User Manual

Tektronix

OTS
Optical Test System

10Gb/s–155MHz Jitter module
OTS92S1 Synchronization module

071-1133-01

Tektronix, Inc.
14200 SW Karl Braun Drive
Beaverton, OR 97077
USA

Warranty

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

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

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any equipment connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

How to Avoid Fire or Personal Injury

Use Proper Power Cord. To avoid fire hazard, use only the power cord specified for this product.

Use Proper Power Source. Do not operate this product from a power source that applies more than the voltage specified.

Connect and Disconnect Properly. Do not connect or disconnect test leads while they are connected to a voltage source.

Avoid Electric Overload. To avoid electric shock or fire hazard, do not apply a voltage to a terminal that is outside the range specified for that terminal.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Use Proper AC Adapter. Use only the AC adapter specified for this product.

Do Not Look into the End of a Fiberglass Cable. Never look into the end of a fiberglass cable or a single fiber, which could be connected to a laser source. Laser radiation can damage your eyes because it is invisible and your pupils do not contract instinctively as with normal bright light. If you think your eyes have been exposed to laser radiation, you should have your eyes checked immediately by an eye doctor. The optical output's radiation power corresponds to the laser class in accordance with IEC 825-1, 11.93.

Use Proper Fuse. To avoid fire hazard, use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do not operate in Wet/Damp Conditions. To avoid electric shock, do not operate this product in wet or damp conditions.

Do Not Operate in Explosive Atmosphere. To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Wear Eye Protection. To avoid eye injury, wear eye protections if there is a possibility of exposure to high-intensity rays.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Safety Terms and Symbols

Terms in this Manual

These terms may appear in this manual:

Icon	Label	Meaning
⚠	**WARNING!**	Warning statements identify conditions or practices that could result in injury or loss of life.
⚠	**CAUTION!**	Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms on the Product

These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product

The following symbols may appear on the product:

CAUTION
Laser Radiation

Protective Ground
(Earth) Terminal

ATTENTION
Refer to Manual

Electrostatically
hazardous

Preface

This manual describes how to use the Tektronix OTS Jitter and Synchronization modules. This manual is your primary source of information about how the modules function.

The user interface also provides Windows Help files for further information on specific topics.

How This Manual is Organized

This manual is divided into four sections: *Getting Started*, *Operating Basics*, *Reference*, and *Appendices*.

- *Getting Started* provides an overview of the modules and describes first-time operation.
- *Operating Basics* explains the basic principles of operating the modules. The Operating Basics section also includes sample applications.
- *Reference* provides a brief overview of the syntax and format used for remote commands and provides explanations and listings of the remote commands that may be used with the OTS system and the jitter and synchronization modules.
- The *Appendices* provide a listing of specifications, default factory settings, list of acronyms, new information for the OTS91T3 and OTS91C3 cards, and other useful information.

NOTE: *To support 10Gb/s jitter generation, the OTS91T3 and OTS91C3 cards must be used in place of the OTS91T2, OTS91T1, and OTS91C1 cards. To support 10Gb/s jitter measurement, the 10Gb/s Transmit card must be either OTS91T3 or OTS91T2. The OTS91T1 Transmit card does not support jitter.*

Conventions

This manual uses the following conventions:

- When referring to the modules and cards in a system, the definitions are:
  - A **module** is a technology solution incorporating a number of cards designed to work together to present the customer with a specific testing ability (the generic module cannot be ordered, the specific cards must be ordered).
  - A **card** is a subset of a module and refers to the individual, orderable cards that are plugged into the chassis.
- The names of front-panel connectors and LEDs appear in the manual in the same format as found on the front panel label, for example, OPTICAL IN and Tx EVENT OUT.
- When the user interface is discussed, all menus, name tags, and buttons appear in the manual in the same format as found in the user interface, for example, Enable COM2 and Output Pulse Trigger.
- In reference to terminology, the user interface may be set to either SDH or SONET references. The user manual provides SDH and SONET terminology separated by a slash (/). If no second terminology is present, the terminology is the same for both SDH and SONET.
- In reference to the instrument, the following conventions apply:
  - When referring to the mainframe or the whole system, the name OTS is used.
  - When referring to the two-card or three-card jitter module (Hybrid, Transmit, and Receive), the name OTS9200 is used.
  - When referring to each individual card, the card name is used, for example, Transmit.
  - When referring to the synchronization module and because this module consists of only one card, the card name and module name are the same: OTS92S1.

NOTE: *Some of the content found in this manual does not pertain to some instruments. Depending on the software revision and the options installed, some of the features described in these pages may not be available.*

Getting Started

This chapter describes the preparation and initial setup of the **OTS9200 and OTS92S1 modules.** Also provided is a list of standard and optional accessories for each of the configurations: 10 Gb/s Jitter, 2.5Gb/s Jitter, and Synchronization.

OTS9200 Product Description

The OTS9200 Jitter module provides stable, repeatable jitter measurements capable of jitter generation and measurement. The module provides jitter output and jitter tolerance testing from 155MHz to 10GHz rates with exceptionally low intrinsic noise, wide jitter range with no range switching, no settling time, and high, stable jitter accuracy.

The OTS9200 module utilizes a Tektronix-patented Digital Phase Analysis (DPA) technology employed on a high-speed SiGe chip. This revolutionary approach to jitter generation and measurements provides a number of significant testing advantages during testing.

The DPA technology provides a much more robust signal containing none of the traditional problems of analog noise, gain error, distortion, and band limiting. Measurements can be made rapidly with no settling time delays.

The OTS9200 adds another layer of testing capability to the OTS Product Family solution. The OTS9200 test module is comprised of three cards: Jitter Generation, Jitter Receiver, and Jitter Hybrid. The Jitter Hybrid card is required only for 10Gb/s testing.

To test at the 155Mb/s to 2.5Gb/s rates, the OTS92T1 (Jitter Generator) and OTS92R1 (Jitter Receiver) cards are paired with the OTS9300 Multi-rate SONET/SDH module.

To test at the 10Gb/s rate, the OTS92T1 (Jitter Generator), OTS92R1 (Jitter Receiver), and the OTS92H1 (Jitter Hybrid) cards are paired with the OTS9100 10Gb/s SONET/SDH module.

Next Generation All-Digital Jitter Analysis

This all-digital jitter solution provides consistent results, which in turn produce the following benefits:

- Confidence in repeatability & consistency
- Greater first-pass ratio
- Results in higher yields
- Eliminates the need for repeated tests
- Saves time & money
- Ensures compliance to standards

NOTE: *To support 10Gb/s jitter generation, the OTS91T3 and OTS91C3 cards must be used in place of the OTS91T2, OTS91T1, and OTS91C1 cards. To support 10Gb/s jitter measurement, the 10Gb/s Transmit card must be either OTS91T3 or OTS91T2. The OTS91T1 Transmit card does not support jitter.*

OTS9200 Module Features and Capabilities

- Exceptionally low intrinsic noise
- Wide jitter range with no range switching
- High jitter accuracy
- No settling time
- Greater first-pass ratio
- Eliminates the need for repeated tests
- Results in higher yields
- Saves time and money
- Common user interface with all OTS products
- Fits in the same chassis as other OTS modules
- Available in 10Gb/s Jitter and 2.5Gb/s Jitter configurations
- Windows 2000 compatible user interface
- Direct user download of software updates
- Meets current ITU and GR-253 standards

Low Intrinsic Noise

The OTS9200 module has exceptionally low intrinsic noise levels due to the DPA technology. Therefore, the test equipment can be removed from the testing equation thus increasing the value of the test results.

No Settling Time, No Range Switching

The all-digital nature of the jitter testing eliminates the need to use phase-locked loops for inferring jitter measurements, the traditional way of measuring jitter and suspect to a host of time-eating problems, such as slow settling and range switching requirements. The result of this lack of PLL circuits is a much cleaner signal output providing high resolution of the entire jitter range. The OTS9200 module eliminates both settling time and range switching, saving time and removing the guesswork range switching inevitably involves. Settling time is eliminated because the DPA technology time stamps each edge as it sees them. This ability decreases test times and enhances the thru-put of the testing system.

Time-stamps Every Edge

Jitter testing involves the measurement and generation of phase modulation. The test methodology has become increasingly digital as DACs, ADCs, DSPs, and time-stamp techniques have been incorporated. But the core of the methodology has remained an analog phase detector—one that converts phase (or time interval) to an analog voltage. As a result, the processing of phase has remained limited in frequency, amplitude, and accuracy. Some attempts to digitally time-stamp signal edges don't act in real time and miss data. The OTS9200 can measure phase by continuously time-stamping every edge and generate phase by placing each edge individually.

OTS92S1 Product Description

The OTS92S1 Synchronization module supplies a reference clock to all test modules in the OTS system through the backplane. This clock can be generated by the module's Stratum 3 internal crystal oscillator, by recovering clock from the line signal of any receiver, or by synchronizing to an external BITS or SETS reference or GPS clock, thereby adding great flexibility to the user's synchronization needs. The reference clock has a user-selectable frequency offset capability to facilitate the generation of line offset for use in stress testing.

OTS92S1 Module Features and Capabilities

- Loop timing
- Internal timing
- Synchronization to external clocks (BITS/SETS, 2MHz, 5MHz, & 10MHz)
- Fits in the same chassis as other OTS modules
- Common user interface with all OTS products
- User-settable frequency offset capability
- Windows 2000 compatible user interface
- Direct user download of software updates
- Meets current ITU and GR-253 standards

Applications

The OTS9200 module and the OTS92S1 module both meet the needs of development, manufacturing, and service engineers by providing the capabilities for:

• Manufacturing Test of SONET/SDH and DWDM Network equipment

• DWDM Parallel Channel System Test

• Equipment Performance Monitoring

• In-service Monitoring

• Module Test

• Design Verification

Accessories

Some accessories are included with the **OTS9200 and OTS92S1 modules**. Should you need to purchase optional accessories contact your local Tektronix Representative.

Standard

	Certificate of Traceable Calibration
644-1015-xx	Blank panel
378-0485-xx	Air diverter
679-5487-xx	Air Management Card
015-1022-01	Terminator Cap
174-4275-01	4.25” coaxial cable
174-4277-01	8.25” coaxial cable
174-4702-00	6.25” coaxial cable
063-3560-xx	User manuals CDrom
119-6364-xx	OTS Product Family software CDrom
063-3561-xx	Windows 2000 restore CDrom

Optional

Adapters, SMA:

015-0572-00	SMA male to BNC male
015-0554-00	SMA male to BNC female
015-0549-00	Male to female connector (Used permanently installed to prolong life of instrument connector)
020-1693-00	SMA Kit

Miscellaneous:

OTS9210SL	Power splitter
071-1133-xx	OTS9200/OTS92S1 User manual (hardcopy)

OTS chassis upgrades:

OTS90UW2K	Windows 2000 upgrade
OTS90U128	128MB RAM upgrade for the OTS9000 chassis

First Operation

OTS9200 and OTS92S1 Card Installation

This procedure gives proper instructions on installing module cards. Before installing the module, verify that the OTS system is properly set up and powered OFF, as instructed in Steps 1 through 3 below:

1. Remove the unit from its shipping carton and place it on an anti-static surface.

NOTE: *Save all shipping cartons from OTS products. If returning the instrument is necessary, you will be required to ship them in their original shipping cartons.*

2. Verify that the operating environment is within the limits detailed under the Environmental Requirement section in this manual.
3. Allow approximately 2 inches (5 cm) clearance for cooling. The OTS9000 requires this clearance for the front and rear of the unit. The OTS9010, OTS9030, and OTS9040 require cooling clearance on the left and right sides of the unit.
4. Install all required module cards into the chassis. If the module cards are not already installed, perform the following steps:

CAUTION! *When installing and removing modules from the chassis, power must not be present. Ensure that all power switches are in the OFF position and power cords are not installed before removing or installing modules.* ***The OTS system does NOT support hot-swap installations. Damage will occur if modules are swapped with power applied.***

   A. Remove the module from its packaging, if necessary.

CAUTION! *All modules are static sensitive. When handling module cards, ensure that personnel are properly grounded and module cards are always placed on anti-static surfaces. If proper precautions are not taken, damage will occur.*

   B. For those locations in which module cards are being installed, remove the blanking panels and air diverters.
   C. Carefully install each module card into a slot in the mainframe. Make sure that the module is lined up and fits cleanly with the connectors on the back plane of the mainframe.

CAUTION! *Beware of bending the pins of the connectors when installing and removing modules from the chassis. Backplane connectors with bent pins will cause damage to the both the module card and the chassis.*

   To install the module cards, slowly slide the card into the desired slot. Make sure the card is lined up with the connectors and push down on the top release and up on the bottom release until the card snaps into place.

D. When the module card is in place, tighten the two screws to secure it.

CAUTION! *Do not torque the screws with more than 2 in-lbs of force or damage will occur.*

5. Verify that the power switch of the OTS chassis is in the OFF position.
6. Plug the unit into the appropriate AC Power source as follows:

Table 1-4: Power Requirements

AC Voltage	Voltage Range	Frequency Range
110 VAC	90 VAC - 132 VAC	48 - 62 Hz
220 VAC	180 VAC - 250 VAC	48 - 62 Hz

CAUTION! *If the OTS92T1 or OTS92R1 cards are installed with an unpopulated module slot to the right, you must install the Air Management Card. Installing the Air Management Card in the right-hand slot beside the card ensures the jitter cards are properly cooled and won't be damaged due to overheating.*

Removing Module Cards

To remove the module cards, perform the following steps:

CAUTION! *Before installing or removing module cards, secure dust caps onto optical connectors. If hanging loose when modules are moved, the dust caps can swing, damaging the EMI gaskets and potentially shorting to parts behind the front panels.*

All modules are static sensitive. When handling module cards, ensure that personnel are properly grounded and module cards are always placed on anti-static surfaces. If proper precautions are not taken, damage will occur.

1. Turn off the power to the OTS system.
2. Fully loosen the two screws found on the top and bottom of the module card.
3. Push up on the top release and down on the bottom release until the card is released from the connectors.
4. Carefully slide the module card out of the slot.

NOTE: *If a module card is removed, a blanking panel and air diverter must be installed to ensure proper airflow through the system. Failure to replace the air diverter and blanking panel could cause the system to overheat.*

Slot Positioning of Modules

OTS9200 Cards

The slot into which each OTS9200 card is installed is very important to the proper operation of the instrument. Due to the tight integration between OTS software and OTS modules certain cards must be placed in specific locations to support many of the features, through-mode is an example of this.

CAUTION! *If the OTS92T1 or OTS92R1 cards are installed with an unpopulated module slot to the right, you must install the Air Management Card. Installing the Air Management Card in the right-hand slot beside the card ensures the jitter cards are properly cooled and won't be damaged due to overheating.*

An OTS9200 module consists of OTS92H1, OTS92R1 and OTS92T1. Every OTS9200 module requires that the OTS92H1 Clock Recovery card be placed in the left-most slot of the module grouping followed by one OTS92R1 Receiver card and one OTS92T1 Transmitter card. A module may span the CPU in a multi-module system. Empty slots or slots containing non-OTS cards effectively end the grouping.

NOTE: *If the slot positioning rules are not followed, the module functions will be invalid. The transmitter and receiver functionality depends upon the absolute position and relative order of the module cards.*

OTS92S1 Card

The OTS92S1 Synchronization card can only be placed into the highest numbered slot available in the chassis. In addition, only one OTS92S1 card is allowed per chassis.

Module Interconnection

Before powering on the system, install all interconnection cables, DC blocks, and splitters between the module cards. For jitter, there are three typical configurations, each is described in the following sections, complete with instructions and diagrams for cabling.

NOTE: *Depending upon the configuration of the module cards within the OTS system, some of these connections may not need to be made. If multiple cards are present within the system, the 8" cables provided may be required in place of the 4" cables.*

CAUTION! *Before moving previously installed cables, loosen the connections on both ends of the cable. If one end of a cable is moved and the other end is not loosened, damage to the cable will occur.*

10Gb/s Jitter Configuration

The OTS9210 configuration supports only 10Gb/s (OC-192) Jitter testing. The combination of the OTS9100 10Gb/s SONET/SDH module with the OTS9210 Jitter module provides a solution developed to support testing of jitter at a 10Gb/s signal rate.

To connect the OTS9100 and OTS9210 modules for 10Gb/s jitter testing, the following interconnections must be installed, as shown in Figure 1-1.

1. Install a DC signal block to Rx DATA IN on the OTS91R2 card.
2. Install a DC signal block to Tx DATA OUT on the OTS91T3 card.
3. Install a power splitter to Rx DATA OUT on the OTS91L1 card
4. Install a coax cable between 10GHz CLOCK IN on the OTS91T3 card and 10GHz CLOCK OUT on the OTS91C3 card.
5. Install a coax cable between Rx CLOCK OUT on the OTS91R2 card and Rx CLOCK IN on the OTS91C3 card.
6. Install a coax cable between the DC block on the OTS91T3 card and Tx DATA IN on the OTS91L1 card.
7. Install a coax cable between the DC block on the OTS91R2 card and one end of the power splitter on Rx DATA OUT on the OTS91L1 card.
8. Install a coax cable between the other end of the power splitter on Rx DATA OUT on the OTS91L1 card and 10Gb/s DATA IN on the OTS92H1 card.

NOTE: *Before testing, ensure that both ends of the power splitter are always connected on both ends.*

9. Install a coax cable between 10GHz CLOCK IN on the OTS91C3 card and 10GHz JITTER CLOCK OUT on the OTS92H1 card.

10. Install a coax cable between 10GHz CLOCK OUT on the OTS92H1 card and 10GHz CLOCK IN on the OTS92R1 card.
11. Install a coax cable between 2.5GHz JITTER CLOCK IN on the OTS92H1 card and 2.5GHz JITTER A CLOCK OUT on the OTS92T1 card.
12. Ensure 50 ohm terminator caps are affixed.

NOTE: It is recommended that 50 ohm terminator caps be affixed to two connectors in this configuration to increase protection against static discharge and to help reduce EMC emissions. Ensure that the terminator cap for Received Data IN, located on the OTS92R1 Jitter Receive card and the connector for 2.5GHz Jitter B Clock Out, located on the OTS92T1 Jitter Transmit card are attached.

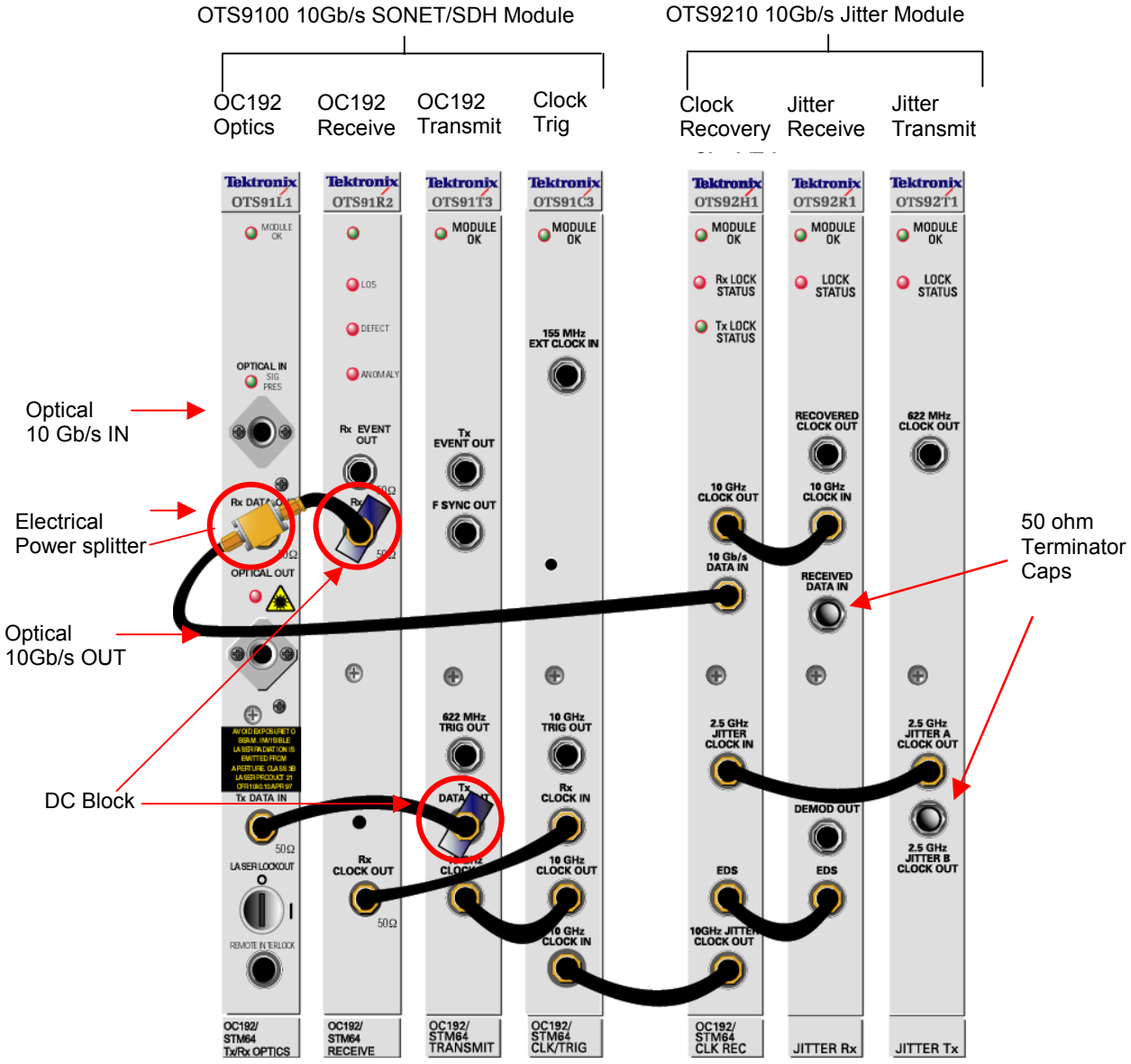


Figure 1-1: Interconnection diagram for OTS 10Gb/s Jitter Testing

Multi-Rate Jitter Configuration

The OTS9225 configuration supports only Jitter testing for signal rates of 2.5Gb/s (OC-48), 622Mb/s (OC-12) and 155Mb/s (OC-3). The combination of the OTS9300 multi-rate module with the OTS9225 Jitter module provides a solution developed to support testing of jitter at different signal rates, one rate at a time.

To connect the OTS9300 and OTS9225 modules for multi-rate jitter testing, the following interconnections must be installed, as shown in Figure 1-2.

1. Install a coax cable between 2.5G CLK IN on the OTS93T1 card and 2.5GHz JITTER B CLOCK OUT on the OTS92T1 card.
2. Install a coax cable between RECEIVED DATA OUT on the OTS93R1 card and RECEIVED DATA IN on the OTS92R1 card.
3. Ensure 50 ohm terminator caps are affixed.

NOTE: *It is recommended that 50 ohm terminator caps be affixed to two connectors in this configuration to increase protection against static discharge and to help reduce EMC emissions. Ensure that the terminator cap for 10GHz Clock IN, located on the OTS92R1 Jitter Receive card and the connector for 2.5GHz Jitter A Clock Out, located on the OTS92T1 Jitter Transmit card are in place.*

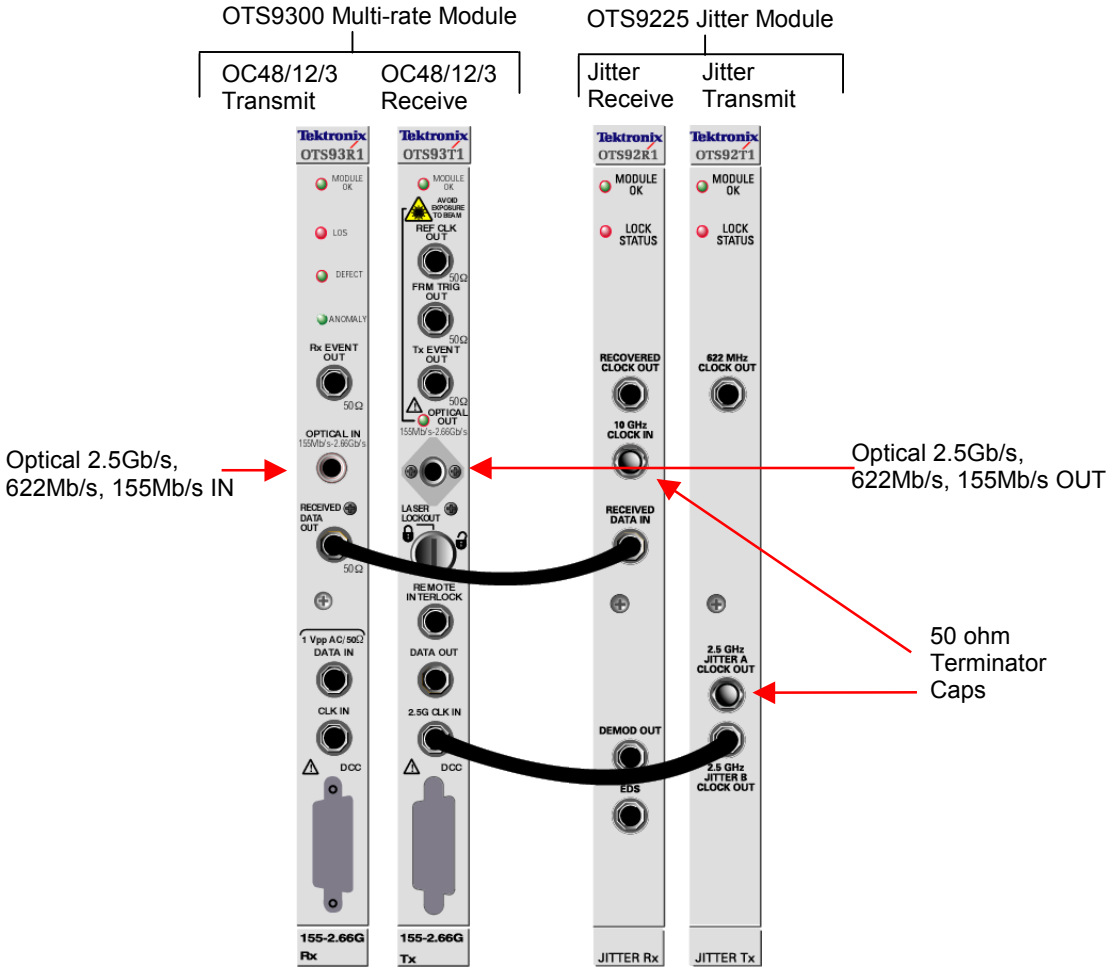


Figure 1-2: Interconnection diagram for OTS Multi-rate Jitter Testing

10Gb/s Jitter with Receive-Only Configuration

The OTS921P configuration just supports Receive-only 10Gb/s (OC-192) Jitter testing. The combination of the OTS9100 10Gb/s SONET/SDH module with the OTS921P Jitter module provides a solution developed to support testing of receive-only jitter at a 10Gb/s signal rate.

To connect the OTS9100 and OTS9210 modules for 10Gb/s Receive-only jitter testing, the following interconnections must be installed, as shown in Figure 1-3.

1. Install a DC signal block to Rx DATA IN on the OTS91R2 card.
2. Install a DC signal block to Tx DATA OUT on the OTS91T3 card.
3. Install a power splitter to Rx DATA OUT on the OTS91L1 card
4. Install a coax cable between 10GHz CLOCK IN on the OTS91T3 card and 10GHz CLOCK OUT on the OTS91C3 card.
5. Install a coax cable between Rx CLOCK OUT on the OTS91R2 card and Rx CLOCK IN on the OTS91C3 card.
6. Install a coax cable between the DC block on the OTS91T3 card and Tx DATA IN on the OTS91L1 card.
7. Install a coax cable between the DC block on the OTS91R2 card and one end of the power splitter on Rx DATA OUT on the OTS91L1 card.
8. Install a coax cable between the other end of the power splitter on Rx DATA OUT on the OTS91L1 card and 10Gb/s DATA IN on the OTS92H1 card.

NOTE: *Before testing, ensure that both ends of the power splitter are always connected on both ends.*

9. Install a coax cable between 10GHz CLOCK OUT on the OTS92H1 card and 10GHz CLOCK IN on the OTS92R1 card.
10. Ensure that 50 ohm terminator caps are used where appropriate.

NOTE :*It is recommended that 50 ohm terminator caps be affixed to the connectors in this configuration to increase protection against static discharge and to help reduce EMC emissions. Ensure that the connectors for 2.5GHz Jitter Clock IN and the 10GHz Jitter Clock Out located on the OTS92H1 Clock Recovery card are attached.*

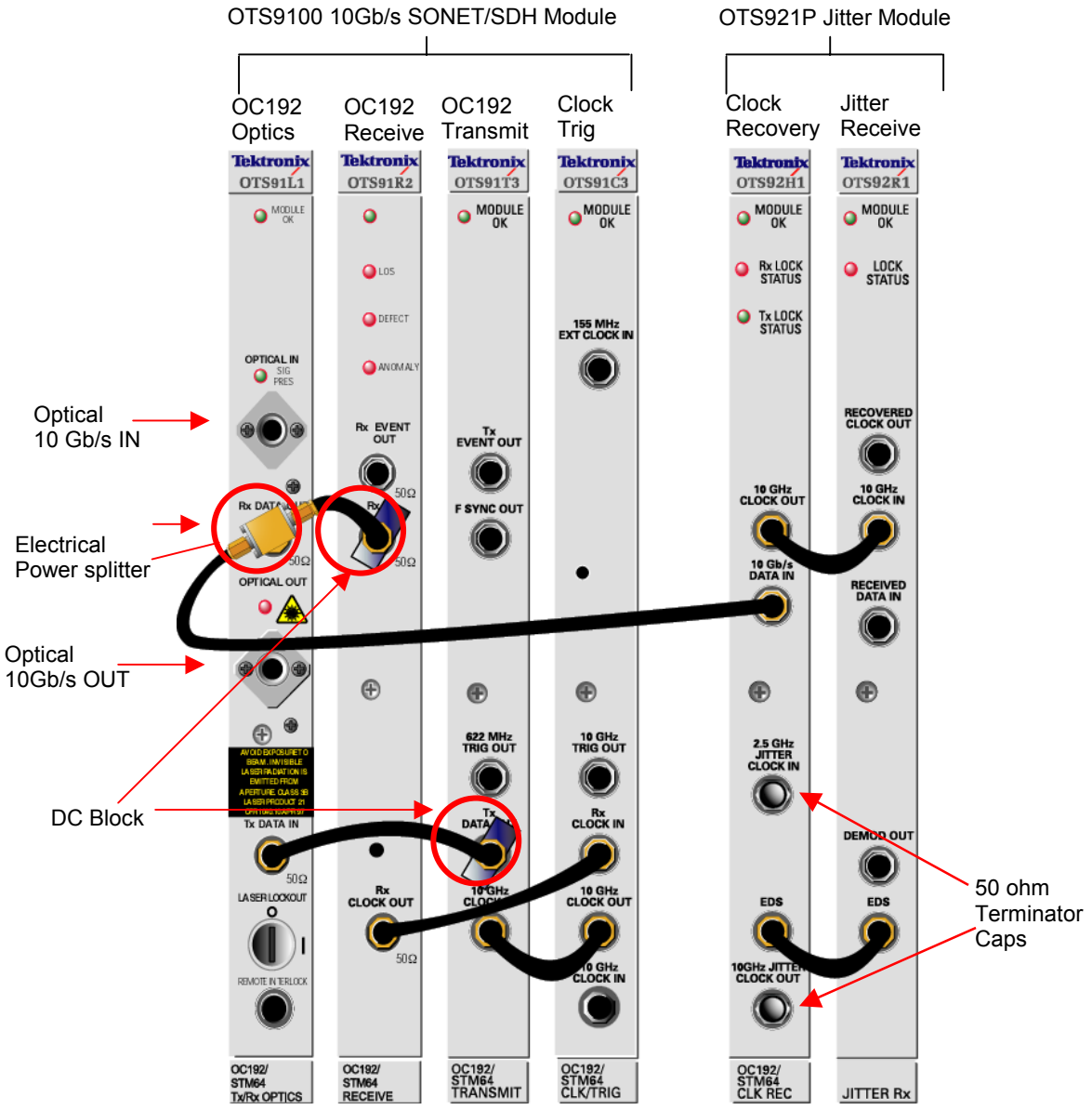


Figure 1-3: Interconnection diagram for OTS Receive-only 10Gb/s Jitter Testing

10Gb/s and Multi-rate Jitter Configuration

The OTS9200 configuration supports 155Mb/s (OC-3), 622Mb/s (OC-12), 2.5Gb/s (OC-48) and 10Gb/s (OC-192) Jitter testing. The combination of the OTS9100 10Gb/s SONET/SDH module with the OTS9300 Multi-rate module, and the OTS9210 Jitter module provides a solution developed to support testing of jitter from 10Gb/s to 155Mb/s signal rates.

To connect the OTS9100, OTS9300 and OTS9210 modules for jitter testing, the following interconnections must be installed, as shown in Figure 1-4.

1. Install a DC signal block to Rx DATA IN on the OTS91R2 card.
2. Install a DC signal block to Tx DATA OUT on the OTS91T3 card.
3. Install a power splitter to Rx DATA OUT on the OTS91L1 card
4. Install a coax cable between 10GHz CLOCK IN on the OTS91T3 card and 10GHz CLOCK OUT on the OTS91C3 card.
5. Install a coax cable between Rx CLOCK OUT on the OTS91R2 card and Rx CLOCK IN on the OTS91C3 card.
6. Install a coax cable between the DC block on the OTS91T3 card and Tx DATA IN on the OTS91L1 card.
7. Install a coax cable between the DC block on the OTS91R2 card and one end of the power splitter on Rx DATA OUT on the OTS91L1 card.
8. Install a coax cable between the other end of the power splitter on Rx DATA OUT on the OTS91L1 card and 10Gb/s DATA IN on the OTS92H1 card.

NOTE: *Before testing, ensure that both ends of the power splitter are always connected on both ends.*

9. Install a coax cable between 10GHz CLOCK IN on the OTS91C3 card and 10GHz JITTER CLOCK OUT on the OTS92H1 card.
10. Install a coax cable between 10GHz CLOCK OUT on the OTS92H1 card and 10GHz CLOCK IN on the OTS92R1 card.
11. Install a coax cable between 2.5GHz JITTER CLOCK IN on the OTS92H1 card and 2.5GHz JITTER A CLOCK OUT on the OTS92T1 card.
12. Install a coax cable between 2.5G CLK IN on the OTS93T1 card and 2.5GHz JITTER B CLOCK OUT on the OTS92T1 card.
13. Install a coax cable between RECEIVED DATA OUT on the OTS93R1 card and RECEIVED DATA IN on the OTS92R1 card.

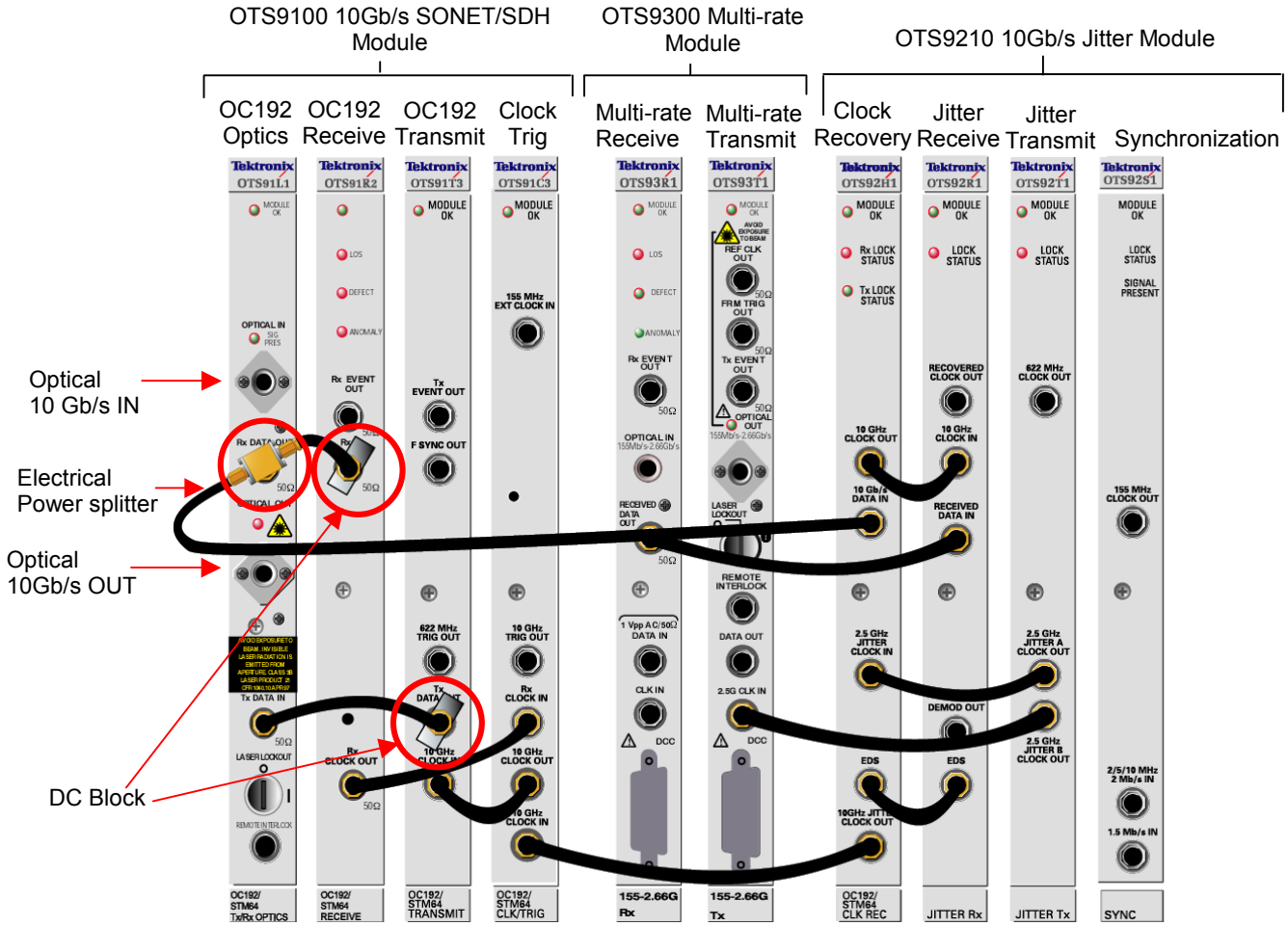


Figure 1-4: Interconnection diagram for OTS 10Gb/s to 155Mb/s Multi-Rate Jitter Testing

Power On and Software Initialization

1. Set the Power Switch, on the back of the OTS chassis, to the ON position. On the OTS9000, turn on the display monitor.
2. To login, press CNTL-ALT+DEL.
3. The login information dialog box is now displayed. Verify that the user name is 'Administrator' and there is no password, then click OK.
4. To launch the OTS user interface application, click the OTS9000 icon on the desktop.

