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Service Manual

Tektronix

AWG5000 Series
Arbitrary Waveform Generators

071-2083-00

Revision A

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

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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.

To Avoid Fire or Personal Injury

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

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

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

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

The inputs are not rated for connection to mains or Category II, III, or IV circuits.

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

Power Disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

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

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

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

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

Symbols and Terms

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

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

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

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

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

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

CAUTION indicates a hazard to property including the product.

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



WARNING
High Voltage



Protective Ground
(Earth) Terminal



CAUTION
Refer to Manual



Double
Insulated

Service Safety Summary

Only qualified personnel should perform service procedures. Read this Service Safety Summary and the General Safety Summary before performing any service procedures.

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

Disconnect Power. To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Environmental Considerations

This section provides information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

Equipment Recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



The symbol shown to the left indicates that this product complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Mercury Notification. This product uses an LCD backlight lamp that contains mercury. Disposal may be regulated due to environmental considerations. Please contact your local authorities or, within the United States, the Electronics Industries Alliance (www.eiae.org) for disposal or recycling information.

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead, cadmium, mercury, and hexavalent chromium.

Preface

This manual contains service information for your instrument. Read this preface to learn how this manual is structured, the conventions it uses, and where to find additional supplemental information related to servicing this product.

You should also read the General and Service safety summaries before servicing the product.

Manual Structure

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

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

Manual Conventions

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

Modules

Throughout this manual, any replaceable component, assembly, or part is referred to by the term *module*. A module is composed of electrical and mechanical assemblies, circuit boards, interconnecting cables, and user-accessible controls.

Replaceable Parts

This manual refers to any field-replaceable assembly or mechanical part specifically by its name or generically as a replaceable part. In general, a replaceable part is any circuit board or assembly, such as the hard disk drive, or a mechanical part, such as the I/O port connectors, that is listed in the replaceable parts list of this manual.

Safety

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

Operating Information

Operating Information

For information on installing, operating, and networking the instrument, refer to the *AWG5000 Series Arbitrary Waveform Generators Quick Start User Manual*. This manual is available on the Document CD that came with your instrument, and on the Tektronix Web site (www.tektronix.com/manuals).

General Features

The following table and bulleted list describe the general features of the AWG5000 Series Arbitrary Waveform Generators.

Table 1-1: General features

Feature	AWG5012	AWG5014	AWG5002	AWG5004
Maximum sample rate	1.2 GS/s		600 MS/s	
D/A resolution	14 bits			
Memory length	16,200,000 or 32,400,000 (Option 01)			
Analog bandwidth	250 MHz (2 V_{p-p}) or 370 MHz (0.6 V_{p-p}, direct)			
Analog output	2	4	2	4
Maximum amplitude	4.5 V_{p-p}			
Marker output	4	8	4	8
Digital data output	28 bits (Option 03)			

- Windows XP Professional operating system
- Up to 32,400,000 memory length (Option 01)
- 28 bits digital data outputs (Option 03)
- A large 10.4 inch (264.2 mm) high resolution XGA color display
- An intuitive, graphical user interface (UI), with built-in online help
- 80 GB removable hard disk drive
- CD-RW/DVD drive
- Supports USB 2.0 interface
- LAN (1000/100/10 Base-T)
- Touch screen user interface

Options

The following options are available for the instrument:

- Option 01: Memory expansion to 32 MB
- Option 03: 28 bits digital data outputs

Table 1-2 indicates the available combinations of instrument options.

Table 1-2: Combination of instrument options

	Option 01	Option 03	Option 01, 03
AWG5014	X		
AWG5012	X	X	X
AWG5004	X		
AWG5002	X	X	X

- Option C3: Calibration service 3 years
- Option C5: Calibration service 5 years
- Option D1: Calibration data report
- Option D3, with Option C3: Calibration data report 3 years
- Option D5, with Option C5: Calibration data report 5 years
- Option R3: Repair service 3 years (including warranty)
- Option R5: Repair service 5 years (including warranty)
- AWG50UP Option M02: AWG5002 Field upgrade for waveform length expansion from 16 M to 32 M points
- AWG50UP Option M04: AWG5004 Field upgrade for waveform length expansion from 16 M to 32 M points
- AWG50UP Option M12: AWG5012 Field upgrade for waveform length expansion from 16 M to 32 M points
- AWG50UP Option M14: AWG5014 Field upgrade for waveform length expansion from 16 M to 32 M points
- AWG50UP Option D03: AWG5002 Field upgrade for digital data outputs
- AWG50UP Option D13: AWG5012 Field upgrade for digital data outputs

Theory of Operation

Theory of Operation

This section describes the electrical operation of the AWG5000 Series Arbitrary Waveform Generators.

Overview

The AWG5000 Series Arbitrary Waveform Generators provide four models with different frequency and numbers of channels. Each model consists of two major sections: the platform section and generator section. The platform section is common to each model.

Block Diagram of the System

The AWG5000 Series Arbitrary Waveform Generators are based on the Tektronix DPO7000 series platform which consists of the μATX CPU board and modern components for a PC. The instrument operates with the microsoft Window XP operating system. Figure 2-1 on page 2-2 shows the system level block diagram of the AWG5000 Series.

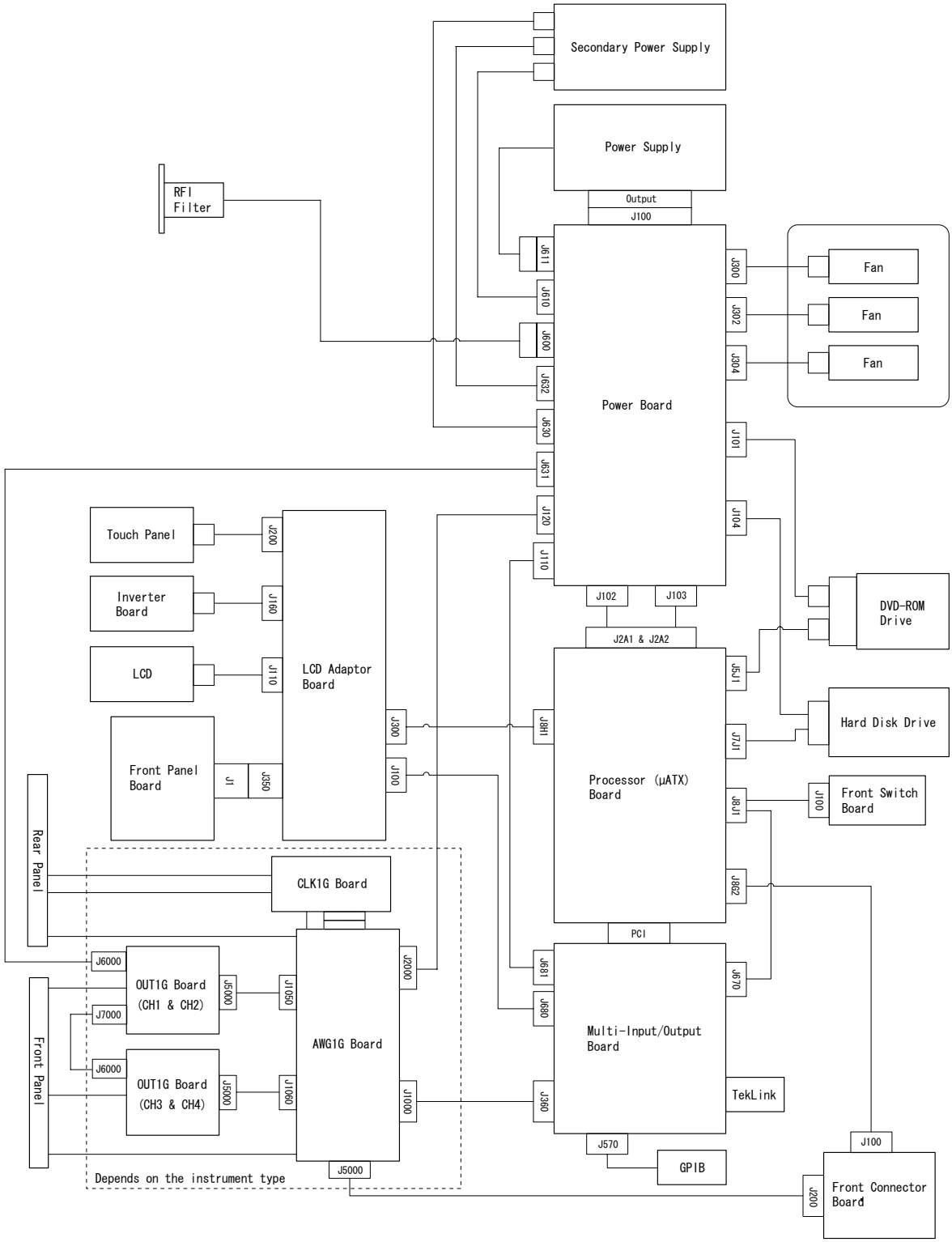


Figure 2-1: AWG5000 Series block diagram

Module Overviews

A Microsoft Windows processor system is the primary controller of the instrument. The instrument features an XGA resolution flat-panel display, a transparent touch screen, and a front panel with direct access to commonly used instrument functions. You can also make complete use of the instrument with a mouse and a keyboard.

Front Panel (FP) Board

Push-button switches on the Front Panel (FP) board are read by an embedded micro controller, which sends the button and knob change information to the μATX board via a USB path. The FP board consists of the following blocks:

- USB controller (Cypress EZ-USB FX1)
- FPGA (Altera Cyclone)
- Key switch matrix
- LED indicators (Tri-Color and Mono-Color)

LCD Adapter (LCDA) Board

The LCDA board supports interconnection between the μATX board and FP board. Two internal USB ports come from the μATX board. One USB connects to a touch panel controller. The other connect to a micro controller on the FP board. Connectors related to the LCD are also included. The LCDA board consists of the following blocks:

- Touch-panel controller
- Rotary encoder (signal goes to the FP board)
- LCD back light controller
- Connector to LCD

Multi-Input/Output (MIO) Board

The MIO board coordinates the flow of data through the Windows PCI port from various devices that communicate with the μATX system. The devices include the display system, GPIB, TekLink, and data flow (PCIF) path to the waveform generator system. An EEROM on this board is used to store the instrument setting and calibration data. The MIO board consists of the following blocks:

- PCI controller
- GPIB controller
- LCD display controller (ATI Mobility-MI)
- PCI target adapter
- PLD140 (Xilinx FPGA)
- EEPROM for calibration data storage
- TekLink interface

Front Switch (FSW) Board

The FSW board provides interconnection between the Standby switch and μATX board. It includes an LED driver.

Front Connector (FCON) Board

The FCON board provides front-panel connections of the USB ports and the DC output. It includes common mode filters that suppress EMI radiation on the USB signal.

Display Panel

The active-matrix LCD display is fully controlled by Windows drivers. It is controlled by the ATI Mobility-M1 micro circuit on the MIO board. The display has a 1024 x 768 resolution. Brightness is controlled by the intensity of the backlight.

Touch Panel

The touch information from the touch screen is processed by Windows drivers, actively placing the pointer at the touched location. Actions from the mouse and the touch panel are interchangeable, and treated alike by the user interface software. The AccuTouch five-wire resistive touch screen uses a glass panel with a uniform resistive coating. A thick polyester coversheet is tightly suspended over the top of a glass substrate, separated by small, transparent insulating dots. The coversheet has a hard, durable coating on the outer side and a conductive coating on the inner side. The controller is located on the LCDA board.

Processor (μATX) Board

The μATX board provides standard Windows functionality and I/O port interfaces on the rear panel. This includes RS-232, Parallel, and Ethernet ports, as well as four USB ports, including two USB2.0 ports located in the lower right front corner of the instrument. The μATX board receives input from the front panel and touch panel, and implements the appropriate changes. Video display data is transferred to the MIO board through the PCI bus interface. The hard drive is connected to the μATX board through the SATA interface, and the CD/DVD is connected to the Windows system through the IDE parallel interface.

Power Supply

The power supply CVR460 is a switching AC to DC converter. It automatically detects the line voltage over the range of 90 to 264 VAC. It supplies power to all the circuitry in the instrument. No switch completely disconnects the line power from the instrument. The ON/STBY switch controls the power to the instrument through the μATX board circuitry. When in the “power off” condition, there is still a low power standby current to allow the system to monitor the ON/STBY switch.

Secondary Power Supply

The secondary power supply ZWQ130 is a switching AC to DC converter. It automatically detects the line voltage over the range of 85 VAC to 265 VAC.

Fans

Three fans on the side of the instrument provide forced air cooling. The fans are controlled by the fan speed control circuit on the PWR board and are regulated by monitoring the temperature at the circuitry.

Power (PWR2) Board

The PWR2 board provides DC power to the fans, HDD, CD Drive, μATX board, MIO board, OUT1G board, and AWG1G board. All the power comes from the CVR460 module and the ZWQ130 module. The fan control circuit has a thermal sensor on this board. DC voltage to the fans is controlled relative to the sensed temperature. DC-DC converters are included for generating different DC voltages.

CLK1G Board

The CLK1G board provides a 600 MHz to 1200 MHz clock to the AWG1G board. The clock input accepts 600 MHz to 1200 MHz clock signals from an external signal source. The reference clock input accepts 5 MHz to 800 MHz reference clock signals from an external signal source. The 10 MHz reference output can be used for synchronizing frequency between two or more instruments. The CLK10G board consists of the following blocks:

- VCO (600 MHz to 1200 MHz)
- Fractional-N PLL
- 10.0 MHz TCXO (reference oscillator)
- External reference input

AWG1G Board

The AWG1G board generates arbitrary waveforms based on the waveform memory and the sequence memory. There are two types of PLDs (Xilinx FPGA) on the board. One is an AWG controller called PLD121 which interfaces to/from the MIO board. The other is a memory controller called PLD120 which generates waveform patterns. Waveform data is stored in ZBT type SRAMs. The sequence memory is included in the memory controller PLD. The AWG1G board consists of the following blocks:

- 1.2 GS/s DAC (AD9736)
- 8 channels 8:1 MUX (TEK0015 ASIC)
- PLD120 (Xilinx Virtex-4 FPGA) as a memory controller
- PLD121 (Xilinx Virtex-4 FPGA) as an AWG controller
- ZBT type SRAM for the waveform memory
- 28 bits digital output driver
- Marker output driver
- Trigger and event inputs
- DC output
- DC-DC converter

OUT1G Board

The OUT1G board provides analog outputs to the front-panel connector. Amplitude, filter, offset, add input, and On/Off controls are added to the analog outputs. The OUT1G board consists of the following blocks:

- Analog differential output amplifier
- Selectable low-pass filter
- Selectable attenuator
- Add input from external
- Control D/A for offset setting
- Level monitor A/D
- Relay driver
- Controller PLD

Adjustment Procedures

Adjustment Procedures

This section contains information about instrument adjustment. Only qualified personnel should perform adjustment procedures. Read the *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

NOTE. *Before performing adjustment procedures, you must warm up the arbitrary waveform generator at least 20 minutes in an ambient temperature between 20 °C and 30 °C. Adjustments performed before warm-up or outside this temperature range may result in poor performance.*

Adjustment Interval

If the instrument fails performance tests (refer to the *AWG5000 Series Arbitrary Waveform Generators Technical Reference Manual*), then adjustment may be required.

If periodic calibration is one of your requirements, a general rule is to verify performance and make adjustments (only if needed) every 2000 hours of operation or once a year if the instrument is used infrequently.

Adjustment After Repair

After removal and replacement of a module, you must perform the Performance Verification procedure, found in the *AWG5000 Series Arbitrary Waveform Generators Technical Reference Manual*. The Technical Reference PDF manual is included in the Product Documentation CD. This manual is also available on the Tektronix Web site (www.tektronix.com/manuals).

Required Equipment

The following equipment is required to complete the procedures.

Table 3-1: Test equipment

Description	Minimum requirements	Recommended equipment	Quantity
Frequency counter	Accuracy: within ± 0.01 ppm	Agilent 53181A	1 ea
50 Ω BNC cable		Tektronix 012-0057-01	1 ea

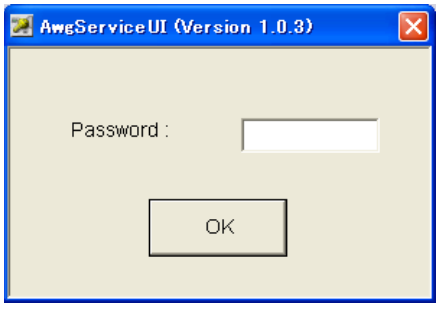
Adjustment Overview

The adjustment procedure contains three adjustment items. Before performing adjustment procedures, you must warm up the arbitrary waveform generator at least 20 minutes in an ambient temperature between 20 °C and 30 °C.

Enable the Service Menu

You must enable the Service menu to perform the adjustment procedure. To do this:

1. Power on the instrument.
2. Select the **System** menu from the menu bar, and then select **Service Mode**...
3. The following dialog box is displayed. Enter the password “1185”.



4. The following service UI menu is displayed:

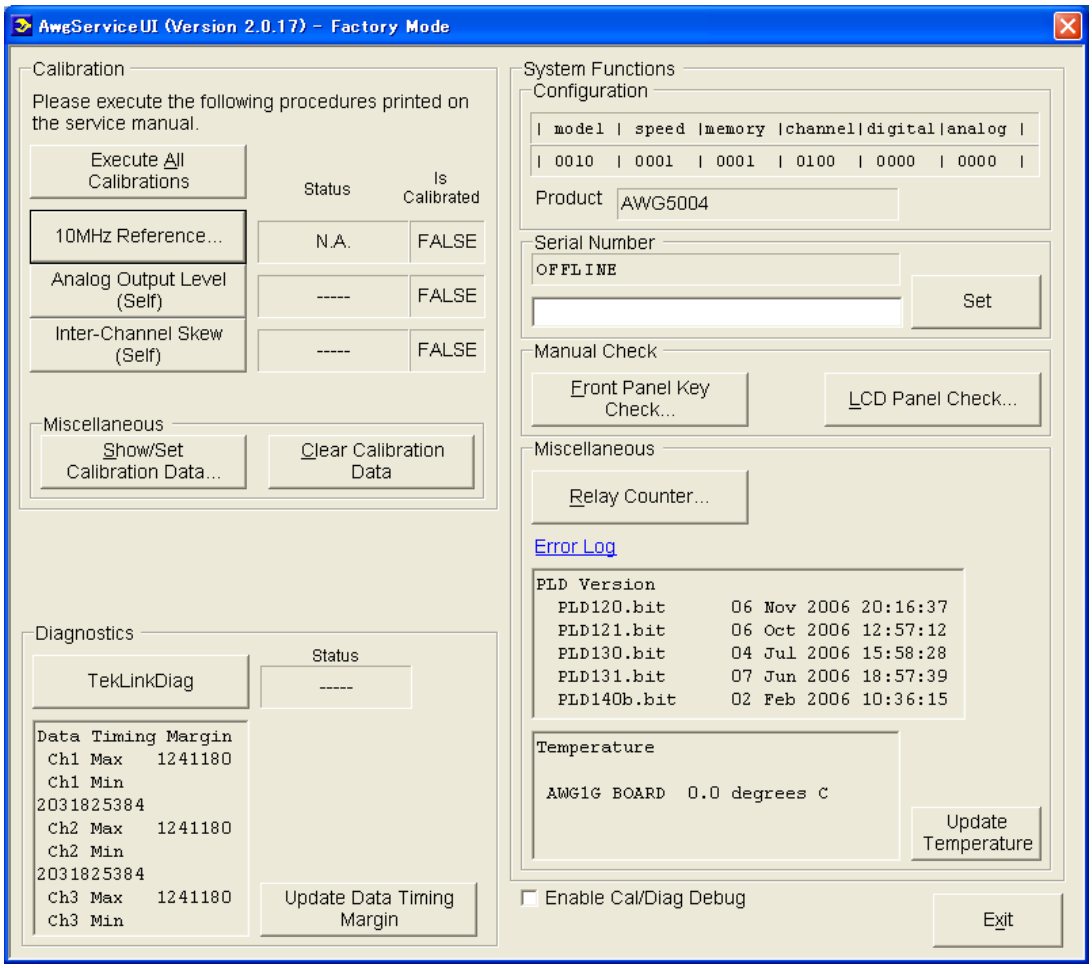


Figure 3-1: Service UI menu

The left half of the window with the title *Calibration* is the calibration part of the window. You can perform the calibrations either all in one step or individually. However, since the calibration sequence is predefined, follow the sequence from the top. You must finish a calibration item listed on the upper part of the screen before performing the lower part of the items. Some items may be grayed out, depending on your instrument option configurations.

Individual Calibrations

To perform individual calibrations, click the calibration buttons, starting with **10MHz Reference...**, and the corresponding calibrations are executed.

Execute All Calibrations

To perform all calibrations in one step, click **Execute All Calibrations** and all calibrations are executed in order starting from the top.

Saving the Calibration Results to EEPROM

When the calibration has been performed and the results are saved to the EEPROM (regardless of the item, all results are saved to the EEPROM on the MIO board), the flag under *Is Calibrated* will be set to TRUE. If the calibration was successful, the *Status* field will display PASS. If the calibration failed, FAIL will be displayed.

There are two types of calibration: Self calibration and Manual calibration.

- Self calibration – The instrument performs the calibration item and ends automatically.
- Manual calibration – This calibration item requires external devices listed on Table 3-1 and manual data input.

A warning message is displayed if you click a calibration button without waiting for 20 minutes after the instrument powered on. Click the Cancel button and allow at least 20 minutes for the instrument to warm up.

Calibration Procedure

10 MHz Reference Clock Calibration

This procedure adjusts the built-in TCXO oscillator frequency for the 10 MHz Reference Output.

Equipment required	One frequency counter One 50 Ω BNC cable

1. Install the test hookup and preset the instrument controls:
   a. Use the 50 Ω BNC cable to connect the 10 MHz Reference Output connector on the AWG5000 rear panel to the CHANNEL 1 connector on the frequency counter. See Figure 3-2.

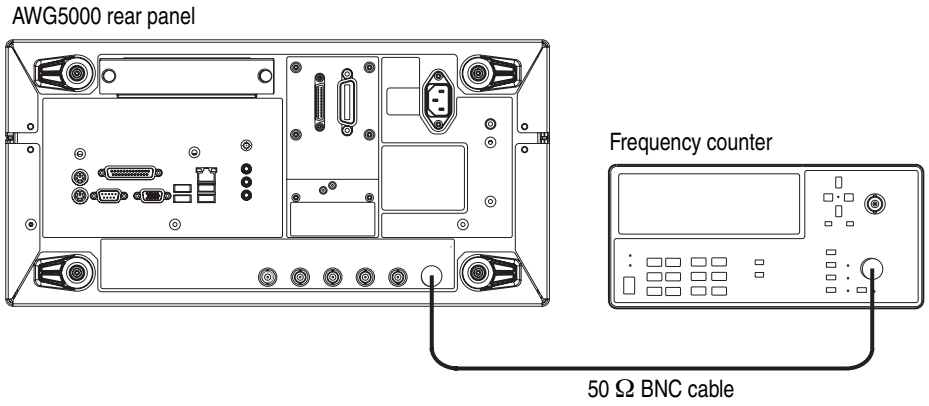


Figure 3-2: 10 MHz Reference clock calibration test hookup

2. Set the frequency counter settings as indicated below:

   Input impedance . . . . . AC, 50 Ω
   Gate time . . . . . 0.1 s

3. Click the **10 MHz Reference...** button in the Service UI menu to display the following dialog box:

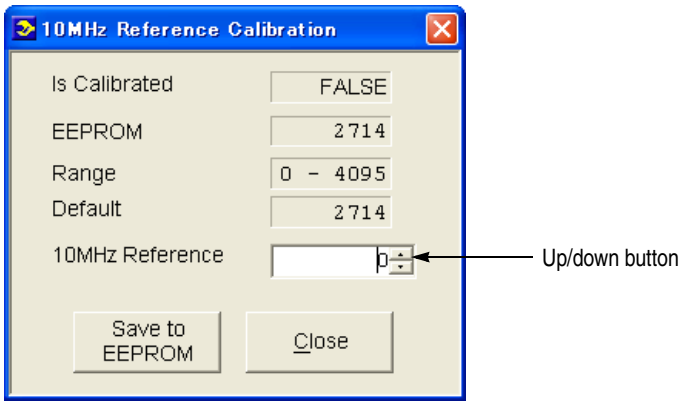


Figure 3-3: 10 MHz Reference Calibration dialog box

4. Change the **10MHz Reference DAC** value using the up/down button or the front-panel rotary knob so that the frequency counter reading is within the range of 10 MHz ±1 Hz.
5. Click **Save to EEPROM** to save the data to the EEPROM.
6. Click **Close** to close the dialog box.

Analog Output Level Calibration

This is a self calibration. This calibration is required to ensure that the analog output levels are within the specified range.

Inter-Channel Skew Calibration

This is a self calibration. This calibration is required to ensure that the inter-channel skews are within the specified range.

This completes the adjustment procedures. Disconnect the equipment from the instrument.

Maintenance

Maintenance

This section contains information needed to do periodic and corrective maintenance on the instrument. The following subsections are included:

- *Preparation* — Tells you how to get ready to do arbitrary waveform generator maintenance.
- *Preparation Preventing ESD* — Provides general information on preventing damage to internal modules when doing maintenance.
- *Inspection and Cleaning* — Information and procedures for inspecting the instrument and cleaning its external and internal modules.
- *Removal and Installation Procedures* — Procedures for the removal of defective modules and replacement of new or repaired modules.
- *Toubleshooting* — Information for isolating failed modules. Included are instructions for operating the instrument diagnostic routines and troubleshooting trees. Most of the trees make use of the internal diagnostic routines to speed fault isolation to a module.

Preparation

Only qualified persons should perform service procedures. Before performing any service procedures, read the *Service Safety Summary* and *General Safety Summary* at the front of this manual and the ESD information below. Also refer to the Operating Information section and your arbitrary waveform generator quick start user manual for information about using the arbitrary waveform generator.

Preventing ESD

When performing any service that requires internal access to this instrument, adhere to the following precautions to avoid damaging internal modules and their components due to electrostatic discharge (ESD).



CAUTION. *Static discharge can damage any semiconductor component in this instrument.*

- Minimize handling of static-sensitive modules.
- Transport and store static-sensitive modules in their static protected containers or on a metal rail. Label any package that contains static-sensitive modules.

- Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these modules. Do service of static-sensitive modules only at a static-free work station.
- Do not allow anything capable of generating or holding a static charge on the work station surface.
- Handle circuit boards by the edges when possible.
- Do not slide the modules over any surface.
- Avoid handling modules in areas that have a floor or work-surface covering capable of generating a static charge.

Inspection and Cleaning

Inspection and Cleaning describes how to inspect for dirt and damage, and how to clean the exterior and interior of the instrument. Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent instrument malfunction and enhance its reliability.

Preventive maintenance consists of visually inspecting and cleaning the instrument and using general care when operating it.

How often to do maintenance depends on the severity of the environment in which the instrument is used. A proper time to perform preventive maintenance is just before instrument adjustment.

General Care

For optimum performance, follow these recommendations:

- Protect the instrument from adverse weather conditions. The instrument is not waterproof.
- Do not store or leave the instrument where the liquid crystal display (LCD) will be exposed to direct sunlight or high humidity for long periods of time.
- The cabinet helps keep dust out of the instrument and must be in place during normal operation.
- To avoid damage to the instrument, do not expose it to any sprays, liquids, or solvents.

Inspection and Cleaning procedures

The collection of dirt on internal components can cause them to overheat and fail. Dirt also provides an electrical conduction path that could cause an instrument failure, especially under high-humidity conditions. Inspect the instrument as often as operating conditions require.

WARNING. *Before performing any of the following procedures, power down the instrument and disconnect it from line voltage.*

CAUTION. *Avoid the use of chemical cleaning agents, which might damage the plastics used in this AWG5000 Series Arbitrary Waveform Generator. Use only deionized water when cleaning the front-panel buttons. Use an ethyl alcohol solution as a cleaner and rinse with deionized water.*

Inspection — Exterior. Inspect the outside of the instrument for damage, wear, and missing parts, using Table 4-1 as a guide. An instrument that appears to have been dropped or otherwise abused should be checked thoroughly to verify correct operation and performance. Immediately repair defects that could cause personal injury or further damage to the instrument.

