Tektronix®

Tektronix BSX Series
Bit Error Rate Analyzers

Installation & Safety Instructions

071-3496-01

Tektronix BSX Series
Bit Error Rate Analyzers

Installation & Safety Instructions

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Contacting Tektronix

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Beaverton, OR 97077
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For product information, sales, service, and technical support:
- In North America, call 1-800-833-9200.
- Worldwide, visit www.tek.com to find contacts in your area.

Warranty

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

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

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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[W2 – 15AUG04]

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Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, additional information is provided at the end of this section. (See page v, *Service safety summary*.)

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Use proper power cord. Use only the power cord specified for this product and certified for the country of use. Do not use the provided power cord for other products.

Ground the product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, make sure that the product is properly grounded. Do not disable the power cord grounding connection.

Power disconnect. The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to operate the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

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

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

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

The measuring terminals on this product are not rated for connection to mains or Category II, III, or IV circuits.

Do not operate without covers. Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

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

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Use proper fuse. Use only the fuse type and rating specified for this product.

Wear eye protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry. Remove the input signals before you clean the product.

Provide proper ventilation. Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment. Always place the product in a location convenient for viewing the display and indicators.

Avoid improper or prolonged use of keyboards, pointers, and button pads. Improper or prolonged keyboard or pointer use may result in serious injury.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use care when lifting and carrying the product. This product is provided with handles for lifting and carrying.

Use only the Tektronix rackmount hardware specified for this product.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock. Do not touch exposed connections.

Do not service alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power. To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair. Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in this manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

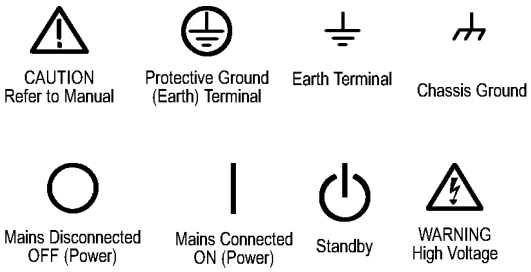
Symbols and terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbol(s) may appear on the product:



Preface

This document provides information for installing the Tektronix BSX series of BERTScope instruments. It includes high-level operating requirements, installation information, high-level descriptions of instrument controls and connectors, and other information for individual products. For more information on the controls and connectors, refer to the *BSX Series User Manual*.

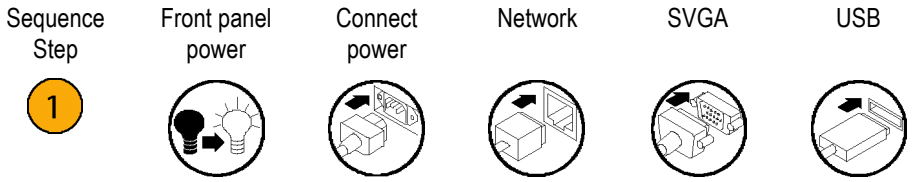
Related documentation

In addition to this manual, the following documentation can be downloaded from the Tektronix Web Site at www.tek.com:

- *BSX Series User Manual*. This document provides basic user information for the BSX series products. Tektronix part number: 077-1288-xx.
- *Online help*. Touch a control on the screen and the select the "Help on ..." listing for help on that control or feature. The online help is part of the BSX products, available from the Help menu.
- *Remote control guide* (PDF). This document provides online help commands used to control the BSX products from remote locations. Tektronix part number: 077-1284-xx.

Conventions used in this manual

The following icons may used throughout this manual.



The terms "touch" and "click" are used interchangeably in this document. The instrument has a touchscreen interface to control the instrument by touching buttons or controls on the screen or by using a mouse.

The terms "view" and "menu" are used interchangeably in this document. A view is defined as the current on-screen menu.

Operating requirements

Read this section before installing the instrument. This section describes environmental considerations, operating requirements, and power considerations.

Environmental requirements

Table 1: Environmental considerations

Characteristic	Description
Warm-up time	20 minutes
Operating temperature	10 °C to 35 °C (50 °F to 95 °F)
Operating Humidity	Noncondensing at 35 °C, 15% to 65%
Maximum operating altitude	2000 m (6562 ft.)

