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Service Manual

Tektronix

Tektronix Logic Analyzer Module (TLA7AAx, TLA7ABx & TLA7NAx)

071-1511-00

This document applies to TLA application software version 4.2 and above.

Warning
The 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.

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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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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 the system. Read the *General Safety Summary* in other system 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.

Use Proper Voltage Setting. Before applying power, ensure that the line selector is in the proper position for the power source being used.

Ground the Product. The TLACAL2 test fixture 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 fixture, ensure that the fixture is properly grounded.

Ground the Product. The logic analyzer modules are 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 modules, ensure that the modules are properly grounded indirectly.

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.

Replace Batteries Properly. Replace batteries only with the proper type and rating specified.

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

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

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

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

Do Not Operate in Wet/Damp Conditions.

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.

Symbols and Terms

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.*

Terms on the Product. These terms may appear on the product:

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

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

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbol 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 is the service manual for the TLA7Axx Series Logic Analyzer Module. Read this preface to learn how this manual is structured, what conventions it uses, and where you can find other information related to servicing this product. Read the Introduction, which follows this preface, for important background information needed before using this manual for servicing this product.

Manual Structure

A brief description of each chapter of this service manual follows:

- *Specifications* contains a product description of the logic analyzer module and tables of the characteristics and descriptions that apply to it.
- *Operating Information* includes basic installation and operating instructions at the level needed to safely operate and service the logic analyzer module. For complete installation and configuration procedures, refer to the *Tektronix Logic Analyzer Family User Manual*.
- *Theory of Operation* contains circuit descriptions that support general service to the circuit board level.
- *Performance Verification* contains the functional verification procedures for the logic analyzer module and logic analyzer module probes.
- *Adjustment Procedures* contains the self calibration procedures for the logic analyzer module.
- *Maintenance* contains information and procedures for doing preventive and corrective maintenance on the logic analyzer module. Included are instructions for cleaning, for removal and installation of replacement parts, and for troubleshooting to the circuit board level.
- *Options* contains information on servicing any of the factory-installed options that may be available for the logic analyzer module.
- *Diagrams* contains block diagrams and interconnection diagrams that are useful when isolating failed circuit boards.
- *Mechanical Parts List* includes a table of all replaceable parts, their descriptions, and their Tektronix part numbers.

Manual Conventions

This manual uses certain conventions that you should be familiar with before attempting service.

Acquisition Board The acquisition board is one of the circuit boards inside the logic analyzer module. The circuit board receives and stores acquisition data from the probes and works with the local processor unit (LPU) board to provide logic analysis information to the operator of the logic analyzer.

Adjustment Procedures Adjustment procedures check for, and if necessary, correct any adjustment errors discovered when performing functional or performance verification procedures.

Certification Procedures Certification procedures certify a product and provide a traceability path to national standards.

Functional Verification Procedures Functional verification procedures verify the basic functionality of the instrument. These procedures include power-on and extended diagnostics, self calibration, as well as semi-automated or manual check procedures. These procedures can be used as incoming inspection purposes. This manual provides information on power-on and extended diagnostics and the self calibration.

LPU Board The LPU board is one of the circuit boards inside the logic analyzer module that provides the main communications interface with the acquisition board and the mainframe.

Maintenance Procedures Maintenance procedures are used for fault isolation and repair to the circuit board level or to the replaceable part level.

Modules Throughout this manual, the term “module” refers to a logic analyzer or digital oscilloscope, or pattern generator unit that mounts inside a mainframe. A module is composed of circuit boards, interconnecting cables, and a user-accessible front panel.

P6960 Logic Analyzer Probe

The P6960 is a 34 channel single-ended high-density logic analyzer probe with D-Max™ probing technology. The P6960 is optimized for applications that require the highest-density footprint for single-ended signals. The probe has<0.5 pF typical capacitance and can connect to circuit boards with thicknesses from 0.050 to 0.250 inches and supports HASL (hot air solder level), immersion gold, and immersion silver board surface finishes. This probe is for use with TLA7Axx/TLA7NAx logic analyzer modules.

P6980 Logic Analyzer Probe

The P6980 is a 34 channel differential high-density logic analyzer probe with D–Max™ probing technology. The P6980 is optimized for applications that require the highest density footprint for differential signals. The probe has <0.5 pF typical capacitance and can connect to circuit boards with thicknesses from 0.050 to 0.250 inches and supports HASL (hot air solder level), immersion gold, and immersion silver board surface finishes. This probe is for use with TLA7Axx/TLA7NAx logic analyzer modules.

P6810 General Purpose Logic Analyzer Probe

This is a 34-channel general purpose probe used with the TLA7Axx/TLA7NAx series logic analyzers. It provides support for single-ended, differential clocks, and data with no trade-off in channels. It connects to a wide variety of probing accessories including SMT KlipChips for quick connections to a variety of IC pins and connectors.

P6880 Differential Probe

This is a 34-channel differential probe used with the TLA7Axx/TLA7NAx series logic analyzers. This probe is designed for use with differential clocks and single-ended data. It uses a connector-less interface that use a compression contact which is mechanically reliable and minimizes impact on board layout and design. Adaptors are available to connect to Mictor probing interfaces.

P6860 High Density Probe

This is a 34-channel high-density probe used with the TLA7Axx/TLA7NAx series logic analyzers. This probe is designed for use with differential clocks and data with no trade-offs in channels. It uses a connector-less interface that use a compression contact which is mechanically reliable and minimizes impact on board layout and design. Adaptors are available to connect to Mictor probing interfaces.

Performance Verification Procedures

Performance verification procedures confirm that a product meets or exceeds the performance requirements for each of the published specifications.

Replaceable Parts

This manual refers to any field-replaceable assembly or mechanical part specifically by its name or generically as a replaceable part. In general, a replaceable part is any circuit board or assembly that is listed in the replaceable parts list near the end of this manual.

Safety Symbols and terms related to safety appear in the *Safety Summary* found at the beginning of this manual.

Related Manuals

The following manuals are available as part of the TLA700 Series Logic Analyzer documentation set.

Manual name	Description	Service use
Tektronix Logic Analyzer Family User Manual	Provides operating information on the TLA Series Logic Analyzer	Augments operating information found in chapter 2 of this manual
TLA715 Portable Mainframe Service Manual	Provides service information for the portable mainframes	Isolating and correcting failures in the portable mainframe
TLA721 Benchtop Mainframe and TLA7XM Expansion Mainframe Service Manual	Provides service information for the benchtop mainframe and expansion mainframe	Isolating and correcting failures in the benchtop mainframe, controller, or expansion mainframe
TLA7Dx/TLA7Ex Digitizing Oscilloscope Service Manual	Provides service information for the digitizing oscilloscope modules	Isolating and correcting failures in the DSO module. Provides adjustment procedures, performance verification procedures, and certification procedures for the DSO modules
TLA7Nx, TLA7Px, & TLA7Qx Logic Analyzer Module Service Manual	Provides service information for the TLA7Nx, TLA7Px, and TLA7Qx logic analyzer modules	Isolating and correcting failures in the logic analyzer module. Provides adjustment procedures, performance verification procedures, and certification procedures for the logic analyzer modules and logic analyzer probes
TLA7Lx, & TLA7Mx Logic Analyzer Module Service Manual	Provides service information for the TLA7Lx, and TLA7Mx logic analyzer modules	Isolating and correcting failures in the logic analyzer module. Provides adjustment procedures, performance verification procedures, and certification procedures for the logic analyzer modules and logic analyzer probes
TLA7PG2 Pattern Generator Service Manual	Provides service information for the TLA7PG2 pattern generator modules	Isolating and correcting failures in the pattern generator module. Provides adjustment procedures and performance verification procedures for the pattern generator modules and probes

Contacting Tektronix

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Sales support	1-800-833-9200, select option 1*
Service support	1-800-833-9200, select option 2*
Technical support	Email: techsupport@tektronix.com 1-800-833-9200, select option 3* 6:00 a.m. – 5:00 p.m. Pacific time

* **This phone number is toll free in North America. After office hours, please leave a voice mail message.**
Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices.

Introduction

This manual contains information needed to properly service the logic analyzer module, as well as general information critical to safe servicing.

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.

When using this manual for servicing follow all warnings and cautions.

Adjustment and Certification Interval

It is recommended that you have a qualified Tektronix Service Center technician perform adjustment and certification (calibration) procedures annually or following repairs that affect adjustment or calibration.

Strategy for Servicing

This manual contains information for corrective maintenance of this product:

- Supports isolation of faults to the failed circuit board or assembly level shown in the replaceable parts list
- Supports removal and replacement of those boards or assemblies
- Supports removal and replacement of fuses, knobs, chassis, and other mechanical parts listed in the replaceable parts list

This manual does not support component-level fault isolation and replacement.

Service Offerings

Tektronix provides service to cover repair under warranty as well as other services that are designed to meet your specific service needs.

Whether providing warranty repair service or any of the other services listed below, Tektronix service technicians are well equipped to service the logic analyzer module.

Warranty Repair Service

Tektronix warrants this product for one year from date of purchase. (The warranty appears behind the title page in this manual.) Tektronix technicians provide warranty service at most Tektronix service locations worldwide. The Tektronix product catalog lists all service locations worldwide or you can visit us on our web site at http://www.tektronix.com/Measurement/Service. See our latest service offerings and contact us by email.

Calibration and Repair Service

In addition to warranty repair, Tektronix Service offers calibration and other services that provide cost-effective solutions to your service needs and quality-standards compliance requirements. Our instruments are supported worldwide by the leading-edge design, manufacturing, and service resources of Tektronix to provide the best possible service.

The following services can be tailored to fit your requirements for calibration and/or repair of the logic analyzer module.

Service Options

Tektronix Service Options can be selected at the time you purchase your instrument. You select these options to provide the services that best meet your service needs.

Service Agreements

If service options are not added to the instrument purchase, then service agreements are available on an annual basis to provide calibration services or post-warranty repair coverage for the logic analyzer module. Service agreements may be customized to meet special turn-around time and/or on-site requirements.

Service On Demand

Tektronix also offers calibration and repair services on a “per-incident” basis that is available with standard prices for many products.

Self Service

Tektronix supports repair to the replaceable-part level by providing for circuit board exchange. Use this service to reduce down-time for repair by exchanging circuit boards for remanufactured ones. Tektronix ships updated and tested exchange boards. Each board comes with a 90-day service warranty.

When you exchange circuit boards, you must supply the following information to allow the board to be preconfigured to the proper PowerFlex level. You can also return the repaired module to your local service center for configuration.

- Model number and serial number
- PowerFlex option upgrade number
- Firmware level

For More Information

Contact your local Tektronix service center or sales engineer for more information on any of the Calibration and Repair Services just described.

Specifications

Refer to the *Tektronix logic Analyzer Family Product Specifications* document for a complete list of specifications for the TLA700 series logic analyzer products. This document is available on the Tektronix Logic Analyzer Family Product Documentation CD or can be downloaded from the Tektronix Web site.

Operating Information

This chapter provides a high-level overview of installation instructions and operating information for the logic analyzer module. The operating information is limited to the functions you need to perform the procedures found in this document. You can find detailed operating instructions in the *Tektronix Logic Analyzer Family User Manual* and in the online help.

Installation

The *Tektronix Logic Analyzer Installation Manual* provides detailed installation instructions for the logic analyzer module and the mainframes. This section contains a summary of those installation procedures.

Logical Address

Every plug-in module in the logic analyzer must have a unique logical address; no two modules can have the same address. Two rotary switches on rear panel select the logical address (see Figure 2–1 for the switch locations). When servicing the logic analyzer module, you should have no need for changing the address. However, in most cases the switches should be set to FF, the factory default setting to enable dynamic auto configuration.

***NOTE**. Do not set the logic analyzer module logical address to 00. Logical address 00 is reserved for the controller.*

Dynamic Autoconfiguration With Dynamic Auto Configuration (recommended) selected (hexadecimal FF or decimal 255), the logic analyzer automatically sets the address to an unused value. For example, if there are modules set to addresses 01 and 02 already in your system, the resource manager will automatically assign the logic analyzer module an address other than 01 or 02.

Static Logical Address Static logical address selections set the address to a fixed value. A static logical address ensures that the logic analyzer module address remains fixed for compatibility with modules that require a specific address value. Remember that each module within the logic analyzer must have a unique address to avoid communication problems.

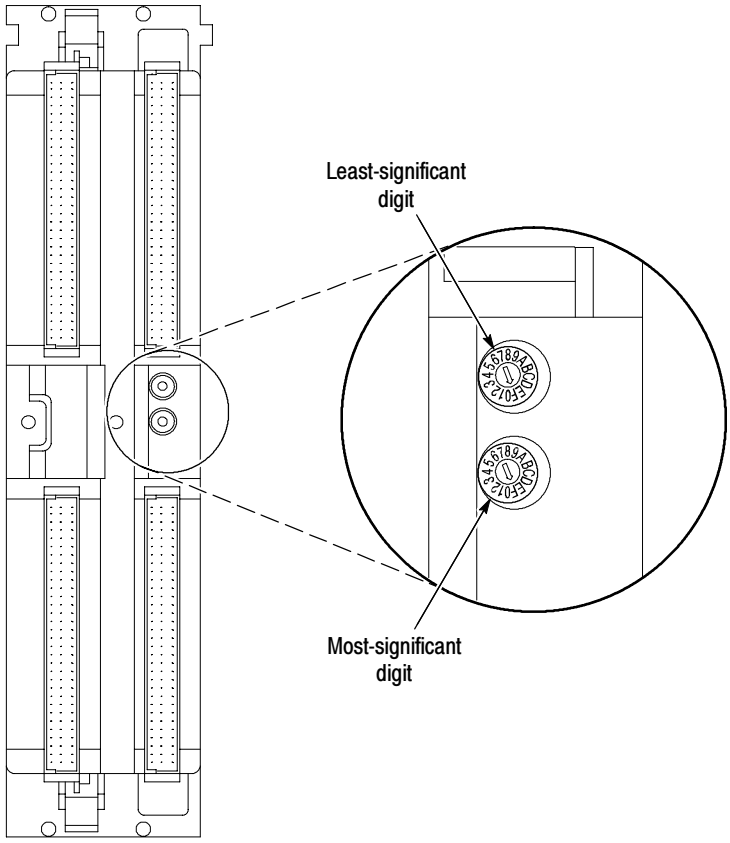


Figure 2-1: Logical address switches

Merged Modules

You can combine up to five logic analyzer modules to create a single module that operates off a single time base. This process is called merging modules. The procedures for merging modules is described under *Merged Modules* beginning on page 2–10.

Module Installation

Install the modules in a mainframe before applying power to the mainframe. Before installing the modules, determine if you want to merge the modules. You must physically connect the module together before installing them in the mainframe.

Slide the module all of the way into the mainframe. Use the injector/ejector handles to seat the module and then hold the modules in place by tightening the retaining screws (see Figure 2–2 on page 2–3). If you are installing merged modules, slide them into the mainframe as a group and then seat them in place individually.

For more detailed information on installing modules, refer to *TLA700 Series Installation Manual.*

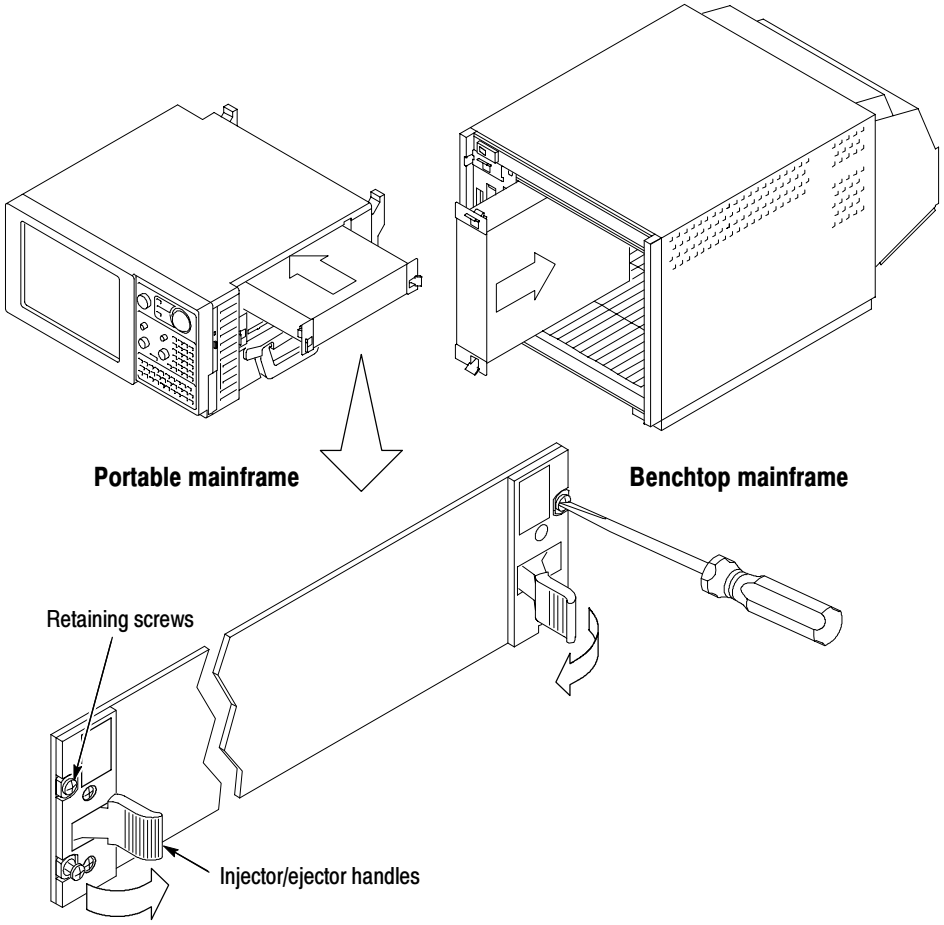


Figure 2- 2: Installing modules in the mainframe

Software Installation

The logic analyzer module operation is controlled by the Tektronix logic analyzer application software located on the hard disk of the mainframe. This software is installed when you purchased your logic analyzer or when you upgrade the software through one of the TLA7UP Field Upgrade Kit options. The logic analyzer module contains firmware which may need to be upgraded to function with the latest system software version; the firmware upgrade procedure is provided with the TLA7UP Field Upgrade Kit. The procedure is also described in this manual under *Updating or Restoring the Logic Analyzer Firmware* beginning on page 6–37.

Operating Information

This section provides a high-level overview of the controls and connectors of the logic analyzer module. It provides a high-level overview of the logic analyzer user interface and software.

Front Panel

Figure 2–3 shows the connectors and indicators on the front panel of a 136-channel logic analyzer module. Modules with fewer channels look and operate the same, but without the additional probe connectors.

Injector/Ejector Handles. The injector/ejector tabs are used to seat and unseat the modules in the mainframe.

READY Indicator. The READY indicator lights continuously after the logic analyzer module successfully completes the power-on process. If the indicator fails to light within five seconds of power-on, an internal module failure may be present.

ACCESSED Indicator. The ACCESSED indicator lights anytime the controller accesses the logic analyzer module.

ARM'D Indicator. The ARM'D indicator lights when the logic analyzer module is armed during an acquisition.

TRIG'D Indicator. The TRIG'D indicator lights when the logic analyzer module triggers and stays on until the module finishes acquiring data.

