DDB DIGEST / 7938

TEKTRONIX

TEK **Service Reference**

Part No. 070-6785-02
Product Group 47
Revised 1991

THE 11A34 FOUR-CHANNEL AMPLIFIER

WARNING

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

Please check for CHANGE INFORMATION at the rear of this manual.

Tektronix
COMMITTED TO EXCELLENCE

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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Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial numbsr are assigned sequentially end are unique to each instrument. Those manufactured in the United States have six unique digits. The county of manufacture Is identified as follows:

B010000	Tektronix, Inc., Beaverton, Oregon, US.4
E200000	Tektronix United Kingdom. Ltd., London
J300000	Sony/Tektronix, Japan
H700000	Tektronix Holland, NV, Heerenveen, me Netherlands

Instruments manufactured for Tektronix by external vsndors outside the United States are assigned a two digit alpha code to identify the county of manufacture (e.g., JP for Japan, HK for Hong Kong, etc.).

Tektronix, inc., P.O. Box 500, Beaverton, OR 97077

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Checks and Adjustments

This section contains procedures to examine measurement limits, check electrical specifications, and to manually set all internal adjustments. This procedure provides a logical sequence of check and adjustment steps, and is intended to return the amplifier to specified operation following repair, or as a pan of a routine maintenance program. To functionally test the oscilloscope, perform the parts which have a "yes" indication in the Functional Test column of Table 2-1, Measurement Limits, Specifications, Adjustments and Functional Test.

Refer to the *IIA34 User's* Reference *Supplement* for more information about advertised specifications and amplifier operation. At the beginning of each pan the specifications or measurement limits are given. Then, the setup for each procedure in that part provides information concerning test equipment setup or interconnection. Refer to Table 2-2, Test Equipment for more information concerning test equipment used in these setups.

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

Part and Description	Measurement Limits *(Examine)*	Specifications *(Check)*	Adjustments *(Adjust)*	Functional *Test*
Pan 1 Initial Setup	none	none	none	ves
Pan 2 Enhanced Accuracy	none	none	successful execution	yes
Pan 3a High Frequency Response: Standard Procedure				
Mainframe High Frequency Response	none	none	none	no
Amplifier Step Response	difference between two waveform aberrations 34.5% peak and 7% p-p	none	HF1, HF2, HF3, and HF4 so that the CH1, CH2, CH3, and CH4 aberrations respectively, are within 4.5% peak and 7% p-p	no
Amplifier Bandwidth: Performance Verlflcatlon Procedure	none	refer to Table 2-3 for the bandwidth specifications	none	no
Amplifier Bandwidth: Functional Test Procedure	none	peak-peak measurement ≥848 mV	none	yes

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

Part and Description	Measurement Limits (Examine)	Specifications (Check)	Adjustments (Adjust)	Functional Test
Pan 3b High Frequency Response: Alternate Procedure				
Mainframe High Frequency Response	none	none	none	no
Amplifier Step Response	difference between two waveform aberrations ≤4.5% peak and 7% p-p	none	HF1, HF2, HF3, and HF4 so that the CH1, CH2. CH3, and CH4 aberrations respectively, are within 4.5% peak and 7% p-p	no
Amplifier Bandwidth: Performance Verification Procedure	none	refer to Table 2-4 for me bandwidth specifications	nane	no
Amplifier Bandwidth: Functional Test Procedure	none	peak-peak measurement ≥848 mV	none	yes
Part 4 Overload	none	input impedance goes to 1 MΩ	none	yes
Pan 5 Input Resistance	none	1 MΩ ± 5 kΩ 50 Ω ± 0.5 Ω	none	yes
Pan 6 Vertical Accuracy				yes
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 ±90 mV for me 11300-Series and 5 V ± 57 mV for the 11400-Series	none	
DC Offset	none	top Of waveform vertically centered within ±0.5 divisions	none	

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

Part and Description	Measurement Limits *(Examine)*	Specifications *(Check)*	Adjustments *(Adjust)*	Functional Test
Part 7 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	yes
Part 8 AC Coupling	none	bottom of square wave near center graticule line and waveform cantered on screen	none	yes
Part 9 DC Balance	none	refer to Table 2-5	none	no
Part 10a AV DC Accuracy: 11400-Series Mainframe Procedure	none	within ±0.63%	none	no
Part 1 Ob AV DC Accuracy: 11300-Series Mainframe Procedure	none	within ±1.2%	none	no
Part 11 DC Offset Accuracy	none	refer to Table 2-S	none	no

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 that is recommended if you are only performing a functional test. Procedure steps are based on the test equipment examples given, but otherequipment 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 Oscilloscope mainframe that accommodates amplifiers	Tektronix mainframe that accommodates amplifiers	TEKTRONIX 11301 Programmable Oscilloscope 11302 Programmable Oscilloscope 11301A Counter Timer Oscilloscope 11302A Counter Timer Oscilloscope 11401 Digitizing Oscilloscope 11402 Digitizing Oscilloscope 11403 Digitizing Oscilloscope	✓
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 SO&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	✓
Signal Standardizer	Tektronix Calibration Fixture with interlace connector modified for 11000-Series use	TEKTRONIX 067-0587-02 Signal Standardizer	

Table 2-2 — Test Equipment (cont)

Description	Minimum Specification	Examples of Recommended Test Equipment	Functional Test
Calibration Generator	Period, 0.1 ms Amplitude, −60 V Square wave output, 0.28% accuracy, 1-2-5 ampl selection from 200 µV p-p to 100 p-p, ~1 ms poriod, 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 Pert 131-0993-00	
Attenuator, 1 OX	Impedance: 50 Ω, one male and one female BNC connector	Tektronix Part 01 1-0059-02	
Adapter, BNC-to-Banana (2 required)	BNC Female-tc-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 Pert 003-0675-01	
Magnetic Screwdriver	Holder for Toot Ups	Tektronix Part 003-0293-00	
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 Pan 003-0964-00 Tektronix Pan 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	

Table 2-2 — Test Equipment (cont)

Description	Minimum Specification	Examples of Recommended Test Equipment	Functional Test
Needle-nose pliers			
Tweezers			
Static Control Mat		Tektronix Pan 006-3414-00	
Wrist Strap		Tektronix Part 005341500	

Using These Procedures

The first-time user should familiarize themselves with the proceeding information prior to performing the procedures in the parts that follow.

Conventions in this Manual

In these procedures, me 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 Verl Pos).
- in some steps, the first word is italicized to identify a step that contains a performance verification and/or an adjustment instruction. 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, me step Involves an electrical adjustment. If *Examine* is the first word in the title, the step involves measurement limits that are used as calibration guides; these limits are not to be interpreted as electrical specifications.

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.

Initialized Setting

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

Part 1 Initial Setup

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

CAUTION

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

Turning ths 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 Date in Section 3.

- ☐ Step 1: Power on the following test equipment, so that it is warmed up with the mainframe and amplifier 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 me 11A34 Amplifier in me 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.

Part 2 Enhanced Accuracy

When displayed, the Enhanced Accuracy symbol (EA) indicates that the instrument is at its highest Accuracy state. The mainframe saves the time of calibration and ambient temperature for use in maintaining the Enhanced Accuracy state.'

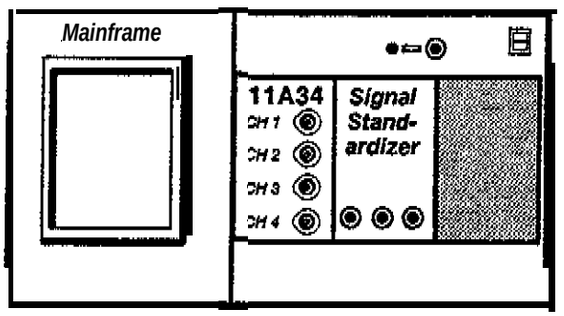
For more information about the Enhanced Accuracy state, see Enhanced Measurement Accuracy Indicator *in* the mainframe *User* Reference manual.

White Enhanced Accuracy Is in effect, to verify the DC measurement accuracy of the amplifier and mainframe system, apply end monitor test voltages, and compare these test voltages with the measurements made on the screen.

Specification

When invoked, me self-calibration activity executes successfully.

Setup to Check Enhanced Accuracy



Setup to Check Enhanced Accuracy

Procedure to Check Enhanced Accuracy

☐ Step 1: Initialize the mainframe's settings.

Leftplug-in..... nosettingchanges
Mainframe . . . . . no setting changes
Signal standardizer . . . . . not used in this part

☐ Step 2: Twenty minutes after power-on, the mainframe must recalibrate itself to achieve me Enhanced Accuracy state. Press the ENHANCED ACCURACY button. A prompt then appears on the display. Press the ENHANCED ACCURACY button again. Enhanced Accuracy is achieved after a couple of 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 event occurs, refer to Restoring Calibration Data in your mainframe's Service Reference manual.

❑ 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 end passed** or Self **calibration** completed **successfully** (indicating that the Enhanced Accuracy state has been achieved) appears. (The EA indicator appears on the display when Enhanced Accuracy is completed.)