NOTE: *The OTS application may also be reached through the START menu. Click START, select Tektronix, then click OTS9000.*

Emergency Startup Disk

Instructions for creating an emergency startup disk can be found in Appendix C. It is recommended that you take the time to do this simple procedure every time you change your system configuration.

Shutdown and Power Off

If necessary, it is considered safe to shut off power without prior shutdown steps. However, it is strongly suggested that a more orderly shutdown be followed. To perform an orderly shutdown, use the following steps:

1. Close the OTS9000 application by clicking the 'X' in the upper right corner or by selecting Exit under the System menu.
2. From the Start button on the Windows 2000 Taskbar, choose Shut Down.
3. On the Shutdown dialog box, choose Shut down the computer and click Yes.
4. When the Windows 2000 message 'It is now safe to turn off your computer' appears, turn off the chassis power.

OTS9200 Module Quick Check 10Gb/s Jitter Test

Ensure that the modules have been cabled together in the 10Gb/s jitter configuration. Refer to the Module Interconnection section above for proper cabling of the OTS9100 and OTS9200 modules.

Power up the unit and initialize the OTS9000 system software as explained in the Power On and Software Initialization section above.

NOTE: *For proper measurement operation, a twenty-minute warm-up time is recommended for the jitter measurement system to stabilize.*

Jitter Transmitter Setup

Controls should be entered into the appropriate fields of the setup menus for each card to be used in the test. The jitter transmitter is the first card in the OTS9200 jitter module to set up.

NOTE: *The default settings that appear in the setup menus will reflect the last test conducted. Do not assume that these are the correct settings for the device about to be tested. Be sure to adjust all settings are correct before conducting a new test.*

1. In the Navigation window click on the Setup Title bar, then click on the transmitter icon to select it (i.e. OTS92T1 has been selected in the example below).

Click on the Setup Title Bar then click on the device icon to open Setup menu.

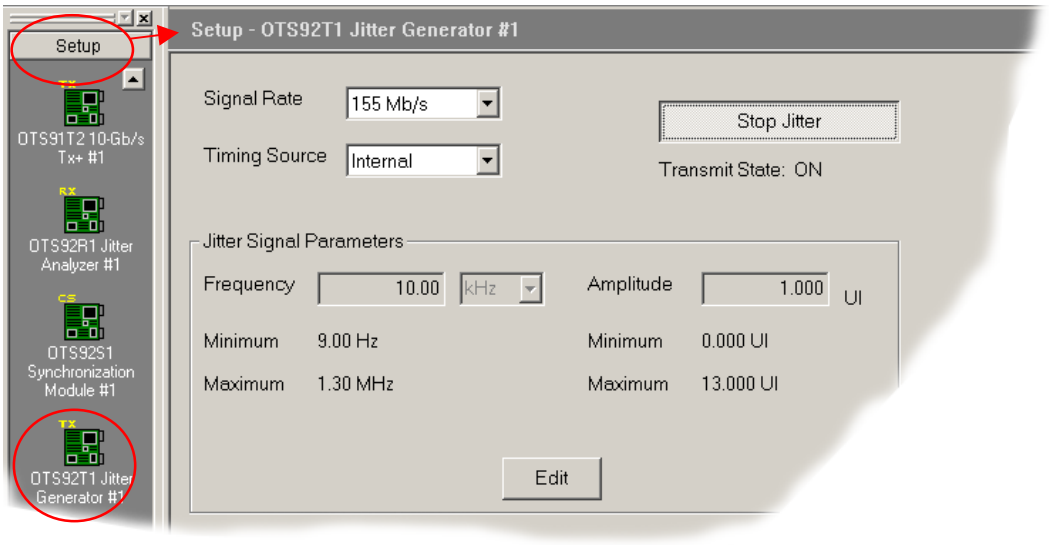


Figure 1-5: Using the Navigation window to access setup for a device

The menu for the transmitter setup becomes active. Make the following selections from the pull-down menus:

- Signal Rate: set to rate of 9.953 Gb/s
- Timing Source: Internal

Jitter Signal Parameters can be changed by clicking on the Edit button. In the editing state set:

- Frequency can be adjusted up or down.
- Amplitude can be adjusted up or down. Amplitude will reset the range to work within its specification for jitter.
- Click on OK to accept the adjusted entries.

Jitter Receiver Setup

1. In the Navigation window click on the receiver (ie. OTS92R1 for example).

   - Signal Rate: 9.953 Gb/s (Ensure that your signal rate corresponds with the device under test.).
   - Filter Bandwidth: 20kHz to 80MHz (select which ever one you want to test).
   - Signal Type: Data
   - Jitter Threshold can be set to flag a failure for example the number can be set to exceed the threshold, readings will vary depending on rate. Click on the Edit button to access this field.

   Front Panel Output Settings:

   - Demodulated Out: can be set to 1, 4, 16, 64, 256, 1024 and 4096 UIpp (4096 is only available at 9.953 Gb/s). The demodulated out signal is an analog representation of the jitter output which can be used to provide another representation by which to compare jitter separated out from the clock.
   - Recovered Clock is rate dependent. Choosing any rate will change its corresponding settings.

Jitter can be turned on or off by using the Start Jitter button located on the transmitter setup menu.

- Click on the Start Jitter button to turn jitter on.
- When the Start Jitter button is activated the status menu will display Jitter: ACTIVE.

Continue with the setup process of additional functions or conduct a jitter test at this point.

To conduct a jitter test select the icon from the toolbar.

Measurement Title bar

In the Navigation window click on the Measurement Title bar, then click on the receiver icon to select the OTS92R1.

Real-Time Tab

The Real-Time window measures signal data based on a sliding window. This window is a block of time under test by the system. The test records a series of time blocks, consecutively and continuously until the predetermined quantity to test is completed. The window status is valid when there are no errors, if errors are present troubleshoot the device.

Cumulative Tab

Cumulative works on a sliding window measurement of time, similar to Real-Time. The following readings are displayed:

- Rate
- Filter
- Test
- Elapsed Time

Window Size can be set from a range of: 2 seconds up to 120 seconds with 60 used as default or in an infinite test.

Measurement Results are displayed in three categories one for Current, one for Windowed and one for Cumulative readings.

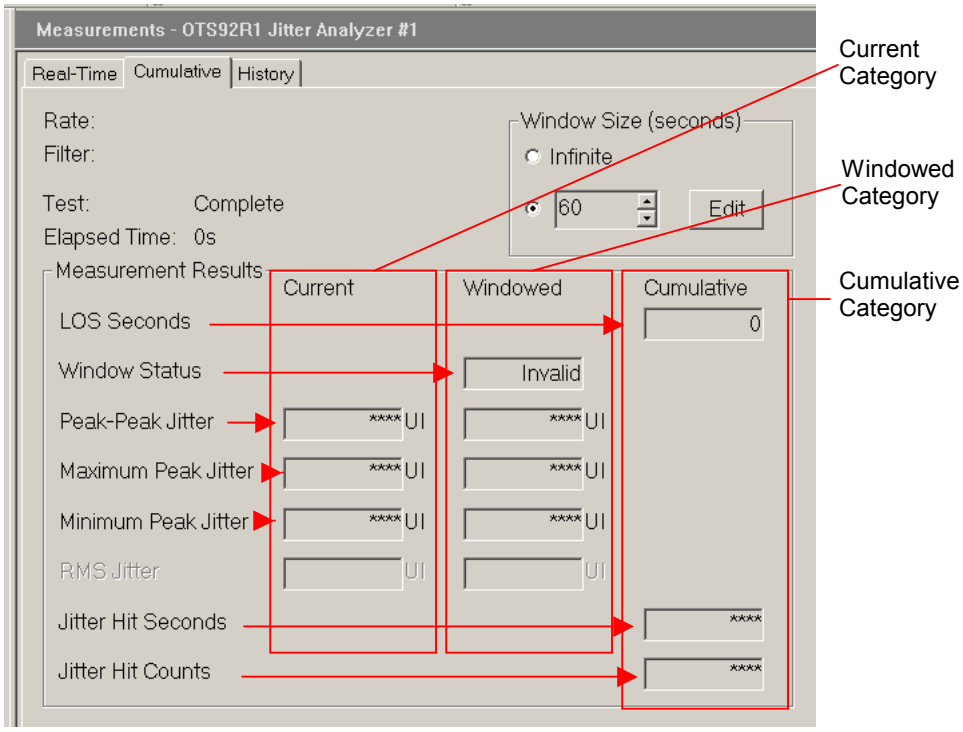


Figure 1-6: The arrows in this diagram identify where the readings are located for each category.

Current – is a one (1) second measurement

Windowed - collects data until window size specified is met. This window will display whether the test passed or failed (ie. Is the measurement over the standards limit required test)

Cumulative – Results for the following readings are displayed in the Cumulative category fields:

LOS – loss of signal in seconds

JITTER Hit Seconds – tracks anytime measurement goes above the set threshold, measures how long the threshold has been exceeded.

JITTER Hit Counts – tracks how many times the measurement went over the threshold and came back.

History Tab

The History menu displays the test results. There are two displays in the center of this window. The top display shows the Upper Trace Parameters and the lower display shows the Lower Trace Parameters.

- Controls for each trace can be set through the use of the drop down menus provided for each trace. The selections are: Peak to Peak, Max Peak, Min Peak, Current P to P, Current Max Peak, Current Min Peak and LOS. RMS and current RMS are added to the list of choices when 10Hz, 50kHz or 12kHz filters are selected.
- Search can be set to several choices. They are: Peak to Peak, Max Peak, Min Peak, Current P to P, Current Max Peak, Current Min Peak and LOS. RMS and current RMS are added to the list of choices when 10Hz, 50kHz or 12kHz filters are selected.

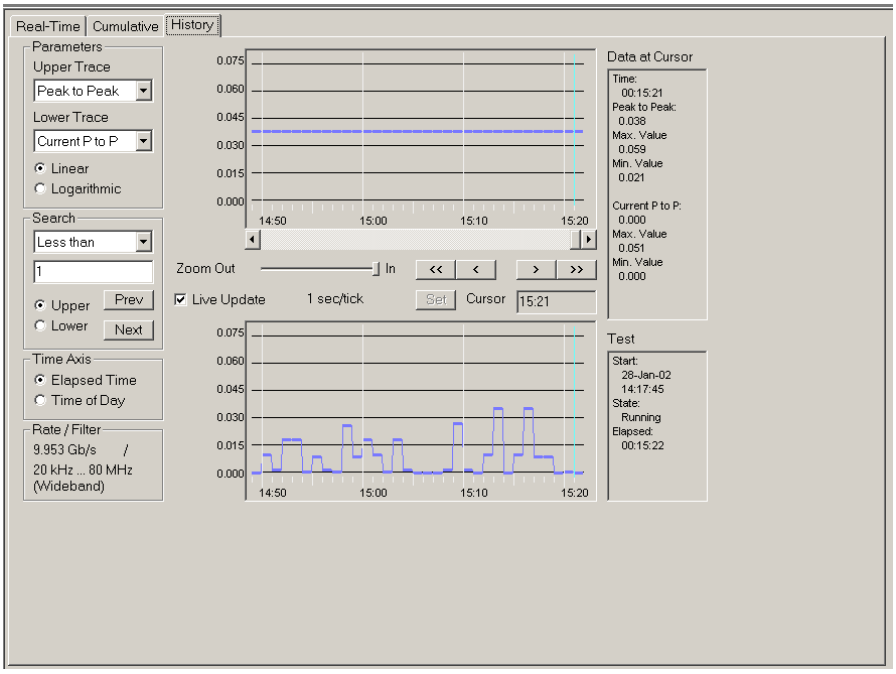


Figure 1-7: History menu showing a test in process

TEST Control Title Bar

The Test Control window is used to set up and run a test. Click on summary icon to see summary of the tests.

Analysis

Analysis does not apply to jitter testing.

APS

APS does not apply to jitter test

Compliance title bar

Several compliance test configurations have been predefined and incorporated into the Compliance tool to facilitate testing. The predefined configurations have been based on standards in the industry. There are three types of test possible.

Compliance screen standards have been preset and can not be altered. Changes can only be entered through the User Defined Field, testing for a particular filter, running a longer test session this sort of customization can be achieved at this field.

Output jitter test - tests how much jitter is being generated by the device under test, and measures it.

Tolerance – tests how much jitter can be tolerated by the device under test.

Transfer – tests how much jitter is transferred through the device under test.

Jitter Test Applications

This section briefly identifies typical applications for jitter testing.

Jitter Output Testing

Also referred to as jitter generation testing, jitter output testing measures the peak-to-peak jitter on the output signal of an instrument. The test is generally performed on a stand-alone network element and verifies that the output jitter of the instrument is within current standard specifications.

Measurements are made using one or more defined bandwidths. The resulting value for each bandwidth is then compared against the specifications. The measurement period is normally 60 seconds and results are in UIpp or UIrms, depending on the specification.

The basic setup, using an OTS system, for jitter output testing is shown in Figure 1-8.

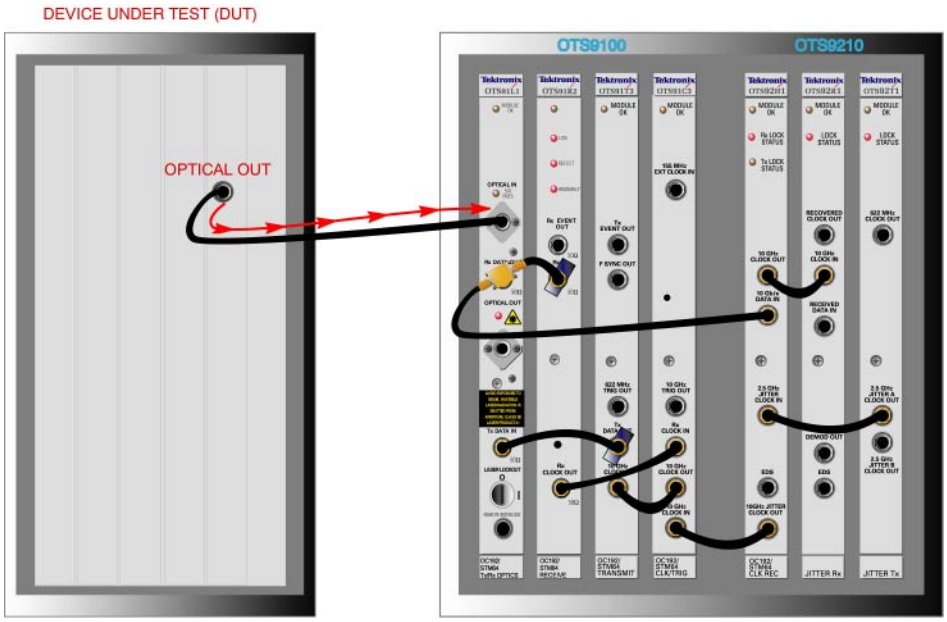


Figure 1-8: Typical OTS System Set-up for Jitter Output Testing

Following the signal flow, the signal is outputted from the device under test (DUT) and fed into the Optical In of the OTS91L1 card. The signal is then converted into an electrical signal by the Optics card and sent to the electrical Data Out on the card. The signal can be split using a power splitter to allow BER and jitter testing simultaneously. Figure 1-7 demonstrates this option. One of the split signals goes to the OTS91R2 card for BER measurements. The other split signal goes to the OTS92H1 Jitter Hybrid card of the jitter module. From there the signal travels to the OTS92R1 Jitter Receive card for jitter measurement and analysis.

Jitter Output Receive-Only Testing in Manufacturing

Jitter output receive-only configuration is the same test as normal jitter output testing. The only difference is that there is one less card; the Jitter Generation card is not used.

This testing package provides a jitter test solution capable of performing jitter output testing but at reduced cost due to the absence of the Jitter Generation card.

The basic setup for jitter output receive-only testing is shown in Figure 1-9.

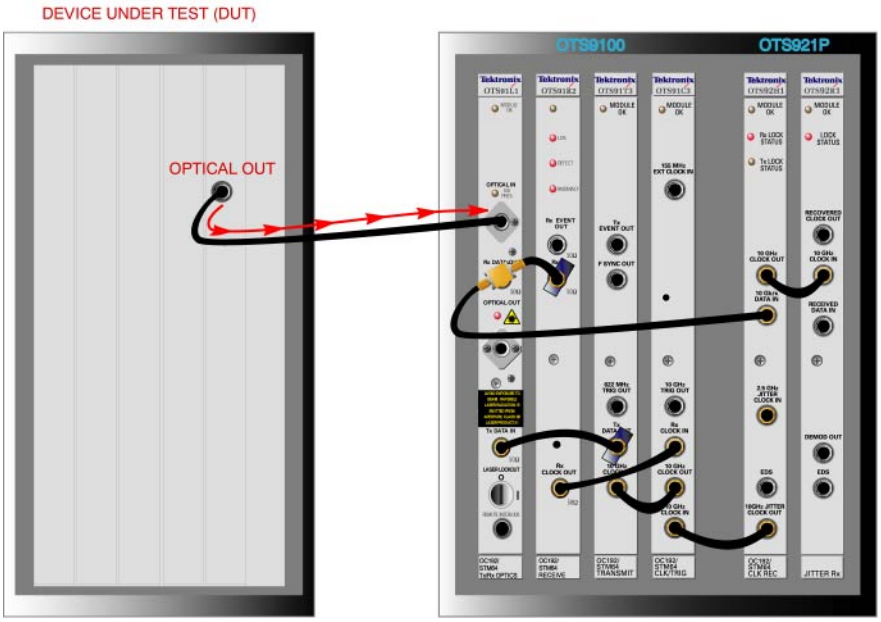


Figure 1-9: Typical OTS System Set-up for Jitter Output Receive-Only Testing

In-service Jitter Monitoring

Another form of jitter output testing is called jitter interface generation testing or in-service jitter monitoring.

This test uses the same method of testing as the standard jitter output testing. However, in jitter interface generation testing the device under test is already part of a network and not setup as stand-alone equipment.

The basic setup, using an OTS system, for jitter output testing is shown in Figure 1-10.

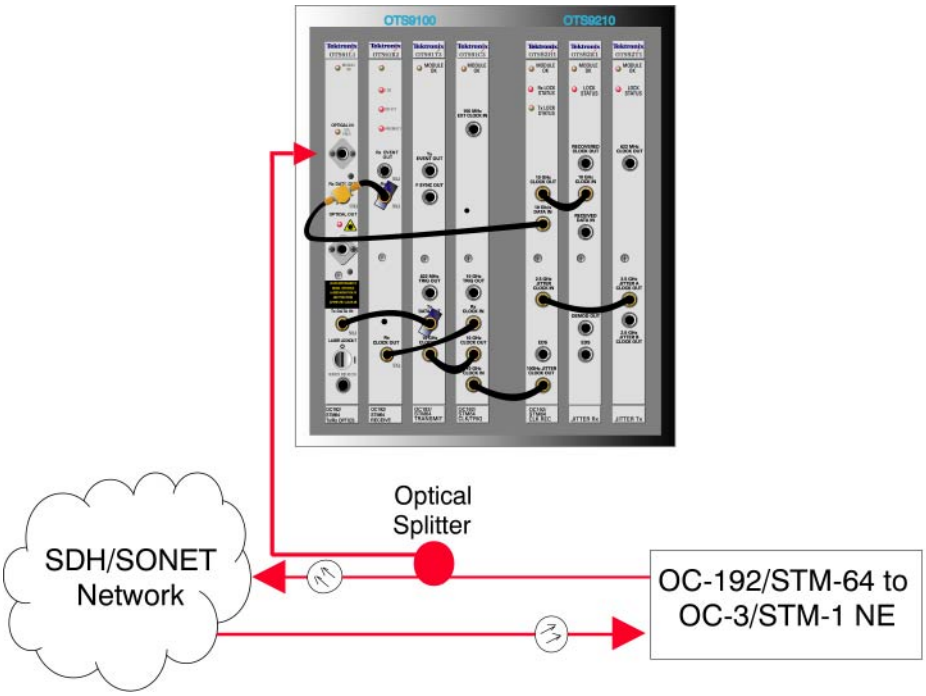


Figure 1-10: Typical OTS System Set-up for In-Service Jitter Monitoring

Jitter Tolerance Testing

Jitter tolerance tests a network element's margins thus ensuring system compliance and reducing design costs. The principal of the test is very simple: at a specified jitter frequency and using sinusoidal modulation, what jitter amplitude is required to cause the element to violate an error performance criteria?

In jitter tolerance testing, jitter is added to the signal input and BER measurements are taken from the signal output. The BER measurements taken at the output signal identify when the signal starts to degrade. The point just before that degradation is the jitter tolerance of the output signal, or of the device under test.

Customarily, a number of different jitter frequencies are tested to determine the complete characteristic of the device under test, which is then compared to the standards. Figure 1-11 demonstrates a typical OTS system set-up for jitter tolerance testing.

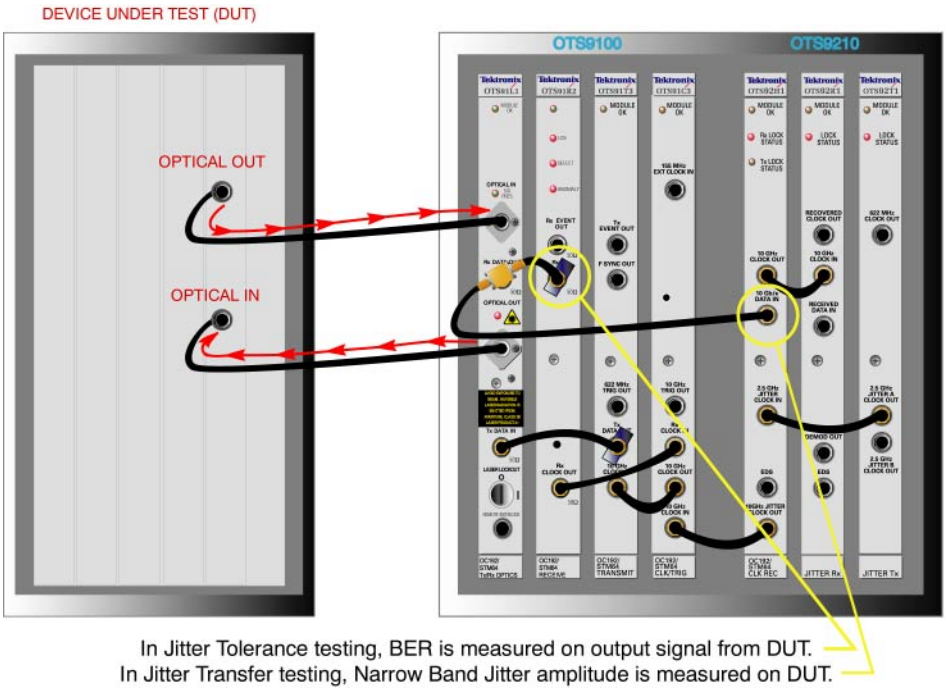


Figure 1-11: Typical OTS System Set-up for Jitter Tolerance Testing

NOTE: *When using the OTS equipment for this test, make sure that on the 10Gb/s Transmitter card the Timing Source chosen is "Jitter". Otherwise the jitter signal will not be transmitted.*

Jitter Transfer Testing

Jitter Transfer testing uses the same set-up as jitter tolerance, as shown in Figure 1-11. Jitter transfer measures the jitter carried on the output signal. A Narrow Band sinusoidal jitter signal is introduced to the device under test. The measured output signal is then compared to the input jitter signal. The ratio of this comparison identifies the jitter transfer of the device under test.

Figure 1-12 demonstrates a typical OTS system set-up for jitter transfer testing.

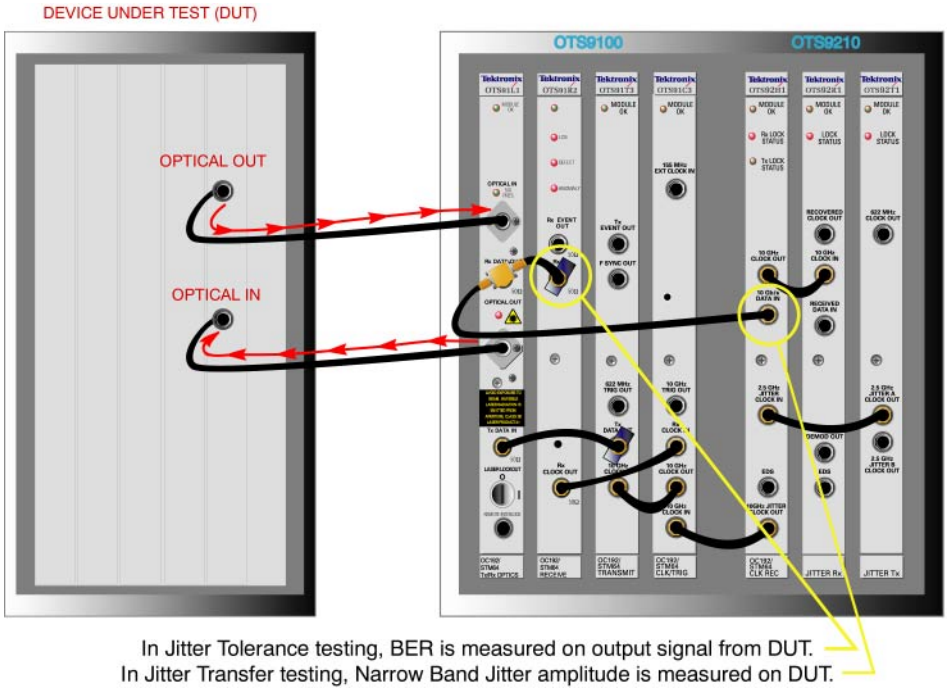


Figure 1-12: Typical OTS System *Set*-up for Jitter Transfer Testing

Jitter Transfer testing requires that a calibration run be performed on the device under test before the actual test is run. To perform a calibration run, the device under test is looped back into itself and then the output signal measured. This sinusoidal signal is then compared to the actual test results and removed from the final results.

Operating Basics

This section describes **OTS9200 and OTS92S1 modules** front panel indicators and connectors. This section also reviews the basic functionality of the Microsoft Windows® application software with menu descriptions.

OTS9200 Front Panel Indicators and Connectors

Figure 2-1 shows a complete view of the front panel for the OTS9200 module. The OTS92S1 module is discussed after the OTS9200 front panel section. For information on the OTS91T3 and OTS91C3 cards which support the OTS9200 10 Gb/s jitter solution go to Appendix D.

The front panel is made up of three different cards:

- Jitter Generation
- Jitter Analyzer
- Clock Recovery

The following sections describe each of these cards in more detail.

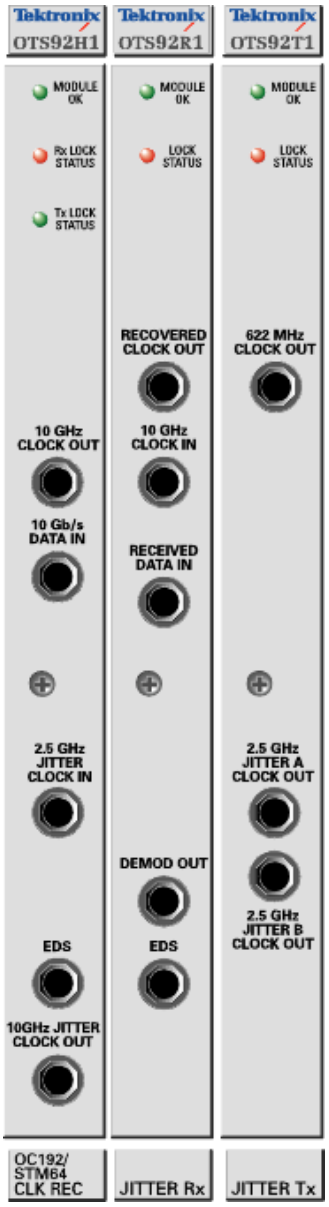


Figure 2-1: OTS9200 Front Panel

OTS92R1 Receive Card

The **OTS92R1 Receive card** of the OTS9200 module provides all of the receiver functionality of the OTS9200 jitter SONET/SDH/DWDM test module.

Figure 2-2 shows the Receive card front panel.

Figure 2-2: Receive Card Front Panel

Module OK

The Module OK LED should be green while the instrument is running. On power up, the LED first lights red, then will switch to green when the system has finished initializing. (The LED lights to yellow when FPGA has completed loading.)

***NOTE:** If the LED remains red after the system has finished initializing, call Tektronix for service.*

Lock Status

The Lock Status LED indicator lights to green indicating reference PLL and DPA PLL are locked. Lighting to red indicates PLL or DPA PLL is not locked.

Recovered Clock OUT

The Recovered Clock Out port interface supports the following: AC-coupled ECL, 50Ω source terminated, 0.4Vpp to 0.6Vpp into 50Ω, 45-55% duty cycle.

Recovered Clock is selectable (dependent on live rate) for at least one rate plus disabled.

10 GHz CLOCK IN

The 10 GHz Clock IN port interface supports the following: AC-coupled, 0.5Vpp to 0.1Vpp into 50Ω.Rate: 9.953280 GHz. Connects to the OTS92H1 card using cable provided.

Received Data IN

The 2.5 GHz Received Data IN port supports 2.5 GHz and lower rates at: AC-coupled, 0.5Vpp to 0.1Vpp into 50Ω.

2.5 GHz Data In (OC192) Rate at 9.953280 kb/s, pattern 23, bulkfilled VC-4-64c. PN working through PN7 scrambler allows 30 as the maximum amount of ones or zeroes. Optical line code is scrambled Non-Repeating Zero (NRZ).

Demodulation Output Signal (DEMOD)

The Demodulation Output Signal provides an analog output that can be measured externally using equipment such as: oscilloscope, RMS meter or a Spectrum Analyzer. The range of the Demodulation Output signal has a maximum of 1Vpp into 50Ω.

The Demodulation Output Signal is the demodulated jitter from the jitter measurement system. The DC offset of the demodulated output should be less than ±100mV.

Edge Density Signal (EDS)

The Clock Receive EDS port is cabled to the Jitter Rx EDS port. The Edge Density Signal port does not support OTS9200 functionality.

OTS92T1 Transmit Card

The **OTS92T1 Transmit card** of the OTS9200 module contains all of the jitter generation functionality.

Module OK

The Module OK LED should be green while the instrument is running. On power up, the LED first lights red, then will switch to green when the system has finished initializing. (The LED lights to yellow when FPGA has completed loading.)

NOTE: *The LED will flash red if the reference clock is missing or out of range. Otherwise, if the LED remains red after the system has finished initializing, call Tektronix for service.*

Lock Status

The Lock Status LED indicator lights to green indicating reference PLL and DPA PLL are locked. Lighting to red indicates PLL or DPA PLL is not locked.

622 MHz Clock Out

The 622 MHz Clock Output provides an external reference clock output to the front panel for calibration and testing purposes.

Connector: SMA, AC-coupled, 600 to 1000 mVpp into 50Ω

Frequency: 622.08MHz

Figure 2-3: Transmit Card Front Panel

2.5 GHz Jitter A Clock Out

The 2.5 GHz Jitter A Clock Out port connects to the OTS92H1 for 10 Gb/s jitter generation using the coax cable supplied. The output is disabled when line rate is 2.5 Gb/s and lower.

Connector: SMA, AC-coupled, 800 mVpp (typical) into 50Ω

Frequency: 2.48832 GHz

2.5 GHz Jitter B Clock Out

The 2.5 GHz Jitter B Clock Out port connects to the OTS93T1 for 2.5 Gb/s, 622 Mb/s and 155 Mb/s jitter generation using the coax cable supplied. The output is disabled when line rate is 10 Gb/s.

Connector: SMA, AC-coupled, 800 mVpp (typical) into 50Ω

Frequency: 2.48832 GHz

OTS92H1 Clock Recovery

The OTS92H1 Clock Recovery card provides three LEDs.

Module OK

The Module OK LED should be green while the instrument is running. On power up, the LED first lights red, then will switch to green when the system has finished initializing. (The LED lights to yellow when FPGA has completed loading.)

***NOTE:** If the LED remains red after the system has finished initializing, call Tektronix for service.*

Lock Status

Rx Lock Status or the Receive LED - when LEDs is off the OTS92H1 card has been disabled by the system software and is not in use. Red indicates an enabled state with no signal present, Green indicates an enabled state with signal present.

Tx Lock Status or the Transmit LED - when LEDs is off the OTS92H1 card has been disabled by the system software and is not in use. Red indicates an enabled state with no signal present, Green indicates an enabled state with signal present.

10 GHz Clock Out

This output is connected to the OTS92R1 card using the coax cable provided. The signal is the recovered clock from the received data signal.

Connector: SMA, AC-coupled, 700 mVpp (typical) into 50Ω

Frequency: 9.95328 GHz

Figure 2-4: Clock Recovery Card Front Panel

10 Gb/s Data In

This input accepts a 10 Gb/s data signal and produces a recovered clock at the 10 GHz Clock Output. Typically, this input is connected to an Optical-to-Electrical converter (OTS91L1) using coax cable and power divider provided. However, some applications may require clock recovery from a user's electrical signal. Electrical specifications are provided for that purpose. The maximum number of consecutive ones or zeroes is 30.

Connector: SMA, AC-coupled to 50Ω termination

Frequency: 9.95328 Gb/s

2.5 GHz Jitter Clock In

The 2.5 GHz Jitter Clock In is connected to the OTS92T1 using the coax cable provided. This is used for frequency multiplication to create the 9.95328 GHz bit rate clock.

Connector: SMA, AC-coupled, 500 to 1100 mVpp into 50Ω

Frequency: 2.48832 GHz

Edge Density Signal (EDS)

The Edge Density Signal port interface has no application to the OTS9200 module. The Clock Receive EDS port is cabled to the Jitter Rx EDS port.

10 GHz Jitter Clock Out

The 10 GHz Jitter Clock Output is connected to the OTS91C3 card using the coax cable provided. The signal is the transmit bit rate clock that can be selected by the OTS91T3.

Connector: SMA, AC-coupled, 700 mVpp (typical) into 50Ω

Frequency: 9.95328 GHz

OTS92S1 Synchronization

Front Panel Indicators & Connectors

The OTS92S1 Synchronization card provides three LEDs.

Figure 2-5 shows the front panel for the OTS92S1 module. The OTS92S1 Synchronization module has only one card: the Synchronization card.

Figure 2-5: Synchronization Card Front Panel

Module OK

The Module OK LED should be green while the instrument is running. On power up, the LED first lights red, then will switch to green when the system has finished initializing. (The LED lights to yellow when FPGA has completed loading.)

***NOTE:** If the LED remains red after the system has finished initializing, call Tektronix for service.*

Lock Status

Lock Status - Red indicates no input. Green indicates input present.

Signal Present

The Signal Present indicator will light green when the module senses an incoming signal.

155 MHz CLOCK OUT

The 155 MHz Clock Output provides an external reference clock output to the front panel for calibration and testing purposes.

Connector: SMA, AC-coupled, 500 to 1000 mVpp into 50Ω

Frequency: 155.52MHz (offset may be imposed as programmed)

2/5/10 MHz, 2 Mb/s IN

The user can select the rate and format of the external reference clock from among the following choices:

- 2.048 MB/s signal
- 2.048 MHz signal
- 5 MHz signal
- 10 MHz signal

Connector: SMA, AC-coupled

1.55 Mb/s IN

The rate of the external reference clock is a 1.544 Mb/s signal.

Connector: Bantam (differential), AC-coupled,

Note: *The internal "backplane" selection for use by transmit functions is generated by the synchronization card and is a copy of the front panel "155 MHz Clock Out".*
Refer to setup menu controls for 10Gb/s and multi-rate cards.

User Interface

The user interface software for the OTS Family Optical Test System controls all configuration, testing, and measuring commands of the OTS cards. The user interface provides easily navigated menus using Windows® 'point and click' operation on a Windows 2000 workstation.

Refer to the section, *Getting Started*, for information on how to load and launch the user interface software.

When the OTS Optical Test System is first powered on the software scans the card slots to determine what modules are loaded. The user interface then provides icons in the navigation window for each card loaded into the system. These icons always reflect the cards loaded and will change depending on the system being used. Because of this 'on the fly' software feature, some of the menus and abilities described in this manual may not be available in all systems since many features require a particular card installation. In addition, some of the menu screens may appear different from those displayed in this manual.

The user interface screen has a number of windows and bars that comprise the main screens of the software, some of which may be disabled. The next section, *Elements of the User Interface*, identifies each element on the main screen. The sections following it provide supporting descriptions for each of these elements.

NOTE: *The user interface is a Microsoft Windows 2000® application. Information regarding standard Windows 2000 functions is beyond the scope of this document. For further information on basic commands and functions of Windows 2000, refer to the Windows 2000 manual.*

Elements of the User Interface

The user interface has a number of windows and bars that comprise the main screens of the software. Figure 2-6 identifies each of these elements. The Navigation Window, Laser and Test Control bars, and Status bars may be disabled for more viewing space, if desired.

