FACTORY CALIBRATION PROCEDURE

CONTENTS:

This is the guide for calibrating new instruments in Product Manufacturing. The procedure consists of 4 sections:

Equipment Required

Factory Test Limits - Factory Test Limits are limits an instrument must meet before leaving Manufacturing. These limits are often more stringent than advertised performance requirements. This is to insure that the instrument will meet advertised requirements after shipment, allows for individual differences in test equipment used, and (or) allows for changes in environmental conditions.

Short Form Procedure - The Short Form Procedure has the same sequence of steps and the same limits on checks or adjustments as the Main Procedure.

Main Procedure - The Main Procedure gives more detailed instructions for the calibration of the instrument. This procedure may require that some checks and adjustments be made so that performance is better than that required by the Factory Test Limits. This insures the Factory Test Limits will be met when side panels are added, permits some normal variation in test equipment and plug-in scopes, etc.

Abbreviations in this procedure will be found listed in TEKTRONIX STANDARD A-100. Definitions of terms used in this procedure may be found in TEKTRONIX STANDARD A-101.

In this procedure, all front panel control labels and Tektronix instrument names are in capital letters (VOLT/DIV, etc). Internal adjustment labels are capitalized only (Gain Adj, etc).

This procedure is company confidential

3A9

April 1969
For all serial numbers.

CHANGE INFORMATION:

This procedure has been prepared by Product Manufacturing Staff Engineering. For information on changes made to this procedure, to make suggestions for changing this procedure, or to order additional copies: please contact PMSE, 39-307.

EQUIPMENT REQUIRED

All TEKTRONIX test equipment must be calibrated to Factory Test Limits using methods specified in the applicable TEKTRONIX Factory Calibration Procedure. Other test equipment should be calibrated to its manufacturer's specifications. Exceptions to calibration procedures, which are necessary to improve the measurement capability of some test equipment, e.g. calibrated to ±0.5% accuracy at some specific setting, are noted on this Equipment Required List.

Equivalent test equipment may be used. A Test-Final Staff Engineer must approve any substitutions.

a. TEKTRONIX Instruments

1	TYPE 561B OSCILLOSCOPE
1	TYPE 3B4 TIME BASE
1	TYPE 547 OSCILLOSCOPE
1	TYPE W PLUG-IN UNIT

b. Test Fixtures and Accessories

*1	Standard Amplitude Calibrator (067-0502-00) (with EXT mod)
*1	Sine Wave Generator (067-0542-99) with "J" series timing caps
1	P6019 AC Current Probe (010-0196-00)
1	Normalizer, 47pF (067-0541-00)
1	50Ω Termination (011-0049-00)
2	10X Attenuators (011-0059-00)
1	COAX T Connector (067-0525-00)
2	50Ω cables (012-0057-00)
1	600V Variable DC Supply PMPE Dwg #1421A
1	Variable Attenuator (067-0511-00)
1	.01 capacitor (MYLAR)
1	1% 100Ω resistor

*Indicates measurement characteristics; test equipment must be traceable to NBS for instrument certification.

Factory Test Limits are qualified by the conditions specified in the main body of the Factory Calibration Procedure. The numbers and letters to the left of the limits correspond to the procedure steps where the check or adjustment is made. Steps without Factory Test Limits (setups, presets, etc.) are not listed. Instruments may not meet Factory Test Limits if calibration or checkout methods and test equipment differ substantially from those in this procedure.

3. BALANCE

b. Variable Balance ±.2div, max

4. INPUT CURRENT

a. + Input Current
b. - Input Current

5. NEUTRALIZATION

b. - Neutralization ±.5%, max
c. + Neutralization ±.5%, max

6. GAIN

a. GAIN range 17.4V/DIV to 24.4 V/DIV
b. VARIABLE ratio: 2.5:1, min, with GAIN full ccw

7. POSITION RANGE + & - 10.2div, min

8. SIGNAL OUT

b. DC Level ±.5V, max
d. Amplitude 1v/div, ±15%, max
e. Dynamic range + & - 5.2 Volts, min
f. Compression-expansion ±2%, max

9. VOLTS/DIV ACCURACY

a. 1mV to 10 VOLTS/DIV
Error: ±1.5%, max, relative to 1mV/DIV
b. 1mV to 10μV VOLTS/DIV accuracy
Error: ±1.5%, max, relative to 1mV/DIV

11. INPUT CAPACITANCE AND ATTENUATOR COMPENSATION

b. Input capacitance aberration: ±1%, max
c. Attenuator compensation aberration: ±1%, max

12. CMRR

*b. CMRR 125,000:1, min, DC to 100kHz
*c. AC coupled CMRR 25,000:1, min, @ 100kHz; 2,500:1, min, @ 60Hz
*d. Attenuator CMRR 1000:1, min, @ 100kHz