Ventilation requirements

Place the instrument on a cart or bench. The instrument should rest on its bottom feet. An optional rack mounting kit is available. Observe the following clearance requirements:

Table 2: Clearance requirements

Feature	Description
Top	0 mm (0 in)
Left and right sides	76 mm (3.0 in)
Bottom	0 mm (0 in) standing on feet, flip stands down
Rear	76 mm (3 in)

Power requirements

Table 3: Instrument power requirements

Feature	Description
Power	460 W Maximum
Voltage & frequency	100 to 240 V_{AC}, 50/60 Hz
Fuse	5A, 250 V, 5 mm x 20 mm, fast blow

Preventing ESD

CAUTION. *A direct electrostatic discharge can damage the instrument input. To learn how to avoid this damage, read the following information.*

Electrostatic discharge (ESD) is a concern when handling any electronic equipment. The instrument is designed with robust ESD protection; however it is still possible that large discharges of static electricity directly into the signal input may damage the instrument. To avoid damage to the instrument, use the following techniques to prevent electrostatic discharge to the instrument.

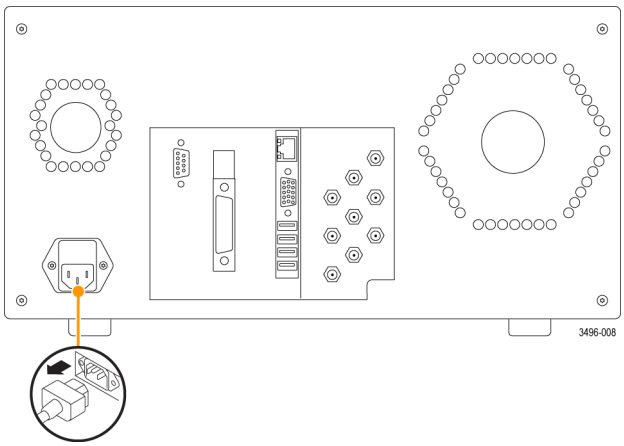
1. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while connecting and disconnecting cables and adapters. The instrument provides a front panel connection for this purpose.
2. A cable that is left unconnected on a bench can develop a large static charge. Discharge the static voltage from all cables before connecting them to the instrument or device under test by momentarily grounding the center conductor of the cable, or by connecting a 50 Ω termination to one end, before attaching the cable to the instrument.

Installation

This section provides basic installation instrument for the BSX series.

Power on the instrument

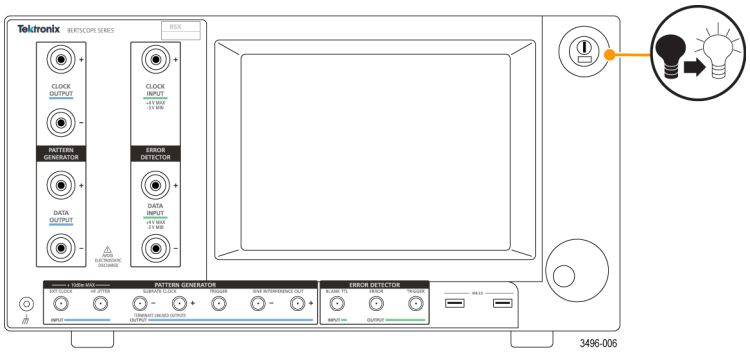
1. Connect the power cord to the rear of the instrument and to a properly grounded power source.



2. Push the front panel power button to turn the instrument on.

   The green power indicator on the button will turn on and the instrument will begin the startup process.

The instrument performs a self-test at start-up. If any tests fail, the tests are listed in the Self Test dialog box. Contact Technical Support for information on any failed tests and for recommended action.



After the instrument completes the start-up sequence, the Home view displays.