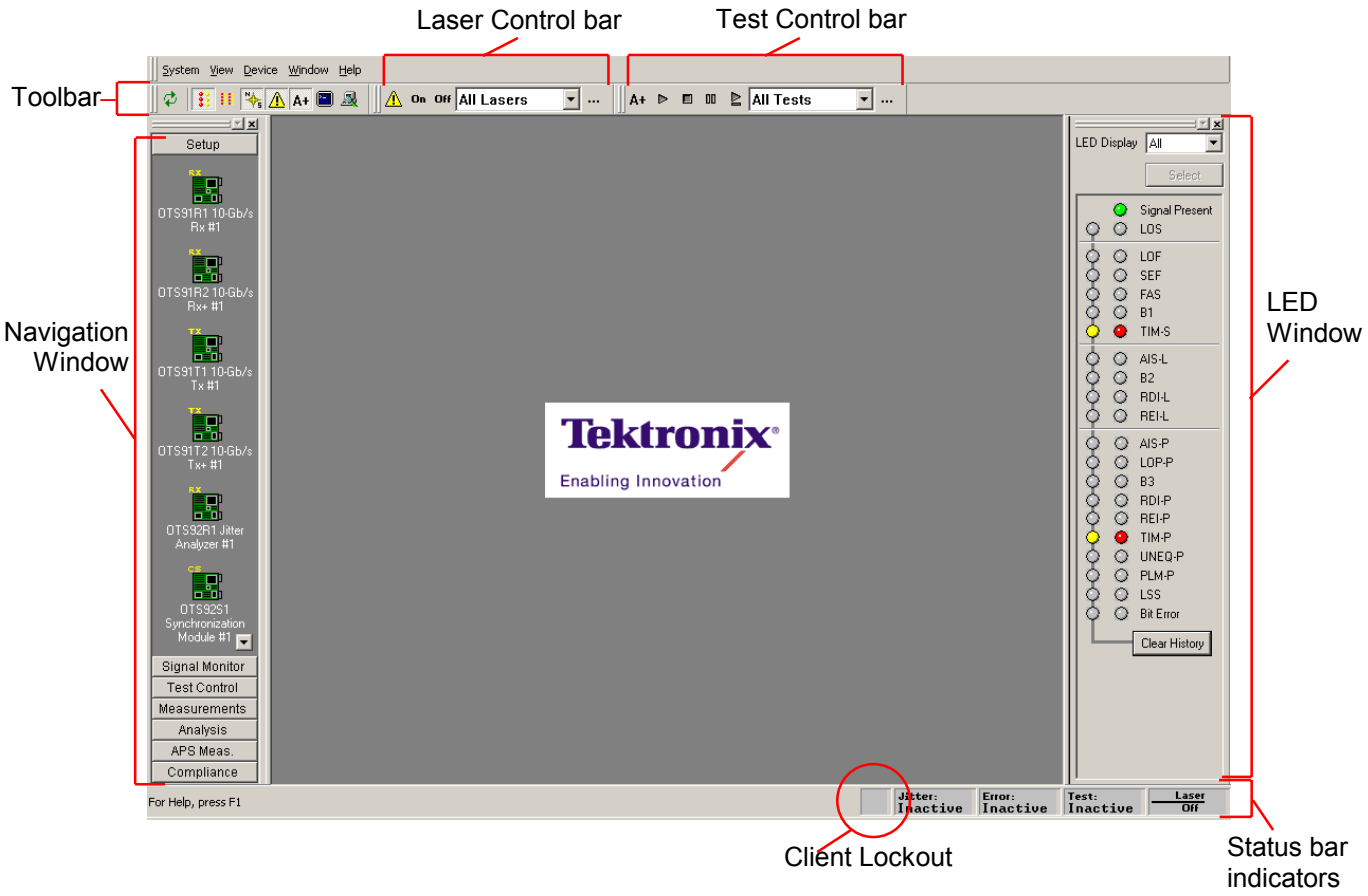


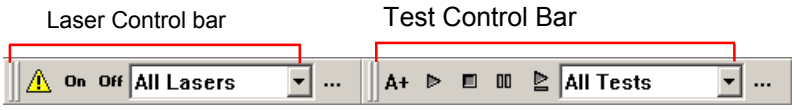
Figure 2-6: Location of the elements of the User Interface

Toolbar

The toolbar provides easy access to different views and selections of the user interface.

The buttons on the toolbar provide a toggle between select server, the LED window, the module LED panel, the system view, the Navigation window, the laser and test control bars, and the SCPI output. Each of these controls is discussed in further detail in later sections. The presence of the toolbar can be toggled via the View menu.

Laser Control Bar



The Laser Control bar provides the user with software control over the laser. Use the pull down menu to select which laser to activate or deactivate. Click the On button to turn on the selected laser. Click the Off button to turn off the selected laser.

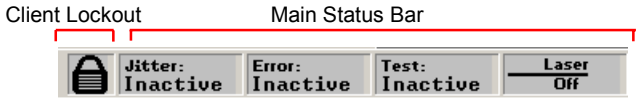
Click the  button to close the bar or use the View menu to activate the bar. When the "…" button is clicked, the Setup Summary is displayed.

Test Control Bar

The Test Control bar provides the controls to start, stop, pause, and continue the test. If multiple cards are present, the test control bar also allows the user to choose the specific card under test by use of the pull down menu. The Test Control bar may be activated via the View menu or from the  toggle button on the toolbar.

NOTE: *Changing parameters while a test is in progress may cause invalid errors.*

Main Status Bar



The main status bar, provides a summary status of the laser, test, error insertion and jitter transmit states of all modules.

Laser Off

If any laser is active in the system, the status bar will change from Laser Off to a Laser On warning. If the laser is not in use the Laser Off message is displayed on a background of gray.

Test

If a test is active in any module in the system, the status bar will change color and the Test Inactive message will change to Test Active. If no test is being conducted the Test Inactive message is displayed on a background of gray.

Error

If an error insertion rate is active, the status bar will change color and change from Error Inactive to Error Active. If no errors are being created the Error Inactive message is displayed on a background of gray.

Jitter

If jitter is generated the Jitter Inactive status box will change color and change from Jitter Inactive to active. If no jitter is being generated the Jitter Inactive message is displayed on a background of gray.

Client Lockout

The user interface has the ability to lockout other users from setting parameters. To set the lockout control, double click the box to the left of the main status bar (if this feature is in an inactive state the box will be an empty gray square). The Lockout Control dialog box will be displayed. Click the desired button and then click OK to return to the main screen. When the lockout is in effect, a lock symbol will appear in the box by the main status bar. To unlock the server, use the same procedure.

When one client has locked out others, the lockout indicator will be displayed. If an operator tries to change a configuration parameter while locked out, a warning dialog will be displayed.

The lockout control dialog box may also be accessed by selecting Server Lockout from the System menu.

LED Window

The LED window does not apply to the OTS9200 module except in the summary LED Display state. When supporting OTS cards are included in a configuration on the system the LED window is active in all states.

Activating the LED window provides the user with a virtual LED status panel. The virtual indicators found on this window provide error conditions, both current and historical, for all traditional receiver error LEDs. The LED window may be activated through the View menu or from the toggle button on the toolbar.

Each LED has two separate conditions. The current condition is on the right and the history, or past, condition is on the left. The current indicators will turn red and the history indicators will turn yellow if an error condition currently exists. Once the condition has been removed, the red current indicator will turn off. The yellow history indicator will remain on until a new test has been started or until the Clear History button is clicked.

See Table 2-1 for a description of each indicator.

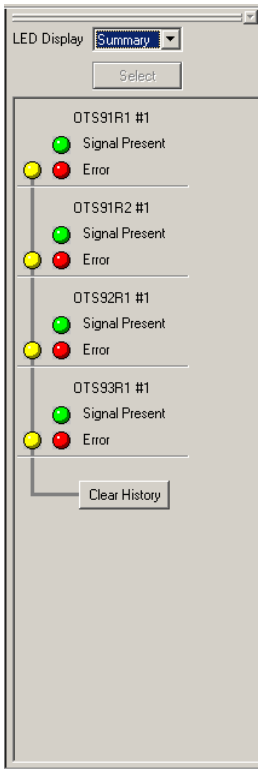


Figure 2-7: LED Summary Window

Module LED Panel

The module LED panel operates like the LED Window. This panel is accessed via the View menu. It may also be toggled from the tool bar.
To make the panel always remain on top of the Windows screen, check the box marked 'Always on top'.

There are two differences between the LED Window and the module LED panel. The module LED panel does not provide the LED display options; all LEDs are always displayed. In addition, in the module LED panel mode, all receiver LED panels are shown. In the example in Figure 2-8, there are four receiver cards loaded, an OTS91R1, OTS91R2, OTS92R1 and an OTS93R and one synchronization card the OTS92S1. Observe that the LEDs shown are different for each card.

NOTE: *For each card, the user interface only displays the options available for that card. If the options are not displayed, then the option is not available for that particular card.*

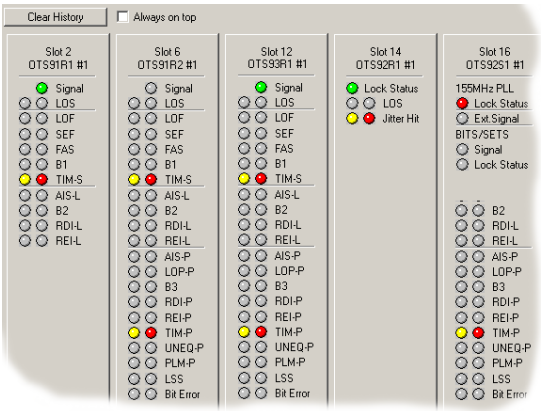


Figure 2-8 Module LED Panel

Table 2-1: Description of Status Window Virtual LED Indicators

LED name	Description
Signal Present	The Signal indicator will light green when the receiver senses an incoming signal.
LOS	The Loss of Signal indicator is activated when a LOS condition has been detected.
LOF	The Loss of Frame indicator is activated when a *Loss of frame* condition has occurred.
SEF (OOF)	The Severely Errored Frame (Out of Frame) indicator is activated when an *Out of frame* condition has occurred.
FAS	The Frame Alignment Sequence indicator activates when errors have been detected in the A1/A2 framing bytes.
B1	The B1 indicator will activate when SDH Regenerator (SONET Section) parity errors have occurred.
TIM-S (RS TIM)	The TIM indicator activates when a J0 trace is received that does not match the expected trace.
AIS-L (MS AIS)	The AIS indicator activates when the overhead and SPE are set to all ones for a user-selected time.
B2	The B2 indicator activates when SDH Multiplex Section (SONET Line) parity errors have been detected.
RDI-L (MS RDI)	The RDI indicator activates when bits 6, 7, and 8, of the K2 byte have been a binary 110, respectively, for five or more consecutive frames.
MS REI (REI-L)	The REI indicator activates when a non-zero value in the M1 byte is detected.
AIS-P (AU-AIS)	The Path AIS indicator activates when the pointer is set to hex 3FF for five consecutive frames.
LOP-P (AU-LOP)	The LOP (Loss of Pointer) indicator is activated when a *Loss of Pointer* condition has occurred. A LOP condition exists when ten consecutive pointer errors are received.
B3	The B3 indicator activates when Path parity errors have been detected.
RDI-P (HP-RDI)	The RDI indicator activates when bits 5, 6, and 7 of the K3 byte have been a binary 1xx, respectively.
REI-P (HP-REI)	The Path REI indicator activates when bits 1-4 of G1 are decimal values between one and eight.
TIM-P (HP-TIM)	The TIM indicator activates when a J1 trace is received that does not match the expected trace. The trace setup is explained later in this section.
UNEQ-P (HP-UNEQ)	The unequipped path indicator activates when C2 equals zero.
PLM-P (HP-PLM)	The Path Label Mismatch occurs when the received C2 does not match the expected C2.
LSS	The Loss of Sequence indicator activates if BER is greater than or equal to 0.20 during an interval of one second or if the test sequence and reference sequence are out of phase.
Bit Error (TSE)	The Test Sequence Error indicator activates when a bit error occurs in the payload.

LED Display Selection

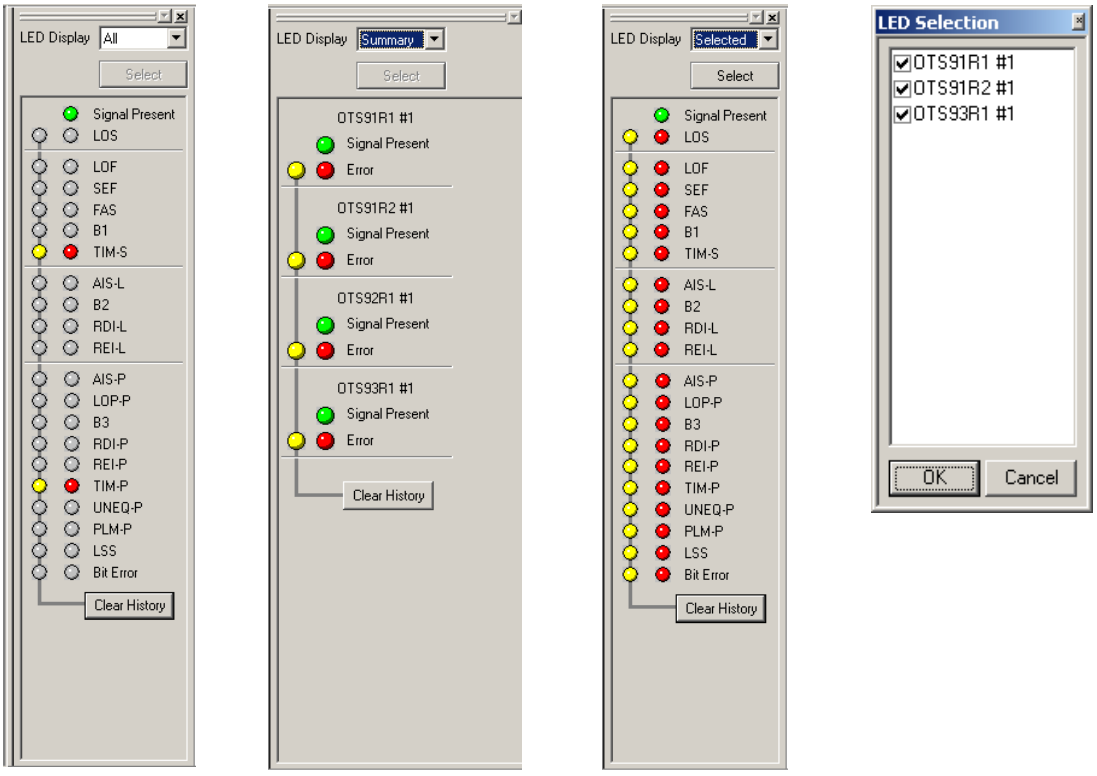
The LED window does not apply to the OTS9200 module except in the summary LED Display state and is included in this document as a reference to use for supporting OTS cards. When supporting OTS cards are included in a configuration on the system the LED window reflect the activity of supporting OTS cards within the chassis in an active state.

The indicators displayed in the LED window may also be selected by using the pull down menu to select either All, Summary, or Selected. Figure 2-9 reflects the LED Window for each of the LED Display selections.

If All is selected from the LED Display menu, the indicators will activate if the defined condition for that indicator is present on any card in the system.

If Selected is chosen, the “Select” button will activate a pop-up menu allowing the user to select a set of receivers to be included in the display. Status information will be displayed in the same fashion as the ‘Display All’ mode. This display configuration is useful in situations when the status of some receiver cards in the system is not of interest to the user.

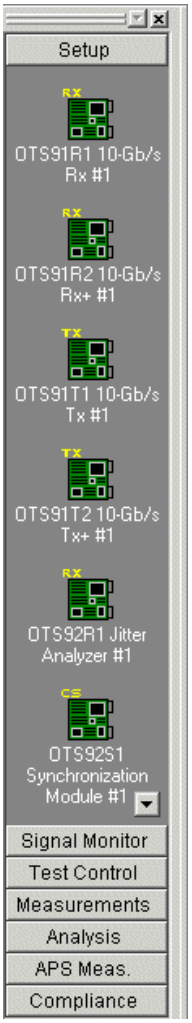
If Summary is selected, the LED Window displays three separate indicators for each receiver the user interface has identified. The indicators reflect the signal present along with current and historical error status for each receiver individually.



All Summary Selected LED Selection dialog box

Figure 2-9: LED Display selection options

Navigation Window



The Navigation window provides the ability to set up, monitor and test the module, and to view the test results. The Navigation window has selection bars for setup, signal, monitor, test control, measurements, analysis, APS measurement and compliance. Each of these bars provides a number of additional configuration and control options.

The Navigation bar is adaptive. Entries are added depending on the system configuration. When the server connection is established, the user interface automatically scans for loaded hardware and displays the appropriate folders and icons for the hardware on that server.

For example, in the following figures, the sample screens reflect two transmitters (OTS91T1 10Gb/s Tx #1 and OTS91T2 10Gb/s Tx+ #1), three receivers (OTS91R1 10Gb/s Rx #1, OTS91R2 10Gb/s Rx+#1 and OTS92R1 Jitter Analyzer) and one synchronization card (OTS92S1) each with a separate icon. Multiple icons of the same type provide the same screens, but separate controls for each instrument. The title bar across the top of the screen reflects the current selection.

NOTE: *Pay attention to the relationship between the icon selected in the Navigation window to the Title Bar.*

When changing screen controls by clicking on a title in the Navigation window, a device icon in the new window must be clicked to change the associated screen menu.

The title bar reflects the current menu selected. If a new icon is not selected from the new navigation view, the menu will still reflect the previous Navigation window selection. For example, the Navigation window may show the Signal Monitor icons, when the currently selected menu is actually Setup-OTS91T2 10Gb/s Tx #1.

Setup Menu

When SETUP is selected from the Navigation window by clicking on the SETUP button, icons for all loaded Transmit and Receive cards, in addition to a summary menu, are displayed. The Setup menu provides separate configuration control over each transmitter and receiver card through these individual icons.

If a Jitter Rx icon is clicked, the Receiver setup menu is displayed. If a Jitter Tx icon is clicked, the Transmitter setup menu is displayed. Signal Rate, Timing Source, Jitter Signal Parameters and Transmit state controls can be set in this menu.

The jitter transmitter setup menu contains one screen that controls various aspect of the transmitter setup. The receiver setup menu contains one screen. Signal Rate, Filter Bandwidth, Signal Type, Jitter Hit Threshold and Front Panel Output Settings can be set in this menu.

Transmitter – Setup

The signal menu of the Transmitter setup, as shown in Figure 2-10, provides the controls for selecting the signal rate, timing source, and jitter signal parameters. Each of the selections available is described in more detail in the following sections.

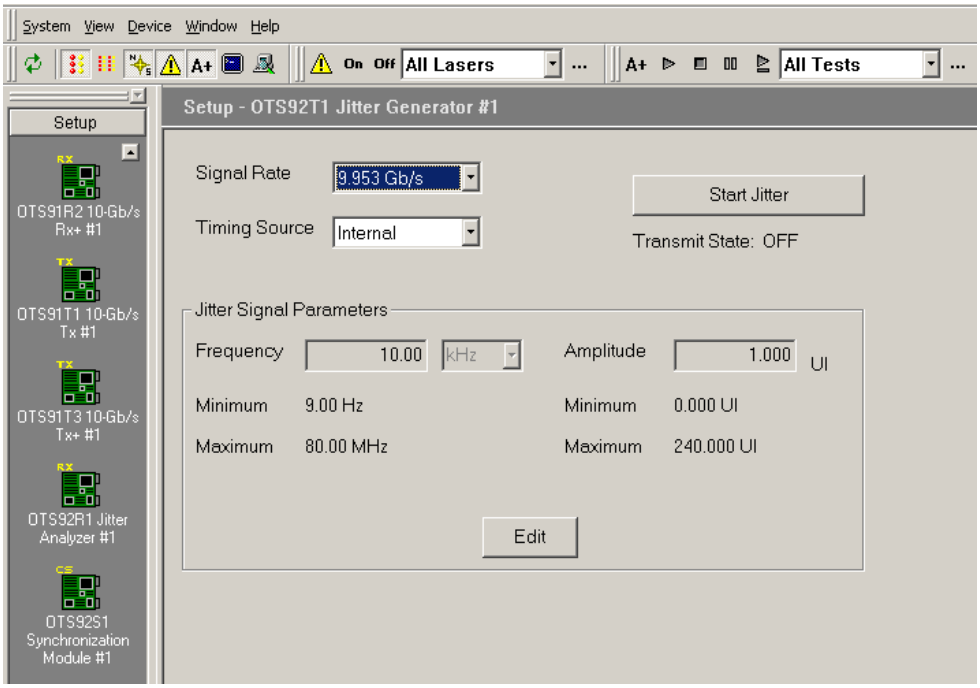


Figure 2-10: Setup – Signal menu

Signal Rate

The selected Signal Standard determines the signal rates available for use. For SONET and SDH selections, the available signal rates include:

- 9.953 Gb/s
- 2.488 Gb/s
- 622 Mb/s
- 155 Mb/s

Timing Source

Timing Source selects either internal or backplane timing (generated by OTS92S1 when present in configuration, across the backplane). Internal timing uses the internal clock.

Jitter Signal Parameters

Changes to jitter signal parameters can be entered by clicking on the Edit button for:

- Frequency
- Amplitude

Receiver Setup

The signal menu of the Receiver setup, as shown in Figure 2-11, allows the user to set the signal rate, filter bandwidth, signal type, jitter hit threshold, demodulated output range and recovered clock. This menu also indicates the current value of the receiver threshold offset. Each of the selections available is described in more detail in the following sections.

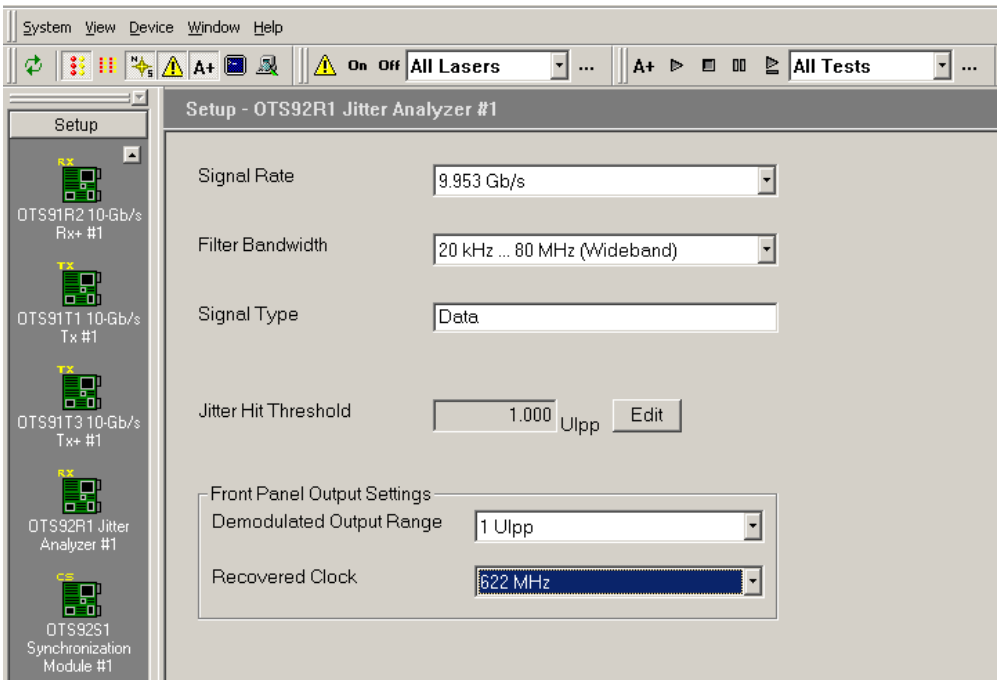


Figure 2-11: Receiver Setup - Signal menu

Signal Rate

The selected Signal Standard determines the signal rates available for use. For SONET and SDH selections, the available signal rates include:

- 9.953 Gb/s
- 2.488 Gb/s
- 622 Mb/s
- 155 Mb/s

Filter Bandwidth

Use the pull down menu to select the filter bandwidth. The available selections include:

- 10 Hz…80 MHz (Fullband)
- 10 kHz…80 MHz (Wideband)
- 20 kHz…80 MHz (Wideband)
- 50 kHz…80 MHz (Wideband – RMS)
- 4 MHz…80 MHz (Highband)

Signal Type

The signal type default is Data.

Jitter Hit Threshold

Click the Edit button to enter a different jitter hit threshold.

Front Panel Output Settings

The Front Panel Output settings section enables the user to select the Demodulated Output Range and Recovered Clock settings. These selections are made via the pull-down menus.

The Demodulated Output Range pull down menu includes:

- 1 UIpp
- 4 UIpp
- 16 UIpp
- 64 UIpp
- 256 UIpp
- 1024 UIpp
- 4096 UIpp

The Recovered Clock pull down menu includes:

- 622 MHz
- 2.488 GHz
- Disable

Setup – Summary

The Setup Summary menu, as shown in Figure 2-12, provides a summary of the setup conditions for each Transmitter and Receiver individually. Clicking on the Turn Laser OFF buttons will turn each associated laser off. Clicking on the Setup buttons will display the associated Setup menu for the specific card number chosen. Clicking on the Transmitter Setup buttons will display the last edited menu tab of the Transmitter Setup menu for the specific Transmitter number chosen.

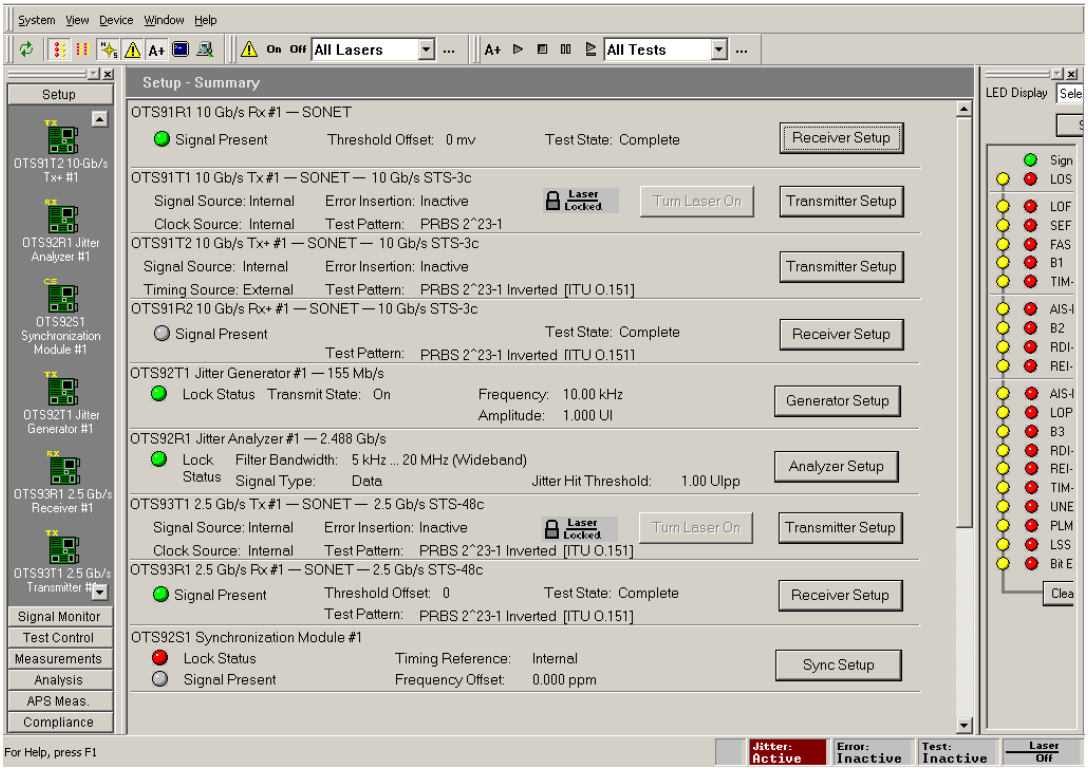


Figure 2-12: Setup Summary menu

Test Control Menu

When Test Control is selected from the Navigation window, the Test Control menu is displayed, as shown in Figure 2-13. The Test Control menu allows the user to choose the type of test to run and the time the test will run.

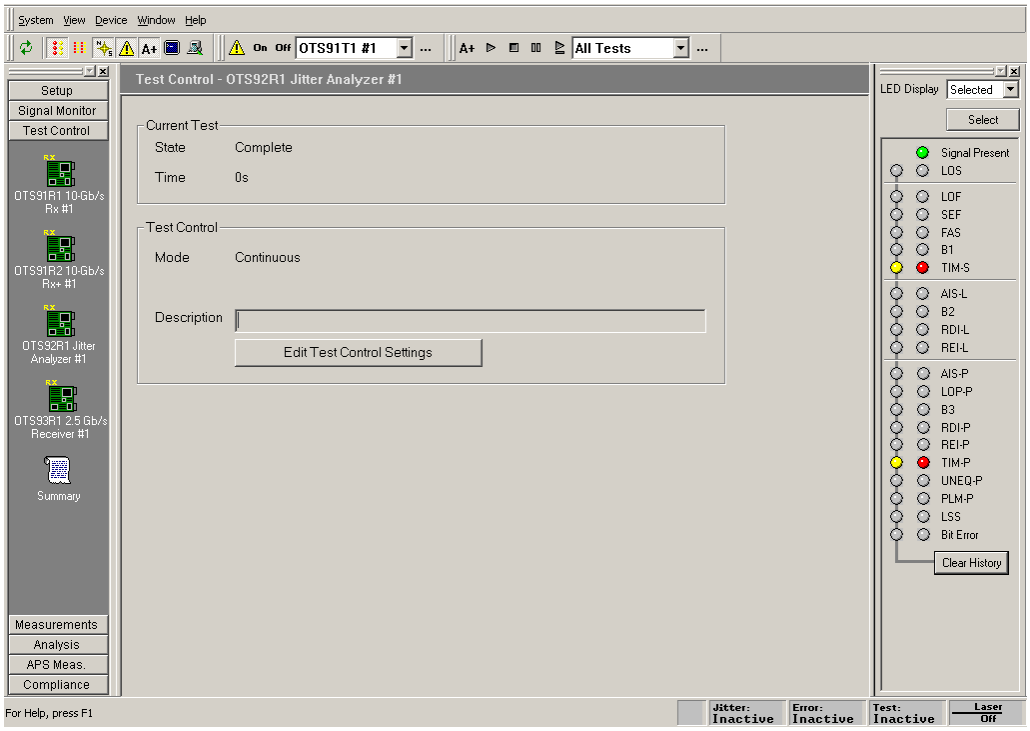


Figure 2-13: Test Control Menu

The Current Test section describes the state of the current test and the time of the current test on the selected card. The Test Control section provides the current test mode and provides an edit box for the user to include a description of the current test. To edit the test control settings, click on the Edit Test Control Settings button. The Test Control Parameters dialog box, shown in Figure 2-14, is now displayed.

The Test Mode section enables the user to set continuous, timed, or timed-repetitive tests. The Continuous setting configures the test cycle so that it will run continuously from the time that the Start button is clicked until the Stop button is clicked. The Timed setting configures the test cycle to run the test for the duration of the test time. The Timed-Repetitive setting configures the test cycle to run the test for the duration of the test time and then to repeat the same test again. To choose the Test Mode click the appropriate radio button.

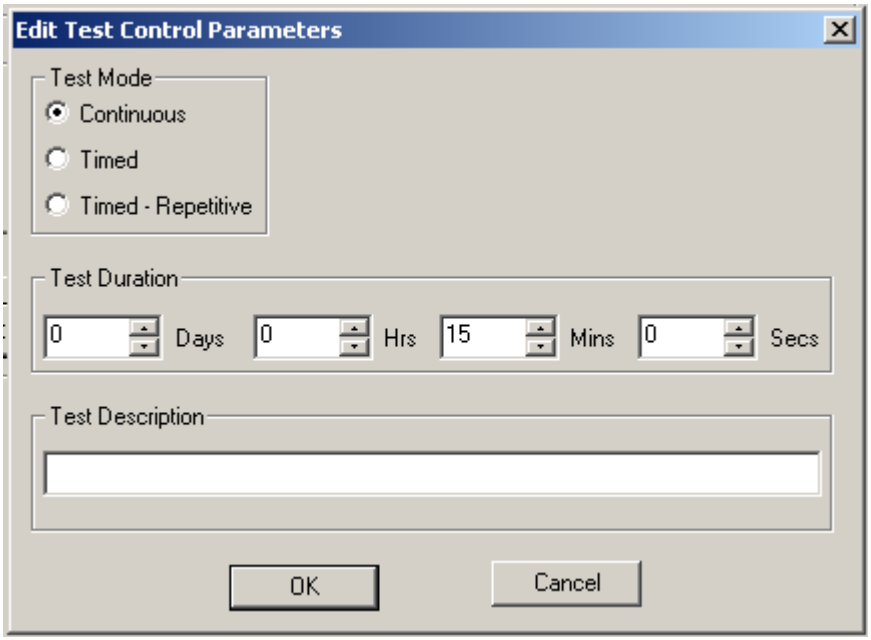


Figure 2-14: Test Control Parameters dialog box

The Test Duration section provides the means to set the length of the test if the Timed or Timed-Repetitive tests were chosen. To set the test duration select the desired test length time by clicking up/down arrows in the Days, Hours, Minutes, and Seconds boxes.

By clicking in the box labeled Test Description, a description of the test may be entered. When editing is finished, click OK to return to the Test Control menu.

Test Control Summary

The Test Control Summary menu, as shown in Figure 2-15, provides a summary of the test control conditions for each Receiver individually. Clicking the Edit button will display the Test Control menu for the specific receiver number chosen. Clicking the Start button will begin a test on the specific receiver number chosen. Once the Start button is clicked, it changes to a Stop button. The Pause button is grayed out until a test is started, then it may be clicked to pause a test.

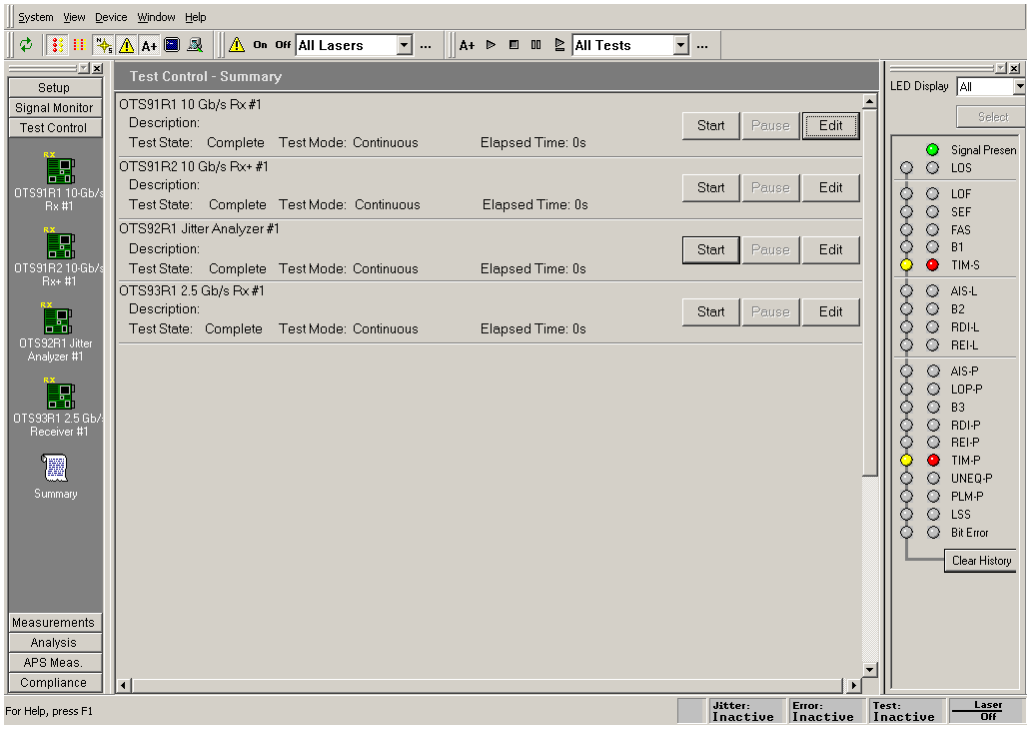


Figure 2-15: Test Control Summary menu

Measurements Menu

When Measurements is selected from the Navigation window, the Measurements menu is displayed. The Measurements menu provides separate configuration control over each receiver by these individual icons.

If an Rx icon is clicked, the Receiver signal monitor menu is displayed. This menu contains three separate menu screens; each selected by a tab. These tabs, Real-Time, Cumulative and History, each display is an aspect of the Receiver Measurement function.

Measurements - Real-Time

The real-time display menu provides the ability to view the measurements monitored during the last n seconds (up to 120). The time component can be changed through the Seconds field, click on edit to activate the field. The measurements shown reflect the display choice, as shown in Figure 2-16.

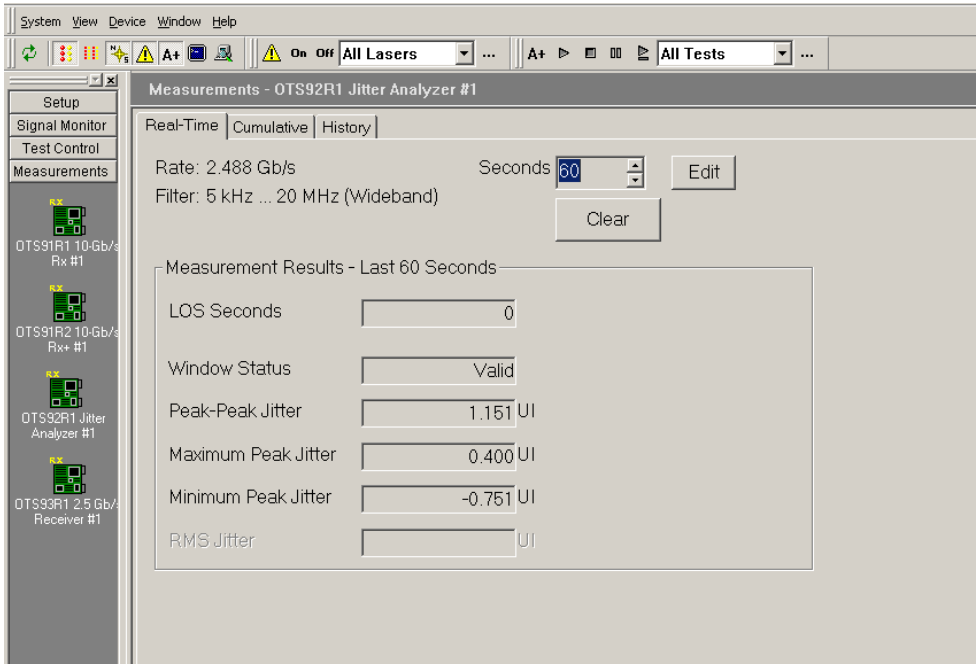


Figure 2-16: Real-Time menu

Note that the RMS Jitter block in Figure 2-16 is grayed out. This measurement is only active if the Wideband-RMS filter bandwidth is selected in the Receiver Setup menu.

Measurements - Cumulative

The cumulative menu displays the test state time elapsed and measurements results. The results are accumulated while the test is in progress and are cleared when a new test begins. The measurements shown reflect the display choice, as shown in Figures 2-17.

