

TLA7S08 & TLA7S16 Series Product Specifications & Performance Verification Technical Reference Manual

This document applies to TLA System Software Version 5.5 or higher

Warning

These servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

www.tektronix.com

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For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

Warranty 2

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.

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General Safety Summary

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

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

Only qualified personnel should perform service procedures.

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

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

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

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

The inputs are not rated for connection to mains or Category II, III, or IV circuits.

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

Power Disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

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

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

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

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

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.*



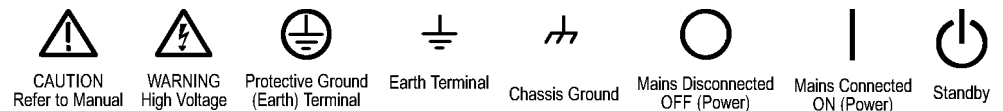
CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

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.

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



Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

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 instrument power, then disconnect the power cord from the mains power.

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.

To avoid electric shock, do not touch exposed connections.

Preface

This document lists the characteristics and specifications of the TLA7S08 and TLA7S16 Serial Analyzer products.

To prevent personal injury or damage, consider the following requirements before attempting service:

- The procedures in this manual should be performed only by qualified service personnel.
- Read the General Safety Summary and Service Safety Summary found at the beginning of this manual.

Be sure to follow all warnings, cautions, and notes in this manual.

Related Documentation

The following table lists related documentation that is available for your Tektronix logic analyzer family product. The documentation is available on the TLA Documentation CD included with your instrument and on the Tektronix Web site (www.Tektronix.com). Refer to the Tektronix Web site for the most current documentation.

To obtain documentation that is not specified in the table, contact your local Tektronix representative.

Table i: Related Documentation

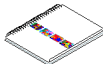




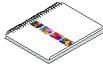




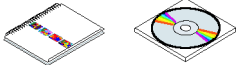
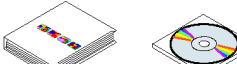

| Item | Purpose | Location |
|------------------------------------|--|---|
| TLA Quick Start User Manual | Basic operational overview |   |
| Online Help | In depth operation and UI help |  |
| Installation Quick Reference Cards | Basic installation information |   |
| Installation Manuals | Detailed first-time installation information |   |
| XYZs of Logic Analyzers | Introduction to logic analyzer basics |  www.Tektronix.com |
| TLA Product Specifications | Complete list of TLA product specifications |  |
| TPI.NET Documentation | Detailed information for controlling the logic analyzer using .NET |  |

Table i: Related Documentation, (cont.)

| Item | Purpose | Location |
|--|--|--|
| Field upgrade kits | Upgrade information for your logic analyzer product |  |
| Optional Service Manuals | Self-service documentation for modules and mainframes |  |
| TLA Application Software Release Notes | Software description, compatibility, impact of changes, contact information, installation, upgrade, and operational notes, and known issues. |  <p data-bbox="1015 606 1393 669">Go to Start→All Programs→Tektronix logic Analyzer→TLA Release Notes</p> |

Specifications and Characteristics

All specifications in this document are guaranteed unless noted *Typical*. Typical characteristics describe typical or average performance and provide useful reference information.

Specifications that are marked with the ✓ symbol are checked directly (or indirectly) at your nearest Tektronix location.

The performance limits in this specification are valid with these conditions:

- The instrument must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in these specifications.
- The instrument must have had a warm-up period of at least 30 minutes.

For modules, the performance limits in this specification are valid with these conditions:

- The serial analyzer modules must be installed in a Logic Analyzer Mainframe.
- The module must have been calibrated/adjusted at an ambient temperature between +20 °C and +30 °C.

Atmospheric Characteristics

The following table lists the Atmospheric characteristics of the Tektronix serial analyzers.

