Service Manual

Tektronix

TLA 720
Color Benchtop Chassis and
TLA 7XM
Expansion Chassis

071-0699-00

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.

CE

Tektronix, Inc., 14200 SW Karl Braun Drive, Beaverton, OR 97077

HARDWARE 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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In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period. If Tektronix is unable to provide a replacement that is free from defects in materials and workmanship within a reasonable time thereafter, Customer may terminate the license for this software product and return this software product and any associated materials for credit or refund.

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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 marking on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

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:

WARNING
High Voltage

Protective Ground
(Earth) Terminal

CAUTION
Refer to Manual

Double
Insulated

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, disconnect the main power by means of the power cord or, if provided, the power switch.

Use Caution When Servicing the CRT. To avoid electric shock or injury, use extreme caution when handling the CRT. Only qualified personnel familiar with CRT servicing procedures and precautions should remove or install the CRT.

CRTs retain hazardous voltages for long periods of time after power is turned off. Before attempting any servicing, discharge the CRT by shorting the anode to chassis ground. When discharging the CRT, connect the discharge path to ground and then the anode. Rough handling may cause the CRT to implode. Do not nick or scratch the glass or subject it to undue pressure when removing or installing it. When handling the CRT, wear safety goggles and heavy gloves for protection.

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.

X-Radiation. To avoid x-radiation exposure, do not modify or otherwise alter the high-voltage circuitry or the CRT enclosure. X-ray emissions generated within this product have been sufficiently shielded.

Preface

Read this preface to learn how this manual is structured, what conventions are used, and where you can find other information related to servicing this product. Read the *Introduction*, which follows this preface for safety and other important background information 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.

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

Manual Conventions

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

Benchtop Chassis A benchtop chassis is a benchtop mainframe without a benchtop controller installed.

Benchtop Mainframe A benchtop mainframe is a benchtop chassis with a benchtop controller installed.

Expansion Chassis An expansion chassis is an expansion mainframe without an expansion module installed.

Expansion Mainframe An expansion mainframe is an expansion chassis with an expansion module installed.

Modules Throughout this manual, the term *module* refers to an LA module or a DSO module that plugs into a portable mainframe, benchtop mainframe, or expansion mainframe. A module is composed of circuit cards, interconnecting cables, and a user-accessible front panel.

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

Replaceable Parts

This manual refers to any field-replaceable assembly or mechanical part specifically by its name or generically as a replaceable part. In general, a replaceable part is any circuit board or assembly that is listed in the replaceable parts list of Chapter 10.

Contacting Tektronix

Product Support	For questions about using Tektronix measurement products, call toll free in North America: 1-800-TEK-WIDE (1-800-835-9433 ext. 2400) 6:00 a.m. – 5:00 p.m. Pacific time Or contact us by e-mail: tm_app_supp@tek.com For product support outside of North America, contact your local Tektronix distributor or sales office.
Service Support	Tektronix offers extended warranty and calibration programs as options on many products. Contact your local Tektronix distributor or sales office. For a listing of worldwide service centers, visit our web site.
For other information	In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.
To write us	Tektronix, Inc. 14200 SW Karl Braun Drive Beaverton, OR 97077 USA
Website	Tektronix.com

Introduction

This manual contains information needed to properly service the benchtop chassis and the expansion chassis. This introduction contains information critical to safe and effective servicing.

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

- The procedures in this manual should be performed only by a qualified service person.
- Read the *General Safety Summary* and *Service Safety Summary* found at the beginning of this manual.
- Read the *Preface* beginning on page xiii.
- Read *Operating Information* beginning on page 2–1.

When using this manual for servicing, be sure to follow all warnings, cautions, and notes.

Adjustment Interval

There are no adjustments or certifiable parameters for the benchtop chassis or expansion chassis.

Strategy for Servicing

This manual supports and contains all the information needed for periodic maintenance of the benchtop chassis and expansion chassis. Examples of such information are procedures for fault isolation of a failed circuit board or assembly and for removal and replacement of the failed boards or assemblies.

This manual also:

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

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

Service Offerings

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

Whether providing warranty repair service or any of the other services listed below, Tektronix service technicians are equipped to service the benchtop chassis and the expansion chassis. 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 appears behind the title page in this manual. Tektronix technicians provide warranty service at most Tektronix service locations worldwide. The Tektronix product catalog lists all service locations worldwide.

Calibration and Repair Service

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

The following services can be tailored to fit your requirements for calibration and/or repair of the benchtop chassis or expansion chassis.

Service Options. Tektronix Service Options can be selected at the time you purchase your instrument. You select these options to provide the services that best meet your service needs. These service options are listed on the *Tektronix Service Options* page following the title page of this manual.

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

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

Self Service. Tektronix supports repair to the replaceable-part level by providing for circuit board exchange.

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

For More Information. Contact your local Tektronix service center or sales engineer for more information on any of the calibration and repair services just described.

Specifications

Benchtop Chassis Specifications

This chapter provides a general description of the benchtop chassis. A selected list of specification tables beginning on page 1–3 that will aid you in servicing.

Product Description

The benchtop chassis is designed to be used as part of the TLA 700 Series Logic Analyzer family. The benchtop chassis is an intelligent 13-slot chassis, with intelligent cooling for installed modules, and a high quality auto-configurable backplane.

Power Supply

The power supply input line capacity is 1450 Watts, with 872 Watts usable by the TLA 700 Series instrument modules at any given time.

The power supply plugs directly into the rear of the chassis and has no cables to disconnect. Because of this design, you can replace the power supply in a short amount of time. The power supply automatically accommodates for the appropriate input voltage and frequency; therefore, their is no mechanical switch required to select the correct line voltage and frequency.

The benchtop chassis accommodates both exclusively digital applications (using the logic analyzer module), and exclusively analog applications (using the DSO module), as well as combinations of both digital and analog.

Intelligent Cooling

The benchtop chassis provides optimal cooling for all installed modules. The chassis uses an intelligent, adaptive cooling scheme to efficiently remove heat while maintaining quiet operation. When you set the blower to variable speed (default), the chassis automatically adjusts the blower speed to keep the temperature rise above the modules to approximately 10° C or less. Using a rear panel switch, you can set the blower to full speed to provide maximum cooling at all times.

Air is exhausted at the sides of the chassis allowing you to stack the expansion chassis with the benchtop chassis or other rackmount equipment. You do not have to to worry about restricting any airflow out of the top of the chassis or creating a chimney effect.

Card guides and airflow shutters automatically direct air to only those slots containing modules and empty slots are shut off. The chassis directs airflow across each installed module from the bottom to the top of each slot. Baffles balance the airflow from the front to back and across occupied slots in the chassis.

Backplane

The benchtop chassis has an autoconfigurable, solid-state backplane that uses electronic jumpering of the IACK and BUS GRANT signal lines.

Full differential distribution of the CLK10 signals provide a clean timing source for the instrument.

Characteristics Tables

This section lists only the specifications that are useful for servicing. All specifications listed here should be considered “typical”. Typical characteristics describe typical or average performance and provide useful reference information.

Refer to Appendix A in the User manual for a complete listing of all specifications.

Table 1–1: AC power source

Characteristic	Description
Source Voltage	90–250 $V_{RMS,}$ 45–66 Hertz, continuous range CAT II 100–132 $V_{RMS,}$ 360–440 Hertz, 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 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 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: Sheet 1, 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 Amps RMS maximum at 207 VAC_{RMS}
Power Factor Correction	Yes

Table 1–2: Secondary power

Characteristic	Description			
DC Voltage Regulation (Combined System, voltage available at each slot)	Voltage	V_{min}	V_{nom}	V_{max}
	+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	5.25 V
	–2 V	–2.1 V	–2.000 V	–1.9 V
	–5.2 V	–5.46 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 1–3: Cooling

Characteristic	Description
Cooling System	Positive pressurization forced air circulation system utilizing a single low-noise squirrel cage centripetal blower configuration with no removable filters.
Blower Speed Control	Rear panel switch selects between full speed and variable speed. Slot exhaust temperature and ambient air temperature are monitored so that a constant delta temperature is maintained across the module with the highest exit air temperature at the minimum operational blower speed.
Slot Activation	Installing a module activates the cooling for the corresponding occupied slots by opening the air flow shutter mechanism.

Table 1–4: Certifications and compliances

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 61326–1 EMC requirements for Class A electrical equipment for measurement, control and laboratory use. IEC 1000–4–2 Electrostatic Discharge Immunity (Performance Criterion B) IEC 1000–4–3 RF Electromagnetic Field Immunity (Performance Criterion A) IEC 1000–4–4 Electrical Fast Transient / Burst Immunity (Performance Criterion B) IEC 1000–4–5 Power Line Surge Immunity (Performance Criterion B) IEC 1000–4–6 Conducted RF Immunity (Performance Criterion A) IEC 1000–4–11 Power Line Dips and Interruptions Immunity (Performance Criterion B) EN 61000–3–2 AC Power Line Harmonic Emissions

Table 1–5: Environmental

Characteristic	Description
Classification	
Atmospherics	
Temperature	
Operating	+5° C to 50° C, 15 ° C/hr max gradient, non-condensing (derated 1° C per 1000 ft. above 5000 ft. altitude
Nonoperating	–20° C to 60° C, 15° C/hr max gradient, non-condensing
Relative Humidity	
Operating	20% to 80% relative humidity, non-condensing. Max wet bulb temperature: +29°C (derates relative humidity to approximately 22% @ 50°C).
Nonoperating	8% to 80% relative humidity, non-condensing. Max wet bulb temperature: +29° C (derates relative humidity to ~55% @ 50°C).
Altitude	
Operating	To 9,144 ft. (3,000 m) (derated 1° C/1000 ft. (305m) above 5000 ft. (1524m) altitude)
Nonoperating	39,376 ft. (12,000 m)

Table 1–6: Mechanical

Characteristic	Description
Overall Dimensions	(See Figure 1–1 for overall chassis dimensions)
Standard Chassis	
Height (with feet)	13.65 in (362.0 mm)
Width	17.6 in (425.5 mm)
Depth	26.5 in (673.1 mm)
Chassis with Rackmount	
Height	13.25 in (355.6 mm)
Width	18.9 in (480.1 mm)
Depth	28.9 in (746.7 mm) min to 33.9 in (873.8 mm) max
Weight	
Minimum mainframe configuration with benchtop controller and slot filler panels installed (5 dual wide and 1 single wide)	48.5 lbs (22.1 kg)
Typical configuration: same as as minimum above with the addition of two TLA 7x4 LA's and one TLA 7x2 DSO at 5 lbs 10 oz each, and removal of 3 slot filler panels	63.7 lbs (28.9 kg)
Shipping weight: minimum configuration with benchtop controller module (only) and all mainframe standard accessories (2 manuals, 5 dual wide, 1 single slot filler panels, power cord, empty pouch, front cover, keyboard, software, and cables	104 lb (47.2 kg)
Shipping weight: fully configured instrument. Same as minimum above with the addition of 3 LA modules (TLA 7N4, TLA 7P2, and TLA 7P4) and 2 DSO's (TLA 7D1 and TLA 7E1), and all module standard accessories (probes, clips)	161 lb (73 kg)
Rackmount kit adder	20 lbs (9.07 kg)
Module Size	13 plug-in slots

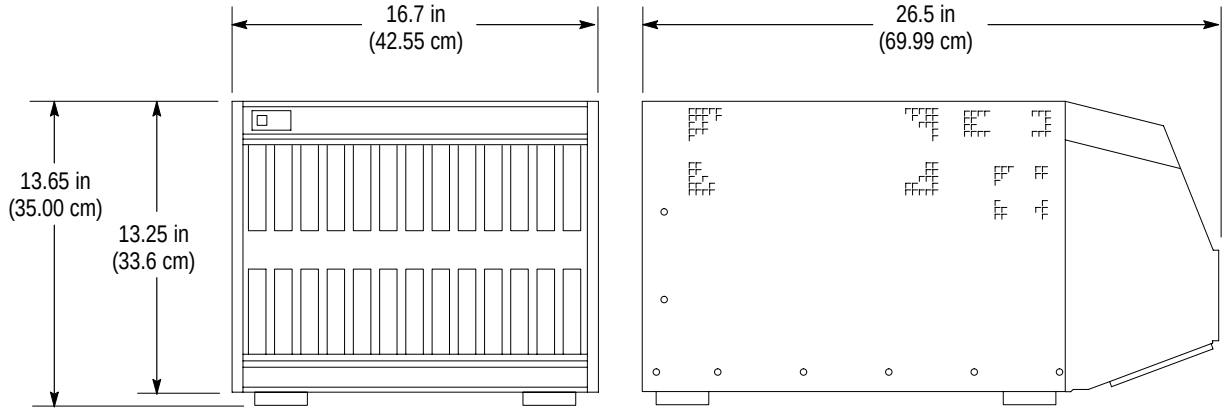


Figure 1–1: Front and side view of the benchtop chassis

Expansion Chassis Specifications

This chapter provides a general description of the expansion chassis. A selected list of specification tables beginning on page 1–3 that will aid you in servicing.

Product Description

The expansion chassis is designed to be used as part of the TLA 700 Series Logic Analyzer family. The expansion chassis is an intelligent 13-slot chassis, with intelligent cooling for installed modules, and a high quality auto-configurable backplane.

Power Supply

The power supply input line capacity is 1450 Watts, with 872 Watts usable by the TLA 700 Series instrument modules at any given time.

The power supply plugs directly into the rear of the chassis and has no cables to disconnect. Because of this design, you can replace the power supply in a short amount of time. The power supply automatically accommodates for the appropriate input voltage and frequency; therefore, their is no mechanical switch required to select the correct line voltage and frequency.

The chassis accommodates both exclusively digital applications (using the logic analyzer module), and exclusively analog applications (using the DSO module), as well as combinations of both digital and analog.

Intelligent Cooling

The expansion chassis provides optimal cooling for all installed modules. The chassis uses an intelligent, adaptive cooling scheme to efficiently remove heat while maintaining quiet operation. When you set the blower to variable speed (default), the chassis automatically adjusts the blower speed to keep the temperature rise above the modules to approximately 10° C or less. Using a rear panel switch, you can set the blower to full speed to provide maximum cooling at all times.

Air is exhausted at the sides of the chassis allowing you to stack the expansion chassis with the benchtop chassis or other rackmount equipment. You do not have to to worry about restricting any airflow out of the top of the chassis or creating a chimney effect.

Card guides and airflow shutters automatically direct air to only those slots containing modules and empty slots are shut off. The chassis directs airflow across each installed module from the bottom to the top of each slot. Baffles balance the airflow from the front to back and across occupied slots in the chassis.

Backplane

The expansion chassis has an autoconfigurable, solid-state backplane that uses electronic jumpering of the IACK and BUS GRANT signal lines.

Full differential distribution of the CLK10 signals provide a clean timing source for the instrument.

Characteristics Tables

This section lists only the specifications that are useful for servicing. All specifications listed here should be considered "typical". Typical characteristics describe typical or average performance and provide useful reference information.

Refer to Appendix A in the User manual for a complete listing of all specifications.

Table 1–7: AC power source

Characteristic	Description
Source Voltage	90–250 $V_{RMS,}$ 45–66 Hertz, continuous range CAT II 100–132 $V_{RMS,}$ 360–440 Hertz, 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 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 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: Sheet 1, 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 Amps RMS maximum at 207 VAC_{RMS}
Power Factor Correction	Yes

Table 1–8: Secondary power

Characteristic	Description			
DC Voltage Regulation (Combined System, voltage available at each slot)	Voltage	V_{min}	V_{nom}	V_{max}
	+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	5.25 V
	–2 V	–2.1 V	–2.000 V	–1.9 V
	–5.2 V	–5.46 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 1–9: Cooling

Characteristic	Description
Cooling System	Positive pressurization forced air circulation system utilizing a single low-noise squirrel cage centripetal blower configuration with no removable filters.
Blower Speed Control	Rear panel switch selects between full speed and variable speed. Slot exhaust temperature and ambient air temperature are monitored so that a constant delta temperature is maintained across the module with the highest exit air temperature at the minimum operational blower speed.
Slot Activation	Installing a module activates the cooling for the corresponding occupied slots by opening the air flow shutter mechanism.

Table 1–10: Certifications and compliances

Category	Standards or description
EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility when used with the TLA 720 Benchtop Chassis. Refer to the EMC published for the TLA 720 Benchtop Chassis.
Australia/New Zealand Declaration of Conformity – EMC	Complies with EMC provision of Radiocommunications Act when used with the TLA 720 Benchtop Chassis. Refer to the EMC published for the TLA 720 Benchtop Chassis.

Table 1–10: Certifications and compliances (Cont.)

Category	Standards or description	
U.S. Nationally Recognized Testing Laboratory Listing	UL3111-1	Standard for electrical measuring and test equipment.
Canadian Certification	CAN/CSA C22.2 No. 1010.1	Safety requirements for electrical equipment for measurement, control, and laboratory use.
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		
Altitude (maximum operating)	2000 meters	
Equipment Type	Test and measuring	
Safety Class	Class 1 (as defined in IEC 1010-1, Annex H) – grounded product	
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1). Note: Rated for indoor use only.	

Table 1–11: Environmental

Characteristic	Description
Classification	
Atmospherics	
Temperature	
Operating	+5° C to 50° C, 15 ° C/hr max gradient, non-condensing (derated 1° C per 1000 ft. above 5000 ft. altitude
Nonoperating	–20° C to 60° C, 15° C/hr max gradient, non-condensing
Relative Humidity	
Operating	20% to 80% relative humidity, non-condensing. Max wet bulb temperature: +29°C (derates relative humidity to approximately 22% @ 50°C).

Table 1–11: Environmental (Cont.)

Characteristic	Description
Nonoperating	8% to 80% relative humidity, non-condensing. Max wet bulb temperature: +29° C (derates relative humidity to ~55% @ 50°C).
Altitude	
Operating	To 9,144 ft. (3,000 m) (derated 1° C/1000 ft. (305m) above 5000 ft. (1524m) altitude)
Nonoperating	39,376 ft. (12,000 m)

Table 1–12: Mechanical

Characteristic	Description
Overall Dimensions	(See Figure 1–1 for overall chassis dimensions)
Standard Chassis	
Height (with feet)	13.65 in (362.0 mm)
Width	17.6 in (425.5 mm)
Depth	26.5 in (673.1 mm)
Chassis with Rackmount	
Height	13.25 in (355.6 mm)
Width	18.9 in (480.1 mm)
Depth	28.9 in (746.7 mm) min to 33.9 in (873.8 mm) max
Weight	
Minimum mainframe configuration with expansion module and slot filler panels installed.	48.5 lbs (22.1 kg)
Typical configuration: same as as minimum above with the addition of two TLA 7x4 LA's and one TLA 7x2 DSO at 5 lbs 10 oz each, and removal of 3 slot filler panels	63.7 lbs (28.9 kg)
Shipping weight: minimum configuration with expansion module module (only) and all mainframe standard accessories (2 manuals, 5 dual wide, 1 single slot filler panels, power cord, empty pouch, front cover, keyboard, software, and cables	104 lb (47.2 kg)
Shipping weight: fully configured instrument. Same as minimum above with the addition of 3 LA modules (TLA 7N4, TLA 7P2, and TLA 7P4) and 2 DSO's (TLA 7D1 and TLA 7E1), and all module standard accessories (probes, clips)	161 lb (73 kg)
Rackmount kit adder	20 lbs (9.07 kg)
Module Size	13 plug-in slots

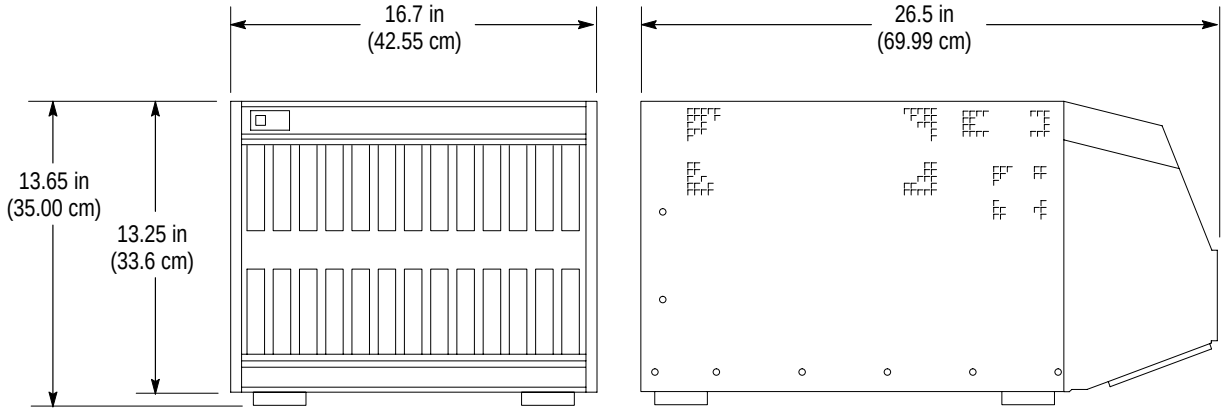


Figure 1–2: Front and side view of the expansion chassis

Operating Information

Operating Information

This chapter contains information about operating the benchtop chassis. Refer to the *TLA 700 Series Installation Manual* for information on how to install and configure the benchtop chassis. For more detailed operating information, refer to the *TLA 700 Series Logic Analyzer User Manual* and in the online help.

Figure 2–1 shows the front view of the benchtop chassis with a benchtop controller installed. Figure 2–3 shows the rear view of the benchtop chassis. Chassis slots 3 through 11 are labeled on the top and bottom of the chassis. Slots 0, 1 and 2 are reserved for the three slot-wide controller, all other slots are available for any other TLA 700 Series module.

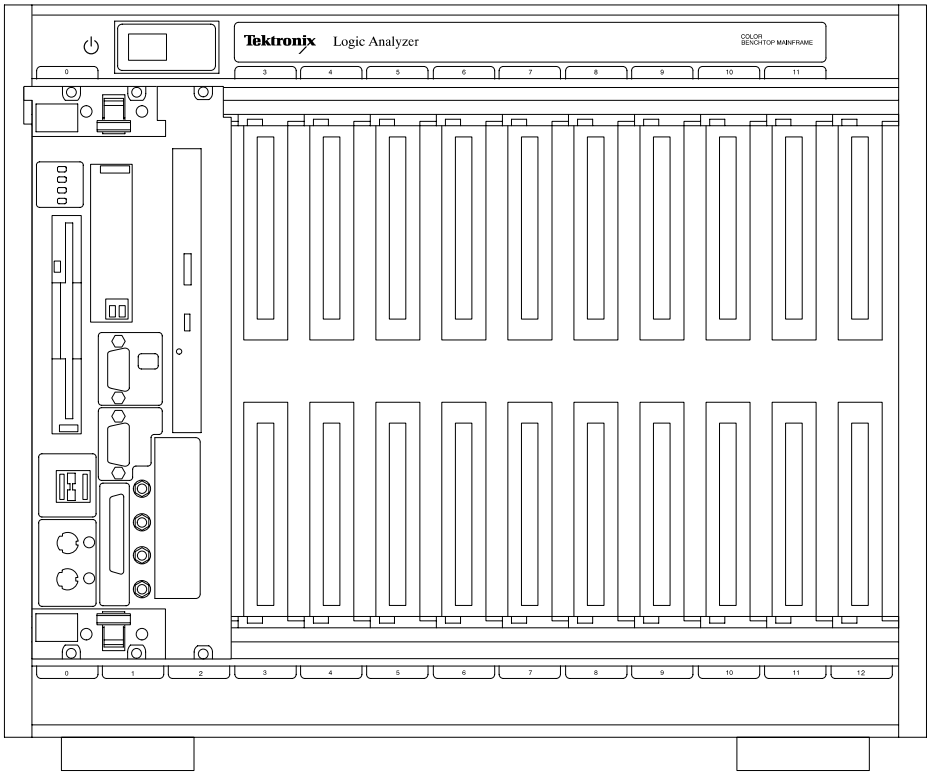


Figure 2–1: Front view of the benchtop chassis with a benchtop controller

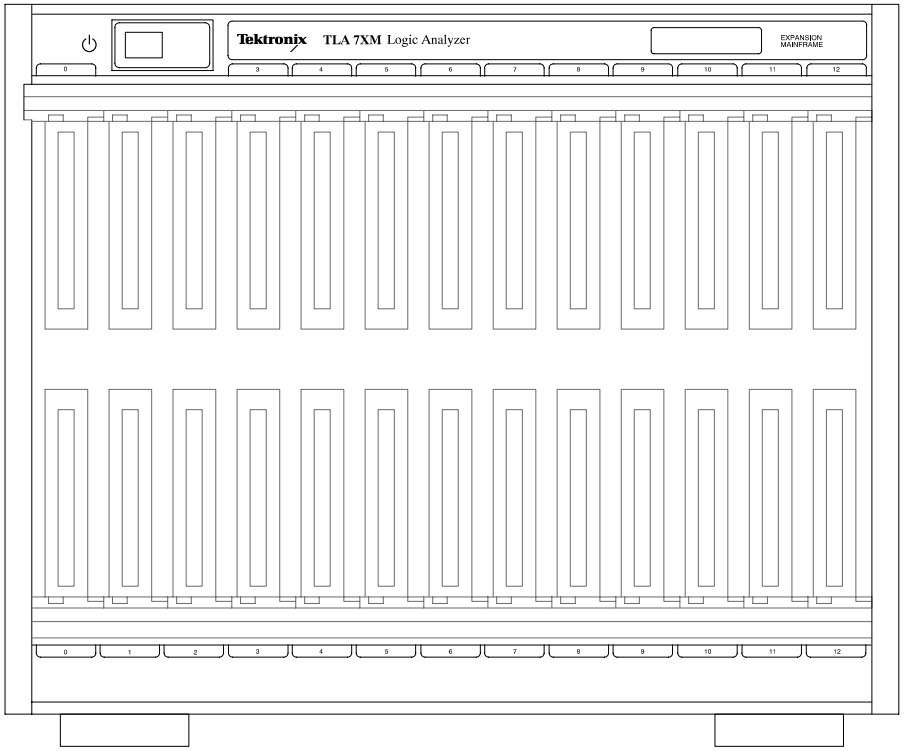


Figure 2–2: Front view of the expansion chassis (with out expansion module)

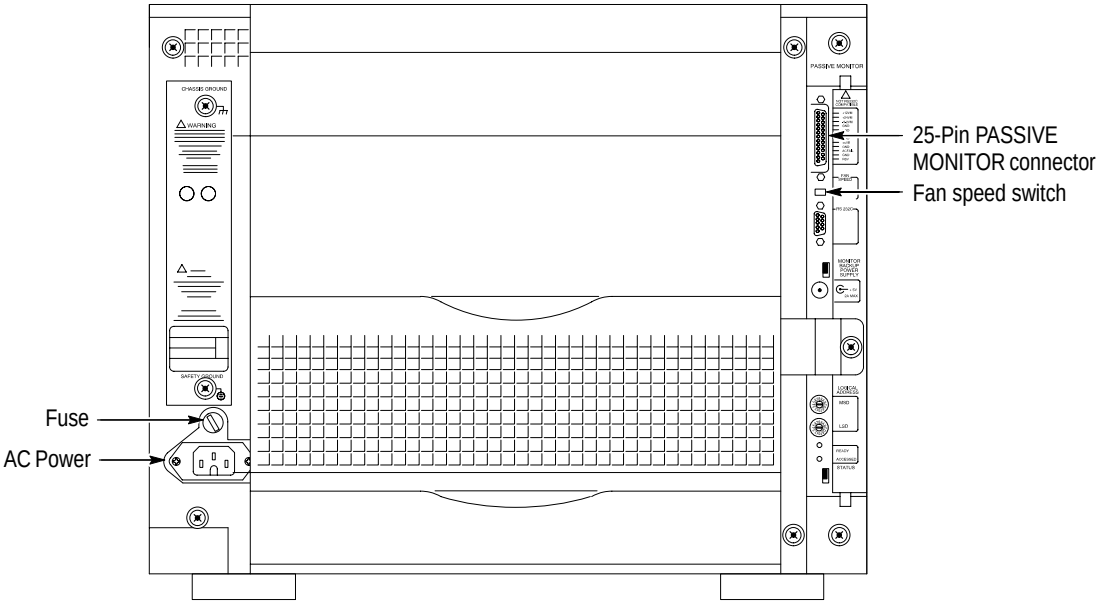


Figure 2–3: Rear view of the benchtop chassis

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

On/Standby Switch

The On/Standby switch on the top-left corner of the front panel applies DC voltages to the chassis. The switch is a momentary contact switch. The switch is lighted when DC voltages are applied to the benchtop chassis. The benchtop chassis can also be remotely controlled.

