

# **Service Manual**



## **TLA5000 Series Tektronix Logic Analyzer 071-1305-00**

This document applies to firmware version 1.00 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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## WARRANTY

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

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

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

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

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

**Powering Off.** The power cord provides Mains disconnect.

**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.*

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

---

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

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

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

CAUTION indicates a hazard to property including the product.

**Symbols on the Product.** The following symbols may appear on the product:



# 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 TLA5000 Logic analyzer products. 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* following this preface for safety and other important background information needed before using this manual for servicing this product.

## Manual Structure

This manual is divided into chapters, which are made up of related subordinate topics. These topics can be cross referenced as sections.

Be sure to read the introductions to all procedures. These introductions provide important information needed to do the service correctly, safely, and efficiently.

## Manual Conventions

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

### **Safety**

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


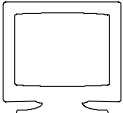

### **Replaceable Parts**

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, such as the hard disk drive, or a mechanical part, such as the I/O port connectors, that is listed in the replaceable parts list.

## Related Documentation

In addition to this service manual, several other pieces of documentation are available. Table i lists other documentation that you may need to support your Tektronix logic analyzer product.

**Table i: Tektronix Logic Analyzer Family documentation**

Location	TLA Documentation
Documents available in printed form and downloadable from the Tektronix web site.	
   <b>tektronix.com</b>	Tektronix Logic Analyzer Family User Manual
	TLA5000 Logic Analyzer Installation Reference
	TLA5000 Series Logic Analyzer Installation Manual
	P6417 & P6418 Logic Analyzer Probes Instructions
	P6419 Logic Analyzer Probe Instructions
	P6434 Mass Termination Probe Instructions
	TLA6UP Field Upgrade Kit Instructions
	TLA7QS Quick Start Training Manual
	TDS5000 Series & TLA5000 Series Rackmount Kit Instructions
Documents available as PDF files on the documentation CD.	
	Tektronix Logic Analyzer Family User Manual
	TLA5000 Series Logic Analyzer Installation Manual
	Tektronix Logic Analyzer Programmatic Interface (TPI.net)
	Tektronix Logic Analyzer Programmatic Interface (TPI.com)
	P6417 & P6418 Logic Analyzer Probes Instructions
	P6419 Logic Analyzer Probe Instructions
	P6434 Mass Termination Probe Instructions

## Contacting Tektronix

<b>Phone</b>	1-800-833-9200*
<b>Address</b>	Tektronix, Inc. Department or name (if known) 14200 SW Karl Braun Drive P.O. Box 500 Beaverton, OR 97077 USA
<b>Web site</b>	<a href="http://www.tektronix.com">www.tektronix.com</a>
<b>Sales support</b>	1-800-833-9200, select option 1*
<b>Service support</b>	1-800-833-9200, select option 2*
<b>Technical support</b>	Email: <a href="mailto:support@tektronix.com">support@tektronix.com</a> 1-800-833-9200, select option 3* 6:00 a.m. – 5:00 p.m. Pacific time

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\* **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. This introduction contains information critical to safe and effective servicing.

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

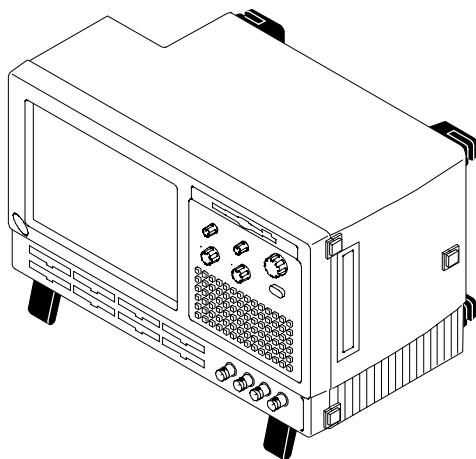
- Read the *General Safety Summary* and *Service Safety Summary* found at the beginning of this manual.
- The procedures in this manual should only be performed by a qualified service person.
- Read the *Preface*.
- Read the *Operating Information* chapter.

Be sure to follow all warnings, cautions and notes.

## TLA5000 Series Logic Analyzers

The TLA5000 series logic analyzers consist of four portable logic analyzer mainframes, which differ by channel width, and all of the accessories and supports that are used with them. The logic analyzers are built upon the Microsoft Windows operating system, which allows you to install any PC-compatible, third-party hardware and software on the instrument.

A TLA5000 logic analyzer is illustrated in Figure i.



**Figure i: TLA5000 series logic analyzers**

The TLA5000 series is comprised of four logic analyzers, as listed in Table ii.

**Table ii: TLA5000 series family**

Logic analyzer	Description
TLA5201	34 channel, 2 GHz timing with 125 ps MagniVu Acquisition, 235 MHz state, 512 K depth Internal and external display
TLA5202	68 channel, 2 GHz timing with 125 ps MagniVu Acquisition, 235 MHz state, 512 K depth Internal and external display
TLA5203	102 channel, 2 GHz timing with 125 ps MagniVu Acquisition, 235 MHz state, 512 K depth Internal and external display
TLA5204	136 channel, 2 GHz timing with 125 ps MagniVu Acquisition, 235 MHz state, 512 K depth Internal and external display

## Adjustment and Certification Interval

Generally, you should perform the adjustments and certification (calibration) described in the *Performance Verification* and *Adjustment Procedures* chapters once per year, or following repairs that affect adjustment or calibration.

## Strategy for Servicing

This manual supports and contains information needed for periodic maintenance of the logic analyzer.

This manual supports and 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 of Chapter 10
- Supports removal and replacement of those boards or assemblies
- Supports removal and replacement of the fuse, 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 equipped to service the logic analyzer. Services are provided at Tektronix Service Centers and on-site at your facility, depending on your location.

### Warranty Repair Service

Tektronix warrants this product for one year from date of purchase. The warranty is located 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 *Customer Services World Center* web site at:

[Tektronix.com/Measurement/Service](http://Tektronix.com/Measurement/Service)

### Calibration and Repair Service

In addition to warranty repair, Tektronix Service offers calibration and other services which provide solutions to your service needs and quality standards compliance requirements.

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

**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. These service options are listed on the Tektronix *Service Options* page following the title page of this manual.

**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. Service agreements may be customized to meet special turn-around time and/or on-site requirements.

**Service on Demand.** Tektronix offers calibration and repair services on a “per incident” basis that is available with standard prices.

**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.

**For More Information.** Contact your local Tektronix service center or sales engineer for more information on any of the Calibration and Repair Service just described.



# Specifications

Refer to the *Tektronix Logic Analyzer Family Product Specifications* document for a complete list of specifications for the TLA5000 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 as a PDF file.



# Operating Information

This chapter covers basic installation information and some high-level operating instructions. For detailed installation information, refer to the TLA5000 Series Installation Manual; for detailed operating information, refer to the online help.

## Installation

The basic operating software is already installed on the hard disk. Use the information in this section to set up the instrument for service or to verify proper operation.

**Before You Start** Verify that all parts and accessories for the logic analyzer are available.

**Environmental Considerations** The logic analyzer is designed to operate on a bench or a cart in the normal position (on the bottom feet).



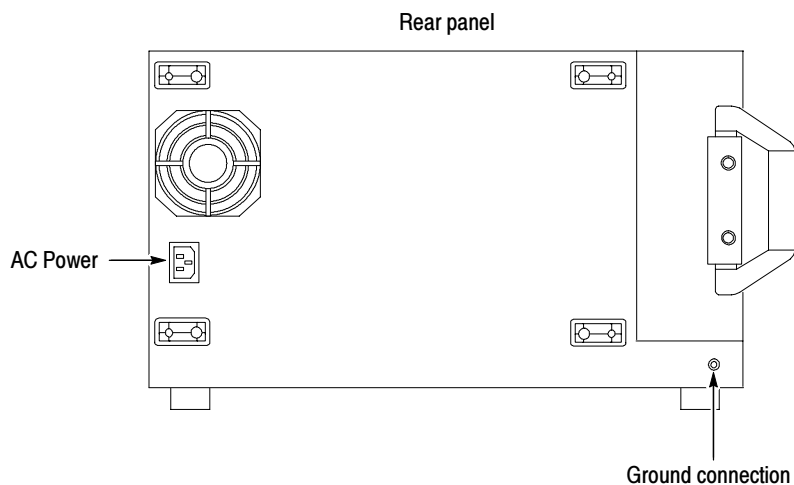
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**CAUTION.** Allow a 5.1 cm (2 in) clearance at the bottom and sides of the instrument to ensure proper cooling. Inadequate clearances can cause the instrument to overheat and shut down.

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**Chassis Ground Connections** Use the chassis ground connections to connect the grounds of the target system (system-under-test) to the logic analyzer to ensure a common ground connection between instruments.

Figure 2-1 shows the chassis ground connection on the logic analyzer.



**Figure 2-1: Location of the ground connection**

### Connect the Accessories

The accessory connections are the same as those on a personal computer. The connection points are shown in Figure 2-2 on page 2-3.



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**WARNING.** Before installing accessories to connectors (mouse, keyboard, etc.), power off the logic analyzer. See Powering Off the Logic Analyzer on page 2-5.

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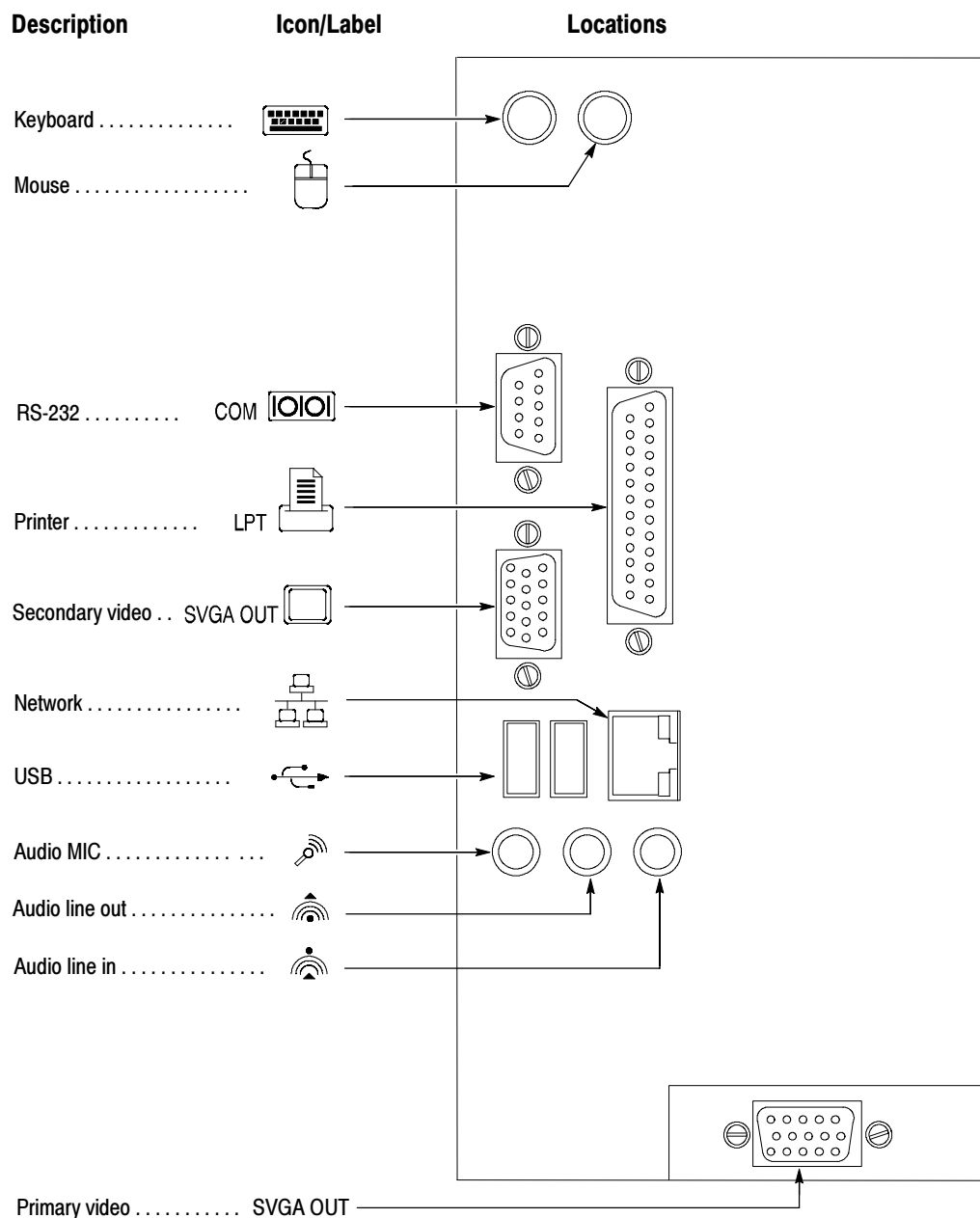


Figure 2-2: TLA5000 series accessory connections

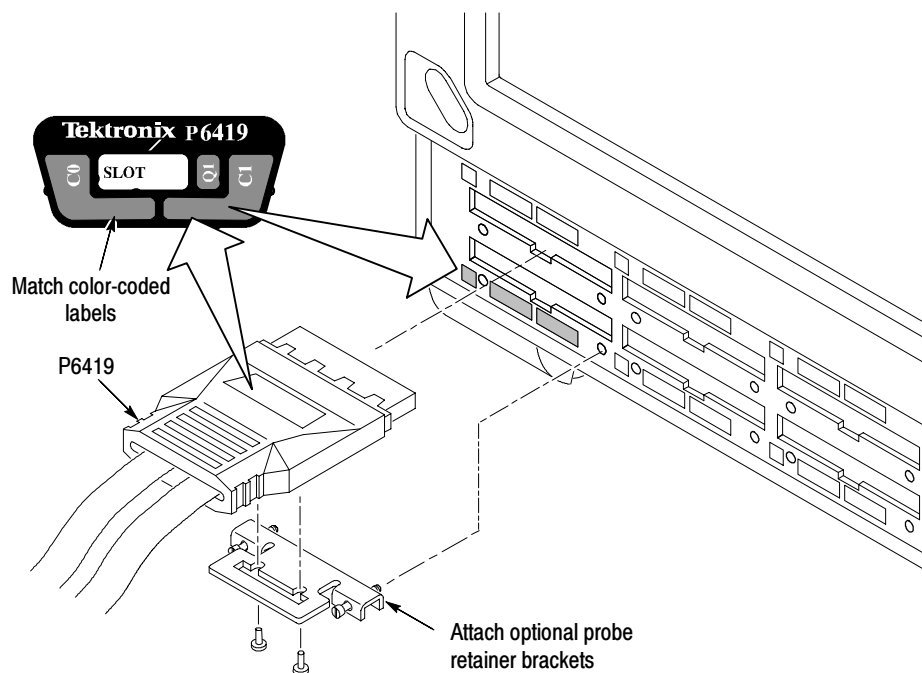
## Connecting Probes

After you connect all the accessories, you can connect the probes to the instrument.



**CAUTION.** When attaching the probe to the logic analyzer, you must use care to evenly tighten probe screws until they are snug. First slightly tighten screws, then snug each screw to 4 in-lbs (max). Undertightening the probe screws can result in intermittent performance.

Connect the logic analyzer probes and the optional retaining brackets as shown in Figure 2-3. Not all probes use the screws to connect the retaining bracket to the probe; currently the P6418 and P6419 probes use the screws, while the P6417 and P6434 probes do not need the screws to hold the retaining bracket in place.



**Figure 2-3: Connecting the logic analyzer probes to the logic analyzer**

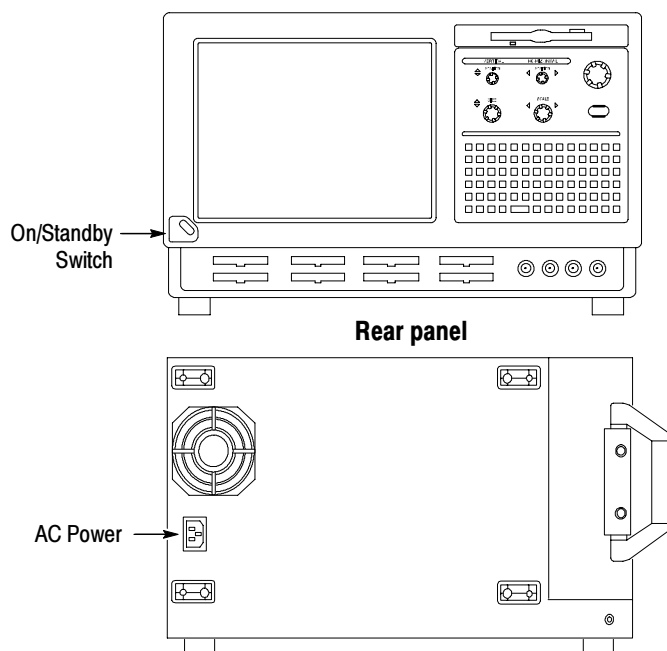
## Power On the Logic Analyzer



Follow these steps to power on the instrument.

**CAUTION.** To prevent damage to the accessories, connect the keyboard, mouse, and other accessories before applying power to the product.

1. Connect the power cord (see Figure 2-4 for the AC power location).
2. If you have an external monitor, connect the power cord and video cable to the logic analyzer and then power on the monitor.
3. Press the On/Standby switch to power on the instrument (see Figure 2-4 for the switch location).
4. Wait for the self test to complete and the application to start.



**Figure 2-4: On/Standby and AC Power switch locations**

## Powering Off the Logic Analyzer

The logic analyzer has a built-in soft power-off function that safely powers off the logic analyzer when you press the On/Standby switch.

To completely remove power to the instrument, press the On/Standby switch, and then remove the power cord from the rear panel. You can also shut down the instrument through the Windows Start Menu.

### Performing the Incoming Inspection

After the power-on diagnostic finishes checking the basic functionality of the logic analyzer, you need to perform an incoming inspection. The incoming inspection consists of verifying the basic operation of the logic analyzer.

For a more detailed functionality check, run the following self-calibration and extended diagnostics procedures.

---

**NOTE.** *Allow the mainframe to warm up for 30 minutes before running the self-calibration.*

---

To run self-calibration and diagnostics, perform the following:

1. Disconnect any probes that are attached to the input connectors.
2. Select the System menu and click Calibration and Diagnostics.
3. Run the self-calibration and then the extended diagnostics by selecting the proper tab. Results of the tests display on the individual property page.

### Checking the P64xx Logic Analyzer Probes (Optional)

Connect the P64xx logic analyzer probes to a signal source, start an acquisition, and verify that the acquired data is displayed in either the listing or waveform windows. You can also use the Activity Indicators in the logic analyzer Setup window to view signal activity at the probe tips.

---

**NOTE.** *If you connect probes to any channels other than the A2 and A3 groups, you must define the groups and channels in the Setup window and set the threshold voltages before acquiring data on other probe channels.*

---

### Software Installation

The logic analyzer ships with the product software installed, so only perform these procedures if reinstallation becomes necessary.

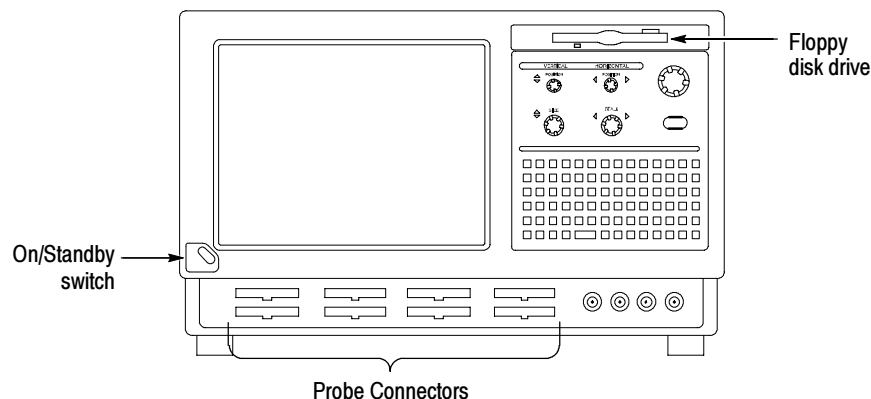
The Windows operating system and drivers are factory installed on the logic analyzer hard disk. The hard disk Image CDs serve as a backup in the event that you have to restore the hard disk drive.



## Operating Information

All features of the logic analyzer can be accessed through the menus using a mouse. Refer to the online help for specific operating information.

Figure 2-5 shows the controls, connectors and floppy disk drive location.



**Figure 2-5: Controls and connectors on the front panel**

The multi-function knob is used primarily for incrementing and decrementing values in selected menu boxes. The four positioning and scale knobs provide scrolling of the logic analyzer displays.

---

**NOTE.** For external connectors on the rear panel see Figure 2-2 on page 2-3.

---

## Connecting Probes to the Target System

The logic analyzer connects to the target system through probes. Several different probes are available for the logic analyzer. For probe-specific connection details, refer to the appropriate probe instruction manual or browse the Tektronix Web site.

## Additional Information

For detailed information on using the logic analyzer refer to the online help. For additional information on the latest software version or other information, refer to the release notes. To access the release notes, click Start > Programs > Tektronix Logic Analyzer > TLA Release Notes.



# Theory of Operation

This chapter provides a high-level overview of the board level theory of operation for the logic analyzer. Refer to the *Diagrams* chapter for a functional block diagram of the instrument.

## Hardware

**General** The logic analyzer controller contains a PC motherboard and microprocessor system that controls the entire instrument. The instrument features a flat-panel display, front panel keyboard with control knobs, probe interface, and external connections for a keyboard, mouse, and other PC accessories.

**Mother Board** The Intel Micro ATX mother board provides all the benefits of a high-performance PC-based mother board. The mother board contains the microcontroller, memory, battery, and input-output components typically used with a PC.

The following peripheral interfaces are included:

- One parallel port
- Four USB 2.0 ports (two external, two internal)
- Two serial ports (one internal, one external)
- Two IDE interfaces supporting up to ATA-100
- Floppy disk drive interface
- PS/2 keyboard and mouse ports
- 10/100 Mbit/s LAN port
- Secondary display connector

**Interface Board** The Interface board connects the mother board to the rest of the instrument through the PCI connector. The interface board contains the following circuitry:

- LPU Circuitry. The LPU circuitry controls the acquisition system using a 68360 microprocessor.
- Internal Display. The interface board contains the display controller that drives the 1024 X 768 resolution as well as an external display connector. The display signal at the external primary connector is identical to the

internal LCD display signal when used with the Windows 2000 Professional operating system.

- **Power Distribution and Miscellaneous Circuitry.** The power supply circuitry on the interface board generates the majority of the 2.5 V needed by the acquisition circuitry. The interface board also provides the interface between the front panel keypad and knobs, the On/Standby switch, main power supply, and the mother board.

### **Power Supply**

The power supply is a switching power converter with active power factor correction. It supplies power to all of the circuitry in the logic analyzer. The power is distributed to the PC interface board and to the hard disk drive connectors.

### **Fans**

The fan assembly provided forced air cooling for the logic analyzer and are controlled by the microprocessor.

### **Front Panel Keypad and Knobs**

The front panel keypad consists of a full QWERTY keypad. The keypad connects to the mother board through one of the internal USB connections. The front panel keypad is active simultaneously with an optional external keyboard.

Five front panel knobs provide the following manual controls:

- Two horizontal and vertical sizing knobs
- Two horizontal and vertical position knobs
- One multifunction knob

### **Display**

The internal display is a 10.4-inch diagonal Active Matrix Thin-Film-Transistor (TFT) liquid crystal display (LCD) with a built-in back light. The color LCD is supported by an external DC switching regulator board to provide the back-light voltage and a display adapter board which supports connector interfacing from the the PC interface board and to the On/Standby front panel switch.

### **Hard Disk Drive**

The internal hard disk drive is a standard 3.5-inch IDE drive which interfaces directly to the mother board through a standard UDMA 80 conductor cable. The hard disk drive is *not* removeable. The CD drive uses the slot on the secondary IDE interface.

### **Floppy Disk Drive**

The floppy disk drive is a standard 1/2-inch drive supporting 3.5-inch 1.44 MByte high-density double sided floppy disks. The drive is an internal USB floppy disk drive.

**CD Drive** The CD drive is a slim-line CD-RW drive. The actual CD-RW drives may vary as new drives become available.

**USB 2.0 Ports** A dual external USB 2.0 port allows external connection to USB devices. Two ports are use internally by the keypad and the floppy disk drive.

## Software

The instrument operation is controlled by the TLA Application Software built upon the Windows Operating System.

## Probe Interface

The logic analyzer connects to the target system through the probe interface. The logic analyzer can use the following probes to acquire data from the target system:

- P6417
- P6418
- P6419
- P6434

Depending on the instrument configuration, you can connect up to eight P6417, P6418, and P6419 general purpose probes or up to four P6434 high-density probes.

## Acquisition

The acquisition board is mounted on the bottom of the instrument. The number of channels for each logic analyzer depend on the configuration. The acquisition board takes the data from the probes, determines when to clock the data into memory, and communicates the acquisition information with the rest of the instrument.

Depending on the instrument configuration the logic analyzer has zero, one, or two daughter boards that provide for additional probe connections.

No manual adjustments or calibration exist. All calibration is done by software but requires the TLACAL1 fixture for the adjustment procedures. The adjustment procedures are described in the *Adjustment Procedures* chapter of this manual.