Table 4-1: External inspection checklist

Item	Inspect for	Repair action
Cabinet, front-panel, and cover	Cracks, scratches, deformations, damaged hardware or gaskets.	Repair or replace defective module.
Front-panel knob	Missing, damaged, or loose knob.	Repair or replace missing or defective knob.
Connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Repair or replace defective modules. Clear or wash out dirt.
Carrying handle and cabinet feet	Correct operation.	Repair or replace defective module.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors.	Repair or replace damaged or missing items, frayed cables, and defective modules.

Cleaning Procedure — Exterior. Do the following steps to clean the instrument exterior:

1. Remove loose dust on the outside of the instrument with a lint-free cloth. Use care to avoid scratching the clear glass display shield.

2. Remove remaining dirt with a lint-free cloth dampened in a general purpose detergent-and-water solution. Do not use abrasive cleaners.

CAUTION. *To prevent getting moisture inside the instrument during external cleaning, use only enough liquid to dampen the cloth or applicator.*

To avoid damage to the surface of the instrument, do not use any abrasive or chemical cleaning agents.

Flat Panel Display Cleaning. The display is a soft plastic display and must be treated with care during cleaning.

CAUTION. *Imported cleaning agents or methods can damage the flat panel display.*

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

Avoid spraying liquids on the display surface.

Avoid scrubbing the display with excessive force.

1. Clean the flat panel display surface by gently rubbing the display with a clean-room wipe (such as Wypall Medium Duty Wipes, #05701, available from Kimberly-Clark Corporation).
2. If the display is very dirty, moisten the wipe with distilled water or a 75% isopropyl alcohol solution and gently rub the display surface. Avoid using excess force or you may damage the plastic display surface.

CAUTION. *To prevent getting moisture inside the instrument during external cleaning, use only enough liquid to dampen the cloth or applicator.*

Inspection — Interior. Inspect and clean the interior if it appears that the instrument may have been damaged or exposed to an unusually dirty environment.

To access the inside of the instrument for inspection and cleaning, refer to the *Removal and Installation Procedures* in this section.

Inspect the internal portions of the instrument for damage and wear, using Table 4-2 as a guide. Defects should be repaired immediately.

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

Table 4-2: Internal inspection checklist

Item	Inspect for	Repair action
Front and rear case	Cracks or deformations. Scratched lettering or display filter. Loose connectors or labels.	Repair or replace defective hardware.
Circuit boards	Loose, broken, or corroded solder connections. Burned circuit boards. Burned, broken, or cracked circuit-run plating.	Remove failed module and replace with a new module.
Solder connections	Cold solder or rosin joints.	Resolder joint and clean with ethyl alcohol.
Wiring and cables	Loose plugs or connectors. Burned, broken, or frayed wiring.	Firmly seat connectors. Repair or replace modules with defective wires or cables.
Chassis	Dents, deformations, and damaged hardware.	Straighten, repair, or replace defective hardware.

Cleaning Procedure — Interior. Do the following steps to clean the instrument interior:

1. Blow off dust with dry, low-pressure, deionized air (approximately 9 psi).
2. Remove any remaining dust with a lint-free cloth dampened in isopropyl alcohol (75% solution) and rinse with warm deionized water. (A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards.)

NOTE. *If steps 1 and 2 do not remove all the dust or dirt, please contact Tektronix. (See Contacting Tektronix at the front of this manual.)*

Lubrication. There is no periodic lubrication required for the AWG5000 Series Arbitrary Waveform Generator.

Removal and Installation Procedures

This section contains procedures for removal and installation of all mechanical and electrical modules.

Preparation



WARNING. *Only qualified personnel should perform service procedures.*

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

To prevent damage to the instrument components, read Preventing ESD *in this section.*

Before doing any procedure in this section, disconnect the power cord from the line voltage source.

This section contains the following items:

- This preparatory information that you need to properly do the following procedures.
- List of tools required to remove and disassemble all modules.
- Procedures for removal and reinstallation of the modules.

NOTE. *Read Equipment Required for a list of the tools needed to remove and install modules in this instrument. See Table 4-3, on page 4-9. Read the cleaning procedure before disassembling the instrument for cleaning.*

Adjustment after repair

After the removal and replacement of a module due to electrical failure, perform the adjustment procedures. Refer to the *Adjustment Procedures* section.

List of Modules

The *Replaceable Parts* section provides a list of all replaceable modules. Any electrical or mechanical module, assembly, or part listed in the parts list is referred to as a module.

Summary of Procedures

Disassembly for replacement is best achieved by removing and replacing the modules in a specific order. Complete disassembly is best achieved by the following procedures in the order given in Figure 4-1 and Figure 4-2.

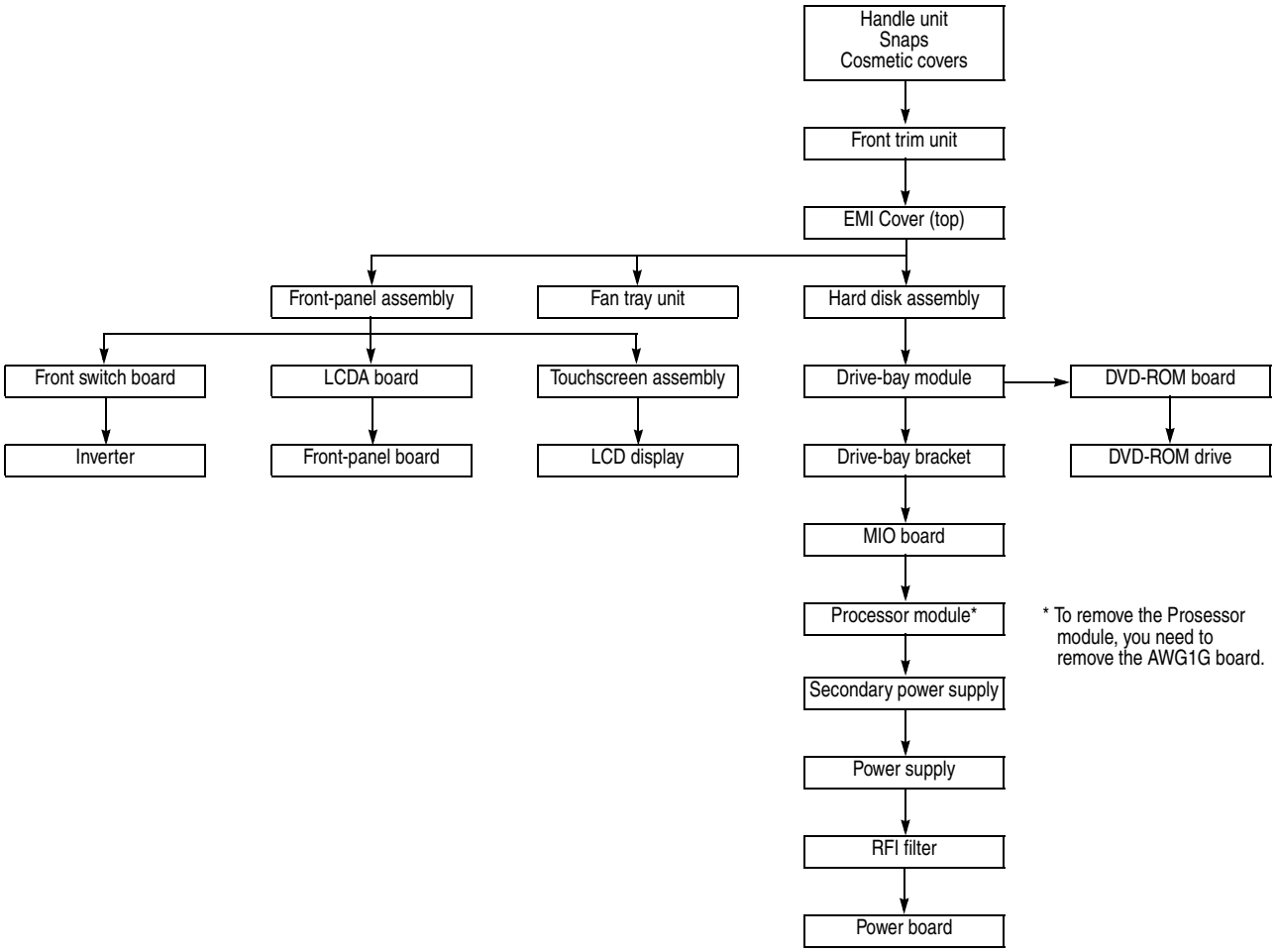


Figure 4-1: Disassembly procedures for external modules and internal modules (top)

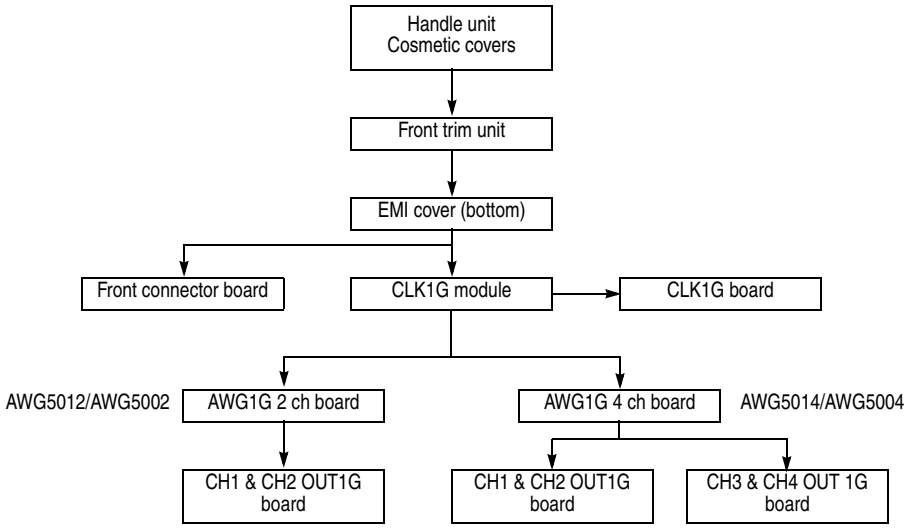


Figure 4-2: Disassembly procedures for internal modules (bottom)

Required Equipment

Most modules in the instrument can be removed with a screwdriver handle mounted with a size T-15, Torx screwdriver tip. All equipment required to remove and reinstall the modules is listed in Table 4-3.

Table 4-3: Tools required for module removal and reinstall

Item #	Name	Description	General tool #
1.	Screwdriver handle	Accepts Torx-driver bits	620-440
2.	T-15 Torx tip	Torx-driver bit for T-15 size screw heads	640-247
3.	T-10 Torx tip	Torx-driver bit for T-10 size screw heads	
4.	T-20 Torx tip	Torx-driver bit for T-20 size screw heads	
5.	#1 Phillips screwdriver	Screwdriver for removing #1 size Phillips screws	Standard tool
6.	#2 Phillips screwdriver	Screwdriver for removing # 2 size Phillips screws	Standard tool
7.	3/16 inch open-end wrench	Used to remove nut posts	Standard tool
8.	Angle-Tip Tweezers	Used to remove the front-panel knob	Standard tool
9.	Wire cutter	Used to remove cable ties	Standard tool

Procedures for External Modules

Handle Unit

You need a screwdriver with a T-20 Torx tip (items 1 and 4).

Removal. To remove the handle unit, refer to Figure 4-3 and follow these steps:

1. Remove the two screws securing the handle base bracket to the cosmetic cover.
2. Grasp the bracket and handle away from the cosmetic cover.

Installation. To install, reverse this procedure.

Snaps

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the snaps, refer to Figure 4-3 and follow these steps:

1. Remove the four screws securing the snaps to the cosmetic cover.
2. Lift the snaps away from the cosmetic cover.

Installation. To install, reverse this procedure.

Cosmetic Cover (Top)

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the top cosmetic cover, refer to Figure 4-3 and follow these steps:

1. Remove the snaps.
2. Remove the two screws securing the cosmetic cover to the chassis.
3. Loosen the cover with a detaching tool, such as a flat-blade screwdriver.
4. Tilt the rear side of the cover up, and then pull it off the chassis.

Installation. To install, reverse this procedure.

Cosmetic Cover (Bottom)

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the top cosmetic cover, refer to Figure 4-3 and follow these steps:

1. Remove the handle unit.
2. Orient the instrument so its top is down on the work surface and its rear is facing you.
3. Remove the two screws securing the cosmetic cover to the chassis.
4. Loosen the cover with a detaching tool, such as a flat-blade screwdriver.

5. Tilt the rear side of the cover up, and then pull it off the chassis.

Installation. To install, reverse this procedure.

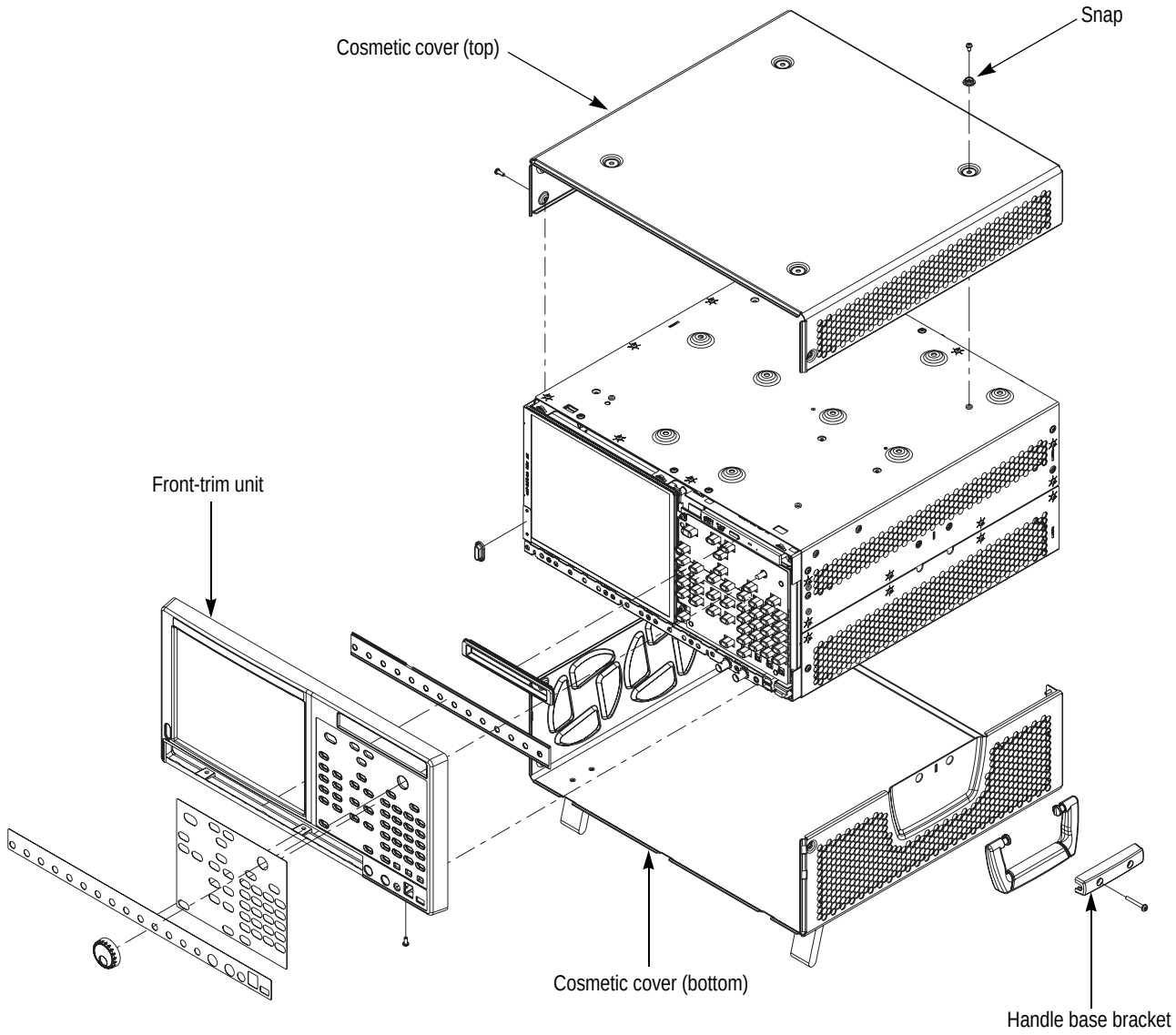


Figure 4-3: Handle, snaps, cosmetic covers, and front-trim unit removal

Front-Trim Unit

You need a screwdriver with a T-15 Torx tip and angle-tip tweezers (items 1, 2, and 8).

Removal. To remove the front-trim unit, refer to Figure 4-3 follow these steps:

1. Remove the handle unit, snaps, and cosmetic covers.
2. Orient the instrument so that the rear is on the work surface.
3. Paste a tape to the power switch button so that it will not come off the front trim.
4. Remove the knob by pulling it straight out from the front panel with the angle-tip tweezers.
5. Remove the three screws at the bottom of the front trim.
6. Grasp the bottom side of the front trim, and pull off the bottom side of it by loosening the DVD drive part.
7. The upper part of the chassis has three projections. The front trim fits in these projections. When removing the front trim, grasp its back edge and flex it upward before pulling it forward.

Installation. To install, reverse this procedure.

EMI Covers

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the EMI covers, refer to Figure 4-4 on page 4-13 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, and front-trim unit.
2. Remove the top cover:
   a. Orient the instrument so that the bottom is on the work surface.
   b. Remove the 14 screws securing the top EMI cover to the chassis.
   c. Lift the cover off the chassis.
3. Remove the bottom cover:
   a. Orient the instrument so that the top is on the work surface.
   b. Remove the 12 screws securing the bottom EMI cover to the chassis.
   c. Lift the cover off the chassis.

Installation. To install, reverse this procedure.

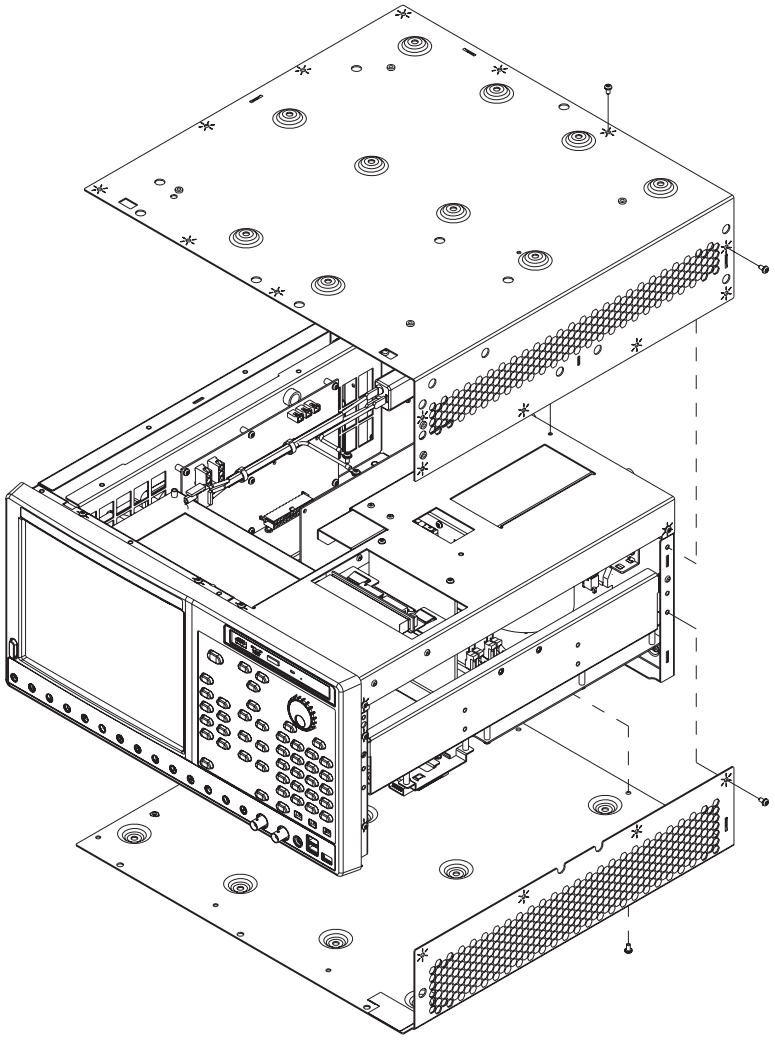


Figure 4-4: EMI covers removal

Hard Disk Assembly

Removal. To remove the removable hard disk assembly, follow these steps:

1. Orient the instrument so that its bottom is down on the work surface and its rear is facing you.
2. Loosen the two thumb screws securing the hard disk assembly to the instrument.
3. Holding the screw heads, pull out the removable hard disk assembly carefully.

Installation. To install, reverse this procedure.

CAUTION. *The hard disk drive is extremely susceptible to static-discharge damage, shock, dust and so on. When you store a removable hard disk assembly, put it into an anti-static plastic bag to protect it.*

Fan Tray Unit

You need a screwdriver with a T-15 Torx tip and a #2 Phillips screwdriver (items 1, 2, and 6).

Removal. To remove the fan tray unit, refer to Figure 4-5 on page 4-14 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, and EMI covers.
2. Disconnect the fan cables from J300, J302, and J304 on the Power board.
3. Remove the four screws securing the fan tray unit to the chassis.
4. Lift the fan tray unit away from the chassis.
5. Use a #2 Phillips screwdriver to remove the 12 screws securing the fans to the fan bracket.

Install. To install, reverse this procedure.

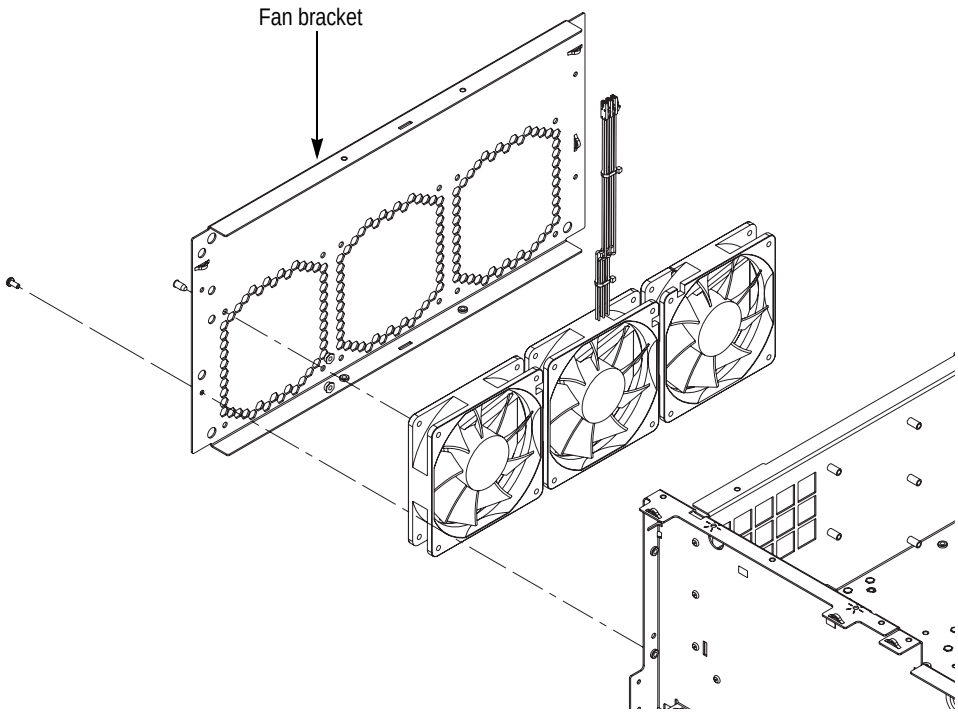


Figure 4-5: Fan tray unit removal

Front-Panel Unit

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the front-panel unit, refer to Figure 4-6 on page 4-16 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, and EMI covers.
2. Orient the instrument so that the rear is on the work surface.
3. Remove the seven screws securing the front-panel bracket to the chassis.
4. Grasp the front-panel assembly and pull it forward.
5. Disconnect the cable from J100 on the LCDA board.
6. Disconnect the cable from J300 on the LCDA board.
7. Disconnect the cable from J100 on the Front Switch board.

Installation. To install, reverse this procedure.

Front-Panel Assembly

You need a a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the front-panel assembly, refer to Figure 4-6 on page 4-16 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, and EMI covers.
2. Remove the LCDA board and Front Panel board:
   a. Remove the four screws securing the LCDA board and Front Panel board to the front-panel bracket.
   b. Remove the cables from J110, J160, and J200.
   c. Lift the boards away from the front-panel bracket.
3. Remove the touch screen module:
   a. Remove the two screws securing the touch screen module to the front-panel bracket.
   b. Disconnect the cable from J200 on the LCDA board.
   c. Lift the touch screen module away from the front-panel bracket.

4. Remove the LCD module:
   a. Remove the four screws securing the LCD module to the front-panel bracket.
   b. Disconnect the cable from J110 on the LCDA board.
   c. Disconnect the cable from CN2 on the Inverter board.
   d. Lift the LCD module away from the front-panel bracket.
5. Disassemble the front-panel assembly components, using Figure 4-6 as a guide.

Installation. To install, reverse this procedure.

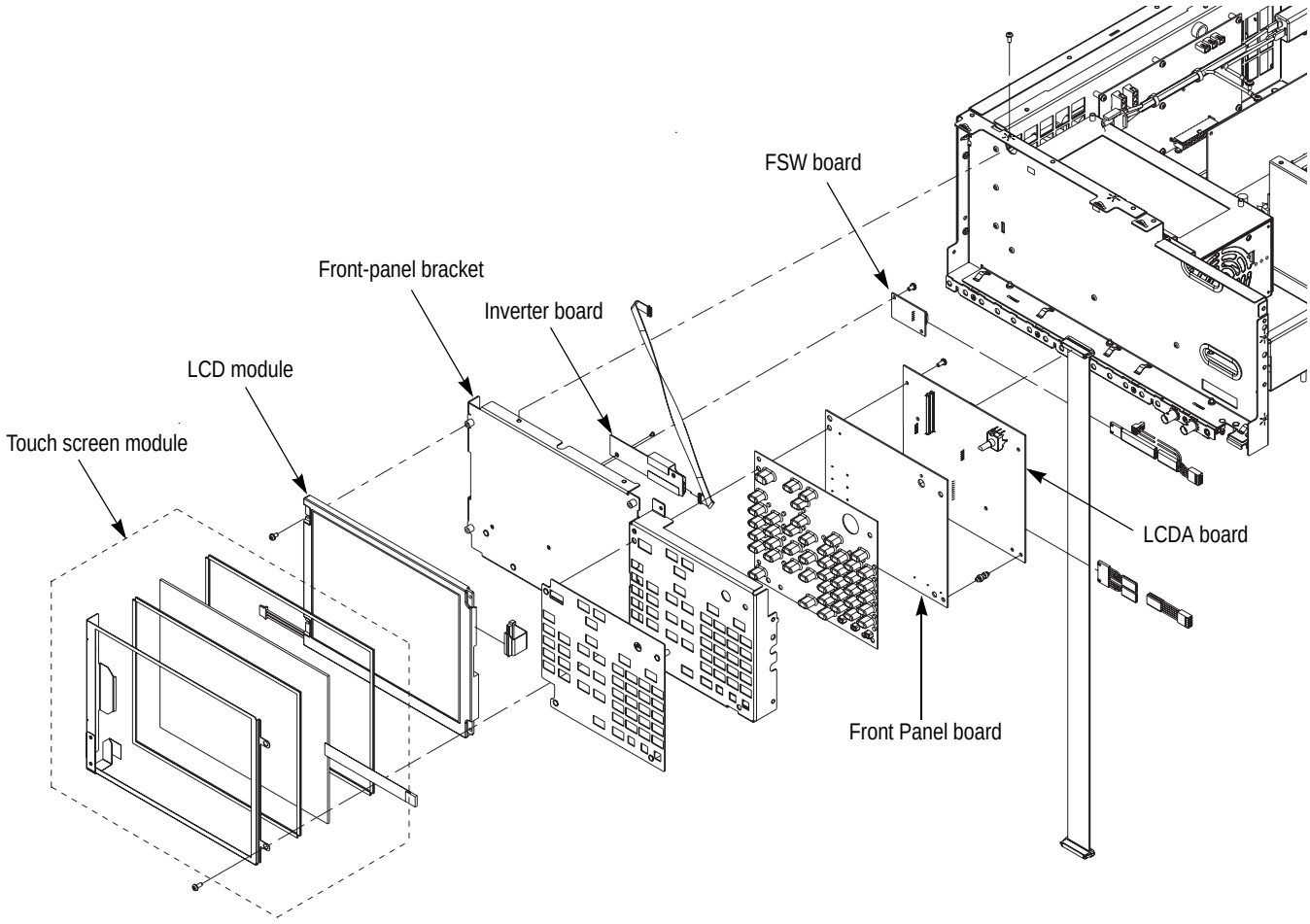


Figure 4-6: Disassembly of front-panel assembly

Procedures for Internal Modules (Upper)

Drive-Bay Module

You need a screwdriver with a T-15 Torx tip and a wire cutter (items 1, 2, and 9).

