

# 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).

## CHANGE INFORMATION:

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

*This procedure is  
company confidential*

December 1969

For all serial  
numbers.

Includes Test Limit  
Changes through  
May 4, 1970



576

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## 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  $\pm 0.5\%$  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 547 OSCILLOSCOPE
- 1 TYPE @ PLUG-IN UNIT

### *b. Calibration Fixtures and Accessories*

- 1 76TU Line Voltage Control Unit (067-0048-00)
- 1 TYPE 576 Calibration Fixture (067-0597-99)
- 1 DC Voltage Bridge (067-0543-00)
- 1 TYPE 576 Standard Test Fixture
- 1 Test Adapter (013-0099-00)
- 1 Test Adapter (013-0098-00)
- 2 50 $\Omega$  BNC cables (012-0057-00)

### *c. Other Manufacturer's Equipment*

- 1 20,000 $\Omega$ /V Multimeter

FACTORY TEST LIMITS

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.

1. PRELIMINARY INSPECTION

- b. Align CRT
  - Center:  $\pm .1$ div, max
  - tilt:  $.1$ div max in 10div

4. POWER SUPPLIES

- a. Check voltage

Supply	Max Error	Max short CKT current	Total Noise
-75V	.4% 300mV	100mA	5mV
-12.5V	$\pm 312$ mV	100mA	5mV
+4.5V	$\pm 225$ mV	1.5A	20mV
+5V	$\pm 250$ mV	500mA	10mV
+12.5V	$\pm 312$ mV	550mA	5mV
+15V	$\pm 750$ mV	200mA	20mV
+100V	$\pm 2.5$ V	175mA	20mV
+225V	$\pm 9.0$ V	4mA	80mV
-4000V	$\pm 200$ V	0.7mA	

- b. Check hi line noise (see table)
- c. Check lo line noise (see table)
- d. Check short circuit current (see table)

6. CRT

- b. Adjust Trace Rotation range: + & -0.25div, min, in 5div
- d. Adjust Geometry  $.12$ div, max, in 12div

9. HORIZ AMP GAIN

- \*f. Adjust "1"s Gain  $\pm 0.25\%$ , max
- \*g. Adjust "5"s Gain  $\pm 0.25\%$ , max
- h. Check CMR; 500:1

10. DISPLAY OFFSET

Centerline Value	Max. Error
10	Adjusted to 0 div
9.5	0.1 div
9	0.1 div
8	0.2 div
7	0.2 div
6	0.2 div
5	0.2 div
4	0.2 div
3	0.2 div
2	0.2 div
1	0.1 div
.5	0.1 div
0	Adjusted to 0 div

11. VERT AMP GAIN

- \*d. Adjust "5"s Gain  $\pm 0.25\%$ , max
- \*f. Adjust "1"s Gain  $\pm 0.25\%$ , max
- g. Check CMR; 500:1

12. NORM CAL CHECK

- b. Cal  $\pm 1\%$

13. POSITION

- \*b. Check horizontal POSITION  $\pm 2\%$ , max  
FINE + & -2.5div, min
- \*c. Check vertical POSITION  $\pm 2\%$ , max  
FINE + & -2.5div, min

14. HORIZONTAL VOLTS/DIV

- \*b. Check HORIZONTAL VOLTS/DIV  $\pm 1.5\%$ , max

15. VERTICAL CURRENT/DIV

- \*b. Check VERTICAL CURRENT/DIV  $\pm 1.5\%$ , max

FACTORY TEST LIMITS

16. VERTICAL LEAKAGE MODE

Check LEAKAGE MODE

- 1nA-5nA:  $\pm 4\% \pm 1nA$ , max
- 10nA-5 $\mu$ A:  $\pm 1.5\% \pm 1nA$ , max

17. RISE TIME

- b. Check vertical risetime -- 2%, max, in 20 $\mu$ s, max
- c. Check horizontal risetime -- 2%, max, in 20 $\mu$ s, max

19. STEP GEN

- b. Check zero crossing,  $\pm 3\%$  of peak

20. STEP AMPLIFIER

- c. Adjust Inv Bal  $\pm 25mV$ , max
- g. Check step gen accuracy  $\pm 1.5\%$ , max
- \*h. Check .1X MULT  $\pm 1.5\%$ , max
- j. Check vert STEP GEN and horiz STEP GEN  $\pm 3\%$ , max

21. STEP GEN AMPLITUDE

- \*c. Check OFFSET MULT  $\pm 2\%$ , max

22. STEP GEN AMPLITUDE

- \*b. Check 10th step accuracy  $\pm 1.5\%$ , max
- \*c. Check hi current linearity  $\pm 1.5\%$ , max
- \*d. Check lo current linearity  $\pm 2\%$ , max

23. PULSED STEPS

- b. Check 300 s with,  $t_r$  and  $t_f$   
Width: -5%, min  $\pm 15\%$  max  
 $t_r$ : 20 $\mu$ s, max  
 $t_f$ : 20 $\mu$ s, max with 1 step
- c. Check 80 s width,  $t_r$  and  $t_f$   
Width: -5% min, +15%  
 $t_r$ : 20 $\mu$ s, max  
 $t_f$ : 20 $\mu$ s, max, with 1 step
- \*d. Check 80 $\mu$ s amplitude  $\pm 1.5\%$  max

25. CURRENT LIMIT

- b. Check 2A CURRENT LIMIT  
 $+15\%$ , min,  $+40\%$ , max
- c. Check 500mA CURRENT LIMIT  
 $+10\%$ , min,  $+60\%$ , max
- d. Check 100mA CURRENT LIMIT  
 $+10\%$ , min,  $+60\%$ , max
- e. Check 20mA CURRENT LIMIT  
 $+10\%$ , min,  $+60\%$ , max
- f. Check opposing current 20mA, max
- g. Check maximum step voltage  
40V,  $-.3V$ , max
- h. Check 20V opposing voltage  
20V,  $-.3V$ , max

26. VOLTAGE LIMIT

- c. Check maximum voltage 10V, min
- d. Check opposing voltage 3V, max

27. MAX PEAK VOLTS AND RIPPLE

- a. Check 15V range  $+5\%$ , min,  $+25\%$  max
- b. Check 75V range  $+5\%$ , min,  $+25\%$  max
- c. Check 350V range  $+5\%$ , min,  $+25\%$  max
- d. Check 1500V range  $+5\%$ , min,  $+25\%$  max
- e. Check ripple 1.5%, max

28. SERIES RESISTORS

- b. Check SERIES RESISTORS  
.3 $\Omega$ : .3 $\Omega$ ,  $\pm 1$   
1.4 $\Omega$  to 6.5M $\Omega$ :  $\pm 5\%$ , max

32. DISPLAYED NOISE

- a. Check 15V displayed noise 1 $\mu$ A max  
LEAKAGE mode: 1nA, max
- b. Check 75V displayed noise 1 $\mu$ A, max  
LEAKAGE mode: 1nA, max
- c. Check 350V displayed noise 2 $\mu$ A, max  
LEAKAGE mode: 2nA, max
- d. Check 1500V displayed noise 5 $\mu$ A, max  
LEAKAGE mode: 5nA, max
- e. Check horizontal displayed noise 5mV, max
- f. Check Step Generator Current Mode Ripple:  
pulse noise 1nA P-P, max

THE END

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

TEST LIMIT CHANGE MEMO

TYPE 576 To: Plant II Date 9/18/70

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576 FCP, December, 1969

Please replace your FCP pages with the attached corrected pages.

For further information please contact Bob Verrinder, ext. 6279.

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FACTORY TEST LIMITS

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.

1. PRELIMINARY INSPECTION

- b. Align CRT
  - Center:  $\pm 1$ div, max
  - tilt:  $.1$ div max in  $10$ div

4. POWER SUPPLIES

- a. Check voltage

Supply	Max Error	Max short CKT current	Total Noise
-75V	.4% 300mV	100mA	5mV
-12.5V	$\pm 312$ mV	100mA	5mV
+4.5V	$\pm 225$ mV	1.5A	20mV
+5V	$\pm 250$ mV	600mA	10mV
+12.5V	$\pm 312$ mV	550mA	5mV
+15V	$\pm 750$ mV	200mA	20mV
+100V	$\pm 2.5$ V	175mA	20mV
+225V	$\pm 9.0$ V	4mA	80mV
-4000V	$\pm 200$ V	0.7mA	

- b. Check hi line noise (see table)
- c. Check lo line noise (see table)
- d. Check short circuit current (see table)

6. CRT

- b. Adjust Trace Rotation range: + & - $0.25$ div, min, in  $5$ div
- d. Adjust Geometry  $.12$ div, max, in  $12$ div

9. HORIZ AMP GAIN

- \*f. Adjust "1"s Gain  $\pm 0.25\%$ , max
- \*g. Adjust "5"s Gain  $\pm 0.25\%$ , max
- h. Check CMR; 500:1

10. DISPLAY OFFSET

Centerline Value	Max. Error
10	Adjusted to 0 div
9.5	0.1 div
9	0.1 div
8	0.2 div
7	0.2 div
6	0.2 div
5	0.2 div
4	0.2 div
3	0.2 div
2	0.2 div
1	0.1 div
.5	0.1 div
0	Adjusted to 0 div

11. VERT AMP GAIN

- \*d. Adjust "5"s Gain  $\pm 0.25\%$ , max
- \*f. Adjust "1"s Gain  $\pm 0.25\%$ , max
- g. Check CMR; 500:1

12. NORM CAL CHECK

- b. Cal  $\pm 1\%$

13. POSITION

- \*b. Check horizontal POSITION  $\pm 2\%$ , max  
FINE + & - $2.5$ div, min
- \*c. Check vertical POSITION  $\pm 2\%$ , max  
FINE + & - $2.5$ div, min

14. HORIZONTAL VOLTS/DIV

- \*b. Check HORIZONTAL VOLTS/DIV  $\pm 1.5\%$ , max

15. VERTICAL CURRENT/DIV

- \*b. Check VERTICAL CURRENT/DIV  $\pm 1.5\%$ , max

2. (Con't)

Preset internal controls

Trace Rotation	midr
Vert Output Gain	midr
Horiz Output Gain	midr

3. LINE VOLTAGE SELECTOR

a. Setup

Connect TYPE 576 to TU76. Adjust TU76 for 115V. Set TYPE 576 power to ON.

b. Check line voltage selector

Connect test scope probe to terminal 23 of the power transformer. Set line voltage selector as indicated in table and check voltage, P-P, ±1V, max. P-P volts must change at least 1 volt between HIGH, MED and LOW with selector in 115V.

