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.

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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 ±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 50Ω BNC cables (012-0057-00)

c. Other Manufacturer's Equipment

1 20,000Ω/V Multimeter
FACTOR 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: ±1.0div, max
   tilt: .1div max in 10div

4. POWER SUPPLIES

a. Check voltage

<table>
<thead>
<tr>
<th>Supply</th>
<th>Max Value</th>
<th>Max short CKT current</th>
<th>Total Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>-75V</td>
<td>±300mV</td>
<td>100mA</td>
<td>5mV</td>
</tr>
<tr>
<td>-12.5V</td>
<td>±31mV</td>
<td>100mA</td>
<td>5mV</td>
</tr>
<tr>
<td>+4.5V</td>
<td>±225mV</td>
<td>1.5A</td>
<td>20mV</td>
</tr>
<tr>
<td>+5V</td>
<td>±250mV</td>
<td>500mA</td>
<td>10mV</td>
</tr>
<tr>
<td>+12.5V</td>
<td>±312mV</td>
<td>550mA</td>
<td>5mV</td>
</tr>
<tr>
<td>+15V</td>
<td>±750mV</td>
<td>200mA</td>
<td>20mV</td>
</tr>
<tr>
<td>+100V</td>
<td>±2.5V</td>
<td>175mA</td>
<td>20mV</td>
</tr>
<tr>
<td>+225V</td>
<td>±9.0V</td>
<td>4mA</td>
<td>80mV</td>
</tr>
<tr>
<td>-4000V</td>
<td>±200V</td>
<td>0.7mA</td>
<td></td>
</tr>
</tbody>
</table>

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 .12div, max, in 12div

9. HORIZ AMP GAIN

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

10. DISPLAY OFFSET

<table>
<thead>
<tr>
<th>Centerline Value</th>
<th>Max. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Adjusted to 0 div</td>
</tr>
<tr>
<td>9.5</td>
<td>0.1 div</td>
</tr>
<tr>
<td>9</td>
<td>0.1 div</td>
</tr>
<tr>
<td>8</td>
<td>0.2 div</td>
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<tr>
<td>7</td>
<td>0.2 div</td>
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<tr>
<td>6</td>
<td>0.2 div</td>
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<tr>
<td>5</td>
<td>0.2 div</td>
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<tr>
<td>4</td>
<td>0.2 div</td>
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<tr>
<td>3</td>
<td>0.2 div</td>
</tr>
<tr>
<td>2</td>
<td>0.2 div</td>
</tr>
<tr>
<td>1</td>
<td>0.1 div</td>
</tr>
<tr>
<td>.5</td>
<td>0.1 div</td>
</tr>
</tbody>
</table>

11. VERT AMP GAIN

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

12. NORM CAL CHECK

b. Cal ±1%

13. POSITION

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

14. HORIZONTAL VOLTS/DIV

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

15. VERTICAL CURRENT/DIV

*b. Check VERTICAL CURRENT/DIV ±1.5%, max
16. VERTICAL LEAKAGE MODE

Check LEAKAGE MODE
1nA-5nA: ±4% ±1nA, max
10nA-5μA: ±1.5% ±1nA, max

17. RISETIME

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

19. STEP GEN

b. Check zero crossing, ±3% of peak

20. STEP AMPLIFIER

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

21. STEP GEN AMPLITUDE

*c. Check OFFSET MULT ±2%, max

22. STEP GEN AMPLITUDE

*b. Check 10th step accuracy ±1.5%, max
c. Check hi current linearity ±1.5%, max
d. Check lo current linearity ±2%, max

23. PULSED STEPS

b. Check 300 s with, t_r and t_f
   Width: -5%, min ±15% max
t_r: 20μs, max
t_f: 20μs, max with 1 step
c. Check 80 s width, t_r and t_f
   Width: -5% min, +15%
t_r: 20μs, max
t_f: 20μs, max, with 1 step
d. Check 80μs amplitude ±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
   .3Ω: .3Ω, ±1
   1.4Ω to 6.5MΩ: ±5%, max