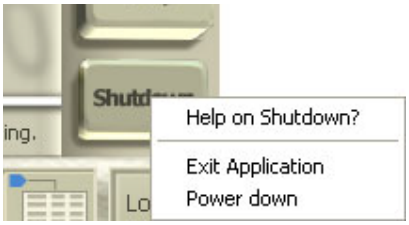
From the Home view, access other menus of the instrument by touching the View button. The contents of the list under the View menu depend on the options and configuration of your instrument.

UPDATE GRAPHIC WITH NEW SCREEN

Power off the instrument

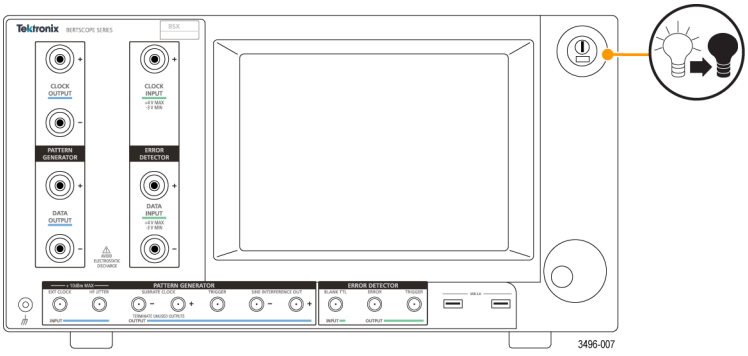
Use the Shutdown button to exit the BERTScope application before powering off the instrument.

1. Touch **Shutdown** on the lower-right side of the screen.
2. Do one of the following:
   - Select **Power down** to close the BERTScope application and power off the instrument.
   - Select **Exit Application** to close the BERTScope application and access the computer desktop.

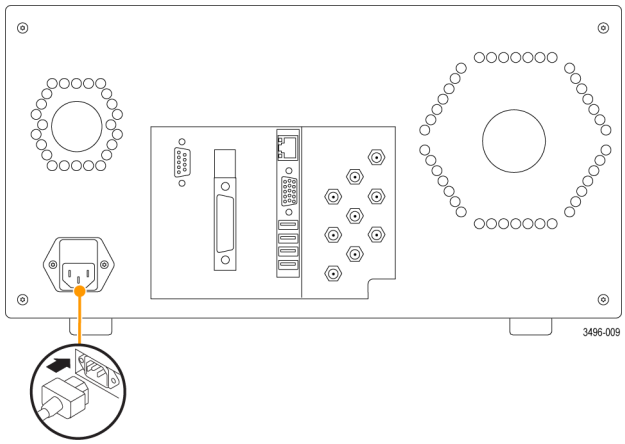


3. To power off the instrument from the computer desktop, close any active applications and then push the front panel power button.

   The green power indicator on the button will turn off and the instrument will begin the shut down process.



4. Disconnect the power cord from the rear of the instrument to completely remove power from the instrument after it shuts down.



Controls and connectors

This section provides a high-level description of the control and connectors on the instrument.

Front panel controls and connectors

The following figure and table describe common front panel controls and connectors.