Part 3a High Frequency Response: Standard Procedure

The amplifier high frequency peaking is adjusted so that the bandwidth is adequate and the aberrations are not excessive. The Standard Procedure uses an 11400-Series mainframe to ensure that the amplifier performs properly in any mainframe. If an 11400-Series mainframe is not available, then use the Alternate Procedure at the end of this part.

First, the 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.

Then, the step response waveform is compared with the characterizations of the waveform In the Procedure to Examine Mainframe High Frequency Response to determine the amplifier's contribution to the aberrations.

Finally, the displayed amplitude is checked at the specification frequencies to determine the amplifier's contribution to the bandwidth.

Measurement Limits

The difference between the two waveform aberrations should not exceed 4.5% peak (2.25 divisions) and 7% (3.5 divisions) peak-to-pesk. (One major graticule division = 2%.)

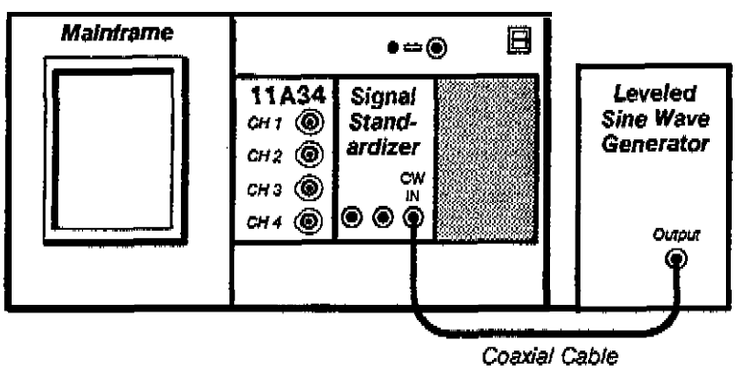
Specification (Performance Verification)

Refer to Table 2-3 for the bandwidth specifications.

Specification (Functional Test)

A peak-peak measurement ≥848 mV.

Setup to Examine Mainframe High Frequency Response



Setup to Examine Mainframe High Frequency Response

Procedure to Examine **Mainframe** High Frequency Response

☐ Step"?: **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 Slze . . . . . 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 Pos: Wfm . . . . . position top of step on center horizontal graticul**line**
Vert Mag: 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 10 µs/div.

❑ Step 4: Set the signal **standardizer** Test switch to **Vert** or **Horiz** Freq Rasp.

ᘐ 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 6-division display amplitude, centered on the screen.

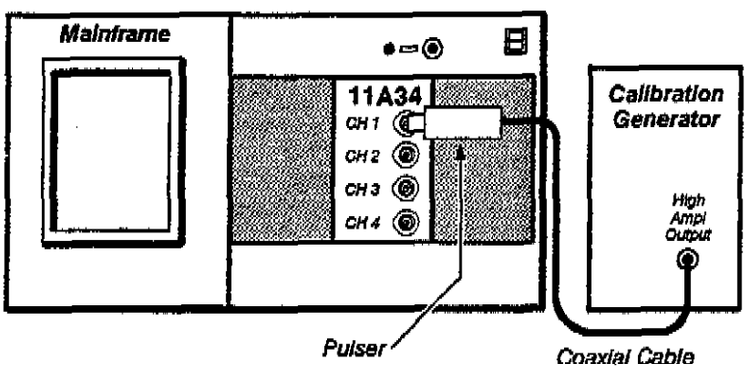
☐ 'Step 7: Set the leveled sine wave generator frequency to each Test Frequency in mlumn (1) of Table 2-3, and record the Displayed Amplitude in column (2) on a copy of Table 2-3. This data is used in the Procedure to Check Amplifier Bandwidth for calculating the amplifier bandwidth.

This procedure may require more man one leveled sine wave generator to test all the Test Frequencies listed. When changing to another leveled sine wave generator, repeat Steps 5 and 6.

☐ 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 me Center plug-in compartment.

Setup to **Examine/Adjust Amplifier** Step Response
(AIR1027, A1R1029, A1R1041, AIR1043)



Setup to Examine/Adjust Amplifier Rep Response

Procedure to Examine/Adjust Amplifier Step Response
(A1R1027, A1R1029, A1R1041, A1R1043)

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

- Remove the left side cover from the amplifier.
- Insert the amplifier into me mainframe *Center* plug-in compartment.
- Connect me pulser to the CH 1 input connector
- 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 ..... 50 mV/div
Impedance ..... 50 Ω
Main Size ..... 1 µs/div
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
Vert Offset ..... position top of step 2.5 divisions above the center horizontal graticule line

Acquire **Desc** pop-up menu
Average N ..... On
Set Avg N 8
Numeric Entry & Knob Res pop-up menu ..... **Fine**
Vert size ..... **5-division** step amplitude display
Vert Offset ..... position right side of trace to the center horizontal gratlcule line
Ven Size ..... set readout for 10% of present readout (-4 **mV/div)**
Vert Offset ..... 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% peak (2.25 divisions) and 7% peak-to-peak (3.5 divisions). (You can use **ΔVert** cursors *or* Horizontal Bars 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 Al Main board, so that the CH 1 aberrations are within 4.5% peak (2.25 divisions) and 7% peak-to-peak (3.5 divisions). Refer to Figure 2-1 for adjustment locations.

☐ Step 4: Remove the displayed waveform.

☐ Step 5: Move the pulser to the CH 2 input connector, Then, repeat Step 1 boginning at the Center plug-in settings and proceeding through Steps 2, 3, and 4 in this procedure (the adjustment is performed using the HF2 adjustment, R1029).

☐ Step 6: Move the pulser to the CH 3 input connector. Then, repeat Step 1 beginning at the Center plug-in settings and proceeding through Steps 2, 3, and 4 in this procedure (the adjustment is performed using the HF3 adjustment, R1 041).

☐ Step 7: Move the pulser to the CH 4 Input connector. Then, repeat Step 1 beginning at the Center plug-in settings and proceeding through Steps 2, 3, and 4 in this procedure (the adjustment is performed using the HF4 adjustment, R1043).

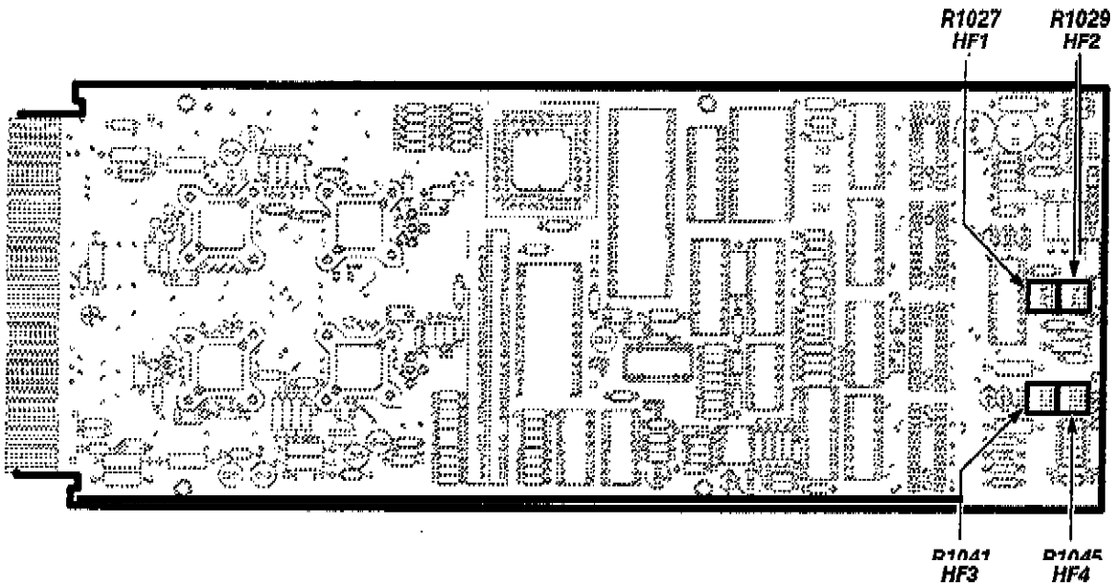
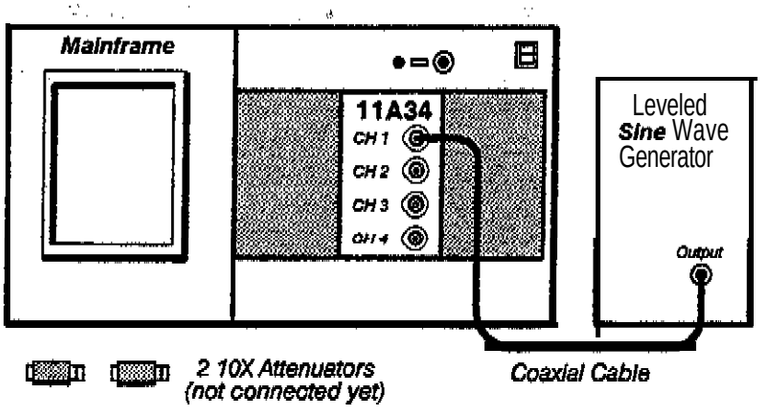


*Figure 2-1 — Al **Main** Board Adjustment Locations*

Setup to Check **Amplifier Bandwidth: Performance** Verification Procedure



Setup to Check Amplifier Bandwidth: Performance Verification Procedure

Procedure to Check **Amplifier Bandwidth:** Performance Verification Procedure

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

Center plug-in
CHI Display on/off . . . . . on
Mainframe
Main Size . . . . . 10 µs/div
Impedance . . . . . 50 Ω
Leveled sine wave generator
Amplitude . . . . . 4 V p-p
Frequency . . . . . Fief

If the leveled sine wave generator has a remote leveling head, then you must **connect** it to the amplifier **input** connector without additional coaxial cables.