32. DISPLAYED NOISE

a. Check 15V displayed noise 1μA max
   LEAKAGE mode: 1nA, max
b. Check 75V displayed noise 1μA, max
   LEAKAGE mode: 1nA, max
c. Check 350V displayed noise 2μA, max
   LEAKAGE mode: 2nA, max
d. Check 1500V displayed noise 5μA, 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.
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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Standards II
Standards III
Ron Vogeltanz (6)
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: ±.1div, max
   tilt: .1div max in 10div

4. POWER SUPPLIES

a. Check voltage

<table>
<thead>
<tr>
<th>Supply</th>
<th>Max Error</th>
<th>Max short CKT current</th>
<th>Total Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>-75V</td>
<td>±.4% 300mV</td>
<td>100mA</td>
<td>5mV</td>
</tr>
<tr>
<td>-12.5V</td>
<td>±.312mV</td>
<td>100mA</td>
<td>5mV</td>
</tr>
<tr>
<td>+4.5V</td>
<td>±.225mV</td>
<td>1.5A</td>
<td>20mV</td>
</tr>
<tr>
<td>+5V</td>
<td>±.250mV</td>
<td>600mA</td>
<td>10mV</td>
</tr>
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<td>+12.5V</td>
<td>±.312mV</td>
<td>550mA</td>
<td>5mV</td>
</tr>
<tr>
<td>+15V</td>
<td>±.750mV</td>
<td>200mA</td>
<td>20mV</td>
</tr>
<tr>
<td>+100V</td>
<td>±.2.5V</td>
<td>175mA</td>
<td>20mV</td>
</tr>
<tr>
<td>+225V</td>
<td>±.9.0V</td>
<td>4mA</td>
<td>80mV</td>
</tr>
<tr>
<td>-4000V</td>
<td>±.200V</td>
<td>0.7mA</td>
<td></td>
</tr>
</tbody>
</table>

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 .12div, max, in 12div

9. HORIZ AMP GAIN

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

10. DISPLAY OFFSET

<table>
<thead>
<tr>
<th></th>
<th>Centerline Value</th>
<th>Max. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Adjusted to 0 div</td>
<td></td>
</tr>
<tr>
<td>9.5</td>
<td>0.1 div</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.1 div</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.2 div</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.2 div</td>
<td></td>
</tr>
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<td>6</td>
<td>0.2 div</td>
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<td>0.2 div</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.1 div</td>
<td></td>
</tr>
<tr>
<td>.5</td>
<td>0.1 div</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjusted to 0 div</td>
<td></td>
</tr>
</tbody>
</table>

11. VERT AMP GAIN

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

12. NORM CAL CHECK

b. Cal ±1%

13. POSITION

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

14. HORIZONTAL VOLTS/DIV

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

15. VERTICAL CURRENT/DIV

*b. Check VERTICAL CURRENT/DIV ±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.

