero by the module. However, when the module is in TRIButary mode and an external tributary signal is inserted into channel #1 of the SDH frame, the module overwrites the current D1 to D3 byte values with the D1 to D3 byte values from the external tributary RSOH. These values can be modified through the appropriate HPE1671A or HP E1673A module. Note that the D1 to D3 byte values are only defined for an external tributary signal inserted in channel #1 of the SDH frame.The *Serial Data* port can also be used to assign a value to this byte.

Generating Errors to test Out of Frame (OOF) Alarms

The module can check a network equipment's ability to detect an OOF alarm by inserting errors into the A1 and A2 framing bytes for at least five consecutive SDH frames. Framing bytes can be errored in the following four ways:

- By erroring all framing bytes in a SDH frame using the module's **`FW On/Off`** function. An 8-bit pattern (a user-defined mask set through the "Stressing" subpanel) is inserted into all A1 and A2 bytes.
- By erroring individual framing bytes in a SDH frame by editing the byte values using the module's **`SOH Byte Access`** function. For more information on SOH byte access, see

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the *Editing SOH Bytes* section.

- By erroring all framing bytes in the selected SDH frames using the module's "Stressing" **Fword Loss** function. An 8-bit pattern (user-defined using mask) is inserted into all A1 and A2 bytes of the selected frame.
- By erroring individual framing bytes using the module's "Stressing" **Fword Err** function. The user defines the error mask for the A1 and A2 bytes. This is typically used to stress the boundary of the A1 and A2 bytes.

NOTE The "Stressing" **Fword Loss** and **Fword Err** functions can also be used to generate signals that check network equipment's ability to regain frame alignment. This is done using the "Stressing" **Norm On** function.

Two stress states can be selected when using the module's "Stressing" function:

- Single
  The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.
- Sequence
  The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.
  The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

NOTE An LOF alarm is generated:

- When an OOF signal is present for 3 ms or more and the alarm threshold of the receiver's LOF Timer is set to **Fixed**.
- When an OOF signal is present for 24 frames and the alarm threshold of the receiver's LOF Timer is set to **Integrating**.

Generating Loss of Frame (LOF) Alarms

The module can check a network equipment's ability to detect a LOF alarm by generating Out of Frame (OOF) alarms for 3 ms, or when 24 frames with OOF have been received. For more information on OOF alarms, see the *Generating Out of Frame (OOF) Alarms* section.

Generating Regenerator Section (RS) BIP-8 Errors

"Bit Interleaved Parity" (BIP) errors can be inserted into the transmitted B1 byte. Errors are inserted after the B1 byte value has been calculated. They can be inserted as single errors, or at rates of $a.b\times10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 5 to 10.

If you are inserting single errors, you can select which bits in the B1 byte you want to error.

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Generating a Regenerator Section (RS) Trace Message

The module can check the continued connection between the transmitting and receiving ends of a regenerator section span by transmitting a message in the J0 byte.

- **16 bytes repeating sequence mode:** The first byte contains a frame start marker (bit 1 set to 1),and the result of a CRC-7 calculation over the previous frame (bits 2 to 8). The remaining 15 bytes are user defined and take the binary form 0XXX XXXX. These byte values will be cycled over 16 consecutive frames.
- **64 byte repeating sequence mode:** The 16 byte sequence defined above repeated four times.
- **Single byte repeating sequence mode:** The J0 value is 01 Hex which is consistent with older equipment and should be interpreted by new NE as "Regenerator Section Trace unspecified".

Alternatively, the J0 byte may be used as an identifier for each channel in a SDH signal.

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Generating Multiplexer Section Overhead (MSOH)

The module generates the overhead bytes which support the transmission of a SDH signal across the Multiplexer Section span of a network. The MSOH bytes are described below.

Byte	Label	Description
H1 to H3	Pointers	Provides the linkage between the section overhead (SOH) and the virtual container (VC). There are payload pointers for each STM-1 in a SDH frame. Bytes H1 and H2 indicate the offset in bytes between the pointer and the first byte of an STM-1 VC. They perform frequency justification, and are used to identify STM Path Alarm Indication Signal (AIS). Byte H3 is the pointer action byte and is allocated for STM-1 VC justification purposes.
B2	RS BIP-24	Provides MS error performance monitoring. There are three B2 bytes for each STM-1 in the SDH frame. These B2 bytes contain a 24-bit wide bit-interleaved parity (BIP-24) computation calculated for all bits of the MSOH and payload envelope capacity of the previous STM-1 frame.
K1, K2	MSP Channel	Provides automatic protection switching (APS) signaling between line terminating equipment. The K2 byte is also used to identify MS AIS and MS Far End Receive Failure (RDI). These bytes are defined only for STM-1 #1a of a SDH frame.
D4 to D12	Data Comm. Channel	Provides a 576 kbit/s data communications channel (DCC). Enables message-based network management and maintenance information to be exchanged between MS terminating equipment. These bytes are defined only for STM-1 #1a of a SDH frame.
S1	Sync Status	Provides information on the synchronization status of a Network Element.
M1	MS REI	Provides multiplexer Section Remote Error Indication. Contains the BIP-24 errors that have been detected.
E2	Orderwire	Provides an express orderwire channel for voice communication between MS terminating equipment. This byte is defined only for STM-1 #1a of a SDH frame.

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Default Settings

The default values assigned to the MSOH are listed in the following table. These values can be modified by the user, unless stated otherwise.

Byte	Label	Description
H1 to H3	Pointers	The module assigns the following pointer default values at power-on or after a module reset. H1 is assigned 68 in hex H2 is assigned 00 in hex H3 is assigned 00 in hex Pointer values can be modified using the module's *SOH Byte Access* or *Pointer Action* functions. When the module is in TRIButary mode and an external tributary signal is inserted into a specific channel in the SDH frame, the module copies the H1 to H3 byte values from the external tributary MSOH to the H1 to H3 bytes associated with the selected channel. The module continues to assign the values to the remaining 15 background channels (see default values shown above). If the external tributary signal is inserted into all 16 channels in the SDH frame, the module copies the H1 to H3 byte values from the external tributary MSOH to all H1 to H3 bytes.
B2	RS BIP-24	This value is always calculated by the module. It cannot be modified by the user.
K1, K2	MSP Channel	K1 and K2 are each assigned the value zero by the module.
D4 to D12	Data Comm. Channel	D4 to D12 are each assigned the value zero by the module.
S1	Sync Status	Bits 5 to 8 assigned the value zero by the module.
M1	MS REI	Indicates that the BIP-24 errors that have been detected.
E2	Orderwire	E2 is assigned the value zero by the module.

Generating Multiplexer Section BIP-24 Errors

Single "Bit Interleaved Parity" (BIP) errors can be inserted into the SDH framed signal by erroring specific bits in any one of the STM-1 B2 bytes. Errors can also be added at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 3 to 10. Errors are evenly distributed over all bits of all B2 bytes, and are inserted after the B2 byte value has been calculated.

Generating Multiplexer Section (MS) AIS Alarms

The module can test a Line Terminating Equipment's ability to detect multiplexer section AIS alarms by inserting MS AIS into the K2 byte, or by overwriting all MS overhead and VC bytes with all 1's. MS AIS can be generated in the following three ways:

- By clicking the mouse on the AIS Off control to AIS On.
- By editing the K2 byte value using the modules **SOH Byte Access** function. For more

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information on TOH byte access, see the *Editing SOH Bytes* section.

- Using the module's "Stressing" **MS AIS** function. This function allows you to apply the MS AIS alarm to consecutive SDH frames in a specified frame sequence. Two stress states can be selected:

  - Single
    The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.

  - Sequence
    The alarm is applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

    The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

Generating MS RDI (Remote Defect Indication) Alarms

The module can test a Line Terminating Equipment's ability to detect MS RDI alarms by inserting MS RDI into the K2 byte.

MS RDI alarms can be generated in the following three ways:

- Using the mouse to set the RDIoff control button to RDIon.
- By editing the K2 byte value using the modules **SOH Byte Access** function. For more information on SOH byte access, see *Editing SOH Bytes*.
- Using the module's "Stressing" **MS RDI** function. This function allows you to apply the MS RDI alarm to consecutive SDH frames in a specified frame sequence. Two stress states can be selected:

  - Single
    The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.

  - Sequence
    The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

    The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

Typically, 5 frames are required for MS RDI to be detected by receiving equipment.

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Generating Multiplexer Section Protection (MSP) Conditions

You can check the MSP capability of Line Terminating Equipment by transmitting the appropriate MSP information in the K1 and K2 bytes. These bytes are generated internally by the HP E1676B or externally using the "EOC add" capability, or when the module is in TRIButary mode they can be supplied externally in a tributary signal from a Transport Overhead Generator (such as the HP E1671A or HP E1673A).

When the module is in TRIButary mode, and you are using the HP E1676B to control the K1 and K2 bytes and intend inserting an external tributary signal into the SDH framed signal, then the HP E1676B "Trib Add" function must be used to locate the tributary signal in the STM-1 #2 to #16 or STM-4 #2 to #4 locations in the SDH framed signal.

If you use an external tributary to control K1 and K2, then the HP E1676B "Trib Add" function must be used to locate the tributary signal in the STM-1 #1, STM-3 #1 or STM-4 #1 of the SDH framed signal.

Generating Alternate MSP Conditions

The module can test a Line Terminating Equipment's ability to detect changes in MSP conditions by inserting alternate MSP values into the K1 and K2 bytes. Alternate MSP values can be generated in the following two ways:

- By editing the byte values using the modules **SOH Byte Access** function. For more information on SOH byte access, see the *Editing SOH Bytes* section.
- Using the module's "Stressing" **APS** function the module can be programmed to switch between two different sets of K1K2 byte values.

NOTE With an internal payload both values of K1K2 are set in the module. In "TRIButary - Trib Add" mode, if the tributary is added to channel #1 then the initial value of K1K2 is derived from the tributary.

- Single new K1K2 value
  The alarm is applied in a user-defined number of consecutive frames in the range 1 to 63. The alarm state can also be applied continuously then turned off for a user-defined number (1 to 63) of consecutive frames.
- Sequence values of K1K2
  The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (initial K1K2 value user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the 2nd and last value durations within the holding pattern. *n* and *m* both have the range 1 to 64.

  The *p+n+m* sequence described assumes the default state of the stressing is normally off ("Stressing" **Norm Off** function selected). If the default state is set to **Norm On**, the values of states of *p*, *n* and *m* are inverted.

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Accessing EOC Data Channels

Data applied to the module's *Serial Data* port may be inserted into specific TOH bytes of the STM-16/STM-16c signal at the *Electrical Line Data Out* port.

Generating Overhead Bit Errors (OHBER)

Errors can be injected and detected in a single overhead channel or in groups of overhead bytes carrying PRBS.

Editing Section Overhead (SOH) Bytes

New values can be assigned to internally generated section overhead bytes with values in the range 00 to FF in hex.

You cannot, however, assign new values to:

a The B1 and B2 BIP-8 bytes - these are always calculated by the module.

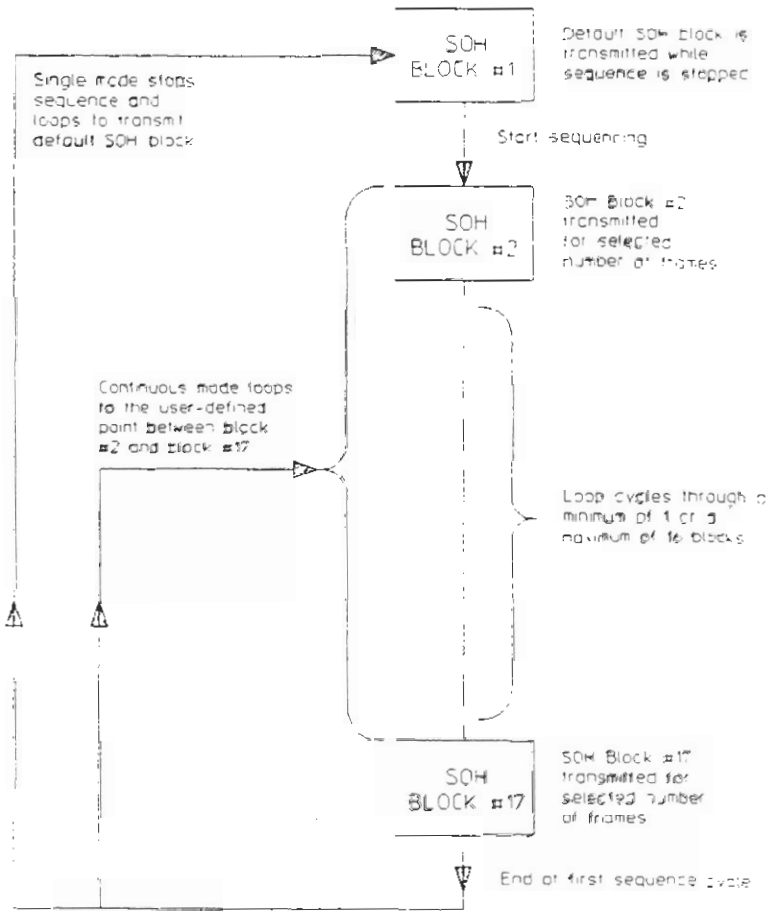
b When the module is in TRIButary mode, the byte values copied from an externally applied tributary when the tributary is inserted into a channel of the SDH frame. These values can only be accessed through the module supplying the external tributary signal (modules such as the HP E1671A and HP E1673A).

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Generating a SOH Sequence

The module provides programmable sequencing of up to 16 transport overhead blocks for stressing network equipment. All bytes are programmable except the B1 and B2 bytes which are automatically calculated.

Three modes of sequencing are available, single, continuous and start/stop operation. Refer to the following diagram.



Each block, with the exception of the first (default block), has a selectable repetition length of 0 to 65535 frames per block. Each block is repeated for the defined number of counts before the next block begins. If a block is set to zero, that block is skipped and the next block is started. When all blocks have been transmitted, the sequence either returns to the default overhead block (single mode), or loops back to a user defined point in the sequence between blocks # 2 to # 17 (continuous mode) to continue looping until stopped.

The value of each transport overhead byte for SOH blocks 2 to 17 is user-definable.

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Controlling AU Pointers

There are four ways to control the movement of internally generated payload pointers, and these are described in the table below. Note, you cannot control externally generated pointers which appear in the payload when the STM-16 "Tributary Add" function is used, or when an external ATM signal is inserted into the STM-16c concatenated payload.

Mode	Description
Decrement/ Increment	The AU pointer value can be decremented or incremented by one. Payload integrity (such as PRBS patterns) is maintained throughout the movement.
Manual	The AU pointer can be assigned any value in the range 0 to 782, with or without the New Data Flag (NDF) set. When initiated, a discontinuity in the payload for the duration of the movement will occur, which may cause PRBS patterns to lose sync.
Sequence	The AU pointer can be programmed to provide the maximum rate of pointer change, which is 1 pointer movement every four frames in either a positive or negative direction.
Periodic	The AU pointer can be programmed to make periodic movements in either a positive or negative direction. The movement rate can be set to 1, 2, 5, or 10 movements/ sec. Payload integrity (such as PRBS patterns) is maintained throughout all movements.
Timing Ref	If you are using a HP E1679A (with this module) then its pointer control features can be used to provide pointer movements, refer to the *HP E1679 User's Manual* for more information.

An invalid pointer value facility is also available which overrides the selected pointer movement. When enabled, the AU pointer is set to 783 (maximum valid pointer value+1).

Generating Incr/Decrementing AU Pointer Movements

The AU pointer value can be manually incremented or decremented in steps of one.

Generating AU Pointer Movements Manually

The AU pointer can be assigned any value in the range 0 to 782, with or without the New Data Flag (NDF) set.

Generating an AU Pointer Sequence

The AU pointer can be programmed to provide the maximum rate of pointer change, which is 1 pointer movement every four frames in either a positive or negative direction.

Generating a Periodic AU Pointer Sequence

The AU pointer can be programmed to make periodic movements in either a positive or negative direction. The movement rate can be set to either 1, 2, 5, or 10 movements per second.

Generating AU Pointer Errors

The module can generate AU pointer errors to test the behavior of network equipment.

To generate pointer errors, the 16 bits which make up the H1H2 pointer bytes can be errored as follows:

- Pulsed On/Off:

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In "Pulsed On" mode, the module can be programmed to inject errors into the H1H2 bytes in consecutive frames (user-selectable in the range 1 to 63). Error injection is turned Off for consecutive frames (user-selectable in the range 1 to 63) when "Pulsed Off".

- Sequence:
  The H1H2 pointer bytes can be errored in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive. holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

- Pointer Action:
  The H1H2 pointer bytes can be errored according to a 16-bit user set mask. The bits specified by the mask are errored every time a pointer adjustment (increment, decrement, new pointer with or without NDF or invalid pointer) occurs.

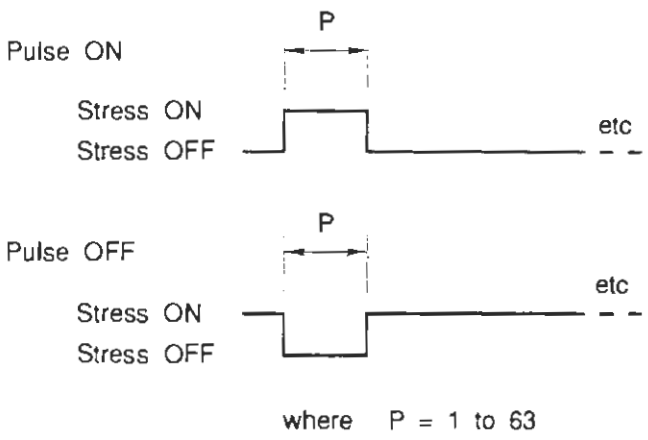
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Stressing

The module provides a stressing facility to allow you to assert alarms and to error particular overhead bytes for specific numbers of consecutive frames.

Two modes of signal stressing are available, single and sequence. Both modes of operation are available when stressing MS AIS/RDI alarms, stressing MSP, stressing Frameword Loss, and injecting Frameword errors.

Single Pulse Mode. The single pulse on/off mode produces the following:

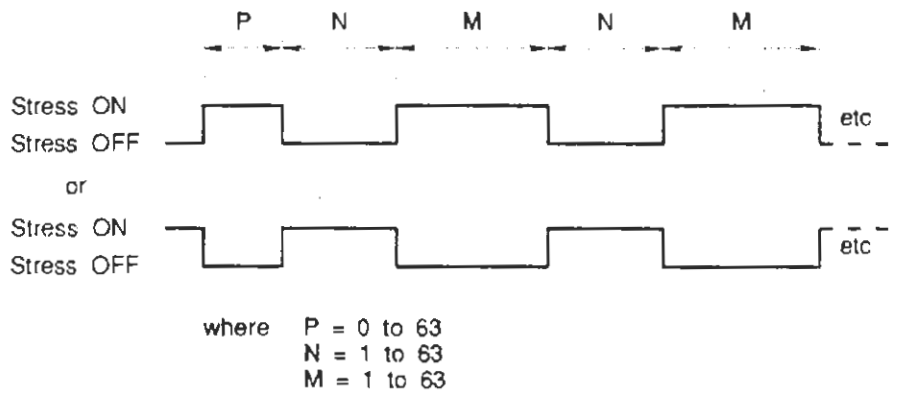


Single Pulse Stressing

If the initial state is "off", this mode produces a single "on" pulse. Conversely, if the initial state is "on", this mode produces a single "off" pulse.

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Sequence Mode. The sequence mode produces a $p+n+m$ function as shown by the following figure.



where P = 0 to 63
N = 1 to 63
M = 1 to 63

Sequence Pulse Stressing

If the initial state was "off", this mode produces an initial "on" pre-stress pulse (p) and then an "off-on" repeated sequence ($n+m$). Conversely, if the initial state is "on", this mode produces an initial "off" pre-stress pulse (p) and then an "on-off" sequence ($n+m$). After the initial stress, the values of n and m can be changed and will take effect synchronously at the end of the m stress period.

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Generating VC Path Overhead

The module generates the "n" POHs required for a VC made up of "n" STM-1 tributaries (where n = 0, 1, 4 or 16). The nine bytes of the 1st POH can be generated by the module or can be user defined. The remaining (2nd to nth) POHs are automatically assigned the values defined for the 1st POH.

Byte	Label	Description
J1	Path Trace	This is the first byte in the VC. Its location is indicated by the associated AU pointer. This byte allows you to transmit a message in the transmitted payload to verify the path connection between the source of the path signal and the receiving terminal.
B3	Path BIP-8	This byte provides path error performance monitoring. It contains an 8-bit wide bit-interleaved parity (BIP-8) computation calculated for all bits of the previous SPE. *You can insert Path BIP errors into the transmitted B3 byte at a specified error rate or as single errors.*
C2	Signal Label	This byte indicates the structure of the SPE. *You can assign a specific label (8-bit byte) to the transmitted payload.*
G1	Path Status	This byte reports back to the originating path terminating equipment the path-terminating status and performance. The value in this byte is dependent on the status of the path alarms and the REI value. Bits 1 to 4 of this byte contain the REI count. Bit 5 is the Path RDI. Bits 6, 7 and 8 are unassigned. *You can insert REI errors into the transmitted G1 byte at a specific error rate or as single errors, or generate a RDI alarm.*
H4	Multiframe	This byte provides a multiframe phase indication for VC payloads and can be payload specific.
F2,Z3, Z4, Z5	Spare	Each byte can be programmed with a sequence of 8 bytes.

Generating a Path Trace Message

A path trace message (J1 byte) can be created or edited. Two formats are available depending on whether a cyclic redundancy check (CRC) is required for frame alignment/bit error monitoring.

- **Non-CRC mode:** Up to 64-bytes in length of the path trace can be transmitted as a message, which includes the carriage return (<CR>) and line feed (<LF>) terminating characters. Each character is 8-bits long.
- **CRC Mode:** Up to 16-bytes in length of the path trace message can be transmitted. One byte is reserved for a CRC-7 value which also acts as the message frame marker.

Generating Path BIP-8 Errors (concatenated operation only)

Path "Bit Interleaved Parity" (BIP) errors can be inserted into selected bits of the transmitted B3 byte as single groups of errors, or at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 5 to 10. Errors are evenly distributed.

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Assigning a Signal Label

The following labels can be assigned to the C2 byte to reflect the current VC payload mapping:

Signal Label	Signal Label
Unequipped	Async 139M
Equ-Non Spec	T1S1-BISDN
Trib float	IEEE 802.6
Trib Locked	Async FDDI
Async DS3	Equipped
Syntran	

Generating Path REI Errors (concatenated operation only)

Path "Remote Error Indication" (REI) can be inserted into the transmitted G1 byte as single groups of errors, or at rates of a.b $\times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 3 to 10. Errors at these rates are evenly distributed. When single is selected, an error rate count (user-selectable in the range 1 to 15) is transmitted in the REI bits.

Generating Path AIS Alarms

The module can test a Path Terminating Equipment's ability to detect Path AIS alarms by overwriting all AU pointer bytes (H1, H2, H3), and all VC bytes with an all 1's pattern.

Three alarm control modes can be selected:

- On/Off
- Pulsed On/Off
  In "Pulsed On" mode, the alarm state is inverted for consecutive frames (user-selectable in the range 1 to 63). The alarm reverts to its original pattern when "Pulsed Off".
- Sequence
  The alarm can be applied in a user-defined frame sequence comprising an initial stressing period *p* (user-selectable in the range 0 to 64), followed by a repetitive holding pattern. Two selectable parameters, *n* and *m*, define the On and Off durations within the holding pattern. *n* and *m* both have the range 1 to 64.

Generating Path RDI Alarms

The module can test a Path Terminating Equipment's ability to detect Path RDI ("Remote Detect Indication") alarms by setting bit 5 of the G1 byte to 1.

Three alarm control modes can be selected as described in "Generating Path AIS Alarms".

Programming the F2, H4, Z3, Z4 and Z5 VC POH Bytes

These bytes can be programmed with different values. Note that with tributary payloads, the H4 byte is generated in normal or simplified format.

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Generating VC Payloads (MULTIrate mode only)

The module provides AU mappings and payloads for different line rates:

- **STM-16 Line Rate:**
  Up to three externally generated AU3s can be mapped into an AUG. This AUG can be then mapped into any combination of 16 possible channels. All other channels are filled with simple byte patterns.

  One externally generated AU4 can be mapped into any combination of 16 possible channels. All other channels are filled with simple byte patterns.

  The VCs of four AU4-4cs can be filled with simple byte patterns.

  The VC of an AU4-16c concatenated payload can be filled with a PRBS or simple byte patterns.

- **STM-4 Line Rate:**
  Up to three externally generated AU3s can be mapped into an AUG. This AUG can then be mapped into any combination of 4 possible channels. All other channels are filled with simple byte patterns.

  One externally generated AU4 can be mapped into any combination of 4 possible channels. All other channels are filled with simple byte patterns.

  The VC of an AU4-4c concatenated payload can be filled with a PRBS or simple byte patterns.

- **STM-1Line Rate:**
  Up to three externally generated AU3s can be mapped into an AUG. All other channels are filled with simple byte patterns

  An externally generated AU4 payload can be directly mapped into the channel, or the channel can be filled with a PRBS or simple byte pattern.

- **STM-0 Line Rate:**
  An externally generated AU3 payload can be directly mapped into the channel, or the channel can be filled with a PRBS or simple byte pattern.

The AU3, AU4 payload can be generated by the module or from an external source, the AU4-4c and AU4-16c payloads can only be generated by the module.

- **STM-16 Line Rate - Tributary Add (TRIButary mode only)**
  An external STM-0, STM-1 or STM-4 tributary signal can be inserted into a single channel, or all channels in the STM-16 framed signal using the module's "Tributary Add" function. When the external signal is inserted into a single (foreground) channel, all other (background) channel payloads are provided by the module. Note, the AU format for the background is normally AU4, but can be set to either AU3 or AU4-4c by the user. (Note, if the tributary rate is STM-0, then the AU format is AU3.) If the "Tributary Add" function is not being used, the payload is provided by the module.

  If you select the AU4-4c format then B3 error correction is also available.

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During STS-16c operation the module provides a bulk filled concatenated payload. If the module is Option 001, an externally generated ATM signal from an HP E1615A can be inserted into the payload. The external ATM signal is applied to the module through the front-panel *Channel Add Payload In* port.

Generating Clock Durability Test Patterns

The module can test the clock recovery capability of a network receiver by using an all 1's or all 0's substitution pattern in the first row of the SDH framed signal. Up to 4176 bytes can contain the substitution pattern. Alternatively, the module can generate a CID pattern which is a repeating block of all 1s or all 0s (programmable in the range 1 to 200 bytes) alternating each frame starting at the first byte of the payload. The remainder of the payload is an all 0s scrambled payload with scrambler synchronized to the frame.

Generating Data Errors

Data errors can be inserted into the transmitted STM-16/STM-16c framed signal, either as single errors, or at rates of $a.b \times 10^{-n}$, where a.b is continuously variable between 1.0000 and 9.9999 where n = 3 to 10.

Activating a Trigger Source

The *Transmit Trig Out (TTL)* port on the front-panel of the module enables you to synchronize external test equipment to events detected by the module for time delay measurements.

The trigger sources are listed in the table below.

Trigger Source (TTL)	Trigger Source (ECL)
None	Frame Pulse
Frame Pulse	Eye Clock
Scrambler	
MS RDI	
MS AIS	
APS Change	
Frameword Off	
Err Frameword	
Err RS BIP	
Err MS BIP	
Err VC Data	
Err Path BIP	
Err REI	
Err Path REI	
Err PRBS	
Err Data	
Pointer Action	
Pointer Stressing	
Sequence	
OH BER	

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SDH Receive Operation

This section describes the modules functions when configured for SDH line signal monitoring. The functions which are described in detail are listed below.

- Receiving a SDH Framed Signal
- Monitoring Alarms
- Selecting Alarm Thresholds
- Monitoring Errors
- Viewing G.826 Error Analysis
- Monitoring Regenerator Section BIP-8 Errors
- Monitoring Multiplexer Section BIP-24 Errors
- Monitoring Multiplexer Section (MS) REI Errors
- Monitoring Path BIP-8 Errors (concatenated operation only)
- Monitoring Path REI Errors (concatenated operation only)
- Monitoring Overhead Bit Errors (OH BER)
- Monitoring Multiplexer Section Protection Switching (MSP) Conditions
- Monitoring AU Pointer Movements
- Capturing Data from the Received Signal
- Dropping a Payload from the Received Signal (MULTIrate mode only)
- Dropping a Tributary from the Received Signal (TRIButary mode only)
- Dropping an ATM Payload to an HP E1615A (STM-16c & Option 001 only)
- Dropping an EOC from the Received Signal
- Activating a Trigger Source

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Receiving an SDH Framed Signal

The module can accept a scrambled or unscrambled electrical STM-0, STM-1, STM-4 or STM-16 framed signal.

Monitoring Alarms

The module monitors the incoming SDH framed signal for the following conditions:

- Signal Loss (LOS)
- Loss of Frame
- Out of Frame (OOF)
- Multiplexer Section AIS (MS-AIS)
- Multiplexer Section RDI (MS-RDI)
- Path AIS (PAIS)
- Loss of Pointer (LOP)
- Path RDI
- PRBS not detected - concatenated operation only
- OH BER Sync

The module can also measure the duration (in seconds) of Signal Loss, Loss of Frame, Out Of Frame, MS AIS, MS RDI, Loss of Pointer, Path AIS, Path RDI OH BER alarm conditions and PRBS Sync Loss, and displays the results as:

Cumulative Results: Results accumulated from the start of the measurement period to the most recent 100 ms sampling period.
Integration Period Results: Results accumulated during the most recent complete measurement period.

Selecting Alarm Thresholds

An alarm indicator is asserted when the alarm threshold is exceeded. The alarm threshold is a specified number of consecutive frames with the alarm condition. You can specify when the alarm indicator is to be negated by specifying the number of consecutive frames that must be detected with no alarm condition.

Monitoring Errors

The module can monitor an SDH signal for the following errors:

- Regenerator Section (RS) BIP-8 (B1)
- Multiplexer Section (MS) BIP-24 (B2)
- Multiplexer Section (MS) REI
- Path BIP-8 Errors (concatenated operation only)
- Path REI Errors (concatenated operation only)
- PRBS Errors (concatenated operation only)
- OH BER

Results can be presented as follows:

Cumulative Results: Results accumulated from the start of the measurement period to the most recent 100 ms sampling period.
Integration Period Results: Results accumulated during the most recent complete measurement period.
Relative Period Results: Bit errors counted during the most recent 100 ms sampling pe-

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riod.

Errors are measured simultaneously and can be displayed as follows:

Count: Displays the total number of bit errors detected in the *N* byte(s) during the measurement period.
Ratio: Displays the *N* error count divided by the total number of bits over which all received *N* bytes were calculated.
Seconds: Displays the number of seconds in the measurement period during which a *N* error occurred. This is not applicable for "Relative Period" measurements.

Note, N can be B1, B2, B3, Path REI, MS REI, OH BER or PRBS.

Viewing G.826 Error Analysis

G.826 error analysis is also available for B1, B2 and B3 bytes when the module is configured for cumulative and period results. The results which are available are listed below:

Errored Block Count (EBC): Displays the total number of blocks in which one or more bits are in error.
Errored Seconds Count (ESEC): Displays the total number of one second periods containing one or more errored blocks.
Severely Errored Seconds Count (SES): Displays the total number of one second periods each containing a number of errored blocks, equal to or greater than 30% of blocks in 1 second, or at least one Severely Disturbed Period (SDP). In an network environment an SDP is defined as the occurrence of a network defect lasting for at least 1 ms or four blocks, whichever is the longest. LOS, OOF, LOF and AIS can cause such a defect.
Unavailable Seconds Count (UAS): A period of unavailable time begins at the onset of 10 consecutive SES events. These 10 seconds are considered part of the unavailable time. A new period of available time begins at the onset of 10 consecutive non-SES events. These 10 seconds are considered part of the available time.
Errored Seconds Ratio (ESR): Displays the ratio of errored seconds to the total seconds in available time.
Severely Errored Seconds Ratio (SESR): Displays the ratio of severely errored seconds to the total seconds in available time.
Background Block Error Ratio (BBER): Displays the ratio of Background Block Errors to the total block errors in available time. The count of total blocks excludes all blocks during Severely Errored Seconds.

Monitoring Multiplexer Section (MS) BIP-24 Errors

The module monitors the "Bit Interleaved Parity" (BIP) B2 byte for errors. Three B2 bytes each contain an 8-bit wide "Bit Interleaved Parity" (BIP-8) computation. This computation is calculated for all bits of the line overhead and payload envelope capacity of the corresponding STM-1 in the previous SDH frame. There are "n" MS BIP-8 (B2) bytes in the STM-n/STM-nc frame.

Monitoring Multiplexer Section (MS) REI Errors

The module monitors the Line "Remote Error Indication" M1 byte for errors. The M1 byte contains the number of interleaved bit block errors that have been detected by the far end Line Terminating Equipment.

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Monitoring Path BIP-8 Errors (concatenated operation only)

The module monitors the "Bit Interleaved Parity" (BIP) B3 byte for errors. The B3 byte contains an 8-bit wide "Bit Interleaved Parity" (BIP-8) computation. This computation is calculated for all bits of the payload envelope capacity of the previous AU before scrambling.

Monitoring Path REI Errors (concatenated operation only)

The module monitors the Path "Remote Error Indication" G1 byte (bits 1 to 4) for errors. The G1 byte contains the number of interleaved bit block errors that have been detected by the far end Path Terminating Equipment.

Monitoring Overhead Bit Errors (OH BER)

The module can monitor errors in a PRBS test pattern inserted into any of the transport overhead bytes (except for the B1 and B2 bytes).

Monitoring Multiplexer Section Protection Switching (MSP) Conditions

You can check the MSP capability of Line Terminating Equipment by monitoring the appropriate MPS information in the K1 and K2 bytes.

You can use the HP E1676B to continuously monitor the K1 and K2 byte values (at a 100 ms sample rate) or capture the values when a specific event occurs.

Monitoring AU Pointer Movements

The module can monitor AU pointer movements which occur for example during frequency offset conditions. The module tracks pointer movements as they occur, and displays the current pointer value(s).

Loss of pointer is also detected and displayed. The LOP alarm indicator changes from green (no alarm) to red (active alarm) if the module is unable to track pointer movements. The indicator changes back to green when the pointer is recovered.

The module can monitor the current AU pointer value as the module tracks pointer movements.

Status information about pointer activity can also be monitored. The pointer status information displayed is described in the table below:

Pointer Status	Description
New Data Flag	Displays the number of new pointer values containing a valid new data flag.
No New Data Flag	Displays the number of new pointer values not accompanied by a valid new data flag.
Decrement Adjustments	Displays the quantity of decrementing pointer movements which have occurred since the start of the measurement period.
Increment Adjustments	Displays the number of incrementing pointer movements which have occurred since the start of the measurement period.

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Capturing Data from the Received Signal

The module can provide two types of data capture:

Snapshot Capture: This enables the module to capture and store the TOH bytes for 201 frames, or all bytes for 6 complete frames. The module can also capture the 16-byte (CRC) or 64-byte Path Trace message, or can capture the 16-byte (CRC) or single byte Section Trace message. There are no duration measurements associated with this type of capture. The bytes that are available for capture are listed below:

Pointer bytes (H1, H2)
APS bytes (K1, K2)
All TOH bytes
All POH bytes (J1 to Z5)

Any transmit trigger (TTL) signals can also be used to trigger a capture (except Scrambler). The receive trigger (TTL) signals can also be used to trigger a capture (except Descrambler, Memory Capture - single and repetitive).

Sequenced Capture: This enables the module to capture and store the value of a single byte or a pairs of bytes and the number of frames that the value remained unchanged. Note, if the frame count exceeds 80,000 the count on the display changes to show the length of time that the value has remained unchanged. The bytes that are available for capture are listed below:

Pointer bytes (H1, H2)
APS bytes (K1, K2)
Single TOH byte (A1 to E2)
Single POH byte (J1 to Z5)

The data capture process also requires a trigger which can be manually initiated by the user, or when one of the bytes listed below changes value or has a specific value.

Pointer bytes (H1, H2)
APS bytes (K1, K2)
Single TOH byte (A1 to E2)
Single POH byte (J1 to Z5)

When the "Manual" trigger action is selected in both snapshot and sequence captures, the captured results are available as soon as you click the mouse on the Capture Data button. Note a manual capture can also be triggered using the Capt button on the capture Display subpanel.

When the "On Change" or "On Value" trigger action is selected, the captured results will be with reference to the trigger point:

- For a TOH byte snapshot capture, 201 frames are captured (up to 100 frames before the trigger and the remainder are after the trigger point). For a Frame snapshot capture, 6 frames are captured (up to 3 frames before the trigger and the remainder are after the trigger point). Note, that during a snapshot capture results are not available for display prior to a trigger being received (the capture Display button only appears after a trigger has been received).
- For a sequenced capture there are up to 16384 samples before the trigger point and 32767 after the trigger point. Note, that during a sequence capture results are available for display prior to a trigger being received (the capture Display button appears as soon as you click the mouse on the Capture Data button).

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If you want to stop a capture or want to change settings (these cannot be changed while a capture is in progress), then click the mouse on the Capture Data button. The button momentarily displays **Force Capture** as it terminates the capture, then displays **Capture Data** again.

Dropping a Payload from the Received Signal (MULTIrate mode only)

The module can drop payloads for different line rates:

- **STM-16 Line Rate:**
  One of 16 groups of three AU3s can be dropped from the SDH signal.

  One of 16 AU4s can be dropped from the SDH signal.
- **STM-4 Line Rate:**
  One of 4 groups of three AU3s can be dropped from the SDH signal.

  One of 4 AU4s can be dropped from the SDH signal.
- **STM-1 Line Rate:**
  Three AU3s are dropped from the SDH signal.

  One AU4 can be dropped from the SDH signal
- **STM-0 Line Rate:**
  One AU3 is dropped from the SDH signal.

Payloads which are dropped can be applied to external payload receivers (via the VXI Mainframe backplane) for analysis. AU4-4c and AU4-16c payloads cannot be dropped.

Dropping a Tributary from the Received Signal (TRIButary mode only)

The STM-16 framed signal received by the module is made up of either 48 STM-0 channels, 16 STM-1 channels, or 4 STM-4 channels.

Dropping an ATM Payload to an HP E1615A (STM-16c & Option 001 only)

The module can drop an ATM signal to an HP E1615A (through the *Channel Drop Payload Out* port) when it is the payload of an STM-16c signal received at the *Electrical Line Data In* port.

Dropping an EOC from the Received Signal

The module can drop an overhead byte to external equipment for analysis.

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Activating a Trigger Source

The *Trig Out (TTL)* ports on the front-panel of the module enable you to synchronize external test equipment to events detected by the module for time delay measurements.

The trigger sources are listed below.

- None
- Out of Frame
- Loss of Frame
- Frame Pulse
- Descrambler
- MS RDI
- MS AIS
- Memory Capture - single
- Memory Capture - repetitive
- B1 Er
- B2 Err
- B3 Err
- Path REI Err
- MS REI Err
- PRBS Err
- Ptr Action
- Ptr Realign
- J1 Position
- OH BER

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Through Mode or Repeater/ Regenerator Operation

The transmit and receive sections of the module operate together in Through Mode and Repeater/Regenerator operation. In both modes the module retransmits the signal received at the *Electrical Line Data In* port. Note, the transmitter's timing is derived from a clock recovered from the received signal.

In Through mode the received SONET/SDH signal can be monitored for alarms and errors before being passed to the transmit section. All receiver function operate as specified, but the transmit section operates in the modes listed below:

Transparent Mode: Normal receiver operation is permitted but the received SONET/SDH signal is retransmitted without alteration. No changes are allowed to the data before retransmission except for Data Error Add. No recalculation will be performed on the B1, B2 or B3.

Recalc Mode: Normal receiver operation is permitted. All available transmitter stressing, error add, OHBER and payload add (MULTIrate mode only) functions are allowed before the SONET/SDH is retransmitted. New values will be calculated for B1, B2 or B3 (where applicable).

The Repeater/Regenerator mode is similar to Through Mode except the complete SOH/RSOH is regenerated. The Repeater/Regenerator section operates in the modes listed below:

Transparent Mode: Normal receiver operation is permitted but the received SONET/SDH signal is retransmitted with a regenerated SOH/RSOH. No changes are allowed to the remainder of the data before retransmission except for Data Error Add. No recalculation will be performed on the B2 or B3.

Recalc Mode: Normal receiver operation is permitted. All available transmitter stressing, error add, OHBER and payload add (MULTIrate mode only) functions are allowed before the SONET/SDH is retransmitted. The SOH/RSOH will be regenerated before transmission. New values will be calculated for B1, B2 or B3 (where applicable).

The following table list the main functions which are available in Through mode or Regenerator/Repeater mode:

Function	Through Mode		Regenerator/Repeater	
	Transparent	Recalc	Transparent	Recalc
B1 Error Add	No	Yes	No	Yes
B2 Error Add	No	Yes	No	Yes
B3 Error Add	No	Yes (Concat' only)	No	Yes (Concat' only)
Data Error Add	Yes	Yes	Yes	Yes
Line FEBE Error Add	No	Yes (Replaces incoming)	No	Yes (Replaces incoming)
MS REI	No	Yes (Replaces incoming)	No	Yes (Replaces incoming)
PRBS Error Add	No	No	No	No
P-FEBE Error Add	No	Yes	No	Yes
P REI	No	Yes	No	Yes

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Through Mode or Repeater/Regenerator Operation

Function	Through Mode		Regenerator/Repeater	
	Transparent	Recalc	Transparent	Recalc
Line AIS	No	Yes	No	Yes
MS AIS	No	Yes	No	Yes
Line FERF	No	Yes	No	Yes
MS RDI	No	Yes	No	Yes
APSW	No	Yes	No	Yes
FW Loss	No	Yes	No	Yes
FW Error	No	Yes	No	Yes
P-AIS	No	Yes	No	Yes
P-FERF	No	Yes	No	Yes
P RDI	No	Yes	No	Yes
Pointer Errors	No	No	No	No
Pointer Generation	No	No	No	No
Pointer SS bits	No	No	No	No
K1K2 Static	No	No	No	No
Clock Durability	No	No	No	No
SPE Background Data Access	No	No	No	No
TOH Data Access	No	No	SOH only (1 plane only)	SOH only (1 plane only)
Overhead Sequencing	No	No	No	No
POH Data Access	No	No	No	No
Fixed Stuff Access	No	No	No	No
EOC Access	No	Yes	SOH only	Yes
OH BER	No	Yes	SOH only	Yes

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Tributary Routing Operation

The tributary routing feature is only available in TRIButary mode, it allows STS-1/STM-0, STS-3/STM-1 or STS-12/STM-4 tributary signals to be routed though to the *Electrical Line* ports. This allows the lower rate signals to be applied to the equipment under test without recabling.

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4

Module Control

About this Chapter

This chapter describes how to control the HP E1676B using the HP ITG software product, and by programs using HP ITG component drivers and SCPI commands.

The information is organized as follows:

- **Controlling the Module Using SCPI Commands**
  Describes how to control your module using the SCPI (Standard Commands for Programming Instruments) commands given in Chapter 5, *Command Reference*.
- **Controlling the Module using HP ITG**
  Describes how to control your module using the Microsoft® Windows™/HP ITG (HP Interactive Test Generator) environment. This section provides a quick overview of the main features of the HP ITG user interface and module's HP ITG soft-panel, and describes how you can use the code generated by your interactions with the module's HP ITG soft-panel to create control programs. This section also lists the components and associated values required to generate instrument-control code.

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Controlling the Module Using SCPI Commands

Module functions, such as controlling the data rate for incoming/outgoing signals, generating and detecting alarms/errors and so on, can be activated using SCPI commands. By combining these SCPI commands with the programming language of your workstation or computer, you can write programs for many test applications.

You can also use IEEE 488.2 common commands, which perform functions such as reset, self-test, and query status, in your programs.

For detailed information on the SCPI commands associated with each module function, refer to Chapter 5, *Command Reference*. This chapter also contains information on the IEEE 488.2 common commands.

NOTE If you are unsure which SCPI command is required to enable a particular function and you have HP ITG capability, click the mouse on the Editor Icon to display the Editor panel. Then, click the mouse on **Options** on the HP ITG menu bar and activate **Bus Traffic to Editor**. In this mode, all the SCPI commands that correspond to an alteration to the module's control-panel configuration are automatically recorded to the Editor panel. By setting up the required module condition, you will be able to identify the appropriate command. For further information, refer to the HP ITG Online Help system.

Command Structure

For programming, SCPI commands are combined with HP BASIC "output" and "enter" commands. The command structures are:

Output Command: `OUTPUT 70907;"INPut:TELecom:RATE"` (The SCPI command is enclosed in quotes.)

Enter Command: `ENTER 70907;variable`

The "output" command is sent to the module from the controller. The "enter" command is the response of the module entered into the controller.

Both commands take a numeric address which specifies the destination of the command. The address used to communicate with the HP E1676B is **70907**, where:

- The **7** represents the switch setting of the controller's interface select code.
- The **09** represents the switch setting of the Slot 0 Command module's HP-IB primary address.
- The **07** represents the HP-IB secondary address value which is derived by dividing the logical address switch setting on the module by 8. For further information on switch settings, refer to Chapter 2, *Preparation for Use*.

For further information on switch configurations of other modules, refer to the Chapter 2, *Installation* in the relevant User's Manuals.

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Controlling the Module using HP ITG

This section describes how to generate and receive test signals using the HP ITG "soft-panels" facility. HP ITG is compatible with Microsoft Windows based user-interface software running on an MS-DOS based computer.

To support operation with HP ITG, the HP E1676B ITG Driver Disk is supplied with the module.

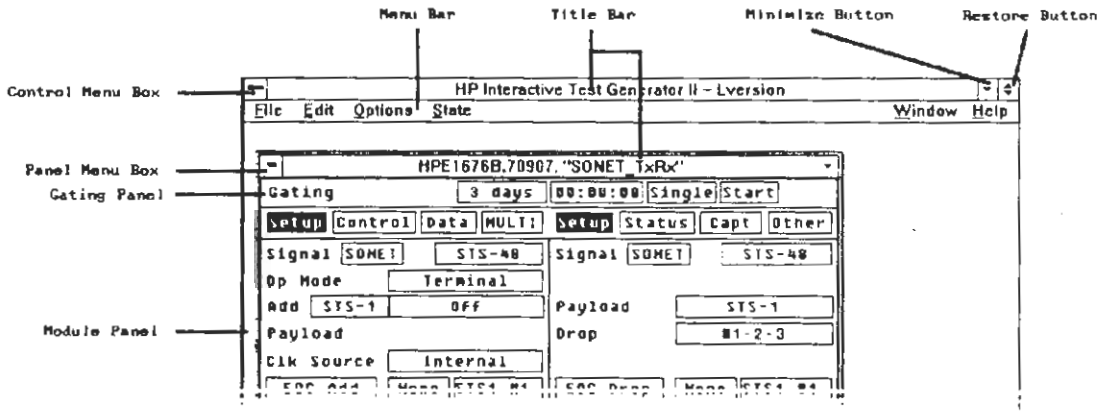
Once loaded into a Windows/HP ITG environment, the module can be controlled through a set of subpanels that appear on the display of your controller.

The HP ITG User Interface

It is assumed that you are familiar with the basic concepts of the user interface and the HP ITG environment. If you are new to Windows and/or HP ITG it is recommended you read the following:

- The *Windows Basics* chapter in the *Microsoft Windows User's Guide* for Windows 3.1.
- The *Instrument Control* chapter in the *HP Interactive Test Generator II User's Manual.*

The main elements of the HP ITG user interface which allow you to interface with the module's soft-panel are shown below, and described in the following table. To display the HP E1676B panel, refer to *Loading Instruments* in Chapter 7 of the *HP Interactive Test Generator II User's Manual.*



HP ITG User Interface

Element	Description
Control Menu Box	Clicking the mouse on this gives you access to commands which enable you to resize, move, maximize, minimize, close windows, and switch to other tasks.Commands that appear dimmed cannot be selected. Detailed information on the Control Menu box is contained in the *Windows Basics* chapter in the *Microsoft Windows User's Guide.*
Gating Panel	Clicking the mouse on the buttons in this panel allows the user to control the module's measurement gating parameters.

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Element	Description
Title Bar	Shows the name of the application/module. The HP E1676B title bar also contains the module address **70907** (factory default setting). The module panel is active when the bar is highlighted. NOTE: The module address on the panel must match your test system's address configuration. To change the panel address, click the mouse on **Options** on the main menu bar, then **Configuration** from the list of available modes to display the configuration dialog box. Enter the new address as required. For further details, refer to the *HP Interactive Test Generator II User's Manual.*
Menu Bar	Clicking the mouse on File, Edit, Options, State, Windows or Help gives you access to a menu. Menu options change depending on what is selected. Detailed information on these menus is contained in *Appendix B* in the *HP Interactive Test Generator II User's Manual.*
Minimize Button (window/panel)	Clicking the mouse on this shrinks the window/panel to an icon (located at the bottom of the display). Detailed information on icons is contained in the *Windows Basics* chapter in the *Microsoft Windows User's Guide.*
Restore Button	If the window is enlarged, clicking the mouse on this restores the window to its previous size.
Panel Menu Box	Clicking the mouse on this gives you access to commands that control module panel operation. Detailed information on controlling a panel is contained in *Instrument Control* in the *HP Interactive Test Generator II User's Manual.*
Mouse Pointer	The pointer (arrow shaped) is used to point to the item you want to select (it moves about the display as you move the mouse). The pointer changes to an hour-glass shape when the controller is busy processing your selection. The mouse pointer can take on other shapes depending on what you are trying to do.More information on the mouse and the mouse pointer is contained in the *Microsoft Windows User's Guide.*

The colors used to distinguish the different displays and buttons on the HP ITG soft-panels are as follows:

Display	Color
Result	Harvest Gold
Highlight Result	Razor blue
OK Alarm	Forest Green
Failed Alarm	Safety Red

Button	Color
Execute	Magenta
Menu	Evening Blue
Selection	Gray
Reset	Turquoise
Alarm Set	Turquoise
Done	Magenta
Toggle	Turquoise

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Panel Layout

A module panel in the HP ITG environment is used to control the module's functions. This panel is made up of seven subpanels:

Setup	Contains transmit/receive settings that are normally only set up once for a particular measurement.
Control	Contains transmit settings that are normally altered during a measurement.
Data	Contains a panel for selecting and modifying data to be transmitted by the module.
Status	Contains the measurement results, and reports current status of signals.
Capt	Contains data that has been captured by the module.
Other	Contains information relevant to all subpanels, such as module reset and error reporting. The module's MULTIrate and TRIButary operating modes are also set from this subpanel.

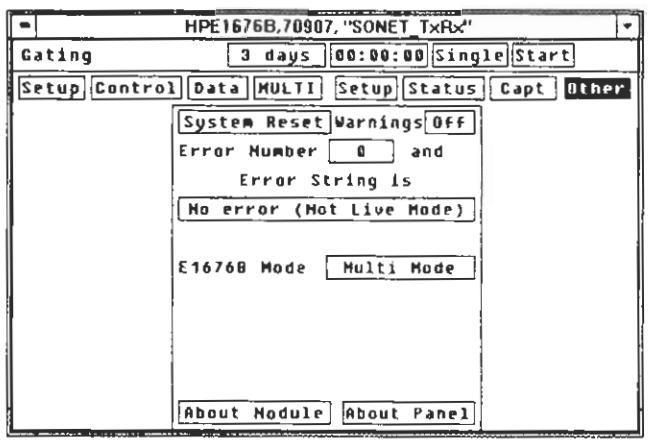
For example, to display the Other subpanel:

1 Use the mouse to position the cursor on the Other subpanel button located near the top of the display.

2 Click the mouse to display the subpanel.

The "Other" Subpanel

The Other subpanel is shown below.



The functions associated with this subpanel are described below.

Function	Description
Module Reset	This button resets the module to its default condition and returns you to the Setup subpanel.
Warnings	This button disables the Live Mode warning dialog box that appears when changing between settings or subpanels when the module is not in live mode.

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Function	Description
Error Reporting	The error number and associated error string is displayed for any SCPI defined errors that occur while the module is active. The error is read from the system error queue on a first-in-first-out basis with the oldest error being displayed first. Refer to *Appendix B* for more information on error messages.
HP E1676B Mode	This button allows the user to configure the module for MULTIrate or TRIButary operation.
About Module	This button displays the module ID or model number, the serial number and the revision number. The serial and revision numbers are displayed only when the module is in live mode.
About Panel	This button displays the revision of the HP ITG panel.

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Programming Using HP ITG

You can create programs to control your module using the HP ITG software product.

When the HP ITG logging facility is enabled, the module automatically translates your interactions with the module's HP ITG control-panel into instrument-control code. The code is stored in a file, and consists of calls to instrument "drivers" - files that describe the layout of the module's control-panel, and its HP-IB commands. Each time the configuration of the module's control-panel is altered, the corresponding instrument driver call is logged to the file. You can access this file to edit the code, add comments, include calls to routines featured in other applications, and integrate the code into new or existing programs.

HP ITG can also recognize and translate command structures in various programming languages into instrument-control code. It does this by means of an instrument driver. Supported languages are:

- HP Instrument BASIC for Windows1/2/3/4.0
- Microsoft C 5.1, 6.0, 6.0ax
- Microsoft C 5.1, 6.0, 6.0ax plus Windows Software Development Kit 3.X (to develop Windows applications)
- Microsoft QuickC^{R} 2.0, 2.5
- Microsoft QuickC for Windows1/2/3/4.0
- Microsoft QuickBASIC 4.5

The command structures of the above languages are as follows:

Prog. Language	Command Structure
HP BASIC	`Hpt_set_str(hpe1676b,"<COMPONENT>","<VALUE>")`
C	`hpt_set_str(hpe1676b,"<COMPONENT>","<VALUE>")`
QuickBASIC	`hptsetstr(hpe1676b,"<COMPONENT>","<VALUE>")`

hpe1676b is the name that HP ITG generates based on the name assigned to your control-panel when you added the module to the HP ITG soft test system.

COMPONENT is a component name (in the HP E1676B driver) which is used to select the mode of operation of the module. A complete list of components which can be selected for this module is given in following table. Note that component names are case sensitive as shown in the table.

VALUE is a value associated with the component selected from the control-panel. A complete list of values which can be selected for a particular component is given in following table. Note that component names are case sensitive as shown in the table.

For further information on generating instrument-control code, refer to the HP ITG User's Handbook.

Driver Components

The following table lists the HP ITG Instrument Driver System Components. Each entry includes a brief description of the component, the range of values associated with the component, and the component default value. Also contained in this section is a procedure for identifying the Transmit and Receive component drivers using the HP ITG soft-panel.

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Component	Description	Values	Initial Value
ELAPSED_TIME	Elapsed time, in seconds, since start of measurement gating		
Error	Error number and clear error stack		0
Error_code	Error code		INVALID
Error_string	Error number	STRING [25]	INVALID
INTEGRATION_PERIOD	Gating period selection	S1, S10, M1, M5, H1, H5, H24, D3	D3
Module_fw	Module firmware revision	STRING [7]	
Module_id	Module product number	STRING [8]	HPE1676B
Module_ser	Module serial number	STRING [11]	
SS	Start/stop/continue measurement select	STOP, START, CONT, IP_1	STOP
SS_Enable	Enable measurement system	False, True	True
SS_Mode	System/local		System
SS_TRIG	Start/stop trigger		
TRIGGER_LINE	Allows selection of one of the four possible pairs of trigger sources on the VXIbus backplane		

To display the Transmit and Receive Driver Components

1 Position the mouse over the appropriate button on the HP ITG soft-panel, then while holding the SHIFT key click the left mouse button. A dialog box will appear on the display which will show the component name and the current value.

2 To find other values for components, set up the soft-panel to the required setting, then repeat step 1 to check its value.

Initial values of components may be found by examining the component immediately after loading or resetting the panel.

NOTE Component values are not always the same as the text displayed on the ITG panel. For example, on the Tx Setup subpanel, the ECL trigger options are labelled Frame Pulse or Eye Clock, but their component values are FPUL and EYECLK respectively.

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5

Command Reference

This chapter contains detailed information on the SCPI (Standard Commands for Programming Instruments) and IEEE 488.2 common commands you will use when writing programs to control the HP E1676B. The chapter contains the following sections:

- **SCPI Overview**
  Gives a brief overview of the SCPI Standard.
- **SCPI Command Format**
  Describes the SCPI command format and conventions.
- **Status Reporting**
  Gives a description of the module status reporting capability.
- **Module Functions**
  Lists the module functions and associated SCPI command subsystems, and also provides the following:
  - **SCPI Command Quick Reference** Cross-references module tasks and functions to the appropriate command in each subsystem.
  - **SCPI Command Reference** Provides detailed information on each command in each subsystem.
- **IEEE 488.2 Command Format**
  Describes the IEEE 488.2 common command format.
- **IEEE 488.2 Command Reference**
  Provides detailed information on each common command.
- **Linking SCPI and IEEE 488.2 Commands**
  Shows you how to link SCPI and IEEE 488.2 commands.
- **Default Settings**
  Lists the commands which configure the module in its default setings.

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SCPI Overview

Standard Commands for Programmable Instruments (SCPI) is a standard of the SCPI Consortium that provides guidelines for remote programming commands for instruments. The goal of SCPI is to reduce automatic test equipment (ATE) program development time. It accomplishes this by providing a consistent programming environment for instrument control and data usage. This programming environment uses defined programming messages, instrument responses, and data formats across all SCPI instruments, regardless of manufacturer.

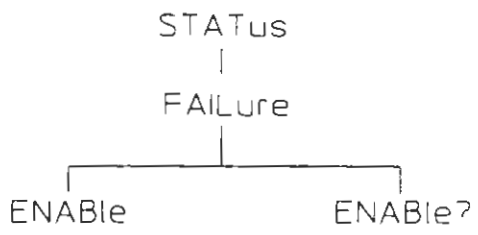
SCPI is based on two IEEE standards:

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands. For use with ANSI/IEEE Standard 488.1-1987, IEEE Standard Digital Interface for Programmable Instrumentation*

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SCPI Command Format

Module functions, such as making measurements and querying the instrument status, are performed by stringing together SCPI 'nodes' into commands. The SCPI commands are based on a hierarchical structure called a 'subsystem' which comprises a top-level 'root' node and one or more lower-level nodes and their parameters. The following diagram shows a typical command subsystem.



In the above diagram, **STATus** is the root node, **FAILure** is a second-level node, and **ENABle/ENABle?** are third-level nodes.

Command Syntax

In this manual, commands are shown in a mix of upper- and lowercase characters.

Commands can be abbreviated for shorter program line lengths. The uppercase characters define the abbreviated form of the command.

Commands are formed by linking the root node with lower-level nodes. A colon (:) is used to link nodes.

If the command requires a parameter, a space must separate the lowest level node and the parameter. If there is more than one parameter, a comma (,) is used to separate the parameters. If you have a choice of parameter or node, a vertical line (|) is used to separate the options available.

An example of a typical command and its abbreviated form are shown below:

```
STATus:QUEStionable:ENABle %<enable_mask>
STAT:QUES:ENAB %<enable_mask> (abbreviated)
```

Query Commands

Commands become query commands when a question mark (?) is added to the lowest level node in the command. An example of a typical query command and its abbreviated form are shown below:

```
STATus:QUEStionable:ENABle?
STAT:QUES:ENAB?
```

If the query command requires a parameter, a space must separate the lowest level node and the parameter.

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Optional Nodes

In this manual nodes that are enclosed within square brackets [ ] are 'optional.' The brackets only highlight the optional node, and are not part of the command. An optional node may be omitted from a command, and the command will still remain valid. For example, the command

[SENSEe[1]:]DATA:TELecom:SCRambling <scramble> becomes

DATA:TEL:SCR <scramble>

Note that in the above example, **1** is also implied, and the lowercase letters have been omitted.

Parameters

In this manual parameters are shown in angled brackets <>. There are five parameter types used in commands. These are listed in the following table.

Parameter Types	Description
Numeric	All commonly used decimal numbers including optional signs, decimal points and scientific notation. Examples are **123,123E2,-123,1.23E2,.123,.123E2** and **1.2300E-01**. Special cases include **MINimum** and **MAXimum**. A numeric parameter can also be specified in hex, octal, and/or binary. Examples are **#H7B, #Q173** and **#B11110111**.
Boolean	A single binary condition that is either true or false. Examples are **ON, OFF, 1** and **0**.
Discrete	Values that are represented by a string of alpha characters. Examples are **INTernal** and **EXTernal**.
String	Any set of ASCII characters enclosed within single quotes or double quotes. Examples are **'10101010'**, or **"10101010"**.
Block	Used to transfer large quantities of related data. Blocks lengths can be sent as definite length blocks **(#<numeric><numeric>)** or indefinite length blocks **(#0)**.

Optional Parameters

In this manual parameters enclosed in square brackets [ ] are optional. These brackets only highlight optional parameters, and are not part of the command.

If you do not specify a value for an optional parameter, a default value is automatically selected.

Linking Command Statements

Command statements can be linked using a semicolons (;) and a colon (:). For example,

[SOUR[1]:]DATA:TEL:ALAR;:STAT:QUES:ENAB?

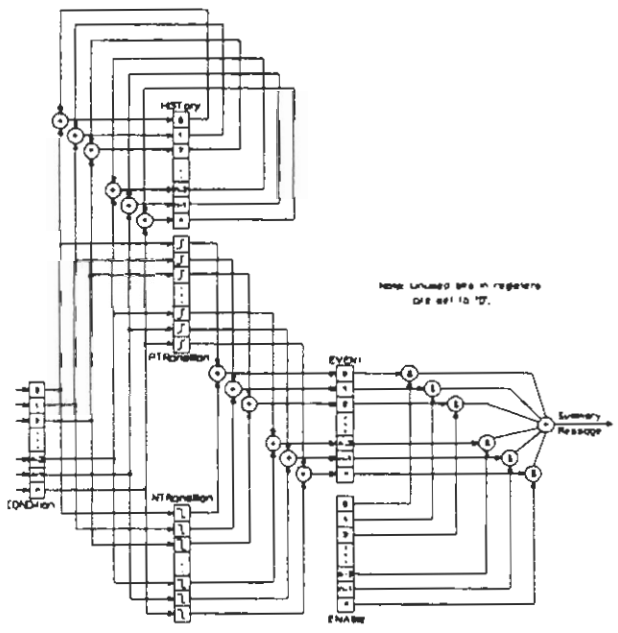
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Status Reporting

This module stores status information in 'status register' structures. These structures, in conjunction with a 'Status Byte' register, form a hierarchy to provide the module with its status reporting capability.

Status Register Structure

The following diagram shows the structure of a status register.



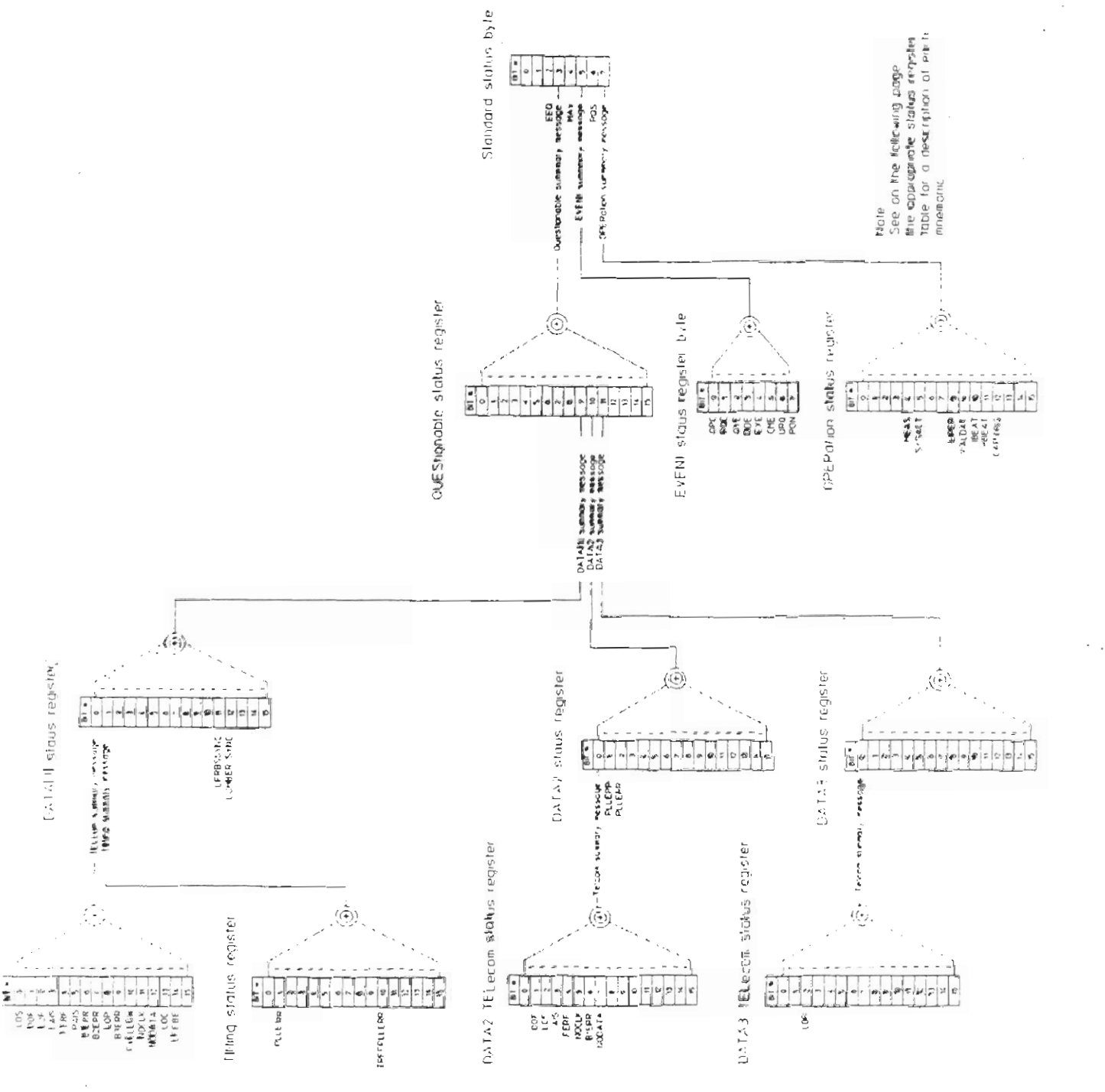
All status register structures used by the module are similar in construction. The table below describes the function of each register within the structure.

Register	Description
CONDition	This register monitors the conditions assigned to it. When a condition changes this register reflects the change, and sets the appropriate 'condition bit' true or false. Changes are reflected in real time.
EVENt	This register captures changes in conditions. The 'event bits' in this register can only be cleared when the contents of the register are read by the user.
P and NTRansition	These registers define whether a rising or falling edge change in the 'condition bits' is captured by the EVENt register.
ENABle	This register defines which event bits will generate a 'summary bit.'
HISTory	This register logs the status of the condition bits.

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Status Register Hierarchy

The module status reporting hierarchy is shown in the following diagram. The bit-labelling for each status register structure is also shown.



Details of each bit used in the status registers are provided in the following tables.

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Standard event (*ESR?) status register

This register contains the instrument's standard event status as defined by the IEEE 488.2 Standard.

Bit	Mnemonic	Description
0	OPC	Operation complete.
1	RQC	Request control.
2	QYE	Query error.
3	DDE	Device dependent error.
4	EXE	Execution error.
5	CME	Command error.
6	URQ	User request.
7	PON	Power on.

STATus:OPERation status register

This register contains conditions that are part of the normal operation of the module. Relevant bits are defined in the table below.

Bit	Mnemonic	Description
4	MEAS	Measuring. The instrument is actively measuring.
5	SYSACT	Capture system active. Set when capture is initiated (see INIT[1] in the TRIG[1] subsystem) and cleared automatically when capture is completed or aborted.
8	EIPER	End of integration period. The measurement system has completed an integration period. An integration period is completed when either a synchronous command pulse from the selected VXIbus trigger line or a **TRIG3[:IMM]** command has been received while **TRIG3:COMM** is set to **STARt**. See OUTP5, TRIG2 and TRIG3 subsystems.
9	VALDAT	Valid data. Cleared when capture is initiated and set when there is valid data in the capture buffer. See TRIG[1] subsystem.
10	IBEAT	Internal heartbeat. This bit is pulsed when an internal heartbeat is received by the measurement system.
11	XBEAT	External heartbeat. This bit is pulsed when an external heartbeat from the selected VXIbus trigger line is received by the measurement system. See OUTP5, TRIG2 and TRIG3 subsystems.
12	CAPTRIG	Capture system triggered. Cleared when capture is initiated and set automatically when capture trigger data match is satisfied. See TRIG1 subsystem.
13	ISR	INSTrument status register summary.

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STATus:QUEStionable status register

This register contains bits that give an indication of the quality of various aspects of the signal.

Bit	Mnemonic	Description
9	D1SR	DATA1 status register summary.
10	D2SR	DATA2 status register summary.
11	D3SR	DATA3 status register summary.

STATus:QUEStionable:DATA[1] status register

This register contains conditions that give an indication of the quality of the results measured on a signal at the STS-48 / STM-16 level of the SONET/SDH signal hierarchy. Relevant bits are defined in the table below.

Bit	Mnemonic	Description
0	TELSR	TELecom status register summary.
1	TIMSR	TIMing status register summary.
11	LPRBSSYNC	Receiver loss of PRBS synchronization.
12	LOHBERSYNC	Receiver loss of OH BER synchronization.

STATus:QUEStionable:DATA[1]:TELecom status register

This register contains conditions that are part of the instrument's telecommunications operation for the STS-48/STM-16 level of the SONET/SDH signal hierarchy. The measurement process updates the TELecom status register every 100 ms. Relevant bits are defined in the table below.

Bit	Mnemonic	Description
0	LOS	Loss of Signal detected.
1	OOF	Out of Frame detected. See the **SENS:DATA:TEL:ALAR:OOFR:CFBA** command.
2	LOF	Loss of Frame Detected. See the **SOUR:DATA:TEL:LOFR:TIM** command.
3	LAIS	LAIS alarm detected. See the **SENS:DATA:TEL:ALAR:LAIS:CFBA** and **SENS:DATA:TEL:ALAR:LAIS:CFBN** commands.
4	FERF	FERF alarm detected. See the **SENS:DATA:TEL:ALAR:FERF:CFBA** and **SENS:DATA:TEL:ALAR:FERF:CFBN** commands.
5	PAIS	Path AIS detected.
6	B1ERR	B1 error detected.
7	B2ERR	B2 error detected.

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Bit	Mnemonic	Description
8	LOP	Loss Of Pointer detected.
9	B3ERR	B3 error detected.
10	PYELLOW	Path Yellow / Path FERF alarm detected.
11	NOCLOCK	Receiver input clock loss detected.
12	NODATA	Receiver input data loss detected.
13	LOC	Loss of Concatenation detected.
14	LFEBE	Line FEBE/MS-FEBE error detected.

STATus:QUEStionable:DATA[1]:TIMing status register

This register contains conditions that give an indication of the quality of the instrument's transmit signal at the STS-48/STM-16 level of the SONET/SDH hierarchy. The measurement process updates the TIMing status register every 100 ms. The relevant bit is defined in the table below.

Bit	Mnemonic	Description
0	PLLERR	A PLL error has occurred in locking to the selected clock source. See the **CLOC:SOUR** command.
10	TREFPLLERR	A PLL error has occurred in the E1679A timing reference (if a servant to the HP E1676B).

STATus:QUEStionable:DATA2 status register

This register contains conditions that give an indication of the quality of the instrument tributaries at the STS-1/3/12 or STM-0/1/4 levels of the SONET/SDH signal hierarchy. Relevant bits are defined in the table below.

Bit	Mnemonic	Description
0	TELSR	TELecom status register summary.
1	RPLLERR	An error has occurred in locking the Generator add tributary PLL to the input clock rate. See the **INP3:TEL:RATE** command.
2	TPLLERR	An error has occurred in locking the Receiver drop tributary PLL to the desired output rate. See the **OUTP3:TEL:RATE** command.

STATus:QUEStionable:DATA2:TELecom status register

This register contains conditions that are part of the instrument's telecommunications operation for the instrument tributaries at the STS-1/3/12 and STM-0/1/4 levels of the SONET/SDH signal hierarchy. The measurement process updates the TELecom status register every 100 ms. Relevant bits are defined in the table below.

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Bit	Mnemonic	Description
1	TOOF	Out of Frame detected at tributary input.
2	TLOF	Loss of Frame detected at tributary input.
3	AIS	AIS alarm detected.
4	FERF	FERF alarm detected.
5	NOCLK	Tributary input clock loss detected.
6	B1ERR	B1 error detected.
7	NODATA	Tributary input data loss detected.

STATus:QUEStionable:DATA3 status register

This register contains conditions that give an indication of the quality of the instrument ATM payload input. The relevant bit is defined in the table below.

Bit	Mnemonic	Description
0	TELSR	TELecom status register summary.

STATus:QUEStionable:DATA3:TELecom status register

This register contains conditions that are part of the instrument's telecommunications operation for the instrument ATM payload input at the STS-48c / STM-16c levels of the SONET/SDH signal hierarchy. The measurement process updates the TELecom status register every 100 ms. The relevant bit is defined in the table below.

Bit	Mnemonic	Description
2	PLOF	Loss of Frame detected at ATM payload input.

Status Byte

The 8-bit Status Byte register contains the single-bit summary messages for the module as defined in IEEE 488.2. It has no associated status register structure. The following table defines these single-bit summary messages.

Bit	Mnemonic	Description
0,1	-	Not used.
2	EEQ	Error/Event Queue summary bit as defined by IEEE 488.2.
3	QSR	Questionable summary bit: indicates that a tributary signal condition has occurred.
4	MAV	Message Available summary bit: indicates that there are characters in the module output queue. The queue is read by addressing the module to talk, and reading data bytes until a line feed character is sent with the EOI control line.
5	ESB	Event status summary bit as defined by IEEE 488.2.

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Bit	Mnemonic	Description
6	RQS	Master summary bit as defined by IEEE 488.2.
7	OSR	OPERation summary bit: indicates general module conditions.

Service Request Enable register

This register enables corresponding summary bits in the Status Byte register to initiate a service request. This register can be accessed by issuing the ***SRE <numeric>** common command. Valid numeric parameters and the bits they enable are listed below.

<numeric> =	8	Questionable summary bit.
	16	Message Available (MAV).
	32	EVENt summary bit.
	64	Request service.
	128	OPERation summary bit.

Implementing Status Reporting

Tasks to consider when implementing status reporting are listed in the table below.

Task	Action
1. Define the conditions you want reported.	Set the appropriate 'Event Enable' register masks in the appropriate status register structures. Summary bits are generated by the status register structures when a condition is detected. These are subsequently summarized in the Status Byte register.
2. Implement a "service request/serial poll" operation.	Set the Service Request Enable register mask. Setting this register mask enables the corresponding bits in the Status Byte register to initiate a service request (RQS) when a condition is detected.
3. Check the status of the module.	Use the ***STB** or ***STB?** common commands to check the content of the Status Byte register. Use the service request/serial poll operation.
4. Identify the condition responsible for generating a summary bit.	Determine which status register structure is responsible, then use the appropriate **STATus** commands to interrogate the registers within the structure.

STATus Subsystem

The status register structures are controlled by the commands in the **STATus** subsystem. See the *Module functions* section in this chapter for more information on these commands.

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Module Functions

Module functions are controlled by commands contained in SCPI subsystems. The following table will help you identify which subsystem you require.

Module functions	Subsystem
Primary Function	
To configure the module for MULTIrate or TRIButary operation.	`INSTrument`
Generator	
To configure the Transport Overhead Generator tributary input	`INPut3`
To configure the Transport Overhead Generator ATM payload input	`INPut8`
To configure the Transport Overhead Generator data output	`OUTPut[1]`
To control device-specific settings which are used to configure the Transport Overhead Generator	`[SOURce[1]:]`
To configure the Transport Overhead Generator front panel *Trigger out* TTL output port	`SOURce2`
To configure the Transport Overhead Generator front panel *Frame out/Eye clock* output port	`SOURce6`
To configure the Transport Overhead Generator reference clock	`SOURce7`
To configure the E1679A timing reference, if present	`SOURce8`
Receiver	
To configure the Transport Overhead Receiver byte capture system	`CONFigure`
To configure the Transport Overhead Receiver byte capture return facility	`FETCh`
To configure the Transport Overhead Receiver data input	`INPut[1]`
To configure the Transport Overhead Receiver tributary output	`OUTPut3`
To configure the VXI trigger lines	`OUTPut5`
To configure the Transport Overhead Receiver ATM payload output	`OUTPut8`
To control device-specific settings which are used to configure the Transport Overhead Receiver	`SENSe[1]`
To configure the Transport Overhead Receiver tributary output drop channel	`SOURce3`
To configure the Transport Overhead Receiver front panel *Trigger out* TTL output port	`SOURce4`
To configure the selected VXI trigger lines	`SOURce5`
To configure the Transport Overhead Receiver front panel *Serial data* EOC output port	`SOURce9`

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Module Functions

Module functions	Subsystem
To select the payload channel group to be placed on the payload drop bus.	SOURce10
To configure the Transport Overhead Receiver byte capture trigger	TRIGger[1]
To control the timing of the Transport Overhead Receiver measurement updates	TRIGger2
To execute a synchronous command on the next heartbeat pulse	TRIGger3
Administrative	
To configure status reporting (see also the *Status reporting* section)	STATus
To configure functions unrelated to module performance	SYSTem
To configure administrative functions associated with operating in a VXI-based system	VXI

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INSTrument Subsystem

This section comprises the INSTrument SCPI subsystem which is used to configure the module for MULTIrate or TRIButary. This section contains:

- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the TRIGger[1] subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To switch the entire instrument between TRIButary and MULTIrate modes	INST[:SEL] <mode>	TRIB
To switch the entire instrument between TRIButary and MULTIrate modes.	INST:NSEL <number>	0

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INST[:SEL] <mode>

Description

`INSTrument[:SELection] <mode>` switches the entire instrument between TRIButary and MULTIrate modes.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
mode	discrete	`TRIButary` | `MRATe`	none

Dependencies

None

Comments

- The major features available in each mode are as follows.

Feature	TRIButary Mode	MULTIrate Mode
2.4 Gb/s Operation	Yes	Yes
51 Mb/s, 155 Mb/s, 622 Mb/s Operation	No	Yes
Front panel tributary ports	Yes	No
Backplane payload bus	No	Yes
Front panel ATM port (option 001 only)	Yes	No

- The default value is `TRIB`.

Error Codes

None.

