



## **T-BERD/MTS/SC Getting Started Guide**

**T-BERD/MTS 5800, 5800-100G, MSAM, CSAM, DMC, and SC 4800/4800P**





# T-BERD/MTS/SC Getting Started Guide

**T-BERD/MTS 5800, 5800-100G, MSAM,  
CSAM, DMC, and SC 4800/4800P**



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Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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# About this Guide

This preface explains how to use this *Getting Started Guide*. Topics discussed in this chapter include the following:

- “Purpose and scope” on page xvi
- “Assumptions” on page xvi
- “Terminology” on page xvi
- “Related information” on page xix
- “Conventions” on page xx
- “Safety and compliance information” on page xxii
- “Technical assistance” on page xxii

## Purpose and scope

The purpose of this manual is to help you successfully use the features and capabilities of the Dual Module Carrier (DMC), Transport Module, Multi-Service Application Module (MSAM), and 100 G Service Application Module (CSAM) for the T-BERD/MTS 8000, 6000A, and 5800 platforms as well as each of the members of the T-BERD/MTS 5800 Handheld Network Test Family, and Smart Class 4800/4800P instruments. This manual includes task-based instructions that describe how to configure, use, and troubleshoot the general functions each of the test instruments.

## Assumptions

This manual is intended for novice, intermediate, and experienced users who want to use their test instruments effectively and efficiently. We are assuming that you have basic computer experience and are familiar with basic telecommunication concepts, terminology, and safety.

## Terminology

The T-BERD 8000 is branded as the MTS-8000 in Europe, and it is interchangeably referred to as the T-BERD 8000, MTS 8000, MTS-8000, MTS8000 and Media Test Set 8000 in the guide.

The T-BERD 6000A is branded as the MTS-6000A in Europe, and it is interchangeably referred to as the T-BERD 6000A, MTS 6000A, MTS-6000A, MTS6000A and Media Test Set 6000A.

The T-BERD 5800 family of instruments is branded as the MTS-5800 in Europe, and it is interchangeably referred to as the T-BERD 5800, MTS 5800, MTS-5800, MTS5800, Media Test Set 5800 and 5800.

The Smart Class 4800 is also referred to as the SC 4800/4800P, SC 4800, SC4800, and 4800.

## Components

The following terms are used to represent instrument components throughout this manual:

- **Application module** — Used throughout this manual to refer to the component that provides test functionality to the assembled instrument. This manual supports two application modules: the **MSAM** and **CSAM**.

The T-BERD / MTS 5800 and 5800-100G are all-in-one test instruments which do not require an application module; however, optional modules are available and can be attached to the devices for additional functionality.

- **Assembly** — Used throughout this manual to refer to a complete *set of components* assembled as an instrument and used for testing.
  - **DMC assembly**, consisting of a T-BERD/MTS 8000 base unit, an intermediary Dual Module Carrier (DMC), and up to two MSAMs with up to four Physical Interface Modules (PIMs, two per MSAM), or up to two CSAMs (requires a DMC2).
  - **MSAM assembly**, consisting of either a T-BERD/MTS 6000A base unit with a single MSAM and up to two PIMs, or a T-BERD/MTS 8000 base unit with a DMCv2 and up to two MSAMs and up to four PIMs.
  - **CSAM assembly**, consisting of either a T-BERD / MTS 6000Av2 base unit with a single CSAM, or a T-BERD/MTS 8000 base unit with a DMCv2 and up to two CSAMs.
  - **5800, 5800-100G assembly**, consisting of a T-BERD/MTS 5800 test instrument and a battery module. Optional Optical Time Domain Reflectometer (OTDR), or Timing Expansion Module (TEM) modules are also available for the 5800. The 5800-100G and 5882 instruments have an internal GNSS receiver.
  - **SC 4800 and 4800P assembly**, consisting of a Smart Class 4800/4800P test instrument and a battery module.
  - **Base unit** — The unit which connects directly to the application module (MSAM or CSAM), DMC (if applicable), and power adapter, providing the user interface and a variety of connectivity and work flow tools. If optioned to do so, the base unit also allows you to measure emitted power, received power, and optical link loss on fiber optic networks.
- **Battery Module** — The module connected to the back of the T-BERD / MTS 8000 base unit, which supplies power whenever power is not provided using the AC power adapter.
- **Component**— Used throughout this manual to refer to an individual hardware *component* which is connected to the other components to build a complete test instrument (assembly). This manual supports the following components: the MSAM, CSAM, DMC, 5800 and SC 4800/4800P devices.
- **CSAM 100G Services Application Module**—Referred to generically as “the instrument” when inserted in the T-BERD / MTS 6000A base unit or the DMCv2 and a T-BERD / MTS 8000 base unit. The CSAM provides testing functionality for the base unit.
- **DMC** — Dual Module Carrier. The DMC is a two slot chassis which you can connect to the T-BERD / MTS 8000 base unit to test using up to two MSAM application modules and up to four PIMs, or up to two CSAMs (DMCv2 required).
- **Expansion Module** — A variety of expansion modules are available for some of the 5800 family of instruments to provide additional functionality. Available expansion modules are listed in [“Attaching an expansion module to the 5800v2/100G and 5882” on page 40](#).
- **FC** — Used to represent Fibre Channel on instrument connector panels and user interface. Also identifies the optical ports used for Fibre Channel testing.
- **MSAM Multiple Services Application Module** — Referred to generically as “the instrument” when inserted in the T-BERD / MTS 6000A base unit with at least one PIM, or the DMC and T-BERD / MTS 8000 base unit with at least one PIM. The MSAM and PIM provide testing functionality for the base unit.

- **PIM** — Physical Interface Module. The module inserted into one of up to two ports provided on the MSAM chassis. PIMs supply the physical connectors (interfaces) required to connect the MSAM to the circuit under test. A variety of cables, SFPs, and XFPs are offered as options, and are used to connect the PIMs to the circuit.
- **T-BERD / MTS 8000, 6000A** — The family of products, typically a combination of a base unit, a battery module, and one or more application modules. The DMC can be used on the T-BERD / MTS 8000 platform to test using two MSAMs or two CSAMS (DMCv2 required).
- **OTDR Module** — Optical Time Domain Reflectometer Module. The module can optionally be connected to the back of the 5800 to characterize optical networks.
- **OTN** — Optical Transport Network.
- **SyncE** — Synchronous Ethernet.
- **TEM Module** — Timing Expansion Module. The module can optionally be connected to the back of the T-BERD / MTS 5800 to support testing using a GNSS (Global Navigation Satellite System) based clock or other precise clock sources.
- **GPS chip** — A device that fulfills some of TEM's GNSS functions and can be used on T-BERD / MTS 5800-100G and 5882.
- **Viavi Ethernet test set** — A test set marketed by Viavi and designed to transmit an Acterna Test Packet (ATP) payload. These packets carry a time stamp used to calculate a variety of test results. The FST-2802 TestPad, the SmartClass Ethernet tester, the HST with an Ethernet SIM, the T-BERD/MTS 6000A MSAM, the T-BERD/MTS 5800, and SC 4800/4800P can all be configured to transmit and analyze ATP payloads, and can be used in end-to-end and loopback configurations during testing.
- **SC 4800 and 4800P** — Stand-alone units that do not support expansion modules.

## Transceivers

The following terms are used to represent the transceivers supported by the instruments documented in this manual:

- **CFP** — C Form-Factor Pluggable optical transceiver. A variety of optional CFPs (CFP, CFP2, and CFP4) and adapters are available for performing tests over 40G and/or 100G fiber circuits using your instrument.
- **Copper SFP** — Small Form-factor Pluggable module. Transceiver used to test copper over 10GigE LAN circuits.
- **QSFP+** — Quad Small Form-Factor Pluggable optical transceiver. A transceiver used to test 40G fiber circuits. A CFP2 to QSFP28 adapter supporting 100G fiber circuits can also be used in the CSAM.
- **SFP** — Small Form-factor Pluggable module. Used on the connector panel and throughout this manual to represent pluggable optical modules.
- **SFP+** — Enhanced Small Form-Factor Pluggable module. An enhanced SFP module designed to support data rates up to 10G.
- **XFP** — 10 Gigabit Small Form-Factor Pluggable optical transceiver. A transceiver used to test 10G fiber circuits.

## Line rates and signals

The following terms are used to represent the line rates and signals supported by the instruments in this manual:

- **10/100/1000 Ethernet** — Used to represent 10/100/1000 Mbps Ethernet. The connector panel may also use 10/100/1000M to identify the port to be used for 10/100/1000 Mbps Ethernet testing.
- **1GigE** — Used to represent 1 Gigabit Ethernet.
- **10G** — Used to represent 10 Gigabit circuits. *10GE* may also be used to identify the optical ports used for 10 Gigabit Ethernet LAN and WAN testing.
- **100G** — Used to represent 100 Gigabit circuits. *100GE* may also be used to identify the optical ports used for 100 Gigabit Ethernet testing.
- **OC-n** — Used to refer to each optical SONET rate (OC-3, OC-12, OC-48, and OC-192), where “n” represents the user-selected line rate.
- **STM-n** — Used to refer to each optical SDH rate (STM-1, STM-4, STM-16, and STM-64), where “n” represents the user-selected line rate.
- **STS-1** — Used to refer to the electrical equivalent of OC-1 (51.84 Mbps).
- **STM-1e** — Used to refer to the electrical equivalent of STM-1 (155.52 Mbps).
- **OTU1** — Optical Transport Unit 1. A 2.7G OTN signal designed to carry a SONET OC-48 or SDH STM-16 client signal. OTU1 is used on connector panels and user interfaces to identify the connectors and applications used for 2.7G OTN testing.
- **OTU2** — Optical Transport Unit 2. A 10.7G, 11.05G, or 11.1G OTN signal designed to carry SONET OC-192, SDH STM-64, or 10G Ethernet WAN and LAN client signals. OTU2 is used on connector panels and user interfaces to identify the connectors and applications used for 10.7G, 11.05G, or 11.1G OTN testing.
- **OTU3** — Optical Transport Unit 3. A 43G OTN signal designed to carry 40G BERT signals.
- **OTU4** — Optical Transport Unit 4. An 111.8G OTN signal designed to carry 100G Ethernet BERT and ODU4 encoded signals.

## Related information

This is the getting started guide for the DMC, Transport Module, CSAM, MSAM, 5800 and 5800-100G, and Smart Class 4800/4800P. It provides basic instructions for assembling the instrument components, setting up the instrument, instrument specifications, and contact information for Viavi’s Technical Assistance Center (TAC). Read this manual carefully before connecting your instrument to the circuit you are testing.

Use this guide in conjunction with the following manuals:

- The *8000 Base Unit User Manual*. This manual provides an overview, specifications, and instructions for proper operation of the 8000 base unit.
- The *6000A Base Unit User Manual*. This manual provides an overview, specifications, and instructions for proper operation of the 6000A base unit.

- The *T-BERD/MTS/SC Ethernet and Fibre Channel Testing Guide* for the T-BERD 5800 family of instruments, MSAM, and CSAM. For SC 4800/4800P only Ethernet, IP, TCP/UDP and IP Video are applicable. The manual provides detailed instructions for testing on each of the listed networks. It also explains how to run key scripts and describes each of the available test results.
- The *T-BERD/MTS/SC SONET, SDH, OTN and PDH Testing Manual* for the T-BERD 5800 family of instruments, MSAM, and CSAM. For SC 4800/4800P only PDH is applicable. The manual provides detailed instructions for testing on each of the listed networks.
- The *Data Communications and Diphasse Testing Manual* for the MSAM. The manual provides detailed instructions for testing Datacom and Diphasse interfaces using the MSAM.
- The *Timing Expansion Module (TEM) User Manual* for the optional TEM Module that is available for high accuracy timing when testing using the 5800v2 and 5800-100G.
- The *OTDR Functions, Options, and Software Applications User Manual* for the optional OTDR modules that are available for testing using the 5800v2 and 5800-100G.
- *Help*. The topics addressed in the three testing manuals are also available on your instrument in an HTML format.

## Conventions

This guide uses typographical and symbols conventions as described in the following tables.

**Table 1** Text formatting and other typographical conventions

Item(s)	Example(s)
Buttons, keys, or switches that you press or flip on a physical device.	Press the <b>On</b> button. – Press the <b>Enter</b> key. – Flip the <b>Power</b> switch to the on position.
Buttons, links, menus, menu options, tabs, or fields on a PC-based or Web-based user interface that you click, select, or type information into.	Press the <b>On</b> button. – Click <b>File &gt; Properties</b> . – Click the <b>Properties</b> tab. – Type the name of the probe in the <b>Probe Name</b> field.
Directory names, file names, and code and output messages that appear in a command line interface or in some graphical user interfaces (GUIs).	<code>\$NANGT_DATA_DIR/results</code> (directory) – <code>test_products/users/defaultUser.xml</code> (file name) – All results okay. (output message)

**Table 1** Text formatting and other typographical conventions (Continued)

Item(s)	Example(s)
Text you must type exactly as shown into a command line interface, text file, or a GUI text field.	<p>– Restart the applications on the server using the following command:</p> <pre>\$BASEDIR/startup/np_iu_init restart</pre> <p>Type: <code>a:\set.exe</code> in the dialog box.</p>
References to guides, books, and other publications appear in <i>this typeface</i> .	Refer to <i>Newton's Telecom Dictionary</i> .
Command line option separators.	<code>platform [a b e]</code>
Optional arguments (text variables in code).	<code>login [platform name]</code>
Required arguments (text variables in code).	<code>&lt;password&gt;</code>

**Table 2** Symbol conventions

	This symbol indicates a note that includes important supplemental information or tips related to the main text.
	This symbol represents a general hazard. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See <a href="#">Table 3</a> for more information.
	This symbol represents an alert. It indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.
	This symbol represents hazardous voltages. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See <a href="#">Table 3</a> for more information.
	This symbol represents a risk of explosion. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message. See <a href="#">Table 3</a> for more information.
	This symbol represents a risk of a hot surface. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See <a href="#">Table 3</a> for more information.
	This symbol represents a risk associated with fiber optic lasers. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message. See <a href="#">Table 3</a> for more information.
	This symbol, located on the equipment, battery, or the packaging indicates that the equipment or battery must not be disposed of in a land-fill site or as municipal waste, and should be disposed of according to your national regulations.

**Table 3** Safety definitions

Term	Definition
<b>DANGER</b>	Indicates a potentially hazardous situation that, if not avoided, <i>will</i> result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol. See <a href="#">Table 2</a> for more information.
<b>WARNING</b>	Indicates a potentially hazardous situation that, if not avoided, <i>could</i> result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol. See <a href="#">Table 2</a> for more information.
<b>CAUTION</b>	<p>Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury and/or damage to equipment.</p> <p>It may be associated with either a general hazard, high voltage, or risk of explosion symbol. See <a href="#">Table 2</a> for more information.</p> <p>When applied to software actions, indicates a situation that, if not avoided, could result in loss of data or a disruption of software operation.</p>
<b>ALERT</b>	Indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.

## Safety and compliance information

Safety and compliance information for the instrument are provided in printed form and ship with your instrument.

The MSAM and CSAM are part of a modular platform; therefore, the safety and compliance information are provided with the base unit in the supporting base unit user manual (delivered in the equipment's help system), with additional information in the printed *T-BERD / MTS-6000 Getting Started Manual* card or the *T-BERD / MTS-8000 Getting Started Manual* card. The cards are shipped and delivered with their respective base units.

For a 5800 and 4800 instruments, refer to the *T-BERD/MTS 5800, SC 4800 and TEM Safety Information* document that is shipped with the instrument.

## Technical assistance

If you require technical assistance, call 1-844-GO-VIAVI. For the latest TAC information, go to <http://www.viavisolutions.com/en/services-and-support/support/technical-assistance>.

# Overview

This chapter provides a general description of each of the test instruments. Topics discussed in this chapter include the following:

- “About the instruments” on page 2
- “Features and capabilities” on page 2
- “Configuring your instrument” on page 4
- “What ships with your instrument?” on page 4
- “Accessories” on page 6
- “About the T-BERD / MTS 5800 and SC 4800” on page 8
- “About the CSAM Assembly” on page 14
- “About the MSAM Assembly” on page 17
- “About the DMC Assembly” on page 24
- “Viavi recommended optical adapters and transceivers” on page 25

## About the instruments

The T-BERD / MTS MSAM, CSAM, 5800, 5800-100G are all-in-one test solutions for the following networks:

- T-Carrier (DS1 and DS3)
- PDH (E1 through E4)
- SONET (STS-1 through OC-192)
- SDH (STM-1e through STM-64)
- Ethernet (10/100/1000, 100 M Optical, 1 Gigabit Optical, 10 Gigabit Ethernet LAN and WAN, 40 Gigabit Optical and 100 Gigabit Optical)
- IP (10/100/1000, 100 M Optical, 1 Gigabit Optical, 10 Gigabit Ethernet LAN and WAN, 40 Gigabit Optical and 100 Gigabit Optical)
- TCP/UDP (10/100/1000, 100 M Optical, 1 Gigabit Optical, and 10 Gigabit Ethernet LAN)
- IP Video (10/100/1000, 100 M Optical, 1 Gigabit Optical, and 10 Gigabit Ethernet LAN)
- Fibre Channel (1G, 2G, 4G, 8 G, 10G, 16G and 32G)  
(8G available only on MSAMv2 with 8G-capable SFP+ or XFP transceiver)
- OTN (2.7G, 10.7G, 11.05G, 11.1G, 43.02G and 111.8G)

The Smart Class 4800 and 4800P are stand-alone units that do not support expansion modules and have fewer features. Refer to your customer documentation for a list of covered networks.

The MSAM also accepts physical interface modules (PIMs) designed to allow you to test Data communications and Diphas interfaces. The 5800 family of instruments allows you to connect optional expansion modules for enhanced optical testing or a highly accurate timing source during testing.

Each of the instruments is designed to be a rugged, portable, battery-operated test solution that facilitates the quick turn-up and troubleshooting of multiple services and network elements in the Metro and Core network. This allows providers who are expanding their offerings into new data and wavelength services to deploy a single technician to install and maintain new elements and services using one integrated module or integrated instrument.

## Features and capabilities

Features and capabilities of the instruments include the following (assuming your instrument is optioned and configured to do so):

- Electrical interfaces support — Ability to test circuits from a variety of electrical interfaces (DS1, E1 BNC, E1 RJ-48, E3, DS3, STS-1, E4, and STM-1e BNC or HD-BNC).
- SONET/SDH interfaces support — Ability to test circuits from a variety of SONET and SDH interfaces (OC-3/STM-1 through OC-192/STM-64).

- Ethernet interface support — Ability to test circuits from a variety of Ethernet interfaces (10/100/1000 Mbps Electrical through 100M and 1 GigE optical circuits), 10 GigE LAN and WAN, and 100 GigE optical circuits at 850 nm, 1310 nm, and 1550 nm.
- SyncE interface support — Ability to test circuits from a variety of SyncE interfaces.
- Fibre Channel interface support — Ability to test 1, 2, 4, 8, 16 and 32 Gigabit (on T-BERD / MTS 5800-100G only) Fibre Channel interfaces.
- OTN support — Ability to test OTU1 (2.7G) and OTU2 (10.7G, 11.05G, and 11.1G) circuits by performing FEC tests, BER tests, and inserting errors and alarms. Also test OTU3 (43.02G) and OTU4 (111.8G) circuits by performing BERT and Ethernet tests and inserting errors and alarms. All tests are to verify that network performance conforms to G.709 standards.
- High Accuracy Timing support — Using the optional TEM module and a T-BERD / MTS 5800v2, the ability to provide a highly accurate timing reference during testing and precisely synchronize the timing on multiple instruments.
- OTDR support — Ability to use your instrument to conduct OTDR testing and characterize an optical fibre cable.
- Intuitive user interface — User interface facilitates quick test configuration and execution, and easy interpretation of test results.
- Detailed test results — You can use the entire screen to observe test results, or you can collapse and expand certain test results for which a variety of measurements are made (such as current, average, minimum, or peak throughput measurements). You can also suppress graphical result collection if you intend to run resource intensive applications. For Dual Term or Dual Through applications, you can observe test results for both ports simultaneously.
- Automatic traffic transmission — You can optionally set up Ethernet, IP, TCP/UDP, and Fibre Channel test applications to generate and transmit traffic automatically whenever you turn the laser on (for optical applications).
- VT-100 terminal emulation — If your instrument is optioned to do so, you can use it to emulate a VT-100 terminal, and then connect it to a network element via a serial interface to gather information about the element.
- Optical power measurements — Ability to measure optical power.
- Automated RFC 2544 and Fibre Channel tests — In addition to the standard tests, expert tests are available which allow you to specify and review test settings quickly and efficiently.
- HTML viewer — An HTML viewer is available which allows you to easily view and navigate through HTML files on your instrument.
- Cable Test — Ability to examine the state of the cables, including AOC/DAC cables, used to transmit 10/25/40/100 GigE before you begin testing.
- Ethernet and Internet Protocol service verification — Ability to verify proper installation and maintenance of carrier-grade Ethernet and Internet Protocol services.
- IP video service verification — The ability to verify and troubleshoot IP video service.
- TCP/UDP, FTP, and HTTP protocol support — The ability to transmit and analyze traffic carried using the TCP/UDP, FTP, and HTTP protocols.

- VLAN, Q-in-Q, VPLS, MPLS, and stacked VLAN up to 8 tags encapsulation support — The ability to transmit and analyze VLAN, Q-in-Q, VPLS, MPLS and stacked VLAN up to 8 tags encapsulated Ethernet traffic.
- Dual view applications — When running multiple tests, you can view results for two tests side-by-side. For more information, see [“Viewing both tests” on page 129](#).
- Support for tunable SFP+ or XFPs — The ITU-T G.694.2 standard provides a frequency grid for DWDM which creates channel spacing. The channel spacing allows different carriers to run on the same fiber. When using a tunable SFP+ or XFP in our instrument, you can specify a channel, wavelength or frequency for the transceiver. If the tunable SFP+ or XFP uses a specification unit other than that specified in the interface, an automatic best-match calculation will be made to select the appropriate value. For more information, see [“Tuning SFP+ and XFP transceivers” on page 100](#).
- VNC password — Allows you to change the password on your test instrument.

For a comprehensive list of features and capabilities for each technology supported, refer to the *Testing Manual* that shipped with your instrument.

## Configuring your instrument

Each instrument is factory-configured to meet your unique testing requirements. When you place an order for an instrument, a customer service or sales representative will help you determine which base unit (if applicable), chassis, optics assembly, connector configuration, PIM, or testing options you need.

To discuss a specific hardware chassis, configuration, or the available testing options, contact your regional sales office. Contact information is provided on the back cover of this manual.

## What ships with your instrument?

The following items typically ship with your instrument:

- Base unit, application modules, and DMC — Depending on your order, the components required to test network elements and services are shipped to you. Components may include the T-BERD/MTS 8000 base unit, the T-BERD/MTS 6000 base unit, the DMC, the CSAM, or the MSAM. Software and hardware options are also available which enable you to expand your testing capabilities for T-Carrier/PDH, SONET/SDH, Ethernet, IP, TCP/UDP, IP Video, Fibre Channel, and OTN testing.
- Physical interface module (PIM) — Each MSAM provides up to two PIM slots, enabling you to connect and swap a variety of PIMs designed to test specific interfaces. After you select the MSAM chassis that best suits your needs, your customer service representative will let you know which PIMs are available for that particular chassis.
- The T-BERD / MTS 5800 and SC 4800 instruments are factory-configured to meet your testing requirements (see [Table 6 on page 10](#)).

- AC power adapter — A power adapter designed specifically for use with your instrument is included. Use only the Viavi AC Power Adapter that shipped with your particular instrument. For details, refer to “Powering the instrument” on page 56.
- Transceivers — When you order your instrument, a customer service representative will let you know which transceivers are available from Viavi. Additional transceivers can be ordered separately for an additional charge.
- Fiber Optic connectors — If your Module is configured for 10 Gigabit testing, one set of SC, FC, or ST fiber optic connectors is included with the module. When you order your module, a customer service representative will ask you which type of connectors (SC, FC, or ST) you would like. For single-mode interfaces, such as 100GBASE-LR4 or 40GBASE-LR4, the typical connector type used on the optics which Viavi provides is LC.

LC connectors, SFPs, and CFP adapters are also available for some interfaces and can be ordered separately for an additional charge.

The CSAM can be used with CFP or CFP2 optics (40/100G rates) or QSFP+ optics (40G rates). The CSAM can also be used with an optional CFP2 to QSFP28 adapter (100G rates).

- BNC to BNC adapter cable — If you order an instrument with SONET testing capabilities, two BNC to BNC adapter cables are included for DS3 and STS-1 applications. **Note:** T-BERD/MTS 5800-100G supports CFP4 and QSFP28 as native ports (i.e. no adapter is required).
- BNC to 440A adapter cable — If you order an instrument with SONET testing capabilities, two BNC to 440A adapter cables are included for DS3 and STS-1 applications.
- SMB to SMA adapter — Included with T-BERD/MTS 5800-100G.
- Carrying case — A carrying case is included with the MSAM. Always use this carrying case when transporting your instrument, and follow the instructions provided with the carrying case carefully.

If you ordered an instrument with optics, a transceiver case designed to accommodate up to six SFPs and three XFPs is also available. A PIM carrying case is also available, which can store up to three PIMs.

- User documentation — A Getting Started Manual and Testing Manuals (on USB memory stick), a list of Viavi recommended optics (SFP transceivers), and a comprehensive help system also ship with the instrument. Remote control command documentation is also available on the documentation USB memory stick.

Before testing, the application modules (and if applicable, the DMC) must be connected to a base unit, which can be ordered separately. Refer to the *8000 Base Unit User Manual* or the *6000A Base Unit User Manual* for a list of options and accessories offered for the base units.

## Unpacking the components

Viavi typically ships our instruments using anti-static packing material to stabilize the components inside the box.

When unpacking the components, verify that all the items you ordered are included in the package. Accessories may be shipped in a separate box.

After you unpack the components, you should inspect them for damage.

If undamaged, consider saving the box and packing materials in case you need to repackage the components for shipment. For information about shipping equipment, see [Appendix C “Storage and Shipment”](#).

## Inspecting the components for damage

After you unpack the components, examine the connectors, ports, LEDs, and screen for damage. Be sure to check the top, bottom, and front panels.

If you find damage, contact Viavi Customer Care at 1-844-GO-VIAVI. For the latest TAC information, go to <http://www.viavisolutions.com/en/services-and-support/support/technical-assistance>.

For information about returning equipment, see [“Returning equipment to Viavi”](#) on page 263.

## Accessories

[Table 4](#) lists some of the accessories available for the instruments.

**Table 4** Accessories

Accessory	Description
Transceivers	A variety of Viavi recommended SFP, SFP+, XFP, QSFP+, QSFP28, and CFP transceivers (and adapters) are available for testing optical circuits. Be certain to only use Viavi recommended transceivers and adapters with your test instrument. Each of the transceivers and adapters offered by Viavi as an accessory is MSA compliant, and has been qualified for use with your instrument. A list of Viavi recommended optics shipped with your instrument or upgrade kit. For a list of currently supported optics, contact your Viavi TAC representative or your local Viavi sales office. Please refer to your transceiver (or adapter) manufacturer’s site for detailed specifications.
Cables	A variety of Viavi-recommended optical cables are available for connecting to the circuit you are testing.
TB/MTS-5800-EPP	The 5800 Ethernet Pairing Partner is an accessory used for enhanced RJ-45 Ethernet cable diagnostics. It includes two RJ-45 ports, one for completing a wire-map test with a TB/MTS-5800 and the other for performing a shield ground continuity test with the RJ-45 connector on port 2 of a TB/MTS-5882.

**Table 4** Accessories (Continued)

Accessory	Description
TB/MTS-5800-TOD	The 5800 Time of Day accessory is a USB powered accessory that accepts two (2) RS-422 interfaces on an 8 pin RJ interface (8P8C – 8 position 8 contact). The Time of Day messages are passed to the TB/MTS-5800 mainframe via a USB type B (Mini-B) connector. The One-Pulse-Per-Second (1 PPS) signals are presented to the 5800 on an SMA coaxial interface.
Attenuators	A variety of Viavi-recommended attenuators are available for attenuating transmitted and received signals if necessary.
Rack Mount	This kit allows you to mount various devices in a 19 inch rack.
Hard case	A hard case allows you to protect your test instrument.
Soft case	Light weight cases allow you to store your test instrument when it is not being used.  The MSAM cases are designed to hold a single base unit with a single MSAM. A PIM carrying case is also available, which can store up to three PIMs. In addition to the MSAM and PIM cases, a transceiver case designed to accommodate up to six SFPs and three XFPs is available.

Refer to the *8000 Base Unit User Manual* or *6000A Base Unit User Manual* for a list of accessories offered for the base unit.

**NOTE:**

For additional information about available configurations, options, and services, contact your local Viavi representative or contact Viavi via the company web site, [www.viavisolutions.com](http://www.viavisolutions.com).

## Optional Expansion Modules

Table 5 lists the available optional expansion modules for the product families and test instruments that are supported in this manual. The expansion modules are configured and offered with different capabilities. For example, different Optical Time-Domain Reflectometer (OTDR) Modules are available that support singlemode, multimode, short range, long range, extended range, and passive optical network (PON) fiber testing.

In addition to providing specific capabilities, each expansion module is designed to support specific product families, and is compatible with specific versions (models) of any given test instrument that is part of the product family. For example, the Timing

Expansion Module (TEM) is designed to support the 5800 product family, and is only compatible with the 5800v2 and 5800-100G test instruments.

**Table 5** T-BERD/MTS Platform Expansion Modules

Modules	Used to
OTDR	Measure and characterize fiber loss. OTDR expansion modules are available to test: <ul style="list-style-type: none"> <li>– 850 nm and 1300 nm multimode fibers spanning short distances;</li> <li>– 1310 nm, 1550 nm, and/or filtered 1625 nm single-mode fibers spanning long distances;</li> <li>– 1310 nm, 1550 nm, and/or filtered 1625 nm single-mode fibers supporting extended distances (metro access);</li> <li>– 1310 nm, 1490 nm, 1550 nm, and/or filtered 1625 nm singlemode fibers supporting passive optical networks (PON);</li> <li>– Multimode (850 nm and 1300 nm) <i>and</i> singlemode (1310 nm and 1550 nm) fibers.</li> </ul> All modules allow you to measure and characterize fiber loss; others also support work flow optimization and accurate fibre-link fingerprinting.
CDWM Optical Spectrum Analyzer (COSA)	Characterize fiber links with exact CWDM wavelengths per ITU-T G.694.2, and simulate a CWDM transmitter for insertion loss testing and end-to-end continuity checks.
TEM	Provide a high accuracy timing reference when testing using a 5800v2.



**NOTE:**

For additional information about the expansion modules that are available for your test instrument, contact your local Viavi representative, or contact Viavi via the company web site, [www.viavisolutions.com](http://www.viavisolutions.com). Data sheets with specifications and product family brochures are also available on the site.

## About the T-BERD / MTS 5800 and SC 4800

The T-BERD / MTS 5800 (shown in [Figure 1](#)) and Smart Class 4800/4800P (shown in [Figure 2](#)) family of testers are designed to be rugged, portable, battery-operated test solutions that facilitate the quick turn-up and troubleshooting of multiple services and network elements in the Metro and Core network. This allows providers who are expanding their offerings into new data and wavelength services to deploy a single

technician to install and maintain new elements and services using one integrated instrument.

**Figure 1** T-BERD / MTS 5800-100G



**Figure 2** SC 4800



## Configuring the T-BERD / MTS 5800 and SC 4800

The T-BERD / MTS 5800 and SC 4800 units are factory-configured to meet your testing requirements.

When you place an order for a 5800 or 4800, a customer service or sales representative will help you determine the right configuration for your needs.

Table 6 describes the available configurations.

**Table 6** T-BERD / MTS 5800 and SC4800 configurations

Catalog Number	Configuration
TB/MTS-5801	T-BERD / MTS 5800 Single Port Test Instrument
TB/MTS-5802	T-BERD / MTS 5800 Dual Port Test Instrument
TB/MTS-5812	T-BERD / MTS 5800 10g and Dual Port Test Instrument
TB/MTS-5812LB	T-BERD / MTS 5800 10G and Dual Port Loop Back Device (used for loop back applications only; no traffic generation)
TB/MTS-5801P	T-BERD / MTS 5800 Single Port Test Instrument with PDH
TB/MTS-5802P	T-BERD / MTS 5800 Dual Port Test Instrument with PDH
TB/MTS-5812P	T-BERD / MTS 5800 10G and Dual Port Test Instrument with PDH
TB/MTS-5811P	T-BERD/MTS 5800 V2 Single 10G Port Test Instrument with PDH
TB/MTS-5811PG	T-BERD / MTS 5800 V2 Single 10G Port Test Instrument with PDH, no WiFi / Bluetooth
TB/MTS-5811PL	T-BERD / MTS 5800 V2 Single 10G Port with T1/E1
TB/MTS-5882	T-BERD / MTS 5800 Dual 10G Port Test Instrument with PDH and internal GNSS receiver
TB/MTS-5822P	T-BERD / MTS 5800 V2 Dual 10G Port Test Instrument with PDH
TB/MTS-5822PG	T-BERD / MTS 5800 V2 Dual 10G Port Test Instrument with PDH, no WiFi / Bluetooth
TB/MTS-5800-100G	T-BERD / MTS 5800-100G Test Unit with internal GNSS receiver
TB/MTS-5800-100GG	T-BERD / MTS 5800-100G Test Unit with internal GNSS receiver, no WiFi / Bluetooth
SC4800	Smart Class 4800 Single Port Test Instrument
SC4800P	Smart Class Single Port Test Instrument with T1/E1 port



**NOTE:**

Some configurations also require you to purchase and install certain testing options; others require specific hardware connectors to connect to circuits for testing. For example, if your instrument does not have a connector designed to support 1GigE Optical testing, you can not transmit and analyze a signal or traffic over a 1GigE circuit. OTDR testing and testing using GNSS timing requires the connection of supporting OTDR and TEM modules or an internal GNSS receiver.

You can quickly determine whether or not your instrument supports certain applications by exploring the technologies, rates, and test modes presented on the Test menu and by reviewing the settings available when you configure a test.

To discuss a specific configuration or to order accessories for your 5800 or 4800, contact Viavi Customer Care or your regional sales office. Contact information for regional sales headquarters is provided on the back cover of this manual. You can also contact Viavi through the company web site, [www.viavisolutions.com](http://www.viavisolutions.com).

## Exploring the SC 4800 and T-BERD / MTS 5800

### Smart Class 4800

The connector panels on SC 4800 and 4800P have one 10/100/1000 port and one SFP+ port. SC 4800P has an additional DS1/E1 port.

**Figure 3** SC 4800 connector panel



**Figure 4** SC 4800P connector panel



### **10/100/1000M connector**

A 10/100/1000M connector allows you to connect the SC 4800 to an electrical Ethernet circuit to transmit and analyze traffic.

### **SFP+ connector**

The SFP+ connector allows you to connect the SC 4800 to 1 Gigabit Ethernet, 100 FX, or 100M Ethernet circuit to transmit and then analyze traffic.

### **DS1/E1 connector (on SC 4800P only)**

One balanced 120 Ohm RJ 48 transmitter/receiver allows you to connect the 4800 to an E1 (2M) circuit to transmit and analyze traffic.



**NOTE:**

The E1 and DS1 interfaces should not be connected at the same time. After running your test, disconnect from one interface before connecting to the other interface.

## T-BERD / MTS 5800

The connector panel of the T-BERD / MTS 5800 provides the connectors and SFP+ connectors (and QSFP/CFP4 on 5800-100G) used to connect the instrument to the circuit for testing.

**Figure 5** T-BERD / MTS 5800-100G connector panel



After selecting a test application, LEDs illuminate indicating which connectors to use for your test.

### **SFP+ connectors**

Two SFP+ connectors allow you to connect the 5800 to a SONET, SDH, 1 Gigabit Ethernet, 10GigE, 100 FX, or 100M Ethernet circuit to transmit and then analyze traffic.

### **QSFP/CFP4 connectors**

The QSFP connectors provide 40G and 100G capabilities, so capabilities cover QSFP+/QSFP28. The CFP4 port is for 100G usage.

### **E3/DS3/STS-1/E4/STM1(e) connectors**

One Tx/Rx pair or two receivers allow you to connect the 5800 to an E3, DS3, STS-1, E4, or STM-1e circuit to transmit and analyze traffic.

### **10/100/1000M connectors**

Up to two 10/100/1000M connectors allow you to connect the 5800 to an electrical Ethernet circuit to transmit and analyze traffic.

## E1 connectors

Two unbalanced 75 Ohm BNC receivers, and one unbalanced 75 Ohm BNC transmitter allow you to connect the instrument to an E1 (2M) circuit to transmit and analyze traffic. The Rx 2 receiver can be used as the input for a SETS signal or an E1 reference clock.

## E1 RJ 48 transmitter/receiver

One balanced 120 Ohm RJ 48 transmitter/receiver allows you to connect the 5800 to an E1 (2M) circuit to transmit and analyze traffic.



### NOTE:

The E1 and DS1 interfaces should not be connected at the same time. After running your test, disconnect from one interface before connecting to the other interface.

## DS1 connectors

Two DS1 Bantam receivers and one DS1 Bantam transmitter allow you to connect the 5800 to a DS1 circuit to transmit and analyze traffic. The Rx 2 receiver can be used as the input for a DS1 BITS signal.

## EXT CLK connector

SMA connector for external clock input. Use the SMA to BNC barrel adapter if a BNC connector is needed (applicable to MSAM v1 only).

## Headset/handset connector

Use the headset connector when dropping voice traffic from a DS0 interface.

## USB host connector

Located on the right side of the unit, the two USB host connectors (USB 2.0) allow connection of a USB drive, or other USB device.

## LAN connector

Located on the right side of the unit, the RJ-45 LAN connector is used to connect to your local network.

# About the CSAM Assembly

The CSAM is used in combination with the T-BERD/MTS 6000A base unit, the T-BERD /MTS 6000AV2 base unit or a T-BERD/MTS 8000 base unit with a DMC chassis. Each CSAM is factory-configured to meet your unique testing requirements.

**Figure 6** T-BERD/MTS 6000AV2 with CSAM user interface



When you place an order for an CSAM, a customer service or sales representative will help you determine the following:

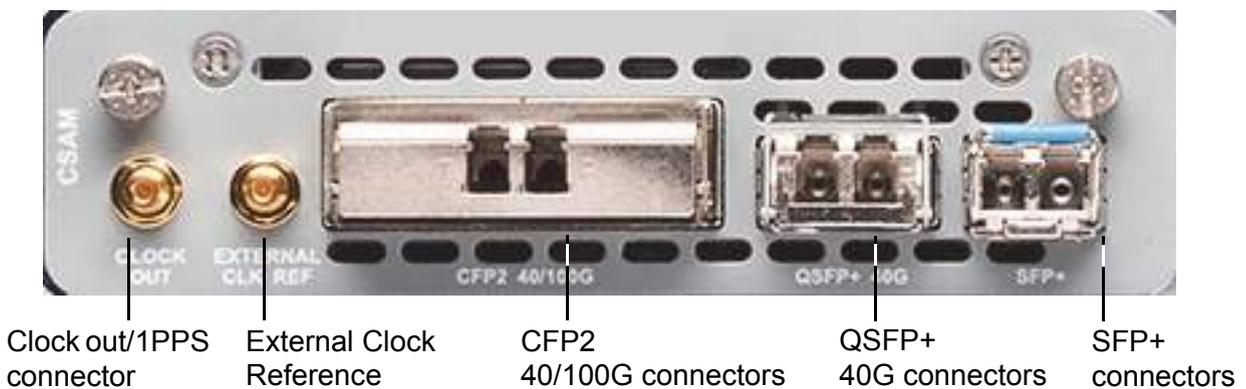
- Whether you want to use the CSAM with a T-BERD/MTS 6000A base unit, or with a T-BERD/MTS 8000 base unit with a Dual Module Carrier (DMCv2).
- If you ordered a CSAM that provides CFP or QSFP+ connectors; associated transceivers (and potentially CFP adapters) are required. A variety of Viavi-approved adapters and transceivers are available.

For assembly instructions, see “[Inserting MSAMs or CSAMs into the 6000A base unit or DMC](#)” on page 35. All dual port applications require two connectors. CFP and QSP+ adapter and transceiver specifications vary depending on the manufacturer.

## Exploring the CSAM connector panel

The CSAM connector panel provides the connectors used to connect the module to the circuit for testing. See [Figure 7](#).

**Figure 7** CSAM Connector Panel



## External Clock Reference and Clock Out/1PPS connectors

These connectors provide input/output of synchronization reference signals (BITS, SETS, 2.048MHz, and 100Mhz) and allow you to connect the CSAM to external sources to obtain synchronization timing signals. The Clock Out/1PPS connector can be used as an input or output.

## CFP2 40/100G connectors

A single CFP connector (labeled *CFP2 40/100G*) supports a CFP2 transceiver, and allows you to connect the CSAM to a 40G SONET/SDH, 40 or 100G Ethernet, or OTU3 (43.02 G)/OTU4 (111.8 G) circuit to transmit and then analyze traffic during testing. You can also use a CFP2 to QSFP28 adapter to connect to and perform tests on 100G Ethernet or OTU4 (111.8 G) circuits; or a CFP2 to CFP4 adapter and a CFP4 transceiver.

## QSFP+ 40G connectors

A single QSFP+ connector (labeled *QSFP+ 40G*) supports QSFP+ transceivers, and allows you to connect the CSAM to a 40G SONET/SDH, 40G Ethernet, or OTU3 (43.02 G) circuit to transmit and then analyze traffic during testing (for more information about the rates, check with your customer documentation).

## MPO connectivity

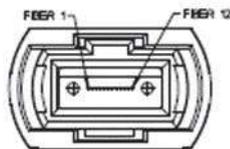
LR4 interfaces for 40G and 100G connectivity are based on regular single mode fibers and use LC connectors.

SRx interfaces are based on multimode ribbon cables and use MPO connectors.

MSA compliant QSFP+ transceivers (with a 40GBASE-SR4 interface) and a CFP2 to QSFP28 adapter (with a 100GBASE-SR4 interface) have been qualified by Viavi for use with the CSAM. CFP transceivers and adapters (with a 100GBASE-SR10 interface) have also been qualified.

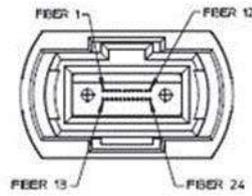
40GBASE-SR4 and 100GBASE-SR4 interfaces use single row MPO connectors with 12 fiber terminations (as illustrated in [Figure 8](#)).

**Figure 8** 12-fiber MPO connector



100GBASE-SR10 interfaces use double row MPO connectors with 24 fiber terminations (as illustrated in Figure 9).

**Figure 9** 24-fiber MPO connector



## SFP+ connectors

Two SFP connectors allow you to connect the CSAM to a SONET, SDH, 1 Gigabit Ethernet, 100 FX, 100M, or 1, 2, or 4 Gigabit Fibre Channel circuit to transmit and then analyze traffic during testing. If your instrument is configured and optioned to do so, you can also analyze IP Video traffic on the Ethernet circuits. OTU-1 connections are only supported on PORT# 1.

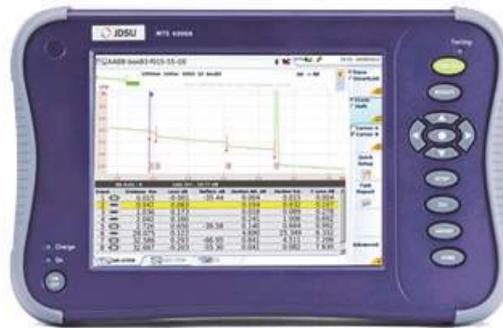
## About the MSAM Assembly

The MSAM is used in combination with the T-BERD/MTS 6000A base unit, the T-BERD /MTS 6000AV2 base unit or a T-BERD/MTS 8000 base unit with a DMC chassis. Each MSAM is factory-configured to meet your unique testing requirements.

**Figure 10** T-BERD/MTS 6000A with MSAM user interface



**Figure 11** T-BERD/MTS 6000AV2 with MSAM user interface



When you place an order for an MSAM, a customer service or sales representative will help you determine the following:

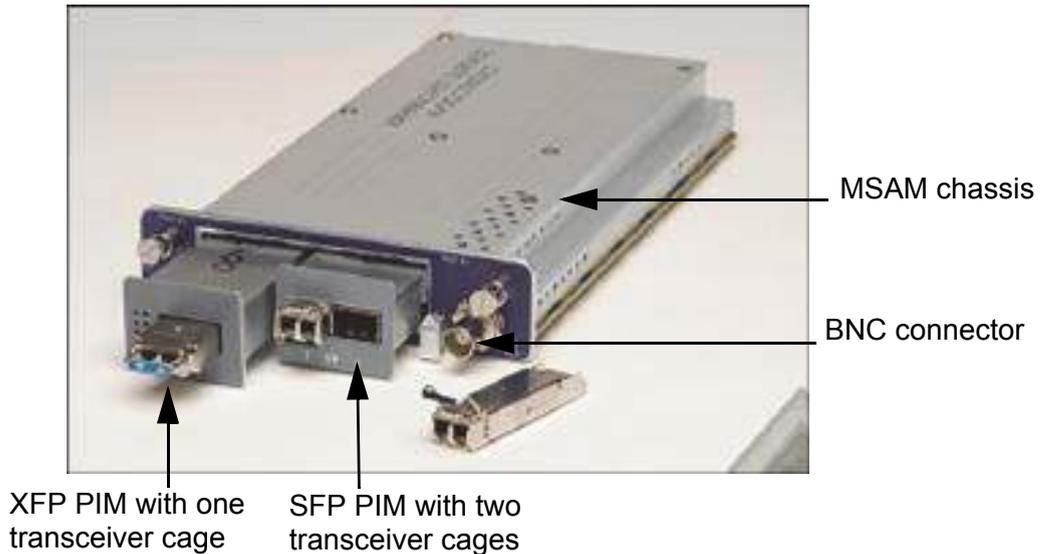
- Whether you want to use the MSAM with a T-BERD/MTS 6000A base unit, or with a T-BERD/MTS 8000 base unit with a Dual Module Carrier (DMC).
- The type of MSAM chassis required (for example, you can order a single or dual port chassis that supports PIMs designed for 1.544 Mbps through 10 Gigabit testing).
- The PIM (or PIMs) required for testing 1.544 Mbps through 10 Gigabit circuits. If you ordered a dual port chassis and you intend to use both ports simultaneously (for example, in dual port through mode), PIMs should be ordered for both ports.
- If you ordered an SFP or XFP PIM, the transceivers are required. A variety of Viavi-approved SFP and XFP transceivers are available for each PIM.

The plug in panel of each MSAM provides one or more physical interface module (PIM) ports. Before connecting the instrument to the circuit for testing, you must insert the required PIMs into the ports, and then insert the appropriate SFPs or XFPs into the transceiver cages provided on the PIMs.

## MSAM chassis

Each MSAM chassis provides the application module software, one or two PIM ports, and a 75 OHM BNC connector (used for external timing). Several types of chassis are available; therefore, your unit may not have both of the ports illustrated in [Figure 12](#).

**Figure 12** MSAM chassis (dual port with XFP and SFP PIMs)



**NOTE:**  
The MSAMv2 chassis has an additional USB host connector to the right of Port 2 and the BNC EXT REF connector is replaced with a SMA CLK I/O connector.

[Table 7](#) lists the available MSAM chassis.

**Table 7** MSAM chassis

Catalog Number	Description	
C0400	Single Port	1.544 Mbps to 4 Gbps
C0400-v2	Single Port	1.544 Mbps to 10 Gbps
C0404	Dual Port <sup>1</sup>	1.544 Mbps to 4 Gbps
C0404-v2	Dual Port	1.544 Mbps to 6 Gbps
C1000	Single Port	1.544 Mbps to 10 Gigabit
C1000LB	Single Port	10 Mbps to 10 Gbps Loopback Only
C1004	Dual Port <sup>1</sup>	– One 1.544 Mbps to 10 Gbps port – One 1.544 Mbps to 4 Gbps port
C1010-v2	Dual Port	1.544 Mbps to 10 Gbps

1. A dual port chassis is required if you intend to use the MSAM for OTN testing.

## USB connector

The MSAMv2 USB connector provides analog audio using a Viavi analog headset and USB-to-analog adapter. When using the MSAMv2, the audio from the MSAMv2 is used (USB audio from the base unit is disabled). USB 2.0 is not supported. For best audio quality, the switch on the headset should be set to the lowest position (the smallest of the three dots, closest to the wire).

## SMA connector

The MSAMv2 SMA connector provides access to external reference timing



### CAUTION: DAMAGE TO COMPONENTS

Use caution when connecting the cable to the SMA connector. Over-tightening could damage internal components. Finger tighten only.

For assembly instructions, see [“Inserting MSAMs or CSAMs into the 6000A base unit or DMC” on page 35.](#)

## MSAM PIMS

[Table 7](#) lists the PIMs available for testing from various interfaces using the MSAM.

**Table 8** MSAM PIMs

Catalog Number	Description	Compatible Chassis
CPHSDATA	Data communications PIM with universal data communications connector.	C0404 C1004 C0404-v2 C1010-v2
CPCDI	Diphase PIM with dual BNC connectors	C0404 C1004 C0404-v2 C1010-v2
CPDS1BANT	DS1 jitter capable PIM with Bantam connector A DS1 PIM is shown in <a href="#">Figure 15 on page 22.</a>	All
CPE1BNC	E1 jitter capable PIM with BNC connector An E1 PIM with a BNC connector is shown in <a href="#">Figure 16 on page 23.</a>	All
CPE1RJ48	E1 jitter capable PIM with RJ-48 connector	All
CPE3DS3BNC	E3/DS3/STS-1 jitter capable PIM An E3/DS3/STS-1 PIM is shown in <a href="#">Figure 17 on page 23.</a>	All

**Table 8** MSAM PIMs (Continued)

Catalog Number	Description	Compatible Chassis
CPE4STM1BNC	E4/STM-1e jitter capable PIM with BNC connector An E4/STM1(e) PIM is shown in <a href="#">Figure 18 on page 23</a> .	All
CPSFP	SFP PIM Provides two transceiver ports, allowing you to insert two transceivers designed to support different wavelengths. Only one transceiver can be used for testing at a time. An SFP PIM is shown in <a href="#">Figure 12 on page 19</a> .	All
CPSFPPLUS	SFP+ PIM Provides two transceiver ports, allowing you to insert two SFP or SFP+ capable transceivers designed to support different wavelengths.	All
CPXFP	XFP PIM Provides one transceiver port. An XFP PIM is shown in <a href="#">Figure 12 on page 19</a> .	C1000 C1004 C1000LB C1010-v2
CPRJSYNCE	SyncE PIM	All

Photos of the HS Datacom and Diphase PIMs are provided in [Figure 13](#) and [Figure 14](#).

**Figure 13** Datacom PIM



**Figure 14** Dipphase PIM



Photos of the DS1, E1 BNC, E1 RJ-48, E3/DS3/STS-1, and E4/STM-1e PIMs are provided in [Figure 15 on page 22](#) through [Figure 18 on page 23](#).

**Figure 15** DS1 PIM



Figure 16 E1 BNC PIM



Figure 17 E3/DS3/STS-1 PIM



Figure 18 E4/STM1(e) PIM

For assembly instructions, see [“Inserting, removing, and swapping PIMs in the MSAM” on page 37.](#)

## Restrictions

With the introduction of the MSAMv2, 6000Av2, and 8000v2, new applications are enabled due to variations in the design. If you require voice support for DS VF and VoIP you are encouraged to use a MSAMv2 with all versions of the 6000A and 8000 mainframes.

## About the DMC Assembly

The DMC chassis is used with the T-BERD/MTS 8000 base unit. It provides two MSAM or CSAM slots, allowing you to insert two MSAMs and up to four PIMs, or two CSAMs. This provides connections for testing up to four independent circuits simultaneously.

**Figure 19** T-BERD/MTS 8000 base unit with a DMC



Figure 19 shows a DMC connected to a base unit. For assembly instructions, see [“Connecting a DMC to a base unit” on page 28.](#)

## Base unit requirements

if you intend to test using two MSAMs or CSAMs in a DMC chassis, verify that the T-BERD/MTS 8000 base unit satisfies the requirements stated in [Table 9 on page 28.](#)

If your base unit does not satisfy the DMC requirements, contact Viavi Customer Care for instructions on returning the base unit for a factory upgrade. For details, see [“Returning equipment to Viavi” on page 263.](#)

## Restrictions

With the introduction of the MSAMv2 and 8000v2, new applications are enabled due to variations in the design. If you require voice support for DS VF and VoIP you are encouraged to use a MSAMv2 with all versions of the 8000 mainframes.

