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Service Manual

Tektronix

VX1405
VXI C-Size Mainframe (5-Slot)

070-7725-00

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to the Safety Summary prior to performing service.

Please check for change information at the rear of this manual.

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Preface

Overview

This manual provides qualified service technicians sufficient information to repair and maintain the VX1405. All aspects of returning this product to peak operating condition are covered, including verification, troubleshooting, and component replacement.

Nomenclature

The following nomenclature is used in this manual.

- All Field Replaceable Unit names are capitalized, e.g. Backplane.
- All control names are printed in capital letter, e.g. RESET.
- All internal signal names are printed in small capital letters, e.g. SENSE IN.
- A signal that is active when in the low state will have an asterisk (*) following the signal name, e.g. ACFAIL*.

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VX1405 Documentation

Operating and service instructions for the VX1405 are found in separate manuals.

VX1405 Mainframe Instruction Manual

The Instruction Manual contains all the instructions, procedures, and data required to install and operate the VX1405. It includes product specifications, installation and set-up procedures, detailed functional descriptions of all controls and indicators, as well as operator check and maintenance procedures.

VX1405 1R Optional Rackmount Adaptor Kit Instruction Manual

Provides instructions for the installation and use of the optional rackmounting kit.

VX1405 Service Manual

The Service Manual contains information to perform maintenance and repairs to the module level. This manual is designed to be used in conjunction with the Instruction Manual. The Service Manual contains the following sections:

Section 1:	General Information - Provides a brief description of the product, and servicing safety information.
Section 2:	Theory of Operation: - Describes the theory of operation of the circuitry of the product. The level of detail varies depending upon the Tektronix support strategy for the various components of the product.
Section 3:	Performance Check - Describes procedures required to test the product to specification.
Section 4:	Maintenance - Describes procedures required to test, isolate faults and repair the VX1405. The procedures are tailored to the Tektronix support strategy for the various components of the product.
Section 5:	Replaceable Parts - Parts lists for Electrical and Mechanical replaceable parts, as well as Standard and Optional Accessories.

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Section 1
General Information

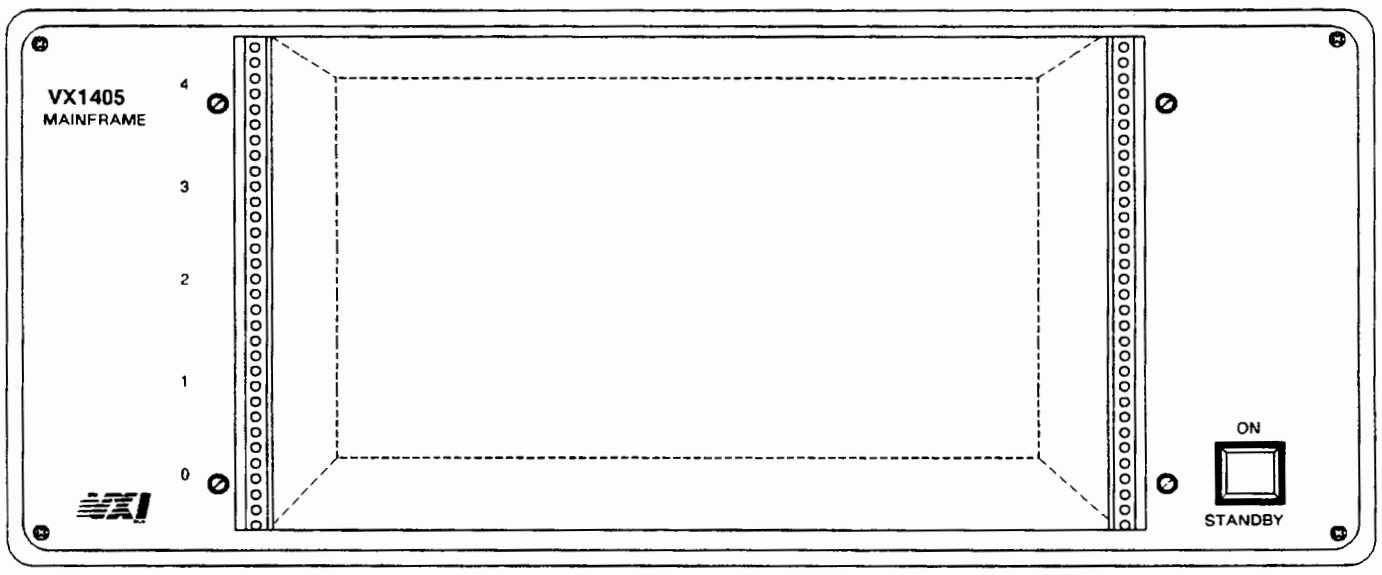


Figure 1-1: VX1405 VXI 5 Slot Horizontal Mainframe

VX1405 General Description

The VX1405 is a portable C-size VXI mainframe that is ideal for portable applications as well VXI card development. It was designed with the desktop environment in mind, having thermally controlled fans for low noise, and a small footprint. For VXI development, it has a prototype access area eliminating the need for extender cards, and a fused backplane for protection. Ample power is provided by two power supplies totaling 425 watts. Figure 1-1 is an illustration of the VX1405.

