TEK INTER-OFFICE COMMUNICATION

TO John Martin 94-540 DATE June 25, 1991

FROM Frank Gray, 50-PAT

SUBJECT GIDEP permit request

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Francis I. Gray
Group Patent Counsel

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TEKTRONIX 11A34V

Checks and Adjustments

This section contains procedures that allow you to examine measurement limits and electrical specifications of the 11A34V Video Amplifier. Procedures 1 to 11 (see Table 2-1) are intended to return the 11A34V Video Amplifier to proper operation following repair, or as a part of a routine maintenance program.

To ensure accurate operation of the amplifier, check the electrical adjustment after each 2,000 hours of operation; or every 24 months if you use the amplifier infrequently. Refer to the *11A34V User Reference* for more information about advertised specifications and amplifier operation.

To verify that the instrument is functioning, perform the procedures which have a (✓) indication in the Functional Test column of Table 2-1. If you wish to verify the specifications of the instrument, perform all procedures.

Table 2-1 – Measurement Limits, Specifications, Adjustments, and Functional Test

Procedure and Description	Measurement Limits *(Examine)*	Specifications *(Check)*	Adjustments *(Adjust)*	Functional Test
Procedure 1 Initial Setup	none	none	none	✓
Procedure 2 Enhanced Accuracy	none	none	successful execution	✓
Procedure 3 High Frequency Response				
Amplifier Step Response	difference between two waveform aberrations +4.5, -6% peak and 8% p-p	none	HF1, HF2, HF3, and HF4 so that the CH1, CH2, CH3, and CH4 aberrations respectively, are within +4.5, -6% peak and 8% p-p	
Amplifier Bandwidth: Performance Verification Procedure	none	refer to Table 2-3 for the bandwidth specifications	none	
Amplifier Bandwidth: Functional Test Procedure	none	peak-peak measurement ≥848 mV	none	✓
Procedure 4 Input Resistance	none	1 MΩ ±0.5% 75 Ω ±0.5%	none	✓

Table 2-1 — Measurement Limits, Specifications, Adjustments, and Functional Test (Cont.)

Procedure and Description	Measurement Limits *(Examine)*	Specifications *(Check)*	Adjustments *(Adjust)*	Functional Test
Procedure 5 Vertical Accuracy				✓
DC Balance	none	from 5 mV to 10 V, trace within ±0.2 divs of center. from 1 mV to 2 mV, trace within ±1 div of center	none	
Gain	none	peak-peak measurement is 5 V ±57 mV.	none	
DC Offset	none	top of waveform vertically centered within ±0.5 divisions	none	
Procedure 6 Bandwidth Limit	none	at 100 MHz limit: 2.45 ns < rise time < 4.55 ns at 20 MHz limit: 12.3 ns < rise time < 22.7 ns	none	✓
Procedure 7 AC Coupling	none	bottom of square wave near center graticule line and waveform centered on screen	none	✓
Procedure 8 DC Balance	none	refer to Table 2-4	none	
Procedure 9 ΔV DC Accuracy	none	within ±0.63%	none	
Procedure 10 DC Offset Accuracy	none	refer to Table 2-6	none	
Procedure 11 Video Pick-off Offset	with input coupling off, the voltage at TP2 is 0 V ±5 mV or less and the voltage at TP4 is 0 V ±5 mV or less	none	CH 1 offset and CH 2 offset are adjusted (with input coupling off) to set the voltage at TP2 is 0 V ±5 mV or less and the voltage at TP4 is 0 V ±5 mV or less	

Table 2-2, Test Equipment, lists recommended test equipment for use in this manual. The Functional Test column of Table 2-2 indicates, with a check mark (✓), the test equipment recommended if you are only performing a functional test. Procedure steps are based on the test equipment examples given, but other equipment with similar specifications may be substituted. Test results, setup information, and related connectors and adapters may be altered if you use different equipment.

Table 2-2 — Test Equipment

Description	Minimum Specification	Examples of Recommended Test Equipment	Functional Test
11000-Series mainframe mainframe that accommodates the amplifiers	11000 Series mainframe that accommodates the amplifier	TEKTRONIX 11401 Digitizing oscilloscope 11402 Digitizing oscilloscope 11402A Digitizing oscilloscope 11403 Digitizing oscilloscope 11403A Digitizing oscilloscope CSA 404 Communications Signal Analyzer DSA 600 Series Digitizing Signal Analyzer with version 2.0 firmware or higher	✓
Power Module	Tektronix four-compartment power module	TEKTRONIX TM 504 Power Module	
Leveled Sine Wave Generators	250 MHz to 1000 MHz, Leveled variable amplitude, 50 kHz or 6 MHz reference	TEKTRONIX SG 504 Leveled Sine Wave Generator with a TM 500-Series Power Module	✓
	260 kHz to 250 MHz, Leveled variable amplitude, 50 kHz or 6 MHz reference	TEKTRONIX SG 503 Leveled Sine Wave Generator with a TM 500-Series Power Module	
Power Supply	Continuously variable from 0-40 V; current limit, adjustable from 0 – 400 mA; 20 V at 400 mA with overcurrent protection	TEKTRONIX PS 503A Dual Power Supply with a TM 500-Series Power Module	✓
DC Voltage Calibrator (optional)	Output, 0–4 V	Data Precision 8200	
Pulser	Amplitude: 250 mV Rise rime: ≤125 ps Aberrations: <1%	TEKTRONIX 067-0681-01 Tunnel diode Calibration Fixture	
Digital Multimeter (w/test leads)	Accuracy ≤0.01%	Fluke 8842A Digital Multimeter	✓

Table 2-2 — Test Equipment (cont)

Description	Minimum Specification	Examples of Recommended Test Equipment	Functional Test
Signal Standardizer	Tektronix Calibration Fixture with interface connector modified for 11000-Series use	TEKTRONIX 067-0587-02 Signal Standardizer	
11K Plug-in Extender		Tektronix Part 067-1261-00	
Calibration Generator	Period, 0.1 ms Amplitude, −60 V Square wave output, 0.25% accuracy, 1-2-5 amplitude selection from 200 μV p-p to 100 p-p, ~1 ms period, fast rise <1 ns	TEKTRONIX PG 506 Calibration Generator with a TM 500-Series Power Module	✓
Coaxial Cable, 36-inch (2 required)	50 Ω, 36-inch male BNC connectors	Tektronix Part 012-0482-00	
Coaxial Cable, 42-inch (2 required)	50 Ω, 42-inch male BNC connectors	Tektronix Part 012-0057-01	✓
Adapter, BNC to Alligator Clips	BNC Female to Clip leads	Tektronix Part 013-0076-00	
Term Conn Link	Shorting strap	Tektronix Part 131-0993-00	
Attenuator, 10X	Impedance: 50 Ω, one male and one female BNC connector	Tektronix Part 011-0059-02	
Adapter, BNC-to-Banana (2 required)	BNC Female-to-Dual Banana Connector	Tektronix Part 103-0090-00	✓
Adapter, T	BNC, T: Two female and one male BNC connector	Tektronix Part 103-0030-00	✓
50 Ω Termination	Impedance: 50 Ω; Accuracy, within 2%; connectors, BNC	Tektronix Part 011-0049-01	
Resistor	430 Ω, 10% tolerance; power rating, 1 W	Tektronix Part 303-0431-00	
Alignment Tool (insulated slot)	Insulated slot	Tektronix Part 003-0675-01	
Magnetic Screwdriver	Holder for Torx tips	Tektronix Part 003-0293-00	

Table 2-2 -- Test Equipment (cont)

Description	Minimum Specification	Examples of Recommended Test Equipment	Functional Test
Torx Screwdriver Tips	#6 tip #7 tip #8 tip #10 tip #10 tip narrow shank #15 tip	Tektronix Part 003-1415-00 Tektronix Part 003-1293-00 Tektronix Part 003-0964-00 Tektronix Part 003-0814-00 Tektronix Part 003-0815-00 Tektronix Part 003-0966-00	
Integrated Circuit Extracting Tools	IC insertion-extraction pliers, 28-pin type	General Tool P/N U505BG or equivalent	
50 to 75 min. loss 2.3X Attenuator	Impedance: In 50 Ω out 75 Ω, one male and one female BNC connector	Tektronix Part 011-0057-01	
Needle-nose pliers			
Tweezers			

Using these Procedures

The first-time user should become familiar with the above information prior to performing the procedures.