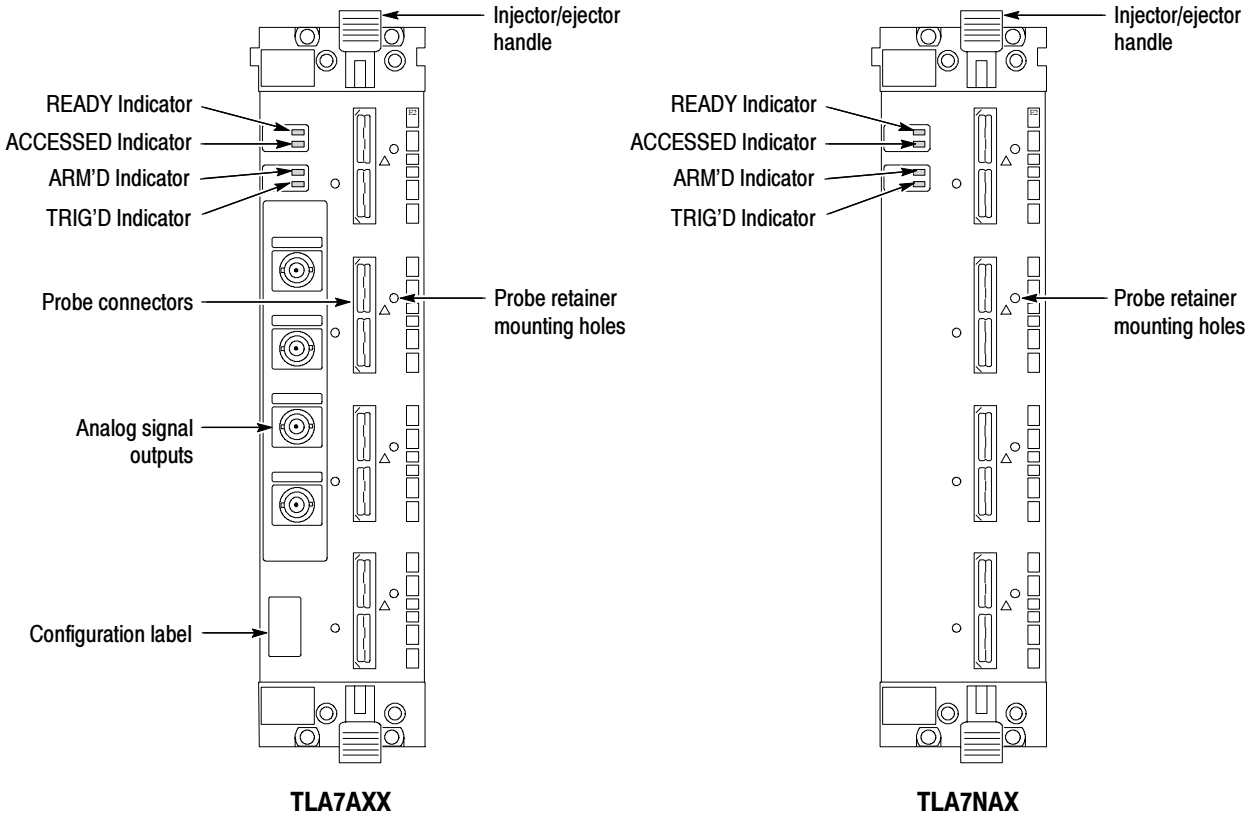


Figure 2- 3: Front panel of the TLA7Axx and TLA7NAx logic analyzer module

Probe Connectors. The probe connectors are color-coded to match the labels on the probes. Each probe connector accepts a 34-channel active probe consisting of 32 data channels and two clock/qualifier channels.

Probe Retainer Mounting Holes. The threaded probe retainer mounting holes provide a means of securely holding the probes in place. You must tighten the retaining screws to ensure a good ground connection for the probes to the module.

Analog Outputs. Each TLA7Axx module has four analog output BNC connectors regardless of the number of acquisition channels. The analog output connectors allow you to tap into the analog signal of any channel and connect the signals to an external instrument, such as an oscilloscope. This feature allows you to view the analog component of a selected channels without requiring a separate oscilloscope probe connection.

Configuration Label. Each TLA7Axx module has a configuration label that indicates the speed and memory depth of the logic analyzer module.

Merge Cable Connectors

Merge connectors on both sides of the module allow you to merge up to five individual modules to create a single module with up to 680 channels with full clock and trigger functionality. The 34-channel and 68-channel modules do not have merge connectors.

The merge connector on the left side of the module can be physically extended to connect with the connector of an adjacent module. The connector is shipped in the recessed position and must be extended when merging modules (see Figure 2–4).

The merge connector on the right side of the module provides play between modules allow easy installation of the module set in a mainframe.

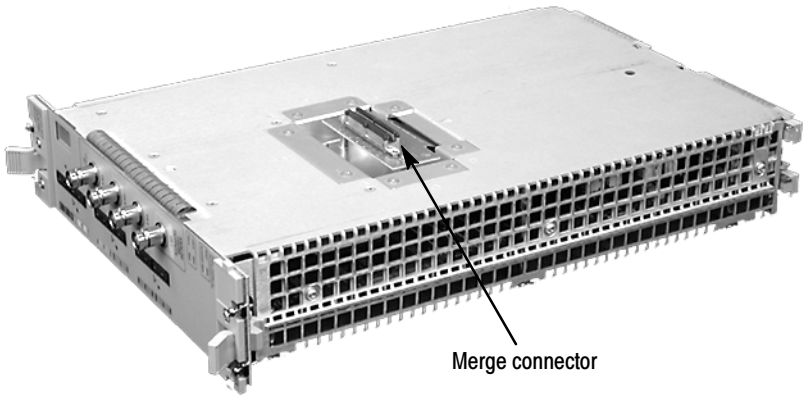


Figure 2- 4: Merge connector on a TLA7Axx (shown in the extended position)

Rear Panel

Figure 2–5 shows the connectors and controls on the rear panel of the logic analyzer module.

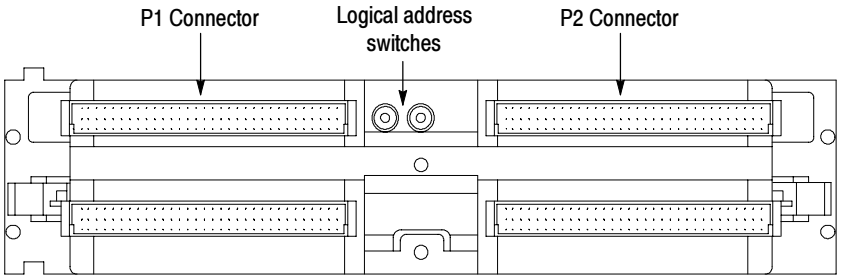


Figure 2–5: Rear panel controls and connectors

P1 and P2 Connectors. The acquisition board and the local processor unit (LPU) provide the electrical connections from the module to the mainframe. These electrical connections include power distribution, processor communications, and intermodule communications.

Logical Address Switches. The logical address switches determine the logical address of the module. These switches should normally be set to address FF. For more information on these switches and their settings, refer to *Logical Address* on page 2–1.

Online Help

Most user information for operating the logic analyzer module is available through the online help within the logic analyzer application. You can select the online help from the Help menu, by clicking the Help button in a dialog box, or by using the what's this help (click the question mark icon, drag the cursor to the item of interest on the screen, and then release the mouse button).

Diagnostics

The logic analyzer module performs power-on diagnostics each time you power on the mainframe. The Calibration and Diagnostics property sheet appears at power-on if one or more of the diagnostics fail.

For more detailed tests, you can execute the extended diagnostics or the self calibration. For more information on the diagnostics, refer to *Calibration and Diagnostic Procedures* beginning on page 6–31.

***NOTE**. For best results, only run the diagnostics with the probes disconnected from the module.*

Self Calibration

Self calibration is an internal routine that optimizes performance. No external equipment or user actions are required to complete the procedure. The logic analyzer saves the data generated by the self calibration in non-volatile memory.

NOTE. *Performing the self calibration does not guarantee that all logic analyzer module parameters operate within limits. Operation within limits is achieved by performing the* Adjustment Procedures. *Proper operation may be confirmed by having a qualified Tektronix Service Center technician perform the performance verification procedures. See* Service Options *on page 7–3 for more information.*

You can run the self calibration at any time during normal operation. To maintain measurement accuracy, perform the self calibration if more than one year has elapsed since the last self calibration.

You can check the status of the self calibration in the Calibration and Diagnostics property sheet.

If the logic analyzer module loses power during the self calibration, rerun the self calibration following the next power-on. The self calibration data generated before power was interrupted must be replaced with a complete set of new data. For best results, always perform the self calibration after at least a 30 minute warm-up.

The logic analyzer module may require several minutes to run the self calibration depending on the number of channels. Select Calibration and Diagnostics property sheet from the System menu. Select the Self Calibration tab page and select the logic analyzer module. Click the Run button to start the self calibration. Upon completing the self calibration the logic analyzer module menu selection changes from Running to Calibrated.

Menu Overview

The logic analyzer is controlled by interactive windows through the TLA application. The TLA application consists of the following windows:

- System Window. This window provides an overview of the entire logic analyzer. Use this window to navigate through the logic analyzer.

  The center of the System window displays icons that represent hardware modules installed in the logic analyzer. The icons are linked to the other windows in the logic analyzer.

- Setup Window. A setup window exists for each module in the logic analyzer. It contains all of the setup information for the logic analyzer module such as clocking, memory depth, threshold information, and channel information. Menus and dialogs contain information to set up the window as needed.

For the DSO, the Setup window contains setup information for each DSO channel such as the input voltage ranges, bandwidth, coupling, and termination. It also contains horizontal setup information and a link to the DSO Trigger window.

An External Oscilloscope setup window may be present if your logic analyzer connects to an external oscilloscope through the iView cable. This setup window provides setup, trigger, and connection information for oscilloscope and logic analyzer.

- Trigger Window. The Trigger window provides access to the logic analyzer module or DSO module trigger setups. For either module, you can specify various trigger events and trigger actions to help you capture the data that you are interested in.
- Listing Data Window. The Listing Data window displays acquired data as tabular text. Each column of data represents one group of data or other logical data information, such as time stamps. Each row of data represents a different time that the data was acquired; newer samples of data display below older samples.
- Waveform Data Window. The Waveform Data window displays acquired data as graphical waveforms. All defined channel groups display as busforms for the logic analyzer and as individual analog channels for the DSO module.
- On/Off Buttons. These buttons enable or disable the operation of the modules. Click the appropriate button to enable or disable the modules.

Refer to the online help for more information on the individual menus, icons, and fields within each window. You may also want to refer to the *Tektronix Logic Analyzer Family User Manual* for additional information.

Merged Modules

The logic analyzer allows you to merge individual 102-channel or 136-channel module modules to provide a logic analyzer module with up to 680 channels. The following procedures provide information for merging and unmerging logic analyzer modules.

Merging Rules

The following logic analyzer module merging rules must be followed:

- Only modules with 102 or 136 channels can be merged.
- Logic analyzer modules must be in adjacent slots and physically connected.
- Logic analyzer modules cannot be merged across mainframes.
- Merging logic analyzer modules with unequal memory depths will result in the merged modules assuming the depth of the shallowest module.
- Merging logic analyzer modules with unequal speeds will result in the merged modules assuming the speed of the slowest module.
- When merging logic analyzer modules of unequal channel widths, use the logic analyzer module with the highest number of channels as the master module. If there is a second slave module, the first slave must have greater than or equal the number of channels as the second slave module. Slave 3 cannot have more channels than the master, slave 1 or slave 2. Slave 4 cannot have more channels than the master, slave 1, slave 2, or slave 3. See Figure 2–6 on page 2–11 to determine the location of the master module with the merged module set.
- The logic analyzer modules must have the same firmware version.
- The maximum merged combinations are two TLA7Lx and TLA7Mx logic analyzer modules; three TLA7Nx, TLA7Px, or TLA7Qx logic analyzer modules; and five TLA7Axx and TLA7NAx logic analyzer modules.
- TLA7Nx, TLA7Px, and TLA7Qx Logic analyzer modules cannot be merged with TLA7Lx and TLA7Mx Logic analyzer modules (even if they are connected together).
- TLA7Axx and TLA7NAx modules cannot be merged with TLA7Nx, TLA7Px, TLA7Qx, TLA7Lx, or TLA7Mx modules.
- Any combination of TLA7Axx and TLA7NAx modules (up to five) can be merged.
- To merge a logic analyzer module to an established merged set, the established merged set must first be unmerged through software. Unmerged modules are the only potential candidates to add to a merged configuration.

Merge Procedure

Complete the following steps to create a merged module from two or more individual modules. You must complete these steps prior to installing the modules in a mainframe.



CAUTION. *To avoid damaging the mainframe or any modules, always power down the mainframe before removing or installing modules.*

1. Determine which modules will reside in the highest-numbered slots in a single mainframe.
2. Place the merge connector of these modules in the extended position. The module in the lowest-numbered slot must have the merge connector in the recessed position.

   Use Figure 2–6 as a guide for determining the location of the master module with the merged module set. Even though Figure 2–6 shows a five module set, you can still use the illustration to position the master module with respect to the slave module. For example, if you have a two module set, the master module is located in the lower-numbered slot, and the slave module is in the higher-numbered slot.

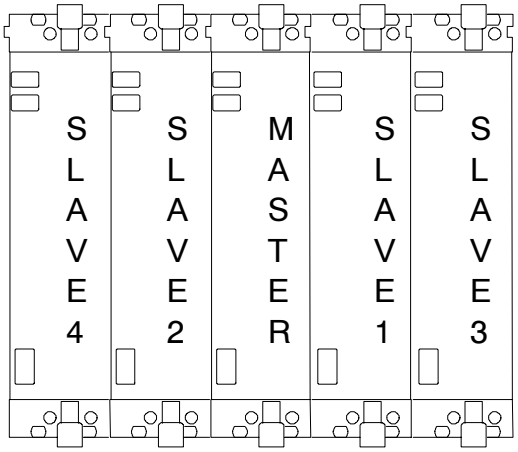


Figure 2- 6: Location of modules in a merged system

3. Place the module on the right side.
4. Using a Torx T-10 screw driver, remove the two screws holding the merge connector to the module (see Figure 2–7).
5. Gently lift the merge connector out of the slot and place it in the extended position such that the screw holes line up over the two standoff posts.
6. Install the two screws into the standoff posts. Tighten the screws to 4-in. lbs.

7. Repeat steps 3 through 6 for the remaining modules.

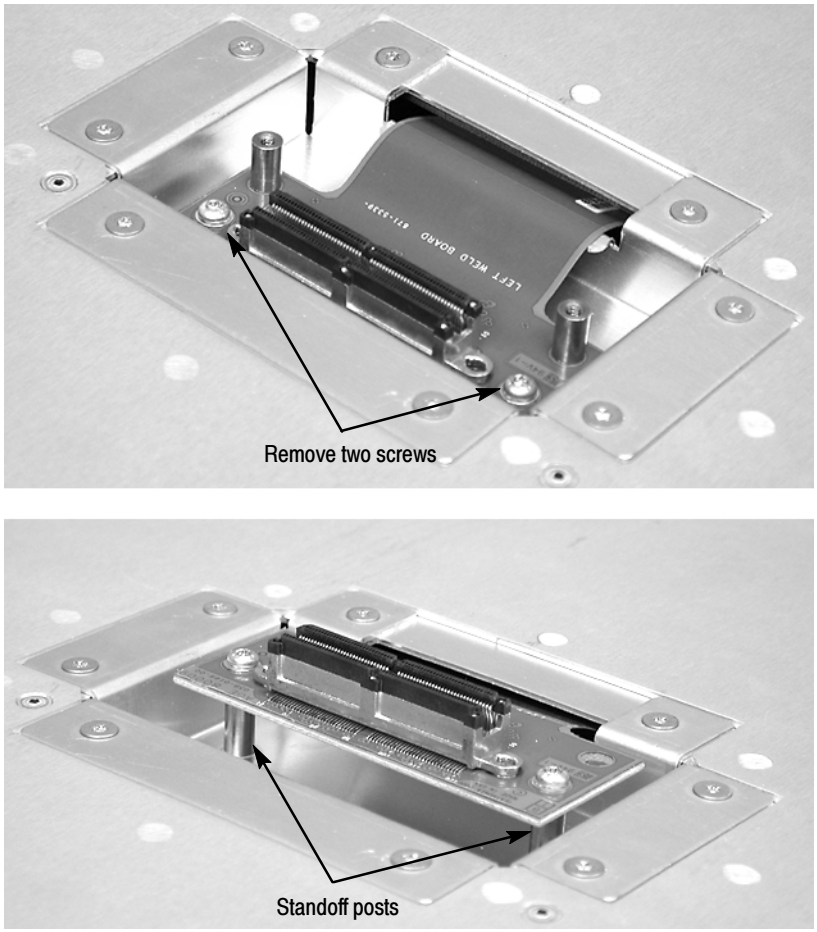


Figure 2- 7: Removing the merge connector assembly from the module

NOTE*. When installing the merged modules into a mainframe, you may need the help of another individual.*

8. Place the first pair of modules to be merged side-by-side such that the merge connector assemblies line up and connect between the two modules.
9. Push the two modules together until the connectors are seated in place.
10. Add any additional modules to the set.

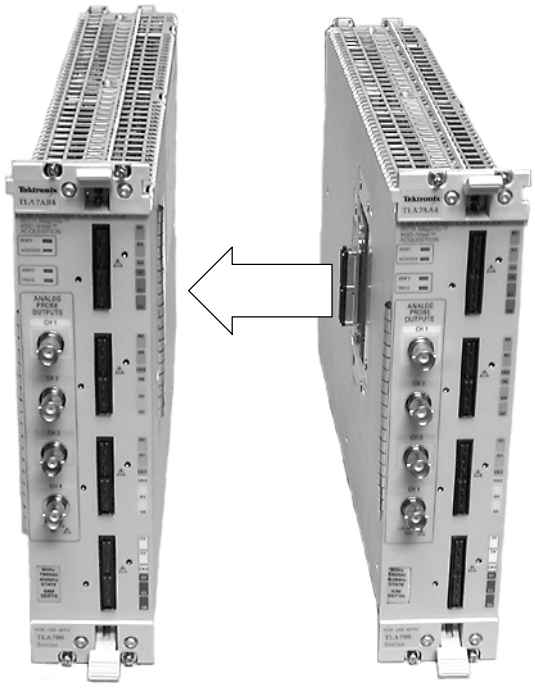


Figure 2- 8: Connecting the logic analyzer modules together

CAUTION. *Ensure that the mainframe is powered down before installing or removing the modules.*

11. Place the merged module set into the mainframe.

12. Align the tops and bottoms of the modules with the slots in the mainframe (see Figure 2–9 on page 2–14). You may need the help of another individual if your merged module set contains more than two modules.

