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Instruction Manual

Tektronix

VX1411A IntelliFrame®
VXIbus Mainframe

070-9646-01

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 the Safety Summary prior to performing service.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

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

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

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.

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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

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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 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.

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Preface

The VX1411A IntelliFrame Mainframe Instruction Manual provides information on using the mainframe. The manual includes the following chapters:

- *Getting Started* provides a brief description of the VX1411A IntelliFrame Mainframe, a list of accessories that accompany the mainframe, installation and configuration procedures, and a functional check procedure.
- *Operating Basics* provides a functional overview of the mainframe and includes illustrations of the main components.
- *Specifications* lists all of the warranted characteristics, nominal traits, and typical characteristics of the mainframe.
- *Maintenance* is intended for qualified service personnel who need to service the mainframe. Module-level removal and replacement procedures and troubleshooting procedures are included in this chapter.
- *Replaceable* Parts includes a list of replaceable mechanical and electrical parts for the mainframe to be used with the maintenance chapter. It also includes the exploded view diagrams of the mainframe and options.
- *Appendices* includes a power budget worksheet, a description of special configuration option.
- *Glossary.*
- *Index.*

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Contacting Tektronix

Product Support	For application-oriented questions about a Tektronix measurement product, 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	Contact your local Tektronix distributor or sales office. Or visit our web site for a listing of worldwide service locations. http://www.tek.com
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. P.O. Box 1000 Wilsonville, OR 97070-1000

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Introduction

This manual contains information needed to properly service the IntelliFrame® mainframe This manual does *not* support component-level fault isolation and replacement.

Service Offerings

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

Whether providing warranty repair service or any of the other services listed below, Tektronix service technicians are well equipped to service the IntelliFrame® mainframe. Tektronix technicians train on Tektronix products; they have access to the latest information on improvements to the IntelliFrame® mainframe as well as the latest new product upgrades. *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 or you can visit us on our *Customer Services World Center* web site at http://www.tek.com/Measurement/Service. See our latest service offerings and contact us by email.

Calibration and Repair Service

In addition to warranty repair, Tektronix Service offers calibration and other services 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 IntelliFrame® mainframe.

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

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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 IntelliFrame® mainframe. 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.

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Getting Started

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Getting Started

This chapter provides an overview of the VX1411A IntelliFrame Mainframe. It includes installation and configuration information on user-installed options.

Product Description

The VX1411A IntelliFrame Mainframe is a 13-slot, C-size, VXIbus Mainframe. It fully complies with the VXIbus Specification 1.4 requirements and is VXI*plug&play* compatible. The mainframe has the following features:

- Excellent available power for the majority of applications
- Variable fan speed based upon operating ambient temperature
- High quality auto-configuration backplane
- EMI DIN shields for superior EMI protection
- Optional adjustable rackmounts and cable tray

These features are explained in more detail in the following paragraphs.

Power Supply

The VX1411A IntelliFrame Mainframe provides all VXIbus voltages at levels necessary for most ATE applications. The power supply has a volt-ampere capacity of 1186 VA, with 700 watts is usable by VXI instrument modules at any one time (refer to *Appendix A: Power Budget Worksheet*). The mainframe accommodates exclusively digital applications, exclusively analog applications, or combinations of both.

The power supply plugs directly into the rear of the mainframe and has no cables to disconnect. The power supply can easily be replaced in less than three minutes, minimizing downtime. The power supply automatically sets the ranges for the appropriate input voltage and frequency.

Cooling

The VX1411A IntelliFrame Mainframe provides optimal cooling for all installed modules. The mainframe is equipped with two efficient variable speed fans. The fan speed can easily be manually switched from a low noise, variable speed to full speed for maximum cooling. Fan speed varies with ambient air temperature:

- Minimum speed <20˚C
- Maximum speed >50˚C
- Variable speed from 20 to 50˚C

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Air is exhausted at the sides of the mainframe, allowing you to safely stack the mainframe with other rackmount equipment. Additional equipment placed on or positioned above the product will not restrict airflow nor will that equipment be directly affected by exhaust air.



CAUTION. *To prevent damage from over heating, make sure the ambient air temperature inside the rackmount enclosure remains below 55˚C.*

Cooling is not wasted on empty slots. IntelliGuides automatically direct air to only those slots containing modules; empty slots are shut off. The mainframe 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 mainframe.

You can easily remove the air filter from the rear of the mainframe. The fans can be replaced without disassembling the entire mainframe.

Backplane

The VX1411A IntelliFrame Mainframe has an auto-configuration, solid-state backplane that uses electronic jumpers for the IACK and BUS GRANT signal lines. There are no jumpers to move or install on the backplane. This results in a high quality backplane that is ideal for ATE systems that must be reconfigured frequently. The backplane is installed with standard EMI DIN shields.

Full differential distribution of the CLK10 signals provides a clean timing source for your VXIbus instruments.

Optional Rackmounts and Cable Tray

You can order the VX1411A IntelliFrame Mainframe with user-installed rackmounts and cable tray. The cable tray provides a means to conveniently route cables from the front of the modules to the rear of the mainframe. Option 1U includes a 1.75-inch connector butch plate. You can install Option 1U to provide a 1.75-inch, 2.5-inch, or 4.25-inch deep cable tray.

The rackmount adapters let you recess the mainframe from the front panel mounting surface at specified depths from 0.735 inches to 5.735 inches in 0.5-inch increments. Similarly, you can configure the mainframe to extend out of the front of the rack at specified depths (0.57 inches to 5.57 inches in 0.5-inch increments).

You can install the rackmount kits along with the cable tray to provide vertical cable access to easily route cables to instruments above or below the mainframe while keeping lead lengths as short as possible.

You can also install an optional Lexan door with the rackmount kit.

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***NOTE**. If you choose to extend the mainframe out of the front of the rack, the mainframe cannot accept a door.*

Instructions for installing the cable tray begin on page 1–6; instructions for the rackmount kits begin on page 1–11.

Options and Upgrade Kits

Table 1–1 lists the VX1411A IntelliFrame Mainframe options and upgrade kits that you can purchase and install separately. Contact your local Tektronix representative for information on the upgrade kits. The VX1411A can be upgraded to include the features of other Tektronix IntelliFrame®Mainframes.

Table 1–1: VX1411A IntelliFrame Mainframe options and upgrade kits

Description	Option	Upgrade or Part number
Rackmount Kit with Rack Slides	1R	020-2221-XX
Rackmount Kit with Rack Slides and Lexan Door	2R	020-2222-XX
Cable Tray Kit	1U	020-2223-XX
Cable Tray Kit	2U	020-2224-XX
VX1411A to VX1410A Upgrade	–	VXF10A
VX1410A Front Panel Display	1M	VXF1M
VX1410A Option 1MVXF to VX1420A	–	VXF20A

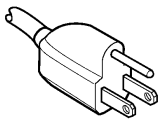
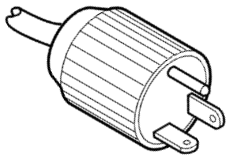
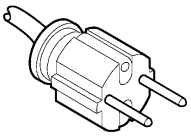
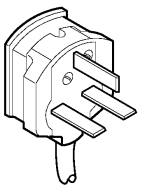
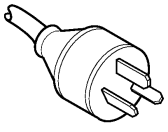
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Standard Accessories

The VX1411A IntelliFrame Mainframe comes with the following standard accessories:

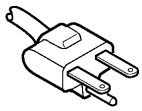
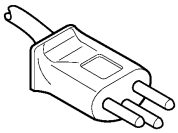
- *VX1411A IntelliFrame Mainframe Instruction Manual*
- One power cord (voltage range and plug type varies according to country, see Table 1–2)
- Fuse holder
- Line fuse, 15 A, 250 V
- Line fuse, 20 A, 250 V
- Line fuse, 6.3 A, 250 V

Table 1–2: Power cord identification

Plug configuration	Normal usage	Option number
	North America 125 V/15 A Plug NEMA 5-15P	Standard
	North America 125 V/20 A Plug NEMA 5-20P	Standard
	Europe 230 V	A1
	United Kingdom 230 V	A2
	Australia 230 V	A3

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Table 1–2: Power cord identification (Cont.)

Plug configuration	Normal usage	Option number
	North America 230 V	A4
	Switzerland 230 V	A5

Optional Accessories

The VX1411A IntelliFrame Mainframe has the following optional accessories: Refer to *Replaceable Parts* on page 5–8 for part numbers.

- Single-wide front panel fillers
- Double-wide front panel fillers
- Single-wide EMI front panel fillers
- Double-wide EMI front panel fillers
- EMI intermodule shields

Selecting the Fuse

The VX1411A IntelliFrame Mainframe comes standard with a power cord and three fuses. Before installing the mainframe, you must determine the correct fuse for your application. Refer to Table 1–3 to determine the appropriate line fuse for the VX1411A IntelliFrame Mainframe.

Table 1–3: Line fuse application

Line voltage	fuse
110 – 250V	15A fast, 0.25 x 1.25 in
207 – 250 V	6.3A time delay, 5 x 20mm, (use 5 x20mm fuseholder cap)
90 – 130 V	20A time delay, 0.25 x 1.25 inch

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Installation

This section describes the procedures to install your mainframe. It includes procedures for installing the mainframe with the rackmount or cable tray options.

This section does not include specific procedures for installing modules in the mainframe. Refer to your module documentation for information regarding the module installation instructions.

Site Considerations

The VX1411A IntelliFrame Mainframe is designed to operate on a bench or in a rackmount environment. For proper cooling, allow at least 2 inches (5.1 cm) of clearance on the rear and sides of the mainframe. Determine how you will use your VX1411A IntelliFrame Mainframe and follow the appropriate installation instructions. If you ordered your mainframe with the cable tray option and one of the rackmount options, install the cable tray before installing the rackmount.



WARNING. *To avoid personal injury, use care when lifting or moving the mainframe to avoid personal injury while performing the installation procedures.*

Cable Tray Installation

The IntelliFrame® mainframe comes a with a 0.75-inch cable access area on the bottom of the mainframe. Use the following procedure to install your cable tray option:

You will need a T-20 Torx and Phillips driver to install Options 1U or 2U.

Options 1U and 2U can be installed three different ways; without rails, with rails, or with rails installed at 90°.

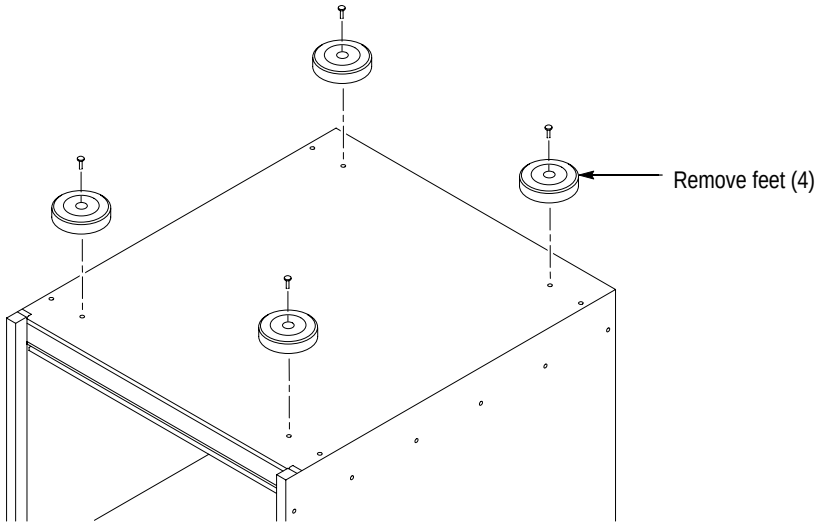
Figure 1–1 on page 1–7 and Figure 1–2 on page 1–8 show how to install Option 1U (without rails, with rails, rails at 90°) to provide a cable tray depth of 1.75, 2.50, or 4.25 inches.

Figure 1–3 on page 1–9 and Figure 1–4 on page 1–10 show how to install Option 2U (without rails, with rails, rails at 90°) to provide a cable tray depth of 3.50, 4.25, or 6.00 inches.

Both options come with butch plates to mount cable connectors at the rear of the cable trays. The butch plate will not fit on Option 1U when the foot rails are not used. You can modify the butch plate to accept cable connectors at the rear of the mainframe. Specific instructions for modifying the butch plate are not given since the locations, types, and size of connectors vary with each application.

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4



Opt 1U without rails
1.75–inch depth

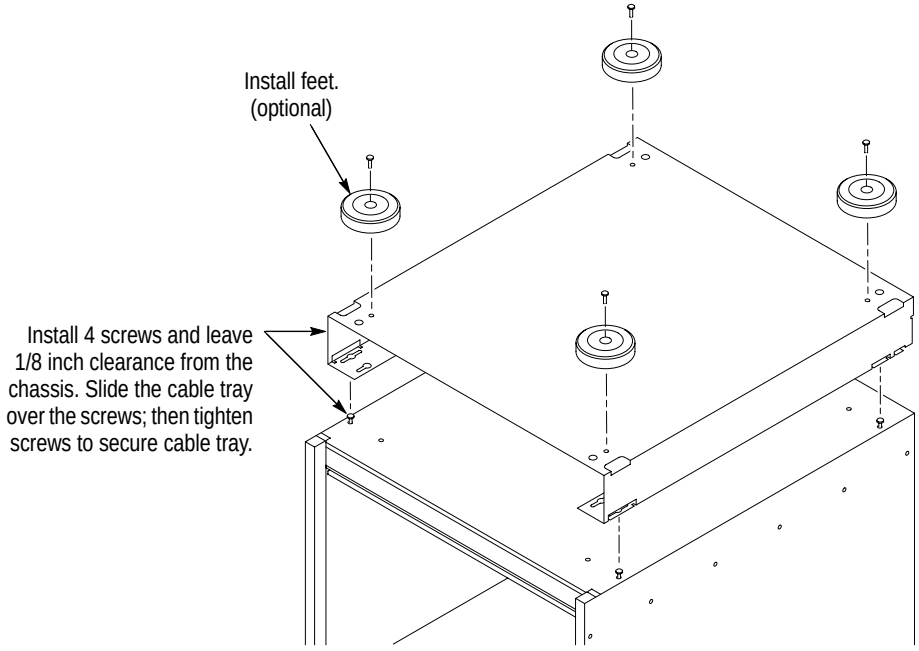


Figure 1–1: Install Option 1U cable tray

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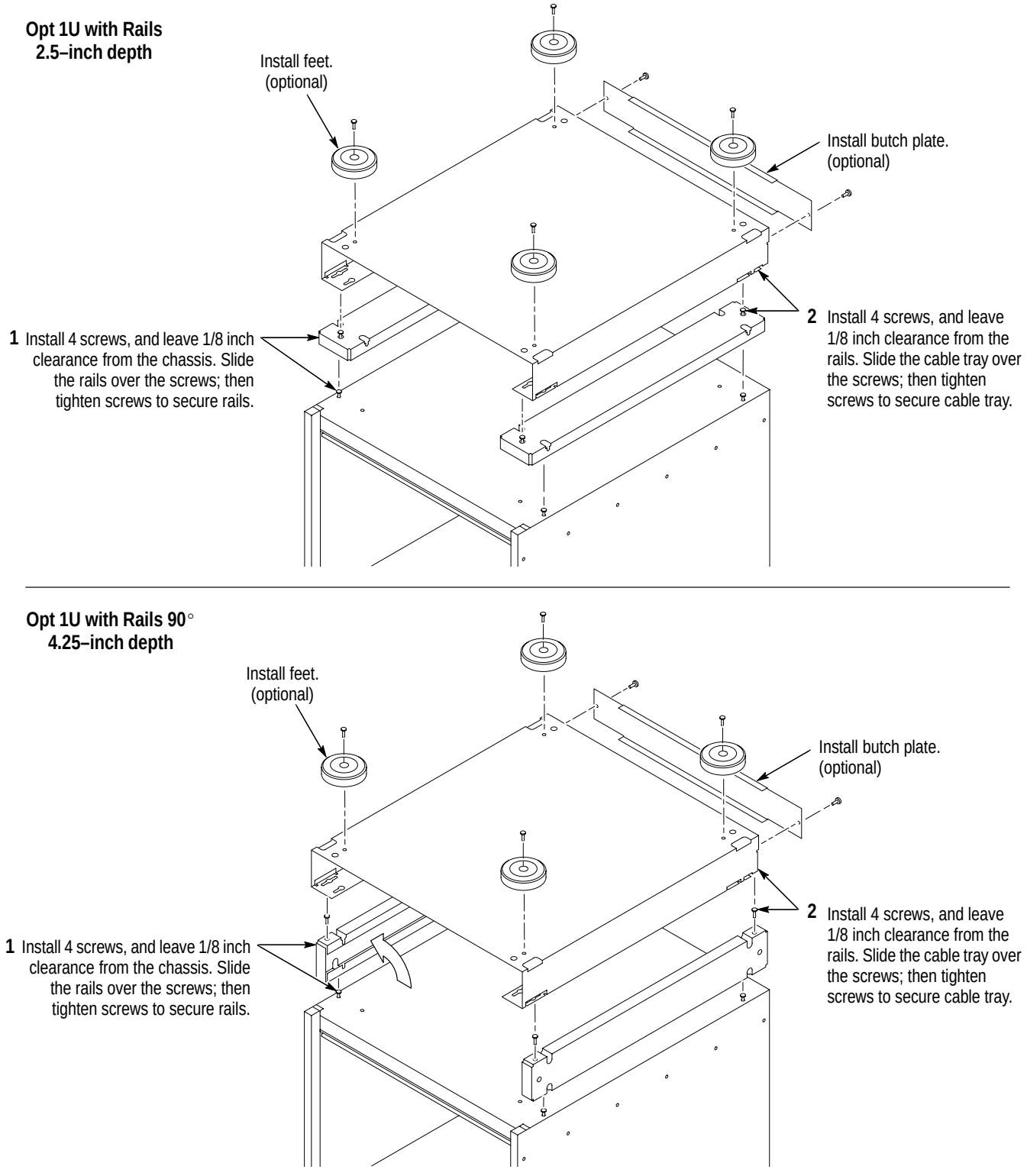
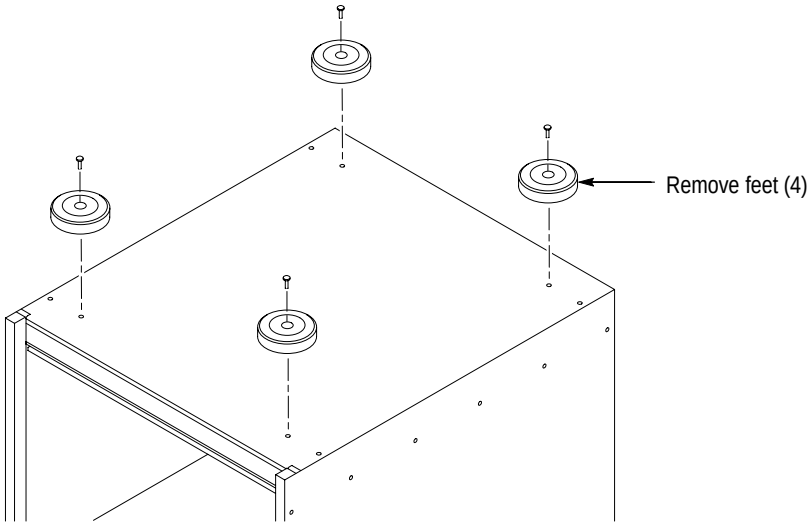


Figure 1–2: Install Option 1U cable tray

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Opt 2U without rails
3.5–inch depth

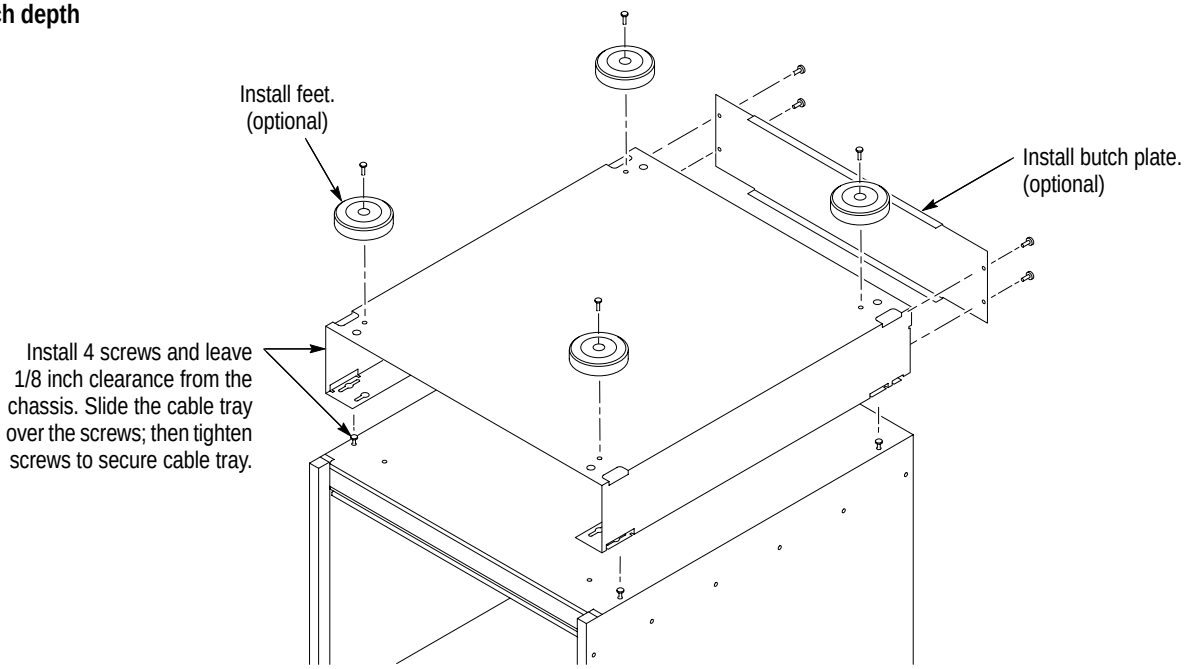


Figure 1–3: Install Option 2U cable tray

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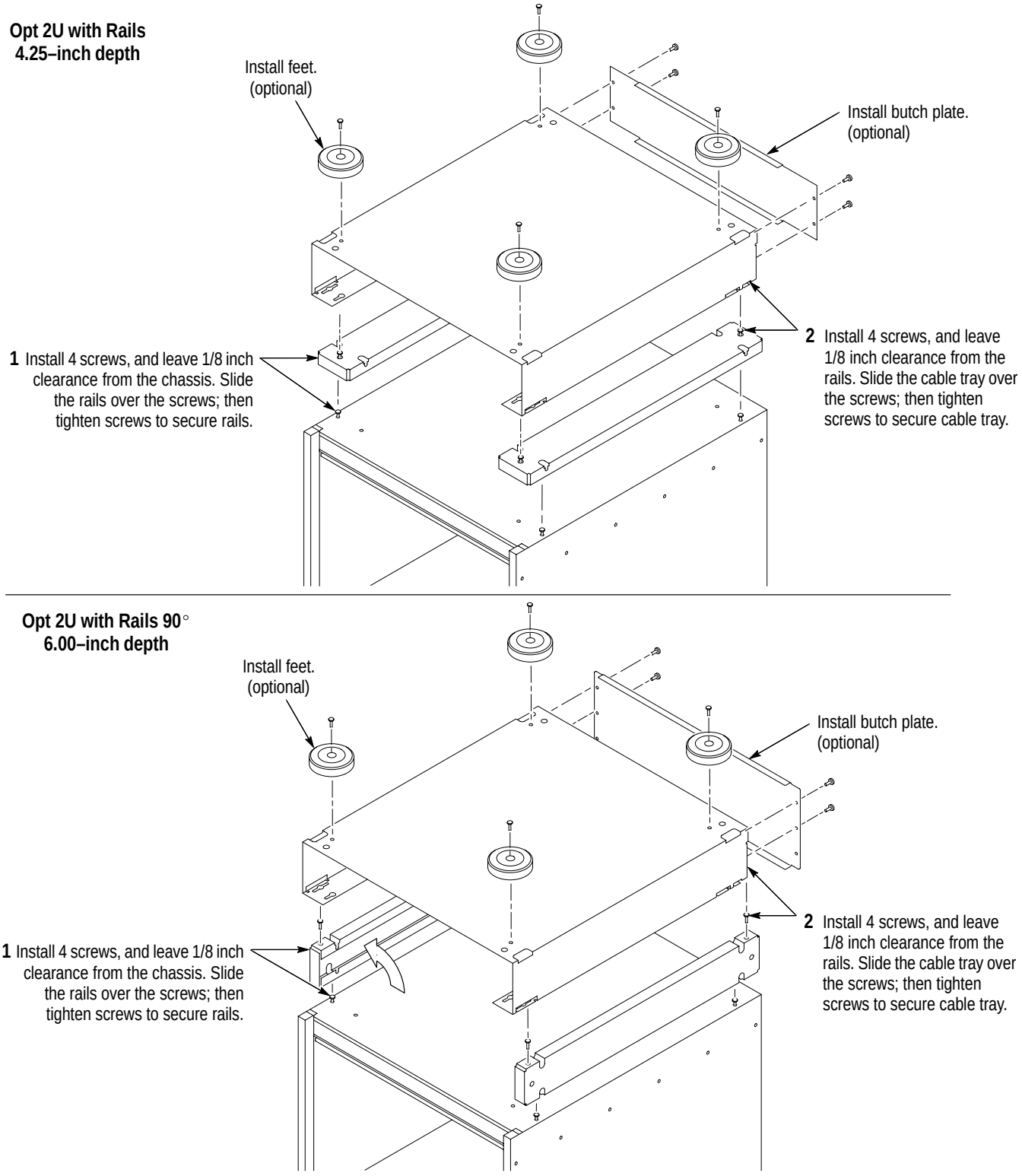


Figure 1–4: Install Option 2U cable tray

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Front Panel SYSReset Activation

The IntelliFrame® mainframe provides you the ability to generate a backplane SYSReset signal from the front panel. This feature allows you to reset the complete VXI system without having to power down the mainframe. A SYSReset activation is accomplished by pushing the right side (nonlighted side) of the On/Standby power switch.

