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

3A3

June 1968

For serial numbers 5000 and up.

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. (JT)

EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. TEKTRONIX Instruments

1 TYPE 561A OSCILLOSCOPE
1 TYPE 3B4 TIMEBASE
1 TYPE 546 or 547 OSCILLOSCOPE
1 TYPE 1A1 DUAL TRACE PLUG-IN
2 TYPE 6006 10X PROBE
1 TYPE 3A3 DUAL TRACE DIFFERENTIAL AMPLIFIER (Phase Reference)
1 TYPE 106 SQUARE WAVE GENERATOR
1 TYPE 76TU LINE VOLTAGE CONTROL UNIT

b. Test fixtures and accessories

1 Coax T connector (067-0525-00)
1 47pF normalozer (067-0541-00)
1 50 Termination (011-0049-00)
2 50 10X attenuators (011-0059-00)
3 50 42" cables (012-0057-00)
1 Plug-in extension (013-0034-00)
1 600V Variable DC supply (PMPE Dwg #1421A)
*1 STANDARD AMPLITUDE CALIBRATOR (SAC) (067-0502-00)
*1 SINE WAVE GENERATOR (067-0542-99)
1 1000:1 divider (067-0529-00)
1 Attenuator shield (PMPE Dwg #1800C)
1 .01 capacitor (Mylar)
1 5 lead coax connector (special) (see page 20)

c. Other equipment

1 20,000Ω/VDC Multimeter

*Equipment must be traceable to NBS for certification of measurement characteristics.

Substitute test equipment may be used. The Plant Staff Engineer must approve any substitutions. All equipment listed must perform within its manufacturer's specifications, unless otherwise stated.

QUALIFICATION

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 (set-ups, 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. INTERNAL VOLTAGES

b. Internal voltages
-50V: ±3V, max
+63.8V: ±1.5V, max
+65V: ±1.5V, max
+75V: ±1V, max

6. GAIN AND VARIABLE

c. VARIABLE ratio: 2.5:1, min
d. GAIN range: 0.8div, min

8. COMPRESSION-EXPANSION AND DRIFT

Compression-expansion: 0.05div, max
Drift: 20μV, max, in one minute

9. NOISE

15μV, max, measured tangentially

10. POSITION

a. POSITION centering: ±1.5div, max
b. POSITION range: + and - 7div, min

11. INPUT CURRENT

b. + Input current: ±80pA, max
c. - Input current: ±80pA, max

*13. VOLTS/DIV ACCURACY ±2%, max

15. INPUT CAPACITANCE AND ATTENUATOR COMPENSATION

a. Input capacitance
Aberration: ±2%, max
b. Attenuator compensation
Aberration: ±2%, max
c. 10mV to .1mV response
Aberration: ±2%, max

*16. CMRR

b. CMRR: 60,000:1, min, DC to 100kHz
c. AC coupled CMRR:
500:1, min, @ 10Hz
2500:1, min, @ 60Hz
d. .2mV to 10mV CMRR:
100,000:1 or 0.1 div displayed, whichever is greater

17. ATTENUATOR CMRR

b. 10X attenuator Adjustable to:
5000:1, min, DC to 1kHz
1000:1, min, 1kHz to 100kHz
c. 100X attenuator Adjustable to:
5000:1, min, DC to 1kHz
1000:1, min, 1kHz to 100kHz
d. 1000X attenuator Adjustable to:
5000:1, min, DC to 1kHz
1000:1, min, 1kHz to 100kHz

18. TRIGGER TAKEOFF

b. CH 1 and CH 2 trigger
Unbalance: 1V, max
Level: ±1v, max
Amplitude: 3V to 7V
c. COMP trigger
Amplitude: 3V to 7V
Level: ±1V, max

19. PHASING

b. Phasing: 1.5°, max

21. CHOPPED

Rate: 150kHz to 250kHz
Display factor: 50%, min
Distortion: .1 div, max

*22. BANDWIDTH

a. 500kHz BANDWIDTH: 500kHz, min
b. 5kHz BANDWIDTH: 5kHz min, 6.2kHz, max

23. NON DESTRUCTIVE DIFFERENTIAL VOLTAGE LIMIT

±350V

24. TRIGGER BANDWIDTH

b. Trigger bandwidth: 400kHz, min

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

25. INPUT CAPACITOR LEAKAGE

leakage 1nA/minute, max

26. AC LF RESPONSE

2Hz, max

27. INTERCHANNEL ISOLATION

b. Attenuator isolation 10^6:1, min
c. Channel isolation 10^5:1, min
d. Dual trace isolation: 100:1, min

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

THE END

SHORT FORM PROCEDURE

Factory TEST LIMITS are limits an instrument must meet 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, it is necessary to set up some circuits so their performance is better than required by Factory Test Limits. Therefore, the instructions given in the Factory Calibration Procedure may call for checks or adjustments which result in less error than that allowed by the Factory Test Limits.