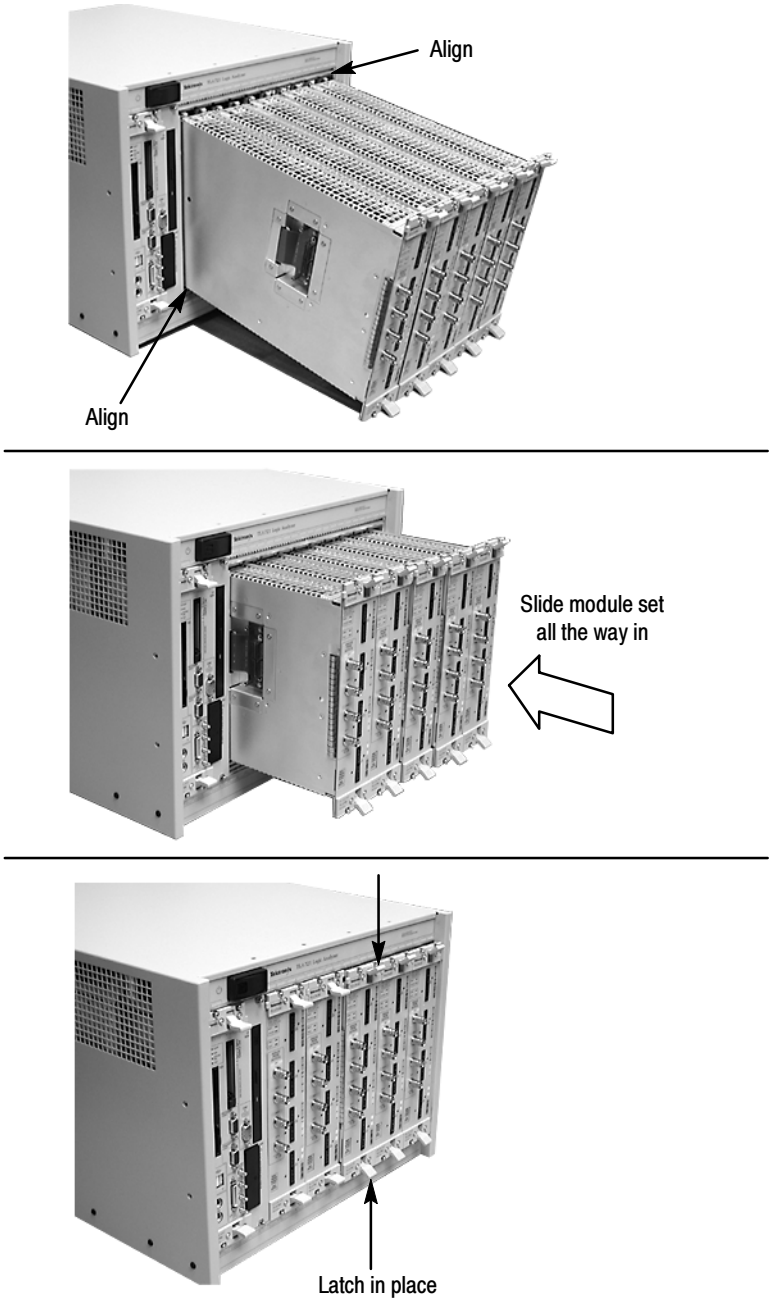


Figure 2- 9: Installing the merged module set in the mainframe

13. Slide the modules all the way into the mainframe until they rest against the rear panel connectors.

14. Use the injector handles to firmly seat the modules in place one at a time and then tighten the hold-down screws on each module. The merge cable assembly should allow enough play between two side-by-side modules.

15. After installing all of the modules, power on the mainframe and complete the merge process listed under the Merged Modules tab in the System Configuration dialog box.

Unmerge Procedure

Although you can unmerge modules from a merged set from within the TLA application without physically separating modules, there will be times when you have to physically unmerge the modules. The following procedures provide the steps for unmerging the modules.

1. Power down the mainframe before removing the modules from the mainframe.

2. Use the ejector handles to disengage each module in the merged module set from the mainframe.

3. With the assistance of another individual, slide all of the merged modules out of the mainframe and place them on a static-free working surface.

4. Gently separate the modules on at a time from the merged module set.

5. Lay the modules on their right sides.

6. Remove the two Torx T-10 screws that hold the merge cable assembly to the module.

7. Place the merge cable assembly into the recessed position.

8. Install the two Torx T-10 screws onto the assembly and tighten the screws to 4 in-lbs.

9. Repeat steps 6 through 8 for the other modules.

You can now reinstall the modules in the mainframe as needed.

Theory of Operation

This chapter describes the general operation of the logic analyzer module. This information is intended to help you isolate faults to the circuit board or probe level. It supplements diagnostic and troubleshooting information presented in the *Troubleshooting* section beginning on page 6–27.

The following *Block Level Description* describes circuit operation to the functional block level. Block diagrams are located in the *Diagrams* chapter beginning on page 9–1.

Block Level Description

The block level description provides an overview of each functional circuit within the logic analyzer module. Except for the number of channels, the basic operation is the same for each individual module and for merged modules.

The basic logic analyzer module consists of two main circuit boards: the Local Processing Unit (LPU) board and the Acquisition board. Each circuit board has two connectors on the rear of the boards that provide connections to the mainframe.

Up to four active probes per module acquire data from the target system and send it to the logic analyzer module for processing. The logic analyzer module can use different types of probes (such as general purpose, high-density, or differential) depending on the user's application.

A single 102-channel or a 136-channel logic analyzer module can be merged with up to five modules to create a two-, three-, four-, or five-module-wide logic analyzer. The 34-channel and 68-channel modules do not support merging.

Local Processor Unit (LPU) Board

The LPU board controls instrument hardware, signal acquisition, power conditioning, and communications functions. A 160-pin connector provides interconnections with the acquisition board for power supplies, data and control signals.

Processor System

The processor system contains a microprocessor that controls the entire instrument. Commands and data sent to the instrument through the mainframe pass through the communications interface, which resides on the bus. The bus also routes data between the main processor system and the acquisition board.

The processor system includes the instrument firmware. To facilitate upgrades, the firmware resides in Flash ROM. The processor system also includes the nonvolatile RAM (NVRAM) used for the calibration constants, module serial numbers, and PowerFlex configuration information.

Communications Interface

The Communications Interface transfers commands and data between the mainframe and the mainframe controller. Signals pass between the logic analyzer module and the mainframe through the rear connectors.

Power Supplies

The onboard power supplies receive +5 V, –5.2 V, ±12 V, and ±24 V from the mainframe through the rear connectors. Voltage converters produce the +2.5 V supply for use on the acquisition board through the 160-pin connector between the LPU and acquisition board.

Acquisition Board

The acquisition board accepts input signals from the probes and converts them to digital information. A 160-pin connector provides interconnections with the LPU board.

Clock Circuitry

The system clock is derived from the 10 MHz clock from the backplane through a phase-locked loop. The acquisition run circuitry is integrated with the clock circuitry to support time correlation.

Probe Interface

The probe interface consists of ASICs that receive data from the probes, compare the data against a threshold, and transfer the digital information to CMOS ASICs via differential outputs. Each ASIC in the probe interface receives 16 data channels and one clock channel. In addition to providing digital signals to the CMOS ASICs, the probe interface ASICs contain outputs for the Analog output signals.

Analog Output Interface

The acquisition board for the TLA7Axx logic analyzer modules has four SMA connectors that connect to the four BNC connectors on the front panel. The software (via the user interface) determines which signals will be sent to the four Analog output connectors. Regardless of the number of channels in the module, there will always be four signals available to route to the Analog output connectors.

Power Supplies

Voltage converters produce the +3.3 V supply on the acquisition board and the ±3 V supplies for the active probes.

Trigger and Storage Control Circuitry

Clocking and triggering is controlled by a single ASIC. This ASIC determines when acquisition data should be sampled based on the clock information and qualifier information. The ASIC also contains 16 Event resources for the purposes of word recognition, range recognition, and other trigger functions. In merged configuration, the ASIC communicates information between modules to ensure proper triggering.

Acquisition Memory

The acquisition memory stores acquired data. The memory can be set up to store all data samples, or it can be split to store data samples and either glitch information or setup and hold violation information.

When the memory is split, only half the memory depth is available and can only run at half the speed. Every stored data sample takes up two memory locations, one to hold the actual data sample and the other to hold the corresponding glitch information or the setup and hold information.

Glitch storage is only enabled with asynchronous clocking while setup and hold storage is only enabled with synchronous clocking.

The trigger machine can trigger on either glitches or setup and hold violations without storing information. This allows the user to trigger on a glitch or on a setup and hold violation at maximum speed and maximum memory depth.

Backplane Interface

The backplane interface provides the interface with the mainframe and the acquisition board. This interface contains intermodule signals that communicate to other modules in the logic analyzer mainframe. The interface also provides the 10 MHz reference clock for the clocking circuitry.

Probes

The logic analyzer module connects to the target system through 34-channel probes (32 data channels and two clock/qualifier channels). Depending on the number of channels in the logic analyzer module, you can connect up to four logic analyzer probes to the module.

Currently six different types of active probes are supported for the logic analyzer module:

- P6810 34-channel general purpose probe
- P6860 34-channel high-density single-ended probe
- P6864 17-channel high-density 4X single-ended probe
- P6880 34-channel high-density differential probe
- P6960 34-channel high-density single-ended probe with D-Max probing technology
- P6980 34-channel high-density differential probe with D-Max probing technology

The high-density probes connect directly to the circuit boards in the target system. The probe connections are footprints designed on the circuit boards. The footprints eliminate the need for additional electro-mechanical parts for probe connectors.

The general purpose probes have lead sets that connect to several general-purpose connectors on the target system.

Detailed information on the probes is available in the *P68xx Logic Analyzer Probe Instruction Manual* and the *P69xx Logic Analyzer Probe Instruction Manual.*

Merged Modules

A merged module consists of a Master module and one or more Slave modules connected together by a merge cable connector. Each module has its own merge cable connectors. The local bus sends the system clock of the Master module to the Slave modules. The merged modules must be located in adjacent slots.

The merge connector passes 48 signals between adjacent modules excluding the system clock. These signals consist of 16 trigger event signals, two storage control signals, 26 clock sample/control signals, and four data-login control signals.

Memory Erasure

To clear the volatile memory from the module you must turn the power off for at least 20 seconds. NVRAM does not contain any acquisition data; it only contains calibration constraints.

Performance Verification

This chapter contains procedures for functional verification. It is recommended that you check the electrical performance and certify the logic analyzer accuracy once a year or following repairs that affect certification. For TLA7Axx/ TLA7NAx modules, this service must be performed by a qualified Tektronix Service Center technician. See *Service Options* on page 7–3 for more information.

Functional Verification

Functional verification procedures verify the basic functionality of the instrument inputs, outputs, and basic instrument actions. These procedures include power-on diagnostics, extended diagnostics, and manual check procedures. You can use these procedures for incoming inspection purposes.

If any check within this section fails, refer to the Troubleshooting section in the *Maintenance* chapter of this manual for assistance. Failed tests indicate the instrument needs to be serviced.

The functional verification procedure consists of the following parts:

- Module self tests and power-on diagnostics
- Extended diagnostics
- Probe functional verification

This procedure provides a functional check only. If more detailed testing is required, refer to *Service Options* on page 7–3 to have Tektronix Service perform the Performance Verification Procedures.

Perform these tests whenever you need to gain confidence that the instrument is operating properly.

Test Equipment

You will need the following equipment to complete the functional verification procedure:

- TLA700 Series logic analyzer mainframe with one logic analyzer module installed (more modules are required to check the merged functionality)
- At least one logic analyzer probe

Setup

It is assumed that the logic analyzer module is properly installed in the mainframe. Refer to *Module Installation* on page 2–2 for module installation instructions.

Power on the logic analyzer mainframe and allow a 30-minute warm-up period before continuing with any procedures in this section.

Module Self Tests and Power-On Diagnostics

During power-on, the installed modules perform an internal self test to verify basic functionality. No external test equipment is required. The self tests require only a few seconds per module to complete. The front-panel ARM'D and TRIG'D indicators blink during the self test. After testing completes, the front panel indicators have the following states:

- READY — Green (on)
- ACCESSED — off
- ARM'D — off
- TRIG'D — off

Next, the power-on diagnostics are run. If any self tests or power-on diagnostics fail, the instrument displays the Calibration and Diagnostics property sheet.

***NOTE**. If any diagnostics fail, you may need to run the self calibration before attempting to service the logic analyzer module. This may be especially true after you install the logic analyzer module in the mainframe for the first time. The Self Calibration procedure is listed under* Self Calibration *beginning on page 5–1.*

Logic Analyzer Module Functional Verification Procedure

The following procedure checks the basic functionality of the logic analyzer module. You can perform this procedure with individual modules or with merged modules. Functional verification consists of running the extended diagnostics.

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

Perform the following steps to complete the functional verification procedures:

1. Disconnect any probes connected to the logic analyzer module.
2. In the logic analyzer application, go to the System menu and select Calibration and Diagnostics.
3. Click the Extended Diagnostics tab.
4. Select the top level test and click the Run button.

   The diagnostics will perform each one of the tests listed in the menu under the module selection. All tests that displayed an Unknown status will change to a Pass or Fail status depending on the outcome of the tests.
5. Scroll through the test results and verify all tests pass.

***NOTE**. If the extended diagnostics fail, run the self calibration procedures as described under* Self Calibration *beginning on page 5-1 for the logic analyzer module under test and then rerun the extended diagnostics.*

Probe Functional Verification

To perform a functional test on your logic analyzer probes, use a NEX-PROBETESTER2 from Nexus Technology. Follow the procedure listed for a functional test in the NEX-PROBETESTER2 manual. For more information, see the Nexus Technology Web site at www.busboards.com.

To have Tektronix service perform the performance verification procedures, which will verify that the logic analyzer and the attached probes meet or exceed the advertised specifications, refer to *Service Options* on page 7-3.

Adjustment Procedures

This chapter contains procedures for self calibration. Adjustments must be performed when performance verification tests have failed. Adjustments must also be made following replacement of any circuit board in the logic analyzer module. For TLA7Axx/TLA7NAx modules, adjustments must be performed by a qualified Tektronix Service Center technician. See *Service Options* on page 7-3 for more information.

Self Calibration

Self calibration is an internal routine that optimizes performance at the current ambient temperature to maximize measurement accuracy. No external equipment or user actions are needed to complete the procedure. The logic analyzer module saves data generated by the self calibration in nonvolatile memory. Passing self calibration provides a higher level of confidence of module functionality.

***NOTE**. Performing the self calibration does not guarantee that all parameters operate within limits. Operation within limits is achieved by performing the adjustment procedures. Verification of operation within limits is accomplished by performing the performance verification procedures.*

You can run the self calibration at any time during normal operation. To maintain measurement accuracy, perform the self calibration if the following conditions occur:

- After repair and replacement of any circuit board.
- It has been a year since the last self calibration was run.

To perform the self calibration procedure, do the following:

1. Ensure that the instrument has had a 30-minute warm up before attempting the self calibration, and that the logic analyzer application is running.
2. Disconnect any probes connected to the logic analyzer module.
3. Select Calibration and Diagnostics from the System menu.
4. Select the Self Calibration tab page.
5. Select the logic analyzer module.
6. Click the Run button to start the self calibration.

   The self calibration takes several minutes to complete, depending on the number of channels in the module. Upon successfully completing the self calibration, the module status changes from Running to Calibrated, and the Date and Time field is set to the present.

Maintenance

This chapter contains the information needed for periodic and corrective maintenance of the Logic Analyzer Modules. The following sections are included.

- This *Maintenance* section provides general information on preventing damage to internal circuit boards when doing maintenance, procedures for inspecting the logic analyzer module, and cleaning external and internal circuit boards.
- The *Removal and Installation Procedures* (page 6–11) provide procedures for removing and installing circuit boards and other common replaceable parts.
- *Troubleshooting* (page 6–27) provides information for isolating faulty circuit boards, probes, and other faults.
- *Repackaging Instructions* (page 6–41) provides packaging information for shipment or storage.

Related Maintenance Procedures

The *TLA7UP Mainframe Field Upgrade Instruction Manual* contains some maintenance procedures not included in this manual. Refer to the *TLA7UP Mainframe Field Upgrade Instruction Manual* for information on upgrading the mainframe software or module firmware.

Preventing Electrostatic Discharge

When performing any service that requires internal access to the logic analyzer module, adhere to the following precautions to avoid damaging internal modules and their components due to electrostatic discharge (ESD).



CAUTION. *Static discharge can damage any semiconductor component.*

- Minimize handling of static-sensitive modules.
- Transport and store static-sensitive modules in their static protected containers. Label any package that contains static-sensitive modules.
- Wear a grounded antistatic wrist strap while handling these modules. Service static-sensitive modules only at a static-free work station.

- Nothing capable of generating or holding a static charge should be allowed on the work surface.
- Handle circuit boards by the edges when possible.
- Do not slide the modules over any surface.
- Avoid handling the modules in areas that have a floor or work surface capable of generating a static charge.

Inspection and Cleaning

Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent malfunctions and enhance reliability.

Preventive maintenance consists of visually inspecting and cleaning the instrument, and using general care when operating it. How often to perform maintenance depends on the severity of the environment in which the instrument is used. A proper time to perform preventive maintenance is just before having performance verification procedures performed or as an incoming inspection.

General Care

The side cover keeps dust out of the instrument and should be in place during normal operation.

Inspection and Cleaning Procedures

Inspect and clean the instrument as often as operating conditions require. Collection of dirt on internal components can cause them to overheat and breakdown. Dirt acts as an insulating blanket, preventing efficient heat dissipation. Dirt also provides an electrical conduction path that can cause failures, especially under high-humidity conditions.



CAUTION. *Avoid using chemical cleaning agents that might damage the plastics and external labels used in the instrument.*

Use a cloth dampened with water to clean external surfaces. To prevent damage to electrical components from moisture during external cleaning, use only enough liquid to dampen the cloth or applicator.

Use a 75% isopropyl alcohol solution to clean internal surfaces and rinse with deionized water. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

Exterior Inspection

Inspect the outside of the instrument for damage, wear, and missing parts. Use Table 6–1 as a guide. Instruments that appear to have been dropped or otherwise abused should be checked thoroughly to verify correct operation and performance.

Immediately repair defects that can cause personal injury or lead to further damage to the logic analyzer module or mainframe where it is used.

Table 6-1: External inspection check list

Item	Inspect for	Repair action
Front panel and side cover	Cracks, scratches, deformations, missing or damaged retainer screws, ejector handles, or EMI shields.	Replace defective or missing mechanical parts.
Front panel connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Replace defective parts or clean parts based on the cleaning procedures.
Rear connectors	Cracked or broken shells, damaged or missing contacts. Dirt in connectors.	Replace defective parts or clean parts based on the cleaning procedures.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors.	Replace damaged or missing items, frayed cables, and defective modules.

Exterior Cleaning Procedure

To clean the exterior, perform the following steps:

1. Remove loose dust on the outside of the logic analyzer module with a lint free cloth.
2. Remove remaining dirt with a lint-free cloth or applicator and water, using only enough liquid to dampen the cloth or applicator. Do not use abrasive cleaners.

Interior Inspection

Inspect the internal portions of the logic analyzer module for damage and wear using Table 6–2 as a guide. When found, defects should be repaired immediately. If you must replace an internal component, refer to the *Removal and Installation Procedures*, later in this chapter, for detailed removal and replacement instructions.



CAUTION. *Do not attempt to repair any circuit boards with a soldering iron. Most of the internal components are surface mounted devices. Using a soldering iron can damage the surface-mounted components and internal circuit boards. Refer the replacement of surface-mounted components to qualified service personnel with the appropriate tools.*

Table 6-2: Internal inspection checklist

Item	Inspect for	Repair action
Circuit boards	Loose, broken, or corroded connections. Burned circuit boards. Burned, broken, or cracked circuit-run plating.	Remove failed circuit board and replace with a new one.
Resistors	Burned, cracked, broken, blistered condition.	Remove failed circuit board and replace with a new one.
Capacitors	Damaged or leaking cases. Corroded solder on leads or terminals.	Remove failed circuit board and replace with a new one.
Semiconductors	Damaged parts or distorted pins.	Replace circuit board if parts are damaged.
Wiring and cables	Loose plugs or connectors. Burned, broken, or frayed wiring.	Firmly seat connectors. Repair or replace circuit boards with defective wires or cables.



