

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 Test-Final Staff Engineering. For information on changes made to this procedure, to make suggestions for changing this procedure, or to order additional copies: please contact T-FSE, 39-307.

*This procedure is
company confidential*

576



May 1969
For all serial
numbers.

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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 W 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 Ω BNC cables (012-0057-00)

c. Other Manufacturer's Equipment

- 1 20,000 Ω /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: ± 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	Adjust R721	100mA	5mV
-12.5V	± 312 mV	100mA	5mV
+4.5V	± 225 mV	1.5A	20mV
+5V	± 250 mV	500mA	10mV
+12.5V	± 312 mV	550mA	5mV
+15V	± 750 mV	200mA	20mV
+100V	± 2.5 V	175mA	20mV
+225V	± 9.0 V	4mA	80mV
-4000V	± 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 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

10. VERT AMP GAIN

- *d. Adjust "5"s Gain $\pm 0.25\%$, max
- *f. Adjust "1"s Gain $\pm 0.25\%$, max

*11. 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

12. POSITION

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

13. HORIZONTAL VOLTS/DIV

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

14. VERTICAL CURRENT/DIV

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

15. VERTICAL LEAKAGE MODE

Check LEAKAGE MODE

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

16. RISE TIME

- b. Check vertical risetime - 2%, max,
in 20 μ S, max.
- c. Check horizontal risetime - 2%, max,
in 20 μ S, max.

19. STEP AMPLIFIER

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

20. OFFSET

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

21. 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.

22. PULSED STEPS

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

24. CURRENT LIMIT

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

25. VOLTAGE LIMIT

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

26. 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

27. SERIES RESISTORS

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

31. DISPLAYED NOISE

- a. Check 15V displayed noise 1 μ A max
LEAKAGE mode: 1nA, max
- b. Check 75V displayed noise 1 μ A, max
LEAKAGE mode: 1nA, max
- c. Check 350V displayed noise 2 μ A, max
LEAKAGE mode: 2nA, max
- d. Check 1500V displayed noise 5 μ A, max
LEAKAGE mode: 5nA, max
- e. Check horizontal displayed noise
5mV, max

THE END

*Indicates measurement characteristics

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	± 312 mV	100mA	5mV
+4.5V	± 225 mV	1.5A	20mV
+5V	± 250 mV	500mA	10mV
+12.5V	± 312 mV	550mA	5mV
+15V	± 750 mV	200mA	20mV
+100V	± 2.5 V	175mA	20mV
+225V	± 9.0 V	4mA	80mV
-4000V	± 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 5 div
- c. Adjust Orthogonality
- d. Adjust Geometry $.12$ div max, in 12 div.
- 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.

10. 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.

11. DISPLAY OFFSET

Check 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

12. POSITION

- Setup
- Check horizontal POSITION $\pm 2\%$, max
- Check vertical POSITION $\pm 2\%$, max

13. HORIZONTAL VOLTS/DIV

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

14. VERTICAL CURRENT/DIV

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

15. VERTICAL LEAKAGE MODE

Check LEAKAGE MODE

1nA-5nA: $\pm 4\% \pm 1\text{nA}$, max
 10nA-5 μ A: $\pm 1.5\%$, $\pm 1\text{nA}$, max

16. RISE TIME

- Complete setup
- Check vertical risetime
-2%, max, in 20 μ S, max.
- Check horizontal risetime
-2%, max, in 20 μ S, max.

17. HORIZ ATTEN COMP

- Complete setup
- Adjust Horiz Comp

18. STEP GEN

- Complete setup
- Adjust Zero Crossing
- Adjust Phasing
- Check Line Frequency Selector

19. STEP AMPLIFIER

- Complete setup
- Adjust +1 Bal and Step Zero
- Adjust Inv Bal $\pm 25\text{mV}$, max.
- Adjust Step Amplitude
- Check step gen accuracy $\pm 1.5\%$, max
- Check .1X MULT $\pm 1.5\%$, max.
- Adjust Output Z
- Check vert STEP GEN and horiz STEP GEN: $\pm 3\%$, max.