## Viavi recommended optical adapters and transceivers

To ensure proper operation of your instrument during testing, we strongly recommend purchasing the required adapters and transceivers from Viavi. These components have been tested to verify that they will perform reliably with our test instruments.

A list of recommended optics can be found by selecting **Recommended Optics** from the Help menu. Or you can obtain the list by contacting Viavi Customer Care, or contacting Viavi via the company web site, [www.viavisolutions.com](http://www.viavisolutions.com).



# Assembling Your Instrument

This chapter explains how to assemble the components of your T-BERD / MTS 5800, MSAM, or CSAM before testing. Topics discussed in this chapter include the following:

- “Preparing for assembly” on page 28
- “Connecting a DMC to a base unit” on page 28
- “Inserting MSAMs or CSAMs into the 6000A base unit or DMC” on page 35
- “Inserting, removing, and swapping PIMs in the MSAM” on page 37
- “Attaching an expansion module to the 5800v2/100G and 5882” on page 40
- “Handling CFP adapters and transceivers” on page 43
- “Handling SFP/SFP+, XFP, and QSFP+ transceivers” on page 48
- “Attaching an external optical connector” on page 51
- “Disconnecting the DMC” on page 52

## Preparing for assembly

Before you unpack the components that comprise your test instrument, review the following instructions in [Chapter 1 “Overview”](#):

- “Unpacking the components” on page 5
- “Inspecting the components for damage” on page 6

## Connecting a DMC to a base unit

Before connecting your DMC to a T-BERD/MTS 8000 base unit, review the key principles and base unit requirements, and gather the proper tools.

### Key principles

When connecting or disconnecting the instrument components, focus on the following principles to ensure a secure connection and avoid damaging the connectors:

**Sequence.** If you are connecting a DMC to an 8000 base unit, *the DMC must be connected directly to the base unit* with no modules between the base unit and the DMC. If you are connecting two DMCs, they must be the first two modules attached, and the first DMC must be connected directly to the base unit. You can attach additional modules after connecting the DMC (or DMCs) to the base unit.

**Alignment.** Ensure that the holes on the corners of the DMC, or Battery Module are aligned with the holes on the component you are attaching it to. For example, if you are attaching the DMC to the base unit, ensure that the holes of the DMC are aligned with the holes on the base unit.

**Parallel position.** Ensure that you are holding the DMC, or Battery Module in a position parallel to the base unit or DMC. If either module is held at even a slight angle, there is a risk of damage to the connectors.

**Proper torque.** Ensure that you tighten the screw using the hex key (for the DMC) or a flat blade screwdriver (for the Battery Module) until you feel a *slight resistance*, and then tighten it using an additional 1/4 turn. If you are using a torque wrench, apply 1.5 N-m (13.3 in-lb) to the final turn.

## Verifying the base unit requirements

Before connecting a DMC to a base unit, verify that the base unit satisfies the requirement stated in [Table 9](#).

**Table 9** T-BERD/MTS 8000 base unit requirements

Requirement	DMC
Serial number of 336 or above	X

**Table 9** T-BERD/MTS 8000 base unit requirements

Requirement	DMC
Touch screen	X
Hard drive	X
BERT Software Version 5 or above	
BERT Software Version 7.0 or above	
BERT Software Version 8.0 or above	X <sup>1</sup>
BERT Software Version 14.0 or above	
400MHz CPU	X
1000MHz CPU	
256 MB DRAM	X
2GB DRAM	

1. Software version 8.0 can also be run on the MSAM assemblies.

### To verify the requirements on a base unit

- 1 Press the **SYSTEM/HOME** key.



**NOTE:**

Depending on the version of T-BERD/MTS 8000 base unit you have, the key may be labeled SYSTEM or may be labeled HOME (on UIMv2).

- 2 To verify the current BERT software version, select the **Help Page** soft key. Under Software Version Information, observe the BERT software version.
  - If the software version is lower than Version 5.0, you must upgrade the software on your base unit *before connecting a Version 2 Transport Module*.
  - If the software version is lower than Version 7.0, you must upgrade the software on your base unit *before connecting a Version 3 Transport Module*.
  - If the software version is lower than Version 8.0, you must upgrade the software on your base unit *before connecting a DMC*.
- 3 To verify the CPU speed and DRAM, select the **Services Data** soft key. Under Services Data, check the CPU speed and the Memory.

If your base unit does not meet the requirements stated above, contact Viavi Customer Care for assistance.

### Required tools

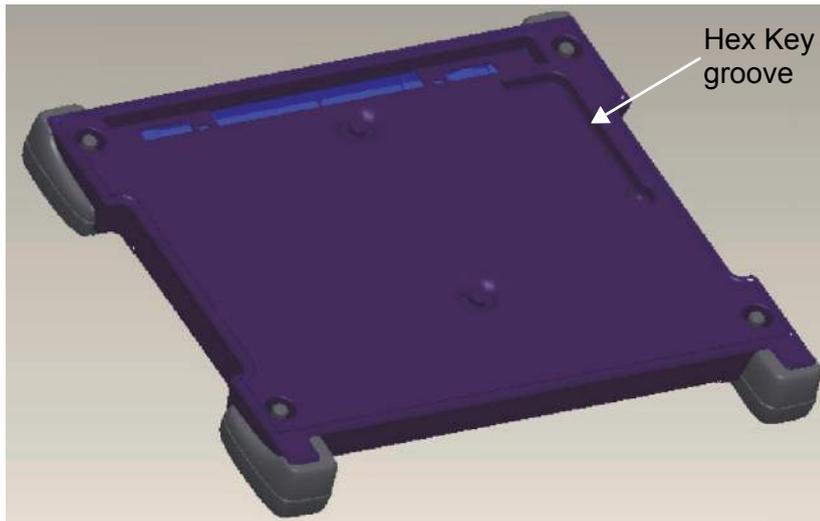
- Large, flat blade screwdriver. You will need a large, flat blade screwdriver to remove and then replace the battery module on the base unit.
- Hex key. A hex key is provided in a groove on the inside panel of the battery module. This key is used to secure and then tighten the screws that connect the DMC to the base unit.

## Connecting the components

### To connect the DMC to a base unit

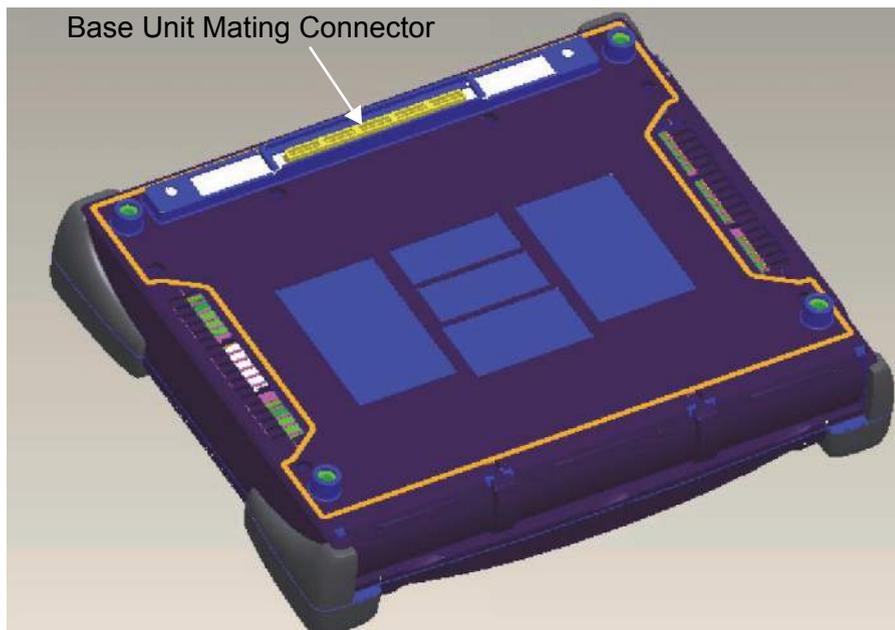
- 1 Verify that power is OFF on your base unit and the power adapter is unplugged.
- 2 Using the large flat blade screwdriver, loosen each of the 4 slotted bolts on the back panel of the battery module (attached to the base unit).
- 3 Disconnect the battery module from the base unit, and then remove the hex key from the groove on the inside panel of the battery module. See [Figure 20](#).

**Figure 20** Hex key groove in battery module



- 4 The base unit and **DMC** have rectangular mating connectors.

**Figure 21** Base Unit Mating Connector



These connectors *must* be aligned carefully before connecting the module to the base unit.

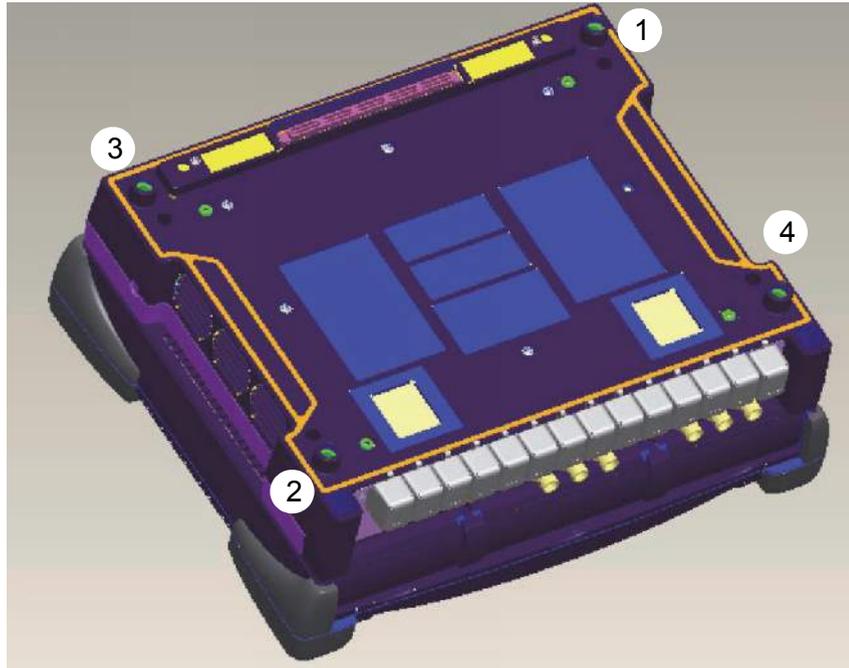
**Figure 22** DMC Mating Connector



- a To align the connectors properly, place the base unit with the screen side down on your work surface. The mating connector on the back panel should be facing you, at the top side of the unit
- b Position the DMC over the base unit, with the DMC's mating connector directly over the mating connector on the base unit.
- c Verify that the holes on each corner of the DMC are aligned precisely with the holes on each corner of the base unit.
- d **IMPORTANT:** Verify that you are holding the DMC in a position parallel to the base unit. If the module or DMC is tilted at even a slight angle, the mating connectors may not connect properly.
- e Slowly lower the DMC until it is just over the holes on the base unit, and then gently but firmly press the center of the module to attach it to the base unit.

- 5 Starting at the upper right corner, do the following:
  - a Using the hex key that you removed from the battery module, tighten screws 1 through 4 (in the sequence illustrated in [Figure 23](#)) until you feel a slight resistance. The same sequence is used when attaching a DMC.
  - b After all four screws are tightened, using the hex key, tighten each screw at least one additional quarter-turn in the sequence illustrated in [Figure 23](#).

**Figure 23** Sequence for securing and tightening the screws



- 6 After the DMC is secured to the base unit, put the hex key back in the battery module, and then do the following:
  - a Position the battery module over the DMC, with the battery module's mating connector directly over the mating connector on the DMC.
  - b Verify that the holes on each corner of the battery module are aligned precisely with the holes on each corner of the DMC.
  - c **IMPORTANT:** Verify that you are holding the battery module in a position parallel to the DMC. If the module is tilted at even a slight angle, the mating connectors may not connect properly.
- 7 Slowly lower the battery module until it is just over the holes on the DMC, and then gently but firmly press the center of the battery module to attach it to the DMC.
- 8 Starting at the upper right corner, do the following:
  - a Using the large flat blade screwdriver, tighten screws 1 through 4 until you feel a slight resistance. Use the same sequence illustrated for the DMC screws in [Figure 23](#).
  - b After all four screws are tightened, tighten each screw at least one additional quarter-turn.

The DMC is connected to the base unit. It is completely assembled, and can be used for testing.

Before testing using the DMC, you must insert the MSAM(s) and the appropriate PIMs or the CSAM(s) for the circuits you intend to test. For details, see “[Inserting MSAMs or CSAMs into the 6000A base unit or DMC](#)” on page 35 and “[Inserting, removing, and swapping PIMs in the MSAM](#)” on page 37.

## Connecting two DMCs to a base unit

If you intend to connect two DMCs to a base unit for testing, verify that you are using an AC power adapter that can support your instrument assembly. To discuss the various power adapters available for your instrument, contact Viavi Customer Care, or contact Viavi via the company web site, [www.viavisolutions.com](http://www.viavisolutions.com).

## Disconnecting the DMC

Before disconnecting the DMC from the base unit, review the “[Key principles](#)” on [page 28](#) for assembling the instrument. The same principals apply when disassembling the various components.

### Required tools

#### Large, flat blade screwdriver

You will need a large, flat blade screwdriver to remove the battery module.

#### Hex key (provided)

A 5 mm hex key is provided in a groove on the inside panel of the battery module. This key is used to secure and then tighten the screws that connect the module to the base unit.

#### Torque wrench (optional)

If you want to ensure that you don't apply too much pressure when connecting or disconnecting components, you can optionally use a torque wrench capable of applying 13.3 in-lb. A torque wrench with the ability to apply up to 20 in-lb in 0.1 in-lb increments will be adequate. You will also need a 5 mm hex key bit for the wrench.

## Disassembling the instrument

### To remove the DMC from a base unit

- 1 Verify that power is OFF on your base unit and that the power adapter is unplugged.

- 2 Using the large flat blade screwdriver, loosen each of the 4 slotted bolts on the back panel of the battery module (attached to the base unit), and then gently remove the battery module.
- 3 Use the provided hex key to loosen screws 1 through 4 in the sequence illustrated in [Figure 23 on page 32](#).
- 4 Turn the base unit over so the display is facing upwards.
- 5 Disconnect the DMC from the base unit by gently pressing upwards on the two lower bumpers of the base unit as illustrated in [Figure 40 on page 53](#).

**Figure 24** Bumpers (Base Unit)



**IMPORTANT:** When lifting the base unit, be certain to apply force directly over the base unit mating connector (illustrated in [Figure 21 on page 30](#)). The lower bumpers are located on the front (display) panel of the base unit, and they are parallel with the mating connector provided on the bottom (connector) panel. In [Figure 40](#), the base unit mating connector is not visible; it is directly above the mating connector of the DMC.

- 6 After the base unit is completely disengaged from the DMC, lift it up further and place it elsewhere on your work surface.

The instrument is disassembled.

# Inserting MSAMs or CSAMs into the 6000A base unit or DMC

Before inserting an MSAM or CSAM into the 6000A base unit or DMC, review the MSAM or CSAM requirements, and gather the proper tools.



## IMPORTANT:

Be certain the base unit is powered OFF and the AC power adapter is unplugged before inserting or swapping MSAMs or CSAMs.

## MSAM requirements

Before inserting an MSAM into a DMC, verify that the MSAM is labeled as *DMC-compatible*. If it is not, you must return it to Viavi for a factory upgrade before using it with a DMC.

DMC-compatible MSAMs can be inserted into any T-BERD/MTS 6000A base unit or DMC; MSAMs that are not compatible with the DMC must be used with a T-BERD/MTS 6000A base unit. A 90W or 150W power supply is also required.

## CSAM requirements

When using a CSAM in a T-BERD/MTS 6000A base unit, the base unit must be a 6000Av2, and the module carrier within the 6000Av2 must be an E6300. A 150W power supply is also required.

If the CSAM is not compatible with the module carrier of the 6000Av2, the software will prevent you from using the instrument to test.

## Required tools

You will need a large, flat blade screwdriver to secure the MSAM or CSAM in the T-BERD/MTS 6000A base unit or the DMC chassis.

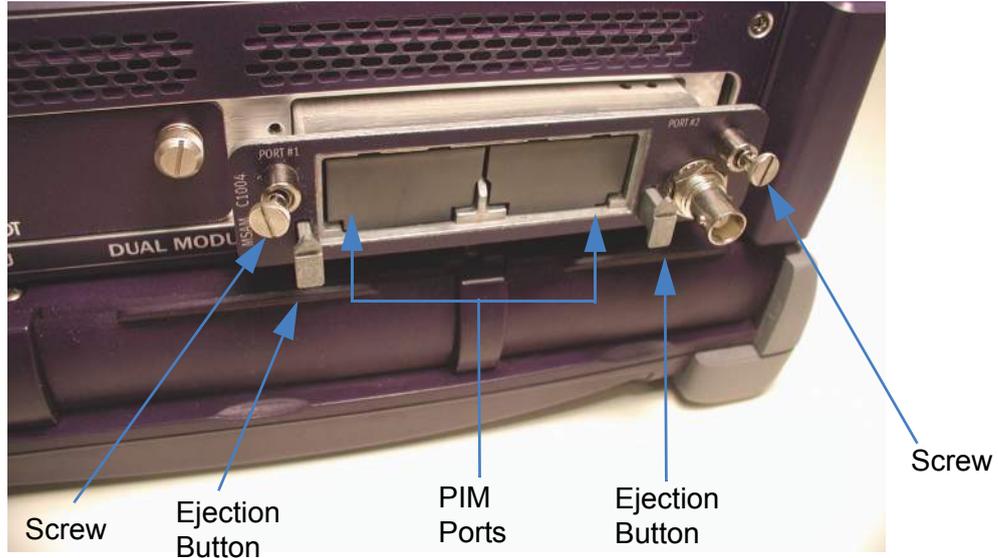
## Inserting the MSAM or CSAM

### To insert the MSAM or CSAM

- 1 Verify the following:
  - Power is OFF on your base unit.
  - The AC power adapter is unplugged.
- 2 Place the base unit on a flat surface, with the screen facing down, and the application module slots on the base unit or DMC chassis facing towards you.

- 3 Hold the MSAM or CSAM with the exterior panel facing towards you. The thumb screws should be at the top of the panel.

**Figure 25** MSAM inserted into the DMC chassis



- 4 Align the MSAM or CSAM with the application module slot, and then gently but firmly slide it into the slot. [Figure 25](#) shows an MSAM in a DMC application module slot; a similar slot is also available on the T-BERD/MTS 6000A base unit.
- 5 Place your thumbs just below each of the thumbscrews on the top of the panel, then push the MSAM or CSAM into the slot until the exterior panel is flush with the side panel of the base unit or DMC chassis (see [Figure 26](#) and [Figure 27](#)).

**Figure 26** Fully inserted MSAM



**Figure 27** DMC with CSAM inserted (left) and MSAM v2 inserted (right)



- 6 Using the screwdriver, tighten each screw. You can also use your fingers to tighten the screws; however, using the screwdriver will ensure a more secure connection.

The MSAM or CSAM is connected to the base unit or DMC chassis.

## Inserting, removing, and swapping PIMs in the MSAM

### Inserting a PIM

After connecting the MSAM to the base unit or DMC chassis, you can insert up to two PIMs into the two ports provided on the MSAM. The PIM(s) will provide the physical interfaces that you need to connect to the circuit for testing.

## To insert a PIM into the MSAM

- 1 Verify that the MSAM is designed to support the PIM that you intend to insert by doing the following:
  - If you are inserting an SFP PIM, it will work with any available MSAM chassis, in any port. Simply look at the PIM label to verify that it is an SFP PIM.

**Figure 28** SFP PIM and SFP transceivers



- If you are inserting an XFP PIM, it requires a high rate MSAM chassis. These chassis are labeled with a C1000, C1004, C0400-v2, C0404-v2, or C1010-v2 model number on the exterior panel. After verifying that the chassis can support the PIM, look at the PIM label to verify that it is an XFP PIM.

**Figure 29** XFP PIM and XFP transceiver



- 2 Place the base unit on a flat surface, with the screen facing down, and the exterior panel of the MSAM facing towards you.
- 3 If you are inserting the PIM into a dual port chassis, determine which port to insert the PIM into.
  - If you are inserting an SFP PIM, you can use any port (all MSAM ports support 10 Mbps to 4 Gbps interfaces).
  - If you are inserting an XFP PIM, in most instances you must use the left port (labeled Port #1).
  - If you have a dual 10G MSAMv2 (labeled C1010-v2), you can insert the XFP PIM on either port.

- 4 After verifying that the port is designed to support the same physical interface(s) as the PIM, align the PIM with the transceiver cages facing you, and the internal connectors facing down towards the interior of the port.
- 5 Insert the PIM into the port (see [Figure 30](#)).

**Figure 30** XFP PIM in Port #1



- 6 Push the PIM into the port until the PIM panel is flush with the exterior panel of the chassis, and the PIM ejection button pops out.

The PIM is inserted.

## Removing a PIM

There are two types of PIMs: single port and dual port. The single port PIMs fit into a single port (for example, the DS1 PIM); dual port PIMs are wider and use both ports (for example, the datacom PIM). Thus, there are slightly different ways to remove the PIMs.

### To remove a single port PIM

- 1 On the exterior panel of the MSAM chassis, press the PIM ejection button.  
The PIM is released.
- 2 Pull the PIM out of the port.

### To remove a dual port PIM

- 1 Rotate the long front lever. This will press both of the PIM ejection buttons.  
The PIM is released.

- 2 Pull the PIM out of the ports.

The PIM is removed from the MSAM chassis.

## Swapping PIMs

If you need to swap PIMs during testing, you must turn the BERT (MSAM) module off, remove one PIM, and then insert another. If you are swapping PIMs in two MSAMs in the DMC, be certain to turn the BERT (MSAM) module off for both MSAMs. *You do not need to turn OFF the instrument.*



### NOTE:

If you do not turn the BERT (MSAM) module off, you will lose the settings for the last test you configured, and your MSAM may not launch the expected test application automatically when you insert a different PIM.

### To swap PIMs

- 1 Press the **SYSTEM/HOME** button to display the System screen, then turn the icon representing the BERT (MSAM) module off. The BERT (MSAM) module can be toggled on or off by selecting the BERT icon. When off, the icon is grey.
- 2 Press the **Results** soft key to go to the MSAM status screen, and then verify that the module is off by observing the Message bar at the top of the screen. When off, the message states:  
BERT Module OFF
- 3 After verifying that the BERT (MSAM) module is off, remove the PIM (see [“Removing a PIM” on page 39](#)).
- 4 Insert the new PIM (see [“Inserting, removing, and swapping PIMs in the MSAM” on page 37](#)).
- 5 On the System screen, turn the BERT module back on. When on, the icon is yellow.

The PIMs are swapped.

## Attaching an expansion module to the 5800v2/100G and 5882

If you have an optional expansion module for your T-BERD / MTS 5800v2/100G or 5882 (for example, an OTDR Module or Timing Expansion Module), follow the instructions on how to attach it.

### To attach a module to your instrument

- 1 Power down the instrument and disconnect the AC power adapter.

- 2 Remove the four screws that hold the back cover in place.



- 3 Lift off the back cover to expose the connector.



- 4 Notice the hinges on the module.



- 5 Insert the module hinges into the instrument at about a 45 to 60 degree angle.



- 6 Pivot the module down towards the connector.



- 7 Seat the module into the connector with slight pressure.



- 8 Tighten the screws on the module.



Power up the instrument. Menus related to the attached module are now available.

## Handling CFP adapters and transceivers

### Inserting a CFP adapter

CFP adapters allow you to use a port designed to support a larger CFP transceiver for a smaller CFP transceiver. For example, a CFP2 to CFP4 adapter (shown in [Figure 31](#)) can be inserted into the CFP2 port of the CSAM to provide the physical interface that you need to connect a CFP4 to the instrument. The release lever shown at the left of the adapter must be pulled up before removing the adapter from a port.

**Figure 31** CFP2 to CFP4 Adapter



Or, you can insert a CFP2 to QSFP28 adapter (shown in [Figure 32](#)) into the CFP2 port of the CSAM.

**Figure 32** CFP2 to QSFP28 Adapter



**NOTE:**

Details concerning the inserted adapter used for the currently selected application appear on the CFP2 Interface setup tab. Details concerning the QSFP28 inserted into the adapter appear on the QSFP Interface setup tab.

**To insert a CFP adapter**

- 1 Ensure that the CSAM is connected to the DMC or base unit.
- 2 Verify that the CSAM is designed to support the CFP adapter that you intend to insert.
- 3 After verifying that you have the correct adapter, do the following:
  - a Position the instrument with the display facing towards you and the connector panel on the top.
  - b With the identification label facing you, align the adapter in the slot, and then gently but firmly insert the adapter until the adapter panel is flush with the exterior panel of the chassis.



**CAUTION: DAMAGE TO UNIT**

If you feel any resistance when first inserting the adapter into the slot (or when tightening the retaining screws, if applicable), *do not force the adapter any further*. The bottom of the adapter may be obstructed.

If this occurs, do the following:

- Remove the adapter.
- Visually inspect the adapter for any mechanical impediments to proper insertion. If impediments are identified, repair or replace the defective part.
- Verify that you are inserting the adapter correctly (for example, with the label facing you).
- Reinsert the adapter.

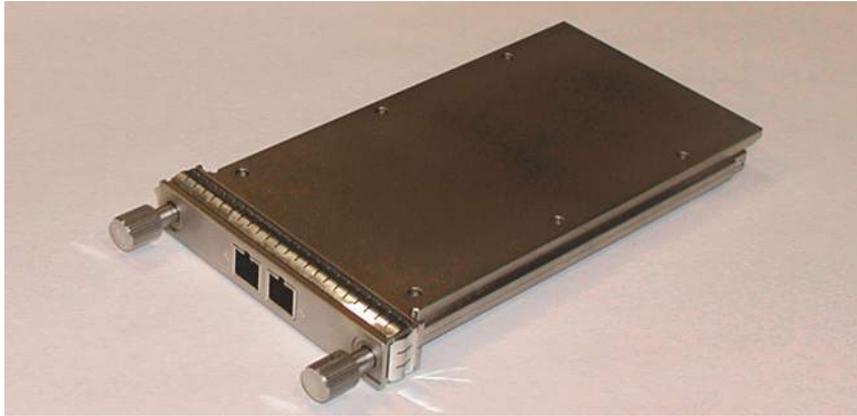
- 4 Tighten the retaining screws (if equipped) until they are finger tight.

The CFP adapter is inserted.

## Inserting a CFP, CFP2, or CFP4 transceiver

Figure 33 through Figure 35 show the CFP transceivers used to perform 40G and/or 100G out-of-service testing over fiber circuits using your instrument.

**Figure 33** CFP transceiver



**Figure 34** CFP2 transceiver



**Figure 35** CFP4 transceiver



Before inserting a CFP, CFP2, or CFP4 transceiver consider the following:

- Expected optical power must not exceed the power level specified for the optical module.

- The recommended optics are available on your unit by selecting **Help > Recommended Optics**.



**NOTE:**

Details concerning the inserted transceiver used for the currently selected application appear on the Interface setup tab.

**To insert a CFP, CFP2, or CFP4 transceiver**

- 1 Obtain a transceiver that supports the physical interface you intend to test.  
If you are not certain which interfaces a particular transceiver supports, refer to the list of Viavi Recommended Optics.  
If you can not locate the sheet, in most instances an online search using the model number (printed on the transceiver label) will result in a number of hits providing specifications for the transceiver.
- 2 After verifying that you have the correct transceiver for the interface, do the following:
  - a Position the instrument with the display facing towards you and the connector panel on the top.
  - b For the CSAM, with the identification label facing you, align the transceiver in the slot, and then gently but firmly insert the transceiver until it is seated securely (indicated by an audible click, or by feeling the transceiver snap into place).



**CAUTION: DAMAGE TO UNIT**

If you feel any resistance when first inserting the transceiver into the unit or when tightening the retaining screws (if applicable), *do not force the transceiver any further*. The bottom of the transceiver may be obstructed.

If this occurs, do the following:

- Remove the transceiver.
  - Visually inspect the transceiver for any mechanical impediments to proper insertion. If impediments are identified, repair or replace the defective part.
  - Verify that you are inserting the adapter correctly (for example, with the label facing you).
  - Reinsert the transceiver.
- c For TB/MTS 5800-100G with the identification label facing against you, align the transceiver in the slot, and then gently but firmly insert the transceiver until it is seated securely (indicated by an audible click, or by feeling the transceiver snap into place).
  - d Tighten the retaining screws (if equipped) until they are finger tight.

The transceiver is inserted; be certain to cover the optical connector openings when they are not in use.



**NOTE: Laser warm up requirement**

When testing 10 Gigabit, 40 Gigabit and 100 Gigabit optical circuits, some lasers (particularly 1550 nm lasers) are temperature stabilized; and therefore need to reach a certain temperature before you can use them to transmit a signal. This is expected behavior, and does not indicate that there is something wrong with the laser or test instrument.

It typically takes up to one minute for the temperature to stabilize. If you have turned the laser on, but no signal is present on the receiving instrument or device, simply wait for one minute.

## Removing a CFP, CFP2, or CFP4 transceiver

To prolong the life of your transceivers, *leave the transceiver you intend to use most frequently in the instrument* until you need to replace them with transceivers designed for a different circuit.

### To remove a CFP, CFP2, or CFP4 transceiver

- 1 If necessary, remove any optical cables that are currently connected to the transceiver. If you need to remove a cable, do the following:
  - a Press the release latch on the cable.
  - b Grasp the cable connector near the connection point.
  - c Gently pull the cable connector from the transceiver.
  - d Insert a dust plug into the open end of the transceiver.
- 2 Remove any external timing reference cables. If you need to remove an external timing reference cable do the following:
  - a Grasp the plug close to the panel.
  - b Loosen by turning the connector counter-clockwise.
  - c When connector threads are fully disengaged, pull the plug straight off the jack.
- 3 Loosen the retaining screws securing the transceiver into the instrument or flip out bail handle.
- 4 Hold onto the retaining screws or bail handle and remove the transceiver from the instrument using a steady, gentle pressure.

The transceiver is removed. Be certain to store it in an anti-static bag.

## Handling SFP/SFP+, XFP, and QSFP+ transceivers

If you have a 5800, CSAM, MSAM chassis, you can insert transceivers designed for testing a variety of optical circuits. Examples of SFP and QSFP transceivers are provided in [Figure 36](#) and [Figure 37](#).

- The 5800v1 accept SFP transceivers.
- The 5800v2, 5882 and CSAM accept SFP/SFP+ transceivers.
- The 5800-100G accepts QSFP+/QSFP28 and SFP/SFP+/SFP28 transceivers.
- The MSAM (with connected SFP and/or XFP PIMs), accepts SFP and XFP transceivers.
- The CSAM accepts QSFP+ transceivers.

Each of these pluggable transceiver modules has similar insertion characteristics.

[Figure 36](#) shows a Copper SFP (used to test copper over 10GigE LAN circuits).

**Figure 36** Copper SFP



[Figure 37](#) shows the QSFP transceiver+ used to perform out of service testing over 40GE fiber circuits.

**Figure 37** QSFP+ transceiver (40GE circuits)



## Inserting an SFP/SFP+, XFP, or QSFP+ transceiver

Before inserting an SFP/SFP+, XFP, or QSFP+ transceiver, consider the following:

- Applied power must not exceed the power level specified on the panel for each optical connector.

- Use only the transceivers and adapters that shipped with your instrument, or those that are identified on the list of Viavi supported optics that shipped with your instrument. The recommended optics are also available on your instrument by selecting **Help > Recommended Optics**. Many of these transceivers and adapters can be purchased from Viavi.
- Verify that the transceiver, adapter (if applicable), and the connector on the instrument support the same physical interface. For example, if you intend to connect a CSAM to a 100G Ethernet circuit, verify that you are inserting a CFP transceiver (or adapter) into the CFP2 port of the CSAM. If you inserted a CFP2 adapter, verify that you are inserting the appropriate transceiver for the adapter (CFP4 or QSFP28).



**NOTE:**

Details concerning the inserted transceiver used for the currently selected application appear on the Interface setup tab.

**To insert a SFP/SFP+, XFP, QSFP+, or QSP28 transceiver**

- 1 Obtain a transceiver from Viavi that supports the physical interface you intend to test.  
If you are not certain which interfaces a particular transceiver supports, refer to the list of Viavi Recommended Optics.  
If you can not locate the sheet, in most instances an online search using the model number (printed on the transceiver label) will result in a number of hits providing specifications for the transceiver.
- 2 After verifying that you have the correct transceiver for the interface, do the following:
  - a Position the instrument with the connector panel facing towards you.
  - b Ensure that the bale-clasp latch on the transceiver is closed as illustrated in [Figure 38](#). The bale-clasp latch handle should be on top of the transceiver module.

**Figure 38** Transceiver (SFP shown) with closed bail-clasp latch



- c With the identification label facing away from you, align the transceiver with the connector cage, and then gently but firmly insert the transceiver until it is seated securely (indicated by an audible click, or by feeling the transceiver snap into place).



### CAUTION: DAMAGE TO UNIT

If you feel any resistance when first inserting the transceiver into the cage, *do not force it any further*. The bottom of the transceiver may be obstructed by the latch tab in the cage, and forcing it any further may damage the cage.

If this occurs, do the following:

- Remove the transceiver, then push the latch tab in the cage down.
- Verify that you are inserting the transceiver correctly (for example, with the label facing away from you). Verify that the bale-clasp latch on the transceiver is completely closed, realign it with the cage, and then insert it again.

The transceiver is inserted; be certain to cover the optical connector openings when they are not in use.



### NOTE: Laser warm up requirement

When testing 10G, 40G, or 100G optical circuits, some lasers (particularly 1550 nm lasers) are temperature stabilized; and therefore need to reach a certain temperature before you can use them to transmit a signal. This is expected behavior, and does not indicate that there is something wrong with the laser or test instrument.

It typically takes up to one minute for the temperature to stabilize. If you have turned the laser on, but no signal is present on the receiving instrument or device, simply wait for one minute.

## Removing an SFP/SFP+, XFP, or QSFP+ transceiver

To prolong the life of your transceivers, *leave the transceiver you intend to use most frequently in the instrument* until you need to replace them with transceivers designed for a different circuit.

### To remove an SFP/SFP+, XFP, or QSFP+ transceiver

- 1 If necessary, remove the dust cover, or any cables that are currently connected to the transceiver. If you need to remove a cable, do the following:
  - a Press the release latch on the cable.
  - b Grasp the cable connector near the connection point.
  - c Gently pull the cable connector from the transceiver.
  - d Insert a dust plug into the open end of the transceiver.

- 2 Open the bail-clasp latch (as illustrated in [Figure 39](#)), and grasp the latch and pull gently upwards to remove the transceiver from the cage.

**Figure 39** Transceiver (SFP shown) with open bail-clasp latch



The transceiver is removed. Be certain to store it in an anti-static bag.

## Attaching an external optical connector

Some instruments also use external optical connectors. Before attaching an external connector to your instrument, be certain the connector is clean. If the external connector is new, or has been used with clean, defect-free fiber connectors and capped when not in use, it does not typically require cleaning.

If you suspect poor performance is due to a dirty cable, connector, or optical jack, make sure you clean them.

### To attach an external optical connector

- 1 Verify that the laser is turned OFF on the instrument.
- 2 Verify that the locking lever of the connector is in a released position.
- 3 Pinch the connector with your index finger on the top of the locking lever, and your thumb on the bottom of the connector.
- 4 Align the connector squarely with the four sides of the optical connector on the panel.



**NOTE:**

If you insert the connector at an angle you risk damaging the connector.

- 5 Insert the connector into the optical connector on the panel, and then lock the shell in place by rotating the locking lever upwards until you hear a click.

The connector is attached. Be certain to cover it with a dust cap if you don't intend to begin testing immediately.

## Disconnecting the DMC

Before disconnecting the DMC from the base unit, review the “Key principles” on [page 28](#) for assembling the instrument. The same principals apply when disassembling the various components.

### Required tools

#### Large, flat blade screwdriver

You will need a large, flat blade screwdriver to remove the battery module.

#### Hex key (provided)

A 5 mm hex key is provided in a groove on the inside panel of the battery module. This key is used to secure and then tighten the screws that connect the module to the base unit.

#### Torque wrench (optional)

If you want to ensure that you don't apply too much pressure when connecting or disconnecting components, you can optionally use a torque wrench capable of applying 13.3 in-lb. A torque wrench with the ability to apply up to 20 in-lb in 0.1 in-lb increments will be adequate. You will also need a 5 mm hex key bit for the wrench.

## Disassembling the instrument

### To remove the DMC from a base unit

- 1 Verify that power is OFF on your base unit and that the power adapter is unplugged.
- 2 Using the large flat blade screwdriver, loosen each of the 4 slotted bolts on the back panel of the battery module (attached to the base unit), and then gently remove the battery module.
- 3 Use the provided hex key to loosen screws 1 through 4 in the sequence illustrated in [Figure 23 on page 32](#).
- 4 Turn the base unit over so the display is facing upwards.

- 5 Disconnect the DMC from the base unit by gently pressing upwards on the two lower bumpers of the base unit as illustrated in [Figure 40 on page 53](#).

**Figure 40** Bumpers (Base Unit)



**IMPORTANT:** When lifting the base unit, be certain to apply force directly over the base unit mating connector (illustrated in [Figure 21 on page 30](#)). The lower bumpers are located on the front (display) panel of the base unit, and they are parallel with the mating connector provided on the bottom (connector) panel. In [Figure 40](#), the base unit mating connector is not visible; it is directly above the mating connector of the DMC.

- 6 After the base unit is completely disengaged from the DMC, lift it up further and place it elsewhere on your work surface.

The instrument is disassembled.



# Getting Started

This chapter explains how to start using your instrument, and describes the user interface. Topics discussed in this chapter include the following:

- “Powering the instrument” on page 56
- “Launching the MSAM or CSAM” on page 60
- “Navigating the user interface” on page 62
- “Setting up the instrument” on page 70
- “Connecting your instrument to the circuit” on page 79

## Powering the instrument

Power is supplied to the instrument by the battery or the AC power adapter *supplied with the application module (MSAM, or CSAM) or DMC*. For the 5800, the adapter is supplied with the instrument. Use of AC power adapters or batteries other than those supplied with your 5800, application module, or DMC is not recommended as other slices/modules may be supplied with incompatible adapters or batteries.

When supplying power using an AC power adapter, consider the following:

- Multiple (“Stacked”) DMCs — If you intend to test by connecting multiple DMCs to a single T-BERD/MTS 8000 base unit, you will need an adapter that provides more than the standard 150 Watts.
- Two MSAMs — If you intend to test by using two MSAMs in one DMC module in a single T-BERD/MTS 8000 base unit, you must connect the AC power adapter that shipped with the DMC.
- Two CSAMs — If you intend to test by using two CSAMs in one DMC module in a single T-BERD/MTS 8000 base unit, you must connect the AC power adapter that shipped with the DMC.

To discuss the various power adapters available for your instrument, contact Viavi Customer Care, or contact Viavi via the company web site, [www.viavisolutions.com](http://www.viavisolutions.com).

## Verifying that you have the correct adapter

The following figure shows the labels on the adapter that ship with T-BERD/MTS 5800v2, 5800-100G and SC 4800/4800P test instruments.

**Figure 41** 5800v2, 5800-100G, 5882 and 4800/4800P Adapter Labels

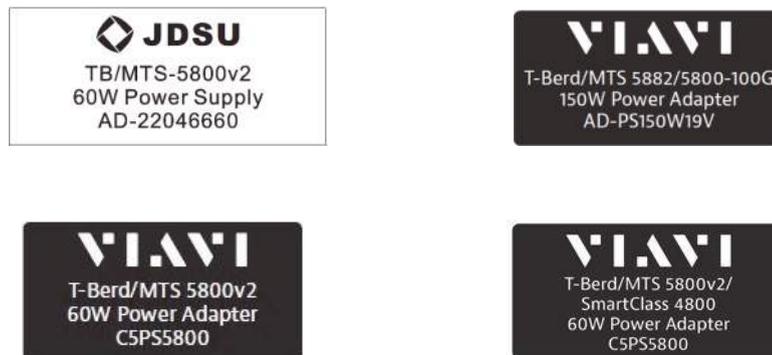


Figure 42 shows the label on the adapter that shipped with the T-BERD/MTS 5800v1 test instruments.

Figure 42 Adapter label



Figure 43, Figure 44 and Figure 45 show the labels provided on the adapters that ship with the DMC and MSAM.

Figure 43 DMC adapter label



Figure 44 MSAM Adapter label



Figure 45 40/100G Power Adapter label



## Using the AC power adapter

### To supply power using the AC power adapter

- 1 Verify that the AC power adapter is the one that shipped with your application module, DMC, 5800 or 4800 (see [“Verifying that you have the correct adapter” on page 56](#)).
- 2 Plug the adapter into the power supply jack.
  - The jack for the DMC is located on the bottom right-hand corner of the unit.
  - The jack for the MSAM or CSAM is located on:
    - the top panel of the unit, or
    - the bottom right-hand corner of the DMC.
  - The jack for the T-BERD / MTS 5800 and SC 4800 families is located on the bottom right side of the unit.
- 3 Plug the opposite end of the adapter into the power mains.

Power is supplied using the adapter.

For specifications, see [“Power supply specifications” on page 178](#).

## Turning on the instrument

### To power the instrument

- Press the **ON/OFF** key.

The On LED, located on the front panel, illuminates green when the unit is powered, and the instrument beeps.

## Turning off the instrument

### To turn off the instrument

- Press the **ON/OFF** key.

The On LED, located on the front panel, extinguishes when the unit turned off, and the instrument beeps.

## Charging the battery

In most instances, the battery charges automatically when you supply power to your instrument using the AC power adapter. In some instances, the instrument may not

automatically charge the battery because the power supplied via the AC Adapter is required to:

- Support high speed applications (for example, OTU2, OTU3, and OTU4 applications).
- Support multiple tests running concurrently; particularly when using an MSAM with an XFP SIM.
- Support optical Jitter applications.

## 6000A Charge LED

The Charge LED on the front of the 6000A base unit behaves as follows when testing using an MSAM:

**Table 10** Charge LED behavior

Scenario	LED State	Indicates
Power supplied by adapter <sup>1</sup>	ON	The battery is charging.
	OFF	The battery is not charging.
Power supplied by battery only	ON	The battery has six minutes or less of power available. If the Charge LED illuminates when operating on battery power, supply power using the adapter immediately.
	OFF	The battery has more than six minutes of power available.

1. When running OTU2 applications, or multiple tests on an MSAM with one application that requires an XFP PIM, the instrument does not charge the battery - even when the adapter supplies power. When you launch these applications, the Charge LED extinguishes to alert you that the battery *is not charging*. Applications that use the XFP PIM include 10 Gigabit LAN, 10 Gigabit WAN, 10 Gigabit Fibre Channel, OC-192 SONET, STM-64 SDH, and OTU2 OTN.

## Launching the MSAM or CSAM

If the MSAM, or CSAM was launched during your last test session (when you turned the power OFF), the instrument launches it automatically when you turn power back ON. If the module was off when you turned power OFF, you must actively launch it after you turn power back ON.

## Multiple BERT icons

The MSAM and CSAM are all represented by a “BERT” icon on the System screen. If you are using a DMC with two MSAMs, two CSAMs, or one of each, two BERT icons appear on the screen (one for each MSAM and CSAM). If you stack multiple DMCs on a single T-BERD/MTS 8000 base unit, an icon appears for each MSAM, or CSAM.

When multiple BERT icons are available, a yellow icon indicates which module is active; a green outline surrounding a yellow icon indicates that the instrument is currently providing the user interface *for that particular module* (in other words, it is the module in focus).

## About the Jitter icon

If your instrument is configured and optioned for optical jitter/wander testing, before launching the module, consider the following:

- Connect the AC power adapter to the power mains *before launching the optical jitter/wander function* (see “Powering the instrument” on page 56).
- Turning on the JITTER icon also automatically turns on the BERT function.
- To conserve power, if you are no longer testing optical jitter or wander, turn off the JITTER icon. All other “BERT” functions will still be available.

## Turning the BERT icon ON

### To turn a BERT icon ON

- 1 Press the **ON/OFF** button.

The unit loads the 8000 Base Unit or 6000A Base Unit software, and then the following occurs:

- The screen goes blank for a few seconds.
- The Presentation page for the base unit appears.
- If the Transport Module, MSAM, or CSAM was launched during your last test session (when you turned the power OFF), the Viavi BERT MODULES STARTUP screen appears, indicating the progress of the software load. When the load reaches 100%, the Main screen appears. The Transport Module, MSAM, or CSAM is launched; proceed to [step 3](#).
- If the Transport Module, MSAM, or CSAM was not launched during your last test session (when you turned the power OFF), the Viavi BERT MODULES STARTUP screen appears, instructing you to press the SYSTEM/HOME button. Proceed to [step 2](#).

- 2 Press the **SYSTEM/HOME** button.

The System screen appears. The MSAM or CSAM is represented by a BERT icon.

- 3 If the icon for the function you want to launch is not already outlined in green, select the icon by doing one of the following:

- Use the touch screen to select the icon.
- Use the arrow key to select the icon.

The icon is highlighted in green when selected.

- 4 After the icon is selected (highlighted in green), do one of the following to turn the module ON.
  - Use the touch screen to select the icon a second time.
  - Press the **Enter** key.

The interface highlights the icon in yellow, and the MSAM or CSAM launches.

- 5 Press the **RESULTS** button.

The Viavi BERT MODULES STARTUP screen appears, indicating how far the software load has progressed. When the load reaches 100%, the Main screen appears.

The MSAM, or CSAM is launched.

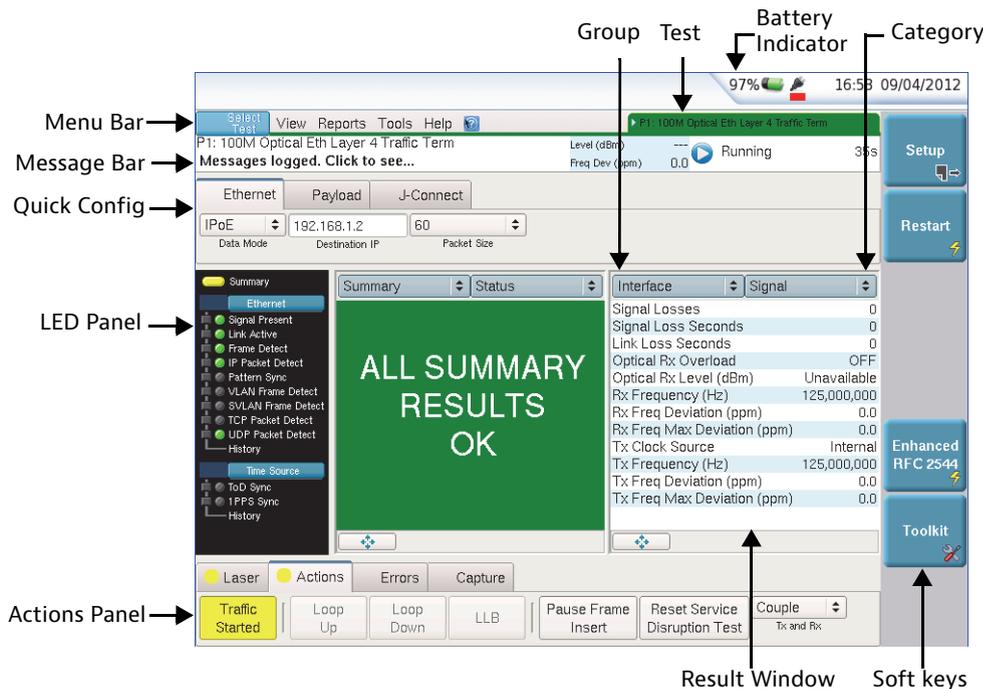
**NOTE:**

After you launch the MSAM or CSAM, you can use the SYSTEM/HOME button at any time to return to the System screen to change settings (such as the screen saver). Pressing the SETUP or RESULTS button will then return you to the corresponding application screen.

## Navigating the user interface

The user interface lets you set up the instrument, configure tests, and display test results. See [Figure 46](#).

**Figure 46** Main screen (Ethernet application)



For descriptions of the physical control buttons on the front panel of the base unit, refer to the *8000 Base Unit User Manual* or the *6000A Base Unit User Manual*.

## Menu Bar

The menu bar provides the following menus:

### Test

Use the options listed on the Test menu to select your test application.

For example, to transmit patterns in a STS-48c Bulk BERT payload over an OC-48 circuit, select:

```
Test> SONET> OC-48 > STS-48c Bulk BERT > Terminate
```

### View

Use the options listed on the View menu to change the format of the Main screen. Options are provided which allow you to change the result layout and hide or display a variety of items on the Main screen, such as the Message bar, LED panel, Signal Structure (graphical display), and the Actions panel. An option is also available which allows you to toggle between tests running on different ports.

### Reports

Use the options on the Reports menu to create, view, and export custom reports for your module. You can also enable and configure automatic reports and test restarts after automatic report generation using the Automatic Reports option.

### Tools

Use the options on the Tools menu to import or export saved test configurations, set up your module to emulate the FST-2000 TestPad or ANT platform LEDs, and to activate new test options on your module. The Clear History option clears all historical LEDs.

### Help

Use the Help menu to launch a help system with each of the topics discussed in the testing manual, or to view signal connections.

## Soft keys

The soft keys located on the right side of the graphical user interface provide quick access to setup screens and the result display.

## Setup/Results

The top key (**Setup/Results**) is used to toggle between the Setup screens and the Main (Result) screen. When the Main screen is displayed, the **Setup** key appears; when the setup screens are displayed, the **Results** key appears. For descriptions of setup parameters and test results, refer to the testing manual for your instrument.



A Restart soft key is also provided which allows you to restart a test (and clear results).



Additional soft keys appear when appropriate for the selected test application which allow you to run a variety of scripts designed to simplify testing.

## Menu Keys

The seven menu keys located on the right side of the front panel perform the same functions as the softkeys immediately to their left on the graphical user interface. If your unit does not have a touch screen, use these buttons to access the setup screens, restart tests, and perform other functions specific to your test application.

## Test Bar

The Test Bar displays the current test application selected on the unit. For example, if you selected the Layer 4 Multiple Streams application for a 10GigE LAN circuit, the following appears in the Test Bar:

```
10GigE LAN Layer 4 Streams Term
```

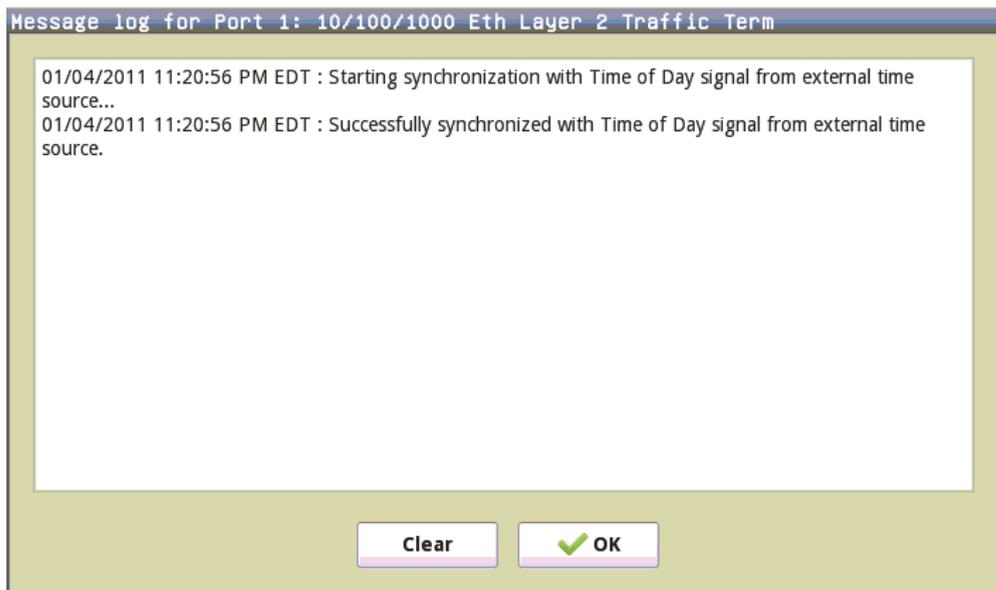
If your instrument is configured with two ports for a particular rate, the currently selected port also appears at the beginning of the text.