You can configure the benchtop chassis to bypass the On/Standby switch. (Refer to *Remote Power Switch Configuration* on page 4–18 of the *Maintenance* chapter for information on configuring the power switch.) In this configuration, the On/Standby switch remains lighted while power is applied, but the switch itself no longer controls the benchtop chassis.

AC Power Connector

The AC power connector is located on the rear bottom left side of the benchtop chassis. 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 benchtop chassis to a common ground point.

Fan Speed Switch

The fan speed switch controls the speed of the 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.

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 2–4.

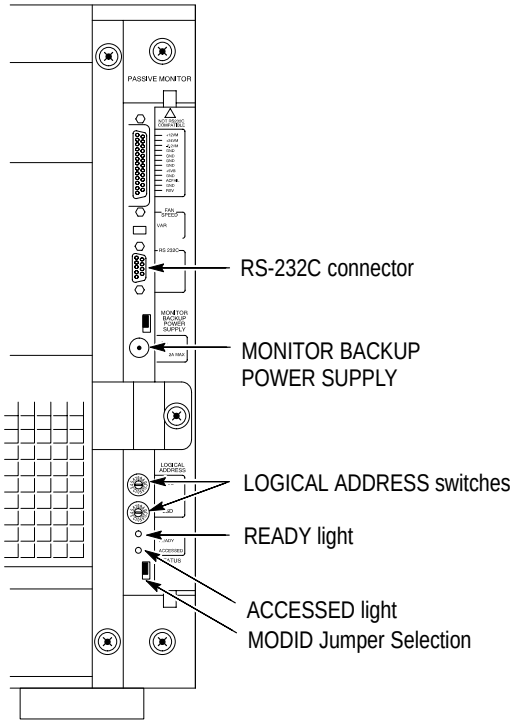


Figure 2–4: Rear view of the enhanced monitor

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.

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. Refer to *Enhanced Monitor Board Jumpers* on page 4–23 for information on the jumper MODID jumper positions.

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.

For additional information on the enhanced monitor board jumpers, refer to the *Enhanced Monitor Board Jumpers* section on page 4–23.

Selecting the Correct Power Cord and Fuse

The benchtop chassis comes standard with two power cords and three fuses. Before installing the chassis you must determine the correct fuse and power cord for your application. Use the following information to determine the appropriate power cord and line fuse. 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 2–5, 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 2–5.

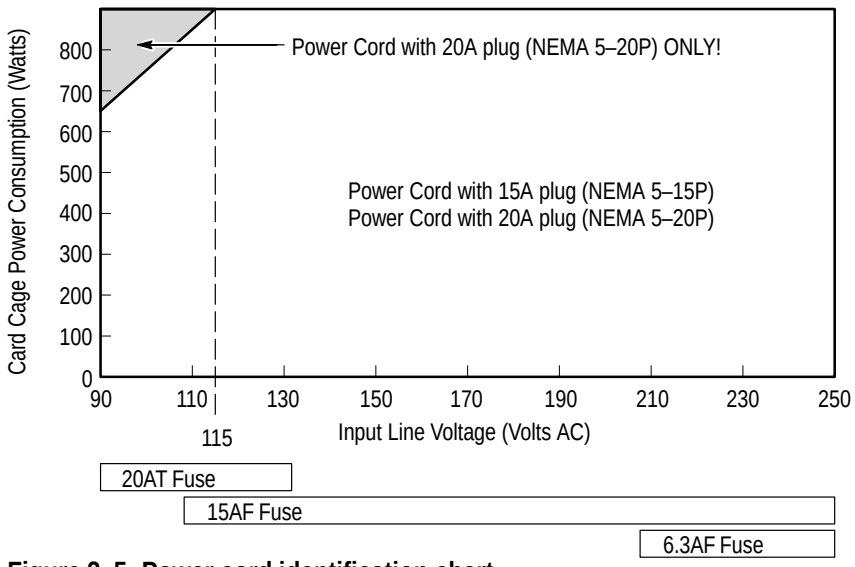


Figure 2–5: Power cord identification chart

Reference

This chapter provides reference information on the mainframe and its connectors. A description of the command set and information related to the Enhanced Monitor makes up the remainder of this chapter.

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 SYSRESET* and ACFAIL* signals.

Figure 2–6 shows the location of the Passive Monitor Connector. Table 2–1 lists the pin out of the Passive Monitor Connector and its function.

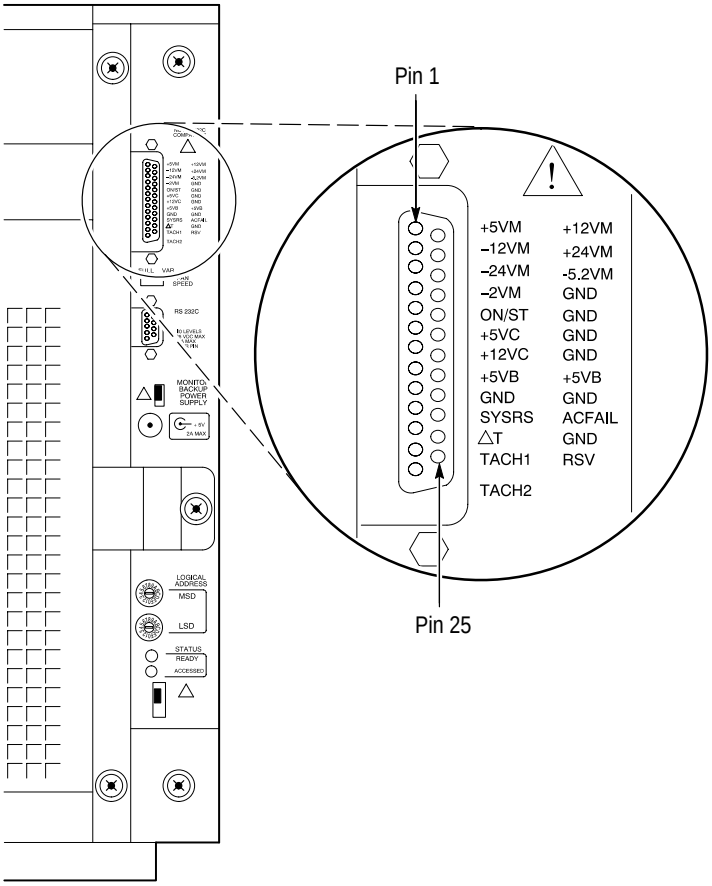


Figure 2–6: Passive monitor connector

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 proporitinal to the speed of fan number 1
13	TACH2	A square wave output signal whose period is proporitinal 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 4–23).

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 RS-232 Connector

The Enhanced Monitor includes a 9-pin RS-232 connector that allows connection to a RS-232 host. Figure 2–7 shows the pinouts of the 9-pin RS-232 connector; Table 2–2 describes the pin assignments.

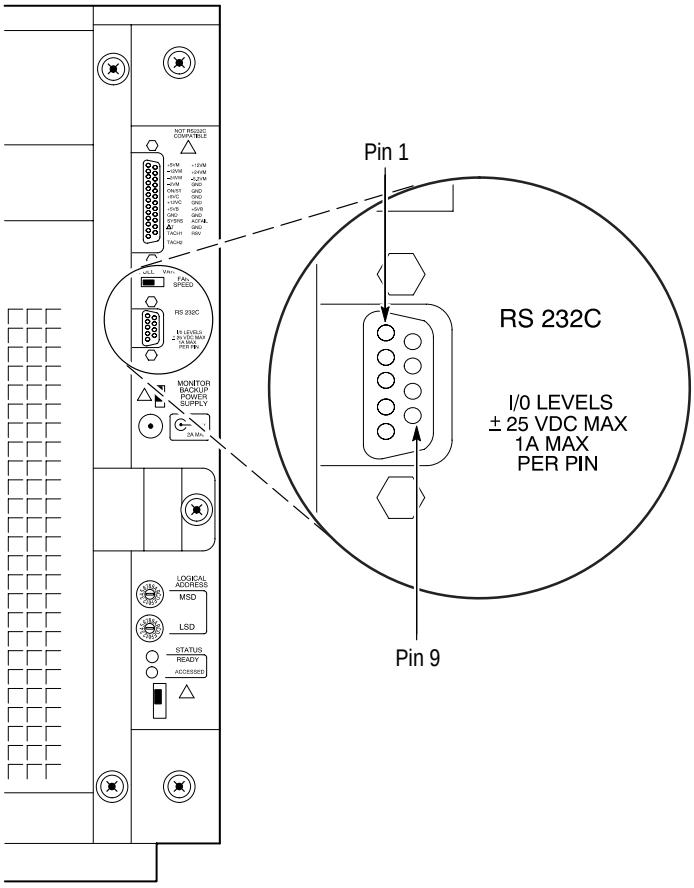


Figure 2–7: RS-232 connector pinout

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

Backplane Connectors

Table 2–3 shows the P1 connector pinouts for all slots in themainframe.

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

Enhanced Monitor

The Enhanced Monitor provides the mainframe with the following additional capabilities via the RS-232 interface:

- Power supply voltage readouts
- Power supply current readouts
- Power supply wattage readout
- Ambient (input) air temperature readout
- Exhaust temperature readout for each slot
- Fan speed readout
- User-selectable maximum temperature rise

Use defined messages with the DISPlay:TEXT command.

Table 2–6: Messages

Category	Message
Power Supply Voltage Messages	FAIL:+24V@XX.XX
	FAIL:+12V@XX.XX
	FAIL:+5V@X.XX
	FAIL:+5V STBY@XX.XX
	FAIL:+5V EXT@XX.XX
	FAIL:–2V@X.XX
	FAIL:–5.2V@X.XX
	FAIL:–12V@XX.XX
	FAIL:–24V@XX.XX
Power Supply Current Average Messages	FAIL:+24I@XX.XXA
	FAIL:+12I@XX.XXA
	FAIL:+5I@XX.XXA
	FAIL:–2I@XX.XXA
	FAIL:–5.2I@XX.XXA
	FAIL:–12I@XX.XXA
	FAIL:–24I@XX.XXA
Power Supply message	FAIL: Total W@XX.XW

Table 2–6: Messages (Cont.)

Category	Message
Slot Temperature messages	FAIL:S0 ΔT@XX°C
	FAIL:S1 ΔT@XX°C
	FAIL:S2 ΔT@XX°C
	FAIL:S3 ΔT@XX°C
	FAIL:S4 ΔT@XX°C
	FAIL:S5 ΔT@XX°C
	FAIL:S6 ΔT@XX°C
	FAIL:S7 ΔT@XX°C
	FAIL:S8 ΔT@XX°C
	FAIL:S9 ΔT@XX°C
	FAIL:S10 ΔT@XX°C
	FAIL:S11 ΔT@XX°C
	FAIL:S12 ΔT@XX°C
	FAIL:Ambient T@XX°C
	FAIL:Fan1 XXXXRPM
	FAIL:Fan2 XXXXRPM (VX1410A only)
Power Supply Voltage Messages	+24 Volts:XX.XXV
	+12 Volts:XX.XXV
	+5 Volts:X.XXV
	+5V Stby:X.XXV
	+5V External:X.XXV
	–2 Volts:X.XXV
	–5.2 Volts:X.XXV
	–12 Volts:XX.XXV
	–24 Volts:XX.XXV
Power Supply Current Amperage Messages	+24V Amps:XX.XXA
	+12V Amps:XX.XXA
	+5V Amps:XX.XXA
	–2V Amps:XX.XXA
	–5.2V Amps:XX.XXA
	–12V Amps:XX.XXA
	–24V Amps:XX.XXA

Table 2–6: Messages (Cont.)

Category	Message
Power Supply Power Messages	Total Power:XXX.XW
Temperature Status Messages	Ambient T:XX°C
	ΔT S0,S1:XX,XX°C
	ΔT S2,S3:XX,XX°C
	ΔT S4,S5:XX,XX°C
	ΔT S6,S7:XX,XX°C
	ΔT S8,S9:XX,XX°C
	ΔT S10,S11:XX,XX°C
	ΔT S12:XX°C
Fan Status Messages	Fan 1 RPM: XXXX
	Fan 2 RPM: XXXX (VX1410A only)
Miscellaneous Messages	Time On:HHHHHH:MM
	Hr of Oper:HHHHHH
Date and Time Message	Year–Mon–XX XX:XX[1]
	SYSTEM OFF
	SYSTEM OK

1 **After power on a prompt will appear in the display. Press the PREV and NEXT buttons to set the date and time. Pressing the PREV or NEXT will cycle through the values, while pressing both buttons simultaneously moves the cursor to the next field.**

Syntax

This section provides an overview of the commands for the mainframe and includes the following topics:

- A brief introduction to SCPI
- A description of the command syntax
- Instructions on how to enter commands

The commands for the mainframe are compatible with IEEE-488.1, IEEE-488.2, and SCPI-1995.0 standards.

SCPI

SCPI (Standard Commands for Programmable Instruments) is a standard created by an international consortium of the major manufacturers of test and measurement equipment. SCPI uses IEEE-488.2 syntax to provide common commands for the same functions of various programmable instruments.

The standard simplifies the task of programming a group of instruments that use SCPI. Instead of having to learn different commands for every instrument, the programmer may use the same commands for the same functions of each instrument.

The controller sends instructions to the instrument in the form of commands or queries.

- Commands modify control settings or tell the instrument to perform a specific action.
- Queries cause the instrument to send data or status information back to the controller.

A question mark at the end of a command header identifies it as a query.

Command Syntax

Any instruction that you send to an instrument that complies with SCPI must have at least three basic elements:

- Command header
- Parameter (if required)
- Message terminator or separator

Command Headers

The command header has a hierarchical structure that may be represented by a command tree. An easy-to-remember word called a mnemonic designates each level of the hierarchy. A colon separates the levels.

The top level of the tree is the root level. A root node is a mnemonic at the root level. A root node and one or more lower-level nodes form a header path to the last node called the leaf node.

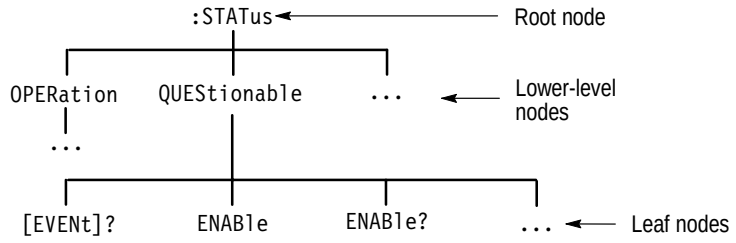


Figure 2–8: Tree hierarchy

The header path and leaf node together form the command header. Figure 2–9 shows the command header for the leaf node indicated in Figure.

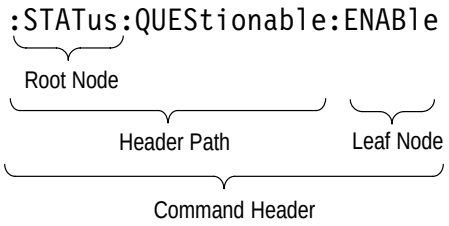


Figure 2–9: Command header

Parameter

You must include values for commands that have parameters. In this manual, the < > symbols enclose the parameter type when stating the syntax of the command. For example, the syntax of the command in Figure 2–10 includes the <NRf> parameter type.

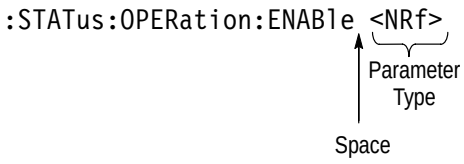


Figure 2–10: Command header with parameter

NOTE. *Do not include the* <, >, {,}, or | *symbols when entering the actual value for a parameter.*

Separate multiple parameters after a command header with a comma. For example:

```
STATus:QUEStionable:TEMPerature:LIMit DELTa1,30
```

Table 2–7 defines the command and response parameter types for the mainframe.

Table 2–7: Parameter types for syntax descriptions

Parameter type	Description	Example
Boolean	Boolean number or value (command parameter, response returns a 1 or 0)	ON or 1 OFF or 0
Block	A specified length of block-formatted data (command parameter)	#212xxxxxxxxxxx where 2 indicates that the following 2 digits (12) specify the length of the following block data (xxx...)
Nondecimal numeric	Integers in hexadecimal (#H), octal (#Q), or binary (#B) format (command parameter).	#H00FF, #B010101, #Q0753
NR1	Integers (response parameter)	0, 1, 15
NR2	Decimal numbers (response parameter)	1.2, 3.141516, 6.5
NRf	Integer, decimal, or floating point number as well as MAX and MIN for setting the largest or smallest value the instrument allows. (command parameter)	1, 3E+1, MAX, 2.6
discrete	A list of specific values (command or response parameter)	P24, P5EXT, N2, ...
String	Alphanumeric characters within quotation marks (command or response parameter)	“No error”

Parameter values that appear in this manual are often enclosed in curly braces ({}) separated by a vertical line. This vertical line means the same thing as the word “or.” For example, values for the parameter <Boolean> are

```
{0|1|OFF|ON}
```

This is the same thing as saying “0 or 1 or OFF or ON.” Any single value is a valid parameter.

Message Terminator and Message Separator

In accordance with IEEE 488.2 specification, the mainframe accepts any of the following message terminators:

- LF^END — Linefeed code (hexadecimal 0A) with the END bit in the *Byte Available* command asserted.
- LF — Linefeed code
- <dab>^END — Last data byte with the END bit in the *Byte Available* command asserted.

A semicolon separates one command from another when the commands appear on the same line. See *Entering Commands*.

Entering Commands

The standards that govern the command set for the mainframe allows for a certain amount of flexibility when you enter commands.

For example, you can abbreviate many commands or combine commands into one message that you send to the mainframe. This flexibility, called “friendly listening,” saves programming time and makes the command set easier to remember and use.

Command Characters

The mainframe is not sensitive to the case of command characters. You can enter commands in either upper or lower case.

You can precede any command with white space characters. White space characters include a space or any combination of the ASCII control characters hexadecimal 00 through 1F except for the character 0A (new line). You must, however, use at least one space between the parameter and the command header.

Abbreviating Commands

Most commands have a long form and a short form. The listing for each command in this section shows the abbreviations in upper case. For example, you can enter the query `SYSTem:ERRor?` simply as `SYST:ERR?` (or `syst:err?`).

The brackets around a mnemonic indicate that the mainframe assumes this level of the command header by default. It is not necessary, therefore, for this mnemonic to appear as part of the header when you send the command. For example, you can abbreviate the command

```
STATus:OPERational[:EVENt]?
```

to

```
STAT:OPER?
```

Because the mainframe assumes that a command at the beginning of a program message starts from the root, you have the option of beginning the initial command header with a colon (:).

Combining Commands

You can combine (concatenate) commands and queries using a semicolon (;). The mainframe executes concatenated commands in the order it receives them.

When you concatenate queries, the mainframe combines the responses into a single response message.

For example: Querying both the standard event status register and the error/event queue in the same program message.

```
STATus:OPERation?;:SYSTem:ERRor?
```

returns the response message

```
0;0,"No errors"
```

If the command that follows the semicolon has a different header path from the root level, you must use a colon to force a return to the root level:

```
SYSTem:VERSion?;:TEST:RESult?
```

If the command that follows the semicolon has the same header path, you may omit the colon and the path and state only the new leaf node. This makes it possible, for example, to shorten the concatenated query

```
SYSTem:TIME:LMAintenance?;:SYSTem:TIME:ON?
```

into

```
SYSTem:TIME:LMAintenance?;ON?
```

The 488.2 common commands that begin with an asterisk (*) may be used anywhere in a command sequence with no effect on the command header path.

```
SYSTem:VERSion?;*ESR?
```

returns

```
1995.0;16
```

You can combine commands and queries into the same message. Note, for example, the following combination which sets the temperature limit and queries to verify the setting

```
status:questionable:temperature:limit AMBient,25;limit?
AMBient
```

Command Groups

This section lists mainframe commands by functional groups. A question symbol surrounded by brackets [?] identifies commands that also have a query form.

Status Commands

Commands in the STATus subsystem, along with several IEEE 488.2 Common Commands, control the status and event reporting system.

Table 2–8: Status commands

Header	Description
:BLOWer?	Returns the contents of the Blower Event register.
:CONDition?	Returns the contents of the Blower Condition register.
:CURRent?	Returns the contents of the Current Event register.
:CMAXimum?	Returns the maximum current level since power on.
:CONDition?	Returns the contents of the Current Condition register.
:LEVel?	Returns current level.
:LIMit[?]	Sets or queries the maximum current usage allowed before generating an alarm.
:MAXimum?	Returns the maximum current level since the last factory maintenance.
:ENABle[?]	Sets or queries the contents of the Blower Enable register.
:SPEed?	Returns the fan speed in revolutions per minute.
:CONDition?	Returns the contents of the Questionable Condition register.
:ENABle[?]	Sets or queries the contents of the Questionable Status Enable register.
:CMAXimum?	Returns the maximum power used since power up.
:CONDition?	Returns the contents of the power condition register.
:ENABle[?]	Sets or queries the contents of the power enable register.
:LEVel?	Returns the wattage used by the mainframe.
:LIMit[?]	Set or query the maximum amount of power allowed before generating an alarm.

Table 2–8: Status commands (Cont.)

Header	Description
:MAXimum?	Returns the maximum power high mark used since the last factory maintenance.
:TEMPerature?	Returns the contents of the Temperature Event register as a decimal number.
:CMAXimum?	Returns the maximum measurable temperatures in the mainframe since power on.
:CONDition?	Returns the contents of the Temperature Condition register.
:ENABle[?]	Sets or queries the contents of the Temperature Enable register.
:LEVel?	Returns the current temperatures in the mainframe.
:LIMit[?]	Sets or queries the maximum ambient and delta temperatures in each slot of the mainframe.
:MAXimum?	Returns the maximum measurable temperatures in the mainframe since the last factory maintenance.
:VOLTage?	Returns the contents of the Voltage Event register as a decimal number.
:CONDition?	Returns the contents of the Voltage Condition register.
:ENABle[?]	Sets or queries the contents of the Voltage Enable register.
:LEVel?	Returns the current power supply output voltages.
:PTR[?]	Sets or queries the power supply positive transition filter.
:QUEue?	Returns the next message in the error queue.
[:NEXT]?	Returns the next event code and message from the Error/Event queue.
:ALL?	Returns a comma-separated list of all unread events from the Error/Event queue.
:CODE?	Returns the next event code from the Error/Event queue.
:ALL?	Returns a comma-separated list of all unread event codes from the Error/Event queue.
:COUNt?	Returns the number of unread events from the Error/Event queue.
:ENABle[?]	Sets or queries enable events to be placed in the Error/Event queue.
:ALL	Presets the Error/Event queue enable to –1999:1000.
:SCONdition?	Returns a summary condition of all monitors.
:S2CONdition?	Returns the overflow summary information of the condition registers.

Table 2–8: Status commands (Cont.)

