Service Manual

Tektronix

TLA721 Benchtop &
TLA7XM Expansion Mainframe

071-0912-00

This document applies to System Software version 4.1 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.

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

Ground the Product. This product is 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.

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

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

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

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

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

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:

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

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

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

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

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

CAUTION indicates a hazard to property including the product.

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

CAUTION
Refer to Manual

WARNING
High Voltage

Protective Ground
(Earth) Terminal

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 TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe. 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.

A brief description of each chapter follows:

- *Specifications* contains a product description of the instrument and tables of the characteristics and descriptions that apply to it.
- *Operating information* includes basic controls and connectors on the instrument. It also provides a high-level overview of the operating system and application interface. Refer to the *Tektronix Logic Analyzer Family User Manual* for detailed information on the operating system and for installation information not found in this document.
- *Theory of Operation* contains a high-level overview of the basic operation of the instrument to help you service the instrument to a module level.
- *Performance Verification* contains the performance verification and certification procedures for the instrument.
- *Adjustments* notes that there are no adjustments for the instrument. For adjustment information on the product modules, refer to the appropriate service module manual.
- *Maintenance* contains information and procedures for doing preventative and corrective maintenance on the instrument. Included are instructions for cleaning, for removal and installation of replaceable parts, and for trouble-shooting product failures. Instructions for shipping the instrument are included in this chapter.
- *Options* contains information on factory installed options and accessories that may be purchased for your instrument.

- *Diagrams* contains block diagrams of the instrument and interconnection diagrams useful for isolating failures in the instrument.
- *Mechanical Parts List* includes tables of all replaceable parts for the instrument along with the Tektronix part number.

Manual Conventions

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

Mainframes

This manual covers at least two different kinds of mainframes. The benchtop mainframe consists of a mainframe with a benchtop controller module. Other slots are available for installing logic analyzer (LA) modules, digitizing oscilloscope (DSO) modules, or pattern generator (Patgen) modules. The expansion mainframe consists of a mainframe with an expansion controller module. Expansion mainframes are used to expand the capabilities of a single TLA700 Logic Analyzer.

Modules

Throughout this manual, the term *module* refers to a TLA700 Series Logic Analyzer, DSO unit, or pattern generator unit that mounts inside the mainframe. A module is composed of circuit cards, interconnecting cables, and a user-accessible front panel enclosed in a mechanical frame.

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.

Safety

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

Related Manuals

The following manuals are available as part of the Tektronix Logic Analyzer Family documentation set. The procedures in this manual assume that the service personnel have access to all manuals listed in the following table. Other manuals may exist outside of the table as the product line offerings change. Contact your local Tektronix Service Representative for the latest part numbers of the service documentation. You can also obtain part numbers from the online help for the instrument.

Table i: Tektronix Logic Analyzer Family Documentation

Manual name	Description	Service use
The *Tektronix Logic Analyzer Family User Manual*	Provides basic operation and installation information for the Tektronix Logic Analyzer Family.	Installation and removal of LA, DSO, and pattern generator modules as well as the mainframes. Reinstallation of the system and application software.
The *TLA715 Portable Mainframe Service Manual.*	Provides service information for the TLA715 Portable Mainframe.	Isolating and correcting failures in the portable mainframe and expansion mainframes.
The *TLA7Nx/TLA7Px/TLA7Qx Logic Analyzer Module Service Manual.*	Provides service information for the logic analyzer modules.	Isolating and correcting failures in the logic analyzer module. Performing periodic or after-repair functional or performance verifications, calibrations, and certifications for the logic analyzer modules. Performing periodic or after-repair adjustments for the logic analyzer modules.
The *TLA7Dx/TLA7EX Digitizing Oscilloscope Module Service Manual.*	Provides service information for the DSO modules.	Isolating and correcting failures in the DSO module. Performing periodic or after-repair functional or performance verifications, calibrations, and certifications for the DSO modules. Performing periodic or after-repair adjustments for the DSO modules.
The *TLA7PG2 Pattern Generator Module Service Manual.*	Provides service information for the pattern generator modules.	Isolating and correcting failures in the pattern generator module. Performing periodic or after-repair functional or performance verifications, calibrations, and certifications for the pattern generator modules.

Introduction

This manual contains information needed to properly service the portable mainframe. This introduction contains information critical to safe and effective servicing.

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

- Read the *General Safety Summary* and *Service Safety Summary* found at the beginning of this manual.
- Read the *Operating Basics* chapter for information on the controls, connectors, and operating system. This information is useful before servicing the instrument.
- The procedures in this manual may only be performed by a qualified service person.

Be sure to follow all warnings, cautions and notes.

Adjustment and Certification Interval

Generally, you should perform the adjustments and certification (calibration) once per year, or following repairs that may affect adjustment or calibration.

Service Strategy

This manual supports and contains information needed for periodic maintenance of the mainframe. It 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
- supports removal and replacement of boards or assemblies
- supports removal and replacement of the fuse, knobs, chassis, and other mechanical parts listed in the parts lists

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 instrument. Services are provided at Tektronix Services 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.

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 portable mainframe.

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

Service Agreements. If service options are not added to the instrument purchase, then service agreements are available on an annual basis to provide calibration services or post-warranty repair coverage. 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 Services just described.

Contacting Tektronix

Phone	1-800-833-9200*
Address	Tektronix, Inc. Department or name (if known) 14200 SW Karl Braun Drive P.O. Box 500 Beaverton, OR 97077 USA
Web site	www.tektronix.com
Sales support	1-800-833-9200, select option 1*
Service support	1-800-833-9200, select option 2*
Technical support	Email: techsupport@tektronix.com 1-800-833-9200, select option 3* 1-503-627-2400 6:00 a.m. – 5:00 p.m. Pacific time

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

Specifications

This chapter provides a brief product description and lists the warranted characteristics, nominal traits, and typical characteristics of the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe.

Product Description

Both the benchtop mainframe and the expansion mainframes are basically identical with the exception of the controllers. The benchtop mainframe includes a PC controller that controls the entire instrument. The expansion mainframe includes an expansion module that expands the capabilities of a benchtop mainframe or a TLA715 Portable Mainframe. Each mainframe can function as a logic analyzer, a digital storage oscilloscope, or a pattern generator, depending on the module cards installed in its slots.

Benchtop Mainframe

The benchtop mainframe comprises of a benchtop chassis and the benchtop controller. The benchtop controller is a Pentium III based, three-wide, C-size, embedded Slot-0 Controller that incorporates the same controller as the TLA715 Portable Mainframe. The benchtop chassis is based on the high power, 13-slot, VX1420A Mainframe without a readout and with additional labels.

The benchtop mainframe has the following key features:

- Microsoft Windows operating system
- Ten slots (excluding three slots for the benchtop controller) for compatibility with new and existing LA, DSO, and patgen modules
- Personal computer (PC) based processor architecture that provides a cost effective, high-performance, system controller with automatic “PC connectivity” to a multitude off-the-shelf devices (such as Ethernet, modem, printers) via standard PC I/O ports and two PC card (CardBus) slots
- High-performance PC-based display system capable of driving large, high-resolution, external monitors in multiple user selected formats via an external SVGA port
- Easy configuration of modules between slots and mainframes through the automatic system configuration support of the resource manager and application software
- Precision clock, trigger line, and event signaling between the mainframe and modules for real-time triggering, sequencing, and correlation of events

- Easy access to field replaceable units (FRUs) to provide a low mean-time-to-repair (MTTR) for exchange modules
- Fan airflow capacity to support a reduction in audible noise levels
- Mainframe compatible with international power standards, certified to international safety and EMC requirements, and tested to rugged environmental standards
- 100% hardware and software compatibility with the TLA715 Portable Mainframe, allowing you to transport modules, data, and end-user application programs between mainframes

Expansion Mainframe

The expansion mainframe comprises of a benchtop chassis and the expansion module. The expansion module is a single-wide, C-size, modules that provides cable connections to a benchtop mainframe or to a portable mainframe.

The expansion mainframe has the following key features:

- Microsoft Windows operating system
- 12 slots (excluding one slot for the expansion module) for compatibility with new and existing LA, DSO, and patgen modules
- Precision clock, trigger line, and event signaling between the mainframe and modules for real-time triggering, sequencing, and correlation of events
- Easy access to field replaceable units (FRUs) to provide a low mean-time-to-repair (MTTR) for exchange modules
- Fan airflow capacity to support a reduction in audible noise levels
- Mainframe compatible with international power standards, certified to international safety and EMC requirements, and tested to rugged environmental standards

Characteristic Tables

This section contains the specifications for the portable mainframe. All specifications are warranted unless noted “typical”. Typical characteristics describe typical or average performance and provide useful reference information. Specifications marked with the ✓ symbol are checked in the Performance Verification chapter in this manual.

The specifications listed in this section are valid under the following conditions:

- The instrument must reside in an environment with temperature, altitude, and humidity, within the operating limits described in Table 1–9 beginning on page 1–13.

- The instrument has has a warm-up period of at least 20 minutes.

Tables 1–1 through 1–2 list the specifications for the TLA721 Benchtop Controller.

Table 1-1: Benchtop controller characteristics

Characteristic	Description
Operating system	Microsoft Windows 2000
Microprocessor	Intel 733 MHz Pentium III configuration with an Intel 815E chip-set
Main memory	Two 144 pin SODIMM sockets support one or two SDRAM modules
Available configurations	16, 32, 64, 256 MB per SODIMM
Installed configuration	512 MB maximum configuration
Speed	133 MHz
CAS latency	2, 3
RAS to CAS delay	2, 3
RAS precharge	2, 3
DRAM cycle time	5/7 or 7/9
Cache memory	512 KB, level 2 (L2) write-back cache
Flash BIOS	512 KB Provides PC plug-and-play services with and without Microsoft Windows operating system. Flash based BIOS field upgradable via a floppy disk Forced recovery jumper is provided
Real-time clock and CMOS setups NVRAM	Real-time clock/calendar. Standard and advanced PC CMOS setups: see BIOS specifications
RTC, CMOS setup, & PnP NVRAM retention time (Typical)	Battery life is typically > 7 years
Floppy disk drive	Standard 3.5 inch, 1.44 MB, high-density, double-sided, PC-compatible high-density floppy disk drive
Transfer rate	500 Kbits per second
Access time (ave.)	194 ms
Bootable replaceable hard disk drive	Standard PC compatible IDE (Integrated device Electronics) hard disk drive residing on an EIDE interface
Size	Maximum 30 GByte Continually subject to change due to the fast-moving PC component environment These storage capacities valid at product introduction
Interface	ATA-5/Enhanced IDE (EIDE)

Table 1-1: Benchtop controller characteristics (Cont.)

Characteristic	Description
Average seek time	Read 12 ms
I/O data-transfer rate	33.3 MB/s maximum (U-DMA mode 2)
Average latency	7/14 ms
Cache buffer	512 KB
CD ROM drive	Standard PC compatible IDE (Integrated device Electronics) 24X (minimum) CD ROM drive residing on an EIDE interface Continually subject to change due to the fast-moving PC component environment
Applicable formats	CD-DA; CE-ROM Mode 1, Mode 2; CD-ROM XA Mode 2 (Form 1, Form 2); Photo CD (single/multi session); Enhanced CD
Interface	IDE (ATAPI)
Average access time	130 ms
Data-transfer rate (burst sustained)	16.7 MB per second maximum, 1290–3000 KB per second
Display classification	Standard PC graphics accelerator technology (bitBLT based) residing on the Peripheral Component Interconnect (PCI) bus capable of supporting external color VGA, SVGA, or XGA monitors
Display configuration	Hardware automatically senses a missing flat panel LCD in the benchtop mainframe and defaults to the external SVGA monitor output during the BIOS boot sequence (no internal TFT LCD display exists). This is indicated by a single beep during the boot sequence. Dynamic Display Configuration 1 (DDC1) support for the external monitor is provided.
Display memory	4 MB SDRAM is on board the video controller; there is no external video memory
Display drive Display size	One VGA, SVGA, or XGA compatible analog output port User selected via Microsoft Windows Plug and Play support for DDC1 and DDC2 A and B (Primary with Silicon Motion Chip) Resolution (Pixels) / Colors / Refresh Rates 640 x 480 / 256, 64 K, 16.8 M / 60, 75, 85 800 x 600 / 256, 64 K, 16.8 M / 60, 75, 85 1024 x768 / 256, 64 K, 16.8 M / 60, 75, 85 1280 x 1024 / 256, 64 K, 16.8 M / 60 1600 x 600 / 256, 64 K / 60 1600 x 1200 / 256, 64 K / 60 (Secondary with 815E Chip set) Resolution (Pixels) / Colors / Refresh Rates 640 x 480 / 256, 64 K, 16.8 M / 60, 75, 85 800 x 600 / 256, 64 K, 16.8 M / 60, 75, 85 1024 x768 / 256, 64 K, 16.8 M / 60, 75, 85 1280 x 1024 / 256, 64 K, 16.8 M / 60, 75, 85 1600 x 1200 / 256 / 60, 75

Table 1-2: Front panel characteristics

Characteristic	Description
SVGA output port (SVGA)	Two 15-pin sub-D SVGA connectors
Dual USB ports	Two USB (Universal Serial Bus) compliant ports
Mouse port	Front panel mounted PS2 compatible mouse port utilizing a mini DIN connector
Keyboard port	Front panel mounted PS2 compatible keyboard port utilizing a mini DIN connector
Parallel interface port (LPT)	36-pin high-density connector supports standard Centronics mode, Enhanced Parallel Port (EPP), or Microsoft high-speed mode (ECP)
Serial interface port (COM)	9-pin male sub-D connector to support an RS232 serial port
PC CardBus32 port	Standard Type I and II PC compatible PC card slot
Type I, II, and III PC Card Port	Standard Type I, II, and III PC compatible PC card slot

Table 1-3: Backplane interface

Characteristic	Description
Slots	
Benchtop mainframe	13
Expansion mainframe	13
✓ CLK10 Frequency	10 MHz ±100 PPM
Relative Time Correlation Error[1,2] *(Typical)*	
LA to LA "MagniVu" data	2 ns
LA to LA "normal" data utilizing an internal clock[4]	1 LA sample - 0.5 ns
LA to LA "normal" data utilizing an external clock	2 ns
LA "MagniVu" to DSO data[3]	3 ns
LA to DSO "normal" data utilizing an internal clock[3,4]	1 LA sample ± 2 ns
LA to DSO "normal" data utilizing an external clock[3,5]	3 ns
DSO to DSO[3]	3 ns
Enhanced monitor	
Voltage readout	+24 V, -24 V, +12 V, -12V, +5 V, -5.2 V, -2 V, +5 $V_{Standby}$ if present, and +5 $V_{External}$ via RS232
Voltage readout accuracy (*Typical*)	±3% maximum
Current readout	Readout of the present current on the +24 V, -24 V, +12 V, -12 V, +5 V, -2 V, -5.2 V rails via RS232
Current readout accuracy (*Typical*)	±5% of maximum power supply I_{mp}
Rear panel connector levels	±25 VDC maximum, 1 A maximum per pin (Provides access for RS-232 host to enhanced monitor)

1 Includes typical jitter, slot-to-slot skew, and probe-to-probe variations to provide a "typical" number for the measurement. Assumes standard accessory probes are utilized.

2 For time intervals longer than 1 μs between modules, add 0.01% of the difference between the absolute time measurements to the relative time correlation error to account for the inaccuracy of the CLK10 source.

3 The DSO module time correlation is measured at the maximum sample rate on one channel only.

4 Sample represents the time from the event to the next valid data sample at the probe tip of the LA. In the normal Internal clock mode, this represents the delta time to the next sample clock

5 On this measurement, the DSO is measuring the CLK channel of the LA. If the DSO is measuring a data channel, the time from when the data edge occurs until the clock edge occurs must be included.

Table 1-4: External signal interface

Characteristic	Description
Intermodule signal line bandwidth	
Signal 1, 2 (ECLTRG0,1) Signal 3, 4 (TTLTRG0,1)	50 MHz square wave minimum 10 MHz square wave minimum
System trigger input	TTL compatible input via front panel mounted SMB connectors (benchtop controller)
Input destination	System trigger (TTLTRG7)
Input Levels V_{IH} V_{IL}	TTL compatible input ≥ 2.0 V ≤ 0.8 V
Input mode	Falling edge sensitive, latched (active low)
Minimum pulse width	12 ns
Active period	Accepts system triggers during valid acquisition periods via real-time gating, resets system trigger input latch between valid acquisition periods
Maximum input voltage	0 to +5 V peak
External signal input	TTL compatible input via front panel mounted SMB connectors (benchtop controller)
Input destination	Signal 1, 2 (ECLTRG0,1) Signal 3, 4 (TTLTRG0,1)
Input levels V_{IH} V_{IL}	TTL compatible input ≥ 2.0 V ≤ 0.8 V
Input mode	Active (true) low, level sensitive
Input bandwidth[1] Signal 1, 2 (ECLTRG0,1) Signal 3, 4 (TTLTRG0,1)	 50 MHz square wave minimum 10 MHz square wave minimum
Active period	Accepts signals during valid acquisition periods via real-time gating
Maximum input voltage	0 to +5 V peak
System trigger output	TTL compatible output via front panel mounted SMB connectors (benchtop controller)
Source selection	System trigger (TTLTRG7)
Source mode	Active (true) low, falling edge latched
Active period	Outputs system trigger state during valid acquisition period, resets system trigger output to false state between valid acquisitions via software
Output levels V_{OH} V_{OL}	50 Ω back terminated TTL-compatible output ≥4 V into open circuit ≥ 2 V into 50 Ω to ground ≤ 0.7 V sinking 10 ma
Output protection	Short-circuit protected (to ground)
External signal output	TTL compatible outputs via front panel mounted SMB connectors (benchtop controller)
Source selection	Signal 1, 2 (ECLTRG0,1) Signal 3, 4 (TTLTRG0,1) 10 MHz clock

Table 1-4: External signal interface (Cont.)

Characteristic	Description
Output modes Level sensitive	User definable Active (true) low or active (true) high
Output levels V_{OH} V_{OL}	50 Ω back terminated TTL output ≥ 4 V into open circuit ≥ 2 V into 50 Ω to ground ≤ 0.7 V sinking 10 ma
Output bandwidth[2] Signal 1, 2 (ECLTRG0,1) Signal 3, 4 (TTLTRG0,1)	 50 MHz square wave minimum 10 MHz square wave minimum
Active period	Outputs signals during valid acquisition periods, resets signals to false state between valid acquisitions Outputs 10 MHz clock continuously
Output protection	Short-circuit protected (to ground)

1 The Input Bandwidth specification only applies to signals to the modules; it does not apply to signals applied to the External Signal Input and sent back to the External Signal Output.

2 The Output Bandwidth specification only applies to signals from the modules; it does not apply to signals applied to the External Signal Input and sent back to the External Signal Output.

Table 1-5: Backplane latencies

Characteristic	Benchtop mainframe	Expansion mainframe
System trigger and external signal input latencies[2] *(Typical)*		
External system trigger input to LA probe tip[4]	-266 ns	-230 ns
External signal input to LA probe tip via Signal 3, 4[5]	-212 ns + Clk	-176 ns + Clk
External signal input to LA probe tip via Signal 1, 2[5, 6]	-208 ns + Clk	-187 ns + Clk
External system trigger input to DSO probe tip[4]	-25 ns	-11 ns
System trigger and external signal output latencies[1] *(Typical)*		
LA probe tip to external system trigger out	376 ns + SMPL	412 ns + SMPL
LA probe tip to external signal out via Signal 3, 4[3]		
OR function	366 ns + SMPL	402 ns + SMPL
AND function	379 ns + SMPL	415 ns + SMPL
LA probe tip to external signal out via Signal 1, 2[3,6]		
normal function	364 ns + SMPL	385 ns + SMPL
inverted logic on backplane	364 ns + SMPL	385 ns + SMPL
DSO probe tip to external system trigger out	68 ns	104 ns
DSO Probe tip to external signal out via Signal 3, 4[3]		
OR function	65 ns	101 ns
AND function	75 ns	111 ns
DSO probe tip to external signal out via Signal 1, 2[3,6]		
normal function	68 ns	89 ns
inverted logic on backplane	71 ns	92 ns
Inter-module latencies (Typical)		
LA to DSO inter-module system trigger (TTLTRG&)[1,4] (LA: Trigger All Modules DSO: Wait for System Trigger)	358 ns + SMPL	394 ns + SMPL
LA to LA inter-module system trigger (TTLTRG7)[1,4] (LA2: Trigger All Modules LA1: Do Nothing)	66 ns + SMPL	102 ns + SMPL
LA to DSO inter-module ARM (TTLTRG2,4,5,6) [1]	360 ns + SMPL	396 ns + SMPL
LA to LA inter-module ARM (TTLTRG2,4,5,6)[1,5]	108 ns + SMPL + Clk	144 ns + SMPL + Clk
LA to LA inter-module via Signal 1, 2 (ECLTRG0,1)[1,5, 6] (LA2: Trigger, then set Signal 2 LA1: If Signal 2 is true, trigger)	116 ns + SMPL + Clk	137 ns + SMPL + Clk
LA to LA inter-module via Signal 3, 4 (TTLTRG0,1)[1,5] (LA2: Trigger, then set Signal 3 LA1: If Signal 3 is true, trigger)	116 ns + SMPL + Clk	152 ns + SMPL + Clk

Table 1-5: Backplane latencies (Cont.)

Characteristic	Benchtop mainframe	Expansion mainframe
DSO to LA inter-module System Trigger (TTLTRG7)[4] (DSO: Trigger all Modules LA: Do Nothing)	-240 ns	-204 ns
DSO to DSO inter-module System Trigger (TTLTRG7)[4] (DSO1: Trigger all Modules DSO2: Wait for System Trigger)	50 ns	86 ns
DSO to LA inter-module ARM (TTLTRG2,4,5,6)[5]	-192 ns + Clk	-156 ns + Clk
DSO to DSO inter-module ARM (TTLTRG2,4,5,6)	59 ns	95 ns
DSO to LA inter-module via Signal 1, 2(ECLTRG0,1)[5, 6] (DSO: Trigger and set Signal 1 LA: Wait for Signal 1, then Trigger)	-179 ns + Clk	-158 ns + Clk
DSO to LA inter-module via Signal 3, 4 (TTLTRG0,1)[5] (DSO: Trigger and set Signal 3 LA: Wait for Signal 3; then Trigger)	-184 ns + Clk	-148 ns + Clk

1 SMPL represents the time from the event at the probe tip inputs to the next valid data sample of the LA module. In the Normal Internal clock mode, this represents the delta time to the next sample clock. In the MagniVu Internal clock mode, this represents 500 ps or less. In the External clock mode, this represents the time to the next master clock generated by the setup of the clocking state machine, the system-under-test supplied clocks, and the qualification data.

2 All system trigger and external signal input latencies are measured from a falling-edge transition (active true low) with signals measured in the wired-OR configuration.

3 All signal output latencies are validated to the rising edge of an active (true) high output.

4 In the Waveform window, triggers are always marked immediately except when delayed to the first sample. In the Listing window, triggers are always marked on the next sample period following their occurrence.

5 "Clk" represents the time to the next master clock at the destination logic analyzer. In the asynchronous (or internal) clock mode, this represents the delta time to the next sample clock beyond the minimum asynchronous rate of 4 ns. In the synchronous (or external) clock mode, this represents the time to the next master clock generated by the setup of the clocking state machine and the supplied system under test clocks and qualification data.

6 Signals 1 and 2 (ECLTRG0, 1) are limited to a "broadcast" mode of operation, where only one source is allowed to drive the signal node at any one time. That single source may be utilized to drive any combination of destinations.

Table 1-6: Benchtop and expansion mainframe AC power source

Characteristic	Description
Source voltage	90-250 V_{RMS}, 45-66 Hz, continuous range CAT II 100-132 V_{RMS}, 360-440 Hz, continuous range CAT II
Maximum power consumption	1450 W line power (the maximum power consumed by a fully loaded 13-slot instrument)
Fuse rating (Current and voltage ratings and type of fuse used to fuse the source line voltage)	
90 V - 132 VAC_{RMS} operation High-power/Low Line (159-0379-00)	Safety: UL198G/CSA C22.2 Size: 0.25 in × 1.25 in Style: Slow acting Rating: 20 A/250 V
103 V - 250 VAC_{RMS} operation (159-0256-00)	Safety: UL198G/CSA C22.2 Size: 0.25 in × 1.25 in Style: No. 59/Fast acting Rating: 15 A/250 V
207 V - 250 VAC_{RMS} operation (159-0381-00)	Safety: IEC 127/Sheet 1 Size: 5 mm × 20 mm Style: Fast acting "F", high-breaking capacity Rating: 6.3 A/250 V
Inrush surge current	70 A maximum
Steady state input current	16.5 A_{RMS} maximum at 90 VAC_{RMS} 6.3 A_{RMS} maximum at 207 VAC_{RMS}
Power factor correction (*Typical*)	0.99 at 60 Hz operation and 0.95 at 400 Hz operation
ON/Standby switch and indicator	Front Panel On/Standby switch with integral power indicator

Table 1-7: Benchtop and expansion mainframe secondary power

Characteristic	Description			
⩘ DC Voltage regulation	Voltage	Minimum	Nominal	Maximum
(Combined System, voltage available at each slot)	+24 V	23.28 V	24.24 V	25.20 V
	+12 V	11.64 V	12.12 V	12.60 V
	+5 V	4.875 V	5.063 V	5.250 V
	-2 V	-2.10 V	-2.00 V	-1.90 V
	-5.2 V	-5.460 V	-5.252 V	-5.044 V
	-12 V	-12.60 V	-12.12 V	-11.64 V
	-24 V	-25.20 V	-24.24 V	-23.28 V

Table 1-8: Benchtop and expansion mainframe cooling

Characteristic	Description
Cooling system	Forced air circulation system (positive pressurization) using a single low-noise centripetal (squirrel cage) fan configuration with no filters for the power supply and 13 module slots.
Fan speed control	Rear panel switch selects between full speed and variable speed. Slot exhaust temperature and ambient air temperature are monitored such that a constant delta temperature is maintained.
Slot activation	Installing a module activates the cooling for the corresponding occupied slots by opening the air flow shutter mechanism. Optimizes cooling efficiency by only applying airflow to modules that are installed.
Pressurization	Positive pressurization system, all chambers including modules
Slot airflow direction	P2 to P1, bottom of module to top of module
Mainframe air intake	Lower fan-pack rear face and bottom
Mainframe air exhaust	Top-sides and top-rear back. Top rear-back exhaust redirected to the sides by the fan pack housing to minimize reentry into the intake.
Δ Temperature readout sensitivity	100 mV/°C with 0°C corresponding to 0 V output
Temperature sense range	-10°C to +90°C, delta temperature ≤ 50°C
Clearance	2 in (51 mm), rear, top, and sides
Fan speed readout	RPM = 20 $\times$ (Tach frequency) or 10 $\div$ (+Pulse Width) where (+Pulse Width) is the positive width of the TACH1 fan output signal measured in seconds
Fan speed range	650 to 2250 RPM

Table 1-9: Atmospheric characteristics

Characteristic	Description
Temperature: Operating and nonoperating	Operating (no media in floppy disk drive): +5°C to +50°C, 15°C/hr maximum gradient, non-condensing (derated 1°C per 1000 ft above 5000 foot altitude Line voltage derated for temperatures > 40°, maximum output power reduced 15W/°C for line voltage < 110 VAC) Nonoperating (no media in floppy disk drive or CD ROM drive): –20°C to +60°C, 15°C/hr maximum gradient, non-condensing.
Relative Humidity: Operating and nonoperating	Operating (no media in floppy disk drive or CD ROM drive): 20% to 80% relative humidity, non-condensing. Maximum wet bulb temperature: +29°C (derates relative humidity to approximately 22% at +50°C). Nonoperating (no media in floppy disk drive or CD ROM drive): 8% to 80% relative humidity, non-condensing. Maximum wet bulb temperature: +29°C (derates relative humidity to approximately 22% at +50°C).
Altitude: Operating and nonoperating	Operating: To 10,000 ft (3048 m), (derated 1°C per 1000 ft (305 m) above 5000 ft (1524 m) altitude) Nonoperating: 40,000 ft (12192 m).

Table 1-10: Mechanical characteristics

Characteristic	Description
Mainframe dimensions	(See Figures 1-1 and 1-2 for overall dimensions.)
Standard	
Height (with feet)	13.7 in (346.7 mm) including feet
Width	16.7 in (424.2 mm)
Depth	26.5 in (673.1 mm)
Rackmount	
Height	13.25 in (336.6 mm)
Width	18.9 in (480.1 mm)
Depth	28.9 in to 33.9 in (734.1 mm to 861.1 mm) in 0.5 in increments, user selectable
Benchtop controller dimensions	
Height	10.32 in (262.1 mm)
Width	2.39 in (60.7 mm)
Depth	14.75 in (373.4 mm)
Expansion module dimensions	
Height	10.32 in (262.1 mm)
Width	1.25 in (31.75 mm)
Depth	14.75 in (373.4 mm)
Weight	
Mainframe with benchtop controller and slot fillers (*Typical*)	58 lbs 11 oz. (26.7 kg)
Shipping configuration (*Typical*)	60 lbs 11 oz. (26.7 kg) minimum configuration with controller (only) and all standard accessories (two manuals, five dual-wide and one single-wide slot filler panels, power cord, empty pouch, front cover, keyboard, software, and cables) 187 lbs (85 kg) fully configured, Same as above with the addition of five LA modules (four TLA7P4 modules, one TLA7N4 module) and all module standard accessories (probes and clips)
Benchtop controller	6 lbs 10 oz. (3.0 kg)
Expansion module	3 lbs (1.4 kg)
Maximum per slot	5 lbs (2.27 kg)
Rackmount kit adder	20 lbs (9.1 kg)
Size	
Benchtop controller	Three slots wide
Expansion module	Single slot wide

Table 1-10: Mechanical characteristics (Cont.)

Characteristic	Description
Acoustic noise level (*Typical*)	
Variable fan speed (at 860 RPM)	43.2 dBA weighted (front) 43.8 dBA weighted (back)
Full speed fan (switched at rear)	66.2 dBA weighted (front) 66.2 dBA weighted (back)
Construction materials	Chassis parts, aluminum alloy Front panel and trim pieces, plastic Circuit boards, glass laminate
Finish type	Mainframes are Tektronix silver gray with dark gray trim on fan pack and bottom feet support rails. Benchtop controllers are Tektronix silver gray on front lexan and injector/ejector assemblies with a black FDD and PC card ejector buttons

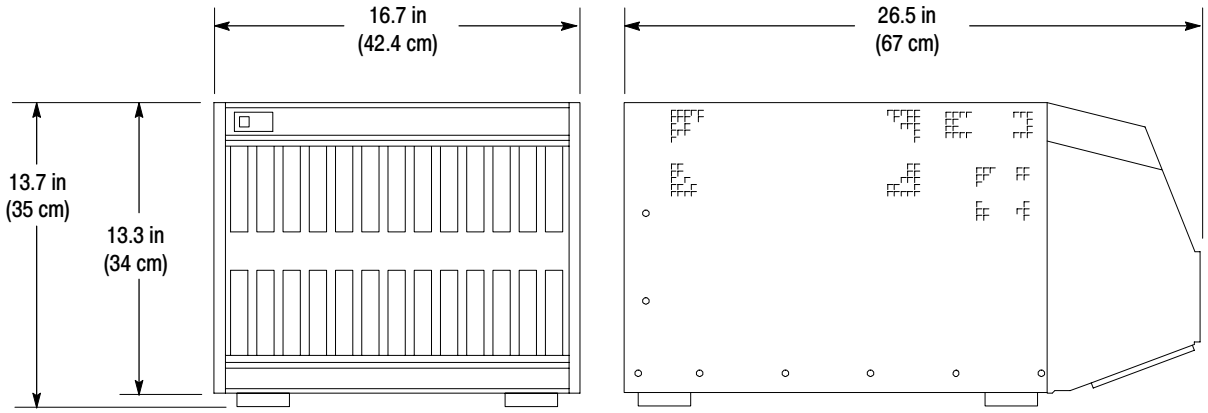

Figure 1-1: Dimensions of the benchtop and expansion mainframe

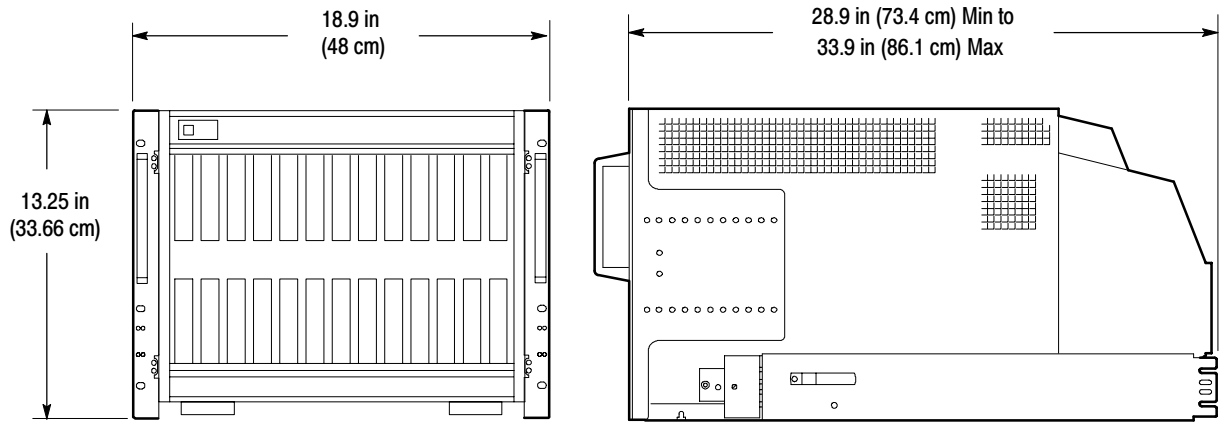

Figure 1-2: Dimensions of the benchtop and expansion mainframe with rackmount option

Table 1-11: Certifications and compliances

Category	Standards or description	
EC Declaration of Conformity - EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:	
	EN 61326	EMC requirements for Class A electrical equipment for measurement, control and laboratory use.[1]
	IEC 61000-4-2	Electrostatic discharge immunity (Performance criterion B)
	IEC 61000-4-3	RF electromagnetic field immunity (Performance criterion A)
	IEC 61000-4-4	Electrical fast transient / burst immunity (Performance criterion B)
	IEC 61000-4-5	Power line surge immunity (Performance criterion B)
	IEC 61000-4-6	Conducted RF immunity (Performance criterion A)
	IEC 61000-4-11	Voltage dips and interruptions immunity (Performance criterion B)
	EN 61000-3-2	AC power line harmonic emissions
Australia / New Zealand Declaration of Conformity - EMC	Complies with EMC provision of Radiocommunications Act per the following standard(s):	
	AS/NZS 2064.1/2	Industrial, Scientific, and Medical Equipment: 1992
EC Declaration of Conformity - Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities:	
	Low Voltage Directive 73/23/EEC, amended by 93/68/EEC	
	EN 61010-1/A2:1995	Safety requirements for electrical equipment for measurement control and laboratory use.
Canadian Certification	CAN/CSA C22.2 No. 1010.1	Safety requirements for electrical equipment for measurement, control, and laboratory use.

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

Table 1-11: Certifications and compliances (Cont.)

Category	Standards or description
Installation (Overvoltage) Category	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are: CAT III — Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location. CAT II — Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected. CAT I — Secondary (signal level) or battery operated circuits of electronic equipment.
Pollution Degree	A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated. Pollution Degree 2 — Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
Safety Certification Compliance	
Equipment Type	Test and measuring
Safety Class	Class 1 (as defined in IEC61010-1, Annex H) - grounded product
Overvoltage Category	Overvoltage Category II (as defined in IEC61010-1, Annex J)
Pollution Degree	Pollution Degree 2 (as defined in IEC61010-1). Note: Rated for indoor use only.

Operating Information

This chapter contains high-level information about operating the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe. It also provides information on the controls and connectors on the instrument. The last part of the chapter contains information on SCPI commands that you can use to service the mainframe from a remote host.

Installation

Complete installation procedures are described in the *Tektronix Logic Analyzer Family User Manual*; refer to that manual for detailed installation instructions. Install any modules that are required for your application before applying power to the instrument.

If you are operating the instrument on a bench (without a rackmount) ensure a two-inch (5.1 cm.) clearance around the instrument for proper cooling.

CAUTION. *Connect the keyboard, mouse, and other accessories before applying power to the instrument.*

Connecting accessories after applying power to the instrument can damage the instrument or the accessories.

Selecting the Correct Power Cord and Fuse

The mainframe comes standard with two power cords and three fuses. Before installing the instrument you must determine the correct fuse and power cord for your application. If you are uncertain of the power requirements of the instrument, refer to *Power Cord and Line Fuse Requirements for the Benchtop and Expansion Mainframes* in the *Tektronix Logic Analyzer Family User Manual*. This information is important to avoid overloading the power distribution system and to comply with the National Electrical Code.

For card cage loads in the nonshaded region of Figure 2–1, use the power cord with the 15 A plug (Tektronix part number 161-0213-XX) or the power cord with the 20 A plug (Tektronix part number 161-0218-XX). For high card cage loads combined with low input line voltages (shaded region), use only the power cord with the 20 A plug.

Select the proper fuse based on the ranges shown in Figure 2-1.

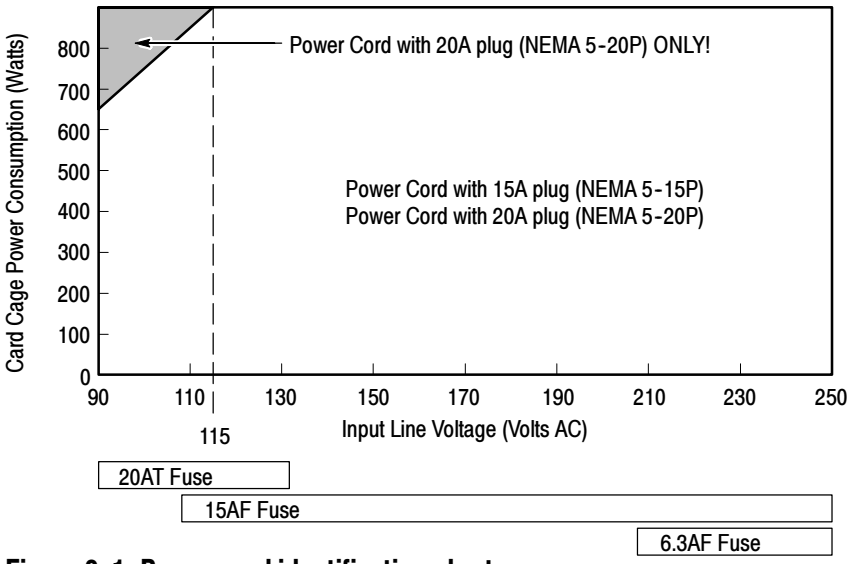

Figure 2-1: Power cord identification chart

Power-on Procedure

Complete the following steps to power on the instrument.

1. If you have not already done so, select the proper power cord and fuse as described in the previous paragraphs.
2. If you have an expansion mainframe, connect the expansion mainframe to the benchtop mainframe as described in the *Tektronix Logic Analyzer Family User Manual*.
3. Connect the external monitor.
4. Power on the monitor.
5. Press the On/Standby switch to turn on the mainframe (if you have an expansion mainframe attached, it should automatically power on when you turn on the benchtop mainframe.
6. Wait for the instrument to complete the power-on self tests, start Windows, and start the logic analyzer application.

Mainframe Controls and Connectors

Figure 2–2 shows the front view of the benchtop mainframe with a benchtop controller installed. The benchtop mainframe and the expansion mainframe are basically identical with the exception of the front panel labels. Slots 3 through 11 are labeled on the top and bottom of the instrument. Slots 0, 1 and 2 are reserved for the three slot-wide controller, all other slots are available for any other TLA700 Series module.

When you install a module, shutters on the bottom of each slot automatically open to provide cooling.