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Standard Accessories

North American 120V Power Cord

Instruction Manual

Service Manual

Options

Rackmount Kit

A1 European Power Cord

A2 United Kingdom Power Cord

A3 Australian Power Cord

A4 North American 240V Power Cord

A5 Swiss Power Cord

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Safety Summary

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply and do not appear in this summary.

Terms in This Manual

CAUTION

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING

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

Terms as Marked on Equipment

CAUTION

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

Symbols as Marked on Equipment



DANGER - High voltage.



Protective ground (earth) terminal.



ATTENTION - Refer to manual.

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Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before making any connections to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Danger Arising from Loss of Ground.

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulated) can render an electric shock.

Use the Proper Power Cord

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this instrument in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections or components while power is on. Disconnect power before removing protective panels, soldering, or replacing components.

Federal Communications Commission Radio Frequency Interference Warning

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the users at their own expense may be required to take whatever measures may be required to correct the interference.

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Section 2
Theory of Operation

Introduction

The VX1405 consists of 3 major electrical functions: Backplane, Power Supplies, and Fans.

Each of these functions will be described below.

Backplane

The VX1405 Backplane complies with the VXIbus System Specification Rev. 1.2, dated June 21, 1989. It also contains several jumpers that allow the user to tailor the VX1405 to their specific application. These jumpers are described in detail in the VX1405 Mainframe Instruction Manual.

Power Supplies

Two interconnected Power Supply Modules are used to provide all the voltages. One module provides -5.2VDC, -2VDC, +24VDC and -24VDC and is mounted in the forward portion of the power supply assembly. The other module provides +5VDC, +12VDC and -12VDC and is mounted in the rear portion of the power supply assembly.

The Power Supply Modules feature automatic line voltage switching and remote switching for power ON/STANDBY (located on the Front Panel). The power supplies are serviced as modules; therefore no description will be provided of module circuitry.

The Power Switch is a SPDT latching switch with built-in lamp. It is connected to the Power Supply Modules' REMOTE CONTROL inputs, allowing low voltage, low current switching control.

When the Power Switch is turned ON, the Power Supply Modules' REMOTE CONTROL line is released from ground, turning on the power supplies. Simultaneously, the ACFAIL* signal is also released from ground. As the +5V rises, SYSRESET* is forced low for at least 200 mSec, reseting all the VXI cards.

When the Power Switch is turned to STANDBY, the ACFAIL* signal is forced immediately low. Approximatly 10 mSec later, SYSRESET* is driven low. The REMOTE CONTROL lines go low approximately 30 mSec after the power switch is turned to STANDBY, shutting down the Power Supply Modules.

If either Power Supply Module detects an AC line interruption, it pulls the POWER FAIL signal low, which immediately forces ACFAIL* low. However, the other Power Supply Module may continue to operate.

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Fans

Three Fans provide cooling for the Power Supply Modules and the VXI modules installed in the card cage. The two forward Fans cool the card cage and run at temperature controlled variable speed. The single Fan in the rear of the chassis cools the Power Supply Modules and also runs at a temperature controlled rate. The temperature sensor for the Fans is located on the left edge of the Backplane and monitors the exhaust air temperature. All Fans draw their power from the + 12V Power Supply, and draw a total of approximately 1.5 amps.

Two Backplane jumpers control the action of the VXI card cage cooling Fans. Jumper J13 enables or disables temperature controlled speed modulation of the card cage Fans. Jumper J14 selects either high or low range. In the high range, the Fans' speed range is approximately 1900 to 2800 RPM. In the low range, the two card cage cooling Fans run from approximately 1000 to 2800 RPM. Maximum Fan speed for both range settings is attained at 42° C to 48° C. An op-amp circuit connected between the temperature sensor and the fan drivers acts as a low pass filter to prevent rapid changes in Fan speeds. The Power Supply Modules' cooling Fan speed control is not user configurable.

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Section 3
Performance Check

Introduction

The VXI Slot 0 Resource Manager and the VXI system host may have diagnostic software checks to indicate system faults. The VX1405 mainframe does not contain diagnostic software itself. In some cases, the mainframe could cause a system fault. This may be indicated by all the individual system components passing their internal self-checks, but failing the system diagnostics. Usually only a visual inspection and a check of the Power Supply Modules is required to verify mainframe performance.

The Power Supply Modules should be checked to specifications if operational problems are found simultaneously in more than one VXI module installed in the mainframe. Power problems usually affect more than one VXI module at a time, though not all VXI modules will fail on marginal power supplies.

Test Equipment Required

The recommended test equipment required for the performance check is listed in Table 3-1. Equivalent equipment may usually be substituted provided it meets the key specifications listed in the table. All equipment is assumed to be operating properly and calibrated to specification.

Table 3-1: Test Equipment Required

Equipment Type	Qty.	Minimum Requirements	Recommended Equipment
Oscilloscope	1	10 Mhz @ 10 mV, with 10 or 20 Mhz Bandwidth Limit	2465BDM
Digital Voltmeter	1	<.3% 2VDC – 24VDC	2465BDM*
X10 Probe	1	>10 Mhz Bandwidth	P6133

* DVM is built-in the oscilloscope

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Preparation for Checks

It is necessary to remove the Top Cover prior to the performance check. Refer to the Removal/Replacement instructions in Section 4 of this manual for disassembly procedures. The performance check requires application of power while the covers are off. Use caution to avoid injury.