Header	Description
:SEVent?	Returns summary information of all events in the mainframe.
:S2EVent?	Returns the overflow summary information for events in the mainframe.

System Commands

Commands in the SYSTem subsystem program utility functions provide version information about the mainframe.

Table 2–9: System commands

Header	Description
SYSTem	
:COMMunicate	
:SERial	
:BAUD[?]	Sets or queries the baud rate of the RS-232 port.
:BITS[?]	Sets or queries the number of bits per character in the RS-232 port.
:CONTrol	
:RTS[?]	Sets or queries the operation of the RTS and CTS lines.
:ECHO[?]	Sets or queries whether incoming characters are echoed back to the RS-232 port.
:ERESponse[?]	Sets or queries whether error messages are automatically returned to the RS-232 port.
:LBUFfer[?]	Sets or queries the state of the character buffer.
:PACE[?]	Sets or queries whether software flow control (XON/XOFF) is enabled.
:PARity[?]	Sets or queries the type of parity for the RS-232 port.
:PRESet	
[:ALL]	Configures RS-232 port parameters to default values.
:RAW	Configures the RS-232 port parameters for use with a computer.
:TERMinal	Configures the RS-232 port parameters for use with a terminal.

Table 2–9: System commands (Cont.)

Header	Description
:SBITs[?]	Sets or queries the number of stop bits sent with each character.
:DATE[?]	Sets or queries the calendar date.
:LMAintenance?	Returns the last factory maintenance date.
:ERRor?	Returns the next entry from the Error/Event queue.
:ALL?	Returns a comma separated list of all events stored in the Error/Event queue.
:CODE?	Returns the next event code stored in the Error/Event queue.
:ALL?	Returns a comma separated list of all event codes stored in Error/Event queue.
:COUNt?	Returns the number of unread events in the Error/Event queue.
:ENABle[?]	Sets or queries enable events to be placed in the Error/Event queue.
:ALL?	Presets the Error/Event queue enable to –1999:1000.
:FACTory	Sets the mainframe settings to the factory default values.
:HELP	
:SYNTax?	Returns the syntax of the specified command.
:IEMessage	Sends interface event messages between the VXI interface and the RS-232 port.
:MODel?	Returns the model number of the mainframe.
:NVRecall	Recalls device settings from nonvolatile RAM.
:NVSave	Saves device settings to nonvolatile RAM.
:OPTions	Returns the options installed in the mainframe.
:PASSword	
:CDISable[1]	Disables the CALibrate command.
:CENable[1]	Enables the CALibrate command.
:STATe?[1]	Queries if password-protected commands are enabled.
:POWer[?]	Powers the mainframe on or off. The query returns whether the power is on or off.
:CYCLe?	Queries the number of times the mainframe power has been cycled.
:SOURce?	Queries the power source of the enhanced monitor.
:SYSReset[?]	Sets or queries whether the VXI SYSRESET signal can reset the enhanced monitor.

Table 2–9: System commands (Cont.)

Header	Description
:IMMediate	Initiates a VXI SYSRESET signal.
:TIME[?]	Sets or queries the time.
:LMAintenance?	Returns the number of hours the mainframe has been operating since the last factory maintenance.
:ON?	Returns the number of hours the mainframe has been operating since power on.
:VERSion?	Returns the SCPI version supported by the mainframe.

1 **These commands are intend to be used only by qualified service personnel while servicing the instrument.**

Test Commands

Commands in the TEST subsystem execute the internal self-tests of the mainframe

Table 2–10: Test commands

Header	Description
TEST	
[:ALL][?]	Executes all internal self tests once. The query returns the test results.
:NUMBer[?]	Executes a test. The query returns the test result.
:RESults?	Returns the failure code for the last self-test command that was executed.
:VERBose?	Returns a failure code as a string describing the last executed self-test command and the test results.

STATus:QUEStionable:BLOWer?

Queries the contents of the Blower Event register. A value of one in a bit indicates the corresponding condition bit changed from false to true and that there may be a problem with one of the fans. Unused bits always return a value of zero. The register is cleared by the *CLS command.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:BLOWer[:EVENt]?
```

Parameters

Parameter	Query response
Not applicable	<NR1>

Blower status word bits	Definition
D0	Blower 1
D1	Blower 2
D2	Not Used
D3	Not Used
D4	Not Used
D5	Not Used
D6	Not Used
D7	Not Used
D8	Not Used
D9	Not Used
D10	Not Used
D11	Not Used
D12	Not Used
D13	Not Used
D14	Not Used
D15	Not Used

Reset Value

Not Applicable

Errors and Events

None

Dependencies Reading the register clears it.

Examples Query: `STAT:QUES:BLOW?`

Response: `0`

Related Commands STATus:QUEStionable:BLOWer:CONDition?
STATus:QUEStionable:BLOWer:ENABle

STATus:QUEStionable:BLOWer:CONDition?

Returns the contents of the Blower Condition register. A value of one in a bit indicates possible problems with one of the fans. Unused always return a value of zero. Definition of the bits in this register can be found under the STATus:QUEStionable:BLOWer command on page 2–30.

Reading this register does not clear it.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:BLOWer:CONDition?
```

Parameters

Parameter	Query response
Not applicable	<NR1>

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Query: `STAT:QUES:BLOW:COND?`

Response: `0`

Related Commands

STATus:QUEStionable:BLOWer?
STATus:QUEStionable:BLOWer:ENABle

STATus:QUEStionable:BLOWer:ENABle?

Sets or queries the contents of the Blower Enable register. Setting unused enable bits does not generate an error; the bits are ignored. Enabling bits in the register allows information from the Blower Event register to be passed on to the Questionable Event register.

If the power-on status clear flag is FALSE (see **PSC* command on page 2–79) at power on, the register value will be restored from nonvolatile RAM; otherwise the register value at power on is set to #H7FFF. Executing the STATus:PRESet command sets the register value to #H7FFF.

Syntax

```
STATus:QUEStionable:BLOWer:ENABle <Mask>
STATus:QUEStionable:BLOWer:ENABle?
```

Parameters

<Mask>	Query response
{<NRf> | <Nondecimal Numeric>} 0 ≤ N ≤ #HFFFF	<NR1>

Reset Value Not Applicable

Errors and Events –222, “Data Out of Range”
You attempted to set the enable register to an illegal value.

Dependencies None

Examples Command: `STAT:QUES:BLOW:ENAB #H0000`

Query: `STAT:QUES:BLOW:ENAB?`

Response: `0`

Related Commands STATus:QUEStionable:BLOWer?
STATus:QUEStionable:BLOWer:CONDition?
STATus:PRESet

STATus:QUEStionable:BLOWer:SPEed?

Queries the current fan (blower) rotational speed in revolutions per minute (RPM). Normal values are 1200 to 3350 for the VX1410A and 650 to 2250 for the VX1420A.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:BLOWer:SPEed? <Blower>
```

Parameters

<Blower>	Query response
{BLOWer1 | BLOWer2}	<NR1>

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to use an invalid parameter value.

Dependencies

None

Examples

Query: `STAT:QUES:BLOW:SPE? BLOW1`

Response: `1200`

Related Commands

STATus:QUEStionable:BLOWer?
STATus:QUEStionable:BLOWer:CONDition?
STATus:QUEStionable:BLOWer:ENABle

STATus:QUEStionable:CONDition?

Queries the contents of the Questionable Condition register. Unused bits always return a value of zero.

Reading the register does not clear it.

There is no command associated with this query.

Syntax `STATus:QUEStionable:CONDition?`

Parameters

Parameter	Query response
Not Applicable	<NR1>

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Query: `STAT:QUES:COND?`

Response: 0

Related Commands STATus:QUEStionable?
STATus:QUEStionable:ENABle

STATus:QUEStionable:CURRent?

Queries the contents of the Current Event register. A one in a bit indicates the corresponding power supply failure event has been asserted. Unused bits always return a value of zero. The register is also cleared by the *CLS command.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:CURRent[:EVENt]?
```

Parameters

<Event>	Query response
Not applicable	<NR1>

Current status word bits	Definition
D0	+24 V
D1	+12 V
D2	+5 V
D3	Not Used
D4	Not Used
D5	–2 V
D6	–5.2 V
D7	–12 V
D8	–24 V
D9	Not Used
D10	Not Used
D11	Not Used
D12	Not Used
D13	Not Used
D14	Not Used
D15	Not Used

Reset Value

Not Applicable

Errors and Events

None

Dependencies

Reading the register clears it.

Examples

Query: `STAT:QUES:CURR?`

Response: `0`

Related Commands

STATus:QUEStionable:CURRent:CONDition?
STATus:QUEStionable:CURRent:ENABle

STATus:QUEStionable:CURRent:CMAXimum?

Queries the current maximum measurable power supply currents within the mainframe since power on; the returned value is in amperes.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:CURRent:CMAXimum? <power supply>
```

Parameters

<Power supply>	Query response
{P24 | P12 | P5 | N2 | N5PT2 | N12 | N24}	<NR2>

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to use an illegal parameter value.

Dependencies

None

Examples

Query: `STAT:QUES:CURR:CMAX? P12`

Response: `5.1`

Related Commands

STATus:QUEStionable:CURRent:LEVel?
STATus:QUEStionable:CURRent:MAXimum?

STATus:QUEStionable:CURRent:CONDition?

Queries the contents of the Current Condition register. A value of one in a bit indicates the corresponding power supply is currently failing. Unused bits always return a value of zero. Definition of the bits in this register can be found in STATus:QUEStionable:CURRent? command.

Reading the register does not clear it.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:CURRent:CONDition?
```

Parameters

Parameter	Query response
Not Applicable	<NR1>

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Query: `STAT:QUES:CURR:COND?`

Response:0

Related Commands

STATus:QUEStionable:CURRent?
STATus:QUEStionable:CURRent:ENABle

STATus:QUEStionable:CURRent:ENABle?

Sets or queries the contents of the Current Enable register. Setting unused enable bits does not generate an error; the bits are ignored.

If the power-on status clear flag is FALSE (see **PSC* command on page 2–79) at power on, the register value will be restored from nonvolatile RAM; otherwise, the register value at power on is set to #H7FFF. Executing the STATus:PRESet command sets the register value to #H7FFF.

Syntax

```
STATus:QUEStionable:CURRent:ENABle <Mask>
STATus:QUEStionable:CURRent:ENABle?
```

Parameters

<Mask>	Query response
<NRf> | <Nondecimal Numeric> 0 ≤ N ≤ #HFFFF	<NR1>

Reset Value

Not Applicable

Errors and Events

–222, “Data Out of Range”
You attempted to set the enable register to an illegal value.

Dependencies

None

Examples

Command: `STAT:QUES:CURR:ENAB #H3FFF`

Query: `STAT:QUES:CURR:ENAB?`

Response: `16383`

Related Commands

STATus:QUEStionable:CURRent?
STATus:QUEStionable:CURRent:CONDition?
STATus:PRESet

STATus:QUEStionable:CURRent:LEVel?

Queries the current power supply output amperage.

There is no command associated with this query.

Syntax `STATus:QUEStionable:CURRent:LEVel? <Power Supply>`

Parameters

<Power supply>	Query response
{P24 | P12 | P5 | N2 | N5PT2 | N12 | N24}	<NR2>

Code	Power supply
P24	+24V
P12	+12V
P5	+5V
N2	–2V
N5PT2	–5.2V
N12	–12V
N24	–24V

Reset Value Not Applicable

Errors and Events –224, “Illegal Parameter Value”
You attempted to use an illegal parameter value.

Dependencies None

Examples Query: `STAT:QUES:CURR:LEV? P5`

Response: `5.11`

Related Commands STATus:QUEStionable:CURRent?
STATus:QUEStionable:CURRent:CONDition?
STATus:QUEStionable:CURRent:ENABle

STATus:QUEStionable:CURRent:LIMit?

Sets or queries the maximum allowable current to be drawn from each of the power supplies.

Syntax

```
STATus:QUEStionable:CURRent:LIMit <Location>,<Limit>
STATus:QUEStionable:CURRent:LIMit? <Location>
```

<Location>	**Query response (Amperes)**
{P24 | P12 | P5 | N2 | N5 | N12 | N24}	<NR2>
<Limit>	
<NRf>	
MIN {all supplies}	0.0
MAX {each supply}	
P24	13.0
P12	13.0
P5	95.0
N2	–30.0
N5PT2	–60.0
N12	–13.0
N24	–13.0

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to set the location to an illegal value.

–222, “Data Out of Range”
You attempted to set the current limit to an illegal value.

Dependencies

None

Examples

Query: `STAT:QUES:CURR:LIM? P24`

Response: `12.0`

Related Commands

STATus:QUEStionable:CURRent?
STATus:QUEStionable:CURRent:CONDition?
STATus:QUEStionable:CURRent:ENABle
STATus:QUEStionable:CURRent:LEVel?

STATus:QUEStionable:CURRent:MAXimum?

Queries the current maximum measurable power supply currents within the mainframe since the last factory maintenance was performed; the returned value is in amperes.

There is no command associated with this query.

Syntax `STATus:QUEStionable:CURRent:MAXimum? <power supply>`

Parameters

<Power supply>	Query response (Amperes)
{P24 | P12 | P5 | N2 | N5PT2 | N12 | N24}	<NR2>

Reset Value Not Applicable

Errors and Events –224, "Illegal Parameter Value"
You attempted to use an illegal parameter value.

Dependencies None

Examples Query: `STAT:QUES:CURR:MAX? P12`

Response: `7.1`

Related Commands STATus:QUEStionable:CURRent:LEVel?
STATus:QUEStionable:CURRent:CMAXimum?

STATus:QUEStionable:POWer?

Queries the contents of the Power Event register. A one in the corresponding bit indicates the power supply failure event has been asserted. Unused bits always return a value of zero. The register is also cleared by the *CLS command.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:POWer[:EVENt]?
```

Parameters

<Event>	Query response
Not applicable	<NR1>

Current status word bits	Definition
D0	Not Used
D1	Not Used
D2	Not Used
D3	Not Used
D4	Not Used
D5	Not Used
D6	Not Used
D7	Not Used
D8	Not Used
D9	Total Power occurred
D10	Not Used
D11	Not Used
D12	Not Used
D13	Not Used
D14	Not Used
D15	Not Used

Reset Value

Not Applicable

Errors and Events

None

Dependencies

Reading the register clears it.

Examples

Query: `STAT:QUES:POW?`

Response: `0`

Related Commands

STATus:QUEStionable:POWer:CONDition?
STATus:QUEStionable:POWer:ENABle

STATus:QUEStionable:POWer:CMAXimum?

Queries the current maximum measurable total power supply wattage within the mainframe since power on; the returned value is in watts.

There is no command associated with this query.

Syntax `STATus:QUEStionable:POWer:CMAXimum?`

Parameters

<Power supply>	Query response
Not Applicable	<NR2>

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Query: `STAT:QUES:POW:CMAX?`

Response: `824.5`

Related Commands STATus:QUEStionable:POWer:LEVel?
STATus:QUEStionable:POWer:MAXimum?

STATus:QUEStionable:POWer:CONDition?

Queries the contents of the Power Condition register. A value of one in the 9 bit indicates the power supply is over limits. Unused bits always return a value of zero. Definition of the bits in this register can be found in STATus:QUEStionable:POWer? command.

Reading the register does not clear it.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:POWer:CONDition?
```

Parameters

Parameter	Query response
Not Applicable	<NR1>

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Query: `STAT:QUES:POW:COND?`

Response:0

Related Commands

STATus:QUEStionable:POWer?
STATus:QUEStionable:POWer:ENABle

STATus:QUEStionable:POWer:ENABle?

Sets or queries the contents of the Power Enable register. Setting unused enable bits does not generate an error; the bits are ignored.

If the power-on status clear flag is FALSE (see **PSC* command on page 2–79) at power on, the register value will be restored from nonvolatile RAM; otherwise the register value at power on is set to #H7FFF. Executing the STATus:PRESet command sets the register value to #H7FFF.

Syntax

```
STATus:QUEStionable:POWer:ENABle <Mask>
STATus:QUEStionable:POWer:ENABle?
```

Parameters

<Mask>	Query response
<NRf> | <Nondecimal Numeric> 0 ≤ N ≤ #HFFFF	<NR1>

Reset Value

Not Applicable

Errors and Events

–222, "Data Out of Range"
You attempted to set the enable register to an illegal value.

Dependencies

None

Examples

Command: `STAT:QUES:POW:ENAB #H3FFF`

Query: `STAT:QUES:POW:ENAB?`

Response: `512`

Related Commands

STATus:QUEStionable:POWer?
STATus:QUEStionable:POWer:CONDition?
STATus:PRESet

STATus:QUEStionable:POWer:LEVel?

Queries the total power supply output wattage.

There is no command associated with this query.

Syntax `STATus:QUEStionable:POWer:LEVel?`

Parameters

<Power Supply>	Query response
Not Applicable	<NR2>

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Query: `STAT:QUES:POW:LEV?`

Response: `812.3`

Related Commands STATus:QUEStionable:POWer?
STATus:QUEStionable:POWer:CONDition?
STATus:QUEStionable:POWer:ENABle

STATus:QUEStionable:POWer:LIMit?

Sets or queries the maximum allowable power to be drawn from the entire power supply.

Syntax

```
STATus:QUEStionable:POWer:LIMit <Limit>
STATus:QUEStionable:POWer:LIMit?
```

<Limit>	Query response
<NRf> MIN MAX	<NR2> 0.0 VX1410A: 925.0 VX1420A: 1000.0

Reset Value

Not Applicable

Errors and Events

–222, “Data Out of Range”
You attempted to set the power limit to an illegal value.

Dependencies

None

Examples

Query: `STAT:QUES:POW:LIM?`

Response: `675.0`

Related Commands

STATus:QUEStionable:POWer?
STATus:QUEStionable:POWer:CONDition?
STATus:QUEStionable:POWer:ENABle
STATus:QUEStionable:POWer:LEVel?

STATus:QUEStionable:POWer:MAXimum?

Queries the current maximum measurable total power supply wattage within the mainframe since the last factory maintenance was performed; the returned value is in watts.

There is no command associated with this query.

Syntax `STATus:QUEStionable:POWer:MAXimum?`

Parameters

<Power supply>	Query response
Not Applicable	<NR2>

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Query: `STAT:QUES:POW:MAX?`

Response: `876.3`

Related Commands STATus:QUEStionable:POWer:LEVel?
STATus:QUEStionable:POWer:CMAXimum?

STATus:QUEStionable:TEMPerature?

Returns the contents of the Temperature Event register. A value of one in a bit indicates the corresponding condition bit has transitioned from false to true. Unused bits always return a value of zero. The register is cleared by the *CLS command.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:TEMPerature[:EVENt]?
```

Parameters

Parameter	Query response
Not applicable	<NR1>

Blower status word bits	Definition
D0	Slot 0 Delta Temperature
D1	Slot 1 Delta Temperature
D2	Slot 2 Delta Temperature
D3	Slot 3 Delta Temperature
D4	Slot 4 Delta Temperature
D5	Slot 5 Delta Temperature
D6	Slot 6 Delta Temperature
D7	Slot 7 Delta Temperature
D8	Slot 8 Delta Temperature
D9	Slot 9 Delta Temperature
D10	Slot 10 Delta Temperature
D11	Slot 11 Delta Temperature
D12	Slot 12 Delta Temperature
D13	Ambient Temperature
D14	Not Used
D15	Not Used

Reset Value Not Applicable

Errors and Events None

Dependencies Reading the register clears it.

Examples Query: `STAT:QUES:TEMP?`

Response: 1

Related Commands STATus:QUEStionable:TEMPerature:CONDition?
STATus:QUEStionable:TEMPerature:ENABle

STATus:QUEStionable:TEMPerature:CMAXimum?

Queries the current maximum measurable temperatures in the mainframe since power on. The returned value is in °C.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:TEMPerature:CMAXimum? <Location>
```

Parameters

<Location>	Query response
{AMBient | OUT0 . . . OUT12 | DELTa0 . . . DELTa12} AMBient – ambient input temperature OUT0 . . . OUT12 – output temperature of each slot DELTa0 . . . DELTa12 – output temperature minus input temperature of each slot	<NR1>

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to use an illegal parameter value.

Dependencies

None

Examples

Query: `STAT:QUES:TEMP:CMAX? DELTA12`

Response: `50`

Related Commands

STATus:QUEStionable:TEMPerature:LEVel?
STATus:QUEStionable:TEMPerature:MAXimum?

STATus:QUEStionable:TEMPerature:CONDition?

Queries the contents of the Temperature Condition register. A value of one in a bit indicates the corresponding temperature condition is outside of the limits. Unused bits always return a value of zero. Definition of the bits in this register can be found under the STATus:QUEStionable:TEMPerature? command on page 2–52.

If the fan speed is already set to the maximum speed and the delta temperature is above the limit for 30 seconds, a failure will be reported.

Reading the register does not clear it.

There is no command associated with this query.

Syntax `STATus:QUEStionable:TEMPerature:CONDition?`

Parameters

Parameter	Query response
Not Applicable	<NR1>

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Query: `STAT:QUES:TEMP:COND?`

Response: 0

Related Commands STATus:QUEStionable:TEMPerature?
STATus:QUEStionable:TEMPerature:ENABle

STATus:QUEStionable:TEMPerature:ENABle?

Sets or queries the contents of the Temperature Enable register. Setting unused enable bits does not generate an error; the bits are ignored.

If the power-on status clear flag is FALSE (see **PSC* command on page 2–79) at power on, the register value will be restored from nonvolatile RAM; otherwise, the register value at power on is set to #H7FFF. Executing the STATus:PRESet command sets the register value to #H7FFF.

Syntax

```
STATus:QUEStionable:TEMPerature:ENABle <Mask>
STATus:QUEStionable:TEMPerature:ENABle?
```

Parameters

<Mask>	Query response
{<NRf> | <Nondecimal Numeric>} 0 ≤ N ≤ #HFFFF	<NR1>

Reset Value

Not Applicable

Errors and Events

–222, “Data Out of Range”
You attempted to set the enable register to an illegal value.

Dependencies

None

Examples

Command: `STAT:QUES:TEMP:ENAB #H7FFF`

Query: `STAT:QUES:TEMP:ENAB?`

Response: `32767`

Related Commands

STATus:QUEStionable:TEMPerature?
STATus:QUEStionable:TEMPerature:CONDition?
STATus:PRESet

STATus:QUEStionable:TEMPerature:LEVel?

Returns the current temperatures in the mainframe; the returned value is in °C.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:TEMPerature:LEVel? <Location>
```

Parameters

<Location>	Query response
{AMBient | OUT0 . . . OUT12 | DELTa0 . . . DELTa12} AMBient – ambient input temperature OUT0 . . . OUT12 – output temperature of each slot DELTa0 . . . DELTa12 – output temperature minus input temperature of each slot	<NR1>

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to use an illegal parameter value.

Dependencies

None

Examples

Query: `STAT:QUES:TEMP:LEV? OUT0`

Response: `24`

Related Commands

STATus:QUEStionable:TEMPerature?
STATus:QUEStionable:TEMPerature:CONDition?
STATus:QUEStionable:TEMPerature:ENABle

STATus:QUEStionable:TEMPerature:LIMit?

Sets or queries the maximum allowable ambient and delta temperatures in each slot. The factory default settings are 55 °C for ambient and 10 °C for each delta temperature.

Syntax

```
STATus:QUEStionable:TEMPerature:LIMit <Location>,<Limit>
STATus:QUEStionable:TEMPerature:LIMit? <Location>
```

<Location>	**Query response**
{AMBient | DELTa0 . . . DELTa12} AMBient - ambient input temperature DELTa0 . . . DELTa12 – output temperature minus input temperature of each slot	<NR1>
<Limit>	
<NRf> If Location is AMBient 1 ≤ Limit ≤ 75 MIN MAX If Location is DELTan 5 ≤ Limit ≤ 30 MIN MAX	 1 75 5 30

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to set the location to an illegal value.

–222, “Data Out of Range”
You attempted to set the temperature limit to an illegal value.

Dependencies

None

Examples

Query: `STAT:QUES:TEMP:LIM? AMB`
Response: `32`

Related Commands

STATus:QUEStionable:TEMPerature?
STATus:QUEStionable:TEMPerature:CONDition?
STATus:QUEStionable:TEMPerature:ENABle
STATus:QUEStionable:TEMPerature:LEVel?

STATus:QUEStionable:TEMPerature:MAXimum?

Queries the maximum measurable temperatures in the mainframe since the last factory maintenance was performed; the returned value is in °C.

There is no command associated with this query.

Syntax `STATus:QUEStionable:TEMPerature:MAXimum? <Location>`

Parameters

<Location>	Query response
{AMBient | OUT0 . . . OUT12 | DELTa0 . . . DELTa12} AMBient – ambient input temperature OUT0 . . . OUT12 – output temperature of each slot DELTa0 . . . DELTa12 – output temperature minus input temperature of each slot	<NR1>

Reset Value Not Applicable

Errors and Events –224, "Illegal Parameter Value"
You attempted to use an illegal parameter value.

Dependencies None

Examples Query: `STAT:QUES:TEMP:MAX? AMB`

Response: `32`

Related Commands STATus:QUEStionable:TEMPerature:LEVel?
STATus:QUEStionable:TEMPerature:CMAXimum?

STATus:QUEStionable:VOLTage?

Returns the contents of the Voltage Event register. A value of one in a bit indicates the corresponding power supply failure event has been asserted. Unused bits always return a value of zero. The register is cleared by the *CLS command.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:VOLTage[:EVENt]?
```

Parameters

Parameter	Query response
Not applicable	<NR1>

Voltage status word bits	Definition
D0	+24 V
D1	+12 V
D2	+5 V
D3	+5 V Standby
D4	+5 V External
D5	–2 V
D6	–5.2 V
D7	–12 V
D8	–24 V
D9	Not Used
D10	Not Used
D11	Not Used
D12	Not Used
D13	Not Used
D14	Not Used
D15	Not Used

Reset Value Not Applicable

Errors and Events None

Dependencies Reading the register clears it.