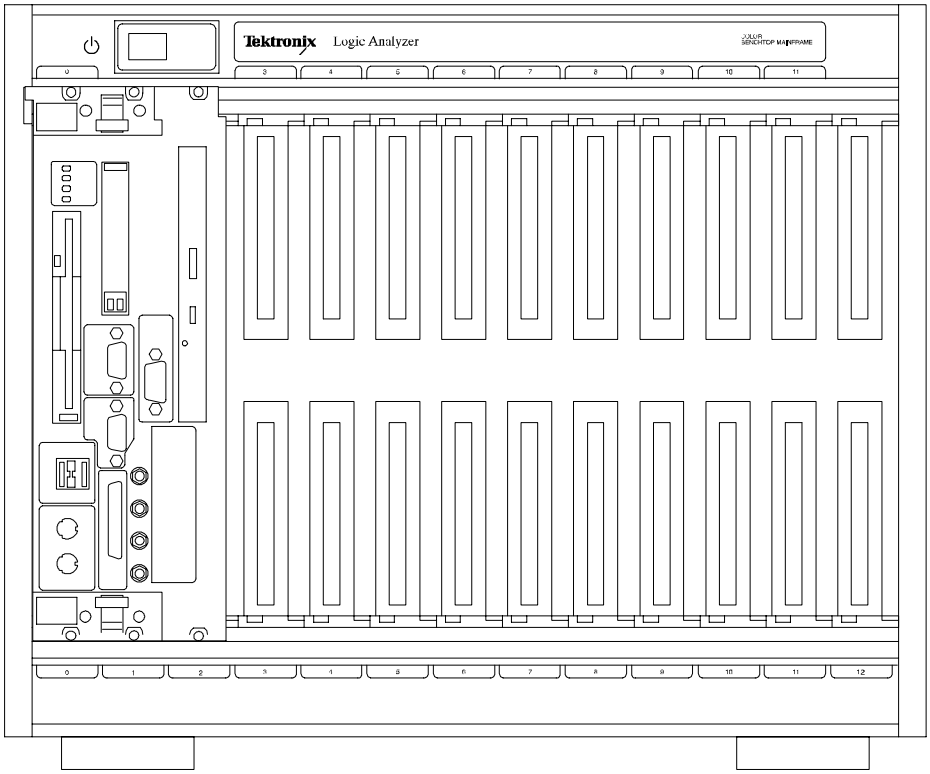

Figure 2-2: Front view of the benchtop chassis with a benchtop controller

On/Standby Switch

The On/Standby switch on the top-left corner of the front panel applies DC voltages to the mainframe. The switch is a momentary contact switch. The switch is lighted when DC voltages are applied to the instrument.

Figure 2–3 shows the rear view of the mainframe along with some of the key connectors.

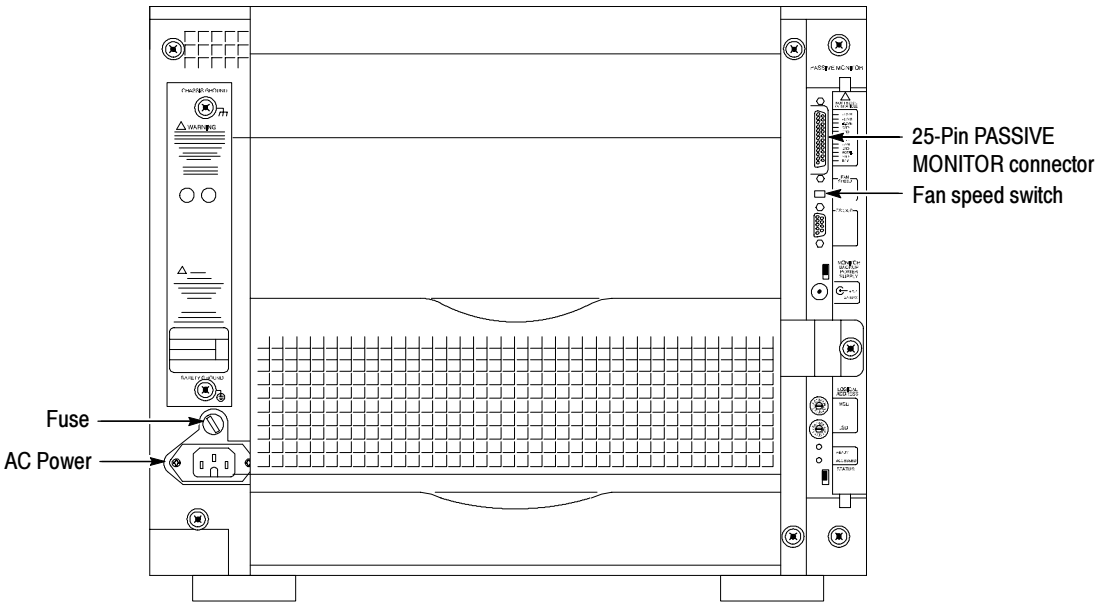

Figure 2- 3: Rear view of the benchtop chassis

AC Power Connector

The AC power connector is located on the rear bottom left side of the instrument. The AC fuse holder is located just above the power connector.

Chassis Ground Screw

The chassis ground screw can be used to connect more than one instrument to a common ground point.

Fan Speed Switch

The fan speed switch controls the speed of the fan (blower). When the switch is set to the VAR (variable) position, the mainframe automatically controls the speed of the blower depending on the air temperature and amount of cooling required by the modules. When the switch is in the FULL position, the blower operates at full speed.

Passive Monitor Connector

The 25-pin Sub-D connector lets you monitor the power supply voltages, fan speed, and the maximum slot temperature rise within the mainframe.

The connector also provides remote on and off capability and access to the SYS-RESET* and ACFAIL* signals.

Figure 2–4 shows the location of the Passive Monitor Connector. Table 2–1 lists the pin out of the Passive Monitor Connector and its function.

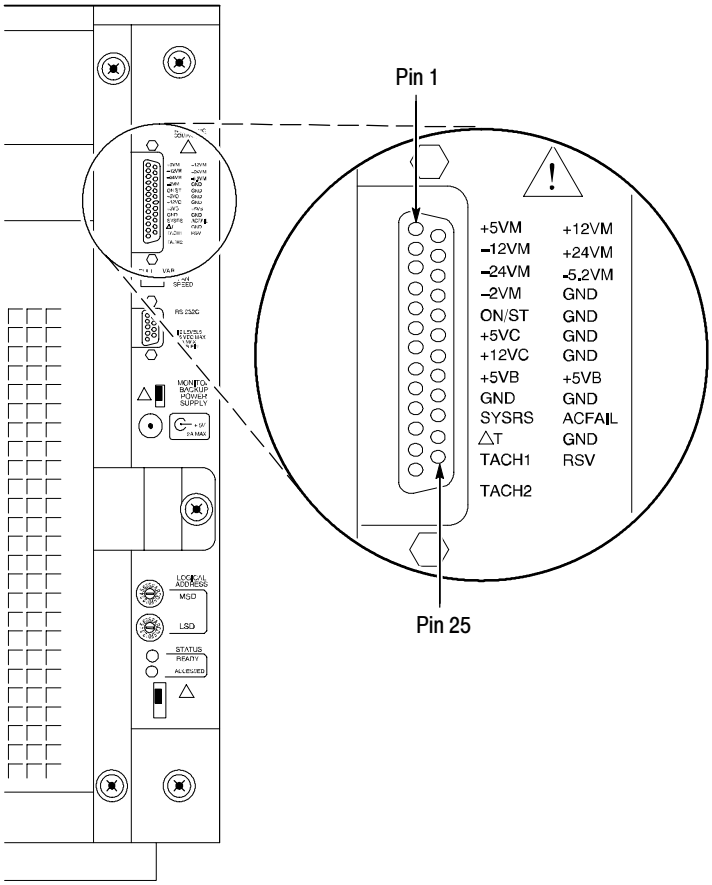

Figure 2-4: Passive monitor connector

Table 2-1: Passive monitor connector pinouts

Pin	Function	Description
1	+5 VM	+5 V for voltage monitoring To monitor, only use a probe with greater than 1 MΩ impedance.
2	-12 VM	-12 V for voltage monitoring To monitor, only use a probe with greater than 1 MΩ impedance.
3	-24 VM	-24 V for voltage monitoring To monitor, only use a probe with greater than 1 MΩ impedance.
4	-2 VM	-2 V for voltage monitoring To monitor, only use a probe with greater than 1 MΩ impedance.
5	ON/ST	Remote On/Standby Power Switch.[1]
6	+5 VC	+5 V output for charging batteries, running external TTL circuitry, 1 A maximum
7	+12 VC	+12 V output for charging batteries, running external TTL circuitry, 1 A maximum
8	+5 VB	Input for +5 V standby voltage (for example, from an external battery). Maximum of 1 A total (pins 8 and 21 combined)[2]
9	GND	Logic Ground
10	SYSRESET*	Backplane SYSRESET* signal (input or output). If you use this pin, do not violate VXIbus electrical specifications (keep the extender cable as short as possible).
11	ΔT	An analog output signal proportional to the maximum temperature rise of the 13 modules (100 mV/°C) 0V=0°C
12	TACH1	A square wave output signal whose period is proportional to the speed of fan number 1
13	TACH2	A square wave output signal whose period is proportional to the speed of fan number 2 when a second fan is used. In the current mainframe only a single fan is used.
14	+12 VM	+12 V for voltage monitoring To monitor, only use a probe with greater than 1 MΩ impedance.
15	+24 VM	+24 V for voltage monitoring To monitor, only use a probe with greater than 1 MΩ impedance.
16	-5.2 VM	-5.2 V for voltage monitoring To monitor, only use a probe with greater than 1 MΩ impedance.
17	GND	Logic Ground
18	GND	Logic Ground
19	GND	Logic Ground
20	GND	Logic Ground

Table 2-1: Passive monitor connector pinouts (Cont.)

Pin	Function	Description
21	+5 VB	Input for +5 V standby voltage (for example, from an external battery). Maximum of 1 A total (pins 8 and 21 combined)[2]
22	GND	Logic Ground
23	ACFAIL*	Backplane ACFAIL* signal output. If you use this pin, do not violate the VXIbus electrical specifications (keep the extender cable as short as possible). Refer to *VMEbus Specification Manual* for details on using the ACFAIL* and SYSRESET* signals.
24	GND	Logic Ground
25	RSV	Request Service signal[3]

1 By momentarily grounding this line, the mainframe will toggle from on to off (or vice versa). The state changes on the falling edge of the signal. Hold the signal low for at least 500 ms before releasing. Attach only a momentary switch or an open collector device to drive this line. The line is pulled up to 1 V internally.

2 If you use pins 8 and 21 (+5 VB) to supply +5 V Standby to the backplane, make sure that the rear panel jumper is in the correct position (refer to *Enhanced Monitor Board Jumpers* on page 2-9).

3 The RSV signal is equivalent to the IEEE 488.1 SRQ signal. The signal is asserted (0) when an enable event is generated; the signal is unasserted(1) when the event is cleared by reading the event register. This line is an open collector output. The signal can be stand-alone or multiple mainframes can be tied together. If you tie multiple mainframes together, each mainframe must be polled to determine the source of the service request.

Enhanced Monitor

The enhanced monitor, in addition to the DB25-pin connector and the fan switch, includes an industry standard 9-pin RS-232 serial port, logical address switches, a jumper for slot-1 or slot-12 MODID selection, an auxiliary power connection, a slot for adding programming FLASH jumper, and status lights. Refer to Figure 2–5.

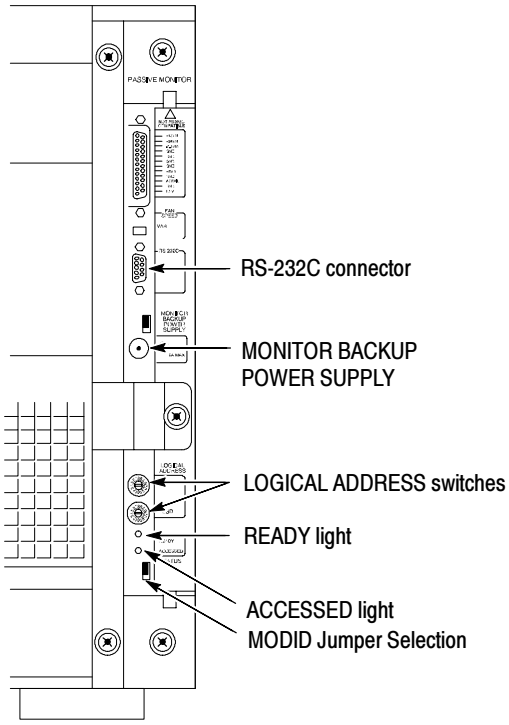

Figure 2- 5: Rear view of the enhanced monitor

The logical address switches select the logical addresses for the enhanced monitor. The top switch sets the most-significant digit, the bottom switch sets the least-significant digit. It is recommended that you set the address switches to FF so that the resource manger can dynamically configure the instruments address; if you select any other address, you must be careful to select a unique address.

The green READY indicator lights after the power-on diagnostics are complete and there are no failures. During normal operation, the light flashes if there is a pending error message. Once all error messages have been retrieved, the READY indicator stops flashing and remains on.

The amber ACCESSED indicator lights when the MODID line is accessed by the slot 0 device.

An auxiliary power connector (MONITOR BACKUP POWER SUPPLY) allows you to apply +5 V to the enhanced monitor board to provide RS-232 communication with the enhanced monitor while the mainframe is not powered on. The jumper located just above the power connector determines whether you source the +5 V standby voltage from the monitor backup power supply connector or from the 25-pin connector.

The enhanced monitor board has two jumpers accessible from the rear of the mainframe. Figure 2–6 shows the factory default settings of these jumpers.

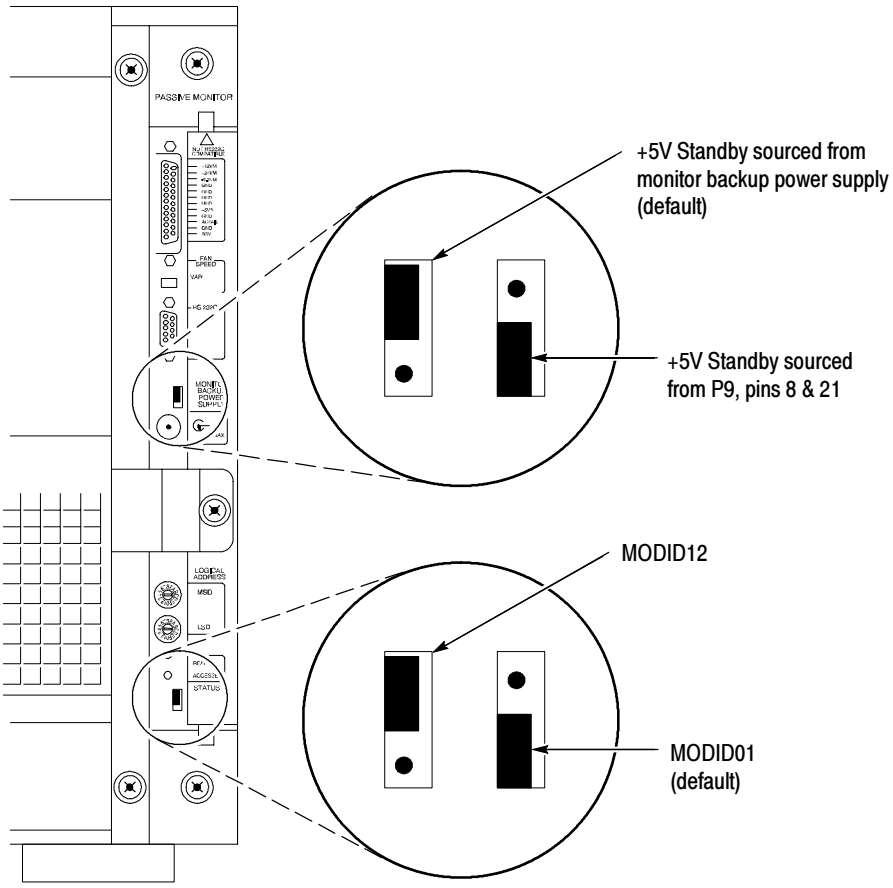

Figure 2-6: Enhanced monitor board jumpers

You can also select the source of the +5 V Standby voltage. If you source the +5 V Standby voltage from the +5 V external supply (monitor backup power supply connector), then the external supply will provide the backplane with the +5 V external voltage (1 A maximum). If you source the +5 V Standby voltage from the 25-pin connector, you must provide the +5 V to pins 8 and 21 of the 25-pin connector. The default jumper setting is to provide the voltage from the external source (+5 V external power supply).

The enhanced monitor can answer to the slot 1 or slot 12 MODID line for the configuration manager. The default position is slot 12.

In order to flash the enhanced monitor board with the latest firmware, you need to install a firmware loader jumper at the location shown in Figure 2–7.

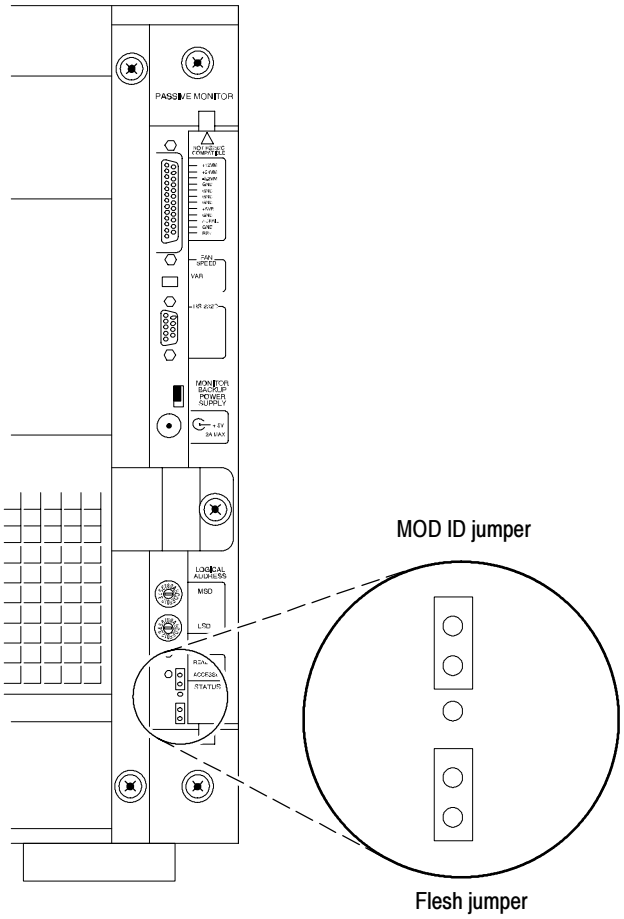

Figure 2-7: Enhanced monitor board flash jumper

Enhanced Monitor RS-232 Connector

The Enhanced Monitor includes a 9-pin RS-232 connector that allows connection to a RS-232 host. Figure 2–8 shows the pin assignments of the 9-pin RS-232 connector; Table 2–2 describes the pin assignments. Use this port to read the status of the mainframe using the SCPI commands documented at the end of this chapter.

Table 2-2: RS-232 pin connector

Pin	Description
Shield	Protective Ground
1	No Connection
2	Receive Data (RxD)
3	Transmit Data (TxD)
4	Data Terminal Ready (DTR)
5	Signal Ground (GND)
6	No Connection
7	Request to Send (RTS)
8	Clear to Send (CTS)
9	No Connection

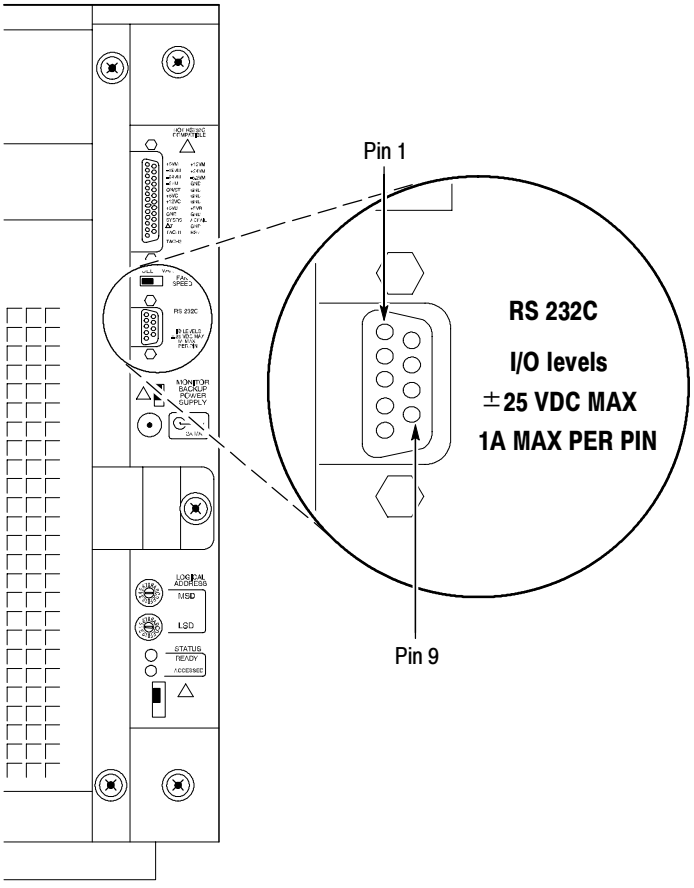

Figure 2-8: Enhanced Monitor RS-232 connector

Backplane Connectors

Table 2–3 shows the P1 connector pinouts for all slots in the mainframe. Table 2–4 shows the P2 connector pinouts for slots 1 to 12 and Table 2–5 shows the pinouts for the Slot 0 P2 connector.

Table 2-3: P1 connector pinouts

Pin	Row A	Row B	Row C
1	D00	BBSY*	D08
2	D01	BCLR*	D09
3	D02	ACFAIL*	D10
4	D03	BG0IN*	D11
5	D04	BG0OUT*	D12
6	D05	BG1IN*	D13
7	D06	BG1OUT*	D14
8	D07	BG2IN*	D15
9	GND	BG2OUT*	GND
10	SYSCLK	BG3IN*	SYSFAIL*
11	GND	BG3OUT*	BERR*
12	DS1*	BR0*	SYSRESET*
13	DS0*	BR1*	LWORD*
14	WRITE*	BR2*	AM5
15	GND	BR3*	A23
16	DTACK*	AM0	A22
17	GND	AM1	A21
18	AS*	AM2	A20
19	GND	AM3	A19
20	IACK*	GND	A18
21	IACKIN*	SERCLK	A17
22	IACKOUT*	SERDAT*	A16
23	AM4	GND	A15
24	A07	IRQ7*	A14
25	A06	IRQ6*	A13
26	A05	IRQ5*	A12
27	A04	IRQ4*	A11
28	A03	IRQ3*	A10
29	A02	IRQ2*	A09
30	A01	IRQ1*	A08
31	-12 V	+5 V STDBY	+12 V
32	+5 V	+5 V	+5 V

Table 2-4: P2 connector pinouts for slots 1 - 12

Pin	Row A	Row B	Row C
1	ECLTRG0	+5 V	CLK10+
2	-2 V	GND	CLK10-
3	ECLTRG1	RSV1	GND
4	GND	A24	-5.2 V
5	LBUSA00	A25	LBUSC00
6	LBUSA01	A26	LBUSC01
7	-5.2 V	A27	GND
8	LBUSA02	A28	LBUSC02
9	LBUSA03	A29	LBUSC03
10	GND	A30	GND
11	LBUSA04	A31	LBUSC04
12	LBUSA05	GND	LBUSC05
13	-5.2 V	+5 V	-2 V
14	LBUSA06	D16	LBUSC06
15	LBUSA07	D17	LBUSC07
16	GND	D18	GND
17	LBUSA08	D19	LBUSC08
18	LBUSA09	D20	LBUSC09
19	-5.2 V	D21	-5.2 V
20	LBUSA10	D22	LBUSC10
21	LBUSA11	D23	LBUSC11
22	GND	GND	GND
23	TTLTRG0*	D24	TTLTRG1*
24	TTLTRG2*	D25	TTLTRG3*
25	+5 V	D26	GND
26	TTLTRG4*	D27	TTLTRG5*
27	TTLTRG6*	D28	TTLTRG7*
28	GND	D29	GND
29	RSV2	D30	RSV3
30	MODID	D31	GND
31	GND	GND	+24 V
32	SUMBUS	+5 V	-24 V

Table 2-5: P2 connector pinouts for slot 0

Pin	Row A	Row B	Row C
1	ECLTRG0	+5 V	CLK10+
2	-2 V	GND	CLK10-
3	ECLTRG1	RSV1	GND
4	GND	A24	-5.2 V
5	MODID12	A25	LBUSC00
6	MODID11	A26	LBUSC01
7	-5.2 V	A27	GND
8	MODID10	A28	LBUSC02
9	MODID09	A29	LBUSC03
10	GND	A30	GND
11	MODID08	A31	LBUSC04
12	MODID07	GND	LBUSC05
13	-5.2 V	+5 V	-2 V
14	MODID06	D16	LBUSC06
15	MODID05	D17	LBUSC07
16	GND	D18	GND
17	MODID04	D19	LBUSC08
18	MODID03	D20	LBUSC09
19	-5.2 V	D21	-5.2 V
20	MODID02	D22	LBUSC10
21	MODID01	D23	LBUSC11
22	GND	GND	GND
23	TTLTRG0*	D24	TTLTRG1*
24	TTLTRG2*	D25	TTLTRG3*
25	+5 V	D26	GND
26	TTLTRG4*	D27	TTLTRG5*
27	TTLTRG6*	D28	TTLTRG7*
28	GND	D29	GND
29	RSV2	D30	RSV3
30	MODID00	D31	GND
31	GND	GND	+24 V
32	SUMBUS	+5 V	-24 V

Benchtop Controller Controls and Connectors

The benchtop controller is an integral part of the benchtop mainframe. The module is a slot zero device and occupies three slots, 0 through 2 in the benchtop mainframe.

LED Indicators

The benchtop controller has four LED indicators located on the front panel. Figure 2–9 shows the front panel with the location of the LED indicators and front panel connectors.

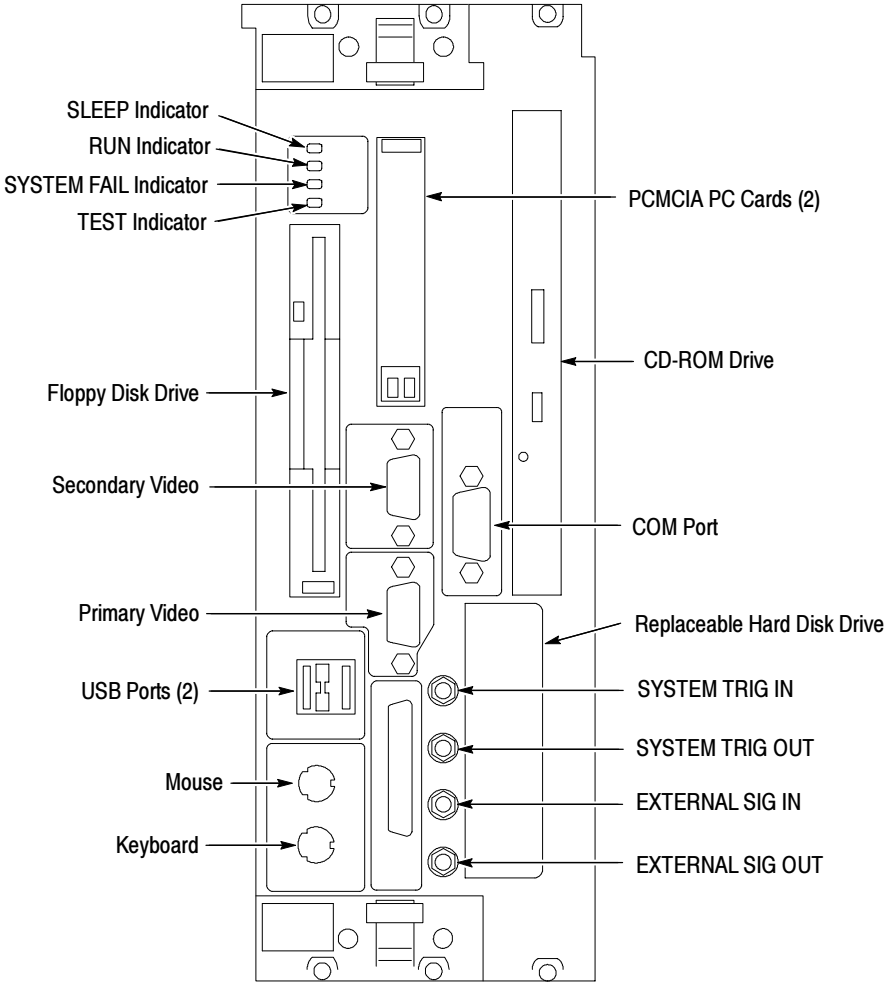

Figure 2- 9: Front view of the benchtop controller

SLEEP Indicator. Indicates that the benchtop controller is in sleep mode.

RUN Indicator. Indicates that the memory is accessing data.

SYSTEM FAIL Indicator. Indicates a SYSFAIL condition exists on the communications bus.

TEST Indicator. Indicates that the benchtop controller is executing a power-on self test (POST) diagnostic test sequence.

Mouse Port

The mouse connector is a standard six-pin, PS/2-compliant DIN connector. The mouse port can be connected to an external, standard PS/2-compliant three-button wheel mouse. Table 2–6 lists the pin assignments.

Table 2-6: Mouse port pin assignments

Pin number	Pin Assignment
1	Data
2	No connection
3	GND
4	+5 V
5	Clock
6	GND

Keyboard Port

The keyboard connector is a standard six-pin PS/2-compliant DIN connector. The keyboard port can be connected to an external, standard PS/2-compliant keyboard. Table 2–7 lists the pin assignments.

Table 2-7: Keyboard port pin assignments

Pin number	Pin Assignment
1	Data
2	No connection
3	GND
4	+5 V
5	Clock
6	GND

Replaceable Hard Disk Drive

There is one replaceable hard drive. Because of the speed at which the PC industry evolves, the hard disk drive size is subject to change. This service manual lists the size of the hard disk drive available at the time the product was introduced.

Floppy Disk Drive

There is one standard high-density/double-sided floppy disk drive.

CD ROM

There is one CD ROM drive. Because of the speed at which the PC industry evolves, the CD ROM drive is subject to change. This service manual lists the speed of the CD ROM drive available at the time the product was introduced.

PC CardBus32 Port

There are two PC Card Bus slots. The PC card(s) can be inserted in either slot, or two cards can occupy both slots at the same time. The PC card port supports an optional Ethernet NIC (network interface card). Table 2–8 shows the pin assignments.

Table 2-8: PC CardBus32 port pin assignments

Pin number	Pin assignment	Pin number	Pin assignment	Pin number	Pin assignment
1	GND	24	A5	47	A18
2	D3	25	A4	48	A19
3	D4	26	A3	49	A20
4	D5	27	A2	50	A21
5	D6	28	A1	51	VCC
6	D7	29	A0	52	VPP2
7	CE1*	30	D0	53	A22
8	A10	31	D1	54	A23
9	OE*	32	D2	55	A24
10	A11	33	ISI16*	56	A25
11	A9	34	GND	57	VS2
12	A8	35	GND	58	RESET
13	A13	36	CD1*	59	WAIT*
14	A14	37	D11	60	INPACK*
15	WE*	38	D12	61	REG*
16	IREQ*	39	D13	62	SPKR*
17	VCC	40	D14	63	STSCHG*
18	VPP1	41	D15	64	D8
19	A16	42	CE2*	65	D9
20	A15	43	VS1	66	D10
21	A12	44	IORD*	67	CD2*
22	A7	45	IOWR*	68	GND
23	A6	46	A17		

USB Ports

There are two USB (universal serial bus) ports. The USB ports can be used for any USB complaint device. Table 2–9 shows the pin assignments for the USB ports.

Table 2-9: USB pin assignments

Pin number	Pin function	Pin number	Pin function
A1	Vcc	B1	Vcc
A2	A DATA -	B2	B DATA -
A3	A DATA +	B3	B DATA +
A4	GND	B4	GND

SVGA Ports

Two SVGA ports (Primary and Secondary) support industry standard SVGA color monitors. Table 2–10 lists the pin assignments for both ports.

Table 2-10: SVGA OUT pin assignments

Pin number	Pin function	Pin number	Pin function
1	Red	2	Green
3	Blue	4	DDC DB2
5	GND	6	GND
7	GND	8	GND
9	(KEY)	10	GND
11	DDC DB0	12	DDC DB1
13	HSYNC	14	VSYNC
15	DDC DB3		

COM Port

The COM port on the benchtop controller is an industry standard RS-232 serial port. Table 2–11 lists the pin assignments for the port.

Table 2-11: RS-232 Port pin assignments

Pin number	Pin function	Pin number	Pin function
1	DCD	2	RXD
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	Ring indicator		

System Trig In Connector

The system trigger input is a TTL compatible signal input that is user definable in software. This connector is a sub-miniature bayonet (SMB) connector.

System Trig Out Connector

The system trigger output is a TTL compatible output signal that is user definable in software. This connector is a sub-miniature bayonet (SMB) connector.

Ext Sig In Connector

The external signal Input is a TTL compatible input signal that is user definable in software. This connector is a sub-miniature bayonet (SMB) connector.

Ext Sig Out Connector

The external signal output is a TTL compatible output signal that is user definable in software. This connector is a sub-miniature bayonet (SMB) connector.

LPT Port

The LPT port is a parallel printer port. This parallel printer port supports standard Centronics mode, Enhanced Parallel Port (EPP), or Microsoft high-speed mode (ECP) and has a 36-pin high density Centronics-compliant connector. See Table 2–12 for pin assignments.

Table 2-12: LPT port pin assignments

Pin number	Pin function	Pin number	Pin function
1	BUSY	19	GND
2	SLCT	20	GND
3	ACK*	21	GND
4	ERR*	22	GND
5	PE	23	GND
6	D0	24	GND
7	D1	25	GND
8	D2	26	GND
9	D3	27	GND
10	D4	28	GND
11	D5	29	GND
12	D6	30	GND
13	D7	31	GND
14	INIT*	32	GND
15	STB*	33	GND
16	SLIN*	34	GND
17	AFD*	35	GND
18	HI	36	GND
See IEEE specification P1284-C for pin connection definitions for other modes			

Expansion Module Controls and Connectors

The expansion module is a control module that is an integral part of the expansion mainframe. The expansion module must be located in slot 0 of the expansion mainframe.

The front panel of the expansion module has three connectors, two of the connectors handle TTL signals, the other connector handles ECL signals. The cables for the three connectors connect to another expansion module in the host benchtop mainframe (or portable mainframe).

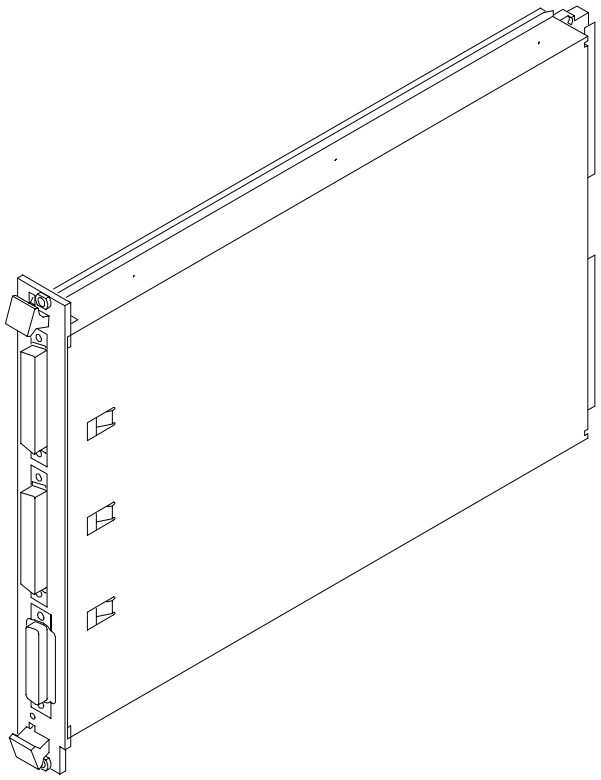

Figure 2- 10: Front view of the benchtop controller

Operating System and Application Interface

The TLA721 Benchtop Mainframe comes with the Microsoft Windows 2000 operating system factory-installed. Operations and capabilities when running on the mainframe are the same as with Microsoft Windows running on a high-performance personal computer. Windows Help is available from the Start menu of the Windows Task Bar.

The instrument also comes with the Tektronix Logic Analyzer Family application software configured at the factory to launch after the logic analyzer boots up and the operating system is running. The application software controls data acquisition and processing by the logic analyzer. The application software is included with the product; refer to the *Tektronix Logic Analyzer Family User Manual* if you need to reinstall any software.

Online Help

Most of the user information for operating the logic analyzer is available through online help.

Refer to the online help for more information on the individual menus, icons, and fields within each window.

System Window

The System window provides an overview of the entire logic analyzer. Use the System window to navigate through the logic analyzer. The center of the system window displays icons that represent logic analyzer modules, DSO modules, or pattern generator modules. These icons provide links to other windows in the instrument.

Setup Window

A setup window exists for each module in the instrument. It contains the setup information for the module, such as clocking, memory depth, threshold information, and channel information.

Trigger Window

Each trigger window provides access to the trigger setups. DSO and logic analyzers have their own trigger windows. Use the trigger window to determine when you want the logic analyzer or DSO to acquire data and how much data to acquire.

Listing Window

The listing window displays acquired data as tabular text. Each column of data represents one group of data or other logical data information, such as time stamps. Each row represents a different time that data was acquired: newer samples display below older samples.

Waveform Window

The waveform window displays acquired data as graphical waveforms. All defined channels display as Busforms for the logic analyzer and as individual data channels for the DSO.

Other Windows

Other windows may exist on the logic analyzer depending on the installed setup. For more information on the logic analyzer application, refer to the *Tektronix Logic Analyzer Family User Manual*.

Theory of Operation

This chapter provides a high-level overview of the theory of operation for the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe. The two mainframes are identical with the following exceptions:

- The TLA721 Benchtop Mainframe includes a plug-in controller that controls the operation of the entire system.
- The TLA7XM Expansion Mainframe includes an expansion module that routes signals from another external mainframe to the expansion mainframe. The external mainframe can be a TLA715 Portable Mainframe, a TLA721 Benchtop Mainframe, or another TLA7XM Expansion Mainframe. The external mainframe also has an expansion module that routes the backplane signals from the external mainframe through three cables to the expansion module in the expansion mainframe.

The theory of operation is broken down according to the benchtop controller, mainframe, and expansion controller. The *Diagrams* chapter contains block diagrams and interconnection diagrams separate from this chapter that you may want to use while servicing the instrument.

Benchtop Controller

Refer to Figure 3–1 while reading the following paragraphs on the benchtop controller.

The benchtop controller provides all the benefits of a high-performance PC-based controller architecture including graphics and I/O. The main difference between the benchtop controller and a standard PC is the interface used to communicate with the modules installed in the mainframe. The benchtop controller is installed in a three-wide controller module that supports integration with the mainframe.

The benchtop controller uses the same Pentium III controller found in the TLA715 Portable Mainframe. However, the parts are rearranged to provide access to the PC I/O connectors found on the front of the controller. An additional adapter board interfaces the controller board to the backplane and additional peripherals. A hard disk drive board mounts the hard disk drive and CD-ROM drive.