Related Commands

`INST:NSEL`

Query Command

`INSTrument[:SELection]?` returns the currently selected operating mode (TRIButary and MULTIrate).

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INST:NSEL <number>

Description

`INSTrument:NSELection <number>` switches the entire instrument between TRIButary and MULTIrate modes.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
number	integer	0 | 1	none

Dependencies

None

Comments

- 0 = TRIButary mode
- 1 = MULTIrate mode
- The major features available in each mode are as follows.

Feature	TRIButary Mode	MULTIrate Mode
2.4 Gb/s Operation	Yes	Yes
51 Mb/s, 155 Mb/s, 622 Mb/s Operation	No	Yes
Front panel tributary ports	Yes	No
Backplane payload bus	No	Yes
Front panel ATM port (option 001 only)	Yes	No

- The default value is 0.

Error Codes

None.

Related Commands

`INST:SEL`

Query Command

`INSTrument:NSELection?` returns the currently selected operating mode as a number (TRIButary=0 and MULTIrate=1).

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Transport Overhead Generator Subsystems

This section comprises the SCPI subsystems used by the Transport Overhead Generator. The subsystems are presented in alphanumeric order as follows:

- **INPut3**
- **INPut8**
- **OUTPut[1]**
- **[SOURce[1]:]**
- **SOURce2**
- **SOURce6**
- **SOURce7**
- **SOURce8**

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INPut3 Subsystem

This subsystem is used to configure the Transport Overhead Generator tributary input. Note that the tributary add mode is selected by the **DATA:TEL:NEL** command.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference summary for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
INPut3
   :TELecom
        :RATE <rate>
        :RATE?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the INPut3 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the Transport Overhead Generator tributary input line rate	**INP3:TEL:RATE <rate>**	**STS3**

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INP3:TEL:RATE <rate>

Description

`INPut3:TELecom:RATE <rate>` selects the Transport Overhead Generator tributary input line rate.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
rate	discrete	`STS1` | `STM0` | `STS3` | `STM1` | `STS12` | `STM4`	none

Dependencies

- When `OUTP:TEL:RATE` is set to `STS48` or `STS48C`, the available choices for `INP3:TEL:RATE` are `STS1`, `STS3` and `STS12`.
- When `OUTP:TEL:RATE` is set to `STM16` or `STM-16C`, the available choices for `INP3:TEL:RATE` are `STM0`, `STM1` and `STM4`.

Comments

- Changing <rate> when `DATA:TEL:NEL` is set to `TRIB` sets `DATA:TEL:PAYL:SOUR <1..48>` to `INT`.
- The reset condition for `INP3:TEL:RATE` is `STS3`.
- This command can be sent at any time but is only valid when `INST:SEL` is set to `TRIB`.

Error Codes

–221, "Settings conflict"

Related Commands

`OUTP:TEL:RATE`

Query Command

`INPut3:TELecom:RATE?` returns the currently selected Transport Overhead Generator input tributary line rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	discrete	`STS1` | `STM0` | `STS3` | `STM1` | `STS12` | `STM4`	none

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INP3:TEL:RATE <rate>

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INPut8 Subsystem

This subsystem is used to configure the Transport Overhead Generator ATM payload input.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference summary for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
INPut8
    :TELecom
        :RATE <rate>
        :RATE?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the INPut8 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the Transport Overhead Generator ATM payload input rate	`INP8:TEL:RATE <rate>`	`STS48C`

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INP8:TEL:RATE <rate>

Description

INPut8:TELecom:RATE <rate> selects the Transport Overhead Generator ATM input rate.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
rate	discrete	**STS48C** | **STM16C**	none

Dependencies

- When **OUTP:TEL:RATE** is set to STS48C, STS48C is the only choice.
- When **OUTP:TEL:RATE** is set to STM16C, STM16C is the only choice.
- When **OUTP:TEL:RATE** is set to STS48 or STM16 this command is not valid.

Comments

- The reset condition of **INP:TEL:RATE** is STS48C
- This command will have no effect with **OUTP:TEL:RATE** set to STM16, STS48 or TRIB.
- This command is only valid when **INST:SEL** is set to **MRATE**.

Error Codes

–221, "Settings conflict"

Related Commands

OUTP:TEL:RATE

Query Command

INPut8:TELecom:RATE? returns the currently selected Transport Overhead Generator ATM input mode.

Response

Response Name	Response Type	Response Range	Default Units
rate	discrete	**STS48C** | **STM16C**	none

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OUTPut[1] Subsystem

This subsystem is used to configure the Transport Overhead Generator data output.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference summary for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
OUTPut[1]
    :TELecom
        :RATE <rate>
        :RATE?
            :PAYLoad <mode>
            :PAYLoad?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the OUTPut1 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the Transport Overhead Generator data output rate	`OUTP[1]:TEL:RATE <rate>`	`STS48`
To select the mapping of the payload add channel and background payloads.	`OUTP[1]:TEL:RATE:PAYLoad <mode>`	`STS1/ AU4`

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OUTP[1]:TEL:RATE <rate>

Description

`OUTPut[1]:TELecom:RATE <rate>` selects the Transport Overhead Generator output rate

Parameters

Parameter Name	Parameter Type	Range of values	Default Units
rate	discrete	`STS48` | `STM16` | `STS48C` | `STM16C` | `STS12` | `STM4` | `STS3` | `STM1` | `STS1` | `STM0` | `TRIButary`	none

Dependencies

- `STS48, STM16, STS48C, STM16C` and `TRIButary` are only available in TRIButary mode.
- `TRIButary` is not allowed in MULTIrate mode

Comments

- When the selection changes, the following settings change:
  - `DATA:TEL:ALAR`, `DATA:TEL:ALAR:FERF`, `DATA:TEL:ALAR:PAIS`, `DATA:TEL:ALAR:PERF`, and `DATA:TEL:ALAR:LAIS` are set to `NONE`.
  - `DATA:TEL:ALT:APSW` is set to `NONE`.
  - `DATA:TEL:FWOR`, `DATA:TEL:FWOR:ERR`, `DATA:TEL:FWOR:LOSS` are set to `NONE`.
  - `DATA:TEL:ERR:LBIP:CHAN` is set to `1`.
  - `DATA:TEL:PATT` is set to `NONE`.
- The data bytes accessed via `DATA:TEL:OVER[<n>]:DATA` are set to their default values for the selected signal type.
- `DATA:TEL:PAYL:BDAT` is set to `VAL` for all channels.
- `DATA:TEL:PAYL:BDAT:VAL` is set to `0` for all channels.
- `DATA:TEL:ERR:POIN` is set to `NONE`.
- `OUTP:TEL:RATE:TRIB` configures the instrument to rout the insert tributary signal to the main output.
- When `OUTP:TEL:RATE` is set to `TRIB` the internal instrument function will have no effect. Most commands sent in this state will produce a -221 error.
- `DATA:TEL:POIN:SOUR` set to `OVER`.
- `DATA:TEL:OVER:SEQ` set to `NONE`.
- `DATA:TEL:OVER:J0|TRACE` set to `SING`.
- `DATA:TEL:POV:J0|TRACE` set to `LONG`.
- The data bytes accessed by `SOUR:DATA:TELPOV:ARRAY:J1`, `SOUR:DATA:TEL:POV:DATA`, and `SOUR:DATA:TEL:POV:G1` are set to the default values.
- The source of the byte controlled by `SOUR:DATA:TEL:POV:SOUR` are all set to `INT`.

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- The source of the bytes controlled by **DATA:TEL:LDCC:SOUR**, **DATA:TEL:SDCC:SOUR**, **DATA:TEL:UND:SOUR**, **DATA:TEL:USER:SOUR**, **DATA:TEL:POV:SOUR**, and **DATA:TEL:OVER**are set to **INT**.
- The reset condition for **OUTP:TEL:RATE** is **STS48**.

Error Codes

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALT:APSW
DATA:TEL:ERR:LBIP:CHAN
DATA:TEL:FWOR
DATA:TEL:FWOR:ERR:CHAN
DATA:TEL:FWOR:ERR:CHAN2
DATA:TEL:PATT
DATA:TEL:PAYL:SOUR
DATA:TEL:ERR:POIN
INP3:TEL:RATE
INP8:TEL:RATE
SOUR:DATA:TEL:POIN:SOUR
OUTP:TEL:RATE:PAYL

Query Command

OUTPut[1]:TELecom:RATE? returns the currently selected Transport Overhead Generator output rate.

Response

Response Name	Response Type	Range of values	Default Units
rate	discrete	**STS48** | **STM16** | **STS48C** | **STM16C** | **STS12** | **STM4** | **STS3** | **STM1** | **STS1** | **STM0** | **TRIButary**	none

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OUTP [1]:TEL:RATE:PAYL <mode>

Description

OUTPut[1]:TELecom:RATE:PAYLoad <mode> selects the mapping of the payload add channel and background payloads.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
mode	discrete	**STS1** | **STS3C** | **STS12C** | **STS48C** | **AU3** | **AU4** | **AU4_4C** | **AU4_16C**	none

Dependencies

- The allowed values for **<rate>** depend on the transmitter rate selected by **OUTP:TEL:RATE**:

Transmitter Rate	Allowed Payload Mappings
STS1	STS1
STS3	STS1 I STS3C
STS12	STS1 I STS3C I STS12C
STS48	STS1 I STS3C I STS12C I STS48C
STS48C	STS48C
STM0	AU3
STM1	AU3, AU4
STM4	AU3, AU4, AU4_4C
STM16	AU3, AU4, AU4_4C, AU4_16C
STM16C	AU4_16C

- When **INST:SEL** is set to **TRIB** and **OUTP:TEL:RATE** is set to **STS48** or **STM16**, the payload mapping is further restricted in the TRIButary mode by **INP3:TEL:RATE**:

Tributary Add Rate	Allowed Payload Mappings
STS1	STS1
STS3	STS1 I STS3C
STS12	STS1 I STS3C I STS12C
STM0	AU3
STM1	AU3 I AU4
STM4	AU3 I AU4 I AU4_4C

- If the **OUTP:TEL:RATE** is changed to a SONET rate then **OUTP:TEL:RATE:PAYL**

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resets the payload mapping to **STS1**.

- If the **OUTP:TEL:RATE** is changed to an SDH rate then **OUTP:TEL:RATE:PAYL** resets the payload mapping to **AU4** (except for STM-0, then the payload mapping is **AU3**).

Comments

- When a payload mapping is selected and it "fills" the entire payload space (i.e. STS1 SPE in STS1, STS3C SPE in STS3, STS12C SPE in STS12, STS48C SPE in STS48, AU3 in STM0, AU4 in STM1, AU4-4C in STM4 and AU4-16C in STM16), the signal is said to be *concatenated*.
- The following features are only available when a concatenated signal is selected:

  Path BIP generation

  Path BIP error add

  Path RDI generation

  Path FEBE error generation

  Payload PRBS generation

Error Codes

-221, "Settings Conflict" The selected payload mapping is not valid.

Related Commands

OUTP:TEL:RATE
INP3:TEL:RATE
INP8:TEL:RATE

Query Command

OUTPut[1]:TELecom:RATE:PAYload? returns the currently selected payload mapping.

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[SOURce[1]] Subsystem

This subsystem controls device-specific settings which are used to configure the Transport Overhead Generator. The SOURce1 node is optional as it constitutes the primary function of the module.

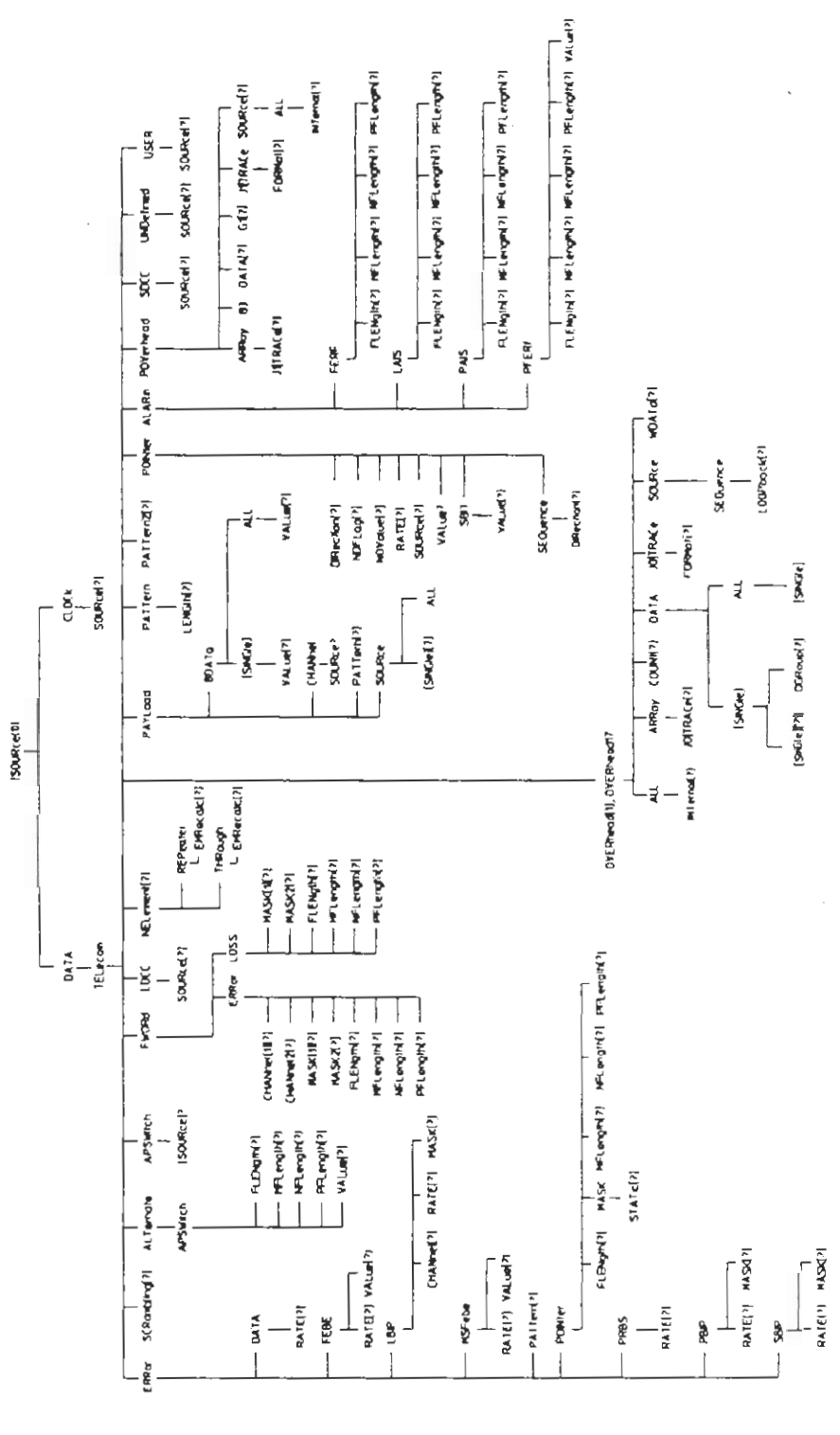
This section contains:

- A SCPI command structure diagram.
- A SCPI command quick reference summary for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.

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Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
[SOURce[1]]
    :CLOCk
        :SOURce <source>
        :SOURce?
    :DATA
        :TELecom
            :ALARm <condition>
                :FERF <mode>
                    :FLENgth <frames>[,<period>]
                    :FLENgth?
                    :MFLength <frames>
                    :MFLength?
                    :NFLength <frames>
                    :NFLength?
                    :PFLength <frames>
                    :PFLength?
                :FERF?
                :LAIS <mode>
                    :FLENgth <frames>[,<period>]
                    :FLENgth?
                    :MFLength <frames>
                    :MFLength?
                    :NFLength <frames>
                    :NFLength?
                    :PFLength <frames>
                    :PFLength?
                :LAIS?
                :PAIS <mode>
                    :FLENgth <frames>[,<period>]
                    :FLENgth?
                    :MFLength <frames>
                    :MFLength?
                    :NFLength <frames>
                    :NFLength?
                    :PFLength <frames>
                    :PFLength?
                :PAIS?
                :PFERf <mode>
                    :FLENgth <frames>[,<period>]
                    :FLENgth?
                    :MFLength <frames>
                    :MFLength?
                    :NFLength <frames>
                    :NFLength?
                    :PFLength <frames>
                    :PFLength?
                    :VALue <value>
                    :VALue?
                :PFERf?
                :ALARm?
                :ALTernate
                    :APSWitch <mode>
                        :FLENgth <frames>[,<period>]
                        :FLENgth?
                        :MFLength <frames>
                        :MFLength?
                        :NFLength <frames>
                        :NFLength?
                        :PFLength <frames>
                        :PFLength?
                        :VALue <value>
```


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```
            :VALue?
        :APSWitch?
    :APSWitch[:SOURce] <source>
    :APSWitch[:SOURce]?
    :ERRor <addition>
        :DATA <mode>
            :RATE <rate>
            :RATE?
        :DATA?
        :FEBE <mode>
            :RATE <rate>
            :RATE?
            :VALue <value>
            :VALue?
        :FEBE?
        :LBIP <mode>
            :CHANnel <channel>
            :CHANnel?
            :RATE <rate>
            :RATE?
            :MASK <mask>
            :MASK?
        :LBIP?
        :MSFebe <mode>
            :RATE <rate>
            :RATE?
            :VALue <value>
            :VALue?
        :MSFebe?
        :PATT <mode>
        :PATT?
        :PBIP <mode>
        :PBIP:MASK <mask>
        :PBIP:MASK?
        :PBIP:RATE <rate>
        :PBIP:RATE?
        :PBIP?
        :POINter <mode>
            :FLENgth <frames>[,<period>]
            :FLENgth?
            :MASK <mask>
                :STATic <state>
                :STATic?
            :MASK?
            :MFLength <frames>
            :MFLength?
            :NFLength <frames>
            :NFLength?
            :PFLength <frames>
            :PFLength?
        :POINter?
        :PRBS <mode>
            :RATE <rate>
            :RATE?
        :PRBS?
        :PBIP <mode>
            :RATE <rate>
            :RATE?
            :MASK <mask>
            :MASK?
        :PBIP?
        :SBIP <mode>
            :RATE <rate>
            :RATE?
            :MASK <mask>
            :MASK?
        :SBIP?
    :FWORd <condition>
        :ERRor <mode>
            :CHANnel[1] <channel>,<offset>
            :CHANnel[1]?
            :CHANnel2 <channel>,<offset>
```


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```
                                :CHANnel2?
                                :MASK[1] <mask>
                                :MASK[1]?
                                :MASK2 <mask>
                                :MASK2?
                                :FLENgth <frames>[,<period>]
                                :FLENgth?
                                :MFLength <frames>
                                :MFLength?
                                :NFLength <frames>
                                :NFLength?
                                :PFLength <frames>
                                :PFLength?
                            :ERRor?
                            :LOSS <mode>
                                :MASK[1] <mask>
                                :MASK[1]?
                                :MASK2 <mask>
                                :MASK2?
                                :FLENgth <frames>[,<period>]
                                :FLENgth?
                                :MFLength <frames>
                                :MFLength?
                                :NFLength <frames>
                                :NFLength?
                                :PFLength <frames>
                                :PFLength?
                            :LOSS?
                        :FWORd?
                        :LDCC
                            :SOURce <source>
                            :SOURce?
                        :NELelement <type>
                            :REPeater[:EMRecalc] <state>
                            :REPeater[:EMRecalc]?
                            :THR[:EMRecalc] <state>
                            :THR[:EMRecalc]?
                        :NELelement?
                        :OVERhead[n] <byte>,<source>,<channel>,<offset>
                            :ALL:INTernal
                            :ALL:INTernal?
                            :ARRay
                                :J0|TRACe <count>,<start>,<value1>[,<value2>....]
                                :J0|TRACe? <count>,<start>
                            :COUNt <count>
                            :COUNt?
                            :DATA[:SINGle][:SINGle] <channel>,<byte>,<offset>,<valu
e>
                                                :OGRoup <channel>,<offset>,<value1>,...,
<value27>
                                                :OGRoup? <channel>,<offset>
                                  :ALL[:SINGle] <byte>,<offset>,<value>
                            :DATA[:SINGle][:SINGle]? <channel>,<byte>,<offset>
                            :J0|TRACe
                                :FORMat <format>
                                :FORMat?
                            :SOURce <mode>
                                :SEQuence
                                    :LOOPback <point>
                                    :LOOPback?
                                :SEQuence?
                            :SOURce?
                            :WDATa <channel>,<word>,<offset>,<value>
                            :WDATa? <channel>,<word>,<offset>
                        :OVERhead? <byte>,<channel>,<offset>
                        :PATTern <pattern>
                            :LENGth <length>
                            :LENGth?
                        :PATTern?
                        :PATTern2 <pattern>
                        :PATTern2?
                        :PAYLoad <payload>
```


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```
        :BDATa[:SINGle] <channel>,<pattern>
                        :VALue <channel>,<value>
                        :VALue? <channel>
                    :ALL <pattern>
                        :VALue <value>
                        :VALue?
                    :ALL?
        :BDATa[:SINGle]? <channel>
        :CHANnel
            :SOURce?
        :PATTern <pattern>
        :PATTern?
        :SOURce[:SINGle] <group>,<source>
                :ALL <source>
        :SOURce[SINGle]? <group>
    :PAYLoad?
    :POINter <action>
        :DIRection <direction>
        :DIRection?
        :NDFLag <state>
        :NDFLag?
        :NDValue <value>
        :NDValue?
        :RATE <rate>
        :RATE?
        :SBIT <type>
            :VALue <value>
            :VALue?
        :SBIT?
        :SEQuence <type>
            :DIRection <direction>
            :DIRection?
        :SEQuence?
        :SOURce <source>
        :SOURce?
        :VALue?
    :POINter?
    :POVerhead
        :ARRay
            :J1|TRACe <length>,<start>,<value1>[,...<value16>]
            :J1|TRACe? <length>,<start>
        :B3
        :B3?
        :DATA <byte>,<value>
        :DATA? <byte>
        :G1 <value>
        :G1?
        :J1|TRACe
            :FORMat <format>
            :FORMat?
        :SOURce <byte>,<source>
        :SOURce:ALL:INTernal
        :SOURce:ALL:INTernal?
        :SOURce? <byte>
    :SCRambling <state>
    :SCRambling?
    :SDCC
        :SOURce <source>
        :SOURce?
    :UNDefined
        :SOURce <source>,<row>,<column>,<interleave>
        :SOURce? <row>,<column>,<interleave>
    :USER
        :SOURce <source>
        :SOURce?
```


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SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the [SOURce[1]:] subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the Transport Overhead Generator clock source.	`[SOUR[1]:]CLOC:SOUR <source>`	`INT`
To select the type of alarm condition to be generated.	`[SOUR[1]:]DATA:TEL:ALAR <condition>`	`NONE`
To select the Line FERF alarm stress mode.	`[SOUR[1]:]DATA:TEL:ALAR:FERF <mode>`	`NONE`
To select the number of frames in a given stress period during which the FERF alarm is generated. or suppressed	`[SOUR[1]:]DATA:TEL:ALAR:FERF:FLEN <frames>[,<period>]`	`1,4`
To select the duration of the Line FERF alarm stress on period.	`[SOUR[1]:]DATA:TEL:ALAR:FERF:MFL <frames>`	`1`
To select the duration of the Line FERF alarm stress off period.	`[SOUR[1]:]DATA:TEL:ALAR:FERF:NFL <frames>`	`63`
To select the duration of the Line FERF alarm pre-stress period.	`[SOUR[1]:]DATA:TEL:ALAR:FERF:PFL <frames>`	`0`
To select the Line AIS alarm stress mode.	`[SOUR[1]:]DATA:TEL:ALAR:LAIS <mode>`	`NONE`
To select the number of frames in a given stress period during which the Line AIS alarm is generated or suppressed.	`[SOUR[1]:]DATA:TEL:ALAR:LAIS:FLEN <frames>[,<period>]`	`1,4`
To select the duration of the Line AIS alarm stress on period.	`[SOUR[1]:]DATA:TEL:ALAR:LAIS:MFL <frames>`	`1`
To select the duration of the Line AIS alarm stress off period.	`[SOUR[1]:]DATA:TEL:ALAR:LAIS:NFL <frames>`	`63`
To select the duration of the Line AIS alarm pre-stress period.	`[SOUR[1]:]DATA:TEL:ALAR:LAIS:PFL <frames>`	`0`
To select the Path AIS alarm stress mode.	`[SOUR[1]:]DATA:TEL:ALAR:PAIS <mode>`	`NONE`

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Task	Command	Default Value
To select the number of frames in a given stress period during which the Path AIS alarm is generated or suppressed.	[SOUR[1]:]DATA:TEL:ALAR:PAIS:FLEN <frames>[,<period>]	1,4
To select the duration of the Path AIS alarm stress on period.	[SOUR[1]:]DATA:TEL:ALAR:PAIS:MFL <frames>	1
To select the duration of the Path AIS alarm stress off period.	[SOUR[1]:]DATA:TEL:ALAR:PAIS:NFL <frames>	63
To select the duration of the Path AIS alarm pre-stress period.	[SOUR[1]:]DATA:TEL:ALAR:PAIS:PFL <frames>	0
To select the Path FERF alarm stress mode.	[SOUR[1]:]DATA:TEL:ALAR:PFER <mode>	NONE
To select the number of frames in a given stress period during which the Path FERF alarm is generated or suppressed.	[SOUR[1]:]DATA:TEL:ALAR:PFER:FLEN <frames>[,<period>]	1,4
To select the duration of the Path FERF alarm stress on period.	[SOUR[1]:]DATA:TEL:ALAR:PFER:MFL <frames>	1
To select the duration of the Path FERF alarm stress off period.	[SOUR[1]:]DATA:TEL:ALAR:PFER:NFL <frames>	63
To select the duration of the Path FERF alarm pre-stress period.	[SOUR[1]:]DATA:TEL:ALAR:PFER:PFL <frames>	0
To set the alternative value for SONET bits 5,6,7 and 8 of the G1 byte.	[SOUR[1]:]DATA:TEL:ALAR:PFER:VAL <value>	
To select the Automatic or Ring Protection Switching (APS/RPS) alternate value stress mode.	[SOUR[1]:]DATA:TEL:ALT:APSW <mode>	NONE
To select the number of frames in a given stress period during which the APS/RPS alternate value. is generated	[SOUR[1]:]DATA:TEL:ALT:APSW:FLEN <frames>[,<period>]	1,4
To select the duration of the APS/ RPS alternate value stress on period.	[SOUR[1]:]DATA:TEL:ALT:APSW:MFL <frames>	1
To select the duration of the APS/ RPS alternate value stress off period.	[SOUR[1]:]DATA:TEL:ALT:APSW:NFL <frames>	63
To select the duration of the APS/ RPS alternate value pre-stress period.	[SOUR[1]:]DATA:TEL:ALT:APSW:PFL <frames>	0
To set the value of the alternate APS/RPS byte pair.	[SOUR[1]:]DATA:TEL:ALT:APSW:VAL <value>	0

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Task	Command	Default Value
To select the source of the alternate APS/RPS byte pair.	`[SOUR[1]:]DATA:TEL:APSW[:SOUR] <source>`	INT
To disable any active error addition.	`[SOUR[1]:]DATA:TEL:ERR NONE`	-
To select the data error add mode.	`[SOUR[1]:]DATA:TEL:ERR:DATA <mode>`	NONE
To select the data error add rate.	`[SOUR[1]:]DATA:TEL:ERR:DATA:RATE <rate>`	1E-3
To select the Path FEBE error add mode.	`[SOUR[1]:]DATA:TEL:ERR:FEBE <mode>`	NONE
To select the Path FEBE error add rate.	`[SOUR[1]:]DATA:TEL:ERR:FEBE:RATE <rate>`	1E-5
To select the Path FEBE error add value.	`[SOUR[1]:]DATA:TEL:ERR:FEBE:VAL <value>`	1
To select the Line BIP-8 byte (B2) error add mode.	`[SOUR[1]:]DATA:TEL:ERR:LBIP <mode>`	NONE
To select the Line BIP-8 byte (B2) error add channel.	`[SOUR[1]:]DATA:TEL:ERR:LBIP:CHAN <channel>`	1
To select the Line BIP-8 byte (B2) error add rate.	`[SOUR[1]:]DATA:TEL:ERR:LBIP:RATE <rate>`	1E-3
To select the bits in the Line BIP-8 byte (B2) to be errored.	`[SOUR[1]:]DATA:TEL:ERR:LBIP:MASK <mask>`	1
To select the MS-FEBE error add mode.	`[SOUR[1]:]DATA:TEL:ERR:MSF <mode>`	NONE
To select the MS-FEBE error add rate.	`[SOUR[1]:]DATA:TEL:ERR:MSF:RATE <rate>`	1E-5
To select the MS-FEBE error add value.	`[SOUR[1]:]DATA:TEL:ERR:MSF:VAL <value>`	1
To allow a single error to be inserted into the overhead test byte.	`[SOUR[1]:]DATA:TEL:ERR:PATT <mode>`	
To select the Path-8 BIP (B3) error add mode.	`[SOUR[1]:]DATA:TEL:ERR:PBIP <mode>`	
To select the bits in the Path BIP-8 (B3) to be errored.	`[SOUR[1]:]DATA:TEL:ERR:PBIP:MASK <mask>`	
To select the Path BIP-8 (B3) error add rate.	`[SOUR[1]:]DATA:TEL:ERR:PBIP:RATE <rate>`	
To select the pointer stress mode.	`[SOUR[1]:]DATA:TEL:ERR:POIN <mode>`	NONE
To select the number of frames in a given stress period during which the current pointer value will be modified.	`[SOUR[1]:]DATA:TEL:ERR:POIN:FLEN <frames>[,<period>]`	1,4

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Task	Command	Default Value
To select the bits in the pointer bytes (H1/H2) to be errored.	[SOUR[1]:]DATA:TEL:ERR:POIN:MASK <mask>	1
To select the pointer stress static mode.	[SOUR[1]:]DATA:TEL:ERR:POIN:MASK:STAT <state>	OFF
To select the duration of the pointer stress on period.	[SOUR[1]:]DATA:TEL:ERR:POIN:MFL <frames>	1
To select the duration of the pointer stress off period.	[SOUR[1]:]DATA:TEL:ERR:POIN:NFL <frames>	63
To select the duration of the pointer pre-stress period.	[SOUR[1]:]DATA:TEL:ERR:POIN:PFL <frames>	0
To select the PRBS error add mode.	[SOUR[1]:]DATA:TEL:ERR:PRBS <mode>	NONE
To select the PRBS error add rate.	[SOUR[1]:]DATA:TEL:ERR:PRBS:RATE <rate>	1E-5
To select the Path BIP-8 (B3) error add mode.	[SOUR[1]:]DATA:TEL:ERR:PBIP <mode>	NONE
To select the Path BIP-8 (B3) error add rate.	[SOUR[1]:]DATA:TEL:ERR:PBIP:RATE <rate>	1E-5
To select the bits in the Path BIP-8 byte (B3) to be errored.	[SOUR[1]:]DATA:TEL:ERR:PBIP:MASK <mask>	1
To select the Section BIP-8 (B1) error add mode.	[SOUR[1]:]DATA:TEL:ERR:SBIP <mode>	NONE
To select the Section BIP-8 (B1) error add rate.	[SOUR[1]:]DATA:TEL:ERR:SBIP:RATE <rate>	1E-5
To select the bits in the Section BIP-8 byte (B1) to be errored.	[SOUR[1]:]DATA:TEL:ERR:SBIP:MASK <mask>	1
To select the Frameword (A1/A2) stress condition.	[SOUR[1]:]DATA:TEL:FWOR <condition>	NONE
To select the Frameword (A1/A2) error stress mode.	[SOUR[1]:]DATA:TEL:FWOR:ERR <mode>	NONE
To select the channel in which the A1 byte is to be stressed.	[SOUR[1]:]DATA:TEL:FWOR:ERR:CHAN[1] <channel>,<offset>	1,0
To select the channel in which the A2 byte is to be stressed.	[SOUR[1]:]DATA:TEL:FWOR:ERR:CHAN2 <channel>,<offset>	1,0
To select the bits in the A1 byte to be stressed (Frameword error).	[SOUR[1]:]DATA:TEL:FWOR:ERR:MASK[1] <mask>	01
To select the bits in the A2 byte to be stressed (Frameword error).	[SOUR[1]:]DATA:TEL:FWOR:ERR:MASK2 <mask>	00

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Task	Command	Default Value
To select the number of frames in a given stress period during which Frameword errors are generated or suppressed.	[SOUR[1]:]DATA:TEL:FWOR:ERR:FLEN <frames>[,<period>]	1,4
To select the duration of the Frameword error sequence stress on period.	[SOUR[1]:]DATA:TEL:FWOR:ERR:MFL <frames>	1
To select the duration of the Frameword error sequence stress off period.	[SOUR[1]:]DATA:TEL:FWOR:ERR:NFL <frames>	63
To select the duration of the Frameword error sequence pre-stress period.	[SOUR[1]:]DATA:TEL:FWOR:ERR:PFL <frames>	0
To select the Frameword loss stress mode.	[SOUR[1]:]DATA:TEL:FWOR:LOSS <mode>	NONE
To select the bits in the A1 byte to be stressed (Frameword loss).	[SOUR[1]:]DATA:TEL:FWOR:LOSS:MASK [1] <mask>	92
To select the bits in the A2 byte to be stressed (Frameword loss).	[SOUR[1]:]DATA:TEL:FWOR:LOSS:MASK 2 <mask>	130
To select the number of frames in a given stress period during which Frameword loss is generated, or suppressed	[SOUR[1]:]DATA:TEL:FWOR:LOSS:FLEN <frames>[,<period>]	1,4
To select the duration of the Frameword loss sequence stress on period.	[SOUR[1]:]DATA:TEL:FWOR:LOSS:MFL <frames>	1
To select the duration of the Frameword loss sequence stress off period.	[SOUR[1]:]DATA:TEL:FWOR:LOSS:NFL <frames>	63
To select the duration of the Frameword loss sequence pre-stress period.	[SOUR[1]:]DATA:TEL:FWOR:LOSS:PFL <frames>	0
To select the source of the Line Data Communications Channel (DCC).	[SOUR[1]:]DATA:TEL:LDCC:SOUR <source>	INT
To select the type of network element to be emulated.	[SOUR[1]:]DATA:TEL:NEL <element>	TERM
To select through mode repeater error monitoring recalculation mode.	[SOUR[1]:]DATA:TEL:NEL:REP[:EMRecalc] <state>	0
To select fully transparent through mode error monitoring recalculation mode.	[SOUR[1]:]DATA:TEL:NEL:THR[:EMRecalc] <state>	0
To select the source of the transport overhead byte(s).	[SOUR[1]:]DATA:TEL:OVER <byte>,<source>,<channel>,<offset>	INT

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Task	Command	Default Value
To internally source all the transport overhead bytes, and effectively turns off any single-byte transport overhead or path overhead EOC or BER which is active.	`[SOUR[1]:]DATA:TEL:OVER:ALL:INT`	
To program up to 16 bytes of the J0 trace message.	`[SOUR[1]:]DATA:TEL:OVER:ARR:J0|TRAC <count>,<start>,<value1>[,<value2>...]`	0
To set the repetition count in the internal sequencer for each block of transport overhead frames.	`[SOUR[1]:]DATA:TEL:OVER[<n>]:COUN <count>`	0
To program a particular transport overhead byte in a given channel to a specific value.	`[SOUR[1]:]DATA:TEL:OVER[<n>]:DATA[:SING] <channel>,<byte>,<offset>,<value>`	page 5-133
To program the values of bytes A1 - E2 in a particular transport overhead group to specific values.	`[SOUR[1]:]DATA:TEL:OVER[<n>]:DATA[:SING]:OGR <channel>,<offset>,<value1>,...,<value26>`	page 5-133
To select the format of the J0 trace.	`[SOUR[1]:]DATA:TEL:OVER:J0|TRAC:FORM <format>`	SING
To select normal or sequencer mode.	`[SOUR[1]:]DATA:TEL:OVER:SOUR <mode>`	NORM
To select the internal sequencer operating mode.	`[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ <mode>`	NONE
To set the sequencer loopback point.	`[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ:LOOP <point>`	3
To set the sequencer TTL trigger position.	`[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ:TRIG <point>`	2
To program the APS bytes (K1 and K2) to a specific value.	`[SOUR[1]:]DATA:TEL:OVER:WDAT <channel>,<word>,<offset>,<value>`	1
To select the specific test pattern to be generated.	`[SOUR[1]:]DATA:TEL:PATT <pattern>`	NONE
To select the length (in bytes) of the test patterns defined by **DATA:TEL:PATT**.	`[SOUR[1]:]DATA:TEL:PATT:LENG <length>`	1
To select the test pattern to be used for transport overhead or path overhead testing.	`[SOUR[1]:]DATA:TEL:PATT2 <pattern>`	PRBS9
To select the data to be carried in the payload.	`[SOUR[1]:]DATA:TEL:PAYL <data>`	DATA
To select the background pattern for a particular channel.	`[SOUR[1]:]DATA:TEL:PAYL:BDAT[:SING] <channel>,<pattern>`	VAL

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Task	Command	Default Value
To select the background load byte value when the specified channel pattern is set to **VAL**.	**[SOUR[1]:]DATA:TEL:PAYL:BDAT[:SING]:VAL <channel>,<value>**	0
To select the background pattern for all channels.	**[SOUR[1]:]DATA:TEL:PAYL:BDAT:ALL <pattern>**	VAL
To select the background byte value when all channel patterns are set to **VAL**.	**[SOUR[1]:]DATA:TEL:PAYL:BDAT:ALL:VAL <value>**	0
To query if any tributary or ATM channels are inserted.	**[SOUR[1]:]DATA:TEL:PAYL:CHAN:SOUR?**	NONE
To set the payload test pattern.	**[SOUR[1]:]DATA:TEL:PAYL:PATT <pattern>**	PRBS23
To select the source of the payload generated for the specified group.	**[SOUR[1]:]DATA:TEL:PAYL:SOUR[:SIN G] <group>,<source>**	INT
To select the source of the payload generated for all groups.	**[SOUR[1]:]DATA:TEL:PAYL:SOUR:ALL <source>**	INT
To select the pointer action.	**[SOUR[1]:]DATA:TEL:POIN <action>**	NONE
To select the pointer action direction.	**[SOUR[1]:]DATA:TEL:POIN:DIR <direction>**	UP
To select the New Data Flag state.	**[SOUR[1]:]DATA:TEL:POIN:NDFL <state>**	1
To select the new pointer value.	**[SOUR[1]:]DATA:TEL:POIN:NDV <value>**	0
To select the payload pointer rate.	**[SOUR[1]:]DATA:TEL:POIN:RATE <rate>**	+1
To select between default and programmable pointer size bits.	**[SOUR[1]:]DATA:TEL:POIN:SBIT <type>**	DEF
To select the programmable value for the pointer size bits.	**[SOUR[1]:]DATA:TEL:POIN:SBIT:VAL <value>**	0
To select the pointer sequence type.	**[SOUR[1]:]DATA:TEL:POIN:SEQ MRATe**	MRAT
To select the direction of pointer sequences.	**[SOUR[1]:]DATA:TEL:POIN:SEQ:DIR <direction>**	UP
To select the source of the transmitted pointer bytes.	**[SOUR[1]:]DATA:TEL:POIN:SOUR <source>**	OVER
To query the value of the transmitted pointer.	**[SOUR[1]:]DATA:TEL:POIN:VAL?**	0
To program up to 16 bytes of the J1 trace message.	**[SOUR[1]:]DATA:TEL:POV:ARR:J1|TRAC <length>,<start>,<value1>[,...<value16>]**	<0>[,...0]

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Task	Command	Default Value
To calculate the correct value for the B3 byte in each background payload pattern.	`[SOUR[1]:]DATA:TEL:POV:B3`	
To assign values to the path overhead bytes.	`[SOUR[1]:]DATA:TEL:POV:DATA <byte>,<value>`	0
To set bits 5, 6, 7 and 8 of the path overhead G1 byte.	`[SOUR[1]:DATA:TEL:POV:G1 <value>`	0
To select the format of the J1 trace.	`[SOUR[1]:]DATA:TEL:POV:J1|TRAC:FORM <format>`	LONG
To select the source of the path overhead bytes.	`[SOUR[1]:]DATA:TEL:POV:SOUR <byte>,<source>`	INT
To internally source all the path overhead bytes, and turn off single-byte path overhead EOC or BER.	`[SOUR[1]:]DATA:TEL:POV:SOURce:ALL:INT`	
To enable or disable the scrambling stage of the transmitter.	`[SOUR[1]:]DATA:TEL:SCR <state>`	1
To select the source of the Section Data Communications Channel (DCC).	`[SOUR[1]:]DATA:TEL:SDCC:SOUR <source>`	INT
To select the source of the undefined transport overhead bytes.	`[SOUR[1]:]DATA:TEL:UND:SOUR <source>,<row>,<column>,<interleave>`	INT
To select the source of the user channel (F1).	`[SOUR[1]:]DATA:TEL:USER:SOUR <source>`	INT

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[SOUR[1]:]CLOC:SOUR <source>

Description

`[SOURce[1]:]CLOCk:SOURce <source>` selects the clock source used by the Transport Overhead Generator.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	`TRIButary` | `EXTernal` | `RECovered` | `INTernal` | `TREFerence`	none

Dependencies

- When `INST:SEL` is set to `MRATe`, the clock source settings are restricted to `EXTernal`, `INTernal`, `RECovered` and `TREFerence` in MULTIrate mode.
- When `SOUR:DATA:TEL:NEL` is sent with `REP` or `THR RECovered` is the only setting allowed.
- When `SOUR:DATA:TEL:NEL` is sent with `TRIB` this node is set to `TRIButary`.
- When `SOUR:DATA:TEL:NEL` is sent with `TEAM` this node is set to INTernal.
- `TREF` is only allowed if an HP E1679A Timing Reference is present and configured as a servant of the HP E1676B.

Comments

- If `TRIB` is selected, the clock source is taken from the clock signal on the generator's input tributary.
- If either `EXT` or `REC` is selected as the generator clock source, a tributary clock synchronized to the selected reference must be connected to the front-panel *Transmit TTLIB CLOCK IN* port, at the tributary rate specified by `INP3:TEL:RATE` for tributary insert to operate correctly.
- If `EXT` is selected, the clock source is taken from the front-panel *Transmit Ref Clock In* port.
- If `REC` is selected, the clock source is taken from the receiver's recovered clock.
- If TREF is selected the clock source is taken from the E1679A generated timing signals on the backplane of the VXI system.
- The reset condition for `CLOC:SOUR` is `INT`.

Error Codes

None.

Related Commands

None.

Query Command

`[SOURce[1]:]CLOCk:SOURce?` returns the currently selected clock source for the Transport Overhead Generator.

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[SOUR[1]:]CLOC:SOUR <source>

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	TRIB|EXT|REC|INT|TREF	none

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[SOUR[1]:]DATA:TEL:ALAR <condition>

Description

`[SOURce[1]:]DATA:TELecom:ALARm <condition>` selects the type of alarm condition to be generated by the Transport Overhead Generator.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
condition	discrete	**NONE** | **LAIS** | **FERF** | **PAIS** | **PFERf**	none

Dependencies

- This command is only effective when **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:LOSS** **DATA:TEL:FWOR:ERR** and **DATA:TEL:ERR:POIN** are set to **NONE**, as only one stress condition can be active at any time.
- The operation of this command is qualified by the settings of **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, and **DATA:TEL:ALAR:PFER**, until another **DATA:TEL:ALAR** is issued.
- This command is not allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- This command is not allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.
- The stress on state for **ONCE** or **SEQ** may either generate or suppress the alarm. It is the inverse of the initial state set by **DATA:TEL:ALAR**.
- Stressing is not possible if **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.

Comments

- Generation of Line AIS corresponds to an all 1s pattern in all the line overhead and payload bytes. Line AIS is detected by observing a 111 pattern in bits 6, 7 and 8 of the K2 byte. The LAIS parameter causes the module to generate this pattern.
- Line FERF corresponds to a 110 pattern in bits 6, 7 and 8 of the K2 byte. The FERF parameter causes the module to generate this pattern.
- Alarm conditions can be selected by writing specific patterns to the K2 byte using the **DATA:TEL:OVER[<n>]:DATA** or **DATA:TEL:OVER[<n>]:WDAT** commands.
- Continuous alarm generation can be achieved by setting **DATA:TEL:ALAR** to the desired alarm condition with the corresponding **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER** or **DATA:TEL:ALAR:LAIS** set to **NONE**.
- When **DATA:TEL:ALAR NONE** is received, **DATA:TEL:ALAR:LAIS** and **DATA:TEL:ALAR:FERF** are forced to **NONE**.
- When **DATA:TEL:ALAR:XXXX** is either **ONCE** or **SEQ**, it reverts to **NONE** when **DATA:TEL:ALAR:YYYY** is received where XXXX is one of the alarms and YYYY is another, error **+201 "Settings change"** is also issued.
- The reset condition for **DATA:TEL:ALAR** is **NONE**.

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[SOUR[1]:]DATA:TEL:ALAR <condition>

Error Codes –221, "Settings conflict" +201 "Settings change"

Related Commands

```
DATA:TEL:ALAR:FERF
DATA:TEL:ALAR:LAIS
DATA:TEL:ALT:APSW
DATA:TEL:ALAR:PFER
DATA:TEL:ALAR:PAIS
DATA:TEL:ALAR:POIN
DATA:TEL:FWOR
DATA:TEL:OVER[<n>]:DATA
DATA:TEL:OVER[<n>]:WDAT
DATA:TEL:NEL
DATA:TEL:NEL:REP:EMR
DATA:TEL:NEL:THR:EMR
DATA:TEL:NEL
```

Query Command `[SOURce[1]:]DATA:TELecom:ALARm?` returns the alarm condition currently being generated by the Transport Overhead Generator.

Response

Response Name	Response Type	Response Range	Default Units
condition	discrete	NONE | LAIS | FERF | PAIS | PFERf	none

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[SOUR[1]:]DATA:TEL:ALAR:FERF <mode>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:FERF <mode>` selects the Line FERF alarm stress mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **SEQuence**	none

Dependencies

- This command is only effective when **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:LOSS**, **DATA:TEL:FWOR:ERR** and **DATA:TEL:ERR:POIN** are set to **NONE**, as only one stress condition can be active at any time.
- This command is only effective until a **DATA:TEL:ALAR** command is issued.
- Stressing is not possible if **DATA:TEL:OVER:SOUR:SEQ** is not not set to **NONE**.

Comments

- **NONE** results in continuous FERF generation when **DATA:TEL:ALAR** is set to **FERF**.
- **ONCE** generates an alarm only once for a set number of frames when **DATA:TEL:ALAR** is set to **NONE**.
- **ONCE** suppresses an alarm only once for a set number of frames when **DATA:TEL:ALAR** is set to **FERF**.
- The alarm duration is set by **DATA:TEL:ALAR:FERF:FLEN** for **ONCE**.
- **SEQ** generates or suppresses an alarm for P frames immediately upon invocation. Thereafter it repeats every N+M frames, reverting to the initial state for N frames then again generating or suppressing the alarm for M frames.
- The numbers of frames P, N and M for **SEQ** are set by the commands **DATA:TEL:ALAR:FERF:PFL**, **DATA:TEL:ALAR:FERF:MFL** and **DATA:TEL:ALAR:FERF:NFL**.
- The reset condition for **DATA:TEL:ALAR:FERF** is **NONE**.

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Error Codes

–221	"Settings conflict"	1. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR:LAIS**, or **DATA:TEL:ALAR:PAIS** or **DATA:TEL:ALAR:PFER** were set to **SEQ**. 2. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALT:APSW** was set to **SEQ**. 3. **ONCE**, or **SEQ** was selected, but **DATA:TEL:FWOR** was set to **LOSS** or **ERR**, or **DATA:TEL:FWOR:LOSS** was set to **SEQ**, or **DATA:TEL:FWOR:ERR** was set to **SEQ**. 4. **ONCE** or **SEQ** was selected but **DATA:TEL:ERR:POIN** was set to **SEQ** or **ACT**. 5. **ONCE** or **SEQ** was selected, but **DATA:TEL:ALAR** was set to **LAIS**, **PAIS**, **PFER**. 6. **ONCE** or **SEQ** was selected, but **DATA:TEL:OVER:SOUR** was set to **SEQ**.

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALAR:FERF:FLEN
DATA:TEL:ALAR:FERF:MFL
DATA:TEL:ALAR:FERF:NFL
DATA:TEL:ALAR:FERF:PFL
DATA:TEL:ALAR:LAIS
DATA:TEL:ALT:APSW
DATA:TEL:FWOR
DATA:TEL:ERR:POIN

Query Command

[SOURce[1]:]DATA:TELecom:ALARm:FERF? returns the currently selected alarm stress mode of the Line FERF alarm. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **SEQ**	none

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[SOUR[1]:]DATA:TEL:ALAR:FERF:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which the FERF alarm is generated or suppressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see below)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effecive when **DATA:TEL:ALAR:FERF** is set to **ONCE**.
- The range of the <frames> parameter depends on the stress <period> parameter selected:
  - 1 to 3 in a stress period of 4 frames.
  - 1 to 63 in a stress period of 64 frames.
- The optional value of <period> is 4 or 64. If omitted, the value remains as last set.

Comments

- Continuous FERF alarm generation can be achieved by setting **DATA:TEL:ALAR** to **FERF** and **DATA:TEL:ALAR:FERF** to **NONE**.
- The reset condition for **DATA:TEL:ALAR:FERF:FLEN** is **1,4**.

Error Codes

None.

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALAR:FERF

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:FLENgth?` returns the currently selected number of frames and the stress period during which the FERF alarm is generated or suppressed.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:FERF:MFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:MFLength <frames>` selects the duration of the Line FERF alarm stress on period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:FERF`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALAR:FERF:MFL`** is **`1`**.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:FERF`
`DATA:TEL:ALAR:FERF:NFL`
`DATA:TEL:ALAR:FERF:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:MFLength?` returns the Line FERF alarm sequence stress on duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:FERF:NFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:NFLength <frames>` selects the duration of the Line FERF alarm stress off period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when `DATA:TEL:ALAR:FERF` is set to `SEQ`.

Comments

- The reset condition for `DATA:TEL:ALAR:FERF:NFL` is `63`.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:FERF`
`DATA:TEL:ALAR:FERF:MFL`
`DATA:TEL:ALAR:FERF:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:NFLength?` returns the Line FERF alarm sequence stress off duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:FERF:PFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:PFLength <frames>` selects the duration of the Line FERF alarm pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:FERF`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALAR:FERF:PFL`** is 0.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:FERF`
`DATA:TEL:ALAR:FERF:MFL`
`DATA:TEL:ALAR:FERF:NFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:FERF:PFLength?` returns the Line FERF alarm sequence pre-stress duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`0 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:LAIS <mode>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS <mode>` selects the Line AIS alarm stress mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **SEQuence**	none

Dependencies

- This command is only effective when **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:LOSS**, **DATA:TEL:FWOR:ERR** and **DATA:TEL:FWOR:POIN** are set to **NONE**, as only one stress condition can be active at any time.
- This command is only effective until a **DATA:TEL:ALAR** command is issued.
- The stress on state for **ONCE** and **SEQ** may either generate or suppress the alarm. It is the inverse of the initial state set by **DATA:TEL:ALAR** which must be either **NONE** or **LAIS**.
- Stressing is not possible if **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.

Comments

- **NONE** will result in continuous LAIS generation when **DATA:TEL:ALAR** is set to **LAIS**.
- **ONCE** generates an alarm once only, for a set number of frames when **DATA:TEL:ALAR** is set to **NONE**.
- **ONCE** suppresses the alarm once only, for a set number of frames when **DATA:TEL:ALAR** is set to **LAIS**.
- The number of frames for which the effects of **ONCE** apply is set by the **DATA:TEL:ALAR:LAIS:FLEN** command.
- **SEQ** generates or suppresses an alarm for P frames immediately upon invocation. Thereafter it repeats every N+M frames, reverting to the initial state for N frames then again generating or suppressing the alarm for M frames.
- The numbers of frames P, N and M for **SEQ** are set by the commands **DATA:TEL:ALAR:LAIS:PFL**, **DATA:TEL:ALAR:LAIS:MFL** and **DATA:TEL:ALAR:LAIS:NFL**.
- The reset condition for **DATA:TEL:ALAR:LAIS** is **NONE**.

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Error Codes

-221	"Settings conflict"	1. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR:FERF** or **DATA:TEL:ALAR:PAIS** or **DATA:TEL:ALAR:PERF** was set to **SEQ**. 2. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALT:APSW** was set to **SEQ**. 3. **ONCE**, or **SEQ** was selected, but **DATA:TEL:FWOR** was set to **LOSS** or **ERR**, or **DATA:TEL:FWOR:LOSS** was set to **SEQ**, or **DATA:TEL:FWOR:ERR** was set to **SEQ**. 4. **ONCE** or **SEQ** was selected but **DATA:TEL:ERR:POIN** was set to **SEQ** or **ACT**. 5. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR** was set to **FERF**, **PAIS** or **PFER**. 6. **ONCE** or **SEQ** was selected, but **DATA:TEL:OVER:SOUR** was set to **SEQ**.

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALAR:LAIS:FLEN
DATA:TEL:ALAR:LAIS:MFL
DATA:TEL:ALAR:LAIS:NFL
DATA:TEL:ALAR:LAIS:PFL
DATA:TEL:ALT:APSW
DATA:TEL:FWOR
DATA:TEL:ERR:POIN

Query Command

[SOURce[1]:]DATA:TELecom:ALARm:LAIS? returns the currently selected alarm stress mode of the Line AIS alarm. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **SEQ**	none

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[SOUR[1]:]DATA:TEL:ALAR:LAIS:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which the Line AIS alarm is generated or suppressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see below)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:LAIS`** is set to **`ONCE`**.
- The range of the <frames> parameter depends on the stress <period> parameter selected:
  - 1 to 3 in a stress period of 4 frames.
  - 1 to 63 in a stress period of 64 frames.
- The optional value of <period> is 4 or 64. If omitted, the value remains as last set.

Comments

- Continuous LAIS alarm generation can be achieved by setting **`DATA:TEL:ALAR`** to **`LAIS`**, and **`DATA:TEL:ALAR:LAIS`** to **`NONE`**.
- The reset condition for **`DATA:TEL:ALAR:LAIS:FLEN`** is **`1,4`**.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:LAIS`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:FLENgth?` returns the currently selected number of frames and the stress period during which the LAIS alarm is generated or suppressed.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:LAIS:MFL <frames>

Parameters

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:MFLength <frames>` selects the duration of the Line AIS alarm stress on period. The period is specified as a number of consecutive of frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:LAIS`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALAR:LAIS:MFL`** is **`1`**.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:LAIS`
`DATA:TEL:ALAR:LAIS:NFL`
`DATA:TEL:ALAR:LAIS:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:MFLength?` returns the line AIS alarm sequence stress on duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:LAIS:NFL <frames>

Parameters

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:NFLength <frames>` selects the duration of the Line AIS alarm stress off duration. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:LAIS`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALAR:LAIS:NFL`** is `63`.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:LAIS`
`DATA:TEL:ALAR:LAIS:MFL`
`DATA:TEL:ALAR:LAIS:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:NFLength?` returns the line AIS alarm sequence stress off duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:LAIS:PFL <frames>

Parameters

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:PFLength <frames>` selects the duration of the Line AIS alarm pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:LAIS`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALAR:LAIS:PFL`** is `0`.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:LAIS`
`DATA:TEL:ALAR:LAIS:MFL`
`DATA:TEL:ALAR:LAIS:NFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:LAIS:PFLength?` returns the line AIS alarm sequence pre-stress duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`0 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PAIS <mode>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS <mode>` selects the Path AIS alarm stress mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **SEQ**	none

Dependencies

- This command is only effective when **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:LOSS**, **DATA:TEL:FWOR:ERR** and **DATA:TEL:FWOR:POIN** are set to **NONE**, as only one stress condition can be active at any time.
- This command is only effective until a **DATA:TEL:ALAR** command is issued.
- The stress on state for **ONCE** and **SEQ** may either generate or suppress the alarm. It is the inverse of the initial state set by **DATA:TEL:ALAR** which must be either **NONE** or **PAIS**.
- Stressing is not possible if **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.

Comments

- **NONE** will result in continuous PAIS generation when **DATA:TEL:ALAR** is set to PAIS.
- **ONCE** generates the alarm once only, for a set number of frames when **DATA:TEL:ALAR:** **is set to NONE**.
- **ONCE** suppress the alarm once only for a set number of frames when **DATA:TEL:ALAR** is set to **PAIS**.
- The number of frames for which the effects of **ONCE** apply is set by the **DATA:TEL:ALAR:PAIS:FLEN** command.
- **SEQ** generates or suppresses an alarm for P frames immediately upon invocation. Thereafter it repeats every N+M frames, reverting to the initial state for N frames then again generating or suppressing the alarm for M frames.
- The numbers of frames P, N and M for **SEQ** are set by the commands **DATA:TEL:ALAR:PAIS:PFL**, **DATA:TEL:ALAR:PAIS:MFL** and **DATA:TEL:ALAR:PAIS:NFL**.
- The reset condition for **DATA:TEL:ALAR:PAIS** is **NONE**.

Error Codes

– 221	"Settings conflict"	1. **ONCE** or **SEQ** was selected, but **DATA:TEL:ALAR:FERF** was set to **SEQ** or **DATA:TEL:ALAR:LAIS** or **DATA:TEL:ALAR:PFER**. 2. **ONCE** or **SEQ** was selected, but **DATA:TEL:ALT:APSW** was set to **SEQ**.

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3. **ONCE** or **SEQ** was selected, but **DATA:TEL:FWOR** was set to **LOSS** or **ERR**, or **DATA:TEL:FWOR:LOSS** was set to **SEQ**, or **DATA:TEL:FWOR:ERR** was set to **SEQ**.

4. **ONCE** or **SEQ** was selected, but **DATA:TEL:ERR:POIN** was set to **SEQ** or **ACT**.

5. **ONCE** or **SEQ** was selected, but **DATA:TEL:ALAR** was set to **FERF,LAIS** or **PFER**.

6. **ONCE** or **SEQ** was selected, but **DATA:TEL:OVER:[<n>]:SOUR** was set to **SEQ**.

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALAR:PAIS:FLEN
DATA:TEL:ALAR:PAIS:MFL
DATA:TEL:ALAR:PAIS:NFL
DATA:TEL:ALAR:PAIS:PFL
DATA:TEL:ALT:APSWDATA:TEL:FWOR
DATA:TEL:ERR:POIN

Query Command

[SOURce[1]:]DATA:TELecom:ALARm:PAIS? returns the currently selected Path AIS alarm stress mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **SEQ**	none

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[SOUR[1]:]DATA:TEL:ALAR:PAIS:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which the Path AIS alarm is generated or suppressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see below)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:PAIS`** is set to **`ONCE`**.
- The range of the <frames> parameter depends on the stress <period> parameter selected:
- 1 to 3 in a stress period of 4 frames.
- 1 to 63 in a stress period of 64 frames.
- The optional value of <period> is 4 or 64. If omitted, the value remains as last set.

Comments

- Continuous **`PAIS`** alarm generation can be achieved by setting **`DATA:TEL:ALAR`** to **`PAIS`** and **`DATA:TEL:ALAR:PAIS`** to **`NONE`**.
- The reset condition for **`DATA:TEL:ALAR:PAIS:FLEN`** is **`1,4`**.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PAIS`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:FLENgth?` returns the currently selected number of frames and the stress period during which the Path AIS alarm is generated or suppressed.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PAIS:MFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:MFLength <frames>` selects the duration of the Path AIS alarm stress on period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command only effective when **`DATA:TEL:ALAR:PAIS`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALAR:PAIS:MFL`** is `1`.

Error Codes

NONE.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PAIS`
`DATA:TEL:ALAR:PAIS:NFL`
`DATA:TEL:ALAR:PAIS:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:MFLength?` returns the duration of the currently selected Path AIS alarm stress on period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PAIS:NFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:NFLength <frames>` selects the duration of the Path AIS alarm stress off period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command only effective when `DATA:TEL:ALAR:PAIS` is set to `SEQ`.

Comments

- The reset condition for `DATA:TEL:ALAR:PAIS:NFL` is `63`.

Error Codes

NONE.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PAIS`
`DATA:TEL:ALAR:PAIS:MFL`
`DATA:TEL:ALAR:PAIS:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:NFLength?` returns the duration of the currently selected Path AIS alarm stress off period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PAIS:PFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:PFLength <frames>` selects the duration of the Path AIS alarm stress pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:PAIS`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALAR:PAIS:PFL`** is 0.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PAIS`
`DATA:TEL:ALAR:PAIS:MFL`
`DATA:TEL:ALAR:PAIS:NFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PAIS:PFLength?` returns the currently selected duration of the Path AIS alarm stress pre-stress period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`0 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PFER <mode>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf <mode>` selects the Path FERF/ Path RDI alarm stress mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	NONE | ONCE | SEQuence	none

Dependencies

- This command is only effective when **DATA:TEL:ALT:APSW, DATA:TEL:FWOR, DATA:TEL:FWOR:LOSS, DATA:TEL:FWOR:ERR, and DATA:TEL:FWOR:POIN** are set to **NONE**, as only one stress condition can be active at any time.
- This command is only effective until a **DATA:TEL:ALAR** command is issued.
- The stress on state for **ONCE** and **SEQ** may either generate or suppress the alarm. It is the inverse of the initial state set by **DATA:TEL:ALAR** which must be either **NONE** or **PFER**.
- Stressing is not possible if **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.

Comments

- During Path FERF stressing, the alternate value specified by the **DATA:TEL:ALARM:PFER:VAL** command is output on bits 5 to 8 of the G1 byte.
- **NONE** will result in continuous **PFER** generation when **DATA:TEL:ALAR** is set to **PFER**.
- **ONCE** generates an alarm once only, for a set number of frames when **DATA:TEL:ALAR** is set to **NONE**.
- **ONCE** suppresses the alarm once only, for a set number of frames when **DATA:TEL:ALAR** is set to **PFER**.
- The number of frames for which the effects of **ONCE** apply is set by the **DATA:TEL:ALAR:PFER:FLEN** command.
- **SEQ** generates or suppresses the alarm for P frames immediately upon invocation. Thereafter it repeats every N+M frames, reverting to the initial state for N frames then again generating or suppressing the alarm for M frames.
- The numbers of frames P, N and M for **SEQ** are set by the commands **DATA:TEL:ALAR:PFER:PFL, DATA:TEL:ALAR:PFER:MFL** and **DATA:TEL:ALAR:PFER:NFL**.
- The reset condition for **DATA:TEL:ALAR:PFER** is **NONE**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALAR:PFER:FLEN
DATA:TEL:ALAR:PFER:MFL

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[SOUR[1]:]DATA:TEL:ALAR:PFER <mode>

```
DATA:TEL:ALAR:PFER:NFL
DATA:TEL:ALAR:PFER:PFL
DATA:TEL:ALAR:PFER:VAL
DATA:TEL:ALT:APSW
DATA:TEL:FWOR
DATA:TEL:ERR:POIN
```

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf?` returns the currently selected Path FERF alarm stress mode. Note that `ONCE` cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	`NONE` | `SEQ`	none

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[SOUR[1]:]DATA:TEL:ALAR:PFER:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which the Path FERF alarm is generated or suppressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see below)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effective when **DATA:TEL:ALAR:PFER** is set to **ONCE**.
- The range of the <frames> parameter depends on the stress <period> parameter selected:
  - 1 to 3 in a stress period of 4 frames.
  - 1 to 63 in a stress period of 64 frames.

Comments

- Continuous **LAIS** alarm generation can be achieved by setting **DATA:TEL:ALAR** to **PFER** and **DATA:TEL:ALAR:PFER** to **NONE**.
- The reset condition for **DATA:TEL:ALAR:PFER:FLEN** is **1,4**.

Error Codes

None.

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALAR:PFER

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:FLENgth?` returns the currently selected number of frames and the stress period during which the Path FERF alarm is generated or suppressed.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PFER:MFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:MFLength <frames>` selects the duration of the Path FERF alarm stress on period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when `DATA:TEL:ALAR:PFER` is set to `SEQ`.

Comments

- The reset condition for `DATA:TEL:ALAR:PFER:MFL` is `1`.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PFER`
`DATA:TEL:ALAR:PFER:NFL`
`DATA:TEL:ALAR:PFER:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:MFLength?` returns the currently selected duration of the Path FERF alarm stress on period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PFER:NFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:NFLength <frames>` selects the duration of the Path FERF alarm stress off period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALAR:PFER`** is set to **`SEQ`**.

Comments

The reset condition for **`DATA:TEL:ALAR:PFER:NFL`** is `63`.

Error Codes

NONE.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PFER`
`DATA:TEL:ALAR:PFER:MFL`
`DATA:TEL:ALAR:PFER:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:NFLength?` returns the currently selected duration of the Path FERF alarm stress off period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PFER:PFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:PFLength <frames>` selects the duration of the Path FERF alarm stress pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

- This command is only effecuve when **`DATA:TEL:ALAR:PFER`** is set to **`SEQ`**.

Comments

The reset condition for **`DATA:TEL:ALAR:PFER:PFL`** is `0`.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PFER`
`DATA:TEL:ALAR:PFER:MFL`
`DATA:TEL:ALAR:PFER:NFL`

Response

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:PFLength?` returns the currently selected duration of the Path FERF alarm stress pre-stress period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`0 to 64`	none

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[SOUR[1]:]DATA:TEL:ALAR:PFER:VAL <value>

Description

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:VALue <value>` sets the alternative value for bits 5, 6, 7 and 8 of the G1 byte during Path FERF stressing.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
value	integer	0 to 15	none

Dependencies

None.

Comments

- The alternative value is output during the P and M sections of Path FERF stressing.
- The reset value for `DATA:TEL:ALAR:PFER:VAL` is 8.

Error Codes

None.

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ALAR:PFER`

Query Command

`[SOURce[1]:]DATA:TELecom:ALARm:PFERf:VALue?` returns the alternative value for bits 5, 6, 7 and 8 of the G1 byte.

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[SOUR[1]:]DATA:TEL:ALT:APSW <mode>

Description

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch <mode>` selects the Automatic or Ring Protection Switching (APS/RPS) alternate value stress mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **SEQuence**	none

Dependencies

- This command is only effective when **DATA:TEL:ALAR**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN** **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:LOSS** and **DATA:TEL:FWOR:ERR** are set to **NONE**, as only one stress condition can be active at any time.
- Stressing is not possible if **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.

Comments

- **NONE** stops the Alternate APS generation. The APS bytes will then be those set by **DATA:TEL:OVER[<n>]:DATA** and **DATA:TEL:OVER[<n>]:WDAT** commands.
- **ONCE** generates the Alternate APS value only once for a set number of frames.
- The number of frames for which the effects of **ONCE** and **PER** apply is set by the **DATA:TEL:ALT:APS:FLEN** command.
- **SEQ** generates or suppresses an alarm for P frames immediately upon invocation. Thereafter it repeats every N+M frames, reverting to the initial state for N frames then again generating or suppressing the alarm for M frames.
- The numbers of frames P, N and M for **SEQ** are set by the commands **DATA:TEL:ALT:APS:PFL**, **DATA:TEL:ALT:APS:MFL** and **DATA:TEL:ALT:APS:NFL**.
- The reset condition for **DATA:TEL:ALT:APSW** is **NONE**.

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[SOUR[1]:]DATA:TEL:ALT:APSW <mode>

Error Codes

–221	"Settings conflict"	1. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR:FERF** was set to **SEQ**. 2. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR:LAIS** was set to **SEQ**. 3. **ONCE** or **SEQ** was selected, but **DATA:TEL:ALAR:PAIS** was set to **SEQ**. 4. **ONCE** or **SEQ** was selected, but **DATA:TEL:ALAR:PFER** was set to **SEQ**. 5. **ONCE**, or **SEQ** was selected, but **DATA:TEL:FWOR** was set to **LOSS** or **ERR**, or **DATA:TEL:FWOR:LOSS** was set to **SEQ**, or **DATA:TEL:FWOR:ERR** was set to **SEQ**. 6. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR** was set to **LAIS**, **FERF**, **PAIS** or **PFER**. 7. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ERR:POIN** was set to **SEQ** or **ACT**.8. **ONCE**, or **SEQ** was selected, but **DATA:TEL:OVER:SOUR** was set to **SEQ**.

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALT:APSW:FLEN
DATA:TEL:ALT:APSW:MFL
DATA:TEL:ALT:APSW:NFL
DATA:TEL:ALT:APSW:PFL
DATA:TEL:ALT:APSW:VAL
DATA:TEL:FWOR
DATA:TEL:ERR:POIN

Query Command

[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch? returns the currently selected Alternate APS/RPS values stress mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **SEQ**	none

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[SOUR[1]:]DATA:TEL:ALT:APSW:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which the APS/RPS alternate value is generated.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see below)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALT:APSW`** is set to **`ONCE`**.
- The range of the <frames> parameter depends on the stress <period> parameter selected:
  - 1 to 3 in a stress period of 4 frames.
  - 1 to 63 in a stress period of 64 frames.

Comments

- The reset condition for **`DATA:TEL:ALT:APSW:FLEN`** is `1,4`.

Error Codes

None.

Related Commands

`DATA:TEL:ALT:APSW`
`DATA:TEL:ALT:APSW:VAL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:FLENgth?` returns the currently selected number of frames and the stress period during which the Alternate APS/RPS value is generated.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:ALT:APSW:MFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:MFLength <frames>` selects the duration of the APS/RPS alternate value stress on period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ALT:APSW`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALT:APSW:MFL`** is **`1`**.

Error Codes

None.

Related Commands

`DATA:TEL:ALT:APSW`
`DATA:TEL:ALT:APSW:NFL`
`DATA:TEL:ALT:APSW:PFL`
`DATA:TEL:ALT:APSW:VAL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:MFLength?` returns the currently selected Alternate APS/RPS sequence stress on duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALT:APSW:NFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:NFLength <frames>` selects the duration of the APS/RPS alternate value stress off period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effecive when `DATA:TEL:ALT:APSW` is set to `SEQ`.

Comments

- The reset condition for `DATA:TEL:ALT:APSW:NFL` is `63`.

Error Codes

None.

Related Commands

`DATA:TEL:ALT:APSW`
`DATA:TEL:ALT:APSW:PFL`
`DATA:TEL:ALT:APSW:MFL`
`DATA:TEL:ALT:APSW:VAL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:NFLength?` returns the currently selected Alternate APS/RPS sequence stress off duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ALT:APSW:PFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:PFLength <frames>` selects the duration of the APS/RPS alternative value pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

- This command is only effecuve when **`DATA:TEL:ALT:APSW`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ALT:APSW:PFL`** is **`0`**.

Error Codes

None.

Related Commands

`DATA:TEL:ALT:APSW`
`DATA:TEL:ALT:APSW:MFL`
`DATA:TEL:ALT:APSW:NFL`
`DATA:TEL:ALT:APSW:VAL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:PFLength?` returns the currently selected Alternate APS/RPS sequence pre-stress duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`0 to 64`	none

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[SOUR[1]:]DATA:TEL:ALT:APSW:VAL <value>

Description

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:VALue <value>` sets the value of the alternate APS/RPS byte pair.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	`0 to 65535`	none

Dependencies

- This command is only effective when `DATA:TEL:ALT:APSW` is set to `ONCE` or `SEQ`.

Comments

- <value> can be specified in decimal, hexadecimal (`#H<value>`), octal (`#Q<value>`), or binary (`#B<value>`) format.
- The reset condition for `DATA:TEL:ALT:APSW:VAL` is `0`.

Error Codes

None.

Related Commands

`DATA:TEL:ALT:APSW`
`DATA:TEL:ALT:APSW:FLEN`
`DATA:TEL:ALT:APSW:MFL`
`DATA:TEL:ALT:APSW:NFL`
`DATA:TEL:ALT:APSW:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ALTernate:APSWitch:VALue?` returns the currently programmed Alternate APS decimal value.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`0 to 65535`	none

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[SOUR[1]:]DATA:TEL:APSW[:SOUR] <source>

Description

`[SOURce[1]:]DATA:TELecom:APSWitch[:SOURce] <source>` selects the source of the APS/RPS alternate byte pair.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	**INT** | **EXT** | **PATTern**	none

Dependencies

- Setting `<source>` to **PATT** will insert the pattern selected by `[SOUR[1]:]DATA:TEL:PATT2` into the relevant overhead bytes
- Command not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- When **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** set to **OFF** this comment will only accept **INT**.
- When **DATA:TEL:NEL** set to **THRU** and **SOUR:DATA:TEL:NEL:THRU:EMR** set to **OFF** this command will only accept **INT**.

Comments

- The reset condition for `[SOURce[1]:]DATA:TELecom:APSWitch[:SOURce]` in **INT**.
- When set to **EXT** the **K1** or **K2** bytes are sourced from the front panel serial port.

Error Codes

–221, "Settings conflict"

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:APSWitch[:SOURce]?` returns the currently selected source of the APS/RPS alternate byte pair.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**INT** | **EXT** | **PATTern**	none

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[SOUR[1]:]DATA:TEL:ERR

Description `[SOURce[1]:]DATA:TELecom:ERRor NONE` turns off any active error addition.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
	discrete	**NONE**	none

Dependencies None.

Comments

- Data, FEBE, LBIP, MS FEBE, PBIP, PRBS and SBIP error addition are disabled by this command.

Error Codes None.

Related Commands

DATA:TEL:ERR:DATA
DATA:TEL:ERR:FEBE
DATA:TEL:ERR:LBIP
DATA:TEL:ERR:MSF
DATA:TEL:ERR:PBIP
DATA:TEL:ERR:PRBS
DATA:TEL:ERR:SBIP

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[SOUR[1]:]DATA:TEL:ERR:DATA <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:DATA <mode>` selects the data error add mode. In this mode errors are added to the data after the Section and Line BIP-8s are calculated.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **RATE**	none

Dependencies

- This command is only effective when **DATA:TEL:ERR:SBIP** **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:FEBE**, **DATA:TEL:ERR:MSF** **DATA:TEL:ERR:PRBS** and **DATA:TEL:ERR:LBIP** are set to **NONE**.
- This command is not allowed with **ONCE** or **RATE** when **OUTP:TEL:RATE** is set to **TRIB**.

Comments

- **NONE** and **RATE** are latched settings. If you select either of these parameters, the relevant setting remains active.
- **ONCE** is a transient state that causes a single data error to be generated, after which the setting reverts to **NONE**.
- Selecting **ONCE** when in **RATE** mode causes the mode to revert to **NONE** after generation of a single error.
- The reset condition for **DATA:TEL:ERR:DATA** is **NONE**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:ERR:DATA:RATE

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:DATA?` returns the currently selected data error add mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **RATE**	none

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[SOUR[1]:]DATA:TEL:ERR:DATA:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:DATA:RATE <rate>` selects the data error add rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`1.0E-10 to 1.1E-3`	none

Dependencies

- This command can be sent at any time, but is only effective when **DATA:TEL:ERR:DATA** is set to **RATE**.
- This command is only effective when **DATA:TEL:ERR:SBIP**, **DATA:TEL:ERR:LBIP**, **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:DATA**, **DATA:TEL:ERR:PRBS** are set to **NONE**.
- Only **NONE** is allowed when **DATA:TEL:PAYL:SOUR** is set to **PPOR** or **DATA:TEL:PAYL:SOUR:ALL** is set to **PPOR**.
- Only **NONE** is allowed when **OUTP:TEL:RATE** is set to **TRIB**.

Comments

- Hardware limitations result in a quantization of allowed values. The received parameter is used to set the nearest value allowed by the hardware. The actual value used may be determined by using the Query Command.
- The reset condition for **DATA:TEL:ERR:DATA:RATE** is **1E-3**.

Error Codes

None.

Related Commands

DATA:TEL:ERR:DATA

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:DATA:RATE?` returns the currently selected data error add rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`1.0E-10 to 1.1E-3`	none

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[SOUR[1]:]DATA:TEL:ERR:FEBE <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:FEBE <mode>` selects the Path FEBE error add mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **RATE** | **EALL**	none

Dependencies

- This command is only effective when **DATA:TEL:ERR:SBIP**, **DATA:TEL:ERR:LBIP**, **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:DATA**, **DATA:TEL:ERR:PRBS**, **DATA:TEL:ERR:MSF** and **DATA:TEL:ERR** are set to **NONE**.
- This command is only allowed with **ONCE**, **RATE**, or **EALL** when concatenated transmitter signal is selected.
- Only **NONE** is allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- Only **NONE** allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.

Comments

- **NONE**,**RATE** and **EALL** are latched settings. If any of these are selected the setting remains active.
- **ONCE** is a transient state that cause the value specified by **DATA:TEL:ERR:FEBE:VAL** to be added, after which the setting reverts to **NONE**.
- **EALL** applies the value specified by **DATA:TEL:ERR:FEBE:VAL** to be added on every occurrence of the **FEBE** byte.
- Selecting **ONCE** when in another mode causes the mode to revert to **NONE** after generation of the single value.
- The reset condition for **DATA:TEL:ERR:FEBE** is **NONE**.
- When **DATA:TEL:PAYL** for <channel> set to 1, and <offset> set to 0 is **EXT** the error selected will not appear at the output.

Error Codes

-221 "Settings conflict".

Related Commands

DATA:TEL:ERR:FEBE:VAL
OUTP:TEL:RATE:PAYL

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:FEBE?` returns the currently selected Path FEBE error add mode.

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[SOUR[1]:]DATA:TEL:ERR:FEBE <mode>

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **RATE** | **EALL**	none

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[SOUR[1]:]DATA:TEL:ERR:FEBE:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:FEBE:RATE <rate>` selects the Path FEBE error add rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`1.0E-10 to 2.66E-5`	none

Dependencies

- This command can be set at any time, but is only effective when **`DATA:TEL:ERR:FEBE`** is set to **`RATE`**.
- The range for **`<rate>`** depends on the transmitter rate set by **`OUTP:TEL:RATE`** as follows:

Transmitter Rate	Range for Error Rate
STS48, STM16, STS48C or STM16C	1.0E-10 to 2.660E-5
STS12 or STM4	1.0E-10 to 1.064E-4
STS3 or STM1	1.0E-10 to 4.257E-4
STS1 or STM0	1.0E-10 to 1.277E-3

Comments

The reset condition for **`DATA:TELecom:ERRor:FEBE:RATE`** is 1.0E-5.

Error Codes

None.