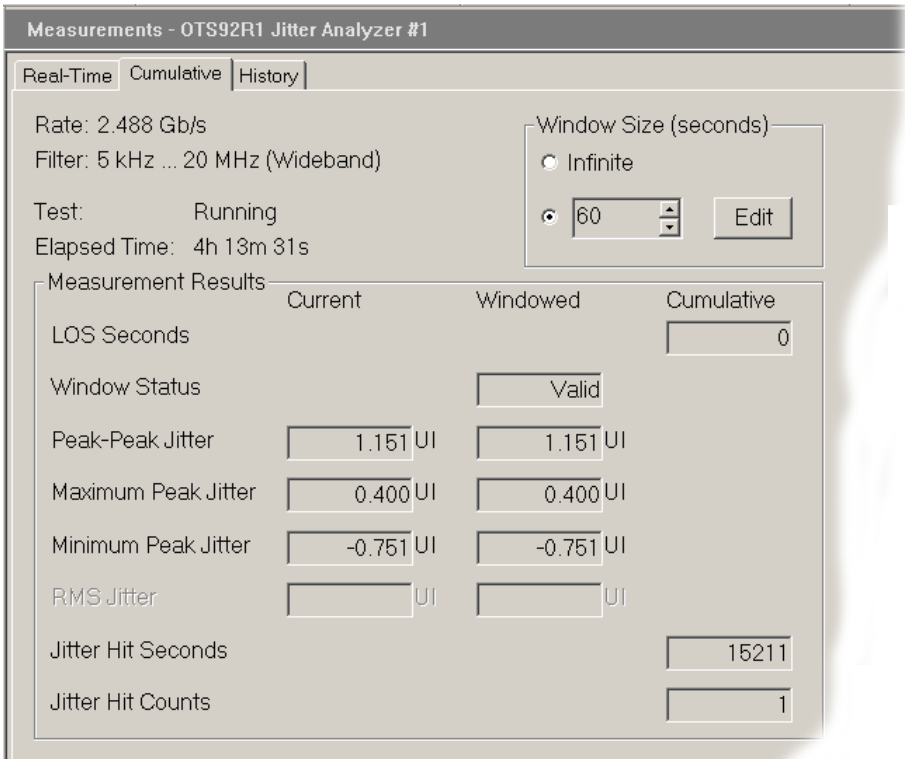


Figure 2-17: Cumulative Measurements Display

Measurements – History

The history display shows the results history data collected by the associated receiver during the current or most recent test, as shown in Figures 2-18. There are three selections to set, Upper Trace, Lower Trace, Search and the Time Axis.

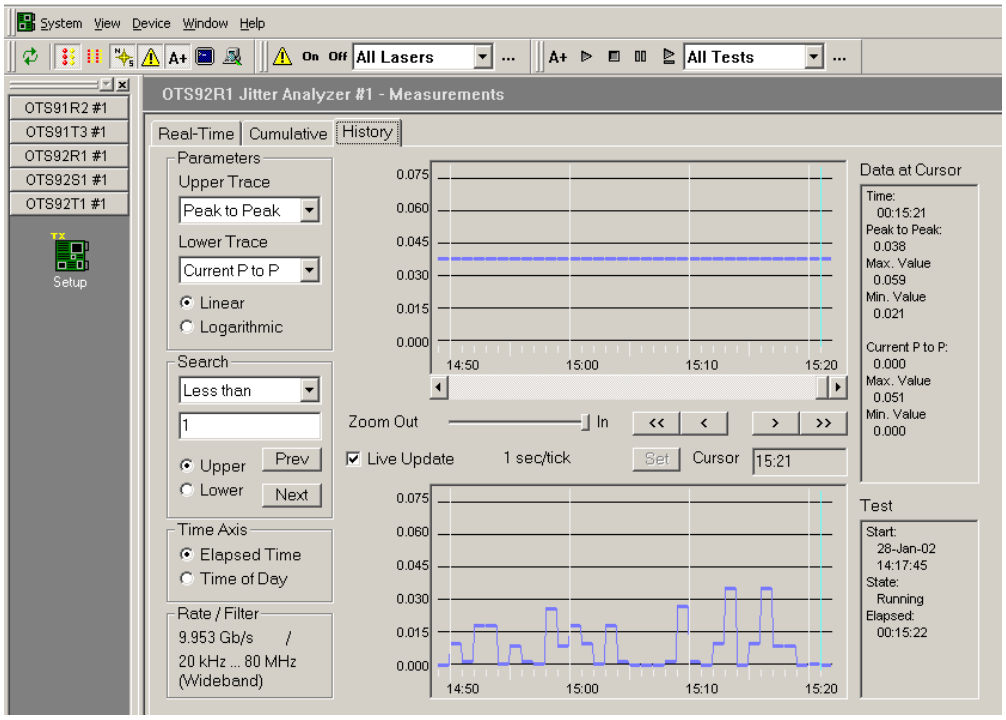


Figure 2-18: Measurement History Menu

The Upper Trace drop down menu provides several methods for tracing to choose from. The choices are Peak to Peak, Maximum Peak, Minimum Peak, Current Peak to Peak, Current Maximum Peak, Current Minimum Peak, Loss of Signal (LOS) and RMS (when an RMS filter is applied).

The Lower Trace drop down menu provides several methods for tracing to choose from. The choices are Peak to Peak, Maximum Peak, Minimum Peak, Current Peak to Peak, Current Maximum Peak, Current Minimum Peak, Loss of Signal (LOS) and RMS (when an RMS filter is applied).

The Search drop down menu provides several options for conducting a search, the choices are Less than, Equal to, Greater than, Maximum and Minimum.

The Time Axis option may be set to show elapsed test time or time of day. Elapsed test time does not accrue when a test is paused; time of day continues.

The Rate/Filter field displays the signal rate being tested.

Deselect the Live update check box to edit the cursor.

Compliance

Compliance testing is controlled through the Compliance bar found on the Navigation Window. Compliance settings are used to ensure that the system being tested complies with industry standards.

To perform Output Jitter testing, the Jitter Analyzer Compliance menu is used to set-up, start, and measure the results.

To perform Jitter Transfer and Jitter Tolerance testing, the Jitter Generator Compliance menu is used.

Compliance – Jitter Analyzer

The Jitter Analyzer Compliance menu, shown in Figure 2-19, controls output jitter testing. The menu displays readings for Line Rate, Test Standard, Measurement Time and Filter. When the Edit Settings button is clicked, the Set Output Jitter Test Parameters dialog box is displayed, allowing the user to make changes to the jitter compliance test setup.

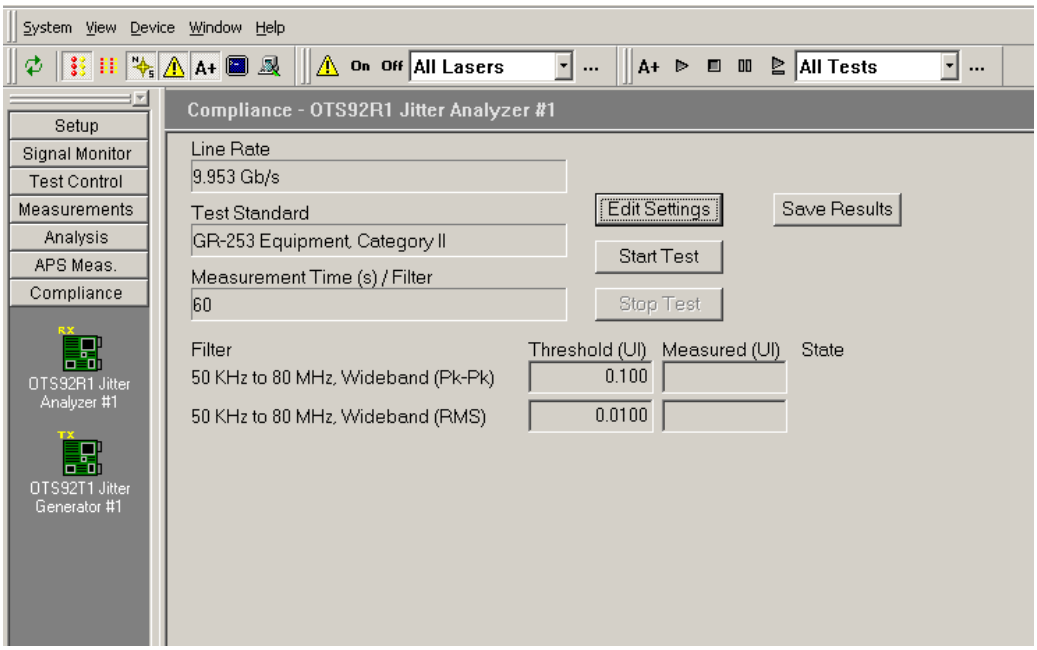


Figure 2-19: Jitter Analyzer Compliance Menu

Set Output Jitter Test Parameters window

The Set Output Jitter Test Parameters dialog box, shown in Figure 2-20, controls the test parameters.

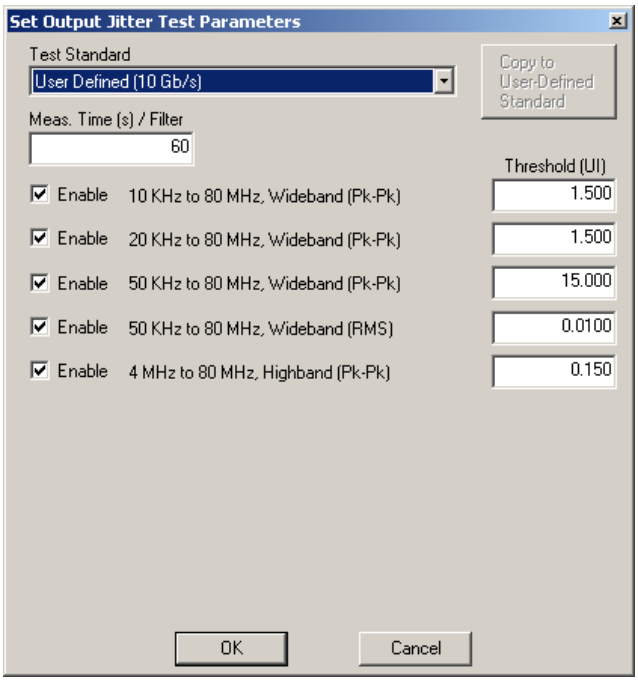


Figure 2-20: Set Jitter Output Parameters Dialog box

To select the compliance test standard for the jitter test, select the standard from the pull down menu.

In addition to the predefined standards for compliance testing, a User Defined (10Gb/s) selection is available. When this option is selected from the Test Standard pull down menu, the user may enable individual filter parameters. For each enabled filter, the user can change the Threshold level by typing a new number into the Threshold field.

To accept the entries made click on the OK button. After the Set Output Jitter Test Parameters dialog box closes, click on Start Test to initiate a new test.

Compliance – Jitter Generator

The Jitter Generator Compliance menu, shown in Figure 2-21, controls jitter transfer and tolerance testing. The menu displays readings for Line Rate, Elapsed Time, Test Type, Tolerance Test Condition, and Mask Selection as well as numerous control points for the results grid. When the Edit Settings button is clicked, the Set Output Jitter Test Parameters dialog box is displayed, allowing the user to make changes to the jitter compliance test setup.

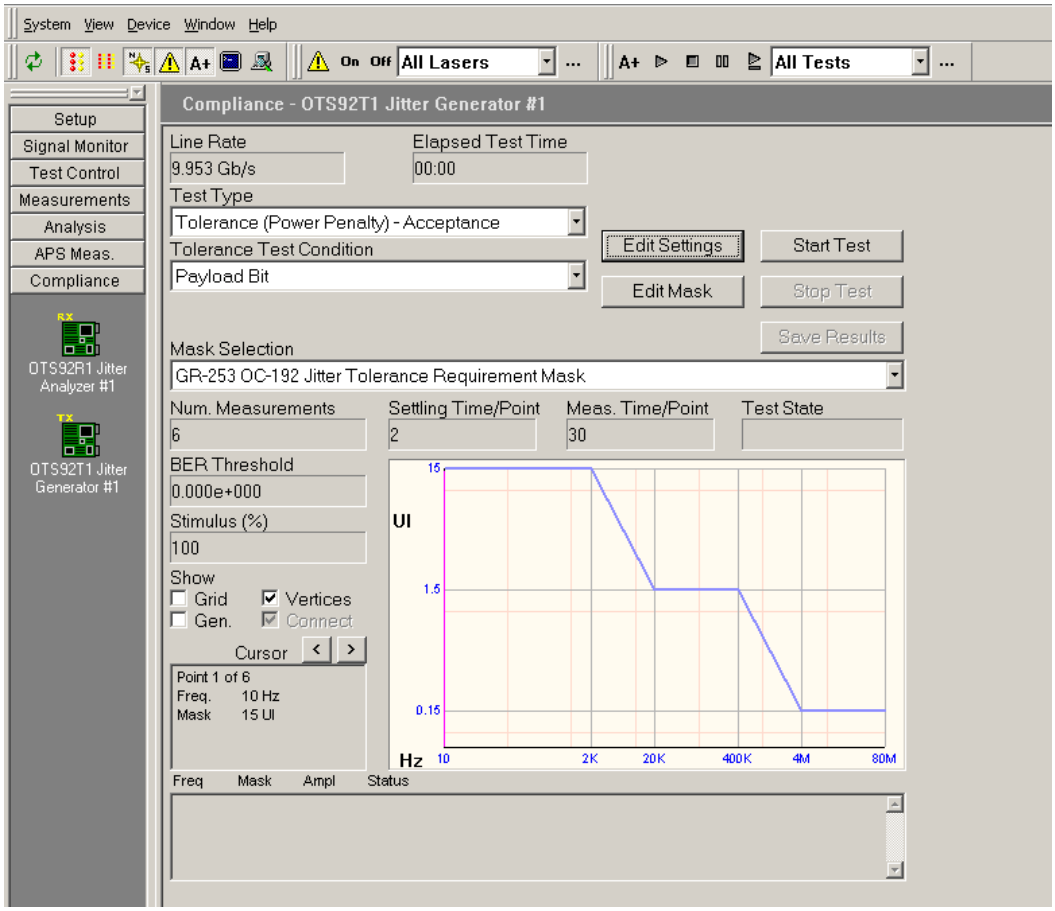


Figure 2-21: Jitter Generator Compliance Menu

Jitter Tolerance

To select a jitter tolerance compliance test, choose Tolerance from the Test Type pull down menu. The following jitter tolerance tests are available:

- Tolerance (Power Penalty) – Acceptance
- Tolerance (Power Penalty) – Measure
- Tolerance (Onset) – Acceptance
- Tolerance (Onset) - Measure

A jitter tolerance test verifies a network element's ability to perform its function in the presence of jitter on its input signal. This is traditionally measured in one of two ways:

The **onset-of-errors** method starts with a signal that is error-free when no jitter is applied. Jitter of a specified frequency and amplitude is then applied to the input of the device under test and its output is monitored for errors for a specified time interval. If, during this interval, the number of *errored seconds* – one-second intervals in which one or more errors occur – is at or below a threshold, the device under test can tolerate the jitter applied.

The **1-dB optical power penalty** method uses an attenuated input signal adjusted to achieve a specified error rate, typically approximately 100 errors per second with no jitter applied. The input power level is increased by 1 dB; this action reduces the error rate. Jitter of a specified frequency and amplitude is then applied and the error rate again measured. If the error rate with jitter is at or below the error rate initially measured at reduced power, the device under test can tolerate the jitter applied.

The fully automated compliance test applies jitter and measures errors at a series of frequency/amplitude points. The OTS9200 performs both jitter tolerance acceptance tests and jitter tolerance measurements, as follows:

- **Acceptance test:** functions as described above, it applies jitter at a set of particular frequencies and amplitudes, and verifies that the device under test functions under those conditions. Any point for which the device under test cannot tolerate the specified jitter causes the test to fail.
- **Measurement test:** attempts to determine the maximum level of jitter with which a device will function. The OTS9200 applies jitter at the same frequencies as for the acceptance test, but at each frequency, it varies the jitter amplitude to find the level at which the device under test fails the selected criterion. The highest level at which the device under test passes becomes the measured jitter tolerance for that frequency.

Tolerance Test Condition

The Tolerance Test Condition dropdown list offers a choice of the four bit error conditions that may be monitored for jitter tolerance testing. Bit error conditions available are B1, B2, B3, and Payload Bit.

Mask Selection

The Mask dropdown list offers a choice of jitter tolerance masks applicable to the currently selected line rate. Both standard (fixed) masks and user-defined masks appear in this list.

Display Controls

The **Cursor** buttons move the cursor to the various measurement points on the graph. The window immediately below them displays the frequency, mask value, measured value, and pass/fail status of the current point.

The check boxes under **Show** offer options for the graph display:

- **Grid** shows or hides the frequency and amplitude annotations for the graph axes.
- **Vertices** shows or hides the coordinate display for the mask vertices
- **Gen** shows or hides a display of the maximum amplitude capability of the jitter generator
- **Connect** enables or disables drawing a line between adjacent dots that show measured jitter tolerance values. This function is not applicable to acceptance tests.

Jitter Tolerance Settings

Clicking the **Edit Settings** button displays the Edit Jitter Tolerance Settings dialog box, shown in Figure 2-22, that selects the various test control parameters.

The Setting time/point, Meas. time/point, Stimulus level, and BER Threshold values are user-selectable. To change the value, enter a new value by typing in the appropriate field.

The *Set* buttons copy the value from the *Recommended threshold* or *Current measured BER* displays to the *BER Threshold* field.

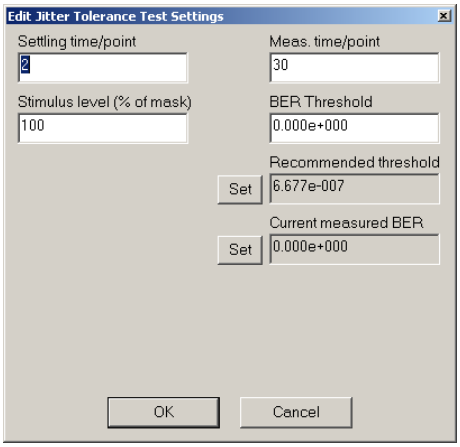


Figure 2-22: Edit Jitter Tolerance Settings

NOTE: *Before the Edit Settings dialog box can be changed the timing source for the SONET/SDH transmitter module used for the test must be set to Jitter. Otherwise the BER reading will be invalid. If the timing source is not changed to Jitter, a warning dialog box is displayed when the Edit Settings button is clicked.*

Jitter Tolerance Mask

The **Edit Mask** button opens the Edit Jitter Tolerance Mask dialog, shown in Figure 2-23, with controls to define or modify the currently selected mask (for user-defined masks only) and to select the number of measurement points.

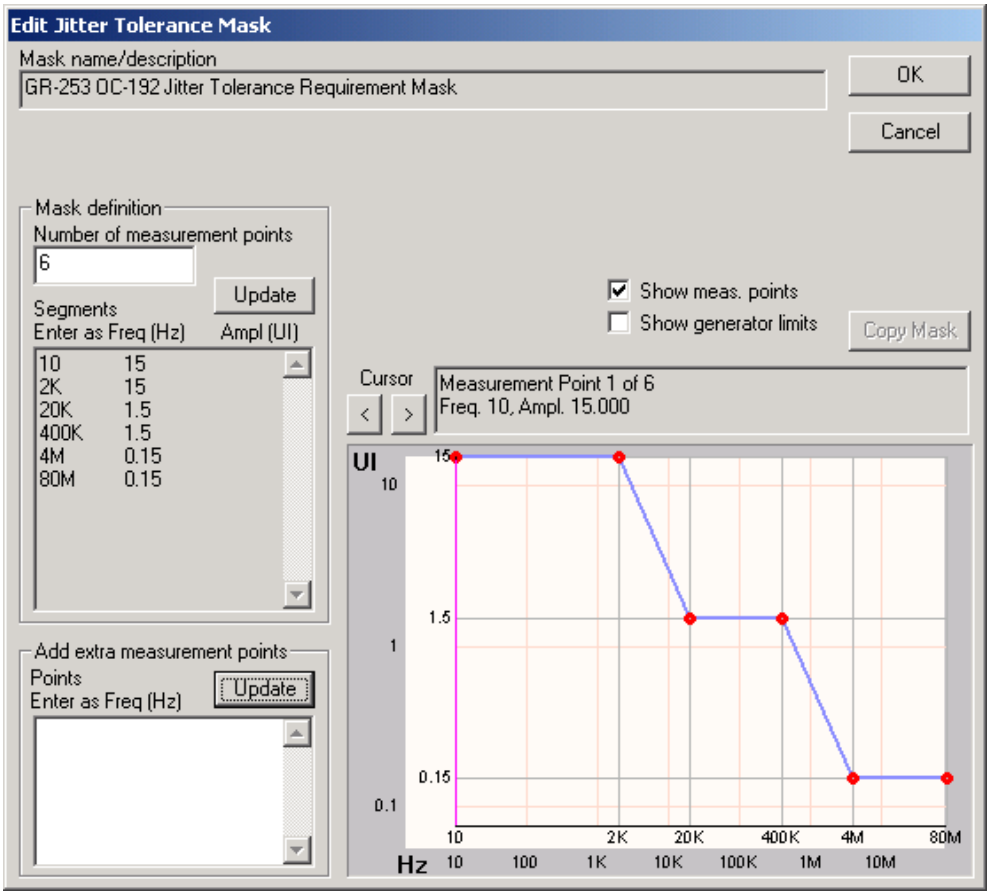


Figure 2-23: Jitter Tolerance Mask dialog

The **Number of measurement points** field selects the number of points along the mask curve at which measurements are performed. There must be at least as many points as the number of mask vertices.

The **Mask name/description** field shows the name of the currently selected mask. For user-defined masks, this field may be used to enter or modify the mask name.

The **Mask definition: Segments** field shows the coordinates of the end points (vertices) of the mask segments. For user-defined masks, this field may be used to enter or modify the vertex coordinates. Examining the segment definitions of a standard mask is an effective way to become familiar with the format in which mask definitions are displayed and entered.

The **Show meas. points** check box enables or disables the display of dots at the frequencies of the selected measurement points.

The **Show generator limits** check box shows or hides a mask trace representing the maximum jitter amplitude capability of the jitter generator.

The **Copy Mask** button, which is enabled for user-defined masks, allows copying the data from a standard mask or another user-defined mask.

The **Add extra measurement points** field allows specifying particular frequencies at which you want measurements to be made. These points are independent of those automatically assigned. The frequencies specified must be within the range covered by the mask. This feature may be used to concentrate measurements in a frequency range that is of particular interest. Figure 2-24

illustrates this feature by showing measurement points added at 6 KHz, 8 KHz, and 10 KHz. Observe that extra measurement points may be specified for both standard masks and user-defined masks.

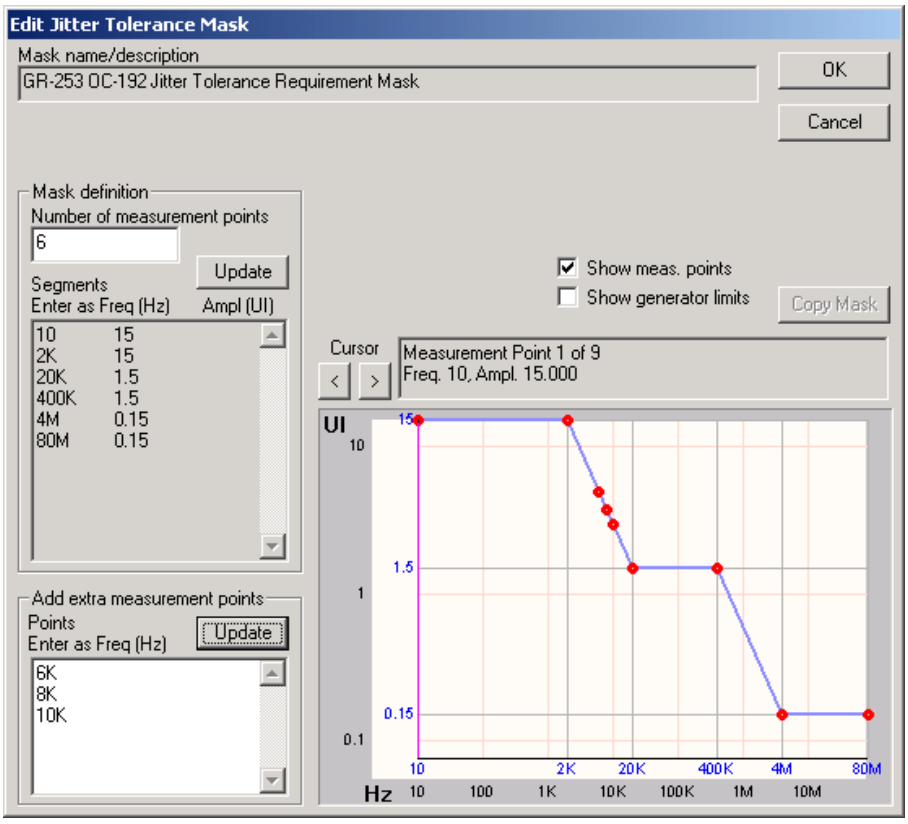


Figure 2-24: Example of mask with extra data points

Running a Test and Viewing the Results

To run a test, click the Start Test button. A test monitoring bar is now displayed above the Start Test button, as shown in Figure 2-25. During the execution of the test, the Elapsed Test Time indicator increments, the progress bar display advances, and the graph and Results display are updated as measurements are made.

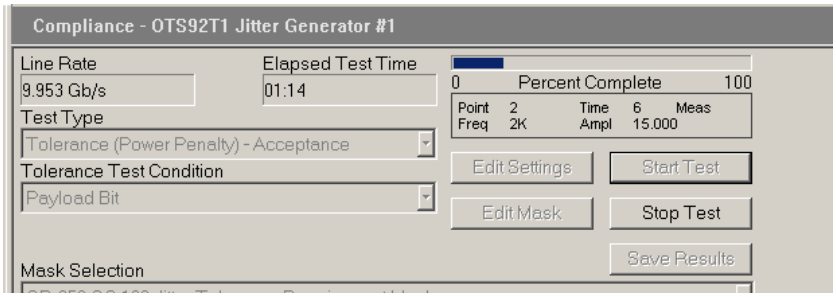


Figure 2-25: Test monitoring bar

The individual measurements appear as dots on the graph. Measurements that pass are shown as green dots; those that fail are shown as red dots. If a measurement's applied jitter amplitude is limited by the maximum capability of the jitter generator, it is marked *at source limit* in the status field and it is shown as a green or red dot with a black center and, if space permits, the word LIMIT next to or below it.

The frequency, mask value, amplitude applied, and pass/fail status for each point are shown in the window below the graph. These values also appear in the *Cursor* window for the point at the cursor.

A jitter tolerance measurement displays the value measured rather than the amplitude applied.

Saving Results

To save the results of the test, when completed, click the Save Results button to open a Copy to Clipboard dialog, as shown in Figure 2-26. From here, you can save the test results to a file or copy them to the Windows Clipboard. The results may be saved as text formatted with spaces or tabs, as comma-separated data, or as a bitmap image of the graphical display.

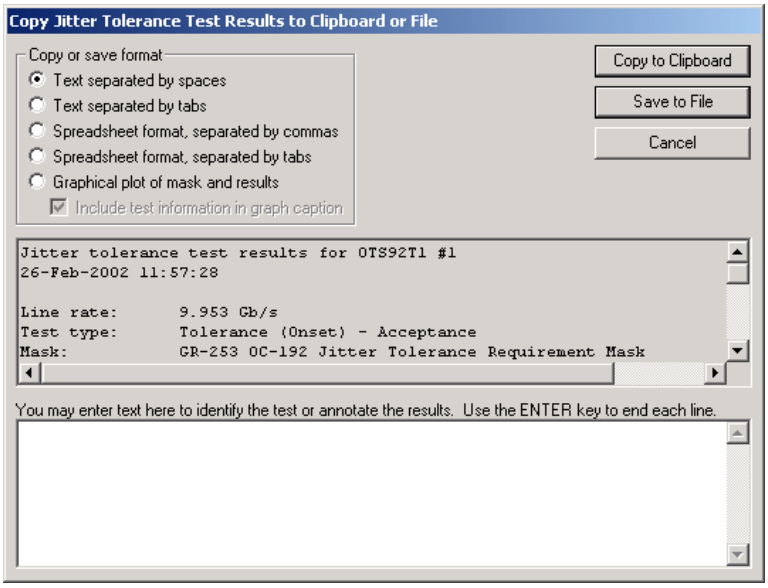


Figure 2-26: Copy to Clipboard dialog

Jitter Transfer

To select a jitter transfer compliance test, choose Transfer from the Test Type pull down menu. The following jitter transfer tests are available:

- **Transfer (Fast):** uses an efficient jitter transfer measurement to achieve the shortest test time; for most test situations, this technique yields satisfactory accuracy
- **Transfer (High accuracy):** uses an integration technique to minimize the effects of noise and random variation in the jitter measurement, at the expense of a longer test time

A jitter transfer test verifies that a network element generates or retransmits no more than an allowed fraction of the jitter it receives at its input.

Mask Selection

The Mask dropdown list offers a choice of jitter tolerance masks applicable to the currently selected line rate. Both standard (fixed) masks and user-defined masks appear in this list.

Diplay Controls

The **Cursor** buttons move the cursor to the various measurement points on the graph. The window immediately below them displays the frequency, mask value, measured value, and pass/fail status of the current point.

The check boxes under **Show** offer options for the graph display:

- **Grid** shows or hides the frequency and amplitude annotations for the graph axes.
- **Vertices** shows or hides the coordinate display for the mask vertices
- **Connect** enables or disables drawing a line between adjacent dots that show measured jitter transfer values.

Jitter Transfer Settings

Clicking the **Edit Settings** button displays the Edit Jitter Transfer Settings dialog box, shown in Figure 2-27.

The Stimulus Level field allows control of the applied jitter level at which jitter transfer is measured. The value is expressed as a percentage of the amplitude specified by the stimulus mask.

The Start Frequency field allows specifying an explicit starting frequency, and thus performing the jitter transfer test over only a part of the frequency range specified by the jitter transfer mask. For this value to have an effect, the **Enable start freq. limit** check box must be checked.

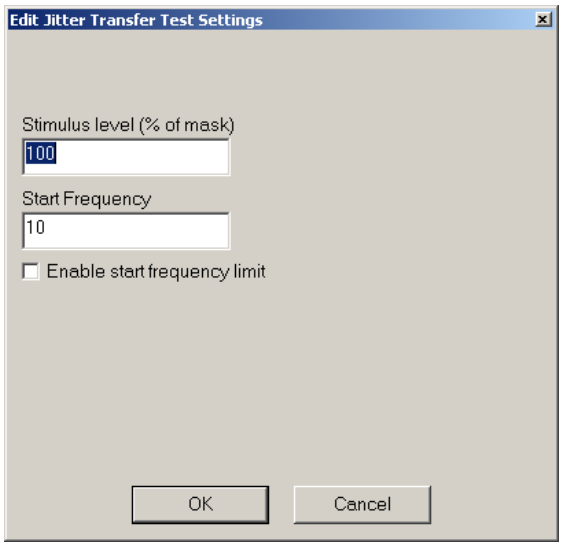


Figure 2-27: Edit Jitter Transfer Settings

Jitter Transfer Mask

The **Edit Mask** button opens the Edit Jitter Transfer Mask dialog, shown in Figure 2-28, with controls to define or modify the currently selected mask (for user-defined masks only) and to select the number of measurement points.

The **Number of measurement points** field selects the number of points along the mask curve at which measurements are performed. There must be at least as many points as the number of mask vertices.

The **Mask name/description** field shows the name of the currently selected mask. For user-defined masks, this field may be used to enter or modify the mask name.

The **Associated stimulus mask name/description** field shows the name of the jitter tolerance mask that defines the stimulus for this jitter transfer mask. For user-defined masks this field may be used to enter or modify the stimulus mask name.

The **Mask definition: Segments** field shows the coordinates of the end points (vertices) of the mask segments. For user-defined masks, this field may be used to enter or modify the vertex coordinates. Examining the segment definitions of a standard mask is an effective way to become familiar with the format in which mask definitions are displayed and entered.

The **Display** control selects whether the response mask or stimulus mask is shown. For user-defined masks, this control selects the mask currently open for editing.

The **Show meas. points** check box enables or disables the display of dots at the frequencies of the selected measurement points.

The **Copy Mask** button, which is enabled for user-defined masks, allows copying the response mask, stimulus mask, or both from a standard mask or another user-defined mask.

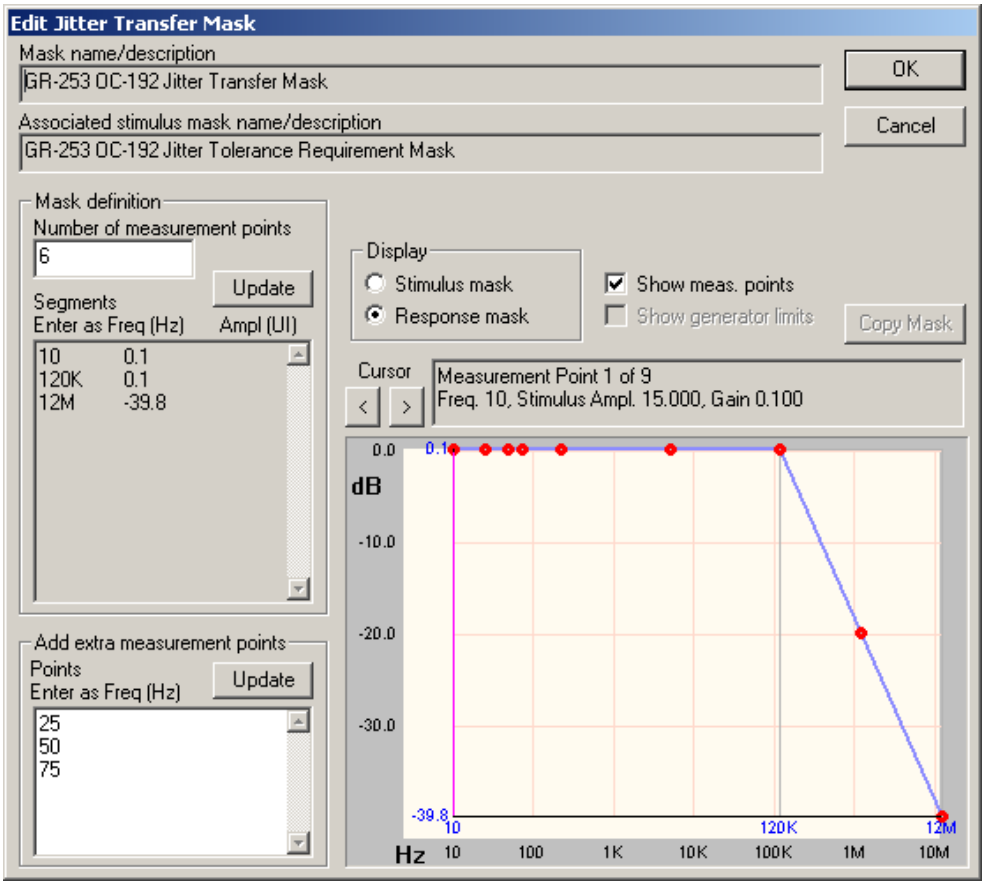


Figure 2-28: Jitter Transfer Mask dialog

The **Add extra measurement points** field allows specifying particular frequencies at which you want measurements to be made. These points are independent of those automatically assigned. The frequencies specified must be within the range covered by the mask. This feature may be used to concentrate measurements in a frequency range that is of particular interest.

NOTE: *The measurement points are allocated based on the response mask independent of whether the response mask or stimulus mask is displayed. Extra measurement points are similarly allocated within the range specified by the response mask.*

Running Jitter Transfer Calibration

With the system properly set up and looped back to itself for calibration, and the mask and test settings at their desired values, click the Start Cal button. During calibration, the Elapsed Test Time indicator increments and the progress bar display advances. When calibration is complete, the user interface displays Calibrated.

NOTE: *Do not change mask selection or test settings after calibration is completed. Changing these settings erases the calibration data and thus requires that the calibration sequence be run again. Note that calibration should be performed after the OTS system has warmed up for 20 minutes or more, and repeated at least once a day.*

Running a Test and Viewing the Results

To run a test, click the Start Test button. A test monitoring bar is now displayed above the Start Test button, as shown in Figure 2-29. During the execution of the test, the Elapsed Test Time indicator increments, the progress bar display advances, and the graph and Results display are updated as measurements are made.

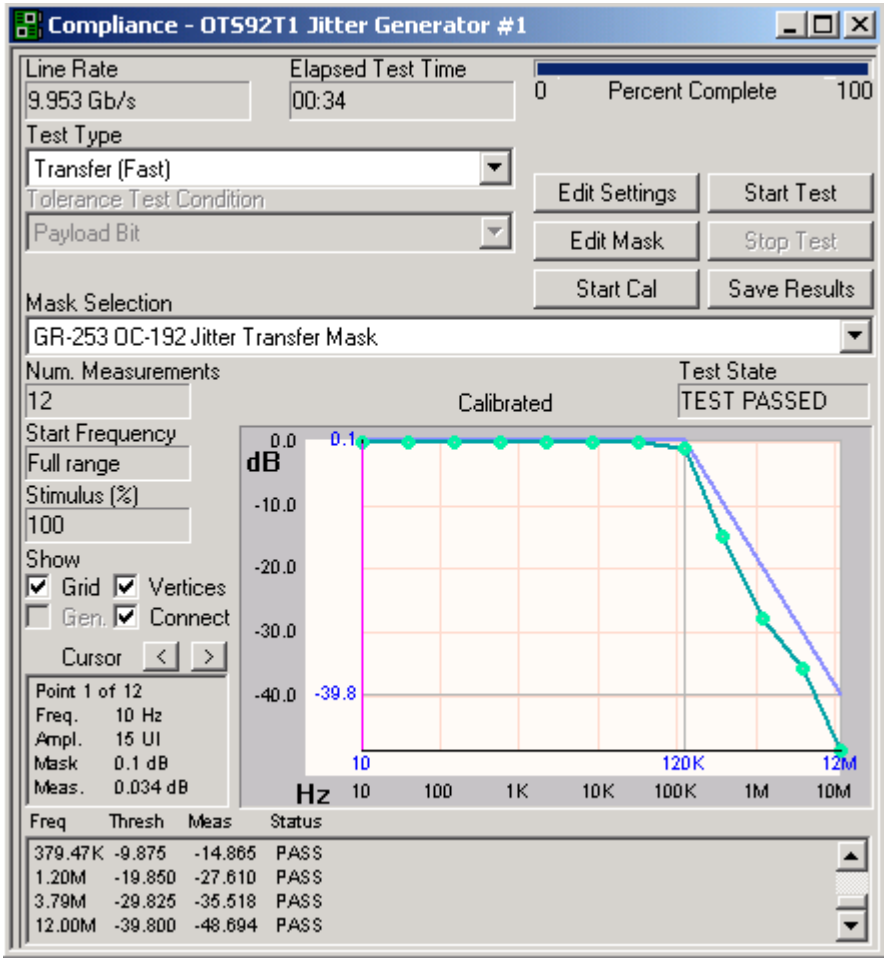


Figure 2-29: Completed Jitter Transfer Test screen

The individual measurements appear as dots on the graph. Measurements that pass are shown as green dots; those that fail are shown as red dots. If a measurement's applied jitter amplitude is limited by the maximum capability of the jitter generator, it is marked *at source limit* in the status field and it is shown as a green or red dot with a black center and, if space permits, the word LIMIT next to or below it.