1. TYPE 3A3 PRESETS

a. Preset external controls
b. Preset internal adjustments

2. RESISTANCE CHECKS

3. INTERNAL VOLTAGES

a. Setup
b. Check internal voltages
   -50V: ±3V, max
   +63.8V: ±1.5V, max
   +65V: ±1.5V, max
   +75V: ±1V, max

4. BALANCE

a. Adjust Coarse Step Atten Bal
b. Adjust STEP ATTEN BALANCE
c. Adjust Var DC Bal

5. ALTERNATE

6. GAIN

a. Setup
b. Check CH 1 & CH 2 Gain range:
   See CRT sensitivity graph
c. Check VARIABLE Ratio: 2.5:1, min
d. Check GAIN range .8div, min

7. INPUT SELECTORS

a. Check + input selectors
b. Check - input selectors

8. COMPRESSION - EXPANSION AND DRIFT

Compression-Expansion: 0.05div, max
Drift: 0.2div, max

9. NOISE

15μV, measured tangentially

10. POSITION

a. Check POSITION centering ±1.5div, max
b. Check POSITION range + & - 7div, min

11. INPUT CURRENT

a. Setup
b. Check + input current: ±80pA, max
c. Check - input current: ±80pA, max

12. ATTENUATOR DC CMRR

a. Setup
b. Adjust and check differential balance Trace separation: adjustable to zero

13. VOLTS/DIV ACCURACY ±2%

14. CROSS NEUTRALIZATION

a. Setup
b. Adjust C116, C216, C316, C416

15. INPUT CAPACITANCE & ATTENUATOR COMPENSATION

a. Adjust input capacitance
   Aberration: ±2%, max
b. Adjust attenuator compensation
   Aberration: ±2%, max
c. Check 10mV to .1mV response
   Aberration: ±2%, max

16. CMRR

a. Setup
b. Adjust CMRR 100,000:1, min
   DC to 100kHz
c. Check AC coupled CMRR
   500:1, min, @ 10Hz
   2500:1, min, @ 60Hz
d. Check .2mV to 10mV CMRR
   100,000:1 or .1div displayed
   whichever is greater

17. ATTENUATOR CMRR

a. Setup
b. Adjust 10X attenuator
   5000:1, DC to 1kHz
   1000:1, 1kHz to 100kHz
c. Adjust 100X attenuator
   5000:1, DC to 1kHz
   1000:1, 1kHz to 100kHz
d. Adjust 1000X attenuator
   5000:1, DC to 1kHz
   1000:1, 1kHz to 100kHz

18. TRIGGER TAKEOFF

a. Setup
b. Adjust Trig DC Bal, Trig DC Level and Compensation
   Unbalance: 1V, max
   Level: ±1V, max
   Amplitude: 3V to 7V
c. Adjust Comp Trig Level and compensation
   Amplitude: 3V to 7V
   Level: ±1V, max

19. PHASING

a. Setup
b. Adjust Phasing 1.5° , max

20. X-Y POSITIONING

21. CHOPPED

Rate: 150kHz to 250kHz
Display factor: 50%, min
Distortion: .1div, max

22. BANDWIDTH

a. Check 500kHz BANDWIDTH
   500kHz, min
b. Check 5kHz BANDWIDTH
   5kHz, min, 6.2kHz

23. NONDESTRUCTIVE DIFFERENTIAL VOLTAGE LIMIT

±350V, max

24. TRIGGER BANDWIDTH

b. Check trigger bandwidth 400kHz, min

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

25. INPUT CAPACITOR LEAKAGE

1nA/minute, max

26. AC LF RESPONSE

2Hz

27. INTERCHANNEL ISOLATION

a. Setup
b. Check attenuator isolation 10^6:1, min
c. Check channel isolation: 10^5:1, min
d. Check dual trace isolation.
   100:1, min

THE END

1. TYPE 3A3 PRESETS

a. External controls

CH 1 and 2

+ and - input selectors	GND
POSITION	midr
STEP ATTEN BALANCE	midr
VOLTS/DIV	1mVOLTS
VARIABLE volts/div	CAL
BANDWIDTH	500kHz
TRIGGER	COMP
MODE	CH 1
GAIN	midr

b. Internal adjustments

Input Current Zero R110, R210	ccw
Input Current Zero R310, R410	cw
All other adjustments	midr

Leave controls and adjustments, for any step, as they were in the preceding, unless noted otherwise.

2. RESISTANCE CHECKS

Set VOM to X1k scale. Check resistance at Amphenol connector with negative polarity lead to ground.

Pin No.	Approx Resistance	Use
1, 2	inf	6.3VAC
3	inf	alt trace sync pulse
4	0Ω	sync pulse out
5	0Ω	-12V return
6	34k	+300V shunt
7, 8	inf	unused
9	0Ω	gnd
10	30k	+300V
11	60k	V583B pin 8
12	60k	V583A pin 3
13, 14	inf	unused
15	7k	+125V
16	60k	-12.2V
17	40k	sig out
18, 19	inf	unused
20	7k	+125V shunt
21	40k	sig out
22	220Ω	-100V shunt
23	8k	-100V
24	2k	chop blanking pulse

3. INTERNAL VOLTAGES

a. Setup

Place the TYPE 3A3, on a plug-in extension, in left hand compartment of TYPE 561A. Place TYPE 3B4 in right-hand compartment. Plug the TYPE 561A into variable line voltage source set to 117V and turn power on.