## Message Box

The Message Box displays the duration of the currently running test and indicates whether any messages related to the test have been generated (for example, to alert you that loop ups are successful, or that your instrument has been synchronized to a particular external timing source).



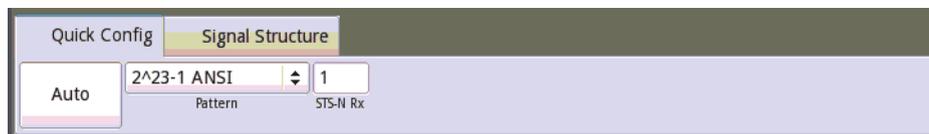
If messages exist, you can select the box to display the Message Log, which lists each message.



## Quick Config settings

After you select a test application, a Quick Config tab appears to the right of the Message Box, with key settings required to configure your test. For example, if you selected the **SONET -> OC-48 -> STS-12c Bulk BERT -> Terminate** application, quick configuration settings appear that allow you to automatically detect and insert a BERT pattern. See [Figure 47](#).

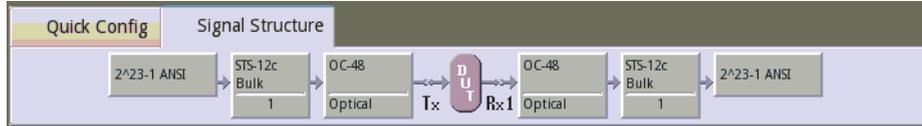
**Figure 47** Quick Config Settings



## Signal Structure

If you are running a SONET, SDH, or OTN application, a Signal Structure tab appears to the right of the Quick Config tab. When selected, the tab shows the structure of the signal transmitted from the unit to the device under test (DUT) and then to another device on the far end of the circuit (typically another test instrument). [Figure 48](#) illustrates the signal structure when you transmit a Bulk BERT payload in an STS-12c signal carried in an OC-48 wrapper.

**Figure 48** OC-48 STS-12c Bulk BERT signal structure

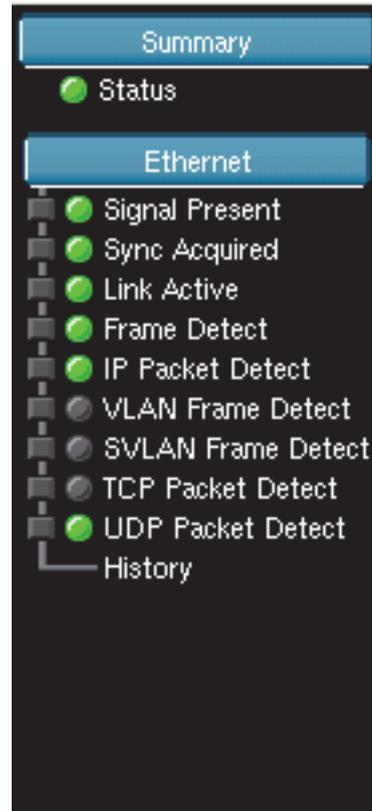


## LED Panel

The LEDs in the panel to the left of the Results Windows help you determine whether a signal is present, pattern synchronization has been achieved, and other key events have occurred when performing tests. The color of the Summary LED at the top of the panel indicates the overall status of Summary test results supporting the application.

You can collapse and expand an LED panel by tapping the panel name (for example, SONET or Ethernet). [Figure 49](#) illustrates the LEDs supporting a 1GigE Layer 4 Traffic test application.

**Figure 49** 100GigE Layer 4 Traffic LEDs



When you set up your instrument, you can indicate that the LEDs should emulate those displayed on the user interface of the FST-2000 TestPad or the ANT platform.

- For instructions on customizing the LED panel, see [“Customizing the user interface look and feel”](#) on page 74.
- For descriptions of each of the LEDs, refer to the Test Results chapter in the testing manual that shipped with your instrument.

## Current and history LEDs

The round LEDs on the inside column provide the current state of the key event; the square LEDs on the outside column provide the historical state (in other words, the event occurred in the past).

## LED colors

Green LEDs indicate an event occurred as expected, yellow LEDs indicate that an event occurred that warrants additional investigation, and red LEDs indicate that an error, anomaly, alarm, or defect has occurred.

## LEDs for muxed payloads

When testing muxed payloads, panels appear for each of the payloads (in addition to the LEDs for the interface rate). For example, if you are testing an E1 BERT payload carried in a DS3 signal, a DS3 panel *and* a E1 panel appear.

## 10 Gigabit Ethernet WAN LEDs

When testing 10 Gigabit Ethernet WAN circuits, a SONET or SDH panel *and* an Ethernet panel appear.

## Actions Panel

After you select a test application (using the Test menu), an Actions Panel appears under the LED display that provides tabs with the buttons required to perform your test. The buttons available vary depending on the test application you select. For example, buttons may appear that allow you to start and stop transmitting Ethernet traffic, start and stop a local loopback, or, if you selected a SONET application, allow you to specify error, anomaly, alarm, defect, and pointer parameters for the test.

**Figure 50** Action Panel (1GigE Layer 4 Traffic application)



A blinking circle on a tab indicates that some action is required on your part. For example, if you are running a BERT test, the Actions tab may blink indicating that you need to start transmitting the BERT pattern.

If you select a test application for an optical rate, a Laser tab also appears, with buttons that allow you to select an SFP connector for the test (if appropriate), specify the transmitted wavelength (for OC-192, STM-64, OTU-2, and 10 Gigabit Ethernet and Fibre Channel signals), and turn the laser on and off.

If you do not see the buttons that you need to perform a test, select **View > Actions Panel** on the Menu Bar, and then select the tab with the buttons that you need. You can also hide the Action Panel on the Main screen by clearing the **View > Actions Panel** selection.



**NOTE:**

The color of a button reflects its current state. Action buttons are highlighted in yellow when they are turned on; they are grey when they are off.

## Result Buttons

Group and Category buttons are provided at the top of each result window. The Group button on the left allows you to select the type of results you want to observe (for example, Summary results); the Category button on the right allows you to select a specific results category for the group you specified. By selecting a different group or category for each pane, you can view multiple sets of results at the same time. See [Figure 51](#).

**Figure 51** Result Group and Category Buttons (Ethernet application)



## Result Windows

The test results appear in Result Windows (see [Figure 52](#)). Errors are highlighted in red; other results appear in black.

**Figure 52** Result Window (Ethernet application)

Ethernet		Error Stats	
⚠	Symbol Errors		2
⚠	Code Violations		2
	Code Violation Rate	1.29E-10	
	Code Violation Seconds		2
	Undersized Frames		0
	Runts		0
	Jabbers		0
⚠	FCS Errored Frames		3
⚠	Errored Frames		3
	Lost Frames		0
	Frame Loss Ratio	0.0	
	OoS Frames		0

You can change the layout of the Result Windows using options provided on the View menu. You can also choose to show just test results on the main screen by selecting **View > Show Only Results**.

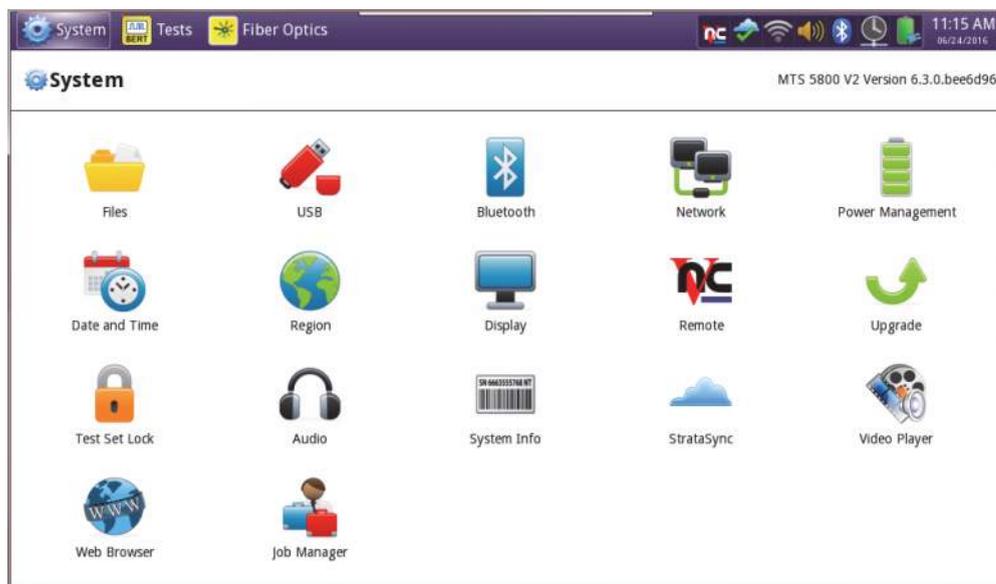
For test result descriptions, refer to the Test Results chapter in the *Testing Manual* that supports your instrument.

## Setting up the instrument

Setting up the instrument involves loading new software upgrades or options, setting up the screen saver, specifying a printer for the instrument, and indicating whether you want your LEDs displayed using the format used on the FST-2000 TestPad format, or the format used on the ANT platform. You can also change the instrument's default VNC password.

The System menu provides access to regional settings, the date and time, and display settings. The T-BERD / MTS 5800 system menu shown in Figure 53. Details concerning the System menu for other test instruments are provided in the *6000 or 8000 Base Unit User Manual* that supports the corresponding base unit.

**Figure 53** T-BERD / MTS 5800, 5800-100G System Menu



## Specifying international settings

Before testing, you can specify the language and the date and time format for the user interface.

### To specify international settings

- 1 Select the **SYSTEM/HOME** icon.  
The System Menu appears.
- 2 Do one of the following:
  - a T-BERD / MTS 5800
    - i Select **Region**.
    - ii The System Setup screen appears, listing settings that control the appearance and behavior of your unit.

- iii In the **Language** box, select the language for the user interface.  
The formatting standard changes automatically.
  - iv In the **Samples for selected formatting** box, the date, time, and number formatting appear.
  - v If you want to change the formatting standard, click the **Change formatting standard** box, and then select a country.
  - vi If you wish to do so, click the check box next to **Use 24-hour time**.
  - vii Turn the instrument off then back on.  
The user interface changes to the language you specified.
- b** T-BERD/MTS 8000, 6000A, and 5800
- i Press **System Setup**.  
The System Setup screen appears, listing settings that control the appearance and behavior of your unit.
  - ii Select **Language**, and then select the language for the user interface.
  - iii Select **Date Format**, and then select the mm/dd/yyyy or dd/mm/yyyy format.
  - iv Select **Time Format**, and then select the 24 hour clock or 12 hour clock format.  
A message appears indicating that you need to reboot the unit for the settings to take effect.
  - v Press the **ON/OFF** button to turn the unit OFF, and then press it again to turn the unit back ON.  
The unit reboots in the language you specified.

International settings are specified.

## Setting the date and time

### MSAM and CSAM

You can change the date and time on your instrument by editing the system settings, and then *rebooting your module*. For instructions on changing the date and time, refer to the *8000 Base Unit User Manual* or *6000A Base Unit User Manual*.

### T-BERD / MTS 5800 and SC 4800

The T-BERD / MTS 5800 and SC 4800 have an internal clock that you can set to provide accurate time stamps for test results.

#### To set the date and time

- 1 Select the **System** icon.

The System screen appears.

- 2 Select **Date and Time**.
- 3 Specify the **Region, Country, and Area**, and if you wish to do so, click the check box for **Automatically adjust for daylight savings time**.
- 4 Under Current Date & Time, do the following:
  - a Use the up and down arrows to specify the current local time. If you wish to do so, click the check box next to **Use 24-hour time**.
  - b Use the calendar to select the current date.

## Changing the remote access password

### To change the default password

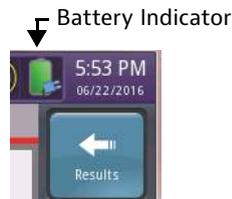
- 1 Select the **System** icon.  
The System screen appears.
- 2 Select the **Remote (VNC)** icon.
- 3 Select the **Change Password** button, then specify a new password.

For more information, refer to the *8000 Base Unit User Manual* or the *6000A Base Unit User Manual*.

## Checking the battery

You can check the status of the battery in two ways:

**Method 1** — The battery status indicator in the upper right corner of the screen provides a graphic indication of the approximate battery charge.



**Method 2** — The Battery Level percentage on the Battery status page.

- 1 Select the **System** icon.
- 2 Select **Battery**.  
The battery status appears.
- 3 View the **Battery Level**.

The Battery Status page indicates the charge level (both in percentage under the battery and the color of the battery), whether the adapter is plugged in, and indicates the battery temperature range.

## Setting up the display

Setting up the display includes setting the screen brightness and setting up the screen saver.

**NOTE:**

The Display menu also allows calibration of the touchscreen. See [“Calibrating the T-BERD / MTS 5800 and SC 4800 touchscreen”](#) on page 247.

### Adjusting screen brightness

The following procedure describes how to adjust the screen brightness.

#### To adjust the screen brightness

- 1 Select the **System** icon, then select **Display**.
- 2 Change the brightness level by moving the slider left or right.

### Setting up the screen saver

If you are operating the instrument using the battery, you should set up the screen saver to switch off the screen automatically after the unit has not been used for a specific interval of time. For instructions on setting up the screen saver on a MSAM, refer to the *8000 Base Unit User Manual* or *6000A Base Unit User Manual*. For the T-BERD / MTS 5800 and SC 4800, see below.

#### To set up the screen saver

- 1 Select the **System** icon, and then select **Display**.
- 2 To enable the screen saver, click the check box next to **Enable automatic screen saver**.
- 3 To change the message displayed as a screen saver, click in the **Message** field, and then enter the message.
- 4 To specify the time to wait until the screen saver begins, do the following:
  - a Click on the drop down next to the Delay field, and then specify the time unit, for example, seconds, minutes or hours.
  - b Click in the Delay field. A keyboard appears. Enter the amount of time, and then click OK. For example, if you selected minutes in the previous step, enter the number of minutes of delay.

- 5 Click the check box next to **Screen saver password** if you wish to enable a screen saver password (a password is required to close the screen saver and resume using the instrument). Make a note of the password and put it somewhere safe.

The screen saver is setup.

## Customizing the user interface look and feel

You can set up the instrument to emulate the FST-2000 TestPad user interface (TestPad mode), or the ANT platform user interface (ANT mode). This primarily impacts the LED result format on the Main screen.

### TestPad mode

If you specify TestPad mode for the LED display, the inside green LEDs illuminate sequentially as key events occur, such as signal detection, frame synchronization, and pattern synchronization. The Summary LED illuminates green if all summary results are OK. If the test stops, the Summary LED is locked until you start or restart the test.

If the module loses any of the LED events, the green Status LED extinguishes, and the red Alarm LED in the history column illuminates indicating an error condition has occurred. For example, if the module detected a signal, but then loses it, the green Signal Present LED extinguishes, and the red LED in the history column illuminates. If the module then regains a signal, the green Signal Present LED illuminates, and the red history LED stays illuminated until you clear history results or restart the test.

### ANT mode

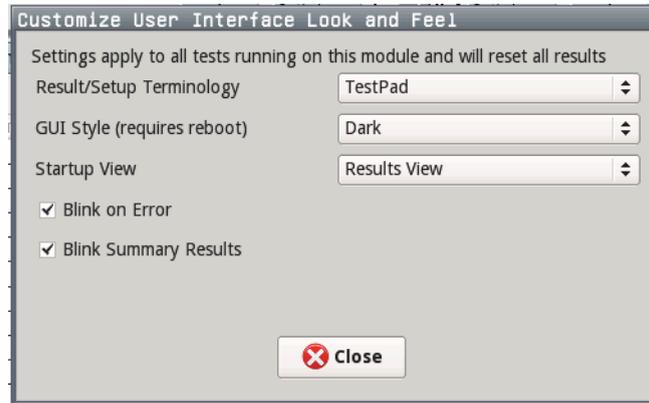
If you specify ANT mode for the LED display, the LEDs illuminate red when key events or errors occur. For example, if the module does not detect a signal, the associated LOS LED illuminates. When the module detects a signal, the LOS LED extinguishes.

## Specifying the LED results mode

### To specify the LED results mode

- 1 Select **Tools > Customize**.

The Customize User Interface Look and Feel screen appears.



- 2 Set Result/Setup Terminology to TestPad or ANT mode.
- 3 Select **Close** to store the result mode and return to the Main screen.

The test results mode is specified.

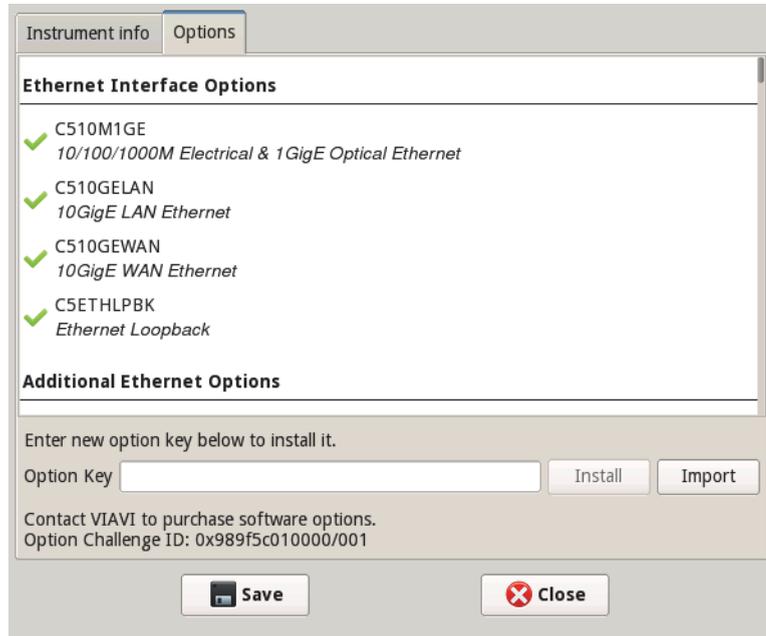
## Viewing or installing options

Your instrument may come with software options installed or you may order them later and install yourself.

### To view installed options

- Select **Tools > Review/Install Options**.

The Software Options screen appears.



The icon indicates whether the option is enabled.

Icon	Indicates
	Option is enabled.
	An expiring option. An “expiring option” is an option that is installed for free for a trial period. The time left in the trial is indicated to the right. When the trial period ends, a warning message appears. If you are running a test when the option expires, you can continue testing, but the expiration warning will reappear every minute until you either enter a permanent option key or reset the module (changing applications will reset the module).
	Option has not been enabled. If you need this option, contact Viavi Customer Care to place an order.

### To install software options

- Refer to the *Software Option Installation Instruction* provided with the option.

## Loading upgrades

Software upgrades can be loaded from storage media such as a CD-ROM or a USB memory key. To obtain the latest software release for your unit, contact your local Viavi sales office.

Refer to the instructions provided with the software upgrades for details.

## Synchronizing to the StrataSync server

To automatically obtain the latest configuration settings, software options, updates and ownership registration information, the instrument may be synchronized with a Viavi server via the Internet with an optional subscription-based service called StrataSync.

In addition to the latest operating software, the synchronization also stores any user files saved to the unit's hard drive on the StrataSync server. A connection to the internet would be provided upon receipt of the unit and on a regular (daily) basis thereafter to ensure that it has the most currently issued options and updates and to allow all user information to be backed up.

If an internet connection is available and contact has been made with the StrataSync server, a message appears asking you to initiate the syncing process.

**NOTE:**

Before attempting to synchronize the unit to the StrataSync server, be certain that no applications are currently using the RJ-45 Management port.

### To sync with the StrataSync Server

- 1 Verify that the server ID is displayed in the Server ID field -default= *strata-sync.viavisolutions.com*
- 2 Enter the Account ID for this test instrument. No synchronization can occur without the entry of a pre-approved, unique ID number. This ID must be obtained from Viavi before attempting to sync to the server.
- 3 Enter an optional Tech ID. This will be populated by a default value representing your test instrument, but can be changed to identify the user who is initiating the synchronization.
- 4 Press the **Synchronize** button.  
To halt the synchronization process after it has been started, select the Stop Sync button.

**NOTE:**

During Synchronization, a cloud icon will be displayed at the top of the screen and the state of the synchronization activities will be displayed below the Synchronize button. The cloud icon will also be modified to indicate the following actions -

Up/Downloading- Cloud with arrows

Failed Sync - Cloud with red X overlay

Sync Success - Cloud with green check mark

If an error or failure occurs, a message detailing the possible reason for the problem will be displayed in the status message under the Start button.

The synchronization process includes:

- After syncing with the StrataSync server, your test instrument sends identifying information about the hardware and software that currently comprise the instrument.

If the configuration information contained on the server is newer than that on the test instrument, the server will be considered to be the most up-to-date.

 **NOTE:**

StrataSync may have difficulty determining the newest file if the system time of the instrument has been modified.

- If the server finds files that are newer than those on the test instrument, the server sends the files to the instrument.

Each time the synchronization process modifies or copies files, a message appears indicating the action just taken.

- The test instrument will then send any reports, configuration profiles, screen shots, and similar files that have been saved on the unit since the last configuration. File names that may be included include the following:

Reports	Configurations
*.txt	*.tst
*.csv	*.dualtst
*.pdf	*.ams
*.xml	*.sam
*.html	*.truespeed
*.png	*.expert_rfc
*.pcap	*.cat
	*.xml

- The server then applies any applicable Options to the unit.

 **NOTE:**

If an Option Code was entered as a part of synchronization, your instrument must be restarted to complete the process and initialize the option.

Anytime an option is updated, the unit will conclude the update process by attempting to contact the StrataSyncserver. If a connection is unavailable, one should be provide at the earliest convenience to register all installed options.

- Finally, if any upgrades are available, you will be informed of their availability and asked to verify that you want to receive the upgrade.
- After synchronization is complete, the Status will indicate “Status Complete” and the instrument will reboot. The test instrument may be disconnected from the internet.

The test instrument has been synchronized to the StrataSync Server

## Specifying a printer for the instrument

After specifying a printer for the instrument, you can print the following for the currently running test application:

- The display
- The setup parameters
- The test results

### To specify a printer for the instrument

- 1 Press the **SYSTEM/HOME** button.
- 2 Select the **System Setup** softkey.
- 3 In the Printer box, select **Printer**, and then select the type of printer you are connecting to the unit. If you select a USB printer, you can then select the manufacturer for the printer.

The printer is specified. For instructions on connecting a printer to the base unit, refer to the *8000 Base Unit User Manual* or *6000A Base Unit User Manual*.

## Connecting your instrument to the circuit

Before connecting your instrument to the circuit for testing, consider the following:

- Older chassis for some test instruments provide internal connectors for all supported optical line rates.
- Newer chassis require either an external optical connector or a CFP, SFP, SFP+, XFP, or QSFP+ transceiver (and/or adapter) to test optical circuits, providing greater flexibility. For handling guidance, see [“Handling CFP adapters and transceivers” on page 43](#), or [“Handling SFP/SFP+, XFP, and QSFP+ transceivers” on page 48](#).
- If you are connecting an MSAM to the circuit, verify that the appropriate PIM (or PIMs) are inserted into the MSAM.
- When selecting the cable, consider the following:
  - What type of connectors are required?
  - Are you testing an electrical or optical circuit?
  - If you are testing an optical circuit, is it a single-mode or multi-mode circuit?
  - Do you need a crossover cable?
  - Do you have the appropriate attenuator for the cable?

After considering the items above, these basic steps should be followed.

## To connect your instrument to the circuit

- 1 If you are testing on an optical circuit, insert a Viavi recommended optical connector, transceiver and/or adapter into the supporting port on the instrument's connector panel (see [“Viavi recommended optical adapters and transceivers” on page 25](#)).
- 2 Using the blinking yellow LEDs and labels on the connector panel as a guide, connect one end of the selected cable to the appropriate transceiver or jack on your instrument, and then connect the other end to the device on the circuit. If you are connecting to an optical circuit, *be certain to attenuate the signal*.  
  
NOTE: If your test instrument is configured with dual ports, flashing LEDs indicate which connectors are used for the *currently selected test*; solid LEDs indicate the connectors used for other tests.
- 3 If you connected to an optical circuit, determine whether you can remove the attenuator by observing the **Optical Rx Level (dBm)** result in the Interface group, Signal category. If attenuation is not necessary, remove the attenuator, reconnect the cable to the transceiver, and then press **Restart**.

The instrument is connected to the circuit.

## Configuring Expert Optical settings

The optics used in the CSAM ideally auto-configure upon insertion and therefore require no user intervention.

For applications where configuration of the optics is critical, an Expert configuration is provided. This function provides adjustments for the optics to compensate for equipment variations and transmission conditions.

### To configure expert settings

- 1 On the Main screen, select the **Setup** soft key. A series of setup tabs appear.
- 2 On the **Interface** tab, select the **Connector** tab.
- 3 Select the **QSFP Expert** or **CFP Expert** tab.
- 4 Click the box to **Enable Expert Mode**.  
  
The expert mode parameters are automatically set, and are only applicable to the CFP or QSFP modules. Therefore, the settings only appear if a valid (non-loop-back) CFP transceiver, CFP Adapter, or QSFP+ transceiver is inserted in the corresponding port.
- 5 If you are testing using unreleased pluggable options (e.g., optics that are still under development), use **Ignore LOS** if you receive LOS errors.

- 6 If you enabled QSFP Expert mode in Step 4 *and the QSFP is capable of bypassing transmit or receive clock data recovery (CDR)*, if you want to bypass CDR, do the following:

- To bypass transmit CDR, select **Tx CDR bypass enable**.
- To bypass receive CDR, select **Rx CDR bypass enable**.

**NOTE:** If the QSFP is not capable of bypassing CDR, these settings will be disabled.

- 7 If you enabled CFP Expert mode in Step 4, adjust the Transmit (Tx) settings as applicable:

- a Specify the **Pre-Emphasis** setting.

Setting	Description
Default	Original manufacturer settings.
Low	Some pre-emphasis is applied.
Nominal	A moderate level of pre-emphasis is applied. This is the ideal setting for most CFPs.
High	A high level of pre-emphasis is applied.

The default pre-emphasis settings are set to values which are recommended to work with all optics on the Recommended Optics List.

- b Specify the **Clock Divider** setting.

Setting	Description
Default	Original manufacturer settings.
1/16	The reference clock will be set to 1/16 of the CAU line rate.
1/64	The reference clock will be set to 1/64 of the CAU line rate.

The default reference clock will be set to the default mode that the CFP is expecting.

- c If you are testing using serial CFP optical modules, specify the **Skew Offset**.

The Synchronous Transport Lane (STL) specification requires 32-byte lane spacing but some serial CFP hardware exists that does not conform to this specification. The CSAM is being shipped with a **CFP Skew** value at **-32**. If, at a later time, hardware changes require it, a skew value of **32** is also available.

The Skew settings appear only for SONET applications when using single-lambda CFPs.

- d Specify whether to **Invert Polarity**.

This inverts the polarity of the data from the FPGA transceiver to the CFP. This is a special case feature that may be necessary for use with electrical-breakout or other evaluation CFPs.

- e Specify whether to reset the FIFO on the transmit path (**Reset Tx FIFO**) of the CFP.

This button appears only if the CFP has indicated that it supports FIFO *manual* reset. Errors may be recorded after a FIFO reset. To clear the errors, restart the test after resetting the FIFO.

If the unit is looped back to itself, reset the Tx FIFO before resetting the Rx FIFO.

- f If you are using an OpNext 100G LR4 CFP, specify whether to automatically reset the FIFO any time it has regained synchronization (lock) after having lost it.

This is specific to the OpNext 100G LR4 CFP. Per the manufacturer's recommendation, the 40G/100G Transport Module can execute software-monitored and assisted resets of the transmit and receive FIFO.

This automatic FIFO-resetting mechanism will be gated (blocked) if

- SONET/SDH service disruption is enabled
- OTN service disruption is enabled
- Ethernet SD has decoupled TX from RX

The *manual* FIFO reset (specified in [step e](#)) on the expert configuration page will not be blocked or gated.

- 8 If you enabled CFP Expert mode in Step 4, adjust the Receive (Rx) settings as applicable:

- a Specify the **Equalization** setting.

Setting	Description
Default	Original manufacturer settings.
Low	Minimal equalization is applied. This is the ideal setting for most CFPs.
Nominal	A moderate level of equalization is applied.
High	A high level of equalization is applied.

The default Equalization settings are set to values which are recommended to work with all optics on the Recommended Optics List.

- b Specify whether to activate **Invert Polarity**.

This inverts the polarity of the data from the CFP to the FPGA transceiver. This is a special case feature that may be necessary for use with electrical-breakout or other evaluation CFPs.

- c Specify whether to reset the FIFO on the receive path (**Reset Rx FIFO**) of the CFP.

These buttons appear only if the CFP has indicated that it supports FIFO *manual* reset. Errors may be recorded after a FIFO reset. To clear the errors, restart the test after resetting the FIFO.

If the unit is looped back to itself, reset the Tx FIFO before resetting the Rx FIFO.

- d If you are using an OpNext 100G LR4 CFP, specify whether to automatically reset the FIFO any time it has regained synchronization (lock) after having lost it.

This is specific to the OpNext 100G LR4 CFP. Per the manufacturer's recommendation, the 40G/100G Transport Module can execute software-monitored and assisted resets of the transmit and receive FIFO.

This automatic FIFO-resetting mechanism will be gated (blocked) if

- SONET/SDH service disruption is enabled
- OTN service disruption is enabled
- Ethernet SD has decoupled TX from RX

The *manual* FIFO reset (specified in [step c](#)) on the expert configuration page will not be blocked or gated.

The Optics Expert Mode parameters are set.

## Browsing the web

The T-BERD / MTS 5800v2, 5800-100G, 5882 and SC 4800/4800P include a web browser similar to that found on a tablet. Although it is not expected to perform in all aspects like that of a browser on a PC, it will allow access to a company intra-net or work order system as well as access to Viavi provided web resources on the instrument. It runs over the Ethernet management interface.

**NOTE:**

You need access to the Internet for the web browser to function properly.

### To browse the web

- Select the **System** icon, then select **Web Browser**.  
The Browser launches on your instrument.

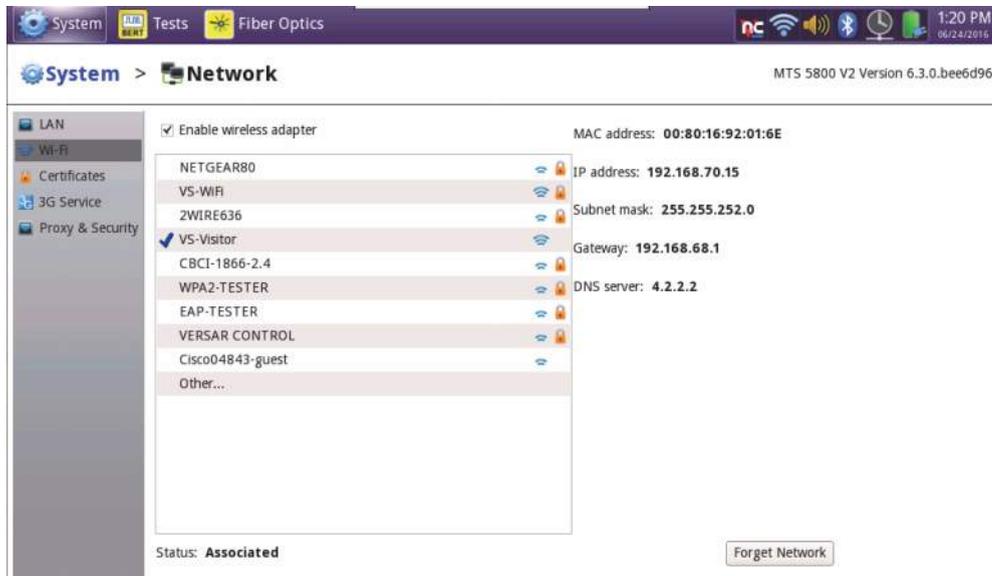
## Connecting to WiFi

The T-BERD / MTS 5800v2, 5800-100G, 5882 and SC 4800/4800P include internal WiFi. WiFi is also available on the T-BERD / MTS 5800v1 using an external dongle.

### To connect to WiFi

- 1 Select the **System** icon, then select **Network**.
- 2 On the left of the screen, select **Wi-Fi**.

### 3 Select **Enable wireless adapter**.



### 4 Select the wireless network to connect to.

If it is a private network, a lock icon appears. You must enter the correct password to access the private network.

### 5 If you want the instrument to forget the wireless network password as soon as it connects, select the **Forget Network** button at the bottom right of the screen.

## Playing videos

The T-BERD/MTS 5800v2, 5800-100G, 5882, SC 4800/4800P include a video player. It can be used to play training videos, advertisements, or other videos. You can access videos from USB or the file system. The player supports AVI, MP4, H.265/MPEG-4 video formats.

### To play videos

#### 1 Select the **System** icon, then select **Video Player**.

The player launches.



- 2 Select **Open File**, then browse to locate the video that you want to play.
- 3 Select the video file, then select **Open**.  
The video plays.

## Setting up the Job Manager

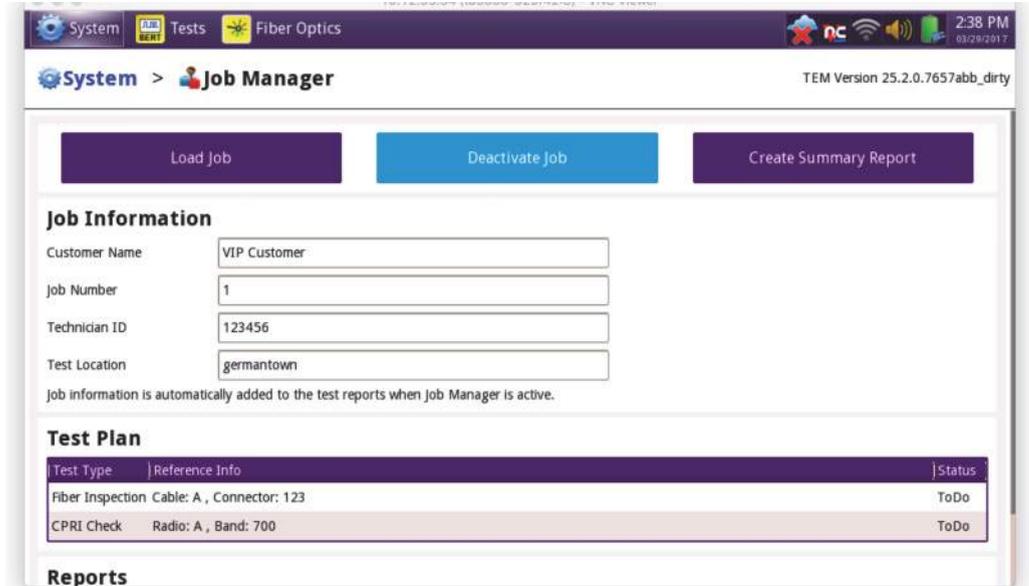
The Job Manager allows you to specify the information to be included whenever you run a test and generate a report. Each time you generate a report, your instrument will automatically insert the Customer Name, Job Number, Technician ID, and Test Location that you specified in the Job Manager into the report heading.

**NOTE:**  
The Job Number specified in the Job Manager will be provided as the default Work Order Number when applicable to specific reports.

If you change the report information on the Report Info screen (before you generate a report), the new report information will override the defaults that are specified in the Job Manager. For example, if you change the Work Order number on the Report Info screen, the Work Order number will be included in your report output instead of the default Job Number.

### To specify report information

- 1 Select the **System** icon, then select **Job Manager**.  
The Job Manager screen appears.



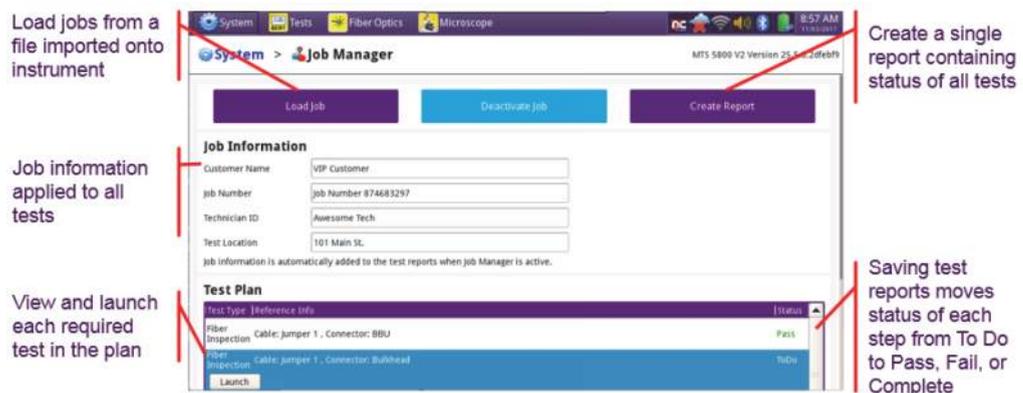
2 Specify the **Customer Name**, **Job Number**, **Technician ID**, and **Location**.

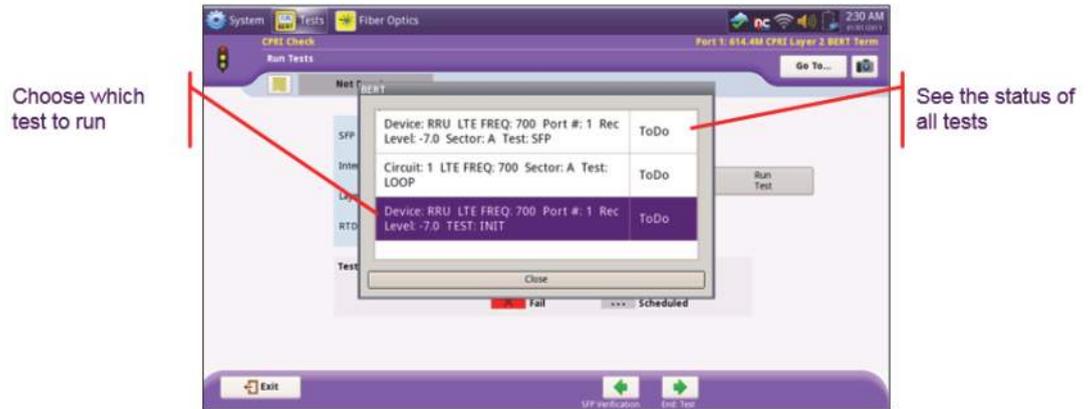
The report information is specified, and will be retained until you change it.

### Job Manager Test Plan

The **Test Plan** section provides a list of planned test items associated with a job, including the test type to be performed, reference information, and the pass/fail status.

If you load a test plan, you can select the test in the test list and the **Launch** button will appear on the highlighted row. It will be enabled if the application is available on the unit. Clicking the button will start the application and open its work flow screen. With the test plan you can also automatically load the configuration and profile of the test.





The Pass/Fail status is updated when the report for a planned test item is created. To associate a report to a planned test item, you need to match the reference information entered for the current test with the reference information specified in the desired planned test item.

Selecting the **Create Summary Report** button allows the user to generate a report of the test plan, including the associated report artifacts and the Pass/Fail status.

Selecting the **Load Job** button allows the user to load a new Job onto the instrument. Attach a USB stick containing the job file and select **Load Job** to open the file dialog.



# Basic Testing

This chapter explains basic testing concepts and procedures common to each test. Topics discussed in this chapter include the following:

- “Preparing to test” on page 90
- “Step 1: Selecting a test application” on page 109
- “Step 2: Configuring a test” on page 113
- “Step 3: Connecting the instrument to the circuit” on page 115
- “Step 4: Starting the test” on page 115
- “Step 5: Viewing test results” on page 118
- “Running multiple tests” on page 125
- “Scheduling timed tests” on page 131
- “Creating and printing reports” on page 131
- “Restoring test defaults” on page 138
- “VT-100 emulation” on page 138
- “HTML Viewer” on page 141

## Preparing to test

Before testing, Viavi recommends:

- Verifying that you have the correct cables, connectors, transceivers, or adapters required to connect to the circuit.
- Determining whether you need to synchronize near and far end instruments to a high accuracy timing reference before beginning the test.
- Determining whether a high accuracy timing reference is required for precise measurements and analysis.

## Understanding synchronization requirements

Some test applications will provide more accurate measurements and test results if near and far end instruments are precisely synchronized using external high accuracy timing references.

- The MSAM, CSAM, and 5800 can use optional, external CDMA receivers or the optional TM4-4 GPS receiver to ensure that both instruments are synchronized, providing measurements that are accurate within +/- 10 us. Instructions for synchronizing test instruments using optional CDMA or GPS receivers are provided in this manual.
- The 5800v2/100G, and 5882 can use an optional Timing Expansion Module (TEM), to ensure that both instruments are synchronized per the same timing reference and provide measurements that are accurate within +/- 10 ns. Instructions for synchronizing 5800v2/100G and 5882 test instruments using the optional TEM Modules are provided in the *Timing Expansion Module User Manual* that shipped with your TEM.

GPS is increasingly being used as a timing reference because it is available almost everywhere and provides a common reference between various field locations. CDMA and GPS receivers provide an accurate Time of Day (ToD) signal and 1 Pulse per Second (PPS) signal, which, when averaged over a long time period, provide very precise signals that can be used to create common timestamps and provide a reference clock for instruments performing precise measurements.

When using GPS to synchronize timing on your test instruments, each instrument must be equipped with the same type of receiver (CDMA or GPS).

### ATP-GPS test packets

When your test instrument is synchronized to GPS time via the optional CDMA or TM4-M GPS receiver (or via the optional TEM module), it tags outgoing Acterna Test Packets (ATP) with GPS timestamps. The timestamps are required for accurate one way delay, wander, and 1588v2 PTP, PDV, and Master-Slave delay measurements. The receiving, synchronized instrument recognizes these packets and uses them when performing the measurements.

## About CDMA receivers

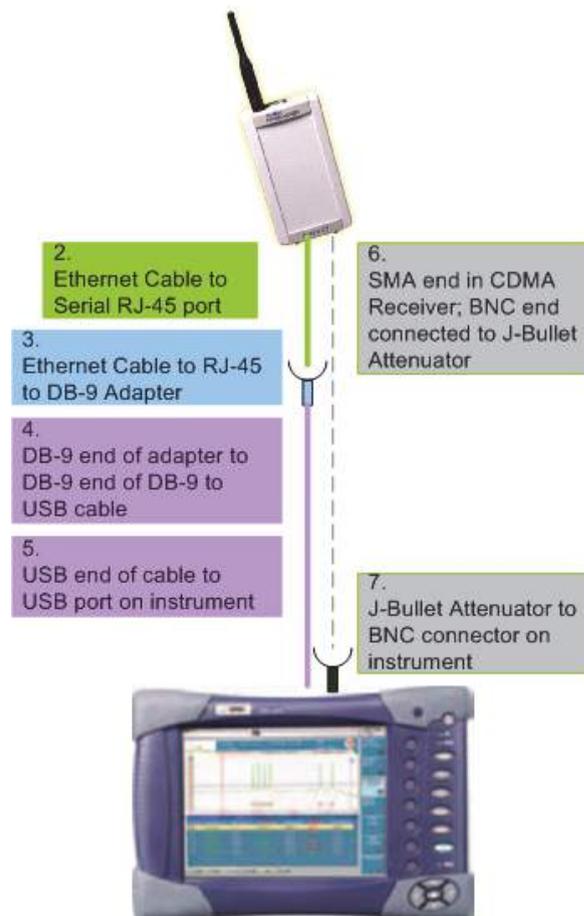
CDMA base stations are synchronized to GPS time provided by a GPS Satellite; the time is then broadcast to the CDMA receivers connected to your instruments. Alternatively, if your instruments use GPS receivers, the receivers obtain highly accurate timing information directly from a GPS Satellite (there is no intermediary base station).

Your instruments use the messages and signals provided by the CDMA or GPS receivers to synchronize their internal clocks with GPS time. The receivers provide 1) periodic messages with GPS time via the DB9, RJ-45, or USB connector on the instruments, and 2) an accurate 1PPS signal into the BNC, SMA, or SMB connector. Outgoing packets are then marked with GPS timestamps. If your instruments are configured and optioned to do so, both test ports can be used, allowing you to measure one way delay for two different circuits simultaneously. Connecting a CDMA Receiver to an instrument

When you use CDMA receivers to synchronize your test instruments, the receivers communicate with each other to establish synchronization.

Figure 54 illustrates each of the required connections for a CDMA receiver connected to a T-BERD/MTS 5800 or a MTS6000 or MTS8000v2 base unit with a CSAM or MSAM module.

**Figure 54** CDMA connection for one way delay measurements



## To connect a CDMA receiver to your instrument

- 1 Connect the ToD signal between the CDMA receiver and the MST6000 or MST8000.
  - a Connect one end of the Ethernet cable to the serial RJ-45 port of the CDMA receiver.
  - b Connect the other end of the Ethernet cable to the RJ-45 to DB9 adapter.
  - c Connect the other end of the cable to the instrument:
    - If using a DMC in an 8000v1 base unit, connect the DB9 adapter to the instrument.
    - If using a CSAM or MSAM with a 6000A or 8000v2 base unit, do the following:
      - i. Connect the DB9 end of the RJ-45 to DB9 adapter to the DB9 to USB cable.
      - ii. Connect the USB end of the DB9 to USB cable to a USB port on your instrument.
  - d If using a CSAM, connect a SMA to SMA cable from “1PPS” output jack on the CDMA receiver to a SMA to SMB adapter and then to the CSAM’s “CLK OUT/1PPS” port.
- 2 Verify that your instrument is synchronized with GPS time by checking the CDMA Sync and 1PPS Sync LEDs. When synchronized, the LEDs will be illuminated.
- 3 Repeat [step 1](#) through [step 2](#) on the second instrument.

The receivers are connected to your instruments, and the instruments are synchronized with GPS time.

## About GPS Receivers

Instruments using the optional TM4-M GPS receiver (instead of CDMA receivers) communicate directly with the GPS satellite instead of via terrestrial-based radio broadcast by the base station. The GPS receiver will establish synchronization by using a common signal received from a GPS satellite.

The GPS receiver provides accurate ToD and 1PPS signal, which, when averaged over a long time period, provide very precise signals that can be used to create common timestamps and as reference clock for other precision system measurements. The GPS receiver provides a Time of Day (ToD) and a 1PPS signal which are used to generate accurate time stamps that are encoded into the data transmitted between the local and remote instruments.

## Connecting the GPS receiver to your instrument

### To connect the TM4-M GPS receiver to your instrument

- 1 Connect the 1PPS signal between the GPS receiver and the instrument.
  - If you are connecting to a MSAM v1, connect the BNC to BNC cable from “OUT B” on the GPS receiver to the J-Bullet attenuator, and then connect the J-Bullet attenuator to the “EXT REF” connector on your instrument (see [Figure 55 on page 93](#), [Figure 56 on page 94](#), or [Figure 57 on page 94](#)).
  - If you are connecting to a MSAMv2, connect the BNC to SMA cable from “OUT B” on the GPS receiver to the “EXT REF” connector on your instrument (see [Figure 61 on page 97](#), [Figure 62 on page 97](#), or [Figure 63 on page 97](#)).
  - If you are connecting to a 5800v1, connect the BNC to SMA cable from “OUT B” on the GPS receiver to the “EXT REF” connector on your instrument (see [Figure 58 on page 95](#)).
  - If you are connecting to a 5800v2, connect the BNC to SMA cable from the “OUT B” on the GPS receiver to the SMA Timing Cable Adapter’s CLK1 connector, which is connected to the “EXT CLK” connector on your instrument (see [Figure 59 on page 95](#)).
  - If you are connecting to a 5800-100G, connect the BNC to SMB cable from the "OUT B" on the GPS receiver to the "EXT REF" connector on your instrument.
  - If you are connecting to a CSAM, connect the SMA to SMB adapter to the CSAM’s “CLK OUT/1PPS” port, then connect the SMA to BNC cable from the adapter to “OUT B” on the GPS receiver.

*Optional.* Connect the DB9 to USB serial cable from the Control Port on the GPS receiver to a PC.