Examples Query: `STAT:QUES:VOLT?`

Response: `0`

Related Commands STATus:QUEStionable:VOLTage:CONDition?
STATus:QUEStionable:VOLTage:ENABle

STATus:QUEStionable:VOLTage:CONDition?

Queries the contents of the Voltage Condition register. A value of one in a bit indicates the corresponding power supply has a failure. Unused bits always return a value of zero. The definition of the bits in this register can be found in STATus:QUEStionable:VOLTage? command on page 2–60.

Reading the register does not clear it.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:VOLTage:CONDition?
```

Parameters

Parameter	Query response
Not Applicable	<NR1>

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Query: `STAT:QUES:VOLT:COND?`

Response: `0`

Related Commands

STATus:QUEStionable:VOLTage?
STATus:QUEStionable:VOLTage:ENABle

STATus:QUEStionable:VOLTage:ENABle?

Sets or queries the contents of the Voltage Enable register. Setting unused enable bits does not generate an error; the bits are ignored.

If the power-on status clear flag is FALSE (see **PSC* command on page 2–79) at power on, the register value will be restored from nonvolatile RAM; otherwise, the register value at power on is set to #H7FFF. Executing the STATus:PRESet command sets the register value to #H7FFF.

Syntax

```
STATus:QUEStionable:VOLTage:ENABle <Mask>
STATus:QUEStionable:VOLTage:ENABle?
```

Parameters

<Mask>	Query response
{<NRf> | <Nondecimal Numeric>} 0 ≤ N ≤ #HFFFF	<NR1>

Reset Value

Not Applicable

Errors and Events

–222, "Data Out of Range"
You attempted to set the enable register to an illegal value.

Dependencies

None

Examples

Command: `STAT:QUES:VOLT:ENAB #H3FFF`

Query: `STAT:QUES:VOLT:ENAB?`

Response: `16383`

Related Commands

STATus:QUEStionable:VOLTage?
STATus:QUEStionable:VOLTage:CONDition?
STATus:PRESet

STATus:QUEStionable:VOLTage:LEVel?

Queries the current power supply output voltage.

There is no command associated with this query.

Syntax

```
STATus:QUEStionable:VOLTage:LEVel? <Power Supply>
```

Parameters

<Power supply>	Query response
{P24 | P12 | P5 | P5STBY|P5EXT | N2 | N5PT2 | N12 | N24}	<NR2>

Code	Power supply
P24	+24 V
P12	+12 V
P5	+5 V
P5STBY	+5 V Standby
P5EXT	+5 V External
N2	–2 V
N5PT2	–5.2 V
N12	–12 V
N24	–24 V

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to use an illegal parameter value.

Dependencies

None

Examples

Query: `STAT:QUES:VOLT:LEV? P24`

Response: `24.01`

Related Commands

STATus:QUEStionable:VOLTage?
STATus:QUEStionable:VOLTage:CONDition?
STATus:QUEStionable:VOLTage:ENABle

STATus:QUEStionable:VOLTage:PTR?

Sets or queries the power supply positive transition filter.

You can only set or clear bits 3 and 4 of the transition filter. Setting a bit enables the corresponding power supply condition to propagate to the event system. Any failures will display on the front panel readout. If you disable the bits, any failure in the corresponding power supply will not be reported to the front panel readout or to the event system.

Bits 0 – 2 and bits 5 – 8 of the transition filter are always enabled. Bit 15 always returns a 0. The factory default setting is 32743. The +5 V Standby and +5 V External are not monitored.

Syntax

```
STATus:QUEStionable:VOLTage:PTR <Mask>
STATus:QUEStionable:VOLTage:PTR?
```

Parameters

<Mask>	Query response
{<NRf> | <Nondecimal Numeric>} 0 ≤ N ≤ #HFFFF	<NR1>

Voltage positive transition filter bits	Definition
D3	+5 V Standby
D4	+5 V External

Reset Value Not Applicable

Errors and Events –222, “Data Out of Range”
You attempted to set the transition filter to an illegal value.

Dependencies None

Examples Command: `STAT:QUES:VOLT:PTR #H7FF7`

Query: `STAT:QUES:VOLT:PTR?`

Response: `32759`

Related Commands STATus:QUEStionable:VOLTage:CONDition?

TEST Subsystem

This section describes each command and query in the TEST subsystem. These commands are used to execute internal self tests. The TEST subsystem controls the parameters shown in Figure 2–11.

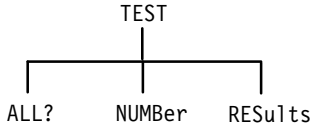


Figure 2–11: TEST subsystem hierarchy

Table 2–11 lists all of the internal self tests of the mainframe.

Table 2–11: Mainframe self test

Test number	Test name	Execution time (seconds)	Power on test	Included in TEST?	Invoked by TEST:NUMBer?
1000	Fan Speed Control	116	No	Yes	Yes
1010	ADC and DAC Control	< 1	Yes	Yes	Yes

A description of each self test is listed below:

- Fan Speed Control test. This test varies the fan speed control and verifies that the fan speed changes accordingly.
- ADC and DAC Control test. This test verifies the internal ADC and DAC circuitry.

TEST?

This command executes all internal self tests. If a failure occurs and the halt control is enabled, the test will immediately end. The query form returns the unique numeric identifier of the first test that failed. A value of zero is returned if there are no failures. The command form executes the same tests but returns no results code.

Each internal self test has a unique numeric identifier in the range of 1000 to 1999 (see Table 2–11 on page 2–67).

*TST? and TEST? are aliases.

Syntax

```
TEST[:ALL]
TEST[:ALL]?
```

Parameters

Parameter	Query response
Not Applicable	<NR1> 0 1000 ≤ N ≤ 1999

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Command: `TEST`

Query: `TEST?`

Response: `0`

Related Commands TEST:RESults?
TEST:RESults:VERBose?

TEST:NUMBer?

The command executes the specified self test but does not return the test results. The query returns the results of the specified test. A value of zero is returned if there are no failures.

Each internal self test has a unique numeric identifier in the range of 1000 to 1999 (see Table 2–11 on page 2–67).

Syntax

```
TEST:NUMBer <test>
TEST:NUMBer? <test>
```

Parameters

Parameter	Query response
{<NRf>|<Non-decimal number>} 1000 ≤ N ≤ 1999	<NR1> 0 1000 ≤ N ≤ 1999

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples

Command: `TEST:NUMB 1000`

Query: `TEST:NUMB? 1000`

Response: `0`

Related Commands

TEST:RESults?
TEST:RESults:VERBose?

TEST:RESults?

This query returns the results code for the last executed self test command. The unique numeric identifier of the first individual test that failed is reported. A value of zero is returned if there were no failures.

There is no associated command for this query.

Each internal self test has a unique numeric identifier in the range of 1000 to 1999 (see Table 2–11 on page 2–67).

Syntax `TEST:RESults[:CODE]?`

Parameters

Parameter	Query response
Not Applicable	<NR1> 0 1000 ≤ N ≤ 1999

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Query: `TEST:RES?`

Response: `0`

Related Commands TEST
TEST:RESults:VERBose?

TEST:RESults:VERBose?

This query returns a string describing the results of the last executed self test command. The unique numeric identifier of the first individual test that failed is reported. A value of zero is returned if there were no failures.

There is no associated command for this query.

Syntax `TEST:RESults:VERBose?`

Parameters

Parameter	Query response
Not Applicable	<string> error number: <NR1> 0 1000 ≤ N ≤ 1999 verbose message: (error specific)

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Query: `TEST:RES:VERB?`

Response: `1001,"Test ADC and DAC failed"`

Related Commands TEST
TEST:RESults?

IEEE 488.2 Common Commands

This section describes each of the IEEE 488.2 common commands implemented in the mainframe.

The mainframe supports the following IEEE 488.2 common commands. Detailed information on the command begins on page 2–73.

Table 2–12: IEEE 488.2 common commands

Header	Description
*CLS	Clears the SCPI and IEEE 488.2 event registers and the Error/Event Queue.
*ESE[?]	Sets or queries standard Event Status Enable register.
*ESR?	Returns the contents of the Standard Event Status Register.
*IDN?	Returns the identification message of the mainframe.
*OPC[?]	Synchronizes command execution with the controller.
*PSC[?]	Sets or queries the power-on status clear flag.
*RST	Resets instrument settings to a default state.
*SRE[?]	Sets or queries the Service Request Enable register.
*STB?	Returns the contents of the Status Byte Register.
*TST?	Initiates an internal self test and returns a failure code.
*WAI?	Synchronizes command execution with the system controller.

*CLS

Clears the SCPI and IEEE 488.2 event registers and the Error/Event queue.

There is no query associated with this command. SCPI and IEEE 488.2 enable registers are not cleared by this command.

Syntax `*CLS`

Parameters None

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Command: `*CLS`

Related Commands STATus:PRESet

*ESE?

Sets or queries the enable mask for the Standard Event Status Register. The STATus:PRESet command does not change this enable mask.

The factory default setting is 0.

Syntax

```
*ESE <mask>
*ESE?
```

Parameters

Parameter	Query response
{<NRf> | <Non-Decimal Numeric>} 0 ≤ N ≤ #HFF	<NR1>

Standard status byte definition	Query response
D0	Operation Complete
D1	Not Used
D2	Query Error
D3	Device Dependent Error
D4	Execution Error
D5	Command Error
D6	Not Used
D7	Power On

Reset Value

Not Applicable

Errors and Events

–222, “Data Out of Range”
You attempted to set the enable mask to an illegal value.

Dependencies

None

Examples

Command: `*ESE #H40`

Query: `*ESE?`

Response: `64`

Related Commands

*ESR?

*ESR?

This query returns the event(s) from the Standard Event Status Register. There is no command associated with this query. The Error/Event queue contains a chronological record of the events.

Syntax

```
*ESR?
```

Parameters

Parameter	Query response
Not Applicable	<NR1>

Standard status byte definition	Query response
D0	Operation Complete
D1	Not Used
D2	Query Error
D3	Device Dependent Error
D4	Execution Error
D5	Command Error
D6	Not Used
D7	Power On

Reset Value Not Applicable

Errors and Events None

Dependencies Reading this register clears it.

Examples Query: `*ESR?`

Response: 0

Related Commands *ESE

*IDN?

This query returns the mainframe identification message. There is no command associated with this query. The fourth field of the id message includes both the SCPI and firmware version numbers.

Syntax

```
*IDN?
```

Parameters

Parameter	Query response
Not Applicable	<Syntax Defined by IEEE 488.2> Manufacturer, Model Number, Serial Number, Firmware Version (or Equivalent)

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Query: `*IDN?`

Response: `TEKTRONIX,VX1420A,B123456,SCPI:95.0 RM1:1.0 RM2:1.0`

Related Commands

None

*OPC?

The command synchronizes command execution with the controller. The command causes the device to set the OPC bit in the Standard Event Status register after the previous command has completed execution.

The query causes an ASCII one to be placed in the output queue after the previous command has completed execution.

Syntax

```
*OPC
*OPC?
```

Parameters None

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples

Command: `*OPC`

Query: `*OPC?`

Response: 1

Related Commands *WAI

*PSC?

Sets or queries the setting of the power-on state clear flag. If the <Value> parameter is zero, the power-on state clear flag is set to FALSE; otherwise the flag is set to TRUE.

If the power-on state clear flag is FALSE, at power on, the Service Request Enable Register, the Standard Event Status Enable Register, and the SCPI Enable Register settings will be restored to their previous settings. Otherwise, the settings will be cleared.

The factory default setting is 0.

Syntax

```
*PSC <Value>
*PSC?
```

Parameters

<Value>	Query response
{<NRf> | <Non-Decimal Numeric>}	<NR1>
$N \neq 0$	1
0	0
$-32767 \leq N \leq 32767$	

Reset Value

Not Applicable

Errors and Events

–224, “Illegal Parameter Value”
You attempted to set the parameter to an illegal value.

Dependencies

None

Examples

Command: `*PSC 0`

Query: `*PSC?`

Response: `0`

Related Commands

STATus

*RST

This command resets instrument settings to a default state. There is no query associated with this command. This command has no effect other than stopping the VXI Monitor.

The VXI Monitor stops execution while other monitors remain active.

Syntax `*RST`

Parameters None

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Command: `*RST`

Related Commands STATus:PRESet
*CLS

*SRE?

Sets or queries the enable mask for the Service Request (Status Byte) Register. Setting unused enable bits does not generate an error; they are ignored. The STATus:PRESet command does not change this enable mask.

The mainframe accepts NonDecimal Numeric masks even though this is not required by IEEE 488.2.

The factory default setting is 0.

Syntax

```
*SRE <mask>
*SRE?
```

Parameters

<Mask>	Query response
{<NRf> | <Non-Decimal Numeric>} 0 ≤ N ≤ #HFF	<NR1>

Standard status byte definition	Query response
D0	Not Used
D1	Not Used
D2	Error/Event Queue
D3	Questionable Event Register
D4	MAV
D5	ESB Standard Event Status Reg
D6	Not Defined
D7	Operation Event Register

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Command: `*SRE #H60`

Query: `*SRE?`

Response: `96`

Related Commands

*STB?

*STB?

This query returns the contents of the Status Byte Register. There is no command associated with this query.

Syntax

```
*STB?
```

Parameters

Parameter	Query response
Not Applicable	<NR1>

Standard status byte definition	Definition
D0	Not Used
D1	Not Used
D2	Error/Event Queue
D3	Questionable Event Register
D4	MAV
D5	ESB Standard Event Status Reg
D6	RQS/MSS
D7	Operation Event Register

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Query: `*STB?`

Response: `96`

Related Commands

*SRE

*TST?

This query initiates an internal self test and returns a failure code. If more than one failure occurred, only the the unique numeric identifier of the first self test that failed is reported. A value of zero is returned if there were no failures.

Each internal self test has a unique identifier in the range of 1000 to 1999.

*TST? and TEST? are identical queries. There is no command associated with this query. You can obtain additional test results with the TEST:RESult:VERBose? command.

Syntax