The frequency, jitter transfer threshold value, measured jitter transfer value, and pass/fail status for each point is shown in the window below the graph. These values also appear in the Cursor window for the point at the cursor.

Saving Results

To save the results of the test, when completed, click the Save Results button to open a Copy to Clipboard dialog, as shown in Figure 2-30.

From here, you can save the test results to a file or copy them to the Windows Clipboard. The results may be saved as text formatted with spaces or tabs, as comma-separated data, or as a bitmap image of the graphical display.

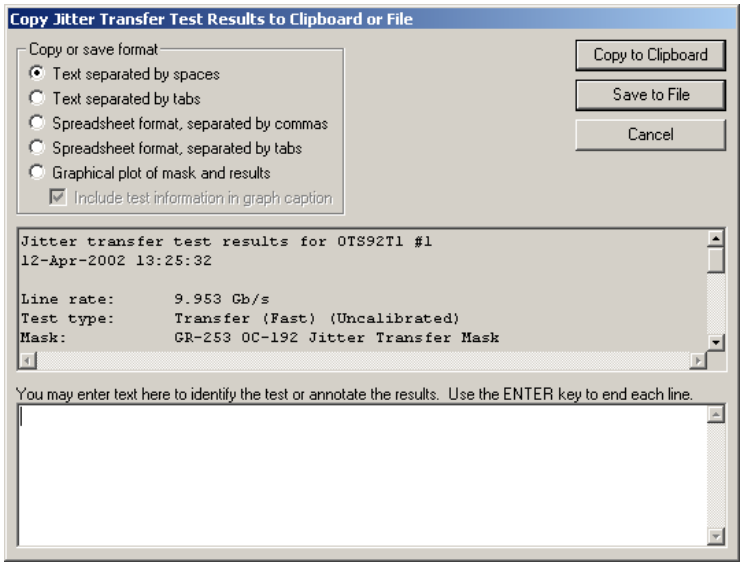


Figure 2-30: Copy to Clipboard dialog

Remote Access Setups

The remote control settings for selecting GPIB, RS-232, and Ethernet LAN controls are located under the menu bar in the System menu. Click on the System menu and select Remote Control. The Remote Control Settings dialog box is displayed. Across the top are tabs for COM1, COM2, and Telnet, as shown in Figures 2-31, and 2-32.

To set up the proper configurations for the type of remote access desired, select the appropriate setup information via the pull-down menus and boxes provided.

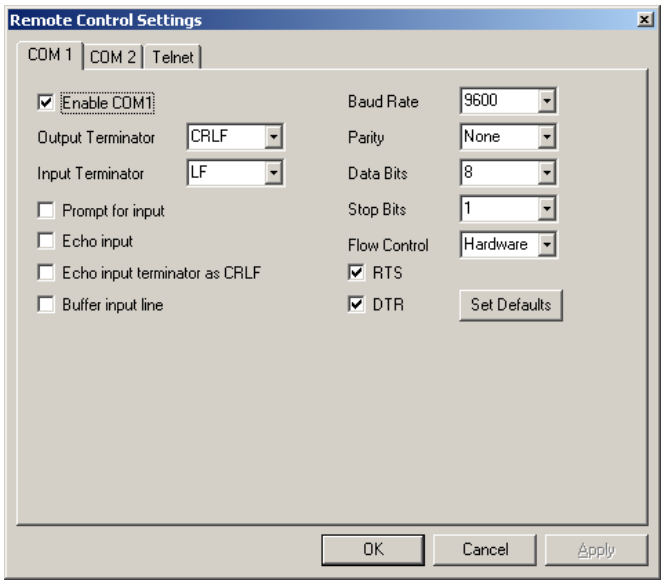


Figure 2-31: COM 1/COM 2 Remote Control Settings

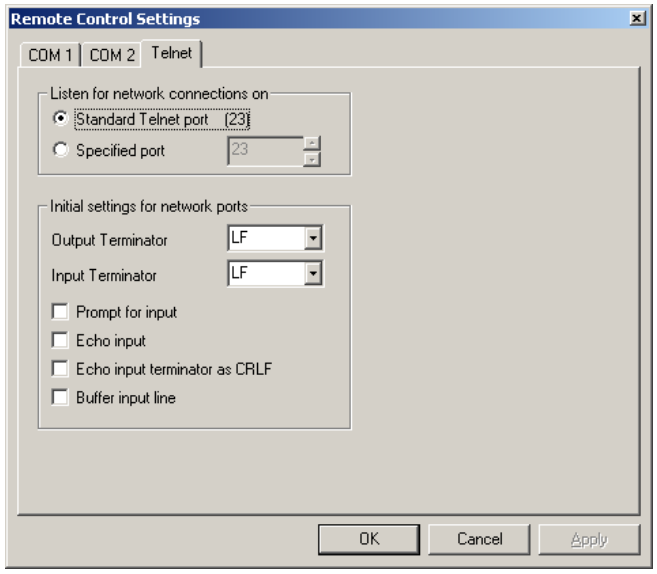


Figure 2-32: Telnet (network) Remote Control Settings

Select Server

The select server dialog box, as shown in Figure 2-33, allows the user to select the server when the OTS system is networked. If there are no networks available, the only selection is LocalServer.

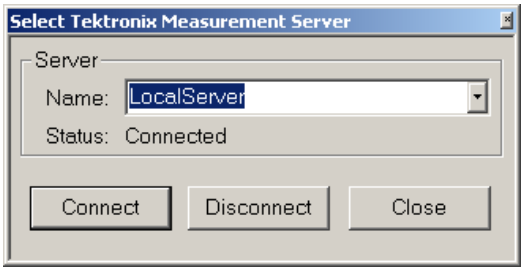


Figure 2-33: Select Server dialog box

View Options

To open the options menu, as shown in Figure 2-34, click View and select Options. The options menu allows the user to customize the user interface to their preferences. The OTS9200 module works with jitter and clock, and will not be effected by many of these settings. The OTS9100 module is effected by all of the settings within this menu.

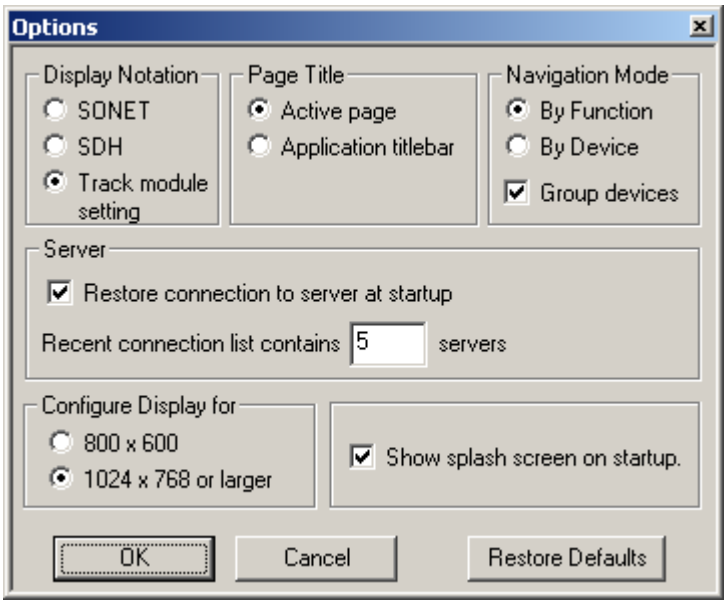


Figure 2-34: View Options dialog box

Display Notation

Since SONET and SDH provide different notation in regards to some measurements, the display notation option allows the user to set the notation to their choice. If SONET is selected, then where applicable, all notation will be in SONET. If SDH is selected, then where applicable, all notation will be in SDH.

NOTE: *This switch does not affect the actual functionality of the module. It affects only the notation on the user interface for viewing convenience.*

If the 'Track Module Setting' option is selected, then the display notation follows that of the module setting. For example, if the module is set to SONET mode, then SONET notation is displayed.

Page Title

The active screen is always displayed on the title bar, but if Active Page is selected the active screen name also appears as a title at the top of the current menu, as shown by Figure 2-35. If the Application title bar option is selected, then the active title is removed.

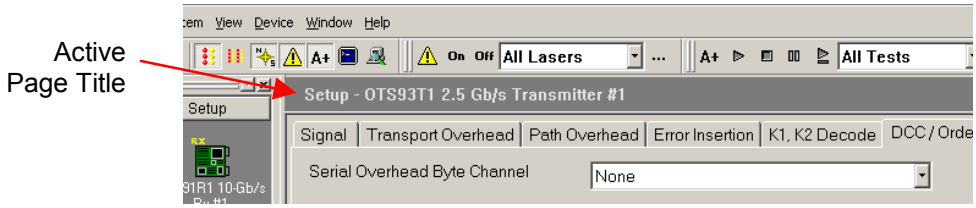


Figure 2-35: Location of the Active Page Title

Server (System)

The server selections allow the user to restore connection to the server at startup and to change the quantity displayed in the recent connection list. These server connections refer to the specific OTS system.

Display Configuration

Display configuration provides two different display sizes, 800 x 600 and 1024 x 768.

NOTE: *For viewing on the OTS9010, the 800 x 600 display is recommended. Otherwise, the whole screen will only be viewable with the use of scrollbars.*

Navigation Mode

For the user's convenience, two ways of navigating through the menus of the user interface are provided. The Navigation Mode in the options dialog box provides the switch between these two styles. The differences appear in the Navigation Window, as shown in Figure 2-36.

If the Group devices box is not clicked, all devices will be shown by either Function or Device.

By Function

If this option is selected, the Navigation Window is arranged so that each function is a selectable bar (Setup, Signal Monitor, etc). The devices available for configuration and control appear as separate icons under each bar (Rx#1, Tx#1, Tx#2, etc).

By Device

If this option is selected, the Navigation Window is arranged so that each device is a selectable bar (Rx #1, Tx #1, Rx #2, etc). The configuration and control menus appear as separate icons under each bar (Setup, Signal Monitor, etc).

By FUNCTION | By FUNCTION Group Devices OFF | By DEVICE | By DEVICE Group Devices OFF

Figure 2-36: Navigation Mode – By Device and By Function

System View

A system view is available by clicking View and selecting System View. This view, as shown in Figure 2-37, represents all modules currently installed in the OTS system. The System View reflects the name of each module card and its slot position. This feature is provided as a reference for proper module installation and connections for multiple modules. The screen may also be reached by pressing CTRL-Y on the keyboard.

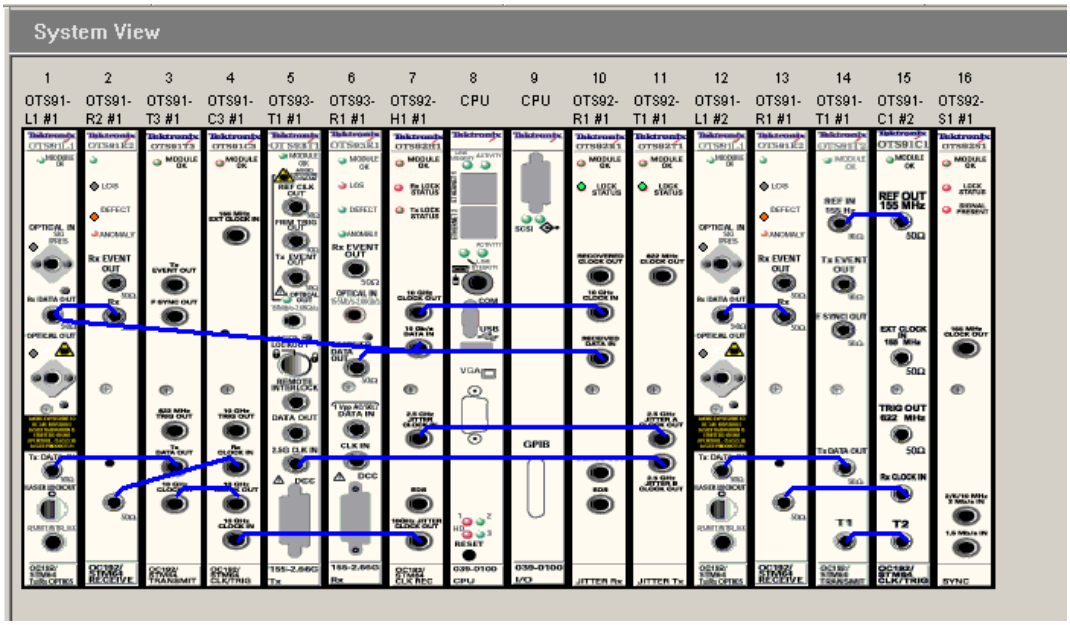


Figure 2-37: System View

SCPI Output

The SCPI Output option is provided for use in programming remote commands. To activate, click on the View menu and select SCPI Output. A dialog box, as shown in Figure 2-38, is displayed which provides an echo for all commands performed via the user interface. The commands are shown in SCPI format and may be copied from the dialog box into a text document.

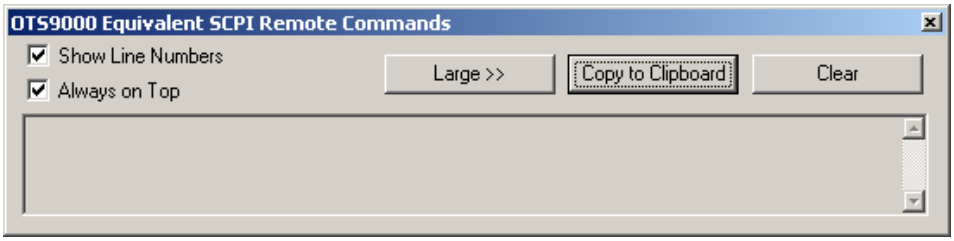


Figure 2-38: View SCPI Output dialog box

Multiple Windows

The user interface provides single window viewing and multiple window viewing, as shown in Figure 2-39. To view a single window at a time, select Single Window Mode under the Window menu. When the single window mode is active, only a single window may be viewed, the other selections under the Window menu are grayed out, and the Window Control Bar is grayed out.

If the single window mode is not checked, then multi-window mode is available. The multi-window mode allows the user to open more than one screen at a time. The Window Control Bar, and the Window menu options, are active while the interface is in multi-window mode. The Window Control bar provides the ability to tile the windows horizontally or vertically and to select the next window and the previous window to provide better navigation for the user.

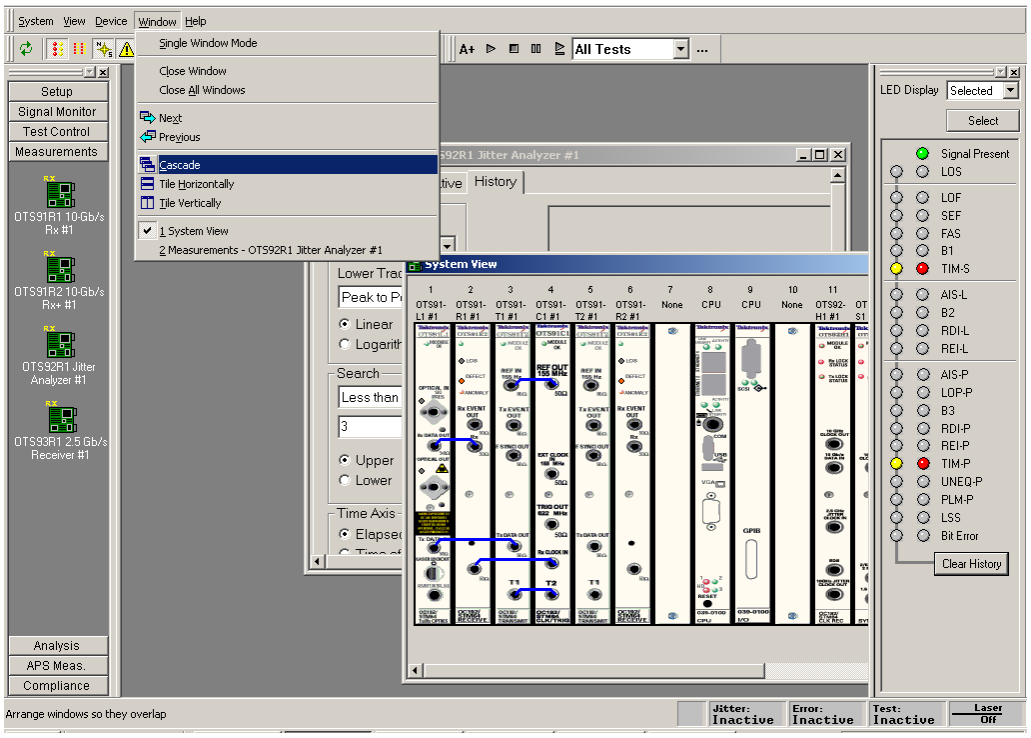


Figure 2-39: Multiple Window View

Results Files

Every time a test is started, data files are generated. These files are stored on the C-drive in a folder marked 'Tektronix Measurement Data'. To view these files from the user interface, click on View and select 'Test Results Files'. The Results Viewer dialog box is displayed. Refer to the Results Viewer description in this section for further information.

Results File Management

As tests are run measurement data files accumulate in the 'Tektronix Measurement Data' folder. Once this folder becomes large from the quantity and size of the files, overall system performance will suffer. The OTS system provides a results file cleanup tool to assist in automatically managing these files.

NOTE: *By default the system will keep only the most recent 100 results files. If there is a need to preserve all results files the user must explicitly disable results file cleanup before any tests are run.*

To access the Results File Management tool, click on the Systems menu and select Results File Management. The Results File Deletion Parameters dialog box is displayed, as shown in Figure 2-40.

All cleanup parameters may be independently enabled or disabled by modifying the check box to the left of the relevant parameter. Disabled parameters will retain their prior settings while disabled. The value fields for disabled will be grayed out indicating that the relevant limit is not being checked. All changes to parameters do not take effect until the 'OK' button is pressed.

The overall cleanup process is controlled by the pair of radio buttons at the top of the dialog. If the 'Disabled' button is selected then all results file cleanup will be turned off.

Results file cleanup is accomplished in two steps. The first step selects files to be moved or deleted. Results file sets (a history file and a summary file) are processed from oldest to newest based on the setting of the 'Delete files by oldest' control. This allows files to be selected based on their creation time, last modification time or last accessed time. Files are added to the delete/move list until all enabled criteria have been met.

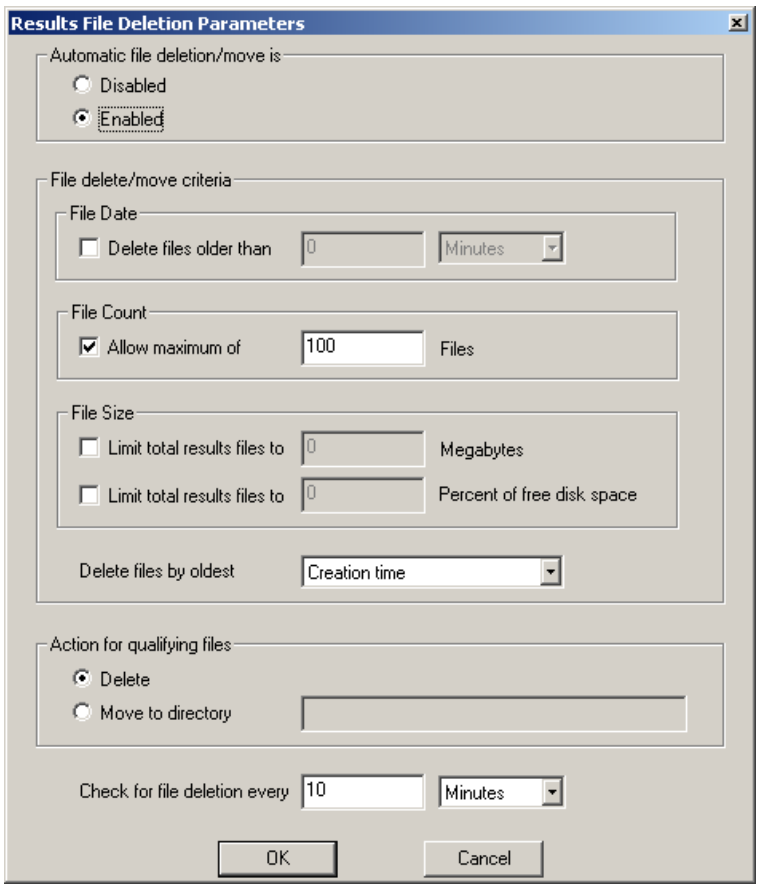


Figure 2-40: Results File Management dialog box

The cleanup facility allows files to be moved or removed based on their absolute age, the total number of files present or the total size of the files (either in absolute megabytes or as a percentage of the total capacity of the disk). The age of a file is determined based on the 'Delete files by oldest' setting. The number of files present counts 'sets' of results data (a summary file and its associated history file count as one 'results file set').

When enough files have been added to the list to meet all enabled limits the indicated files are either deleted or moved to the indicated directory. If processing of a given file fails (possibly due to file permissions or the destination directory being unavailable) processing of files will proceed through the remainder of the list. For a move to complete successfully, the target directory must exist and be accessible to the OTS system. If a move fails, the system will simply retry the operation next time the cleanup process runs.

The final control in the dialog allows the user to control how frequently the cleanup process runs. It is guaranteed that cleanup passes will occur no more frequently than specified here. It is possible for the system to defer cleanup for a longer interval as necessary.

ResultsViewer

The OTS Results Viewer is a stand-alone Windows program that reads the Test Results files from the OTS Test System. It provides the following functionality:

- Access to test results files, either on the OTS system or on the file system of the computer that is running ResultsViewer
- Display of results data – Cumulative Results, Analysis, and History – with the same presentation as the OTS User Interface, TekUI
- Printing of Cumulative Results and Analysis data, and export of the same text to an ASCII text file or the Windows clipboard
- Export of Cumulative Results, Analysis, and History data in delimited ASCII-text form, to a file or to the Windows clipboard
- Printing of History data to a graphical form
- Copying results files to a directory on the local file system

NOTE: *The results of a test are stored in two files, with the same file name but different extensions. One has extension* ***.sum*** *(summary information) and one has the extension* ***.his*** *(history data). Although ResultsViewer file selection operations involve only the .sum file, both files are used and must be present and in the same directory. Therefore,*

- *If you copy a test's results files to another computer or directory, you must copy both the ".sum" and the ".his" files*
- *If you rename a test's results files, you must rename both the ".sum" and ".his" file to have the same name*
- *If you use the File menu Save As function to copy the currently active test results to a directory on the local computer, the operation creates both the ".sum" and the ".his" files under the specified name*

Operation

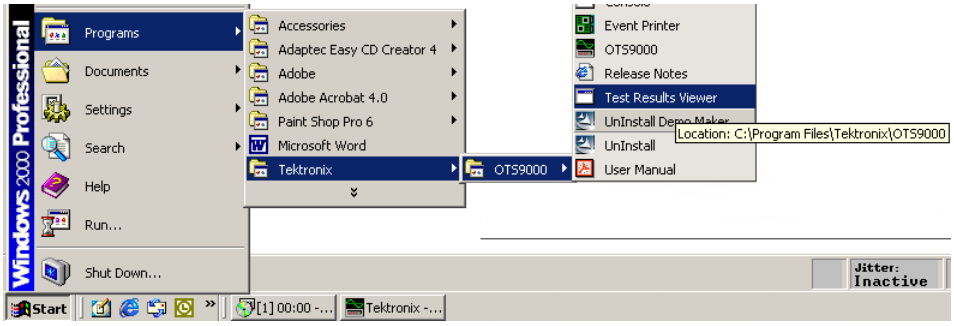


Figure 2-41: Results File Management dialog box

To start ResultsViewer, from the start menu select Programs>Tektronix>OTS9000>Results Viewer. It can also be started from TekUI, by clicking on the View menu and selecting Test Results.

Opening files on the local computer

On the Local computer:

To open a file locally, click on File and select Open Local File. A dialog box displays from which the user may select one or more test results files. Files with an extension of .sum are test results files.

On the OTS System:

To open a file on the OTS system, the ResultsViewer must be connected to an operating OTS system. Once the ResultsViewer is connected, click on File and select Open File on Server. A dialog box appears with a listing of all available files, their creation times, and any Test Description text with which the user annotated the test.

Connecting to an OTS System

ResultsViewer uses the same mechanism as the OTS User Interface program, TekUI. The OTS user manual discusses this procedure in more detail. In quick overview, click on File and Select Server in ResultsViewer. A dialog box displays from which the user can connect to an OTS system or disconnect an existing connection.

NOTE: *When ResultsViewer is started from TekUI, it starts, by default, connected to the same OTS system as TekUI.*

Viewing results files

When a test results file is opened, a measurement screen is displayed, as shown in Figure 2-42. The screen has three tabs for Cumulative Results, Analysis Results, and History Data. The window title bar displays the file name, the start time for the test displayed, and the device whose data is displayed.

These screens provide the same information and controls as the Measurement Results screens in the TekUI. Refer to Measurement Results section of the module user manual for detailed information of the data presented.

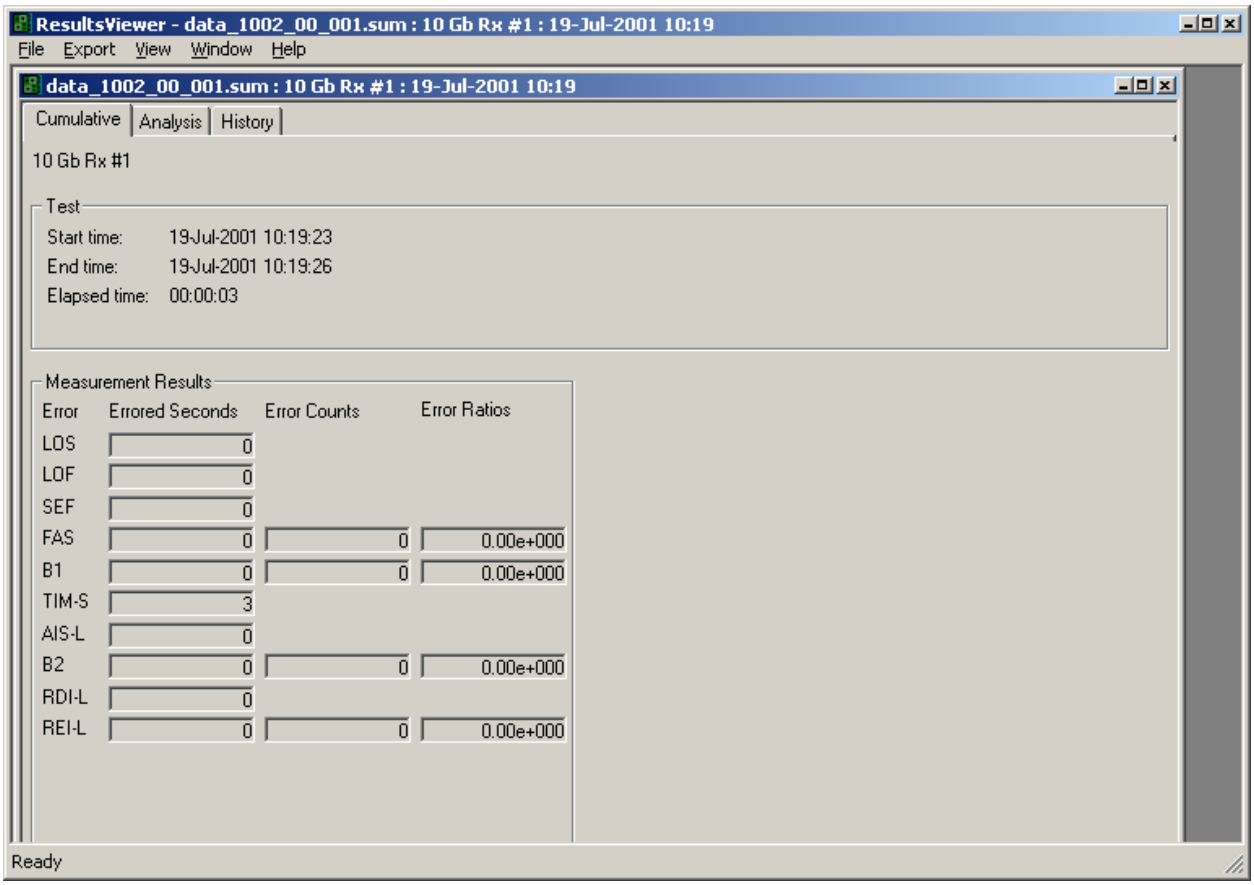


Figure 2-42: Cumulative Results screen of the ResultsViewer

Selecting and arranging windows

The Window menu in the ResultsViewer contains the usual commands to close, cascade, tile, and otherwise arrange windows. It also contains a list of windows for all open files, and this list provides direct access to any window.

Printing results data

All Print controls are located under the File menu. The Print Setup option allows selecting a printer, even when no files are open.

Print Results prints a report displaying all the parameters of the Cumulative Data and Analysis pages.

Print History Graphics prints a page showing the same information as is displayed on the active window's history tab.

Configuring ResultsViewer

To configure the ResultsViewer, click View and select Options. An Options dialog box will appear in which the user may change the following options:

- SONET or SDH conventions for parameter names
- Option to have ResultsViewer automatically connect to an OTS system on start-up
- Option to have ResultsViewer display the Tektronix splash screen on start-up

Exporting test data to other programs

ResultsViewer can export results data as either ASCII text, primarily intended for documentation, or delimited, formatted ASCII text readable by spreadsheet programs.

Exporting text

To export the test results file as text, click on Export and select Summary (text) to File. This option writes an ASCII file containing exactly the same information as the printed output of the Print Results command. Summary (text) to Clipboard writes the same ASCII text to the Windows clipboard. Summary Text Preview displays the same text in a pop-up window.

Exporting numeric data

Under the Export menu, the Data to File selection writes a file of delimited ASCII data containing information selected by the user; Data to Clipboard writes the same information to the Windows clipboard. Data Preview displays the same text in a pop-up window. The following paragraphs describe the data available, the formats, and the process of configuring a file to contain the desired information.

Configuring the exported data

To configure the exported data, click on Export and select Data Setup. The Configure Data Report dialog box, as shown in Figure 2-43, is now displayed. To enable a selection, click the box or radio button beside it. The report written to the file or clipboard is configured accordingly.

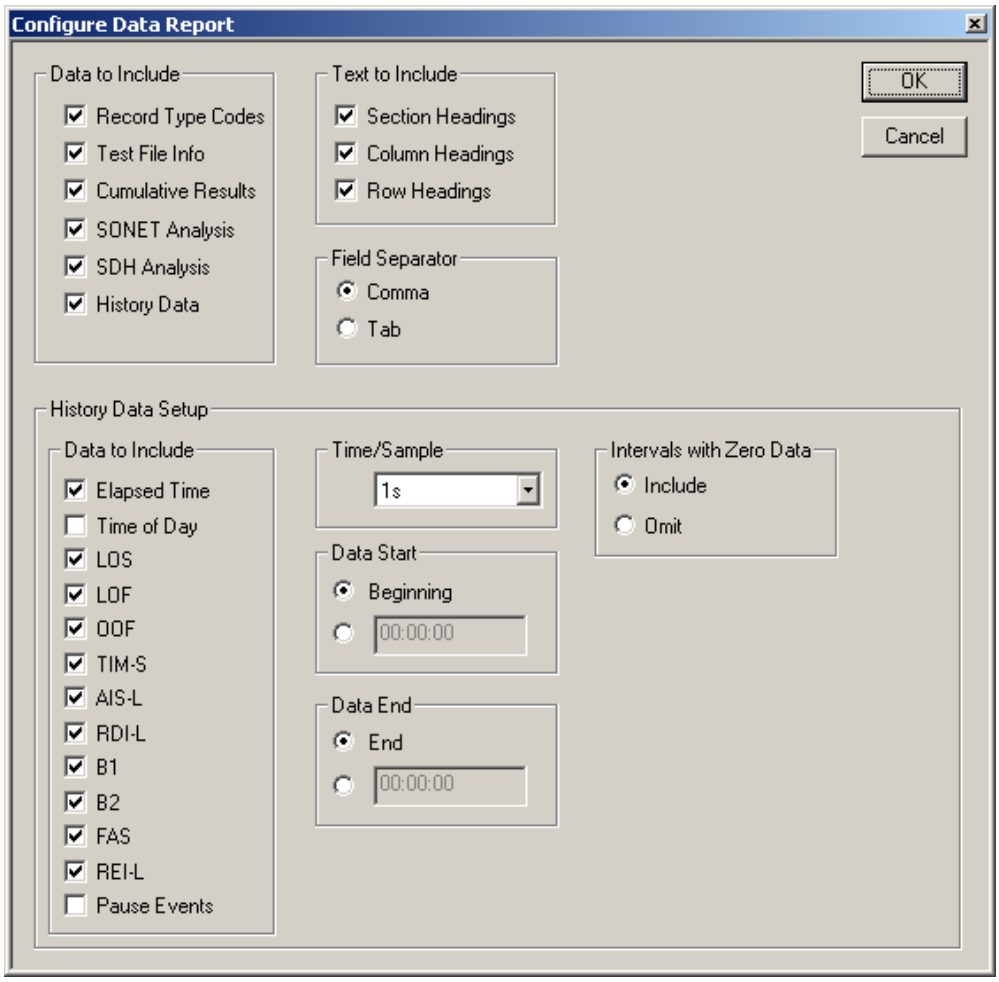


Figure 2-43: Configure Data Report dialog box

OTS System Event Printer Application

This is an auxiliary application that runs on the OTS system to log receiver events (defects and anomalies). Events may be printed as they are logged, if a printer is attached to the system, or the list of logged events may be captured to a file or to the Windows clipboard.

Starting the Event Printer program

The Event Printer is a separate application from the user interface. To start Event Printer, double-click its desktop icon. When started, the Event Printer main screen is displayed, as shown in Figure 2-44.

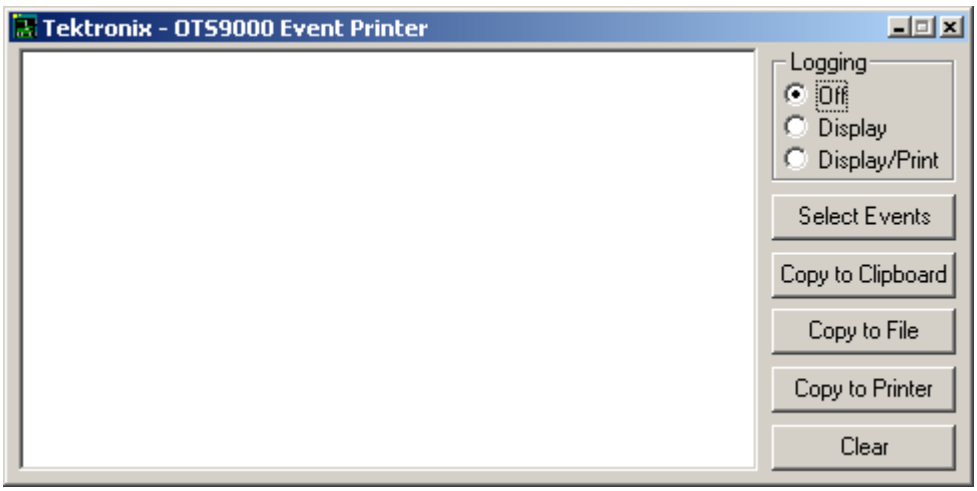


Figure 2-44: Event Printer main screen

Logging

Logging controls how events are logged. The selections available are:

- Off. Event logging is disabled
- Display. Events are logged to the application's text window only
- Display/Print. Events are logged to the application's window and to the default Windows printer

Select Events

Clicking this button brings up a window, shown and discussed below, with which the user selects the events to be monitored.

Copy to Clipboard

Clicking this button copies the list of logged events to the Windows Clipboard, from which it may be pasted into another application such as a word processor.

Copy to File

Clicking this button brings up a file selection dialog, with which the user specifies the location and name of a text file to receive the list of logged events.

Copy to Printer

Clicking this button copies the list of logged events to the default Windows printer. Note that this button is disabled if the currently selected logging mode is Display/Print.

Clear

Clicking this button clears the list of logged events. Any events that haven't already been copied or printed are thus lost.

Selecting events to log

Clicking the *Select Events* button brings up the Select Events to Monitor display, as shown in Figure 2-45, which has one panel for each OTS receiver module.

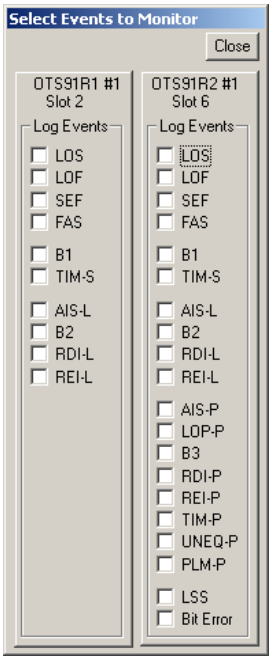


Figure 2-45: Select Events to Monitor dialog box

Checking a check box on a receiver's panel enables logging for the corresponding event on that receiver.

The events selected are saved in persistent storage on the OTS system and are restored when the Event Printer application is next started.

Muting: Event Printer behavior with continuous events

When Event Printer logs events in five consecutive seconds, it follows the last event with the words MUTE ON and suppresses further logging. When a one-second interval occurs in which no loggable events occur, Event Printer logs the event as MUTE OFF and resumes normal event logging.

Minimizing the Event Printer window

The Event Printer application may be minimized, so that its window is not displayed but its button is visible in the Windows Taskbar. It continues to log events while minimized.

Exiting the Event Printer application stops the logging of events.

Configuring a printer in Windows

Printing events as they occur is only possible with a printer capable of printing a single line at a time, e.g., a dot-matrix printer. Printers such as laser printers, which print an entire page at a time, cannot do this.

To use a suitably capable printer for line-at-a-time operation, configure it as follows:

1. In the Windows Start Menu, select Settings->Printers
2. Right-click the printer selected as the default Windows printer, and select Properties.
3. Select the Scheduling tab
4. Select “Print directly to the printer” and click OK

Reference

This chapter describes the remote commands that may be used to control the OTS system from an external controller. The remote commands conform to IEEE 488.2 and SCPI conventions. The OTS system accepts remote commands over GPIB, RS-232 serial links, or a network using Telnet protocol.

The **Commands Overview** section organizes the remote commands by function in a simple command tree format.

The **Syntax** section provides an overview of IEEE 488.2 command formats, the SCPI conventions, and the data formats used by the OTS system. Readers familiar with these topics may find that it duplicates material they already know.

The **Command Descriptions** section provides detailed descriptions of the format and parameters of each OTS system, OTS92S1, and OTS9200 remote command. These commands are listed in alphabetical order and listed by page number in the Table of Contents.