	<u>115V</u>	<u>230V</u>
HIGH	16	8
MED	17.5	9
LOW	20	10

Return line voltage selector to 115V MED.

4. POWER SUPPLIES

a. Voltage

Connect DC Voltage Bridge to proper location. Adjust and check power supply voltage as in table:

<u>Supply</u>	<u>Location</u>	<u>Max Error</u>	<u>Max short CKT current</u>	<u>Total Noise</u>
-75V	Pin K	Adjust R721	100mA	5mV
-12.5V	Pin I	±312mV	100mA	5mV
+4.5V	Pin U	±225mV	1.5A	20mV
+5V	Pin Q	±250mV	600mA	10mV
+12.5V	Pin F	±312mV	550mA	5mV
+15V	Pin Z	±750mV	200mA	20mV
+100V	Pin E	±2.5V	175mA	20mV
*+225V	R592	±9.0V	4mA	80mV
	2-6 wire			
*-4000V	R883	±200V	0.7mA	
	9-7 wire			

Note:

<u>Typical short CKT current</u>
-75
-12.5
+4.5
+5
+12.5
+15
+100
+225
-4000

\*check with INTENSITY CW and CCW.

## SHORT FORM PROCEDURE

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. PRELIMINARY INSPECTION

- a. Check Fuses
- b. Align CRT: Center;  $\pm 1$ div, max tilt;  $.1$ div max in 10div

### 2. PRESETS

### 3. LINE VOLTAGE SELECTOR

- a. Setup
- b. Check line voltage selector

### 4. POWER SUPPLIES

- a. Check Voltage

Supply	Max Error	Max short CKT current	Total Noise
-75V	Adjust R721	100mA	5mV
-12.5V	$\pm 312$ mV	100mA	5mV
+4.5V	$\pm 225$ mV	1.5A	20mV
+5V	$\pm 250$ mV	500mA	10mV
+12.5V	$\pm 312$ mV	550mA	5mV
+15V	$\pm 750$ mV	200mA	20mV
+100V	$\pm 2.5$ V	175mA	20mV
+225V	$\pm 9.0$ V	4mA	80mV
-4000V	$\pm 200$ V	0.7mA	

- b. Check hi line noise (see table)
- c. Check lo line noise (see table)
- d. Check short circuit current (see table)

### 5. READOUT ILLUM AND GRATICULE ILLUM

### 6. CRT

- a. Adjust Astigmatism
- b. Adjust Trace Rotation  
Range: 0.25div, min, in 5div
- c. Adjust Orthogonality
- d. Adjust Geometry  $.12$ div max, in 12div
- e. Check resolution

### 7. HORIZONTAL AMP BAL

- a. Complete setup
- b. Adjust Horizontal Center
- c. Adjust "1"s Bal
- d. Adjust "5"s Bal

### 8. VERT AMP BAL

- a. Adjust Vert Center
- b. Adjust "2"s Bal
- c. Adjust "1"s Bal

### 9. HORIZ AMP GAIN

- a. Complete setup
- b. Adjust Horiz Output Gain
- c. Adjust Horiz Mag. Gain
- d. Adjust "2"s Gain
- e. Adjust 2V Cal
- f. Adjust "1"s Gain  $\pm 0.25\%$ , max.
- g. Adjust "5"s Gain  $\pm 0.25\%$ , max.
- h. Check CMR; 500:1



SHORT FORM PROCEDURE

10. DISPLAY OFFSET

Check DISPLAY OFFSET

<u>Centerline Value</u>	<u>Max Error</u>
10	Adjusted to 0div
9.5	0.1div
9	0.1div
8	0.2div
7	0.2div
6	0.2div
5	0.2div
4	0.2div
3	0.2div
2	0.2div
1	0.1div
.5	0.1div
0	Adjusted to 0div

11. VERT AMP GAIN

- a. Complete setup
- b. Adjust Vert Output Gain
- c. Adjust Vert Mag Gain
- d. Adjust "5"s Gain  $\pm 0.25\%$ , max
- e. Adjust "2"s Gain
- f. Adjust "1"s Gain  $\pm 0.25\%$ , max
- g. Check CMR; 500:1

12. NORM CAL CHECK

- a. Complete setup
- b. Check Cal  $\pm 1\%$

13. POSITION

- a. Setup
- b. Check horizontal POSITION  $\pm 2\%$ , max
- c. Check vertical POSITION  $\pm 2\%$ , max

14. HORIZONTAL VOLTS/DIV

- a. Complete setup
- b. Check HORIZONTAL VOLTS/DIV  $\pm 1.5\%$ , max

15. VERTICAL CURRENT/DIV

- a. Complete setup
- b. Check VERTICAL CURRENT/DIV  $\pm 1.5\%$ , max

16. VERTICAL LEAKAGE MODE

Check LEAKAGE MODE  
 1nA-5nA:  $\pm 4\% \pm 1nA$ , max  
 10nA-5 $\mu$ A:  $\pm 1.5\%$ ,  $\pm 1nA$ , max

17. RISE TIME

- a. Complete setup
- b. Check vertical risetime  $-2\%$ , max, in 20 $\mu$ s, max
- c. Check horizontal risetime  $-2\%$ , max, in 20 $\mu$ s, max

18. HORIZ ATTEN COMP

- a. Complete setup
- b. Adjust Horiz Comp

19. STEP GEN

- a. Complete setup
- b. Adjust Zero Crossing
- c. Check Zero Crossing,  $\pm 3\%$  of peak Collector Volts

20. STEP AMPLIFIER

- a. Complete setup
- b. Adjust +1 Bal and Step Zero
- c. Adjust Inv Bal  $\pm 25mV$ , max
- d. Adjust Step Generator Transitions
- e. Check Line Frequency Switch
- f. Adjust Step Amplitude
- g. Check Step Gen Accuracy
- h. Check .1X (Step Mult)
- i. Adjust Output Z<sub>1</sub>
- j. Check vert STEP GEN and horiz STEP GEN  $\pm 3\%$  max

SHORT FORM PROCEDURE

21. OFFSET

- a. Adjust AID
- b. Adjust OPPOSE
- c. Check OFFSET MULT  $\pm 2\%$ , max

22. STEP GEN AMPLITUDE

- a. Complete setup
- b. Check 10th step accuracy  $\pm 1.5\%$ , max
- c. Check hi current linearity  $\pm 1.5\%$ , max
- d. Check lo current linearity  $\pm 1.5\%$ , max

23. PULSED STEPS

- a. Setup
- b. Check 300 $\mu$ s width,  $t_r$  and  $t_f$   
Width:  $-5\%$ , min  $+15\%$ , max  
 $t_r$ : 20 $\mu$ s, max  
 $t_f$ : 20 $\mu$ s, max, with 1 step
- c. Check 80 $\mu$ s width,  $t_r$  and  $t_f$   
Width:  $-5\%$ , min,  $+15\%$ , max  
 $t_r$ : 20 $\mu$ s, max  
 $t_f$ : 20 $\mu$ s, max, with 1 step
- d. Check 80 $\mu$ s amplitude  $\pm 1.5\%$ , max

24. RATE

- a. Setup
- b. Check RATE

25. CURRENT LIMIT

- a. Complete setup
- b. Check 2A CURRENT LIMIT  $+10\%$ , min,  $+40\%$ , max
- c. Check 500mA CURRENT LIMIT  $+10\%$ , min,  $+60\%$ , max
- d. Check 100mA CURRENT LIMIT  $+10\%$ , min,  $+60\%$ , max
- e. Check 20mA CURRENT LIMIT  $+10\%$ , min,  $+60\%$ , max
- f. Check opposing current 20mA, max
- g. Check maximum step voltage 40V,  $-.2V$ , max
- h. Check 20V opposing voltage 20V,  $-.3V$ , max

26. VOLTAGE LIMIT

- a. Complete setup
- b. Check SINGLE and NUMBER OF STEPS
- c. Check maximum voltage 10V, min
- d. Check opposing voltage 3V, max

27. MAX PEAK VOLTS

- a. Check 15V range  
15V:  $+5\%$ , min  $+25\%$ , max
- b. Check 75V range  
75V:  $+5\%$ , min  $+25\%$ , max
- c. Check 350V range  
350V:  $+5\%$ , min,  $+25\%$ , max
- d. Check 1500V range  
1500V:  $+5\%$ , min,  $+25\%$ , max
- e. Check ripple 1.5%, max

28. SERIES RESISTORS

- a. Setup
- b. Check SERIES RESISTORS  
.3 $\Omega$ : .3 $\Omega$   $\pm 1\Omega$   
1.4 $\Omega$  to 6.5M $\Omega$ :  $\pm 10\%$ , max

29. READOUT

- a. Check PER VERT DIV
- b. Check PER HORIZ DIV
- c. Check PER STEP
- d. Check B or gm PER DIV

30. LOGIC

- a. Setup
- b. Check LOGIC INPUT
- c. Check LOGIC OUTPUT

31. COLLECTOR SWEEP BALANCE

- a. Setup
- b. Adjust Looping Balance
- c. Adjust 350 & 1500 Looping Compensation
- d. Adjust HF Noise Rejection
- e. Check LOOPING COMPENSATION

SHORT FORM PROCEDURE

32. DISPLAYED NOISE

- a. Check 15V displayed noise  $1\mu\text{A}$ , max  
LEAKOUT mode:  $1\text{nA}$ , max
- b. Check 75V displayed noise  $1\mu\text{A}$ , max  
LEAKOUT mode:  $1\text{nA}$ , max
- c. Check 350V displayed noise  $2\mu\text{A}$ , max  
LEAKOUT mode:  $2\text{nA}$ , max
- d. Check 1500V displayed noise  $5\mu\text{A}$ , max  
LEAKOUT mode:  $5\text{nA}$ , max
- e. Check horizontal displayed noise  
 $4\text{mV}$ , max
- f. Check Step Generator Current Mode  
Ripple plus Noise:  $1\text{nA}$  P-P, max

33. COLLECTOR SUPPLY RESET

THE END

1. PRELIMINARY INSPECTION*a. Check fuses*

115V 50-60Hz---6.25A SLOW

230V 50-60Hz---4.0A SLOW

*b. Align CRT center:  $\pm 1$ div, max.  
tilt: .1div max in 10div*

Align CRT to bezel cross-hair.

2. PRESETS

Preset TYPE 576 front panel controls.