Removal. To remove the drive-bay module, refer to Figure 4-8 on page 4-18 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, and hard disk assembly.
2. Orient the instrument so that the bottom is on the work surface.
3. Remove the eight screws securing the drive-bay module to the chassis.
4. Use a wire cutter to remove the two cable ties. See Figure 4-7.

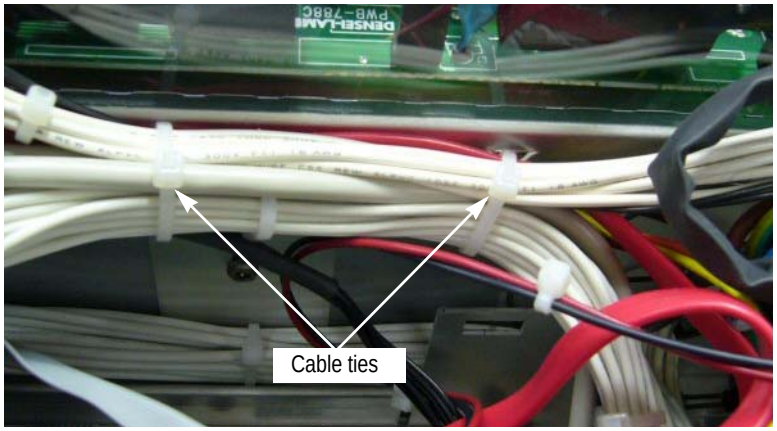


Figure 4-7: Location of the cable ties

5. Disconnect the cables from J101 and J104 on the Power board.
6. Disconnect the cables from J5J1 and J7J1 on the Processor board.
7. Lift the drive-bay module away from the chassis.

Installation. To install, reverse this procedure.

DVD-ROM Drive

You need a screwdriver with a T-15 Torx tip and a #1 Phillips screwdriver (items 1, 2, and 5).

Removal. To remove the DVD-ROM drive, refer to Figure 4-8 on page 4-18 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, hard disk assembly, and drive-bay module.

2. Remove the two screws securing the DVD-ROM bracket to the drive-bay chassis.
3. Slide the DVD-ROM drive with bracket out from the drive-bay chassis.
4. Remove the four screws securing the DVD-ROM drive to the bracket.

Installation. To install, reverse this procedure.

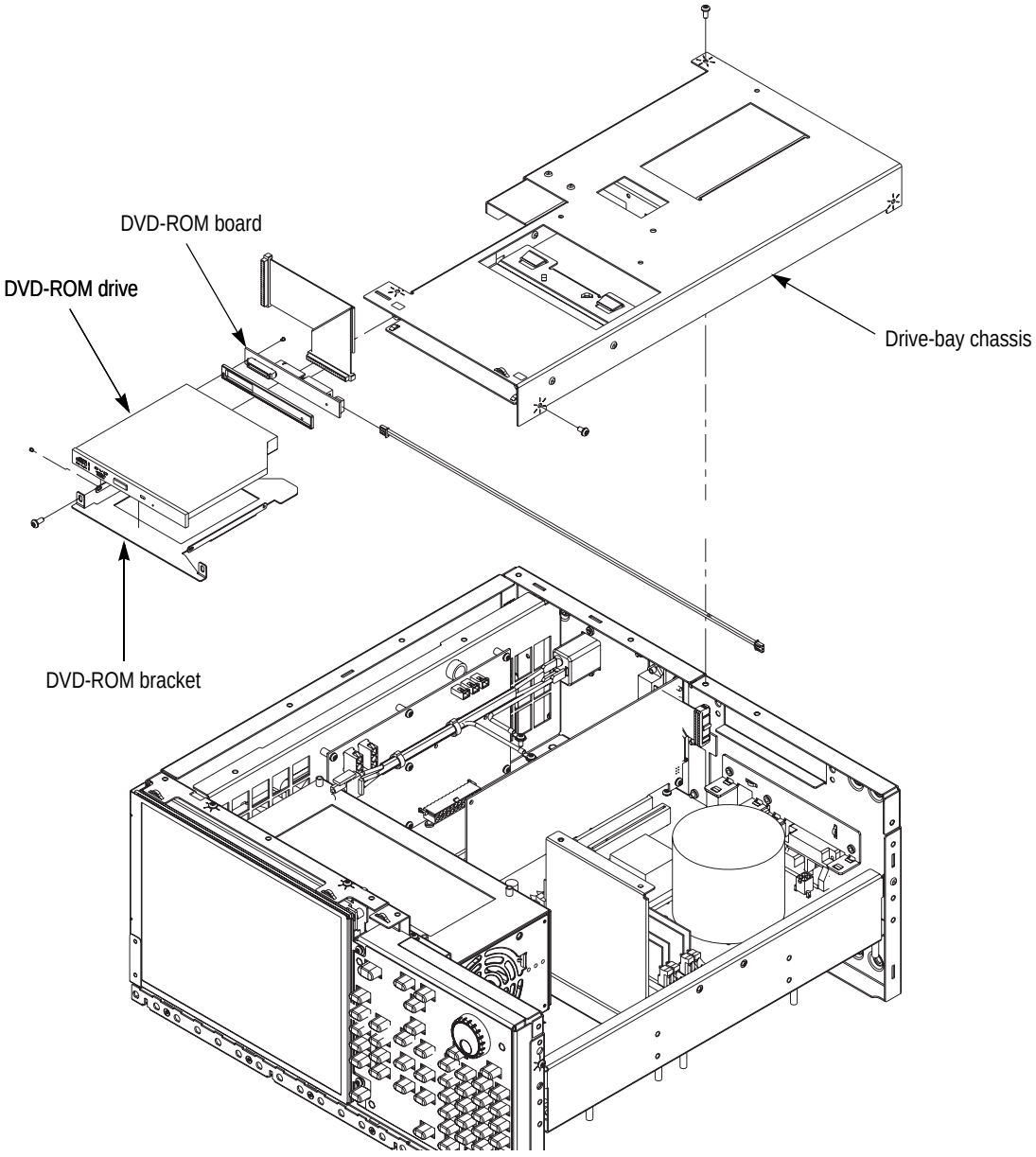


Figure 4-8: Drive module removal

DVD-ROM Board

You need a #1 Phillips screwdriver (item 5).

Removal. To remove the DVD-ROM board, refer to Figure 4-8 and follow these steps:

1. Remove the handle unit, snaps, cosmetic cover, front-trim unit, EMI covers, hard disk assembly, and drive-bay module.
2. Remove the two screws securing the DVD-ROM board to the DVD-ROM drive.
3. Disconnect the cable from J1 on the DVD-ROM board.
4. Disconnect the interface cable on the DVD-ROM board.
5. Lift the board away from the DVD-ROM drive.

Installation. To install, reverse this procedure.

Multi-Input/Output Board

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the Multi-Input/Output board, refer to Figure 4-10 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, and EMI covers.
2. Orient the instrument so that the bottom is on the work surface and the rear is facing you.
3. Remove the clamp cover from the cable clamp to release the ribbon cable. See Figure 4-9.

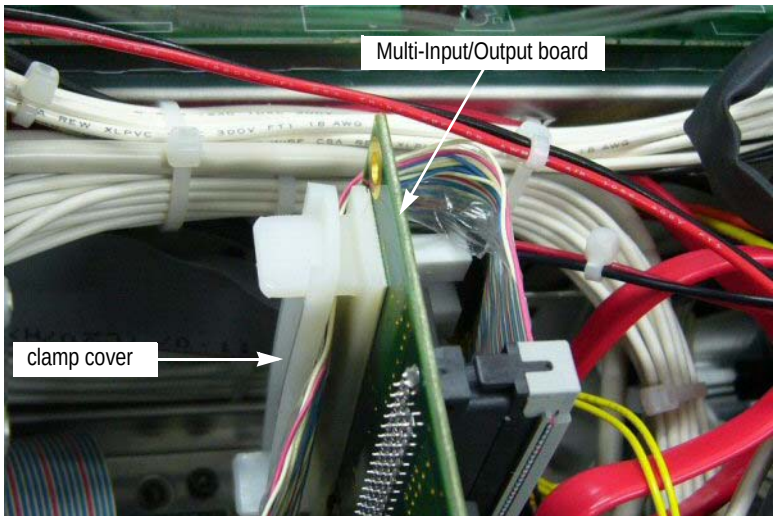


Figure 4-9: Removing the clamp cover

4. Disconnect the cables from J360, J670, J680, and J681 on the Multi-Input/Output board.
5. Remove the six screws securing the Multi-Input/Output board to the chassis.
6. Carefully pull up on the board to loosen it from the Processor board.
7. Lift the board away from the chassis.

Installation. To install, reverse this procedure.

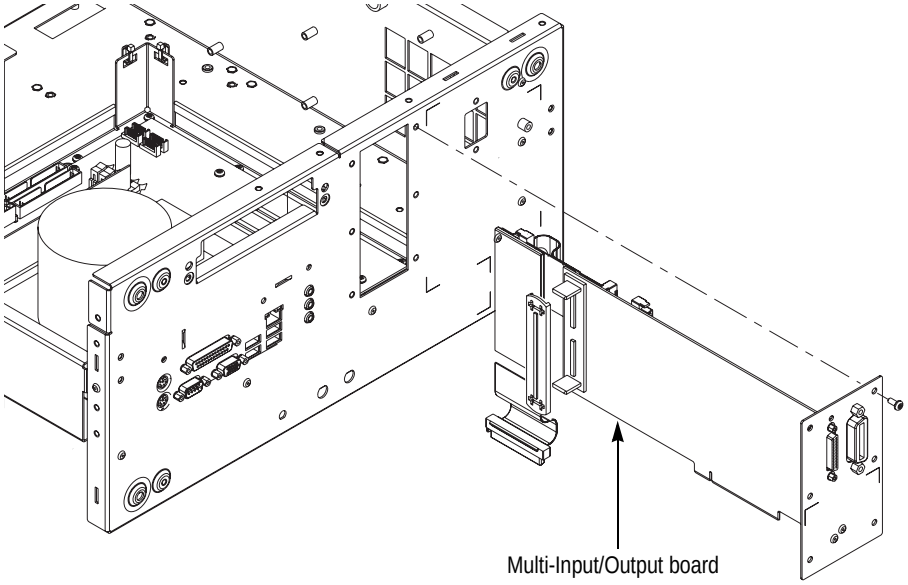


Figure 4-10: Multi-Input/Output board removal

Processor Module

You need a screwdriver with a T-15 Torx tip, and a 3/16 inch open-end wrench (items 1, 2, and 7).

NOTE. *Before you remove the processor module, you need to disconnect the ribbon cable at J1000 from the AWG1G board. Refer to* AWG1G 2 CH Board *on page 4-30 or* AWG1G 4 CH Board *on page 4-31.*

Removal. To remove the processor module, refer to Figure 4-11 on page 4-22 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, drive-bay module, and Multi-Input/Output board.
2. Orient the instrument so that the bottom is on the work surface.
3. Remove the two screws securing the drive-bay bracket to the processor tray.

4. Lift the drive-bay bracket away from the processor tray. (If necessary, remove the ribbon cable through the hole on the drive-bay bracket.)
5. Remove the three screws securing the connector bracket to the rear panel.
6. Lift the connector bracket away from the rear panel.
7. Remove the six mounting posts securing the VIDEO connector, COM 1 connector, and PARALELL PORT connector to the rear panel.
8. Remove the eight screws securing the Processor tray to the chassis.
9. Disconnect these cables:
   - The cable from the Power board at J2A1, J2A2, and J2J1.
   - The cable from the LCDA board at J8H1.
   - The cable from the Front Connector board at J8G2.
   - The cable from the Front Switch board and Multi-Input/Output board at J8J3.
10. Carefully lift up and slide the processor module away from the chassis.

Installation. To install, reverse this procedure.

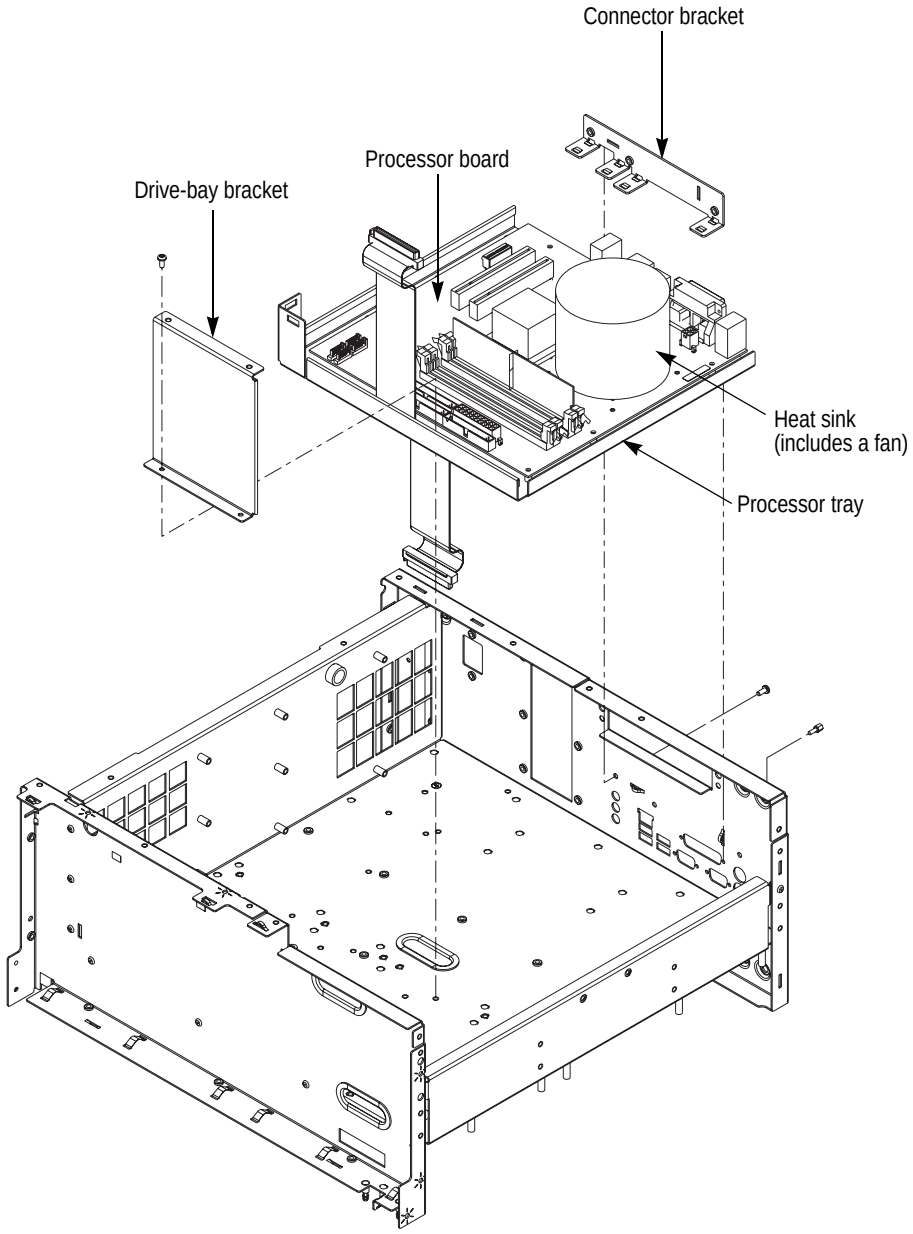


Figure 4-11: Processor board removal

Secondary Power Supply

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the secondary power supply, refer to Figure 4-12 on page 4-24 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, drive-bay module, and Multi-Input/Output board.
2. Orient the instrument so that the bottom is on the work surface.
3. Disconnect the cables from J610, J630, and J632 on the Power board.
4. Remove the four screws securing the secondary power supply to the power supply bracket.
5. Lift the secondary power supply with the insulator away from the chassis.
6. Remove the insulator from the power supply.
7. Remove the three cable from CN1, CN53, and CN51/CN61 on the power supply.

Installation. To install, reverse this procedure.

Power Supply

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the power supply, refer to Figure 4-12 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, drive-bay module, and Multi-Input/Output board.
2. Orient the instrument so that the bottom is on the work surface.
3. Remove the six screws securing the power supply bracket to the chassis.
4. Disconnect the cable from J611 on the Power board.
5. Remove the three screws securing the bracket to the power supply.
6. Carefully slide the module to loosen it from the Power board.
7. Lift the power supply up out of the chassis.
8. Lift the bracket up out of the chassis.

Installation. To install, reverse this procedure.

RFI Filter

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the power supply, refer to Figure 4-12 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, and EMI covers.

2. Orient the instrument so that the bottom is on the work surface.
3. Disconnect the cable from J600 on the Power board.
4. Remove the two screws securing the ground leads to the chassis.
5. Remove the two screws securing the RFI filter to the chassis.
6. Pull the RFI filter away from the chassis.

Installation. To install, reverse this procedure.

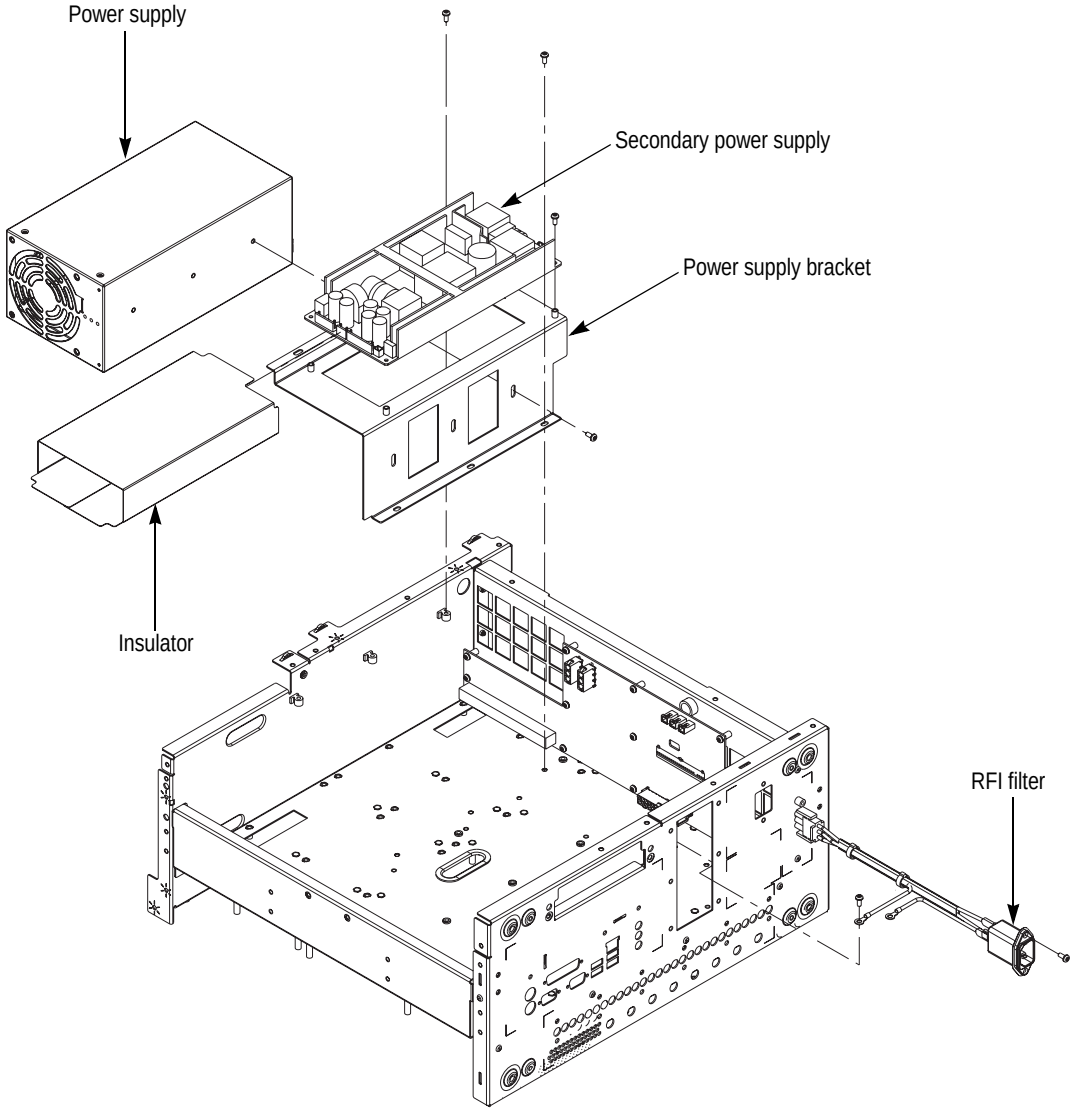


Figure 4-12: Secondary power supply, power supply, and RFI filter removal

Power Board

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the Power board, refer to Figure 4-13 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, drive- bay module, power supply, Multi-Input/Output board, and Processor board.
2. Orient the instrument so that the bottom is on the work surface.
3. Disconnect the cables from J102, J103, J120, J300, J302, J304, J600, J610, J611, J630, and J632 on the Power board.
4. Remove the 10 screws securing the Power board to the chassis.
5. Lift the board away from the chassis.

Installation. To install, reverse this procedure.

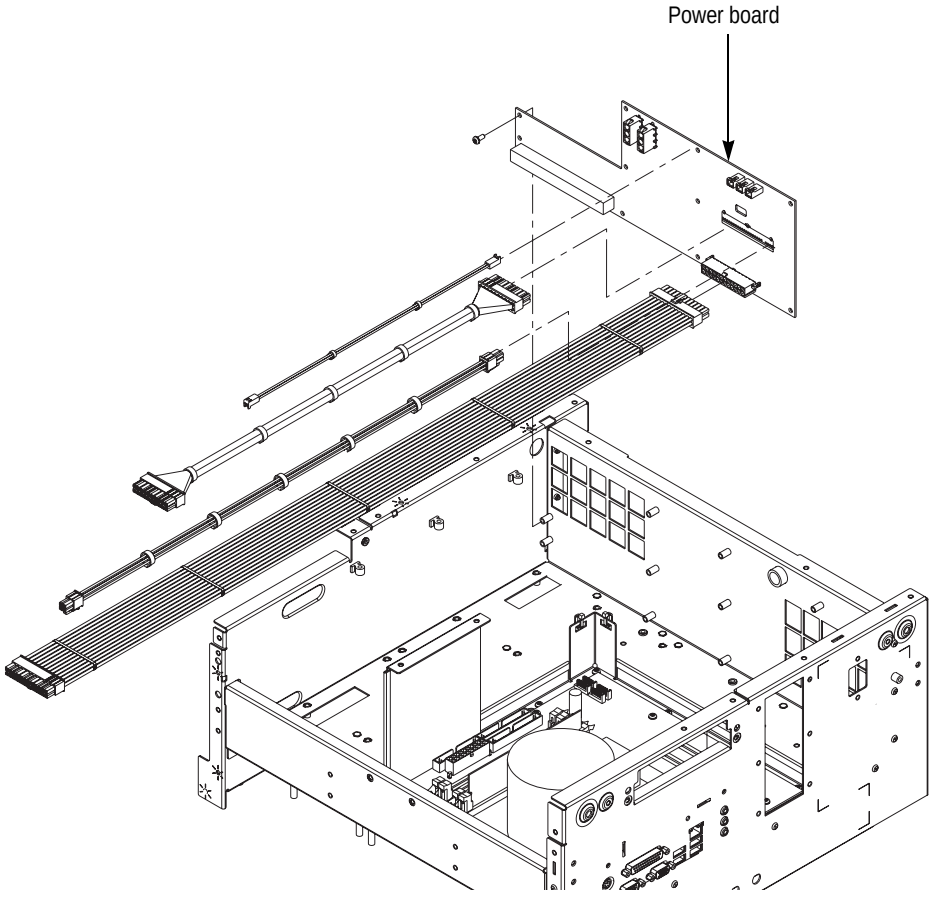


Figure 4-13: Power board removal

Procedures for Internal Modules (Lower)

Front Connector Board

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the Front Connector board, refer to Figure 4-14 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, and EMI covers.
2. Orient the instrument so that the top is on the work surface.
3. Disconnect the cables from J100 and J200 on the Front Connector board.
4. Remove the screw securing the Front Connector board to the chassis.
5. Grasp the board and pull it gently away from the chassis.

Installation. To install, reverse this procedure.

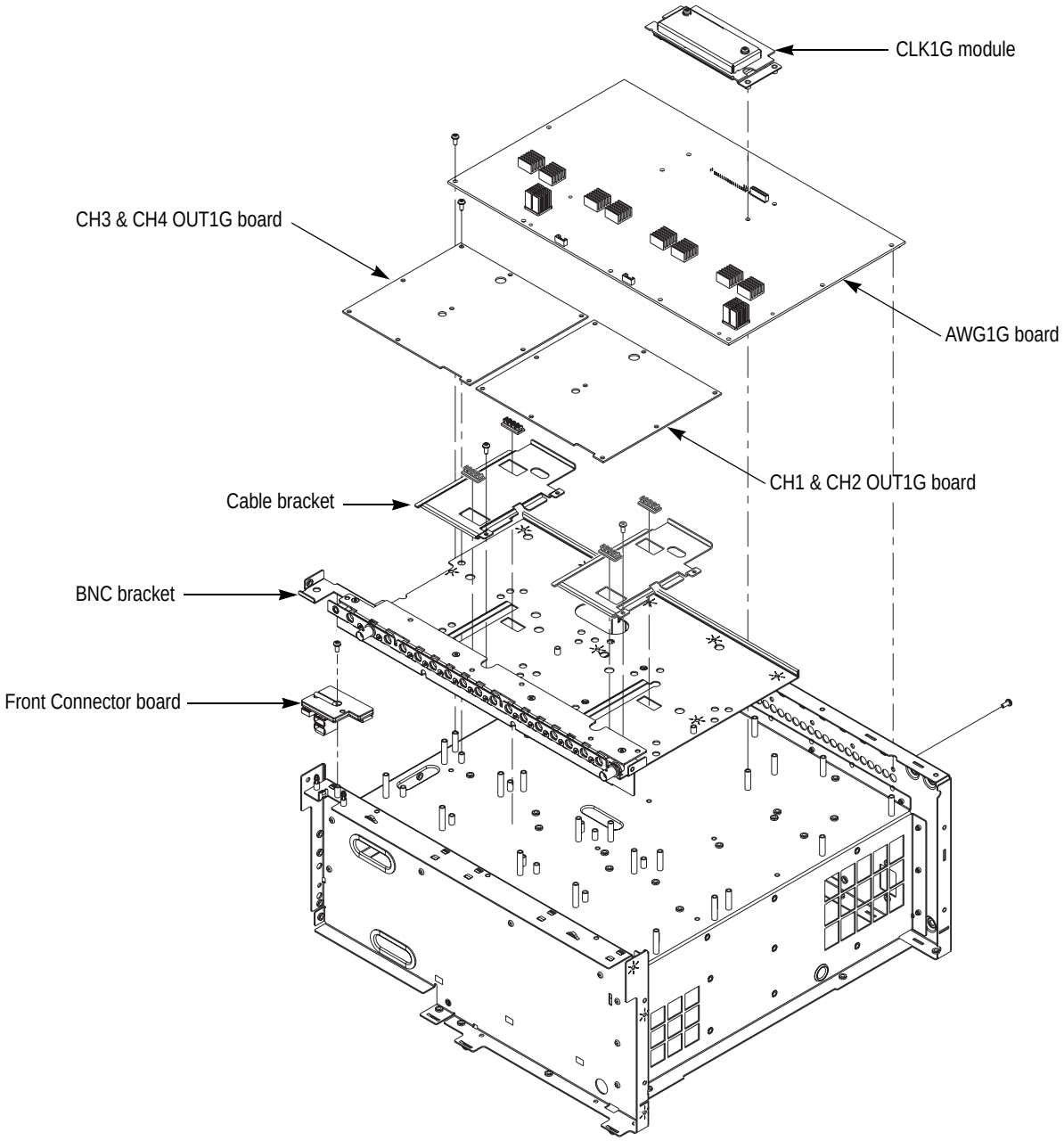


Figure 4-14: Front Connector board, CLK1G module, AWG1G board, and OUT1G boards removal (4-channel model)

CLK1G Module

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the CLK1G module, refer to Figure 4-15 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, and EMI covers.
2. Orient the instrument so that the top is on the work surface.
3. Disconnect these cables:
   - The cable at J3110 from the CLK1G board to the 10 MHz Reference Output connector.
   - The cable at J3120 from the CLK1G board to the Reference Clock Input connector.
   - The cable at J3230 from the CLK1G board to the AWG1G board (J3010).
4. Remove the four screws securing the bottom shield case to the chassis.
5. Carefully pull up on the CLK1G module to loosen it from the AWG1G board.
6. Remove the two screws securing the top shield case and CLK1G board to the chassis.
7. Lift the top shield case away from the CLK1G board.
8. Lift the CLK1G board away from the bottom shield case.