NOTE: *The Commands Overview and the Command Description section compile all system level, OTS92S1, and OTS9200 specific commands. For all other command descriptions, refer to the appropriate module user manual.*

Commands Overview

This section organizes the OTS remote commands by function in a simple command tree format. Each main topic provides a brief description of the command set uses and then lists each command in that section. For more detail on specific commands, refer to the following section, *Command Descriptions*, which lists all commands in alphabetical order.

IEEE 488.2 System Commands

These commands control basic generic functionality and interface control functions.

Clear interface error status	*CLS
Enable error status conditions	*ESE
Query error status	*ESR
Query identification string	*IDN
Query all instrument settings	*LRN
Query operation complete	*OPC
Recall system settings	*RCL
Restore default settings	*RST
Restore saved settings	*SAV
Service Request Enable Register	*SRE
Status Byte Register	*STB
Self Test results	*TST
Wait for pending operations	*WAI

Remote Control Setup and Format Commands

These commands provide commands to initialize the error reporting system, get the error status from the previous commands, query response command headers and keywords in short or long form, and set binary block data format.

Initialize error reporting system	:status:preset
Get error status from previous commands	:system:error
Query response command headers	:system:headers
Query response keywords – short/long form	:system:verbose
Binary or hex block data format	:system:format:block

Remote Control Port Settings

These commands provide the GPIB, Serial, and network port setups as well as the serial and network port protocols.

GPIB port setup	:system:communicate:gpib:primary
	:system:communicate:gpib:secondary
COM1 serial port setup	
enable	:system:communicate:serial:com1a:enable
baud rate	:system:communicate:serial:com1a:rate
number of data bits	:system:communicate:serial:com1a:ndata
number of stop bits	:system:communicate:serial:com1a:nstop
flow control mode	:system:communicate:serial:com1a:flow
parity	:system:communicate:serial:com1a:parity
RS-232 DTR line	:system:communicate:serial:com1a:dtr
RS-232 RTS line	:system:communicate:serial:com1a:rts
COM2 serial port setup	:system:communicate:serial:com2a: ... as above
Network port connect address	:system:communicate:network:ipport
COM1 serial port protocol	
echo control	:system:communicate:serial:com1a:echo
prompt	:system:communicate:serial:com1a:prompt
input terminator	:system:communicate:serial:com1a:rxterm
output terminator	:system:communicate:serial:com1a:txterm
COM2 serial port protocol	:system:communicate:serial:com2a: ... as above
Network session protocol, initial values	:system:communicate:network: ... as above
Current serial or network port session protocol	:system:communicate:port: ... as above

Remote Control Lockout

These commands enable remote control lockout.

:system:lock:request
:system:lock:release

System Configuration Queries

These commands provide the ability to query the modules installed in the OTS system to determine what configurations are installed.

:system:config:module:slots
:system:config:module:type
:system:config:module:version
:system:config:module:variant
:system:config:module:serial

Save and Restore System Settings

These commands provide the save and restore functionality for system level settings.

*SAV
*RCL
:system:description:setup

System File Management

These commands define the necessary settings to allow the system to delete old files thus preventing performance degradation due to lack of memory.

:system:files:mgmt:results

General OTS Commands

These commands relate to the whole OTS system and are standard across all OTS modules and systems.

Signal standard	:system:signal:standard

Synchronization commands (OTS92S1 module)

Reference clock	:sync:clock:reference
Synchronization clock frequency offset	:sync:clock:offset
Synchronization module status	:sync:clock:status

Jitter Generation Commands (OTS9200 module)

These commands provide configuration and control of the jitter generation settings.

Jitter generation timing source	:source:jitter:clock:source
Jitter generation line rate	:source:jitter:rate
Jitter frequency and amplitude	:source:jitter:signal
Jitter on/off	:source:jitter:state
Jitter generation status	:source:jitter:busy :source:jitter:lock

Jitter Analyzer Setup Commands (OTS9200 module)

These commands provide configuration and control of the jitter analyzer settings.

Jitter analyzer line rate	:sense:jitter:rate
Filter selection	:sense:jitter:filter
Jitter hit threshold	:sense:jitter:hit:threshold
Recovered clock output	:sense:jitter:recovered:rate :sense:jitter:output:range
Jitter analyzer status	:sense:jitter:busy

Jitter Analyzer Test Control (OTS9200 module)

These commands provide test control information for the jitter analyzer.

Test execution: continuous, timed, repetitive	:sense:jitter:test:mode
Timed test duration	:sense: jitter:test:time
Test annotation text	:sense: jitter:test:description
Test start/stop and run-state query	:sense: jitter:test:state
Test elapsed time query	:sense: jitter:test:time:elapsed

Jitter Measurement Commands (OTS9200 module)

These commands are queries that return the measured values “real-time”. The Windowed queries also provide a few control functions.

Real-time measurements	:sense:jitter:measure:realtime
Windowed measurements	:sense:jitter:measure:windowed
Cumulative measurements	:sense:jitter:measure:cumulative
Current Measurements	:sense:jitter:measure:current

Output Jitter Compliance Test Commands (OTS9200 module)

These commands provide configuration and control for output jitter automated compliance tests and query the results from running such tests.

Output jitter compliance test standard selection	:sense:jitter:compliance:output:standard
Output jitter compliance test filter selection	:sense:jitter:compliance:output:filter
Output jitter compliance test measurement time	:sense:jitter:compliance:output:time
Output jitter compliance test start/stop and run state query	:sense:jitter:compliance:output:state
Output jitter compliance test progress query	:sense:jitter:compliance:output:progress
Output jitter compliance test pass/fail result	:sense:jitter:compliance:output:outcome
Output jitter compliance test measured result values	:sense:jitter:compliance:output:filter:measured

Jitter Transfer & Tolerance Compliance Test Commands (OTS9200 module)

These commands provide configuration and control for output jitter automated compliance tests and query the results from running such tests.

Test type selection	:source:jitter:compliance:type
Available masks query	:source:jitter:compliance:mask:available
Test mask selection	:source:jitter:compliance:mask

Test mask definition:

Mask description	:source:jitter:compliance:mask:description
Stimulus mask (tolerance, transfer)	:source:jitter:compliance:mask:stimulus
Response mask (transfer)	:source:jitter:compliance:mask:response
Number of measurement points	:source:jitter:compliance:mask:npoints
Extra measurement points (data)	:source:jitter:compliance:mask:epoints
Extra measurement points (count)	:source:jitter:compliance:mask:epoints:count

Jitter Tolerance parameters:

Monitored bit error type	:source:jitter:compliance:tolerance:condition
Onset-of-errors ES threshold	:source:jitter:compliance:tolerance:onset:threshold
Optical power penalty BER threshold	:source:jitter:compliance:tolerance:ber:threshold
Recommended BER threshold	:source:jitter:compliance:tolerance:ber:recommended
Currently measured BER	:source:jitter:compliance:tolerance:ber:current
Tolerance measurement search method	:source:jitter:compliance:tolerance:search:method
Measurement time per point	:source:jitter:compliance:time:measure
Settling time per point	:source:jitter:compliance:time:settle

Jitter Transfer parameters:

Stimulus amplitude	:source:jitter:compliance:transfer:amplitude
Starting frequency	:source:jitter:compliance:transfer:fmin
Starting frequency enable	:source:jitter:compliance:transfer:fmin:enable
Calibration state query	:source:jitter:compliance:transfer:calstate

Compliance test control:

Test state	:source:jitter:compliance:state
Test execution progress query	:source:jitter:compliance:progress
Test pass/fail outcome query	:source:jitter:compliance:outcome
Test step-by-step results query	:source:jitter:compliance:results
with frequency and threshold data	:source:jitter:compliance:results:full
Test start time query	:source:jitter:compliance:results:time

Syntax

This section contains information on the Standard commands for Programmable Instruments (SCPI) and IEEE 488.2 Common Commands that may be used to program the OTS system.

IEEE 488.2 Common Commands

Description

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

Command and Query Structure

The syntax of an IEEE 488.2 common command is an asterisk (*) followed by a command and, optionally, a space and parameter value. The syntax for an IEEE 488.2 common query is an asterisk (*) followed by a query and a question mark. The following are examples of common commands:

*ESE 16

*CLS

The following are examples of common queries:

*ESR?

*IDN?

Block Format

IEEE-488 block format is a means of encoding arbitrary binary data, including characters that aren't valid in text strings, for transmission over a GPIB link. The format is most easily explained with an example.

This is a block containing 16 bytes of data:

#216abcdeFGHIJklmnop

where:

'#' denotes the start of a block

'2' is the number of digits that follow, to represent the byte count in the block

'16' is the number (represented by two decimal digits) of data bytes

'abcdeFGHIJklmnop' is the 16 data bytes in this example

The OTS system uses blocks in commands and queries for overhead data and section trace sequences; the descriptions of these commands include the number of bytes expected or sent.

Hex Block Format

The GPIB can transmit eight-bit binary data without problems. But the OTS system can also be controlled over RS-232 serial links and Telnet protocol over network links. These may not be able to send eight-bit data or ASCII control characters. For this reason, the OTS remote command system implements an alternative block format called *hex block format* in which each byte of binary data is sent as two hex digits using the characters 0 to 9 and A to F.

Blocks in hex format thus consist of twice many characters as the corresponding blocks in binary format.

The block in the example above would be, in hex format,

#2326162636465464748494A6B6C6D6E6F70

where

'#232' is the prefix for a 32-character block

'61' is the hexadecimal representation of "a," the first character in the block

'62' is the hexadecimal representation of "b," and so on.

Note that the block's count of data bytes is doubled, representing twice as much data as in the binary-format block.

The OTS system must be explicitly set to transmit or receive blocks in *binary* or *hex* block format. See the description of the command.

SCPI Commands and Queries

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

The SCPI language is based on a hierarchical tree structure, as shown in Figure 3-1, that represents a subsystem. The top level of the tree is the root node; it is followed by one or more lower-level nodes.

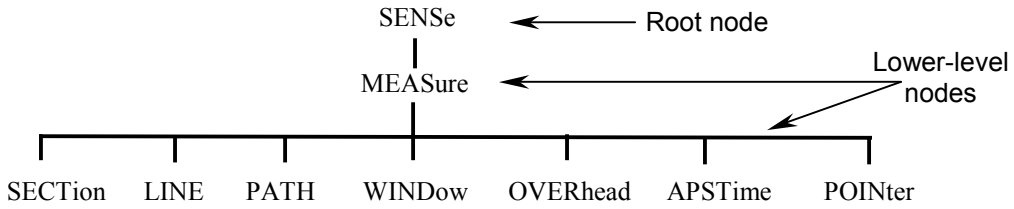


Figure 3-1: Example of SCPI subsystem hierarchy tree

You can create commands and queries from these subsystem hierarchy trees.

Command Format

A *command* sets the value of an instrument parameter or initiates an instrument event. A command consists of one or more alphanumeric keywords separated by colons; this part is called the *header*. If the command includes parameter values, these appear after the header and separated from the header by a space. Multiple parameter values are separated by commas.

Example

The command to set the OTS-9100 Receiver input threshold voltage to 100 mV is

:SENSE:INPUT:THRESHOLD 100

where :SENSE:INPUT:THRESHOLD is the header, and 100 is the parameter value.

Query format

A *query* fetches the current value of an instrument parameter, measurement, or status condition. A query consists of a *header*, like that of a command, followed by a question mark. If a query includes parameter values, these appear after the question mark and a separating space.

Example

The query to fetch from the OTS-9100 Receiver the current setting of the input threshold voltage is

:SENSE:INPUT:THRESHOLD?

The response to this query might be the value, 100 - it might also be formatted as a complete command, for example:

:SENSE:INPUT:THRESHOLD 100

as controlled by the :SYSTEM:HEADERS and :SYSTEM:VERBOSE commands (q.v.).

Parameter types and formats

Parameter values may be of several different types, e.g., integer numbers, floating-point numbers, selections from a list of particular values, strings, etc. The following are the parameter types that appear in OTS system remote control commands.

<NR1> An integer number.

<NR2> A decimal number with integer and/or fractional parts, e.g., 12.43

<NR3> A decimal number in scientific notation, e.g., 1.243E1

NOTE: *A command parameter value specified as <NR2> or <NR3> may be entered in either standard or scientific-notation formats. A query will return its value in the format indicated.*

<Enum> A selection from an enumerated list of values that appear as alphanumeric keywords, usually with a mnemonic value.

For example, the command that specifies the payload inserted into the generated signal appears as:

:SOURCE:DATA:PAYLOAD:PATTERN <Enum>

followed by a list of possible values,

PRBS23A	Standard PRBS 2^{23}-1 pattern
PRBS23I	Inverted PRBS 2^{23}-1 pattern
ZEROS	Constant zero data
ONES	Constant one data

The command must include one of these values; the corresponding query returns one of these values corresponding to the instrument's current setting.

<Boolean> A binary value that typically indicates whether a function is on or off, enabled, or disabled. Querying a Boolean parameter always returns 0 or 1, never OFF or ON.

Boolean values may be specified as follows:

0 or OFF	off, disabled
1 or ON	on, enabled

<String> A string of characters, delimited by either apostrophes ' or quote marks ". Strings must, in general, be composed of ASCII printing characters and may not contain the apostrophe or quote mark used as the delimiter.

<Block> An array of arbitrary binary data (bytes), including characters not in the ASCII printing character set. A block is transmitted as a block header followed by data bytes, as in the following example:

#216ABCDEFGHIJKLMNOP

in which:

- ⇒ The # character indicates that what follows is a block of data
- ⇒ The first digit, 2 in this example, is the number of digits in the block length field
- ⇒ The next digits, of which there are two in this example, indicate the number of bytes of data that follow. In this example, there are 16 bytes, so the block length field is 16. There are two digits in "16," so the character "2" following the "#" is the digit count.
- ⇒ The bytes that follow, ABCDEFGHIJKLMNOP, are the actual data. The number of bytes of data must match the number indicated by the block header.

Optional and alternative parameters

Some parameters are optional; these appear in brackets ([ ]):

:SENSE:STATUS:LEDS [<NR1>]

The command description includes the meaning of the parameter and the effect of leaving it out. Some parameters may accept data of more than one type; the alternatives are shown separated by a vertical bar. For example,

:SYSTEM:COMMUNICATE:GPIB:PRIMARY <Enum>|<NR1>

means that the command can accept either a keyword from the given enum list or an integer numeric value.

Abbreviating Commands, Queries, and Parameters

You can abbreviate most SCPI commands, queries, and parameters to an accepted short form. This manual shows these short forms as a combination of upper and lower case letters. The upper case letters tell you what the accepted short form should consist of, as shown in Figure 3-2, you can create a short form by using only the upper case letters. The accepted short form and long form are equivalent and request the same action of the instrument.

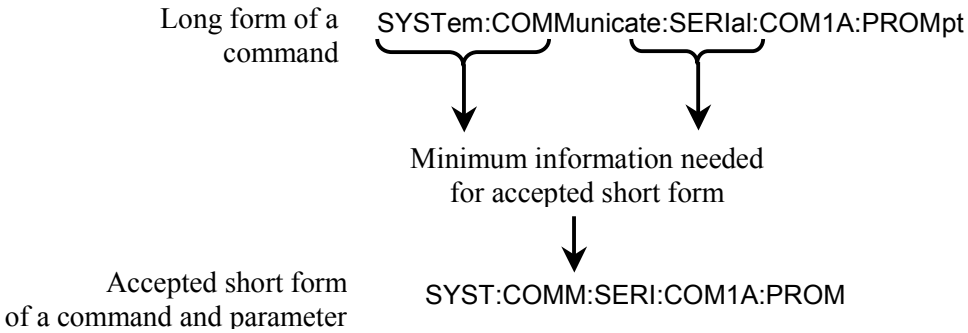


Figure 3-2: Example of abbreviating a command

NOTE: *The numeric part of a command or query must always be included in the accepted short form. In Figure 3-2, the "1" of "COM1A" is always included in the command or query.*

Controlling Responses to Queries

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

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

Chaining Commands and Queries

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

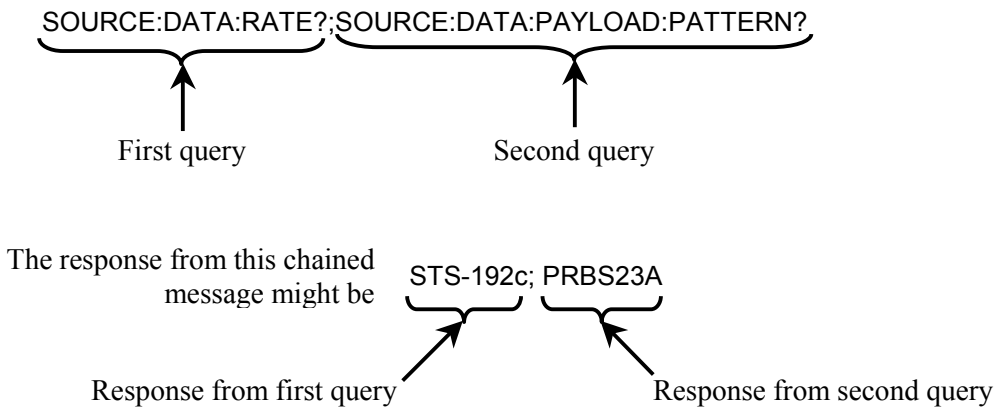


Figure 3-3: Example of chaining commands and queries

If a command or query has the same root and lower-level nodes as the previous command or query, you can omit these nodes. In Figure 3-4, the second command has the same root and lower-level nodes (SOURCe:INSErt:ANOMaly) as the first command, so these nodes can be omitted.

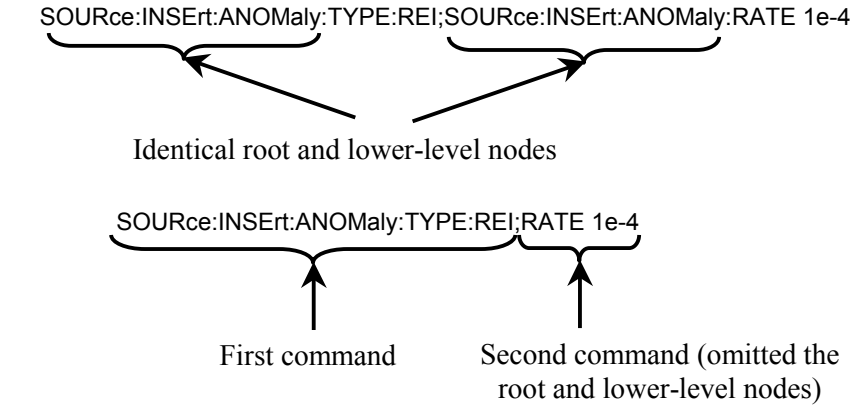


Figure 3-4: Example of omitting root and lower-level nodes in chained message

General Rules

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

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

  correct: “This string uses quotation marks correctly.”

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

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

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

  SOURCE:DATA:STRUCTURE

  is the same as

  source:data:structure

  and

  SOURCE:data:Structure

- No embedded spaces are allowed between or within nodes.

  correct: SOURce:DATA:STRUcture

  incorrect: SOURce: DATA: STRUcture

  incorrect: SO URce:DATA: STRU cture

Slot Specifiers

The OTS system can contain multiple modules of the same type, e.g., more than one receiver, more than one transmitter. Any module-specific command or query may include, as a numeric suffix on the header’s first keyword, the slot number of the target module to indicate the particular instance of that module for which the command or query is intended.

For example, the command

:SOURCE5:INSERT:ANOMALY:MODE CONTINUOUS

is intended for the transmitter module in slot 5.

Slot specifiers are indicated by **<Slot>** in the command listings. Slot specifiers are optional; if a slot specifier is omitted, the command or query is directed to the lowest-numbered slot that contains a module for which the command or query is valid.

Command Description

This section provides detailed descriptions of the format and parameters of all system and OTS9200-specific commands. These commands are listed in alphabetical order.

NOTE: *Not all commands and command parameters are available for all modules. Commands with option limitations are so noted.*

*CLS

This command clears the IEEE-488.2 error status register and event queue.

Syntax *CLS

*ESE

This command sets the value of the IEEE-488.2 Event Status Enable register. The query form returns the current value.

Syntax *ESE?
*ESE <NR1>

*ESR

This query returns, as a NR1 parameter, the value of the IEEE-488.2 Event Status Register.

Syntax *ESR?

*IDN

This query returns, as a string parameter, the identification string for the Tektronix OTS instrument.
Syntax *IDN?

*LRN

This query returns the current state of the instrument as a string of commands that will restore the instrument to that state.

Syntax *LRN?

*OPC

This command causes the OTS9000 system to set the Operation Complete bit (bit value 0x01) in the IEEE-488.2 Standard Event Status register when previously initiated operations are complete. The query form returns the Boolean value '1' to indicate that any pending operation is complete.

Syntax *OPC?

*RCL

This command recalls system parameter settings from the specified buffer. The buffer specification is a number in the range 1 to 99.

Syntax *RCL <NR1>

*RST

This command restores all system parameters to their default values.

Syntax *RST

*SAV

This command saves system parameter settings to the specified buffer. The buffer specification is a number in the range 1 to 99.

Syntax *SAV <NR1>

:SENSe:JITTer:BUSY

This query returns the busy status of the jitter analyzer module. It should be used following the command :SENSe:JITTer:RATE to verify that the rate operation has completed.

Syntax :SENSe<slot>:JITTer:BUSY?

:SENSe:JITTer:COMPliance:OUTPut:FILTer:AVAIlable

This query returns a list of the filters included in the currently selected test standard. For a user-defined standard, this list specifies the filters that may be selected as part of the test. For non-user-defined test standards, this query returns a list of the filters specified by the standard.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:FILTer:AVAIlable?

Parameters	**Description**
G10_10KPP	9.953G band pass filter - 10KHz to 80MHz Wide band, Peak-to-peak measurement
G10_20KPP	9.953G band pass filter - 20KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KPP	9.953G band pass filter - 50KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KRMS	9.953G band pass filter - 50KHz to 80MHz Wide band, RMS measurement
G10_4MPP	9.953G band pass filter - 4MHz to 80MHz High band, Peak-to-peak measurement
G2P5_5KPP	2.488G band pass filter - 5KHz to 20MHz Wide band, Peak-to-peak measurement
G2P5_12KPP	2.488G band pass filter - 12KHz to 20MHz RMS, Peak-to-peak measurement
G2P5_12KRMS	2.488G band pass filter - 12KHz to 20MHz RMS, RMS measurement
G2P5_1MPP	2.488G band pass filter - 1MHz to 20MHz High band, Peak-to-peak measurement
M622_1KPP	622.08M band pass filter - 1KHz to 5MHz Wide band, Peak-to-peak measurement
M622_12KPP	622.08M band pass filter - 12KHz to 5MHz RMS, Peak-to-peak measurement
M622_12KRMS	622.08M band pass filter - 12KHz to 5MHz RMS, RMS measurement
M622_250KPP	622.08M band pass filter - 250KHz to 5MHz High band, Peak-to-peak measurement
M155_500APP	155.52M band pass filter - 500Hz to 1.3MHz Wide band, Peak-to-peak measurement
M155_12KPP	155.52M band pass filter - 12kHz to 1.3MHz RMS, Peak-to-peak measurement
M155_12KRMS	155.52M band pass filter - 12kHz to 1.3MHz RMS, RMS measurement
M155_65KPP	155.52M band pass filter - 65HKz to 1.3MHz High band, Peak-to-peak measurement

:SENSe:JITTer:COMPliance:OUTPut:FILTer:ENABle

This command selects the filters to be included in a user-defined output jitter test. The command requires two parameters. The first parameter may be an Enum keyword that specifies the specific filter or a NR1 value that specifies the filter's position in the list returned by the :SENSe:JITTer:COMPliance:OUTPut:FILTer:AVAILable query. The second parameter specifies whether the filter is included in the test. The query form returns the enable setting for the specified filter.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:FILTer:ENABle? <Enum> | <NR1>
:SENSe<slot>:JITTer:COMPliance:OUTPut:FILTer:ENABle (<Enum> | <NR1>),<Boolean>

Parameters	**Description**
G10_10KPP	9.953G band pass filter - 10KHz to 80MHz Wide band, Peak-to-peak measurement
G10_20KPP	9.953G band pass filter - 20KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KPP	9.953G band pass filter - 50KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KRMS	9.953G band pass filter - 50KHz to 80MHz Wide band, RMS measurement
G10_4MPP	9.953G band pass filter - 4MHz to 80MHz High band, Peak-to-peak measurement
G2P5_5KPP	2.488G band pass filter - 5KHz to 20MHz Wide band, Peak-to-peak measurement
G2P5_12KPP	2.488G band pass filter - 12KHz to 20MHz RMS, Peak-to-peak measurement
G2P5_12KRMS	2.488G band pass filter - 12KHz to 20MHz RMS, RMS measurement
G2P5_1MPP	2.488G band pass filter - 1MHz to 20MHz High band, Peak-to-peak measurement
M622_1KPP	622.08M band pass filter - 1KHz to 5MHz Wide band, Peak-to-peak measurement
M622_12KPP	622.08M band pass filter - 12KHz to 5MHz RMS, Peak-to-peak measurement
M622_12KRMS	622.08M band pass filter - 12KHz to 5MHz RMS, RMS measurement
M622_250KPP	622.08M band pass filter - 250KHz to 5MHz High band, Peak-to-peak measurement
M155_500APP	155.52M band pass filter - 500Hz to 1.3MHz Wide band, Peak-to-peak measurement
M155_12KPP	155.52M band pass filter - 12kHz to 1.3MHz RMS, Peak-to-peak measurement
M155_12KRMS	155.52M band pass filter - 12kHz to 1.3MHz RMS, RMS measurement
M155_65KPP	155.52M band pass filter - 65HKz to 1.3MHz High band, Peak-to-peak measurement

:SENSe:JITTer:COMPliance:OUTPut:FILTer:MEASured

This query returns the measured jitter and pass/fail status for the specified filter. The parameter may be an Enum keyword that specifies the specific filter or a NR1 value that specifies the filter's position in the list returned by the :SENSe:JITTer:COMPliance:OUTPut:FILTer:AVAILable query. The first value returned is the measured jitter as a NR2 value. The second value returned is an Enum keyword that indicates the measurement status.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:FILTer:MEASured? <Enum> | <NR1>

Parameters	**Description**
G10_10KPP	9.953G band pass filter - 10KHz to 80MHz Wide band, Peak-to-peak measurement
G10_20KPP	9.953G band pass filter - 20KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KPP	9.953G band pass filter - 50KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KRMS	9.953G band pass filter - 50KHz to 80MHz Wide band, RMS measurement
G10_4MPP	9.953G band pass filter - 4MHz to 80MHz High band, Peak-to-peak measurement
G2P5_5KPP	2.488G band pass filter - 5KHz to 20MHz Wide band, Peak-to-peak measurement
G2P5_12KPP	2.488G band pass filter - 12KHz to 20MHz RMS, Peak-to-peak measurement
G2P5_12KRMS	2.488G band pass filter - 12KHz to 20MHz RMS, RMS measurement
G2P5_1MPP	2.488G band pass filter - 1MHz to 20MHz High band, Peak-to-peak measurement
M622_1KPP	622.08M band pass filter - 1KHz to 5MHz Wide band, Peak-to-peak measurement
M622_12KPP	622.08M band pass filter - 12KHz to 5MHz RMS, Peak-to-peak measurement
M622_12KRMS	622.08M band pass filter - 12KHz to 5MHz RMS, RMS measurement
M622_250KPP	622.08M band pass filter - 250KHz to 5MHz High band, Peak-to-peak measurement
M155_500APP	155.52M band pass filter - 500Hz to 1.3MHz Wide band, Peak-to-peak measurement
M155_12KPP	155.52M band pass filter - 12kHz to 1.3MHz RMS, Peak-to-peak measurement
M155_12KRMS	155.52M band pass filter - 12kHz to 1.3MHz RMS, RMS measurement
M155_65KPP	155.52M band pass filter - 65HKz to 1.3MHz High band, Peak-to-peak measurement
NOTRUN	This test step has not yet run
PASS	This test step passed
FAIL	This test step failed
BUSY	This test step is in progress
NODATA	This test step lacks valid data

:SENSe:JITTer:COMPliance:OUTPut:FILTer:MEASured:ALL

This query returns the measured jitter and pass/fail status for all filters used in the most recently completed output jitter compliance test. The first value returned is a NR1 value indicating the number of filters. This is followed by three values for each filter: an Enum keyword identifying the filter, a NR2 value for the measured jitter value, and a Enum keyword for the measurement status.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:FILTer:MEASured:ALL?

Parameters	**Description**
G10_10KPP	9.953G band pass filter - 10KHz to 80MHz Wide band, Peak-to-peak measurement
G10_20KPP	9.953G band pass filter - 20KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KPP	9.953G band pass filter - 50KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KRMS	9.953G band pass filter - 50KHz to 80MHz Wide band, RMS measurement
G10_4MPP	9.953G band pass filter - 4MHz to 80MHz High band, Peak-to-peak measurement
G2P5_5KPP	2.488G band pass filter - 5KHz to 20MHz Wide band, Peak-to-peak measurement
G2P5_12KPP	2.488G band pass filter - 12KHz to 20MHz RMS, Peak-to-peak measurement
G2P5_12KRMS	2.488G band pass filter - 12KHz to 20MHz RMS, RMS measurement
G2P5_1MPP	2.488G band pass filter - 1MHz to 20MHz High band, Peak-to-peak measurement
M622_1KPP	622.08M band pass filter - 1KHz to 5MHz Wide band, Peak-to-peak measurement
M622_12KPP	622.08M band pass filter - 12KHz to 5MHz RMS, Peak-to-peak measurement
M622_12KRMS	622.08M band pass filter - 12KHz to 5MHz RMS, RMS measurement
M622_250KPP	622.08M band pass filter - 250KHz to 5MHz High band, Peak-to-peak measurement
M155_500APP	155.52M band pass filter - 500Hz to 1.3MHz Wide band, Peak-to-peak measurement
M155_12KPP	155.52M band pass filter - 12kHz to 1.3MHz RMS, Peak-to-peak measurement
M155_12KRMS	155.52M band pass filter - 12kHz to 1.3MHz RMS, RMS measurement
M155_65KPP	155.52M band pass filter - 65HKz to 1.3MHz High band, Peak-to-peak measurement
NOTRUN	This test step has not yet run
PASS	This test step passed
FAIL	This test step failed
BUSY	This test step is in progress
NODATA	This test step lacks valid data

:SENSe:JITTer:COMPliance:OUTPut:FILTer:THREshold

This command sets the thresholds and measurement types for the filters included in a user-defined output jitter test. The command requires two parameters. The first parameter may be an Enum keyword that specifies the specific filter or a NR1 value that specifies the filter's position in the list returned by the :SENSe:JITTer:COMPliance:OUTPut:FILTer:AVAILable query. The second parameter specifies the pass/fail threshold in unit intervals (UI). The query form returns the threshold setting for the specified filter.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:FILTer:THREshold? <Enum> | <NR1>
:SENSe<slot>:JITTer:COMPliance:OUTPut:FILTer:THREshold (<Enum> | <NR1>),<NR2>

Parameters	Description
G10_10KPP	9.953G band pass filter - 10KHz to 80MHz Wide band, Peak-to-peak measurement
G10_20KPP	9.953G band pass filter - 20KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KPP	9.953G band pass filter - 50KHz to 80MHz Wide band, Peak-to-peak measurement
G10_50KRMS	9.953G band pass filter - 50KHz to 80MHz Wide band, RMS measurement
G10_4MPP	9.953G band pass filter - 4MHz to 80MHz High band, Peak-to-peak measurement
G2P5_5KPP	2.488G band pass filter - 5KHz to 20MHz Wide band, Peak-to-peak measurement
G2P5_12KPP	2.488G band pass filter - 12KHz to 20MHz RMS, Peak-to-peak measurement
G2P5_12KRMS	2.488G band pass filter - 12KHz to 20MHz RMS, RMS measurement
G2P5_1MPP	2.488G band pass filter - 1MHz to 20MHz High band, Peak-to-peak measurement
M622_1KPP	622.08M band pass filter - 1KHz to 5MHz Wide band, Peak-to-peak measurement
M622_12KPP	622.08M band pass filter - 12KHz to 5MHz RMS, Peak-to-peak measurement
M622_12KRMS	622.08M band pass filter - 12KHz to 5MHz RMS, RMS measurement
M622_250KPP	622.08M band pass filter - 250KHz to 5MHz High band, Peak-to-peak measurement
M155_500APP	155.52M band pass filter - 500Hz to 1.3MHz Wide band, Peak-to-peak measurement
M155_12KPP	155.52M band pass filter - 12kHz to 1.3MHz RMS, Peak-to-peak measurement
M155_12KRMS	155.52M band pass filter - 12kHz to 1.3MHz RMS, RMS measurement
M155_65KPP	155.52M band pass filter - 65HKz to 1.3MHz High band, Peak-to-peak measurement

:SENSe:JITTer:COMPliance:OUTPut:OUTCome

This query returns the status of the current output jitter compliance test.

Syntax: :SENSe<slot>:JITTer:COMPliance:OUTPut:OUTCome?

Parameters	Description
NOTRUN	This test step has not yet run
PASS	This test step passed
FAIL	This test step failed
BUSY	This test step is in progress

:SENSe:JITTer:COMPliance:OUTPut:PROGress

This query returns two NR1 values. The first is the 1-based index of the filter on which a measurement is currently being performed. The second is the elapsed time in seconds for that measurement. Together, these numbers give an indication of the progress of the output jitter compliance test.

Syntax: :SENSe<slot>:JITTer:COMPliance:OUTPut:PROGress?

:SENSe:JITTer:COMPliance:OUTPut:STANdard

This command selects the test standard - the filters and measurement thresholds to use, for an output jitter compliance test. The user-defined standard allows the user to specify filters and thresholds. The query form returns the current setting.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:STANdard?
:SENSe<slot>:JITTer:COMPliance:OUTPut:STANdard <Enum>

Parameter	Description
USER	User-defined set of filters and thresholds
GR253EQ	GR-253 Equipment, Category II
G783EQRGN	G.783 Equipment, Type A Regenerators in 2.048 Kb/s networks
G783EQ1X	G.783 Equipment, Option 1 (Ref. G.813)
G783EQ2X	G.783 Equipment, Option 2 (Ref. G.813)
GR1377EQ	GR-1377 Equipment, Category II (Obsolete)
GR253NET	GR-253 Network
GR253NETB	GR-253 Network, Type B
G825NET	G.825 Network
GR1377NET	GR-1377 Network (Obsolete)
T1P105P03X	T1.105.03 Network
T1P105P03A	T1.105.03 Network with Type A Regenerators
T1P105P03B	T1.105.03 Network with Type B Regenerators

:SENSe:JITTer:COMPliance:OUTPut:STANdard:AVAIlable

This query returns a list of the output jitter compliance standards available at the line rate currently selected for the jitter analyzer.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:STANdard:AVAIlable?

Parameter	Description
USER	User-defined set of filters and thresholds
GR253EQ	GR-253 Equipment, Category II
G783EQRGN	G.783 Equipment, Type A Regenerators in 2.048 Kb/s networks
G783EQ1X	G.783 Equipment, Option 1 (Ref. G.813)
G783EQ2X	G.783 Equipment, Option 2 (Ref. G.813)
GR1377EQ	GR-1377 Equipment, Category II (Obsolete)
GR253NET	GR-253 Network
GR253NETB	GR-253 Network, Type B
G825NET	G.825 Network
GR1377NET	GR-1377 Network (Obsolete)
T1P105P03X	T1.105.03 Network
T1P105P03A	T1.105.03 Network with Type A Regenerators
T1P105P03B	T1.105.03 Network with Type B Regenerators

:SENSe:JITTer:COMPliance:OUTPut:STATe

This command starts or stops the execution of an output jitter compliance test. The query form returns the current state of the test execution.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:STATe?
:SENSe<slot>:JITTer:COMPliance:OUTPut:STATe <Enum>

Parameters	Description
RUN	Start test (command), the test is running (query response)
END	Stop test (command), the test is not running (query response)
COMPLETE	The test has run to completion (query response only)

:SENSe:JITTer:COMPliance:OUTPut:TIME

When a user-defined test standard is selected, this command sets the measurement time per filter; for non-user-defined standards this command has no effect. The query returns the measurement time for the currently selected test standard.

Syntax :SENSe<slot>:JITTer:COMPliance:OUTPut:TIME?
:SENSe<slot>:JITTer:COMPliance:OUTPut:TIME <NR1>

:SENSe:JITTer:FILTer

This command sets the jitter measurement filter type. The query form returns the current setting.

Syntax :SENSe<slot>:JITTer:FILTer?
:SENSe<slot>:JITTer:FILTer <Enum>

Parameters	Description
G10_10A	9.953G band pass filter - 10Hz to 80MHz Full band
G10_10K	9.953G band pass filter - 10KHz to 80MHz Wide band
G10_20K	9.953G band pass filter - 20KHz to 80MHz Wide band
G10_50K	9.953G band pass filter - 50KHz to 80MHz Wide band
G10_4M	9.953G band pass filter - 4MHz to 80MHz High band
G2P5_10A	2.488G band pass filter - 10Hz to 20MHz Full band
G2P5_5K	2.488G band pass filter - 5KHz to 20MHz Wide band
G2P5_12K	2.488G band pass filter - 12KHz to 20MHz RMS
G2P5_1M	2.488G band pass filter - 1MHz to 20MHz High band
M622_10A	622.08M band pass filter - 10Hz to 5MHz Full band
M622_1K	622.08M band pass filter - 1KHz to 5MHz Wide band
M622_12K	622.08M band pass filter - 12KHz to 5MHz RMS
M622_250K	622.08M band pass filter - 250KHz to 5MHz High band
M155_10A	155.52M band pass filter - 10Hz to 1.3MHz Full band
M155_500A	155.52M band pass filter - 500Hz to 1.3MHz Wide band
M155_12K	155.52M band pass filter - 12kHz to 1.3MHz RMS
M155_65K	155.52M band pass filter - 65HKz to 1.3MHz High band

:SENSe:JITTer:HIT:THREshold

This command sets the jitter measurement hit threshold in Unit Intervals (UI). The query form returns the current setting.

Syntax :SENSe<slot>:JITTer:HIT:THREshold?
:SENSe<slot>:JITTer:HIT:THREshold <NR2>

:SENSe:JITTer:HIT:THREshold:RANGe

This query returns the minimum and maximum jitter hit threshold values in NR2 format.

Syntax: :SENSe<slot>:JITTer:HIT:THREshold:RANGe?

:SENSe:JITTer:LOCK

This query returns the status of the DPA phase locked loop.

Syntax: :SENSe<slot>:JITTer:LOCK?

Parameters	Description
LOCKed	DPA is locked
UNLOcked	DPA is unlocked

:SENSe:JITTer:MEASure:CUMUlative

This query returns the measurement status and value of the specified result parameter for the most recent test. The value is returned in NR1 format.