Table 1: Atmospheric characteristics

| Characteristic | Description |
|-------------------|---|
| Temperature | <i>Operating (no media in CD or DVD drive of the mainframe)</i> |
| | +5 °C to +50 °C, 15 °C/hr maximum gradient, noncondensing (derated 1 °C per 305 m (1000 ft) above 1524 m (5000 ft) altitude) |
| | <i>Nonoperating (no media)</i> |
| | -20 °C to +60 °C, 15 °C/hr maximum gradient, noncondensing |
| Relative Humidity | <i>Operating (no media)</i> |
| | 20% to 80% relative humidity, noncondensing. Maximum wet bulb temperature: +29 °C (derates relative humidity to approximately 22% at +50 °C). |
| | <i>Nonoperating (no media)</i> |
| | 8% to 80% relative humidity, noncondensing. Maximum wet bulb temperature: +29 °C (derates relative humidity to approximately 22% at +50 °C). |
| Altitude | <i>Operating</i> |
| | To 3000 m (9843 ft), (derated 1 °C per 305 m (1000 ft) above 1524 m (5000 ft) altitude. |
| | <i>Nonoperating</i> |
| | 12,190 m (40,000 ft) |

Certifications and Compliances

The certifications and compliances apply to all components of the Tektronix logic analyzer family unless noted otherwise.

EC Declaration of Conformity - EMC

Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326. EMC requirements for Class A electrical equipment for measurement, control, and laboratory use. ¹

- IEC 61000-4-2. Electrostatic discharge immunity (Performance criterion B)
- IEC 61000-4-3. RF electromagnetic field immunity (Performance criterion A)
- IEC 61000-4-4. Electrical fast transient / burst immunity (Performance criterion B)
- IEC 61000-4-5. Power line surge immunity (Performance criterion B)
- IEC 61000-4-6. Conducted RF immunity (Performance criterion A)
- IEC 61000-4-11. Voltage dips and interruptions immunity (Performance criterion B)

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

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

¹ Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

**Australia / New Zealand
Declaration of
Conformity - EMC**

Complies with EMC provision of Radiocommunications Act per these standards:

- AS/NZS 2064.1/2. Industrial, Scientific, and Medical Equipment: 1992

**EC Declaration of
Conformity - Low Voltage**

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

Low Voltage Directive 2006/96/EC

- EN 61010-1: 2001. Safety requirements for electrical equipment for measurement control and laboratory use.

**U.S. Nationally Recognized
Testing Laboratory Listing**

- UL 61010-1: 2004, 2nd Edition. Standard for electrical measuring and test equipment.

Canadian Certification

- CAN/CSA C22.2 No. 61010-1:2004. Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1.

Additional Compliances

- IEC 61010-1: 2001. Safety requirements for electrical equipment for measurement, control, and laboratory use.

Equipment Type

Test and measuring equipment.

Safety Class

Class 1 – grounded product.

Pollution Degree Description

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

Pollution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.

Installation (Overvoltage) Category Descriptions

Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:

- Measurement Category IV. For measurements performed at the source of low-voltage installation.
- Measurement Category III. For measurements performed in the building installation.
- Measurement Category II. For measurements performed on circuits directly connected to the low-voltage installation.
- Measurement Category I. For measurements performed on circuits not directly connected to MAINS.

Overvoltage Category

Overvoltage Category II (as defined in IEC 61010-1)

TLA7S08 & TLA7S16 Serial Analyzer Module Specifications

Table 2: Data input for differential probes

| Characteristic | Description |
|--|---|
| Data rate | 5 Gb/s |
| Minimum differential input amplitude, peak-to-peak | 120 mV |
| Maximum nondestructive input signal to probe | ± 7.5 V |
| Input common mode range | ± 7.5 V |
| Minimum input eye height | 60 mV for continuous data streams |
| Input eye width | 60 ps |
| Location of transition detect inputs | Channels A3, A0, B3, B0, C3, C0, D3, D0 |

Table 3: Channel width and depth

| Characteristic | Description |
|--------------------------|-------------------------------|
| Number of data channels | TLA7S08 8 TLA7S16 16 |
| Acquisition memory depth | 32 M samples |

Table 4: Clocking

| Characteristic | Description |
|--|---------------------------|
| Internal reference clock | |
| Frequency range | Maximum 250,012,500 Hz |
| | Minimum 249,987,500 Hz |
| Tolerance | ± 50 ppm |
| Rise time | 400 ps |
| Fall time | 400 ps |
| Duty cycle | 45% to 55% |
| Total jitter (<i>Typical</i>) | t_{DJ} 0.2 ps |
| | t_{RJ} 3.0 ps |
| | t_{RMS} 3.0 ps |
| | t_{p-p} 25 ps |
| | t_{acc} 4.0 ps |
| External reference clock | |
| Minimum peak-to-peak differential input voltage (<i>Typical</i>) | 150 mV |
| Absolute differential input voltage limit (<i>Typical</i>) | 2.5 V |
| Clock frequency (<i>Typical</i>) | 125 MHz |