```
*TST?
```

Parameters

<failure code>	Query response
Not Applicable	<NR1> 0 | 1000 ≤ N ≤ 1999

Reset Value

Not Applicable

Errors and Events

None

Dependencies

None

Examples

Query: `*TST?`

Response: `0`

Related Commands

TEST
TEST:RESults:VERBose?

*WAI

This command is used to synchronize command execution with the controller. There is no query associated with this command.

*WAI prevents the instrument from executing further commands until the previous command has completed execution.

Syntax `*WAI`

Parameters None

Reset Value Not Applicable

Errors and Events None

Dependencies None

Examples Command: `*WAI`

Related Commands *OPC

Theory of Operation

Theory of Operation

This section provides a brief overview of the theory of operation for the benchtop chassis. Figure 6–1 and 6–2 on page 6–1 shows a functional block diagram.

Benchtop Chassis

The standard chassis contains the following major modules:

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

Power Supply and Power Supply Interface Board

The power supply provides all voltages and currents to the chassis. 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 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.

Maintenance

Maintenance

This chapter provides procedures for inspecting and cleaning, removing and replacing internal chassis components, and isolating problems to module levels.

You must accomplish instrument-level repairs by exchanging faulty modules with known-good modules or parts. This chapter does not provide component-level procedures.

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.

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 chassis are susceptible to static discharge damage.*

Service the chassis 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.

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

Inspection and Cleaning

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

Cleaning procedures consist of exterior and interior cleaning of the chassis. Periodic cleaning reduces instrument breakdown and increases reliability. Clean the chassis as needed, based on the operating environment. Refer to your module documentation for information on cleaning the individual TLA 700 Series modules.

Interior Cleaning

Use a dry, low-velocity stream of air to clean the interior of the chassis. 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 water.

Exterior Cleaning

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

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

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

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

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

Removal and Installation Procedures

This section describes how to remove and install the major mechanical and electrical modules.

Preparation

Please read the following warning statement. Then read the following general instructions before removing a part.

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.*

To prevent possible damage to electrical components, read Preventing ESD *on page 4–1.*

Tools Required

The following tools are needed to disassemble the Benchtop Mainframe:

- Flat blade screwdriver
- Phillips screwdriver
- Screwdriver with a T-15 Torx tip
- Screwdriver with a T-20 Torx tip
- 3/32 Allen wrench

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 4–1 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.*

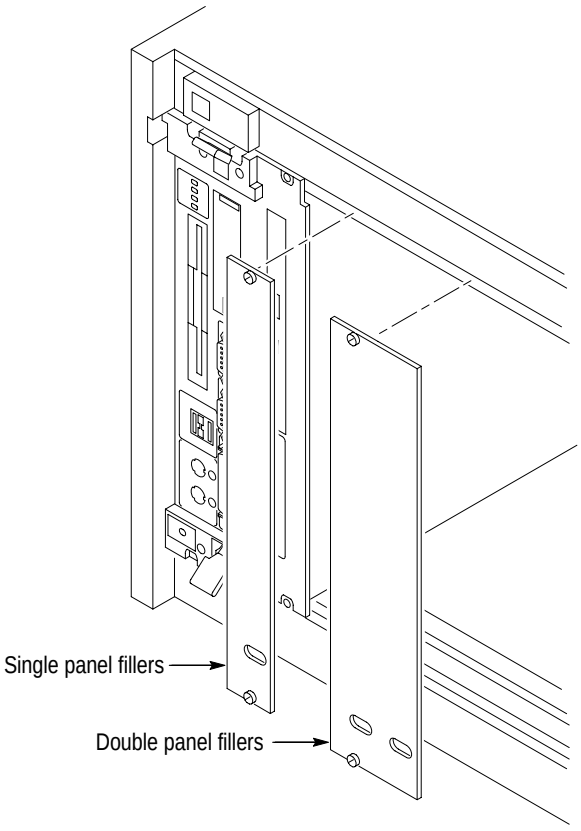


Figure 4–1: Installing the empty slot panel fillers

Module Removal and Replacement

The following procedures describe how to remove and replace benchtop chassis and expansion chassis modules.

Removing the Blower Assembly

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

1. From the back of the chassis, loosen the five captive screws including the safety ground (refer to Figure 4–2 for the screw locations).
2. Remove the cable cover.
3. Unplug the blower cable and set the blower assembly aside on a clean working surface.
4. To remove the blower, remove the ten screws 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 4–4.
5. Remove the two screws at the top of the blower.
6. Remove the four screws that hold the blower to the chassis part of the blower assembly.
7. For convenience, replace the two screws from step 5 onto the top of the blower.

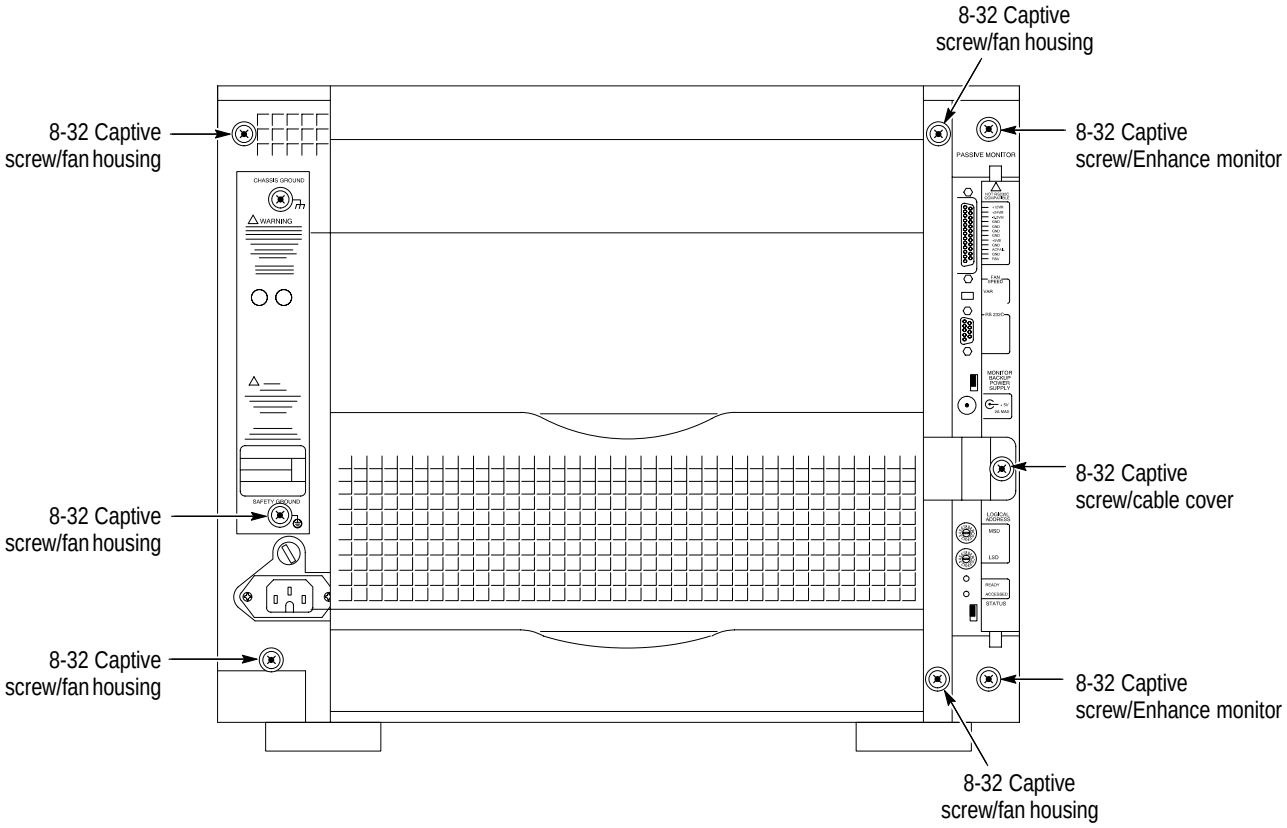


Figure 4–2: Location of blower assembly screws

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

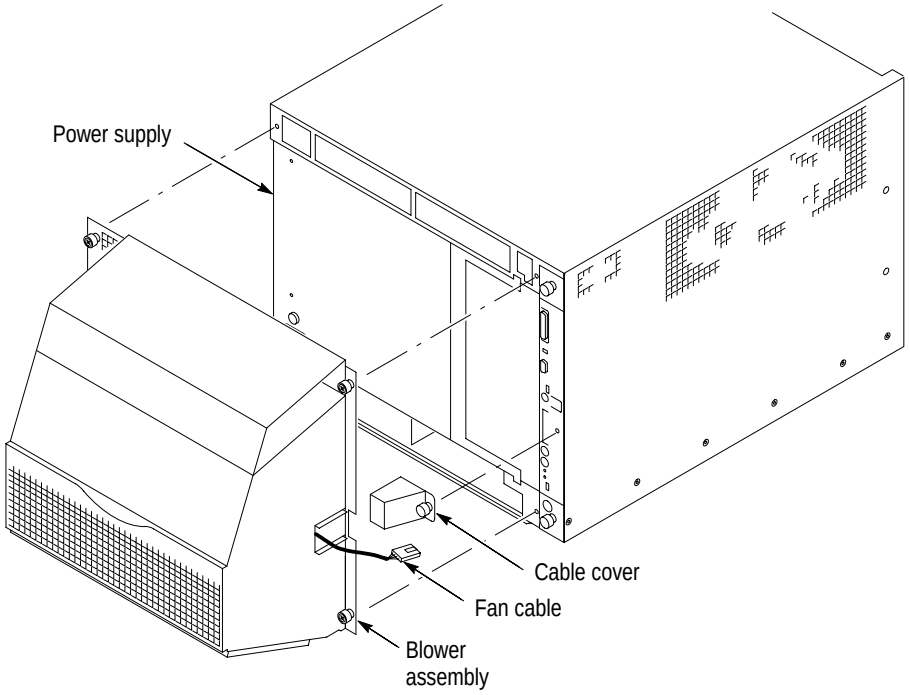


Figure 4–3: Removing the blower assembly

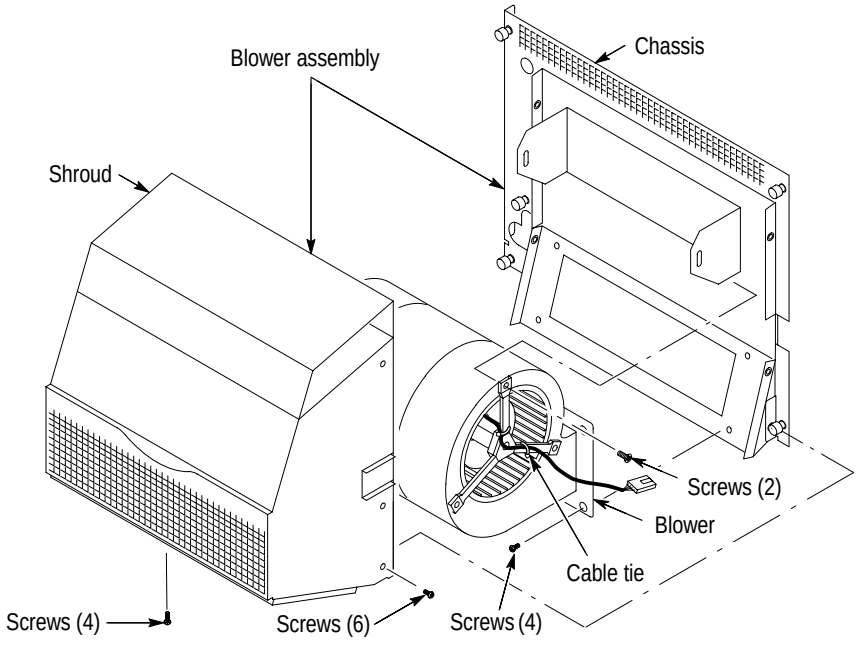


Figure 4–4: Removing the blower

Removing the Enhanced Monitor Board

To remove the enhanced monitor board first remove the cable cover.

1. Unscrew the two captive screws that attach the monitor board to the chassis.
2. Slide the board out of the chassis.

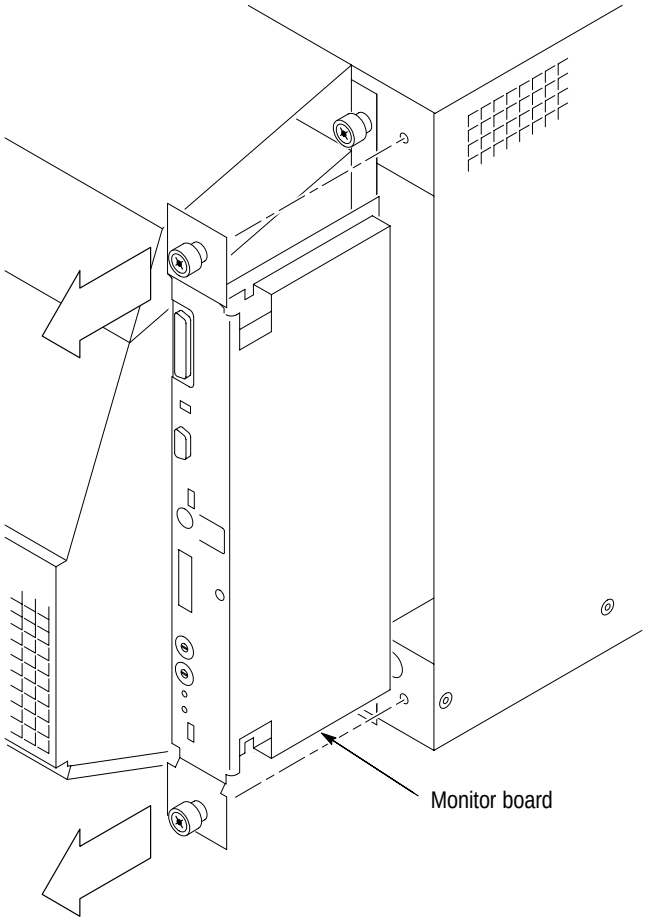


Figure 4–5: Removing the enhanced monitor board

Removing the Power Supply

To remove the power supply from the chassis, perform *Removing the Blower Assembly* procedure on page 4–5.

Perform the *Removing the Enhanced Monitor Board* procedure on page 4–8.

Remove the power supply by pulling the power supply handle to the right.

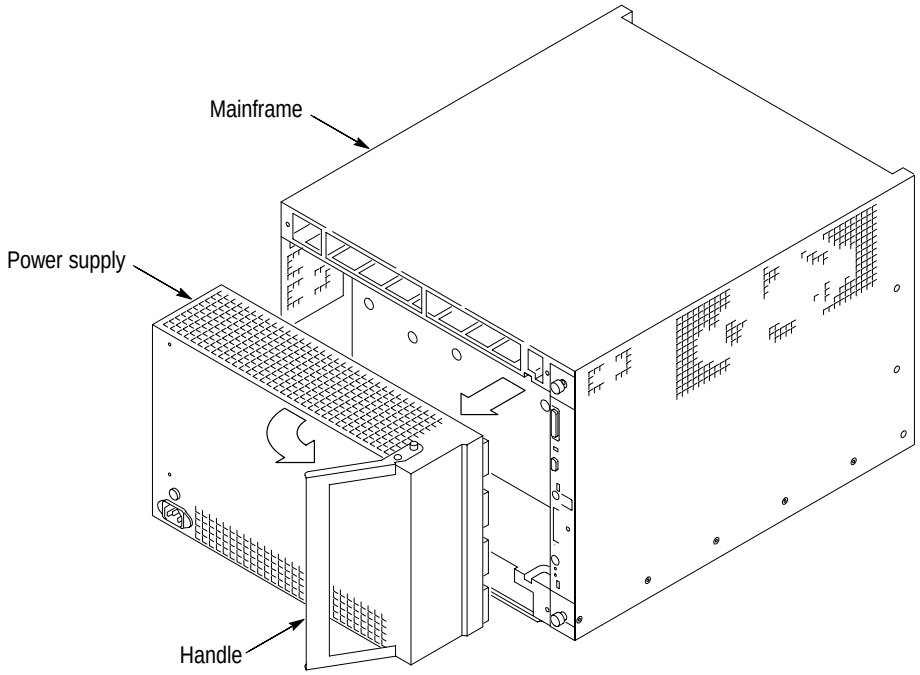


Figure 4–6: Removing the power supply

Removing the Mainframe Cover

To remove the mainframe cover, refer to Figure 4–7 while performing the following steps:

1. Remove the 12 hex drive screws, 6 on the left side, 6 on the right side, using a 3/32 Allen wrench.
2. Remove the 10 screws: 4 on the top front, 4 on the top rear, and two screws on the front using a 3/32 Allen wrench.
3. Lift the front bottom corners up.
4. After tilting the cover up about 3 inches, lift the cover straight off the instrument.

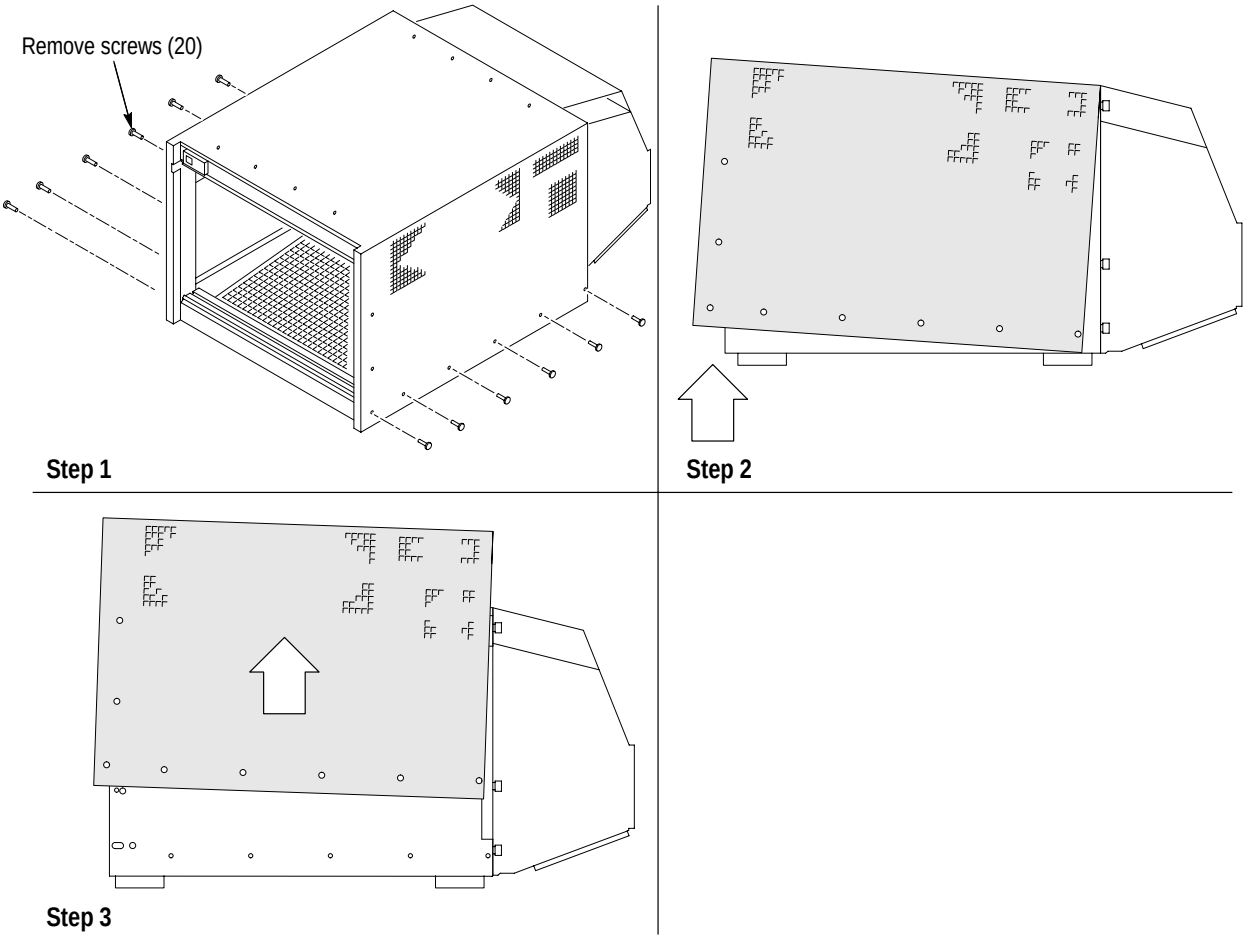


Figure 4–7: Removing the mainframe cover

Removing the Card Guides

The card guides at the top and bottom of the chassis are very similar. The main difference is that the bottom guides include the spring-loaded shutters to redirect air into the chassis. The procedure for removing both guides is identical.

Refer to Figure 4–8 while using a small flat blade screwdriver to pry up the tab of the card guide at the front of the chassis being careful not to damage the card guide or the chassis.

Gently pull the card guide forward until it pops out of place then remove the card guide.

NOTE*. The bottom card guides are replaced as a unit.*

These guides are not intended to be disassembled.

To replace a card guide, slide the card guide towards the rear of the chassis and allow the front of the card guide to snap into place.

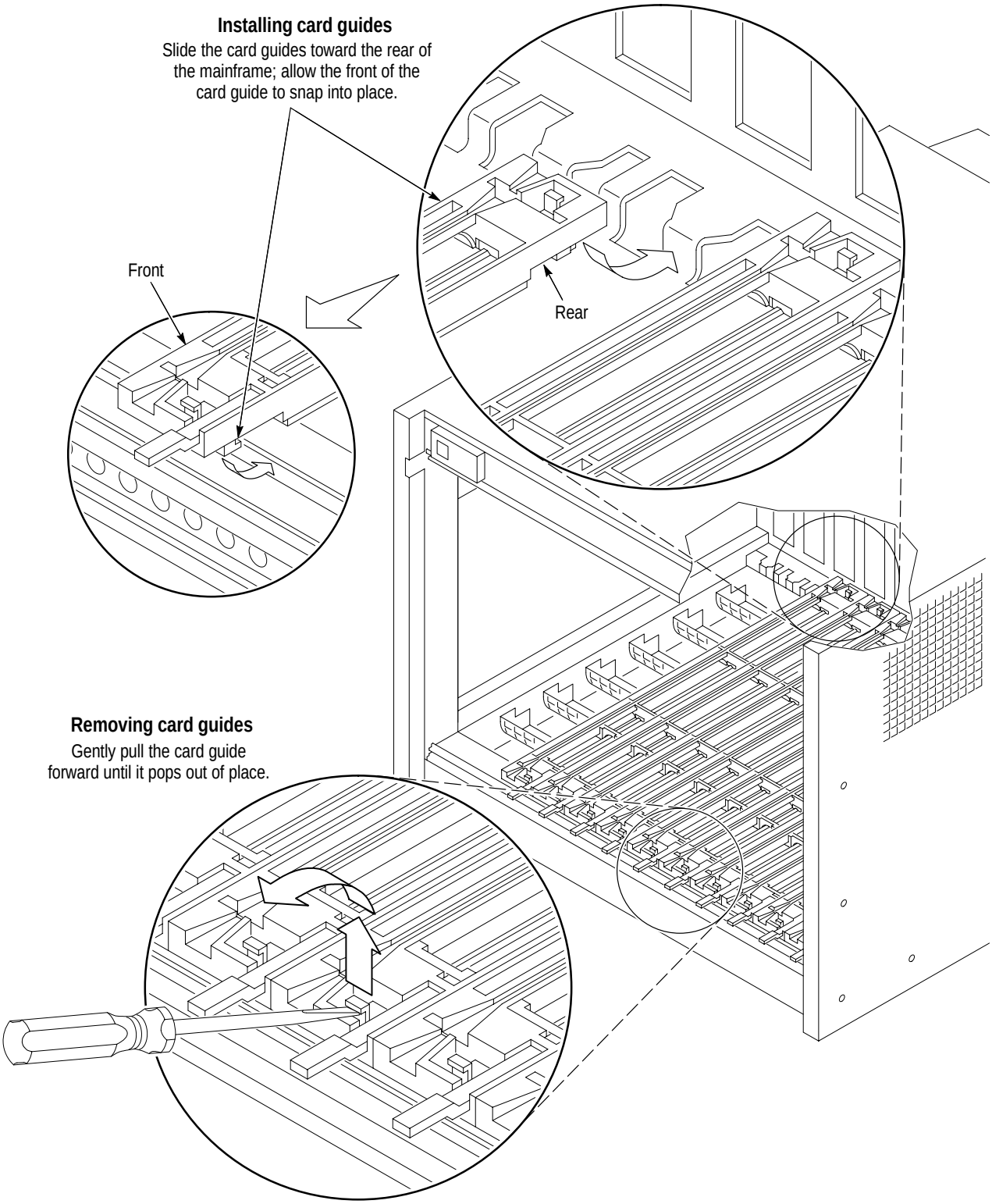


Figure 4–8: Removing the top and bottom card guides

Removing the Nut Rails

The nut rails at the top and the bottom of the front of the benchtop chassis 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. Refer to Figure 4–9 to remove these nut rails.

1. Loosen all module retaining screws (it may be necessary to slide the modules partially out of the chassis) and remove the top cover to the chassis.
2. Slide the top cover of the chassis back far enough to expose the hole just inside the top and bottom extrusions.
3. Slide the nut rail out of the hole on the side of chassis.
4. Replace the nut rail by sliding it back in the side of the chassis and pushing it into place.

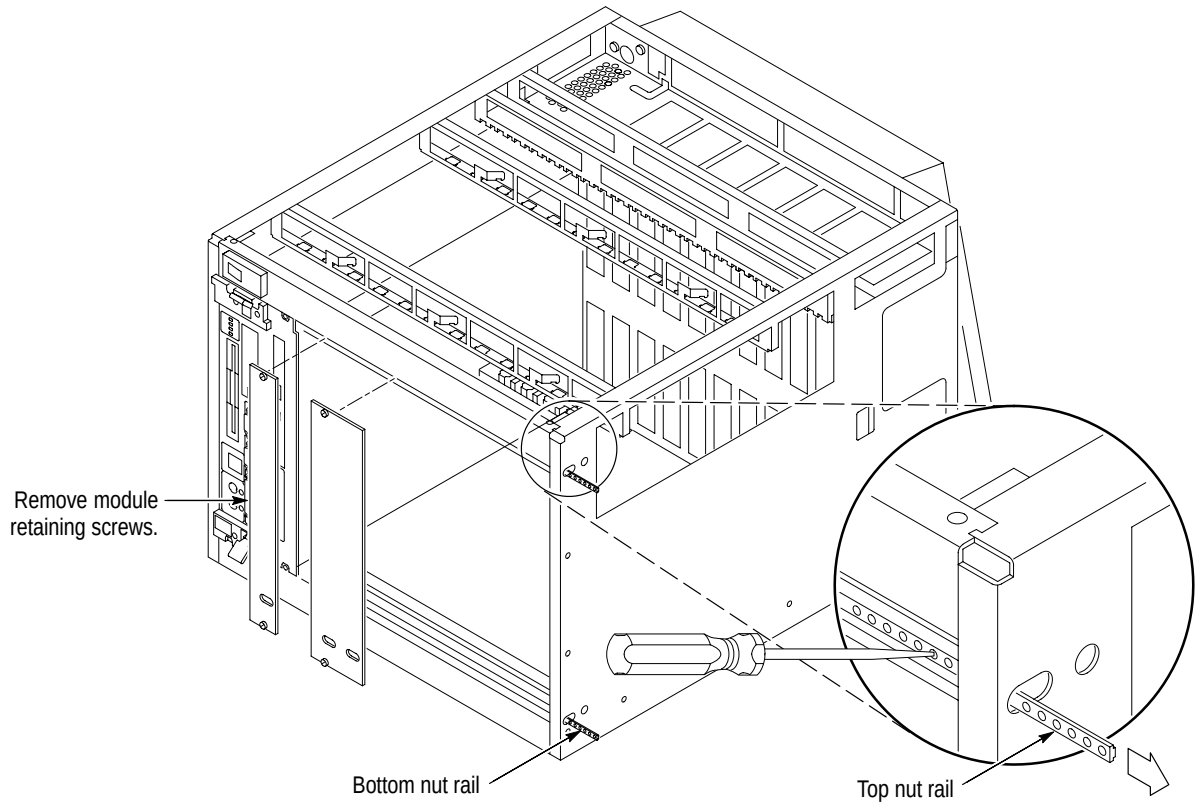


Figure 4–9: Replacing the top and bottom nut rails

Removing the Temperature Sense Board

To remove the temperature sense board, remove the chassis cover.

Disconnect the ribbon cable from the temperature sense board.

Refer to Figure 4–10 and gently pry back on each retainer holding the temperature sense board in place.

Lift the board out of the holes at the top of the chassis being careful not to damage any components on the circuit board.

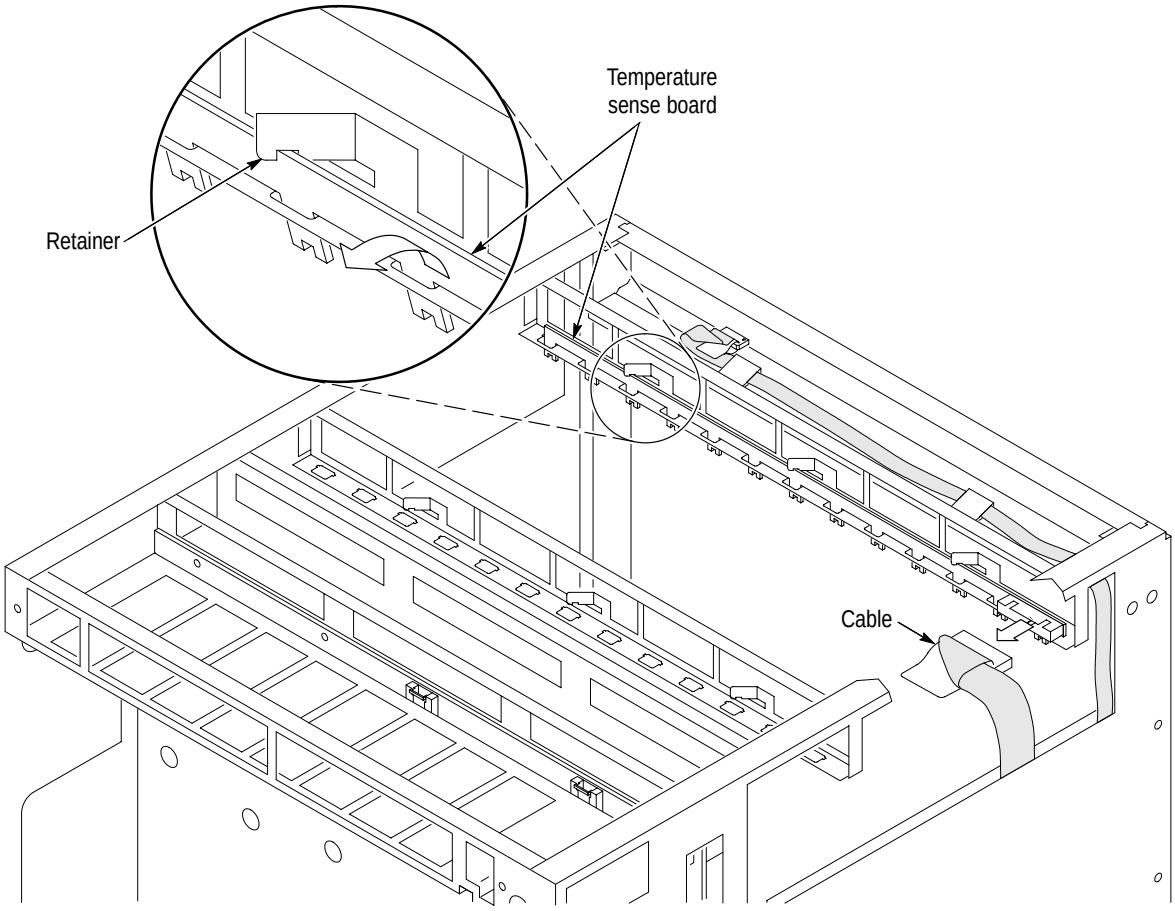


Figure 4–10: Removing the temperature sense board

Removing the EMI DIN Shields

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 4–11.
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.

Install the EMI DIN shield by reversing the disassembly procedure.

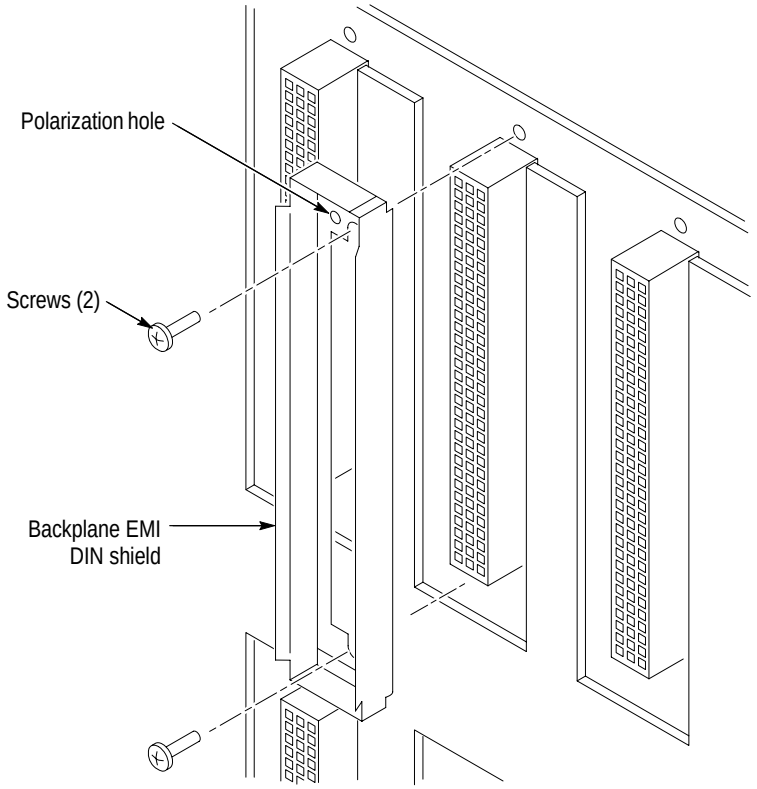


Figure 4–11: Removing the backplane EMI DIN shields

Removing the Backplane

To remove the backplane, perform the *Removing the Blower Assembly* on page 4–5, *Removing the Enhanced Monitor Board* on page 4–8, and *Removing the Power Supply* on page 4–9.

Refer to Figure 4–12 and then perform the following steps:

1. Remove the top cover of the chassis (see Figure 4–9, if necessary).
2. Disconnect the ribbon cable on the right side of the backplane.