<table>
<thead>
<tr>
<th></th>
<th>115V</th>
<th>230V</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>MED</td>
<td>17.5</td>
<td>9</td>
</tr>
<tr>
<td>LOW</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Supply</th>
<th>Location</th>
<th>Max</th>
<th>Max short</th>
<th>Total</th>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-75V</td>
<td>Pin K</td>
<td>Adjust</td>
<td>100mA</td>
<td>5mV</td>
<td>Typical short CKT current</td>
</tr>
<tr>
<td>-12.5V</td>
<td>Pin I</td>
<td>±312mV</td>
<td>100mA</td>
<td>5mV</td>
<td>-75  30mA</td>
</tr>
<tr>
<td>+4.5V</td>
<td>Pin U</td>
<td>±225mV</td>
<td>1.5A</td>
<td>20mV</td>
<td>-12.5 20 to 60mA</td>
</tr>
<tr>
<td>+5V</td>
<td>Pin Q</td>
<td>±250mV</td>
<td>600mA</td>
<td>10mV</td>
<td>+4.5 1.4A</td>
</tr>
<tr>
<td>+12.5V</td>
<td>Pin F</td>
<td>±312mV</td>
<td>550mA</td>
<td>.5mV</td>
<td>+5  400mA</td>
</tr>
<tr>
<td>+15V</td>
<td>Pin Z</td>
<td>±750mV</td>
<td>200mA</td>
<td>20mV</td>
<td>+12.5 250mA</td>
</tr>
<tr>
<td>+100V</td>
<td>Pin E</td>
<td>±2.5V</td>
<td>175mA</td>
<td>20mV</td>
<td>+15  120mA</td>
</tr>
<tr>
<td>*+225V</td>
<td>R592</td>
<td>±9.0V</td>
<td>4mA</td>
<td>80mV</td>
<td>+100 150mA</td>
</tr>
<tr>
<td>*-4000V</td>
<td>R883</td>
<td>±200V</td>
<td>0.7mA</td>
<td></td>
<td>-4000 1mA</td>
</tr>
</tbody>
</table>

*check with INTENSITY CW and CCW.

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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; ±1.0 div, max tilt; .1 div .max in 10 div

2. PRESETS

3. LINE VOLTAGE SELECTOR
   a. Setup
   b. Check line voltage selector

4. POWER SUPPLIES
   a. Check Voltage

<table>
<thead>
<tr>
<th>Supply</th>
<th>Max Error</th>
<th>Max short CKT current</th>
<th>Noise Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>-75V</td>
<td>Adjust 721</td>
<td>100mA</td>
<td>5mV</td>
</tr>
<tr>
<td>-12.5V</td>
<td>±312mV</td>
<td>100mA</td>
<td>5mV</td>
</tr>
<tr>
<td>+4.5V</td>
<td>±225mV</td>
<td>1.5A</td>
<td>20mV</td>
</tr>
<tr>
<td>+5V</td>
<td>±250mV</td>
<td>500mA</td>
<td>10mV</td>
</tr>
<tr>
<td>+12.5V</td>
<td>±312mV</td>
<td>550mA</td>
<td>5mV</td>
</tr>
<tr>
<td>+15V</td>
<td>±750mV</td>
<td>200mA</td>
<td>20mV</td>
</tr>
<tr>
<td>+100V</td>
<td>±2.5V</td>
<td>175mA</td>
<td>20mV</td>
</tr>
<tr>
<td>+225V</td>
<td>±9.0V</td>
<td>4mA</td>
<td>80mV</td>
</tr>
<tr>
<td>-4000V</td>
<td>±200V</td>
<td>0.7mA</td>
<td></td>
</tr>
</tbody>
</table>
   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: 0.25 div, 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 ±0.25%, max.
   g. Adjust "5"s Gain ±0.25%, max.
   h. Check CMR; 500:1

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SHORT FORM PROCEDURE

10. DISPLAY OFFSET

Check DISPLAY OFFSET

<table>
<thead>
<tr>
<th>Centerline Value</th>
<th>Max Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Adjusted to 0div</td>
</tr>
<tr>
<td>9.5</td>
<td>0.1div</td>
</tr>
<tr>
<td>9</td>
<td>0.1div</td>
</tr>
<tr>
<td>8</td>
<td>0.2div</td>
</tr>
<tr>
<td>7</td>
<td>0.2div</td>
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<td>3</td>
<td>0.2div</td>
</tr>
<tr>
<td>2</td>
<td>0.2div</td>
</tr>
<tr>
<td>1</td>
<td>0.1div</td>
</tr>
<tr>
<td>.5</td>
<td>0.1div</td>
</tr>
<tr>
<td>0</td>
<td>Adjusted to 0div</td>
</tr>
</tbody>
</table>

15. VERTICAL CURRENT/DIV

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

16. VERTICAL LEAKAGE MODE

Check LEAKAGE MODE

lnA-5nA: ±4% ±1nA, max
10nA-5μA: ±1.5%, ±1nA, max

17. RISETIME

a. Complete setup
b. Check vertical risetime -2%, max, in 20μs, max
c. Check horizontal risetime -2%, max, in 20μs, 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, ±3% of peak Collector Volts