NOTE. *If you decide to configure the front panel SYSReset, you should configure the mainframe before installing the rackmount hardware. Refer to* Appendix B: Special Configuration Options *for activation of this feature and then return to this section to continue the installation procedures.*

Rackmount Installation

The procedures for installing the rackmount kits are similar for the Option 1R and 2R kits. You can install the Option 1R kit to either recess the mainframe from the front of the mainframe rack or to extend it out of the mainframe rack. However, you can only install the door for the Option 2R kit so that the mainframe recesses into the rack.

The steps for installing the rackmount kits consist of installing the rackmount hardware to the mainframe, and then installing the mainframe in the rack.

You will need the following tools to install the rackmount options:

- T-15 Torx Driver
- T-20 Torx Driver
- #2 Phillips Screw Driver

Install the Rackmount Kit Hardware

Refer to Figure 1–5, and perform the following steps to install the rackmount kit hardware:

1. Determine whether you want to install the VX1411A IntelliFrame Mainframe so that it extends out of the rack or is recessed within the rack.

   If you want to extend the VX1411A IntelliFrame Mainframe from the front of the rack, position the rackmount bracket as shown on the right side of Figure 1–5. If you want to recess the VX1411A IntelliFrame Mainframe in the rack, position the rackmount bracket as shown on the left side of Figure 1–5.

2. Determine how far you want to recess or extend the VX1411A IntelliFrame Mainframe and install the rackmount adapter as shown using two 8-32 screws (included with the kit). Similarly, install the other bracket on the other side of the mainframe.

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***NOTE**. To comply with VXI*plug&play *mounting specifications, position the rackmount adapter at the mounting holes with the adjacent identifier keys (see Figure 1–5). This results in 3.960 in (10.06 cm) from the module panel mounting surface to the rack frame mounting surface.*

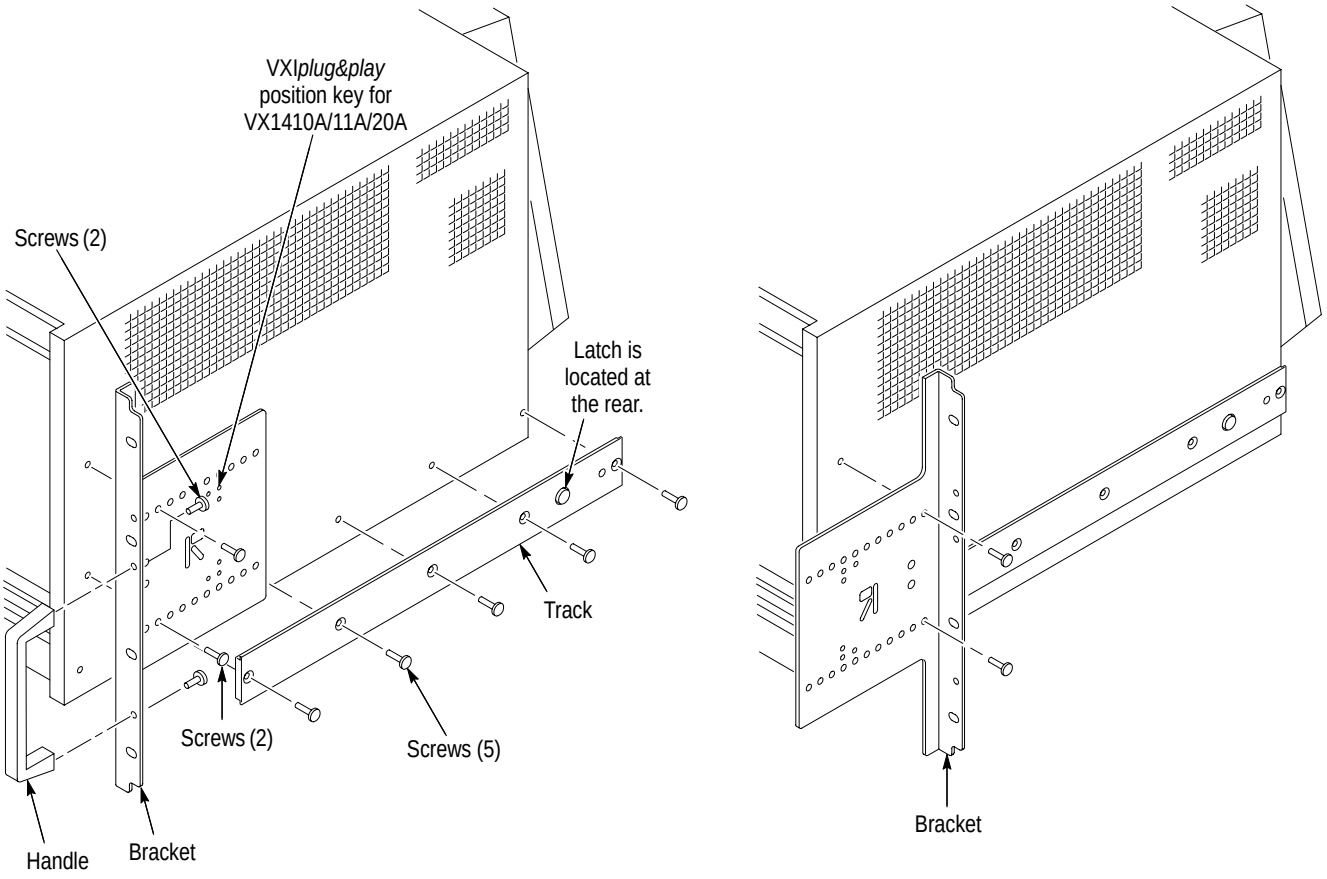


Figure 1–5: Installing the rackmount kit hardware

3. Remove the five 8-32 screws from both sides of the mainframe.
4. Attach the left and right inside tracks to the sides of the VX1411A IntelliFrame Mainframe using five 8-32 flathead screws. Add a spacer plate between the left track and mainframe, refer to the *Replaceable Parts* on page 5–13. Orient the button latch so that it faces away from the mainframe and toward the rear.

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Install the Mainframe in the Rack

Use the following procedure to install the VX1411A IntelliFrame Mainframe in the rack:

1. Identify the right and left slide-out track assemblies: find the date code label on each assembly. The assembly to be mounted in the left side of the rack (the side nearest the left side of the mainframe when it is mounted in the rack) has a date code that ends with LH (for left hand). The right assembly has a date code ending with RH.
2. Measure the distance between the front and rear rail of the rack.
3. Align the rear bracket to the right slide-out track as shown in Figure 1–6. Note that the rear bracket has two pairs of mount-through holes. When aligning the bracket and the track, select a pair of holes that mount the rear bracket so the flange-to-flange distance (see Figure 1–6) matches the front rail to rear rail spacing that you just measured in step 2.

NOTE. *If necessary, refer to the rackmount kit instructions for detailed installation information.*

4. Attach the rear bracket to the right slide-out track using two 10-32 screws and a bar nut as shown in Figure 1–6. Leave the screws loose so that you can adjust the overall length of the slide-out track assembly when installing the mainframe in the rack.
5. Repeat steps 3 and 4 to assemble the left slide-out track assembly.

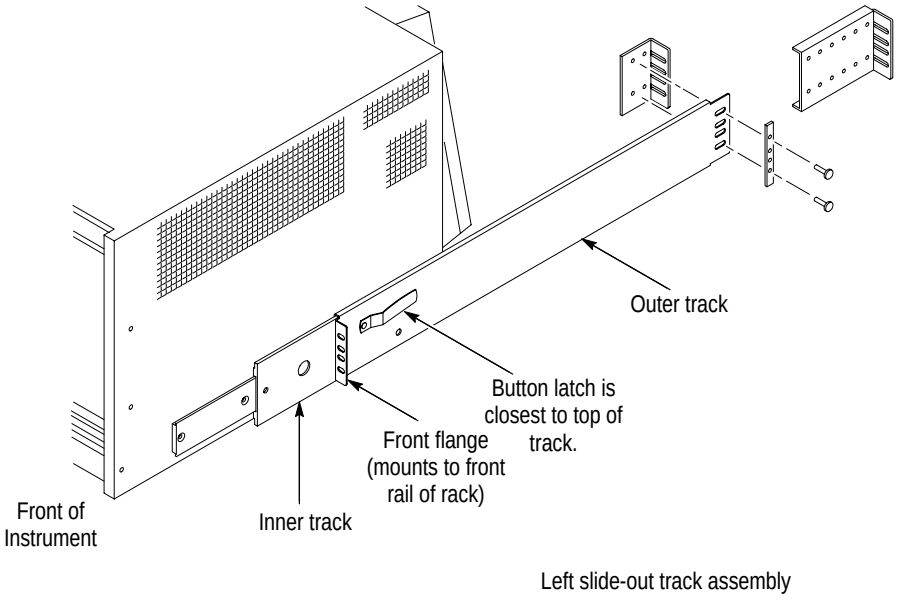


Figure 1–6: Assembling the slide-out track assemblies

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6. Select the mounting position in the rack: select two 0.5-inch spaced holes in the front rail and verify that the 1.5-inch and 14.00-inch clearances exist relative to the mounting holes as shown in Figure 1–7.

NOTE. *The 14-inch vertical clearance is only valid for the mainframe without the rubber feet and cable trays. Refer to Figures 3–2 and 3–3, on page 3–9 for information on vertical clearances of the mainframe with cable tray options.*

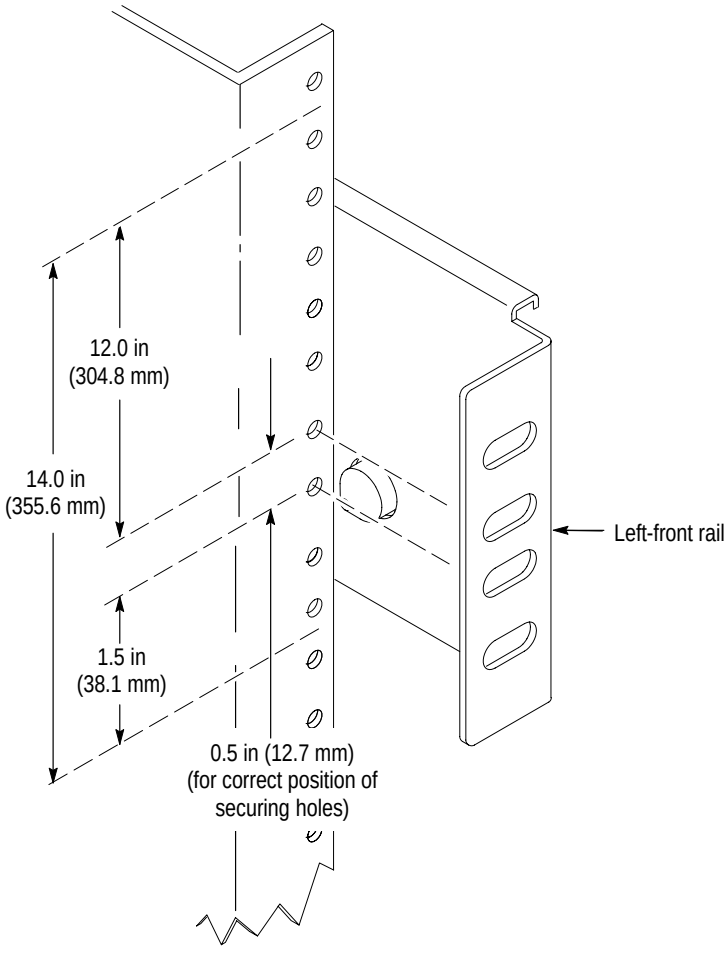


Figure 1–7: Vertical clearance for rack installation (standard mainframe)

7. Select the mounting method according to the rack type.

   To mount the slide-out tracks with the front and rear flanges outside of the front and rear rails, use method A shown in Figure 1–8 when doing step 8. Add a bar nut to the installation only if the rails have untapped holes.

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To mount with front and rear flanges inside of the rails, use mounting method B shown in Figure 1–8 when doing step 8. This mounting method assumes untapped holes.

8. Using the mounting method determined from the previous step, secure the right slide-out track assembly to the front and rear rails. Seat the screws fully, but lightly, so that you can adjust the mounting later.

9. Tighten the screws left loose in step 4 to fix the front to rear flange spacing of the slide-out track assembly.

10. Repeat steps 6 through 9 to mount the left slide-out track assembly.

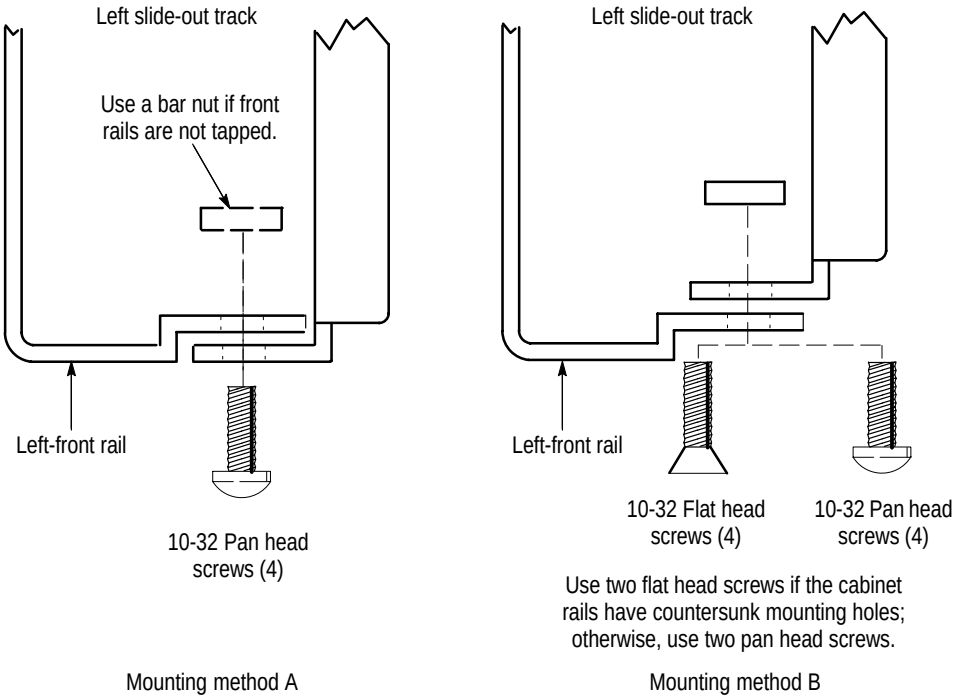


Figure 1–8: Installing the slide-out track assemblies in the rack (top view)

WARNING. *Because of the size and weight of the mainframe, installing the mainframe alone can result in personal injury or equipment damage. Installing the VX1411A IntelliFrame Mainframe in the rack requires at least two people. One person should be on the left side of the mainframe with one hand holding the left front handle and with the other hand underneath the mainframe. The other person should do likewise on the right side of the mainframe.*

11. Fully extend the inner tracks of each slide-out section out of the front of the rack until they lock.

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12. Lift the mainframe and insert the left and right tracks that extend from the rear of the mainframe into the ends of the tracks that you just extended. Make sure that the tracks mounted on the mainframe slip just inside the inner tracks that you extended earlier.

13. Slide the mainframe back until it stops.

14. Push to release the button latches, located on the outside of each track, and continue to slide the mainframe all the way back into the rack cabinet.

15. Tighten the four screws that you left loose at the rear of the rack when you performed step 8 and pull the mainframe part way out of the rack. (Tighten the 10-32 screws using 28 inch-lbs of torque.)

16. Be sure that the screws that you left loose at the front of the rack are loose enough to allow the slide-out track assemblies to seek the normal positions.

17. Tighten the screws and push the mainframe all the way into the rack. If the tracks do not slide smoothly, readjust the level using the method described in steps 15 and 16. (Tighten the 10-32 screws using 28 inch-lbs of torque.)

18. Install the proper power cord at the rear of the mainframe.

***NOTE**. To ensure the mainframe is properly mounted in the rack do not tighten the screws while installing the chassis track to the rack front rails. After all the mounting screws have been installed shift the mainframe to the far right of the rack, then tighten all the mounting screws. Refer to Figure 1–9 for screw positions. Depending on the rack manufacturer it may be necessary to use an additional spacer plate, refer to the* Replaceable Parts *on page 5–15.*

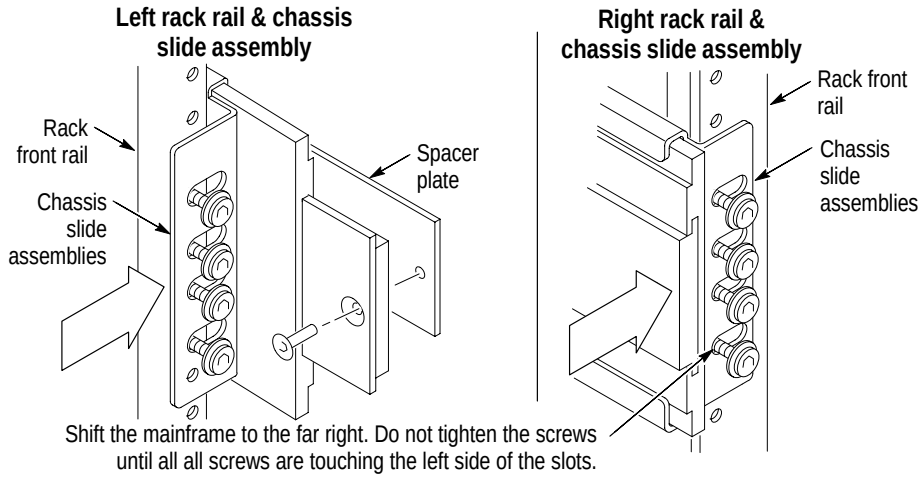


Figure 1–9: R1 or R2 rackmounting screw positions (front view).

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Install the Option 2R Rackmount Door

Refer to Figure 1–10 and perform the following steps to install the rackmount door for Option 2R:

1. Install the bottom halves of the two hinges to the left rackmount bracket as shown in Figure 1–10.
2. Install the top halves of the hinges on the door.
3. Install the catch on the right rackmount bracket.

   You can adjust the catch position forward or back to assure a flush fit between the door and the rackmount bracket.
4. Lift the rackmount door and mate the door with the hinges.

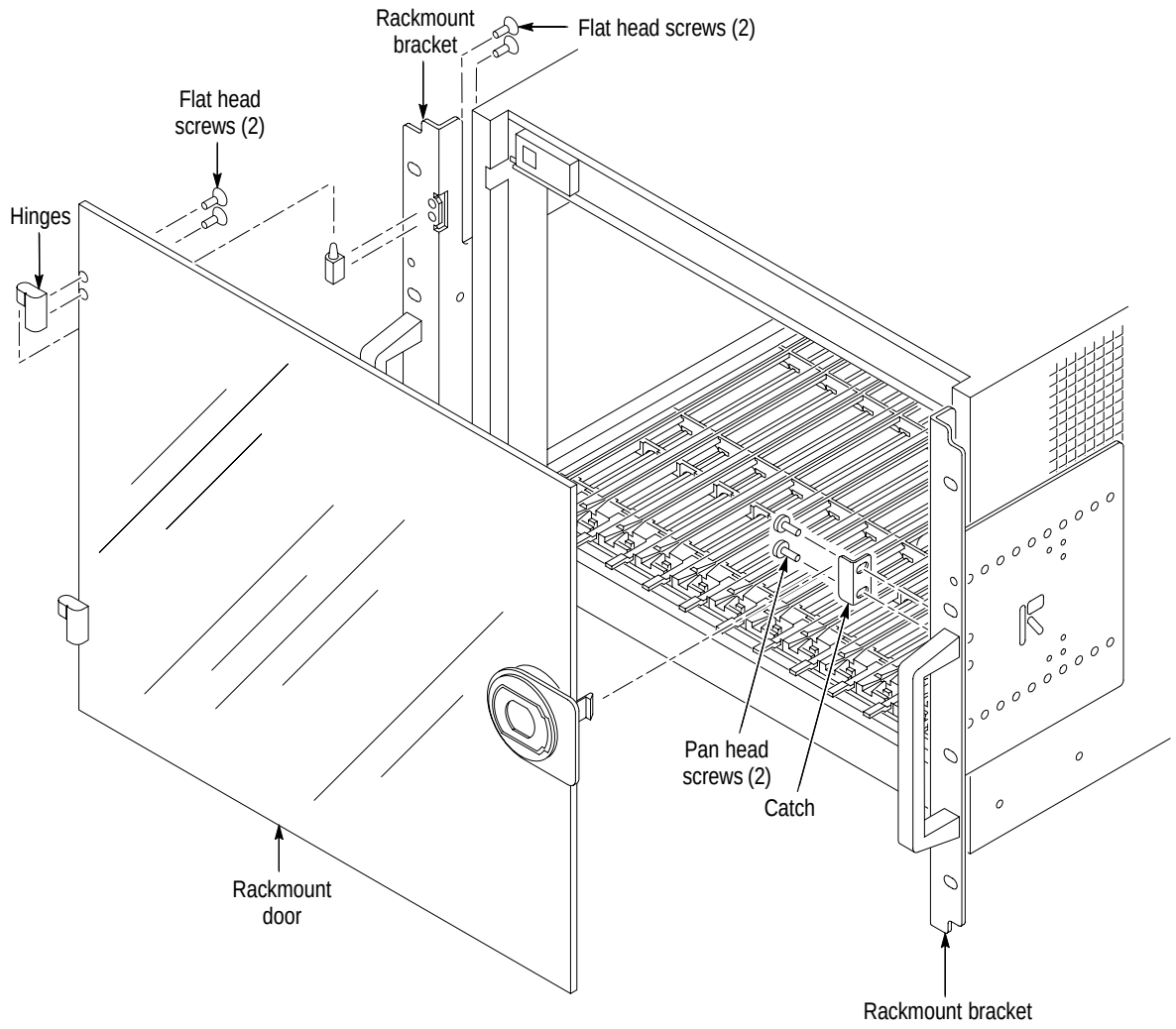


Figure 1–10: Installing the rackmount door (Option 2R)

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Configuration

After installing the mainframe, you are ready to configure it for your applications. If you have not already done so, install your VXIbus modules in the mainframe following the installation guidelines for your VXIbus module.