At the beginning of each procedure a short narrative describes the purpose of the procedure. The next section, labeled Measurement Limit, gives the proper range for the specification. The Specification section gives the specification to be verified by the procedure. The Setup section provides a figure that shows test equipment setup and connection. The final section, labeled Steps Necessary To Check, lists the steps required to check the video amplifier's specification.

Conventions in this Manual

In these procedures, the following conventions are used:

- CAPITAL letters within the body of text identify front panel controls, indicators, and connectors (for example, MEASURE) on the mainframe and amplifier.
- **Bold** letters identify menu labels, display messages, and commands typed in from a terminal or controller.
- Initial Capital letters identify connectors, controls, and indicators (for example, Position) on associated test equipment. Initial Capital letters also identify adjustments inside the amplifier (for example Vert Pos).

A heading system is used to readily identify the steps that contain performance verification and/or adjustment instructions. For example, if *Check* is the first word in the title of a step, an electrical specification is checked. If *Adjust* appears in the title, the step involves an electrical adjustment. If *Examine* is the first word in the title, the step concerns measurement limits that indicate whether the instrument is operating properly.These limits are not to be interpreted as electrical specifications.

Initial Mainframe Settings

At the beginning of most steps, you are instructed to **Initialize** the instrument as part of the setup. The **Initialize** feature, available through the UTILITY menu, presets all mainframe controls and functions to known values. Initializing the instrument at the beginning of a step eliminates the possibility of settings from previous steps causing erroneous or confusing results. For more information on initialization, refer to the mainframe *User Reference* manual.

Menu Selections and Measurement Techniques

Details on measurement techniques and instructions for making menu selections are generally not included in this procedure. Comprehensive descriptions of menus and instrument features are located in the mainframe *User Reference* manual.

Procedure 1
Initial Setup

Perform the Checks and Adjustment procedure within the ambient temperature range of +18° and +28°C to ensure proper mainframe and 11A34V operation.

Specification

Power on and warm test equipment.

CAUTION

To avoid damage to any of the equipment, set the mainframe ON/STANDBY switch to STANDBY before installing or removing plug-ins.

Turning the mainframe power off during probe calibration, self-calibration, Extended Diagnostics, or other intense system activity may result in some internal data being corrupted. If corruption occurs, refer to Restoring Calibration Data in Section 3.

Steps Necessary for Initial Setup

☐ Step 1: Power on the following test equipment, so that it is warmed up with the mainframe and 11A34V to be tested.

Power supply
Calibration generator
Leveled sine wave generators
Digital multimeter

☐ Step 2: With the ON/STANDBY switch set to STANDBY, connect the mainframe to a suitable power source.

☐ Step 3: Install a signal standardizer in the Center plug-in compartment and the 11A34V in the Left plug-in compartment. If you are performing a functional test, it is not necessary to install the signal standardizer.

☐ Step 4: Set the front panel ON/STANDBY switch to ON.

☐ Step 5: Allow the equipment to warm up for 20 minutes before continuing.

Procedure 2
Enhanced Accuracy

This procedure shows the setup and lists the steps necessary to check the Enhanced Accuracy state of the mainframe. Its purpose is to verify that the Enhanced Accuracy state can be achieved by the mainframe. When the mainframe has achieved Enhanced Accuracy, the symbol (**EA**) will be displayed The mainframe stores both the time of calibration and ambient temperature for use in maintaining the Enhanced Accuracy state.

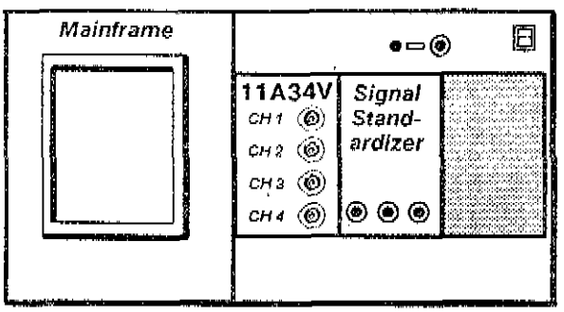
For more information about the Enhanced Accuracy state, see Enhanced Accuracy in your mainframe *User Reference* manual.

To verify the Enhanced Accuracy state, check the DC measurement accuracy of the amplifier and mainframe system, apply and monitor test voltages, then compare these test voltages with the measurements made on the screen.

Specification

When invoked, the Enhanced Accuracy self-calibration executes successfully.

Setup to Check Enhanced Accuracy



Steps Necessary to Check Enhanced Accuracy

☐ Step 1: **Initialize** the mainframe's settings.

Left plug-in ..... no setting changes
Mainframe ..... no setting changes
Signal standardizer ..... not used in this part

☐ Step 2: Twenty minutes after power-on, the mainframe must recalibrate its to achieve the Enhanced Accuracy state. Press the ENHANCED ACCURAC button. A prompt then appears on the display. Press the ENHANCED ACCURACY button again. Enhanced Accuracy is achieved after a couple o minutes.

CAUTION

Turning the mainframe's power off during Enhanced Accuracy testing may result in losing some of the non-volatile RAM data. This could cause diagnostic errors at the next power-up, and cause the mainframe to operate unpredictably. If this occurs, refer to your mainframe's Service Reference manual for instructions on restoring calibration data.

☐ Step 3: *Check* that the message, **Enhanced Accuracy in Progress** (indicating that the mainframe is attempting to achieve Enhanced Accuracy) appears.

☐ Step 4: *Check* that the message, **Enhanced Accuracy completed and passed** or **Self calibration completed successfully** appears. This indicates that the Enhanced Accuracy state has been achieved. The EA indicator appears on the display when Enhanced Accuracy is active.

Procedure 3 High Frequency Response

This procedure describes the setup and lists the steps necessary to check the 11A34V system high frequency response. It is divided into two parts, a functional test and a performance verification procedure.

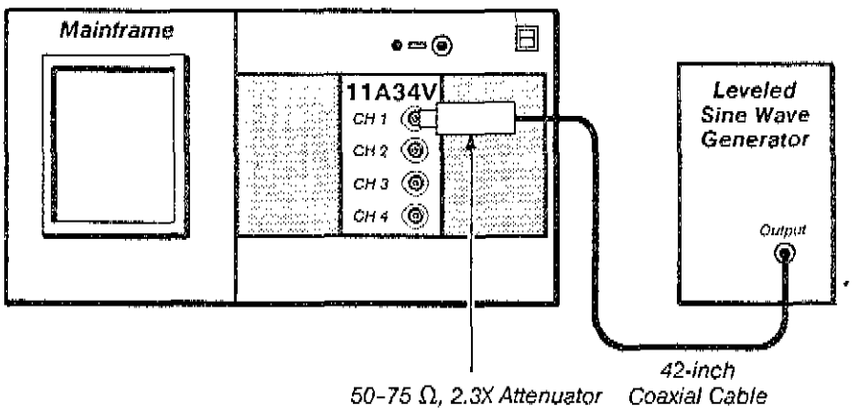
Functional Test

This procedure describes the setup and lists the steps necessary to perform a functional test of the 11A34V bandwidth.

Specification

A peak-peak measurement ≥848 mV.

Setup to Check Amplifier Bandwidth: Functional Test Procedure



Steps Necessary to Check Amplifier Bandwidth: Functional Test Procedure

☐ Step 1: First **Initialize** the mainframe's settings.

☐ Step 2: Perform the following settings in the order listed:

Amplifier
CH 1 Display on/off ..... on
Leveled sine wave generator
Frequency ..... Ref (6 MHz)
Mainframe
Impedance ..... 75 Ω
Vert Size ..... 200 mV/div
Main Size ..... 100 ns/div

☐ Step 3: Select the **Peak-Peak** measurement to measure the peak-to-peak amplitude of the waveform.

☐ Step 4: Set the leveled sine wave generator for 1.2 V peak-to-peak.