20. OFFSET

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

21. STEP GEN AMPLITUDE

- Complete setup
- Check 10th step accuracy
 $\pm 1.5\%$, max
- Check hi current linearity
 $\pm 1.5\%$, max
- Check lo current linearity
 $\pm 2\%$, max

22. PULSED STEPS

- Setup
- Check 300 μ S width, t_r , and t_f
Width: -5%, min +15%, max
 t_r : 20 μ S, max
 t_f : 20 μ S, max, with 1 step
- Check 80 μ S width, t_r , and t_f
Width: -5%, min, $\pm 15\%$, max
 t_r : 20 μ S, max
 t_f : 20 μ S, max, with 1 step
- Check 80 μ S amplitude $\pm 1.5\%$, max

23. RATE

- a. Setup
- b. Check RATE

24. CURRENT LIMIT

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

25. VOLTAGE LIMIT

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

26. 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

27. SERIES RESISTORS

- a. Setup
- b. Check SERIES RESISTORS
1.3Ω: .3Ω ± .1Ω
1.4Ω to 6.5MΩ: ±10%, max

28. READOUT

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

29. LOGIC

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

30. COLLECTOR SWEEP BALANCE

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

31. DISPLAYED NOISE

- a. Check 15V displayed noise 1μ A, max
LEAKOUT mode: 1nA, max
- b. Check 75V displayed noise 1μA, max
LEAKOUT mode: 1nA, max
- c. Check 350V displayed noise 2μA, max
LEAKOUT mode: 2nA, max
- d. Check 1500V displayed noise 5μA, max
LEAKOUT mode: 5nA, max
- e. Check horizontal displayed noise
4mV, max.

32. 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: ± 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	prèssed
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, ±1V, max.

	<u>115V</u>	<u>230V</u>
HIGH	17	8.5
MED	18.5	9.5
LOW	21	10.5

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	500mA	10mV
+12.5V	Pin F	±312mV	550mA	5mV
+15V	Pin Z	±750mV	200mA	20mV
+100V	Pin E	±2.5V	175mA	20mV
*+225V	R592 2-6 wire	±9.0V	4mA	80mV
*-4000V	R883 9-7 wire	±200V	0.7mA	

Note:

<u>Typical short CKT current</u>	
-75	30mA
-12.5	20 to 60mA
+4.5	1.4A
+5	400mA
+12.5	250mA
+15	120mA
+100	150mA
+225	1mA
-4000	.1mA

*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	50 μ A
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.

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.*

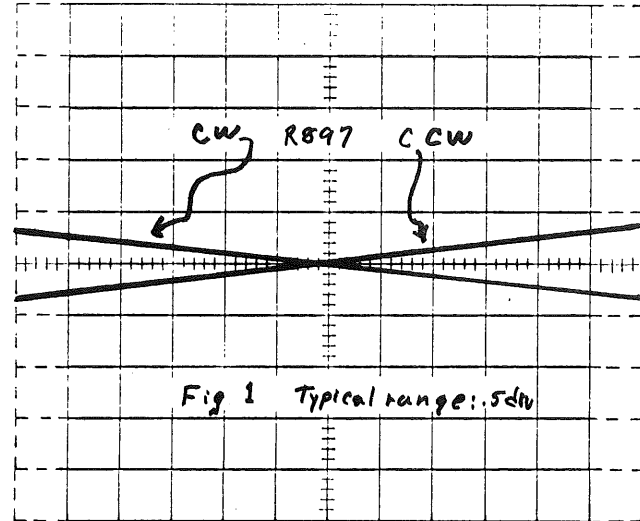
Set CALIBRATION FIXTURE STEP GENERATOR LOADS to OFF. Adjust Geometry (R893) for optimum geometry over full 10div. Set STEP GENERATOR LOADS to 1k COLLECTOR SHORT and check vertical geometry. Set VARIABLE COLLECTOR SUPPLY to 0 and recheck FOCUS and Astigmatism. Set STEP GENERATOR LOADS to OFF.

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

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

8a. (Con't)

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 GAINa. *Complete Setup*

TYPE 576

MAX PEAK VOLTS	15
SERIES RESISTORS	.3 Ω
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	10

9. (Con't)

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.

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

b. Adjust Vert Output Gain

Adjust Vert Output Gain (R592) for 10 div 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, ± 0.25 div, max.

10. (Con't)

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, $\pm 0.25\text{div}$, max.

11. DISPLAY OFFSET

Check DISPLAY OFFSET

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 and adjust Cal Fixture 50mV VARIABLE to return spot to graticule center.