Table 4: Clocking, (cont.)

| Characteristic | Description |
|--|-------------|
| Frequency tolerance (<i>Typical</i>) | ±350 ppm |
| Rise time (<i>Typical</i>) | 55 ps |
| Fall time (<i>Typical</i>) | 55 ps |

Table 5: SerDes

| Characteristic | Description |
|--------------------------|------------------------------------|
| Trigger resources | |
| Clock encoding standard | Supports 8b10b encoded serial data |

Table 6: Lane processing

| Characteristic | Description |
|--|---|
| Polarity inversion | Available on all input channels |
| Descrambling polynomial | Descrambles data using the polynomial defined in PCI Express Specification Revision 1.1: $x^{16}=x^5+x^4+x^3+x^1$ |
| Training sequence recognizer resources | Each input channel is analyzed for the presence of a TS1 or TS2 ordered set |

Table 7: Link processing

| Characteristic | Description | |
|----------------|-------------|---|
| Link support | TLA7S08 | One uni-directional x8, x4, x2, or x1 link |
| | | One bi-directional x4, x2, or x1 link |
| | TLA7S16 | One uni-directional x16, x8, x2, or x1 link |
| | | One bi-directional x4, x2, or x1 link |

Table 8: Event recognizer resources

| Characteristic | Description |
|-------------------------|--|
| DLLP packet recognizers | 8 separate DLLP recognizers. The total number of unique DLLPs that can be detected depends on the link width |
| x1, x2, or x4 links | 8 unique DLLP packet recognizer resources |
| x8 and x16 links | 4 unique TLP packet recognizer resources |
| TLP packet recognizers | 4 |

Table 8: Event recognizer resources, (cont.)

| Characteristic | Description |
|------------------------------|-------------|
| Ordered set recognizers | 8 |
| Ordered set recognizer depth | 16 symbols |

Table 9: Link real-time statistics

| Characteristic | Description |
|---|-------------|
| Real-time statistic counters per link processor | 8 |
| Real-time statistic counter depth | 48 bits |

Table 10: Trigger state machine

| Characteristic | Description |
|-----------------------------------|--|
| Sequencer states | 16 |
| Event recognizer inputs per state | 8 |
| Event occurrence counter-timers | two 32-bit event occurrence counter-timers per state |
| Global states | 1 |
| Global counter-timers | four 48-bit global counter/timers |
| Global event occurrence | two 32-bit event occurrence counter-timers per state |

Table 11: Trigger machine actions

| Characteristic | Description |
|---------------------------------|---|
| Main acquisition trigger | Triggers the main acquisition memory |
| Increment and decrement counter | When counters-timers are used as counters, they can be incremented or decremented |
| Start or stop timer | When counters-timers are used as timers, they can be started or stopped |
| Reset counter or timer | Counters and timers can be reset. When a counter-timer being used as a timer is reset, the timer continues in the started or stopped state that it was in before the reset. |
| Signal Out | A signal can be driven to the backplane to be used by other modules |
| Trigger Out | A Trigger Out signal can be driven to the backplane to trigger other modules |

Table 12: Other trigger machine characteristics

| Characteristic | Description |
|-----------------------|--|
| Main trigger position | The trigger position is programmable to any data sample within 2 ns boundaries |

Table 13: Storage control

| Characteristic | Description |
|-------------------------|--|
| Global event triggering | Storage can be controlled globally to filter based on the following traffic types: Ordered sets DLLP packets TLP packets Other lane or link conditions |