## Internal Indicator LEDs

The logic analyzer has two internal indicator LEDs located on the PC Interface board. These LEDs can be used for troubleshooting:

- Ready Indicator. This LED indicates that the instrument has passed the power-up diagnostics and is ready to communicate with the acquisition controller.
- Access Indicator. This LED turns on any time the acquisition controller accesses the main instrument circuitry.

# Performance Verification

This chapter contains procedures for functional verification, certification, and performance verification for the logic analyzer. Generally, you should perform these procedures once per year or following repairs that affect certification.

---

**NOTE.** *This chapter does not contain any procedures for verifying, adjusting, or certifying the TLACAL1 Performance Verification fixture. If the test fixture requires, verification, adjustment, or certification, you must return the test fixture to the factory.; contact your local Tektronix service center for more information.*

---

## Summary 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. These procedures can be used for incoming inspection purposes.

Certification procedures certify the accuracy of an instrument and provide a traceability path to national standards. Calibration data reports are produced for the logic analyzers as output from the performance verification and adjustment software.

Performance verification procedures confirm that a product meets or exceeds the performance requirements for the published specifications. Refer to Figure 4-1 on page 4-2 for a graphic overview of the procedures.

Adjustment procedures check for, and if necessary, correct any adjustment errors discovered when performing functional or performance verification procedures. The adjustment procedures for the logic analyzers are controlled by software but some of the adjustment procedures require manual intervention to move probes or to change test equipment settings.

The performance verification and adjustment software is provided on the product CD-ROM.

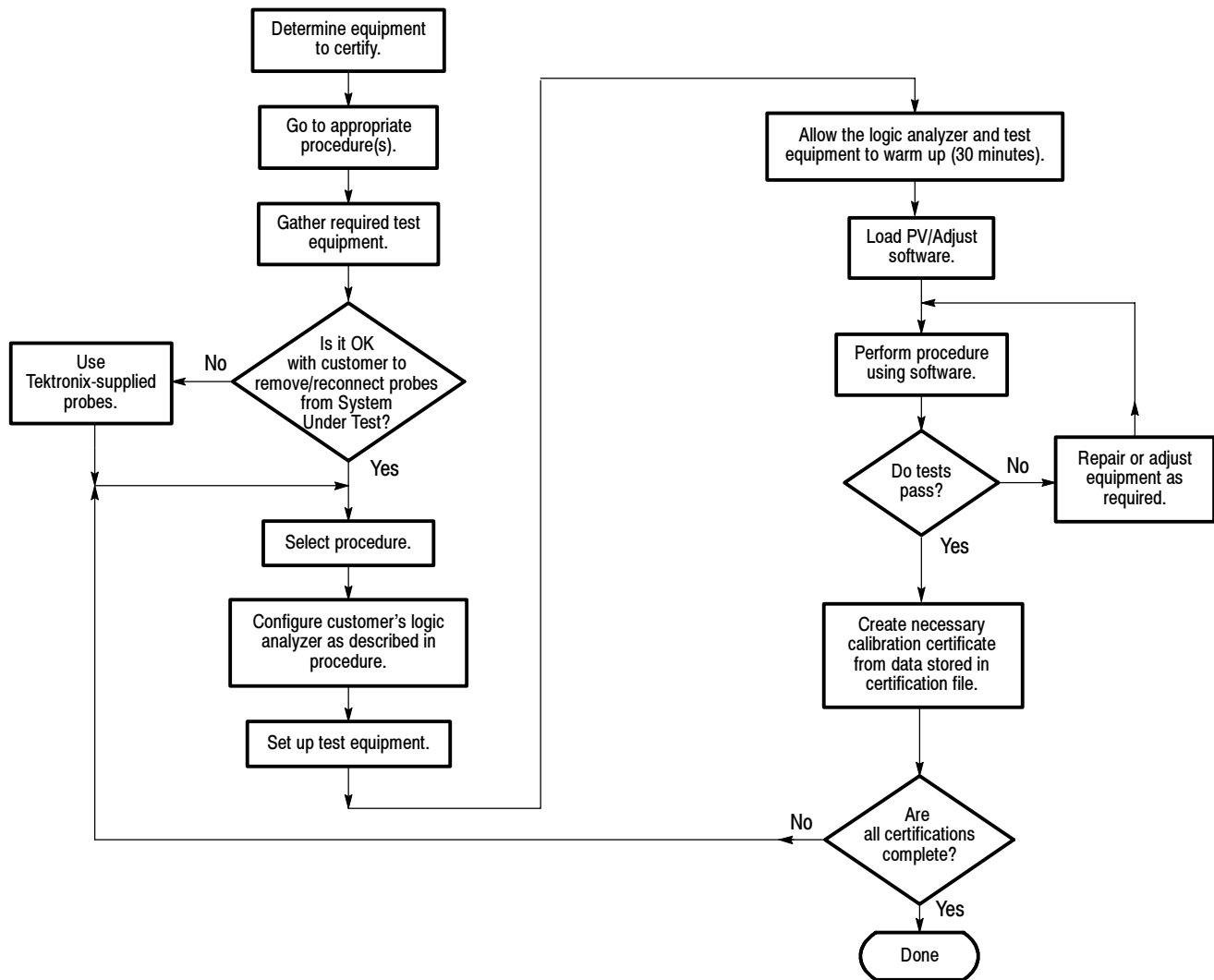


Figure 4- 1: Calibration/certification procedure flow chart



## Test Equipment

The procedures use external, traceable signal sources to directly test characteristics that are designated as checked (✓) under the TLA5000 Series Logic Analyzer specifications. These specifications are listed in the *Tektronix Logic Analyzer Product Specifications* document on the *Tektronix Logic Analyzer Family Product Documentation CD* or can be downloaded from the Tektronix website as a PDF file.

Table 4-1 shows the required equipment list; this equipment is required for the performance verification and adjustment procedures.

**Table 4-1: Test equipment**

Item number and description	Minimum requirements	Example
1. TLA5000 Logic Analyzer	TLA5000 Series Logic Analyzer with TLA Application software V4.3 or higher	TLA5204 Logic Analyzer
2. Logic analyzer probes	P6417, P6418, or P6419 logic analyzer probes. One probe required for every 17-channels <sup>1</sup>	No substitute allowed
3. Performance Verification test fixture with accessories	TLACAL1 test fixture	No substitute allowed
4. Digital Multimeter with probes	Agilent 34401A, 6.5 digit display, 35 ppm, 1 year accuracy, 1000 readings per minute, 100 nV sensitivity, GPIB controllable	No substitute allowed
5. USB-GPIB controller:	National Instruments 778195-01 Windows 2000 compatible with 2 m cable	Tektronix iView cable
6. RS-232 cable	2 m RS-232 cable, 9-pin female-to-female connector	Tektronix part number 012-1379-00

<sup>1</sup> The P6419 logic analyzer probes can be used to complete all of the verification procedures. The P6417 and the P6418 logic analyzer probes can be use to complete all of the verification procedures *except* the Setup and Hold procedures.

## Test Equipment Setup

The TLACAL1 Performance Verification and Adjustment test fixture and the performance verification software are required to perform the performance verification procedures, certification procedures, and adjustment procedures.

### Connecting the Test Fixture

You will need to connect the test fixture to the logic analyzer and associated test equipment before running any of the procedures. A complete list of test equipment is listed in Table 4-1. Complete the following steps to connect the test equipment to the logic analyzer:

1. Connect the RS-232 cable from the COM A connector of the logic analyzer to the RS-232 connector on the test fixture.

---

**NOTE.** When using GPIB, make sure that you select unique GPIB addresses on the individual instruments to avoid conflicts.

---

2. Connect the iView cable from the USB connector on the logic analyzer to the GPIB connector on the DMM.
3. Connect the multimeter leads to the DMM test points on the test fixture.
4. Connect the power cord to the test fixture.

---

**NOTE.** The performance verification software will prompt you to make necessary probe connections when you run the individual tests.

---

### Installing the Performance Verification and Adjustment Software

The performance verification software is a separate application that consists of executable software files. The software must be installed on the hard disk before you can use it. You must quit the logic analyzer application before starting the performance verification software; you cannot run both applications at the same time.

---

**NOTE.** If your logic analyzer already has the performance verification software installed, verify that the performance verification software version matches that of the logic analyzer application software. If the software versions do not match, you must delete the performance analysis software from the hard disk drive and install the matching version.

---

Complete the following steps to install the performance verification software:

1. Close all open applications.
2. Insert Disc 1 of the Tektronix Logic Analyzer Family application software CD in the CD-ROM drive.
3. On the desktop select Start → Run to display the Run dialog.

4. In the Run dialog box, enter the following path or use the Browse button to navigate to the path:

D:\TLACAL\Setup.exe

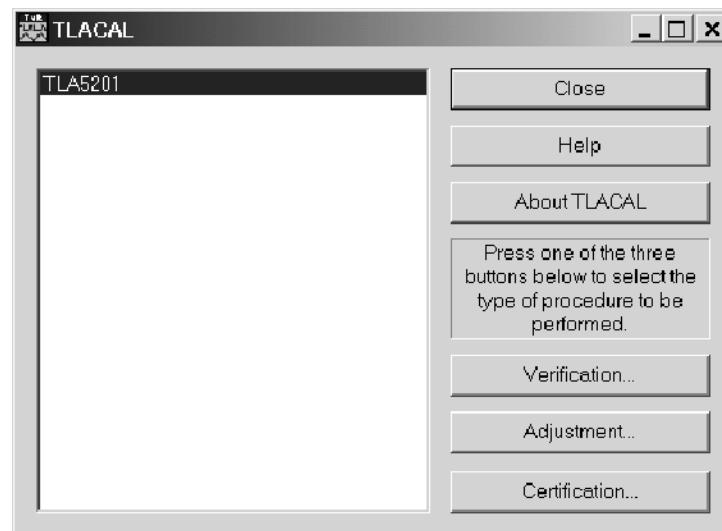
5. Click OK to begin the installation program and then follow the on-screen instructions to install the software.
6. Remove the CD when the installation is complete.

To remove the software from the logic analyzer, use the Add/Remove Program utility from the Windows Control Panel.

### Starting the Performance Verification Software

Use the following steps to start and run the software. These steps are repeated under the individual procedures but are listed here to give you an overview of using the software.

1. Allow the logic analyzer and all test equipment to warm up for at least 30 minutes.
2. Exit the logic analyzer application.
3. Select Start → Programs → Tektronix Logic Analyzer → TLACAL. An application window similar to Figure 4-2 appears.
4. The instrument appears selected in the list. Click either the Verification button, Adjustment button, or Certification button depending on the type of procedure that you want to perform.



**Figure 4-2: Performance verification software startup window**

## **Software Overview**

After selecting the type of test that you want to run, a new dialog box appears. The dialog box contains the following information:

- Name and serial number of the instrument to be tested
- Probe selection box
- A list of procedures organized by groups

The individual procedures are organized by groups that require the same test equipment setups. Depending on the type of probe selected, the related procedures are indicated by a checkmark adjacent to the procedure. You can disable any procedures by clearing the check box. All selected procedures will be tested beginning with the top-most procedure in the dialog box. In most cases, you will want to run all of the selected tests.

The software determines which GPIB instruments are required to perform the selected procedures and sets up the individual instruments. If any equipment problems are found, an appropriate error message will be displayed.

## **Obtaining Test Results**

After completing the various procedures, you have the option of saving the test results to a text file on the hard disk. You can assign a name to the file from a dialog box. You can then edit the file as necessary using any of the Windows tools or print the file.

## **Troubleshooting**

If any tests fail, use the following steps to troubleshoot the problems:

1. Check that all test equipment is powered on and has the proper warm-up time.
2. Check all test equipment for improper or loose connections.
3. Verify that the probes are properly connected to the logic analyzer.
4. Verify that all probes are properly connected to the test fixture and to the correct locations on the test fixture.
5. Rerun the instrument diagnostics.
6. Run the self calibration from the TLA application.
7. Run the adjustment procedures.
8. Run the tests a second time to verify the failure.
9. If all else fails, contact your local Tektronix service center for additional information.

## Functional Verification

This section contains instructions for performing the functional verification procedures for the logic analyzer. These procedures provide an easy way to check the basic functionality of the logic analyzer and probes. The test fixture or software is not required for any of the functional verification checks.

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:

- Self tests and power-on diagnostics
- Extended diagnostics
- Mainframe diagnostics
- Probe functional verification

This procedure provides a functional check only. If more detailed testing is required, perform the *Performance Verification Procedures* beginning on page 4-11 after completing this procedure.

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:

- TLA5000 series logic analyzer
- At least one logic analyzer probe
- One short BNC-to-BNC cable (to complete the Mainframe Diagnostics)

### Setup

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

### Self Tests and Power-On Diagnostics

During power-on, the instrument performs an internal self test to verify basic functionality. No external test equipment is required.

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 showing the failed test.

---

**NOTE.** *If any diagnostics fail, you may need to run the self calibration before attempting to service the logic analyzer. The Self Calibration procedure is listed under Self Calibration beginning on page 5-3.*

---

## Extended Diagnostics

The following procedure checks the basic functionality of the logic analyzer by 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.
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 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 5-3 and then rerun the extended diagnostics.*

---

## Mainframe Diagnostics

The Mainframe Diagnostics are comprehensive software tests that check the logic analyzer. Perform the following steps to run the mainframe diagnostics:

1. Quit all other applications on the instrument.
2. Select Start → Programs → Tektronix Logic Analyzer → TLA Mainframe Diagnostics.
3. Click the Run button to start the diagnostics. Follow the online instructions to complete the tests. If necessary, refer to the online help for more information on the diagnostics.

**Probe Functional Verification**

There are two ways of verifying probe functionality. One way is to connect the probes from the logic analyzer to a signal source, adjust the appropriate threshold voltage levels, and then verify that the logic analyzer acquires the data in a listing or waveform window.

Alternately, you can perform the performance verification procedures which will verify that the logic analyzer and the attached probes meet or exceed the advertised specifications. The performance verification procedures are covered in the remainder of this chapter.

## Performance Verification Instructions

This section contains information to verify the performance of the logic analyzer. Testing is performed using the performance verification software and the test fixture.

As a general rule, these tests should be done once a year.

**Prerequisites**

The performance verification procedures in this section comprise an extensive, valid confirmation of performance and functionality when the following requirements are met:

- The performance verification software must be loaded on the hard disk.
- The logic analyzer, test fixture, and other related test equipment must be installed, connected, and operating for at least 30 minutes at an ambient temperature between +20 °C and +30 °C.
- The logic analyzer and the test fixture must have been last adjusted at an ambient temperature between +20 °C and +30 °C.
- The logic analyzer and test fixture must be in an operating environment within the limits described in the *Tektronix Logic Analyzer Product Specifications* document.

**Procedure Overview**

When using the performance verification software, you will connect external test equipment and probes to the logic analyzer in response to prompts on the screen. The software automatically selects the instrument settings and determines the results of each test.

The results of the tests are recorded in a temporary file and are available upon test completion for completing test records.

---

**NOTE.** Before testing an instrument following repair, you must first complete the adjustment procedure.

---

Table 4-2 lists the specifications as checked (✓) in the *Tektronix Logic Analyzer Product Specifications* document for the logic analyzer and the performance verification software checks used to verify those specifications. In addition to the software test listed in the table, some specifications are verified by the built-in diagnostics. By running all tests and diagnostics, you will verify the performance of the logic analyzer and probes.

**Table 4-2: Performance verification tests**

Specification	Test method
Threshold accuracy	Verified by the Thresholds test. Certified by running Certification procedure; refer to <i>Logic Analyzer Certification</i> beginning on page 4-19.
Channel-to-channel skew	Verified indirectly by the Setup and Hold procedure
Internal sampling period	Verified indirectly by Pulse Width procedure and Time Base Accuracy procedure
Minimum recognizable word (across all channels)	Verified indirectly by the Setup and Hold procedure and by the Internal Sampling Period
Setup and hold window size (data and qualifiers)	Verified directly by Setup and Hold procedure (Can only be run with P6419 probes)
Maximum synchronous clock rate	Diagnostics verify the clock detection/sampling circuitry. Bandwidth is verified by Setup and Hold procedures and by the Pulse Width procedure
Counters and timers	Verified by diagnostics
Trigger state sequence rate	Verified indirectly by the at-speed diagnostics and the Internal Sampling Period



## Performance Verification Procedures

Table 4-3 provides a summary of the performance verification procedures. The procedures are listed by groups and include individual procedures. Some of these procedures are optional and are recommended for performing a thorough performance verification. Others are the minimum required to verify the advertised specifications of the logic analyzer. Each group requires different equipment setups.

**Table 4-3: TLA5000 performance verification procedures**

Procedure by groups	Notes
Module+Probe Gain and Offset Procedures	
Threshold <sup>1</sup>	
Module+Probe Timing Procedures	
Pulse Width	
Timebase <sup>2</sup>	
Setup and Hold Procedure	Can only be verified with P419 logic analyzer probes
Setup and Hold	

<sup>1</sup> **Certifiable parameter. This procedure can be run separate from the performance verification procedures. Select the Certification button from main window in the software. The Certification instructions are listed on page 4-19.**

<sup>2</sup> **The Timebase procedure indirectly tests the CLK10 specification.**

Use the tables and illustrations to set up and execute the procedures. The procedures assume that you have already installed the performance verification software on the logic analyzer. They also assume that you will only perform the procedures selected in each group.

Figure 4-3 shows the locations of connectors and test points on the test fixture. You may need to refer to this illustration when connecting probes to the test fixture. You should also refer to the label on top of the test fixture.

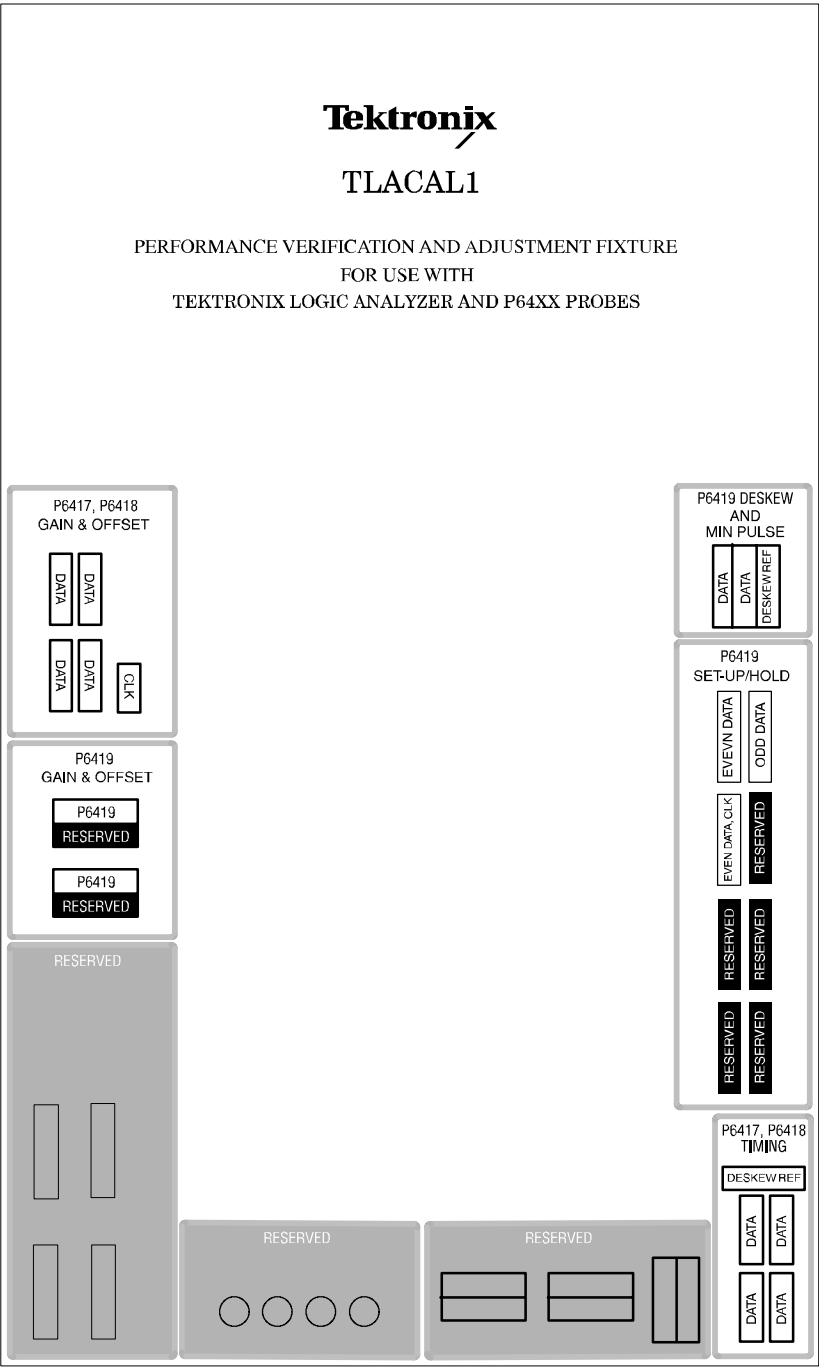


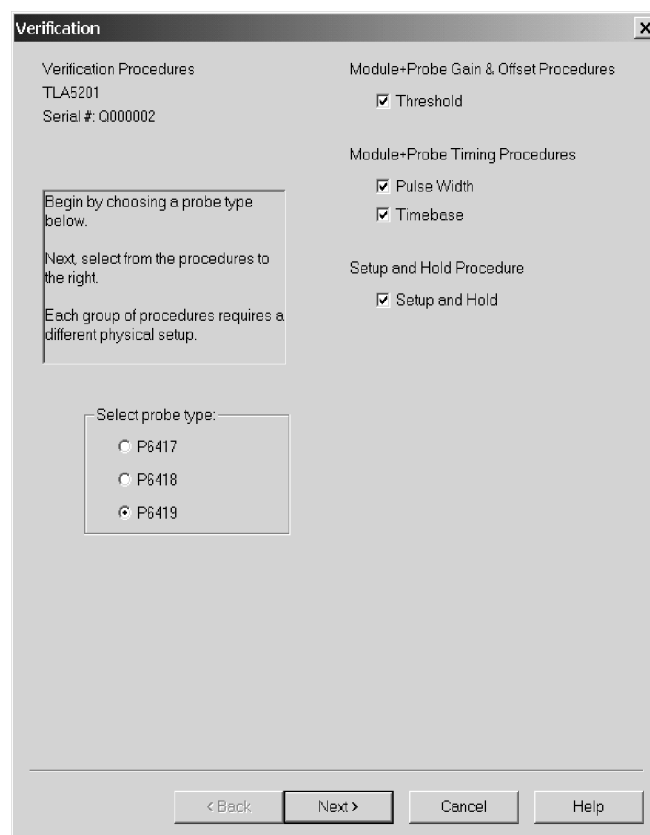
Figure 4- 3: TLACAL1 test fixture connections

## Module+Probe Gain & Offset Procedures

These procedures verify the threshold accuracy of the instrument. These tests can be run separately as certifiable parameters (see Logic Analyzer Certification beginning on page 4-19).

Complete the following steps to run the procedures:

1. If you haven't already done so, power on the instrument and allow all test equipment to warm up for 30 minutes.
2. Exit the TLA application.
3. Double-click the TLACAL icon on the desktop. An application window similar to Figure 4-2 on page 4-5 appears.
4. Click the Verification button to start the software. A Verification dialog box similar to Figure 4-4 appears.



**Figure 4-4: Default Verification dialog box**

5. Select the probe type near the bottom of the dialog box.

6. Verify that Pulse Threshold is selected under Module+Probe Gain & Offset Procedures. Clear all other procedure selections in the dialog box.

---

**NOTE.** *The software will perform all selected procedures without interruption, with the exception of when user interaction is required (such as moving a probe). To limit the test to specific procedures, clear any procedures that you do not want to run. If you want to run all of the selected procedures, you need to pay close attention to the connection instructions as they are displayed on the screen.*

---

7. Click the Next button at the bottom of the dialog box to display the probe connection instructions. Follow the on-screen instructions to connect the probes from the logic analyzer to the test fixture. If necessary, refer to the test fixture label to determine the correct probe connection.

---

**NOTE.** *When connecting the P6419 Logic Analyzer probes, make sure that the alignment pin on the probe head aligns with the hole on the test fixture. Tighten the probe head screws by alternating between them until they are finger tight (no more than 1 in-lbs of torque).*

---

8. Click the Next button to begin the verification procedure.

The software will begin the procedures and display a list of results in the window.

9. After the first set of procedures are done, click the Next button to display the instructions for the next step. In most cases you only need to connect a different probe to the test fixture.
10. After changing the connections, click the Next button to continue the tests.
11. Repeat steps 7 through 8 as indicated by the software.
12. After the procedure finishes, click the Next button to open the Finish dialog box where you can save the results to a file. Enter a file name and click the Save button. You can use the Save dialog to save the file to a folder of your choice or use the default location.
13. Click the Finish button to complete the process.

**Module+Probe Timing Procedures**

These procedure verify the minimum pulse width specification and the accuracy of the time base.

It is assumed that the logic analyzer is already connected to the test fixture and that all test equipment has had a 30-minute warm-up period. Complete the following steps to run the procedures:

1. If the TLA application is running, exit the application.
2. Double-click the TLACAL icon on the desktop. An application window similar to Figure 4-2 on page 4-5 appears.
3. Click the Verification button to start the software.
4. Select the probe type near the bottom of the dialog box.
5. Verify that Pulse Width and Timebase are selected under Module+Probe Timing Procedures. Clear all other procedures in the dialog box.