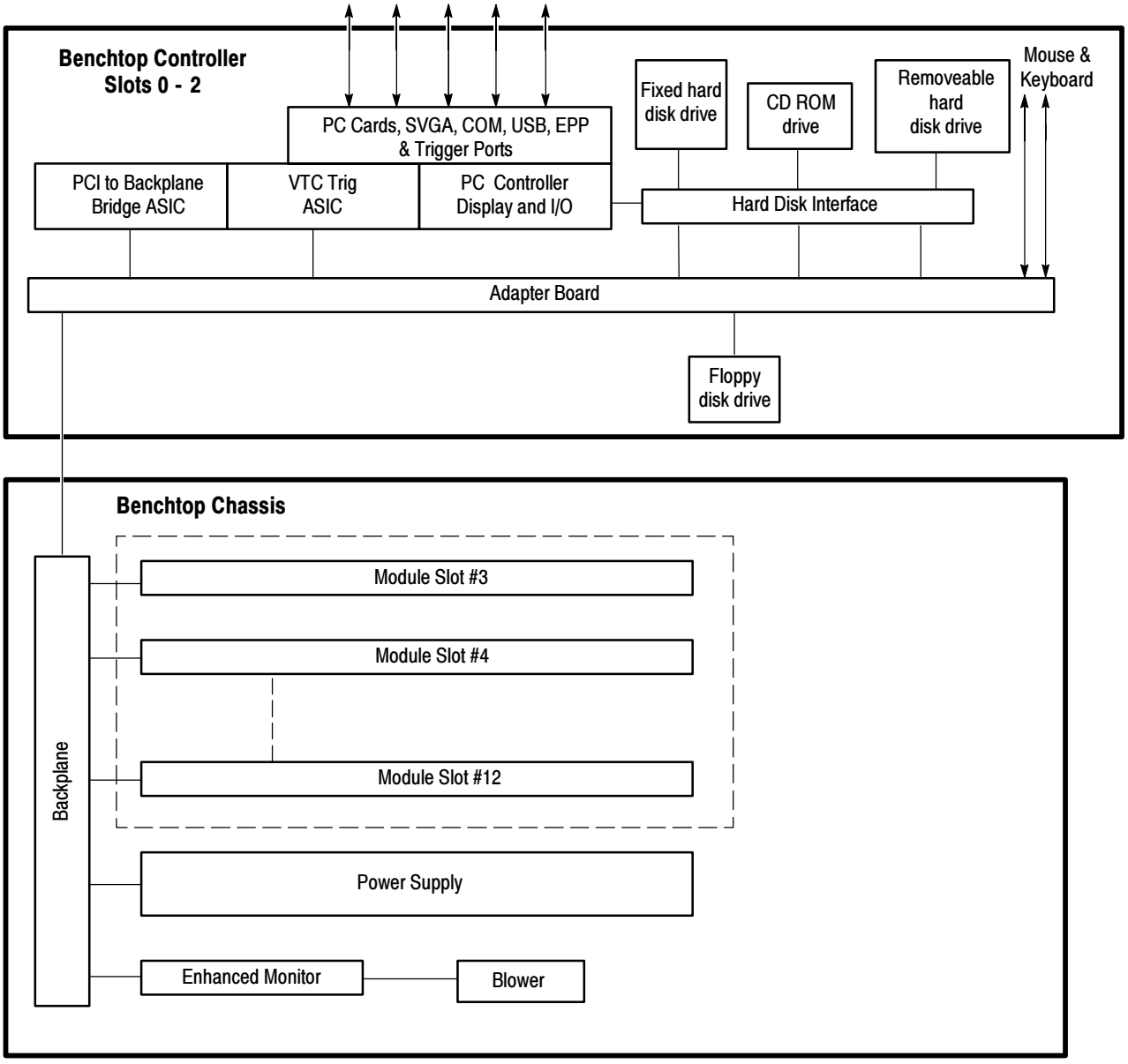

Figure 3-1: Interconnection and block diagram for the benchtop mainframe and controller

PC Controller, Display, and I/O

The PC controller uses a standard Intel Pentium III microprocessor using the 815E chip-set. The controller has a 733 MHz Pentium III processor with 512 MB of SDRAM, 512 KB of L2 cache, and 512 KB of flash-based BIOS. A Texas Instrument TI PCI1251B controls the two CardBus 32 slots.

A Silicon Motion Lynx3DM SVGA/XGA display controller with up to 4 MB of internal DRAM supports both the integrated color TFT LCD flat panel and external SVGA port.

An ECP/EPP Centronics compatible parallel port, two USB ports, and two 16550-based serial RS-322 COM ports (one external) support standard PC-based I/O peripherals.

PCI-to-Backplane Bridge ASIC

The backplane bus interface appears as a standard PCI device to the PC-based controller. The PCI-to-Backplane interface is managed by a Tektronix-designed ADG343 CMOS ASIC which includes support for DMA transfers with FIFO, IRQ management, programmable byte swapping, backplane address space management and windowing (A16, A24, and A32 space), backplane control lines, and MODID control lines.

Trigger Crossbar ASIC

The trigger lines are managed through the Tektronix-designed Trigger Crossbar (VTC) ASIC. The VTC ASIC cross connects any of the ten backplane trigger lines (ECL and TTL) to any of the four SMB connector ports on the front panel. The logic analyzer uses four SMB ports to accommodate two inputs (System Trigger In and External Signal In) and two outputs (System Trigger Out and External Signal Out).

The VTC ASIC also supports several standard backplane protocols including START/STOP, which support a synchronous start of all installed modules to System Time Zero (STZ), and several custom features. These features include time interpolation to support the use of the VTC ASIC in individual module applications.

Adapter Board

The Adapter board integrates the TLA715 Portable Mainframe controller into the TLA721 Benchtop Mainframe controller by providing electrical and mechanical support for the controller board, floppy disk drives, keyboard and mouse ports, PC speaker, decoding of additional MODID lines via an FPGA, and buffering of the backplane signal lines to comply with VXI System Specification 1.4 and VMEbus ANSI/IEEE Std 1014-1987 standards.

Hard Disk Drive Board

The hard disk drive board provides electrical and mechanical support for the hard disk drive and the CD-ROM drive.

Hard Disk Drive

The hard disk drive (HDD) is a standard 2.5-inch IDE drive which interfaces directly to the controller through the Enhanced Integrated Device Electronics (IDE) interface. The hard disk drive is easily replaceable without removing any of the covers or screws on the controller.

The hard disk drive is only available in the maximum configuration. The sizes of the hard disk drive are dependent on the current cost and availability. The benchtop controller is electrically capable of accepting dual master/slave IDE HDD configurations for a total of three hard disk drives (however the CD-ROM takes one of the configurations) but is currently limited to mounting two hard

disk drives. A second hard disk drive can be added to the controller with one of the options in the TLA7UP upgrade kits.

Floppy Disk Drive The floppy disk drive is a standard 0.5-inch drive supporting 3.5-inch, 1.44 MB high-density, double sided floppy disks.

CD-ROM Drive The CD-ROM drive is a standard 24X CD-ROM drive.

Mouse and Keyboard Ports The mouse and keyboard ports are standard PS2 compliant ports. They interface to the controller board through the Adapter board.

USB Ports A dual USB port connects USB devices to the controller.

Mainframe

The benchtop and expansion mainframes are identical and contain the following major modules:

- Power supply
- Backplane
- Enhanced monitor board
- Temperature sense board

Refer to Figure 3–2 while reading the following paragraphs on the mainframe.

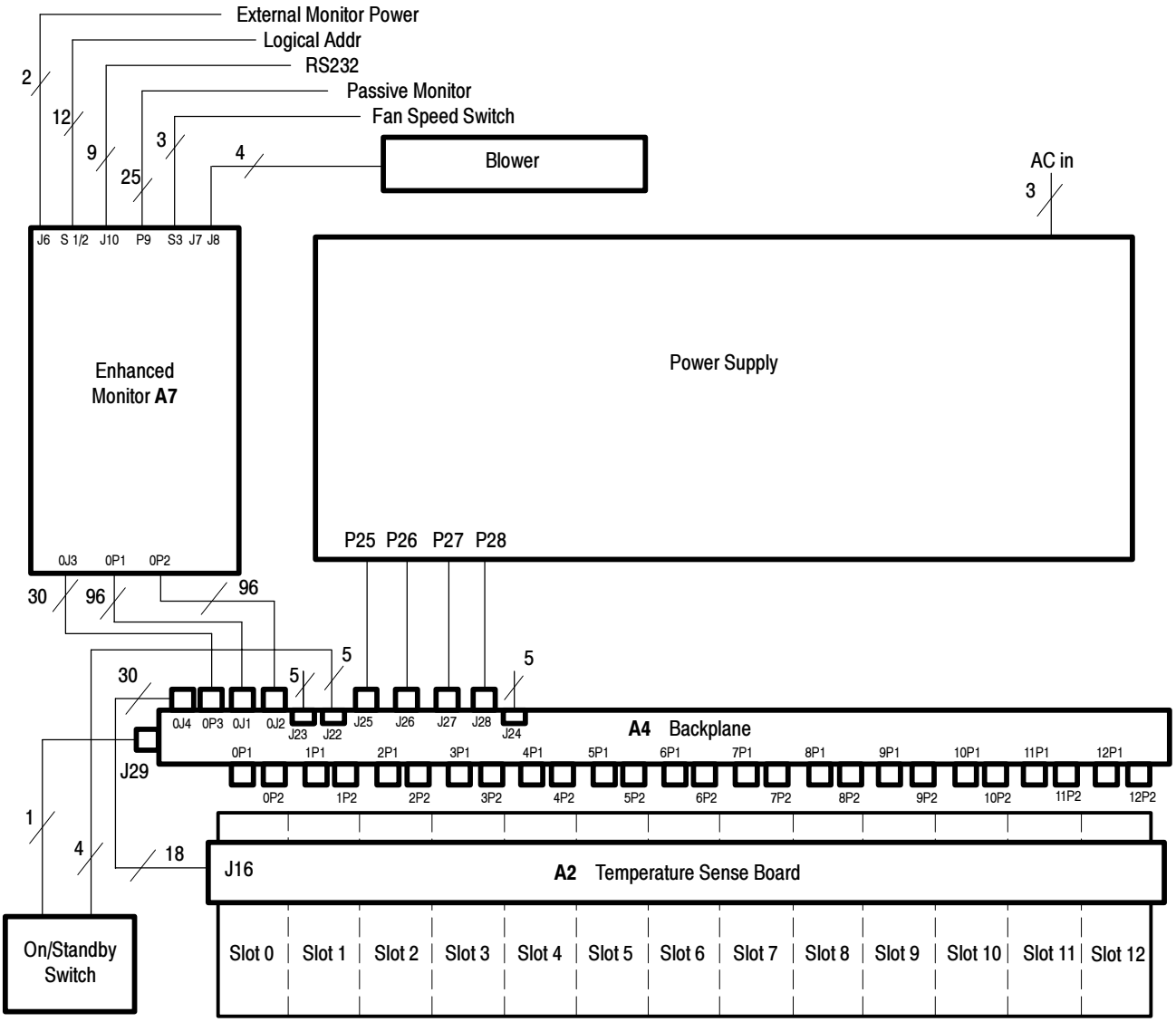

Figure 3-2: Mainframe block diagram

Power Supply and Power Supply Interface

The power supply is a custom power supply capable of supplying 1000 Watts of secondary power to the overall mainframe with an input power of up to 1450 Watts operating at it's minimum 70% efficiency. The power supply incorporates a continuous AC source operating in the range of 90 to 250 VAC (from 45 Hz to 66 Hz) and 100 to 132 VAC (from 360 Hz to 440 Hz). This covers virtually all international power combinations. The power supply also supports automatic power factor correction and over-voltage, current, and thermal protection mechanisms.

The power supply connects to the backplane at J1 and J2 through the power supply interface board.

Backplane

The backplane (A4) provides all the connections to module slots 0 through 12 in the chassis. It also has connections to all other circuit boards and modules in the chassis.

The front panel On/Standby DC switch connects to one of two connectors at the top of the backplane. When the switch is connected to J22, the switch controls the power in the chassis. When the switch is connected to J23, the power-on functions are controlled by an external source through the 25-pin connector on the enhanced monitor board. Although the switch still illuminates when power is applied to the chassis, the on/off function of the switch is disabled.

A 34-wide ribbon cable at 0J4 on the backplane connects to J16 on the temperature sense board. Connectors 0J1, 0J2, and 0P3 carry instrument monitoring information from the backplane to the enhanced monitor board.

Enhanced Monitor Board

The enhanced monitor board (A3) collects the monitoring information from the power supply, blower, and temperature sense board and passes the information to the 25-pin D connector. The enhanced monitor board connects directly to the backplane at 0J3, 0P1 and 0P2.

The 25-pin D passive monitor connector lets you monitor the power supply voltages, blower speed, and the maximum slot temperature rise within the chassis. The connector also provides remote on and off capability and access to the SYSRESET* and ACFAIL* signals.

CAUTION. *Do not connect an RS-232 cable to the 25-pin connector. This 25-pin connector is not an RS-232 port.*

Connecting an RS-232 cable to this connector might result in damage to the equipment.

The universal fan controller on the enhanced monitor board drives the EBM/PAPST fan pulse with modulation (PWM) speed control input.

Blower

The blower (fan assembly) consists of a chassis mount, rear fan cover, and EBM/PAPST fan. The fan is a low-noise, high-airflow design that supports up to 308 CFM of airflow through the mainframe at full speed. The blower connects to the enhanced monitor board at FAN 1/Blower (J8). The fan speed switch (S1) lets you select either variable fan speed (VAR) or full speed (FULL).

Temperature Sense Board

The temperature sense board (A2) monitors the temperatures for each slot within the chassis. The temperature sense board connects to the backplane through the ribbon cable at J16.

Expansion Module

Figure 3-3 shows the block diagram for the expansion module when one is installed in an mainframe and second expansion module is installed in a second mainframe. You may want to refer to this illustration while reading the following text.

The primary expansion module, located in the primary benchtop mainframe or portable mainframe, is connected to the expansion module, located in second expansion mainframe, by routing signals through three expansion cables. The expansion module both receives and drives the bus signals in both mainframes. The expansion modules are connected together by two TTL cables and one ECL cable.

Slot 0 Interface

The MODID register is enabled only when the expansion module is installed in slot 0 of the expansion mainframe. During power up, the value of the MODID0 signal is sampled. If the signal on MODID0 is low, the expansion module is determined to be installed in slot 0. If the signal on MODID0 is high, the expansion module is determined to be installed in slot 1–12.

System Clock

The SYSCLK (system clock) is buffered and transmitted to the expansion mainframe from the benchtop mainframe.

Slot 0 Interface

The MODID register is enabled only when the expansion module is installed in slot 0 of the expansion mainframe. During power up, the value of the MODID0 signal is sampled. If the signal on MODID0 is low, the expansion module is determined to be installed in slot 0. If the signal on MODID0 is high, the expansion module is determined to be installed in slot 1–12.

System Clock

The SYSCLK (system clock) is buffered and transmitted to the expansion mainframe from the benchtop mainframe.

CLK10

The CLK10 is a differential ECL signal that provides system timing and reference. The CLK10 is transmitted to the expansion mainframe from the benchtop mainframe.

Power On Sequence

On power up, the expansion module determines correct configuration of the expansion modules and the expansion cables.

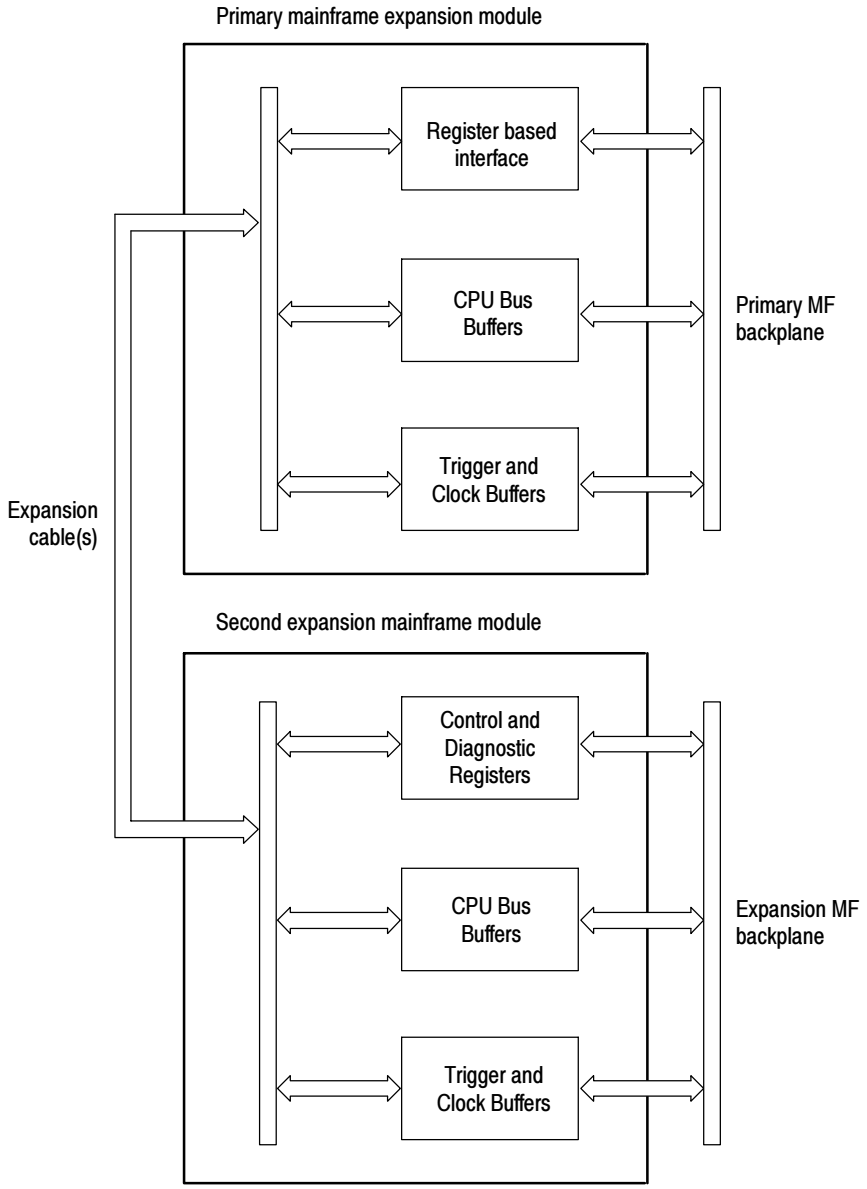

Figure 3-3: Benchtop and expansion mainframe block diagram

Automatic Power Control

The expansion module controls the power on and power off of the expansion mainframe. When the benchtop mainframe is powered on, a signal is sent to the expansion mainframe causing the expansion mainframe to power on. The same signal is sent to the expansion mainframe upon power down.

Automatic power on and automatic power off only work when the primary power switch on the expansion mainframe is closed.

Performance Verification Procedures

This chapter contains procedures for functional verification, certification, and performance verification procedures for the TLA721 Benchtop Mainframe and TLA7XM Expansion Mainframe. Generally, you should perform these procedures once per year or following repairs that affect certification.

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. Certification data is recorded on calibration data reports provided with this manual. The calibration data reports are intended to be copied and used for calibration/certification procedures.

After completing the performance verification procedures or the certification procedures, you can fill out a calibration data report to keep on file with your instrument.

Performance verification procedures confirm that a product meets or exceeds the performance requirements for the published specifications documented in the *Specifications* chapter of this manual. Refer to Figure 4–1 on page 4–2 for a graphic overview of the procedures.

Test Equipment

These procedures use external, traceable signal sources to directly test characteristics that are designated as checked (✓) in the *Specifications* chapter of this manual. Table 4–1 on page 4–3 shows the required equipment list. Always warm up the equipment for 30 minutes before beginning the procedures.

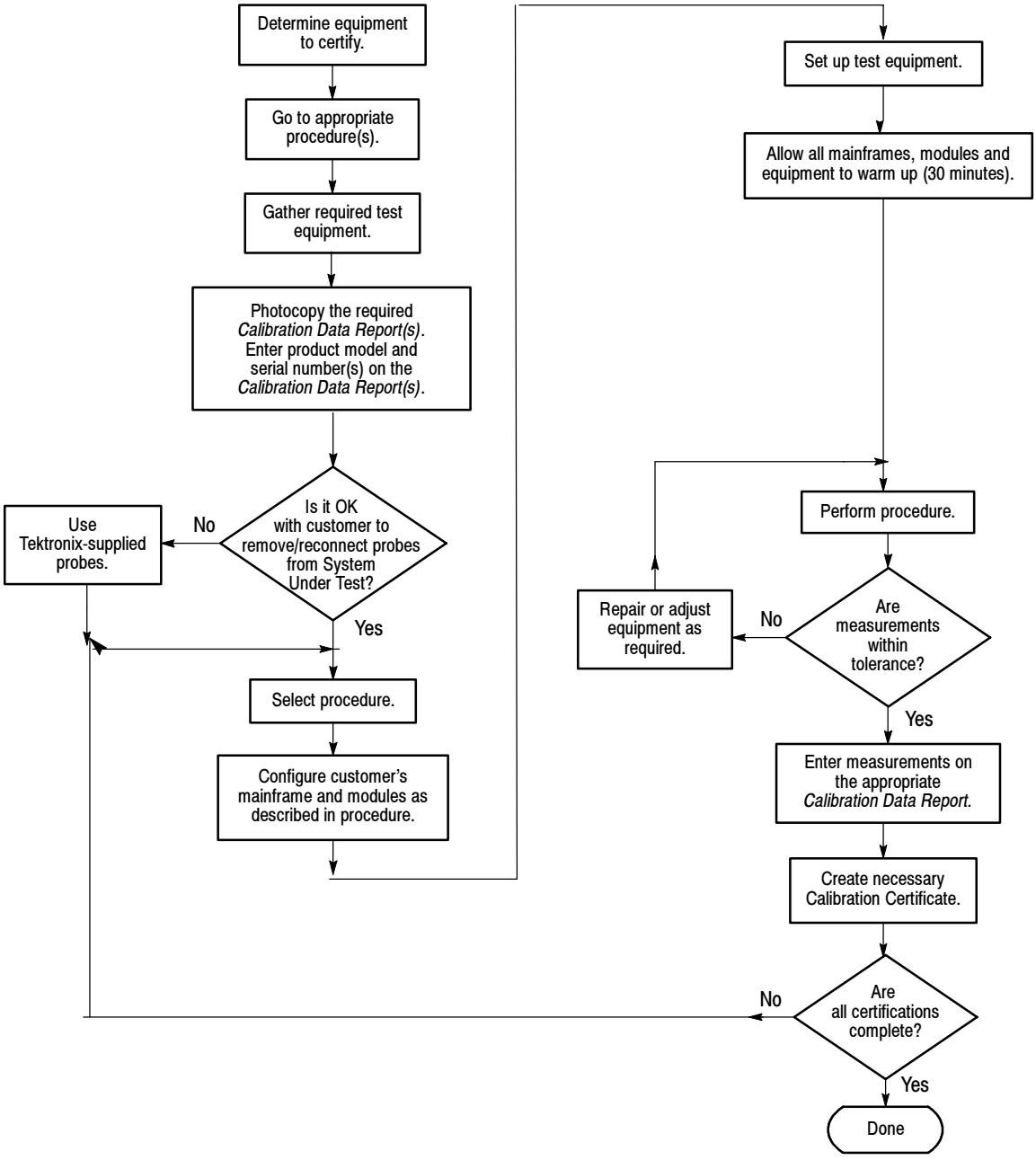

Figure 4- 1: Calibration/certification procedure flow chart

Table 4-1: Test equipment

Item number and description	Minimum requirements	Example
1. Benchtop Mainframe	TLA721 Benchtop Mainframe with a LA, DSO, or Patgen module installed	-
2. Expansion Mainframe	TLA7XM Expansion Mainframe with a LA, DSO, or Patgen module installed. Expansion mainframe should be connected to the TLA721 Benchtop Mainframe	-
3. Frequency counter	Frequency accuracy: <0.0025% Frequency range: 1 kHz to 100 MHz	Hewlett Packard 5314A
4. Miniature probe-to-square pin adapters	Two required	Tektronix part number 103-0177-XX
5. 0.025-inch square pin	3/4-inch length, (two required)	Tektronix part number 131-1426-XX
6. Digital multimeter with test leads	VDC accuracy: 0.1% from –10 V to +100 V	Tektronix DMM 900 Series
7. Cable, precision 50 Ω coaxial	50 Ω, 36 in, male-to-male BNC connectors	Tektronix part number 012-0482-XX
8. SMB-to-BNC cable	One required	Tektronix P6041

Functional Verification

Table 4–2 lists the functional verification procedures that are available for the benchtop and expansion mainframes. If you have an expansion mainframe, these procedures assume that the expansion mainframe is properly connected to the TLA721 Benchtop Mainframe. If necessary, refer to the *Tektronix Logic Analyzer Family User Manual* for installation instructions.

Table 4-2: Functional verification procedures

Instrument	Procedure
Benchtop and expansion mainframe	Power-on and fan operation
	Power-up diagnostics
	Extended diagnostics
	TLA Mainframe diagnostics
	CheckIt Utilities diagnostics

Power-on and Fan Operation

Complete the following steps to check the power-on and fan operation of the TLA721 Benchtop Mainframe and the TLA7XM Expansion mainframe (if installed).

You will need a mainframe with an LA or DSO module installed in each mainframe.

1. Power on the benchtop mainframe and observe that the On/Standby switch illuminates.
2. If you have an expansion mainframe attached, check that the expansion mainframe automatically powers on.
3. Check that the fan spins without undue noise.
4. If everything is properly connected and operational, you should see the modules (and expansion mainframe with its modules) in the System window of the logic analyzer application.
5. If there are no failures indicated in the System window, the power-on diagnostics pass when you power on the mainframe(s).

Extended Diagnostics

Do the following steps to run the extended diagnostics:

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

You will need a mainframe with an LA or DSO module installed in each mainframe.

Equipment required	Cable, 50 Ω coaxial (item 7)
Prerequisites	Warm-up time: 30 minutes

Perform the following tests to complete the functional verification procedure.

1. If you have not already done so, power on the instrument and wait for the logic analyzer application to start.
2. Go to the System menu and select Calibration and Diagnostics.
3. Verify that all power-on diagnostics pass.
4. Click the Extended Diagnostics tab.

5. Select All Modules, All Tests, and then click the Run button on the property sheet.

   All tests that displayed an "Unknown" status will change to a Pass or Fail status depending on the outcome of the tests.

6. Scroll through the tests and verify that all tests pass.

TLA Mainframe Diagnostics

The TLA Mainframe Diagnostics are a comprehensive software test that checks the functionality of the mainframes. To run these diagnostics, do the following steps:

1. Quit the logic analyzer application.
2. Click the Windows Start button.
3. Select Programs → Tektronix Logic Analyzer → TLA Mainframe Diagnostics.
4. Run the mainframe diagnostics.

CheckIt Utilities

CheckIt Utilities is a comprehensive software application used to check and verify the operation of the PC hardware in the portable mainframe. To run the software, you must have either a keyboard, mouse, or other pointing device.

***NOTE**. To check the floppy disk drive or the CD-ROM drive, you must have a test floppy disk or CD installed before starting the CheckIt Utilities.*

To run CheckIt Utilities, follow these instructions:

1. Quit the logic analyzer application.
2. Click the Windows Start button.
3. Select Programs → CheckIt Utilities.
4. Run the tests. If necessary, refer to the CheckIt Utilities online help for information on running the software and the individual tests.

Certification

Benchtop Mainframe

The system clock of the controller is checked for accuracy. The instrument is certifiable if this parameter meets specifications. This procedure is described under *Checking the 10 MHz System Clock (CLK10)* on page 4–8. Record the results in a copy of the Calibration Data Report at the end of this chapter.

Expansion Mainframe

There are no certifiable parameters for the TLA7XM Expansion Mainframe.

Performance Verification Procedures

This section contains procedures to verify that the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe perform as warranted. Verify instrument performance whenever the accuracy or function of your instrument is in question.

Tests Performed

Do the following tests listed in Table 4–3 to verify the performance of the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe. You will need some of the equipment shown in Table 4–1 on page 4–3 to complete the performance verification procedures. If you substitute equipment, always choose instruments that meet or exceed the minimum requirements specified.

Table 4-3: Performance verification procedures

Parameter	Procedure
Power supply voltages	Voltage level check at the 25-pin connector
System clock (CLK 10)[1]	10 MHz system clock test

[1] Certifiable parameter

Checking Power Supply Voltages

Use a digital voltmeter to check the voltages on the pins of the 25-pin connector and compare the results against the range listed in Table 4–4. The connector is located on the right rear panel of the mainframe (see Figure 4–2).

Equipment required	Digital multimeter with test leads (item 6) Two 0.025-inch square pins (item 5) Two miniature probe-to-square pin adapters (item 4)
Prerequisites	Warm-up time: 30 minutes

CAUTION. *To prevent damaging the 25 pin connector, use care when probing the connector with the square pins.*

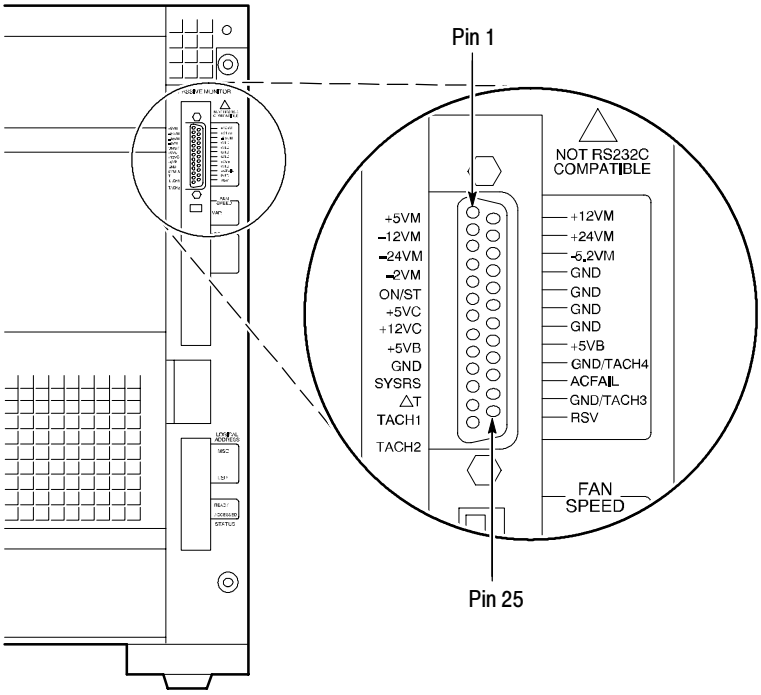

Figure 4-2: Benchtop and expansion mainframe 25-pin rear panel connector

1. Connect the reference lead of the digital voltmeter to one of the ground pins.
2. Connect the other lead of the digital voltmeter to the supply pins of the 25-pin connector on the right rear panel of the mainframe.
3. Measure the power supply voltages with the voltmeter and compare each reading to the values listed in Table 4–4. If the voltages are within the specified ranges, the mainframe is operating properly.

Table 4-4: Power supply voltages at the 25-pin connector

Pin	Supply	Acceptable voltage range
1	+5 V	4.875 V to 5.250 V
2	-12 V	-12.60 V to -11.64 V
3	-24 V	-25.20 V to -23.28 V
4	-2 V	-2.10 V to -1.90 V
14	+12 V	11.64 V to 12.60 V
15	+24 V	23.28 V to 25.20 V
16	-5.2 V	-5.460 V to -5.044 V
9, 17-20, 22, 24	Logic Ground	

Checking the 10 MHz System Clock (CLK10)

The following procedure checks the accuracy of the 10 MHz system clock. This procedure is only required on the benchtop mainframe; it is not required for the expansion mainframe.

Equipment required	Frequency counter (item 3) SMB-to-BNC cable (item 8)
Prerequisites	Warm-up time: 30 minutes Power-up, mainframe, and CheckIt diagnostics pass

1. Verify that all of the prerequisites above are met for the procedure.
2. Connect the frequency counter to the External Signal Out TTL SMB connector on the benchtop mainframe controller.
3. Go to the System window and select System Configuration from the System menu.
4. In the System Configuration dialog box, select 10 MHz Clock from the list of routable signals in the External Signal Out selection box and click OK.
5. Verify that the output frequency at the External Signal Out TTL connector is 10 MHz ±1 kHz. Record the measurement on a copy of the calibration data report and disconnect the frequency counter.
6. In the System Configuration dialog box, reset the External Signal Out signal to None.

Calibration Data Report

TLA721 Benchtop Mainframe

Instrument model number: _____

Serial number: _____ Certificate number: _____

Verification performed by: _____ Verification date: _____

System Clock Test Data

Characteristic	Specification	Tolerance	Procedure reference	Incoming data	Outgoing data
Clock frequency	10 MHz	±1 kHz (9.9990 MHz-10.0010 MHz)	Page 4-8, Step 5		

Tektronix

Adjustment Procedures

There are no adjustments for the TLA721 Benchtop Mainframe or TLA7XM Expansion Mainframe. For adjustment procedures on the individual modules, refer to the appropriate module service manual.

Maintenance

This chapter provides information and procedures for inspecting, cleaning, removing and replacing components, and troubleshooting the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe. The procedures isolate problems to a module lever rather than a component level.

This chapter is divided up as follows:

- Preventing electrostatic discharge (ESD)
- Inspection and cleaning
- Mainframe removal and replacement procedures
- Benchtop controller removal and replacement procedures
- Expansion module removal and replacement procedures
- Troubleshooting
- Repackaging instructions

Preparation

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.

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

Preventing ESD

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

CAUTION. *Many components within the instrument are susceptible to static discharge damage.*

Service the instrument only in a static-free environment. Observe standard handling precautions for static-sensitive devices.

1. Minimize handling of static-sensitive circuit boards.
2. 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.
3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these circuit boards.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Handle circuit boards by the edges when possible.
6. Do not slide the circuit boards over any surface.
7. Avoid handling circuit boards in areas that have a floor or work-surface covering capable of generating a static charge.

Inspection and Cleaning

The instrument 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 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. Periodic cleaning reduces instrument breakdown and increases reliability. Clean the instrument as needed, based on your operating environment.

These procedures equally to the mainframes, benchtop controller, and expansion modules. You will have to remove the benchtop controller and the expansion module from the mainframes to complete the inspection and cleaning procedures.

Exterior Inspection

Inspect the outside of the instrument for damage, wear, and missing parts. Use Table 6–1 as a guide. Modules that appear to have been dropped or otherwise abused should be checked thoroughly to verify correct operation and performance. Immediately repair defects that could cause personal injury or lead to further damage to the benchtop controller, expansion module, or the mainframes that the module plug into.

Table 6-1: External inspection check list

Item	Inspect for	Repair action
Front panel and side cover	Cracks, scratches, deformations, missing or damaged retainer screws, or ejector handles.	Replace defective or missing parts.
Front panel connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Replace defective parts. Clear dirt out of connectors.
Rear connectors	Cracked or broken shells, damaged or missing contacts. Dirt in connectors.	Replace defective parts. Clear dirt out of connectors.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors.	Replace damaged or missing parts, frayed cables.

CAUTION. *To prevent damage to electrical components from moisture during external cleaning, use only enough liquid to dampen the cloth or applicator.*

Exterior Cleaning Procedure

Clean the exterior surfaces with a soft dry lint-free cloth, or a soft-bristle brush. If any dirt remains, use a soft 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 cleaning compounds.

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

Use only deionized 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.

Interior Inspection

Remove the module covers to access the inside of the benchtop controller or the expansion module for inspection and cleaning. Refer to the *Removal and Installation Procedures* for detailed information on cover removal. Inspect the internal portions of the modules and the mainframes for damage and wear using Table 6–2 as a guide. Defects found should be repaired immediately.

Table 6-2: Internal inspection check list

Item	Inspect for	Repair action
Circuit boards	Loose, broken, or corroded solder connections. Burned circuit boards. Burned, broken, or cracked circuit-run plating.	Return to a Tektronix Service Center.
Resistors	Burned, cracked, broken, blistered condition.	Return to a Tektronix Service Center.
Solder connections	Cold solder or rosin joints.	Return to a Tektronix Service Center.
Capacitors	Damaged or leaking cases. Corroded solder on leads or terminals.	Return to a Tektronix Service Center.
Wiring and cables	Loose plugs or connectors. Burned, broken, or frayed wiring.	Firmly seat connectors. Repair or replace parts with defective wires or cables.
Chassis	Dents, deformations, and damaged hardware.	Straighten, repair, or replace defective hardware.

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

Interior Cleaning Procedure

Use a dry, low-velocity stream of air to clean the interior of the modules and the mainframes. Use a soft-bristle 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 or distilled water.

Clean the exterior (face) of the floppy disk drive, CD-ROM, and replaceable hard disk drive cartridge on the benchtop controller with a soft, clean cloth and a mild detergent.

To clean the floppy disk drive or the CD-ROM, use commercially available floppy disk drive or CD-ROM drive cleaning kits and follow the manufacturer's instructions.

Mainframe Removal and Installation Procedures

This section provides procedures for removing and installing mechanical and electrical modules in the benchtop and expansion mainframes. These procedures apply identically to both the benchtop and expansion mainframes unless noted otherwise.

CAUTION. *Before doing this or any other procedure in this manual, read the* General Safety Summary *and* Service Safety Summary *found at the beginning of this manual.*

Equipment Required

Table 6–3 lists the tools needed to remove and replace components in the mainframes.

Table 6-3: Equipment required to service the mainframes

Item number	Item	Description
1	Flat blade screwdriver	Small flat blade screwdriver
2	Cutters	Diagonal cutters (for removing cable ties)
3	Screwdriver handle	Accepts Torx driver bits
4	T-7 Torx tip	Torx drive bit for T-7 size screws
5	T-15 Torx tip	Torx drive bit for T-15 size screws
6	T-20 Torx tip	Torx drive bit for T-20 size screws
7	Allen wrench	A 3/32-inch Allen wrench (hex wrench)
8	Phillips screwdriver	Phillips #1 screwdriver
9	Cable ties	4-inch tie-down straps (Tektronix part number 343-0549-00)

NOTE*. When installing the screws, use a torque screwdriver and tighten the screws to 8 in-lbs unless otherwise noted.*

Install Empty Slot Panel Fillers

If you have any unused (empty) slots in your mainframe, you may install the empty slot Panel Fillers. Install either the single-wide or double-wide fillers that came with your mainframe. Refer to Figure 6–1 for information on installing the slot fillers.

CAUTION. *To avoid damage caused by heat use only Tektronix front panels; otherwise, the shutters may activate, effectively robbing airflow from installed modules. Installing the fillers provides improved cooling for installed modules, improved EMI shielding, and more accurate air temperature sensing to control the fan speeds.*

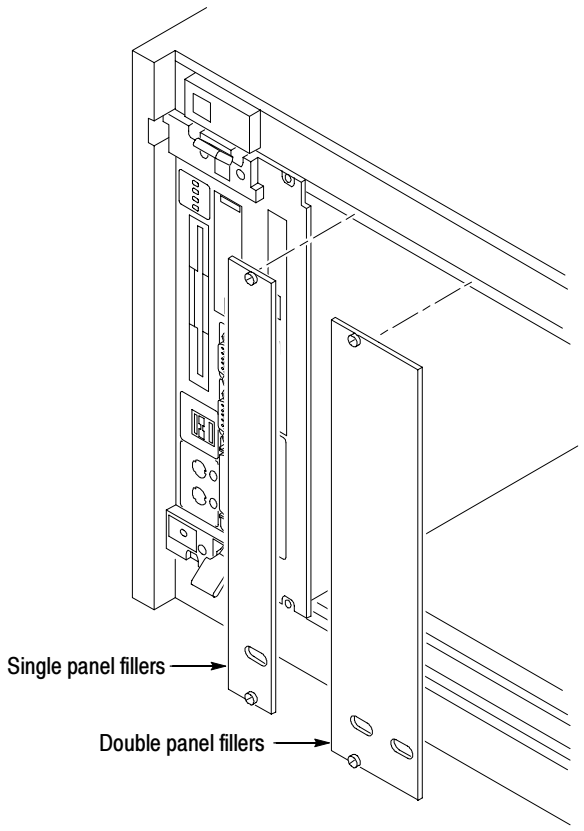

Figure 6- 1: Installing the empty slot panel fillers

Blower Assembly

You will need a Phillips #1 screwdriver and an Allen wrench to complete these procedures.