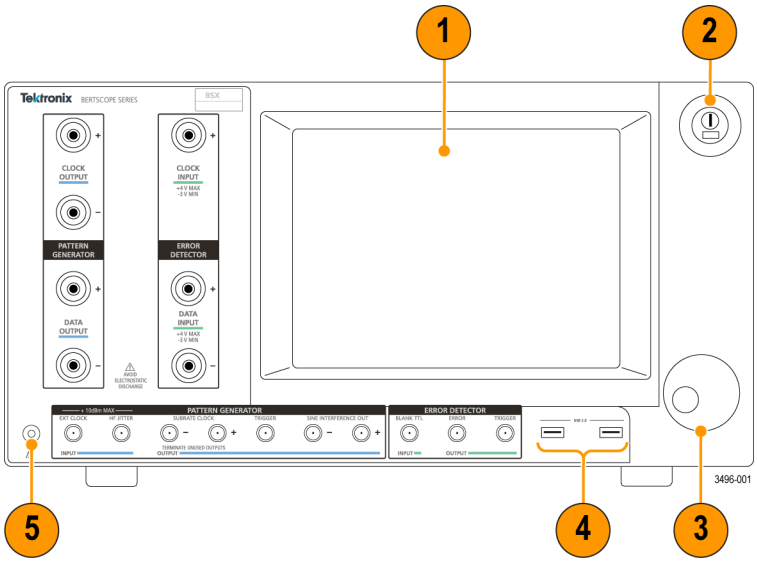


Figure 1: Front panel

Table 4: Common front panel controls and connectors

Connector		Description
1	Display	TFT touchscreen display to set up, control, and view information in the menus.
2	Power switch	Activates the power supply to provide power to the primary circuits in the instrument. The switch has a green light when power is turned on. The primary power control circuitry is always live whenever the power cord is connected to the instrument. To completely disconnect power from the instrument, disconnect the power cord at the rear of the instrument.
3	Control knob	Use the multifunction knob in stead of directly entering values to control items in the display such as moving the cursor, scaling inputs, changing stress or amplitude levels, and scrolling data.
4	USB	Use the USB connectors for connecting USB devices such as a mouse, keyboard, or USB flash drive. Four additional USB connectors are located on the back of the instrument.
5	Ground connector	Use this connector to connect a common ground to other instruments.

Pattern Generator connectors

The following figure and table describe the Pattern Generator front panel connectors.

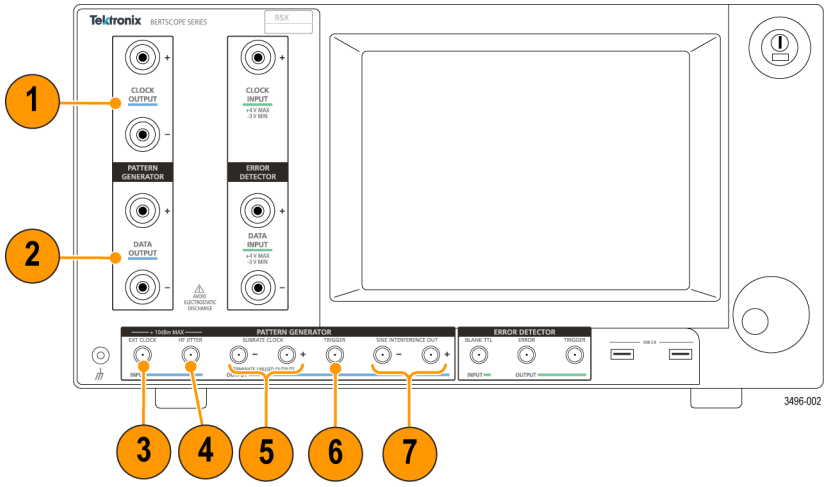


Figure 2: Pattern Generator front panel connectors

Table 5: Pattern Generator front panel connectors

Connector		Description
1	CLOCK OUTPUT	Clock Output connectors. Use the differential connectors to output a clock signal from the Pattern Generator. (Amplitude range: 250 mV to 1.8 V_{p-p}).
2	DATA OUTPUT	Data Output connectors. Use the differential connectors to output data from the Pattern Generator. (Amplitude range: 50 mV to 1.8 V_{p-p}, each leg).
3	EXT CLOCK	External clock input connector. Use this input to connect an external clock source to the BERTScope analyzer; (maximum input amplitude of +10 dBm or 2 V_{p-p}).
4	HF JITTER	High-frequency jitter insertion input connector. Use this connector to add external high-frequency jitter (DC to 1 GHz) to the instrument with up to 0.5% UI. Apply signals up to 16 dBm (4 V_{p-p}) if needed.
5	SUBRATE CLOCK	Pattern Generator Subrate clock output connectors. The signal available at these differential output connectors depend on the settings in the Generator view. Select SUBRATE to produce a Pattern Generator clock or a submultiple of the clock without any added jitter (useful for measuring any jitter that was added to the Pattern Generator output). Select STRESS to produce a version of the Pattern Generator clock including any added jitter.
6	TRIGGER	Pattern Generator trigger output connector. Use this connector to synchronize external equipment, such as an oscilloscope to the BERTScope analyzer.
7	SINE INTERFERENCE OUT	Sine Interference output connectors. The signals at these output connectors provide the summed differential output of two internal interference channel sources. In-phase and out-of-phase interference can be output, or with the GUI selection, two independent single-ended tones are available.