---

**NOTE.** *The software will perform all selected procedures without interruption, with the exception of when user interaction is required (such as moving a probe). To limit the test to specific procedures, clear any procedures that you do not want to run. If you want to run all of the selected procedures, you need to pay close attention to the connection instructions as they are displayed on the screen.*

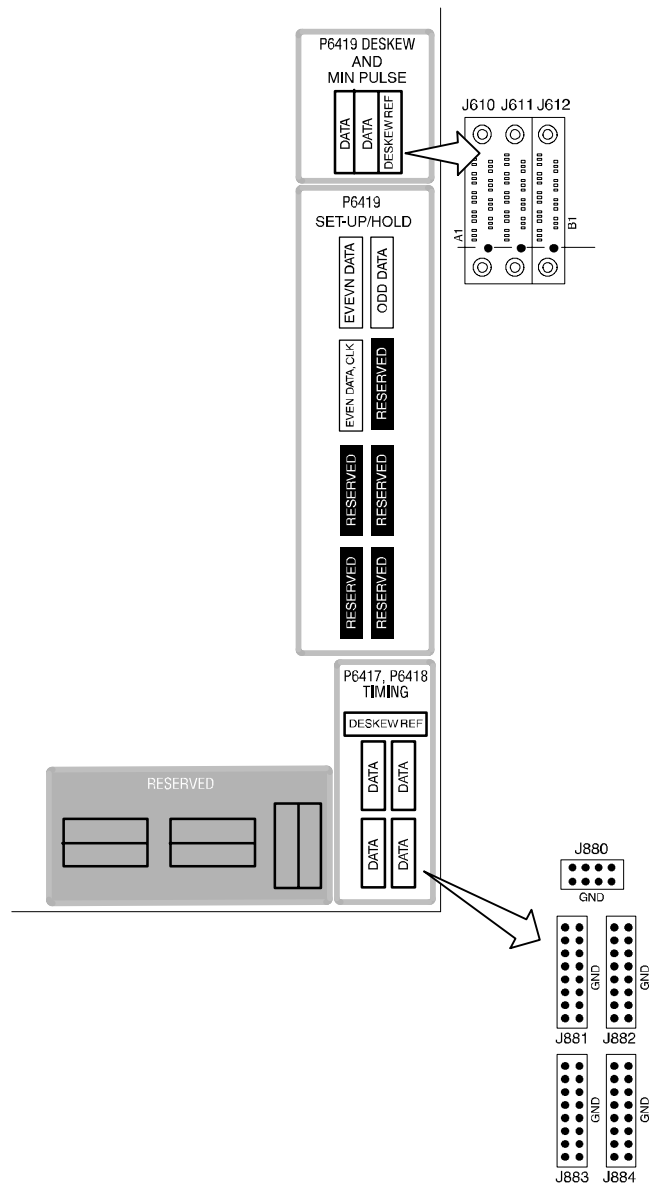
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6. Click the Next button at the bottom of the dialog box to display the probe connection instructions. Follow the on-screen instructions to connect the probes from the logic analyzer to the test fixture. If necessary, refer Figure 4-5 on page 4-16 and to the test fixture label to determine the correct probe connection.

---

**NOTE.** *When connecting the P6419 Logic Analyzer probes, make sure that the alignment pin on the probe head aligns with the hole on the test fixture. Tighten the probe head screws by alternating between them until they are finger tight (no more than 1 in-lbs of torque).*

---



**Figure 4- 5: Module+Probe timing procedure probe connections**

7. Click the Next button at the bottom of the dialog box to begin the procedure.

The software will begin the procedures and display a list of results in the window.

---

**NOTE.** *Note that the Timebase test is only run on the first probe section. When the software tests the next section, the Timebase test is not run. The screen will display a line indicating that the test is not run; you can ignore this message.*

---

8. After the first set of procedures are done, click the Next button to display the instructions for the next step. In most cases you only need to move a probe or connect a different probe to the test fixture.
9. After changing the connections, click the Next button to continue the procedures.
10. Repeat steps 7 through 8 as indicated by the software.
11. After the procedure finishes, click the Next button to open the Finish dialog box where you can save the results to a file. Enter a file name and click the Save button. You can use the Save dialog box to save the file to a folder of your choice or use the default location.
12. Click the Finish button to complete the process.

### Setup and Hold Procedure

This procedure verifies the setup and hold specification of the logic analyzer. This procedure can be verified using P6419 probes only. Depending on the number of channels in your instrument, the procedure requires several iterations of connecting and disconnecting probes to the test fixture.

Complete the following steps to start the software and to run the procedures:

1. If the TLA application is running, exit the application.
2. Double-click the TLACAL icon on the desktop. An application window similar to Figure 4-2 on page 4-5 appears.
3. Click the Verification button to start the software.
4. Verify that Setup and Hold is selected under Setup and Hold Procedures.

---

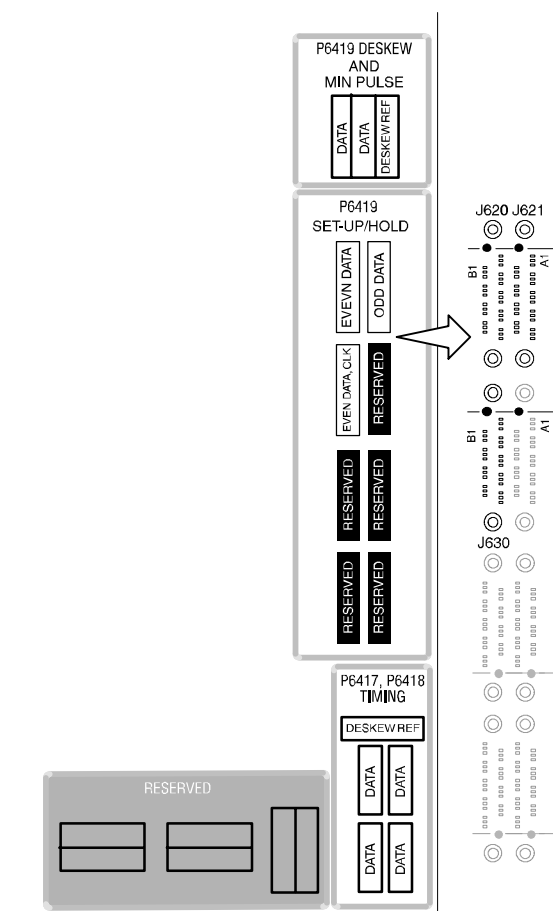
**NOTE.** *The software will perform all selected procedures without interruption, with the exception of when user interaction is required (such as moving a probe). To limit the test to specific procedures, clear any procedures that you do not want to run. If you want to run all of the selected procedures, you need to pay close attention to the connection instructions as they are displayed on the screen.*

---

5. Clear all other procedures in the dialog box.

6. Click the Next button at the bottom of the dialog box to display the probe connection instructions. Follow the on-screen instructions to connect the probes from the logic analyzer to the test fixture. If necessary, refer Figure 4-6 on page 4-6 and to the test fixture label to determine the correct probe connection.

**NOTE.** When connecting the P6419 Logic Analyzer probes, make sure that the alignment pin on the probe head aligns with the hole on the test fixture. Tighten the probe head screws by alternating between them until they are finger tight (no more than 1 in-lbs of torque).



**Figure 4- 6: P6419 Setup & Hold procedure connections**

7. Click the Next button at the bottom of the dialog box to begin the procedure.



The software will begin the procedures and display a list of results in the window.

8. After the first set of procedures are done, click the Next button to display the instructions for the next step. Move the probes on the test fixture as indicated by the instructions.
9. After changing the connections, click the Next button to continue the procedures.
10. Repeat steps 7 through 8 as indicated by the software.
11. After the procedure finishes, click the Next button to open the Finish dialog box where you can save the results to a file. Enter a file name and click the Save button. You can use the Save dialog to save the file to a folder of your choice or use the default location.
12. Click the Finish button to complete the process.

## Logic Analyzer Certification

This section describes the procedures to certify the logic analyzer. You can certify the logic analyzer without completing the main performance verification procedures. Table 4-4 lists the certifiable parameters for the logic analyzer.

**Table 4-4: Logic analyzer certification test**

Performance verification test name	Specification tested
1. Thresholds <sup>1</sup>	Threshold accuracy

<sup>1</sup> **Certifiable parameter**

To certify the logic analyzer, use the performance verification software and click the Certification button. Perform the required procedure and then print the results to obtain a copy of the software-generated calibration data report.

---

**NOTE.** *The certification procedures have the same prerequisites as the performance verification procedures. Refer to Prerequisites on page 4-9 for a detailed list of prerequisites.*

---

### Equipment Setups

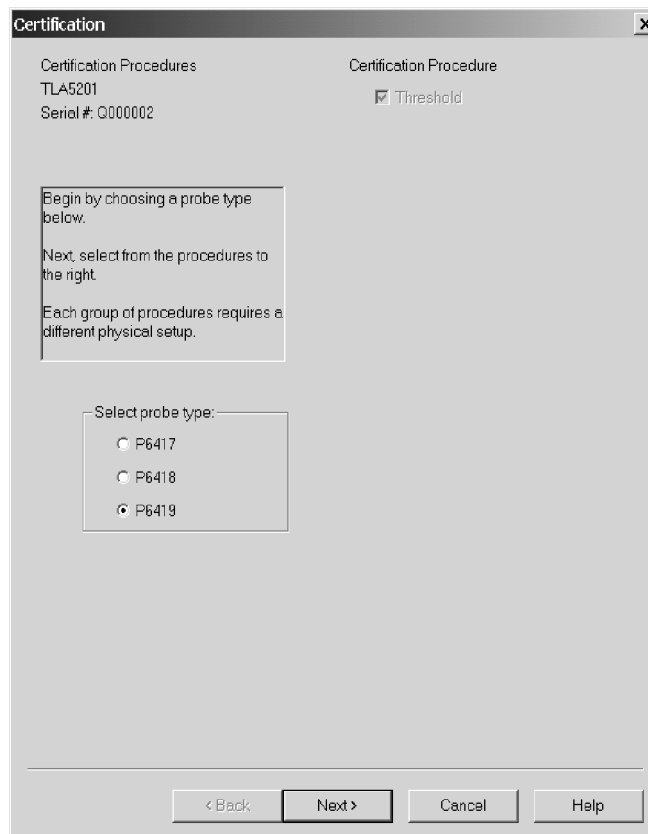
These procedures require the same setups as described for the Performance Verification procedures. It is assumed that the logic analyzer is already connected to the test fixture and that the performance verification software is installed on the logic analyzer.

Power on the test fixture, logic analyzer, and other test equipment. Allow all test equipment to warm up for 30 minutes before continuing.

### Start the Software

Complete the following steps to run the procedures:

1. If you have not already done so, exit the TLA application.
2. Double-click the TLACAL icon on the desktop. An application window similar to Figure 4-2 on page 4-5 appears.
3. Click the Certification button to start the software. A Certification dialog box similar to Figure 4-7 on page 4-20 appears.



**Figure 4-7: Default Certification procedure dialog box**

4. Select the probe type near the bottom of the dialog box.  
The Threshold Certification Procedure is selected by default.
5. Click the Next button at the bottom of the dialog box to display the probe connection instructions. Follow the on-screen instructions to connect the

probes from the logic analyzer to the test fixture. If necessary, refer to the test fixture label to determine the correct probe connection.

---

**NOTE.** *When connecting the P6419 Logic Analyzer probes, make sure that the alignment pin on the probe head aligns with the hole on the test fixture. Tighten the probe head screws by alternating between them until they are finger tight (no more than 1 in-lbs of torque).*

---

6. Click the Next button to begin the certification procedure.

The software will begin the procedures and display a list of results in the window.

7. After the first set of procedures are done, click the Next button to display the instructions for the next step. In most cases you only need to move a probe or connect a different probe to the test fixture.
8. After changing the connections, click the Next button to continue the tests.
9. Repeat steps 7 through 8 as indicated by the software.
10. After the procedure finishes, click the Next button to open the Finish dialog box where you can save the results to a file. Enter a file name and click the Save button. You can use the Save dialog to save the file to a folder of your choice or use the default location.
11. Click the Finish button to complete the process.
12. Locate the file that you saved in step 10 and print the file for your records.
13. Power down the test fixture and then disconnect the remaining test equipment.

This completes the certification procedures.



# Adjustment Procedures

This chapter contains procedures that use the performance verification software to adjust the logic analyzer to within factory specifications. The software contains instructions and control programs for adjusting the logic analyzer. The software describes test equipment connections and settings, selects setup parameters, and loads calibration constants into memory.

---

**NOTE.** *There are no adjustment procedures for the TLACAL1 Performance Verification test fixture in this section. If the test fixture requires any adjustments, you must return the test fixture to the factory; contact your local Tektronix service center for more information.*

---

These procedures adjust the logic analyzer for conformance with the warranted characteristics listed in the *Tektronix Logic Analyzer Family Product Specifications document*. This document is available on the *Tektronix Logic Analyzer Product Documentation CD* or can be downloaded from the Tektronix web site.

Perform the adjustments after repairing the instrument or when performance verification tests have failed.

## Test Equipment and Initial Setup

The adjustment procedures use the same test equipment, software, and setups as listed in the Performance Verifications chapter. Refer to *Test Equipment Setup* beginning on page 4-3 for information on setting up the test equipment and loading the performance verification software before starting the adjustment procedures.

## Prerequisites

---

**NOTE.** *The performance verification software reads the serial number of the logic analyzer from information stored in the instrument. If you have replaced the acquisition board verify that the serial number on the label on the back of the instrument matches the serial number read by the software before beginning the adjustment procedures.*

---

Perform these procedures after meeting the following requirements:

- The logic analyzer application must not be running.
- The performance verification software must be installed on the hard disk of the logic analyzer.
- The logic analyzer, test fixture, and all other test equipment require a 30-minute warm-up time in a +20 °C to +30 °C environment before performing any adjustments. Adjustments performed before the operating temperature has stabilized may cause errors in performance.
- The logic analyzer and test fixture must be in an operating environment within the limits described in the *Tektronix Logic Analyzer Family Product Specifications* document.

## Using the Software

This section describes how to perform adjustments using the software.

### Performing the Adjustments

There are no manual adjustments for the logic analyzer. The software adjusts the instrument hardware using external test equipment connections that you provide in response to prompts on the screen. Upon successful completion of each adjustment, the software automatically loads the new calibration data into memory.

### Adjustment After Repair

You must perform all adjustment procedures following replacement of any circuit board in the logic analyzer.

This section describes how to perform adjustments using the software.

## Tests Performed

Table 5-1 lists the adjustment procedures available for the logic analyzer and probes.

**Table 5- 1: Logic analyzer adjustment procedures**

Category	Procedure
Self calibration	Self Calibration
Probe+Module Timing Procedures	Deskew

With the exception of the self calibration procedures, all other procedures must be completed using the performance verification software and the test fixture.

Figure 5-1 on page 5-4 shows the locations of connectors and test points on the test fixture. You may need to refer to this illustration when connecting probes and cables to the fixture.

## 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 saves data generated by the self calibration in nonvolatile memory. Passing self cal provides a higher level of confidence of functionality.

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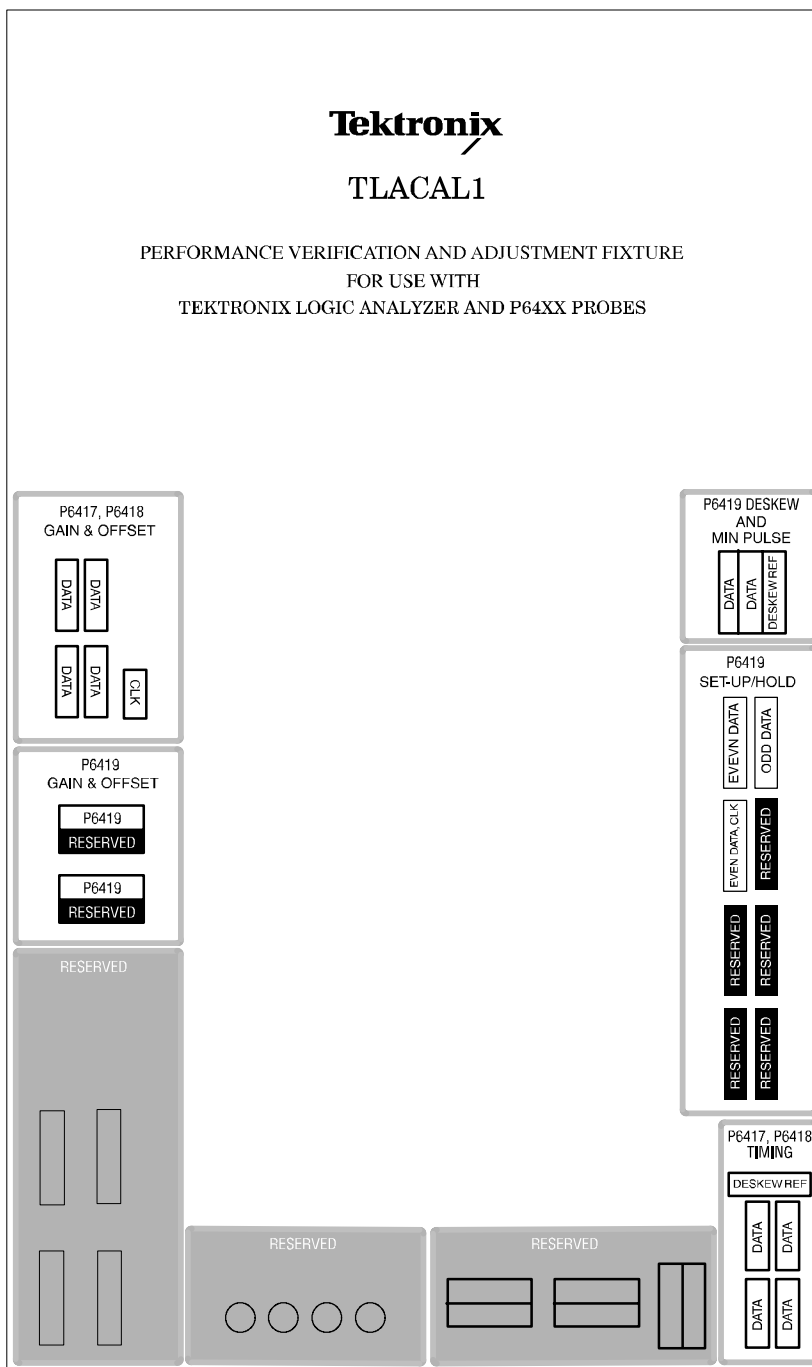
**NOTE.** *Performing the self calibration does not guarantee that all parameters operate within limits. Operation within limits is achieved by performing the adjustment procedures. Verification of operation within limits is accomplished by performing the performance verification procedures.*

---

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.
- 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.
- 3. Select Calibration and Diagnostics from the System menu.
- 4. Select the Self Calibration tab page.
- 5. Click the Run button to start the self calibration.

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



**Figure 5- 1: TLACAL2 test fixture connections**



## Module+Probe Timing Procedures

The Module+Probe Timing procedures consist of the deskew adjustments. These procedures are required to adjust the logic analyzer. These procedures use the logic analyzer probes connected to the Deskew and Minimum Pulse connections on the test fixture.

### Equipment Setups

These procedures require the same setups as described in the Performance Verification chapter of this manual. It is assumed that the logic analyzer is already connected to the test fixture and that the performance verification software is installed on the hard disk of the logic analyzer.

---

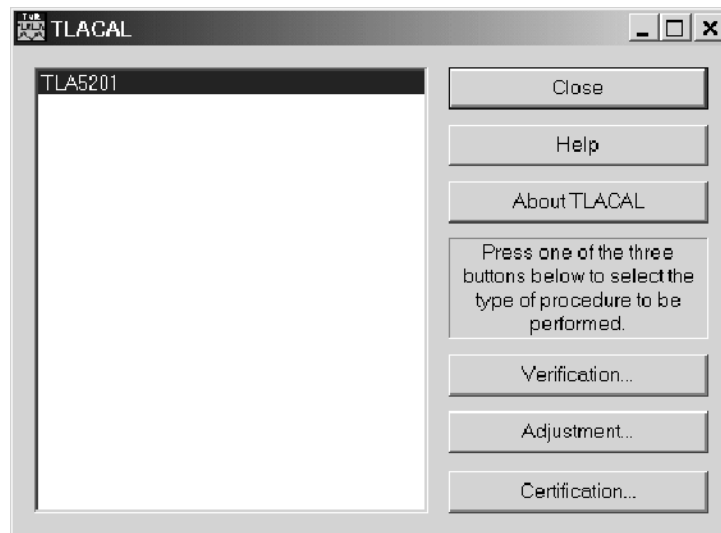
**NOTE.** To obtain the best results, keep the probes connected to the logic analyzer and only move the connections on the test fixture.

---

### Start the Software

Complete the following steps to start the software and to run the adjustments:

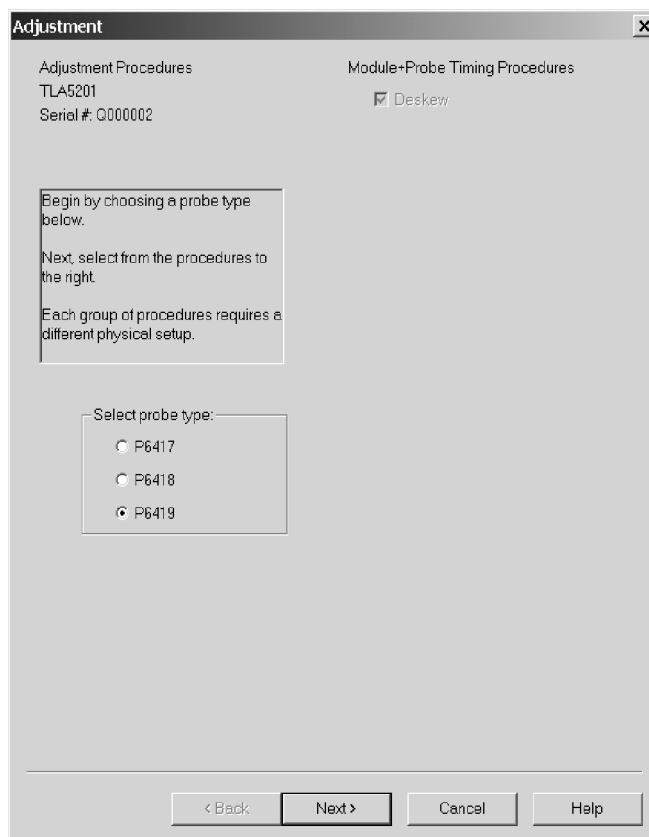
1. Exit the TLA application.
2. Double-click the Performance Verification icon on the desktop. An application window similar to Figure 5-2 appears.



**Figure 5-2: Performance verification software startup window**

3. Click the Adjustment button to start the software. An Adjustment dialog box similar to Figure 5-3 on page 5-6 appears.

4. Verify that Deskew is selected under the Module+Probe Timing Procedures.



**Figure 5-3: Default Adjustment procedure dialog box**

5. Click the Next button at the bottom of the dialog box to display the probe connection instructions. Follow the on-screen instructions to connect the probes from the logic analyzer to the test fixture. If necessary, refer Figure 5-4 on page 5-7 and to the test fixture label to determine the correct probe connection.

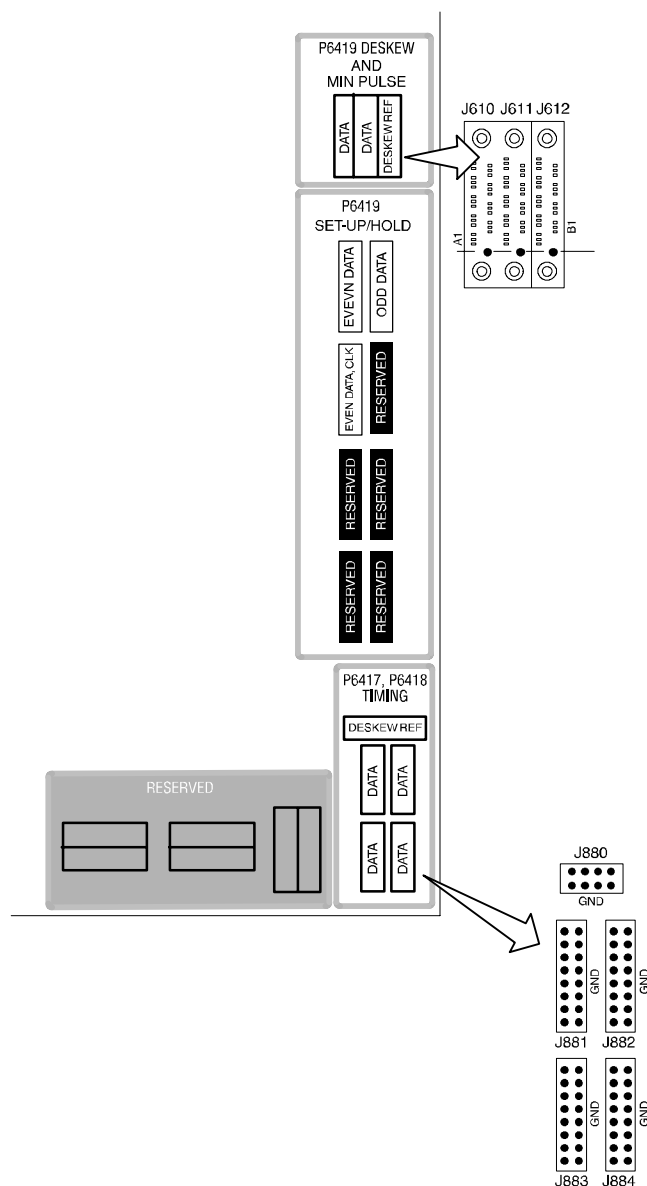
---

**NOTE.** When connecting the P6419 Logic Analyzer probes, make sure that the alignment pin on the probe head aligns with the hole on the test fixture. Tighten the probe head screws by alternating between them until they are finger tight (no more than 1 in-lbs of torque).