TYPE 3B4 presets:

POSITION	midr
TRIGGER MODE	FREE RUN
SLOPE	+
COUPLING	AC
SOURCE	INT
TIME/DIV	.5mSEC
VARIABLE	CALIB

b. Check internal voltages

Check point	voltage
R699-D699 junction	-50V; ±3V, max
R689-D689 junction	+63.8V; ±1.5V, max
D688-D687 junction	+65V; ±1.5V, max
D687-±684 emitter junction	+75V; ±1V, max

4. BALANCE

a. Adjust Coarse Step Atten Bal

Set POSITION to mechanical center. Adjust R131 (R331) to position trace as close to graticule center as possible.

Note: When adjusting both channels, the circuit numbers for the 2nd channel will be in parenthesis.

b. Adjust STEP ATTEN BALANCE

Rotate STEP ATTEN BALANCE full cw and ccw. Adjust for no trace shift while moving VOLTS/DIV between 1mV and .1mV.

c. Adjust Var DC Bal

Adjust R159 (R359) for no trace shift while rotating VARIABLE VOLTS/DIV. Recheck step 4b.

Set MODE to CH 2 and repeat step 4 for CH 2.

5. ALTERNATE

Set MODE to ALTER. Note each time sweep is triggered the trace alternates between CH 1 and 2. Check at all TIME/DIV positions.

Set TIME/DIV to .5mSEC.

6. GAIN

a. Setup

SAC 1000:1 divider--coax T --CH1 + input
--CH2 + input

b. Check CH 1 and CH 2 Gain range

Set 1000:1 divider to X1. Set TYPE 3A3 GAIN to mid range and VOLTS/DIV switches to 10mV. Set both + input selectors to DC. Set SAC AMPLITUDE to 50mVOLTS and MODE to square wave.

Turn R175 Gain and R375 Gain full cw. Check CH 1 and CH 2 display for amplitude equal to or greater than amplitude indicated on CRT sensitivity graph.

Turn R175 Gain and R375 Gain full ccw. Check CH 1 and CH 2 display for amplitude equal to or less than amplitude indicated on CRT sensitivity graph.

Adjust R175 Gain and R375 Gain for exactly 5 div of display centered in the graticule area on CH 1 and CH 2.

c. Check VARIABLE ratio: 2.5:1, min

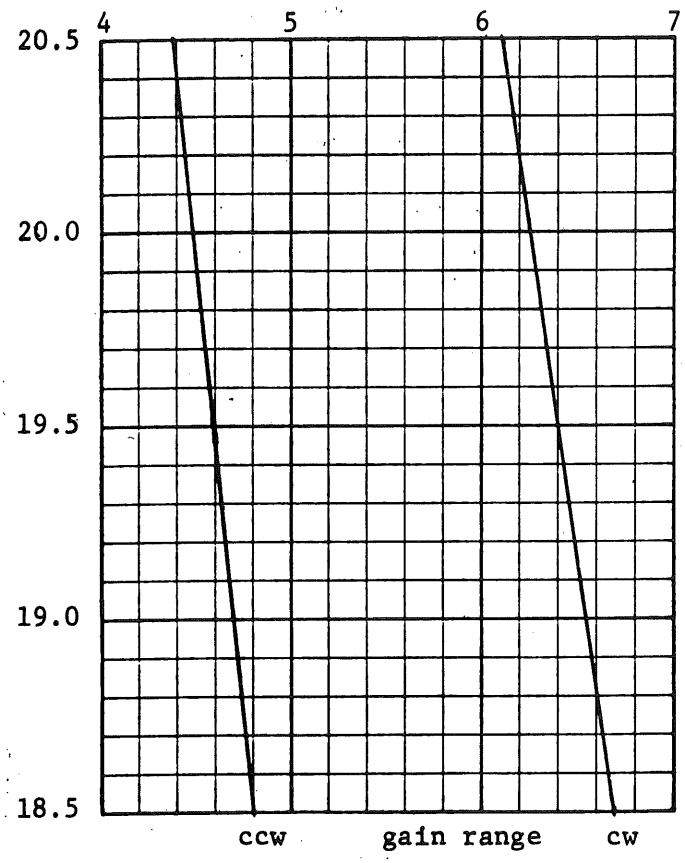
Set both VARIABLE VOLTS/DIV to max attenuation. Note deflection: 2div, max. Check for smooth mechanical and electrical operation during rotation. Return VARIABLE to CAL.

d. Check GAIN range
range: .8div, min

Set MODE to CH 1 and rotate GAIN through its range. Note total amplitude change: .8div, min.