Removal

To remove the blower assembly, refer to Figures 6–2, 6–3 and Figure 6–4 while performing the following steps:

1. From the back of the chassis, loosen the five captive screws including the safety ground (refer to Figure 6–2 for the screw locations).
2. Loosen the four 8-32 hex screws (see Figure 6–4 on page 6–9) under the mainframe so that you can easily remove the blower assembly.
3. Remove the cable cover.
4. Unplug the blower cable and set the blower assembly aside on a clean working surface.
5. To remove the blower, remove the ten screws with (the Allen wrench) holding the shroud part of the blower assembly to the chassis part of the assembly. Set the shroud aside. There are three screws on each side and four on the bottom. See Figure 6–4.
6. Remove the two sheet metal screws at the top of the blower.
7. Remove the four screws that hold the blower to the chassis part of the blower assembly.
8. For convenience, replace the two sheet metal screws from step 6 onto the top of the blower.

Installation

Install the blower assembly by following the removal procedures in reverse order.

***NOTE**. When reconnecting the blower cables to the chassis, verify that you connect the blower cable to J8, 1/BLOWER.*

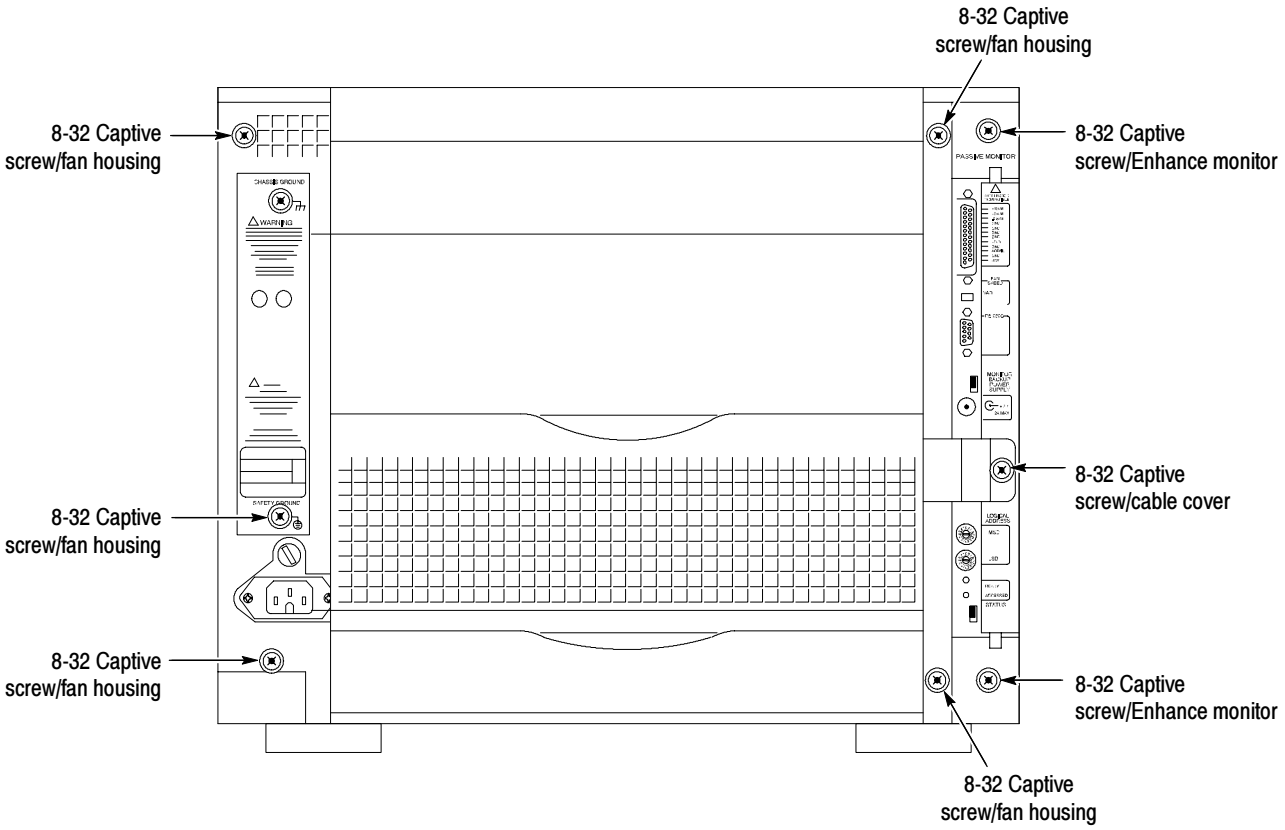

Figure 6- 2: Location of blower assembly screws

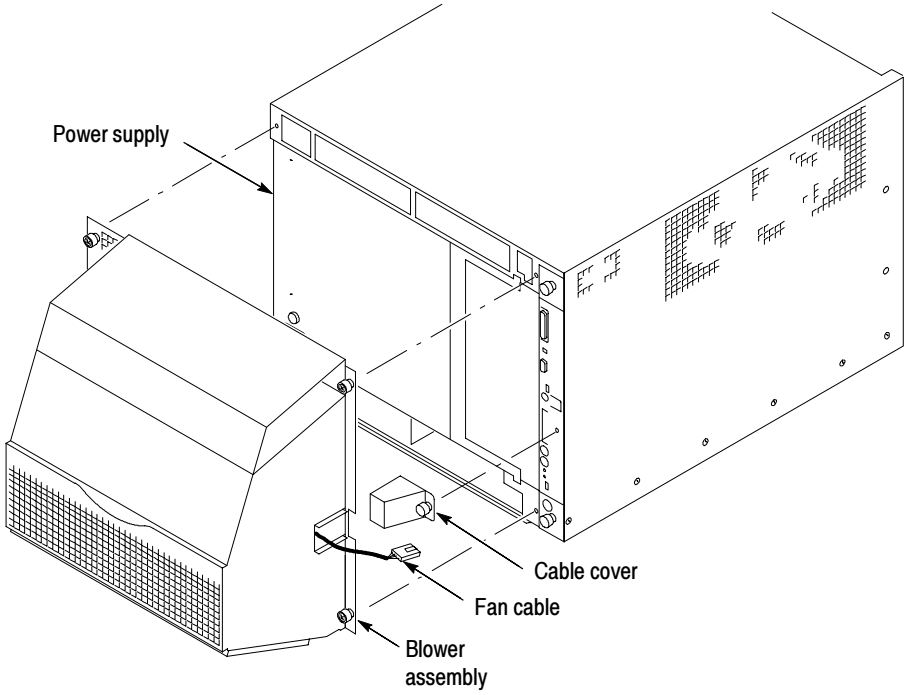

Figure 6-3: Removing the blower assembly

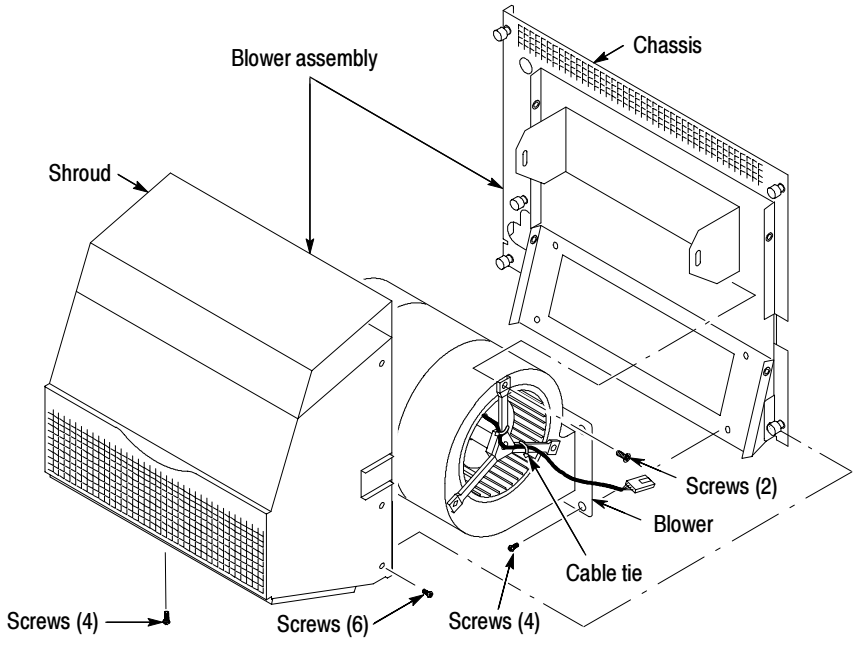

Figure 6-4: Removing the blower

Removing the Enhanced Monitor Board

Removal

To remove the enhanced monitor board, complete the following steps:

1. Refer to Figure 6–3 and unscrew the captive screw that attaches the cable cover. Remove the cable cover and set it aside.
2. Unplug the blower cable from the connector labeled 1/BLOWER.
3. Unscrew the two captive screws that attach the monitor board to the mainframe.
4. Slide the enhanced monitor board out of the mainframe as shown in Figure 6–5.

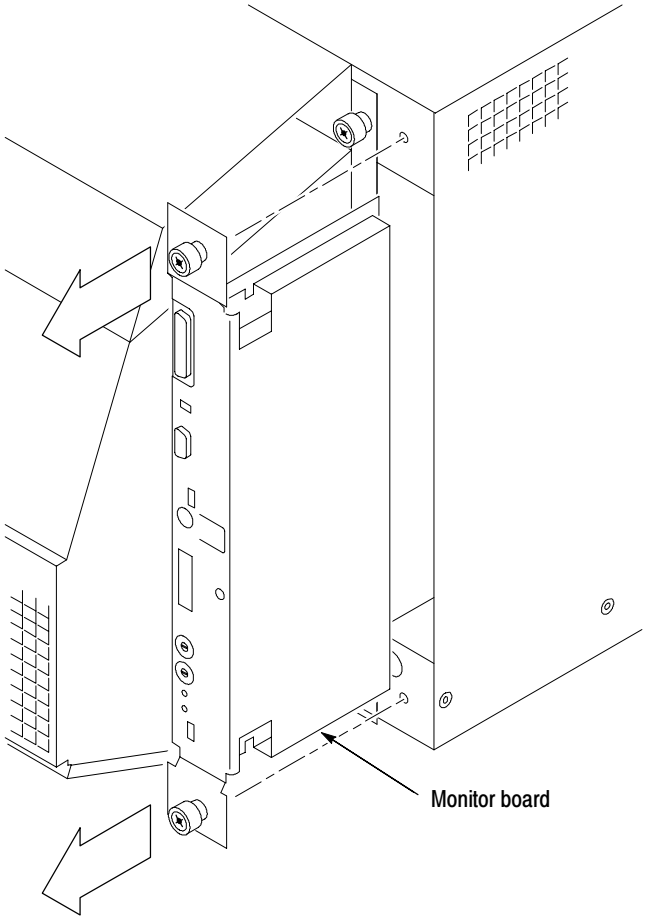

Figure 6- 5: Removing the enhanced monitor board

Installation

To install the enhanced monitor board, complete the following steps:

1. Refer to Table 6–4 and verify that the jumpers on the enhanced monitor board are in the default locations before installing the board in the mainframe.

Table 6-4: Enhanced monitor board jumpers

Jumpers (location)	Pins	Label on board
J2 (top of board)	1-2 and 3-4	TLA721
J38 (middle of board)	2-3	Blower
J19 (bottom of board)	2-3	Blower

2. Slide the enhanced monitor board into the mainframe as shown in Figure 6–5. You may have to adjust the enhanced monitor board to engage the connectors on the rear of the board.
3. Push the enhanced monitor board into the mainframe to fully mate the rear connectors.
4. Tighten the two screws that attach the enhanced monitor board to the mainframe.
5. Connect the blower cable into the connector labeled 1/BLOWER.
6. Install the cable cover and tighten the captive screw to that attaches to the mainframe.

Power Supply

Removal

To remove the power supply from the mainframe, perform *Removing the Blower Assembly* procedure on page 6–7 and then complete the following steps:

1. Using the handle on the power supply, firmly pull out the power supply form the rear of the mainframe.
2. Remove the two 3/32 hex drive screws and washers to remove the handle from the power supply.

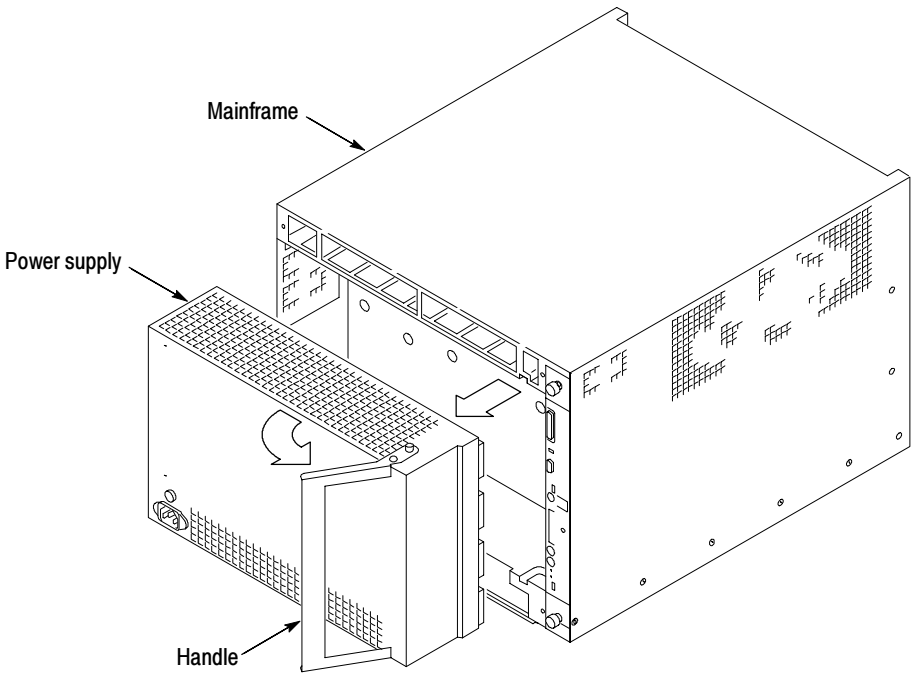

Figure 6- 6: Removing the power supply

Installation

Complete the following steps to reinstall the power supply in the mainframe:

1. Reinstall the handle to the power supply if you removed it earlier.
2. Slide the power supply into the mainframe.
3. Push the power supply handle in firmly to ensure that the connectors are completely seated into the back plane connectors.
4. Reinstall the blower assembly.

Mainframe Cover

Removal

To remove the mainframe cover, refer to Figure 6–7 while performing the following steps (Note that this procedure assumes that the mainframe does not include any rails for the rackmount option; if it does, remove the rails before continuing this procedure).

1. Remove the 12 hex drive screws (6 on each side) using a 3/32 Allen wrench.
2. Remove the eight T-7 screws: four on the top front and four on the top rear.
3. Lift the front bottom corners up.
4. After tilting the cover up about 3 inches, lift the cover straight off the instrument.

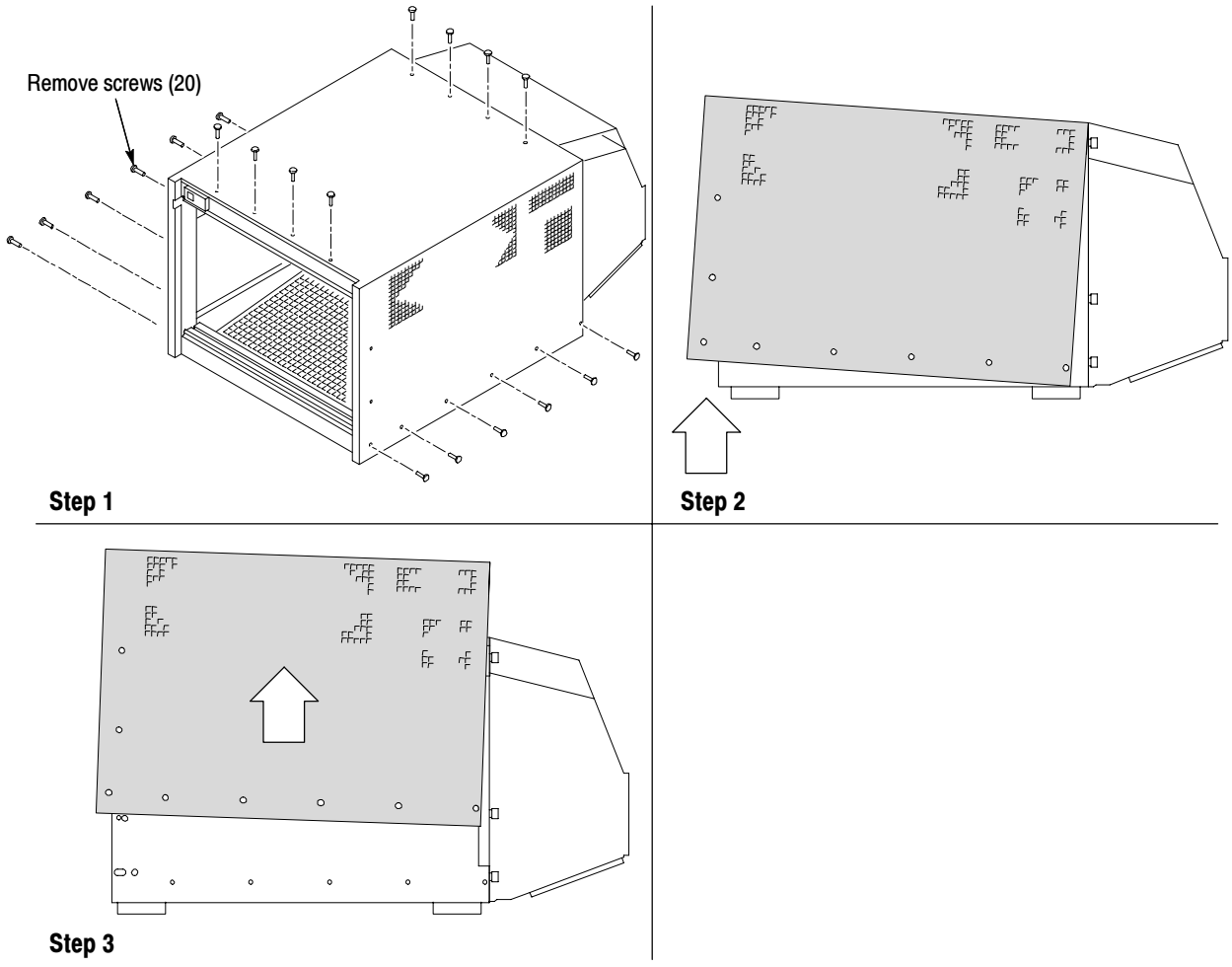

Figure 6-7: Removing the mainframe cover

Installation

Complete the following steps to install the mainframe cover (refer to Figure 6–7 as necessary):

1. Slide the cover over the mainframe.
2. Tilt the rear of the cover in place and then lower the front until the cover binds slightly (do not force the cover down).
3. Slowly push the cover down until the screw holes on the sides of the cover line up with those on the mainframe. Use care not to damage the front panel label while installing the cover.
4. Install the eight T-7 screws on the top of the mainframe cover; tighten them to 4 in-lbs.
5. Install the remaining 12 screws on the sides of the mainframe.
6. Tighten all screws.

Card Guides

Removal

The card guides at the top and bottom of the mainframe are very similar. The main difference is that the bottom guides include the spring-loaded shutters to redirect air into the mainframe. The procedure for removing both guides is identical. Refer to Figure 6–8 while performing the following steps:

1. Use a small flat blade screwdriver to pry up the tab of the card guide at the front of the mainframe being careful not to damage the card guide or the mainframe.
2. Gently pull the card guide forward until it pops out of place.
3. Remove the card guide.

Installation

Refer to Figure 6–8 while completing the following steps:

NOTE. *The bottom card guides are replaced as a unit. These guides are not intended to be disassembled.*

1. Slide the card guide towards the rear of the mainframe and allow the front of the card guide to snap into place.
2. Test the card guides in the mainframe and verify that they do not move.

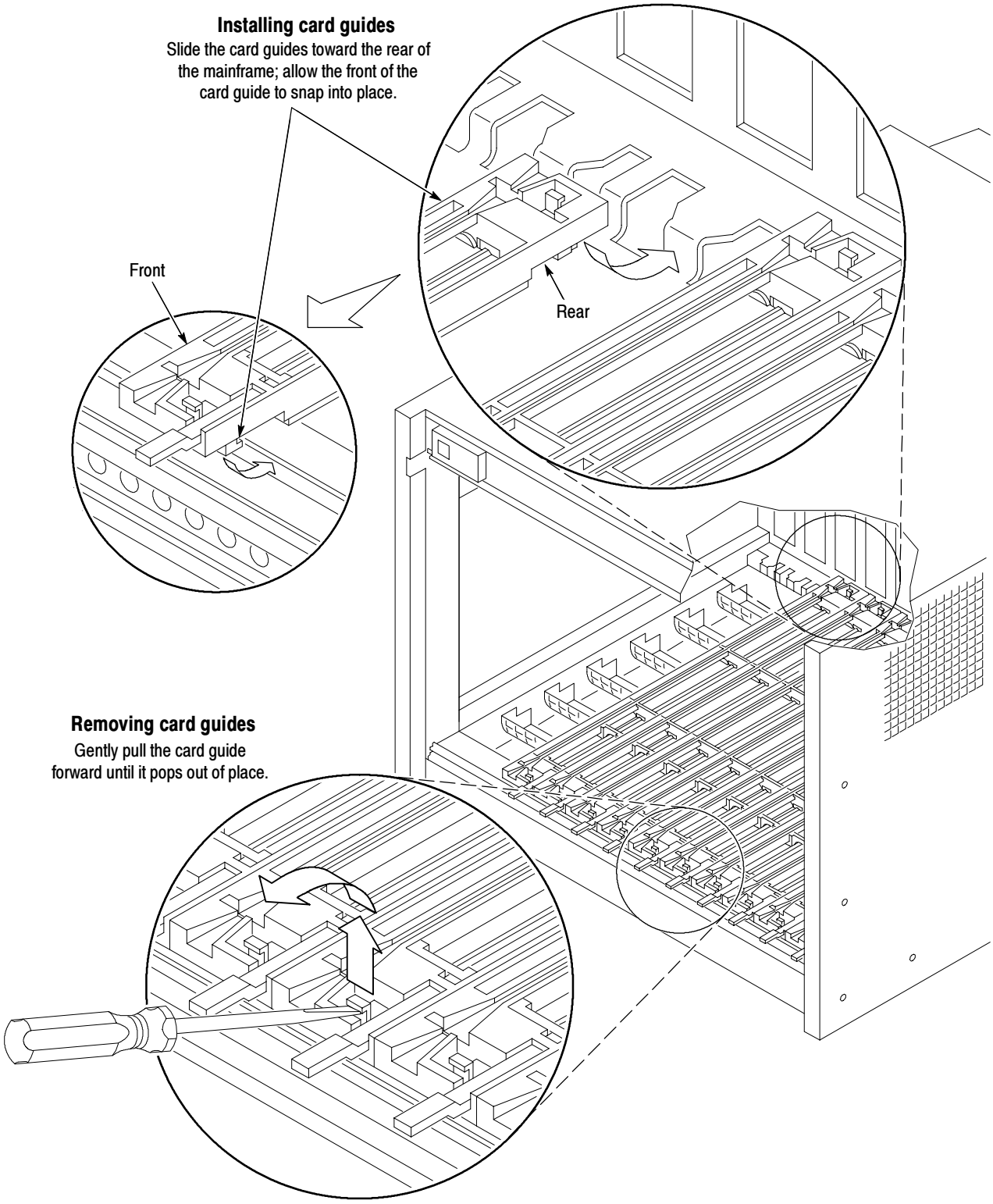

Figure 6-8: Removing the top and bottom card guides

Nut Rails

The nut rails at the top and the bottom of the front of the mainframe allow you to securely install the modules in the chassis by screwing the top and bottom of the modules to the front of the chassis.

Removal

Complete the following steps to remove the top or bottom nut rails:

1. Remove the mainframe cover by following the *Mainframe Cover* removal procedure on page 6–13.
2. Loosen all module retaining screws (it may be necessary to slide the modules partially out of the chassis).
3. Refer to Figure 6–9 and slide the nut rail out of the hole on the side of chassis (use a small screwdriver if necessary).

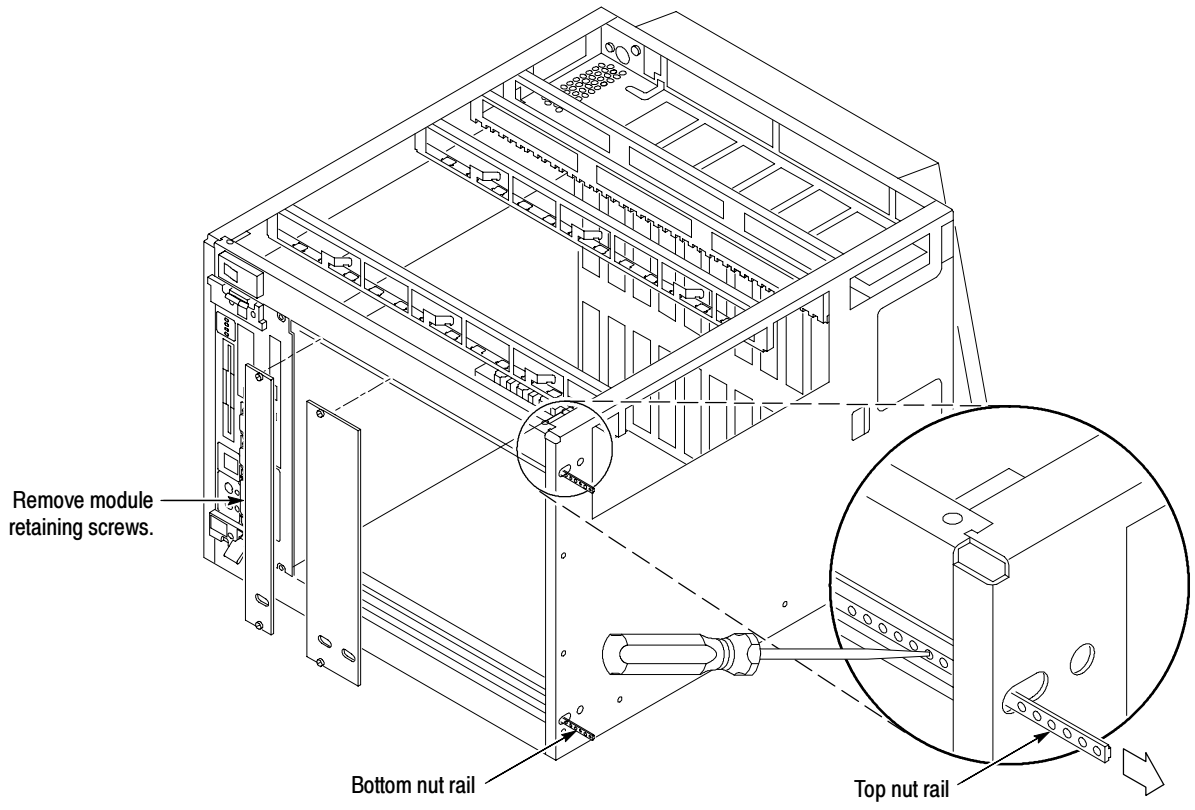

Figure 6- 9: Replacing the top and bottom nut rails

Installation

Complete the following steps to install the top or bottom nut rails in the mainframe:

1. Replace the nut rail by sliding it back in the side of the chassis and pushing it into place.
2. Reinstall the mainframe cover.

Temperature Sense Board

Removal

To remove the temperature sense board complete the following steps:

1. Remove the mainframe cover by following the *Mainframe Cover* removal procedure on page 6–13.
2. Disconnect the ribbon cable from the temperature sense board.
3. Refer to Figure 6–10 and gently pry back on each retainer holding the temperature sense board in place.
4. Tilt the board forward and lift it out of the holes at the top of the mainframe being careful not to damage any components on the circuit board.

Installation

Complete the following steps to install the temperature sense board in the mainframe:

1. Refer to Figure 6–10 and install the temperature sense board in the mainframe as shown.
2. Make sure that the circuit board snaps into place under each retainer.
3. Reconnect the ribbon cable.
4. Reinstall the mainframe cover.

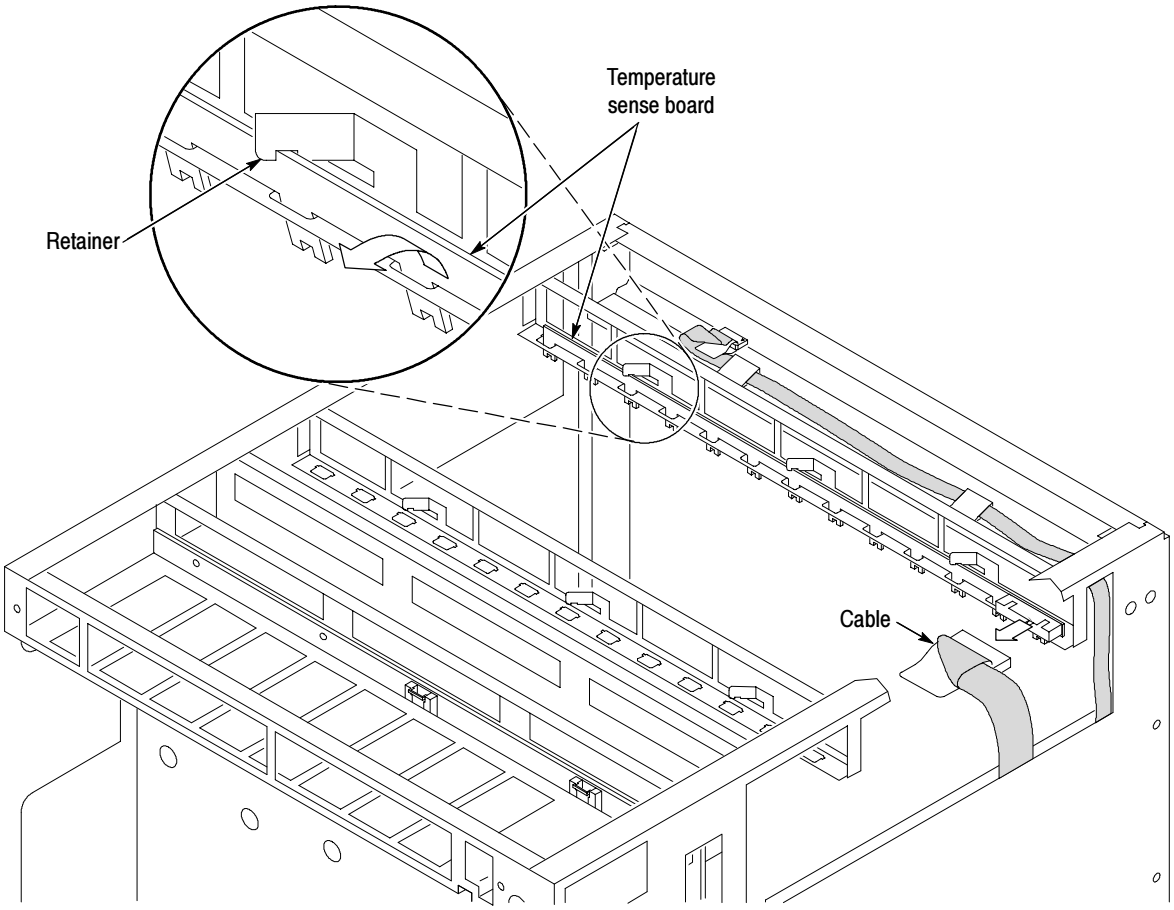

Figure 6-10: Removing the temperature sense board

EMI DIN Shields

Removal

Perform the following steps to remove the EMI DIN shields:

1. Remove any modules surrounding the slots where you intend to remove the Backplane EMI DIN shields. Refer to Figure 6–11.
2. Remove two 4-40 Torxdrive T-10 screws that secure each EMI DIN shield to the backplane.
3. Remove EMI DIN shield from the backplane.

Installation

Install the EMI DIN shield by reversing the removal procedure.

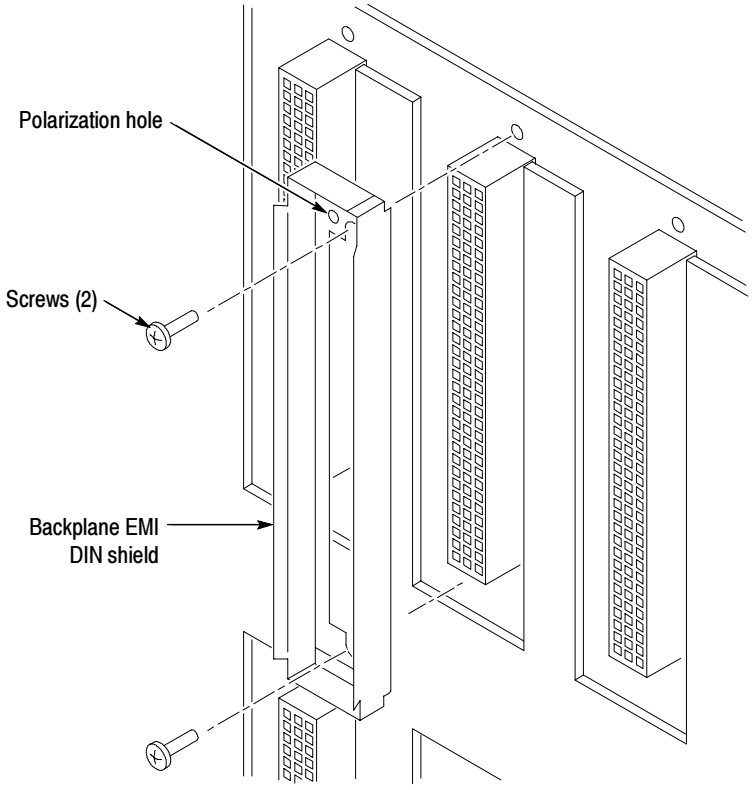

Figure 6- 11: Removing the backplane EMI DIN shields

Backplane

Removal

To remove the backplane from the mainframe, complete the following steps:

1. Follow the instructions on page 6–7, to remove the blower assembly from the mainframe.
2. Follow the instructions on page 6–10 to remove the enhanced monitor board from the mainframe.
3. Follow the instructions on page 6–12 to remove the power supply from the mainframe.
4. Follow the instructions on page 6–13 to remove the cover from the mainframe.
5. Refer to Figure 6–12 and disconnect the ribbon cable on the right side of the backplane.
6. Note the location of the power switch cable at J22 (or from J23) at the top of the backplane and disconnect the cable.

***NOTE**. If the front panel switch is connected to the backplane at J22, the switch controls the power-on functions. If the switch is connected to J23, the front panel switch is disabled, however, the light still illuminates when the chassis is powered on.*

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7. From the rear of the mainframe, remove the five 6-32 screws on the top of the backplane, remove the seven 6-32 screws from the center, and then remove the five 6-32 screws from the bottom (refer to Figure 6–12 if necessary).
8. After removing all of the screws from the backplane, remove the backplane from the mainframe by sliding it out of the right side.

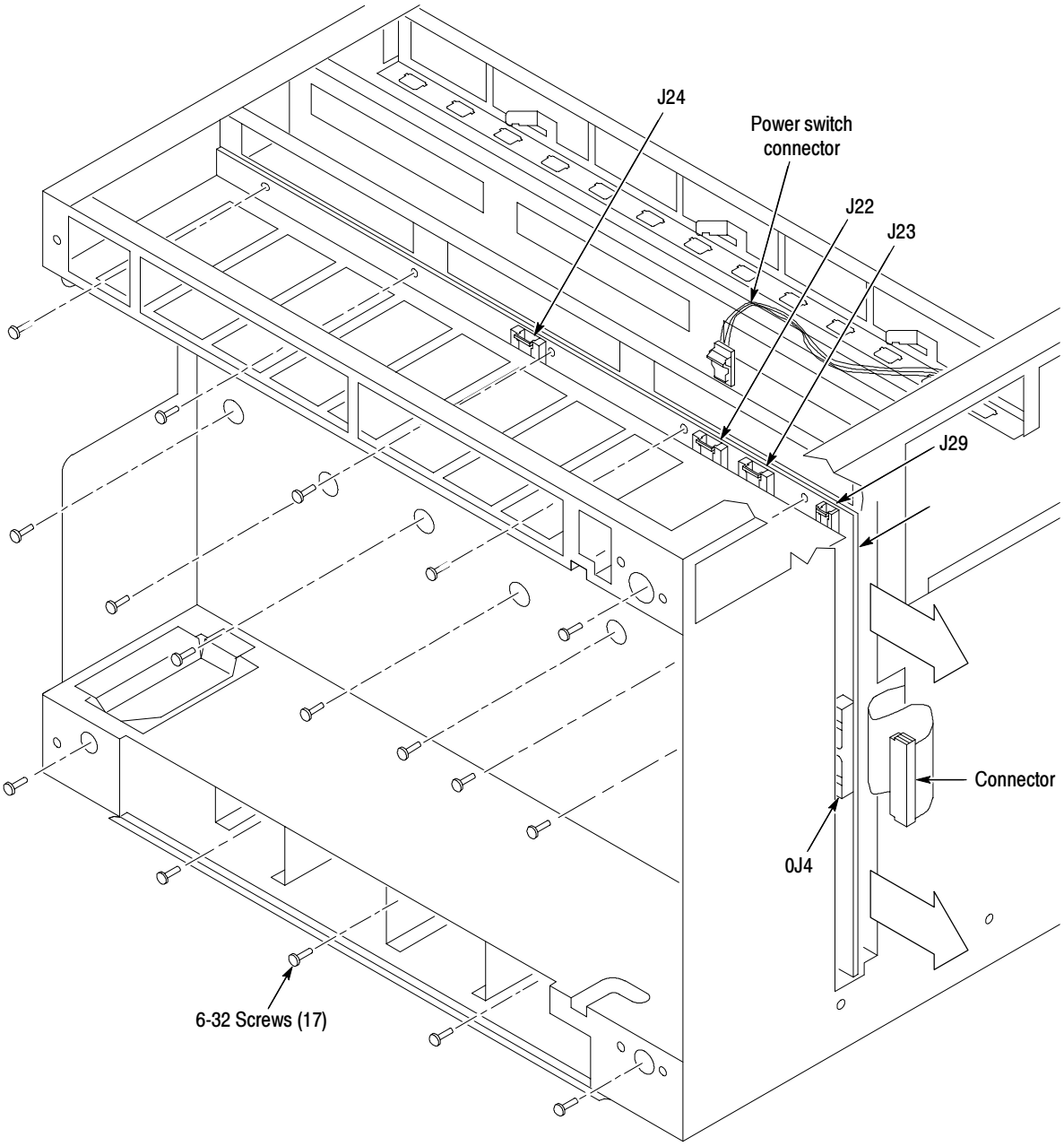

Figure 6- 12: Removing the backplane

Installation

Complete the following steps to install the backplane board in the mainframe:

1. Before installing the backplane board in the mainframe, verify the correct position and location of the jumpers (refer to Figure 6–13 and to Table 6–5). The jumper settings are different for the benchtop mainframe and the expansion mainframe. The jumper settings determine how the mainframes power down.