**Figure 55** GPS Reference Timing Connection Diagram- MSAMv1 w/ MTS6000A

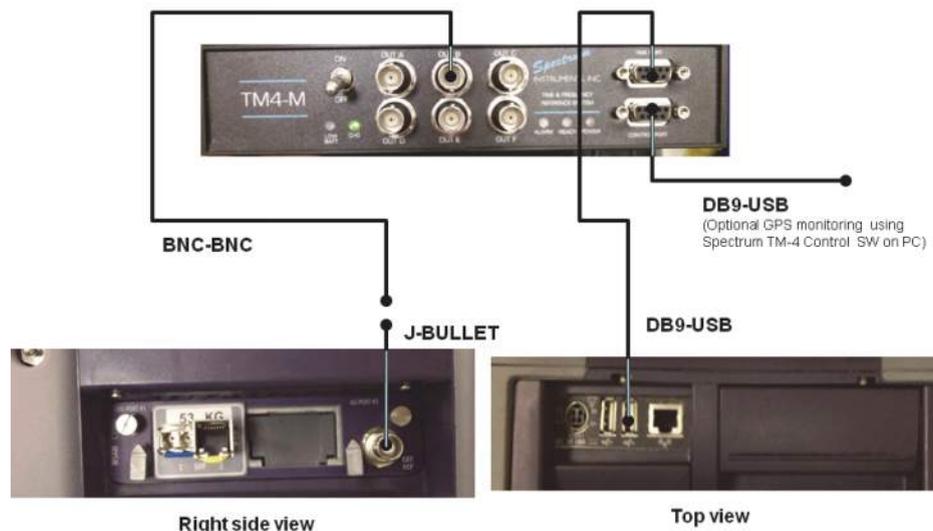


Figure 56 GPS Reference Timing Connection Diagram - MSAM v1 in MTS8000v1

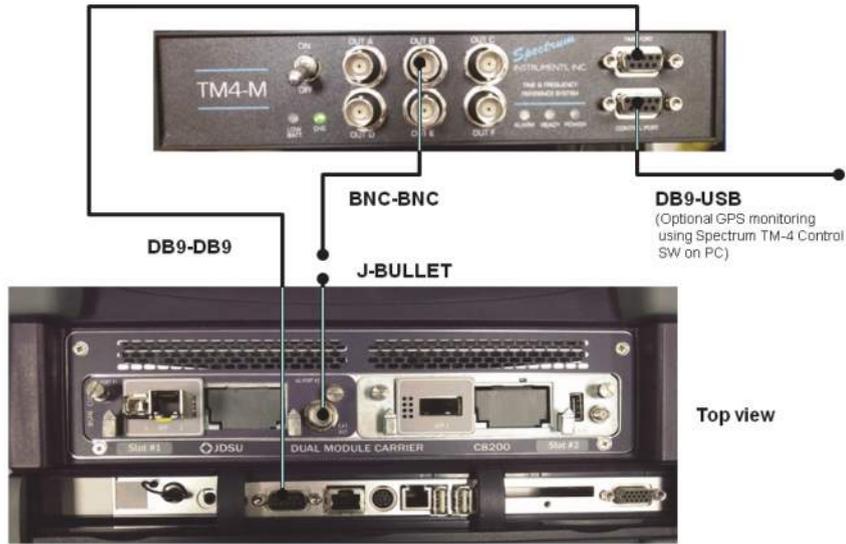
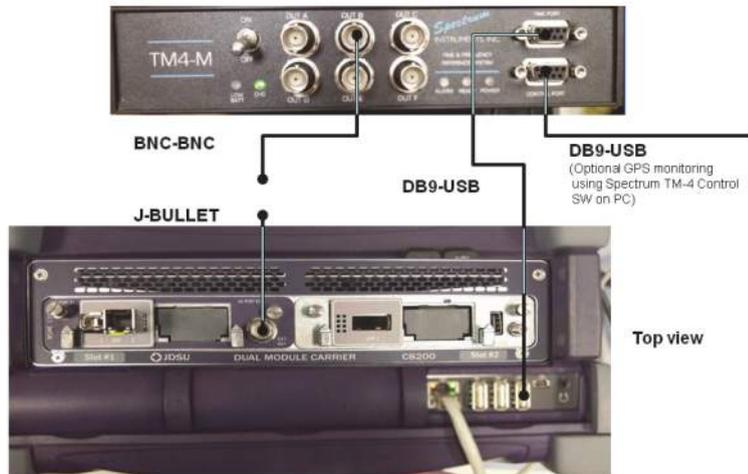
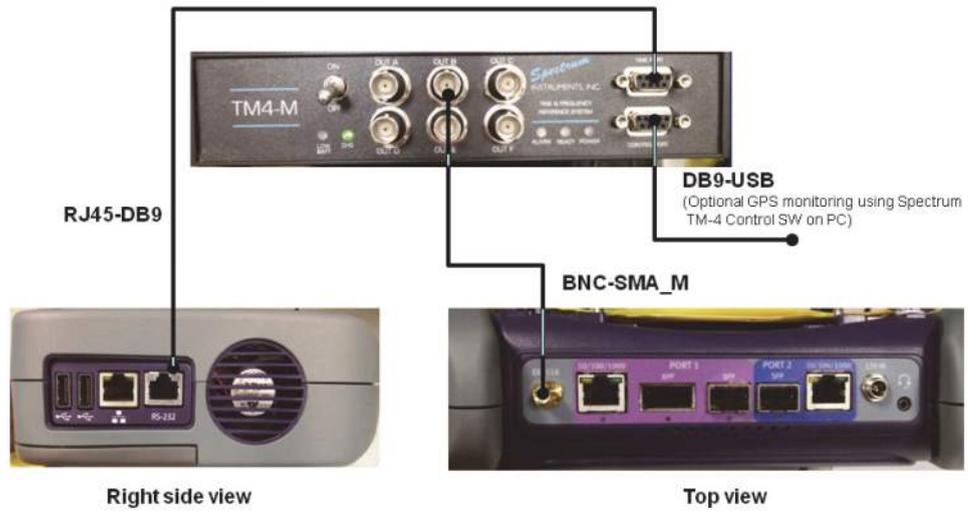


Figure 57 GPS Reference Timing Connection Diagram - MSAM v1 in MTS8000v2



**Figure 58** GPS Reference Timing Connection Diagram - 5800v1



**Figure 59** GPS Reference Timing Connection Diagram - 5800v2

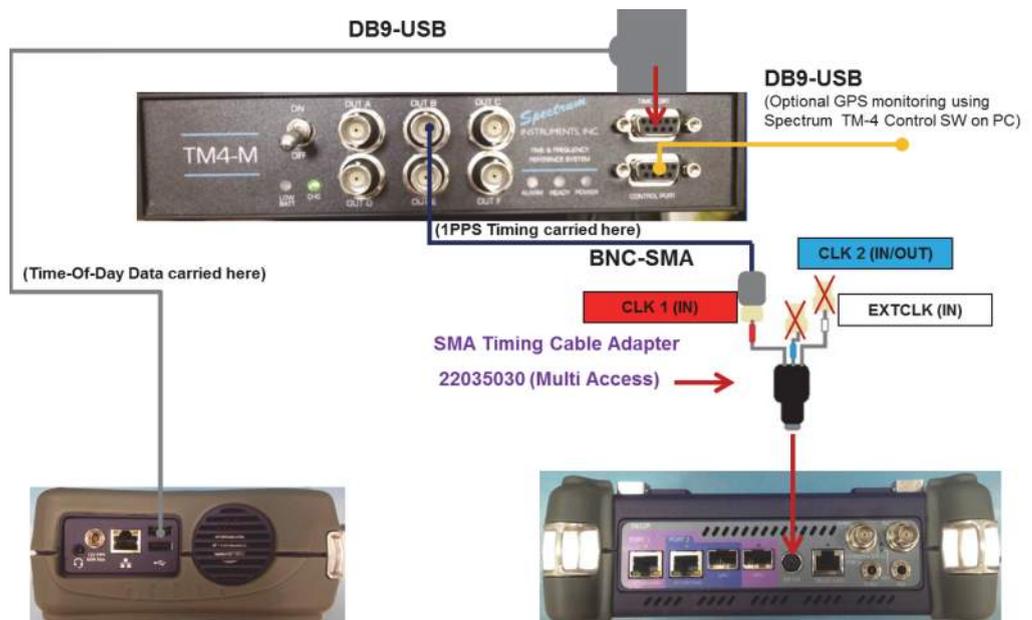
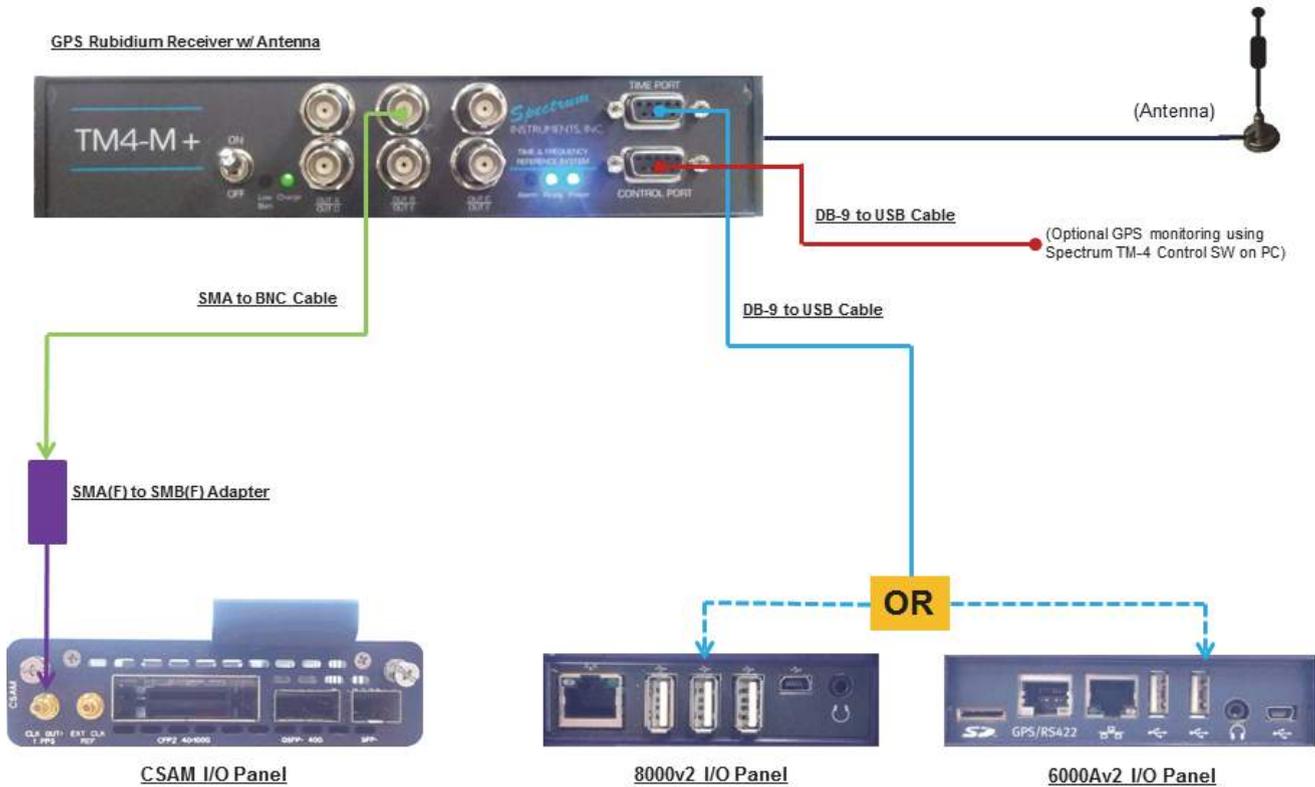


Figure 60 GPS Connection Diagram - CSAM



- 2 Connect the ToD signal between the GPS receiver and the instrument.
  - For an 8000v1, connect the DB9-DB9 cable from the “Time Port” on the GPS receiver to the DB9 connector on the T-BERD/MTS 8000, 6000A, and 5800 (see [Figure 56 on page 94](#) or [Figure 62 on page 97](#)).
  - For a 5800v1, connect the DB9 to RJ-45 cable from the “Time Port” on the GPS receiver to the RJ-45 connector on the 5800 (see [Figure 58 on page 95](#)).
  - For a 5800v2, 6000A or 8000v2, connect the DB9 to USB cable from the “Time Port” on the GPS receiver to the USB port on the 6000A or 8000 (see [Figure 55 on page 93](#), [Figure 57 on page 94](#), [Figure 59 on page 95](#), [Figure 60 on page 96](#), [Figure 61 on page 97](#), or [Figure 63 on page 97](#)).

Figure 61 GPS Connection Diagram - MSAMv2 w/ MTS6000A

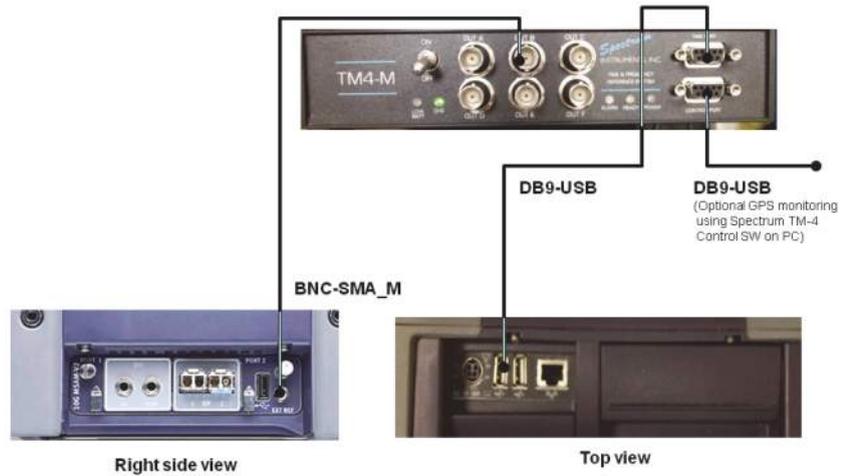


Figure 62 GPS Connection Diagram - MSAM v2 in MTS8000v1

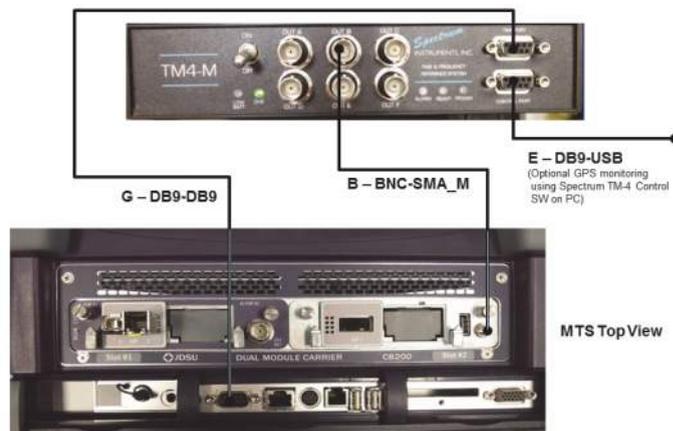
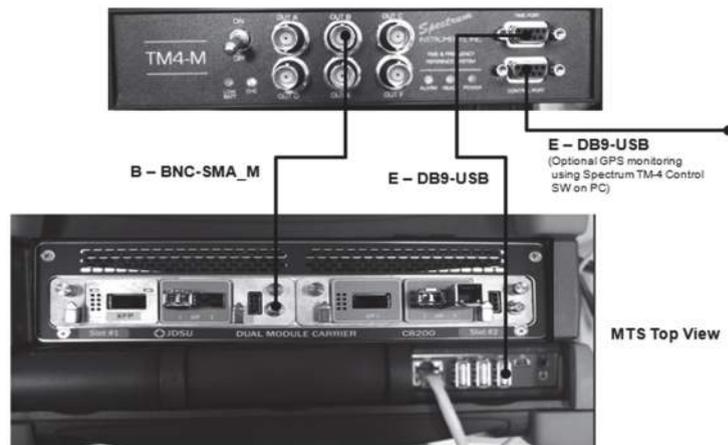


Figure 63 GPS Connection Diagram - MSAM v2 in MTS8000v2



- 3 Repeat [step 1](#) and [step 2](#) on the second instrument.
- 4 Verify that it is synchronized with GPS time by checking the GPS Sync and 1 PPS Sync LEDs. When synchronized, the LEDs will be illuminated.



The 1PPS minimum pulse width that can be detected is 20 $\mu$ s.

The GPS receivers are now connected.

## Configuring GPS as the time source

After the TM4-M GPS receiver is connected to the instrument, the instrument must be configured to use the GPS as the time source. If sync to the GPS is lost at any time, the instrument will automatically switch to the internal oscillator as the PTP time source and an event will be recorded in the log.

### To select GPS as time source

- 1 If you haven't already done so, use the Test Menu to select the test application for the interface you are testing.
- 2 On the instrument, select the **Setup** soft key.
- 3 Select the **Interface** tab, and then on the **CDMA/GPS Receiver** tab, select the **Enable CDMA** or **GPS receiver** check box.

The GPS receiver has been selected as the time source.

## Understanding external high accuracy timing references

Some test applications require an external, high accuracy timing reference to provide an accurate analysis.

If you intend to run an application using an external source of high accuracy timing (for example, a GPS receiver such as the TM4M or the optional Timing Expansion Module/TEM), it is important to understand the connections required to input the reference and analyzed signals. This is especially true when providing signal input to a 5800v2 test instrument via an SMA Timing Cable Adapter.

## Using the 5800v2 and 5800-100G to provide high accuracy external timing

Your 5800 instrument can be used as a highly accurate external timing reference for another device via one of the following:

- The EXT\_CLK (white) cable provided on the Multi Access SMA Timing Cable Adapter, which is connected to the EXT CLK connector on the 5800v2.
- The 10 MHz OUT connector on the optional TEM Module if 1) the module is connected to your 5800v2, 2) a GNSS antenna is connected to the module, and 3) the module's rubidium oscillator has been tuned to a highly precise synchronization source. 5800-100G has a built-in GNSS receiver.

## Preparing for optical testing

Before testing on optical circuits using the instrument, you should be familiar with the following concepts.

### Considerations

Before testing on optical circuits using the instrument, consider the following:

- Only use the optical adapters and transceivers that shipped with your instrument, or optics that you purchased from Viavi as accessories. A list of Viavi supported optics shipped with your instrument.
- Details concerning the transceiver used for the currently selected application are available on the Interface setup tab.



#### **WARNING: HAZARDOUS LIGHT EXPOSURE**

Do not look directly into the optical output of the unit or at the output of any optical cable or transceiver connected to the unit. If a fiber optic cable is removed from a transmitting connector or transceiver, cover the connector with the safety cap to prevent inadvertent exposure to the laser output.



#### **WARNING: RISK OF DAMAGE TO TRANSCEIVERS**

When connecting the instrument to optical circuits using a transceiver, *do not apply optical power that exceeds the maximum optical power published as permitted by the transceiver manufacturer.*

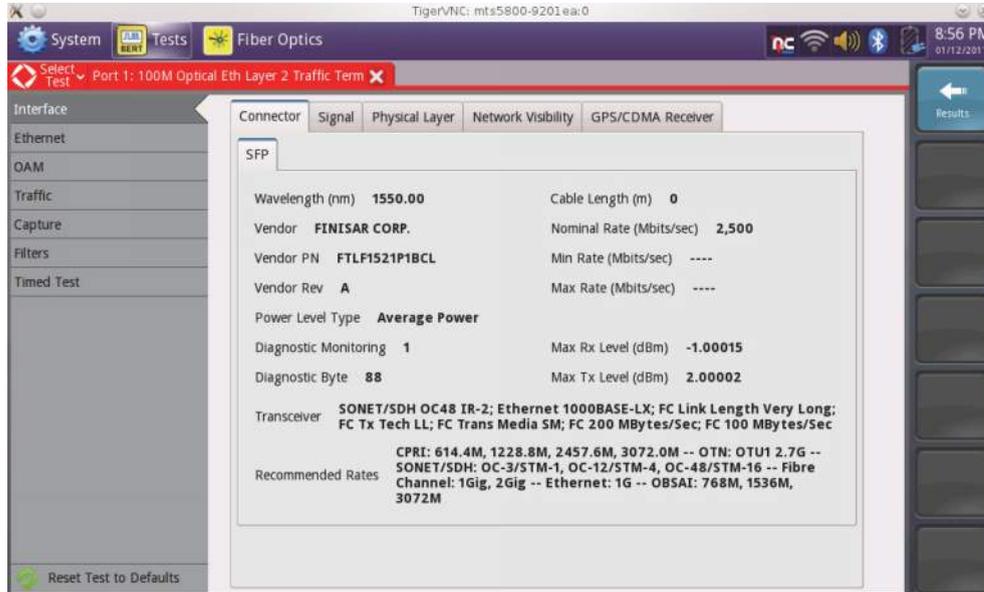
If you do not know the optical power of the applied signal, use an attenuator when you connect to the circuit for the first time, then remove the attenuator if you determine that it was not necessary. Otherwise, the transceiver can be permanently damaged due to the "hot signal".

A variety of attenuators are available for purchase as options when you order your instrument.

## Verifying supported line rates

Before testing, verify that the optic can support the line rate for the circuit that you are testing.

- 1 Press the **Setup** soft key.
- 2 Select **Interface**, then view the **Connector** tab.



The recommended rates are listed. Press the **Results** soft key to return to the results screen.

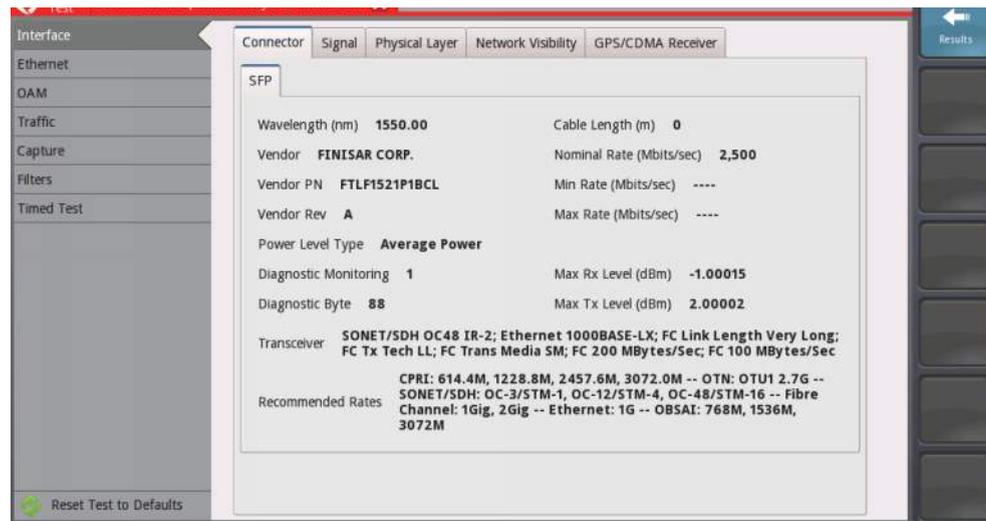
If the line rate is not supported by the transceiver, "Recommended optic rates not available" appears. Turn the instrument off and try another transceiver.

## Tuning SFP+ and XFP transceivers

The ITU-T G.694.2 standard provides a frequency grid for DWDM which creates channel spacing from 12.5 GHz to 100 GHz. The channel spacing allows different carriers to run on the same fiber. Using a tunable SFP+ or XFP in our instrument, you can use different channels or wavelengths. Most XFPs are designed for C-band wavelengths.

## To tune an SFP+ or XFP transceiver

- 1 Verify whether your transceiver supports tuning by viewing the **Connector Setup**.



This screen varies depending on the device.

The first two lines under the SFP or XFP tab relate to the tunable characteristics of the transceiver. The first indicates that the transceiver is tunable, and may show which wavelengths are tunable. The second line indicates which types of tuning are supported.

- 2 Do one of the following:
  - a To specify the tuning in the Setup menu, do the following:
    - Select the **Signal** tab.
    - Select the **Tuning Mode**: Channel, Wavelength or Frequency.
    - If you selected Wavelength, specify the wavelength. The available wavelength range appears. If you selected Channel, specify the channel. The available channel range appears.
    - If you selected Frequency, specify the frequency. The value entered will be converted and the available wavelength and/or channel ranges appear.
    - If the transceiver being tuned is capable of channel-only or wavelength-only tuning, the user selected value will be translated to the appropriate value and tuning method respectively. If the device is tunable by both wavelength and channel, the software will determine the closest channel

(50 GHz spacing) and wavelength (50 nm spacing) value. The tuning method with the smallest difference to the user selected value will be used to tune the transceiver.

- b** To specify the tuning on the Main screen, do the following:
- Press the **Result** soft key.
  - Use the Laser action buttons to specify the Tuning Mode: **Frequency**, **Wavelength** or **Channel**.
  - If you selected Wavelength, click on the wavelength field, and use the keypad to enter the wavelength.
  - If you selected Channel, click on the channel field, and use the keypad to enter the channel.
  - If you selected Frequency, specify the frequency. The value entered will be converted and the available wavelength and/or channel ranges appear.

If the transceiver being tuned is capable of channel only or wavelength only tuning, the user selected value will be translated to the appropriate value and tuning method respectively. If the device is tunable by both wavelength and channel, the software will determine the closest channel (50 GHz spacing) and wavelength(50 nm spacing) value. The tuning method with the smallest difference to the user selected value will be used to tune the transceiver.

The transceiver is tuned.

## Testing Optics and Cables

The Optics Self-Test and the Cable Test scripts are available for all 10G/25G/40G/100G interfaces on T-BERD/MTS. They allow users to verify the proper operation and stability of the CFP, CFP2, CFP4, QSFP28, QSFP+, SFP+, or SFP28 transceiver(s) connected to their 5800v2, 5800-100G, or CSAM. The Optics Self-Test and Cable Test applications appear as the topmost entries in the Start Test menu.

The Optics Self-Test or Cable Test verify signal presence, level (at all possible rates), and rejection of excessive skew. They also allow you to specify a BER threshold and maximum Offset (in PPM). You can save and reload the test configuration, and observe results for the underlying application while the test is running using the **Go To...** button. The Cable Test enables users to test optical or copper cables terminated by SFP or QSFP cages in a 5800v2 and 5800-100G.

## Testing Active Optical Cables and Direct Attach Copper cables using T-BERD/MTS 5800-100G and 5800v2

An active optical cable (AOC) is a multimode fiberized cable with pluggable optic cages such as QSFP or SFP, permanently mated to both ends.

**Figure 64** AOC Cable



Direct Attach Copper (DAC) is a similar device but with copper cables. These AOC/DAC cables are used inside data centers to, for example, connect a TOR (Top of Rack) switch to a Leaf/Spine. These cables may cause errors due to manufacturing defects such as reversed polarities or potentially crushed or squeezed optical fibers. Errors can be identified before cables are laid avoiding extra effort to replace the cable, or to prevent discarding a good cable by mistake. The T-BERD/MTS 5800-100G and 5800v2 enable technicians to test such cables quickly and easily via a built-in script.

AOC and DAC cables testing includes the following features:

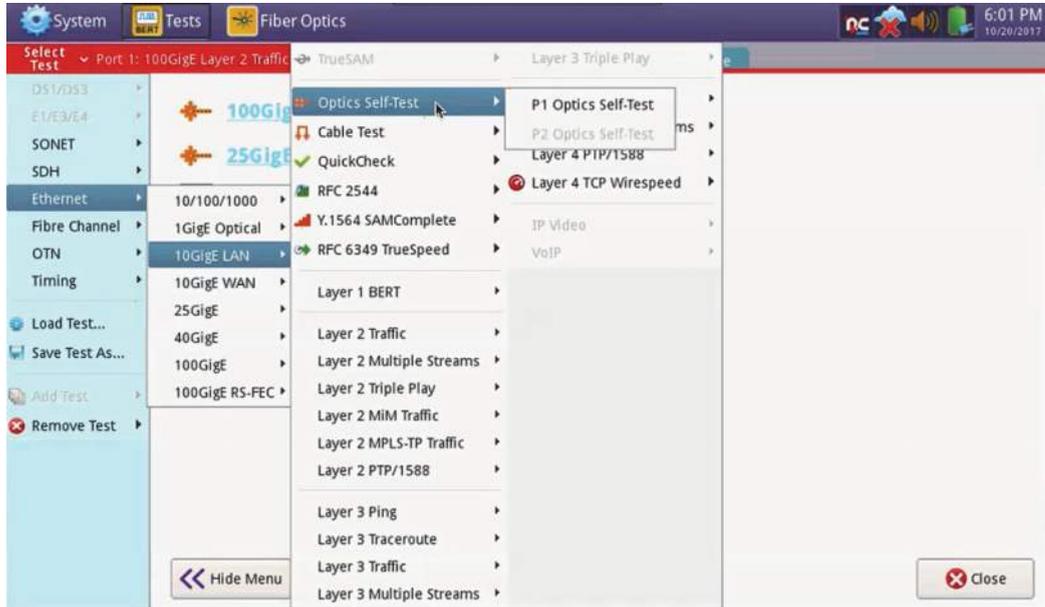
- Cable Test script built into the T-BERD/MTS 5800-100G or 5800v2
- Test reports capture the serial number of the cable tested, as well as the setup and results
- Pass/fail results against adjustable bit error rate threshold
- Choice of five report file formats
- Available for tests at 10GigE LAN (for T-BERD/MTS 5800v2, 5800-100G, and CSAM); 25GigE (for 5800-100G); 40GigE, 100GigE, and 100 GigE RS-FEC (for CSAM and 5800-100G)
- User can save and reuse configuration files

### Running the Optics Self-Test and Cable Test

#### To run the tests:

- 1 For the Cable Test, connect the AOC or DAC cable between 2 ports. For the Optics Self-Test, connect an optical cable between the interface input and output ports.
- 2 Use the Test Menu screen to select the **Optics Self-Test** or **Cable Test** (located under it in the image below) application for the interface you are testing.

Figure 65 Selecting Optics Self-Test.

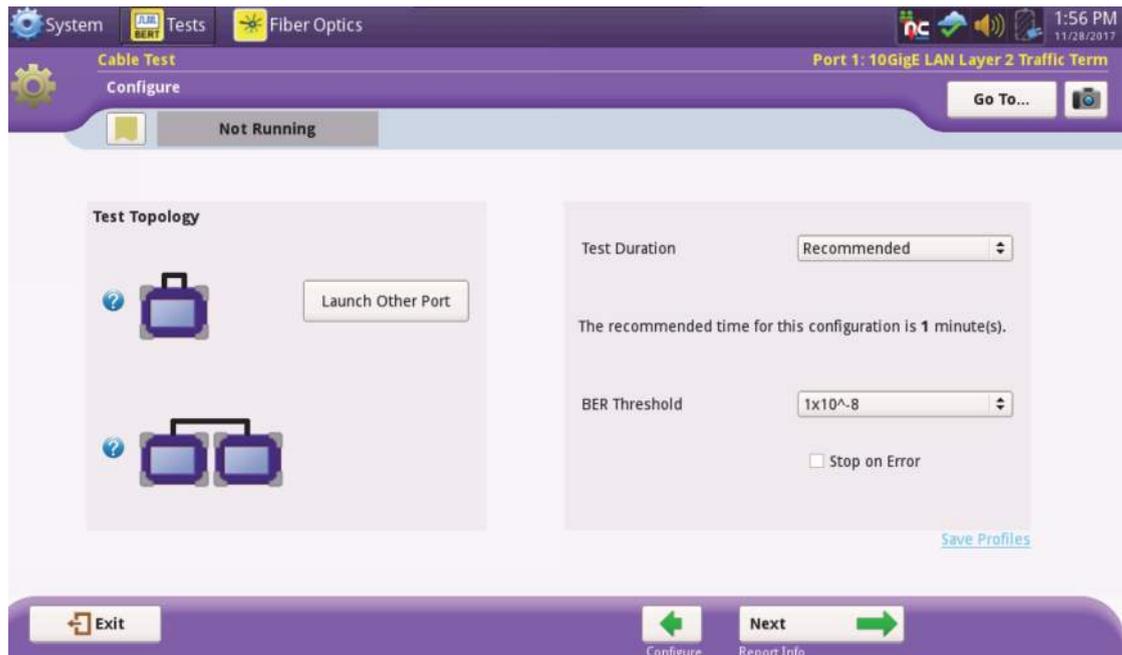


- 3 On the next screen you have three configuration options: **Edit Previous Configuration**, **Load Configuration from a Profile**, and **Start a New Configuration (reset to defaults)**, each with a **Go** button. Pick your option by clicking the **Go** next to it.



- 4 The next screen for the Optics Self-Test has one pane (the right one in the image below). The Cable Test screen has an additional **Test Topology** pane. The two-ports test is run by the **Launch Other Port** button and is only available on

correctly optioned dual port units. It launches the appropriate test application to test a cable from port 1 to port 2. Any application already running on the other port will be closed.



- 5 For both the Cables test and Optics Self-Test, specify the following:
  - **Test Duration.** If you set test duration to User Defined, you can define your value in minutes or seconds.
  - **BER Threshold.** If you are running the cable test for 25GigE (where RS-FEC is implicit) or for 100GigE RS-FEC, there is a BER Threshold Type selection of Pre-FEC (default) or Post-FEC.

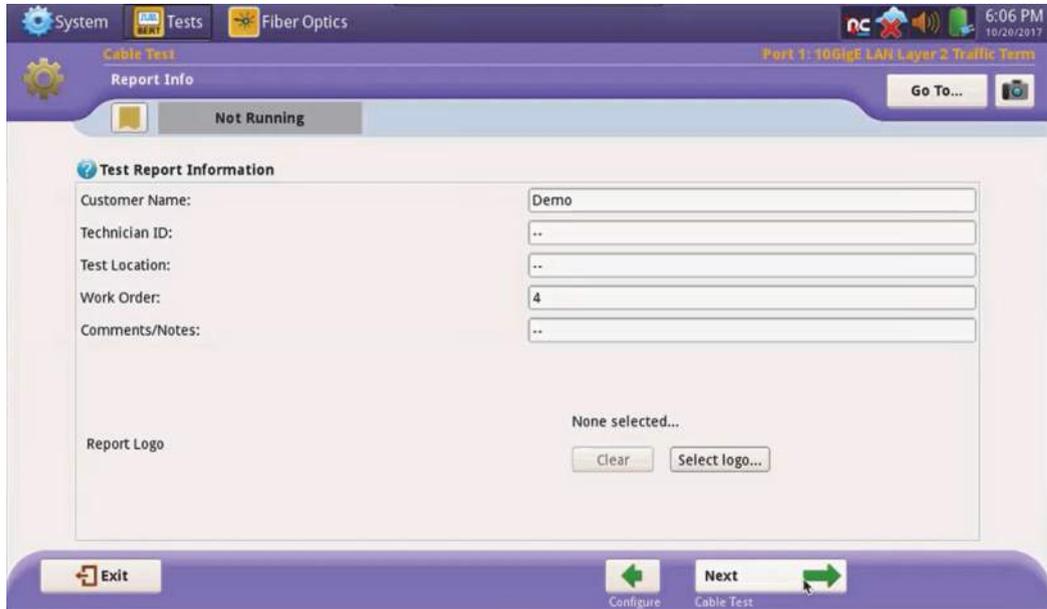
**NOTE:**

The recommended test times are calculated using BER theory based on the following:

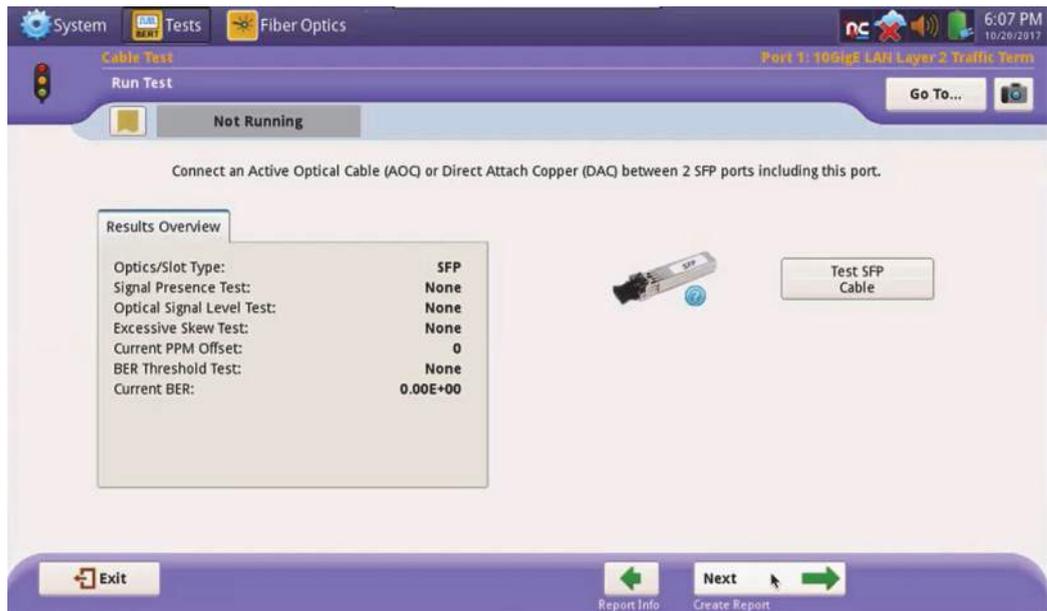
- confidence level (CL) set to 95%
- the user-defined BER threshold
- the duration depends on the line rate selected from the applications menu

- **Stop on Error.** If enabled, the test stops immediately upon discovery of an out-of-parameter result.
- Once you have configured your test, you can create a saved profile by clicking the blue **Save Profiles** link. Afterwards you can load these profiles by pressing the **Go To** button and clicking **Configure** to return to the earlier test configuration screen where you can restart the tests.

- 6 On the next Report Info screen, fill out all entries and press **Next**.



- 7 On the Run Test screen, start your test by clicking the test button (**Test SFP Cable** on the screen below). You will see the results overview on the left pane.



- 8 *Optional.* To verify the specifics of the optic being tested, select the  symbol next to the graphic of the transceiver. A list of specifications (including the SN) similar to the following will appear.

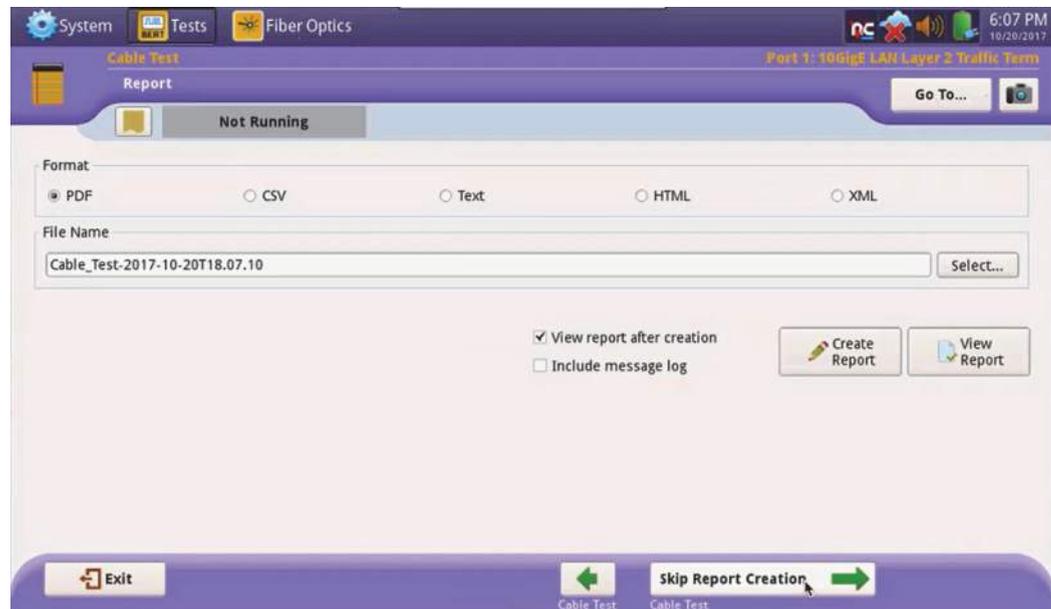
Nominal Wavelength (nm)	0	Power Level Type	OMA
Vendor	ELPEUS TECHNOLOG	Rx Max Lambda Power (dBm)	-0.849169
Vendor PN	QSFP-LB	Tx Max Lambda Power (dBm)	Unavail
Vendor SN	P32331000026	Nominal Bit Rate (Mbits/sec)	—
Vendor Rev	00	Diagnostic Byte	0
Date Code	110407		
Lot Code			
Transceiver	00 00 00 00 00 00 00 00 59		

Select the **Back** button to return to the test.

- 9 If you are testing a QSFP+/QSFP28 on CSAM and the transceiver is capable of bypassing transmit or receive clock data recovery (CDR), you can bypass CDR. Do the following:
- To bypass transmit CDR, select **Tx CDR bypass enable**.
  - To bypass receive CDR, select **Rx CDR bypass enable**.
- NOTE:** If the QSFP is not capable of bypassing CDR, these settings will be disabled.
- 10 Click **Next** to proceed to the Report screen.

## Generating Reports

- 1 After the Optics Self-Test or Cable Test have concluded, select the **Next** arrow at the bottom of the screen. The Report screen appears.



- 2 Select the report format in the **Format** pane.
- 3 To view the report without saving it, select the **View Report** button.
- 4 To save a report, do the following:
  - a Enter the filename of the report to be saved. File names of other saved reports are accessible via the **Select** button after the File Name box.
  - b Click the **Create Report** button. If the **View Report after Creation** check box was checked, the report appears. If not checked, a message appears confirming that the report was saved. Select **OK**.
  - c If checked, the **Include message log** box will add a message log to the report.
- 5 If **Job Manager** was activated in the System page, the generated report will be available in the report section of the Job Manager application. The reference information lists the Serial Number, Optics type and Vendor for SFP and SFP28 optics along with the tests results. Job Manager activation is recommended for the Cable Test. Note: **Job Number** in Job Manager is the same as the **Work Order** (number) in the report information.
- 6 A summary Job Manager report can be generated to provide the summary of all the cable and optics tests performed.

## Step 1: Selecting a test application

There are two methods available for selecting a test application. The first method uses the Quick Launch screen, which lists pinned (saved) and recently run tests. The second method uses the Test Menu, which lists *every available test* for the currently installed options and configuration of your instrument.



**NOTE:**

Some tests (for example, the NextGen GFP tests) only appear if you purchased the associated testing options for your instrument.

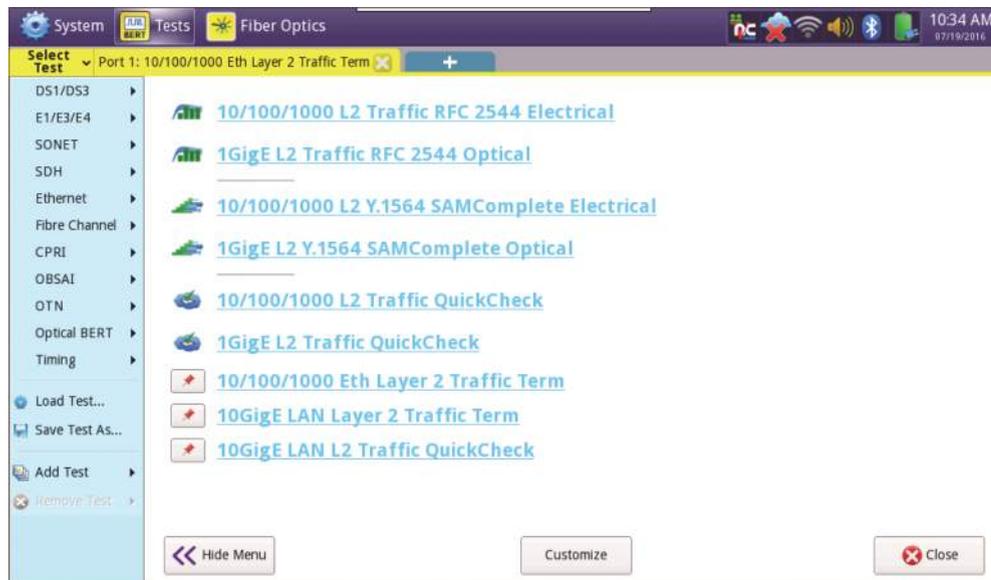
When testing using an MSAM, only the tests supported by currently inserted PIMs will appear on the Test menu. For example, if an SFP and XFP PIM are inserted in the MSAM chassis, you will not see DS1 applications.

### About the Quick Launch screen

The Quick Launch screen allows you to select and run pinned and recently run tests quickly without navigating through the Test Menu. Instead of selecting the technology, signal, payload, and test mode from the Test Menu, you can launch a previously configured test directly from the Quick Launch screen in a single step.

Figure 66 shows a Quick Launch Screen with a number of commonly used Ethernet applications pinned to the screen, and three applications that were recently selected. The Test Menu also appears to the left of the screen; you can hide it if you want to using the **Hide Menu** button (provided at the bottom of the screen).

**Figure 66** Quick Launch Screen (with Test Menu shown)



## Pinned tests

An icon appears to the left of each pinned test representing the application or technology that is supported by the test. Table 11 lists the icons used to represent key applications.

**Table 11** Quick Launch Icons

Application	Icon	Application	Icon
1 PPS Analysis or Wander Analysis		J-Profiler	
CPRI / OBSAI		Multiple Streams	
DS1 and ISDN PRI		PTP/1588	
DS3		RFC 2544	
E1 and ISDN PRA		RFC 6349 Truespeed	
E3		SDH and OTN	
E4		SONET and OTN	
Ethernet Quick Check		TCP Wirespeed	
Ethernet Traffic		TrueSAM	
Fiber Channel Traffic		VoIP	
IP Video		Y.1564 SAMComplete	

## Recently selected tests

Up to three recently selected tests are also identified on the Quick Launch screen using a pin icon:



You can run the tests from the Quick Launch screen (without pinning them), or you can pin a test to the Quick Launch screen by 1) selecting the pin icon, and then 2) either accepting the default test name or entering a different test name for the test when prompted. This allows you to be more descriptive about the test configuration. For example, if you pin a 1 GigE Layer 2 Ethernet test that is configured to transmit VLAN tagged frames, you can append the default test name with “VLAN” to indicate that the test was configured for VLAN tagged traffic.

## Launching a test from the Quick Launch screen

### To launch a test from the Quick Launch screen

- 1 If the Quick Launch screen did not appear by default when you turned on your instrument, on the Main screen, click **Select Test**.  
The Quick Launch screen appears.  
The All Tests and Hide Tests buttons are used to display or hide the Test Menu to the left of the screen; the Customize button is used to maintain and customize the list of tests that appear on the screen.
- 2 If the test you want to launch appears on the screen, select the test; otherwise, customize the screen to add the test (see [“Customizing the Quick Launch screen” on page 111](#)), then select the test on the Quick Launch screen.
- 3 Wait for the test to launch and appear on the Main screen, then proceed to [“Step 2: Configuring a test” on page 113](#).

The test is launched.

## Customizing the Quick Launch screen

Using the Customize Test List dialog box, you can add shortcuts to new tests, add saved tests, and rearrange, rename, or delete existing tests that appear on the screen.

### To customize the Quick Launch screen

- 1 On the Main screen, click **Select Test**.  
The Quick Launch screen appears.
- 2 Select the **Customize** button at the bottom center of the screen. The Customize Test List dialog box appears.

- 3 Do the following to customize the Quick Launch screen:
  - To add a shortcut: Select the **Add Shortcut** button, then use the Test Menu that appears to navigate to and select the test that you want to save as a shortcut on the Quick Launch screen.
  - To add a saved test: Select the **Add Saved Test** button, then select a previously saved test from the Select Saved Test dialog box. Press Ok to save the selected saved test - it will appear as a favorite on the Quick Launch screen.
  - To delete one or more tests: Use the **Delete** button to delete a single selected test, or the **Delete All** button to delete all selected tests. You will be prompted to confirm the deletion before the tests are deleted from the Quick Launch screen.
  - To rename a test: Select the test that you want to rename, then select the **Rename** button. Enter a new name for the test, then select **Ok**.
  - To rearrange the tests: Use the **Move Up** and **Move Down** buttons to move the selected test to a new position within the list of tests.
  - To insert a separator between two tests: Select the test under which you want to insert the separator, then select the **Separator** button. This allows you to group tests on the screen by technology, line rate, technician, customer, or any manner that is helpful to you.
- 4 If you want the Main screen to appear by default when you start your test instrument (instead of the Quick Launch screen), select **Show results at startup**.

The Quick Launch screen is customized.

## Launching a test using the Test Menu

Tests are grouped and listed on the Test Menu by technology (for example, Ethernet or SONET), signal, payload, and test mode.



**NOTE:**

If the Test Menu is not displayed, select the **All Tests** button (located at the bottom left of the Quick Launch screen). The Test Menu will appear.

### To select a test using the Test Menu

- 1 On the Main screen, click **Select Test**.  
The Quick Launch screen appears.
  - If the Test Menu appears to the left of the screen, proceed to [step 2](#).
  - If the Test Menu does not appear, select the All Tests button (located at the bottom left of the Quick Launch screen). The Test Menu will appear.
- 2 Using the Test Menu, select the technology, signal, payload, and test mode for your test.  
The instrument displays a message asking you to wait while it loads the test.
- 3 Wait for the Main screen to appear, and then proceed to [“Step 2: Configuring a test” on page 113](#).

The test is selected.

## Step 2: Configuring a test

Configuring a test involves displaying the setup screens, specifying test settings, and optionally saving the test setup.

Key settings are also available on the Main screen, on the Quick Config tabs. Changing key settings while running a test (for example, changing the pattern transmitted) triggers an automatic restart of the test.

## Displaying the setup screens

### To display the setup screens

- 1 Using the Test menu or Quick Launch screen, select a test application (see “[Step 1: Selecting a test application](#)” on page 109).
- 2 Select the **Setup** soft key.  
The setup page appears and typically includes a series of tabs. The tabs displayed vary based on the test application you selected. See [Figure 67](#).

**Figure 67** Setup Screen (Ethernet Settings tab for GFP testing)

Interface	SDH	LCAS	GFP	Ethernet	Traffic	Filters	Timed Test
Encapsulation	None						
Frame Type	DIX						
Frame Size (Bytes)	512						
DA	SA	Type	Data	FCS			

- 3 To navigate to a different setup screen, select the corresponding tab at the top of the screen. For example, to display the Traffic setup screen, select the Traffic tab.

- 4 After you finish specifying the test settings (see “Entering data in the setup fields” on page 114), select the **Results** soft key to return to the Main screen.



**TIP:**

If you want to provide a screen shots of a configuration tab (and the settings that you specified on the tab), on the Main screen, select **Tools > Capture Screenshot**. A screen shot will be captured and stored as a JPG file in the `/acterna/user/storage/bert/images` folder. You can include the screen shot when you create reports.

## Entering data in the setup fields

When specifying test settings, you can either select a value from a drop-down menu, or tap the field to launch a keypad, then type a value.

### To select a value from a drop-down menu

- Select the arrow icon to the right of the field, and then highlight the value for the setting.

### To type text or numeric values

- Select the field to launch a keypad, type the value, and then select **OK**.  
The value appears in the field.



**NOTE:**

The valid ranges and values for user-specified settings appear at the top of the keypad. For example, if you configure a constant traffic load for a 10 GigE LAN circuit, `0.001 .. 100.000` appears at the top of the keypad, indicating that a number ranging from `0.001` to `100.000` is a valid value for the load percentage.

## Saving setups

After you specify your test settings, you can save the setup (configuration) to use it again for future tests.

### To save a setup (configuration)

- 1 On the menu bar of the Main screen, select **Test > Save Test Config As...**  
The Save Test Configuration screen appears, listing existing saved setup files.
- 2 Select the arrow icon to the right of the **Look in:** field, and then highlight the directory where you want to save the configuration.

- 3 Select the **Save Config** soft key.  
The File Name dialog box appears.
- 4 Select the keypad icon directly to the right of the **Enter a name for the test:** field.  
A keyboard appears on the screen.
- 5 Use the keyboard to type a name for the saved setup file. You do not need to enter the .tst extension; the module automatically appends the extension to the name.
- 6 If you want to secure the setup so other technicians can not modify it (or delete it using the **Delete All** button), select **Save as read-only**.
- 7 Select **OK** to save the setup.
- 8 To return to the Main screen, select the **Exit** soft key.

The setup is saved and the file appears on the screen with the other saved setups.

If you setup multiple tests, the settings are saved in a dual configuration file. For more information, see [“Running multiple tests” on page 125](#).

## Understanding write-protected configurations

If you indicate that you want to save a configuration (setup) as read-only, the following occurs:

- Any custom result categories defined for the configuration are also protected.
- The configuration can not be deleted using the Delete All button.
- The configuration can be deleted using the Delete button.
- When you import a read-only configuration file onto your instrument, the instrument will retain the read-only permissions. Any custom categories defined for the configuration will also be imported.

## Step 3: Connecting the instrument to the circuit

For detailed instructions on connecting your instrument to the circuit, refer to the appropriate testing manual for the circuit you are testing. Basic instructions are provided in [Chapter 3 “Getting Started”](#) of this manual.

When connecting the unit to optical circuits, bear in mind that applied power must not exceed the power level specified on the panel for each optical connector.

## Step 4: Starting the test

After you configure a test and connect the unit to the circuit, the following occurs:

- If you are running a PDH, or classic SONET or SDH application, and you are testing an optical circuit, you must turn the laser ON. The test starts automatically, and test results immediately accumulate.

- If you are running an Ethernet, OTN, Fibre Channel, or NextGen application (launched from the SONET or SDH test menu options), and you are testing an optical circuit, you must turn the laser ON, then actively **Start Traffic** (using the corresponding action button).
- If you are running an Ethernet or Fibre Channel application, and you would like your unit to transmit traffic automatically, you can enable the automatic traffic generation feature. For details, refer to the *Ethernet and Fibre Channel Testing Manual* that shipped with your instrument or upgrade.



**NOTE: Temperature stabilized lasers**

When testing 10 Gigabit, 40 Gigabit or 100 Gigabit optical circuits, some lasers (particularly 1550 nm lasers) are temperature stabilized; therefore, they need to reach a certain temperature before you can use them to transmit a signal. This is expected behavior, and does not indicate that there is something wrong with the laser or test instrument.

It typically takes up to one minute for the temperature to stabilize. If you have turned the laser on, but no signal is present on the receiving instrument or device, simply wait for one minute.

## Using the Action buttons

After you start a test, use the buttons at the bottom of the screen to perform actions such as turning the laser on and off, starting and stopping traffic, starting and stopping a local loopback, and inserting errors, anomalies, alarms, or defects.

Table 12 lists some common Action buttons.

**Table 12** Action buttons

Button	Action
Laser On/Off <sup>1</sup>	Turns the laser on or off when testing optical rates.
Insert Error/Anomaly	Inserts an error or anomaly into the transmitted traffic.
Insert Alarm/Defect	Inserts an alarm or defect into the transmitted traffic.
Start Traffic/Stop Traffic	Starts or stops transmission of Ethernet, IP, Fibre Channel, OTN, TCP/UDP, or GFP traffic over the circuit.

1. You can optionally configure optical standard Ethernet and Fibre Channel applications to automatically transmit traffic after you turn the laser ON.

## Controlling laser transmission

Some optical transceivers are capable of transmitting signals from different lanes. If you are testing using a CSAM and your transceiver has this capability, after you turn the laser on, you can “poke” the A013 register to turn lasers off *for specific lanes within the register*.

The “poke” function is only available for the A013 register, which is dedicated to the control of the transceiver’s lasers. A related “peek” function allows you to determine the status of any valid register by reading the corresponding peek value.

### To turn off laser transmission for a specific lane or lanes

- 1 Select your test application, configure the test, connect your instrument to the circuit, then turn the laser **ON**.
- 2 From the main menu, select the **Setup** soft key. A series of setup tabs appear.
- 3 On the **Interface** tab, select the **Connector** tab, then select the **MDIO** tab.
- 4 To turn lasers OFF for a specific register, under Poke, do the following:
  - a In **PokeRegAddr**, enter the register address (A013).
  - b In **Poke Value**, enter the bit value representing the lane for which the laser will be turned off:
    - 0001 indicates that the laser in the first lane should be turned off.
    - 0002 indicates that the laser in the second lane should be turned off.
    - 0003 indicates that the lasers in both lanes should be turned off.
  - c Select **Poke**.

The lasers are turned off for the specified lanes.