☐ Step 5: Set the leveled sine wave generator Frequency control to 300 MHz.

☐ Step 6: Set the **Main Size** to 2 ns/div.

☐ Step 7: *Check* that the measurement is at least 848 mV (70.7% of Step 3).

☐ Step 8: Set the CH 1 display on/off button to off.

☐ Step 9: Move the coaxial cable and 50-75 Ω, Min Loss Pad to the CH 2 input.

☐ Step 10: Perform the Steps 2 to 9 for the remaining channels.

Performance Verification (Optional)

This procedure describes the setup and lists the steps necessary to check the mainframe and 11A34V system high frequency response. Its purpose is to check the mainframe high frequency response, the 11A34V step response, and the 11A34V bandwidth. The 11A34V high frequency peaking is checked to verify that the bandwidth is adequate and the aberrations are not excessive.

A plug-in signal standardizer provides a reference waveform to characterize the mainframe high frequency response. Mainframe aberrations are displayed at 2% per division. Amplitude is measured at specification frequencies.

A step response waveform is recorded then compared with the Mainframe High Frequency Response waveform. This will to determine the 11A34V contribution to any aberrations.

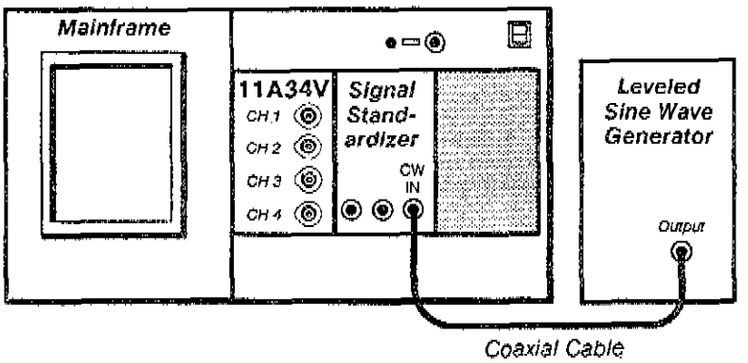
Measurement Limits

The difference between the two waveform aberrations should not exceed +4.5% and -6% peak (2.25 and 3 divisions) and 8% (4 divisions) peak-to-peak. (One major graticule division = 2%.)

Specification (Performance Verification)

Refer to Table 2-3 for the bandwidth specifications.

Setup to Examine Mainframe High Frequency Response



Steps Necessary to Check Mainframe High Frequency Response

☐ Step 1: First **Initialize** the mainframe's settings, then perform the following settings in the order listed:

Mainframe

UTILITY major menu ..... **Instrument Options** or **Modes** **Waveform Scaling (Forced)**

Def Wfm ..... **C** (center)

TRIGGER major menu ..... **Source Desc**

Main Trigger Source Description pop-up menu ..... **C** (center)

Left plug-in ..... not used in this procedure

Signal standardizer

Test ..... Vert or Horiz + Step Resp

Rep Rate ..... 100 kHz

Position ..... 12 o'clock

Amplitude ..... 9 o'clock

Mainframe

Main Size ..... 2 ns/div

Trig Level 40%

Main Pos ..... position positive pulse transition one division from left edge of graticule

Acquire Desc pop-up menu

Average N ..... **On**

Set Avg N **8**

Signal standardizer

Amplitude ..... 5-division vertical step

Mainframe

Vert Offset: Wfm ..... position top of step on center horizontal graticule line

Vert Size: Wfm ..... 100 mV

Leveled sine wave generator
Frequency ..... Ref

☐ Step 2: Record the displayed waveform on graph paper or make a hardcopy of the display. This waveform is used in the Procedure to Examine/Adjust Amplifier Step Response for comparison against the amplifier step response.

☐ Step 3: Set **Average N** to **Off**. Set **Main Size** to 200 ns/div (for 6 MHz Ref).

☐ Step 4: Set the signal standardizer Test switch to Vert or Horiz Freq Resp.

☐ Step 5: Set the leveled sine wave generator output amplitude so that the signal standardizer CW Leveled light is on. Ensure that the light remains on throughout the following steps. The reference frequency must be between 50 kHz and 6 MHz.

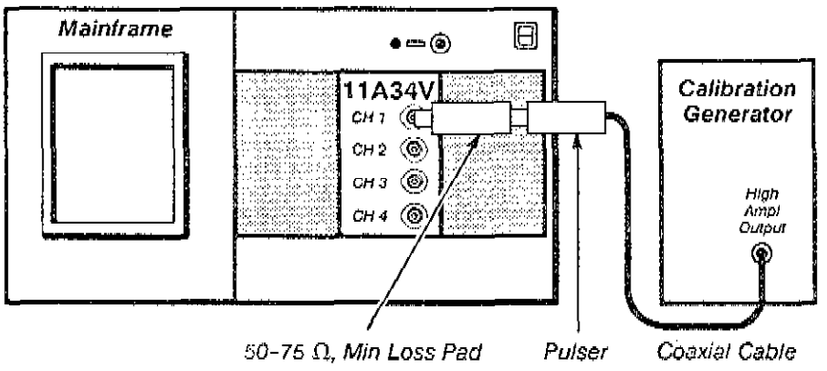
☐ Step 6: Set the signal standardizer Position and Amplitude for a 6-division display amplitude, centered on the screen.

☐ Step 7: Set the leveled sine wave generator frequency to 300 MHz, and record the Displayed Amplitude in line 2 on a copy of Table 2-3. This data is used in the Procedure to Check Amplifier Bandwidth for calculating the amplifier bandwidth

☐ Step 8: Set the mainframe ON/STANDBY switch to STANDBY.

☐ Step 9: Remove the signal standardizer from the Center plug-in compartment. Remove the amplifier from the Left plug-in compartment and install it in the Center plug-in compartment.

Setup to Examine/Adjust Amplifier Step Response (A1R1027, A1R1029, A1R1041, A1R1045)



Procedure to Examine/Adjust Amplifier Step Response (A1R1027, A1R1029, A1R1041, A1R1045)

☐ Step 1: Perform the following settings in the order listed:

- Remove the left side cover from the amplifier.
- Insert the amplifier into the mainframe Center plug-in compartment.
- Connect the 50 to 75 Ω, Min Loss Pad to CH 1 input connector.
- Connect the pulser to the 50 to 75 Ω, Min Loss Pad.
- Connect a 50 Ω coaxial cable from the calibration generator High Ampl Output connector to the pulser.

Calibration generator
- Function switch ..... High Ampl
- Period ..... 0.1 ms
- Pulse Amplitude ..... Max

Pulser
- TD Triggered Level ..... fully clockwise

Mainframe
- ON/STANDBY switch ..... ON
- Wait for calibration cycle to complete
- UTILITY major menu ..... **Initialize**
- UTILITY major menu ..... **Instrument Options** or **Modes** **Waveform Scaling (Forced)**

Center plug-in
- CH 1 Display on/off ..... on

Mainframe
- **Vert Size** ..... 20 mV/div
- **Impedance** ..... 75 Ω
- **Main Size** ..... 1 µs/div
- **Vert Offset** ..... position top of step 2.5 divisions above the center horizontal graticule line
- **Main Pos** ..... position positive-going edge to first graticule line from left edge of graticule

Pulser
- TD Triggered Level ..... rotate control counterclockwise until the step disappears, then rotate clockwise just enough to obtain a step

Mainframe
- **Main Size** ..... 2 ns/div
- **Main Pos** ..... position positive-going edge between the first and second graticule lines from the left edge of the graticule

Acquire Desc pop-up menu
- **Average N** ..... **On**
- **Set Avg N** 8

Vertical icon . . . . . select
Vert Size . . . . . Set for fine knob resolution and adjust for a 5-division step amplitude display
Vert Offset . . . . . vertically position right side of trace to the center horizontal graticule line
Vert Size . . . . . use numeric entry to set readout for 10% of present readout (~3.1 mV/div)
Vert Offset . . . . . vertically position right side of trace to the center horizontal graticule line

☐ Step 2: *Examine* the displayed waveform with the waveform recorded in the previous Procedure to Examine Mainframe Step Response and examine the amplifier's contribution for aberrations within +4.5%, -6% peak (+2.25, -3.0 divisions) and 8% peak-to-peak (4 divisions). (You can use cursors to measure this amplitude.)