Error Detector connectors

The following figure and table describe the Error Detector front panel connectors (outlined in green).

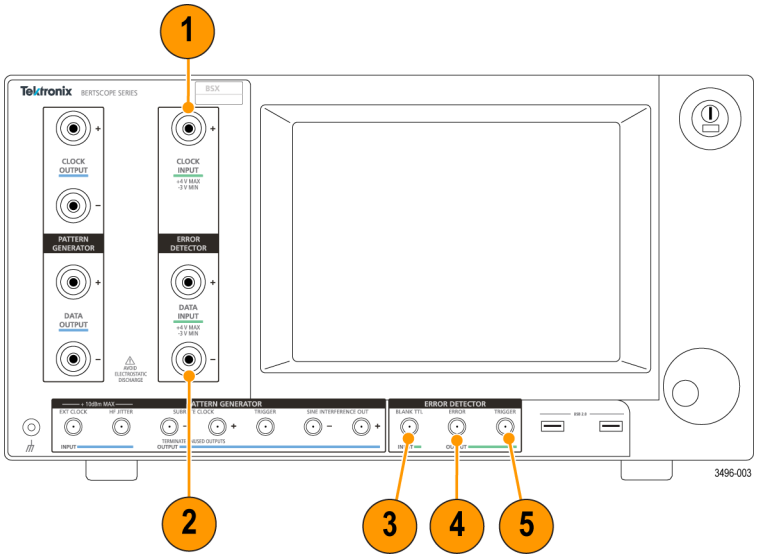


Figure 3: Error Detector front panel connectors

Table 6: Error Detector front panel connectors

Connector		Description
1	CLOCK INPUT	Error Detector clock input connector. Use this connector to provide a single-ended clock input to the Error Detector. The input frequency range depends on the instrument model. (Amplitude range: –3 V to +4 V, 50 Ω, AC-coupled)
2	DATA INPUT	Error Detector data input connectors. Use the Data+ and Data– connectors to input differential data signals to the Error Detector. (Amplitude range: –3 V to +4 V, 50 Ω, AC-coupled)
3	BLANK	Error Blank input connector. Use this connector to accept a TTL-level signal to cause the Error Detector to ignore errors. The Error Detector will ignore errors while this signal is active.
4	ERROR	Error output connector. Use this connector to provide a 1000 mV pulse when an error is detected. The minimum pulse width is 128 serial clock periods.
5	TRIGGER	Trigger output connector. Use this connector to synchronize external equipment, such as an oscilloscope to the BERTScope analyzer.

Rear panel controls and connectors

The following figure and table describe the rear panel power and communication connectors.