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

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	Adjust to 0 div

12. POSITION

a. Setup

Cal Fixture	
FUNCTION	STEP GEN
TYPE 576	
POLARITY	AC
DISPLAY OFFSET	HORIZ X1
CENTERLINE VALUE	10

b. Check Horizontal POSITION

Note the spot positions 5div, ± 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, ± 0.1 div, max, to the left for each ccw position of the horizontal POSITION switch.

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, ± 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, ± 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.

13. 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

*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.

14. VERTICAL CURRENT/DIV*a. Complete setup*

MAX PEAK VOLTS	15
SERIES RESISTORS	.3
VARIABLE COLLECTOR SUPPLY	100%
POLARITY	+(NPN)
MODE	DC
VERTICAL CURRENT/DIV	2A

14a. (Cont.)

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

b. Check VERTICAL CURRENT/DIV ±1.5%, max

Press ZERO and position spot horizontally and vertically to graticule center. Set VARIABLE COLLECTOR SUPPLY to 100. Check deflection from ZERO, ±.75div, 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, ±1.5div, max.

Set DISPLAY OFFSET to OFF.

15. VERTICAL LEAKAGE MODE 1nA-5nA: ±4%, ±1nA, max
 10nA-5μA: ±1.5%, ±1nA, 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.

<u>DISPLAY OFFSET</u>	<u>VERTICAL CURRENT</u>	<u>Div of Error</u>
OFF	1nA	±1.4
OFF	2nA	±0.9
OFF	5nA	±0.6
VERT X10	10nA	±2.5
VERT X10	20nA	±2.0
VERT X10	50nA	±1.7
VERT X10	.1μA	±1.5
VERT X10	.2μA	±1.5
VERT X10	.5μA	±1.5
VERT X10	1μA	±1.5
VERT X10	2μA	±1.5
VERT X10	5μA	±1.5

Set MODE to NORM.

16. 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 2div, horizontally, from start of rise. See Fig. 2.

c. Check Horizontal Risetime

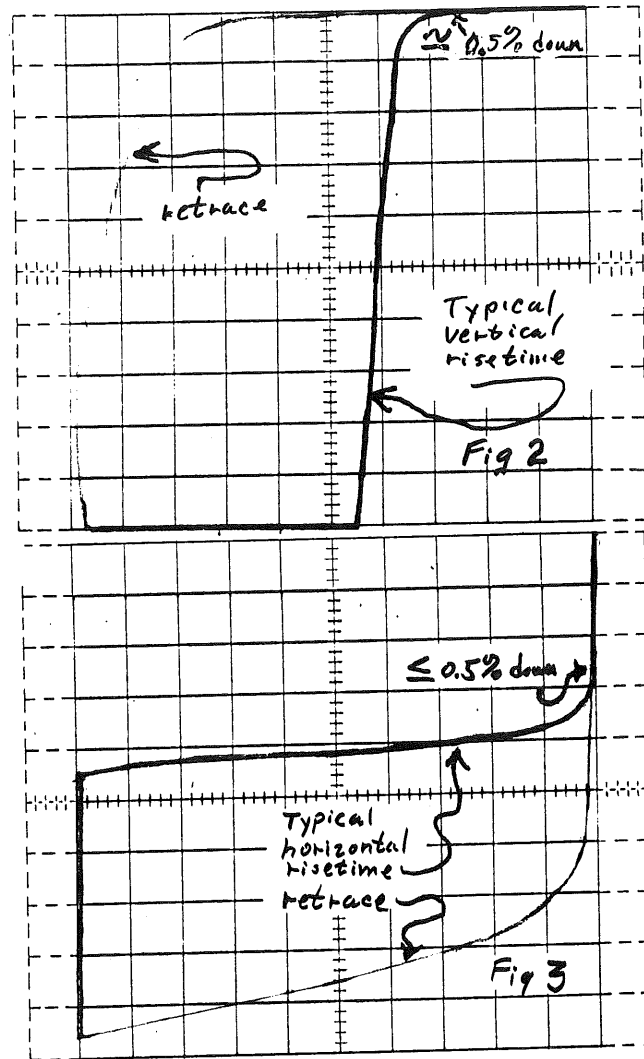
Set Cal Fixture FUNCTION to HORIZ RISETIME CHECK. Set TYPE 576 vertical POSITION one position cw and horizontal POSITION to center.

