Service Manual

Tektronix

**AVG 1
Analog Video Generator**

070-9677-00

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CE

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Calibration Services provide annual calibration of your product, standards compliance and required audit documentation, recall assurance, and reminder notification of scheduled calibration. Coverage begins upon registration; you may purchase up to five years of Calibration Services.

Service Assurance Advantages

- Priced well below the cost of a single repair or calibration

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- Eliminates unexpected service expenses

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For more information or to order Service Assurance, contact your Tektronix representative and provide the information below. Service Assurance may not be available in locations outside the United States of America.

Name	VISA or Master Card number and expiration
Company	date or purchase order number
Address	Repair Protection (1,2, or 3 years)
City, State, Postal code	Calibration Services (1,2,3,4, or 5 years)
Country	Instrument model and serial number
Phone	Instrument purchase date

Table of Contents

Specifications

Operating Information

Theory of Operation

Performance Verification

Adjustment Procedures

Maintenance

Replaceable Electrical Parts

Diagrams

Replaceable Parts

List of Figures

List of Tables

General Safety Summary

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

Only qualified personnel should perform service procedures.

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

To Avoid Fire or Personal Injury

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

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

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

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

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

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

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

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

Symbols and Terms   **Terms in this Manual.** These terms may appear in this manual:

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

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

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

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

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

CAUTION indicates a hazard to property including the product.

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

WARNING High Voltage	Protective Ground (Earth) Terminal	CAUTION Refer to Manual	Double Insulated

Service Safety Summary

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

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

Disconnect Power. To avoid electric shock, disconnect the mains power by means of the power cord or, if provided, the power switch.

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

To avoid electric shock, do not touch exposed connections.

Preface

You have purchased this optional service manual for the AVG1 Analog Video Generator module. To optimize troubleshooting capability, you should also purchase the service manual for the TG 2000 Platform mainframe. The service manual for the mainframe is shipped in a binder that is large enough to hold the module service manuals as well. Each module manual begins with a tab so that you can locate it after you add it to the binder.

About This Manual

This manual contains information for servicing the AVG1 Generator module to a module level. The information is designed only for qualified service technicians, with moderate experience in analog circuits, digital circuits, and television technology.

This manual is composed of the following sections:

- *Specifications* provides instrument specifications tables.

- *Operating Information* provides basic operating information.

- *Theory of Operation* is an overview of the module's design.

- *Performance Verification* contains procedures necessary to verify that the module is meeting the requirements listed in the *Specifications.*

- *Adjustments* contains procedures to adjust the module to return it's operation to within specifications.

- *Maintenance* contains installation, removal and replacement, and trouble-shooting instructions.

- *Options* informs you that there are no options available for the AVG1 Generator module at this time.

- *Replaceable Electrical Parts* for the module level are included in the Replaceable Mechanical Parts list.

- *Diagrams* contains interconnect diagrams showing the connections between the AVG1 Generator module, the mainframe and other modules.

- *Replaceable Mechanical Parts* lists the part numbers for replacement parts that you can order. Exploded view illustrations help you to identify the parts.

Related Manuals

The following documents are related to the AVG1 Generator module:

- The *TG 2000 Signal Generation Platform Service Manual* describes how to service the mainframe to the module level, and includes a troubleshooting disk that is required for all module and mainframe troubleshooting. This optional manual must be ordered separately, and is recommended before beginning any troubleshooting.

- The *TG 2000 Signal Generation Platform User Manual* describes how to use the TG 2000 Platform. It also contains information about SCPI commands, programming structure, and status and events for the TG 2000 Signal Generation Platform. Some of this information applies to all generator modules, including the AVG1 Generator module.

- The *AVG1 Analog Video Generator User Manual* contains operating information and information about SCPI commands for the AVG1 Generator module.

Contacting Tektronix

Product Support	For application-oriented questions about a Tektronix measurement product, call toll free in North America: 1-800-TEK-WIDE (1-800-835-9433 ext. 2400) 6:00 a.m. – 5:00 p.m. Pacific time
	Or, contact us by e-mail: tm_app_supp@tek.com
	For product support outside of North America, contact your local Tektronix distributor or sales office.
Service Support	Contact your local Tektronix distributor or sales office. Or, visit our web site for a listing of worldwide service locations.
	http://www.tek.com
For other information	In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.
To write us	Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000

Specifications

Specifications

This section contains the *Product Description* and the *Characteristics Tables,* which list the product specifications.

Product Description

The AVG1 Generator module is a high accuracy, multiformat analog video test signal generator. The signal generation architecture is 12-bit, 27 MHz component with digital modulation for composite signals. This ensures high accuracy, distortion free signals within a 6 MHz video bandwidth.

The module has four BNC connectors on the rear panel. One output is a trigger out and the other three are channel outputs. The trigger output can be used to trigger other video equipment or an oscilloscope.

Signal Formats   The module can generate signals in these component and composite formats:

- NTSC
- PAL
- PAL-D
- PAL-M
- PAL-N

- SECAM
- GBR
- YC plus composite
- Y, B-Y, and R-Y

You can create other formats with the SDP2000 Signal Development Program. However, the output reconstruction filters are optimized for a 27 MHz sampling frequency.

Characteristics

This section contains the specifications for the AVG1 Generator module. Table 1–1 lists the electrical specifications, and Table 1–2 lists the EMC compliance specifications. All specifications are guaranteed unless labeled "typical." Typical specifications are provided for your convenience, but are not guaranteed.

Specifications are only valid when the module is installed in a TG 2000 Platform mainframe. For installation instructions, refer to *Module Installation* on page 2–2.

For a list of environmental specifications, refer to the *TG 2000 Signal Generation Platform Service Manual*.

Table 1–1: Electrical specifications

Characteristics	Description
Maximum Clock Frequency	≤ 30 MHz
Amplitude Errors (Excluding Y/C in Y/C/Composite mode)	
Luminance and Component Channels	≤ 0.5 % at 700 mV amplitude. Absolute, self calibrated after warm up and outputs terminated in 75 Ω.
Component Channel-to-Channel Gain Match	≤ 0.5 % at 700 mV amplitude. Relative to channel 1.
Chroma/Luma Gain Error	≤ 0.5 % at 700 mV amplitude. Relative to 100 kHz.
Pedestal Amplitude Error	≤ 1 % at 1 V amplitude
Y/C Composite Mode Gain Match	
Y Level Accuracy	± 1% at 700 mV amplitude
Y/C Match	± 2% at 700 mV amplitude
Delay Errors	
Chroma/Luma Delay, typical	≤ 2.5 ns on a composite output
Channel to Channel Delay	≤ 1 ns. Channels 2 and 3 relative to channel 1.
Group Delay, typical	≤ 3 ns to 6 MHz
SCH Phase Error, typical	≤ ± 1.25 ns (± 1.6° at 3.58 MHz and ± 2° at 4.43 MHz)
Frequency Response	Flat within 0.5% peak from 0.1 MHz to 6 MHz at 700 mV amplitude. Typically ≤ 0.1% to 6 MHz and ≤ 5% to 8 MHz at 700 mV amplitude

Table 1–1: Electrical specifications (cont.)

Characteristics	Description
Short Time Distortion	$\leq$ 1% peak. Measured with 2T bar.
Line Time Distortion	$\leq$ 0.5% peak. Measured with field square wave, pedestal off.
Field Time Distortion	$\leq$ 0.5% peak. Measured with field square wave, pedestal off.
2T5 Pulse Ringing	$\leq$ 1% peak
2T5 Pulse Ringing, typical	$\leq$ 0.5%
K Factor 2T5 Pulse	$\leq$ 0.5% peak
Pulse/Bar Ratio, typical	1:1 within 0.5%, with 2T5 pulse and bar signal
DC Offset	$\leq$ 10 mV
Luminance Linearity Error	$\leq$ 0.5%
Chroma/Luminance Intermodulation	$\leq$ 0.5%
Dynamic Gain Error (10% to 90% APL)	$\leq$ 0.5%. Measured using 5-step ramp while varying APL 10% to 90%.
Differential Gain	
Hardware Modulated Signals	$\leq$ 0.1%
Software Modulated Signals, typical	$\leq$ 0.5%
Differential Phase	$\leq$ 0.5° Typically $\leq$ 0.1° on hardware modulated signals, and $\leq$ 0.2° on software modulated signals
In-band Signal/Noise Ratio	
Quiet Line	$\geq$ 67 dB to 6 MHz, unweighted
Full Amplitude Ramp	$\geq$ 60 dB to 6 MHz, unweighted
Out-of-band Signal/Noise Ratio	SNR to 100 MHz, 54 dB RMS relative to 700 mV on quiet line
Out-of-band Signal/Noise Ratio, typical	$\geq$ 50 dB max spur, 6 MHz to 50 MHz $\geq$ 45 dB max spur, 50 MHz to 100 MHz
Crosstalk (channel to channel)	$\leq$ –60 dB to 6 MHz. From any one channel to any other one channel.
Glitches (synchronous noise)	
Shallow ramp signal	$\leq$ 2 mV peak
Shallow ramp signal, typical	$\leq$ 1 mV peak on full DAC range shallow ramp (0.1 mV per bit)
Standard signal, typical	$\leq$ 2 mV peak
Pedestal Gate, typical	$\leq$ 1 mV peak on pedestal levels $>$ 5 mV; $\leq$ 5 mV on pedestal levels $\leq$ 5 mV

Table 1–1: Electrical specifications (cont.)

Characteristics	Description
Return Loss/Output Impedance	$\geq$ 40 dB to 6 MHz, 75 Ω
Output Timing Offset Adjustment Range	Added to genlock offset timing, offsets relative to internal clock and frame reset. Adjustable to any point in the video frame.
Trigger Output	
Amplitude	TTL compatible if unterminated.
Rise Time, typical	$\leq$ 10 ns
Output Impedance	75 Ω
Trigger Range	Adjustable to any point in the video frame
Power Consumption	+5 Volts: 5.5 Watts typical –5 Volts: 5 Watts typical –2 Volts: 0.6 Watts typical +15 Volts: 0.75 Watts typical –15 Volts: 0.75 Watts typical Battery: 30 μA maximum

Certifications

Table 1–2: Certifications and compliances

Characteristics	Description
EMC Compliance	Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility when it is used with the product(s) stated in the specifications table. Refer to the EMC specification published for the stated products. May not meet the intent of the directive if used with other products.
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits

Operating Information

Installation

This section contains instructions for installing the module into the TG 2000 Platform mainframe. Listed below are the starting page numbers for the major topics in this section.

- Preventing component damage

- Module Installation (including signal set installation), page 2–2

- Instrument Backup and Restore, page 2–8

- Module Removal, page 2–9

Preventing Component Damage

⚠️ *CAUTION. Electrostatic discharge (ESD) can damage components on this module and mainframe. To prevent ESD or other component damage, follow the steps below when installing, removing, or handling modules:*

1. Wear a grounded antistatic wrist strap to discharge the static voltage from your body while installing or removing modules from the TG 2000 Platform mainframe.

2. Transport and store modules in a static-protected bag or container.

3. Do not slide the module over any surface.

4. Handle modules as little as possible.

5. Do not touch module components or connector pins.

6. Do not use any devices capable of generating or holding a static charge in the work area where you remove, install, or handle modules.

7. Avoid handling modules in areas that have a floor or work-surface covering capable of generating a static charge.

8. Do not remove the module circuit board assembly from the shield. The shield provides important support and protection for the surface-mount components.

Module Installation

A T-10 torx tip screwdriver is the only tool you need to install the module. A T-10 torx tip is supplied with the module.

Hardware Installation   To install the module into the TG 2000 Platform mainframe, perform these steps:

1. Set the TG 2000 Platform mainframe rear-panel power switch to off.

2. Unplug the power cord.

3. Select the slot you will use to install the module. Table 2–1 lists the slot restrictions. Figure 2–1 shows a sample configuration with slot numbers.

Table 2–1: Module slot assignments

Module	Slots in which the module can be installed
AGL1 Genlock module	Slot 2 or 3
AVG1 Generator module	Slots 2 through 10
AWVG1 Generator module	Slots 2 through 10
BG1 Generator module	Slot 2 through 10
Clock module	Slot 1
CPU module	Slot 11
DVG1 Generator module	Slots 2 through 10
GP1 GPIB Interface module	Slot 10
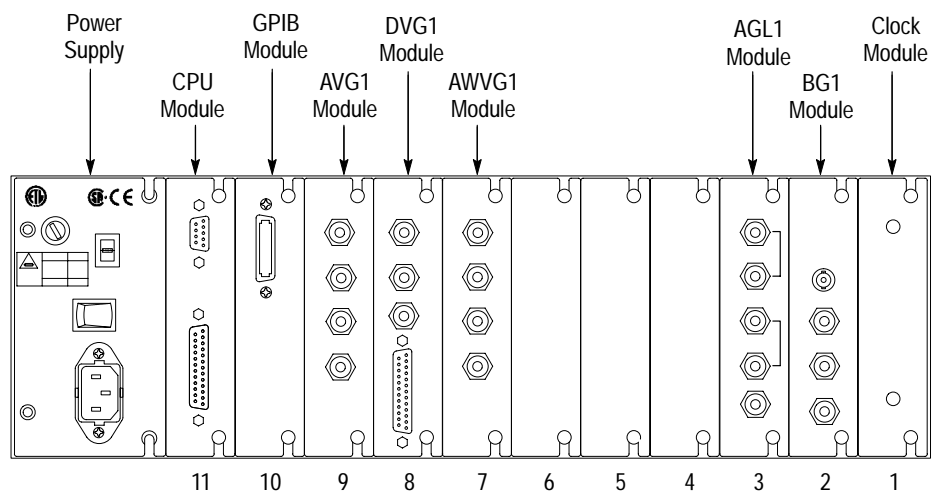
Figure 2–1: TG 2000 Platform mainframe rear panel, showing slot numbering

WARNING. *To avoid a shock hazard, always remove the power cord before removing the top cover. Failure to remove the power cord can result in serious injury or death.*

4. Refer to Figure 2–2 and remove or loosen all screws to remove the top cover.

Top cover

Loosen screws (12)

Top cover

Remove screws (23)
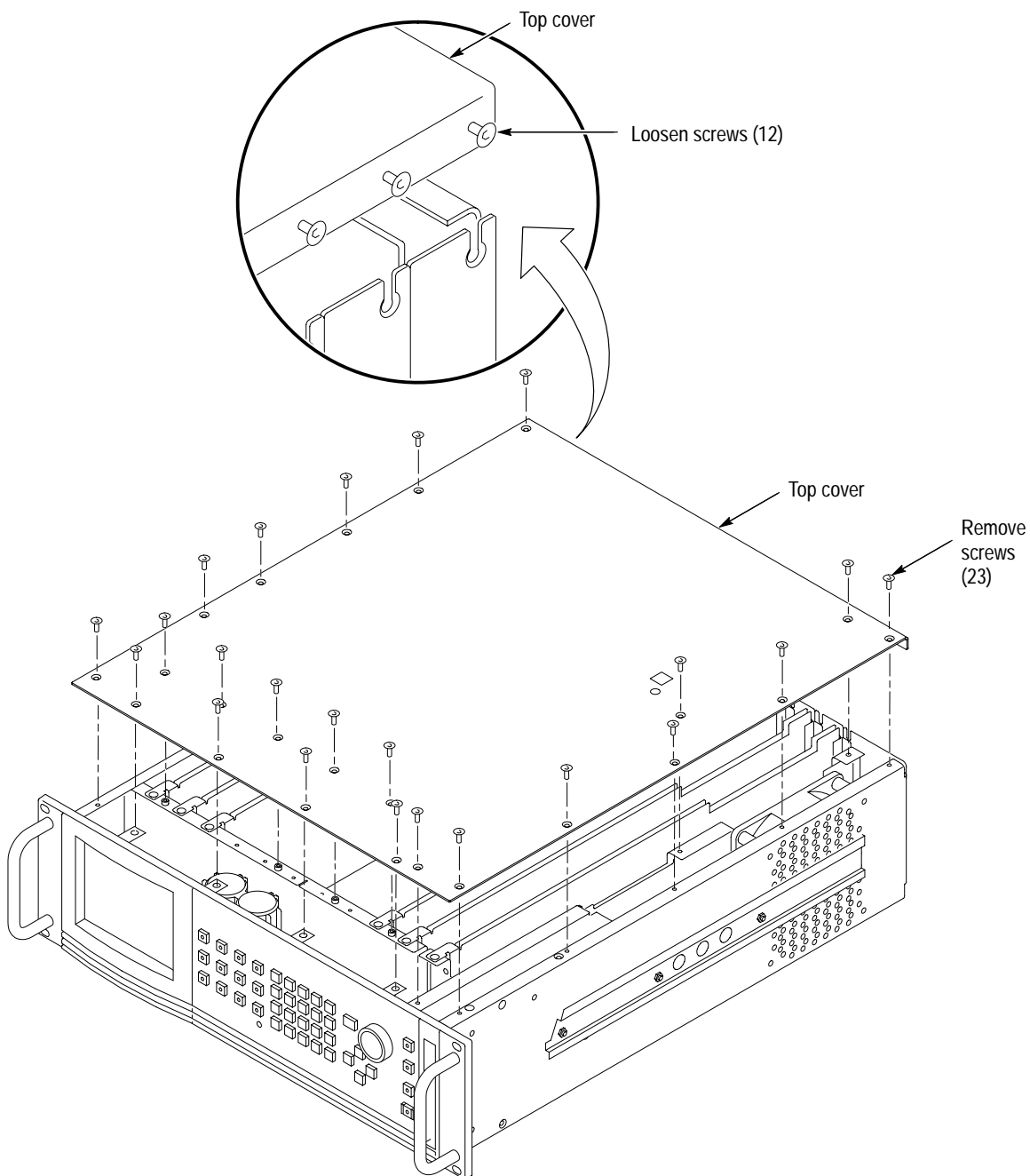
Figure 2–2: Top cover removal

5. Remove the appropriate rear panel as shown in Figure 2–3. Loosen, but do not remove the bottom screw. You will use it later to secure the module.

Loosen screw
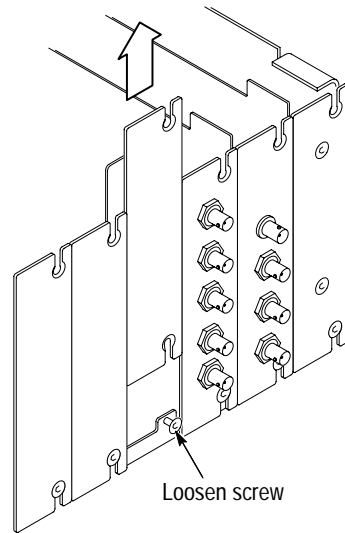
Figure 2–3: Removing the rear panel

6. While ensuring correct alignment of the module flange as shown in Figure 2–4, lower the module into the desired slot as shown in Figure 2–5.
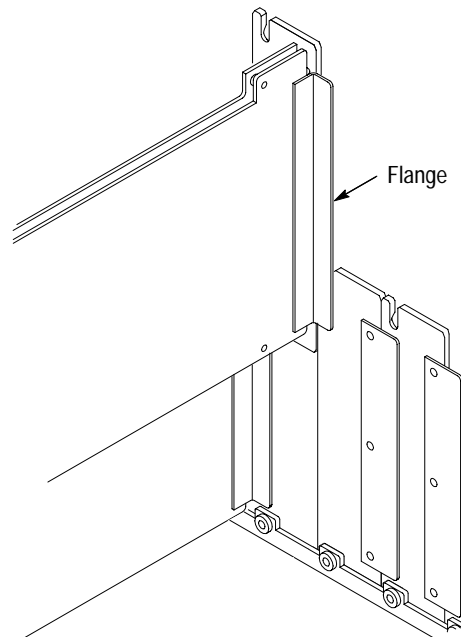
Flange

Figure 2–4: Module flange
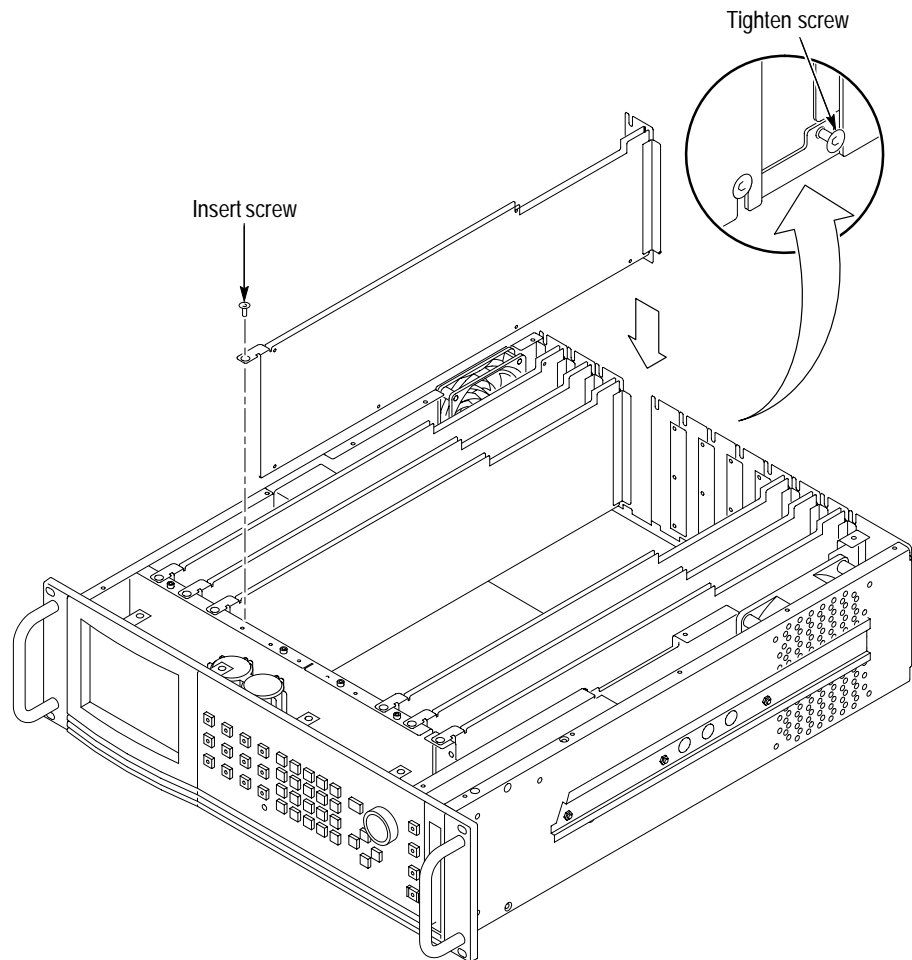
Figure 2–5: Installing the module

7. Ensure that the connectors on the mother board and the module exactly match before seating the module.

⚠ *CAUTION. The connectors must exactly match before you attempt to press the module firmly in place. If the connectors do not match you could bend a pin that could damage the module, mainframe, or both when power is applied.*

8. Press down evenly on the module until it is firmly in place.

9. Refer to Figure 2–6 and insert and tighten the top screw, which comes with your module, and tighten the rear panel screw.
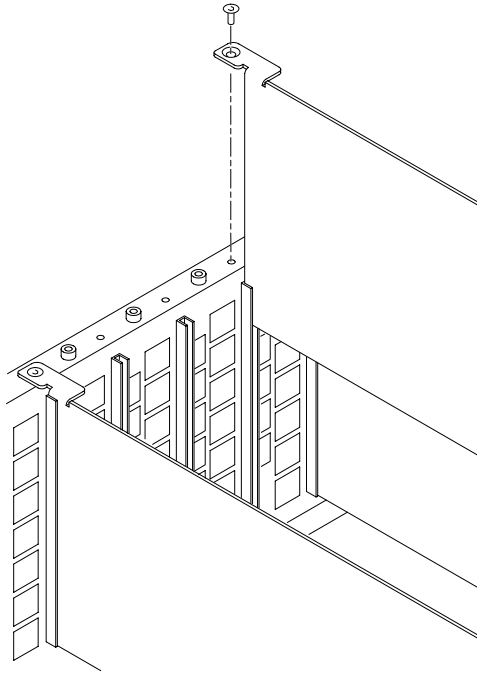
Figure 2–6: Top screw

10. Reinstall the top cover and insert and tighten all top cover screws.

11. Plug in the instrument power cord. Power on the mainframe by setting the rear-panel power switch to ON and pressing the front-panel power switch. Wait for the instrument to perform self tests.