13. BANDWIDTH LIMIT

*b. 1MHz bandwidth 1MHz, +30%, -0%, max
*c. UPPER -3dB FREQUENCY ±10%, max
*d. LOWER -3dB FREQUENCY ±10%, max

14. DYNAMIC RANGE AND INPUT OVERDRIVE

b. - Dynamic range and INPUT OVERDRIVE
Range: 1.0V, min
INPUT OVERDRIVE light: 0.8V, min, 1.0V, max
c. + Dynamic range and INPUT OVERDRIVE
Range: 1.0V, min
INPUT OVERDRIVE light: 0.8V, min, 1.0V, max

15. DC OFFSET

b. -DC OFFSET 1V, ±9%, max
c. +DC OFFSET 1V, ±9%, max

16. OVERDRIVE RECOVERY

b. Overdrive recovery 0.5% in 10μS, max

17. NOISE

b. Noise measured tangentially:
10μV, max

18. DRIFT 5μV, max, in one min

19. CURRENT

b. LF COMP Range: must compensate
125 turn probe
c. CURRENT/DIV Error: 2%, max

20. INPUT CURRENT

a. + Input Current 16pA, max.
b. - Input Current 16pA, max.

THE FOLLOWING CHECKS ARE NOT MADE ON 100% OF THE INSTRUMENTS BUT ARE DONE ON SAMPLING BASIS.

21. AC LF RESPONSE

b. + INPUT AC LF response
-3dB @1.6Hz, ±5%, max

22. SIGNAL OUT RESISTANCE

b. SIGNAL OUT resistance 100Ω, max

THE END

*Indicates measurement characteristics; test equipment used must be traceable to NBS for instrument certification.

This instrument must meet Factory Test Limits before it leaves Manufacturing; therefore, it must be possible to inspect to these limits. Because of normal variations in test equipment and plug-in scopes, addition of side panels, etc, this procedure may require that some checks and adjustments be made so that performance is better than that required by Factory Test Limits.

1. PRESETS

a. Preset TYPE 3A9
b. Preset TYPE 3B4

2. CHECK RESISTANCE

3. BALANCE

a. Setup
b. Adjust Variable Balance
   ±.2div, max
c. Adjust AC Atten Bal
d. Adjust Coarse Bal

4. INPUT CURRENT

a. Adjust + Input Current
b. Adjust - Input Current

5. NEUTRALIZATION

a. Complete setup
b. Adjust - neutralization:
   ±0.5%, max
c. Adjust + neutralization:
   ±0.5%, max

6. GAIN

a. Check GAIN range and SIGNAL OUT AMPLITUDE
b. Check VARIABLE
   Ratio: 2.5:1, min

7. CHECK POSITION RANGE

   + & - 10.3div,min

8. SIGNAL OUT

a. Complete setup
b. Adjust DC Level
   Adjust for 0V
c. Adjust HF Compensation
d. Check dynamic range + & - 5.5 volts, min
e. Check compression-expansion
   ±2%, max

9. VOLTS/DIV ACCURACY

a. Check 1mV to 10 VOLTS/DIV
   Error: ±1.5%, max, relative to 1mV/div
b. Check 1mV to 10mV VOLTS/DIV accuracy
   Error: ±1.5%, max, relative to 1mV/div

10. ADJUST ATTENUATOR DC CMRR

11. INPUT CAPACITANCE AND ATTENUATOR COMPENSATION

a. Complete setup
b. Adjust C112 (C212)
   Aberration: ±1%, max
c. Adjust attenuator compensation
   Aberration: ±1%, max

12. CMRR

a. Adjust CMRR 125,000:1, min, @100kHz
b. Check CMRR 125,000:1, min, 10Hz to 10kHz
c. Check AC coupled CMRR
   25,000:1, min, @100kHz
   2,500:1, min, @60Hz
d. Check attenuator CMRR

13. BANDWIDTH LIMIT

a. Complete setup
b. Check 1MHz bandwidth
   1MHz, +3%, min, +30%, max
c. Check -3dB FREQUENCY UPPER
   ±10%, max
d. Check -3dB FREQUENCY LOWER
   ±10%, max

14. DYNAMIC RANGE AND INPUT OVERDRIVE

a. Setup
b. Check - dynamic range and INPUT OVERDRIVE Range: 1.0V, min
   INPUT OVERDRIVE light: 0.8V, min, 1.0V, max
c. Check + dynamic range and INPUT OVERDRIVE
   Range: 1.0V, min
   INPUT OVERDRIVE light: 0.8V, min, 1.0V, max

15. DC OFFSET

a. Setup
b. Check - DC OFFSET
   1.0V, ±9%, max
c. Check + DC OFFSET
   1.0V ±9%, max