Module Selection and Design Guidelines

The VX1411A IntelliFrame Mainframe is UL listed to UL 3111-1 and CAN/CSA C22.2 No. 1010.1 and is IEC 1010-1 compliant. You should use VXIbus modules with the mainframe that are listed or designed to limit electric shock and fire.

- Investigate the possibility of fire hazards due to the availability of power from the mainframe exceeding 150 W per slot. Use similar considerations for VXIbus Modules that externally receive power greater than 150 W per slot.
- Printed wiring boards should be flame rated UL 94V–1 or better.
- To prevent possible electrical shock, limit the voltage to the mainframe interface or chassis to less than 60 VDC, 30 V_{RMS}, or 42.4 V_{pk}.
- Ensure that high voltage measuring inputs provide a means of limiting unintended voltages that may reach the mainframe interface or chassis to less than 60 VDC, 30 V_{RMS}, or 42.4 V_{pk}.

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Install Empty Slot Panel Fillers

If you have any unused (empty) slots in your mainframe, you may choose to purchase and install the empty slot panel fillers. Install either the optional single-wide or double-wide 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 and improved EMI shielding.*

Refer to Figure 1–11 for information on installing the slot fillers.

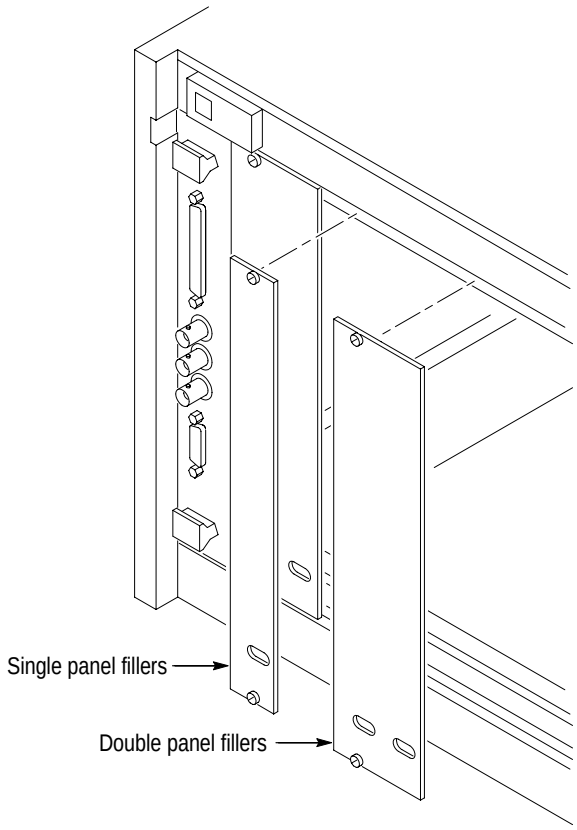


Figure 1–11: Installing the empty slot panel fillers

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Safety and Chassis Grounds

The left rear of the VX1411A IntelliFrame Mainframe has a connection point for the chassis ground (see Figure 1–12).

WARNING. *To avoid personal injury the safety ground screw must always be in place to ensure the proper bonding of the power supply to the mainframe. You can use the chassis ground connection to connect the grounds of one or more instruments to the mainframe. This ensures a common ground connection between instruments.*

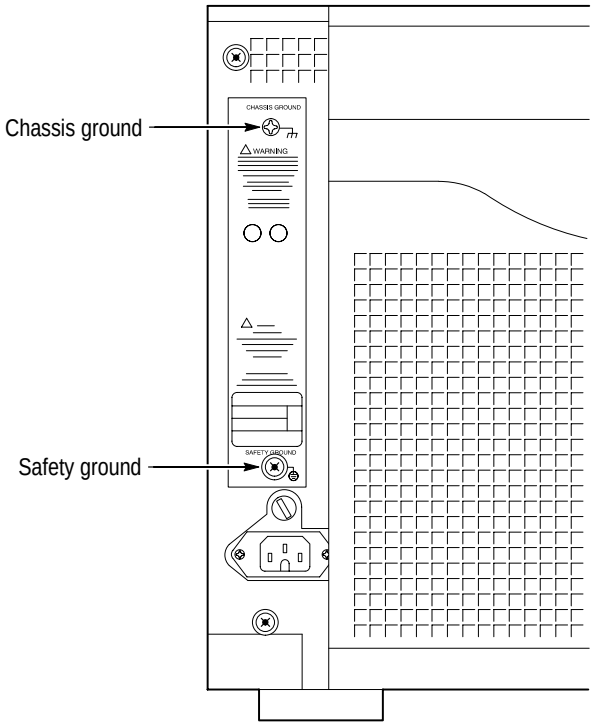


Figure 1–12: Locations of safety and chassis ground connections on left rear of the mainframe

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EMI Configurations

Perform the following steps if you intend to install the optional EMI Intermodule shields and/or EMI filler panels. (Part numbers are listed under *Optional Accessories* on page 5–8):

NOTE. *It is only necessary to install the EMI intermodule shields if your VXIbus module does not have EMI shielding. Backplane EMI DIN shields are standard.*

1. Refer to Figure 1–13 and slide the EMI intermodule shields between the grooves of the card guide on one side of each installed VXIbus module. This is recommended to use with unshielded modules; the shielding may not be compatible with some modules. The shield conforms with the VXI specification for intermodule shielding.
2. Install a blank EMI front panel for each empty slot making sure that the EMI shielding is in contact with the adjacent front panel.

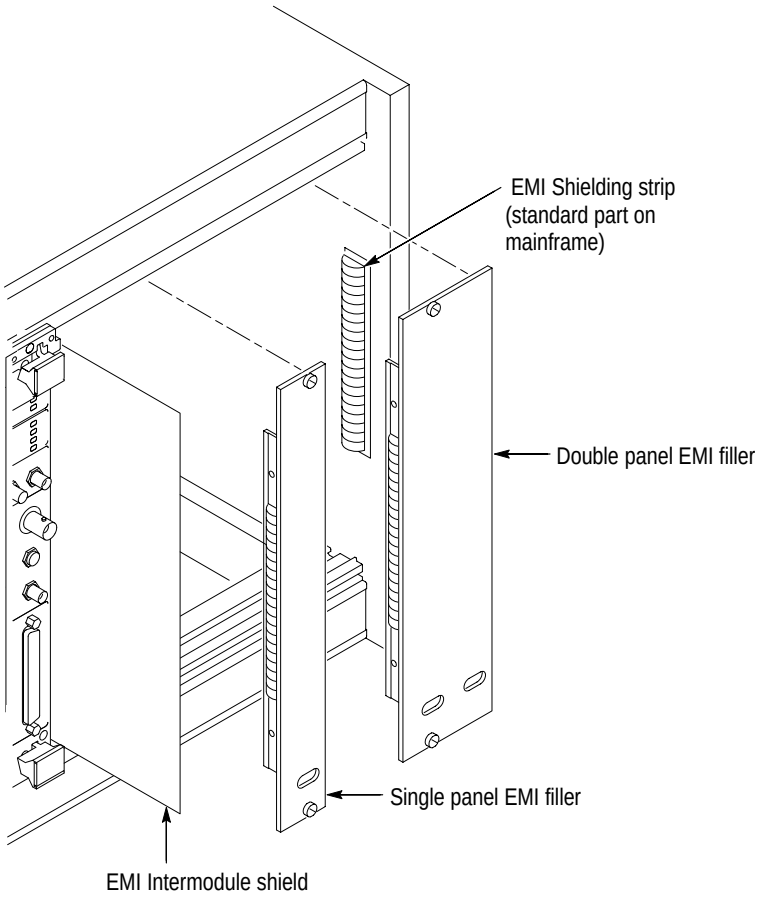


Figure 1–13: Installing the EMI intermodule shield and front panel EMI fillers

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Functional Check and Performance Verification

Use the information in this section to determine that the VX1411A IntelliFrame Mainframe operates properly. The functional check and performance verification consist of checking the power supply voltages. To check these voltages you will need an extender card and a digital voltmeter. Refer to *Troubleshooting Procedures* on page 4–16 for extender card and digital voltmeter ordering information. No adjustments are required for the VX1411A mainframe.

Connect one lead of the voltmeter to the pins of the extender card that is inserted into slot 0 of the mainframe. Connect the reference lead of the voltmeter to one of the ground pins. Compare each voltage reading to the values listed in Table 1–4.

Table 1–4: Power supply voltages P1 and P2 of the extender card

Pin	Supply	Acceptable voltage range
P1 – A32	+5 V	4.875 V to 5.25 V
P1 – A31	–12 V	–12.6 V to –11.64 V
P2 – C32	–24 V	–25.2 V to –23.28 V
P2 – A2	–2 V	–2.1 V to –1.9 V
P1 – C31	+12 V	11.64 V to 12.6 V
P2 – C31	+24 V	23.28 V to 25.2 V
P2 – C4	–5.2 V	–5.46 V to –5.044 V
P2 – A31 or B31	Logic Ground	

If the voltages are within the specified ranges, your mainframe is functional.

NOTE. *Operators may perform exterior surface and fan filter cleaning as described in the* Maintenance *chapter.*

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Operating Basics

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Operating Basics

This chapter provides a brief overview of the VX1411A IntelliFrame Mainframe including illustrations and descriptions of switches, indicators, and connectors.

Figure 2–1 shows the front view of the VX1411A IntelliFrame Mainframe. All of the mainframe slots are labeled on the top and bottom of the mainframe. Slot 0 is reserved for the mainframe controller; all other slots are available for any VXIbus modules.

IntelliGuides on the bottom of each slot automatically open when you install a module. The guides remain closed for empty slots to direct airflow only where it is needed.

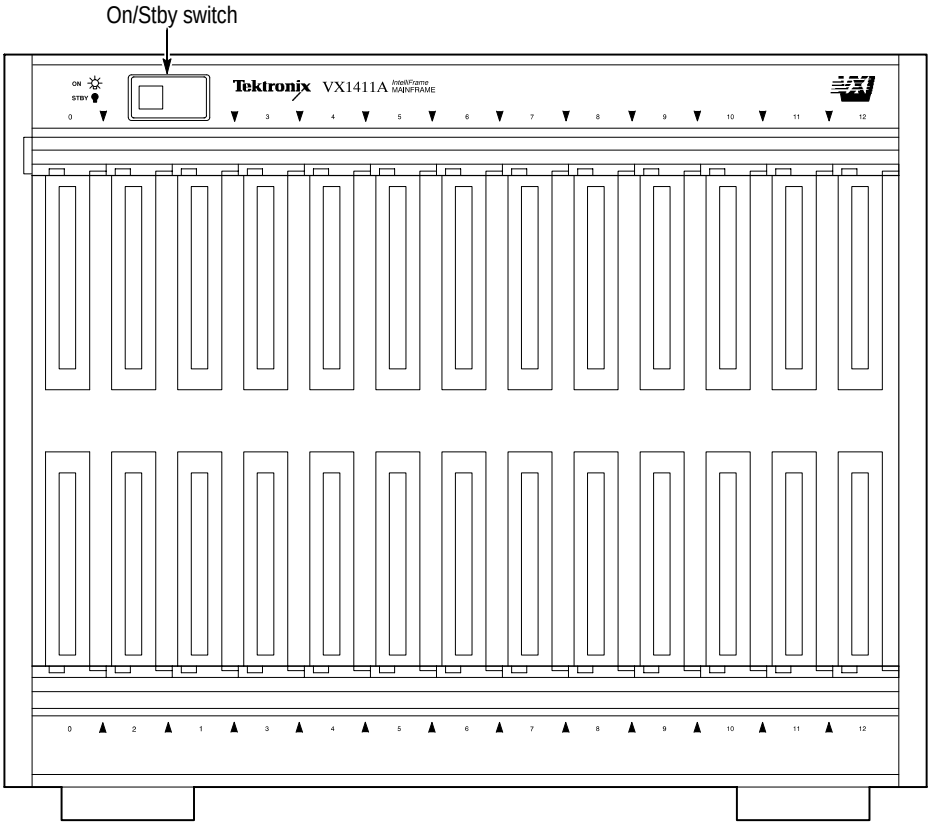


Figure 2–1: Front view of the VX1411A IntelliFrame Mainframe

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The On/Standby switch on the top-left corner of the front panel applies DC voltages to the mainframe. The switch is a momentary contact switch. The switch is lighted when DC voltages are applied to the mainframe. This switch can also generate a SysReset on the VXI Backplane, refer to Appendix B: *Special Configuration* for configuration information.

NOTE. *Disconnecting the power cord provides the mainframe's voltage disconnect. Even when powered off by the Power/Standby switch the power supply circuits are connected to primary power.*

Figure 2–2 shows the rear view of the standard VX1411A IntelliFrame Mainframe.

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

The chassis ground screw (if installed) can be used to connect multiple mainframes to a common ground point.

The fan filter is located on the back of the mainframe. The filter slides easily into the mainframe; there is no need to remove any covers to replace or clean the fan filter. Refer to the maintenance section page 4–3.

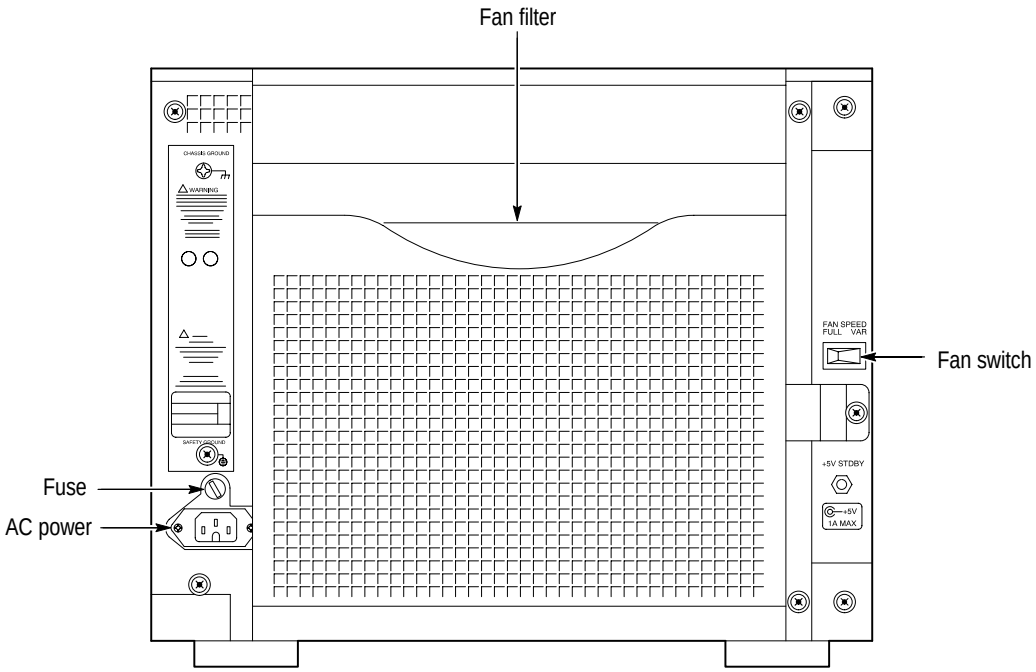


Figure 2–2: Rear view of the VX1411A IntelliFrame Mainframe

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Fan Speed Control

The Fan Speed switch controls the speed of the system cooling fans. When the switch is set to the variable position, the fans are set to a variable speed to reduce fan noise. The fans are automatically adjusted by the mainframe to minimize fan noise and provide appropriate cooling. When the switch is in the FULL position, the fans operate at full speed.

The fans' speed varies by the level of the ambient air temperature:

- Air temperatures less than 20˚C the fans operate at minimum speed
- Air temperatures between 0 to 50˚C the fans speed linearly increase with temperature
- Air temperatures greater than 50˚C fans operate at full fan speed

The power supply is adequately cooled for any load condition when the fan speed is placed in either the VAR or FULL speed position.

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Specifications

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Specifications

This chapter contains the complete specifications for the VX1411A IntelliFrame Mainframe. Within each section, the specifications are arranged in functional groups such as: *AC Power Source*, *Secondary Power*, *Cooling*, *Safety*, *Environmental*, *Backplane*, and *Mechanical*.

All specifications are warranted unless they are designated *typical*. *DC Voltage Regulation* is a warranted characteristic and can be directly checked by procedures contained in the *Functional Check & Performance Verification* section beginning on page 1–22; These warranted characteristic are marked with the ✓ under the Characteristics column.

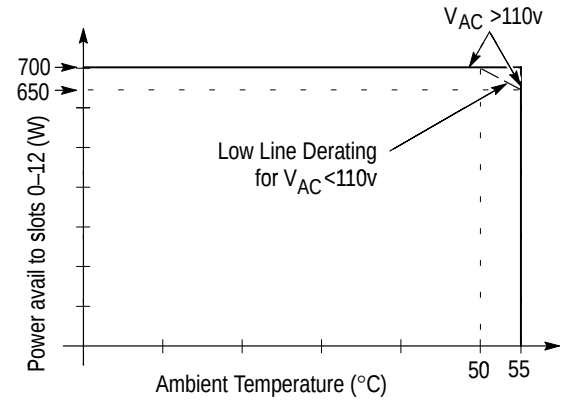
If the characteristic is noted as *typical*, the characteristic is not warranted. Typical characteristics describe typical or average performance and provide useful reference information.

Table 3–1: AC Power source

Characteristic	Description
Source Voltage	90 V_{RMS} to 250 V_{RMS}, continuous range
Source Frequency	115 V Operation: 45 to 66 Hz or 360 to 440 Hz 230 V Operation: 45 to 66 Hz
Power Consumption	1100 W line power maximum
Fuse Rating	
90 V – 250 V Operation	0.25 in × 1.25 in, Fast Blow, 10 A, 250 V
103 V – 250 V Operation	0.25 in × 1.25 in, Fast Blow, 15 A, 250 V
207 V – 250 V Operation	5 mm × 20 mm, Slow Blow, 4 A, 250 V
Inrush Surge Current	70 A maximum
Input Current	12 A maximum at 90 V_{RMS} 5 A maximum at 207 V_{RMS}
Power Factor Correction	0.99 @ 60 Hz operation 0.95 @ 4000 Hz operation
Power Disconnect	Front Panel On/Standby. No primary switch on rear panel. Power cord provides main power disconnect.

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Table 3–2: Secondary power

Characteristic	Description	
Maximum Power Available		
DC Current Capacity (I_{MP}[1])	*Voltage*	*I_{MP} (steady-state current)*
	+24 V	8 A
	+12 V	9 A
	+5 V	80 A
	–2 V	–15 A
	–5.2 V	–30 A
	–12 V	–9 A
	–24 V	–8 A
	+5 V STDBY	0A (if user supplied, 1A maximum)
Maximum Current Capacity (I_{MD}[2])	*Voltage*	*I_{MD} (dynamic current)*
	+24 V	6 A
	+12 V	2 A
	+5 V	12 A
	–2 V	–6 A
	–5.2 V	–10 A
	–12 V	–2 A
	–24 V	–6 A
	+5 V STDBY	0 A (user supplied,1A maximum)

1 **Rated mainframe peak DC output current as defined by the VXIbus specification.**

2 **Rated mainframe peak-to-peak dynamic current as defined in the VXIbus specification by a current verses frequency curve.**

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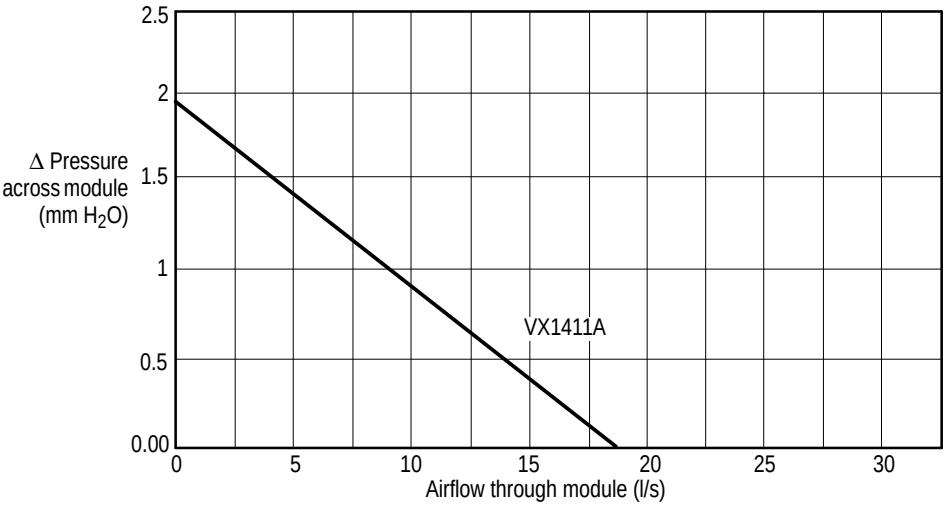
Table 3–2: Secondary power (Cont.)