WARNING

To avoid electric shock, disconnect the power source when removing/replacing the covers. Hazardous voltages are exposed when the covers are removed, even when the power switch is in the STANDBY position. Use extreme caution when the product is connected to the power source while the covers are removed.

CAUTION

To prevent possible damage to the mainframe and modules, remove all VXI modules from the mainframe before removing the mainframe covers, or before performing this performance check.

Table 3-2: Power Supply Test Limits

Nominal Voltage	Voltage Limits	Noise Limit
+5.0V	+5.25V to +4.875V	<50mV
+12.0V	+12.6V to +11.64V	<50mV
-12.0V	-12.6V to -11.64V	<50mV
-2.0V	-2.1V to -1.9V	<50mV
-5.2V	-5.46V to -5.044V	<50mV
+24.0V	+25.2V to +23.28V	<150mV
-24.0V	-25.2V to -23.28V	<150mV

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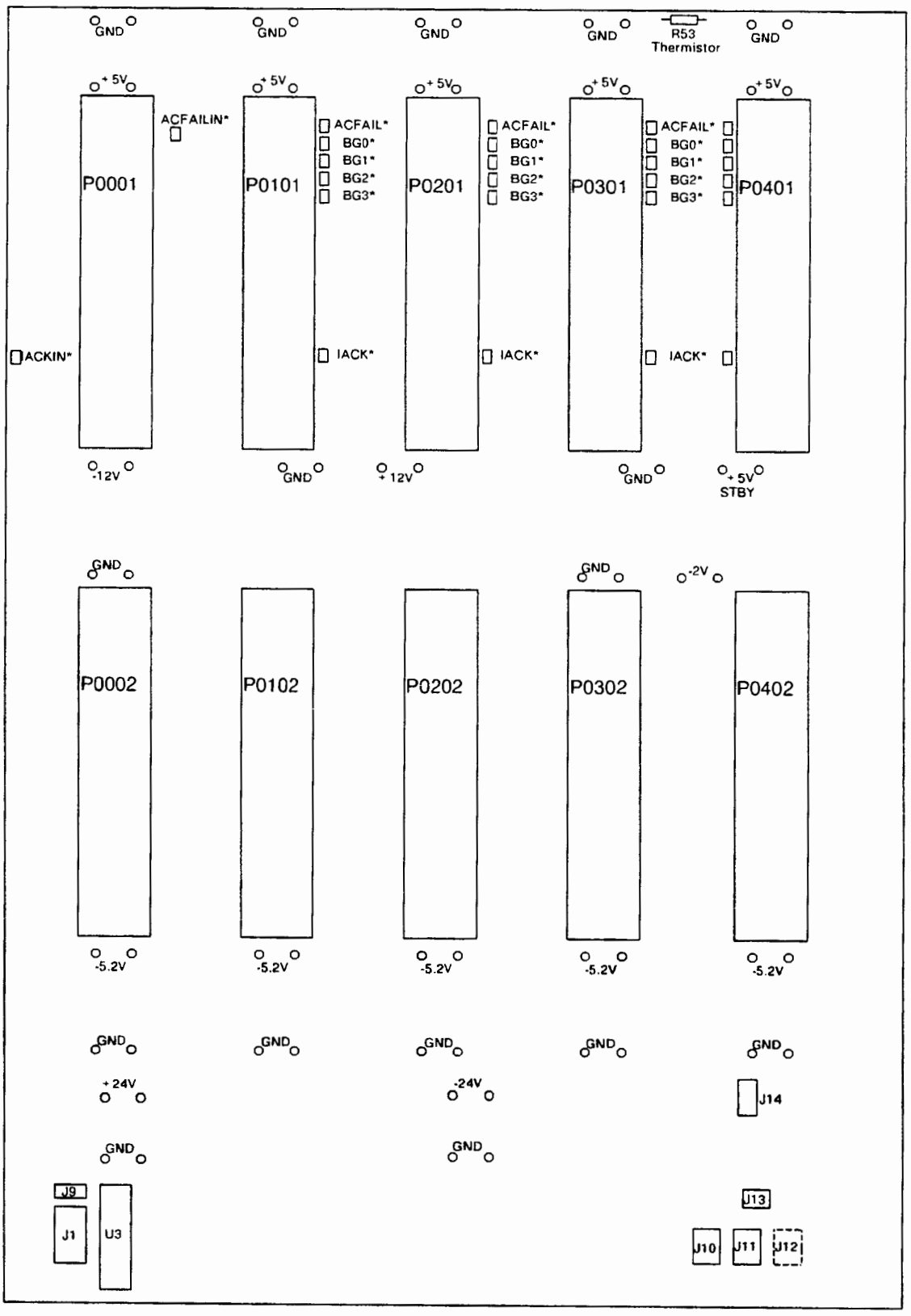


Figure 3-1: VX1405 Backplane

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Power Supply Voltages

The power supply voltages can be checked in several places: at the power lugs on the back of the Backplane, on the front of the Backplane at the power lug through-hole connections, and at the P1 and P2 connectors. Usually it is easiest to make measurements from the front of the Backplane at the power lug through-hole connectors. Refer to Figure 3-1 for test locations.