### To check the current status of a register

- 1 Select your test application, configure the test, connect your instrument to the circuit, then turn the laser **ON**.
- 2 From the main menu, select the **Setup** soft key. A series of setup tabs appear.
- 3 On the **Interface** tab, select the **Connector** tab, then select the **MDIO** tab.
- 4 Under Peek, do the following:
  - a In **PeekRegAddr**, enter the register address.
  - b Select **Peek**.

The displayed Peek Value indicates the status of the register.

## Restarting a test

### To restart a test

- Press the **Restart** soft key.

The unit clears your test results, and then the test restarts.

## Stopping a test

When you stop a test, test results immediately stop accumulating, but remain on the display until you start the test again.

### To stop a test

- Press the **START/STOP** button.

The test stops. To start the test again, you must press the START/STOP button.



**NOTE:**

If you scheduled a timed test, the test stops automatically after running for the duration you specified.

## Step 5: Viewing test results

Test results appear in the Results Windows of the Main screen.

## Setting the result group and category

### To set the result group and category

- 1 Using the Test menu or Quick Launch screen, select a test application see “[Step 1: Selecting a test application](#)” on page 109), and then configure your test (see “[Step 2: Configuring a test](#)” on page 113).
- 2 Select the **Results** soft key to return to the Main screen.
- 3 Connect your module to the circuit. For details, refer to the testing manual for the circuit you are connecting to.
- 4 If you are testing an optical interface, select the **Laser** button.
- 5 If you selected an Ethernet, Fibre Channel, or SONET/SDH GFP test application, select the **Start Traffic** button to start generating and analyzing traffic.  
Results appear in the Results Windows.
- 6 *Optional.* Insert errors or anomalies into the traffic stream, or use the Action buttons to perform other actions. These buttons only appear if applicable to your test application.
- 7 Use the Group and Category buttons to specify the type of results you want to observe. [Figure 68](#) illustrates buttons for a standard SONET application.

**Figure 68** Result Group and Category buttons



Results for the category you selected appear in the result window.

- 8 *Optional.* To observe results for a different group or category in another result window, press the buttons at the top of the window to specify the group and category.

For descriptions of each result, refer to the testing manual for the technology you are testing.



**TIP:**

If you want to provide a screen shot of key test results, on the Main screen, select **Tools > Capture Screenshot**. A screen shot will be captured and stored as a JPG file in the `/acterna/user/disk/bert/images` folder. You can include the screen shot when you create reports.

## Expanding and collapsing result measurements

Certain test results for which a variety of measurements are made (such as current, average, minimum, or peak throughput measurements) can now be expanded (to see all measurements for the test result), or collapsed (to hide measurements for the test result). When multiple measurements exist for a result, a plus or minus sign appears to the right of the result name.

Collapsing the results that you are not interested in reduces scrolling, and allows you to observe more results that you are interested in simultaneously.

### To expand result measurements

- Select the plus sign  to the right of the result name, or
- Select the plus sign at the bottom of the result window to expand all expandable results.

### To collapse result measurements

- Select the minus sign  to the right of the result name, or
- Select the minus sign at the bottom of the result window to collapse all collapsible results.

## Changing the result layout

You can change the default layout of the test results on the Main screen. In many instances it is helpful to use the Full Size layout.

### To change the default result layout

- 1 Select **View > Result Windows**.  
A menu listing the available layouts appears.

- 2 Select a new layout.

The Result Windows appear using the layout you selected.

## Using the entire screen for results

You can expand a single result pane to use the entire screen by selecting the Full Screen button at the bottom of the pane.

### To use the entire screen

- 1 Use the Group and Category buttons to specify the type of results you want to observe.
- 2 Select the **Full Screen**  button provided at the bottom of the results pane.

The pane expands to use the entire screen, and the result layout options provided by selecting **View > Result Windows** are disabled.

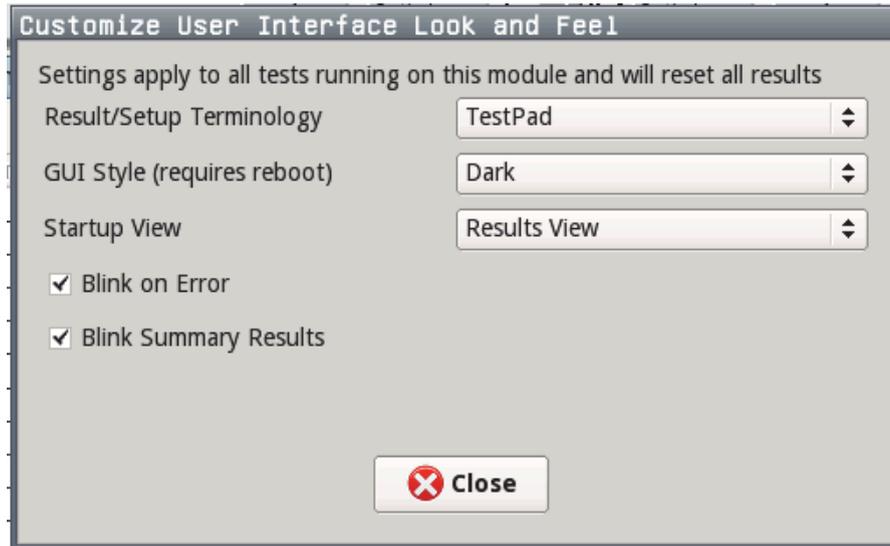
To restore the screen to its original layout, select . After returning the screen to its original layout, the layouts available from the View menu will be enabled.

## Setting the blink option on errors

To alert the user to an error condition, the tab at the top of the screen, indicating the current application, can be configured to blink when there is an error condition. The Summary results background can also be configured to blink if a more obvious indicator is helpful.

## Configuring the blink option

- 1 Select **Tools > Customize** from the menu bar. The Customize User Look and Feel window appears.



- 2 Select the check boxes for **Blink on Error** to have the tab blink and **Blink Summary Results** to have the Summary background blink. Blink on Error must be checked to activate the Blink Summary results option.
- 3 Select **Close**.

The blink on error option is activated.

## About histogram results

A histogram is a display or print output of test results in a bar graph format. Histograms enable you to quickly identify spikes and patterns of errors or anomalies over a specific interval of time (seconds, minutes, or hours).

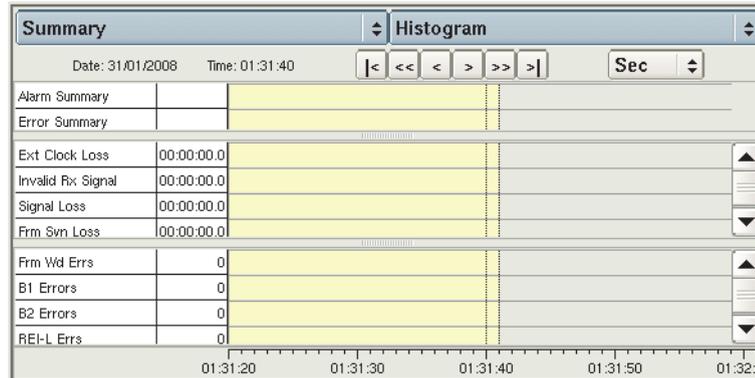
### Viewing a histogram

#### To view a histogram

- 1 Set one of your result groups to Summary, and then select the Histogram category.

The Histogram display appears.

**Figure 69** Histogram display (full size)



2 You can modify the default display as follows:

- To view the complete histogram, select Full Size view (see “Changing the result layout” on page 119).
- To scroll horizontally through the display, use the arrow keys at the top of the pane.
- To change the histogram interval, select the arrow keys to the right of the interval button (illustrated as “Sec” in Figure 69), and then select the new interval (Min, Hour, or Day).

**NOTE:**

Histograms are not available when running IP Video applications; however, an event log is available.

## About the Event log

An event log is a display listing any errors, anomalies, alarms, or defects that occur during the course of your test. The log displays the value for each event, and provides the date and time that the event occurred.

### Viewing an event log

#### To view an event log

- 1 Select the Summary group, and then select the Event Log category.

The associated Event Log appears.

**Figure 70** Event Log display (SONET application)

No.	Event	Date	Start	Stop	Dur./Val.
1	START	02/20/2007	01:57:49.0 pm	01:57:49.0 pm	00:00:00.0
2	Pattern Sync Loss	02/20/2007	02:04:53.8 pm	In progress	On
3	Frm Syn Loss	02/20/2007	02:04:53.8 pm	In progress	On
4	LDP-P	02/20/2007	02:04:53.8 pm	In progress	On
5	Path Ptr Loss	02/20/2007	02:04:53.8 pm	In progress	On
6	Frame Wd Errs	02/20/2007	02:04:53.8 pm	02:04:53.9 pm	28

- 2 To scroll through the display, use the arrow keys at the top of the pane.

The event log is displayed.

## About result graphs

You can observe a some results graphically, such as frame loss, packet jitter, throughput, or errors. Each graph provides a legend underneath the results to help you interpret the graph, and controls above the results that allow you to customize the scale and indicate whether you want to observe the mean, minimum, or maximum value for the results.

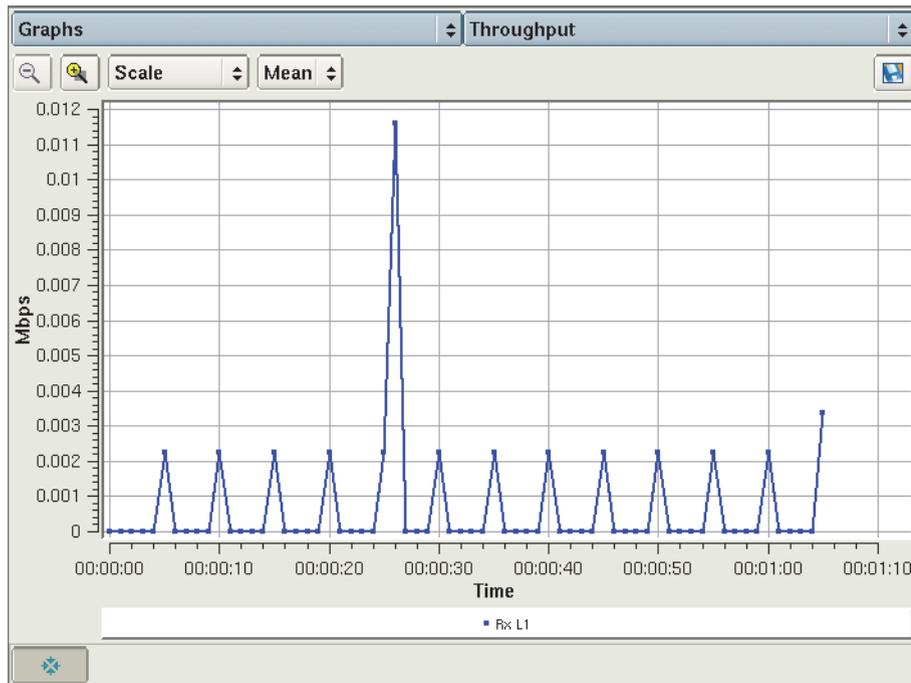
### Viewing graphs

#### To view a graph

- 1 Select the Graph group, and then select the category for the results you want to observe.

The associated Graph appears.

**Figure 71** Graph display (Ethernet application)



2 To scroll through the display, use the arrow keys at the top of the pane.

The graph is displayed. You can optionally save the data by selecting the Save Plot Data icon at the top of the graph.

## Clearing History results

### To clear history results

- Select Tools > **Clear History**.

Historical LED results are cleared.

## Creating and maintaining Custom result groups

For each available test application on your unit, you can create Custom result groups with results from a variety of categories. This allows you to quickly view certain results on a single result pane without navigating through each individual category. You can add up to 50 results to each Custom group.

## To create or maintain custom result groups

- 1 Set one of your result groups to **Custom**. If this is the first time you are creating a group, the Custom result pane is empty.
- 2 Do one of the following:
  - To add a new group, select **New ...**
  - To update an existing group, select the check box to the left of the group name, then select the wrench icon.

The Configure Custom Results Category screen appears. Summary results appear in the pane on the left of the screen, and buttons appear at the top of the pane which allow you to display and then select results from any category for your application.

- 3 Do one of the following:
  - To add results, use the buttons at the top of the left pane to specify the group and category for the results you want to add, then highlight the result you want to add to the category.  
Select the right arrow key to move the result to the Selected Results pane.
  - To remove results, select the result you don't want on the Selected Results pane, then select the left arrow key to move the result back to the left pane. If you want to delete all of the results in the category, select **Clear**.
- 4 Repeat [step 2](#) and [step 3](#) for each custom group that you want to add or maintain.
- 5 After you finish populating the custom category with results (or modifying the results), press **Save** to store the category and return to the Main screen.

The Custom result group is populated.

You can use the **Delete** button on the result pane (on the Main screen) to delete a group at any time.



### **NOTE: Protecting Custom Result Groups**

When you protect a saved test configuration by making it read-only, the associated custom result group is also saved and is protected.

## Running multiple tests

If your instrument is configured and optioned to do so, you can significantly reduce your testing time by terminating traffic over multiple circuits simultaneously. When running multiple tests, you should power your instrument using the AC power adapter that shipped with the instrument. If the instrument loses power while running multiple tests, when you restore power, the instrument will only restore *the last active test application*.



### **NOTE:**

Only one application can be run at a time using the CSAM, or single port 5800.

## Restrictions

Certain applications require more system resources; therefore, your instrument may not be able to run more than one application simultaneously, or you may need to consider the temperature before running the tests. Table 13 lists the applications that are limited to a single test, or should be run at lower temperatures.

**Table 13** Multiple Test Restrictions

Assembly	Application	Restriction
T-BERD / MTS 5800-100G	Dual 100GE	Maximum operating temperature: 0-40°C
	Dual 10GE	0-50°C
MSAM in 6000A Base Unit	Ethernet Applications in Dual Term or Dual Through Mode	Two SFP PIMs are required when running applications in Dual Term or Dual Through mode; therefore, you can only run one application at a time (using both PIMs).
	VoIP	Additional tests <i>can not be run</i> when running a VoIP test.
	IP Video	Additional tests <i>can not be run</i> when running an IP Video test.
	L3 Triple Play	Additional tests <i>can not be run</i> when running a layer 3 Triple Play test.
	PRI ISDN	Additional tests <i>can not be run</i> when running a PRI ISDN test.
	TCP Wirespeed	Additional tests <i>can not be run</i> when running a TCP Wirespeed test.
	J-Profiler	Additional tests <i>can not be run</i> when running a J-Profiler test.
	OTN	Additional tests <i>can not be run</i> when running an OTN test.
	Data communications or Diphase	The HS Datacom and Diphase PIMs require both PIM ports on the MSAM chassis; therefore, you can only run one application at a time (using a single PIM).
Any other application at a line rate less than 10 Gbps	When running any application at a line rate less than 10 Gbps, you can run one additional test at a line rate less than 10 Gbps while operating the instrument at: – 32°F to 104°F (0°C to +40°C)	

**Table 13** Multiple Test Restrictions

Assembly	Application	Restriction
	10 Gbps applications	<p>When running a 10 GigE Ethernet, 10 Gig Fibre Channel, OC-192, or STM-64 test, you can run one additional test (at a lower line rate) while operating the instrument at:</p> <ul style="list-style-type: none"> <li>– 32°F to 95°F (0°C to +35°C)</li> </ul> <p>Your battery will not charge while running multiple tests with one application at a 10 Gbps line rate. For details, see the section on charging your battery in the Getting Started Manual that shipped with your instrument or upgrade.</p>
	10 Gbps Packet Capture	<p>When running a 10 GigE LAN or WAN application, and capturing data on Port #1, you can not run a 1 GigE application from Port #2. If you want to run a 1 GigE application on Port #2, you must first disable packet capture for the 10 GigE application running on Port #1. You can run applications for lower line rates (for example, 10/100/10000 Mbps Ethernet) on Port #2 when capturing packets on Port #1 for a 10 GigE application.</p>
	NextGen applications (launched from the standard SONET or SDH test menu)	<p>Additional tests can not be run when running a NextGen application, and if you are using an MSAM, you must use the PIM in port 1. You can not run a second test on port 2, and you can not run NextGen tests from port 2.</p>
MSAMs in 8000 Dual Module Carrier (DMC)	All	<p>Please contact your local sales office or technical assistance representative for a list of restrictions when running multiple tests using this assembly.</p>

## Running multiple tests

### To run multiple tests you need to have a dual port unit:

- 1 Verify that your instrument is powered using the adapter that shipped with it.
- 2 Start the first test by doing the following:
  - a Using the Test menu, select a test application see [“Step 1: Selecting a test application”](#) on page 109).
  - b Configure the test (see [“Step 2: Configuring a test”](#) on page 113).
  - c Connect the module to the circuit (refer to your instrument’s Getting Started Manual).
  - d Start the test (see [“Step 4: Starting the test”](#) on page 115).
- 3 To run a second test, do the following:
  - a Select **Test > Add Test**.

A menu appears listing the rates still available for testing. These rates will vary depending on the rates *you are already testing*, and on the remaining resources available on your unit.

Using the MSAM as an example, if you are currently running a DS1 test using a DS1 PIM on port 1, the DS1 rate is disabled for port 1 because the port is already used. If you are running an OTN test from port 1, you can not add a second test, even if a PIM is connected to port 2 because the MSAM needs the resources for the OTN test application.

- b Select an application, and then configure the test, connect to the circuit, and start the test.

You are running multiple tests.

Two tabs appear on the menu bar of the Main screen (as shown in [Figure 72](#)), one for each test.

**Figure 72** Multiple test tabs, MSAM



A tab also indicates which slot (or application module) and port the currently selected test is running on. The large tab indicates the currently selected test. Click the other tab to view the results for the second test.

A green tab indicates no errors, anomalies, alarms, or defects have been detected for a test.

A red tab indicates errors, anomalies, alarms, or defects have been detected for a test.

A yellow tab indicates you should research the conditions displayed in the Summary result category. In some instances, the conditions constitute errors; in other instances, they are expected and should not be interpreted as errors. For details, refer to the supporting testing manual.

A blue tab indicates some action is required on your part before the test can proceed. Typically a dialog box will indicate the type of action required.

The LEDs, results, and tabs applicable to the *currently selected test* appear on the Main screen. Each of the other tests is still actively running in the background.

A blue arrow under the tabs indicate that the *currently selected test* is running:

**Figure 73** Test Elapsed Time



## Viewing both tests

When running multiple tests, you can view results side-by-side using the Dual Test View button.

**Figure 74** Dual Test View button



The Dual Test View button appears when one of the following occurs:

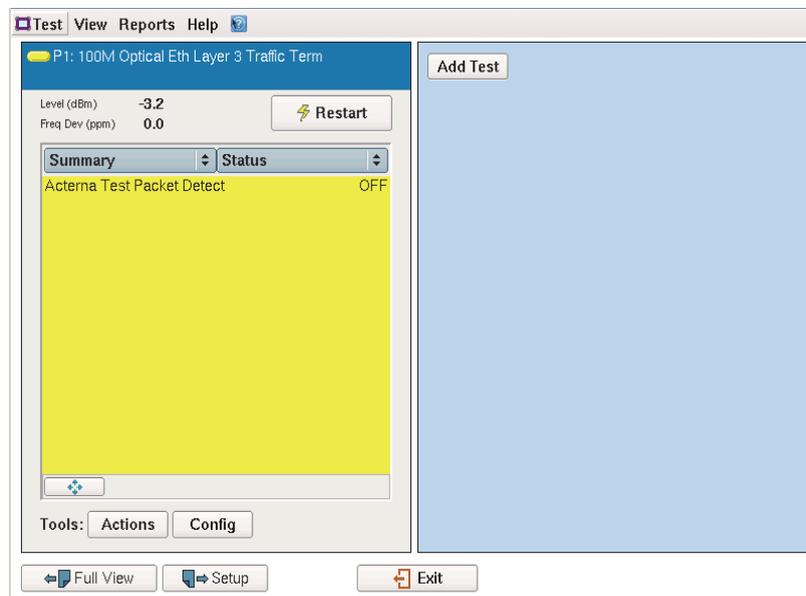
- a second test is launched.
- you select **Enable Dual Test** from the View menu.

### To view both tests

- Press the **Dual Test View** button.  
The tests are displayed side-by-side.

If Dual Test View is launched with only one test active, the display will look similar to [Figure 75](#).

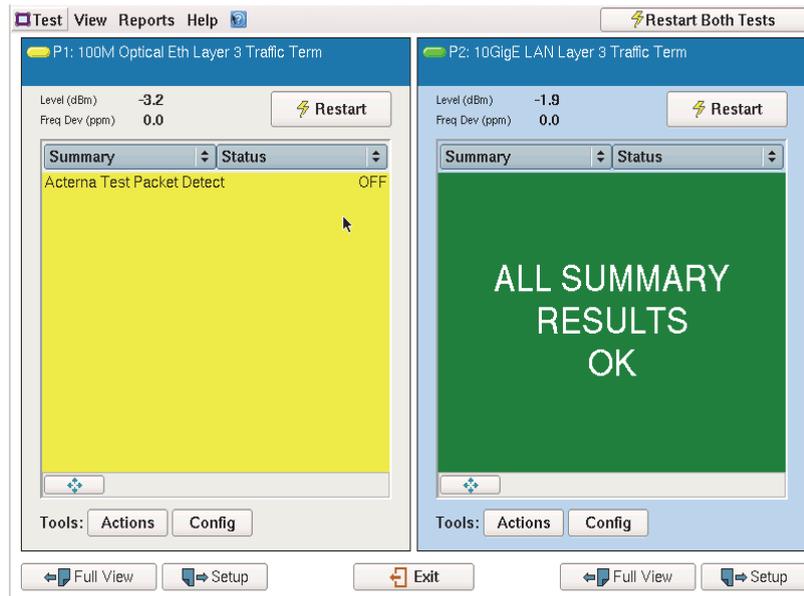
**Figure 75** Dual Test view with one active test



Use the **Add Test** button to launch a second test as described in [“Running multiple tests”](#) on page 125.

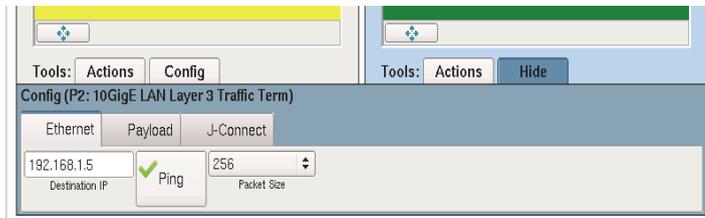
If a second test is active when viewing both tests, the display will look similar to [Figure 76](#).

Figure 76 Dual Test view with two active tests



The buttons included in each side represent the buttons available for that test. For example, pressing the **Restart (at the top)** on the left side restarts the 100M Optical Eth Layer 3 Traffic Term test; similarly, pressing the **Config** button on the right will display the configurable parameters bar related to the 10GigE LAN Layer 3 Traffic Term test (see Figure 77), allowing changes to parameters such as “Destination IP” or “Packet Size”. Every tab, when expanded, changes color and the text changes to “Hide”. Pressing the **Hide** tab will remove the expanded bar. Only one tab can be expanded at a time from either side.

Figure 77 Right Window Config Tab expanded



If you want to simultaneously restart both tests, use the **Restart Both Tests** button in the upper right.

Use the **Test** menu to save the dual test configurations or to load a previously saved dual test configuration.

Use the **Reports** menu to save (create) a dual test report or to view a previous report.

## Scheduling timed tests

When you setup a test, you can indicate that the test should run for a specific period of time (Timed Tests), or you can schedule tests to begin at a specific time (Delayed-start Timed Test).

### To schedule a timed test

- 1 Using the Test menu, select a test application (see “[Step 1: Selecting a test application](#)” on page 109).
- 2 Select the **Setup** soft key.  
A setup screen with a series of tabs appears.
- 3 Select the Timed Test tab, and then select one of the following test types:
  - **Timed Test.** If you want the test to start immediately and run for a specific interval of time, select Timed Test, and then specify the duration for the test in the corresponding fields.
  - **Delayed-start Timed Test.** If you want the test to start at a specific time, and then run for a specific interval of time, select Delayed-start Timed Test, specify the duration for the test, and then specify the date and time you want the test to begin in the corresponding fields.
- 4 In Timed Test Enable, select **ON**.
- 5 Specify the timed test duration in the fields provided. Use the up and down arrows to increase or decrease the intervals, or select a field, and then select the keypad icon to type in a value.

The test duration is specified. The test will run for the interval you specified when you press START or Restart to begin your test.



#### **NOTE: J-Connect**

Do not run timed tests when using J-Connect to detect other Viavi test instruments on a subnet. For details, see the *Ethernet and Fibre Channel Testing Manual* that shipped with your instrument or upgrade.

## Creating and printing reports

Use the Reports option on the Menu bar or the PRINT/EXPORT key on the front panel of your unit to format, create, store, and print reports detailing the current setup and test results. You can also optionally include screen shots in your reports.



#### **NOTE:**

Depending on the version of T-BERD/MTS 8000 base unit you have, the key may be labeled PRINT or may be labeled EXPORT (on UIMv2).

## Including a logo in your reports

### If you want to include a logo in your report, do the following:

- 1 Load the logo graphic in a .png, .jpg, or .jpeg format into the following folder on your unit:

`/acterna/user/disk/bert/images`

**NOTE:**

The file must be no larger than 1900 x 1200 resolution. If importing a file larger than this, the graphic may not appear on the report.

For details concerning loading files onto your unit, refer to the *6000A Base Unit User Manual*.

- 2 Select **Reports > Edit User Info**, and then press **Select logo ...** to navigate to the `cflash/bert/images` folder, select the logo graphic, and then press **Select**.

The logo is selected, and you return to the Edit User Info screen.

**NOTE:**

Some automated test applications allow you to save the report details as a profile. This includes the directory path for the logo. However, if you move the profile from one unit to another, you must ensure that the logo file is in the same directory on the unit that you are using.

## Specifying report details

Before creating a report, you can specify details that will be captured in the report header, such as the name, model, software revision, serial number of the device under test, or the name of the technician running the test. You can also import your company logo to include it in the report.

### To specify details about the report

- 1 From the menu bar, select **Reports > Edit User Info**.  
The Edit User Info screen appears.

- 2 To specify information about the device you are currently testing, select the **Device Under Test** tab (if it isn't already displayed), and then use the keypads provided to type the following:
  - Owner (represents the owner of the device).
  - Device Under Test (represents the name or model of the device).
  - Software Revision (represents the software revision the device is currently running).
  - Serial Number.
  - Comment.
- 3 If you want to specify additional comments concerning test results or the tester, select the **Tester Comments** tab, and use the keypads provided to type additional information.
- 4 If you want to change the default name for your Dual Module Carrier, Transport Module, and MSAM as provided in the report, select the **Test Instrument** tab, and then type the revised model name.
- 5 Select **Ok** to store the report details and return to the Main Screen.

Report details are specified.

## Creating a report

You can create reports in a PDF, CSV, Text, HTML, or XML format. Before creating a report, you can choose the type of content provided in the report. For example, you can include the details you specified as the User Info, select specific configuration groups (corresponding to the information that you specified on the setup tabs), and select key result groups that you want to review in detail.

You can also indicate whether you want to include captured screen shots in the report.

### To create a report

- 1 On the Main screen, select **Reports > Create Report ...**  
The Create Report dialog box appears.
- 2 Your unit will automatically assign a default file name to your report as follows:
  - The port number (if applicable) appears at the beginning of the name. For example, if you are creating a report while running a test on Port 1, “P1\_” appears at the beginning of the name.
  - The interface appears next. For example, if you are currently running a test on a 1 Gigabit Ethernet circuit, “1GigE” appears after “P1\_”.
  - The date and time, expressed per ISO 8601, appear after the interface.
  - Finally, a “report” suffix ends the filename.
  - The appropriate extension for the file format that you specify will be assigned when the report is created. For example, if you select the Text format, a “txt” extension will automatically be assigned to the file name.

If you do not want to use the default filename, launch the keypad for the File Name field, and then type a name using up to 60 characters.

- 3 In **Format**, select PDF, CSV, Text, HTML, or XML.
- 4 Select **Choose Contents**, and then expand each of the following report information groups by selecting the plus sign to the left.
  - User Info
  - Configuration Groups
  - Results Groups
  - Event Loggers
  - Histograms
  - Screenshots

Review each of the reportable elements, and then select the elements you want to report, or clear those you do not want to include in the report output.

If you want to unselect all Report Groups or Screenshots, use the **Unselect All** or **Unselect Screenshots** button.

If you want to select all Report Groups or Screenshots, use the **Select All** or **Select Screenshots** button.

- 5 If you want to view the report after it is created, select the checkbox to the left of **View report after creation**.
- 6 Select **Create Report**.

A watch icon appears indicating that you should wait for the report to be created. If you selected **View report after creation**, the report appears automatically; otherwise, it is stored in the following folder and can be viewed at any time:

```
acterna/user/disk/bert/reports
```

## Printing reports

If using a T-BERD/MTS 8000 base unit, you can print reports. If using a T-BERD/MTS 6000A base unit, use the Export Report to USB command and transfer the file to a PC for printing.

Before printing a report, verify that you specified a printer when you set up your unit. If you need to specify a printer, refer to the Base Unit User Manual that shipped with your instrument.

### To print a report

- 1 From the menu bar, select **Reports > View Report**.  
The View Reports dialog box appears.
- 2 Select the report that you want to print, then press **View**.
- 3 Press the **PRINT/EXPORT** key on the front panel of your unit.
- 4 Specify the print rate (the entire report, or the current page).

The unit sends the report to the printer.

## Generating reports automatically

You can set up your instrument to automatically generate reports at specific intervals. When you set up automatic reports, you can specify a suffix to append to each report, indicate the file format for the reports, and select the content for automatically generated reports.

### To setup your module to generate reports automatically

- 1 From the menu bar, select **Reports > Automatic Reports**.  
The Automatic Report Settings screen appears.
- 2 Select the **Enable automatic reports** check box.
- 3 If you want to restart the test after an automatic report is generated, select the corresponding check box.

**NOTE:**

When running automated scripts, tests will not restart automatically after reports are generated.

**ALERT:**

If you are running two tests when your instrument is configured to automatically generate reports and restart after the reports are generated, both tests will restart.

- 4 Using the keypads and arrows provided, specify the reporting period in hours and minutes.
- 5 In Mode, specify whether you'd like the module to overwrite the previous automatic report each time it generates an automatic report, or create a new, separate report file.
- 6 By default, "AutoReport" is appended to the end of the filename of each automatically generated report. If you'd like to use a different suffix, in Report Name, type a new suffix.
- 7 In Report Format, select PDF, CSV, Text, HTML, or XML.
- 8 Select **Choose Contents**, and then expand each of the following report information groups by selecting the plus sign to the left.
  - User Info
  - Configuration Groups
  - Results Groups
  - Event Loggers
  - Histograms
  - Screenshots

Review each of the reportable elements, and then select the elements you want to report, or clear those you do not want to include in the report output.

- 9 Select **OK** to store the automatic report settings and return to the Main Screen.

Reports will be automatically generated at the intervals you specified as the reporting period. When the module generates an automatic report, a dialog box will briefly appear indicating that a report is being generated.

## Viewing a report

### To view a report

- 1 On the Menu bar, select **Reports > View**.

The Reports screen appears, listing the contents of:

`acterna/user/harddisk/bert/reports`

- 2 To display the report on the user interface of your module, select the report file from the list, and then select **View Report**.

The report viewer appears, providing:

- Arrows that allow you to navigate through the contents of the report.
- A binoculars (lookup) button that allows you to search for key terms in the report.
- A rotate button that rotates the display of your report, and changes the default report orientation from landscape to portrait.
- A folder button that allows you to rename the report and store it in a different folder.
- An X button that closes the report viewer and returns you to the Reports screen.

- 3 To print the report you are viewing, press the **PRINT/EXPORT** key (located on the front of your T-BERD/MTS 8000 base unit).

The instrument sends the report to the printer.

## Accessing test reports remotely

Using FTP, you can view, print, or save the test reports on your unit from a remote workstation.



### NOTE:

- Verify that your system's Security Mode is set to Standard. You cannot access the test reports remotely if the mode is set to Enhanced.
- When using your unit remotely, it is helpful to lock the screen to prevent other users from disrupting your testing.

For details on locking the screen or specifying the system's security mode, refer to the base unit manual for your instrument.

### To access test reports using FTP

- 1 Launch your web browser, and then go to the following address:  
`ftp://xxx.xxx.xxx.xxx/disk/`  
where `xxx.xxx.xxx.xxx` represents the static or DHCP assigned IP address of the Base unit.  
A log on screen appears.
- 2 Do the following:
  - a In User name, do one of the following:
    - If you are using an MSAM, enter **t-berd6000** or **mts6000** using lower case characters.
  - b In Password, enter **acterna** using lower case characters.
  - c Select **Log On**.The bert directory (folder) appears in your browser window.
- 3 Open the bert directory, and then open the reports directory.  
The reports that are stored on your unit appear.
- 4 Select, and then save the report to a directory on your workstation, or simply open the report and view it remotely.

## Exporting reports

After generating a report, you can export the report file to a USB memory key. Two USB slots are provided on the top panel of your base unit.

### To export a report to a USB memory key

- 1 Insert a USB memory key into one of the two slots provided on the top panel of the base unit.
- 2 On the Menu Bar, select **Reports > Export Report to USB**.

The Reports screen appears, listing the contents of:  
`acterna/user/disk/bert/reports`

- 3 Select the report you want to export, and then select the **Export** button.

The File Export dialog box appears, indicating that the unit is copying the selected report file to the USB memory key.

The report is exported.

Before removing the USB key, you must eject the USB.

View the File Manager (using the **File** key), and then select the **Eject USB** soft key. After the Eject USB soft key disappears, it is safe to remove the USB.

## Restoring test defaults

You can restore test settings to the factory defaults at any time.

### To restore test defaults

- On the Main screen, select **Tools > Reset Test to Defaults**.

The default settings are restored.

## VT-100 emulation

If your instrument is optioned to do so, you can use it to emulate a VT-100 terminal, and then connect it to a network element (such as an HTU-R, HTU-C, HRE, or SmartJack (NIU)) via a serial interface to gather information about the element. When emulating a VT-100 terminal, data from the network element appears on the Dual Module Carrier, Transport Module, and MSAM screen. You can save this information to an ASCII file, print it, or export it. Information gathered typically includes loss, margin, synchronization, performance (SES, ES, UAS, etc.), and alarm information.

During a VT100 session, you can also configure and provision the accessed network element from the Dual Module Carrier, Transport Module, and MSAM. When using VT-100 emulation, you must connect the optional USB keyboard to the instrument to issue queries and commands.

## Establishing a serial connection

When you order the VT-100 Emulation option, Viavi ships a USB to serial (DB-9) cable with the instrument or option. This cable has been tested for use with the Dual Module Carrier, Transport Module, and MSAM, and should be used whenever you connect the Dual Module Carrier, Transport Module, and MSAM to a network element for VT-100 communication.

## To establish a serial connection for VT-100 emulation

- 1 Turn the Dual Module Carrier, Transport Module, and MSAM ON.
- 2 Verify that you have the Viavi supplied cable that shipped with the VT-100 option or with your test instrument.
- 3 Connect the USB connector to one of the USB slots on the top panel of your test instrument.
- 4 Connect the DB-9 serial connector to the network element.

A connection is established.

## Running a VT-100 session

After establishing a serial connection to the network element, you can run a VT-100 terminal emulation session to query or configure the element.

### To run a VT-100 terminal emulation session

- 1 If you haven't already done so, turn the Dual Module Carrier, Transport Module, and MSAM ON, and establish a connection to the network element (see [“Establishing a serial connection” on page 138](#)).
- 2 From the Menu Bar, select **Tools > VT-100 Emulation**.  
The VT-100 Terminal screen appears, with softkeys to the right that allow you to do the following:
  - **VT-100 Setup**. Use this softkey to specify values for the session (as described in [step 3 on page 140](#)).
  - **Clear Screen**. Use this softkey to clear the data currently displayed on the terminal screen.
  - **Hide Keyboard**. Use this softkey to hide the keyboard. This is helpful when using a USB keyboard, or if you want to observe more data on the terminal screen.
  - **Move Keyboard**. Use this softkey to move the keyboard to the top or bottom of the terminal screen. This is helpful if the keyboard is blocking the display of key data.
  - **Autobaud**. Use this softkey to send a series of sequential space characters to force the network element to re-evaluate its baud rate.
  - **Capture Screen**. Use this softkey to capture the data on the terminal screen and save it in an ASCII file.
  - **Exit**. Use this softkey to end the session and return to the Main screen.

- 3 To specify the settings required for the session, select **VT-100 Setup**. The VT-100 Setup screen appears.
  - a Under Port Settings, specify values for the following:

Setting	Value
Baud Rate	Select one of the predefined baud rates ranging from 50 to 115200 Kbps.
Data Bits	Select the number of data bits (ranging from 5 to 8) that contain information. These are the bits that are not used to start, stop, or provide checksum values.
Parity	Indicate whether no parity check will be performed (None), or whether the instrument will use odd or even bits for parity checking.
Stop Bits	Indicate whether bit 1 or bit 2 will be used as the stop bit.
Flow Control	Indicate whether the instrument will use software ( <b>X ON / X OFF</b> codes), hardware, or no flow control ( <b>None</b> ).

- b Under Terminal Settings, specify values for the following:

Setting	Value
Enter/Return	Select <b>CR</b> to send a carriage return every time you press Enter, <b>LF</b> to send a line feed, or <b>CR + LF</b> to send both.
Local Echo	If you want to echo the characters you type on the MSAM screen, select <b>ON</b> ; otherwise, select <b>OFF</b> .
Enable Reserved Keys	If you want to use the keyboard's function keys when communicating with the network element, select <b>Enable</b> ; otherwise, select <b>Disable</b> . <b>NOTE:</b> If you enable reserved keys, the buttons on your instrument will be <b>disabled</b> . Be certain to change this setting back to Disable when you are done with your VT-100 session.

- 4 Select the **Terminal Window** softkey to return to the VT-100 Terminal screen, then use the keyboard to issue commands just as you would on a VT-100 terminal.

You are running a VT-100 session.

## Saving terminal screen data

When running a VT-100 session, you can capture the data on the terminal screen. The instrument saves the data to an ASCII file; you can export the file just as you would any other report on the instrument (see “Exporting reports” on page 137).

## To save terminal screen data

- Select the **Capture Screen** softkey. The instrument captures the data on the terminal screen and saves it in an ASCII file in the following location:

```
/acterna/user/disk/bert/reports
```

The data on the screen is saved.

## HTML Viewer

An HTML viewer is available on your instrument which allows you to view and navigate through the help topics and any reports that you stored in an HTML format. When used to display help topics, the viewer remembers and returns you to the last help topic you visited for a specific test application while you are actively running the application. You can return to the Contents page at any time by selecting the **Home** soft key. If you change test applications, the last help topic is no longer stored because the viewer will track the topics visited for the new application.

For specifics on using the viewer, see:

- [“Launching the viewer” on page 141](#)
- [“Navigating using the viewer” on page 141](#)
- [“Exiting the viewer” on page 142](#)

## Launching the viewer

The viewer is launched *automatically* whenever you do one of the following:

- Select **Help > User Manual** to view the topics in the testing manual for your instrument on the unit itself.
- Select **Reports > View Report**, and then select an HTML file.

## Navigating using the viewer

The viewer provides softkeys that allow you to navigate through a series of HTML pages.

### Scrolling

A scroll bar appears on the right of the viewer window; select and then drag it down to move to the bottom of the page, or drag it up to move to the top of the page.

### Finding text on a page

You can search for a specific term on a page using the Find in page feature.

### To find a specific term

- 1 Select the Find in page field. A keypad appears.
- 2 Type the term you want to search for, and then select **OK**. The keypad closes, and the term appears in the field.
- 3 Select **Find**. The viewer scrolls to and highlights the first instance of the term on the page.

### Selecting links

Links to other help topics or HTML pages appear in blue. To jump to another topic or page from a link, simply or select tap the link.

### Going back or forward one pages

Softkeys are provided that allow you to move **Back** and **Forward** through a series of previously visited pages

### Going home

The **Home** softkey takes you to the home page. For example, if you are browsing through the HTML help topics, pressing **Home** returns you to the Contents page.

## Exiting the viewer

To exit the viewer, use the **Results** or **Setup** soft key, or the **Results** or **Setup** hard key on the right of the front panel. You will return to the last Result view (on the Main screen) or the Setup tab that you visited before launching the HTML viewer.

# Smart Access Anywhere

This chapter explains how to configure and use the Smart Access Anywhere utility. Additional details concerning the utility are provided in the applicable *Base Unit User Manual* for all instruments except the 5800 and 4800, which do not use a base unit.

The topics discussed in this chapter are as follows:

- “About Smart Access Anywhere” on page 144
- “Licensing” on page 144
- “Downloading and extracting the utility” on page 144
- “Establishing a connection” on page 145
- “Launching the utility” on page 147
- “Displaying the instrument’s user interface” on page 148
- “Transferring files” on page 149
- “Displaying and modifying connection settings” on page 149

## About Smart Access Anywhere

Smart Access Anywhere allows you to view and control the instrument's user interface from a remote location using a workstation. In addition to configuring the instrument and performing tests, you can transfer files to and from the instrument using the instrument's file manager utility. You can also rename and delete files, or create, rename, and delete directories.

## Licensing

If you are using the Smart Access Anywhere utility to remotely access a 5800/4800 test instrument, you do not need a license. If you want to remotely access any other instrument (for example, a CSAM or MSAM), you must specify a license key before using the utility.

The following licenses are available:

- License 1 (reference **SAA-6K-L1**): for Smart Access Anywhere using an Ethernet or Wifi hotspot connection.
- License 2 (reference **SAA-6K-L2**): for Smart Access Anywhere using an Ethernet, Wifi hotspot, or USB / Wifi connection via a 3G smart phone.

## Downloading and extracting the utility

The **Smart Access Anywhere** utility must be downloaded and extracted on the workstation that you intend to use to connect remotely to the test instrument.



**NOTE:**

You do not need administrator privileges to install the utility on your workstation. The utility will be downloaded as a zip file.

### To download the utility

- 1 On your workstation, open a browser and type the following address:  
<http://smartaccess.updatemyunit.net>
- 2 Click on the **SmartAccessAnywhere\_Vxx.xx.xx.zip** link.
- 3 Select **Save** in the dialog box.  
After the download is complete, the browser can be closed.
- 4 Go to the download directory, then extract the files in the zip file into the desired destination directory.

The utility is downloaded and extracted.

## Establishing a connection

You can connect remotely to your test instrument using a 1) wired Ethernet connection, 2) WiFi connection, or 3) Smartphone with Data Tethering. Before establishing a connection to the instrument, verify that port 22 (SSH) or 443 (HTTPS) is open on your workstation.



**NOTE:**

To connect using WiFi, the WiFi option must be installed on the target test instrument. To order the option, or to determine whether a particular Smartphone has been qualified by Viavi for the purpose of establishing remote connections to the instrument, contact Viavi Customer Care at 1-866-228-3762 or [www.viavisolutions.com](http://www.viavisolutions.com).

Although [Figure 78](#) through [Figure 81](#) show a T-BERD / MTS 6000 test instrument, all supported instruments can be accessed remotely using each illustrated connection mode.

### Wired Ethernet Connection

[Figure 78](#) illustrates a test instrument connected to a workstation via a wired Ethernet connection to the Internet. Before establishing a wired connection, you need to 1) determine the instruments IP address and, 2) configure the network proxy (if a proxy is used).

**Figure 78** Wired Ethernet Connection



## WiFi Connection

Figure 79 illustrates a test instrument connected to a workstation using a WiFi connection.

**Figure 79** WiFi Connection



## Smartphone with Data Tethering

You can remotely connect to a test instrument using a Smartphone capable of data tethering and a WiFi hotspot or USB cable.

Figure 80 illustrates a test instrument connected to a workstation using a WiFi hotspot provided by a Smartphone that supports data tethering.

**Figure 80** WiFi Connection using Smartphone



Figure 81 illustrates a test instrument connected to a workstation using a USB connection to a Smartphone that supports data tethering.

Figure 81 USB Connection using Smartphone



## Launching the utility

To use the Smart Access Anywhere utility, you must 1) establish a connect from your workstation to the test instrument, 2) launch the utility on the test instrument to obtain the required remote access code, and then 3) launch the utility on your workstation, and enter the remote access code that was obtained from the instrument.

## Launching the utility on the instrument

### To launch the utility on your instrument

- 1 On the **System** page, select **Remote**.
- 2 Press **Connect** next to the SmartAccess Anywhere icon.  
The connection to SmartAccess Anywhere Server will initiate.
- 3 After a connection is established to the server, the instrument displays a message with the code that is required to access to the equipment remotely.
- 4 If you will be accessing the instrument remotely from your workstation, write down or capture the code in some manner so you have it when you return to your workstation. If another individual will be accessing the instrument remotely, provide the code to the individual.

## Testing your connection

Before launching the utility on your workstation, you can also optionally test the connection between the workstation and target test instrument.

## To test your connection

- 1 On your workstation, launch the Smart Access Anywhere utility.
- 2 Select **Test connection**.  
The test automatically launches.
- 3 To display connection log details in real time, select the **See full logs** button.  
The connection log appears, and provides the following information:
  - Upload and Download speed (in Kbyte/s) from Device to server.
  - Latency between Device and server (in ms).
- 4 After analyzing the results, do one of the following:
  - Select the **Clear test results** button to delete the current table, and retest the connection if desired.
  - If connection is deemed to be valid, enter the access code and establish connection.

## Launching the utility on your workstation

After you establish a connection to your test instrument, you can launch the Smart Access Anywhere utility to update your instrument.

- 1 On your workstation, go to the directory where you installed the utility, then double click **SmartAccessAnywhere.exe**.  
The utility opens.
- 2 Enter the access code that was provided to you in the field provided on the upper part of the screen.
- 3 Click **Connect** to validate the code.

The Smart Access Anywhere screen appears.



### NOTE:

After upgrading or rebooting a remote instrument, please wait at least two minutes before re-establishing the link between your workstation and the test instrument.

## Displaying the instrument's user interface

After you launch the utility on your workstation, you can display the remote instrument's user interface on your workstation's display.

### To display the instrument's user interface

- On the Introduction page, click **Remote Screen**.  
The user interface for the instrument appears on your workstation's display.

The VNC icon in the system tray indicates that the remote screen is active.

## Transferring files

Single files can be transferred one by one from your workstation to the instrument, or from the instrument to your workstation.

### To transfer a file to or from the workstation or instrument:

- 1 On the Introduction page, click **File Transfer**.  
A two-pane window appears, showing the workstation directories (or storage devices) in one pane, and the instrument directories (or storage devices) in the other pane.
- 2 In the “source” pane (the pane that has the file that you want to transfer), double click on the directory or storage device, then select the file to be transferred.
- 3 In the “destination” pane (the pane with the directory that you want to transfer the file to, select the destination directory for the file.
- 4 Do one of the following:
  - If you are transferring a file from your workstation to the instrument, click **Upload**.
  - If you are transferring a file from your instrument to the workstation, click **Download**.A dialog box appears asking you to verify the destination that you selected for the transferred file. If it is the correct destination, click OK.
- 5 Click **Save** to transfer the file.

A message will appear at the bottom of the screen providing details concerning the status of the file transfer. After the transfer is complete, the message disappears and the transferred file is underlined in the workstation or instrument’s file manager.

## Displaying and modifying connection settings

You can review information about the current remote session at any time.

### To display session information

- Select the **Session icon** key.

Session details appear. This page gives information on the connection in real time.

### To modify connection settings

- 1 Select the **Session** icon.

- 2 Disconnect the session using the **Disconnect** button.
- 3 On the session screen, select the **Network Settings** icon.  
The connection settings screen appears. The default connection is defined as **Smart-guess (default)**.
- 4 To modify the settings, select **Forced settings**, and then modify **SSI tunnel port** and/or **Internet proxy** as needed.  
The **Internet proxy** configuration is available exclusively if the port selected is **Alternative port (443)** and if **HTTPS packing** is selected.



**NOTE:**

If the default parameters need to be modified, it is recommended you discuss it with your local network administrator.

- 5 After configuring the settings, select **Back to main page**.

# Using Bluetooth Connections

This chapter explains how to configure and use the Bluetooth<sup>®</sup> option on your T-BERD/MTS 5800 and SC 4800. The Bluetooth application is available as a factory installed option on the instrument. If using Bluetooth on another device (for example, the CSAM or MSAM), refer to the applicable *Base Unit User Manual*.

The topics discussed in this chapter are as follows:

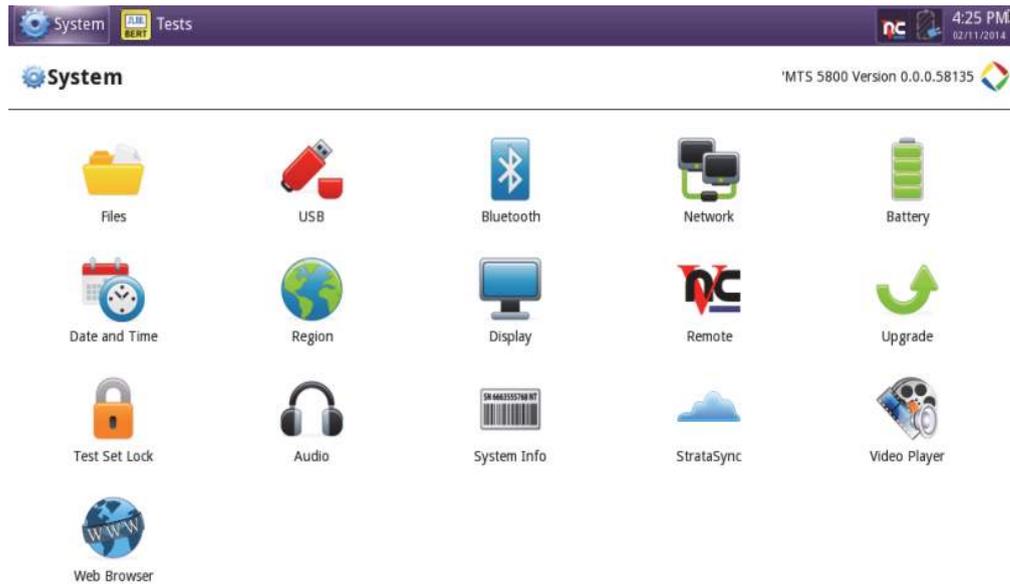
- “Setting up a Bluetooth connection” on page 152
- “Transferring files via Bluetooth” on page 153
- “Using a Bluetooth audio device” on page 154
- “Disconnecting and unpairing Bluetooth devices” on page 155
- “Deactivating Bluetooth” on page 156

## Setting up a Bluetooth connection

The Bluetooth option allows file transfers between the 5800 or 4800 and another device and the use of audio devices.

### To set up a Bluetooth connection

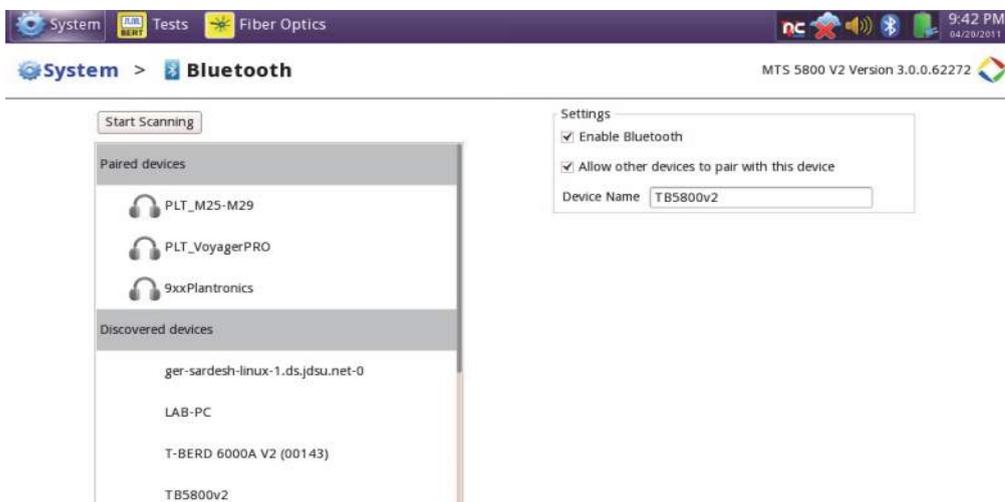
- 1 On the System page, select the Bluetooth icon.