12. If you previously moved or removed a module and backed up the instrument, perform *Instrument Restore from Backup* now (page 2–8).

Signal Set Installation
If this module was installed in the TG 2000 Platform mainframe at the factory, signal sets are already installed. If a generator module is ordered separately, you must install signal sets when installing the module. If you need to install signal sets, use one of the two following procedures: *Installing Signals to the Default Destination* or *Installing Signals to a Non-default Destination*. To replace signal sets, refer to the *TG 2000 Signal Generation Platform User Manual*.

Installing Signals to the Default Destination. To install signal sets from the disk to the default destination, perform these steps:

1. Insert the test signal disk into the TG 2000 Platform mainframe disk drive.

2. Push the **DISK** button.

3. Touch **Add Signals** when the Disk menu appears.

4. Touch **Select Source**.

5. Move the cursor to the .DNL you want to load and push the **Select** button.

6. Select all of the signal sets at the module level and push the **Select** button.

7. Touch **Quit/Load**. The previous menu appears.

8. Touch **Quit/Load** again. The Add Signals window reappears, showing the module as the selected destination.

NOTE. The Add Signals window shows the amount of kbytes selected (Total Tagged) and the amount available on the module. If the tagged total is greater than the amount available, the signal set will not load.

---

9. Touch **Start Load**. The signal sets are automatically loaded into the module. A popup menu tells you when the transfer is complete.

Installing Signals to a Non-default Destination. To install signal sets from the floppy disk to a non-default destination, perform these steps:

1. Insert the test signal disk into the TG 2000 Platform mainframe disk drive.

2. Push the **DISK** button.

3. Touch **Add Signals** when the Disk menu appears.

4. Touch **Select Source**.

5. Move the cursor to the .DNL you want to load and push the **Select** button.

6. Move the browse ring to a particular test signal and push the **Select** button.

7. Touch **Quit/Load**. The previous menu appears.

8. Touch **Quit/Load** again. The Add Signals window reappears.

NOTE. The Add Signals window shows the amount of kbytes selected (Total Tagged) and the amount available on the module. If the tagged total is greater than the amount available, the signal set will not load.

---

9. Touch **Select Destination**.

10. Move the cursor to the signal's field and place the cursor where you want the test signal to be installed. Be sure to choose a destination that is one level above the source. Push the **Select** button.

11. Touch **Start Load**. A popup menu tells you when the transfer is complete.

Instrument Backup and Restore

You may be required to remove a module from the TG 2000 Platform mainframe during service. Before you remove a generator module from the mainframe, you should save its signal sets to disks. A generator module will lose its signal memory 30 seconds after removal from the mainframe.

Required Equipment

You will need blank, DOS formatted 3.5 inch disks. You will need approximately one disk for each installed module, and one disk for the CPU.

Instrument Backup

To save signal sets and instrument settings, perform these steps:

1. Insert the Troubleshooting disk supplied with the *TG 2000 Signal Generation Platform Service Manual* into the mainframe disk drive and push the front-panel **Sequences** button.

2. Touch **File Utilities** on the display, and then touch **Add Sequences from Disk**.

3. Select the **tgbackup.seq** sequence file, and then touch **Start Load**.

4. When you see the message, "The Load is Complete", touch **OK**.

5. Touch **Quit**, and then touch **Quit** again.

6. Touch **Sequences** and then select the **tgbackup.seq** file to run (use the touch screen and the **Select** key). Be sure this file name appears in the box at the top of the window.

7. Touch **Run**. A popup message will tell you how many disks are needed. Touch **Quit**.

8. When you see the message, "Insert a Floppy Disk", remove the troubleshooting disk and insert a blank formatted disk. Touch **Quit**.

9. After each backup disk is complete, a popup message will tell you to insert a disk. Replace the completed disk with a new disk, and touch **Quit**.

10. After the last backup disk is complete, touch **Quit** and then **Quit** again.

Instrument Restore from Backup

To restore signal sets and instrument settings, perform these steps:

1. Insert the Troubleshooting disk supplied with *TG 2000 Signal Generation Platform Service Manual* into the mainframe disk drive and push the front-panel **Sequences** button.

2. Select the **tgrstore.seq** file, and then touch **Start Load**.

3. When you see the message, "The Load is Complete", touch **OK**.

4. Touch **Quit**, and then touch **Quit** again.

5. Touch **Sequences** and then select the **tgrstore.seq** file to run (use the touch screen and the **Select** key). Be sure this file name appears in the box at the top of the window.

6. Touch **Run**. Insert any of the backup disks that you created when you performed the *Instrument Backup* procedure. Touch **Quit.**

7. Insert another disk and touch **Quit** each time you are prompted. (You can insert the disks in any order.)

8. When the Restore Complete window appears, turn the mainframe power off and then on again to cycle power.

Module Removal

To remove a module, perform these steps:

1. Perform *Instrument Backup* on page 2–8.

2. Turn off the TG 2000 Platform mainframe by pressing the On/Standby front panel button and switching the rear panel power switch to off.

3. Unplug the power cord.

⚠️ **WARNING.** *To avoid a shock hazard always unplug the power cord before removing the top cover. Failure to unplug the power cord can result in serious injury or death.*

4. Remove all top-cover screws and remove the top cover. See Figure 2–2 on page 2–3.

5. Remove the appropriate rear panel as shown in Figure 2–3 on page 2–4. Loosen, but do not remove the bottom screw. You will use it later to secure the rear panel.

6. Refer to Figure 2–6 on page 2–6 and remove the top screw.

⚠️ **CAUTION.** *The module will lose its signal memory 30 seconds after you remove it from the TG 2000 Platform mainframe. Before removing the module, be sure you have performed* Instrument Backup *(step 1 of this procedure).*

7. Remove the module.

8. To ensure proper cooling and adherence to EMI shielding requirements, install a blank panel to cover any empty slots in the rear panel. A spare blank panel is included in the TG 2000 Platform mainframe accessories kit.

9. Tighten the screws on the blank rear panel.

10. If you will be installing a module, proceed to *Module Installation* on page 2–2. If you do not need to install a module, proceed to step 11.

11. Reinstall the top cover and insert and tighten all top cover screws.

12. Plug in the instrument power cord.

This completes the module removal procedure.

Operating Information

This section provides the service technician with information needed to operate this module during service. For more detailed operating information, refer to the user manual.

Functional Overview

Figure 2–7 shows the menu structure for basic module operations.

Push **Modules** button ● ──── **Modules window**
Touch **AVG1** module

Push **Signal Sets** button ● ──── **Signal Sets window**
Touch desired signal set
(usually represents format)

Push **Test Signals** button ● ──── **Test Signals window**
Touch desired Test Signal icon until correct
signal is selected.

Touch **Module Parameters**   Touch **Active Signal Parameters**

Module Parameters window
Touch **Output Enable/Disable, Module Timing, Circle, Trigger,** or **Output Config**

Active Signal Parameters window
Touch **Video** or **Text Overlay**

Module Timing, Circle Overlay, Trigger , Output Config windows
Set module timing with respect to the BG1 module, create circle overlay, configure trigger or signal outputs.

Video Parameters window
Set video parameters

Text Overlay window
Edit text overlay

Figure 2–7: Basic menu structure for the AVG1 Generator module

Outputs   The three signal output connectors for this module can be configured (see *Configure the Outputs* on page 2–17). The trigger output can also be configured (see the *AVG1 Analog Video Generator User Manual*).

Online Help   Push the front-panel **HELP** button to display a help window. The help window describes the AVG1 Generator module window you were using when you pushed HELP.

Operating Procedures

These operating procedures provide information specific to the AVG1 Generator module. Before proceeding, you should be familiar with the operation of the TG 2000 Signal Generation Platform. If you are not familiar with this platform, refer to the *TG 2000 Signal Generation Platform User Manual*.

Refer to Figure 2–7 for information on how to access the appropriate window for these procedures.

Required Equipment   There is no special equipment required to perform these procedures, but it will be helpful to view the signals on a monitor. To do this, you will need a television monitor, a 75 Ω coaxial cable, and a 75 Ω termination.

Power-On Procedure   After the module is installed in the mainframe, and the mainframe is installed in the rack or other location where it will be used, power on the mainframe by performing the following steps:

1. Set the rear-panel power switch to the ON position.

2. Press the front-panel POWER switch, if necessary.

3. Wait for a few seconds as the mainframe executes confidence tests on the mainframe and modules. Check for any error messages that might appear.

4. When the self tests are complete, the instrument will display icons representing each of the installed generator modules. If an installed module is not represented on the display, proceed to *Troubleshooting* on page 6–11.

Select the Module   To select the AVG1 Generator module, perform the following steps:

1. Push the front-panel Modules button. The Modules window will display an icon for each installed module. By default, each module name is followed by the slot number in which it is installed.

2. Touch the AVG1 icon on the display.
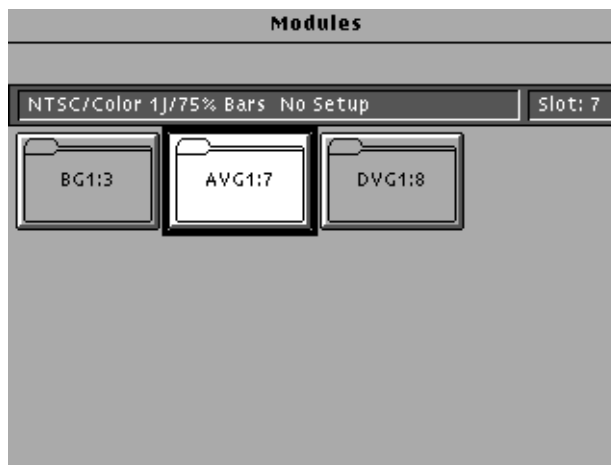
3. Selections you make after this will pertain to the AVG1 module.

Enable/Disable the Module Output

You can enable or disable the output of the AVG1 Generator module. If you disable the module output, it releases all system resources used by this module. To enable or disable the output signal, touch the **Enable/Disable** icon in the Module Parameters window.

Select the Output Test Signal

Use the following procedure to select the module's output signal. You can select any of the AVG1 signals that are loaded in your instrument. For instructions on loading signals, refer to page 2–6 of this manual. Information about adding/deleting signals is provided in the *TG 2000 Signal Generation Platform User Manual*.

1. If you do not already have the Signal Sets window open, go to that window now by pushing the Signal Sets button. You should see an icon for each installed signal set, as in the following example. If your signal sets are not installed, refer to *Signal Set Installation* on page 2–6.

2. Touch the desired signal set on the display. In this example, select NTSC.

3. The Test Signals window for the selected signal set appears, as shown in the following illustration.
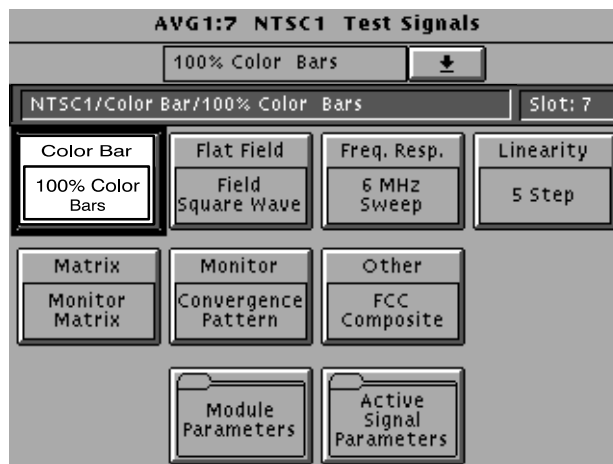
4. Each test signal icon in the Test Signals window represents one or more signals. In the following example of an NTSC test signal window, the Color Bar test signal icon is selected, and the 100% Color Bars signal is being generated.

5. To change to another Color Bar signal, touch the **Color Bar** repeatedly to cycle through all available signals. You can also display the complete list of test signals available under a selected test-signal icon by touching the list box or by rotating the Navigation knob, and then select a signal by pressing the front-panel **Select** key.

6. To change to a different signal type, such as Linearity, touch the corresponding icon on the display. Then select the signal as shown in step 5.

Set Video Parameters

From the Video Parameters window (entered by touching Video in the Active Signal Parameters window), you can adjust the signal parameters of the currently selected test signal. Changing the value of one parameter may affect the values of other parameters. To change all entries to their values when the Video parameters window was opened, press Reset. There are no factory defaults.

You can also rename and save a test signal after modifying it. You can not modify and save a Tektronix-generated signal without renaming it. If you do rename the signal, the original and the modified one are both saved. The instrument can rename the test signal for you by adding an underscore to the front of the current name.

To rename the test signal, delete the suggested name using the **BS** key, and then enter new text. (You can not backspace over an underscore character.) Press **Set 1** or **Set 2** to provide additional sets of characters. Press **OK** when text is complete.

The following example shows the Video Parameters window for a hardware modulated composite signal.

```
                    AVG1:7  Parameters
   ┌──────────────────────────────────────┬──────────┐
   │ NTSC1/Monitor/_Convergence Pattern   │ Slot: 7  │
   ├────────────────────────────────────┬─┴─┐        │
   │ Overall Video Gain        100.0 %  │ ↑ │        │
   │  Active Video Gain        100.0 %  │   │        │
   │   Luma Ampl               100.0 %  │   │        │
   │   Chroma Gain             100.0 %  │   │        │
   │    Active R-Y Ampl        100.0 %  │   │        │
   │    Active B-Y Ampl        100.0 %  │   │        │
   │  Burst Ampl               100.0 %  │   │ ┌──────┐│
   │  Sync Ampl                100.0 %  │   │ │ Reset││
   │  Pedestal Ampl              0.0 mV │   │ └──────┘│
   │  Chroma Phase Offset        0.0 deg│   │         │
   │  SCH Phase                  0.0 deg│ ↓ │┌───────┐│
   └────────────────────────────────────┴───┘│Quit/Save│
                                              └───────┘
```
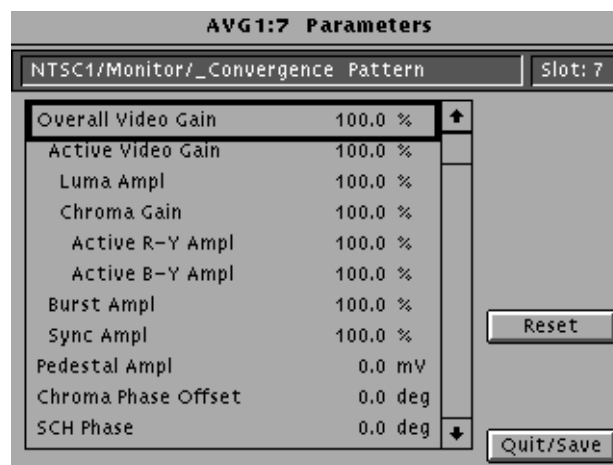
Text Overlay

From the Signal Text window (entered by touching Signal Text from the Active Signal Parameters window), you can enter text that overlays your displayed test signal. When turning text on or off, you are turning text on or off for all test signals that have overlaid text. Pressing **Reset** returns the text, horizontal and vertical to previously saved values.
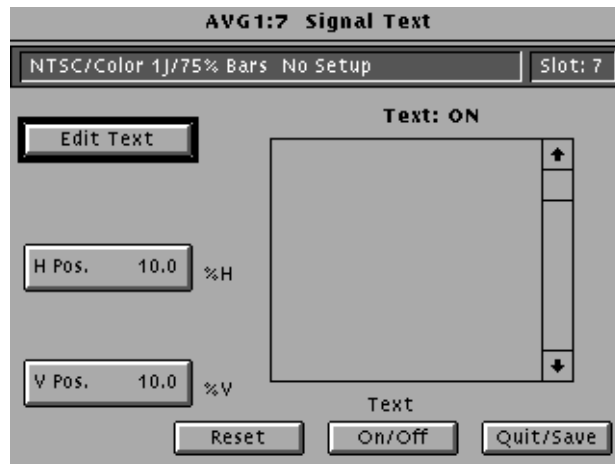
Set Module Timing   You can set the horizontal and vertical timing of this module with respect to the BG1 Generator module, using the Module Parameters window (entered by touching Module Parameters at the bottom of the Test Signals window). Changes you make to timing affect all signals for the AVG1 Generator module. If you want to set horizontal and vertical values to zero, touch **Reset All**.

Configure the Outputs   You can configure the three output channels located at the rear panel of the
AVG1 module. The configuration only affects hardware modulated composite
signals. To configure the channels, select one of the following:

■ **Signal Specified** permits the SDP2000 to configure the channel outputs.

■ **Y–C Composite** specifies that Ch 1 outputs Y, Ch 2 outputs C, and Ch 3
outputs a composite signal.

■ **Composite all Channels** specifies a composite signal on all three outputs.
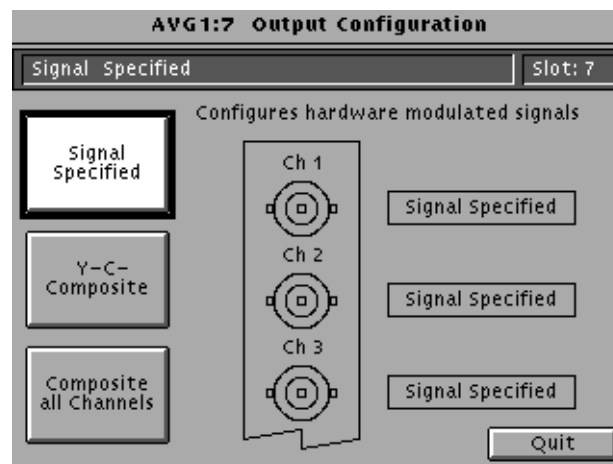
Theory of Operation

Theory of Operation

This discussion provides an overview of the AVG1 Generator module. For information about the TG 2000 Platform mainframe, refer to the *TG 2000 Signal Generation Platform Service Manual*.

Block Level Description

Figure 3–1 shows a simplified block diagram of the AVG1 Analog Video Generator module. The switches are shown in the three-channel operation position.
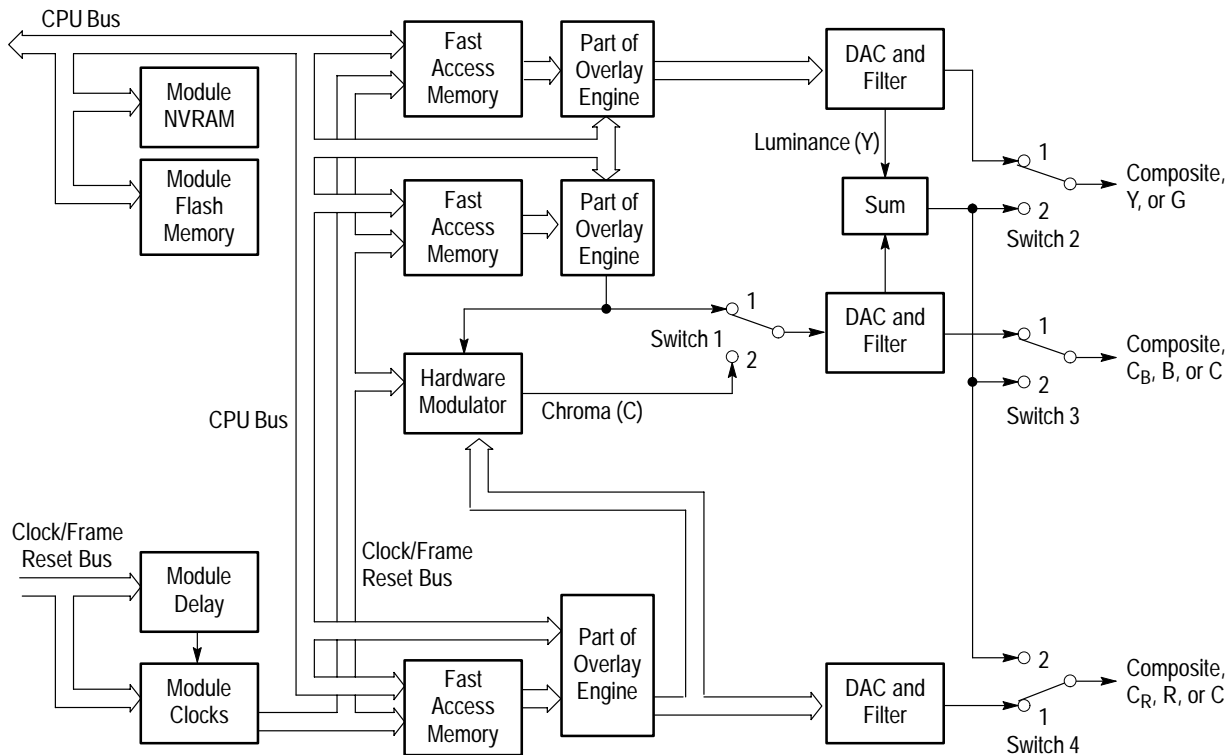
Figure 3–1: Simplified block diagram of the AVG1 Analog Video Generator module

The AVG1 Generator module is basically a three-channel generator, with four BNC connectors on the rear panel. One output is a Trigger Out and the other three are video outputs.

Output signal data for each channel is stored in fast access memory, which has been loaded from the CPU bus. Table 3–1 lists the memory capacity. Sample rate

and line length directly affect the total number of unique lines that can be stored. An overlay data modifier changes data as it is read out of the fast access memory to create circular patterns, cursors, and text characters.

Table 3–1: AVG1 Signal Memory Summary

Video format	Maximum unique lines	Maximum sequence length
NTSC/525-line Component	76 lines @ 1716 samples	2.7 seconds
PAL/625-line Component	72 lines @ 1728 samples	2.7 seconds

There are two methods of signal generation for composite signals: hardware modulation and software modulation. Hardware modulated signals are preferred when the lowest amount of differential phase and differential gain is required. Hardware modulated signals also use less memory than software modulated signals, and signal parameter adjustments are more complete and responsive.

Software modulated signals are preferred when three different signals are generated at one time. PAL is not supported in this mode due to the 25 Hz offset.

Signal Switching

Figures 3–2 and 3–3 show the output signal connections for hardware modulated signals. Hardware modulated signals are preferred when the lowest amount of differential phase and differential gain is required. Hardware modulated signals also use less memory than software modulated signals, and signal parameter adjustments are more complete and responsive.

When signals are hardware modulated, digital data from the C_B and C_R channels are quadrature modulated at the subcarrier frequency and added to the luminance (Y) channel. This method is used for NTSC signals in cases where the best non-linearity specifications are required. The hardware modulator is also used to create YC composite signals (SVHS or Hi–8). The CPU-controlled switch settings for all modes of operation are listed in Table 3–2.