Table 14: Mechanical

| Characteristic | Description | | | | | | |
|---------------------|---|---------|----------------------|---------|--------------------|--------|------------------|
| Material | Chassis parts are constructed of aluminum alloy. The front panel is constructed of plastic laminated to steel front panel. Circuit boards are constructed of glass laminate. | | | | | | |
| Weight | <table border="0"> <tr> <td>TLA7S08</td> <td>5.17 lbs (2.345 kg)</td> </tr> <tr> <td>TLA7S16</td> <td>5.30 lbs(2.405 kg)</td> </tr> </table> | TLA7S08 | 5.17 lbs (2.345 kg) | TLA7S16 | 5.30 lbs(2.405 kg) | | |
| TLA7S08 | 5.17 lbs (2.345 kg) | | | | | | |
| TLA7S16 | 5.30 lbs(2.405 kg) | | | | | | |
| Shipping weight | Includes packaging | | | | | | |
| | <table border="0"> <tr> <td>TLA7S08</td> <td>14.21 lbs (6.445 kg)</td> </tr> <tr> <td>TLA7S16</td> <td>14.34 (6.505)</td> </tr> </table> | TLA7S08 | 14.21 lbs (6.445 kg) | TLA7S16 | 14.34 (6.505) | | |
| TLA7S08 | 14.21 lbs (6.445 kg) | | | | | | |
| TLA7S16 | 14.34 (6.505) | | | | | | |
| Overall dimensions | <table border="0"> <tr> <td>Height</td> <td>10.32 in (262 mm)</td> </tr> <tr> <td>Width</td> <td>2.39 in (61 mm)</td> </tr> <tr> <td>Length</td> <td>14.7 in (373 mm)</td> </tr> </table> | Height | 10.32 in (262 mm) | Width | 2.39 in (61 mm) | Length | 14.7 in (373 mm) |
| Height | 10.32 in (262 mm) | | | | | | |
| Width | 2.39 in (61 mm) | | | | | | |
| Length | 14.7 in (373 mm) | | | | | | |
| Mainframe interlock | 1.4 ECL keying is implemented | | | | | | |

Performance Verification Procedures

There are no customer self-service performance verification procedures for the TLA7S08 or TLAS716 Serial Analyzer modules. If you want to verify the performance of your serial analyzer module, you must return the module to your local Tektronix office. However you can perform a functional check. (See page 10, *Functional Verification*.)

Functional Check Procedures

Functional Verification

Functional verification procedures consist of running the Power-on diagnostics, Extended diagnostics, and acquiring a signal from the SUT.

Power-on and Extended Diagnostics

Do the following steps to run the power-on and extended diagnostics:

NOTE. *Running the extended diagnostics will invalidate any acquired data. If you want to save any of the acquired data, do so before running the extended diagnostics.*

You will need a mainframe with a serial analyzer module installed in the mainframe.

Perform the following tests to complete the functional verification procedure:

NOTE. *If you control your logic analyzer from a remote location, make sure that you select Run Power-on Diagnostics in the TLA Connection dialog box. Otherwise the instrument will bypass the power-on diagnostics.*

1. If you have not already done so, power on the instrument.
The instrument runs the power-on diagnostics each time that you power-on the instrument. If any failures occur, the diagnostic window will appear.
2. Go to the System menu and select Calibration and Diagnostics.
3. Scroll through the list of tests and verify that all power-on diagnostics pass.

NOTE. Allow the instrument to warm up for 30 minutes before continuing with the Extended diagnostics.

4. Click the Extended Diagnostics tab.
5. Select the top-most selection for your module in the list of tests. For example, if your serial analyzer module is installed in Slot 3 of your mainframe, select Slot 3:TLA7S08 - SA.
6. Select the type of test that you want to run (One Time, Continuous, or Until Fail).
7. Click Run to start the tests.
All tests that displayed an "Unknown" status will change to a Pass or Fail status depending on the outcome of the tests.
8. After the tests have completed, scroll through the list and verify that the instrument passes all tests.

NOTE. Installing a module in the mainframe provides a means of verifying connectivity and communication between the module and the mainframe. If the instrument fails any test, try using a different module and repeat the tests to isolate the problem to the mainframe or to the module.

Acquire a Signal

To verify that the serial analyzer module can acquire signals, connect the serial analyzer to a known good signal source through one of the serial analyzer probes.

Power on the serial analyzer and the SUT.

Go to the serial analyzer Setup window and verify that the channel activity connectors show activity for any channels connected to the SUT. If necessary, refer to the Status Area near the top of the Setup window to decode the channel status colors. The serial analyzer always acquires signals. If the channel activity indicators show the correct activity for the SUT, you have verified that the serial analyzer acquired a signal from the SUT and displayed the information in the Setup window.