The reference frequency must be between 50 **kHz** and 6 **MHz.**

Perform this **procedure** for each Vertical Size listed in column (3) of Table 2-3; then repeat for CH 2.

This procedure may require the use of more than one leveled sine wave generator to test all the frequencies listed in Table 2-3.

If the leveled sine wave generator is not equipped with internal attenuators, **then** use the 10X attenuators at the amplifier input when **setting** amplitude.

To measure the amplitude, either count tne divisions, ***or use*** the AV cursors.

☐ Step 2: **Set** the leveled sine wave generator amplitude as shown in the Reference Amplitude column (4).

☐ Step **3:** Set the leveled sine wave generator frequency as shown in **the** Frequency column (1).

☐ **Step 4:** Record the Displayed Amplitude In column (9).

☐ **Step 5:** *Check* that the amplifier amplitude, computed by dividing column (5) by column (2), is at least the value shown in column (6).

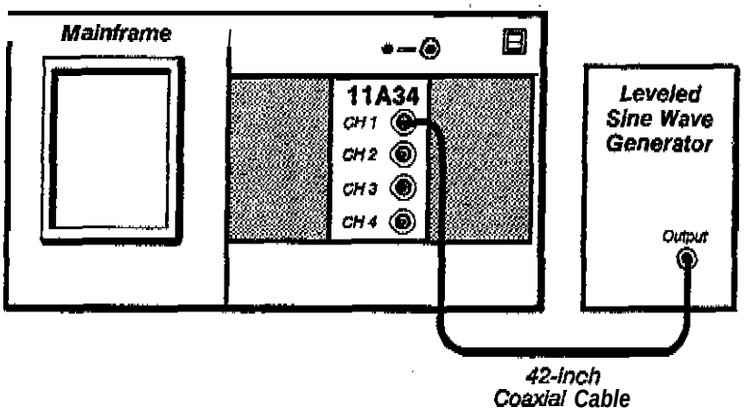
☐ **Step 6:** Set the leveled sine wave generator to the reference frequency.

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

Table 2-3 — 11A34 Amplifier Bandwidth

(1)	(2)	(3)	(4)	(5)				(6)			
	Mainframe with Standardizer	Mainframe with Amplifier						Amplifier only			
Test Frequency MHz	Displayed Amplitude: div	Vertical Size	Reference Amplitude: div	Displayed Amplitude: div				Calculated Amplitude: col (5) ÷ col (2)			
				CH 1	CH 2	CH 3	CH 4	CH 1	CH 2	CH 3	CH 4
300	____	1 V/div	4	____	____	____	____	____≥0.518	____≥0.518	____≥0.518	____≥0.518
300	____	500 mV/div	6	____	____	____	____	____≥0.777	____≥0.777	____≥0.777	____≥0.777
300	____	50 mV/div	6	____	____	____	____	____≥0.777	____≥0.777	____≥0.777	____≥0.777
300	____	20 mV/div	6	____	____	____	____	____≥0.777	____≥0.777	____≥0.777	____≥0.777
300	____	10 mV/div	6	____	____	____	____	____≥0.777	____≥0.777	____≥0.777	____≥0.777
250	____	5 mV/div	6	____	____	____	____	____≥0.821	____≥0.821	____≥0.821	____≥0.821
200	____	2 mV/div	6	____	____	____		____≥0.803	≥0.803	____≥0.803	≥0.803
150	____	1 mV/div	6	____	____	____		____≥0.790	____≥0.790	____≥0.790	≥0.790

Setup to Check Amplifier Bandwidth: Functional Test Procedure



Setup to Check Amplifier Bandwidth: Functional Test Procedure

Procedure to Check Amplifier Bandwidth: Functional Test Procedure

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

Amplifier

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

Leveled sine wave generator

Frequency..... Ref (6 MHz)

Mainframe

Impedance ..... 50 Ω

Vert Size ..... 200 mV/div

Main Size ..... 100 ns/div

☐ **Step 2:** Select the Peak-Peak measurement to measure the peak-to-peak amplitude of the waveform.

☐ Step 3: Set the leveled sine wave generator for 1.2 V peak-to-peak.

☐ Step 4: Set the leveled sine wave generator Frequency control to the maximum bandwidth frequency specified for me mainframe-amplifier combination. This limit is displayed as SW **Limit** (WAVEFORM button).

☐ **Step 5:** Set the **Main Size** to display several cycles of the waveform.

☐ **Step 6:** *Check* that the measurement is at least 848 mV (70.7% of Step 3).

☐ **Step 7:** Set the CH 1 display on/off button to off.

☐ Step 8: Move the coaxial cable to the CH 2 input and set its display on/off to on.

☐ Step 9: Perform the Steps 1 to 8 *for* the remaining channels.

Part 3b High Frequency Response: Alternate Procedure

The amplifier high frequency peaking is adjusted so that the bandwidth is adequate and the aberrations are not excessive. This Alternative Procedure is used when the available mainframe is an 11300-Series. Performance is assured only for the particular amplifier and mainframe combination examined and adjusted during this procedure.

First, the mainframe performance is characterized at the specification frequencies using the signal standardizer.

Then, the amplifier and mainframe aberrations are displayed at 20% per division.

Finally, the displayed amplitude is checked at the specification frequencies to determine the amplifier's contribution to the bandwidth.

Measurement Limits

The waveform aberrations should not exceed 4.5% peak (0.275 division) and 7% (0.35 division) peak-to-peak. One major graticule division = 20%.

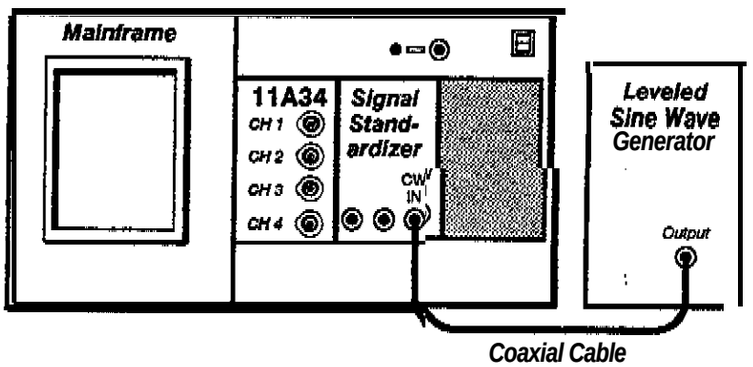
Specification (Performance Verification)

Refer to Table 2-4 for the bandwidth specifications.

Specification (Functional Test)

A peak-peak measurement ≥848 mV.

Setup to Examine Mainframe High Frequency Response



Setup to Examine Mainframe High Frequency Response

Procedure to Examine Mainframe High Frequency Response

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

Mainframe
- Waveform ..... C (center)
- Trigger Source ..... C (center)
- HORIZONTAL SIZE ..... 10 µs/div

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

Signal standardizer
- Test ..... Vert or Horiz Freq Resp

Leveled sine wave generator
- Frequency ..... Ref

The reference frequency must be between 50 kHz and 6 MHz.

☐ Step 2: Sat 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.

☐ Step 3: Set the signal standardizer Position and Amplitude for a 6-division display amplitude, centered on the screen.

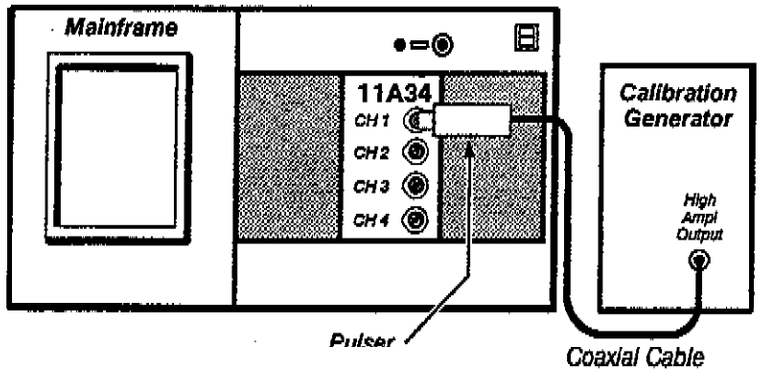
☐ Step 4: Set the leveled sine wave generator frequency to each Test Frequency in column (1) of Table 2-4, and record the displayed amplitude in the Displayed Amplitude column (2) on a copy of Table 2-4. This date Is used in the Procedure to Check Amplifier Bandwidth for calculating the amplifier bandwidth.

misprocedure may require more than one leveled sine wave generator to test all the Test Frequencies listed. When changing to another leveled sine wave generator, repeat Steps 2 and 3.