Characteristic	Description		
⌐ DC Voltage Regulation	*Voltage*	*Tolerance, ΔV*	*Tolerance, ΔV*
	+24 V	+1.2 V, –720 mV	+1.2 V, –720 mV
	+12 V	+600 mV, –360 mV	+600 mV, –360 mV
	+5 V	+250 mV, –125 mV	+250 mV, –125 mV
	–2 V	–100 mV, +100 mV	–100 mV, +100 mV
	–5.2 V	–260 mV, +156 mV	–260 mV, +156 mV
	–12 V	–600 mV, +360 mV	–600 mV, +360 mV
	–24 V	–1.2 V, +720 mV	–1.2 V, +720 mV
⌐ Maximum DC Load Ripple/Noise	*Voltage*	*Ripple/Noise*	*Ripple/Noise*
	+24 V	150 mV_{pp}	150 mV_{pp}
	+12 V	50 mV_{pp}	50 mV_{pp}
	+5V	50 mV_{pp}	50 mV_{pp}
	–2 V	50 mV_{pp}	50 mV_{pp}
	–5.2 V	50 mV_{pp}	50 mV_{pp}
	–12 V	50 mV_{pp}	50 mV_{pp}
	–24 V	150 mV_{pp}	150 mV_{pp}
Maximum DC Induced Ripple/Noise	*Voltage*	*Ripple/Noise*	*Ripple/Noise*
	+24 V	150 mV_{pp}	150 mV_{pp}
	+12 V	50 mV_{pp}	50 mV_{pp}
	+5V	50 mV_{pp}	50 mV_{pp}
	–2 V	50 mV_{pp}	50 mV_{pp}
	–5.2 V	50 mV_{pp}	50 mV_{pp}
	–12 V	50 mV_{pp}	50 mV_{pp}
	–24 V	150 mV_{pp}	150 mV_{pp}
Protection	Over voltage protection Under voltage protection Over temperature protection Short circuit protection		

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Table 3–3: Cooling

Characteristic	Description
Cooling System	Forced air circulation (positive pressurization) with one removable filter. Two internal DC fans provide cooling for the power supply and the 13 VXIbus module slots.
Fan Speed Control	Rear panel switch chooses between full speed and variable speed. Variable speed is minimum for ambient temperatures below 20° C, linearly increasing from 20 to 50° C, and high speed for ambient temperatures above 50° C.
Slot Activation	Installing a VXIbus module activates the cooling for the corresponding occupied slots by opening the IntelliGuide mechanism. Provides cooling only to modules installed.
Slot Airflow Direction	P2 to P1, bottom of module to the top of module
Mainframe Intake	Rear of mainframe
Mainframe Exhaust	Top rear and top sides of mainframe
Cooling Clearance	Two inches on both sides and rear of mainframe
Pressurization	Positive (modules pressurized)
Filter Access	Single air filter accessible from rear of the mainframe



Note 1. Proposed VXI–8 cooling methods fan filter removed, fans at full speed and sea level.
Note 2. These curves represent airflow through a single slot with all other shutters closed. The airflow will decrease as additional shutters are opened.

Figure 3–1: Mainframe cooling curve

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Table 3–4: Certifications and compliances

Characteristic	Description
EC Declaration of Conformity	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility and Low Voltage Directive 73/23/ECC for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: EMC Directive 89/336/EEC: EN 55011 Class A Limits for Conductive Emissions. EN60555-2 AC Power Line Harmonic Emissions. EN 55011 Class A limits for Radiated Emissions. EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity IEC 801-5 Power Line Surge Immunity Low Voltage Directive 73/23/EEC: EN61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use
Australian Declaration of Conformity (C-Tick Mark)	Complies with Australian EMC Framework, under the Standard applicable product class 2064, governing radiated and conducted emissions.
Immunity, Enclosure, Electrostatic Discharge (ESD)	Up to 8 kV with no change to control settings or impairment of normal operation, and up to 15 kV with no loss of stored data or damage that prevents recovery of normal operation by the user (IEC 801-2).
Immunity, Enclosure, Radio Frequency Electromagnetic Field	No mainframe failures when the mainframe is subjected to a 3 V/m electromagnetic field over the frequency range of 27 MHz to 500 MHz (IEC 801-3).
Immunity, Fast Transients, Common Mode	No loss of stored data, change to control settings, degradation of performance, or temporary loss of function will occur when the mainframe is subjected to the following transients (IEC 801-4): *Port* — *Peak Voltage* — *Tr/Th* — *Rep Frequency* Signal & Control — 0.5 kV — 5/50 ns — 5 kHz DC Power — 0.5 kV — 5/50 ns — 5 kHz AC Power — 1.0 kV — 5/50 ns — 5 kHz

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Table 3–4: Certifications and compliances (Cont.)

Characteristic	Description		
Immunity, AC Power Line Transients	No loss of stored data, change to control settings, degradation of performance, or temporary loss of function will occur when the mainframe is subjected to the transients as described below (IEC 801-5).		
	Mode	*Peak Voltage*	*Tr/Th*[3]
	Common Differential	2 kV 1 kV	1.2/50 μs 8/20 μs
FCC	The mainframe complies with the radiated and conducted emissions requirements of FCC 47 CFR, Part 15, Subpart B, Class A equipment		
Certifications	UL3111-1 Standard for electrical measuring and test equipment CAN/CSA C22.2 No. 1010.1–Safety requirements for electrical equipment for measurement, control, and laboratory use.		
Conditions of Approval	Installation CAT II [Local-level mains (wall sockets). This instrument is cord-connected]. Certifications are made for the following conditions: Pollution Degree 2 (rated for indoor use only) Safety Class I (grounded product) Altitude (maximum operating) 2000 meters Equipment Type: Test and Measuring		
Installation Category Definitions	Category: CAT III CAT II CAT I equipment,	Examples of Products in this category: Distribution-level mains, fixed installation Local-level mains, appliances, portable equipment Signal levels in special equipment or parts of telecommunications, electronics	

[3] **Open circuit voltage (short circuit current) transient characteristics.**

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Table 3–5: Environmental

Characteristic	Description
Classification	The VX1411A IntelliFrame Mainframe is suitable for operation in the Tektronix and MIL-T-28800E (Type III, Class 5, Style E or F) environments as specified in this table.
Atmospherics	
Temperature	Meets the limits stated in MIL-T-28800E for Type III, Class 5
Operating	0° C to 55° C, derated 1° C/1000 ft (305 m) above 5000 ft (1524 m)
Nonoperating	–40° C to 75° C
Relative Humidity	
Operating	Up to 95% at up to 30° C and up to 45% at up to 55° C
Nonoperating	Up to 95% at up to 55° C
Altitude	
Operating	15,000 ft (4570 m), operating temperature derated 1° C/1000 ft. (305 m) above 5000 ft. (1524 m)
Nonoperating	40,000 ft (12,190 m)
Dynamics	
Random Vibration	Three axis, 30 minutes total, 10 minutes per axis, without VXI modules installed. Rear face exempted.
Operating	0.27 g_{RMS} total from 5 Hz to 500 Hz
Nonoperating	2.28 g_{RMS} total from 5 Hz to 500 Hz
Mechanical Shock, Nonoperating	Half Sine, 30 g's, 11 ms duration, 3 drops each side, 18 shocks total without VXI modules installed or with installed VXI modules weighing less than 5 lbs each. Meets functional shock requirements of Mil–T–28800E, Type III, Class 5.
User Handling, Operating	Each edge lifted four inches and allowed to free fall onto a solid wooden bench surface without VXI modules installed. Rear face exempted.

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Table 3–6: Backplane

Characteristic	Description
Bus Grant/ Interrupt Acknowledge	Solid state, auto-configuring (jumperless)
VXIbus CLK10 Distribution	The ECL clock, CLK10, is distributed from Slot 0 to Slots 1–12 in full differential form.

Table 3–7: Mechanical

Characteristic	Description
Overall Dimensions	
Standard Mainframe	
Height (with feet)	13.65 in (35.00 cm)
Width	16.7 in (42.55 cm)
Depth	24 in (60.96 cm)
Mainframe with Rackmount	
Height	13.25 in (33.6 cm)
Width	18.9 in (48.01 cm)
Depth	26.4 in (67.06 cm) to 31.4 in (79.76 cm) in 0.5 in (1.27 cm) increments, user selectable
Cable Tray, Option 1U	(See Figure 3–3 for overall mainframe dimensions)
Height	1.75 in (4.45 cm)
Width	16.6 in (42.16 cm)
Depth	18.5 in (47.43 cm)
Standard Instrument	45.5 lbs (20.7 kg) with no modules installed
Rackmount Option 1R	20 lbs (9.1 kg)
Rackmount Option 2R	22 lbs (10 kg)
Cable Tray Option 1U	7 lbs (3.2 kg)
Cable Tray Option 2U	9 lbs (4.1 kg)
Shipping Weight	
Instrument package	90 lbs (40.9 kg) maximum with no modules installed
Options package	38 lbs (17.3 kg) maximum
Module Size	13 C-size VXI slots. The mainframe also accepts A-size or B-size modules using the 73A-851 module.
Finish	Tektronix TV gray paint on an aluminum chassis

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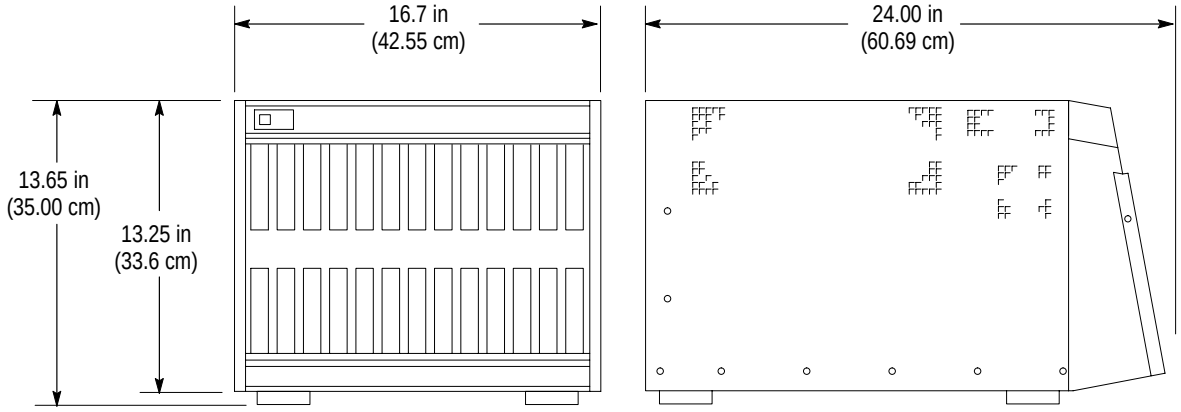


Figure 3–2: Front view and side view of VX1411A IntelliFrame Mainframe

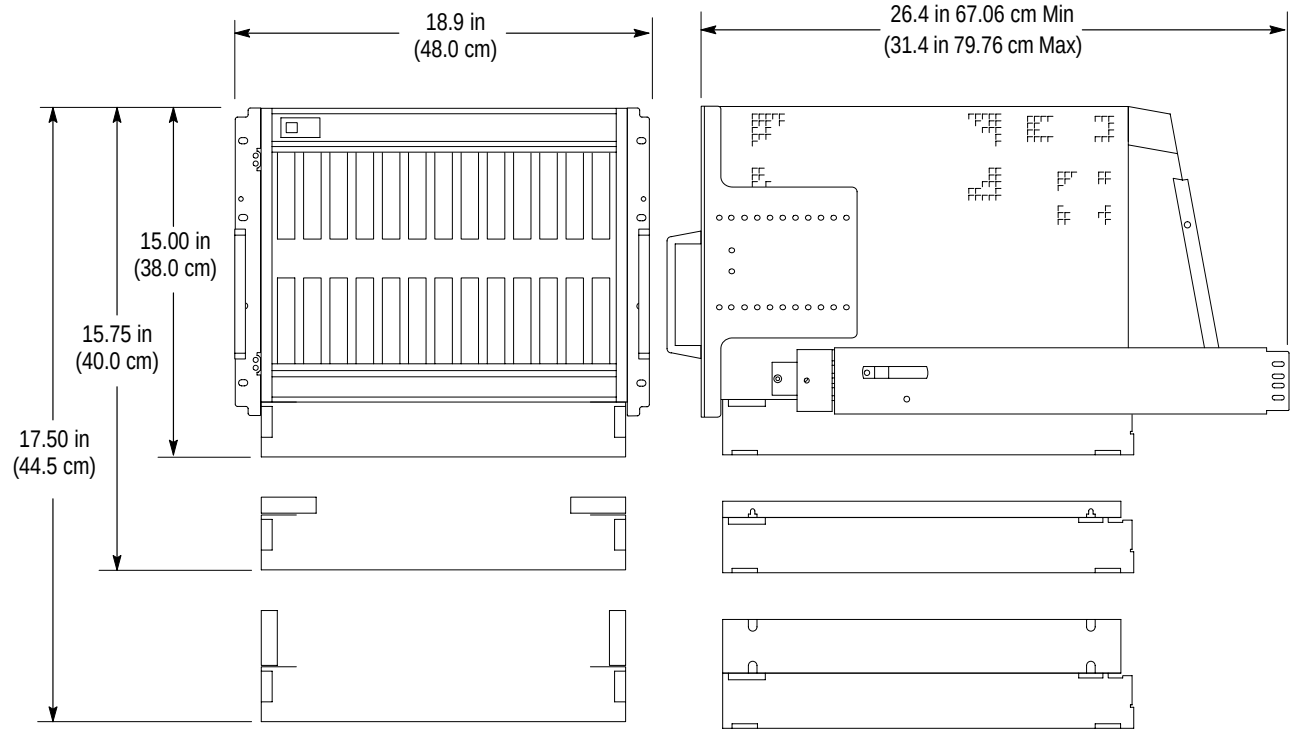


Figure 3–3: Front view and side view of VX1411A IntelliFrame Mainframe with Option 1U and rackmount option

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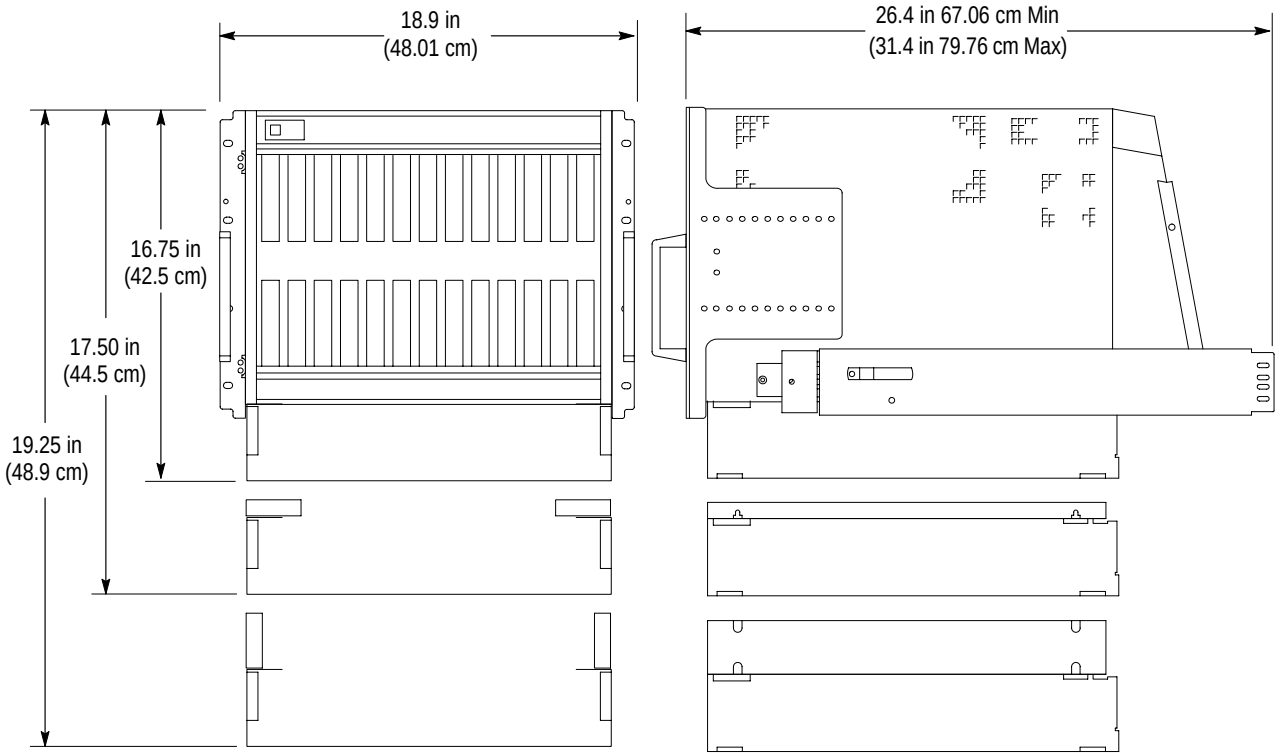


Figure 3–4: Front view and side view of IntelliFrame Mainframe with Option 2U and Rackmount Option

Table 3–8: VXI and Plug & Play

Characteristic	Description
VXI	Fully compatible with VXIbus System Specifications, Rev 1.4
VXI*Plug&Play*	
Mainframe	VXI*Plug&Play* compliant with the following: WIN Framework 4.0 WIN 95 Framework WIN NT Framework

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WARNING

The following servicing instructions are for use only by qualified personnel. To avoid injury, do not perform any servicing other than that stated in the operating instructions unless you are qualified to do so. Refer to all Safety Summaries before performing any service.

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Maintenance

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Maintenance

This chapter provides procedures for inspecting and cleaning the VX1411A IntelliFrame Mainframe, removing and replacing internal mainframe components, and isolating problems to module levels.

Service Strategy

The service procedures in this manual provide removal and replacement procedures to repair the VX1411A IntelliFrame Mainframe to a module level. Instrument level repairs are accomplished by exchanging faulty modules with known-good modules or parts. No component-level repair information is provided in this manual.

Preparation

The information in this section is designed for use by qualified service personnel. Read the *General Safety Summary and Safety Summary* at the front of this manual and *Service Strategy* before attempting any procedures in this chapter. Refer to the *Operating Basics* chapter for information on the location of controls, indicators, and connectors used with the mainframe.



CAUTION. *Many components within the mainframe are susceptible to static-discharge damage. Service the mainframe only in a static-free environment. Observe standard handling precautions for static-sensitive devices while servicing the mainframe. Always wear a grounded wrist strap, or equivalent, while servicing the mainframe.*

Observe the following precautions to avoid damaging the mainframe:

- Do not handle static-sensitive components on boards.
- Transport and store static-sensitive boards in their original containers or on conductive foam. Label any package that contains static-sensitive assemblies.
- Wear a wrist strap attached to the mainframe while handling the boards to discharge the static voltage from your body.

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- Do not allow anything capable of holding or generating a static charge on the work surface.
- Do not slide a board over any surface.
- Avoid handling boards in areas that have a floor or work surface cover that is capable of generating a static charge.

***NOTE**. Always power off the mainframe and disconnect the power cord before cleaning or servicing the mainframe.*

Inspection and Cleaning

The mainframe is inspected mechanically and electrically before shipment. It should be free of marks or scratches and should meet or exceed all electrical specifications. Inspect the mainframe for physical damage incurred during transit. Retain the mainframe 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 mainframe and cleaning the fan filter. Periodic cleaning reduces instrument breakdown and increases reliability. Clean the mainframe as needed, based on the operating environment. Refer to your module user documentation for information on cleaning the individual VXIbus modules.

Interior Cleaning

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

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CAUTION. *To avoid damaging the instrument, avoid getting moisture inside the mainframe 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 mainframe.

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 mainframe. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Cleaning the Fan Filter

The fan filter easily removes from the rear of the mainframe. The filter slides out of the rear of the mainframe as shown in Figure 4–1.

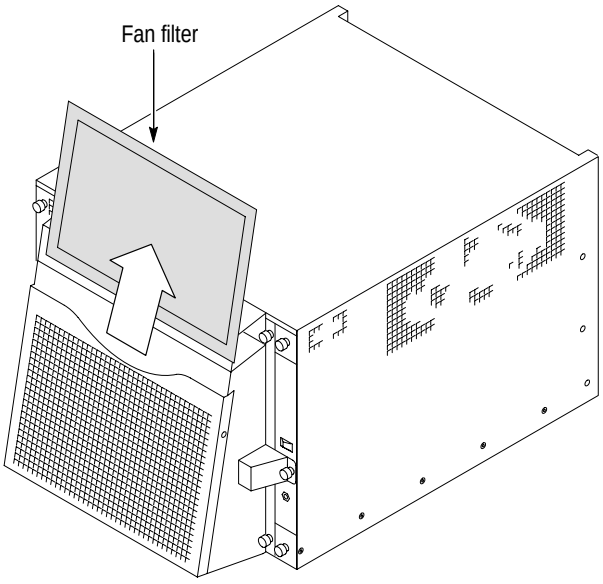


Figure 4–1: Removing the fan filter

Clean the fan filter by vacuuming or blowing air through the filter. Rinse the filter in cool water and dry it before replacing it in the mainframe.

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Removal and Replacement

The following procedures describe how to remove and replace module-level components of the VX1411A IntelliFrame Mainframe. Refer to the exploded view illustrations in *Replaceable Parts* for an overview of the assembly and disassembly of the mainframe.



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

Tools Required

The following tools are required to disassemble the VX1411A IntelliFrame Mainframe to the module level:

- Small flat blade screwdriver
- Diagonal cutters (for removing cable ties)
- Torx screwdriver with a T-10, T-15 and T-20 tip
- A 3/32-inch Allen wrench (hex wrench)
- #2 Phillips or #1 Pozidrive driver

Procedure 1: Removing the Mainframe Cover

To remove the mainframe cover, refer to Figure 4–2 while performing the following steps:

1. Remove the 12 hex drive screws (6 each side) using a 3/32 Allen wrench.
2. Lift the front bottom corners up.
3. After tilting the cover up about 3 inches, lift the cover straight off of the instrument.

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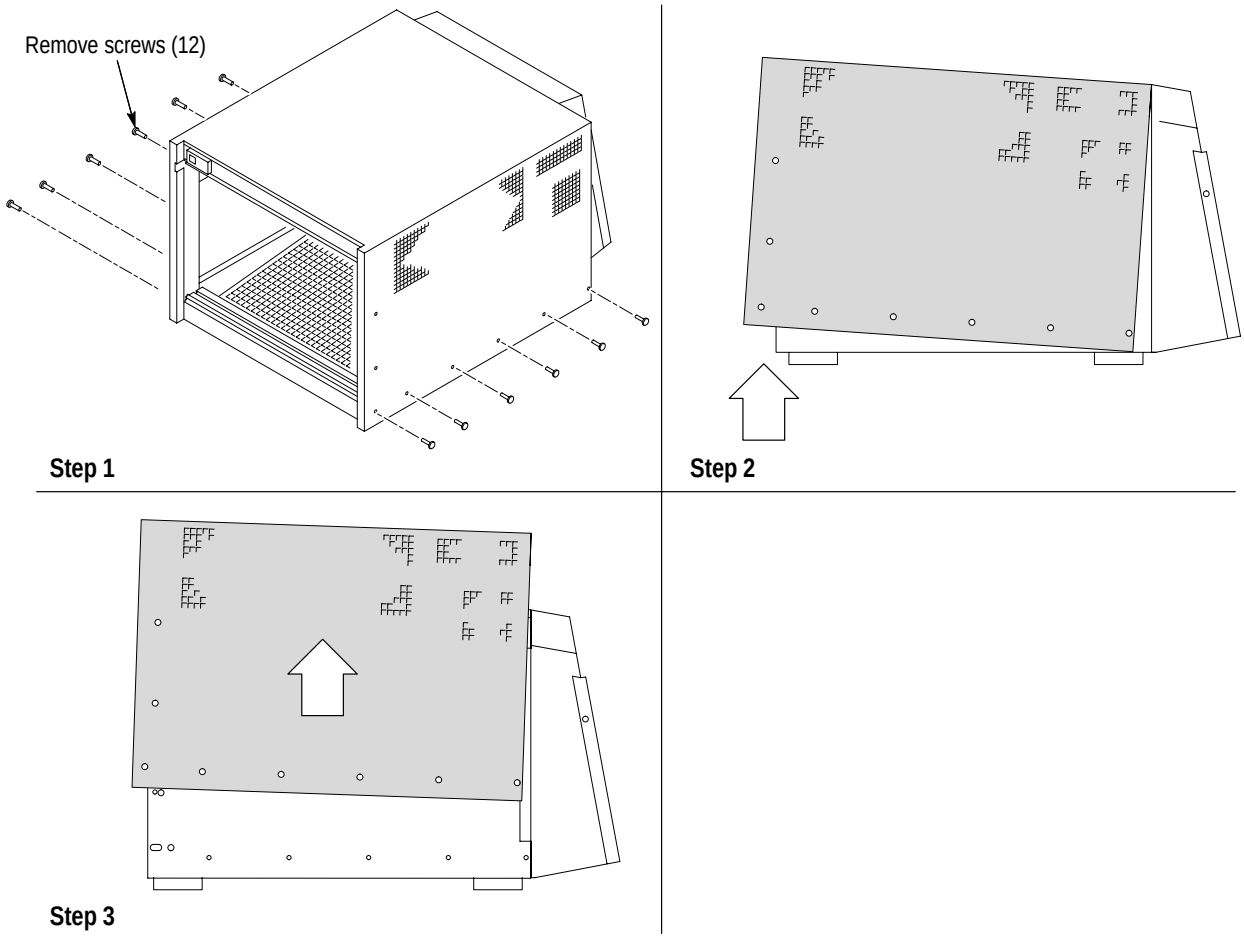


Figure 4–2: Removing the mainframe cover

Procedure 2: Removing the Fan Assembly

To remove the VX1411A fan assembly refer to Figures 4–3, 4–4 and 4–5 while performing the following steps:

1. Loosen the fan cable channel captive screw, and remove the cable channel.
2. Unplug the cables.
3. Remove the Chassis Ground screw (if installed) using a T-20 tip .
4. From the back of the mainframe, loosen the five captive screws using a Phillips screwdriver. Refer to Figure 4–3 for screw locations.
5. Remove the fan assembly from the instrument and set aside on a clean working surface.
6. Remove the fan filter from the fan assembly.