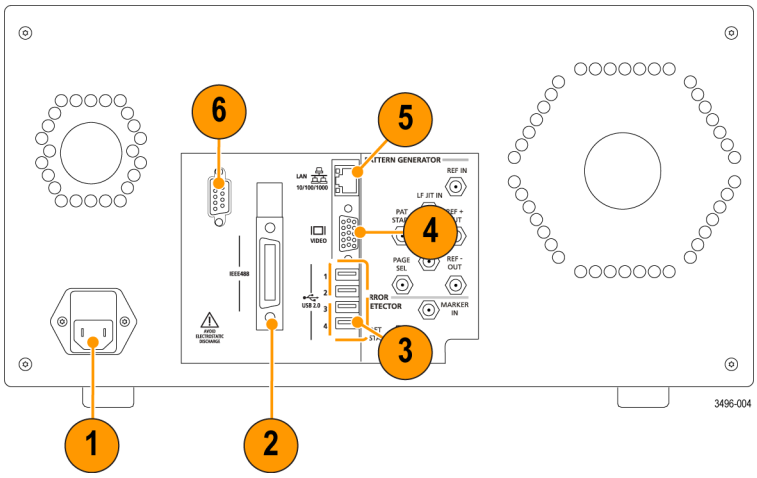


Figure 4: Rear panel connectors

Table 7: Rear panel power and communications connectors

Connector		Description
1	AC power	Connect a suitable power cord to match the local power outlet type.
2	IEEE4888	GPIB connector.
3	USB	Four USB connectors (two additional connectors are located on the front of the instrument). Connect USB devices such as keyboard, mouse, or USB flash drive.
4	VIDEO	Monitor/display connector. Connect an external VGA display device.
5	LAN	Connect the instrument to a network for remote control operation, file sharing, and other network operations.
6	SERIAL	Reserved for future use.

The following figure and table describe the rear panel BNC connectors.

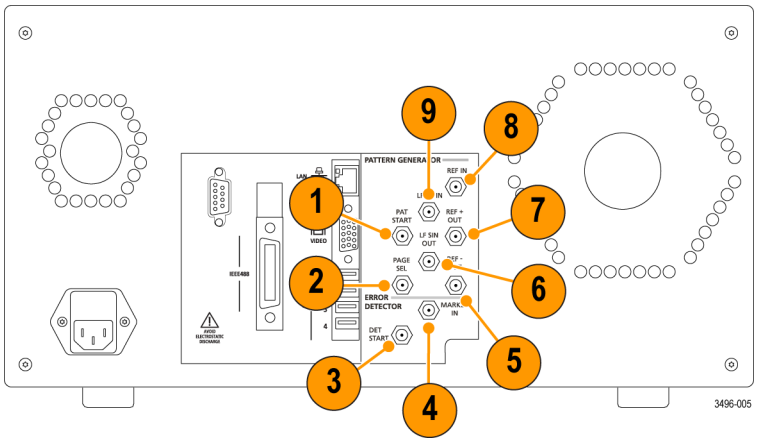


Figure 5: Rear panel BNC connectors

Table 8: Rear panel BNC connectors

Connector		Description
1	PAT START	Pattern Start input. Use this input connector to simultaneously synchronize the patterns of multiple data streams from multiple instruments.
2	PAGE SEL	Page Select. When enabled in the Pattern Sequencer, this input will cause the Pattern Sequencer to advance to the next state depending upon the TTL level of the input signal. In legacy Page A/Page B mode, a logic 0 selects Page A; and logic 1 selects Page B
3	DET START	Detector Start Input. Use this input to synchronize the Error Detector with external equipment. (LVTTL logic level, >1 kΩ into 0 V)
4	MARKER IN	Detector Marker input connector. Use this connector to accept a TTL-level Marker signal. The signal can be used to synchronize error analysis with low-speed reference signals, such as mechanical frequencies, packet boundaries, or loop markers. The minimum pulse width is 128 clock periods with a maximum repetition rate of 512 serial clock periods.
5	REF- OUT	Reference Output (–). Use this connector with the (+) connector to provide a differential reference frequency for other instruments (typically 100 MHz). For single-ended applications, use the (+) connector.
6	LF SIN OUT	Low-Frequency Sine Jitter Out. Use this connector to track the internal sine jitter modulation frequency. It can be used to ensure that two BERTScope analyzers are both in-phase or out-of-phase.
7	REF+ OUT	Reference Output (+). Use this connector with the (–) connector to provide a differential reference frequency for other instruments (typically 100 MHz).
8	REF IN	Reference Input. Use this connector to provide an input reference signal (amplitude: –6 dBm to +6 dBm). When the Synthesizer clock mode is selected, the fixed reference clock frequencies are: 10, 100, 106.25, 133.33, 165.25, 166.67, and 200 MHz. When the Reference Clock Multiplier (RCM) mode is selected, the input frequency can be any frequency between 10 MHz and 200 MHz.
9	LF JIT IN	Low Frequency Jitter In. Use this connector to add external low frequency jitter (DC to 80 MHz) to the instrument. The maximum signal level for this connector for normal operation is +10 dBm (2 V_{p-p}).