☐ Step 5: Set the mainframe ON/STANDBY switch to STANDBY

☐ Step 6: Remove the signal standardizer from the Canter 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, A1R1043)



Setup to Examine/Adjust Amplifier Step Response

Procedure to Examine/Adjust Amplifier Step Response (AIRI027, AIRI029, A1R1041, A1R1043)

☐ 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 pulser to the CH 1 input connector.
- Connect a 50 Ω coaxial cable from the calibration generator High Ampl Output connector to me 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 . . . . . Init
Center plug-in
CH 1 Display on/off . . . . . on
Mainframe
VERTICAL SIZE . . . . . 50 mV/div
Impedance . . . . . 50 Ω
HORIZONTAL SIZE . . . . 1 µs/div
HORIZONTAL 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

HORIZONTAL SIZE . . . . . 5 ns/div

HORIZONTAL POS . . . . . position positive-going edge between the first and second graticule lines from the left edge of the graticule

VERTICAL OFFSET . . . . . position top of step 2.5 divisions above the center horizontal graticule line

VERTICAL SIZE: FINE . . . . . 5-division step amplitude display

☐ Step 2: *Examine* that the displayed waveform aberrations are less than 4.5% peak (0.225 division) and 7% peak-to-peak (0.35 division). (You can use ΔVert 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 AI Main board, so that the aberrations are within 4.5% peak (0.225 division) and 7% peak-to-peak (0.35 division). Refer to Figure 2-I for adjustment locations.

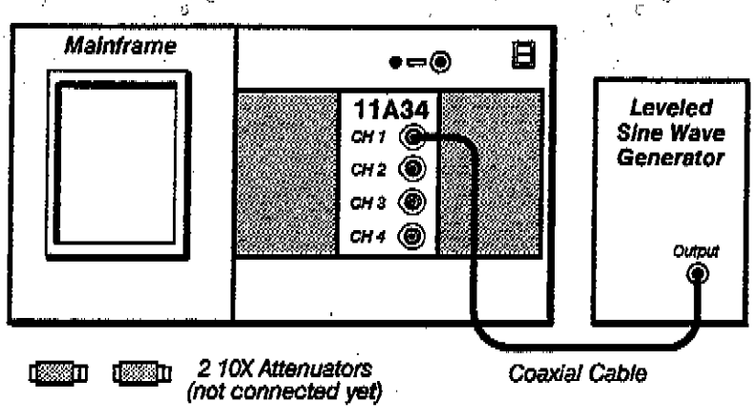
☐ Step 4: Remove the displayed waveform.

☐ Step 5: Move the pulser 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 in this procedure (the adjustment is performed using the HF2 adjustment, R1029).

☐ Step 6: Move the pulser to the CH 3 input connector. Then, repeat Step 1 beginning at the Center plug-in settings and proceeding through Step 2, 3, and 4 in this procedure (the adjustment is performed using the HF3 adjustment, R1041).

☐ Step 7: Move the pulsar to the CH 4 input Connector. Then, repeat Step 1 beginning at the Center plug-in settings and proceeding through Steps 2, 3, and 4 in this procedure (the adjustment is performed using the HF4 adjustment, R1043).

Setup to Check Amplifier Bandwidth: Performance Verification Procedure



Setup to Check Amplifier Bandwidth: Performance Verification Procedure

Procedure to Check Amplifier Bandwidth: Performance Verification Procedure

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

Center plug-in
CH1 Display on/off . . . . . **. . on**
Mainframe
HORIZONTAL SIZE . . . . . 10 **µs/div**
Leveled **sine** wave **generator**
Amplitude . . . . . **4 V p-p**
Frequency . . . . . Ref

If the **leveled** sine wave generator has a remote leveling head, then you must **connect** it to the amplifier input connector **without additional** coaxial cables.

The reference frequency must be between **50 kHz** and 6 MHz.

Perform this procedure for **each** Vertical Site listed in column (3) of Table 2-4; then repeat for CH 2.

This procedure may require the use of more than one leveled **sine** wave generator to test all the frequencies listed in Table **2-4.**

If the leveled sine wave generator is not equipped with internal attenuators, then ***use*** the **10X** Attenuators at the amplifier input when setting amplitude,

To measure the amplitude, either count the **divisions** or use the AV cursors.

☐ Step 2: Set the leveled sine wave generator amplitude as shown in the Reference Amplitude column **(4).**

☐ Step 3: Set the leveled sine wave generator frequency as shown in the Frequency column (1).

☐ Step 4: Record the Displayed Amplitude in column (5).

☐ Step 5: *Check* that, the amplifier amplitude, computed by dividing column (5) by column (2), is at least the value shown in column (6).

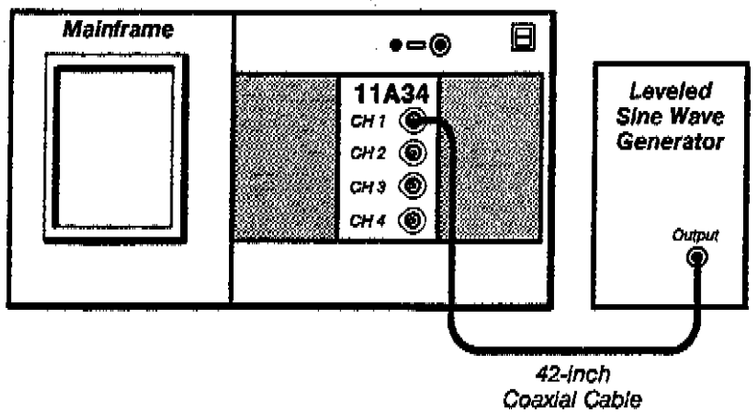
☐ Step 6: Set the leveled sine wave generator to the reference frequency.

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

Table 2-4 — 11A34 Amplifier Bandwidth

(1)	(2)	(3)	(4)	(5)				(6)			
	Mainframe with Standardizer	Mainframe with Amplifier						Amplifier only			
Test Frequency MHz	Displayed Amplitude: div	Vertical Size	Reference Amplitude: div	Displayed Amplitude: div				Calculated Amplitude: col (5) ÷ col (2)			
				CH 1	CH 2	CH 3	CH 4	CH 1	CH 2	CH 3	CH 4
250	____	1 V/div	4	____	____	____	____	≥0.545	≥0.545	≥0.545	≥0.545
250	____	500 mV/div	6	____	____	____	____	≥0.818	≥0.818	≥0.818	≥0.818
250	____	50 mV/div	6	____	____	____	____	≥0.818	≥0.818	≥0.818	≥0.818
250	____	20 mV/div	6	____	____	____	____	≥0.818	≥0.818	≥0.818	≥0.818
250	____	10 mV/div	6	____	____	____	____	≥0.818	≥0.818	≥0.818	≥0.818
250	____	5 mV/div	6	____	____	____	____	≥0.821	≥0.821	≥0.821	≥0.821
200	____	2 mV/div	6	____	____	____	____	≥0.803	≥0.803	≥0.803	≥0.803
150	____	1 mV/div	6	____	____	____	____	≥0.790	≥0.790	≥0.790	≥0.790

Setup to Check Amplifier Bandwidth: Functional Test Procedure



Setup to Check Amplifier Bandwidth: Functional Test Procedure

Procedure to Check **Amplifier Bandwidth:** Functional Test Procedure

❑ Step 1: First **Initialize** the mainframe's settings, then 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 . . . . . **50 Ω**

VERTICAL SIZE . . . . . **200 mV/div**

HORIZONTAL **SIZE** . . . . . 100 **ns/div**

☐ Step 2: Select the CURSORS to measure the peak-tc-peak amplitude of the waveform.

☐ Step 3: Set the leveled sine wave generator for 1.2 V peak-m-peak.

❑ Step 4: Sat the leveled sine **wave** generator Frequency control to **the** maximum bandwidth frequency specified for **the** mainframe-amplifier combination. This **limit** is displayed as HF Limit **(VERTICAL. SIZE** button).

❑ **Step 5: Set the** HORIZONTAL SIZE to display several cycles of the **waveform.**

☐ Step 6: ***Check*** that the measurement is at least **848 mV** (70.7% of Step 3).

☐ Step 7: Set the CH 1 display on/off button to off.

☐ Step 8: **Move** the coaxial cable to the CH 2 input and set its display on/off to on.

❑ Step 9: Perform the Steps 1 to 8 for the remaining channels.