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:FEBE:RATE?` returns the currently selected Path FEBE error add rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`1.0E-10 to 2.66E-5`	none

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[SOUR[1]:]DATA:TEL:ERR:FEBE:VAL <value>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:FEBE:VALue <value>` selects the Path FEBE value.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	`1 to 15`	none

Dependencies

- This command may be set at any time, but is only effective when **`DATA:TEL:ERR:FEBE`** is set to **`ONCE`** or **`EALL`**.

Comments

- The reset condition for **`DATA:TELecom:ERRor:FEBE:VALue`** is `1`.

Error Codes

None.

Related Commands

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:FEBE:VALue?` returns the currently programmed Path FEBE value.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`1 to 15`	none

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[SOUR[1]:]DATA:TEL:ERR:LBIP <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP <mode>` selects the Line BIP-8 byte (B2) error add mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **RATE** | **EALL**	none

Dependencies

- **ONCE**, **RATE** and **EALL** are only effective when **DATA:TEL:ERR:SBIP**, **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:FEBE**, **DATA:TEL:ERR:MSF**, **DATA:TEL:ERR:PRBS** and **DATA:TEL:ERR:DATA** are set to **NONE**.
- Only **NONE** is allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is sent to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.

Comments

- **NONE**, **RATE** and **EALL** are latched settings. If you select either of these parameters, the relevant setting remains active.
- **ONCE** is a transient state that causes a single error to be generated, after which the setting reverts to **NONE**.
- Selecting **ONCE** when in **RATE** or **EALL** mode causes the mode to revert to **NONE** after generation of a single error.
- The reset condition for **DATA:TEL:ERR:LBIP** is **NONE**.
- Selecting **EALL** causes the bits selected by **DATA:TEL:ERR:LBIP:MASK** to be errored every frame.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:ERR:LBIP:CHAN
DATA:TEL:ERR:LBIP:MASK
DATA:TEL:ERR:LBIP:RATE

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP?` returns the currently selected Line BIP-8 error injection mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

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[SOUR[1]:]DATA:TEL:ERR:LBIP <mode>

Response Name	Response Type	Response Range	Default Units
mode	discrete	NONE | RATE | EALL	none

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[SOUR[1]:]DATA:TEL:ERR:LBIP:CHAN <channel>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP:CHANnel <channel>` selects the Line BIP-8 byte (B2) error add channel.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1 to n` (see *Dependencies*)	none

Dependencies

- The range of `<channel>` depends on the signal type selected by the `OUTP:TEL:RATE` command as follows:

Transmitter Rate	Range for Error Channel
STS48 or STS48C	1 to 48
STM16 or STM16C	1 to 16
STS12	1 to 12
STM4	1 to 4
STS3	1 to 3
STS1, STM1 or STM0	1

- This command is only effective when `DATA:TEL:ERR:LBIP` is set to `ONCE` or `EALL`.
- This command cannot be sent when `OUTP:TEL:RATE` is set to `TRIB`.

Comments

- The reset condition for `DATA:TEL:ERR:LBIP:CHAN` is `1`.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:LBIP`
`DATA:TEL:ERR:LBIP:MASK`
`OUTP:TEL:RATE`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP:CHANnel?` returns the currently selected channel for Line BIP-8 byte (B2) error addition.

Response

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[SOUR[1]:]DATA:TEL:ERR:LBIP:CHAN <channel>

Response Name	Response Type	Response Range	Default Units
channel	numeric	`1 to n` (see *Dependencies*)	none

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[SOUR[1]:]DATA:TEL:ERR:LBIP:MASK <mask>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP:MASK <mask>` selects the bits in the Line BIP-8 byte (B2) to be errored.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`1 to n` (see *Dependencies*)	none

Dependencies

- The range for `<mask>` depends on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	Range for Error Mask
STS48, STS48C, STS12, STS3, STS1 or STM0	#H01 to #HFF (1 to 255)
STM16, STM16C, STM4 or STM1	#H000001 to #HFFFFFF (1 to 16777215)

- This command is only effective when `DATA:TEL:ERR:LBIP` is set to `ONCE` or `EALL`.
- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.

Comments

- <value> can be specified in decimal, hexadecimal (`#H<value>`), octal (`#Q<value>`), or binary (`#B<value>`) format.
- The reset condition for `DATA:TEL:ERR:LBIP:MASK` is `1`.

Error Codes

-221 "Settings conflict".

Related Commands

```
DATA:TEL:ERR:LBIP
DATA:TEL:ERR:LBIP:CHAN
OUTP:TEL:RATE
```

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP:MASK?` returns the error mask value for the bits in the Line BIP-8 byte (B2) selected for erroring.

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`1 to 16777215 (#HFFFFFF)`	none

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[SOUR[1]:]DATA:TEL:ERR:LBIP:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP:RATE <rate>` selects the Line BIP-8 byte (B2) error add rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`1.0E-10 to 1.248E-3`	none

Dependencies

- This command can be sent at any time, but is only effective when **`DATA:TEL:ERR:LBIP`** is set to **`RATE`**.

Comments

- The reset condition for **`DATA:TEL:ERR:LBIP:RATE`** is `1E-3`.
- Hardware limitations may result in an actual error rate that differs slightly from that set using this command, the quantized value may be determined by using the Query Command.

Error Codes

-221 "Settings conflict"

Related Commands

`DATA:TEL:ERR:LBIP`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:LBIP:RATE?` returns the currently selected Line BIP-8 byte (B2) error addition rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`1.0E-10 to 1.248E-3`	none

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[SOUR[1]:]DATA:TEL:ERR:MSF <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:MSF <mode>` selects the MS-FEBE error add mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **RATE** | **EALL**	none

Dependencies

- **ONCE**, **RATE** and **EALL** are only effective when **DATA:TEL:ERR:SBIP**, **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:FEBE**, **DATA:TEL:ERR:LBIP**, **DATA:TEL:ERR:PRBS**, and **DATA:TEL:ERR:DATA** are set to **NONE**.
- Only **NONE** is allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is sent to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.

Comments

- **NONE**, **RATE** and **EALL** are latched settings. If any of these are selected the setting remains active.
- **ONCE** is a transient state that causes the value specified by **DATA:TEL:ERR:MSF:VAL** to be added, after which the setting reverts to **NONE**.
- **EALL** applies the value specified by **DATA:TEL:ERR:MSF:VAL** to be added, on every occurrence of the **MSFEBE** byte.
- Selecting **ONCE** when in another mode causes the mode to revert to **NONE** after generation of the single value.
- The reset condition for **DATA:TEL:ERR:MSF** is **NONE**.
- When **DATA:TEL:PAYL** for <channel> set to 1 <offset> set to 0 is **EXT** the error selected will not appear at the output.

Error Codes

-221 "Settings conflict".

Related Commands

DATA:TEL:ERR:MSF:RATE
DATA:TEL:ERR:MSF:VAL

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:MSF?` returns the currently selected MS-FEBE error add mode. Note that **ONCE** cannot be returned as it is a transient state.

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[SOUR[1]:]DATA:TEL:ERR:MSF <mode>

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	NONE | RATE | EALL	none

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[SOUR[1]:]DATA:TEL:ERR:MSF:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:MSF:RATE <rate>` selects the MS-FEBE error add rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`1.0E-10 to 1.248E-3`	none

Dependencies

- The range for `<rate>` depends on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	Range for Error Rate
STS48, STM16, STS48C or STM16C	1.0E-10 to 8.290E-4
STS12, STM4, STS3, STM1, STS1 or STM0	1.0E-10 to 1.248E-3

- This command can be sent at any time, but is only effective when `DATA:TEL:ERR:MSF` is set to `RATE`.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:ERR:MSF:RATE` is `1E-5`.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:MSF`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:MSF:RATE?` returns the currently selected MS-FEBE error add rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`1.0E-10 to 1.248E-3`	none

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[SOUR[1]:]DATA:TEL:ERR:MSF:VAL <value>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:MSF:VALue <value>` selects the MS-FEBE error add value.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	`1 to 255`	none

Dependencies

- This command may be sent at any time, but is only effective when **`DATA:TEL:ERR:MSF`** is set to **`ONCE`** or **`EALL`**.
- The range of **`<value>`** depends on the stting of **`OUTP:TEL:RATE`**:

Line Rate	Range
`STS48, STM16, STS48C, STM16C`	1 to 255
`STS12, STM4`	1 to 96
`STS3, STM1`	1 to 24
`STS1, STM0`	1 to 8

Comments

- The reset condition for **`[SOUR[1]:]DATA:TEL:ERR:MSF:VAL`** is **`1`**.

Error Codes

NONE.

Related Commands

`DATA:TEL:ERR:MSF`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:MSF:VALue?` returns the currently programed MS-FEBE error add value.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`1 to 255`	none

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[SOUR[1]:]DATA:TEL:ERR:PATT <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:PATTern <mode>` allows a single error to be inserted into the overhead test byte.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
mode	discrete	NONE | ONCE	none

Dependencies

- **ONCE** is only allowed when one of **DATA:TEL:APSW[:SOUR]**, **DATA:TEL:LDCC:SOUR**, **DATA:TEL:POV:SOUR**, **DATA:TEL:OVER**, **DATA:TEL:SDCC:SOUR**, **DATA:TEL:UND:SOUR** or **DATA:TEL:USER:SOUR** is set to **PATT**.

Comments

The setting automatically reverts to **NONE** after the error has been inserted.

Error Codes

-221, "Settings Conflict"

Related Commands

None

Query Commands

`[SOURce[1]:]DATA:TELecom:ERRor:PATTern?` always returns a **NONE**.

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[SOUR[1]:]DATA:TEL:ERR:PBIP <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:PBIP <mode>` selects the Path-8 BIP (B3) error add mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **RATE** | **EALL**	none

Dependencies

- This command is only effective when **DATA:TEL:ERR:SBIP**, **DATA:TEL:ERR:LBIP**, **DATA:TEL:ERR:PEBE**, **DATA:TEL:ERR:DATA**, **DATA:TEL:ERR:PRBS** and **DATA:TEL:ERR:MSF** are set to **NONE**.
- Only **NONE** is allowed when **DATA:TEL:PAYL:SOUR** is set to **PPOR** or **DATA:TEL:PAYL:SOUR:ALL** is set to **PPOR**.
- **DONCE**, **RATE** and **EALL** are only allowed when a concatenated signal is selected by **OUTP:TEL:RATE:PAYL**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.

Comments

- **NONE**, **RATE** and **EALL** are latched settings. If any of these are selected the setting remains active.
- **ONCE** is a transient state that causes the value specified by **DATA:TEL:ERR:PBIP:MASK** to be added, after which the setting reverts to **NONE**.
- **EALL** applies the value specified by **DATA:TEL:ERR:PBIP:MASK** to be added, on every occurrence of the **PBIP** byte.
- Selecting **ONCE** when in another mode causes the mode to revert to **NONE** after generation of the single value.
- The reset condition for **DATA:TEL:ERR:PBIP** is **NONE**.
- When **DATA:TEL:PAYL** for <channel> set to 1 <offset> set to 0 is **EXT** the error selected will not appear at the output.

Error Codes

-221 "Settings conflict"

Related Commands

OUTP:TEL:RATE:PAYL
DATA:TEL:ERR:PBIP:MASK

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[SOUR[1]:]DATA:TEL:ERR:PBIP <mode>

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:PBIP?` returns the currently selected Path-8 BIP (B3) error add mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **RATE** | **EALL**	none

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[SOUR[1]:]DATA:TEL:ERR:PBIP:MASK <mask>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:PBIP:MASK <mask>` selects the bits in the Path BIP-8 (B3) to be errored.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`1 to 255`	none

Dependencies

- **ONCE**, **RATE** and **EALL** are only effective when **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:PRBS**, **DATA:TEL:ERR:FEBE**, **DATA:TEL:ERR:MSF**, **DATA:TEL:ERR:LBIP** and **DATA:TEL:ERR:DATA** are set to **NONE**.
- The mask pattern is dependent upon the selection made via the **DATA:TEL:ERR:PBIP:MASK** command.
- The rate is dependent upon the rate selected by the **DATA:TEL:ERR:PBIP:RATE** command.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:ERR:PBIP:MASK` is `1`.

Error Codes

None.

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:PBIP:MASK?` returns the value of the bits in the Path BIP-8 (B3) currently selected for erroring.

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`1 to 255`	none

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[SOUR[1]:]DATA:TEL:ERR:PBIP:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:PBIP:RATE <rate>` selects the Path BIP-8 (B3) error add rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`1.0E-10 to 1.277E-3`	none

Dependencies

- The range for `<rate>` depends on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	Range for Error Rate
STS48, STM16, STS48C or STM16C	1.0E-10 to 2.660E-3
STS12 or STM4	1.0E-10 to 1.064E-4
STS3 or STM1	1.0E-10 to 4.257E-4
STS1 or STM0	1.0E-10 to 1.277E-3

- This command maybe sent at any time but is only effective when `DATA:TEL:ERR:PBIP` is set to `RATE`.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:ERR:PBIP:RATE` is `1E-5`.

Error Codes

None.

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:PBIP:RATE?` returns the currently selected Path BIP-8 (B3) error add rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`1.0E-10 to 1.277E-3`	none

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[SOUR[1]:]DATA:TEL:ERR:POIN <mode>

Description

`[SOUR[1]:DATA:TEL:ERR:POIN <mode>` selects the pointer stress mode. The pointer value is errored by having an error mask applied for a sequence of user-defined frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	NONE | ONCE | SEQuence| ACTion	none

Dependencies

- This command is only effective when **DATA:TEL:ALAR, DATA:TEL:ALAR:FERF, DATA:TEL:ALAR:PAIS, DATA:TEL:ALAR:PFER, DATA:TEL:ALT:APSW, DATA:TEL:FWOR** are set to **NONE**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **TERM** or **TRIB** and **DATA:TEL:POIN:SOUR** is set to **OVER** or **EXT**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- Only **NONE** is allowed when **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.

Comments

- **ONCE** generates the errors for a set number of **SPE/AUs** set by **DATA:TEL:ERR:POIN:FLEN**.
- **SEQ** generates the errors for **P SPE/AUs** immediately on invocation. Thereafter it repeats every N+M **SPE/AUs**, reverting to the initial state for N frames and applying errors for M **SPE/AUs**.
- **ACT** mode causes the error mask to be applied when any change in pointer value occurs, for example, when a pointer value increments, decreases, setting or clearing of invalid pointer.

Error Codes

None.

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:POINter?` returns the currently selected pointer stress mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	NONE | SEQ| ACT	none

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[SOUR[1]:]DATA:TEL:ERR:POIN:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which the current pointer value will be modified.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see below)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ERR:POIN`** is set to **`ONCE`**.
- The range of the <frames> parameter depends on the stress <period> parameter selected:
- 1 to 3 in a stress period of 4 frames.
- 1 to 63 in a stress period of 64 frames.
- The optional value of <period> is 4 or 64. If omitted, the value remains as last set.

Comments

- The reset condition for **`DATA:TEL:ERR:POIN:FLEN`** is 1,4.

Error Codes

- None.

Related Commands

`DATA:TEL:ERR:POIN`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:FLENgth?` returns the currently selected number of frames and the stress period during which the current pointer value is modified.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:ERR:POIN:MASK <mask>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:MASK <mask>` selects the bits in the pointer bytes (H1/H2) to be errored.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`1 to 65535`	none

Dependencies

- This command is only effective when **`DATA:TEL:ERR:POIN`** is set to **`ONCE`**, **`SEQ`** or **`ACT`**.

Comments

- A logical 1 in the appropriate bit position of the <mask> parameter causes that bit of the pointer to be errored.
- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for **`DATA:TEL:ERR:POIN:MASK`** is `1`.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:POIN`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:MASK?` returns the value of the bits in the pointer bytes (H1/H2) to be errored.

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`1 to 65535`	none

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[SOUR[1]:]DATA:TEL:ERR:POIN:MASK:STAT <state>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:MASK:STATic <state>` selects the pointer stress static mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
state	discrete	OFF | ON	none

Dependencies

- This command is only effective when `DATA:TEL:POIN:SOUR` is set to `INT`.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:ERR:POIN:MASK:STAT` is `OFF`.
- When set to `ON` the error mask is continuously applied to the pointer value.

Error Codes

+201, "Settings Change".

Related Commands

`DATA:TEL:ERR:POIN`
`DATA:TEL:ERR:POIN:MASK`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:MASK:STATic?` returns the currently selected pointer stress static mode.

Response

Response Name	Response Type	Response Range	Default Units
state	discrete	OFF | ON	none

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[SOUR[1]:]DATA:TEL:ERR:POIN:MFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:MFLength <frames>` selects the duration of the pointer stress on period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ERR:POIN`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ERR:POIN:MFL`** is `1`.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:POIN`
`DATA:TEL:ERR:POIN:PAIS`
`DATA:TEL:ERR:POIN:PAIS:NFL`
`DATA:TEL:ERR:POIN:PAIS:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:MFLength?` returns the currently selected duration of the pointer stress on period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ERR:POIN:NFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:NFLength <frames>` selects the duration of the pointer stress off period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:ERR:POIN`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:ERR:POIN:NFL`** is **`63`**.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:POIN`
`DATA:TEL:ERR:POIN:MFL`
`DATA:TEL:ERR:POIN:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:NFLength?` returns the currently selected duration of the pointer stress off period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ERR:POIN:PFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:PFLength <frames>` selects the duration of the pointer pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

Comments

- The reset condition for **`DATA:TEL:ERR:POIN:PFL`** is `0`.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:POIN`
`DATA:TEL:ERR:POIN:MFL`
`DATA:TEL:ERR:POIN:NFL`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:POINter:PFLength?` returns the currently selected duration of the pointer pre-stress period.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:ERR:PRBS <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:PRBS <mode>` selects the PRBS error add mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **RATE**	none

Dependencies

- This command is only effective when **DATA:TEL:ERR:SBIP**, **DATA:TEL:ERR:LBIP**, **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:DATA**, **DATA:TEL:ERR:FERF**, **DATA:TEL:ERR:MSF** are set to **NONE**.
- This command is only allowed with **RATE** or **ONCE** when a concatenated signal is selected by **OUTP:TEL:RATE:PAYL**, and **DATA:TEL:PAYL** is set to **PATT** and **DATA:TEL:NEL** is set to **TERM** or **TRIB** and **DATA:TEL:PAYL:SOUR** is set to **INT**.

Comments

- **NONE** and **RATE** are latched settings. If you select either of these parameters, the relevant setting remains active.
- **ONCE** is a transient state that causes a single data error to be generated, after which the setting reverts to **NONE**.
- Selecting **ONCE** when in **RATE** mode causes the mode to revert to **NONE** after generation of a single error.
- The reset condition for **DATA:TEL:ERR:PRBS** is **NONE**.

Error Codes

-221 "Settings conflict"

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:PRBS?` returns the currently selected PRBS error add mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **RATE**	none

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[SOUR[1]:]DATA:TEL:ERR:PRBS:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:PRBS:RATE <rate>` selects the PRBS error add rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`1.0E-10 to 1.1E-3`	none

Dependencies

- This command can be sent at any time, but is only effective when `DATA:TEL:ERR:PRBS` is set to `RATE`.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:ERR:PRBS:RATE` is `1E-5`.

Error Codes

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:PRBS:RATE?` returns the currently selected PRBS error add rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`1.0E-10 to 1.1E-3`	none

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[SOUR[1]:]DATA:TEL:ERR:SBIP <mode>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:SBIP <mode>` selects the Section BIP-8 (B1) error add mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **RATE** | **EALL**	none

Dependencies

- **ONCE**, **RATE** and **EALL** are only effective when **DATA:TEL:ERR:PBIP**, **DATA:TEL:ERR:PRBS**, **DATA:TEL:ERR:FEBE**, **DATA:TEL:ERR:MSF**, **DATA:TEL:ERR:LBIP**, and **DATA:TEL:ERR:DATA** are set to **NONE**.
- The mask pattern is dependent upon the selection made via the **DATA:TEL:ERR:SBIP:MASK** command.
- The rate is dependent upon the rate selected by the **DATA:TEL:ERR:SBIP:RATE** command.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.
- Only **NONE** is allowed when **OUTP:TEL:RATE** is set to **TRIB**.

Comments

- **ONCE** is a transient state that causes a single Section BIP-8 error to be generated, after which the setting reverts to **NONE**.
- **NONE**, **RATE** and **EALL** are latched settings. If you select either of these parameters, the relevant setting remains active.
- Selecting **ONCE** when in **RATE** or **EALL** mode causes the mode to revert to **NONE** after generation of a single error.
- The reset condition for **DATA:TEL:ERR:SBIP** is **NONE**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:ERR:SBIP:MASK

DATA:TEL:ERR:SBIP:RATE

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:SBIP?` returns the currently selected Section BIP-8 error add mode. Note that **ONCE** cannot be returned as it is a transient state.

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[SOUR[1]:]DATA:TEL:ERR:SBIP <mode>

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **RATE** | **EALL**	none

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[SOUR[1]:]DATA:TEL:ERR:SBIP:MASK <mask>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:SBIP:MASK <mask>` selects the bits in the Section BIP-8 byte (B1) to be errored.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`1 to 255`	none

Dependencies

- This command is only effective when **`DATA:TEL:ERR:SBIP`** is set to **`ONCE`** or **`EALL`**.

Comments

- A logical 1 in the appropriate bit position of the <mask> parameter causes that bit of the Section BIP-8 to be errored.
- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for **`DATA:TEL:ERR:SBIP:MASK`** is **`1`**.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:SBIP`
`DATA:TEL:ERR:SBIP:RATE`
`DATA:TEL:ERR:DATA`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:SBIP:MASK?` returns the value of the bits in the Section BIP-8 byte (B1) currently selected for erroring.

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`1 to 255`	none

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[SOUR[1]:]DATA:TEL:ERR:SBIP:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:ERRor:SBIP:RATE <rate>` selects the Section BIP-8 (B1) error add rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`1.0E-10 to 1.234E-3`	none

Dependencies

- The range for `<rate>` depends on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	Range for Error Rate
STS48, STM16, STS48C or STM16C	1.0E-10 to 2.572E-3
STS12 or STM4	1.0E-10 to 1.029E-4
STS3 or STM1	1.0E-10 to 4.115E-4
STS1 or STM0	1.0E-10 to 1.234E-3

- This command can be sent at any time, but is only effective when **`DATA:TEL:ERR:SBIP`** is set to **`RATE`**.

Comments

- The reset condition for **`DATA:TEL:ERR:SBIP:RATE`** is `1E-5`.
- Hardware limitations may result in an actual error rate that differs slightly from that set using this command.

Error Codes

None.

Related Commands

`DATA:TEL:ERR:SBIP`

Query Command

`[SOURce[1]:]DATA:TELecom:ERRor:SBIP:RATE?` returns the currently selected Section BIP-8 (B1) error add rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`1.0E-10 to 1.234E-3`	none

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[SOUR[1]:]DATA:TEL:FWOR <condition>

Description

`[SOURce[1]:]DATA:TELecom:FWORd <condition>` selects the Frameword stress condition for the A1 and A2 bytes of the transport overhead. The value contained in the A1 and A2 Frameword bytes is #HF628 as defined by the standards so that SONET/SDH network elements can frame align. This command allows these bytes to be stressed in a controlled manner.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
condition	discrete	**NONE** | **LOSS** | **ERRor**	none

Dependencies

- This command is only effective when **DATA:TEL:ALAR**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:LAIS** **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN** and **DATA:TEL:ALT:APSW** are set to **NONE**, as only one stress condition can be active at any time.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.
- The operation of this command is qualified by the settings of **DATA:TEL:FWOR:LOSS** and **DATA:TEL:FWOR:ERR**, until another **DATA:TEL:FWOR** is issued.
- When set to **ERR**, this command is only effective when the settings of **DATA:TEL:FWOR:ERR:CHAN** and **DATA:TEL:FWOR:ERR:CHAN2** meet the frameword channel restrictions.
- Stressing is only possible when **DATA:TEL:OVER:SOUR:SEQ** is set to **NONE**.

Comments

- Selecting **LOSS** will result in the stress generation of the A1A2 loss condition as defined by the error masks **DATA:TEL:FWOR:ERR:MASK** and **DATA:TEL:FWOR:ERR:MASK2**.
- Selecting **ERR** will result in the stress generation of an A1A2 error condition as defined by the error channels **DATA:TEL:FWOR:ERR:CHAN** and **DATA:TEL:FWOR:ERR:CHAN2**, and error masks **DATA:TEL:FWOR:ERR:MASK** and **DATA:TEL:FWOR:ERR:MASK2**.
- Frameword stress conditions can be selected by writing certain patterns to the A1 and A2 bytes using the **DATA:TEL:OVER[<n>]:DATA** command.
- When **DATA:TEL:FWOR NONE** is received, **DATA:TEL:FWOR:LOSS** and **DATA:TEL:FWOR:ERR** are forced to **NONE**.
- When **DATA:TEL:FWOR:LOSS** is either **ONCE**, or **SEQ**, it reverts to **NONE** when **DATA:TEL:FWOR:ERR** is received. The error **+201 "Settings change"** is also issued. The same happens when **DATA:TEL:FWOR:ERR** is either **ONCE**, or **SEQ** and **DATA:TEL:FWOR:LOSS** is received.

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- When using Frameword stressing in Through mode (that is, when **DATA:TEL:NEL** is set to **THRough**), the stressed frameword is the result of applying the error or loss mask to the internal frameword value, not the frameword being passed through the transmitter.
- The reset condition for **DATA:TEL:FWOR** is **NONE**.

Error Codes

–221, "Settings conflict"
+201 "Settings change"

Related Commands

DATA:TEL:ALAR
DATA:TEL:ALT:APSW
DATA:TEL:FWOR:ERR
DATA:TEL:FWOR:ERR:CHAN
DATA:TEL:FWOR:ERR:CHAN2
DATA:TEL:FWOR:ERR:MASK
DATA:TEL:FWOR:ERR:MASK2
DATA:TEL:FWOR:LOSS
DATA:TEL:FWOR:LOSS:MASK
DATA:TEL:FWOR:LOSS:MASK2
DATA:TEL:OVER[<n>]:DATA

Query Command

[SOURce[1]:]DATA:TELecom:FWORd? returns the currently selected Frameword stress condition.

Response

Response Name	Response Type	Response Range	Default Units
condition	discrete	**NONE** | **LOSS** | **ERRor**	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR <mode>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor <mode>` selects the Frameword (A1/A2) error stress mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **SEQuence**	none

Dependencies

- This command is only effective when **DATA:TEL:ALAR**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:LAIS** and **DATA:TEL:ALT:APSW** are set to **NONE**, as only one stress condition can be active at any time.
- This command is only effective when the settings of **DATA:TEL:FWOR:ERR:CHAN** and **DATA:TEL:FWOR:ERR:CHAN2** meet the frameword channel restrictions.
- Stressing is only possible when **DATA:TEL:OVER:SOUR:SEQ** is set to **NONE**.

Comments

- **NONE** will result in continuous frameword error stress generation when **DATA:TEL:FWOR** is set to **ERR**.
- **ONCE** generates a frameword stress condition only once for a set number of frames when **DATA:TEL:FWOR** is set to **NONE**.
- **ONCE** suppresses a frameword error stress condition only once for a set number of frames when **DATA:TEL:FWOR** is set to **ERR**.
- The **DATA:TEL:OVER[<n>]:DATA**, **DATA:TEL:PAYL:BDAT**, and **DATA:TEL:PATT** settings cannot be altered once a stress condition is active.
- **SEQ** generates or suppresses an alarm for P frames immediately upon invocation. Thereafter it repeats every N+M frames, reverting to the initial state for N frames then again generating or suppressing the alarm for M frames.
- The numbers of frames P, N and M for **SEQ** are set by the commands **DATA:TEL:FWOR:ERR:PFL**, **DATA:TEL:FWOR:ERR:MFL** and **DATA:TEL:FWOR:ERR:NFL**.
- The reset condition for **DATA:TEL:FWOR:ERR** is **NONE**.

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[SOUR[1]:]DATA:TEL:FWOR:ERR <mode>

Error Codes

–221	"Settings conflict"	1. **ONCE**, or **SEQ** was selected, but **DATA:TEL:FWOR:LOSS** was set to **SEQ**. 2. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALT:APSW** was set to **SEQ**. 3. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR** was set to **FERF**, **LAIS**, **PAIS** or **PFER** or **DATA:TEL:ALAR:FERF** was set to **SEQ** or **DATA:TEL:ALAR:LAIS** was set to **SEQ**, **DATA:TEL:ALAR:PAIS** was set to **SEQ**, **DATA:TEL:ALAR:PFER** was set to **SEQ**. 4. **ONCE** or **SEQ** was selected, but **DATA:TEL:ERR:POIN** was set to **SEQ** or **ACT**. 5. **ONCE**, or **SEQ** was selected, but **DATA:TEL:FWOR** was set to **LOSS**. 6. **ONCE**, or **SEQ** was selected, but **DATA:TEL:OVER[<n>]:SOUR** was set to **SEQ**.

Related Commands

DATA:TEL:FWOR
DATA:TEL:FWOR:ERR:CHAN
DATA:TEL:FWOR:ERR:CHAN2
DATA:TEL:FWOR:ERR:FLEN
DATA:TEL:FWOR:ERR:MASK
DATA:TEL:FWOR:ERR:MASK2
DATA:TEL:FWOR:ERR:MFL
DATA:TEL:FWOR:ERR:NFL
DATA:TEL:FWOR:ERR:PFL

Query Command

[SOURce[1]:]DATA:TELecom:FWORd:ERRor? returns the currently selected Frameword (A1/A2) error stress mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **SEQ**	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR:CHAN[1] <channel>,<offset>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:CHANnel[1] <channel>,<offset>` selects the channel in the which the A1 byte is to be stressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1 to n` (see below)	none
offset	numeric	`0 to 2`	none

Dependencies

- The ranges for `<channel>` and `<offset>` depend on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	<channel>	<offset>
STS48 or STS48C	1 to 48	0
STM16 or STM16C	1 to 16	0 to 2
STS12	1 to 12	0
STM4	1 to 4	0 to 2
STS3	1 to 3	0
STM1	1	0 to 2
STS1 or STM0	1	0

- The <channel> and <offset> parameters can only be altered when the frameword error stress condition is inactive.
- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.

Comments

- The reset condition for `DATA:TEL:FWOR:ERR:CHAN` is `1,0`.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:FWOR`
`DATA:TEL:FWOR:ERR:CHAN2`
`DATA:TEL:SIGN`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:CHANnel[1]?` returns the currently selected channel and offset in which the A1 byte is to be stressed.

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[SOUR[1]:]DATA:TEL:FWOR:ERR:CHAN[1] <channel>,<offset>

Response

Response Name	Response Type	Response Range	Default Units
channel	numeric	1 to 48	none
offset	numeric	0 to 2	none

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[SOURce[1]:]DATA:TEL:FWOR:ERR:CHAN2 <channel>,<offset>

Description

`[SOURce[1]:]DATA:TELecom:FWOR:ERRor:CHANne12 <channel>,<offset>` selects the channel in which the A2 byte is to be stressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1 to 48`	none
offset	numeric	`0 to 2`	none

Dependencies

- The ranges for `<channel>` and `<offset>` depend on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	<channel>	<offset>
STS48 or STS48C	1 to 48	0
STM16 or STM16C	1 to 16	0 to 2
STS12	1 to 12	0
STM4	1 to 4	0 to 2
STS3	1 to 3	0
STM1	1	0 to 2
STS1 or STM0	1	0

- The <channel> and <offset> parameters can only be altered when the frameword error stress condition is inactive.
- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.

Comments

- The reset condition for `DATA:TEL:FWOR:ERR:CHAN2` is `1,0`.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:FWOR`
`DATA:TEL:FWOR:ERR:CHAN`
`OUTP:TEL:RATE`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:CHANnel2?` returns the currently selected channel and offset in which the A2 byte is to be stressed.

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[SOURce[1]:]DATA:TEL:FWOR:ERR:CHAN2 <channel>,<offset>

Response

Response Name	Response Type	Response Range	Default Units
channel	numeric	1 to 48	none
offset	numeric	0 to 2	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which Frameword errors are to be generated or suppressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see *Dependencies*)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effective when **DATA:TEL:FWOR:ERR** is set to **ONCE**.
- The range of the <frames> parameter depends on the stress <period> parameter selected:
  - *n* in range 1 to 3 in a stress period of 4 frames.
  - *n* in range 1 to 63 in a stress period of 64 frames.
- The optional value of <period> is 4 or 64. If omitted, the value remains as last set.

Comments

- Continuous frameword error generation can be achieved by setting **DATA:TEL:FWOR** to **ERR** and **DATA:TEL:FWOR:ERR** to **NONE**.
- The reset condition for **DATA:TEL:FWOR:ERR:FLEN** is **1,4**.

Error Codes

None.

Related Commands

DATA:TEL:FWORDATA:TEL:FWOR:ERR

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:FLENgth?` returns the number of frames and the stress period for during which Frameword errors are generated or suppressed.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR:MASK[1] <mask>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:MASK[1] <mask>` selects the bits in the A1 byte to be stressed (Frameword error).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`0 to 255`	none

Dependencies

- The mask is only effective when a frameword error stress condition is active.
- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.

Comments

- A logical 1 in the appropriate bit position of the <mask> causes that bit of the A1 byte to be stressed.
- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for `DATA:TEL:FWOR:ERR:MASK` is `1`.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:FWOR`
`DATA:TEL:FWOR:ERR`
`DATA:TEL:FWOR:ERR:CHAN`
`DATA:TEL:FWOR:ERR:CHAN2`
`DATA:TEL:FWOR:ERR:MASK2`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:MASK[1]?` returns the value of the bits in the A1 byte currently selected for stressing (Frameword error addition).

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`0 to 255`	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR:MASK2 <mask>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:MASK2 <mask>` selects the bits in the A2 byte to be stressed (Frameword error).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`0 to 255`	none

Dependencies

- The mask is only effective when a frameword error stress condition is active.
- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.

Comments

- A logical 1 in the appropriate bit position of the <mask> causes that bit of the A2 byte to be stressed.
- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for `DATA:TEL:FWOR:ERR:MASK2` is `0`.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:FWOR`
`DATA:TEL:FWOR:ERR`
`DATA:TEL:FWOR:ERR:CHAN`
`DATA:TEL:FWOR:ERR:CHAN2`
`DATA:TEL:FWOR:ERR:MASK`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:MASK2?` returns the value of the bits in the A2 byte currently selected for stressing (Frameword error addition).

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`0 to 255`	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR:MFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:MFLength <frames>` selects the duration of the Frameword error sequence stress on period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:FWOR:ERR`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:FWOR:ERR:MFL`** is **`1`**.

Error Codes

None.

Related Commands

`DATA:TEL:FWOR:ERR`
`DATA:TEL:FWOR:ERR:NFL`
`DATA:TEL:FWOR:ERR:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:MFLength?` returns the currently selected frameword error sequence on duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR:NFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:NFLength <frames>` selects the duration of the Frameword error sequence off period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when `DATA:TEL:FWOR:ERR` is set to `SEQ`.

Comments

- The reset condition for `DATA:TEL:FWOR:ERR:NFL` is `63`.

Error Codes

None.

Related Commands

`DATA:TEL:FWOR:ERR`

`DATA:TEL:FWOR:ERR:MFL`

`DATA:TEL:FWOR:ERR:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:NFLength?` returns the currently selected frameword error sequence off duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:FWOR:ERR:PFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:PFLength <frames>` selects the duration of the Frameword error sequence pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:FWOR:ERR`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:FWOR:ERR:PFL`** is `0`.

Error Codes

None.

Related Commands

`DATA:TEL:FWOR:ERR`

`DATA:TEL:FWOR:ERR:MFL`

`DATA:TEL:FWOR:ERR:NFL`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:ERRor:PFLength?` returns the currently selected frameword error sequence off duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`0 to 64`	none

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[SOUR[1]:]DATA:TEL:FWOR:LOSS <mode>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS <mode>` selects the Frameword loss stress mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **SEQuence**	none

Dependencies

- This command is only effective when **DATA:TEL:ALAR**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:LAIS** and **DATA:TEL:ALT:APSW** are set to **NONE**, as only one stress condition can be active at any time.
- Stressing is only possible when **DATA:TEL:OVER:SEQ:SOUR** is set to **NONE**.

Comments

- **NONE** will result in continuous frameword loss generation when **DATA:TEL:FWOR** is set to **LOSS**.
- **ONCE** generates a frameword loss stress condition only once for a set number of frames when **DATA:TEL:FWOR** is set to **NONE**.
- **ONCE** suppresses a frameword loss stress condition only once for a set number of frames when **DATA:TEL:FWOR** is set to **LOSS**.
- The **DATA:TEL:OVER[<n>]:DATA**, **DATA:TEL:PAYL:BDAT**, and **DATA:TEL:PATT** settings cannot be altered once a stress condition is active.
- **SEQ** generates or suppresses an alarm for P frames immediately upon invocation. Thereafter it repeats every N+M frames, reverting to the initial state for N frames then again generating or suppressing the alarm for M frames.
- The numbers of frames P, N and M for **SEQ** are set by the commands **DATA:TEL:FWOR:LOSS:PFL**, **DATA:TEL:FWOR:LOSS:MFL** and **DATA:TEL:FWOR:LOSS:NFL**.
- The reset condition for **DATA:TEL:FWOR:LOSS** is **NONE**.

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[SOUR[1]:]DATA:TEL:FWOR:LOSS <mode>

Error Codes

–221	"Settings conflict"	1. **ONCE**, or **SEQ** was selected, but **DATA:TEL:FWOR:ERR** was set to **SEQ**. 2. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALT:APSW** was set to **SEQ**. 3. **ONCE**, or **SEQ** was selected, but **DATA:TEL:ALAR** was set to **FERF**,**PAIS**, **PFER** or **LAIS**, or **DATA:TEL:ALAR:FERF** was set to **SEQ**, or **DATA:TEL:ALAR:LAIS** was set to **SEQ**. 4. **ONCE** or **SEQ** was selected, but **DATA:TEL:ERR:POIN** was set to **SEQ** or **ACT**. 5. **ONCE**, or **SEQ** was selected, but **DATA:TEL:FWOR** was set to **ERR**. 6. **ONCE**, or **SEQ** was selected, but **DATA:TEL:OVER:SOUR** was set to **SEQ**.

Related Commands

DATA:TEL:FWOR
DATA:TEL:FWOR:LOSS:FLEN
DATA:TEL:FWOR:LOSS:MFL
DATA:TEL:FWOR:LOSS:NFL
DATA:TEL:FWOR:LOSS:PFL

Query Command

[SOURce[1]:]DATA:TELecom:FWORd:LOSS? returns the currently selected frame-word loss stress mode. Note that **ONCE** cannot be returned as it is a transient state.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NONE** | **SEQ**	none

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[SOUR[1]:]DATA:TEL:FWOR:LOSS:FLEN <frames>[,<period>]

Description

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:FLENgth <frames>[,<period>]` selects the number of frames in a given stress period during which Frameword loss is generated or suppressed.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to n` (see *Dependencies*)	none
period	numeric	`4 | 64`	none

Dependencies

- This command is only effective when **DATA:TEL:FWOR:LOSS** is set to **ONCE**.
- The range of the frames parameter depends on value of the stress period parameter selected:
  - 1 to 3 in a stress period of 4 frames.
  - 1 to 63 in a stress period of 64 frames.
- The optional value of <period> is 4 or 64. If omitted, the value remains as last set.

Comments

- Continuous frameword loss generation can be achieved by setting **DATA:TEL:FWOR** to **LOSS** and **DATA:TEL:FWOR:LOSS** to **NONE**.
- The reset condition for **DATA:TEL:FWOR:LOSS:FLEN** is **1,4**.

Error Codes

None.

Related Commands

DATA:TEL:FWOR
DATA:TEL:FWOR:LOSS

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:FLENgth?` returns the currently selected number of frames and the stress period for frameword loss generation or suppression.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 63`	none
period	numeric	`4 | 64`	none

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[SOUR[1]:]DATA:TEL:FWOR:LOSS:MASK[1] <mask>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:MASK[1] <mask>` selects the bits in the A1 byte to be stressed (Frameword loss).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`0 to 255`	none

Dependencies

- The mask is only effective when a frameword error stress condition is active.
- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.

Comments

- A logical 1 in the appropriate bit position of the <mask> causes that bit of the A1 byte to be stressed.
- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for `DATA:TEL:FWOR:LOSS:MASK` is `92`.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:FWOR`
`DATA:TEL:FWOR:LOSS`
`DATA:TEL:FWOR:LOSS:MASK2`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:MASK[1]?` returns the value of the bits in the A1 byte currently selected for stressing (Frameword loss).

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`0 to 255`	none

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[SOUR[1]:]DATA:TEL:FWOR:LOSS:MASK2 <mask>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:MASK2 <mask>` selects the bits in the A2 byte to be stressed (Frameword loss).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	`0 to 255`	none

Dependencies

- The mask is only effective when a frameword loss stress condition is active.
- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.

Comments

- A logical 1 in the appropriate bit position of the <mask> causes that bit of the A2 byte to be stressed.
- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for `DATA:TEL:FWOR:LOSS:MASK2` is `130`.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:FWOR`
`DATA:TEL:FWOR:LOSS`
`DATA:TEL:FWOR:LOSS:MASK`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:MASK2?` returns the value of the bits in the A2 byte currently selected for stressing (Frameword loss).

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	`0 to 255`	none

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[SOUR[1]:]DATA:TEL:FWOR:LOSS:MFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:MFLength <frames>` selects the Frameword loss sequence stress on period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when `DATA:TEL:FWOR:LOSS` is set to `SEQ`.

Comments

- The reset condition for `DATA:TEL:FWOR:LOSS:MFL` is `1`.

Error Codes

None.

Related Commands

`DATA:TEL:FWOR:LOSS`
`DATA:TEL:FWOR:LOSS:NFL`
`DATA:TEL:FWOR:LOSS:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:MFLength?` returns the currently selected frameword loss sequence on duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:FWOR:LOSS:NFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:NFLength <frames>` selects the duration of the Frameword loss stress sequence off period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`1 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:FWOR:LOSS`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:FWOR:LOSS:NFL`** is **`63`**.

Error Codes

None.

Related Commands

`DATA:TEL:FWOR:LOSS`
`DATA:TEL:FWOR:LOSS:MFL`
`DATA:TEL:FWOR:LOSS:PFL`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:NFLength?` returns the currently selected frameword loss sequence off duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`1 to 64`	none

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[SOUR[1]:]DATA:TEL:FWOR:LOSS:PFL <frames>

Description

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:PFLength <frames>` selects the duration of the Frameword loss sequence pre-stress period. The period is specified as a number of consecutive frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`0 to 64`	none

Dependencies

- This command is only effective when **`DATA:TEL:FWOR:LOSS`** is set to **`SEQ`**.

Comments

- The reset condition for **`DATA:TEL:FWOR:LOSS:PFL`** is `0`.

Error Codes

None.

Related Commands

`DATA:TEL:FWOR:LOSS`
`DATA:TEL:FWOR:LOSS:MFL`
`DATA:TEL:FWOR:LOSS:NFL`

Query Command

`[SOURce[1]:]DATA:TELecom:FWORd:LOSS:PFLength?` returns the currently selected frameword loss sequence off duration.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`0 to 64`	none

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[SOUR[1]:]DATA:TEL:LDCC:SOUR <source>

Description

`[SOURce[1]:]DATA:TELecom:LDCC:SOURce <source>` selects the source of the Line Data Communications Channel (LDCC).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	`INTernal` | `EXTernal` | `PATTern`	none

Dependencies

- Only one of `DATA:TEL:LDCC:SOUR`, `DATA:TEL:USER:SOUR`, `DATA:TEL:SDCC:SOUR`, `DATA:TEL:UND:SOUR` and `DATA:TEL:OVER` may be set to `EXT`.
- The line `DCC (D4-D12) can be programmed to any value using DATA:TEL:OVER[<n>]:DATA`, however, that is effective only when this command is set to `INT`.
- The front panel Serial Data port is capable of injecting the `DCC` data when this command is set to `EXT`.
- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.
- Only `INT` is allowed when `DATA:TEL:NEL` is set to `THR` and `DATA:TEL:NEL:THR:EMR` is set to `OFF`.
- Only `INT` is allowed when `DATA:TEL:NEL` is set to `REP` and `DATA:TEL:NEL:REP:EMR` is set to `OFF`.

Comments

- Setting `<source>` to `PATT` will insert the pattern selected by `[SOUR[1]:]DATA:TEL:PATT2` into the relevant overhead bytes.

Error Codes

-221, "Settings conflict"

Related Commands

None

Query Command

`[SOURce[1]:]DATA:TELecom:LDCC:SOURce?` returns the currently selected source of the Line Data Communications Channel (LDCC).

Response

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[SOUR[1]:]DATA:TEL:LDCC:SOUR <source>

Response Name	Response Type	Response Range	Default Units
source	discrete	**INT** | **EXT** | **PATT**	none

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[SOUR[1]:]DATA:TEL:NEL <element>

Description

`[SOURce[1]:]DATA:TELecom:NELement <element>` selects the type of network element to be emulated.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
element	discrete	`TERMinal` | `TRIButary` | `THRough` | `REPeater`	none

Dependencies

- This command is only allowed with `TRIB` when `OUTP:TEL:RATE` is set to `STM16` or `STS48` and `INST:SEL` is set to `TRIB`.
- This command is only allowed with `THR` or `REP` when `INP:TEL:RATE` and `OUTP:TEL:RATE` are set to the same signal rate, and are not set to `TRIB`.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:NEL` is `TERM`.

Error Codes

–221, "Settings conflict"

Related Commands

Query Command

`[SOURce[1]:]DATA:TELecom:NELement?` returns the currently selected type of network element to be emulated.

Response

Response Name	Response Type	Response Range	Default Units
element	discrete	`TERM` | `TRIB` | `THR` | `REP`	none

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[SOUR[1]:]DATA:TEL:NEL:REP[:EMR] <state>

Description

`[SOURce[1]:]DATA:TELEcom:NELement:REPeater[:EMRecalc] <state>` enables through mode repeater error monitor recalculation. This results in recalculation of the B1, B2 and B3 byte values.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
state	boolean	0 | 1 | OFF | ON	none

Dependencies

- This command may be sent at any time but is only effective when **DATA:TEL:NEL** is set to **REP**.

Comments

- The reset condition for **[SOUR[1]:]DATA:TEL:NEL:REP[:EMR]** is 0.
- B2 and B3 values are recalculated when this command is sent with **ON**.
- When this command is sent with a different value to the current setting a burst of B2 and B3 errors is possible.

Error Codes

None.

Related Commands

Query Command

`[SOURce[1]:]DATA:TELEcom:NELement:REPeater[:EMRecalc]?` returns the currently selected state of through mode repeater Error Monitoring Recalculation.

Response

Response Name	Response Type	Response Range	Default Units
state	boolean	0 | 1	none

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[SOUR[1]:]DATA:TEL:NEL:THR[:EMR] <state>

Description

`[SOURce[1]:]DATA:TELEcom:NELement:THRough[:EMRecalc] <state>` enables fully transparent through mode error monitoring recalculation.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
state	boolean	0 | 1 | OFF | ON	none

Dependencies

- This command may be sent at any time but is only effective when **DATA:TEL:NEL** is set to **THR**.

Comments

- The reset value of **[SOUR[1]:]DATA:TEL:NEL:THR[:EMR]** is 0.
- B1, B2 and B3 values are recalculated when this command is sent with **ON**.
- When this command is sent with a different value to the current setting a burst of B1, B2 and B3 errors is possible.

Error Codes

None.

Related Commands

Query Command

`[SOURce[1]:]DATA:TELEcom:NELement:THRough[:EMRecalc]?` returns the currently selected state of through mode transparent operation.

Response

Response Name	Response Type	Response Range	Default Units
state	boolean	0 | 1	none

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[SOUR[1]:]DATA:TEL:OVER <byte>,<source>,<channel>,<offset>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead <byte>,<source>,<channel>,<offset>` selects the source of the transport overhead byte(s).

Parameters

Parameter Name	Parameters Type	Range of Values		Default Units
byte	discrete	**A1 | A2 | C1 | J0 | Z0 | E1 | F1 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 |D10 | D11 | D12 | K1 | K2 | K1K2 | Z1 | Z2| S1| M1 | E2**		none
source	discrete	**INTernal | EXTernal | PATTern**		none
channel	numeric	STS48 I STS48C	1 to 48	none
		STM16 I STM16C	1 to 16	
		STS12	1 to 12	
		STM4	1 to 4	
		STS3	1 to 3	
		STM1 I STS1 I STM0	1	
offset	numeric	STS48 I STS48C	0	none
		STS12 I STS3 I STS1 I STM0	0	
		STM16 I STM16C I STM4 I STM1	0 to 2	

Dependencies

- The range of values for **<channel>** and **<offset>** depend on the transmitter rate selected by **OUTP:TEL:RATE**.
- The range of values for **<channel>** and **<offset>** depend on the transmitter rate selected by **OUTP:TEL:RATE**.
- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- This command is not allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.
- The value of <channel> and <offset> are further limited by the <byte> parameter as follows:
  - For <byte> set to E1, F1, K1, K2, K1K2, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, E2, J0, S1 <channel> must be 1 <offset> must be 0.
  - For <byte> set to Z0 <channel> set to 1 and <offset> set to 0 is not allowed.
  - For <byte> set to M1 and **OUTP:TEL:RATE** set to **STM16**, **STM16C** or **STM4**,

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<channel> must be set to 3 and <offset> must be set 0.

- For <byte> set to M1 and **OUTP:TEL:RATE** set to **STS48**, **STS48C** or **STS12**, <channel> must be set to 7 and <offset> must be 0.
- For <byte> set to M1 and **OUTP:TEL:RATE** set to **STM1**, <channel> must be set to 1 and <offset> must be set to 2.
- For <byte> set to M1 and **OUTP:TEL:RATE** set to **STS3**, <channel> must be set to 3 and <offset> must be set to 0.
- For <byte> set to M1 and **OUTP:TEL:RATE** set to **STS1** or **STM0**, <channel> must be set to 1 and <offset> must be set to 0.

Comments

- Setting **<source>** to **PATT** will insert the pattern selected by **[SOUR[1]:]DATA:TEL:PATT2** into the relevant overhead byte.
- When **EXT** is selected the specified byte(s) is sourced from the front panel parallel port.
- When **INT** is selected the specified byte(s) is generated by the module except when <channel> is set to 1 and <offset> is set to 0 and the payload source for <channel> 1 and <offset> 0 is **EXT**.
- Only one byte may be set to **EXT** by this command or by **DATA:TEL:POV:SOUR**, **DATA:TEL:USER:SOUR**, **DATA:TEL:SDCC:SOUR**, **DATA:TEL:LDCC:SOUR**, **DATA:TEL:UND:SOUR**, **DATA:TEL:OVER**.

Error Codes

–221 "Settings conflict"

Related Commands

Query Command

[SOURce[1]:]DATA:TELecom:OVERhead? <byte>,<channel>,<offset> returns the source of the transport overhead byte(s).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
byte	discrete	**A1 | A2 | C1 | J0 | Z0 | E1 | F1 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 |D10 | D11 | D12 | K1 | K2 | K1K2 | Z1 | Z2| S1| M1 | E2**	
channel	numeric	**1 to n** (see Dependencies)	none
offset	numeric	**0 to m** (see Dependencies)	none

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[SOUR[1]:]DATA:TEL:OVER <byte>,<source>,<channel>,<offset>

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**INT** | **EXT**	none

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SOUR[1]:]DATA:TEL:OVER:ALL:INT

Description `[SOURce[1]:]DATA:TELecom:OVERhead:ALL:INTernal` internally sources all the transport overhead bytes, and turns off single-byte transport overhead EOC or BER.

Parameters None

Dependencies

- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.

Comments

- If EOC or BER is being inserted into the APSW, SDCC, LDCC or USER channels, it will remain active.

Error Codes None.

Related Commands None.

Query Command None.

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[SOUR[1]:]DATA:TEL:OVER:ARR:J0|TRAC <count>,<start>,<value1>[,<value2>...]

Description

`[SOURce[1]:]DATA:TELecom:OVERhead:ARRay:J0|TRACe <count>,<start>,<value1>[,<value2>...]` programs up to 16 bytes of the J0 trace message.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	numeric	`1 to 16`	none
start	numeric	`1 to 16`	none
value1... value16	numeric	`0 to 255`	none

Dependencies

- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.
- This command is not allowed when `DATA:TEL:NEL` is set to `THRU`.

Comments

- The length of the J0 message is defined by `DATA:TEL:OVERJ0/TRAC:FORM`.
- In `SHORT` format a `CRC` byte is automatically added.
- The sum of <count> + <start> must not exceed 2 when the format is `SINGLE` or 17 when the format is `SHORT`.

Error Codes

None.

Related Commands

`DATA:TEL:OVER:J0:FORM`

Query command

`[SOURce[1]:]DATA:TELecom:OVERhead:ARRay:J0|TRACe? <count>,<start>` returns the Transport Overhead Generator J0 trace message (a total of <count> comma-separated values).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	numeric	`1 to 16`	none
start	numeric	`1 to 16`	none

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[SOUR[1]:]DATA:TEL:OVER:ARR:J0|TRAC <count>,<start>,<value1>[,<value2>...]

Response

Response Name	Response Type	Response Range	Default Units
value1... value16	numeric	0 to 255	none

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[SOUR[1]:]DATA:TEL:OVER[<n>]:COUN <count>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:COUNt <count>` sets the repetition count in the internal sequencer for each block of transport overhead frames.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	numeric	**2 to 65535**	frames
<n>	numeric	**1 to 17**	none

Dependencies

- Command not allowed when **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.

Comments

- <n> identifies the particular block of sequencing overhead data to be accessed.
- The reset condition for **DATA:TEL:OVER2:COUN** is **0**.
- The reset condition for **DATA:TEL:OVER3:COUN** is **1**.
- The reset condition for **DATA:TEL:OVER[<n>]:COUN** for all other values of <n> (<n> = 4 to 17) is **0**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:OVER[<n>]:DATA
DATA:TEL:OVER[<n>]:SOUR
DATA:TEL:OVER[<n>]:SOUR:SEQ
DATA:TEL:OVER[<n>]:WDAT

Query Command

`[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:COUNt?` returns the currently set repetition count in the internal sequencer for each block of transport overhead frames.

Response

Response Name	Response Type	Response Range	Default Units
count	numeric	**2 to 65535**	frames

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[SOUR[1]:]DATA:TEL:OVER[<n>]:DATA:ALL <byte>,<offset>,<value>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:DATA:ALL[:SING] <byte>,<offset>,<value>` programs a particular transport overhead byte in all channels to a specific value.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
n	numeric	`1 to 17`	none
byte	discrete	`A1 | A2 | C1 | B1 | E1 | F1| D1 | D2 | D3 | H1 | H2 | H3 | K1 | K2 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12| Z1 | Z2 | E2`	none
offset	numeric	`0 to 2`	none
value	numeric	`0 to 255`	none

Dependencies

- The range of `<offset>` depends on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	<offset>
STS48 or STS48C	0
STM16 or STM16C	0 to 2
STS12	0
STM4	0 to 2
STS3	0
STM1	0 to 2
STS1 or STM0	0

- When `DATA:TEL:PAYL:SOUR 1` is set to `TRIB`, the following bytes are sourced from the transmit input tributary for the STS1#1/STM1#1a in the number one group:
  `E1, F1, D1-D3, H1, H2, H3, K1, K2, D4-D12, Z1, Z2, E2`
- For any other group set to `TRIB` or `ABUS`, the following bytes are sourced from the transmit input tributary for the STS#1/STM1#a in that group:
  `H1, H2, H3`
- Overhead byte access is not possible while any stress condition is active, or if `DATA:TEL:OVER[<n>]:SOUR:SEQ` is set to `ONCE` or `CONT`.
- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.
- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.

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- This command is not allowed when **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.
- This command is not allowed when stressing is active i.e. when one of the following is not set to **NONE**. **DATA:TEL:ALAR**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:ERR**, **DATA:TEL:FWOR:LOSS**.

Comments

- <n> identifies the particular block of sequencing overhead data to be accessed.
  If <n> is 1 or is omitted, the command refers to the default overhead block used both for sequencing and normal operation.
  If <n> is greater than 1, the command refers to the alternative blocks of overhead data which may be transmitted only during sequencing mode (when **DATA:TEL:OVER[<n>]:SOUR** set to **SEQ**).
- In STS mode, the selected byte in all 48 STS-1 channels of the STS-48 signal will be programmed to <value>.
- In STM mode, the selected byte, in either STM1#A or STM1#B or STM1#C as specified by <offset>, will be programmed to <value>.
- <value> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset conditions are identical to those listed for the **DATA:TEL:OVER[<n>]:DATA:[SING]** command.

Error Codes

–221, "Settings conflict" –222 "Data out of Range"

Related Commands

DATA:TEL:OVER[<n>]:DATA:[SING]
DATA:TEL:OVER[<n>]:WDAT

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[SOUR[1]:]DATA:TEL:OVER[<n>]:DATA[:SING] <channel>,<byte>,<offset>,<value>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:DATA[:SINGle][:SINGle] <channel>,<byte>,<offset>,<value>` programs a particular transport overhead byte in a given channel to a specific value.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
n	numeric	`1 to 17`	none
channel	numeric	`1 to n` (see below)	none
byte	discrete	`A1 | A2 | C1 | B1 | E1 | F1 | D1 | D2 | D3 | H1 | H2 | H3 | K1 | K2 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | Z1 | Z2 | E2`	none
offset	numeric	`0 to 2`	none
value	numeric	`0 to 255`	none

Dependencies

- The ranges for `<channel>` and `<offset>` depend on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	<channel>	<offset>
STS48 or STS48C	1 to 48	0
STM16 or STM16C	1 to 16	0 to 2
STS12	1 to 12	0
STM4	1 to 4	0 to 2
STS3	1 to 3	0
STM1	1	0 to 2
STS1 or STM0	1	0

- When `DATA:TEL:PAYL:SOUR 1` is set to **TRIB**, the following bytes are sourced from the transmit input tributary for the STS1#1/STM1#1a in the number one group:

  `E1, F1, D1-D3, H1, H2, H3, K1, K2, D4-D12, Z1, Z2, E2`

- For any other group set to **TRIB** or **ABUS**, the following bytes are sourced from the transmit input tributary for the STS#1/STM1#a in that group:

  `H1, H2, H3`

- Overhead byte access is not possible while any stress condition is active, or if `DATA:TEL:OVER:SOUR:SEQ` is set to **ONCE** or **CONT**.

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- The transmit tributary clock on the front-panel *Transmit 155/622Mb/s Clock In* port must be identical to the rate specified by **OUTP:TEL:RATE** for this command to operate correctly.
- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- The line overhead bytes are not allowed to be accessed when **DATA:TEL:NEL** is set to **REP**.
- This command is not allowed when **DATA:TEL:NEL** is set to **THRU**.
- This command is not allowed when stressing is active in one of: **DATA:TEL:ALAR**, **DATA:TEL:ALAR:FEBE**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:ERR**, **DATA:TEL:FWOR:LOSS** is not **NONE**.

Comments

- <n> identifies the particular block of sequencing overhead data to be accessed.
  If <n> is 1 or is omitted, the command refers to the default overhead block used both for sequencing and normal operation.
  If <n> is greater than 1, the command refers to the alternative blocks of overhead data which may be transmitted only during sequencing mode (when **DATA:TEL:OVER:SOUR** set to **SEQ**).
- The reset condition for the overhead bytes accessible via **DATA:TEL:OVER[<n>]:DATA** is dependent upon the signal type **OUTP:TEL:RATE** as follows:

Overhead Byte	Signal Type	
	STS-n	STM-n
A1	#HF6	#HF6
A2	#H28	#H28
C1	1 .. N in transmission order	1 .. N followed by 2N* #HAA in transmission order
B1, E1, F1, D1-D12, H3, K1, K2, Z1,Z2, E2	#H00	#H00

  The B1 values do not apply to B1 bytes in STS1#1 or STM1#1 as they are automatically calculated by the transmitter.
- <value> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.

Error Codes

–221, "Settings conflict" –222, "Data Out of Range"

Related Commands

OUTP:TEL:RATE
DATA:TEL:OVER[<n>]:DATA:ALL
DATA:TEL:OVER[<n>]:WDAT

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[SOUR[1]:]DATA:TEL:OVER[<n>]:DATA[:SING] <channel>,<byte>,<offset>,<value>

Query Command

`[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:DATA[:SINGle][:SINGle]? <channel>,<byte>,<offset>` returns the value of a particular byte within a particular transport overhead.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1 to n` (see Dependencies)	none
byte	discrete	`A1 | A2 | C1 | B1 | E1 | F1 | D1 | D2 | D3 | H1 | H2 | H3 | K1 | K2 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | Z1 | Z2 | E2`	none
offset	numeric	`0 to 2`	none

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`0 to 255`	none

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[SOUR[1]:]DATA:TEL:OVER[<n>]:DATA[:SING]:OGR <channel>,<offset>,<value1>,...,<value26>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:DATA[:SINGle]:OGRoup <channel>,<offset>,<value1>,...,<value26>` programs bytes A1 - E2, excluding B2 in a particular transport overhead group to specific values.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
n	numeric	`1 to 17`	none
channel	numeric	`1 to n (see below)`	none
offset	numeric	`0 to 2`	none
value1... value26	numeric	`0 to 255`	none

Dependencies

- The ranges for `<channel>` and `<offset>` depend on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	<channel>	<offset>
STS48 or STS48C	1 to 48	0
STM16 or STM16C	1 to 16	0 to 2
STS12	1 to 12	0
STM4	1 to 4	0 to 2
STS3	1 to 3	0
STM1	1	0 to 2
STS1 or STM0	1	0

- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.
- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.
- This command is not allowed when `DATA:TEL:OVER:SOUR:SEQ` is not set to `NONE`.
- This command is not allowed when stressing is active i.e. when one of the following is not set to `NONE` `DATA:TEL:ALAR`, `DATA:TEL:ALAR:LAIS`, `DATA:TEL:ALAR:FERF`, `DATA:TEL:ALAR:PAIS`, `DATA:TEL:ALAR:PFER`, `DATA:TEL:ERR:POIN`, `DATA:TEL:ALT:APSW`, `DATA:TEL:FWOR`, `DATA:TEL:FWOR:ERR`, `DATA:TEL:FWOR:LOSS`.

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[SOUR[1]:]DATA:TEL:OVER[<n>]:DATA[:SING]:OGR <channel>,<offset>,<value1>,...,<value26>

Comments

Error Codes

–221, "Settings conflict" –222, "Data out of range"

Related Commands

Query Command

`[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:DATA[:SINGle]:OGRoup? <channel>,<offset>` returns 26 comma-separated values of the A1 - E2 bytes (with the exception of B2) in a particular transport overhead group.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1 to n (see Dependencies)`	none
offset	numeric	`0 to 2`	none

Response

Response Name	Response Type	Response Range	Default Units
value1... value26	numeric	`0 to 255`	none

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[SOUR[1]:]DATA:TEL:OVER:J0|TRAC:FORM <format>

Description `[SOURce[1]:]DATA:TELecom:OVERhead:J0|TRACe:FORMat <format>` selects the format of the J0 trace.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
format	discrete	**SINGle** | **SHORt**	none

Dependencies

- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- This command is not allowed when **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.
- This command is not allowed when stressing is active i.e. when one of the following is not set to **NONE**. **DATA:TEL:ALAR**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:ERR**, **DATA:TEL:FWOR:LOSS**.

Comments

- The **SINGLE** setting is included to allow for backward compatibility where the J0 byte is used to transmit the first C1 byte.
- The **SHORT** setting transmits a 16 byte sequence consisting of 15 bytes of message plus one byte of framing/CRC information.

Error Codes –221, "Settings conflict" –113, "Undefined header"

Related Commands **DATA:TEL:OVER:ARRAY:J0|FORM**

Query Command `[SOURce[1]:]DATA:TELecom:OVERhead:J0|TRACe:FORMat?` returns the format of the J0 trace.

Response

Response Name	Response Type	Response Range	Default Units
format	discrete	**SING** | **SHOR**	none

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[SOUR[1]:]DATA:TEL:OVER:SOUR <mode>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead:SOURce <mode>` selects between normal and overhead sequencer operation.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	`NORMal | SEQuence`	none

Dependencies

- Selecting **SEQ** is only effective if **DATA:TEL:ALAR**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:LOSS**, **DATA:TEL:ALT:APSW**, and **DATA:TEL:FWOR:ERR** are set to **NONE**.
- Only **NORM** is allowed when **DATA:TEL:NEL** is set to **THR** and **REP**.

Comments

- Changing between **NORM** and **SEQ** modes causes a momentary break in transmission.
- Sequencing is unavailable if any stressing condition is active.
- All stressing is unavailable when sequencing is selected.
- The reset condition for **DATA:TEL:OVER[<n>]:SOUR** is **NORM**.
- If sequencing is in progress, it should be terminated, by means of **DATA:TEL:OVER:SOUR:SEQ** set to **EOS** or waiting until the sequence terminates before **NORM** is sent.

Error Codes

–221, "Settings conflict" –113, "Undefined header"

Related Commands

```
DATA:TEL:OVER[<n>]:COUN
DATA:TEL:OVER[<n>]:DATA
DATA:TEL:OVER[<n>]:SOUR
DATA:TEL:OVER:SOUR:SEQ
DATA:TEL:OVER[<n>]:WDAT
```

Query Command

`[SOURce[1]:]DATA:TELecom:OVERhead:SOURce?` returns the current Transport Overhead sequencer configuration.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**NORM** | **SEQ**	none

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[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ <mode>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead:SOURce:SEQuence <mode>` selects the internal sequencer operating mode.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mode	discrete	**NONE** | **ONCE** | **CONTinuous** | **EOSequence**	none

Dependencies

- **DATA:TEL:OVER:SOUR** must be set to **SEQ** to enable sequencer operation and for this command to be accepted.

Comments

- **NONE** causes the sequencer to transmit the default block 1 indefinitely. **NONE** may be specified anytime to terminate the sequence in progress.
- **ONCE** generates a sequence of overhead blocks 2,...17 repeating each block according to the appropriate repeat count. When block 17 is complete the mode reverts to **NONE** and the sequencer returns to the default block 1.
- **CONT** generates a sequence of overhead blocks 1, 2,...17 repeating each block according to the appropriate repeat count. When block 17 is complete the sequencer returns to the loopback point set by **DATA:TEL:OVER:SOUR:SEQ:LOOP** and continues the sequence from there.
- Where a repeat count is 0, the block is omitted from the sequence.
- **EOS** causes the sequencing to terminate next time block 17 is completed returning to the **NONE** setting.
- The reset condition for **DATA:TEL:OVER[<n>]:SOUR:SEQ** is **NONE**.

Error Codes

–221	"Settings conflict"	1. **CONT** was selected, but the **COUNT** values for blocks 3, 4,...17 were all 0.2. **ONCE** was selected, but the **COUNT** values for blocks 2, 3,...17were all 0.
–113	"Undefined header"	

Related Commands

```
DATA:TEL:OVER[<n>]:COUN
DATA:TEL:OVER[<n>]:DATA
DATA:TEL:OVER[<n>]:SOUR
DATA:TEL:OVER[<n>]:WDAT
DATA:TEL:OVER:SOUR
DATA:TEL:OVER:SOUR:SEQ:LOOP
```


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[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ <mode>

Query Command `[SOURce[1]:]DATA:TELecom:OVERhead:SOURce:SEQuence?` returns the currently selected operating mode of the internal sequencer.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	NONE | CONT | EOS	none

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[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ:LOOP <point>

Description `[SOURce[1]:]DATA:TELecom:OVERhead:SOURce:SEQuence:LOOPback <point>` sets the sequencer loopback point.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
point	numeric	`1 to 17`	none

Dependencies None.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ:LOOP` is 3.

Error Codes None.

Related Commands `SOUR:DATA:TEL:OVER:SOUR:SEQ`

Query Command `[SOURce[1]:]DATA:TELecom:OVERhead:SOURce:SEQuence:LOOPback?` returns the currently selected sequencer loopback point.

Response

Response Name	Response Type	Response Range	Default Units
point	numeric	`1 to 17`	none

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SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ:TRIG <point>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead:SOURce:SEQuence:TRIGger <point>` sets the sequencer trigger point.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
point	numeric	`1 to 17`	none

Dependencies

None.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:OVER:SOUR:SEQ:TRIG` is 2.
- When `SOUR2:TRIG:SOUR` is set to `SSEQ`, a trigger pulse will be output for one frame at the start of the block specified by `DATA:TEL:OVER:SOUR:SEQ:TRIG`.

Error Codes

None.

Related Commands

`SOUR:DATA:TEL:OVER:SOUR:SEQ`

Query Command

`[SOURce[1]:]DATA:TELecom:OVERhead:SOURce:SEQuence:TRIGger?` returns the currently selected sequencer trigger point.

Response

Response Name	Response Type	Response Range	Default Units
point	numeric	`1 to 17`	none

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[SOUR[1]:]DATA:TEL:OVER:WDAT <channel>,<word>,<offset>,<value>

Description

`[SOURce[1]:]DATA:TELecom:OVERhead:WDATa <channel>,<word>,<offset>,<value>` programs the APS bytes (K1 and K2) to a specific value. This command sets both bytes simultaneously so that new APS messages can be transmitted without an intermediate value (as would be the case with two byte writes).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1`	none
word	discrete	`APSWitch | K1K2`	none
offset	numeric	`0`	none
value	numeric	`0 to 65535`	none

Dependencies

- In STS mode, <offset> must be `0`.
- When a tributary is being added to either STS3/STM1#1, STS1/STM0 or STS12/STM4#1 group in the STS-48/STM-16 signal, or to all STS1/STM0, STS-3/STM-1 or STS-12/STM-4 groups in the STS-48/STM-16 signal, the K1K2 bytes are sourced from the transmit input tributary for that group.
- Overhead word access is not possible while any stress condition is active, or if **DATA:TEL:OVER:SOUR:SEQ** is set to **ONCE** or **CONT**.
- The transmit tributary clock on the front-panel *Transmit 155/622Mb/s Clock In* port must be identical to the rate specified by **INP3:TEL:RATE** for this command to operate correctly.
- This command is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is not allowed when **DATA:TEL:OVER:SOUR:SEQ** is not set to **NONE**.
- This command is not allowed when stressing is active i.e. when one of the following is not set to **NONE**. **DATA:TEL:ALAR**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:ERR**, **DATA:TEL:FWOR:LOSS**.

Comments

- This command writes a word of data to the K1 and K2 bytes, programming them both simultaneously. The K1 and K2 bytes can be programmed individually using the **DATA:TEL:OVER[<n>]:DATA** command.
- <value> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for **DATA:TEL:OVER:WDAT 1,K1K2,0** is `0`.

Error Codes

–221, "Settings conflict"

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[SOUR[1]:]DATA:TEL:OVER:WDAT <channel>,<word>,<offset>,<value>

Related Commands `DATA:TEL:OVER[<n>]:DATA`
`OUTP:TEL:RATE`

Query Command `[SOURce[1]:]DATA:TELecom:OVERhead[<n>]:WDATa? <channel>,<word>,<offset>` returns the currently set value of the APS (K1 and K2) bytes.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	1	none
word	discrete	APSWitch | K1K2	none
offset	numeric	0	none

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	0 to 65535	none

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[SOUR[1]:]DATA:TEL:PATT <pattern>

Description

`[SOURce[1]:]DATA:TELecom:PATTern <pattern>` selects the specific test pattern to be generated.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
pattern	discrete	`NONE` | `ZSUBstitute` | `OSUBstitute` | `CIDSubstitute`	none

Dependencies

- The length of the specific test pattern is defined by the `DATA:TEL:PATT:LENG` command.
- `ZSUB`, `OSUB` or `CIDS` are only allowed when `DATA:TEL:NEL` is set to `TERM` or `TRIB` and `OUTP:TEL:RATE` is not set to `TRIB` and `DATA:TEL:RATE` is not set to `TRIB` and `DATA:TEL:PAYL` is set to `DATA` and `DATA:TEL:POIN:SOUR` is set to `OVER` and no tributaries are inserted i.e. `DATA:TEL:PAYL:SOUR` is set to `INT` for all channels.

Comments

- When `NONE` is selected, the patterns generated by the module are unchanged.
- When `ZSUB` is selected, a test pattern is placed in the first row of the payload, such that a pattern of all 0s is generated after scrambling.
- When `OSUB` is selected, a test pattern is placed in the first row of the payload, such that a pattern of all 1s is generated after scrambling.
- The reset condition for `DATA:TEL:PATT` is `NONE`.
- When `CIDS` is selected, a test pattern is placed in the first row of the payload, such that after scrambling all ones is generated in alternate frames all zeroes in the others. The remainder of the payload is all zeros which are scrambled.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:PATT:LENG`

Query Command

`[SOURce[1]:]DATA:TELecom:PATTern?` returns the currently selected test pattern to be generated.

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[SOUR[1]:]DATA:TEL:PATT <pattern>

Response

Response Name	Response Type	Response Range	Default Units
pattern	discrete	NONE | ZSUB | OSUB | CIDS	none

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[SOUR[1]:]DATA:TEL:PATT2 <pattern>

Description

`[SOURce[1]:]DATA:TELecom:PATTern2 <pattern>` selects the test pattern to be used for transport overhead or path overhead testing.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
pattern	discrete	`PRBS9` | `PRBS11`	none

Dependencies

- The test pattern is enabled when one of `DATA:TEL:APSW[:SOUR]`, `DATA:TEL:LDCC:SOUR`, `DATA:TEL:OVER`, `DATA:TEL:POV:SOUR`, `DATA:TEL:SDCC:SOUR`, `DATA:TEL:UND:SOUR` or `DATA:TEL:USER:SOUR` is set to `PATT`.

Comments

The default setting is `PRBS9`.

Error Codes

None.

Related Commands

`DATA:TEL:APSW:SOUR`
`DATA:TEL:LDCC:SOUR`
`DATA:TEL:OVER`
`DATA:TEL:POV:SOUR`
`DATA:TEL:SDCC:SOUR`
`DATA:TEL:UND:SOUR`
`DATA:TEL:USER:SOUR`

Query Command

`[SOURce[1]:]DATA:TELecom:PATTern2?` returns the test pattern PRBS9 or PRBS11.

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[SOUR[1]:]DATA:TEL:PATT:LENG <length>

Description

`[SOURce[1]:]DATA:TELecom:PATTern:LENGth <length>` selects the length (in bytes) of the specific test pattern defined by the `DATA:TEL:PATT` command.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
length	numeric	`1 to 4176`	none

Dependencies

- The range of `<length>` depends on the transmitter rate set by `OUTP:TEL:RATE` as follows:

Transmitter Rate	Range of <length>
STS48, STS48C, STM16 or STM16C	1 to 4176
STS12 or STM4	1 to 1044
STS3 or STM1	1 to 261
STS1 or STM0	1 to 87

- This command can be sent at any time but is only effective when `DATA:TEL:PATT` is set to `OSUB` or `ZSUB` or `CIDS`.
- The value of length is restricted to 1-200 for `DATA:TEL:PATT` set to `CIDS`.

Comments

- The reset condition for `DATA:TEL:PATT:LENG` is `1`.
- If the setting was >200 when `DATA:TEL:PATT CIDS` was sent the value is reset to 1.

Error Codes

–221, "Settings conflict" –222, "Data out of Range"

Related Commands

`DATA:TEL:PATT`

Query Command

`[SOURce[1]:]DATA:TELecom:PATTern:LENGth?` returns the length of the test pattern currently defined by the `DATA:TEL:PATT` command.

Response

Response Name	Response Type	Response Range	Default Units
length	numeric	`1 to 4176`	none

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[SOUR[1]:]DATA:TEL:PAYL <payload>

Description

`[SOURce[1]:]DATA:TELecom:PAYLoad <payload>` selects the data to be carried in the payload.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
payload	discrete	**DATA** | **PATTern**	none

Dependencies

- This command is not allowed when **DATA:TEL:NEL** is set to **REP** or **THRU**.
- **PATT** is only allowed when a concatenated signal is selected by **OUTP:TEL:RATE:PAYL**.

Comments

- When **DATA** is sent the payload is sourced from the data area controlled by **DATA:TEL:PAYL:BDATA**.
- When **PATT** is sent the payload is sourced from a pattern generator controlled by **DATA:TEL:PAYL:PATT**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:PAYL:ADAT
DATA:TEL:PAYL:PATT

Query Command

`[SOURce[1]:]DATA:TELecom:PAYLoad?` returns the currently selected data to be carried in the payload.

Response

Response Name	Response Type	Response Range	Default Units
payload	discrete	**DATA** | **PATT**	none

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[SOUR[1]:]DATA:TEL:PAYL:BDAT[:SING] <channel>,<pattern>

Description

`[SOURce[1]:]DATA:TELecom:PAYLoad:BDATa[:SINGle] <channel>,<pattern>` selects the background pattern for a particular channel.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1 to n` (see below)	none
pattern	discrete	**AZERo | AONE | ALTernating |INCRementing | AA55 | VALue**	none

Dependencies

- The range of the <channel> parameter depends on the signal type selected by the **OUTP:TEL:RATE** command, and the payload format set by the **OUTP:TEL:RATE:PAYL** command::

Line Rate	Payload Format			
	STS-48c/ AU4-16c	STS-12c/ AU4-4c	STS-3c/ AU4	STS-1/ AU3
STS48	1	1 .. 4	1 .. 16	1 .. 48
STM16	1	1 .. 4	1 .. 16	1 .. 48
STS12	-	1	1 .. 4	1 .. 12
STM4	-	1	1 .. 4	1 .. 12
STS3	-	-	1	1 .. 3
STM1	-	-	1	1 .. 3
STS1	-	-	-	1
STM0	-	-	-	1

- Patterns specified by the **DATA:TEL:PATT** command overwrite portions of the background load.
- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- This command is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is not allowed when stressing is active i.e. when one of the following is not set to **NONE DATA:TEL:ALAR**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:PAIS**, **DATA:TEL:ERR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:ERR**, **DATA:TEL:FWOR:LOSS**.