Adjust GAIN for exactly 5div of display centered in the graticule area.

b. CRT sensitivity graph



7. INPUT SELECTORS

a. Check + Input Selectors

Set SAC to 20mV. Set both + input selectors to AC and note: both 2 div displays shift down ≈ 1 div.

b. Check - Input Selectors

Set + input selectors to GND and - input selectors to DC. Change coax T to - inputs. Set - input selectors to AC and note: both 2 div displays shift up ≈ 1 div.

8. COMPRESSION-EXPANSION DRIFT

Compression: 0.05div, max
Drift: 0.2div, max in one minute

With CH 1 POSITION, position 2div display to graticule center and note exact amplitude. Position display to top and bottom of graticule and note not more than .05div amplitude change.

Repeat with CH 2 POSITION.

Vary line voltage from 105V to 125VAC (allow sufficient time for filaments to react). Check for no shift or change in amplitude.

Set line voltage to 117V. Set input selectors to GND and VOLTS/DIV switches to .1mV. Observe traces for one minute and note drift: .2div, max.

9. NOISE

15 μV, max, measured tangentially

Check displayed noise: .2div, max. If displayed noise appears borderline, then measure noise tangentially as noted. Set VOLTS/DIV switches to 10mV.

Noise measured tangentially.

Connect 5mV from TYPE 561A CALIBRATOR through Variable Attenuator, 10X atten, and 50Ω term to TYPE 3A3 + input. Set + input selector to DC. Set TYPE 3B4 TRIGGER MODE to FREE RUN. Adjust the Variable Attenuator until the dark band just vanishes. Remove 10X atten and note deflection: 1.5div, max

10. POSITION

a. Check POSITION centering ±1.5div, max

Set MODE to CH 1 (CH2). Set CH 1 (CH2) POSITION to mechanical center and note trace is within 1.5div of electrical center.

b. Check POSITION range + & - 7div, min

Set SAC to 100mVOLTS + DC. Set CH1, (CH2) - input selector to DC. Rotate CH1 (CH2) POSITION full cw and note trace moves to within 3 div of graticule center. Set SAC MODE to -DC. Rotate CH1 (CH2) POSITION full ccw. Note trace moves to within 3 div of graticule center.

Repeat step 10a and 10b for CH 2.

Remove input signals and set all input selectors to GND.

11. INPUT CURRENT

a. Setup

Set TYPE 3A3 BANDWIDTH to 5kHz, POSITION to midrange and VOLTS/DIV to .1mVOLTS. Install the special attenuator shield.

b. Check + INPUT current: ±80pA, max

Connect the .01 cap from the + Input connector to GND. Adjust R310 (R110) for no shift when + input selector is switched from GND to DC. Set + input selector to GND.

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

11. Cont'd)

c. Check - input current: ±80pA, max

Connect the .01 cap from the CH2 (CH1) - input connector to GND. Adjust R410 (R210) for no shift when - input selector is switched from GND to DC. Set - input selector to GND.

Set MODE to CH1. Repeat step 11 for CH 1. Remove .01 cap.

12. ATTENUATOR DC CMRR

a. Setup

Apply SAC signal to CH1 inputs through coax T. Set SAC MODE to square wave. Set CH1 VOLTS/DIV to 20m VOLTS and input selectors to DC.

b. Adjust and check differential balance trace separation: adjustable to zero

VOLTS/ DIV	SAC	Adjust CH 1		Adjust CH 2	
20mVOLTS	100 VOLTS	R105F		R305F	X10 attenuator
50	100		check*		X10 attenuator
.1 VOLTS	100		check*		X10 attenuator
.2	100	R106F		R306F	X100 attenuator
.5	100		check*		X100 attenuator
1	100		check*		X100 attenuator
2	100	R107F		R307F	X1000 attenuator
5	100		check*		X1000 attenuator
10	100		check*		X1000 attenuator

* Each adjustment must be capable of moving the display levels through a null at all three of its attenuator positions.

Set MODE to CH2 and repeat for CH2 attenuator.

13. VOLTS/DIV ACCURACY

Set CH 2 (CH 1) - input selector to GND and check VOLTS/DIV accuracy as follows:

VOLTS/ DIV	SAC	1000:1 divider	deflection ±2%, max
.1mVOLTS	.5V	X1000	5 div
.2mVOLTS	1V	X1000	5 div
.5mVOLTS	2V	X1000	4 div
1mVOLTS	5V	X1000	5 div
2mVOLTS	10V	X1000	5 div
5mVOLTS	20V	X1000	4 div
10mVOLTS	50mV	X1	5 div
20mVOLTS	.1V	X1	5 div
50mVOLTS	.2V	X1	4 div
.1 VOLTS	.5V	X1	5 div
.2 VOLTS	1 V	X1	5 div
.5 VOLTS	2 V	X1	4 div
1 VOLTS	5 V	X1	5 div
2 VOLTS	10 V	X1	5 div
5 VOLTS	20 V	X1	4 div
10 VOLTS	50 V	X1	5 div

Set + input selector to GND, - input selector to DC, and repeat check.

Switch MODE and signal to CH1 and repeat check for + and - inputs.