16. OVERDRIVE RECOVERY

a. Complete setup
b. Check overdrive recovery
   0.5%, in 10μS, max

17. NOISE

a. Setup
b. Check noise measured tangentially:
   10μV, max

18. CHECK DRIFT

5μV, max, in one minute

19. CURRENT

a. Setup
b. Check LF COMP
   Range: must compensate 125 turn probe
c. Check CURRENT/DIV accuracy
   Error: 2%, max

20. INPUT CURRENT

a. Adjust + Input Current 10pA, max
b. Adjust - Input Current 10pA, max

THE FOLLOWING CHECKS ARE NOT MADE ON 100% OF THE INSTRUMENTS BUT ARE DONE ON A SAMPLING BASIS.

21. AC LF RESPONSE

a. Setup
b. Check AC LF response
   -3dB ±1.6Hz, ±5%, max

22. SIGNAL OUT RESISTANCE

a. Setup
b. Check SIGNAL OUT resistance
   100Ω, max

THE END

1. PRESETS

a. Preset TYPE 3A9

VOLTS/DIV	10mV
VARIABLE	CAL
POSITION	centered
-3dB FREQUENCY	
UPPER	10kHz
LOWER	10Hz
DC OFFSET	
FINE	midr
COARSE	midr
STEP ATTEN DC BAL	midr
GAIN	midr
AC CURRENT -VOLTS	VOLTS
+ INPUT	GND
- INPUT	GND
all internal adjustments	midr

b. Preset TYPE 3B4

TIME/DIV	.5mSEC
TRIGGER MODE	AUTO
TRIGGERING LEVEL	0
SLOPE	+
COUPLING	AC
SOURCE	INT
VARIABLE	CALIB

2. RESISTANCE

Check resistance to ground or 24 pin Amphenol connector. Connect negative lead of VOM to gnd. Set VOM to X1k scale.

pin number	≃ resistance	use
1-8	∞	unused
9	0Ω	gnd
10	>200k	+300V
11	7.5k	internal trig out
12	∞	unused
13-14-15	7k	+125V
16	8.5k	internal trig out
17	>200k	sig out
18-19	∞	unused
20	6k	+125V shunt
21	>200k	sig out
22	680Ω	-100V shunt
23	10k	-100V
24	0Ω	gnd

3. BALANCE

a. Setup

Install plug-in extension in TYPE 561B VERTICAL compartment. Connect TYPE 3A9 to extension. Turn POWER on.

b. Adjust Variable Balance ±.2div, max

→ Set TYPE 3A9 VOLTS/DIV to 10mV. Adjust R425 for no trace shift while rotating the VARIABLE con-
→ trol ccw and cw. Set VARIABLE to CAL.

c. Adjust AC Atten Bal

Position the trace to graticule center with the TYPE 3A9 POSITION
→ control. Set VOLT/DIV to 50μV. Adjust R405 to return trace as near to graticule center as possible.

d. Adjust Coarse Bal

Position trace to graticule center with the TYPE 3A9 POSITION control.
→ Set -3dB FREQUENCY LOWER to DC. Set
→ VOLTS/DIV to .5mV. Adjust R345 to return trace to approximately graticule center. Adjust STEP ATTEN DC BAL for no trace shift while switchine VOLTS/DIV between .5mV and 10μV.

→ Set VOLTS/DIV to 10mV and position trace to graticule center with TYPE 3A9 POSITION control.

Note: The arrows in the left margin indicated a switch position change. They are an aid in checking the front panel setup.

4. INPUT CURRENT

a. Adjust + Input Current

→ Set -3dB FREQUENCY UPPER to 100Hz.
→ Set VOLTS/DIV to 10μV. Connect a .01 capacitor to the + INPUT. Position trace to graticule center with STEP ATTEN DC BAL. Adjust R215 for minimum trace shift while switching the + INPUT selector between GND and DC.
→ Set + INPUT to GND.

b. Adjust - Input Current

Change the .01 capacitor to the - INPUT. Adjust R115 for minimum trace shift while switching the - INPUT selector between GND and DC. Set - INPUT selector to GND.

→ Set -3dB FREQUENCY UPPER to 1MHz and VOLTS/DIV to 10mV.

Note: The .01 cap should be inclosed in a holder such as the 204-0209-00 with a 134-0044 connector.

The Input Current will be readjusted later in the FCP.