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[SOUR[1]:]DATA:TEL:PAYL:BDAT[:SING] <channel>,<pattern>

Comments

- When **AZER** is selected, the value #H00 is replicated through the payload.
- When **AONE** is selected, the value #HFF is replicated through the payload.
- When **ALT** is selected, the values #H00 and #HFF are replicated through the payload.
- When **INCR** is selected, an incrementing pattern is placed in consecutive bytes of the payload.
- When **AA55** is selected, the values #HAA and #H55 are replicated through the payload.
- When **VAL** is selected, the byte value defined by the **DATA:TEL:PAYL:BDAT:VAL** command is replicated through the payload.
- The reset condition for **DATA:TEL:PAYL:BDAT** in all channels is **VAL**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:PAYL:BDAT:VAL
OUTP:TEL:RATE

Query Command

[SOURce[1]:]DATA:TELecom:PAYLoad:BDATa[:SINGle]? <channel> returns the currently selected background pattern for a particular channel.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	**1 to n** (see Dependencies)	none

Response

Response Name	Response Type	Response Range	Default Units
pattern	discrete	**AZERo | AONE | ALTernating |INCRementing | AA55 | VALue**	none

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[SOUR[1]:]DATA:TEL:PAYL:BDAT[:SING]:VAL <channel>,<value>

Description

`[SOURce[1]:]DATA:TELecom:PAYLoad:BDATa[:SINGle]:VALue <channel>,<value>` selects the background load byte that is replicated throughout the payload portion of the SONET/SDH signal when the channel pattern is set to **VAL**.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	`1 to n` (see below)	none
value	numeric	`0 to 255`	none

Dependencies

- The range of the <channel> parameter depends on the signal type selected by the **OUTP:TEL:RATE** command, and the payload format set by the **OUTP:TEL:RATE:PAYL** command:

Line Rate	Payload Format			
	STS-48c/ AU4-16c	STS-12c/ AU4-4c	STS-3c/ AU4	STS-1/ AU3
STS48	1	1 .. 4	1 .. 16	1 .. 48
STM16	1	1 .. 4	1 .. 16	1 .. 48
STS12	-	1	1 .. 4	1 .. 12
STM4	-	1	1 .. 4	1 .. 12
STS3	-	-	1	1 .. 3
STM1	-	-	1	1 .. 3
STS1	-	-	-	1
STM0	-	-	-	1

- This command can be sent at any time, but is only effective when **DATA:TEL:PAYL:BDAT** is set to **VAL**.
- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- This command is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is not allowed when stressing is active i.e. when one of the following is not set to **NONE** **DATA:TEL:ALAR**, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**,

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[SOUR[1]:]DATA:TEL:PAYL:BDAT[:SING]:VAL <channel>,<value>

DATA:TEL:FWOR:ERR, **DATA:TEL:FWOR:LOSS**.

Comments

- <value> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for **DATA:TEL:PAYL:BDAT:VAL** in all channels is **0**.

Error Codes

–221, "Settings conflict" –222, "Data out of range"

Related Commands

DATA:TEL:PAYL:BDAT
OUTP:TEL:RATE

Query Command

[SOURce[1]:]DATA:TELecom:PAYLoad:BDATa[:SINGle]:VALue? <channel> returns the background load byte value that is replicated throughout the payload portion of the SONET/SDH signal when the channel pattern is set to **VAL**.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	**1 to n** (see Dependencies)	none

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	**0 to 255**	none

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[SOUR[1]:]DATA:TEL:PAYL:BDAT:ALL <pattern>

Description

`[SOURce[1]:]DATA:TELecom:PAYLoad:BDATa:ALL <pattern>` selects the background pattern for all channels.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
pattern	discrete	**AZERo | AONE | ALTernating |INCRementing | AA55 | VALue**	none

Dependencies

- Patterns specified by the **DATA:TEL:PATT** command overwrite portions of the background load.
- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- This command is not allow when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is not allowed when stressing is active i.e. when one of the following is not set to **NONE**

  DATA:TEL:ALAR, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:ERR**, **DATA:TEL:FWOR:LOSS**.

Comments

- When **AZER** is selected, the value #H00 is replicated through the payload.
- When **AONE** is selected, the value #HFF is replicated through the payload.
- When **ALT** is selected, the values #H00 and #HFF are replicated through the payload.
- When **INCR** is selected, an incrementing pattern is placed in consecutive bytes of the payload.
- When **AA55** is selected, the values #HAA and #H55 are replicated through the payload.
- When **VAL** is selected, the byte value defined by the **DATA:TEL:PAYL:BDAT:VAL** command is replicated through the payload.
- The reset condition for **DATA:TEL:PAYL:BDAT:ALL** is **VAL**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:PAYL:BDAT:ALL:VAL
DATA:TEL:PAYL:BDAT
DATA:TEL:PAYL:BDAT:VAL
OUTP:TEL:RATE

Query Command

None.

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[SOUR[1]:]DATA:TEL:PAYL:BDAT:ALL:VAL <value>

Description

`[SOURce[1]:]DATA:TELecom:PAYLoad:BDATa:ALL:VALue <value>` defines the background load byte value that will be replicated throughout the payload portion of the SONET/SDH signal when all channels have their patterns set to **VAL**.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	0 to 255	none

Dependencies

- This command can be sent at any time, but is only effective when **DATA:TEL:PAYL:BDAT:ALL** is set to **VAL**.
- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- This command is not allow when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is not allowed when stressing is active i.e. when one of the following is not set to **NONE**

  DATA:TEL:ALAR, **DATA:TEL:ALAR:LAIS**, **DATA:TEL:ALAR:FERF**, **DATA:TEL:ALAR:PAIS**, **DATA:TEL:ALAR:PFER**, **DATA:TEL:ERR:POIN**, **DATA:TEL:ALT:APSW**, **DATA:TEL:FWOR**, **DATA:TEL:FWOR:ERR**, **DATA:TEL:FWOR:LOSS**.

Comments

- <value> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for **DATA:TEL:PAYL:BDAT:ALL:VAL** is 0.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:PAYL:BDAT:ALL
DATA:TEL:PAYL:BDAT
DATA:TEL:PAYL:BDAT:VAL

Query Command

`[SOURce[1]:]DATA:TELecom:PAYLoad:BDATa:ALL:VALue?` returns the currently defined background load byte that is replicated throughout the payload portion of the SONET/SDH signal when all channels have their patterns set to **VAL**.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	0 to 255	none

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[SOUR[1]:]DATA:TEL:PAYL:CHAN:SOUR?

Description `[SOURce[1]:]DATA:TELecom:PAYLoad:CHANnel:SOURce?` queries if any tributary, backplane payload or ATM channels are inserted.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	NONE | USED	none

Dependencies None.

Comments None.

Error Codes None.

Related Commands None.

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[SOUR[1]:]DATA:TEL:PAYL:PATT <pattern>

Description

`[SOURce[1]:]DATA:TELecom:PAYLoad:PATTern <pattern>` sets the payload test pattern.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
pattern	discrete	**PRBS23** | **PRBS15**	none

Dependencies

- This command is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is only effective when **DATA:TEL:PAYL** is set to **PATT**.

Comments

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:PAYL

Query Command

`[SOURce[1]:]DATA:TELecom:PAYLoad:PATTern?` returns the currently selected payload test pattern.

Response

Response Name	Response Type	Response Range	Default Units
pattern	discrete	**PRBS23** | **PRBS15**	none

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[SOUR[1]:]DATA:TEL:PAYL:SOUR[:SING] <group>,<source>

Description

[SOURce[1]:]DATA:TELecom:PAYLoad:SOURce[:SINGle] <group>,<source> selects the source of the payload generated for the specified group.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
group	numeric	**1 to n** (see below)	none
source	discrete	**INTernal | TRIButary | PPORt | ABUS**	none

Dependencies

- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- This command is not allowed with **TRIB** unless **DATA:TEL:NEL** is set to **TRIB**.
- This command is not allowed with **PPOR** unless **OUTP:TEL:RATE** is set to **STM16C** or **STS48C**.
- **TRIButary** and **PPORt** are only valid when **INST:SEL** is set to **TRIB**. Also to select **PPORt**, **OUTP:TEL:RATE** must be set to **STS48C** or **STM16C**.
- **ABUS** is only valid when **INST:SEL** is set to **MRATe**, and **OUTP:TEL:RATE:PAYL** is set to **STS3C**, **AU4**, **STS1** or **AU3**.
- The range of values for **<group>** depends on the output signal rate selected by **OUTP:TEL:RATE**, the tributary rate set by **INP3:TEL:RATE** and the payload mappings set by **OUTP:TEL:RATE:PAYL**.

Transmitter Rate	<source>	Tributary Rate/Payload Mapping	<group>
STS48	INT	STS1	1 to 48
		STS3C	1 to 16
		STS12C	1 to 4
		STS48C	1
	TRIB	STS1	1 to 48
		STS3	1 to 16
		STS12	1 to 4
	ABUS	STS1	1 to 48
		STS3C	1 to 16
STS48C	INT	STS48C	1
	PPOR	STS48C	1

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[SOUR[1]:]DATA:TEL:PAYL:SOUR[:SING] <group>,<source>

Transmitter Rate	<source>	Tributary Rate/Payload Mapping	<group>
STM16	INT	AU3	1 to 48
		AU4	1 to 16
		AU4-4C	1 to 4
		AU4-16C	1
	TRIB	STM0	1 to 48
		STM1	1 to 16
		STM4	1 to 4
	ABUS	AU3	1 to 48
		AU4	1 to 16
STM16C	INT	AU4-16C	1
	PPOR	AU4-16C	1
STS12	INT	STS1	1 to 12
		STS3C	1 to 4
		STS12C	1
	ABUS	STS1	1 to 12
		STS3C	1 to 4
STM4	INT	AU3	1 to 12
		AU4	1 to 4
		AU4-4C	1
	ABUS	AU3	1 to 12
		AU4	1 to 4
STS3	INT	STS1	1 to 3
		STS3C	1
	ABUS	STS1	1 to 3
		STS3C	1
STM1	INT	AU3	1 to 3
		AU4	1
	ABUS	AU3	1 to 3
		AU4	1
STS1	INT	STS1	1
	ABUS	STS1	1
STM0	INT	AU3	1
	ABUS	AU3	1

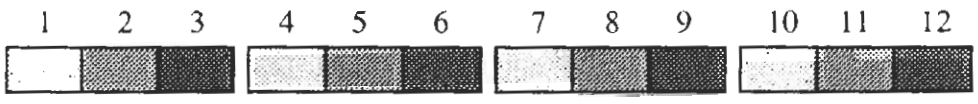
Comments

- **PPOR** will source the payload from the front panel Payload port.
- **INT** sources the selected <group> from the internally generated background.

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- **TRIB** will source the selected <group> from the transmit input tributary.
- **ABUS** will source the the selected <group> from the SPE generator connected via the backplane payload bus.
- When **DATA:TEL:PAYL:SOUR 1** is set to **TRIB**, the following bytes are sourced from the transmit input tributary for the STS1#1/STM1#1a in the number one group:
  E1, F1, D1-D3, H1, H2, H3, K1, K2, D4-D12, Z1, Z2, E2
- The reset condition for **DAT:TEL:PAYL:SOUR <1.n>** is **INT**.
- There are some side effects to using this command when adding an AU3 or STS1 payload into an STM4, STM16, STS12 or STS48.

  The AU3s or STS1s are arranged into 4 (STS12 or STM4) or 16 (STS48 or STM16) groups of 3 channels. An STS-12 is illustrated below:



  A group is active when any of its three channels are selected. When a channel in another group is selected, then the corresponding channel is automatically selected in all other active groups. Active groups always contain identical channel selection.

  For example, if channel 2 is being sourced from the payload bus, and you want to select channel 6, by issuing **SOUR:DATA:TEL:PAYL:SOUR 6,ABUS** command, then channels 2,3,5 and 6 will all be sourced from the payload bus.

  Note, deselecting a channel to an internal source will automatically deselect the corresponding channel in other active groups. In the example above, the command **SOUR:DATA:TEL:PAYL:SOUR 5,INT** will leave only channels 3 and 6 sourced from the payload bus. Channels 2 and 5 will be sourced internally.
- For any group set to **TRIB**, **PPOR** or **ABUS**, the following overhead bytes in that group are also sourced externally:
  H1, H2, H3,

Error Codes

-221, "Settings conflict"
-222, "Data out of Range"
+1025, "Payload Input Port Not Selected" - **PPOR** was selected but no HP E1615A is connected to the payload input port.

Related Commands

DATA:TEL:PAYL:SOUR:ALL
OUTP:TEL:RATE
INP3:TEL:RATE
DATA:TEL:NEL

Query Command

[SOURce[1]:]DATA:TELecom:PAYLoad:SOURce[:SINGle]? <group> returns the currently selected source of the payload generated for the specified group.

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[SOUR[1]:]DATA:TEL:PAYL:SOUR[:SING] <group>,<source>

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
group	numeric	1 to n (see Dependencies)	none

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	INT | TRIB | PPOR | ABUS	none

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[SOUR[1]:]DATA:TEL:PAYL:SOUR:ALL <source>

Description

`[SOURce[1]:]DATA:TELecom:PAYLoad:SOURce:ALL <source>` selects the source of the payload generated for all groups.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	`INTernal` | `TRIButary` | `PPORt` | `ABUS`	none

- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.
- This command is not allowed with `TRIB` unless `DATA:TEL:NEL` is set to `TRIB`.
- This command is not allowed with `PPOR` unless `OUTP:DATA:RATE` is set to `STM16C` or `STS48C`.
- `TRIButary` and `PPORt` are only valid when `INST:SEL` is set to `TRIB`. Also to select `PPORt`, `OUTP:TEL:RATE` must be set to `STS48C` or `STM16C`.
- `ABUS` is only valid when `INST:SEL` is set to `MRATe`, `OUTP:TEL:RATE:PAYL` is set to `STS3C`, `AU4`, `STS1` or `AU3`.

Comments

- `INT` sources all groups from the internally generated background.
- `TRIB` will source all groups from the transmit input tributary.
- `PPOR` will source the payload from the front panel Payload port.
- `ABUS` will source all groups from the SPE generator connected via the backplane payload bus.
- When `DATA:TEL:PAYL:SOUR:ALL` is set to `TRIB`, the following bytes are sourced from the transmit input tributary for the STS1#1/STM1#1a in the number one group:

  `E1, F1, D1-D3, H1, H2, H3, K1, K2, D4-D12, Z1, Z2, E2`
- When `TRIB`, `PPOR` or `ABUS` is selected, the following bytes are sourced from the transmit input port for all groups:

  `H1, H2, H3`
- The reset condition for `DAT:TEL:PAYL:SOUR:ALL` is `INT`.

Error Codes

1025 "Payload input port not selected - invalid signal".

Related Commands

`DATA:TEL:PAYL:SOUR`
`OUTP:TEL:RATE`
`INP3:TEL:RATE`

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[SOUR[1]:]DATA:TEL:POIN <action>

Description `[SOURce[1]:]DATA:TELecom:POINter <action>` selects the pointer action.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
action	discrete	**NONE** | **IDECrement** | **NDValue** |**RATE** | **LOSS** | **SEQuence** | **TREF**	none

Dependencies

- This command cannot be sent with other than **NONE** unless **DATA:TEL:NEL** is set to **TERM** or **TRIB** and **DATA:TEL:POIN:SOUR** is set to **INT**.

Comments

- Default setting is **NONE**.
- When **IDEC** is sent the action reverts back to **NONE** after the pointer increment or decrement is performed. See **DATA:TEL:POIN:DIR**.
- When **NDV** is sent the action reverts back to **NONE** after the pointer new value is set. See **DATA:TEL:POIN:NDFL**.
- When **RATE** is sent a series of pointer increments or decrements is performed until the command is sent again with a different parameter. See **DATA:TEL:POIN:RATE**.
- When **SEQ** is sent a sequence of pointer moves is performed until the comment is sent again with a different parameter. See **DATA:TEL:POIN:SEQ**.
- When **TREF** is selected the pointer behavior is controlled by the E1679A Timing Reference module.
- When **LOSS** is selected the pointer value is set to one greater than the maximum allowed value i.e. 783.

Error Codes –221, "Settings conflict"

Related Commands

DATA:TEL:POIN:DIR
DATA:TEL:POIN:NDFL
DATA:TEL:POIN:RATE
DATA:TEL:POIN:SEQ

Query Command `[SOURce[1]:]DATA:TELecom:POINter?` returns the currently selected pointer action.

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[SOUR[1]:]DATA:TEL:POIN <action>

Response

Response Name	Response Type	Response Range	Default Units
action	discrete	NONE | IDEC | NDV | RATE | LOSS | SEQ | TREF	none

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[SOUR[1]:]DATA:TEL:POIN:DIR <direction>

Description

`[SOURce[1]:]DATA:TELecom:POINter:DIRection <direction>` selects the IDEC direction

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	**UP** | **DOWN**	none

Dependencies

None.

Comments

- This command may be sent at any time but is only effective when **DATA:TEL:POIN** is sent with **IDEC**.
- When **UP** is selected the pointer increments on receipt of **DATA:TEL:POIN:IDEC**.
- The default setting of **DATA:TEL:POIN:DIR** is **UP**.

Error Codes

None.

Related Commands

DATA:TEL:POIN

Query Command

`[SOURce[1]:]DATA:TELecom:POINter:DIRection?` returns the currently selected IDEC direction.

Response

Response Name	Response Type	Response Range	Default Units
direction	discrete	**UP** | **DOWN**	none

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[SOUR[1]:]DATA:TEL:POIN:NDFL <state>

Description

`[SOURce[1]:]DATA:TELecom:POINter:NDFLag <state>` selects the New Data Flag state.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
state	boolean	0 | OFF | 1 | ON	none

Dependencies

None.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:POIN:NDFL` is `1`.
- This command may be sent at any time but will not be effective until `DATA:TEL:POIN` is sent with `NDV`.
- When set to `ON` the new data flag bits are generated when the new pointer value is output.
- When set to `OFF` the new pointer value is output without the `NDF` bits being set.

Error Codes

None.

Related Commands

`DATA:TEL:POIN`
`DATA:TEL:POIN:NDV`

Query Command

`[SOURce[1]:]DATA:TELecom:POINter:NDFLag?` returns the currently selected New Data Flag state.

Response

Response Name	Response Type	Response Range	Default Units
state	boolean	0 | 1	none

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[SOUR[1]:]DATA:TEL:POIN:NDV <value>

Description `[SOURce[1]:]DATA:TELecom:POINter:NDValue <value>` selects the new pointer value.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	`0 to 782`	none

Dependencies None.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:POIN:NDV` is `0`.
- This command may be sent at any time but is only effective when `SOUR:DATA:TEL:POIN` is sent with `NDV`.

Error Codes None.

Related Commands

`DATA:TEL:POIN`
`DATA:TEL:POIN:NDFL`

Query Command `[SOURce[1]:]DATA:TELecom:POINter:NDValue?` returns the currently programmed new pointer value.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`0 to 782`	none

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[SOUR[1]:]DATA:TEL:POIN:RATE <rate>

Description

`[SOURce[1]:]DATA:TELecom:POINter:RATE <rate>` selects the payload pointer rate.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	numeric	`-10 to 10`	none

Dependencies

None.

Comments

- The values are quantized onto the discrete values −10, −5, −2, −1, +1, +2, +5, +10 where the sign gives the direction of the pointer moves, − indicates decrements. The number indicates the rate in moves per second.
- This command can be sent at any time but is only effective when **`DATA:TEL:POIN`** is set to **`RATE`**.

Error Codes

None.

Related Commands

`DATA:TEL:POIN`

Query Command

`[SOURce[1]:]DATA:TELecom:POINter:RATE?` returns the currently selected payload pointer rate.

Response

Response Name	Response Type	Response Range	Default Units
rate	numeric	`-10 to 10`	none

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[SOUR[1]:]DATA:TEL:POIN:SBIT <type>

Description

`[SOURce[1]:]DATA:TELecom:POINter:SBIT <type>` selects between default and programmable pointer size bits.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
type	discrete	**DEFault** | **VALue**	none

Dependencies

- This comment is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- **DATA:TEL:POIN:SOUR** must be set to **INT** for this command to be effective.

Comments

- The reset condition for **[SOUR[1]:]DATA:TEL:POIN:SBIT** is **DEF**.
- When set to **DEF** the S bits in the H1, H2 pointer word will be sent at the default value for the output rate.
- When set to **VAL** the 5 bits are sent as set by **DATA:TEL:POIN:SBIT:VAL**.

Error Codes

–221, "Settings conflict"

Related Commands

DATA:TEL:POIN:SOUR

Query Command

`[SOURce[1]:]DATA:TELecom:POINter:SBIT?` returns the currently selected pointer size bits type (default or programmable).

Response

Response Name	Response Type	Response Range	Default Units
type	discrete	**DEF** | **VAL**	none

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[SOUR[1]:]DATA:TEL:POIN:SBIT:VAL <value>

Description

`[SOURce[1]:]DATA:TELecom:POINter:SBIT:VALue <value>` selects the programmable value for the pointer size bits.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	`0 to 3`	none

Dependencies

- This command is not allowed when **`DATA:TEL:NEL`** is set to **`THR`** or **`REP`**.
- This command is not effective until **`DATA:TEL:POIN:SOUR`** is set to **`INT`** and **`DATA:TEL:POIN:SBIT`** is set to **`VAL`**.

Comments

- The reset condition for **`[SOUR[1]:]DATA:TEL:POIN:SBIT:VAL`** is `0`.

Error Codes

None.

Related Commands

`DATA:TEL:POIN:SOUR`
`DATA:TEL:POIN:SBIT`

Query Command

`[SOURce[1]:]DATA:TELecom:POINter:SBIT:VALue?` returns the currently programmed value for the pointer size bits.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`0 to 3`	none

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[SOUR[1]:]DATA:TEL:POIN:SEQ

Description `[SOURce[1]:]DATA:TELecom:POINter:SEQuence` selects the pointer sequence type.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	discrete	**MRATe**	none

Dependencies None.

Comments

- This command is only effective when **DATA:TEL:POIN:SOUR** is set to **INT** and **DATA:TEL:POIN** is set to **SEQ**.
- There is only one setting **MRATe** which causes the pointer to increment or decrement at maximum rate i.e. one pointer move every 4 frames.
- The reset condition for **DATA:TEL:POIN:SEQ** is **MRAT**.

Error Codes None.

Related Commands

DATA:TEL:POIN:SOUR
DATA:TEL:POIN
DATA:TEL:POIN:SEQ:DIR

Query Command `[SOURce[1]:]DATA:TELecom:POINter:SEQuence?` returns the currently selected pointer sequence type (MRATe).

Response

Response Name	Response Type	Response Range	Default Units
rate	discrete	**MRATe**	none

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[SOUR[1]:]DATA:TEL:POIN:SEQ:DIR <direction>

Description

`[SOURce[1]:]DATA:TELecom:POINter:SEQuence:DIRection <direction>` selects the direction of pointer sequences.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	**UP** | **DOWN**	none

Dependencies

None.

Comments

- The reset condition for **[SOUR[1]:]DATA:TEL:POIN:SEQ:DIR** is **UP**.
- This command can be sent at any time but is only effective when **DATA:TEL:POIN** is set to **SEQ**.
- **UP** causes the sequence to increment the pointer.
- **DOWN** causes the sequence to decrement the pointer.

Error Codes

None.

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:POINter:SEQuence:DIRection?` returns the currently selected direction of pointer sequences.

Response

Response Name	Response Type	Response Range	Default Units
direction	discrete	**UP** | **DOWN**	none

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[SOUR[1]:]DATA:TEL:POIN:SOUR <source>

Description

`[SOURce[1]:]DATA:TELecom:POINter:SOURce <source>` selects the source of the transmitted pointer bytes.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	**OVERhead** | **INTernal**	none

Dependencies

- This command is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.

Comments

- **EXT** is returned when **OUTP:TEL:RATE** is set to **STM16C** or **STS48C** and **DATA:TEL:PAYL:SOUR** is set to **PPOR**.
- When set to **OVER** the pointer bytes are sourced from the data area controlled by **DATA:TEL:OVER**.
- When set to **INT** the pointer bytes are controlled by the **DATA:TEL:POIN** mode commands.
- When set to **EXT** the pointer bytes are sourced from the front panel payload port.

Error Codes

None.

Related Commands

None.

Query Command

`[SOURce[1]:]DATA:TELecom:POINter:SOURce?` returns the currently selected source of the transmitted pointer bytes.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**OVER** | **INT** | **EXT**	none

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[SOUR[1]:]DATA:TEL:POIN:VAL?

Description `[SOURce[1]:]DATA:TELecom:POINter:VALue?` queries the value of the transmitted pointer.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`0 to 782`	none

Dependencies None.

Comments None.

Error Codes None.

Related Commands None.

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[SOUR[1]:]DATA:TEL:POV:ARR:J1|TRAC <length>,<start>,<value1>[,...<value16>]

Description

`[SOURce[1]:]DATA:TELecom:POVerhead:ARRay:J1|TRACe <length>,<start>,<value1>[,...<value16>]` programs up to 16 bytes of the J1 trace message.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
length	numeric	`1 to 16`	none
start	numeric	`1 to 64`	none
value1... value16	numeric	`0 to 255`	none

Dependencies

- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- This command is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.

Comments

- In **SHORT** format <start> must be less than 16.
- The sum of <length> and <start> must be less than 65 in **LONG** format and 17 in **SHORT**.
- The length of the J1 message is defined by **DATA:TEL:POV:J1:FORM**. This automatically reformats the message adding a **CRC** and framing byte when **SHORT** selected and padding with null when **LONG** is selected.
- The reset condition of **DATA:TEL:POV:ARR:J1** is a string of null characters.

Error Codes

–221, "Settings conflict"
–222, "Data out of range"
–223 "Too much data"

Related Commands

DATA:TEL:POV:J1:FORM

Query Command

`[SOURce[1]:]DATA:TELecom:POVerhead:ARRay:J1|TRACe? <length>,<start>` returns the J1 trace message in the form of a total of <length> comma-separated values.

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[SOUR[1]:]DATA:TEL:POV:ARR:J1ITRAC <length>,<start>,<value1>[,...<value16>]

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
length	numeric	1 to 16	none
start	numeric	1 to 65	none

Response

Response Name	Response Type	Response Range	Default Units
value1... value16	numeric	0 to 255	none

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[SOUR[1]:]DATA:TEL:POV:B3

Description

`[SOURce[1]:]DATA:TELecom:POVerhead:B3` calculates the correct value for the B3 byte in each background payload pattern.

Parameters

None

Dependencies

- This command is only allowed when `OUTP:TEL:RATE` is set to `STS48` or `STM16`, and `OUTP:TEL:RATE:PAYL` is set to `STS12C` or `AU4-4C`.

Comments

- In order to give a constant value for the B3 byte, all J1 path traces will be reset to their default values. If necessary, one or more bytes in the payload will be also altered.
- The B3 values for background payload patterns will remain correct until either one of the payload patterns are changed, any of the path overhead or stuff bytes are changed, or the J1 path trace is changed.

Error Codes

-221, "Settings Conflict"

Related Commands

None.

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[SOUR[1]:]DATA:TEL:POV:DATA <byte>,<value>

Description

`[SOURce[1]:]DATA:TELecom:POVerhead:DATA <byte>,<value>` assigns a value to a specified path overhead byte.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
byte	discrete	`C2 | SLABel | F2 | UCHannel | H4 | MULTiframe | Z3 | GROW3 | GROWTH3 | Z4 | GROW4 | GROWTH4 | Z5 | GROW5 | GROWTH5 | STUFf`	none
value	numeric	`0 to 255`	none

Dependencies

- This command is not allowed when `DATA:TEL:PATT` is set to `CIDS`.
- This command is not allowed when `DATA:TEL:NEL` is set to `THR` or `REP`.
- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.

Comments

- When `STUF` is sent <value> may only take value of 0 and 255.
- The G1 path overhead byte is programmed using `DATA:TEL:ALAR`, `DATA:TEL:ERR:FEBE` and `DATA:TEL:POV:G1` command.
- The reset value of `DATA:TEL:POV:DATA` is 0.

Error Codes

–222, "Data out of range"
–221, "Settings conflict"

Related Commands

`DATA:TEL:POV:G1`
`DATA:TEL:POV:ARR:J1`

Query Command

`[SOURce[1]:]DATA:TELecom:POVerhead:DATA? <byte>` returns the value of the specified path overhead byte.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
byte	discrete	`C2 | SLABel | F2 | UCHannel | H4 | MULTiframe | Z3 | GROW3 | GROWTH3 | Z4 | GROW4 | GROWTH4 | Z5 | GROW5 | GROWTH5 | STUFf`	none

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[SOUR[1]:]DATA:TEL:POV:DATA <byte>,<value>

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	0 to 255	none

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[SOUR[1]:]DATA:TEL:POV:G1 <value>

Description

`[SOURce[1]:]DATA:TELecom:POVerhead:G1 <value>` sets bits 5, 6, 7 and 8 of the path overhead G1 byte.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	`0 to 15`	none

Dependencies

- This command is not allowed when **`DATA:TEL:PATT`** is set to **`CIDS`**.
- This command is not allowed when **`DATA:TEL:NEL`** is set to **`THR`** or **`REP`**.
- This command is not allowed when **`OUTP:TEL:RATE`** is set to **`TRIB`**.

Comments

- The reset condition for **`[SOUR[1]:]DATA:TEL:POV:G1`** is **`0`**.
- **`<value>`** can be specified in decimal, hexadecimal (**`#H<value>`**), octal (**`#Q<value>`**), or binary (**`#B<value>`**) format.

Error Codes

–221, "Settings conflict"

Related Commands

`DATA:TEL:ALAR`
`DATA:TEL:ERR:FEBE`

Query Command

`[SOURce[1]:]DATA:TELecom:POVerhead:G1?` returns the values of bits 5, 6, 7 and 8 of the path overhead G1 byte.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`0 to 15`	none

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[SOUR[1]:]DATA:TEL:POV:J1|TRAC:FORM <format>

Description

`[SOURce[1]:]DATA:TELecom:POVerhead:J1|TRACe:FORMat <format>` selects the format of the J1 trace.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
format	discrete	**LONG** | **SHORt**	none

Dependencies

- This command is not allowed when **DATA:TEL:PATT** is set to **CIDS**.
- This command is not allowed when **DATA:TEL:NEL** is set to **THR** or **REP**.
- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when **OUTP:TEL:RATE** is set to **STM16C** or **STS48C** and **DATA:TEL:PAYL:SOUR** is set to **EXT**.

Comments

- The reset condition for **[SOUR[1]:]DATA:TEL:POV:J1|TRAC:FORM** is **LONG**.
- When **LONG** is selected the J1 message contains 64 bytes set by **DATA:TEL:POV:ARR:J1**.
- When **SHORT** is selected the J1 message contains 15 bytes set by **DATA:TEL:POV:ARR:J1** plus a **CRC/Alignment** byte.
- Padding with nulls is executed automatically.

Error Codes

Related Commands

DATA:TEL:POV:ARRAY:J1

Query Command

`[SOURce[1]:]DATA:TELecom:POVerhead:J1|TRACe:FORMat?` returns the format of the J1 trace.

Response

Response Name	Response Type	Response Range	Default Units
format	discrete	**LONG** | **SHORt**	none

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[SOUR[1]:]DATA:TEL:POV:SOUR <byte>,<source>

Description

`[SOURce[1]:]DATA:TELecom:POVerhead:SOURce <byte>,<source>` selects the source of a specified path overhead byte.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
byte	discrete	NONE | J1 | C2 | G1 | F2 | H4 | 3 | Z4 | Z5	none
source	discrete	INTernal | EXTernal PATTern	none

Dependencies

- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.

Comments

- When **INT** is selected the path overhead byte is sourced from the data area and is controlled by **DATA:TEL:POV:DATA** unless a tributary is being inserted.
- When **EXT** is selected the path overhead byte is sourced from the front panel Serial Data port.
- Setting **<source>** to **PATT** will insert the pattern selected by **[SOUR[1]:]DATA:TEL:PATT2** into the relevant overhead bytes
- Only one byte may be set to **EXT** by this command or by **DATA:TEL:OVER**, **DATA:TEL:USER:SOUR**, **DATA:TEL:SDCC:SOUR**, **DATA:TEL:LDCC:SOUR**, **DATA:TEL:UND:SOUR**, **DATA:TEL:POV:SOUR**.
- The reset condition for **DATA:TEL:POV** is **INT**.

Error Codes

Related Commands

DATA:TEL:OVER
DATA:TEL:LDCC:SOUR
DATA:TEL:SDCC:SOUR
DATA:TEL:UND:OVER
DATA:TEL:USER:SOUR

Query Command

[SOURce[1]:]DATA:TELecom:POVerhead:SOURce? <byte> returns the source of a specified path overhead byte.

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[SOUR[1]:]DATA:TEL:POV:SOUR <byte>,<source>

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
byte	discrete	J1 | C2 | G1 | F2 | H4 | 3 | Z4 | Z5	none

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	INT | EXT | PATT	none

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[SOUR[1]:]DATA:TEL:POV:SOUR:ALL:INT

Description `[SOURce[1]:]DATA:TELecom:POVerhead:SOURce:ALL:INTernal` internally sources all the path overhead bytes, and turns off single-byte path overhead EOC or BER.

Parameters None

Dependencies None

Comments None

Error Codes None.

Related Commands `DATA:TEL:POV:SOUR`

Query Command None.

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[SOUR[1]:]DATA:TEL:SCR <state>

Description

`[SOURce[1]:]DATA:TELecom:SCRambling <state>` enables or disables the scrambling stage of the transmitter.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
state	boolean	0 | OFF | 1 | ON	none

Dependencies

Comments

- When scrambling is selected, all bytes except A1, A2, and C1 are passed through a scrambling stage.
- When scrambling is not selected, the data bypasses the scrambling stage.
- The reset condition for **DATA:TEL:SCR** is **ON**.
- When **DATA:TEL:PATT** is set to **CIDS, ON** is the only valid setting.

Error Codes

-221, "Settings conflict"

Related Commands

DATA:TEL:PATT

Query Command

`[SOURce[1]:]DATA:TELecom:SCRambling?` returns the currently selected state of the transmitter scrambling stage.

Response

Response Name	Response Type	Response Range	Default Units
state	boolean	0 | 1	none

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[SOUR[1]:]DATA:TEL:SDCC:SOUR <source>

Description

`[SOURce[1]:]DATA:TELecom:SDCC:SOURce <source>` selects the source of the Section Data Communications Channel (DCC).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	`INTernal` | `EXTernal` | `PATTern`	none

Dependencies

- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:SDCC:SOUR` is **INT**.
- When **INT** is selected the **SDCC** bytes are sourced from the data area and are controlled by **DATA:TEL:OVER:DATA** unless a tributary is being inserted.
- When **EXT** is selected the path overhead byte is sourced from the front panel Serial Data port.
- Setting `<source>` to **PATT** will insert the pattern selected by `[SOUR[1]:]DATA:TEL:PATT2` into the relevant overhead bytes
- Only one byte may be set to **EXT** by this command or by **DATA:TEL:OVER**, **DATA:TEL:USER:SOUR**, **DATA:TEL:POV:SOUR**, **DATA:TEL:LDCC:SOUR**, **DATA:TEL:UND:SOUR**.

Error Codes

None.

Related Commands

DATA:TEL:OVER
DATA:TEL:LDCC:SOUR
DATA:TEL:USER:SOUR
DATA:TEL:UND:SOUR
DATA:TEL:POV:SOUR

Query Command

`[SOURce[1]:]DATA:TELecom:SDCC:SOURce?` returns the currently selected source of the Section Data Communications Channel(DCC).

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[SOUR[1]:]DATA:TEL:SDCC:SOUR <source>

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	INT | EXT | PATTb	none

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[SOUR[1]:]DATA:TEL:UND:SOUR <source>,<row>,<column>,<interleave>

Description

`[SOURce[1]:]DATA:TELecom:UNDefined:SOURce <source>,<row>,<column>,<interleave>` selects the source of the undefined transport overhead bytes.

Parameters

Parameter Name	Parameter Type	Range of Values		Default Units
source	discrete	INTernal | EXTernal | PATTern		none
row	numeric	1 to 9		none
column	numeric	STM0 | STS1	1 to 3	none
		all other rates	1 to 9	
interleave	numeric	STM0 | STS1	1	none
		STM1 | STS3	1	
		STM4 | STS12	1 to 4	
		STM16 | STS48	1 to 16	

Dependencies

- This command is not allowed when **OUTP:TEL:RATE** is set to **TRIB**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **THR** and **DATA:TEL:NEL:THR:EMR** is set to **OFF**.
- Only **NONE** is allowed when **DATA:TEL:NEL** is set to **REP** and **DATA:TEL:NEL:REP:EMR** is set to **OFF**.
- **<row>** set to 4 is not allowed.
- The range of values for **<column>** and **<interleave>** depends on the transmitter rate selected by **OUTP:TEL:RATE**.

Comments

- The reset condition for **[SOUR[1]:]DATA:TEL:UND:SOUR** is **INT**.
- When **INT** is selected the **UND** bytes are sourced from the data area and are controlled by **DATA:TEL:OVER:DATA** unless a tributary is being inserted.
- When **EXT** is selected the transport overhead byte is sourced from the front panel Serial Data port.
- **PATT** inserts the pattern selected by **[SOUR[1]:]DATA:TEL:PATT2** into the undefined overhead byte.
- Only one byte may be set to **EXT** by this command or by **DATA:TEL:OVER**, **DATA:TEL:USER:SOUR**, **DATA:TEL:POV:SOUR**, **DATA:TEL:LDCC:SOUR**, **DATA:TEL:POV:SOUR**, **DATA:TEL:UND:SOUR**.

Error Codes

None.

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[SOUR[1]:]DATA:TEL:UND:SOUR <source>,<row>,<column>,<interleave>

Related Commands

```
DATA:TEL:SDCC:SOUR
DATA:TEL:LDCC:SOUR
DATA:TEL:POV:SOUR
DATA:TEL:OVER
DATA:TEL:USER:SOUR
```

Query Command

`[SOURce[1]:]DATA:TELecom:UNDefined:SOURce? <row>,<column>,<interleave>` returns the source of a specified transport overhead byte.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
row	numeric	1 to 9	none
column	numeric	1 to 9	none
interleave	numeric	1 to 16	none

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	INT | EXT | PATT	none

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[SOUR[1]:]DATA:TEL:USER:SOUR <source>

Description

`[SOURce[1]:]DATA:TELecom:USER:SOURce <source>` selects the source of the user channel (F1).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	`INTernal` | `EXTernal` | `PATTern`	none

Dependencies

- This command is not allowed when `OUTP:TEL:RATE` is set to `TRIB`.
- Only `NONE` is allowed when `DATA:TEL:NEL` is set to `THR` and `DATA:TEL:NEL:THR:EMR` is set to `OFF`.
- Only `NONE` is allowed when `DATA:TEL:NEL` is set to `REP` and `DATA:TEL:NEL:REP:EMR` is set to `OFF`.

Comments

- The reset condition for `[SOUR[1]:]DATA:TEL:USER:SOUR` is `INT`.
- When `INT` is selected the `F2` bytes are sourced from the data area and are controlled by `DATA:TEL:OVER:DATA` unless a tributary is being inserted.
- When `EXT` is selected the `F2` overhead byte is sourced from the front panel Serial Data port.
- Setting `<source>` to `PATT` will insert the pattern selected by `[SOUR[1]:]DATA:TEL:PATT2` into the relevant overhead bytes
- Only one byte may be set to `EXT` by this command or by `DATA:TEL:OVER`, `DATA:TEL:USER:SOUR`, `DATA:TEL:POV:SOUR`, `DATA:TEL:LDCC:SOUR`, `DATA:TEL:UND:SOUR`, `DATA:TEL:SDCC:SOUR`.

Error Codes

Related Commands

`DATA:TEL:SDCC:SOUR`
`DATA:TEL:LDCC:SOUR`
`DATA:TEL:POV:SOUR`
`DATA:TEL:OVER`
`DATA:TEL:USER:SOUR`

Query Command

`[SOURce[1]:]DATA:TELecom:USER:SOURce?` returns the currently selected source of the user channel (F1).

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[SOUR[1]:]DATA:TEL:USER:SOUR <source>

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**INT** | **EXT** | **PATT**	none

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SOURce2 Subsystem

This subsystem is used to configure the Transport Overhead Generator front panel *Trigger out* TTL output port. This trigger output has been provided for synchronization of external test equipment to Transmit Overhead Generator events.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
SOURce2
   :TRIGger
        :SOURce <source>
        :SOURce?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the SOURce2 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the source of signals sent to the front panel Transport Overhead Generator *Trigger Out* TTL port.	`SOUR2:TRIG:SOUR <source>`	NONE

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SOUR2:TRIG:SOUR <source>

Description

SOURce2:TRIGger:SOURce <source> selects the source of signals sent to the front panel Transport Overhead Generator *Trigger Out* TTL port. The trigger output only reflects internally generated conditions, and can be used to trigger external test equipment for time delay measurements.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
source	discrete	**NONE** | **EFWord** | **FPULse** | **SCRambling** | **OFWord** | **LAIS** | **SBIP** | **LBIP** | **EDATa** | **FERF** | **APSWitch** | **PBIP** | **PFEBe** | **PRBSerr** | **MSFebe** | **SSEQuence** | **PACTion** | **PERRor**	none

Dependencies

- The trigger output cannot be used to give the status of the alarm when a tributary channel is being added.

Comments

- The frameword errored trigger (EFW) is level-sensitive. It is TTL high for a frame in which the frameword is errored.
- The frame pulse trigger (FPUL) is a 1 µs pulse. A TTL high every 125 µs indicates the location of the A1 byte in channel 1.
- The scrambling trigger (SCR) is level-sensitive. It is a TTL high when scrambling is enabled.
- The frameword loss, frameword on/off (OFW) trigger is level-sensitive. It is TTL high for a frame in which the frameword is lost/off.
- The line AIS trigger (LAIS) is level-sensitive. It is TTL high for a frame that contains a line AIS alarm.
- The Section BIP trigger (SBIP) is a 1 ms pulse, indicating the Section BIP (B1 byte) contains an error.
- The Line BIP trigger (LBIP) is a 1 µs pulse, indicating the Line BIP (B2 byte) contains an error.
- The error data trigger (EDAT) is a 1 µs pulse, indicating that an errored data bit has been generated.
- The far end receiver failure trigger (FERF) is level-sensitive. It is TTL high for a frame that contains a line FERF alarm.
- The APS trigger (APS) is level-sensitive. It is A TTL high for a frame that contains the Alternate APS value.
- The Path BIP pulse (PBIP) is a 1 µs pulse, low indicating that the Path BIP (B3) contains an error.
- The reset condition for **SOUR2:TRIG:SOUR** is **NONE**.

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SOUR2:TRIG:SOUR <source>

Error Codes None.

Related Commands None.

Query Command **SOURce2:TRIGger:SOURce?** returns the currently selected source for signals sent to the front panel Transport Overhead Generator *Trigger Out* TTL port.

Response

Response Name	Response Type	Range of Values	Default Units
source	discrete	NONE | **EFW** | **FPUL** | **SCR** | **OFW** | **LAIS** |**SBIP** | **LBIP** | **EDAT**| **FERF** | **APSW** | **PBIP** | **PFEB** |**PRBS** | **MSF** | **SSEQ** | **PACT** | **PERR**	none

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SOURce6 Subsystem

This subsystem is used to configure the Transport Overhead Generator front panel *Frame out/Eye clock* TTL output port.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem command structure is shown in the following diagram.

```
SOURce6
    :TRIGger
        :SOURce <source>
        :SOURce?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the SOURce6 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the source of signals sent to the front panel Transport Overhead Generator *Frame out/Eye clock* TTL port.	**SOUR6:TRIG:SOUR <source>**	**FPUL**

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SOUR6:TRIG:SOUR <source>

Description

SOURce6:TRIGger:SOURce <source> selects the source of the signal sent to the Transport Overhead Generator front panel *Transmit Frame Out/Eye Clock* port. This output can be used to provide either a Frame Out trigger pulse coincident with the first A1 byte of the STS-48(C)/STM-16(C) frame, or an Eye Clock to for use in triggering an oscilloscope for eye diagram displays.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
source	discrete	**FPULse** | **ECLK**	none

Dependencies

None.

Comments

- The frame pulse trigger (**FPUL**) is a 3.2 ns pulse every 125 [micro]s indicating the location of the A1 byte in channel 1.
- The eye clock trigger (**ECLK**) is a 50% duty cycle, 155 MHz clock.
- The reset condition for **SOUR3:TRIG:SOUR** is **FPUL**.

Error Codes

None.

Related Commands

None.

Query Command

SOURce6:TRIGger:SOURce? returns the currently selected source of the signal sent to the Transport Overhead Generator front panel *Transmit Frame Out/Eye Clock* port.

Response

Response Name	Response Type	Range of Values	Default Units
source	discrete	**FPUL** | **ECLK**	none

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SOURce7 Subsystem

This subsystem configures the Transport Overhead Generator reference clock.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
SOURce7
   [:CLOCk]
        [:RATE] <rate>
         :RATE?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the SOURce7 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the Transport Overhead Generator reference clock rate	**SOUR7[:CLOC][:RATE] <rate>**	**M155**

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SOUR7[:CLOC][:RATE]: <rate>

Description

`SOURce7[:CLOCk][:RATE] <rate>` selects the Transport Overhead Generator reference clock rate.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
rate	discrete	`M51` | `M155` | `M622`	none

Dependencies

None.

Comments

None

Error Codes

None

Related Commands

None

Query Command

`SOURce7[:CLOCk][:RATE]?` returns the currently selected Transport Overhead Generator reference clock rate.

Response

Response Name	Response Type	Range of values	Default Units
rate	discrete	`M51` | `M155` | `M622`	none

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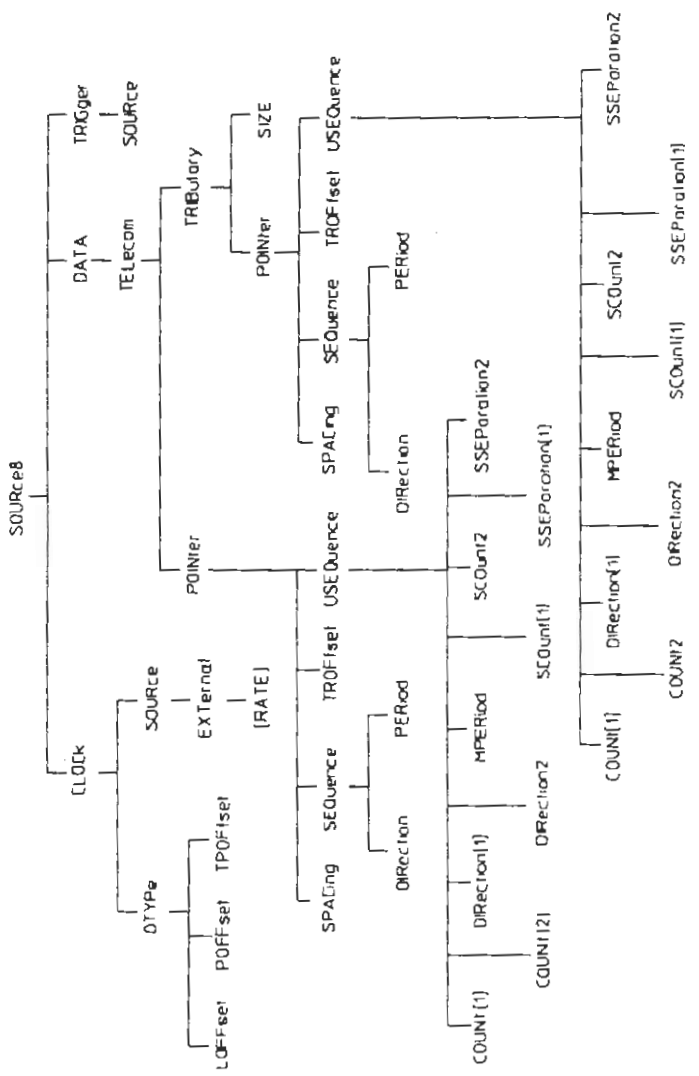
SOURce8 Subsystem

The **SOURce8** subsystem is used to configure the HP E1679A Timing Reference. Issuing commands from this subsystem when an HP E1679A is not present causes "Settings Conflict" errors.

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Subsystem Diagram

The commands recognized by the SOURce8 subsystem are shown in the figure below.



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Subsystem Syntax

```
SOURce8
    :CLOCk
        :OTYPe <otype>
            :LOFFset <ratio>[ppm]
            :LOFFset? [MIN|MAX]
            :Offset <ratio>[ppm]
            :POFFset? [MIN|MAX]
            :TPOFfset <ratio>[ppm]
            :TPOFfset? [MIN|MAX]
        :OTYPe?
        :SOURce <source>
        :SOURce?
          :EXTernal
            :[RATE] <rate>
            :[RATE]?
    :DATA
        :TELecom
            :POINter <action>
                :SEQuence <sequence>
                    :DIRection <direction>
                    :DIRection?
                    :PERiod <time>[ms|s]
                    :PERiod? [MIN|MAX]
                :SEQuence?
                :SPACing <spacing>
                :SPACing?
                :TROFfset? [MIN|MAX]
                :USEQuence <sequence>
                    :COUNt <count>
                    :COUNt? [MIN|MAX]
                    :COUN2 <count>
                    :COUN2? [MIN|MAX]
                    :DIRection[1] <direction>
                    :DIRection[1]?
                    :DIRection2 <direction>
                    :DIRection2?
                    :MPERiod <time>[ms|s]
                    :MPERiod? [MIN|MAX]
                    :SCOunt[1] <stuffs>
                    :SCOunt[1]? [MIN|MAX]
                    :SCOunt2 <stuffs>
                    :SCOunt2? [MIN|MAX]
                    :SSEParation[1] <frames>
                    :SSEParation[1]? [MIN|MAX]
                    :SSEParation2 <frames>
                    :SSEParation2? [MIN|MAX]
                :USEQuence?
            :POINter?
```


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```
                :TRIButary
                    :POINter <action>
                        :SEQuence <sequence>
                            :DIRection <direction>
                            :DIRection?
                            :PERiod <time>[ms|s]
                            :PERiod? [MIN|MAX]
                        :SEQuence?
                        :SPACing <spacing>
                        :SPAcing?
                        :TROFfset? [MIN|MAX]
                        :USEQuence <sequence>
                            :COUNt1 <count>
                            :COUNt1? [MIN|MAX]
                            :COUNt2 <count>
                            :COUNt2? [MIN|MAX]
                            :DIRection[1] <direction>
                            :DIRection[1]?
                            :DIRection2 <direction>
                            :DIRection2?
                            :MPERiod <time>[ms|s]
                            :MPERiod? [MIN|MAX]
                            :SCOunt[1] <stuffs>
                            :SCOunt[1]? [MIN|MAX]
                            :SCOunt2 <stuffs>
                            :SCOunt2? [MIN|MAX]
                            :SSEParation[1] <frames>
                            :SSEParation[1]? [MIN|MAX]
                            :SSEParation2 <frames>
                            :SSEParation2? [MIN|MAX]
                        :USEQuence?
                    :POINter?
                    :SIZE <size>
                    :SIZE?
:TRIGger
    :SOURce
    :SOURce?
```


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SOUR8:CLOC:OTYP

Description

`SOURce8:CLOCk:OTYPe <otype>` is used to select the clock offset type.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
otype	discrete	**NONE** | **LINE** | **PAYLoad** | **TPAYload**	none

Dependencies

- A "Settings Conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When you select **LINE** the offset as specified by **DATA:CLOC:OTYP:LOFF** is used to offset the transport overhead analyzer line rate. To maintain a constant payload rate, compensating pointer movements may be introduced by **SOUR8:DATA:TEL:POIN COMP**. To minimize any short-term disturbance to the payload rate, these commands should be issued before setting the offset.
- When you select **PAYL** the offset as specified by **DATA:CLOC:OTYP:POFF** is used to offset the payload clock.
- When you select **TPAY** the offset as specified by **DATA:CLOC:OTYP:TPOF** is used to offset the tributary payload clock.
- The reset condition for **SOUR8:CLOC:OTYP** is **NONE**.

Error Codes

+201	"Settings change"	1. **LINE** was selected, but**SOUR8:DATA:TEL:POIN** was not set to **NONE** or **COMP** (**SOUR8:DATA:TEL:POIN** is set to **NONE**). 2. **LINE** was selected, but **SOUR8:DATA:TEL:TRIB:POIN** was not set to **NONE** or **COMP** (**SOUR8:DATA:TEL:TRIB:POIN** is set to **NONE**).
-221	"Settings Conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select line clock offset type:

```
SOUR8:CLOCK:OTYP LINE
```

Related Commands

CLOC:SOUR
DATA:TEL:NEL
SOUR8:DATA:TEL:POIN

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SOUR8:DATA:TEL:TRIB:POIN

Query Command

SOURce8:CLOCk:OTYPe? returns the current line clock offset type.

Response

Response Name	Response Type	Response Range	Default Units
otype	discrete	**NONE**|**LINE**|**PAYL**|**TPAY**	none

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SOUR8:CLOC:OTYP:LOFF

Description

SOURce8:CLOCk:OTYPe:LOFFset <ratio>[ppm] is used to select the line clock offset as a ratio or in parts per million (ppm).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
ratio	numeric	**-0.0001 to 0.0001|-100ppm to 100ppm | MINimum | MAXimum**	none

Dependencies

- This command is effective only if **SOUR8:CLOC:OTYP** is set to **LINE**.
- A "Settings Conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **ppm** occurs after <ratio>, the value is taken to be parts per million.
- The generated value of offset changes immediately this command is issued without the need to reissue **SOUR8:CLOC:OTYP LINE**.
- **MIN** corresponds to –0.0001 or –100ppm.
- **MAX** corresponds to 0.0001 or 100ppm.
- The reset condition for **SOUR8:CLOC:OTYP:LOFF** is **0**.

Error Codes

-221 "Settings Conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select the minimum value for the line clock offset:

```
SOUR8:CLOCK:OTYP:LOFF MIN
```

Related Commands

SOUR8:CLOC:OTYP
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:TRIB:POIN

Query Command

SOURce8:CLOCk:OTYPe:LOFFset? [MINimum|MAXimum] returns the current line clock offset as a ratio.

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SOUR8:CLOC:OTYP:LOFF

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
ratio	discrete	[MINimum|MAXimum]	none

Response

Response Name	Response Type	Response Range	Default Units
ratio	numeric	-0.0001 to 0.0001	none

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SOUR8:CLOC:OTYP:POFF

Description

`SOURce8:CLOCk:OTYPe:POFFset <ratio>[ppm]` is used to select the payload clock offset as a ratio or in parts per million (ppm).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
ratio	numeric	`-0.0001 to 0.0001|-100ppm to 100ppm|MINimum|MAXimum`	none

Dependencies

- This command is effective only if `SOUR8:CLOC:OTYP` is set to `PAYL`.
- A "Settings Conflict" error occurs when any `SOURce8` subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When `ppm` occurs after <ratio>, the value is taken to be parts per million.
- The generated value of offset changes immediately this command is issued without the need to reissue `SOUR8:CLOC:OTYP LINE`.
- `MIN` corresponds to –0.0001 or –100ppm.
- `MAX` corresponds to 0.0001 or 100ppm.
- The reset condition for `SOUR8:CLOC:OTYP:POFF` is `0`.

Error Codes

-221	"Settings Conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select a payload clock offset of 56 parts per million:

```
SOUR8:CLOCK:OTYP:POFF 56ppm
```

Related Commands

`SOUR8:CLOC:OTYP`

Query Command

`SOURce8:CLOCk:OTYPe:POFFset? [MINimum|MAXimum]` returns the current payload clock offset as a ratio.

Parameters

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SOUR8:CLOC:OTYP:POFF

Parameter Name	Parameters Type	Range of Values	Default Units
ratio	discrete	[MINimum|MAXimum]	none

Response

Response Name	Response Type	Response Range	Default Units
ratio	numeric	-0.0001 to 0.0001	none

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SOUR8:CLOC:OTYP:TPOF

Description

SOURce8:CLOCk:OTYPe:TPOFset <ratio>[ppm] is used to select the tributary payload clock offset as a ratio or in parts per million (ppm).

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
ratio	numeric	**-0.0001 to 0.0001|-100ppm to 100ppm|MINimum|MAXimum**	none

Dependencies

- This command is effective only if **SOUR8:CLOC:OTYP** is set to **TPAY**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **ppm** occurs after <ratio>, the value is taken to be parts per million.
- The generated value of offset changes immediately this command is issued without the need to reissue **SOUR8:CLOC:OTYP LINE**.
- **MIN** corresponds to –0.0001 or –100ppm.
- **MAX** corresponds to 0.0001 or 100ppm.
- The reset condition for **SOUR8:CLOC:OTYP:TPOF** is 0.

Error Codes

-221	"Settings conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select the maximum value for the line clock offset:

```
SOUR8:CLOCK:OTYP:TPOF MAX
```

Related Commands

SOUR8:CLOC:OTYP

Query Command

SOURce8:CLOCk:OTYPe:TPOFfset? [MINimum|MAXimum] returns the current tributary payload clock offset as a ratio.

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SOUR8:CLOC:OTYP:TPOF

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
ratio	discrete	[MINimum|MAXimum]	none

Response

Response Name	Response Type	Response Range	Default Units
ratio	numeric	-0.0001 to 0.0001	none

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SOUR8:CLOC:SOUR

Description

`SOURce8:CLOCk:SOURce <source>` is used to select the clock source for the HP E1679A Timing Reference.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	`INTernal|EXTernal|RECovered|DS1|M2|K64|E1`	none

Dependencies

- A "Settings conflict" error occurs when any `SOURce8` subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.
- `REC` is only allowed when `INP:TEL:RATE` is set to `STS48`, `STM16`, `STS48C` or `STM16C`.

Comments

- When you select `INT`, the clock source for the timing reference is generated internally.
- When you select `EXT`, the clock source for the timing reference is the 622/155/52 MHz port on the timing reference front panel. The required external frequency is the line rate selected by the `SOUR8:CLOC:SOUR:EXT:RATE` command.
- When you select `REC`, the clock source for the timing reference is recovered from the transport overhead receiver data stream.
- When you select `DS1`, the clock source for the timing reference is the DS1/64 kb/s port on timing reference front panel.
- When you select `M2`, the clock source for the timing reference is a 2048 kHz synchronization signal inserted at one of the 2 MHz ports on timing reference front panel.
- When you select `K64`, the clock source for the timing reference is the DS1/64 kb/s port on timing reference front panel.
- When you select `E1`, the clock source for the timing reference is a 2048 kb/s HDB3-coded signal inserted at one of the 2 MHz ports on timing reference front panel.
- The reset condition for `SOUR8:CLOC:SOUR` is `INT`.

Error Codes

-221	"Settings conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

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Example To select an external clock source for the HP E1679A:

```
SOUR8:CLOCK:SOUR EXT
```

Related Commands `CLOC:SOUR`

Query Command `SOURce8:CLOCk:SOURce?` returns the clock source of the HP E1679A Timing Reference.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	`INT|EXT|REC|DS1|M2|K64|E1`	none

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SOUR8:CLOC:SOUR:EXT[:RATE] <rate>

Description

`SOURce8:CLOCk:SOURce:EXTernal[:RATE) <rate>` is used to select the external clock rate for the HP E1679A Timing Reference.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
rate	discrete	`M51|M155|M622`	none

Dependencies

- This command is only valid when the clock source is the HP E1679A.
- This command is only available when `SOUR8:CLOC:SOUR` is set to `EXT`.

Comments

- `M51`, `M155`, and `M622` corresponds to 51 Mb/s, 155 Mb/s and 622 Mb/s.
- The reset condition is `M155`

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Related Commands

SOUR8:CLOC:SOUR

Query Command

`SOURce8:CLOCk:SOURce:EXT?` returns the external clock rate.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	`M51|M155|M662`	none

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SOUR8:DATA:TEL:POIN

Description

SOURce8:DATA:TELecom:POINter <action> is used to select the pointer action mode for a payload module or the HP E1677B.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
action	discrete	**NONE | COMPensate | SEQuence | USEQuence**	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command can be selected at any time, but it is effective only when **SOUR8:CLOC:OTYP** is set to **NONE** or **LINE**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- Selecting **NONE** stops any sequence started by the **SEQ** and **USEQ** commands.
- Selecting **COMP** causes the timing reference to generate pointer movement signals for use by the HP E1676B or a payload module. These pointer movement compensate for the offset to the line clock. This means that the line clock is offset, but the payload clock is not.
- The **SEQ** and **USEQ** commands start sequences whose parameters are specified by commands in the **SOUR8:DATA:TEL:POIN:SEQ** and **SOUR8:DATA:TEL:POIN:USEQ** command trees, respectively.
- Selecting **SEQ** moves the pointer according to the sequence selected by the **SOUR8:DATA:TEL:POIN:SEQ** command.
- Selecting **USEQ** moves the pointer according to the sequence selected by the **SOUR8:DATA:TEL:POIN:USEQ** command.
- Selecting **USEQ** causes the measurement period to be recalculated using the current settings. The newly calculated measurement period, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125 \times 10^{-6}$$

Further, the newly calculated measurement period, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff

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count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125 \times 10^{-6}$$

If either of these conditions is not met, the measurement period is increased and the conditions are rechecked. If the measurement period is increased to maximum and the conditions are still not met, the number of type 2 bursts is reduced to 1, and the number of consecutive type 1 bursts is decremented until the conditions are met.

- The reset condition for **SOUR8:DATA:TEL:POIN** is **NONE**.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer. 2. **SEQ** or **USEQ** was selected, but **SOUR8:CLOC:OTYP** was not set to **NONE**, or **SOUR8:DATA:TEL:TRIB:POIN** was not set to **NONE**. 3. **COMP** was selected, but **SOUR8:DATA:TEL:TRIB:POIN** was not set to **NONE**.

Example

To generate a standard pointer sequence:

```
SOUR8:DATA:TEL:POIN SEQ
```

Related Commands

DATA:TEL:POIN TREF (payload generator command)
SOUR8:CLOC:OTYP
SOUR8:DATA:TEL:TRIB:POIN

Query Command

SOURce8:DATA:TELecom:POINter? returns the current pointer action mode for a payload module.

Response

Response Name	Response Type	Response Range	Default Units
action	discrete	**NONE** | **COMP** | **SEQ** | **USEQ**	none

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SOUR8:DATA:TEL:POIN:SEQ

Description

SOURce8:DATA:TELecom:POINter:SEQuence <sequence> is used to select the payload pointer sequence.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
sequence	discrete	**PERiodic|BURSt|PADDition|PCANcel|PALTernate|PDALternate|SADJ|BUR7|GAP|GADD| GCANSADJustment|BUR7|GAP|GADDition | GCANcel**	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command can be selected at any time, but is effective only when **SOUR8:DATA:TEL:POIN** is set to **SEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **PER** option allows the periodic movement of the SPE pointer from hardware control, defined by the **DIR** and **PER** commands below.
- The **BURS** option corresponds to the T1X1 jitter generation test sequence: Burst with three Pointer Adjustments, for DS3.
- The **BUR7** option corresponds to the T1X1.3 jitter generation test sequence: Burst with seven pointer movements.
- The **GAP** option corresponds to the T1X1.3 jitter generation test sequence: Gapped Pointer Sequence.
- The **GADD** option corresponds to the T1X1.3 jitter generation test sequence: Gapped Pointer Sequence with pointer adjustment addition.
- The **GCAN** option corresponds to the T1X1.3 jitter generation test sequence: Gapped Pointer Sequence with pointer adjustment cancellation.
- The **PADD** option corresponds to the T1X1 jitter generation test sequence: Periodic with Pointer Adjustment Addition, for DS1.
- The **PCAN** option corresponds to the T1X1 jitter generation test sequence: Periodic with Pointer Adjustment Cancellation, for DS1.
- The **PALT** option is a G.783 jitter generation test sequence where the pointer is periodically shifted forward and backward by one unit, with no net pointer movement.

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- The **PDAL** option is a G.783 jitter generation test sequence where the pointer is periodically shifted forward and backward by two units, with no net pointer movement.
- The **SADJ** option corresponds to the T1X1.3 jitter generation test sequence: Single Pointer Adjustments, with interval of 30s.
- The reset condition for **SOUR8:DATA:TEL:POIN:SEQ** is **PER**.

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To periodically shift the pointer forward and backward by two units:

```
SOUR8:DATA:TEL:POIN:SEQ PDAL
```

Related Commands

DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:SEQ:DIR
SOUR8:DATA:TEL:POIN:SEQ:PER

Query Command

SOURce8:DATA:TELecom:POINter:SEQuence? returns the current setting of the payload pointer sequence.

Response

Response Name	Response Type	Response Range	Default Units
sequence	discrete	**PER** | **BURS** | **PADD** | **PCAN** | **PALT** | **PDAL** | **SADJ** | **BUR7** | **GAP** | **GADD** | **GCAN**	none

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SOUR8:DATA:TEL:POIN:SEQ:DIR

Description

`SOURce8:DATA:TELecom:POINter:SEQuence:DIRection <direction>` is used to select the payload pointer sequence direction.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	DOWN|UP	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the the HP E1676B or SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command can be selected at any time, but does not take effect until the **SOUR8:DATA:TEL:POIN:SEQ** command is executed.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI maintrame, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **DOWN** option decrements the value of the pointer (negative movement).
- The **UP** option increments the value of the pointer (positive movement).
- The reset condition for **SOUR8:DATA:TEL:POIN:SEQ:DIR** is **DOWN**.

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the direction of the pointer sequence to down:

```
SOUR8:DATA:TEL:POIN:SEQ:DIR DOWN
```

Related Commands

DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:SEQ
SOUR8:DATA:TEL:POIN:SEQ:PER

Query Command

`SOURce8:DATA:TELecom:POINter:SEQuence:DIRection?` returns the direction of the current payload pointer sequence.

Response

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SOUR8:DATA:TEL:POIN:SEQ:DIR

Response Name	Response Type	Response Range	Default Units
direction	discrete	DOWN | UP	none

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SOUR8:DATA:TEL:POIN:SEQ:PER

Description

SOURce8:DATA:TELecom:POINter:SEQuence:PERiod <time>[ms|s] is used to select the period between regular payload pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	numeric	**0.0005002 to 15|DOWN|UP|MINimum|MAXimum**	seconds

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command can be selected at any time, but does not take effect until the **SOUR8:DATA:TEL:POIN SEQ** command is executed.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **ms** or **s** occurs after <time>, the value is taken to be milliseconds or seconds respectively.
- When neither **ms** nor **s** occurs after <time>, the value is taken to be seconds.
- The range of values for <time> in milliseconds is 0.5 to 15000.
- <time> can only assume certain discrete values. These values depend on the pointer sequence selected.
- The period setting changes immediately this command is issued without the need to reissue **SOUR8:DATA:TEL:POIN SEQ**.
- **DOWN** causes the period to move to the next lower available value, or 10 ms less than the current value, whichever is greater.
- **UP** causes the period to move to the next higher available value, or 10 ms greater than the current value, whichever is greater.
- **MIN** corresponds to a value that depends on the setting of the **SOUR8:DATA:TEL:POIN:SEQ** command:
  - 0.0005002 seconds or 0.5002 milliseconds when **SOUR8:DATA:TEL:POIN:SEQ** is set to **PER**.
  - 0.01 seconds or 10 milliseconds when **SOUR8:DATA:TEL:POIN:SEQ** is set to **PADD**, **PCAN**, **PANT**, or **PDAL**.
- **MAX** corresponds to a value that depends on the setting of the **SOUR8:DATA:TEL:POIN:SEQ** command:
  - 10 seconds or 10000 milliseconds when **SOUR8:DATA:TEL:POIN:SEQ** is set to

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PER, **PALT**, or **PDAL**.

- 15 seconds or 15000 milliseconds when **SOUR8:DATA:TEL:POIN:SEQ** is set to **PADD** or **PCAN**.

- The reset condition for **SOUR8:DATA:TEL:POIN:SEQ:PER** is **1**.

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set period between pointer movements to 10 seconds:

```
SOUR8:DATA:TEL:POIN:SEQ:PER 10
```

Related Commands

DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:SEQ

Query Command

SOURce8:DATA:TELecom:POINter:SEQuence:PERiod? [MINimum|MAXimum] returns the current setting of the period between regular payload pointer movements in seconds.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	discrete	**[MINimum|MAXimum]**	none

Response

Response Name	Response Type	Response Range	Default Units
time	numeric	**0.0005002 to 15**	seconds

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SOUR8:DATA:TEL:POIN:SPAC

Description

SOURce8:DATA:TELecom:POINter:SPACing controls the sequence of pointer movements generated to compensate for line or payload clock offsets.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
spacing	discrete	**NORM** | **GAP**	none

Dependencies

- This command may be issued at any time, but is only effective when **SOUR8:CLOC:OTYP** is set to **LINE** or **PAYL**, and **SOUR8:DATA: TEL:POIN** is set to **COMP**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **SOUR8:DATA:TEL:POIN:SPAC** is set to **NORM**, a regularly spaced sequence of pointer adjustments is generated to compensate for the line or payload clock offset.
- When **SOUR8:DATA:TEL:POIN:SPAC** is set to **GAP**, a gapped sequence of pointer adjustments is generated to compensate for the line or payload clock offset. The gapped sequence is the same as the sequence generated when **SOUR8:DATA:TEL:POIN:SEQ** is set to **GAP**, and provides the same net compensation for the line or payload clock offsets as the regularly spaced pointer adjustments.
- The reset condition for **SOUR8:DATA:TEL:POIN:SPAC** is **NORM**.

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set gapped pointer spacing:

```
SOUR8:DATA:TEL:POIN:SPAC GAP
```

Related Commands

```
SOUR8:CLOC:OTYP
SOUR8:CLOC:OTYP:LOFF
SOUR8:CLOC:OYTP:POFF
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:SEQ
```


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Query Command

SOURce8:DATA:TELecom:POINter:SPACing? queries the sequence of pointer movements generated to compensate for line or payload clock offsets.

Response

Response Name	Response Type	Response Range	Default Units
spacing	discrete	**NORM | GAP**	none

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SOUR8:DATA:TEL:POIN:TROF?

Description

SOURce8:DATA:TELecom:POINter:TROFfset? [MINimum|MAXimum] returns the payload service rate offset, introduced by the HP E1679A Timing Reference, resulting from SPE/AU level pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
offset	discrete	**[MINimum|MAXimum]**	none

Response

Response Name	Response Type	Response Range	Default Units
offset	numeric	**-0.005 to 0.005** (See "Comments")	none

Dependencies

- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The numerical limits of <offset> are –0.005 and 0.005, however, the actual values are limited by the pointer sequences selected.
- **MIN** corresponds to –0.005.
- **MAX** corresponds to 0.005.
- <offset> is passed on to the payload modules to permit bit stuffing compensation and so maintain zero service rate offset.

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To return the service rate offset introduced by the timing reference:

```
SOUR8:DATA:TEL:POIN:TROF?
```

Response:

```
+1.00000000E-004
```


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SOUR8:DATA:TEL:POIN:TROF?