Check display is within 0.2div, horizontally, of final value, within 2div, vertically, from start of rise. See Fig. 3.

17. 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

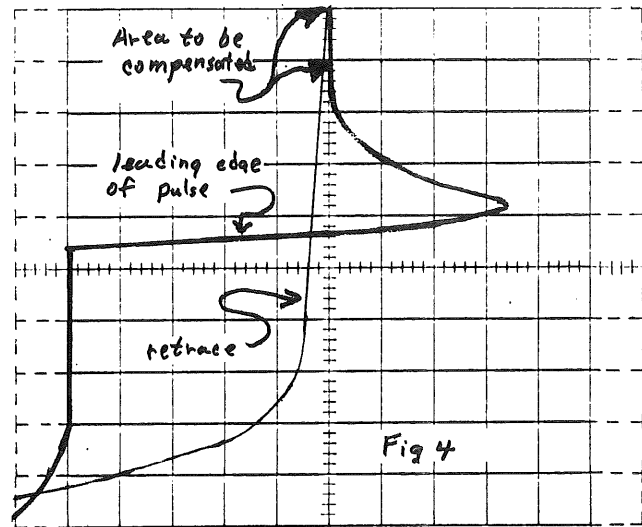


17a. (Con't)

Cal Fixture
 LOGIC INPUT OFF (cw)
 FUNCTION HORIZ COMP-
 ENSATION

b. *Adjust Horiz Comp*

Adjust Horiz-Comp (C433) for top 1div of display to be vertical. See Fig. 4.



18. STEP GEN

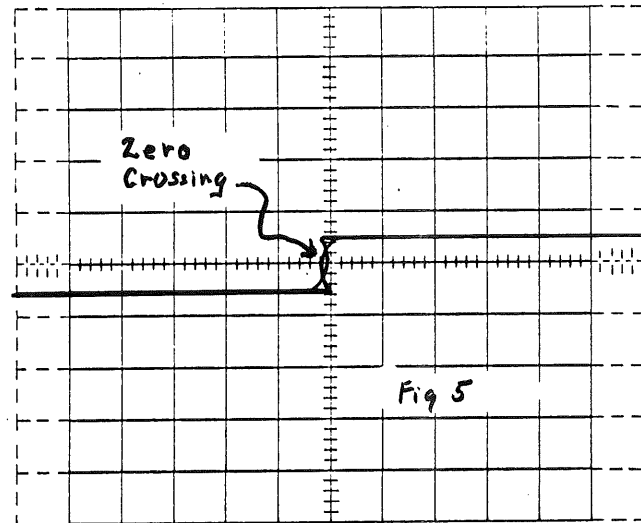
a. *Complete setup*

TYPE 576	
MAX PEAK VOLTS	15
SERIES RESISTORS	140
VARIABLE COLLECTOR SUPPLY	100%
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	2X
.1X	released

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

b. *Adjust Zero Crossing*

Adjust Zero Crossing (R8) to bring crossover lines together. See Fig. 5.



18. (Cont.)

c. Adjust Phasing

Set TYPE 576	
DISPLAY OFFSET	HORIZ X10
CENTERLINE VALUE	5
HORIZONTAL VOLTS/DIV	2 COLLECTOR
horizontal POSITION	full cw
80 μ S	pressed
.5X	pressed
Line Frequency	
(rear panel)	50Hz

Position the 80 μ S pulse on screen with horizontal FINE control.

Adjust Phasing (R24) to position the 80 μ S pulse 3div from the end of the trace.

18. (Con't)

d. Check Line Frequency switch

Set Line Frequency switch (rear panel) to 60Hz. Pulse should shift to the end of the trace

19. 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
Cal Fixture	
LOGIC INPUT	OFF (cw)
FUNCTION	STEP GEN
STEP GENERATOR LOADS	1K COLLECTOR SHORT
STEP GENERATOR	50 μ A

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: ± 2 div, max.