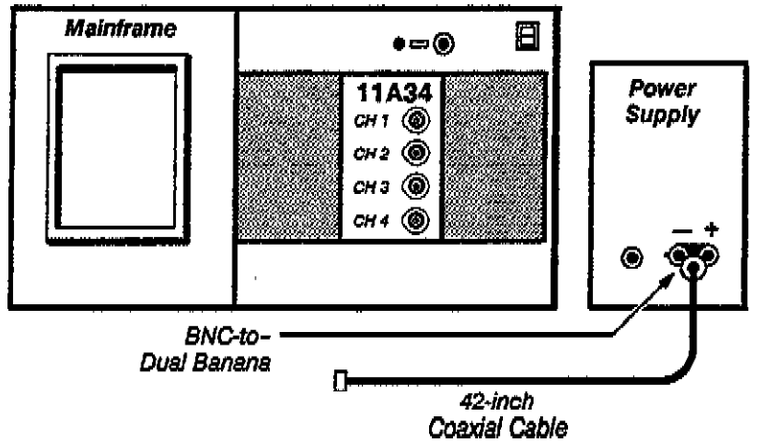
Part 4 Overload

This part shows Me setup and lists the procedure to check overload.

Specification

Input impedance goes to 1 MΩ.

Setup to Check Overload



Setup to Check Overload

Procedure to Check Overload

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

Mainframe ..... no setting changes
Amplifier
CH 1 Display on/off ..... on
Power **supply**
Volts ..... 20 V
Current Limit ..... 400 mA

❑ **Step 2: Set Impedance to 50 Ω.**

CAUTION

In the following steps, IMMEDIATELY disconnect the cable at the input if the impedance does not change within 3 seconds.

☐ Step 3: Connect the power supply to the CH 1 input using the 42-inch coaxial cable.

❑ Step 4: *Check* that the input impedance goes to 1 MΩ (tne current status is shown below the Impedance label).

❑ Step 5: Disconnect the power supply at the input.

- ☐ **Step 6:** Set the Ch 2 display on/off to on.
- ☐ **Step 7:** Repeat Steps 2 through 6 for the remaining input channels.

Part 5 Input Resistance

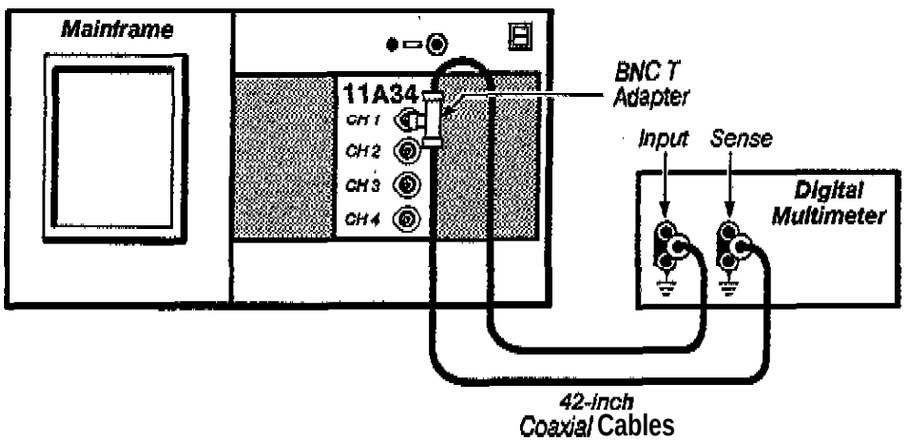
This part shows the setup and lists the procedure to check input resistance.

Specifications

The specifications for this part are as follows:

- Impedance resistance is 1 MΩ within ±5 kΩ.
- Impedance resistance is 50 Ω within ±0.5 Ω.

Setup to Check input Resistance



Setup to Check Input Resistance

Procedure 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
Amplifier
CH 1 Display on/off . . . . . on
Digital multimeter (DMM)
Resistance mode 4-Wire

☐ Step 2: *Check that the* input resistance is 1 MΩ within ±5 kΩ.

☐ Step 3: Set CH 1 Impedance to 50 Ω.

☐ Step 4: *Check* that input resistance is 50 Ω within ±0.5 Ω.

☐ Step 5: Repeat Steps 1 through 4 for the remaining input channels

Vertical Accuracy

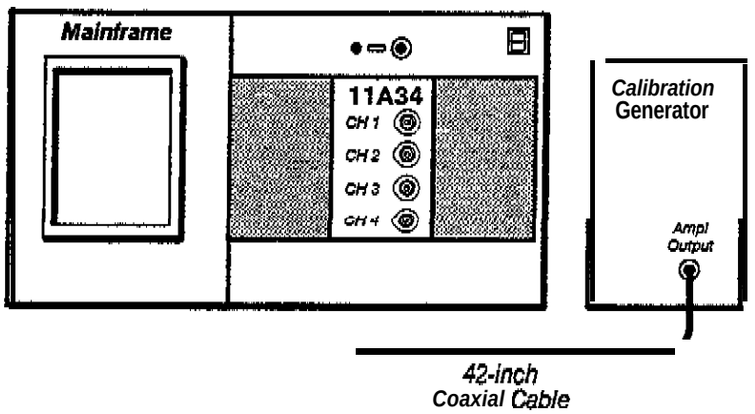
Part 6 This part shows the setup and lists the procedure to check vertical accuracy.

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 ± 90 mV for the 11 300-Series and 5 V ±57 mV for the 11400-Series.
- DC offset so that the top of the waveform is vertically cantered within ±0.5 divisions.

Setup to Check Vertical Accuracy



Setup to Check Vertical Accuracy

Procedure 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 . . . . . Stcl Ampl

Amplitude Output . . . . . 5 V

Mainframe

Main Size or HORIZONTAL SIZE 1 0 0 µs/div

Average N (if available) . . . . . **On**

Check DC Balance- by performing Step 2.

☐ Step 2: *Check* the Vertical Size to each position from 10 V through 5 mV and observe that the trace stays within ± 0.2 divisions of center. Then, set the, Vertical Size to 2 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 the 42-inch coaxial cable.

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

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

☐ Step 6: Select the Peak-Peak measurement, if available, or me vertical amplitude Cunors and measure the peak-to-peak amplitude of the waveform.

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

90 mV for me 11300-Series mainframe, or
57 mV for the 1 MOO-Series mainframe.

Check **Offset—by performing steps** 8 through 11.

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

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

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

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

Part 7 Bandwidth Limit

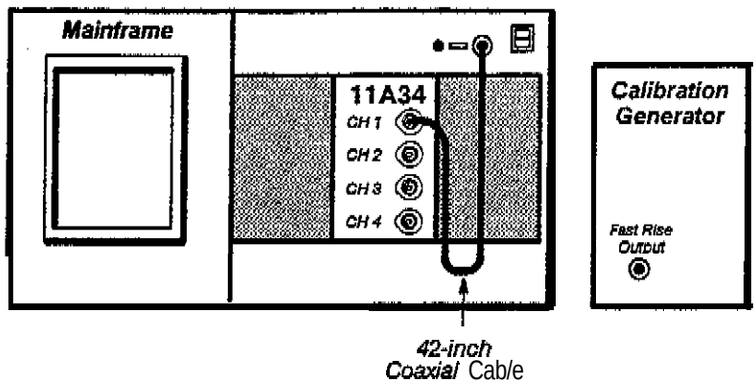
This part shows the setup and lists ttie procedure to check rise time.

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



Setup to Check Bandwidth Limit

Procedure 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: On 11400-Series mainframes only, 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 50 Ω.**

- ☐ **Steps:** Sat the Vert Size or VERTICAL SIZE to 200 mV/div.
- ☐ **Step6:** Set the **Vert Offset** or VERTICAL OFFSET to -500 mV.
- ☐ **Step 7:** Sat the calibration generator Amplitude to 1 V.
- ☐ **Step 8:** Select 100 MHz bandwidth limit.
- ☐ **Step 9:** Select the Rise Time measurement, if available.
- ☐ **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 current input channel display to off.
- ☐ **Step14:** Set me next channel's display on/off to on.
- ☐ **Step 15:** Repeat Steps 3 through 14 for the remaining channels.

Part 8 A C Coupling

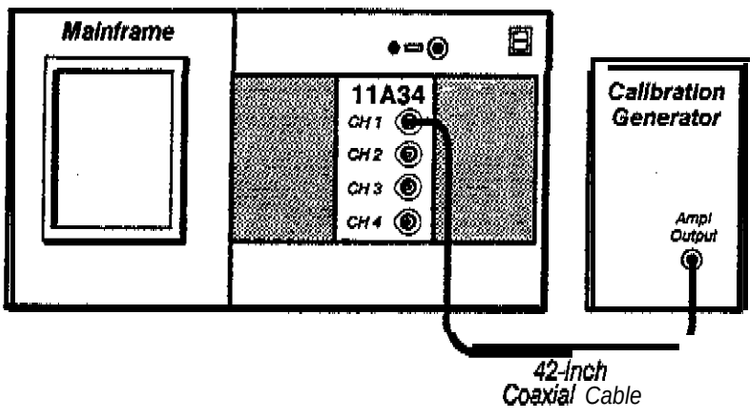
This pert shows the setup and lists the procedure to check AC coupling.