Table 6-5: Mainframe backplane jumpers

Jumpers (location)	Benchtop mainframe	Expansion mainframe
JP1	No Jumper installed	Jumper both pins
JP2	2-5	2-5

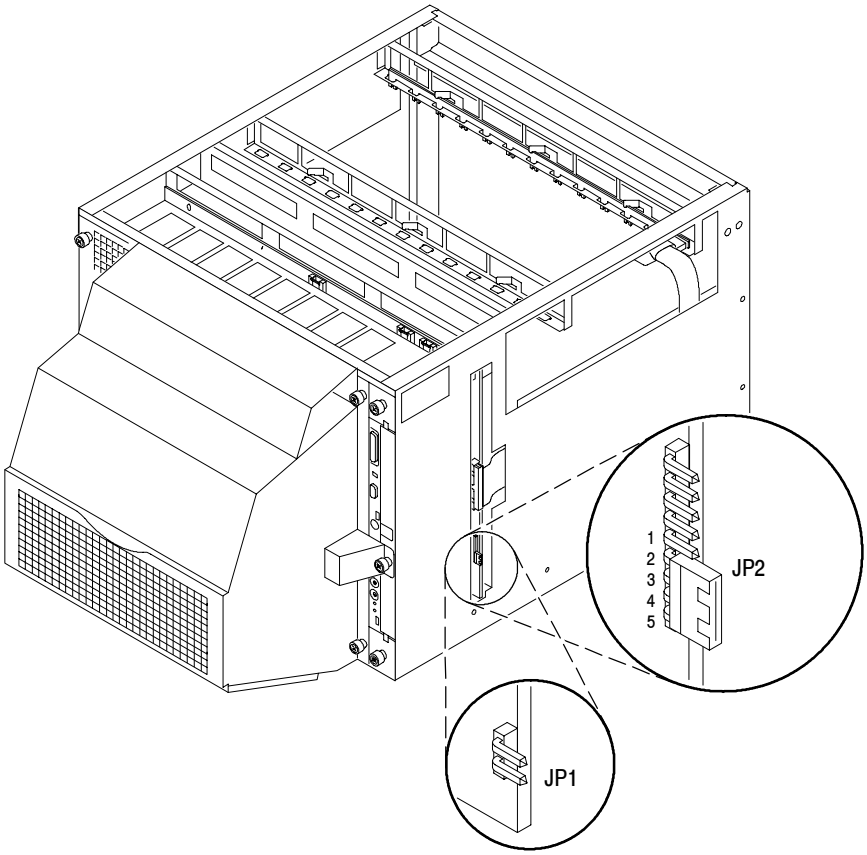

Figure 6-13: Soft power down jumper setting

2. Install the backplane board following the removal procedures in reverse order.

Special Configuration Options

This section contains information for configuring the mainframe for specific situations not documented earlier in this manual. These special configuration options require you to disassemble parts of the mainframe to access jumpers or circuit boards.

CAUTION. *To avoid damage from high currents on the backplane, always power off the mainframe and disconnect the power cord before performing any of the configuration procedures described in this section.*

Remote Power Switch Configuration

You can control the power-on function of the benchtop mainframe using the front panel On/Standby switch and from a remote momentary switch through the connections of the 25-pin rear panel connector. If you connect a remote switch to pins 5 and 18 (return side) of the 25-pin connector, the remote switch and the front-panel On/Standby switch control the power-on functions of the chassis.

You can also disable the front-panel switch and control the power-on functions from the remote switch only. The backplane has two connectors that control the power-on functions.

If the front panel switch is connected to the backplane at J22, the switch controls the power-on functions. If the switch is connected to J23, the front panel switch is disabled; however, the light still illuminates when the chassis is powered on.

To configure the mainframe to disable the front panel On/Standby switch, disconnect the power cord from the mainframe.

Refer to Figure 6–14 and remove the cover from the mainframe.

Locate the two connectors at the top of the backplane and disconnect the On/Standby switch cable at J22 and connect it to J23. Replace the mainframe cover.

Connect the momentary switch to pins 5 and 18 (return side) of the 25-pin rear panel connector.

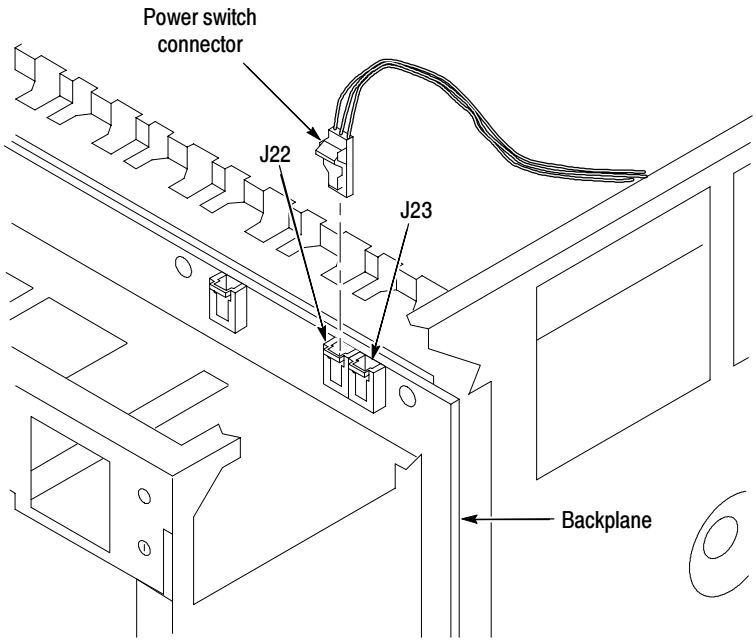

Figure 6- 14: Power switch connectors

Benchtop Controller Removal and Installation Procedures

This section provides procedures for removing and installing mechanical and electrical modules in the benchtop controller. Individual boards inside the controller are not individually replaceable. If you isolate faults to a circuit board, you must return the entire controller module to Tektronix for repair.

CAUTION. *Do not remove or install the benchtop controller or any other modules while the mainframe is powered on. Installing or removing modules while the mainframe is powered on can damage the module or the mainframe.*

After replacing the mechanical and electrical modules, verify the operation by running the instrument diagnostics as described later in this chapter.

Equipment Required

Table 6–6 lists the tools needed to complete the procedures in this section.

Table 6-6: Equipment required to service the benchtop controller

Item number	Item	Description
1	Flat blade screwdriver	Small flat blade screwdriver
2	Cutters	Diagonal cutters (for removing cable ties)
3	Screwdriver handle	Accepts Torx driver bits
4	T-9 Torx tip	Torx drive bit for T-9 size screws
5	T-10 Torx tip	Torx drive bit for T-10 size screws
6	Nut driver	A $^{3}/_{16}$-inch nut driver
7	Nut driver	A $^{1}/_{4}$-inch nut driver
8	Phillips screwdriver	Phillips #0 screwdriver
9	Phillips screwdriver	Phillips #1 screwdriver
10	Needle nose plier	
11	Cable ties	4-inch tie-down straps (Tektronix part number 343-0549-00)

NOTE*. When installing the screws, use a torque screwdriver and tighten the screws to 3 in-lbs unless otherwise noted.*

Replaceable Hard Disk Drive

Complete the following steps to remove the replaceable hard disk drive from the mainframe. You should always remove the hard disk drive before accessing any of the replaceable components in the benchtop controller.

CAUTION. *Do not remove the replaceable hard disk drive while the mainframe is powered on. The replaceable hard disk drive can be permanently damaged if you remove it while the mainframe is powered on. Always power down the mainframe before removing the replaceable hard disk drive.*

1. Power down the mainframe.
2. Press the latch on the front of the controller as shown in Figure 6–15 to unlatch the hard disk drive.
3. Pull on the replaceable hard disk drive cartridge to remove it from the controller.

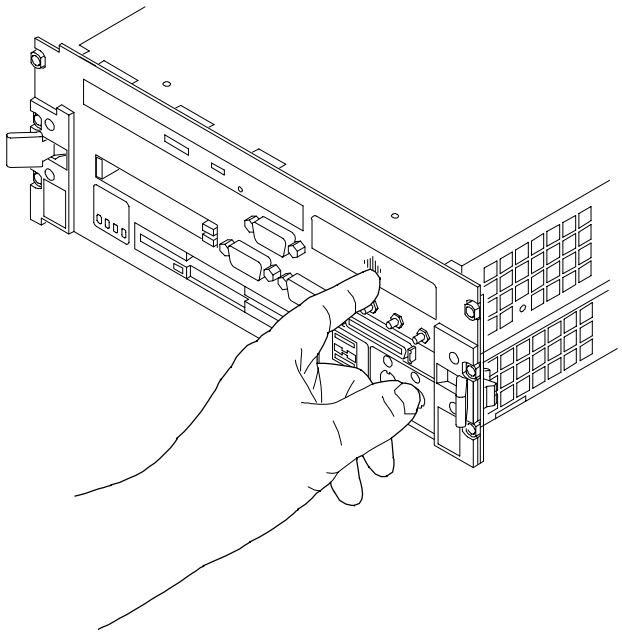

Figure 6- 15: Removing the replaceable hard disk drive

4. To remove the hard disk drive from the cartridge refer to Figure 6–16 and remove the four screws that fasten the hard disk drive to the cartridge.
5. Carefully remove the hard disk drive from the cartridge, and remove the cable assembly from the connector on the hard disk drive.
6. When you reinstall the four screws, start the screws by hand and then tighten them to 4 in-lbs.

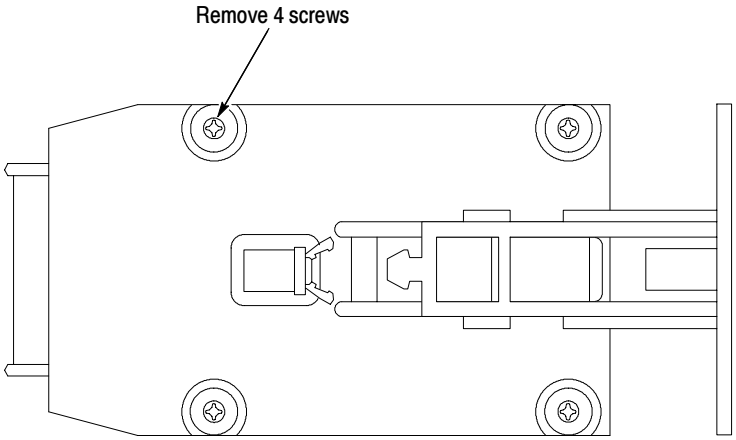

Figure 6-16: Removing the hard disk drive from the cartridge

***NOTE**. The remaining procedures in this section assume that the removable hard disk drive is not installed in the controller.*

Injector/Ejector Handles

You will need a T-10 Torx tip driver to replace the injector/ejector handles.

***NOTE**. The labels can be replaced without removing the handles.*

Removal

To remove the injector/ejector handles place the controller on the right side as shown in Figure 6–17. Remove the screws that secure the handle to the chassis and then remove the handle.

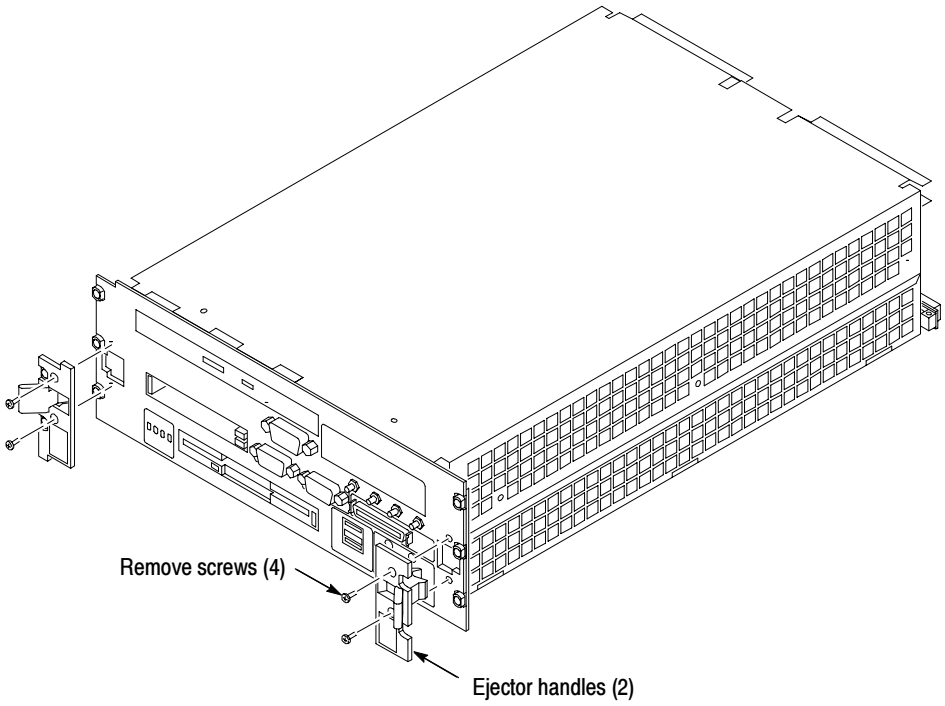

Figure 6- 17: Removal and installation of the ejectors

Installation

Install the injector/ejector handle through the front panel cutout onto the mounting post, and install the screws to secure the handle to the chassis.

***NOTE**. The top and bottom injector/ejector handles are not interchangeable.*

Covers

Remove the controller cover to gain access internal components and memory. You will need a screwdriver with a T-10 Torx tip to perform the following procedure.

Removal

Remove the ten flat-head T-10 Torx-drive screws, shown in Figure 6–18, and lift off the controller left and rear covers.

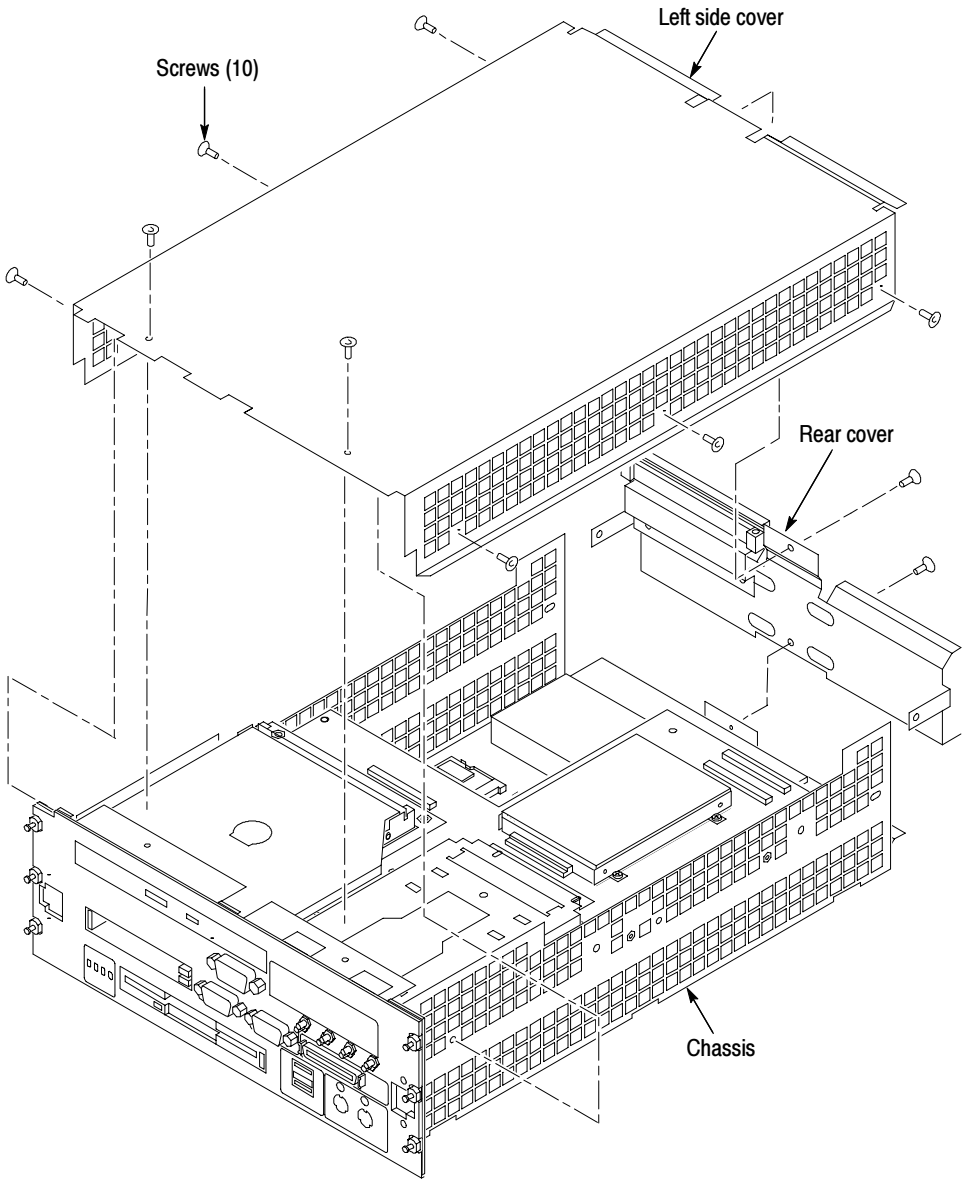

Figure 6-18: Removing and installing the left and rear covers

Installation

Use the following instructions and refer to Figure 6–18 to install the controller covers:

1. Place the left side cover on the chassis.
2. Secure the rear cover to the module.
3. Make sure that all the holes line up and then install the T-10 Torx-drive screws; tighten the screws to 4 in-lbs.

Front Panel and Hard Disk Drive Interface Board

You must remove the front panel and then the hard disk drive interface board before you can access the other replaceable components in the benchtop controller. You will need a screwdriver with a T-10 Torx tip, a $^1/_4$-inch nut driver, a $^3/_{16}$-nut driver, and a small flat-blade screwdriver to complete the procedures.

Removal

To remove the front panel complete the following steps:

1. Remove the injector handles by completing the procedure on page 6–28.
2. Remove the left and rear covers by completing the procedures on page 6–29.
3. Remove the five $^1/_4$-inch nuts on the back of the front panel.
4. Using a small, flat-blade screw driver, remove the two screws from the printer port connector on the front panel (see Figure 6–19).
5. Using the $^3/_{16}$-nut driver, remove the four standoffs from the two video port connectors (do not remove the standoffs at the COM A connector).
6. Pull the front panel off so that you can access the flat-head T-10 screws underneath the front panel (be careful so that you do not damage the cable from the COM A connector).

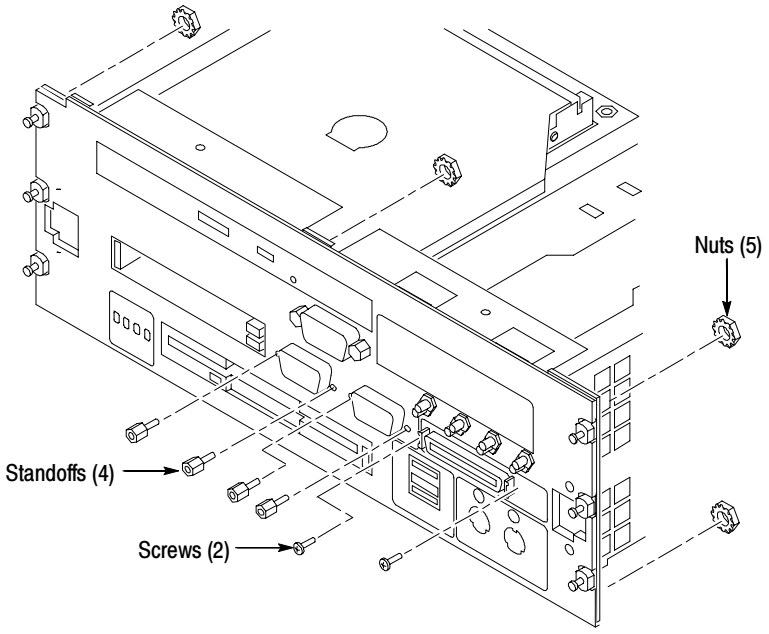

Figure 6-19: Removing and installing the front panel hardware

7. Refer to Figure 6–20 and remove the four T-10 screws from the front of the controller.
8. Remove the four flat-head T-10 screws on the top and bottom covers that hold the hard drive interface board in place. See Figure 6–20.
9. Disconnect the two ribbon cables located on the rear of the hard disk interface board.
10. Slide the hard drive interface board out of the chassis.

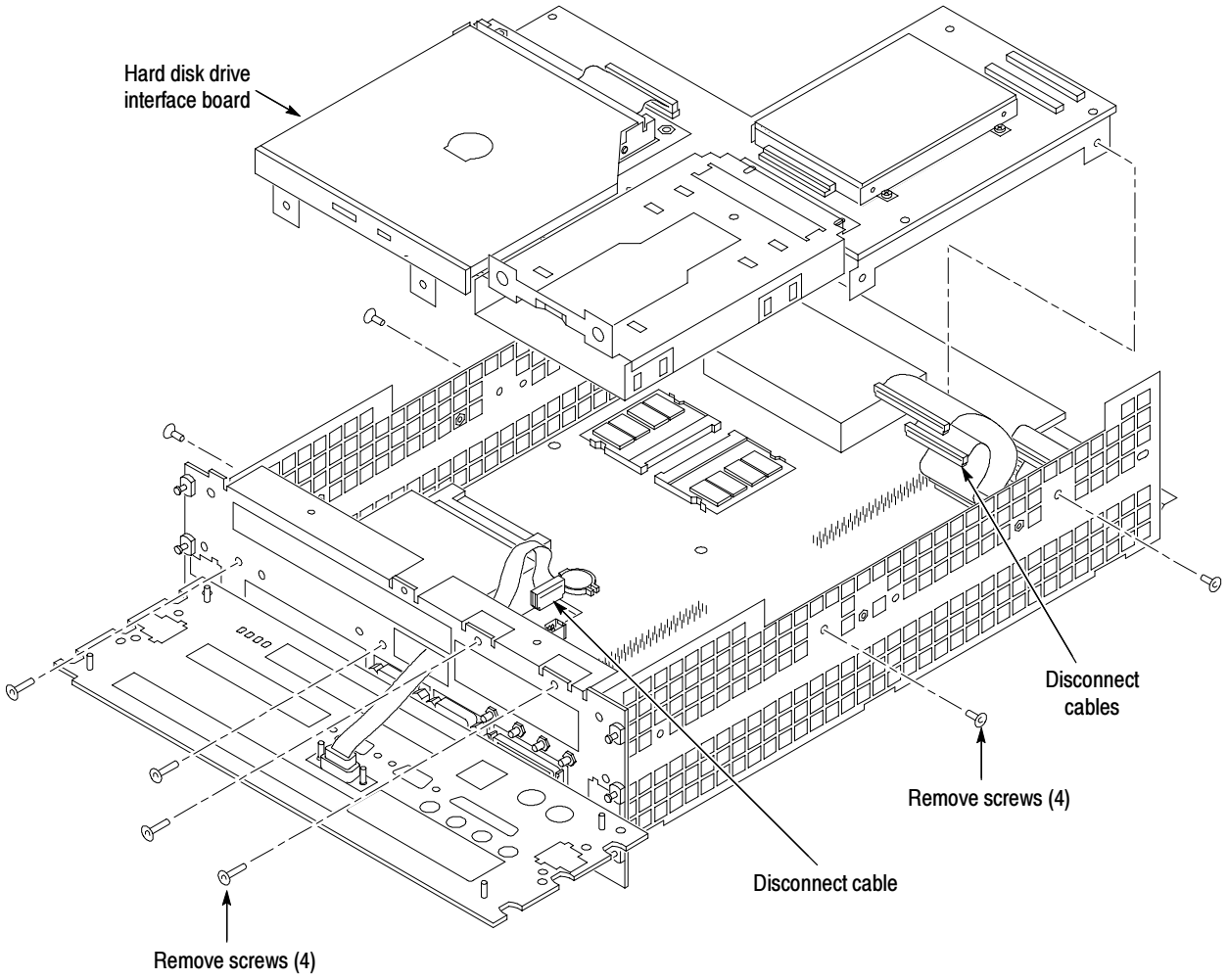

Figure 6-20: Removing screws from the front and sides of the controller

Installation

To install the hard disk drive interface board and the front panel, complete the following steps:

1. If you have not already done so, Place front panel near the front of the chassis and thread the COM A connector cable through the hole in the chassis.
2. Connect the COM cable connector to the COM connector on the processor board.
3. Install the hard disk drive interface board in the chassis making sure that the CD-ROM drive fits into the opening at the front of the chassis.
4. Install the four flat-head T-10 screws on the top and bottom of the chassis; tighten the screws to 4 in-lbs.

5. Connect the two ribbon cables from the processor to the hard disk drive interface board.
6. Install the four flat-head T-10 screws on the front of the chassis; tighten the screws to 4 in-lbs.
7. Secure the front panel in place by lining up the five studs on front panel with the holes on the front of the chassis. Install and tighten the five $^{1}/_{4}$-inch nuts on the back of the front panel to 4 in-lbs.
8. Using the $^{3}/_{16}$-nut driver, install the four standoffs to the two video port connectors. Tighten the standoffs to 3 in-lbs.
9. Install the two screws on the printer port connector using a small, flat-blade screw driver.
10. Install the left side cover and the rear cover.
11. Install the ejector handles.

Fixed Hard Drive

You must remove the hard disk drive interface board so that you can access the small screws on the hard disk drive bracket. You will need a screwdriver with a T-10 Torx tip and a small flat blade screwdriver to remove the fixed hard disk drive.

Removal

To remove the hard drive interface board, complete the following steps:

1. Remove the injector handles by completing the procedure on page 6–28.
2. Remove the left and rear covers by completing the procedures on page 6–29.
3. Remove the front panel and the hard disk drive interface board by following the procedure beginning on page 6–30.
4. Remove the four 3/16-inch flat blade screws that secure the fixed hard disk drive to the bracket (see Figure 6–21).

NOTE. *It may be necessary to loosen the four T-10 Torx drive screws that hold the brackets to the circuit board before you can remove the hard disk drive.*

5. Slide the fixed hard disk drive out of the brackets.

Installation

To install the fixed hard disk drive and the hard drive interface board, complete the following steps:

NOTE. *If you are replacing the fixed hard disk drive, verify that the jumper settings on the new drive match those of the old drive. If the hard disk drive is a different type, refer to the vendor's instruction for jumper settings.*

1. Loosen the fixed hard disk drive bracket T-10 Torx-drive screws to ease the insertion of the hard disk drive between the brackets.
2. Carefully align the connector pins on the back of the hard disk drive to the socket on the board. Gently slide the hard disk drive into the socket. Verify that all of the pins are fully engaged and that no pins are bent.
3. Install the four 3/16 inch flat blade screws to secure the fixed hard disk drive to the brackets, as shown in Figure 6–21; tighten the screws to 1 in-lbs.
4. Tighten the fixed hard disk drive bracket T-10 Torx-drive screws to secure the fixed hard disk drive brackets to the interface board; tighten the screws to 3 in-lbs.

5. Install the hard disk drive interface board and the front panel.
6. Install the covers and the injector handles.

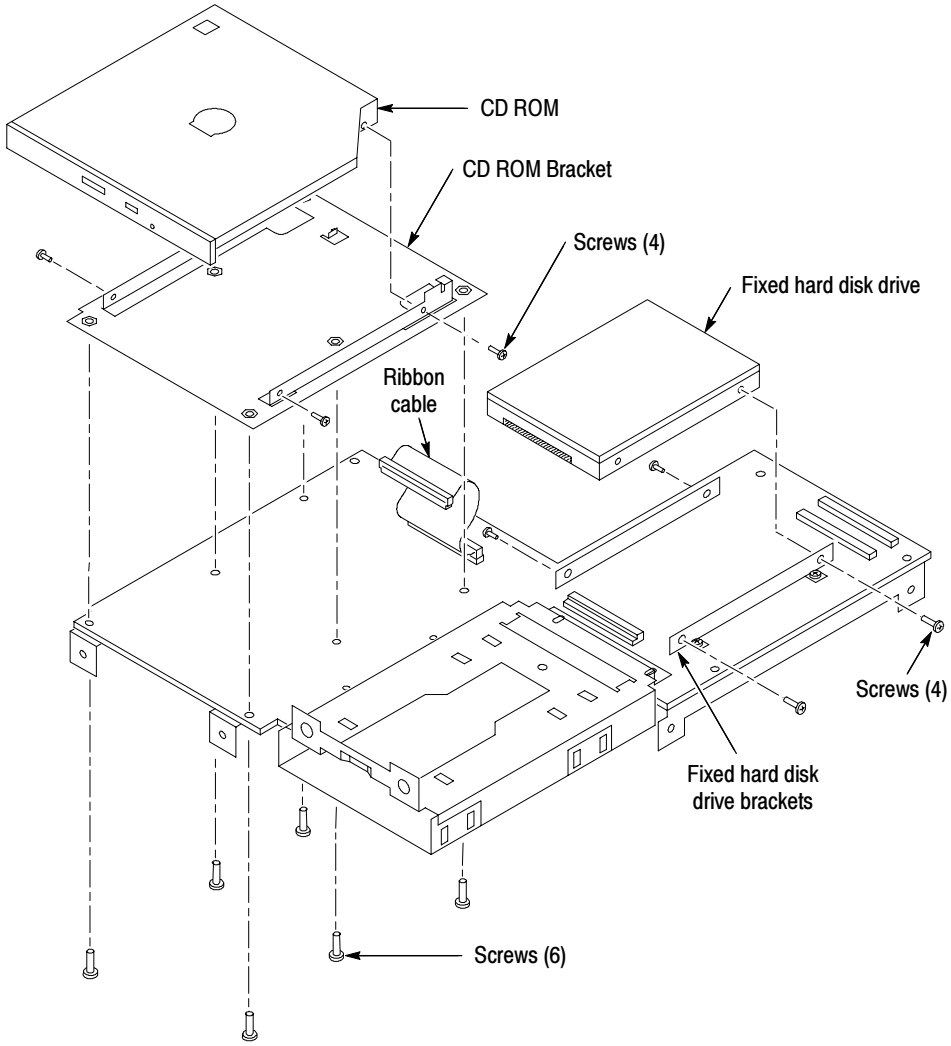

Figure 6-21: Removing and installing the fixed hard disk drive and CD-ROM drive

CD-ROM Drive

You must remove the hard disk drive interface board so that you can access the CD-ROM drive. You will need a screwdriver with a T-10 Torx tip and a #0 Phillips head screwdriver to remove the CD-ROM drive.

Removal

The CD-ROM drive is located on the hard drive interface board. Complete the following steps to remove the CD-ROM drive:

1. Remove the left and rear covers by completing the *Cover Removal* procedures on page 6–29.
2. Remove the injector handles by completing the procedure on page 6–28.
3. Remove the front panel and the hard disk drive interface board by following the procedure beginning on page 6–30.
4. Remove the six T-10 screws on the bottom of the hard disk drive interface board that secure the CD-ROM drive bracket (see Figure 6–21).
5. Remove the CD-ROM drive bracket from the hard disk drive interface board.
6. Using a #0 Phillips head screwdriver with, remove the four screws on the sides of the CD-ROM bracket (see Figure 6–21).
7. Remove the ribbon cable from the CD-ROM drive.
8. Remove the CD-ROM drive assembly from the bracket.
9. Disconnect the interface board from the CD-ROM drive.

Installation

To install the CD-ROM, complete the following steps:

1. Connect the interface board to the CD-ROM drive.
2. Install the CD-ROM drive assembly in the bracket using the four screws that you removed earlier. Tighten the screws to 1 in-lbs.
3. Install the CD-ROM drive assembly to the hard disk drive interface board by attaching the six T-10 screws on the bottom of the board; tighten the screws to 3 in-lbs.
4. Connect the CD-ROM drive ribbon cable to the CD-ROM drive. Verify that pin-1 of the cable is connected to pin-1 of the connector.
5. Install the hard disk drive interface board and the front panel.
6. Install the covers and the injector handles.

Button Battery

The 3 V Lithium battery is located on the processor board.

Removal

You need to remove the hard disk drive interface board to access the processor board.

1. Remove the left and rear covers by completing the *Cover Removal* procedures on page 6–29.
2. Remove the injector handles by completing the procedure on page 6–28.
3. Remove the front panel and the hard disk drive interface board by following the procedure beginning on page 6–30.
4. Locate the battery on the processor board (see Figure 6–22).
5. To remove the battery, slip the battery out of the clip.

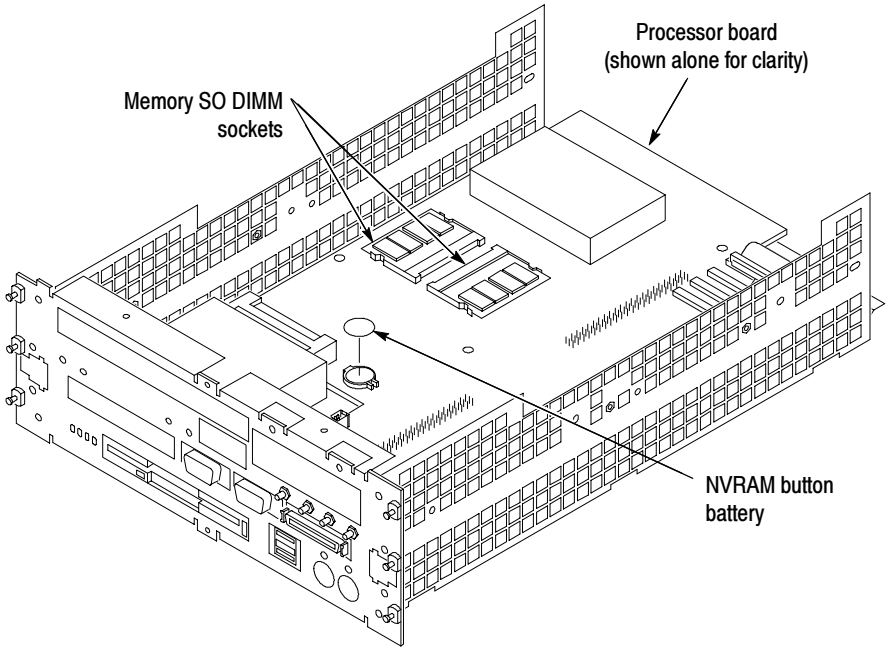

Figure 6-22: Removal and installation of the button battery and memory

Installation

Install the new battery in the battery clip. Reinstall the hard disk drive interface board, the left side and rear covers, and then the ejector handles.

Main Memory

The main memory is located on the processor board.

Removal

You need to remove the hard drive interface board to access the processor board.

1. Remove the left and rear covers by completing the *Cover Removal* procedures on page 6–29.
2. Remove the injector handles by completing the procedure on page 6–28.
3. Remove the front panel and the hard disk drive interface board by following the procedure beginning on page 6–30.
4. Locate the SO DIMM on the processor board (see Figure 6–22).
5. Remove the SO DIMM by depressing the tabs on each side and lift it out of the socket.

Installation

To replace memory, complete the following steps:

CAUTION. *Always use SO DIMM modules with gold plated contacts. Using SO DIMM modules that do not have gold plated contacts will result in eventual failure of the SO DIMM module.*

1. Populate SO DIMM 0 first.
2. Align the memory SO DIMM with the socket.
3. Gently push the SO DIMM into the socket. The locking tabs on each side will engage.
4. Reinstall the hard disk drive interface board, the left side and rear covers, and then the ejector handles.

Floppy Disk Drive

The floppy disk drive is located on the interface board. You must remove the processor board and the interface board to access the floppy disk drive. You will need a T-9 and a T-10 Torx tip driver to complete the following procedures.

***NOTE**. The internal boards are not individually replaceable. If faults are isolated to the boards, the entire benchtop controller must be returned to a Tektronix Service Center for repair.*

Removal

To remove the front panel hardware follow these steps:

1. Complete the instructions for removing the front panel and the hard disk drive interface board found on page 6–30.
2. Disconnect the COM A connector cable on the processor board and set the front panel aside.
3. Refer to Figure 6–23 and remove the two T-9 Torx screws holding the mouse and keyboard connectors to the front of the chassis.
4. Refer to Figure 6–23 and remove the two T-10 Torx screws holding the PC card connector housing to the front of the chassis.
5. Disconnect the four SMB cables from the processor board.
6. Refer to Figure 6–23 and remove the six T-10 Torx screws from the interface (bottom) board that secure the two boards to the chassis.

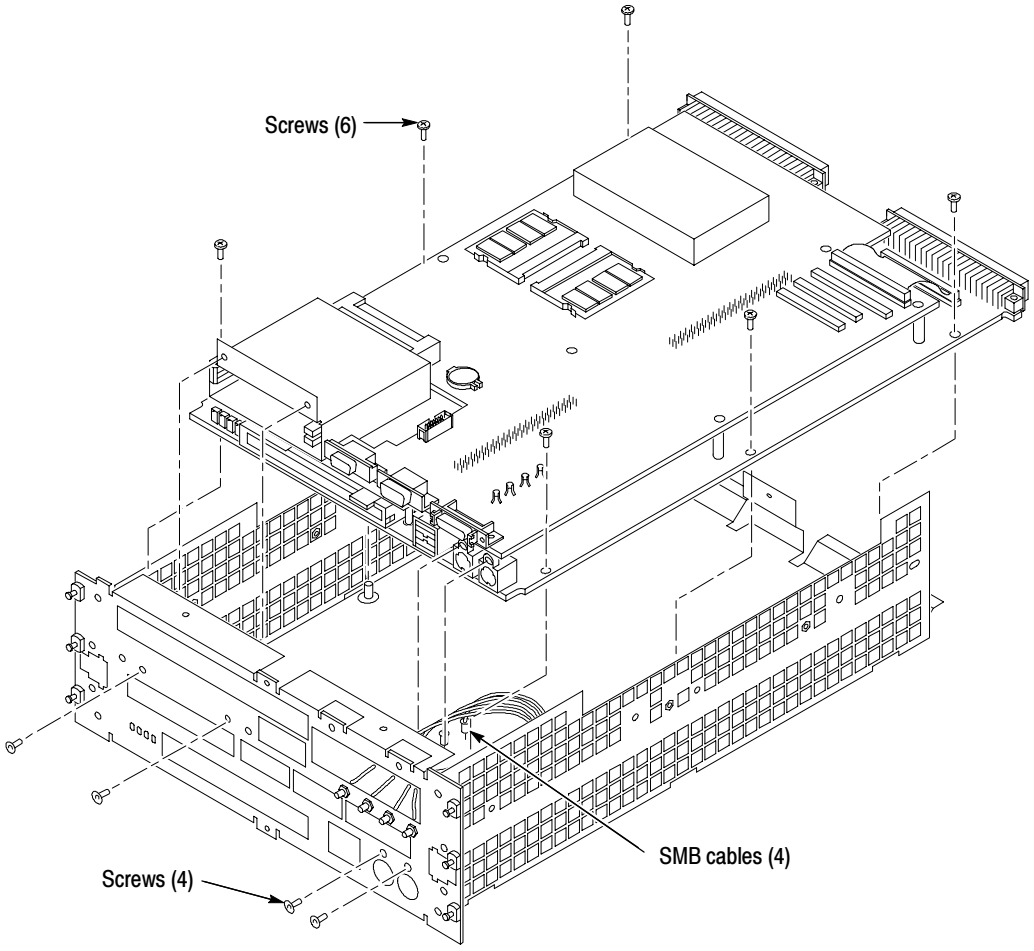

Figure 6-23: Removing the processor and interface boards

7. Lift the two boards out of the chassis.
8. Disconnect the ribbon cable at the back of the processor board.
9. To separate the two boards, refer to Figure 6–24 and remove the five T-10 screws and then carefully separate the two boards. The boards are connected by two pass through connectors

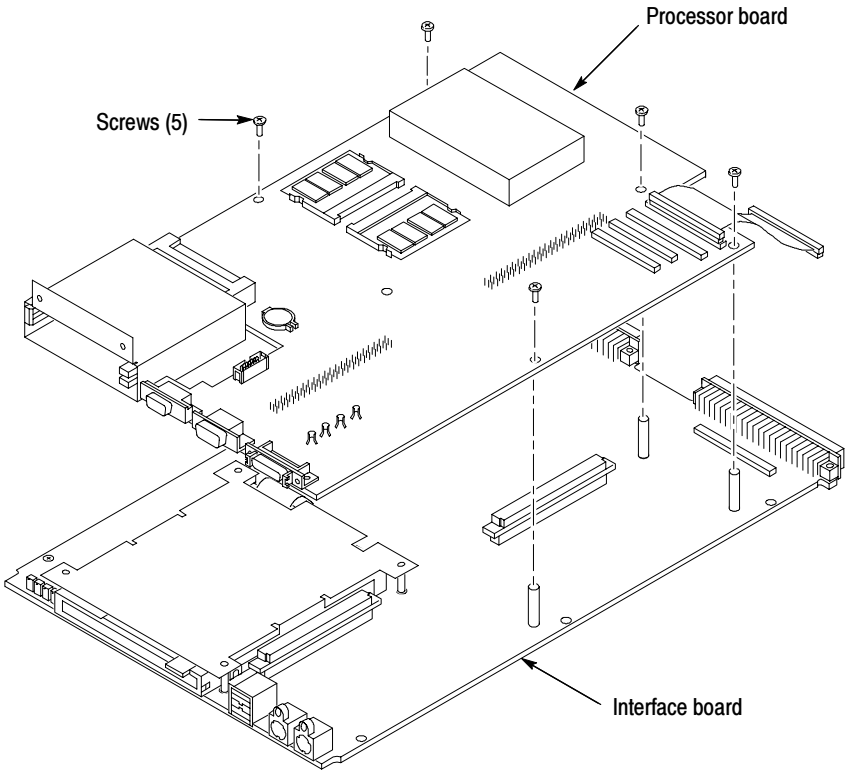

Figure 6-24: Separating the processor and interface boards

10. Remove the four T-10 screws on the bottom side of the interface board that attach the floppy disk drive bracket to the circuit board as shown in Figure 6–25.