---

6. Click the Next button to begin the procedures.

The software will begin the adjustment procedures and display the results of the first 34 channels in the window.



**Figure 5-4: Deskew procedure probe connections**

**NOTE.** If any failures occur, you must complete the entire test sequence. Do not click the Back button; otherwise the test results will be incorrect. Address the problem and then restart the Deskew procedures.

In some cases the software will detect a failure and automatically redo the test until it passes or times out and stops the test. You should only be concerned for a test that continuously fails.

7. Click the Next button.
8. If you have a 34-channel logic analyzer, go to step 9. If your instrument has more than 34 channels, connect the next probe as indicated by the software instructions and then click the Next button to start testing the next probe input section.
9. After the tests have completed, click the Next button to save the deskew adjustment values.
10. Click the Next button to open the Finish dialog box where you can save the results.
11. Click the Finish button to finish the procedure and return to the startup window.

## Completing the Adjustment Steps

After completing the adjustment procedures, you should always run the *Performance Verification Procedures* to verify that the all parameters are within the allowable specifications. If any of the adjustment and performance verification procedures fail, further service may be necessary. Contact your local Tektronix service center for recommended action.

# Maintenance

This chapter contains the information needed to do periodic and corrective maintenance on the logic analyzer.

To repair the instrument, you must exchange or replace the failed part; this manual does not provide component-level procedures for isolating components on the failed part.

The information in this chapter is designed for use by qualified service personnel. Read the *Safety Summary* at the front of this manual before attempting any procedures in this chapter.

## Preventing ESD

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



---

**CAUTION.** *Many components within the chassis are susceptible to static-discharge damage. Service the chassis only in a static-free environment.*

*Observe standard handling precautions for static-sensitive devices while servicing the chassis.*

*Always wear a grounded wrist strap, or equivalent, while servicing the chassis.*

---

- Minimize handling of static-sensitive circuit boards.
- Transport and store static-sensitive circuit boards in their static protected containers or on a metal rail. Label any package that contains static-sensitive boards.
- Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these circuit boards. Service static-sensitive circuit boards only at a static-free work station.
- Nothing capable of generating or holding a static charge should be allowed on the work station surface.
- Handle circuit boards by the edges when possible.
- Do not slide the circuit boards over any surface.
- Avoid handling circuit boards in areas that have a floor or work-surface covering capable of generating a static charge.



---

**WARNING.** To avoid electric shock, always power off the instrument and disconnect the power cord before cleaning or servicing the instrument.

---

## Inspection and Cleaning

The logic analyzer is inspected mechanically and electrically before shipment. It should be free of marks or scratches and should meet or exceed all electrical specifications. To confirm this, inspect the chassis for physical damage incurred during transit. Retain the packaging in case shipment for repair is necessary. If there is damage or deficiency, contact your local Tektronix representative.

Cleaning procedures consist of exterior and interior cleaning of the chassis. Clean the chassis as needed, based on the operating environment.

### Interior Cleaning

Use a dry, low-velocity stream of air to clean the interior of the chassis. Use a soft-bristle, nonstatic-producing brush for cleaning around components. If you must use a liquid for minor interior cleaning, use a 75% isopropyl alcohol solution and rinse with deionized water.

### Exterior Cleaning

Clean the exterior surfaces of the chassis with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, use a cloth or swab dipped in a 75% isopropyl alcohol solution. Use a swab to clean narrow spaces around controls and connectors. Do not use abrasive compounds on any part of the chassis that may damage the chassis.

Clean the On/Standby switch using a dampened cleaning towel. Do not spray or wet the switch directly.



---

**CAUTION.** Avoid getting moisture inside the instrument during exterior cleaning; use just enough moisture to dampen the cloth or swab.

---

*Do not wash the front-panel On/Standby switch. Cover the switch while washing the instrument.*

*Use only deionized or distilled water when cleaning. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized or distilled water.*

*Do not use chemical cleaning agents; they may damage the chassis. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.*

---

### Flat Panel Display Cleaning

The logic analyzer display is a soft plastic display and must be treated with care during cleaning.



---

**CAUTION.** *To prevent damage to the flat panel display, do not use improper cleaning agents or methods.*

*Avoid using abrasive cleaners or commercial glass cleaners to clean the display surface.*

*Avoid spraying liquids directly on the display surface.*

*Avoid scrubbing the display with excessive force.*

---

Clean the flat panel display surface by gently rubbing the display with a clean-room wipe (such as Wypall Medium Duty Wipes, #05701, available from Kimberly-Clark Corporation).

If the display is very dirty, moisten the wipe with distilled water or a 75% isopropyl alcohol solution and gently rub the display surface. Avoid using excess force or you may damage the plastic display surface.





# Removal and Installation Procedures

This section contains procedures for removal and installation of field-replaceable parts. This section is set up as a series of tasks.

## Preparation



---

**WARNING.** Before performing this or any other procedure in this manual, read the Safety Summary found at the beginning of this manual.

To prevent possible injury to service personnel or damage to the logic analyzer, read Installation in Chapter 2, and Preventing ESD on page 6-1.

---



---

**WARNING.** Before performing any procedure in this subsection, disconnect the power cord from the line voltage source. Failure to do so could cause serious injury or death.

---

## General Instructions

---

**NOTE.** Read the following general instructions before removing a part.

Following these instructions helps ensure that you remove the part to be serviced while removing the minimum number of additional parts.

---

First read over the *Summary of Procedures* that follows to understand how the procedures are grouped. Then see Table 6-1, page 6-6 for a list of the tools needed to remove and install replaceable parts in this logic analyzer.

If you are removing a part for service, begin by looking up the procedure for that part. If any procedures are listed as required in advance in order to gain access to the part, perform those procedures first.

## Equipment Required

Most parts in this logic analyzer can be removed using a screwdriver with a T-15 Torx tip.

**Table 6- 1: Tools required for module removal**

Item no.	Name	Description	General tool number
1	Screwdriver handle	Accepts Torx-driver bits	620-440
2	T-15 Torx tip	Used for removing most of the instrument's screws. Torx-driver bit for T-15 size screw heads	640-247
3	1/8 inch flat-bladed screwdriver	Screwdriver for unlocking cable connectors	Standard tool
4	#0 Phillips screwdriver	Screwdriver for removing small Phillips screws, CD, floppy drive	Standard tool
5	#1 Phillips screwdriver	Screwdriver for removing small Phillips screws, hard drive	Standard tool
6	Angle-Tip Tweezers	Used to remove front panel knobs	Standard tool
7	3/16 inch nut driver	Used to remove the nut posts	Standard tool
8	9/16 inch open-end wrench	Used to remove BNC nuts	Standard tool

## Accessories Pouch

You must remove the accessories pouch to access the covers on the instrument. The remaining procedures assume that you have removed the accessories pouch.

1. Open the pouch and located the two snaps on the inside front side of the pouch.
2. Gently pull on each of the two tabs to unsnap the front of the pouch.
3. At the rear of the instrument, peel off the Velcro that holds the pouch to the instrument.
4. Set the pouch aside.
5. To reinstall the pouch, perform these steps in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.

## Trim and Covers

Remove the trim and covers as shown in Figures 6-1 on page 6-9, by following this procedure.

1. Turn the logic analyzer off.
2. Remove the power cord and all probes.
3. Remove the top cover trim.
  - a. Remove the two T-15 Torx-drive screws that secure the top cover trim to the instrument.
  - b. Remove the snap studs from the top cover.
  - c. Slide the trim panel toward the rear of the instrument allowing the tabs to clear the cover openings, then pull out to remove the panel from the instrument (you may need to loosen the two top black feet on the back of the instrument if the cover does not come off easily).
4. Remove the carrying handle and left side trim.

---

**NOTE.** *For many service operations you do not need to remove the left panel.*

---

- a. Remove the T-15 Torx-drive screws that secure the handle to the instrument. Remove the handle.
  - b. Remove the two T-15 Torx-drive screws that secure the left side trim to the bottom of the instrument.
  - c. Slide the trim panel toward the rear of the instrument allowing the tabs to clear the cover openings, then pull out to remove the panel from the instrument.
5. Remove the right side trim.

---

**NOTE.** *When you remove the CD Drive trim, notice the notches in the trim that provide the clearance for the chassis screws located under the trim. When you replace the trim, make sure that you orient the trim with the notches in the correct location. Otherwise the trim may not fit properly.*

---

- a. Remove the CD Drive trim by inserting a flat blade screwdriver in the bottom slot of the CD trim and gently prying the trim piece out of the side panel. Pull the trim up and out from the instrument.
  - b. Remove the two T-15 Torx-drive screws that secure the right side trim to the bottom of the instrument.

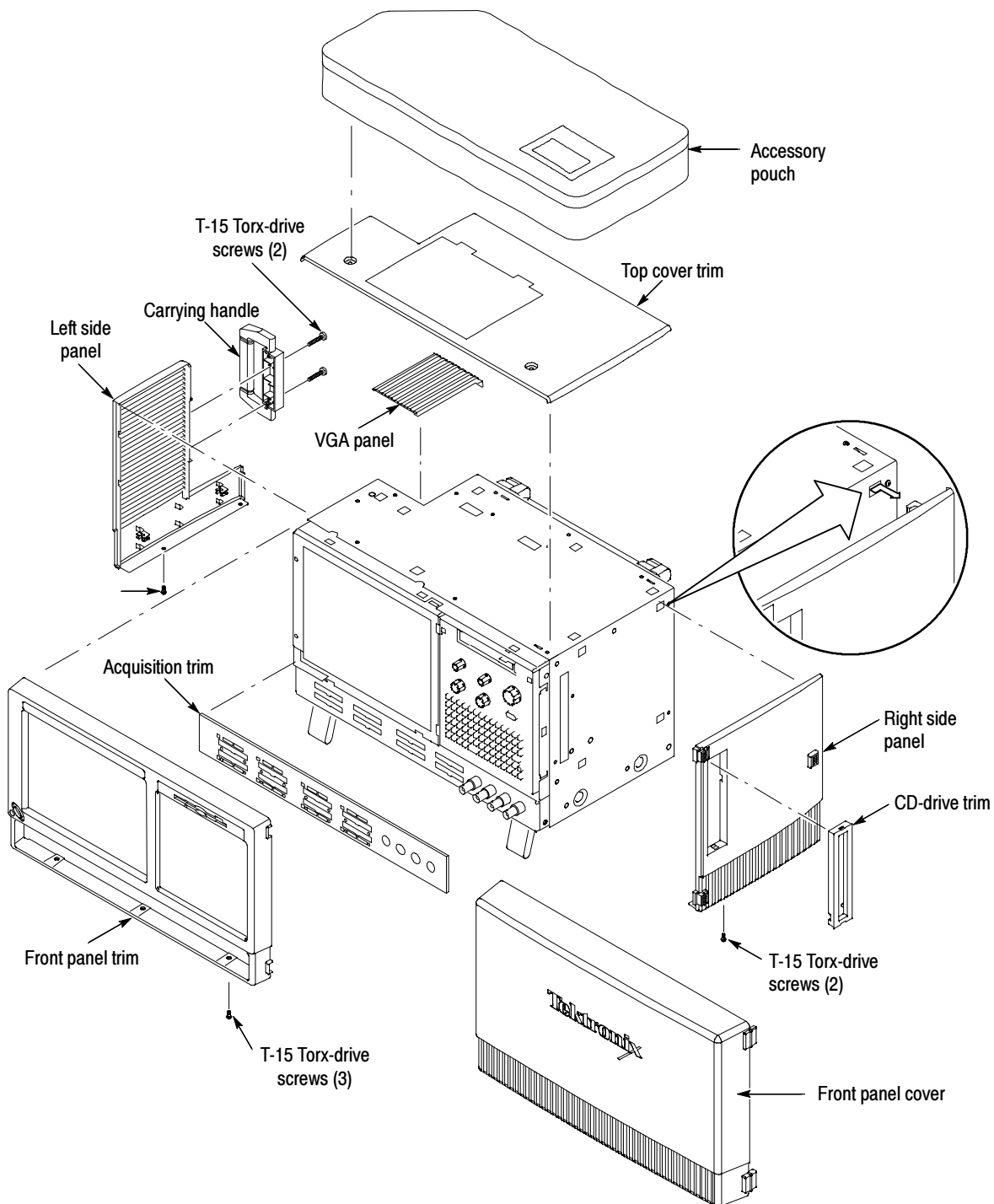
- c. Slide the trim panel toward the rear of the instrument allowing the tabs to clear the cover openings, then pull out to remove the panel from the instrument.
6. Remove the VGA Panel by gently pulling the trim up and out from the instrument.
7. Remove the front panel trim.

---

**NOTE.** *You should not need to remove the front panel trim unless you are servicing the display, front panel assembly, or the Acquisition board.*

---

- a. To prevent the On/Standby button from falling out of the front panel trim, place a piece of tape over the button.
  - b. Remove the three T-15 Torx-drive screws that secure the front panel trim to the bottom of the instrument.
  - c. Grasp the trim ring by its top edge and pull toward you to detach the three plastic snaps. (Alternatively, you can use a spudger tool to help you detach the snaps.)
  - d. Grasp the trim ring by its side edges and slide it back and forth to release the snap in the middle of the trim ring. The snap is at the lower right corner of the display.
  - e. Pull off the trim ring.
8. Lift off the acquisition trim.
9. Reinstall the trim and covers by reversing the preceding steps to reinstall the appropriate trim. Tighten the T-15 Torx-drive screws to 8-in lbs.

**Figure 6-1: Trim and covers**

## Right-Side Cover

Remove the right-side cover to access most of the internal components of the instrument. Refer to Figure 6-2 while removing the right-side cover.

1. Remove the top and right trim to access the right-side cover.

---

**NOTE.** All mounting screw holes are indicated by a star etched around the mounting hole.

---

2. Remove the 15 T-15 Torx-drive screws that secure the cover to the top and right sides of the chassis.
3. Remove the cover.

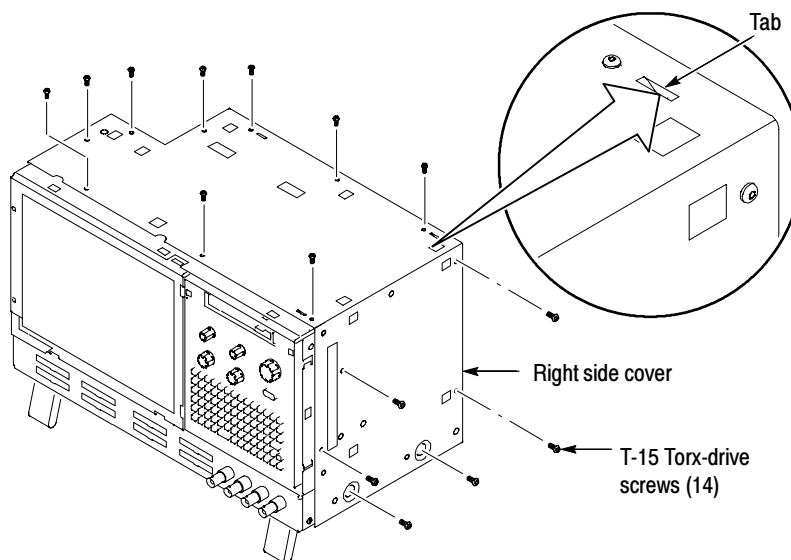


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**CAUTION.** Take care not to bind or snag the covers on the internal cabling as you remove or install.

---

4. To reinstall the right-side cover reverse steps 1 through 3. Tighten the T-15 Torx-drive screws to 8-in lbs.



**Figure 6-2: Right-side cover removal**

## Bottom Covers

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**NOTE.** *You should only need to remove the bottom covers when servicing the Acquisition board.*

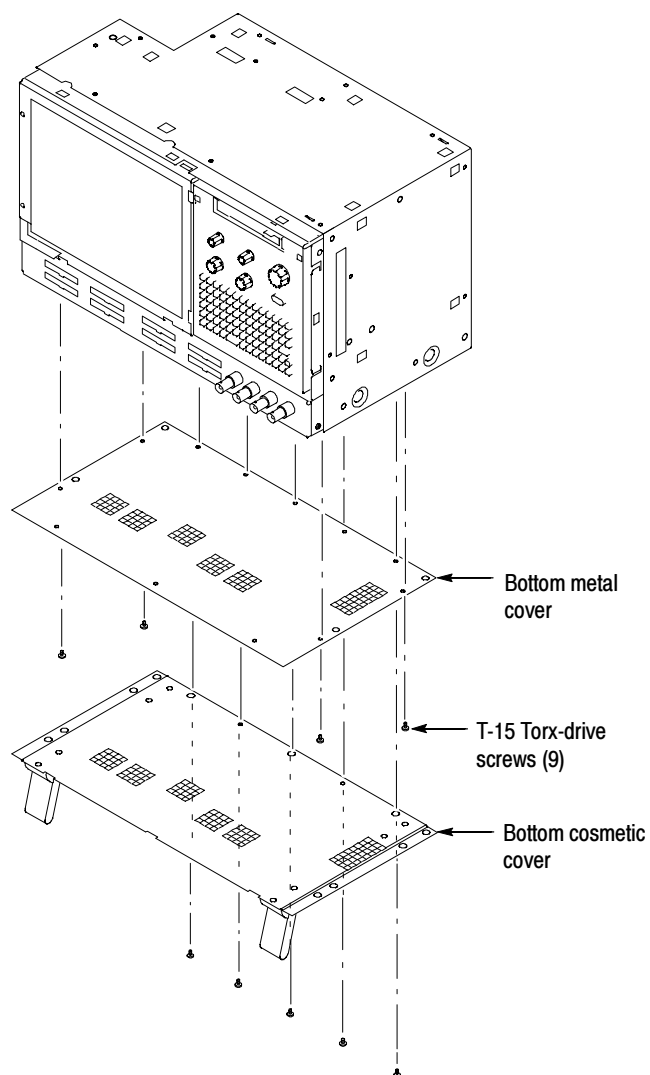
---

1. Remove the top, left, and right trim covers.
2. Remove the bottom cover (with feet) as shown in Figure 6-3 on page 6-12 by following this procedure.
3. Remove the two T-15 Torx-drive screws that secure the bottom cosmetic cover to the instrument.
4. Remove the bottom cosmetic cover.
5. Remove the seven T-15 Torx-drive screws that secure the bottom cover to the instrument.
6. Remove the bottom cover.
7. To reinstall the bottom cover, reverse the above procedures. Tighten the T-15 Torx-drive screws to 8-in lbs.

---

**NOTE.** *When reinstalling the bottom sheet metal cover, make sure that you install the cover with the etched stars around the mounting holes on the outside. If you install the cover upside down, then the vent holes will not line up with the holes on the bottom cosmetic cover and you will not be able to install all screws.*

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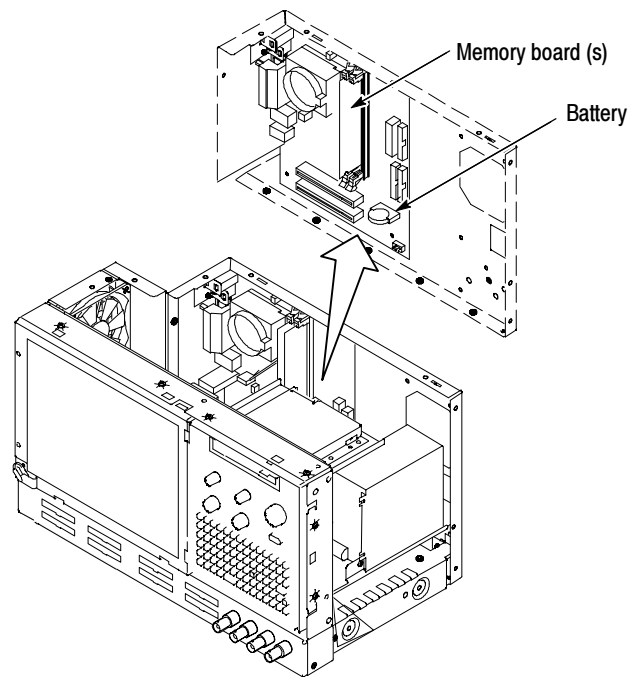
**Figure 6-3: Bottom cover removal**



## Adding Memory

To add memory to your logic analyzer, follow these instructions.

1. Remove the top and right trim and top-right covers by following the procedure on page 6-7.
2. Install the memory in the location shown in Figure 6-4.



**Figure 6-4: Memory board and battery location**

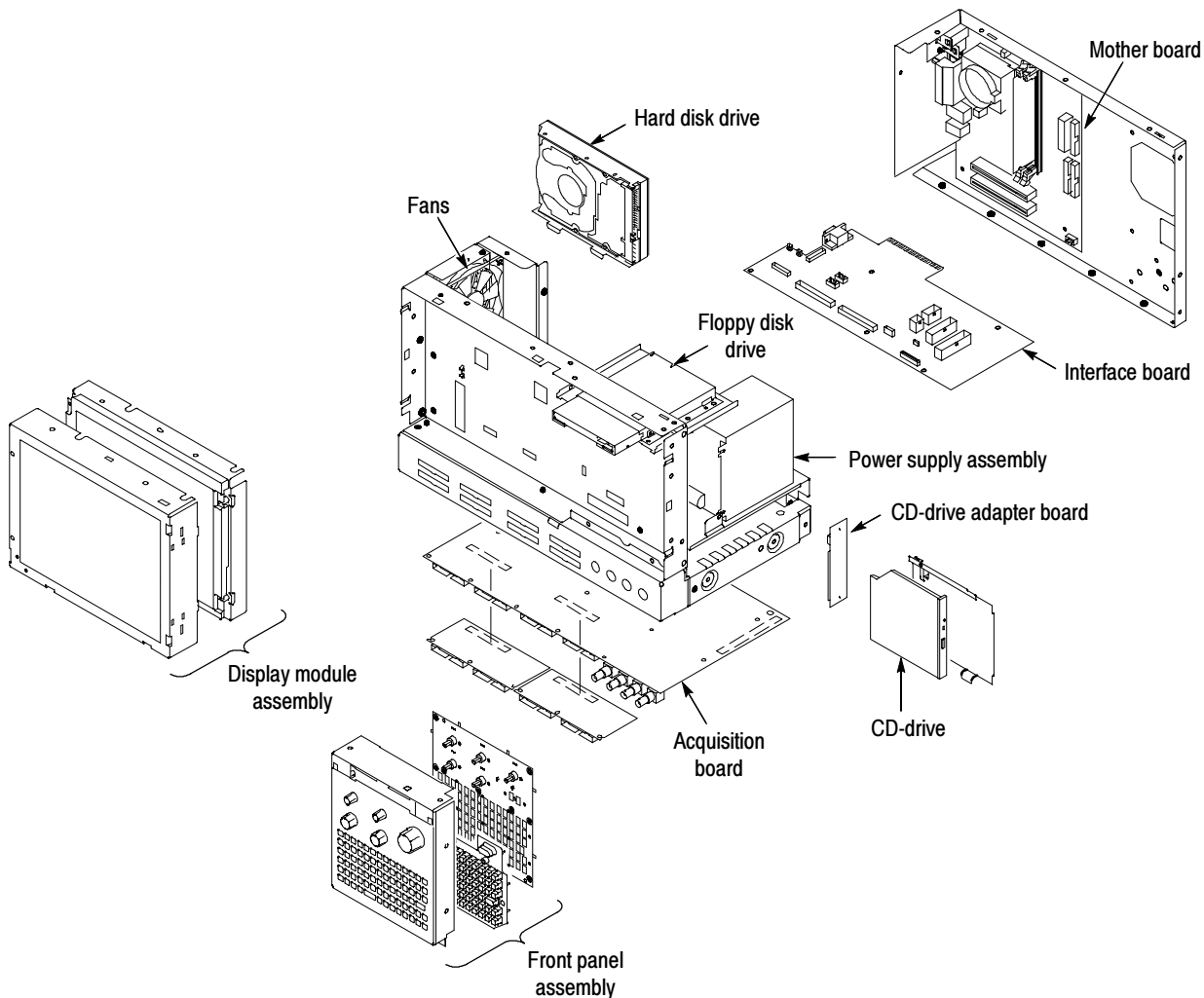
3. Reinstall the trim and covers.
4. Verify the operation by following the procedure on page 6-35.

## Battery

The battery type is CR2032 and is located directly below the memory boards. Remove the top and right trim covers and the top-right cover to access the battery. Refer to Figure 6-4 to locate the battery. Disengage the latch and remove the battery from its holder. Dispose of the battery properly.