- 2 Place a check in the boxes next to the settings for this session; **Enable Bluetooth**, **Allow other devices to pair with this device** and/or enter a **Device Name** for identifying this device.

The Bluetooth icon appears in the system tray.

- 3 Activate Bluetooth on the equipment that needs to be paired with the 5800 or 4800.
- 4 Press the **Start Scanning** soft key to find any devices in range.



All detectable devices that are within range appear in the Discovered Devices area.

Previously paired devices appear in the Paired Devices area.

- 5 From the list of Discovered devices, select the device to pair with the 5800 or 4800.
- 6 If prompted to do so, enter a pairing code on the remote equipment.
- 7 Press **Pair** to validate.  
The devices are paired.

If you have paired with an audio device, e.g. headphones, you are able to connect it for use with your applications, see [“Using a Bluetooth audio device” on page 154](#).

If you paired with another unit or a computer, you are able to connect it for file transfers. For details, see [“Transferring files via Bluetooth” on page 153](#).

## Transferring files via Bluetooth

The Bluetooth option allows file transfers between the 5800/4800 and another device. File transfer between devices via Bluetooth requires that the devices be paired - see [“Setting up a Bluetooth connection” on page 152](#). Files may be transferred from the 5800/4800 to paired devices.

### To transfer files

- 1 On the System page, select the Bluetooth icon.
- 2 Select the target device (the recipient) from the Paired devices list.  
When the device is selected, a panel appears at the bottom-left of the screen, displaying information about that device.
- 3 Click the **Send File** button.  
A dialog appears listing the files that can be sent.
- 4 Click on the desired file to be transferred and then click the **Send** button.  
The file is sent to the target device.



**NOTE:**

Using an audio device while transferring files is not recommended. The performance of either may be degraded.

## Using a Bluetooth audio device

The Bluetooth option allows the use of audio devices. Before the devices are used, they must be paired - see [“Setting up a Bluetooth connection” on page 152](#).

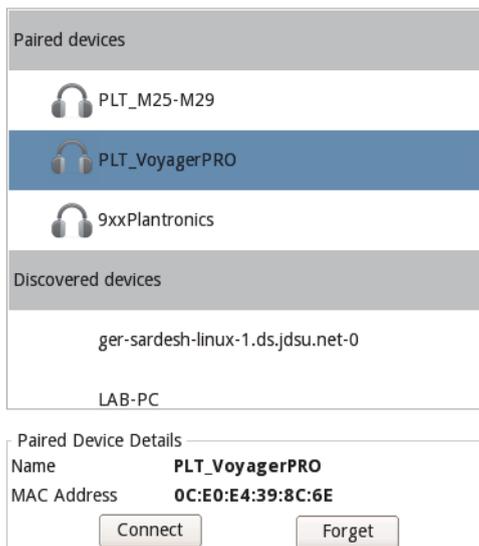


**NOTE:**

While support for Bluetooth headsets and loudspeakers is supported, Viavi does not guarantee correct operation with all off-the-shelf commercially available devices. The user/owner of the 5800/4800 should verify whether it will work with the 5800/4800 before regular use.

### To connect to a Bluetooth audio device

- 1 On the System page, select the Bluetooth icon.
- 2 Select a device in the Paired devices list. If no devices appear, see [“Setting up a Bluetooth connection” on page 152](#).



The Name and the MAC Address for that device will display in the Paired Device Details box.

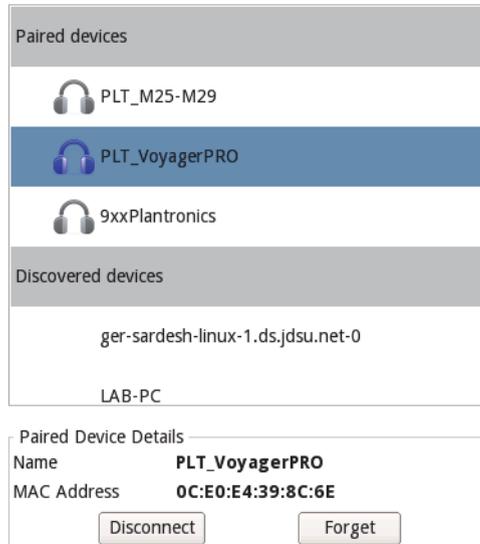


**NOTE:**

Only one Bluetooth audio device can be connected at a time.

- 3 Select the **Connect** button.

The icon for the device will turn blue and the **Disconnect** button appears.



The devices are connected.



**NOTE:**

Using an audio device while transferring files is not recommended. The performance of either may be degraded.

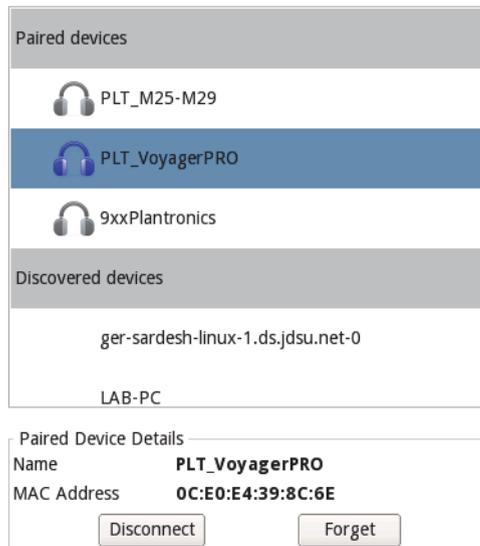
## Disconnecting and unpairing Bluetooth devices

If you want to stop using the device, you should disconnect it and then remove pairing.

### To disconnect from a paired device

- 1 On the System page, select the Bluetooth icon.

- 2 Select the device that is currently connected (blue icon) from the Paired Devices list.



- 3 Select the **Disconnect** button.

The devices are no longer connected but are still paired.

After disconnecting a Bluetooth device, you should remove the pairing.

### To remove pairing

- 1 On the System page, select the Bluetooth icon.
- 2 Select the device, from the Paired Devices List, you would like to unpair.
- 3 Click on the **Forget** button.

The devices are no longer paired.

## Deactivating Bluetooth

After disconnecting and removing pairing, the Bluetooth application can be deactivated.

### To deactivate Bluetooth communication

- 1 On the System page, select the Bluetooth icon.
- 2 Uncheck **Enable Bluetooth**.

The Bluetooth icon will be removed from the system tray as the Bluetooth option is no longer active.

# Optical Tools

This chapter describes the optical tools on your T-BERD/MTS 5800 and SC 4800 platforms. If using the optical tools on another device (for example, a CSAM or MSAM), refer to the applicable *Base Unit User Manual*.

Topics discussed in this chapter include the following:

- “About the optical tools” on page 158
- “Inspecting fiber” on page 158
- “Measuring optical power” on page 160

## About the optical tools

Two USB optical accessories are available for the T-BERD/MTS 5800 and SC 4800/4800P:

- Fiber Microscope
  - Inspect both the bulkhead (female) and patch cord (male) sides of fiber interconnect as well as optical devices located in hard-to-reach places (transceivers).
  - Inspect both simplex connectors.
  - Use with a comprehensive selection of precision FBPT tips.
- Optical Power Meter
  - Takes power measurements for all single-mode and multi-mode connectors via USB 2.0 connection.
  - Measures optical power with multiple pre-calibrated wavelengths (850, 980, 1300, 1310, 1490, 1550 and 1625 nm).
  - Integrates digital power measurements, fiber inspection, and analysis into a single, unified work sequence.

In addition to the two USB accessories, you can connect an optional 4100-Series OTDR module to the 5800 to support the installation, turn up, and troubleshooting of optical networks. For instructions on using the OTDR modules, refer to the *MTS 2000/4000 OTDR User Manual*.

## Inspecting fiber

The Viavi fiber microscope accessory is used to view a live video of a simplex fiber to determine if the fiber is clean. It can also capture a snapshot and provide pass/fail analysis.

### To inspect fiber

- 1 Connect the fiber microscope to a USB connector on the right side of the instrument.

A MicroScope icon appears in the title bar.



**NOTE:**

The Microscope icon only appears if the microscope is connected.



- 2 Select the **MicroScope** icon.  
The Fiber Microscope screen appears.
- 3 Connect the microscope to the optical patch cord or bulkhead.

**NOTE:**

Although some microscopes can inspect multi-fiber or ribbon fiber (depending on the microscope and the tip used) the T-BERD/MTS 5800's microscope application supports simplex fiber only.

The video of the fiber appears.

- 4 Specify which **Tip** is being used on the microscope.
- 5 Adjust the focus as needed using the wheel on the microscope. The color of the vertical bar on the left indicates the quality of the focus: green is good, yellow is ok, red is poor. Older microscopes have a blue bar only.  
*Optional.* To verify which version you have, use the Viavi *FiberChek Pro* desktop application.
- 6 Select the inspection **Profile**.  
If you have a custom profile, do one of the following:
  - Use the file manager to put the file into the disk/bert/scope/profiles/ folder, and it will appear in the P5000i viewer the next time it is launched (if it is already running, it will need to be closed and reopened).
  - Click the **Import from USB** button next to the profile list to import your custom profile. Once imported it may be selected in the viewer.
- 7 Select **Other settings** and then check the **Auto-center** check box. If checked, the live picture automatically centers on the fiber center. If not checked, the picture will center at the last location of a fiber center following an analysis. High magnification is always automatically centered.
- 8 To manually inspect the fiber, do the following:
  - a Observe the video of the fiber, and if desired, magnify the image by selecting the **Zoom In** button.
  - b Select **Other settings** and then specify **Freezes** as the **Test Button** setting. This captures a snapshot.
  - c Select the **Test** button.
  - d To compare the current capture to the live feed, select **Overlay**
  - e To return to the live video, select the **Live** button.
- 9 To test the fiber, do the following:
  - a Select **Other settings** and then specify **Tests** as the **Test Button** setting.
  - b Select the **Test** button.

**NOTE:**

The test will fail if the focus quality is poor (vertical bar is red).

The T-BERD/MTS 5800 captures an image, and then analyzes it using the profile specified. The test result will highlight particles or spots where defects are present and provide a PASS/FAIL indication.

- 10 After running a test, you can save a PDF report by selecting **Save PDF**, and, if desired, specify the job ticket details such as the company name, technician, location, and job number. If the fields are left blank, they will not be included in the PDF report.

Select the **Quit** button to exit the test.

## Measuring optical power

The Optical Power Meter is a Viavi accessory used to measure optical power.

- The MP-60 meter measures 850, 1300, 1310, 1490, and 1550 nm wavelengths
- The MP-80 meter measures 980, 1310, 1480, and 1550 nm wavelengths

### To measure optical power

- 1 Connect the Optical Power Meter to a USB connector on the right side of the instrument.  
The USB Power Meter Summary screen appears.
- 2 Connect the optical patch cord to the power meter.  
The measurement appears.
- 3 To measure a specific wavelength, select the Wavelength.
- 4 Use the **Display Type** drop-down box to specify Power Meter Summary or Graph.  
**NOTE:** The graph shows the dB result only (not available for dBm or mW).
- 5 Use the **Display Units** drop-down box to specify the measurement mode.

Setting	Description
dBm	Absolute mode, displayed as dBm. The default setting.
mW	Absolute mode, displayed as mW.
dB	Relative measurement mode. The received signal is compared to the reference value, and displays the <i>difference</i> in dB. <b>NOTE:</b> If no reference value has been stored, 0.00 dBm will be used as reference value.
SET REF	Used in relative measurement mode (dB), to set the reference value. When selected, the current absolute power level is stored as new reference value.

- 6 To save results, select the **Save Results** button.

# Specifications

This appendix contains specifications for the T-BERD / MTS 5800, Dual Module Carrier, MSAM, and CSAM. Specifications for the optional OTDR and TEM Modules are provided in their respective user manuals.

Topics discussed in this appendix include the following:

- “T-BERD / MTS 5800 and Smart Class 4800 specifications” on page 162
- “MSAM specifications” on page 177
- “Jitter and Wander specifications” on page 224
- “CSAM specifications” on page 239
- “Transceiver and adapter specifications” on page 242
- “Environmental specifications” on page 242

## T-BERD / MTS 5800 and Smart Class 4800 specifications

Refer to the following sections for specifications for the T-BERD / MTS 5800 and SC 4800:

- “Physical specifications” on page 162
- “Power specifications” on page 163
- “Electrical Ethernet specifications” on page 163
- “Clock source (Timing) specifications” on page 163
- “DS1 specifications” on page 164
- “E1 specifications” on page 166
- “E3/DS3/STS-1 specifications (5800 family of instruments only)” on page 168
- “E4/STM-1e specifications (5800 family of instruments only)” on page 172
- “SFP/SFP+/SFP28 specifications” on page 175
- “Optional expansion module specifications” on page 177

### Physical specifications

The physical characteristics for the T-BERD / MTS 5800 and Smart Class 4800 are listed in [Table 14](#).

**Table 14** Physical specifications

Dimension	5801/5802/5812	5801P/5802P/5812P	5811/5811PL/ 5811PG/5822P/ 5822PG/4800/ 4800P	5800-100G/ 5800-100GG 5882
Height	6.7 inches/17.02 cm	6.7 inches/17.02 cm	7 inches/17.78 cm	7.6 inches/ 19.23 cm
Width	8.4 inches/21.34 cm	8.4 inches/21.34 cm	9.5 inches/24.13 cm	9.5 inches/ 24.13 cm
Depth	2.75 inches/7.00 cm	3.5 inches/8.90 cm	3 inches/7.62 cm	3.2 inches/ 8.1 cm
Weight	3.25 lb/1.47 kg	3.8 lb/1.72 kg	4.2 lb/1.9 kg	5.4 lb/ 2.5 kg

## Power specifications

Although battery life varies depending on the type of test, [Table 15](#) provides specifications for the battery life and the specifications for the AC adapter.

**Table 15** Power specifications

Parameter	5800v1 and v2, 4800	5800-100G, 5882
Battery operating time	2-5 hours depending on the application	For 5800-100G: 1-3 hours. For 5882: 2-5 hours.
Battery charging time	Approximately 7 hours from empty	Approximately 3 hours from empty
Unit power input	12VDC, 60 Watt Max	19VDC, 160 Watt
Power supply input	100 to 240 VAC, 50/60 Hz, auto-sensing	100 to 240 VAC, 50/60 Hz, auto-sensing
Power supply output	12VDC, 5 AMP Max	19VDC, 8.5 AMP

## Electrical Ethernet specifications

The electrical Ethernet applications use the RJ-45 jacks. The 10/100/1000 Base-T/Tx interfaces conform to the IEEE 802.3 electrical requirements.

[Table 16](#) lists the electrical specifications for the 10/100/1000 Mb/s interface.

**Table 16** 10/100/1000 Mb/s interface specifications

Specification	Description
Cable	CAT5e 100-Ohm STP cable, $\leq$ 100 meters

[Table 17](#) lists the electrical Ethernet rates supported.

**Table 17** Electrical rates

Rate	Mbps
10Base-T Ethernet	10
100Base-T Ethernet	100
1000Base-T Ethernet	1000

## Clock source (Timing) specifications

[Table 18](#) lists internal and external timing specifications for 4800.

**Table 18** Timing specifications for SC 4800

Clock Source	Description
Internal reference	accuracy $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging

Table 19 lists internal and external timing specifications for 5800.

**Table 19** Timing specifications for 5800

Clock Source	Description
Internal reference	accuracy $\pm 1.5$ ppm, $\pm 1$ ppm per year aging
5800 v 1 has SMA	from BITS, SETS, or CLOCK
5800 v 2 has DIN with adapter cables to SMA	- BITS 1.544 Mbps DS1/T1 signal - SETS 2.048 Mbps E1 signal - 2MClock 2.048 MHz $\pm 100$ ppm G.703 sync clock (square wave) 10M Clock 10.000 MHz $\pm 100$ ppm square clock
5800-100G and 5882 have SMB	- BITS 1.544 Mbps DS1/T1 signal - SETS 2.048 Mbps E1 signal - 2MClock 2.048 MHz $\pm 100$ ppm G.703 sync clock (square wave) 10M Clock 10.000 MHz $\pm 100$ ppm square clock

## DS1 specifications

Table 20 through Table 23 on page 166 list specifications for the DS1 interface.



**NOTE:**

For the 5800 v1 and v2, the E1 and DS1 interfaces should not be connected at the same time. Multiple connections can influence the integrity of the signal under test. After running your test, disconnect from one interface before connecting to the other interface.

## Receiver

Table 20 lists specifications for the DS1 receivers.

**Table 20** DS1 receiver specifications

Parameter	Specification
Connector	For the 5800 v1 and v2, one RX1 Bantam Jack, and one TX/RX2 Bantam jack; both jacks can be used as receivers. For 5800-100G, 5882 and 4800, T1 and E1 interfaces are combined in one RJ48 connector. Adapter cable (part # 80-41645-01) should be used to convert to Bantam connector.
Bit rate	1544 kbps $\pm$ 250 ppm
Line coding	AMI, B8ZS

Table 21 lists the input sensitivity specifications for the DS1 receiver.

**Table 21** DS1 receiver sensitivity specifications

Termination Type	Impedance	Input Range
Bridge	>1000 $\Omega$	+6 to -35.0 dBdsx due to cable loss
Terminate	100 $\Omega$ nom	+6 to -35.0 dBdsx due to cable loss
DSX monitor	100 $\Omega$ nom	-20 dBdsx due to resistive loss in addition to 0 to -6 dB due to cable loss

## Transmitter

Table 22 lists specifications for the DS1 transmitter.

**Table 22** DS1 transmitter specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one TX/RX2 Bantam jack; only the TX/RX2 jack can be used as a transmitter. For 5800-100G, 5882 and 4800, T1 and E1 interfaces are combined in one RJ48 connector. Adapter cable (part # 80-41645-01) should be used to convert to Bantam connector.
Output	6 Vnom peak-peak into 100 $\Omega$ Complies with ANSI T1.403-1999.
Line build out (LBO) level	0 dB, -7.5 dB, -15.0 dB or -22.5 dB due to cable loss at 772 kHz
LBO level accuracy	At 772 kHz relative to the signal at 0 dBdsx: – $\pm$ 2.5 dB for -7.5 dB – $\pm$ 3 dB for -15.0 dB and -22.5 dB
Line code	AMI, B8ZS

**Table 22** DS1 transmitter specifications (Continued)

Parameter	Specification
Clock source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from RX1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 100$ ppm, in 1 ppm steps
Pulse shape	Terminated with 100 $\Omega$ resistive load and 0 dB LBO selected, the interface meets ITU-T Recommendation G.703 (11/01) and ANSI T1.102-1993

## Physical measurements

Table 23 lists frequency and level measurement specifications when running DS1 applications.

**Table 23** DS1 frequency and level measurement specifications

Parameter	Specification
Level V p-p	Range: 8.0 V to 0.06 V Accuracy: $\pm 0.04$ V $\pm 10\%$ Resolution: 0.01 V
Frequency	Range: 1.544 MHz $\pm 250$ ppm Accuracy: $\pm 1.5$ ppm, $\pm 1$ ppm per year aging Resolution: 1 Hz or 1 ppm
Level dBdsx <sup>1</sup>	Range: +2.5 dBdsx to -37 dBdsx Resolution: 0.1 dB
Level dBm <sup>2</sup>	Range: +19.0 dBm to -10.5 dBm Resolution: 0.1 dB

1. The designation dBdsx is a level measurement in dB relative to dsx level, which is 6 V peak-peak. A signal with a peak-peak level of 6V corresponds to 0 dBdsx.
2. Available only when unframed all ones (AIS) signal is detected.

## E1 specifications

When testing E1 circuits, either BNC or RJ48 connectors can be used. 5882 supports E1 only on RJ48.



**NOTE:**

For the 5800 v1, 5811P and 5822P, the E1 and DS1 interfaces should not be connected at the same time. Multiple connections can influence the integrity of the signal under test. After running your test, disconnect from one interface before connecting to the other interface.

## E1 (RJ-48) specifications

Table 24 through Table 26 on page 167 list specifications for the E1 (RJ-48) connector.

### Receiver (RJ-48)

The E1 receiver operates as per ITU-G.703 (11/01). Table 24 lists the receiver specifications.

**Table 24** E1 RJ-48 receiver specifications

Parameter	Specification
Connector	Balanced RJ-48
Bit rate	2.048 Mbps
Frequency measurement	Range: 2.048 MHz $\pm$ 250 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz
Level Measurement (Balanced)	Level Vp Range: +4 V to 0.03 V Accuracy: $\pm$ 0.02 V $\pm$ 10% Resolution: 0.01 V Level dBnom <sup>1</sup> : Range: +2.5 dBnom to -37 dBnom Resolution: 0.1 dB

1. The designation in dBnom is relative to nominal signal 3 Vp.

Table 25 lists the input sensitivity specifications for the E1 receiver.

**Table 25** E1 RJ-48 receiver sensitivity specifications

Termination Type	Impedance	Input Range
Bridge (HI-Z)	>1200 $\Omega$	+2.5 to -35 dBnom due to cable loss
Terminate	120 $\Omega$ balanced	+2.5 to -35 dBnom due to cable loss
PMP	120 $\Omega$ balanced	-20 dBnom due to resistive loss in addition to 0 to -6 dB due to cable loss

### Transmitter (RJ-48)

The E1 transmitter operates as per ITU-G.703 (11/01). Table 26 lists the transmitter specifications.

**Table 26** E1 RJ-48 transmitter specifications

Parameter	Specification
Connector	Balanced RJ-48
Line code	HDB3 or AMI

**Table 26** E1 RJ-48 transmitter specifications (Continued)

Parameter	Specification
Bit rate	Nominal: 2.048 Mbps Accuracy: $\pm 1.5$ ppm, $\pm 1$ ppm per year aging Frequency offset: $\pm 100$ ppm in 1 ppm steps
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from E1 RX1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 100$ ppm in 1 ppm steps
Pulse shape	Complies with ITU-T G.703 (11/01)

## E3/DS3/STS-1 specifications (5800 family of instruments only)



**NOTE:**

These specifications are not applicable to Smart Class 4800/4800P.

Refer to these tables for specifications for the E3/DS3/STS-1 connectors:

- [Table 27 on page 168](#) through [Table 29 on page 169](#) list specifications when running E3 applications.
- [Table 30 on page 169](#) through [Table 32 on page 171](#) list specifications when running DS3 applications.
- [Table 33 on page 171](#) through [Table 35 on page 172](#) list specifications when running STS-1 applications.

### Receiver (E3 circuits)

[Table 27](#) lists specifications for the receiver when running applications for E3 circuits.

**Table 27** E3 receiver specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (RX1) For 5800-100G and 5882, one HD-BNC (RX1)
Bit rate	34.368 Mbps
Impedance	Nominal 75 $\Omega$ at 17 MHz, unbalanced
Input Range	Term: 0 to 12 dBnom due to cable loss at 17 MHz, from a nominal signal PMP: -20 dB due to resistive loss in addition to 0 to 12 dB due to cable loss at 17 MHz, from a nominal signal

## Transmitter (E3 circuits)

Table 28 lists specifications for the transmitter when running applications for E3 circuits.

**Table 28** E3 transmitter specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (TX/RX2); used as transmitter only. For 5800-100G and 5882, one HD-BNC (TX/RX2)
Bit rate	34.368 Mbps
Line coding	HDB3
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from E3 Rx</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 100$ ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vp Complies with ITU-T G.703 (11/01)
Impedance	Nominal 75 $\Omega$

## Level measurements (E3 circuits)

Table 29 lists frequency and level measurement specifications when running applications for E3 circuits.

**Table 29** E3 frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	Range: 34.368 MHz $\pm 100$ ppm Accuracy: $\pm 1.5$ ppm, $\pm 1$ ppm per year aging Resolution: 1 Hz or 1 ppm
Level Vp	Range: 1.6 V to 0.01 V Resolution: 0.01 V Accuracy: $\pm 0.02$ V $\pm 10\%$

## Receiver (DS3 circuits)

Table 30 lists specifications for the receivers when running DS3 applications.

**Table 30** DS3 receiver specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one RX1 BNC, and one TX/RX2 BNC; both BNCs can be used as receivers. For 5800-100G and 5882, one RX1 HD-BNC and one TX/RX2 HD-BNC can be used as receivers.
Bit rate	44.736 Mbps

**Table 30** DS3 receiver specifications (Continued)

Parameter	Specification
Impedance	Nominal 75 $\Omega$ at 22 MHz unbalanced
Input Range	High/Low: 0 to 12 dB due to cable loss at 22 MHz, from a high signal DSX/Monitor: -20 dB due to resistive loss in addition to 0 to 9 dB due to cable loss at 22MHz, from a High signal

## Transmitter (DS3 circuits)

Table 31 lists specifications for the transmitter when running DS3 applications.

**Table 31** DS3 transmitter specifications

Parameter	Specification
Output	For 5800 v1 and v2, one BNC (TX/RX2) can be used as transmitter or receiver. For 5800-100G and 5882, one HD-BNC (TX\RX2) can be used as transmitter or receiver.
Bit rate	44.736 Mbps
Line coding	B3ZS
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from DS3 Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 100$ ppm, in 1 ppm steps
Pulse (high)	Nominal 1.15 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> after passing through 450 feet of RG59B/U cable.
Pulse (DSX)	Nominal 0.6 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> .
Pulse (low)	Nominal 0.35 Vp
Pulse shape	With output terminated in 75 $\Omega$ resistive load and DSX selected, the T-BERD/MTS 8000, 6000A, and 5800 meets <i>ITU-T Recommendation G.703 (11/01)</i> and <i>ANSI T1.102-1993</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements (DS3 circuits)

Table 32 lists frequency, level, and jitter measurement specifications when running DS3 applications.

**Table 32** DS3 frequency and level measurement specifications

Parameter	Specification
Tx and Rx frequency	<ul style="list-style-type: none"> <li>– Range: 44.736 MHz <math>\pm</math>100 ppm</li> <li>– Accuracy: <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Resolution: 1 Hz or 1 ppm</li> </ul>
Level Vp	<ul style="list-style-type: none"> <li>– Range: 1.6 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm</math>0.02 V <math>\pm</math>10%</li> </ul>

## Receiver (STS-1 circuits)

Table 33 lists specifications for the receivers when running STS-1 applications.

**Table 33** STS-1 receiver specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (RX1). For 5800-100G and 5882, one HD-BNC (RX1).
Bit rate	51.84 Mbps
Impedance	Nominal 75 $\Omega$ at 26 MHz unbalanced
Range	<ul style="list-style-type: none"> <li>– High/Low: 0 to 12 dB due to cable loss at 26 MHz, from a high signal</li> <li>– DSX/Monitor: -20 dB due to resistive loss in addition to 0 to 9 dB due to cable loss at 26 MHz, from a High signal</li> </ul>

## Transmitter (STS-1 circuits)

Table 34 lists specifications for the transmitter when running STS-1 applications.

**Table 34** STS-1 transmitter specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (TX/RX2); used as transmitter only. For 5800-100G and 5882, one HD-BNC (TX/RX2); used as transmitter only.
Bit rate	51.84 Mbps
Line coding	B3ZS
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Recovered from STS-1 Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>

**Table 34** STS-1 transmitter specifications (Continued)

Parameter	Specification
Frequency offset	±50 ppm, in 1 ppm steps
Pulse (high)	Nominal 1.15 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> after passing through 450 feet of RG59B/U cable.
Pulse (DSX)	Nominal 0.6 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> .
Pulse (low)	Nominal 0.32 Vp
Pulse shape	With output terminated in 75 Ω resistive load and DSX selected, the Dual Module Carrier, Transport Module, and MSAM meets <i>ITU-T Recommendation G.703 (11/01)</i> and <i>ANSI T1.102-1993</i>
Impedance	Nominal 75 Ω

### Physical measurements (STS-1 circuits)

Table 35 lists frequency and level measurement specifications when running STS-1 applications.

**Table 35** STS-1 frequency and level measurement specifications

Parameter	Specification
Tx and Rx frequency	Range: 51.84 MHz ±50 ppm Accuracy: ±1.5 ppm, ±1 ppm per year aging Resolution: 1 Hz or 1 ppm
Level Vp	Range: 1.6 V to 0.01 V Resolution: 0.01 V Accuracy: ±0.02 V ±10%

## E4/STM-1e specifications (5800 family of instruments only)

Refer to these tables for specifications for the E4/STM-1e connector:

- Table 36 through Table 38 on page 173 list specifications for E4 receivers, transmitters, and frequency and level measurements.
- Table 39 on page 174 through Table 41 on page 175 list specifications for STM-1e receivers, transmitters, and frequency and level measurements.

## Receiver (E4 circuits)

Table 36 lists specifications for the receiver when running E4 applications.

**Table 36** E4 receiver specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (RX1). For 5800-100G and 5882, one HD-BNC (RX1).
Bit rate	139.264 Mbps
Impedance	Nominal 75 $\Omega$ at 70 MHz unbalanced
Range	<ul style="list-style-type: none"> <li>– Term: 0 to 12 dB due to cable loss at 70 MHz, from a nominal signal</li> <li>– Monitor: -20 dB due to resistive loss in addition to 0 to 12 dB due to cable loss at 70 MHz, from a nominal signal</li> </ul>

## Transmitter (E4 circuits)

Table 37 lists specifications for the transmitter when running E4 applications.

**Table 37** E4 transmitter specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (TX/RX2); used as transmitter only. For 5800-100G and 5882, one HD-BNC (TX/RX2); used as transmitter only.
Bit rate	139.264 Mbps
Line coding	CMI
Tx clock (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from E4 RX1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 50$ ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vpp Complies with <i>ITU-T G.703 (11/01)</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements (E4 circuits)

Table 38 lists frequency and level measurement specifications when running E4 applications.

**Table 38** E4 frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	<ul style="list-style-type: none"> <li>– Range: 139.264 MHz <math>\pm 100</math> ppm</li> <li>– Accuracy: <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Resolution: 1 Hz, or 1 ppm</li> </ul>

**Table 38** E4 frequency and level measurement specifications (Continued)

Parameter	Specification
Level Vpp	<ul style="list-style-type: none"> <li>– Range: 1.4 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm 0.02 \text{ V} \pm 10\%</math></li> </ul>

## Receiver (STM-1e circuits)

Table 39 lists specifications for the receiver when running STM-1e applications.

**Table 39** STM-1e receiver specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (RX1). For 5800-100G and 5882, one HD-BNC (RX1).
Bit rate	155.52 Mbps
Impedance	Nominal 75 $\Omega$ at 78 MHz unbalanced
Range	Term: 0 to 12.7 dB due to cable loss at 78 MHz, from a nominal signal PMP: -20 dB due to resistive loss in addition to 0 to 12.7 dB due to cable loss at 70 MHz, from a nominal signal

## Transmitter (STM-1e circuits)

Table 40 lists specifications for the transmitter when running STM-1e applications.

**Table 40** STM-1e transmitter specifications

Parameter	Specification
Connector	For 5800 v1 and v2, one BNC (TX/RX2); used as transmitter only. For 5800-100G and 5882, one HD-BNC TX/(RX2); used as transmitter only.
Bit rate	155.52 Mbps
Line coding	CMI
Tx clock (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5 \text{ ppm}</math>, <math>\pm 1 \text{ ppm}</math> per year aging</li> <li>– Recovered from STM-1e RX1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 50 \text{ ppm}$ , in 1 ppm steps
Pulse	Nominal 1.0 Vpp Complies with <i>ITU-T G.703 (11/01)</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements (STM-1e circuits)

Table 41 lists frequency and level measurement specifications when running STM-1e applications.

**Table 41** STM-1e frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	<ul style="list-style-type: none"> <li>– Range: 155.52 MHz <math>\pm</math>50 ppm</li> <li>– Accuracy: <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Resolution: 1 Hz or 1 ppm</li> </ul>
Level Vpp	<ul style="list-style-type: none"> <li>– Range: 1.4 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm</math>0.02 V <math>\pm</math>10%</li> </ul>

## SFP/SFP+/SFP28 specifications

The interfaces of the SFP comply with *INF-8074i, Rev 1.0* published on May 12, 2001.

The interfaces of the SFP+ comply with *SFF-8431, Rev 4.1* published July 6, 2009.

The interfaces of the SFP28 comply with *SFF-8436* and *SFF-8402*. **Note:** SFP28 is for T-BERD/MTS 5800-100G only.

Performance is only guaranteed when using Viavi Recommended Optics.

## Supported optical rates

Table 42 provides the optical SONET, SDH, and Ethernet rates supported by the SFP/SFP+.

**Table 42** SONET, SDH, and Ethernet rates

Rate	SONET	SDH	Ethernet
4 Gbps	N/A	N/A	N/A
2.5 Gbps	OC-48	STM-16	N/A
2 Gbps	N/A	N/A	N/A
1 Gbps	N/A	N/A	1 GigE
10 Gbps	N/A	N/A	10 GigE
622 Mbps	OC-12	STM-4	N/A
155 Mbps	OC-3	STM-1	N/A
100 Mbps	N/A	N/A	100M

## CFP4 and QSFP+/QSFP28 specifications for 5800-100G

T-BERD/MTS 5800-100G has three types of physical optical ports: CFP4, QSFP28 and SFP28.

### CFP4 Interface

The optical specifications for the CFP4 module interface are detailed in [Table 43](#).

**Table 43** CFP4 Optical Module interface specifications

Module	Specification
CFP4, hot-pluggable	compliant with CFP MSA, CFP4 Hardware Specification Rev 1.1, E 802.3ba

### QSFP+/QSFP28 Interface

The optical specifications for the QSFP28 interface are detailed in [Table 44](#).

**Table 44** QSFP28 Optical module interface specifications

Module	Specification
QSFP+/QSFP28, hot-pluggable	compliant with QSFP28 MSA(SFF-8679), IEEE P802.3ba

### Optical specifications

[Table 45](#) lists specifications when testing optical circuits.

**Table 45** Optical specifications

Item	Description
Clock frequency accuracy	$\pm 1.5$ ppm $\pm 1$ ppm per year aging
Transmitter frequency offset	$\pm 50$ ppm from the nominal rate, in 1 ppm steps
Frequency measurement accuracy	$\pm 1.5$ ppm $\pm 1$ ppm per year aging
APS <sup>1</sup> resolution	1ms
accuracy	1ms
RTD resolution	1 $\mu$ s
accuracy	2 $\mu$ s

1. Published resolution and accuracy only ensured when using Viavi recommended transceivers (optics).

## Optional expansion module specifications

**NOTE:**

These specifications are not applicable to Smart Class 4800/4800P.

Specifications for optional expansion modules are provided in the user manuals and data sheets that support the modules.

### OTDR Modules

For OTDR Module specifications, refer to the *T-BERD / MTS 2000 / 4000 OTDR User Manual*. Supporting data sheets are available at [www.viavisolutions.com](http://www.viavisolutions.com).

### TEM Module

For TEM Module specifications, refer to the *T-BERD / MTS 5800 GNSS and Timing Expansion Module User Manual*. Supporting data sheets are available at [www.viavisolutions.com](http://www.viavisolutions.com).

### Internal GNSS application for T-BERD / MTS 5800-100G and 5882

T-BERD / MTS 5800-100G and 5882 support an internal GNSS that can be used when the TEM module is not available. For more information refer to the *T-BERD / MTS 5800 GNSS and Timing Expansion Module User Manual*.

## MSAM specifications

Refer to the following sections for specifications for the MSAM and each of the available PIMs:

- “Physical specifications” on page 178
- “Power supply specifications” on page 178
- “Battery specifications” on page 178
- “HS Datacom PIM specifications” on page 178
- “Diphase PIM specifications” on page 198
- “DS1 PIM specifications” on page 199
- “E1 (BNC) PIM specifications” on page 201
- “E1 (RJ-48) PIM specifications” on page 202
- “E3/DS3/STS-1 PIM specifications” on page 204
- “E4/STM-1e PIM specifications” on page 207
- “Interface Specifications- Jitter and Wander applications” on page 210
- “SFP PIM specifications” on page 210
- “XFP PIM specifications” on page 211

- “Optical specifications” on page 212
- “Clock source (Timing) specifications” on page 212

## Physical specifications

The physical characteristics for the MSAM chassis are listed in [Table 46](#).

**Table 46** MSAM physical specifications

Item	Description
Height	1.25 inches / 3.17 cm
Width	4.87 inches / 12.38 cm
Depth	9.12 inches / 23.49 cm
Weight (MSAM only)	1.8 lbs / 0.82 kg
Combined Weight (MSAM, 6000A Base Unit, one SFP PIM, and one XFP PIM)	8.2 lbs / 3.72 kg

## Power supply specifications

Refer to the *6000A Base Unit User Manual* for power supply specifications.

## Battery specifications

Typical battery life when testing a single interface using a MSAM (inserted in a base unit) with a single PIM ranges from at least one hour to two hours depending on the selected interface and test application.

For detailed battery information, refer to the *6000A Base Unit User Manual*.

## HS Datacom PIM specifications

[Table 47 on page 179](#) through [Table 83 on page 197](#) provide specifications for the HS Datacom PIM, and for each of the supported interfaces.

### Clock input interface specifications

The clock input interface is a BNC connector that allows you to provide a clock from an external source into the MSAM for interface timing. The external clock does not affect the MSAM’s internal clock when measuring frequency. You can verify the clock in frequency by viewing the associated result in the Signal test result category.

Table 47 provides specifications for the clock input interface.

**Table 47** Clock input interface specifications

Item	Description
Outer shell	Ground
Inner conductor	Clock input signal
Acceptable wave signals	Square or sine waves
Minimum input	1.5 Vpp
Maximum input	5 Vpp with DC offset of 0 V
Termination	50 Ohm AC termination impedance
Frequency <sup>1</sup>	5 Hz to 25 MHz
Async signal frequency	16 times the baud rate. For example, an external clock generator set to 153,600 Hz results in a 9600 baud signal out of the MSAM.

1. Line interfaces may not operate properly if the external clock is outside the supported frequency range for the interface.

## Clock output interface specifications

The clock output interface is a BNC connector that allows you to provide a clock for interface timing from the MSAM. Table 48 provides specifications for the clock output interface.

**Table 48** Clock output interface specifications

Item	Description
Outer shell	Ground
Inner conductor	Clock output signal
Output signal <sup>1</sup>	Square wave
Minimum high level	From 25 MHz: – 2 Vpp into a 50 Ohm (+/-1%) load – 4 Vpp unterminated
Maximum low level	600 mV when sinking 1 mA DC
Async signal frequency	16 times the baud rate. For example, an internally generated line rate of 9600 baud causes a BNC clock out signal of 153,600 Hz.

1. A limited current is supplied to protect against short circuits.

## Internal synthesizer specifications

Table 49 provides specifications for the MSAM's internal synthesizer.

**Table 49** Internal synthesizer specifications

Item	Description
Accuracy	+/- 1,5 ppm
	+/- 1 ppm per year aging
Resolution	1 Hz
Synchronous data rate	User selectable from 0.005 kHz to 20000 kHz, with a resolution of 1 Hz. See the <i>Data Communications and Diphas Testing Manual</i> for the synthesizer frequencies supported for each interface.

## X.21 interface specifications

Recommendation X.21 describes a data communications interface that uses balanced X.26 circuits (equivalent to V.11) and unbalanced X.27 circuits (equivalent to V.10) circuits. The MSAM X.21 interface uses V.11 amplifiers.

Table 50 lists the MSAM X.21 interface specifications.

**Table 50** X.21 interface specifications

Specification	Description
Termination impedance	100 Ohm for balanced circuits, with 10% tolerance.
Timing modes	Synchronous
Maximum speed	20 Mbps
Minimum output range	+/- 2 V terminated
Maximum input range	+/- 12 V
Rise/Fall times	– Clock/data: 6 ns – Signaling: 10 ns
Receiver minimum input sensitivity	+/- 200 mV
Hysteresis	Meets minimum input range

## Supported circuits

Table 51 lists the X.21 circuits supported by the MSAM.

**Table 51** X.21 circuits

Supported Circuits	
C	Request to Send
I	Clear to Send

**Table 51** X.21 circuits (Continued)

<b>Supported Circuits</b>	
R	Receive Data
S	Receiver Signal Element Timing <sup>1</sup> Shield
G	Signal Ground
T	Transmit Data
X	Transmitter Signal Element Timing <sup>2</sup>

1. The equivalent of an STC circuit is not available in X.21; when testing a X.21 interface, select S instead.
2. Interchange Circuit X (DTE signal element timing = Transmit Clock) is provided per ISO 4903.

### DTE emulation

[Table 52](#) lists specifications for X.21 testing in DTE emulation mode.

**Table 52** X.21 DTE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable lead	C (Control lead)
Sync Timing Mode	
Rx Timing Sources	– Interface (from the S circuit) – Interface Recovered
Sync Timing Mode	
Tx Timing Sources	– Interface (from the S circuit) – Interface Recovered – Internal Synthesizer – External Clock

### DCE emulation

[Table 53](#) lists specifications for X.21 testing in DCE emulation mode.

**Table 53** X.21 DCE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable lead	I (Indication lead)
Sync Timing Mode	
Rx Timing Sources	– Interface (from the X circuit) – Internal Synthesizer – External Clock – Interface Recovered

**Table 53** X.21 DCE emulation specifications (Continued)

Specification	Description
Sync Timing Mode	
Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the X circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

## RS-232/V.24 interface specifications

Recommendation V.24 (equivalent to RS-232D and EIA-232D) describes a data communications interface that uses unbalanced, bipolar, slew rate limited, V.28 amplifiers. [Table 54](#) lists the MSAM V.24 specifications.

**Table 54** V.24 specifications

Specification	Description
Termination source	V.28 receiver
Timing modes	<ul style="list-style-type: none"> <li>– Synchronous</li> <li>– Asynchronous</li> </ul>
Maximum speed	256 Kbps
Minimum output range	+/- 5 V loaded
Maximum input range	+/- 15 V
Rise/Fall times	1.5 uS
Receiver minimum input sensitivity	< 0.8 V, > 3.0 V
Hysteresis	Meets minimum input range

## Supported circuits

[Table 55](#) lists the V.24 circuits supported by the MSAM.

**Table 55** V.24 circuits

Supported Circuits	
RTS	Request to Send
ST	Transmitter Element Signal Timing from DCE
TD	Transmit Data
DTR	Data Terminal Ready
RD	Receive Data
RI	Ring Indicator
LL	Local Loopback
	Signal Ground
TT	Transmitter Element Signal Timing to DCE

**Table 55** V.24 circuits (Continued)

<b>Supported Circuits</b>	
DSR	Data Set Ready
RT	Receiver Signal Element Timing
RLSD	Receiver Line Signal Detect
RL	Remote Loopback
TM	Test Mode

### DTE emulation

[Table 56](#) lists specifications for V.24 testing in DTE emulation mode.

**Table 56** V.24 DTE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable leads	<ul style="list-style-type: none"> <li>– RTS</li> <li>– DTR</li> <li>– LL</li> <li>– RL</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface (from the ST circuit)</li> <li>– Interface Recovered</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> </ul>

### DCE emulation

[Table 57](#) lists specifications for V.24 testing in DCE emulation mode.

**Table 57** V.24 DCE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable leads	<ul style="list-style-type: none"> <li>– RLSD</li> <li>– DSR</li> <li>– CTS</li> <li>– RI</li> <li>– TM</li> </ul>

**Table 57** V.24 DCE emulation specifications (Continued)

Specification	Description
Sync Timing Mode	
Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode	
Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

### EIA-530/EIA-530A balanced interface specifications

Recommendation EIA-530/EIA-530A describes a data communications interface that uses balanced V.11 amplifiers for clock and data circuits, and unbalanced V.10 amplifiers for signaling circuits. [Table 58](#) lists EIA-530/EIA-530A specifications for both balanced and unbalanced circuits.

**Table 58** EIA-530/EIA-530A specifications

Specification	Description
Timing modes	Synchronous
Maximum speed	20 Mbps
Minimum output range	
V.11	+/- 2 V terminated
V.10	+/- 4 V unterminated
Maximum input range	
V.11	+/- 10 V
V.10	+/- 10 V
Rise/Fall times	
V.11	10 nS
V.10	500 nS
Receiver minimum input sensitivity	
V.11	+/- 200 mV
V.10	+/- 200 mV
Hysteresis	Meets minimum input range

Table 59 lists the EIA-530/EIA-530A termination specifications for balanced circuits.

**Table 59** EIA-530/EIA-530A balanced circuit termination specifications

Specification	Description
Termination options	<ul style="list-style-type: none"> <li>– unterminated</li> <li>– 78 Ohm</li> <li>– 100 Ohm</li> <li>– 124 Ohm</li> </ul>
Impedance	<ul style="list-style-type: none"> <li>– &gt; 4 k Ohms unterminated circuits</li> <li>– 10% tolerance, terminated</li> </ul>

### Supported circuits

Table 60 lists the EIA-530/EIA-530A circuits supported by the MSAM in balanced mode.

**Table 60** EIA-530/EIA-530A balanced circuits

Supported Circuits	
RTS	Request to Send
ST	Transmitter Element Signal Timing from DCE
TD	Transmit Data
DTR	Data Terminal Ready
RD	Receive Data
RL	Remote Loopback
TM	Test Mode
	Shield
CTS	Clear to Send
TT	Transmitter Element Signal Timing to DCE
DSR	Data Set Ready
RT	Receiver Signal Element Timing
RLSD	Receiver Line Signal Detect
LL	Local Loopback
	Signal Ground
RI	Ring Indicator (for EIA-530A only)

## DTE emulation

Table 61 lists specifications for EIA-530/EIA-530A balanced testing in DTE emulation mode.

**Table 61** EIA-530/EIA-530A balanced DTE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RTS</li> <li>– DTR</li> <li>– LL</li> <li>– RL</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface (from the ST circuit)</li> <li>– Interface Recovered</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> </ul>

## DCE emulation

Table 62 lists specifications for balanced EIA-530/EIA-530A testing in DCE emulation mode.

**Table 62** EIA-530/EIA-530A balanced DCE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RLSD</li> <li>– DSR</li> <li>– CTS</li> <li>– TM</li> <li>– RI (for EIA-530A only)</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

## EIA-530/EIA-530A unbalanced interface specifications

Recommendation EIA-530/EIA-530A describes a data communications interface that uses unbalanced V.10 amplifiers for all circuits. [Table 63](#) lists the MSAM EIA-530/EIA-530A unbalanced termination source and timing modes.

**Table 63** EIA-530/EIA-530A unbalanced termination and timing modes

Specification	Description
Maximum speed	256 Kbps
Termination	V.10 amplifier
Timing modes	Synchronous

### Supported circuits

[Table 64](#) lists the EIA-530/EIA-530A circuits supported by the MSAM in unbalanced mode.

**Table 64** EIA-530/EIA-530A unbalanced mode circuits

Supported Circuits	
RTS	Request to Send
ST	Transmitter Element Signal Timing from DCE
TD	Transmit Data
DTR	Data Terminal Ready
RD	Receive Data
RL	Remote Loopback
TM	Test Mode
	Shield
CTS	Clear to Send
TT	Transmitter Element Signal Timing to DCE
DSR	Data Set Ready
RT	Receiver Signal Element Timing
RLSD	Receiver Line Signal Detect
LL	Local Loopback
	Signal Ground
RI	Ring Indicator (for EIA-530A only)

## DTE emulation

Table 65 lists specifications for EIA-530/EIA-530A unbalanced testing in DTE emulation mode.

**Table 65** EIA-530/EIA-530A unbalanced DTE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RTS</li> <li>– DTR</li> <li>– LL</li> <li>– RL</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface (from the TT circuit)</li> <li>– Interface Recovered</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> </ul>

## DCE emulation

Table 66 lists specifications for unbalanced EIA-530/EIA-530A testing in DCE emulation mode.

**Table 66** EIA-530/EIA-530A unbalanced DCE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RLSD</li> <li>– DSR</li> <li>– CTS</li> <li>– TM</li> <li>– RI (for EIA-530A only)</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

## MIL-188c interface specifications

Specification MIL-188c, published in 1969, describes a data communications interface that uses a 25 pin connector, and unbalanced MIL-188c amplifiers for all circuits. The MSAM supports testing of unterminated MIL-188c circuits. [Table 67](#) lists the MIL-188c specifications.

**Table 67** MIL-188c specifications

Specification	Description
Timing Modes	Synchronous
Maximum speed	64 Kbps
Minimum output range	+/- 5 V loaded
Maximum input range	+/- 15 V
Rise/Fall times	1.5 uS
Receiver minimum input sensitivity	< 0.8 V, > 3.0 V
Hysteresis	Meets minimum input range

### Supported circuits

[Table 68](#) lists the unbalanced MIL-188c circuits supported by the MSAM.

**Table 68** Unbalanced MIL-188c circuits

Supported Circuits	
RTS	Request to Send
ST	Transmitter Element Signal Timing from DCE
TD	Transmit Data
DTR	Data Terminal Ready
RD	Receive Data
RL	Remote Loopback
TM	Test Mode
	Shield
CTS	Clear to Send
TT	Transmitter Element Signal Timing to DCE
DSR	Data Set Ready
RT	Receiver Signal Element Timing
RLSD	Receiver Line Signal Detect
LL	Local Loopback
	Signal Ground
RI	Ring Indicator

## DTE emulation

Table 69 lists specifications for MIL-188c testing in DTE emulation mode.

**Table 69** MIL-188c DTE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RTS</li> <li>– DTR</li> <li>– LL</li> <li>– RL</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface (from the ST circuit)</li> <li>– Interface Recovered</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> </ul>

## DCE emulation

Table 70 lists specifications for MIL-188c testing in DCE emulation mode.

**Table 70** MIL-188c DCE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RLSD</li> <li>– DSR</li> <li>– CTS</li> <li>– TM</li> <li>– RI</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

## V.35 interface specifications

Recommendation V.35 is primarily a modem specification; however, it also describes a data communications interface that uses balanced V.35 amplifiers for clock and data circuits, and unbalanced V.28 amplifiers for signaling circuits. [Table 71](#) lists the V.35 specifications for balanced and unbalanced circuits.

**Table 71** V.35 specifications

Specification	Description
Timing modes	Synchronous
Maximum speed	15 Mbps
Minimum output range	
V.35	+/- 0.44 V terminated
V.28	+/- 5 V
Rise/Fall times	
V.35	< 10 nS
V.28	1.5 uS
Receiver minimum input sensitivity	
V.35	+/- 200 mV
V.28	< 0.8 V, > 3.0 V
Hysteresis	Meets minimum input range

[Table 72](#) lists the MSAM V.35 termination specifications.

**Table 72** V.35 circuit termination specifications

Specification	Description
Balanced receivers	
Termination	100 Ohm
Impedance	+/- 20%
Unbalanced receivers	
Load impedance	3k to 7 k Ohms
Maximum input voltage	+/- 15 V
Signaling polarity	ON: greater than +3 V dc OFF: open or less than -3 V dc

## Supported circuits

Table 73 lists the V.35 circuits supported by the MSAM.

**Table 73** V.35 circuits

Supported Circuits	
RTS	Request to Send
SCT	Transmitter Element Signal Timing from DCE
SD	Transmit Data
DTR	Data Terminal Ready
RD	Receive Data
RL	Remote Loopback
TM	Test Mode
	Shield
CTS	Clear to Send
SCTE	Transmitter Element Signal Timing to DCE
DSR	Data Set Ready
SCR	Receiver Signal Element Timing
RLSD	Receiver Line Signal Detect
LL	Local Loopback
	Signal Ground
RI	Ring

## DTE emulation

Table 74 lists specifications for V.35 testing in DTE emulation mode.

**Table 74** V.35 DTE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RTS</li> <li>– DTR</li> <li>– LL</li> <li>– RL</li> </ul>
Sync Timing Mode	
Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the SCR circuit)</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode	
Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the SCT circuit)</li> <li>– Interface (from the SCR circuit)</li> <li>– Interface Recovered</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> </ul>

## DCE emulation

Table 75 lists specifications for V.35 testing in DCE emulation mode.

**Table 75** V.35 DCE emulation specifications

Specification	Description
User controllable leads	<ul style="list-style-type: none"> <li>– RLSD</li> <li>– DSR</li> <li>– CTS</li> <li>– TM</li> <li>– CI</li> </ul>
Sync Timing Mode	
Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the SCTE-306 circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode	
Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the SCTE-306 circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

## RS-449/V.36 specifications

Recommendation V.36 (equivalent to RS-449) is primarily a modem specification; however, it also describes a data communications interface that uses balanced V.11 amplifiers for all circuits except test mode circuits. The V.36 test mode circuits use unbalanced V.10 amplifiers. V.10 amplifiers can also be used for signaling circuits. When V.10 amplifiers are used for signaling, the B lead is grounded internally in the MSAM.