Cleaning and maintenance

Periodic cleaning reduces instrument breakdown and increases reliability. Clean the instrument as needed, based on the operating environment. Dirty conditions may require more frequent cleaning than computer room conditions.

Clean the flat panel display

The flat panel display is a soft plastic display and must be treated with care during cleaning.

CAUTION. *Improper cleaning agents or methods can damage the flat panel display.*

- Do not use abrasive cleaners or commercial glass cleaners to clean the display surface.
- Do not spray liquids directly on the display surface.
- Do not scrub the display with excessive force.
- Avoid getting moisture inside the instrument while cleaning the display; use only enough solution to dampen the wipe.
- Clean the flat panel display surface by gently rubbing the display with a cleanroom wipe (such as Wypall Medium Duty Wipes, #05701, available from Kimberly-Clark Corporation).
- If the display is very dirty, moisten the wipe with distilled water or a 75% isopropyl alcohol solution and gently rub the display surface. Avoid using excess force or you may damage the plastic display surface.

Clean the exterior surfaces

Clean the exterior surfaces with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a cloth or swab dampened with a 75% isopropyl alcohol solution. A swab is useful for cleaning in narrow spaces around the controls and connectors. Do not use abrasive compounds on any part of the instrument.

To avoid damaging the instrument follow these precautions:

- Avoid getting moisture inside the instrument during external cleaning and use only enough solution to dampen the cloth or swab.
- Do not wash the front-panel power switch. Cover the switch while washing the instrument.

- Use only deionized water when cleaning. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.
- Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Compliance information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies.

EMC compliance

Meets intent of Directive 2014/30/EU for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326-1. EMC requirements for electrical equipment for measurement, control, and laboratory use. [1] [2]

- CISPR 11. Radiated and conducted emissions, Group 1, Class A
- IEC 61000-4-2. Electrostatic discharge immunity
- IEC 61000-4-3. RF electromagnetic field immunity
- IEC 61000-4-4. Electrical fast transient / burst immunity
- IEC 61000-4-5. Power line surge immunity
- IEC 61000-4-6. Conducted RF immunity
- IEC 61000-4-11. Voltage dips and interruptions immunity

EN 61000-3-2. AC power line harmonic emissions

EN 61000-3-3. Voltage changes, fluctuations, and flicker

Compliance Contact
Tektronix, Inc. PO Box 500, MS 19-045
Beaverton, OR 97077, USA
www.tek.com

1 This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

2 Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

Australia / New Zealand

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- CISPR 11. Radiated and Conducted Emissions, Group 1, Class A, in accordance with EN 61326-1.

Safety compliance

This section lists the safety standards with which the product complies and other safety compliance information.

European Union

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:

Low Voltage Directive 2014/35/EU.

- EN 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

U.S. nationally recognized testing laboratory listing

- UL 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Canadian certification

- CAN/CSA-C22.2 No. 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Additional compliances

- IEC 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Equipment type

Test and measuring equipment.

Safety class

Class 1 – grounded product.

Pollution degree descriptions

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
- Pollution degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.

- Pollution degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
- Pollution degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

Pollution degree rating

Pollution degree 2 (as defined in IEC 61010-1). Rated for indoor, dry location use only.

Measurement and overvoltage category descriptions

Measurement terminals on this product may be rated for measuring mains voltages from one or more of the following categories (see specific ratings marked on the product and in the manual).

- Category II. Circuits directly connected to the building wiring at utilization points (socket outlets and similar points).
- Category III. In the building wiring and distribution system.
- Category IV. At the source of the electrical supply to the building.

NOTE. *Only mains power supply circuits have an overvoltage category rating. Only measurement circuits have a measurement category rating. Other circuits within the product do not have either rating.*

Mains overvoltage category rating

Overvoltage category II (as defined in IEC 61010-1).

Environmental considerations

This section provides information about the environmental impact of the product.

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Perchlorate materials. This product contains one or more type CR lithium batteries. According to the state of California, CR lithium batteries are classified as perchlorate materials and require special handling. See www.dtsc.ca.gov/hazardouswaste/perchlorate for additional information.

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