3. Disconnect the power switch cable at J22 (or from J23) at the top of the backplane.

***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.*

Before disconnecting the power switch cable, note which connector the cable is connected to (J22 normally, sometimes J23).

Remember to reconnect the cable to the correct connector.

---

4. From the rear of the chassis, remove the five screws on the top of the backplane, remove seven screws from the center, and remove five screws from the bottom.
5. After removing all of the screws from the backplane, remove the backplane from the chassis by sliding it out of the right side.

Install the backplane by reversing the disassembly procedure.

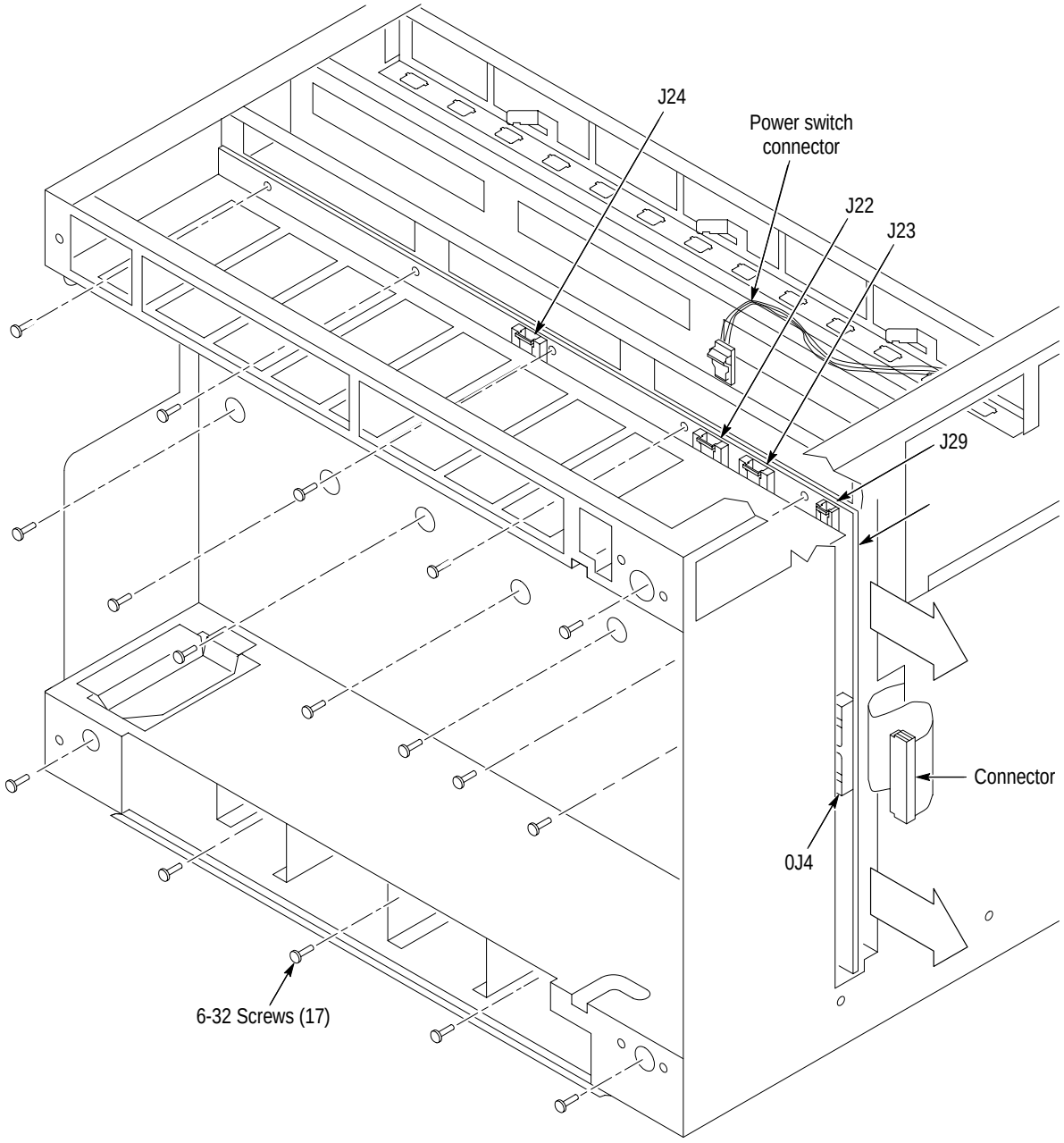


Figure 4–12: Removing the backplane

Special Configuration Options

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

CAUTION. *To avoid damage from high currents on the backplane, always power off the chassis 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 chassis 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 chassis to disable the front panel On/Standby switch, disconnect the power cord from the chassis.

Refer to Figure 4–13 and remove the cover from the chassis.

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 chassis cover.

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

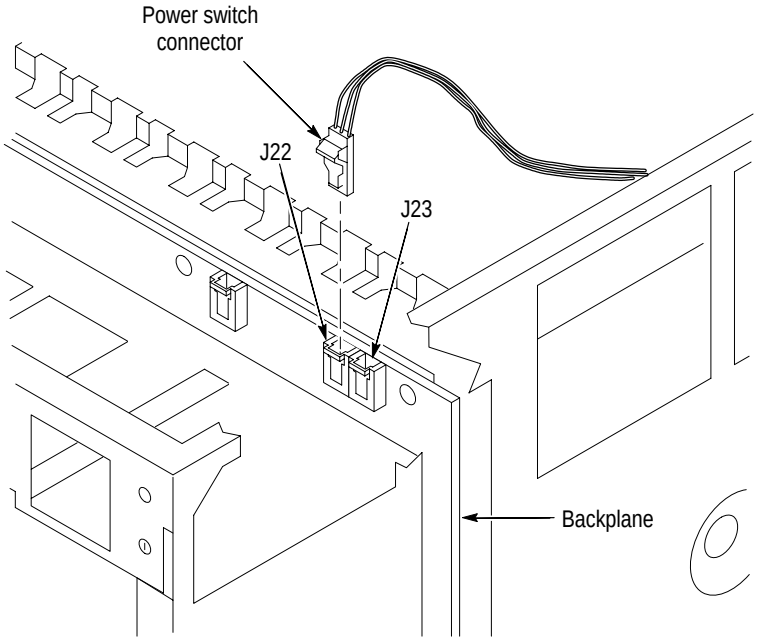


Figure 4–13: Power switch connectors

Jumper Settings

NOTE. *Any jumpers or jumper settings that are not described or listed in this manual are jumpers or jumper settings that are used for manufacturing use only.*

Backplane Jumpers

The soft power down jumper is located on the backplane at position JP1. For the benchtop chassis there is no jumper installed. For the expansion chassis a jumper is installed at JP1. See Table 4–1.

The backplane jumper is located on the backplane at position JP2. Jumper pins 2 through 5 on JP2 as shown in Figure 4–14.

Table 4–1 lists the jumper positions for the TLA 720 Benchtop Chassis and the TLA 7XM Expansion Chassis.

Table 4–1: Chassis backplane jumpers

Jumpers (location)	TLA 720	TLA 7XM
JP1	No Jumper installed	Jumper both pins
JP2	2–5	2–5

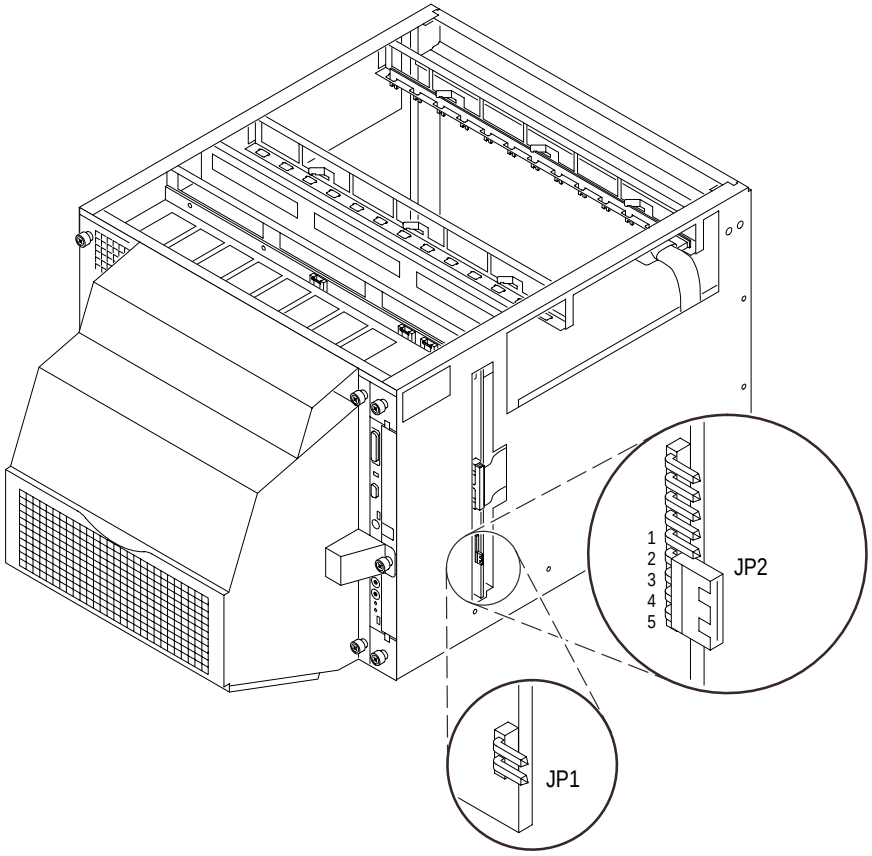


Figure 4–14: Soft power down jumper setting

Enhanced Monitor Board Jumpers

The enhanced monitor board has two jumpers accessible from the rear of the mainframe. Figure 4–15 shows the factory default settings of these jumpers.

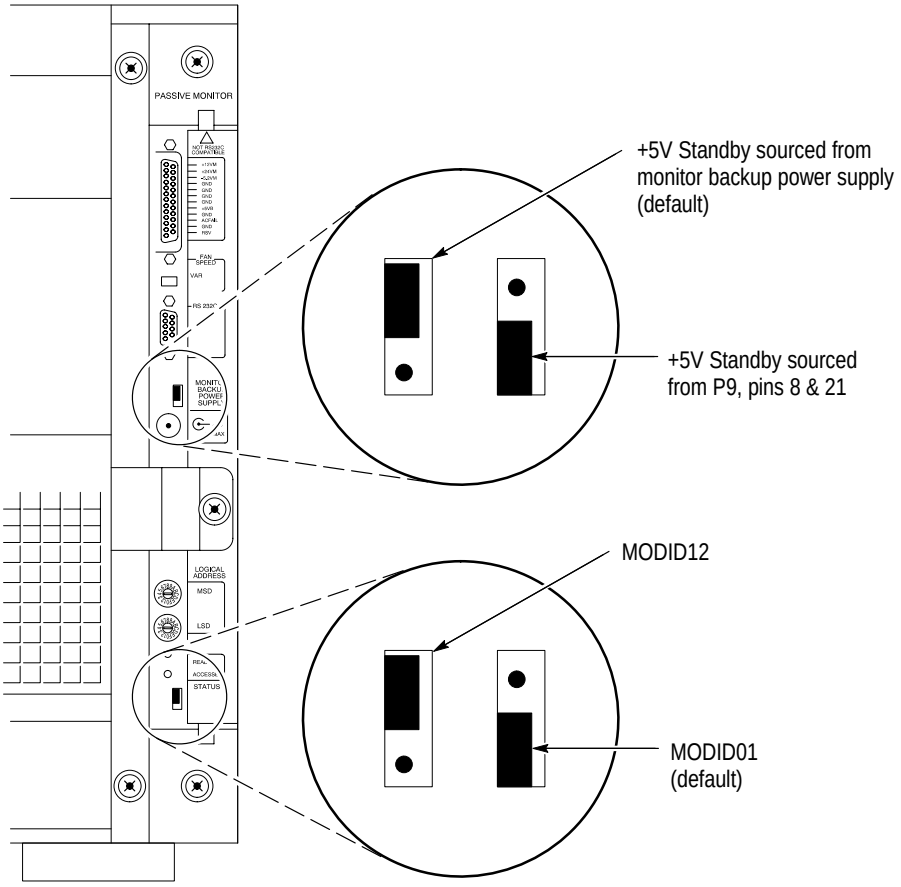


Figure 4–15: Enhanced monitor board jumpers

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.

Table 4–2 lists the default jumper positions on the enhanced monitor board for both the benchtop and expansion chassis.

Table 4–2: Enhanced monitor board jumpers

Jumpers (location)	Pins	Label on board
J2 (top of board)	1-2 and 3-4	TLA 720
J38 (middle of board)	2-3	Blower
J19 (bottom of board)	2-3	Blower

Enhanced Monitor Board Flash Jumper

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 4–16.

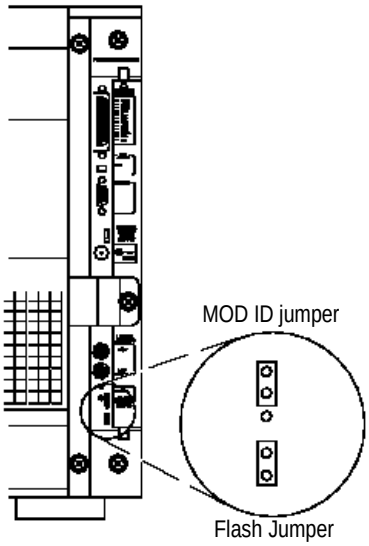


Figure 4–16: Enhanced monitor board flash jumper

Enhanced Monitor Board Logical Address Switch Settings

You can set the logical address of the mainframe with the switches on the rear panel. Figure 4–17 shows the locations of the logical address switches on the rear of the enhanced monitor panel.

If all modules in the mainframe are set to FF, the resource manager will "dynamically" configure the module's logical address. If a module is set to a logical address other than FF, you must be careful to choose a unique address.

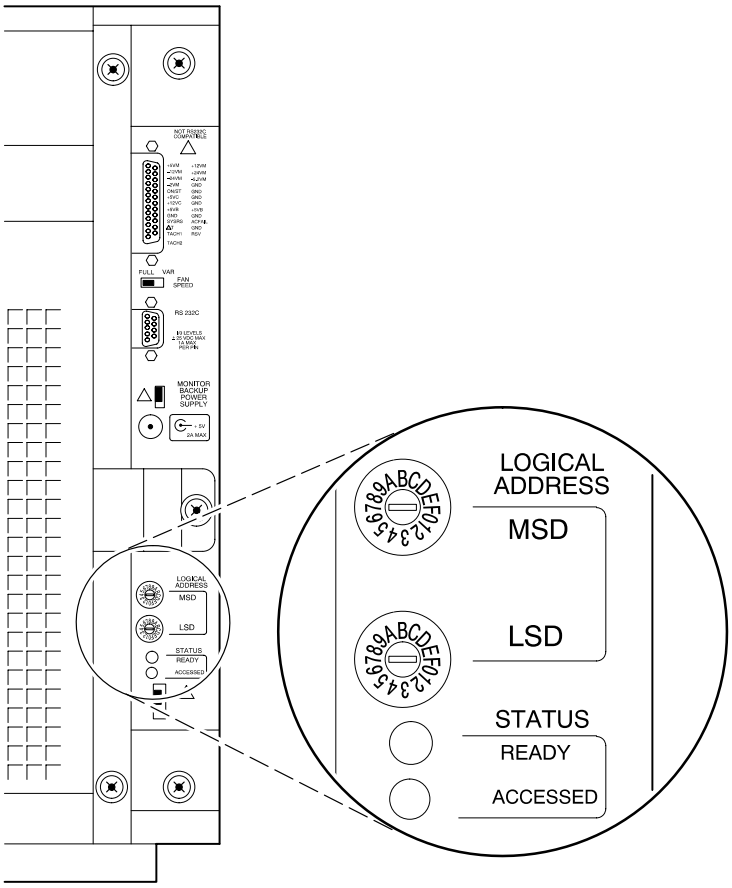


Figure 4–17: Logical address switches

Hardware 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 4–1.*

This section contains information and procedures designed to help you isolate faults to the replaceable part level. To eliminate easy to find problems first, use the following steps:

- Follow *Check for Common Problems* on page 4–28.
- Follow *Troubleshoot the Benchtop Chassis*, beginning on page 4–29.

If you replace a faulty part, you must follow any verification procedures identified in the *TLA 700 Series Performance Verification and Adjustment Technical Reference Manual*.

Service Level

This section supports isolation of faults to the replaceable-part level that is reflected in the replaceable parts list in Chapter 10.

In most cases, faults are isolated to circuit boards or assemblies, but not to individual components on those boards. (See *Strategy for Servicing* on page xv.)

Fault isolation is supported for the following replaceable parts:

- Blower
- Enhanced monitor board
- Power-supply
- Backplane
- Fuses, cables, and other parts

Check for Common Problems

Use Table 4–3 to quickly isolate possible failures. The table lists problems related to the benchtop chassis and possible causes. The list is not exhaustive, but it may help you eliminate a problem that's quick to fix, such as a blown fuse or loose cable.

Table 4–3: Failure symptoms and possible causes

Symptom	Possible Cause(s)
Chassis does not power on	■ Power connection faulty: check or substitute power cord ■ Fuse blown: check line fuse ■ Chassis power supply failure: contact local Tektronix service center
Front-panel power switch light comes on (chassis powers up), but the blower will not operate	■ Faulty blower cable ■ Defective blower ■ Faulty power supply
Monitor does not power on	■ Power connection faulty: check or substitute cord ■ Fuse blown: check line fuse ■ Monitor power supply failure: contact local Tektronix service center
Monitor display is blank	■ Adjust monitor controls for brightness and contrast ■ VGA cable connection faulty: check or substitute VGA cable ■ Monitor failure: contact local Tektronix service center
Chassis does not boot	■ Non-system diskette or floppy in external drive: make sure computer is booting from hard drive ■ Hard drive failure or corrupted files on hard drive: consult manufacturer or product literature for service information
Digitizing Oscilloscope or Logic Analyzer module *and* controller do not power on	■ Modules not fully inserted: make sure front of module is flush with front panel ■ Chassis not configured properly: consult manufacturer or product literature for information ■ Chassis power supply failure: contact local Tektronix service center
Controller does not power on	■ Module not fully inserted: make sure front of module is flush with front panel ■ Chassis not configured properly: consult manufacturer or product literature for information ■ Module failure: contact local Tektronix service center

Troubleshoot the Benchtop Chassis

Follow the procedure in this section to identify the failed part within the chassis.

Equipment Required

The following test equipment is recommended to perform these procedures.

- Digital voltmeter (Tektronix DM250 series digital voltmeter)
- Oscilloscope, 20 MHz BW, with 10x Probe with < 1-inch ground lead, (Tektronix TDS400A or TDS500A series oscilloscope)

Preparation

The fault isolation procedure requires that you:

- Verify if the front-panel Standby/On button lights up.
- Verify if the blower operates.
- Measure voltages.

Front-Panel Standby/On button. The Standby/On switch in the upper-right of the front panel should light up when pressed. The blower in the rear should power on.

NOTE. *Before replacing circuit boards, be sure to inspect all associated cables and connectors for damage and proper installation.*

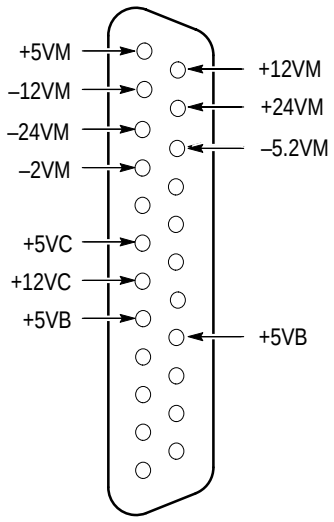


Figure 4–18: Rear-panel connector diagram

Overview of Procedures

Table 4–4 provides a brief overview of the troubleshooting and verification procedures.

Table 4–4: Troubleshooting overview

Procedure	Recommended interval	Purpose	Where Documented
Incoming test	When you initially receive the unit and open the packing box	Verifies unit is not dead on arrival	*TLA 700 Series Performance Verification and Adjustment Technical Reference Manual*
Performance verification	After board replacement	Verifies advertised performance specifications	*TLA 700 Series Performance Verification and Adjustment Technical Reference Manual*
Troubleshooting	When unit fails to work correctly		*Troubleshoot the Benchtop Chassis*, page 4–29

Troubleshooting and Fault Isolation Procedure

Figure 4–19 is a troubleshooting chart that may help you locate faults within the chassis.

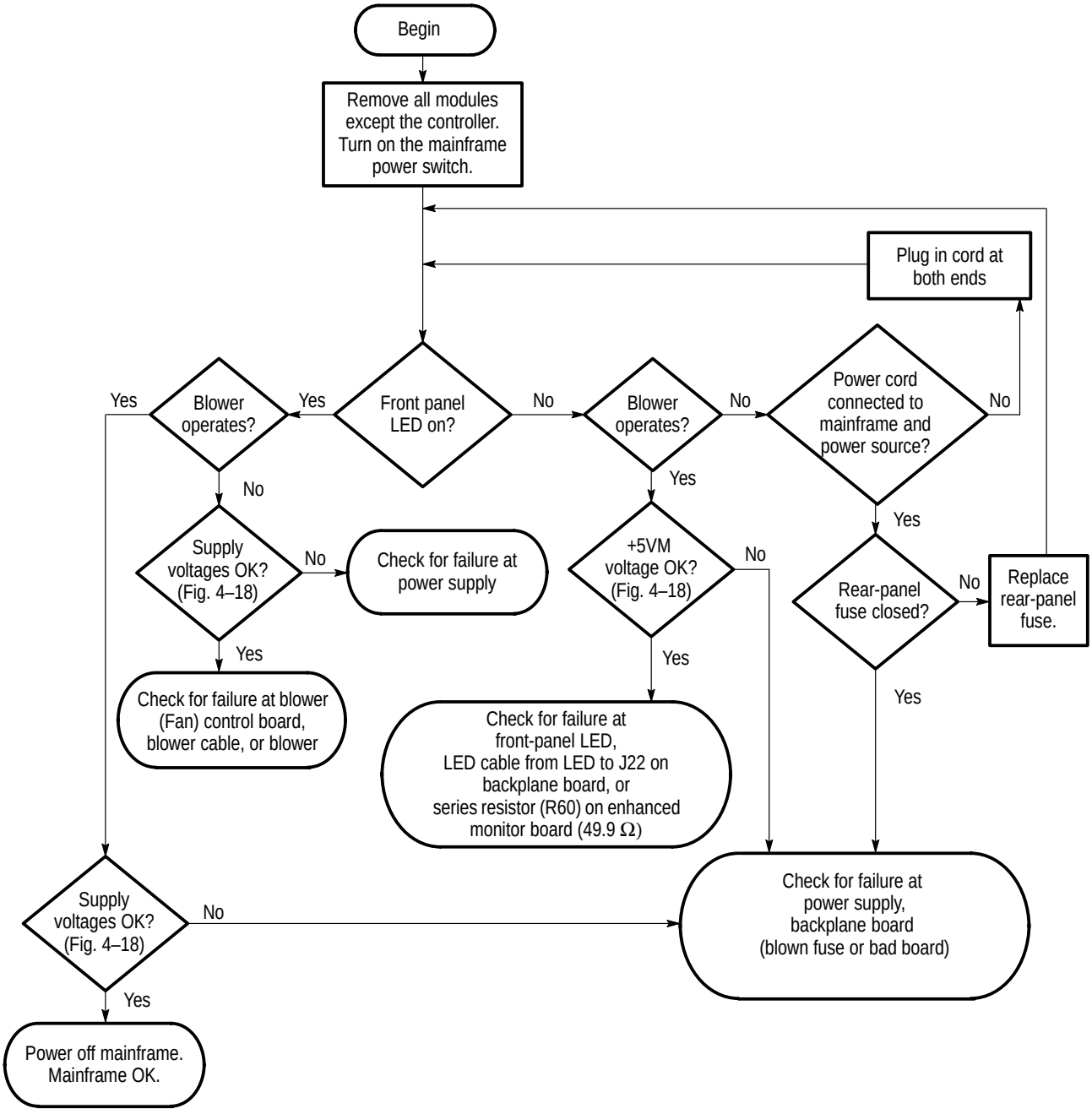


Figure 4–19: Primary troubleshooting procedure

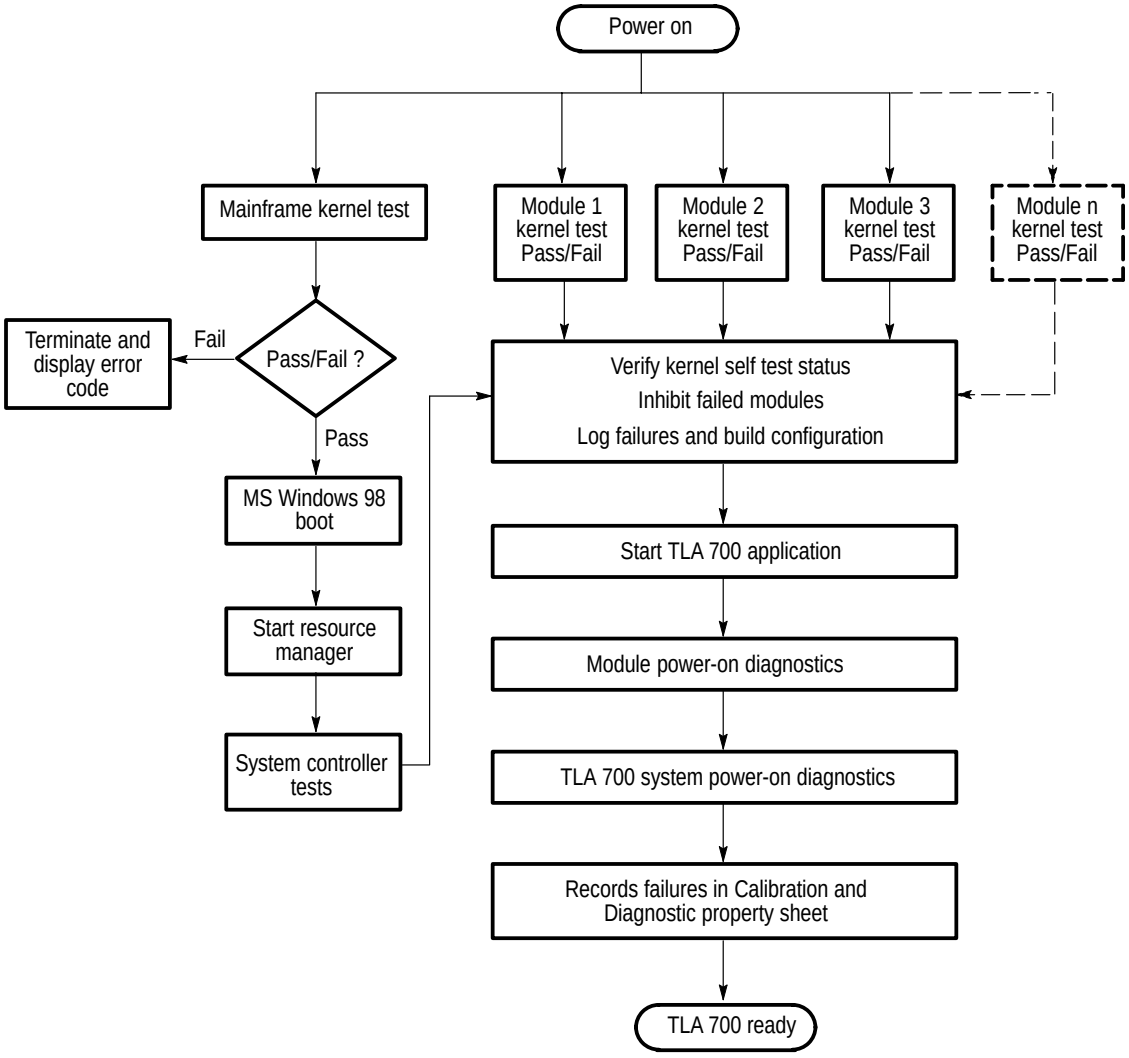


Figure 4–20: TLA 700 startup sequence

Fault Isolation

The main focus of the troubleshooting procedures is to isolate problems to one of the major modules within the chassis.