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN:TROF?
```


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SOUR8:DATA:TEL:POIN:USEQ:COUN[1]

Description

`SOURce8:DATA:TELecom:POINter:USEQuence:COUNt <count>` is used to select the number of consecutive type 1 bursts of pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	numeric	`0 to 4095|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **`DATA:TEL:POIN`** is set to **`TREF`**).
- This command is not effective unless **`SOUR8:DATA:TEL:POIN`** is set to **`USEQ`**.
- A "Settings conflict" error occurs when any **`SOURce8`** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **`MIN`** corresponds to 0.
- **`MAX`** corresponds to 4095.
- When **`SOUR8:DATA:TEL:POIN`** is set to **`USEQ`**, executing this command causes the measurement period to be recalculated. The newly calculated measurement period, when divided by the sum of **`:COUN1`** and **`:COUN2`** commands must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **`SOUR8:DATA:TEL:POIN:USEQ`**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125 \times 10^{-6}$$

  Further, the newly calculated measurement period, when divided by the sum of **`:USEQ:COUN1`** and **`:USEQ:COUN2`** commands must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125 \times 10^{-6}$$

- The reset condition for **`SOUR8:DATA:TEL:POIN:USEQ:COUN`** is **`0`**.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

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Example

To set 17 consecutive type 1 bursts of pointer movements:

```
SOUR8:DATA:TEL:POIN:USEQ:COUN 17
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:DIR
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SCO
SOUR8:DATA:TEL:POIN:USEQ:SSEP
```

Query Command

`SOURce8:DATA:TELecom:POINter:USEQuence:COUNt? [MINimum|MAXimum]` returns the current setting of the number of consecutive type 1 bursts of pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	discrete	[MINimum|MAXimum]	none

Response

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 4095	none

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SOUR8:DATA:TEL:POIN:USEQ:COUN2

Description

`SOURce8:DATA:TELecom:POINter:USEQuence:COUNt2 <count>` is used to select the number of consecutive type 2 bursts of pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	numeric	1 to 16|MINimum|MAXimum	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **MIN** corresponds to 1.
- **MAX** corresponds to 16.
- When **SOUR8:DATA:TEL:POIN** is set to **USEQ**, executing this command causes the measurement period to be recalculated. The newly calculated measurement period, when divided by the sum of **:USEQ:COUN1** and **:USEQ:COUN2** command must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125 \times 10^{-6}$$

Further, the newly calculated measurement period, when divided by the sum of **:COUN1** and **:COUN2** command must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125 \times 10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:POIN:USEQ:COUN2** is **1**.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

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Example

To set 12 consecutive type 2 bursts of pointer movements:

```
SOUR8:DATA:TEL:POIN:USEQ:COUN 12
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:DIR
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SCO
SOUR8:DATA:TEL:POIN:USEQ:SSEP
```

Query Command

`SOURce8:DATA:TELecom:POINter:USEQuence:COUNt2? [MINimum|MAXimum]` returns the current setting of the number of consecutive type 1 bursts of pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	discrete	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
count	numeric	`1 to 16`	none

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SOUR8:DATA:TEL:POIN:USEQ:DIR

Description

`SOURce8:DATA:TELecom:POINter:USEQuence:DIRection[1] <direction>` is used to select the pointer sequence direction for type 1 bursts of pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	**DOWN**|**UP**	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **DOWN** option decrements the value of the pointer (negative movement).
- The **UP** option increments the value of the pointer (positive movement).
- The reset condition for **SOUR8:DATA:TEL:POIN:USEQ:DIR** is **DOWN**.

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select a positive pointer movement for type 1 bursts of pointer movements:

```
SOUR8:DATA:TEL:POIN:USEQ:DIR UP
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:COUN
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SCO
SOUR8:DATA:TEL:POIN:USEQ:SSEP
```

Query Command

`SOURce8:DATA:TELecom:POINter:USEQuence:DIRection[1]?` returns the pointer sequence direction for type 1 bursts of pointer movements.

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SOUR8:DATA:TEL:POIN:USEQ:DIR

Response

Response Name	Response Type	Response Range	Default Units
direction	discrete	DOWN | UP	none

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SOUR8:DATA:TEL:POIN:USEQ:DIR2

Description

`SOURce8:DATA:TELecom:POINter:USEQuence:DIRection2 <direction>` is used to select the pointer sequence direction for type 2 bursts of pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	**DOWN** | **UP**	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **DOWN** option decrements the value of the pointer (negative movement).
- The **UP** option increments the value of the pointer (positive movement).
- The reset condition for **SOUR8:DATA:TEL:POIN:USEQ:DIR2** is **DOWN**.

Error Codes

-221 "Settings conflict" A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select a positive pointer movement for type 2 bursts of pointer movements:

```
SOUR8:DATA:TEL:POIN:USEQ:DIR UP
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SCO2
SOUR8:DATA:TEL:POIN:USEQ:SSEP2
```

Query Command

`SOURce8:DATA:TELecom:POINter:USEQuence:DIRection2?` returns the pointer sequence direction for type 2 bursts of pointer movements.

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SOUR8:DATA:TEL:POIN:USEQ:DIR2

Response

Response Name	Response Type	Response Range	Default Units
direction	discrete	DOWN | UP	none

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SOUR8:DATA:TEL:POIN:USEQ:MPER

Description

SOURce8:DATA:TELecom:POINter:USEQuence:MPERiod <time>[ms|s] is used to select the period between the start of the first type 1 burst and the end of the last type 2 burst.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	discrete	**0.010 to 45|DOWN|UP|MINimum|MAXimum**	seconds

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **ms** or **s** occurs after <time>, the value is taken to be milliseconds or seconds respectively.
- When neither **ms** nor **s** occurs after <time>, the value is taken to be seconds.
- The range of values for <time> in milliseconds is 10 to 45000.
- **MIN** corresponds to 0.010 seconds or 10 milliseconds.
- **MAX** corresponds to 45 seconds or 45000 milliseconds.
- <time> can only assume certain discrete values. These values depend on the pointer sequence specified.
- **DOWN** causes the period to move to the next lower available value, or 10 ms less than the current value, whichever is greater.
- **UP** causes the period to move to the next higher available value, or 10 ms greater than the current value, whichever is greater.
- When **SOUR8:DATA:TEL:POIN** is set to **USEQ**, executing this command causes <time> to be recalculated. The newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula "..." represents **SOUR8:DATA:TEL:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125 \times 10^{-6}$$

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Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125 \times 10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:POIN:USEQ:MPER** is **30**

Error Codes

-221	"Settings conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the measurement period to 5 seconds:

```
SOUR8:DATA:TEL:POIN:USEQ:MPER 5
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:COUN & COUNT2
SOUR8:DATA:TEL:POIN:USEQ:DIR
SOUR8:DATA:TEL:POIN:USEQ:DIR2
SOUR8:DATA:TEL:POIN:USEQ:SCO
SOUR8:DATA:TEL:POIN:USEQ:SCO2
SOUR8:DATA:TEL:POIN:USEQ:SSEP
SOUR8:DATA:TEL:POIN:USEQ:SSEP2
```

Query Command

SOURce8:DATA:TELecom:POINter:USEQuence:MPERiod? [MINimum|MAXimum] returns the current setting of the measurement period.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	discrete	[MINimum|MAXimum]	seconds

Response

Response Name	Response Type	Response Range	Default Units
time	numeric	0.010 to 45	seconds

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SOUR8:DATA:TEL:POIN:USEQ:SCO

Description

`SOURce8:DATA:TELecom:POINter:USEQuence:SCOunt[1] <stuffs>` is used to select the number of stuffs for type 1 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	numeric	`0 to 16|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **MIN** corresponds to 0.
- **MAX** corresponds to 16.
- When **SOUR8:DATA:TEL:POIN** is set to **USEQ**, executing this command causes the measurement period to be recalculated. The newly calculated measurement period, when divided by the number of 1 bursts plus the number of type 2 bursts must be greater than the product of <stuffs>, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125\times10^{-6}$$

Further, the newly calculated measurement period, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125\times10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:POIN:USEQ:SCO** is 0

Error Codes

-221	"Settings conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

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Example

To set the number of stuffs for type 1 burst pointer movements to 12:

```
SOUR8:DATA:TEL:POIN:USEQ:SCO 12
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ;COUN
SOUR8:DATA:TEL:POIN:USEQ:DIR
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SSEP
```

Query Command

`SOURce8:DATA:TELecom:POINter:USEQuence:SCOunt[1]? [MINimum|MAXimum]` returns the current setting of the number of stuffs for type 1 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	numeric	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
stuffs	numeric	0 to 16	none

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SOUR8:DATA:TEL:POIN:USEQ:SCO2

Description

`SOURce8:DATA:TELecom:POINter:USEQuence:SCOunt2 <stuffs>` is used to select the number of stuffs for type 2 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	numeric	`0 to 16|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **`DATA:TEL:POIN`** is set to **`TREF`**).
- This command is not effective unless **`SOUR8:DATA:TEL:POIN`** is set to **`USEQ`**.
- A "Settings conflict" error occurs when any **`SOURce8`** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **`MIN`** corresponds to 0.
- **`MAX`** corresponds to 16.
- When **`SOUR8:DATA:TEL:POIN`** is set to **`USEQ`**, executing this command causes <time> to be recalculated. The newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **`SOUR8:DATA:TEL:POIN:USEQ`**);

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125 \times 10^{-6}$$

Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125 \times 10^{-6}$$

- The reset condition for **`SOUR8:DATA:TEL:POIN:USEQ:SCO2`** is 0

Error Codes

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-221	"Settings conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the number of stuffs for type 2 burst pointer movements to the maximum allowable value:

```
SOUR8:DATA:TEL:POIN:USEQ:SCO2 MAX
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:COUN
SOUR8:DATA:TEL:POIN:USEQ:DIR2
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SSEP2
```

Query Command

`SOURce8:DATA:TELecom:POINter:USEQuence:SCOunt2? [MINimum|MAXimum]` returns the current setting of the number of stuffs for type 2 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	numeric	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
stuffs	numeric	0 to 16	none

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SOUR8:DATA:TEL:POIN:USEQ:SSEP

Description

`SOURce8:DATA:TELecom:POINter:USEQuence:SSEParation[1] <frames>` is used to select the number of frames separating each stuff for type 1 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`4 to 16|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **MIN** corresponds to 4.
- **MAX** corresponds to 16.
- When **SOUR8:DATA:TEL:POIN** is set to **USEQ**, executing this command causes <time> to be recalculated. The newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125 \times 10^{-6}$$

Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125 \times 10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:POIN:USEQ:SSEP** is **4**

Error Codes

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-221	"Settings conflict"	A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the number of frames separating each stuff for type 1 burst pointer movements to 13:

```
SOUR8:DATA:TEL:POIN:USEQ:SCO 13
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:COUN
SOUR8:DATA:TEL:POIN:USEQ:DIR
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SCO
```

Query Command

`SOURce8:DATA:TELecom:POINter:USEQuence:SSEParation[1]? [MINimum|MAXimum]` returns the current setting of the number of frames separating each stuff for type 1 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	4 to 16	none

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SOUR8:DATA:TEL:POIN:USEQ:SSEP2

Description

SOURce8:DATA:TELecom:POINter:USEQuence:SSEParation2 <frames> is used to select the number of frames separating each stuff for type 2 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	**4 to 16|MINimum|MAXimum**	none

Dependencies

- This command has no effect unless the HP E1676B or a payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the HP E1676B or the SPE generator command **DATA:TEL:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **MIN** corresponds to 4.
- **MAX** corresponds to 16.
- When **SOUR8:DATA:TEL:POIN** is set to **USEQ**, executing this command causes <time> to be recalculated. The newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125\times10^{-6}$$

Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125\times10^{-}$$

- The reset condition for **SOUR8:DATA:TEL:POIN:USEQ:SSEP2** is **4**

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Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the number of frames separating each stuff for type 2 burst pointer movements to the minimum value:

```
SOUR8:DATA:TEL:POIN:USEQ:SSEP2 MIN
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:USEQ:COUN
SOUR8:DATA:TEL:POIN:USEQ:DIR2
SOUR8:DATA:TEL:POIN:USEQ:MPER
SOUR8:DATA:TEL:POIN:USEQ:SCO2
```

Query Command

SOURce8:DATA:TELecom:POINter:USEQuence:SSEParation2? [MINimum|MAXimum] returns the current setting of the number of frames separating each stuff for type 2 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	discrete	[MINimum|MAXimum]	none

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	4 to 16	none

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SOUR8:DATA:TEL:TRIB:POIN

Description

SOURce8:DATA:TELecom:TRIButary:POINter <action> is used to select the tributary pointer action mode for a payload module.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
action	discrete	**NONE**|**COMPensate**|**SEQuence**|**USEQuence**	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command can be selected at any time, but it is effective only when **SOUR8:CLOC:OTYP** is set to **NONE** or **LINE**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VX1 mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- Selecting **NONE** stops any sequence started by the **SEQ** and **USEQ** commands.
- Selecting **COMP** causes the timing reference to generate tributary pointer movements to compensate for the offset to the line clock. This means that the line clock is offset, but the tributary clock is not.
- The **SEQ** and **USEQ** commands start sequences whose parameters are specified by commands in the **SOUR8:DATA:TEL:TRIB:POIN:SEQ** and **SOUR8:DATA:TEL:TRIB:POIN:USEQ** command trees, respectively.
- Selecting **SEQ** moves the pointer according to the sequence selected by the **SOUR8:DATA:TEL:TRIB:POIN:SEQ** command.
- Selecting **USEQ** moves the pointer according to the sequence selected by the **SOUR8:DATA:TEL:TRIB:POIN:USEQ** command.
- Selecting **USEQ** causes the measurement period to be recalculated using the current settings. The newly calculated measurement period, when divided by the number of consecutive type 1 bursts plus the number of consecutive type 2 bursts be must greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:TRIB:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 125 \times 10^{-6}$$

Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the

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number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 125 \times 10^{-6}$$

If either of these conditions is not met, the measurement period is increased and the conditions are rechecked. If the measurement period is increased to maximum and the conditions are still not met, the number of consecutive type 1 bursts is decremented until the conditions are met.

- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN** is **NONE**.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer. 2. **SEQ** or **USEQ** was selected, but **SOUR8:CLOC:OTYP** was not set to **NONE**, or **SOUR8:DATA:TEL:POIN** was not set to **NONE**. 3. **COMP** was selected, but **SOUR8:DATA:TEL:POIN** was not set to **NONE**.

Example

To select the action mode of the tributary payload pointer to follow a selected sequence:

```
SOUR8:DATA:TEL:TRIB:POIN SEQ
```

Related Commands

```
DATA:TEL:POIN TREF (payload generator command)
SOUR8:CLOC:OTYP
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:TRIB:POIN:RATE
SOUR8:DATA:TEL:TRIB:POIN:SEQ
SOUR8:DATA:TEL:TRIB:POIN:SEQ:DIR
SOUR8:DATA:TEL:TRIB:POIN:SEQ:PER
```

Query Command

SOURce8:DATA:TELecom:TRIButary:POINter? returns the tributary pointer action mode for a payload module.

Response

Response Name	Response Type	Response Range	Default Units
action	discrete	**NONE** | **COMP** | **SEQ** | **USEQ**	none

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SOUR8:DATA:TEL:TRIB:POIN:SEQ

Description

`SOURce8:DATA:TELecom:TRIButary:POINter:SEQuence <sequence>` is used to select the T1X1 or G.783 tributary pointer sequence.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
sequence	discrete	**PERiodic | PADDition | PCANcel | PALTernate | PDALternate | SADJ | BUR7 | GAP | GADD | GCANSADJustment | BUR7 | GAP | GADDition | GCANcel**	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command can be selected at any time, but is effective only when **SOUR8:DATA:TEL:TRIB:POIN** is set to **SEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **BUR7** option corresponds to the T1X1.3 jitter generation test sequence: Burst with seven pointer movements.
- The **GAP** option corresponds to the T1X1.3 jitter generation test sequence: Gapped Pointer Sequence.
- The **GADD** option corresponds to the T1X1.3 jitter generation test sequence: Gapped Pointer Sequence with pointer adjustment addition.
- The **GCAN** option corresponds to the T1X1.3 jitter generation test sequence: Gapped Pointer Sequence with pointer adjustment cancellation.
- The **PER** option allows the periodic movement of the SPE pointer from hardware control, defined by the **DIR** and **PER** commands below.
- The **PADD** option corresponds to the T1X1 jitter generation test sequence: Periodic with Pointer Adjustment Addition, for DS1.
- The **PCAN** option corresponds to the T1X1 jitter generation test sequence: Periodic with Pointer Adjustment Cancellation, for DS1.
- The **PALT** option is a G.783 jitter generation test sequence where the pointer is periodically shifted forward and backward by one unit, with no net pointer movement.
- The **PDAL** option is a G.783 jitter generation test sequence where the pointer is periodically shifted forward and backward by two units, with no net pointer movement.
- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:SEQ** is **PER**.

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- The **SADJ** option corresponds to the T1X1.3 jitter generation test sequence: Single Pointer Adjustments, with interval of 30s.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To periodically shift the tributary pointer forward and backward by two units:

```
SOUR8:DATA:TEL:TRIB:POIN:SEQ PDAL
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:SEQ:DIR
SOUR8:DATA:TEL:TRIB:POIN:SEQ:PER
```

Query Command

SOURce8:DATA:TELecom:TRIButary:POINter:SEQuence? returns the current setting of the tributary pointer sequence.

Response

Response Name	Response Type	Response Range	Default Units
sequence	discrete	**PER | PADD | PCAN | PALT | PDAL | SADJ | BUR7 | GAP | GADD | GCAN**	none

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SOUR8:DATA:TEL:TRIB:POIN:SEQ:DIR

Description

SOURce8:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection <direction> is used to select the tributary pointer sequence direction.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	**DOWN|UP**	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **DOWN** option decrements the value of the pointer (negative movement).
- The **UP** option increments the value of the pointer (positive movement).
- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:SEQ:DIR** is **DOWN**.

Error Codes

-221 "Settings conflict" 1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select the direction of the tributary pointer sequence to down:

```
SOUR8:DATA:TEL:TRIB:POIN:SEQ:DIR DOWN
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:SEQ
SOUR8:DATA:TEL:TRIB:POIN:SEQ:PER
```

Query Command

SOURce8:DATA:TELecom:TRIButary:POINter:SEQuence:DIRection? returns the direction of the current tributary pointer sequence.

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SOUR8:DATA:TEL:TRIB:POIN:SEQ:DIR

Response

Response Name	Response Type	Response Range	Default Units
direction	discrete	DOWN | UP	none

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SOUR8:DATA:TEL:TRIB:POIN:SEQ:PER

Description

SOURce8:DATA:TELecom:TRIButary:POINter:SEQuence:PERiod <time> [ms|s] is used to select the period between regular tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	discrete	0.0020008a to 15|DOWN|UP|MINimum|MAXimum	seconds

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command can be selected at any time, but does not take effect until the **SOUR8:DATA:TEL:TRIB:POIN SEQ** command is executed.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **ms** or **s** occurs after <time>, the value is taken to be milliseconds or seconds respectively.
- When neither **ms** nor **s** occurs after <time>, the value is taken to be seconds.
- The range of values for <time> in milliseconds is 2 to 15000.
- <time> can only assume certain discrete values. These values depend on the pointer sequence selected.
- The period setting changes immediately this command is issued without the need to reissue **SOUR8:DATA:TEL:TRIB:POIN SEQ**.
- **DOWN** causes the period to move to the next lower available value, or 10 ms less than the current value, whichever is greater.
- **UP** causes the period to move to the next higher available value, or 10 ms greater than the current value, whichever is greater.
- **MIN** corresponds to a value that depends on the setting of the **SOUR8:DATA:TEL:TRIB:POIN:SEQ** command:
  - 0.0020008 seconds or 2.0008 milliseconds when **SOUR8:DATA:TEL:TRIB:POIN:SEQ** is set to **PER**.
  - 0.01 seconds or 10 milliseconds when **SOUR8:DATA:TEL:TRIB:POIN:SEQ** is set to **PADD**, **PCAN**, **PANT**, or **PDAL**.
- **MAX** corresponds to a value that depends on the setting of the

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SOUR8:DATA:TEL:TRIB:POIN:SEQ command:

- 10 seconds or 10000 milliseconds when **SOUR8:DATA:TEL:TRIB:POIN:SEQ** is set to **PER**, **PALT**, or **PDAL**.
- 15 seconds or 15000 milliseconds when **SOUR8:DATA:TEL:TRIB:POIN:SEQ** is set to **PADD** or **PCAN**.

- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:SEQ:PER** is 1

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set period between tributary pointer movements to 5 seconds:

```
SOUR8:DATA:TEL:TRIB:POIN:SEQ:PER 5
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:SEQ
```

Query Command

SOURce8:DATA:TELecom:TRIButary:POINter:SEQuence:PERiod? [MINimum|MAXimum] returns the current setting of the period between regular tributary pointer movements in seconds.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	discrete	**[MINimum|MAXimum]**	none

Response

Response Name	Response Type	Response Range	Default Units
time	numeric	0.0020008 to 15	seconds

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SOUR8:DATA:TEL:TRIB:POIN:SPAC

Description

SOURce8:DATA:TELecom:POINter:SPACing controls the sequence of tributary pointer movements generated to compensate for line or payload clock offsets.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
spacing	discrete	**NORM|GAP**	none

Dependencies

- This command may be issued at any time, but is only effective when **SOUR8:CLOC:OTYP** is set to **LINE** or **TPAY** and **SOUR8:DATA:TEL:TRIB:POIN** is set to **COMP**.
- A "Settings conflict" occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **SOUR8:DATA:TEL:TRIB:POIN:SPAC** is set to **NORM**, a regularly spaced sequence of pointer adjustments is generated to compensate for the line or payload clock offset.
- When **SOUR8:DATA:TEL:POIN:SPAC** is set to **GAP**, a gapped sequence of pointer adjustments is generated to compensate for the line or payload clock offset. The gapped sequence is the same as the sequence generated when **SOUR8:DATA:TEL:TRIB:POIN:SEQ** is set to **GAP**, and provides the same net compensation for the line or payload clock offsets as the regularly spaced pointer adjustments.
- The reset condition for the **SOUR8:DATA:TEL:TRIB:POIN:SPAC** is **NORM**.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set gapped pointer spacing:

```
SOUR8:DATA:TEL:TRIB:POIN:SPAC GAP
```

Related Commands

```
SOUR8:CLOC:OTYP
SOUR8:CLOC:OTYP:LOFF
SOUR8:CLOC:OYTP:POFF
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:SEQ
```


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Query Command

SOURce8:DATA:TELecom:POINter:SPACing? queries the sequence of pointer movements generated to compensate for line or payload clock offsets.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
spacing	discrete	**NORM | GAP**	none

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SOUR8:DATA:TEL:TRIB:POIN:TROF?

Description

SOURce8:DATA:TELecom:TRIButary:POINter:TROFfset? [MINimum|MAXimum] returns the tributary service rate offset, introduced by the HP E1679A Timing Reference, resulting from VT/TU-level pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
offset	discrete	**[MINimum|MAXimum]**	none

Response

Response Name	Response Type	Response Range	Default Units
offset	numeric	**-0.005 to 0.005** (See "Comments")	none

Dependencies

- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The numerical limits of <offset> are –0.005 and 0.005, however, the actual values are limited by the pointer sequences selected.
- **MIN** corresponds to –0.005.
- **MAX** corresponds to 0.005.
- <offset> is passed on to the payload modules to permit bit stuffing compensation and so maintain zero service rate offset.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To return the tributary service rate offset introduced by the timing reference:

```
SOUR8:DATA:TEL:TRIB:POIN:TROF?
```

Response:

```
+1.00000000E-004
```


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SOUR8:DATA:TEL:TRIB:POIN:TROF?

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:POIN:TROF?
```


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SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN[1]

Description

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:COUNt <count>` is used to select the number of consecutive type 1 bursts of tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	numeric	`0 to 4095|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **`DATA:TEL:TRIB:POIN`** is set to **`TREF`**).
- This command is not effective unless **`SOUR8:DATA:TEL:TRIB:POIN`** is set to **`USEQ`**.
- A "Settings conflict" error occurs when any **`SOURce8`** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **`MIN`** corresponds to 0.
- **`MAX`** corresponds to 4095.
- When **`SOUR8:DATA:TEL:TRIB:POIN`** is set to **`USEQ`**, executing this command causes the measurement period to be recalculated. The newly calculated measurement period, when divided by the sum of **`:COUN1`** and **`:COUN2`** commands must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **`SOUR8:DATA:TEL:TRIB:POIN:USEQ`**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 500 \times 10^{-6}$$

  Further, the newly calculated measurement period, when divided by the sum of **`:COUN1`** and **`:COUN2`** commands must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 500 \times 10^{-6}$$

- The reset condition for **`SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN`** is 0.

Error Codes

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-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set 17 consecutive type 1 bursts of tributary pointer movements:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN 17
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP
```

Query Command

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:COUNt? [MINimum|MAXimum]` returns the current setting of the number of consecutive type 1 bursts of tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	discrete	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
offset	numeric	`0 to 4095`	none

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN2

Description

SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:COUNt2 <count> is used to select the number of consecutive type 2 bursts of tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	numeric	**1 to 16|MINimum|MAXimum**	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:TRIB:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **MIN** corresponds to 1.
- **MAX** corresponds to 16.
- When **SOUR8:DATA:TEL:TRIB:POIN** is set to **USEQ**, executing this command causes the measurement period to be recalculated. The newly calculated measurement period, when divided by the sum of **:COUN1** and **:COUN2** commands must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:TRIB:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 500 \times 10^{-6}$$

  Further, the newly calculated measurement period, when divided by the sum of **:COUN1** and **:COUN2** commands must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 500 \times 10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN** is 1.

Error Codes

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-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set 12 consecutive type 2 bursts of tributary pointer movements:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN 12
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP
```

Query Command

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:COUNt2? [MINimum|MAXimum]` returns the current setting of the number of consecutive type 2 bursts of tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
count	discrete	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
count	numeric	`1 to 16`	none

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR

Description

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:DIRection[1] <direction>` is used to select the pointer sequence direction for type 1 bursts of tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	DOWN | UP	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command is not effecive unless **SOUR8:DATA:TEL:TRIB:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **DOWN** option decrements the value of the pointer (negative movement).
- The **UP** option increments the value of the pointer (positive movement).
- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR** is **DOWN**.

Error Codes

-221 "Settings conflict" 1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select a positive pointer movement for type 1 bursts of tributary pointer movements:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR UP
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP
```


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Query Command

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:DIRection[1]?` returns the pointer sequence direction for type 1 bursts of tributary pointer movements.

Response

Response Name	Response Type	Response Range	Default Units
direction	discrete	`DOWN | UP`	none

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR2

Description

SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:DIRection2 <direction> is used to select the pointer sequence direction for type 2 bursts of tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
direction	discrete	**DOWN | UP**	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:TRIB:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The **DOWN** option decrements the value of the pointer (negative movement).
- The **UP** option increments the value of the pointer (positive movement).
- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR2** is **DOWN**.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select a positive pointer movement for type 2 bursts of tributary pointer movements:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR UP
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO2
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP2
```

Query Command

SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:DIRection2? returns the pointer sequence direction for type 2 bursts of tributary pointer movements.

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR2

Response

Response Name	Response Type	Response Range	Default Units
direction	discrete	DOWN | UP	none

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER

Description

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:MPERiod <time>[ms|s]` is used to select the period between the start of the first type 1 burst and the end of the last type 2 burst.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	discrete	`0.010 to 45|DOWN|UP|MINimum|MAXimum`	seconds

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **`DATA:TEL:TRIB:POIN`** is set to **`TREF`**).
- This command is not effective unless **`SOUR8:DATA:TEL:TRIB:POIN`** is set to **`USEQ`**.
- A "Settings conflict" error occurs when any **`SOURce8`** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- When **`ms`** or **`s`** occurs after <time>, the value is taken to be milliseconds or seconds respectively.
- When neither **`ms`** nor **`s`** occurs after <time>, the value is taken to be seconds.
- The range of values for <time> in milliseconds is 10 to 45000.
- **`MIN`** corresponds to 0.010 seconds or 10 milliseconds.
- **`MAX`** corresponds to 45 seconds or 45000 milliseconds.
- <time> can only assume certain discrete values. These values depend on the pointer sequence specified.
- **`DOWN`** causes the period to move to the next lower available value, or 10 ms less than the current value, whichever is greater.
- **`UP`** causes the period to move to the next higher available value, or 10 ms greater than the current value, whichever is greater.
- When **`SOUR8:DATA:TEL:TRIB:POIN`** is set to **`USEQ`**, executing this command causes <time> to be recalculated. The newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **`SOUR8:DATA:TEL:TRIB:POIN:USEQ`**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 500 \times 10^{-6}$$

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Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 500 \times 10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER** is **30**

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set period between tributary pointer movements to 5 seconds:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER 5
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN & COUN2
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR2
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO2
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP2
```

Query Command

SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:MPERiod? [MINimum|MAXimum] returns the current setting of the tributary measurement period.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
time	discrete	**[MINimum|MAXimum]**	none

Response

Response Name	Response Type	Response Range	Default Units
time	numeric	**0.010 to 45**	seconds

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO

Description

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SCOunt[1] <stuffs>` is used to select the number of stuffs for type 1 burst tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	numeric	`0 to 16|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **`DATA:TEL:TRIB:POIN`** is set to **`TREF`**).
- This command is not effective unless **`SOUR8:DATA:TEL:TRIB:POIN`** is set to **`USEQ`**.
- A "Settings conflict" error occurs when any **`SOURce8`** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **`MIN`** corresponds to 0.
- **`MAX`** corresponds to 16.
- When **`SOUR8:DATA:TEL:TRIB:POIN`** is set to **`USEQ`**, executing this command causes the measurement period to be recalculated. The newly calculated measurement period, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of <stuffs>, the number of frames separating each stuff for type 1 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **`SOUR8:DATA:TEL:TRIB:POIN:USEQ`**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 500 \times 10^{-6}$$

  Further, the newly calculated measurement period, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 500 \times 10^{-6}$$

- The reset condition for **`SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO`** is `0`

Error Codes

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-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the number of stuffs for type 1 burst tributary pointer movements to 12:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO 12
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP
```

Query Command

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SCOunt[1]? [MINimum|MAXimum]` returns the current setting of the number of stuffs for type 1 burst tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	discrete	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
stuffs	numeric	`0 to 16`	none

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO2

Description

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SCOunt2 <stuffs>` is used to select the number of stuffs for type 2 burst pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	numeric	`0 to 16|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:TRIB:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **MIN** corresponds to 0.
- **MAX** corresponds to 16.
- When **SOUR8:DATA:TEL:TRIB:POIN** is set to **USEQ**, executing this command causes the measurement period to be recalculated. The newly calculated measurement period, when divided by the number of type 1 bursts plus the number of type 2 must be greater than the product of <stuffs>, the number of frames separating each stuff for type 2 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:TRIB:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 500 \times 10^{-6}$$

Further, the newly calculated measurement period, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (500 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 500 \times 10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO2** is 0

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

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Example

To set the number of stuffs for type 2 burst tributary pointer movements to the maximum allowable value:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO2 MAX
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR2
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP2
```

Query Command

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SCOunt2? [MINimum|MAXimum]` returns the current setting of the number of stuffs for type 2 burst tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
stuffs	discrete	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
stuffs	numeric	`0 to 16`	none

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP

Description

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SSEPara-tion[1] <frames>` is used to select the number of frames separating each stuff for type 1 burst tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	`4 to 16|MINimum|MAXimum`	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **`DATA:TEL:TRIB:POIN`** is set to **`TREF`**).
- This command is not effective unless **`SOUR8:DATA:TEL:TRIB:POIN`** is set to **`USEQ`**.
- A "Settings conflict" error occurs when any **`SOURce8`** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **`MIN`** corresponds to 4.
- **`MAX`** corresponds to 16.
- When **`SOUR8:DATA:TEL:POIN`** is set to **`USEQ`**, executing this command causes <time> to be recalculated. The newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **`SOUR8:DATA:TEL:POIN:USEQ`**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 500 \times 10^{-6}$$

Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 500 \times 10^{-6}$$

- The reset condition for **`SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP`** is **`4`**

Error Codes

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-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the number of frames separating each stuff for type 1 burst tributary pointer movements to 13:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO 13
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO
```

Query Command

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SSEPara-tion[1]? [MINimum|MAXimum]` returns the current setting of the number of frames separating each stuff for type 1 burst tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	discrete	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`4 to 16`	none

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SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP2

Description

SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SSEParation2 <frames> is used to select the number of frames separating each stuff for type 2 burst tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	numeric	**4 to 16|MINimum|MAXimum**	none

Dependencies

- This command has no effect unless the payload module is configured to be controlled by the HP E1679A Timing Reference (that is, the SPE generator command **DATA:TEL:TRIB:POIN** is set to **TREF**).
- This command is not effective unless **SOUR8:DATA:TEL:TRIB:POIN** is set to **USEQ**.
- A "Settings conflict" error occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- **MIN** corresponds to 4.
- **MAX** corresponds to 16.
- When **SOUR8:DATA:TEL:POIN** is set to **USEQ**, executing this command causes <time> to be recalculated. The newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 1 stuff count, the number of frames separating each stuff for type 1 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows (in the following formula, "..." represents **SOUR8:DATA:TEL:POIN:USEQ**):

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO \times \ldots SSEP) \times 500 \times 10^{-6}$$

  Further, the newly calculated <time>, when divided by the number of type 1 bursts plus the number of type 2 bursts must be greater than the product of the type 2 stuff count, the number of frames separating each stuff for type 2 bursts, and the length of the frame (125 micro secs). This is represented mathematically as follows:

$$\frac{\ldots MPER}{\ldots COUNT1 + \ldots COUNT2} > (\ldots SCO2 \times \ldots SSEP2) \times 500 \times 10^{-6}$$

- The reset condition for **SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP2** is **4**

Error Codes

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-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To set the number of frames separating each stuff for type 2 burst tributary pointer movements to the minimum value:

```
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SSEP2 MIN
```

Related Commands

```
DATA:TEL:TRIB:POIN TREF (payload generator command)
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:COUN
SOUR8:DATA:TEL:TRIB:POIN:USEQ:DIR2
SOUR8:DATA:TEL:TRIB:POIN:USEQ:MPER
SOUR8:DATA:TEL:TRIB:POIN:USEQ:SCO2
```

Query Command

`SOURce8:DATA:TELecom:TRIButary:POINter:USEQuence:SSEParation2? [MINimum|MAXimum]` returns the current setting of the number of frames separating each stuff for type 2 burst tributary pointer movements.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
frames	discrete	`[MINimum|MAXimum]`	none

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	`4 to 16`	none

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SOUR8:DATA:TEL:TRIB:SIZE

Description

`SOURce8:DATA:TELecom:TRIButary:SIZE <size>` is used to set the tributary synchronous payload envelope or virtual container size for pointer actions and service rate offset correction.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
size	discrete	VT1_5 | VT2 | VT6 | TU11 | TU12 | TU2 | TU3	none

Dependencies

- A "Settings conflict" error occurs when any `SOURce8` subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.

Comments

- The reset condition for `SOUR8:DATA:TEL:TRIB:SIZE` is `VT1_5`.

Error Codes

-221	"Settings conflict"	1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To select a tributary virtual container size of TU2:

```
SOUR8:DATA:TEL:TRIB:SIZE TU2
```

Related Commands

`SOUR8:CLOC:OTYP`

Query Command

`SOURce8:DATA:TELecom:TRIButary:SIZE?` returns the tributary synchronous payload envelope or virtual container size for pointer actions and service rate offset correction.

Response

Response Name	Response Type	Response Range	Default Units
size	discrete	VT1_5 | VT2 | VT6 | TU11 | TU12 | TU2 | TU3	none

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SOUR8:TRIG:SOUR

Description

SOURce8:TRIGger:SOURce selects the source of the timing reference trigger output to the payload generator.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	**NONE** | **PSEQ**	none

Dependencies

- A "Settings Conflict" occurs when any **SOURce8** subsystem command is issued when a HP E1679A Timing Reference is not present in the VXI mainframe, or is present, but is *not* configured as a servant of the transport overhead analyzer.
- This command is only vaild when a payload generator is configured to detect and output timing reference triggers (that is, the SPE generator command **SOURC2:TRIG:SOUR** is set to **TREF**).

Comments

- When **SOUR8:TRIG:SOUR** is set to **NONE**, no trigger is output to the payload generator
- When **SOUR8:TRIG:SOUR** is set to **PSEQ**, trigger is output to the payload generator upon specific events in the pointer sequence.
- When pointer movements are being generated to compensate for line or payload clock offsets, a trigger is output for every pointer movement for normal pointer spacing, or immediately before the gap for gapped pointer sequences.
- When a T1X1 pointer sequence is being generated, triggers are output for the following events:

Pointer Sequence	Placement of Trigger Output
Periodic	Every movement
Periodic with Add	Immediately before the added adjustment.
Periodic with Cancel	Immediately before the cancelled adjustment.
Burst of 3	Immediately before the burst.
Alternate	On every second adjustment.
Single Adjustment	Immediately before the single adjustment.
Burst of 7	Immediately before the burst.
Gapped	Immediately before the gap.
Gapped with Add	Immediately before the added movement.

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Pointer Sequence	Placement of Trigger Output
Gapped with Cancel	Immediately before the cancelled movement.

- When a user defined pointer sequence is being generated, the trigger is output immediately before the first of each series of consecutive type 2 bursts.
- The reset condition for **SOUR8:TRIG:SOUR** is **NONE**.

Error Codes

-221 "Settings conflict" 1. A timing reference was not configured as a servant to the transport overhead analyzer.

Example

To enable the trigger output to the payload generator:

```
SOUR8:TRIG:SOUR PSEQ
```

Related Commands

```
SOUR8:CLOC:OTYP
SOUR8:CLOC:OTYP:LOFF
SOUR8:CLOC:OYTP:POFF
SOUR8:CLOC:OYTP:TPOF
SOUR8:DATA:TEL:POIN
SOUR8:DATA:TEL:POIN:SEQ
SOUR8:DATA:TEL:TRIB:POIN
SOUR8:DATA:TEL:TRIB:POIN:SEQ
SOUR2:TRIG:SOUR TREF (SPE generator command)
```

Query Command

SOURce8:TRIGger:SOURce? queries the source of the timing reference output to the payload generator.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	**NONE** | **PSEQ**	none

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Transport Overhead Receiver Subsystems

This section comprises the SCPI subsystems used by the Transport Overhead Receiver. The subsystems are presented in alphanumeric order as follows:

- **CONFigure**
- **FETCh**
- **INPut[1]**
- **OUTPut3**
- **OUTPut5**
- **OUTPut8**
- **SENSe[1]**
- **SOURce3**
- **SOURce4**
- **SOURce5**
- **SOURce9**
- **TRIGger[1]**
- **TRIGger2**
- **TRIGger3**

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CONFigure Subsystem

This subsystem configures the byte capture system of the Transport Overhead Receiver.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem syntax

The subsystem syntax is shown in the following diagram.

```
CONFigure
    :DATA
         :TELecom
              :DATA
              :OVERhead
              :POVerhead
              :SEQuence
         :TELecom?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the CONFigure subsystem are listed in the following table.

Task	Command	Default Value
To return the currently selected capture type.	**CONF:DATA:TEL?**	
To set the capture system to capture complete frame	**CONF:DATA:TEL:DATA**	**N/A**
To set the capture system to capture complete TOHs	**CONF:DATA:TEL:OVER**	**N/A**
To set the capture system to capture complete POHs	**CONF:DATA:TEL:POV**	**N/A**
To set the capture system to capture sequences of a selected byte	**CONF:DATA:TEL:SEQ**	**N/A**

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CONF:DATA:TEL?

Description `CONFigure:DATA:TELecom?` returns the currently selected capture type.

Parameters

Response Name	Response Type	Range of Values	Default Units
mode	discrete	`OVERhead` | `POVerhead` | `DATA` | `SEQuence`	none

Dependencies None.

Comments

- Capture type is set by `CONF:DATA:TEL:OVER`, `CONF:DATA:TEL:POV`, `CONF:DATA:TEL:SEQ` and `CONF:DATA:TEL:DATA`.

Error Codes None.

Related Commands None.

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CONF:DATA:TEL:DATA

Description

`CONFigure:DATA:TELecom:DATA` configures the data capture function to capture snap shots of the complete frames of data.

Parameters

None.

Dependencies

- This command is not allowed when `INP:TEL:RATE` is set to `TRIB`.
- This command is not allowed when the capture system is not in the idle state.

Comments

- Previously captured overhead, paqth overhead or sequence data is lost after issuing `CONF:DATA:TEL:DATA`.

Error Codes

None.

Related Commands

`CONF:DATA:TEL:SEQ`

`CONF:DATA:TEL:OVER`

`CONF:DATA:TEL:POV`

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CONF:DATA:TEL:OVER

Description

CONFigure:DATA:TELecom:OVERhead configures the data capture function to capture snapshots of the complete overhead data.

Parameters

None.

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the capture system is not in the idle state.

Comments

- Previously captured frame, path overhead or sequence data is lost after issuing **CONF:DATA:TEL:OVER**.

Error Codes

None.

Related Commands

CONF:DATA:TEL:SEQ

CONF:DATA:TEL:DATA

CONF:DATA:TEL:POV

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CONF:DATA:TEL:POV

Description

CONFigure:DATA:TELecom:POVerhead configures the data capture function **DATA:TEL:SEQ** to capture complete sets of path overhead from channel 1 of the received signal.

Parameters

None.

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the capture system is not in the idle state.

Comments

- Previously captured frame, overhead or sequence data is lost after issuing **CONF:DATA:TEL:POV**.

Error Codes

None.

Related Commands

CONF:DATA:TEL:OVER

CONF:DATA:TEL:DATA

CONF:DATA:TEL:SEQ

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CONF:DATA:TEL:SEQ

Description

CONFigure:DATA:TELecom:SEQuence configures the data capture function to capture sequences of a selected byte or word from the overhead data.

Parameters

None.

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the capture system is not in the idle state.

Comments

- Previously captured frame, overhead or path overhead data is lost after issuing **CONF:DATA:TEL:SEQ**.

Error Codes

None.

Related Commands

CONF:DATA:TEL:OVER

CONF:DATA:TEL:DATA

CONF:DATA:TEL:POV

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FETCh Subsystem

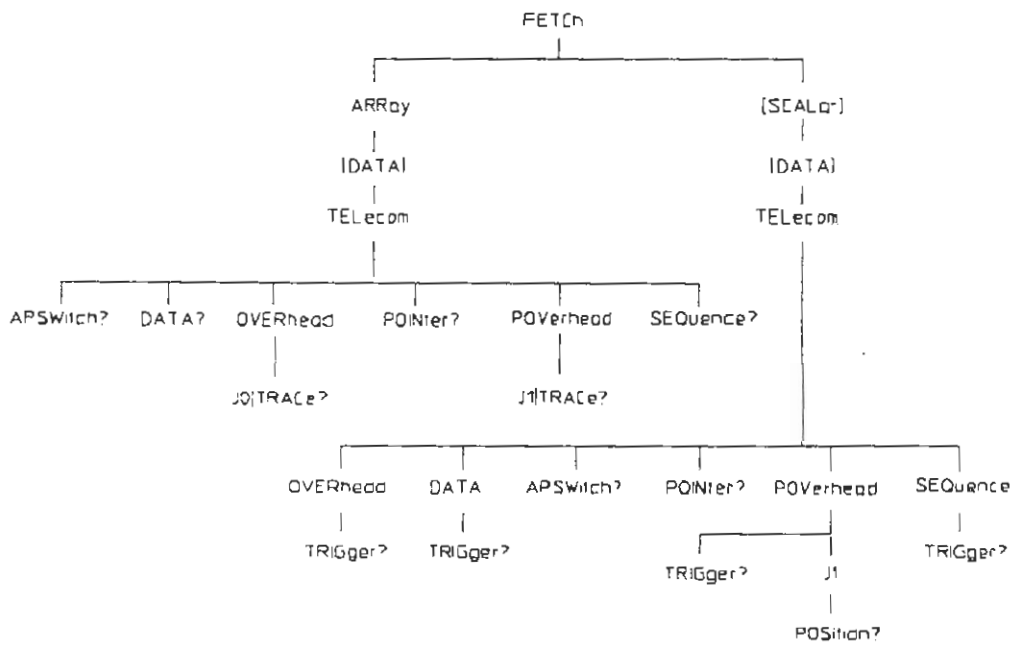
This subsystem configures the Transport Overhead Receiver byte capture return facility.

This section contains:

- A SCPI command structure diagram.
- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
FETCh
    :ARRay
       [:DATA]
            :TELecom
                :APSwitch? <samples>,<start>
                :DATA? <samples>,<frame>,<start>
                :OVERhead? <bytes>,<frame>,<channel>,<offset>
                    :J0|TRACe?
                :POINter? <samples>,<start>,<channel>,<offset>
                :POVerhead? <samples>,<frame>
                    :J1|TRACe?
                :SEQuence? <samples>,<start>
```


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```
[:SCALar]
    [:DATA]
        :TELecom
            :APSWitch?
            :DATA
                :TRIGger?
            :OVERhead
                :TRIGger?
            :POINter?
            :POVerhead
                :J1
                  :POSition? <frame>
                :TRIGger?
            :SEQuence
                :TRIGger?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the FETCh subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To return APS bytes from the captured transport overhead	**FETC:ARR[:DATA]:TEL:APSW? <samples>,<start>**	**N/A**
To return frame capture bytes from the snapshot memory	**FETC:ARR[:DATA]:TEL:DATA? <samples>,<frame>,<start>**	**N/A**
To return transport overhead bytes from the snapshot memory	**FETC:ARR[:DATA]:TEL:OVER? <bytes>,<frame>,<channel>,<offset>**	**N/A**
To return the J0 section trace message	**FETC:ARR[:DATA]:TEL:OVER:J0|TRAC?**	**N/A**
To return pointer bytes from the captured transport overhead	**FETC:ARR[:DATA]:TEL:POIN? <samples>,<start>,<channel>,<offset>**	**N/A**
To return path overhead bytes from the snapshot memory	**FETC:ARR[:DATA]:TEL:POV? <samples>,<frame>**	**N/A**
To return the J1 path trace message	**FETC:ARR[:DATA]:TEL:POV:J1|TRAC?**	**N/A**
To return sequence data as value duration pairs	**FETC:ARR[:DATA]:TEL:SEQ? <samples>,<start>**	**N/A**
To return the current K1K2 byte value	**FETC[:SCAL][:DATA]:TEL:APSW?**	**N/A**
To return the first byte position and the number of full frame data samples captured	**FETC[:SCAL][:DATA]:TEL:DATA:TRIG?**	**N/A**
To return the first byte position and the number of overhead data samples captured	**FETC[:SCAL][:DATA]:TEL:OVER:TRIG?**	**N/A**
To return the current pointer value	**FETC[:SCAL][:DATA]:TEL:POIN?**	**N/A**

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Task	Command	Default Value
To return the J1 position relative to the trigger point	**FETC[:SCAL][:DATA]:TEL:POV:J1:POS? <frame>**	**N/A**
To return the first byte position and the number of path overhead data samples captured	**FETC[:SCAL][:DATA]:TEL:POV:TRIG?**	**N/A**
To return the position of the first sample and the total number of samples in sequence capture	**FETC[:SCAL][:DATA]:TEL:SEQ:TRIG?**	**N/A**

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FETC:ARR[:DATA]:TEL:APSW? <samples>,<start>

Description

FETCh:ARRay[:DATA]:TELecom:APSWitch? <samples>,<start> returns APS bytes from the captured transport overhead in the form of <samples> comma-separated values.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
samples	numeric	1 to 101	none
start	numeric	-201 to 200	none

Response

Response Name	Response Type	Response Range	Default Units
value1...value101	numeric	-32768 to 32767	none

Dependencies

- An error –230 is generated if a transport overhead capture was not done before this command was sent or the data is stale due to alteration of the capture system settings.
- The <frame> and <frame> + <samples> values must not exceed the range of captured data. See **FETC:TEL:OVER:TRIG?**

Comments

- <samples> represents the number of values to be returned.
- <frame> represents the frame number (relative to the trigger point) from which the first value is to be returned.

Error Codes

–222, "Data out of range" –230, "Data corrupt or stale"

Related Commands

FETC:TEL:OVER:TRIG?

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FETC:ARR[:DATA]:TEL:DATA? <samples>,<frame>,<start>

Description

`FETCh:ARRay[:DATA]:TELecom:DATA? <samples>,<frame>,<start>` returns frame capture bytes from the snapshot memory in the form of <samples> comma-separated values.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
samples	numeric	1 to 2430	none
frame	numeric	-6 to 5	none
start	numeric	1 to 4320	none

Response

Response Name	Response Type	Response Range	Default Units
value1.... value2430	numeric	0 to 255	none

Dependencies

- An error -230 is generated if a full frame snapshot capture was not done before this command was sent or the data is stale due to alteration of the capture system settings.
- The range of the **<samples>** and **<start>** parameters depend on the receiver rate selected by **INP:TEL:RATE.**

Receiver Rate	Range for <samples>	Range for <start>
STS48, STS48C, STM16, STM16C	1 to 2430	1 to 4320
STS12.or STM4	1 to 2430	1 to 1080
STS3 or STM1	1 to 2430	1 to 270
STS1 or STM0	1 to 810	1 to 90

Comments

- <samples> represents the number of values to be returned.
- <frame> represents the frame number (relative to the trigger point) from which the first value is to be returned.
- <start> represents the column position (relative to the start of <frame> from which the first value is to be returned.
- The values are output in column order i.e. 9 bytes from column n followed by 9 from column n+1 etc.

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FETC:ARR[:DATA]:TEL:DATA? <samples>,<frame>,<start>

Error Codes

–222, "Data out of range"

–230, "Data corrupt or stale"

Releated Commands `FETC:TEL:DATA:TRIG?`

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FETC:ARR[:DATA]:TEL:OVER? <bytes>,<frame>,<channel>,<offset>

Description

`FETCh:ARRay[:DATA]:TELecom:OVERhead? <bytes>,<frame>,<channel>,<offset>` returns transport overhead bytes from the snapshot memory in the from of <bytes> comma-separated values.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
bytes	numeric	1 to 27	none
frame	numeric	-201 to 200	none
channel	numeric	1 to 48	none
offset	numeric	0 to 2	none

Response

Response Name	Response Type	Response Range	Default Units
value1... value27	numeric	0 to 255	none

Dependencies

- An error –230 is generated if transport overhead snapshot capture was not done before this command was sent or the data is stale due to the alteration of the capture system settings.
- The range of the `<channel>` parameter depends on the receiver rate selected by `INP:TEL:RATE`:

Receiver Rate	Range for <channel>	Range for <OFFSET>
STS48, STS48C	1 to 48	0
STM16, STM16C	1 to 16	0 to 2
STS12	1 to 12	0
STM4	1 to 4	0 to 2
STS3	1 to 3	0
STS1, STM1, STM0	1	0 to 2
STM1, STM0	1	0

Comments

- <bytes> is the number of values to be returned.
- <frame> is the frame number, relative to the trigger point from which the first value is to be

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returned.

Error Codes

–222, "Data out of range"

–230, "Data corrupt or stale"

Related Commands

`FETC:TEL:OVER:TRIG?`

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FETC:ARR[:DATA]:TEL:OVER:J0|TRAC?

Description

`FETCh:ARRay[:DATA]:TELecom:OVERhead:J0|TRACe?` returns the J0 section trace message in the form of a comma-separated list of either 1 or 16 values preceded by either '1,' or '16,'.

Response

Response Name	Response Type	Response Range	Default Units
value1... value16	numeric	0 to 255	none

Dependencies

- An error –230 is generated if a transport overhead snapshot capture was not done before this command was sent, or the data is stale due to the alteration of the capture system settings.

Comments

- When the length is 16 the returned sequence of values is aligned with the CRC/Framing byte as the first value, or if this is not detected, with the longest run of null characters as the first results.
- The length value, 1 or 16, is set by the `SENS:DATA:TEL:OVER:J0:FORM`.

Error Codes

–230, "Data corrupt or stale"

Related Commands

`SENS:DATA:TEL:OVER:J0:FORM`

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FETC:ARR[:DATA]:TEL:POIN? <samples>,<start>,<channel>,<offset>

Description

`FETCh:ARRay[:DATA]:TELecom:POINter? <samples>,<start>,<channel>,<offset>` returns pointer bytes from the captured transport overhead in the form of <samples> comma-separated values.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
samples	numeric	1 to 101	none
start	numeric	-201 to 200	none
channel	numeric	1 to 48	none
offset	numeric	0 to 2	none

Response

Response Name	Response Type	Response Range	Default Units
value1... value101	numeric	-32768 to 32767	none

Dependencies

- An error –230 is generated if a transport overhead snapshot capture was not done before this command was sent or the data is stale due to the alteration of the capture system settings.
- The range of <sample> and <start> must not exceed the number of samples captured after the trigger point. See **FETC:TEL:OVER:TRIG?**.
- The range of the **<channel>** and **<offset>** parameters depend on the receiver rate selected by **INP:TEL:RATE** :

Receiver Rate	Range for <channel>	Range for <offset>
STS48, STS48C	1 to 48	0
STM16, STM16C	1 to 16	0 to 2
STS12, STS12C	1 to 12	0
STM4, STM4C	1 to 4	0 to 2
STS3, STS3C	1 to 3	0
STM1	1	0 to 2
STS1, STM0	1	0

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FETC:ARR[:DATA]:TEL:POIN? <samples>,<start>,<channel>,<offset>

Comments

- <samples> is the number of result values to be returned.
- <start> is the frame number, relative to the trigger point from which the first value is to be returned.

Error Codes

–230, "Data corrupt or stale"

–222, "Data out of range"

Related Commands

`FETC:TEL:OVER:TRIG?`

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FETC:ARR[:DATA]:TEL:POV? <samples>,<frame>

Description

FETCh:ARRay[:DATA]:TELecom:POVerhead? <samples>,<frame> returns path overhead bytes from the snapshot memory in the form of <samples> comma-separated values.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
samples	numeric	1 to 99	none
frame	numeric	-201 to 200	none

Response

Response Name	Response Type	Response Range	Default Units
value1... value99	numeric	0 to 255	none

Dependencies

- An error –230 is generated if a path overhead snapshot capture was not done before this command was sent or the data is stale due to the alteration of the capture system settings.
- The range of <samples> and <start> must not exceed the number of samples captured, after the trigger point. See **FETC:TEL:OVER:TRIG?**.

Comments

- <samples> represents the number of values to be returned.
- <frame> represents the frame number relative to the trigger point, from which the first value is to be returned.

Error Codes

–222, "Data out of range"

–230, "Data corrupt or stale"

Related Commands

FETC:TEL:POV:TRIG?

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FETC:ARR[:DATA]:TEL:POV:J1|TRAC?

Description

`FETCh:ARRay[:DATA]:TELecom:POVerhead:J1|TRACe?` returns the J1 path trace message in the form of a comma-separated list of either 16 or 64 values preceded by either '16,' or '64,'.

Response

Response Name	Response Type	Response Range	Default Units
value1... value64	numeric	0 to 256	none

Dependencies

- An error −230 is generated if a path overhead snapshot capture was not done before this command was sent or the data is stale due to the alteration of the capture system settings.

Comments

- When the length is 16 the returned sequence of values is aligned with the CRC/Framing byte as the first value, or if this is not detected, with the longest run of null characters as the first values.
- When the length is 64 the returned sequence of values is aligned with the line feed character as the last value, or if this is not detected, with the longest run of null characters as the first values.
- The length value, 16 or 64 is set by `SENS:DATA:TEL:POV:J1:FORM` command.

Error Codes

−230, "Data corrupt or stale"

Related Commands

`SENS:DATA:TEL:POV:J1:FORM`

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FETC:ARR[:DATA]:TEL:SEQ? <samples>,<start>

Description

`FETCh:ARRay[:DATA]:TELecom:SEQuence? <samples>,<start>` returns sequence data in the form of <samples> comma-separated value/duration pairs (each pair also comma-separated).

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
samples	numeric	1 to 100	none
start	numeric	-16384 to 32767	none

Response

Response Name	Response Type	Response Range	Default Units
value1...value100	numeric	-32768 to 32767	none
duration1... duration100	numeric	1 to 21474836479999	none

Dependencies

- An error –230 is generated if a sequenced data capture was not done before this command was sent or the data is stale due to the alteration of the capture system settings.
- The range of <samples> and <start> must not exceed the range of the captured data. See **FETC:TEL:SEQ:TRIG?**.

Comment

- <samples> represents the number of pairs to be returned.
- <start> indicates the position relative to the trigger point of the first sample pair to be returned.
- <duration> is measured in frames or **SPE/AUs**.

Error Codes

–230, "Data corrupt or stale"

Related Commands

None.

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FETC[:SCAL][:DATA]:TEL:APSW?

Description `FETC[:SCAL][:DATA]:TEL:APSW?` returns the current K1K2 byte value.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	-32768 to 32767	none

Dependencies None.

Comments

- This value result is updated every 100ms and is not dependent on the data capture system.

Error Codes None.

Related Commands None.

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FETC[:SCAL][:DATA]:TEL:DATA:TRIG?

Description

`FETC[:SCAL][:DATA]:TEL:DATA:TRIG?` returns the first byte position and the number of full frame data samples captured.

Response

Response Name	Response Type	Response Range	Default Units
samples	numeric	1 to 6	none
position	numeric	-6 to 0	none

Dependencies

- An error -230 is generated if a full frame capture was not done before this command was sent, or the data is stale due to the alteration of the capture system settings.

Comments

- Position 0 corresponds to the frame in which the capture system was triggered.

Error Codes

–230, "Data corrupt or stale"

Related Commands

`FETC:ARR:TEL:DATA?`

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FETC[:SCAL][:DATA]:TEL:OVER:TRIG?

Description

`FETC[:SCAL][:DATA]:TEL:OVER:TRIG?` returns the first byte position and the number of overhead data samples captured.

Response

Response Name	Response Type	Response Range	Default Units
samples	numeric	`1 to 201`	none
position	numeric	`-101 to 0`	none

Dependencies

- An error -230 is generated if a transport overhead capture was not done before this command was sent or if the data is stale due to alteration of capture system settings.

Comments

- Position 0 corresponds to the frame in which the capture system was triggered.

Error Codes

–230, "Data corrupt or stale"

Related Commands

`FETC:ARR:TEL:OVER?`
`FETC:ARR:TEL:APSW?`
`FETC:ARR:TEL:POIN?`

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FETC[:SCAL][:DATA]:TEL:POIN?

Description `FETC[:SCAL][:DATA]:TEL:POIN?` returns the current pointer value.

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	0 to 782	none

Dependencies None.

Comments

- Updated every 100ms and is not dependent on the measurement system.

Error Codes None.

Related Commands None.

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FETC[:SCAL][:DATA]:TEL:POV:J1:POS? <frame>

Description

`FETC[:SCAL][:DATA]:TEL:POV:J1:POS? <frame>` returns the J1 position relative to the start of frame.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
frame	numeric	-6 to 5	none

Response

Response Name	Response Type	Response Range	Default Units
column	numeric	97 to 4320	none
row	numeric	1 to 9	none

Dependencies

- An error –230 is generated if a full frame data capture was not done before this command was sent or the data is stale due to alteration of the capture system settings.
- The range of the `<column>` response depends on the receiver rate selected by `INP:TEL:RATE`:

Receiver Rate	Range for <column>
STS48, STS48C, STM16, STM16C	97 to 4320
STS12 or STM4	25 to 1080
STS3 orSTM1	7 to 270
STS1 or STM0	3 to 90

Comments

None.

Error Codes

–230, "Data corrupt or stale"

Related Commands

`FETC:ARR:TEL:DATA?`

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FETC[:SCAL][:DATA]:TEL:POV:TRIG?

Description

`FETC[:SCAL][:DATA]:TEL:POV:TRIG?` returns the first byte position and the number of path overhead data samples captured.

Response

Response Name	Response Type	Response Range	Default Units
samples	numeric	0 to 201	none
position	numeric	-101 to 0	none

Dependencies

- An error –230 is generated if this command is sent and a path overhead capture was not done or the data is stale due to alteration of the capture system settings.

Comments

- Position 0 corresponds to the SPE/AU where the capture system was triggered.

Error Codes

–230, "Data corrupt or stale"

Related Commands

`FETC:ARR:TEL:POV?`

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FETC[:SCAL][:DATA]:TEL:SEQ:TRIG?

Description

`FETC[:SCAL][:DATA]:TEL:SEQ:TRIG?` returns the position of the first sample and the total number of sequence capture samples.

Response

Response Name	Response Type	Response Range	Default Units
samples	numeric	0 to 32768	none
position	numeric	-16384 to 0	none

Dependencies

- An error –230 is generated if this command is sent and a sequence capture was not done or the data is stale due to alteration of the capture system settings.

Comments

- Position 0 corresponds to the point at which the capture system was triggered.

Error Codes

–230, "Data corrupt or stale"

Related Commands

`FETC:ARR:TEL:SEQ?`

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INPut[1] Subsystem

This subsystem controls the Transport Overhead Receiver data input.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
INPut[1]
    :TELecom
         :RATE <rate>
         :RATE?
           :PAYLoad <mode>
           :PAYLoad?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the INPut[1] subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the type of signal to be received	**INP[1]:TEL:RATE**	**STS48**
To select the mapping of the dropped or analyzed payload channel.	**INP[1]:TEL:RATE:PAYL <mode>**	

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INP[1]:TEL:RATE <rate>

Description `INPut[1]:TELecom:RATE <rate>` selects the type of signal to be received.

Parameters

Parameter name	Parameter type	Parameter range	Default units
rate	discrete	`STS48` | `STM16` | `STS48C` | `STM16C` | `STS12` | `STM4` | `STS3` | `STM1` | `STS1` | `STM0` | `TRIButary`	none

Dependencies

- This command is not allowed with `TRIB` when `DATA:TEL:NEL` is set to `THR` or `REP`.
- Only `STS48`, `STM16`, `STS48C`, `STM16C` and `TRIButary` are allowed when `INST:SEL` is set to `TRIB`.
- `TRIButary` is not allowed when `INST:SEL` is set to `MRATe`.

Comments

- When `TRIB` is selected the signals at Electrical Line Data In and Data Out are routed to Channel Drop Trib Data Out and Trib Data In.

Error Codes –221, "Settings conflict"

Related Commands `INP:TEL:RATE:PAYL`

Query Command `INPut[1]:TELecom:RATE?` returns the currently selected receiver input signal type.

Response

Response Name	Response Type	Range of Values	Default Units
rate	discrete	`STS48` | `STM16` | `STS48C` | `STM16C` | `STS12` | `STM4` | `STS3` | `STM1` | `STS1` | `STM0` | `TRIButary`	none

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INP[1]:TEL:RATE:PAYL <mode>

Description

`INPut[1]:TELecom:RATE:PAYLoad <mode>` selects the mapping of the dropped or analyzed payload channel.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
mode	discrete	**STS1** | **STS3C** | **STS12C** | **STS48C** | **AU3** | **AU4** | **AU4_4C** | **AU4_16C**	none

Dependencies

- The values allowed depend on the receiver rate selected by **INP:TEL:RATE**:

Transmitter Rate	Allowed Values
STS1	STS1
STS3	STS1 | STS3C
STS12	STS1 | STS3C | STS12C
STS48	STS1 | STS3C | STS12C | STS48C
STS48C	STS48C
STM0	AU3
STM1	AU3, AU4
STM4	AU3, AU4, AU4_4C
STM16	AU3, AU4, AU4_4C, AU4_16C
STM16C	AU4_16C

Comments

- When the **INP:TEL:RATE** is changed to a SONET rate then **INP:TEL:RATE:PAYL** resets the payload mapping to **STS1**.
- When the **INP:TEL:RATE** is changed to an SDH rate then **INP:TEL:RATE:PAYL** resets the payload mapping to **AU4** (except for STM-0, then the payload mapping is **AU3**).

- The allowed values for this setting are further restricted by **INP3:TEL:RATE** when **INST:SEL** is set to **TRIB**:

Tributary Drop Rate	Allowed Values
STS1	STS1
STS3	STS1 | STS3C
STS12	STS1 | STS3C | STS12C
STM0	AU3
STM1	AU3 | AU4

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INP[1]:TEL:RATE:PAYL <mode>

Tributary Drop Rate	Allowed Values
STM4	AU3 I AU4 I AU4_4C

- When the payload mapping "fills" the entire payload space (i.e. STS1 SPE in STS1, STS3C SPE in STS3, STS12C SPE in STS12, STS48C SPE in STS48, AU3 in STM0, AU4 in STM1, AU4-4C in STM4 and AU4-16C in STM16), the signal is said to be *concatenated.*
- The following receiver features are only available with concatenated signals:
  Pointer concatenation detection
  Path BIP detection
  Path RDI detection
  Path FEBE detection
  Payload PRBS detection

Error Codes

Related Commands

Query Command

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OUTPut3 Subsystem

This subsystem is used to control the Transport Overhead Receiver output tributary.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
OUTPut3
    :TELecom
         :RATE <rate>
         :RATE?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the OUTput3 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the line rate for the Transport Overhead Receiver tributary output	**OUTP3:TEL:RATE <rate>**	**STM1**

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OUTP3:TEL:RATE <rate>

Description

`OUTPut3:TELecom:RATE <rate>` selects the line rate for the Transport Overhead Receiver tributary output.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
rate	discrete	`STS1` | `STM0` | `STS3` | `STM1` | `STS12` | `STM4`	none

Dependencies

- When `INP:TEL:RATE` is set to STS48, the available choices are `STS1, STS3 and STS12`.
- When `INP:TEL:RATE` is set to STM16 the available choices are `STM0, STM1 and STM4`.
- This command is not effective when `INP:TEL:RATE` is set to `STM16C, STS48C` or `TRIB`.
- This command is not effective when `INST:SEL` is set to `MRAT`.

Comments

- Changing <rate> sets `SOUR3:DATA:SOUR` to `1`.
- The reset condition for `OUTP3:TEL:RATE` is `STS3`.

Error Codes

–221, "Settings conflict"

Related Commands

`INP:TEL:RATE`
`SOUR3:DATA:SOUR`

Query Command

`OUTPut3:TELecom:RATE?` returns the currently selected line rate for the Transport Overhead Receiver tributary output.

Response

Response Name	Response Type	Range of Values	Default Units
rate	discrete	`STS1` | `STM0` | `STS3` | `STM1` | `STS12` | `STM4`	none

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OUTPut5 Subsystem

This subsystem is used to control the VXI trigger lines. The measurement systems of all HP 75000 Series 90 receiver/analyzer modules use heartbeat and synchronous command signals to synchronize their measurement operations. These signals are implemented as a pair of VXI TTL trigger lines, and can be generated on the selected VXI TTL trigger lines by the Transport Overhead Receiver (using the OUTP5 and SOUR5 subsystems), by the HP E1405B Command Module, or by other Series 90 receiver/analyzer modules. The HP E1405B Command Module configuration allows several mainframes to be synchronized to each other.

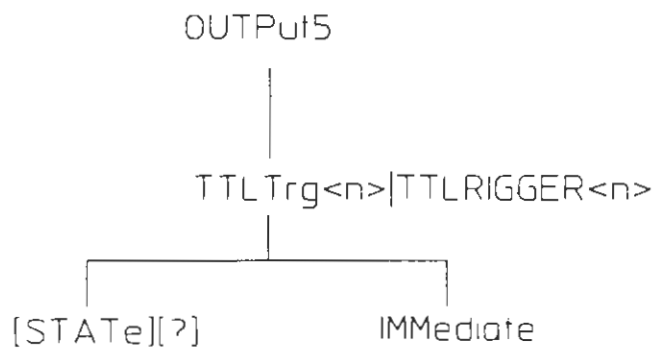
The heartbeat is a 10 Hz square wave signal that is injected onto an even-numbered trigger line (TTLT0,2,4,6) under the control of the **OUTP5:TTLT<n>** command. The synchronous command pulse is injected on to an odd-numbered trigger line (TTLT1,3,5,7) under the control of either the SOURce5 subsystem or the **OUTP5:TTLT<n>:IMM** command. The **TRIG2:SOUR** command selects which pair of trigger lines will carry the heartbeat and synchronous command pulse.

This section contains:

- A SCPI command structure diagram.
- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
OUTPut5
   :TTLTrg<n> | TTLTRIGGER<n>
      [:STATe] <state>
      [:STATe]?
       :IMMediate
```


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SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the OUTput5 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To enable or disable the generation of the designated heartbeat and synchronous command pulse signals for the VXI TTL trigger lines	`OUTP5:TTLT[RIGGER]<n>[:STAT] <state>`	0
To transmit a synchronous command pulse on the selected VXI TTL trigger line	`OUTP5:TTLT[RIGGER]<n>:IMM`	N/A

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OUTP5:TTLT[RIGGER]<n>:IMM

Description

`OUTPut5:TTLTrg<n>:IMMediate` or `OUTPut5:TTLTRIGGER<n>:IMMediate` causes a synchronous command pulse to be transmitted immediately on the selected VXI TTL trigger line. The synchronous command pulse is used to select commands on all HP 75000 Series 90 receiver/analyzer modules.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
n	numeric	1 | 3 | 5 | 7	none

Dependencies

- The appropriate TTL trigger line for the synchronous command pulse must be selected by the `TRIG2:SOUR` command, and enabled by the `OUTP5:TTLT[RIGGER]<n>` command for this command to be effective.

Comments

- Parameter <n> is one of the odd-numbered VXI TTL trigger lines.
- The synchronous command pulse can only be generated on odd-numbered TTL trigger lines.

Error Codes

None.

Related Commands

`OUTP5:TTLT<n>`
`TRIG2:SOUR`
`TRIG3:COMM`
`TRIG3:SOUR?`
`SOUR5:PULS2:PER`

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OUTP5:TTLT[RIGGER]<n>[:STAT] <state>

Description

`OUTPut5:TTLTrg<n>[:STATe] <state>` or `OUTPut5:TTLTRIGGER<n>[:STATe] <state>` selects whether the transport overhead receiver section will generate the designated heartbeat and synchronous command pulse signals for the VXI TTL trigger lines.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
n	numeric	0 to 7	none
state	boolean	OFF | 0 | ON | 1	none

Dependencies

- The `TRIG2:SOUR` command selects which pair of VXI TTL trigger lines will be used for the heartbeat and synchronous command pulses. Once selected, only those TTL trigger lines can be enabled by the `OUTP:TTLT[RIGGER]<n>` command.
- If `TRIG2:SOUR` is changed while `OUTP5:TTLT[RIGGER]<n>` is `ON`, `OUTP5:TTLT[RIGGER]<n>` is set to `OFF`.

Comments

- Parameter `<n>` is one of the VXI TTL trigger lines.
- The heartbeat signal can only exist on even-numbered TTL trigger lines and must be enabled separately.
- The synchronous command pulse signal can only exist on the odd-numbered TTL trigger lines and must be enabled separately. The synchronous command pulse trigger line number is always one more than the trigger line number for the heartbeat signal.
- The reset condition for `OUTP:TTLT[RIGGER]<n>` is `OFF`.

Error Codes

–221, "Settings conflict"

Related Commands

`TRIG2:SOUR TRIG3:SOUR?`

Query Command

`OUTPut5:TTLTrg<n>[:STATe]?` or `OUTPut5:TTLTRIGGER<n>[:STATe]?` returns the currently selected state of the Transport Overhead Receiver (enabled or disabled) when generating the designated heartbeat and synchronous command pulse signals for the VXI TTL trigger lines.

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OUTP5:TTLT[RIGGER]<n>[:STAT] <state>

Response

Response Name	Response Type	Range of Values	Default Units
state	boolean	0 | 1	none

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OUTPut8 Subsystem

This subsystem is used to control the Transport Overhead Receiver ATM payload output.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
OUTPut8
    :TELecom
        :RATE <rate>
        :RATE?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the OUTput8 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the Transport Overhead Receiver ATM payload tributary rate	**OUTP8:TEL:RATE <rate>**	**STM48C**

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OUTP8:TEL:RATE <rate>

Description

`OUTPut8:TELecom:RATE <rate>` selects the Transport Overhead Receiver ATM payload tributary rate.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
rate	discrete	`STS48C` | `STM16C`	none

Dependencies

- This command has no effect when `INST:SEL` is set to `MRAT` or when `INP:TEL:RATE` is not set to `STS48C` or `STM16C`.

Comments

- The parameter value follows that set by the `INP:TEL:RATE` command, and does not need to be set independently.

Error Codes

–221, "Settings conflict"

Related Commands

`INP:TEL:RATE`
`SOUR3:DATA:SOUR`

Query Command

`OUTPut8:TELecom:RATE?` returns the currently selected rate for the Transport Overhead Receiver ATM payload.

Response

Response Name	Response Type	Range of Values	Default Units
rate	discrete	`STS48C` | `STM16C`	none

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SENSe[1] Subsystem

This subsystem directly affects device-specific settings used to configure the Transport Overhead Receiver. The SENSe[1] subsystem can select the type of receive signal (SONET or SDH), enable the receive descrambler, set status thresholds, and provide access to measurement results.

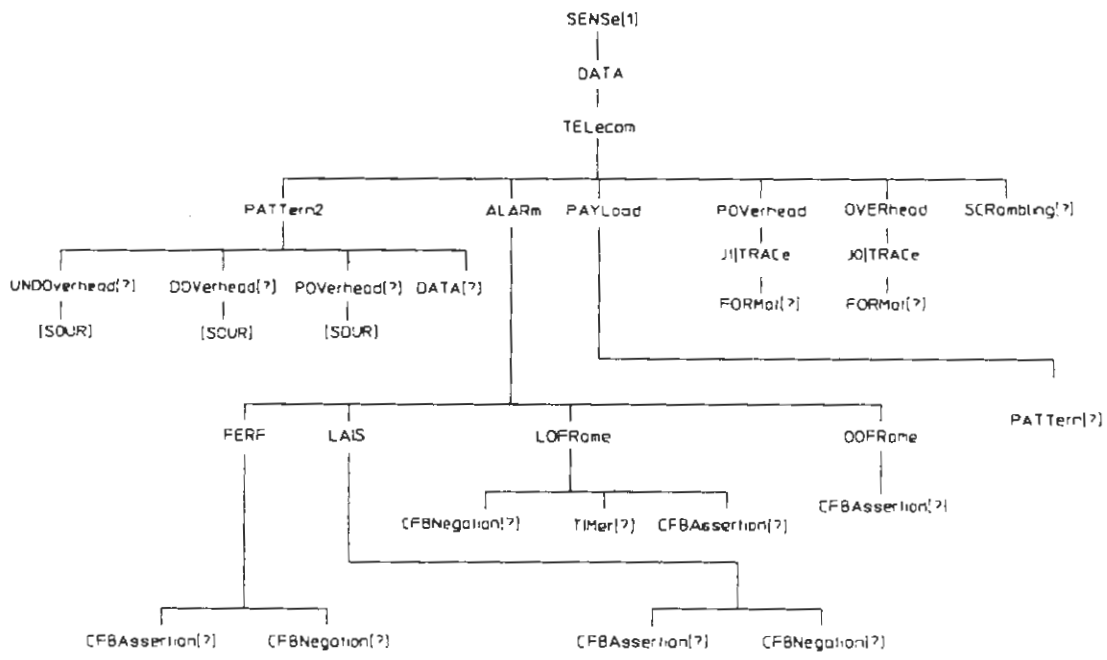
Access to all measurement results is through the **SENSe:DATA?** command. This information is continuously updated at intervals dictated by the heartbeat trigger signal. To make error and frame count measurements, the measurement system must be enabled by commands in the TRIGger2 and TRIGger3 subsystems. This feature is included to control when measurements are made. Refer to "TRIGger2 subsystem" and "TRIGger3 subsystem" for further information.

This section contains:

- A SCPI command structure diagram.
- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



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Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
SENSe[1]
    :DATA
        :TELecom
            :ALARm
                :FERF
                    :CFBAssertion <frames>
                    :CFBAssertion?
                    :CFBNegation <frames>
                    :CFBNegation?
                :LAIS
                    :CFBAssertion <frames>
                    :CFBAssertion?
                    :CFBNegation <frames>
                    :CFBNegation?
                :LOFRame
                    :CFBAssertion
                    :CFBAssertion?
                    :CFBNegation
                    :CFBNegation?
                    :TIMer <mode>
                    :TIMer?
                :OOFRame
                    :CFBAssertion <frames>
                    :CFBAssertion?
            :OVERhead
                :J0|TRACe
                    :FORMat
                    :FORMat?
            :PATTern2 <pattern>
                :DATA <source>
                :DATA?
                :DOVerhead <byte>,<channel>,<offset>
                :DOVerhead?
                :POVerhead <byte>
                :POVerhead?
                :UNDoverhead <row>,<column>,<interleave>
                :UNDoverhead?
            :PATTern2?
            :PAYLoad <mode>
                :PATTern <type>
                :PATTern?
            :PAYLoad?
            :POVerhead
                :J1|TRACe
                    :FORMat
                    :FORMat?
            :SCRambling <scramble>
            :SCRambling?
    :DATA? <result>
```


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SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the SENSe[1] subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the number of consecutive frames throughout which a FERF condition must be detected before the measurement system asserts the FERF alarm	`SENS[1]:DATA:TEL:ALAR:FERF:CFBA <frames>`	5
To select the number of consecutive frames throughout which a FERF condition is not detected before the measurement system negates the FERF alarm	`SENS[1]:DATA:TEL:ALAR:FERF:CFBN <frames>`	5
To select the number of consecutive frames throughout which an LAIS condition must be detected before the measurement system asserts the LAIS alarm	`SENS[1]:DATA:TEL:ALAR:LAIS:CFBA <frames>`	5
To select the number of consecutive frames throughout which an LAIS condition is not detected before the measurement system negates the LAIS alarm	`SENS[1]:DATA:TEL:ALAR:LAIS:CFBN <frames>`	5
To controls the Loss Of Frame alarm assertion and negation thresholds respectively.	`SENS[1]:DATA:TEL:ALAR:LOFR:CFBA <value>`	24
To controls the Loss Of Frame alarm assertion and negation thresholds respectively.	`SENS[1]:DATA:TEL:ALAR:LOFR:CFBN <value>`	24
To select the LOF alarm timer mode	`SENS[1]:DATA:TEL:ALAR:LOFR:TIM <mode>`	INT
To select the number of consecutive frames throughout which an Out of Frame condition must be detected before the measurement system asserts the OOF alarm	`SENS[1]:DATA:TEL:ALAR:OOFR:CFBA <frames>`	4
To set the expected J0 message format	`SENS[1]:DATA:TEL:OVER:J0|TRAC:FORM <format>`	SING
To select the test pattern to be detected.	`SENS[1]:DATA:TEL:PATT2 <pattern>`	
To select the byte or bytes on which the overhead test pattern will be detected.	`SENS[1]:DATA:TEL:PATT2:DATA <source>`	
To select a defined overhead byte on which the overhead test pattern will be detected.	`SENS[1]:DATA:TEL:PATT2:DOV <byte>,<channel>,<offset>`	

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Task	Command	Default Value
To select a POH byte on which the overhead test pattern will be detected.	`SENS[1]:DATA:TEL:PATTern2:POV <byte>`	
To select an undefined overhead byte on which the overhead test pattern will be detected.	`SENS[1]:DATA:TEL:PATT2:UND <row>,<column>,<interleave>`	
To select between the payload data and pattern	`SENS[1]:DATA:TEL:PAYL <mode>`	DATA
To set the expected J1 message format	`SENS[1]:DATA:TEL:POV:J1|TRAC:FORM <format>`	LONG
To set the payload pattern type	`SENS[1]:DATA:TEL:PAYL:PATT <type>`	PRBS2 3
To enable or disable the Transport Overhead Receiver descrambling stage	`SENS[1]:DATA:TEL:SCR <state>`	1
To query the selected measurement result from the module's receiver.	`SENS[1]:DATA? <result>`	N/A

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SENS[1]:DATA:TEL:ALAR:FERF:CFBA <frames>

Description

SENSe[1]:DATA:TELecom:ALARm:FERF:CFBAssertion <frames> selects the number of consecutive frames throughout which a FERF condition must be detected before the measurement system asserts the FERF alarm.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
frames	numeric	1 to 7	none

Dependencies

None.

Comments

- The reset condition for **SENS:DATA:TEL:ALAR:FERF:CFBA** is 5.
- The value is set to 3 when **INP:TEL:RATE** is set to a SDH rate.
- The value is set to 5 when **INP:TEL:RATE** is set to a SONET rate.

Error Codes

None.

Related Commands

```
SENS:DATA? "ESEC:FERF:CUM"
SENS:DATA? "ESEC:FERF:IPER"
SENS:DATA:TEL:ALAR:FERF:CFBN
INP:TEL:RATE
```

Query Command

SENSe[1]:DATA:TELecom:ALARm:FERF:CFBAssertion? returns the currently selected number of consecutive frames throughout which a FERF condition must be detected before the measurement system asserts the FERF alarm.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	1 to 7	none

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SENS[1]:DATA:TEL:ALAR:FERF:CFBN <frames>

Description

SENSe[1]:DATA:TELecom:ALARm:FERF:CFBNegation <frames> selects the number of consecutive frames throughout which a FERF condition is not detected before the measurement system negates the FERF alarm.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
frames	numeric	1 to 7	none

Dependencies

None.

Comments

- The reset condition for **SENS:DATA:TEL:ALAR:FERF:CFBN** is 5.
- The value is set to 3 when **INP:TEL:RATE** is set to a SDH rate.
- The value is set to 5 when **INP:TEL:RATE** is set to a SONET rate.

Error Codes

None.

Related Commands

SENS:DATA? "ESEC:FERF:CUM"
SENS:DATA? "ESEC:FERF:IPER"
SENS:DATA:TEL:ALAR:FERF:CFBA

Query Command

SENSe[1]:DATA:TELecom:ALARm:FERF:CFBNegation? returns the currently selected number of consecutive frames throughout which an FERF condition is not detected before the measurement system negates the FERF alarm.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	1 to 7	none

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SENS[1]:DATA:TEL:ALAR:LAIS:CFBA <frames>

Description

SENSe[1]:DATA:TELecom:ALARm:LAIS:CFBAssertion <frames> selects the number of consecutive frames throughout which a LAIS condition must be detected before the measurement system asserts the LAIS alarm.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
frames	numeric	1 to 7	none

Dependencies

- None.

Comments

- The reset condition for **SENS:DATA:TEL:ALAR:LAIS:CFBA** is 5.
- The value is set to 3 when **INP:TEL:RATE** is set to a SDH rate.
- The value is set to 5 when **INP:TEL:RATE** is set to a SONET rate.

Error Codes

None.

Related Commands

```
SENS:DATA? "ESEC:LAIS:CUM"
SENS:DATA? "ESEC:LAIS:IPER"
SENS:DATA:TEL:ALAR:LAIS:CFBN
INP:TEL:RATE
```

Query Command

SENSe[1]:DATA:TELecom:ALARm:LAIS:CFBAssertion? returns the currently selected number of consecutive frames throughout which a LAIS condition must be detected before the measurement system asserts the LAIS alarm.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	1 to 7	none

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SENS[1]:DATA:TEL:ALAR:LAIS:CFBN <frames>

Description

SENSe[1]:DATA:TELecom:ALARm:LAIS:CFBNegation <frames> selects the number of consecutive frames throughout which an LAIS condition is not detected before the measurement system negates the LAIS alarm.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
frames	numeric	1 to 7	none

Dependencies

None.

Comments

- The reset condition for **SENS:DATA:TEL:ALAR:LAIS:CFBN** is 5.
- The value is set to 3 when **INP:TEL:RATE** is set to a SDH rate.
- The value is set to 5 when **INP:TEL:RATE** is set to a SONET rate.

Error Codes

None.

Related Commands

```
SENS:DATA? "ESEC:LAIS:CUM"
SENS:DATA? "ESEC:LAIS:IPER"
SENS:DATA:TEL:ALAR:LAIS:CFBA
INP:TEL:RATE
```

Query Command

SENSe[1]:DATA:TELecom:ALARm:LAIS:CFBNegation? returns the currently selected number of consecutive frames throughout which an LAIS condition is not detected before the measurement system negates the LAIS alarm.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	1 to 7	none

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SENS[1]:DATA:TEL:ALAR:LOFR:CFBA <value>

Description

SENSe[1]:DATA:TELecom:ALARm:LOFR:CFBA <value> controls the Loss Of Frame alarm assertion and negation thresholds respectively.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
value	integer	16 to 31	frames

Dependencies

None.

Comments

- The default value is **24**.
- This settng is reset to 24 when **INP:TEL:RATE** changes.

Error Codes

None.

Related Commands

SENS:DATA? "ESEC:LOFR:CUM"
SENS:DATA? "ESEC:LOFR:IPER"
SENS:DATA:TEL:ALAR:LOFR:CFBN

Query Command

SENSe[1]:DATA:TELecom:ALARm:LOFR:CFBAssertion? returns the currently selected number of consecutive frames throughout which a LOFR condition must be detected before the measurement system asserts the LOFR alarm.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	16 to 31	none

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SENS[1]:DATA:TEL:ALAR:LOFR:CFBN <value>

Description

`SENSe[1]:DATA:TELecom:ALARm:LOFR:CFBN <value>` controls the Loss Of Frame alarm assertion and negation thresholds respectively.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
value	integer	16 to 31	frames

Dependencies

None.

Comments

- The default value is **24**.
- This settng is reset to 24 when `INP:TEL:RATE` changes.

Error Codes

None.

Related Commands

```
SENS:DATA? "ESEC:LOFR:CUM"
SENS:DATA? "ESEC:LOFR:IPER"
SENS:DATA:TEL:ALAR:LOFR:CFBA
```

Query Command

`SENSe[1]:DATA:TELecom:ALARm:LOFR:CFBNegation?` returns the currently selected number of consecutive frames throughout which an LOFR condition is not detected before the measurement system negates the LOFR alarm.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	16 to 31	none

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SENS[1]:DATA:TEL:ALAR:LOFR:TIM <mode>

Description

`SENSe[1]:DATA:TELecom:ALARm:LOFRame:TIMer <mode>` selects the LOF alarm timer mode.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
mode	discrete	`FIXed | INTegrating`	none

Dependencies

None.

Comments

The reset condition for `DATA:TEL:ALAR:LOFR:TIM` is `INT`.

Error Codes

None.

Related Commands

```
SENS:DATA? "ESC:LOFR"CUM"
SENS:DATA? "ESC:LOFR:IPER"
```

Query Command

`SENSe[1]:DATA:TELecom:ALARm:LOFRame:TIMer?` returns the currently selected LOF alarm timer mode.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	`FIX | INT`	none

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SENS[1]:DATA:TEL:ALAR:OOFR:CFBA <frames>

Description

SENSe[1]:DATA:TELecom:ALARm:OOFRame:CFBAssertion <frames> selects the number of consecutive frames throughout which an Out of Frame condition must be detected before the measurement system asserts the OOF alarm.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
mode	discrete	1 to 7	none

Dependencies

None.

Comments

- The reset condition for **SENS:DATA:TEL:ALAR:OOFR:CFBA** is **4**.
- The value is set to 3 when **INP:TEL:RATE** is set to a SDH rate.
- The value is set to 5 when **INP:TEL:RATE** is set to a SONET rate.