20. STEP AMPLIFIER

a. Complete setup
b. Adjust +1 Bal and Step Zero
c. Adjust Inv Bal ±25mV, max
d. Adjust Step Generator Transitions
e. Check Line Frequency Switch
f. Adjust Step Amplitude
g. Check Step Gen Accuracy
h. Check .IX (Step Multi)
i. Adjust Output Z1
j. Check vert STEP GEN and horiz STEP GEN ±3% max
21. OFFSET
   a. Adjust AID
   b. Adjust OPPOSE
   c. Check OFFSET MULT ±2%, max

22. STEP GEN AMPLITUDE
   a. Complete setup
   b. Check 10th step accuracy ±1.5%, max
   c. Check hi current linearity ±1.5%, max
   d. Check lo current linearity ±1.5%, max

23. PULSED STEPS
   a. Setup
   b. Check 300μs width, τᵣ and τᵋ
      Width: -5%, min +15%, max
      τᵣ: 20μs, max
      τᵋ: 20μs, max, with 1 step
   c. Check 80μs width, τᵣ and τᵋ
      Width: -5%, min, +15%, max
      τᵣ: 20μs, max
      τᵋ: 20μs, max, with 1 step
   d. Check 80μs amplitude ±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
      .3Ω: .3Ω ±.1Ω
      1.4Ω to 6.5MΩ: ±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

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32. DISPLAYED NOISE

a. Check 15V displayed noise 1μA, 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
f. Check Step Generator Current Mode
   Ripple plus Noise: 1nA 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: 1.1div, 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, ±1V, max. P-P volts must change at least 1 volt between HIGH, MED, and LOW with selector in 115V.

<table>
<thead>
<tr>
<th></th>
<th>115V</th>
<th>230V</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>MED</td>
<td>17.5</td>
<td>9</td>
</tr>
<tr>
<td>LOW</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

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:

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

*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.

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>STEP GEN</th>
<th>CALIBRATOR RANGE</th>
<th>200mV</th>
<th>VARIABLE</th>
<th>CAL</th>
<th>VERTICAL</th>
<th>10A (ccw)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISPLAY OFFSET</td>
<td></td>
<td>MULTIPLIER</td>
<td>10</td>
<td>HORIZONTAL VOLTS</td>
<td>.5 COLLECTOR</td>
<td>STEP GENERATOR</td>
<td>50μA</td>
</tr>
<tr>
<td>LOADS</td>
<td></td>
<td></td>
<td>OFF</td>
<td>STEP GENERATOR</td>
<td>LOADS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 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
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 COL-
LECTOR 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 .3Ω
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 1Ω
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 ±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, ±0.25div, max.

g. Adjust "5"s Gain ±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, ±0.25div, 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:

<table>
<thead>
<tr>
<th>CENTERLINE VALUE</th>
<th>Max Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Adjusted to 0div</td>
</tr>
<tr>
<td>9.5</td>
<td>0.1div</td>
</tr>
<tr>
<td>9</td>
<td>0.1div</td>
</tr>
<tr>
<td>8</td>
<td>0.2div</td>
</tr>
<tr>
<td>7</td>
<td>0.2div</td>
</tr>
<tr>
<td>6</td>
<td>0.2div</td>
</tr>
<tr>
<td>5</td>
<td>0.2div</td>
</tr>
<tr>
<td>4</td>
<td>0.2div</td>
</tr>
<tr>
<td>3</td>
<td>0.2div</td>
</tr>
<tr>
<td>2</td>
<td>0.2div</td>
</tr>
<tr>
<td>1</td>
<td>0.1div</td>
</tr>
<tr>
<td>.5</td>
<td>0.1div</td>
</tr>
<tr>
<td>0</td>
<td>Adjust to 0div</td>
</tr>
</tbody>
</table>

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

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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 ±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.