Remove SAC signal.

14. CROSS NEUTRALIZATION

a. Setup

Set CH1 - input selector to GND, VOLTS/DIV to 10mVOLTS, + input selector to DC, and BANDWIDTH to 500kHz.

TYPE 106 -- 50Ω cable -- 2-10:1 attenuators -- 50Ω Termination -- + input

14b. (cont'd)

b. Adjust C116, C216, C316, C416

Apply 5 div of 1 kc signal from TYPE 106 to + input. Set TYPE 3B4 TRIGGER MODE to AUTO and adjust TRIGGERING LEVEL for stable display.

Adjust CH1 neutralizer C116 for least change in front corner of squarewave when switching - input selector from DC to GND.

Set - input selector to DC, move signal to - input and adjust C216 for least change in front corner of square wave, when switching + input selector from DC to GND.

Change MODE, and signal to CH2. Adjust + neutralizer C316 and - neutralizer C416 for least change in front corner of waveshape.

15. INPUT CAPACITANCE AND ATTENUATOR COMPENSATION

a. Adjust input capacitance
Aberration: ±2%, max

Remove 1 10:1 attenuator from setup. Add the 47pf Normalizer between signal and CH2 (CH1) - input. Set + input selector to GND. Set 106 Amplitude for 5div.

Adjust C409 (C209) for flat top. Connect Normalizer to CH2 (CH1) + input. Set + input to DC and - input to GND. Adjust C309 (C109) for flat top.

b. Adjust attenuator compensation
Aberration: ±2%, max

Maintain a 5div display with the TYPE 106 AMPLITUDE. Remove attenuation as necessary. Adjust for best front corner and then for level as follows:

15. (cont'd)

	Adjust front corner		level	
VOLTS/DIV	(+)	(-)	(+)	(-)
10mVOLTS	--	--	C309	C409
20mVOLTS	C305C	C405C	C305A	C405A
50mVOLTS		check*		
.1 VOLTS		check*		
.2 VOLTS	C306C	C406C	C306A	C406A
.5 VOLTS		check*		
1 VOLTS		check*		
2 VOLTS	C307C	C407	C307A	C407A
5 VOLTS		check*		
10 VOLTS		check*		

* The flat top of the waveform must be within 2% of being level. If necessary, detune positions involved (within 2%) to bring the stacked positions within2%.

c. Check 10mV to .1mV response
Aberration: ±2%, max

Add attenuation and adjust TYPE 106 to maintain 5 div display. Check front corner and level from 10mVOLTS to .1m VOLTS. Set MODE to CH1 and repeat step 15. CH2 components number C3 -- and C4--. CH1 components number C1 -- and C2--.

Remove input signal and set all input selectors to GND.

16. CMRR

a. Setup

Apply 10 volts from Sine Wave Generator through a BNC T and a COAX T to TYPE 3A3 CH1 (CH1) + and - inputs. Connect a BNC cable from the BNC T to the TYPE 3B4 EXT HORIZ IN connector. Set HORIZONTAL VOLTS/DIV and VARIABLE for 10cm of sweep.

Set TYPE 3A3 CH1 (CH2) input selectors to DC and VOLTS/DIV to .1mV.

16. (cont'd)

b. Adjust CMRR 100,000:1, min DC to 100kHz

Set Sine Wave Generator to 10Hz and note slope: 1 div max.

Set Sine Wave Generator to 1kHz and adjust C212 (C412) for minimum slope: 1div, max.

Set Sine Wave Generator to 100kHz and adjust C214 (C414) and C115 (C315): 1div, max. See fig 1.

Recheck CMRR at 10kHz, 1kHz, 100Hz, and 10Hz.

c. Check AC coupled CMRR
500:1, min, @ 10Hz
2500:1, min, @ 60Hz

Set Sine Wave Generator to 10Hz. Set TYPE 3A3 VOLTS/DIV to 5mV and both input selectors to AC. Note deflection: 4 div, max.

Set Sine Wave Generator to 60Hz and note deflection: 0.8div, max.

Set both input selectors to DC.

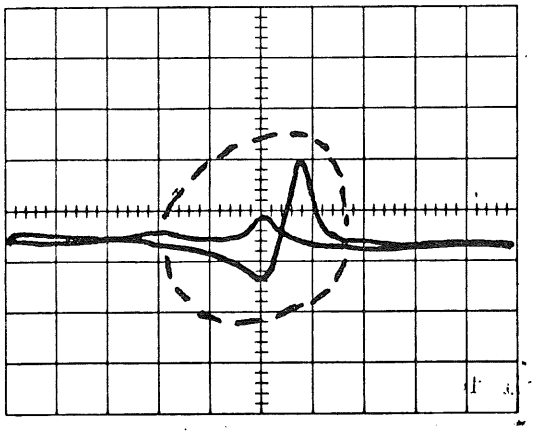
d. Check .2mV to 10mV CMRR
100,000:1 or .1 div displayed whichever is greater

Set TYPE 3B4 TIME/DIV to 50μSEC. Set Sine Wave Generator to 100kHz. Check .2mV to 10mV as in table. Disregard spikes.