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7. Remove the two hex socket screws that secures the filter cover to the fan assembly using a 3/32 inch Allen wrench. Then remove the filter cover from the assembly.

8. To remove the two fans, remove the three 6-32 screws (with a pozidriv tip) that secures each fan to the inside of the fan assembly as shown in Figure 4–5.

9. Remove the cable tie holding the fan cables to the fan.

***NOTE**. When reconnecting the fan cables to the mainframe, verify that you connect the fan cables to their respective connectors. Match the labels on the fan cables to their respective connector on the rear of the mainframe.*

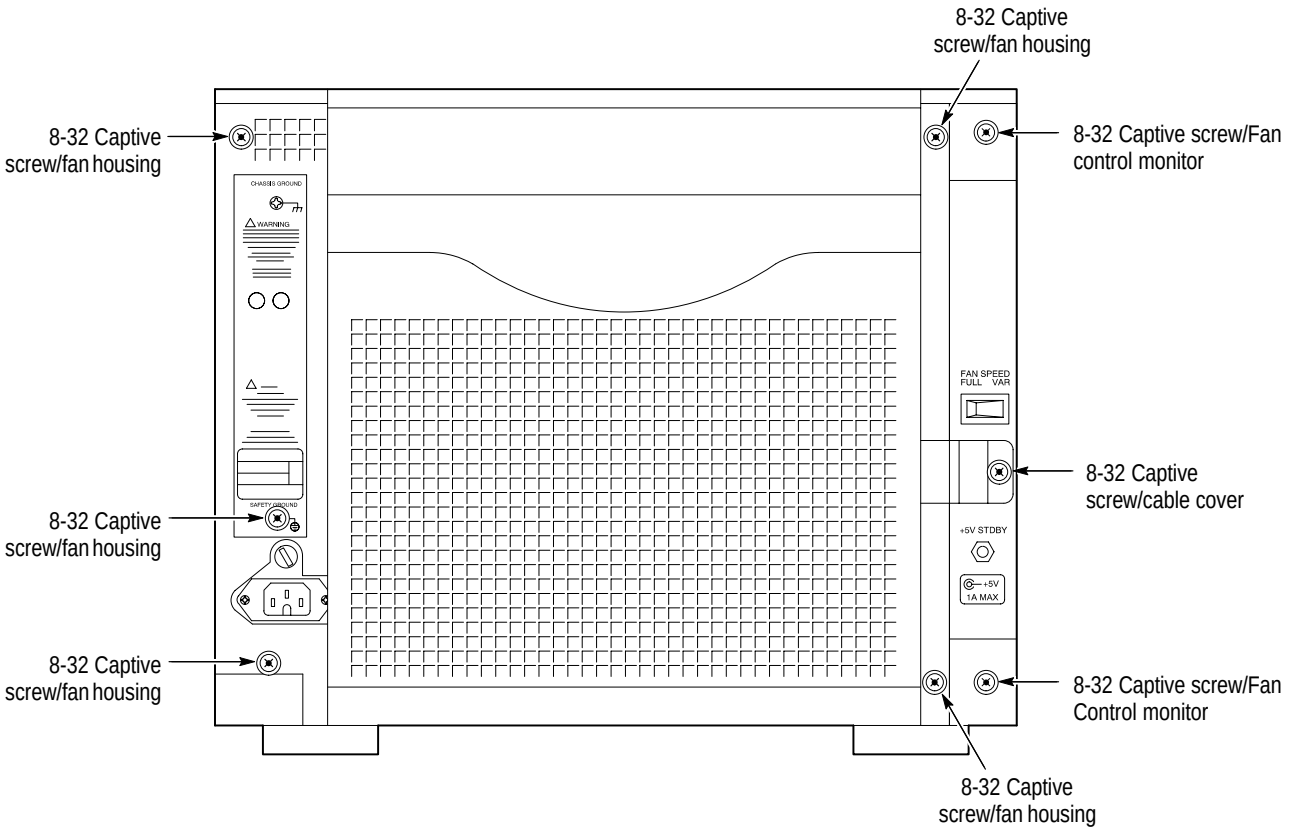


Figure 4–3: Location of fan assembly screws on the rear of the mainframe

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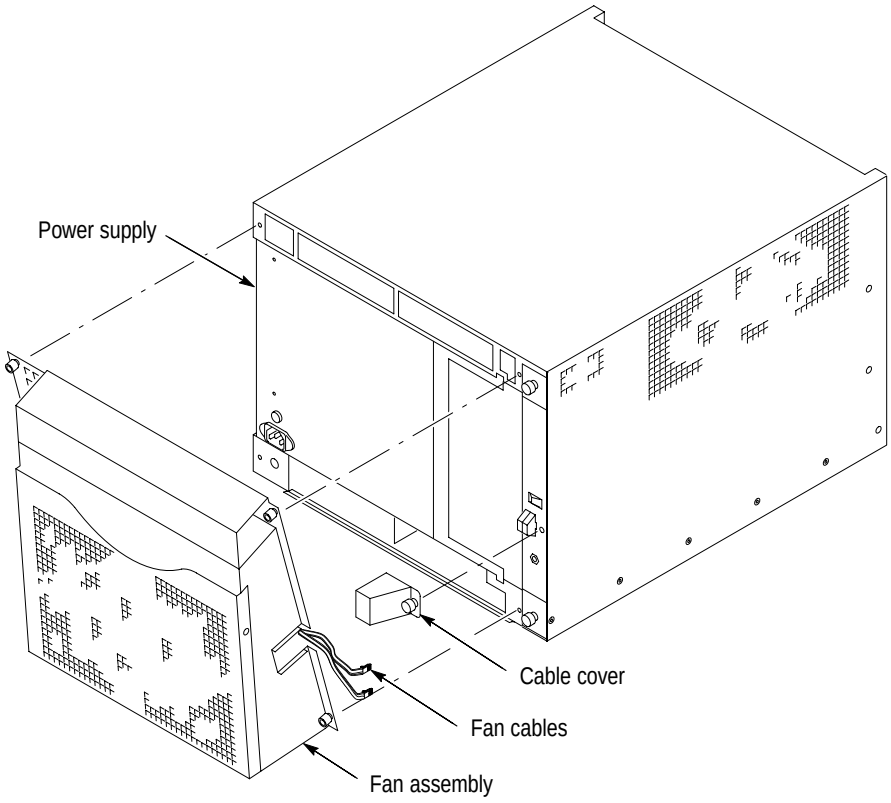


Figure 4–4: Removing the fan assembly

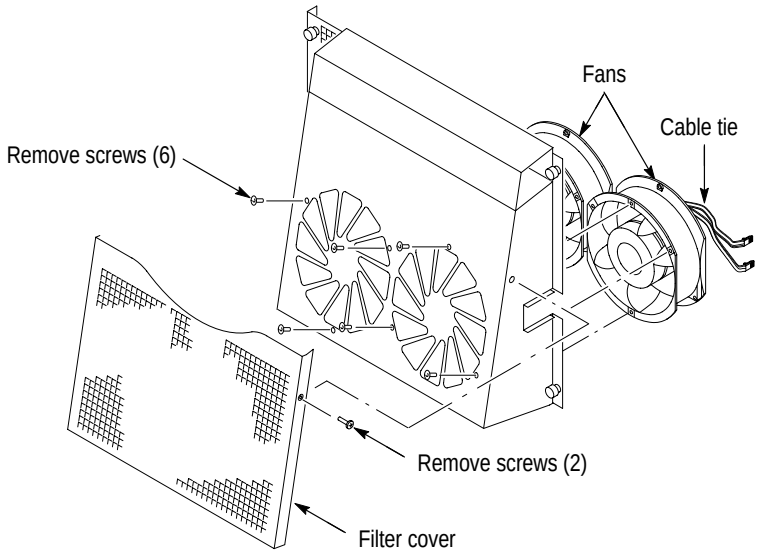


Figure 4–5: Removing the fans

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Procedure 3: Removing the Fan Control Module

To remove the fan control module, perform the following procedure (refer to Figure 4–6):

1. Loosen the captive screw that secures the cable cover to the back panel, and then remove the cable cover.
2. Disconnect the fan cables.
3. Loosen the two captive screws that secure the enhanced monitor to the rear panel. Then slide the fan control module out of the mainframe.

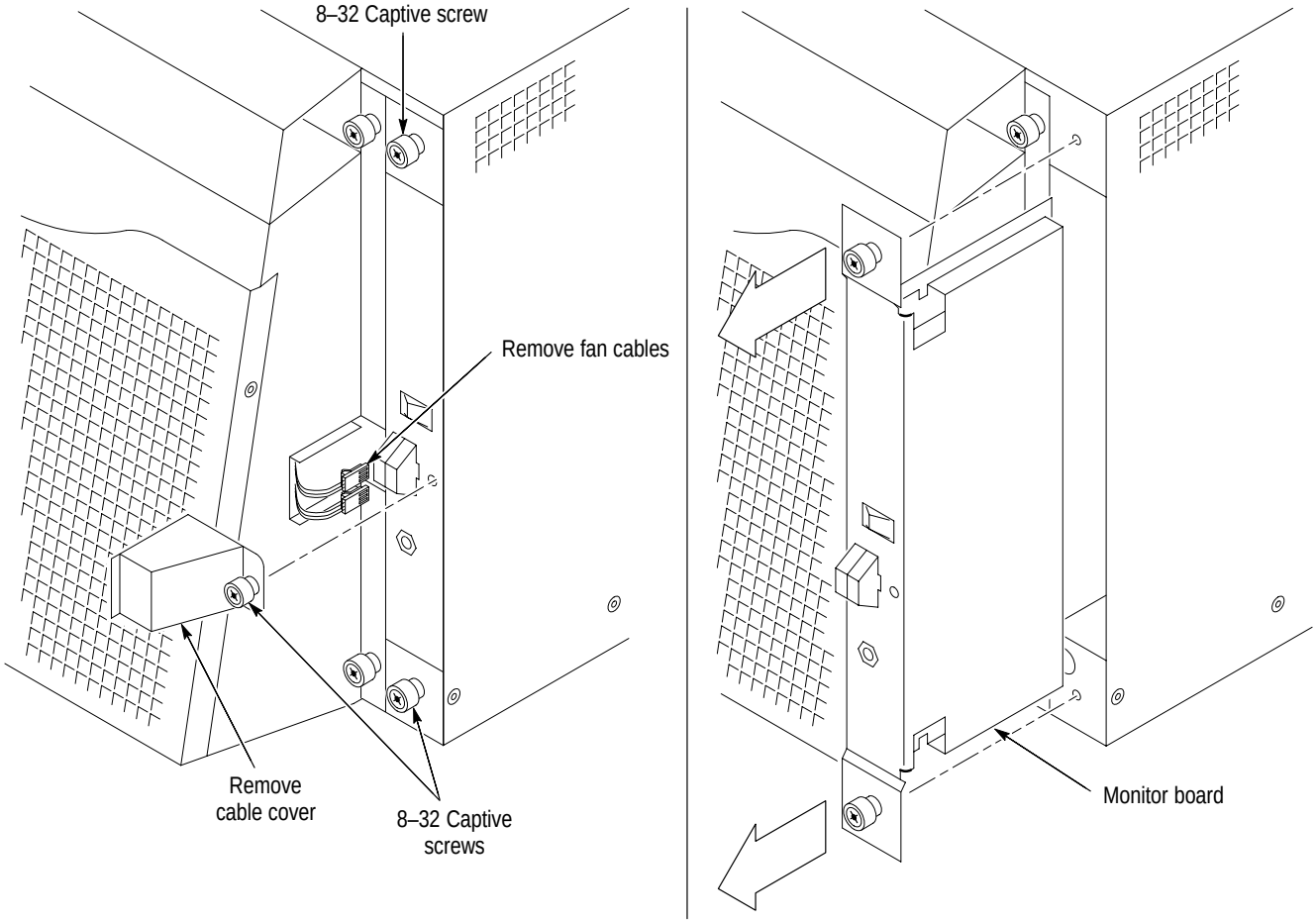


Figure 4–6: Removing the fan control module

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Procedure 4: Removing the Power Supply

To remove the power supply from the mainframe, refer to Figure 4–4 and perform steps 1 through 6 of Procedure 2 on page 4–5 to remove the fan assembly. Then continue with the following steps:

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

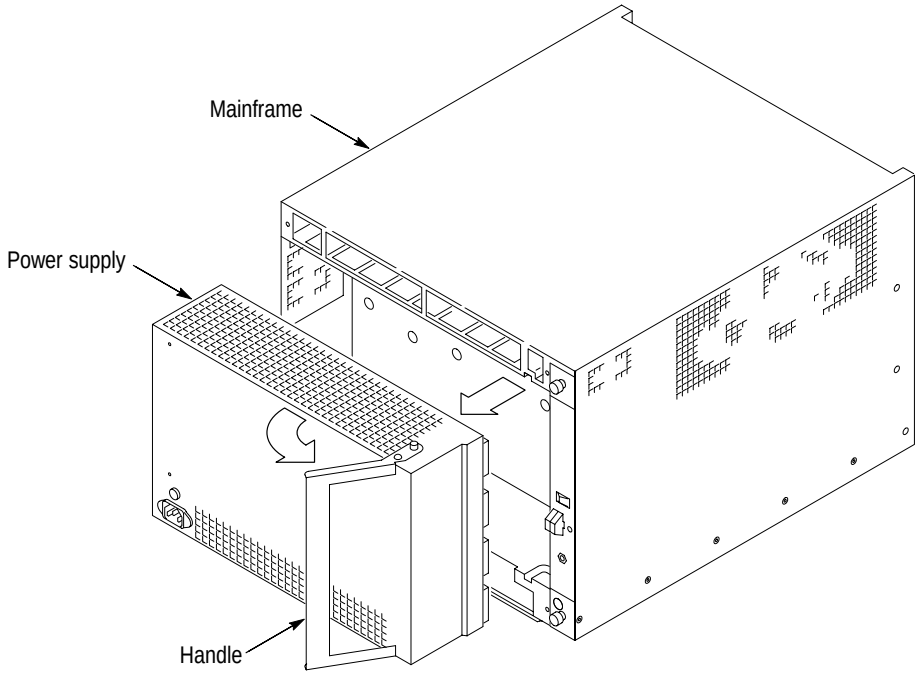


Figure 4–7: Removing the power supply

Procedure 5: Removing the Card Guides

The card guides at the top and bottom of the mainframe are very similar. The main difference is that the bottom guides (IntelliGuides) include the spring-loaded shutters to redirect air into the mainframe. The procedure for removing both guides is identical. Refer to Figure 4–8 while performing the following steps:

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

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

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

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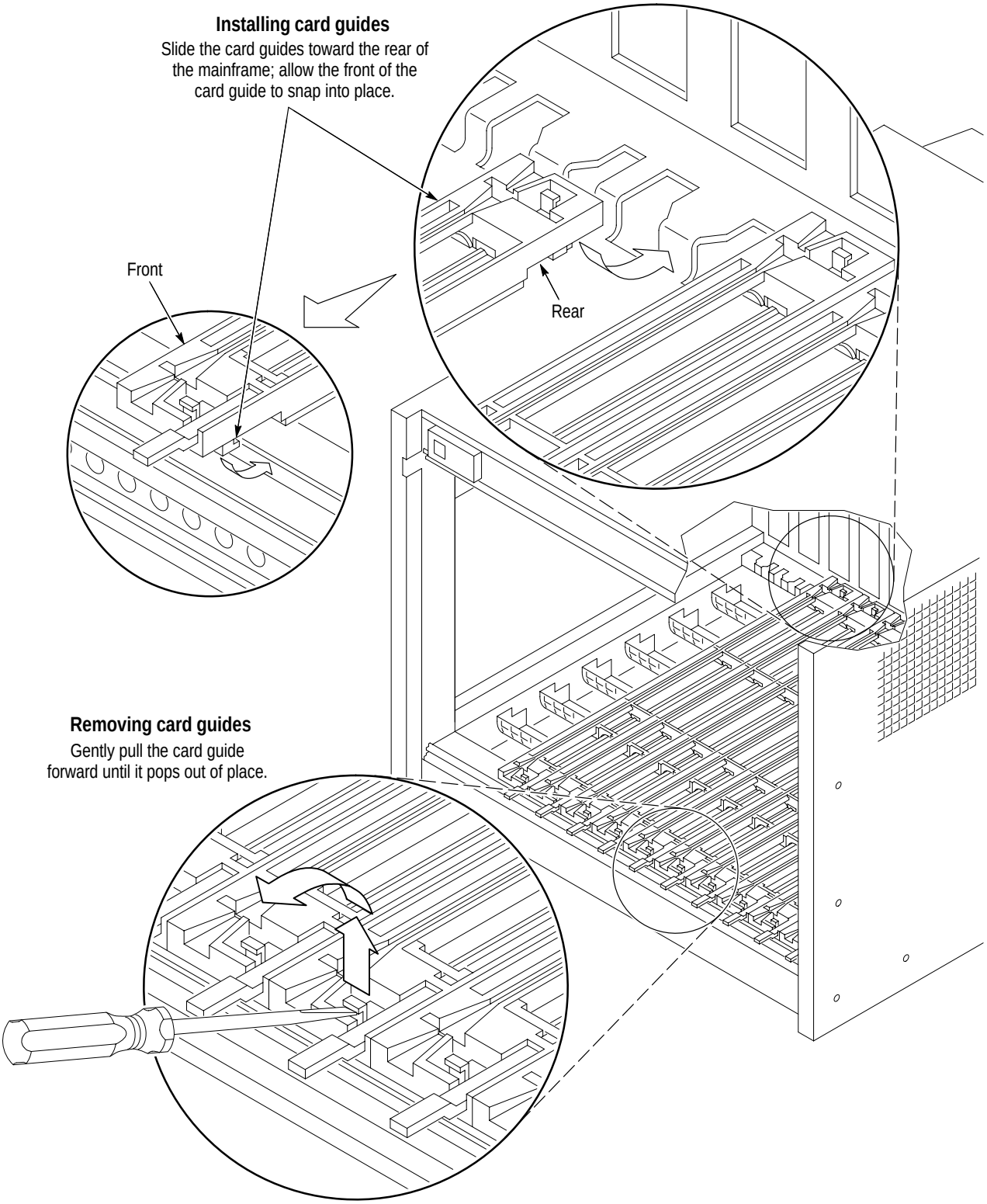


Figure 4–8: Removing the top and bottom card guides

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Procedure 6: Replacing the Top and Bottom Nut Rails

The nut rails at the top and the bottom of the front of the VX1411A IntelliFrame Mainframe allow the user to securely install the modules in the mainframe by screwing the top and bottom of the modules to the front of the mainframe. Refer to Figure 4–9 to remove these nut rails and perform Procedure 1 on page 4–4 to remove the mainframe cover.

1. Loosen all module retaining screws (it may be necessary to slide the modules partially out of the mainframe).
2. Slide the nut rail out of hole on the side of mainframe.

Replace the nut rail by sliding it back in the side of the mainframe and pushing it into place.

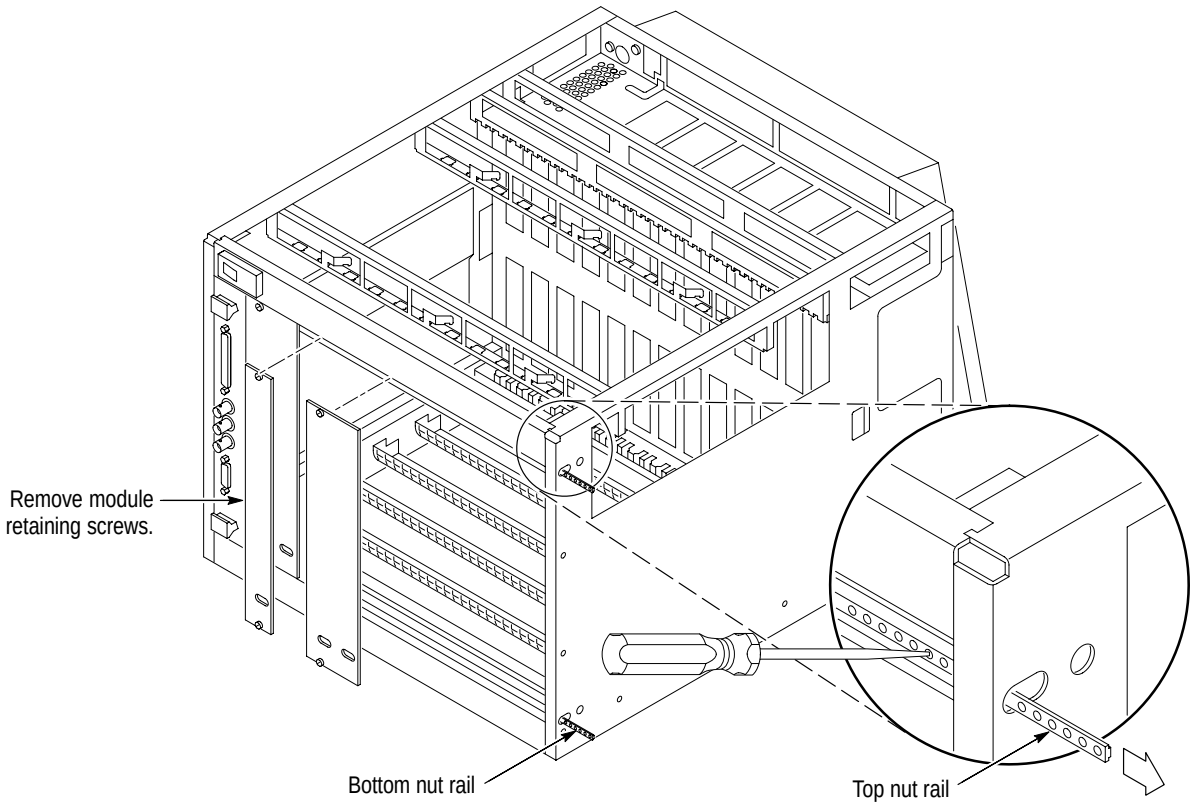


Figure 4–9: Replacing the Top and Bottom Nut Rails

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Procedure 7: Remove the EMI DIN Shields

Perform the following steps to remove the EMI DIN shields (part numbers are listed under *Replaceable Parts* on page 5–9):

1. Remove any modules surrounding the slots where you intend to remove the Backplane EMI DIN shields. Refer to Figure 4–10.
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.