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 ±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, ±0.25div, 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 ±1%

Press CAL and note spot deflects 10 vertical and horizontal divisions within ±.1div 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 ±.1div.

13. HORIZONTAL VOLTS/DIV

a. Setup

TYPE 576
POLARITY
AC
DISPLAY OFFSET
HORIZ X1

b. Check Horizontal POSITION

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

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, ±0.1div, 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, ±0.1div, 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
HORIZONTAL VOLTS
LOGIC INPUT
MAX PEAK VOLTS
SERIES RESISTORS
POLARITY
VARIABLE COLLECTOR SUPPLY
MODE
VERTICAL CURRENT/DIV
DISPLAY OFFSET
CENTERLINE VALUE
vertical POSITION
FINE
horizontal POSITION
FINE
HORIZONTAL VOLTS/DIV
DISPLAY INVERT

HORIZ ATTN CHECK
.5 COLLECTOR
OFF (cw)
1500
3K
+(NPN)
100%
DC
2A
HORIZ X10
10
one step cw
center
center
.05 COLLECTOR
released

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14. (Cont.)

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

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

Rotate HORIZONTAL VOLTS/DIV and Cal
Fixture HORIZONTAL VOLTS simultaneously
through each COLLECTOR and BASE position
and check for ±1.5 div, 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 ±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.

Set VARIABLE COLLECTOR SUPPLY to 0.

16. VERTICAL LEAKAGE MODE

lnA-5nA: ±4%, ±lnA, max
10nA-5pA: ±1.5%, ±lnA, max

Set TYPE 576 MODE to LEAKAGE. Rotate VERTICAL CURRENT/DIV and Cal Fixture VERTICAL ccw simultaneously from lnA 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.

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

Set MODE to NORM.

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.
CALIBRATION

17. RISETIME

a. Complete setup

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

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

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.

a. 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 released
HORIZONTAL VOLTS/DIV 50
DISPLAY INVERT
Cal Fixture OFF (cw)
LOGIC INPUT HORIZ COMPENSATION
FUNCTION
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
type POSITION center
FINF center
HORIZONTAL VOLTS/DIV .5 COLLECTOR
NUMBER OF STEPS 1
ZERO OFFSET pressed
STEPS pressed
REP pressed
RATE .5X

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX PEAK VOLTS</td>
<td>15</td>
</tr>
<tr>
<td>VARIABLE COLLECTOR SUPPLY</td>
<td>0%</td>
</tr>
<tr>
<td>POLARITY</td>
<td>+ (NPN)</td>
</tr>
<tr>
<td>MODE</td>
<td>NORM</td>
</tr>
<tr>
<td>VERTICAL CURRENT/DIV</td>
<td>STEP GEN</td>
</tr>
<tr>
<td>DISPLAY OFFSET</td>
<td>HORIZ X10</td>
</tr>
<tr>
<td>CENTERLINE VALUE</td>
<td>0</td>
</tr>
<tr>
<td>vertical POSITION</td>
<td>center</td>
</tr>
<tr>
<td>FINE</td>
<td>center</td>
</tr>
<tr>
<td>horizontal POSITION</td>
<td>center</td>
</tr>
<tr>
<td>FINE</td>
<td>center</td>
</tr>
<tr>
<td>HORIZONTAL VOLTS/DIV</td>
<td>.05 BASE</td>
</tr>
<tr>
<td>DISPLAY INVERT</td>
<td>released</td>
</tr>
<tr>
<td>STEP AMPLITUDE</td>
<td>.05V</td>
</tr>
<tr>
<td>ZERO OFFSET</td>
<td>pressed</td>
</tr>
<tr>
<td>STEPS·</td>
<td>pressed</td>
</tr>
<tr>
<td>STEP FAMILY</td>
<td>OFF</td>
</tr>
<tr>
<td>2X</td>
<td>pressed</td>
</tr>
<tr>
<td>Cal Fixture</td>
<td></td>
</tr>
<tr>
<td>LOGIC INPUT</td>
<td>OFF (cw)</td>
</tr>
<tr>
<td>FUNCTION</td>
<td>STEP GEN</td>
</tr>
<tr>
<td>STEP GENERATOR LOADS</td>
<td>1K COLLECTOR SHORT</td>
</tr>
<tr>
<td>STEP GENERATOR</td>
<td>50µA</td>
</tr>
</tbody>
</table>