## Locator Diagram

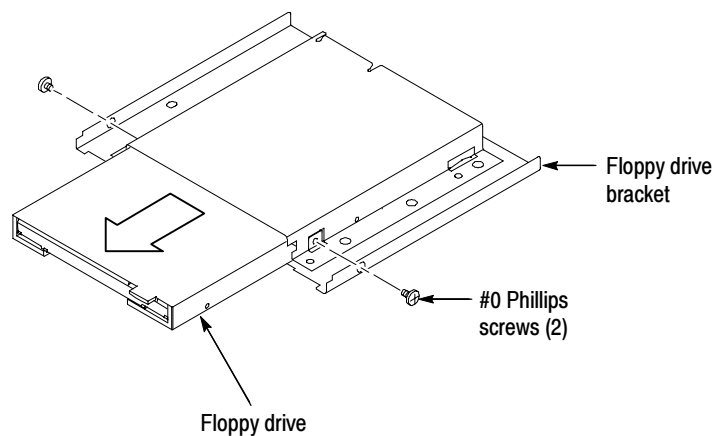
Use Figure 6-5 to locate the components for the remaining removal and installation procedures.



**Figure 6- 5: Locator diagram**

## Floppy Disk Drive

1. Remove the top and right trim and the top-right cover.
2. Locate the Floppy Disk Drive in the locator diagram in Figure 6-5 on page 6-14.
3. Set the instrument so its bottom is down on the work surface and the front panel is facing you.
4. Remove the cable from the back of the floppy disk drive.
5. Remove the two T-15 Torx-drive screws that secure the floppy disk drive assembly to the chassis.
6. Use a #0 Phillips screwdriver to remove the two small Phillips screws that secure the floppy disk drive assembly to the bracket (see Figure 6-6).
7. Remove the floppy drive from the bracket.



**Figure 6-6: Floppy disk drive removal**

8. To reinstall the floppy disk drive, reverse steps 1 through 7. Tighten the T-15 Torx-drive screws to 8-in lbs; tighten the Phillips screws to 2.5-in lbs.

## Hard Disk Drive

1. Remove the top and right trim and the top-right cover.
2. Set the instrument so its bottom is down on the work surface and the front panel is facing you.
3. Locate the Hard Disk Drive in the locator diagram in Figure 6-5 on page 6-14.
4. Remove the two T-15 Torx-drive screws that secure the hard disk drive to the chassis.
5. Pull the hard disk drive away from the chassis so that you can disconnect the ribbon and power cables.
6. Disconnect the ribbon and power cables and then remove the hard disk drive from the chassis.
7. Remove the two T-15 Torx-drive screws that secure the bracket to hard disk drive.
8. To reinstall the hard disk drive, reverse steps 1 through 7. When installing the assembly in the chassis, align the two tabs from the bracket to the slots in the chassis before tightening the Torx-drive screws. Tighten the T-15 Torx-drive screws to 8-in lbs.

## CD Drive

1. Remove the top and right trim and the top-right cover.
2. Set the instrument so its bottom is down on the work surface and the front panel is facing you.
3. Locate the CD Drive in the locator diagram in Figure 6-5 on page 6-14.
4. Remove the single T-15 Torx-drive screw that secures the CD Drive assembly to the chassis.
5. Pull the assembly away from the chassis so that you can disconnect the ribbon and power cables.
6. Disconnect the ribbon and power cables and then remove the hard disk drive from the chassis.
7. Remove the four Phillips screws that secure the CD drive to the bracket.
8. Gently pull the CD drive away from the connector and remove the drive from the bracket.

9. Remove the two Phillips screws that secure the CD drive adapter board to the back of the CD drive.
10. Remove the CD drive adapter board from the CD drive.
11. To reinstall the hard disk drive, reverse steps 1 through 10. When installing the assembly in the chassis, align the two tabs from the bracket to the slots in the chassis before tightening the Torx-drive screws. Tighten the T-15 Torx-drive screw to 8-in lbs; tighten the Phillips screws to 2.0-in lbs.

## Display

1. Remove the trim and covers by following the procedure on page 6-7.

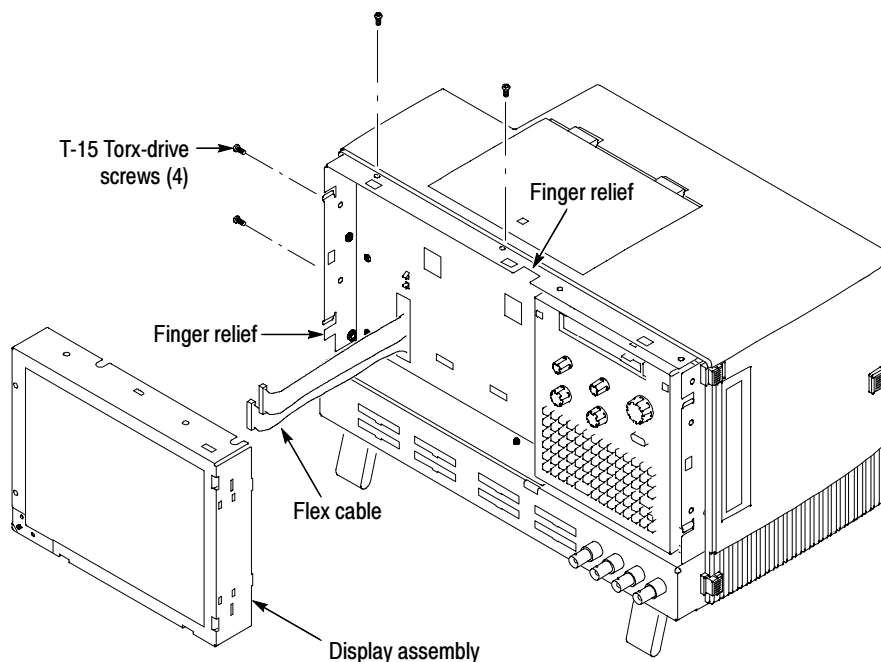


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**CAUTION.** To avoid damage to the front panel Standby/On switch assembly, do not set the Display module assembly on a work surface. Sliding the instrument over the edge of the work surface could break off the Standby/On switch assembly.

---

2. Remove the four T-15 Torx-drive screws that secure the Display assembly to the chassis as shown in Figure 6-7, page 6-18.
3. Grasp the top edge of the Display assembly and pull forward far enough to allow access to the flex cable connectors.
4. Disconnect the two flex cables from the display assembly. Remove the display module assembly from the instrument.
5. To install the display, do steps 1 through 4 in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.

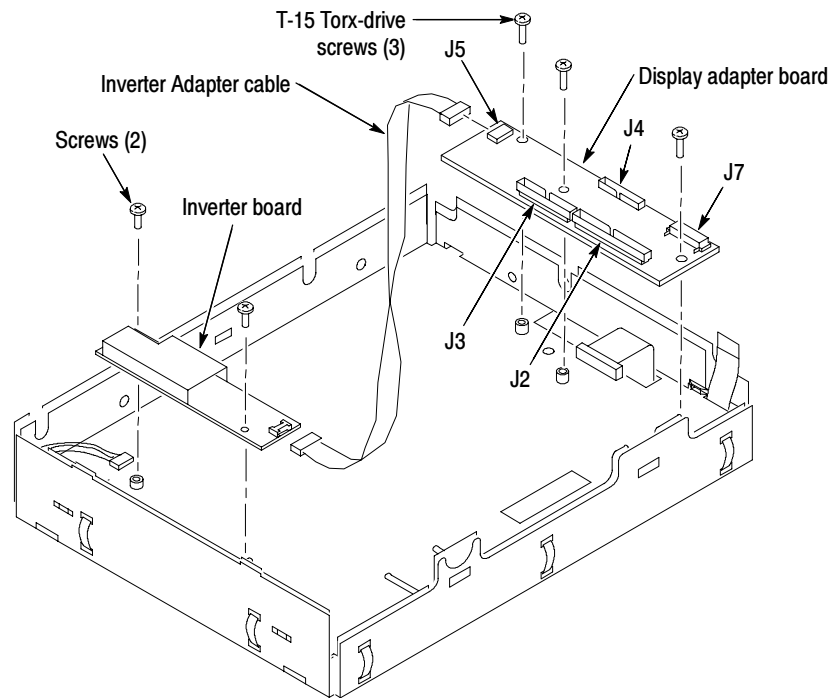


**Figure 6-7: Flat panel display assembly removal**

## Display Adapter Board

To remove the display adapter board perform the following:

1. Remove the trim and covers by following the procedure on page 6-7.
2. Remove the display assembly by following the procedure on page 6-17.
3. Remove the *Display Adapter Board*: See Figure 6-8, page 6-19.
4. Refer to Figure 6-8 on page 6-19 and disconnect the cables from the Display Adapter board.
5. Remove the three T-15 Torx-drive screws that secure the Display Adapter circuit board to the Display assembly.
6. Remove the Display Adapter from the assembly.
7. Reinstallation: Reverse steps 1 and 6 to reinstall the board. Tighten the T-15 Torx-drive screws to 8-in lbs.



**Figure 6-8: Display adapter board removal**

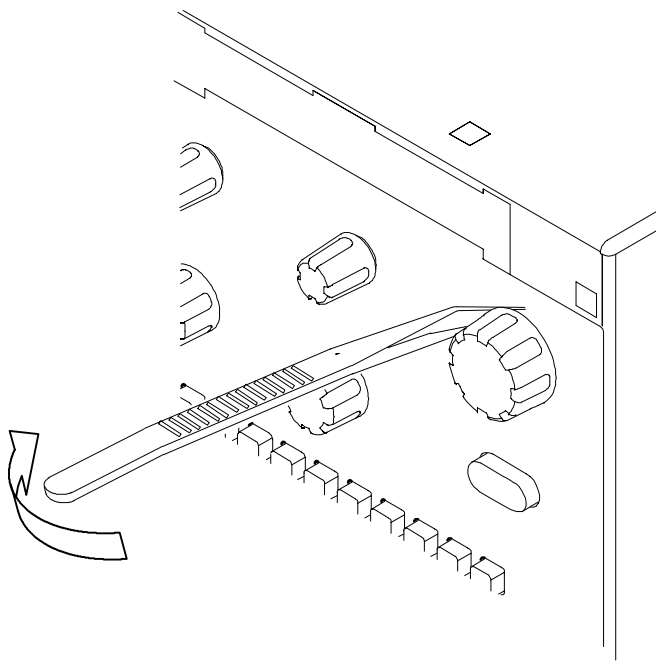
## Standby/On Switch Flex Circuit

1. Remove the trim and covers by following the procedure on page 6-7.
2. Remove the display assembly by following the procedure on page 6-17.
3. Peel the Standby/On switch flex circuit away from the front of the display assembly.
4. Disconnect the flex circuit from the Display Adapter circuit board.
5. Grasp the flex circuit and pull it out of the Display assembly.
6. To reinstall the Standby/On Switch.
  - a. Remove the protective backing on the new Standby/On switch flex circuit.
  - b. Slide the connector end of the Standby/On switch flex circuit through the slot in the Display assembly. Make sure the flex circuit connector aligns to the connector on the Display Adapter circuit board.

- c. Align the holes in the flex circuit to the two index posts on the front side of the Display assembly.
  - d. Firmly press the flex circuit to the Display assembly chassis surface.
7. Reinstall the display assembly and then the trim and covers.

## Front-Panel Knobs

1. Set the instrument so its bottom is down on the work surface and its front is facing you.
2. Remove the knob(s): Grasp any knob you want to remove and pull it straight out from the front panel  $\frac{1}{4}$  inch to create some clearance between the base of the knob and the front panel. Insert the angled-tip tweezers between the knob and front panel and use them to remove the knob. See Figure 6-9.



**Figure 6-9: Knob removal**



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**CAUTION.** To prevent damage to the encoders located onto the circuit board, apply pressure to the encoders while pushing the knob on the shaft.

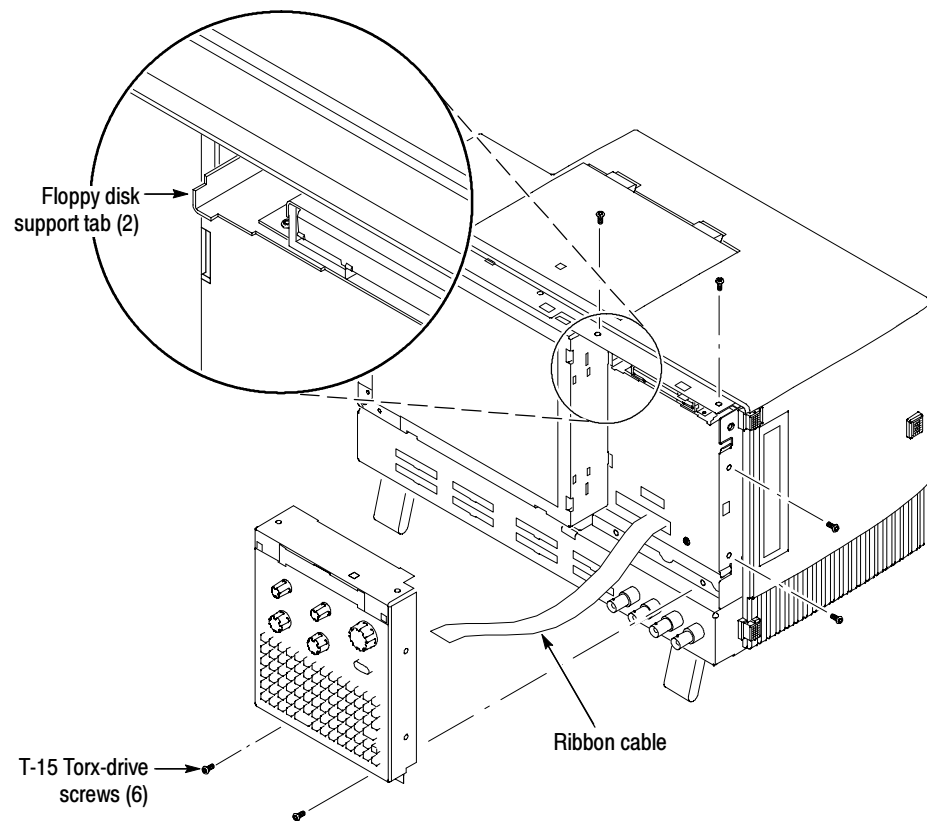
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3. To reinstall the knob, align the knob to the shaft and push it in until it snaps.

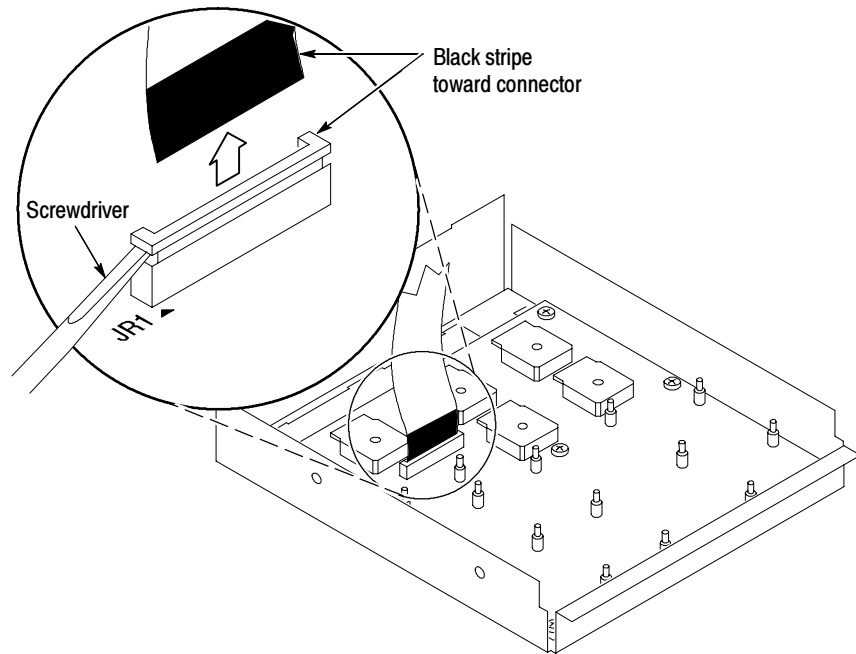


## Front Panel Assembly

1. Remove the trim and covers by following the procedure on page 6-6.
2. Set the instrument so its bottom is down on the work surface and its front panel is facing you.
3. Remove the six T-15 Torx-drive screws that secure the Front panel assembly to the front chassis. See Figure 6-10, page 6-22.
4. Grasp the top of Front Panel assembly and pull forward to allow access to the ribbon cable connector on the front panel board.
5. Use the  $\frac{1}{8}$  inch flat-bladed screwdriver to carefully lift the cable connector lock up to disconnect the flex cable from the display module assembly. See Figure 6-11, page 6-23. Note the connector's pin 1 index mark and the black stripe on the cable for later reassembly.
6. Pull the Front Panel assembly forward and remove from the instrument.
7. To reinstall the front panel assembly, do steps 1 through 6 in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.



**Figure 6- 10: Front panel assembly removal**



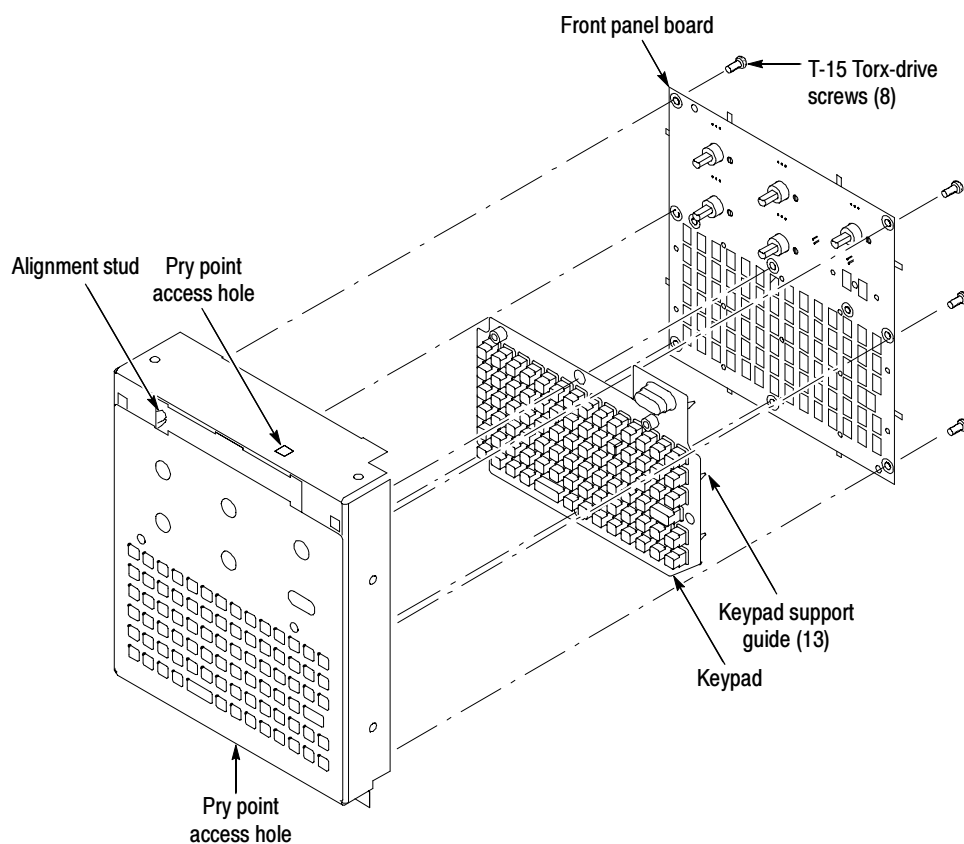
**Figure 6- 11: JR1 flex cable connector removal**

## Front Panel Board

1. Remove the trim and covers by following the procedure on page 6-6.
2. Remove the front panel knobs.
3. Remove the front panel assembly.
4. Remove the eight T-15 Torx-drive screws that secure the Front panel board to the Front panel assembly. See Figure 6-12, page 6-24.
5. Pry the board up off the alignment studs. Place a Use flat bladed screwdriver in the pry point access holes to pry the board up from the assembly.
6. To reinstall the front panel board do steps 1 through 5 in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.

## Front Panel Keypad

1. Remove the trim and covers by following the procedure on page 6-6.
2. Remove the front panel knobs.
3. Remove the front panel assembly.
4. Remove the front panel board.
5. Remove the Front Panel keypad:
6. Pull on each of the keypad support guides to separate the keypad from the Front panel board. Use a pair of tweezers or equivalent tool to pull the twelve keypad support guides.
7. Remove the keypad from the front panel board.



**Figure 6-12: Front panel board & keyboard removal**



---

**CAUTION.** When removing or installing the keypad, make sure you do not touch the switch contact with your fingers. The oils in your fingers will degrade or damage the switch contacts. To help prevent damage to the keypad use cotton gloves when removing or installing the keyboard pad.

---

8. To reinstall the keypad, do steps 1 through 7 in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.

## Fans

1. Remove the top, right, and left trim and the top-right cover.
2. Set the instrument so its bottom is down on the work surface and the front panel is facing you.
3. Locate the fans in the locator diagram in Figure 6-5 on page 6-14.
4. Remove the four plastic fasteners that secure each of the fans to the chassis. See Figure 6-13 on page 6-26.

---

**NOTE.** A wire cutter can help you remove each fastener. First, use the cutter to pry up and retract the fastener head. Then use it to remove the fastener body. Be careful to only pry with the wire cutters and NOT to cut!

---

5. Lift the fan cable up and out from the cable clamp.

---

**NOTE.** A needle-nose pliers can serve as an effective tool to remove the cable clamp if you use it to carefully squeeze the clamp's top and bottom latches

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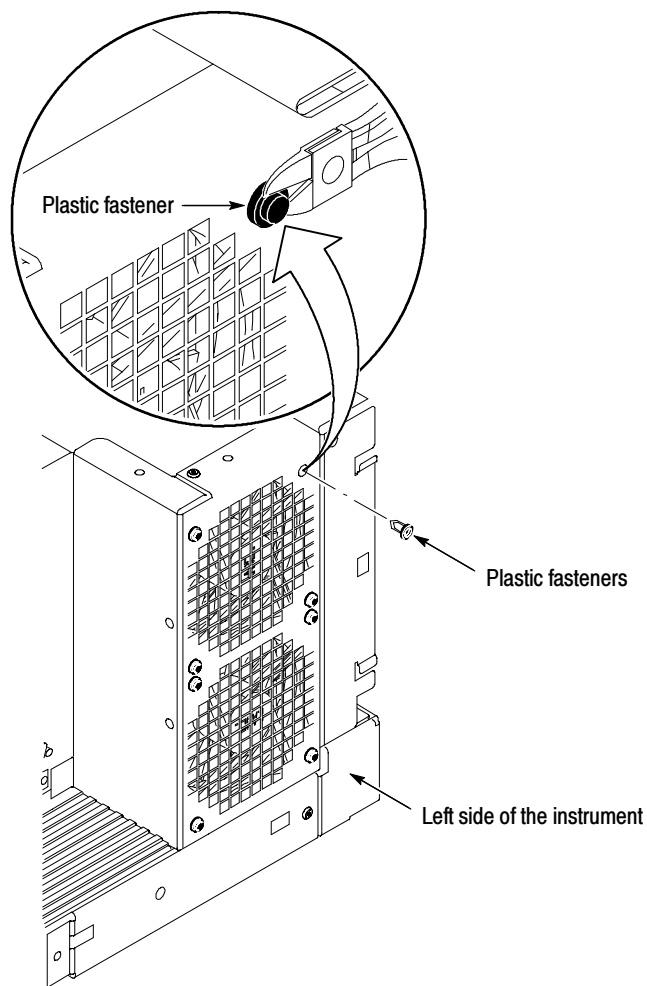
6. Disconnect the fan cable from the Interface board.
7. Lift the fan assembly up and out from the chassis.
8. To reinstall the fan assembly, do steps 4 through 7 in reverse order.



---

**CAUTION.** Take care when handling the fans; the fan blades are brittle and can be easily damaged.

---

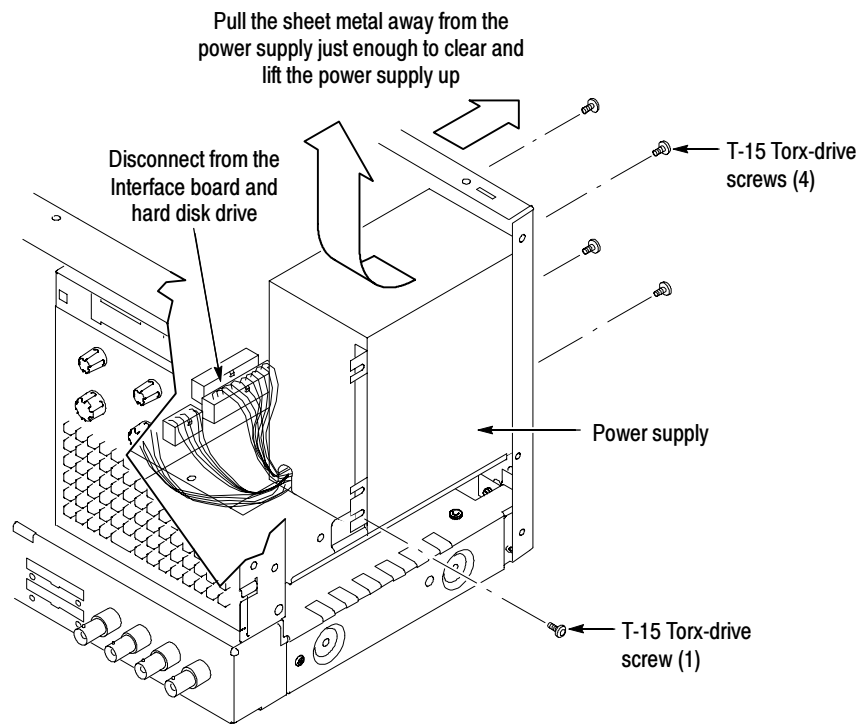


**Figure 6-13: Fan fastener removal**

## Power Supply

1. Remove the top and right trim and the top-right cover.
2. Remove the floppy disk drive assembly.
3. Set the instrument so its bottom is down on the work surface and the back is facing you.
4. Locate the power supply in the locator diagram in Figure 6-5 on page 6-14.
5. Refer to Figure 6-14, on page 6-27 and remove the four T-15 Torx-drive screws that secure the power supply to the back of the chassis.