11. Disconnect the ribbon cable from the floppy disk drive by pulling up on the locking latch on the connector and then lifting the ribbon cable out of the connector.

12. Lift the floppy disk drive assembly from the interface board.

13. Loosen the four Phillips screws on sides of the floppy disk drive so that you can remove the drive from the bracket.

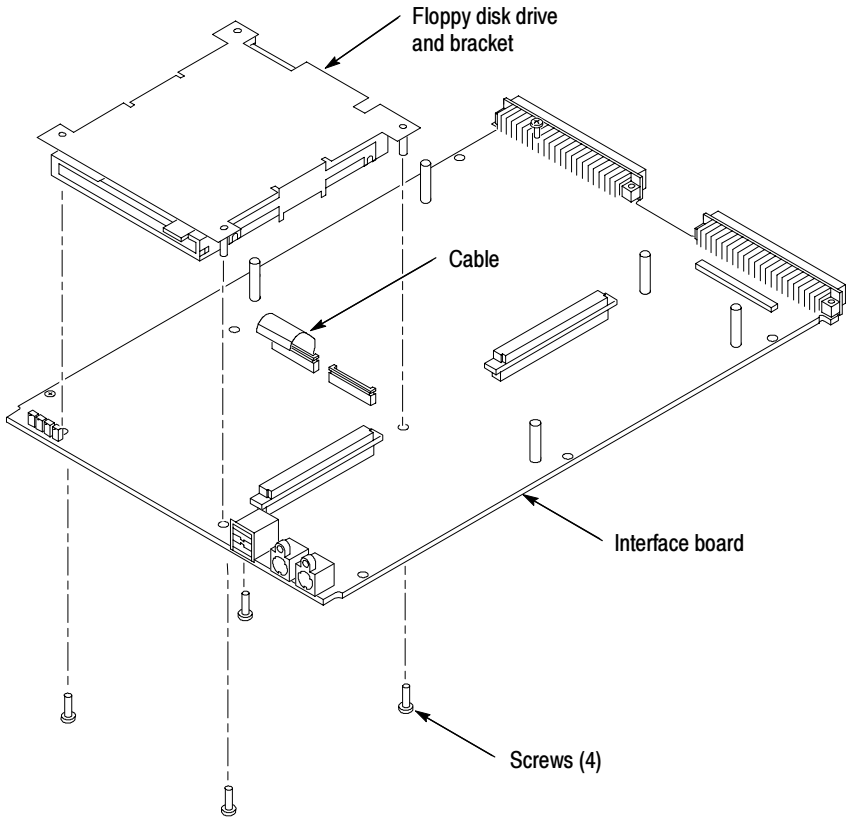

Figure 6-25: Removing the floppy disk drive from the interface board

Installation

To install the floppy disk drive and the processor board assembly, complete the following steps:

1. Loosen the four Phillips screws so that you can install the floppy disk drive in the bracket.
2. Install the floppy disk drive in the bracket and tighten the four Phillips screws.
3. Refer to Figure 6–25 and install the floppy disk drive assembly on the interface board; secure floppy disk drive to the interface board with the four T-10 screws.
4. Connect the floppy disk drive ribbon cable to the floppy disk drive. Fasten the cable in place by pushing down on both sides of the locking latch.
5. Refer to Figure 6–24 on page 6–41 and install the processor board on the interface board making sure that the board connectors are fully seated.
6. Install the five T-10 screws that you removed earlier.

7. Connect the ribbon cable from the interface board to the processor board.
8. Place the board assembly into the chassis as shown in Figure 6–23 on page 6–40.
9. Install the six T-10 screws on the interface board (bottom) that secure the board assembly to the chassis; tighten the screws to 3 in-lbs.
10. Connect the four SMB cables as listed in Table 6–7 (the cable connections are also labeled on the processor board).

Table 6-7: Signal wire identification

Color	Signal
White	EXT SIG OUT
Brown	EXT SIG IN
Red	SYSTEM TRIG OUT
Orange	SYSTEM TRIG IN

11. Install the two T-10 screws from the front of the chassis to the PC card connector housing; tighten the screws to 4 in-lbs.
12. Install the two T-9 screws from the front of the chassis to the mouse and keyboard connectors; tighten the screws to 2 in-lbs.
13. Place front panel near the front of the chassis and thread the COM A connector cable through the hole in the chassis.
14. Connect the COM cable connector to the COM connector on the processor board.
15. Reinstall the hard disk drive interface board, the covers, and the ejector handles.

Expansion Module Removal and Installation Procedures

This section contains information needed to perform repair or corrective maintenance on the expansion module.

The internal circuit board in the expansion module is not individually replaceable. If faults are isolated to the board level, return the entire expansion module to a Tektronix Service Center for repair.

CAUTION. *Do not remove or install the expansion module when the mainframe is powered on. Installing or removing the expansion module when the mainframe is powered on can damage the expansion module or the mainframe.*

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

These procedures assume that you have removed the expansion module from the mainframe.

Equipment Required

Table 6–8 lists the tools you may need to replace modules in the expansion module.

Table 6- 8: Equipment required to service the expansion module

Item
Screwdriver with a T-10 tip
3/16 inch nut driver

Ejector Handles

You will need T-10 Torx tip driver to replace the ejector handles.

***NOTE**. The labels can be replaced without removing the handles.*

Removal

To remove the ejector handles place the module on its right side as shown in Figure 6–26, and remove the screws and flat washers that secure the handle to the chassis. Remove the handle.

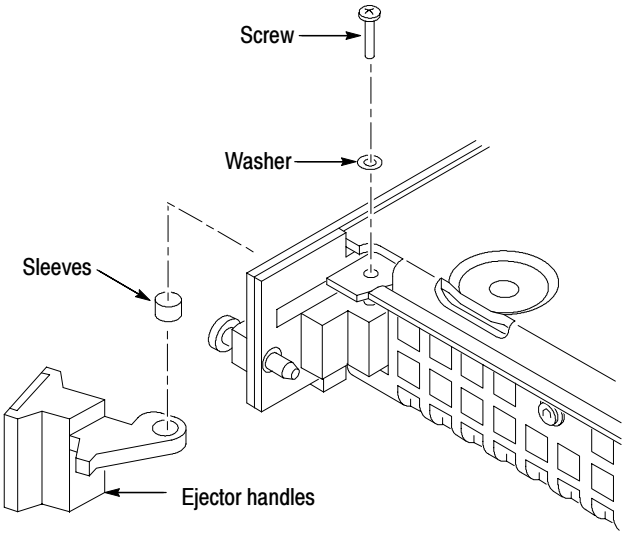

Figure 6-26: Removal and installation of the ejector handles

Installation

Install the ejector handle through the front panel cutout onto the mounting post, and install the screws and flat washers to secure the handle to the chassis as shown in Figure 6–26.

***NOTE**. The top and bottom ejector handles are not interchangeable.*

Expansion Module Cover

You will need T-10 Torx tip driver to remove the cover and gain access to the internal circuit board.

Removal

Remove the screws shown in Figure 6–27 and lift the cover off.

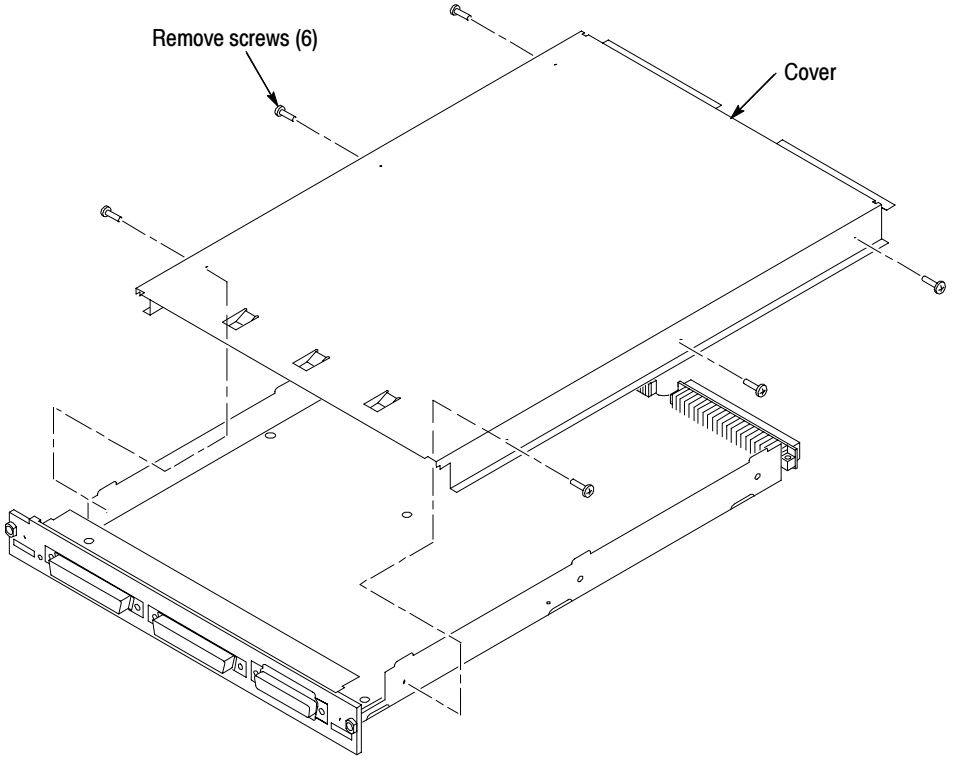

Figure 6-27: Removal and installation of the cover

Installation

Place the cover on the chassis by sliding the three EMI tabs under the lip of the front cover. Make sure that the cover is fully seated, and with no gaps, against the front and rear chassis flanges.

Secure cover with the screws removed from the top and bottom of the enclosure.

Expansion Module Circuit Board

You will need T-10 Torx tip driver to remove and install the circuit board.

Removal

Refer to Figure 6–28 and follow these instructions:

1. Remove the cover following the instructions on page 6–29.
2. Remove the six connector mounting standoffs.
3. Remove the screws from the circuit board as shown in Figure 6–28.
4. Remove the circuit board.

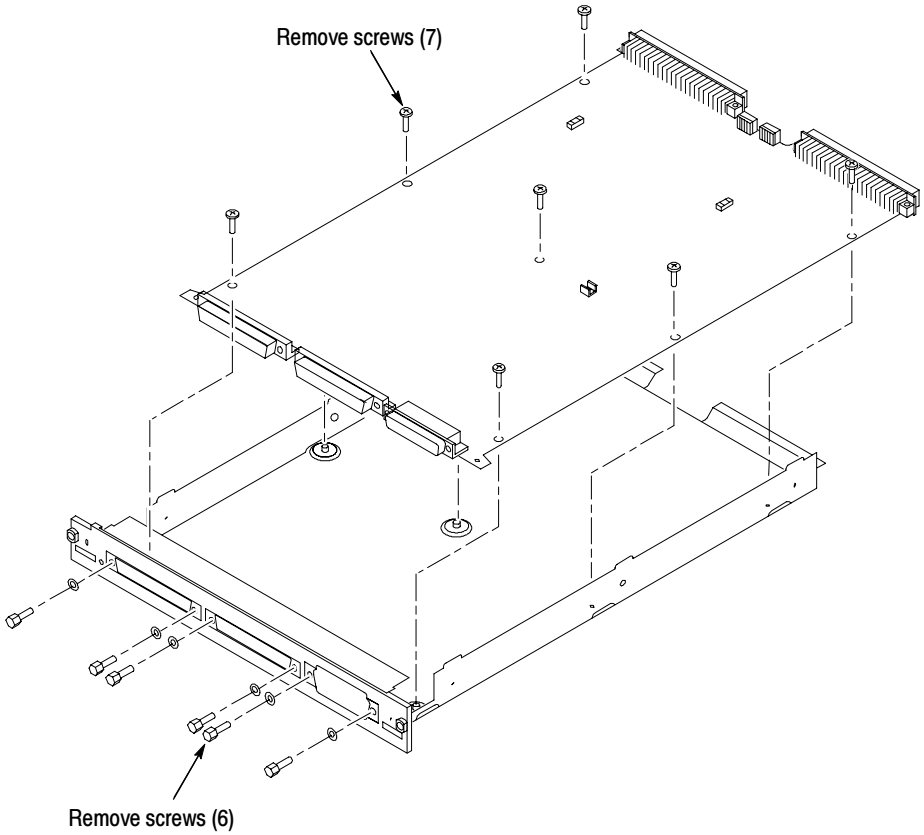

Figure 6-28: Removing the circuit board

Installation

Refer to Figure 6–28 and follow these instructions:

1. Install the circuit board into the frame as shown in Figure 6–28.
2. Install the six connector mounting standoffs.
3. Install the screws into the circuit board as shown in Figure 6–28.
4. Replace the cover following the instructions on page 6–47.

Soldered-On Components

CAUTION. *Removing soldered on components requires that a qualified service person is skilled in the servicing of through hole and surface mount technology on printed circuit boards.*

Self servicing may impact the warranty. Check with your Tektronix Service Center before servicing.

Every reasonable precaution shall be made by the service person to eliminate damage to the circuit board.

None of the soldered-on components are considered replaceable. You should not have to replace any soldered-on components. Please return the entire module to your local Tektronix service center to replace any soldered-on components.

Troubleshooting

WARNING. *Read the* General Safety Summary *and* Service Safety Summary *found at the beginning of this manual before doing this or any other procedure.*

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

This section contains information and procedures designed to help you isolate faults to the replaceable part level. The following subsections are included :

- *Check for Common Problems* beginning on page 6–52 describes common problems and suggestions that you may encounter.
- *Isolating System Problems* beginning on page 6–56 describes problems that may be due to the overall system.
- *Eliminate other Problem Sources* beginning on page 6–59 describes other problem sources that may indicate a faulty instrument.
- *Diagnostics* beginning on page 6–59 provides an overview of the various diagnostics available to help you service the instrument.
- *BIOS Error Messages* beginning on page 6–62 provides information on any BIOS error messages may appear while you service the instrument.
- *TLA Start-up Sequence* beginning on page 6–65 describes the start-up sequence for the logic analyzer.
- *Troubleshoot the Benchtop Controller* beginning on page 6–66 describes troubleshooting procedures for the benchtop controller.
- *Troubleshoot the Mainframe* beginning on page 6–68 describes troubleshooting procedures for the benchtop mainframe.
- *Troubleshoot the Expansion Mainframe* beginning on page 6–71 describes troubleshooting procedures for the expansion mainframe and the expansion module.

Service Level

This section is designed to help you isolate problems to a replaceable part level that is reflected in the replaceable parts lists at the end of this manual. In most cases, faults are isolated to circuit boards or assemblies but not to individual components on the circuit boards. If you suspect problems with components on the circuit boards that are not covered in this manual, you must return the entire assemblies to Tektronix for repair.

Check for Common Problems

Use Table 6–9 to quickly isolate possible failures. The table lists problems related to the TLA721 Benchtop Mainframe, TLA7XM Expansion Mainframe, and TLA715 Portable Mainframe (the TLA715 Portable Mainframe is included in this section to cover instances where the TLA715 Portable Mainframe is connected to a TLA7XM Expansion Mainframe). The symptoms listed in the Table 6–9 are not exhaustive, but they may help you eliminate problems that are easy to fix.

CAUTION. *Always power the mainframe off before attempting to install or remove modules. Installing or removing modules when the mainframe is powered on can damage the modules and the mainframes.*

Table 6-9: Failure symptoms and possible causes

Symptom	Possible causes and recommended action
Mainframe does not power-on	Verify that all power cords are connected to the mainframe and to the power source. Check that the mainframe receives power when you press the On/Standby switch. Check that fans start and that front-panel indicators light. Check that power is available at the power source. Check for failed fuses. Mainframe failure: contact your local Tektronix service center.
Expansion mainframe does not power-on	Verify that all power cords are connected to the expansion mainframe and to the power source. Check that all of the TLA 7XM expansion modules are firmly seated, and that the mounting screws on the TLA 7XM expansion modules are tightened. Check that the cables between the mainframe and the expansion mainframe are correctly connected: A → A, B → B, and C → C. Check that the TLA 7XM expansion module is in slot 0 of the TLA 7XM expansion chassis. Check that power is available at the power source. Check for failed fuses. Expansion mainframe failure: contact your local Tektronix service center.
Front panel power switch light comes on but the blower will not operate	Check for faulty blower cable. Check for defective bower. Power supply failure: contact your local Tektronix service center.
Monitor does not power-on	Check the monitor power cord connection. Check for failed fuse. Monitor connected to Secondary Video Out port and dual monitor operation not enabled. Ensure that the monitor is connected to the Primary Video Out port and that dual monitor mode is enabled. Monitor failure: contact the vendor of your monitor for corrective action.
Monitor display is blank	Check that the monitor is connected to the mainframe; replace the cable if necessary. If the monitor connected to the Primary Video Out port is blank, try connecting another monitor to the Secondary Video Out port; if both displays are blank, contact your local Tektronix service center. External monitor controls turned down; adjust monitor controls for brightness and contrast. Check the controller BIOS setups for the monitor. Faulty monitor; contact the vendor of your monitor for corrective action.

Table 6-9: Failure symptoms and possible causes (Cont.)

Symptom	Possible causes and recommended action
Mainframe powers on but does not complete the power-on sequence	Power off mainframe and check that all modules are fully inserted. If mainframe is a benchtop mainframe, check the status of the SYSTEM FAIL and TEST LEDs on the benchtop controller. If the modules are fully inserted in the mainframe and either LED stays on, contact your local Tektronix service center. Check the status of the READY and ACCESSED LEDs on the front panel of the application modules. The READY LED turns on when the module passes the power-on diagnostics and when the module is ready to communicate with the controller. The ACCESSED LED turns on any time the controller accesses the module. Check for disk in floppy disk drive; make sure mainframe boots from the hard disk drive. Check for faulty module. Remove modules one at a time and power-on the mainframe. If mainframe completes the power-on sequence, replace faulty module. Possible software failure or corrupted hard disk; try reinstalling the software.
Hard disk drive related symptoms Benchtop controller fails to boot Benchtop controller not operating	Faulty hard disk drive, try booting to the floppy disk drive or CD-ROM drive. Corrupted controller BIOS module firmware, reinstall firmware (refer to the instructions in the *Tektronix Logic Analyzer Family User Manual*). Controller BIOS setup problem, verify BIOS settings in the *Tektronix Logic Analyzer Family User Manual* or check Table 6–12 on page 6–62 for information on BIOS error codes and messages. Replaceable hard disk drive not installed. Replaceable hard disk drive or fixed hard disk drive not configured properly for master-slave operation; reconfigure master-slave jumpers on the respective drives. Faulty hard disk drive: contact your local Tektronix service center. Faulty benchtop controller: contact your local Tektronix service center.
Power-on diagnostics fail	Isolate problem to faulty mainframe or to faulty module. Multiple diagnostic failures across modules indicate a faulty mainframe. Diagnostic failures confined to an single module most likely indicate a faulty module. Contact your local Tektronix service center.
Mainframe does not recognize accessories such as monitor, printer, or keyboard	Check that accessories are properly connected or installed. Try connecting other standard PC accessories or contact your local Tektronix service center.
CD-ROM drive related failure	Defective CD-ROM drive, substitute known good CD-ROM drive. Defective CD-ROM drive cable. Defective CD-ROM drive board. Incorrect CD-ROM drive configuration in BIOS table, refer to the *Tektronix Logic Analyzer Family User Manual* for the correct settings.
LA Module merge not allowed in the Tektronix Logic Analyzer application	Merge cable between LA modules not installed. LA modules are not compatible: check the merge rules in the online help and in the *Tektronix Logic Analyzer Family User Manual.*

Table 6-9: Failure symptoms and possible causes (Cont.)

Symptom	Possible causes and recommended action
MS Windows comes up but the Tektronix Logic Analyzer application does not	Mainframe not set up to start application at power-on. Start application from the desktop, by double-clicking on the Tektronix Logic Analyzer icon on the desktop. Faulty or corrupt software; reinstall the application software.
MS Windows comes up in Safe mode	Exit the Safe mode and restart the mainframe. Incompatible hardware and hardware driver software. Either install hardware driver or remove the incompatible hardware.
Tektronix Logic Analyzer application starts but modules do not display in System window	Module firmware has not been updated (reflashed) The flash jumper was not removed after the module firmware was reflashed. Power off mainframe and check that all modules are fully inserted. Module address switches not set correctly. Power off mainframe and remove module. Set address switches to FF and reinstall module. Module failure; replace with known-good module or contact your local Tektronix service center. Mainframe failure; contact your local Tektronix service center.
Expansion mainframe is not recognized by the system. Expansion mainframe does not show up in the system window.	Power down the mainframe and expansion mainframe(s). Check that both of the TLA7XM expansion modules are firmly seated, and that the mounting screws on the TLA7XM expansion modules are tightened. Remove the two blue expansion cables and the gray expansion cable. Examine the connectors on the cables for bent or broken pins. Examine the connectors on the expansion mainframe. Reconnect the two blue expansion cables and the gray expansion cable and tighten the screws on the connectors. Verify that the cables are not crossed; verify that the cables are connected: A → A, B → B, and C → C. Power-on the mainframe and expansion mainframe(s). (The mainframe power must be recycled in order for the ResMan32 (resource manager) application to correctly configure.) Expansion mainframe failure; contact your local Tektronix service center.
Expansion mainframe is recognized by the system, but installed modules are not.	Power down the mainframe and expansion mainframe(s). Power-on the mainframe and expansion mainframe(s). (The mainframe power must be recycled in order for the ResMan32 (resource manager) application to correctly configure.) Module address switches not set correctly. Power off mainframe and remove module. Set address switches to FF and reinstall module. Power-down all mainframes, install a known good module from the benchtop mainframe into the expansion mainframe where the modules were not recognized. Power up all mainframes and retry. Module failure; contact your local Tektronix service center.

Table 6-9: Failure symptoms and possible causes (Cont.)

Symptom	Possible causes and recommended action
Portable Mainframe will not power-off with On/Standby switch.	The mainframe utilities may be set up to disable hard power-off. Check the setting of the mainframe utilities (the mainframe utilities are located in the Windows Control Panel). This is a Windows operating system problem. Try powering-off the mainframe using the Windows shutdown procedure. If the mainframe still does not power-off, disconnect power cord and reconnect after 10 seconds to reboot the mainframe.
Expansion Mainframe will not power-off with On/Standby switch.	If the expansion mainframe was incorrectly shut down (for example, the power cord was disconnected while the expansion mainframe was running) the expansion mainframe utility still "thinks" that the expansion mainframe is on. To correct this condition, press and hold the power switch for three to four seconds. The expansion mainframe will power-down on its own. Power-off the benchtop mainframe. Power-on the benchtop mainframe, the expansion mainframe will power-up normally.

Isolating System Problems

If you have looked at Table 6–9 and the Tektronix Logic Analyzer application fails to display any modules in the System window, you may have a system problem. Check for the following:

- Verify that the module address switches are set correctly. Power off the mainframe and remove the modules. Set the address switches to FF and reinstall the modules.
- Verify that the modules do not have the flash programming jumper installed on the rear of the module. Power off the mainframe and remove the modules. Remove the jumper and reinstall the modules.
- Try placing a suspected module in a different slot to verify slot dependency problems. For example, if you have a single module in slots 2 and 3, power off the mainframe, move the module to slots 3 and 4, and try the tests again If the module works in the new location, you have identified a faulty slot in the mainframe.
- Check for bent or broken pins on the backplane of the mainframe.
- Faulty module. Replace the suspected faulty module with a known good module, or contact your local Tektronix service center.
- Incompatible module firmware and mainframe software versions. You may have to update the system software and the module firmware so that they are compatible Refer to the *Tektronix Logic Analyzer Family User Manual* for updating the system software and module firmware.
- Check for computer viruses.

You can also execute the internal resource manager program (ResMan32.exe) to identify if any of the installed modules are being identified in the mainframe slots. Table 6-10 lists some of the command line options for executing ResMan32.

Table 6-10: Command line options for ResMan32

Option	Description
-a, -A, -o ,-O	ResMan32 will not close the text window after executing and displaying the results the major functions (default).
-p, -P	ResMan32 will not execute the mainframe power-on self test diagnostics (default).
-v, -V	ResMan32 records the resource manager actions in the text window in a short form or nonverbose mode.
+a, +A, +o ,+O	ResMan32 will terminate the tests and display the resultant action information in the text window.
+p, +P	ResMan32 will perform the mainframe power-on self test diagnostics.
+v, +V	ResMan32 records all actions in a text window in the verbose mode (default).
+t, +T	ResMan32 will not display the text window and the tests will terminate after executing regardless of the error conditions.
+m, +M	ResMan32 displays in a minimized window.

1. Quit the logic analyzer application and any other applications on the desktop.
2. Click on the Window Start button and select Run.
3. In the dialog box enter the following path:

   `C:\Program Files\TLA700\System\ResMan32.exe`

4. Click on OK.

   The ResMan32 program will check all of the installed modules and their address locations. The program will print out data similar to that in Figure 6-29 on page 6-58. In this example the mainframe has two logic analyzer modules installed.

   If ResMan32 encounters any errors (such as an unsupported instrument or application module), the resource manager will stop further communications and display information on why or at what point the instrument module was disabled.

```
Auto Exit - Off
Identify Static Configure Devices
             Found a device at LA 1
             Found a device at LA 2
Identify Dynamic Configure Devices
Finding expansion devices
Matching Devices to Slots
Configuring slots for 2 instruments ...
             match la=1 to slot=1 in frame=0
             match la=2 to slot=3 in frame=0
Checking device self test
Setting VISA Attributes
        la 1, slot 1: device_class 2, manf_id 0xffd, model_code 0x7eb, addr_spc 0
        la 2, slot 3: device_class 2, manf_id 0xffd, model_code 0x7f4, addr_spc 0
Setting VISA Address Maps
        A24 device @ la 1 - reqmem:7
        A24 device @ la 1 - starting address 200000x, size 65536
        A24 device @ la 2 - reqmem:7
        A24 device @ la 2 - starting address 210000x, size 65536
Enabling Events & Responses
             Default IRQ for system: 4
             la 1: Int ID 1 assigned to IRQ 4
             Enabling Events: 8-9 16-32 47-63 124-125 127
             la 1: Asynchronous Enable succeeded
                          **Responses are unsupported by this device
             la 2: Int ID 1 assigned to IRQ 4
             Enabling Events: 16-32 124-125 127
             la 2: Asynchronous Enable succeeded
                          **Responses are unsupported by this device
Begin Normal Operation
     slot 1, LA 1, started successfully
     slot 3, LA 2, started successfully
VISA Data
        Frame 0, Slot 01:  la_1=1,1,4093,2027,2,0,1,7,2097152
        Frame 0, Slot 03:  la_2=2,3,4093,2036,2,0,1,7,2162688
```

Figure 6-29: ResMan32 program output

Eliminate other Problem Sources

The TLA700 Series Logic Analyzer comprises modules and the benchtop mainframes. The following procedures will help you eliminate the mainframe and other modules as possible sources of the failure.

Substitute a Good Module

If you have available a known good controller, perform the following procedure:

1. Remove the suspect benchtop controller from the mainframe. The benchtop controller is a slot zero device. First verify that the benchtop controller is installed in Slot 0 of the mainframe.
2. Power on the mainframe and check for normal operation.
3. If the failure symptoms are still present with the known good benchtop controller installed, the problem is most likely in the benchtop mainframe, not in the controller.
4. If your benchtop chassis operates normally with the known good benchtop controller installed, then the suspect controller is at fault; refer to the *Troubleshoot the Benchtop Controller Module* on page 6–66 for more information.

Check the Benchtop Mainframe

If you do not have a known good benchtop controller, perform the following procedure to make sure the benchtop mainframe is not the source of the failure:

- Disconnect any attached expansion mainframes.
- Remove all plug-in modules from the mainframe except the benchtop controller.
- Power on the mainframe and check for normal operation. If the instrument powers on, then the problem is in one of the modules that you removed earlier, the expansion mainframe, or cables connecting the expansion mainframe.

Diagnostics

The following diagnostics are available for the logic analyzer. Only those tests that apply to the mainframe and benchtop controller are listed here. For information on diagnostics that are run on individual product modules, refer to the appropriate service manual.

- Power-on BIOS test
- Power-on diagnostics
- Extended diagnostics

- CheckIt Utilities
- TLA Mainframe diagnostics

Power-on BIOS Test

On power up, the instrument automatically runs the power on BIOS test. If the power on BIOS test detects a problem, BIOS error(s) will be displayed. The BIOS error messages are found in Table 6–12 on page 6–62.

Power-on Diagnostics

The power-on diagnostics check the basic functionality of the instrument at every power on. If any failures occur at power on, the screen displays the calibration and diagnostics property page. Table 6–11 lists a subset of the power on tests. Use the results of the tests to help you isolate problems. You can also select the Calibration and Diagnostics property page from the System menu of the logic analyzer application.

The power on tests ensure that hardware is installed and can be accessed by the software. The tests do not provide any performance information, but they provide limited diagnostic information. The TLA Mainframe diagnostics provide more extensive tests than the power-on diagnostics. The interrupt lines and trigger lines are tested for each installed application module.

Table 6-11: Power-on diagnostic tests

Component	Group & test	Power on	Extended
TLA Mainframe	VTC Reset Test	✓	
	VTC Walk1 Test	✓	
	ADG Register Test	✓	
	ADG VXI Addr Test	✓	
	ADG VXI Data Test	✓	
TLA System	Interrupt Lines	✓	✓
	Trigger Lines	✓	✓

Extended Diagnostics

The extended diagnostics provide more in-depth information than the power-on diagnostics. The extended diagnostics test modules in the mainframe and in the expansion mainframe. You can use the extended diagnostics to isolate problems to a single module or to a mainframe. To display the extended diagnostics, select the Extended tab in the Calibration and Diagnostics property page. Disconnect probes attached to module before starting the diagnostics.

You can run individual tests, loop on tests, or run until a failure occurs by selecting the options at the right side of the property page. When you first display the extended diagnostics property page, some of the test results may display an Unknown test result. This indicates that parts of the tests did not get checked by the power-on tests. When you click the Run button on the property page, the extended diagnostics run and the unknown state should change to either Pass or Fail. Table 6–11 indicates the system tests that are checked in more detail with the extended diagnostics.

For more information on the extended diagnostics refer to the online help by clicking on the Help button in the property page.

TLA Mainframe Diagnostics

The TLA Mainframe Diagnostics are comprehensive software tests that check benchtop mainframe as well as the benchtop controller. If the TLA Mainframe Diagnostics test fails to run correctly, the benchtop controller is defective.

To run the TLA Mainframe diagnostics, do the following steps:

1. Quit all other applications on the instrument.
2. Click on START in the tool bar.
3. Select Programs from the Start menu.
4. Select Tektronix Logic Analyzer from the Programs menu.
5. Select TLA Mainframe Diagnostics from the Tektronix Logic Analyzer menu. (Refer to the online help in the TLA Mainframe Diagnostics application for information on running the TLA Mainframe Diagnostics).

Expansion Mainframe Diagnostics

At power-on, the instrument runs two power-on diagnostics for any attached expansion mainframes: “Power, Cables A & B and config”, and “Cable C Connection Test”.

If either of these power-on diagnostics fail, none of the modules associated with the expansion mainframe, and possibly the expansion mainframe itself, will be recognized. The result will be as if the expansion mainframe was not connected.

CheckIt Utilities

If the instrument passes all other diagnostics and you still suspect problems, you can run the CheckIt Utilities. The CheckIt Utilities is a third-party software that allows you to check the main part of the PC controller such as memory, I/O ports, disk drives, keyboard, and mouse.

To run the CheckIt Utilities, you must have either a working keyboard, a pointing device (mouse), and Windows must be running. Before starting the utilities install a test floppy disk in the floppy disk drive and a test CD in the CD-ROM drive. Refer to the CheckIt Utilities online help for additional information on running the utilities.

BIOS Error Messages

The instrument runs a BIOS test on when you first power-on the instrument. If the BIOS test encounters any problem the program displays the error on the external monitor. Table 6–12 lists the error codes, an explanation of each error code, and actions that can be taken. Refer to the *Tektronix Logic Analyzer Family User Manual* for information on BIOS setup parameters and feature settings.

Table 6-12: BIOS error codes and explanations

Error code	Error code explanation	Action to be taken
Check Date and Time Settings	The date and time settings have been reset to their factory default values.	In BIOS Setup, enter the correct date and time.
Diskette drive A error	The BIOS test recognizes the presence of the floppy disk drive but the floppy disk drive fails the POST test. The floppy disk drive may be defined incorrectly in the CMOS setup. The floppy disk drive may not be connected correctly on the adapter board.	Verify the floppy disk drive is configured correctly in the CMOS setup. Verify that the floppy disk drive cable is connected on the floppy disk drive and the adapter board.
Extended RAM Failed at offset: nnnn	The extended memory may not be configured correctly or the extended memory is defective at HEX address nnnn.	Verify that the extended memory is configured correctly in the CMOS setup. Exchange the SO DIMMs, if one of the SO DIMMs are defective the error address should change.
Failing Bits: nnnn	The RAM address mapped to HEX nnnn in the system, shadow, or extended memory has failed. A 1 in the map indicates a failed bit.	Exchange the SO DIMMs, if one of the SO DIMMs are defective the error address should change.
Fixed Disk 0 Failure (or) Fixed Disk Controller Failure	The hard disk drive may not be defined correctly in the CMOS setup. The hard disk drive may not be connected correctly. The hard disk drive may be defective. The replaceable hard disk drive may not be installed.	Verify the hard disk drive is configured correctly in the CMOS setup. Verify that the hard disk drive cable is connected on the hard disk drive. Verify that the replaceable hard disk drive is installed.
Incorrect Drive A Type - run Setup	The floppy disk drive may not be defined correctly in the CMOS setup.	Verify the floppy disk drive is configured correctly in the CMOS setup.

Table 6-12: BIOS error codes and explanations (Cont.)

Error code	Error code explanation	Action to be taken
Invalid NVRAM media type	The BIOS can not access the NVRAM.	Replace the memory SO DIMMs.
Keyboard controller error	The keyboard controller may be defective.	Swap keyboard with a known good keyboard. Replace the benchtop controller module.
Keyboard error	The keyboard may be missing or defective.	Swap keyboard with a known good keyboard.
Keyboard error nn	There may be a stuck or defective key. The BIOS returns the address of the key where HEX nn is the address of the key.	Swap keyboard with a known good keyboard.
Operating system not found	The operating system can not be found.	Insert a bootable disk into the floppy disk drive and try to reboot. Reload the Windows operating system.
Parity Check 1	A parity error was found on the communications bus. The BIOS will return the address of the error or display ???? if it cannot.	There may be a bad connection between the benchtop controller and the Benchtop Chassis, or the benchtop controller is not installed at slot zero and one. Turn the power off, remove the benchtop controller. Inspect the connectors on the rear of the benchtop controller. Install the benchtop controller into slot zero and one. Apply power and re-test.
Parity Check 2	A parity error was found on the I/O bus. The BIOS will return the address of the error, or display ???? if it cannot.	The controller board may be defective. Replace the benchtop controller.
Press <F1> to resume, <F2> to Setup	This message is displayed after a recoverable error message.	This is a information message. Press the <F1> key to restart the boot process, or press the <F2> key to enter the CMOS setup and make changes to the definitions. Verify that the CMOS setup is configured correctly.
Press <F2> to enter SETUP	This is an optional message that can be turned on and off in CMOS setup. It is only displayed during a POST test.	This is a information message.

Table 6-12: BIOS error codes and explanations (Cont.)

Error code	Error code explanation	Action to be taken
Previous boot incomplete - Default configuration used	The previous POST test was not successful. If the POST test fails, POST will load default values then display a message to run the CMOS setup. If incorrect values are loaded, future boot attempts may fail.	This is an information message. Verify that the CMOS setup is configured correctly.
Real time clock error	The real time clock may be defective.	The controller board may be defective. Replace the benchtop controller.
Shadow Ram Failed at offset: nnnn	The shadow RAM has failed at Hex location nnnn.	The system will run without shadow RAM, but it will run slow. Exchange the SO DIMMs, if one of the SO DIMMs are defective the error address should change.
System battery is dead - Replace and run SETUP	The CMOS clock may be dead or disconnected. The CMOS setup may have to be reset.	The system battery is internal to the RAM/Calender component. To replace the system battery, replace the RAM/Calender component. Note: After replacing the RAM/Calendar component, you must reflash the BIOS. Refer to *Update the BIOS* and perform the procedures to reflash the BIOS.
System BIOS shadowed	The system BIOS was copied to shadow RAM.	This is an informational message. No action needs to be performed.
System cache error - Cache disabled	When the system BIOS failed the cache test the cache was disabled.	The system will run without cache RAM, but it will run slow. Reboot the system.
System CMOS checksum bad - run SETUP	The system CMOS settings may be incorrect or modified incorrectly by some application. The CMOS setup may have to be redefined.	This is an information message. Reboot the system first, then verify that the CMOS setup is configured correctly.

Table 6-12: BIOS error codes and explanations (Cont.)

Error code	Error code explanation	Action to be taken
System RAM Failed at offset: nnnn	The system RAM at HEX address nnnn may be defective.	Exchange the SO DIMMs. If one of the SO DIMMs are defective the error address should change.
System timer error	The BIOS failed the timer test. The controller board may be defective.	Try rebooting the system first. If this message keeps reappearing the benchtop controller is defective. Replace the benchtop controller.

TLA Startup Sequence

The following information is intended to provide troubleshooting hints in case the logic analyzer fails to complete the startup sequence. You may want to refer to Figure 6–30 on page 6–66 while reading the following paragraphs.

At power on, the mainframe software starts the mainframe and module kernel tests. If the mainframe passes the kernel tests, it attempts to boot the Windows operating system. If the mainframe fails the kernel tests, it displays the error code(s), beeps, and terminates the startup sequence.

The Windows operating system starts the resource manager. The resource manager performs the following tasks:

- Mainframe power-on self tests.
- Verifies the power-on self test status.
- Inhibits any failed modules.
- Records the power-on self test failures.
- Determines the logic analyzer configuration.
- Executes the system controller power-on diagnostics.

After completing all of the above tasks, the logic analyzer starts the Tektronix Logic Analyzer application which performs the following tasks:

- Power-on diagnostics on all installed modules.
- Power-on diagnostics on the logic analyzer system.
- Records the Pass/Fail status in the Calibration and Diagnostics property sheet.

If no failures occur, the logic analyzer application is ready to use for regular tasks.