**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: ±2div, 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, ±5div max. Release INVERT.
20. (Cont.)

d. Adjust Step Generator Transitions

Set TYPE 576:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP GENERATOR AMPLITUDE</td>
<td>1V</td>
</tr>
<tr>
<td>HORIZONTAL V/DIV</td>
<td>1V BASE</td>
</tr>
<tr>
<td>NUMBER OF STEPS</td>
<td>2</td>
</tr>
<tr>
<td>REP</td>
<td>pressed</td>
</tr>
<tr>
<td>2X</td>
<td>pressed</td>
</tr>
</tbody>
</table>

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, ±.1div.

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

f. Adjust Step Amplitude

Set TYPE 576:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER OF STEPS</td>
<td>10</td>
</tr>
</tbody>
</table>

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∞. 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.

<table>
<thead>
<tr>
<th>COMPARISON VOLTAGE</th>
<th>Max Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>±0.3div</td>
</tr>
<tr>
<td>2</td>
<td>±0.6div</td>
</tr>
<tr>
<td>3</td>
<td>±0.9div</td>
</tr>
<tr>
<td>4</td>
<td>±1.2div</td>
</tr>
<tr>
<td>5</td>
<td>±1.5div</td>
</tr>
<tr>
<td>6</td>
<td>±1.8div</td>
</tr>
<tr>
<td>7</td>
<td>±2div</td>
</tr>
<tr>
<td>8</td>
<td>±2div</td>
</tr>
<tr>
<td>9</td>
<td>±1div</td>
</tr>
</tbody>
</table>

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.

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

Check each step to be within 1.5div of the adjacent steps.
20. (Cont.)

i. Adjust Output Z

Set TYPE 576.

Step AMPLITUDE 50µA
.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 ±3% max

Set TYPE 576

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

Check the vertical deflection: 10 div, ±.3div, max.

Set HORIZONTAL VOLTS/DIV to STEP GEN.
Check the horizontal deflection: 10div, ±.3div, 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.
CALIBRATION

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 >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

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22a. (Cont.)

<table>
<thead>
<tr>
<th>STEPS</th>
<th>pressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP FAMILY</td>
<td>OFF</td>
</tr>
<tr>
<td>STEP AMPLITUDE</td>
<td>2V</td>
</tr>
<tr>
<td>HORIZONTAL VOLTS/DIV</td>
<td>STEP GEN</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>OFFSET MULT</th>
<th>VOLTAGE</th>
<th>max error</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 (10)</td>
<td>10</td>
<td>±3div</td>
</tr>
<tr>
<td>9.00</td>
<td>9</td>
<td>±2.7div</td>
</tr>
<tr>
<td>8.00</td>
<td>8</td>
<td>±2.4div</td>
</tr>
<tr>
<td>7.00</td>
<td>7</td>
<td>±2.1div</td>
</tr>
<tr>
<td>6.00</td>
<td>6</td>
<td>±1.8div</td>
</tr>
<tr>
<td>5.00 (see note)</td>
<td>5</td>
<td>±1.5div</td>
</tr>
<tr>
<td>4.00</td>
<td>4</td>
<td>±1.2div</td>
</tr>
<tr>
<td>3.00</td>
<td>3</td>
<td>±.9div</td>
</tr>
<tr>
<td>2.00</td>
<td>2</td>
<td>±.6div</td>
</tr>
<tr>
<td>1.00</td>
<td>1</td>
<td>±.3div</td>
</tr>
</tbody>
</table>