Specifications

The specifications for this part are as follows:

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

Setup to Check AC Coupling



Setup to Check AC Coupling

Procedure to Check AC Coupling

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

Amplifier

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

Calibration generator

Mode ..... Std Ampl

Amplitude ..... 5 V

Mainframe

Impedance ..... 50 Ω

Vert Ske or VERTICAL SIZE ..... 500 mV/div

Main Size or HORIZONTAL SIZE ..... 100 µs/div

☐ Step 2: Check that the bottom of the square wave is near the center graticule line.

☐ Step 3: Select AC Coupling for the CH 1 input.

☐ Step 4: Check that the waveform is approximately centered on the screen (duty cycle will cause some variation).

☐ Step 5: Set the CH 1 display on/off to off.

☐ Step 6: Move coaxial cable to the CH 2 input and set Ifs display on/off to on.

☐ Step 7: Repeat Steps 1 through 6 for the remaining channels.

Part 9 DC Balance

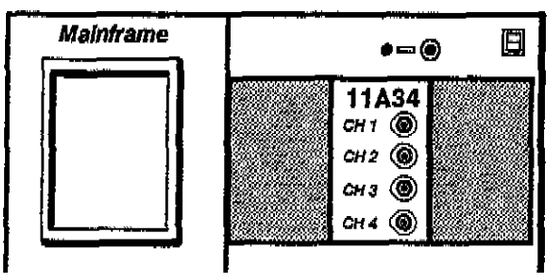
The position of the displayed trace with no input signal applied is examined.

The purpose of this procedure is to confirm that DC balance can be accomplished accurately. This procedure does not test for drift over time or temperature. Therefore, the specifications are more stringent than the specifications in the *11A34 User's Reference Supplement* and this procedure must be performed immediately after Enhanced Accuracy calibration.

Specifications

Refer to Table 2-5.

Setup to Check DC Balance



Setup to Check DC Balance

Procedure to Check DC Balance

❑ Step 1: First initialize the mainframe's settings then perform the following settings in the order lied.

Center plug-in

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

Mainframe

Vert Size or VERTICAL SIZE ..... 10 V/div

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

Impedance ..... 50 Ω

❑ Step 2: *Check* that me displayed trace position Is at the *center* graticule line, within the value Shift listed in Table 2-5 for each Vert Size setting.

If you are using the 11300-Series mainframe, use Vertical Cursors to help measure the trace position.

If you are using the 11400-Series mainframe, 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 2-5 — 1A34 Amplifier DC Balance

Vert size		1400-Series (± div)	Shift (± mV)	300-Series (± div)	Shift
10	V/div	0.063	630	0.093	
5	V/div	0.065	330	0.095	
2	V/div	0.073	146	0.103	
1	V/div	0.086	85	0.115	
0.5	V/div	0.065	33	0.095	
0.2	V/div	0.073	14.6	0.103	
0.1	V/div	0.085	8.3	0.115	
50	mV/div	0.065	3.3	0.096	
20	mV/div	0.073	1.46	0.103	
10	mV/div	0.085	.83	0.115	
5	mV/div	0.110	.55	0.140	
2	mVdiv	0.185	.37	0.215	
1	mV/div	0.310	.31	0.340	

Part 10a ΔV DC Accuracy: 11400-Series Mainframe Procedure

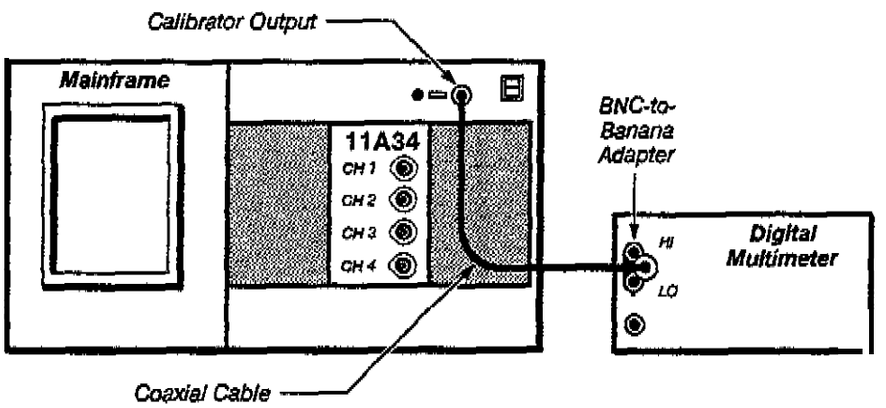
The system ΔV DC Accuracy is checked using a precision digital multimeter and power supply.

The purpose of this procedure is to confirm that the amplifier can be accurately calibrated. This procedure does not test for mainframe calibration voltage reference accuracy or long term stability. Therefore, the mainframe Is characterized and tests must be performed immediately after an Enhanced Accuracy calibration. Also, the amplifier specifications are more stringent than those in the *1 1A34 User's Reference Supplement.*

Specification

AV DC Accuracy within ±0.63%.

Setup to Characterize the 11400-Series Mainframe



Setup to Characterize the 11400-Series Mainframe

Procedure to Characterize the 11400-Series Mainframe

❑ Step 1: Perform the following Settings:

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

❑ Step 2: Record the DMM absolute value.

☐ Step 3: Press **Exit.**

☐ Step 4: Press **FP + 9.9951 V.**

☐ Step 5: Press **Run.**

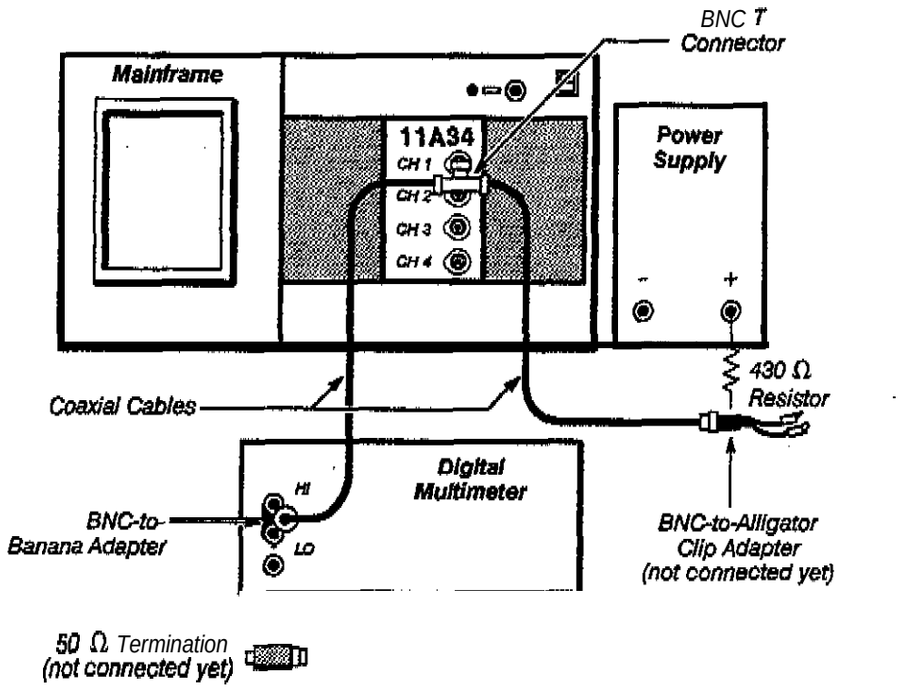
☐ **Step 6:** Record the D MM reading.

☐ 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 Vto obtain the mainframe's calibration voltage reference characterization factor (which is used In the Procedure to Test the **Amplifier).**

Setup to Check the Amplifier ΔV DC Accuracy



Setup *to* Check the *Amplifier* AV DC *Accuracy*

Procedure to Check the Amplifier AV DC Accuracy

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

Center plug-in
CH 1 Display on/oft , on

Mainframe
- Vert Size ..... 10 V/div
- BW Limit ..... 20 MHz

Power supply
- Output ..... on

Digital multimeter (DMM)
- Mode ..... DC
- Range ..... Auto

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

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

It Is helpful if you use a pocket calculator to do the calculations required for evaluating the data in this part. If your DMM is equipped with a comparison or relative reference feature, use this feature for the readings and calculation required in Steps 3 and 5.

When connecting the alligator clips, connect one clip directly to the power supply's negative terminal and me other clip to the 430Ω resistor (not the power supply's positive terminal).

☐ Step 2: Set Average N to On. select Mean (whole zone) in the MEASURE major menu, and set Compare to On.

☐ Step 3: Connect me alligator clips to me power supply and set the voltage so that the trace is within ±0.2 division of the first gratlcule line above the bottom of the screen. Read the DMM and record the absolute value (that is, ignore the polarity).

☐ Step 4: Select Save Current Meas Value as References in the Compare and Reference pop-up menu of the MEASURE major menu.

☐ Step 5: Connect the alligator clips to the power supply end set me voltage $0 that the trace is within ±0.2 division of the first gratlcule line below the top of the screen. Read the DMM and add the absolute value (that is, ignore the polarity) to the reading obtained in Step 3.