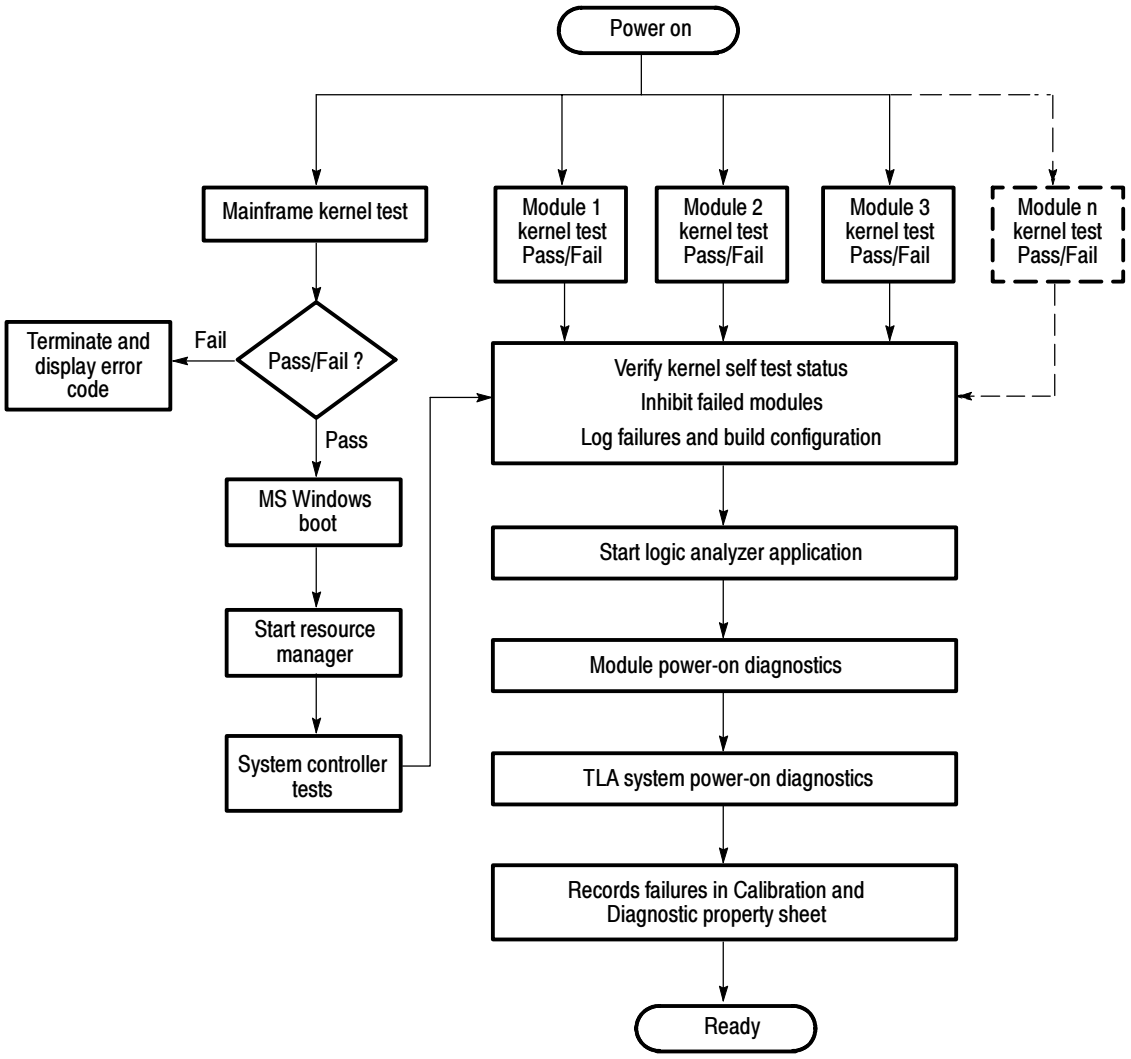

Figure 6-30: Startup sequence

Troubleshoot the Benchtop Controller

This subsection provides additional information to help you troubleshoot the benchtop controller. The procedures assume that the benchtop mainframe is fully functional.

Required Equipment

No special equipment is required since there are no accessible test points to measure voltages and signals within the controller.

Fault Isolation

Use the troubleshooting tree in Figure 6–31 to identify problems in the benchtop controller.

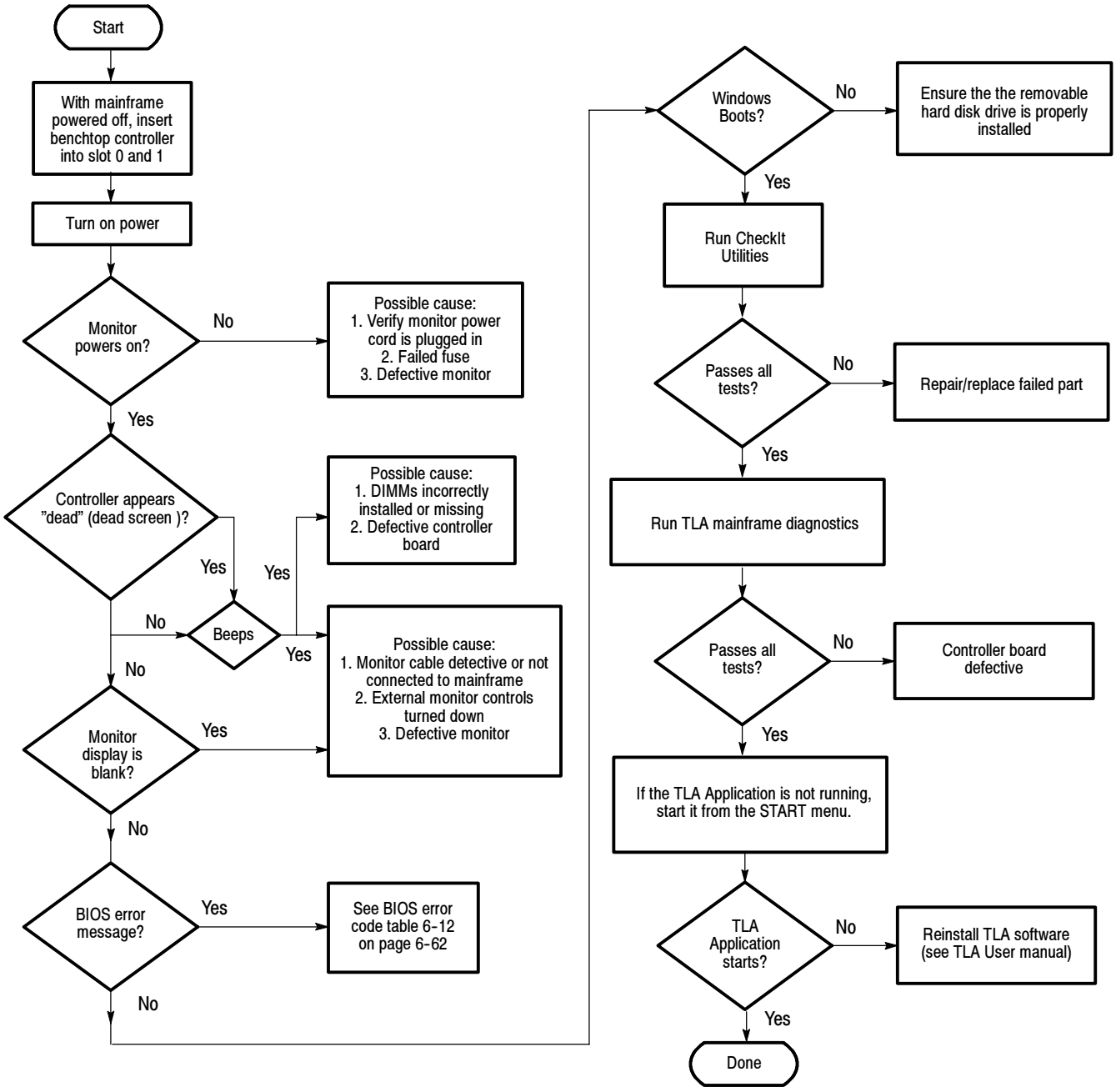

Figure 6-31: Benchtop controller troubleshooting tree

Troubleshoot the Mainframe

Use the following steps to troubleshoot problems in the benchtop mainframe. This procedures assume that the benchtop mainframe is not connected to any

expansion mainframes and that the benchtop controller is fully functional. You can use these procedures to also troubleshoot the expansion mainframe once you have isolated problems to the mainframe itself.

Most of the problems in the mainframe can be isolated to power supply problems or to cooling problems. If the front panel Standby/On switch lights up when you turn the switch on, you should verify that the blower operates and then check the power supply voltages. You can also isolate problems in the mainframe by using the troubleshooting tree shown in Figure 6–32.

Power Supply Problems

You can easily check the power supply voltages by following the *Checking the Power Supply Voltages* beginning on page 4–6. If the power supply voltages are not correct, this could be due to several reasons:

- Open fuses
- Faulty power supply
- Faulty modules. Remove the modules and try the power supply checks again. Alternately, try installing a known-good module.

Inadequate Cooling

If there is a cooling problem, check for the following:

- Blower not working properly
- Faulty shutters. Verify that all of the empty slots in the mainframe are closed when no modules are installed. If necessary replace the shutters.
- Verify that the instrument has adequate clearance near the ventilation holes around the instrument.
- If the instrument has shut down due to overheating, and you have exhausted all other troubleshooting suggestions, you may have a faulty controller; replace the controller module.

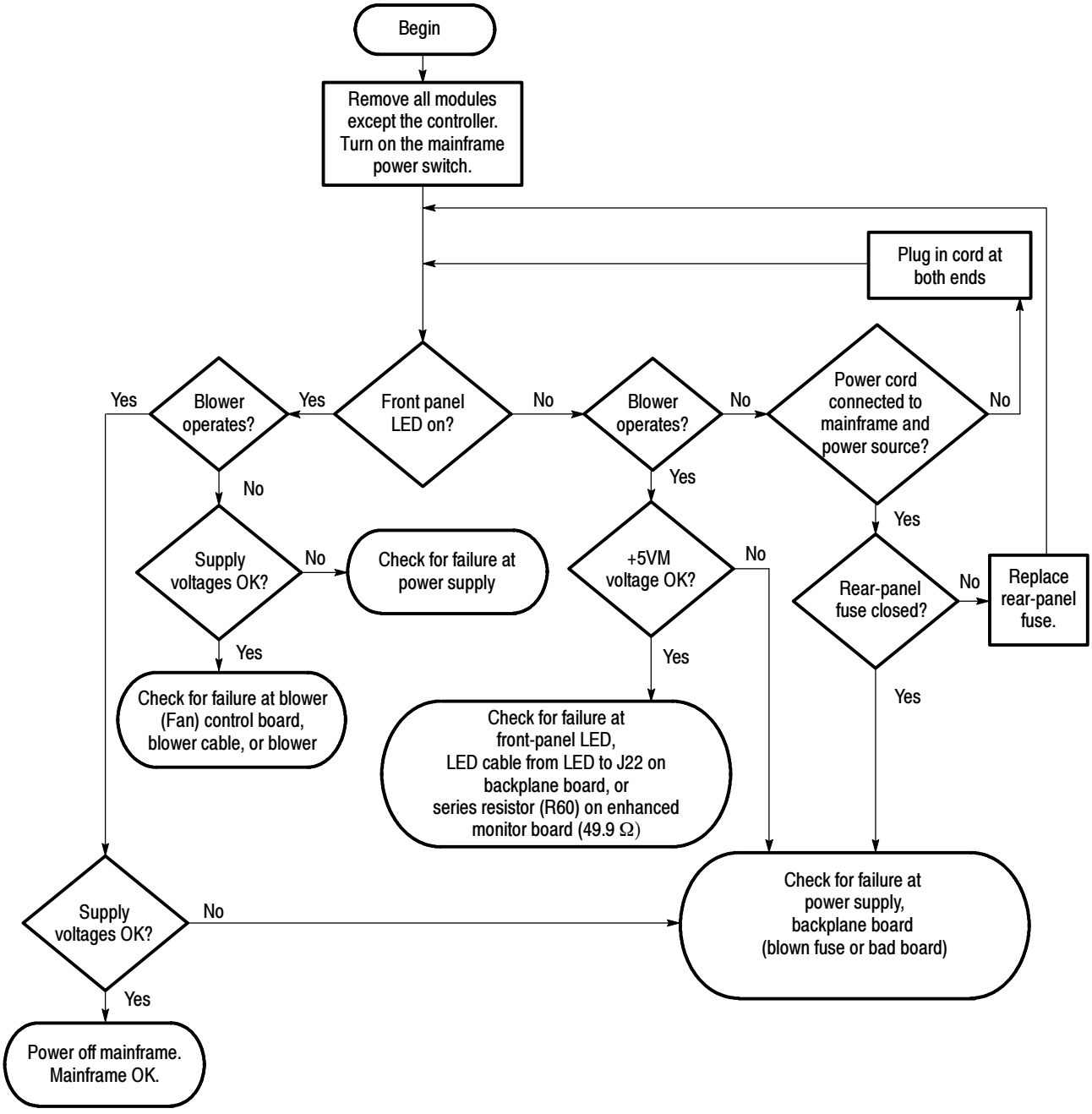

Figure 6-32: Mainframe troubleshooting tree

Troubleshoot the Expansion Mainframe

Because the expansion mainframe adds a level of complexity to troubleshooting problems, this section will concentrate on tips to aid you in troubleshooting expansion mainframe related problems.

Check the Power-on Sequence

There are certain signs that the expansion mainframe is not powering-on correctly. By looking and listening you can determine if the expansion mainframe is not powering-on because the expansion mainframe is not receiving a signal from the expansion module.

Upon powering-on the benchtop mainframe (or portable mainframe), the expansion module in the benchtop mainframe sends a signal, to the expansion module in the expansion mainframe via the three expansion cables. If the expansion mainframe does not receive this signal, the expansion mainframe will not be prompted to power-on.

If the expansion mainframe receives the power-on signal the fan will start and the lamp on the mainframe will light. Further indications that the mainframe is receiving signals from the expansion module is that the lights on the expansion module and any other installed modules will blink, indicating that signals are being received.

Substitute a Known Good Expansion Module

If you have available a known good expansion module, complete the following steps:

1. Remove the suspect expansion module from the expansion mainframe. The expansion module is a Slot 0 device when installed in the expansion mainframe. Verify that the expansion module is installed in Slot 0 and that the MODID switches on the back of the module are set to FF.
2. Try swapping the expansion module from the benchtop mainframe (or portable mainframe) with the expansion module from the expansion chassis. This sometimes works because one module is a sender while the other module is a receiver.

CAUTION. *The single-wide expansion module requires up to 60 lbs. of insertion force to engage it into the back plane. Do not use the mounting screws to engage the module into the backplane of the mainframe.*

The mounting screws will not provide enough force to seat the expansion module, and you can easily be strip the threads.

3. Power-on the mainframe and check for normal operation.

4. If the mainframe still fails to operate properly, install the known good expansion module in Slot 0 of the expansion mainframe.
5. If the failure symptoms are still present with the known good expansion module installed, try new expansion cables between the mainframes.
6. If the symptoms are still present after using a known good expansion module and known good cables, the problem is most likely in the expansion mainframe and the module needs to be serviced.

Check the Expansion Mainframe

If you do not have a known good expansion module, perform the following steps to make sure the expansion mainframe is not the source of the failure:

- Remove all plug-in modules from the expansion mainframe except the expansion module.
- Power-on the benchtop mainframe and determine if the expansion mainframe is recognized by the TLA system.

Replace the Expansion Module with a Benchtop Controller Module

Another way to isolate problems would be to "trick" the expansion mainframe into thinking it was a benchtop mainframe. You can do this by removing the expansion module from the Slot 0 position in the expansion mainframe and replacing it with a known good benchtop controller module from your benchtop mainframe.

Because the expansion mainframe is set up to power-on from a signal from the expansion module (which is no longer present) you will have to press and hold the power switch on the expansion mainframe for three to four seconds.

If the expansion mainframe powers-on correctly, the problem can be isolated to either the expansion modules or to the expansion cables.

Adjustments after Repair

There are no adjustment procedures required after replacing any part of the benchtop controller, expansion module, or mainframes. You should, however, power-on the instrument and verify that all diagnostics pass.

There may be adjustment procedures required for some of the installed modules. Check the appropriate service manual for additional information.

Repackaging Instructions

This section contains the information needed to repackage the instrument for shipment or storage.

Packaging

When repacking the instrument 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 the advertised options and optional accessories for the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe. Refer to the *Mechanical Parts List* for a list of standard and optional accessories for the mainframes.

Service Options

Tektronix Service Options are available at the time you order your instrument. Table and Table list the service options available for the TLA721 Benchtop Mainframe and TLA7XM Expansion Mainframe. The availability of installation and on-site services depends on the product and geography. Upgrade options are ordered with the mainframe products and cover individual modules.

Table 7-1: TLA721 Service Options

Option	Description
C3	Provides factory calibration certification on delivery, plus two more years of calibration coverage.
D1	Provides initial test data report from factory on delivery
D3	Provides test data on delivery plus a test data report for every calibration performed during three years of coverage; requires Option 3C
IN	Provides initial product installation/configuration and start-up training session including front panel and product familiarization.
R3	Extends product repair warranty to a total of three years.
S1	Upgrades the standard one year, “return to depot” warranty to an on-site warranty.
S3	Upgrades any C3, D3, and R3 options purchased to on-site coverage for three years

Table 7-2: TLA7XM Service Options

Option	Description
IN	Provides initial product installation/configuration and start-up training session including front panel and product familiarization.
R3	Extends product repair warranty to a total of three years.
S1	Upgrades the standard one year, “return to depot” warranty to an on-site warranty.
S3	Upgrades any C3, D3, and R3 options purchased to on-site coverage for three years

Product Options

The following product options are available for the TLA721 Benchtop Mainframe:

- Option 1A, add 10/100 LAN CardBus/32-bit PC card, 10BaseT
- Option 1C, add iView cable
- Option 1K, add LACART logic analyzer cart
- Option 3M, add 18-inch LCD flat panel monitor
- Option 4M, add 21-inch LCD flat panel monitor

Power Cord Options

The following power cord options are available for the TLA721 Benchtop Mainframes:

- Option A1, Universal European 230 V
- Option A2, United Kingdom 230 V
- Option A3, Australian 230 V
- Option A4, North American, 230 V
- Option A5, Swiss 230 V
- Option 99, no power cord

The following power cord options are available for the TLA7XM Expansion Mainframes:

- Option A1, Universal European 230 V
- Option A2, United Kingdom 230 V
- Option A3, Australian 230 V
- Option A4, North American, 230 V
- Option A5, Swiss 230 V
- Option 99, no power cord

Electrical Parts List

Refer to the *Mechanical Parts List* chapter for a complete listing and description of replaceable parts for the TLA721 Benchtop Mainframe and the TLA7XM Expansion mainframe.

Diagrams

This chapter contains the interconnection and block diagrams for the benchtop mainframe and expansion mainframe.

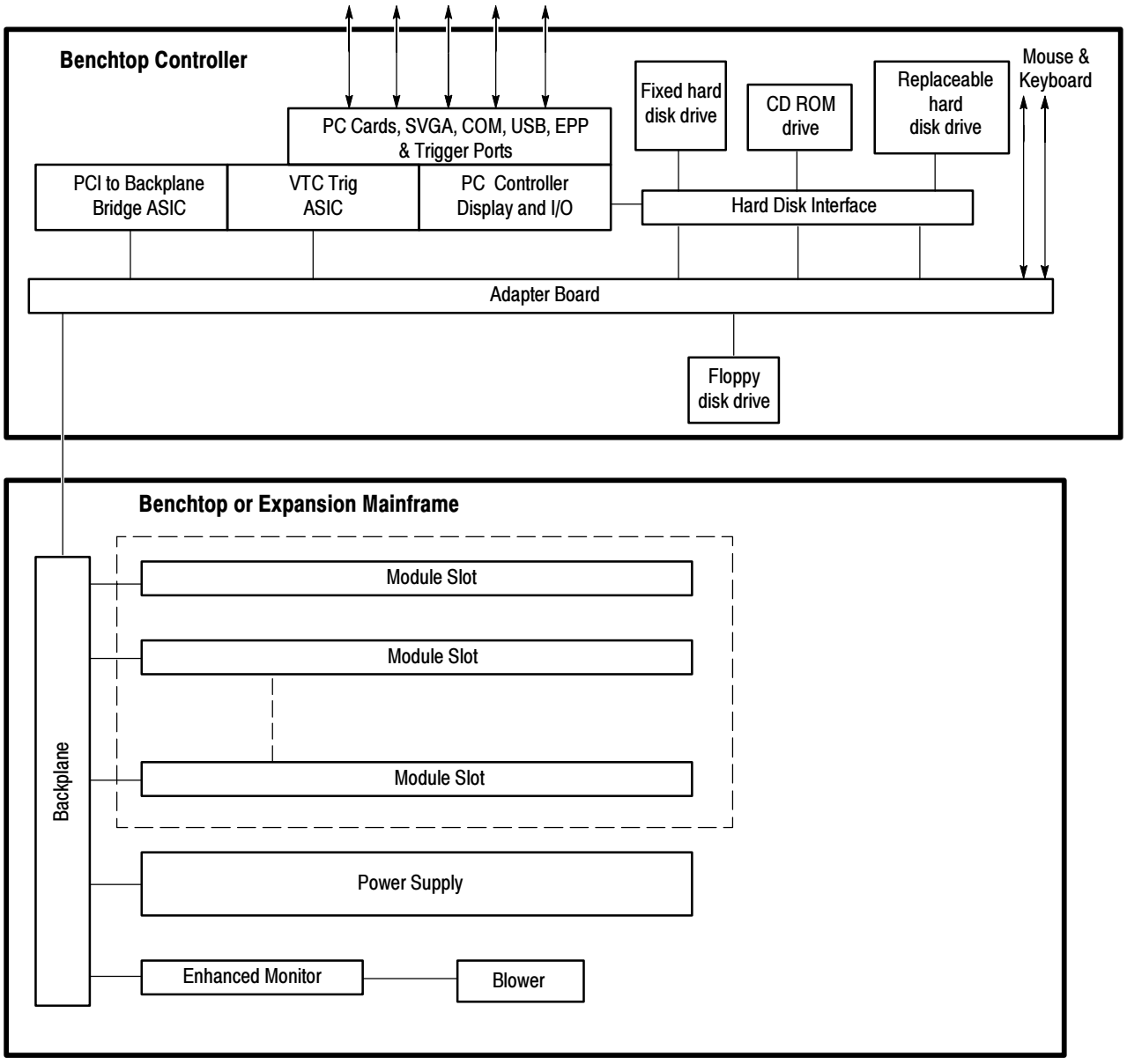

Figure 9-1: Interconnection diagram

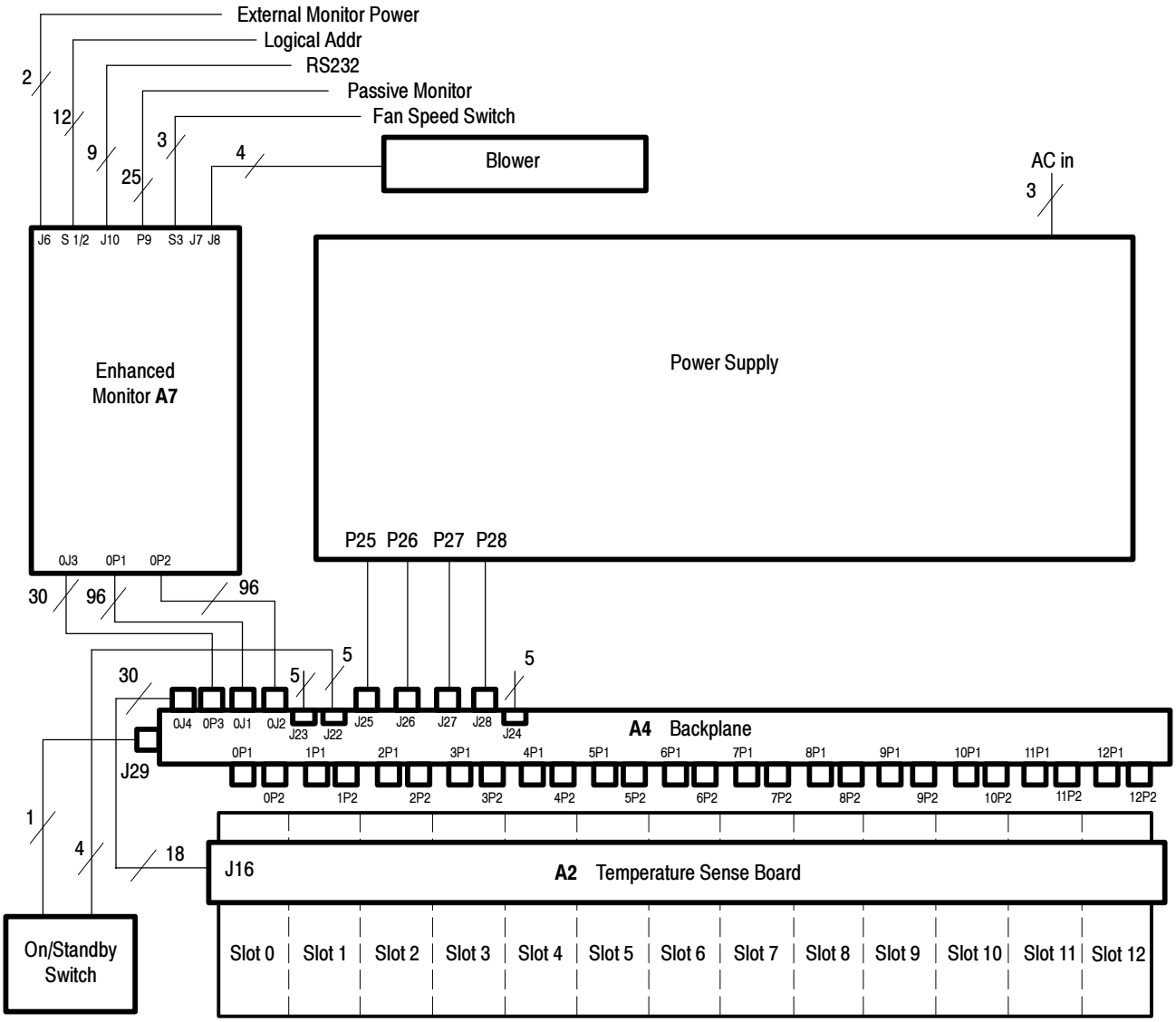

Figure 9-2: Benchtop mainframe block diagram

Figure 9-3 shows the block diagram for the expansion mainframe when it is connected to a benchtop mainframe.

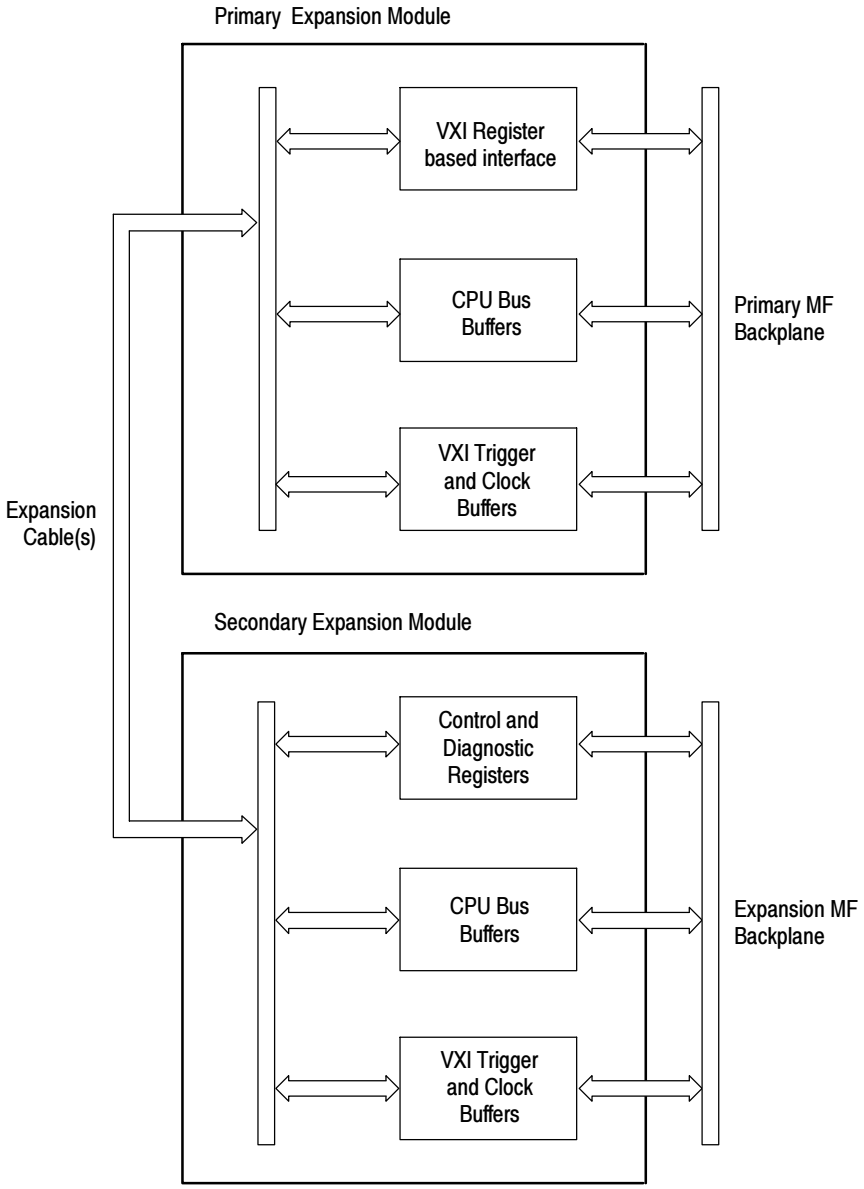

Figure 9-3: Benchtop and expansion mainframe block diagram

Mechanical Parts List

This section contains a list of the replaceable parts for the TLA721 Benchtop Mainframe and the TLA7XM Expansion Mainframe. 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.

Module Servicing

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

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

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

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

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the TLA721 Benchtop Mainframe and TLA7XM Expansion Mainframe. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts list column descriptions

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

Abbreviations

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

Mfr. Code to Manufacturer Cross Index

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

Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
00779	TYCO ELECTRONICS CORPORATION	CUSTOMER SERVICE DEPT PO BOX 3608	HARRISBURG, PA 17105-3608
01295	TEXAS INSTRUMENTS INC	SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY PO BOX 655303	DALLAS, TX 75272-5303
01963	CHERRY ELECTRICAL PRODUCTS CO	3600 SUNSET AVENUE	WAUKEGAN, IL 60087-3214
04713	MOTOROLA INC	SEMICONDUCTOR PRODUCTS SECTOR 5005 E MCDOWELL ROAD	PHOENIX, AZ 85008-4229
06383	PANDUIT CORP	17303 RIDGELAND AVE	TINLEY PARK, IL 60477-3048
060D9	TENSOLITE COMPANY	PRECISION HARNESS AND ASSEMBLY 3000 COLUMBIA HOUSE BLVD, #120	VANCOUVER, WA 98661
09922	FCI USA INC	825 OLD TRAIL ROAD	ETTERS, PA 17319-9769
0B445	ELECTRI-CORD MFG CO INC	312 EAST MAIN STREET	WESTFIELD, PA 16950
0D1M6	NMB TECHNOLOGIES INC	9730 INDEPENDENCE AVE	CHATSWORTH, CA 91311
0J9P4	DELTA ENGINEERING & MFG. CO.	19500 SW TETON	TUALATIN, OR 97062
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214-4657
0KB05	NORTH STAR NAMEPLATE INC	5750 NE MOORE COURT	HILLSBORO, OR 97124-6474
0KM03	INSTRUMENT SPECIALTIES CO INC.	505 PORTER WAY	PLACENTIA, CA 92670
0L0L7	RADISYS CORPORATION	5445 NE DAWSON CREEK DRIVE	HILLSBORO, OR 97124
0VF15	TOTAL TECHNOLOGIES LTD	2110 S ANNE ST	SANTA ANNA, CA 92704
0ZQ35	3COM CORPORATION	5353 BETSY ROSS DRIVE	SANTA CLARA, CA 95052-8145
1GM54	ZYTEC CORP	7575 MARKET PLACE DR	EDEN PRAIRIE, MN 55344
24931	BERG ELECTRONICS INC	BERG ELECTRONICS RF/COAXIAL DIV 2100 EARLYWOOD DR, PO BOX 547	FRANKLIN, IN 46131
26742	METHODE ELECTRONICS INC	7444 WEST WILSON AVE	CHICAGO, IL 60656-4548
27264	MOLEX PRODUCTS COMPANY	2222 WELLINGTON CT.	LISLE, IL 60532
2W733	BELDEN WIRE & CABLE COMPANY	2200 US HWY 27 SOUTH	RICHMOND, IN 47374
2W944	PAPST MECHATRONIC CORP	AQUIDNECK INDUSTRIAL PARK	NEWPORT, RI 02840
30817	INSTRUMENT SPECIALTIES CO INC.	SHIELDING WAY, PO BOX 650	DELAWARE WATER GAP, PA 18327
3M099	PORTLAND SCREW COMPANY	6520 N BASIN AVE	PORTLAND, OR 97217
50356	TEAC AMERICA INC	7733 TELEGRAPH RD	MONTEBELLO, CA 90640-6537
51506	ACCURATE SCREW MACHINE CO	19 BALTIMORE ST	NUTLEY, NJ 07110-1303
52152	3M COMPANY	INDUSTRIAL TAPE DIVISION 3M CENTER	ST PAUL, MN 55144-1000
53387	3M COMPANY	ELECTRONICS PRODUCTS DIV 3M AUSTIN CENTER	AUSTIN, TX 78769-2963
5F520	PANEL COMPONENTS CORP	PO BOX 115	OSKALOOSA, IA 52577-0115
5Y921	COMAIR ROTRON INC	2675 CUSTOMHOUSE CT	SAN YSIDRO, CA 92073
60128	MICROSOFT CORPORATION	ONE MICROSOFT WAY	REDMOND, WA 98052-8300
61081	ELECTRONIC SOLUTIONS	6790 FLANDERS DR	SAN DIEGO, CA 92121
61935	SCHURTER INC	1016 CLEGG CT PO BOX 750158	PETALUMA, CA 94975-0158
62559	SCHROFF INC	170 COMMERCE DRIVE	WARWICK, RI 02886-2430
63426	NKK SWITCH	NIHON KAIHEIKA IND CO LTD 7850 E GELDING DRIVE	SCOTTSDALE, AZ 85260
68579	PERMATRON CORP.	11400 MELROSE ST	FRANKLIN PARK, IL 60131
71400	BUSSMANN	DIVISION COOPER INDUSTRIES INC	ST LOUIS, MO 63178

Manufacturers cross index (Cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
73893	MICRODOT INC	50631 E RUSSELL SCHMIDT BLVD	MT CLEMENS, MI 48045
74594	COMPONENT RESOURCES INC	BUSSMAN PARTS, C/O CASEY LAKEY 14525 SW WALKER ROAD	BEAVERTON, OR 97006
75915	LITTELFUSE INC	800 E NORTHWEST HWY	DES PLAINES, IL 60016-3049
7X318	KASO PLASTICS INC	11013 A NE 39TH	VANCOUVER, WA 98662
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001
80126	PACIFIC ELECTRICORD CO	747 WEST REDONDO BEACH	GARDENA, CA 90247-4203
86928	SEASTROM MFG CO INC	456 SEASTROM STREET	TWIN FALLS, ID 83301
8X345	NORTHWEST SPRING MFG CO	5858 WILLOW LANE	LAKE OSWEGO, OR 97035
93907	CAMCAR DIV OF TEXTRON INC	ATTN: ALICIA SANFORD, 516 18TH AVE	ROCKFORD, IL 611045181
9F560	IBM CORPORATION	420 E SOUTH TEMPLE ST	SALT LAKE CITY, UT 84145
H2329	AEG-NEDERLAND NV	ALETTA JACOBSLAAN 7 POSTBUS 18, 1066 BP	AMSTERDAM, NETHERLANDS
34416	PARSONS MANUFACTURING CORP	1055 O'BRIEN DRIVE	MENLO PARK, CA 940251476
S3109	FELLER U.S. CORPORATION	72 VERONICA AVE	SOMERSET, NJ 08873
TK0588	UNIVERSAL PRECISION PRODUCT	1775 NW CORNELIUS PASS RD	HILLSBORO, OR 97124
TK2157	CONNECTOR TECHNOLOGY INC	5065 E HUNTER AVE	ANAHEIM, CA 92807-6001
TK2208	NORTHWEST RUBBER EXTRUDERS INC	16748 SW 72ND AVE	PORTLAND, OR 97224
TK2469	UNITREK CORPORATION	3000 LEWIS & CLARK HWY, SUITE 2	VANCOUVER, WA 98661
TK2541	AMERICOR ELECTRONICS LTD	2682 W COYLE AVE	ELK GROVE VILLAGE, IL 60007
TK2548	XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON, OR 97005
TK2626	OPTIMA ELECTRONIC PACKAGING SYSTEMS	2166 MOUNTAIN INDUSTRIAL BLVD.	TUCKER, GA 30084-5088
TK2637	SAMSUNG ELECTRONICS	18600 BROADWICK ST	RANCHO DOMINQUES, CA 90220
TK6314	MCX INC	1315 OREGON AVE	KLAMATH FALLS, OR 97601-6540

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					STANDARD ACCESSORIES		
-	119-6574-00			1	WHEEL MOUSE, 3 BUTTON	80009	119-6574-00
-	119-5662-00			1	KEYBOARD:104 WINDOWS,RT5156TW,	0D1M6	122761-001
-	131-4356-00			1	CONN,SHUNT:SHUNT/SHORTING	26742	9618-302-50
-	335-0483-00			1	LABEL SET, TLA7XM ONLY	0KB05	335-0483-00
-	200-4326-00			1	CAP, FUSEHOLDER: 5MM X20MM STM FUSE CARRIER, USE W/ BUSS HTB SCREWDRIVER SLOTTED FUSEHOLDER	71400	STM
-	159-0256-00			1	FUSE, CARTRIDGE: 15A, 250V, FAST	71400	ABC-15
-	159-0379-00			1	FUSE, CARTRIDGE: 20A, 250V, 5 SEC MIN @ 200%, 0.25 X 1.25, UL REC, 326020	75915	326 020
-	159-0381-00			1	FUSE, CARTRIDGE: 5 X 20 MM, 6.3A, 250V, FAST BLOW, HIGH BREAKING CAPACITY, UL REC, SEMKO	71400	GDA-6.3
-	161-0213-00			1	CABLE ASSY, PWR: 3, 16 AWG, 2.5 METER, SJT, GREY, 105 DEG C, MCA-3T X BME-3S, 13A/250V, NORTH AMERICAN,	0B445	161-0213-00
-	161-0218-00			1	CABLE ASSY, PWR: 3, 14 AWG, 100 L, SJT, BLK, 60 DEG C, 5-20P X BME-3S, 15A/125V,	0B445	161-0218-00
					Optional Accessories		
-	020-2369-XX			1	RACKMOUNT KIT:COMPONENTS,SILVER GRAY,TLA72X,TLA7XM	80009	020-2369-00
-	012-0057-01			1	CABLE ASSEMBLY:Coaxial, RFD, 50 Ohm, 43 inch L, BNC	060D9	012-0057-01
-	012-1241-00			1	CABLE,INTERCON	09922	902318
-	012-1468-00			1	PARALLEL CABLE:CONNECT HIGH-DENSITY PARALLEL PRINTER PORT TO PC PARALLEL PORT	00779	012-1468-00
-	016-1651-00			1	CASE,CARRYING:TRANSPORT WHEELED HARD CASE	34416	3121TS MODIFIED
-	020-2194-00			1	COMPONENT KIT: BACKPLANE, EMI SHIELD KIT CONTAINS DIN SHIELD WITH 2 SCREWS	80009	020-2194-00
-	P6041			2	SMB-TO-BNC CABLE	80009	P6041
-	070-9780-XX			1	MANUAL,TECH:SERVICE,TLA SERIES,DP	TK2548	070-9780-XX
-	071-0912-XX			1	MANUAL,TECH:CHASSIS SERVICE,TLA7XM,TLA721	TK2548	071-0912-XX
-	071-0913-XX			1	MANUAL,TECH:SERVICE,TLA715,DP	TK2548	071-0913-XX
-	071-0714-XX			1	MANUAL,TECH:SERVICE,TLA7PG2	TK2548	071-0714-XX
-	071-0864-XX			1	MANUAL,TECH:SERVICE,LOGIC ANALYZER MODULE,TLA7NX,TLA7PX SERIES,DP	TK2548	071-0864-XX
-	003-0008-00			1	ALIGN TOOL,ELEK:6.0 L X 0.375 DIA NYLON W/SCDR SHAPED ENDS	80009	003-0008-00