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

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

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 lo current linearity ±1.5%, max

Set Cal Fixture STEP GENERATOR and TYPE 576 AMPLITUDE to .05μA. 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
300μs pressed
NUMBER OF STEPS 1
RATE NORM
POLARITY INVERT pressed

Set test scope VC RANGE to 0.

b. Check 300μs width \( t_p \) and \( t_f \)

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

\( t_p \): 20μs, max

\( t_f \): 20μs, max, with 1 step

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

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

Set POLARITY to +NPN.

c. Check 80μs width, \( t_p \) and \( t_f \)

Width: -5%, min, ±15% max

\( t_p \): 20μs, max, with 1 step

\( t_f \): 20μs, max

Press TYPE 576 80μs. Check falltime, 20μs, max. Check risetime, 20μs, max. Set test scope TIME/DIV to 10μSEC. Check pulse width, 7.6div, min, 9.2div, max.
23. (Cont.)

d. Check 80μs amplitude, ±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.

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

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

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

Press 2X and .5X. Check time of one step
to be ≈8ms.
25. CURRENT LIMIT

a. Complete setup

TYPE 576

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

Cal Fixture

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGIC INPUT</td>
<td>OFF (cw)</td>
</tr>
<tr>
<td>FUNCTION</td>
<td>STEP GEN</td>
</tr>
<tr>
<td>STEP GENERATOR LOADS</td>
<td>.1Ω</td>
</tr>
<tr>
<td>STEP GENERATOR</td>
<td>200mA</td>
</tr>
</tbody>
</table>

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 -(PDP): 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 -(PDP): 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.

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 ATTN  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, ±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.

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

26. VOLTAGE LIMIT

a. Complete setup

<table>
<thead>
<tr>
<th>TYPE 576</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLARITY</td>
</tr>
<tr>
<td>MODE</td>
</tr>
<tr>
<td>DISPLAY OFFSET</td>
</tr>
<tr>
<td>vertical POSITION</td>
</tr>
<tr>
<td>FINE</td>
</tr>
<tr>
<td>horizontal POSITION</td>
</tr>
<tr>
<td>FINE</td>
</tr>
<tr>
<td>DISPLAY INVERT</td>
</tr>
<tr>
<td>HORIZONTAL VOLTS/DIV</td>
</tr>
<tr>
<td>NUMBER OF STEPS</td>
</tr>
<tr>
<td>STEPS</td>
</tr>
<tr>
<td>REP</td>
</tr>
<tr>
<td>.1X</td>
</tr>
<tr>
<td>STEP AMPLITUDE</td>
</tr>
<tr>
<td>POLARITY INVERT</td>
</tr>
<tr>
<td>Cal Fixture</td>
</tr>
<tr>
<td>LOGIC INPUT</td>
</tr>
<tr>
<td>FUNCTION</td>
</tr>
<tr>
<td>STEP GENERATOR LOADS</td>
</tr>
<tr>
<td>STEP GENERATOR</td>
</tr>
</tbody>
</table>
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 +(PNP)
SERIES RESISTOR .3Ω
Press ZERO and position spot -5div vertically and -5div horizontally with FINE controls. Check horizontal deflection with POLARITY at:

+(PNP) 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.
CALIBRATION

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
27a. (Cont.)

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

<table>
<thead>
<tr>
<th>MAX PEAK VOLTS</th>
<th>HORIZONTAL VOLTS/DIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>100</td>
</tr>
<tr>
<td>350</td>
<td>20</td>
</tr>
<tr>
<td>75</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
</tr>
</tbody>
</table>

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.

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

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

December 1969
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 50μA
DISPLAY OFFSET VERT X10
STEP AMPLITUDE 2V
.1X STEP MULT released

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

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

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

<table>
<thead>
<tr>
<th>LOGIC INPUT</th>
<th>Logic Level</th>
<th>Logic Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>PER VERT DIV readout</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OFF    off    2mA
VOLTS  2mV    2mA
10X    20mA   2mA
1X     1A     2mA
2X     2A     1A
5X     5A     1A
10^-1  100mA  1A
10^-2  10mA   1A
10^-3  1mA   1A
10^-4  100μA  1A
CALIBRATION

30b. (Cont.)