5. NEUTRALIZATION

a. Complete setup

TYPE 3A9

POSITION	midr
CURRENT - VOLTS	VOLTS
+ INPUT	DC
- INPUT	GND
VOLTS/DIV	10mV
VARIABLE	CAL
STEP ATTEN DC BAL	midr
DC OFFSET FINE	midr
COARSE	midr
-3dB FREQUENCY UPPER	1MHz
LOWER	DC OFFSET

TYPE 3B4

POSITION	midr
FINE	midr
TIME/DIV	.5mSEC
TRIGGER MODE	AUTO
TRIGGERING LEVEL	0
SLOPE	+
COUPLING	AC
SOURCE	INT

5. (CONT)

b. Adjust - neutralization: ±0.5%, max

Apply a 100V signal through the 1000:1 divider to the TYPE 3A9 + INPUT. Set
→ the 1000:1 divider to X1000. Position the top of the display to graticule center with the TYPE 3A9 COARSE con-
→ trol. Set VOLTS/DIV to 1mV.

Adjust C131 for least change in front corner of waveshape when switching - INPUT from GND to DC. Aberration: ±0.5 div, max.

c. Adjust + neutralization: ±0.5%, max

Set TYPE 3A9 - INPUT to DC. Change signal from + INPUT to - INPUT. Position bottom of display to graticule center with DC OFFSET COARSE (approx 1 turn CW). Adjust C231 for least change in front corner of waveshape when switching + INPUT from GND to DC. Aberration: ±1cm, max. Re-
→ move signal. Set both INPUT switches to GND.

→ Set -3dB FREQUENCY LOWER to DC.

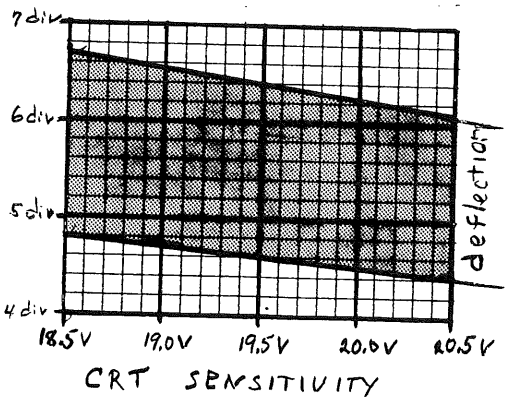
6. GAIN

a. Check GAIN range and SIGNAL OUT amplitude GAIN range: see graph
SIGNAL OUT amplitude: ±20%

Connect a 5V signal from the SAC through the 1000:1 divider to the TYPE 3A9 + INPUT.

Connect a cable from the SIGNAL OUT jack to the TYPE W "A" INPUT. Position the TYPE 561B trace to graticule center with the TYPE 3A9 POSITION control. Adjust Signal Out DC Level (R467) for ≈ zero volts on the test scope display.
→ Set the TYPE 3A9 + INPUT selector to DC.

Adjust the TYPE 3A9 GAIN CW to the number of divisions indicated by the graph. The test scope display should be 5V, ±1V, max.



6a. (CONT)

Adjust the TYPE 3A9 GAIN ccw to the number of divisions indicated by the graph. The test scope display should be 5V, ±1V, max.

Adjust GAIN for exactly 5div.

b. Check VARIABLE ratio: 2.5:1, min

Rotate VARIABLE full ccw. Note amplitude, 1.9div, max.

→ Set VARIABLE to CAL.

NOTE: If the amplitude appears to be boarderline (1.9div), check the ratio by the alternate method.

b. Alternate method:
Adjust GAIN full ccw and note amplitude. Rotate VARIABLE full ccw and note amplitude. The amplitude noted with the VARIABLE ccw should be not more than 40% of the amplitude noted with the VARIABLE at CAL.

7. POSITION RANGE + & - 10.3 div, min

→ Set SAC to 10 VOLTS and MODE to + DC. Rotate TYPE 3A9 POSITION full ccw. Trace must be at least .3div
→ below electrical center. Set SAC MODE to - DC. Rotate TYPE 3A9 POSITION full cw. Trace must be at least .3div above electrical center.

→ Set + INPUT selector to GND. Set SAC MODE to square wave.

Remove cable from 1000:1 divider.

8. SIGNAL OUT

a. Complete setup

TYPE 3A9

CURRENT VOLTS	VOLTS
+ INPUT	DC
- INPUT	GND
VOLTS/DIV	10mV
VARIABLE	CAL
STEP ATTEN DC BAL	midr
-3dB FREQUENCY UPPER	1MHz
LOWER	DC
POSITION	electrical center

8a. (CONT)

Test Scope

TRIGGERING LEVEL	0
MODE	AUTO
SLOPE	+
COUPLING	AC
SOURCE	NORM
TIME/CM	.2mSEC

TYPE W

VC RANGE	0
A INPUT	GND
INPUT ATTEN	10
MILLIVOLTS/CM	50
POSITION	trace centered

TYPE 3A9 SIGNAL OUT is connected to TYPE W A INPUT.

b. Adjust DC Level ±0.5V, max

Adjust R467 for no trace shift on test scope while switching TYPE W Input selector → between GND and DC. Leave input selector at DC.

c. Adjust HF Compensation

Connect 40mV from TYPE 561B CALIBRATOR to the TYPE 3A9 + INPUT. Set → + INPUT selector to DC. Adjust C461 for best front corner compensation of test scope display.