Syntax: :SENSe<slot>:JITTer:MEASure:CUMUlative? <Enum>

Parameters	Description
LOS_Eses	Loss of Signal Errored Seconds
JHSEC	Jitter Hit Seconds
JHCOunt	Jitter Hit Count
VALId	The data are valid
INVAlid	The data are not valid
OVERrange	The receiver's tracking ability was exceeded

:SENSe:JITTer:MEASure:CUMUlative:ALL

This query returns the measurement status and values of all the parameters of the :SENSe:JITTer:MEASure:CUMUlative? query, in the order in which they are listed under :SENSe:JITTer:MEASure:CUMUlative. The values are returned in NR1 format.

Syntax: :SENSe<slot>:JITTer:MEASure:CUMUlative:ALL?

:SENSe:JITTer:MEASure:CURRent

This query returns the measurement status and value of the specified result parameter for the most recent test. The value is returned in NR3 format.

Syntax: :SENSe<slot>:JITTer:MEASure:CURRent? <Enum>

Parameters	**Description**
PTP	Peak to Peak
PMAX	Maximum peak
PMIN	Minimum peak
RMS	RMS (valid only for RMS filters)
VALId	The data is valid
INVAlid	The data is not valid
OVERrange	The receiver's tracking ability was exceeded

:SENSe:JITTer:MEASure:CURRent:ALL

This query returns the measurement status and values of all the parameters of the :SENSe:JITTer:MEASure:CURRent? query, in the order in which they are listed under :SENSe:JITTer:MEASure:CURRent. All values are returned in NR3 format.

Syntax :SENSe<slot>:JITTer:MEASure:CURRent:ALL?

:SENSe:JITTer:MEASure:REALtime

This query returns the measurement status and value of the specified result parameter as measured during the most recent 'N' seconds. The value is returned in NR3 format unless noted otherwise in the table.

Syntax :SENSe<slot>:JITTer:MEASure:REALtime? <Enum>

Parameters	**Description**
PTP	Peak to Peak
PMAX	Maximum peak
PMIN	Minimum peak
RMS	RMS (valid only for RMS filters)
LOS	LOS Errored Seconds (returned as a NR1 value)
VALId	The data is valid
INVAlid	The data is not valid
Collecting	There is an insufficient number of data points to compute the value(s)
OVERrange	The receiver's tracking ability was exceeded

:SENSe:JITTer:MEASure:REALtime:ALL

This query returns the measurement status and values of all the parameters of the :SENSe:JITTer:MEASure:REALtime? query in the order in which they are listed under :SENSe:JITTer:MEASure:REALtime. The values are returned in NR3 format unless otherwise noted.

Syntax :SENSe<slot>:JITTer:MEASure:REALtime:ALL?

:SENSe:JITTer:MEASure:REALtime:CLEAr

This command clears the data in the sliding measurement window.

Syntax: :SENSe<slot>:JITTer:MEASure:REALtime:CLEAr

:SENSe:JITTer:MEASure:REALtime:SIZE

This command sets the duration in seconds of the interval over which real time results measurements are calculated. The query form returns the current setting.

Syntax: :SENSe<slot>:JITTer:MEASure:REALtime:SIZE?
:SENSe<slot>:JITTer:MEASure:REALtime:SIZE <NR1>

:SENSe:JITTer:MEASure:WINDowed

This query returns the measurement status and value of the specified result parameter for the most recent test. The value is returned in NR3 format unless noted otherwise in the table.

Syntax: :SENSe<slot>:JITTer:MEASure:WINDowed? <Enum>

Parameters	**Description**
PTP	Peak to Peak
PMAX	Maximum peak
PMIN	Minimum peak
RMS	RMS (valid only for RMS filters)
VALId	The data is valid
INVAlid	The data is not valid
Collecting	There is an insufficient number of data points to compute the value(s)
OVERrange	The receiver's tracking ability was exceeded

:SENSe:JITTer:MEASure:WINDowed:ALL

This query returns the measurement status and values of all the parameters of the :SENSe:JITTer:MEASure:WINDowed? query in the order in which they are listed under :SENSe:JITTer:MEASure:WINDowed. The values are returned in NR3 format unless noted otherwise in the table.

Syntax: :SENSe<slot>:JITTer:MEASure:WINDowed:ALL?

:SENSe:JITTer:MEASure:WINDowed:SIZE

This command sets the duration in seconds of the interval over which windowed results measurements are calculated. The query form returns the current setting.

Syntax: :SENSe<slot>:JITTer:MEASure:WINDowed:SIZE?
:SENSe<slot>:JITTer:MEASure:WINDowed:SIZE <NR1>

:SENSe:JITTer:OUTPut:RANGe

This command sets the jitter measurement demodulated output range. The query form returns the current setting.

Syntax: :SENSe<slot>:JITTer:OUTPut:RANGe?
:SENSe<slot>:JITTer:OUTPut:RANGe <Enum>

Parameters	Description
UI1A	0 - 1 UI
UI4A	0 - 4 UI
UI16A	0 - 16 UI
UI64A	0 - 64 UI
UI256A	0 - 256 UI
UI1024A	0 - 1024 UI
UI4096A	0 - 4096 UI (Not applicable to 2.488 Gb/s and below

:SENSe:JITTer:RATE

This command sets the jitter measurement rate. The query :SENSe:JITTer:BUSY should be used to determine when the operation has completed. The query form returns the current setting.

Syntax: :SENSe<slot>:JITTer:RATE?
:SENSe<slot>:JITTer:RATE <Enum>

Parameters	Description
G10A	9.953 Gb/s (OC-192 or STM-64)
G2P5A	2.488 Gb/s (OC-48 or STM-16)
M622A	622.08 Mb/s (OC-12 or STM-4)
M155A	155.52 Mb/s (OC-3 or STM-1)

:SENSe:JITTer:RECOvered:RATE

This command sets the jitter measurement recovered clock rate. At 9.953 Gb/s and 2.488 Gb/s, valid clock rates are 2.488 GHz and 622 MHz. At 622 Mb/s, the valid clock rate is 622 MHz. At 155 Mb/s, the valid clock rate is 155 MHz. The query form returns the current setting.

Syntax: :SENSe<slot>:JITTer:RECOvered:RATE?
:SENSe<slot>:JITTer:RECOvered:RATE <Enum>

Parameters	Description
DISAble	Disabled
M155A	155.52MHz
M622A	622.08MHz
G2P5A	2.488 GHz

:SENSe:JITTer:TEST:DESCription

This command sets the description text that is written to the results file at the start of a test. The text may be up to 127 characters long. The query form returns the current setting.

Syntax: :SENSe<slot>:JITTer:TEST:DESCription?
:SENSe<slot>:JITTer:TEST:DESCription <String>

:SENSe:JITTer:TEST:MODE

This command sets the way the OTS system runs a test. The query form returns the current setting.

Syntax: :SENSe<slot>:JITTer:TEST:MODE?
:SENSe<slot>:JITTer:TEST:MODE <Enum>

Parameters	Description
CONTinuous	The test runs continuously
TIMEd	The test runs for a preset amount of time
REPEtitive	The test runs for a preset time and then restarts

:SENSe:JITTer:TEST:STATe

This command controls the OTS system's execution of a test. The query form returns the state of a currently executing test.

Syntax :SENSe<slot>:JITTer:TEST:STATe?
:SENSe<slot>:JITTer:TEST:STATe <Enum>

Parameters	Description
RUN	Start a test
PAUSe	Pause the test in progress
RESUme	Resume the test in progress
END	Stop the test
RESTart	Stop the test and start a new test
STARTING	A test is starting (status query only)
STOPPING	A test is stopping (status query only)
UNKNOWN	UNDOC

:SENSe:JITTer:TEST:TIME

This command sets the time duration for a test. The query form returns the currently programmed time.

Syntax :SENSe<slot>:JITTer:TEST:TIME?
:SENSe<slot>:JITTer:TEST:TIME <NR1>

:SENSe:JITTer:TEST:TIME:ELAPsed

This query returns the time since the start of the current test.

Syntax :SENSe<slot>:JITTer:TEST:TIME:ELAPsed?

:SOURce:JITTer:BUSY

This query returns the busy status of the jitter generator module, and should be used, following the commands :SOURce:JITTer:STATe, :SOURce:JITTer:SIGNal, and :SOURce:JITTer:RATE, to verify that those operations have completed.

Syntax :SOURce<slot>:JITTer:BUSY?

:SOURce:JITTer:CLOCk:SOURce

This command selects the timing source for the signal generated by the OTS9200 transmitter. The query :SOURce:JITTer:BUSY should be used to determine when the operation has completed. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:CLOCk:SOURce?
:SOURce<slot>:JITTer:CLOCk:SOURce <Enum>

Parameters	**Description**
BACKplane	Synchronizing to OTS92S1 Synchronization module
INTErnal	Self-Timing

:SOURce:JITTer:COMPliance:MASK

This command selects the jitter compliance test mask to use. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK?
:SOURce<slot>:JITTer:COMPliance:MASK <Enum>

Parameters	**Description**
GR253TL	GR-253 Jitter Tolerance Mask
GR253REQTL	GR-253 Jitter Tolerance Requirement Mask
GR253OBJTL	GR-253 Jitter Tolerance Objective Mask
GR1377TL	GR-1377 Jitter Tolerance Mask (Obsolete Standard)
G825NET1P5TL	G.825 Jitter Tolerance Mask (1.544 kbits/s networks)
G825NET2TL	G.825 Jitter Tolerance Mask (2.048 kbits/s networks)
G958TYPEATL	G.958 Jitter Tolerance Mask (Type A)
G958TYPEBTL	G.958 Jitter Tolerance Mask (Type B)
USER1TL	User Defined Jitter Tolerance Mask #1
USER2TL	User Defined Jitter Tolerance Mask #2
USER3TL	User Defined Jitter Tolerance Mask #3
USER4TL	User Defined Jitter Tolerance Mask #4
USER5TL	User Defined Jitter Tolerance Mask #5
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:AVAilable

This query returns a comma-separated list of the jitter compliance test masks that are applicable to the currently selected line rate and compliance test type.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:AVAilable?

Parameters	**Description**
GR253TL	GR-253 Jitter Tolerance Mask
GR253REQTL	GR-253 Jitter Tolerance Requirement Mask
GR253OBJTL	GR-253 Jitter Tolerance Objective Mask
GR1377TL	GR-1377 Jitter Tolerance Mask (Obsolete Standard)
G825NET1P5TL	G.825 Jitter Tolerance Mask (1.544 kbits/s networks)
G825NET2TL	G.825 Jitter Tolerance Mask (2.048 kbits/s networks)
G958TYPEATL	G.958 Jitter Tolerance Mask (Type A)
G958TYPEBTL	G.958 Jitter Tolerance Mask (Type B)
USER1TL	User Defined Jitter Tolerance Mask #1
USER2TL	User Defined Jitter Tolerance Mask #2
USER3TL	User Defined Jitter Tolerance Mask #3
USER4TL	User Defined Jitter Tolerance Mask #4
USER5TL	User Defined Jitter Tolerance Mask #5
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:DESCription

The first command parameter specifies a mask - use the keyword CURRENT to specify the mask currently selected. The Set form of this command is applicable only to user-defined masks; it sets the mask description, which is the text string that appears in the user interface mask selection list. For all masks, the query form returns the description text for the specified mask.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:DESCription? <Enum>
:SOURce<slot>:JITTer:COMPliance:MASK:DESCription <Enum>,<String>

Parameters	**Description**
CURRent	The currently selected Jitter Transfer or Jitter Tolerance Mask
GR253TL	GR-253 Jitter Tolerance Mask
GR253REQTL	GR-253 Jitter Tolerance Requirement Mask
GR253OBJTL	GR-253 Jitter Tolerance Objective Mask
G877TL	GR-1377 Jitter Tolerance Mask (Obsolete Standard)
G825NET1P5TL	G.825 Jitter Tolerance Mask (1.544 kbits/s networks)
G825NET2TL	G.825 Jitter Tolerance Mask (2.048 kbits/s networks)
G958TYPEATL	G.958 Jitter Tolerance Mask (Type A)
G958TYPEBTL	G.958 Jitter Tolerance Mask (Type B)
USER1TL	User Defined Jitter Tolerance Mask #1
USER2TL	User Defined Jitter Tolerance Mask #2
USER3TL	User Defined Jitter Tolerance Mask #3
USER4TL	User Defined Jitter Tolerance Mask #4
USER5TL	User Defined Jitter Tolerance Mask #5
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:DESCription:ASSociated

This command and query are applicable only to jitter transfer masks. The first command parameter specifies a mask - use the keyword CURRENT to specify the mask currently selected. The Set form of this command is applicable only to user-defined masks and sets the description of the associated stimulus mask. For all masks, the query form returns the description text for the associated stimulus mask.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:DESCription:ASSociated? <Enum>
:SOURce<slot>:JITTer:COMPliance:MASK:DESCription:ASSociated <Enum>,<String>

Parameters	**Description**
CURRent	The currently selected Jitter Transfer or Jitter Tolerance Mask
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:EPOints

The Set form of this command specifies the extra frequency points, beyond the points automatically selected, to make jitter transfer or jitter tolerance measurements. The first command parameter specifies a mask - use the keyword CURRENT to specify the mask currently selected. The mask specifier is followed by a starting index and a number of points, followed by the corresponding number of frequency values in NR3 format. Those values are assigned to frequency points starting at the specified index; the index value of the first point is 1. The total number of extra frequency points may be set or queried with :SOURce:JITTer:COMPliance:MASK:EPOints:COUNt. The query form takes a mask specifier, starting index, and count of points, and returns the specified number of frequency values starting at the specified index.

Setting the highest-numbered point causes the array of frequency points to be sorted in order of ascending frequency. When setting the frequency values for extra measurement points, the controlling application should thus set the highest-numbered point last.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:EPOints? <Enum>,<NR1>,<NR1>
:SOURce<slot>:JITTer:COMPliance:MASK:EPOints <Enum>,<NR1>,<NR1>,<NR3>[,<NR3>]

Parameters	**Description**
CURRent	The currently selected Jitter Transfer or Jitter Tolerance Mask
GR253TL	GR-253 Jitter Tolerance Mask
GR253REQTL	GR-253 Jitter Tolerance Requirement Mask
GR253OBJTL	GR-253 Jitter Tolerance Objective Mask
G877TL	GR-1377 Jitter Tolerance Mask (Obsolete Standard)
G825NET1P5TL	G.825 Jitter Tolerance Mask (1.544 kbits/s networks)
G825NET2TL	G.825 Jitter Tolerance Mask (2.048 kbits/s networks)
G958TYPEATL	G.958 Jitter Tolerance Mask (Type A)
G958TYPEBTL	G.958 Jitter Tolerance Mask (Type B)
USER1TL	User Defined Jitter Tolerance Mask #1
USER2TL	User Defined Jitter Tolerance Mask #2
USER3TL	User Defined Jitter Tolerance Mask #3
USER4TL	User Defined Jitter Tolerance Mask #4
USER5TL	User Defined Jitter Tolerance Mask #5
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:EPOints:COUNt

The first command parameter specifies a mask - use the keyword CURRENT to specify the mask currently selected. The Set form of this command specifies the number of extra frequency points - specific frequencies at which jitter transfer or jitter tolerance measurements are made, independent of the automatically selected points specified by :SOURce:JITTer:COMPliance:MASK:NPOints. This is followed by an integer number of points. The query form returns the number of extra frequency points for the specified mask.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:EPOints:COUNt? <Enum>
:SOURce<slot>:JITTer:COMPliance:MASK:EPOints:COUNt <Enum>,<NR1>

Parameters	**Description**
CURRent	The currently selected Jitter Transfer or Jitter Tolerance Mask
GR253TL	GR-253 Jitter Tolerance Mask
GR253REQTL	GR-253 Jitter Tolerance Requirement Mask
GR253OBJTL	GR-253 Jitter Tolerance Objective Mask
G877TL	GR-1377 Jitter Tolerance Mask (Obsolete Standard)
G825NET1P5TL	G.825 Jitter Tolerance Mask (1.544 kbits/s networks)
G825NET2TL	G.825 Jitter Tolerance Mask (2.048 kbits/s networks)
G958TYPEATL	G.958 Jitter Tolerance Mask (Type A)
G958TYPEBTL	G.958 Jitter Tolerance Mask (Type B)
USER1TL	User Defined Jitter Tolerance Mask #1
USER2TL	User Defined Jitter Tolerance Mask #2
USER3TL	User Defined Jitter Tolerance Mask #3
USER4TL	User Defined Jitter Tolerance Mask #4
USER5TL	User Defined Jitter Tolerance Mask #5
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:NPOints

The first command parameter specifies a mask - use the keyword CURRENT to specify the mask currently selected. This command sets the number of measurement points to be used when testing with the specified mask. The query form returns the current setting for the specified mask.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:NPOints? <Enum>
:SOURce<slot>:JITTer:COMPliance:MASK:NPOints <Enum>,<NR1>

Parameters	**Description**
CURRent	The currently selected Jitter Transfer or Jitter Tolerance Mask
GR253TL	GR-253 Jitter Tolerance Mask
GR253REQTL	GR-253 Jitter Tolerance Requirement Mask
GR253OBJTL	GR-253 Jitter Tolerance Objective Mask
G877TL	GR-1377 Jitter Tolerance Mask (Obsolete Standard)
G825NET1P5TL	G.825 Jitter Tolerance Mask (1.544 kbits/s networks)
G825NET2TL	G.825 Jitter Tolerance Mask (2.048 kbits/s networks)
G958TYPEATL	G.958 Jitter Tolerance Mask (Type A)
G958TYPEBTL	G.958 Jitter Tolerance Mask (Type B)
USER1TL	User Defined Jitter Tolerance Mask #1
USER2TL	User Defined Jitter Tolerance Mask #2
USER3TL	User Defined Jitter Tolerance Mask #3
USER4TL	User Defined Jitter Tolerance Mask #4
USER5TL	User Defined Jitter Tolerance Mask #5
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:RESPonse

The first command parameter specifies a mask - use the keyword CURRENT to specify the mask currently selected. The Set form of this command is applicable only to user-defined masks and sets the parameters of the response mask. The second parameter specifies the number of data points that define the mask followed by pairs of numeric values that specify, respectively, the frequency (in Hz) and jitter gain (in dB) for each point. The number of frequency/amplitude value pairs must match the number of points specified. For all masks, the query form returns the mask data for the specified mask; frequency values are returned in NR3 format, gain values are returned in NR2 format.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:RESPonse? <Enum>
:SOURce<slot>:JITTer:COMPliance:MASK:RESPonse <Enum>, <NR1>, <NR3>, <NR2>, <NR3>, <NR2> [,<NR3>,<NR2>]

Parameters	**Description**
CURRent	The currently selected Jitter Transfer or Jitter Tolerance Mask
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:MASK:STIMulus

The first command parameter specifies a mask - use the keyword CURRENT to specify the mask currently selected. The Set form of this command is applicable only to user-defined masks, for which it sets the parameters of the stimulus mask. The second parameter specifies the number of data points that define the mask followed by two or more pairs of numeric values that specify, respectively, the frequency (in Hz) and amplitude (in UI) for each point. The number of frequency/amplitude value pairs must match the number of points specified. For all masks, the query form returns the mask data for the specified mask; frequency values are returned in NR3 format, amplitude values are returned in NR2 format.

Syntax :SOURce<slot>:JITTer:COMPliance:MASK:DESCription:ASSociated? <Enum>
:SOURce<slot>:JITTer:COMPliance:MASK:DESCription:ASSociated <Enum>,<String>

Parameters	**Description**
MAXimum	The jitter generator's maximum amplitude capability
CURRent	The currently selected Jitter Transfer or Jitter Tolerance Mask
GR253TL	GR-253 Jitter Tolerance Mask
GR253REQTL	GR-253 Jitter Tolerance Requirement Mask
GR253OBJTL	GR-253 Jitter Tolerance Objective Mask
G877TL	GR-1377 Jitter Tolerance Mask (Obsolete Standard)
G825NET1P5TL	G.825 Jitter Tolerance Mask (1.544 kbits/s networks)
G825NET2TL	G.825 Jitter Tolerance Mask (2.048 kbits/s networks)
G958TYPEATL	G.958 Jitter Tolerance Mask (Type A)
G958TYPEBTL	G.958 Jitter Tolerance Mask (Type B)
USER1TL	User Defined Jitter Tolerance Mask #1
USER2TL	User Defined Jitter Tolerance Mask #2
USER3TL	User Defined Jitter Tolerance Mask #3
USER4TL	User Defined Jitter Tolerance Mask #4
USER5TL	User Defined Jitter Tolerance Mask #5
GR253TR	GR-253 Jitter Transfer Mask
G783A1P5TR	G.783 Type A Jitter Transfer Mask (1.544 kbits/s networks)
G783A2TR	G.783 Type A Jitter Transfer Mask (2.048 kbits/s networks)
G783BTR	G.783 Type B Jitter Transfer Mask
USER1TR	User Defined Jitter Transfer Mask #1
USER2TR	User Defined Jitter Transfer Mask #2
USER3TR	User Defined Jitter Transfer Mask #3
USER4TR	User Defined Jitter Transfer Mask #4
USER5TR	User Defined Jitter Transfer Mask #5

:SOURce:JITTer:COMPliance:OUTCome

This query returns the status of the current jitter transfer or jitter tolerance compliance test.

Syntax :SOURce<slot>:JITTer:COMPliance:OUTCome?

Parameters	Description
NOTRUN	This test step has not yet run
PASS	This test step passed
PASS_LIMIT	This test step passed, with the stimulus level at the generator maximum value
FAIL	This test step failed
BUSY	This test step is in progress
NODATA	This test step lacks valid data

:SOURce:JITTer:COMPliance:PROGress

This query returns a NR1 value that indicates the number of measurement points completed in the jitter transfer or jitter tolerance test currently running.

Syntax :SOURce<slot>:JITTer:COMPliance:PROGress?

:SOURce:JITTer:COMPliance:RESults

This query returns an integer count of points, followed by the measured value and pass/fail status for each specified measurement point of the current test. The first parameter specifies the 1-based index of the first point to be returned, and must be between 1 and the number of measurement points for the test. The second, optional, parameter specifies the number of points to be returned; if omitted, the query returns data for a single point. If more points are requested than are available, only the available points' data are returned. Measured values are returned in NR2 format.

The maximum number of measurement points of data returned by this query is 25. Use multiple queries to transfer more than that many data points.

Syntax :SOURce<slot>:JITTer:COMPliance:RESults? <NR1>[,<NR1>]

Parameters	Description
NOTRUN	This test step has not yet run
PASS	This test step passed
PASS_LIMIT	This test step passed, with the stimulus level at the generator maximum value
FAIL	This test step failed
BUSY	This test step is in progress
NODATA	This test step lacks valid data

:SOURce:JITTer:COMPliance:RESults:FULL

This query returns an integer count of points, followed by the frequency, stimulus level, threshold value, measured value, and pass/fail status for each specified measurement point of the current test. The first parameter specifies the 1-based index of the first point to be returned, and must be between 1 and the number of measurement points for the test. The second, optional, parameter specifies the number of points to be returned; if omitted, the query returns data for a single point. If more points are requested than are available, only the available points' data are returned. Frequency values are returned in NR3 format; other data values are returned in NR2 format.

The maximum number of measurement points of data returned by this query is 10. Use multiple queries to transfer more than that many data points.

Syntax :SOURce<slot>:JITTer:COMPliance:RESults:FULL? <NR1>[,<NR1>]

Parameters	**Description**
NOTRUN	This test step has not yet run
PASS	This test step passed
PASS_LIMIT	This test step passed, with the stimulus level at the generator maximum value
FAIL	This test step failed
BUSY	This test step is in progress
NODATA	This test step lacks valid data

:SOURce:JITTer:COMPliance:RESults:TIME

This query returns the start time of the test associated with the current test result values. The time is returned as six NR1 values, for year, month, day, hour, minute, and second respectively. If there is no valid current test result data, the six values are returned as 0.

Syntax :SOURce<slot>:JITTer:COMPliance:RESults:TIME?

:SOURce:JITTer:COMPliance:STATe

This command starts or stops the execution of a jitter transfer or jitter tolerance compliance test. The query form returns the current state of test execution.

Syntax :SOURce<slot>:JITTer:COMPliance:STATe?
:SOURce<slot>:JITTer:COMPliance:STATe <Enum>

Parameters	**Description**
RUN	Start test (command), the test is running (query response)
RUNCAL	Start a calibration sequence for jitter transfer; calibration is running (query response)
END	Stop the test or calibration sequence in progress
COMPLETE	The compliance test has finished (query response only)
CALCOMP	The calibration sequence has finished (query response only)
INITFAIL	The jitter tolerance test was unable to establish a no-errors condition before applying jitter

:SOURce:JITTer:COMPliance:TIME:MEASure

This command sets the measurement time per point for jitter transfer and jitter tolerance tests. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TIME:MEASure?
:SOURce<slot>:JITTer:COMPliance:TIME:MEASure <NR1>

:SOURce:JITTer:COMPliance:TIME:SETTle

This command sets the settling time per point, i.e., the time between when jitter is applied and when a measurement starts, for jitter transfer and jitter tolerance tests. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TIME:SETTle?
:SOURce<slot>:JITTer:COMPliance:TIME:SETTle <NR1>

:SOURce:JITTer:COMPliance:TOLerance:AMPLitude

This command takes a NR1 value that specifies, as a percentage of the mask value at a given frequency, the applied stimulus level for a jitter tolerance acceptance test. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:AMPLitude?
:SOURce<slot>:JITTer:COMPliance:TOLerance:AMPLitude <NR1>

:SOURce:JITTer:COMPliance:TOLerance:BER:CURRent

This query returns, as a NR3 value, the bit error rate (BER) currently measured by the associated line receiver module.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:BER:CURRent?

:SOURce:JITTer:COMPliance:TOLerance:BER:RECommended

This query returns, as a NR3 value, a recommended bit error rate (BER) jitter tolerance threshold value, based on the currently selected line rate, condition monitored, and signal structure.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:BER:RECommended?

:SOURce:JITTer:COMPliance:TOLerance:BER:THReshold

This command sets the bit error rate (BER) threshold for 1-dB optical power penalty jitter tolerance tests. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:BER:THReshold?
:SOURce<slot>:JITTer:COMPliance:TOLerance:BER:THReshold <NR3>

:SOURce:JITTer:COMPliance:TOLerance:CONDition

This command sets the error condition to be monitored for jitter tolerance tests. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:CONDition?
:SOURce<slot>:JITTer:COMPliance:TOLerance:CONDition <Enum>

Parameters	**Description**
B1A	B1 parity errors
B2A	B2 parity errors
B3A	B3 parity errors
PAYLoad	Payload pattern bit errors

:SOURce:JITTer:COMPliance:TOLerance:ONSET:THReshold

This command sets the errored seconds (ES) threshold for onset-of-errors jitter tolerance tests. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:ONSET:THReshold?
:SOURce<slot>:JITTer:COMPliance:TOLerance:ONSET:THReshold <NR1>

:SOURce:JITTer:COMPliance:TOLerance:SEARch:METHod

This command sets the particular search method used to measure jitter tolerance. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:SEARch:METHod?
:SOURce<slot>:JITTer:COMPliance:TOLerance:SEARch:METHod <Enum>

Parameters	**Description**
INCRease	Increase jitter amplitude from 0 using binary search, to find highest jitter tolerated by a device in normal operation
DECRease	Decrease jitter amplitude from maximum using binary search, to find highest jitter from which a device making errors will recover
LIN_Incr	Increase jitter amplitude from 0 using linear search, to find highest jitter tolerated by a device in normal operation

:SOURce:JITTer:COMPliance:TOLerance:SEARch:RESolution

This command sets, as a percentage of the stimulus mask value, the minimum step size for the jitter tolerance measurement. When the step size reaches this value, the search terminates and returns the highest measured passing value. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TOLerance:SEARch:RESolution?
:SOURce<slot>:JITTer:COMPliance:TOLerance:SEARch:RESolution <NR1>

:SOURce:JITTer:COMPliance:TRANsfer:AMPLitude

This command takes a NR1 value that specifies, as a percentage of the mask value at a given frequency, the applied stimulus level for a jitter transfer test. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TRANsfer:AMPLitude?
:SOURce<slot>:JITTer:COMPliance:TRANsfer:AMPLitude <NR1>

:SOURce:JITTer:COMPliance:TRANsfer:CALState

This query returns a Boolean value that is 1 when valid jitter transfer calibration data exists for the current instrument settings, 0 when there is no valid calibration data.

Syntax :SOURce<slot>:JITTer:COMPliance:TRANsfer:CALState?

:SOURce:JITTer:COMPliance:TRANsfer:FMIN

This command sets the starting (minimum) frequency for a jitter transfer test, used when the corresponding enable function :SOURce:JITTer:COMPliance:TRANsfer:FMIN:ENABle is true. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TRANsfer:FMIN?
:SOURce<slot>:JITTer:COMPliance:TRANsfer:FMIN <NR2>

:SOURce:JITTer:COMPliance:TRANsfer:FMIN:ENABle

This command enables the use of a partial frequency range for jitter transfer tests. When this function is enabled, jitter transfer tests start at the frequency set by the :SOURce:JITTer:COMPliance:TRANsfer:FMIN command; when this function is disabled, jitter transfer tests start at the lowest frequency specified by the mask. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TRANsfer:FMIN:ENABle?
:SOURce<slot>:JITTer:COMPliance:TRANsfer:FMIN:ENABle <Boolean>

:SOURce:JITTer:COMPliance:TYPE

This command selects the type of jitter compliance test to be run. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:COMPliance:TYPE?
:SOURce<slot>:JITTer:COMPliance:TYPE <Enum>

Parameters	Description
POWER_Accept	Jitter tolerance acceptance test using the 1-dB optical power penalty method
POWER_Meas	Jitter tolerance measurement using the 1-dB optical power penalty method
ONSET_Accept	Jitter tolerance acceptance test using the onset-of-errors method
ONSET_Meas	Jitter tolerance measurement using the onset-of-errors method
TRANS_Fast	Jitter transfer compliance test (Fast)
TRANS_Acc	Jitter transfer compliance test (High accuracy)

:SOURce:JITTer:LOCK

This query returns the status of the DPA phase locked loop.

Syntax :SOURce<slot>:JITTer:LOCK?

Parameters	Description
LOCKed	DPA is locked
UNLOcked	DPA is unlocked

:SOURce:JITTer:RATE

This command sets the jitter generation line rate. The query :SOURce:JITTer:BUSY should be used to determine when the operation has completed. The query form returns the current setting.

Syntax: :SOURce<slot>:JITTer:RATE?
:SOURce<slot>:JITTer:RATE <Enum>

Parameters	Description
G10A	9.953 Gb/s (OC-192 or STM-64)
G2P5A	2.488 Gb/s (OC-48 or STM-16)
M622A	622.08 Mb/s (OC-12 or STM-4)
M155A	155.52 Mb/s (OC-3 or STM-1)

:SOURce:JITTer:SIGNal

This command sets the jitter generation frequency and amplitude. The parameters appear in the order (frequency, amplitude). The query :SOURce:JITTer:BUSY is used to determine when the operation has completed. The query form returns both frequency and amplitude, in that order.

Syntax :SOURce<slot>:JITTer:SIGNal?
:SOURce<slot>:JITTer:SIGNal <NR3>,<NR2>

:SOURce:JITTer:SIGNal:RANGe:AMPLitude

This query returns the minimum and maximum jitter amplitude values in NR2 format.

Syntax: :SOURce<slot>:JITTer:SIGNal:RANGe:AMPLitude?

:SOURce:JITTer:SIGNal:RANGe:FREQuency

This query returns the minimum and maximum jitter frequency values in NR2 format.

Syntax: :SOURce<slot>:JITTer:SIGNal:RANGe:FREQuency?

:SOURce:JITTer:STATe

This command starts or stops the generation of jitter. The query :SOURce:JITTer:BUSY should be used to determine when the operation has completed. The query form returns the current setting.

Syntax :SOURce<slot>:JITTer:STATe?
:SOURce<slot>:JITTer:STATe <Boolean>

:SYNC:CLOCk:OFFSet

This command sets the frequency offset in ppm. The query form returns the current setting.

Syntax: :SYNC<slot>:CLOCk:OFFSet?
:SYNC<slot>:CLOCk:OFFSet <NR2>

:SYNC:CLOCk:OFFSet:RANGe

This query returns the minimum and maximum frequency offset values in ppm. The values are returned in NR2 format.

Syntax: :SYNC<slot>:CLOCk:OFFSet:RANGe?

:SYNC:CLOCk:REFErence

This command sets the reference clock source. The query form returns the current setting.

Syntax: :SYNC<slot>:CLOCk:REFErence?
:SYNC<slot>:CLOCk:REFErence <Enum>

Parameters	Description
INTErnal	Internal Sync card clock
EXTErnal	External clock reference
RECOvered	Recovered clock reference

:SYNC:CLOCk:REFErence:RATE

This command sets the external reference clock rate. The query form returns the current setting.

Syntax: :SYNC<slot>:CLOCk:REFErence:RATE?
:SYNC<slot>:CLOCk:REFErence:RATE <Enum>

Parameters	Description
M1P5Bits	External clock reference is 1.5M Bits / second
M2A	External clock reference is 2MHz
M2Bits	External clock reference is 2M Bits / second
M5A	External clock reference is 5 MHz
M10A	External clock reference is 10 MHz

:SYNC:CLOCk:REFErence:SLOT

This command selects the slot from which the Sync Module receives its recovered clock source reference. The query form returns the current setting.

Syntax: :SYNC<slot>:CLOCk:REFErence:SLOT?
:SYNC<slot>:CLOCk:REFErence:SLOT <NR1>

:SYNC:CLOCk:STATus:LOCK:BITS

This query returns the lock status of the BITS/SETS signal.

Syntax: :SYNC<slot>:CLOCk:STATus:LOCK:BITS?

Parameters	Description
OFF	Signal not selected
LOCKed	Signal is locked
UNLOcked	Signal is not locked

:SYNC:CLOCk:STATus:LOCK:M155Pll

This query returns the lock status of the 155.52 MHz phase locked loop.

Syntax: :SYNC<slot>:CLOCk:STATus:LOCK:M155Pll?

Parameters	Description
LOCKed	Signal is locked
UNLOcked	Signal is not locked

:SYNC:CLOCk:STATus:SIGNal:BITS

This query returns whether the Sync module is receiving a BITS/SETS signal.

Syntax: :SYNC<slot>:CLOCk:STATus:SIGNal:BITS?

Parameters	Description
OFF	Signal not selected
NOT_PRESent	Signal is not present
PRESent	Signal is present

:SYNC:CLOCk:STATus:SIGNal:EXTErnal

This query returns whether the Sync module is receiving an external signal.

Syntax: :SYNC<slot>:CLOCk:STATus:SIGNal:EXTErnal?

Parameters	Description
OFF	Signal not selected
NOT_PRESent	Signal is not present
PRESent	Signal is present

*SRE

This command sets the value of the IEEE-488.2 Service Request Enable Register. Any bit in the IEEE-488.2 Status Byte Register that is set, and for which the corresponding Service Request Enable Register bit is set, causes a Service Request (SRQ). The query form returns the current setting of this register.

Syntax *SRE?
*SRE <NR1>

*STB

This query returns the current value of the IEEE-488.2 Status Byte Register.

Syntax *STB?

:STATus:PRESet

This command initializes the Interface Status subsystem to a defined initial state.

Syntax :STATus:PRESet

Parameters	Description
NONE	The GPIB port is disabled

:SYSTem:COMMunicate:GPIB:PRIMary

This command sets the primary address for the GPIB remote control port. A value of NONE disables the GPIB port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:GPIB:PRIMary?
:SYSTem:COMMunicate:GPIB:PRIMary <Enum> |<NR1>

Parameters	**Description**
NONE	The GPIB port is disabled

:SYSTem:COMMunicate:GPIB:SECOndary

This command sets the secondary address for the GPIB port. A value of NONE disables secondary addressing. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:GPIB:SECOndary?
:SYSTem:COMMunicate:GPIB:SECOndary <Enum> |<NR1>

Parameters	**Description**
NONE	Secondary GPIB addressing is disabled

:SYSTem:COMMunicate:NETWork:ECHO

This command sets the initial value of the echo control variable for new network connections. This setting has no effect on connections already established (see :SYSTEM:COMMUNICATE:PORT:ECHO). The query form returns the current setting.

Syntax :SYSTem:COMMunicate:NETWork:ECHO?
:SYSTem:COMMunicate:NETWork:ECHO <NR1>

Bit value	**Function**
0	Disables echo
1	Enables echo
2	Causes the input terminator character to be echoed as CR-LF
4	Enables input line buffering: received characters are not processed until the terminating CR or LF

:SYSTem:COMMunicate:NETWork:IPPORT

This command sets the IP port address on which the system listens for new connections. Changing the setting has no effect on connections already established. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:NETWork:IPPORT?
:SYSTem:COMMunicate:NETWork:IPPORT <NR1>

:SYSTem:COMMunicate:NETWork:PROMpt

This command sets the initial state of the user prompt on new network connections. This setting has no effect on connections already established (see :SYSTEM:COMMUNICATE:PORT:PROMPT). The query form returns the current setting.

Syntax :SYSTem:COMMunicate:NETWork:PROMpt?
:SYSTem:COMMunicate:NETWork:PROMpt <Boolean>

:SYSTem:COMMunicate:NETWork:RXTERM

This command sets the initial selection, for new network connections, of the character recognized as End-of-Input. This setting has no effect on connections already established (see :SYSTEM:COMMUNICATE:PORT:RXTERM). The query form returns the current setting.

Syntax :SYSTem:COMMunicate:NETWork:RXTERM?
:SYSTem:COMMunicate:NETWork:RXTERM <Enum>

Parameters	**Description**
LF	Line feed (LF) character, 0x0A; an optional preceding CR is ignored
CR	Carriage return (CR) character, 0x0D; an optional preceding LF is ignored

:SYSTem:COMMunicate:NETWork:TXTERM

This command sets the initial selection, for new network connections, of the characters sent at the end of a query response. This setting has no effect on connections already established (see :SYSTEM:COMMUNICATE:PORT:TXTERM). The query form returns the current setting.