Error Codes

None.

Related Commands

```
SENS:DATA? "ESEC:OOFR:CUM"
SENS:DATA? "ESEC:OOFR:IPER"
INP:TEL:RATE
```

Query Command

SENSe[1]:DATA:TELecom:ALARm:OOFRame:CFBAssertion? returns the currently selected number of consecutive frames throughout which an Out of Frame condition must be detected before the measurement system asserts the OOF alarm.

Response

Response Name	Response Type	Response Range	Default Units
frames	numeric	1 to 7	none

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SENS[1]:DATA:TEL:OVER:J0|TRAC:FORM <format>

Description `SENSe[1]:DATA:TELecom:OVERhead:J0|TRACe:FORMat <format>` sets the expected J0 message format.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
format	discrete	`SINGle` | `SHORt`	none

Dependencies None.

Comments

- When set to `SHOR` a 16 byte message is expected.
- The reset condition of `SENS:DATA:TEL:OVER:J0:FORM` is `SING`.

Error Codes None.

Related Commands `FETC:ARR:TEL:OVER:J0?`

Query Command `SENSe[1]:DATA:TELecom:OVERhead:J0|TRACe:FORMat?` returns the currently expected format of the J0 message.

Response

Response Name	Response Type	Response Range	Default Units
format	discrete	`SING` | `SHOR`	none

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SENS[1]:DATA:TEL:PATT2 <pattern>

Description

`SENSe[1]:DATA:TELecom:PATTern2 <pattern>` selects the test pattern to be detected.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
pattern	discrete	`PRBS9` | `PRBS11`	none

Dependencies

- This command selects the test pattern when `SENS[1]:DATA:TEL:PATT2:DATA` is set to a value other than `NONE`.

Comments

- The default setting is `PRBS9`.

Error Codes

None.

Related Commands

`SENS:DATA:TEL:PATT2:DATA`
`SENS:DATA:TEL:PATT2:DOV`
`SENS:DATA:TEL:PATT2:POV`
`SENS:DATA:TEL:PATT2:UND`

Query Command

`SENSe[1]:DATA:TELecom:PATTern2?` returns the currently expected test pattern.

Response

Response Name	Response Type	Response Range	Default Units
pattern	discrete	`PRBS9` | `PRBS11`	none

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SENS[1]:DATA:TEL:PATT2:DATA <source>

Description

`SENSe[1]:DATA:TELecom:PATTern2:DATA <source>` selects the byte or bytes on which the overhead test pattern will be detected.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
source	discrete	`NONE` | `APSW` | `USER` | `LDCC` | `SDCC` | `DOVerhead` | `UNDoverhead` | `POVerhead`	none

Dependencies

- Only `NONE` is allowed when `SOUR9:DATA:SOUR` is set to a value other than `NONE`.
- This command is not allowed when `INP:TEL:RATE` is set to `TRIB`.

Comments

- The default setting is `NONE`.

Error Codes

-221, "Settings Conflict"

Related Commands

`SENS:DATA:TEL:PATT2:DOV`
`SENS:DATA:TEL:PATT2:POV`
`SENS:DATA:TEL:PATT2:UND`

Query Command

`SENSe[1]:DATA:TELecom:PATTern2:DATA?` returns the currently expected overhead byte.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	`NONE` | `APSW` | `USER` | `LDCC` | `SDCC` | `DOVerhead` | `UNDoverhead` | `POVerhead`	none

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SENS[1]:DATA:TEL:PATT2:DOV <byte>,<channel>,<offset>

Description

`SENSe[1]:DATA:TELecom:PATTern2:DOVerhead <byte>,<channel>,<offset>` selects a defined overhead byte on which the overhead test pattern will be detected.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
byte	discrete	**NONE** | **C1** | **E1** | **F1** | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | **D11** | **D12** | **Z1** | **Z2** | **M1** | **E2** | **J0** | **Z0** | **S1**	none
channel	numeric	(see below)	none
offset	numeric	(see below)	none

Byte	Receiver Rate	Channel	Offset
C1 | Z1 | Z2	STS48 | STS48C	1 to 48	0
	STM16 | STM16C	1 to 16	0 to 2
	STS12	1 to 12	0
	STM4	1 to 4	0 to 2
	STS3	1 to 3	0
	STM1	1	0 to 2
	STS1 | STM0	1	0
E1 | F1 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | E2 | J0	all rates	1	0
M1	STS48 | STS48C | STS12	7	0
	STM16 | STM16C | STM4	4	0
	STS3	3	0
	STM1	1	2
	STS1 | STM0	1	0
Z0	all rates	Channel=1 .Offset = 0 not allowed	

Dependencies

- The command may be set at any time but only takes effect when `SENS[1]:DATA:TEL:PATT2:DATA` is set to **DOV**.
- This command is not allowed when `INP:TEL:RATE` is set to **TRIB**.

Comments

- The default setting is **NONE**.

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SENS[1]:DATA:TEL:PATT2:DOV <byte>,<channel>,<offset>

Error Codes -221, "Settings Conflict"

Related Commands `SENS:DATA:TEL:PATT2:DATA`

Query Command `SENSe[1]:DATA:TELecom:PATTern2:DATA?` returns the currently expected values for <byte>, <channel> and <offset>.

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SENS[1]:DATA:TEL:PATT2:POV <byte>

Description

SENSe[1]:DATA:TELecom:PATTern2:POVerhead <byte> selects a POH byte on which the overhead test pattern will be detected.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
byte	discrete	NONE | J1 | C2 | G1 | F2 | H4 | Z3 | Z4 | Z5	none

Dependencies

- The command may be set at any time but only takes effect when **SENS[1]:DATA:TEL:PATT2:DATA** is set to **POV**.
- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.

Comments

- The default setting is **NONE**.

Error Codes

-221, "Settings Conflict"

Related Commands

SENS:DATA:TEL:PATT2:DATA

Query Command

SENSe[1]:DATA:TELecom:PATTern2:POVerhead? returns the currently expected path overhead value <byte>.

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SENS[1]:DATA:TEL:PATT2:UND <row>,<column>,<interleave>

Description

SENSe[1]:DATA:TELecom:PATTern2:UNDoverhead <row>,<column>,<interleave> selects an undefined overhead byte on which the overhead test pattern will be detected.

Parameter Name	Parameter Type	Range of Values		Default Units
row	numeric	1 to 9		none
column	numeric	STS48 | STS48C | STM16 | STM16C | STS12 | STM4 | STS3 | STM1	1 to 9	none
		STS1 | STM0	1 to 3	
interleave	numeric	STS48 | STS48C | STM16 | STM16C	1 to 16	none
		STS12 | STM4	1 to 4	
		STS3 | STM1 | STS1 | STM0	1	

Dependencies

- The command may be set at any time but only takes effect when **SENS[1]:DATA:TEL:PATT2:DATA** is set to **UND**.
- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.

Comments

- Default value is **1**, **1**, **1**.

Error Codes

-221, "Settings Conflict"

Related Commands

Query Command

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SENS[1]:DATA:TEL:PAYL <mode>

Description

SENSe[1]:DATA:TELecom:PAYLoad <mode> selects between data and pattern as expected payload.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
mode	discrete	**DATA** | **PATTern**	none

Dependencies

- This command is only allowed with **PATT** when **INP:TEL:RATE:PAYL** is set such that a concatenated signal is expected.

Comments

- This command is used to enable **PRBS** error and synchronization measurements when set to **PATT**.
- The reset of **SENS:DATA:TEL:PAYL** is **DATA** condition.

Error Codes

–221, "Settings conflict"

Related Commands

INP:TEL:RATE
SENS:DATA:TEL:PAYL:PATT
INP:TEL:RATE:PAYL

Query Command

SENSe[1]:DATA:TELecom:PAYLoad? returns the currently selected payload mode.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**DATA** | **PATT**	none

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SENS[1]:DATA:TEL:PAYL:PATT <type>

Description

SENSe[1]:DATA:TELecom:PAYLoad:PATTern <type> selects the payload pattern type.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
mode	discrete	**PRBS23** | **PRBS15**	none

Dependencies

None.

Comments

- A change in the selection of the PRBS type may cause a momentary glitch in the PRBS errors or synchronization state.
- This command can be sent at any time but is only effective when **SENS:DATA:TEL:PAYL** is set to **PATT**.
- The reset condition of **SENS:DATA:TEL:PAYL:PATT** is **PRBS23**.

Error Codes

None.

Related Commands

SENS:DATA:TEL:PAYL

Query Command

SENSe[1]:DATA:TELecom:PAYLoad:PATTern? returns the currently selected payload pattern type.

Response

Response Name	Response Type	Response Range	Default Units
mode	discrete	**PRBS23** | **PRBS15**	none

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SENS[1]:DATA:TEL:POV:J1|TRAC:FORM <format>

Description

`SENSe[1]:DATA:TELecom:POVerhead:J1|TRACe:FORMat <format>` sets the expected J1 message format.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
format	discrete	`LONG` | `SHORt`	none

Dependencies

None.

Comments

- When set to `LONG` a 64 byte message is expected.
- The reset condition of `SENS:DATA:TEL:POV:J1:FORM` is `LONG`.

Error Codes

Related Commands

`FETC:TEL:POV:J1?`

Query Command

`SENSe[1]:DATA:TELecom:POVerhead:J1|TRACe:FORMat?` returns the currently expected J1 message format.

Response

Response Name	Response Type	Response Range	Default Units
format	discrete	`LONG` | `SHOR`	none

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SENS[1]:DATA:TEL:SCR <state>

Description

`SENSe[1]:DATA:TELecom:SCRambling <state>` enables or disables the Transport Overhead Receiver descrambling stage.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
state	discrete	0 | OFF | 1 | ON	none

Dependencies

None.

Comments

- When descrambling is selected, all bytes except A1, A2, and C1 are passed through a descrambling stage.
- When descrambling is not selected, the data bypasses the descrambling stage.
- The reset condition for `SENS:DATA:TEL:SCR` is `ON`.

Error Codes

–221, "Settings conflict"

Related Commands

Query Command

`SENSe[1]:DATA:TELecom:SCRambling?` returns the currently selected state of the Transport Overhead Receiver descrambling stage.

Response

Response Name	Response Type	Response Range	Default Units
state	discrete	0 | 1	none

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SENS[1]:DATA? <result>

Description

SENSe[1]:DATA? <result> returns the selected measurement result from the Transport Overhead Receiver. The Receiver can perform several measurements in parallel, the results of which may be queried at any time.

When **TRIG2:CONT** is set to **ON**, the status measurements are continuously updated at the heartbeat rate. When both **TRIG2:CONT** and **TRIG3:CONT** are set to **ON**, the error and frame count measurements can be controlled using the TRIGger3 subsystem. The **TRIG3:COMM** command can control the operation of the measurement updates via the **STARt**, **STOP**, **CONT** and **ONCE** commands.

Measurement updates start after either a **STARt** or **ONCE** command has been issued and the instrument has subsequently received either a synchronous command pulse from the selected VXI trigger line, as returned by **TRIG3:SOUR**, or a **TRIG3** command. If the **STARt** command is issued, the integration period is controlled by pulses on the synchronous command pulse trigger line, or until a **TRIG3** command is issued to begin a new integration period. The **ONCE** command is identical to the **STARt** command except that no new integration period starts until completion of the first integration period.

Hardware error counters and status registers are sampled at each heartbeat pulse of the TRIGger2 subsystem, from which three types of results are derived:

RELative: These results are measured between the previous two heartbeats only.

CUMulative: These results are measured from the start of the current integration period until the last heartbeat.

IPERiod: These results are measured over the entire previous integration period. When operating in this mode, the module's receiver performs measurements over repetitive integration periods defined by the occurrence of synchronous command pulses or **TRIG3** commands.

At the end of each integration period the contents of the cumulative results registers are stored in the integration period result registers, and the cumulative result registers are reset.

The string parameter for this command selects the result that is returned. It must be enclosed in double quotes (""), however, and can be used in its long or short form (the short form corresponds to the uppercase letters only).

Parameters

The result parameter can be any of the string parameters listed below. Each string parameter is listed with its individual response.

- **"ECOunt:SBIP:CUMulative"**

  The **"ECOunt:SBIP:CUMulative"** parameter requests the SONET/SDH Section overhead BIP error count since the start of the integration period. If a signal loss or out of frame error occurs, this measurement is suspended.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to **1.7E10**	none

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- **"ECOunt:SBIP:IPERiod"**

  The**"ECOunt:SBIP:IPERiod"** parameter requests the SONET/SDH Section overhead BIP error count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1.7E10	none

- **"ECOunt:SBIP:RELative"**

  The **"ECOunt:SBIP:RELative"** parameter requests the SONET/SDH Section overhead BIP error count between the two previous heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1.0E4	none

- **"ERATe:SBIP:CUMulative"**

  The **"ERATio:SBIP:CUMulative"** parameter requests the SONET/SDH Section overhead BIP error ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- **"ERATe:SBIP:IPERiod"**

  The **"ERATio:SBIP:IPERiod"** parameter requests the SONET/SDH Section overhead BIP error ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- **"ERATe:SBIP:RELative"**

  The **"ERATio:SBIP:RELative"** parameter requests the SONET/SDH Section overhead BIP error ratio between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

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- **"ESEConds:SBIP:CUMulative"**

  The **"ESEConds:SBIP:CUMulative"** parameter requests the SONET/SDH Section overhead BIP errored seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	seconds

- **"ESEConds:SBIP:IPERiod"**

  The **"ESEConds:SBIP:IPERiod"** parameter requests the SONET/SDH Section overhead BIP errored seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	seconds

- **"EBCount:SBIP:ANALysis:G826:CUMulative"**

  The **"EBCount:SBIP:ANALysis:G826:CUMulative"** parameter requests the Section overhead BIP Errored Block Count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 2.1E9	none

- **"EBCount:SBIP:ANALysis:G826:IPERiod"**

  The **"EBCount:SBIP:ANALysis:G826:IPERiod"** parameter requests the Section overhead BIP Errored Block Count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 2.1E9	none

- **"ESEConds:SBIP:ANALysis:G826:CUMulative"**

  The **"ESEConds:SBIP:ANALysis:G826:CUMulative"** parameter requests the Section overhead BIP Errored Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

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- **"ESEConds:SBIP:ANALysis:G826:IPERiod"**

  The **"ESEConds:SBIP:ANALysis:G826:IPERiod"** parameter requests the Section overhead BIP Errored Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"SESeconds:SBIP:ANALysis:G826:CUMulative"**

  The **"SESeconds:SBIP:ANALysis:G826:CUMulative"** parameter requests the Section overhead BIP Severely Errored Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"SESeconds:SBIP:ANALysis:G826:IPERiod"**

  The **"SESeconds:SBIP:ANALysis:G826:IPERiod"** parameter requests the Section overhead BIP Severely Errored Seconds for the pervious integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"UASeconds:SBIP:ANALysis:G826:CUMulative"**

  The **"UASeconds:SBIP:ANALysis:G826:CUMulative"** parameter requests the Section overhead BIP Unavailable Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"UASeconds:SBIP:ANALysis:G826:IPERiod"**

  The **"UASeconds:SBIP:ANALysis:G826:IPERiod"** parameter requests the Section overhead BIP Errored Unavailable Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

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- **"ESRatio:SBIP:ANALysis:G826:CUMulative"**

  The **"ESRatio:SBIP:ANALysis:G826:CUMulative"** parameter requests the Section overhead BIP Errored Seconds Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"ESRatio:SBIP:ANALysis:G826:IPERiod"**

  The **"ESRatio:SBIP:ANALysis:G826:IPERiod"** parameter requests the Section overhead BIP Errored Seconds Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"SESRatio:SBIP:ANALysis:G826:CUMulative"**

  The **"SESRatio:SBIP:ANALysis:G826:CUMulative"** parameter requests the Section overhead BIP Severely Errored Seconds Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"SESRatio:SBIP:ANALysis:G826:IPERiod"**

  The **"SESRatio:SBIP:ANALysis:G826:IPERiod"** parameter requests the Section overhead BIP Severely Errored Seconds Ratio for the last integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"BBERatio:SBIP:ANALysis:G826:CUMulative"**

  The **"BBERatio:SBIP:ANALysis:G826:CUMulative"** parameter requests the Section overhead BIP Background Block Error Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

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- **"BBERatio:SBIP:ANALysis:G826:IPERiod"**

  The **"BBERatio:SBIP:ANALysis:G826:IPERiod"** parameter requests the Section overhead BIP Background Block Error Ratio for the pervious integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"ECOunt:LBIP:CUMulative"**

  The **"ECOunt:LBIP:CUMulative"** parameter requests the SONET/SDH Line overhead BIP error count since the start of the integration period. If a signal loss or out-of-frame error occurs, this measurement is suspended.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 8.0E11	none

- **"ECOunt:LBIP:IPERiod"**

  The **"ECOunt:LBIP:IPERiod"** parameter requests the SONET/SDH Line overhead BIP error count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 8.0E11	none

- **"ECOunt:LBIP:RELative"**

  The **"ECOunt:LBIP:RELative"** parameter requests the SONET/SDH Line overhead BIP error count between the two previous heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 4.0E5	none

- **"ERATe:LBIP:CUMulative"**

  The **"ERATio:LBIP:CUMulative"** parameter requests the SONET/SDH Line overhead BIP error ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.3E-3	none

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- **"ERATe:LBIP:IPERiod"**

  The **"ERATio:LBIP:IPERiod"** parameter requests the SONET/SDH Line overhead BIP error ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.3E-3	none

- **"ERATe:LBIP:RELative"**

  The **"ERATio:LBIP:RELative"** parameter requests the SONET/SDH Line overhead BIP error ratio between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.3E-3	none

- **"ESEConds:LBIP:CUMulative"**

  The **"ESEConds:LBIP:CUMulative"** parameter requests the SONET/SDH Line overhead BIP errored seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	seconds

- **"ESEConds:LBIP:IPERiod"**

  The **"ESEConds:LBIP:IPERiod"** parameter requests the SONET/SDH Line overhead BIP errored seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	seconds

- **"EBCount:LBIP:ANALysis:G826:CUMulative"**

  The **"EBCount:LBIP:ANALysis:G826:CUMulative"** parameter requests the Line overhead BIP Errored Block Count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 2.1E9	none

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- **"EBCount:LBIP:ANALysis:G826:IPERiod"**

  The **"EBCount:LBIP:ANALysis:G826:IPERiod"** parameter requests the Line overhead BIP Errored Block Count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to **2.1E9**	none

- **"ESEConds:LBIP:ANALysis:G826:CUMulative"**

  The **"ESEConds:LBIP:ANALysis:G826:CUMulative"** parameter requests the Line overhead BIP Errored Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:LBIP:ANALysis:G826:IPERiod"**

  The **"ESEConds:LBIP:ANALysis:G826:IPERiod"** parameter requests the Line overhead BIP Errored Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"SESeconds:LBIP:ANALysis:G826:CUMulative"**

  The **"SESeconds:LBIP:ANALysis:G826:CUMulative"** parameter requests the Line overhead BIP Severely Errored Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"SESeconds:LBIP:ANALysis:G826:IPERiod"**

  The **"SESeconds:LBIP:ANALysis:G826:IPERiod"** parameter requests the Line overhead BIP Severely Errored Seconds for the pervious integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

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- **"UASeconds:LBIP:ANALysis:G826:CUMulative"**

  The **"UASeconds:LBIP:ANALysis:G826:CUMulative"** parameter requests the Line overhead BIP Unavailable Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"UASeconds:LBIP:ANALysis:G826:IPERiod"**

  The **"UASeconds:LBIP:ANALysis:G826:IPERiod"** parameter requests the Line overhead BIP Unavailable Seconds for the pervious integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESRatio:LBIP:ANALysis:G826:CUMulative"**

  The **"ESRatio:LBIP:ANALysis:G826:CUMulative"** parameter requests the Line overhead BIP Errored Seconds Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"ESRatio:LBIP:ANALysis:G826:IPERiod"**

  The **"ESRatio:LBIP:ANALysis:G826:IPERiod"** parameter requests the Line overhead BIP Errored Seconds Ratio for the pervious integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"SESRatio:LBIP:ANALysis:G826:CUMulative"**

  The **"SESRatio:LBIP:ANALysis:G826:CUMulative"** parameter requests the Line overhead BIP Severely Errored Seconds Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

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- **"SESRatio:LBIP:ANALysis:G826:IPERiod"**

  The **"SESRatio:LBIP:ANALysis:G826:IPERiod"** parameter requests the Line overhead BIP Severely Errored Seconds Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"BBERatio:LBIP:ANALysis:G826:CUMulative"**

  The **"BBERatio:LBIP:ANALysis:G826:CUMulative"** parameter requests the Line overhead BIP Background Block Error Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"BBERatio:LBIP:ANALysis:G826:IPERiod"**

  The **"BBERatio:LBIP:ANALysis:G826:IPERiod"** parameter requests the Line overhead BIP Background Block Error Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- "**ECOunt:PATTern:CUMulative**"

  The **ECOunt:PATTern:CUMulative** requests the SONET/SDH overhead test cumulative pattern errors since the start of the integration period, when **SENS[1]:DATA:TEL:PATT2:DATA** is set to a value other than **NONE**.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- " **ECOunt:PATTern:IPERiod**"

  The **ECOunt:PATTern:IPERiod** requests the SONET/SDH overhead test pattern errors in the previous integration period, when **SENS[1]:DATA:TEL:PATT2:DATA** is set to a value other than **NONE**.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric		none

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- "**ECOunt:PATTern:RELative**"
  The **ECOunt:PATTern:RELative** requests the SONET/SDH overhead test pattern errors between two previous heartbeats, when **SENS[1]:DATA:TEL:PATT2:DATA** is set to a value other than **NONE**.
  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- "**ERATe:PATTern:CUMulative**"
  The **ERATe:PATTern:CUMulative** requests the SONET/SDH overhead test cumulative error ratio since the start of the integration period, when **SENS[1]:DATA:TEL:PATT2:DATA** is set to a value other than **NONE**
  Response:.

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- "**ERATe:PATTern:IPERiod**"
  The **ERATe:PATTern:IPERiod** requests the SONET/SDH overhead test error ratio for the previous integration period, when **SENS[1]:DATA:TEL:PATT2:DATA** is set to a value other than **NONE.**
  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- "**ERATe:PATTern:RELative**"
  The **ERATe:PATTern:RELative** requests the SONET/SDH overhead test error ratio between the two previous heartbeats, when **SENS[1]:DATA:TEL:PATT2:DATA** is set to a value other than **NONE.**
  Response::

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- "**ESEConds:PATTern:CUMulative**"
  The **ESEConds:PATTern:CUMulative** requests the SONET/SDH overhead test cumulative error seconds since the start of the integration period, when **SENS[1]:DATA:TEL:PATT2:DATA** is set to a value other than **NONE**.

Response Name	Response Type	Response Range	Default Units
count	numeric		none

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- "ESEConds:PATTern:IPERiod"

  The ESEConds:PATTern:IPERiod requests the SONET/SDH overhead test error seconds in the previous integration period, when SENS[1]:DATA:TEL:PATT2:DATA is set to a value other than NONE.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- "ECOunt:PBIP:CUMulative"

  The "ECOunt:PBIP:CUMulative" parameter requests the Path overhead BIP Error Count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1.7E10	none

- "ECOunt:PBIP:IPERiod"

  The "ECOunt:PBIP:IPERiod" parameter requests the Path overhead BIP Error Count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1.7E10	none

- "ECOunt:PBIP:RELative"

  The "ECOunt:PBIP:RELative" parameter requests the Path overhead BIP Error Count between the two previous heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1E4	none

- "ERATe:PBIP:CUMulative"

  The "ERATe:PBIP:CUMulative" parameter requests the Path overhead BIP Error Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- "ERATe:PBIP:IPERiod"

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The **"ERATe:PBIP:IPERiod"** parameter requests the Path overhead BIP Error Ratio for the previous integration period.

Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- **"ERATe:PBIP:RELative"**

  The **"ERATe:PBIP:RELative"** parameter requests the Path overhead BIP Error Ratio between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- **"ESEConds:PBIP:CUMulative"**

  The **"ESEConds:PBIP:CUMulative"** parameter requests the Path overhead BIP Errored Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PBIP:IPERiod"**

  The **"ESEConds:PBIP:IPERiod"** parameter requests the Path overhead BIP Errored Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"EBCount:PBIP:ANALysis:G826:CUMulative"**

  The **"EBCount:PBIP:ANALysis:G826:CUMulative"** parameter requests the Path overhead BIP Errored Block Count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 2.1E9	none

- **"EBCount:PBIP:ANALysis:G826:IPERiod"**

  The **"EBCount:PBIP:ANALysis:G826:IPERiod"** parameter requests the Path overhead BIP Errored Block Count for the previous integration period.

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Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 2.1E9	none

- **"ESEConds:PBIP:ANALysis:G826:CUMulative"**

  The **"ESEConds:PBIP:ANALysis:G826:CUMulative"** parameter requests the Path overhead BIP Errored Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PBIP:ANALysis:G826:IPERiod"**

  The **"ESEConds:PBIP:ANALysis:G826:IPERiod"** parameter requests the Path overhead BIP Errored Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"SESeconds:PBIP:ANALysis:G826:CUMulative"**

  The **"SESeconds:PBIP:ANALysis:G826:CUMulative"** parameter requests the Path overhead BIP Severely errored Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"SESeconds:PBIP:ANALysis:G826:IPERiod"**

  The **"SESeconds:PBIP:ANALysis:G826:IPERiod"** parameter requests the Path overhead BIP Severely errored Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

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- **"UASeconds:PBIP:ANALysis:G826:CUMulative"**RB3_UAS;

  The **"UASeconds:PBIP:ANALysis:G826:CUMulative"** parameter requests the Path overhead BIP Unavailable Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"UASeconds:PBIP:ANALysis:G826:IPERiod"**

  The **"UASeconds:PBIP:ANALysis:G826:IPERiod"** parameter requests the Path overhead BIP Unavailable Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESRatio:PBIP:ANALysis:G826:CUMulative"**

  The **"ESRatio:PBIP:ANALysis:G826:CUMulative"** parameter requests the Path overhead BIP Errored Seconds Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to **1.0**	none

- **"ESRatio:PBIP:ANALysis:G826:IPERiod"**

  The **"ESRatio:PBIP:ANALysis:G826:IPERiod"** parameter requests the Path overhead BIP Errored Seconds Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to **1.0**	none

- **"SESRatio:PBIP:ANALysis:G826:CUMulative"**

  The **"SESRatio:PBIP:ANALysis:G826:CUMulative"** parameter requests the Path overhead BIP Severely Errored Seconds Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to **1.0**	none

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- **"SESRatio:PBIP:ANALysis:G826:IPERiod"**

  The **"SESRatio:PBIP:ANALysis:G826:IPERiod"** parameter requests the Path overhead BIP Severely Errored Seconds Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"BBERatio:PBIP:ANALysis:G826:CUMulative"**

  The **"BBERatio:PBIP:ANALysis:G826:CUMulative"** parameter requests the Path overhead BIP Background Block Error Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"BBERatio:PBIP:ANALysis:G826:IPERiod"**

  The **"BBERatio:PBIP:ANALysis:G826:IPERiod"** parameter requests the Path overhead BIP Background Block Error Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"ECOunt:FEBE:CUMulative"**

  The **"ECOunt:FEBE:CUMulative"** parameter requests the Path overhead FEBE Error Count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1.7E10	none

- **"ECOunt:FEBE:IPERiod"**

  The **"ECOunt:FEBE:IPERiod"** parameter requests the Path overhead FEBE Error Count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1.7E10	none

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- **"ECOunt:FEBE:RELative"**

  The **"ECOunt:FEBE:RELative"** parameter requests the Path overhead FEBE Error Count between the two previous heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1.0E4	none

- **"ERATe:FEBE:CUMulative"**

  The **"ERATe:FEBE:CUMulative"** parameter requests the Path overhead FEBE Error Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- **"ERATe:FEBE:IPERiod"**

  The **"ERATe:FEBE:IPERiod"** parameter requests the Path overhead FEBE Error Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- **"ERATe:FEBE:RELative"**

  The **"ERATe:FEBE:RELative"** parameter requests the Path overhead FEBE Error Ratio between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0E-4	none

- **"ESEConds:FEBE:CUMulative"**

  The **"ESEConds:FEBE:CUMulative"** parameter requests the Path overhead FEBE Error Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

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- **"ESEConds:FEBE:IPERiod"**

  The **"ESEConds:FEBE:IPERiod"** parameter requests the Path overhead FEBE Error Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ECOunt:PRBS:CUMulative"**

  The **"ECOunt:PRBS:CUMulative"** parameter requests the payload PRBS Error Count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 6.3E14	none

- **"ECOunt:PRBS:IPERiod"**

  The **"ECOunt:PRBS:IPERiod"** parameter requests the payload PRBS Error Count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 6.3E14	none

- **"ECOunt:PRBS:RELative"**

  The **"ECOunt:PRBS:RELative"** parameter requests the payload PRBS Error Count between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 2.4E8	none

- **"ERATe:PRBS:CUMulative"**

  The **"ERATio:PRBS:CUMulative"** parameter requests the payload PRBS Error Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

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- **"ERATe:PRBS:IPERiod"**

  The **"ERAtio:PRBS:IPERiod"** parameter requests the payload PRBS Error Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"ERATe:PRBS:RELative"**

  The **"ERAtio:PRBS:RELative"** parameter requests the payload PRBS Error Ratio between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 1.0	none

- **"ESEConds:PRBS:CUMulative"**

  The **"ESEConds:PRBS:CUMulative"** parameter requests the payload PRBS Error Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PRBS:IPERiod"**

  The **"ESEConds:PRBS:IPERiod"** parameter requests the payload PRBS Error Seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ECOunt:MSFebe:CUMulative"**

  The **"ECOunt:MSFebe:CUMulative"** parameter requests the Line overhead MS-FEBE Error Count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.3E11	none

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- **"ECOunt:MSFebe:IPERiod"**

  The **"ECOunt:MSFebe:IPERiod"** parameter requests the Line overhead MS-FEBE Error Count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.3E11	none

- **"ECOunt:MSFebe:RELative"**

  The **"ECOunt:MSFebe:RELative"** parameter requests the Line overhead MS-FEBE Error Count between the last two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 2.1E5	none

- **"ERATe:MSFebe:CUMulative"**

  The **"ERAte:MSFebe:CUMulative"** parameter requests the Line overhead MS-FEBE Error Ratio since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 8.3E-4	none

- **"ERATe:MSFebe:IPERiod"**

  The **"ERAte:MSFebe:IPERiod"** parameter requests the Line overhead MS-FEBE Error Ratio for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 8.3E-4	none

- **"ERATe:MSFebe:RELative"**

  The **"ERAte:MSFebe:RELative"** parameter requests the Line overhead MS-FEBE Error Ratio between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
ratio	numeric	0 to 8.3E-4	none

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- **"ESEConds:MSFebe:CUMulative"**

  The **"ESEConds:MSFebe:CUMulative"** parameter requests the Line overhead MS-FEBE Error Seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:MSFebe:IPERiod"**

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:SLOSs:CUMulative"**

  The **"ESEConds:SLOSs:CUMulative"** parameter requests the number of seconds since the start of the integration period that the module's receiver has experienced signal loss.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:SLOSs:IPERiod"**

  The **"ESEConds:SLOSs:IPERiod"** parameter requests the number of seconds for the previous integration period that the module's receiver experienced signal loss.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:OOFRame:CUMulative"**

  The **"ESEConds:OOFRame:CUMulative"** parameter requests the number of seconds since the start of the integration period that the module's receiver has been out of frame.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

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- **"ESEConds:OOFRame:IPERiod"**

  The **"ESEConds:OOFRame:IPERiod"** parameter requests the number of seconds that the module's receiver was out of frame for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:LOFRame:CUMulative"**

  The **"ESEConds:LOFRame:IPERiod"** parameter requests the number of seconds that the module's receiver had lost frame for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:LOFRame:IPERiod"**

  The **"ESEConds:LOFRame:IPERiod"** parameter requests the number of seconds that the module's receiver had lost frame for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:LAIS:CUMulative"**

  The **"ESEConds:LAIS:CUMulative"** parameter requests the SONET/SDH Line AIS seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

- **"ESEConds:LAIS:IPERiod"**

  The **"ESEConds:LAIS:IPERiod"** parameter requests the SONET/SDH Line AIS seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to **2.6E5**	none

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- **"ESEConds:FERF:CUMulative"**

  The **"ESEConds:FERF:CUMulative"** parameter requests the SONET/SDH Line overhead FERF seconds since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:FERF:IPERiod"**

  The **"ESEConds:FERF:IPERiod"** parameter requests the SONET/SDH Line overhead FERF seconds for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PYELlow:CUMulative"**

  The **"ESEConds:PYELlow:CUMulative"** parameter requests the number of seconds that the module's receiver detected Path Yellow (Path FERF/RDI) since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PYELlow:IPERiod"**

  The **"ESEConds:PYELlow:IPERiod"** parameter requests the number of seconds that the module's receiver detected Path Yellow (Path FERF/RDI) for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PAIS:CUMulative"**

  The **"ESEConds:PAIS:CUMulative"** parameter requests the number of seconds that the module's receiver detected Path AIS since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

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- **"ESEConds:PAIS:IPERiod"**

  The **"ESEConds:PAIS:IPERiod"** parameter requests the number of seconds that the module's receiver detected PAth AIS for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:LOPointer:CUMulative"**

  The **"ESEConds:LOPointer:CUMulative"** parameter requests the number of seconds that the module's receiver detected LOP since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:LOPointer:IPERiod"**

  The **"ESEConds:LOPointer:IPERiod"** parameter requests the number of seconds that the module's receiver detected Loss of Pointer for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PSLoss:CUMulative"**

  The **"ESEConds:PSLoss:CUMulative"** parameter requests the number of seconds that the module's receiver detected pattern(PRBS) synchronisation loss since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"ESEConds:PSLoss:IPERiod"**

  The **"ESEConds:PSLoss:IPERiod"** parameter requests the number of seconds that the module's receiver detected pattern(PRBS) synchronisation loss for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

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- "ESEConds:SYNC:CUMulative"

  The ESEConds:SYNC:CUMulative requests the SONET/SDH overhead test error seconds of test pattern synchronisation loss since the start of the integration period, when SENS[1]:DATA:TEL:PATT2:DATA is set to a value other than NONE.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- "ESEConds:SYNC:IPERiod"

  The ESEConds:SYNC:IPERiod requests the SONET/SDH overhead test error seconds of test pattern synchronisation loss since the start of the integration period, when SENS[1]:DATA:TEL:PATT2:DATA is set to a value other than NONE.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric		none

- "ETIMe:CUMulative"

  The "ETIMe:CUMulative" parameter requests the SONET/SDH elapsed time since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- "ETIMe:IPERiod"

  The "ETIMe:IPERiod" parameter requests the SONET/SDH elapsed time for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- "ETIMe:RELative"

  The "ETIMe:RELative" parameter requests the SONET/SDH elapsed time between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
time	numeric	0.1	seconds

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- **"FCOunt:CUMulative"**

  The **"FCOunt:CUMulative"** parameter requests the SONET/SDH frame count since the start of the integration period. If a signal loss or out-of-frame error occurs, this measurement is suspended.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to **2.1E9**	none

- **"FCOunt:IPERiod"**

  The **"FCOunt:IPERiod"** parameter requests the SONET/SDH frame count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to **2.1E9**	none

- **"FCOunt:RELative"**

  The **"FCOunt:RELative"** parameter requests the SONET/SDH frame count between the two previous heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to **1000**	none

- **"SPECount:CUMulative"**

  The **"SPECount:RELative"** parameter requests the SONET/SDH SPE/AU count since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to **2.1E9**	none

- **"SPECount:IPERiod"**

  The **"SPECount:IPERiod"** parameter requests the SONET/SDH SPE/AU count for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to **2.1E9**	none

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- **"SPECount:RELative"**

  The **"SPECount:IPERiod"** parameter requests the SONET/SDH SPE/AU count between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 1000	none

- **"PACTion:NDFCount:CUMulative"**

  The **"PACTion:NDFCount:CUMulative"** parameter requests the count of new pointer values with New Data Flag received since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

- **"PACTion:NDFCount:IPERiod"**

  The **"PACTion:NDFCount:IPERiod"** parameter requests the count of new pointer values with New Data Flag received for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

- **"PACTion:NDFCount:RELative"**

  The **"PACTion:NDFCount:RELative"** parameter requests the count of new pointer values with New Data Flag received between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 200	none

- **"PACTion:MNDCount:CUMulative"**

  The **"PACTion:MNDCount:CUMulative"** parameter requests the count of new pointer values with no New Data Flag received since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

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- **"PACTion:MNDCount:IPERiod"**

  The **"PACTion:MNDCount:IPERiod"** parameter requests the count of new pointer values with no New Data Flag received for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

- **"PACTion:MNDCount:RELative"**

  The **"PACTion:MNDCount:RELative"** parameter requests the count of new pointer values with no New Data Flag received between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 200	none

- **"PACTion:ICOunt:CUMulative"**

  The **"PACTion:ICOunt:CUMulative"** parameter requests the count of pointer increments received since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

- **"PACTion:ICOunt:IPERiod"**

  The **"PACTion:ICOunt:IPERiod"** parameter requests the count of pointer increments received for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

- **"PACTion:ICOunt:RELative"**

  The **"PACTion:ICOunt:RELative"** parameter requests the count of pointer increments received between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 200	none

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- **"PACTion:DCOunt:CUMulative"**

  The **"PACTion:DCOunt:CUMulative"** parameter requests the count of pointer decrements received since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

- **"PACTion:DCOunt:IPERiod"**

  The **"PACTion:DCOunt:IPERiod"** parameter requests the count of pointer decrements received for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 5.2E5	none

- **"PACTion:DCOunt:RELative"**

  The **"PACTion:DCOunt:RELative"** parameter requests the count of pointer decrements received between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
count	numeric	0 to 200	none

- **"PACTion:ISEConds:CUMulative"**

  The **"PACTion:ISEConds:CUMulative"** parameter requests the pointer increment seconds received since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"PACTion:ISEConds:IPERiod"**

  The **"PACTion:ISEConds:IPERiod"** parameter requests the pointer increment seconds received for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

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- **"PACTion:ISECondS:RELative"**

  The **"PACTion:ISECondS:RELative"** parameter requests the pointer increment seconds received between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"PACTion:DSECondS:CUMulative"**

  The **"PACTion:DSECondS:CUMulative"** parameter requests the pointer decrement seconds received since the start of the integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"PACTion:DSECondS:IPERiod"**

  The **"PACTion:DSECondS:IPERiod"** parameter requests the pointer decrement seconds received for the previous integration period.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

- **"PACTion:DSECondS:RELative"**

  The **"PACTion:DSECondS:RELative"** parameter requests the pointer decrement seconds received between the previous two heartbeats.

  Response:

Response Name	Response Type	Response Range	Default Units
seconds	numeric	0 to 2.6E5	none

Dependencies

None.

Comments

- Alarm error counting has the following hierarchical structure:
  - **a** Signal Loss.
  - **b** Out of Frame.
  - **c** Line AIS.
  - **d** Line FERF.
  - **e** Path AIS.
  - **f** Loss of Pointer.
  - **g** Path Yellow/FERF/RDI.
  - **h** Loss of Pattern Synchronisation.

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When a particular alarm condition is present, error counting for alarms lower in the hierarchy is suspended until the more significant alarm is no longer present.

- All results can be interrogated at any time. When a result is invalid, the SCPI Not a Number (NAN) value of 9.91E+37 is returned.
- Results (other than those noted above) will not be updated if measurements have not been started.

Error Codes

None.

Related Commands

```
SENS:DATA:TEL:ALAR:OOFR:CFBA
SENS:DATA:TEL:ALAR:FERF:CFBA
SENS:DATA:TEL:ALAR:FERF:CFBN
SENS:DATA:TEL:ALAR:LAIS:CFBA
SENS:DATA:TEL:ALAR:LAIS:CFBN
```


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SOURce3 Subsystem

This subsystem is used to configure the Transport Overhead Receiver tributary output drop channel. SOURce3 selects the payload data group to be dropped by the Receiver output tributary.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
SOURce3
  :DATA:SOURce <group>
       :SOURce?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the SOURce3 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default value
To select the Transport Overhead Receiver drop channel group	**SOUR3:DATA:SOUR <group>**	1

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SOUR3:DATA:SOUR <group>

Description

`SOURce3:DATA:SOURce <group>` selects the group to be dropped by the Transport Overhead Receiver tributary output.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
group	discrete	1 to *n* (see below)	none

Dependencies

- The `SOUR3:DATA:SOUR` command is not allowed in multi-rate mode.
- This command is not allowed when `INP:TEL:RATE` is set to `TRIB`, `STM16C` or `STS48C`.

Comments

- The range of the <group> parameter depends on the signal type selected by the `OUTP3:TEL:RATE` command:
  - STS1/STM-0: 1 to 48
  - STS-3/STM-1: 1 to 16
  - STS-12/STM-4: 1 to 4
- `SOUR3:DATA:SOUR` is set to `1` whenever `OUTP3:TEL:RATE` is changed to a new value.
- When one of the possible, STS-1/STM-0, STS-3/STM-1 or STS-12/STM-4 groups present in the STS-48/STM-16 signal is being dropped, all of the overhead and payload bytes are sourced from the STS-48/STM-16 signal with the exception of the B1 byte which is recalculated.
- The reset condition for `SOUR3:DATA:SOUR` is `1`.

Error Codes

None.

Related Commands

`INP:TEL:RATE`
`OUTP3:TEL:RATE`

Query Command

`SOURce3:DATA:SOURce?` returns the currently selected group to be dropped by the Transport Overhead Receiver tributary output.

Response

Response Name	Response Type	Response Range	Default Units
group	discrete	1 to *n* (see below)	none

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SOURce4 Subsystem

This subsystem is used to configure the front panel Transport Overhead Receiver *Trigger output* TTL output port. This trigger output is provided to allow synchronization of external test equipment to events detected by the Receiver.

This section contains:

- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
SOURce4
     :TRIGger
          :SOURce <trigger>
          :SOURce?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the SOURce4 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default value
To configure the front panel Transport Overhead Receiver *Trigger output* TTL port	**SOUR4:TRIG:SOUR <trigger>**	**NONE**

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SOUR4:TRIG:SOUR <trigger>

Description

`SOURce4:TRIGger:SOURce <trigger>` selects the source of the trigger sent to the front panel Transport Overhead Receiver *Trigger output* TTL port. The trigger output can be used to trigger external test equipment for time delay measurements.

Parameters

Parameter Name	Parameter Type	Range of Values	Default units
trigger	discrete	`NONE` | `OOFRame` | `LOFRame` | `FPULse` | `CREPeat` | `SCRambling` | `FERF` | `LAIS` | `MCAPture` | `LBIP` | `PBIP` | `PFEBe` | `EPATtem` | `SBIP` | `MSFebe` | `PACTion` | `PREalign` | `J1Position`	

Dependencies

None.

Comments

- The out-of-frame trigger (OOFR) is level-sensitive to the frame lock of the incoming transport overhead. It is a TTL low for out-of-frame.
- The loss-of-frame trigger (LOFR) is level-sensitive to the loss of frame lock of the incoming transport overhead. It is a TTL low for loss-of-frame.
- The frame pulse trigger (FPUL) provides a 1 µs TTL pulse every 125 µs, aligned to the A1 byte of channel 1.
- The capture system repeated trigger (CREP) provides a 1 µs, TTL pulse every time the capture system trigger conditions are met.
- The far end receiver failure trigger (FERF) is level-sensitive to the incoming line FERF. It is a TTL low if line FERF is present.
- The line AIS trigger (LAIS) is level-sensitive to the incoming line AIS signal. It is a TTL low if line AIS is present.
- The capture system trigger action trigger (MCAP) provides a 1 µs TTL pulse when the capture system is triggered.
- The line BIP trigger pulse (LBIP) provides a TTL pulse of approx 100 µs every time one or more errors are detected in a frame.
- The path BIP trigger pulse (PBIP) provides a 110 µs TTL pulse every time one or more BIP errors are detected in the AU/SPE.
- The path FEBE trigger pulse (PFEB) provides a 1 µs TTL pulse every time a FEBE count of 1-8 is received.
- The pattern error trigger pulse (EPAT) provides a 1 µs TTL pulse every time a PRBS error is detected.
- The Multiplex section FEBE trigger pulse (MSF) provides a 1 µs TTL pulse every time a MS-FEBE error is detected.
- The pointer action trigger pulse (PACT) provides a 1 µs TTL pulse when a pointer action is

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detected.

- The pointer realignment trigger pulse (PRE) provides a 1 µs TTL pulse when a realignment of the pointer is detected
- The J1 position trigger pulse (J1P) is a 1 µs TTL pulse indicating the position of the J1 byte in the path overhead of channel 1.
- The section BIP pulse (SBIP) provides a TTL pulse of approx 60 µs every time one or more SBIP errors are detected in a frame.
- The scrambling trigger (SCR) is level-sensitive to the descrambling function of the transport overhead receiver. It is TTL low when scrambling is enabled.
- The reset condition for **SOUR4:TRIG:SOUR** is **NONE**.

Error Codes

None.

Related Commands

None.

Query Command

SOURce4:TRIGger:SOURce? returns the source of the trigger sent to the front panel Transport Overhead Receiver *Trigger output* TTL port.

Response

Response name	Response type	Response Range	Default units
trigger	discrete	**NONE** | **EFW** | **FPUL** | **SCR** | **OFW** | **LAIS** |**SBIP** | **LBIP** | **EDAT** | **FERF** | **APSW** | **TOOF** |**TFP** | **TFERF** | **TLAIS** | **TLO** | **PBIP** | **PFEBe** |**PRBS** | **MSF** | **SSEQ**	none

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SOURce5 Subsystem

The measurement systems of all HP 75000 Series 90 receiver/analyzer modules are driven from heartbeat and synchronous command signals present on the VXI TTL trigger lines. The heartbeat and synchronous command signals can be generated on the selected VXI TTL trigger lines by either the Transport Overhead Receiver (using the OUTPut5 and SOURce5 subsystems), the HP E1405B Command Module, or any other Series 90 receiver/analyzer modules. The HP E1405B Command Module configuration allows several mainframes to be synchronized.

The SOURce5 subsystem is used to configure the selected VXI trigger lines to produce a specific integration period.

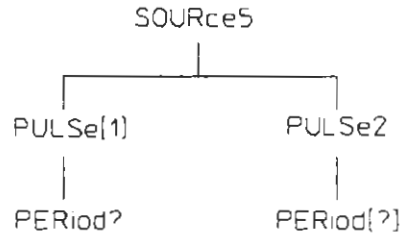
Refer to the OUTPut5 subsystem for further information about the heartbeat and its function.

This section contains:

- A SCPI command structure diagram.
- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
SOURce5
    :PULSe[1]
         :PERiod?
    :PULSe2
         :PERiod <period>
         :PERiod?
```


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SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the SOURce5 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To check the time interval between heartbeats	`SOUR5:PULS[1]:PER?`	N/A
To select the integration period over which the measurement system will accumulate measurements	`SOUR5:PULS2:PER <period>`	1

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SOUR5:PULS[1]:PER? [<interval>]

Description `SOURce5:PULSe[1]:PERiod?` returns the time interval between heartbeats.

Response

Response Name	Response Type	Response Range	Default Units
interval	numeric	`0.1`	seconds

Dependencies None.

Comments

- The interval between heartbeats is always 0.1 seconds.

Error Codes None.

Related Commands `OUTP5:TTLT<n>`

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SOUR5:PULS2:PER <period>

Description

SOURce5:PULSe2:PERiod <period> selects the integration period over which the measurement system will accumulate measurements. When the OUTP5 subsystem is active, the measurement system will automatically generate a synchronous command pulse on the VXI TTL trigger line at the end of each integration period.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
period	numeric	1 to 8640000	seconds

Dependencies

- This command can be programmed at any time. It is only effective when **TRIG3:COMM** is set to **STAR**, and the selected VXI trigger line is enabled via **OUTP5:TTLT<n>**.

Comments

- At the end of each integration period, a synchronous command pulse is transmitted on the TTL trigger lines, provided that integration period control is selected in the module.
- Once the OUTP5 subsystem is activated via **OUTP5:TTLT<n>:IMM**, any change to **SOUR5:PULS2:PER <period>** parameter will not become effective until the next synchronous command pulse generated from either **OUTP5:TTLT<n>:IMM** or **TRIG3:IMM**.
- The reset condition for **SOUR5:PULS2:PER** is **1**.

Error Codes

None.

Related Commands

TRIG3:COMM OUTP5:TTLT<n>

Query Command

SOURce5:PULSe2:PERiod? returns the currently selected integration period over which the measurement system accumulates measurements.

Response

Response Name	Response Type	Response Range	Default Units
period	numeric	1 to 8640000	seconds

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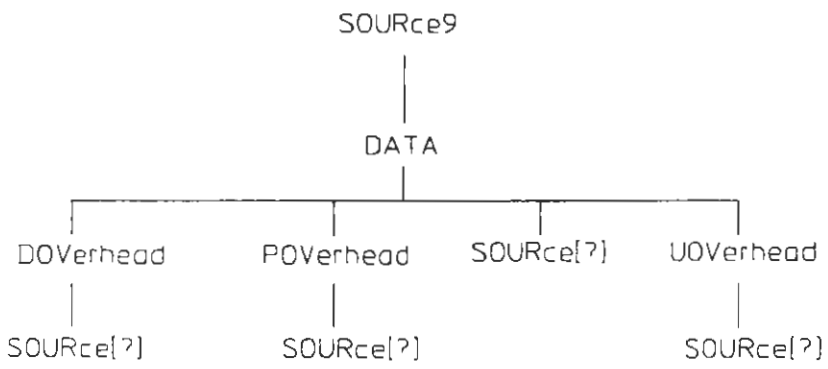
SOURce9 Subsystem

The SOURce9 subsystem is used to configure the Transport Overhead Receiver front panel *Serial data* EOC output port.

- A SCPI command structure diagram.
- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem..

SCPI command structure diagram

The subsystem command structure is shown in the following diagram.



Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
SOURce9
    :DATA
        :DOVerhead
            :SOURce <byte>,<channel>,<offset>
            :SOURce?
        :POVerhead
            :SOURce <byte>
            :SOURce?
        :SOURce <byte>
        :SOURce?
        :UNDoverhead
            :SOURce <row>,<column>,<interleave>
            :SOURce?
```


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SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the CONFigure subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select a defined overhead byte for output via the Transport Overhead Receiver front panel *Serial data* EOC output port	`SOUR9:DATA:DOV:SOUR <byte>,<channel>,<offset>`	`NONE, 1,0`
To select a POH byte for output via the Transport Overhead Receiver front panel *Serial data* EOC output port	`SOUR9:DATA:POV:SOUR <byte>`	`NONE`
To select the source of the byte to be output via the Transport Overhead Receiver front panel *Serial data* EOC output port	`SOUR9:DATA:SOUR <source>`	`NONE`
To select an undefined overhead byte for output via the Transport Overhead Receiver front panel *Serial data* EOC output port	`SOUR9:DATA:UND:SOUR <row>,<column>,<interleave>`	`1,1,1`

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SOUR9:DATA:DOV:SOUR <byte>,<channel>,<offset>

Description

SOURce9:DATA:DOVerhead:SOURce <byte>,<channel>,<offset> selects a defined overhead byte for output via the Transport Overhead Receiver front panel *Serial data* EOC output port.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
byte	discrete	**NONE|C1|E1|F1|D1|D2|D3|K1|K2|D4|D5|D6|D7|D8| D9|D10|D11|D12|Z1|Z2|M1|E2|A1|A2|J0|Z0|S1**	none
channel	numeric	**1** to **48**	none
offset	numeric	**0** to **2**	none

Byte	Receiver Rate	Channel	Offset
C1 I Z1 I Z2	STS48 I STS48C	1 to 48	0
	STM16 I STM16C	1 to 16	0 to 2
	STS12	1 to 12	0
	STM4	1 to 4	0 to 2
	STS3	1 to 3	0
	STM1	1	0 to 2
	STS1 I STM0	1	0
E1 I F1 I D1 I D2 I D3 I D4 I D5 I D6 I D7 I D8 I D9 I D10 I D11 I D12 I E2 I J0	all rates	1	0
M1	STS48 I STS48C I STS12	7	0
	STM16 I STM16C I STM4	4	0
	STS3	3	0
	STM1	1	2
	STS1 I STM0	1	0
Z0	all rates	Channel=1 .Offset = 0 not allowed	

Dependencies

- The <channel> and <offset> are limited by the <byte> value and the settings of **INP:TEL:RATE** as shown in above table.
- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.

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SOUR9:DATA:DOV:SOUR <byte>,<channel>,<offset>

Comments

- The reset condition for **SOUR9:DATA:DOV:SOUR** is **NONE,1,0**.
- The ranges of **<channel>** and **<offset>** depend on the receiver rate selected by **INP:TEL:RATE**.

Receiver Rate	<channel>	<offset>
STS48 I STS48C	1 to 48	0
STM16 I STM16C	1 to 16	0 to 2
STS12	1 to 12	0
STM4	1 to 4	0 to 2
STS3	1 to 3	0
STM1	1	0 to 2
STS1 I STM0	1	0

Error Codes

None.

Related Commands

SOUR9:DATA:POV:SOUR
SOUR9:DATA:SOUR
SOUR9:DATA:UND:SOUR

Query Command

SOURce9:DATA:DOVerhead:SOURce? returns the currently selected overhead byte for output via the Transport Overhead Receiver front panel *Serial data* EOC output port.

Response

Response name	Response type	Response Range	Default units
byte	discrete	**NONE|C1|E1|F1|D1|D2|D3|K1|K2|D4|D5| D6|D7|D8| D9|D10|D11|D12|Z1|Z2|M1| E2|A1|A2| J0|Z0|S1**	none
channel	numeric	**1** to **48**	none
offset	numeric	**0** to **2**	none

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SOUR9:DATA:POV:SOUR <byte>

Description

`SOURce9:DATA:POVerhead:SOURce <byte>` selects a POH byte from output via the Transport Overhead Receiver front panel *Serial data* EOC output port.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
byte	discrete	NONE|J1|C2|G1|F2|H4|Z3|Z4|Z5	none

Dependencies

None.

Comments

- The reset condition for `SOUR9:DATA:POV:SOUR` is `NONE`.

Error Codes

None.

Related Commands

`SOUR9:DATA:DOV:SOUR`
`SOUR9:DATA:SOUR`
`SOUR9:DATA:UND:SOUR`

Query Command

`SOURce9:DATA:POVerhead:SOURce?` returns the currently selected POH byte for output via the Transport Overhead Receiver front panel *Serial data* EOC output port.

Response

Response Name	Response Type	Response Range	Default Units
byte	discrete	NONE|J1|C2|G1|F2|H4|Z3|Z4|Z5	none

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SOUR9:DATA:SOUR <source>

Description

SOURce9:DATA:SOURce <source> selects the source of the byte to be output via the Transport Overhead front panel *Serial data* EOC output port

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
source	discrete	**NONE|USER|LDCC|SDCC|DOVerhead|UNDoverhead|POVerhead|APSWitch**	none

Dependencies

- Only **NONE** is allowed when **SOUR9:DATA:PATT2:DATA** is set to a value other than **NONE** (ie, the two are mutually exclusive).

Comments

- The reset condiuon for **SOUR9:DATA:SOUR** is **NONE**.
- When **USER** is selected the F1 byte is output.
- When **LDCC** is selected the D4 to D12 bytes are output.
- When **SDCC** is selected the D1 to D3 bytes are output.
- When **APSW** is selected the K1 and K2 bytes are output

Error Codes

Related Commands **SOUR9:DATA:DOV:SOUR SOUR9:DATA:POV:SOUR SOUR9:DATA:UND:SOUR**

Query Command

SOURce9:DATA:SOURce? returns the currently selected source of the byte to be output via the Transport Overhead front panel *Serial data* EOC output port

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**NONE|USER|LDCC|SDCC|DOV|UND|POV|APSW**	none

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SOUR9:DATA:UND:SOUR <row>,<column>,<interleave>

Description

`SOUR9:DATA:UNDoverhead:SOURce <row>,<column>,<interleave>` selects an undefined overhead byte for output via the Transport Overhead Receiver front panel *Serial data* EOC output port.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
row	numeric	1 to 9	none
column	numeric	1 to 9	none
interleave	numeric	1 to 16	none

Dependencies

- This command is not allowed when `INP:TEL:RATE` is set to `TRIB`.
- The ranges of `<column>` and `<interleave>` depend on the receiver rate selected by `INP:TEL:RATE`.

Receiver Rate	<column>	<interleave>
STS48 I STS48C I STM16 I STM16C	1 to 9	1 to 16
STS12 I STM4	1 to 9	1 to 4
STS3 I STM1	1 to 9	1
STS1 I STM0	1 to 3	1

Comments

- The reset condition for `SOUR9:DATA:UND:SOUR` is `1,1,1`.
- Note all `TOH` bytes maybe accessed using this byte including the defined bytes.
- Interleave level is defined in `COM15-91-E` section `9.2.1` and is an indication of the STM1 number in an STM-n signal.

Error Codes

Related Commands

`SOUR9:DATA:DOV:SOUR`
`SOUR9:DATA:POV:SOUR`
`SOUR9:DATA:SOUR`

Query Command

`SOUR9:DATA:UNDoverhead:SOURce?` returns the undefined overhead byte currently selected for output via the Transport Overhead Receiver front panel *Serial data* EOC output port.

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SOUR9:DATA:UND:SOUR <row>,<column>,<interleave>

Response

Response Name	Response Type	Response Range	Default Units
row	numeric	1 to 9	none
column	numeric	1 to 9	none
interleave	numeric	1 to 16	none

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SOURce10 Subsystem

The **SOURce10** subsystem selects the payload channel group to be placed on the payload drop bus. The transport overhead receiver is capable of demultiplexing at up to 155.52Mb/s (three STS1s or one STM1) on to the payload drop bus for analysis by SPE receivers.

This section contains:

- A SCPI command structure diagram.
- A SCPI command quick reference summary for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
[SOURce10
   :DATA
      SOURce <channel
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the TRIGger[1] subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To select the payload channel group to be placed on the payload drop bus.	SOUR10:DATA:SOUR <channel>	N/A

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SOUR10:DATA:SOUR <channel>

Description

SOUR10:DATA:SOUR <channel> selects the payload channel group to be placed on the payload drop bus.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
channel	numeric	1 to n	none

Dependencies

- The range of the **<channel>** parameter depends on the line rate selected by the **INP:TEL:RATE** command and the drop mapping selected by the **INP:TEL:RATE:PAYL** command.
- This command will result in a *Settings Conflict* if issued when a receiver payload mapping other than **STS1**, **STS3C**, **AU3** or **AU4** is selected via the **INP:TEL:RATE:PAYL** command.

Receiver Rate	Payload Drop Mapping	Channel Range
STS48	STS1	1..48
	STS3C	1..16
STM16	AU3	1..48
	AU4	1..16
STS12	STS1	1..12
	STS3C	1..4
STM4	AU3	1..12
	AU4	1..4
STS3	STS1	1..3
	STS3C	1
STM1	AU3	1..3
	AU4	1
STS1	STS1	1
STM0	AU3	1

Comments

- When dropping an STS1 or AU3 payload, the dropped signal is actually an STS3C or AU4, one third of which will contain the desired STS1 or AU3. The correct STS1 or AU3 must be selected in the SPE receiver module.

Error Codes

None.

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SOUR10:DATA:SOUR <channel>

Related Commands `INP:TEL:RATE:PAYL`

Query Command **`SOUR10:DATA:SOUR?`** returns the currently selected payload channel group (1 to n).

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TRIGger[1] subsystem

The **TRIGger[1]** subsystem is used to capture data into snapshot memory.

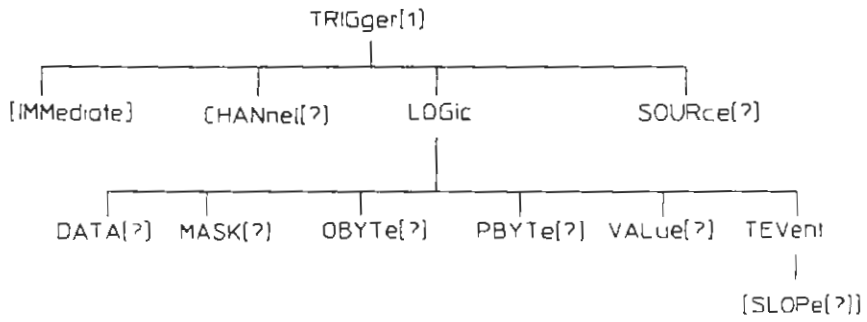
The **TRIGger[1]** subsystem consists of a simplified state machine based on the ARM-TRIGger model defined in the SCPI Standard. No arming or sequencing is possible in the **TRIGger[1]** subsystem.

This section contains:

- A SCPI command structure diagram.
- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
ABORt[1]

INITiate[1]
  [:IMMediate]

TRIGger[1]
    :CHANnel <channel>
    :CHANnel?
   [:IMMediate]
    :LOGic <condition>
        :DATA <source>
        :DATA?
        :MASK <mask>
        :MASK?
        :OBYTe <byte>,<offset>
        :OBYTe?
        :PBYTe <byte>
        :PBYTE?
        :TEVent
          :[SLOPe]
          :[SLOPe] ?
        :VALue <value>
        :VALue?
   :LOGic?
```


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```
:SOURce <source>
:SOURce?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the TRIGger[1] subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To reset the TRIGger1 subsystem to the idle state	`ABOR[1]`	N/A
To set the TRIGger1 subsystem to wait for the trigger state	`INIT[1]:IMM`	`N/A`
To cause the TRIGger1 subsystem to trigger immediately	`TRIG[1]`	`N/A`
To select the transport overhead channel for snapshot and trigger	`TRIG[1]:CHAN <channel>`	`1`
To select the trigger qualification for the TRIGger1 subsystem	`TRIG[1]:LOG <condition>`	`CHAN`
To select the type of data to be used in a TRIGger1 comparison	`TRIG[1]:LOG:DATA <type>`	`OVER`
To select the bits to be used in a TRIGger1 comparison	`TRIG[1]:LOG:MASK <mask>`	`255`
To select the transport overhead byte to be used in trigger comparison and sequence capture	`TRIG[1]:LOG:OBYTe <byte>,<offset>`	`A1,0`
To select path overhead byte to be used in trigger comparison and sequence capture	`TRIG[1]:LOG:PBYTe <byte>`	`J1`
To specify the value used in a trigger comparison	`TRIG[1]:LOG:VAL <value>`	`0`
To select the source for the TRIGger1 subsystem	`TRIG[1]:SOUR <source>`	`IMM`
To select the slope of the transmitter TTL trigger which will be used to trigger the capture system	`TRIG[1]:LOG:TEVent[:SLOPe]`	`POS`

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ABOR[1]

Description

ABORt[1] resets the **TRIGger[1]** subsystem to the idle state.

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.

Comments

- If the **TRIGger[1]** subsystem is in the wait for trigger state, this command resets it to the idle state and will not capture valid data.
- This command has no effect if the **TRIGger[1]** subsystem is in the idle state.
- When this subsystem exits the wait for trigger state, the "capture system active" bit (bit 5) and the "valid data" bit (bit 9) in the operation status register are reset.

Error Codes

–221, "Settings conflict"

Related Commands

INIT
TRIG[:IMM]
TRIG:SOUR

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INIT[1][:IMM]

Description

INITiate[1]:[IMMediate] initiates the **TRIGger[1]** subsystem into the wait-for-trigger state. The Transport Overhead Receiver will then capture data into snapshot memory when the trigger qualifier conditions are satisfied.

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.

Comments

- If the **TRIGger[1]** subsystem is in the idle state, this command initiates it into the wait for trigger state. This sets the SYSACT "capture system active" bit (bit 5) and resets the VALDATA 'valid data' bit (bit 9) and the "capture triggered" bit (bit 12) in the STATus:OPERation register.
- This command generates an error if the **TRIGger[1]** subsystem is in the wait for trigger state.
- If the **TRIG:SOUR** command is set to **IMM**, then the overhead or sequence data is immediately captured into snapshot memory and the **TRIGger[1]** subsystem returns to the idle state provided no signal loss is present.
- If the **CONF** command is set to **DATA:TEL:SEQ**, and **TRIG:SOUR** is set to **LOG** then this command initiates collection of pre-trigger states.

Error Codes

-213	"Init ignored"	The **TRIGger[1]** subsystem was not in the idle state when the command was issued.

Related Commands

ABOR
TRIG[:IMM]
TRIG:SOUR

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TRIG[1][:IMM]

description

TRIGger[1][:IMMediate] causes the **TRIGger[1]** subsystem to trigger immediately. Normally, the **TRIGger[1]** subsystem waits until the trigger conditions are satisfied. This command overrides that situation and captures overhead data into the snapshot memory, returning the **TRIGger[1]** subsystem to the idle state. In sequence capture mode this command also terminates collection of post-trigger states.

Dependencies

- The **Trigger[1]** subsystem must be in the wait for trigger state for this command to be accepted.
- This command is not allowed if **INP:TEL:RATE** is set to **TRIB**.

Comments

- This command is ignored if the **Trigger[1]** subsystem is in the idle state.
- This command causes data to be captured into snapshot memory and returns the **TRIGger[1]** subsystem to the idle state.
- In sequence capture mode, this command will terminate collection of post-trigger states. Post-trigger collection would otherwise continue until the capture buffer is full, potentially many seconds after the trigger condition is found.
- This command resets the "capture system active" bit (5) in the operation status register.
- If there is valid data available then the "valid data" bit (9) is set in the operation status register.
- Sets the "captured triggered" bit (bit 12) in the operation status register.

Error Codes

–211, "Trigger ignored" –221, "Settings conflict"

Related Commands

ABOR
INIT
TRIG:LOG
TRIG:SOUR

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TRIG[1]:CHAN <channel>

Description

TRIGger[1]:CHANnel <channel> selects the transport overhead channel that will be captured in snapshot memory. The same channel will be used as a trigger qualifier to the **TRIGer[1]** subsystem.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
channel	numeric	**1** to **16** (STM); **1** to **48** (STS)	none

Dependencies

- This command is only allowed when the **TRIGger[1]** subsystem is in the idle state.
- The channel numbers available depend on the line rate selected by the **INP:TEL:RATE** command.
- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- The range of **<channel>** depends on the receiver rate selected by **INP:TEL:RATE**.

Receiver Rate	<channel>
STS48 I STS48C	1 to 48
STM16 I STM16C	1 to 16
STS12	1 to 12
STM4	1 to 4
STS3	1 to 3
STS1 I STM1 I STM 0	1

Comments

- This command should be used in with the **TRIG:LOG:OBYT** command to specify the specific transport overhead byte to qualify the trigger.
- The <channel> parameter must be valid for the byte and <offset> selected by **TRIG:LOG:OBYT** otherwise and error –221 is generated.
- The reset condition for **TRIG:CHAN** is **1**.

Error Codes

–221, "Settings conflict"

Related Commands

ABOR
INIT
TRIG
TRIG:LOG
TRIG:LOG:VAL

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Query Command

TRIGger[1]:CHANnel? returns the currently transport overhead channel that will be captured in snapshot memory.

Response

Response Name	Response Type	Response Range	Default Units
channel	numeric	**1** to **16** (STM); **1** to **48** (STS)	none

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TRIG[1]:LOG <condition>

Description

TRIGger[1]:LOGic <condition> selects the trigger qualification for the **TRIGger[1]** subsystem. The snapshot memory can be triggered immediately, via a logic condition (such as on a change in the value of a transport overhead byte), or when a transport overhead byte has a specific value. This command selects the trigger logic condition qualification.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
condition	discrete	**CHANge|VALue|TEVent**	none

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the trigger system is not in the idle state.

Comments

- When you select **CHAN**, the snapshot memory is triggered by a change in the value of the overhead byte specified by the **TRIG:LOG:OBYT**, **TRIB:LOG:PBYT** and **TRIG:CHAN** commands.
- When you select **VAL**, the snapshot memory is triggered when the byte specified in the **TRIG:LOG:OBYT**, **TRIG:LOG:PBYT** and **TRIG:CHAN** commands corresponds to the value specified by the **TRIG:LOG:VAL** command.
- For both **CHAN** and **VAL** comparisons, the bits used during a comparison can be selected by the **TRIG:LOG:MASK** command.
- When you select **TEVent**, the snapshot memory is triggered by the transmitter TTL port trigger.
- The transmitter TTL port trigger selected by **SOUR2:TRIG:SOUR** must be set to a valid value for **TEV** to be available.
- The reset condition for **TRIG:LOG** is **CHAN**.

Error Codes

–221, "Settings conflict"

Related Commands

TRIG:CHAN
TRIG:LOG:DATA
TRIG:LOG:MASK
TRIG:LOG:OBYT
TRIG:LOG:REV:SLOP
TRIG:LOG:TEV:SLOP
TRIG:LOG:VAL
TRIG:SOUR
SOUR2:TRIG:SOUR

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TRIG[1]:LOG <condition>

Query Command

`TRIGger[1]:LOGic?` returns the currently selected trigger qualification for the `TRIGger[1]` subsystem.

Response

Response Name	Response Type	Response Range	Default Units
condition	discrete	`CHAN|VAL|TEV`	none

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TRIG[1]:LOG:DATA <source>

Description

TRIGger[1]:LOGic:DATA <source> selects the type of data used in the trigger comparison to initiate capture of data into memory by the **TRIGger[1]** subsystem. It also selects the type of data to be captured in sequence capture mode. It is possible select a single overhead byte, the APS bytes (K1 and K2 bytes), or a pointer value.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	**OVERhead|APSWitch|POINter|POVerhead**	none

Dependencies

- **APSW** can only be selected if **TRIG:CHAN** is set to channel 1 and if offset in **TRIG:LOG:OBYTE** is set to 0.
- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the trigger system is not in the idle state.
- **CONF:DATA:TEL:DATA**, **CONF:DATA:TEL:POV** or **CONF:DATA:TEL:SEQ** must be set before **TRIG:LOG:DATA** is set to **POV**.
- **CONF:DATA:TEL:DATA**, **CONF:DATA:TEL:OVER** or **CONF:DATA:TEL:SEQ** must be set before **TRIG:LOG:DATA** is set to **OVER**, **APSW** or **POIN**.

Comments

- When you select **OVER**, trigger qualification is possible on any single (8-bit) transport overhead byte. See **TRIG:LOG:OBYTE**.
- When you select **APSW**, trigger qualification is only possible on the (16-bit) K1 and K2 bytes. When you select **POIN**, trigger qualification is only possible on the (10-bit) pointer value contained in the H1 and H2 bytes.
- When you select **POV**, trigger qualification is possible on the byte set by **TRIG:LOG:PBYT**.
- In overhead capture mode, the whole of the transport overhead is captured, therefore it is possible to alternate between transport overhead modes while still retaining valid data.
- In sequence capture mode only the selected data is captured.
- In overhead sequence capture mode this command identifies the type of overhead data to be captured, as well as selecting the trigger qualifier.
- This command should be issued prior to the **TRIG:LOG:MASK** or **TRIG:LOG:VAL** commands to ensure correct retention of those settings.
- The reset condition for **TRIG:LOG:DATA** is **OVER**.

Error Codes

–221, "Settings conflict"

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TRIG[1]:LOG:DATA <source>

Related Commands

`TRIG:CHAN`
`TRIG:LOG`
`TRIG:LOG:MASK`
`TRIG:LOG:OBYT`
`TRIG:LOG:VAL`

Query Command

`TRIGger[1]:LOGic:DATA?` returns the currently selected type of data used in the trigger comparison to initiate capture of data into memory by the `TRIGger[1]` subsystem.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	OVER|APSW|POIN|POV	none

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TRIG[1]:LOG:MASK <mask>

Description

TRIGger[1]:LOGic:MASK <mask> is used to enable which bits in the specified transport overhead data are used in the trigger comparison to initiate capture of data into snapshot memory.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
mask	numeric	**-32768** to **32767** (**#H1** to **#HFFFF**)	none

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- <mask> is not allowed with value 0.
- This command is not allowed when the trigger system is not in the idle state.

Comments

- A logic 1 in a bit position enables that bit during a trigger comparison.
- Different mask limits apply for each transport overhead data type selected by the **TRIG:LOG:DATA** command:
  - **OVER**: 1 to 255 (#HFF)
  - **POV**: 1 to 255
  - **POIN**: -32768 to 32767, excluding 0.
  - **APSW**: -32768 to 32767, excluding 0 (#H1 to #HFFFF)
- The **TRIG:LOG:DATA** command should be issued prior to this command to ensure that <mask> is returned correctly.
- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for **TRIG:LOG:MASK** is **255**.

Error Codes

–221, "Settings conflict" –222, "Data out of range"

Related Commands

ABOR
INIT
TRIG
TRIG:LOG
TRIG:LOG:VAL

Query Command

TRIGger[1]:LOGic:MASK? returns the currently programmed value of the bits in the specified transport overhead data that are used in the trigger comparison to initiate capture of data into snapshot memory.

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TRIG[1]:LOG:MASK <mask>

Response

Response Name	Response Type	Response Range	Default Units
mask	numeric	-32768 to 32767 (#H1 to #HFFFF)	none

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TRIG[1]:LOG:OBYT <byte>,<offset>

Description

TRIGger[1]:LOGic:OBYTe <byte>,<offset> selects the particular transport overhead byte used in the trigger comparison mechanism to initiate capture of data into memory by the **TRIGger[1]** subsystem. It also selects the overhead byte to be captured in sequence capture mode. The transport overhead byte is identified by its name, and, in the case of SDH, also by its offset.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
byte	discrete	**A1|A2|C1|B1|E1|F1|D1|D2|D3|H1|H2|H3|B2|K1|K2|D4|D5|D6|D7|D8|D9|D10|D11|D12|Z1|Z2|E2|J0|M1|Z0|S1**	none
offset	numeric	**0|1|2**	none

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the trigger system is not in the idle state.
- The combination of <channel> set by **TRIG:CHAN** and the <byte> and <offset> set by this command must be valid.
- Only 0 is allowed for **<offset>** at SONET line rates (i.e. when **INP:TEL:RATE** is set to **STS48**, **STS48C**, **STS12**, **STS3** or **STS1**)

Comments

- <offset> is used in SDH to select which set (first, second, or third) of transport overhead bytes is used to trigger the snapshot memory.
- In overhead byte sequence capture mode this command identifies which overhead byte is to be captured, as well as selecting the trigger qualifier.
- The reset condition for **TRIG:LOG:OBYT** is **A1,0**.

Error Codes

–221, "Settings conflict"

Related Commands

ABOR
INIT
TRIG
TRIG:LOG
TRIG:LOG:VAL

Query Command

TRIGger[1]:LOGic:OBYTe? returns the currently selected transport overhead byte used in the trigger comparison mechanism to initiate capture of data into memory by the **TRIGger[1]** subsystem.

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TRIG[1]:LOG:OBYT <byte>,<offset>

Response

Response Name	Response Type	Response Range	Default Units
byte	discrete	A1|A2|C1|B1|E1|F1|D1|D2|D3|H1|H2|H3| B2|K1|K2|D4|D5|D6|D7|D8|D9|D10|D11| D12|Z1|Z2|E2|J0|M1|Z0|S1	none
offset	numeric	0 | 1 | 2	none

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TRIG[1]:LOG:PBYT <byte>

Description

`TRIGger[1]:LOGic:PBYTe <byte>` selects the particular path overhead byte from channel 1 used in the trigger comparison mechanism to initiate capture of data into memory by the `TRIGger[1]` subsystem. It also selects the overhead byte to be captured in sequence capture mode. The path overhead byte is identified by its name, and, in the case of SDH, also by its offset.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
byte	discrete	J1|B3|C2|G1|F2|H4|Z3|Z4|Z5	none

Dependencies

- This command is not allowed when `INP:TEL:RATE` is set to `TRIB`.
- This command is not allowed when the trigger system is not in the idle state.

Comments

- In overhead byte sequence capture mode this command identifies which overhead byte is to be captured, as well as selecting the trigger qualifier.
- The reset condition for `TRIG:LOG:PBYT` is `J1,0`.

Error Codes

–221, "Settings conflict"

Related Commands

`ABOR`
`INIT`
`TRIG`
`TRIG:LOG`
`TRIG:LOG:VAL`

Query Command

`TRIGger[1]:LOGic:PBYTe?` returns the currently selected path overhead byte used in the trigger comparison mechanism to initiate capture of data into memory by the `TRIGger[1]` subsystem.

Response

Response Name	Response Type	Response Range	Default Units
byte	discrete	J1|B3|C1|G1|F2|H4|Z3|Z4|Z5	none

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TRIG:LOG:REV:SLOP <slope>

Description

TRIGger[1]:LOGic:REVent:SLOPe <slope> is used to specify the edge of the receiverer trigger event which is used to initiate a capture of data into snapshot memory.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
slope	discrete	**POSitive**|**NEGative**	none

Dependencies

- This command is only effective when **TRIG:LOG** is set to **REV**.

Comments

Error Codes

Related Commands

ABOR
INIT
TRIG
TRIG:LOG

Query Command

TRIGger[1]:LOGic:REVent:SLOPe? returns the currently selected edge of the receiver trigger.

Response

Response Name	Response Type	Response Range	Default Units
slope	discrete	**POS**|**NEG**	none

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TRIG:LOG:TEV:SLOP <slope>

Description

TRIGger[1]:LOGic:TEVent:SLOPe <slope> is used to specify the edge of the transmitter trigger event which is used to initiate a capture of data into snapshot memory.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
slope	discrete	**POSitive|NEGative**	none

Dependencies

- This command is only effective when **TRIG:LOG** is set to **TEV**.

Comments

Error Codes

Related Commands

ABOR
INIT
TRIG
TRIG:LOG

Query Command

TRIGger[1]:LOGic:TEVent:SLOPe? returns the currently selected edge of the transmitter trigger.

Response

Response Name	Response Type	Response Range	Default Units
slope	discrete	**POS|NEG**	none

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TRIG[1]:LOG:VAL <value>

Description

TRIGger[1]:LOGic:VALue <value> is used to specify the value in the byte (or bytes) to use in the trigger comparison to initiate capture of data into snapshot memory.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
value	numeric	**-32768** to **32767** (**#H0** to **#HFFFF**)	none

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the trigger system is not in the idle state.
- This command can be selected at any time, but it is only effective if the **TRIG:SOUR** command is set to **LOGic** and the **TRIG:LOG** command set to **VALue**.
- The value set by this command is qualified by the mask set by the **TRIG:LOG:MASK** command before the **TRIGger[1]** subsystem is triggered.

Comments

- When the **TRIGger[1]** subsystem is set to "trigger on value" mode, this command specifies the value that the specified byte must contain to trigger the snapshot memory.
- The range of <value> is limited by the setting of **TRIG:LOG:DATA** as follows:
  - **OVER** or **POV** limit the range to 0 to 255.
  - **APSW** or **POIN** allow full range.
- <value> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.
- The reset condition for **TRIG:LOG:VAL** is **0**.

Error Codes

-221, "Settings conflict"

Related Commands

ABOR
INIT
TRIG
TRIG:LOG
TRIG:MASK
TRIG:LOG:DATA

Query Command

TRIGger[1]:LOGic:VALue? returns the currently specified value in the byte (or bytes) to use in the trigger comparison to initiate capture of data into snapshot memory.

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TRIG[1]:LOG:VAL <value>

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	-32768 to 32767 (#H0 to #HFFFF)	none

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TRIG[1]:SOUR <source>

Description

TRIGger[1]:SOURce <source> used to select the source for the **TRIGger[1]** subsystem. The snapshot memory can be triggered immediately or by the conditions set in the **TRIG:LOG** command.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	**IMMediate|LOGic**	none

Dependencies

- This command is not allowed when **INP:TEL:RATE** is set to **TRIB**.
- This command is not allowed when the trigger system is not in idle state.

Comments

- When you select **IMM**, the snapshot memory triggers immediately after initiating the snapshot using the **INIT** command.
- When you select **LOG**, the snapshot memory triggers when the **TRIG:LOG** conditions are satisfied after initiating the snapshot using the **INIT** command.
- The reset condition for **TRIG:SOUR** is **IMM**.

Error Codes

–221, "Settings conflict"

Related Commands

ABOR
INIT
TRIG
TRIG:LOG
TRIG:LOG:DATA

Query Command

TRIGger[1]:SOURce? returns the currently selected source for the **TRIGger[1]** subsystem.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**IMM|LOG**	none

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TRIGger2 Subsystem

This subsystem controls the timing of the Transport Overhead Receiver measurement updates. When initiated via **INIT2:CONT ON**, the heartbeat is normally provided by the selected even-numbered VXI TTL trigger line. If this signal is not present, the module utilizes its own internal heartbeat until an external signal is provided. Only status measurements, as defined under the **SENSe[1]:DATA?** command, are updated prior to initiating this trigger subsystem and issuing a **STARt** or **ONCE** command using the TRIGger3 subsystem.

The TRIGger2 subsystem consists of a simplified state machine based on the ARM-TRIGger model defined by the SCPI standard.

This section contains:

- A SCPI command structure diagram.
- A SCPI subsystem syntax diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
ABORt2

INITiate2
    :CONTinuous <state>
    :CONTinuous?

TRIGger2
    :SOURce <source>
    :SOURce?
```

SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the TRIGger2 subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To reset the TRIGger2 subsystem to the idle state	**ABOR2**	N/A
To set the TRIGger2 subsystem to be continuously initiated	**INIT2:CONT <state>**	0
To select the source for the TRIGger2 subsystem	**TRIG2:SOUR <source>**	**TTLT0**

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ABOR2

Description — `ABORt2` resets the TRIGger2 subsystem to the idle state.