Power Supply Problems. Use the following information to isolate power supply problems to the power supply or to other modules.

- Isolate the problem to either the chassis or to one of the installed modules. Remove the modules from the chassis and check that the problem still exists.
- Run the mainframe diagnostic tests.

- Try isolating the problem to a module by either replacing the module with an known-good module or moving the module to a different slot.
- Check the fuses in the chassis.

Inadequate Cooling. If there is a cooling problem, perform the following checks:

- The blower may not be operating properly.
- Verify that all of the empty slots within the chassis are closed when no modules are installed. If necessary replace the faulty shutter assembly.

Mainframe Troubleshooting

This chapter provides information that addresses problems you may encounter while installing the logic analyzer.

This chapter does not identify module specific problems relating to performance verification or adjustments.

Diagnostics

The following diagnostic tools are available with your logic analyzer:

Power-On Diagnostics. Power-on diagnostics run when you first power-on the logic analyzer, or when you first start the TLA 700 Series application. If any diagnostic failures occur during power-on, the Calibration and Diagnostics property page appears.

Extended Diagnostics. Extended diagnostics test the logic analyzer more thoroughly than the power-on diagnostics. The extended diagnostics test the modules in the benchtop mainframe as well as the modules in the expansion mainframe(s). You can use the extended diagnostics to isolate problems to an individual module.

Before running the extended diagnostics, disconnect any attached probes.

TLA 700 Mainframe Diagnostics. The TLA Mainframe diagnostics program is a stand alone Windows application located in the TLA 700 program group. These diagnostics check operation of the mainframe beyond the basic PC circuitry. These diagnostics also check the front panel knobs of the portable mainframe.

Expansion Mainframe Diagnostics. At power-on, the expansion mainframe runs two power-on diagnostics: “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.

Power down the mainframes. Remove the two blue expansion cables and the gray expansion cable. Examine the connectors for bent or missing pins. Reconnect the two blue expansion cables and the gray expansion cable, and tighten the two connector screws. power-on the mainframes and try again.

QA+Win32 Diagnostics. The QA+Win32 diagnostics are a separate Windows application located in the Windows Start Programs menu. The diagnostics check the basic operation of the controller.

Software Problems

Your TLA 700 Series Logic Analyzer comes with most software already installed. Before running any of the diagnostics, you should check the online release notes to verify the logic analyzer software matches the module firmware.

Run the QA+Win32 diagnostics software to identify hardware or software problems. Follow the QA+Win32 online help instructions for running the diagnostics software. The diagnostics are located in the Start menu under:

\Programs\QA+Win32

Many software problems can be due to corrupted or missing software files. In most cases the easiest way to solve software problems is to reinstall the software and follow the on-screen instructions. Refer to *Upgrading Software* for instructions on reinstalling or upgrading software.

Refer to Table 2–11 on page 2–67 for a list of software and hardware troubleshooting information and recommended action.

If you suspect problems with the TLA 700 Series software, contact your local Tektronix representative or refer to *Contacting Tektronix* on page NO TAG.

Hardware Problems

If you are certain that you have installed the logic analyzer correctly, run the TLA 700 Series extended diagnostics (located under the System menu) to identify any problems with the individual modules.

If your logic analyzer powers up so that you have access to the desktop, run the QA+Win32 diagnostics software to identify possible controller hardware problems. Follow the QA+Win32 online help instructions for running the diagnostics software. The diagnostics are located in the Start menu under:

\Programs\QA+Win32

You can also run the external TLA 700 Mainframe diagnostics to identify problems not covered by other diagnostics. The TLA 700 Mainframe diagnostics are located under the Start menu under the Tektronix TLA 700 programs.

Check for Common Problems

Use Table 2–11 to quickly isolate possible failures. This list is not exhaustive, but it may help you eliminate a problem that are quick to fix, such as a blown fuse, loose cable, or defective module.

CAUTION. *Do not install or remove any modules while the mainframe is powered on. The modules are not hot swapable.*

Installing or removing modules when the mainframe is powered on can damage the modules and the mainframes.

Always power the mainframe off before attempting to install or remove modules.

Table 4–5: 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.
Monitor does not power-on	Check the monitor power cord connection. Check for failed fuse. Monitor failure: contact the vendor of your monitor for corrective action.

Table 4–5: Failure symptoms and possible causes (cont.)

Symptom	Possible causes and recommended action
Monitor display is blank	Check that the monitor is connected to the mainframe; replace the cable if necessary. If portable mainframe display is blank, try connecting external monitor; 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.
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 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; see *Software Problems* at the beginning of this chapter.
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.
LA Module merge not allowed in TLA 700 Application	Merge cable between LA modules not installed. LA modules are not compatible: TLA 7Nx and TLA 7Px LA modules may not be merged with TLA 7Lx and TLA 7Mx LA modules. Refer to the *Merge Rules*.
Windows 98 comes up but the TLA 700 application does not	Mainframe not set up to start TLA 700 application at power-on. Start application from the desktop, by double-clicking on the TLA 700 Final Setup icon located on the desktop. Faulty or corrupt software; reinstall the TLA 700 application software.
Windows 98 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.

Table 4–5: Failure symptoms and possible causes (cont.)

Symptom	Possible causes and recommended action
TLA 700 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 TLA 7XM expansion modules are firmly seated, and that the mounting screws on the TLA 7XM 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 $\rightarrow$ A, B $\rightarrow$ B, and C $\rightarrow$ 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 4–5: 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 98 Control Panel). This is a Windows operating system problem. Try powering-off the mainframe using the Windows 98 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.

TLA 700 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 4–20 on page 4–32 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 (ResMan32) performs the following tasks:

- Mainframe power-on self tests.
- Expansion 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 (if you have performed the TLA 700 Final Setup), the logic analyzer starts the TLA 700 application which performs the following tasks:

- Power-on diagnostics on all installed modules.

- Power-on diagnostics on the TLA 700 system.
- Records the Pass/Fail status in the Calibration and Diagnostics property sheet.

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

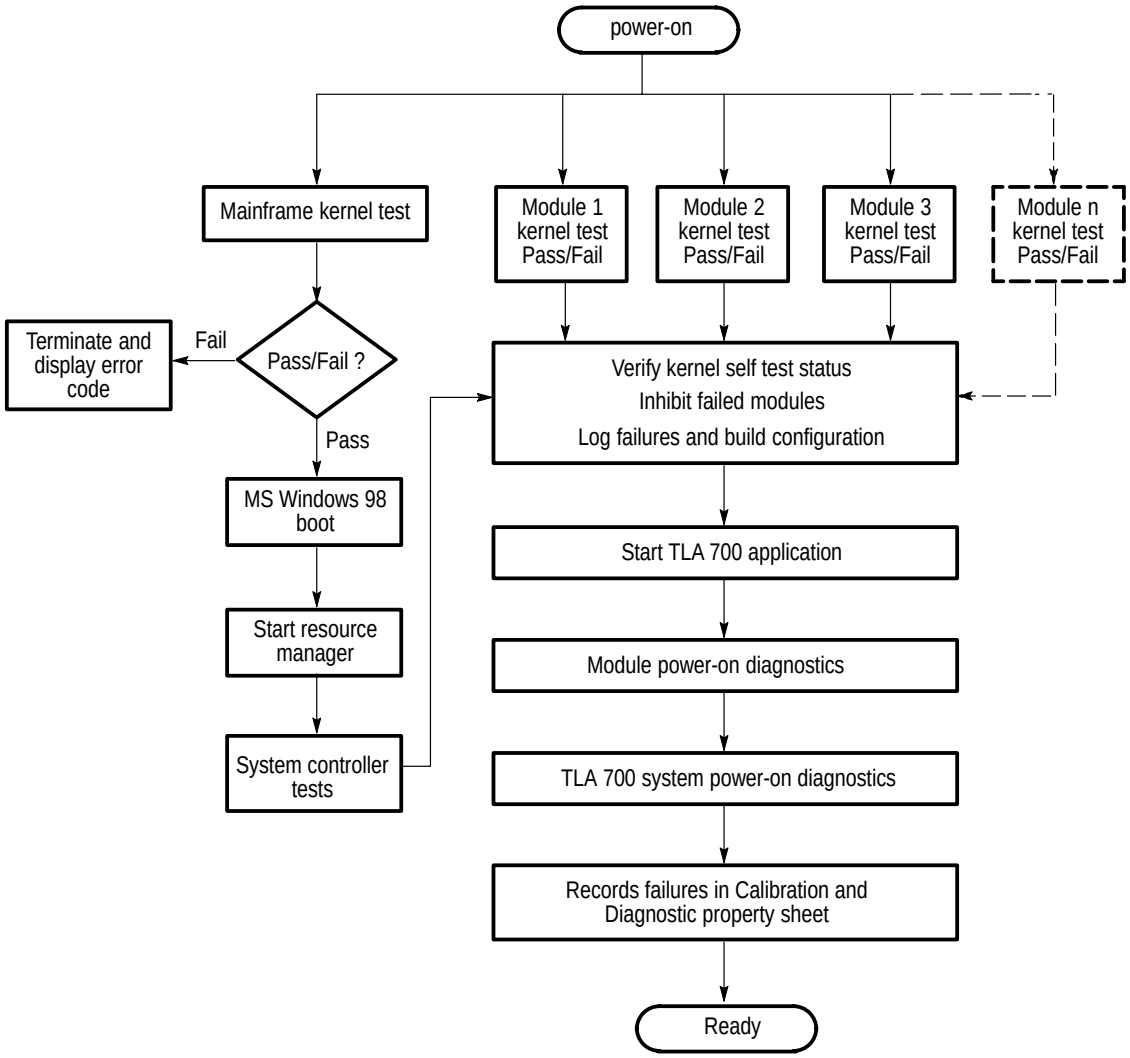


Figure 4–21: TLA 700 startup sequence

Isolating System Problems

If you have completed all of the troubleshooting procedures up to this point and the TLA application fails to display any modules in the System Window, you may have a system problem. Check for the following:

- Verify that all modules are properly installed.
- 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.

You can execute the internal resource manager program (ResMan32.exe) to identify if any of the installed modules are being identified in the mainframe slots. Table 4–6 lists some of the command line options for executing ResMan32.

Table 4–6: 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 TLA 700 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\TLA 700\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 4–22 on page 4–43. 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.