Installation. To install, reverse this procedure.

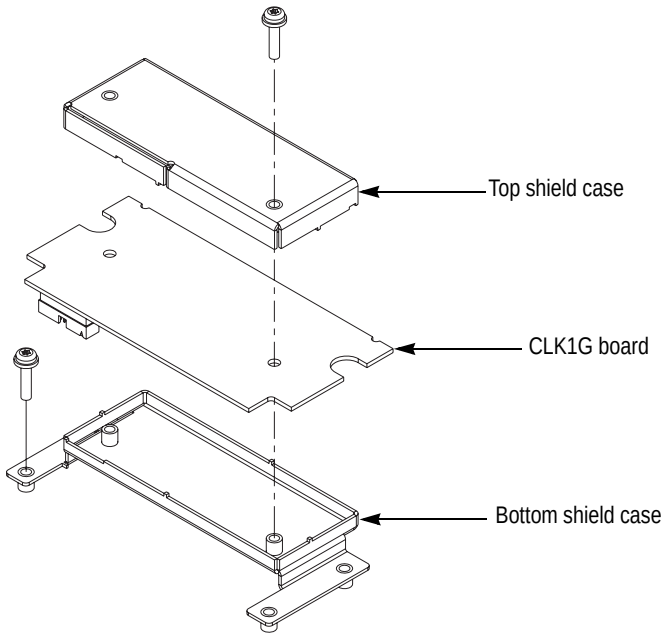


Figure 4-15: Disassembly of the CLK1G module

AWG1G 2 CH Board

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the AWG1G 2 channel board, refer to Figure 4-14 on page 4-27 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, and CLK1G module.
2. Orient the instrument so that the top is on the work surface.
3. Remove the two screws securing the cable clamps to the AWG1G board. See Figure 4-16.

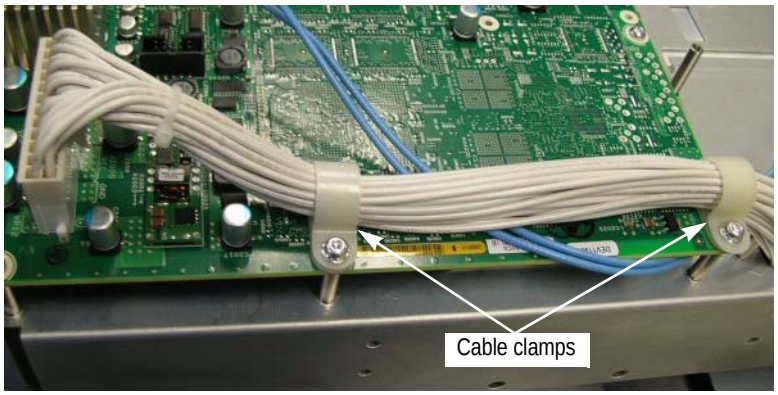


Figure 4-16: Location of the cable clamps on the AWG1G board

4. Disconnect the cables at J1050, J2000, and J5000 from the AWG1G board.
5. Disconnect these Peltola cables:
   - The cable at J6020A from the AWG1G board to the CH1 & CH2 OUT1G board (J1000).
   - The cable at J6030A from the AWG1G board to the CH1 & CH2 OUT1G board (J2000).
   - The cable at J6020B from the AWG1G board to the CH1 & CH2 OUT1G board (J3000).
   - The cable at J6030B from the AWG1G board to the CH1 & CH2 OUT1G board (J4000).
   - The cable at J7800I from the AWG1G board to the Channel 1 Mkr 1 connector.
   - The cable at J7810I from the AWG1G board to the Channel 1 Mkr 2 connector.

- The cable at J7820I from the AWG1G board to the Channel 2 Mkr 1 connector.
- The cable at J7830I from the AWG1G board to the Channel 2 Mkr 2 connector.
- The cable at J1430 from the AWG1G board to the Trigger Input connector.
- The cable at J1440 from the AWG1G board to the Event Input connector.
- The cable at J3011 from the AWG1G board to the External Clock Input connector.
- The cable at J3020 from the AWG1G board to the Oscillator Output connector.
- The cable at J3010 from the AWG1G board to the CLK1G board.

6. Remove the 10 screws securing the AWG1G board to the chassis.
7. Lift the board away from the chassis.
8. Disconnect the ribbon cable at J1000 on the AWG1G board.

Installation. To install, reverse this procedure.

AWG1G 4 CH Board

You need a screwdriver with a T-15 Torx tip (items 1 and 2).

Removal. To remove the AWG1G 4 channel board, refer to Figure 4-14 on page 4-27 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, and CLK1G module.
2. Orient the instrument so that the top is on the work surface.
3. Remove the screw securing the cable clamp to the AWG1G board. See Figure 4-17.

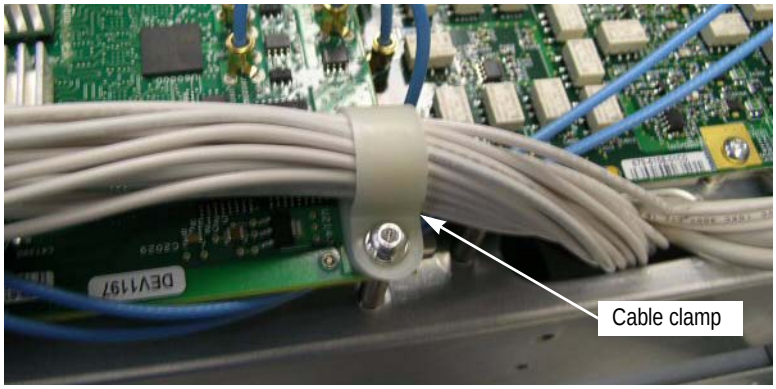


Figure 4-17: Location of the cable clamp on the AWG1G board

4. Disconnect the cables at J1050, J1060, J2000, and J5000 from the AWG1G board.

5. Disconnect these Peltola cables:

   - The cable at J6020A from the AWG1G board to the CH1 & CH2 OUT1G board (J1000).
   - The cable at J6030A from the AWG1G board to the CH1 & CH2 OUT1G board (J2000).
   - The cable at J6020B from the AWG1G board to the CH1 & CH2 OUT1G board (J3000).
   - The cable at J6030B from the AWG1G board to the CH1 & CH2 OUT1G board (J4000).
   - The cable at J6020C from the AWG1G board to the CH3 & CH4 OUT1G board (J1000).
   - The cable at J6030C from the AWG1G board to the CH3 & CH4 OUT1G board (J2000).
   - The cable at J6020D from the AWG1G board to the CH3 & CH4 OUT1G board (J3000).
   - The cable at J6030D from the AWG1G board to the CH3 & CH4 OUT1G board (J4000).
   - The cable at J7800I from the AWG1G board to the Channel 1 Mkr 1 connector.
   - The cable at J7810I from the AWG1G board to the Channel 1 Mkr 2 connector.

- The cable at J7820I from the AWG1G board to the Channel 2 Mkr 1 connector.
- The cable at J7830I from the AWG1G board to the Channel 2 Mkr 2 connector.
- The cable at J7800J from the AWG1G board to the Channel 3 Mkr 1 connector.
- The cable at J7810J from the AWG1G board to the Channel 3 Mkr 2 connector.
- The cable at J7820J from the AWG1G board to the Channel 4 Mkr 1 connector.
- The cable at J7830J from the AWG1G board to the Channel 4 Mkr 2 connector.
- The cable at J1430 from the AWG1G board to the Trigger Input connector.
- The cable at J1440 from the AWG1G board to the Event Input connector.
- The cable at J3011 from the AWG1G board to External Clock Input connector.
- The cable at J3020 from the AWG1G board to Oscillator Output connector.
- The cable at J3010 from the AWG1G board to the CLK1G board.

6. Remove the 11 screws securing the AWG1G board to the chassis.
7. Lift the board away from the chassis.
8. Disconnect the ribbon cable at J1000 on the AWG1G board.

Installation. To install, reverse this procedure.

CH1 & CH2 OUT1G Board

You need a screwdriver with a T-15 Torx tip and a wire cutter (items 1, 2, and 9).

Removal. To remove the CH1 & CH2 OUT1G board, refer to Figure 4-14 on page 4-27 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, and AWG1G board.
2. Orient the instrument so that the top is on the work surface.
3. Use a wire cutter to remove the four cable ties. See Figure 4-18.

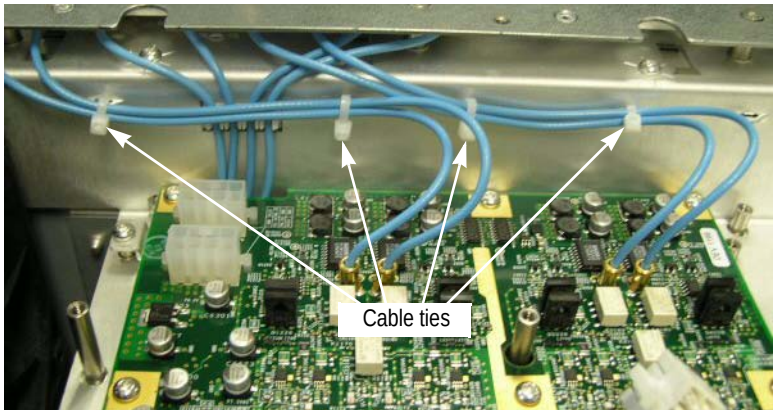


Figure 4-18: Location of the cable ties

4. Disconnect these cables:
   - The cable at J5000 from the CH1 & CH2 OUT1G board to the AWG1G board (J1050).
   - The cable at J6000 from the CH1 & CH2 OUT1G board to the Power board (J631).
5. Disconnect these Peltola cables:
   - The cable at J1000 from the CH1 & CH2 OUT1G board to the AWG1G board (J6020A).
   - The cable at J2000 from the CH1 & CH2 OUT1G board to the AWG1G board (J6030A).
   - The cable at J3000 from the CH1 & CH2 OUT1G board to the AWG1G board (J6020B).
   - The cable at J4000 from the CH1 & CH2 OUT1G board to the AWG1G board (J6030B).
   - The cable at J1180 from the CH1 & CH2 OUT1G board to the Channel 1 Analog connector.
   - The cable at J2180 from the CH1 & CH2 OUT1G board to the Channel 1 Analog connector.
   - The cable at J3180 from the CH1 & CH2 OUT1G board to the Channel 2 Analog connector.
   - The cable at J4180 from the CH1 & CH2 OUT1G board to the Channel 2 Analog connector.

- The cable at J1410 from the CH1 & CH2 OUT1G board to the Ch 1 Add Input connector.
- The cable at J3410 from the CH1 & CH2 OUT1G board to the Ch 2 Add Input connector.

6. Remove the nine screws securing the CH1 & CH2 OUT1G board to the chassis.
7. Lift the board away from the chassis.

Installation. To install, reverse this procedure.

CH3 & CH4 OUT1G Board

You need a screwdriver with a T-15 Torx tip and a wire cutter (items 1, 2, and 9).

Removal. To remove the CH3 & CH4 OUT1G board, refer to Figure 4-14 on page 4-27 and follow these steps:

1. Remove the handle unit, snaps, cosmetic covers, front-trim unit, EMI covers, and AWG1G board.
2. Orient the instrument so that the top is on the work surface.
3. Use a wire cutter to remove the three cable ties. See Figure 4-19.

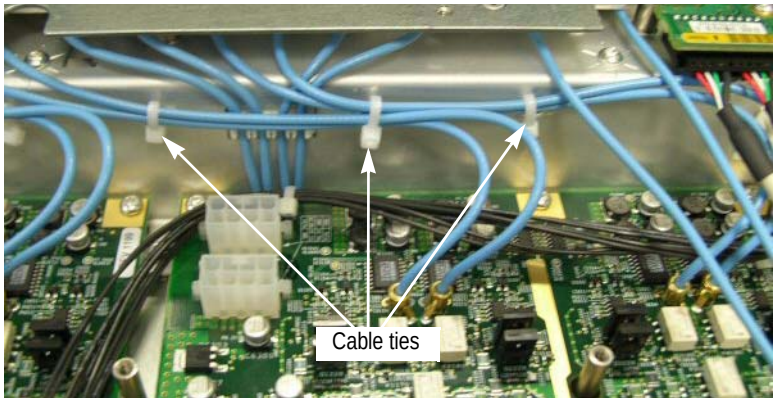


Figure 4-19: Location of the cable ties

4. Disconnect these cables:
   - The cable at J5000 from the CH3 & CH4 OUT1G board to the AWG1G board (J1060).
   - The cable at J7000 from the CH3 & CH4 OUT1G board to the CH1 & CH2 OUT1G board (J7000).

5. Disconnect these Peltola cables:
   - The cable at J1000 from the CH3 & CH4 OUT1G board to the AWG1G board (J6020C).
   - The cable at J2000 from the CH3 & CH4 OUT1G board to the AWG1G board (J6030C).
   - The cable at J3000 from the CH3 & CH4 OUT1G board to the AWG1G board (J6020D).
   - The cable at J4000 from the CH3 & CH4 OUT1G board to the AWG1G board (J6030D).
   - The cable at J1180 from the CH3 & CH4 OUT1G board to the Channel 3 Analog connector.
   - The cable at J2180 from the CH3 & CH4 OUT1G board to the Channel 3 Analog connector.
   - The cable at J3180 from the CH3 & CH4 OUT1G board to the Channel 4 Analog connector.
   - The cable at J4180 from the CH3 & CH4 OUT1G board to the Channel 4 Analog connector.
   - The cable at J1410 from the CH3 & CH4 OUT1G board to the Ch 3 Add Input connector.
   - The cable at J3410 from the CH3 & CH4 OUT1G board to the Ch 4 Add Input connector.
6. Remove the nine screws securing the CH3 & CH4 OUT1G board to the chassis.
7. Lift the board away from the chassis.

Installation. To install, reverse this procedure.

Troubleshooting



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

To prevent possible injury to service personnel or damage to electrical components, please read Preventing ESD *on page 4-1.*

This section contains information and procedures designed to help you isolate faults to a module.

This section requires that service personnel have the appropriate skills to work on this instrument, including PC troubleshooting and Microsoft Windows operating system skills. Details of PC and Windows operation and service are not in this manual.

For assistance, contact your local Tektronix Service Center.

Equipment Required

You will need a digital multimeter to check voltages of the power supply, secondary power supply, and PWR board, as described on page 4-40 through page 4-43.

Fault Isolation Procedure

Follow the primary troubleshooting tree in Figure 4-20 and Figure 4-21 for fault isolation.

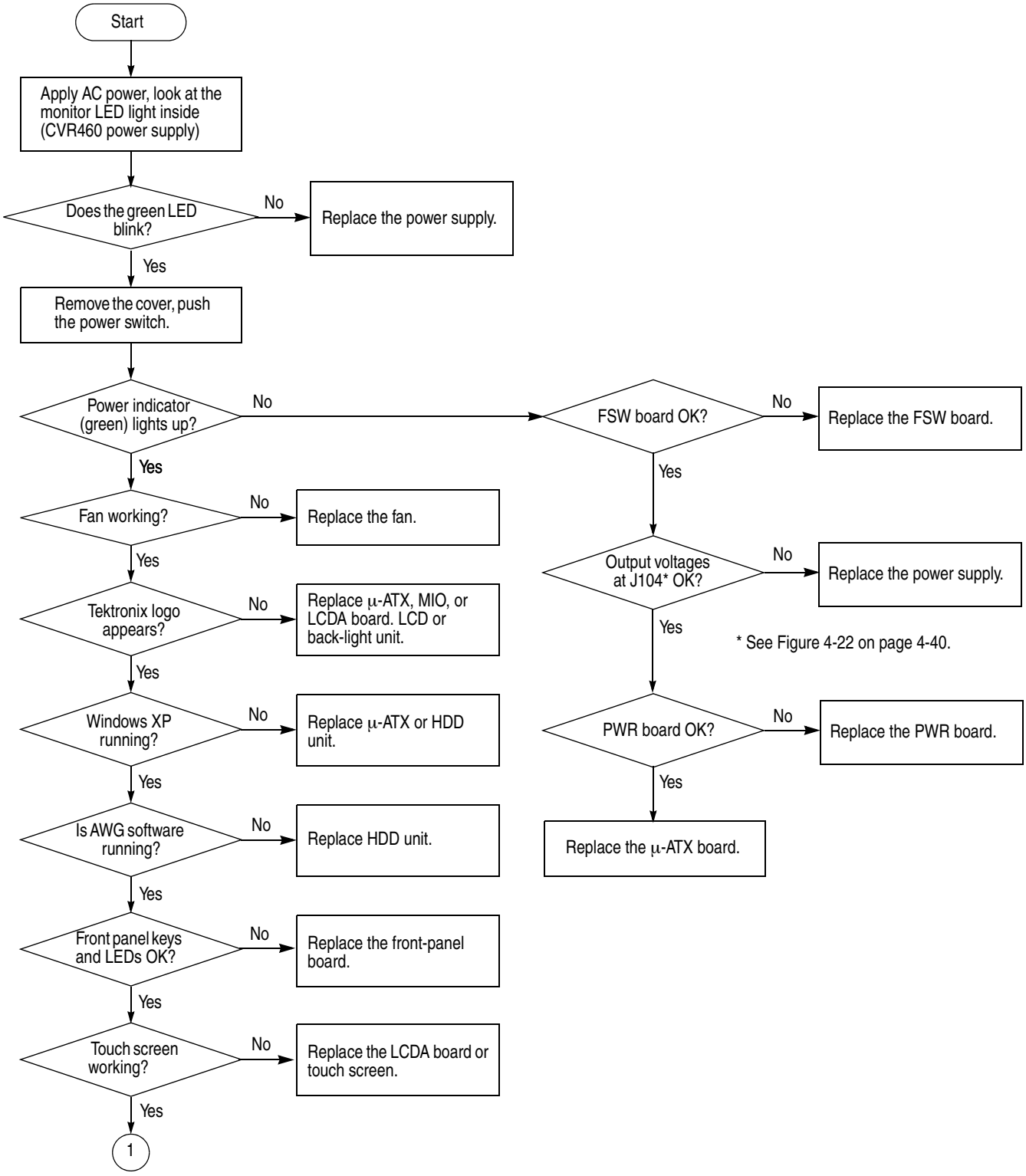


Figure 4-20: Primary troubleshooting tree (1)

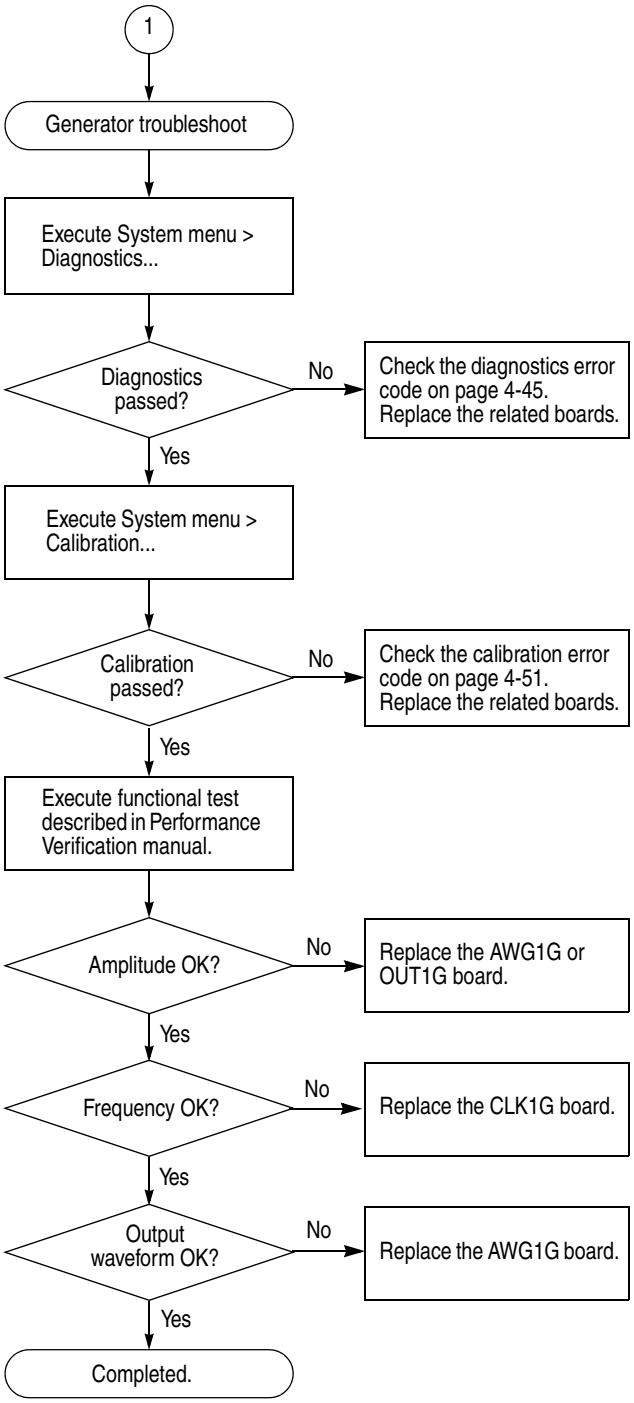


Figure 4-21: Primary troubleshooting tree (2)

Checking the Power Supply Voltages

To check the power supply voltages, power on the instrument and connect the (–) lead of a multi-meter to chassis ground.

To measure the output voltages of the power supply, check the voltages at J104 on the PWR board with the digital multimeter and compare each reading to the values listed in Table 4-4. If the voltages are within the allowance, your power supply is functional.

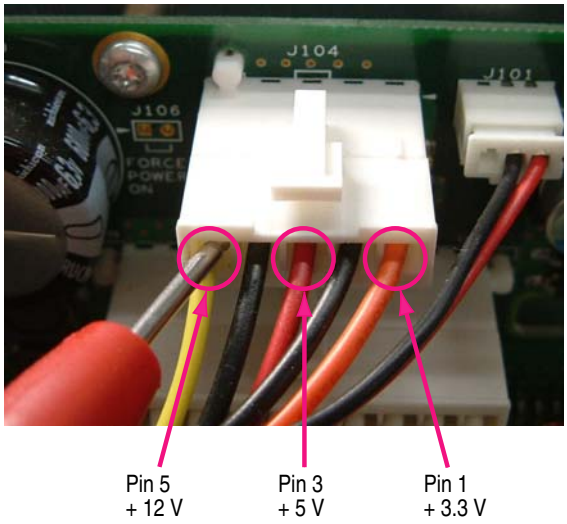


Figure 4-22: PWR board test points (J104)

Table 4-4: Test points voltage (J104)

Test point	Voltage	Allowance
Pin1	+3.3 V	+3.1 V to +3.5 V
Pin 3	+5 V	+4.7 V to +5.3 V
Pin 5	+12 V	+11.4 V to +12.6 V

Checking the Secondary Power Supply Voltages

To measure the output voltages of the secondary power supply, check the voltages at CN51 and CN61 on the power supply with the digital multimeter and compare each reading to the values listed in Table 4-5. If the voltages are within the allowance, your power supply is functional.

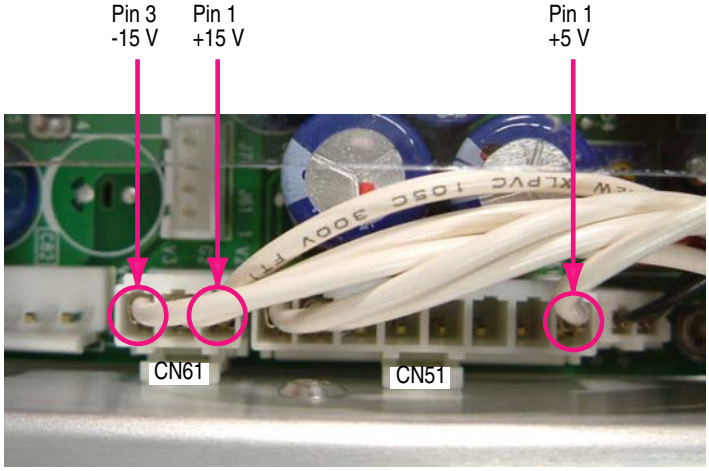


Figure 4-23: Secondary power supply test points (CN51 and CN61)

Table 4-5: Test points voltage (CN51 and CN61)

Test point	Voltage	Allowance
CN51: Pin 1	+5 V	+4.7 V to +5.3 V
CN61: Pin 1	+15 V	+14.2 V to +15.8 V
CN61: Pin 3	-15 V	-14.2 V to -15.8 V

Checking the Voltages on the AWG1G Board

To measure the output voltages of the PWR board, check the voltages at J2000 on the AWG1G board with the digital multimeter and compare each reading to the values listed in Table 4-6. If the voltages are within the allowance, your PWR board is functional.

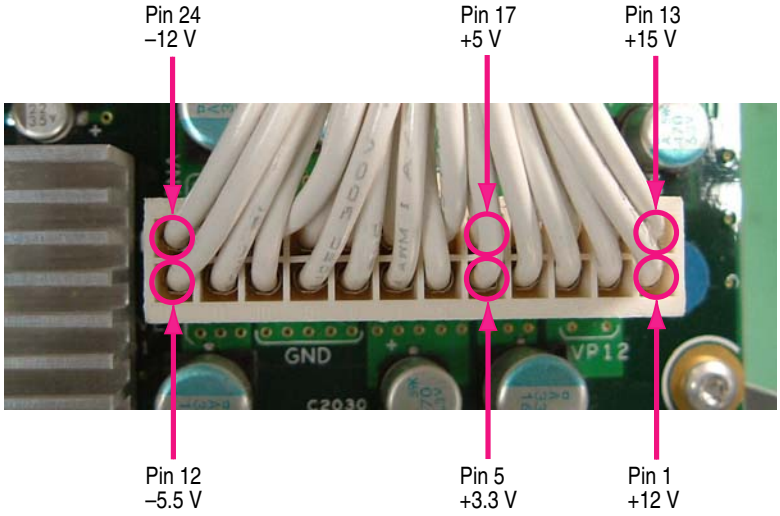


Figure 4-24: AWG1G board test points (J2000)

Table 4-6: Test points voltage (J2000)

Test point	Voltage	Allowance
Pin 1	+12 V	+11.4 V to +12.6 V
Pin 5	+3.3 V	+3.1 V to +3.5 V
Pin 12	–5.5 V	–5.2 to –5.8 V
Pin 13	+15 V	+14.2 V to +15.8 V
Pin 17	+5 V	+4.7 V to +5.3 V
Pin 24	–12 V	–11.4 to –12.6 V

Checking the Voltages on the OUT1G Board

To measure the output voltages of the PWR board, check the voltages at J7000 (or J6000) on the OUT1G board with the digital multimeter and compare each reading to the values listed in Table 4-7. If the voltages are within the allowance, your PWR board is functional.