STOP

DO NOT attempt to optimize the aberrations if they are within the stated limits. Proceed to Step 4.

☐ Step 3: *Adjust* HF1, R1027 on the A1 Main board, so that the CH 1 aberrations are within +4.5%, -6% peak (+2.25, -3.0 divisions) and 8% peak-to-peak (4 divisions). Refer to Figure 2-1 for adjustment locations.

☐ Step 4: Remove the displayed waveform.

☐ Step 5: Move the 50–75 Ω Min Loss Pad to the CH 2 input connector. Then, repeat Step 1 beginning at the Center plug-in settings and proceeding through Steps 2, 3, and 4 (the adjustment is performed using the HF2 adjustment, R1029).

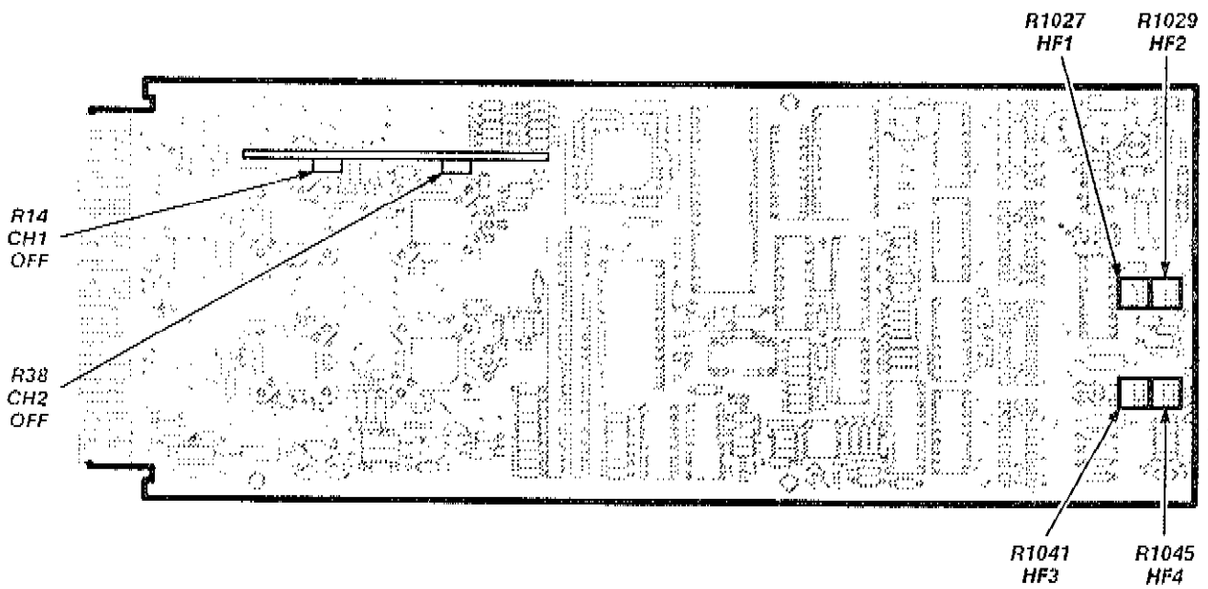
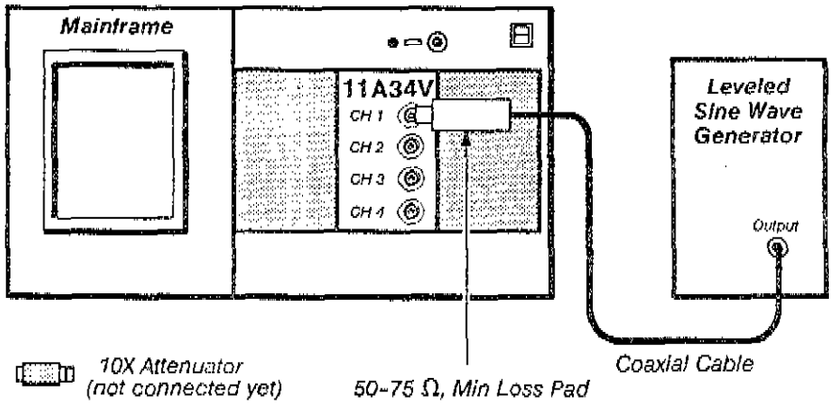


Figure 2-1 — A1 Main Board Adjustment Locations

☐ Step 6: Move the 50-75 Ω Min Loss Pad to the CH 3 input connector. The repeat Step 1 beginning at the Center plug-in settings and proceeding through Steps 2, 3, and 4 (the adjustment is performed using the HF3 adjustment, R1041).

☐ Step 7: Move the 50-75 Ω Min Loss Pad to the CH 4 input connector. The repeat Step 1 beginning at the Center plug-in settings and proceeding through Steps 2, 3, and 4 (the adjustment is performed using the HF4 adjustment, R1043).

Setup to Check Amplifier Bandwidth: Performance Verification Procedure



Steps Necessary to Check Amplifier Bandwidth: Performance Verification Pr cedure

☐ Step 1: First **Initialize** the mainframe's settings.

☐ Step 2: Perform the following settings in the order listed:

Center plug-in
- CH1 Display on/off ..... on

Mainframe
- **Main Size** (for 6 MHz Ref) ..... 200 ns/div
- **Impedance** ..... **75 Ω**
- **Vert Size** ..... 50 mV/div

Leveled sine wave generator
- Amplitude ..... 2 V p-p displayed
- Frequency ..... Ref

If the leveled sine wave generator has a remote leveling head, then you must connect it to the 50-75 Ω Min Loss Pad without additional coaxial cables.

If the leveled sine wave generator is not equipped with internal attenuators, the use the 10X attenuator between the leveling head (if used) and the 50-75 Ω, M Loss Pad when setting amplitude.

☐ Step 3: Set the leveled sine wave generator amplitude (ref freq) to 300 mV (6 div) using peak-to-peak measurements.

☐ Step 4: Set the leveled sine wave generator to 300 MHz.

☐ Step 5: Record the Peak-Peak measurement in line 5.

☐ Step 6: *Check* that the computed value $\geq$0.777.

If there are any failures, then the step response must be readjusted, so that the Measurement Limits for step response aberrations and the Specifications for bandwidth are both met.

☐ Step 7: Repeat for all channels.

***Table 2-3** — 11A34 Bandwidth*

Configuration	Characteristic		Value
Mainframe with Standardizer	Displayed Amplitude/div		_____ (2)
Mainframe with Amplifier	Vertical Size		50 mV/div
	Reference Amplitude		300 mV
	Displayed Amplitude/div	CH 1	_____ (5)
		CH 2	_____ (6)
		CH 3	_____ (7)
		CH 4	_____ (8)
Amplifier Only	Calculated Amplitude	CH 1 0.02 × line (5) ÷ line (2)	_____$\geq$0.777
		CH 2 0.02 × line (6) ÷ line (2)	_____$\geq$0.777
		CH 3 0.02 × line (7) ÷ line (2)	_____$\geq$0.777
		CH 4 0.02 × line (8) ÷ line (2)	_____$\geq$0.777
		Example: $\frac{0.02 \times 260}{5.8} = 0.896$	

Procedure 4
Input Resistance

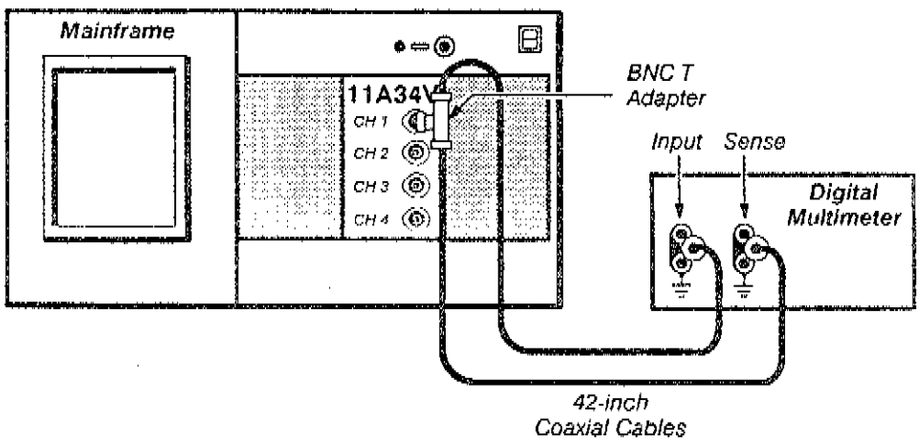
This procedure describes the setup and lists the steps necessary to check input resistance.