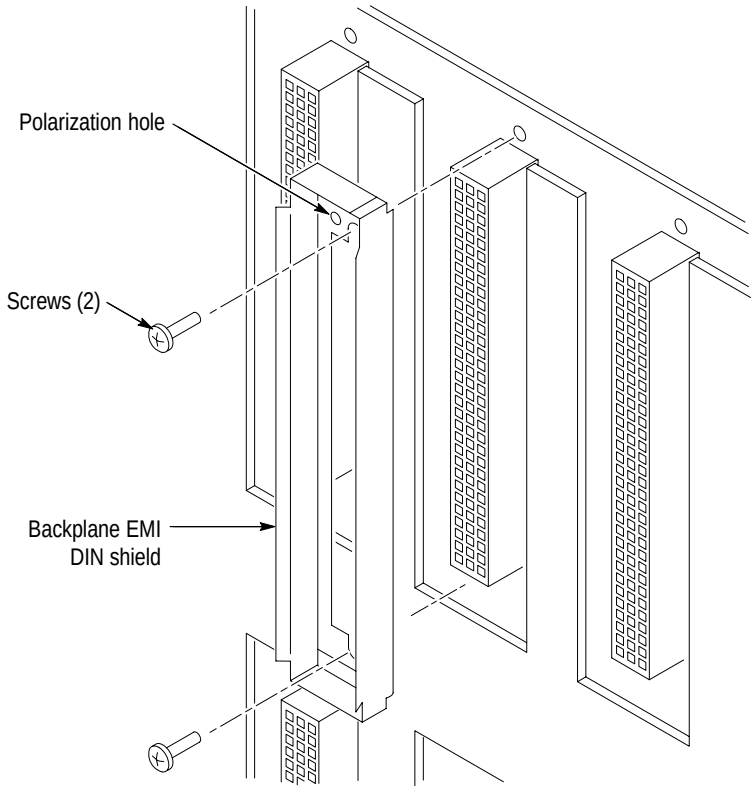


Figure 4–10: Removing the backplane EMI DIN shields

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Procedure 8: Remove the Backplane

To remove the backplane, perform Procedures 1, 2, 3, and 4 beginning on page 4–4. Refer to Figure 4–11, and then complete the following steps:

1. Remove the top cover of the mainframe (see Figure 4–9 on page 4–12, if necessary).
2. Disconnect the Power switch cable at J22 at the top of the backplane.
3. From the rear of the mainframe, remove the five 6-32 screws on the top of the backplane, the seven 6-32 screws from the center, and the five 6-32 screws from the bottom.
4. After removing all screws from the backplane, remove the backplane from the mainframe by sliding it out of the right side.

Install the backplane by reversing the disassembly procedure.

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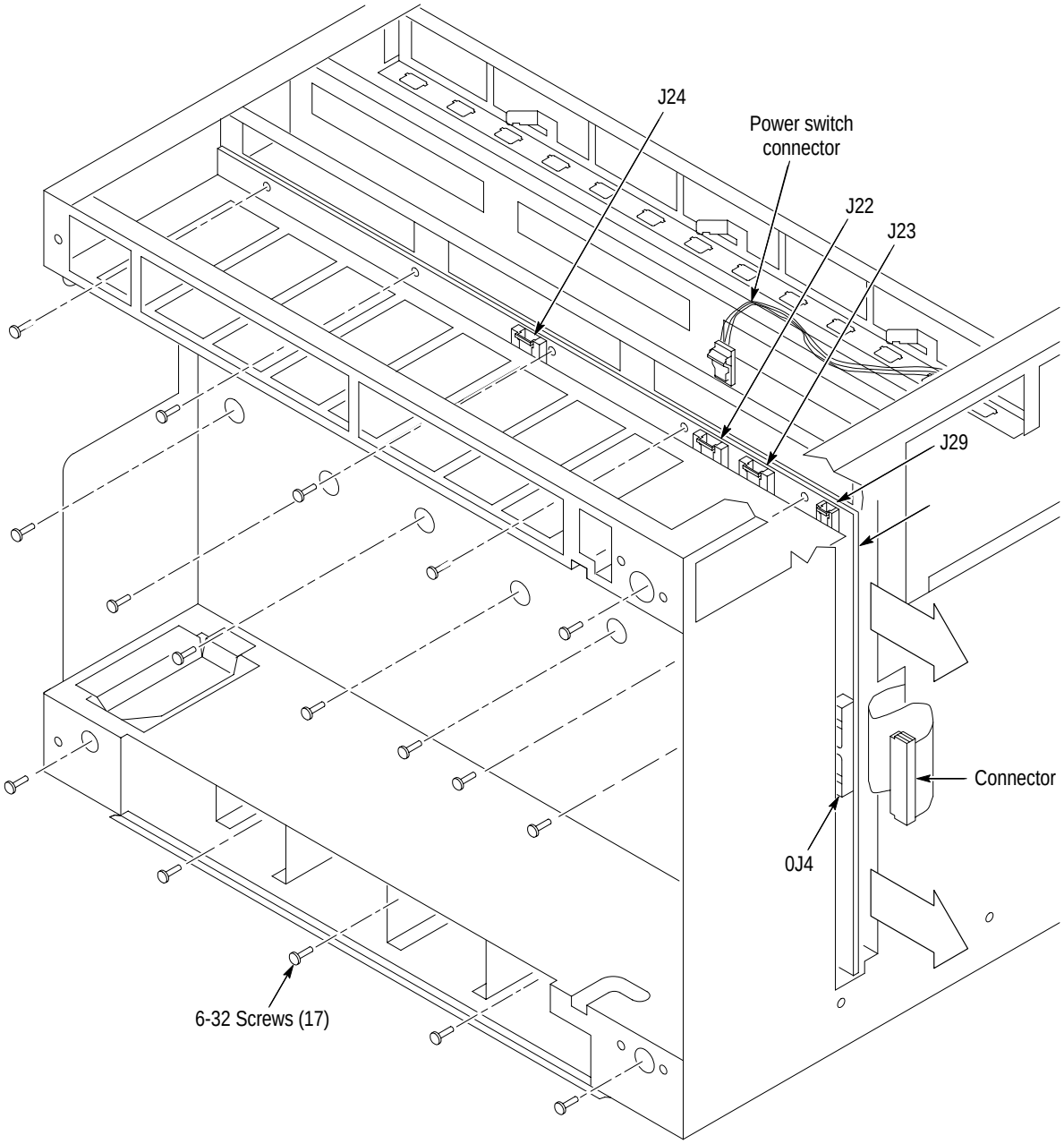


Figure 4–11: Removing the backplane

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Troubleshooting Procedures

The troubleshooting procedures are designed to isolate problems to a module level. No component-level procedures are provided.

Equipment List

The following test equipment is recommended for troubleshooting procedures:

- Digital Voltmeter (Tektronix DM250 series digital voltmeter)
- Oscilloscope, 20 MHz BW, with 10x Probe (Tektronix TDS500A series oscilloscope)
- Extender card (Tektronix 73A-850 VXIbus Extender Board)

Diagnostic Information

The VX1411A IntelliFrame Mainframe does not include diagnostics. The functionality of the mainframe can be verified by following the performance verification procedures as described in *Functional Check and Performance Verification* beginning on page 1–22.

Fuses

The mainframe has one line fuse. The line fuse can be one of three different kinds depending on the operating voltage of the mainframe. Table 4–1 summarizes the different fuses that can be used as the line fuse in the mainframe.

Table 4–1: Fuses

Voltage	Rating	Tektronix replacement part number
90 V to 250 V operation	20 A, Slow Blow, 250 V	159-0379-00
103 V to 250 V operation	15 A, Fast Blow, 250 V	159-0256-00
207 V to 250 V operation	6.3 A, Fast Blow, 250 V	159-0381-00

Fault Isolation

The main focus of the troubleshooting procedures is to isolate problems to one of the major modules within the mainframe. You may find it helpful to refer to the functional block diagram in Figure 4–12 on page 4–19 to isolate problems to one of the modules within the mainframe.

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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 mainframe or to one of the installed VXIbus Modules. Remove the modules from the mainframe and check that the problem still exists.
- 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 mainframe.
- Perform the procedures as described in *Functional Check and Performance Verification* beginning on page 1–22 to verify the power supply voltages are present and within the specified limits. If the voltages are not present, replace the power supply. If any of the voltages are not within the specified limits, replace the power supply.

Inadequate Cooling. If cooling problems occur, perform the following checks:

- Verify that the air filter is clean. If not, remove the air filter and clean it.
- One or both fans may not be operating properly. Check that both fans rotate.
- Verify that each fan is properly connected to the fan control module (see Figure 4–4 on page 4–7).
- Check the power switch for proper function.
- Check that both fans are working at variable and high speeds.
- Verify that all of the empty slots within the mainframe are closed when no modules are installed. If necessary replace the faulty shutter assembly.
- Verify that each VXIbus module has a front panel that activates the IntelliGuides (shutters).

Repackaging Instructions

If you need to send the VX1411A IntelliFrame Mainframe to a Tektronix field center for repair, attach a tag to the mainframe with the owner name and address, the serial number, and a brief description of the problem(s) encountered or the service required. Always return all accessories so that the entire system can be tested.

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

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Theory of Operation

This section provides a brief overview of the theory of operation for the VX1411A IntelliFrame Mainframe. Figure 4–12 shows the functional block diagram of the mainframe and the major components.

The VX1411A IntelliFrame Mainframe contains the following major components:

- Power supply
- Backplane

Power Supply. The power supply provides all voltages and currents to the mainframe. The power supply connects to the backplane at P25, P26, P27, and P28. The power supply can be replaced as a single unit.

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

The front panel On/Standby DC switch connects to J22 at the top of the backplane.

The backplane connects to the Power Supply at J25 and J28. Connector P25 supplies power to the fans from the backplane via the fan control cable.

The VX1411A IntelliFrame Mainframe provides optimal cooling for all installed modules. The mainframe is equipped with two efficient variable speed fans. The fan speed can easily be manually switched from a low noise, variable speed to full speed for maximum cooling. Fan speed varies with ambient air temperature:

- Minimum speed <20˚C
- Maximum speed >50˚C
- Variable speed from 20 to 50˚C

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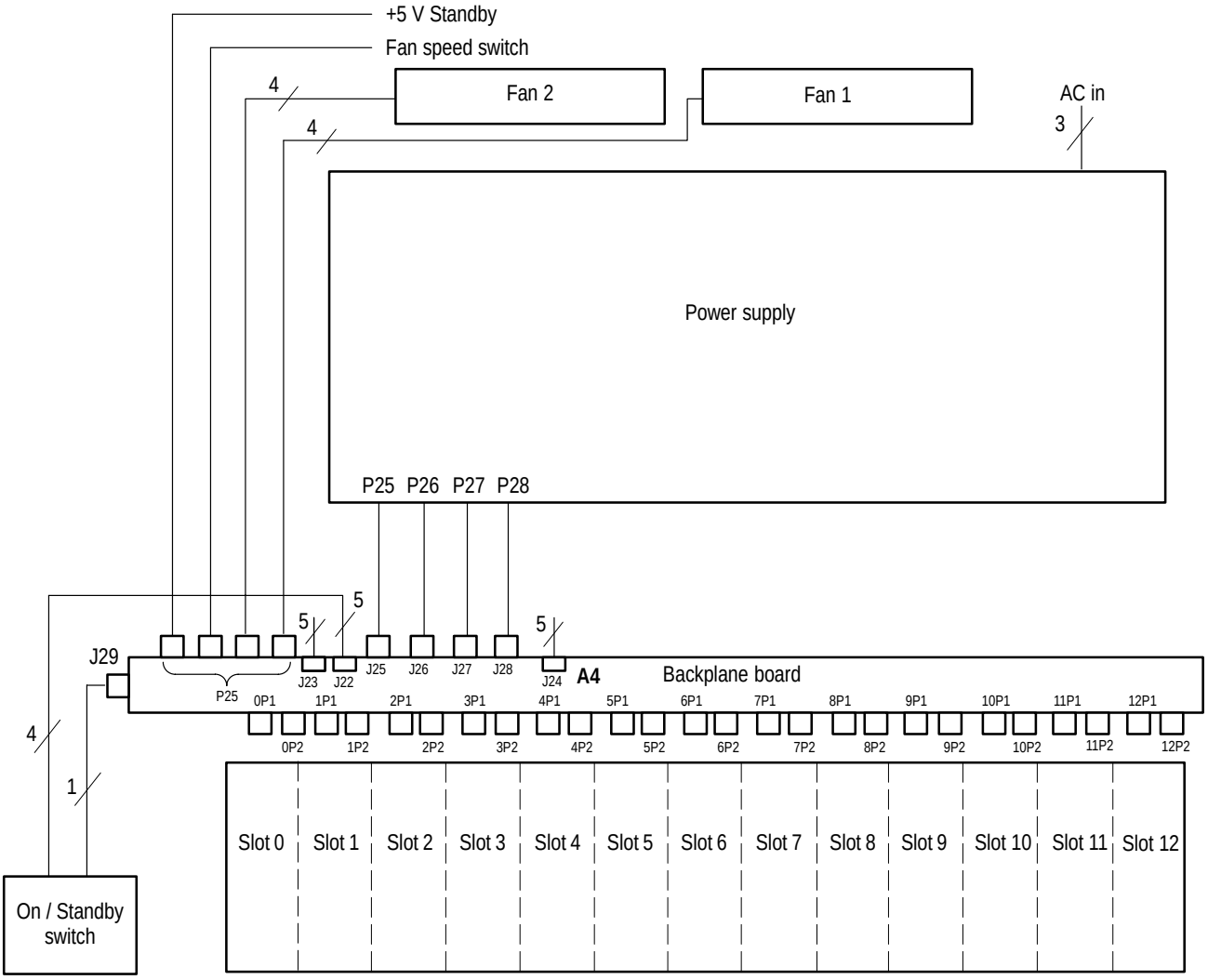


Figure 4–12: Mainframe block diagram

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Replaceable Parts

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Replaceable Parts

This section contains a list of the replaceable modules for the VX1411A IntelliFrame Mainframe Instrument. Use this list to identify and order replacement parts.

Parts Ordering Information

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

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

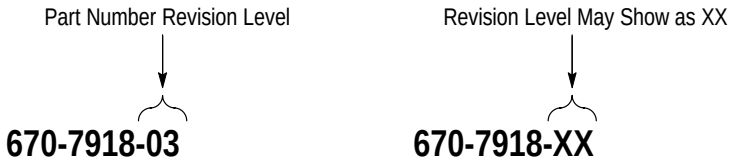
- Part number (see Part Number Revision Level below)
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

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.

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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.

VX1411A IntelliFrame Mainframe Common Replaceable Parts

Table 5–1 provides a quick reference list of parts that you are most likely to replace. The table only provides a summary of information on the parts. For more detailed information, refer to the individual parts lists in this chapter.

Table 5–1: VX1411A IntelliFrame Mainframe common replaceable parts

Name	Description	Tektronix part number
Power Supply Module	Power supply	119-5553-XX
Air Filter	Air filter:Woven Polypropylene, black, 0.125 thick, 2 layer, vinyl,edging	378-2075-00
Fuse	Fuse, cartridge:15A,250V,Fast	159-0256-00
Fuse	Fuse, cartridge:20A,250V,5 Sec Min @ 200%,0.25 X 1.25,US REC:326020	159-0379-00
Fuse	Fuse, cartridge:5MM X 20MM,250V,6.3A,High Breaking capacity,ceramic;VDE	159-0381-00
Bottom Card Guide with Shutters	Baffle, Assy:VXI Slot, Single, Molded Polycarbonate Alloy	378-0438-00
Card Guide	Guide:Plastic Guide,ECB,VXI Molded Ckt Bd Guide, VXI Form Factor	351-1007-00
Fan	Fan,DC:48V;TUBEAXIAL,Programmable with Tach Out, 15W,2500 RPM,170 CFM,48dBA,6.75” X 5.9” X 2.0”	119-4801-XX

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Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the VX1411A IntelliFrame Mainframe Instrument. 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.

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Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
TK1163	POLYCAST INC	9898 SW TIGARD ST	TIGARD OR 97223
TK1499	AMLAN INC	97 THORNWOOD RD	STAMFORD CT 06903–2617
TK1547	MOORE ELECTRONICS INC.	19500 SW 90TH CT PO BOX 1030	TUALATIN OR 97062
TK1943	NEILSEN MANUFACTURING INC	3501 PORTLAND RD NE	SALEM, OR 97303
TK2469	UNITREK CORPORATION	3000 LEWIS & CLARK HWY SUITE 2	VANCOUVER WA 98601
TK2548	XEROX BUSINESS SERVICES DIV OF XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON OR 97077
0B445	ELECTRI–CORD MFG CO INC	312 EAST MAIN ST	WESTFIELD PA 16950
0KB01	STAUFFER SUPPLY	810 SE SHERMAN	PORTLAND OR 97214
1Y013	DEANCO, ACACIA DIVISION	3101 SW 153RD DRIVE	BEAVERTON OR 97006
3M099	PORTLAND SCREW CO	6520 N BASIN ST	PORTLAND OR 97217–3920
4T165	NEC ELECTRONICS, INC.	475 ELLIS STREET PO BOX 7241	MOUNTAIN VIEW CA 94039
5Y921	COMAIR ROTRON	2675 CUSTOMHOUSE CT	SAN YSIDRO, CA 92073
06383	PANDUIT CORP	17303 RIDGELAND AVE	TINLEY PARK, IL 60477–3048
06666	GENERAL DEVICES CO INC	1410 S POST RD PO BOX 39100	INDIANAPOLIS IN 46239–9632
22589	ELECTRO–SPACE FABRICATORS INC	300 W HIGH ST PO BOX 67	TOPTON PA 19562–1420
51506	ACCURATE SCREW MACHINE COMPANY (ASMCO)	19 BALTIMORE STREET	NUTLEY NY 07110–1303
52152	MINNESOTA MINING AND MFG CO INDUSTRIAL TAPE DIV	3M CENTER	ST PAUL MN 55144–0001
61081	ELECTRONIC SOLUTIONS	6790 FLANDERS DRIVE	SAN DIEGO, CA 92121
61935	SCHURTER INC	1016 CLEGG COURT	PETALUMA CA 94952–1152
63426	NKK SWITCHES OF AMERICA INC	14415 N SCOTTSDALE RD NO 600	SCOTTSDALE AZ 85260
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
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

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Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
5–1					**CABINET AND CHASSIS ASSEMBLY**		
–1	212–0193–00			12	SCREW,EXT RLV:8–32 X 0.375 BUTTON HEAD,HEX DRIVE,STAINLESS STEEL,BLACK OXIDE FINISH	0KB01	ORDER BY DESCRIPTION
–2	200–4330–00			1	COVER:MAINFRAME,0.050 ALUM, SILVER GRAY	80009	200–4330–00
–3	441–2115–00			1	CHASSIS:VXI MAINFRAME,SHEET METAL ASSY, INCLUDES ITEMS 3 THRU 5	80009	441–2115–00
–4	348–1542–00			4	FOOT,CABINET:BLACK PLASTIC	74594	348–1542–00
–5	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		
	070–9646–XX			1	MANUAL,TECH:INSTRUCTION,VX1411A	TK2548	070–9646–XX
	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	0B445	ECM–161–0213–00

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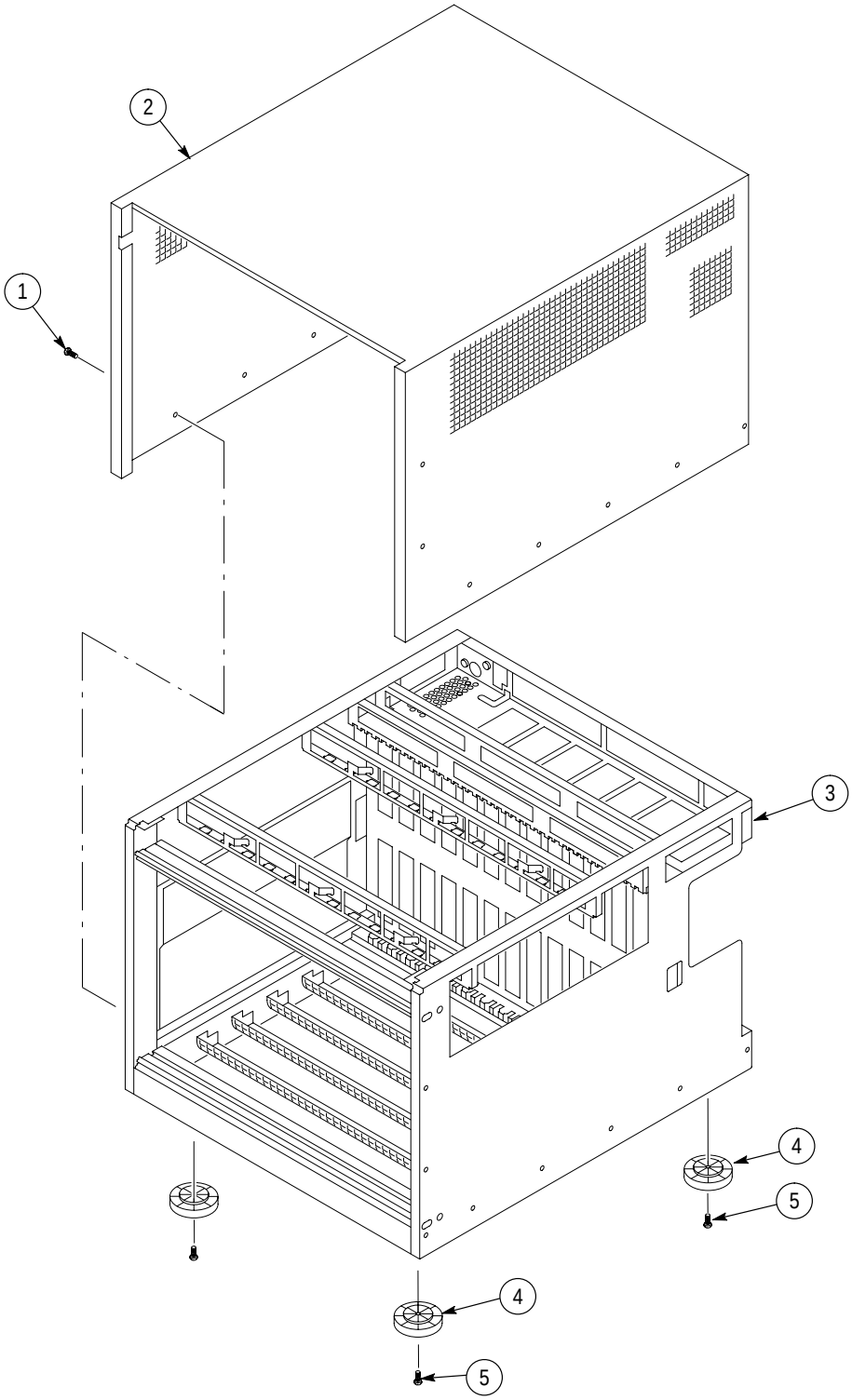