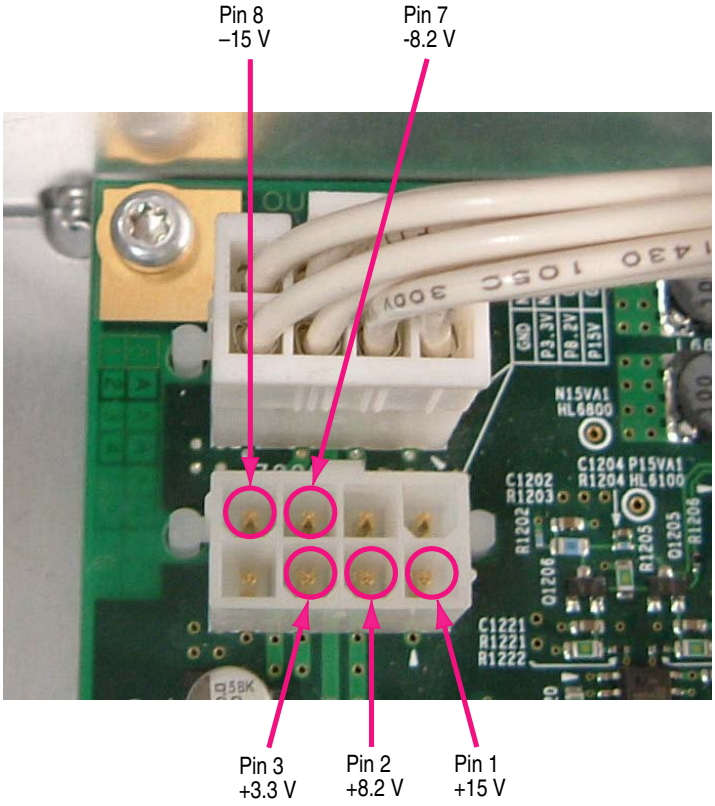


Figure 4-25: OUT1G board test points (J7000)

Table 4-7: Test points voltage (J7000 or J6000)

Test point	Voltage	Allowance
Pin 1	+15 V	+14.2 V to +15.8 V
Pin 2	+8.2 V	+7.8 V to +8.6 V
Pin 3	+3.3 V	+3.1 to +3.5 V
Pin 7	-8.2 V	-7.8 V to -8.6 V
Pin 8	-15 V	+14.2 V to +15.8 V

Instrument Diagnostics

The primary diagnostics for the instrument are accessible through the AWG application software. The instrument diagnostics check the basic functionality of analog outputs at every power on. The instrument diagnostics run after Windows has booted up and run its own set of system checks. If any failures occur at power on, a pop-up message indicates that a failure has occurred and provides an error code. Table 4-8 lists diagnostics error codes, Table 4-9 lists calibration error codes, and Table 4-10 lists hardware error codes.

The power-on tests ensure that the hardware is installed and can be accessed by the software. The tests provide limited diagnostic information, and provide no performance information.

To run the instrument Diagnostics manually, do these steps:

1. Turn off all other applications.
2. From the menu bar, select **System** and then select **Diagnostics...**; the Diagnostics dialog box appears (see Figure 4-26).

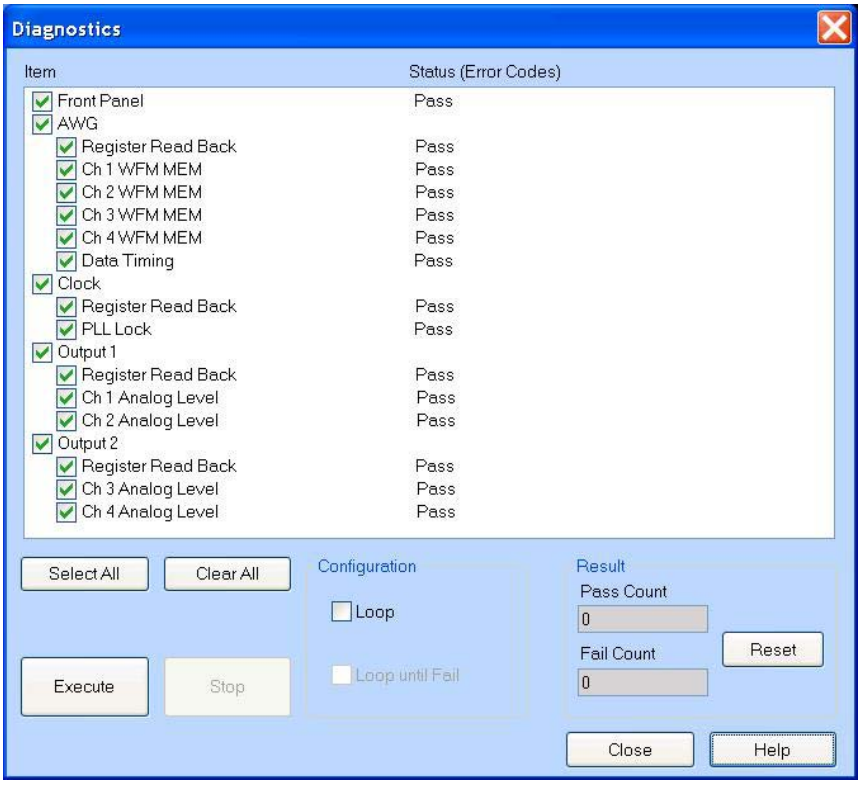


Figure 4-26: Diagnostics dialog box

3. In the dialog box, confirm that all the check boxes are selected. If they are not all selected, click **Select All**.
4. Click **Execute** to execute the diagnostics.

Table 4-8: Diagnostics error

Error code	Error log message	Possible defect on board	Note
AWG register readback			
120000000	HwDiagAwgRegister AwgController address_0x21 register diag. Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000
120000001	HwDiagAwgRegister AwgController address_0x23 register diag. Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000
120000002	HwDiagAwgRegister AwgController address_0x30 register diag. Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000
120000003	HwDiagAwgRegister AwgController address_0x40 register diag. Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000
120000004	HwDiagAwgRegister AwgController address_0x41 register diag. Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000
120000005	HwDiagAwgRegister AwgController address_0x42 register diag. Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000
120000006	HwDiagAwgRegister AwgController address_0x50 register diag. Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000
120000007	HwDiagAwgRegister Ch1 MemoryController-N Communication Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000, U4000A
120000008	HwDiagAwgRegister Ch2 MemoryController-N Communication Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000, U4000B
120000009	HwDiagAwgRegister Ch1 TEK0015-TNO address_REG register diag. Fail expected data=xxxx actual data=xxxx TNO: TEK0015 number REG: Register number	AWG1G	AWG1G: U1000, U4310A, U4420A
120000010	HwDiagAwgRegister Ch2 TEK0015-TNO address_REG register diag. Fail expected data=xxxx actual data=xxxx TNO: TEK0015 number REG: Register number	AWG1G	AWG1G: U1000, U4310B, U4420B
120000013	HwDiagAwgRegister Ch1 TEK0015-TNO address_REG register diag. Fail expected data=xxxx actual data=xxxx TNO: TEK0015 number REG: Register number	AWG1G	AWG1G: U1000, U4310C, U4420C
120000014	HwDiagAwgRegister Ch2 TEK0015-TNO address_REG register diag. Fail expected data=xxxx actual data=xxxx TNO: TEK0015 number REG: Register number	AWG1G	AWG1G: U1000, U4310D, U4420D
120000023	HwDiagAwgRegister AD9736 failed channel=1 address=xx expected data=0xXX actual data=0xXX	AWG1G	AWG1G: U1000, U6000A
120000024	HwDiagAwgRegister AD9736 failed channel=2 address=xx expected data=0xXX actual data=0xXX	AWG1G	AWG1G: U1000, U6000B

Table 4-8: Diagnostics error (cont.)

Error code	Error log message	Possible defect on board	Note
120000025	HwDiagAwgRegister AD9736 failed channel=3 address=xx expected data=0xXX actual data=0xXX	AWG1G	AWG1G: U1000, U6000C
120000026	HwDiagAwgRegister AD9736 failed channel=4 address=xx expected data=0xXX actual data=0xXX	AWG1G	AWG1G: U1000, U6000D
120000027	HwDiagAwgRegister Ch3 MemoryController Communication Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000, U4000C
120000028	HwDiagAwgRegister Ch4 MemoryController Communication Fail expected data=xxxx actual data=xxxx	AWG1G	AWG1G: U1000, U4000D
CH 1 waveform memory			
121000000	HwDiagWaveformMemory channel1, testNo Data bus [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx testNo: 1'st 2'nd IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000A, U4500A, U4510A, U4520A, U4530A, U4600A, U4610A, U4620A, U4630A.
121000001	HwDiagWaveformMemory channel1, Address Bus=xxxxxxxx [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000A, U4500A, U4510A, U4520A, U4530A, U4600A, U4610A, U4620A, U4630A.
121000002	HwDiagWaveformMemory channe1, Memory Cell testNo BIT[CNT] Error testNo: 1'st or 2'nd BIT: Data bus bit CNT: data bit	AWG1G	AWG1G: U4000A, U4500A, U4510A, U4520A, U4530A, U4600A, U4610A, U4620A, U4630A.
CH 2 waveform memory			
122000000	HwDiagWaveformMemory channel2, testNo Data bus [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx testNo: 1'st 2'nd IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000B, U4500B, U4510B, U4520B, U4530B, U4600B, U4610B, U4620B, U4630B.
122000001	HwDiagWaveformMemory channel2, Address Bus=xxxxxxxx [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000B, U4500B, U4510B, U4520B, U4530B, U4600B, U4610B, U4620B, U4630B.
122000002	HwDiagWaveformMemory channe2, Memory Cell testNo BIT[CNT] Error testNo: 1'st or 2'nd BIT: Data bus bit CNT: data bit	AWG1G	AWG1G: U4000B, U4500B, U4510B, U4520B, U4530B, U4600B, U4610B, U4620B, U4630B.

Table 4-8: Diagnostics error (cont.)

Error code	Error log message	Possible defect on board	Note
CH 3 waveform memory			
123000000	HwDiagWaveformMemory channel3, testNo Data bus [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx testNo: 1'st 2'nd IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000C, U4500C, U4510C, U4520C, U4530C, U4600C, U4610C, U4620C, U4630C.
123000001	HwDiagWaveformMemory channel3, Address Bus=xxxxxxxx [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000C, U4500C, U4510C, U4520C, U4530C, U4600C, U4610C, U4620C, U4630C.
123000002	HwDiagWaveformMemory channe3, Memory Cell testNo BIT[CNT] Error testNo: 1'st or 2'nd BIT: Data bus bit CNT: data bit	AWG1G	AWG1G: U4000C, U4500C, U4510C, U4520C, U4530C, U4600C, U4610C, U4620C, U4630C.
CH 4 waveform memory			
124000000	HwDiagWaveformMemory channel4, testNo Data bus [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx testNo: 1'st 2'nd IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000D, U4500D, U4510D, U4520D, U4530D, U4600D, U4610D, U4620D, U4630D.
124000001	HwDiagWaveformMemory channel4, Address Bus=xxxxxxxx [IC-Pin] Error expected data=xxxxxxxx actual data=xxxxxxxx IC: IC number Pin: Pin number	AWG1G	AWG1G: U4000D, U4500D, U4510D, U4520D, U4530D, U4600D, U4610D, U4620D, U4630D.
124000002	HwDiagWaveformMemory channe4, Memory Cell testNo BIT[CNT] Error testNo: 1'st or 2'nd BIT: Data bus bit CNT: data bit	AWG1G	AWG1G: U4000D, U4500D, U4510D, U4520D, U4530D, U4600D, U4610D, U4620D, U4630D.
Data timing margin			
125000000	HwDiagDataTiming channel=1, Value is out of a range max=xx min=xx	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200
125000001	HwDiagDataTiming channel=2, Value is out of a range max=xx min=xx	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200
125000002	HwDiagDataTiming channel=3, Value is out of a range max=xx min=xx	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200
125000003	HwDiagDataTiming channel=4, Value is out of a range max=xx min=xx	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200

Table 4-8: Diagnostics error (cont.)

Error code	Error log message	Possible defect on board	Note
Clock register read back			
130000000	HwDiagClockRegister PLL_MUX_HIGH=0	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200
130000001	HwDiagClockRegister PLL_MUX_LOW=1	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200
Clock PLL lock			
131000008	HwDiagClockPll 100MHz PLL Locked	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200, U3220, Y3100, Y3230
131000009	HwDiagClockPll 900MHz PLL Unlocked	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200, U3220, Y3100, Y3230
131000010	HwDiagClockPll 590MHz PLL Unlocked	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200, U3220, Y3100, Y3230
131000011	HwDiagClockPll 1210MHz PLL Unlocked	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200, U3220, Y3100, Y3230
Output 1 register read back			
140000000	The error occurred in the EEPROM read. 1'St=FST 2'Nd=SND FST: the data that is received from EEPROM at the first read check SND: the data that is received from EEPROM at the second read check, which is implemented after writing 0x55 to EEPROM	OUT1G	OUT1G-CH1/CH2: U5010, U5020
140000001	Error message is changed according to the situation.	OUT1G	OUT1G-CH1/CH2: U5010, U5020
Output 2 register read back			
150000000	The error occurred in the EEPROM read. 1'St=FST 2'Nd=SND FST: the data that is received from EEPROM at the first read check SND: the data that is received from EEPROM at the second read check, which is implemented after writing 0x55 to EEPROM	OUT1G	OUT1G-CH3/CH4: U5010, U5020
150000001	Error message is changed according to the situation.	OUT1G	OUT1G-CH3/CH4: U5010, U5020
TekLink			
190000000	TekLink receive error Send=TR Recv=RV TR:Transmition data RV:Receive data	MIO	MIO: U300
Output 1 analog level			
141XP0031	Analog Level Diag CHX positive (negative) 6db attenuator failed. Expected 0.5005, actual xxxxx	OUT1G	OUT1G: K1100, K2100, K3100, K4100
141XP0032	Analog Level Diag CHX positive (negative) 12db attenuator failed. Expected 0.2530, actual xxxxx	OUT1G	OUT1G: K1105, K2105, K3105, K4105
141XP0033	Analog Level Diag CHX positive (negative) 24db attenuator failed. Expected 0.0631, actual xxxxx	OUT1G	OUT1G: K1110, K2110, K3110, K4110

Table 4-8: Diagnostics error (cont.)

Error code	Error log message	Possible defect on board	Note
141XP0034	Analog Level Diag CHX positive (negative) 20mhz filter failed. Expected 0.975, actual xxxxx	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
141XP0035	Analog Level Diag CHX positive (negative) 100mhz filter failed. Expected 0.995, actual xxxxx	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
141XP0036	Analog Level Diag CHX positive (negative) amp failed. Expected 8.95, actual xxxxx	OUT1G	OUT1G: U1140, U1145, U1160A/B, U2140, U2145, U2160A/B, U3140, U3145, U3160A/B, U4140, U4145, U4160A/B
141XP0037	Analog Level Diag CHX positive (negative) output offset failed. Expected 2.0V, actual xxxxxV	OUT1G	OUT1G: U1200, U1220, Q1218, Q1228, U2200, U2220, Q2218, Q2228, U3200, U3220, Q3218, Q3228, U4200, U4220, Q4218, Q4228
141XP0038	Analog Level Diag CHX positive (negative) output offset failed. Expected 0.0V, actual xxxxxV	OUT1G	OUT1G: U1200, U1220, Q1218, Q1228, U2200, U2220, Q2218, Q2228, U3200, U3220, Q3218, Q3228, U4200, U4220, Q4218, Q4228
141XP0040	Analog Level Diag CHX positive (negative) D/A internal offset1 failed. Expected 0.0mV, actual xxxxxmV	AWG1G	AWG1G: U6000, U6025, U6035 [A-B]
141XP0041	Analog Level Diag CHX positive (negative) D/A internal offset2 failed. Expected 0.0mV, actual xxxxxmV	AWG1G	AWG1G: U6000, U6025, U6035 [A-B]
141XP0042	Analog Level Diag CHX positive (negative) read D/A gain11 failed. Expected 0.300V, actual xxxxxV	AWG1G, OUT1G	AWG1G: U6000, U6015 [A-B], J6020 [A-B], J6030 [A-B] OUT1G: J1000, J2000, J3000, J4000
141XP0043	Analog Level Diag CHX positive (negative) read D/A gain21 failed. Expected 0.150V, actual xxxxxV	AWG1G	AWG1G: U6000, U6015 [A-B]
141XP0052	Analog Level Diag CHX 6db att gain balance failed.	OUT1G	OUT1G: K1100, K2100, K3100, K4100
141XP0053	Analog Level Diag CHX 12db att gain balance failed.	OUT1G	OUT1G: K1105, K2105, K3105, K4105
141XP0054	Analog Level Diag CHX 24db att gain balance failed.	OUT1G	OUT1G: K1110, K2110, K3110, K4110
141XP0055	Analog Level Diag CHX 20mhz filter gain balance failed.	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
141XP0056	Analog Level Diag CHX 100mhz filter gain balance failed.	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
141XP0057	Analog Level Diag CHX amp gain balance failed.	OUT1G	OUT1G: U1140, U1145, U1160A/B, U2140, U2145, U2160A/B, U3140, U3145, U3160A/B, U4140, U4145, U4160A/B
141XP0058	Analog Level Diag CHX A/D converter read failed.	OUT1G	OUT1G: U5010, U5100, U5112, U5114
Output 2 analog level			
151XP0031	Analog Level Diag CHX positive (negative) 6db attenuator failed. Expected 0.5005, actual xxxxx	OUT1G	OUT1G: K1100, K2100, K3100, K4100
151XP0032	Analog Level Diag CHX positive (negative) 12db attenuator failed. Expected 0.2530, actual xxxxx	OUT1G	OUT1G: K1105, K2105, K3105, K4105

Table 4-8: Diagnostics error (cont.)

Error code	Error log message	Possible defect on board	Note
151XP0033	Analog Level Diag CHX positive (negative) 24db attenuator failed. Expected 0.0631, actual xxxxx	OUT1G	OUT1G: K1110, K2110, K3110, K4110
151XP0034	Analog Level Diag CHX positive (negative) 20mhz filter failed. Expected 0.975, actual xxxxx	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
151XP0035	Analog Level Diag CHX positive (negative) 100mhz filter failed. Expected 0.995, actual xxxxx	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
151XP0036	Analog Level Diag CHX positive (negative) amp failed. Expected 8.95, actual xxxxx	OUT1G	OUT1G: U1140, U1145, U1160A/B, U2140, U2145, U2160A/B, U3140, U3145, U3160A/B, U4140, U4145, U4160A/B
151XP0037	Analog Level Diag CHX positive (negative) output offset failed. Expected 2.0V, actual xxxxxV	OUT1G	OUT1G: U1200, U1220, Q1218, Q1228, U2200, U2220, Q2218, Q2228, U3200, U3220, Q3218, Q3228, U4200, U4220, Q4218, Q4228
151XP0038	Analog Level Diag CHX positive (negative) output offset failed. Expected 0.0V, actual xxxxxV	OUT1G	OUT1G: U1200, U1220, Q1218, Q1228, U2200, U2220, Q2218, Q2228, U3200, U3220, Q3218, Q3228, U4200, U4220, Q4218, Q4228
151XP0040	Analog Level Diag CHX positive (negative) D/A internal offset1 failed. Expected 0.0mV, actual xxxxxmV	AWG1G	AWG1G: U6000, U6025, U6035 [C-D]
151XP0041	Analog Level Diag CHX positive (negative) D/A internal offset2 failed. Expected 0.0mV, actual xxxxxmV	AWG1G	AWG1G: U6000, U6025, U6035 [C-D]
151XP0042	Analog Level Diag CHX positive (negative) read D/A gain11 failed. Expected 0.300V, actual xxxxxV	AWG1G, OUT1G	AWG1G: U6000, U6015 [C-D], J6020 [C-D], J6030 [C-D] OUT1G: J1000, J2000, J3000, J4000
151XP0043	Analog Level Diag CHX positive (negative) read D/A gain21 failed. Expected 0.150V, actual xxxxxV	AWG1G	AWG1G: U6000, U6015 [C-D]
151XP0052	Analog Level Diag CHX 6db att gain balance failed.	OUT1G	OUT1G: K1100, K2100, K3100, K4100
151XP0053	Analog Level Diag CHX 12db att gain balance failed.	OUT1G	OUT1G: K1105, K2105, K3105, K4105
151XP0054	Analog Level Diag CHX 24db att gain balance failed.	OUT1G	OUT1G: K1110, K2110, K3110, K4110
151XP0055	Analog Level Diag CHX 20mhz filter gain balance failed.	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
151XP0056	Analog Level Diag CHX 100mhz filter gain balance failed.	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
151XP0057	Analog Level Diag CHX amp gain balance failed.	OUT1G	OUT1G: U1140, U1145, U1160A/B, U2140, U2145, U2160A/B, U3140, U3145, U3160A/B, U4140, U4145, U4160A/B
151XP0058	Analog Level Diag CHX A/D converter read failed.	OUT1G	OUT1G: U5010, U5100, U5112, U5114

Calibration Error

To run the instrument calibration, do these steps:

1. Turn off all other applications.
2. From the menu bar, select **System** and then select **Calibration...**; the Calibration dialog box appears (see Figure 4-27).

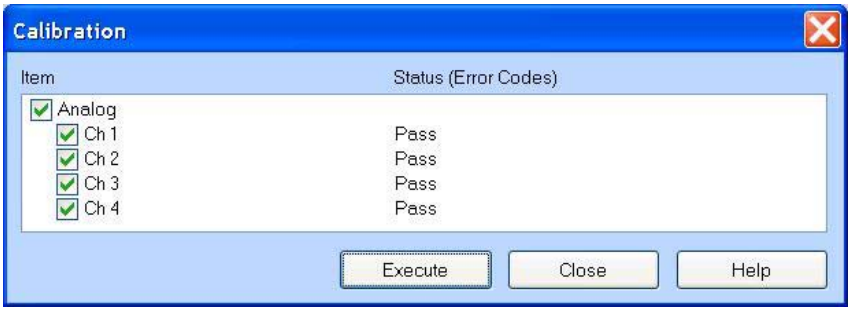


Figure 4-27: Calibration dialog box

3. Click **Execute** to execute the calibration.

Table 4-9: Calibration error

Error code	Error log message	Possible defect on board	Note
200XP0031	Analog Level Calibration CHX positive (negative) 6db attenuator failed. Expected:0.5005, actual:xxxx	OUT1G	OUT1G: K1100, K2100, K3100, K4100
200XP0032	Analog Level Calibration CHX positive (negative) 12db attenuator failed. Expected:0.2530, actual:xxxx	OUT1G	OUT1G: K1105, K2105, K3105, K4105
200XP0033	Analog Level Calibration CHX positive (negative) 24db attenuator failed. Expected:0.0631, actual:xxxxx	OUT1G	OUT1G: K1110, K2110, K3110, K4110
200XP0034	Analog Level Calibration CHX positive (negative) 20mhz filter failed. Expected:0.975, actual:xxxx	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
200XP0035	Analog Level Calibration CHX positive (negative) 100mhz filter failed. Expected:0.995, actual:xxxx	OUT1G	OUT1G: K1120,, K1125, K2120, K2125, K3120, K3125, K4120, K4125
200XP0036	Analog Level Calibration CHX positive (negative) amplitude amp failed. Expected:8.95, actual:x	OUT1G	OUT1G: U1140, U1145, U1160A/B, U2140, U2145, U2160A/B, U3140, U3145, U3160A/B, U4140, U4145, U4160A/B
200XP0037	Analog Level Calibration CHX positive (negative) output offset 0V failed. Expected:0.0V, actual:xxxV	OUT1G	OUT1G: U1200, U1220, Q1218, Q1228, U2200, U2220, Q2218, Q2228, U3200, U3220, Q3218, Q3228, U4200, U4220, Q4218, Q4228

Table 4-9: Calibration error (cont.)

Error code	Error log message	Possible defect on board	Note
200XP0038	Analog Level Calibration CHX positive (negative) output offset 2.0V failed. Expected:2.0V, actual:xxxV	OUT1G	OUT1G: U1200, U1220, Q1218, Q1228, U2200, U2220, Q2218, Q2228, U3200, U3220, Q3218, Q3228, U4200, U4220, Q4218, Q4228
200XP0039	Analog Level Calibration CHX positive (negative) D/A internal offset0 failed. FSC=900(FSC=260) expected:0.0mV, actual:xxxmV	AWG1G, OUT1G	AWG1G: U6000, U6025, U6035, J6020 [A-D], J6030 [A-D] OUT1G: J1000, J2000, J3000, J4000
200XP0040	Analog Level Calibration CHX positive (negative) D/A internal offset1 failed. FSC=900(FSC=260) expected:0.0mV, actual:xxxmV	AWG1G	AWG1G: U6000, U6025, U6035
200XP0041	Analog Level Calibration CHX positive (negative) D/A internal offset2 failed. FSC=900(FSC=260) expected:0.0mV, actual:xxxmV	AWG1G	AWG1G: U6000, U6025, U6035
200XP0042	Analog Level Calibration CHX positive (negative) read D/A gain1 failed. Expected:0.300V, actual:xxxV	AWG1G, OUT1G	AWG1G: U6000, U6015, J6020 [A-D], J6030 [A-D] OUT1G: J1000, J2000, J3000, J4000
200XP0043	Analog Level Calibration CHX positive (negative) read D/A gain2 failed. Expected:0.150V, actual:xxxV	AWG1G	AWG1G: U6000, U6015
200X00044	Analog Level Calibration CHX D/A gain balance1 failed.	AWG1G	AWG1G: U6000
200X00045	Analog Level Calibration CHX D/A gain balance2 failed.	AWG1G	AWG1G: U6000
200X00046	Analog Level Calibration CHX D/A gain balance3 failed.	AWG1G	AWG1G: U6000
200X00047	Analog Level Calibration CHX D/A gain balance4 failed.	AWG1G	AWG1G: U6000
200X00048	Analog Level Calibration CHX D/A gain balance5 failed.	AWG1G	AWG1G: U6000, U6025, U6035
200X00049	Analog Level Calibration CHX D/A gain balance6 failed.	AWG1G	AWG1G: U6000, U6025, U6035
200X00050	Analog Level Calibration CHX D/A gain balance7 failed.	AWG1G	AWG1G: U6000
200X00051	Analog Level Calibration CHX D/A gain balance8 failed.	AWG1G	AWG1G: U6000
200X00052	Analog Level Calibration CHX 6db attenuator gain balance failed.	OUT1G	OUT1G: K1100, K2100, K3100, K4100
200X00053	Analog Level Calibration CHX 12db attenuator gain balance failed.	OUT1G	OUT1G: K1105, K2105, K3105, K4105
200X00054	Analog Level Calibration CHX 24db attenuator gain balance failed.	OUT1G	OUT1G: K1100, K2100, K3100, K4100
200X00055	Analog Level Calibration CHX filter 20mhz gain balance failed.	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
200X00056	Analog Level Calibration CHX filter 100mhz gain balance failed.	OUT1G	OUT1G: K1120, K1125, K2120, K2125, K3120, K3125, K4120, K4125
200X00057	Analog Level Calibration CHX amp gain balance failed.	OUT1G	OUT1G: U1140, U1145, U1160A/B, U2140, U2145, U2160A/B, U3140, U3145, U3160A/B, U4140, U4145, U4160A/B

Hardware Error

Table 4-10 lists the instrument hardware related errors.