Table 3–2: AVG1 Generator module output configurations

Operating mode	Switch 1 setting	Switch 2 setting	Switch 3 setting	Switch 4 setting
Software Modulated	1	1	1	1
Y-C/Composite	2	1	1	2
Composite All Channels	2	2	2	2
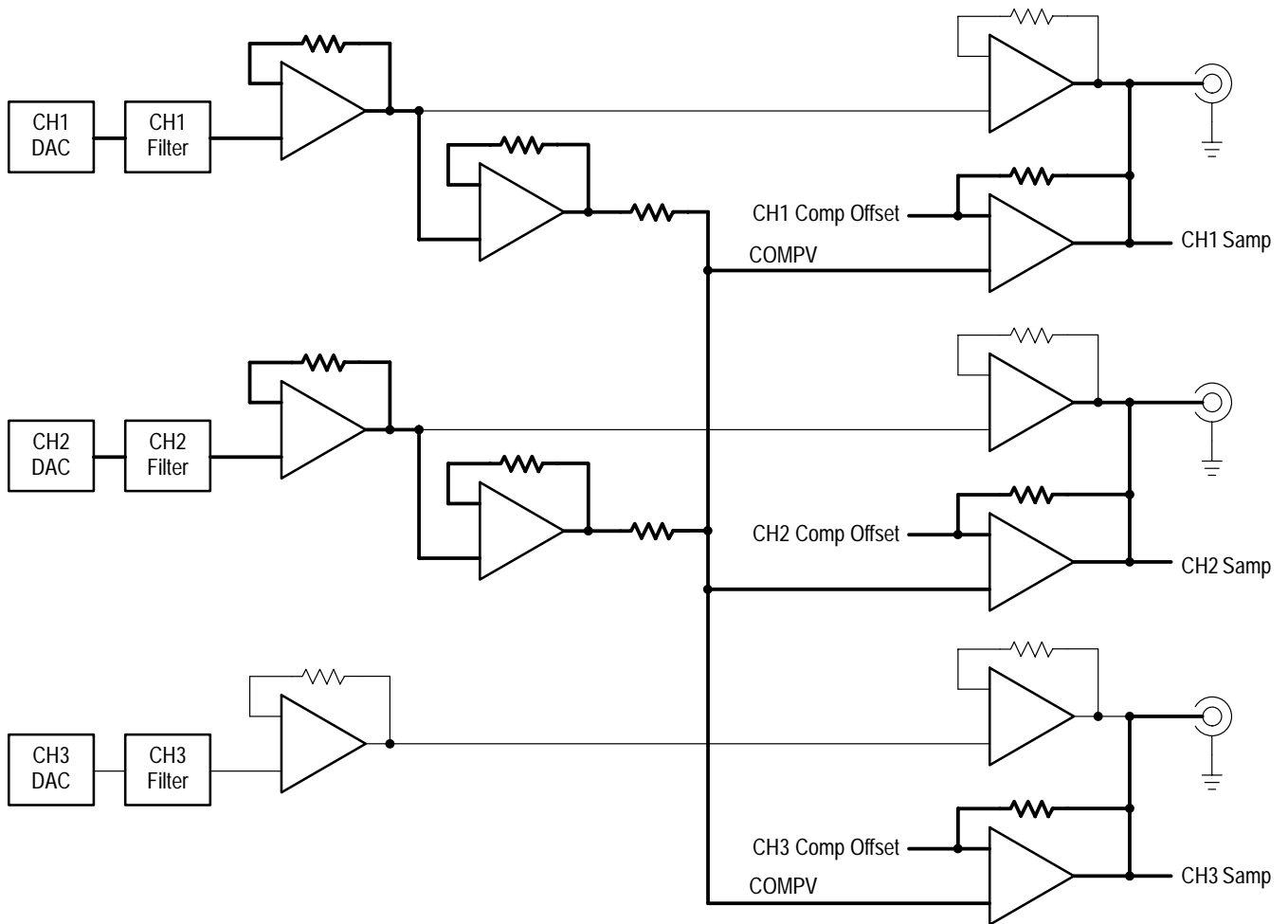
Figure 3–2: Hardware modulated signal mode (three channel composite)
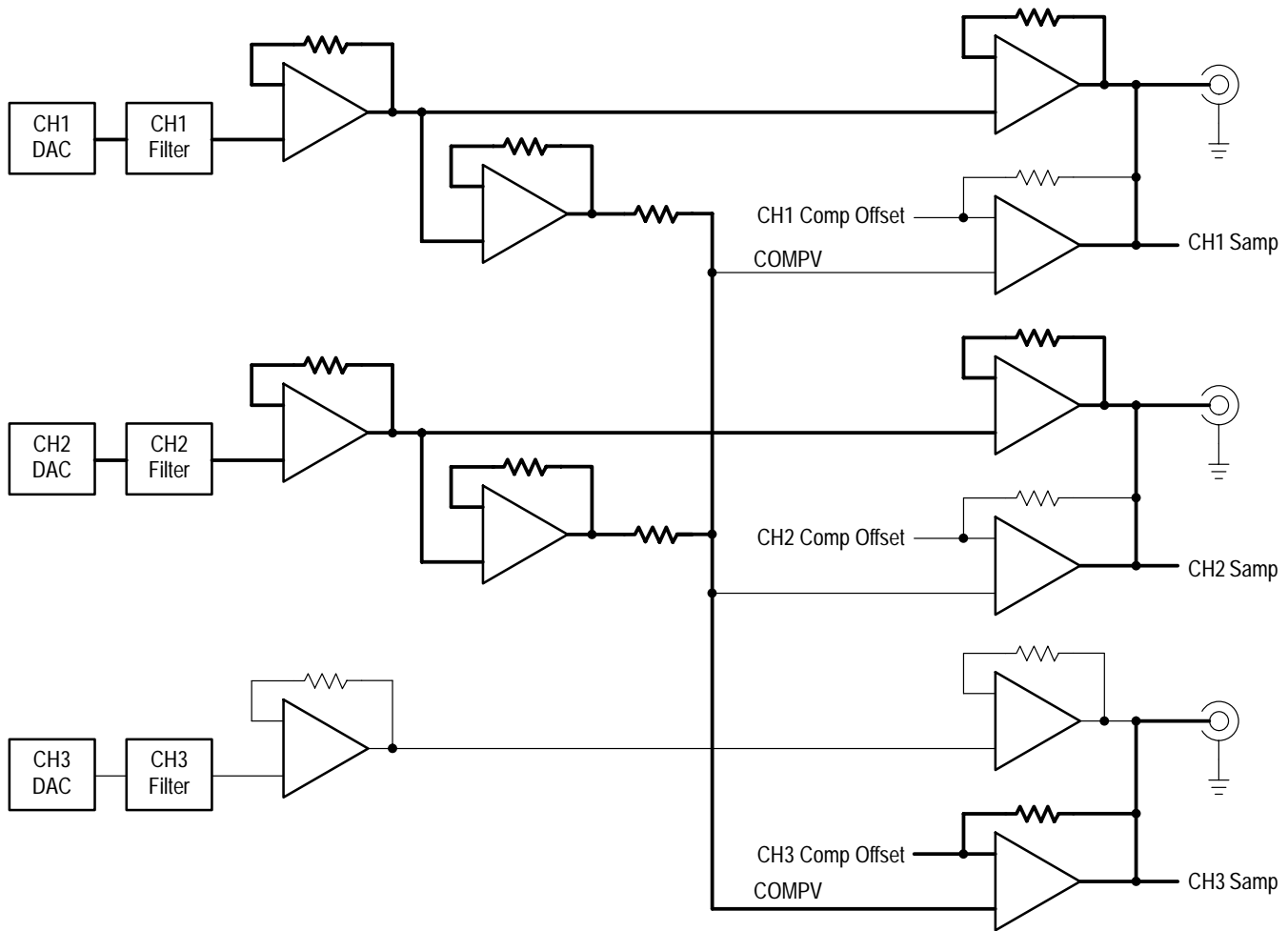
Figure 3–3: Hardware modulated signal mode (YC composite)

Software Modulated Signals

Figure 3–4 shows the output signal connections for a software modulated signal. Software modulated signals are preferred when three different signals are generated at one time. PAL is not supported in this mode due to the 25 Hz offset. When signals are software modulated, the data is directly stored in each channel of fast access memory, in which case the AVG1 Generator module can output three different composite signals. With software modulated signals, the subcarrier is directly defined when the signal data is created.

For component analog operation, the three output channels produce a combination of GBR or Y, CB, CR signals.
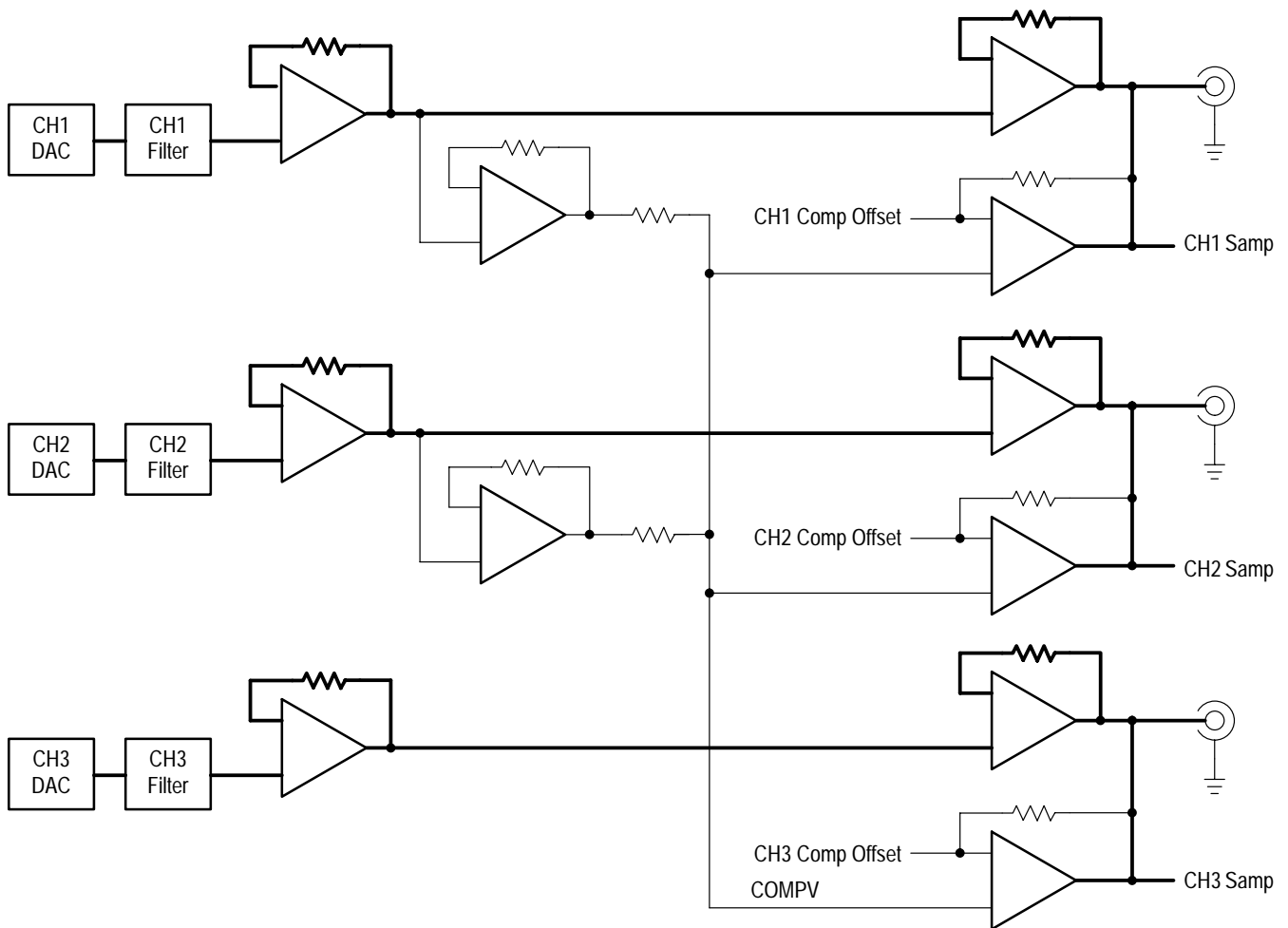
Figure 3–4: Component and software modulated signal mode

Signal Memory   The AVG1 Generator module uses two levels of RAM to generate signals in real time. Each level of memory puts constraints on the maximum complexity of a signal that can be generated. The Line RAM holds the actual sample points which define the signal. The Line RAM will hold 128K (131072) samples. The following equation determines the maximum number of unique video lines that can be stored in the Line RAM:

131072 samples / # of samples per line = # of unique video lines.

The Frame RAM contains a series of pointers which control the order in which the video lines that are stored in Line RAM are used to produce composite video signals. The maximum number of pointers is 43690. The following equation determines the maximum length of a video sequence for a given line time:

video sequence length (in seconds) = line time (in seconds) X 43690

Performance Verification

Performance Verification

Perform the following procedure to verify that your AVG1 Generator module is meeting the requirements listed in the *Specifications* section. If, after performing this procedure, you determine that the module is not meeting specifications, proceed to *Adjustments* on page 5–1, or purchase a calibration service through your Tektronix representative.

⚠️ **WARNING.** *Dangerous electric shock hazards exist inside the mainframe. Only qualified service personnel should perform these procedures.*

Verification Interval

To ensure correct instrument operation, verification procedures should be performed once a year. Before performing any verification procedures, complete all relevant maintenance procedures outlined in the *Maintenance* section of this manual.

Required Equipment

Test Equipment Table 4–1 lists the equipment required for the *Performance Verification* procedure.

Table 4–1: Equipment required for Performance Verification

Equipment	Example or Tektronix equivalent
Digital Multimeter	Tektronix DM5120 Digital Multimeter
High Precision Oscilloscope	Tektronix DSA602A Digital Signal Analyzer with the 11A34 module installed in the left slot.
Video Measurement Set	Tektronix VM700-Series Video Measurement Set
Spectrum Analyzer	Tektronix 2712 Spectrum Analyzer
Peak Detector Amplifier	015-0408-00
Peak Detector Head	015-0413-00
Return Loss Bridge, Low Band	A57T from Wide Band Engineering
Return Loss Bridge, 75 Ω	011-0103-00
BNC Termination, 75 Ω	011-0102-01

Table 4–1: Equipment required for Performance Verification (cont.)

Equipment	Example or Tektronix equivalent
BNC Termination, 75 Ω feed-through	011-0055-01
75 Ω Low-Loss BNC Cables	012-0074-00

Test Software   You will need test software files (.dnl files), which are included on the AVG1 Service disk shipped with this manual.

Preparation for Performance Verification

Follow all instructions for power on, instrument warmup, loading test signals, loading DSA presets, and self calibration.

Overview   This is a list of the steps that you will follow while preparing for and performing the *Performance Verification* procedure:

- Power on and warm up page 4–3

- Create a preset of the current instrument state page 4–4

- Perform an instrument backup page 4–4

- Recall the Factory preset page 4–4

- Load the test signals page 4–5

- Load the DSA setups for the DSA602A Digital Signal Analyzer page 4–6

- Perform Self Cal page 4–7

- Complete the *Performance Verification* procedure page 4–7

- Restore signals page 4–46

- Recall the preset you created page 4–46

Power On and Warm Up   Power on and warm up the mainframe as follows:

1. Connect the TG 2000 Platform mainframe to an AC power source that is appropriate for your system.

2. Set the rear-panel power switch to the ON position.

3. Press the front-panel POWER switch if necessary.

4. Wait for a few seconds as the mainframe executes confidence tests on the mainframe and modules. Check to see if any error messages appear.

5. When the self tests are complete, the instrument will display icons representing each of the installed generator modules. If an installed module is not represented on the display, proceed to *Troubleshooting* on page 6–11.

6. Allow 20 minutes of warm-up time before performing *Self Cal* or *Performance Verification*. During warm-up time, you can perform the remaining preparation steps.

Create Preset

Before beginning the *Performance Verification* procedure, create a preset to save your instrument settings as follows:

1. Push the **Presets** button.

2. Touch **Presets** on the display.

3. Touch **Create** on the display.

4. Touch letters on the display to spell out a name for the new preset, and then touch **OK**.

5. Use the **Navigation** arrows to move the cursor to the new preset. Press the **Select** button.

6. Touch **Save To**. Your current instrument settings are saved to the new preset.

Instrument Backup

Determine whether you will be replacing signals (see the following procedure, *Loading Test Signals*). If you will be replacing signals, perform *Instrument Backup* on page 2–8 now. During the backup procedure, you will create disks to restore the module signals after you finish the *Performance Verification* procedure.

If you do not wish to perform the backup, you can choose to restore the standard AVG1 test signals instead, using the AVG1 Test Signals disks that were shipped with the *AVG1 Analog Video Generator User Manual*.

Recall the Factory Preset

Recall the Factory Preset as follows:

1. Push the **Presets** button.

2. Touch **Presets** on the display.

3. Use the **Navigation** arrows to move the cursor to the **Factory** preset. Press the **Select** button.

4. Touch **Recall**. The instrument is set to factory presets.

Loading Test Signals

Some of the procedure steps require you to load test signals.

If you have more than one AVG1 Generator module loaded, or if you have the optional memory upgrade installed, you may have enough memory capacity to add all of these signals at once to the AVG1 Generator module. To do this, use the *Add Signals* procedure on page 4–5.

If you do not have sufficient memory to add the signals, you must replace the AVG1 Generator module signals with the required test signal for each step as you go through the *Performance Verification* procedure. To do this, use the *Replace Signals* procedure on page 4–6.

Add Signals. To add the test signals, perform the following steps:

1. Insert the AVG1 Service disk supplied with this manual into the TG 2000 Platform mainframe disk drive.

2. Push the **Disk** button on the TG 2000 Platform mainframe.

3. Touch **Add Signals** on the display.

4. Touch **Select Source**.

5. Use the **Navigation** arrow to select the .dnl file you want to add. (For example, the **dc_level.dnl** file is specified for checking DC level, the first performance verification step.)

6. Press the **Select** button.

7. When the new window opens, use the **Navigation** arrow to move the cursor to the **AVG1** folder on the right side of the display.

8. Press the **Select** button.

9. Touch **Quit/Load**.

10. Touch **Quit/Load** again to return to the Add Signals window.

11. Touch **Select Destination**.

12. Use the right **Navigation** arrow to move the cursor to the **AVG1** folder on the right side of the display.

13. Press the **Select** button.

14. Touch **Quit/Load**. The Add Signals window reappears, showing the amount of kbytes selected (Total Tagged) and the amount of space available on the module (Free). If the tagged total is greater than the free amount, the signal sets will not load. Use the *Replace Signals* procedure on page 4–6.

15. Touch **Start Load**.

16. When the load is complete, touch **OK**.

17. Touch **Quit**.

This completes the *Add Signals* procedure.

Replace Signals. To replace the test signals, perform the following steps:

1. To save the instrument signals and settings, perform *Instrument Backup* on page 2–8.

NOTE. If you are using only standard signals and settings, then you can use the test signal disks that are shipped with the module user manual to restore the signals at the end of the Adjustments procedure. In this case, you do not need to perform the Instrument Backup.

---

2. Insert the AVG1 Service disk supplied with this manual into the TG 2000 Platform mainframe disk drive.

3. Push the **Disk** button on the TG 2000 Platform mainframe.

4. Touch **Replace Signals** on the display.

5. Use the **Navigation** arrow to select the .dnl file you want to add. (For example, the **dc_level.dnl** file is specified for checking DC level, the first performance verification step.)

6. Press the **Select** button.

7. When the Replace screen appears, use the right **Navigation** arrow to move the cursor to the **AVG1** folder.

8. Press the **Select** button.

9. Touch **Quit/Load**.

10. Touch **Start Replace**.

11. Touch **OK** to remove all current signals and replace them with the new selections. If you are prompted to disable the active signal, touch **Yes**.

12. When the load is complete, touch **OK**, and then touch **Quit**.

This completes the *Replace Signals* procedure.

Recall DSA 602A Digital Signal Analyzer Settings

These test procedures require a number of DSA 602A Digital Signal Analyzer settings. These settings are provided on the AVG1 Service disk included with this manual. The files have the extension **.fpb**.

1. Insert the AVG1 Service disk in the DSA 602A Digital Signal Analyzer disk drive.

2. Leave the disk in the disk drive while performing the Performance Verification Procedure.

3. When the Performance Verification procedure instructs you to recall a DSA 602A setup, do the following:

   a. Press the **Utility** button until the Directory Ops icon is displayed.

   b. Touch **Directory Ops**.

   c. Press the **Store/Recall** button.

   d. Touch **Recall Setting**.

   e. Touch **Disk** at the top of the Recall Setting window.

   f. Select the file to recall from the displayed list. The DSA 602A configures itself to the specified setting.

Perform Self Cal   Perform instrument calibration as follows:

NOTE. *The original calibration file will be replaced by the new one.*

---

1. Perform the Module Self Cal by performing the following steps:

   a. Terminate the AVG1 Generator module outputs 1, 2, and 3 in 75 Ω.

   b. Push the **Utilities** button.

   c. Touch the following on the TG 2000 Signal Generation Platform:

      ■ **Module Self Cal**

      ■ **AVG1:X Self Cal**

      ■ **Start Cal**

   d. When the Self Cal is successfully completed, the display will return to the Modules window, with no error message. This may take 2 to 5 minutes, depending on the module. An error message indicates a failed calibration. If the Self Cal fails refer to *Troubleshooting* in this manual, contact your Tektronix representative for assistance.

2. Touch **AVG:X** on the display.

Performance Verification Procedures

You can perform the entire procedure sequentially, or, if you only want to check selected specifications, you can perform the steps individually. Be sure you have performed the *Preparation for Performance Verification* before proceeding.

If you perform an instrument backup, be sure to follow the instructions on page 4–46 to restore the signals after completing performance verification.

A Test Record is provided on page 4–47.

Luminance Amplitude, DC Offset, and Linearity

Test Equipment Required:

■ Digital Multimeter (This procedure was prepared using a Tektronix DM5120 Digital Multimeter.)

■ 75 Ω coaxial cable

■ 75 Ω feed-through termination

Equipment Hookup:

■ Connect a precision 75 Ω feed-through termination to input of the digital multimeter.

■ Connect a 75 Ω coaxial cable between the precision termination and Channel 1 of the AVG1 Generator module.

Test Signal:

Load the **dc_level.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure: Repeat this procedure for each of the three signal outputs; Channel 1, Channel 2, and Channel 3.

1. Select the test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Auto Test** on the display.

   c. Touch **dc_pos** on the display until the **dc000** signal is selected.

2. Check that the value displayed on the digital multimeter is 0.0 mV, ±10 mV. Enter the value on line **(1)** of the Test Record on page 4–47.

3. Check at 100 mV:

   a. Touch **dc_pos** to display the **dc100** test signal.

   b. Check that the value displayed on the digital multimeter is:

   c. 100 mV from the value read for dc000, ±0.5 mV.

    d. Enter the value on line **(2)** of the Test Record on page 4–47.

4. Check at 200 mV:

    a. Touch **dc_pos** to display the **dc200** test signal.

    b. Check that the value displayed on the digital multimeter is:

        ■   100 mV from the value read for dc100, ±0.5 mV.

        ■   200 mV from the value read for dc000, ±1.0 mV.

    c. Enter the value on line **(3)** of the Test Record on page 4–47.

5. Check at 300 mV:

    a. Touch **dc_pos** to display the **dc300** test signal.

    b. Check that the value displayed on the digital multimeter is:

        ■   100 mV from the value read for dc200, ±0.5 mV.

        ■   300 mV from the value read for dc000, ±1.5 mV.

    c. Enter the value on line **(4)** of the Test Record on page 4–47.

6. Check at 400 mV:

    a. Touch **dc_pos** to display the **dc400** test signal.

    b. Check that the value displayed on the digital multimeter is:

        ■   100 mV from the value read for dc000, ±0.5 mV.

        ■   400 mV from the value read for dc000, ±2.0 mV.

    c. Enter the value on line **(5)** of the Test Record on page 4–47.

7. Check at 500 mV:

    a. Touch **dc_pos** to display the **dc500** test signal.

    b. Check that the value displayed on the digital multimeter is:

        ■   100 mV from the value read for dc400, ±0.5 mV.

        ■   500 mV from the value read for dc000, ±2.5 mV.

    c. Enter the value on line **(6)** of the Test Record on page 4–47.

8. Check at 600 mV:

    a. Touch **dc_pos** to display the **dc600** test signal.

    b. Check that the value displayed on the digital multimeter is:

■   100 mV from the value read for dc500, ±0.5 mV.

■   600 mV from the value read for dc000, ±3.0 mV.

   c.   Enter the value on line **(7)** of the Test Record on page 4–47.

9. Check at 700 mV:

   a.   Touch **dc_pos** to display the **dc700** test signal.

   b.   Check that the value displayed on the digital multimeter is:

■   100 mV from the value read for dc600, ±0.5 mV.

■   700 mV from the value read for dc000, ±3.5 mV.

   c.   Enter the value on line **(8)** of the Test Record on page 4–47.

10. Check at 800 mV:

   a.   Touch **dc_pos** to display the **dc800** test signal.

   b.   Check that the value displayed on the digital multimeter is:

■   100 mV from the value read for dc700, ±0.5 mV.

■   800 mV from the value read for dc000, ±4.0 mV.

   c.   Enter the value on line **(9)** of the Test Record on page 4–47.

11. Check at 900 mV:

   a.   Touch **dc_pos** to display the **dc900** test signal.

   b.   Check that the value displayed on the digital multimeter is:

■   100 mV from the value read for dc800, ±0.5 mV.

■   900 mV from the value read for dc000, ±4.5 mV.

   c.   Enter the value on line **(10)** of the Test Record on page 4–47.

12. Check at 1000 mV:

   a.   Touch **dc_pos** to display the **dc1000** test signal.

   b.   Check that the value displayed on the digital multimeter is:

■   100 mV from the value read for dc900, ±0.5 mV.