CAUTION. *To prevent damage from electrical arcing, ensure that circuit boards and components are dry before applying power to the logic analyzer module.*

Interior Cleaning Procedure

To clean the interior, perform the following steps:

1. Blow off dust with dry, low-pressure, deionized air (approximately 9 psi).
2. Remove any remaining dust with a lint free cloth dampened in isopropyl alcohol (75% solution) and rinse with warm deionized water. (A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards.)

***NOTE**. If, after performing steps 1 and 2, a module is clean upon inspection, skip the remaining steps. If steps 1 and 2 do not remove all the dust or dirt, the module may be spray washed using a solution of 75% isopropyl alcohol (see steps 3 through 7).*

3. Gain access to the parts to be cleaned by removing easily accessible shields and panels (see *Removal and Installation Procedures* on page 6–11).
4. Spray wash dirty parts with the isopropyl alcohol and wait 60 seconds for the majority of the alcohol to evaporate.
5. Use warm (48.9 °C to 60 °C / 120 °F to 140 °F) deionized water to thoroughly rinse the parts.
6. Dry all parts with low-pressure, deionized air.
7. Dry all components and assemblies in an oven or drying compartment using low-temperature (51.7 °C to 65.6 °C / 125 °F to 150 °F) circulating air.

Cleaning the Probes

To clean the exterior surfaces of the probes, remove dirt and dust with a soft brush. For more extensive cleaning, use only a damp cloth. Never use abrasive cleaners or organic solvents



***CAUTION.** Static discharge can damage any semiconductor component in the probe head. Always wear a grounded antistatic wrist strap whenever handling the probe head. Also verify that anything to which the probe head is connected does not carry a static charge.*

***NOTE**. Never clean the elastomers. Always replace them instead. Refer to the* P68XX Series Logic Analyzer Probe Instruction Manual *for information on replacing the probe elastomers and other probe accessories.*

Cleaning the P6864, P6880, P6960, and P6980 Compression Footprints



CAUTION. *To avoid electrical damage, always turn off the power of your target system before cleaning the compression footprint.*

Prior to connecting the probe to the target system, the compression footprints on the target system must be properly cleaned. Clean the compression footprints according to the following steps:

1. Use a lint-free cloth moistened with isopropyl alcohol and gently wipe the footprint surface.
2. Remove any remaining lint using a nitrogen air gun.

NOTE*. Use alcohol sparingly and be sure that you have removed any remaining lint or residue with the nitrogen air gun.*

Cleaning the P6864, and P6880 Probe Heads

Before connecting the P6864 or P6880 probes to the target system, ensure that the probe heads are free from dust, dirt, and contaminants. If necessary, clean the probe heads according to the following steps.



CAUTION. *Static discharge can damage semiconductor components in the probe head. Always wear a grounded antistatic wrist strap whenever handling the probe head. Also verify that anything to which the probe head is connected does not carry a static charge.*

NOTE*. Never clean the elastomers. Always replace them instead. Refer to the* Operating Basics *chapter of the* P68XX Series Logic Analyzer Probe Instruction Manual *for information on replacing elastomers.*

1. Remove elastomer holder (see Figure 6–1).
2. Moisten a cotton swab with isopropyl alcohol.

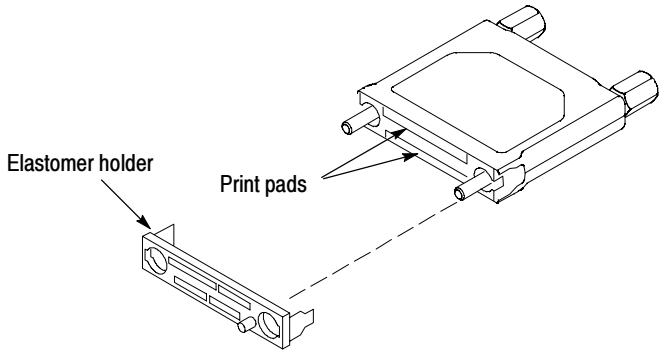


Figure 6-1: Cleaning the probe heads

3. Gently wipe the edge print pads of the hybrid.
4. Remove any remaining lint using a nitrogen air gun.
5. Put the elastomer holder back in place.

CAUTION. *Do not touch the elastomers to avoid damaging the probe contacts.*

Cleaning the P69xx Probe Heads

To maintain a reliable electrical contact, keep the probes free from dirt, dust, and contaminants. Remove dirt and dust with a soft brush. Avoid brushing or rubbing the c-spring contacts. For more extensive cleaning, use only a damp cloth. Never use abrasive cleaners or organic solvents.

CAUTION. *Static discharge can damage semiconductor components in the probe head. Always wear a grounded antistatic wrist strap whenever handling the probe head. Also verify that anything to which the probe head is connected does not carry a static charge.*

CAUTION. *To prevent damage during the probe connection process, do not touch the exposed edge of the interface clip. Do not drag the contacts against a hard edge or corner.*

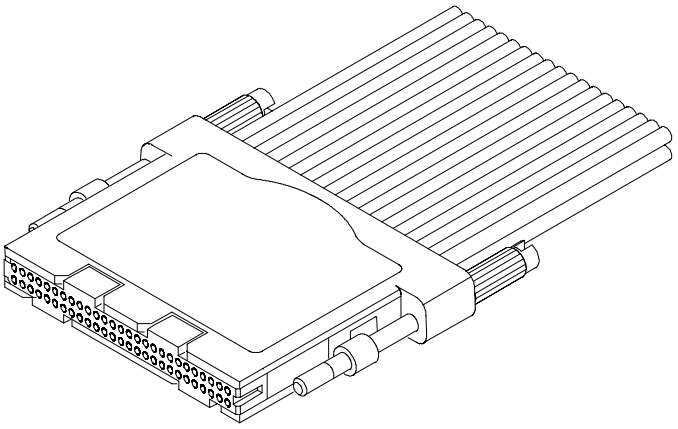


Figure 6- 2: Cleaning the P69xx probe heads

Storing the P68xx Probe Heads

To protect the elastomer, it is important to properly store the probe heads when the probes are not in use. See Figure 6-3.

1. Locate the keying pin on the probe end and align it to the keying pin hole on the nutbar.
2. While holding the probe end at a perpendicular angle to the nutbar, finger-tighten both probe head screws until snug (no more than 1 in-lbs of torque).

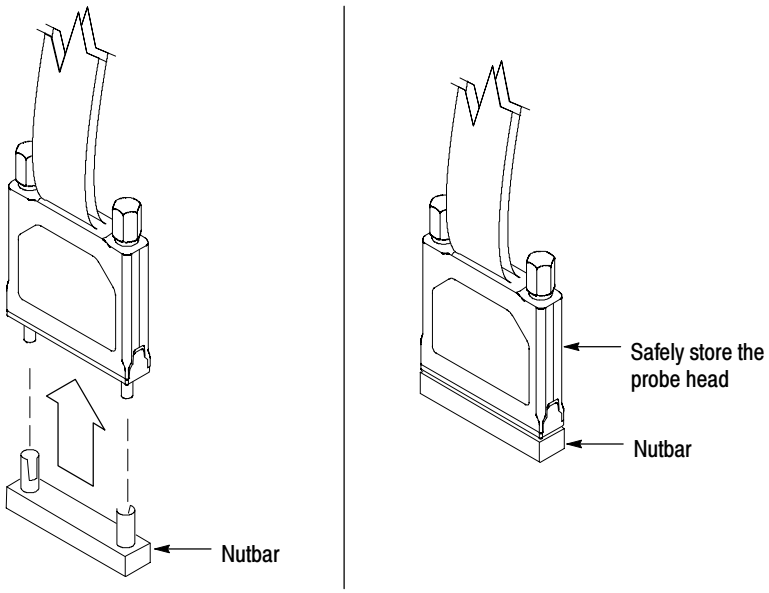


Figure 6-3: Storing the probe head

Storing the P69xx Probe Heads

To protect the probe head, when the probes are not in use place the probe head cover on the probe. See Figure 6–4.

1. Gently slide the probe cover over the probe end.

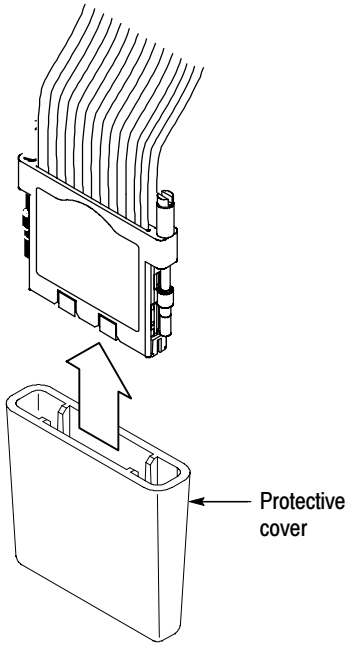


Figure 6- 4: Storing the P69xx probe heads

Removal and Installation Procedures

This section describes how to remove and install the major mechanical and electrical modules. The procedures in this section assume that you already have removed the module from the mainframe.



WARNING. *Before doing any procedures in this manual, read the* General Safety Summary *and* Service Safety Summary *found at the beginning of this manual.*

To prevent possible injury to service personnel or damage to electrical components, read Preventing Electrostatic Discharge *on page 6–1.*

Tools Required

Table 6–3 lists the tools needed to replace the internal components of the logic analyzer module.

Table 6-3: Tools required for circuit board replacement

Name	Description
Screwdriver with a T-9 and a T-10 Torx tip	Standard tool
1/4-inch nut driver	Standard tool
9/16-inch nut driver	Standard tool
Needle-nose pliers	Standard tool

Torque Requirements

Tighten all T-9 and T-10 screws to 4 in. lbs. Tighten standoff posts to 8 in. lbs.

Injector/Ejector Handles

You will need a screwdriver with a T-10 tip to complete the following procedures.

Removal

Use the following procedure to remove the injector/ejector handles:

1. Place the module on the right side (see Figure 6–5).
2. Remove the two screws that secure the injector/ejector handle to the chassis.
3. Remove the injector/ejector handle from the module.

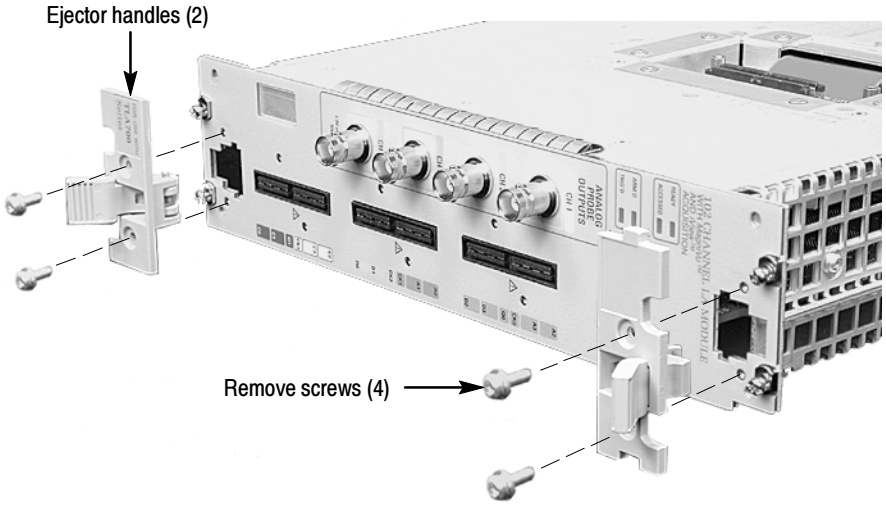


Figure 6- 5: Injector/ejector handle replacement

Installation

Use the following procedure and Figure 6–5 to install the injector/ejector handles:

***NOTE**. The top and bottom injector/ejector handles are not interchangeable. The top injector/ejector handle assembly has a notch on right side and a tab on the left side; the bottom injector/ejector handle assembly does not have a notch or a tab.*

1. Install the injector/ejector handle through the front panel cutout onto the mounting post.
2. Install the screws to secure the injector/ejector handle to the chassis.
3. Apply the proper replacement label (see the *Replaceable Mechanical Parts List* for label part numbers if necessary).

Covers

You will need a screwdriver with a T-9 and a T-10 tip to complete the following procedures.

Removal

Use the following procedure and Figures 6–6 and 6–7 to remove the covers:

1. Place the module on the right side.
2. Remove the two screws on the rear of the chassis and the two rear screws, located on either side of the rear panel, that secure the rear panel to the chassis.
3. Remove the rear panel and set it aside.
4. Remove the two top screws and the two bottom screws that secure the cover to the chassis.
5. If you have a 102-channel module or a 136-channel module with a merge cable, complete to following steps (refer to Figure 6–6 as necessary):
   a. Remove the eight T-9 countersunk screws holding the bracket to the cover.
   b. Lift the assembly out of the cover and then reach into the hole and disconnect the merge cable from the circuit board.
6. Slide the cover back to disengage the tab and lift the cover from the chassis.

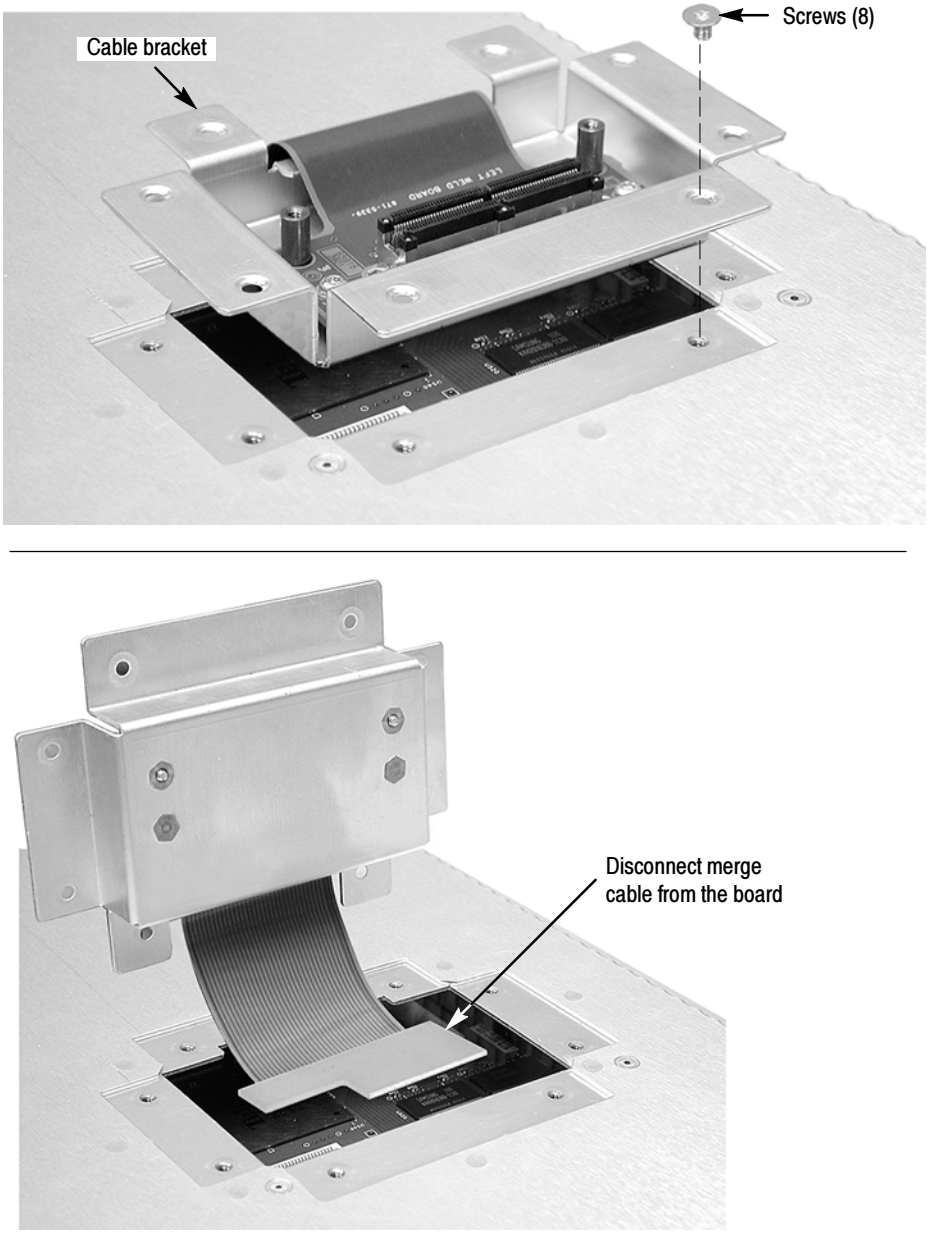


Figure 6- 6: Removing the merge cable bracket from the cover

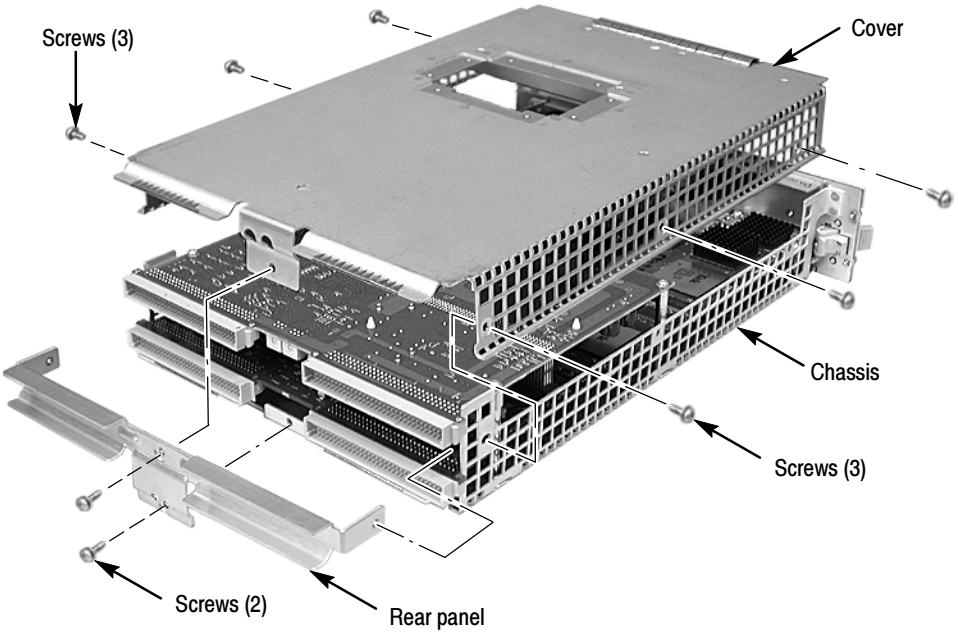


Figure 6-7: Cover removal

Installation

Use the following procedure and Figure 6–6 through Figure 6–9 to install the covers:

***NOTE**. Install the cover tightly against the chassis. This will ensure that the module fits into adjacent slots in the mainframe.*

1. Place the module on its right side.

***CAUTION.** To prevent damage to the module during the installation process, reinstall the cover exactly as described in steps 2 through 8.*

If the cover is not properly seated, the module can be damaged when you install it in a mainframe.

2. Insert the cover at an angle (step 1 in Figure 6–8) such that the front edge of the cover engages with the EMI gaskets on the back of the front panel. Then push the rear of the cover in place (step 2 Figure 6–8).