Remove signal.

d. Check dynamic range + & - 5.5 volts, min

→ Set TYPE W INPUT ATTEN to 100 and A input selector to AC. Position trace to graticule center. Connect 1kHz from Sine Wave Generator to TYPE 3A9 + INPUT. Increase Sine Wave Generator Amplitude until clipping occurs on the positive and negative peaks of the test scope display.

Note amplitude of test scope display: + & - 5.5 Volts, min.

8. (CONT)

e. Check compression-expansion ±2%, max

Decrease Sine Wave Generator amplitude to 1div displayed on TYPE 561B. Set
→ TYPE W INPUT ATTEN to 10 and MILLIVOLTS/CM to 20. Adjust TYPE W VARIABLE for 5cm signal on test scope.

Position top of the 1div display to top of graticule with TYPE 3A9 POSITION control. Check test scope display amplitude: 4.9div, min, 5.1div, max. Position bottom of the 1div display to the bottom of graticule with TYPE 3A9 POSITION control. Check test scope display amplitude: 4.9div, min, 5.1div, max.

Remove cables from TYPE 3A9.

9. VOLTS/DIV ACCURACY

a. Check 1mV to 20 VOLTS/DIV Error: ±1.5%, max relative to 1mV/DIV

Note: Use a SAC with EXT MOD.

Connect 100V @ 500Hz from Sine Wave
→ Generator to SAC EXT INPUT. Set SAC MODE to EXT. Set SAC AMPLITUDE to 10VOLTS. Connect SAC OUTPUT through 1000:1 divider to TYPE 3A9 + INPUT.
→ Set 100:1 divider to X1000.

Set TYPE 3A9 VOLTS/DIV to 1mV. Adjust Sine Wave Generator AMPLITUDE MULTIPLIER for 6div display. Maintain a 6div display with the SAC AMPLITUDE switch while checking each position of the TYPE 3A9 VOLTS/DIV switch from 1mV to 10mVOLTS: ±.09div, max error.

Set 1000:1 divider to X1. Set SAC AMPLITUDE to .1V. Maintain a 6div display with SAC AMPLITUDE switch while checking each position of the TYPE 3A9 VOLTS/DIV switch from 100mV to 10V: ±.09div, max error.

9. (CONT)

b. Check 1mV to 10μV VOLTS/DIV accuracy
Error: ±1.5%, max, relative to 1mV/DIV

→ Set TYPE 3A9 -3dB FREQUENCY UPPER to 100Hz and LOWER to 10kHz. Set VOLTS/
→ DIV to 1mV. Set SAC AMPLITUDE to 1 VOLT. Adjust Sine Wave Generator AMPLITUDE MULTIPLIER for exactly 6div of display. Maintain a 6div display with the SAC AMPLITUDE switch while checking each position of the TYPE 3A9 VOLTS/DIV switch from 1mV to 10μV: ±0.09div, max error.

→ Set + INPUT selector to GND, -3dB FREQUENCY UPPER to 1MHz and LOWER to DC. Remove signal.

10. ATTENUATOR DC CMRR

Connect TYPE 547 AMPLITUDE CALIBRATOR through the coax T to TYPE 3A9 + and - INPUT. Set both input selectors to DC and adjust for minimum square wave amplitude as in table below:

VOLTS/DIV	CALIBRATOR	adjust
20mV	2 VOLTS	R105E
.2 V	20 VOLTS	R107E
2 V	100 VOLTS	R109E

Remove coax T.

11. INPUT CAPACITANCE AND ATTENUATOR COMPENSATION

a. Complete setup

TYPE 3A9

POSITION	midr
CURRENT-VOLTS	VOLTS
VOLTS/DIV	10mV
-3dB FREQUENCY UPPER	1MHz
LOWER	DC
STEP ATTEN DC BAL	midr
+ INPUT	GND
- INPUT	DC

Test Scope

AMPLITUDE CALIBRATOR	.1V

b. Adjust C112 (C212)
Aberration: ±1%, max.

Connect test scope CAL OUT through a 50Ω cable and 47pf Normalizer to the TYPE 3A9 - INPUT.

Adjust C112 (C212) for best square wave.

c. Adjust attenuator compensation
Aberration: ±1%, max

→ Set the AMPLITUDE CALIBRATOR for 5div of deflection in each of the following steps.

Adjust for best front corner, then for level.