■   1000 mV from the value read for dc000, ±5.0 mV.

   c.   Enter the value on line **(11)** of the Test Record on page 4–47.

13. Check at –300 mV:

    a. Touch **dc_neg** to display the **dcneg300** test signal.

    b. Check that the value displayed on the digital multimeter is –300 mV from the value read for dc000, $\pm$1.5 mV.

    c. Enter the value on line **(12)** of the Test Record on page 4–47.

14. Check at –600 mV:

    a. Touch **dc_neg** to display the **dcneg600** test signal.

    b. Check that the value displayed on the digital multimeter is:

        ■ –300 mV from the value read for neg300, $\pm$1.5 mV.

        ■ –600 mV from the value read for dc000, $\pm$3.0 mV.

    c. Enter the value on line **(13)** of the Test Record on page 4–47.

15. Check at 000 mV:

    a. Touch **fmtlimit** to display the **YPbPr 000** test signal.

    b. Check that the value displayed on the digital multimeter is 0.0 mV, $\pm$10 mV.

    c. Enter the value on line **(14)** of the Test Record on page 4–47.

16. For Channel 1 ONLY
Check at 1000 mV and –600 mV:

    a. Touch **fmtlimit** to display the **YPbPr pos** test signal.

    b. Check that the value displayed on the digital multimeter is 1000 mV from the value read for ypbpr 000, $\pm$5 mV.

    c. Enter the value on line **(15)** of the Test Record on page 4–47.

    d. Touch **fmtlimit** to display the **YPbPr neg** test signal.

    e. Check that the value displayed on the digital multimeter is –600 mV from the value read for ypbpr 000, $\pm$3 mV.

    f. Enter the value on line **(17)** of the Test Record on page 4–47.

17. For Channel 2 and Channel 3 ONLY
Check at 800 mV and –800 mV:

    a. Touch **fmtlimit** to display the **YPbPr pos** test signal.

    b. Check that the value displayed on the digital multimeter is 800 mV from the value read for ypbpr 000, $\pm$4 mV.

    c. Enter the value on line (**16**) of the Test Record on page 4–47.

    d. Touch **fmtlimit** to display the **YPbPr neg** test signal.

    e. Check that the value displayed on the digital multimeter is –800 mV from the value read for ypbpr 000, ±4 mV.

    f. Enter the value on line (**18**) of the Test Record on page 4–47.

18. Check at 000 mV:

    a. Touch **fmtlimit** to display the **HW 3CH 000** test signal.

    b. Check that the value displayed on the digital multimeter is 0.0 mV, ±10 mV.

    c. Enter the value on line (**19**) of the Test Record on page 4–47.

19. Check at 1000 mV:

    a. Touch **fmtlimit** to display the **HW 3CH pos** test signal.

    b. Check that the value displayed on the digital multimeter is 1000 mV from the value read for hw 3ch 000, ±5 mV.

    c. Enter the value on line (**20**) of the Test Record on page 4–47.

20. Check at –600 mV:

    a. Touch **fmtlimit** to display the **HW 3CH neg** test signal.

    b. Check that the value displayed on the digital multimeter is –600 mV from the value read for hw 3ch 000, ±3 mV.

    c. Enter the value on line (**21**) of the Test Record on page 4–47.

21. Check at 000 mV:

    a. Touch **fmtlimit** to display the **HW YC 000** test signal.

    b. Check that the value displayed on the digital multimeter is 0.0 mV, ±10 mV.

    c. Enter the value on line (**22**) of the Test Record on page 4–47.

22. Check at 100 mV:

    a. Touch **fmtlimit** to display the **HW YC pos** test signal.

    b. Check that the value displayed on the digital multimeter is 1000 mV from the value read for HW YC 000, ±5 mV.

    c. Enter the value on line (**23**) of the Test Record on page 4–47.

23. Move the coaxial cable from Channel 1 to Channel 2.

24. Repeat steps 1 through 22, entering values in the Channel 2 column of the test record.

25. Move the precision termination and coaxial cable from Channel 2 to Channel 3.

26. Repeat steps 1 through 22, entering values in the Channel 3 column of the test record.

Pedestal Amplitude Error

Test Equipment Required:

- Digital Multimeter (This procedure was prepared using a Tektronix DM5120 Digital Multimeter.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a precision 75 Ω feed-through termination to input of the digital multimeter.

- Connect a 75 Ω coaxial cable between the precision termination and Channel 1 of the AVG1 Generator module.

Test Signal:

Load the **dc_level.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Auto Test** on the display.

    c. Touch **dc_pos** on the display until the **dc000** signal is selected.

2. Set the AVG1 Generator module pedestal as follows:

    a. Push the **Test Signals** front-panel button on the TG 2000 Signal Generation Platform.

    b. Touch **Active Signal Parameters** on the display.

    c. Touch **Video**.

    d. Use the navigation arrow buttons to highlight **Pedestal Gain:Mstr**.

    e. Key in **1000** and press the **Enter** button.

3. Check that the value displayed on the digital multimeter, minus the value you recorded on line (11) of the Test Record (page 4–47) for channel 1 equals 1000 mV, ± 10 mV.

4. Move the coaxial cable from Channel 1 to Channel 2.

5. Check that the value displayed on the digital multimeter, minus the value you recorded on line (1) of the Test Record for channel 2 equals 1000 mV, ±10 mV.

6. Move the coaxial cable from Channel 2 to Channel 3.

7. Check that the value displayed on the digital multimeter, minus the value you recorded on line (1) of the Test Record for channel 3 equals 1000 mV, ±10 mV.

8. Move the coaxial cable from Channel 3 to Channel 1.

9. Change the **Pedestal Gain:Mstr** value to –1000 mV and press the **Enter** button.

10. Check that the value displayed on the digital multimeter, minus the value you recorded on line (1) of the Test Record (page 4–47) for channel 1 equals –1000 mV, ±10 mV.

11. Move the coaxial cable from Channel 1 to Channel 2.

12. Check that the value displayed on the digital multimeter, minus the value you recorded on line (1) of the Test Record for channel 2 equals –1000 mV, ±10 mV.

13. Move the coaxial cable from Channel 2 to Channel 3.

14. Check that the value displayed on the digital multimeter, minus the value you recorded on line (1) of the Test Record for channel 3 equals –1000 mV, ±10 mV.

15. Reset the **Pedestal Gain:Mstr** to 0.00.

Frequency Response, Chroma/Luma Gain Error, and Y/C Match

Test Equipment Required:

- Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

- Peak-to-Peak Detector Head and Amplifier

- 75 Ω coaxial cables

Equipment Hookup:

- Connect the Peak-to-Peak detector head directly to the Channel 1 connector on the AVG1 Generator module.

- Connect the Peak-to-Peak detector head to the Peak-to-Peak Amplifier + Input.

- Connect the Peak-to-Peak Amplifier Output to the oscilloscope Channel 1.

- Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Test Signal:

Load the **filt_adj.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure: Software Response

1. Select the test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Filter Adjustment** on the display.

   c. Touch **Freq Rsp SW** on the display until the **Frequency Response SW** signal is selected.

2. Set the Trigger as follows:

   a. Touch **Module Parameters** on the display.

   b. Touch **Trigger Output**.

   c. Touch **Type** until **Horizontal** is selected.

   d. Touch **H Pos**.

   e. Use the front-panel Keypad to select **34.93 uS** and select **Enter**.

      f.   Push the **Test Signals** button again.

3. Recall the **FREQ_RSP** preset in the DSA 602A Digital Signal Analyzer.

4. Turn the + Input Level on the peak-to-peak detector until the green led lights.

5. Set the .1 MHz packet to the vertical center of the display (packets before and after the trigger pulse).

6. Set the oscilloscope Vertical to 1 mV/div.

NOTE. This signal has 8 MHz pulses for locators and 0.1 MHz packets on either side for reference levels. The remainder of the signal is made up of packets of CW frequencies in .5 MHz steps, from .5 MHz to 6 MHz. There are markers before the 1, 2, 3, 4, 5 and 6 MHz packets.

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7. Check that the portions between markers are flat (within 3.5 mV of the .1 MHz packet). See Figures 4–1 and 4–2.

8. Repeat steps 5 through 7 for channel 2 and channel 3, moving the peak-to-peak detector head to channel and channel 3 in turn.
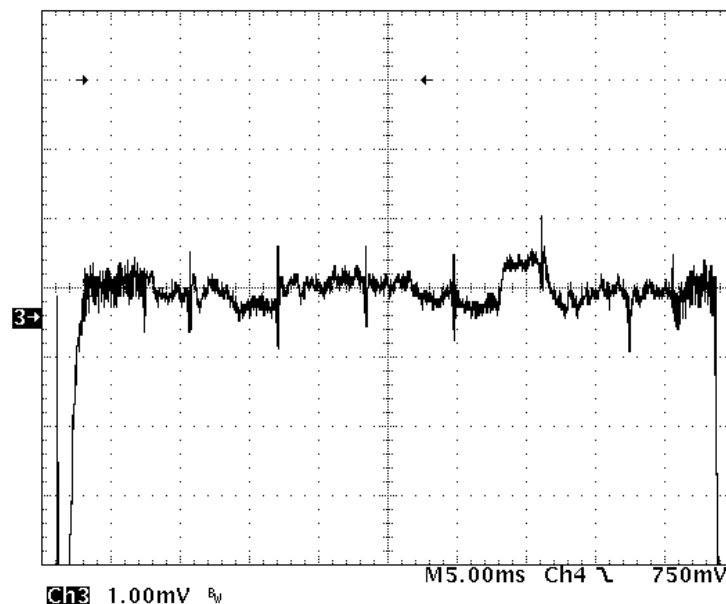
Figure 4–1: Properly adjusted frequency response
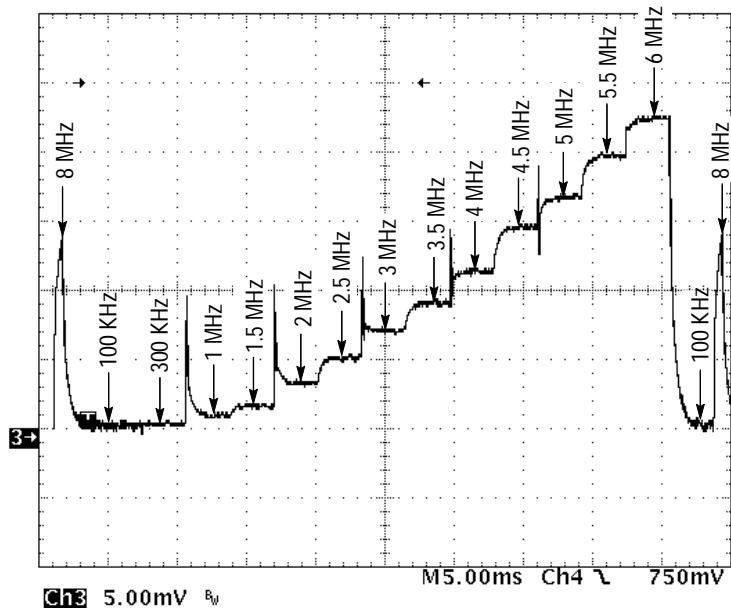
Figure 4–2: Poorly adjusted frequency response

Procedure: Hardware Response

1. Select the **Frequency Response HW** test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Filter Adjustment** on the display.

    c. Touch **Freq Rsp HW** on the display until the **Frequency Response HW** signal is selected.

2. Connect the Peak-to-Peak Detector as follows:

    a. Connect the Peak-to-Peak detector head directly to the Channel 1 connector on the AVG1 Generator module.

    b. Connect the Peak-to-Peak detector head to the Peak-to-Peak Amplifier + Input.

    c. Connect the Peak-to-Peak Amplifier Output to the oscilloscope Channel 1.

    d. Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 2 input.

3. Set the .1 MHz packet to the vertical center of the display (packets before and after the trigger pulse).

4. Set the oscilloscope Vertical to 1 mV/div.

5. Check that the portions between markers are flat (within 3.5 mV of the .1 MHz packet). See Figures 4–1 and 4–2.

6. Repeat steps 2 through 5 for channel 2 and channel 3.

Channel to Channel Delay Errors

Test Equipment Required:

- Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω feed-through termination to the oscilloscope Channel 1 input.

- Connect a 75 Ω coaxial cable between the 75 Ω feed-through termination and the AVG1 Generator module Channel 1 output.

- Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Test Signal:

Load the **filt_adj.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Filter Adjustment** on the display.

    c. Touch **Group Delay** on the display until the **Group Delay Lum 3.5 4.4** signal is selected.

2. Set the AVG1 Generator module Trigger as follows (if you have not already done so in the preceding check):

    a. Touch **Module Parameters** on the display.

    b. Touch **Trigger Output**.

    c. Touch **Type** until **Horizontal** is selected.

    d. Touch **H Pos**.

    e. Use the front-panel Keypad to select **34.93 uS**.

      f.   Push the **Test Signals** button again.

3. Recall the **GRP_DELY** preset in the DSA 602A Digital Signal Analyzer.

4. Set the DSA 602A Digital Signal Analyzer as follows:

      a.   Select horizontal (touch horizontal arrows).

      b.   Use the Main Position to center the X display.

      c.   Set Main Size (time) to 2 nS.

      d.   Select CURSORS.

      e.   Set CURSOR TYPE to Vertical Bars.

      f.   Set one cursor to the luminance (lower) cross-over point on the CH 1 signal.

5. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

6. Check that the Channel 2 cross-over point is vertically aligned to within 1 nS of the cursor position.

7. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

8. Check that the Channel 3 cross-over point is vertically aligned to within 1 nS of the cursor position.

2T5 Pulse Ringing

Test Equipment Required:

- Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω feed-through termination to the oscilloscope Channel 1 input.

- Connect a 75 Ω coaxial cable between the 75 Ω feed-through termination and the AVG1 Generator module Channel 1 output.

- Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Test Signal:

Load the **dsa_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Test SW** on the display.

    c. Touch **NTC7** on the display until the **Composite No Vertical** signal is selected.

2. Set the AVG1 Generator module Trigger as follows:

    a. Touch **Module Parameters** on the display.

    b. Touch **Trigger Output**.

    c. Touch **Type** until **Horizontal** is selected.

    d. Touch **H Pos**.

    e. Use the front-panel Keypad to select **33.59 uS** and touch **Enter**.

    f. Push the **Test Signals** button again.

3.   Recall the **RINGING** preset in the DSA 602A Digital Signal Analyzer.

4.   Select CURSORS and Horizontal Bars.

5.   Using the cursors, check that the ringing (overshoot of falling edge) is < 7 mV.

6.   Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

7.   Using the cursors, check that the ringing (overshoot of falling edge) is < 7 mV.

8.   Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

9.   Using the cursors, check that the ringing (overshoot of falling edge) is < 7 mV.

10. Move the coaxial cable from the AVG1 Generator module Channel 3 output back to the Channel 1 output.

11. Select the test signal as follows:

   a.   Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b.   Touch **Test HW** on the display.

   c.   Touch **NTC7** on the TG 2000 Signal Generation Platform display until the **Composite No Vertical** signal is selected.

12. Using the cursors, check that the ringing (overshoot of falling edge) is < 7 mV.

13. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

14. Using the cursors, check that the ringing (overshoot of falling edge) is < 7 mV.

15. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

16. Using the cursors, check that the ringing (overshoot of falling edge) is < 7 mV.

Glitches (Shallow Ramp Signal)

Test Equipment Required:

- Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω feed-through termination to the oscilloscope Channel 1 input.

- Connect a 75 Ω coaxial cable between the 75 Ω feed-through termination and the AVG1 Generator module Channel 1 output.

- Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Test Signal:

Load the **dsa_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Test SW** on the display.

   c. Touch **Linearity** on the display until the **Sp Shl Ramp No Vertical** signal is selected.

2. Set the AVG1 Generator module Trigger as follows:

   a. Push the **Test Signals** button on the TG 2000 Signal Generation Platform.

   b. Touch **Module Parameters** on the display.

   c. Touch **Trigger Output**.

   d. Touch **Type** until **Horizontal** is selected.

   e. Touch **H Pos**.

     f. Use the front-panel Keypad to select **10 uS**.

     g. Push the **Test Signals** button again.

3. Recall the **SHL_RAMP** preset in the DSA 602A Digital Signal Analyzer.

4. Check for glitches as follows:

     a. On the oscilloscope, check the ramp from end to end for glitches. (At 5 mV, you should just see suggestions of glitches.)

     b. If you see any glitches, magnify and examine them.

     c. Check that each glitch is < 1 mV.

5. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output and repeat step 4.

6. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output and repeat step 4.

Out-of-Band Signal/Noise Ratio

Test Equipment Required:

- Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω feed-through termination to the oscilloscope Channel 1 input.

- Connect a 75 Ω coaxial cable between the 75 Ω feed-through termination and the AVG1 Generator module Channel 1 output.

- Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Test Signal:

Load the **dsa_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Test SW** on the display.

   c. Touch **Flat Field** on the display until the **Black No Vertical** signal is selected.

2. Set the AVG1 Generator module Trigger as follows:

   a. Push the **Test Signals** button on the TG 2000 Signal Generation Platform.

   b. Touch **Module Parameters** on the display.

   c. Touch **Trigger Output**.

   d. Touch **Type** until **Horizontal** is selected.

   e. Touch **H Pos**.

     f.   Use the front-panel Keypad to select **12 uS**.

     g.   Push the **Test Signals** button again.

3. Recall the **NOISE** preset in the DSA 602A Digital Signal Analyzer.

4. On the oscilloscope, press MEASURE for Histograms.

5. Check that the RMS value is less then 1.4 mV.

6. Move the coaxial cable from the AVG1 Generator module Channel 1 to Channel 2.

7. On the oscilloscope, press MEASURE twice for Histograms.

8. Check that the RMS value is less then 1.4 mV.

9. Move the coaxial cable from the AVG1 Generator module Channel 1 to Channel 3.

10. On the oscilloscope, press MEASURE twice for Histograms.

11. Check that the RMS value is less then 1.4 mV.

12. Return the coaxial cable to Channel 1 on the AVG1 Generator module.

13. Select the test signal as follows:

     a.   Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

     b.   Touch **Test HW** on the display.

     c.   Touch **Flat Field** on the display until the **Black No Vertical** signal is selected.

14. On the oscilloscope, press MEASURE twice for Histograms.

15. Repeat steps 5 through 12.

K-Factor 2T5 Pulse

Test Equipment Required:

- Video Measurement Set (This procedure was prepared using the Tektronix VM700A Video Measurement Set.)

- 75 Ω coaxial cable

- 75 Ω termination

Equipment Hookup:

- Connect a 75 Ω coaxial cable between the AVG1 Generator module Channel 1 output and the Channel A input on the video measurement set.

- Terminate the Channel A loop-through on the video measurement set with a 75 Ω precision termination.

Test Signal:

Load the **vm_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Auto Test** on the display.

    c. Touch **VM SW Test** on the display until the **NTC7 Composite** signal is selected.

2. Select the following on the video measurement set:

    a. Press Measure and select Video Standard (to set the video measurement set to the correct video standard).

    b. Select Source: CH A.

    c. Select Waveform and push Select Line.

    d. Scroll to a line in active video (lines 21 – 250).

    e. Select Measure and K_Factor.

3. Select Average on the video measurement set.

4. Check that the two K readings are both ≤ 0.5%.

5. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

6. Select Average on the video measurement set (turn Average off and then on again).

7. Check that the two K readings are both $\leq 0.5\%$.

8. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

9. Select Average on the video measurement set (turn Average off and then on again).

10. Check that the two K readings are both $\leq 0.5\%$.

11. Move the coaxial cable from the AVG1 Generator module Channel 3 output to the Channel 1 output.

12. Touch **VM HW Test** on the TG 2000 Platform mainframe display until the **NTC7 Composite** signal is selected.

13. Repeat steps 3 through 11.

Chrominance-Luminance Intermodulation

Test Equipment Required:

- Video Measurement Set (This procedure was prepared using the Tektronix VM700A Video Measurement Set.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω coaxial cable between the AVG1 Generator module Channel 1 output and the Channel A input on the video measurement set.

- Terminate the Channel A loop-through on the video measurement set with a 75 Ω precision termination.

Test Signal:

Load the **vm_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Auto Test** on the display.

    c. Touch **VM SW Test** on the display until the **NTC7 Composite** signal is selected.

2. Select the following on the video measurement set:

    a. Select Video Standard (to set the video measurement set to the correct video standard).

    b. Select Source: Channel A.

    c. Select Measure and touch ChromLum GainDelay.

3. Select Average on the video measurement set.

4. Check that the chroma delay reading is ≤ 2.5 nS.

5. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

6. Select Average on the video measurement set (turn Average off and on again).

7. Check that the chroma delay reading is ≤ 2.5 nS and matches the Channel 1 value ± 1 nS.

8. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

9. Select Average on the video measurement set (turn Average off and on again).

10. Check that the chroma delay reading is ≤ 2.5 nS and matches the Channel 1 value ± 1 nS.

11. Move the coaxial cable from the AVG1 Generator module Channel 3 output to the Channel 1 output.

12. Select the **NTC7 Composite** (HW) test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Auto Test** on the display.

   c. Touch **VM HW Test** on the display until the **NTC7 Composite** signal is selected.

13. Repeat steps 3 through 11.

In-Band Signal to Noise Ratio

Test Equipment Required:

- Video Measurement Set (This procedure was prepared using the Tektronix VM700A Video Measurement Set.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω coaxial cable between the AVG1 Generator module Channel 1 output and the Channel A input on the video measurement set.

- Terminate the Channel A loop-through on the video measurement set with a 75 Ω precision termination.

Test Signal:

Load the **vm_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Auto Test** on the display.

    c. Touch **VM SW Test** on the display until the **Ramp** signal is selected.

2. Select the following on the video measurement set:

    a. Select Video Standard (to set the video measurement set to the correct video standard).

    b. Select Measure and Noise Spectrum.

    c. Select Menu.

    d. Select Filters Selection and Tilt Null.

3. Check that the Noise Level reading is ≤ –60 dB rms.

4. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

5. Select Average on the video measurement set.

6. Check that the Noise Level reading is ≤ -60 dB rms.

7. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

8. Select Average on the video measurement set.

9. Check that the Noise Level reading is ≤ -60 dB rms.

10. Move the coaxial cable from the AVG1 Generator module Channel 3 output to the Channel 1 output.

11. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **Ramp** signal is selected.

12. Repeat steps 3 through 10.

13. Touch **VM SW Test** on the TG 2000 Signal Generation Platform display until the **Black** signal is selected.

14. Repeat steps 3 through 10, checking for a minus number ≤ -67 dB rms.

15. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **Black** signal is selected.

16. Repeat steps 3 through 10, checking for a minus number ≤ -67 dB rms.

Line Time, Field Time, and Short Time Distortions

Test Equipment Required:

- Video Measurement Set (This procedure was prepared using the Tektronix VM700A Video Measurement Set.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω coaxial cable between the AVG1 Generator module Channel 1 output and the Channel A input on the video measurement set.

- Terminate the Channel A loop-through on the video measurement set with a 75 Ω precision termination.

Test Signal:

Load the **vm_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Select the test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Auto Test** on the display.

   c. Touch **VM SW Test** on the display until the **VM700 Fld Square Wave** signal is selected.

2. Select Video Standard to set the video measurement set to the correct video standard.

3. Select Auto on the video measurement set.

4. Scroll to Line Time Distortion and check that the reading is $\leq 0.5\%$.

5. Scroll to Field Time Distortion and check that the reading is $\leq 0.5\%$ Bar.

6. Scroll to FCC Color Bars and check that the amplitude and phase errors shown are ≤ 1.0.

7. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

8. Repeat steps 3 through 6 for Channel 2.

9. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

10. Repeat steps 3 through 6 for Channel 3.

11. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **VM700 Fld Square Wave** signal is selected.

12. Repeat steps 3 through 10.

**Differential Phase and
Differential Gain**

Test Equipment Required:

- Video Measurement Set (This procedure was prepared using the Tektronix VM700A Video Measurement Set.)

- 75 Ω coaxial cable

- 75 Ω precision termination

Equipment Hookup:

- Connect a 75 Ω coaxial cable between the AVG1 Generator module Channel 1 output and the Channel A input on the video measurement set.

- Terminate the Channel A loop-through on the video measurement set with a 75 Ω precision termination.