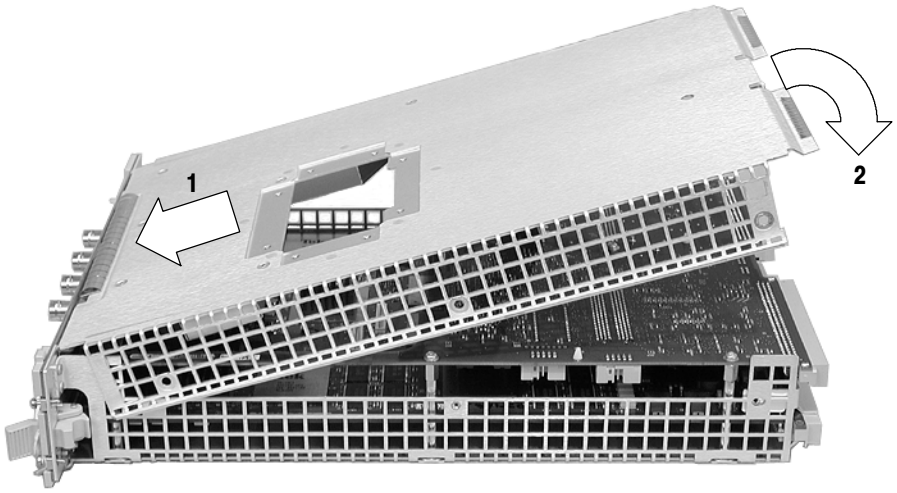


Figure 6- 8: Installing the cover onto the chassis

3. Make sure that the cover is fully seated (no gaps) against the front and rear chassis flanges (see Figure 6–9).
4. While holding the cover in place, install the four T-10 Torx-drive screws nearest the front of the module (two on each side of the cover), to secure the cover to the chassis.
5. Slide the rear panel on the chassis and install the two rear panel T-10 Torx-drive screws.
6. Gently squeeze the chassis flange and rear panels flange together while tightening the screws on the sides. This ensures that the rear panel does not rotate, otherwise the module may not seat properly when installed in the mainframe.
7. Install the two remaining T-10 Torx-drive screws nearest the rear of the module (one on each side of the cover).
8. Place the cover onto the chassis.
9. If your instrument has a merge cable, complete the following steps to install the merge cable assembly:
   a. Feed the merge cable through the cover.
   b. Carefully connect the merge cable to the circuit board (refer to Figure 6–6 on page 6–14 as necessary).
   c. Insert the bracket assembly into the hole in the cover.
   d. Install the eight T-9 countersunk screws on the bracket.

10. Check and tighten all screws to 4 in lbs.

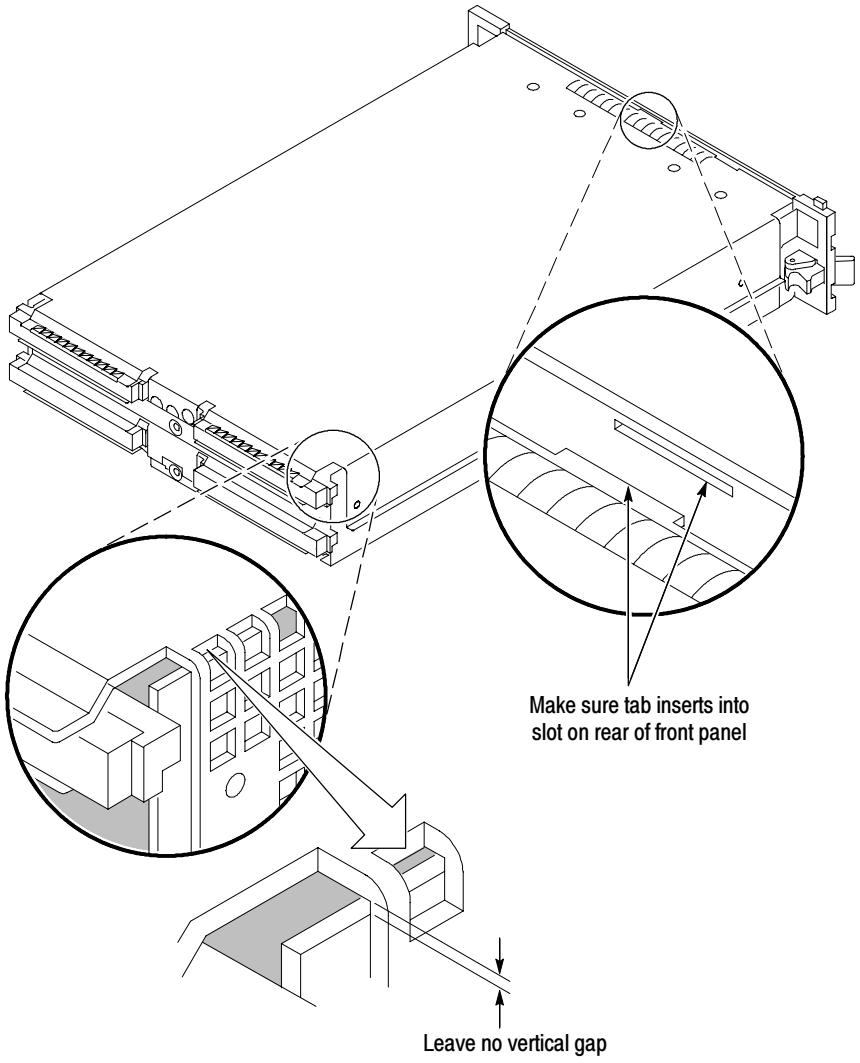


Figure 6- 9: Seating the cover on the chassis

Local Processor Unit Board

You will need a screwdriver with a T-10 tip to complete the following procedures.

***NOTE**. When placing an order for a replacement LPU board or an LPU exchange board from the Tektronix Exchange Center, you must supply the model number, serial number, PowerFlex Option upgrade number and firmware level.*

Removal

Use the following procedure and Figure 6–10 to remove the LPU board:

1. Perform the *Covers* removal procedure (see page 6–13).
2. Remove the five T-10 Torx-drive screws that secure the LPU board to the chassis.



***CAUTION.** Handle the LPU board gently to avoid breaking the front panel LED extension.*

3. Carefully lift the LPU board up from the chassis to disengage the 160-pin connecter from the acquisition board.
4. Move the LPU board away from the front panel until the tabs (Figure 6–10) clear the front subpanel and then remove the LPU board from the chassis.

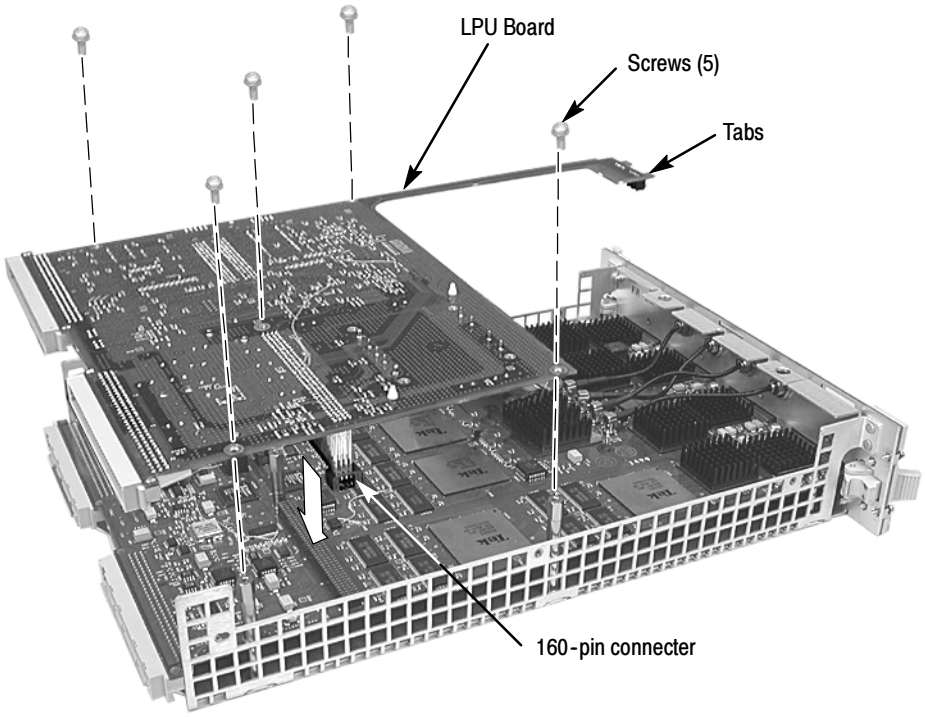


Figure 6-10: LPU board removal

Installation

Use the following procedure and Figure 6–10 and Figure 6–11 to install the LPU board:

1. Place the LPU board (component side down) over the chassis and insert the tabs on the LPU board into the front subpanel as shown in Figure 6–11.
2. Line up the pins on the 160-pin connector from the LPU board to the acquisition board and gently press the LPU board in place.
3. Install the five T-10 Torx-drive screws that secure the LPU board to the chassis.
4. Perform the *Covers* installation procedure (see page 6–15).

***NOTE**. After replacing the LPU board, you must verify the proper PowerFlex level. The PowerFlex configuration information is listed on the side panel of the logic analyzer module. This information should match the module specific information on the System Properties tab in the TLA application.*

If the PowerFlex level does not match the information on the side panel label, you must return the entire logic analyzer module to your local Tektronix service center.

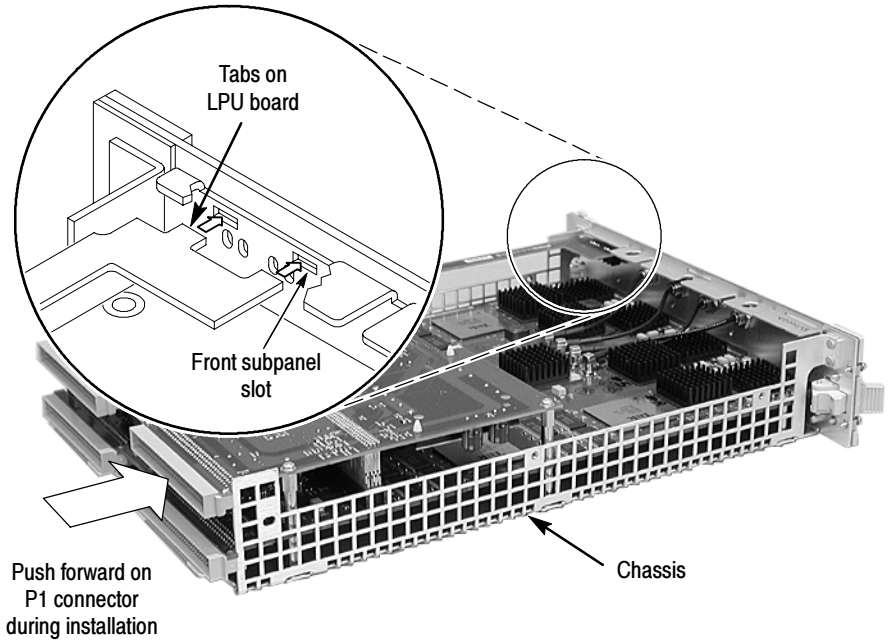


Figure 6-11: Inserting LPU board tabs into front subpanel

Acquisition Board

You will need a $^1/_4$ inch nut driver in addition to the T-10 Torx tip screwdriver to complete the following procedures.

Removal

Use the following procedure and Figure 6–14 to remove the acquisition board:

1. Perform the *Covers* removal procedure (see page 6–13).
2. Perform the *Local Processor Unit Board* removal procedure (see page 6–18).

***NOTE**. The 34-channel and 68-channel modules do not have a left side or right side merge cable. For these modules, ignore the steps dealing with the merge cable.*

3. Complete the following steps while referring to Figure 6–12 and Figure 6–13 on page 6–22 to remove the merge cable assembly:
   a. Turn the chassis over and remove the two T-10 screws from the merge cable assembly bracket as shown in Figure 6–12.

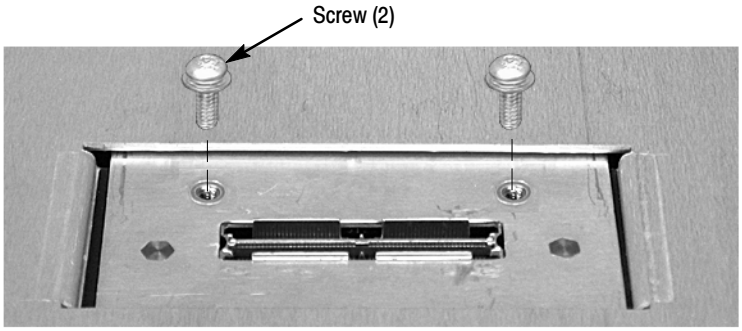


Figure 6- 12: Remove the single screw from the merge cable bracket

   b. Carefully slide the bracket back underneath the cover until you can grasp the edge as shown in Figure 6–13.
   c. Lift the merge cable assembly bracket out of the hole being careful not to damage the assembly.
   d. Disconnect the merge cable from the acquisition board and set the assembly aside.

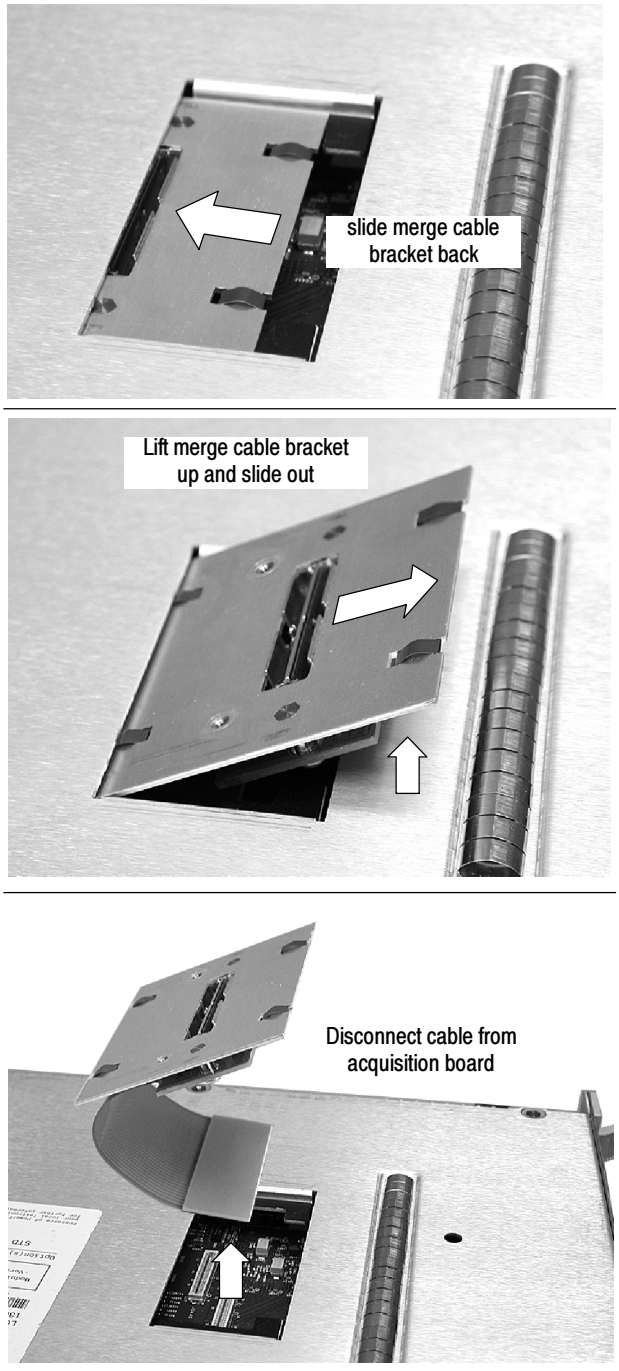


Figure 6- 13: Removing the merge cable assembly

4. Turn the chassis over and then remove the five spacer posts with the $^1/_4$ nut driver from the acquisition board.
5. For TLA7Axx modules, disconnect the four analog output cables on the acquisition board. For TLA7NAx modules skip this step.
6. Remove the five T-10 screws from the acquisition board located near the front of the chassis.

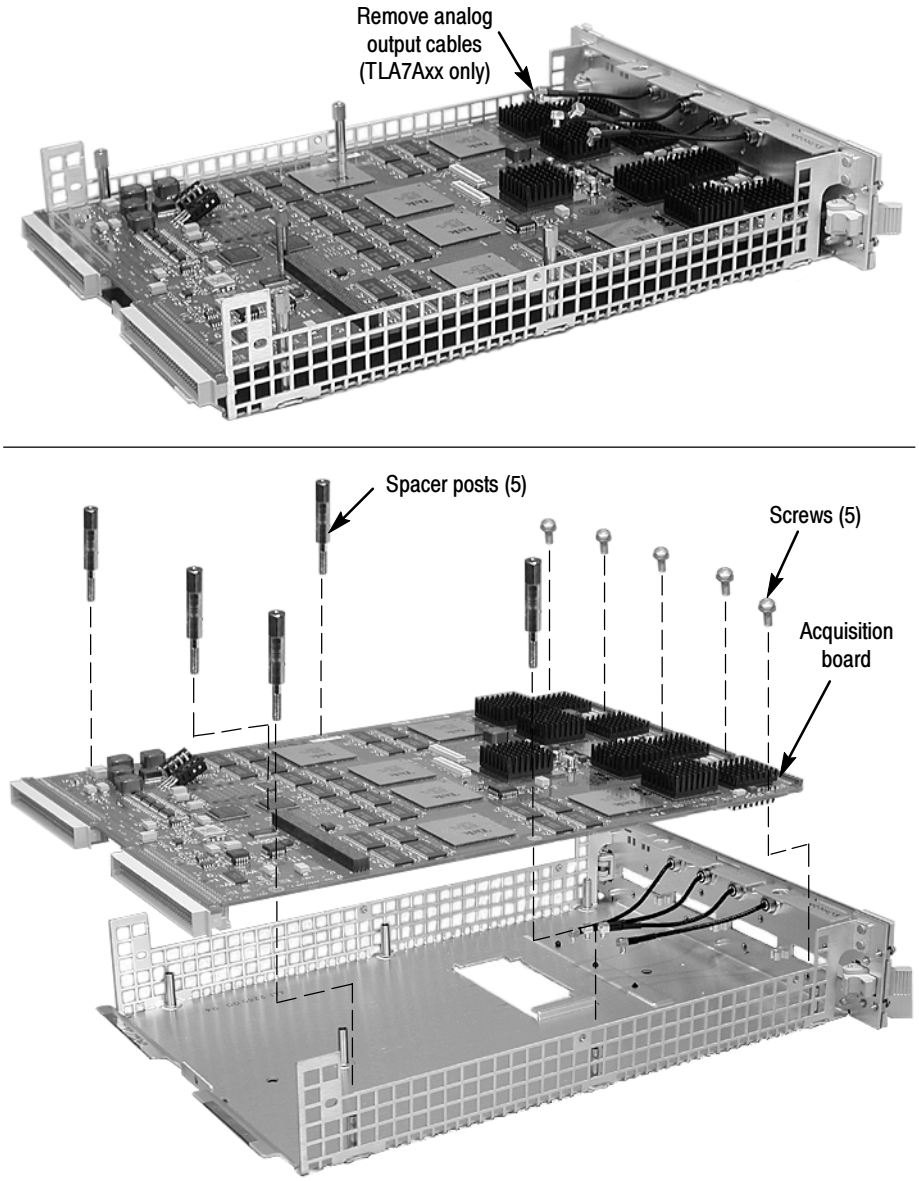


Figure 6- 14: Removing the acquisition board from the chassis

7. Carefully slide the acquisition board away from the front panel until the probe connectors clear the front panel. Then lift the circuit board out of the chassis.