VOLTS/DIV	div of deflection
.2mV	.5
.5mV	.2
1mV	.1
2mV	.1
5mV	.1
10mV	.1

Note: Select Q134 and Q234 (Q334 & Q434) to increase CMRR at 10Hz (decrease slope).

Note: If C212 range is insufficient, dress wires connecting to C112 tie point



The above display is ≃ .3div the distortion within the circle is caused by the generator and should be ignored.

16d. (cont'd)

Set - input selector to GND. Re-check step 15a (input capacitance).

Reconnect for XY display as in step 16a. If input capacity was readjusted it may be necessary to readjust C214 and C115 at 100kHz.

17. ATTENUATOR CMRR

a. Setup

Set TYPE 3A3 CH1 (CH2) VOLTS/DIV to 20mV. Set Sine Wave Generator to 50V P-P @ 10Hz. Set TYPE 3B4 HORIZONTAL VOLTS/DIV and VARIABLE for 10div of swp.

b. Adjust 10X attenuator CMRR
5000:1, DC to 1kHz
1000:1, 1kHz to 100kHz

Adjust R105F (R305F) for minimum slope: .5div, max. Set Sine Wave Generator to 1kHz and adjust C205C (C405C) for minimum opening. Vertical deflection: 0.5 div, max.

Set Sine Wave Generator to 100kHz and note vertical deflection: 2.5div max. It may be necessary to readjust C205C (C405C) slightly. Set VOLTS/DIV to 50mV. Vertical deflection: 1div, max. Set VOLTS/DIV to .1. Vertical deflection: 0.5 div, max.

c. Adjust 100X attenuator CMRR
5000:1, DC to 1kHz
1000:1, 1kHz to 100kHz

Set TYPE 3A3 CH1 (CH2) VOLTS/DIV to .2. Set Sine Wave Generator to 100V P-P @ 10Hz. Set TYPE 3B4 HORIZONTAL VOLTS/DIV and VARIABLE for 10div of sweep.

Adjust R106F (R306F) for minimum slope: 0.1 div, max.

Set Sine Wave Generator to 1kHz. Adjust C206C (C406C) for minimum opening. Vertical deflection: 0.1 div, max.

Set Sine Wave Generator to 100kHz. Note vertical deflection: 0.5div, max. It may be necessary to readjust C206C (C406C) slightly.

17c. (cont'd)

Set VOLTS/DIV to .5 and note deflection: 0.2div, max. Set VOLTS/DIV to 1V and note deflection: 0.1div, max.

d. Adjust 1000X attenuator CMRR

Set TYPE 3A3 CH1 (CH2) VOLTS/DIV to 2. Set Sine Wave Generator to 10Hz. Adjust R107F (R307F) for minimum slope: .1div, max. Set Sine Wave Generator to 100kHz and adjust C207C (C407C) for minimum vertical deflection: .1 div, max.

Set MODE to CH2 and Repeat step 16 and 17.

Remove all input signals.

18. TRIGGER TAKEOFF

a. Setup

Connect 2 10X probes from the TYPE 1A1 CHANNEL 1 and CHANNEL 2 to TYPE 3A3, V583, pin 3 and pin 8 respectively. Set TYPE 1A1 MODE to ALT, both VOLTS/CM to .2, INPUT SELECTORS to GND and traces to graticule center. Set both INPUT SELECTORS to DC. Set TYPE 3B4 TIME/DIV

Set both TYPE 3A3 VOLTS/DIV to 10mV all input selectors to GND and TRIGGER to CH2. Check and adjust, if necessary, STEP ATTEN BALANCE and Var DC Bal. Set CH2 + input selector to DC.

Connect TYPE 106 to TYPE 3A3 CH2 + input. Adjust TYPE 106, with necessary attenuation, for 2div @ 1kHz. Position top of display to electrical center.

Adjust test scope TRIGGERING LEVEL for a stable display.

b. Adjust Trig DC Bal, Trig DC Level, and compensation. *Unbalance: IV, max*
Level: ±IV, max
Amplitude: 3V to 7V

Adjust R541 (R511) Trig DC Bal for no separation between baselines on test scope display. Adjust R555 (R525) Trig DC Level to set baselines to zero Volts on test scope.

18b. (cont'd)

Adjust C538 (C508) for flat top on test scope CHANNEL 2 display. Adjust C548 for flat top on CHANNEL 1 display.

Check Amplitude of each channel on test scope display: 3V to 7V.

Connect signal to TYPE 3A3 CH1 input. Set MODE and TRIGGER to CH1. Repeat step 18b for CH1.

c. *Adjust Comp Trigger Level and compensation* *Amplitude: 3V to 7V*
Level: ±1V, max

Set TYPE 3A3 TRIGGER to COMP. Adjust CH1 POSITION to set top of display to electrical center. Adjust R565, Comp Trig DC Level, to set TYPE 1A1 CHANNEL 1 baseline to zero Volts on test scope. Check CHANNEL 2 baseline: ±1V. Adjust C561 and C569 for flat top on test scope CHANNEL 1 and CHANNEL 2. Check amplitude: 3V to 7V.