TYPE 3A9 VOLTS/DIV	adjust for best front corner	adjust for level
20mVOLTS	C105C (C205C)	C105B (C205B)
50mVOLTS	check*	
.1 VOLTS	check*	
.2 VOLTS	C107C (C207C)	C107B (C207B)
.5 VOLTS	check*	
1 VOLTS	check*	
2 VOLTS	C109C (C209C)	C109B (C209B)
5 VOLTS	check*	
10 VOLTS	check*	

* The rolloff, overshoot and level must be within 1%. If necessary, detune preceding variable capacitors (within 1%) to bring all positions involved within 1%.

Repeat step 11 for + INPUT.

Remove signal and Normalizer

12. CMRR

a. Adjust CMRR 125,000:1, min

→ Set TYPE 3A9 VOLTS/DIV to 1mV, and - INPUT Selector to DC. Apply 20V at 100kHz from SINE WAVE GENERATOR to Coax T connector and connect to TYPE 3A9 ± INPUTS. Adjust C162 for
→ minimum deflection. Set VOLTS/DIV to .1mV and adjust C162 for minimum deflection, 1.6div, max.

b. Check CMRR 125,000:1, min

→ Set SINE WAVE GENERATOR FREQUENCY MULTIPLIER to 10kHz, 1kHz, 100Hz, and 10Hz and note deflection: 1.6div, max.

c. Check AC coupled CMRR
25,000:1, min @100kHz
2,500:1, min, @60Hz

→ Set TYPE 3A9 VOLTS/DIV to 1mV and INPUT
→ selectors to AC. Set Sine Wave Generator to 100kHz and note deflection: .8div,
→ max. Set TYPE 3A9 VOLTS/DIV to 10mV.
→ Set Sine Wave Generator to 60Hz and note deflection: .8div, max.

d. Check attenuator CMRR 1000:1, min, @100kHz

→ Set Sine Wave Generator to 100kHz. Set
→ both INPUT selectors to DC and check as in table:

Sine Wave Generator	VOLTS/DIV	Adjust if necessary	deflection
20 Volts	20mV	C205C	1div
50 Volts	50mV		1div
100 Volts	.1 Volts		1div
100 Volts	.2	C207C	0.5div
100 Volts	.5		0.2div
100 Volts	1		0.1div
100 Volts	2	C209C	0.1div
100 Volts	5		0.1div
100 Volts	10		0.1div

Remove inputs. Set the - INPUT selector to GND.

13. BANDWIDTH LIMIT

a. Complete setup

POSITION	midr
CURRENT-VOLTS	VOLTS
VOLTS/DIV	10mV
+ INPUT	DC
- INPUT	GND
-3dB FREQUENCY UPPER	1MHz
LOWER	DC

Connect Sine Wave Generator to TYPE 3A9 + INPUT. Adjust the Sine Wave Generator for 5div @ 1KHz.

b. Check 1MHz bandwidth 1MHz, +3%, min +30% max

→ Set Sine Wave Generator to 1MHz and note deflection: 3.6div, min, 4.1div, max.

Note: The difference between 3.5div and 3.6div @ 1MHz is ≈3%.

c. Check -3dB FREQUENCY UPPER ±10%, max

→ Set the TYPE 3A9 -3dB FREQUENCY UPPER and the Sine Wave Generator to each front panel frequency and note deflec-
→ tion: 3.3div, min, 3.7div, max. Set -3dB FREQUENCY UPPER to 1MHz.

d. Check -3dB FREQUENCY LOWER ±10%, max

→ Set TYPE 3A9 -3dB FREQUENCY LOWER and Sine Wave Generator to each front panel frequency from 10kHz to 1Hz and note deflection: 3.3div, min, 3.7div, max.

Remove input.

14. DYNAMIC RANGE AND INPUT OVERDRIVE

a. Setup

→ Set Sine Wave Generator AMPLITUDE
→ to 0.2 VOLTS and connect to TYPE 3A9 -INPUT. Set TYPE 3A9 -3dB FREQUENCY LOWER to 10Hz. Connect 40V DC from TYPE 561B CALIBRATOR through the variable attenuator to the TYPE 3A9 + INPUT.

→ Set - INPUT to DC.

14. (CONT)

b. Check - dynamic range and INPUT OVERDRIVE Range: 1.0V, min INPUT OVERDRIVE light: 0.8V, min, 1.0V, max

Adjust the variable attenuator slowly cw from the ccw position until the INPUT OVERDRIVE light barely illuminates.

→ Set TYPE 561B CALIBRATOR to 40V and TYPE 3A9 VOLTS/DIV to .2. Note display amplitude: 4div, min, 5div, max. Set

→ TYPE 561B CALIBRATOR to 40V DC and TYPE 3A9 VOLTS/DIV to 10mV. Adjust Variable Attenuator until CRT display begins to compress.