POWER	OFF
READOUT ILLUM	cw
GRATICULE ILLUM	cw
COLLECTOR SUPPLY	
POLARITY	AC
MODE	NORM
MAX PEAK VOLTS	15
SERIES RESISTOR	140
VARIABLE COLLECTOR SUPPLY	0%
INTENSITY	ccw
FOCUS	ccw
VERTICAL CURRENT/DIV	2mA
vertical POSITION	ccw
FINE	ccw
horizontal POSITION	ccw
FINE	.ccw
HORIZONTAL VOLTS/DIV	.5 COLLECTOR
DISPLAY OFFSET	OFF
CENTERLINE VALUE	5
DISPLAY INVERT	released
STEP GENERATOR AMPLITUDE	2V
NUMBER OF STEPS	10
CURRENT LIMIT	2A
OFFSET MULT	cw 0.0 (10.0)
OFFSET ZERO	pressed
STEPS	pressed
STEP FAMILY REP	released
RATE 2X	pressed
STEP MULT .1X	pressed
POLARITY INVERT	released
50Hz---60Hz (rear panel)	60Hz

2. (Con't)

Preset internal controls

Trace Rotation	midr
Vert Output Gain	midr
Horiz Output Gain	midr

3. LINE VOLTAGE SELECTOR

a. Setup

Connect TYPE 576 to TU76. Adjust TU76 for 115V. Set TYPE 576 power to ON.

b. Check line voltage selector

Connect test scope probe to terminal 23 of the power transformer. Set line voltage selector as indicated in table and check voltage, P-P,  $\pm 1V$ , max. P-P volts must change at least 1 volt between HIGH, MED, and LOW with selector in 115V.

	<u>115V</u>	<u>230V</u>
HIGH	16	8
MED	17.5	9
LOW	20	10

Return line voltage selector to 115V MED.

4. POWER SUPPLIES

a. Voltage

Connect DC Voltage Bridge to proper location. Adjust and check power supply voltage as in table:

<u>Supply</u>	<u>Location</u>	<u>Max Error</u>	<u>Max short CKT current</u>	<u>Total Noise</u>	<u>Note:</u>
-75V	Pin K	Adjust R721	100mA	5mV	<u>Typical short CKT current</u> -75 30mA
-12.5V	Pin I	$\pm 312mV$	100mA	5mV	-12.5 20 to 60mA
+4.5V	Pin U	$\pm 225mV$	1.5A	20mV	+4.5 1.4A
+5V	Pin Q	$\pm 250mV$	500mA	10mV	+5 400mA
+12.5V	Pin F	$\pm 312mV$	550mA	5mV	+12.5 250mA
+15V	Pin Z	$\pm 750mV$	200mA	20mV	+15 120mA
+100V	Pin E	$\pm 2.5V$	175mA	20mV	+100 150mA
*+225V	R592	$\pm 9.0V$	4mA	80mV	+225 1mA
	2-6 wire				-4000 .1mA
*-4000V	R883	$\pm 200V$	0.7mA		
	9-7 wire				

\*check with INTENSITY CW and CCW.

4. (Con't)

*b. Check hi line noise*

Set TU76 to 126V. Connect test scope probe to proper test points and check total noise as is table in step 4a. When checking the +100V supply, rotate INTENSITY full cw and verify noise remains within limits.

*c. Check lo line noise*

Install Cal Fixture (067-0597-99) and readout. Preset controls.

FUNCTION	STEP GEN
CALIBRATOR RANGE	200mV
VARIABLE	CAL
VERTICAL	10A (ccw)
DISPLAY OFFSET	
MULTIPLIER	10
HORIZONTAL VOLTS	.5 COLLECTOR
STEP GENERATOR	50μA
STEP GENERATOR	
LOADS	OFF

Set TU76 to 104V and check noise as in step 4b.

Reset TU76 to 115V.

*d. Check short circuit current*

Connect VOM between chassis gnd and proper test point and check max short circuit current as noted in tabel in step 4a.

5. READOUT ILLUM AND GRATICULE ILLUM

Check READOUT ILLUM and GRATICULE ILLUM for no abrupt changes in intensity with rotation.

5. Check that B Readout does not change indication with Intensity.

6. CRT

*a. Adjust Astigmatism*

Increase INTENSITY for normal brightness. Adjust FOCUS and Astigmatism (R891) for a small circular spot.

6. (Con't)

b. *Adjust Trace Rotation Range: 0.25div, min, in 5div*

Set VARIABLE COLLECTOR SUPPLY to 20%. Position trace to graticule center with vertical FINE position. Check Trace Rotation (R897) for + & - .25div, min, of range at +5div graticule line. See Fig. 1. Adjust R897 to align trace to graticule.

c. *Adjust Orthogonality*

Set CALIBRATION FIXTURE STEP GENERATOR LOADS to 1k COLLECTOR SHORT. Position the trace to graticule center with the horizontal FINE control. Adjust Orthogonality (R685) to align trace to graticule.

d. *Adjust Geometry .12 div max, in 12div.*

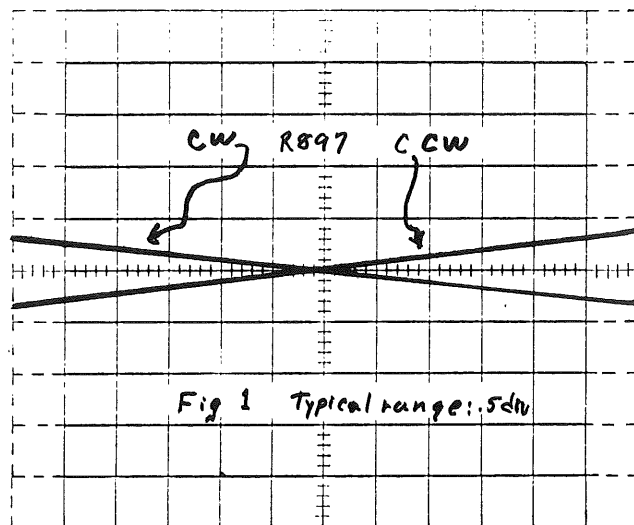
Set CALIBRATION FIXTURE STEP GENERATOR LOADS to OFF. Adjust Geometry (R893) for optimum geometry over full 10div. Set STEP GENERATOR LOADS to 1k COLLECTOR SHORT and check vertical geometry. Set VARIABLE COLLECTOR SUPPLY to 0 and re-check FOCUS and Astigmatism. Set STEP GENERATOR LOADS to OFF.

e. *Check Resolution*

Set TYPE 576 VERTICAL CURRENT/DIV to STEP GEN, POLARITY to +NPN and VARIABLE COLLECTOR SUPPLY to 40%. Press REP. Check vertical resolution over entire graticule. Lines must be clearly defined.

Set VERTICAL CURRENT/DIV to 2mA and HORIZONTAL VOLTS/DIV to STEP GEN. Set STEP GENERATOR LOADS to 1k COLLECTOR SHORT. Check horizontal resolution over entire graticule. Lines must be clearly defined.

Set STEP GENERATOR LOADS to OFF.



7. HORIZONTAL AMP BAL*a. Complete Setup*

MAX PEAK VOLTS	15
SERIES RESISTORS	.3
VARIABLE COLLECTOR SUPPLY	0%
POLARITY	AC
MODE	NORM
VERTICAL CURRENT/DIV	.5A
CENTERLINE VALUE	5
DISPLAY OFFSET	HORIZ X10
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
HORIZONTAL VOLTS/DIV	2 COLLECTOR
DISPLAY INVERT	released

## Cal Fixture

LOGIC INPUT	OFF (cw)
FUNCTION	STEP GEN
Step Generator Loads	OFF

*b. Adjust Horiz Center*

Position spot to graticule center with horizontal FINE position. Set DISPLAY OFFSET to HORIZ X1 and adjust Horiz Center (R681) to return spot to graticule center. Repeat for interaction.

*c. Adjust "1"s Bal*

Set DISPLAY OFFSET to HORIZ X10 and HORIZONTAL VOLTS/DIV to 1 COLLECTOR. Adjust "1"s Bal (R650) to return spot to graticule center.

*d. Adjust "5"s Bal*

Set HORIZONTAL VOLTS/DIV to .5 COLLECTOR and adjust "5"s Bal (R645) to return spot to graticule center.

Recheck balance at 1V COLLECTOR and 2V COLLECTOR.

Leave in 2V COLLECTOR.



8. VERT AMP BAL*a. Adjust Vert Center*

Set DISPLAY OFFSET to VERT X10. Position spot to graticule center with vertical FINE position control. Set DISPLAY OFFSET to VERT X1 and adjust Vert Center (R581) to return spot to graticule center. Repeat for interaction.

*b. Adjust "2"s Bal*

Set VERTICAL CURRENT/DIV to .2A and DISPLAY OFFSET to VERT X10. Adjust "2"s Bal (R545) to return spot to graticule center.

*c. Adjust "1"s Bal*

Set VERTICAL CURRENT/DIV to .1A and adjust "1"s Bal (R550) to return spot to graticule center. Recheck balance at .2A and .5A. Leave switch at .5A.

9. HORIZ AMP GAIN*a. Complete Setup*

TYPE 576

MAX PEAK VOLTS	15
SERIES RESISTORS	.3 $\Omega$
VARIABLE COLLECTOR SUPPLY	0%
POLARITY	+(NPN)
MODE	NORM
VERTICAL CURRENT/DIV	.5A
CENTERLINE VALUE	5
DISPLAY OFFSET	OFF
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
HORIZONTAL VOLTS/DIV	2 COLLECTOR
DISPLAY INVERT	released
Cal Fixture	
LOGIC INPUT	OFF(cw)
FUNCTION	STEP GEN
CAL RANGE	200mV
DISPLAY OFFSET MULT	1Q

## 9. (Cont.)

*b. Adjust Horiz Output Gain*

Adjust Horiz Output Gain (R692) for 10div of horizontal deflection when POLARITY is changed from +(NPN) to -(PNP).

*c. Adjust Horiz Mag Gain*

Set POLARITY to AC and DISPLAY OFFSET to X10. Adjust Horiz Mag Gain (R673) for 10div horizontal deflection when CENTERLINE VALUE is switched from 4.5 to 5.5.

*d. Adjust "2"s Gain*

Set POLARITY to +(NPN) and CENTERLINE VALUE to 10. Set Cal Fixture FUNCTION to HORIZ AMP CAL. Press TYPE 576 ZERO and position spot to graticule center horizontally and -5div vertically. Release ZERO and adjust "2"s Gain (R636) to center spot horizontally.

*e. Adjust 2V Cal*

Press TYPE 576 CAL and adjust 2V Cal (R512) to center spot horizontally.