Specifications

The specifications for this part are as follows:

- Impedance resistance is 1 MΩ within ±0.5%.
- Impedance resistance is 75 Ω within ±0.5%.

Setup to Check Input Resistance



Steps Necessary to Check Input Resistance

☐ Step 1: First **Initialize** the mainframe's settings, then perform the following settings in the order listed:

Mainframe ..... no setting changes
Digital multimeter (DMM)
Resistance mode 4-Wire

☐ Step 2: Set the CH 1 display to on.

☐ Step 3: *Check* that the input resistance is 1 MΩ within ±5 kΩ.

☐ Step 4: Set CH 1 **Impedance** to **75 Ω**.

☐ Step 5: *Check* that input resistance is 75 Ω within ±0.375 Ω.

☐ Step 6: Set the CH 1 display to off.

☐ Step 7: Repeat Steps 2 through 6 for the remaining input channels.

Procedure 5
Vertical Accuracy

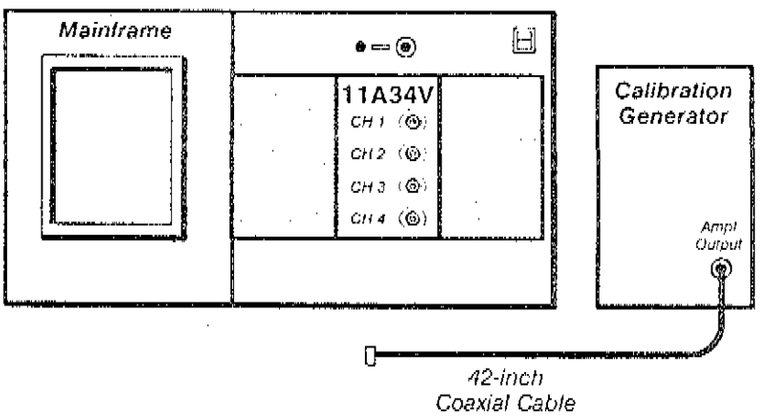
This procedure describes the setup and lists the steps necessary to check vertical accuracy.

Specifications

The specifications for this part are as follows:

- DC balance so that trace is within ±0.2 divisions of center from 5 mV through 10 V; and ±1 division of center from 1 mV to 2 mV.
- Peak-Peak measurement of 5 V ±57 mV for the 11400/DSA 600 Series.
- DC offset so that the top of the waveform is vertically centered within ±0.5 division.

Setup to Check Vertical Accuracy



Steps Necessary to Check Vertical Accuracy

☐ Step 1: First **Initialize** the mainframe's settings, then perform the following settings in the order listed:

Amplifier
- CH 1 Display on/off ..... on

Calibration generator
- Mode ..... Std Ampl
- Amplitude Output ..... 5 V

Mainframe
- **Main Size** or HORIZONTAL SIZE ..... 100 µs/div
- **Average N** ..... **On**

Check DC Balance – by performing Step 2.

☐ Step 2: *Check* the Vertical Size to each position from 10 V through 5 mV a observe that the trace stays within ±0.2 divisions of center. Then, set the Vertical Size to 2 mV and 1 mV and observe that the trace stays centered within ±1 division.

Check Gain – by performing Steps 3 through 7.

☐ Step 3: Connect the calibration generator output to the CH 1 input using t 42-inch coaxial cable.

☐ Step 4: Set the **Vert Size** to 1 V/div.

☐ Step 5: Set the **Vert Offset** to +2.5 V.

☐ Step 6: Select the **Peak-Peak** measurement, to measure the peak-to-pea amplitude of the waveform.

☐ Step 7: *Check* that the measurement is 5 V, plus or minus 57 mV.

Check Offset – by performing steps 8 through 11.

☐ Step 8: Set the **Vert Offset** to 5 V.

☐ Step 9: Set the **Vert Size** to 100 mV/div.

☐ Step 10: *Check* that the top of the waveform is vertically centered within ±0.5 divisions.

☐ Step 11: Repeat the Steps 1 through 10 for the remaining channels.

Procedure 6 Bandwidth Limit

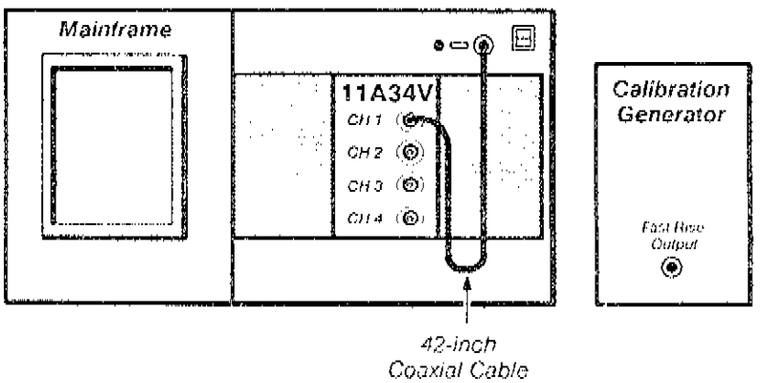
This procedure describes the setup and lists the steps necessary to check rise time.

Specifications

The specifications for this part are as follows:

- At a bandwidth limit of 100 MHz, rise time is between 2.45 and 4.55 ns.
- At a bandwidth limit of 20 MHz, rise time is between 12.3 and 22.7 ns.

Setup to Check Bandwidth Limit



Steps Necessary to Check Bandwidth Limit

☐ Step 1: First **Initialize** the mainframe's settings, then perform the following settings in the order listed:

Amplifier
- CH 1 Display on/off ..... on

Calibration generator
- Period ..... 1 µs
- Mode ..... Fast Rise

Mainframe
- **Main Size** or HORIZONTAL SIZE ..... 5 ns/div
- **Main Pos** or HORIZONTAL POSITION ..... -25.5 ns

☐ Step 2: Calibrate all input channels by connecting each channel to the CALIBRATOR with the 42-inch coaxial cable and selecting the **Probes** function in the UTILITY major menu.

☐ Step 3: Connect the calibration generator Fast Rise output (rising edge) to CH 1 with the 42-inch coaxial cable.

☐ Step 4: Set the **Impedance** to 75 Ω.

☐ Step 5: Set the **Vert Size** or VERTICAL SIZE to 100 mV/div.

- ☐ Step 6: Set the **Vert Offset** or VERTICAL OFFSET to –250 mV.
- ☐ Step 7: Set the calibration generator Amplitude to approximately 5 divisions.
- ☐ Step 8: Select 100 MHz bandwidth limit.
- ☐ Step 9: Select the **Rise Time** measurement.
- ☐ Step 10: *Check* that the rise time is between 2.45 and 4.55 ns.
- ☐ Step 11: Set the bandwidth limit to 20 MHz.
- ☐ Step 12: *Check* that the rise time is between 12.3 and 22.7 ns.
- ☐ Step 13: Set the input channel display to off.
- ☐ Step 14: Set the next channel's display on/off to on.
- ☐ Step 15: Repeat Steps 3 through 14 for the remaining channels.