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					CABINET AND CHASSIS ASSEMBLY		
10-1-1	212-0193-00			12	SCREW, EXT RLV: 8-32 X 0.375 BUTTON HEAD, HEX DRIVE, STAINLESS STEEL, BLACK OXIDE FINISH, 0.093 DRIV	0KB01	ORDER BY DESCRIPTION
-2	211-1093-00			8	SCREW, MACHINE: 4-40 X 0.25, FLH 100 DEG, STL BLK OXIDE, T7	0KB01	211-1093-00
-3	200-4547-00			1	COVER: MAINFRAME, AL, TLA720	TK1943	200-4547-00
-4	441-2191-00			1	CHASSIS ASSY: MAIN, AL, TLA720	TK1943	441-2191-00
-5	348-1542-00			4	FOOT, CABINET: BLACK RUBBER	74594	348-1542-00
-6	212-0204-00			4	SCR, ASSY WSHR: 8-32 X 0625 L, PNH, PLATED CARBON STL, W/SQUARE CONE WASHER, PHILLIPS DRIVE,	3M099	212-0204-00

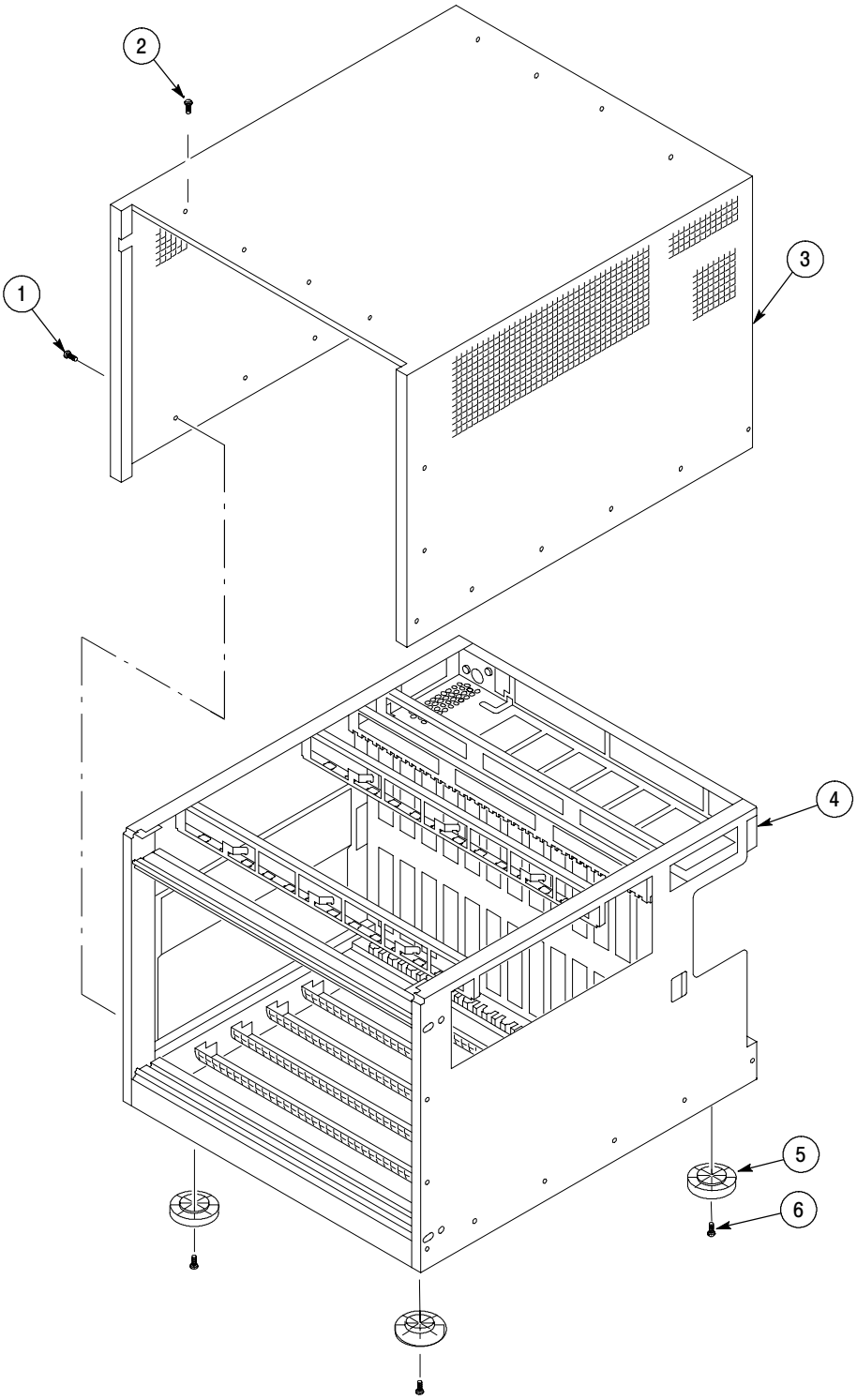

Figure 10-1: Cabinet and chassis assembly

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					CIRCUIT BOARDS AND CHASSIS PARTS		
10-2-1	260-2682-00			1	SWITCH, PUSH: SPST, GOLD OVER NICKEL CONTACT, 0.4V @ 28V, ILLUMINATED BUTTON, PANEL MNT W/CABLE	80009	260-2682-00
-2	333-4390-00			1	PANEL, FRONT: TOP, W/LEXAN OVERLAY, TLA 721	TK1943	333-4390-00
-3	333-4350-00			1	PANEL, FRONT: TOP, W/LEXAN OVERLAY, TLA 7XM	TK1943	333-4350-00
-4	174-3697-00			1	CABLE ASSY: RIBBON, CABLE TEMP SENSE/BACKPLANE, 28AWG, 2x15, 2x10, 2x15	TK2469	174-3697-00
-5	671-3219-00			1	CIRCUIT BD ASSY: TEMP SENSE	80009	671-3219-00
-6	211-0720-00			17	SCR, ASSEM WSHR: 6-32 X 0.500, PNH, STL, CDPL, T-15 TORX DR	0KB01	ORDER BY DESCRIPTION
-7	118-9417-XX			1	BACKPLANE VXI: BACKPLANE VXI COMPATIBLE WITH 13 C-SIZE SLOTS ELECTRONIC AUTOMATIC	80009	118-9417-00
-8	343-0775-00			2	CABLE, CLAMP: RIBBON, 1.0X1.0, GRAY, POLYVI-NYL, W/URETHANE FOAM TAPE BACKING	52152	80610029243/3484-1000
-9	220-0199-01			2	NUT BAR: VXI, M2.5 THREADS	OKB01	ORDER BY DESCRIPTION
-10	378-0438-00			13	BAFFLE ASSY: VXI SLOT, SINGLE, SHUTTER	80009	378-0438-00
-11	351-1007-00			13	GUIDE, SINGLE: PLASTIC	80009	351-1007-00
-12	333-4206-00			5	PANEL, FRONT: DOUBLE, BLANK, EMI, AL, PAINTED SILVER GRAY	TK1943	333-4206-00
-13	333-4205-00			1	PANEL, FRONT: SINGLE, BLANK, EMI, AL, PAINTED SILVER GRAY (TLA7XM ONLY)	TK1943	333-4205-00
-14	334-9920-00			1	MARKER, IDENT: LABEL, FRONT BOTTOM SLOT, 0.010 LEXAN, 1.25 X 15.60, BACKGROUND SILVER GRAY, TLA721	0KB05	334-9920-00
	212-0112-00			2	SCREW,MACHINE:8-32 X 0.188,TRH,SST POZ	0KB01	ORDER BY DESCRIPTION
	211-1093-00			2	SCREW,MACHINE:4-40 X 0.25,FLH 100 DEG,STL BLK OXIDE,T7	0KB01	211-1093-00

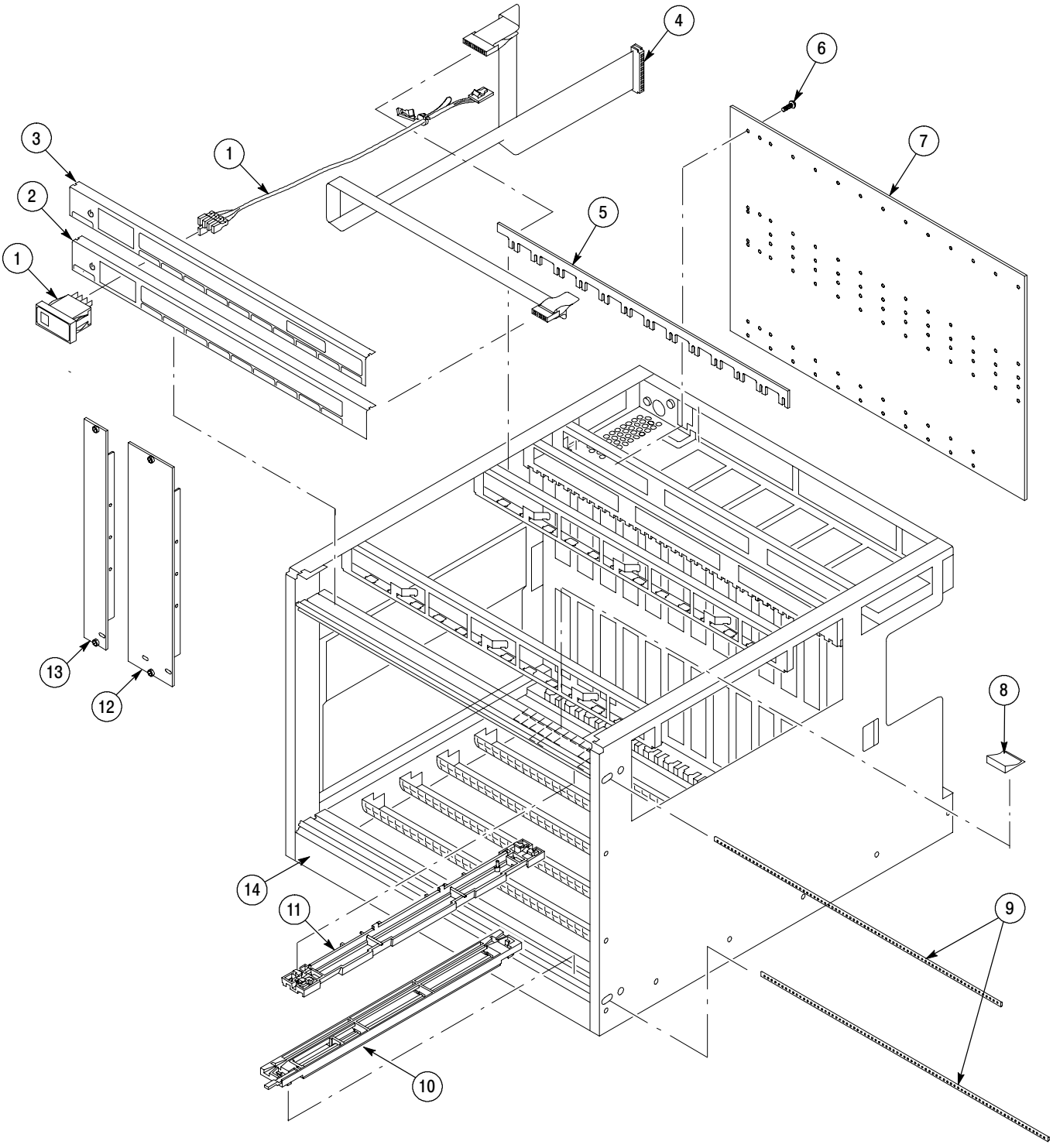

Figure 10- 2: Circuit boards and chassis parts

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					POWER SUPPLY, MONITOR, AND BLOWER		
10-3-1	671-3982-01	B010100	B019999	1	CIRCUIT BD ASSY: ENHANCED MONITOR (CONTAINS ITEMS 1 THRU 4)	80009	671-3982-00
-1	671-3982-02	B020000		1	CIRCUIT BD ASSY: ENHANCED MONITOR (CONTAINS ITEMS 1 THRU 4)	80009	671-3982-02
-2	333-4236-00			1	PANEL, MONITOR: ENHANCED, 0.062 AL, W/LEXAN OVERLAY	TK1943	333423600
-3	214-3903-01			4	SCREW, JACK: 4-40 X 0.312 EXT THD, 4-40 INT THD, 0.188 HEX, STEEL, CADPLATE	0KB01	214-3903-01
-4	211-0747-00			4	SCREW, MACHINE: 6-32 X 0.188, PNH, STL, CDPL, T-15	0KB01	ORDER BY DESCRIPTION
-5	200-4344-00			1	COVER: BLOWER CABLE, 0.040 A1 ALLOY	TK1943	200-4344-00
-6	380-1112-00			1	HOUSING: BLOWER HOUSING BLOWER	TK1943	380-1112-00
-7	212-0193-00			10	SCREW, EXT RLV: 8-32 X 0.375 BUTTON HEAD, HEX DRIVE, STAINLESS STEEL, BLACK OXIDE FINISH, 0.093 DRIV	0KB01	212-0193-00
-8	119-5199-00			1	FAN, DC: BLOWER, 48V, DUAL INLET, 450 CFM, 177 W, WITH 6 SCREWS	80009	119-5199-00
-9	212-0400-00			4	SCREW, MACHINE: 8-32 X 0.250, PNH, STL, ZINC, T-20	3M099	BY DESCRIPTION
10	334-9921-00			1	MARKER, IDENT: LABEL, REAR POWER RATING, 0.010 LEXAN, 1.500 X 7.500, BACKGROUND SILVER GRAY	0KB05	334-9921-00
11	119-5553-XX			1	POWER SUPPLY: VXI MAINFRAME, 925W	80009	119-5553-XX
12	367-0494-00			1	HANDLE: EJECTOR POWER SUPPLY	TK1943	367-0494-00 0BD
13	211-0932-00			2	SCREW: SHLDR, 8-32 X 0.187 OD X 0.125 L, 0.187 L	24931	PZ-6-3

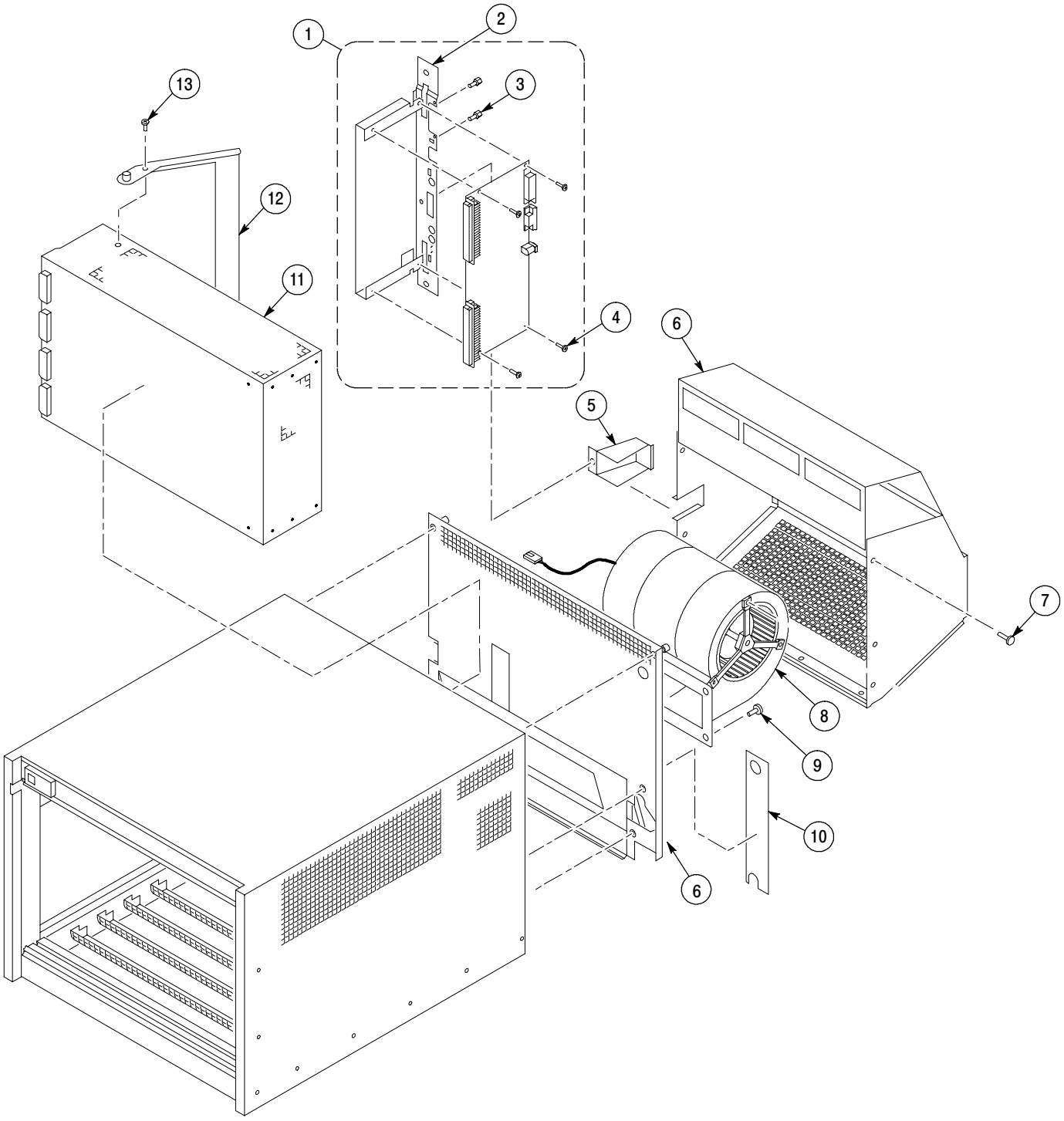

Figure 10- 3: Power supply, monitor, and fan assembly

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	348-1537-00			1	GASKET,EMI:CLIP-ON,1.98 L,BE CU,TIN PLATED,W/T LANCES	0KM03	0493011500
-2	348-1365-01			4	SHLD GSKT,ELEC:SYMETRICAL SLOTTED FINGER,0.350 W X 7.5 L,RIVIT MTG,SNAP-IN,RIVIT SPACING 1.5 IN	0KM03	0493-0070-00
-3	367-0484-00			1	HANDLE,EJECTOR:INJECTOR/EJECTOR ASSEMBLY,TWO WIDE VXI,W/OUT KEYING,SPRING LOADED,PLASTIC,20% GL	80009	367-0484-00
-4	335-0646-00			1	MARKER INDENT:EJECTOR LABEL,BOTTOM,0.745 X 0.520	0KB05	335064600
-5	334-9236-00			1	MARKER,IDENT:MKD TEKTRONIX,TOP INJECTOR/EJECTOR LABEL,BENCHTOP CONTROLLER	0KB05	334923600
-6	367-0489-00			1	HANDLE:INJECTOR/EJECTOR ASSEMBLY,TWO WIDE VXI,WITH TTL KEYING,SPRING LOADED,PLASTIC,10%	80009	367-0489-00
-	214-4762-00			2	SPRING,CONICAL:SPRING,CONICAL	8X345	ORDER BY DESCRIPTION

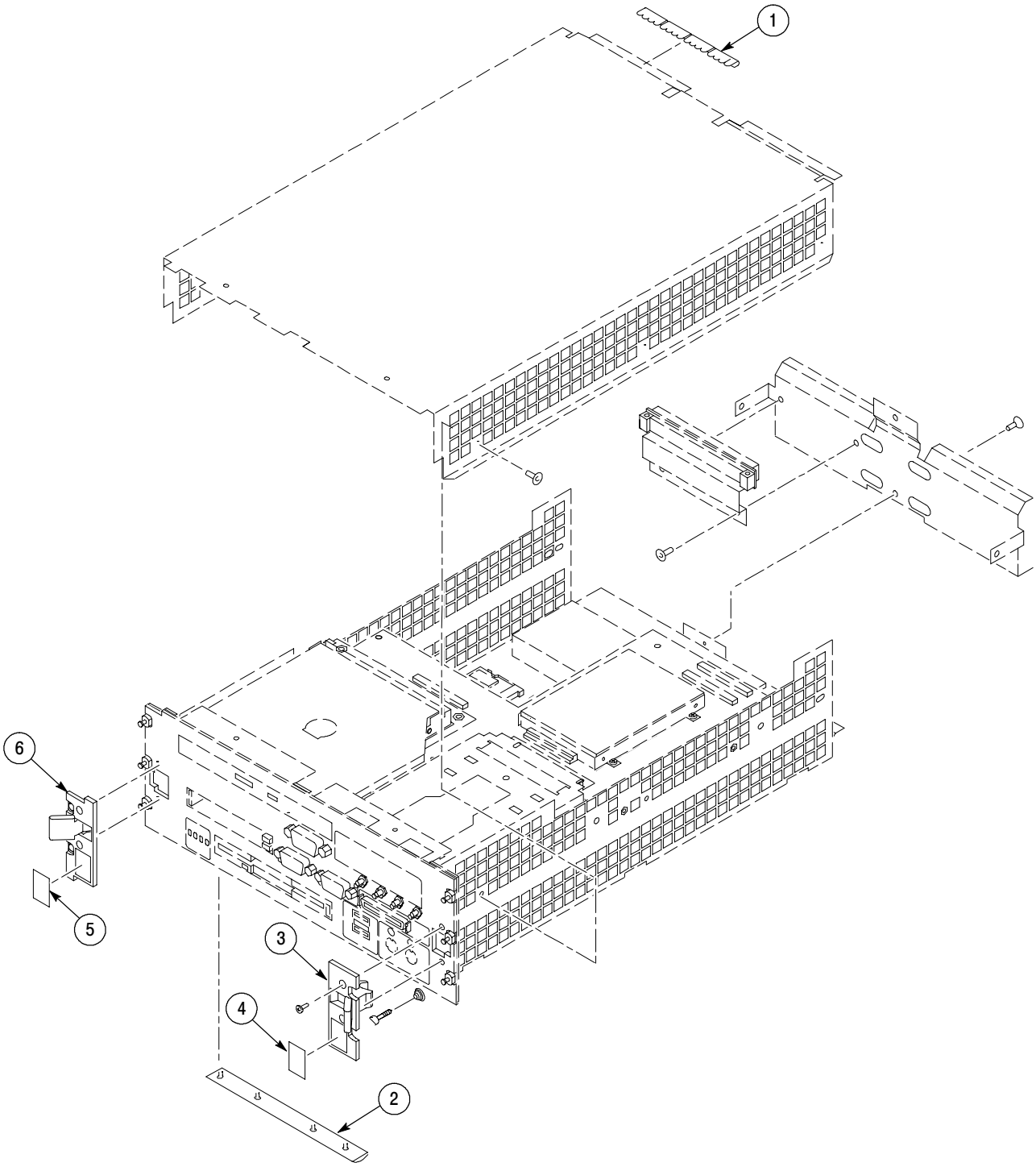

Figure 10- 4: Benchtop controller exploded view (covers and handles)

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name and description	Mfr. code	Mfr. part number
10-5-0	039-0115-00			1	CONTROLLER:THREE WIDE VXI CONTROLLER MODULE,PENTIUM 3III 500 MHZ MMX PROCESSOR	0L0L7	039-0115-00
-1	211-1070-00			4	SCREW:M2 X 2MM,PNH,PHL, STL NI PLT	0KB01	211-1070-00
-2	119-5728-00			1	DISK DRIVE:OPTICAL,644MB,CD-ROM,16.7 MB/SEC, IDE/ATAPI, CD-224E-903,	50356	CD-224E-903
-3	671-4377-00			1	CIRCUIT BD ASSY:CD ROM INTERFACE	80009	671-4377-00
-4	156-4857-00			1	IC,MEMORY:CMOS,SDRAM 512M	80009	156-4857-00
-5	146-0132-00			1	BATTERY, 3V,1AH,LITHIUM COIN CELL, 1 IN DIA X 0.3 IN HEIGHT,SAFETY CONTROLLED	TK6379	CR2477N
-6	119-5677-00			1	FLOPPY DISK DRIVE, 3.5 INCH, 1.44 MBYTE	NA	NA
-7	174-4195-00			4	CABLE ASSY:COAXIAL CABLE,PELTOLA TO SMB (SET OF FOUR)	060D9	44-0162-01
-8	119-6494-00			1	DISK DRIVE:WINCHESTER,2.5 IN,30.0GB,SINGLE PLATTER,IDE,07N4392,	9F560	119-6494-00
-9	174-3925-00			1	CA ASSY,SP:RIBBON,CD ROM AUDIO CABLE,IDC,44,28 AWG,1MM,1.0 L,2 X 22,0.079 CTR (2MM)	060D9	174-3925-00
-10	671-4378-00			1	CIRCUIT BD ASSY:HARD DISK DRIVE	80009	671-4378-00
-11	437-0494-00			1	CABINET ASSY:PLASTIC,REMOVEABLE HARD DISK DRIVE HOLDER (DOES NOT INCLUDE HARD DISK DRIVE)	7X318	437-0494-00
-12	211-1081-00			4	SCREW,MACHINE:M3 X 0.5 X 3.5MM,FLAT WAFER HD W/SERRATIONS STRESS RELIEVED,PHL,0.0002 STL ZI PL	0KB01	211-1081-00
-	650-4272-00			1	DRIVE ASSEMBLY:REMOVEABLE HARD DISK DRIVE,MAX REPLACEABLE HDD,W/O SOFTWARE INSTALLED,TLA700	80009	650-4272-00

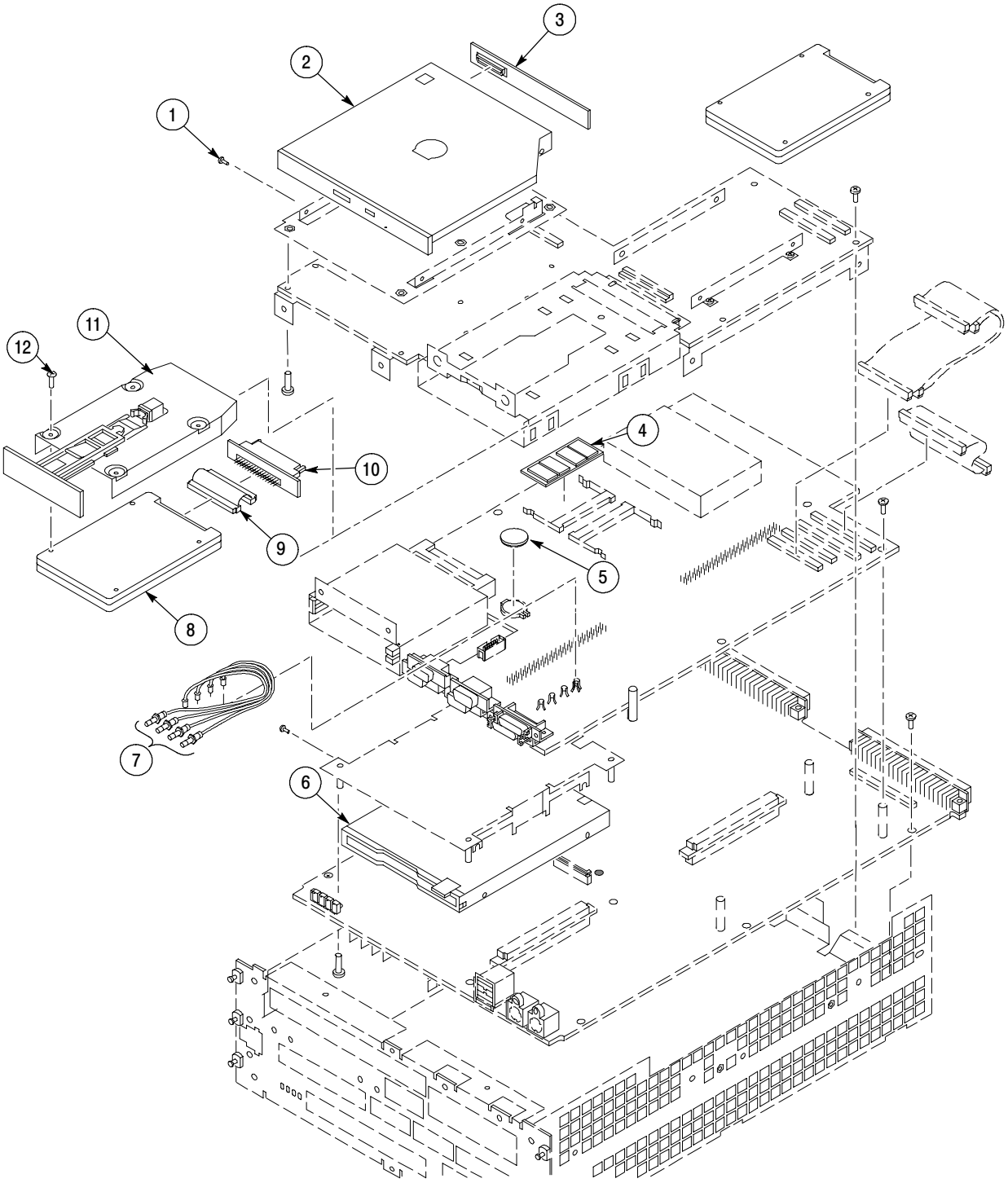

Figure 10-5: Benchtop controller exploded view (internal parts)

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-6-0	650-4131-00			1	MODULE ASSY:EXPANSION MAINFRAME CARD,TLA7XM	80009	650-4131-00
-1	671-4987-XX			1	CIRCUIT BD ASSY:MAIN FRAME EXPANSION CARD	80009	671-4987-XX
-2	441-2214-00			1	CHASSIS ASSY: AL	TK1943	441-2214-00
-3	348-1434-00			4	GASKET, EMI: 2.912 L, CLIP ON, BE CU EMI GASKET, TIN PLATED	30817	97-613-17-029
-4	211-0373-00			14	SCREW, MACHINE: 4-40 X 0.250, PNH, STL CD PLT, T10	93907	ORDER BY DESCRIPTION
-5	260-2597-00			2	SWITCH, ROTARY: HEXADECIMAL, 100MA AT 50VDC, RIGHT ANGLE, 0.430 W X 0.400 H X 0.202 L	81073	94HAB16RA
-6	200-4231-00			1	COVER: APPLICATION, SAFETY CONTROLLED	TK1943	200-4231-00
-7	386-7267-00			1	SUBPANEL:END CAP,0.040 AL,ETCH/CHROMATE, TLA7XM	TK1943	386-7267-00
-8	367-0410-00			1	HANDLE, EJECTOR: BOTTOM, SINGLE WIDE MODULE	62559	20817-327
-9	335-0646-00			1	MARKER,IDENT:LABEL,MKD FOR USE WITH TLA700 SERIES,BOTTOM INJECTOR/EJECTOR,0.745 X 0.520,0.010	0KB05	335-0646-00
-10	950-4827-00			2	SCREW: PHIL, M, 2.5 X 8,CSK, CDS 92502-25008	93907	ORDER BY DESCRIPTION
-11	950-3794-00			2	WASHER:WAVY,2.7MM,CDS 92505-25005	H2329	409-013-911
-12	950-4448-00			2	92501-25010:SCREW M2.5X10 CHEESEHEAD	TK2626	409013905
-13	348-1365-01			1	SHLD GSKT, ELEC: SYMETRICAL SLOTTED FINGER, 0.350 W X 7.5 L, RIVIT MTG, SNAP-IN, RIVIT SPACING 1.5 IN	0KM03	0493-0070-00
-14	211-0391-00			2	SCR,ASSEM,WSHR:2-56 X 0.437, PNH,STL, CDPL,T-8 TORX DR	93907	ORDER BY DESCRIPTION
-15	214-4964-00			1	BRACKET,KEYING:ALUMINUM,606X-T6	TK1943	214-4964-00
-16	367-0411-00			1	HANDLE, EJECTOR: TOP, SINGLE WIDE	62559	20817-328
-17	335-0106-00			1	MARKER, IDENT: TOP LABEL	0KB05	335-0106-00
	129-1544-00			4	SPACER, POST: 0.510L, 0.188 HEX 0.135L, 4-40 INT, SSTL, MOUNT TO CONNECTORS	TK0588	129-1544-00
	214-3106-00			2	HARDWARE KIT:JACK SOCKET MOUNT TO TOP CONNECTOR	53387	3341-1S

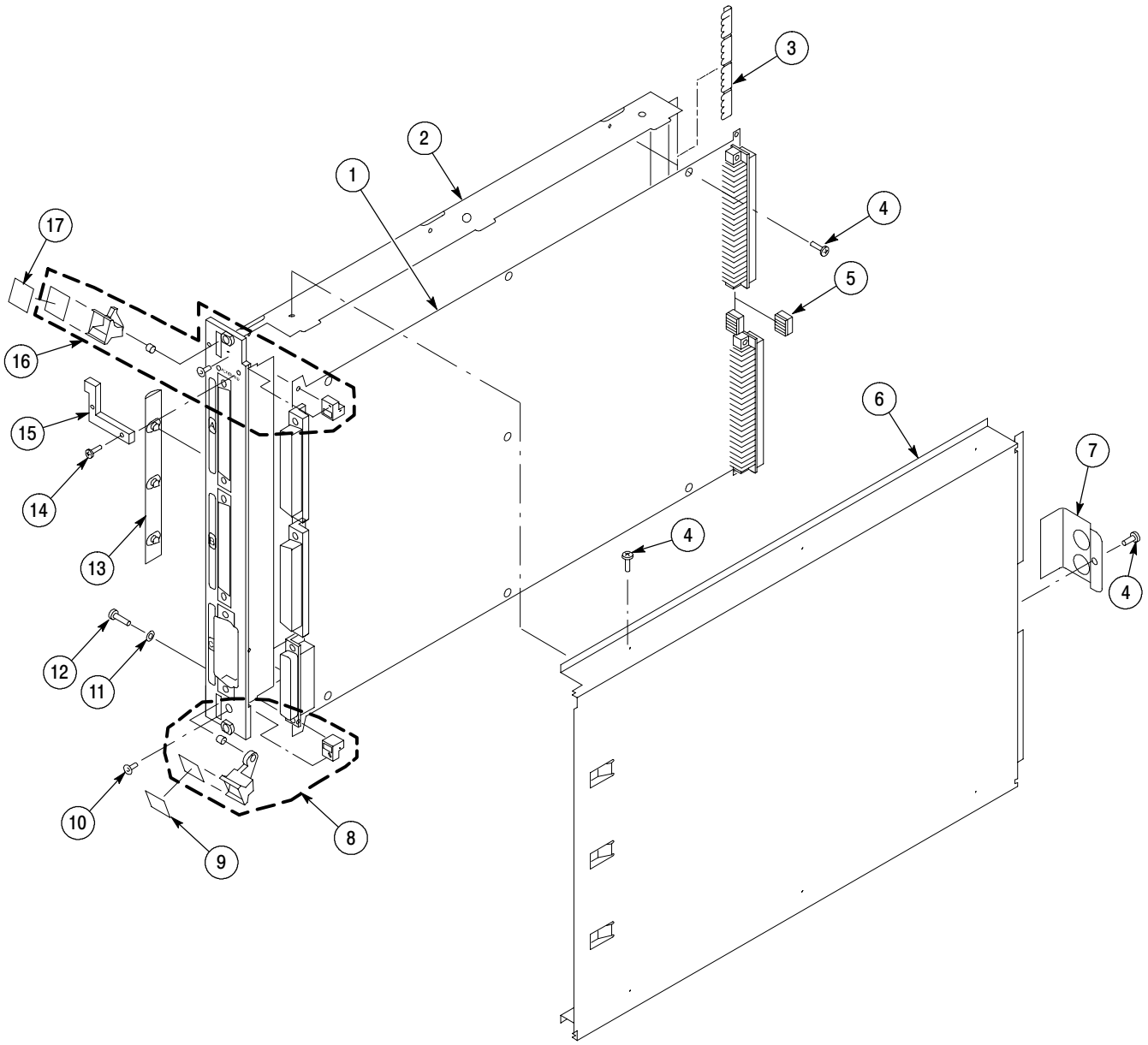

Figure 10-6: Expansion module exploded view

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-7-1	174-4363-00			2	CA ASSY, SP: ELEC, 30 AWG, 48.0L, 80 TW PAIR, W/D-SUB BOTH ENDS, PLUG TO PLUG	27264	174-4363-00
-2	174-4350-00			1	CA ASSY, SP: SHLD, 25, TW PR, 24 AWG, 36.00L, 25 POS, RECPT, DSUB, CRIMP BOTH ENDS	TK6314	174-4350-00
10-8-1	012-1614-00			1	CA ASSY:INTEROPTIBILITY ADAPTER CABLE	060D9	012-1614-00
-2	174-4583-00			1	CA ASSY:SMB TO BNC ADAPTER	060D9	174-4583-00

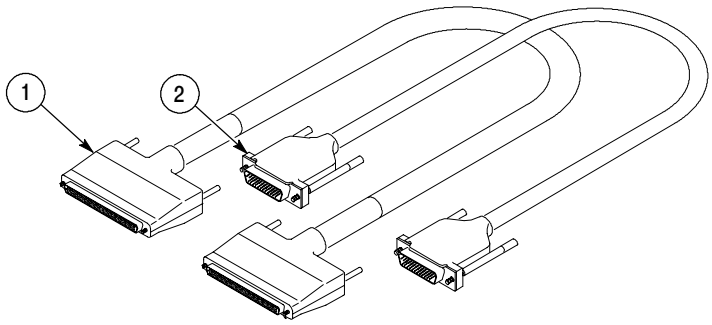

Figure 10-7: Expansion module exploded view

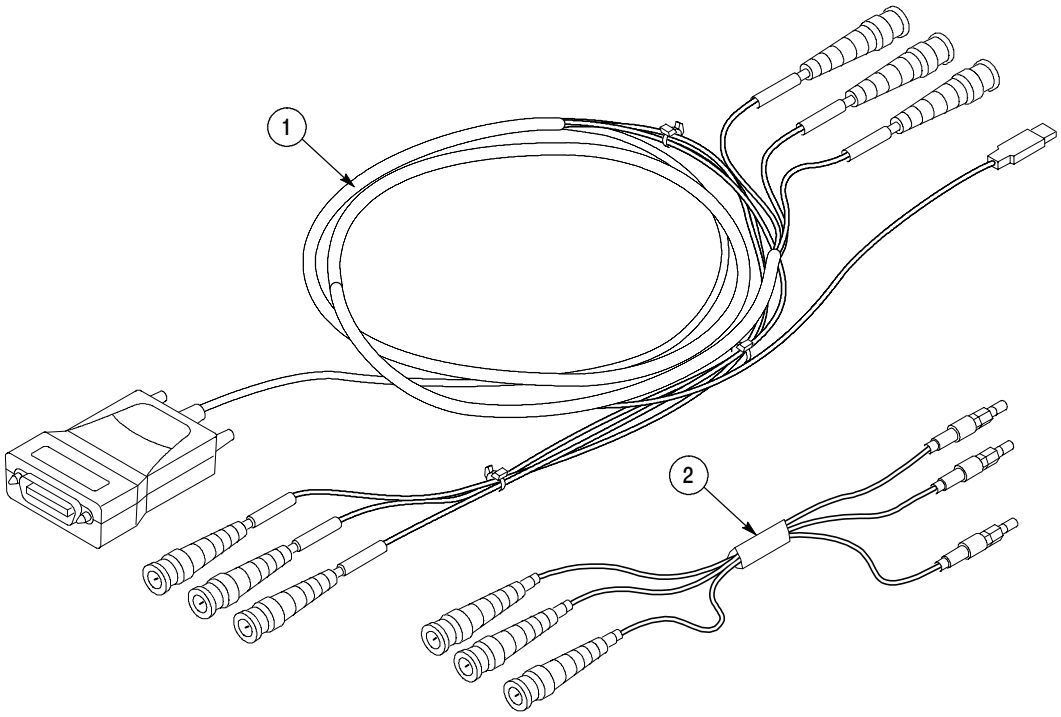

Figure 10-8: IView cables