The through-hole power and ground lug connections are in groups of two circuit board pads each; either of these pads may be used to check a given supply. Note there are multiple test points for the +5V and –5.2V supplies. These supplies are connected to the Backplane through separately fused circuits, though they originate from the same source. Each of these multiple connections should be checked to verify the fuses. Refer to Table 3-2 for the acceptable voltage limits.

All the ground leads are connected together within the Backplane. Therefore, any convenient ground lead can be used for measurement purposes.The chassis ground is not connected to the power supply ground, and should not be used for power supply measurement.

Power Supply Noise

The noise specification for the power supplies includes only noise with frequency components between 2 Hz and 10 Mhz. However, it is generally sufficient to test for noise with a DC coupled oscilloscope that has a 20 Mhz bandwidth limit. Only in cases of questionable results should it be necessary to use 2 Hz and 10 Mhz filters in the measurement process.

Noise checks should be made in the same manner as the voltage checks. The oscilloscope test probe ground lead should be as short as possible, and must be securely connected to power supply ground. Generally, the oscilloscope should be set to its fastest sweep speed for easiest interpretation of the display. The trace width from the top to the bottom of the envelope represents the noise amplitude. Refer to Table 3-2 for the allowable noise limits.

Fans

The fans should be running at all times while the Power Switch is in the ON position and the mainframe is at or above room temperature. If jumper J13 is installed, the two VXI card cage cooling fans will be running at full speed, and the Power Supply Module cooling Fan will run at a variable rate. If jumper J13 is not installed, all three Fans will run at a variable rate. The fan control circuitry can be checked by alternately heating and cooling the sensing thermistor R53 at the upper left edge of the Backplane, as shown in Figure 3-1. The fans should run faster as the thermistor is warmed, and slower as the thermistor is cooled. Avoid contact with the thermistor, as it is easily damaged.

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Section 4
Maintenance

Removal/Replacement Procedures

Covers

WARNING

To avoid electric shock, disconnect the power source when removing/replacing the covers. Hazardous voltages are exposed when the covers are removed, even when the power switch is in the STANDBY position. Use extreme caution when the product is connected to the power source while the covers are removed.

Removal

It is not necessary to remove the Bottom Cover for most service operations. The Top and Bottom Covers are fastened with fourteen screws each. Four screws are located on each side along the edge of the cover, and three screws are located along the front and rear edges. After removing the screws, the covers may be lifted off.

Replacement

Place the cover on the frame, making sure the ventilation holes are oriented over the cooling Fans. Install and tighten the fourteen screws; four on each side, and three along the front and rear edges.

Power Supply Assembly

WARNING

Several capacitors in the power supply assembly retain a substantial charge (up to 660 volts) after power is disconnected. To avoid electrical shock, allow at least five minutes discharge time after disconnecting power before attempting any service to the power supply assembly.

Removal

Remove the Top Cover. Remove two screws attaching the left side of the power supply assembly to the bottom panel. These screws are located in the exhaust air duct, and can be accessed with a long shaft screwdriver. Remove six screws from the rear panel, one in each corner and and one each at the top and bottom center. Slide the power supply assembly straight out the back.

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If the power supply assembly is to be completely removed, it will be necessary to disconnect the wires to the Backplane. Note the location of each wire so it can be re-connected to the proper terminal upon re-installation of the Power Supply Assembly.

Replacement

If the wires to the Backplane had been disconnected, they should be re-connected first. Refer to Figures 4-1, 4-2, and 4-3 for wiring connections. Carefully slide the power supply assembly into the chassis, exercising care that none of the wires interfere with the cooling fan or get pinched between the power supply assembly and the VX1405 bottom chassis panel. Install and tighten six screws on the rear panel, one in each corner, and one each at the top and bottom center. Install and tighten two screws in the exhaust air duct attaching the left side of the power supply assembly to the bottom panel.

Referring to the Voltage Checks paragraphs in Section 3 of this manual, verify that the proper voltages are present on the Backplane. These checks should be made before any VXI modules are plugged into the card cage.

Upon successful verification of power supply voltages, the VX1405 Top Cover may be installed.

Power Supply Modules

WARNING

Voltages up to 660 volts are always present in the Power Supply Modules while the VX1405 is connected to the power source, even when the Power Switch is in the STANDBY mode. These voltages are present on some easily accessible areas, such as heat sinks and capacitor housings. Use extreme caution when working on the Power Supply Modules while primary power is connected.

Numerous capacitors in the Power Supply Modules retain a substantial charge for several minutes after the power source is disconnected. This charge is present on some easily accessible areas, such as heat sinks and capacitor housings. To avoid electrical shock, allow at least five minutes discharge time after disconnecting primary power before attempting any work on the Power Supply Modules.

Removal

+5V, +12V and -12V Module

Remove the Top Cover. Remove eight screws from the rear panel; four along the left edge, one each at the top and bottom center, and two along the right edge. The rear panel can now be lowered for access. Mark all the cables connected to the Power Supply Module and disconnect. Remove four screws attaching the Power Supply Module metal bracket to the rear panel. Remove the Power Supply Module. The metal bracket should remain attached to the Power Supply Module.