☐ Step 6: Read the ΔMean value in the MEASURE major menu.

☐ Step 7: Divide the sum obtained In Step 5 by the A readout obtained in Step 6. Then, dlvide this result by the mainframe characterization factor (obtained in Step 9 of the Procedure to Characterize 1400-Series Mainframe).

☐ Step 8: Check that the result obtained in Step 7 is 20.9937 but ≤1.0063.

❑ Step 9: Repeat Steps 3 through 8 for the vertical size settings listed below. When testing with small voltages, it may help to install a 50 Ω termination and attenuators in series between the BNC-to-alligator clip adapter and the coaxial cable so that you can set the voltages with better resolution. You can also use a DC voltage calibrator to achieve better resolution (when testing with small voltages).

5 V/div
2 V/div
1 V/div
0.5 V/div
0.2 V/div
0.1 V/div
50 mV/div
49.8 mV/div
23 mV/div
20 mV/div
10 mV/div
5 mV/div
2 mV/div
1 mV/div

Part 1 0b ΔV DC Accuracy: 11300-Series Mainframe Procedure

The system ΔV DC Accuracy is checked using a precision digital multimeter and power supply.

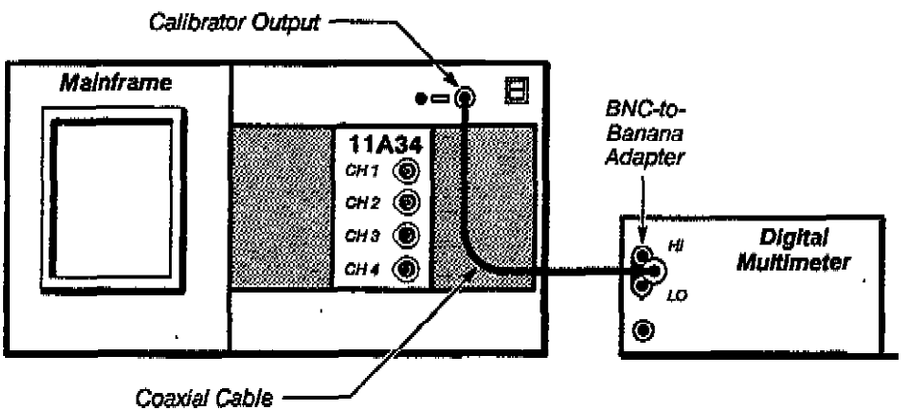
The purpose of this procedure is to confirm that the amplifier can be accurately calibrated. This procedure does not test for mainframe calibration voltage reference accuracy or long term stability. Therefore, the mainframe is characterized and tests must be performed immediately after an Enhanced Accuracy calibration. Also, the amplifier specifications are mare stringent than those in me *11A34 User's Reference Supplement.*

Specification

ΔV DC Accuracy within ±1.2%.

Setup to Characterize the 11300-Series Mainframe

Note: After entering Extended Test, verify that your mainframe's firmware is Version V2.4 or higher: If your mainframe's firmware version is lower then W.4, then you cannot perform this procedure.



Setup to Characterize the 11300-Series Mainframe

Procedure to Characterize the 11300-Series Mainframe

❑ Step 1: Perform me following settings:

Center plug-in	no setting changes
Mainframe	
UTILITY major menu	Ext Test
Run	
Block	Front Panel
Area	FP Calibrator
Routine	-9.9988 V
Loop	cnt( )
Run..	

Digital multimeter (DMM)
Mode ..... DC,
Range ..... Auto

☐ Step.2: Record the **DMM** reading.

☐ Step 3: Select Run.

☐ Step 4: Select Routine and set to + **9.9939V.**

☐ Step 5: **Select** Run.

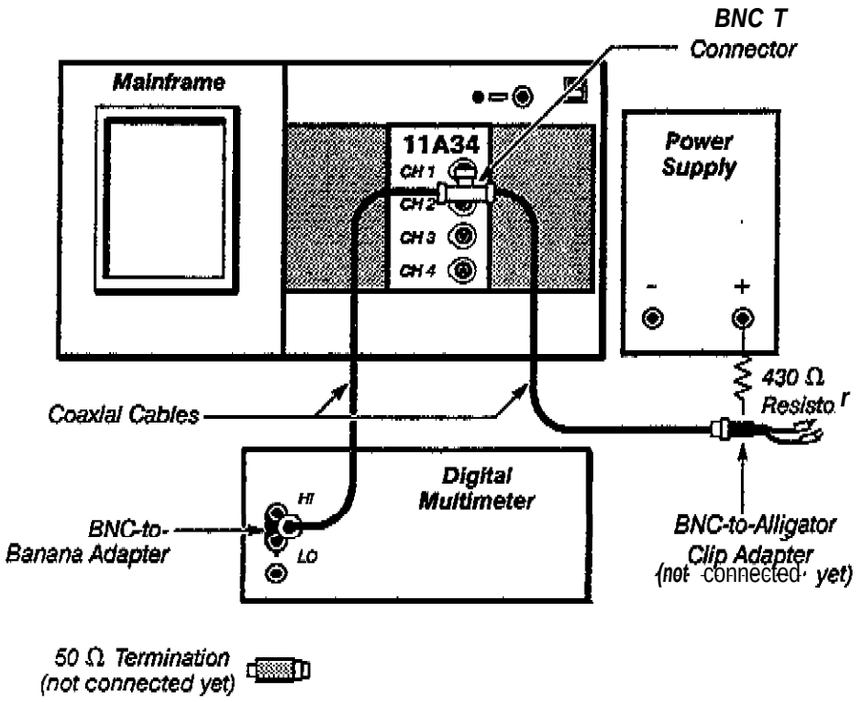
☐ Step 6: Record the DMM reading.

❑ Step 7: **Select Run.**

❑ **Step 8:Press the UTILITY button.**

❑ Step 9: Add the absolute values of the DMM readings obtained in Steps 2 **and 6. Divide** the result by 19.9927 to obtain the mainframe's calibration **voltage** *reference* **characterization** factor (which **is** used in the **Procedure** to Test Amplifier).

Setup to Check the Amplifier AV DC Accuracy



Setup to Check the Amplifier AV DC *Accuracy*

Procedure to Check the Amplifier ΔV DC Accuracy

☐ "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 . . ..r.....on
Mainframe
HF Limit .....20 MHz
Power supply
Output .....on
Digital multimeter (DMM)
Mode..... DC
Range . . . . Auto

If the environment Is electrically noisy, then connect a capacitor (at least 0.1 μF) across the input terminals of the DMM.

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

It is helpful If you use a pocket calculator to do the calculations required for evaluating the date in this pan. If your DMM is equipped with a comparison or relative reference feature, use this feature for the readings and calculation required in Steps 3 and 5.

When connecting me alligator clips, connect one clip to me power supply's negative terminal directly and the other clip to the 430 Ω resistor (not the power supply% positii terminal).

☐ Step 2: Select Vertical Cursors.

☐ Step 3: Connect the alligator clips to the Dower supply and set the voltage so that the trace is within ±0.2 divisions of the first graticule line above the bottom of the screen. Read the DMM and record the absolute value (that Is, ignore me polarity).

☐ Step 4: Sat the Vert Ref cursor on me trace using the left function control knob with FINE resolution.

☐ Step 5: Connect the alligator clips to the power supply and set the voltage so that the trace is within ±0.2 divisions of the first graticule line below the top of the screen. Read the DMM and add the absolute value to the reading obtained in Step 3.

☐ Step 6: Set the ΔVert cursor on the trace using the right function control knob with FINE resolution. Read the ΔVert readout,

☐ Step 7: Divide the sum obtained in Step 5 by the A readout obtained in Step 6. Then divide this result by the mainframe characterization factor obtained in Step 9 of the Procedure to Characterize 11300-Series Mainframe.

☐ Step 8: *Check* that the result obtained in Step 7 is ≥0.988 but ≤1.012.

☐ Step 9: Repeat Steps 3 through 8 for the vertical site settings listed below; When testing with small voltages, it may help to install a 50 Ω termination and attenuators in series between the BNC-to-alligator clip adapter and the coaxial cable so that you can set the voltages with better resolution. You can also use a DC voltage calibrator to achieve better resolution (when testing with small voltages).