→ Set TYPE 3A9 VOLTS/DIV to .2 volts.

→ Set TYPE 561B CALIBRATOR to 40V (1kHz). Observe the CRT and note amplitude of the 1kHz component: 5.0div, min.

c. Check + dynamic range and INPUT OVERDRIVE Range: 1.0V, min INPUT OVERDRIVE light: 0.8V, min, 1.0V, max

Transpose + INPUT and - INPUT signals.

→ Set TYPE 3A9 VOLTS/DIV to 10mV. Set

→ TYPE 561B CALIBRATOR to 40V DC.

Repeat step 14b.

→ Remove input signals. Set INPUT switches to GND and -3dB FREQUENCY LOWER to DC.

15. DC OFFSET

a. Setup

→ Set TYPE 3A9 VOLTS/DIV to 10mV. Connect +1V DC from SAC to + INPUT and .1V @ 10kHz from Sine Wave Generator to - INPUT. Position trace to graticule

→ center with POSITION control Set TYPE 3B4 TIME/DIV to .5mS and TRIGGERING

→ LEVEL to 0. Set both INPUT switches to DC and -3dB FREQUENCY LOWER to DC OFFSET.

15. (CONT)

b. Check -DC OFFSET 1.0V ±9%, max

With TYPE 3A9 DC OFFSET FINE at mid range, rotate DC OFFSET COURSE full ccw and note any part of the 10kHz signal is displayed in the graticule area.

Note: The TYPE 3A9 sensitivity checks the offset range to 1%/div. The .1V Sine wave represents + & - 5%. The 8div graticule represents + & - 4%. The combination totals + & - 9%.

c. Check +DC OFFSET 1.0V ±9%, max

→ Set SAC MODE to -DC. Rotate TYPE 3A9 DC OFFSET COURSE full cw. Note any part of the 10kHz signal is displayed in the graticule area.

→ Set DC OFFSET COURSE so the top of the display can be observed. Rotate DC OFFSET FINE full cw and ccw and note ≃.5div range.

Remove inputs.

16. OVERDRIVE RECOVERY

a. Complete setup

TYPE 3A9

CURRENT/VOLTS	VOLTS
VOLTS/DIV	1mV
-3dB FREQUENCY UPPER	1MHz
LOWER	DC
+ INPUT	GND
- INPUT	GND
POSITION	Center trace

TYPE 3B4

POSITION	start trace at left edge of graticule
TIME/DIV	10µS
TRIGGER MODE	AUTO
TRIGGERING LEVEL	ccw
SLOPE	-
COUPLING	AC
SOURCE	INT

Connect +100V from SAC through the 250:1 divider to the TYPE 3A9 + INPUT.

Set TYPE 3B4 TRIGGER MODE to NORM and TYPE 561B INTENSITY CW.

16. (CONT)

b. Check overdrive recovery 0.5% in 10μS

→ Set TYPE 3A9 + INPUT selector to DC.
→ Set switch on 250:1 divider to 250:1 for at least one second and return to GND. Note: trace must return to within 2div of graticule center within
→ 10μS. See Fig. 1. Set + INPUT selector to GND.

→ Set TRIGGERING MODE to AUTO and decrease intensity to normal.

Remove input signal and 250:1 divider.

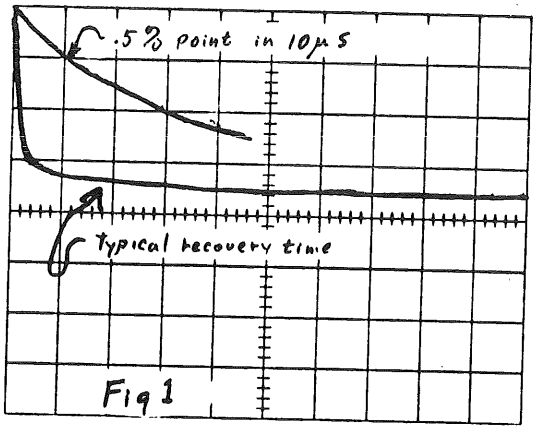


Fig 1

17. NOISE

a. Setup

TYPE 3A9

VOLTS/DIV	50μV
+ INPUT	DC

TYPE 561B

CALIBRATOR	4mV

TYPE 3B4

TIME/DIV	50μS

Install TYPE 3A9 in main frame. Connect CAL OUT through two 10X attenuators and the variable attenuator to the TYPE 3A9 + INPUT.

b. Check noise measured tangentially: 10μV, max

Adjust the variable attenuator until the dark band vanishes. Set the TYPE 3A9 VOLTS/DIV to .2mV. Set the TYPE 561B CALIBRATOR to .4V. Note display amplitude: 5div, max.