Figure 5–1: Cabinet and chassis assembly

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Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
5–2					**CHASSIS PARTS AND BACKPLANE**		
–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	333–4235–00			1	PANEL,FRONT,ASSY:0.062 ALUM,W/LABEL, VX1411A	80009	333–4235–00
–3	174–3697–00			1	CABLE ASSY:RIBBON,CABLE TEMP SENSE/BACKPLANE,28AWG,2x15,2x10,2x15	TK2469	174–3697–00
–4	211–0720–00			17	SCR,ASSEM WSHR:6–32 X 0.500,PNH,STL,CDPL,T–15 TORX DR	0KB01	ORDER BY DESCRIPTION
–5	118–9417–00			1	BACKPLANE VXI:BACKPLANE VXI COMPATIBLE WITH 13 C–SIZE SLOTS ELECTRONIC AUTOMATIC	80009	118–9417–00
–6	020-2194-00			1	COMPONENT KIT:BACKPLANE,EMI SHIELD KIT CONTAINS DIN SHIELD WITH 2 SCREWS	80009	020-2194-00
–7	343–0775–00			2	CABLE,CLAMP:RIBBON,1.0X1.0,GRAY,POLYVINYL,FOAM TAPE BACKING	52152	80610029243/3484–1000
–8	220-0199-01			2	NUT BAR: VXI, M2.5 THREADS	OKB01	ORDER BY DESCRIPTION
–9	378–0438–00			13	BAFFLE ASSY:VXI SLOT, SHUTTER	80009	378–0438–00
–10	351–1007–00			13	GUIDE,SINGLE:PLASTIC	80009	351–1007–00
					OPTIONAL ACCESSORIES		
–11	333–4206–00			5	PANEL,FRONT:DOUBLE,BLANK,EMI,AL,PAINTED SILVER GRAY	TK1943	333–4206–00
–12	333–4205–00			1	PANEL,FRONT:SINGLE,BLANK,EMI,AL,PAINTED SILVER GRAY	TK1943	333–4205–00
–13	333–4208–00			5	PANEL,FRONT:DOUBLE,BLANK,AL,PAINTED SILVER GRAY	80009	333–4208–00
–14	333–4207–00			1	PANEL,FRONT:SINGLE,BLANK,AL,PAINTED SILVER GRAY	80009	333–4207–00
–15	337–4046–00			1	SHIELD,ELEC:AL,DVG1,TG2000	80009	337–4046–00

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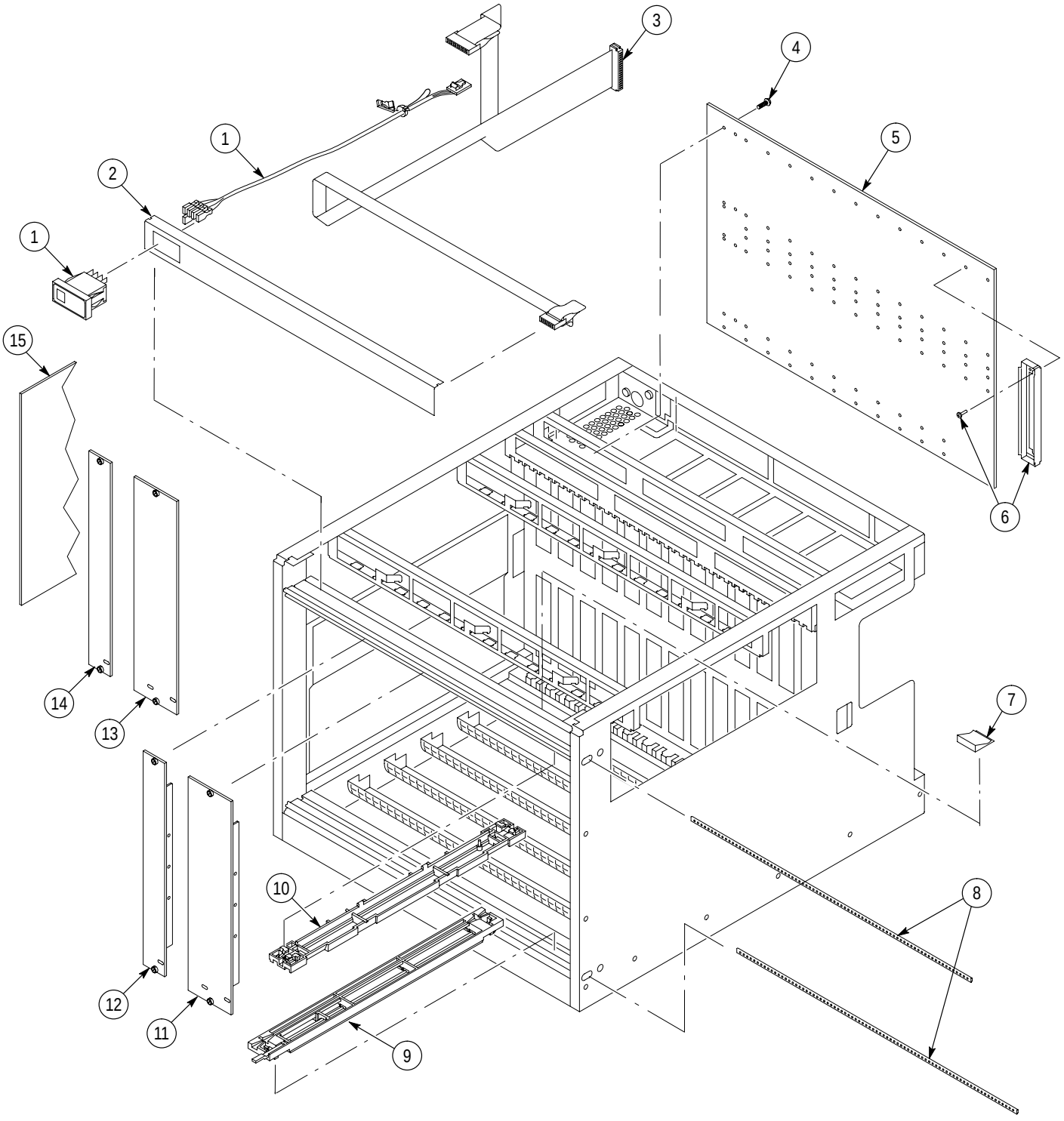


Figure 5–2: Circuit boards and chassis parts

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Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
5–3					**POWER SUPPLY AND FAN ASSEMBLY**		
–1	333–4238–00			1	PANEL,REAR:MONITOR,W/LEXAN OVERLAY,VX1411A	80009	333–4238–00
–2	174–3694–00			1	CABLE ASSY SP:DESCRETE,FAN,CPD,8.0L,1X6,0.1CT, SWITCH	TK2469	174–3694–00
–3	200–4344–00			1	COVER:FAN CABLE,0.040 Al ALLOY	TK1943	200–4344–00
–4	380–1110–00			1	HOUSING:FAN, PAINT, TEK TV GRAY	80009	380–1110–00
–5	378–2075–00			1	AIR FILTER:WOVEN POLYPROPYLENE,BLACK,0.125 THICK,2 LAYER,VINYL EDGING	74594	378–2075–00
–6	212–0193–00			2	SCREW,EXT RLV:8–32 X 0.375 BUTTON HEAD,HEX DRIVE,STAINLESS STEEL,BLACK OXIDE FINISH,0.093 DRIV	0KB01	212–0193–00
–7	211–0512–00			6	SCREW,MACHINE:6–32 X 0.5,FLH,100 DEG,STL,POZ	73893	ORDER BY DESCRIPTION
–8	119–4801–XX			2	FAN,DC:48V,TUBEAXIAL,REGULATED,PROGRAMMABLE,7–2 2W,1275–3460RPM,80–235CFM	5Y921	JQ48R0X (031569)
–9	343–0549–00			2	STRAP,TIEDOWN:0.098 W X 4.0 L,ZYTEL	06383	PLT1M
–10	200–4326–00			1	CAP,FUSEHOLDER:5MM X20MM STM FUSE CARRIER, USE W/ BUSS HTB SCREWDRIVER SLOTTED FUSEHOLDER	71400	STM
–11	159–0256–00			1	FUSE,CARTRIDGE:15A,250V,FAST	71400	ABC–15
–11	159–0379–00			1	FUSE,CARTRIDGE:20A,250V,5 SEC MIN @ 200%,0.25 X 1.25,UL REC,326020	75915	326 020
–11	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
–12	119–5553–XX			1	POWER SUPPLY:VXI MAINFRAME, 925W	80009	119–5553–XX
–13	367–0494–00			1	HANDLE:EJECTOR POWER SUPPLY	TK1943	367–0494–00 0BD
–14	211–0932–00			2	SCREW:SHLDR,8–32 X 0.187 OD X 0.125 L,0.187 L	24931	PZ–6–3
–15	210–0804–00			2	WASHER,FLAT:0.17 ID X 0.375 OD X 0.032 STL	86928	76430–000

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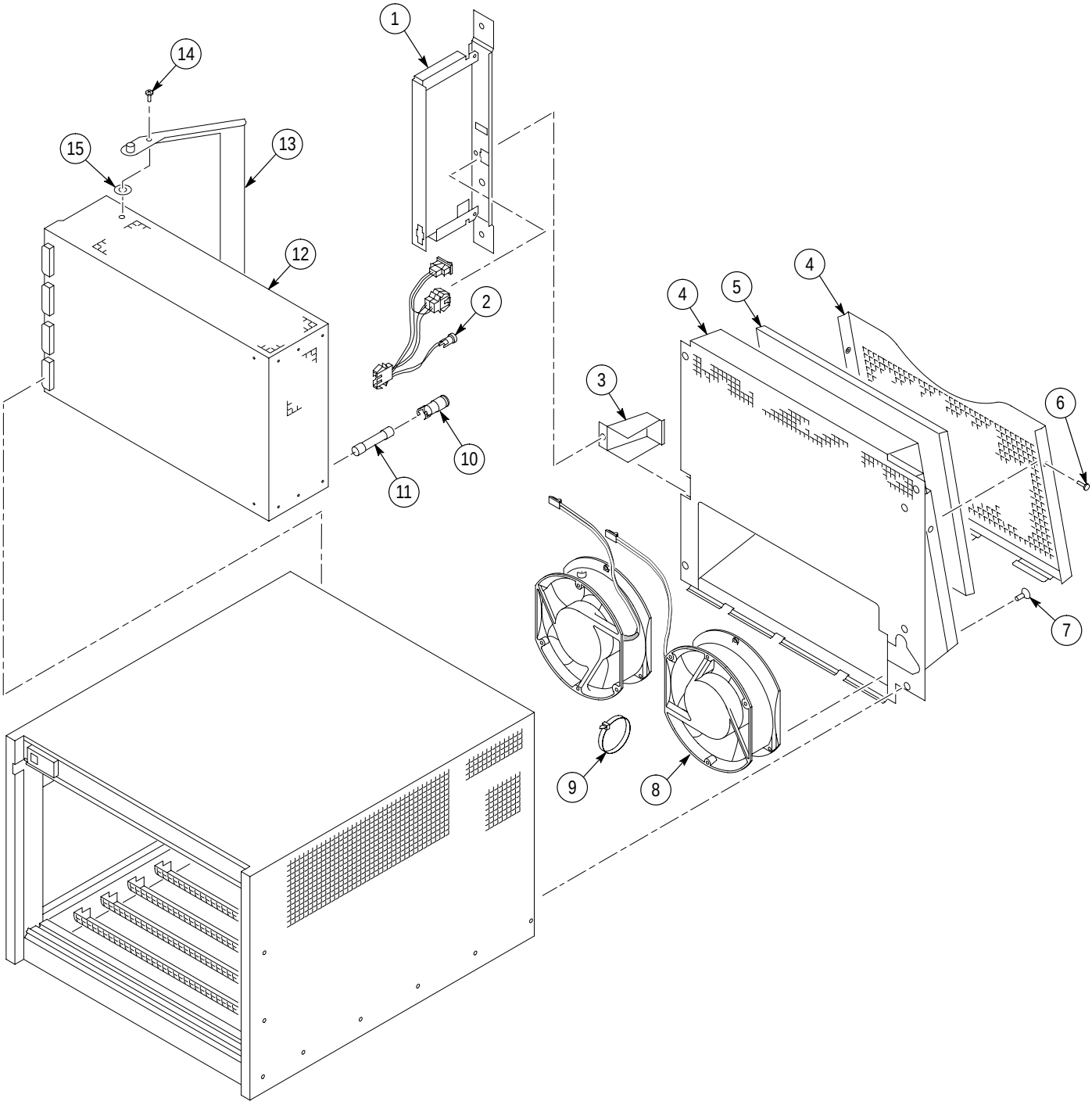


Figure 5–3: Power supply and fan assembly

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Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
5–4					**1R RACKMOUNT ASSEMBLY**		
–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

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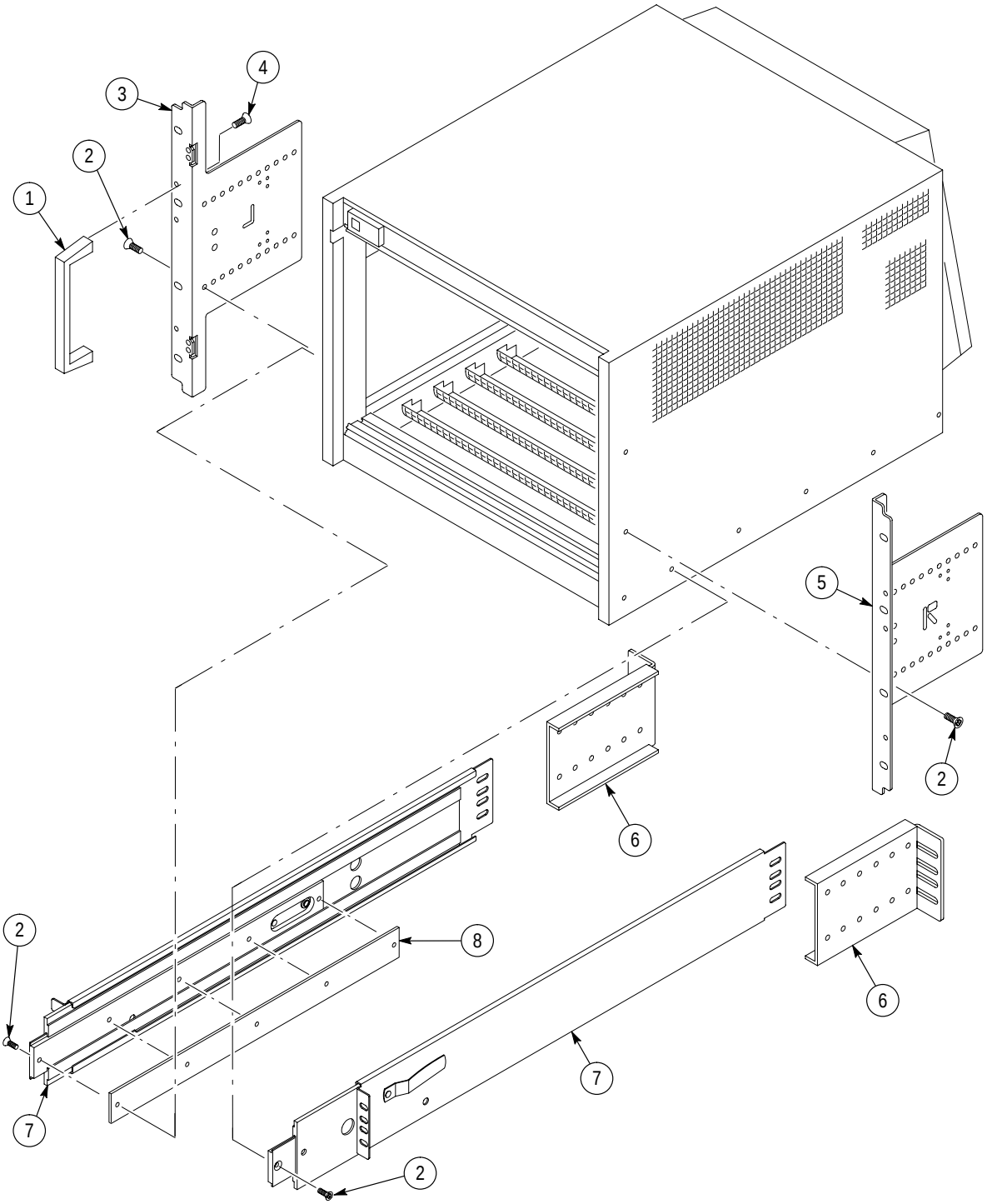


Figure 5–4: 1R Rackmount assembly

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Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
5–5					**2R RACKMOUNT AND DOOR ASSEMBLY**		
–0	020–2222-XX			1	COMPONENT KIT:RACKMOUNT KIT 2R (KIT CONTAINS ITEMS 1 THRU 12)	80009	0202222XX
–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	214–4678–00			2	HINGE LIFT OFF, BLACK	80009	214467800
–4	407–4524–00			1	BRACKET:LEFT,RACKMOUNT,SILVER GRAY	TK1943	407–4524–00
–5	211–0718–00			8	SCREW,MACHINE:6–32 X 0.312,FLH100,STL,CDPL,T–10	0KB01	211–0718–00
–6	212–0671–00			4	SCREW,MACHINE:10–32 X 0.625,FLH,100 DEG,STL,CD PL, TORX DRIVE	0KB01	ORDER BY DESC
–7	212–0158–00			2	SCREW,MACHINE:8–32 X 0.375,PNH,STL,CDPL,T–20	0KB01	ORDER BY DESC
–8	200–4243–00			1	DOOR ASSY:LEXAN DOOR,W/LATCH HARDWARE ATTACHED	80009	200424300
–9	407–4525–00			1	BRACKET:RIGHT, RACKMOUNT,SILVER GRAY	TK1943	407–4525–00
–10	351–1010–00			1	GUIDE:RACK SLIDE EXTENSION BRACKET,CLOSED SLOT,9.7 X 8.1 INCHES	06666	B–814–2
–11	351–0800–00			1	GUIDE,SLIDE:CHASSIS TRACK (PAIR)	06666	CTS–124
–12	386–6999–00			1	PLATE,LEFT:OFFSET SPACER,16 X 1.45,0.062 THICK AL	TK1943	386–6999–00

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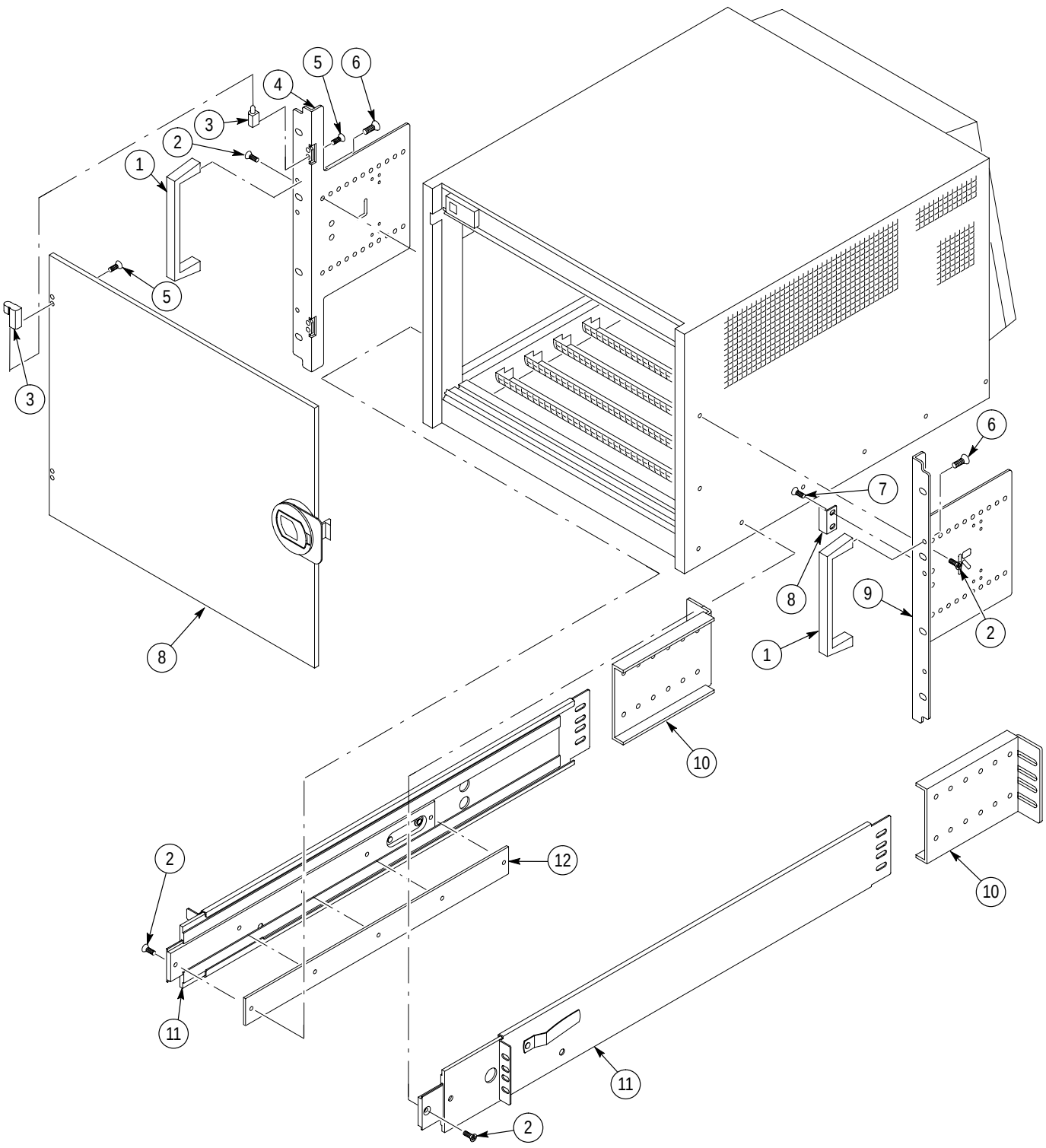


Figure 5–5: 2R Rackmount and door assembly

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Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
5–6					**OPTION 1U CABLE TRAY**		
–0	020–2223–XX			1	COMPONENT KIT:CABLE TRAY 1U KIT (KIT INCLUDES ITEMS 1 THRU 3)	80009	0202223XX
–1	212–0158–00			14	SCREW,MACHINE:8–32 X 0.375,PNH,STL,CDPL,T–20	0KB01	ORDER BY DESC
–2	333–4158–00			1	PANEL,CONN:0.09ALUM	80009	333415800
–3	407–4482–00			1	CABLE TRAY:0.09 ALUMINUM,PAINTED SILVER GRAY	80009	407–4482–00
–4	426–2537–00			2	RAIL,FOOT:CHASSIS,ALUM SHEET METAL	TK1943	426–2537–00