Remove input signals and Probes.

19. PHASING

a. *Setup*

Remove attenuator shield. Remove TYPE 3A3 from plug-in extension, remove plug-in extension, place "reference" 3A3 in left hand compartment, and TYPE 3A3 under calibration in right hand compartment.

	CH1 and CH2
VOLTS/DIV	10mVOLTS
BANDWIDTH	HI
VARIABLE	CAL
all input selectors	DC
MODE	CH1

19a. (cont'd)

Apply 50mVOLTS from SAC to "reference" 3A3 and adjust GAIN for 5div of vertical display.

Move signal to TYPE 3A3 under calibration and adjust GAIN for 5div of horizontal display. Remove SAC signal.

Connect the Sine Wave Generator through the special 5 lead coax to both TYPE 3A3 CH1 + and - inputs.

Set all CH1 input selectors to DC.

b. Adjust phasing *1.5°, max*

Adjust Sine Wave Generator for 8 vertical div of 100kc signal in each of the following steps.

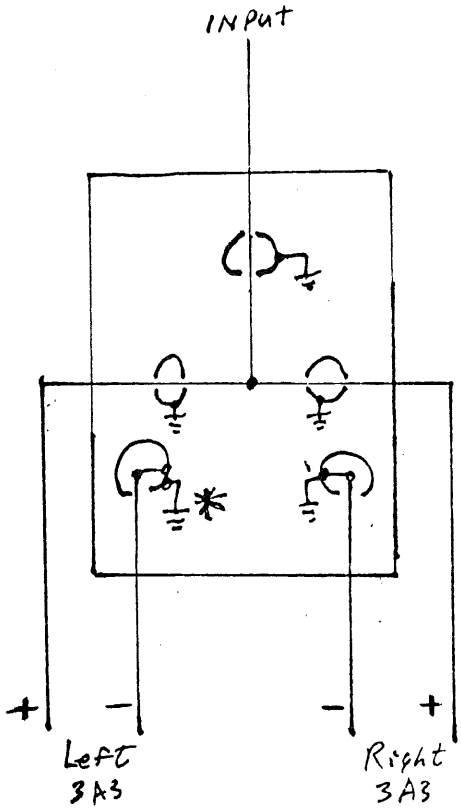
Adjust C251M for min trace separation of the 45° phased signal. Make other adjustments similarly:

VOLTS/DIV	Adjust CH1	Max separation
10mVOLTS	C251M	.2 div
5mVOLTS	C251L	.2 div
2mVOLTS	C251K	.2 div
1mVOLTS	C251H	.2 div
.5mVOLTS	C251F	.2 div
.2mVOLTS	C251D	.2 div
.1mVOLTS	C251B	.2 div

Remove signal from CH1 of TYPE 3A3 under calibration and connect signal to CH2 (leave signal in CH1 of reference 3A3). Switch MODE switch of TYPE 3A3 under calibration to CH2.

VOLTS/DIV	Adjust CH2	Max separation
10mVOLTS	C451M	.2 div
5mVOLTS	C451L	.2 div
2mVOLTS	C451K	.2 div
1mVOLTS	C451H	.2 div
.5mVOLTS	C451F	.2 div
.2mVOLTS	C451D	.2 div
.1mVOLTS	C451B	.2 div

Remove signals.



5 lead coax connector

20. X-Y POSITIONING

Set all eight input selectors to GND. Set left TYPE 3A3 VOLTS/DIV to 10mVOLTS and MODE to CHOP. See right TYPE 3A3 VOLTS/DIV to 10mVOLTS and MODE to ALT.

Two dots must be present. Note that one dot can be moved vertically by left hand TYPE 3A3 CH1 POSITION and moved horizontally by right hand TYPE 3A3 CH1 POSITION.

The other dot must move vertically with left hand TYPE 3A3 CH2 POSITION and move horizontally with right hand TYPE 3A3 CH2 POSITION.

It may be necessary to switch one or the other MODE controls in and out of CHOP or ALT to gain synchronization.

Set left TYPE 3A3 to ALT and right TYPE 3A3 to CHOP and recheck positioning of dots as above.

Remove reference 3A3. Remove TYPE 3A3 under test and place in left hand compartment. Install TYPE 3B4 in right hand compartment.

21. CHOPPED

Rate: 150kHz to 250kHz
Display factor: 50%, min
Distortion: .1div, max

Set TYPE 3B4 TIME/DIV to 2μSEC on + TRIGGER MODE to AUTO. Set TYPE 3A3 MODE to CHOP and TRIGGER to COMP.

Note a chopped waveform display of 3 to 5 cycles.

Set both traces to graticule center. Set TIME/DIV to 1μSEC. Check chopped waveform for (1) blanked switching transients and (2) time of unblanked segment to be greater than time of blanked segment.