*f. Adjust "1"s Gain  $\pm 0.25\%$ , max*

Set Cal Fixture CALIBRATOR RANGE to 100mV. Set TYPE 576 HORIZONTAL VOLTS/DIV to 1V COLLECTOR. Press ZERO and re-position spot to graticule center horizontally. Release ZERO, press CAL and adjust "1"s Gain (R638) to center spot horizontally. Release CAL and note spot remains at horizontal graticule center,  $\pm 0.25\text{div}$ , max.

*g. Adjust "5"s Gain  $\pm 0.25\%$ , max*

Set Cal Fixture CALIBRATOR RANGE to 50mV. Set TYPE 576 HORIZONTAL VOLTS/DIV to .5V COLLECTOR. Press ZERO and re-position spot to horizontal graticule center. Release ZERO, press CAL and adjust "5"s Gain (R641) to center spot horizontally.

Release CAL and note spot remains at horizontal graticule center,  $\pm 0.25\text{div}$ , max.

*h. Check CMR; 500:1*

Press ZERO and note location of spot; while pressing ZERO also press CAL and note spot shifts less than .2div horizontally.

10. DISPLAY OFFSET

Check DISPLAY OFFSET

Press ZERO and position spot to graticule center vertically. Release ZERO and adjust Cal Fixture 50mV VARIABLE to return spot to graticule center.

Rotate Cal Fixture DISPLAY OFFSET MULTIPLIER switch and TYPE 576 CENTERLINE VALUE switch simultaneously from 10 to 0 and check spot deviation from horizontal graticule center as in table:

<u>CENTERLINE VALUE</u>	<u>Max Error</u>
10	Adjusted to 0div
9.5	0.1div
9	0.1div
8	0.2div
7	0.2div
6	0.2div
5	0.2div
4	0.2div
3	0.2div
2	0.2div
1	0.1div
.5	0.1div
0	Adjust to 0div

Set 50mV VARIABLE to CAL.

11. VERT AMP GAIN

*a. Complete Setup*

TYPE 576

MAX PEAK VOLTS	15
SERIES RESISTORS	.3
VARIABLE COLLECTOR SUPPLY	0%
POLARITY	+(NPN)
MODE	NORM
VERTICAL CURRENT/DIV	.5A
CENTERLINE VALUE	5
DISPLAY OFFSET	OFF
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
HORIZONTAL VOLTS/DIV	.5 COLLECTOR
DISPLAY INVERT	released

## 11a. (Cont.)

Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	STEP GEN
CAL RANGE	125mV
DISPLAY OFFSET MULTIPLIER	10

*b. Adjust Vert Output Gain*

Adjust Vert Output Gain (R592) for 10div of vertical deflection when POLARITY is switched from +(NPN) to -(PNP). Set POLARITY to AC.

*c. Adjust Vert Mag Gain*

Set TYPE 576 CENTERLINE VALUE to 5 and DISPLAY OFFSET to VERT X10. Adjust Vert Mag Gain (R573) for 10div of Vertical deflection while switching DISPLAY OFFSET between 4.5 and 5.5.

*d. Adjust "5"s  $\pm 0.25\%$ , max*

Set Cal Fixture FUNCTION to VERT AMP CAL and CALIBRATOR RANGE to 125mV. Set TYPE 576 CENTERLINE VALUE to 10 and POLARITY to +(NPN). Press ZERO and position spot to graticule center vertically and -5div horizontally. Release ZERO, press CAL and adjust "5"s Gain (R536) to return spot to graticule center vertically. Release CAL and note spot remains at graticule center vertically,  $\pm 0.25$  div, max.

*e. Adjust "2"s Gain*

Set Cal Fixture CALIBRATOR RANGE to 50mV. Set TYPE 576 VERTICAL CURRENT/DIV to .2A. Press ZERO and position spot to graticule center vertically. Release ZERO, press CAL and adjust "2"s Gain (R538) to return spot to vertical graticule center.

*f. Adjust "1"s Gain  $\pm 0.25\%$ , max*

Set Cal Fixture CALIBRATOR RANGE to 25mV. Set TYPE 576 VERTICAL CURRENT/DIV to .1A. Press ZERO and position spot to vertical graticule center. Release ZERO, press CAL and adjust "1"s Gain (R541) to return spot to graticule center vertically.

Release CAL and note spot remains at vertical graticule center,  $\pm 0.25$ div, max.

## 11. (Cont.)

*g. Check CMR; 500:1*

Press ZERO and note location of spot; while pressing ZERO also press CAL and note spot shifts less than .2div vertically.

12. NORM CAL CHECK

*a. Setup*

Cal Fixture

FUNCTION

STEP GEN

TYPE 576

DISPLAY OFFSET

NORM (OFF)

*b. Check CAL  $\pm 1\%$*

Press CAL and note spot deflects 10 vertical and horizontal divisions within  $\pm .1$ div while rotating HORIZONTAL VOLTS/DIV from .5 to 2 and VERTICAL CURRENT/DIV from .1A to .5A. Change POLARITY switch to - (PNP) and press CAL and note spot deflects 10 vertical and horizontal divisions within  $\pm .1$ div.

13. HORIZONTAL VOLTS/DIV

*a. Setup*

TYPE 576

POLARITY

AC

DISPLAY OFFSET

HORIZ X1

*b. Check Horizontal POSITION*

Note the spot positions 5div,  $\pm 0.1$ div, max, to the right for each cw position of the horizontal POSITION switch. Return POSITION switch to center. Press DISPLAY INVERT. Note the spot positions 5div,  $\pm 0.1$ div, max, to the left for each ccw position of the horizontal POSITION switch.

13a. (Cont.)

Set horizontal POSITION to center, DISPLAY OFFSET to OFF, and release DISPLAY INV. Rotate horizontal position FINE full cw and ccw. Note range + & - 2.5div, min.

*c. Check Vertical POSITION*

Set DISPLAY OFFSET to VERT X1. Note the spot positions 5div,  $\pm 0.1$ div, max, up for each cw position of the vertical POSITION switch.

Return the vertical POSITION switch to center and press DISPLAY INVERT. Note the spot positions 5div,  $\pm 0.1$ div, max, down for each ccw position of the vertical POSITION switch.

Set vertical POSITION to center, DISPLAY OFFSET to OFF, and release DISPLAY INVERT. Rotate vertical FINE full cw and ccw. Note range + & -2.5div, min.

14. HORIZONTAL VOLTS/DIV

*a. Complete setup*

Cal Fixture	
FUNCTION	HORIZ ATTEN CHECK
HORIZONTAL VOLTS	.5 COLLECTOR
LOGIC INPUT	OFF (cw)
MAX PEAK VOLTS	1500
SERIES RESISTORS	3K
POLARITY	+(NPN)
VARIABLE COLLECTOR SUPPLY	100%
MODE	DC
VERTICAL CURRENT/DIV	2A
DISPLAY OFFSET	HORIZ X10
CENTERLINE VALUE	10
vertical POSITION	one step cw
FINE	center
horizontal POSITION	center
FINE	center
HORIZONTAL VOLTS/DIV	.05 COLLECTOR
DISPLAY INVERT	released

## 14. (Cont.)

b. Check HORIZONTAL VOLTS/DIV  
±1.5%, max

Press ZERO and adjust FINE position to position spot vertically and horizontally to graticule center. Release ZERO and note spot is at graticule center, ±1.5div, max.

Rotate HORIZONTAL VOLTS/DIV and Cal Fixture HORIZONTAL VOLTS simultaneously through each COLLECTOR and BASE position and check for ±1.5div, max from ZERO (except 200V).

Set TYPE 576 HORIZONTAL VOLTS/DIV to 200 and CENTERLINE VALUE to 5. Set Cal Fixture HORIZONTAL VOLTS to 1K and check deflection from ZERO, ±.75 div, max.

Set VARIABLE COLLECTOR SUPPLY to 0.

## 15. VERTICAL CURRENT/DIV

a. Complete setup

MAX PEAK VOLTS	15
SERIES RESISTORS	.3
POLARITY	+(NPN)
MODE	DC
VERTICAL CURRENT/DIV	2A
DISPLAY OFFSET	VERT X10
CENTERLINE VALUE	5
vertical POSITION	center
FINE	center
horizontal POSITION	one step cw
FINE	center
HORIZONTAL VOLTS/DIV	200
DISPLAY INVERT	released
300µs	pressed
Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	VERT CURRENT CHECK
VERTICAL	10A

15. (Cont.)

b. Check VERTICAL CURRENT/DIV  $\pm 1.5\%$ , max

Press ZERO and position spot horizontally and vertically to graticule center. Set VARIABLE COLLECTOR SUPPLY to 100. Check deflection from ZERO,  $\pm 0.75$ div, max. Set CENTERLINE VALUE to 10. Rotate VERTICAL CURRENT/DIV and Cal Fixture VERTICAL switches simultaneously through each position and check vertical deflection from ZERO,  $\pm 1.5$ div, max.

Set DISPLAY OFFSET to OFF.

Set VARIABLE COLLECTOR SUPPLY to 0.

b. If there is an abnormal amount of NOISE on the display the CRT may not be properly Intensified by the intensifying pulse.

Check for the intensifying pulse on pin Y of the step generator board.

On the lower current ranges, if due to separation of the dots, or noise on the display makes it difficult to measure vertical deflection, momentarily turning the VARIABLE COLLECTOR SUPPLY to 0 will give a more accurate display.

16. VERTICAL LEAKAGE MODE

1nA-5nA:  $\pm 4\%$ ,  $\pm 1$ nA, max  
 10nA-5 $\mu$ A:  $\pm 1.5\%$ ,  $\pm 1$ nA, max

Set TYPE 576 MODE to LEAKAGE. Rotate VERTICAL CURRENT/DIV and Cal Fixture VERTICAL ccw simultaneously from 1nA to 5nA (576) and check for 10 divisions of vertical deflection as in table. Set DISPLAY OFFSET to VERT X10 and check deflection from ZERO as in table.

DISPLAY OFFSET	VERTICAL CURRENT	Div of Error
OFF	1nA	$\pm 1.4$
OFF	2nA	$\pm 0.9$
OFF	5nA	$\pm 0.6$
VERT X10	10nA	$\pm 2.5$
VERT X10	20nA	$\pm 2.0$
VERT X10	50nA	$\pm 1.7$
VERT X10	.1 $\mu$ A	$\pm 1.5$
VERT X10	.2 $\mu$ A	$\pm 1.5$
VERT X10	.5 $\mu$ A	$\pm 1.5$
VERT X10	1 $\mu$ A	$\pm 1.5$
VERT X10	2 $\mu$ A	$\pm 1.5$
VERT X10	5 $\mu$ A	$\pm 1.5$

Set MODE to NORM.