Procedure 7
AC Coupling

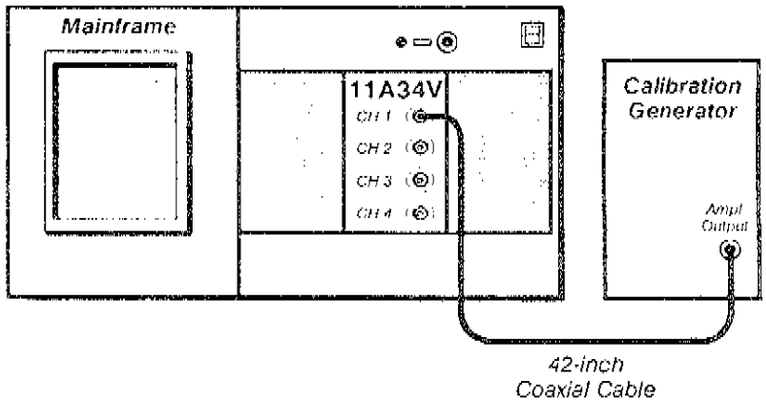
This procedure describes the setup and lists the steps necessary to check AC coupling.

Specifications

The specifications for this part are as follows:

- Bottom of square wave is near the bottom graticule line.
- The waveform is approximately centered on the screen.

Setup to Check AC Coupling



Steps Necessary to Check AC Coupling

☐ Step 1: **Initialize** the mainframe's settings.

☐ Step 2: Perform the following settings in the order listed:

Amplifier
- CH 1 Display on/off ..... on

Calibration generator
- Mode ..... Std Ampl
- Amplitude ..... 5 V

Mainframe
- **Impedance** ..... 75 Ω
- **Vert Size** or VERTICAL SIZE ..... 500 mV/div
- **Main Size** or HORIZONTAL SIZE ..... 100 µs/div

☐ Step 3: *Check* that the bottom of the square wave is near the center graticule line.

☐ Step 4: Select AC Coupling for the CH 1 input.

☐ Step 5: *Check* that the waveform is approximately centered on the screen (duty cycle will cause some variation).

- ☐ Step 6: Set the CH 1 display on/off to off.
- ☐ Step 7: Move coaxial cable to the CH 2 input and set its display on/off to on.
- ☐ Step 8: Repeat Steps 2 through 7 for the remaining channels.

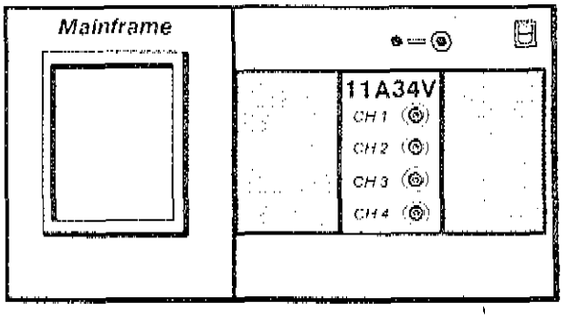
Procedure 8
DC Balance

The purpose of this procedure is to confirm that DC balance can be accomplished accurately. This procedure must be performed immediately after Enhanced Accuracy calibration. The position of the displayed trace with no input signal applied is examined.

Specifications

Refer to Table 2-4.

Setup to Check DC Balance



Steps Necessary to Check DC Balance

☐ Step 1: First **Initialize** the mainframe's settings, then perform the following settings in the order listed.

Center plug-in

CH 1 Display on/off ..... on

Mainframe

Vert Size or VERTICAL SIZE ..... 5 V/div

BW Limit or **HF Limit** ..... **20 MHz**

Impedance ..... 75 Ω

☐ Step 2: *Check* that the displayed trace position is at the center graticule line within the value Shift listed in Table 2-4 for each Vert Size setting.

Set **Average N** to **On** and use **Mean (whole zone)** in the **Measurement** pop-up menu to help measure the trace position.

Repeat Step 2 for each channel.

Table 2-4 — 11A34V Amplifier DC Balance

Vert Size	11400 Series or DSA 600 Series Shift (± div)	(± mV)
5 V/div	0.065	330
0.5 V/div	0.065	33
50 mV/div	0.065	3.3

Procedure 9
ΔV DC Accuracy

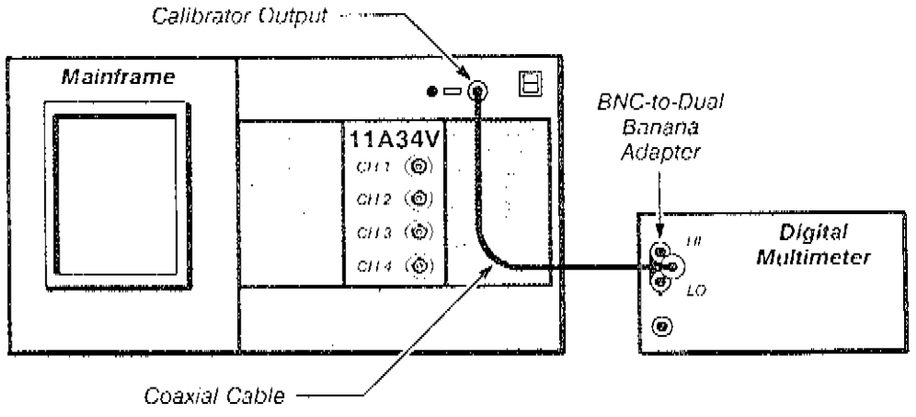
This procedure shows the setup and lists the steps necessary to check ΔV DC Accuracy. Its purpose is to confirm that the 11A34V can be accurately calibrated. Check ΔV DC Accuracy immediately after an Enhanced Accuracy calibration.

Before checking ΔV DC Accuracy you must characterize your mainframe by using the following procedure that corresponds to your mainframe series.

Specification

ΔV DC Accuracy within ±0.63%.

Setup to Characterize the Mainframe



Steps Necessary to Characterize the 11400-Series Mainframe

☐ Step 1: Set the following parameters:

Center plug-in ..... no setting changes
Digital multimeter (DMM)
Mode ..... DC
Range ..... Auto (Range 10 V)
Mainframe
UTILITY major menu ..... **Extended Diagnostics**
Subsystem ..... **Digitizer**
Block ..... **Points Acq**
Area ..... **FP Cal Refs**
Routine ..... **FP –10.000 V**
Run ..... touch

☐ Step 2: Record the DMM absolute value.

☐ Step 3: Press **Exit**.

☐ Step 4: Press **FP + 9.9951 V**.

☐ Step 5: Press **Run**.

☐ Step 6: Record the DMM reading.

☐ Step 7: Press **Exit**.

☐ Step 8: Press **Exit Diagnostics.**

☐ Step 9: Add the DMM absolute values of the readings obtained in Steps 2 and 6. Divide the result by 19.9951 V to obtain the mainframe's calibration voltage reference characterization factor.

Steps Necessary to Characterize the DSA 600 Series Mainframe

☐ Step 1: Set the following parameters:

Center plug-in ..... no setting changes
Digital multimeter (DMM)
Mode ..... DC
Range ..... Auto (Range 10 V)
Mainframe
UTILITY major menu ..... Calibrator
Frequency ..... **DC**
Adjust Amplitude ..... Adjust amplitude to −10 V

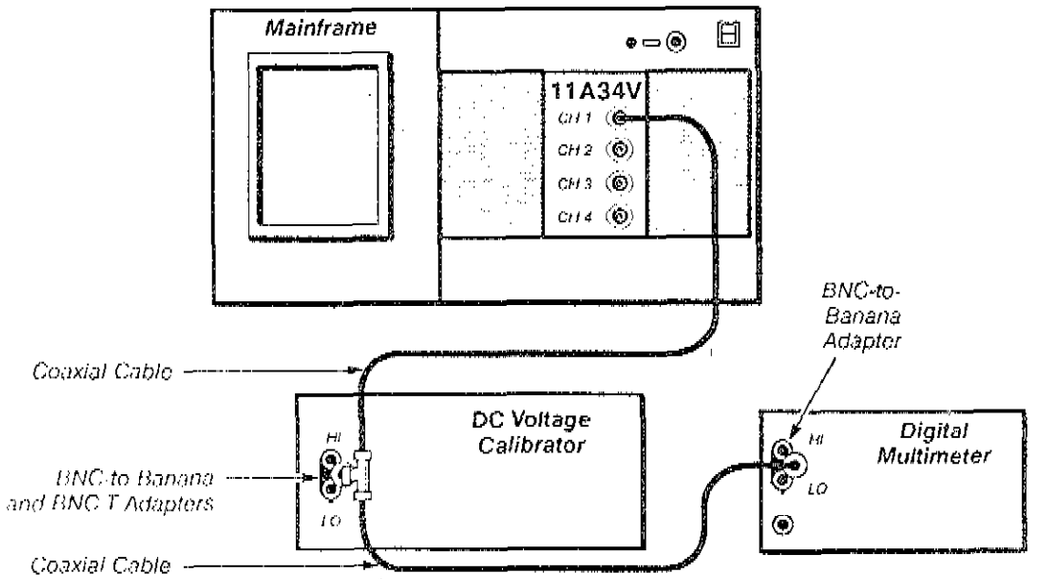
☐ Step 2: Record the DMM absolute value.