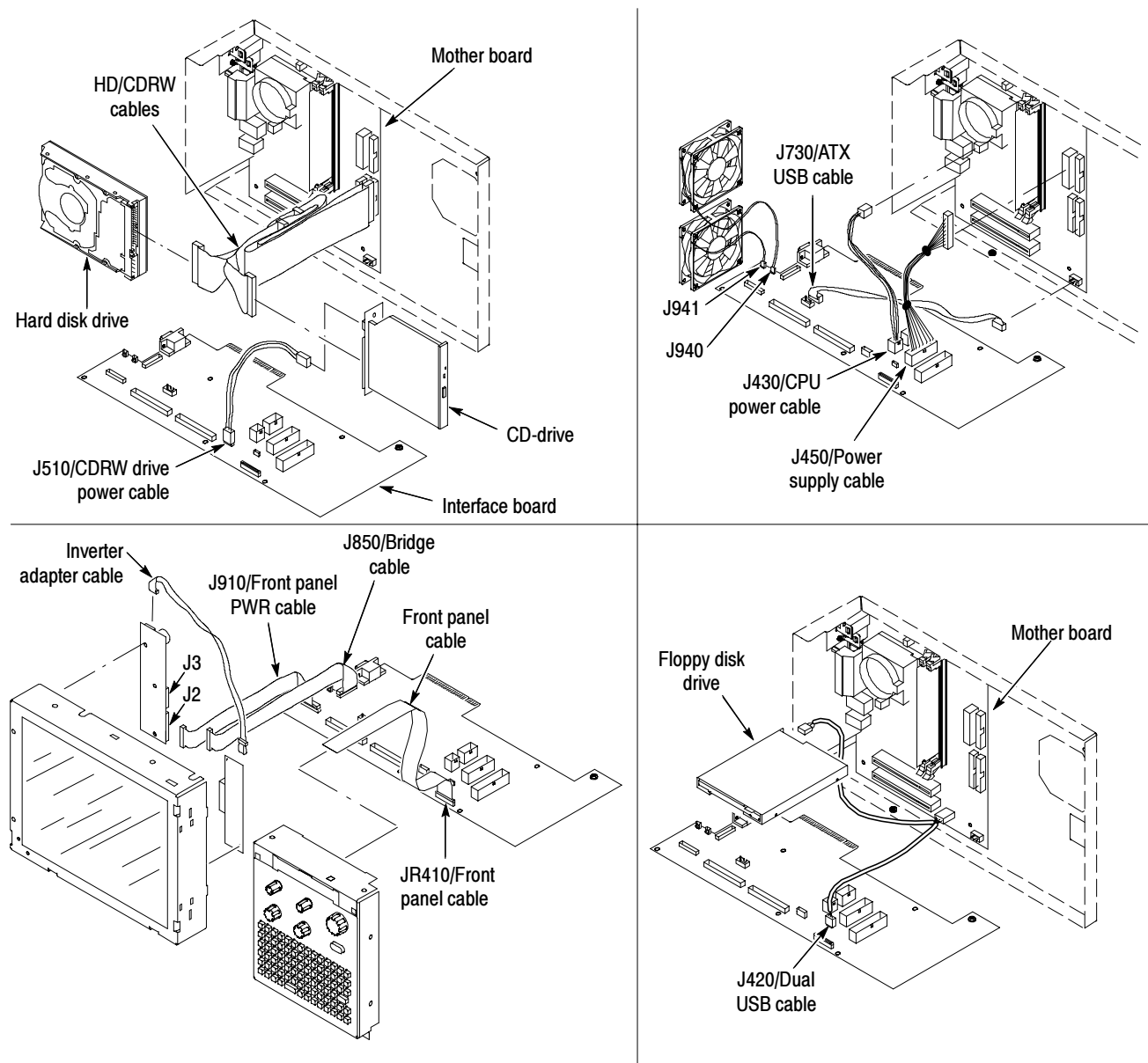
6. Remove the single T-15 Torx-drive screw that secures the power supply to the right side of the chassis.
7. Move the power supply towards the front of the instrument to disengage the power connector from the back panel. Then lift the power supply out of the chassis so that you can access the cables and disconnect them from the circuit boards and hard disk drive.
8. Lift the power supply away from the chassis and guide the cables out.
9. To reinstall the power supply do steps 1 through 8 in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.



**Figure 6-14: Power supply removal**

## Interface Board and Mother Board Cable Connections

Figure 6-15 shows the location of cables and cable connectors for the Interface board and the Mother board. Pay close attention to this diagram and the cable connections when you disassemble and reassemble the instrument.



**Figure 6- 15: Interface board and Mother board cable connections**



## Mother Board

1. Remove all the trim, top-right cover, *and* bottom covers.
2. Remove the floppy disk drive assembly.
3. Set the instrument so its bottom is down on the work surface and the back is facing you.
4. Remove the power supply.

---

**NOTE.** *The Mother board and rear chassis is removed as one assembly.*

---

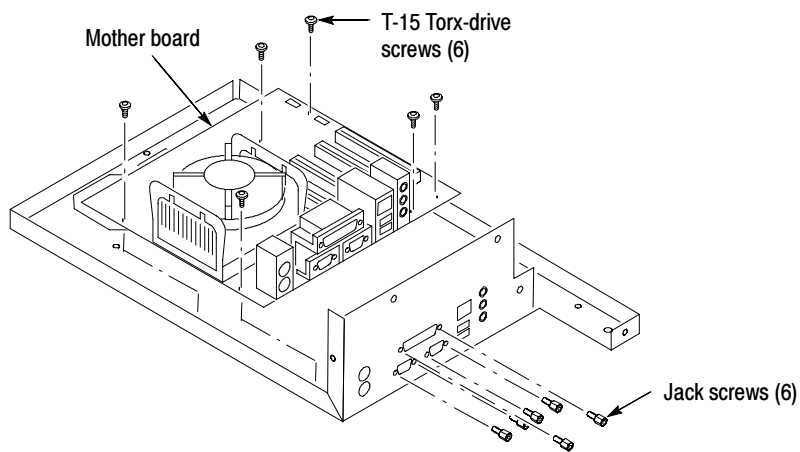
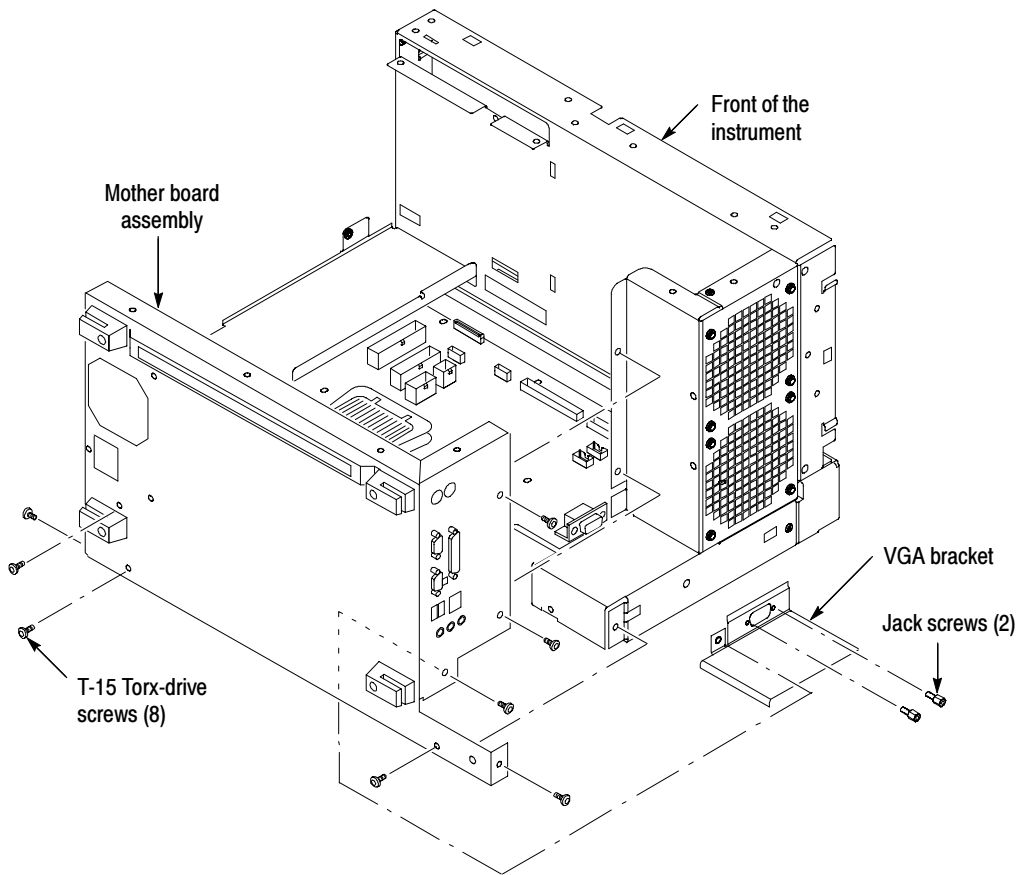
5. Remove the eight T-15 Torx-drive screws that secure the Mother board assembly to the side of the chassis, see Figure 6-16, on page 6-30.

---

**NOTE.** *You only need to separately remove the cord-wrap post if you plan to replace the sheet metal and reuse the posts. If you do plan to replace the sheet metal, then remember that it has stickers with important information on it such as the serial #, option label and safety data.*

---

6. Disconnect the four cables and from the Mother board assembly.
7. Carefully lift the assembly out of the chassis.
8. Disconnect the remaining two cables at the bottom of the assembly.
9. Set the Mother board assembly so the bottom is down on the work surface and the connector panel is facing you.
10. Remove the six jack screws that secure the Mother board connectors to the connector panel of the rear chassis.
11. Remove the six T-15 Torx-drive screws that secure the Mother board to the rear chassis.
12. Carefully lift the Mother board out of the rear chassis.
13. To reinstall the Mother board do steps 1 through 12 in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.



**Figure 6-16: Mother board removal**

## Interface Board

1. Remove all the trim, top-right cover, and bottom covers.
2. Remove the floppy disk drive assembly.
3. Remove the power supply.
4. Remove the Mother board.
5. Set the instrument so its bottom is down on the work surface and the top panel is facing you.
6. Remove the two jack screws that secure the VGA connector to the bracket (see Figure 6-16 on page 6-30) and then remove the bracket and set it aside.
7. Refer to Figure 6-17 on page 6-32 and disconnect all cables from the Interface board. Note the location of each cable so you can reconnect them properly during reassembly.
8. Remove the six T-15 Torx-drive screws that secure the Interface board to the chassis.

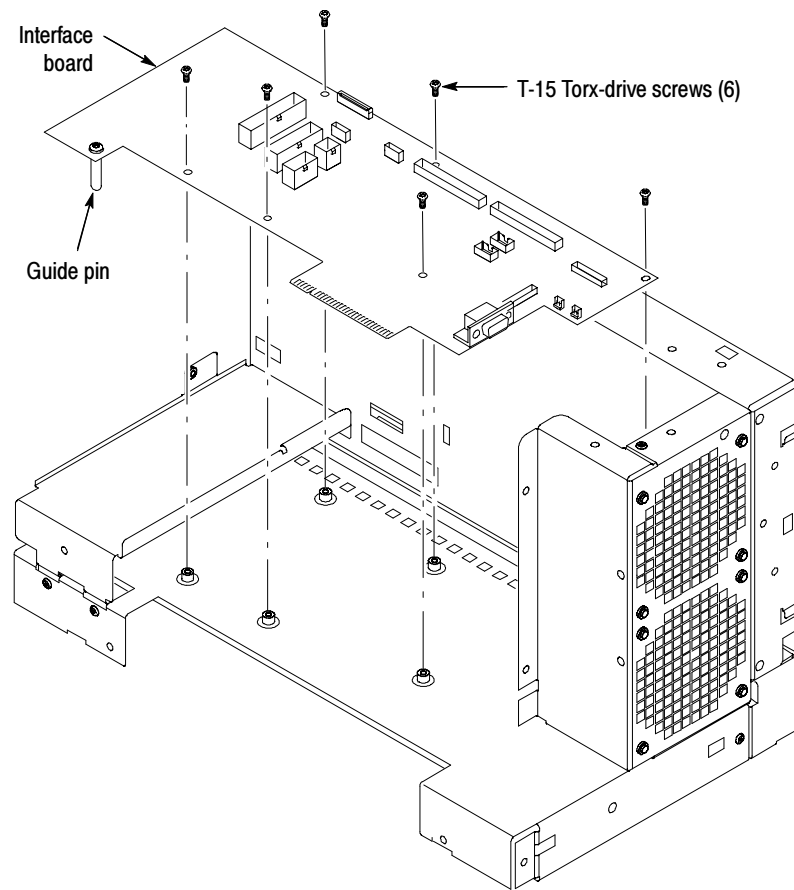


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**CAUTION.** Do not remove the screw underneath the power supply bracket next to the multi-pin connector (See Figure 6-17 on page 6-32). The screw secures an indexing pin used to align the multi-pin connector to the Acquisition board.

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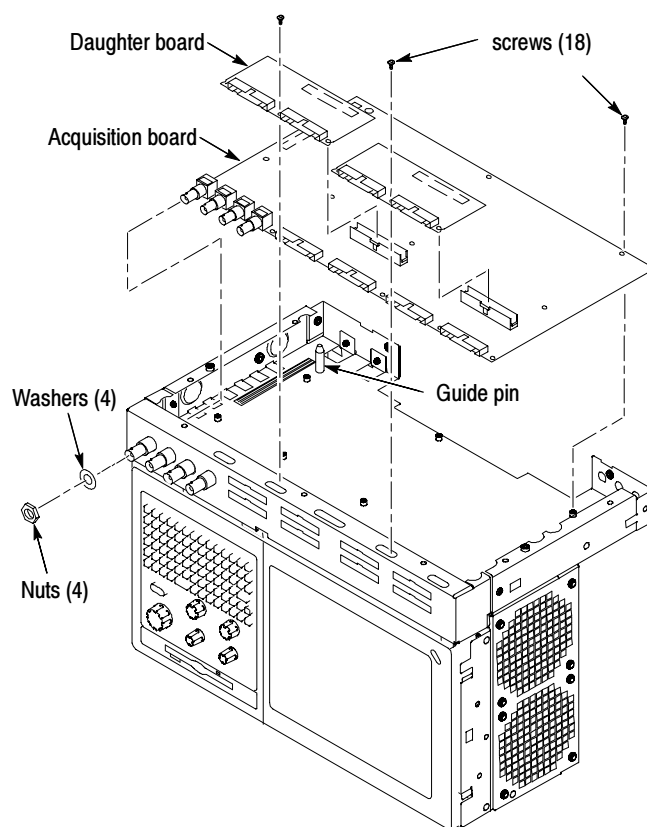
9. Grasp the Interface board (see Figure 6-17) and carefully pull the board up to disconnect the multi-pin connector underneath the power supply bracket. Once you have cleared the connector, remove the board from the chassis.
10. When installing the Interface board, set the board in place and align the multi-pin connector under the power supply bracket using the guide pin. Gently press the board into place to seat the connector between the Interface board and the Acquisition board.
11. Complete steps 8 through 1 in reverse order to complete the installation. Tighten the T-15 Torx-drive screws to 8-in lbs. Tighten the jack screws to 4.0-in lbs.



**Figure 6-17: Interface board removal**

## Replacing the Acquisition Board

1. Remove the trim and covers by following the procedure on page 6-7.
2. Remove the bottom covers.
3. Set the instrument so its top is down on the work surface and its bottom is facing up.
4. Refer to Figure 6-18 on page 6-34 and remove the 12 T-15 Torx-drive screws that secure the Acquisition board to the chassis.
5. Using a 9/16 inch open-end wrench, remove the nuts and washers from the four BNC connectors on the front panel.
6. Grasp the Acquisition board on the left-rear edge near the multi-pin connector and the right side and carefully pull the board up to disconnect the multi-pin connector and to clear the guide pin. Once you have cleared the connector, remove the board from the chassis.
7. When installing the Acquisition board, guide the BNC connectors into the holes in the front panel. Then set the board in place and align the multi-pin connector halves using the guide pin. Gently press the board into place to seat the connector between the Interface board and the Acquisition board.
8. Install the 12 T-15 Torx-drive screws to secure the Acquisition board to the front chassis.
9. Reinstall the nuts and washers on the four BNC connectors and tighten the nuts to 8 in-lbs.
10. Install the covers and trim following the procedures that start on page 6-6. Tighten the T-15 Torx-drive screws to 8-in lbs.
11. Verify the operation by following the procedure on page 6-35.



**Figure 6- 18: Acquisition board removal**

## Daughter Boards

1. Remove the trim and covers by following the procedure on page 6-7.
2. Remove the bottom covers.
3. Set the instrument so its top is down on the work surface and its bottom is facing up.
4. Locate the daughter board to be replaced.
5. Remove the three T-15 Torx-drive screws securing the daughter boards to the Acquisition board.
6. Lift the daughter board off the connector.
7. To reinstall the daughter board place the daughter board over the connector and gently press it in place.
8. Complete steps 1 through 5 in reverse order. Tighten the T-15 Torx-drive screws to 8-in lbs.

## Verifying Operation

To verify the proper operation of the logic analyzer, follow these steps:

1. Plug the power cord in and turn the logic analyzer on.
2. Verify that the instrument passes all power-up diagnostics.
3. Exit all applications and close any open windows.
4. Click Start in the Windows tool bar.
5. Select Programs from the Start menu.
6. Select the CheckIt Utilities application from the Programs menu.
7. Run the appropriate verification tests from the application.
8. Turn the logic analyzer off, and then on again before running any application software including the TLA application software.





# Troubleshooting



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**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.

*To prevent possible injury to service personnel or damage to electrical components, please read Preventing ESD on page 6-1.*

---

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

- Do *Check for Common Problems* on page 6-38 to eliminate easy-to-find problems first.
- Do *Diagnostics*, beginning on page 6-39, to locate the failed replaceable part within the logic analyzer.

For assistance, contact your local Tektronix Service Center.

## Service Level

This section supports isolation of faults within the logic analyzer to the replaceable-part level. In most cases, faults are isolated to circuit boards or assemblies, but not to individual components on those boards.

## Check for Common Problems

Use Table 6-2 to quickly isolate possible failures. The table lists problems related to the logic analyzer and possible causes. The list is not exhaustive, but it may help you eliminate a problem that is quick to fix, such as a loose cable.

**Table 6-2: Failure symptoms and possible causes**

Symptom	Possible cause(s)
Logic analyzer will not turn on	<ul style="list-style-type: none"> <li>■ Power cord not plugged in</li> <li>■ Faulty power supply</li> </ul>
Logic analyzer turns on but one or more fans will not operate	<ul style="list-style-type: none"> <li>■ Faulty fan cable</li> <li>■ Defective fan assembly</li> <li>■ Faulty power supply</li> <li>■ Faulty fan controller circuitry on the interface board</li> </ul>
Controller appears “dead”; power light comes on, but monitor screens is (are) blank, logic analyzer emits no beeps	<ul style="list-style-type: none"> <li>■ DIMMs incorrectly installed or missing</li> <li>■ Defective mother board</li> <li>■ CMOS settings may have the primary video adapter switched from PCI to AGP. Check CMOS settings.</li> </ul>
External monitor does not power on	<ul style="list-style-type: none"> <li>■ Monitor power cord not plugged in</li> <li>■ Failed fuse</li> <li>■ Monitor failure</li> </ul>
External monitor powers on, but is blank	<ul style="list-style-type: none"> <li>■ External monitor controls turned down</li> <li>■ Monitor cable faulty or not connected to logic analyzer</li> <li>■ Monitor defective</li> <li>■ Check Windows display properties to see if the external monitor is enabled</li> </ul>
Hard disk drive related symptoms	<ul style="list-style-type: none"> <li>■ Defective hard disk drive</li> <li>■ Incorrect hard disk type selected in the BIOS setup</li> <li>■ Power supply failure</li> <li>■ Controller BIOS setup problem. See BIOS Settings</li> <li>■ Loose cable</li> <li>■ Faulty motherboard</li> </ul>
CD-RW ROM related symptoms	<ul style="list-style-type: none"> <li>■ Defective CD-RW ROM</li> <li>■ Defective ribbon cable from PC mother board to CD-RW ROM adapter board</li> <li>■ Defective CD-RW ROM power cable</li> <li>■ Defective CD-RW ROM adapter board</li> <li>■ Incorrect CD-RW ROM configuration in the BIOS setup</li> </ul>

**Table 6-2: Failure symptoms and possible causes (Cont.)**

Symptom	Possible cause(s)
Internal display blank	<ul style="list-style-type: none"> <li>■ Defective cable from interface board to display adapter board</li> <li>■ Defective cable from inverter board to display adapter board</li> <li>■ Defective cable from inverter board to backlighting display lamp</li> <li>■ Defective backlighting display lamp</li> <li>■ Faulty display</li> <li>■ CMOS settings may have the primary video adapter switched from PCI to AGP. Check CMOS settings.</li> <li>■ Faulty inverter board</li> <li>■ Faulty interface board</li> </ul>
BIOS error messages	<ul style="list-style-type: none"> <li>■ Refer to the BIOS error message table on page 6-40.</li> </ul>

## Diagnostics

The primary diagnostics for the logic analyzer are the Power-On Diagnostics, Extended Diagnostics, Mainframe Diagnostics, and the CheckIt Utilities. Procedures for running these diagnostics are described below.

### Power On Diagnostics

The Power-On Diagnostics check the basic functionality of the logic analyzer at power on. If any failures occur at power on, the screen displays the Calibration and Diagnostics property page. Use the results of the tests to help you isolate problems.

If there are no failures, you can view the results of the tests in the Calibration and Diagnostics page under the System menu.

### Extended Diagnostics

The Extended Diagnostics extend the tests of the power-on diagnostics. In many cases they are the same tests as the Power-On Diagnostics but test more details. You can also run individual tests. To view and run the Extended Diagnostics, select the Extended tab from the Calibration and Diagnostics page from the system menu.

The Extended Diagnostics do not run automatically when you power on the instrument. You must run the diagnostics manually. After running the diagnostics the Pass or Fail status shows adjacent to each test.

## Mainframe Diagnostics

The Mainframe Diagnostics are comprehensive software tests that check the logic analyzer. You will need a short BNC-to-BNC cable to complete all of the tests. Perform the following steps to run the mainframe diagnostics:

1. Quit all other applications on the instrument.
2. Select Start → Programs → Tektronix Logic Analyzer → TLA Mainframe Diagnostics.
3. Click the Run button to start the diagnostics. Follow the online instructions to complete the tests. If necessary, refer to the online help for more information on the diagnostics.

## CheckIt Utilities

For PC hardware diagnostics the instrument uses a third party diagnostic software tool called CheckIt Utilities To start software, the perform the following steps:

1. Quit all other applications on the instrument.
2. Select Start → Programs → CheckIt Utilities.
3. Refer to the online help for additional information on using the software.

---

**NOTE.** To test the floppy disk drive and the CD-ROM drives, you must insert a test floppy disk or CD before starting the CheckIt Utilities.

---

## BIOS Setup Error Messages

The logic analyzer runs a BIOS test when you power on the instrument. If the BIOS test encounters a problem, the program displays the error on the display. Table 6-3 lists the BIOS error messages and explanations for the messages.