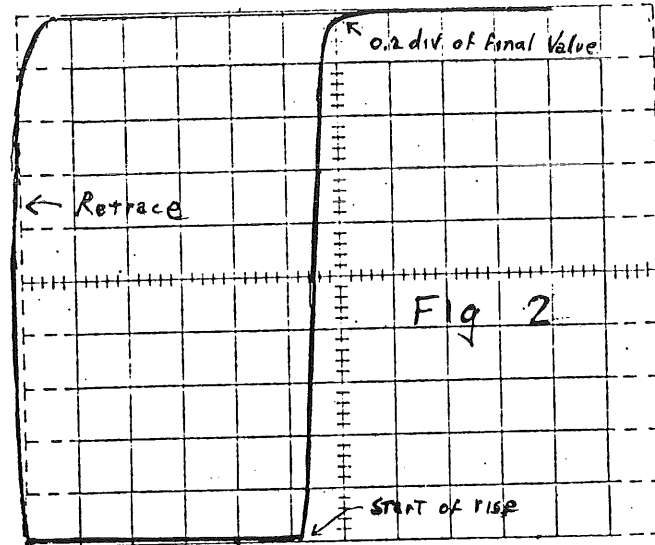


17. RISETIME

a. Complete setup

TYPE 576	
POLARITY	+ (NPN)
VERTICAL CURRENT/DIV	2mA
DISPLAY OFFSET	OFF
vertical POSITION	center
FINE	center
horizontal POSITION	one step cw
FINE	center
HORIZONTAL VOLTS/DIV	50
DISPLAY INVERT	released

Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	VERT RISETIME CHECK



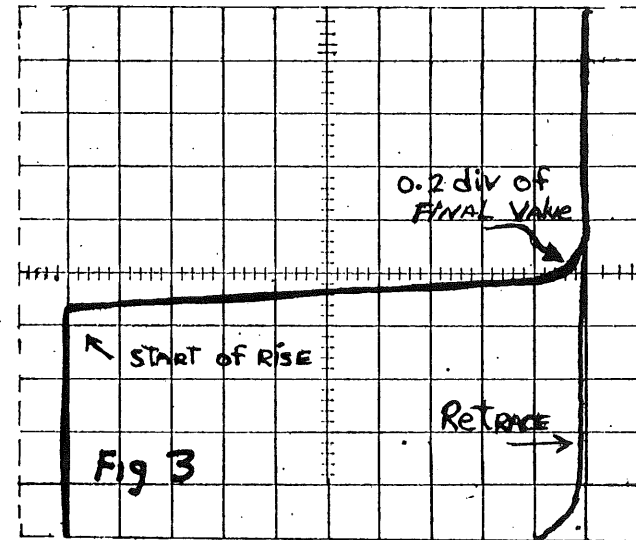
b. Check Vertical Risetime -2%, max, in 20µs, max

Check the display is within 0.2div, vertically, of final value, within 1div, horizontally, from start of rise. See Fig. 2.

c. Check Horizontal Risetime

Set Cal Fixture FUNCTION to HORIZ RISETIME CHECK. Set TYPE 576 vertical POSITION one position cw and horizontal POSITION to center.

Check display is within 0.2div, horizontally, of final value, within 1div, vertically, from start of rise. See Fig. 3.



18. HORIZ ATTEN COMP

a. Complete setup

POLARITY	AC
VERTICAL CURRENT/DIV	2mA
CENTERLINE VALUE	5
DISPLAY OFFSET	HORIZ X10
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
HORIZONTAL VOLTS/DIV	50V
DISPLAY INVERT	released
Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	HORIZ COMP-ENSATION

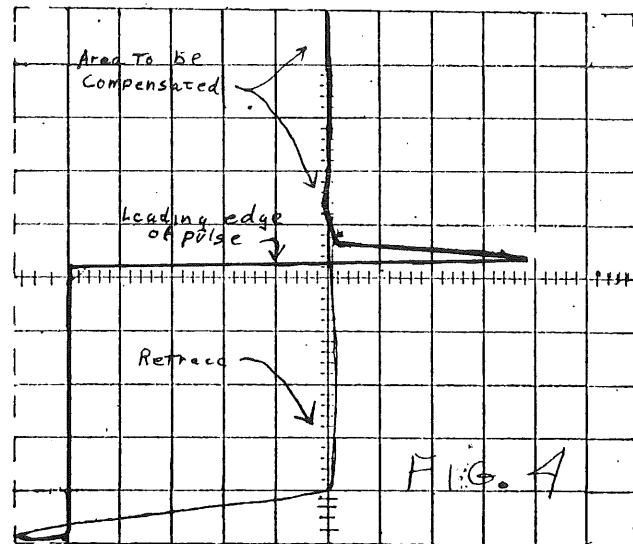
18. (Cont.)

b. Adjust Horiz Comp

Adjust Horiz Comp (C433) for the top 2 to 3 div of display to be as straight and vertical as possible. See Fig. 4.

c. Check Horiz Comp

Set DISPLAY OFFSET to HORIZ X1, CENTERLINE VALUE to 10, and HORIZONTAL VOLTS/DIV to 5. Check waveform to be similar to Fig. 4.



19. STEP GEN

a. Complete setup

TYPE 576

MAX PEAK VOLTS	15
SERIES RESISTORS	140
VARIABLE COLLECTOR SUPPLY	80%
POLARITY	AC
MODE	NORM
VERTICAL CURRENT/DIV	STEP GEN
DISPLAY OFFSET	OFF
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
HORIZONTAL VOLTS/DIV	.5 COLLECTOR
NUMBER OF STEPS	1
ZERO OFFSET	pressed
STEPS	pressed
REP	pressed
RATE	.5X
.1X	released
Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	STEP GEN
STEP GENERATOR LOADS	OFF

18c. There is no adjustment for compensation on this range. This check is for proper components, and minor variations from Fig. 4 should be tolerated.

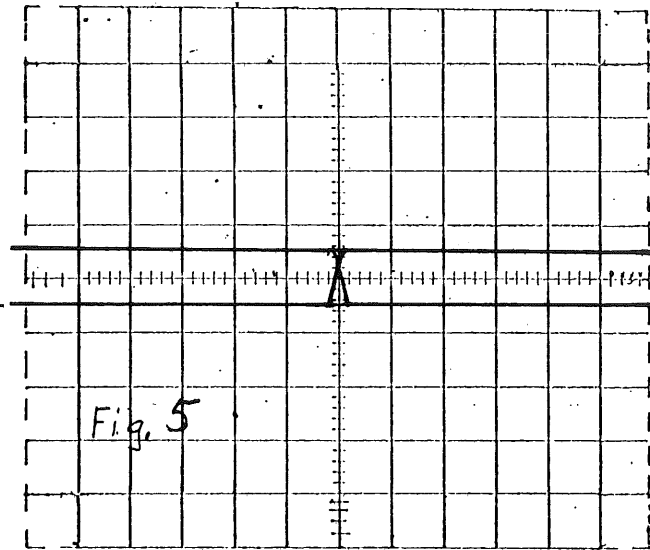
19. (Cont.)

*b. Adjust Zero Crossing*

Press ZERO and position dot to horizontal center and .5div below center vertically, with FINE POSITION controls. Adjust Zero Crossing (R8) to bring crossover lines to horiz center. See Fig. 5.

*c. Check Zero Crossing,  $\pm 3\%$  of peak collector Volts*

Change VARIABLE COLLECTOR SUPPLY to 100%. Check both transitions to be within 1div of horizontal center at vertical center. Change VARIABLE COLLECTOR SUPPLY to 50% and check both transitions to be within .5div. Readjust R8 if necessary.



## 20. STEP AMPLIFIER

*a. Complete setup*TYPE 576

MAX PEAK VOLTS	15
VARIABLE COLLECTOR SUPPLY	0%
POLARITY	+ (NPN)
MODE	NORM
VERTICAL CURRENT/DIV	STEP GEN
DISPLAY OFFSET	HORIZ X10
CENTERLINE VALUE	0
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
HORIZONTAL VOLTS/DIV	.05 BASE
DISPLAY INVERT	released
STEP AMPLITUDE	.05V
ZERO OFFSET	pressed
STEPS	pressed
STEP FAMILY	OFF
2X	pressed
Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	STEP GEN
STEP GENERATOR LOADS	1K COLLECTOR SHORT
STEP GENERATOR	50 $\mu$ A

a. Cal Fixture must be tightly secured in TYPE 576 with hold down bolts.

*b. Adjust +1 Bal and Step Zero*

Press ZERO and position spot horizontally to graticule center with FINE control. Release ZERO and adjust +1 Bal (R224) to return spot to graticule center.

Set STEP GENERATOR AMPLITUDE 2V and adjust Step Zero (R97) to return spot to graticule center. Repeat adjustment of R224 at .05V and R97 at 2V for no change. Shift:  $\pm 2$ div, max.

*c. Adjust Inv Bal*

Set STEP GENERATOR AMPLITUDE to 2V and press STEP POLARITY INVERT. Adjust Inv Bal (R127) to return spot to horizontal graticule center,  $\pm 5$ div max. Release INVERT.

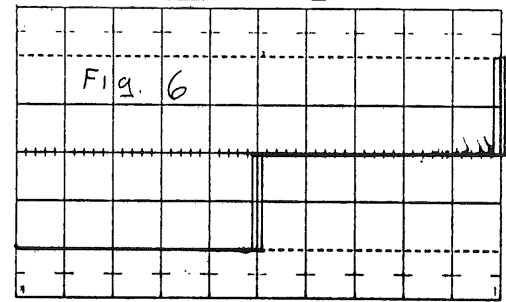
20. (Cont.)

*d. Adjust Step Generator Transitions*

Set TYPE 576:

STEP GENERATOR AMPLITUDE	1V
HORIZONTAL V/DIV	1V BASE
NUMBER OF STEPS	2
REP	pressed
2X	pressed

Set test scope to trigger negative with a .5ms sweep and .5V/DIV vertical sensitivity. Connect a BNC cable from Cal Fixture External Monitor to test scope A INPUT. Adjust test scope VARIABLE TIME/CM to include just 0 and first step in display. (See fig. 6). Adjust R24 to center start of first step at graticule center.



*e. Check Line Frequency Switch*

Set test scope to LINE trigger and TRIGGERING LEVEL knob for step transitions at 0 graticule marker, and VARIABLE TIME/CM for step transitions at center of graticule. Set TYPE 576 Line Frequency switch (rear panel) to 50Hz, and check for the step transitions to be at the 6th div graticule marker on test scope,  $\pm 1$ div.