☐ Step 3: Adjust Amplitude to +9.9951 V.

☐ Step 4: Record the DMM absolute value.

☐ Step 5: Add the DMM absolute values of the readings obtained in Steps 2 and 4. Divide the result by 19.9951 V to obtain the mainframe calibration voltage reference characterization factor.

Setup to Check the 11A34V ΔV DC Accuracy



Steps Necessary to Check the 11A34V ΔV DC Accuracy

☐ Step 1: First **Initialize** the mainframe settings, then perform the following settings in the order listed.

Center plug-in
- CH 1 Display on/off ..... on

Mainframe
- WAVEFORM major menu
  - **BW Limit** (11400) ..... **20 MHz**
  - **Input Parameters** (DSA 600) ..... touch
    - **Bandwidth** ..... **20 MHz**
    - **Acquire Desc** pop-up menu
      - **Average N** ..... **On**

DC Voltage Calibrator
- On/Standby ..... on
- 50 Ω Override ..... on

If the environment is electrically noisy, connect a capacitor (at least 0.1 μF) across the input terminals of the DC Voltage Calibrator.

☐ Step 2: Press the Enhanced Accuracy button twice to initiate Enhanced Accuracy calibration and ensure peak performance of the system.

Immediately after self-calibration has completed and passed, perform this procedure for each channel.

☐ Step 3: Select the **Mean** measurement in the MEASURE major menu, and set the **Data Interval** to **Whole Zone** in the **Mean** pop-up menu.

☐ Step 4: Set **Compare** to **On**. For the 11400 Series, select **Stat, Comp, & Def** in the MEASURE major menu, and then select **Compare Options**. For the DSA600 Series, select the second page of the MEASURE major menu, then select **Compare & Defaults**.

☐ Step 5: Set **Vert Size** to the first Vertical Size entry in Table 2-5. Fine knob resolution will be required to select the 49.8 and 23 mV settings.

☐ Step 6: Set the DC Voltage Calibrator polarity to minus (-), then set its output level to the appropriate Deflection Volts setting from Table 2-5.

☐ Step 7: Save the current **Mean** measurement as the reference value in the menu that you used to set Compare on in Step 4.

☐ Step 8: Set the DC Voltage Calibrator polarity to plus (+), leaving its output level set to the Deflection Volts setting used in Step 6.

☐ Step 9: Clear the waveform data by selecting **Remove/Clr Waveform**, then selecting **Clear** waveform name (wfm 1) in the pop-up menu. This will restart waveform averaging and give a measurement based on the new input signal

☐ Step 10: Now calculate the difference between the delta-mean value and the combined applied signal levels to get the ΔVDC error:

Read the current Δ**Mean** measurement.

Divide the Δ**Mean** value by the mainframe characterization factor that you determined earlier in this procedure.

Subtract from this value, 2 times the present Deflection Volts setting to obtain the ΔV DC error.

☐ Step 11: *Check* that the ΔV DC error obtained in Step 10 is within the Error Limits given in Table 2-5.

☐ Step 12: Repeat Steps 5 through 11 for all Vertical Size settings listed in Table 2-5.

Table 2-5 — 11A34V ΔV DC Accuracy Error Limits

Vertical Size	Deflection Volts	Error Limits (±V)
1 V/div	4 V	50.4 mV
100 mV/div	400 mV	5.04 mV
50 mV/div	200 mV	2.52 mV
49.8 mV/div (Fine res)	200 mV	2.52 mV
23 mV/div (Fine res)	92 mV	1.159 mV
20 mV/div	80 mV	1.008 mV
10 mV/div	40 mV	.504 mV
5 mV/div	20 mV	.252 mV
2 mV/div	8 mV	.101 mV
1 mV/div	4 mV	.050 mV

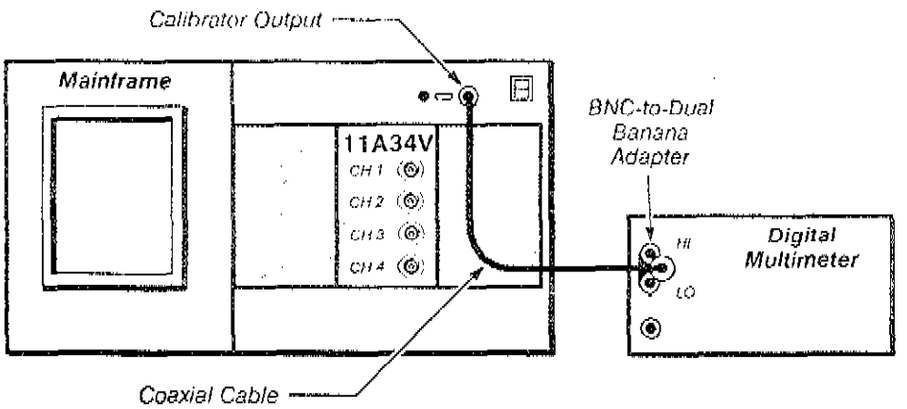
Procedure 10
DC Offset Accuracy

This procedure shows the setup and lists the steps necessary to check DC Offset. Its purpose is to confirm that the amplifier can be accurately calibrated. This procedure does not test the mainframe calibration voltage reference accuracy or long term stability. Therefore, before checking DC Offset Accuracy you must characterize your mainframe by using the procedure corresponding to your series of mainframe. Check DC Offset Accuracy immediately after an Enhanced Accuracy calibration.

Specifications

Refer to Table 2-6.

Setup to Characterize the 11400 or DSA 600 Series Mainframe



Steps Necessary to Characterize the 11400 Series Mainframe

This characterization procedure is identical to that performed in Procedure 10. You can use the mainframe calibration voltage reference characterization factor computed in Procedure 10 for the verification portion of this procedure.

☐ Step 1: Perform the following settings:

Center plug-in ..... no setting changes
Digital multimeter (DMM)
  Mode ..... DC
  Range ..... Auto
Mainframe
  UTILITY major menu ..... **Extended Diagnostic**
    Subsystem ..... **Digitizer**
    Block ..... **Points Acq**
    Area ..... **FP Cal Refs**
    Routine ..... **FP –10.000 V**
    Run ..... touch

☐ Step 2: Record the DMM absolute value.

☐ Step 3: Press **Exit**.

☐ Step 4: Press FP + **9.9951 V**.

☐ Step 5: Press **Run**.

☐ Step 6: Record the DMM reading.

☐ Step 7: Press **Exit**.

☐ Step 8: Press **Exit Diagnostics**.

☐ Step 9: Add the absolute values of the DMM readings obtained in Steps 2 and 6. Divide the result by 19.9951 V to obtain the mainframe's calibration voltage reference characterization factor (which is used in the Procedure to Test the Amplifier).