Dependencies — None.

Comments

- When the TRIGger2 subsystem is in the idle state, the Transport Overhead Receiver will not respond to any heartbeat signals, and the measurement system will not update error and other measurements.
- When `INIT2:CONT` is set to `OFF`, this command aborts the measurement system.
- If `INIT2:CONT` is set to `ON`, the TRIGger2 subsystem immediately returns to the "wait for trigger" state.

Error Codes — None.

Related Commands — `INIT2:CONT TRIG2:SOUR?`

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INIT2:CONT <state>

Description

`INITiate2:CONTinuous <state>` selects whether the TRIGger2 subsystem is to be continuously initiated. The TRIGger2 subsystem controls the heartbeat to the measurement system of the module's receiver. Continuous retriggering causes the measurement system to update all measurements continuously.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
state	boolean	OFF | 0 | ON | 1	none

Dependencies

None.

Comments

- With **INIT2:CONT** set to **OFF**, the trigger system remains in the idle state until **INIT2:CONT** is set to **ON**. Once **INIT2:CONT** is set to **ON**, the trigger system is initiated and enters the "wait for trigger" state. On completion of each trigger cycle (with **INIT2:CONT** set to **ON**), the trigger system immediately starts another trigger cycle without entering the idle state.
- With the trigger system set to cycle continuously, the **ABOR2** command forces the trigger system to the idle state, however, the value of **INIT2:CONT** is unaffected. If **INIT2:CONT** was set to **ON** prior to receiving **ABOR2**, it remains **ON** and the trigger system immediately exits the idle state.
- The reset condition for **INIT2:CONT** is **OFF**.
- Note that
  - with **INIT2:CONT ON**, the measurement system operates continuously
  - with **INIT2:CONT OFF**, the measurement system is disabled once the trigger has occurred.

Error Codes

None.

Related Commands

ABOR2
TRIG2:SOUR?

Query Command

`INITiate2:CONTinuous?` returns the currently selected state of continuously initiating mode of the TRIGger2 subsystem.

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INIT2:CONT <state>

Response

Response Name	Response Type	Response Range	Default Units
state	boolean	OFF | 0 | ON | 1	none

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TRIG2:SOUR <source>

Description

TRIGger2:SOURce <source> selects the source for the TRIGger2 subsystem. This is selected from one of the even-numbered VXI TTL trigger lines. This command also selects the TTL trigger to be used as the source for the TRIGger3 subsystem.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
source	discrete	**TTLTrig0 | TTLTrig2| TTLTrig4 | TTLTrig6**	none

Dependencies

- The trigger system must be in the idle state before the trigger lines can be altered with this command. To do this, set **INIT2:CONT** and **INIT3:CONT** to **OFF** and issue the **ABOR2** and **ABOR3** commands.

Comments

- The VXI TTL trigger lines used are selected in adjacent pairs for the heartbeat and synchronous command pulses.
- As the trigger lines are selected in pairs, the heartbeat is assigned to the even-numbered VXI TTL trigger line, and the synchronous command pulse is assigned to the odd-numbered VXI TTL trigger line.
- If **TRIG2:SOUR** is changed while **OUTP5:TTLT<n>** is **ON**, **OUTP5:TTLT<n>** is set to **OFF**.
- The reset condition for **TRIG2:SOUR** is **TTLT0**.
- Note that the TTL trigger lines are assigned in pairs for the heartbeat and synchronous command pulse signals. The VXI TTL trigger line for the synchronous command pulse is automatically one more than the VXI TTL trigger line selected for measurement updates by this **TRIG:SOUR2** command.

Error Codes

–221, "Settings conflict" +201, "Settings change"

Related Commands

ABOR2 INIT2:CONT

Query Command

TRIGger2:SOURce? returns the currently selected source for the TRIGger2 subsystem.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**TTLT0 | TTLT2| TTLT4 | TTLT6**	none

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TRIGger3 Subsystem

This subsystem is used to execute a synchronous command on the next heartbeat pulse. If the same synchronous command has been selected on all receive modules, detection of a pulse by this subsystem on each module causes measurements to start, stop, continue, or undergo integration (gating) period control. This only occurs if the TRIGger2 subsystem has been enabled on each module, and a common timing or heartbeat signal is provided via the TTL trigger line. Both the heartbeat and the synchronous command pulse can be provided on the TTL trigger lines by the module using the OUTPut5 and SOURce5 subsystems.

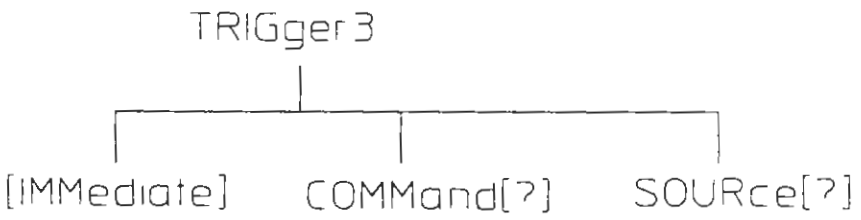
The TRIGger3 subsystem consists of a simplified state machine based on the ARM-TRIGger model defined by the SCPI standard. No arming or sequencing is possible in the TRIGger3 subsystem.

This section contains:

- A SCPI command structure diagram.
- A SCPI command quick reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
ABORt3
INITiate3
    :CONTinuous <state>
    :CONTinuous?

TRIGger3
    :COMMand <command>
    :COMMand?
   [:IMMediate]
    :SOURce?
```


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SCPI Command Quick Reference

The tasks, abbreviated commands and default values associated with the CONFigure subsystem are listed in the following table. More detailed information on the commands is given after the table.

Task	Command	Default Value
To reset the TRIGger3 subsystem to the idle state	`ABOR3`	N/A
To set the TRIGger3 subsystem to be continuously initiated	`INIT3:CONT <state>`	0
To select the synchronous commands to be executed on receipt of a synchronous command pulse or a `TRIG3[:IMM]` command	`TRIG3:COMM <command>`	`STOP`
To cause the TRIGger3 subsystem to trigger immediately, and to select the synchronous commands to be executed upon receipt of a synchronous command pulse or a `TRIG3[:IMM]` command	`TRIG3[:IMM]`	N/A
To query the source of the TRIGger3 subsystem	`TRIG3:SOUR?`	`TTLT1`

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ABOR3

Description

`ABORt3` resets the TRIGger3 subsystem to the idle state.

Dependencies

- If `INIT3:CONT` is `ON`, the TRIGger3 subsystem immediately returns to the "wait for trigger" state.

Comments

- When the TRIGger3 subsystem is in the idle state, the Transport Overhead Receiver will not respond to any synchronous command pulses, or immediate trigger commands.
- When `INIT3:CONT` is `OFF`, this command aborts the synchronous command system.

Error Codes

None.

Related Commands

`INIT3:CONT`
`TRIG3 TRIG3:COMM`
`TRIG3:SOUR?`

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INIT3:CONT <state>

Description

INITiate3:CONTinuous <state> sets the TRIGger3 subsystem to be continuously initiated. The TRIGger3 subsystem controls the synchronous command pulse to the measurement system of the module's receiver. Continuous retriggering causes the measurement system to respond to all external synchronous command pulses or immediate trigger commands.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
state	boolean	OFF | 0 | ON | 1	none

Dependencies

None.

Comments

- With **INIT3:CONT** set to **OFF**, the trigger system remains in the idle state until **INIT3:CONT** is set to **ON**. Once **INIT3:CONT** is set to **ON**, the trigger system is initiated and enters the "wait for trigger" state. On completion of each trigger cycle, with **INIT3:CONT** set to **ON**, the trigger system immediately starts another trigger cycle without entering the idle state.
- With the trigger system set to cycle continuously, the **ABOR3** command forces the trigger system to the idle state, however, the value of **INIT3:CONT** is unaffected. If **INIT3:CONT** was set to **ON** prior to receiving **ABOR3**, it remains on and the trigger system immediately exits the idle state.
- The reset condition for **INIT3:CONT** is **OFF**.
- Note that with continuous initiation set to **ON**, the measurement system responds to external synchronous command pulses or trigger immediate commands.

Error Codes

None.

Related Commands

ABOR3
TRIG3
TRIG3:COMM
TRIG3:SOUR?

Query Command

INITiate3:CONTinuous? returns the currently selected state of the continuous initiation mode of the TRIGger3 subsystem.

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INIT3:CONT <state>

Response

Response Name	Response Type	Response Range	Default Units
state	boolean	0 | 1	none

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TRIG3:COMM <command>

Description

TRIGger3:COMMand <command> selects the command to be executed on receipt of a synchronous command pulse or a **TRIG3[:IMM]** command.

Parameters

Parameter Name	Parameters Type	Range of Values	Default Units
command	discrete	**STARt** | **STOP** | **ONCE** | **CONTinue**	none

Dependencies

- The command will be executed on the heartbeat pulse (TRIGger2) immediately following the synchronous command pulse (TRIGger3) or trigger immediate command.

Comments

- Any command is active until it is replaced by another command, regardless of how many synchronous command pulses or trigger immediate commands are received.
- **STARt** resets all measurement counters to zero and starts continuous measurement updates at the heartbeat rate. All measurement counters are latched into the last integration period result area and the measurement counters are reset to zero. The EIPER status bit in the OPERation status register is also updated.

  The integration period is determined by the time between synchronous command pulses on the selected VXI trigger line or **TRIG3[:IMM]** commands. There is no "dead time" between integration periods. Synchronous command pulses or **TRIG3[:IMM]** commands cause the retriggering of the **STARt** command at the end of each integration period interval.
- **STOP** stops the measurement system and freezes all measurement counters.
- **ONCE** is a transient state that takes one measurement. The first synchronous command pulse or **TRIG3:IMM** command after **ONCE** returns **TRIG3:COMM** to **STOP**. The EIPER status bit in the OPERation status register is not updated until another integration period has started. The result data for the completed integration period is not copied into the integration period result area until the new integration period has started.
- **CONT** resumes the measurement system from where it was stopped using the values in the measurement counters.
- The reset condition for **TRIG3:COMM** is **STOP**.
- Note that any command, except **ONCE**, is active until it is replaced by another command regardless of how many synchronous command pulses are received. **ONCE** can only be returned until the first synchronous command pulse or **TRIG3:IMM** command following the **TRIG3:COMM ONCE** command has been issued.

Error Codes

None.

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Related Commands

ABOR3
INIT3:CONT
TRIG3
TRIG3:SOUR?

Query Command

TRIGger3:COMMand? returns the currently selected command to be executed on receipt of a synchronous command pulse or a **TRIG3[:IMM]** command.

Response

Response Name	Response Type	Response Range	Default Units
command	discrete	**STAR** | **STOP** | **ONCE** | **CONT**	none

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TRIG3[:IMM]

Description

TRIGger3[:IMMediate] causes the TRIGger3 subsystem to trigger immediately. Normally, the TRIGger3 subsystem waits until it receives a synchronous command pulse before triggering. The **TRIG3[:IMM]** command, however, overrides this.

The command also selects the synchronous commands to be executed upon receipt of a synchronous command pulse or a **TRIG3[:IMM]** command.

Dependencies

- The TRIGger3 subsystem must be in the "wait for trigger" state to execute this command.

Comments

None.

Error Codes

None.

Related Commands

ABOR3
INIT3:CONT
TRIG3:COMM
TRIG3:SOUR?

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TRIG3:SOUR?

Description

TRIGger3:SOURce? returns the source of the TRIGger3 subsystem. The TRIGger3 subsystem's source is the odd-numbered VXI TTL trigger lines, one higher than that selected for the TRIGger2 subsystem.

Response

Response Name	Response Type	Response Range	Default Units
source	discrete	**TTLT1** | **TTLT3** | **TTLT5** | **TTLT7**	none

Dependencies

- The particular VXI TTL trigger line for the synchronous command pulse is selected by the **TRIG2:SOUR** command.

Comments

- As the TTL trigger lines are selected in pairs, the TTL trigger line is the odd-numbered line in the pair selected by the **TRIG2:SOUR** command.

Error Codes

None.

Related Commands

ABOR3
INIT3:CONT
TRIG2:SOUR?
TRIG3
TRIG3:COMM

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STATus Subsystem

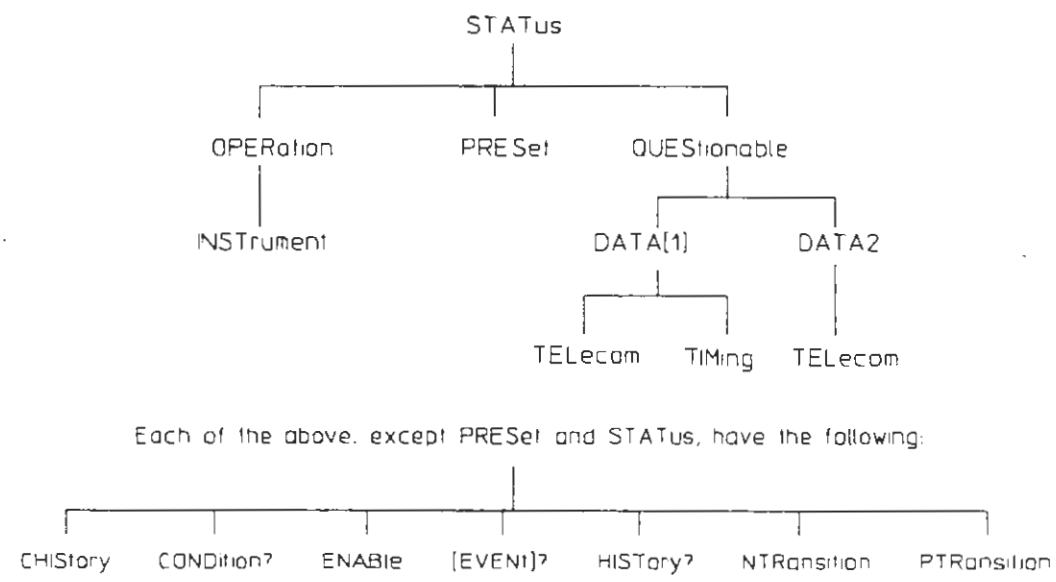
This subsystem controls the SCPI-defined status reporting structures. The IEEE 488.2 defines the status byte and standard event registers and are accessed via commands listed in the "IEEE 488.2 Common Command Reference" at the end of this chapter. The SCPI standard defines **QUEStionable** and **OPERation** registers; the HP E1676B defines all other registers. These registers are accessed via the STATus subsystem. All of these registers conform to the IEEE 488.2 specification and each includes a CONDition register, Positive and Negative TRansition registers, an EVENt register, an ENABle register, and a HISTory register.

This section contains:

- A SCPI Command Structure diagram for the subsystem.
- A SCPI Command Quick Reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



Subsystem Syntax

The subsystem syntax is shown in the following diagram.

```
STATus
      :PRESet
      :OPERation
            :CHIStory
            :CONDition?
            :ENABle <mask>
            :ENABle?
```


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```
        [:EVENt]?
        :HISTory?
        :INSTrument
             :CHIStory
             :CONDition?
             :ENABle <mask>
             :ENABle?
             [:EVENt]?
             :HISTory?
             :NTRansition <filter>
             :NTRansition?
             :PTRansition <filter>
             :PTRansition?
        :NTRansition <filter>
        :NTRansition?
        :PTRansition <filter>
        :PTRansition?
:QUEStionable
        :CHIStory
        :CONDition?
        :DATA[1]
             :CHIStory
             :CONDition?
             :ENABle <mask>
             :ENABle?
             [:EVENt]?
             :HISTory?
             :NTRansition <filter>
             :NTRansition?
             :PTRansition <filter>
             :PTRansition?
             :TELecom
                  :CHIStory
                  :CONDition?
                  :ENABle <mask>
                  :ENABle?
                  [:EVENt]?
                  :HISTory?
                  :NTRansition <filter>
                  :NTRansition?
                  :PTRansition <filter>
                  :PTRansition?
             :TIMing
                  :CHIStory
                  :CONDition?
                  :ENABle <mask>
                  :ENABle?
                  [:EVENt]?
                  :HISTory?
                  :NTRansition <filter>
                  :NTRansition?
                  :PTRansition <filter>
                  :PTRansition?
:DATA2
        :CHIStory
        :CONDition?
        :ENABle <mask>
        :ENABle?
        [:EVENt]?
        :HISTory?
        :NTRansition <filter>
        :NTRansition?
        :PTRansition <filter>
        :PTRansition?
        :TELecom
             :CHIStory
             :CONDition?
             :ENABle <mask>
             :ENABle?
             [:EVENt]?
             :HISTory?
             :NTRansition <filter>
```


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```
            :NTRansition?
            :PTRansition <filter>
            :PTRansition?
:ENABle <mask>
:ENABle?
[:EVENt]?
:HISTory?
:NTRansition <filter>
:NTRansition?
:PTRansition <filter>
:PTRansition?
```

Each Status register structure used by the module is described in the table below. For detailed information on each bit used in the registers, refer to "Status Reporting" at the beginning of this chapter.

The status register structures listed in the following table are used by the module to implement status reporting.

Status Register Structure	Description
DATA[1]	Series 90 specific, and conforms to IEEE 488.2. Monitors the quality of data with respect to the validity of the measurement results at STS-48/STM-16.
DATA2	Series 90 specific, and conforms to IEEE 488.2. Monitors the quality of data with respect to the validity of the measurement results for the instrument tributaries at STS-3/STM-1 and STS-12/STM-3.
INSTrument	Series 90 specific, and conforms to IEEE 488.2. Monitors general module conditions.
QUEStionable	Defined by SCPI.
OPERation	Defined by SCPI.
Event	Defined by IEEE 488.2. This register is accessed by issuing the ***ESR** or ***ESR?** common commands.
TELecom	Series 90 specific, and conforms to IEEE 488.2. Detects alarm and error conditions, and loss of signal and frame.
TIMing	Series 90 specific, and conforms to IEEE 488.2. Monitors the quality of the transmit signal at STS-48/STM-16. The register is updated every 100 ms.

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SCPI Command Quick Reference

The tasks and commands (abbreviated form) associated with the TRIGger3 subsystem are listed in the following table. More detailed information on the commands follows on after the table.

Task	Command
To preset the enable and transition filter registers.	**STAT:PRES**
To clear the HISTory registers associated with the specified status register.	**STAT:<register>:CHIS**
To check the contents of the specified CONDition register without resetting any of the bits in the register.	**STAT:<register>:COND?**
To set the enable mask for the specified register.	**STAT:<register>:ENAB**
To check the contents of the specified EVENt register, and reset all bits to 0.	**STAT:<register>[:EVEN]?**
To check the state of the HISTory register for the specified status register.	**STAT:<register>:HIST?**
To set the negative transition filter mask for the specified register.	**STAT:<register>:NTR**
To set the positive transition filter mask for the specified register.	**STAT:<register>:PTR**

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STAT:PRES

Description `STATus:PRESet` presets the enable and transition filter registers.

Parameters None.

Dependencies None.

Comments The SCPI status structure is preset to:

Register	ENABle	PTRansition	NTRansition
OPERation	all 0s	all 1s	all 0s
QUEStionable	all 0s	all 1s	all 0s
All others	all 1s	all 1s	all 1s

Error Codes None.

Related Commands `*CLS *SRE *ESE`

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STAT:<register>:CHIS

Description

`STATus:<register>:CHIStory` clears the HISTory registers associated with the specified status register.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
register	discrete	`QUEStionable` | `QUEStionable:DATA[1]` | `QUEStionable:DATA[1]:TELecom` | `QUEStionable:DATA[1]:TIMing` | `QUEStionable:DATA2` | `QUEStionable:DATA2:TELecom` | `QUEStionable:DATA3` | `QUEStionable:DATA3:TELecom` | `OPERation`	none

Dependencies

- `STAT:<register>:CHIS` clears the HISTory register, except when the instrument is gating. In this case, the HISTory register is set to the value of the CONDition register.

Comments

None.

Error Codes

None.

Related Commands

`STAT:<register>:HIST?`
`INIT2:CONT`
`INIT3:CONT`
`TRIG3:COMM`

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STAT:<register>:COND?

Description

`STATus:<register>:CONDition?` returns the contents of the specified CONDition register without resetting any of the bits in the register.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
register	discrete	`QUEStionable` | `QUEStionable:DATA[1]` | `QUEStionable:DATA[1]:TELecom` | `QUEStionable:DATA[1]:TIMing` | `QUEStionable:DATA2` | `QUEStionable:DATA2:TELecom` | `QUEStionable:DATA3` | `QUEStionable:DATA3:TELecom` | `OPERation`	none

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	0 to 32767	none

Dependencies

None.

Comments

None.

Error Codes

None.

Related Commands

`STAT:<register>?`
`STAT:<register>:ENAB`
`STAT:<register>:NTR`
`STAT:<register>:PTR`
`STAT:<register>:HIST?`

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STAT:<register>:ENAB

Description

`STATus:<register>:ENABle` sets the enable mask for the specified register. Each bit within the specified register is capable of influencing the register's summary bit. The summary bit is the logical OR of all the bits in the specified status register's EVENt register that have a logical 1 in the corresponding enable mask bit.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
register	discrete	`QUEStionable` | `QUEStionable:DATA[1]` | `QUEStionable:DATA[1]:TELecom` | `QUEStionable:DATA[1]:TIMing` | `QUEStionable:DATA2` | `QUEStionable:DATA2:TELecom` | `QUEStionable:DATA3` | `QUEStionable:DATA3:TELecom` | `OPERation`	none
mask	numeric	0 to 32767	none

Dependencies

None.

Comments

- <mask> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.

Error Codes

None.

Related Commands

```
STAT:<register>:COND?
STAT:<register>?
STAT:<register>:NTR
STAT:<register>:PTR
STAT:<register>:HIST?
```

Query Command

Returns the value of the enable mask for the specified register. The query command is in the form `STATus:<register>:ENABle?`, and the response range is 0 to 32767.

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STAT:<register>[:EVEN]?

Description

`STATus:<register>[:EVENt]?` returns the contents of the specified EVENt register, and resets all bits to `0`.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
register	discrete	`QUEStionable` | `QUEStionable:DATA[1]` | `QUEStionable:DATA[1]:TELecom` | `QUEStionable:DATA[1]:TIMing` | `QUEStionable:DATA2` | `QUEStionable:DATA2:TELecom` | `QUEStionable:DATA3` | `QUEStionable:DATA3:TELecom` | `OPERation`	none
mask	numeric	`0` to `32767`	none

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	`0` to `32767`	none

Dependencies

None.

Comments

None.

Error Codes

None.

Related Commands

`STAT:<register>:COND?`
`STAT:<register>:ENAB`
`STAT:<register>:NTR`
`STAT:<register>:PTR`

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STAT:<register>:HIST?

Description

`STATus:<register>:HISTory?` returns the state of the HISTory register for the specified status register.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
register	discrete	`QUEStionable` | `QUEStionable:DATA[1]` | `QUEStionable:DATA[1]:TELecom` | `QUEStionable:DATA[1]:TIMing` | `QUEStionable:DATA2` | `QUEStionable:DATA2:TELecom` | `QUEStionable:DATA3` | `QUEStionable:DATA3:TELecom` | `OPERation`	none

Response

Response Name	Response Type	Response Range	Default Units
value	numeric	0 to 32767	none

Dependencies

None.

Comments

- The history of a status register is the logical OR of all bits set in the relevant CONDition register since the start of a gating period or the last `STAT:<register>:CHIS` command.

Error Codes

None.

Related Commands

`STAT:<register>?`
`STAT:<register>:COND?`
`STAT:<register>:ENAB`
`STAT:<register>:NTR`
`STAT:<register>:PTR`
`STAT:<register>:CHIS`
`*CLS`

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STAT:<register>:NTR

Description

STATus:<register>:NTRansition sets the negative transition filter mask for the specified register.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units
register	discrete	**QUEStionable** | **QUEStionable:DATA[1]** | **QUEStionable:DATA[1]:TELecom** | **QUEStionable:DATA[1]:TIMing** | **QUEStionable:DATA2** | **QUEStionable:DATA2:TELecom** | **QUEStionable:DATA3** | **QUEStionable:DATA3:TELecom** | **OPERation**	none
mask	numeric	0 to **32767**	none

Dependencies

None.

Comments

- A 1 to 0 transition in one of the specified status register's CONDition register bits will cause a 0 to 1 transition in the corresponding EVENt register bit only if the corresponding bit in the negative transition filter is set.
- <filter> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.

Error Codes

None.

Related Commands

STAT:<register>?
STAT:<register>:COND?
STAT:<register>:ENAB
STAT:<register>:PTR
STAT:<register>:HIST?

Query Command

Returns the value of the negative transition filter mask for the specified register. The query command is in the form **STATus:<register>:NTRansition?**, and the response range is **0** to **32767**.

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STAT:<register>:PTR

Description

`STATus:<register>:PTRansition` sets the positive transition filter mask for the specified register.

Parameters

Parameter Name	Parameter Type	Parameter Range	Default Units

register	discrete	`QUEStionable`
		|
		`QUEStionable:DATA[1]`
		|
		`QUEStionable:DATA[1]:TELecom`
		|
		`QUEStionable:DATA[1]:TIMing`
		|
		`QUEStionable:DATA2`
		|
		`QUEStionable:DATA2:TELecom`
		|
		`QUEStionable:DATA3`
		|
		`QUEStionable:DATA3:TELecom`
		| `OPERation`	

mask	numeric	0 to 32767	none

Dependencies

None.

Comments

- A 1 to 0 transition in one of the specified status register's CONDition register bits will cause a 0 to 1 transition in the corresponding EVENt register bit only if the corresponding bit in the positive transition filter is set.
- <filter> can be specified in decimal, hexadecimal (#H), octal (#Q), or binary (#B) format.

Error Codes

None.

Related Commands

```
STAT:<register>?
STAT:<register>:COND?
STAT:<register>:ENAB
STAT:<register>:NTR
STAT:<register>:HIST?
```


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Query Command

Returns the state of the positive transition filter mask for the specified register. The query command is in the form **STATus:<register>:PTRansition?**, and the response range is **0** to **32767**.

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SYSTem Subsystem

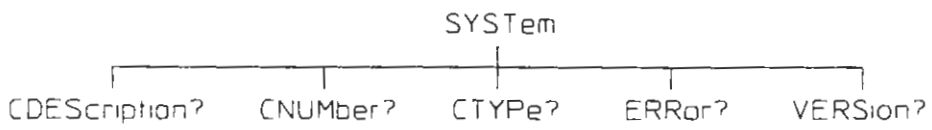
This subsystem incorporates functions that are not related to instrument performance.

This section contains:

- A SCPI Command Structure diagram.
- A SCPI Command Quick Reference for the subsystem.
- Detailed information on each command in the subsystem.

SCPI Command Structure Diagram

The subsystem command structure is shown in the following diagram.



SCPI Command Quick Reference

The tasks and commands (abbreviated form) associated with the SYSTem subsystem are listed in the following table. More detailed information on the commands follows on after the table.

Task	Command
To check the error at the top of the instrument error queue.	**SYST:CDES?**
To check the error at the top of the instrument error queue.	**SYST:CNUM?**
To check the error at the top of the instrument error queue.	**SYST:CTYP?**
To check the error at the top of the instrument error queue.	**SYST:ERR?**
To check the module's SCPI version number.	**SYST:VERS?**

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SYST:CDES?

Description

SYSTem:CDEScription? <module> returns a textual description of the specified servant module allocated to the transport overhead module by the Resource Manager.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
module	numeric	`0 to n` (See "Comments")	none

Response

Response Name	Response Type	Response range	Default Units
description	string	See "Comments"	none

Dependencies

- The parameter <module> must be less than or equal to the number of servant modules to the transport overhead module. The **`SYST:CNUM`** command identifies how many servants are allocated.

Comments

- The maximum value for <module> is that which is returned by the **`SYST:CNUM?`** command.
- The description of module 0 is always "No Interface".
- Other possible responses are:

  "SONET/SDH Timing Reference"

  "Unknown Interface"

Error Codes

-151 "Servant access failure" Read access to the line interface module VXI ID register or VXI device type register failed.

Example

To get a description of servant number 1:
SYST:CDES? 1

Response:
"SONET/SDH Timing Reference"

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SYST:CDES?

Related Commands

```
SYST:CNUM?
SYST:CTYP?
```


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SYST:CNUM?

SYSTem:CNUMber? returns the number of servant modules that are allocated to the transport overhead module by the Resource Manager.

Parameters

None.

Response

Response Name	Response Type	Response Range	Default Units
module	numeric	0 to 254	none

Dependencies

None.

Comments

- Zero indicates that no servant modules are allocated to the transport overhead module.

Error Codes

None.

Example

To identify how many servant modules are allocated:

```
SYST:CNUM?
```

Response:

```
2
```

Related Commands

```
SYST:CDES?
SYST:CTYP?
```


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SYST:CTYP?

SYSTem:CTYPe? <module> returns the type of servant module allocated to the transport overhead module by the Resource Manager.

Parameters

Parameter Name	Parameter Type	Range of Values	Default Units
module	numeric	`0 to n` (See "Comments")	none

Response

Response Name	Response Type	Response Range	Default Units
type	string	See "Comments"	none

Dependencies

- The parameter <module> must be less than or equal to the number of servant modules to the transport overhead module. The **`SYST:CNUM`** command identifies how many servants are allocated.

Comments

- The maximum value for <module> is that which is returned by the **`SYST:CNUM?`** command.
- The type of servant module 0 is always "NONE,NONE,0,0".
- Other possible responses are:

  "HEWLETT-PACKARD,E1679A,0,0"

  "HEWLETT-PACKARD,UNKNOWN,0,0"

  "UNKNOWN,UNKNOWN,0,0"

Error Codes

-151 "Servant access failure" Read access to the line interface module VXI ID register or VXI device type register failed.

Example

To identify the type of servant module 2:
SYST:CTYP? 2

Response:
"HEWLETT-PACKARD,E1679A,0,0"

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SYST:CTYP?

Related Commands

```
SYST:CNUM?
SYST:CDES?
```


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SYST:ERR?

Description

`SYSTem:ERRor?` returns the error from the top of the instrument error queue. System errors are placed in a first-in-first-out queue as they are detected.

Parameters

None.

Response

Response Name	Response Type	Response Range	Default Units
error no.	numeric	-32768 to 32767	none
error\string	string	0 to 255 characters	none

Dependencies

None.

Comments

- If there are no errors in the queue, then (0, "No error") will be returned.
- If the queue overflows, the last error in the queue will be replaced with –350, "Too many errors".
- The error queue will be cleared:
  - At power up.
  - On receipt of `*CLS` command.
  - On removal of the last item from the queue.
- A complete list of error codes are given in *Appendix B*.

Error Codes

None.

Related Commands

None.

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SYST:VERS?

Description `SYSTem:VERSion?` returns the module's SCPI version number.

Response

Response Name	Response Type	Response Range	Default Units
version	numeric	*XXXX.Y* (see "Comments" below)	none

Dependencies None.

Comments

- *XXXX* corresponds to the year of the SCPI revision.
- *Y* corresponds to the approved revision.

Error Codes None.

Related Commands None.

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IEEE 488.2 Common Command Format

Common commands (as defined by the IEEE 488.2 Standard) perform functions such as reset, self-test, status byte query and so on. The command format comprises an asterisk (*) and a command keyword. The command may also include parameters which must be separated from the keyword by a space character. Some examples of common commands are:

```
*RST
*STB?
```


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IEEE 488.2 Common Command Reference

The IEEE 488.2 common commands which are used to control the module are listed in the following table.

Task	Command
To clear the event registers and error queue.	`*CLS`
Event Status enable.	`*ESE <numeric>`
To check the content of the Event Status enable register.	`*ESE?`
To check the content of the Event Status register.	`*ESR?`
To check the module's identity.	`*IDN?`
Operation complete.	`*OPC`
To reset the module to its default values.	`*RST`
Service Request enable, see also *Status Reporting.*	`*SRE <numeric>`
To check the content of the Service Request enable register.	`*SRE?`
To check the content of the Status Byte register.	`*STB?`
Wait-to-continue.	`*WAI`
Trigger.	`*TRG`
To run the module self-test.	`*TST?`

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Linking IEEE 488.2 and SCPI Commands

The IEEE 488.2 common commands and SCPI commands can be linked using a semicolon (;). Examples of linking commands are:

```
*RST;SOUR:DATA:TEL:ALAR
SOUR2:TRIG:SOUR;*STB?
```


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Default Settings

The module default settings and associated SCPI commands are listed in the following table.

NOTE The module can be configured to its default settings by using the SCPI **SYSTem:PRESet** command, or the ***RST** IEEE 488.2 common command.

Commands	Default Settings
Generator Section	
INP3:TEL:RATE	STS3
INP8:TEL:RATE	STS48C
OUTP:TEL:RATE	STS48
CLOC:SOUR	TRIB
DATA:TEL:ALAR	NONE
DATA:TEL:ALAR:FERF	NONE
DATA:TEL:ALAR:FERF:FLEN	1,4
DATA:TEL:ALAR:FERF:MFL	1
DATA:TEL:ALAR:FERF:NFL	63
DATA:TEL:ALAR:FERF:PFL	0
DATA:TEL:ALAR:LAIS	NONE
DATA:TEL:ALAR:LAIS:FLEN	1,4
DATA:TEL:ALAR:LAIS:MFL	1
DATA:TEL:ALAR:LAIS:NFL	63
DATA:TEL:ALAR:LAIS:PFL	0
DATA:TEL:ALAR:PAIS	NONE
DATA:TEL:ALAR:PAIS:FLEN	1,4
DATA:TEL:ALAR:PAIS:MFL	1
DATA:TEL:ALAR:PAIS:NFL	63
DATA:TEL:ALAR:PAIS:PFL	0

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Default Settings

Commands	Default Settings
DATA:TEL:ALAR:PFER	NONE
DATA:TEL:ALAR:PFER:FLEN	1,4
DATA:TEL:ALAR:PFER:MFL	1
DATA:TEL:ALAR:PFER:NFL	63
DATA:TEL:ALAR:PFER:PFL	0
DATA:TEL:ALT:APSW	NONE
DATA:TEL:ALT:APSW:FLEN	1,4
DATA:TEL:ALT:APSW:MFL	1
DATA:TEL:ALT:APSW:NFL	63
DATA:TEL:ALT:APSW:PFL	0
DATA:TEL:ALT:APSW:VAL	0
DATA:TEL:ERR:DATA	NONE
DATA:TEL:ERR:DATA:RATE	1E-3
DATA:TEL:ERR:FEBE	NONE
DATA:TEL:ERR:FEBE:RATE	1.0E-5
DATA:TEL:ERR:FEBE:VAL	1
DATA:TEL:ERR:LBIP	NONE
DATA:TEL:ERR:LBIP:CHAN	1
DATA:TEL:ERR:LBIP:MASK	1
DATA:TEL:ERR:LBIP:RATE	1E-3
DATA:TEL:ERR:MSF	NONE
DATA:TEL:ERR:MSF:RATE	1.0E-5
DATA:TEL:ERR:MSF:VAL	1
DATA:TEL:ERR:POIN	NONE
DATA:TEL:ERR:POIN:FLEN	1,4

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Commands	Default Settings
DATA:TEL:ERR:POIN:MASK	1
DATA:TEL:ERR:POIN:MASK:STAT	OFF
DATA:TEL:ERR:POIN:MFL	1
DATA:TEL:ERR:POIN:NFL	63
DATA:TEL:ERR:POIN:PFL	0
DATA:TEL:ERR:PRBS	NONE
DATA:TEL:ERR:PRBS:RATE	1.0E-5
DATA:TEL:ERR:PBIP	NONE
DATA:TEL:ERR:PBIP:RATE	1.0E-5
DATA:TEL:ERR:PRIB:MASK	1
DATA:TEL:ERR:SBIP	NONE
DATA:TEL:ERR:SBIP:MASK	1
DATA:TEL:ERR:SBIP:RATE	1E-5
DATA:TEL:FWOR	NONE
DATA:TEL:FWOR:ERR	NONE
DATA:TEL:FWOR:ERR:CHAN	1,0
DATA:TEL:FWOR:ERR:CHAN2	1,0
DATA:TEL:FWOR:ERR:FLEN	1,4
DATA:TEL:FWOR:ERR:MASK	92
DATA:TEL:FWOR:ERR:MASK2	130
DATA:TEL:FWOR:ERR:MFL	1
DATA:TEL:FWOR:ERR:NFL	63
DATA:TEL:FWOR:ERR:PFL	0
DATA:TEL:FWOR:LOSS	NONE
DATA:TEL:FWOR:LOSS:FLEN	1,4
DATA:TEL:FWOR:LOSS:MASK	1
DATA:TEL:FWOR:LOSS:MASK2	0
DATA:TEL:FWOR:LOSS:MFL	1
DATA:TEL:FWOR:LOSS:NFL	63

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Default Settings

Commands	Default Settings
DATA:TEL:FWOR:LOSS:PFL	0
DATA:TEL:LDCC:SOUR	INT
DATA:TEL:NEL	TERM
DATA:TEL:NEL:REP	0
DATA:TEL:NEL:THR	0
DATA:TEL:OVER:ARR:J0	NULL STRING
DATA:TEL:OVER<n>:COUN	Dependent on <n>
DATA:TEL:OVER:DATA	See table on page 5-83
DATA:TEL:OVER:DATA:ALL	See table on page 5-83
DATA:TEL:OVER:J0:FORM	SINGLE
DATA:TEL:OVER:SOUR	NORM
DATA:TEL:OVER:SOUR:SEQ	NONE
DATA:TEL:OVER:SOUR:SEQ:LOOP	3
DATA:TEL:OVER:WDAT	0
DATA:TEL:PATT	NONE
DATA:TEL:PATT:LENG	1
DATA:TEL:PAYL	DATA

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Default Settings

Commands	Default Settings
DATA:TEL:PAYL:BDAT %<1..48>,	VAL
DATA:TEL:PAYL:BDAT:VAL %<1..48>,	0
DATA:TEL:PAYL:BDAT:ALL	VAL
DATA:TEL:PAYL:BDAT:ALL:VAL	0
DATA:TEL:PAYL:PATT	PRBS23
DATA:TEL:PAYL:SOUR %<1..16>,	INT
DATA:TEL:PAYL:SOUR:ALL	INT
DATA:TEL:POIN	NONE
DATA:TEL:POIN:DIR	UP
DATA:TEL:POIN:NDEL	1
DATA:TEL:POIN:NDV	0
DATA:TEL:POIN:RATE	+1
DATA:TEL:POIN:SBIT	DEF
DATA:TEL:POIN:SBIT:VAL	0
DATA:TEL:POIN:SEQ	MRAT
DATA:TEL:POIN:SEQ:DIR	UP
DATA:TEL:POIN:SOUR	OVER
DATA:TEL:POV:ARR:J1	NULL STRING
DATA:TEL:POV:J1	0
DATA:TEL:POV:J1:FORM	LONG
DATA:TEL:POV:SOUR	INT
DATA:TEL:SCR	ON
DATA:TEL:SDCC:SOUR	INT
DATA:TEL:UND:SOUR	INT
DATA:TEL:USER:SOUR	INT
SOUR2:TRIG:SOUR	NONE

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Commands	Default Settings
SOUR6:TRIG:SOUR	FPUL
SOUR7	M155
Receiver Section	
OUTP3:TEL:RATE	STS3
OUTP8:TEL:RATE	STS48C
INP:TEL:RATE	STS48
SENS:DATA:TEL:ALAR:FERF:CFBA	5
SENS:DATA:TEL:ALAR:FERF:CFBN	5
SENS:DATA:TEL:ALAR:LAIS:CFBA	5
SENS:DATA:TEL:ALAR:LAIS:CFBN	5
SENS:DATA:TEL:ALAR:OOFR:CFBA	4
SENS:DATA:TEL:ALAR:LOFR:TIM	INT
SENS:DATA:TEL:ALAR:OVER:J0:FORM	SING
SENS:DATA:TEL:PAYL	DATA
SENS:DATA:TEL:PAYL:PATT	PRBS23
SENS:DATA:TEL:POV:J1:FORM	LONG
SENS:DATA:TEL:SCR	ON
SOUR3:DATA:SOUR	1
SOUR4:TRIG:SOUR	NONE
SOUR5:PULS2:PER	1
SOUR9:DATA:DOV:SOUR	NONE,1,0
SOUR9:DATA:POV:SOUR	NONE
SOUR9:DATA:SOUR	NONE
SOUR9:DATA:UND:SOUR	1,1,1
INIT2:CONT	OFF

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Default Settings

Commands	Default Settings
INIT3:CONT	OFF
TRIG[1]:CHAN	1
TRIG[1]:LOG	CHAN
TRIG[1]:LOG:DATA	OVER
TRIG[1]:LOG:MASK	255
TRIG[1]:LOG:OBYT	A1,0
TRIG[1]:LOG:PBYT	J1,0
TRIG[1]:LOG:TEV:SLOP	POS
TRIG[1]:LOG:VAL	0
TRIG[1]:SOUR	1MM
TRIG2:SOUR	TTLT0
TRIG3:COMM	STOP
TRIG3:CONT	OFF
OUTP5:TTLT<n>	OFF
SYST:RCAR	0

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6

Performance Tests

About this Chapter

This chapter contains information to enable you to test the HP E1676B (including Option 001) to the warranted specification given in Appendix A, and comprises the following sections:

- **Recommended Test Equipment**
  Lists the equipment required for performance testing the module.
- **Calibration Cycle**
  Recommends the time period between verification of performance.
- **Operational Verification**
  Provides tests which quickly establish with >90% confidence the module is performing properly, without testing the full warranted specification.
- **Performance Tests**
  Contains the performance test procedures. Each test is self-contained, and the tests can be performed individually or in any order. The tests, and the order in which they appear, are listed below.

1 Loopback Operation (TRIButary Mode)

2 Rate Tolerance

3 Trigger Outputs & Frame Pulse/Eye Clock Output

4 Reference Clock Output

5 Serial Port Check

6 ATM Port Check (Option 001 only)

7 Loopback Operation (MULTIrate Mode)

- **Test Records**
  Contains an Operational Verification Test Record and a Performance Test Record for recording the results of each test.

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Recommended Test Equipment

Test equipment which meets or exceeds the critical specifications may be substituted for the recommended model.

Instrument	Critical Specification	Recommended Model	Use
HP 75000 Series 90 Analyzer	Line Rates 155 Mb/s and 622 Mb/s.	HP E1650B	All tests
VT/TU Payload Modules	Unique	HP E1683A/84A	All tests
Signal Generator	Frequency accuracy: ±0.005% at 155.52 MHz.	HP 8656B	2
50Ω BNC-BNC Cable*	Qty 2.	HP 8120-1839	2, 3
Power Supply	Supplies –2.45 Vdc.	HP 6281A	3
Oscilloscope	20 GHz Bandwidth.	HP 54121T	3
ECL Terminator	50Ω. Qty 2.	HP 10086A	3
ECL Termination Cable	Unique. Qty 2.	See Cabling section.	3
Frequency Counter	Frequency range: 1 Hz to ≥200 MHz.	HP 5335A Opt.030,010	4
HP Datacom Analyzer	Unique. Qty 1.	HP 37732A	5
Serial Data Port Cable	Unique. Qty 1.	See Cabling section.	5
2.4 Gb/s ATM Analyzer	Unique. Qty 1.	HP E1615A	6
SMA-SMA Cable	Qty 2.	HP 8120-4948	All tests
SMA-SMA Cable	Qty 4.	HP E1650-64203	All tests

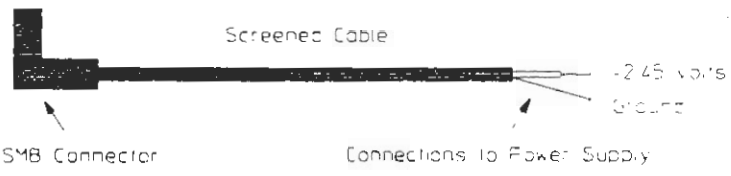
* Connect the SMA-BNC adapters to the 50Ω BNC-BNC cables, to form the 50Ω SMA-BNC cables required for each performance test.

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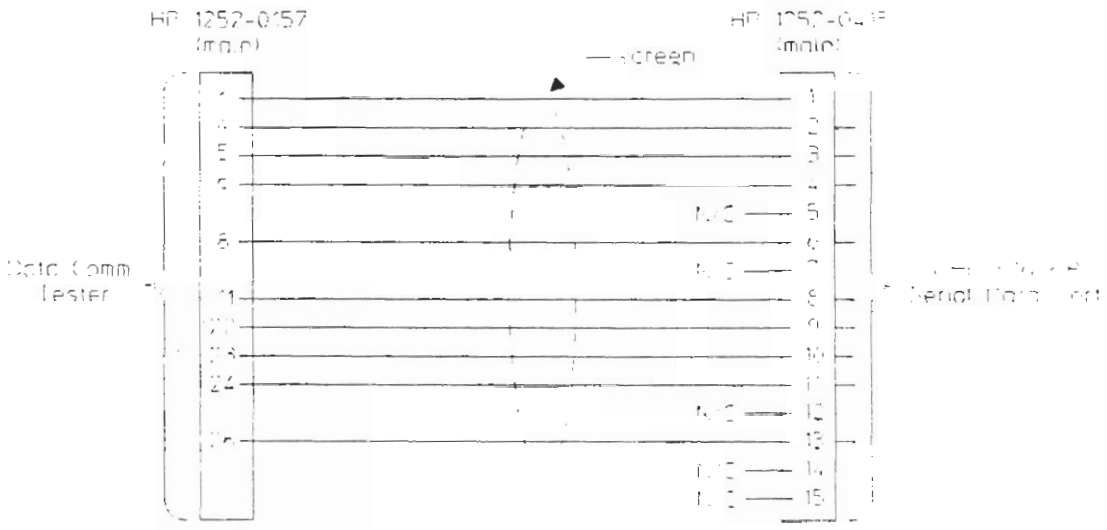
Cabling

The following unique cables are required during performance testing:

- **ECL termination** - The HP 10086A ECL Terminator provides proper bias and termination impedance for the *155.52 MHz Clock Out* port on the HP E1676B. The HP 10086A connects to the Clock Out port via the SMA connector. The bias is provided from a –2.45 V power supply via the SMB connector.



- **Serial Data Port** - If the HP E1676B is used in an electrically noisy environment it is recommended that a double screen cable is applied to the *Serial Data* port. The cabling diagram for the port is shown below;



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Calibration Cycle

The module requires periodic verification of its performance. Depending on the use and environmental conditions, the module should be checked using the performance tests at least every 24 months. Results recorded on the Performance Test Record can be used for comparison in calibration.

Operational Verification

Perform Performance Test· 1& 7, "Loopback Operation" to quickly establish with >90% confidence that the module meets the warranted specifications listed in Appendix A.

Performance Tests

CAUTION The VXIbus Mainframe and module-under-test must be powered-up for a minimum of 30 minutes before carrying out any tests.

NOTE If any of the performance tests fail, refer to *Returning the Module for Service* in Chapter 1 for information.

SONET/SDH Format

The tests in this chapter refer only to SONET format, however, the tests can also be performed in SDH format. To perform the tests in SDH format, substitute the STS-3, STS-12, and STS-48 SONET formats for their equivalent STM-1, STM-4, and STM-16 SDH formats respectively. Also, where reference is made to STS#1, substitute STM#1.

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Performance Test 1
Loopback Operation (TRIButary Mode)

Description

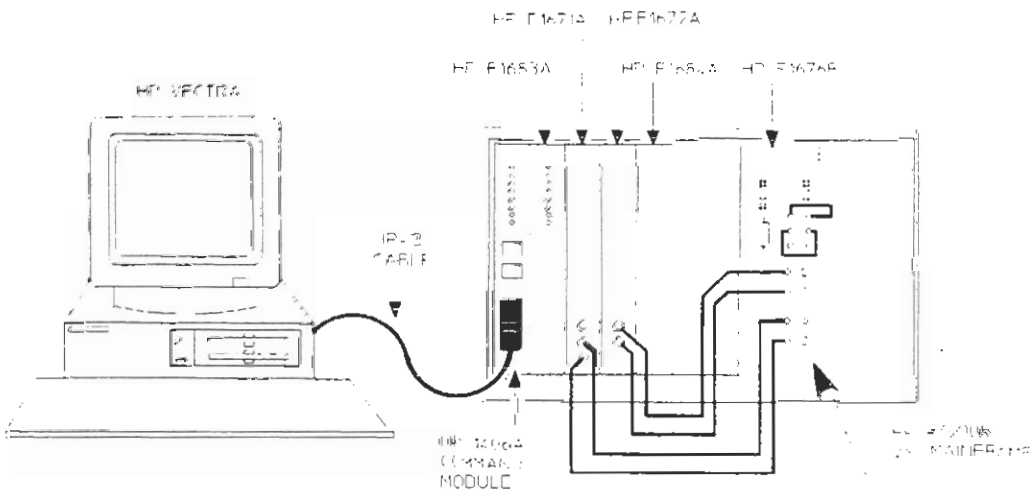
A Transport Overhead Generator and a Payload Generator are used to produce frames with a PRBS23 payload for testing the HP E1676B optical interface. These frames are passed to the HP E1676B and mapped into the 2.488 Gbit/s hierarchal rate. The HP E1676B transmitter and receiver ports are connected together via a loopback arrangement. The appropriate 622 Mbit/s or 155 Mbit/s tributary is dropped and sent back to the Transport Overhead Receiver and Payload Receiver to confirm that the module is capable of adding then dropping 155/622 Mbit/s data without errors.

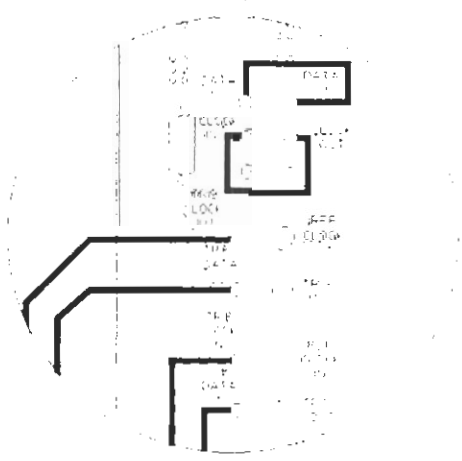
Equipment

HP 75000 Series 90 Analyzer	HP E1650B
Payload Generator/Receiver	HP E1683A/84A
SMA-SMA Cable, Qty2	HP 8120-4948
SMA-SMA Cable, Qty 4	HP E1650-64203

Procedure

1 Connect the equipment as shown below.





2 Click on the HP E1676B "Other" subpanel, ensure the TRIB/MULTI mode selection is TRIB.

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3 Change the settings on the HP E1676B panel to the following:

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Signal	SONET (STS-48)	**Signal**	SONET (STS-48)
Op Mode	Trib Add		
Add	STS3 # 1-2-3-4		
Channel	On Off Off Off	**Drop Channel**	STS-3 #1

4 Change the settings on the HP E1671A and HP E1672A panels to the following:

HP E1671A: Setup Subpanel		HP E1672A: Setup Subpanel	
Format	STS-3	**Format**	STS-3
Add	STS#1 -2 -3		
Channel	On Off Off		
Transmit I/F	Binary	**Receive I/F**	Binary

5 Change the settings on the HP E1683A and HP E1684A panels to the following:

HP E1683A: Setup Subpanel		HP E1684A: Setup Subpanel	
Channel	STS#1	**Channel**	STS#1
Payload	SPE (Unmap)	**Payload**	SPE (Unmap)
Payload Setup Test Pattern	PRBS23	**Payload Setup Test Pattern**	PRBS23

6 Start the measurement by selecting START on the HP E1651A subpanel.

7 Select the Status check that there are no active alarms or error counts on the HP E1676B.

8 Select the Status subpanel, check that there are no active alarms or error counts on the Transport Overhead Receiver.

9 Check that there are no active alarms or error counts on the Payload Receiver.

10 Click the mouse on the Stop button on the HP E1651A System panel to stop the gating.

11 Change the settings on the HP E1676B panel to the following:

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Signal	SONET (STS-48)	**Signal**	SONET (STS-48)
Op Mode	Trib Add		
Add	STS12 # 1-2-3-4		
Channel	On Off Off Off	**Drop Channel**	STS-12 #1

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12 Change the settings on the HP E1671A and HP E1672A panels to the following:

HP E1671A: Setup Subpanel		HP E1672A: Setup Subpanel	
Format	STS-12	**Format**	STS-12
Add	STS#1 -2 -3		
Channel	On Off Off		
Transmit I/F	Binary	**Receive I/F**	Binary

NOTE If you make any changes on the HP E1671/2A then the HP E1651A, 70900, **System 1** will go **Local** on the Tx/Rx.

13 Repeat steps 6 through to 10.

14 Change the settings on the HP E1676B panel to the following:

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Signal	SONET (STS-48)	**Signal**	SONET (STS-48)
Op Mode	Trib Add		
Add	STS3 # 5-6-7-8		
Channel	Off Off On Off	**Drop Channel**	STS-3 #7

15 Repeat step 14 for following channels 12, 16.

NOTE **Add** and **Drop Channel** must be the same on the Transmitter and Receiver.

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Performance Test 2
Rate Tolerance

Specification

Data Rates : STS-3/STM-1 mode (155.52 MHz).
: STS-12/STM-4 mode (622.08 MHz).

Tolerance : ±50 ppm.

Description

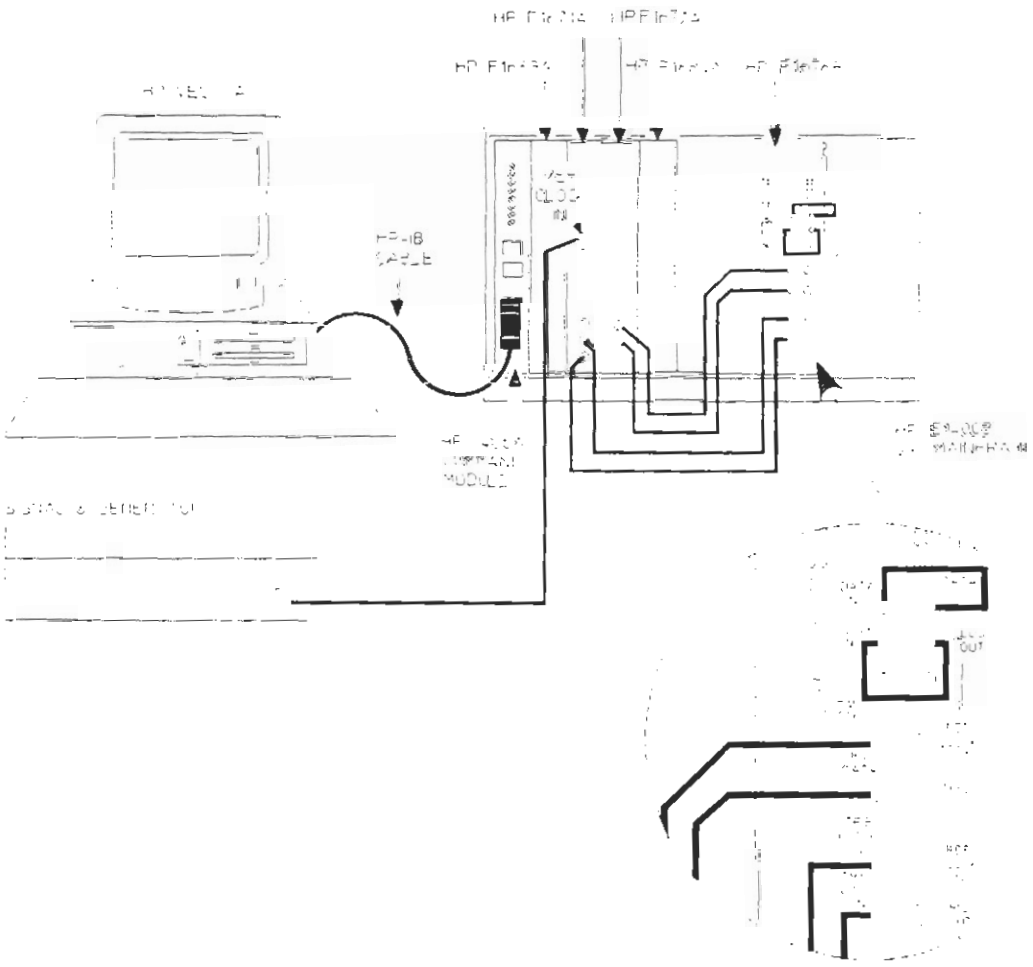
The Transport Overhead Generator and Signal Generator are used to provide STS-3 and STS-12 signals offset by ±50 ppm to check that the HP E1676B input rate tolerance is within the specified range.

Equipment

HP 75000 Series 90 Analyzer	HP E1650B
Payload Generator/Receiver	HP E1683A/84A
Signal Generator	HP 8656B
50Ω BNC-BNC Cable	HP 8120-1839

Procedure

1 Connect the equipment as shown below.



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2 Set the Signal Generator to provide a frequency of 155.520000 MHz at +4 dBm.

3 Change the HP E1676B settings as follows:

Transmitter: Setup Subpanel	
Add	STS3 All

4 Change the settings on the HP E1671A and HP E1672A panels to the following:

HP E1671A: Setup Subpanel		HP E1672A: Setup Subpanel	
Format	STS-3	**Format**	STS-3
Clock	External		
Channel	Off Off Off		
Transmit I/F	Binary	**Receive I/F**	Binary

5 Set the HP 8656B Generator to **OFFSET** by ± 50 ppm and check that the BIP LEDs come on the Transmitter Overhead Receiver and E1676B. Remember that the LEDs will go off as the unit locks up.

6 Set the HP E1676B Add and Drop Channel to **STS-12**, and the HP E1671A and HP E1672A format to **STS-12**.

7 Repeat steps 2 to 6 for the STS-12 line rate (622.08 MHz).

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Performance Test 3
Trigger Outputs & Frame Pulse/Eye Clock Output

Specification

Transmitter

Trigger Source	Trigger Signal	Trigger Source	Trigger Signal
Frame pulse	pulse	Errored Section/RS BIP (B1)	pulse
Section/RS BIP	pulse	Errored Line/MS BIP (B2)	pulse
Scrambler	level	Errored B3	pulse
Line MS-FERF	level	Errored PRBS pattern	pulse
Line/MS-AIS	level	Errored Path FEBE	pulse
APS/MSP change	level	Errored MS FEBE	pulse
Frameword on/off	level	Pointer Action	pulse
Errored Frameword	level	Errored STS/STM data	pulse

Level: TTL compatible.

Pulse: 1 µs (nominal) high pulse.

Receiver

Trigger Source	Trigger Signal	Trigger Source	Trigger Signal
Out Of Frame	level	B1 Errors	pulse
Loss Of Frame	level	B2 Errors	pulse
Frame pulse	pulse	B3 Errors	pulse
Section/RS BIP	pulse	Line/MS FEBE Errors	pulse
Descrambler	level	Path FEBE Errors	pulse
Line MS-FERF	level	PRBS Errors	pulse
Line/MS-AIS	level	Pointer Action	pulse
Snapshot mem triggered - single	pulse	Pointer Realign	pulse
Snapshot mem triggered - repetitive	pulse	Start of Payload (J1)	pulse

Level: TTL compatible.

Pulse: 1 µs (nominal) high pulse, except B1, B2 and B3 which are 100 ms wide.

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Description

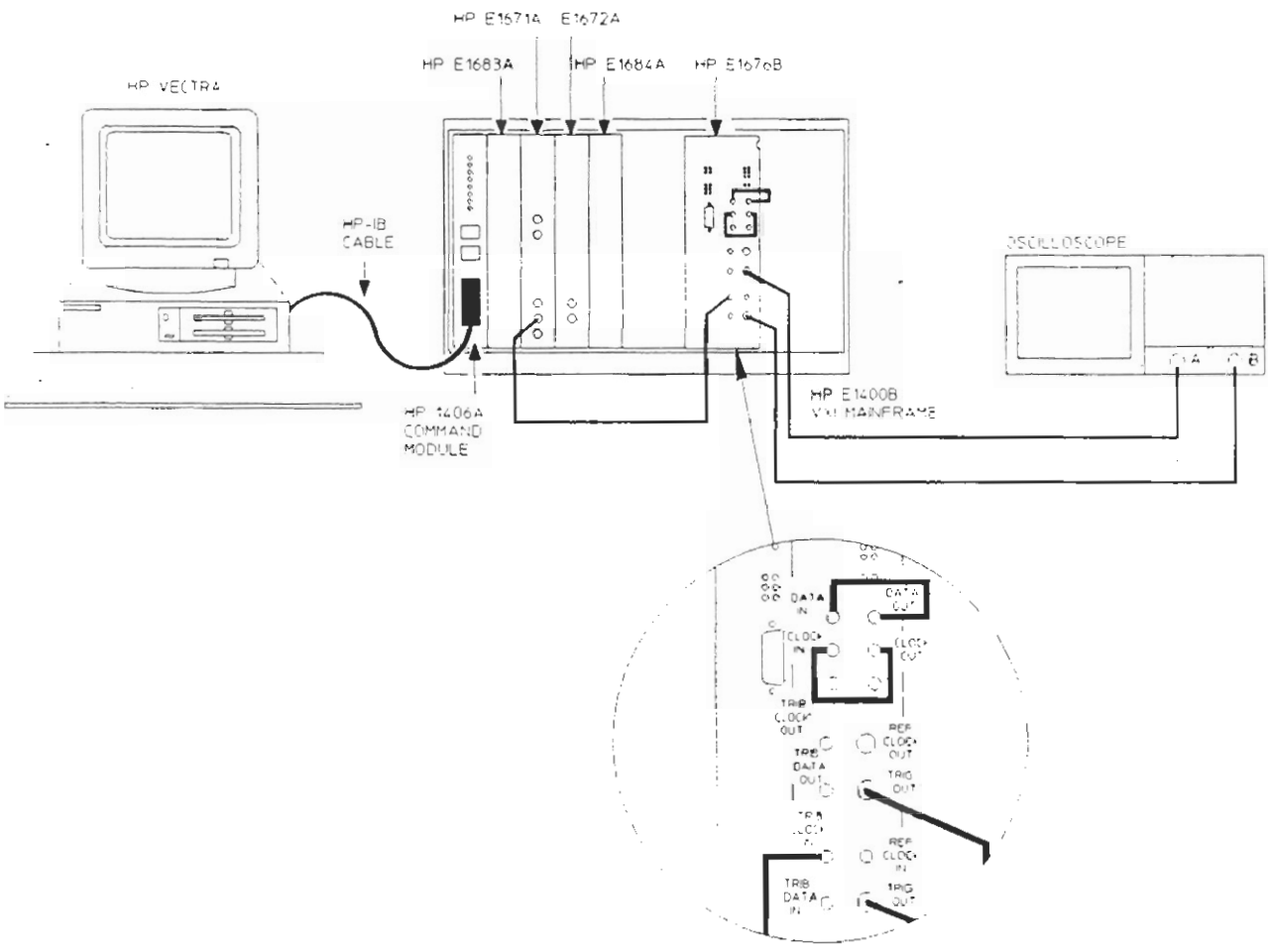
This test checks for pulse and level trigger signals on the HP E1676B Transmit and Receive trigger outputs. An oscilloscope is used to monitor the trigger signal operation. The Frame Trigger/Eye Clock output is also checked. The test uses the "Frame Pulse" and "Frame-word" trigger sources to check the trigger outputs. Other trigger signals can be checked in a similar way, however, the design of the instrument makes this unnecessary.

Equipment

HP 75000 Series 90 Analyzer	HP E1650B
Payload Generator/Receiver	HP E1683A/84A
Oscilloscope	HP 54121T
ECL Terminator	HP 10086A
50Ω BNC-BNC Cable, Qty 2	HP 8120-1839
ECL Termination Cable	"See Cabling Section"

Procedure

1 Connect the equipment as shown below.



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2 Change the settings on the HP E1676B panel to the following:

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Format	SONET (STS-48)	**Format**	SONET (STS-48)
Op Mode	Terminal		
Clk Source	Ref Clk In		
Trig (TTL)	Frame Pulse	**Trig Output**	Frame Pulse

3 Change the settings on the HP E1671A and HP E1672A panels to the following:

HP E1671A: Setup Subpanel		HP E1672A: Setup Subpanel	
Format	STS-3	**Format**	STS-3
Clock	Internal		
Channel	Off Off Off		
Transmit I/F	Binary	**Receive I/F**	Binary

4 Check that the trigger output pulses are TTL high for approximately 1 µs, repeated at 125 µs frame rate.

5 Change the trigger selection on the HP E1676B panel as follows.

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Trig (TTL)	Frameword Off	**Trig Output**	Out Of Frame

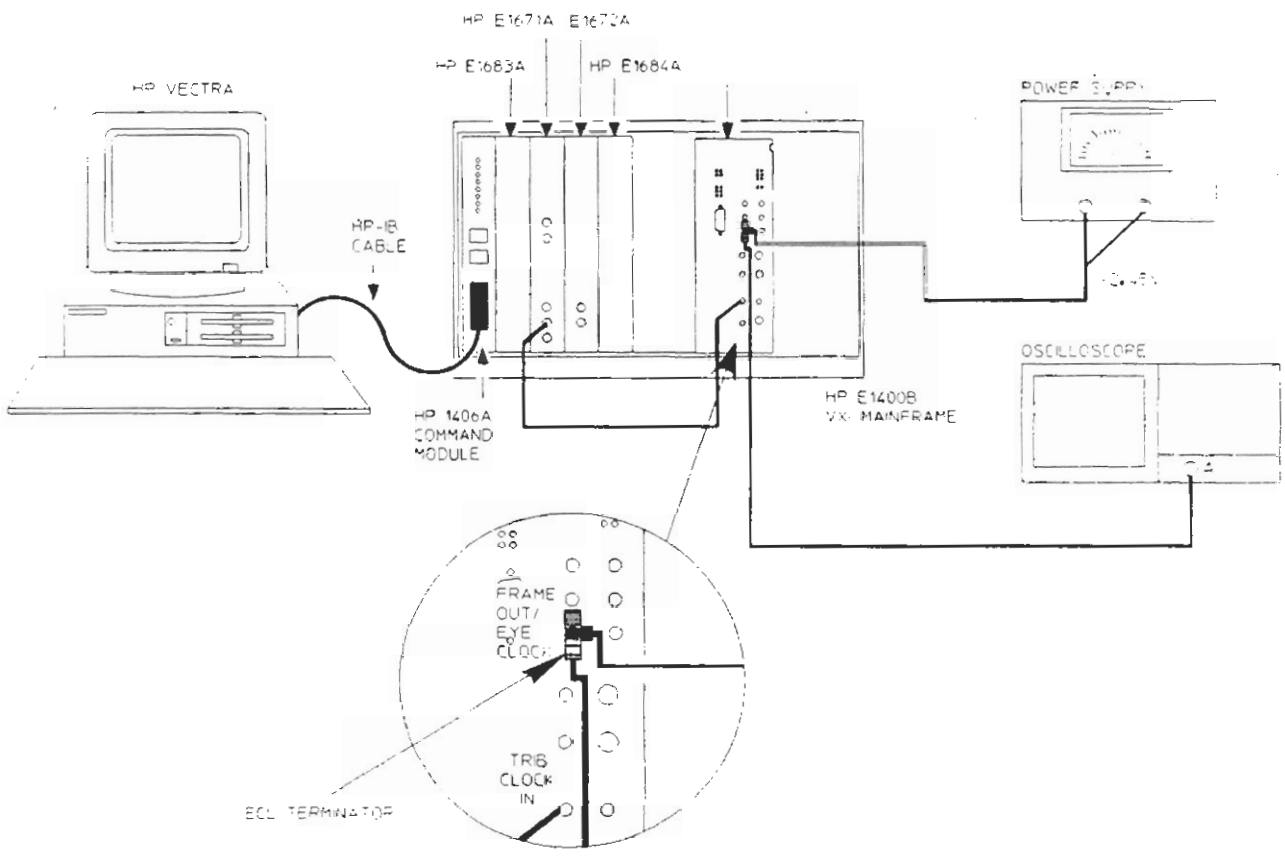
6 Check that the trigger outputs are TTL high level when the Frameword alarm on the Control subpanel is set to FW Off.

7 Reset the Frameword alarm to FW On.

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ECL Frame/Pulse Eye Clock Output

1 Connect the equipment as shown below to monitor the Frame Pulse/Eye Clock (ECL) output port.



2 Change the **Trig** (ECL) on the HP E1676B Tx to **Frame Pulse**. Check that an ECL Pulse Output (8KHz) is present on the Oscilloscope. Note, the ECL clock pulse width is 3.2 ns (nominal).

3 Change the **Trig** (ECL) on the HP E1676B to **Eye Clock**. Check that an ECL Pulse Output (155.2 MHz) is present on the Oscilloscope.

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Performance Test 4
Reference Clock Output

Specification

Reference Clock Output Frequency: 155.52 MHz.

Description

The HP E1676B Reference Clock output is monitored on a Frequency Counter to check the output signal.

Equipment

HP 75000 Series 90 Analyzer	HP E1650B
Payload Generator/Receiver	HP E1683A/84A
Frequency Counter	HP 5335A Opt.030, 010
50Ω BNC-BNC Cable	HP 8120-1839
50Ω SMA-BNC Cable	see "Recom'd Test Equipment"

Procedure

1 Connect the equipment as shown below.

2 Ensure the **`Clock Source`** setting on the HP E1671A panel is set to **`Internal`**.

3 Change the settings on the HP E1676B panel to the following:

Transmitter: Setup Subpanel	
`Clock Source`	Ref Clk In

4 Check that the frequency output is 155.52 MHz ± 10 ppm.

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Performance Test 5
Serial Port Check

Specification

The serial port allows external serial data to be inserted or dropped from STS-48/STM-16 data stream. The following table gives the different rates for the bytes added/dropped:

Byte	Serial Data (kb/s)	Clock Frequency (kHz)
F1	64	64
K1, K2	128	128
D1-D3	192	192
D4-D12	576	576

Description

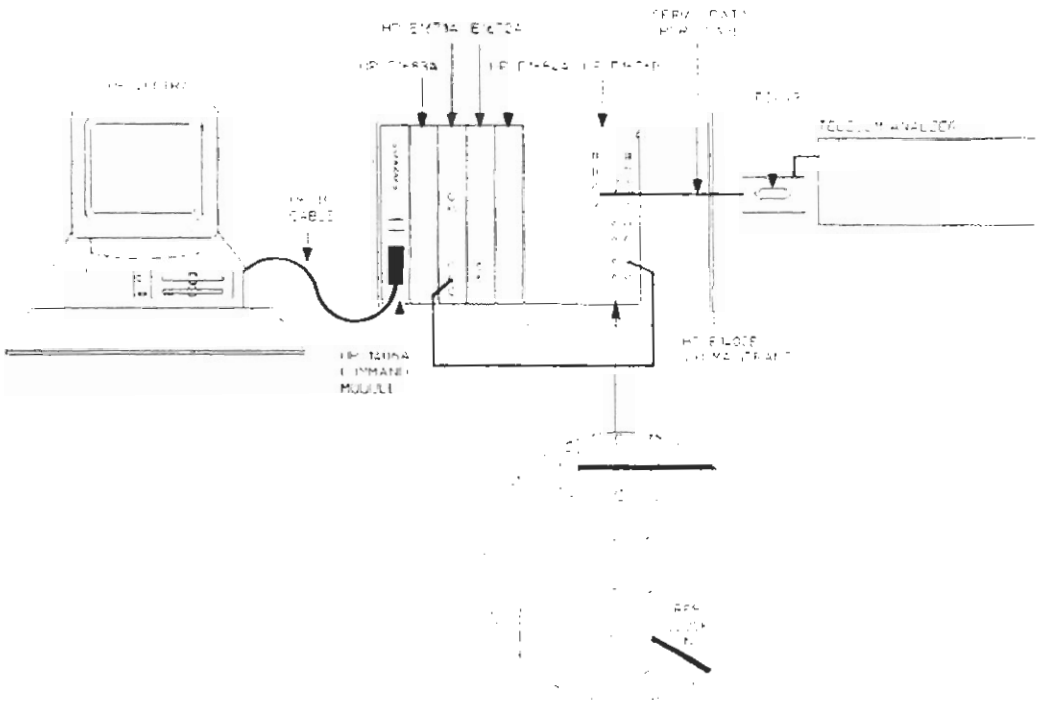
In the following test, the Telecom Analyzer generates a signal that is inserted from the HP E1676B *Serial Data* port. The transmitter is looped back to the receiver, the overhead bytes are dropped to check that the byte from the Telecom Analyzer is the same as that received.

Equipment

HP 75000 Series 90 Analyzer ..... HP E1650B
Payload Generator/Receiver ..... HP E1683A/84A
HP 37732A Datacom Analyzer ..... HP 37732A
SMA-SMA Cable, Qty 2 ..... HP 8120-4948
Serial Data Port Cable ..... see "See Cabling Section."

Procedure

1 Connect the equipment as shown below:



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2 Set the HP 37732A as follows:

Mode Dataeom	Button on lid
Interface	V.11 TERMINATED. DTE. SYNC
Tx clock source	INTERFACE. rising edge
Rx clock source	INTERFACE and rising edge
Pattern	PRBS 15
Block Length	AUTO, RS OFF and TR OFF

3 Set the HP E1676B Transmitter **EOC Add** function to **F1**.

4 Check that *Serial In* LED comes on.

5 Set the receive **EOC** function to **F1**.

6 Check that the *Serial Out* LED comes on.

7 Press the START/STOP key on the HP 37732A to start a measurement. Check that no BIT ERRORS and 0% BER are displayed.

8 Press the SINGLE ERROR ADD key on the HP 37732A and check that single BIT ERRORS are displayed on the HP 37732A each time the key is pressed.

9 Press the START/STOP key to end the measurement.

10 Repeat steps 3 to 6 for K1/K2, D1-D3, and D4-D12 bytes.

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Performance Test 6
ATM Port Check (Option 001 Only)

Description

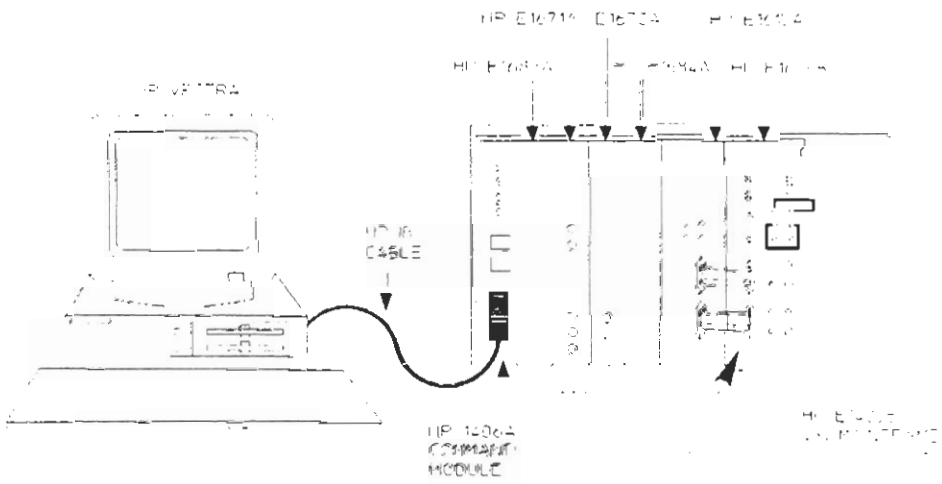
The HP E1615A is used to generate a payload for the HP E1676B. The payload is received by the HP E1676B and retransmitted back to the HP E1615A. A single PRBS error is generated by the HP E1615A and a check is made to see that this error is returned to the HP E1615A.

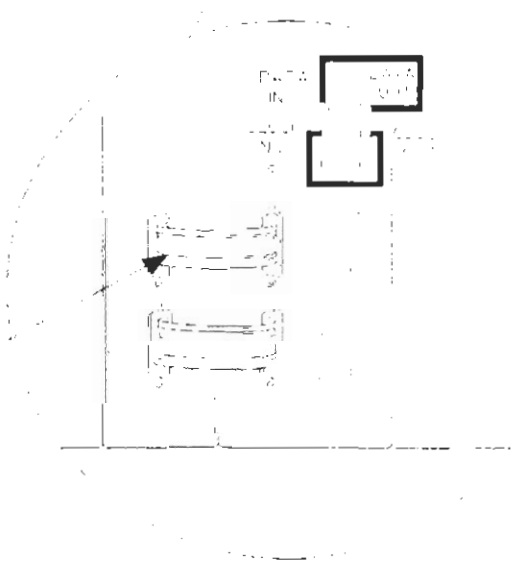
Equipment

HP 75000 Series 90 Analyzer	HP E1650B
Payload Generator/Receiver	HP E1683A/84A
2.4G ATM Generator/Receiver	HP 1615A
SMA-SMA Cable, Qty 2	HP 8120-4948

Procedure

1 Connect the equipment as shown below:





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2 Change the settings on the E1676B panel to the following:

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Signal	SONET (STS-48c)	**Signal**	SONET (STS-48c)
Op Mode	Terminal		
Payload	External		

3 Check that the HP E1676B **Payload In/Out** LED lights when a valid ATM payload is applied to the module.

4 Set the HP E1615A for PRBS23 cell stream.

5 Click on the HP E1676B Status subpanel. Check that there are no errors.

6 Start the HP E1615A gating and ensure no errors are detected by the HP E1615A.

7 After gating for about 30 seconds, inject a single PRBS error into the payload being transmitted from the HP E1615A.

8 Check that the HP E1615A Receiver detects the single error.

9 Stop gating.

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Performance Test 7
Loopback Operation (Multi-rate Mode)

Description

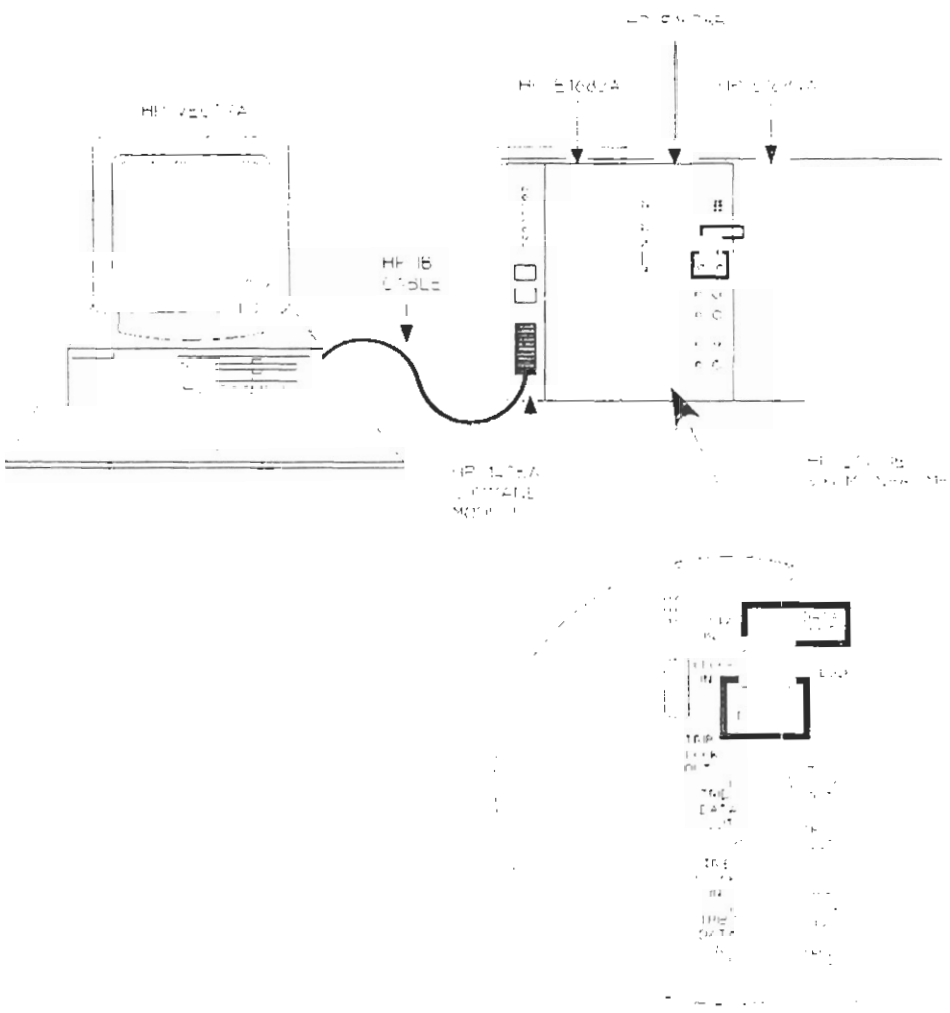
A Payload Generator & Receiver are used to produce with a PRBS23 payload for testing the HP E1676B payload bus. The payload is passed to the HP E1676B and mapped into the hierarchal rate. The HP E1676B transmitter and receiver ports are connected together via a loopback arrangement. The appropriate payload is dropped to the Payload Receiver and to confirm that the module is capable of adding then dropping payload while operating at each hierarchal rate. HP E1676A Interval Payload generation and analysis is also checked.

Equipment

HP 75000 Series 90 Analyzer	HP E1650B
Payload Generator/Receiver	HP E1683A/84A
SMA-SMA Cable, Qty2	HP 8120-4948

Procedure

1 Connect the equipment as shown below. Then start system from Series90 Sonnet/Don Default icon.



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STS-1 and STS-3C Payloads add/drop with payload modules

2 Ensure **Other** panel mode selection is set to Trib Mode. Change the settings on the HP E1676B panel to the following: .

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Signal	SONET STS-48	**Signal**	SONET STS-48
Op Mode	Terminal		
Add	STS1 # 1-2-3		
Payload	On Off Off	**Payload**	STS-1 #1-2-3

3 Change the settings on the HP E1683A and HP E1684A panels to the following:

HP E1683A: Setup Subpanel		HP E1684A: Setup Subpanel	
Signal	SONET (STS-1)	**Signal**	SONET (STS-1)
Payload	SPE (Unmap)	**Payload**	SPE (Unmap)
Channel	STS#1	**Channel**	STS#1
Payload Setup	PRBS23	**Payload Setup**	PRBS23

4 Start the measurement by selecting **Start** on the HP E1676B panel.

5 Select the **Status** check that there are no active alarms or error counts on the HP E1676B.

6 Check that there are no active alarms or error counts on the Payload Receiver.

7 Click the mouse on the **Stop** button on the HP E1676B panel to stop the gating.

8 Change the settings on the HP E1683A and HP E1684A panels to the following:

HP E1683A: Setup Subpanel		HP E1684A: Setup Subpanel	
Signal	Sonet (STS-3C)	**Signal**	Sonet (STS-3C)
Channel	STS-3C#1	**Channel**	STS-3C#1

9 Change the settings on the HP E1676B to the following:

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Signal	Sonet STS-48 is set to Tribe Mode	**Signal**	Sonet STS-48
Op Mode	Terminal		
Add	STS-3C # 1-2-3-4		
Payload	On Off Off Off	**Payload**	STS-3C #1
		Drop	#1

10 Repeat steps 4 through to 7.

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11 Repeat steps 1 through to 10 for E1676B Transmitter & Receiver signal set to STS-12.

12 Repeat steps 1 through to 10 for E1676B Transmitter & Receiver signal set to STS-3.

NOTE In step 8 set STS-3-C Add Playload to External, Receiver Payload STS-3C to Data.

13 Repeat steps 1 through to 7 for E1676B Transmitter & Receiver signal set to STS-1.

NOTE In step 2 Add Payload STS-1 set to External, Receiver Payload STS-1 to DATA.

STS-12C and STS-48C Internal Payloads

14 Set E1676B as follows:

Transmitter: Setup Subpanel		Receiver: Setup Subpanel	
Signal	Sonet STS-48	**Signal**	Sonet STS-48
OP Mode	Terminal		
Add Payload	STS-48C PRBS23	**Payload**	STS-48C PRBS23

15 Click on the START button on E1676B panel.

16 Check that no errors on alarms are registered.

17 Change E1676B as follows:

Terminal: Setup Subpanel		HP E1672A: Setup Subpanel	
Signal	Sonet STS-12	**Signal**	Sonet STS-12
OP Mode	Terminal		
ADD Payload	STS-12C PRBS 23	**Payload**	STS-12C PRBS23

18 Check that no errors on alarms are registered.

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Test Record - Op Verification

Hewlett-Packard Model E1676B Module

Serial No.:

Tested by:

Date:

Test No.	Test Description	Result
1	**Loopback Operation (TRIButary Mode)**	
	Step 7	PASS/FAIL
	Step 8	PASS/FAIL
	Step 9	PASS/FAIL
	Step 13 (7)	PASS/FAIL
	Step 13 (8)	PASS/FAIL
	Step 13 (9)	PASS/FAIL
7	**Loopback Operation (MULTIrate Mode)**	
	Step 5	PASS/FAIL
	Step 6	PASS/FAIL
	Step 10 (5)	PASS/FAIL
	Step 10 (6)	PASS/FAIL
	Step 11 (5)	PASS/FAIL
	Step 11 (6)	PASS/FAIL
	Step 12 (5)	PASS/FAIL
	Step 12 (6)	PASS/FAIL
	Step 13 (5)	PASS/FAIL
	Step 13 (6)	PASS/FAIL
	Step 16	PASS/FAIL
	Step 18	PASS/FAIL

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Test Record - Performance Tests

Hewlett-Packard Model E1676B Module

Serial No.:

Tested by:

Date:

Test No.	Test Description	Result
1	**Loopback Operation (TRIButary Mode)**	
	Step 7	PASS/FAIL
	Step 8	PASS/FAIL
	Step 9	PASS/FAIL
	Step 13 (7)	PASS/FAIL
	Step 13 (8)	PASS/FAIL
	Step 13 (9)	PASS/FAIL
2	**Rate Tolerance**	
	Step 6	PASS/FAIL
	Step 9	PASS/FAIL
	Step 11 (6)	PASS/FAIL
	Step 11 (9)	PASS/FAIL
3	**Trigger Outputs & Frame Pulse/Eye Clock Output**	
	Step 4	PASS/FAIL
	Step 6	PASS/FAIL
	Step 9	PASS/FAIL
4	**Reference Clock Output**	
	Step 5	PASS/FAIL
5	**Serial Port Check**	
	F1 Byte:	

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Test No.	Test Description	Result
	Step 4	PASS/FAIL
	Step 6	PASS/FAIL
	Step 8	PASS/FAIL
	Step 9	PASS/FAIL
	K1, K2 Bytes:	
	Step 4	PASS/FAIL
	Step 6	PASS/FAIL
	Step 8	PASS/FAIL
	Step 9	PASS/FAIL
	D1-D3 Bytes:	
	Step 4	PASS/FAIL
	Step 6	PASS/FAIL
	Step 8	PASS/FAIL
	Step 9	PASS/FAIL
	D4-D12 Bytes:	
	Step 4	PASS/FAIL
	Step 6	PASS/FAIL
	Step 8	PASS/FAIL
	Step 9	PASS/FAIL
6	**ATM Port Check (Option 001 Only)**	
	Step 3	PASS/FAIL
	Step 5	PASS/FAIL
	Step 6	PASS/FAIL
	Step 8	PASS/FAIL
7	**Loopback Operation (MULTIrate Mode)**	
	Step 5	PASS/FAIL
	Step 6	PASS/FAIL
	Step 10 (5)	PASS/FAIL

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Test Record - Performance Tests

Test No.	Test Description	Result
	Step 10 (6)	PASS/FAIL
	Step 11 (5)	PASS/FAIL
	Step 11 (6)	PASS/FAIL
	Step 12 (5)	PASS/FAIL
	Step 12 (6)	PASS/FAIL
	Step 13 (5)	PASS/FAIL
	Step 13 (6)	PASS/FAIL
	Step 16	PASS/FAIL
	Step 18	PASS/FAIL

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A

Specifications

Except where otherwise stated, the following parameters are warranted performance specifications. Parameters described as "typical" or "nominal" are supplemental characteristics which provide a useful indication of typical, but non-warranted, performance. All specifications are for 0°C to 40°C after 30 minute warm-up.

Environmental

Operating Temperature: 5 to 40°C.
Storage Temperature: –20 to 60°C.
Humidity: Up to 95% Relative Humidity to 40°C.
EMC: Meets CISPR11 Level A and EN50082-1.

Physical

Size: 3 slot, C-size.
Weight: 4.3 kg/9.5 lb (nominal).
Dimensions (height x width x length): 262 mm x 90 mm x 355 mm (nominal).

Power Requirements

Maximum current drawn from VXIbus dc voltage rails:

dc Volts	dc Current	Dynamic Current
+5 V	9.5 A	0.95 A
+12 V	0.5 A	0.05 A
+24 V	2.2 A	0.22 A
–5.2 V	8.8 A	0.88 A
–12 V	0.1 A	0.01 A
–24 V	0.2 A	0.02 A

The fuses used in this module are listed below, and are non-operator replaceable Axial Leaded, Fast Blow fuses.

Fuse	Current	Voltage
F1	1 A	125 V
F2	1 A	125 V
F3	1 A	125 V
F4	1 A	125 V

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Fuse	Current	Voltage
F5	1 A	125 V
F6	1 A	125 V
F7	7 A	125 V
F8	7 A	125 V
F9	2 A	125 V
F10	2 A	125 V
F11	15 A	32 V
F12	15 A	32 V
F13	3 A	125 V
F14	1 A	125 V
F15	5 A	125 V
F16	1 A	125 V

Power Dissipation: 175 VA (max).

WARNING **For continued protection against fire hazard, replace the line fuse only with the same type and line rating (type nA/nV). The use of other fuses or materials is prohibited.**

Cooling Requirements

For 10°C rise 4.5 liters/second 0.2 mm H_2O

VXIbus Characteristics

Device Type: Message Based.
VXIbus Backplane Connectors: P1 and P2 (as defined in VXIbus Specification Rev 1.3).
Local Bus Connection: Active connection to LBUSA and LBUSC.
Module Keying: ECL.

Operating Modes

Primary Operating Modes:

Multi-rate Mode: The instrument will operate at the four line rates STS-1/STM-0, STS-3/STM-1, STS-12/STM-4 and STS-48/STM-16.

Tributary Add /Drop Mode: The instrument will generate an STS-48/STM-16 signal only. Tributary signals operating at STS-1/STM-0, STS-3/STM-1 or STS-12/STM-4 may be added or dropped from the STS-48/STM-16 line signal

Secondary Operating Modes:

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Terminal (Tx and Rx): Transmitter and receiver act independently of each other.

Through Mode: The received signal can be monitored for alarms and errors before being passed to the transmit section. All receiver function operate as specified, but the transmit section operates in the modes listed below:

Transparent Mode: Normal receiver operation is permitted but the received signal is retransmitted without alteration. No changes are allowed to the data before retransmission except for Data Error Add. No recalculation will be performed on the B1, B2 or B3.

Recalc Mode: Normal receiver operation is permitted. New values will be calculated for B1, B2 or B3. Before retransmission the following actions can be performed on the signal:
- B1 Error Add
- B2 Error Add
- B3 Error Add (concatenated payload only)
- Frameword Error Add
- Data Error Add
- APS/RPS Message Change
- AIS
- FERF

Note: If B1, B2 or B3 error add is active any input errors are removed before new errors added.

Repeater/Regenerator Mode: The same basic operation is possible as in Through Mode but the complete SOH/RSOH is regenerated. The Repeater/Regenerator section operates in the modes listed below:

Transparent Mode: Normal receiver operation is permitted but the received signal is retransmitted with a regenerated SOH/RSOH. No changes are allowed to the remainder of the data before retransmission except for Data Error Add. No recalculation will be performed on the B2 or B3.

Recalc Mode: Normal receiver operation is permitted. The SOH/RSOH will be regenerated before transmission. New values will be calculated for B1, B2 or B3 (where applicable). Before retransmission the following actions can be performed on the signal:
- B1 Error Add
- B2 Error Add
- B3 Error Add (concatenated payload only)
- Frameword Error Add
- Data Error Add
- APS/RPS Message Change
- AIS
- FERF

Tributary Add Mode (TX): The signal received at the Tributary data input port can be mapped into one or all of the possible locations within the STS-48/STM-16 channel structure.

Tributary Add Mode (RX): Any one of the STS-1/STM-0, STS-3/STM-1 or STS-12/STM-4 mapped tributaries may be dropped. Not available in Multi-rate Mode.

Option 001: ATM payload add/drop from HP E1615A

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Transmitter Section

Frame Formats

SONET: STS-48, STS-12, STS-3, and STS-1 to meet ANSI T1.105-1991and GR-253-CORE.
SDH: (STM-16, STM-4, STM-1 and STM-0 to meet ITU-T G.707.

Line Clock and Data Outputs

Data Rates
STS-48/STM-16: 2.48832 Gb/s
STS-12/STM-4: 622.08 Mb/s
STS-3/STM-1: 155.52 Mb/s
STS-1/STM-0: 51.84 Mb/s

Data format: NRZ, scrambled or unscrambled.
Clock frequency(nominal)
STS-48/STM-16: 2.48832 GHz.
STS-12/STM-4: 622.08 MHz.
STS-3/STM-1: 155.52 MHz.
STS-1/STM-0: 51.84 MHz.
Level: Nominal ECL when terminated in 50 ohm to -2 V, dc coupled.
Connectors: SMA.

Timing sources

Timing for the transmitter outputs is derived from one of five sources:

Internal
Oscillator locked to internal reference.
Frequency: 155.52 MHz
Accuracy: ±5ppm.

Reference clock
Frequency: 155.52 MHz nominal.
Duty cycle: 50% ±5% (typical).
Level: ECL (nominal).
Impedance: dc coupled 50 ohm (nominal) to -2 V.
Connector: SMA.

Timing reference (LBUS)
This is a timing signal generated from an HP E1679A Timing Reference module when placed to the immediate left of the HP E1676B.
Frequency: 19.44MHz
Level: ECL (nominal)
Termination: dc coupled 50 ohms to -2V
Connector: VXI P2 connector number LBUS06

Tributary
Only valid in Tributary Add Mode. When operating with tributary clock and data signals the timing reference may be taken from the tributary clock signal. (Details as per Tributary Input Ports).

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Loop-timed
A clock derived from the received data will time the transmitter. This applies to both Through Mode and Independent Tx and Rx operation at 2.488GHz.

Tributary Clock and Data Input

Valid Operating Mode: Tributary Add Mode.
Data rate: 51.84, 155.52, 622.08 Mb/s.
Data rate tolerance: ±1%.
Data format: NRZ, signal to be DC coupled.
Level: ECL (nominal).
Impedance: dc coupled 50 ohm (nominal) to -2 V.
Connector: SMA.

Tributary Input Alarms

Valid Operating Mode: Tributary Add Mode.
The following alarms will be available but not displayed during normal instrument operation
- Data Loss
- Clock missing
- OOF
- LOF
- B1 errors present.

ATM Payload Input Port (Option 001 only)

Valid Operating Mode: Tributary Add Mode.

Propriety format between HP E1615A and the HP E1676B (no details required).

EOC Access

Mutually exclusive with OHBER Tx.
Channel Select:
Single Byte:
Any Payload: Any overhead byte may be accessed with the exception of B1, B2, H1, H2, H3.
Internally sourced payload: Any Path Overhead Byte from STS-48c/STM-16c (not fixed stuff bytes) or from the first column of POH from STS-48/STM-16 with the exception of B3.
Group: The following byte groups can be accessed - D1-D3, D4-D12, K1K2.
Rate: Automatically selected based on EOC channel selected:

Overhead Bytes	Channel Rate
Single byte	64 kb/s
D1-D3	192 kb/s channel
D4-D12	576 kb/s channel
K1, K2	128 kb/s

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Format: CCITT V.11 (EIA RS-422).
Timing: TBD.
Level: As per RS-422.
Connector: 15 way mini D-type (shared with Rx section).

Frame Pulse/Eye Clock Output

Frame Pulse: An 8kHz pulse coincident with first A1 byte of the STS-48/STM-16 frame. High during transmission of first A1 byte.

Eye Clock
Frequency: 155.52 MHz. Timed from the output clock. Accuracy determined by clock source.
Duty Cycle: 50% ±10% (typical).
Level: ECL (nominal).
Required Termination: dc coupled 50 ohms to -2V.
Connector: SMA.

External SPE/AU Payload Mapping

Payload Add Selection:
Valid when operating in conjunction with HP E1683A payload generator modules. Valid when operating in Multi-rate mode. Selects which part of the payload capacity of the STS-n/STM-n will be loaded by an STS-1 or AU-3/AU-4 payload.

Internal Payload Generation

Concatenated Payloads
Complete concatenated payload including valid POH and pointers.
Payload Patterns PRBS: - 2^{23}-1 ITU inverted pattern. - 2^{15}-1 ITU inverted pattern.
Byte Patterns:
- all 0s
- all 1s
- AA55
- Incrementing
- Alternating
- User programmable

Non-Concatenated Payloads
Path Overhead
SONET: The signal simulates a payload overhead built up from 48 STS-1 tributaries ie, 48 POH data columns. Column 1 is set by default values or as modified by the user. Columns 2 to 48 will be copies of column 1.
SDH: The signal simulates a payload overhead built up from 16 STM-1 tributaries ie, 16 POH data columns. Column 1 set by default values or as modified by the user. Columns 2 to 16 will be copies of column 1.
Byte Patterns:
- All 0s
- All 1s
- AA55
- Incrementing
- Alternating
- User programmable

Tributary Add Selection

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Apply to all pointers together in STS-48 / STM-16, or to the only pointer in STS-48c /STM-16c. Only valid in Tributary Add/Drop Mode.

Selects the channel(s) within the STS-48/STM-16 signal into which the tributary signal will be added. Tributary signals may be STS-12/STM-4, STS-3/STM-1, or STS-1/STM-0 format.

Off: Entire STS-48/STM-16 frame is sourced from internal memory.
Single: In this mode the tributary can be placed into any of the 48/16/4 available channels.
Combo: In this mode the tributary can be placed in into a user selectable combination of channels (all rates except STS-1,STM-0).
All: The tributary input is replicated into all channel locations.

Background Channel Loading

Channels not loaded from the tributary input may be independently filled with a user-selected payload pattern. Default value is all zeros.

Patterns: All 1s, all 0s, AA55, 00FF, incrementing byte value, user byte.

Frameword Control

On: Standard 'F628' transmitted in A1A2 byte locations.
Off: All A1 and A2 bytes set to 'AA' hex.
Frameword Error Add: See error injection.

Trigger signal
Frameword: Low when frameword generation is on, high when off.
Frame Pulse: Trigger pulse at start of frame.

Frame Scrambler Control

On: Scrambler enabled.
Off: Scrambler disabled.

Trigger Signal
Scrambler: Low when scrambler off, high when on.

Clock Durability Stress Pattern

A user-defined number of bytes in the first row of the SPE/VC is overwritten by an all 0s or all 1s pattern. Valid B1 and B2 BIP values are transmitted.

Note: Pointer processing is disabled in this mode.

Mode:
All 1: Repeating block of all 1s in range 1 - (48x87) bytes starting at first byte of payload.
All 0: Repeating block of all 0s in range 1 - (48x87) bytes starting at first byte of payload.
CID Stressing
Pattern: To meet requirements of ITU-T CID pattern - repeating block of all 1s or all 0s, programmable in the range 1 - 200 bytes, alternating on a per SONET/SDH frame basis starting at first byte of payload. The remainder of the payload is an all 0s scrambled payload with scrambler synchronized to the frame.
Sequence Length: 1 SONET/SDH frame (125 micro secs).
(Ref. - ITU-T G.958 Appendix 1)

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Overhead BER

For each byte in the TOH or POH a PRBS can be inserted. Used in conjunction with the error detection capability in the receiver the BER of a single 64kb/s overhead channel may be measured. Additionally specified groups of bytes may be measured.

Validity: Mutually exclusive with EOC Access
Single byte channels: Any 64kb/s byte channel can be selected with the exception of B1, B2, B3, H1, H2, H3.
Group Channels: D1-D3, D4-D12, K1K2
Test Pattern: PRBS 211-1 or 29-1, non inverted.
Error Add: Single bit errors added to test pattern.

TOH/SOH Byte Access

Allows a user-defined value in the range 00 to FF hex to be programmed into any TOH/SOH byte (except B1 and B2 bytes).
Note: Values may be altered by Trib add, EOC add or error add.

TOH/SOH Sequencer

Allows a sequence of up to 16 user defined TOH/SOHs to be transmitted as part of a STS-n/STM-n line signal. Sequence length: 2 to 16 independent TOH/SOHs.

Programmable Bytes: Within each TOH/SOH all bytes are user programmable (except B1 and B2 which are automatically calculated).
Duration: Each TOH/SOH in sequence is transmitted for a user specified number of frames, in the range 0 to 65535.

Sequence Control
Single: Sequence transmitted once. On completion, return to default TOHSOH.
Repetitive: Sequence continually repeats, looping from last TOH/SOH to the second TOH/SOH. When manually stopped, returns to default TOH/SOH.

POH Byte Access

Allows a user-defined value in the range 00 to FF Hex to be programmed into any POH byte with the exception of B3. Values may be altered by Trib add, EOC add or error add.

Pointer Adjustment

Note: This function is only available with internally generated payloads.

Increment/decrement: Single increment or decrement of the payload position.
Mode: ALL - apply to all pointers together in STS-48/STM-16, or to the only pointer in the STS-48c/STM-16c.
Manual: The pointer values can be set to any value in the valid range with or without NDF.
Mode: ALL - apply to all pointers together in non concatenated signal, or to the only pointer in the concatenated signal.
Range: 0 - 782.
Periodic: The pointer will be moved as a series of increments or decrements to represent payload/line frequency offset.
Mode: ALL - apply to all pointers together in non concatenated signal, or to the only pointer in the concatenated signal.
Rate: 1, 2, 5, 10 moves per second.
Direction: Increment or decrement.
Maximum Rate: Applies maximum rate of pointer change.
Mode: ALL - apply to all pointers together in non concatenated signal, or to the only pointer in the concatenated signal.

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Rate: 1 pointer move every 4 frames.
Direction: Increment or decrement.
Invalid: The pointer value is set to 783.
Mode: ALL - apply to all pointers together in non concatenated signal, or to the only pointer in the concatenated signal.
Trigger signal: A pulse is output when the pointer value changes.

Pointer Stressing

Note: This function is only available with internally generated payloads.

Mode
Concatenated: The value of the H1/H2 byte pair will be modified using a 16 bit mask.
Non-concatenated: All H1/H2 byte pairs will be modified in the same manner using a mask.

Control
Pulse on/off: the current value of H1/H2 will be modified by the mask for n consecutive frames (where n = 1 to 63).
Sequence: current value of H1/H2 will be modified by the mask for a single period of duration "p" frames, immediately followed by repeating "n "frames of normal value followed by "m" frames of modified value where:
p = 0 - 64 frames
n = 1 to 64 frames
m = 1 to 64 frames
Pointer Action: The bits specified by the mask are modified every time a pointer adjustment (increment, decrement, new pointer with NDF, new pointer without NDF or invalid pointer) occurs.
Trigger Output: Level high for duration of frames with stress applied.

Alarm Control

Alarms: Line/MS-AIS, line/MS-FERF Line/MS FEBE, Path FERF/RDI (only valid when generating internal payloads).
Modes: On, off, pulse on/off, sequence.
Pulse on/off: Alarm is on/off for n consecutive frames (where n = 1 to 63).
Sequence: Single pulse duration "p" frames, immediately followed by repeating "n,m" sequence:
p = 0 - 64 frames
n = 1 to 64 frames
m = 1 to 64 frames
Note: Values of p, n and m may be changed hitlessly during operation.
Trigger Signal: Level high for duration of frames with stress applied.

Protection Switching Control

There are two means of exercising protection switch control. If a tributary signal is added to the first channel location in the STS-48/STM-16 signal, then internal control allows switching between an APS/MSP or RPS message set by the tributary and another generated internally. Otherwise internal control supports user programming of two independent APS/MSP or RPS messages.

Pulse on/off: Second message is on/off for n consecutive frames (n = 1 to 63).
Sequence: p+n+m, with p and m representing the second message and n the first message.
Trigger Signal: Output pulse coincident with data change in transmitted K1K2 bytes.

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Error Injection

Note: All error add types are mutually exclusive.

B1 Error Add
Single: Single error added to selected bits of the BIP-8 value (B1 byte). Bits to be errored are selected using an 8-bit mask.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9; n = 5 to 10). Errors are evenly distributed over all bits in B1 byte.
Accuracy: 0.01%
Trigger Signal: An output pulse can be generated coincident with error injection.

B2 Error Add
Single
SONET: Single error add to selected bits of Line BIP-8 (B2 byte). Bits to be errored are selected using an 8-bit mask. Selection of B2 byte to be errored is provided.
SDH: Single error add to selected bits of MS BIP-24 (3 x B2 bytes associated with each STM-1). Bits to be errored are selected using a 24-bit mask. Selection of BIP-24 to be errored is provided.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9; n = 3 to 10).
Trigger Signal: An output pulse can be generated coincident with error injection.

B3 Error Add
Only applicable when internally generated concatenated payloads are selected. With externally generated payloads the erroring will be done in the source module.

Mode
Single: Bits to be errored are selected using an 8-bit mask. Errors are evenly distributed over all bits of each B3.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9; n = 5 to 10).
Accuracy: 0.01%.
Trigger Signal: 1 microsec (approximately) pulse on frame when error injected

Data Error Add
Note: This mode could impact the B1 and B2 measured error rate if an error hits a B1 or B2 byte. Errors are evenly distributed over the entire STS/STM frame.

Mode
Single: One data bit errored.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9; n = 3 to 10).
Range: Max. $1.1E^{-3}$, Min. $1.0E^{-10}$.
Accuracy:
0.5% for $1.1E^{-3}$ to $2E^{-4}$.
0.1% for $2E^{-4}$ to $2E^{-5}$
Better than 0.01% for $2E^{-5}$ and smaller.
Trigger Signal: An output pulse can be generated coincident with error injection.

PRBS Error Add
Applicable only when in internal concatenated mode with PRBS payload fill.

Mode
Single: One bit inverted in the PRBS pattern.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9; n = 3 to 10).
Range: Max. $1.0E^{-3}$, Min. $1.0E^{-10}$.
Accuracy:
0.5% for $1.1E^{-3}$ to $2E^{-4}$

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0.1% for $2E^{-4}$ to $2E^{-5}$
Better than 0.01% for $2E^{-5}$ and smaller.
Trigger signal: An output pulse can be generated coincident with error injection.

Line FEBE/MS REI Error Add (M1)

Mode
Single: A Line FEBE/MS REI value is inserted into the M1 byte. The value to be sent is selectable 0 - 255.
All: - A value, selectable in the range 0 - 255 is sent every frame.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9 in 0.1 steps; n = 3 to 10).
Trigger: 1 microsec (approximately) pulse when error injected.

Line FEBE Error Add (M0) - STS-1 only

Mode
Single: A Line FEBE/MS REI value is inserted into the M1 byte. The value to be sent is selectable 0 - 255.
All: - A value, selectable in the range 0 - 255 is sent every frame.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9 in 0.1 steps; n = 3 to 10).
Trigger: 1 microsec (approximately) pulse when error injected.

Path FEBE/Path REI Error Add (G1 bits 1-4)

Method: Path FEBE/Path REI errors may be added in single bursts or corresponding to far-end B3 error rates from E^{-9} to E^{-3}. Bits 1 to 4 of G1 byte are used to send information.
Mode
Single: FEBE/REI codes from 1 (0001) to 15 (1111).
Note: Only codes 1 to 8 are valid error codes - other codes should be ignored by the terminating equipment.
Rate: a.b x E^{-n} (where a.b is continuously variable between 1.0 and 9.9; n = 3 to 10).
Trigger: 1 microsec (approximately) pulse when error injected.

Frameword Control

Mode
On: Standard "F628" transmitted in A1A2 bytes.
Off: A1 and A2 bytes set to AA Hex (Alternative non-F628H values may be selected using two 8 bit mask selection for A1 and A2. Selection of A1 and A2 values not allowed during stressing.
Pulse on/off: Alarm is on/off for n consecutive frames (where n = 1 to 63).
Sequence: Single pulse duration "p" frames, immediately followed by repeating "n, m" sequence:
p = 0 - 64 frames
n = 1 to 64 frames
m = 1 to 64 frames
Note: Values of p, n and m may be changed hitlessly during operation.

Trigger Signal
Frameword: High when frameword generation is on, low when off.
Frame Pulse: Trigger pulse at start of frame.
Trigger signal: Low for duration of any frame in which framewords are errored.

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Trigger Output

Configured to action on one of the following transmit conditions:

Trigger Source	Trigger
Frame pulse	Pulse
Scrambler	Level
Line MS-FERF	Level
Line/MS-AIS	Level
APS/MSP change	Level
Frameword	Level
Errored frameword	Level
Errored section/RS-BIP(B1)	Pulse
Errored line/MS-BIP(B2)	Pulse
Errored B3	Pulse
Errored PRBS pattern	Pulse
Errored MS-FEBE	Pulse
Errored Path FEBE	Pulse
Errored STS/STM data	Pulse
Pointer Action	Pulse
Pointer Stress	Pulse
Start of TOH Sequ.	Pulse

Level: TTL compatible.
Pulse: 1 ms (nominal) high pulse.
Drive capability: 50 ohm to ground.
Connector: BNC.

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Receiver Section

Frame Formats

SONET: STS-48, STS-12, STS-3, and STS-1 to meet ANSI T1.105-1991 and GR-253-CORE.
SDH: STM-16, STM-4, STM-1 and STM-0 to meet ITU-T G.707.

Data Input

Data Rate: 2.48832 Gb/s, 622.08 Mb/s, 155.52 Mb/s, 51.84 Mb/s.
Data Rate Tolerance: ±50 ppm.
Data format: NRZ, scrambled or unscrambled.
Level: ECL (nominal).
Impedance: dc coupled 50 ohm (nominal) to -2V.
Connector: SMA.

Clock Input

Frequency: For timing HP E1676B: 2.48832 GHz, 622.080MHz, 155.520MHz, 51.840 MHz.
Level: ECL (nominal)
Termination: dc coupled 50 ohms to -2V
Connector: SMA

Frame Alignment

STS-48/STM-16: Frame alignment is achieved on detection of an error-free A1A1A1A2A2A2 frameword followed, at the next frame boundary, by an error-free A1A2A2 frameword. Alignment is maintained until n consecutive errored A1A2A2 framewords are received (n is user selectable from 1 to 7, default value is 5).
STS-12/STM-4, STS-3/STM-1: Frames up on 32 bits around A1A2 boundary.
STS-1/STM-0:

Frame Descrambler Control

Mode: On, Off.
Trigger Signal: Descrambler low when on, and high when off.

Tributary Data Output

Not available in Multi-rate mode.
Data Rate: 51.84, 155.52, 622.08 Mb/s (nominal).
Data Format: NRZ, scrambled.
Level: Nominal ECL when externally terminated in 50 ohm to -2 V, dc coupled.
Connector: SMA.

Tributary Clock Output

Not available in Multi-rate Mode.
Frequency: 51.840, 155.52 or 622.08MHz.
Level: Nominal ECL when externally terminated in 50 ohm to -2 V, dc coupled.
Connector: SMA.

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Reference Clock Output

Source: Obtained from the 2.5GHz phase lock loop (divided by 16) which can be referenced to:
- Reference Clock input
- Internal clock source
- Rx recovered clock
- Tributary Clock
- Backplane clock from HP E1679A

Frequency: Switch selectable between, 52, 155 and 622MHz.
Amplitude: 800mV pk-pk, ac coupled.
Required Termination: 50 ohms to ground.
Connector: BNC.

ATM Payload Output Port (Option 001 only)

Not available in Multi-rate Mode.
Connector: 36 way mini D-type.

EOC Access

Channel Select
Single Byte: Any overhead byte may be accessed with the exception of B1, B2, H1, H2, H3 - any Path Overhead Byte from a concatenated payload (not fixed stuff bytes) or from the first column of POH from a non-concatenated payload with the exception of B3. Only available when payload is sourced internally.
Group: The following byte groups can be accessed - D1-D3, D4-D12, K1K2.
Rate: Automatically selected based on EOC channel selected: Single - 64kb/s D1-D3 - 192kb/s D4-D12 - 576kb/s K1K2 - 128kb/s
Format: CCITT V.11 (EIA RS-422).
Timing: TBD
Level: As per RS 422.
Connector: 15 way D-type (shared with Tx section)

Tributary Drop Selection

This mode of operation is only valid in Tributary Add/Drop Mode. Dropped tributary signals may be STS-12, STM-4, STS-3, STM-1, STS-1, or STM-0.

Modes
STS-1/STM-0 #1: The payload, including the path overhead bytes, and the overhead bytes, apart from B1, corresponding to the STS-1/STM-0 #1channel will be dropped via the tributary port. A new value for B1 will be calculated before dropping.
STS-1/STM-0 #2 - #48: The payload, including the path overhead bytes, and the overhead bytes, corresponding to the STS-1/STM-0 #2 - #48, channel will be dropped via the tributary port. A new value for B1 will be calculated before dropping.
STS-3/STM-1 #1: The payload, including the path overhead bytes, and the overhead bytes, apart from B1, corresponding to the STS-3/STM-1 #1 channel will be dropped via the tributary port. A new value for B1 will be calculated before dropping.
STS-3/STM-1 #2 - #16: The payload, including the path overhead bytes, and the overhead bytes, corresponding to the STS-3/STM-1 #2 - #16 channel will be dropped via the tributary port. A new value for B1 will be calculated before dropping.
STS12/STM-4 #1: The payload, including the path overhead bytes, and the overhead bytes, apart from B1, corresponding to the STS-12/STM-4 #1 channel will be dropped via the tributary port. A new value for B1 will be calculated before dropping.

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STS-12/STM-4 #2 - #4: The payload, including the path overhead bytes, and the overhead bytes, corresponding to the STS-12/STM-4 #2 - #4 channel will be dropped via the tributary port. A new value for B1 will be calculated before dropping.

Pointer Analysis

The following results are provided for pointer activity in concatenated payloads. For non-concatenated payloads the value of the first channel's pointer is displayed.

Pointer Value: The value of the AU pointer is updated every 100 ms.
Pointer Activity: The number of pointer re-alignments with and without the NDF being set is counted.
Pointer Adjustments: The number of pointer increments and decrements is measured. Also the number of seconds containing at least one pointer increment and those containing pointer decrements is counted.
Trigger Signal
Pointer Action: A pulse is output when the selected pointer performs an increment, decrement or new value with NDF.
Pointer Realign: A pulse is output when the selected pointer assumes a new value with no NDF.

Data Capture

Snapshot Mode: Provides triggered capture of complete groups of data.

Captured Data
TOH/SOH Bytes: TOH/SOH data from 201 consecutive SONET/SDH frames.
POH Bytes: 201 consecutive POH data groups.
Frame: Captures 6 full SONET/SDH frames of both overhead and payload.
AU/STS Pointers: H1H2 pointer bytes (201 pairs).
Protection Switching Bytes: K1K2 bytes (201 pairs).

Trigger Data

Tx triggers: Some triggers originated in the Tx section can be used. The value must correspond to that set in the Tx section.
Valid signals: APS/MSP change, Errored Frameword, Errored B1, Errored B2, Errored B3 and Start of TOH Sequence.

Rx Triggers: TOH/SOH Bytes (not POH capture), APS/RPS change, Pointer change (not POH, Frame, or pointer capture), POH Bytes (not TOH/SOH capture).
Capture Position
About: Symmetrical about trigger point i.e. for 201 frames:- 100 frames before plus 100 frames after trigger.
Trigger Byte Modifiers
Value: Settable in range 0 - 0FFFF Hex
Mask: Settable in range 0 - 0FFFF Hex
Trigger Action
Manual: Triggered on user request.
On Change: Trigger when a change of value is detected in a user specified Rx trigger byte.
On Value: Trigger when a user defined value is detected in a specified Rx trigger byte.
On Tx Event: Trigger when a Tx trigger signal is detected.
Trigger Signal: Output pulse coincident with snapshot memory being triggered (see trigger output).

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Byte Capture

Captures the sequence of changing values in a selected TOH/SOH/POH byte or H1H2/K1K2 byte pairs. Records the received byte values plus the number of consecutive frames during which each value is received.
Note: POH capture is restricted to concatenated payload or STS-1 #1/STM-1 #1.

Capture Position: Capture begins immediately sequence capture is started.
- where trigger occurs before sample # 16384, then a total of 32768 samples are stored with trigger at trigger position.
- where trigger occurs after sample # 16384, then there are 16384 samples before trigger and 16383 after.

Trigger Data
Tx triggers: Some triggers originated in the Tx section can be used. The value must correspond to that set in the Tx section.
Valid signals: APS/MSP change, Errored Frameword, Errored B1, Errored B2, Errored B3 and Start of TOH Sequence.
Rx triggers: Selected capture byte.
Trigger Byte Modifiers
Value: Settable in range 0 - 0FFFF Hex
Mask: Settable in range 0 - 0FFFF Hex
Trigger Action
Manual: Triggered on user request.
On change:
Single - Trigger when first change of value is detected in the captured byte.
Repetitive - Trigger on each change of value detected in the captured byte.
On value:
Single - Trigger when first change of value is detected in the captured byte.
Repetitive - Triggered when each occurrence of user defined value is detected in the captured byte.
On Tx event: Trigger when a Tx trigger signal is detected.
Capture depth: up to 32,768 value changes.
Captured State Duration
Frame Counter: Records number of consecutive frames containing selected value received in captured sequence (max. =2 E 24)
Display (ITG): For first 10 secs the frame count is displayed. For periods greater than ten seconds the display (ITG) will show duration in hours, minutes and seconds where consecutive frames contain selected value received in captured sequence.
Trigger Signal: Output pulse coincident with byte capture being triggered (see trigger output).

Protection Switching Capture

In addition to Snapshot and Byte capture the protection switching bytes have a third capture mode:
Current - Provides K1K2 bytes received in most recent sampled SONET/SDH frame. This mode operates concurrently with Snapshot or Sequence mode.

Alarm Detection

Loss of Signal: Clock missing approximately 25 ns or Data is all 1s or all 0s for 1 or more frames.
Out of Frame (OOF)
STS-48/STM-16 Mode: Frame alignment is achieved on detection of an error-free A1A1A1A2A2A2 frameword followed, at the next frame boundary, by an error-free A1A2A2 frameword. Alignment is maintained until n consecutive errored A1A2A2 frame-

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words are received (n is user selectable from 1 to 7, default value is 4 for SONET and 5 for SDH).
STS-12/STM-4, STS-3/STM-1 Mode: Frames up on 32 bits around A1A2 boundary.
STS-1/STM-01 Mode: TBD

Loss of Frame (LOF)
Integrating Timer Method: Activated after 24 frames with OOF have been detected. These frames need not be consecutive but if 24 consecutive frames with no OOF are received the count of frames with OOF is re-started. De-activated after 24 consecutive frames which are in frame ie, with no LOF.

Fixed Timer Method: Activated if OOF exists for a 3 ms period, deactivated when frame aligned has been achieved for 3 ms.

Line/MS-AIS: Asserted when bits 6,7,8 of K2 byte are 111 for n consecutive frames (n is user selectable from 1 to 7; SONET default = 5, SDH default = 3). Negated when bits 6, 7, 8 of K2 byte are not 111 for m consecutive frames (m = 1 to 7, default 5 for SONET or 3 for SDH).

Line/MS-FERF: Asserted when bits 6, 7, 8 of K2 byte are 110 for n consecutive frames (n is user selectable from 1 to 7, default 5). Negated when bits 6, 7, 8 of K2 byte are not 110 for m consecutive frames (m = 1 to 7, default 5 for SONET or 3 for SDH).

LOP: Asserted when 8 invalid pointer values or 8 NDF indicators not set to 0110 are received.

Path AIS: Alarm is asserted on receipt of three consecutive frames containing all ones in the H1 and H2 bytes. The alarm is deactivated on receipt of three consecutive frames not containing all ones in the H1 and H2 bytes.

Path Yellow/Path FERF: Alarm is asserted on receipt of 5 consecutive frames with the G1 bit 5 set to 1. The alarm is deactivated on receipt of 5 consecutive frames with the bit reset.
PRBS Sync Loss: An error rate of 1 in 5 or greater is measured over 100 ms.
PRBS Sync Gain: When no errors are detected over 64 bits (two sets of 32 bits).

External Concatenated Payload

With the E1676B Option 001 set to Tributary Add/Drop STS-48c/STM-16c mode an external payload module, the HP E1615A, is used to receive an STS-48c/STM-16c concatenated payload envelope. Connection is made via a front panel connector which sends timing information from E1676B to the E1615A along with the payload data signal in 8-bit wide format.

Rate: STS-48c/STM-16c
Alarms Detected: All alarms unique to this mode are detected and displayed in HP E1615A.
STS-48c/VC-4-16c Path Overhead Analysis: Performed in HP E1615A.

Overhead BER Error Detect

Mutually exclusive with EOC Access Rx
Single Byte Channels: any 64kb/s byte channel can be selected with the exception of B1, B2, B3, H1, H2, H3
Group Channels: D1-D3, D4-D12, K1K2.
Test Pattern: PRBS 211-1 or 29-1, non inverted.
Results: Error Count, Error Ratio, Error Seconds, %Error free Seconds, Pattern loss Seconds.

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Error Analysis

Errors Detected:
B1 Errors
B2 Errors
MS FEBE Errors (display of received value plus indication if saturated value (>255) has been received)

In addition the following errors are detected with internal concatenated payload selected.

B3 Errors
PRBS Bit Errors
Path FEBE Errors

Measurements

All measurements are performed simultaneously.

B1 Error Count: Total number of bit errors detected in B1 byte during measurement period.
B1 Error Ratio: B1 error count divided by the total number of bits over which all received B1 bytes were calculated.
B1 Error Seconds: Number of seconds in measurement period during which a B1 error or OOF condition is detected.
B2 Error Count: Total number of bit errors detected in all B2 overhead bytes during measurement period.
B2 Error Ratio: B2 error count divided by the total number of bits over which all received B2 bytes were calculated.
B2 Error Seconds: Number of seconds in measurement period containing one or more B2 errors.
B3 Error Count: Total number of bit errors detected in all B3 overhead bytes during measurement period.
B3 Error Ratio: B3 error count divided by the total number of bits over which all received B3 bytes were calculated.
B3 Error Seconds: Number of seconds in measurement period containing one or more B3 errors.
PRBS Error Count: Total number of bit errors detected in payload PRBS bytes during measurement period.
PRBS Error Ratio: PRBS error count divided by the total number of PRBS bits transmitted during measurement period.
Alarm Seconds: Number of seconds in measurement period during which a specific alarm condition is detected. Alarm seconds measurements provided for line/MS-AIS, line/MS-FERF, OOF, LOS conditions, LOF, LOP, PAIS, PFERF, PRBS Sync Loss.

G.826 Analysis

Errors Measured:
B1, B2, B3 - concatenated signals
B1, B2, - non-concatenated signals
Block Length: 1 SONET/SDH frame.
Measurement type
Errored Block Count: Total blocks in which one or more bits are in error.
Errored Seconds Count: Total number of one second periods containing one or more errored blocks.
Severely Errored Seconds Count: Total number of one second periods each containing a number of errored blocks, greater than a user setable threshold, or at least one Severely Dis-

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turbed Period.
Unavailable Seconds Count: A period of Unavailable Time begins at the onset of 10 consecutive SES events. These 10 seconds are considered to be part of unavailable time. A new period of available time begins at the onset of 10 consecutive non-SES events. These 10 seconds are considered part of available time.
Errored Seconds Ratio: The ratio of errored seconds to total seconds in available time.
Severely Errored Seconds ratio: The ratio of severely errored seconds to total seconds in available time.
Background Block Error ratio: The ratio of Background Block Errors to total blocks in available time. The count of total blocks excludes all blocks during Severely Errored Seconds.

Results

Three types of result are provided by the HP E1676B module: sampling period, cumulative, and measurement period results. All three are available for error count and error ratio measurements - cumulative and measurement period results are available for error-seconds and alarm-seconds measurements.
Sampling Period Results: Errors counted during the most recent 100 ms sampling period.
Cumulative Results: Result data accumulated from start of measurement period until most recent 100 ms sampling period.
Measurement Period Results: Calculated based on result data accumulated during most recent complete measurement period.

Measurement Period

Manual: Start/stop.
Timed: User-defined from 1s to 3 days. Single or repetitive gating with no dead time between measurement periods.

Trigger Output

Provides a trigger signal on one of the following receive conditions:

Trigger Source	Trigger
Out of frame	Level
Loss of frame	Level
Frame pulse	Pulse
Descrambler	Level
Line/MS-FERF	Level
Line/MS-AIS	Level
Snapshot mem triggered	
- single	Pulse
- repetitive	Pulse
B1 errors	Pulse (see pulse def.)
B2 errors	Pulse (see pulse def.)
B3 errors	Pulse (see pulse def.)
MS-FEBE errors	Pulse

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Trigger Source	Trigger
Path FEBE errors	Pulse
PRBS errors	Pulse
Pointer Action	Pulse
Pointer Realign	Pulse
Start of payload (J1)	Pulse
OHBER Error	Pulse

Level: TTL compatible.
Pulse: 1 ms (nominal) high pulse, except for B1, B2, B3, which are defined below:

If a B1 error is detected: The trigger will go high sometime in row 2 of the frame and stay high until the start of the next frame. The exact location of the start of the trigger is dependent upon the first bit detected in error.
If a B2 error is detected: The trigger will go high sometime in row 5 of the frame and stay high until the start of the next frame. The exact location of the start of the trigger is dependent upon the first bit detected in error.
If a B3 error is detected: The trigger will go high sometime after the errored B3 byte is detected and stay high until the occurrence of the next J1 byte (SPE synchronized). The exact location of the start of the trigger is dependent upon the first bit detected in error.

Drive capability: 50 ohm to ground.
Connector: BNC.

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B

Error Messages

This appendix lists module specific and SCPI error messages.

Error Reporting

When an error occurs, the module's error indicator lights and an error message is stored in the module's internal error queue. To access the message depends on how the module is controlled:

- If you are using SCPI commands, the message can be read using the **SYSTem:ERRor?** command.
- If you are using the Windows/HP ITG panels, the message can be viewed by clicking the mouse on the **Error Number** button on the Other subpanel.

It is recommended that error messages are read from this queue as they occur, since the error condition may affect the integrity of a measurement. The error indicator extinguishes when the error message is read.

Up to 30 error messages can be held in the queue. Messages are read on a first-in first-out basis; when a message is read it is removed from the queue. If the error queue becomes full and another error condition is detected, the last entry in the queue is replaced with error message **-350 "QUEUE OVERFLOW"**. No more errors are recorded while this condition exists.

If no error messages reside in the error queue, the message **+0, "NO ERROR"** is returned to an error queue inquiry.

Error Numbers

Error messages are grouped into several classes, where each class is allocated a range of error numbers, see the table below. These numbers can be positive (+) or negative (-). Positive numbers are HP E1676B errors. Negative numbers represent general Standard Commands for Programming Instruments (SCPI) errors.

Error Type	Error No. Range	Error Class
Module Errors	1 to 32767	Indicates that an error has been detected in the module.
Command Errors	-100 to -199	Indicates that an IEEE 488.2 syntax error has been detected by the module's parser.
Execute Errors	-200 to -299	Indicates that an error has been detected in the module's execution control block.

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Error Type	Error No. Range	Error Class
Device Specific Errors	–300 to –399	Indicates that the module has detected an error which is not a command error, execute error, or a query error.
Query Errors	–400 to –499	Indicates that the output queue control of the module has detected a problem with the message exchange protocol.

The error messages are listed in numerical order, and for convenience, positive numbered error messages are tabulated separately from the negative numbered error messages.

Positive Numbered Errors

Error N°.	Error Message	Error Description
0	"No error"	No error/event in error/event queue.
+101	"Invalid firmware record"	An internal error occurred during a firmware download. Retry the operation that caused the error. If this error persists, report the error number and the circumstances of its occurrence to your Hewlett-Packard representative.
+102	"EEPROM programming error"	An internal error occurred during a firmware download. Retry the operation that caused the error. If this error persists, report the error number and the circumstances of its occurrence to your Hewlett-Packard representative.
+103	"EEPROM erasure error"	An internal error occurred during a firmware download. Retry the operation that caused the error. If this error persists, report the error number and the circumstances of its occurrence to your Hewlett-Packard representative.
+104	"Invalid gate array record"	An internal error occurred during a firmware download. Retry the operation that caused the error. If this error persists, report the error number and the circumstances of its occurrence to your Hewlett-Packard representative.
+105	"Gate array programming error"	The firmware found valid data in memory, but could not program a gate array with it.
+106	"Checksum error"	An internal error occurred during a firmware download. Retry the operation that caused the error. If this error persists, report the error number and the circumstances of its occurrence to your Hewlett-Packard representative.
+108	"Instrument failed"	The instrument has failed and is inoperable.
+109	"Invalid gate array data"	The firmware found invalid gate array data in memory. Retry the operation that caused the error. If this error persists, report the error number and the circumstances of its occurrence to your Hewlett-Packard representative.
+201	"Settings change"	The configuration settings were changed to accommodate the last configuration setting.
+202	"Invalid word address"	An even word address was expected.
+1017	"Payload input framing failed"	The front panel payload input port signal could not be framed up on.

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Positive Numbered Errors

Error N°.	Error Message	Error Description
+1021	"Payload input port not connected"	The front panel payload input port is not connected to the HP E1615A.
+1022	"Payload output port not connected "	The front.panel payload output port is not connected to the HP E1615A.
+1023	"Capture system aborted"	Thedatacapturesystemhashaditsactivityabortedand is returned to the idle state, and any captured data is made stale.

Negative Numbered Errors

Error N°.	Error Message	Error Description
0	"No error"	No error/event in error/event queue.
−100	"Command error"	This is the generic syntax error for devices that cannot detect more specific errors.
−101	"Invalid character"	A syntactic element contains a character which is invalid for that type.
−102	"Syntax error"	An unrecognized command or data type was encountered.
−103	"Invalid separator"	The parser was expecting a separator and encountered an illegal character.
−104	"Data type error"	The parser recognized a data element different than that allowed.
−105	"GET not allowed"	A group execute trigger (GET) was received within a program message.
−108	"Parameter not allowed"	More parameters were received than expected for the header.
−109	"Missing parameter"	Fewer parameters were received than required for the header.
−110	"Command header error"	An error was detected in the header.
−111	"Header separator error"	A character which is not a legal header separator was encountered while parsing the header.
−112	"Program mnemonic too long"	The header contains more than 12 characters.
−113	"Undefined header"	The command is syntactically correct, but it is undefined for this specific device.
−114	"Header suffix out of range"	The value of a numeric suffix attached to a program mnemonic makes the header invalid.
−120	"Numeric data error"	An error was detected when parsing a data element which appears to be numeric, including the nondecimal numeric types.

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Negative Numbered Errors

Error N°.	Error Message	Error Description
−121	"Invalid character in number"	An invalid character for the data type being parsed was encountered.
−123	"Exponent too large"	The magnitude of the exponent was larger than 32000.
−124	"Too many digits"	The mantissa of a decimal numeric data element contained more than 255 digits, excluding leading zeros.
−128	"Numeric data not allowed"	A legal numeric data element was received, but the device does not accept one in this position for the header.
−130	"Suffix error"	An error was detected when parsing a suffix.
−131	"Invalid suffix"	The suffix does not follow the syntax, or the suffix is inappropriate for this device.
−134	"Suffix too long"	The suffix contained more than 12 characters.
−138	"Suffix not allowed"	A suffix was encountered after a numeric parameter which does not allow suffixes.
−140	"Character data error"	An error was detected when parsing a character data element.
−141	"Invalid character data"	Either the character data element contains an invalid character, or the particular element received is not valid for the header.
−144	"Character data too long"	The character data element contained more than 12 characters.
−148	"Character data not allowed"	A legal character data element was encountered where prohibited by the device.
−150	"String data error"	An error was encountered when parsing a string data element.
−151	"Invalid string data"	A string data element was expected, but was invalid for some reason.
−158	"String data not allowed"	A string data element was encountered but was not allowed by the device at this point in parsing.
−160	"Block data error"	An error was encountered when parsing a block data element.
−161	"Invalid block data"	A block data element was expected, but was invalid for some reason.
−168	"Block data not allowed"	A legal block data element was encountered but was not allowed by the device at this point in parsing.
−170	"Expression error"	An error was encountered when parsing an expression data element.
−171	"Invalid expression"	The expression data element was invalid.
−178	"Expression data not allowed"	A legal expression data was encountered but was not allowed by the device at this point in parsing.

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Negative Numbered Errors

Error N°.	Error Message	Error Description
–180	"Macro error"	An error was encountered when defining a macro or executing a macro.
–181	"Invalid outside macro definition"	A macro parameter place holder ($<number>) was encountered outside a macro definition.
–183	"Invalid inside macro definition"	The program message unit sequence, sent with a ***DDT** or ***DMC** command, was syntactically invalid.
–184	"Macro parameter error"	Indicates that a command inside the macro definition had the wrong number or type of parameters.
–200	"Execution error"	This is the generic syntax error for devices that cannot detect more specific errors.
–211	"Trigger ignored"	A group execute trigger (GET), ***TRG**, or triggering signal was received and recognized by the device but was ignored because of device timing considerations.
–212	"Arm ignored"	An arming signal was received and recognized by the device but was ignored.
–213	"Init ignored"	A request for a measurement initiation was ignored as another measurement was already in progress.
–214	"Trigger deadlock"	The trigger source for the initiation of a measurement is set to group execute trigger (GET) and subsequent measurement query is received.
–215	"Arm deadlock"	The arm source for the initiation of a measurement is set to group execute trigger (GET) and subsequent measurement query is received.
–220	"Parameter error"	A program data element related error occurred.
–221	"Settings conflict"	A legal program data element was parsed but could not be executed due to the current device state.
–222	"Data out of range"	A legal program data element was parsed but could not be executed because the interpreted value was outside the legal range.
–223	"Too much data"	A legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.
–224	"Illegal parameter value"	The numeric value specified is not allowed.
–230	"Data corrupt or stale"	Possibly invalid data; new reading started but not completed since last access.
–231	"Data questionable"	Measurement accuracy is suspect.
–240	"Hardware error"	A legal program command or query could not be executed because of a hardware problem in the device.
–241	"Hardware missing"	A legal program command or query could not be executed because of missing device hardware.

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Negative Numbered Errors

Error N°.	Error Message	Error Description
–250	"Mass storage error"	A mass storage error occurred.
–251	"Missing mass storage"	A legal program command or query could not be executed because of missing mass storage.
–252	"Missing media"	A legal program command or query could not be executed because of missing media.
–253	"Corrupt media"	A legal program command or query could not be executed because of corrupt media.
–254	"Media full"	A legal program command or query could not be executed because the media was full.
–255	"Directory full"	A legal program command or query could not be executed because the media directory was full.
–256	"File name not found"	A legal program command or query could not be executed because the file name on the device media was not found.
–257	"File name error"	A legal program command or query could not be executed because the file name on the device media was in error.
–258	"Media protected"	A legal program command or query could not be executed because the media was protected.
–260	"Expression error"	An expression program data element related error occurred.
–261	"Math error in expression"	A syntactically legal expression program data element could not be executed due to a math error.
–270	"Macro error"	A macro-related execution error occurred.
–271	"Macro syntax error"	A syntactically legal macro program data sequence could not be executed due to a syntax error within the macro definition.
–272	"Macro execution error"	A syntactically legal macro program data sequence could not be executed due to some error in the macro definition.
–273	"Illegal macro label"	The macro label defined in the ***DMC** command could not be accepted by the device.
–274	"Macro parameter error"	The macro definition improperly used a macro parameter place holder.
–275	"Macro definition too long"	A syntactically legal macro program data sequence could not be executed because the string or block contents were too long for the device to handle.
–276	"Macro recursion error"	A syntactically legal macro program data sequence could not be executed because the device found it to be recursive.

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Negative Numbered Errors

Error N°.	Error Message	Error Description
–277	"Macro redefinition not allowed"	A syntactically legal macro label in the ***DMC** command could not be executed because the macro label was already defined.
–278	"Macro header not found"	A syntactically legal macro label in the ***GMC?** query command could not be executed because the header was not previously defined.
–280	"Program error"	A downloaded program-related execution error occurred.
–281	"Cannot create program"	An attempt to create a program was unsuccessful.
–282	"Illegal program name"	The name used to reference a program was invalid.
–283	"Illegal variable name"	An attempt was made to reference a non-existent variable in a program.
–284	"Program currently running"	Certain operations dealing with programs may be illegal while the program is running.
–285	"Program syntax error"	A syntax error appears in a downloaded program.
–286	"Program runtime error"	A program runtime error has occurred.
–300	"Device-specific error"	This is the generic device-dependent error for devices that cannot detect more specific errors.
–310	"System error"	An error, termed "system error" by the device, has occurred.
–311	"Memory error"	An error was detected in the device's memory.
–312	"PUD memory lost"	The protected user data (PUD) saved by the ***PUD** command has been lost.
–313	"Calibration memory lost"	The non-volatile calibration data used by the ***CAL?** query command has been lost.
–314	"Save/recall memory lost"	The non-volatile data saved by the ***SAV?** query command has been lost.
–315	"Configuration memory lost"	The non-volatile configuration data saved by the device has been lost.
–330	"Self-test failed"	The self-test has failed.
–350	"Too many errors"	The error queue is full as more than 30 errors have occurred.
–400	"Query error"	This is the generic query error for devices that cannot detect more specific errors.
–410	"Query INTERRUPTED"	Data was not read from the output buffer before another command was executed.
–420	"Query UNTERMINATED"	A command that generates data was not able to finish executing due to a configuration error.

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Negative Numbered Errors

Error N°.	Error Message	Error Description
–430	"Query DEADLOCKED"	Command execution cannot continue because the mainframe's command input and data output buffers are full. Clearing the instrument restores control.
–440	"Query UNTERMINATED after indefinite response"	A query was received in the same program message after a query requesting an indefinite response was executed.

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Using the HP E1676B in the HP 75000 Series 90

Introduction

The HP E1676B SONET/SDH Transport Overhead (TOH) Analyzer can be used in the HP 75000 Series 90 System - a VXI C-size modular system. The elements that make up the system are listed below:

- HP-IB Controller
- Mainframe
- Slot 0 Command Module
- SONET/SDH Modules
- Three Intermodule Buses

The HP E1676B operates in the following basic modes:

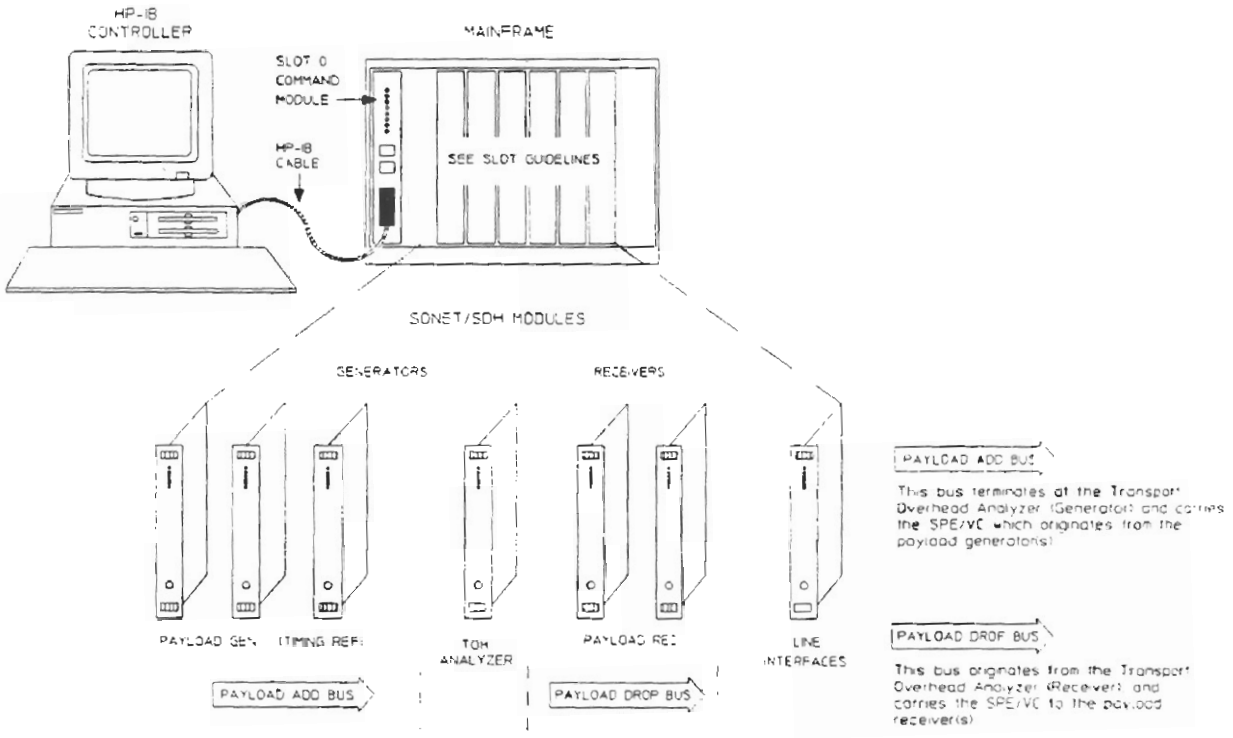
- MULTIrate mode
- TRIButary mode

How the HP E1676B TOH Analyzer is positioned relative to the other Series 90 modules when operating in each of the above modes is described in the following pages.

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MULTIrate Mode

The following diagram shows the relationship between the Series 90 elements and the HP E1676B TOH Analyzer when operating in MULTIrate mode:



Slot Guidelines

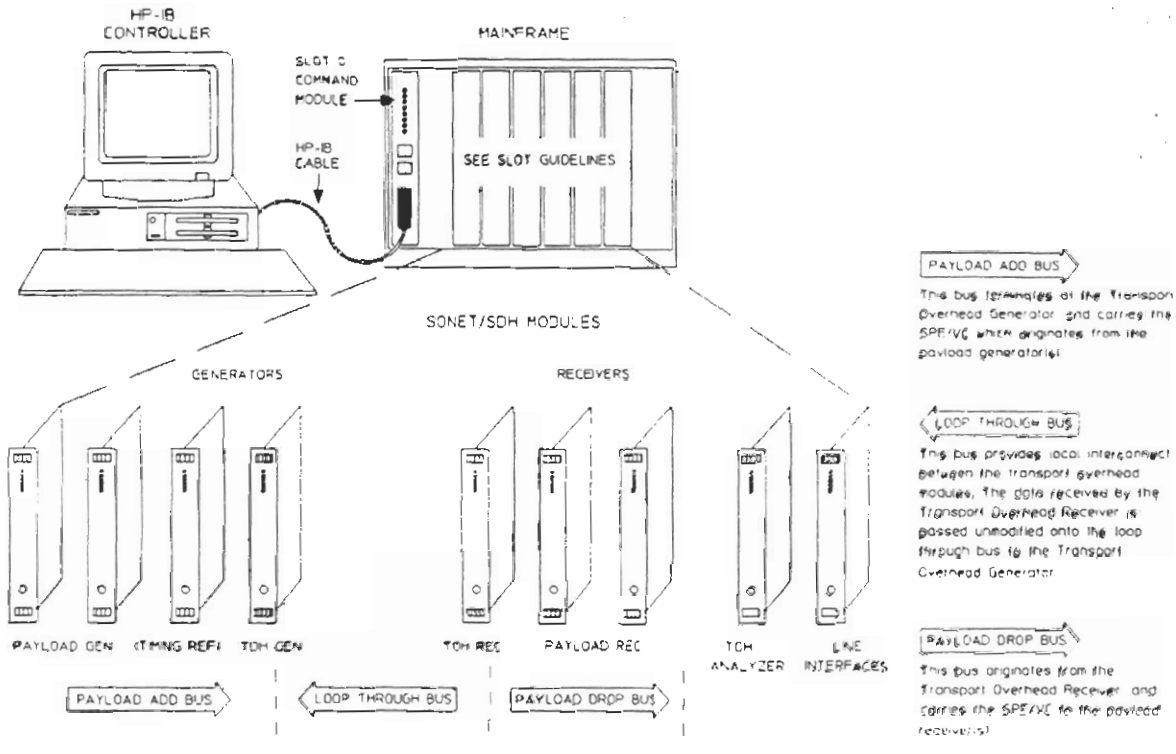
The relative positioning of the modules within the Mainframe is shown above. The slot guidelines which must be observed are as follows:

- All generators must be to the left of the TOH Analyzer with no vacant slots between them.
- If a Timing Reference is part of the system, it must be positioned between the TOH Analyzer and right-most payload generator.
- All receivers must be to the right of the TOH Analyzer with no vacant slots between them.
- By convention, Line Interfaces are positioned to the right of all other modules.
- Other VXIbus modules must not be located immediately next to any Series 90 generator or receiver.

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TRIButary Mode

The following diagram shows the relationship between the Series 90 elements and the HP E1676B TOH Analyzer when operating in TRIButary mode:



Slot Guidelines

The relative positioning of the modules within the Mainframe is shown above. The slot guidelines which must be observed are as follows:

- The Transport Overhead (TOH) Generator module must be to the left of the Transport Overhead Receiver with no vacant slots between them.
- All generators must be to the left of the TOH Generator with no vacant slots between them.
- If a Timing Reference is part of the system, it must be positioned between the TOH Generator and right-most payload generator.
- All receivers must be to the right of the TOH Receiver with no vacant slots between them.
- If an HP E1676B is part of the system, it must be to the right of any receiver module.
- By convention, Line Interfaces are positioned to the right of all other modules.
- Other VXIbus modules must not be located immediately next to any Series 90 generator or receiver.

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Controller/ Module Communication

To enable the HP-IB Controller to communicate with modules in the Mainframe, commands are first applied to an HP-IB/VXIbus Interface contained on the Slot 0 Command Module. The commands are then passed along the Mainframe's VXIbus backplane, and routed to specific modules using commander/servant module addressing; for more information on *Addressing* see below.

Commanders and Servants

A "commander" is a message-based module which can control up to 7 "servant" modules. Servant modules are normally register-based.

Addressing

The addressing used in the Series 90 System is outlined in the following table:

Element	Comments
Controller	Assigned an HP-IB interface select code - normally 7.
Slot 0 Command Module	a. Assigned an HP-IB primary address - normally 9. b. Assigned a VXIbus logical address - normally 0.
Commander	a. Assigned a VXIbus logical address - its value must be a multiple of 8, and is set using switches located on the module. The commander's HP-IB secondary address is derived from the logical address by dividing the logical address value by 8. b. Assigned a VXIbus servant area - its value is set by a second series of switches located on the module, and defines the number of servants that the commander can control. Normally, the servant area value is set to 7
Servant	Assigned a VXIbus logical address - its value must fall within the following two boundaries: the first boundary is defined by adding 1 to its commander's logical address, the second boundary is defined by adding together the commander's servant area value and logical address value. *For example, if a commander has a logical address of 24, and a servant area of 7, the servant area address range is 25 through 31.* Note that the servant area address range must not include commander modules.

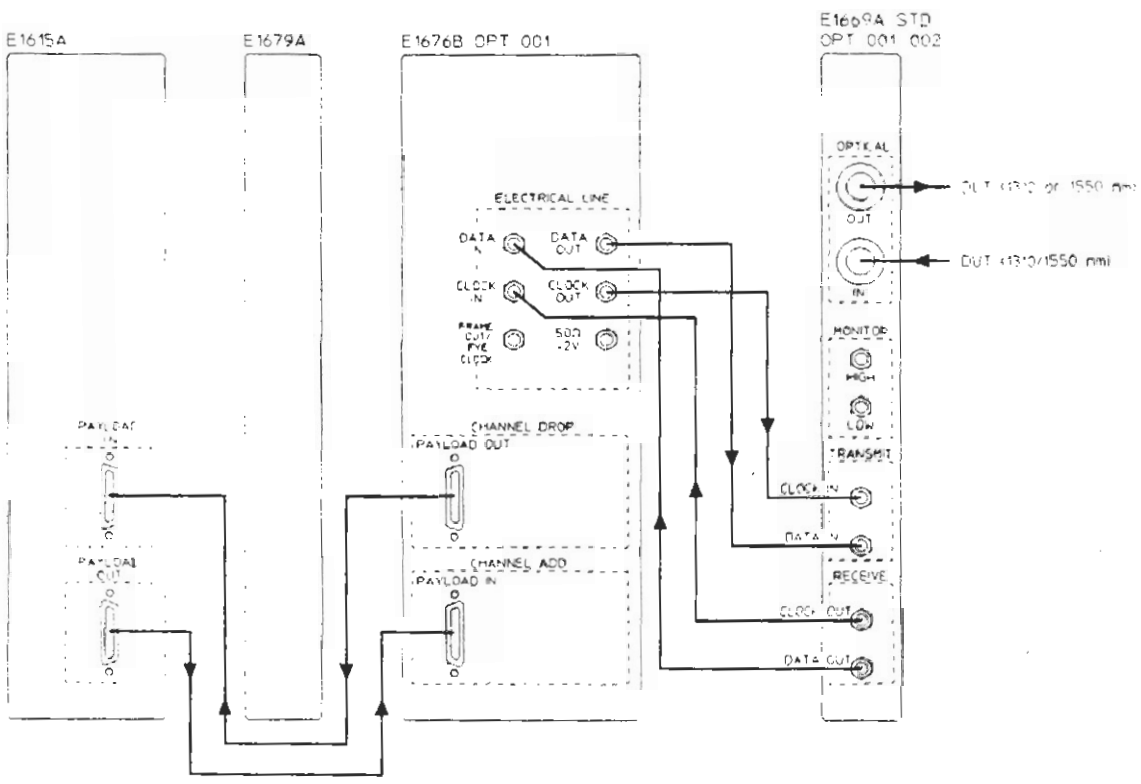
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ATM Payload Operation (HP E1676B Option 001)

The HP E1676B Transport Overhead Analyzer Option 001 can add an externally generated ATM signal (from an HP E1615A) into an STS-48c/STM-16c concatenated payload. It can also drop an ATM concatenated payload to an HP E1615A for analysis.

The following diagram shows the modules which can be used during ATM operation:



Slot Guidelines

The relative positioning of the modules within the Mainframe is shown above. The slot guidelines which must be observed are as follows:

- The HP E1676B Transport Overhead Analyzer option 001 module must be immediately to the right of the HP E1615A ATM Transmitter/Receiver (no vacant slots between them, except when an HP E1679A is part of the system).
- If an HP E1679A Timing Reference is part of the system, it must be positioned between the HP E1676B and the HP E1615A.
- By convention, Line Interfaces (such as an HP E1669A) are positioned to the right of all other modules.

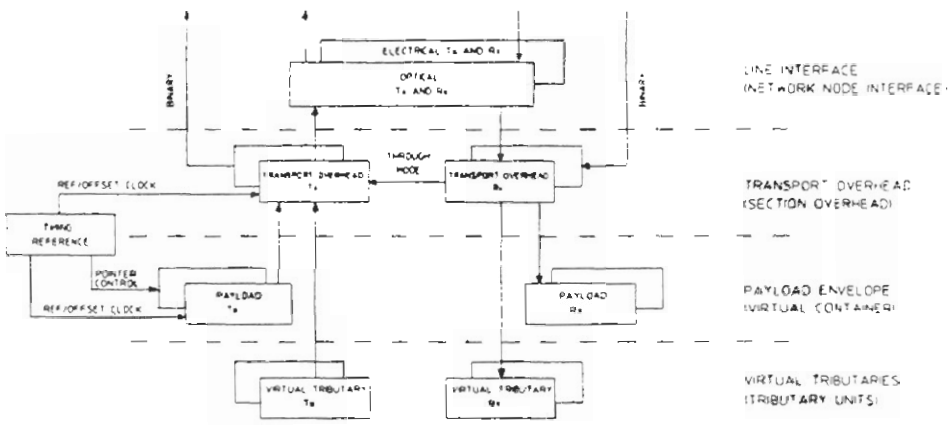
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Modular SONET/SDH Analyzer

Overview

The HP 75000 Series 90 Modular SONET/SDH Analyzer is designed to make measurements, and test equipment, in digital transport networks complying with SONET and SDH Standards.

Synchronous Optical NETwork (SONET) and Synchronous Digital Hierarchy (SDH) Standards are defined as a series of layers, where each layer has its own distinct functions. Modules in the analyzer are assigned layer specific transmit and/or receive capabilities. An interconnection diagram of the modules, and a description of each layer is given below.



Line Interface (Network Node Interface) — This is the physical transmission layer. It enables SONET/SDH signals to be transmitted electrically over short distances, or optically and by microwave radio over long distances.

Transport Overhead (Section Overhead) — Contains the administrative information necessary to transport services throughout the SONET/SDH network which includes framing and error checking. It also has communication channels set aside for operations, administration, maintenance, and provisioning.

Payload Envelope (Virtual container) — Carries broadband service payloads such as DS-3 and 139 Mbit/s. Each service has a predefined mapping within the payload.

Virtual Tributaries (Tributary Units) — Carries wideband service payloads such as DS-1 and 2 Mbit/s. The payload is divided into sections called "virtual tributaries". Each service is mapped to an associated virtual tributary. Different groups of virtual tributaries can be combined to form a payload envelope.

NOTE: SONET and SDH each have their own terminology, SDH terms are in brackets ().

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SONET/SDH Equivalent Terms

The following table lists the equivalent terms used in SONET and SDH.

SONET Term	SDH Term
Intermediate Reach (IR)	I-*n* Intra Office, STM-*n*
Line	Multiplexer Section (MS)
Line AIS	MS-AIS
Line BIP	MS-BIP
Line DCC	MS-DCC
Line FERF	MS-RDI
Line Interface	Network Node Interface
Line Overhead	Multiplexer Section Overhead
LR long reach	L-*n*.1 or L-*n*.2 long haul
Payload Envelope	Virtual Container
Repeater	Regenerator
Section	Regenerator Section (RS)
Section DCC	RS-DCC
Section Overhead	Regenerator Section Overhead
Short Reach (SR)	S-*n*.1 or S-*n*.2 short haul
SPE	VC
STS-*n*	STM-*n*
Synchronous Payload Envelope (SPE)	Virtual Container (VC)
TOH	SOH
Transport Overhead (TOH)	Section Overhead (SOH)
Virtual Tributary (VT)	Tributary Unit (TU)
VT	TU
VT AIS	TU AIS
VT FEBE	TU REI
Yellow Alarm	Remote Alarm Indicator

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