Installation

Use the following procedure to install the acquisition board:

1. Place the acquisition board into the chassis.
2. Carefully slide the acquisition board into the chassis until the probe connectors fit snuggly into the front panel slots.
3. Install five T-10 screws on the acquisition board at the front of the chassis.
4. Install the five spacer posts that secure the acquisition board to the chassis.
5. For TLA7Axx modules, connect the four analog output cables from the front panel to the acquisition board. For TLA7NAx modules, skip this step.
6. Complete the following steps to install the merge cable assembly (skip these steps if your instrument does not have a merge cable assembly):
   a. Turn the chassis over.
   b. Feed the merge cable into the hole and connect it to the circuit board (refer to Figure 6–13 on page 6–22 if necessary).
   c. Carefully slide the merge cable assembly into the hole.
   d. Slide the bracket forward and install the tow T-10 screws to hold the bracket in place.
7. Perform the *Local Processor Unit Board* installation procedure (see page 6–19).
8. Perform the *Covers* installation procedure (see page 6–15).

Fuses

There are no user-replaceable parts on any of the circuit boards. If you suspect that an open fuse exists, there is no easy way of determining the cause of the open fuse. Most of the fuses are surface mounted and attempting to change the fuses with improper tools will result in damaging the circuit boards beyond repair. You should return the circuit board to you local Tektronix service center for corrective action.

Front and Rear EMI Gaskets

Removal

Use the following procedure to remove the front and rear EMI gaskets:

1. Perform the *Cover* removal procedure (see page 6–13).
2. For the front EMI gaskets:
   a. Locate the gasket to be replaced.
   b. Lift the gasket fingers and rotate the gasket off.
3. For the two rear gaskets on the chassis
   a. Perform the *Local Processor Unit Board* removal procedure (page 6–18), and the *Acquisition Board* removal procedure (page 6–21).
   b. Lift the gasket fingers and rotate the gasket off (see Figure 6–15).

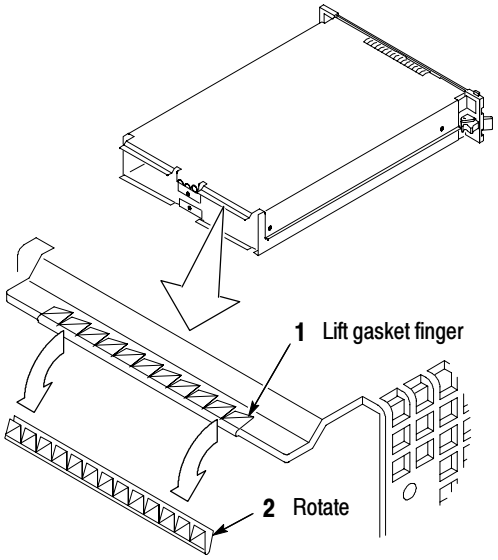


Figure 6-15: Rear EMI gasket removal

Installation

Use the following procedure and Figure 6-16 to install the EMI gaskets:

1. Position each gasket so the gasket fingers face the outside of the module.



CAUTION. *To avoid breaking the gasket fingers, do not lift the fingers too high.*

2. Pick up each gasket at the end where the gasket finger is formed up. Then rotate the gasket on. As you do this, lift up any fingers that bind to the chassis or cover.
3. Slide each gasket gently from side to side to ensure that the gasket snaps in place.

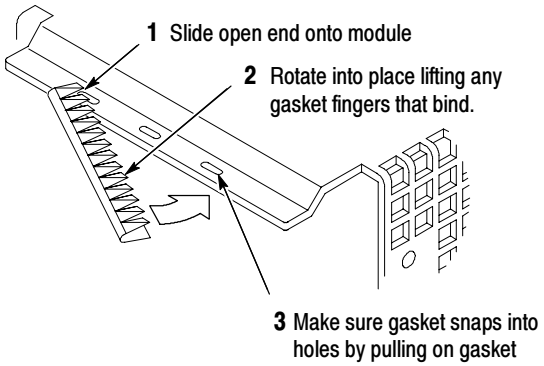


Figure 6-16: Rear EMI gasket replacement

4. Reinstall the Acquisition board and the LPU board if you removed them to install the rear EMI gaskets (see pages 6-19 and 6-24).
5. Install the module covers. (see page 6-15).

Side EMI Gaskets

To remove the side EMI gaskets, remove the covers and circuit boards as necessary to access the EMI gaskets (refer to Figure 10-1 on page 10-4 for the gasket locations). Pop the EMI gaskets out of the cover.

To install the side EMI gaskets, pop them into place on the covers.

Troubleshooting



WARNING. *Before performing this or any other procedure in this manual, read the* General Safety Summary *and* Service Safety Summary *found at the beginning of this manual. Also, to prevent possible injury or damage to electrical components, read* Preventing Electrostatic Discharge *on page 6–1.*

This section contains information and procedures designed to help isolate faults to within the logic analyzer module. The process is as follows:

1. Review *Check for Common Problems*, beginning on page 6–28, to eliminate easy to find problems.
2. Perform procedures outlined in *Eliminate Other Problem Sources*, beginning on page 6–30, to eliminate the mainframe, probes, and other modules as the source of the fault(s).
3. Perform the *Troubleshoot the Logic Analyzer Module* procedure, beginning on page 6–31, to identify the failed replaceable part within the module.

If you replace a faulty circuit board or assembly found using these procedures, you must follow any verification and adjustment procedures identified in Table 6–6 on page 6–37 for the replaced board.

Service Level

This section supports isolation of faults within the logic analyzer module to the replaceable-part level that's reflected in the replaceable parts lists in Chapter 10. In most cases, faults are isolated to circuit boards or assemblies, but not to individual components on those boards. (See *Strategy for Servicing* on page xvii.)

Fault isolation is supported to the following circuit boards and replaceable parts:

- LPU board
- Acquisition board

Required Documentation

You may need to refer to additional service manuals to isolate faults. In addition, other manuals and other sections in this manual contain instructions you will need to complete repairs after locating a faulty part. For a list of supplemental documentation, refer to the following table.

Manual or Section	Purpose
TLA715 Portable Mainframe Service Manual or *TLA721 Benchtop Mainframe & TLA7XM Expansion Mainframe Service Manual*	To eliminate benchtop or portable mainframe as problem source (whichever configuration is in use)
TLA700 Series Logic Analyzer Installation Manual	To remove and reinstall modules in mainframe
TLA7UP Mainframe Field Upgrade Instruction Manual	To reinstall Windows 2000, the TLA application software on mainframes or to upgrade module firmware when required

Check for Common Problems

Use Table 6–4 to quickly isolate possible failures. The table lists problems related to the logic analyzer module and possible causes. The list is not exhaustive, but it may help you eliminate a problems that are easy to fix.



CAUTION. *To avoid damaging the logic analyzer module or the mainframe, be sure to power down the mainframe before removing or reinstalling any modules.*

Table 6-4: Failure symptoms and possible causes

Symptom	Possible cause(s)
Mainframe does not power on	■ Power connection faulty; check or substitute power cord ■ Fuse blown; check line fuse ■ Mainframe power supply failure; contact local Tektronix service center ■ Mainframe controller is not installed properly (or not at all)
Mainframe does not boot	■ Non-system disk or floppy in external drive; make sure logic analyzer boots from hard drive (Refer to the *TLA700 Series Logic Analyzer Installation Manual* for software reinstallation procedures) ■ Hard drive failure or corrupted files on hard drive; contact local Tektronix service center
Modules not recognized	■ Modules not fully inserted; make sure front of module is flush with front panel ■ Mainframe power supply failure; contact local Tektronix service center ■ Corrupted module firmware; reinstall firmware. Refer to the *TLA7UP Mainframe Field Upgrade Instruction Manual* for information on reinstalling the latest firmware ■ Module logical address switches set to 00. Reset the switches to FF.
Controller does not power on	■ Module not fully inserted; make sure front of module is flush with front panel ■ Module failure; try substituting a known-good controller module and if necessary, contact local Tektronix service center
Module does not pass the normal power on diagnostics (READY indicator not green)	■ Module not fully inserted; make sure front of module is flush with front panel ■ Module failure; see *Troubleshoot the Logic Analyzer Module*, or contact local Tektronix service center ■ Open fuses on logic analyzer module circuit boards
Module loses settings when power is turned off	■ Module failure; see *Troubleshoot the Logic Analyzer Module*, or contact local Tektronix service center ■ NV RAM failure; refer to page 6–18 for local processor unit board replacement instructions
Module will not acquire data or the acquired data is incorrect	■ Module failure; see *Troubleshoot the Logic Analyzer Module*, or contact local Tektronix service center ■ Faulty probe, leadset, or probe adaptor

Eliminate Other Problem Sources

The logic analyzer module is part of the Tektronix Logic Analyzer Family, which consists of modules installed in either a benchtop or portable mainframe. The following procedures will help you eliminate the mainframe and other modules as possible sources of failures.

Substitute a Good Module

If you have available a known-good logic analyzer module, perform the following procedure:

1. Remove the suspect logic analyzer module from the mainframe.
2. Install a known-good logic analyzer module in the same slot as the suspected module (verify that address switches on the rear of the module are set to same address as the module that you are replacing).
3. Power-on the logic analyzer and check for normal operation.
4. If the failure symptoms are still present with the known-good logic analyzer module installed, the problem most likely is in the mainframe or in the attached probes, not in the logic analyzer module.
5. To eliminate the probes, use known-good probes and verify that the probes are properly connected to the target system.

NOTE. *Viewing the diagnostic window from the TLA application may help you isolate failures to individual modules or to the mainframe.*

---

6. If the logic analyzer operates normally with the known-good logic analyzer module and with known-good probes, the suspect logic analyzer module needs to be repaired. Refer to *Troubleshoot the Logic Analyzer Module* on page 6–31 for additional troubleshooting procedures.

Probe-Level Troubleshooting

If the logic analyzer module acquires no data or faulty data, the probes may be at fault. Perform the following procedure to isolate faults to a probe or to the logic analyzer module.

NOTE. *The procedure below requires that the logic analyzer is functional and operates normally when the modules are installed.*

---

1. Verify that the probe is correctly connected to the module and to the target system.

2. Move the suspected probe to another probe connector and observe if the problem follows the probe. If the problem does not follow the probe, the module may be faulty.
3. Substitute the suspected probe with a known good probe and observe if the problem is still present. If the problem still occurs, the module may be faulty. Refer to *Troubleshoot the Logic Analyzer Module* to isolate the problems within that module.
4. If you are using a general purpose probe with lead sets and you have determined that the probe is faulty, try to isolate the problem to an individual channel. A faulty channel may indicate a faulty probe podlet. Isolate faulty podlets by switching single podlets and observing if the problem tracks with the suspected podlet.

Troubleshoot the Logic Analyzer Module

Follow the procedure in this section to identify the failed part within the logic analyzer module.

This procedure requires that the module is installed in a fully functional mainframe. If you have not determined that the mainframe is functional, or if you suspect the problem might be in a probe or in another module, refer to *Eliminating Other Problem Sources*.

Equipment Required

The basic troubleshooting procedures require minimal test equipment. There are no accessible test points to measure voltages. An ohmmeter is recommended for checking fuses.

Preparation

The fault isolation procedure requires that you:

- Recognize codes flashed by the front-panel LEDs during power up
- Are familiar with the power-on diagnostics

To fill these requirements, read the topics below before performing the *Fault Isolation Procedure* on page 6–33.

Calibration and Diagnostic Procedures

The following calibration and diagnostic procedures will help you diagnose problems.

Self Calibration. Use self calibration to calibrate the installed modules. Run the self calibration after a minimum of a 30 minute warm-up and prior to running the extended diagnostics. For more information on when to run the self calibration, refer to *Self Calibration* on page 5–1.

Power-On Diagnostics. Power-on diagnostics check basic functionality of the logic analyzer at every power on. If any failures occur at power on, the screen displays the calibration and diagnostics property sheet.

If there are no diagnostic failures when you power on the logic analyzer, you can display and run the calibration and diagnostics property sheet by selecting Calibration and Diagnostics from the System menu.

Extended Diagnostics. The extended diagnostics execute more thorough tests than the power-on diagnostics. Using the extended diagnostics, you can do the following tasks:

- Run tests individually or as a group
- Run tests once or continuously
- Run tests until failures occur

***NOTE**. Certain diagnostic tests will fail if probes are attached. For best results, run the diagnostics with probes disconnected from the module.*

To run the extended diagnostics, do the following steps:

1. Disconnect the probes from the logic analyzer module.
2. Start the TLA application if it is not already running.
3. From the System menu, select Calibration and Diagnostics.
4. Select the Extended Diagnostics property page.
5. Select the individual tests, group of tests, or all tests.
6. Click the Run button.

While the tests are executing, the word Running displays adjacent to the tests. When the tests are complete, either a Pass or Fail indication displays adjacent to each test.

Merged Modules. The extended diagnostics include a special merge test that verifies the correct pipeline adjustment for the master module, inside slave module, and outside slave module. This test does not require the modules to be physically merged together.

Every time modules are merged in the System Configuration window, a calibration is performed between the merged modules. An error message will appear if there are any problems with the merge cables, circuit board traces, or if the calibration fails.

Fault Isolation Procedure

The Primary Troubleshooting Tree (Figure 6–17 on page 6–34) provides troubleshooting steps that test the logic analyzer module. Use the following procedure with that tree:

To determine if module is recognized, perform the following steps:

1. Install the logic analyzer module into a known-good mainframe.
2. Before you power on the mainframe, look at the READY, ACCESSED ARM'D, and TRIG'D front panel indicators.
3. Power on the mainframe and note how the front panel indicators respond.
   a. Verify that the green READY indicator turns on while the diagnostics are being checked. If the green READY indicator does not turn on, the module is not being recognized which indicates possible problems on the LPU board.
   b. Verify that after a few seconds the ACCESSED indicator turns on. The indicator stays on while the module is accessed by the controller. After the System window displays, the indicator blinks anytime the controller accesses the module.
4. If steps 3a and 3b are verified, the module is recognized; if not verified, the module is not recognized. Proceed as the troubleshooting tree instructs.
5. If diagnostic failures occur, replace the circuit board indicated by the troubleshooting tree. For further confirmation, you can correlate the failed test displayed with a board using Table 6–5 on page 6–35. *You should also first check the "special cases" of diagnostic failures below:*
   - Note from the tree, that if all the diagnostics pass, but self calibration fails, replace the Acquisition board.
   - If any of the Kernel test groups fail (ROM check, LPU RAM, LPU Address decode, etc.) replace the LPU board.
   - If the kernel group passes, but there are other failures, replace the Acquisition board. Also, ensure that the probes are disconnected from the module before running the diagnostics.
   - If multiple tests fail, the problem could be power-supply related problems or the mainframe. If replacing the acquisition board does not remedy the failures, try replacing the LPU board.

***NOTE**. Due to the module design, there are no accessible test points on the module to connect external test equipment, to help isolate faults to an individual circuit board.*

6. Use the *Removal and Installation Procedures* that begin on page 6–11 to replace the faulty circuit board.
7. Refer to Table 6–6 on page 6–37 after module replacement and perform *all* verification and adjustment procedures identified for the replaced module.

Primary Troubleshooting Chart

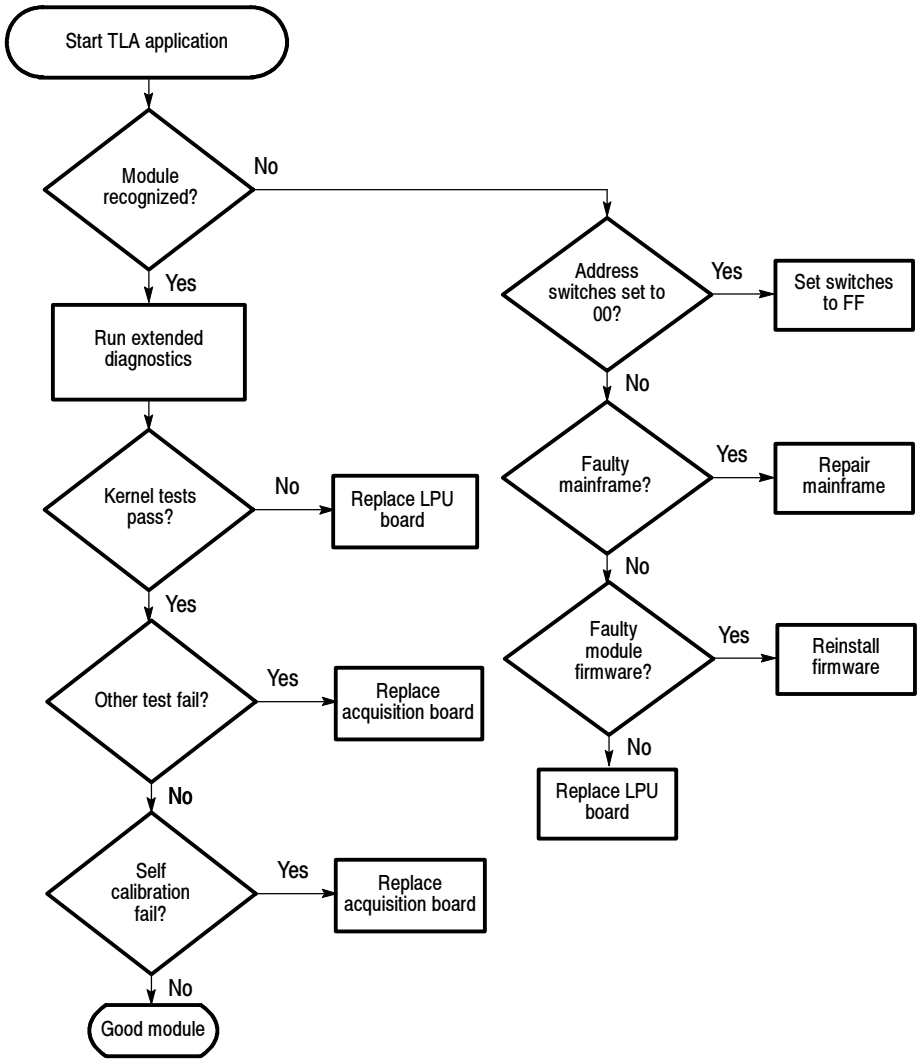


Figure 6-17: Primary troubleshooting chart

Diagnostics Table

Table 6–5 can help you isolate problems to one of the circuit boards in the module (use the *Removal and Installation Procedures* beginning on page 6–11 to replace the faulty circuit board):

Table 6-5: Diagnostic tests

Circuit board	Group & test	Power on	Extended
LPU board	Kernel		
	ROM Check	✓	✓
	LPU RAM	✓	✓
	Address Decode	✓	✓
	NVRAM Check	✓	✓
Acquisition board	Timestamp		
	Timestamp Rollover	✓	✓
	Acquisition RAM Data Bus	✓	✓
	Acquisition RAM Address Bus	✓	✓
	Timestamp Acquire		✓
	Clock		
	Qualifier/Combiner RAM	✓	✓
	Clock State Machine RAM	✓	✓
	Acquisition Data Path		
	Address/Data Bus	✓	✓
	MagniVu RAM		✓
	Trigger		
	Internal RAM	✓	✓
	Trigger Crossbar	✓	✓
	Signal/Trigger Lines	✓	✓
	Trigger State Machine Counters	✓	✓
	Prefill Counter	✓	✓
	Word Recognizer	✓	✓
	Transition Detector	✓	✓
	Clock Group Detector	✓	✓
	At-speed Transition Detect		✓
	Snapshot		✓
	Acquisition RAM		
	RAM Select	✓	✓
	Acquisition Memory		✓

Table 6-5: Diagnostic tests (Cont.)