**Table 6-3: BIOS Error messages**

Error message	Explanation
GA20 Error	An error occurred with Gate-A20 when switching to protected mode during the memory test.
Pri Master HDD Error Pri Slave HDD Error Sec Master HDD Error Sec Slave HDD Error	Could not read sector from corresponding drive
Pri Master Drive - ATAPI Incompatible Pri Slave Drive - ATAPI Incompatible Sec Master Drive - ATAPI Incompatible Sec Slave Drive - ATAPI Incompatible	Corresponding drive is not an ATAPI drive. Run Setup to make sure the device is selected correctly.
A: Drive Error	No response from the floppy disk drive

**Table 6-3: BIOS Error messages (Cont.)**

Error message	Explanation
Cache Memory Bad	An error occurred while testing L2 cache. Memory may be bad.
CMOS Battery Low	The battery may be losing power. Replace the battery soon.
CMOS Display Type Wrong	The display type is different than what has been stored in CMOS. Check Setup to make sure type is correct.
CMOS Check Sum Bad	The CMOS checksum is incorrect. CMOS memory may have been corrupted. Run Setup to reset values.
CMOS Settings Wrong	CMOS values are not the same as the last boot. These values have either been corrupted or the battery has failed.
CMOS Date/Time Not Set	The time and/or date values stored in CMOS are invalid. Run Setup to set correct values.
DMA Error	Error during read/write test of DMA controller.
FDC Error	An error occurred trying to access the floppy disk drive controller.
HDC Failure	Error while trying to access hard disk controller.
Checking NVRAM...	NVRAM is being checked to see if it is valid.
Update OK!	NVRAM was invalid and has been updated.
Update Failed	NVRAM was invalid but was unable to be updated.
Keyboard Error	Error in the keyboard connection. Make sure keyboard is connected properly.
KB/Interface Error	Keyboard interface test failed.
Memory Size Decreased	Memory size has decreased since the last boot. If no memory was removed, then memory may be bad.
Memory Size Increased	Memory size has increased since the last boot. If no memory was added, then memory may be bad.
Memory Size Changed	Memory size has changed since the last boot. If no memory was added or removed, then memory may be bad.
No Boot Device Available	System did not find a boot device.
Off Board Parity Error	A parity error occurred on an off-board card. This error is followed by an address.
On Board Parity Error	A parity error occurred in onboard memory. This error is followed by an address.
Parity Error	A parity error occurred in onboard memory at an unknown address.

**Table 6-3: BIOS Error messages (Cont.)**

Error message	Explanation
NVRAM/CMOS/PASSWORD cleared by Jumper	NVRAM, CMOS, and passwords have been cleared. The system should be powered off and the jumper removed.
<CTRL_N> Pressed	CMOS is ignored and NVRAM is cleared. User must enter Setup.

## BIOS Beep Codes

When an error occurs during the power on self test (POST), the BIOS displays an error message describing the problem. The BIOS also issues a beep code (one long tone followed by two short tones) during POST if the video configuration fails (a faulty video card or no card installed) or if an external ROM module does not properly checksum to zero.

An external ROM module (for example, a video BIOS) can also issue audible errors, usually consisting of one long tone followed by a series of short tones. For more information on the beep codes, check the documentation for the device.

There are several POST routines that issue a POST terminal error and shut down the system if they fail. Before shutting down the system, the terminal-error handler issues a beep code (see Table 6-4) signifying the test point error, writes the error to I/O port 80h, attempts to initialize the video, and writes the error in the upper left corner of the screen (using both monochrome and color adapters).

If the POST completes normally, the BIOS issues one short beep before passing control to the operating system.

**Table 6-4: Beep codes**

Beeps	Description
1	Refresh failure
2	Parity cannot be reset
3	First 64 K memory failure
4	Timer not operational
5	Not used
6	8042 Gate A20 cannot be toggled
7	Exception interrupt error
8	Display memory R/W error
9	Not used

**Table 6-4: Beep codes (Cont.)**

Beeps	Description
10	CMOS shutdown register test error
11	Invalid BIOS (for example, POST module not found, etc.)

## Restoring or Reinstalling Software

Most of the software comes factory-installed when you receive your logic analyzer. You only need to refer to this section if you reinstall the software. These instructions refer to resetting the controller BIOS, restoring the operating system (hard disk image), and reinstalling the application software.

## Setting Up the TLA5000 Controller BIOS

This procedure is necessary when the BIOS settings are corrupted or lost. To configure the Controller BIOS, complete the following steps:

1. Power on the logic analyzer and press the F2 function key before the logic analyzer boots the Windows operating system.
2. Press the F9 function key, select Yes, and then press Enter to set all settings to their default values. Verify that the hard disk was auto-recognized and that the correct size of the hard disk is displayed in the Primary Master setting.
3. Using the arrow keys, navigate to the Advanced page.
4. Under Peripheral Configuration, perform the following:
  - a. Set the Parallel Port Mode to ECP
  - b. Set the Audio to Disabled.
5. Under Diskette Configuration, set the Diskette Controller to Disabled.
6. Under Video Configuration, set the Primary Video Adapter to PCI.
7. Press the F10 function key to exit and save the BIOS setup.

## Restoring the Hard Disk Image

The Tektronix Logic Analyzer comes with a set of CDs (labeled *TLA5000 Hard Disk Image*) containing the Microsoft Windows operating system and the latest application software. All software required to restore the hard disk drive to its factory configuration is included on the CDs. The process of reloading the software on the hard disk will destroy any files or programs installed on the hard disk and replace them with the original factory configuration. Therefore, you should back up any files that you want to save to another media before restoring the hard disk image.



---

**CAUTION.** To avoid destroying the *entire contents* of the hard disk, save any files or applications by backing them up to another media before continuing with this procedure.

---

### Backing Up Files

Before loading the Hard Disk Image software, make sure that you back up any files that a customer may want to keep to an external storage device.

You can find most TLA user files using the Windows Search utility. For example, open Windows Explorer and select the C:\My Documents folder. Right click on the folder and select Search. Enter one of the suffixes from Table 6-5 to locate the files in the current folder and all subfolders (you may want to search for other file suffixes depending on the files installed on the logic analyzer).

**Table 6-5: TLA user file suffixes**

Suffix	Description
.tla	TLA setup files
.tsf	TLA symbol files
.tbf	Tektronix binary format
.tls	TLA script file
.txt	Tektronix TLA data exchange format files
.stk	Stack files
.spz	Protocol files

Once you find the files, copy them to the external storage device.



---

**NOTE.** You can reinstall the Microsoft Windows operating system and other software only from the Hard Disk Image CD that came with the instrument. These software applications are licensed and cannot be reinstalled by any other method without violating the license agreements.

---

## Installing the Operating System and TLA Application Software



This procedure overwrites all data on the hard disk drive with the new product software image.

---

**CAUTION.** To avoid losing user files on your hard disk, back them up before proceeding.

---

**Change the BIOS Boot Settings.** Before installing the Hard Disk Image, you may need to change the BIOS settings to enable booting the logic analyzer from the CD-ROM.

1. Restart the logic analyzer and then press the F2 function key to enter the BIOS setup.
2. In the BIOS setup, go to the Boot menu.
3. Set the Boot devices for your instrument as shown in Table 6-6 (follow the on-screen instructions to change the settings).

**Table 6-6: BIOS Boot settings for reinstalling software from the CD-ROM**

Instrument	Setting	
TLA5000 series	First Boot Device:	[CD Drive]
	Second Boot Device:	[Floppy]
	Third Boot Device:	[Hard Disk Drive]

4. Save the settings by pressing function key F10 and confirm that you want to save the new settings.

**Load the Hard Disk Image.** Complete the following steps to load the Hard Disk Image:

1. Insert the Disc 1 of Hard Disk Image CD set in the CD drive.
2. Reboot the logic analyzer.

3. There is a warning that the contents of your hard disk will be destroyed if you choose to continue. Click Yes to continue the process.
4. The program will automatically start and guide you through the rest of the procedure. The image loading procedure is fully automatic and takes approximately 15 minutes to complete.

The image loading procedure automatically installs and sets up the logic analyzer application. You do not need to make any changes to the setup to use the logic analyzer. When prompted, remove Disc 1 and insert Disc 2.

5. After the image is loaded, remove the CD from the CD drive and reboot the logic analyzer.
6. The Systems Settings Change error message displays, prompting you to restart the instrument before your changes can take effect. Click Yes to restart the instrument.
7. Reinstall any user files that you backed up previously. Reinstall any other software (such as the microprocessor support packages) that the customer purchased and may want to use on the logic analyzer.

---

**NOTE.** Before reinstalling the TLA Application software, check to see if any operating system patches need to be installed.

---

## Reinstalling the TLA Application Software

Complete the following steps to reinstall the latest version of the TLA application software without reinstalling the operating system software. Use these steps as a first resort to recovering from application software problems. If you still experience problems with the software after completing these steps, follow the instructions under *Restoring the Hard Disk Image* beginning on page 6-44.

While using this procedure you will be asked to log on as Administrator. The logic analyzer is initially set up to automatically log on as Administrator (with no password) so you may not see the login prompt. If the network setups have been changed on the instrument, make sure that you log on as Administrator or as a user who has administrator privileges. Failure to do so can prevent the software upgrade from completing successfully.

1. Log on to the instrument as Administrator and quit any applications.
2. Install Disc 1 of the Tektronix Logic Analyzer Family Application Software in the CD-ROM drive of the logic analyzer.
3. Click Run in the Windows Start menu to display the Run dialog box.

4. To reinstall the TLA application software, enter D:\TLA Application SW\Setup.exe in the Run dialog box.
5. Click OK to perform the installation.

---

**NOTE.** *If there is an older version of the software on the hard disk, the installation program will detect it and will ask you to remove it. You must uninstall the old software before you load the new software. Follow the instructions to remove the software, answering “Yes” to any prompts. Restart the instrument when prompted. Repeat Step 4 to reinstall the software.*

---

6. After the software has been successfully installed, restart the instrument.

## Upgrading or Restoring Firmware

You may have to upgrade the firmware on the logic analyzer. The most current firmware for the TLA application software resides in a file on the hard disk of the logic analyzer. You can easily tell if the firmware needs updating by the absence of the logic analyzer module in the System window.

1. Exit the logic analyzer application.
2. Click Start → Programs → Tektronix Logic Analyzer → TLA Firmware Loader.
3. Select the module from the Supported list box near the top of the window.
4. Select Load Firmware from the Execute menu.
5. Click the TLA520x.lod file.
6. Click OK. You will be prompted to confirm your action; click Yes.
7. 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.
8. Locate the big label on the back of the instrument.
9. Record the firmware version that is printed on the label. You will need this information to see that the firmware version matches the label.
10. Power on the instrument.
11. After the logic analyzer completes the power-on diagnostics, select System Properties from the System menu.
12. Click the LA1 tab.

- 13.** Verify that the firmware version matches the version on the label that you recorded in step 9.
- 14.** If the firmware versions do not match, update the label on the back of the instrument.

# Repackaging Instructions

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

## Packaging

When repacking the logic analyzer for shipment, use the original packaging. If the packaging is unavailable or unfit for use, contact your local Tektronix representative to obtain new packaging.

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 and serial number of the instrument.
- Reason for returning.
- A complete description of the service required.

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



# Options

This chapter lists options that might be installed in the instrument. Other product options were selected when the instrument was purchased and are not listed here.

The following PowerFlex options are available for all versions of the TLA5000 Series Logic Analyzer:

- Option 7S: Increased memory to 2M@235 MHz. Memory depth and speed indicated on super label on rear of instrument
- Option 8S: Increased memory to 8M@235 MHz. Memory depth and speed indicated on super label on rear of instrument



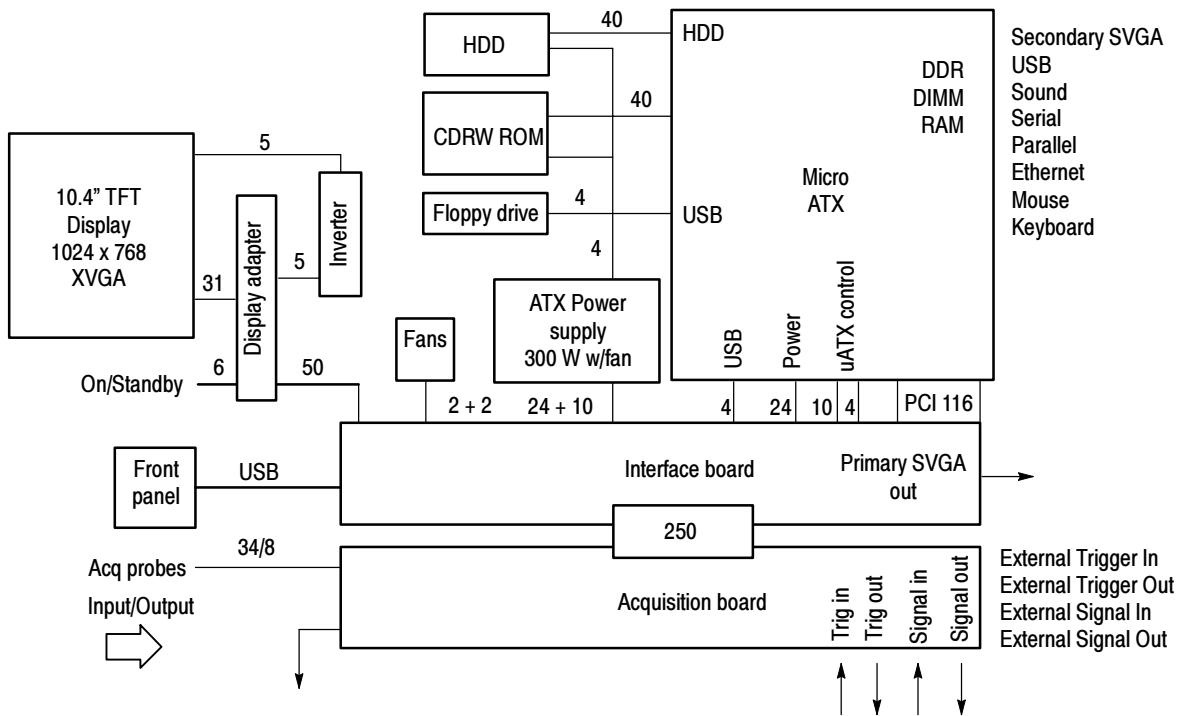


# Electrical Parts List

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



# Diagrams



**Figure 9-1: TLA5000 interconnect diagram**



# Mechanical Parts List

This section contains a list of the replaceable mechanical components for the TLA5000 Series logic analyzer. Use this list to identify and order replacement parts.

## 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.

## Using the Replaceable Mechanical Parts List

The tabular information in the Replaceable Mechanical Parts List is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replacement parts. The following table describes the content of 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.

**Chassis Parts**      Chassis-mounted parts and cable assemblies are located at the end of the Replaceable Electrical Parts List.

**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
80009	TEKTRONIX, INC.	P.O. BOX 500	BEAVERTON, OR, 97077-0001
	ARTESYN AUSTRIA GMBH	2800 TATABANYA	TAVASZEMZO U. 4, HU
	MICRON SEMICONDUCTOR PRODUCTS INC	15455 NW GREENBRIER PKWY # 244	BEVERTON, OR US 97006
060D9	TENSOLITE COMPANY	PRECISION HARNESS AND ASSEMBLY~3000 COLUMBIA HOUSE BLVD~#120	VANCOUVER, WA 98661
0D1M6	NMB TECHNOLOGIES CORPORATION	9730 INDEPENDENCE AVE	CHATSWORTH, CA 91311
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214-4657
12136	PHC INDUSTRIES INC	1643 HADDON AVE	CAMDEN, NJ 08103
1DM20	PARLEX CORP	ONE PARLEX PLACE	METHUEN, MA 01844
1WNW6	ACCRA-FAB INC	23201 E APPLEWAY	LIBERTY LAKE, WA 99019
1WNW6	ACCRA-FAB INC	23201 E APPLEWAY	LIBERTY LAKE, WA 99019
22670	GM NAMEPLATE INCORPORATED	2040 15TH AVE WEST	SEATTLE, WA 98119-2783
34649	INTEL CORPORATION	3065 BOWERS~PO BOX 58130	SANTA CLARA, CA 95051-8130
4T165	NEC ELECTRONICS, INC.	2880 SCOTT BLVD~PO BOX 58062	SANTA CLARA, CA 95052-2554

## Manufacturers cross index (Cont.)

<b>Mfr. code</b>	<b>Manufacturer</b>	<b>Address</b>	<b>City, state, zip code</b>
50356	TEAC AMERICA INC	7733 TELEGRAPH RD~PO BOX 750	MONTEBELLO, CA 90640-6537
55566	RAF ELECTRONIC HARDWARE INC	95 SILVERMINE ROAD	SEYMOUR, CT 06483
61058	PANASONIC INDUSTRIAL CO ECG	M/S 7H-4~TWO PANASONIC WAY	SECAUCUS, NJ 07094
68167	BELKIN COMPONENTS	1303 WALNUT PARKWAY	COMPTON, CA 90220
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR~PO BOX 500	BEAVERTON, OR 97077-0001
83486	ELCO INDUSTRIES INC	1101 SAMUELSON ROAD	ROCKFORD, IL 61101
9F560	IBM CORPORATION	420 E SOUTH TEMPLE ST	SALT LAKE CITY, UT 84145
TK1943	NEILSEN MANUFACTURING INC	3501 PORTLAND RD NE	SALEM, OR 97303
TK2539	ROYAL CASE COMPANY INC	315 S MONTGOMERY~PO BOX 2231	SHERMAN, TX 75070
TK2565	VISION PLASTICS INC	26000 SW PARKWAY CENTER DRIVE	WILSONVILLE, OR 97070
TK6457	BEIJING MINGDAR TECHNOLOGY INC	RM 213 LUIPU BLDG~NO 5 XIAGUANGLI~CHAOYANG DISTRICT	BEIJING, CN
0KB05	NORTH STAR NAMEPLATE INC LABEL PRODUCTS	5750 NE MOORE COURT	HILLSBORO, OR 97124-6474
1WNW6	ACCRA-FAB INC	23201 E APPLEWAY	LIBERTY LAKE, WA 99019
3M099	PORTLAND SCREW COMPANY SONY	6520 N BASIN AVE COMPUTER PERIPHERALS COM- PONENTS~EUROPE~HUGO-ECKENER- STRASSE 20	PORTLAND, OR 97217 D-50829 KOELN, DE
1K3Q9	PACKAGING RESOURCES	12555 SW TUALATIN SHERWOOD RD	TUALATIN, OR 97062-8051
5Y400	TRIAx METAL PRODUCTS INC	1880 SW MERLO DRIVE	BEAVERTON, OR 97006
6Y440	MICRON SEMICONDUCTOR PRODUCTS INC	8000 S FEDERAL WAY~PO BOX 6	BOISE, ID 83707-0006
TK0JL	CHROMA ATE INC	43 WU-CHUAN ROAD~WU-KU INDUSTRIAL PARK	WU-KU, TAIPEI HSIEN, TAIWAN CN
TK6253	VOLEX INC	646 CARRIBEAN DR	SUNNYVALE, CA 94089-1108
TK6372	VOLEX INC	POWER CORD PRODUCTS~5350 LAKEVIEW PARKWAY~SOUTH DRIVE, SUITE D	INDIANAPOLIS, IN 46268
TK6599	BYTECC INC	15332 VALLEY BLVD	CITY OF INDUSTRY, CA US 91746
22670	GM NAMEPLATE INCORPORATED	2040 15TH AVE WEST	SEATTLE, WA 98119-2783

## Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discount'd	Qty	Name & description	Mfr. code	Mfr. part number
10-1-1	200-4669-00			1	DOOR; ACCESSORY TRAY,0.050 AL,SAFETY CONTROLLED	TK2565	200-4669-00
-2	200-4832-00			1	COVER,TOP; PLASTIC,BLUE	TK2565	200-4832-00
-3	211-1050-00			10	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15	0KB01	OBD
-4	348-1685-00			4	FOOT; REAR,ASY. THERMOPLASTIC POLYURETHANE ,SAFETY CONTROLLED	TK2565	348-1685-00
-5	407-4961-00			1	BRACKET; MOUNTING,POUCH,0.050 AL	1WNW6	407496100
-6	200-4639-00			1	COVER,SIDE; RIGHT,FR110,SAFETY CONTROLLED	TK2565	200-4639-00
-7	200-4652-00			1	COVER; CD-ROM,PC/ABS	TK2565	200-4652-00
-8	333-4472-00			1	PANEL,FRONT; INPUT,34CH,SUB-PART 333-4462-00 W/335-0959-00 LABEL ATTACHED;TLA5201,SAFETY CONTROLLED	0KB05	333-4472-00
-8	333-4473-00			1	PANEL,FRONT; INPUT,68CH,SUB-PART 333-4462-00 W/335-0960-00 LABEL ATTACHED;TLA5202,SAFETY CONTROLLED	0KB05	333-4473-00
-8	333-4474-00			1	PANEL,FRONT; INPUT,102CH,SUB-PART 333-4462-00 W/335-0961-00 LABEL ATTACHED;TLA5203,SAFETY CONTROLLED	0KB05	333-4474-00
-8	333-4475-00			1	PANEL,FRONT; INPUT,136CH,SUB-PART 333-4462-00 W/335-0962-00 LABEL ATTACHED;TLA5204,SAFETY CONTROLLED	0KB05	333-4475-00
-9	101-0158-00			1	TRIM RING; FR110,PC/ABS	TK2565	101-0158-00
-10	200-4651-00			1	COVER,FRONT; PC/ABS ALLOY BAYBLEND,FR110,TEK BLUE	TK2565	200-4651-00
-11	260-2746-00			1	SWITCH,KEYPAD; ELASTOMERIC,ON/STANDBY,PUSHBUT-TON	22670	260-2746-00
-12	200-4640-00			1	COVER,SIDE; LEFT,FR110,SAFETY CONTROLLED	TK2565	200-4640-00
-13	367-0528-00			1	HANDLE,CARRYING; DUAL DUROMETER MOLDED,POLYPROPYLENE,VINYL GRIP SECTION,SAFETY CONTROLLED	12136	367-0528-00
-14	407-4838-00			1	BRACKET; HANDLE BASE,PC/ABS ALLOY,BAYER BAYBLEND FR2010,TEK BLUE,SAFETY CONTROLLED	TK2565	407-4838-00
-15	212-0213-00			2	SCREW,MACHINE; 8-32 X 0.75 L,PNH,STL, BLACK OXIDE PL,TORX	0KB01	212-0213-00
-16	200-4667-00			1	COVER; VGA PANEL,PC/ABS ALLOY,BAYER,BAYBLEND FR,TEK BLUE	TK2565	200-4667-00
-17	214-5003-00			1	FASTENER,LATCHG; PUSH LOCK;1V60-3-9-999-9	80009	214-5003-00
-18	355-0303-00			2	STUD,SNAP; 0.570 DIA,0.165 THK,STAINLESS STEEL	TK0588	355-0303-00
-19	016-1935-00			1	POUCH; ACCESSORIES,BLACK,SNAP-ON,TLA5000 SERIES	TK2539	016-1935-00



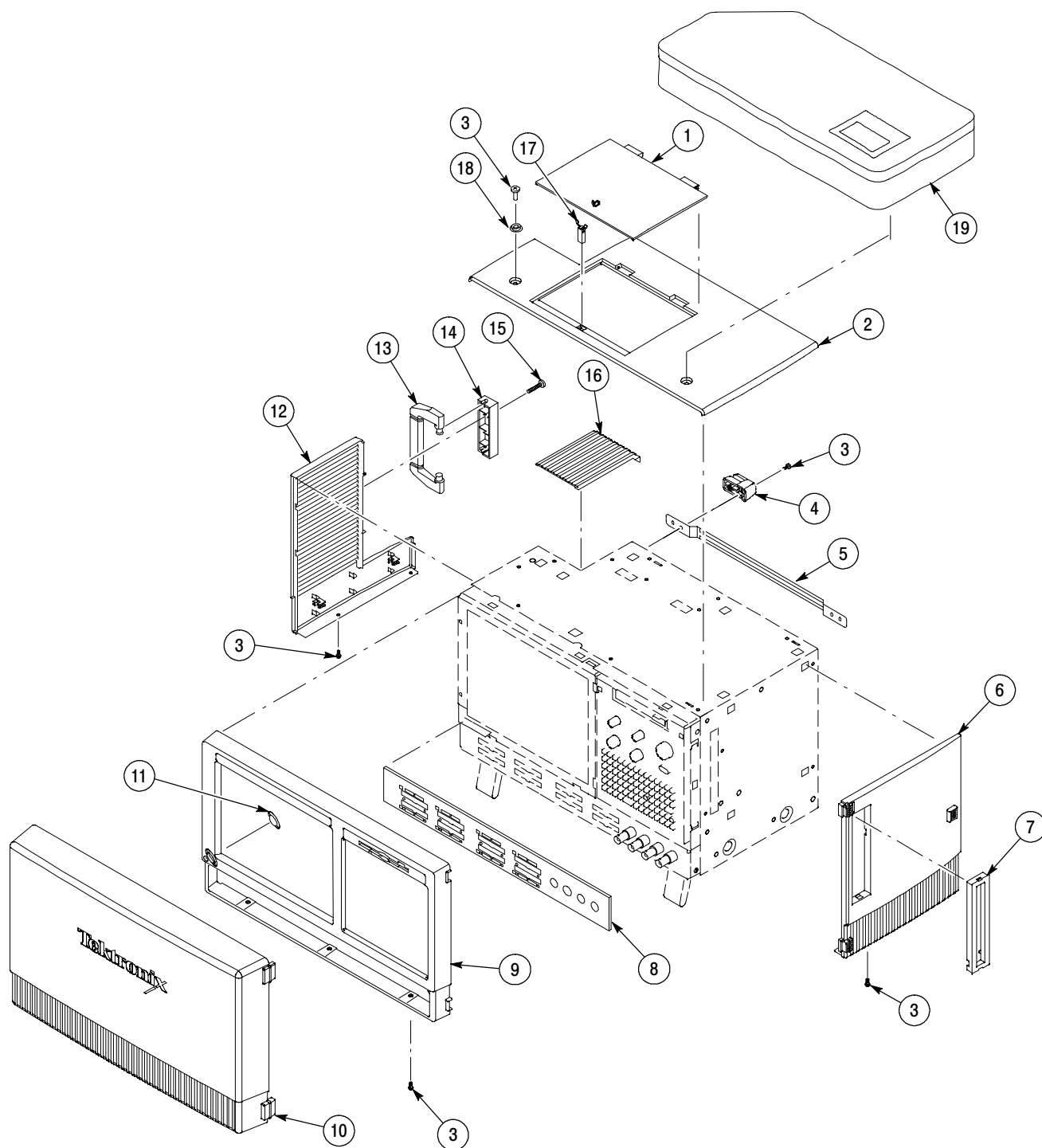
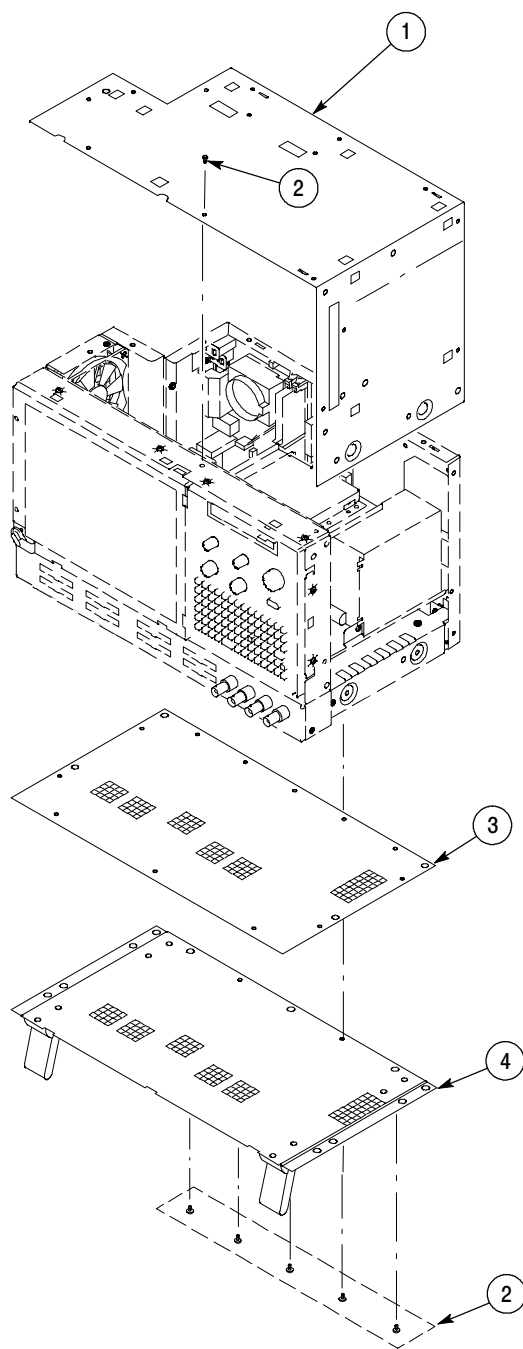