Test Signal:

Load the **vm_test.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure: Differential Phase for Software Modulated Signals

1. Select the test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Auto Test** on the display.

   c. Touch **VM SW Test** on the display until the **NTSC Mod Reference** signal is selected.

2. Select the following on the video measurement set:

   a. Select Video Standard (to set the video measurement set to the correct video standard).

   b. Select Waveform, Menu, Sync, and Sync A.

   c. Select Source A.

   d. Select Measure, DGDP, and Average.

   e. When Average is finished, select Menu, Reference, and Store (1) Reference.

   f. Select Menu, Relative to Ref, and Use (1) Ref.

3. Touch **VM SW Test** on the TG 2000 Signal Generation Platform display until the **Modulated Ramp** signal is selected.

4. Select Average and wait for Average to finish.

5. Check that the Differential Phase is $\leq 0.5°$.

6. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

7. Touch **VM SW Test** on the TG 2000 Signal Generation Platform display until the **NTSC Mod Reference** signal is selected.

8. Select the following on the video measurement set:

   a. Select Waveform, Menu, Sync, and Sync A.

   b. Select Source A.

   c. Select Measure, DGDP, and Average.

   d. When Average is finished, select Menu, Reference, and Store (1) Reference.

   e. Select Menu, Relative to Ref, and Use (1) Ref.

9. Touch **VM SW Test** on the TG 2000 Signal Generation Platform display until the **Modulated Ramp** signal is selected.

10. Select Average and wait for Average to finish.

11. Check that the Differential Phase is $\leq 0.5°$.

12. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

13. Touch **VM SW Test** on the TG 2000 Signal Generation Platform display until the **NTSC Mod Reference** signal is selected.

14. Select the following on the video measurement set:

   a. Select Waveform, Menu Sync, and Sync A.

   b. Select Source B.

   c. Select Measure, DGDP, and Average.

   d. When Average is finished, select Menu, Reference, and Store (1) Reference.

   e. Select Menu, Relative to Ref, and Use (1) Ref.

15. Touch **VM SW Test** on the TG 2000 Signal Generation Platform display until the **Modulated Ramp** signal is selected.

16. Select Average and wait for Average to finish.

17. Check that the Differential Phase is $\leq 0.5°$.

Procedure: Diff Phase and Diff Gain – Hardware Modulated Signals (NTSC)

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Auto Test** on the display.

    c. Touch **VM HW Test** on the display until the **NTSC Reference** signal is selected.

2. Select the following on the video measurement set:

    a. Select Video Standard (to set the video measurement set to the correct video standard).

    b. Select Waveform, Menu, Sync, and Sync A.

    c. Select Source A.

    d. Select Measure, DGDP, and Average.

    e. When Average is finished, select Menu, Reference, and Store (1) Reference.

    f. Select Menu, Relative to Ref, and Use (1) Ref.

3. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **NTSC Mod Ramp** signal is selected.

4. Select Average and wait for Average to finish.

5. Check that the Differential Gain is $\leq 0.1\%$ and that the Differential Phase is $\leq 0.5°$.

6. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

7. Repeat steps 1 through 5.

8. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

9. Repeat steps 1 through 5.

10. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **NTSC Reference** signal is selected.

11. Select the following on the video measurement set:

    a. Deselect Use (1) Ref.

    b. Select Average and wait for Average to finish.

    c. Select Menu, Reference, and Store (1) Ref.

    d. Select Menu, Relative to Ref, and Use (1) Ref.

12. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **NTSC Mod Ramp** signal is selected.

13. Select Average and wait for Average to finish.

14. Check that the Differential Phase is $\leq 0.5°$ and that the Differential Gain is $\leq 0.1\%$.

Procedure: Diff Phase and Diff Gain – Hardware Modulated Signals (PAL)

1. Select the test signal as follows:

    a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

    b. Touch **Auto Test** on the display.

    c. Touch **VM HW Test** on the display until the **PAL Reference** signal is selected.

2. Select the following on the video measurement set:

    a. Select Video Standard (to set the video measurement set to the correct video standard).

    b. Select Waveform, Menu, Sync, and Sync A.

    c. Select Source A.

    d. Select Measure, DGDP, and Average.

    e. When Average is finished, select Menu, Reference, and Store (1) Reference.

    f. Select Menu, Relative to Ref, and Use (1) Ref.

3. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **PAL Mod Ramp** signal is selected.

4. Select Average and wait for Average to finish.

5. Check that the Differential Phase is $\leq 0.5°$ and that the Differential Gain is $\leq 0.1\%$.

6. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

7. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **PAL Reference** signal is selected.

8. Select the following on the video measurement set:

   a. Deselect Use (1) Ref.

   b. Select Average and wait for Average to finish.

   c. Select Menu, Reference, and Store (1) Ref.

   d. Select Menu, Relative to Ref, and Use (1) Ref.

9. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **PAL Mod Ramp** signal is selected.

10. Select Average and wait for Average to finish.

11. Check that the Differential Phase is $\leq 0.5°$ and that the Differential Gain is $\leq 0.1\%$.

12. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

13. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until the **PAL Mod Reference** signal is selected.

14. Select the following on the video measurement set:

   a. Deselect Use (1) Ref.

   b. Select Average and wait for Average to finish.

   c. Select Menu, Reference, and Store (1) Ref.

   d. Select Menu, Relative to Ref, and Use (1) Ref.

15. Touch **VM HW Test** on the TG 2000 Signal Generation Platform display until **PAL Mod Ramp** signal is selected.

16. Select Average and wait for Average to finish.

17. Check that the Differential Phase is $\leq 0.5°$ and that the Differential Gain is $\leq 0.1\%$.

Channel-to-Channel Crosstalk

Test Equipment Required:

■ Spectrum Analyzer (This procedure was prepared using the Tektronix 2712 Spectrum Analyzer.)

■ 75 Ω coaxial cable

Equipment Hookup:

■ Use a 75 Ω coaxial cable to connect the AVG1 Generator module Channel 1 output to the spectrum analyzer RF Input.

Test Signal:

Load the **specanlz.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

1. Load the **specanlz.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

2. Select the **Special 3 MHz Sweep** test signal as follows:

   a. Push the **Signal Sets** button on the TG 2000 Signal Generation Platform.

   b. Touch **Spectrum Analyzer** on the display.

   c. Touch **Sweep** on the display until the **Special 3 MHz Sweep** signal is selected.

3. Set the spectrum analyzer as follows:

   a. Set the Freq to 2.7 MHz.

   b. Set the Span/Div to 0.5 MHz.

   c. Set the Res BW to 30 kHz.

   d. Use Ref Level to set the top of the sweep bar to the top graticule line for reference.

4. Turn off the AVG1 Generator module Channel 1 output as follows:

   a. Push the Test Signals button on the TG 2000 Signal Generation Platform.

   b. Touch **Active Signal Parameters** on the display.

    c. Touch **Video** on the display.

    d. Use the Navigation arrows to select Overall Video Ampl: Ch 1. Enter 0 and press the Select button. Do not save the signal; leave the window displayed.

5. Check that the highest spike between .2 MHz (left side of the spectrum analyzer display) and 3.2 MHz (first major division past center) is ≥ 60 dB down from the top.

6. Turn the Channel 1 output back on by entering 100 and pressing the Select button. Do not save the signal; leave the window displayed.

7. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

8. Turn off the AVG1 Generator module Channel 2 output.

9. Check that the highest spike between .2 MHz (left side of the spectrum analyzer display) and 3.2 MHz (first major division past center) is ≥ 60 dB down from the top.

10. Turn the Channel 2 output back on (100%).

11. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

12. Turn off the AVG1 Generator module Channel 3 output.

13. Check that the highest spike between .2 MHz (left side of the spectrum analyzer display) and 3.2 MHz (first major division past center) is ≥ 60 dB down from the top.

14. Turn the Channel 3 output back on (100%).

    a. Touch Reset.

    b. Touch Quit.

    c. Touch Quit again.

15. Move the coaxial cable from the AVG1 Generator module Channel 3 output to the Channel 1 output.

16. Touch **Sweep** on the TG 2000 Signal Generation Platform display until the **Special 6.5 MHz Sweep** signal is selected.

17. Set the Spectrum Analyzer Freq to 3.0 MHz.

18. Use Ref Level to set the top of the sweep bar to the top graticule line for reference.

19. Turn off the AVG1 Generator module Channel 1 output.

20. Check that the highest spike between 3 MHz (left side of the spectrum analyzer display) and 6.0 MHz (first major division past center) is ≥ 60 dB down from the top.

21. Turn the Channel 1 output back on (100%).

22. Move the coaxial cable from the AVG1 Generator module Channel 1 output to the Channel 2 output.

23. Turn off the AVG1 Generator module Channel 2 output.

24. Check that the highest spike between 3 MHz (left side of the spectrum analyzer display) and 6.0 MHz (first major division past center) is ≥ 60 dB down from the top.

25. Turn the Channel 2 output back on (100%).

26. Move the coaxial cable from the AVG1 Generator module Channel 2 output to the Channel 3 output.

27. Turn off the AVG1 Generator module Channel 3 output.

28. Check that the highest spike between 3 MHz (left side of the spectrum analyzer display) and 6.0 MHz (first major division past center) is ≥ 60 dB down from the top.

29. Turn the Channel 3 output back on (100%).

   a. Touch Reset.

   b. Touch Quit.

   c. Touch Quit again.

Check Return Loss

Test Equipment Required:

- Spectrum analyzer (This procedure was prepared using a Tektronix 2712 Spectrum Analyzer.)

- RF bridge (A57TLSCR low frequency)

- Precision coaxial cables, two 50 Ω and one 75 Ω

- 75 Ω male-to-male adapter

Equipment Hookup:

- Connect a precision 50Ω cable from the spectrum analyzer RF Input to the RF Output on the RF Bridge, as shown in Figure 4–3

- Connect a precision 50Ω cable from the spectrum analyzer TG Output to the RF Input on the RF Bridge.

- Connect a 75 Ω coaxial cable and a 75 Ω male-to-male adapter to the RF bridge 75 Ω Test Port.

Procedure: Check Return Loss from 100 KHz to 6 MHz
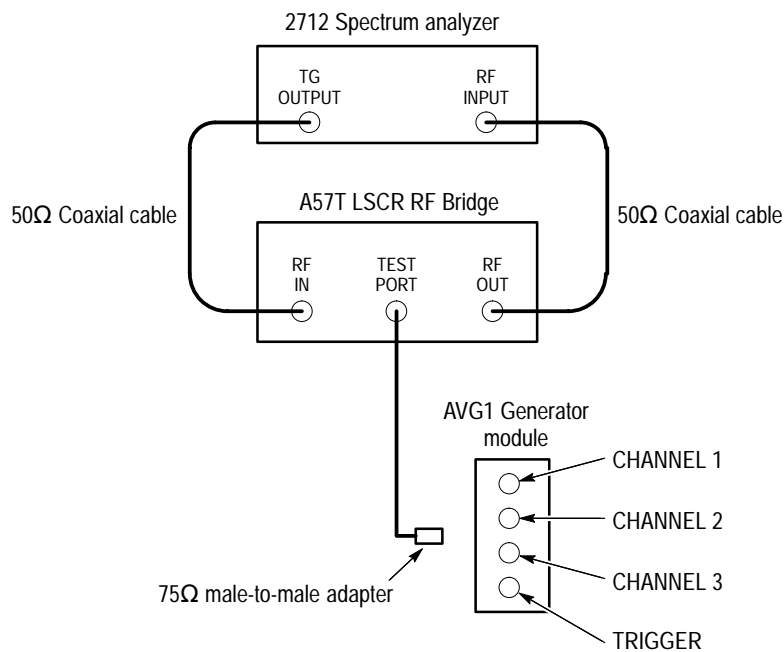
Figure 4–3: Equipment hookup for checking return loss

1. Select the following on the spectrum analyzer:

   a. Select Demod/TG. Turn on the tracking generator and set the tracking generator fixed level to 0.00 dBm.

   b. Set the Span/Div to 1 MHz and the Resolution Bandwidth to 3 kHz.

   c. Set the Reference Level to the first major division down from the top of the analyzer display.

   d. Set the Vertical Scale to 10 dB.

2. Adjust the spectrum analyzer External Attenuation Amplifier as follows:

   a. Disconnect either of the cables connected from the spectrum analyzer to the RF Bridge.

   b. Set the spectrum analyzer frequency to 5 MHz.

   c. Turn on and set the Marker to 6 MHz.

   d. Reconnect the cable to the RF Bridge.

   e. Note the Reference Level Readout value.

   f. Adjust the External Attenuation Amplitude (on the Input menu if using the 2712 Spectrum Analyzer) by the value in step e. The Reference Level Readout should now be 0.00 dBm.

3. Verify bridge function as follows:

   a. Connect the precision, high-frequency termination to the 75 Ω Test Port on the RF Bridge.

   b. Check that the frequency response from 0 MHz to 6 MHz is ≥ 40 dBm.

   c. Return the spectrum analyzer frequency marker to 6 MHz if it was moved.

   d. Remove the precision high-frequency terminator from the RF Bridge.

4. Turn off all AVG1 Generator module outputs as follows:

   a. Push the **Test Signals** button on the TG 2000 Signal Generation Platform.

   b. Touch **Active Signal Parameters** on the display.

   c. Touch **Video** on the display.

   d. Select **Overall Video Gain:Mstr**.

   e. Enter **0** and push the **Select** button.

5. Connect the Test Port of the RF Bridge to the OUTPUT 1 connector on the AVG1 Generator module, using a male-to-male 75 Ω adapter.

6. Check that the Reference Level readout on the spectrum analyzer is ≤ –40 dBm.

7. Repeat steps 5 and 6 for outputs 2 and 3 on the AVG1 Generator module.

8. Touch **Reset** to turn on the TG 2000 Signal Generation Platform output (**Overall Video Gain:Mstr** to **100%**).

9. Remove all cables from the AVG1 Generator module.

Restore Signals   If you performed an instrument backup before beginning the *Performance Verification* procedure, use the disks you created to restore the signals now, using the procedure on page 2–8. If you did not perform an instrument backup, load the AVG1 Test Signal disks supplied with the *AVG1 Analog Video Generator User Manual*.

Recall Preset   Recall the preset you created as follows:

1. Push the **Presets** button.

2. Touch **Presets** on the display.

3. Use the **Navigation** arrows to move the cursor to the preset that you created before beginning the *Performance Verification* procedure. Press the **Select** button.

4. Touch **Recall**. Your instrument settings are recalled.

This completes the Performance Verification procedure.

Test Record

Serial number	Procedure performed by	Self Cal Passed or Failed	Date

Luminance Amplitude, DC Offset, and Linearity Tests

Line no.	Test signal		Low limit	Test result CH 1	CH 2	CH 3	High limit
(1)	DC	000 mV (Offset)	−10 mV				+10 mV
(2)	DC	100 mV	Value (1) +99.5 mV				Value (1) +100.5 mV
(3)	DC	200 mV	Value (1) +199 mV				Value (1) +201 mV
(4)	DC	300 mV	Value (1) +298.5 mV				Value (1) +301.5 mV
(5)	DC	400 mV	Value (1) +398 mV				Value (1) +402 mV
(6)	DC	500 mV	Value (1) +497.5 mV				Value (1) +502.5 mV
(7)	DC	600 mV	Value (1) +597 mV				Value (1) +603 mV
(8)	DC	700 mV	Value (1) +696.5 mV				Value (1) +703.5 mV
(9)	DC	800 mV	Value (1) +796 mV				Value (1) +804 mV
(10)	DC	900 mV	Value (1) +895.5 mV				Value (1) +904.5 mV
(11)	DC	1000 mV	Value (1) +995 mV				Value (1) +1005 mV
(12)	DC	−300 mV	Value (1) −301.5 mV				Value (1) −298.5 mV
(13)	DC	−600 mV	Value (1) −603 mV				Value (1) −597 mV
(14)	ypbpr	000 mV (Offset)	−10 mV				+10 mV
(15)	ypbpr	1000 mV (CH 1)	Value (14) +995 mV		–––––––––	–––––––––	Value (14) +1005 mV
(16)	ypbpr	800 mV (CH 2, CH 3)	Value (14) +796 mV	–––––––––			Value (14) +804 mV
(17)	ypbpr	−600 mV (CH 1)	Value (14) −603 mV		–––––––––	–––––––––	Value (14) −597 mV
(18)	ypbpr	−800 mV (CH 2, CH 3)	Value (14) −804 mV	–––––––––			Value (14) −796 mV
(19)	hw3cp	000 mV (Offset)	−10 mV				+10 mV
(20)	hw3cp	1000 mV	Value (19) +995 mV				Value (19) +1005 mV
(21)	hw3cp	−600 mV	Value (19) −603 mV				Value (19) −597 mV
(22)	hwyc	000 mV (Offset)	−10 mV				+10 mV
(23)	hwyc	1000 mV	Value (23) +995 mV				Value (23) +1005 mV

Adjustment Procedures

Adjustments

Perform this procedure if the *Performance Verification* procedure has indicated that adjustments are necessary to return the instrument to specifications.

Required Equipment

Test Equipment   Table 5–1 lists the equipment required for the *Adjustments* procedure.

Table 5–1: Equipment required for Adjustments

Equipment	Use	Tektronix equivalent
Extender Board	All adjustments	671-2879-XX
High Precision Oscilloscope	Frequency Response Chroma/Luma Gain Error Y/C Match Channel to Channel Delay Errors, 2T5 Pulse Ringing Glitches (Shallow Ramp Signal)	Tektronix DSA602A Digital Signal Analyzer with the 11A34 module installed in the left slot.
Digital Multimeter	Adjust 2.5 V	DM5120 Digital Multimeter
Peak Detector Amplifier	Frequency Response Chroma/Luma Gain Error Y/C Match	015-0408-00
Peak Detector Head	Frequency Response Chroma/Luma Gain Error Y/C Match	015-0413-00
BNC Termination, 75 Ω		011-0102-01
BNC Termination, feed-through, 75 Ω		011-0055-01
75 Ω Low-Loss BNC Cables, two		012-0074-00

Test Software   You will need test software files (.dnl files), which are included on the AVG1 Service disk shipped with this manual:

Preparation for Adjustments

Follow all instructions for power on, instrument warmup, self cal, and loading the test signals.

Overview This is the sequence that you will follow while preparing for and performing the *Adjustments* procedure:

- Install the Extender Board. See page 5–2.

- Power on and warm up. See page 5–2.

- Create a preset of the current instrument state. See page 5–3.

- Perform an instrument backup. See page 5–3.

- Recall the Factory preset. See page 5–3.

- Load the test signals. See page 5–4.

- Load the DSA602A setups. See page 5–5.

- Perform Self Cal. See page 5–6.

- Complete the *Adjustments* procedure. See page 5–7.

- Restore signals. See page 5–23.

- Recall the preset you created. See page 5–23.

Install the extender Board These procedures require that you adjust components on the AVG1 Generator module. To provide access to these components during the procedure, you must first install an extender board, which can be ordered from Tektronix. To install the extender board, use the following procedure:

1. Remove the AVG1 Generator module using *Module Removal* on page 2–9.

2. Install the extender board into the mainframe, being careful to match the connectors on the Backplane board.

3. Install the AVG1 Generator module on the extender board.

Power On and Warm Up Power on and warm up the mainframe as follows:

1. Connect the TG 2000 Platform mainframe to an AC power source that is appropriate for your system.

2. Set the rear-panel rocker switch to the ON position.

3. Press the front-panel POWER switch if necessary.

4. Wait for a few seconds as the mainframe executes confidence tests on the mainframe and modules. Check to see if any error messages appear.

5. When the self tests are complete, the instrument will display icons representing each of the installed generator modules. If an installed module is not represented on the display, proceed to *Troubleshooting* on page 6–11.

6. Allow 20 minutes of warm-up time before performing *Self Cal* or *Adjustments*. During warm-up time, you can perform the remaining preparation steps.

Create Preset

Before beginning the *Adjustments* procedure, create a preset to save your instrument settings as follows:

1. Push the **Presets** button.

2. Touch **Presets** on the display.

3. Touch **Create** on the display.

4. Touch letters on the display to spell out a name for the new preset, and then touch **OK**.

5. Use the **Navigation** arrows to move the cursor to the new preset. Press the **Select** key.

6. Touch **Save To**. Your current instrument settings are saved to the new preset.

Instrument Backup

Determine whether you will be replacing signals (see the following procedure, *Loading Test Signals*). If you will be replacing signals, perform *Instrument Backup* on page 2–8 now. During the backup procedure, you will create disks to restore the module signals after you finish the *Performance Verification* procedure.

If you do not wish to perform the backup, you can choose to restore the standard AVG1 test signals instead, using the AVG1 Test Signals disks that were shipped with the *AVG1 Analog Video Generator User Manual*.

Recall the Factory Preset

Recall the Factory Preset as follows:

1. Push the **Presets** button.

2. Touch **Presets** on the display.

3. Use the **Navigation** arrows to move the cursor to the **Factory** preset. Press the **Select** key.

4. Touch **Recall**. The instrument is set to factory presets.

Loading Test Signals   The *Adjustments* procedure requires you to load test signals in the AVG1 Generator module.

If you have more than one AVG1 Generator module loaded, or if you have the optional memory upgrade installed, you may have enough memory capacity to add these signals to the AVG1 Generator module. To do this, use the *Add Signals* procedure on page 4–5.

If you do not have extended memory, you must replace the AVG1 Generator module signals. To do this, use the *Replace Signals* procedure on page 4–6.

Add Signals. To add test signals, perform the following steps:

1. Insert the AVG1 Service disk (provided with this manual) into the TG 2000 Platform mainframe disk drive.

2. Push the **Disk** button on the TG 2000 Platform mainframe.

3. Touch **Add Signals** on the display.

4. Touch **Select Source**.

5. Use the **Navigation** arrow to select the .dnl file you want to add. (For example, the **dc_level.dnl** file is specified for the first adjustment.)

6. Press the **Select** button.

7. When the new window opens, use the **Navigation** arrow to move the cursor to the **AVG1** folder on the right side of the display.

8. Press the **Select** button.

9. Touch **Quit/Load**.

10. Touch **Quit/Load** again to return to the Add Signals window.

11. Touch **Select Destination**.

12. Use the right **Navigation** arrow to move the cursor to the **AVG1** folder on the right side of the display.

13. Press the **Select** button.

14. Touch **Quit/Load**.

15. Touch **Start Load**. (If the tagged amount will not fit in the destination, go to the *Replace Signals* procedure on page 4–6.)

16. When the load is complete, touch **OK**.

17. Touch **Quit**.

This completes the *Add Signals* procedure.

Replace Signals. To replace the test signals, perform the following steps:

1. To save the instrument signals and settings, perform *Instrument Backup* on page 2–8.

NOTE. If you are using only standard signals and settings, then you can use the test signal disks that are shipped with the module user manual to restore the signals at the end of the Adjustments procedure. In this case, you do not need to perform the Instrument Backup.

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2. Insert the AVG1 Service disk supplied with this manual into the TG 2000 Platform mainframe disk drive.

3. Push the **Disk** button on the TG 2000 Platform mainframe.

4. Touch **Replace Signals** on the display.

5. Use the **Navigation** arrow to select the .dnl file you want to add. (For example, the **dc_level.dnl** file is specified for the first adjustment.)

6. Press the **Select** button.

7. When the Replace screen appears, use the right **Navigation** arrow to move the cursor to the **AVG1** folder.

8. Press the **Select** button.

9. Touch **Quit/Load**.

10. Touch **Start Replace**.

11. Touch **OK** to remove all current signals and replace them with the new selections. If you are prompted to disable the active signal, touch **Yes**.

12. When the load is complete, touch **OK**, and then touch **Quit**.

This completes the *Replace Signals* procedure.

Load and Recall DSA 602A Digital Signal Analyzer Settings

These test procedures require a number of DSA 602A Digital Signal Analyzer settings. These settings are in a directory called *DSA602A* on the AVG1 Service disk included with this manual. The files have the extension *.fpb.*

To load the setting files, perform the following steps:

1. Insert the AVG1 Service disk in the DSA 602A Digital Signal Analyzer disk drive.

2. Press the **Utility** button until the Directory Ops icon is displayed.

3. Touch **Directory Ops**.

4. Touch **chdir**.

5. Enter **DSA602A** by touching the on-screen characters.

6. Touch **Enter**.

7. Touch **Exit**.

To recall a loaded DSA 602A Digital Signal Analyzer setting, do the following:

1. Press the **Store/Recall** button.

2. Touch **Recall Setting**.

3. Touch **Disk** at the top of the Recall Setting window.

4. Select the file to recall from the displayed list. The DSA 602A configures itself to the specified setting.

Perform Self Cal   When you perform Self Cal, you replace the original calibration file with a new one.