Set TYPE 3B4 TRIGGER MODE to FREE RUN and TIME/DIV to 1mSEC. Adjust INTENSITY for normal brightness.

21. (cont'd)

Set CH1 trace to graticule center. Position CH2 trace over entire graticule and check trace width: 0.1div, max.

Set CH2 trace to graticule center. Position CH1 trace over entire graticule and check trace width: 0.1div, max.

Set TRIGGERING MODE to AUTO.

22. BANDWIDTH

a. Check 500kHz BANDWIDTH 500kHz, min

Set MODE to CH1, VOLTS/DIV to 10mV, + input selector to DC, and - input selector to GND. Connect Sine Wave Generator to TYPE 3A3 + input. Adjust Sine Wave Generator for 5div at 100Hz. Adjust Sine Wave Generator to 500kHz and note deflection: 3.5div, min.

b. Check 5kHz BANDWIDTH 5kHz, min 6.2kHz, max

Set TYPE 3A3 BANDWIDTH to 5kHz. Set Sine Wave Generator to 5kHz and note deflection: 3.5div, min.

Set Sine Wave Generator to 6.2kHz and note deflection: 3.5div, max.

Set MODE to CH2 and repeat step 22.

23. NONDESTRUCTIVE DIFFERENTIAL VOLTAGE LIMIT

±350V

Set MODE to CH1, + input selector to DC and VOLTS/DIV to 10mVOLTS.

Apply positive 350V from 600V variable DC supply to + input for 5 seconds. Remove 350V and note any indication of component damange. e.g., unbalanced input amplifier, gain change, etc.

Repeat check with - input.

Change MODE to CH2 and repeat.

24. TRIGGER BANDWIDTH

a. Setup

Set TYPE 3A3 TRIGGER to CH 2 and BANDWIDTH to 500kHz. Connect 10X probe from TYPE 1A1 CHANNEL 1 to TYPE 3A3 V583 pin 3. Set TYPE 1A1 VOLTS/CM to .2 and MODE to CH 1. Set Sine Wave Generator for 5cm @ 1kHz on test scope.

b. Check trigger bandwidth 400kHz, min

Set Sine Wave Generator to 400kHz. Note test scope display: 3.5cm, min.

Set TYPE 3A3 MODE and TRIGGER to CH1. Connect signal to CH1 + input and note test scope display: 3.5cm, min.

Set TYPE 3A3 MODE to COMP. Adjust Sine Wave Generator for 5cm @ 1kHz. Set Sine Wave Generator to 400kHz and note test scope display: 3.5cm, min.

Remove 10X Probe and input signal.

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

25. INPUT CAPACITOR LEAKAGE

1nA/minute, max

CAUTION: Do not apply +500VDC to input when input selector is in AC or DC.

When the input selector is at GND, the input capacitor has a charging path from GND, thru 1meg, thru the capacitor to the input source. This charges the capacitor with the gate grounded.

Set MODE to CH1 + and - inputs to GND, and VOLTS/DIV to 1mVOLTS. Apply +500VDC from 600V variable DC supply to + input.

25. (cont'd)

Change input selector to AC and note trace shift: 1div, max, in one minute.

Set + input selector to GND, remove +500 VDC and repeat for - input.

Set MODE to CH2 and repeat check.

26. AC LF RESPONSE 2Hz, max, at 3dB point

Set MODE to CH1, VOLTS/DIV to 10mV, - input selector to GND and + input selector to AC. Connect Sine Wave Generator to + input. Set Sine Wave Generator for 5div at 1kHz.

Set Sine Wave Generator to 2Hz. Set TYPE 3B4 TIME/DIV to .5sec. Check display amplitude: 3.5div, min.

Repeat at - input.

Set MODE to CH2 and repeat for + and - inputs.

Remove inputs. Set all input selectors to GND.

27. INTERCHANNEL ISOLATION

a. Setup

Set TYPE 3A3 MODE and TRIGGER to CH1 and + input selector to DC. Set Sine Wave Generator to 20V @ 500kHz and connect through the coax T to TYPE 3A3 CH1 + and - inputs. Set TYPE 3B4 TIME/DIV to 2μSEC.

b. Check attenuator isolation 10^6:1, min

Set TYPE 3A3 MODE to CH2 and CH2 VOLTS/DIV to .1mV. Check display for 500kHz component: .2div, max.

27. (cont'd)

c. Check channel isolation 10^5:1, min

Set Sine Wave Generator to 10V @ 100kHz. Set TYPE 3A3 CH1 VOLTS/DIV to 10mV and - input to DC. Check display for 100kHz components: 1div, max.

d. Check dual trace isolation 100:1, min

Set TYPE 3A3 CH2 VOLTS/DIV to 10mV and MODEto CHOP. Set CH1 - input selector to GND. Set TYPE 3B4 TIME/DIV to .1mSEC. Set Sine Wave Generator Amplitude to .1 VOLT. Check CH2 display for 100kHz component: .1div, max.

Repeat step 27 for CH1 isolation from CH2.

Remove input signals.

THE END