Table 76 lists the MSAM V.36 specifications.

**Table 76** V.36 specifications

Specification	Description
Maximum speed	Balanced <ul style="list-style-type: none"> <li>– 20 Mbps</li> </ul> Unbalanced <ul style="list-style-type: none"> <li>– 64 Kbps</li> </ul>
Termination options	<ul style="list-style-type: none"> <li>– unterminated</li> <li>– 78 Ohm</li> <li>– 100 Ohm</li> <li>– 124 Ohm</li> </ul>
Impedance	<ul style="list-style-type: none"> <li>– &gt; 4 k Ohm, unterminated circuits</li> <li>– 10% tolerance, terminated</li> </ul>

**Table 76** V.36 specifications (Continued)

Specification	Description
Minimum output range	
V.11	+/- 2 V terminated
V.10	+/- 4 V unterminated
Maximum input range	
V.11	+/- 10 V
V.10	+/- 10 V
Rise/Fall times	
V.11	10 nS
V.10	500 nS
Receiver minimum input sensitivity	
V.11	+/- 200 mV
V.10	+/- 200 mV
Hysteresis	Meets minimum input range

### Supported circuits

Table 77 lists the V.36 circuits supported by the MSAM.

**Table 77** V.36 circuits

Supported Circuits	
RS	Request to Send
ST	Transmitter Element Signal Timing from DCE
SD	Transmit Data
TR	Data Terminal Ready
RD	Receive Data
RL	Remote Loopback
TM	Test Mode
	Shield
CS	Clear to Send
TT	Transmitter Element Signal Timing to DCE
DM	Data Set Ready
RT	Receiver Signal Element Timing
RR	Receiver Line Signal Detect
LL	Local Loopback
	Signal Ground

**Table 77** V.36 circuits (Continued)

<b>Supported Circuits</b>	
IC	Ring Indicator

### DTE emulation

[Table 78](#) lists specifications for V.36 testing in DTE emulation mode.

**Table 78** V.36 DTE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable leads	<ul style="list-style-type: none"> <li>– RS</li> <li>– TR</li> <li>– LL</li> <li>– RL</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface (from the ST circuit)</li> <li>– Interface Recovered</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> </ul>

### DCE emulation

[Table 79](#) lists specifications for V.36 testing in DCE emulation mode.

**Table 79** V.36 DCE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable leads	<ul style="list-style-type: none"> <li>– RR</li> <li>– DM</li> <li>– CS</li> <li>– TM</li> <li>– IC (37 pin connector only)</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

**Table 79** V.36 DCE emulation specifications (Continued)

Specification	Description
Sync Timing Mode	
Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

## MIL-188-114 interface specifications

Specification MIL-188-114 describes a data communications interface that uses DB-25 connector or DB-37 connectors using balanced or unbalanced MIL-188-114 amplifiers for all circuits. The MSAM supports testing of MIL-188-114 circuits in asynchronous or synchronous mode. [Table 80](#) lists the MIL-188-114 specifications.

**Table 80** MIL-188-114 specifications

Specification	Description
Timing modes	Synchronous
Maximum speed	
Balanced	20 Mbps
Unbalanced	256 Kbps
Minimum output range	+/- 2 V terminated
Rise/Fall times	10 nS
Receiver minimum input sensitivity	+/- 200 mV
Hysteresis	Meets minimum input range

## Supported circuits

[Table 81](#) lists the unbalanced MIL-188-114 circuits supported by the MSAM.

**Table 81** Unbalanced MIL-188-114 circuits

Supported Circuits	
RS	Request to Send
ST	Transmitter Element Signal Timing from DCE
SD	Transmit Data
TR	Data Terminal Ready
RD	Receive Data
RL	Remote Loopback
TM	Test Mode
	Shield

**Table 81** Unbalanced MIL-188-114 circuits (Continued)

<b>Supported Circuits</b>	
CS	Clear to Send
TT	Transmitter Element Signal Timing to DCE
DM	Data Set Ready
RT	Receiver Signal Element Timing
RR	Receiver Line Signal Detect
LL	Local Loopback
	Signal Ground
IC	Ring Indicator

### DTE emulation

[Table 82](#) lists specifications for MIL-188-114 testing in DTE emulation mode.

**Table 82** MIL-188-114 DTE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable leads	<ul style="list-style-type: none"> <li>– RS</li> <li>– TR</li> <li>– LL</li> <li>– RL</li> </ul>
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the RT circuit)</li> <li>– Interface (from the ST circuit)</li> <li>– Interface Recovered</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> </ul>

### DCE emulation

[Table 83](#) lists specifications for MIL-188-114 testing in DCE emulation mode.

**Table 83** MIL-188-114 DCE emulation specifications

<b>Specification</b>	<b>Description</b>
User controllable leads	<ul style="list-style-type: none"> <li>– RR</li> <li>– DM</li> <li>– CS</li> <li>– TM</li> <li>– IC (37 pin connector only)</li> </ul>

**Table 83** MIL-188-114 DCE emulation specifications (Continued)

Specification	Description
Sync Timing Mode Rx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>
Sync Timing Mode Tx Timing Sources	<ul style="list-style-type: none"> <li>– Interface (from the TT circuit)</li> <li>– Internal Synthesizer</li> <li>– External Clock</li> <li>– Interface Recovered</li> </ul>

## Diphase PIM specifications

Table 84 on page 198 and Table 85 on page 199 provide specifications for the Diphase PIM.

### Receiver specifications

Table 84 lists receiver specifications for the Conditioned Diphase PIM.

**Table 84** Receiver specifications

Item	Description
Signal level	6.0 Vrms (+6 dB) to 90 mVrms (-30 dB)
Termination	User selectable, +/- 20% <ul style="list-style-type: none"> <li>– 58 Ohms</li> <li>– 130 Ohms</li> <li>– Bridge (&gt;2 Kohms)</li> </ul>
Pull range	+/- 600 ppm <b>NOTE:</b> The Frequency History result appears in the Summary result category if the measured receive frequency deviates +/- 150 ppm from the expected frequency.
Signal recovery (per MIL-188-202)	128/256/512 kbps <ul style="list-style-type: none"> <li>– 3.2 Km of coaxial cable</li> </ul> 2048 kbps <ul style="list-style-type: none"> <li>– 1.6 Km of coaxial cable</li> </ul> 64 Kbps <ul style="list-style-type: none"> <li>– 2 Km of twisted pair cable</li> </ul>
Cable loss compensation	Up to 30 dB at all data rates

**Table 84** Receiver specifications (Continued)

Item	Description
Signal present	Declared if transitions are > +/- 90 mV. <b>NOTE:</b> Valid signal indication is guaranteed if frequency offset is <600 ppm.

### Transmitter specifications

Table 85 lists transmitter specifications for the Conditioned Diphas interface module.

**Table 85** Transmitter specifications

Item	Description
Timing source	User selectable <ul style="list-style-type: none"> <li>– Rx (Recovered)</li> <li>– Internal (Rate)</li> </ul>
Output level	+/- 3 Vp +/-15% when terminated into 58 or 130 Ohms

## DS1 PIM specifications

Table 86 on page 199 through Table 89 on page 200 list specifications for the DS1 PIM.

### Receiver

Table 86 lists specifications for the DS1 receivers.

**Table 86** DS1 receiver specifications

Parameter	Specification
Connector	One RX1 Bantam Jack, and one TX/RX2 Bantam jack; both jacks can be used as receivers
Bit rate	1544 kbps ±250 ppm
Line coding	AMI, B8ZS

Table 87 lists the input sensitivity specifications for the DS1 receiver.

**Table 87** DS1 receiver sensitivity specifications

Termination Type	Impedance	Input Range
Bridge	>1000 Ω	+6 to -35.0 dBdsx due to cable loss
Terminate	100 Ω nom	+6 to -35.0 dBdsx due to cable loss
DSX monitor	100 Ω nom	-20 dBdsx due to resistive loss in addition to 0 to -6 dB due to cable loss

## Transmitter

Table 88 lists specifications for the DS1 transmitter.

**Table 88** DS1 transmitter specifications

Parameter	Specification
Connector	One TX/RX2 Bantam jack; only the TX/RX2 jack can be used as a transmitter
Output	6 V <sub>nom</sub> peak-peak into 100 Ω Complies with ANSI T1.403-1999.
Line build out (LBO) level	0 dB, -7.5 dB, -15.0 dB or -22.5 dB due to cable loss at 772 kHz
LBO level accuracy	At 772 kHz relative to the signal at 0 dB <sub>dsx</sub> : – ± 2.5 dB for -7.5 dB – ±3 dB for -15.0 dB and -22.5 dB
Line code	AMI, B8ZS
Clock source (Timing)	– Internal reference clock with accuracy ±1.5 ppm, ±1 ppm per year aging – Recovered from RX1 – External from BITS, SETS, or CLOCK
Frequency off-set	±100 ppm, in 1 ppm steps
Pulse shape	Terminated with 100 Ω resistive load and 0 dB LBO selected, the interface meets ITU-T Recommendation G.703 (11/01) and ANSI T1.102-1993

## Physical measurements

Table 89 lists frequency and level measurement specifications when running DS1 applications.

**Table 89** DS1 frequency and level measurement specifications

Parameter	Specification
Level V p-p	Range: 8.0 V to 0.06 V Accuracy: ± 0.04 V ± 10% Resolution: 0.01 V
Frequency	Range: 1.544 MHz ±250 ppm Accuracy: ± 1.5 ppm, ± 1 ppm per year aging Resolution: 1 Hz or 1 ppm
Level dB <sub>dsx</sub> <sup>1</sup>	Range: +2.5 dB <sub>dsx</sub> to -37 dB <sub>dsx</sub> Resolution: 0.1 dB
Level dBm <sup>2</sup>	Range: +19.0 dBm to -10.5 dBm Resolution: 0.1 dB

1. The designation dBdsx is a level measurement in dB relative to dsx level, which is 6 V peak-peak. A signal with a peak-peak level of 6V corresponds to 0 dBdsx.
2. Available only when unframed all ones (AIS) signal is detected.

## E1 (BNC) PIM specifications

Table 90 on page 201 through Table 93 on page 202 list specifications for the E1 (BNC) PIM.

### Receiver (BNC)

The E1 receiver operates as per ITU-G.703 (11/01). Table 90 lists the receiver specifications.

**Table 90** E1 BNC receiver specifications

Parameter	Specification
Connector	One unbalanced RX1 BNC, and one unbalanced TX/RX2 BNC; both BNCs can be used as receivers
Bit rate	2.048 Mbps
Frequency measurement	Range: 2.048 MHz $\pm$ 250 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz
Level Measurement (Unbalanced)	Level Vp Range: +4.0 V to 0.03 V Accuracy: $\pm$ 0.02 V $\pm$ 10% Resolution: 0.01 V Level dBnom <sup>1</sup> : Range: 4.5 dBnom to -37 dBnom Resolution: 0.1 dB

1. The designation in dBnom is relative to nominal signal 2.37 Vp.

Table 91 lists the input sensitivity specifications for the E1 receiver.

**Table 91** E1 receiver sensitivity specifications

Termination Type	Impedance	Input Range
Bridge (HI-Z)	>750 $\Omega$	+4 to -35 dBnom due to cable loss
Terminate	75 $\Omega$ unbalanced	+4 to -35 dBnom due to cable loss
PMP	75 $\Omega$ unbalanced	-20 dBnom due to resistive loss in addition to 0 to -6 dB due to cable loss

## Transmitter (BNC)

The E1 transmitter operates as per ITU-G.703 (11/01). [Table 92](#) lists the transmitter specifications.

**Table 92** E1 BNC transmitter specifications

Parameter	Specification
Connector	One unbalanced BNC/ 75 $\Omega$ ; only the TX/RX2 BNC can be used as a transmitter
Line code	HDB3 or AMI
Bit rate	Nominal: 2.048 Mbps Accuracy: $\pm 1.5$ ppm, $\pm 1$ ppm per year aging Frequency offset: $\pm 100$ ppm in 1 ppm steps
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> <li>– BITS 1.544 Mbps DS1/T1 signal</li> <li>– SETS 2.048 Mbps E1 signal</li> <li>– 2MClock 2.048 MHz G.703 sync clock (square wave)</li> <li>– 10M Clock 10.000 MHz square clock</li> </ul>
Frequency offset	$\pm 100$ ppm in 1 ppm steps
Pulse shape	Complies with ITU-T G.703 (11/01)

## E1 (RJ-48) PIM specifications

[Table 93](#) on page 202 through [Table 95](#) on page 203 list specifications for the E1 (BNC) PIM.

### Receiver (RJ-48)

The E1 receiver operates as per ITU-G.703 (11/01). [Table 93](#) lists the receiver specifications.

**Table 93** E1 RJ-48 receiver specifications

Parameter	Specification
Connector	Balanced RJ-48
Bit rate	2.048 Mbps

**Table 93** E1 RJ-48 receiver specifications (Continued)

Parameter	Specification
Frequency measurement	Range: 2.048 MHz $\pm$ 250 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz
Level Measurement (Balanced)	Level Vp Range: +4 V to 0.03 V Accuracy: $\pm$ 0.02 V $\pm$ 10% Resolution: 0.01 V Level dBnom <sup>1</sup> : Range: +2.5 dBnom to -37 dBnom Resolution: 0.1 dB

1. The designation in dBnom is relative to nominal signal 3 Vp.

[Table 94](#) lists the input sensitivity specifications for the E1 receiver.

**Table 94** E1 RJ-48 receiver sensitivity specifications

Termination Type	Impedance	Input Range
Bridge (HI-Z)	>1200 $\Omega$	+2.5 to -35 dBnom due to cable loss
Terminate	120 $\Omega$ balanced	+2.5 to -35 dBnom due to cable loss
PMP	120 $\Omega$ balanced	-20 dBnom due to resistive loss in addition to 0 to -6 dB due to cable loss

## Transmitter (RJ-48)

The E1 transmitter operates as per ITU-G.703 (11/01). [Table 95](#) lists the transmitter specifications.

**Table 95** E1 RJ-48 transmitter specifications

Parameter	Specification
Connector	Balanced RJ-48
Line code	HDB3 or AMI
Bit rate	Nominal: 2.048 Mbps Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Frequency offset: $\pm$ 100 ppm in 1 ppm steps
Clock Source (Timing)	– Internal reference clock with accuracy $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging – Recovered from Rx1 – External from BITS, SETS, or CLOCK
Frequency offset	$\pm$ 100 ppm in 1 ppm steps
Pulse shape	Complies with ITU-T G.703 (11/01)

## E3/DS3/STS-1 PIM specifications

Refer to these tables for specifications for the E3/DS3/STS-1 PIM:

- [Table 96 on page 204](#) through [Table 97 on page 204](#) list specifications when running E3 applications.
- [Table 99 on page 205](#) through [Table 101 on page 206](#) list specifications when running DS3 applications.
- [Table 102 on page 206](#) through [Table 104 on page 207](#) list specifications when running STS-1 applications.

### Receiver (E3 circuits)

[Table 96](#) lists specifications for the receiver when running applications for E3 circuits.

**Table 96** E3 receiver specifications

Parameter	Specification
Connector	One BNC (RX1)
Bit rate	34.368 Mbps
Impedance	Nominal 75 $\Omega$ at 17 MHz, unbalanced
Input Range	Term: 0 to 12 dBnom due to cable loss at 17 MHz, from a nominal signal PMP: -20 dB due to resistive loss in addition to 0 to 12 dB due to cable loss at 17 MHz, from a nominal signal

### Transmitter (E3 circuits)

[Table 97](#) lists specifications for the transmitter when running applications for E3 circuits.

**Table 97** E3 transmitter specifications

Parameter	Specification
Connector	One BNC (TX/RX2); used as transmitter only
Bit rate	34.368 Mbps
Line coding	HDB3
Clock Source (Timing)	– Internal reference clock with accuracy $\pm 1.5$ ppm, $\pm 1$ ppm per year aging – Recovered from E3 Rx – External from BITS, SETS, or CLOCK
Frequency offset	$\pm 100$ ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vp Complies with ITU-T G.703 (11/01)
Impedance	Nominal 75 $\Omega$

## Level measurements (E3 circuits)

Table 98 lists frequency and level measurement specifications when running applications for E3 circuits.

**Table 98** E3 frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	Range: 34.368 MHz $\pm$ 100 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz or 1 ppm
Level Vp	Range: 1.6 V to 0.01 V Resolution: 0.01 V Accuracy: $\pm$ 0.05 V $\pm$ 10%

## Receiver (DS3 circuits)

Table 99 lists specifications for the receivers when running DS3 applications.

**Table 99** DS3 receiver specifications

Parameter	Specification
Connector	One RX1 BNC, and one TX/RX2 BNC; both BNCs can be used as receivers
Bit rate	44.736 Mbps
Impedance	Nominal 75 $\Omega$ at 22 MHz unbalanced
Input Range	High/Low: 0 to 12 dB due to cable loss at 22 MHz, from a high signal DSX/Monitor: -20 dB due to resistive loss in addition to 0 to 9 dB due to cable loss at 22MHz, from a High signal

## Transmitter (DS3 circuits)

Table 100 lists specifications for the transmitter when running DS3 applications.

**Table 100** DS3 transmitter specifications

Parameter	Specification
Output	One BNC (TX/RX2); can be used as transmitter or receiver.
Bit rate	44.736 Mbps
Line coding	B3ZS
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Recovered from DS3 Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm$ 100 ppm, in 1 ppm steps

**Table 100** DS3 transmitter specifications (Continued)

Parameter	Specification
Pulse (high)	Nominal 1.15 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> after passing through 450 feet of RG59B/U cable.
Pulse (DSX)	Nominal 0.6 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> .
Pulse (low)	Nominal 0.35 Vp
Pulse shape	With output terminated in 75 $\Omega$ resistive load and DSX selected, the T-BERD/MTS 8000, 6000A, and 5800 meets <i>ITU-T Recommendation G.703 (11/01)</i> and <i>ANSI T1.102-1993</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements (DS3 circuits)

Table 101 lists frequency, level, and jitter measurement specifications when running DS3 applications.

**Table 101** DS3 frequency and level measurement specifications

Parameter	Specification
Tx and Rx frequency	<ul style="list-style-type: none"> <li>– Range: 44.736 MHz <math>\pm</math>100 ppm</li> <li>– Accuracy: <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Resolution: 1 Hz or 1 ppm</li> </ul>
Level Vp	<ul style="list-style-type: none"> <li>– Range: 1.6 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm</math>0.05 V <math>\pm</math>10%</li> </ul>

## Receiver (STS-1 circuits)

Table 102 lists specifications for the receivers when running STS-1 applications.

**Table 102** STS-1 receiver specifications

Parameter	Specification
Connector	One BNC (RX1)
Bit rate	51.84 Mbps
Impedance	Nominal 75 $\Omega$ at 26 MHz unbalanced
Range	<ul style="list-style-type: none"> <li>– High/Low: 0 to 12 dB due to cable loss at 26 MHz, from a high signal</li> <li>– DSX/Monitor: -20 dB due to resistive loss in addition to 0 to 9 dB due to cable loss at 26 MHz, from a High signal</li> </ul>

## Transmitter (STS-1 circuits)

Table 103 lists specifications for the transmitter when running STS-1 applications.

**Table 103** STS-1 transmitter specifications

Parameter	Specification
Connector	One BNC (TX/RX2); used as transmitter only
Bit rate	51.84 Mbps
Line coding	B3ZS
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from STS-1 Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 50$ ppm, in 1 ppm steps
Pulse (high)	Nominal 1.15 Vp. Complies with <i>ANSI T1.102-1993 and ITU-T G.703 (11/01)</i> after passing through 450 feet of RG59B/U cable.
Pulse (DSX)	Nominal 0.6 Vp. Complies with <i>ANSI T1.102-1993 and ITU-T G.703 (11/01)</i> .
Pulse (low)	Nominal 0.32 Vp
Pulse shape	With output terminated in 75 $\Omega$ resistive load and DSX selected, the Dual Module Carrier, Transport Module, and MSAM meets <i>ITU-T Recommendation G.703 (11/01)</i> and <i>ANSI T1.102-1993</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements (STS-1 circuits)

Table 104 lists frequency and level measurement specifications when running STS-1 applications.

**Table 104** STS-1 frequency and level measurement specifications

Parameter	Specification
Tx and Rx frequency	Range: 51.84 MHz $\pm 50$ ppm Accuracy: $\pm 1.5$ ppm, $\pm 1$ ppm per year aging Resolution: 1 Hz or 1 ppm
Level Vp	Range: 1.6 V to 0.01 V Resolution: 0.01 V Accuracy: $\pm 0.05$ V $\pm 10\%$

## E4/STM-1e PIM specifications

Refer to these tables for specifications for the E4/STM-1e PIM:

- [Table 105 on page 208](#) through [Table 107 on page 209](#) list specifications for E4 receivers, transmitters, and frequency and level measurements.
- [Table 108 on page 209](#) through [Table 110 on page 210](#) list specifications for STM-1 receivers, transmitters, and frequency and level measurements.

## Receiver (E4 circuits)

[Table 105](#) lists specifications for the receiver when running E4 applications.

**Table 105** E4 receiver specifications

Parameter	Specification
Connector	One BNC
Bit rate	139.264 Mbps
Impedance	Nominal 75 $\Omega$ at 70 MHz unbalanced
Range	<ul style="list-style-type: none"> <li>– Term: 0 to 12 dB due to cable loss at 70 MHz, from a nominal signal</li> <li>– PMP: -20 dB due to resistive loss in addition to 0 to 12 dB due to cable loss at 70 MHz, from a nominal signal</li> </ul>

## Transmitter (E4 circuits)

[Table 106](#) lists specifications for the transmitter when running E4 applications.

**Table 106** E4 transmitter specifications

Parameter	Specification
Connector	One BNC
Bit rate	139.264 Mbps
Line coding	CMI
Tx clock (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from E4 Rx</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 50$ ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vpp Complies with <i>ITU-T G.703 (11/01)</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements (E4 circuits)

Table 107 lists frequency and level measurement specifications when running E4 applications.

**Table 107** E4 frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	<ul style="list-style-type: none"> <li>– Range: 139.264 MHz <math>\pm</math>100 ppm</li> <li>– Accuracy: <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Resolution: 1 Hz, or 1 ppm</li> </ul>
Level Vpp	<ul style="list-style-type: none"> <li>– Range: 1.4 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm</math>0.05 V <math>\pm</math>10%</li> </ul>

## Receiver (STM-1e circuits)

Table 108 lists specifications for the receiver when running STM-1e applications.

**Table 108** STM-1e receiver specifications

Parameter	Specification
Connector	One BNC
Bit rate	155.52 Mbps
Impedance	Nominal 75 $\Omega$ at 78 MHz unbalanced
Range	Term: 0 to 12.7 dB due to cable loss at 78 MHz, from a nominal signal PMP: -20 dB due to resistive loss in addition to 0 to 12.7 dB due to cable loss at 70 MHz, from a nominal signal

## Transmitter (STM-1e circuits)

Table 109 lists specifications for the transmitter when running STM-1e applications.

**Table 109** STM-1e transmitter specifications

Parameter	Specification
Connector	One BNC
Bit rate	155.52 Mbps
Line coding	CMI
Tx clock (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Recovered from Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm$ 50 ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vpp Complies with <i>ITU-T G.703 (11/01)</i>

**Table 109** STM-1e transmitter specifications (Continued)

Parameter	Specification
Impedance	Nominal 75 $\Omega$

## Physical measurements (STM-1e circuits)

Table 110 lists frequency and level measurement specifications when running STM-1e applications.

**Table 110** STM-1e frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	<ul style="list-style-type: none"><li>– Range: 155.52 MHz <math>\pm</math>50 ppm</li><li>– Accuracy: <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li><li>– Resolution: 1 Hz or 1 ppm</li></ul>
Level Vpp	<ul style="list-style-type: none"><li>– Range: 1.4 V to 0.01 V</li><li>– Resolution: 0.01 V</li><li>– Accuracy: <math>\pm</math>0.05 V <math>\pm</math>10%</li></ul>

## Interface Specifications- Jitter and Wander applications

The electrical and optical interface specifications for MSAM Jitter and Wander applications are detailed in “[Jitter and Wander specifications](#)” on page 224.

## SFP PIM specifications

The interfaces of the SFP PIM comply with *INF-8074i, Rev 1.0 published on May 12, 2001*. Performance is only guaranteed when using Viavi Recommended Optics.

### Supported electrical rates

The 10/100/1000 Base-T/Tx interfaces conform to the IEEE 802.3 electrical requirements.

Table 111 lists the electrical rates supported by the SFP PIM.

**Table 111** Electrical rates

Rate	Mbps
10Base-T Ethernet	10
100Base-T Ethernet	100
1000Base-T Ethernet	1000

## Electrical interface specifications

Table 112 lists the electrical specifications for the 10/100/1000 Mb/s interface.

**Table 112** 10/100/1000 Mb/s interface specifications

Specification	Description
Cable	CAT5e 100-Ohm STP cable, ≤ 100 meters

## Supported optical rates

Table 113 provides the optical SONET, SDH, OTN, Ethernet, and Fibre Channel rates supported by the SFP PIM.

**Table 113** SONET, SDH, OTN, Ethernet, and Fibre Channel rates

Rate	SONET	SDH	OTN	Ethernet	Fibre Channel
4 Gbps	N/A	N/A	N/A	N/A	4Gig
2.5 Gbps	OC-48	STM-16	2.7 Gbps	N/A	N/A
2 Gbps	N/A	N/A	N/A	N/A	2Gig
1 Gbps	N/A	N/A	N/A	1 GigE	1Gig
622 Mbps	OC-12	STM-4	N/A	N/A	N/A
155 Mbps	OC-3	STM-1	N/A	N/A	N/A
100 Mbps	N/A	N/A	N/A	100M	N/A

## XFP PIM specifications

The interface of the XFP PIM complies with *INF-8077i, Rev 4.5 published on August 31, 2005*. Performance is only guaranteed when using Viavi Recommended Optics.

## Supported optical rates

The XFP PIM supports the 10 Gigabit optical interfaces listed in Table 114.

**Table 114** SONET, SDH, OTN, Ethernet, and Fibre Channel rates

Rate	SONET	SDH	OTN	Ethernet	Fibre Channel
10 Gbps	OC-192	STM-64	10.7 Gbps 11.1 Gbps 11.05 Gbps	10GigE	8Gig 10Gig

## Optical specifications

Table 115 lists specifications for the available PIMs when testing optical circuits.

**Table 115** Optical specifications

Item	Description
Clock frequency accuracy	$\pm 1.5$ ppm $\pm 1$ ppm per year aging
Transmitter frequency offset	$\pm 50$ ppm from the nominal rate, in 1 ppm steps
Frequency measurement accuracy	$\pm 1.5$ ppm $\pm 1$ ppm per year aging
APS <sup>1</sup> resolution	1ms
accuracy	1ms
RTD resolution	1 $\mu$ s
accuracy	2 $\mu$ s

1. Published resolution and accuracy only ensured when using Viavi recommended transceivers (optics).

## Clock source (Timing) specifications

Table 116 lists internal and external timing specifications for the MSAM chassis.

**Table 116** Timing specifications

Clock Source	Description
Internal reference	accuracy $\pm 1.5$ ppm, $\pm 1$ ppm per year aging
External BNC	from BITS, SETS, or CLOCK

## DS1 electrical specifications

Table 117 on page 212 through Table 120 on page 213 list specifications for DS1 receivers, transmitters, and frequency and level measurements.

### Receivers

Table 117 lists specifications for the Primary and Secondary DS1 receivers.

**Table 117** DS1 receiver specifications

Parameter	Specification
Connectors	Two bantam jacks
Bit rate	1544 kbps $\pm 250$ ppm
Line coding	AMI, B8ZS

Table 118 lists the input sensitivity specifications for the Primary and Secondary DS1 receivers.

**Table 118** DS1 receiver sensitivity specifications

Termination Type	Impedance	Input Range
Bridge	>1000 $\Omega$	+6 to -35.0 dBdsx due to cable loss
Terminate	100 $\Omega$ $\pm$ 5%	+6 to -35.0 dBdsx due to cable loss
DSX monitor	100 $\Omega$ $\pm$ 5%	-20 dBdsx due to resistive loss in addition to 0 to -6 dB due to cable loss

## Transmitter

Table 119 lists specifications for the DS1 transmitter.

**Table 119** DS1 transmitter specifications

Parameter	Specification
Connector	Bantam jack
Output	6 V peak-peak into 100 $\Omega$
Line build out (LBO) level	0 dB, -7.5 dB, -15.0 dB or -22.5 dB due to cable loss at 772 kHz
LBO level accuracy	At 772 kHz relative to the signal at 0 dBdsx: <ul style="list-style-type: none"> <li>– <math>\pm</math> 2.5 dB for -7.5 dB</li> <li>– <math>\pm</math>3 dB for -15.0 dB and -22.5 dB</li> </ul>
Line code	AMI, B8ZS
Clock source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm</math>1.5 ppm, <math>\pm</math>1 ppm per year aging</li> <li>– Recovered from Rx1 or Rx2</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm$ 100 ppm, in 1 ppm steps
Pulse shape	With output terminated in 100 $\Omega$ resistive load and 0 dB LBO selected, the interface meets ITU-T Recommendation G.703 (11/01) and ANSI T1.102-1993

## Physical measurements

Table 120 lists frequency, level, and jitter measurement specifications for DS1.

**Table 120** DS1 frequency, level, and jitter measurement specifications

Parameter	Specification
Level V p-p	Range: 14.0 V to 0.06 V Accuracy: $\pm$ 0.04 V $\pm$ 10% Resolution: 0.01 V

**Table 120** DS1 frequency, level, and jitter measurement specifications (Continued)

Parameter	Specification
Frequency	Range: 1.544 MHz $\pm$ 250 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz or 1 ppm
Level dBdsx <sup>1</sup>	Range: +7.3 dBdsx to -37 dBdsx Resolution: 0.1 dB
Level dBm <sup>2</sup>	Range: +23.8 dBm to -10.5 dBm Resolution: 0.1 dB

1. The designation dBdsx is a level measurement in dB relative to dsx level, which is 6 V peak-peak. A signal with a peak-peak level of 6V corresponds to 0 dBdsx.
2. Available only when unframed all ones (AIS) signal is detected.

## E1 (2M) electrical specifications

Table 121 on page 214 through Table 123 on page 215 list specifications for the E1 (2M) receivers and transmitters.

### Receivers

The E1 receivers operate as per ITU-G.703 (11/01). Table 121 lists the receiver specifications.

**Table 121** E1 receiver specifications

Parameter	Specification
Input	One Balanced RJ-48 jack. Two Unbalanced BNC connectors. Secondary Input may also be used as an external E1 reference clock: – 0.5 to 3 Vpp square or sine wave, 2.048 MHz, unbalanced/ 75 $\Omega$
Bit rate	2.048 Mbps
Frequency measurement	Range: 2.048 MHz $\pm$ 250 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz
Level Measurement (Balanced)	Level Vp Range: +7 V to 0.03 V Accuracy: $\pm$ 0.02 V $\pm$ 10% Resolution: 0.01 V Level dBnom <sup>1</sup> : Range: 7.3 dBnom to -37 dBnom Resolution: 0.1 dB

**Table 121** E1 receiver specifications (Continued)

Parameter	Specification
Level Measurement (Unbalanced)	Level Vp Range: +5 V to 0.03 V Accuracy: $\pm 0.02 \text{ V} \pm 10\%$ Resolution: 0.01 V Level dBnom <sup>2</sup> : Range: 7.3 dBnom to -37 dBnom Resolution: 0.1 dB

1. The designation in dBnom is relative to nominal signal 3 Vp.
2. The designation in dBnom is relative to nominal signal 2.37 Vp.

[Table 122](#) lists the input sensitivity specifications for the E1 receivers.

**Table 122** E1 receiver sensitivity specifications

Termination Type	Impedance	Input Range
Bridge (HI-Z)	>1200 $\Omega$	+6 to -35 dBnom due to cable loss
Terminate	120 $\Omega$ balanced 75 $\Omega$ unbalanced	+6 to -35 dBnom due to cable loss
PMP	120 $\Omega$ balanced 75 $\Omega$ unbalanced	-20 dBnom due to resistive loss in addition to 0 to -6 dB due to cable loss

## Transmitters

The E1 transmitters operate as per ITU-G.703 (11/01). [Table 123](#) describes the transmitter specifications.

**Table 123** E1 transmitter specifications

Parameter	Specification
Output	One balanced RJ-48 jack Impedance 120 W One unbalanced BNC connector/ 75 W
Line code	HDB3 or AMI
Bit rate	Nominal: 2.048 Mbps Accuracy: $\pm 1.5 \text{ ppm}$ , $\pm 1 \text{ ppm}$ per year aging Frequency offset: $\pm 100 \text{ ppm}$ in 1 ppm steps
Clock Source (Timing)	– Internal reference clock with accuracy $\pm 1.5 \text{ ppm}$ , $\pm 1 \text{ ppm}$ per year aging – Recovered from Rx1 – External from BITS, SETS, or CLOCK
Frequency offset	$\pm 100 \text{ ppm}$ in 1 ppm steps

**Table 123** E1 transmitter specifications (Continued)

Parameter	Specification
Pulse shape	Complies with ITU-T G.703 (11/01)

## E3 electrical specifications

Table 124 on page 216 through Table 126 on page 217 list specifications for E3 receivers, transmitters, and frequency and level measurements.

### Receiver

Table 124 lists specifications for the E3 receiver.

**Table 124** E3 receiver specifications

Parameter	Specification
Input	One BNC connector
Bit rate	34.368 Mbps
Impedance	Nominal 75 $\Omega$ at 17 MHz, unbalanced
Input Range	Term: 0 to 12 dBnom due to cable loss at 17 MHz, from a nominal signal PMP: -20 dB due to resistive loss in addition to 0 to 12 dB due to cable loss at 17 MHz, from a nominal signal

### Transmitter

Table 125 lists specifications for the primary E3 transmitter.

**Table 125** E3 transmitter specifications

Parameter	Specification
Output	One BNC connector
Bit rate	34.368 Mbps
Line coding	HDB3
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from E3 Rx</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 100$ ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vp Complies with ITU-T G.703 (11/01)
Impedance	Nominal 75 $\Omega$

## Level measurements

Table 126 lists frequency and level measurement specifications for E3.

**Table 126** E3 frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	Range: 34.368 MHz $\pm$ 100 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz or 1 ppm
Level Vp	Range: 1.6 V to 0.01 V Resolution: 0.01 V Accuracy: $\pm$ 0.02 V $\pm$ 10%

## DS3 electrical specifications

Table 127 on page 217 through Table 129 on page 218 list specifications for DS3 receivers, transmitters, and frequency and level measurements.

### Receivers

Table 127 lists specifications for the primary and secondary DS3 receivers.

**Table 127** DS3 receiver specifications

Parameter	Specification
Input	Two BNC connectors
Bit rate	44.736 Mbps
Impedance	Nominal 75 $\Omega$ at 22 MHz unbalanced
Input Range	High/Low: 0 to 12 dB due to cable loss at 22 MHz, from a high signal DSX/Monitor: -20 dB due to resistive loss in addition to 0 to 9 dB due to cable loss at 22MHz, from a high signal

### Transmitter

Table 128 lists specifications for the primary DS3 transmitter.

**Table 128** DS3 transmitter specifications

Parameter	Specification
Output	One BNC connector
Bit rate	44.736 Mbps
Line coding	B3ZS

**Table 128** DS3 transmitter specifications (Continued)

Parameter	Specification
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from DS3 Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 100$ ppm, in 1 ppm steps
Pulse (high)	Nominal 1.15 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> after passing through 450 feet of RG59B/U cable.
Pulse (DSX)	Nominal 0.6 Vp. Complies with <i>ANSI T1.102-1993</i> and <i>ITU-T G.703 (11/01)</i> .
Pulse (low)	Nominal 0.35 Vp
Pulse shape	With output terminated in 75 $\Omega$ resistive load and DSX selected, the T-BERD/MTS 8000, 6000A, and 5800 meets <i>ITU-T Recommendation G.703 (11/01)</i> and <i>ANSI T1.102-1993</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements

[Table 129](#) lists frequency, level, and jitter measurement specifications for DS3.

**Table 129** DS3 frequency and level measurement specifications

Parameter	Specification
Tx and Rx frequency	<ul style="list-style-type: none"> <li>– Range: 44.736 MHz <math>\pm 100</math> ppm</li> <li>– Accuracy: <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Resolution: 1 Hz or 1 ppm</li> </ul>
Level Vp	<ul style="list-style-type: none"> <li>– Range: 1.6 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm 0.02</math> V <math>\pm 10\%</math></li> </ul>

## STS-1 electrical specifications

[Table 130](#) on [page 219](#) through [Table 132](#) on [page 220](#) list specifications for STS-1 receivers, transmitters, and frequency and level measurements.

## Receivers

Table 130 lists specifications for the primary and secondary STS-1 receivers.

**Table 130** STS-1 receiver specifications

Parameter	Specification
Input	Two BNC connectors
Bit rate	51.84 Mbps
Impedance	Nominal 75 $\Omega$ at 26 MHz unbalanced
Range	<ul style="list-style-type: none"> <li>– High/Low: 0 to 12 dB due to cable loss at 26 MHz, from a high signal</li> <li>– DSX/Monitor: -20 dB due to resistive loss in addition to 0 to 9 dB due to cable loss at 26 MHz, from a high signal</li> </ul>

## Transmitter

Table 131 lists specifications for the primary STS-1 transmitter.

**Table 131** STS-1 transmitter specifications

Parameter	Specification
Output	One BNC connector
Bit rate	51.84 Mbps
Line coding	B3ZS
Clock Source (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from STS-1 Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 50$ ppm, in 1 ppm steps
Pulse (high)	Nominal 1.15 Vp. Complies with <i>ANSI T1.102-1993 and ITU-T G.703 (11/01)</i> after passing through 450 feet of RG59B/U cable.
Pulse (DSX)	Nominal 0.6 Vp. Complies with <i>ANSI T1.102-1993 and ITU-T G.703 (11/01)</i> .
Pulse (low)	Nominal 0.32 Vp
Pulse shape	With output terminated in 75 $\Omega$ resistive load and DSX selected, the Dual Module Carrier, Transport Module, and MSAM meets <i>ITU-T Recommendation G.703 (11/01)</i> and <i>ANSI T1.102-1993</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements

Table 132 lists frequency and level measurement specifications for STS-1.

**Table 132** STS-1 frequency and level measurement specifications

Parameter	Specification
Tx and Rx frequency	Range: 51.84 MHz $\pm$ 50 ppm Accuracy: $\pm$ 1.5 ppm, $\pm$ 1 ppm per year aging Resolution: 1 Hz or 1 ppm
Level Vp	Range: 1.6 V to 0.01 V Resolution: 0.01 V Accuracy: $\pm$ 0.02 V $\pm$ 10%

## E4 electrical specifications

Table 133 on page 220 through Table 135 on page 221 list specifications for E4 receivers, transmitters, and frequency and level measurements.

### Receiver

Table 133 lists specifications for the E4 receiver.

**Table 133** E4 receiver specifications

Parameter	Specification
Input	One BNC connector
Bit rate	139.264 Mbps
Impedance	Nominal 75 $\Omega$ at 70 MHz unbalanced
Range	<ul style="list-style-type: none"> <li>– Term: 0 to 12 dB due to cable loss at 70 MHz, from a nominal signal</li> <li>– PMP: -20 dB due to resistive loss in addition to 0 to 12 dB due to cable loss at 70 MHz, from a nominal signal</li> </ul>

### Transmitter

Table 134 lists specifications for the primary E4 transmitter.

**Table 134** E4 transmitter specifications

Parameter	Specification
Output	One BNC connector
Bit rate	139.264 Mbps
Line coding	CMI

**Table 134** E4 transmitter specifications (Continued)

Parameter	Specification
Tx clock (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from E4 Rx</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 50$ ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vpp Complies with <i>ITU-T G.703 (11/01)</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements

Table 135 lists frequency and level measurement specifications for E4.

**Table 135** E4 frequency and level measurement specifications

Parameter	Specification
Tx and Rx Fre- quency	<ul style="list-style-type: none"> <li>– Range: 139.264 MHz <math>\pm 100</math> ppm</li> <li>– Accuracy: <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Resolution: 1 Hz, or 1 ppm</li> </ul>
Level Vpp	<ul style="list-style-type: none"> <li>– Range: 1.2 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm 0.02</math> V <math>\pm 10\%</math></li> </ul>

## STM-1 electrical specifications

Table 136 on page 221 through Table 138 on page 222 list specifications for STM-1 receivers, transmitters, and frequency and level measurements.

### Receiver

Table 136 lists specifications for the STM-1 receiver.

**Table 136** STM-1 receiver specifications

Parameter	Specification
Input	One BNC connector
Bit rate	155.52 Mbps
Impedance	Nominal 75 $\Omega$ at 78 MHz unbalanced
Range	Term: 0 to 12.7 dB due to cable loss at 78 MHz, from a nominal signal PMP: -20 dB due to resistive loss in addition to 0 to 12.7 dB due to cable loss at 78 MHz, from a nominal signal

## Transmitter

Table 137 lists specifications for the STM-1 transmitter.

**Table 137** STM-1 transmitter specifications

Parameter	Specification
Output	One BNC connector
Bit rate	155.52 Mbps
Line coding	CMI
Tx clock (Timing)	<ul style="list-style-type: none"> <li>– Internal reference clock with accuracy <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Recovered from Rx1</li> <li>– External from BITS, SETS, or CLOCK</li> </ul>
Frequency offset	$\pm 50$ ppm, in 1 ppm steps
Pulse	Nominal 1.0 Vpp Complies with <i>ITU-T G.703 (11/01)</i>
Impedance	Nominal 75 $\Omega$

## Physical measurements

Table 138 lists frequency and level measurement specifications for STM-1.

**Table 138** STM-1 frequency and level measurement specifications

Parameter	Specification
Tx and Rx Frequency	<ul style="list-style-type: none"> <li>– Range: 155.52 MHz <math>\pm 50</math> ppm</li> <li>– Accuracy: <math>\pm 1.5</math> ppm, <math>\pm 1</math> ppm per year aging</li> <li>– Resolution: 1 Hz or 1 ppm</li> </ul>
Level Vpp	<ul style="list-style-type: none"> <li>– Range: 1.2 V to 0.01 V</li> <li>– Resolution: 0.01 V</li> <li>– Accuracy: <math>\pm 0.02</math> V <math>\pm 10\%</math></li> </ul>

## 10/100/1000Base T electrical specifications

The Transport Module provides up to two connectors with interfaces that support rates of 10Base-T, 100Base-T, and 1000Base-T. Each connector is fully compliant with IEEE 802.3, IEEE 802.3u, and IEEE 802.3ab.

## Optical interface specifications

Table 139 describes the optical interface specifications for the *internal* SONET, SDH, and Ethernet optical connectors for non-jitter and wander applications.

If your unit is equipped with SFP interfaces, the interfaces comply with *INF-8074i, Rev 1.0 published on May 12, 2001*. For SFP specifications refer to the specifications provided by the manufacturer.

**Table 139** Optical interface specifications (Non-Jitter/Wander)

Item	Description
Optical connector types <sup>1</sup>	FC, SC, ST, or LC
Wavelength	850, 1310, or 1550 nm
Fiber mode compatibility	1310 and 1550 nm — singlemode fiber 850 nm — multimode fiber
Transmit level	
1550 nm, 2.5 Gbps and lower	0 to -6.5 dBm
1310 nm, 2.5 Gbps option	+3 to -3.5 dBm
1310 nm, 622 Mbps option	-8 to -16.5 dBm
1310 nm, 1 GigE option	-3 to -13 dBm
850 nm, 1 GigE option	-3 to -13 dBm
Transmit level for 10Gbps	
1550 nm	+4 to -3 dBm
1310 nm	-1 to -7 dBm
850 nm	Per <i>IEEE std 802.3ae 2002</i> for 10GigE
Eye diagram, 1310 nm, 1550 nm	Per <i>Telcordia GR-253-CORE Issue 4-2005</i> <i>ITU-T REC. G.957</i>
850 nm, 1310 nm	Per <i>IEEE std 802.3ae 2002</i>
Clock frequency accuracy	±1.5 ppm ±1 ppm per year aging
Receive level range	
2.5 Gbps option	- 9 to -27 dBm
155 Mbps option	- 8 to -34 dBm
622 Mbps option	- 8 to -28 dBm
GigE only ports	
1310 nm	-3 to -19 dBm
850 nm	0 to -17 dBm
Receive level range 10 Gbps	
1310 nm only option	-1 to -11 dBm
1550 nm intermediate reach (IR) option	-1 to -14 dBm
1550 nm long reach (LR) option	-9 to -23 at 9.95 Gbps -9 to -22 at 11.1 Gbps
850 nm	-1 to -11 dBm
Transmitter frequency offset	±50 ppm from the nominal rate, in 1 ppm steps
Frequency measurement accuracy	±1.5 ppm ±1 ppm per year aging
Jitter output	Per <i>Telcordia GR-253-CORE Issue 4-2005</i> <i>ITU-T G.825, IEEE std 802.3ae 2002</i>

**Table 139** Optical interface specifications (Non-Jitter/Wander) (Continued)

Item	Description
Receiver shutdown <sup>2</sup>	
2.5 Gbps option	-5.9 dBm
10 Gbps long reach	-5.9 dBm
Reflectance	Per Telcordia <i>GR-253-CORE Issue 4-2005</i>
Level measurement range	
2.5 Gbps	- 6 to -30 dBm
622 Mbps	-5 to -31 dBm
155 Mbps	-5 to -31 dBm
Level measurement range for 10 Gbps	
1310 nm and 1550 nm	+0 to -17 dBm
IR RX	-6 to -20 dBm
LR RX	+0 to -14 dbm
850 nm	
Level measurement accuracy	±3 dB
Level measurement resolution	0.1dB
APS	
resolution	1ms
accuracy	1ms
RTD	
resolution	1 μs
accuracy	2 μs

1. Remove the connector to clean the optical fiber.
2. Do not apply a greater than -8 dBm optical-level signal to the long reach receiver on the Dual Module Carrier, and MSAM. Damage to the receiver may occur.

## Jitter and Wander specifications

Refer to the following sections for jitter and wander specifications for the T-BERD / MTS 5800 and MSAM:

- [“Electrical jitter and wander specifications” on page 224](#)
- [“Interface specifications \(Jitter and Wander applications\)” on page 230](#)
- [“Optical jitter and wander specifications” on page 231](#)

## Electrical jitter and wander specifications

This section provides electrical jitter and wander specifications for the T-BERD / MTS 5800 and MSAM. For specifications, see:

- [“Standards” on page 225](#)

- “Jitter generator” on page 225
- “Jitter analyzer” on page 225
- “Automatic jitter measurements” on page 227
- “Wander generator” on page 228
- “Wander measurement” on page 229
- “Memory requirements” on page 230

## Standards

Jitter and wander are generated and analyzed in accordance with the following standards:

- *ITU-T Recommendations G.823, G.825, O.172 (04/2005)*
- *Telcordia GR-499-CORE Issue 2-1998, GR-253-CORE Issue 4-2005*
- *ANSI Standards T1.102 - 1993, Table 9, T1.404-1994 section 5.10*

## Jitter generator

Meets or exceeds the requirements stated in *ITU-T Recommendation O.172 (04/2005)*.

### Modulation specifications

Table 140 provides modulation specifications for the electrical jitter generator.

**Table 140** Electrical jitter generator modulation specifications

Item	Description
Jitter modulation signal	Sine wave
Jitter amplitude	Per ITU-T O.172
Step width	0.001 UI
Modulation frequency accuracy	± 0.1%

The settling time for the changes in amplitude is less than 30 seconds.

### Error limits

Error limits conform to the requirements stated in *ITU-T Recommendation O.172 (04/2005)*.

## Jitter analyzer

Meets or exceeds the requirements of *ITU-T Recommendation O.172 (04/2005)*.

## Bit rate

Table 141 describes the bit rate specifications for the electrical jitter analyzer.

**Table 141** Bit rate of the electrical jitter analyzer

Item	Description
Bit rate	1.544 Mbps, 44.736 Mbps, 2.048 Mbps, 34.368 Mbps, 51.84 Mbps, 139.264 Mbps, 155.520 Mbps
Permitted offset	± 1000 ppm

## Measuring ranges

Table 142 provides measuring ranges for the electrical jitter analyzer.

**Table 142** Electrical jitter analyzer measuring ranges

Item	Range/Resolution
Peak-Peak	0 to 4,000 UIpp/1 mUIpp
RMS	0 to 2,000 UI/1 mUI

## Measurement filters - Standard range

Table 143 describes the standard range and properties for the measurement filters. The default filter settings are per *ITU-T Recommendation O.172 (04/2005)*.

**Table 143** Standard ranges and properties for the measurement filters

Item	Description
High-pass filters <sup>1</sup>	2 Hz, 4 Hz, 10 Hz, 20Hz, 40 Hz, 80 Hz, 100Hz, 200Hz, 400 Hz, 500 Hz, 700 Hz, 1 kHz, 3 kHz, 5 kHz, 8 kHz, 10 kHz, 12 kHz, 18 kHz, 20 kHz, 30 kHz, 65 kHz, 80 kHz, 250 kHz
High-pass filter characteristics	1 <sup>st</sup> order (to ITU-T O.172)
Low-pass filter	40 kHz, 60 kHz, 100 kHz, 400 kHz, 800 kHz, 1.3 MHz, 3.5 MHz
Low-pass filter characteristics	3 <sup>rd</sup> order Butterworth (refer to ITU-T O.172)
Filter properties:	
-3 dB cut-off frequency tolerance	$f_c \pm 10\%$
Maximum attenuation	at least 60 dB/decade

1. Filter availability depends on the electrical input rate.

## Results display

Positive and negative jitter amplitudes are measured.

## Current values

Table 144 describes the ranges for the current values. The values are displayed continuously, or they appear in a graph.

**Table 144** Ranges for the current values

Item	Description
Standard range	
– Jitter peak-peak	– 4000 U <sub>lpp</sub>
– Jitter +peak/-peak	– 2000 U <sub>lp</sub>

## Display resolution

Table 145 describes the resolution of the current and maximum values for displayed and logged results.

**Table 145** Display resolution for the maximum values

Item	Description
Standard range	0.001 U <sub>lpp</sub>

## Error limits for displayed jitter

The error limits for displayed jitter meet the requirements of *ITU-T Recommendation O.172 (04/2005)*.

The stated error limits apply under the following conditions:

- Sine wave modulation
- Structured test signals (for STM-1e as described in *ITU-T Recommendation O.172 (04/2005)*)
- Standard filter selections

## RMS jitter - Range and resolution

Refer to Table 142 on page 226 for the RMS range and resolution. Measurement accuracy is per *ITU-T Recommendation O.172 (04/2005)*.

## Automatic jitter measurements

This section provides specifications for automatic jitter measurements.

### Maximum Tolerable Jitter (MTJ)

A group of up to 20 user-specified jitter frequencies (scan frequencies) can be defined. A set of pre-defined masks per applicable standards is also provided.

## Fast Maximum Tolerable Jitter (Fast MTJ)

A group of up to 20 user-specified frequencies (scan frequencies) can be defined. A set of pre-defined masks per applicable standards is also provided.

## Jitter Transfer Function (JTF) measurement

A group of up to 20 user-specified jitter frequencies (scan frequencies) can be defined. A set of pre-defined masks per applicable standards is also provided.

Table 146 describes the JTF measurement specifications.

**Table 146** JTF measurement specifications

Item	Description
Settling time	0.1 to 999.9 seconds
RMS integration period	5 seconds
Recovery time	0.1 to 999.9 seconds
Filter bandwidth (band-pass, -3 dB)	10 Hz
Measurement range	-60 dB to -50 dB

## Measurement error

According to *ITU-T Recommendations G.783 and G.8251*.

## Wander generator

This section provides specifications for the electrical wander generator.

### Bit rate

Table 147 provides bit rate specifications for the electrical wander generator.

**Table 147** Bit rate specifications

Item	Description
Bit rate	1.544 Mbps, 44.736 Mbps, 2.048 Mbps, 34.368 Mbps, 51.89 Mbps, 139.264 Mbps, 155.520 Mbps
Maximum offset	± 50 ppm
Modulation source	internal

## Modulation specifications

Table 148 describes the modulation specifications for the electrical wander generator.