1. Perform the Module Self Cal by performing the following steps:

   a. Push the **Utilities** button.

   b. Touch the following on the TG 2000 Signal Generation Platform:

      ■ **Module Self Cal**

      ■ **AVG1:X Self Cal**

      ■ **Start Cal**

   c. When the Self Cal is successfully completed, the display will return to the Modules window with no error message. This may take 2 to 5 minutes, depending on the module. An error message indicates a failed calibration. If the Self Cal fails, contact your Tektronix representative for assistance.

2. Touch **AVG1:X** on the display.

Adjustments

You should perform the entire procedure sequentially. Be sure you have performed the *Preparation for Adjustments* before proceeding.

If you perform an instrument backup, be sure to follow the instructions on page 5–23 to restore the signals after completing adjustments.

1.25 V Reference

Test Equipment Required:

- Digital Multimeter (This procedure was prepared using a Tektronix DM5120 Digital Multimeter.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

Connect the digital multimeter to read the voltage at **W149**. See Figure 5–1 for location.

Test Signal:

Load the **dc_level.dnl** test signals in the TG 2000 Platform mainframe (see *Loading Test Signals* on page 4–4).

Procedure:

Adjust R370 for 1.2500 V.

**Frequency Response
(Preliminary Adjustment)**

Test Equipment Required:

■ Oscilloscope (This procedure was prepared using the Tektronix DSA 602A
   Digital Signal Analyzer.)

■ Peak-to-Peak Detector Head and Amplifier

■ 75 Ω coaxial cables

Equipment Hookup:

■ Connect the Peak-to-Peak detector head directly to the Channel 1 connector
   on the AVG1 Generator module.

■ Connect the Peak-to-Peak detector head to the Peak-to-Peak Amplifier
   + Input.

■ Connect the Peak-to-Peak Amplifier Output to the oscilloscope Channel 1.

■ Connect the Trigger output of the AVG1 Generator module to the oscillo-
   scope Channel 4.

Test Signal:

Load the **filt_adj.dnl** test signals in the TG 2000 Platform mainframe (see
Loading Test Signals on page 4–4).

Procedure:

1. Select the **Frequency Response SW** test signal as follows:

   a. Push the Signal Sets button on the TG 2000 Signal Generation Platform.

   b. Touch **Filter Adjustment** on the display.

   c. Touch **Freq Rsp SW** on the display until the **Frequency Response SW**
          signal is selected.

          (This signal has an 8 MHz pulse for locator, and 0.1 MHz packets on
          either side for reference levels. The remainder of the signal is made up of
          packets of CW frequencies at 0.5 MHz steps from 0.5 MHz to 6 MHz.
          There are markers before the 1, 2, 3, 4, 5, and 6 MHz packets.)

2. Set the TG 2000 Signal Generation Platform trigger as follows:

   a. Push the Test Signals button on the TG 2000 Signal Generation
          Platform.

    b. Touch **Module Parameters** on the display.

    c. Touch **Trigger Output** on the display.

    d. Touch **Type** on the display until **Vertical** is selected.

    e. Touch **Reset All** on the display.

    f. Push the Test Signals button to return to the Test Signals window.

3. Recall the **FREQ_RSP** preset in the DSA 602A Digital Signal Analyzer.

4. Change the Peak Ampl. + Input level until the green LED lights.

5. **Adjust C218 (Sinx/x correction)** for a nearly flat line except for the 8 MHz pulse. (Minor mid-band excursions are acceptable.) For adjustment location, see Figure 5–1. For sample signals, see Figures 5–2, 5–3, and 5–4.
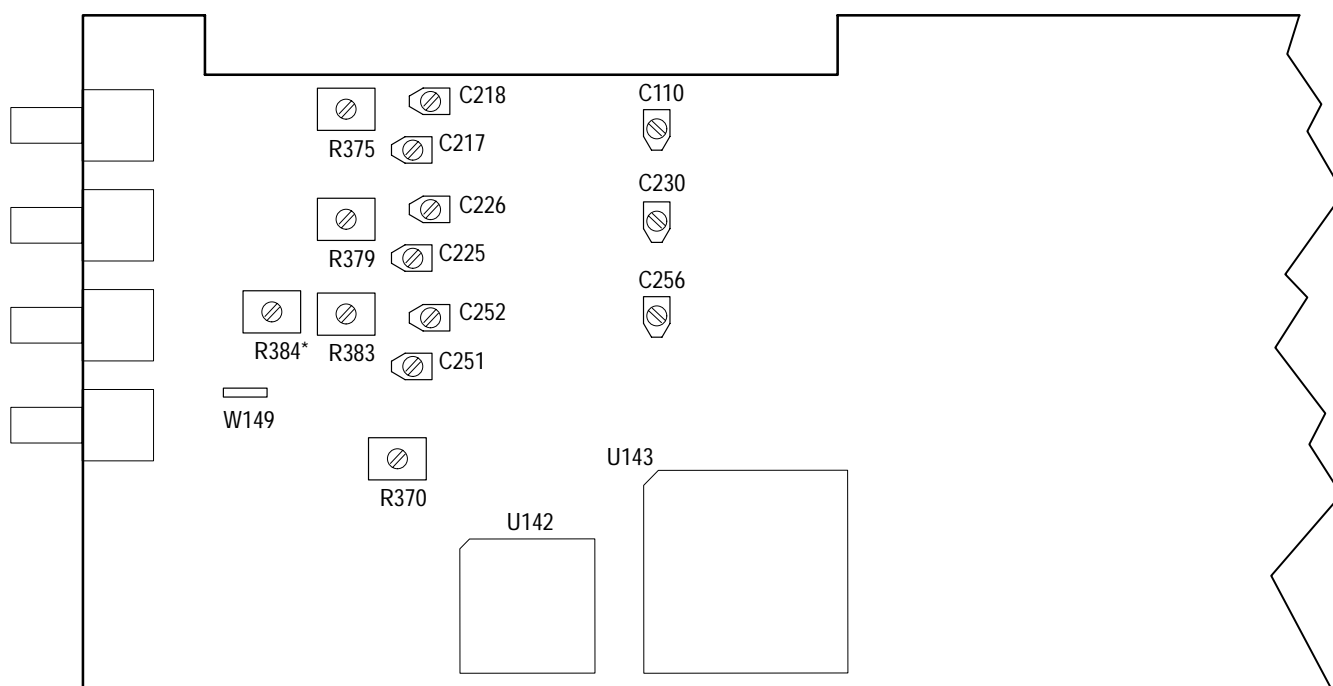
Figure 5–1: Adjustment locations for the AVG1 Generator Module
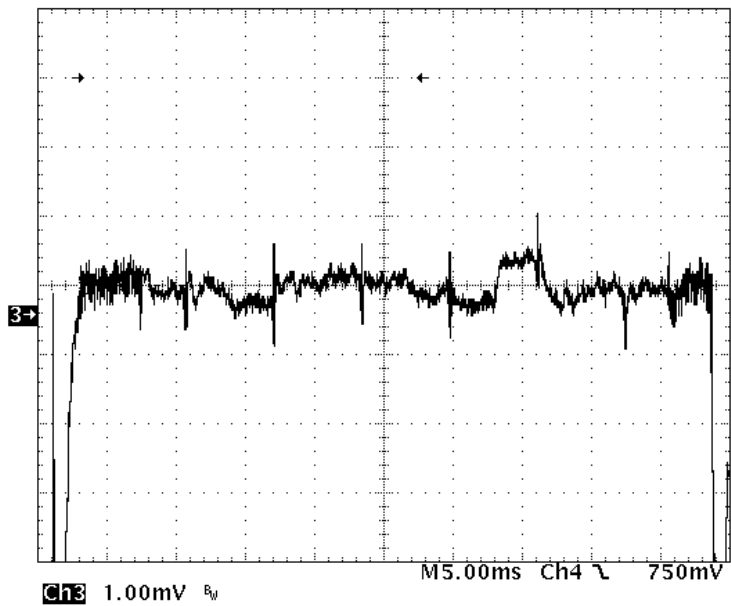
Figure 5–2: Properly adjusted frequency response
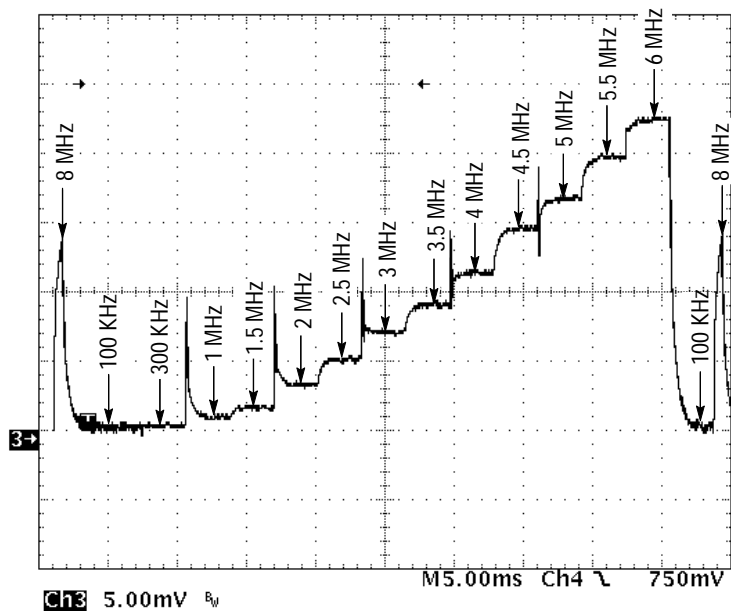
Figure 5–3: Poorly adjusted frequency response
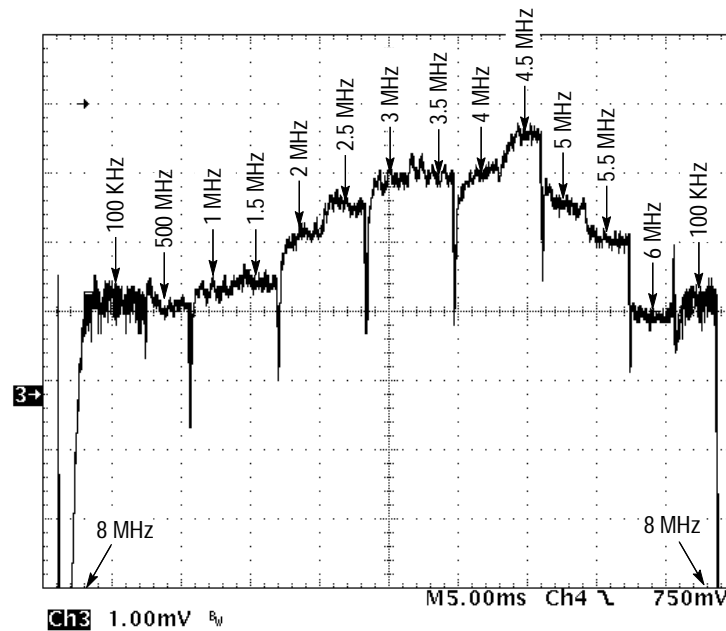
Figure 5–4: Frequency response after adjusting C218, but before adjusting R375 for bowing.

6. Connect the peak-to-peak detector head to the AVG1 Generator module Channel 2 Output.

7. Change the Peak Ampl. + Input level until the green LED lights.

8. **Adjust C226 (Sinx/x correction)** for a nearly flat line except for the 8 MHz pulse. (Minor mid-band excursions are acceptable.)

9. Connect the peak-to-peak detector head to the AVG1 Generator module Channel 3 Output.

10. Change the Peak Ampl. + Input level until the green LED lights.

11. **Adjust C252 (Sinx/x correction)** for a nearly flat line except for the 8 MHz pulse. (Minor mid-band excursions are acceptable.)

Group Delay

Test Equipment Required:

- Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

- 75 Ω coaxial cable

- 75 Ω feed-through termination

Equipment Hookup:

- Connect a 75 Ω feed-through termination to the oscilloscope Channel 1 input.

- Connect a 75 Ω coaxial cable between the 75 Ω feed-through termination and the AVG1 Generator module Channel 1 output.

- Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Procedure:

1. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay Adjustment** signal is selected.

2. Set the TG 2000 Signal Generation Platform trigger as follows:

    a. Push the Test Signals button on the TG 2000 Signal Generation Platform.

    b. Touch **Module Parameters** on the display.

    c. Touch **Trigger Output** on the display.

    d. Touch **Type** on the display until **Horizontal** is selected.

    e. Touch **H Pos**, and set to **34.93 µS.**

    f. Push the **Test Signals** button to return to the Test Signals window.

3. Recall the **GRP_DELY** preset in the DSA 602A Digital Signal Analyzer.

4. **Adjust C217** to the center of its range.

5. Set the oscilloscope time (Main Size) to 1 nS/div. and use the Main Position to center the display.

6. **Adjust C110** so that the cross-over points are as close together as possible.

7. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay Lum 3.5 4.4** signal is selected.

8. Select the oscilloscope Cursors and set Cursor Type to Vertical Bars.

9. Set one cursor to the lowest cross-over point (luminance).

NOTE. The top two traces (representing 4.43 MHz) should have the same slope, and the middle two traces (representing 3.58 MHz) should have the same slope.

10. Adjust C110 to align the second (3.58) and third (4.43) cross-over points horizontally with the lowest cross-over point (luminance), to within 1 nS.

11. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay 1 & 6** signal is selected.

12. Use the cursors to check that the middle (1 MHz) and top (6 MHz) cross-over points are horizontally aligned to within 3 nS of the lower (luminance) cross-over point.

13. Move the coaxial cable to connect the oscilloscope Channel 1 input with the AVG1 Generator module Channel 2 output.

14. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay Adjustment** signal is selected.

15. If necessary to find the "X" display, set the oscilloscope time to 5 nS/div.

16. Use the oscilloscope Main Position to center the "X" display.

17. Set the oscilloscope time (Main Size) to 1 nS/div.

18. Use the oscilloscope Main Position to center the "X" display.

19. Adjust C230 so that the cross-over points are as close together as possible.

20. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay Lum 3.5 4.4** signal is selected.

21. Select the oscilloscope Cursors and set Cursor Type to Vertical Bars.

22. Set one cursor to the lowest cross-over point (luminance).

NOTE. The top two traces (representing 4.43 MHz) should have the same slope, and the middle two traces (representing 3.58 MHz) should have the same slope.

23. Adjust C230 to align the second (3.58) and third (4.43) cross-over points horizontally with the lowest cross-over point, to within 1 nS.

24. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay 1 & 6** signal is selected.

25. Use the cursors to check that the middle (1 MHz) and top (6 MHz) cross-over points are horizontally aligned to within 3 nS of the lower (luminance) cross-over point.

26. Move the coaxial cable to connect the oscilloscope Channel 1 input with the AVG1 Generator module Channel 3 output.

27. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay Adjustment** signal is selected.

28. If necessary to find the "X" display, set the oscilloscope time to 5 nS/div.

29. Use the oscilloscope Main Position to center the "X" display.

30. Set the oscilloscope time (Main Size) to 1 nS/div.

31. Use the oscilloscope Main Position to center the "X" display.

32. Adjust C256 so that the cross-over points are as close together as possible.

33. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay Lum 3.5 4.4** signal is selected.

34. Select the oscilloscope Cursors and set Cursor Type to Vertical Bars.

35. Set one cursor to the lowest cross-over point (luminance).

NOTE. The top two traces (representing 4.43 MHz) should have the same slope, and the middle two traces (representing 3.58 MHz) should have the same slope.

36. Adjust C256 to align the second (3.58) and third (4.43) cross-over points horizontally with the lowest cross-over point, to within 1 nS.

37. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay 1 & 6** signal is selected.

38. Use the cursors to check that the middle (1 MHz) and top (6 MHz) cross-over points are horizontally aligned to within 3 nS of the lower (luminance) cross-over point.

Channel Timing Match

Test Equipment Required:

■ Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

■ 75 Ω coaxial cable

■ 75 Ω feed-through termination

Equipment Hookup:

■ Connect a 75 Ω feed-through termination to the oscilloscope Channel 1 input.

■ Connect a 75 Ω coaxial cable between the 75 Ω feed-through termination and the AVG1 Generator module Channel 1 output.

■ Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Procedure:

1. Touch **Group Delay** on the TG 2000 Signal Generation Platform display until the **Group Delay Lum 3.5 4.4** signal is selected.

2. Select the oscilloscope Cursors and set Cursor Type to Vertical Bars.

3. Set one cursor to the lowest cross-over point (luminance).

4. Move the coaxial cable to connect the oscilloscope Channel 1 input with the AVG1 Generator module Channel 2 output.

5. **Adjust C225** to move the Channel 2 luminance cross-over point to the cursor setting, within 0.5 nS.

6. Move the coaxial cable to connect the oscilloscope Channel 1 input with the AVG1 Generator module Channel 3 output.

7. **Adjust C251** to move the Channel 3 luminance cross-over point to the cursor setting, within 0.5 nS.

8. Move the coaxial cable to connect the oscilloscope Channel 1 input with each of the AVG1 Generator module output channels, and check that the output timing of all three channels matches within 1 nS..

9. If all three channels do not match, readjust **C217** (page 5–12, step 4) and then repeat steps 3 through 8 above.

Frequency Response Fine Adjustment for Hardware Version 1.0

Use this step to adjust the frequency response for modules with hardware version 1.0. If you have version 2.0 or up, proceed to the next procedure. To determine your hardware version, push the Utilities button on the TG 2000 Signal Generation Platform, then touch Versions. Check for the version number across from AVG1 in the Hardware column.

Test Equipment Required:

- Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

- Peak-to-Peak Detector Head and Amplifier

- 75 Ω coaxial cables

Equipment Hookup:

- Connect the Peak-to-Peak detector head directly to the Channel 1 connector on the AVG1 Generator module.

- Connect the Peak-to-Peak detector head to the Peak-to-Peak Amplifier + Input.

- Connect the Peak-to-Peak Amplifier Output to the oscilloscope Channel 1.

- Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Procedure: Hardware Response

1. Touch **Freq RSP SW** on the TG 2000 Signal Generation Platform display until the **Frequency Response SW** signal is selected.

2. Set the TG 2000 Signal Generation Platform trigger to vertical as follows:

    a. Push the **Test Signals** button on the TG 2000 Signal Generation Platform.

    b. Touch **Module Parameters** on the display.

    c. Touch **Trigger Output** on the display.

    d. Touch **Type** on the display until **Vertical** is selected.

    e. Touch **Reset All** on the display.

    f. Push the **Test Signals** button to return to the Test Signals window.

3. Recall the **FREQ_RSP** preset in the DSA 602A Digital Signal Analyzer.

4. Set the 0.1 MHz packet to the vertical center of the display.

5. Set the oscilloscope Vertical to 1 mV/Div.

6. **Adjust C218 (Sinx/x correction)** for a flat response at the .1 MHz and 6 MHz packets.

7. If needed, **adjust R375 (Mid-range bowing)** about 1/4 turn to adjust the flatness of the middle packets. Adjust counter-clockwise to bring the mid-range down and the tip up, or clockwise to bring up the mid range and drop the tip.

8. Repeat steps 6. and 7. as needed to achieve best flat response, keeping all packets except the 8 MHz within 3.5 mV of the 0.1 MHz packet.

9. Note the amplitudes of the 3.5 MHz and the 6 MHz packets with respect to the 0.1 MHz reference.

10. Touch **Freq Rsp HW** on the TG 2000 Signal Generation Platform display until the **Frequency Response HW** signal is selected.

11. Note the amplitudes of the 3.5 MHz and the 6 MHz packets with respect to the 0.1 MHz reference.

12. **Adjust C218** to balance the error between SW and HW frequency response signals, switching back and forth between the signals as necessary.

13. Touch **Freq Rsp HW** on the TG 2000 Signal Generation Platform display until the **Frequency Response HW** signal is selected.

14. Connect the Peak-to-Peak detector head to Channel 2 on the AVG1 Generator module.

15. Check that all packets are within ± 3.5 mV the 0.1 MHz reference.

16. Connect the Peak-to-Peak detector head to Channel 3 on the AVG1 Generator module.

17. Check that all packets are within ± 3.5 mV the 0.1 MHz reference.

18. If either the Channel 2 or Channel 3 HW frequency response varies from the Channel 1 SW frequency response, change the Channel 1 adjustments for balance, keeping all packets within ± 3.5 mV the 0.1 MHz reference.

NOTE. In hardware modulated mode, the Channel 1 SW adjustments control the luminance frequency response of all three output channels, through different amplifiers.

19. Connect the Peak-to-Peak detector head to Channel 2 on the AVG1 Generator module.

20. Touch **Freq RSP SW** on the TG 2000 Signal Generation Platform display until the **Frequency Response SW** signal is selected.

21. Set the 0.1 MHz packet to the vertical center of the display.

22. **Adjust C226 (Sinx/x correction)** for a flat response at the .1 MHz and 6 MHz packets.

23. If needed, **adjust R379 (Mid-range bowing)** about 1/4 turn to adjust the flatness of the middle packets. Adjust counter-clockwise to bring the mid-range down and the tip up, or clockwise to bring up the mid range and drop the tip.

24. Repeat steps 22. and 23. as needed to achieve best flat response, keeping all packets except the 8 MHz within 3.5 mV of the 0.1 MHz packet.

25. Note the amplitudes of the 3.5 MHz and the 6 MHz packets with respect to the 0.1 MHz reference.

26. Touch **Ch2_Chroma** on the TG 2000 Signal Generation Platform display until the **Chroma Resp 3.58 MHz** signal is selected.

27. Note the amplitudes of the second and third quarters of the signal compared to the first and fourth. (The second is DDS based 3.58. The third quarter is RAM based 3.58. The first and fourth are 0.1 reference.)

28. Touch **Ch2_Chroma** on the TG 2000 Signal Generation Platform display until the **Chroma Resp 4.43 MHz** signal is selected.

29. Note the amplitudes of the second and third quarters of the signal compared to the first and fourth. (The second is DDS based 4.43. The third quarter is RAM based 4.43. The first and fourth are 0.1 reference.)

30. Compare the noted amplitude of the SW 3.58 in step 25 with the two 3.58 values in step 27.

31. Compare the noted amplitude of the SW 4.43 in step 25 with the two 4.43 values in step 29.

32. **Adjust C226** for the best overall balance between the SW frequency response and the DDS and RAM-based 3.58 and 4.43 chroma around the 0.1 MHz references (first and fourth Quarters), keeping all packets within ± 3.5 mV the 0.1 MHz reference.

33. Connect the Peak-to-Peak detector head to Channel 3 on the AVG1 Generator module.

34. Touch **Freq RSP SW** on the TG 2000 Signal Generation Platform display until the **Frequency Response SW** signal is selected.

35. Set the 0.1 MHz packet to the vertical center of the display.

36. **Adjust C252 (Sinx/x correction)** for a flat response at the .1 MHz and 6 MHz packets.

37. **Adjust R383 (Mid-range bowing)** about 1/4 turn to adjust the flatness of the middle packets. Adjust counter-clockwise to bring the mid-range down and the tip up, or clockwise to bring up the mid range and drop the tip.

38. Repeat steps 6. and 7. as needed to achieve best flat response, keeping all packets except the 8 MHz within 3.5 mV of the 0.1 MHz packet.

Frequency Response Fine Adjustment for Hardware Version 2.0

Use this step to adjust the frequency response for modules with hardware version 2.0 and up. To determine your hardware version, push the Utilities button on the TG 2000 Signal Generation Platform, then touch Versions. Check for the version number across from AVG1 in the Hardware column.

Test Equipment Required:

■ Oscilloscope (This procedure was prepared using the Tektronix DSA 602 Digital Signal Analyzer.)

■ Peak-to-Peak Detector Head and Amplifier

■ 75 Ω coaxial cables

Equipment Hookup:

■ Connect the Peak-to-Peak detector head directly to the Channel 1 connector on the AVG1 Generator module.

■ Connect the Peak-to-Peak detector head to the Peak-to-Peak Amplifier + Input.