Circuit board	Group & test	Power on	Extended
Acquisition board	Miscellaneous Tests		
	Acquisition Address Decode	✓	✓
	Threshold	✓	✓
	At-speed Async Acquire		✓
	Pseudo Random		✓
	SFDL-1	✓	✓
	SFDL-2	✓	✓
	PLL	✓	✓
	Demux		✓
	Edge Detector		✓
	Setup and Hold		✓
	Glitch		✓
	Memory Interface Controller		
	AD Bus	✓	✓
	MAR Rollover	✓	✓
	Waveform 0	✓	✓
	Waveform 1	✓	✓
	Waveform Pins	✓	✓
	Waveform Change	✓	✓
	Search Stack	✓	✓
	Internal Search	✓	✓
	External Search	✓	✓
	Counters	✓	✓
	RAM Data	✓	✓
	RAM Address	✓	✓
	High-Speed Memory Compare	✓	✓
	Pattern Acquire		✓
	Miscellaneous 2 Tests		
	Counters		✓
	Timers		✓
	Store Stretch		✓
	Range Recognizer		✓
	Global Storage		✓
	CSM Input Path		✓

Adjustment After Repair

After replacing a circuit board or assembly due to electrical failure, locate the board removed in Table 6–6 and perform the indicated procedures.

Table 6-6: Requirements after replacement

Board replaced	Adjustment required	Verification checks
LPU board	Adjustment: Powerflex[1], Firmware level restoration[2], Deskew, Self Calibration, Threshold tests	Self Calibration, Power-on and Extended Diagnostics, performance verification procedures
Acquisition board	Adjustment: Self Calibration, Deskew, Threshold tests	Self Calibration, Power-on and Extended Diagnostics, performance verification procedures

1 **The PowerFlex restoration or changes can only be made by Tektronix service personnel.**

2 **Refer to the *TLA7UP Mainframe Field Upgrade Instruction Manual* for instructions for updating module firmware.**

Updating or Restoring the Logic Analyzer Firmware

You may have to update the firmware on the logic analyzer module if the module does not appear in the TLA System window after you have serviced the module or after you have updated the TLA application software on the mainframe. You can update multiple modules and module types during a single firmware update session. The most current firmware resides on a file on the hard disk of the logic analyzer mainframe.

1. Note which of the modules that may require new firmware.

   If any modules are missing from the System window, you can verify the status of the modules by doing the following steps:

   a. Select System Properties from the System menu.

   b. Click the Modules tab.

   c. Note the information under the Messages column for any installed modules. If any modules indicate invalid or similar messages, you must update the firmware for those modules.

2. Disconnect any probes connected to the modules that you want to update.

3. Exit the logic analyzer application.

4. Click Start → Programs → Tektronix Logic Analyzer → TLA Firmware Loader.

5. When you see the pop-up prompting you to cycle the power on the mainframe after completing the upgrade operation, click Yes.

   The logic analyzer will scan the mainframe to determine which modules are installed and which modules can have their firmware upgraded. If you have any older modules, you may see them listed in the bottom half of the window. These modules cannot be updated until you install the flash jumper on the rear of the modules.

6. Select the modules that you want to update from the list of modules displayed in the Supported list box near the top of the window. If you are updating more than one module at a time, note the slot location of the module in the selection box.

7. Select Load Firmware from the Execute menu.

8. Click the TLA7AXX.lod file for TLA7Axx modules or the TLANAX.lod file for TLA7NAx modules.

NOTE. *Be sure to select the proper .lod file for each module. Note the slot number in the title bar so that you select the correct module for the .lod file.*

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9. Click OK. You will be asked to confirm your action; click Yes when prompted.

NOTE. *The program will not allow you to load firmware to an incompatible module. For example, the program will not load DSO firmware to a logic analyzer module.*

   The program will load the firmware for each module one at a time. The process may take several minutes per module.

10. Exit the firmware loader program and power down the logic analyzer. You must power down the logic analyzer to allow the TLA application to start up properly.

11. Remove the logic analyzer module from the mainframe.

12. Locate the big label on the side of the module.

13. Record the firmware version that is printed on the label. You will need this information to see that the firmware version matches the label.

14. Reinstall the module in the mainframe and power on the mainframe.

15. After the logic analyzer completes the power-on diagnostics, select System Properties from the System menu.
16. Click the module tab (for example, LA1).
17. Verify that the firmware version for the selected module matches the version on the label that you recorded in step 13.
18. If the firmware versions do not match, power down the mainframe, remove the module from the mainframe and update the label.

Overview of Procedures

Table 6–7 provides a brief overview of the troubleshooting, adjustment, verification, and calibration procedures.

***NOTE**. Calibration constants are stored in the LPU NVRAM. You must always perform a new self calibration and have a Tektronix Service technician complete the adjustment procedures, the performance verification procedures, and the certification procedures after you replace the LPU board.*

Table 6-7: Troubleshooting overview

Procedure	Recommended interval	Purpose	When required	Documented
Diagnostics (power on and extended)	Incoming inspection Annually	Verifies basic functionality	During troubleshooting	*Power on Diagnostics*, page 6–32
Adjustment: self calibration and performance verification	Annually As needed	Verifies basic functionality	After board replacement	*Self Calibration*, page 5–1. Adjustments and performance verification performed by Tektronix Service technician
Adjustment: deskew	After board replacement or annually	Time-aligns the data channels	After board replacement	Performed by Tektronix Service technician.
Functional verification	Incoming inspection As needed	Verifies front end and basic functionality including probes	After board replacement	*Performance Verification,* page 4–1.
Performance verification	Annually or as needed	Verifies advertised performance specifications	After board replacement	Performed by Tektronix Service technician.
Calibration (certification)	Annual recertification	Verifies primary references	After board replacement	Performed by Tektronix Service technician.

Repackaging Instructions

This section contains the information needed to repackage the logic analyzer module for shipment or storage.

Packaging

If at all possible, use the original packaging to ship or store the instrument. If the original packaging is not available, use a corrugated cardboard shipping carton having a test strength of at least 275 pounds (125 kg) and with an inside dimension at least six inches (15.25 cm) greater than the instrument dimensions. Add cushioning material to prevent the instrument from moving around in the shipping container. Seal the shipping carton with an industrial stapler or strapping tape.

Shipping to the Service Center

Contact the Service Center to get an RMA (return material authorization) number, and any return or shipping information you may need.

If the instrument is being shipped to a Tektronix Service Center, enclose the following information:

- The RMA number.
- The owner's address.
- Name and phone number of a contact person.
- Type of instrument and serial number.
- Reason for returning.
- A complete description of the service required.

***NOTE**. When ordering the LPU board for exchange or repair, you will need to supply the above information, including the firmware level and PowerFlex configuration information.*

Mark the address of the Tektronix Service Center and the return address on the shipping carton in two prominent locations.



CAUTION. *When returning the LPU board separately, be sure to properly support the narrow LED arm of the circuit board so it will not be damaged during transit or storage.*

Storage

The logic analyzer module should be stored in a clean, dry environment. The following environmental characteristics apply for both shipping and storage:

- Temperature range: –40 °F to +160 °F (–40 °C to +71 °C).
- Altitude: To 40,000 feet (12,190 meters).

See the *Tektronix Logic Analyzer Family Product Specifications* document for a complete listing of the module environmental characteristics.

Options

This chapter lists the advertised options for each logic analyzer module. Refer to the *Mechanical Parts List* chapter for a list of standard and optional accessories for each module.

TLA7AA1, TLA7AA2, TLA7AA3 and TLA7AA4 Options

Table 7–1 lists the options for the TLA7AA1, TLA7AA2, TLA7AA3 and TLA7AA4 modules.

Table 7-1: TLA7AA1, TLA7AA2, TLA7AA3 and TLA7AA4 options

Option	Description
1S	Increase to 512 Kb memory depth @ 120 MHz state speed
2S	Increase to 2 Mb memory depth @ 120 MHz state speed
3S	Increase to 8 Mb memory depth @ 120 MHz state speed
4S	Increase to 32 Mb memory depth @ 120 MHz state speed
5S	Increase to 128 Kb memory depth @ 235 MHz state speed
6S	Increase to 512 Kb memory depth @ 235 MHz state speed
7S	Increase to 2 Mb memory depth @ 235 MHz state speed
8S	Increase to 8 Mb memory depth @ 235 MHz state speed
9S	Increase to 32 Mb memory depth @ 235 MHz state speed
AS	Increase to 128 Kb memory depth @ 450 MHz state speed
BS	Increase to 512 Kb memory depth @ 450 MHz state speed
CS	Increase to 2 Mb memory depth @ 450 MHz state speed
DS	Increase to 8 Mb memory depth @ 450 MHz state speed
ES	Increase to 32 Mb memory depth @ 450 MHz state speed

TLA7AB2 and TLA7AB4 Options

Table 7–2 lists the options for the TLA7AB2 and TLA7AB4 modules.

Table 7-2: TLA7AB2 and TLA7AB4 options

Option	Description
1S	Increase to 64 Mb memory depth @ 235 MHz state speed
2S	Increase to 64 Mb memory depth @ 450 MHz state speed

TLA7NAX Options

Table 7–3 lists the options for the TLA7NAx modules.

Table 7-3: TLA7NAx options

Option	Description
7S	Increase to 2 Mb record length
8S	Increase to 8 Mb record length
9S	Increase to 32 Mb record length
45	Increase state speed to 450 MHz

Service Options

Tektronix Service Options are available at the time you order your instrument. Contact your local Tektronix Sales Office for more information.

Product installation service[1]	Option IN	Provides initial product installation/configuration and start-up training session including front panel and product familiarization.
Three years of calibration services	Option C3	Provides factory calibration certification on delivery, plus two more years of calibration coverage. The instrument will be calibrated according to its calibration interval.
Five years of calibration services	Option C5	Provides factory calibration certification on delivery, plus four more years of calibration coverage. The instrument will be calibrated according to its calibration interval.
Test data	Option D1	Provides initial Test Data Report from factory on delivery.
Test data	Option D3	Provides test data on delivery plus a Test Data Report for every calibration performed during 3 years of coverage – requires Option C3.
Test data	Option D5	Provides test data on delivery plus a Test Data Report for every calibration performed during 5 years of coverage – requires Option C5.
Three years repair coverage	Option R3	Extends product repair warranty to three years.
Five years repair coverage	Option R5	Extends product repair warranty to five years.

1 **Availability of installation and on-site services depends on the type of product and may vary by geography.**

Electrical Parts List

Refer to the *Mechanical Parts List* chapter for a complete list of replaceable parts.

Diagrams

This chapter contains the block diagrams of the logic analzyer module. Use these diagrams in conjunction with the *Theory of Operation* to help you troubleshoot the module.

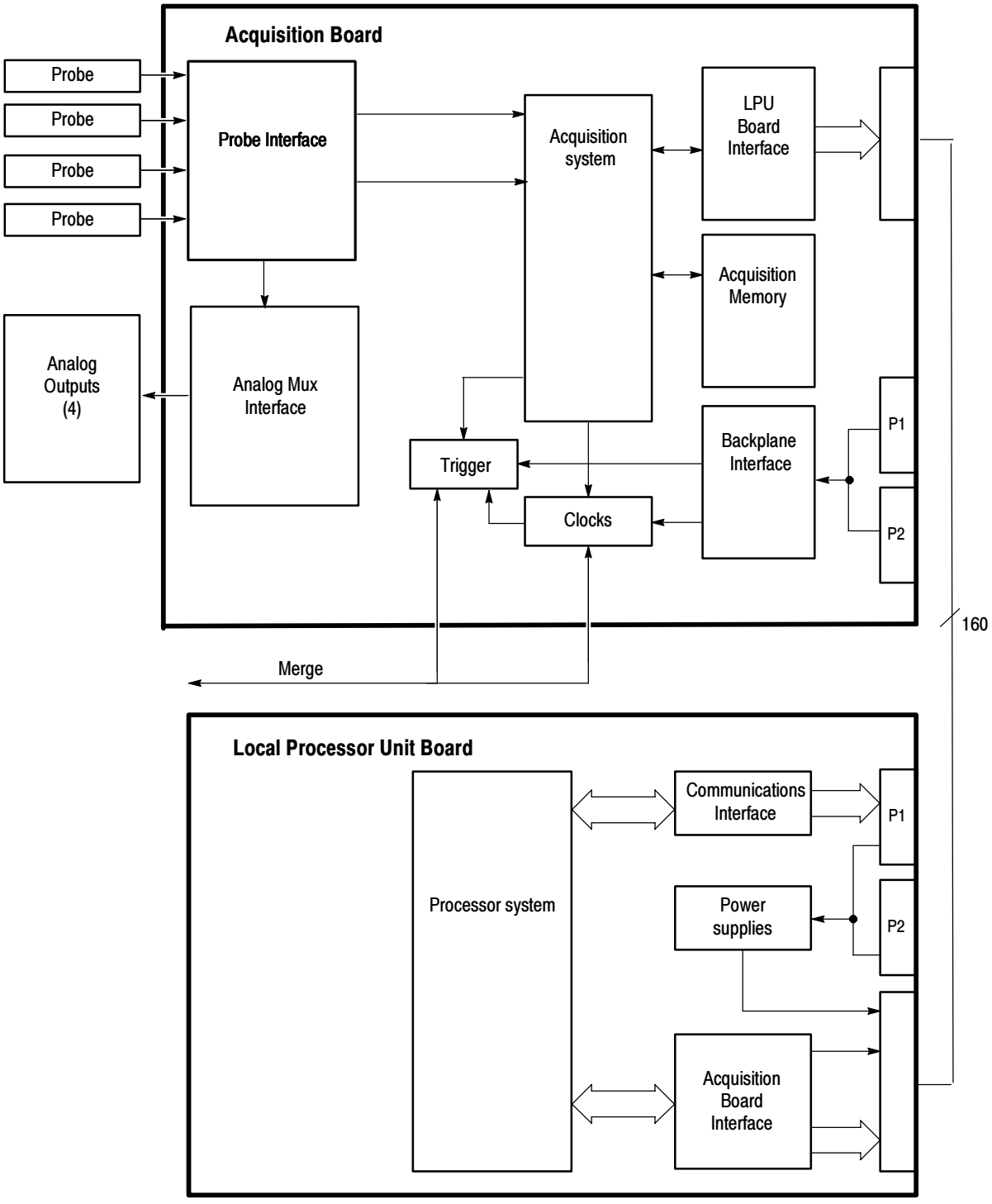


Figure 9-1: TLA7AAx logic analyzer block diagram

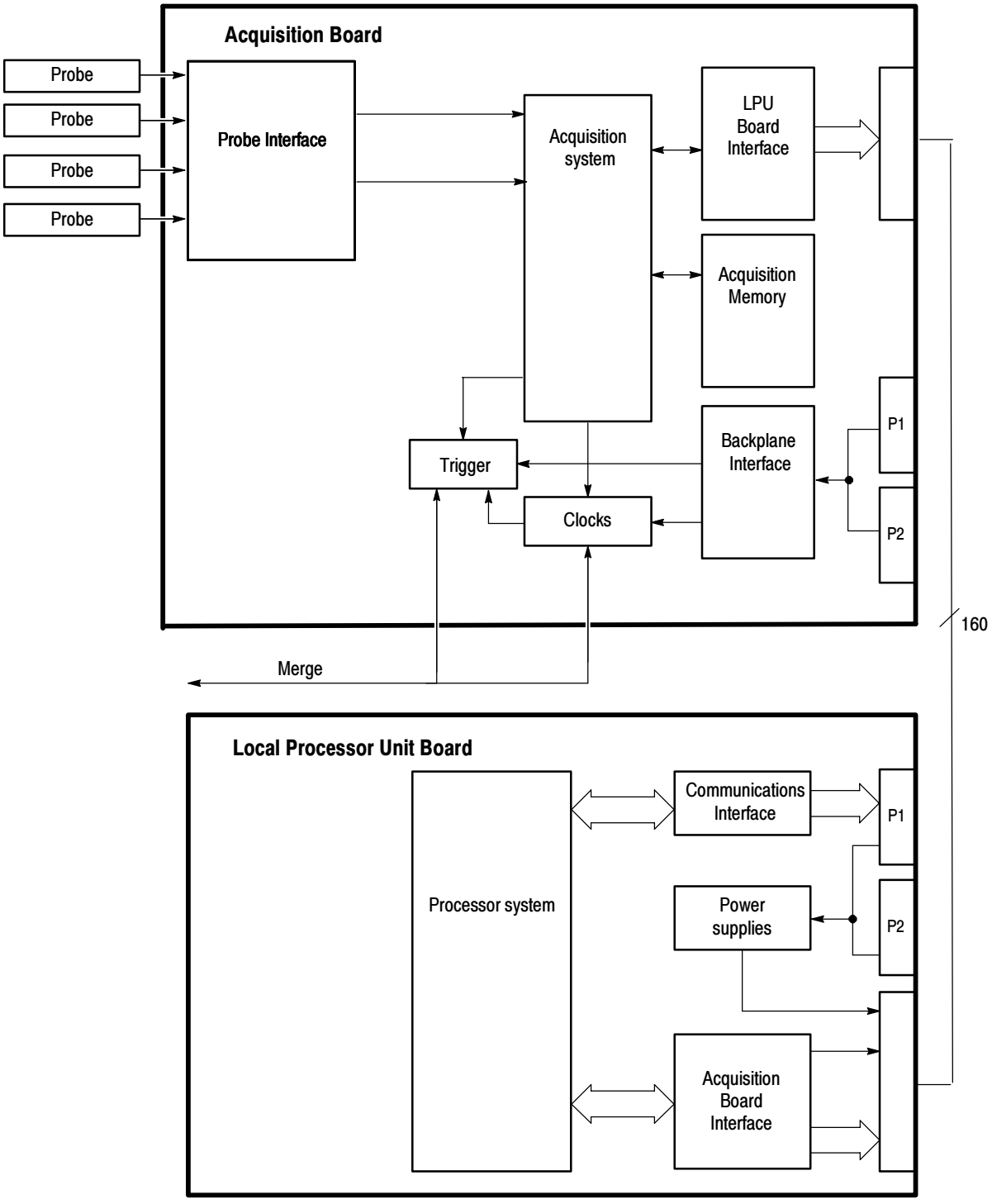


Figure 9- 2: TLA7NAx logic analyzer block diagram

Mechanical Parts List

This chapter contains a list of the replaceable parts for the Tektronix logic analyzer module. Use this list to identify and order replacement parts, modules, and subcomponents.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Module Servicing

Modules can be serviced by selecting one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

Module Exchange. In some cases you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-833-9200. Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices: www.tektronix.com.

Module Repair and Return. You may ship your module to us for repair, after which we will return it to you.

New Modules. You may purchase replacement modules in the same way as other replacement parts.

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the logic analyzer module. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts list column descriptions

Column	Column name	Description
1	Figure & index number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
2	Tektronix part number	Use this part number when ordering replacement parts from Tektronix.
3 and 4	Serial number	Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entry indicates the part is good for all serial numbers.
5	Qty	This indicates the quantity of parts used.
6	Name & description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
7	Mfr. code	This indicates the code of the actual manufacturer of the part.
8	Mfr. part number	This indicates the actual manufacturer's or vendor's part number.

Abbreviations

Abbreviations conform to American National Standard ANSI Y1.1–1972.