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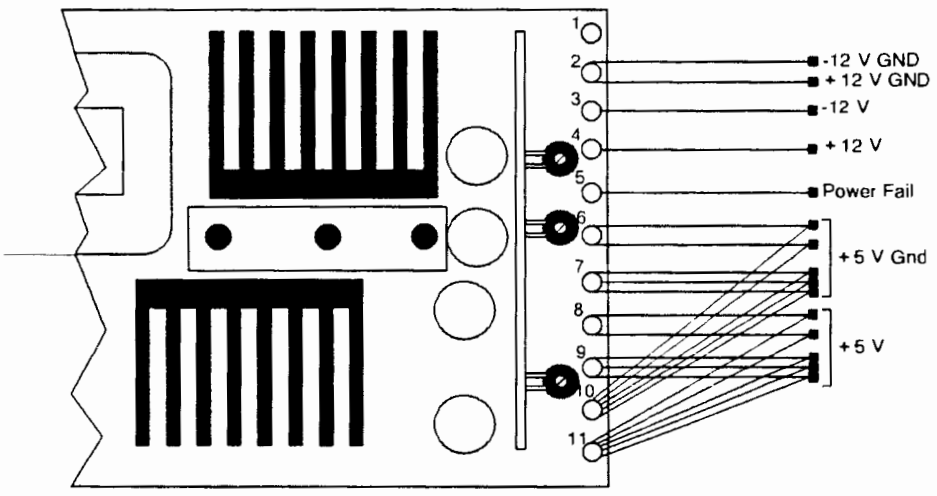


Figure 4-1: +5v, +12v, -12V Module Connections

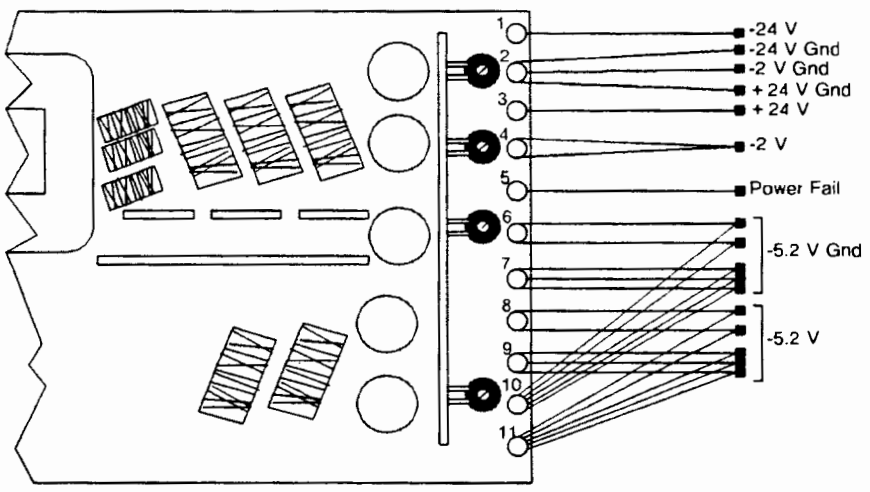


Figure 4-2: -5.2V, -2V, +24V, -24V Module Connections

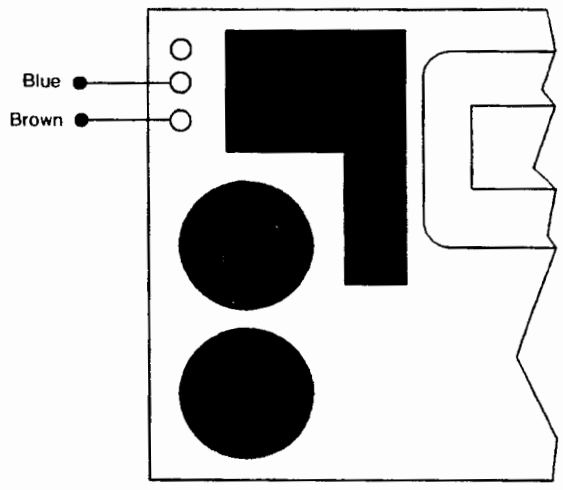


Figure 4-3: Module Primary Power Connections

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–5.2V, –2V, +24V and –24V Module

Remove the Top Cover. Remove the power supply assembly. Remove four screws attaching the top panel to the power supply assembly, and remove the top panel. Remove two screws along the left edge of the power supply assembly rear panel, allowing the rear panel to be lowered. Mark all the cables connected to the Power Supply Module and disconnect. Remove four screws attaching the Power Supply Module metal bracket to the front panel of the power supply assembly. Remove the Power Supply Module. The metal bracket should remain attached to the Power Supply Module.

Replacement

+5V, +12V and –12V Module

Position the Power Supply Module in the rear of the power supply assembly, with the primary power connector to the left. Install and tighten four screws attaching the Power Supply Module to the rear panel. Refering to Figures 4-1 and 4-3, connect all the wires. Position the rear panel onto the power supply assembly, then install and tighten eight screws; four along the left edge, one each at the top and bottom center, and two along the right edge.

Refering to the Voltage Checks paragraphs in Section 3 of this manual, verify that the proper voltages are present on the Backplane. These checks should be made before any VXI modules are plugged into the card cage.

Upon successful verification of power supply voltages, the VX1405 Top Cover may be installed.

–5.2V, –2V, +24V and –24V Module

Position the Power Supply Module in the front of the power supply assembly, with the primary power input connector to the left. Install and tighten four screws attaching the Power Supply Module to the front panel of the power supply assembly. Refering to Figures 4-2 and 4-3, connect all the wires. Position the rear panel onto the power supply assembly, then install and tighten two screws along the left-center edge of the rear panel. Position the top panel onto the power supply assembly, and install and tighten four attaching screws. Install the power supply assembly into the VX1405.