Table 4-10: Hardware error

Error code	Error log message	Possible defect on board	Note
300000000	The system cannot find the device specified.	MIO	MIO: U100, U200, U220,Y230
300000001	The device is not ready.	N/A	Software
300000002	The AWG register access timeout period has expired.		MIO: U200, U300 AWG1G: U1000 MIO-AWG1G Cable
300000003	The time-out was generated while measuring data.	AWG1G	AWG1G: U1000
300000004	The timer for the trigger has stopped.	AWG1G	AWG1G: U1000
300000005	PLL doesn't lock.	AWG1G, CLK1G	AWG1G: U1000 CLK1G: U3200, U3220,Y3230
300000006	AwgController DLL doesn't lock.	AWG1G, CLK1G	AWG1G: U1000, J3010 CLK1G: J3230
300000007	Output board access error Board=No No: Board number (Start with 0)	OUT1G	OUT1G: U5010
300000008	Not enough storage is available to process.	N/A	Software
300000009	Calibration checksum data has an error.	MIO	MIO: U300,U390
300000010	Calibration version unmatched.	MIO	MIO: U300,U390
300000012	The Ipc busy timeout period has expired.	AWG1G	AWG1G: U1000
300000013	MemoryController DLL doesn't lock.	AWG1G	AWG1G: U1000, U4000x
300000050	Failed in the phase adjustment of TEK0015 and AD9736. channel=1	AWG1G, CLK1G	AWG1G: U1000, U6000A, J3010 CLK1G: J3230
300000051	Failed in the phase adjustment of TEK0015 and AD9736. channel=2	AWG1G	AWG1G: U1000, U6000B
300000052	Failed in the phase adjustment of TEK0015 and AD9736. channel=3	AWG1G	AWG1G: U1000, U6000C
300000053	Failed in the phase adjustment of TEK0015 and AD9736. channel=4	AWG1G	AWG1G: U1000, U6000D
300000054	Failed in the adjustment of AD9736 FIFO. Channel=1	AWG1G	AWG1G: U1000, U6000A
300000055	Failed in the adjustment of AD9736 FIFO. Channel=2	AWG1G	AWG1G: U1000, U6000B
300000056	Failed in the adjustment of AD9736 FIFO. Channel=3	AWG1G	AWG1G: U1000, U6000C
300000057	Failed in the adjustment of AD9736 FIFO. Channel=4	AWG1G	AWG1G: U1000, U6000D
300000058	Failed in the phase adjustment of two Tek0015. channel=1	AWG1G	AWG1G: U1000, U4310A, U4420A
300000059	Failed in the phase adjustment of two Tek0015. channel=2	AWG1G	AWG1G: U1000, U4310B, U4420B
300000060	Failed in the phase adjustment of two Tek0015. channel=3	AWG1G	AWG1G: U1000, U4310C, U4420C
300000061	Failed in the phase adjustment of two Tek0015. channel=4	AWG1G	AWG1G: U1000, U4310D, U4420D

Table 4-10: Hardware error (cont.)

Error code	Error log message	Possible defect on board	Note
300000062	Failed in the phase adjustment between channel=2.	AWG1G	AWG1G: U4720, U4740, U4750, U4440, U7504, U7500, U7510, U7600, U7602, U1040
300000063	Failed in the phase adjustment between channel=3.	AWG1G	AWG1G: U4720, U4740, U4750, U4440, U7504, U7500, U7510, U7600, U7602, U1040
300000064	Failed in the phase adjustment between channel=4.	AWG1G	AWG1G: U4720, U4740, U4750, U4440, U7504, U7500, U7510, U7600, U7602, U1040
300000100	The access of MIO board EEPROM, it failed.	MIO	MIO: U300, U390
300000101	The access of OUTPUT board EEPROM, it failed.	OUT1G	OUT1G: U5010, U5100
300000102	The relay count is invalid. Board-1	OUT1G	OUT1G: U5010, U5100
300000103	The relay count is invalid. Board-2	OUT1G	OUT1G: U5010, U5100
300000200	The download (INIT) timeout period has expired.	MIO	MIO: U200, U300
300000201	The download (INIT) timeout period has expired.	MIO	MIO: U200, U300
300000202	The download (DONE) timeout period has expired.	MIO	MIO: U200, U300
300000203	The download timeout period has expired.	MIO	MIO: U200, U300
300000204	The system cannot find the file specified. (PLD140b.Bit)	N/A	Software
300000205	An attempt was made to load a program with an incorrect format. (PLD131.Bit)	N/A	Software
300000206	The download (AwgController-INIT) timeout period has expired.	MIO, AWG1G	MIO: U300, AWG1G: U1000, MIO-AWG1G cable
300000207	The download (AwgController-INIT) timeout period has expired.	MIO, AWG1G	MIO: U300, AWG1G: U1000
300000208	The download (DONE) timeout period has expired.	MIO, AWG1G	MIO: U300, AWG1G: U1000, MIO-AWG1G cable
300000209	The download timeout period has expired.	MIO, AWG1G	MIO: U300, AWG1G: U1000, MIO-AWG1G cable
300000210	The system cannot find the file specified. (PLD131.Bit)	N/A	Software/disk drive
300000211	An attempt was made to load a program with an incorrect format. (PLD131.Bit)	N/A	Software/disk drive
300000212	The download (AwgController-INIT) timeout period has expired.	MIO, AWG1G	MIO: U300, AWG1G: U1000, U4000x Product configuration (number of channels) is wrong.
300000213	The download (AwgController-INIT) timeout period has expired.	MIO, AWG1G	MIO: U300, AWG1G: U1000, U4000x Product configuration (number of channels) is wrong.
300000214	The download (AwgController-DONE) timeout period has expired.	MIO,AWG1G	MIO: U300, AWG1G: U1000, U4000x Product configuration (number of channels) is wrong.

Table 4-10: Hardware error (cont.)

Error code	Error log message	Possible defect on board	Note
300000215	The download (AwgController) timeout period has expired.	MIO/AWG1G	MIO: U300, AWG1G: U1000, U4000x Product configuration (number of channels) is wrong.
300000216	The system cannot find the file specified. (PLD130b.Bit)	N/A	Software/disk drive
300000217	An attempt was made to load a program with an incorrect format. (PLD130b.Bit)	N/A	Software/disk drive
300000218	The DCM timeout period has expired.	MIO	MIO: U300
300000219	The LOCKED timeout period has expired.	MIO	MIO: U300
310000000	The parameter is incorrect.	N/A	Software/disk drive
390000001	The calibration data is invalid. The default value is used.	N/A	This is not a defect.
390000002	*** Warning *** It started with Manufacturing mode.	N/A	This is not a defect.
390000003	The calibration data is invalid. The default value is used.	N/A	This is not a defect.

After Repair

After removal and replacement of a module, you must perform the Adjustment and Performance Verification procedures. You can find the information about these procedures in the following manuals:

- *AWG5000 Series Arbitrary Waveform Generators Service Manual* (Tektronix part number 071-2083-XX)
- *AWG5000 Series Arbitrary Waveform Generators Specifications and Performance Verification* (Tektronix part number 071-2082-XX)

Returning the Instrument for Service

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

Seal the shipping carton with an industrial stapler or strapping tape.

Before returning the instrument for service, contact the Service Center to get an RMA (return material authorization) number, and any return or shipping information you may need.

If the instrument is being shipped to a Tektronix Service Center, enclose the following information:

- The RMA number.
- The owner's address.
- Name and phone number of a contact person.
- Type and serial number of the instrument.
- Reason for returning.
- A complete description of the required service.

Mark the address of the Tektronix Service Center and the return address on the shipping carton in two prominent locations. See www.tektronix.com\service to find a Tektronix Service Center near you.

Replaceable Parts

Replaceable Parts

This section contains a list of the replaceable modules for the AWG5000 Series Arbitrary Waveform Generators. Use this list to identify and order replacement parts.

Parts Ordering Information

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

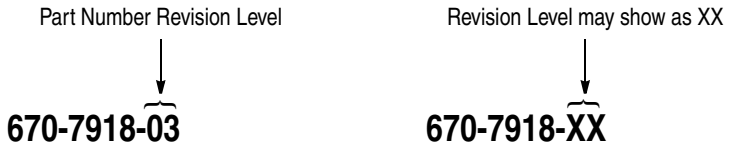
Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest circuit improvements. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Part Number Revision Level

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



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

Module Servicing

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

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

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

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

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the AWG5000 Series. 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 component number.
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.

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

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-1					**COSMETICS**
-1	335-1584-00			1	MARKER,IDENT; LABEL,INDENTIFICATION;AWG5002,SAFETY CONTROLLED
	335-1585-00			1	MARKER,IDENT; LABEL,INDENTIFICATION;AWG5004,SAFETY CONTROLLED
	335-1586-00			1	MARKER,IDENT; LABEL,INDENTIFICATION;AWG5012,SAFETY CONTROLLED
	335-1587-00			1	MARKER,IDENT; LABEL,INDENTIFICATION;AWG5014,SAFETY CONTROLLED
-2	101-0176-00			1	TRIM,RING;FRONT;SAFETY CONTROLLED
-3	101-0177-00			1	TRIM,ACQUISITION INSERT,HPI.SMA SONNECTOR
-4	101-0174-00			1	TRIM,DVD
-5	260-2837-00			1	KEYPAD; FOR POWER BUTTON TOP,CLEAR,SILICONE RUBBER W/CONDUCTIVE SILICONE RUBBER TIP,SNAP ACTION,TRAVEL 0.045 IN,200 GRAM,HYSTERESIS GT 35%,W TOP COAT
-6	211-1050-00			4	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-7	200-4994-00			1	COVER, COSMETIC, TOP
-8	211-1050-00			4	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-9	355-0298-00			4	STUD.SNAP; 0.570 DIA,0.165 THK,STAINLESS STEEL
-10	211-0732-00			4	SCR,ASSEM WSHR; 6-32 X 0.75,PNH,STL,CD PL,TORX T15
-11	348-1861-00			4	FOOT; REAR, ASSY. W/ CORD WRAP, THERMOPLASTIC,SRY
-12	407-4887-00			1	BRACKET:HANDLE BASE,PC/ABS ALLOY,BAYER BAYBLEND FR-110,TEK BLUE, SAFETY CONTROLLED
-13	212-0232-00			2	SCREW,MACHINE; 8-32 X 1.125L,PNH,STL,BLACK ZINK SPEC #ASTM B633 TYPE II, T-20,TORX DRIVE
-14	367-0528-00			1	HANDLE, CARRYING;DUAL DUROMETER MOLDED, POLYPROPYLENE,VINYL GRIP SECTION,SAFETY CONTROLLED
-15	348-1515-00			2	FEET,CABINET; BLACK,SET OF 4 FEET
-16	200-4995-00			1	COVER, COSMETIC, BOTTOM
-17	211-1050-00			3	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-18	335-1576-00			1	MARKER, IDENTIFICATION, FRONT PANEL, 4 CHANNEL, SAFETY CONTROLLED
-19	335-1579-00			1	MARKER, IDENTIFICATION, SIGNAL INPUT/OUTPUT, BNC, 4 CHANNEL, SAFETY CONTROLLED
	335-1580-00			1	MARKER, IDENTIFICATION, SIGNAL INPUT/OUTPUT, BNC, 2 CHANNEL, SAFETY CONTROLLED
-20	366-0841-00			1	KNOB, CAP; 1.380 DIA, PC/ABS, SILVER GRAY

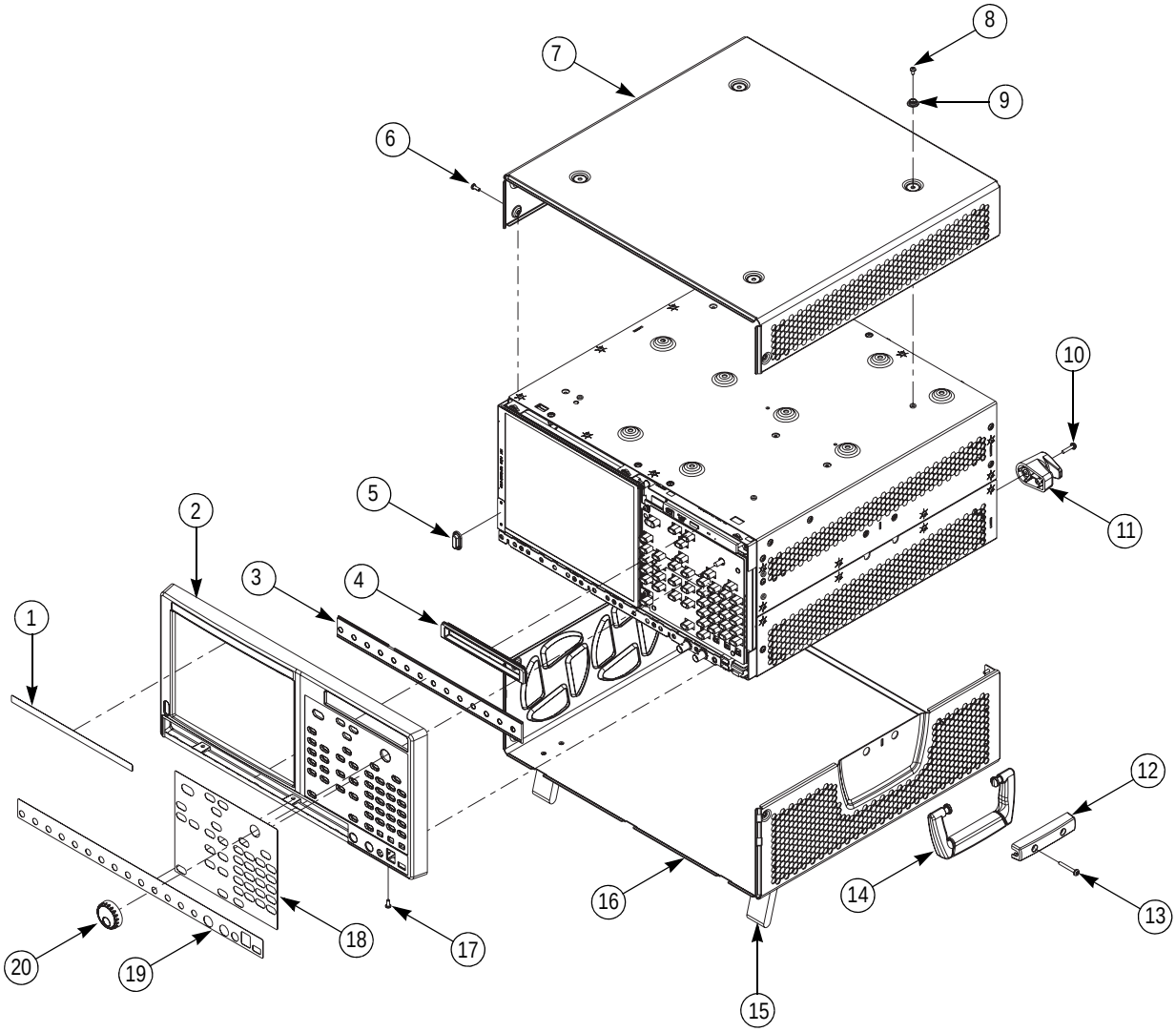


Figure 5-1: Exploded diagram - Cosmetics

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. dis-cont'd	Qty	Name & description
5-2					**EMI COVERS**
-1	200-4992-00			1	COVER, EMI, TOP
-2	200-4993-00			1	COVER, EMI, BOTTOM
-3	211-1050-00			26	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15

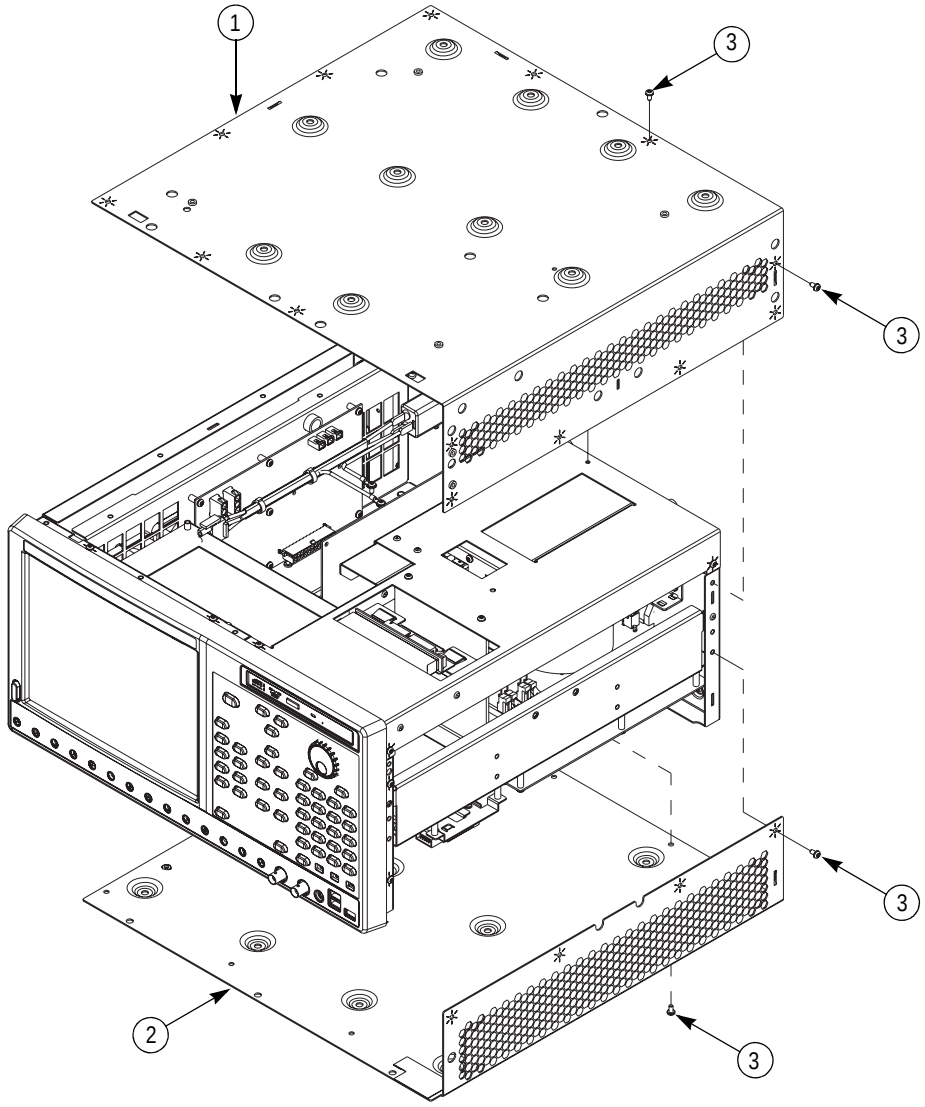


Figure 5-2: Exploded diagram - EMI Covers

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. dis-cont'd	Qty	Name & description
5-3					**CHASSIS ASSEMBLY**
-1	131-6417-00			1	CONTACT,ELEC; GROUNDING,0.600 L X 0.250 W X 0.220 D,ELECTROLESS NICKEL PLATE
-2	348-0966-00			1	GROMMET,PLASTIC;BLACK,ROUND,0.625 ID
-3	441-2471-00			1	CHASSIS, MAIN; ASSEMBLY

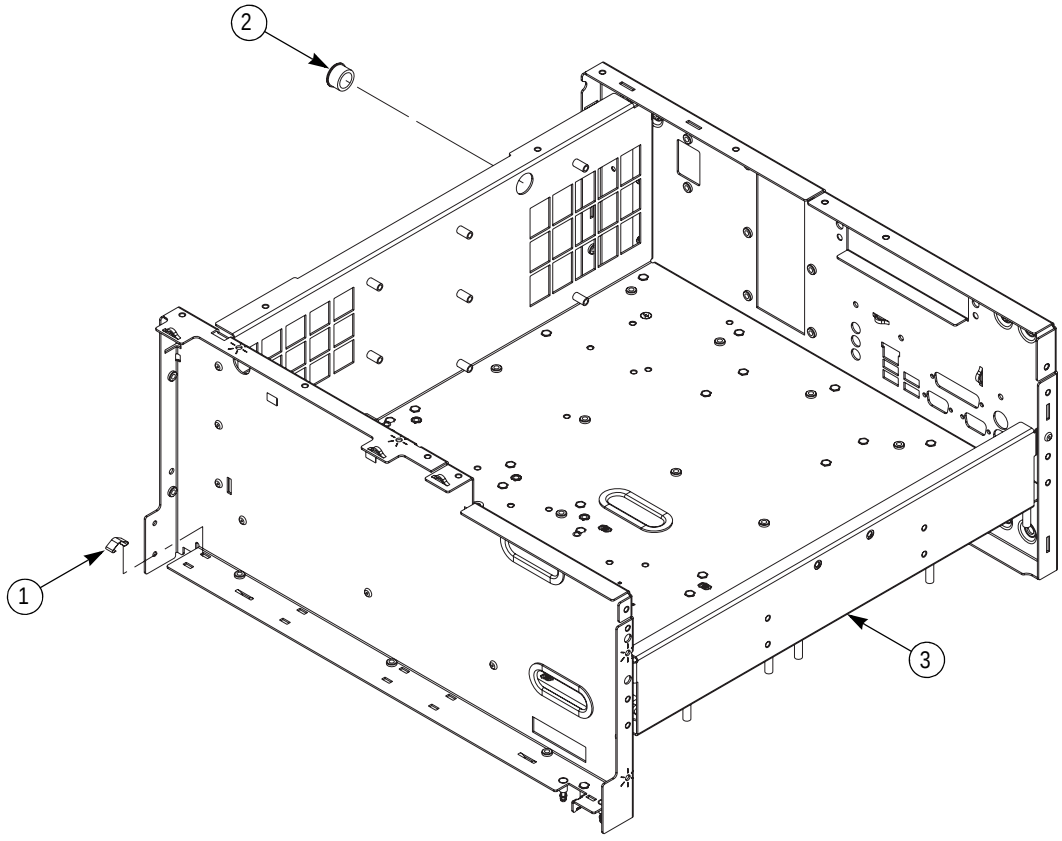


Figure 5-3: Exploded diagram - Chassis assembly

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. dis-cont'd	Qty	Name & description
5-4					**FRONT-PANEL ASSEMBLY**
-1	065-0762-00			1	TOUCH SCREEN ASSEMBLY
-2	211-1050-00			4	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-3	119-6813-00			1	DISPLAY 10.4 INCH NL10276BC24-13
-4	361-1836-00			2	SPACER,PLATE; LEXAN,TOUCH SCREEN,W/ADHESIVE
-5	407-5173-00			1	BRACKET;DISPLAY
-6	119-6806-00			1	POWER SUPPLY;INVERTER
-7	211-0069-00			2	SCREW,MACHINE; 2-56 X 0.125,PNH,STL CR PL,POZ
-8	174-4794-00			1	CA ASSY; DISPLAY ADAPTER TO INVERTOR,SAFETY CONTROLLED
-9	679-6151-00			1	CIRCUIT BOARD ASSY;FSW,FRONT PANEL SWITCH
-10	211-1050-00			2	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-11	211-1050-00			7	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-12	174-5256-00			1	CABLE ASSY ELEC: 7P,0.1,1.18IN L,AWG 24,UL1061,87456-5,103958-4, TYCO,3-640441-3,AMP,FOR PWR SW & LEDS
-13	211-1050-00			4	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-14	671-6098-00			1	CIRCUIT BOARD ASSY:LCDA,LCD ADAPTER
-15	174-5254-00			1	CABLE ASSY ELEC: 2X5P,0.1,19.7 IN L,AWG 24,W/KEYING PLUG,87456-5, 87809-1 CONTACT,AMP
-16	174-5161-00			1	CABLE ASSY;DISPLAY ADAPTER TO PCI BOARD
-17	129-1631-00			2	LOCKING STANDOFF; NATURAL 3/8 IN. SPACER,NYLON 66,1M/BAG TOP/BOTTOM HOLES: 156 IN. /.187 IN. TOP/BOTTOM PANEL THK: .062 IN.;
-18	671-6063-00			1	CIRCUIT BOARD ASSY;FRONTPANEL 389377400 WIRED
-19	260-2819-00			1	SWITCH,KEYPAD; FRONT PANEL 4CH; AWG7000 SERIES
-20	407-5176-00			1	BRACKET;TRIM,FRONTPANEL,SHEET METAL,SAFETY CONTROLLED
-21	174-4791-00			1	CA ASSY; DISPLAY ADAPTER TO XGA DISPLAY,SAFETY CONTROLLED
-22	211-1050-00			2	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15

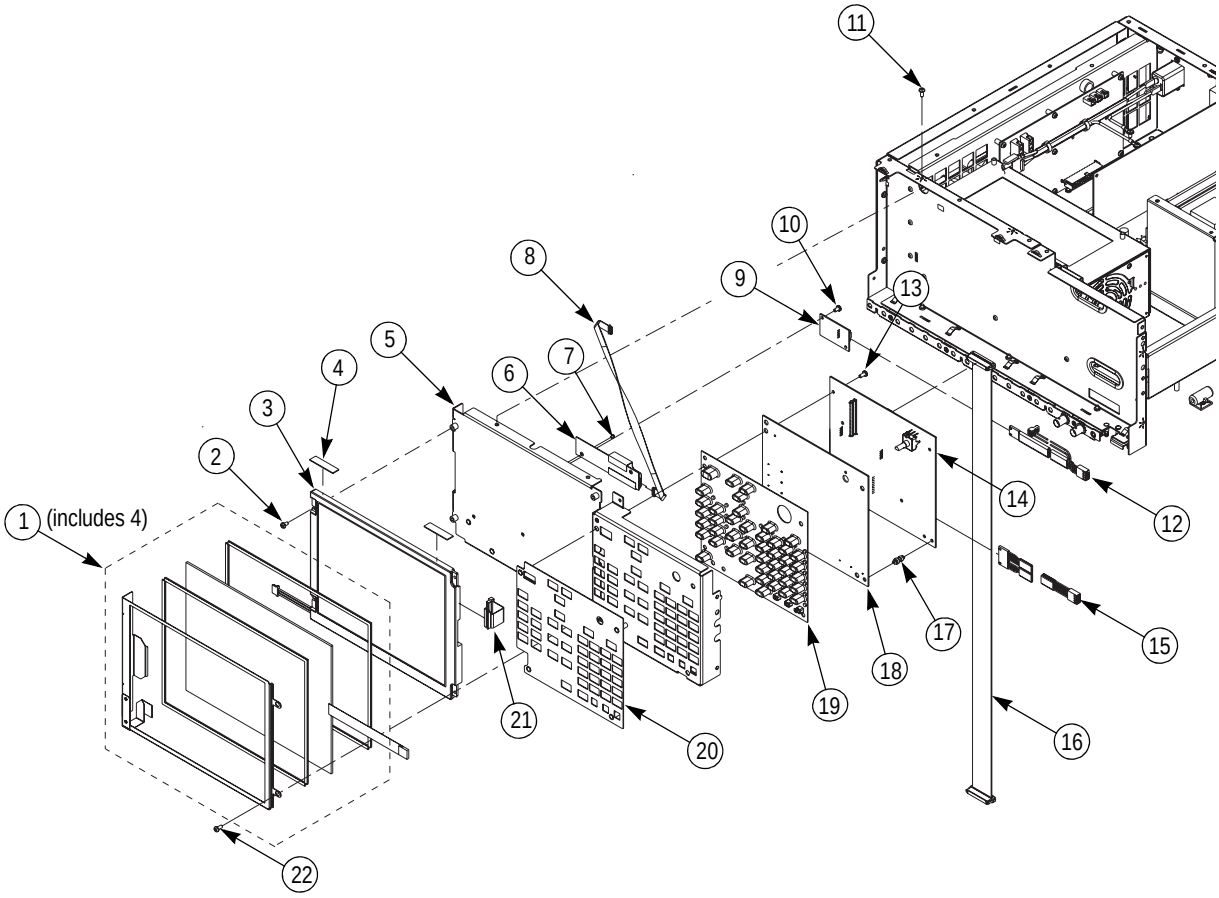


Figure 5-4: Exploded diagram - Front-panel assembly

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. dis-cont'd	Qty	Name & description
5-5					**DRIVE MODULE**
-1	407-5156-00			1	BRACKET,DVD-CD/RW;ADAPTER FOR DVD-CD/RW SLIMLINE
-2	211-1050-00			5	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-3	211-0950-00			4	SCREW,MACHINE; M2X.4X3L,PHL, PNH, STL NI PL
-4	065-0666-02			1	DISK DRIVE; OPTICAL; CDRW/DVDROM / TEAC
-5	129-1618-00			1	SPACER; DVD-CD/RW SLIMLINE DRIVE ADAPTER,PLASTIC
-6	679-5915-00			1	CKT BD SUBASSY; DVD-CD/RW ADAPTER,UNTESTED,389-3689-00 WIRED
-7	211-0888-00			2	SCREW,METRIC; M-2 X 0.4 X 6MM,PHILLIPS PAN,ZINC PLATED,PHIL PAN HEAD,STEEL
-8	174-4671-00			1	CA ASSY,SP; ULTRA DMA/ATA HARD DISK DRIVE,IDE,18.0 L,SAFETY CONTROLLED
-9	211-1050-00			8	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-10	441-2474-00			1	CHASSIS;DRIVE BAY;METAL
-11	407-5069-00			1	BRACKET,RHDD; SATA COMBO CABLE,3.5 INCH REMOVABLE HARD DISK DRIVE RECEPTACLE
-12	211-1050-00			5	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-13	174-5169-00			1	CABLE ASSY; SATA COMBO,HARD DRIVE CABLE
-14	119-7189-00			1	DISK DRIVE,HARD; 80GB,3.5 INCH,7200 RPM,SATA II 3.0 GB/S INTERFACE, HITACHI P/N HDS728080PLA380,PATHFINDER 0A30358, SAFETY CONTROLLED
-15	351-1118-00			1	GUIDE,HD; REMOVABLE,3.5 INCH HARD DISK DRIVE, SAFETY CONTROLLED
-16	211-1174-00			4	SCREW,MACHINE; W/HEAVY PATCH THREADLOCKING MATERIAL; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-17	407-5205-00			1	BRACKET, ASSEMBLY, REMOVABLE 3.5 INCH HARD DRIVE CARTRIDGE, AWG5000 SERIES
-18	211-0734-00			4	SCREW,MACHINE; 6-32 X 0.250,FLH100,STL,CDPL,T-10 TORX DR
-19	174-5017-00			1	CABLE ASSEMBLY; DVD POWER, SAFETY CONTROLLED
-20	065-0768-00			1	ACCESSORY KIT; REMOVABLE HDD ASSY; UNPROGRAMMED HARD DRIVE 119718900 W/PACKAGING