Mfr. Code to Manufacturer Cross Index

The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
00779	TYCO ELECTRONICS CORPORATION	CUSTOMER SERVICE DEPT PO BOX 3608	HARRISBURG, PA 17105-3608
060D9	TENSOLITE COMPANY	PRECISION HARNESS AND ASSEMBLY 3000 COLUMBIA HOUSE BLVD #120	VANCOUVER, WA 98661
06915	RICHCO	5825 N TRIPP AVE P.O. BOX 804238	CHICAGO, IL 60646
09353	C & K COMPONENTS CORP	57 STANLEY AVE	WATERTOWN, MA 02172-4802
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214-4657
0KB05	NORTH STAR NAMEPLATE INC	LABEL PRODUCTS 5750 NE MOORE COURT	HILLSBORO, OR 97124-6474
0KM03	LAIRD TECHNOLOGIES	505 PORTER WAY	PLACENTIA, CA 92870
0MS63	QT OPTOELECTRONICS	610 N MARY AVENUE	SUNNYVALE, CA 94086
1AW87	LEWIS SCREW CO.	4300 SOUTH RACINE AVENUE	CHICAGO, IL 60609
24931	FCI USA INC	RF/COAXIAL DIV 2100 EARLYWOOD DR PO BOX 547	FRANKLIN, IN 46131
51506	ACCURATE SCREW MACHINE CORPORATION (ASM CO)	10 AUDREY PLACE	FAIRFIELD, NJ 07004-6095
61058	PANASONIC INDUSTRIAL CO ECG	M/S 7H-4 TWO PANASONIC WAY	SECAUCUS, NJ 07094
61935	SCHURTER INC	1016 CLEGG CT PO BOX 750158	PETALUMA, CA 94975-0158
71400	BUSSMANN	DIVISION COOPER INDUSTRIES INC PO BOX 14460	ST LOUIS, MO 63178
7X318	KASO PLASTICS INC	5720-C NE 121ST AVE, STE 110	VANCOUVER, WA 98682
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001
81073	GRAYHILL INC	561 HILLGROVE AVE PO BOX 10373	LAGRANGE, IL 60525
83330	DIALIGHT CORP	MANASQUAN DIV 1913 ATLANTIC AVE	MANASQUAN, NJ 08736-1005
S3109	FELLER U.S. CORPORATION	68 VERONICA AVE, UNIT #5	SOMERSET, NJ 08873
TK0212	MURATA MFG CO LTD	TJBO LIAISON M/S 78-210	BEAVERTON, OR 97077
TK0588	UNIVERSAL PRECISION PRODUCT	1775 NW CORNELIUS PASS RD	HILLSBORO, OR 97124
TK1943	NEILSEN MANUFACTURING INC	3501 PORTLAND RD NE	SALEM, OR 97303
TK1163	POLYCAST INC	14140 SW 72ND AVE SUITE 100	TIGARD, OR 97224
TK2058	TDK CORPORATION OF AMERICA	1600 FEEHANVILLE DRIVE	MOUNT PROSPECT, IL 60056
TK2548	XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON, OR 97005
TK2565	VISION PLASTICS INC	26000 SW PARKWAY CENTER DRIVE	WILSONVILLE, OR 97070
TK6314	MCX INC	1315 OREGON AVE	KLAMATH FALLS, OR 97601-6540

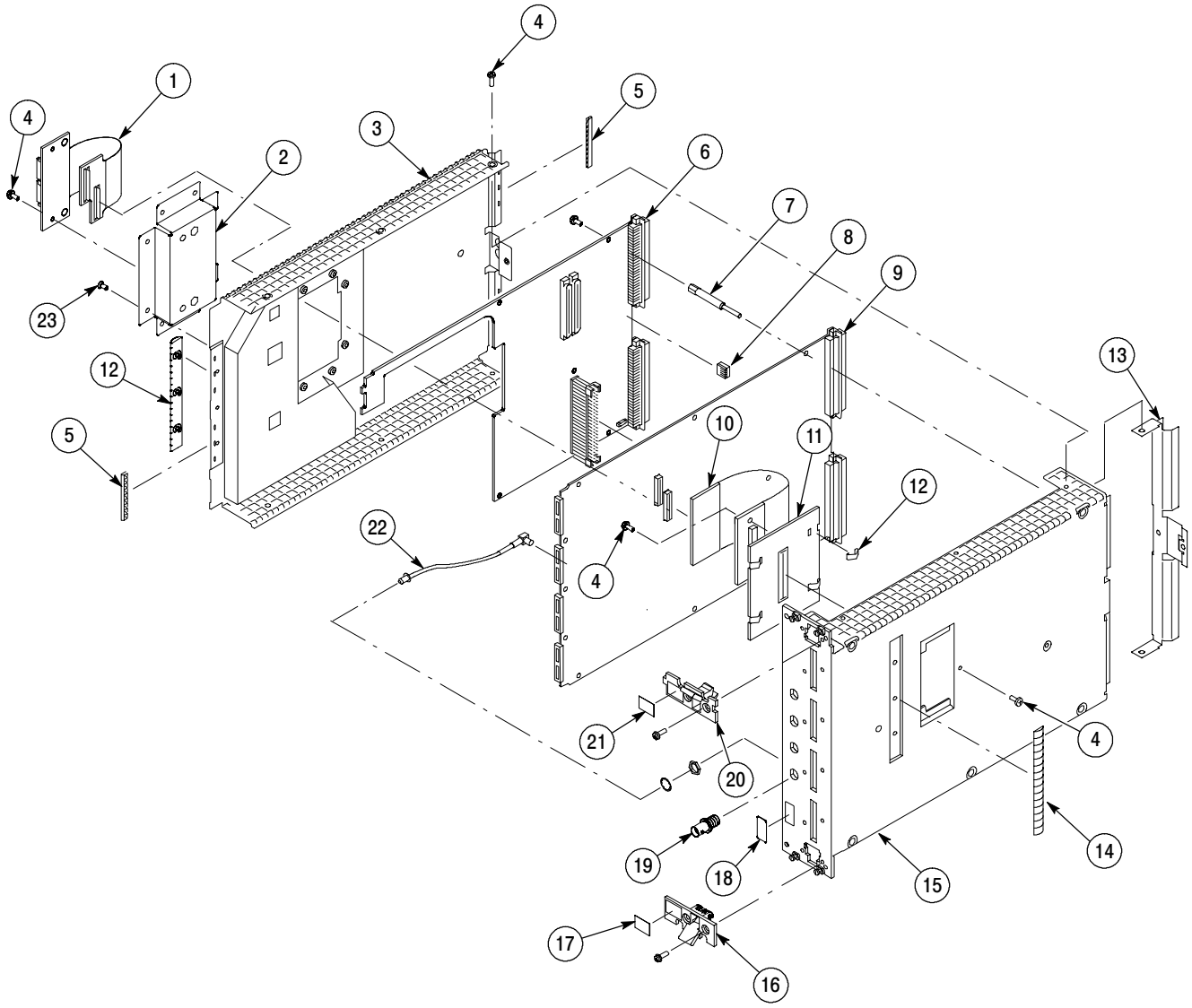


Figure 10-1: TLA7AAX, TLA7ABX, and TLA7NAX Logic Analyzer Module exploded view

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-1-1	671-5339-00			1	CIRCUIT BD ASSY:MERGE CONNECTOR,LEFT SIDE, TESTED, TLA7AA3, TLA7AA4, TLA7AB4, TLA7NA3, TLA7NA4	80009	671-5339-00
-2	407-4859-00			1	BRACKET:MERGE,COVER,LEFT SIDE,0.050 AL, TLA7AA3, TLA7AA4, TLA7AB4, TLA7NA3, TLA7NA4	TK1943	407-4859-00
	407-4860-00			1	BRACKET:BLANK FLAT,MERGE,COVER,LEFT SIDE,0.050 AL, TLA7AA1, TLA7AA2, TLA7AB2, TLA7NA2 (NOT SHOWN)	TK1943	407-4860-00
-3	200-4672-00			1	COVER:TWO WIDE,0.062 AL,TLA700 SERIES,	TK1943	200-4672-00
-4	211-0409-00			22	SCR,ASSEM WSHR:4-40 X 0.312,PNH,STL,CDPL,T-10 TORX DR	0KB01	211-0409-00
-5	348-1537-00			6	GASKET,EMI:CLIP-ON,1.98 L,BE CU,TIN PLATED,W/T LANCES	0KM03	0493011500
-6	671-5312-00			1	CIRCUIT BD ASSY:LPU, LOCAL PROCESSOR UNIT	80009	671-5312-00
	150-1278-00			3	DIODE,OPTO:LED,GRN,569NM,2MCD AT 5V,60 DEG VIEW ANGLE,INTEGRAL RES,TINTED, DIFFUSED, RIGHT AN (NOT SHOWN)	83330	551-0607
	150-1279-00			1	DIODE,OPTO:LED,YELLOW,585NM,2MCD AT 5V,60 DEG VIEW ANGLE,INTEGRAL RES,TINTED DIFFUSED,RIGHT (NOT SHOWN)	0MS63	MR5360 MP4B
-7	129-1478-00			5	SPACER, POST:1.738 L,1.113 SPACING,W/ 0.35 L,0.25 HEX,W/ 4-40 INT THD X 6-32 EXTERNAL THD,NIC	TK0588	129-1478-00
-8	260-2597-00			2	SWITCH,ROTARY:HEXADECIMAL,100MA AT 50VDC,RIGHT ANGLE,0.430 W X 0.400 H X 0.202 L	81073	94HAB16RA
-9	671-5351-00			1	CIRCUIT BD ASSY:34 CH,64MB, DDR, ACQUISITION, TLA7AA1	80009	671-5351-00
	671-5350-00			1	CIRCUIT BD ASSY:68 CH,64MB, DDR, ACQUISITION, TLA7AA2	80009	671-5350-00
	671-5349-00			1	CIRCUIT BD ASSY:102 CH,64MB, DDR, ACQUISITION, TLA7AA3	80009	671-5349-00
	671-5311-00			1	CIRCUIT BD ASSY:136 CH,64MB, DDR, ACQUISITION, TLA7AA4	80009	671-5311-00
	671-5441-00			1	CIRCUIT BD ASSY:68 CH,256MB, DDR, ACQUISITION, TLA7AB2	80009	671-5441-00
	671-5442-00			1	CIRCUIT BD ASSY:136 CH,256MB, DDR, ACQUISITION, TLA7AB4	80009	671-5442-00
	671-9495-00			1	CIRCUIT BD ASSY:34 CH, ACQUISITION, TLA7NA1	80009	671-9495-00
	671-9494-00			1	CIRCUIT BD ASSY:68 CH, ACQUISITION, TLA7NA2	80009	671-9494-00
	671-9493-00			1	CIRCUIT BD ASSY:102 CH, ACQUISITION, TLA7NA3	80009	671-9493-00
	671-9492-00			1	CIRCUIT BD ASSY:136 CH, ACQUISITION, TLA7NA4	80009	671-9492-00
-10	671-5340-00			1	CIRCUIT BD ASSY:MERGE CONNECTOR,RIGHT SIDE,TESTED, TLA7AA3, TLA7AA4, TLA7AB4, TLA7NA3, TLA7NA4	80009	671-5340-00

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-1-11	407-4861-00			1	BRACKET:MERGE,CHASSIS,RIGHT SIDE,0.062 AL, TLA7AA3, TLA7AA4, TLA7AB4, TLA7NA3, TLA7NA4	TK1943	407-4861-00
	407-4862-00			1	BRACKET:BLANK FLAT,MERGE,CHASSIS,RIGHT SIDE,0.062 AL, TLA7AA1, TLA7AA2, TLA7AB2 TLA7NA1, TLA7NA2 (NOT SHOWN)	TK1943	407-4862-00
-12	131-6643-00			4	CONTACT,ELEC:GROUNDING,0.169 L,0.320 DEEP,ELECTROLESS NICKEL,TDS3012	0KM03	131-6643-00
-13	386-6868-00			1	PANEL,VXI:VXI APPLICATION,TWO-WIDE,VENUS 2,BACK PANEL	TK1943	386-6868-00
-14	348-1365-01			2	SHLD GSKT,ELEC:SYMETRICAL SLOTTED FINGER,0.350 W X 7.5 L,RIVIT MTG,SNAP-IN,RIVIT SPACING 1.5 IN	0KM03	0493-0070-00
-15	441-2257-00			1	CHASSIS ASSY:34 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7AA1	TK1943	441-2257-00
	441-2258-00			1	CHASSIS ASSY:68 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7AA2, TLA7AB2	TK1943	441-2258-00
	441-2259-00			1	CHASSIS ASSY:102 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7AA3	TK1943	441-2259-00
	441-2260-00			1	CHASSIS ASSY:136 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7AA4, TLA7AB4	TK1943	441-2260-00
	441-2372-00			1	CHASSIS ASSY:34 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7NA1	TK1943	441-2372-00
	441-2373-00			1	CHASSIS ASSY:34 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7NA2	TK1943	441-2373-00
	441-2374-00			1	CHASSIS ASSY:34 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7NA3	TK1943	441-2374-00
	441-2375-00			1	CHASSIS ASSY:136 CH,W/SUB FRONT PANEL & LEXAN,0.62 AL,TLA7NA4,	TK1943	441-2375-00
-16	367-0484-00			1	HANDLE,EJECTOR:INJECTOR/EJECTOR ASSEMBLY,TWO WIDE VXI,W/OUT KEYING,SPRING LOADED,PLASTIC,20% GL	7X318	1462
-17	335-0646-00			1	MARKER,IDENT:LABEL,MKD FOR USE WITH TLA700 SERIES,BOTTOM INJECTOR/EJECTOR,0.745 X 0.520,0.010, TLA7Axx series only	0KB05	335-0646-00
	335-1163-00			1	MARKER,IDENT:LABEL,MKD FOR USE WITH TLA700 SERIES,BOTTOM INJECTOR/EJECTOR,0.745 X 0.520,0.010, TLA7NAx series only	0KB05	335-1163-00
-18	335-0639-00			1	MARKER,IDENT:CONFIGURATION LABEL,MKD TIMING,STATE SPEED,RAM DEPTH,0.475 X 0.975,0.010 POLY,GE TLA7Axx series only	0KB05	335-0639-00
-19	131-1315-01			4	CONN,RF JACK:BNC,PNL,50 OHM,FEMALE,STR,PELTOLA/PNL MNT,SILVER ALLOY,0.576 MLG X 0.366 TERMN, TLA7Axx series only	24931	28JR306-1

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
-20	367-0483-00			1	HANDLE:INJECTOR/EJECTOR ASSEMBLY,TWO WIDE VXI,W/KEYING,SPRING LOADED,PLASTIC,20% GLASS-	7X318	2TEK 1461
-21	335-0640-00			1	MARKER,IDENT:LABEL,MKD TLA7AA1, 34CH,TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-0640-00
	335-0641-00			1	MARKER,IDENT:LABEL,MKD TLA7AA2, 66CH,TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-0641-00
	335-0642-00			1	MARKER,IDENT:LABEL,MKD TLA7AA3, 102CH,TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-0642-00
	335-0643-00			1	MARKER,IDENT:LABEL,MKD TLA7AA4, 136CH,TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-0643-00
	335-0644-00			1	MARKER,IDENT:LABEL,MKD TLA7AB2, 68CH,TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-0644-00
	335-0645-00			1	MARKER,IDENT:LABEL,MKD TLA7AB4, 136CH,TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-0645-00
	335-1156-00			1	MARKER,IDENT:LABEL,MKD TLA7NA1, TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-1156-00
	335-1157-00			1	MARKER,IDENT:LABEL,MKD TLA7NA2, TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-1157-00
	335-1158-00			1	MARKER,IDENT:LABEL,MKD TLA7NA3 TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-1158-00
	335-1159-00			1	MARKER,IDENT:LABEL,MKD TLA7NA4, TOP INJECTOR/EJECTOR,0.745 X 0.520,0.010 POLY,GE LEXAN,W/ADHE	0KB05	335-1159-00
-22	174-4542-00			4	CA ASSY,RF:COAXIAL,50 OHM,8.0 L,MCX TO PELTOLA, TLA7Axx series only	060D9	174-4542-00
-23	211-0486-00			8	SCREW,MACHINE:4-40 X 0.168 L,FLH,100 DEG,TORX T-9	0KB01	211-0486-00
	174-4595-00			4	CABLE ASSY:BNC - BNC,10X ATTENUATION,50 OHM COAX	060D9	174-4595-00
	174-4596-00			1	CABLE ASSY; STRANDED 7 INDIVIDUAL 16 AWG	060D9	174-4596-00
	174-4597-00			1	CABLE ASSY;RIBBON, EXTENDER CABLE FIXTURE, 28 AWG STRANDED CABLE 2 X 17, 0.1 INCH PITCH, CENTER POLARIZED	060D9	174-4597-00
	071-1236-01			1	MANUAL,TECH:USER,V4.4 SOFTWARE,TLA SERIES,DP	TK2548	071-1236-01
	071-1235-01			1	MANUAL TECH; INSTALLATION, TLA700 SERIES	TK2548	071-1235-01

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					Optional Accessories		
	071-1043-01			1	MANUAL,TECH:SERVICE, LOGIC ANALYZER MODULES,TLA700 SERIES,DP	TK2548	071-1043-01
	071-1511-00			1	MANUAL, TECH; TLA7AXX/TLA7NAX LOGIC ANALYZER SERVICE MANUAL	TK2548	071-1511-00
	071-0912-00			1	MANUAL,TECH:EXPANSION MAIN FRAME SERVICE,TLA7XM,TLA721	TK2548	071-0912-00
	071-0913-00			1	MANUAL,TECH:MAIN FRAME SERVICE,TLA715,DP	TK2548	071-0913-00
	071-0865-05			1	MANUAL,TECH:INSTRUCTION,TLA700 SERIES MAINFRAME FIELD UPDRADE,TLA7UP,DP	TK2548	071-0865-05
	071-0866-05			1	MANUAL,TECH:INSTRUCTION,TLA600 SERIES MAINFRAME FIELD UPDRADE,TLA6UP,DP	TK2548	071-0866-05
	071-1059-04			1	MANUAL,TECH:INSTRUCTION,P6810,P6860,P6880 LOGIC ANALYZER PROBES,DP	TK2548	071-1059-04
	071-1528-00			1	MANUAL,TECH:INSTRUCTION,P6960 AND P6980 LOGIC ANALYZER PROBES,DP	TK2548	071-1528-00
	070-9793-04			1	MANUAL,TECH:MASS,TERMINATION PROBE,P6434	TK2548	070-9793-04
	020-2451-00			1	ACCESSORY KIT:ELASTOMER HOLDER ASSEMBLIES,BAG OF (2) 352-1092-00,THIN BOARD	TK1163	020-2451-00
	020-2452-00			4	ACCESSORY KIT:ELASTOMER HOLDER ASSEMBLIES,BAG OF (2) 352-1093-00,THICK BOARD	TK1163	020-2452-00
	020-2453-00			1	ACCESSORY KIT:NUTBLOCK ASSEMBLIES,BAG OF (2) 220-0255-00	TK1163	020-2453-00
	020-2455-00			1	ACCESSORY KIT:COMPRESSION-ON-PCB TO MICTOR ADAPTER,17 CH,BAG INCLUDES 671-5528-00,ELASTOMERS H	80009	020-2455-00
	020-2456-00			1	ACCESSORY KIT:COMPRESSION ON PCB TO MICTOR ADAPTER,34 CH,BAG INCLUDES 671-5449-00,ELASTOMER HO	80009	020-2456-00
	020-2457-00			1	ACCESSORY KIT:MICTOR-ON-PCB TO COMPRESSION ADAPTER,INCLUDES 671-5294-00	80009	020-2457-00

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