19. (Con't)

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, $\pm 5\text{div}$ max. Release INVERT.

d. Adjust Step Amplitude

Set Cal Fixture STEP GENERATOR to $50\mu\text{A}$. Set TYPE 576:

STEP GENERATOR AMPLITUDE	1V
HORIZONTAL V/DIV	1V BASE
NUMBER OF STEPS	10
REP	pressed
2X	pressed

Set test scope to trigger negative with a 5mSEC sweep and 2V vertical sensitivity. Connect a BNC cable from Cal Fixture EXTERNAL MONITOR to test scope A INPUT. 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.

e. 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	$\pm 0.3\text{div}$
2	$\pm 0.6\text{div}$
3	$\pm 0.9\text{div}$
4	$\pm 1.2\text{div}$
5	$\pm 1.5\text{div}$
6	$\pm 2\text{div}$
7	$\pm 2\text{div}$
8	$\pm 2\text{div}$
9	$\pm 1\text{div}$

19e. (Con't)

Check each step to be within 1div of the adjacent steps.

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

Set test scope sensitivity for 5mV/CM and VC RANGE to +1.1. Press TYPE 576 1X MULT. Rotate test scope COMPARISON VOLTAGE from 0 to 10 and note deviation of each step from test scope graticule center. See step 19e table.

g. *Adjust Output Z*

Set TYPE 576.

Step AMPLITUDE	50 μ 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.

h. *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.

20. OFFSET*a. Adjust Aid*

Set the TYPE 576:

vertical POSITION	center
DISPLAY OFFSET	HORIZ X1
HORIZONTAL VOLTS/DIV	STEP GEN

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. 576

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

20. (Con't)

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 ±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. Note the OFFSET MULT reading matches the test scope COMPARISON VOLTAGE reading, ±2 minor divisions, max.

21. STEP GENERATOR AMPLITUDE

a. Complete setup

TYPE 576

POLARITY	+ (NPN)
MODE	NORM
OFFSET MULT	10.0 (cw)
OFFSET AID	pressed
STEPS	pressed
STEP FAMILY	OFF
STEP AMPLITUDE	2V

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

21a. (Con't)

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.

d. Check lo current linearity ±2%, max

Set Cal Fixture STEP GENERATOR and TYPE 576 AMPLITUDE to .05µA. Repeat step 21c rotating dials from 1 to 0.00 (10).

22. 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 μ S	pressed
POLARITY INVERT	pressed
NUMBER OF STEPS	1
RATE	NORM

Set test scope VC RANGE to 0.

b. Check 300 μ S width t_r , and t_f
Width: -5%, min, +15%, max
 t_r : 20 μ S, max
 t_f : 20 μ S, max, with 1 step

Set test scope TIME/DIV to 50 μ SEC.
 Check pulse width at 50% point, 5.7
 div, min, 7div, max. Check risetime,
 20 μ S, max. Check falltime, 20 μ S, max.

b. Pulse is negative going.

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

Set POLARITY to +NPN.

c. Check 80 μ S width, t_r and t_f
Width: -5% min, $\pm 15%$ max.
 t_r : 20 μ S, max, with 1 step
 t_f : 20 μ S, max

Press TYPE 576 80 μ S. Check falltime,
 20 μ S, max. Check risetime, 20 μ S, max.
 Set test scope TIME/DIV to 10 μ SEC.
 Check pulse width, .7.6div, min, 9.2
 div, max.

d. Check 80 μ S amplitude

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

22d. (Con't)

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

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

23. 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 ≈4mS. Press NORM. Check time of one step to be ≈8mS.

Press .5X. Check time of one step to be ≈16mS.

Pres 2X and .5X. Check time of one step to be ≈8mS.

24. 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

24a. (Con't)

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	.1Ω
STEP GENERATOR	200mA

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

Press ZERO and position spot -5div vertically and -5div horizontally. Check horizontal deflection with COLLECTOR SUPPLY, POLARITY AT +(NPN) AND -(PNP): 4div, min, 5.6div max.

c. Check 500mA CURRENT LIMIT
500mA, min, +40%, 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): 5div, min, 7div, max.

d. Check 100mA CURRENT LIMIT
100mA, min, +40%, 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): 4div, min, 5.6div, max.

e. Check 20mA CURRENT LIMIT
20mA, min, +40%, 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): 4div, min, 5.6div, max.

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

24. (Con't)

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 TYPE 576

STEP AMPLITUDE	2V
CURRENT LIMIT	2A
AID	pressed

Set Cal Fixture STEP GENERATOR LOAD to 40V LOAD.