Return Line Frequency switch to 60Hz, test scope VARIABLE TIME/CM to CALIBRATED, and TRIGGERING SOURCE to INT.

e. TRIGGERING LEVEL knob should be on - side of 0.

*f. Adjust Step Amplitude*

Set TYPE 576:

NUMBER of STEPS	10
-----------------	----

Set test scope to trigger negative with a 5mSEC sweep and 2V vertical sensitivity. Adjust TYPE 576 Step Amplitude (R113) for 5div of vertical deflection on test scope (1V/Step).

Change test scope sensitivity to 50mV/div and INPUT ATTEN to R= $\infty$ . Position zero step to test scope graticule center. Set COMPARISON VOLTAGE to 10.0 and VC RANGE to +11.

Adjust TYPE 576 Step Amplitude (R113) to set 10th step at test scope graticule center.

## 20. (Cont.)

*g. Check Step Gen Accuracy*

Rotate COMPARISON VOLTAGE from 0 to 10 and note deviation from each step from test scope graticule center. See table.

<u>COMPARISON VOLTAGE</u>	<u>Max Error</u>
0	0
1	±0.3div
2	±0.6div
3	±0.9div
4	±1.2div
5	±1.5div
6	±1.8div
7	±2div
8	±2div
9	±1div

Check each step to be within .8div of the adjacent steps.

*h. Check .1X (STEP MULT)*

Set test scope sensitivity for 5mV/CM and VC RANGE to +1.1. Press TYPE 576 .1X MULT. Set the test scope comparison voltage to "0" and position the ZERO step to graticule center with the position control. Rotate test scope COMPARISON VOLTAGE from 0 to 10 and note deviation of each step from test scope graticule center.

<u>Comparison Voltage</u>	<u>Max Error</u>
0	0
1	±.3div
2	±.6div
3	±.9div
4	±1.2div
5	±1.5div
6	±1.8div
7	±2.1div
8	±2.4div
9	±2.7div
10	±3.0div

Check each step to be within 1.5div of the adjacent steps.

## 20. (Cont.)

*i. Adjust Output Z*

Set TYPE 576.

Step AMPLITUDE	50 $\mu$ A
.1X	released
HORIZONTAL VOLTS/DIV	.05 BASE
vertical POSITION	1 step ccw (from center)
CENTERLINE VALUE	10
DISPLAY OFFSET	HORIZ X1

Position top spot to graticule center with FINE position controls. Set DISPLAY OFFSET to HORIZ X10 and reposition spot to graticule center with horizontal FINE.

Switch Cal Fixture STEP GENERATOR LOADS between 1k COLLECTOR SHORT and 1k +18k and adjust Output Z (R243) for no spot shift.

Set Cal Fixture STEP GENERATOR LOADS to 1k COLLECTOR SHORT.

*j. Check vert STEP GEN and horiz STEP GEN  $\pm 3\%$  max*

Set TYPE 576

DISPLAY OFFSET	OFF
vertical POSITION	center
HORIZONTAL VOLTS/DIV	200V

Check the vertical deflection: 10 div,  $\pm .3$ div, max.

Set HORIZONTAL VOLTS/DIV to STEP GEN.  
Check the horizontal deflection:  
10div,  $\pm .3$ div,max.

21. OFFSET*a. Adjust Aid*

Set the TYPE 576:

DISPLAY OFFSET	HORIZ X1
----------------	----------

a. Be sure OFFSET MULT is set to exactly 10.0.

## 21a. (Cont.)

Position the right hand spot to horizontal graticule center with the FINE control.

Press AID and adjust Aid (R86) to position the left hand spot at graticule center.  
See note.

Set DISPLAY OFFSET to HORIZ X10. Adjust R86 for no horizontal spot shift while alternately pressing AID and ZERO. Press ZERO.

*b. Adjust Oppose*

Set TYPE 576 CENTERLINE VALUE to 0 and DISPLAY OFFSET to HORIZ X1.

Position the left hand spot to horizontal graticule center with the FINE control.

Set DISPLAY OFFSET to HORIZ X10.

Adjust R85 for no horizontal spot shift while alternately pressing ZERO and OPPOSE.

*c. Check OFFSET MULT  $\pm 2\%$ , max*

Set the test scope sensitivity for 50mV and VC Range to +11.

Set TYPE 576.

STEP AMPLITUDE	1V
STEP FAMILY	OFF
AID	pressed

Position test scope trace to graticule center with TYPE W POSITION. Rotate test scope COMPARISON VOLTAGE switch one step at a time, from 10 to 1, and return the trace to test scope graticule center with the TYPE 576 OFFSET MULT. Should be less than 2 minor divisions difference between steps.

22. STEP GENERATOR AMPLITUDE*a. Complete setup*TYPE 576

POLARITY	+ (NPN)
MODE	NORM
OFFSET MULT	10.0 (cw)
OFFSET AID	pressed



22a. (Cont.)

STEPS pressed  
 STEP FAMILY OFF  
 STEP AMPLITUDE 2V  
 HORIZONTAL VOLTS/DIV STEP GEN

Cal Fixture  
 LOGIC INPUT OFF (cw)  
 FUNCTION STEP GEN  
 STEP GENERATOR LOADS EXT ONLY  
 STEP GENERATOR 2V

Test Scope  
 VC RANGE 0  
 COMPARISON VOLTAGE 10.0  
 A INPUT GND  
 INPUT ATTEN R= ∞  
 MILLIVOLTS/CM 50

*b. Check 10th step accuracy ±1.5%, max*

Position test scope trace to graticule center with the POSITION control. Set "A" INPUT to DC and VC RANGE to +11.

Rotate TYPE 576 STEP AMPLITUDE and Cal Fixture SETUP GENERATOR simultaneously step by step, from 2V to 200mA. The test scope trace should be at graticule center, ±3div, max.

*c. Check hi current linearity ±1.5%, max*

Set test scope COMPARISON VOLTAGE and TYPE 576 OFFSET MULT as in table and check error:

c. For 5 and below, recheck test scope for drift by setting VC RANGE to 0 and A INPUT to GND.

OFFSET MULT	COMPARISON VOLTAGE	max error
0.00 (10)	10	±3div
9.00	9	±2.7div
8.00	8	±2.4div
7.00	7	±2.1div
6.00	6	±1.8div
5.00 (see note)	5	±1.5div
4.00	4	±1.2div
3.00	3	±.9div
2.00	2	±.6div
1.00	1	±.3div

Check the trace is within 1div of adjacent positions for each position of the COMPARISON VOLTAGE switch.

## 22c. (Cont.)

Set VC RANGE to -11 and press TYPE 576 POLARITY INVERT. Repeat this step rotating dials from 1 to 0.00 (10).

*d. Check to current linearity  $\pm 1.5\%$ , max*

Set Cal Fixture STEP GENERATOR and TYPE 576 AMPLITUDE to  $.05\mu\text{A}$ . Set VC RANGE to +11 and release TYPE 576 POLARITY INVERT. Check low current linearity, using step 22c.

## 23. PULSED STEPS

*a. Setup*

Set Cal Fixture STEP GENERATOR LOADS to 1k COLLECTOR SHORT.

Set TYPE 576

STEP AMPLITUDE	.2mA
ZERO	pressed
REP	pressed
300 $\mu\text{s}$	pressed
NUMBER OF STEPS	1
RATE	NORM
POLARITY INVERT	pressed

Set test scope VC RANGE to 0.

*b. Check 300 $\mu\text{s}$  width  $t_r$ , and  $t_f$*

*Width: -5%, min, +15%, max*

*$t_r$ : 20 $\mu\text{s}$ , max*

*$t_f$ : 20 $\mu\text{s}$ , max, with 1 step*

Set test scope TIME/DIV to 50 $\mu\text{SEC}$ . Check pulse width at 50% point, 5.7div, min, 7div, max. Check risetime, 20 $\mu\text{s}$ , max. Check falltime, 20 $\mu\text{s}$ , max.

Set POLARITY to AC and note the falltime increases (approximately doubles).

Set POLARITY to +NPN.

*c. Check 80 $\mu\text{s}$  width,  $t_r$  and  $t_f$*

*Width: -5%, min,  $\pm 15\%$  max*

*$t_r$ : 20 $\mu\text{s}$ , max, with 1 step*

*$t_f$ : 20 $\mu\text{s}$ , max*

Press TYPE 576 80 $\mu\text{s}$ . Check falltime, 20 $\mu\text{s}$ , max. Check risetime, 20 $\mu\text{s}$ , max. Set test scope TIME/DIV to 10 $\mu\text{SEC}$ . Check pulse width, 7.6div, min, 9.2div, max.

23. (Cont.)

d. Check 80 $\mu$ s amplitude,  $\pm 1.5\%$ , max

Set test scope TIME/DIV to 10mSEC, A INPUT sw to GND and position trace to graticule center. Set A INPUT switch to DC and VC RANGE to +11.

Set Cal Fixture STEP GENERATOR to 200mA and STEP GENERATOR LOADS to STEP GEN.

Set TYPE 576

STEP AMPLITUDE        200mA  
 POLARITY INVERT      released  
 NUMBER OF STEPS      10

Set test scope COMPARISON VOLTAGE as in table and notes error.

<u>COMPARISON VOLTAGE</u>	<u>max error</u>
1	$\pm 0.3$ div
2	$\pm 0.6$ div
3	$\pm 0.9$ div
4	$\pm 1.2$ div
5	$\pm 1.5$ div
6	$\pm 1.8$ div
7	$\pm 2.1$ div
8	$\pm 2.4$ div
9	$\pm 2.7$ div
10	$\pm 3.0$ div

24. RATE

a. Setup

Set test scope VC RANGE to 0, INPUT ATTEN to 100, and TIME/DIV to 2mSEC.

Press TYPE 576 STEPS and 2X RATE.

b. Check RATE

Check time of one step on test scope display to be  $\approx 4$ ms. Press NORM. Check time of one step to be  $\approx 8$ ms.

Press .5X. Check time of one step to be  $\approx 16$ ms.

Press 2X and .5X. Check time of one step to be  $\approx 8$ ms.