Syntax :SYSTem:COMMunicate:NETWork:TXTERM?
:SYSTem:COMMunicate:NETWork:TXTERM <Enum>

Parameters	**Description**
LF	Line feed (LF) character, 0x0A
CR	Carriage return (CR) character, 0x0D
CRLF	CR followed by LF
LFCR	LF followed by CR

:SYSTem:COMMunicate:PORT:ECHO

The PORT commands affect the character-based remote control port (serial port or network connection) that receives the command; they are not valid for the GPIB. This command controls, for the current remote-control port, how the system echoes the characters it receives. The parameter is a numeric value containing three individual control bits. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:PORT:ECHO?
:SYSTem:COMMunicate:PORT:ECHO <NR1>

Bit value	**Function**
0	Disables echo
1	Enables echo
2	Causes the input terminator character to be echoed as CR-LF
4	Enables input line buffering: received characters are not processed until the terminating CR or LF

:SYSTem:COMMunicate:PORT:PROMpt

This command enables or disables the user prompt on the current remote-control port. When the prompt is enabled, the system prompts when it is ready for a command. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:PORT:PROMpt?
:SYSTem:COMMunicate:PORT:PROMpt <Boolean>

:SYSTem:COMMunicate:PORT:RXTERM

This command selects, for the current remote-control port, the character the OTS system recognizes as End-of-Input. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:PORT:RXTERM?
:SYSTem:COMMunicate:PORT:RXTERM <Enum>

Parameters	Description
LF	Line feed (LF) character, 0x0A; an optional preceding CR is ignored
CR	Carriage return (CR) character, 0x0D; an optional preceding LF is ignored

:SYSTem:COMMunicate:PORT:TXTERM

This command controls, for the current remote-control port, the characters the OTSsystem sends at the end of a query response. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:PORT:TXTERM?
:SYSTem:COMMunicate:PORT:TXTERM <Enum>

Parameters	Description
LF	Line feed (LF) character, 0x0A
CR	Carriage return (CR) character, 0x0D
CRLF	CR followed by LF
LFCR	LF followed by CR

:SYSTem:COMMunicate:SERIal:COM1A:DTR

This command controls the state of the DTR (Data Terminal Ready) control signal on the COM1 port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:DTR?
:SYSTem:COMMunicate:SERIal:COM1A:DTR <Boolean>

:SYSTem:COMMunicate:SERIal:COM1A:ECHO

This command controls, for the COM1 serial port, how the system echoes the characters it receives. The parameter is a numeric value containing three individual control bits. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:ECHO?
:SYSTem:COMMunicate:SERIal:COM1A:ECHO <NR1>

Bit value	Function
0	Disables echo
1	Enables echo
2	Causes the input terminator character to be echoed as CR-LF
4	Enables input line buffering: received characters are not processed until the terminating CR or LF

:SYSTem:COMMunicate:SERIal:COM1A:ENABle

This command enables or disables the operation of serial port COM1 as a remote control port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:ENABle?
:SYSTem:COMMunicate:SERIal:COM1A:ENABle <Boolean>

:SYSTem:COMMunicate:SERIal:COM1A:FLOW

This command sets the type of flow control used for serial communications on the COM1 serial port. When flow control is enabled, the receiver signals the sender when its buffer is full, so as not to lose characters. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:FLOW?
:SYSTem:COMMunicate:SERIal:COM1A:FLOW <Enum>

Parameters	Description
NONE	No flow control is enabled
HARDware	Flow control uses RS-232 control signals
SOFTware	Flow control uses XON and XOFF characters in the data stream

:SYSTem:COMMunicate:SERIal:COM1A:NDATA

This command sets the number of data bits per character on the COM1 serial port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:NDATA?
:SYSTem:COMMunicate:SERIal:COM1A:NDATA <Enum>

Parameters	Description
N7A	Seven-bit data
N8A	Eight-bit data

:SYSTem:COMMunicate:SERIal:COM1A:NSTOP

This command sets the number of stop bits per character on the COM1 serial port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:NSTOP?
:SYSTem:COMMunicate:SERIal:COM1A:NSTOP <Enum>

Parameters	Description
N1A	One stop bit
N1P5A	One and one-half stop bits
N2	Two stop bits

:SYSTem:COMMunicate:SERIal:COM1A:PARIty

This command sets, for the COM1 serial port, the function of the high-order (eighth) bit in each serial. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:PARIty?
:SYSTem:COMMunicate:SERIal:COM1A:PARIty <Enum>

Parameters	Description
NONE	No parity
ODD	Odd parity
EVEN	Even parity
MARK	The parity bit is always set
SPACE	The parity bit is always clear

:SYSTem:COMMunicate:SERIal:COM1A:PROMpt

This command enables or disables the user prompt on the COM1 serial port. When the prompt is enabled, the system prompts when it is ready for a command. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:PROMpt?
:SYSTem:COMMunicate:SERIal:COM1A:PROMpt <Boolean>

:SYSTem:COMMunicate:SERIal:COM1A:RATE

This command sets the baud rate for the COM1 serial port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:RATE?
:SYSTem:COMMunicate:SERIal:COM1A:RATE <Enum>

Parameters	**Description**
R1200B	1200 baud
R2400B	2400 baud
R4800B	4800 baud
R9600B	9600 baud
R19KB	19.2K baud
R38KB	38.4K baud
R57KB	57.6K baud
R115KB	115.2K baud

:SYSTem:COMMunicate:SERIal:COM1A:RTS

This command controls the state of the RTS (Request to Send) control signal on the COM1 port. It has no effect when hardware flow control is enabled. The query form returns the current setting.

Syntax: :SYSTem:COMMunicate:SERIal:COM1A:RTS?
:SYSTem:COMMunicate:SERIal:COM1A:RTS <Boolean>

:SYSTem:COMMunicate:SERIal:COM1A:RXTERM

This command selects, for the COM1 serial port, the character the OTS system recognizes as End-of-Input. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:RXTERM?
:SYSTem:COMMunicate:SERIal:COM1A:RXTERM <Enum>

Parameters	Description
LF	Line feed (LF) character, 0x0A; an optional preceding CR is ignored
CR	Carriage return (CR) character, 0x0D; an optional preceding LF is ignored

:SYSTem:COMMunicate:SERIal:COM1A:TXTERM

This command controls, for the COM1 serial port, the characters the OTS system sends at the end of a query response. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM1A:TXTERM?
:SYSTem:COMMunicate:SERIal:COM1A:TXTERM <Enum>

Parameters	Description
LF	Line feed (LF) character, 0x0A
CR	Carriage return (CR) character, 0x0D
CRLF	CR followed by LF
LFCR	LF followed by CR

:SYSTem:COMMunicate:SERIal:COM2A:DTR

This command controls the state of the DTR (Data Terminal Ready) control signal on the COM2 port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:DTR?
:SYSTem:COMMunicate:SERIal:COM2A:DTR <Boolean>

:SYSTem:COMMunicate:SERIal:COM2A:ECHO

This command controls, for the COM2 serial port, how the system echoes the characters it receives. The parameter is a numeric value containing three individual control bits. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:ECHO?
:SYSTem:COMMunicate:SERIal:COM2A:ECHO <NR1>

Bit value	Function
0	Disables (0) echo
1	Enables (1) echo
2	Causes the input terminator character to be echoed as CR-LF
4	Enables input line buffering: received characters are not processed until the terminating CR or LF

:SYSTem:COMMunicate:SERIal:COM2A:ENABle

This command enables or disables the operation of serial port COM2 as a remote control port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:ENABle?
:SYSTem:COMMunicate:SERIal:COM2A:ENABle <Boolean>

:SYSTem:COMMunicate:SERIal:COM2A:FLOW

This command sets the type of flow control used for serial communications on the COM2 serial port. When flow control is enabled, the receiver signals the sender when its buffer is full, so as not to lose characters. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:FLOW?
:SYSTem:COMMunicate:SERIal:COM2A:FLOW <Enum>

Parameter	Description
NONE	No flow control is enabled
HARDware	Flow control uses RS-232 control signals
SOFTware	Flow control uses XON and XOFF characters in the data stream

:SYSTem:COMMunicate:SERIal:COM2A:NDATA

This command sets the number of data bits per character on the COM2 serial port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:NDATA?
:SYSTem:COMMunicate:SERIal:COM2A:NDATA <Enum>

Parameters	Description
N7A	Seven-bit data
N8A	Eight-bit data

:SYSTem:COMMunicate:SERIal:COM2A:NSTOP

This command sets the number of stop bits per character on the COM2 serial port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:NSTOP?
:SYSTem:COMMunicate:SERIal:COM2A:NSTOP <Enum>

Parameters	Description
N1A	One stop bit
N1P5A	One and one-half stop bits
N2	Two stop bits

:SYSTem:COMMunicate:SERIal:COM2A:PARIty

This command sets, for the COM2 serial port, the function of the high-order (eighth) bit in each serial. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:PARIty?
:SYSTem:COMMunicate:SERIal:COM2A:PARIty <Enum>

Parameter	Description
NONE	No parity
ODD	Odd parity
EVEN	Even parity
MARK	The parity bit is always set
SPACE	The parity bit is always clear

:SYSTem:COMMunicate:SERIal:COM2A:PROMpt

This command enables or disables the user prompt on the COM2 serial port. When the prompt is enabled, the system prompts when it is ready for a command. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:PROMpt?
:SYSTem:COMMunicate:SERIal:COM2A:PROMpt <Boolean>

:SYSTem:COMMunicate:SERIal:COM2A:RATE

This command sets the baud rate for the COM2 serial port. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:RATE?
:SYSTem:COMMunicate:SERIal:COM2A:RATE <Enum>

Parameters	**Description**
R1200B	1200 baud
R2400B	2400 baud
R4800B	4800 baud
R9600B	9600 baud
R19KB	19.2K baud
R38KB	38.4K baud
R57KB	57.6K baud
R115KB	115.2K baud

:SYSTem:COMMunicate:SERIal:COM2A:RTS

This command controls the state of the RTS (Request to Send) control signal on the COM2 port. It has no effect when hardware flow control is enabled. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:RTS?
:SYSTem:COMMunicate:SERIal:COM2A:RTS <Boolean>

:SYSTem:COMMunicate:SERIal:COM2A:RXTERM

This command selects, for the COM2 serial port, the character the OTS system recognizes as End-of-Input. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:RXTERM?
:SYSTem:COMMunicate:SERIal:COM2A:RXTERM <Enum>

Parameters	Description
LF	Line feed (LF) character, 0x0A; an optional preceding CR is ignored
CR	Carriage return (CR) character, 0x0D; an optional preceding LF is ignored

:SYSTem:COMMunicate:SERIal:COM2A:TXTERM

This command controls, for the COM2 serial port, the characters the OTS system sends at the end of a query response. The query form returns the current setting.

Syntax :SYSTem:COMMunicate:SERIal:COM2A:TXTERM?
:SYSTem:COMMunicate:SERIal:COM2A:TXTERM <Enum>

Parameters	Description
LF	Line feed (LF) character, 0x0A
CR	Carriage return (CR) character, 0x0D
CRLF	CR followed by LF
LFCR	LF followed by CR

:SYSTem:CONFig:MODule:SERIAL

This query accepts a module slot number, between 1 and 16, and returns a string identifying the Tektronix module card serial number as a quoted string.

Syntax :SYSTem:CONFig:MODule:SERIAL? <NR1>

:SYSTem:CONFig:MODule:TYPE

This query accepts a module slot number, between 1 and 16, and returns a string identifying the Tektronix module in the specified slot. If the slot specified does not contain an OTS system module, this query returns the string 'Non-Tek device or empty slot'.

Syntax :SYSTem:CONFig:MODule:TYPE? <NR1>

:SYSTem:CONFig:MODule:VARIANT

This query accepts a module slot number, between 1 and 16, and returns the module variant as a decimal number, or 0 if there is no variant information. "Variant" is the module sub-type, for example, the Optics card may be a Transceiver, Transmit only, or Receive only version

Syntax :SYSTem:CONFig:MODule:VARIANT? <NR1>

:SYSTem:CONFig:MODule:VERSion

This query accepts a module slot number, between 1 and 16, and returns the version information associated with the Tektronix module in the specified slot. The string returned has the format Mnn.nn,Unn.nn,Dnn.nn,Xnn.nn,Fnn.nn and contains major and minor version numbers for the module itself and its utility, driver, FPGA file, and firmware. Fields that are not applicable to the particular module are returned as 0. If the specified slot does not contain an OTS system module, this query returns an error.

Syntax :SYSTem:CONFig:MODule:VERSion? <NR1>

:SYSTem:CONFig:SLOTs

This query returns, as a NR1 parameter, the number of module slots in the system.

Syntax :SYSTem:CONFig:SLOTs?

:SYSTem:DESCription:SETUp

This command sets a text string that is stored with the current system settings and which may be used to annotate or identify the instrument setup. The query form returns the current setting.

Syntax :SYSTem:DESCription:SETUp?
:SYSTem:DESCription:SETUp <String>

:SYSTem:ERRor

This query returns, as a string parameter, the next event in the Error and Event Queue. The *ESR? query must be given before events occuring since the last *ESR? query can be read.

Syntax :SYSTem:ERRor?

:SYSTem:FILEs:MGMT:RESUlts:AGE

This command sets the maximum age of a file, a delta of file creation time and current system time. Files at this age or older are deleted on the next revisit, as set by INTErval. This command takes three comma separated parameters: Days,Hrs,Mins. The query form returns the current setting in the same form.

Syntax: :SYSTem:FILEs:MGMT:RESUlts:AGE?
:SYSTem:FILEs:MGMT:RESUlts:AGE <NR1> ,<NR1> ,<NR1>

:SYSTem:FILEs:MGMT:RESUlts:COUNt

This command sets the maximum number of result files allowed before deletion begins. The order in which files are deleted is based on the sort criteria, see the SORT command below. The query form returns the current setting.

Syntax: :SYSTem:FILEs:MGMT:RESUlts:COUNt?
:SYSTem:FILEs:MGMT:RESUlts:COUNt <NR1>

:SYSTem:FILEs:MGMT:RESUlts:DESTination

This command defines the path to the files to be deleted. This command requires the full path including drive letter. The query form returns the current directory path marked for deletion.

Syntax: :SYSTem:FILEs:MGMT:RESUlts:DESTination?
:SYSTem:FILEs:MGMT:RESUlts:DESTination <String>

:SYSTem:FILEs:MGMT:RESUlts:ENABle

This command enables or disables each individual deletion trigger. During the current revisit interval the enable flags are polled, if an enabled criteria is met file deletion will begin and continue until all enabled criteria have been satisfied. Disabling the revisit interval flag will keep the system from deleting any files, while maintaining user-selected criteria.

NOTE: *The system requires a single numeric (base 10) parameter, flags are described as a bit field, the user must convert from the bit field (or hex) to a numeric integer. Flags are cumulative. Sending the value of zero disables all criteria.*

Syntax: :SYSTem:FILEs:MGMT:RESUlts:ENABle?
:SYSTem:FILEs:MGMT:RESUlts:ENABle <NR1>

Bit Value	Criteria affected
0x1	Enables (1) or disables (0) deletion based on number of files. Set by the COUNt command.
0x2	Enables (1) or disables (0) deletion based on total consumed space of files. Set by the TOTAlsize command.
0x4	Enables (1) or disables (0) deletion based on percentage of volume consumed. Set by the PERcent command.
0x8	Enables (1) or disables (0) deletion based on age of files (delta). Set by the AGE command.
0x10	Enables (1) or disables (0) the revisit interval. Set by the INTErval command.

:SYSTem:FILEs:MGMT:RESUlts:INTErval

This command sets the minimum amount of time the system waits between polling file deletion criteria. If any deletion criteria have been met, such as number of files, deletion will begin. If no criteria are met no deletion will take place until the next interval. The query form returns the current setting.

NOTE: *Units for INTErval are usec. Settings of less than 30000usec (30sec) should be avoided since constant revisits consume system resources. It is important to understand that this is a requested minimum interval, actual intervals are based on free CPU cycles.*

Syntax: :SYSTem:FILEs:MGMT:RESUlts:INTErval?
:SYSTem:FILEs:MGMT:RESUlts:INTErval <NR1>

:SYSTem:FILEs:MGMT:RESUlts:PERcent

This command sets the maximum percentage of disk volume that files are allowed to consume before deletion begins. The order in which files are deleted is based on the sort criteria, see the SORT command below. The query form returns the current setting.

Syntax: :SYSTem:FILEs:MGMT:RESUlts:PERcent?
:SYSTem:FILEs:MGMT:RESUlts:PERcent <NR1>

:SYSTem:FILEs:MGMT:RESUlts:SORT

This command defines the sorting method by which files are prioritized for deletion. The system default is by a file's creation time. The query form returns the current sorting method.

Syntax: :SYSTem:FILEs:MGMT:RESUlts:SORT?
:SYSTem:FILEs:MGMT:RESUlts:SORT <Enum>

Parameters	**Description**
CREAted	Sort by creation time
MODified	Sort by last modified time
ACCEssed	Sort by last accessed time

:SYSTem:FILEs:MGMT:RESUlts:TOTAlsize

This command sets the maximum amount of space combined files are allowed to span before deletion is initiated. The order in which files are deleted is based on the sort criteria, see the SORT command below. The query form returns the current setting. NOTE: Units for TOTAlsize are in megabytes.

Syntax: :SYSTem:FILEs:MGMT:RESUlts:TOTAlsize?
:SYSTem:FILEs:MGMT:RESUlts:TOTAlsize <NR1>

:SYSTem:FORMat:BLOCk

This command selects whether binary block data command parameters are transmitted as raw 8-bit binary characters or pairs of hex digits. Some communication links may not be able to send raw binary data. The query form returns the current setting.

Syntax :SYSTem:FORMat:BLOCk?
:SYSTem:FORMat:BLOCk <Enum>

Parameter	**Description**
BINary	Block data uses raw 8-bit binary bytes
HEX	Block data uses two hex digits per byte

:SYSTem:HEADers

This command enables or disables command headers in query responses. When headers are enabled, the response to a query is in the form of a complete command sufficient to set the present value. When headers are disabled, the query returns only the present value. The query form returns the current setting.

Syntax :SYSTem:HEADers?
:SYSTem:HEADers <Boolean>

:SYSTem:LOCK:RELease

This command releases the lock set by a :SYSTEM:LOCK:REQUEST operation. The lock must have been set by the same user; an attempt to release a lock set by another user will not succeed. If no lock is set this command is ignored.

Syntax :SYSTem:LOCK:RELease

:SYSTem:LOCK:RELease:FORCE

This command releases any lock set by a :SYSTEM:LOCK:REQUEST operation or any corresponding user-interface operation.

Syntax :SYSTem:LOCK:RELease:FORCE

:SYSTem:LOCK:REQuest

This query attempts to lock' the system interface, ie, to take exclusive control of the system for commands that change system settings ('set' commands). It returns 1 if the lock succeeds, 0 if it fails.

Syntax :SYSTem:LOCK:REQuest?

:SYSTem:SIGNal:STANdard

This command sets all of the OTS system modules to the SONET or SDH signal mode. If all modules are set to the same standard, the query form returns the current setting. If different modules are set to different settings, the query form returns MIXED.

Syntax :SYSTem:STANdard?
:SYSTem:STANdard <Enum>

Parameters	**Description**
SONEt	Set system to SONET signal mode
SDH	Set system to SDH signal mode
BERT	All modules are set to BERT

:SYSTem:VERBose

This command selects short- or long-form command headers in query responses. The query form returns the current setting. Long-form responses are composed of the full header keywords; short-form responses use the abbreviated keywords.

Syntax :SYSTem:VERBose?
:SYSTem:VERBose <Boolean>

*TST

This query returns a Boolean value representing self-test results.

Syntax *TST?

*WAI

This command waits for pending OTS9000 operations to finish before returning.

Syntax *WAI

Specifications

This section contains the instrument specifications for the OTS9200 Jitter and OTS92S1 Synchronization modules.

OTS9200 Jitter module

This section contains a complete listing of the OTS9200 Jitter module specifications.

Environmental Specifications

TEMPERATURE RANGES

Operating Temperature: ..... +5°C to +35°C
Humidity:
20% to 80% relative humidity with a maximum wet bulb temperature of 28°C at or below 35°C. Non-condensing. (Upper limit de-rates to 60% relative humidity at 35°C)
Operating Altitude: ..... 15,000 ft
Storage Temperature: ..... -20°C to +60°C
Humidity:
5% to 80% relative humidity with a maximum wet bulb temperature of 28°C at or below 60°C. Non-condensing
Storage Altitude: ..... 50,000 ft

DIMENSIONS

The dimensions of all module cards are 6u (233.35 mm × 160 mm, 9.19 inches × 6.3 inches) form factor with 4hp (20.32 mm, 0.8 inches) front panel.

WEIGHT

OTS92T1 Jitter Generator card ..... 1.1 lbs
OTS92R1 Jitter Analyzer card ..... 1.1 lbs
OTS92H1 Clock Recovery card ..... 2.3 lbs

POWER

Jitter Generator card (OTS92T1):	+5V	1.50A
	+3.3V	2.40A
	-5.2V	4.25A
	-12V	0.03A
	+12V	0.20A
Jitter Analyzer card (OTS92R1):	+5V	2.00A
	+3.3V	2.40A
	-5.2V	3.50A
	-12V	0.03A
	+12V	0.20A
Clock Recovery card (OTS92H1):	+5V	1.00A
	+3.3V	0.50A
	-5.2V	2.50A
	+12V	0.75A

Jitter Generation Specifications

CLOCK SOURCE

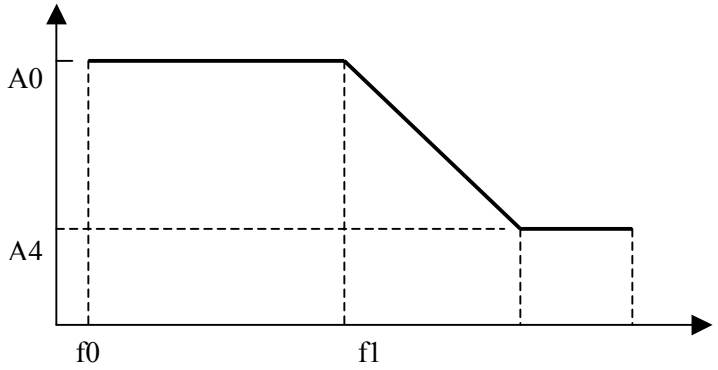
Internally generated clock: ..... 155.52 MHz ± 4.6 ppm
Backplane clock: ..... Requires Synchronization Module

SIGNAL GENERATION

Modulation Source

Internal sinusoidal waveform

Generation Range



Rate (Mb/s)	A0 (UI)	A4 (UI)	f0 (Hz)	f1 (Hz)	F3 (Hz)	f4 (Hz)
9953.28	3800	0.2	10	632	12.0 M	80 M
2488.32	900	0.3	10	2222	6.67 M	20 M
622.08	450	0.3	10	1111	1.67 M	5 M
155.52	450	0.3	10	289	433 k	1.3 M

Internal Transmitter Clock

Frequency deviation .....≤ 4.6 ppm

Generation Amplitude Accuracy

Peak-to-Peak jitter Amplitude error (for structured data signal).....≤ ±Q% of setting ±X UIp-p, where X is the fixed error and Q is the proportional error:

Rate (Mb/s)	Fixed Error (X)
9953.28	0.04
2488.32	0.02
622.08	0.01
155.52	0.01

Frequency Range	Proportional Error (Q)
500 Hz – 500 kHz	8%
500 kHz – 2 MHz	12%
2 MHz – 80 MHz	15%

Generation Frequency Accuracy

The error of the generated jitter frequency f_m is:

for $f_m \leq$ 10 MHz.....≤ ±1%
for 10 MHz < $f_m \leq$ 60 MHz .....≤ ±5%
for 60 MHz < $f_m \leq$ 80 MHz .....≤ ±6%

TRANSMITTER OUTPUT SPECIFICATIONS

Reference Clock Output

Frequency..... 622.08 MHz
Amplitude.....800 mVpp to 1000 mVpp
Connector ..... AC-coupled, 50Ω, SMA

Signal Measurement Capabilities

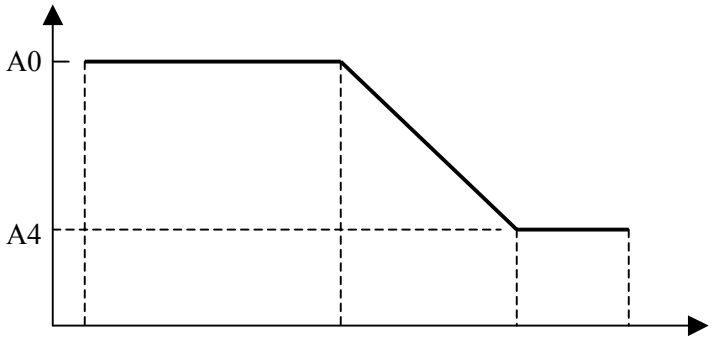
FOR DATA SIGNALS:

Type of Jitter	Display Window
Peak-to-peak jitter (UI) Positive peak jitter (UI) Negative peak jitter (UI) RMS jitter (UI)	• Current (every second) • Sliding window of 2-120 sec with 1-sec increment or infinite window (max hold)

Additional Tests:

Jitter hit count
Jitter hit seconds (variable threshold over entire measurement range)
LOS seconds

MEASUREMENT RANGE



Rate (Mb/s)	A0 (UI)	A4 (UI)	f0 (Hz)	f1 (Hz)	f3 (Hz)	f4 (Hz)
9953.28	3800	0.2	10	632	12.0 M	80 M
2488.32	900	0.3	10	2222	6.67 M	20 M
622.08	450	0.3	10	1111	1.67 M	5 M
155.52	450	0.3	10	289	433 k	1.3 M

Display resolution

Peak-to-peak jitter ..... 0.001 UI
RMS jitter ..... 0.0001 UI

Measurement Bandwidths

Line Rate	HPF –3dB freq	LPF –3dB freq	Line Rate	HPF –3dB freq	LPF –3dB freq
9953.28 Mb/s	10 Hz	80 MHz	622.08 Mb/s	10 Hz	5 MHz
9953.28 Mb/s	10 kHz	80 MHz	622.08 Mb/s	1 kHz	5 MHz
9953.28 Mb/s	20 kHz	80 MHz	622.08 Mb/s	12 kHz	5 MHz
9953.28 Mb/s	50 kHz	80 MHz	622.08 Mb/s	250 kHz	5 MHz
9953.28 Mb/s	4 MHz	80 MHz			
2488.32 Mb/s	10 Hz	20 MHz	155.52 Mb/s	10 Hz	1.3 MHz
2488.32 Mb/s	5 kHz	20 MHz	155.52 Mb/s	500 Hz	1.3 MHz
2488.32 Mb/s	12 kHz	20 MHz	155.52 Mb/s	12 kHz	1.3 MHz
2488.32 Mb/s	1 MHz	20 MHz	155.52 Mb/s	65 kHz	1.3 MHz

RMS is available on 10-Hz and 50-KHz filters at 9953.28 Mb/s, 10-Hz and 12-kHz filters at 2488.32Mb/s, 622.08Mb/s, and 155.52Mb/s**.**

Frequency Response of Measurement Function

All high-pass filters (HPF) are first-order (20 dB/dec). All low-pass filters (LPF) are third-order (–60 dB/dec) maximally flat.

HPF –3dB frequency error .....< ±5%
LPF –3dB frequency error.....< ±10%

Measurement filters meet or exceed requirements of ITU Recommendation O.172.

Measurement Result Accuracy

Peak-to-Peak Jitter Measurement error.....≤ ±7% of reading ±0.05 UIp-p,

RMS Jitter Measurement error.....≤ ±7% of reading ±0.005UIrms

RECEIVER OUTPUT SPECIFICATIONS

Recovered Clock Output

Frequency Selection ..... varies by line rate, see table
Voltage level ..... 600 mVpp to 1100 mVpp
Connector ..... AC-coupled, 50Ω, SMA

Line Rate	Frequency selection
9953.28 Mb/s	2.48832 GHz, 622.08 MHz
2488.32 Mb/s	2.48832 GHz, 622.08 MHz
622.08 Mb/s	622.08 MHz
155.52 Mb/s	155.52 MHz

Demodulated Output

Maximum voltage ..... 1.0 Vpp +/- 5%
Sensitivity ..... 1 UIpp/V to 4096 UIpp/V
Connector ..... DC-coupled, 50Ω, SMA

CLOCK RECOVERY INPUT AND OUTPUT SPECIFICATIONS

10 GHz Clock Out

Frequency ..... 9953.28 MHz
Amplitude ..... +3dBm typical
Connector ..... AC-coupled, 50Ω, SMA

10 Gb/s Data In

PN23 working through PN7 scrambler the maximum number of consecutive ones or zeroes is 30

Amplitude ..... 750mVpp typical
Connector ..... AC-coupled, 50Ω, SMA

2.5 GHz Jitter Clock In

Frequency ..... 2.48832 GHz
Amplitude ..... 750mVpp typical
Connector ..... AC-coupled, 50Ω, SMA

Edge Density Signal (EDS)

The Edge Density Signal port interface has no application to the OTS9200 module.

10 GHz Jitter Clock Out

Frequency ..... 9953.28 MHz
Amplitude ..... +3dBm typical
Connector ..... AC-coupled, 50Ω, SMA

Certifications and Compliance

EMC Compliance Directive

OTS9200 Jitter Test Module installed in the Optical Test System meets the requirements of Directive 89/336/EEC for Electromagnetic Compatibility for all modules.

NOTE: *If the module is installed into an OTS9010 chassis, the chassis must be serial number B000225 or higher for EMC compatibility.*

OTS92S1 Synchronization module

This section contains a complete listing of the OTS92S1 Synchronization module specifications.

Environmental Specifications

TEMPERATURE RANGES

Operating Temperature: ..... +5°C to +35°C
Humidity:
20% to 80% relative humidity with a maximum wet bulb temperature of 28°C at or below 35°C. Non-condensing. (Upper limit de-rates to 60% relative humidity at 35°C)
Operating Altitude: ..... 15,000 ft
Storage Temperature: ..... -20°C to +60°C
Humidity:
5% to 80% relative humidity with a maximum wet bulb temperature of 28°C at or below 60°C. Non-condensing
Storage Altitude: ..... 50,000 ft

DIMENSIONS

The dimensions of all module cards are 6u (233.35 mm × 160 mm, 9.19 inches × 6.3 inches) form factor with 4hp (20.32 mm, 0.8 inches) front panel.

WEIGHT

Synchronization card ..... 1.1 lbs

POWER

Synchronization card:	+5V	0.5A
	+3.3V	0.1A
	-5.2V	1.75A
	-12V	0.1A
	+12V	0.3A

FREQUENCY OFFSET

Range ..... ± 100 ppm
Resolution ..... 0.001 ppm

EXTERNAL CLOCK SOURCES

1.5 Mb/s Reference Clock Input

(externally synchronized)

Frequency ..... 1.544 Mb/s ± 50 ppm
Connector ..... AC-coupled, 100Ω, Balanced Bantam

2/5/10 MHz, 2 Mb/s Reference Clock Input

(externally synchronized)

Frequency ..... user-selectable, see table
Connector ..... AC-coupled, SMA

Frequency	Impedance
2.048 Mb/s ± 50 ppm	75Ω
2.048 MHz ± 50 ppm	50Ω
5.0 MHz ± 50 ppm (sine 0.25 - 5.0 Vpp)	50Ω
10.0 MHz ± 50 ppm (sine 0.25 - 5.0 Vpp)	50Ω

INTERNAL CLOCK SOURCES

Internal Clock Source

Frequency ..... 155.52 MHz ± 4.6 ppm

Recovered Clock Source

Frequency ..... Derrived from any OTS receiver (limited to +/-50ppm)

OUTPUTS

Reference Clock Output

Frequency ..... 155.52 MHz
Amplitude ..... 500 mVpp to 1000 mVpp
Connector Type ..... AC-coupled, 50Ω, SMA

CERTIFICATIONS AND COMPLIANCE

EMC Compliance Directive

OTS92S1 Synchronization Test Module installed in the Optical Test System meets the requirements of Directive 89/336/EEC for Electromagnetic Compatibility for all modules.

NOTE: *If the module is installed into an OTS9010 chassis, the chassis must be serial number B000225 or higher for EMC compatibility.*

List of Acronyms

AIS-L	Line Alarm Indication Signal
AMI	Alternate Mark Inversion
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
BBE	Background Block Error
BER	Bit Error Ratio
BIP	Bit Interleaved Parity
BIP-8	Bit Interleaved Parity-8
CFR	Code of Federal Regulations
CSES	Consecutive Severely Errored Second
CV	Coding Violation
DCC	Data Communications Channel
EB	Errored Block
ES	Errored Second
ESA	Errored Second Type A
ESB	Errored Second Type B
FAS	Frame Alignment Signal
Gb/s	Refers to a data signal rate
GHz	Refers to a clock signal rate
IEC	International Electrotechnical Commission
ITU	International Telecommunications Union
J0 TIM	J0 Trace Identifier Marker
LOF	Loss of Frame
LOS	Loss of Signal
MS	Multiplex Section
MS AIS	Multiplex Section Alarm Indication Signal
MS RDI	Multiplex Section Remote Defect Indication
MS REI	Multiplex Section Remote Error Indication
NE	Network Element

OC	Optical Carrier
OC-N	Optical Carrier level N
OOF	Out of Frame
OS	Operating System
RAI	Remote Alarm Indication
RAI-L	Line Remote Alarm Indication
RDI	Remote Defect Indication
RDI-L	Line Remote Defect Indication
REI	Remote Error Indication
REI-L	Line Remote Error Indication
RS	Regenerator Section
Rx	Receiver
SCPI	Standard Commands for Programmable Instruments
SDH	Synchronous Digital Hierarchy
SES	Severely Errored Second
SONET	Synchronous Optical Network
SPE	Synchronous Payload Envelope
STS	Synchronous Transport Signal
STS-N	Synchronous Transport Signal level N
TIM	Trace Identifier Mismatch
TOH	Transport Overhead
TU	Tributary Unit
TUG	Tributary Unit Group
Tx	Transmitter
UAS	Unavailable Second
VC	Virtual Container
VT	Virtual Tributary

Emergency Startup Disk

These instructions explain how to make an emergency startup disk for your OTS system.

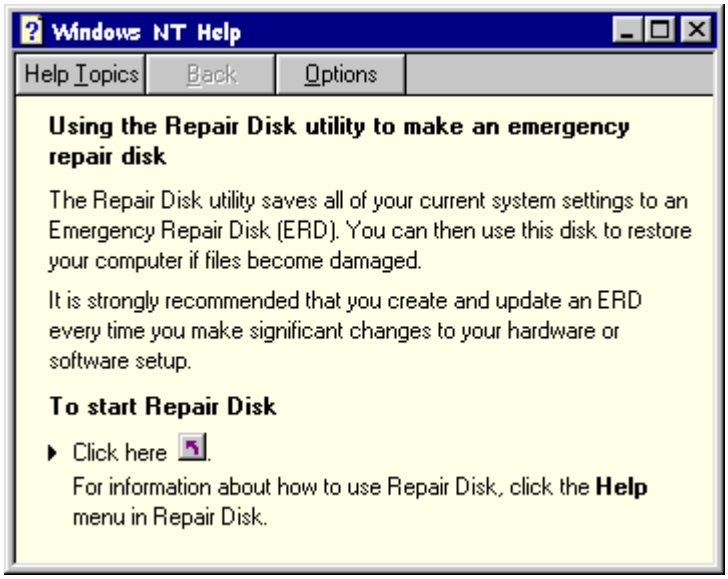
It is recommended that you take the time to do this procedure every time you change your system configuration (such as modifying the network settings). The process takes less than five minutes.

Accessing Help Files

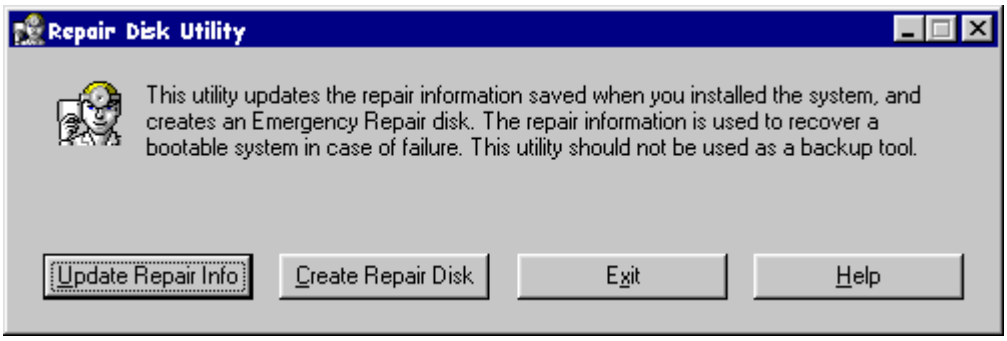
The procedure for making an emergency startup disk is located in the Windows Help files. Follow the steps below to access these files and create the emergency disk. You will need a blank floppy disk for the procedure.

NOTE: *Make sure you are on the correct OTS system before making the emergency disk. Because of licensing information, an emergency startup disk must be made for each system.*

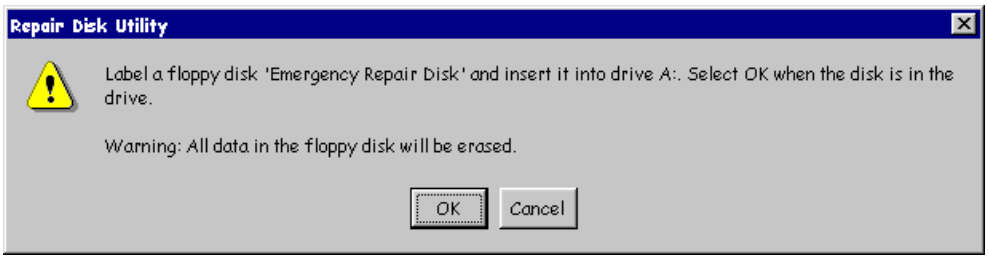
1. Click on the **Start** menu and select **Help**.
2. In the Help dialog box, select the **Index** tab and type in "Emergency".
3. The following dialog box is displayed. Click on the button as prompted to begin making the emergency disk.



4. The Repair Disk Utility box is now displayed. In this box you may update the repair information, create the repair disk, exit, or request additional help. Click Create Repair Disk.



5. The computer then prompts you to label the floppy disk and insert it into your floppy disk drive. Click on OK to continue.



6. The computer now creates your emergency disk. The computer erases the disk and then copies the pertinent files onto it.
7. When the computer finishes, it will prompt you with a final message. Exit the repair disk utility and remove your floppy disk. Be sure to store it in a safe location.

Module Card Replacement

Replacement parts are available from or through your local Tektronix, Inc. service center or representative. For further information or module replacement, inquiries may be directed to the Service Call Center at (800) 833-9200.

The OTS9200 is serviced by module replacement. If a faulty module card is detected, use the following table to determine the necessary replacement card part number. Please have this number available when inquiring with your Tektronix representative.

Tektronix Part Number	Description
672-1691-00	OTS92S1 Sync card
672-1690-00	OTS92H1 Clock Recovery card
672-1692-00	OTS92T1 Tx Jitter card
672-1693-00	OTS92R1 Rx Jitter card

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