■ Connect the Peak-to-Peak Amplifier Output to the oscilloscope Channel 1.

■ Connect the Trigger output of the AVG1 Generator module to the oscilloscope Channel 4.

Procedure: Software Response

1. Touch **Freq RSP SW** on the TG 2000 Signal Generation Platform display until the **Frequency Response SW** signal is selected.

2. Set the TG 2000 Signal Generation Platform trigger to vertical as follows:

   a. Push the Test Signals button on the TG 2000 Signal Generation Platform.

   b. Touch **Module Parameters** on the display.

   c. Touch **Trigger Output** on the display.

   d. Touch **Type** on the display until **Vertical** is selected.

   e. Touch **Reset All** on the display.

   f. Push the **Test Signals** button to return to the Test Signals window.

3. Recall the **FREQ_RSP** preset in the DSA 602A Digital Signal Analyzer.

4. Set the 0.1 MHz packet to the vertical center of the display.

5. Set the oscilloscope Vertical to 1 mV/Div.

6. **Adjust C218 (Sinx/x correction)** for a flat response at the .1 MHz and 6 MHz packets.

7. **Adjust R375 (Mid-range bowing)** about 1/4 turn to adjust the flatness of the middle packets. Adjust counter-clockwise to bring the mid-range down and the tip up, or clockwise to bring up the mid range and drop the tip.

8. Repeat steps 6 and 7 as needed to achieve best flat response, keeping all packets except the 8 MHz within 3.5 mV of the 0.1 MHz packet.

Procedure: Hardware Response

1. Touch **Freq Rsp HW** on the TG 2000 Signal Generation Platform display until the **Frequency Response HW** signal is selected.

2. **Adjust R384 (HW frequency resp)** for a flat response.

3. Connect the Peak-to-Peak detector head to Channel 2 on the AVG1 Generator module.

4. Check that all packets are within ±3.5 mV the 0.1 MHz reference.

5. Connect the Peak-to-Peak detector head to Channel 3 on the AVG1 Generator module.

6. Check that all packets are within ±3.5 mV the 0.1 MHz reference.

7. If either the Channel 2 or Channel 3 HW frequency response varies from the Channel 1 SW frequency response, **adjust R384 (HW frequency resp)** for balance, keeping all packets within ±3.5 mV the 0.1 MHz reference.

NOTE. In hardware modulated mode, the Channel 1 SW adjustments control the luminance frequency response of all three output channels, through different amplifiers. R384 allows fine tuning of the hardware response after the software response is adjusted.

8. Connect the Peak-to-Peak detector head to Channel 2 on the AVG1 Generator module.

9. Touch **Freq RSP SW** on the TG 2000 Signal Generation Platform display until the **Frequency Response SW** signal is selected.

10. Set the 0.1 MHz packet to the vertical center of the display.

11. **Adjust C226 (Sinx/x correction)** for a flat response at the .1 MHz and 6 MHz packets.

12. **Adjust R379 (Mid-range bowing)** about 1/4 turn to adjust the flatness of the middle packets. Adjust counter-clockwise to bring the mid-range down and the tip up, or clockwise to bring up the mid range and drop the tip.

13. Repeat steps 22 and 23 as needed to achieve best flat response, keeping all packets except the 8 MHz within 3.5 mV of the 0.1 MHz packet.

14. Note the amplitudes of the 3.5 MHz and the 6 MHz packets with respect to the 0.1 MHz reference.

15. Touch **Ch2_Chroma** on the TG 2000 Signal Generation Platform display until the **Chroma Resp 3.58 MHz** signal is selected.

16. Note the amplitudes of the second and third quarters of the signal compared to the first and fourth. (The second is DDS based 3.58. The third quarter is RAM based 3.58. The first and fourth are 0.1 reference.)

17. Touch **Ch2_Chroma** on the TG 2000 Signal Generation Platform display until the **Chroma Resp 4.43 MHz** signal is selected.

18. Note the amplitudes of the second and third quarters of the signal compared to the first and fourth. (The second is DDS based 4.43. The third quarter is RAM based 4.43. The first and fourth are 0.1 reference.)

19. Compare the noted amplitude of the SW 3.58 in step 14 with the two 3.58 values in step 16.

20. Compare the noted amplitude of the SW 4.43 in step 14 with the two 4.43 values in step 18.

21. **Adjust C226** for the best overall balance between the SW frequency response and the DDS and RAM-based 3.58 and 4.43 chroma around the 0.1 MHz references (first and fourth Quarters), keeping all packets within ± 3.5 mV the 0.1 MHz reference.

22. Connect the Peak-to-Peak detector head to Channel 3 on the AVG1 Generator module.

23. Touch **Freq RSP SW** on the TG 2000 Signal Generation Platform display until the **Frequency Response SW** signal is selected.

24. Set the 0.1 MHz packet to the vertical center of the display.

25. **Adjust C252 (Sinx/x correction)** for a flat response at the .1 MHz and 6 MHz packets.

26. **Adjust R383 (Mid-range bowing)** about 1/4 turn to adjust the flatness of the middle packets. Adjust counter-clockwise to bring the mid-range down and the tip up, or clockwise to bring up the mid range and drop the tip.

27. Repeat steps 6 and 7 as needed to achieve best flat response, keeping all packets except the 8 MHz within 3.5 mV of the 0.1 MHz packet.

Channel Timing Match Recheck

1. Repeat the Channel Timing Match adjustment procedure, ensuring that the output timing of all three channels matches within 1 nS.

2. Remove all cables from the TG 2000 Signal Generation Platform.

Remove Extender Board

1. Set the rear-panel power switch to off and disconnect the power cord from the mainframe.

2. Remove the extender board from the mainframe, and reinstall the AVG1 Generator module in the same slot as it was before installing the extender board. Refer to *Module Installation* on page 2–2.

Restore Signals

If you performed an instrument backup before beginning the *Adjustments* procedure, restore the signals now, using the procedure on page 2–8. If you did not perform an instrument backup, load the AVG1 Test Signal disks supplied with the *AVG1 Analog Video Generator User Manual*.

Recall Preset

Recall the preset you created as follows:

1. Push the **Presets** button.

2. Touch **Presets** on the display.

3. Use the **Navigation** arrows to move the cursor to the preset that you created before beginning the *Adjustments* procedure. Press the **Select** key.

4. Touch **Recall**. Your instrument settings are recalled.

This completes the Adjustments.

Maintenance

Maintenance

This section contains instructions and procedures for maintaining the AVG1 Analog Video Generator module. For information on servicing the mainframe, refer to the *TG 2000 Signal Generation Platform Service Manual*.

The following information can be found in this section:

If the instrument does not function properly, troubleshooting and corrective measures should be taken immediately to prevent additional problems.

NOTE. Contact your local Tektronix representative for information on where to return your instrument if it requires repair during the warranty period.

Preparation

Please read and follow these preparation instructions before attempting to perform any maintenance or service to the instrument.

Servicing Prerequisites

Make sure of the following before beginning any instrument service:

- The maintenance or service of this instrument must be performed by qualified service personnel only.

- Read the *Service Safety Summary* located at the beginning of this manual before attempting to perform any maintenance or service to the instrument.

- Read the *Operating Information* section of this manual before attempting to perform any maintenance or service to the instrument.

Electrostatic Damage Prevention

This instrument contains electrical components that are susceptible to damage from electrostatic discharge. Static voltages of 1 kV to 30 kV are common in unprotected environments.

⚠

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

Observe the following precautions to avoid static damage:

■ Minimize handling of static-sensitive components.

■ Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.

■ Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should only be performed at a static-free workstation by qualified personnel.

■ Nothing capable of generating or holding a static charge should be allowed on the workstation surface.

■ Keep the component leads shorted together whenever possible.

■ Pick up components by the body, never by the leads.

■ Do not slide the components over any surface.

■ Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.

■ Use a soldering iron that is connected to earth ground.

■ Use only special antistatic, suction-type or wick-type desoldering tools.

NOTE. A 2% RMA flux content solder is recommended for making repairs in this instrument. Cleaning of rosin residue is not recommended. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.

Inspection and Cleaning

Preventive maintenance consists of cleaning, visual inspection, performance checking, and, if needed, readjustment. The preventive maintenance schedule established for the instrument should be based on the environment in which it is operated and the amount of use. Under average conditions, scheduled preventive maintenance should be performed every 2000 hours of operation.

General Care

Protect the module from adverse weather conditions. The module is not waterproof.

⚠️ *CAUTION. To avoid damage to this module, do not expose it to sprays, liquids, or solvents. Do not flex the circuit board if you remove the board from its mounting shield. The circuit board can be damaged by flexing. The shield provides necessary structural support to the circuit board.*

Cleaning and Visual Inspection

Clean the mainframe and modules often enough to prevent dust or dirt from accumulating. Refer to *Cleaning* and *Visual Inspection* in the *TG 2000 Signal Generation Platform Service Manual*.

Performance Verification and Readjustments

Check module performance after each 2000 hours of operation or every 12 months. This will help to ensure maximum performance and assist in locating defects that may not be apparent during regular operation. Performance verification and adjustment procedures are included in this manual.

After Repair Adjustments

After replacing the module or subassembly, allow the mainframe and module to warm up for 20 minutes, and then perform the self cal as follows:

1. Push the **Utilities** button.

2. Touch the following on the TG 2000 Signal Generation Platform:

    a. **Module Self Cal**

    b. **AVG1:X Self Cal** (X represents the slot number of the replaced module)

    c. **Start Cal**

3. When the self cal is successfully completed, the display will return to the Modules window with no error message. This may take 2 to 5 minutes, depending on the module. An error message indicates a failed calibration. If the self cal fails, contact your Tektronix representative for assistance.

Repackaging Instructions

Use the following instructions to prepare your instrument for shipment to a Tektronix, Inc., Service Center:

1. Attach a tag to the instrument showing: the owner, complete address and phone number of someone at your firm who can be contacted, the instrument serial number, and a description of the required service.

2. Package the instrument in the original packaging materials. Figures 6–1 and 6–2 illustrate how to repackage the module in the original packaging materials. If the original packaging materials are not available, follow these directions:

   a. Obtain a carton of corrugated cardboard having inside dimensions six or more inches greater than the dimensions of the instrument. Use a shipping carton that has a test strength of at least 250 pounds (113.5 kg).

   b. Surround the module with a protective (anti-static) bag.

   c. Pack dunnage or urethane foam between the instrument and the carton. If using Styrofoam kernels, overfill the box and compress the kernels by closing the lid. There should be three inches of tightly packed cushioning on all sides of the instrument.

3. Seal the carton with shipping tape, industrial stapler, or both.

004-4712-00
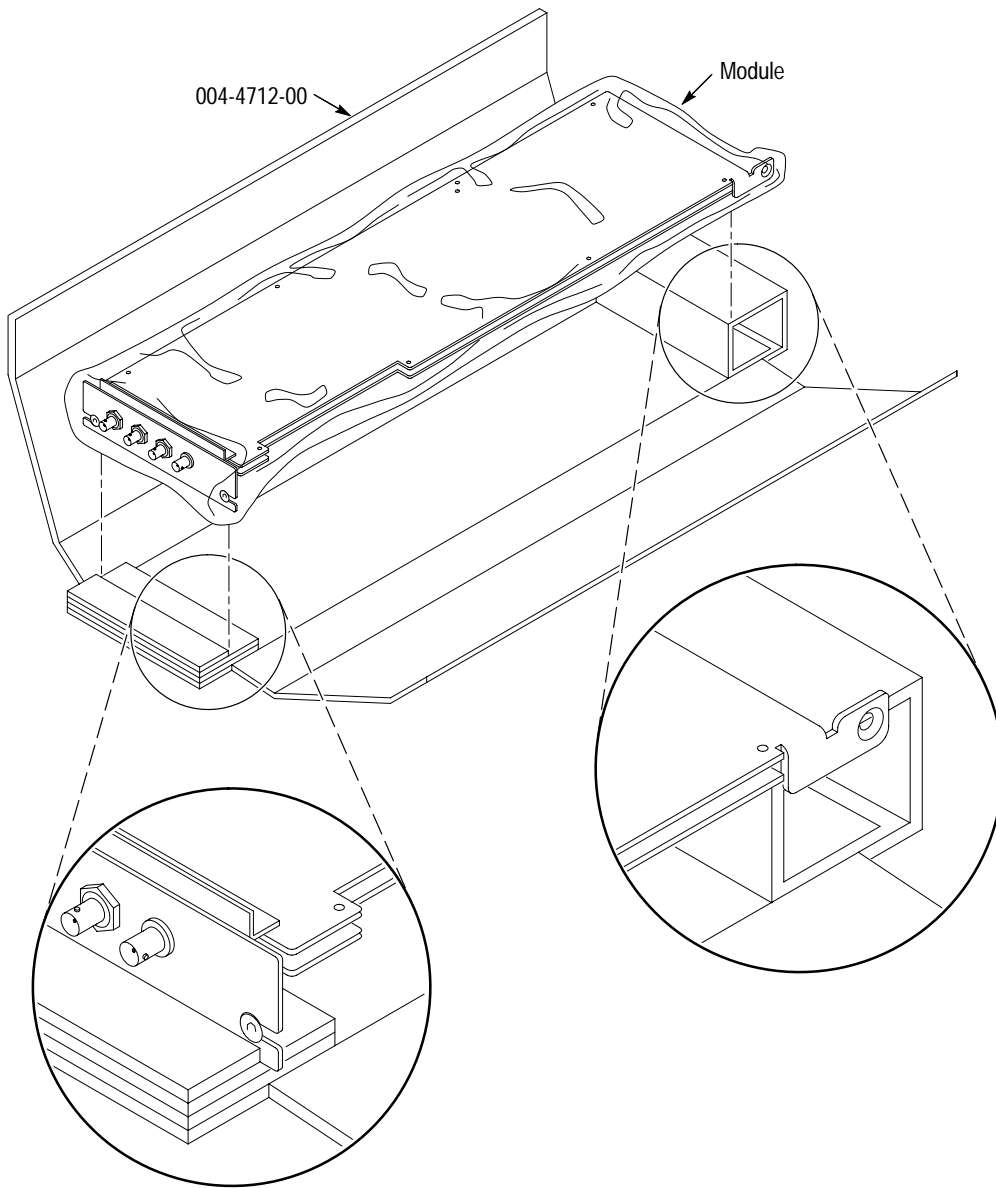
Module

Figure 6–1: Placing the module in the protective wrapping

004-4713-00
2 Each

004-4712-00

004-0828-00
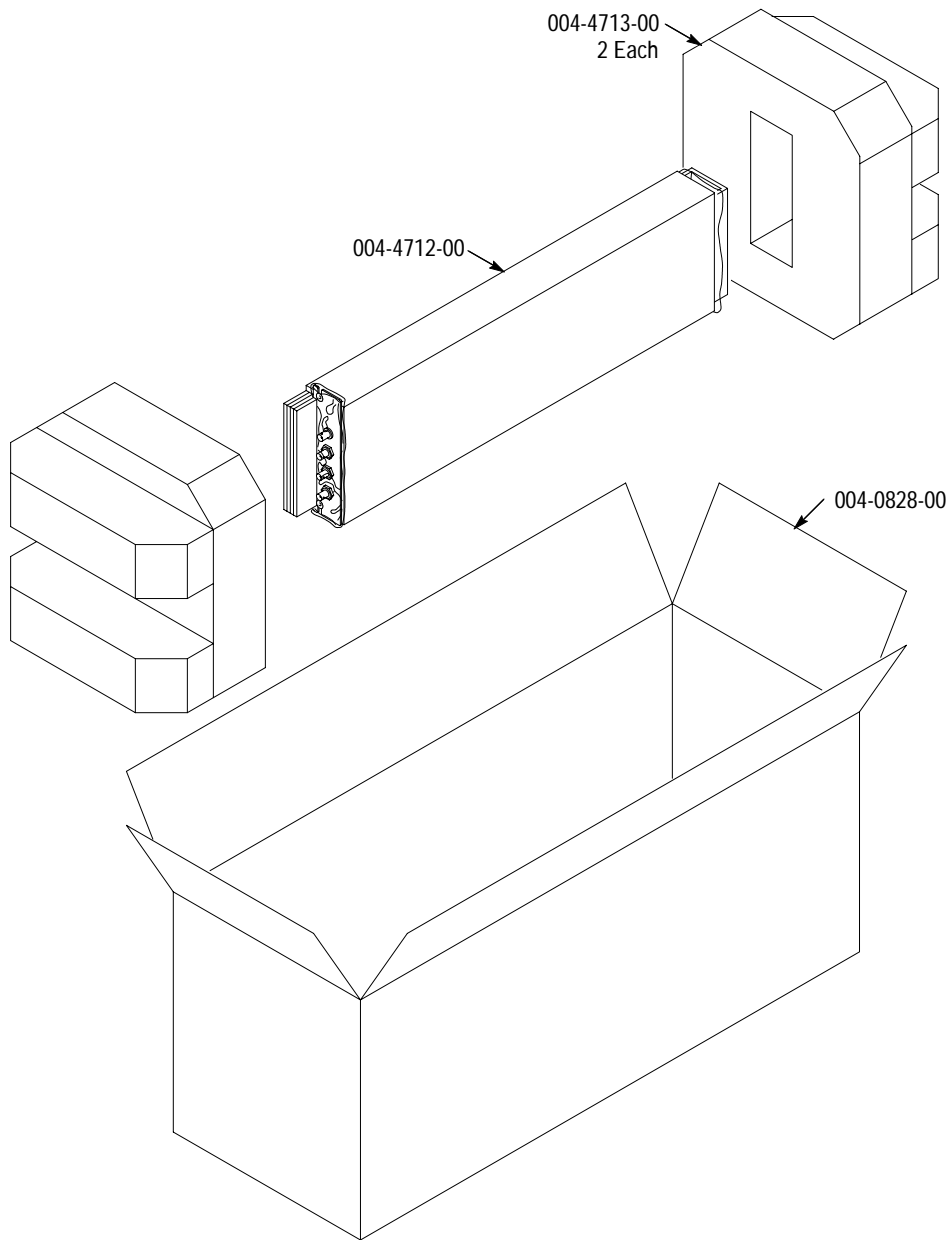
Figure 6–2: Placing the module in the shipping carton

Removal and Replacement

This section contains the instructions on how you can remove and replace the customer replaceable parts of the AVG1 Analog Video Generator module.

Tools Required

The following tools are required to perform the removal and replacement procedures:

Table 6–1: Required tools

Tool	Use
Torx screwdriver handle	Removing the module from the mainframe
T-10 Torx tip	Removing the module from the mainframe
9/16 inch box wrench	Removing the rear panel

Replacing Subassemblies

There are three subassemblies (small circuit boards) attached to the AVG1 circuit board; two delay boards and one memory board. To remove any of the three boards, perform the following procedure:

1. Perform *Instrument Backup* on page 2–8.

2. Use the *Module Removal* procedure on page 2–9 to remove the AVG1 Generator module from the mainframe.

3. Remove the subassembly from the AVG1 Generator module by moving the retaining tabs away from the Delay board and swinging the board down and out. See Figure 6–3.
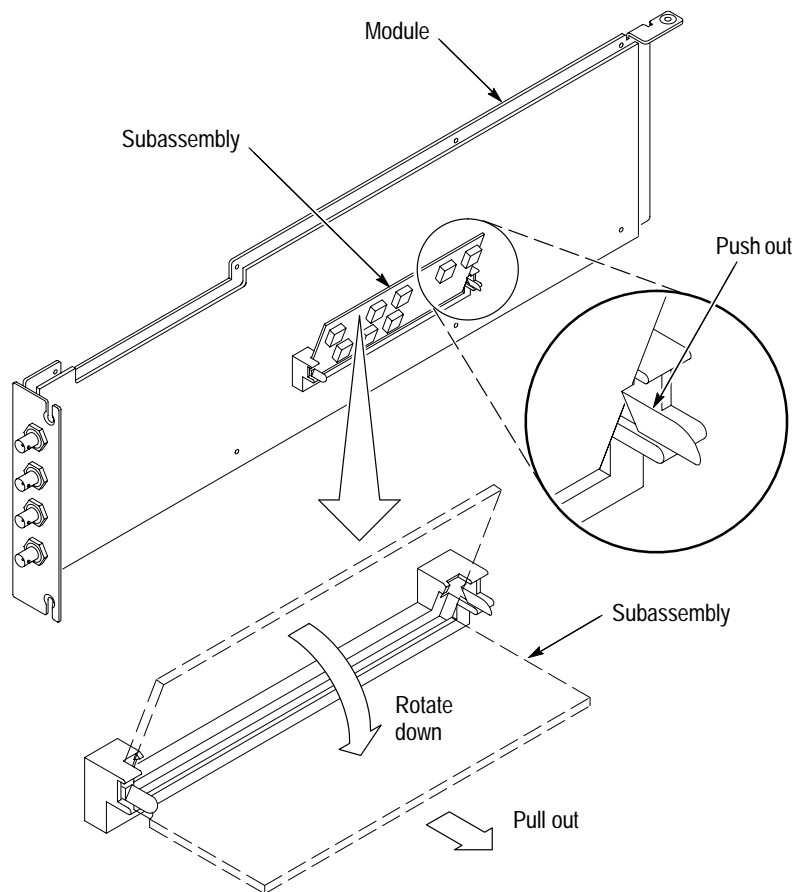
Figure 6–3: Removing a subassembly from a module

Removing the Rear Panel

To remove the rear panel from a module, perform the following steps:

1. Perform *Instrument Backup* on page 2–8.

2. Use the *Module Removal* procedure on page 2–9 to remove the AVG1 Generator module from the mainframe.

3. Remove the nuts and washers from each of the rear panel BNC connectors.

4. Lift the rear panel away from the module.

5. To replace the rear panel, position it on the module, install the lock washers and then the nuts.

6. Tighten the nuts.

Replacing the Shield

It is usually not necessary to remove the shield. If you are returning the AVG1 Generator module to Tektronix for service, do not remove the shield. Return the entire module.

If you need to replace a damaged shield, carefully follow these instructions.

⚠ *CAUTION. The shield provides important support and protection for the surface-mount components. If you remove the shield, be sure not to flex the circuit board.*

1. Perform *Removing the Rear Panel* on page 6–8.

2. Using the T-10 Torx tip, remove the eight screws that attach the AVG1 circuit board to the shield.

3. Using great care not to bend or flex the circuit board, pull it out until the BNC connectors clear the rear portion of the shield. Remove the circuit board from the shield and place it on a static free surface.

4. Set the replacement shield assembly (which includes a metal portion and a plastic portion) on a firm, flat, static-free work surface. Carefully place the circuit board in place on the shield.

5. Install and tighten the eight screws that you removed in step 2. Check that the circuit board is flat and is not flexed.

⚠ *CAUTION. When installing the circuit board onto the shield, make sure both the shield and the circuit board are flat. If the board is flexed or warped, it may damage sensitive surface-mount components.*

6. Reinstall the rear panel.

Replacing the Rear Panel Connectors

It is usually not necessary to replace the rear panel connectors (shown in the *Replaceable Parts List*, Figure 1–7). However, if a connector becomes damaged, you can replace it by performing the following steps:

1. Refer to the preceding instructions, *Replacing the Shield*, to remove the shield from the AVG1 Generator module.

2. Carefully desolder the damaged connector (at J4, J13, J16, or J7) from the back side of the board.

3. To replace the connector, reverse the procedure.

Troubleshooting Procedures

This section contains instructions and procedures for troubleshooting the AVG1 Generator module. These procedures will help you decide whether it is necessary to replace your module.

If the TG 2000 Platform mainframe does not boot up or if the display is not working, refer to *Troubleshooting* in the *TG 2000 Signal Generation Platform Service Manual*.

Equipment Required

The equipment listed in Table 6–2 is required for troubleshooting.

Table 6–2: Equipment required for troubleshooting

Equipment description	Minimum requirements/example
Torx screwdriver handle	Accepts Torx-driver bits
T-10 Torx tip	Torx-driver bit for T-10 screw head
Blank disks	MS–DOS preformatted, 3.5 inch. For instrument backup, you will need approximately one disk for each installed generator module, and one disk for the CPU. To write the console ring file, you will need two disks.
Troubleshooting disk	Supplied with the *TG 2000 Signal Generation Platform Service Manual*
Voltmeter with probes	Accurate to two decimal places, able to measure AC voltage of 900 V_{RMS}. For example, Tektronix DM2510 Digital Multimeter

General Troubleshooting

This section contains general troubleshooting instructions and procedures to use when you begin to troubleshoot suspected faults with the AVG1 Generator module.