25. CURRENT LIMIT*a. Complete setup*TYPE 576

POLARITY	+ (NPN)
MODE	NORM
VERTICAL CURRENT/DIV	2A
DISPLAY OFFSET	OFF
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
DISPLAYINVERT	released
HORIZONTAL VOLTS/DIV	.05 BASE
NUMBER OF STEPS	10
CURRENT LIMIT	2A
STEP AMPLITUDE	.5V
ZERO OFFSET	pressed
STEPS	pressed
REP	pressed
.1X	released

## Cal Fixture

LOGIC INPUT	OFF (cw)
FUNCTION	STEP GEN
STEP GENERATOR LOADS	.1 $\Omega$
STEP GENERATOR	200mA

*b. Check 2A CURRENT LIMIT +10%, min, +40%, max*

Press ZERO and position spot -5div vertically and -5div horizontally. Check horizontal deflection with COLLECTOR SUPPLY, POLARITY at +(NPN) and -(PNP): 4.4div, min, 5.6div, max.

*c. Check 500mA CURRENT LIMIT +10%, min, +60%, max*

Set TYPE 576 HORIZONTAL VOLTS/DIV to .5 BASE and CURRENT LIMIT to 500mA. Set Cal Fixture STEP GENERATOR LOADS to STEP GEN.

Check horizontal deflection with COLLECTOR SUPPLY POLARITY at +(NPN) and -(PNP): 5.5div, min, 8div, max.

25. (Cont.)

d. *Check 100mA CURRENT LIMIT +10%, min, +60%, max*

Set TYPE 576 CURRENT LIMIT to 100mA. Set Cal Fixture STEP GENERATOR to 50mA. Check horizontal deflection with COLLECTOR SUPPLY POLARITY at +(NPN) and -(PNP): 4.4div, min 6.4div, max.

e. *Check 20mA CURRENT LIMIT +10%, min, +60%, max*

Set TYPE 576 CURRENT LIMIT to 20mA. Set Cal Fixture STEP GENERATOR to 10mA. Check horizontal deflection with COLLECTOR SUPPLY POLARITY at +(NPN) and -(PNP): 4.4div, min, 6.4div, max.

e. If 20mA CURRENT LIMIT is above limits, allow a few minutes for the transistors to cool.

f. *Check opposing current 10mA, min, 20mA, max*

Set COLLECTOR SUPPLY POLARITY to AC.

Press OFFSET OPPOSE and note horizontal deflection (from ZERO DIV), 2div, min, 4div, max. Press POLARITY INVERT and note horizontal deflection 2div, min, 4div, max.

Release POLARITY INVERT.

g. *Check max step voltage 40V, -.3V, max*

Set Cal Fixture STEP GENERATOR LOAD to 40V LOAD.

Set TYPE 576

STEP AMPLITUDE	2V
CURRENT LIMIT	2A
AID	pressed

Set test scope

TIME/CM	5mSEC
MILLIVOLTS/CM	20
INPUT ATTEN	10

Set test scope A INPUT to GND and position trace to graticule center.

COMPARISON VOLTAGE	4
VC RANGE	+11
A INPUT	DC

25g. (Cont.)

The 10th step should be at the test scope graticule center,  $\pm 1.5\text{div}$ , max. It may be necessary to adjust the TRIGGER LEVEL and SLOPE to observe the 10th step.

Set the test scope VC RANGE to -11. Press TYPE 576 POLARITY INVERT. The 10th step should be at test scope graticule center,  $\pm 1.5\text{div}$ , max.

*h. Check 20V opposing Voltage 20V, -.3V, max*

Press TYPE 576 OPPOSE. Set test scope COMPARISON VOLTAGE to 2.0 and VC RANGE to +11. The 10th step should be at graticule center,  $\pm 1.5\text{div}$ , max.

Release TYPE 576 POLARITY INVERT. Set the test scope VC RANGE to -11. The 10th step should be at graticule center,  $\pm 1.5\text{div}$ , max.

26. VOLTAGE LIMIT

*a. Complete setup*

TYPE 576

POLARITY	+ (NPN)
MODE	NORM
DISPLAY OFFSET	OFF
vertical POSITION	center
FINE	center
horizontal POSITION	center
FINE	center
DISPLAY INVERT	released
HORIZONTAL VOLTS/DIV	2V BASE
NUMBER OF STEPS	10
ZERO OFFSET	pressed
STEPS	pressed
REP	pressed
.1X	released
STEP AMPLITUDE	1mA
POLARITY INVERT	released

Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	STEP GEN
STEP GENERATOR LOADS	STEP GEN
STEP GENERATOR	.5mA

## 26. (Cont.)

*b. Check SINGLE and NUMBER OF STEPS*

Press SINGLE several times. Observe one set of dots each time the SINGLE button is pressed.

Press REP.

Rotate NUMBER OF STEPS from 10 to 1 and note the display corresponds to each position of the switch. Set NUMBER OF STEPS to 10.

*c. Check maximum voltage 10V, min*

Note linear horizontal deflection (from ZERO DIV) 5div, min.

Set POLARITY to -(PNP). Note linear horizontal deflection (from ZERO DIV), 5div, min.

*d. Check opposing voltage 3V, max*

Set POLARITY to AC and press OFFSET OPPOSE. Note horizontal deflection (from ZERO DIV), 1.5div, max.

Press POLARITY INVERT and note horizontal deflection, 1.5div, max.

27. MAX PEAK VOLTS AND RIPPLE*a. Check 15V range 15V, +5%, min  
+25%, max*

Set TYPE 576

HORIZONTAL VOLTS/DIV 5 COLLECTOR

VARIABLE COLLECTOR SUPPLY 100%

POLARITY +(NPN)

SERIES RESISTOR .3 $\Omega$

Press ZERO and position spot -5div vertically and -5div horizontally with FINE controls. Check horizontal deflection with POLARITY at:

+(NPN) 3.2 div, min; 3.8 div, max

-(PNP) 3.2 div, min; 3.8 div, max

AC 6.4 div, min; 7.6 div, max

a. Peak power must be 220 WATTS and TU76 must be 115V.

## 27. (Cont.)

- b. Check 75V range 75V, +5%, min,  
+25%, max

Set MAX PEAK VOLTS to 75 and HORIZONTAL VOLTS/DIV to 20. Check horizontal deflection with POLARITY at:

AC 7.8 div, min; 9.4 div, max  
+(NPN) 3.8 div, min; 4.7 div, max  
-(PNP) 3.9 div, min; 4.7 div, max

- c. Check 350V range +5%, min,  
+25%, max

Set MAX PEAK VOLTS to 350 and HORIZONTAL VOLTS/DIV to 100. Check horizontal deflection with POLARITY at:

-(PNP) 3.7 div, min; 4.4 div, max  
+(NPN) 3.7 div, min; 4.4 div, max  
AC 7.4 div, min; 8.8 div, max

- d. Check 1500V range +5%, min  
+25%, max

Set HORIZONTAL VOLTS/DIV to 200 and MAX PEAK VOLTS to 1500. Check horizontal deflection with POLARITY at +(NPN) and -(PNP), 7.9 div, min; 9.4 div, max (from ZERO).

Set POLARITY to AC and horizontal POSITION one step ccw from center. Check horizontal deflection (from ZERO), 7.9 div, min; 9.4 div, max.

- e. Check ripple 1.5%, max

Set TYPE 576

CENTERLINE VALUE	10
DISPLAY OFFSET	HORIZ X10
HORIZONTAL VOLTS/DIV	100
POLARITY	+(NPN)
MODE	DC
horizontal POSITION	center

Set the controls as in table and position the display to graticule center with the



27e. (Cont.)

VARIABLE COLLECTOR SUPPLY control ( $\approx 50-60\%$ ).  
 Check horizontal deflection: 1.5div, max.

<u>MAX PEAK VOLTS</u>	<u>HORIZONTAL VOLTS/DIV</u>
1500	100
350	20
75	5
15	1

Set POLARITY to -(PNP) and check horizontal deflection; 1.5div, max. Set POLARITY to +(NPN).

28. SERIES RESISTORS

a. Setup

TYPE 576

MODE	NORM
POLARITY	AC
VERTICAL CURRENT/DIV	2A
DISPLAY OFFSET	OFF
HORIZONTAL VOLTS/DIV	.5 COLLECTOR
VARIABLE COLLECTOR SUPPLY	10 div of horiz deflection

Cal Fixture

STEP GENERATOR LOADS	1k COLLECTOR SHORT
VERTICAL	50mA

b. Check SERIES RESISTORS

In the 3k and 300k position readjust VARIABLE COLLECTOR SUPPLY for 10div of deflection with STEP GENERATOR LOADS OFF.

<u>SERIES RESISTOR</u>	<u>MAX PEAK VOLTS</u>	<u>HORIZONTAL VOLTS/DIV</u>	<u>VERTICAL CURRENT/ DIV</u>	<u>deflection</u>	
				<u>min</u>	<u>max</u>
.3	15	.5	2A	6	9
1.4	15	.5	.5A	4.3	6.9
6.5	15	.5	.1A	6.8	8.2
30	15	.5	20mA	7.0	8.5
140	15	.5	5mA	5.6	6.6
650	15	.5	1mA	6.8	8.2
3k	350	50	20mA	7.5	9.3
14k	350	50	5mA	6.5	8.0
65k	350	50	1mA	7.0	8.5
300k	1500	100	.5mA	6.0	7.4
1.4M	1500	100	.1mA	6.4	8.0
6.5M	1500	100	50 $\mu$ A	2.8	3.4

Set MAX PEAK VOLTS to 15 and VARIABLE COLLECTOR SUPPLY to 0%.

29. READOUT*a. Check PER VERT DIV*

Rotate the TYPE 576 VERTICAL CURRENT/DIV switch throughout its range and check the PER VERT DIV readout to coincide with the COLLECTOR value of the VERTICAL CURRENT/DIV switch.

Set DISPLAY OFFSET to VERT X10. Rotate the VERTICAL CURRENT/DIV switch throughout its range. Check the VERTICAL CURRENT/DIV COLLECTOR value is 10 times the PER VERT DIV readout.

Set VERTICAL CURRENT/DIV to STEP GEN. PER VERT DIV readout should be off.

Set MODE to LEAKAGE. Rotate the VERTICAL CURRENT/DIV switch throughout its range. Check the VERTICAL CURRENT/DIV EMITTER value is 10 times the PER VERT DIV readout.

The PER VERT DIV readout should be off in the three cw positions of the VERTICAL CURRENT/DIV switch.

Set MODE to NORM.

*b. Check PER HORIZ DIV*

Set HORIZONTAL VOLTS/DIV to STEP GEN and note PER HORIZ DIV readout is off.

Rotate the HORIZONTAL VOLTS/DIV switch throughout its range and note its value coincides with the PER HORIZ DIV readout.