Refering to the Voltage Checks paragraphs in Section 3 of this manual, verify that the proper voltages are present on the Backplane. These checks should be made before any VXI modules are plugged into the card cage.

Upon successful verification of power supply voltages, the VX1405 Top Cover may be installed.

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Backplane

Removal

Remove the Top Cover. Remove the Power Supply Assembly. Note the position of all wires to the Backplane, and disconnect. Remove the twelve screws attaching the Backplane to the card cage rear brackets. Lift the Backplane out of the VX1405.

Replacement

Place the Backplane in its approximate installed position. Connect the Fan and STANDBY/ON Power Switch cables to the front side of the Backplane. Note the card cage rear bracket has multiple screw holes for the Backplane mounting screws. The correct screw holes are those that will position the bottom edge of the Backplane 1/16" to 1/8" above the chassis bottom panel. If a VXI module is available, it may be used to align and hold in place the Backplane during installation. Install and tighten the twelve Backplane mounting screws. Note that the center two rows of screws have two flat washers each under the screw head, the other screws have one flat washer each. Refering to Figures 3-1, 4-1 and 4-2, connect the remaining wires to the rear of the Backplane. Install the Power Supply Assembly, taking care to position the connecting wires so they will not be damaged.

Referring to the Voltage Checks paragraphs in Section 3 of this manual, verify that the proper voltages are present on the backplane. These checks should be made before any VXI modules are plugged into the card cage.

Upon successful verification of Power Supply voltages, the VX1405 Top Cover may be installed.

Card Cage Fans

Removal

Remove the Top Cover. With a long shaft screwdriver, remove the six screws attaching the fan bracket to the VX1405 bottom chassis panel. Remove the two screws attaching the top of the fan bracket to the card cage. Unplug the two fan power connectors from the backplane at J10 and J11. Carefully lift the fan assembly from the chassis, taking care not to entangle the Power Switch cable in the fan bracket. Remove the screws attaching the Fans to the fan bracket.

Replacement

Install the Fans in the fan bracket. Slide the fan assembly into the VX1405, taking care not to pinch the power switch cable between the fan bracket and the VX1405 bottom chassis panel. Connect either Fan power cable to J10 and the other Fan power cable to J11. Using a long shaft screwdriver, install and tighten the six screws attaching the fan bracket to the VX1405 bottom chassis panel. Install and tighten the two screws attaching the top of the fan bracket to the card cage. Install the VX1405 Top Cover.

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Power Switch

Removal

Remove the Top Cover. Disconnect the power switch cable from the Backplane at J1. Remove four screws, one from each corner, from the front panel. Loosen the four captive screws around the card cage opening in the Front Panel. Lift out the Front Panel. Release the locking tabs retaining the Power Switch to the Front Panel, and remove the switch and cable as an assembly.

Replacement

Press the Power Switch into the Front Panel until the locking tabs snap into position. Thread the Power Switch cable under the Fans to the Backplane, and connect to J1. It may be easier to remove the fan bracket to route and connect the cable. Place the Front Panel into position and tighten the four captive screws around the card cage opening. Install and tighten four screws, one in each corner of the Front Panel. Install the Top Cover.

Preventative Maintenance

The VX1405 is designed to require a minimum of periodic preventative maintenance. The frequency of maintenance will depend upon the use and environment in which the mainframe is used.

Cleaning

Accumulations of dirt impair the efficiency of the cooling Fans and reduce heat transfer from components. Dirt may also cause faulty operation of the Fan speed control temperature sensor. Periodically vacuum dirt and dust from the inside of the mainframe, paying particular attention to the Fans. Heavy accumulations of dirt should be removed with a soft brush. The VXI module plug connectors may be cleaned with a Freon based cleaner. Under no circumstances should water or alcohol be used to clean the VXI module plug connectors.

Adjustments

The VX1405 has been designed to require no adjustments under normal conditions.

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Troubleshooting

A visual inspection and voltage check should be adequate for most VX1405 trouble isolation. Some Slot 0 cards, such as the Tektronix VX5520, have a "DC FAIL" indicator that can be used to determine the availability of power in Slot 0.

Fuses

There are two primary power fuses, which are located on the VX1405 Rear Panel. One fuse supplies power to the +5V, +12V, –12V Power Supply Module, the other fuse supplies power to the –5.2V, –2V, +24V, –24V Power Supply Module. These should be inspected if voltage checks at the backplane indicates a group of supply voltages have failed. The fuses can be removed by inserting a screwdriver into the slot in the fuse holder cap and turning 1/8 turn counter clockwise.

There are secondary power fuses located in in-line fuse holders in the +5V cabling between the Power Supply Module and the Backplane. These fuses are to protect against catastrophic failure, and will not normally blow. The +5V supply has five fuses, one for each Backplane slot. These fuses should be inspected if the +5V supply to a single slot has failed. To gain access to the fuses, it is necessary to remove the power supply assembly from the mainframe. Refer to Removal/Replacement section of this manual for disassembly procedures.