**Table 148** Modulation specifications

Item	Description
Jitter modulation signal	sinusoidal
Frequency range	10 $\mu$ Hz to 100 MHz
Amplitude range at 155.52 Mbps	0.01 UI to 3600 UI

## Error limits

The error limits conform to the requirements of *ITU-T Recommendation O.172 (04/2005)*, with a modulation frequency accuracy of  $\pm 0.1\%$ .

## Synchronization

When generating wander, the device must be synchronized with an external timing source. For more details, see “Reference clock” on page 229.

## Wander measurement

This section provides specifications for wander measurements.

### Reference clock

Table 149 lists the wander clock frequency and input level specifications.

**Table 149** Wander clock frequency and input level specifications

Permissible offset	$\pm 1000$ ppm
Wander transfer bandwidth	Driven by the low pass filter as specified in Table 150 on page 229.

### Measurement range

The upper limit of the wander frequency range is set by a first-order low-pass filter. The sample rate is selected automatically to correspond with the selected low-pass filter. Table 150 lists the sample rates for various low pass filters.

**Table 150** Sample rates for various low pass filters

Low pass filter/ $f_c$	Sample rate
0.1 Hz	1/s
10 Hz	30/s
20 Hz	60/s
100 Hz	1000/s

## Measurement filters

Measurement filters are defined per *ITU-T Recommendation O.172 (04/2005)*.

## Memory requirements

Table 151 describes the memory requirements (storage requirements) for the base unit when measuring wander.

**Table 151** Memory requirements for wander measurements

Sample rate	Required flash/hard disk space
1/second	approximately 150 KB/hour
30/second	approximately 5 MB/hour
60/second	approximately 9.0 MB/hour
1000/second <sup>1</sup>	approximately 150 MB/hour

1. Supported on MSAM only.

The maximum wander measurement time is only limited by the available hard disk space. However, you can only perform wander analysis (MTIE/TDEV) for the first 8.64 million samples of the measurement.

## Interface specifications (Jitter and Wander applications)

Table 152 describes the specifications for the optical connectors when running jitter and wander applications. The interfaces meet the specifications stated in *ITU-T Recommendation G.957/GR-253*.

**Table 152** Optical interface specifications (Jitter and Wander applications)

Item	Description
Optical connector types <sup>1</sup>	FC, SC, ST, or LC
Wavelength	1310 and 1550 nm
Line rates	<ul style="list-style-type: none"> <li>– 155 Mbps</li> <li>– 622 Mbps</li> <li>– 2488 Mbps</li> <li>– 2666 Mbps</li> </ul>
Line code	Scrambled NRZ
<b>Transmitter specifications</b>	
Transmit level	-2 to +3 dBm
Fiber mode compatibility	1310 and 1550 nm — singlemode fiber
Frequency offset	±50 ppm from the nominal rate, in 1 ppm steps
Frequency accuracy	±1,5 ppm ±1 ppm per year aging

**Table 152** Optical interface specifications (Jitter and Wander applications) (Continued)

Item	Description
Synchronization	See the Reference Clock Requirements published in the testing guide that shipped with your unit.
<b>Receiver specifications</b>	
Wavelength range	1260 to 1360 nm 1430 to 1580 nm
Rx offset acceptance	±100 ppm
Sensitivity	622/2488/2666 Mbps – -8 to -28 dBm 155 Mbps – -8 to -34 dBm
Maximum input power (destructive)	+0 dBm
Fiber mode compatibility	OC3/OC12 connector – multimode fiber – singlemode fiber OC48/OTU1 connector – singlemode fiber
Optical level measurement	622/2488/2666 Mbps – -8 to -28 dBm 155 Mbps – -8 to -34 dBm
Level measurement accuracy	±3 dB
Level measurement resolution	0.1 dB

1. Remove the connector to clean the optical fiber.

## Optical jitter and wander specifications

This section provides jitter and wander specifications for the MSAM:

- [“Standards” on page 232](#)
- [“Jitter generator” on page 232](#)
- [“Jitter analyzer” on page 232](#)
- [“Automatic jitter measurements” on page 236](#)
- [“Wander generator” on page 236](#)
- [“Wander measurement” on page 237](#)
- [“Memory requirements” on page 239](#)

## Standards

Optical jitter and wander are generated and analyzed in accordance with the following standards:

- *ITU-T Recommendations G.825, G.8251, O.172 (04/2005) and O.173 (03/2003)*
- *Telcordia GR-253-CORE Issue 4-2005*
- *ANSI Standards T1.101, T1.105.03*

## Jitter generator

The jitter generator meets or exceeds the requirements of *ITU-T Recommendation O.172 (04/2005) and O.173 (03/2003)*.

### Internal modulation source

Table 153 provides modulation specifications for the optical jitter generator.

**Table 153** Modulation specifications

Item	Optical
Jitter modulation signal	Sine wave
Jitter amplitude	up to 800 UIpp
Step size	0.001 UI

The settling time for the changes in amplitude is less than two seconds.

### Error limits

Error limits conform to the requirements of *ITU-T Recommendations O.172 (04/2005) and O.173 (03/2003)*.

### Intrinsic jitter

The maximum output jitter of the intrinsic jitter for a jitter amplitude setting of 0 UI is  $\leq 0.04$  UIpp. Wideband is assumed.

## Jitter analyzer

Meets or exceeds the requirements of *ITU-T Recommendation O.172 (04/2005) and O.173 (03/2003)*.

## Measuring ranges

Table 154 describes the measuring ranges for the optical jitter analyzer.

**Table 154** Measuring ranges

Item	Range/Resolution
Standard	
– Peak-Peak	0 to 50 UIpp/1 mUIpp
– RMS	0 to 25 UI/0.1 mUI
Extended	
– Peak-Peak	
155M	0 to 50 UIpp/100 mUIpp
622M	0 to 200 UIpp/100 mUIpp
2.5/2.7G	0 to 800 UIpp/100 mUIpp
– RMS	
155M	0 to 25 UI/10 mUI
622M	0 to 100 UI/10 mUI
2.5/2.7G	0 to 400 UI/10 mUI

## Measurement filters

This section provides specifications for the measurement filters.

### Standard range

Table 155 describes the standard range and properties for the measurement filters.

**Table 155** Standard ranges and properties for the measurement filters

Item	Description
High-pass filters	500 Hz, 1 kHz, 5 kHz, 12 kHz, 65 kHz, 250 kHz, 1 MHz
High-pass filter characteristics	1 <sup>st</sup> order (to ITU-T O.172/O.173)
Low-pass filter	1.3 MHz, 5 MHz, 20 MHz
Low-pass filter characteristics	3 <sup>rd</sup> order Butterworth (to ITU-T O.172/O.173)
Filter properties:	
–3 dB cut-off frequency tolerance	$f_c \pm 10\%$
Maximum attenuation	at least 60 dB

Default filter settings are per *ITU-T Recommendations O.172 (04/2005) and O.173 (03/2003)*.

## Extended range

Table 156 provides the extended range for the measurement filters.

**Table 156** Extended ranges for measurement filters

Item	Description
High-pass filter characteristics (-3 dB cut-off frequency)	typically 25 Hz
Low-pass filter	typically 400 kHz

## Results display

Positive and negative jitter amplitudes are measured.

## Current and maximum values

The current and maximum values are displayed continuously or shown as a graph. Table 157 describes the ranges for the current and maximum values.

**Table 157** Ranges for the current and maximum values

Item	Description
Standard range	
– Jitter peak-peak	– 50 UIpp
– Jitter +peak/-peak	– 25 UIp
Extended range	
– Jitter peak-peak	– 800 UIpp
– Jitter +peak/-peak	– 400 UIp

## Resolution

Table 158 describes the resolution for the current and maximum values, display and logged results.

**Table 158** Resolution for current and maximum values

Item	Description
Standard range	0.001 UIpp
Extended range	0.1 UIpp

## Error limits for jitter measurement

The error limits for displayed jitter meet the requirements of *ITU-T Recommendation O.172 (04/2005) and O.173 (03/2003)*.

The stated error limits apply under the following conditions:

- Optical input level in the range -10 dBm to -12 dBm (scrambled NRZ signal code)

- Structured test signals (for SDH as described in ITU-T Recommendation O.172)
- Sine wave modulation
- Standard filters: Highband

### Measurement error

The stated measurement error applies without restriction to standard range, for values >25 UIp in extended range.

- Maximum measurement error:  $\pm R$  % of reading  $\pm W$

The value for W (fixed error) is taken from [Table 159](#). The value for R (variable error) can be taken from *ITU-T Recommendations O.172 (04/2005) and O.173 (03/2003)* as applicable.

**Table 159** W (fixed error)

Range	Wide-band Filter	Extended-band Filter
	W in UIpp	W in UIpp
Standard range	0.035 <sup>1</sup>	0.5

1. Mapping SDH VC-4/SONET STS-1, payload pattern PRBS31, environmental temperature +20°C to +30°C.

### RMS jitter

This section describes the RMS jitter specifications.

### Range and resolution

[Table 160](#) describes the RMS range and resolution.

**Table 160** RMS range and resolution

(peak-peak)	Standard range	Extended range
RMS range	0 to 25 UI	0 to 400 UI
Resolution	0.0001 UI	0.01 UI

### Measurement accuracy

[Table 161](#) describes the RMS jitter measurement accuracy.

**Table 161** RMS jitter measurement accuracy

Item	Description
Standard range	$\pm R$ % of measured value $\pm 0.003$ UI <sup>1</sup>
Extended range	$\pm R$ % of measured value $\pm 0.05$ UI <sup>1</sup>
Integration time	1 second

1. The value R (variable error) is taken from *ITU-T Recommendation O.172 (04/2005) and O.173 (03/2003)* as applicable.

## Automatic jitter measurements

This section provides specifications for automatic jitter measurements.

### Maximum Tolerable Jitter (MTJ)

A group of up to 20 user-specified jitter frequencies (scan frequencies) can be defined. A set of pre-defined masks per applicable standards is also provided.

### Fast Maximum Tolerable Jitter (Fast MTJ)

A group of up to 20 user-specified frequencies (scan frequencies) can be defined. A set of pre-defined masks per applicable standards is also provided.

### Jitter Transfer Function (JTF) measurement

A group of up to 20 user-specified jitter frequencies (scan frequencies) can be defined. A set of pre-defined masks per applicable standards is also provided.

[Table 162](#) describes the JTF measurement specifications.

**Table 162** JTF measurement specifications

Item	Description
TX jitter settings	see <a href="#">Table 140 on page 225</a>
Settling time	0.1 to 999.9 seconds
RMS integration period	5 seconds
Recovery time	0.1 to 999.9 seconds
Filter bandwidth (band-pass, -3 dB)	10 Hz

### Measurement error

*Per ITU-T Recommendations G.783 and G.8251.*

## Wander generator

This section provides specifications for the optical wander generator.

### Modulation

[Table 163](#) provides the modulation specifications for the optical wander generator.

**Table 163** Internal modulation source specifications

Item	Description
Jitter modulation signal	sinusoidal

**Table 163** Internal modulation source specifications (Continued)

Item	Description
Frequency range	10 $\mu$ Hz to 10 Hz
Amplitude range at 2.5/2.7G	0.1 UI to 100000UI
Modulation frequency accuracy	$\pm$ 0.1%

### Error limits

The error limits conform to the requirements of *ITU-T Recommendations O.172 (04/2005) and O.173 (03/2003)*.

### Synchronization

When generating wander, the Dual Module Carrier, Transport Module, and MSAM must be synchronized to an external timing source. For more details, see “Reference clock” on page 229.

## Wander measurement

This section provides specifications when measuring wander on an optical circuit.

### Reference clock

See to “Reference clock” on page 229 for reference clock requirements.

**Table 164** Wander clock frequency specifications

Item	Description
Permissible offset	$\pm$ 20 ppm
Wander transfer bandwidth	approximately 1 Hz

### TIE measurement

Per *ITU-T Recommendation O.172 (04/2005) and O.173 (03/2003)*, TIE can be interpreted as the time difference between the signal you are measuring and the reference clock. This measurement is used to calculate other results, such as MTIE and TDEV. To ensure accuracy of the TIE measurement, warm-up the Dual Module Carrier, Transport Module, and MSAM for at least 30 minutes and ensure there is no change in ambient temperature exceeding 5° Celsius.

## Measurement range

The upper limit of the wander frequency range is set by a first-order low-pass filter. The sample rate is selected automatically to correspond with the selected low-pass filter. [Table 165](#) lists the sample rates for various low pass filters.

**Table 165** Wander clock frequency specifications

Low pass filter/ $f_c$	Sample rate	Maximum measurable rate of phase change at 2.5/2.7G
0.1 Hz	1/s	250000 UI/s
10 Hz	30/s	250000 UI/s
20 Hz	60/s	250000 UI/s
100 Hz	1000/s	300000 UI/s

## Measurement filters

This section provides specifications for the measurement filters.

[Table 166](#) describes the measurement filters.

**Table 166** Measurement filters

Item	Description
Low-pass filter	0.1, 10, 20, 100 Hz
Low-pass filter characteristics	1 <sup>st</sup> order (to ITU-T O.172/O.173)
Filter properties: -3 dB cut-off frequency tolerance	$f_c \pm 10\%$

**Table 166** Measurement filters (Continued)

Item	Description
Pass band ripple (referred to 0.1 Hz)	< $\pm$ 0.2 dB
Maximum attenuation	$\geq$ 30 dB

Default filter settings are per *ITU-T Recommendations O.172 (04/2005) and O.173 (03/2003)*.

## Memory requirements

See “Memory requirements” on page 230.

# CSAM specifications

## Physical Specifications

The physical specifications for CSAM are detailed below:.

**Table 167** CSAM physical specifications

Item	Description
Height	1.25 inches / 3.17 cm
Width	4.87 inches / 12.38 cm
Depth	9.12 inches / 23.49 cm
Weight (CSAM only)	1.0 lbs / 0.45 kg
Combined Weight (CSAM, 6000Av2 Base Unit, one CFP2)	7.6 lbs / 3.4 kg

## Power Supply Specifications

The specifications for the Power Supply for CSAM are detailed in [Table 168](#) and [Table 169](#).

**Table 168** CSAM in 6000Av2

Item	220W power supply
Input, nominal range	100-240 V. 50-60 Hz, 2A
Maximum power draw	150W

**Table 169** CSAM in 8000v2

Item	220W power supply
Input, nominal range	100-240 V, 50-60 Hz, 0.4A
Output	20 V, 11A, 220W max power

## Battery Specifications

To ensure the maximum operating time is obtained while testing using the CSAM, if you are not using the power adapter, be certain to install two batteries in the 6000Av2 or 8000v2. Different tests deplete the batteries at different rates; therefore battery life can not be guaranteed for any specific length of time. Always use the power supply when multiple modules are attached to an 8000v2.

**Table 170** Battery Specifications

Item	Specification
Battery Life in 6000Av2	45 minutes minimum
Battery Life in 8000Av2 (one CSAM in DMCv2)	1 hour 30 minutes minimum

## Optical Specifications

The CSAM has three physical optical ports — CFP2, QSFP+, and SFP+.

### CFP2 Interface

The optical specifications for the CFP2 module interface in the CSAM are detailed in [Table 171](#).

**Table 171** CFP Optical Module Interface Specifications

Module	Specification
CFP2, hot-pluggable	compliant with CFP MSA, CFP2 Hardware Specification Rev 1.0, E 802.3ba

### QSFP+ Interface

The optical specifications for the QSFP+ interface in the CSAM are detailed in [Table 172](#).

**Table 172** QSFP+ Optical Module Interface Specifications

Module	Specification
QSFP+, hot-pluggable	compliant with QSFP+ MSA(SFF-8436), IEEE P802.3ba

## SFP+ Interface

The optical specifications for the SFP+ interface in the CSAM are detailed in [Table 173](#).

**Table 173** SFP+ Optical Module Interface Specifications

Module	Specification
SFP/SFP+, hot-pluggable	compliant with MSA(SFF-8436), IEEE P802.3ba

## DMC specifications

Refer to the following sections for specifications for the DMC:

- “Physical specifications” on page 241
- “Power supply specifications” on page 241
- “Battery specifications” on page 242

## Physical specifications

The physical characteristics for the DMC are described in [Table 174](#).

**Table 174** Module physical specifications

Item	Description
Height	2.75 inches / 7 cm
Width	12 inches / 30.48 cm
Depth	9.74 inches / 24.76 cm
Weight	DMC Only: – 4.91 lbs / 2.22 kg Combined (DMC, two MSAMs, 8000 base unit, two SFP PIMs, and two XFP PIMs): – 17.28 lbs / 7.83 kg

## Power supply specifications

[Table 175](#) describes the specifications for the 150W power supply.

**Table 175** Power supply specifications

Item	150W power supply
Input, nominal range	100-240 V. 50-60 Hz, 2A
Maximum power draw	150 watts

## Battery specifications

To ensure the maximum operating time is obtained while testing using the DMC and MSAMs, if you are not using the power adapter, be certain to install two batteries in the battery module. Different tests deplete the batteries at different rates; therefore, when performing more than one BER test, battery life can not be guaranteed for any specific length of time. Do not power the unit using batteries if multiple DMCs or application modules are attached. For detailed battery information, refer to the *8000 Base Unit User Manual*.

## Transceiver and adapter specifications

For detailed transceiver and adapter specifications, refer to your SFP, SFP+, XFP, QSFP+, or CFP manufacturer’s web site. Summarized information for inserted transceivers (such as the model number, supported wavelength, and supported interface) is provided on the user interface (GUI).

If you are not certain whether you are using a Viavi recommended transceiver, contact your local Viavi representative, or review the list of Viavi Recommended Optics that shipped with the transceiver.

## Environmental specifications

Refer to the following sections for environmental specifications:

- [“T-BERD / MTS 5800 and SC 4800 environmental specifications” on page 242](#)
- [“MSAM environmental specifications” on page 243](#)

### T-BERD / MTS 5800 and SC 4800 environmental specifications

Table 176 lists the environmental characteristics for the T-BERD / MTS 5800 and SC 4800. *Operating* temperature and humidity are provided below; for *storage* temperature and humidity, see [“Storing the instrument” on page 262](#).

**Table 176** T-BERD / MTS 5800 and SC 4800 Environmental specifications

Item	5800 v1 & v2, 5882, 4800/4800P	5800-100G
Operating Temperature	32°F to 122°F (0°C to +50°C) Note: For maximum battery capacity and runtime, limit charge and discharge temperature of the battery to 40°C (104°F).	Dual 100GE: 0°C to +40°C; Dual 10GE: 0°C to +50°C;
Operating Humidity	10% to 90% relative humidity, non-condensing	the same

**Table 176**T-BERD / MTS 5800 and SC 4800 Environmental specifications (Continued)

Item	5800 v1 & v2, 5882, 4800/ 4800P	5800-100G
Shock/Drop/Vibe	Shock - per IEC 68-2-27 and 68-2-29 Ed. 2.0 Drop - per IEC 721-3-7 2nd Ed. /IEC 61010-1 Vibration -per IEC 68-2-6 and MIL-PRF-28800F (Class 2)	the same

## MSAM environmental specifications

Table 177 lists the environmental characteristics for the assembled instrument. *Operating* temperature and humidity are provided below; for *storage* temperature and humidity, see “[Storing the instrument](#)” on page 262.

**Table 177**MSAM Environmental specifications

Item	Model	Description
Operating Temperature	MSAMv2	All applications 32°F to 104°F (0°C to +40°C)
	MSAM v1	One or two applications at line rates less than 10 Gbps: – 32°F to 104°F (0°C to +40°C)  One 10 Gbps application, with a second application at a line rate less than 10 Gbps: – 32°F to 95°F (0°C to +35°C)  OTU-1 applications – 32°F to 104°F (0°C to +40°C) OTU-2 applications – 32°F to 95°F (0°C to +35°C)
Operating Humidity		5% to 95% relative humidity, non-condensing
Shock/drop height		As published in the <i>6000A Base Unit User Manual</i>



# Maintenance and Troubleshooting

This chapter describes how to maintain your unit and identify and correct issues related to the T-BERD / MTS 5800 family, Transport Module, CSAM, and MSAM. Topics discussed in this chapter include the following:

- [“Maintaining the T-BERD/MTS 5800 and SC 4800 batteries” on page 245](#)
- [“About troubleshooting” on page 253](#)
- [“Assembly and setup” on page 254](#)
- [“Operating the instrument” on page 255](#)
- [“Performing tests” on page 257](#)
- [“Maintaining your instrument” on page 259](#)
- [“Battery communication” on page 260](#)

## Maintaining the T-BERD/MTS 5800 and SC 4800 batteries

This section provides guidelines for maintaining the T-BERD / MTS 5800's and SC 4800's rechargeable lithium-ion battery. For instructions on maintaining the MSAM, or CSAM batteries, refer to the supporting *8000 Base Unit User Manual* or *6000A Base Unit User Manual*.

### Guidelines

To prolong the life span of the battery, follow the guidelines below:

- **WARNING:** Danger of extreme heat, fire, or explosion if battery is tampered with. Use only Viavi approved Li-ION battery. Dispose of used batteries according to the manufacturer's instructions.
- Use the AC power adapter to power up the instrument the first time you use it or after prolonged storage (see [“Verifying that you have the correct adapter” on page 56](#)). For optimal battery gauge accuracy, run the battery through a complete charge cycle by fully charging the battery, then fully discharging and recharging the battery.

- Constantly holding a Li-ION battery at full charge can shorten the battery lifetime. Do not keep the AC power adapter connected for long durations without occasionally discharging the battery. Disconnect the adapter about once a month and operate the instrument using battery power to discharge the battery to approximately 20%-40%. If you have a spare battery, rotate the batteries periodically (for example, once a month) so that they are used on a regular basis.
- The charger will not charge the battery when the battery temperature is above or below the battery's charging temperature specification.
- Store the instrument and battery in a cool, dry, and clean environment. Do not leave the battery in a car or truck, particularly during extremely hot or cold weather.
- When storing the instrument for extended periods of time, it is best to keep the battery capacity in the 20% to 80% range. The battery will discharge slowly over time when the instrument is off, so it is recommended to occasionally check that the battery is not approaching full depletion.

See [“Checking the battery”](#) on page 72 for information on checking the battery status.

## Recharging the battery

The T-BERD/MTS 8000, 6000A, and 5800, and SC 4800 will typically run between two and five hours on a fully charged battery, depending on the type of tests you are conducting. Some applications or modes require more power than others, so run time will vary.

When the battery level is at 25 percent or less, the battery should be recharged.



### NOTE:

You can test a circuit and recharge the battery at the same time. If you do not want to interrupt the current test, you may leave the power on and connect the AC power adapter. You can also charge the battery while it is removed from the T-BERD/MTS 8000, 6000A, and 5800.



### WARNING: ELECTRICAL SHOCK

Electrical shock may result in serious injury or death. Be sure the AC power adapter is connected to the correct voltage mains. Do not use outdoors or in wet locations. Use only the AC power adapter supplied with the instrument.

### To charge the battery

- 1 Connect one end of the AC power adapter to the power jack on the right side panel.
- 2 Connect the other end of the AC power adapter to an AC power supply.
- 3 Let the instrument charge for up to 7 hours depending on the battery charge level. The power button is amber when the battery is charging. The battery icon in the title bar turns green when the charge is above the “low battery” threshold.

Charging the battery is complete.

## Replacing the T-BERD / MTS 5800 and SC 4800 batteries

This section discusses replacing the battery in a T-BERD / MTS 5800 and SC 4800. For instructions on replacing the MSAM, or CSAM batteries, refer to the supporting *8000 Base Unit User Manual* or *6000A Base Unit User Manual*.

The battery compartment is located on the back of the unit.

Before replacing the battery, verify that it is a Viavi-supplied replacement battery pack.



### CAUTION: INSTRUMENT DAMAGE

Failure to turn the power off before removing the batteries from the instrument could damage internal components and/or corrupt the software. Always power down the unit before removing the battery pack.

### To replace the battery pack

- 1 Turn the power off.
- 2 Turn the instrument over, resting on the face.
- 3 Using a Phillips screw driver, remove the four screws from the battery compartment door.
- 4 Remove the battery compartment door.
- 5 Pull the battery out of the battery compartment and disengage the battery cable's locking connector from the mating connector on the right side.
- 6 Engage the locking connector of the new battery with the mating connector on the right side and then place the new battery into the battery compartment.
- 7 Replace the battery compartment door.
- 8 Tighten the four screws until hand tight.

Replacing the battery pack is complete.

## Calibrating the T-BERD / MTS 5800 and SC 4800 touchscreen

This section discusses calibrating the touchscreen on a T-BERD / MTS 5800 and SC 4800. For instructions on calibrating the MSAM or CSAM touchscreen, refer to the supporting *8000 Base Unit User Manual* or *6000A Base Unit User Manual*.

If, after a period of time, you observe issues with your touchscreen (for example, the arrow does not appear in the correct location after you touch the screen, or the top or bottom of the screen become unresponsive), the touchscreen may require recalibration.

### To calibrate the touchscreen

- 1 Select the **SYSTEM** icon.  
The System screen appears.
- 2 Select **Display**.
- 3 Select **Calibrate touchscreen**.
- 4 Tap the screen on the cross-hairs, as prompted.

The calibration process closes automatically after calibration is complete.

## Viewing the System Info

To view the revisions of internal components and to see which options are enabled, use the System Info menu. This menu also provides the serial numbers of internal components. The Copy System Info to File button is used to save a file that includes all of the system information for the instrument.

## Enabling software options

You can enable purchased software options in the field by entering the option key that was provided to you by Viavi. Please call the Viavi Solutions Technical Assistance Center (TAC) when you receive the option key so we can assist you with entry of the key and ensure that the process goes smoothly.

TAC will ask you for two items:

- the serial number of the test instrument for which the upgrade or software option was ordered
- the Option Challenge ID assigned to your test instrument.

## Locating the Option Challenge ID

Your instrument's Option Challenge ID is provided on the Review/Install Options screen.

### To locate the Option Challenge ID that is assigned to your instrument

- Select the **Tools** menu, and then select **Review/Install Options...**

The Option Challenge ID appears close to the bottom of the screen, directly under the Option Key field.

## Enabling the software option

After you provide the instrument's serial number and Option Challenge ID, TAC will assist you as you enable the software option.

### To enable the software option

- 1 Select the **Tools** menu, and then select **Review/Install Options...**
- 2 In the **Option Key** field at the bottom of the screen, enter the option key that was provided by Viavi Solutions, and then select **OK**.
- 3 Select **Install** to enable the software option.

When enabled, a check mark will appear next to the option indicating it is available for use.

## Updating the software

The SC 4800 software update instructions (TBD). The T-BERD / MTS 5800 software can be updated in the field two ways:

- Using a USB memory stick.
  - Software can be downloaded for the 5800v1 from <http://5800.update-myunit.net>
  - Software can be downloaded for the 5800v2 from <http://5800v2.updatemyunit.net>
  - Software can be downloaded for the 5800-100G from <http://5800-100G.updatemyunit.net>
- Over a network.

The process for updating varies depending on the way the update is performed.



### NOTE:

To upgrade the 5800's **firmware**, follow the instructions provided with the firmware upgrade package. The instructions include requirements, restrictions, and the procedure that must be followed to upgrade the firmware. Please contact your local sales office or technical assistance representative if you experience significant problems with the upgrade.

## Downloading software to a USB

A USB memory stick with at least 750MB of space is required to store the 5800 software.

## To download the software

- 1 Using a browser, go to one of the following:
  - 5800v1: <http://5800.updatemyunit.net>
  - 5800v2: <http://5800v2.updatemyunit.net>
  - 5800-100G: <http://5800-100G.updatemyunit.net>This will bring you to a landing page where you can download the latest self extracting software upgrade file.
- 2 Click the `bert-rpm-x.x.exe` link for the software release you want to download (“x.x” represents the software release number).
- 3 Save the file to the desktop of your personal computer (PC).

The software is downloaded.

## Reimage software URLs

<http://5800.updatemyunit.net/archives/>

<http://5800v2.updatemyunit.net/archives/>

<http://5800-100g.updatemyunit.net/archives/>

<http://4800.updatemyunit.net/archives/>

The reimage exe files are in the format: Base5800v2-Bert-x.x-Fiber-x-reimage.exe

## Extracting the software to a USB stick

After downloading the software to your PC, it must be extracted to a USB stick.

### To extract the files to a USB stick

- 1 Insert the USB memory stick into your PC.
- 2 Double-click the downloaded self-extracting file you saved to your desktop, then click **Run** as prompted.  
A dialog box appears asking for the location to extract the files.
- 3 Click **Browse** to navigate to and select the drive with the USB stick.
- 4 Click **Extract**.  
The files are extracted to the USB stick. *Do not remove the USB stick.*
- 5 Using Windows Explorer, navigate to the drive with the USB stick, right-click on the drive, and then select **Eject**.
- 6 Remove the USB stick from the PC.

The software is ready to be installed on your instrument using the USB stick.

## Installing the software using a USB stick

### To install the software using a USB stick

- 1 To ensure an uninterrupted supply of power during the installation, connect the AC power adapter to the T-BERD / MTS 5800 or SC 4800.



#### **WARNING: ELECTRICAL SHOCK**

Electrical shock may result in serious injury or death. Be sure the AC power adapter is connected to the correct voltage mains. Do not use the adapter outdoors or in wet locations. Use only the AC power adapter supplied with the instrument.

- 2 Connect the USB flash drive with the extracted software into the USB connector on the top panel of the instrument.
- 3 Select the **SYSTEM** icon.
- 4 Select **Upgrade**.
- 5 Select **USB**.  
The release number of the software on the USB is displayed.  
If the release is equal to the current software release installed on your instrument, an equals symbol will be displayed next to the USB software release number.  
If the release is a retrograde (an earlier software release than that installed on your instrument), a down arrow will be displayed next to the USB software release number.  
If the release is an upgrade (a later software release than that installed on your instrument) an up arrow will be displayed next to the USB software release number.
- 6 Select **Start Upgrade**.  
A dialog box appears instructing you to exit any existing tests. You have the option to cancel the upgrade at this point (for example, if you need to complete a test that you are currently running).
- 7 Select **OK**.

The software is installed. The instrument automatically reboots when the installation is complete. After the instrument reboots, remove the USB stick from the instrument.

## Reimage Software using a USB stick

### To reimage software using a USB stick

- 1 To ensure an uninterrupted supply of power during the installation, connect the AC power adapter to the T-BERD / MTS 5800 or SC 4800.



**WARNING: ELECTRICAL SHOCK**

Electrical shock may result in serious injury or death. Be sure the AC power adapter is connected to the correct voltage mains. Do not use the adapter outdoors or in wet locations. Use only the AC power adapter supplied with the instrument.

- 2 Connect the USB flash drive with the extracted software into the USB connector on the top panel of the instrument.
- 3 Use the power button to turn off the unit.
- 4 Use the power button to turn on the unit.

The software is installed. The instrument automatically reboots when the installation is complete. After the instrument reboots, remove the USB stick from the instrument.

## Updating over a network connection

Before updating your instrument using a network connection, review the following recommendations:

- A wired network connection is recommended for software upgrades.
- You may experience problems accessing the `update myunit.net` site from behind a firewall. If this is the case, please connect the instrument or your PC to a public network for the purpose of performing the upgrade.

### To update over a network connection

- 1 Connect the T-BERD / MTS 5800 or SC 4800 to AC power to ensure an uninterrupted supply of power during the update.



**WARNING: ELECTRICAL SHOCK**

Electrical shock may result in serious injury or death. Be sure the AC power adapter is connected to the correct voltage mains. Do not use outdoors or in wet locations. Use only the AC power adapter supplied with the instrument.

- 2 Select the **SYSTEM** icon.
- 3 Select **Upgrade**.
- 4 Select **Network**.
- 5 Do one of the following:
  - Enter the address where the software file is located. This could include the FTP address, server IP address or hostname, and the proxy server address (if necessary), as well as a User Name and Password.
  - Use the provided `update myunit.net` server address.

- 6 Select **Connect**.

This will bring you to a landing page where you can select the software release that you want to use to update your instrument.

Click the bert-rpm-x.x.exe link for the software release that you want to install. (“x.x” represents the software release number).

The release number of the software is displayed.

If the release is equal to the current software release installed on your instrument, an equals symbol will be displayed next to the software release number.

If the release is an upgrade (a later software release than that installed on your instrument) an up arrow will be displayed next to the software release number.

**7 Select Start Upgrade.**

A dialog box appears instructing you to exit any existing tests. You have the option to cancel the upgrade at this point (for example, if you need to complete a test that you are currently running).

**8 Select OK.**

The instrument will communicate with the upgrade server, download the software, and then install it.



**NOTE:**

You will be downloading a file in excess of 700MB; therefore, the update will typically take 15 to 30 minutes, depending on the speed and reliability of the network.

## Retrograding the software

If you require an earlier software version (you wish to retrograde your instrument’s software), the software must be updated via a USB stick; retrogrades are not possible via a network connection.

The “Older software releases are available here” link located at the bottom of the [updatemyunit.net](http://updatemyunit.net) page provides access to older, released versions of software for the 5800 and 4800 (available as self-extracting files). For instructions, see “[Downloading software to a USB](#)” on page 249



**ALERT: LOSS OF FUNCTIONALITY**

Please be aware that retrograding your unit to older software releases may render some installed software options unusable - especially if these software test options were released after the date of the software release you retrograde to. Please proceed with caution. Once complete, if some of your previously installed test options disappear, these can be restored by upgrading to the most recent software version again.

## About troubleshooting

If you experience problems using your instrument, you may be able to solve these problems on your own after referring to this section. If you experience significant problems

with the module, call the Technical Assistance Center (see [“Technical assistance”](#) on page xxii).

## Assembly and setup

The following issues may arise when assembling and setting up the instrument.

### Which transceivers are compatible with the instrument?

A list of Viavi recommended optics is available by selecting the corresponding option from the Help menu on the user interface of your instrument. You can also see detailed information for the currently inserted SFP, XFP, QSFP+ or CFP on the Interface setup tab of the user interface.

### Can I hot-swap MSAMs and CSAMs?

No, MSAMs and CSAMs are not hot-swappable. You must power down the instrument and unplug the AC power adapter before swapping MSAMs and CSAMs.

### Can I hot-swap PIMs?

No, PIMs are not hot-swappable. You must turn the BERT module OFF before inserting or swapping PIMs.

### Can I hot-swap transceivers?

Yes, all Viavi-qualified transceivers are hot-swappable.

### Can I do dual port testing from a single SFP PIM?

No. Two SFP jacks are provided on the PIM to allow you to insert transceivers for different line rates or wavelengths *without swapping SFPs*. This minimizes wear and tear on the SFPs.

If you need to perform dual port tests, you need a dual port chassis and two SFP PIMs.

### No signal is detected when running 10 GigE application

There are several reasons why a signal may not be detected:

- Verify that the XFP transceiver is properly inserted.

- Turn the laser OFF, and then ON again.
- If you are using an MSAM, verify that the MSAM chassis supports 10 GigE testing. If so, the panel will be labeled C1000 or C1004.
- If you are using an MSAMv1, verify that the XFP PIM is inserted properly in Port 1. It will not work if it is inserted in Port 2. This restriction does not apply to the MSAMv2.

## Operating the instrument

The following issues may present themselves when operating and performing basic functions using your instrument.

### How much space is available for my data?

#### **T-BERD / MTS 5800v1**

There is roughly 1 GB of space available for storing data such as reports.

#### **T-BERD / MTS 5800v2**

There is roughly 1 GB of space available for storing data such as reports.

#### **T-BERD / MTS 5800-100G**

There is roughly 1 GB of space available for storing data such as reports.

#### **SC 4800**

There is roughly 1 GB of space available for storing data such as reports.

#### **6000A Base Unit**

There is roughly 512 MB of space available for storing data such as reports.

#### **6000Av2 Base Unit**

There is roughly 1 GB of space available for storing data such as reports.

#### **8000 Base Unit**

50% of the base unit hard drive is available for storing data such as reports. If the disk is full, you will be alerted to the situation when you attempt to save your data.

## Instrument will not power up

There are several reasons why the instrument may not be powering:

- Check the power source and restart the instrument.
- If the instrument is running on the AC power adapter, verify that the power source is adequate.
- Verify that the components are secured tightly to the base unit. The instrument will not power up if it is not properly assembled.
- Unplug the AC power adapter. Remove the battery, and then reconnect the battery. Plug in the AC power adapter, and then turn the instrument ON.

## Can not print test results

Verify the following:

- Verify that the printer cable is properly connected to the instrument. For instructions on connecting a printer to the base unit, refer to the base unit manual that shipped with your instrument or upgrade.
- Verify that correct printer is specified for the instrument (see [“Specifying a printer for the instrument” on page 79](#)).
- Verify that your printer is working properly.
- Verify that the printer is turned on and loaded with paper.

## Instrument shows an unused slot

In rare instances, the instrument may show an unused slot. This is more likely to occur if a MSAM is swapped while the base unit is using AC power but may occur after upgrading firmware.

If it occurs after upgrading the firmware, 1) hard boot the instrument, 2) power down and unplug the adapter, then 3) replug the adapter and power up again.

If removing a MSAM, power down the instrument and unplug the AC power adapter. See [“Inserting MSAMs or CSAMs into the 6000A base unit or DMC” on page 35](#).

## Instrument does not recognize USB stick

Do the following:

- Reboot the instrument. Verify that your instrument is OFF, and then unplug the unit for at least 5 seconds to force a hard boot.
- Reconnect AC power to the instrument.
- Turn ON the instrument.
- Re-insert the USB stick. This should resolve the issue.

## Performing tests

The following section addresses questions that may be asked about completing tests with the instrument.

### Test menu does not appear

Your instrument may be configured to display the Quick Launch screen by default (instead of the Main screen). If this is the case, on the Quick Launch screen, select the **All Tests** button. The Test menu will appear to the left of the screen.

### Application does not appear on the Test menu

Verify the following:

- Ensure that the required test option is installed. For example, if you are looking for MiM (PBT) applications, or if you do not see the settings required to verify layer 2 transparency, verify that the associated test option has been installed.
- If you are testing using an MSAM, ensure that the appropriate PIM is inserted in the MSAM chassis. For example, to see DS1 applications, a DS1 PIM must be inserted into a port on the chassis. If an SFP PIM is inserted, the DS1 applications will not appear.

### Optical Overload Protection is activated

When testing on an optical circuit, the instrument displays a warning that the Optical Overload Protection is activated, or the instrument does not detect a signal.

Verify that the applied power does not exceed the power level supported by the connected transceiver. If it does, attenuate the signal.

### MSAM or CSAM user interface is not launching

After verifying that the appropriate BERT icon is highlighted in yellow with a green outline, press the **Results** or the **Start/Stop** key to display the MSAM, or CSAM user interface.

The green outline indicates which particular BERT module the instrument is currently displaying the user interface for (in other words, it is the module in focus). A yellow icon without a green outline indicates that the BERT module is active, but that the user interface is not displayed.

## Test results are inconsistent

Verify the following:

- Verify that your instrument is connected to the circuit properly for the test you are running. For details, see [“Connecting your instrument to the circuit” on page 79](#). This is the primary reason for inconsistent test results.
- Verify that your transceivers and cables are good and are connected properly for the test you are performing.
- Verify that you have inserted the correct transceiver for the circuit you are testing. SFPs, SFP+, XFPs, QSFP+, and CFPs are designed to support different line rates and interfaces.
- Verify that the correct timing source is selected on the Interface setup screen.
- Verify that the correct line rate for the interface is selected.
- If you are running SONET or SDH applications, verify that the correct mapping, tributaries, and analysis rates are selected.
- If an object or person coming in contact with the test set causes a temporary burst of errors to be recorded, the errors might have been caused by an ESD event. The recorded errors can be cleared by pressing Test Restart. Please note that the test set is fully compliant with IEC 61326-1 ESD requirements for industrial equipment and has passed testing according to IEC 61000-4-2 using test limits of 4 kV/8 kV contact/air and performance criterion B.

The best method of preventing ESD events is to use an ESD wrist strap and/or use a grounding mat or table. Viavi recognizes that most field users will not have access to these items at will and therefore cannot have an ideal, ESD-free environment.

In this case, Viavi offers the steps below to help reduce the chances of an ESD event as much as possible.

- a** Zero Potential - Most importantly, make sure that you and the test set are at Zero Potential by touching the metal frame of the AC mains power strip before touching the unit both before and during the test.
- b** Restricting movement – When achieving zero potential through the above means is not practical, it is recommended to stand upright while using the test set or otherwise minimize movement. Even when still, use of ESD-safe furniture is recommended whenever possible.
- c** Clothes - Make sure not to wear any clothing that builds excessive electrical charge, such as a wool sweater.
- d** Weather - Electrical storms can increase the risk of ESD events. Unless absolutely necessary, try not to use the test set during an electrical storm.
- e** Accessories - To help reduce ESD and help prevent other problems, it is also a good idea to remove all jewelry.

## Result values are blank

Results are blank if gating criteria have not been met. Criteria examples include Signal Present, Frame Sync Present, Pointer Present, and BERT Pattern Sync Present.

## No RFC 2544 or FC test buttons appear

If the **RFC 2544 Test** or **FC Test** buttons do not appear on the Main screen, verify the following:

- Payload analysis is ON for your current test application. You can not run the automated RFC 2544 or FC tests when the instrument is configured to analyze live traffic.
- Traffic is not VPLS or MPLS encapsulated. You can not run the RFC 2544 tests with VPLS or MPLS encapsulated traffic.
- The instrument is not configured to run a multiple streams Ethernet test.
- The instrument is not configured to run a timed test. You can not run the RFC 2544 or FC tests during a timed test.

## Maintaining your instrument

The following section addresses questions that may be asked about maintaining your instrument.

### How often does the instrument need to be calibrated?

- The T-BERD / MTS 5800, MSAM, and CSAM must be calibrated every 36 months.
- The 6000A base unit must be calibrated every 12 months if the VFL and PM options are installed.
- For calibration intervals for the 8000 base unit, refer to the base unit user's manual.

### What are the insertion rates for all components?

- The MSAM and Fiber Optics chassis can be inserted into the 6000A base unit up to 1,000 times.
- The MSAM can be inserted into the DMC chassis up to 1,000 times.
- Each PIM can be inserted into the MSAM chassis up to 1,000 times.
- Each SFP or XFP transceiver can be inserted into the jacks provided on the PIMs up to 100 times. More insertions may be possible, but after 100 times, the plug-gable optic should be checked.

## Battery communication

The following section addresses questions that may be asked about powering the instrument using the battery.

### Battery gauge reading is inaccurate

Some users have experienced sporadic issues with battery communication when using the 8000 Base Unit and Battery Modules. When communication issues occur, the battery gauge reading is no longer accurate, and warnings will not be presented to warn you that the battery is low.

The 8000 Base Unit detects the problem if it exists. If the power adapter is connected to your unit when the unit detects the problem, a warning message appears. A similar message is also presented when the power adapter is not connected to the unit.

To restore battery communication, you must turn OFF the instrument, and restart the instrument.

### To restore battery communication

1 Do one of the following:

- If a test is currently in progress, and you want to wait to turn OFF the instrument, verify that power is supplied using the adapter, and then select **Ask me again later**.  
The instrument will continue running the test (if power is supplied using the adapter), and will prompt you later to restart the instrument.
- If no tests are currently in progress, verify that the power adapter is disconnected, and then select **Restart Now** to restart the instrument immediately.

After you turn OFF or restart the unit, battery communication is restored.

# Storage and Shipment

This appendix describes how to maintain, store and ship your test instrument. Topics discussed in this appendix include the following:

- [“Storing the instrument” on page 262](#)
- [“Shipping the your instrument” on page 262](#)
- [“Returning equipment to Viavi” on page 263](#)

## Storing the instrument

When the instrument is not in use, it can be stored. You should follow the criteria below when storing the Dual Module Carrier, Transport Module, CSAM, MSAM, T-BERD/MTS 5800 and SC 4800.

Refer to “[Maintaining the T-BERD/MTS 5800 and SC 4800 batteries](#)” on page 245” for guidelines related to battery storage.

## Environmental specifications

The T-BERD/MTS 5800, SC 4800, and DMC should be stored according to the environmental specifications listed in [Table 178](#).

**Table 178** T-BERD/MTS 5800, SC 4800 and DMC storage specifications

Item	Description
Storage Temperature	-4°F to 140°F (-20°C to +60°C)
Humidity at 86°F (30°C)	10% to 95% relative humidity, non-condensing
Shock/drop height (non-operating)	Meets requirements specified in IEC 721-3-7, 2nd Ed. for Class 7M3 products.

The CSAM, MSAM, and PIMs should be stored according to the environmental specifications listed in [Table 179](#).

**Table 179** CSAM, MSAM, and PIM storage specifications

Item	Description
Storage Temperature	-4°F to 140°F (-20°C to +60°C)
Humidity at 86°F (30°C)	10% to 95% relative humidity, non-condensing
Shock/drop height (non-operating)	As published in the <i>6000A Base Unit User Manual</i> .

## Shipping the your instrument

If you will be shipping the instrument, you should follow the guidelines below.

## Removing the component

If you are returning the Dual Module Carrier, Transport Module, and MSAM only (rather than the entire assembly), remove the component before shipping. For instructions, [Chapter 2 “Assembling Your Instrument”](#).

## Packing the components

When packing the components for shipment, Viavi recommends using the original shipping container and packing materials. If the original container and packing materials are damaged or not available, the components should be carefully packed so that they will not be damaged in transit. Viavi recommends using anti-static packing material to secure the components inside a box or other container. If needed, you can obtain appropriate packing materials by contacting Viavi Customer Care at 1-866-228-3762 or at [www.viavisolutions.com](http://www.viavisolutions.com).



**NOTE:**

Viavi is not liable for any damage that may occur during shipping.

## Returning equipment to Viavi

Before you return any equipment to Viavi, contact Viavi Customer Care at 1-844-GO-VIAMI or [www.viavisolutions.com](http://www.viavisolutions.com) for the correct shipping address and for a Return or Reference Authorization. You must have a Return or Reference Authorization whenever you return equipment to Viavi.

For each piece of equipment returned for repair, attach a tag that includes the following information:

- Owner's name, address, and telephone number.
- The serial number, product type, and model.
- Warranty status. (If you are unsure of the warranty status of your instrument, contact Viavi Customer Care.)
- A detailed description of the problem or service requested.
- The name and telephone number of the person to contact regarding questions about the repair.
- The return authorization (RA) number (US customers), or reference number (European Customers).

Clearly mark the outside of the package with the Viavi-issued Return or Reference Authorization number and ship it prepaid and insured to Viavi. For information on packaging equipment for shipment, see [“Shipping the your instrument” on page 262](#).





# Glossary

## Symbols/Numerics

**10G** — Used on the connector panel to represent 10 Gigabit Ethernet.

**10GE** — Used on the connector panel to represent 10 Gigabit Ethernet.

**10GigE** — Used throughout this manual to represent 10 Gigabit Ethernet.

**802.11b** — IEEE standard for wireless LANs. You can establish wireless LAN connections to the T-BERD/MTS 8000, 6000A, and 5800 using an 802.11 PCMCIA card.

## A

**AC** — Alternating Current. An AC power adapter is supplied with the T-BERD/MTS 8000, 6000A, and 5800.

**Assembly** — Used throughout this manual to refer to a complete set of components assembled as an instrument and used for testing.

## B

**Base unit** — The unit which connects to the Transport Module and battery or power adapter, providing the user interface and a variety of connectivity and work flow tools.

**BER** — Bit Error Rate.

**BERT** — Bit error rate test. A known pattern of bits is transmitted, and errors received are counted to figure the BER. The Bit Error Rate test is used to measure transmission quality.

## C

**CFP** — C Form-Factor Pluggable optical transceiver. Optical transceiver used to connect to and test over 40G and/or 100G fiber circuits.

**Component** — Used throughout this manual to refer to an individual hardware component which is connected to the other components to build a test instrument (assembly). This manual supports the following components: the MSAM and the DMC. The base units are documented in separate manuals.

## D

**Data tether** — A connection to a cell phone (using a data cable) for the purpose of establishing an Internet connection via the phone's wireless connection to the cell phone network.

**DHCP** — Dynamic Host Configuration Protocol. A communications protocol that assigns IP addresses dynamically as needed. The test instrument supports static IP address assignment.

**DMC** — Dual Module Carrier. Two slot chassis which you can connect to the T-BERD / MTS 8000 base unit to test using up to two MSAM application modules and four Physical Interface Modules (PIMs).

## E

**Ethernet** — A LAN protocol. Using the T-BERD/MTS 8000, 6000A, and 5800, you can test and verify Ethernet network elements and services.

**Ethernet link partner** — The nearest Ethernet device on a link. The T-BERD/MTS 8000, 6000A, and 5800 auto-negotiates its capabilities with this device when you initialize a link.

## F

**FTP** — File transfer protocol. Protocol used on LANs and the Internet to transfer files.

## G

**GE** — Used on some devices to represent Gigabit Ethernet.

**GigE** — Used throughout this manual to represent Gigabit Ethernet.

**GNSS** — Global Navigation Satellite System.

**GUI** — Graphical User Interface. Layout of commands in a user-friendly environment. *See also* UI (user interface).

## H

**Histogram** — Print output of specific results in a bar graph format.

## I

**ISO** — International Organization for Standardization.

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**IP** — Internet Protocol. Protocol specifying the format and address scheme of packets transmitted over the Internet. Typically used with TCP.

## L

**LAN** — Local Access Network.

**LED** — Light emitting diode.

**LLB** — Line loopback.

**LIION** — Lithium Ion. The T-BERD/MTS 8000, 6000A, and 5800 can be equipped with a rechargeable Lithium Ion battery.

## M

**MDI** — Medium dependent interface.

**MDI-X** — Medium dependent interface crossover.

**MPO** — Multi Fiber Push On connector.

**MSAM** — Multiple Services Application Module.

**Msg** — Message.

## O

**OC-3** — Optical carrier 3. A SONET channel equal to three DS3s (155.52 Mbps).

**OC-12** — Optical carrier 12. A SONET channel of 622.08 Mbps.

**OC-48** — Optical Carrier 48. SONET channel of 2.488 Gbps.

**OC-192** — Optical Carrier 192. SONET channel of 9.953 Gbps.

**OTDR** — Optical Time Domain Reflectometer.

## P

**Packet** — Bundle of data, configured for transmission. Consists of data to be transmitted and control information.

**PIM** — The physical interface module inserted into one of up to two ports provided on the MSAM chassis. Provides the interfaces used to connect to the circuit you are testing.

**PON** — Passive Optical Network.

**Q**

**QSFP+** — Quad Small Form-Factor Pluggable optical transceiver. A transceiver used to test 40G fiber circuits.

**QSFP28** — An optical adapter or transceiver used to connect to and test over 100G fiber circuits. An optional CFP2 to QSFP28 adapter is available for the CSAM.

**R**

**RJ 48-45** — Jack on the Transport Module used for 10/100/1000 Mbps Ethernet testing.

**Rx** — Receive or receiver or input.

**S**

**SDH** — Synchronous Data Hierarchy.

**SONET** — Synchronous optical network.

**STM-1e** — An electrical SDH signal of 155.52 Mbps.

**STM-4** — An SDH signal of 622.08 Mbps.

**STM-16** — An SDH signal of 2488.32 Mbps.

**STM-64** — An SDH signal of 9.953 Gbps.

**STS-1** — An electrical SONET signal of 51.84 Mbps.

**Sync** — Synchronization.

**SyncE** — Synchronized Ethernet.

**T**

**TEM** — Timing Expansion Module

**Term** — See Terminate

**Terminate** — An application where the test set is terminating the circuit. In these applications, the test set sends and receives traffic.

**Through** — An application where the test set is used in series with a network circuit to monitor the traffic on that circuit.

**Tx** — Transmit or transmitter or output.

**U**

**USB** — Universal Serial Bus. A bus designed to handle a broad range of devices, such as keyboards, mice, printers, modems, and hubs.

**V**

**VNC** — Virtual Network Computing. A thin client system that enables you to run applications on a VNC server from any other computer connected to the Internet. Using VNC, you can run the T-BERD/MTS 8000, 6000A, and 5800 from a remote workstation, and you can run remote applications from the T-BERD/MTS 8000, 6000A, and 5800.

**W**

**WAN** — Wide area network.

**X**

**XFP** — 10 Gigabit Small Form Factor Pluggable optical transceiver. A variety of optional XFPs are available for testing 10 Gigabit LAN or 10 Gigabit WAN fibre circuits.







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