Remove signal. Set TYPE 3A9 + INPUT selector to GND.

Note: This adjustment should be done quite slowly (≈ 1min) as the eye tends to adapt itself to the display and may see a dark band where there is none.

After you become familiar with this check, it may be easier to first adjust the attenuator for 5 divisions and then see that a dark band can be observed.

18. DRIFT 5μV, max, in one minute

Position trace to graticule center with TYPE 3A9 POSITION control. Set
→ -3dB FREQUENCY UPPER to .1kHz and VOLTS/DIV to 10μV. Observe trace shift for ≈ one minute: 0.5div, max.

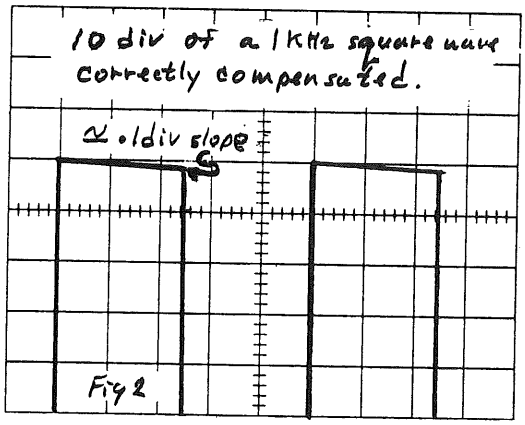
19. CURRENT

a. Setup

→ Set TYPE 3A9 -3dB FREQUENCY UPPER to .1MHz and CURRENT-VOLTS switch
→ to CURRENT. Set CURRENT/DIV to 1mA.
→ Set TYPE 561B CALIBRATOR to 10mA. Connect P6019 probe from TYPE 3A9 AC PROBE INPUT to TYPE 561B current loop.
→ Set TYPE 3B4 TIME/DIV to .2mS and TRIGGERING LEVEL near 0.

b. Check LF COMP
must compensate 125 turn probe

Position top of display to graticule center with TYPE 3A9 POSITION control. Rotate LF COMP full cw and ccw. Observe some range above and below point of correct compensation. Adjust LF COMP for a correctly compensated display. See fig. 2.



c. Check CURRENT/DIV accuracy
Error: ±2%, max

→ Set SAC to 5mA square wave. Connect P6019 to SAC current loop. Position display on graticule with TYPE 3A9 POSITION control. Check display ampli-
→ tude: 5div, ±.1div, max. Set CURRENT-VOLTS switch to VOLTS. Remove P6019.

20. INPUT CURRENT

a. Adjust + Input Current 10pA, max

→ Set -3dB FREQUENCY UPPER to 100Hz.
→ Set VOLTS/DIV to 10μV. Connect a .01 capacitor to the + INPUT. Position trace to graticule center with STEP ATTEN DC BAL. Adjust R215 for minimum trace shift while switching the + INPUT selector between GND and DC.
→ Set + INPUT to GND.

Note: The .01 cap should be inclosed in a holder such as the 204-0209-00 with a 134-0044 connector.

b. Adjust - Input Current 10pA, max

Change the .01 capacitor to the - INPUT. Adjust R115 for minimum trace shift wile switching the - INPUT selector between GND and DC. Set - INPUT selector to GND.

→ Set -3dB FREQUENCY UPPER to 1MHz and VOLTS/DIV to 10mV.

THE FOLLOWING CHECKS ARE NOT MADE ON 100% OF THE INSTRUMENTS BUT ARE DONE ON SAMPLING BASIS.

21. AC LF RESPONSE

a. Setup

→ Set TYPE 3A9 VOLTS/DIV to 10mV and +
→ INPUT switch to DC. Set KROHN-HITE OSCILLATOR to 1.6Hz and connect SINE WAVE OUTPUT to TYPE 3A9 + INPUT. Adjust OSCILLATOR RMS VOLTS for 8div displayed on CRT.

b. Check AC LF response
-3dB @ 1.6Hz, ±5%, max

→ Set TYPE 3A9 + INPUT switch to AC. Note CRT deflection: 5.5div, min, 5.8div, max.

22. SIGNAL OUT RESISTANCE

a. Setup

→ Set OSCILLATOR to 1kHz. Connect TYPE 3A9 SIGNAL OUT to TYPE W INPUT
→ with patch cords. Set TYPE W INPUT ATTEN to 10 and MILLIVOLTS/CM to 20. Adjust OSCILLATOR RMS VOLTS for a 5cm display on the TYPE 547 CRT.

b. Check SIGNAL OUT resistance
100Ω, max

Connect a 1% 1KΩ resistor between TYPE 3A9 SIGNAL OUT and GND. Note TYPE 547 display: 4.5cm, min

THE END