Instrument Backup

Before you begin any troubleshooting procedures, perform Instrument Backup on page 2–8. After the problem is solved, restore instrument signals from the backup disks.

> *CAUTION. To prevent data loss, back up the instrument before you begin any troubleshooting procedures.*

Saving the Console Ring File to Disk

The TG 2000 Platform mainframe displays module diagnostic information during instrument power up. Any error messages are written to an internal file called the console ring file. Tektronix technicians can use the information in the console ring file to help troubleshoot a malfunctioning module.

> *NOTE. Write the console ring file to disk before performing troubleshooting to prevent the troubleshooting routines from overwriting the console ring file.*

Write the file as follows:

1. Load the Troubleshooting disk (supplied with the *TG 2000 Signal Generation Platform Service Manual*) into the floppy drive. Press the front-panel **Sequences** button.

2. Touch **File Utilities**, and then touch **Add Sequences from Disk**.

3. Select the **consbak.seq** sequence file and then touch **Start Load**.

4. Touch **OK, Quit**, and then **Quit** again.

5. Touch **Sequences** and then select the **consbak.seq** file to run (use the **Select** key).

6. Touch **Run**. Insert a blank disk when prompted, and touch **Quit**. Label this disk #1.

7. Turn the instrument off and then back on from the front panel. Wait until the instrument has completed its power up process.

8. Write the console ring file to disk again, using a different disk. Label this disk #2.

9. Read the console ring file power up messages. If there are AVG1 Generator module errors, refer to the *Fault Symptom Table* on page 6–13.

10. If the TG 2000 Platform does not display any power-up confidence test messages, or the CPU module fails the confidence test, refer to *Troubleshooting* in the *TG 2000 Signal Generation Platform Service Manual*.

Returning Modules to Tektronix

When you return a mainframe or module to Tektronix for repair or replacement, be sure to include the following:

- The disks containing the console ring files.

- Whether or not the module passed diagnostics, the highest number reached for that module, and any error messages.

- Description of the problem, including which troubleshooting flow chart you used.

Fault Symptom Table

Use this fault symptom table after you have performed the preceding *General Troubleshooting*. Before proceeding, it is important to save the console ring file as indicated in *General Troubleshooting* on page 6–12.

Locate your fault symptom in Table 6–3 and go to the flowchart indicated.

Table 6–3: Fault symptom table

Symptom	Flowchart
Major difficulties with module	page 6–14
with module installed in current slot	page 6–15
with module moved to different slot	page 6–16
Mainframe fails to power up	page 6–17
Signals lost after power down	page 6–18
Missing output signal	page 6–20
Wrong signal on output	page 6–19
Jitter on the signal	page 6–21

Troubleshooting Flowcharts

The troubleshooting flowcharts provide a series of steps to help you determine whether the AVG1 Generator module is faulty. Each chart relates to an entry in Table 6–3.

Figure 6–4: Flowchart for major difficulties with module

Continuation of flowchart from
page 6–14.

Use the Module Removal procedure on page 2–9 to remove the
affected module.

Check for bent or damaged pins on the three Backplane board
connectors (P1, P2, and P3). Carefully straighten any bent pins.

Check that all module subassemblies and socketed parts are
seated properly. Reinstall the module in the same slot.

Set the rear-panel power switch to on, and then use the
front-panel switch to turn the instrument on

Watch the display for the AVG1 Confidence Tests. Note
whether the AVG1 module passed the diagnostic. Note the
highest number to appear.

Does the
TG 2000 recog-
nize the AVG1
module?

No

Yes

Does the AVG1
module pass
Confidence
tests?

No

Yes

Go to flowchart
on page 6–16.

Perform Self Cal: push the **Utilities** button. Touch **Module Self
Cal**, **AVG1**, and then **Start Cal**.

Does the AVG1
module pass Self
Cal?

No

Yes

TG 2000 now recognizes the AVG1 module.
AVG1 Module now passes power-up
confidence and self-calibration tests.

Figure 6–5: Flowchart for checking the current module installation slot

Figure 6–6: Flowchart for checking the module in a different slot

Use this procedure when the TG 2000 Platform mainframe fails to power up and you suspect the AVG1 module.

Set the rear-panel power switch to off, then on, and then use the front-panel switch to turn the instrument on

Watch the display for the AVG1 Confidence Tests. Note whether the AVG1 module passed the diagnostic. Note the highest number to appear.

Did the AVG1 fail confidence tests? → No → The problem is probably in another module. Refer to *Troubleshooting* in the *TG 2000 SIgnal Generation Platform Service Manual*.

Yes

Use the Module Removal procedure on page 2–9 to remove the AVG1 module.

Set the rear-panel power switch to off, then on, and then use the front-panel switch to turn the instrument on.

Did the mainframe power up successfully? → No → The problem is probably in another module. Refer to *Troubleshooting* in the *TG 2000 SIgnal Generation Platform Service Manual*.

Yes

Install the AVG1 module in a different slot.

Set the rear-panel power switch to on, and then use the front-panel switch to turn the instrument on

Watch the display for the AVG1 Confidence Tests. Note whether the AVG1 module passed the diagnostic. Note the highest number to appear.

Did the AVG1 still fail confidence tests? → No → There may be a problem with the Backplane board. Record troubleshooting information and contact Tektronix.

Yes

Replace the module.

Figure 6–7: Flowchart for failure to power up

Use this procedure when your module's signals are lost after powering down the mainframe from the rear-panel power switch.

Check that the backup battery wires are connected.

Turn off the rear-panel power switch and measure the backup battery voltage (+4.2 V).

Is the battery voltage ok? — No →

Check Power Supply charging circuit.

Remove the cable from J2 on the Power Supply board and measure pin 7 (See Figure 6–9) for +4.7 V with rear panel power on, +0.5 V with rear-panel power off.

Yes

Use the Module Removal procedure on page 2–9 to remove the faulty module.

Check that the Backplane board pins are not bent on the affected module.

Move the affected module to another slot.

Is the battery charging circuit ok? — Yes →

The problem is probably the backup battery, but it could be the Backplane board or the CPU module. Record troubleshooting information and contact Tektronix.

No

Does the affected module operate in the new slot? — No → Replace the module.

Refer to the TG2000 Service Manual for instructions to replace the Power Supply module.

Yes

There may be a problem with the Backplane board. Record troubleshooting information and contact Tektronix.
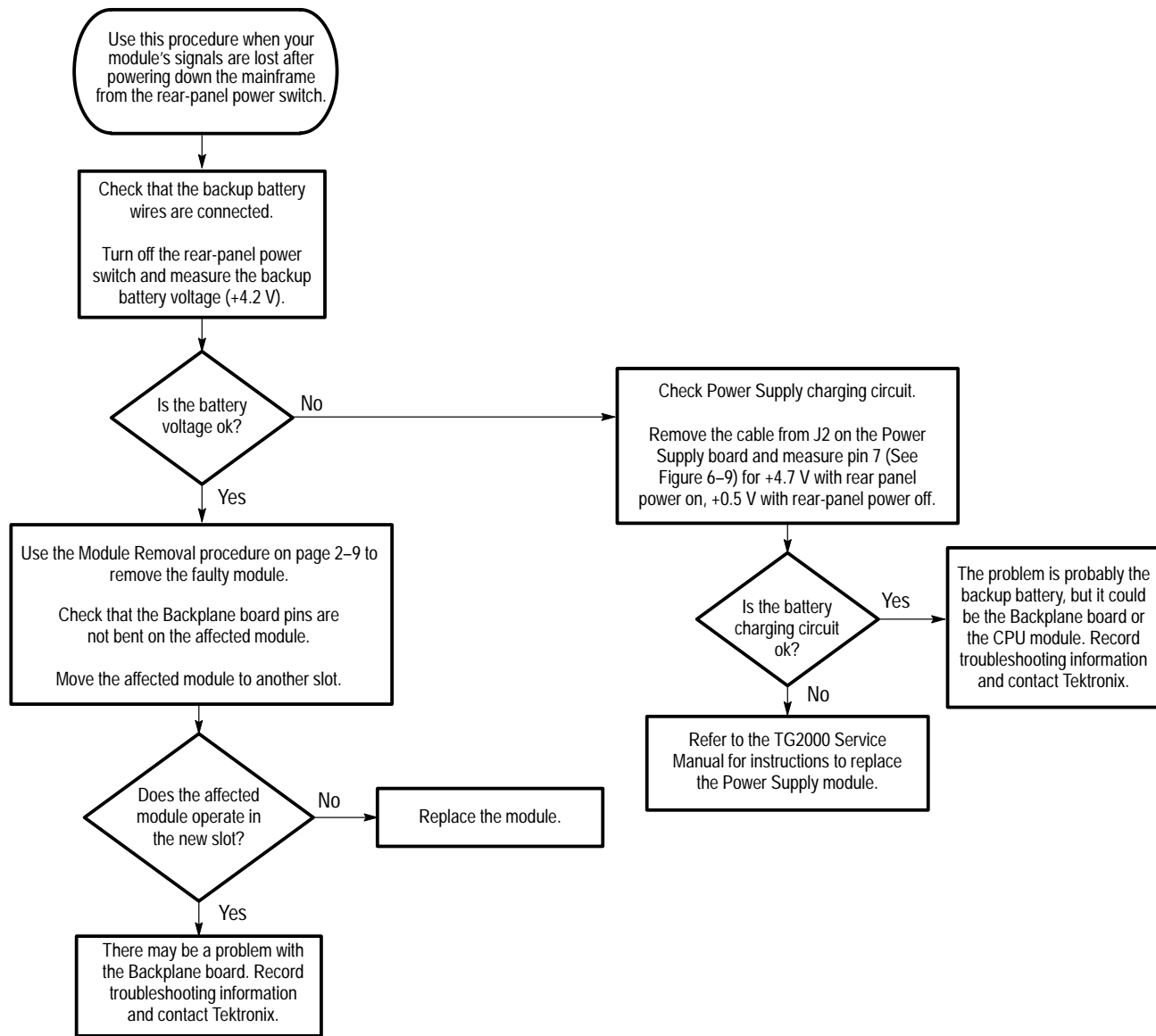
Figure 6–8: Flowchart for signals lost after power down

Figure 6–9: Measuring the battery charging circuit

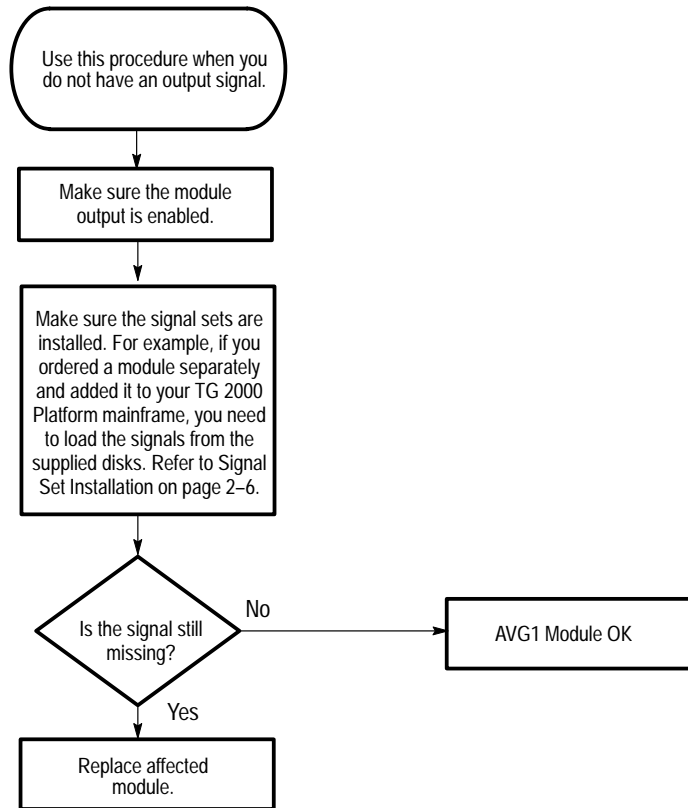**Figure 6–10: Flowchart for wrong signal on output**

Use this procedure when you
do not have an output signal.

Make sure the module
output is enabled.

Make sure the signal sets are
installed. For example, if you
ordered a module separately
and added it to your TG 2000
Platform mainframe, you need
to load the signals from the
supplied disks. Refer to Signal
Set Installation on page 2–6.

Is the signal still
missing?

No → AVG1 Module OK

Yes

Replace affected
module.

Figure 6–11: Flowchart for missing output signal
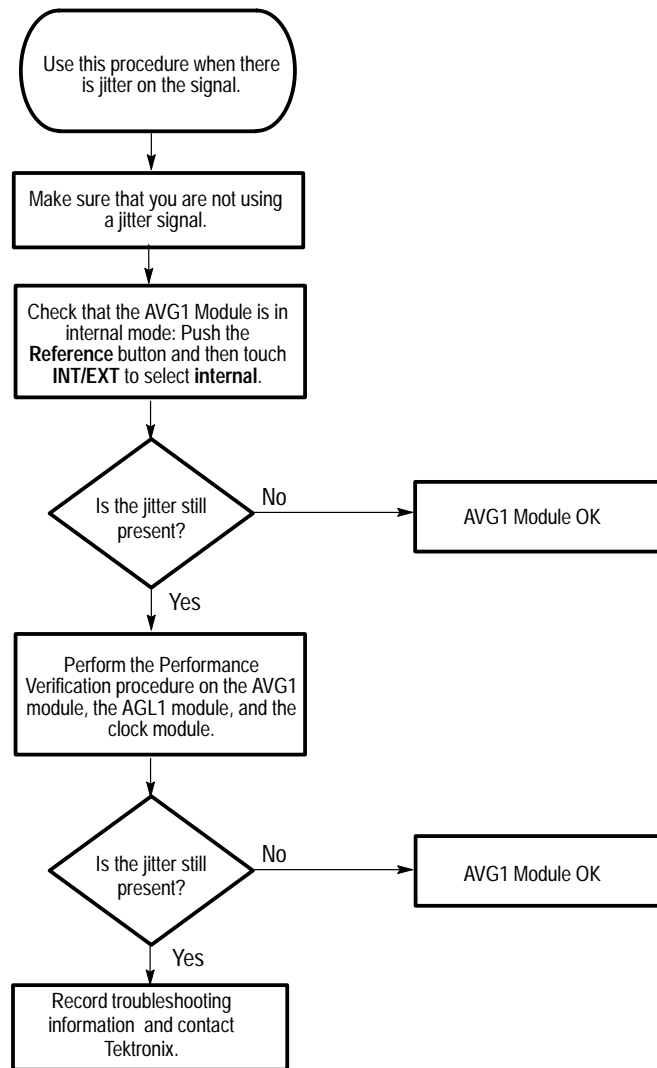
Figure **6–12: Flowchart for jitter on signal**

6–21

Options

Options

There are no options available for use with the AVG1 Analog Video Generator module.

However, a customer-installable memory upgrade is available for AVG1 Generator modules with hardware versions less than 1.2. To determine your hardware version, push the **Utilities** button and then touch **Version** on the display. On the display, note the hardware version number that corresponds to the AVG1 module.

The upgrade kit contains hardware and instructions to upgrade the memory from 256Kb to 1Mb. To order the upgrade kit, contact your local Tektronix field office or representative.

Replaceable Electrical Parts

Replaceable Electrical Parts

The module-level replaceable electrical parts are included in the *Replaceable Mechanical Parts* list. Since component-level repair is not supported, individual electrical components are not listed.

Diagrams

Diagrams

Figure 9–1 shows how the AVG1 Generator module and how it interconnects with the TG 2000 Signal Generation Platform.

Diagrams showing mainframe component interconnections, such as power supply and clock, can be found in the *TG 2000 Signal Generation Platform Service Manual*.

Block diagrams of the AVG1 Generator module are located in the *Theory of Operation* section, beginning on page 3–1.
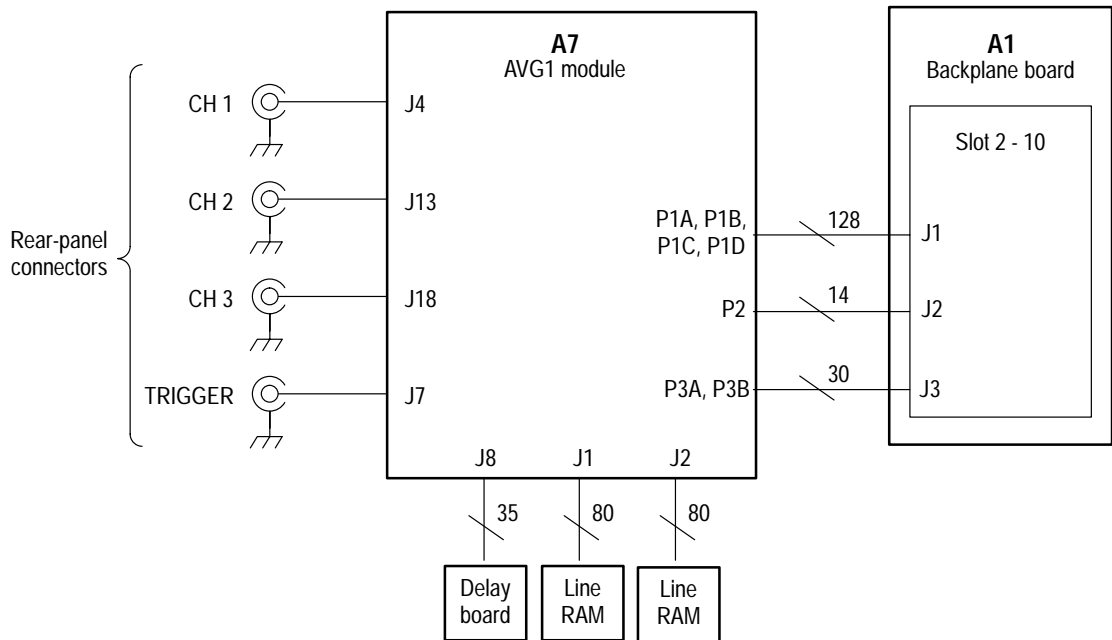

Figure 9–1: AVG1 module connections

Replaceable Parts

Replaceable Parts

This section contains a list of the replaceable modules for the TG 2000 Signal Generation Platform. Use this list to identify and order replacement parts.

Parts Ordering Information

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

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

- Part number

- Instrument type or model number

- Instrument serial number

- Instrument modification number, if applicable

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

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

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-TEK-WIDE, extension 6630.

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 TG 2000 Signal Generation Platform. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts List Column Descriptions

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

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

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

Manufacturers Cross Index

Mfr. code	Manufacturer	Address	City, state, zip code
01536	TEXTRON INC	1818 CHRISTINA ST	ROCKFORD, IL 61108
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214–4657
0GZV8	HUBER & SUHNER INC	ONE ALLEN MARTIN DRIVE	ESSEX, VT 05451
00779	AMP INC.	CUSTOMER SERVICE DEPT PO BOX 3608	HARRISBURG, PA 17105–3608
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD PO BOX 76500	COLD SPRINGS, KY 41076
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001

Replaceable Parts List

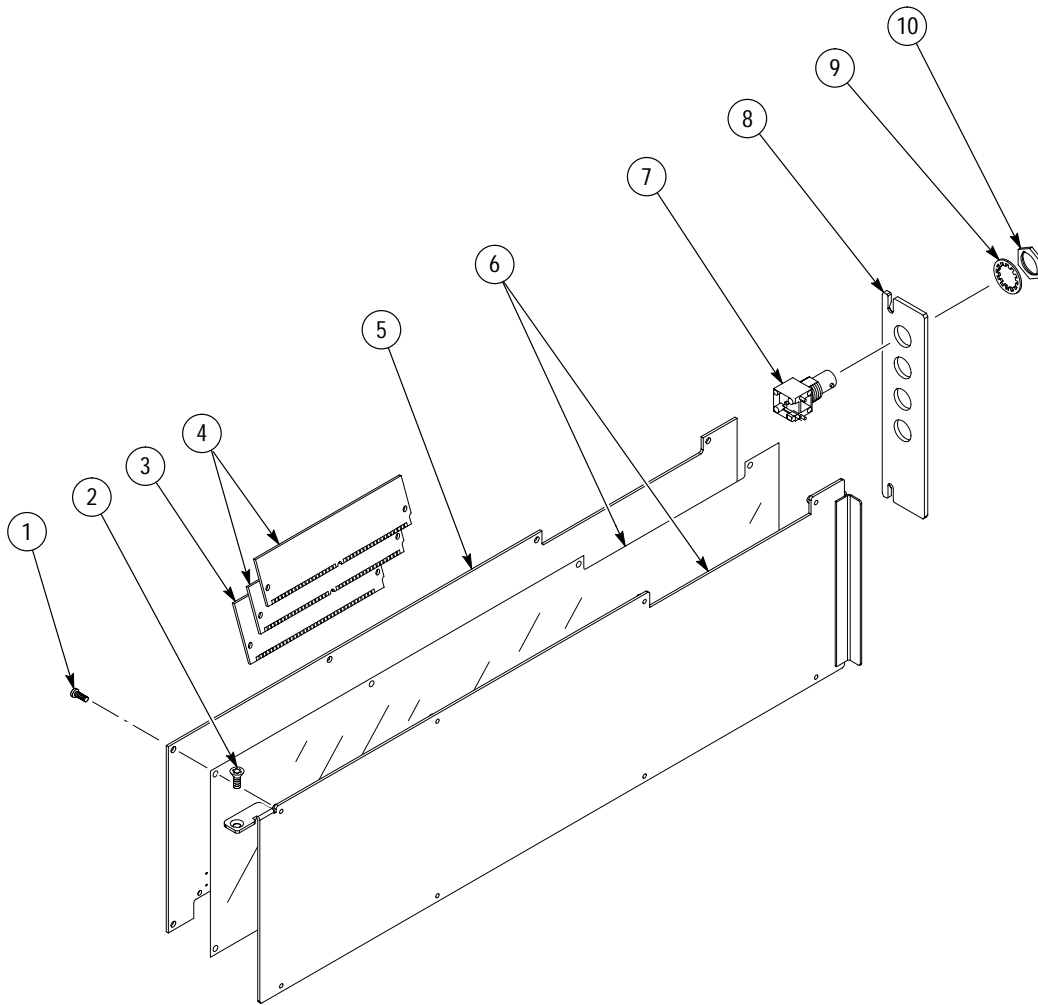| Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–1–1	211–0408–00			8	SCR,ASSEM WSHR:4–40 X 0.250,PNH,STL,ZINC,T–10 TORX	0KB01	211–0408–00
10–1–2	211–0725–00			2	SCREW,MACHINE:6–32 X 0.375,FLH TORX	01536	ORDER BY DESCR
10–1–3	671–3104–00	B010100	B010697	1	CIRCUIT BD ASSY:DELAY	80009	671–3104–00
	671–3104–01	B010698		1	CIRCUIT BD ASSY:DELAY	80009	671–3104–01
10–1–4	671–3041–00			2	CIRCUIT BD ASSY:LINE RAM	80009	671–3041–00
10–1–5	671–2876–00			1	CIRCUIT BD ASSY:ANALOG VIDEO GENERATOR	80009	671–2876–00
10–1–6	337–3942–00			1	SHIELD ELEC:ALUMINUM	80009	337–3942–00
10–1–7	131–3378–00			4	CONN,RF JACK:BNC,50 OHM	00779	227677–1
10–1–8	333–4101–00			1	PANEL,REAR:ALUMINUM,AVG1	80009	333–4101–00
10–1–9	210–1039–00			4	WASHER,LOCK:0.521 ID,INT,0.025 THK,SST	0KB01	1224–02–00–0541C
10–1–10	220–0497–00			4	NUT,PLAIN,HEX:0.5–28 X 0.562 HEX,BRS CD PL	73743	ORDER BY DESCR
					STANDARD ACCESSORIES		
	070–9048–XX			1	MANUAL,TECH:USERS,AVG1 MODULE	80009	070–9048–XX
					OPTIONAL ACCESSORIES		
	070–9677–XX			1	MANUAL,TECH:SERVICE,AVG1 MODULE	80009	070–9677–XX
	671–2879–XX			1	EXTENDER BOARD	80009	671–2879–XX

Figure 10–1: Exploded view