Set DISPLAY OFFSET to HORIZ X10. Rotate the HORIZONTAL VOLTS/DIV switch throughout its range. Check the HORIZONTAL VOLTS/DIV value is 10 times the PER HORIZ DIV readout.

Set DISPLAY OFFSET to OFF.

*c. Check PER STEP*

Rotate STEP AMPLITUDE throughout its range its value coincides with the PER STEP readout.

29c. (Cont.)

Press .1X STEP MULT. Rotate STEP AMPLITUDE throughout its range and check its value is 10 times the PER STEP readout.

d. Check B or gm PER DIV

Set TYPE 576

VERTICAL CURRENT/DIV      50 $\mu$ A  
 DISPLAY OFFSET            VERT X10  
 STEP AMPLITUDE            2V  
 .1X STEP MULT              released

B or gm PER DIV readout should be 2.5 $\mu$ .  
 Press .1X STEP MULT.

Rotate STEP AMPLITUDE for 2V to .05V. Check gm PER DIV readout changes from 25 $\mu$  to 1m in a 25-50-100 sequence.

Set VERTICAL CURRENT/DIV to .2A. Rotate STEP AMPLITUDE from .05 $\mu$ A to 200mA. Check the B PER DIV is off in the .05 $\mu$ A, .1 $\mu$ A and .2 $\mu$ A positions and changes from 400k to 1 in the remaining positions in a 4-2-1 sequence.

Set DISPLAY OFFSET to OFF. Release .1X STEP MULT.

30. LOGIC

a. Setup

VERTICAL CURRENT/DIV      2mA  
 HORIZONTAL VOLTS/DIV      2V COLLECTOR  
 STEP AMPLITUDE            2mA  
 Logic level                 TRUE

b. Check LOGIC INPUT

Check readout as in table:

LOGIC INPUT	Logic Level	
	TRUE	FALSE
	PER VERT DIV readout	
Vertical		
OFF	off	2mA
VOLTS	2mV	2mA
10X	20mA	2mA
1X	1A	2mA
2X	2A	1A
5X	5A	1A
10 <sup>-1</sup>	100mA	1A
10 <sup>-2</sup>	10mA	1A
10 <sup>-3</sup>	1mA	1A
10 <sup>-4</sup>	100 $\mu$ A	1A

30b. (Cont.)

Horiz	PER HORIZ DIV readout	
OFF	off	2V
AMP	2A	2V
1X	1V	2V
2X	2V	1V
5X	5V	1V
10 <sup>1</sup>	10V	1V
10 <sup>2</sup>	100V	1V
10 <sup>-2</sup> (NEG 10 mV EXP)		100V

PER STEP readout		
STEP GEN		
OFF	off	2mA

B or gm PER DIV readout		
BETA OFF	off	1

## COLLECTOR SUPPLY

TYPE 576

POLARITY +NPN

Cal Fixture	
STEP GEN loads	OFF

Set the VARIABLE COLLECTOR SUPPLY to 50%  
and LOGIC INPUT to DC MODE.

With the TRUE-FALSE sw in TRUE the collector  
sweep is in the DC mode. With the sw in  
FALSE, the collector sweep is NORM. Set  
supply to 0%.

LOGIC INPUT	STEP GEN 10X
TRUE	Per Step 20mA
FALSE	Per Step 2mA

Set LOGIC INPUT switch CW to OFF.

30. (Cont.)

c. Check LOGIC OUTPUT

Obtain a TRUE and FALSE indication on the OUTPUT INDICATORS in each position of the LOGIC OUTPUT switch.

LOGIC OUTPUT	OUTPUT INDICATORS	
	TRUE	FALSE

VERTICAL CURRENT/DIV

2X	2A	1A
5X	.5A	1A
10 <sup>-1</sup>	.5A	1A
10 <sup>-2</sup>	50mA	.1A
10 <sup>-4</sup>	.5mA	1mA

10 <sup>-3</sup>	MODE switch	
	LEAKAGE	NORM

HORIZONTAL VOLTS/DIV COLLECTOR

2X	2V	1V
5X	.5V	1V
10 <sup>1</sup>	.5V	1V
10 <sup>2</sup>	.05V	.1V
NEG EXP	.5V	1V

STEP POLARITY

NEG POL	pressed	released
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STEP GEN AMPLITUDE

2X	2V	1V
5X	.5V	1V
10 <sup>-1</sup>	.5V	.05V
10 <sup>-2</sup>	.05V	.1V
VOLTS	.05V	
10 <sup>-8</sup>	.05μA	
10 <sup>-4</sup>	.5μA	1mA

POLARITY

NEG POL	-(PNP)	+(NPN)
---------	--------	--------

MAX PEAK VOLTS

15V	15V	75V
75V	75V	350V
350V	350V	75V

30c. (Cont.)

## AC POWER

TYPE 576

HORIZONTAL VOLTS/DIV	50
MAX PEAK VOLTS	350
POLARITY	+ NPN
NUMBER OF STEPS	10
STEPS	pressed
REP	pressed
INVERT	pressed
ZERO offset	pressed

Cal Fixture

FUNCTION	STEP GEN
LOGIC OUTPUT	AC POWER

Increase the VARIABLE COLLECTOR SUPPLY until the TRUE light is on ( $\approx 50\%$ ).

Release STEP INVERT. The TRUE light should be off. After a few seconds delay, the FALSE light should be on.

NOTE: This also checks .5volt steps.

Set supply to 0%.

31. COLLECTOR SWEEP BALANCE*a. Setup*

Remove the CAL Fixture and install the standard Test Fixture. Install the HV and Collector sweep shields.

Set the TYPE 576:

VERTICAL CURRENT/DIV	1 $\mu$ A
HORIZONTAL VOLTS/DIV	200V
STEP FAMILY	OFF
POLARITY	+(NPN)
MODE	DC
VARIABLE COLLECTOR SUPPLY	100%
MAX PEAK VOLTS	15
SERIES RESISTOR	.3
DISPLAY OFFSET	VERT X10
CENTERLINE VALUE	0

## 31. (Cont.)

*b. Adjust Looping Balance*

Close plastic cover on Standard Test Fixture. Adjust LOOPING COMPENSATION and Looping Balance (C301) for minimum vertical deflection.

Switch MAX PEAK VOLTS to 75. Open and close the protective cover to insure the lights and relay operate.

*c. Adjust 350 and 1500V Looping Comp*

Set TYPE 576:

DISPLAY OFFSET	VERT X1
HORIZONTAL VOLTS/DIV	200
MAX PEAK VOLTS	1500

Adjust Looping Compensation (C339) for minimum vertical deflection. Switch MAX PEAK VOLTS between 1500 and 350 and readjust C339 for equal deflection on both ranges. Open and close the protective cover to insure the lights and relay operate.

*d. Adjust HF Noise Rejection*

Set MAX PEAK VOLTS to 1500 and MODE to NORM.

Adjust HF Noise Rejection (C341) for minimum deviation from a horizontal line at the start of sweep. Typical adjustment is full ccw.

*e. Check LOOPING COMPENSATION*

Rotate the LOOPING COMPENSATION control 360° for each position of the MAX PEAK VOLTS switch (maintain several div of horizontal deflection with the HORIZONTAL VOLTS/DIV switch) and note the looping passes through zero.

32. DISPLAYED NOISE*a. Check 15V displayed noise 1.0 $\mu$ A, max LEAKAGE mode: 1nA, max*

Set MAX PEAK VOLTS to 15 and MAX PEAK POWER to .5. Set DISPLAY OFFSET to VERT X1 and check vertical deflection: 1div, max.

a, b, c, d. Readjust LOOPING COMPENSATION if necessary.

a. Typical vertical deflection is .1div in NORM and .2div in LEAKAGE.

32a. (Cont.)

Set MODE to LEAKAGE and check vertical deflection: 1div, max.

b. *Check 75V displayed noise 1 $\mu$ A, max  
LEAKAGE mode: 1nA, max*

Set MAX PEAK VOLTS to 75 and check vertical deflection: 1div, max.

Set MODE to NORM and check vertical deflection: 1div, max.

c. *Check 350V displayed noise 2 $\mu$ A, max  
LEAKAGE mode: 2nA, max*

Set MAX PEAK VOLTS to 350 and check vertical deflection: 2div, max.

Set MODE to LEAKAGE and check vertical deflection: 2div, max.

d. *Check 1500V displayed noise 5 $\mu$ A, max  
LEAKAGE mode: 5 $\mu$ A, max*

Set MAX PEAK VOLTS to 1500 and note vertical deflection: 5div, max.

Set MODE to NORM. Check vertical deflection: 5div, max.

e. *Check horiz displayed noise 4mv, max*

Set TYPE 576

MAX PEAK VOLTS	15
VARIABLE COLLECTOR SUPPLY	0%
DISPLAY OFFSET	HORIZ X10
HORIZONTAL VOLTS/DIV	.05 COLLECTOR
STEPS	pressed

Check horizontal deflection: 0.8div, max.

f. *Check Step Generator Current Mode Ripple plus Noise 1nA P-P max*

Set TYPE 576

MAX PEAK VOLTS	75
HORIZONTAL VOLTS/DIV	.05V BASE
STEP AMPLITUDE	.05 $\mu$ A

b. Typical vertical deflection is .6div in NORM and .4div in LEAKAGE

c. Typical vertical deflection is 2div in NORM and .8div in LEAKAGE.

d. Vertical deflection at .5 MAX PEAK POWER is typically 3div in NORM. When MAX PEAK POWER is in .1 and 220, typical vertical deflection is  $\approx$ 4-5div in NORM. In LEAKAGE vertical deflection is typically 2div in all MAX PEAK POWER POSITIONS.



32f. (Cont.)

Set Test Scope

Vc Range	0
Input Atten	1
Millivolts/cm	1

Remove Protective Box and connect a X10 Probe from test scope across right B & E (ground clip on E) terminals on Standard Test Fixture. Set the transistor selector switch to RIGHT. NOISE and RIPPLE on test scope should be less than 10mV (1cm). Remove Probe.

33. COLLECTOR SUPPLY RESET

Set TYPE 576

HORIZONTAL VOLTS/DIV	2 COLLECTOR
VERTICAL CURRENT/DIV	2A
DISPLAY OFFSET	OFF
MAX PEAK VOLTS	15
VARIABLE COLLECTOR SUPPLY	6div
SERIES RESISTOR	.3 $\Omega$

Short the right E & C terminals on the Standard Test Fixture. Set the transistor selector switch to RIGHT. The COLLECTOR SUPPLY RESET should break between 15 and 45 seconds.

The COLLECTOR SUPPLY RESET should reset 45 seconds after it breaks.

THE END