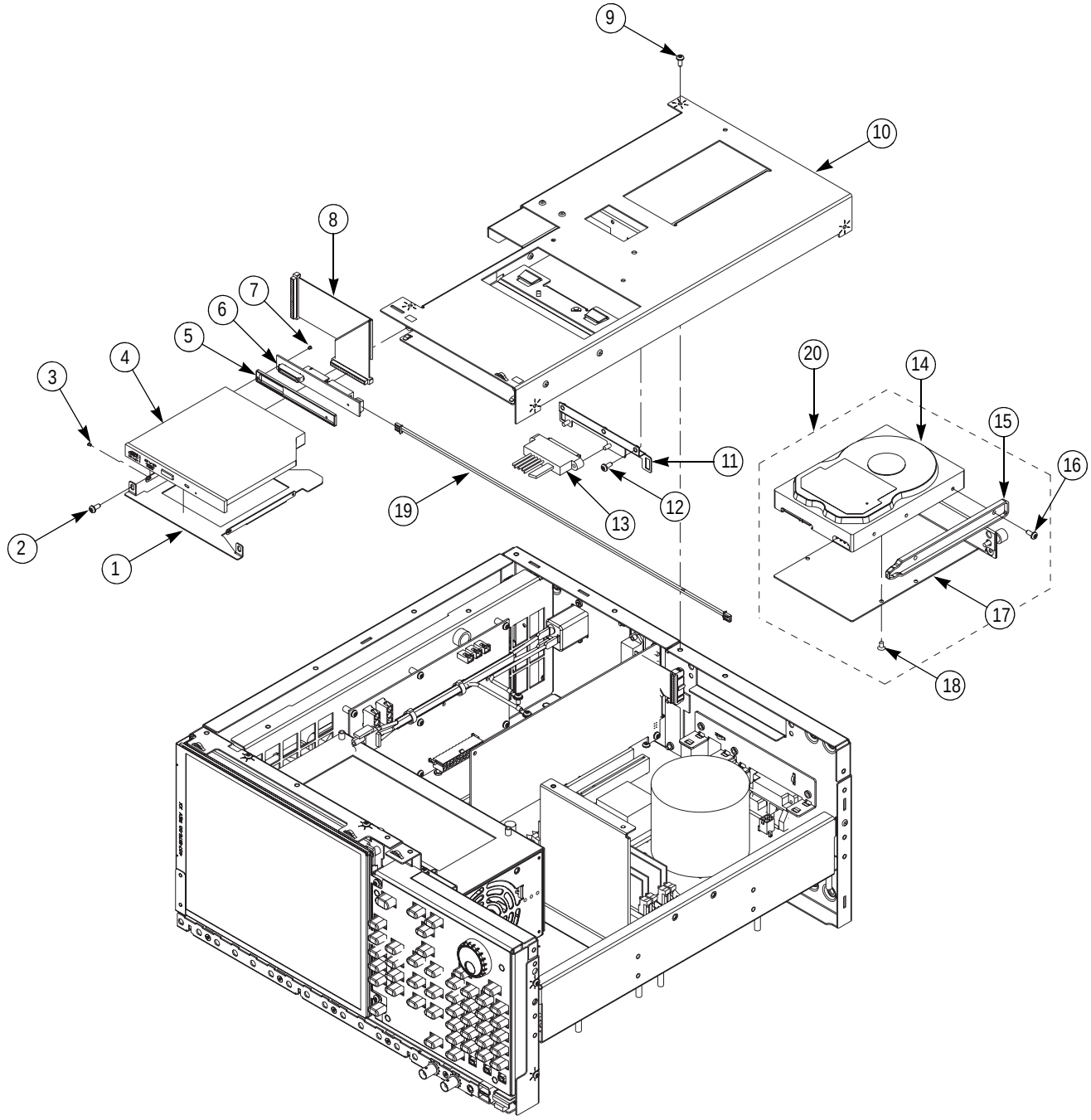


Figure 5-5: Exploded diagram - Drive module

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-6					**PROCESSOR MODULE**
-1	407-5195-00			1	BRACKET;DRIVE BAY UNIT
-2	211-1050-00			10	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-3	346-0128-00			2	STRAP,TIEDOWN;8.0 L X 0.1 W,NYLON
-4	343-1701-00			2	CLAMP,CABLE; WITH ADHESIVE BACK
-5	211-1050-00			8	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-6	167-0428-00			1	IC,MEMORY;64M X 64,512 MB DDR2,1.8V,3-3-3;MT16HTF6464AY-40E,DIMM240,DS1
-7	214-5119-00			1	HEAT SINK,SEMIC; IC,PROCESSOR;ALUMINUM WITH 12V FAN FOR INTEL PENTIUM 4 PROCESSOR,FOR LGA775 PACKAGE USE;COOLER MASTER S3N-9IWLS-06-GP, SAFETY CONTROLLED
-8	167-0543-00			1	PROCESSOR; CELERON D,2.93 GHZ,1.287V TO 1.4V CORE,84W,BUS SPD 533MHZ, FC-LGA4 775 PKG,W/O FAN&HEATSINK,JM80547RE077CN,INTEL
-9	335-1259-00			1	MARKER,IDENT;MKD MAC ADDRESS LABEL
-10	342-1153-00			1	INSULATOR; PLATE,MOTHER BOARD,0.04 POLYCARBONATE,TAPPEN
-11	441-2484-00			1	CHASSIS,TRAY,PROCESSOR,TAPPEN, SAFETY CONTROLLED
-12	407-5205-00			1	BRACKET,CONN; AL,0.063 THICK,W/131641700 EMI CLIPS
-13	211-1050-00			3	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-14	214-3903-00			6	SCREW,JACK; 4-40 X 0.312 LONG,0.188 H HEX HEAD STAND OFF,4-40 INT THD, X 0.312 THD EXT 4-40
-15	065-0761-00			1	MODULE; PROCESSOR

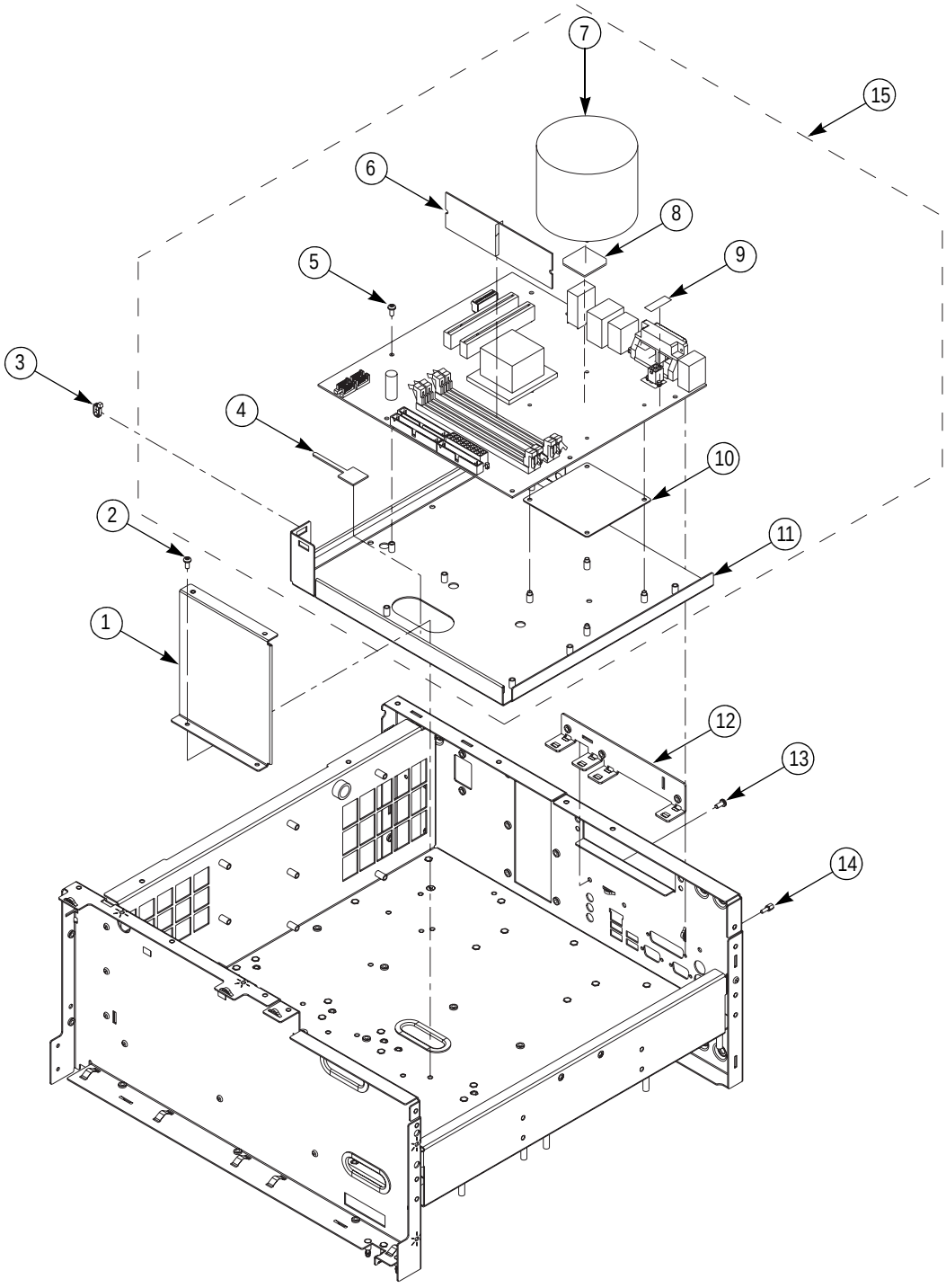


Figure 5-6: Exploded diagram - Processor module

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. dis-cont'd	Qty	Name & description
5-7					**POWER SUPPLY ASSEMBLY**
-1	342-1152-00			1	INSULATOR,FOR 119B12800 ZWQ130-5224 POWER SUPPLY,POLYCARBONATE, SAFETY CONTROLLED
-2	335-1724-00			1	MARKER,IDENT; LABEL,WARNING,2.0 X 1.0,0.0035 SILVER POLY,W/ACRYLIC ADHESIVE;TMSSK1,SAFETY CONTROLLED
-3	119-6986-01			1	POWER SUPPLY; AC-DC;460W;+3.3V 40A,+5V 34A,+12V 25A,-12V 1A,+5VSB 2A;90-264VAC,47-63HZ;BERG 51624-XX001;9.5X4.9X3.8IN,SAFETY CONTROLLED
-4	174-5304-00			1	CABLE ASSY ELEC: 1 X 6,1 X 3,1 X 8,17.7IN L,18 AWG X 6,VHR-6N,VHS-3N,VHR-8N,JST
-5	174-5305-00			1	CABLE ASSY ELEC: 1 X 6,1 X 3,1 X 8,17.7IN L,18 AWG X 6,VHR-6N,VHS-3N,VHR-8N,JST
-6	174-5306-00			1	CABLE ASSY ELEC: 1 X 5,1 X 3,7.9IN L,AWG18 X 3,VHR-5H,JST,350766-1,TYCO,SAFETY CONTROLLED
-7	211-1050-00			6	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-8	211-1050-00			7	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-9	119-B128-00			1	POWER SUPPLY;ZWQ130-5224
-10	407-5145-00			1	BRACKET, POWER SUPPLY
-11	211-1050-00			4	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-12	174-5269-00			1	CABLE ASSY; AC INLET TO CKT BD,14 IN L,AWG16 X 3,W/FN9222-10/06 FILTER/1-480700 CONN

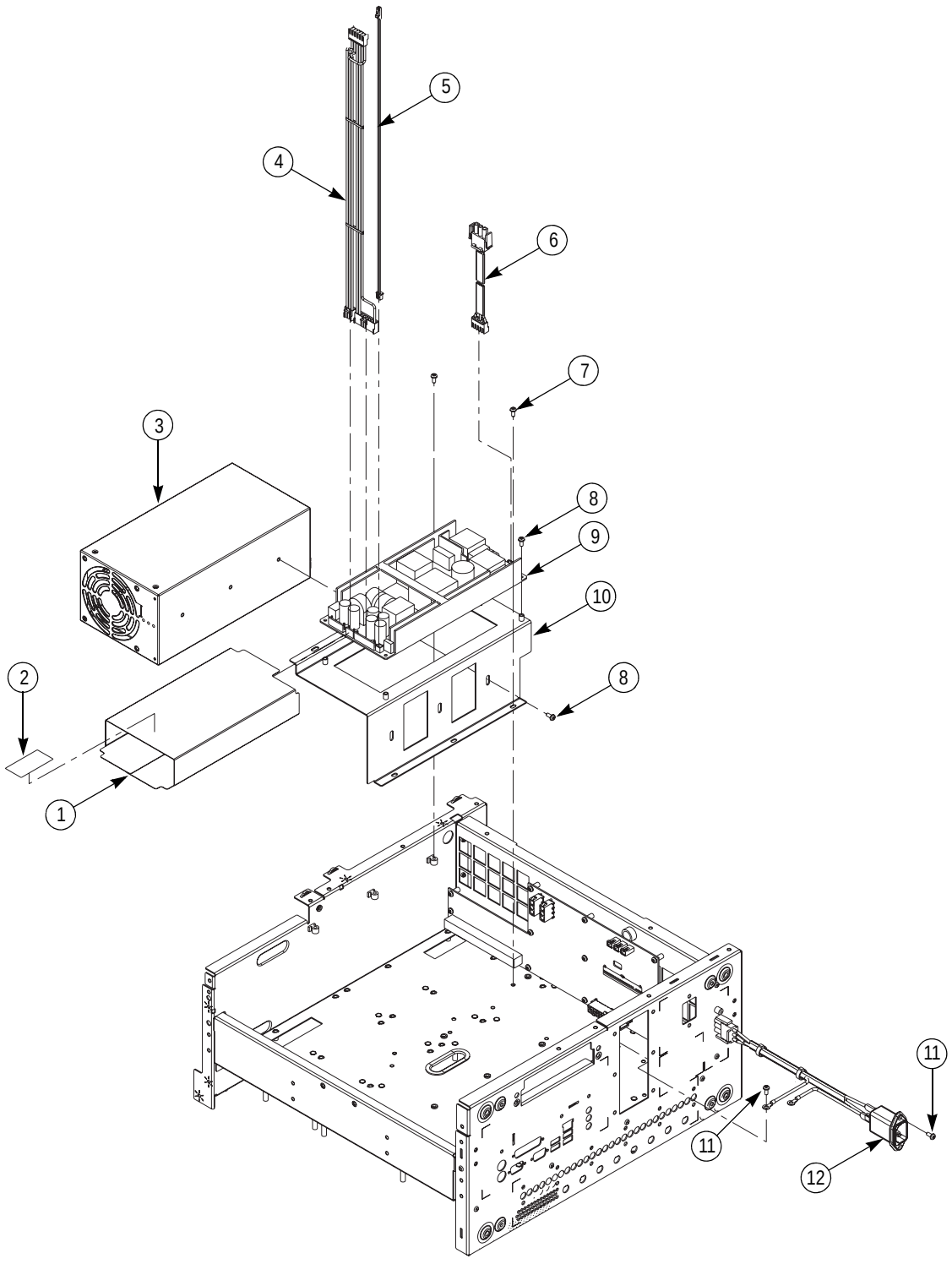


Figure 5-7: Exploded diagram - Power supply assembly

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-8					**PCI/POWER INTERFACE MODULE**
-1	174-5246-00			1	CABLE ASSY ELEC: 2 X 12P,31IN L,AWG16 X 24,39-01-2245,39-01-2245, MOLEX
-2	174-4798-00			1	CABLE ASSEMBLY; 4 PIN P4 POWER,SAFETY CONTROLLED
-3	174-4797-00			1	CABLE ASSEMBLY; 20 PIN ATX POWER,SAFETY CONTROLLED
-4	174-5255-00			1	CABLE ASSY ELEC: 2P,0.1,11.8IN L,AWG 22,UL1430,22-01-3027,08-50-0114 CONTACT, MOLEX
-5	346-0128-00			2	STRAP,TIEDOWN;8.0 L X 0.1 W,NYLON
-6	211-1050-00			10	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-7	671-6237-00			1	CIRCUIT BOARD ASSY; POWER DC-DC, 389-3775-00
-8	343-1701-00			1	CLAMP,CABLE; WITH ADHESIVE BACK
-9	335-1663-00			1	MARKER, IDENT; LABEL, COSMETIC, REAR, LEXAN
-10	335-0347-00				MARKER,IDENT; REAR PANEL,BLANK,2.100 X 2.700,SAFETY CONTROLLED
-11	174-5245-00			1	CABLE ASSY ELEC: FLAT CABLE,TWISTED PAIR,68P,0.05 PITCH,20IN L, SDA-71660-3568,MOLEX
-12	174-5307-00			1	CABLE ASSY ELEC: GPIB,5INL,BOARD TO REAR PANEL,24P GPIB CONN TO 24P HEADER CONN,W/O JACK SCREW, SAFETY CONTROLLED
-13	335-1668-00			1	MARKER,IDENT; LABEL, I/O FOR PCI PCB (ATTACHES TO PCI PCB BRACKET), SAFETY CONTROLLED
-14	211-1050-00			6	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-15	213-1061-00			2	JACKSCREW; 6-32 X 0.320 EXT THD,M3.5 X 0.6-6 INT THD X 0.215L,GPIB, BLACK OXIDE, BULK PACK
-16	211-1206-00			2	SCREW,JACK; 2-56 ID X 4-40 OD,0.188 HEX,SS
-17	386-7462-00			1	BRACKET, REAR: MIO
-18	211-1050-00			1	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-19	671-6049-01			1	CIRCUIT BOARD ASSY; MIO MULTI-I/O, FR-4
-20	343-1627-00			1	CABLE,CLAMP; 0.5H X 2.98L,0.625 W,NYLON 6-6,ADHESIVE,COVER 343-1636-00
-21	343-1636-00			1	CLAMP, COVER; FLT CABLE ROUTING CLAMP, 343-1627-00 BASE
-22	335-1723-00			1	MARKER,IDENT; LABEL,REAR IO,AWG2,SAFETY CONTROLLED,LEXAN,4CH
-23	335-1662-00			1	MARKER,IDENT; LABEL,REAR I/O,MAIN,LEXAN, SAFETY CONTROLLED

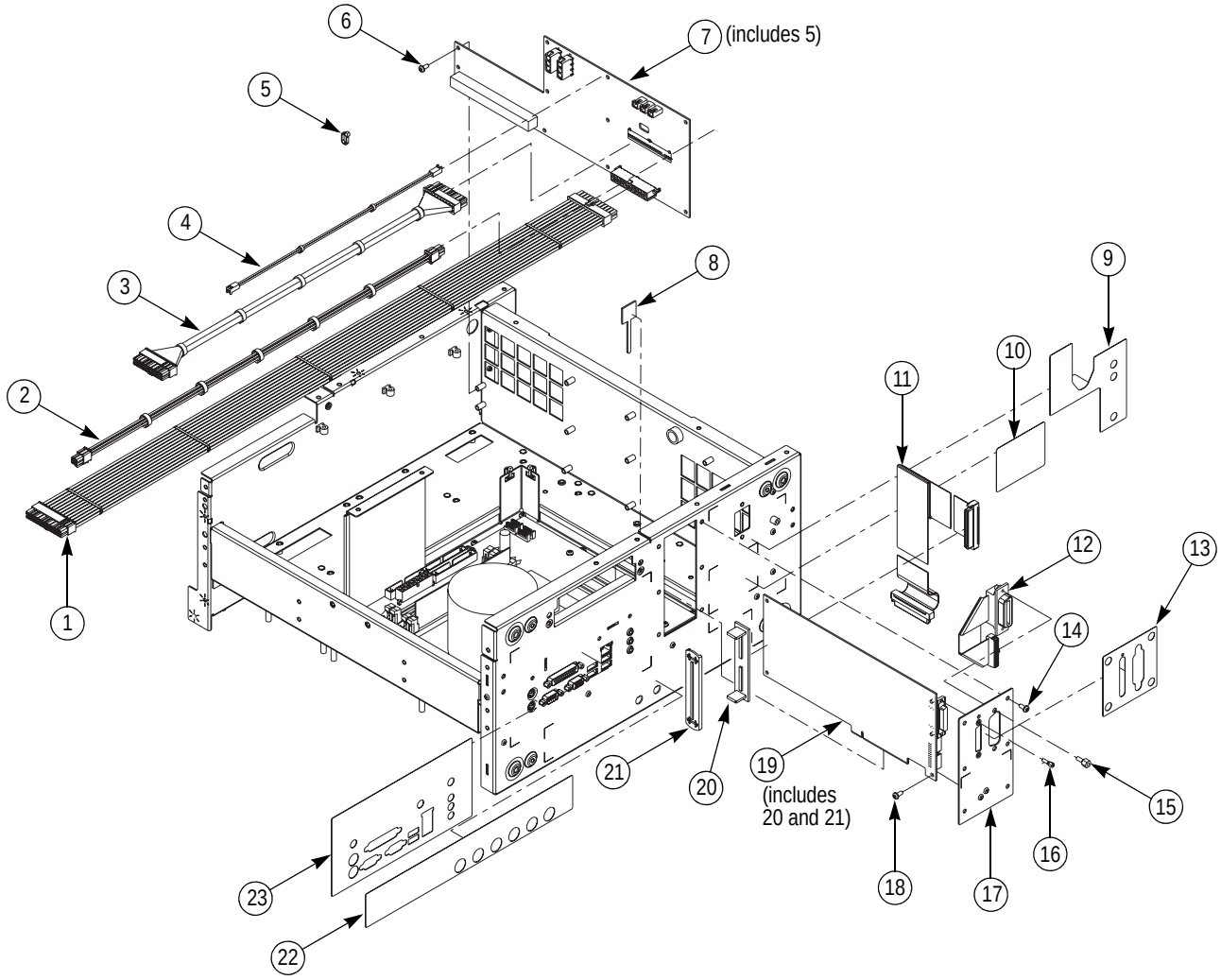


Figure 5-8: Exploded diagram - PCI/power interface module

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-9					**FAN TRAY ASSEMBLY**
-1	211-1050-00			4	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-2	211-1213-01			12	SCREW, METRIC 5 X 10MM, FLATHEAD, STL, ZINC, POSI
-3	407-5170-00			1	BRACKET,FAN TRAY
-4	343-0549-00			2	STRAP,TIEDOWN; 0.098 W X 4.0 L, ZYTEL
-5	119-7182-00			3	FAN,TUBEAXIAL; 12VDC,0.40A,4.80W,2500RPM,100.6CFM,120MM,LEADS W/CONN; SAFETY CONTROLLED

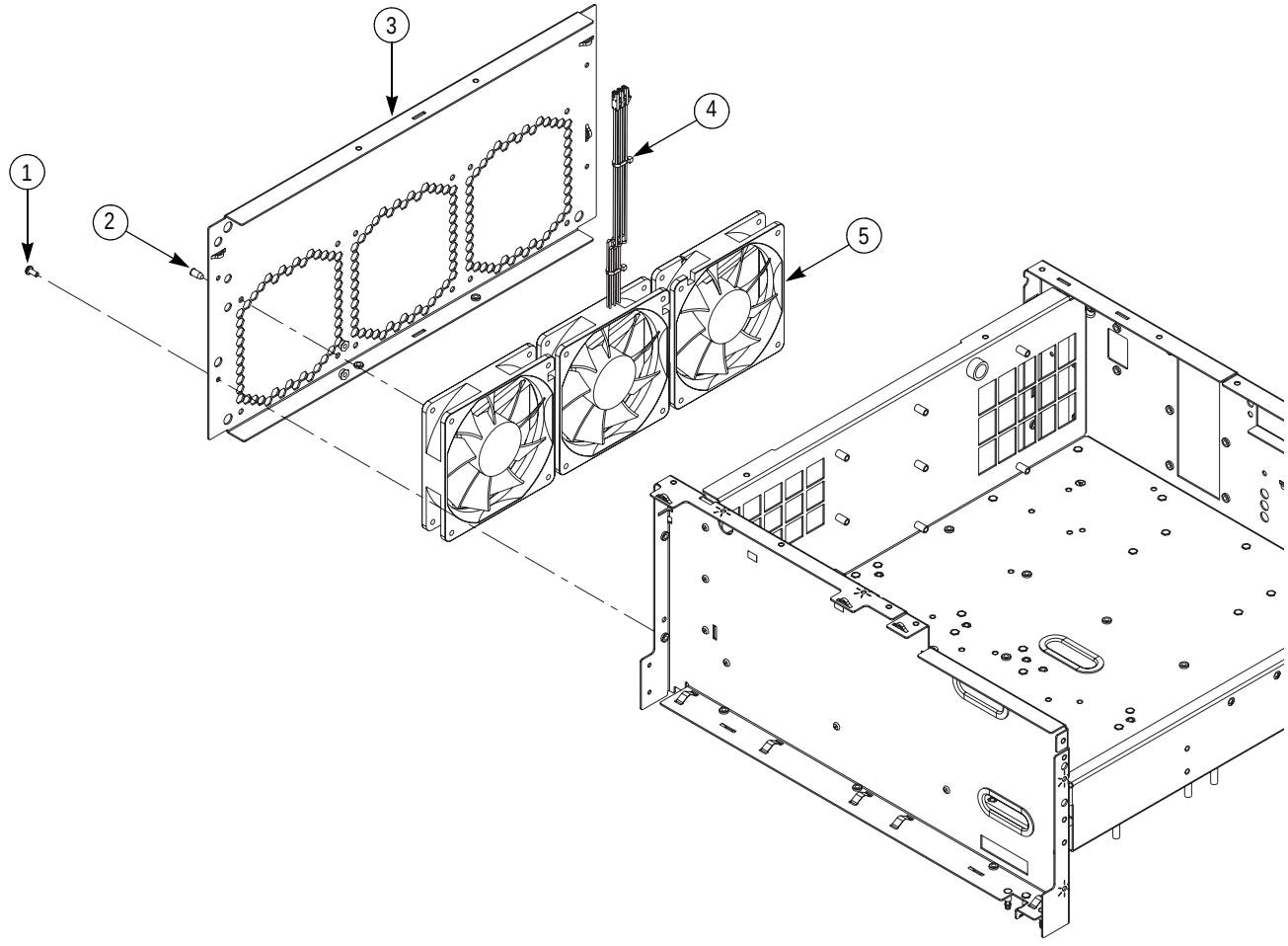


Figure 5-9: Exploded diagram - Fan tray assembly

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no discont'd	Qty	Name & description
5-10					**USB MODULE**
-1	348-1898-00			1	GASKET,ELEC;CONDUCTIVE URETHANE FORM 0.196X0.196X0.850,W/ADHESIVE, CHOMERICS #77-12-3611-00085,SOFT-SHIELD 3500
-2	342-1169-00			1	INSULATOR,PLATE,USB-DC BOARD
-3	671-6350-00			1	CIRCUIT BOARD ASSY; FCON, FRONT PANEL CONNECTOR
-4	174-5233-00			1	CA ASSY,INTCON; CMPST,USB2.0,24/28 AWG,24 IN L,10 POS,1 X 10 AND 2 X 5,USB2.0 CABLE X 2,0.1 CTR
-5	174-5248-00			1	CABLE ASSY ELEC: 1 X 8P,FLAT,0.1,16.8IN L,AWG 26,103958-7 AMP
-6	211-1050-00			2	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15