```
#Resource Mgr
#09/09/97  08:48:49
Auto Exit - Off
Identify Static Configure Devices
       Found a device at LA 1
       Found a device at LA 2
Identify Dynamic Configure Devices
Matching Devices to Slots
       match la=1 to slot=1
       match la=2 to slot=3
Setting VISA Attributes
        la 1, slot 1: device_class 2, manf_id 0xffd, model_code 0x7f4, addr_spc 0
        la 2, slot 3: device_class 2, manf_id 0xffd, model_code 0x7f1, addr_spc 0
Setting VISA Address Maps
        A24 device @ la 1 - starting address 200000x, size 65536
        A24 device @ la 2 - starting address 210000x, size 65536
Enabling Events & Responses
       la 1: Int ID 1 assigned to IRQ 4
       Enabling Events: 16-32 124-125 127
       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
        la_1=1,1,4093,2036,2,0,1,7,2097152
        la_2=2,3,4093,2033,2,0,1,7,2162688
```

Figure 4–22: ResMan32 program output

Expansion Mainframe Troubleshooting

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

If you have exhausted all of the failure symptoms and possible causes that start on page 4–28, try some of the troubleshooting tips and tricks that follow.

Look and Listen for the Expansion Mainframe Power-On Sequence

There are certain signs that the expansion mainframe is not powering-on correctly. By looking and listening to these "signs of life" 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, a signal is sent from the expansion module in the benchtop mainframe, 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 power-on signal is received by the expansion mainframe 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, perform the following procedure:

1. Remove the suspect expansion module from the expansion mainframe. The expansion module is a slot zero device when installed in the expansion mainframe. First verify that the expansion module is installed in slot zero and that the MODID switches on the back of the module are set to FF.
   or,
   Try swapping the expansion module from the benchtop 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.

   The single-wide expansion module requires up to 60 lbs. of insertion force to engage it into the back plane.

CAUTION. *Do not use the mounting screws to engage the module into the backplane of the chassis.*

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

Attempting to seat a module using the mounting screws may result in damage to the chassis.

2. Install the known good expansion module in slot zero of the expansion chassis.
3. Power-on the benchtop mainframe and check for normal operation.
4. If the failure symptoms are still present with the known good expansion module installed, the problem is most likely in the expansion mainframe, not in the expansion module.
5. If your expansion mainframe operates normally with the known good expansion module installed, then the suspect expansion module needs to be serviced.

Check the Expansion Mainframe

If you do not have a known good expansion module, perform the following procedure 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 zero 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 module(s) or the expansion cable(s).

Repackaging Instructions

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

Packaging

When repacking the benchtop chassis 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

Options

This chapter lists the options for the benchtop chassis. Refer to the *Replaceable Mechanical Parts* chapter for a list of standard and optional accessories.

Service Options

Tektronix offers the following service options. These options are modular, flexible, and easy to order with your instrument. Designed to ease installation and start up, to support tracking of calibration to requirements of ISO9000, and to provide for extended repair coverage, these options help fix your long-term maintenance costs and eliminate unplanned expenditures. And these options can be converted from service at Tektronix service depots to service on-site (see Option S1 and S3), which helps keep downtime to a minimum.

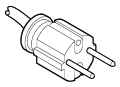
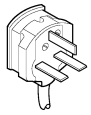
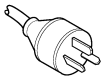
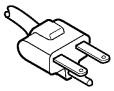
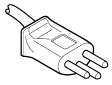
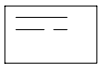
Product installation service[1]	Option IN	Provides initial product installation/configuration and start-up training session including front panel and product familiarization.
Upgrade installation service[1]	Option IF	Provides installation of product upgrades performed at a Tektronix Service Center.
Three years of calibration services	Option C3	Provides factory calibration certification on delivery, plus two more years of calibration coverage. Throughout the coverage period the instrument will be calibrated according to its Recommended Calibration Interval.
Test data	Option D1	Provides initial Test Data Report from factory on delivery.
Test data	Option D3	Provides test data on delivery plus a Test Data Report for every calibration performed during 3 years of coverage – requires Option C3.
Three years repair coverage	Option R3	Extends product repair warranty to a total of three years.
One year upgrade to on-site service[1,2]	Option S1	Upgrades the standard one year, “return to depot” warranty to an on-site warranty.
Three year upgrade to on-site service[1,2]	Option S3	Upgrades any C3, D3, and R3 options purchased to on-site coverage for three years

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

2 **Upgrade options are ordered with the mainframe products and cover individual modules.**

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

Table 5–1: Options

	Option #	Label	Description
	A1	Universal European power cord	220 V, 50 Hz, 16A power cord Delete standard power cord
	A2	UK power cord	240 V, 50 Hz, 13A power cord Delete standard power cord
	A3	Australian power cord	240 V, 50 Hz, 10A power cord Delete standard power cord
	A4	North American power cord	240 V, 60 Hz, 15A power cord Delete standard power cord
	A5	Switzerland power cord	220 V, 50 Hz, 10A power cord Delete standard power cord
	1S	Sub MF Kit	32 MB DRAM/2.16 GB Hard Disk Upgrade Delete: Controller w/16 MB DRAM/840 MB HD Add: Controller w/32 MB DRAM/2.16 GB HD Note: All current TLA 700 Series SW installed on HD (Windows 98 SW, QA Plus SW, and TLA 700 Applications SW; Windows 98 manuals also included)
	1A	Add LAN PC card	10BaseT Add: LAN Package
	1M	Add 17 inch monitor	Add: 17 inch color monitor
	2M	Add 21 inch monitor	Add: 21 inch color monitor
	1K	Add LACART	Add LACART
	95	Add cal report	Add: Cal (Test Data) Report

Diagrams

Diagrams

This chapter contains the interconnection and block diagram for the benchtop chassis and expansion chassis.

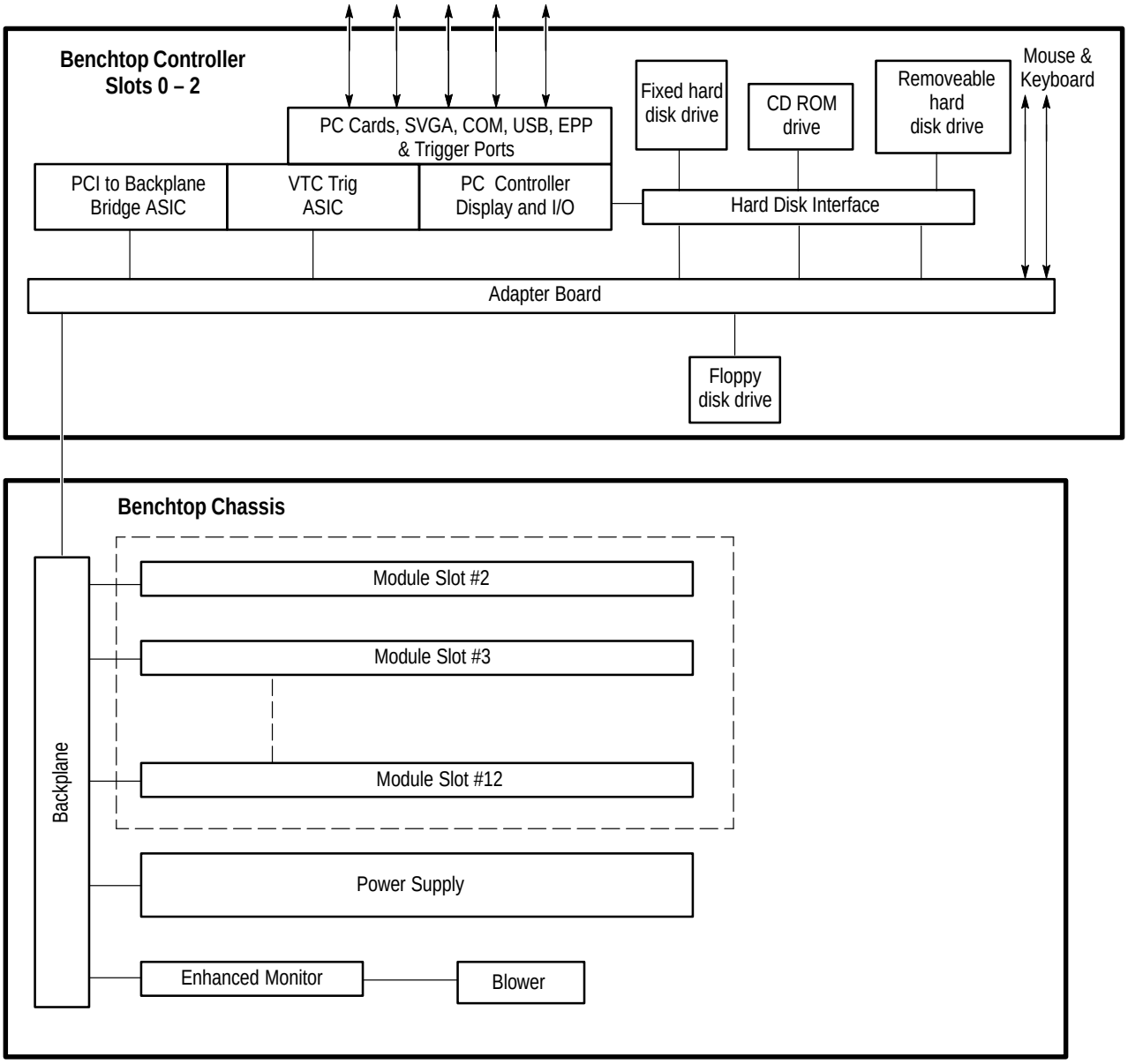


Figure 6–1: Interconnection block diagram

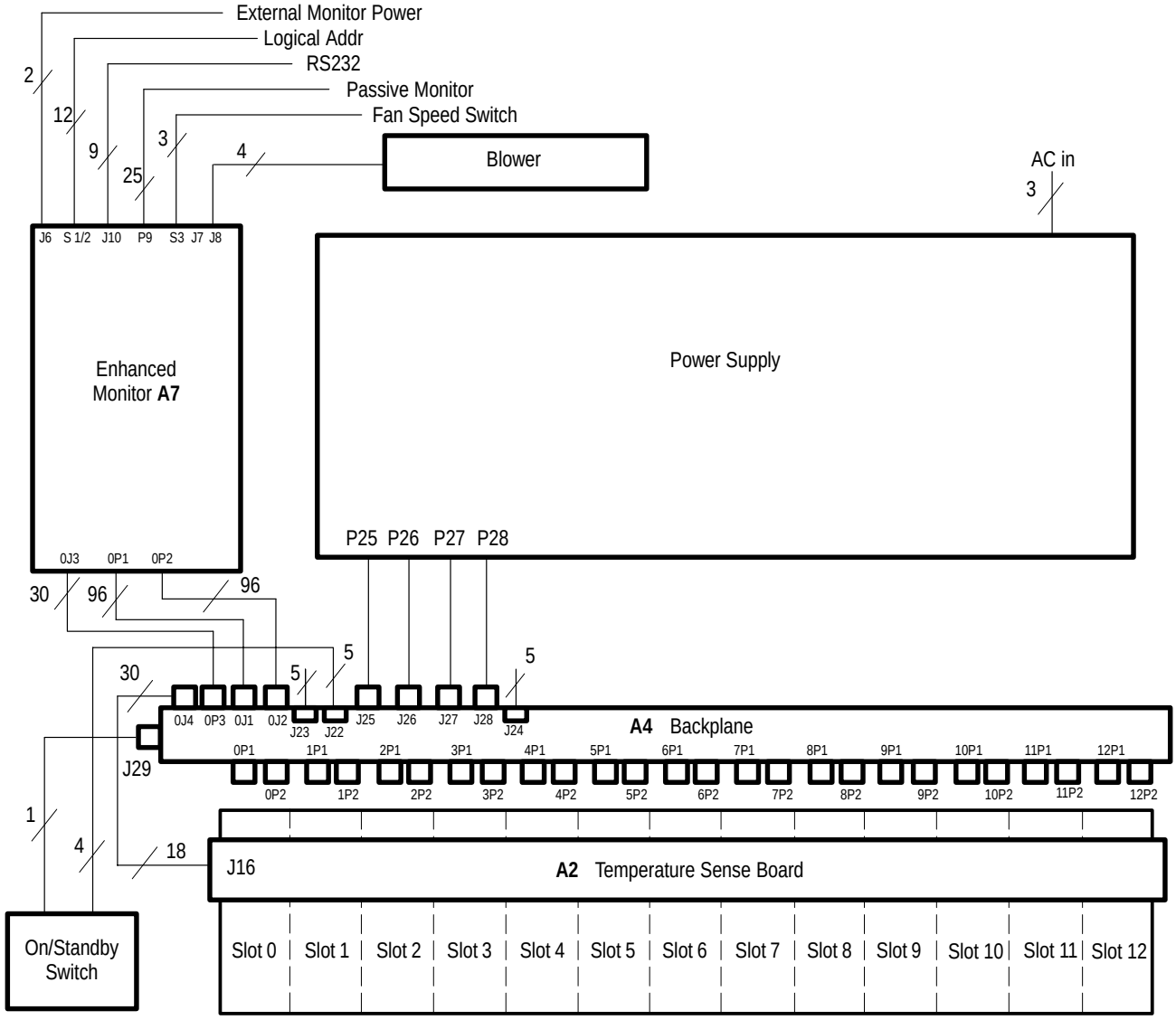


Figure 6–2: Benchtop chassis block diagram

Replaceable Mechanical Parts

Replaceable Mechanical Parts

This chapter contains a list of standard accessories, optional accessories, and replaceable parts for the benchtop chassis. Use this list to identify and order replacement parts.

After the benchtop controller is mated to the benchtop chassis, the resulting combination is the benchtop mainframe. The standard accessories and the optional accessories listed in this section are for the benchtop mainframe.

Standard Accessories

Table 7–1 lists the standard accessories shipped with the benchtop mainframe.

Table 7–1: Standard accessories

Accessory	Part number
Windows keyboard, PS2 mini-DIN	119–5662–00
Mouse, 3-button, PS2 mini-DIN	119–5662–02
Dual wide slot fillers	333–4206–00
SMB to BNC cable (2)	P6041
Female to female BNC (used to join 2 P6041 cables for diagnostics)	103–0028–00
Printer adapter cable	015–0687–00
Windows 98 package (software and manual)	063–3135–00
TLA 700 application software TLA TPI client software Diagnostics software	063–3022–XX
Windows 98 preinstall internal/external CDROM boot disk	063–3227–XX
Flash jumper with pull tab (for flashing module firmware)	131–4356–00
TLA 700 Series, Version 3.1, User Manual	071–0684–XX
Tek mouse pad	016–1524–XX
Cap, fuse holder	200–4326–00
Fuse, 15A	159–0256–00
Fuse, 6.3A	159–0381–00
Fuse, 20A	159–0379–00

Optional Accessories

Table 7–2 lists the optional accessories available for the benchtop mainframe.

Table 7–2: Standard accessories

Accessory	Part number
Power cord, North American	
right angle	161–0104–00
straight	161–0066–00
Power cord, Universal Euro	
right angle	161–0104–06
straight	161–0066–09
Power cord, UK	
right angle	161–0104–07
straight	161–0066–10
Power cord, Australian	
right angle	161–0104–05
straight	161–0066–11
Power cord, Switzerland	
right angle	161–0167–00
straight	161–0154–00
Transport hard case, wheeled	016–1522–00
TLA 720 Benchtop Controller Module Service Manual	071–0269–XX
TLA 7Nx and TLA 7Px Logic Analyzer Module Service Manual	071–0266–XX
TLA 7D1/7D2/7E1/7E2 Oscilloscope Module Service Manual	070–9780–XX
TLA 7XM Expansion Module Service Manual	071–0674–XX
Performance Verification and Adjustment Technical Reference	070–9776–XX

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 (see Part Number Revision Level below)
- Instrument type or model number

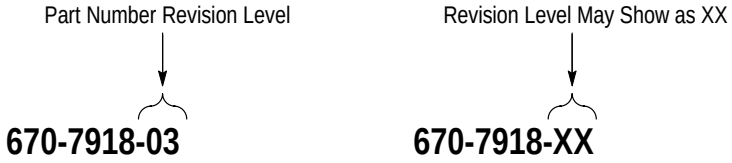
- Instrument serial number
- Instrument modification number, if applicable

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.

Change information, if any, is located at the rear of this manual.

Part Number Revision Level

Tektronix part numbers contain two digits that show the revision level of the part. For most parts in this manual, you will find the letters XX in place of the revision level number.



When you order parts, Tektronix will provide you with the most current part for your product type, serial number, and modification (if applicable). At the time of your order, Tektronix will determine the part number revision level needed for your product, based on the information you provide.

Module Servicing

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

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 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 entries 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
0B445	ELECTRI–CORD MFG CO INC	312 EAST MAIN STREET	WESTFIELD, PA 16950
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
TK1943	NEILSEN MANUFACTURING INC	3501 PORTLAND RD NE	SALEM, OR 97303
TK2157	CONNECTOR TECHNOLOGY INC	5065 E HUNTER AVE	ANAHEIM, CA 92807–6001
TK2469	UNITREK CORPORATION	3000 LEWIS & CLARK HWY SUITE 2	VANCOUVER, WA 98661
TK2548	XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON, OR 97005
TK2637	SAMSUNG ELECTRONICS	18600 BROADWICK ST	RANCHO DOMINQUES, CA 90220
3M099	PORTLAND SCREW COMPANY	6520 N BASIN AVE	PORTLAND, OR 97217
8X345	NORTHWEST SPRING MFG CO	5858 WILLOW LANE	LAKE OSWEGO, OR 97035
5Y921	COMAIR ROTRON INC	2675 CUSTOMHOUSE CT	SAN YSIDRO, CA 92073
52152	3M COMPANY	INDUSTRIAL TAPE DIVISION 3M CENTER	ST PAUL, MN 55144–1000
01295	TEXAS INSTRUMENTS INC	SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY PO BOX 655303	DALLAS, TX 75272–5303

Manufacturers cross index (Cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
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
24931	BERG ELECTRONICS INC	BERG ELECTRONICS RF/COAXIAL DIV 2100 EARLYWOOD DR PO BOX 547	FRANKLIN, IN 46131
61935	SCHURTER INC	1016 CLEGG CT PO BOX 750158	PETALUMA, CA 94975–0158
68579	PERMATRON CORP.	11400 MELROSE ST	FRANKLIN PARK, IL 60131
71400	BUSSMANN	DIVISION COOPER INDUSTRIES INC PO BOX 14460	ST LOUIS, MO 63178
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
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001
86928	SEASTROM MFG CO INC	456 SEASTROM STREET	TWIN FALLS, ID 83301

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		
1–1	212–0193–00			22	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			10	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
					STANDARD ACCESSORIES		
–	071–0268–00			1	MANUAL, SERVICE: TLA 720 BENCHTOP CHASSIS	80009	071–0268–00
–	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

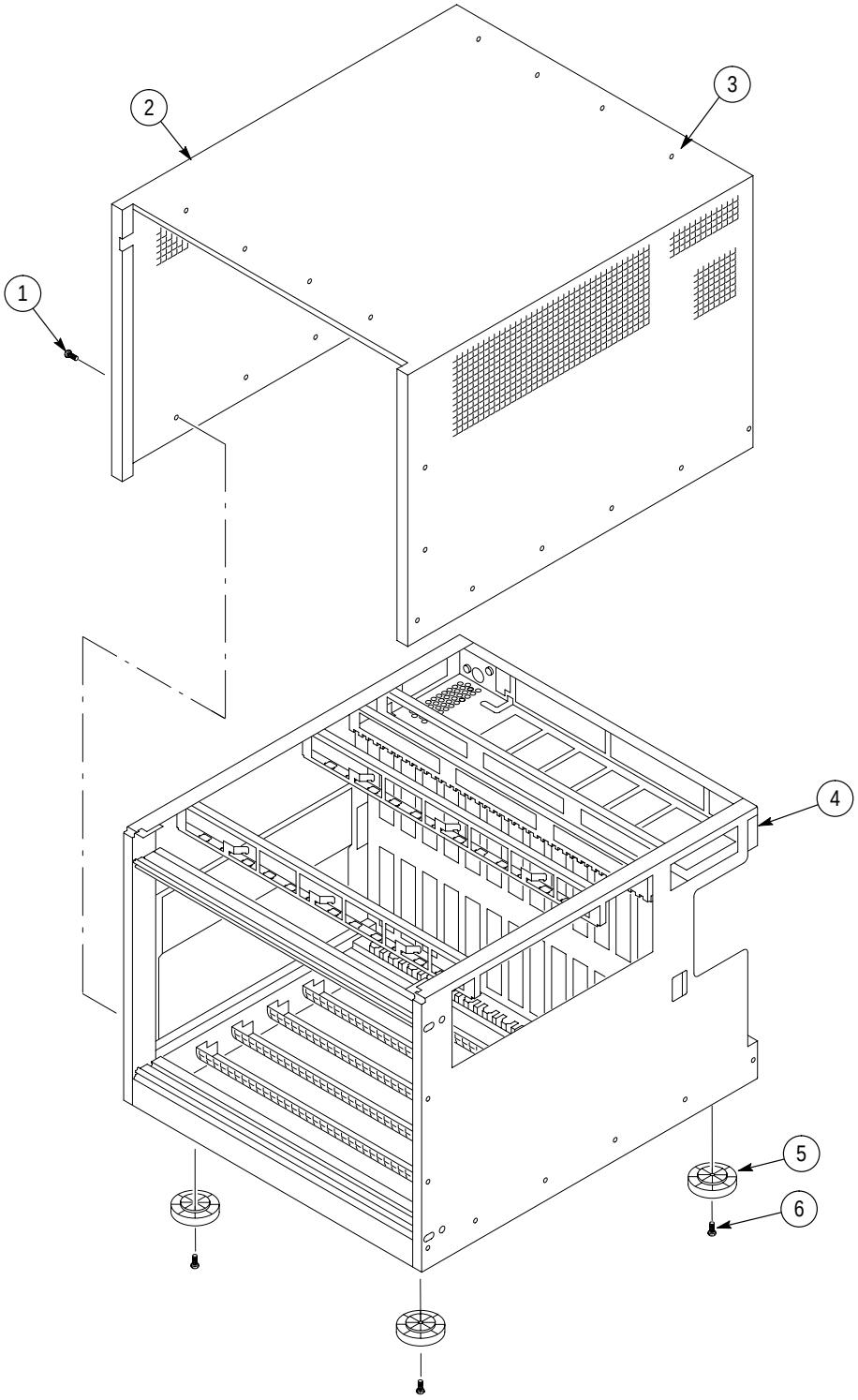


Figure 7–1: Cabinet and chassis assembly

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		
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	333–4275–00			1	PANEL, FRONT: TOP, W/LEXAN OVERLAY, TLA 720	TK1943	333–4275–00
–3	333–xxxx–00			1	PANEL, FRONT: TOP, W/LEXAN OVERLAY, TLA 7XM	TK1943	333–xxxx–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, 389–1876–XX WIRED, TESTED	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	118–9417–00			1	BACKPLANE VXI: BACKPLANE VXI COMPATIBLE WITH 13 C–SIZE SLOTS ELECTRONIC AUTOMATIC	80009	118–9417–00
–8	020–2194–00			1	COMPONENT KIT: BACKPLANE, EMI SHIELD KIT CONTAINS DIN SHIELD WITH 2 SCREWS ITEMS 7 & 8	80009	020-2194-00
–9	343–0775–00			2	CABLE, CLAMP: RIBBON, 1.0X1.0, GRAY, POLYVINYL, W/URETHANE FOAM TAPE BACKING	52152	80610029243/3484–1000
–10	220–0199–01			2	NUT BAR: VXI, M2.5 THREADS	OKB01	ORDER BY DESCRIPTION
–11	378–0438–00			13	BAFFLE ASSY: VXI SLOT, SINGLE, SHUTTER	80009	378–0438–00
–12	351–1007–00			13	GUIDE, SINGLE: PLASTIC	80009	351–1007–00
–13	333–4206–00			5	PANEL, FRONT: DOUBLE, BLANK, EMI, AL, PAINTED SILVER GRAY	TK1943	333–4206–00
–14	333–4205–00			1	PANEL, FRONT: SINGLE, BLANK, EMI, AL, PAINTED SILVER GRAY	TK1943	333–4205–00
–15	337–4046–00			1	SHIELD, ELEC: AL, DVG1, TG2000	80009	337–4046–00
–16	334–9920–00			1	MARKER, IDENT: LABEL, FRONT BOTTOM SLOT, 0.010 LEXAN, 1.25 X 15.60, BACKGROUND SILVER GRAY, TLA711A	0KB05	334–9920–00

Replaceable parts list (Cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					OPTIONAL ACCESSORIES		
	070–9776–XX			1	MANUAL, TECH: TECHNICAL REFERENCE, TLA700 SERIES PERFORMANCE VERIFICATION AND ADJUSTMENT	80009	070–9776–00
	071–0269–XX			1	MANUAL, TECH: SERVICE, TLA 720 BENCHTOP CONTROLLER	80009	071–0269–00
	071–0268–XX			1	MANUAL, TECH: SERVICE, TLA 720 BENCH TOP CHASSIS	80009	071–0268–XX
	071–0267–XX			1	MANUAL, TECH: SERVICE, TLA 714 PORTABLE MAINFRAME	80009	071–0267–XX
	071–0266–XX			1	MANUAL, TECH: SERVICE, TLA 7Nx and TLA 7Px SERIES LOGIC ANALYZER MODULE	80009	071–0268–XX
	070–9780–XX			1	MANUAL, TECH: SERVICE, TLA7D1, TLA7E1 DIGITIZING OSCILLOSCOPE MODULE	80009	070–9780–XX
	071–0572–XX			1	MANUAL, TECH: INSTRUCTION, TLA 7UP MAINFRAME FIELD UPGRADE KIT	80009	071–0572–XX

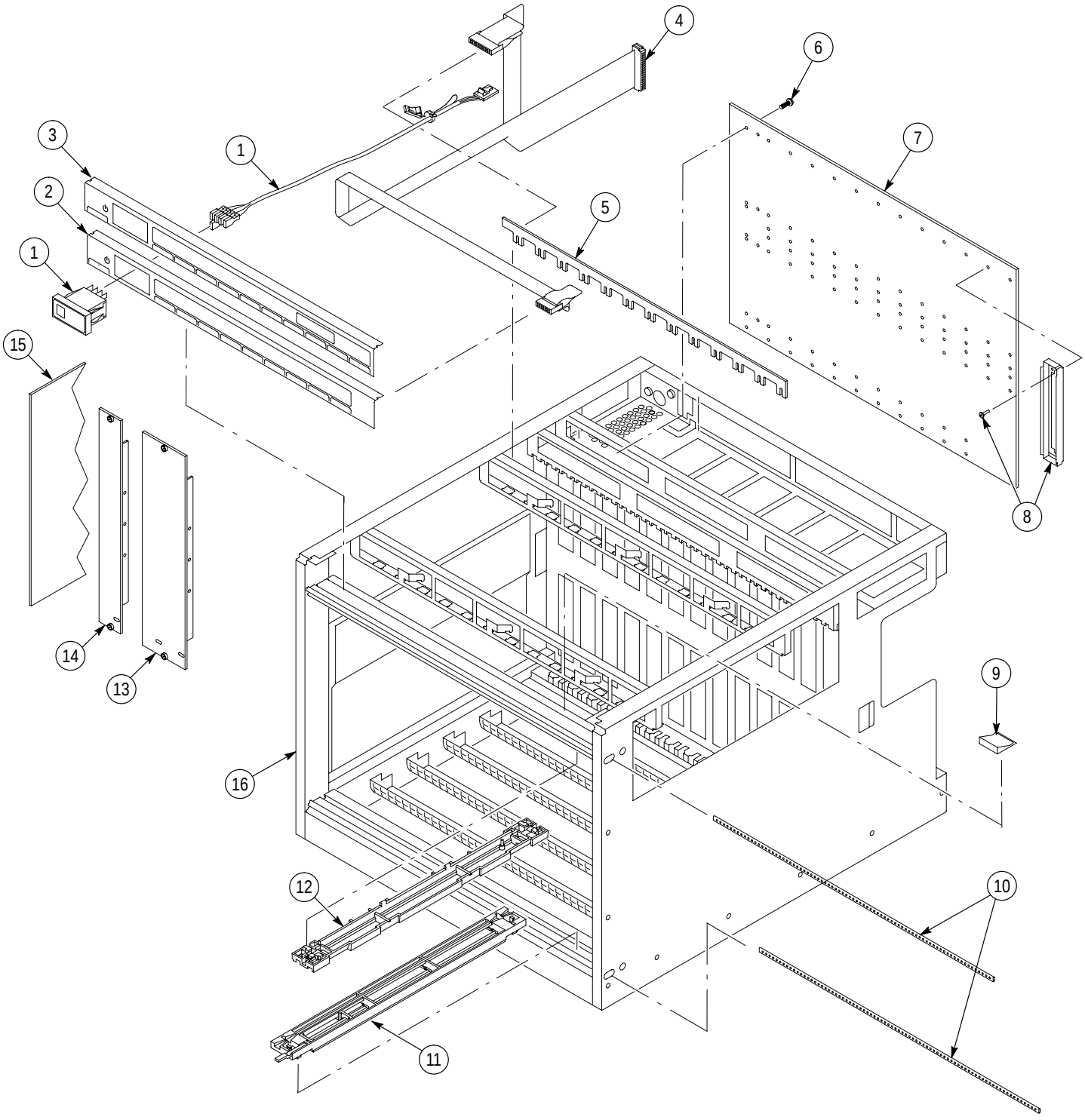


Figure 7–2: Circuit boards and chassis parts

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		
3–1	671–3982–01	B010100	B019999	1	CIRCUIT BD ASSY: ENHANCED MONITOR (CONTAINS ITEMS 1 THRU 5)	80009	671–3982–00
3–1	671–3982–02	B020000		1	CIRCUIT BD ASSY: ENHANCED MONITOR (CONTAINS ITEMS 1 THRU 5)	80009	671–3982–02
–2	333–4236–00			1	PANEL, MONITOR: ENHANCED, 0.062 AL, W/LEXAN OVERLAY, VX1410A,	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	See Figure –1			1	CIRCUIT BD: ENHANCED MONITOR	———	————————
–5	211–0747–00			4	SCREW, MACHINE: 6–32 X 0.188, PNH, STL, CDPL, T–15	0KB01	ORDER BY DESCRIPTION
–6	200–4344–00			1	COVER: BLOWER CABLE, 0.040 A1 ALLOY	TK1943	200–4344–00
–7	380–1112–00			1	HOUSING: BLOWER HOUSING BLOWER	TK1943	380–1112–00
–8	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
–9	211–0512–00			6	SCREW, MACHINE: 6–32 X 0.5, FLH, 100 DEG, STL, POZ	73893	ORDER BY DESCRIPTION
–10	119–5199–00			1	FAN, DC: BLOWER, 48V, DUAL INLET, 450 CFM, 177 W, WITH 6 SCREWS	80009	119–5199–00
–11	212–0400–00			4	SCREW, MACHINE: 8–32 X 0.250, PNH, STL, ZINC, T–20	3M099	BY DESCRIPTION
–12				1	LABEL	80009	BY DESCRIPTION
–13	380–1112–00			1	HOUSING: FAN HOUSING BLOWER	TK1943	380–1112–00
–14	200–4326–00			1	CAP, FUSEHOLDER: 5MM X20MM STM FUSE CARRIER, USE W/ BUSS HTB SCREWDRIVER SLOTTED FUSEHOLDER	71400	STM
–15	159–0256–00			1	FUSE, CARTRIDGE: 15A, 250V, FAST	71400	ABC–15
–15	159–0379–00			1	FUSE, CARTRIDGE: 20A, 250V, 5 SEC MIN @ 200%, 0.25 X 1.25, UL REC, 326020	75915	326 020
–15	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
–16	119–5553–XX			1	POWER SUPPLY: VXI MAINFRAME, 925W	80009	119–5553–XX
–17	367–0494–00			1	HANDLE: EJECTOR POWER SUPPLY, VX1410A	TK1943	367–0494–00 0BD
–18	211–0932–00			2	SCREW: SHLDR, 8–32 X 0.187 OD X 0.125 L, 0.187 L	24931	PZ–6–3
–19	210–0804–00			2	WASHER, FLAT: 0.17 ID X 0.375 OD X 0.032 STL	86928	76430–000
–	334–9921–00			1	MARKER, IDENT: LABEL, REAR POWER RATING, 0.010 LEXAN, 1.500 X 7.500, BACKGROUND SILVER GRAY, TLA711A	0KB05	334–9921–00

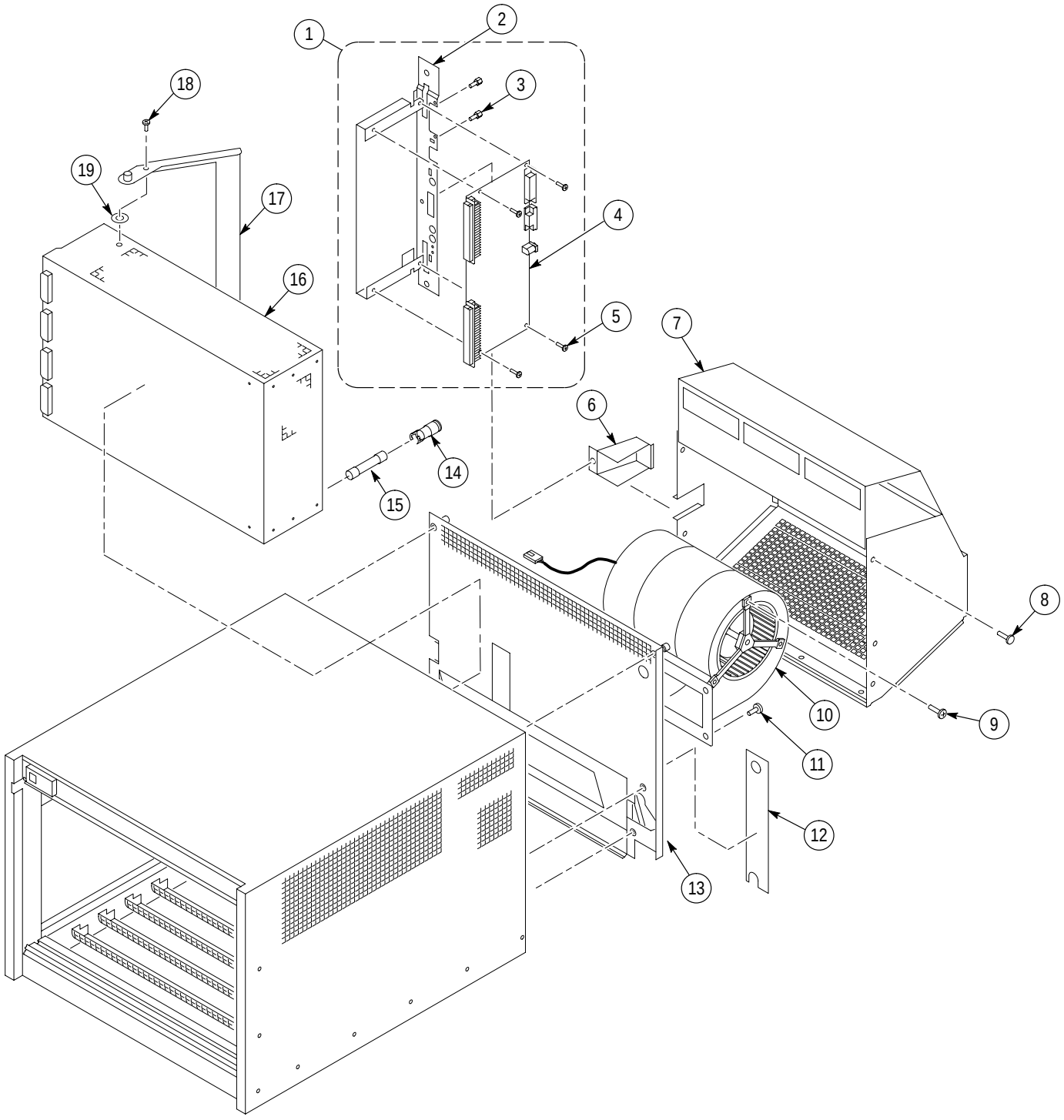


Figure 7–3: Power supply, monitor, and fan assembly

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					RACKMOUNT ASSEMBLY		
4–0	020–2221–XX			1	COMPONENT KIT: RACKMOUNT KIT 1R, (KIT CONTAINS ITEMS 1 THRU 8)	80009	0202221XX
–1	950–0991–00			2	HANDLE ALUMINUM BLK	80009	950099100
–2	212–0157–00			14	SCREW, MACHINE: 8–32 X 0.5, FLH, 100 DEG, STL CDPL, T–15	0KB01	ORDER BY DESC
–3	407–4524–00			1	BRACKET: LEFT, RACKMOUNT, SILVER GRAY	TK1943	407–4524–00
–4	212–0671–00			4	SCREW, MACHINE: 10–32 X 0.625, FLH, 100 DEG, STL, CD PL, TORX	0KB01	ORDER BY DESC
–5	407–4525–00			1	BRACKET: RIGHT, RACKMOUNT, SILVER GRAY	TK1943	407–4525–00
–6	351–1010–00			1	GUIDE: RACK SLIDE EXTENSION BRACKET, CLOSED SLOT, 9.7 X 8.1 INCHES	06666	B–814–2
–7	351–0800–00			1	GUIDE, SLIDE: CHASSIS TRACK, (PAIR)	06666	CTS–124
–8	386–6999–00			1	PLATE, LEFT: OFFSET SPACER, 16 X 1.45, 0.062 THICK AL	TK1943	386–6999–00

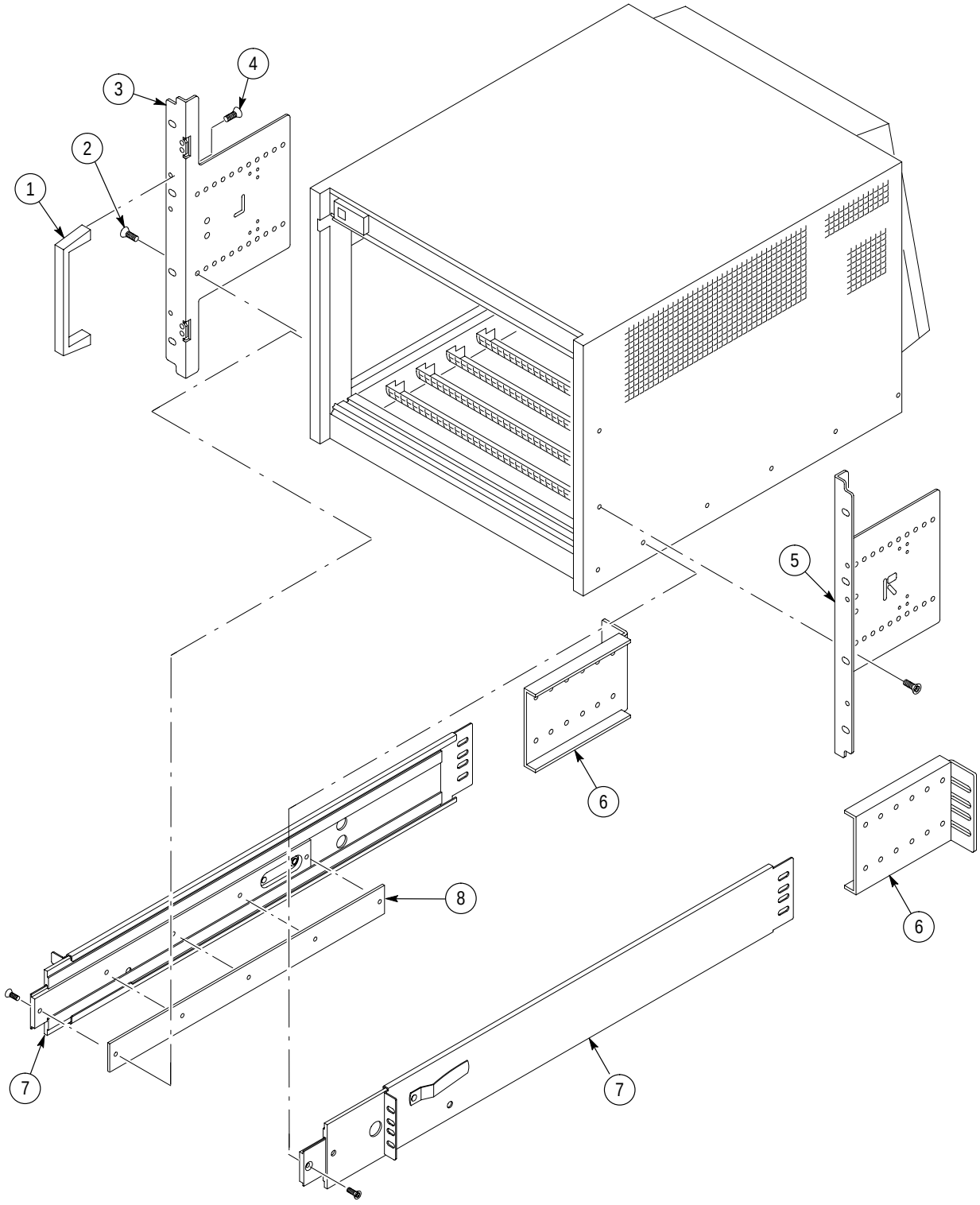


Figure 7–4: Rackmount assembly

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