Figure 10-1: External parts

### Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-2-1	200-4814-00			1	COVER, TOP; 0.050 AL, SAFETY CONTROLLED	1WNW6	200-4814-00
-2	211-1050-00			24	SCREW, MACHINE; 6-32 X 0.312 L, PNH, STL CAD PLT, T15	0KB01	OBD
-3	200-4815-00			1	COVER, BOTTOM; 0.050 AL, SAFETY CONTROLLED	1WNW6	200481500
-4	200-4816-00			1	COVER, BOTTOM; BLACK VINYL, W/FEET, SAFETY CONTROLLED	1WNW6	200481600

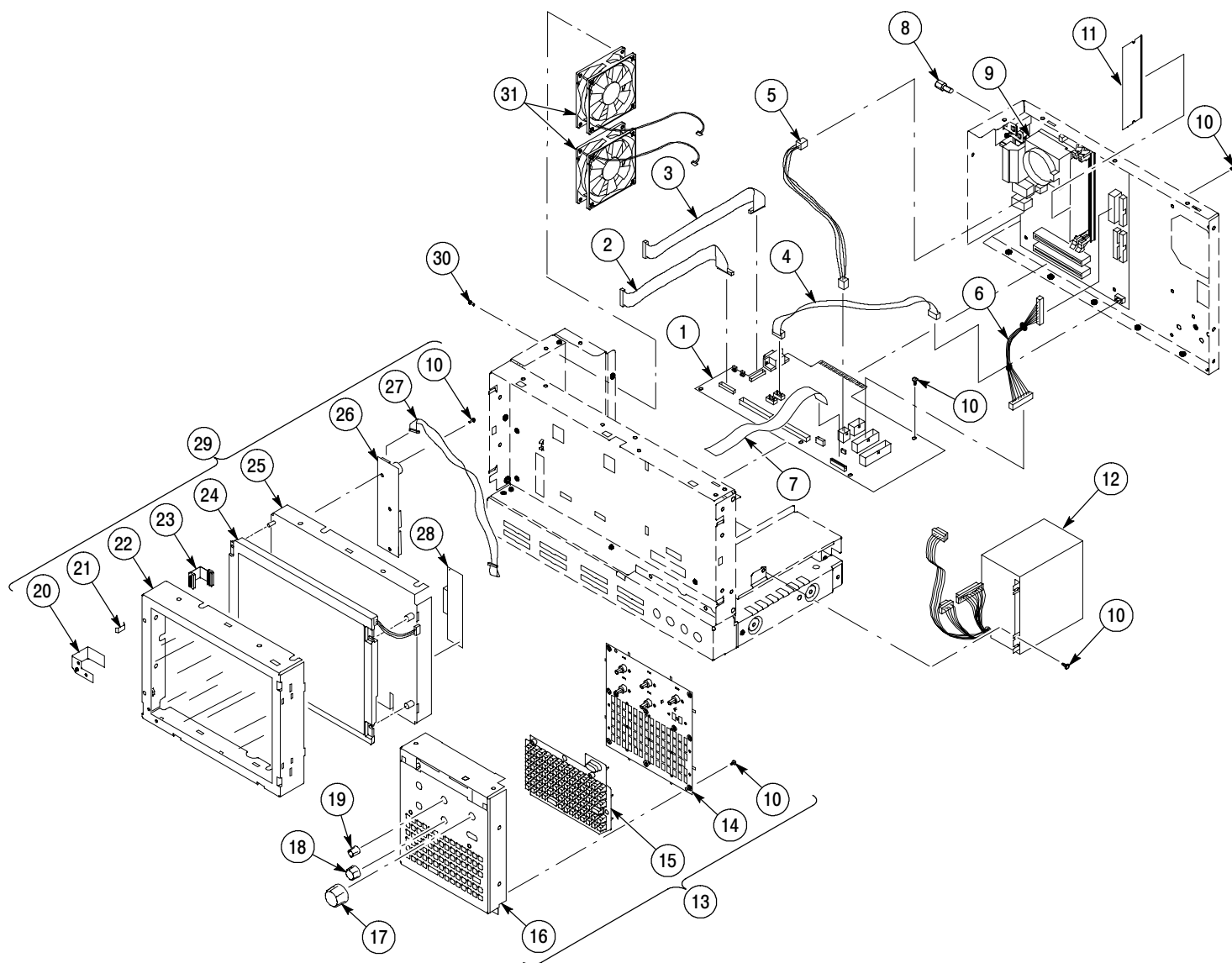


**Figure 10-2: Inner panels**

## Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-3-1	671-5655-XX			1	CIRCUIT BD ASSY; INTERFACE,TESTED	80009	671-5655-XX
-2	174-4792-00			1	CA ASSY; DISPLAY ADAPTER TO PPC	060D9	174-4792-00
-3	174-4793-00			1	CA ASSY; DISPLAY ADAPTER TO BRIDGE	060D9	174-4793-00
-4	174-4807-00			1	CA ASSY, ATX USB, PLUS MISC. TO DISPLAY	060D9	174-4807-00
-5	174-4865-00			1	CA ASSY; 4 PIN P4 POWER,9.5 INCHES LONG,MOTHERBOARD TO INTERFACE	060D9	174-4865-00
-6	174-4427-00			1	CA ASSY,SP; DESCRETE,CPD,20,18 AWG,8.0L,2 X 10,RCPT,STR,2X10 BOTH ENDS	060D9	174-4427-00
-7	174-4321-00			1	CABLE ASSY; FLAT FLEX,26POS,10.440L,0.039 CTR,FRONT PANEL	1DM20	174-4321-00
-8	214-3903-00			6	SCREW,JACK; 4-40 X 0.312 LONG,0.188 H HEX HEAD STAND OFF,4-40 INT THD, X 0.312 THD EXT 4-40	55566	4750-3-12 (+LOCKWASHER)
-9	039-0154-00 *			1	MOTHER BOARD; PENTIUM 4/CELERON BOARD,UATX,ASHLAND 2.1 MOTHER BOARD ASSY,W/O PROCESSOR,D845GVAD2L,SAFETY CONTROLLED	34649	BOXD845GVAD2LC 18934-106
-10	211-1050-00			16	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15	0KB01	OBD
-11	156-9442-00			1	IC,MEMORY; CMOS,DDR SDRAM;64MEG X 64,512MEG, 266MHZ,CL=2.5,PC2100;MT16VDDT6464A,DIMM184		MT16VDDT6464AG -265B1
-12	119-6480-00			1	POWER SUPPLY; 300W,AC-DC,STANDARD,ATX PC SUPPLY,90-132 180-264VAC 50-60 HZ IN,+3.3V 16A +5V 26A +12V 10A -12V 0.5A +5VSB 0.8A;70%EFF,PFC,INTERNAL FAN,UL,TUV,CE,CCIB,SAFETY CONTROLLED		CVN300-96P01-A0 1-REV1B
-13	614-0980-02			1	PANEL ASSEMBLY; FRONT;TLA6XX	80009	614-0980-02
-14	671-4823-01			1	CIRCUIT BD ASSY; FRONT PANEL,TESTED	80009	671-4823-01
-15	260-2726-00			1	SWITCH,KEYPAD; ELASTOMERIC,FRONT PANEL,PUSHBUT-TON	22670	260-2726-00
-16	333-4333-01			1	PANEL,FRONT; CONTROL,0.050 AL,W/0.010 LEXAN OVERLAY;TLA601,SAFETY CONTROLLED	TK1943	333-4333-01
-17	366-0822-00			1	KNOB,CAP; 0.925 DIA,SOFT FEEL COATING,PC/ABS BAYBLEND,FR110,TEK SILVER GRAY	22670	366-0822-00
-18	366-0820-00			2	KNOB,CAP; 0.425 DIA,SOFT FEEL COATING,PC/ABS,BAYBLEND,FR110,TEK SILVER GRAY	22670	366-0820-00
-19	366-0821-00			2	KNOB,CAP; 0.650 D,SOFT FEEL COATING,PC/ABS BAYBLEND,FR110,TEK SILVER GRAY	22670	366-0821-00
-20	259-0155-01			1	FLEX CIRCUIT; POWER SWITCH,W/LED	22670	259-0155-01
-21	131-6417-00			5	CONTACT,ELEC; GROUNDING,0.600 L X 0.250 W X 0.220 D,ELECTROLESS NICKEL PLATE	TK6457	131-6417-00
-22	407-4955-00			1	BRACKET,FRONT; DISPLAY,0.050 AL,TOUCH PANEL COMPATIBLE,SAFETY CONTROLLED	TK1943	407-4955-00
-23	174-4791-00			1	CA ASSY; DISPLAY ADAPTER TO XGA DISPLAY	060D9	174-4791-00

\* Hard disc-drive cable is included with the mother board.



**Figure 10-3: Display, Front panel, Interface board, and Mother board**

## Replaceable parts list

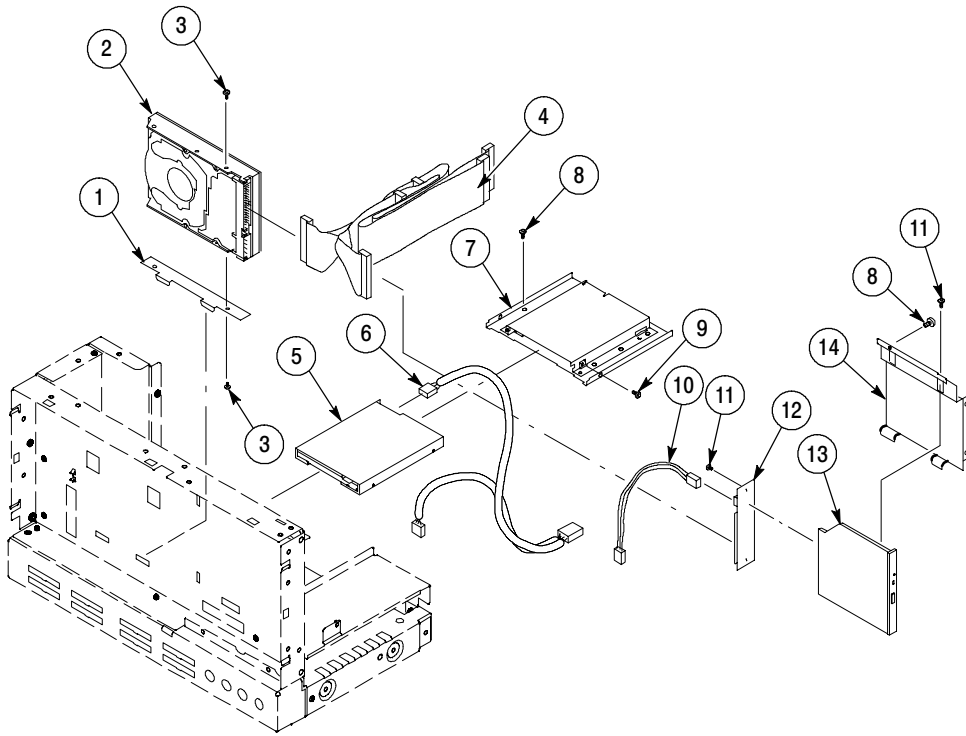
Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-3-24	119-6813-00			1	DISPLAY MODULE; LCD;1024 X 768;10.4 INCHES DIAGONAL,TFT,CCFL DUAL LAMP EDGE BACK LIGHT300 NITS,262144 COLORS,18-BIT,LVDS;NL10276BC20-04,SAFETY CONTROLLED	TK1502	NL10276BC20-04
-25	407-4953-00			1	BRKT, MOUNTING; DISPLAY, REAR, .050 ALUM (Part of Display Module)	060D9	407-4953-00
-26	671-5721-00			1	CIRCUIT BD ASSY; DISPLAY ADAPTER	80009	671-5721-00
-27	174-4794-00			1	CA ASSY; DISPLAY ADAPTER TO INVERTER	060D9	174-4794-00
-28	119-6806-00			1	POWER SUPPLY; INVERTER,1200VAC NO-LOAD & 600VAC @ 85KOHM LOADED OUTPUT; 12VDC INPUT,PWM LUMINANCE CONTROLLER,65KHZ SWITCHING FREQ,8-PIN & 3-PIN CONNECTORS,USE WITH NEC NL10276BC20-04 DISPLAY(10.4 IN LCDS);105MM X 27MM X 10 MM,SAFETY CONTROLLED	4T165	104PW191
-29	650-4558-00			1	MODULAR ASSY; DISPLAY SUB-ASSEMBLY	80009	650-4558-00
-30	210-0164-00			1	RIVET,SOLID; 0.163 OD X 0.415 L,PANEL RANGE HEAD STYLE,NYLON	3M099	D30-0156-01
-31	119-6441-00			1	FAN,TUBEAXIAL; 12VDC,0.15A,1.8W,48CFM,2450RPM,30DBA,92MM X 92MM X 26MM,W/7IN LEADS & CONNECTOR,SAFETY CONTROLLED	61058	FBA09A12M
not shown	119-6810-00			1	PROCESSOR; CELERON,2.0 GHZ INTERNAL CLOCK,400MHZ BUS,SOCKET 478 COMPATIBLE,BOXED W/FAN HEATSINK,BX80532RC2000B	34649	BX80532RC2000B



## Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-4-1	407-4951-00			1	BRKT,MOUNTING; HARD DISK DRIVE,.050 ALUM	1WNW6	407495100
-2	119-6873-00			1	DISK DRIVE; WINCHESTER,3.5 IN,80GB,180GXP FAMILY,IDE,SINGLEPLATTER, UDMA100, 7200RPM;07N9685,SAFETY CONTROLLED	9F560	07N9685
-3	211-0747-00			4	SCREW,MACHINE; 6-32 X 0.188,PNH,STL,CDPL,T-15 TORX	0KB01	OBD
-4	174-4671-00			2	CA ASSY SP; ULTRA DMA/ATA HARD DISK DRIVE,IDE,18" L	68167	F2N1107-18INCH
-5	119-6833-00			1	DISK DRIVE; USB FLOPPY,3.5 INCH;1.44MB,0.5 INCH,TWO SIDED, DOUBLE DENSITY	50356	FD-005U-296
-6	174-4808-00			1	CA ASSY; USB 2.0,DUAL HEAD	060D9	174480800
-7	407-4706-00			1	BRACKET ASSY; FLOPPY DRIVE,6.064 X 5.075 X 0.538,AL,ETCH & CLEAR CHROMATE	TK1943	407-4706-00
-8	211-1050-00			3	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15	0KB01	OBD
-9	211-1079-00			2	SCREW,MACHINE; 2.5 X 0.45 MM,3.0L,PNH,STL,NICKEL PL,PHILLIPS,JCIS	0KB01	10310188-0
-10	174-4867-00			1	CA ASSY; 4 PIN P4 POWER,7.5 INCHES LONG,MOTHERBOARD TO INTERFACE	060D9	174486700
-11	211-0950-00			2	SCREW,MACHINE; M2X.4X3L,PHL, PNH, STL NI PL	0KB01	0310248-0
-12	103-0443-00			1	ADAPTER; FOR CD-ROM DRIVE,SLIMLINE,IDE INTERFACE CONNECTOR,SAFETY CONTROLLED	50356	E951073-10A
-13	119-6839-00			1	DISK DRIVE; OPTICAL,CD-RW,5.25 SLIM,IDE,24X,24X,10X, 650/700MB,110MS;CD-W224E-A93	50356	CD-W224E-A93
-14	407-4964-00			1	BRACKET ASSY; CD-RW DISK DRIVE,0.050 AL	1WNW6	407-4964-00

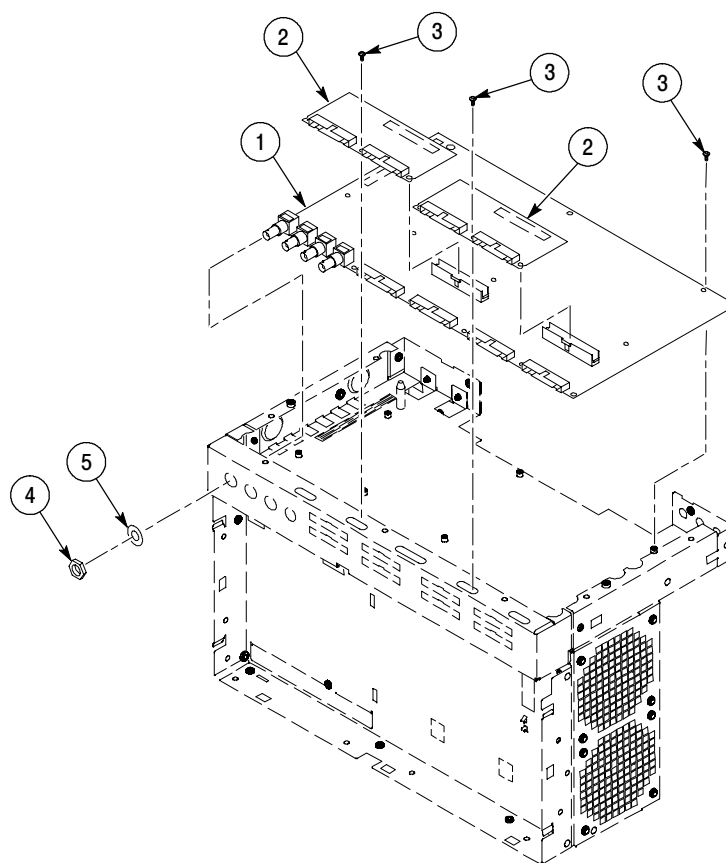




**Figure 10-4: Drives**

## Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-5-1	672-1721-00			1	CIRCUIT BD ASSY; 34CH ACQUISITION ASSEMBLY,TESTED	80009	672-1721-00
	672-1722-00			1	CIRCUIT BD ASSY; 68CH ACQUISITION ASSEMBLY WITH ONE DAUGHTER CARD,TESTED	80009	672-1722-00
	672-1723-00			1	CIRCUIT BD ASSY; 102CH ACQUISITION ASSEMBLY WITH ONE DAUGHTER CARD,TESTED	80009	672-1723-00
	672-1724-00			1	CIRCUIT BD ASSY; 136CH ACQUISITION ASSEMBLY WITH TWO DAUGHTER CARDS,TESTED	80009	672-1724-00
-2	671-5670-00			0	CIRCUIT BD ASSY; DAUGHTER CARD,TESTED, 34CH	80009	671-5670-00
	--- -----			1	CIRCUIT BD ASSY; DAUGHTER CARD,TESTED, 68CH	80009	671-5670-00
	--- -----			1	CIRCUIT BD ASSY; DAUGHTER CARD,TESTED, 102CH	80009	671-5670-00
	--- -----			2	CIRCUIT BD ASSY; DAUGHTER CARD,TESTED, 136CH	80009	671-5670-00
-3	211-1050-00			12	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15	0KB01	OBD
-4	210-1039-00			1	WASHER,LOCK; 0.521 ID,INT,0.025 THK,SST	78189	1224-02
-5	220-0497-00			1	NUT,PLAIN,HEX; 0.5-28 X 0.562 HEX,BRS CD PL	0KB01	220-0497-00



**Figure 10-5: Acquisition assembly**

## Accessories

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discount'd	Qty	Name & description	Mfr. code	Mfr. part number
<b>STANDARD ACCESSORIES</b>							
	161-0104-05			1	CA ASSY,PWR:3,1.0MM SQ,250V/10A,2.5 METER, (OPTION A3 - AUSTRALIA)	TK1373	161-0104-05
	161-0104-06			1	CA ASSY,PWR:3,1.0MM SQ,250V/10A,2.5 METER, (OPTION A1 - EUROPEAN)	TK1373	ORDER BY DESCRIPTION
	161-0104-07			1	CA ASSY,PWR:3,1.0MM SQ,240V/10A,2.5 METER,FUSED, (13A FUSE) (OPTION A2 - UNITED KINGDOM)	TK2541	ORDER BY DESCRIPTION
	161-0167-00			1	CA ASSY,PWR:3,0.75MM SQ,250V/10A,2.5 METER, (OPTION A5 - SWITZERLAND)	S3109	ORDER BY DESCRIPTION
	161-0306-00			1	CABLE ASSY,PWR; 3,1.0MM SQ,250V/10A,2.5 METER,RTANG,IEC320,RCPT,3C CERTIFICATION,CHINA;SAFETY CONTROLLED	TK6253	92-2637-250BKH
	161-0104-04			1	CABLE ASSY,PWR; 3,18 AWG,115 V,40.0 L	80009	161-0104-04
	161-0104-08			1	CABLE ASSY,PWR; 3,18 AWG,250/10A,98.0 L,RTANG,IEC320,RCPT X STR,NEMA 6-15P,US,SAFETY CONTROLLED	TK6372	161-0104-08
	161-A005-00			1	CABLE ASSY,PWR; JAPANESE T MARK,SAFETY CONTROLLED		161-A005-00
	119-6900-00			1	POINTER ASSY; MOUSE, USB, BLACK, OPTICAL, THREE BUTTON, WHEELED, WITH USB TO PS2 ADAPTER, SAFETY CONTROLLED	46628	952442-0403
	016-1524-04			1	MOUSE PAD; ANTI STATIC TEKTRONIX;TLA700 SERIES		
	119-6906-00			1	KEYBOARD; BLACK,MINI,PS2,SAFETY CONTROLLED	TK6599	MCK-91
	407-4435-01			1	BRACKET,SUPPORT; 1.2MM THK CRS,LOGIC ANALYZER PROBE,SATIN NICKEL PL	TK0JL	407-4435-01
<b>OPTIONAL ACCESSORIES</b>							
	071-1305-XX			1	MANUAL,TECH;SERVICE TLA5000	TK2548	071-1305-XX
	071-1263-XX			1	MANUAL,TECH; INSTRUCTIONS,CHANGING WINDOWS LANGUAGE DOCUMENT	TK2548	071-1263-XX
	071-1301-XX			1	MANUAL,TECH; INSTALLATION,TLA5000 SERIES,ENGLISH	TK2548	071-1301-XX
	071-1343-XX			1	MANUAL,TECH; INSTRUCTIONS,TLA5000 QUICK INSTALLATION	TK2548	071-1343-XX
	016-1887-00			1	RACKMOUNT KIT; TDS5000	5Y400	016-1887-00
	016-1937-00			1	CASE,TRANSPORT; WHEELED HARD CASE,W/RETRACTING WHEELS & HANDLE,24.0 X 26.00 X 18.0,POLYETHYLENE	1K3Q9	016-1937-00