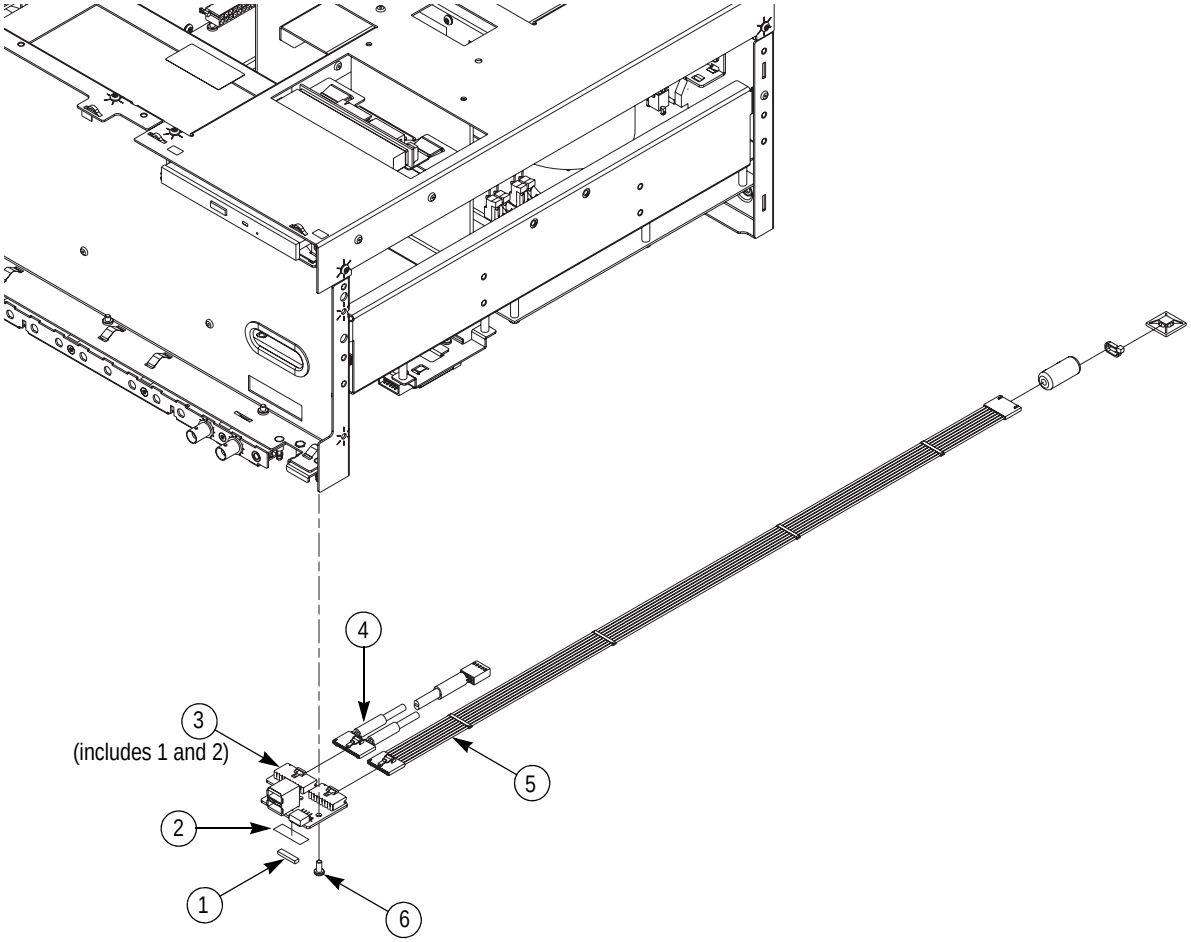


Figure 5-10: Exploded diagram - USB module

Replaceable Parts List

Fig. & index number	Tektronix part number	Model	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-11						**AWG1G/CLK1G/OUT1G MODULES**
-1	337-4400-00	AWG50x2			1	BRACKET, BNC CABLES
	337-4400-00	AWG50x4			2	BRACKET, BNC CABLES
-2	211-1050-00	AWG50x2			2	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
	211-1050-00	AWG50x4			4	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-3	343-1716-00	AWG50x2			3	CLAMP, CABLE; WIRE ROUTING, FOR 3MM OD,4 WAY,0.870(W) X 0.370(D) X 0.260(H),NYLON66,UL94V-0,W/ADHESIVE,NATURAL COLOR,SAFETY CONTROLLED,PB-FREE
	343-1716-00	AWG50x4			6	CLAMP, CABLE; WIRE ROUTING, FOR 3MM OD,4 WAY,0.870(W) X 0.370(D) X 0.260(H),NYLON66,UL94V-0,W/ADHESIVE,NATURAL COLOR,SAFETY CONTROLLED,PB-FREE
-4	343-0549-00	AWG50x2			3	STRAP,TIEDOWN; 0.098 W X 4.0 L,ZYTEL
	343-0549-00	AWG50x4			6	STRAP,TIEDOWN; 0.098 W X 4.0 L,ZYTEL
-5	671-6158-00	AWG50x2			1	CIRCUIT BOARD ASSY; OUT1G,OUTPUT 1.2GS
	671-6158-00	AWG50x4			2	CIRCUIT BOARD ASSY; OUT1G,OUTPUT 1.2GS
-6	211-1050-00	AWG50x2			8	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
	211-1050-00	AWG50x4			16	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-7	211-1050-00				12	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15
-8	174-5303-00				1	CABLE ASSY ELEC: 2X4, 9.5IN L,18 AWG X 8, 39-01-2085, MOLEX
-9	211-1050-00				12	SCREW,MACHINE; 6-32 X 0.312 L,PNH,STL CAD PLT,T15

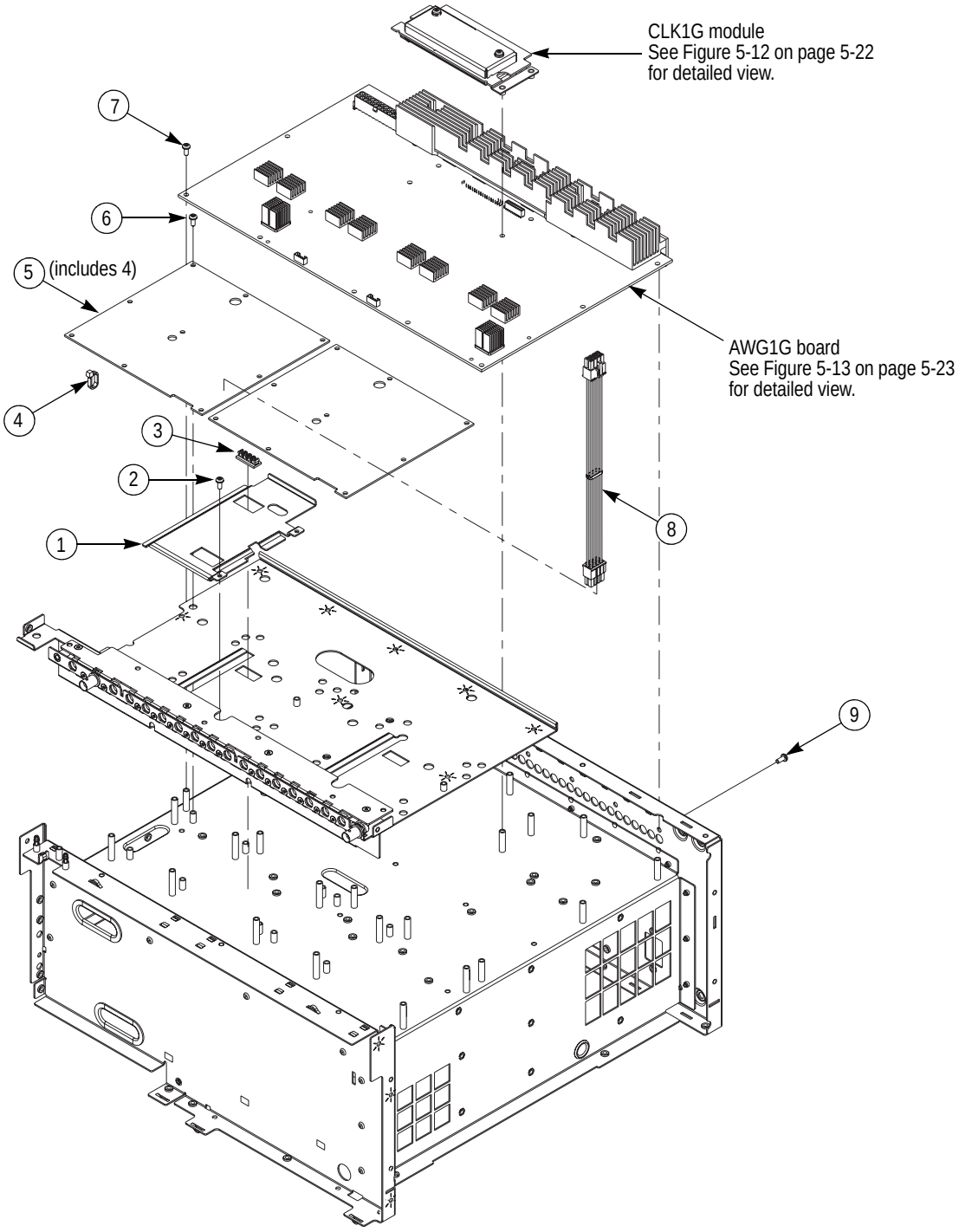


Figure 5-11: Exploded diagram - AWG1G/CLK1G/OUT1G modules

Replaceable Parts List

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-12					**CLK1G MODULE**
-1	174-5315-00			1	CABLE ASSY ELEC: RF,COAX,7.1IN L,50 OHM,PELTOLA,PELTOLA,FLEX COAX CABLE
-2	211-0691-00			6	SCR, ASSEM WSHR; 6-32 X 0.625, PNH, 410 SS PASSIVATED, T-15 TORX DR, MACHINE
-3	337-4376-00			1	SHIELD ELEC,TOP,CLK1 BOARD
-4	671-6187-00			1	CLK1G, 1.2GHZ CLOCK BOARD ASSY
-5	337-4377-00			1	SHIELD ELEC,BOTTOM,CLK1 BOARD

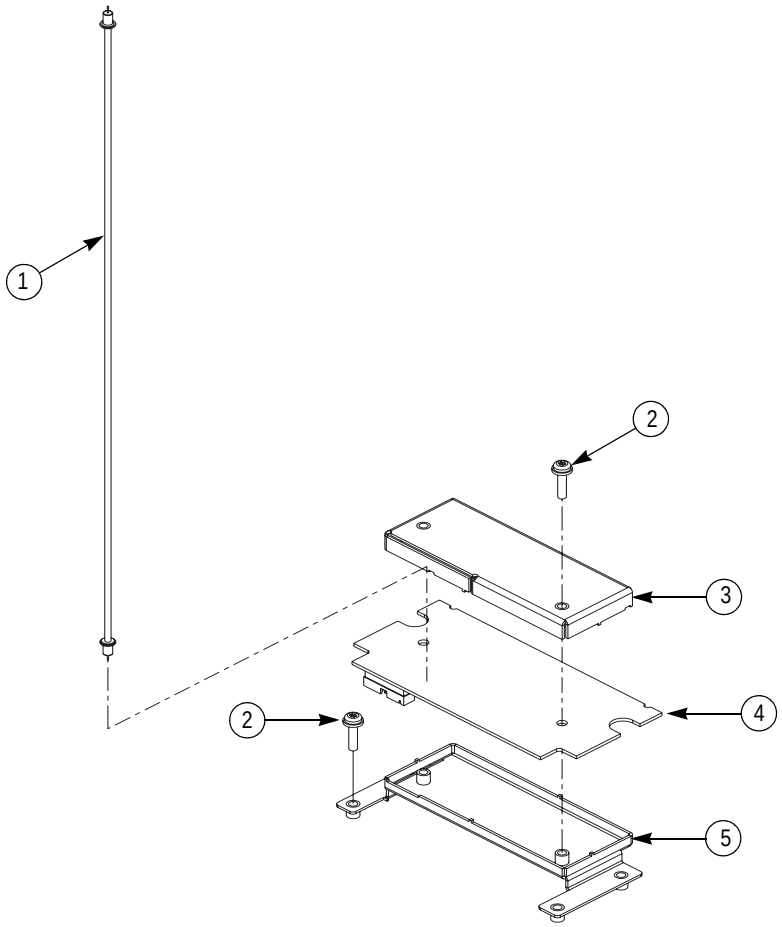


Figure 5-12: Exploded diagram - CLK1G module

Replaceable parts list

Fig. & index number	Tektronix part number	Model	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-13						**AWG1G MODULE**
-1	174-5292-00	AWG50x2			4	CABLE ASSY ELEC: RF,COAX,4IN L,50 OHM,PELTOLA,PELTOLA,FLEX COAX CABLE
	174-5292-00	AWG50x4			8	CABLE ASSY ELEC: RF,COAX,4IN L,50 OHM,PELTOLA,PELTOLA,FLEX COAX CABLE
-2	671-6155-00	AWG50x2			1	CIRCUIT BOARD ASSY; AWG1G, AWG 1.2GS, 2CH, W/EXT_MEMORY, W/DIGITAL-OUT
	671-6157-00	AWG50x4			1	CIRCUIT BOARD ASSY; AWG1G, AWG 1.2GS, 4CH, W/EXT_MEMORY
-3	174-5316-00	AWG50x2			1	CABLE ASSY ELEC: 1 X 5,7.1IN L,24 AWG X 5,PHR-5,PHR-5,JST
	174-5316-00	AWG50x4			2	CABLE ASSY ELEC: 1 X 5,7.1IN L,24 AWG X 5,PHR-5,PHR-5,JST

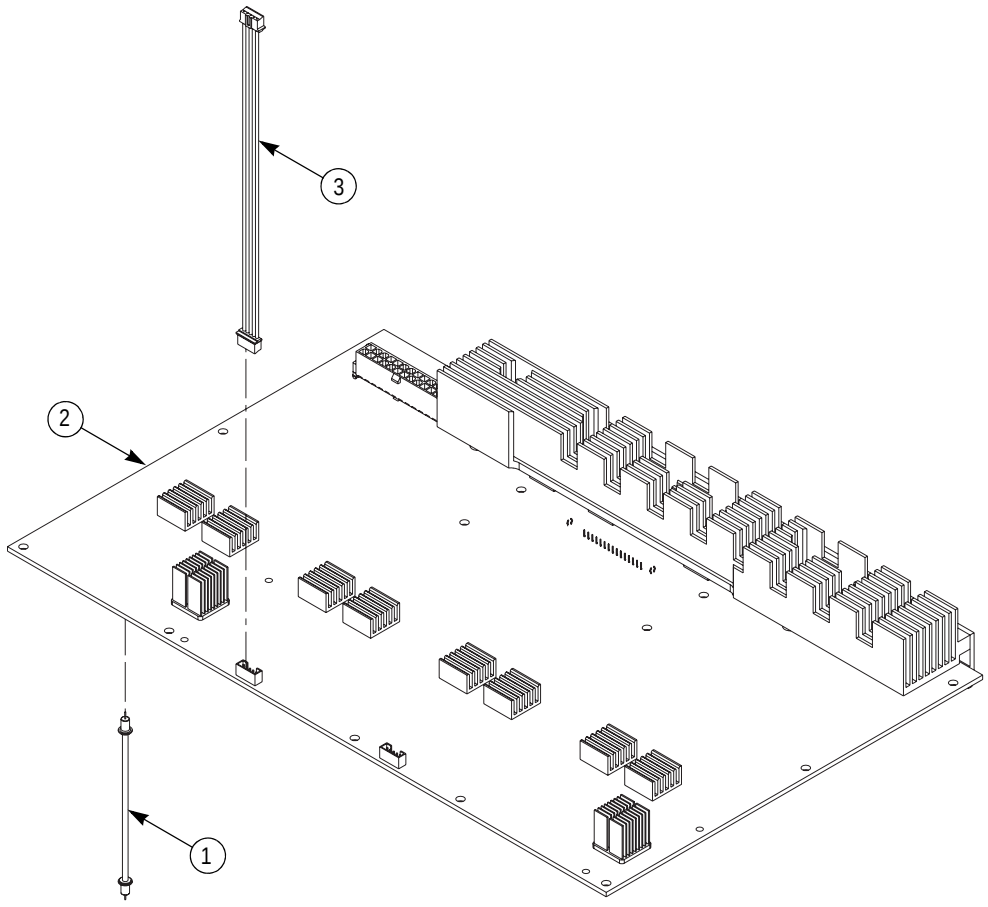


Figure 5-13: Exploded diagram - AWG1G module

Replaceable parts list

Fig. & index number	Tektronix part number	Model	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-14						**BNC BRACKET**
-1	211-0734-00				18	SCREW,MACHINE; 6-32 X 0.250,FLH100,STL,CDPL,T-10 TORX DR
-2	386-7485-00				1	PLATE,BOTTOM:BRACKET FRONT BNC,14.975 X 1.160 X 0.060,AL
-3	174-5313-00				2	CABLE ASSY ELEC: RF,COAX,18.5IN L,50 OHM,PELTOLA,FLEX COAX CABLE
-4	407-5166-00				1	BRACKET,BNC,FRONT I/O
-5	174-5312-00	AWG50x2			4	CABLE ASSY ELEC: RF,COAX,14.2IN L,50 OHM,PELTOLA,FLEX COAX CABLE
	174-5312-00	AWG50x4			8	CABLE ASSY ELEC: RF,COAX,14.2IN L,50 OHM,PELTOLA,FLEX COAX CABLE
-6	174-5311-00	AWG50x2			4	CABLE ASSY ELEC: RF,COAX,9IN L,50 OHM,PELTOLA,FLEX COAX CABLE
	174-5311-00	AWG50x4			8	CABLE ASSY ELEC: RF,COAX,9IN L,50 OHM,PELTOLA,FLEX COAX CABLE
-7	131-8054-00	AWG50x2			10	CONN,RF,JACK; BNC,PNL,50 OHM,FEMALE,STR,PELTOLA/PNL MNT,SILVER ALLOY,0.576 MLG X 0.366 TERMN,0.375-32 THD,D-FLAT, WITH KNURL
	131-8054-00	AWG50x4			18	CONN,RF,JACK; BNC,PNL,50 OHM,FEMALE,STR,PELTOLA/PNL MNT,SILVER ALLOY,0.576 MLG X 0.366 TERMN,0.375-32 THD,D-FLAT, WITH KNURL

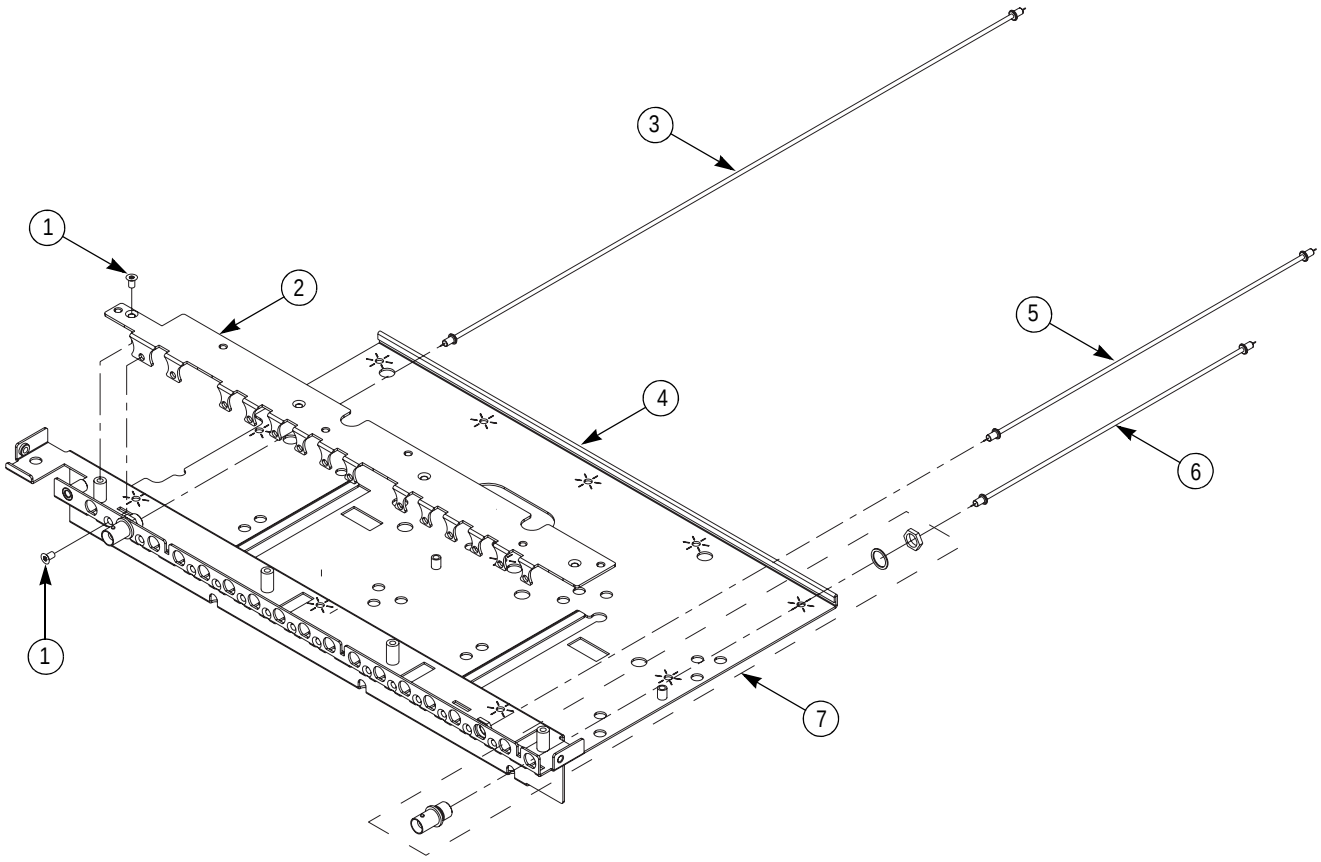


Figure 5-14: Exploded diagram - BNC bracket

Replaceable parts list

Fig. & index number	Tektronix part number	Model	Serial no. effective	Serial no. discont'd	Qty	Name & description
5-16						**REAR CONNECTORS**
-1	174-5312-00				2	CABLE ASSY ELEC: RF,COAX,14.2IN L,50 OHM,PELTOLA,FLEX COAX CABLE
-2	174-5314-00	AWG50x2			2	CABLE ASSY ELEC: RF,COAX,12.8IN L,50 OHM,PELTOLA,FLEX COAX CABLE
	174-5314-00	AWG50x4			4	CABLE ASSY ELEC: RF,COAX,12.8IN L,50 OHM,PELTOLA,FLEX COAX CABLE
-3	131-8054-00				6	CONN,RF,JACK; BNC,PNL,50 OHM,FEMALE,STR,PELTOLA/PNL MNT,SILVER ALLOY,0.576 MLG X 0.366 TERMN,0.375-32 THD,D-FLAT, WITH KNURL
-4	174-5315-00				2	CABLE ASSY ELEC: RF,COAX,7.1IN L,50 OHM,PELTOLA,FLEX COAX CABLE

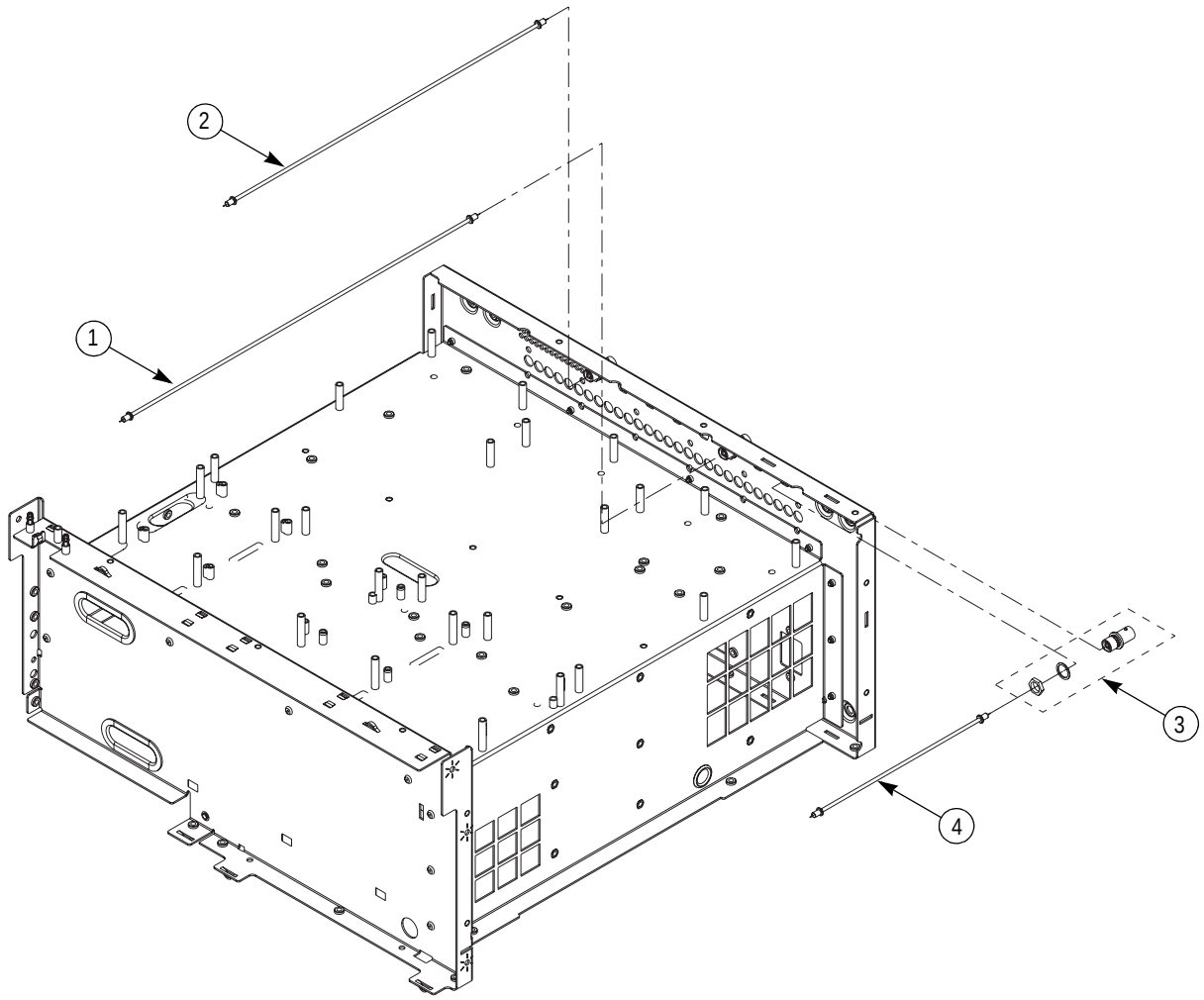


Figure 5-15: Exploded diagram - Rear connectors

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