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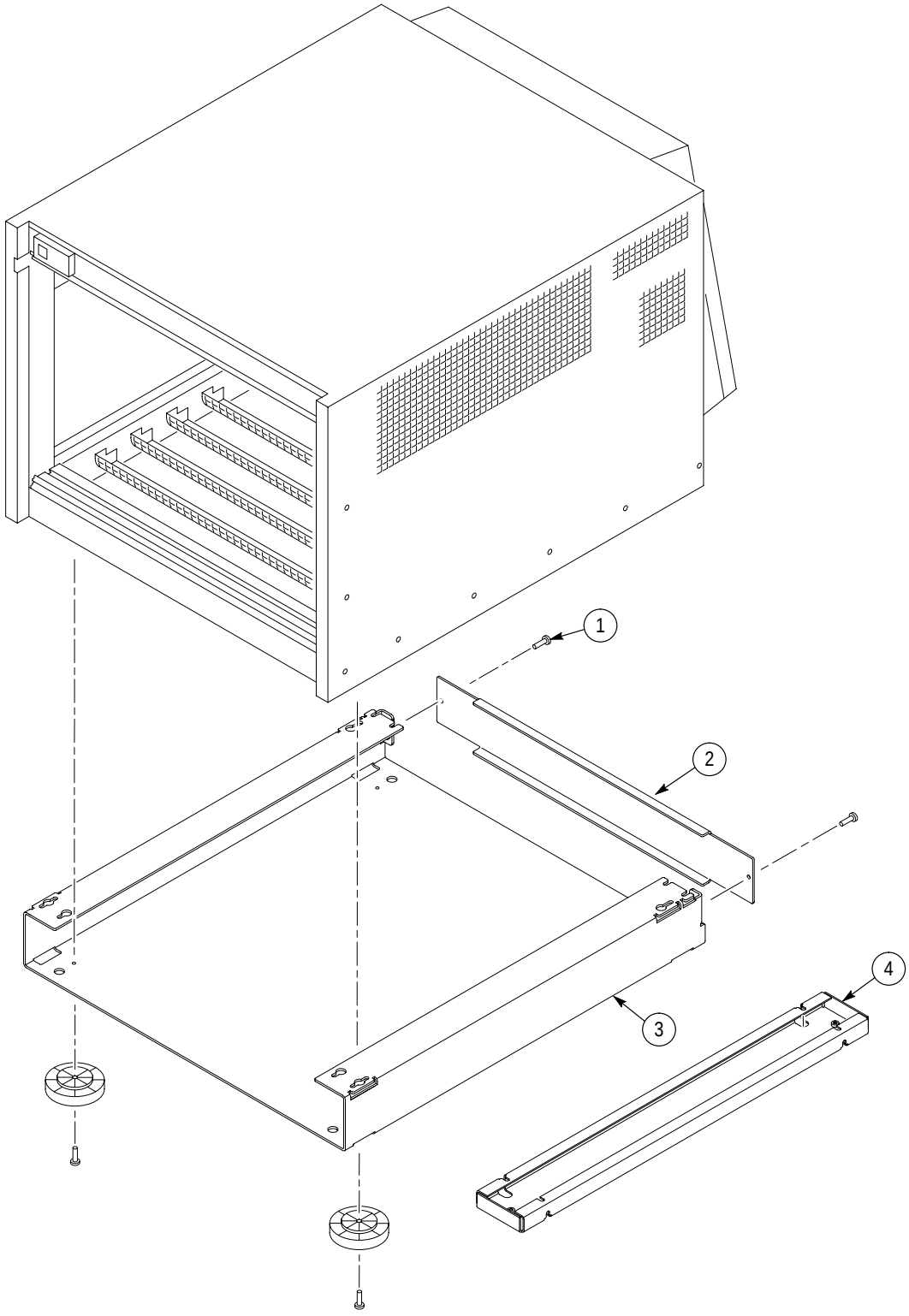


Figure 5–6: Option 1U cable tray

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Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
5–7					**OPTION 2U CABLE TRAY**		
–0	020–2224–XX			1	COMPONENT KIT: CAB;E TRAY 2U KIT (KIT INCLUDES THE ITEMS 1 THRU 4)	80009	0202224XX
–1	426–2537–00			2	RAIL,FOOT:CHASSIS,ALUM SHEET METAL SILVER GRAY	TK1943	426–2537–00
–2	212–0158–00			16	SCREW,MACHINE:8–32 X 0.375,PNH,STL,CDPL,T–20	0KB01	ORDER BY DESC
–3	333–4162–00			1	PANEL,CONN:2U,0.09 AL	80009	333416200
–4	333–4159–00			1	PANEL,CONN:1U,0.09 AL	80009	333415900
–5	407–4502–00			1	TRAY,CABLE:16.600 X 3.045,0.09 ALUM,TEK SILVER GRAY,2U	0J9P4	407–4502–00

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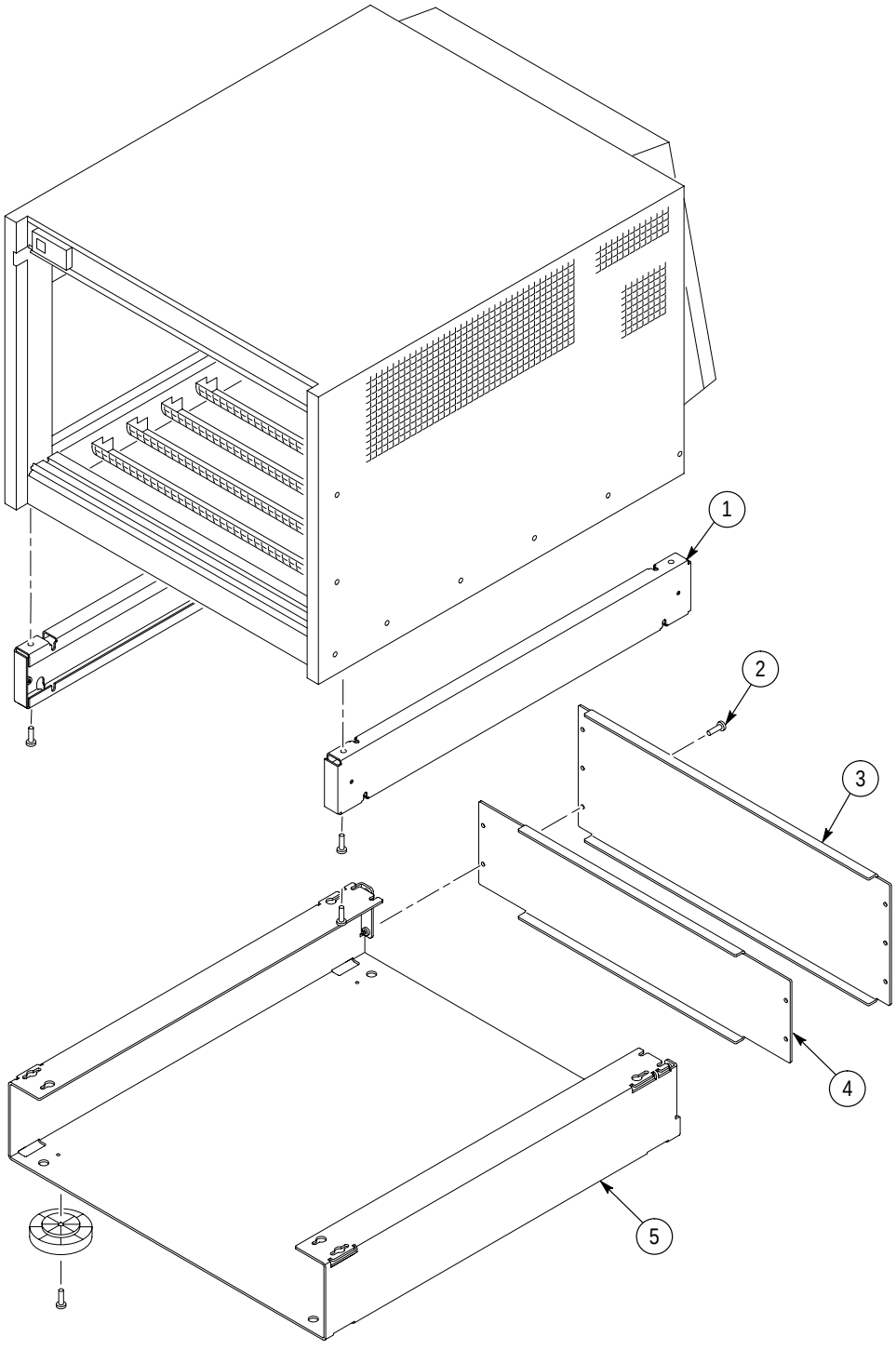


Figure 5–7: Option 2U cable tray

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Appendices

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Appendix A: Power Budget Worksheet

Use the Power Budget Worksheet to determine the operating parameters of the VX1411A IntelliFrame Mainframe and any installed modules. Enter the steady-state current (I_{MP}) and the dynamic current (I_{MD}) for each module. Add the individual currents to determine the total current needed for each power rail. Calculate the total power for the mainframe.

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Power Requirements

Slot	Module	I_{MP} +5V	I_{MD}	I_{MP} +12V	I_{MD}	I_{MP} −12V	I_{MD}	I_{MP} +24V	I_{MD}	I_{MP} −24V	I_{MD}	I_{MP} −5.2V	I_{MD}	I_{MP} −2V	I_{MD}
0															
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
Total Current of All Modules (I_{MP}, I_{MD})															
VX1411A Current Limit		80A	12A	9A	2A	9A	2A	8A	6A	8A	6A	30A	10A	15A	6A
Individual Current Sums Less Than VX1411A Current Limits?															

Power Calculation ($V \times \text{total } I_{MP}$)

Total Power < 700W

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Appendix B: Special Configuration

This appendix contains information for configuring your IntelliFrame® Mainframe for specific situations not documented earlier in this manual. This special configuration requires you to disassemble parts of the mainframe to access cables and circuit boards. Refer to the Maintenance chapter for detailed information on the assembly and disassembly procedures. You may also need to refer to the exploded views.

The information in this section is intended for use by qualified service personnel. Read the *General Safety summary and Service Safety Summary* at the front of this manual and the static precautions on page 4–1 before attempting any procedures in this appendix. Refer to the *Operating Basics* chapter for information on the location of controls, indicators, and connectors used with the mainframe.



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

Front Panel SYSReset Cable Connector Configuration

The IntelliFrame® Mainframe front panel switch cable connector must be configured as shown in Figure B–1 before the SYSReset feature can be utilized. Perform the following procedures to activate the SYSReset feature.

1. Remove the mainframe cover.
2. Cut the tie wrap that secures the SYSReset connector to the front panel switch cable.
3. Connect the SYSReset connector to J29 on the backplane circuit board.
4. Replace the mainframe cover.

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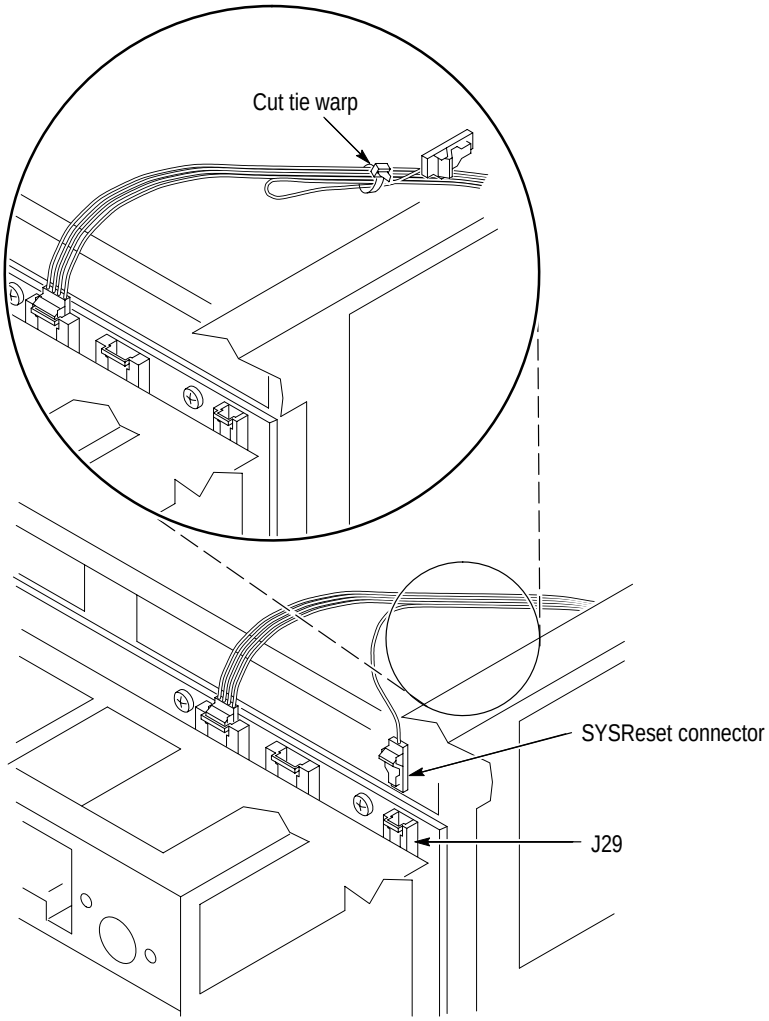


Figure B–1: SYSReset cable connector

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Glossary

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Glossary

The terms in this glossary are defined as used in the VXIbus System. Although some of these terms may have different meanings in other systems, it is important to use these definitions in VXIbus applications. Terms which apply only to a particular instrument module are noted. Not all terms appear in every manual.

ACFAIL*

A VMEbus backplane line that is asserted under these conditions: 1) by the mainframe Power Supply when a power failure has occurred (either ac line source or power supply malfunction), or 2) by the front panel ON/STANDBY switch when switched to STANDBY.

A-Size Card

A VXIbus instrument module that is 100.0 × 160 mm × 20.32 mm (3.9 × 6.3 in × 0.8 in), the same size as a VMEbus single-height short module.

Asynchronous Communication

Communications that occur outside the normal "command-response" cycle. Such communications have higher priority than synchronous communication.

Backplane

The printed circuit board that is mounted in a VXIbus mainframe to provide the interface between VXIbus modules and between those modules and the external system.

B-Size Card

A VXIbus instrument module that is 233.4 × 160 mm × 20.32 mm (9.2 × 6.3 in × 0.8 in), the same size as a VMEbus double-height short module.

Bus Arbitration

In the VMEbus interface, a system for resolving contention for service among VMEbus Master devices on the VMEbus.

Bus Timer

A functional module that measures the duration of each data transfer on the Data Transfer Bus (DTB) and terminates the DTB cycle if the duration is excessive. Without the termination capability of this module, a Bus Master attempt to transfer data to or from a non-existent Slave location could result in an infinitely long wait for the Slave response.

Butch Plate

A connector plate that optionally connects to the rear of the cable tray options. The plate can be modified to accept panel mount connectors thus reducing the number of cables under the VX1411A IntelliFrame Mainframe.

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Client
In shared memory protocol (SMP), that half of an SMP channel that does not control the shared memory buffers.

CLK10
A 10 MHz, ±100 ppm, individually buffered (to each module slot), differential ECL system clock that is sourced from Slot 0 and distributed to Slots 1–12 on P2. It is distributed to each module slot as a single source, single destination signal with a matched delay of under 8 ns.

CLK100
A 100 MHz, ±100 ppm, individually buffered (to each module slot), differential ECL system clock that is sourced from Slot 0 and distributed to Slots 1–12 on P3. It is distributed to each module slot in synchronous with CLK10 as a single source, single destination signal with a maximum system timing skew of 2 ns, and a maximum total delay of 8 ns.

Commander
In the VXIbus interface, a device that controls another device (a servant). A commander may be a servant of another commander.

Command
A directive to a device. There are three types of commands:

In Word Serial Protocol, a 16-bit imperative to a servant from its commander.

In Shared Memory Protocol, a 16-bit imperative from a client to a server, or vice versa.

In a Message, an ASCII-coded, multi-byte directive to any receiving device.

Communication Registers
In word serial protocol, a set of device registers that are accessible to the commander of the device. Such registers are used for inter-device communications, and are required on all VXIbus message-based devices.

Configuration Registers
A set of registers that allow the system to identify a (module) device type, model, manufacturer, address space, and memory requirements. In order to support automatic system and memory configuration, the VXIbus standard specifies that all VXIbus devices have a set of such registers, all accessible from P1 on the VMEbus.

C-Size Card
A VXIbus instrument module that is 340.0 × 233.4 mm × 30.48 mm (13.4 × 9.2 in × 1.2 in).

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Custom Device
A special-purpose VXIbus device that has configuration registers so as to be identified by the system and to allow for definition of future device types to support further levels of compatibility.

Data Transfer Bus
One of four buses on the VMEbus backplane. The Data Transfer Bus allows Bus Masters to direct the transfer of binary data between Masters and Slaves.

Device Specific Protocol
A protocol for communication with a device that is not defined in the VXIbus specification.

D-Size Card
A VXIbus instrument module that is 340.0 × 366.7 mm × 30.48 mm (13.4 × 14.4 in × 1.2 in).

DTB
See Data Transfer Bus.

DTB Arbiter
A functional module that accepts bus requests from Requester modules and grants control of the DTB to one Requester at a time.

DUT
Device Under Test.

ECLTRG
Six single-ended ECL trigger lines (two on P2 and four on P3) that function as inter-module timing resources, and that are bussed across the VXIbus subsystem backplane. Any module, including the Slot 0 module, may drive and receive information from these lines. These lines have an impedance of 50 Ω; the asserted state is logical High.

Embedded Address
An address in a communications protocol in which the destination of the message is included in the message.

ESTST
Extended STart/STop protocol; used to synchronize VXIbus modules.

Extended Self Test
Any self test or diagnostic power-on routine that executes after the initial kernel self test program.

External System Controller
The host computer or other external controller that exerts overall control over VXIbus operations.

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IACK Daisy Chain Driver
The circuit that drives the VMEbus Interrupt Acknowledge daisy chain line that runs continuously through all installed modules or through jumpers across the backplane.

ID-ROM
An NVRAM storage area that provides for non-volatile storage of diagnostic data.

Instrument Module
A plug-in printed circuit board, with associated components and shields, that may be installed in a VXIbus mainframe. An instrument module may contain more than one device. Also, one device may require more than one instrument module.

IntelliGuides
The card guides used in the VX1411A IntelliFrame Mainframe. The card guides on the bottom of the mainframe shut off airflow when no modules are installed in the respective slots.

IntelliFrame® mainframe
A family of VXI mainframes from Tektronix that automatically direct airflow to the installed modules, have an autoconfigure backplane, have adjustable rack kits and cable trays (optional), and can be upgraded.

Interface Device
A VXIbus device that provides one or more interfaces to external equipment.

Interrupt Handler
A functional module that detects interrupt requests generated by Interrupters and responds to those requests by requesting status and identity information.

Interrupter
A device capable of asserting VMEbus interrupts and performing the interrupt acknowledge sequence.

IRQ
The Interrupt ReQuest signal, which is the VMEbus interrupt line that is asserted by an Interrupter to signify to the controller that a device on the bus requires service by the controller.

Local Bus
A daisy-chained bus that connects adjacent VXIbus slots.

Local Controller
The instrument module that performs system control and external interface functions for the instrument modules in a VXIbus mainframe or several mainframes. See Resource Manager.

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Local Processor
The processor on an instrument module.

Logical Address
The smallest functional unit recognized by a VXIbus system. It is often used to identify a particular module.

Mainframe
Tektronix VX1411A IntelliFrame Mainframe, an operable housing that includes 13 C-size VXIbus instrument module slots.

Memory Device
A storage element (such as bubble memory, RAM, and ROM) that has configuration registers and memory attributes (such as type and access time).

Message
A series of data bytes that are treated as a single communication, with a well defined terminator and message body.

Message Based Device
A VXIbus device that supports VXI configuration and communication registers. Such devices support the word serial protocol, and possibly other message-based protocols.

MODID Lines
Module/system identity lines.

Physical Address
The address assigned to a backplane slot during an access.

Power Monitor
A device that monitors backplane power and reports fault conditions.

P1
The top-most backplane connector for a given module slot in a vertical mainframe such as the Tektronix VX1411A IntelliFrame Mainframe. The left-most backplane connector for a given slot in a horizontal mainframe.

P2
The bottom backplane connector for a given module slot in a vertical C-size mainframe such as the VX1411A IntelliFrame Mainframe; or the middle backplane connector for a given module slot in a vertical D-size mainframe.

P3
The bottom backplane connector for a given module slot in a vertical D-size mainframe.

Query
A form of command that allows for inquiry to obtain status or data.

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READY Indicator
A green LED indicator that lights when the power-on diagnostic routines have been completed successfully. An internal failure or failure of +5 V power will extinguish this indicator.

Register Based Device
A VXIbus device that supports VXI register maps, but not high level VXIbus communication protocols; includes devices that are register-based servant elements.

Requester
A functional module that resides on the same module as a Master or Interrupt Handler and requests use of the DTB whenever its Master or Interrupt Handler requires it.

Resource Manager
A VXIbus device that provides configuration management services such as address map configuration, determining system hierarchy, allocating shared system resources, performing system self test diagnostics, and initializing system commanders.

Self Calibration
A routine that verifies the basic calibration of the instrument module circuits, and adjusts this calibration to compensate for short- and long-term variables.

Self Test
A set of routines that determine if the instrument module circuits will perform according to a given set of standards. A self test routine is performed upon power-on.

Servant
A VXIbus message-based device that is controlled by a commander.

Server
A shared memory device that controls the shared memory buffers used in a given Shared Memory Protocol channel.

Shared Memory Protocol
A communications protocol that uses a block of memory that is accessible to both client and server. The memory block operates as a message buffer for communications.

Slot 0 Controller
See Slot 0 Module. Also see Resource Manager.

Slot 0 Module
A VXIbus device that provides the minimum VXIbus slot 0 services to slots 1 through 12 (CLK10 and the module identity lines), but that may provide other services such as CLK100, SYNC100, STARBUS, and trigger control.

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SMP
See Shared Memory Protocol.

STARX
Two (2) bi-directional, 50 Ω, differential ECL lines that provide for inter-module asynchronous communication. These pairs of timed and matched delay lines connect slot 0 and each of slots 1 through 12 in a mainframe. The delay between slots is less than 5 ns, and the lines are well matched for timing skew.

STARY
Two (2) bi-directional, 50 Ω, differential ECL lines that provide for inter-module asynchronous communication. These pairs of timed and matched delay lines connect slot 0 and each of slots 1 through 12 in a mainframe. The delay between slots is less than 5 ns, and the lines are well matched for timing skew.

STST
STart/STop protocol; used to synchronize modules.

SYNC100
A Slot 0 signal that is used to synchronize multiple devices with respect to a given rising edge of CLK100. These signals are individually buffered and matched to less than 2 ns of skew.

Synchronous Communications
A communications system that follows the “command-response” cycle model. In this model, a device issues a command to another device; the second device executes the command; then returns a response. Synchronous commands are executed in the order received.

SYSFAIL*
A signal line on the VMEbus that is used to indicate a failure by a device. The device that fails asserts this line.

System Clock Driver
A functional module that provides a 16 MHz timing signal on the Utility Bus.

System Hierarchy
The tree structure of the commander/servant relationships of all devices in the system at a given time. In the VXIbus structure, each servant has a commander. A commander may also have a commander.

Test Monitor
An executive routine that is responsible for executing the self tests, storing any errors in the ID-ROM, and reporting such errors to the Resource Manager.

Test Program
A program, executed on the system controller, that controls the execution of tests within the test system.

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Test System
A collection of hardware and software modules that operate in concert to test a target DUT.

TTLTRG
Open collector TTL lines used for inter-module timing and communication.

VXIbus Subsystem
One mainframe with modules installed. The installed modules include one module that performs slot 0 functions and a given complement of instrument modules. The subsystem may also include a Resource Manager.

Word Serial Protocol
A VXIbus word oriented, bi-directional, serial protocol for communications between message-based devices (that is, devices that include communication registers in addition to configuration registers).

Word Serial Communications
Inter-device communications using the Word Serial Protocol.

WSP
See Word Serial Protocol.

10-MHz Clock
A 10 MHz, ±100 ppm timing reference. Also see CLK10.

100-MHz Clock
A 100 MHz, ±100 ppm clock synchronized with CLK10. Also see CLK100.

488-To-VXIbus Interface
A message based device that provides for communication between the IEEE-488 bus and VXIbus instrument modules.

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