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

Set test scope

MILLIVOLTS/CM	20
INPUT ATTEN	10
COMPARISON VOLTAGE	4
VC RANGE	+11
A INPUT	DC

The 10th step should be at the test scope graticule center, ± 1.5 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, ± 1.5 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, ± 1.5 div, max.

25. 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	1mA

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

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

Set POLARITY to -(PNP). Note 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.

26. 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 Ω

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

- 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.

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

26. (Cont.)

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

 27. 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

27. (Cont.)

b. Check SERIES RESISTORS

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

SERIES RESISTOR	MAX	HORIZONTAL VOLTS/DIV	VERTICAL	deflection	
	PEAK VOLTS		CURRENT/ DIV	min	max
.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 μ A	2.8	3.4

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

28. 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 their VERTICAL CURRENT/DIV switch.

Set MODE to NORM.

576

28. (Cont'd)

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.

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 μ A
DISPLAY OFFSET	VERT X10
STEP AMPLITUDE	2V
.1X STEP MULT	released

B or gm PER DIV readout should be 2.5 μ . Press .1X STEP MULT.

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

28d. (Con't)

Set VERTICAL CURRENT/DIV to .2A.
 Rotate STEP AMPLITUDE from .05 μ A to 200mA. Check the B PER DIV is off in the .05 μ A, .1 μ A, and .2 μ 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.

29. 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	<u>Logic Level</u>	
	<u>TRUE</u>	<u>FALSE</u>
	PER VERT DIV readout	
OFF	off	2mA
VOLTS	2mV	2mA
10X	20mA	2mA
1X	1A	2mA
2X	2A	
5X	5A	
10 ⁻¹	100mA	
10 ⁻²	10mA	
10 ⁻³	1mA	
10 ⁻⁴	100 μ A	
	PER HORIZ DIV readout	
OFF	off	2V
AMP	2A	2V
1X	1V	2V
2X	2V	
5X	5V	
10 ¹	10V	
10 ²	100V	
10 ⁻² (NEG 10 mV EXP)		

29b. (Con't)

PER STEP readout

STEP GEN
OFF off 2mA

B or gm PER DIV readout

BETA OFF off 1

Set LOGIC INPUT switch CW to OFF.

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 ⁻¹	.5A	1A
10 ⁻²	50mA	.1A
10 ⁻⁴	.5mA	1mA

MODE switch	LOGIC OUTPUT	
	TRUE	FALSE
10 ⁻³	LEAKAGE	NORM

HORIZONTAL VOLTS/DIV COLLECTOR

2X	2V	1V
5X	.5V	1V
10 ¹	.5V	1V
10 ²	.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 ⁻¹	.5V	.05V
10 ⁻²	.05V	.1V
VOLTS	.05V	
10 ⁻⁸	.05μA	
10 ⁻⁴	.5μA	1mA

POLARITY

NEG POL	-(PNP)	+(NPN)
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29c. (Con't)

MAX PEAK VOLTS

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

30. 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 μ A
HORIZONTAL VOLTS/DIV	200V
STEP FAMILY	OFF
POLARITY	+(NPN)
MODE	DC
VARIABLE COLLECTOR SUPPLY	100%
MAX PEAK VOLTS	75
DISPLAY OFFSET	VERT X10
CENTERLINE VALUE	0

b. Adjust Looping Balance

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

Switch MAX PEAK VOLTS between 15 and 75 and readjust C301 for equal deflection on both ranges. 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.

30. (Con't)

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 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.

31. DISPLAYED NOISE*a. Check 15V displayed noise 1.0 μ A, max
LEAKAGE mode: 1nA, max*

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

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

*b. Check 75V displayed noise 1 μ 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 μ A, max
LEAKAGE mode: .2 nA, max*

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

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

31. (Con't)

d. Check 1500V displayed noise $5\mu\text{A}$, max
LEAKAGE mode: $5n\text{A}$, max

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

Set MODE to NORM. Check vertical de-
flection: 5div, max.

e. Check horiz displayed noise $4m\text{V}$, 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.

32. COLLECTOR SUPPLY RESET

Set TYPE 576

HORIZONTAL VOLTS/DIV	2 COLLECTOR
VERTICAL CURRENT/DIV	2A
DISPLAY OFFSET	OFF
VARIABLE COLLECTOR SUPPLY	6div
SERIES RESISTOR	.3 Ω

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

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

THE END