Steps Necessary to Characterize the DSA 600 Series Mainframe

☐ Step 1: Set the following parameters:

Center plug-in ..... no setting changes
Mainframe
UTILITY major menu ..... Calibrator
Frequency ..... **DC**
Adjust Amplitude ..... Adjust amplitude to −10 V
Digital multimeter (DMM)
Mode ..... DC
Range ..... Auto

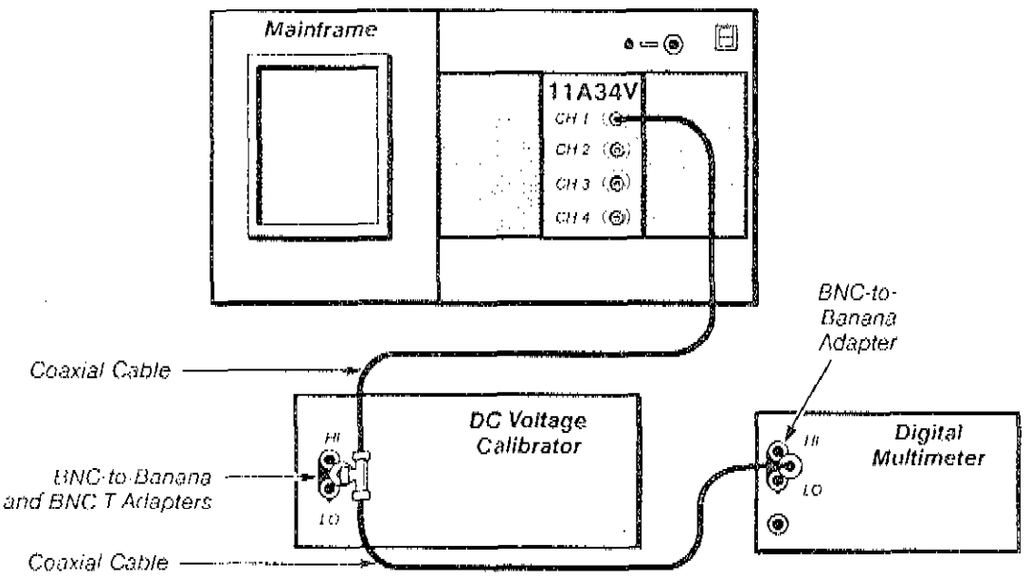
☐ Step 2: Record the DMM absolute value.

☐ Step 3: Adjust Amplitude to +9.9951V.

☐ Step 4: Record the DMM reading.

☐ Step 5: Add the DMM absolute values of the readings obtained in Steps 2 and 4. Divide the result by 19.9951 V to obtain the mainframe calibration voltage reference characterization factor.

Setup to Check the 11A34V DC Offset Accuracy



Steps Necessary to Check the 11A34V DC Offset Accuracy

☐ Step 1: First **Initialize** the mainframe settings, then perform the following settings in the order listed:

DC Voltage Calibrator
- On/Standby . . . . . on
- 50 Ω Override . . . . . on
- Output Level . . . . . 0 V

Center plug-in
- CH 1 Display on/off . . . . . on

Mainframe
- WAVEFORM major menu
  - **(11400)) BW Limit** . . . . . **20 MHz**
  - **(DSA600) Input Parameters** . . . . . touch
    - **Bandwidth** . . . . . **20 MHz**
  - **Acquire Desc** pop-up menu
    - **Average N** . . . . . **On**

If the environment is electrically noisy, connect a capacitor (at least 0.1 μF) across the input terminals of the DC Voltage Calibrator.

☐ Step 2: Press the Enhanced Accuracy button twice. Immediately after self-calibration has completed and passed, perform this procedure for each channel.

☐ Step 3: Select the **Mean** measurement in the MEASURE major menu, and set the **Data Interval** to **Whole Zone** in the **Mean** pop-up menu.

☐ Step 4: Set **Compare** to **On**. For the 11400 Series, select **Stat, Comp, & Def** in the MEASURE major menu, and then select **Compare Options**. For the DSA600 Series, select the second page of the MEASURE major menu, then select **Compare & Defaults**.

☐ Step 5: Save the current **ΔMean** measurement as the reference value in the menu in which you set Compare to on in Step 4.

☐ Step 6: Set **Vert Size** to 1 mV/div.

☐ Step 7: Set **Vert Offset** to 1 V.

☐ Step 8: Set the DC Voltage Calibrator to the current Vertical Offset divided by the characterization-factor which you computed earlier in this procedure.

☐ Step 9: Clear the waveform data by selecting **Remove/Clr Waveform**, then selecting **Clear** waveform name (wfm 1) in the pop-up menu. This will restart waveform averaging and give a measurement based on the new input signal.

☐ Step 10: Read the **ΔMean** measurement after it has stabilized. Subtract the Vertical Offset set in Step 7 from the current **ΔMean** reading to get the DC Offset error.

☐ Step 11: *Check* that the DC Offset error obtained in Step 10 is less than the Error Limit shown in Table 2-6.

☐ Step 12: Repeat Steps 1 through 12 for each Channel.

Table 2-6 — 11A34V Video Amplifier DC Offset Accuracy

Vertical Size	Vertical Offset	Error Limit (±Volts)
1 mV/div	1 V	2.0 mV

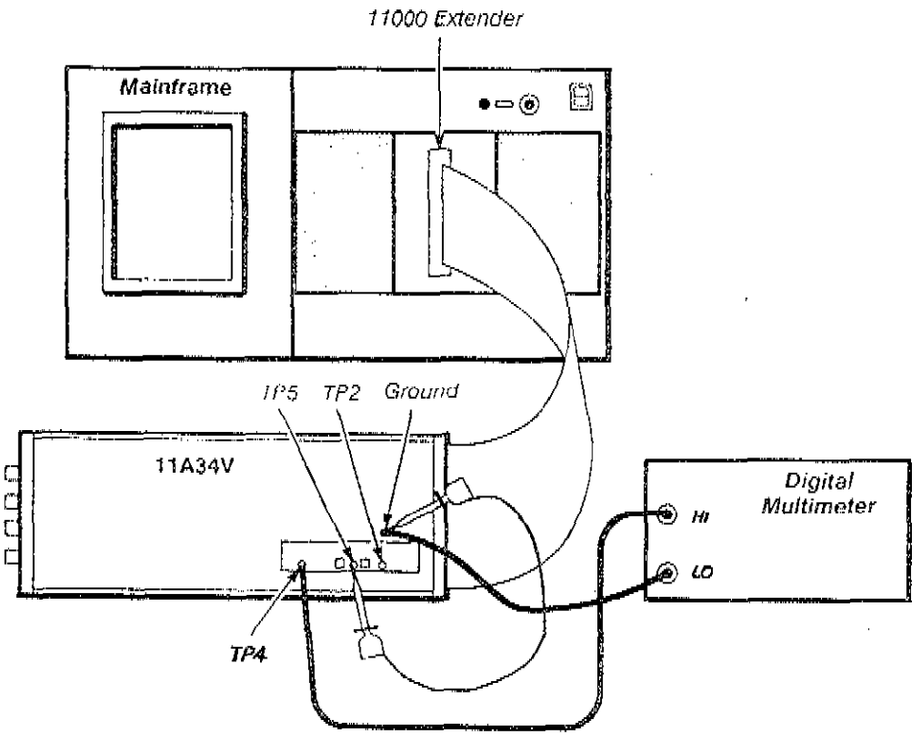
Procedure 11 Video Pick-off Offset Adjust

This procedure shows how to check and adjust the video pick-off offset.

Specifications

- Voltage between test point 2 (TP2) and ground 0 V ±5 mV.
- Voltage between test point 4 (TP4) and ground 0 V ±5 mV.

Setup to Check Video Pick-off Adjust



Steps Necessary to Check Video Pick-off Adjust

☐ Step 1: Remove the left side-panel of the 11A34V. Use an 11000 extender to connect the 11A34V to the mainframe.

☐ Step 2: Initialize the mainframe's settings and perform the following settings in the order listed:

Amplifier

CH 1 coupling . . . . . off

CH 2 coupling . . . . . off

Digital multimeter (DMM)

Mode . . . . . DC

Range . . . . . 200 mV

- ☐ Step 3: Connect clip lead between TP5 and ground.
- ☐ Step 4: Measure the voltage between TP2 and ground with the DMM.
- ☐ Step 5: *Check* that reading is 0 V ±5 mV or less. If it is, skip the next ste
- ☐ Step 6: *Adjust* R14, CH 1 OFFSET until the voltage between TP2 and gro is within ±5 mV of 0 V.
- ☐ Step 7: Measure the voltage between TP4 and ground with the DMM.
- ☐ Step 8: *Check* that reading is 0 V ±5 mV or less. If it is, skip the next ste
- ☐ Step 9: *Adjust* R38, CH 2 OFFSET until voltage between TP4 and ground within ±5 mV of 0 V.
- ☐ Step 10: Remove grounding lead from TP5.