5 V/div
2 V/div
1 V/div
0.5 V/div
0.2 V/div
0.1 V/div
50 mV/div
49.8 mV/div
23 mV/div
20 mV/div
10 mV/div
5 mV/div
2 mV/div
1 mV/div

Part 11 DC Offset Accuracy

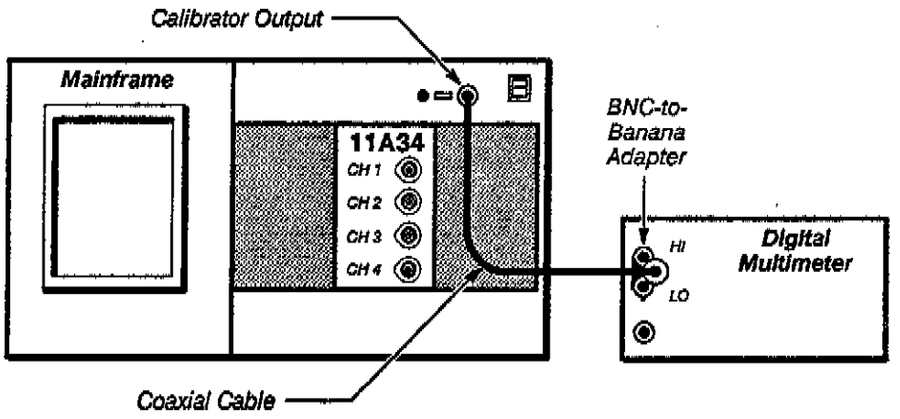
The system DC Offset is checked using a precision digital multimeter and a power supply.

The purpose of this procedure is to confirm that the amplifier can be accurately calibrated. This procedure does not test for mainframe calibration voltage reference accuracy or long term stability. Therefore, the mainframe is characterized and tests must be performed immediately after an Enhanced Acwracy calibration. Also, the amplifier specifications are more stringent than *those in the IIA34 User's Reference Supplement.*

Specifications

Refer to Table 2-S.

Setup to Characterize the 11400-Series Mainframe



Setup to Characterize the 11400-Series Mainframe

Procedure to Characterize the 11400-Series Mainframe

☐ Step 1: Perform the following settings:

Center plug-in . . . . . no setting changes

Mainframe

UTILITY major menu . . . . . Extended Diagnostic

Black . . . . . **Points Acq**

Area . . . . . **Cal Refs**

Routine . . . . . **FP** -10.000 v

Run . . . . .

Digital multimeter (DMM)

Mode . . . . . DC

Range . . . . . Auto

☐ Step 2: Record the DMM absolute value,

❑ Step 3: Press **Exit.**

❑ step 4: 'Press r-p„+ 4.9991 V.

❑ Step 5: Press **Run.**

❑ **Step 6:** Record the DMM reading.

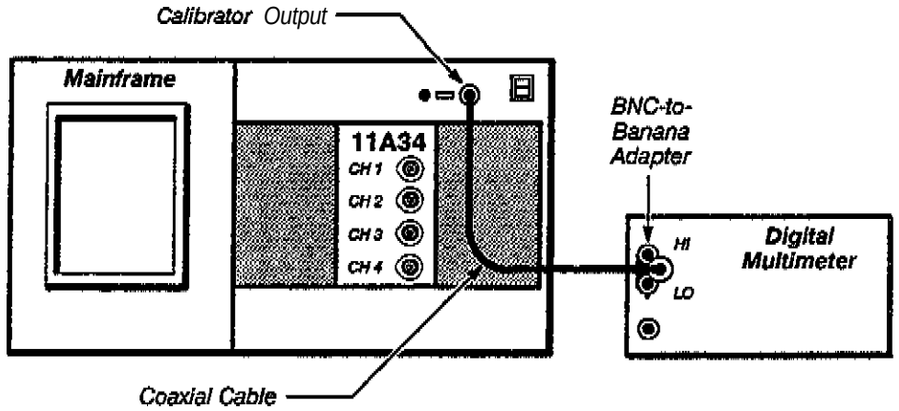
❑ Step 7:Press **Exit.**

❑ 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).

Setup to Characterize the 11300-Series Mainframe

Note: After entering Extended Test, verify that your mainframe's firmware is Version V2.4 *or higher. If your mainframe's firmware version is lower then V2.4, then you cannot perform this procedure.*



Setup to Characterize the 11300-Series Mainframe

Procedure to Characterize the 11300-Series Mainframe

❑ **Step 1:** Perform the following settings:

Center plug-in ..... no setting changes
Mainframe
UTILITY major menu ..... Ext Test
Block .... Front Panel
Area ..... FP Calibrator
Routine ..... -9.9998 V
Loop ..... cnt( )
Run .....

❑ Step 2: Record the DMM reading.

☐ Step 3: 'Select Run,

☐ Step 4: Select Routine and set to +9.9939.

☐ Step 5: Select Run.

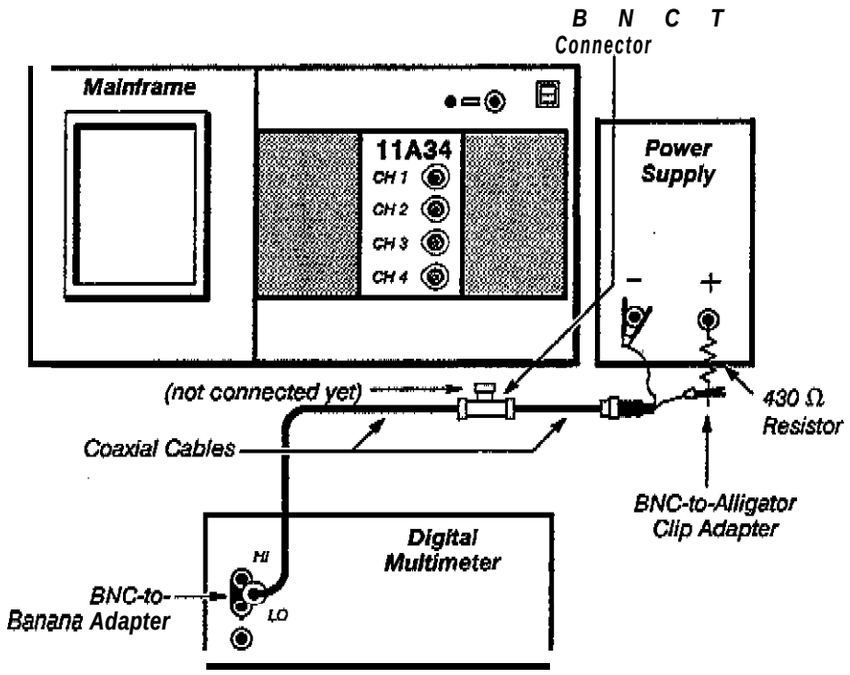
☐ Step 6: Record the DMM reading.

☐ step 7: Select Run.

❑ Step 8: [illegible] the UTILITY button.

☐ Step 9: Add the absolute values of the DMM readings obtained in Steps 2 and 6. Divide the result by 19.9927 to obtain the mainframe's calibration voltage reference characterization factor (which is used in the Procedure to Test the Amplifier).

Setup to Check the Amplifier AV DC Offset Accuracy



Setup to Check the Amplifier ΔV DC Accuracy

Procedure to Check. the Amplifier AV DC Offset Accuracy

☐ Step 1: First initialize the mainframe's setting's; then perform me following settings in the order listed:

Center plug-in
CH 1 Display on/off . . . . . on
Mainframe
BW Limit or HF Limit . . . . . 20 MHz
Power supply
output . . . . . on
Digital multimeter (DMM)
Mode . . . . . DC
Range . . . . . Auto

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

Press the Enhanced Accuracy button twice. Immediately after self-calibration has completed and passed, perform this procedure fcr each *channel.*

When connecting the alligator dips, connect one clip directly to the power supply's negative terminal end the other clip to the 430 Ω resistor (not the power supply's positive terminal).

❑ Step 2: Note the position of the displayed trace (it should be near the center of me graticule).

If you are using me 11300-Series mainframe, use Vertical Cursors to help measure and set the trace position.

If you are using the 11400-Series mainframe, set Average N to On and use Mean (whole zone) in the MEASURE major menu to help measure and set the trace position.

❑ Step 3: Connect the BNC T Connector to the CH 1 input connector, with the DMM connected.

☐ *Step 4:* Set the Vert Offset or VERTICAL OFFSET to 4 V. Set the, *power* supply voltage so that the displayed trace returns to the position noted in Step 2. Divide the DMM reading by the mainframe characterization factor (obtained in the Procedure to Characterize the Mainframe) and subtract the Vertical Offset.

☐ Step 5: *Check* that the result obtained in Step 4 is less than the Error Limit shown in Table 2-6.

☐ Step 6: Disconnect the BNC T connector at the CH 1 input connector and set Vert Offset or VERTICAL OFFSET to 0.

❑ Step 7: Repeat Steps 2 through 6 for each Vertical Size and Offset shown In Table 2-6. When testing with small voltages, it may help to install attenuators in series between the BNC-to-alligator clip adapter and the coaxial cable so that you can set the voltages with better resolution. You can also use a DC voltage calibrator to achieve better resolution (when testing with small voltages).

Table 2-6 — 11A34 Amplifier DC Offset Accuracy

Vertical Size	Vertical Offset	Error Limit (± Volts)
1 V/div	4 v	57.4 mV
0.1 V/div	4 v	12.4 mV
1 mV/div	1 V	2.0 mV
1 mV/div	800 mV	1.7 mV
1 mV/div	600 mV	1.4 mV
1 mV/div	400 mV	1.1 mV
1 mV/div	200 mV	800 µV