Power Supply Modules

If one Power Supply Module detects a failure, it may shut itself and the other Power Supply Module off. This shut down, accomplished through the REMOTE SENSE lines, is to prevent VXI module damage due to partial power-on conditions.

To determine which Power Supply Module is forcing shutdown, it is necessary to disable the REMOTE CONTROL function. First, remove all the VXI modules from the card cage. Disconnect the REMOTE CONTROL line from both Power Supply Modules at the single wire connector attached to the small gauge wire soldered to each module's circuit board. Apply power, and following the Power Supply Voltage Check procedure in Section 3 of this manual, check for failed voltages. Be sure to reconnect the REMOTE CONTROL lines after performing this check and making repairs.

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Electrical Noise

Unlike many high-efficiency switching supplies, the VX1405 Power Supply Modules are designed to provide low noise power from no-load to full-load conditions. If a performance check indicates excessive electrical noise, environmental conditions or measurement technique should be inspected first.

Extremely noisy primary power can cause noisy DC voltages. An oscilloscope can be used to check incoming primary power. If excessive noise is noted, an external line filter can be installed.

The use of VXI or VME card modules that do not meet the VXIbus standard for radiated and conducted emissions can cause the power supplies to appear noisy. This can easily be verified by removing the card modules from the mainframe and re-testing for noise.

When measuring noise, it is essential that a good ground for the oscilloscope probe be established. Use as short a probe ground lead as possible. Do not connect the probe ground lead to the VX1405 chassis; the lead should be connected to one of the Backplane ground lugs. The oscilloscope bandwidth limit should be switched on, as noise above 10 Mhz is to be ignored.

Occasionally, a defective cooling Fan can inject noise into the +12V supply even though the Fan appears to be operating normally. This can be checked by unplugging the Fan power cables one at a time while monitoring the +12V supply with an oscilloscope. This check should be performed twice: first with jumper J13 installed; secondly with J13 removed, J14 in the low speed position, and the thermistor chilled to operate the Fans at their lowest operating speed.

If noise appears on the –5.2V, –2V, +24V, or –24V supplies, try connecting a 5 ohm 10 watt resistor to the –5.2V supply. If the noise disappears, no problem is indicated, as the noise is present only when the supply is unloaded. This condition will not affect normal operation of these supplies.

Loose screws and covers will cause an increase in radiated EMI.

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Fans

There are two circuits controlling the Fans. One circuit controls the Power Supply Module cooling Fan, the other controls the two card cage Fans. Both circuits are located on the Backplane, and use the same temperature sensor. All three Fans draw power from the +12V Power Supply. Note that none of the fans may run if the mainframe is very cold. However, the fans should normally start running after several minutes of operation.

The VXI card cage Fans are controlled by two user configurable jumpers. They may run continuously at full speed, or at one of two variable speed ranges. These Fans should be running at some speed whenever the Power Switch is ON and the mainframe is at or above room temperature. If one Fan does not run, then the Fan and cabling should be inspected. If both Fans fail to run, the Backplane circuitry has likely failed.

The Power Supply Module cooling Fan always runs at a variable rate, and is not user configurable. It should always be running at some speed when the Power Switch is ON and the mainframe is at or above room temperature. If the Fan is not running, its power cable can be temporarily be moved from J12 on the rear of the Backplane to J11 on the front of the Backplane. If the Fan now functions, the Backplane circuitry has likely failed. If the Fan still does not run, either the Fan or its cable has failed.

If none of the fans are running, verify the +12V supply is operational. Check that the thermistor is not damaged. A quick check of the thermistor can be made by attaching a jumper across its leads: if the fans now run, the thermistor has failed. If the fans can be made to run by reconfiguring the two fan control jumpers, a Backplane circuit failure is indicated.

Backplane Connectors

If a VXI connector is suspect, a continuity check can be made using a length of 22 AWG gauge copper wire and a DVM. The 22 AWG gauge copper wire is the correct size such that it will not damage the VXI module plug connector sockets, and can be used as a probe. The copper wire probe can also be used for checking voltages directly at the connector instead of at the through-hole power lug test points. If a bad VXI module connector is discovered, the Backplane must be replaced. The VXI module connectors are press-fit into the Backplane and are not field replaceable.

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Section 5
Replaceable Parts

Parts Ordering Information

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available. To give you the benefit of the latest circuit improvements developed in our engineering department, it is important, when ordering parts, to include the following information in your order: part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