PER HORIZ DIV readout

<table>
<thead>
<tr>
<th>Horiz</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>off</td>
<td>2V</td>
</tr>
<tr>
<td>AMP</td>
<td>2A</td>
<td>2V</td>
</tr>
<tr>
<td>1X</td>
<td>1V</td>
<td>2V</td>
</tr>
<tr>
<td>2X</td>
<td>2V</td>
<td>1V</td>
</tr>
<tr>
<td>5X</td>
<td>5V</td>
<td>1V</td>
</tr>
<tr>
<td>$10^1$</td>
<td>10V</td>
<td>1V</td>
</tr>
<tr>
<td>$10^2$</td>
<td>100V</td>
<td>1V</td>
</tr>
<tr>
<td>$10^{-2}$ (NEG 10 mV)</td>
<td>100V</td>
<td>EXP</td>
</tr>
</tbody>
</table>

PER STEP readout

<table>
<thead>
<tr>
<th>STEP GEN</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>off</td>
<td>2mA</td>
</tr>
</tbody>
</table>

B or gm PER DIV readout

<table>
<thead>
<tr>
<th>BETA OFF</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>off</td>
<td>1</td>
</tr>
</tbody>
</table>

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%.

<table>
<thead>
<tr>
<th>LOGIC INPUT</th>
<th>STEP GEN 10X</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRUE</td>
<td>Per Step 20mA</td>
</tr>
<tr>
<td>FALSE</td>
<td>Per Step 2mA</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>LOGIC OUTPUT</th>
<th>OUTPUT INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TRUE</td>
</tr>
<tr>
<td></td>
<td>FALSE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VERTICAL CURRENT/DIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2X 2A 1A</td>
</tr>
<tr>
<td>5X .5A 1A</td>
</tr>
<tr>
<td>10^-1 .5A 1A</td>
</tr>
<tr>
<td>10^-2 50mA .1A</td>
</tr>
<tr>
<td>10^-4 .5mA 1mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HORIZONTAL VOLTS/DIV COLLECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2X 2V 1V</td>
</tr>
<tr>
<td>5X .5V 1V</td>
</tr>
<tr>
<td>10^1 .5V 1V</td>
</tr>
<tr>
<td>10^2 .05V .1V</td>
</tr>
<tr>
<td>NEG EXP .5V 1V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STEP POLARITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEG POL</td>
</tr>
<tr>
<td>pressed</td>
</tr>
<tr>
<td>released</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STEP GEN AMPLITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2X 2V 1V</td>
</tr>
<tr>
<td>5X .5V 1V</td>
</tr>
<tr>
<td>10^-1 .5V .05V</td>
</tr>
<tr>
<td>10^-2 .05V .1V</td>
</tr>
<tr>
<td>VOLTS .05V</td>
</tr>
<tr>
<td>10^-8 .05μA</td>
</tr>
<tr>
<td>10^-4 .5μA 1mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POLARITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEG POL</td>
</tr>
<tr>
<td>-(PNP)</td>
</tr>
<tr>
<td>+(NPN)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MAX PEAK VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>15V</td>
</tr>
<tr>
<td>15V</td>
</tr>
<tr>
<td>75V</td>
</tr>
<tr>
<td>75V</td>
</tr>
<tr>
<td>350V</td>
</tr>
<tr>
<td>350V</td>
</tr>
</tbody>
</table>

December 1969
CALIBRATION

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 (≈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 µA
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
CALIBRATION

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 1.0µA, 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.

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32a. (Cont.)

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

b. Check 75V displayed noise 1µA, 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 2µA, 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 5µA, max
LEAKAGE mode: 5nA, max

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

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

e. Check horizontal 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 .05µA

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 ~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 .3Ω

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