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Mechanical Parts

Tektronix Part Number	Effective Serial Numbers	Qty.	Name and Description
119-3868-00		3	Fan
119-3659-00		1	–5.2V, –2V, +24V, –24V Power Supply Module
119-3660-00		1	+5V, +12V, –12V Power Supply Module
119-3661-00		1	Circuit Board Assy, Backplane
166-0670-00		10	Sleeve, Gray Plastic
174-1976-01		5	Cable Assembly, 24.0"L, +5V Power
174-1979-01		2	Cable Assembly, Black, 24.0"L, Ground
174-1980-01		10	Cable Assembly, Black, 24.0"L, Main Ground
174-2078-00		1	Cable Assembly, 10.0"L, Power Monitor
174-2102-01		5	Cable Assembly, Violet, 24.0"L, 5.2V Branched
196-3289-01		4	Cable Assembly, White, 24.0"L, Low Current Power
196-3290-01		1	Cable Assembly, Black, 24.0"L, Low Current Power
196-3291-01		1	Cable Assembly, Brown, 15.0"L
196-3292-01		1	Cable Assembly, Brown, 9.5"L
196-3300-01		2	Cable Assembly, White, 18.0"L
196-3316-01		1	Cable Assembly, Violet, 24.0"L
196-3317-01		2	Cable Assembly, White, 24.0"L
200-2191-00		2	Cap, Handle, Plastic Retainer, Earth Brown
210-0457-00		1	Nut, 6-32 x 0.312
210-0586-00		2	Nut, 4-40 x 0.25
210-0938-00		18	Washer, Flat, 0.109 ID x 0.25 OD
210-0940-00		12	Washer, Flat, 0.25 ID x 0.375 OD
211-0008-00		30	Screw, 4-40 x 0.25, PNH, POZ
211-0017-00		2	Screw, 4-40 x 0.75, PNH, POZ
211-0474-00		16	Screw, M5 x 12, FLH, POZ
211-0504-00		24	Screw, 6-32 x 0.25 PNH, POZ
211-0530-00		12	Screw, 6-32 x 1.75, PNH, POZ
211-0541-00		12	Screw, 6-32 x 0.25, FLH, POZ
211-0602-00		8	Screw, 6-32 x 0.438 PNH, BRS, POZ, w/Flat & Lock Washers
211-0658-00		22	Screw, 6-32 x 0.312, PNH, w/Washer
212-0023-00		4	Screw, 8-32 x 0.375, PNH, POZ
213-0146-00		8	Screw, 6-20 x 0.312, Tapping, PNH, POZ
213-0192-00		8	Screw, 6-32 x 0.5, Tapping, FLH, POZ
213-1035-00		10	Screw, M2.5 x 11, Collar, Slotted
213-1039-00		8	Set Screw, M2.5 x 0.45, Slotted
213-1041-00		12	Screw, M2.5 x 0.45 PNH, Phillips

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Tektronix Part Number	Effective Serial Numbers	Qty.	Name and Description
255-0334-00		6.5"	Plastic Channel, Power Supply Assembly
262-1034-00		1	Switch, Power, Wired, SPST w/light
333-3776-00		1	Front Panel, VX1405, w/Lexan
333-3777-00		1	Rear Panel, VX1405
334-3379-00		1	Marker, Identification, GND Symbol
337-3631-00		1	Shield, Electrical, Power Supply
342-0901-00		4	Insulator Strip, 6.076", Plastic, Backplane
343-0136-00		1	Clamp, Plastic, 0.25" ID
343-0549-00		7	Strap, Tiedown, 4.0"
343-1247-00		8	Clip, Retainer, Plastic, Red
348-0080-01		4	Foot, Cabinet, Charcoal Gray, Bottom Cover
348-0187-00		4	Foot, Cabinet, Black, Right Side
348-1166-00		2	Foot, Cabinet, Tan, Right Side
351-0865-00		10	Guide, Circuit Board, 10.7"L, Aluminum
352-0482-00		1	Holder, Cable Tie, Adhesive Backed
352-0787-00		2	Fuseholder with Cap, Panel Mount
358-0215-00		1	Grommet, Black, U Shaped, 0.524 ID
367-0248-07		1	Handle, Cabinet, 16.34"L
381-0473-00		8	Nut Bar, Threaded Insert, 6.2"L
386-5961-00		16	Support, Circuit Guides
386-6000-00		1	Rail, Cabinet, Right Side
386-6001-00		1	Ralil, Cabinet, Left Side
386-6010-00		4	Support, Circuit Guides, 1/2 Size
390-1086-00		1	Cabinet Top
390-1087-00		1	Cabinet Bottom
407-3900-00		1	Fan Bracket, Left
407-3901-00		1	Fan Bracket, Right
407-3921-00		1	Bracket, Chassis Top
426-2365-00		2	Frame, Cabinet
426-2366-00		2	Rail, Card Cage Front, 6.2"
426-2367-00		2	Rail, Card Cage Rear, 6.2"
426-2368-00		1	Rail, Center Backplane, 6.2"
441-1939-00		1	Chassis, Main
441-1940-00		1	Chassis, Top
441-1941-00		1	Chassis, Power Supply
671-1650-00	B010100-B010443	1	Circuit Board Assy, Power Monitor
671-1650-01	B010444	1	Circuit Board Assy, Power Monitor

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Electrical Parts

Tektronix Part Number	Effective Serial Numbers	Qty.	Name and Description
150-0146-00		1	Lamp, 14V 80mA, Power Switch Indicator
159-0014-00		1	Fuse, 3AG, 5A, 250V Fast Blow
159-0017-00		1	Fuse, 3AG, 4A, 250V Fast Blow
159-0088-00		5	Fuse, 3AG, 12A, 250V Slow Blow

Standard Accessories

Tektronix Part Number	Effective Serial Numbers	Qty.	Name and Description
070-7778-00		1	Instruction Manual
070-7725-00		1	Service Manual
386-6002-00		3	Plate, Front Slot Cover

Exchangeable Modules

Tektronix Part Number	Effective Serial Numbers	Qty.	Name and Description
119-3659-00		1	–5.2V, –2V, +24V, –24V Power Supply Module
119-3660-00		1	+5V, +12V, –12V Power Supply Module
119-3661-00		1	Backplane

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