*TB 9-6625-1961-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR CALIBRATION GENERATOR, TEKTRONIX MODEL PG 506

Headquarters, Department of the Army, Washington, DC
25 March 2008

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also send in your comments electronically to our E-mail address: 2028@redstone.army.mil or by fax 256-842-6546/DSN 788-6546. For the World Wide Web use: https://amcom2028.redstone.army.mil. Instructions for sending an electronic 2028 can be found at the back of this manual.

*This bulletin supersedes TB 9-6625-1961-50, dated 14 June 1977, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Calibration Generator, Tektronix Model PG 506. The manufacturer's manual was used as the prime date source in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. None.

b. Time and Technique. The time required for this calibration is approximately 6 hours, using the dc and low frequency technique.

2. Forms, Records, and Reports

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

b. Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

3. Calibration Description. TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Line voltage regulation	Satisfactory performance with any line voltage between 105 and 125 V ac
Output amplitude	100 μV to 100 V ± 0.25%
Deflection error readout	Range: ± 7.5% Resolution: within 0.1%
Period [1]	1 μs to 10 ms ± 5%
High amplitude output	6 V to 60 V p-p
Fast risetime amplitude	100 mV to 1 V p-p
Fast risetime	1 ns or less into a 50 ohm load
Fast risetime leading edge aberrations during first 10 ns	Within 2% of signal p-p amplitude or 10 mV
High amplitude risetime	10 ns or less into a 50 ohm load
High amplitude leading edge aberrations during first 50 ns	Within 2% of signal p-p amplitude or 50 mV

[1]Only 1 kilohertz frequency verified.

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Sets, AN/GSM-286, AN/GSM-287 and AN/GSM-705. Alternate items may be used by the calibrating activity. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories required for this calibration are common usage accessories, issued as indicated in paragraph **4** above, and are not listed in this calibration procedure. The following peculiar accessories are also required for this calibration: Power Module, Tektronix, model TM 503 (supplied with TI), and Precision Cable, Tektronix, model 012-0482-00 (supplied with TI).

Table 2. Minimum Specifications of Equipment required

Common name	Minimum use specifications	Manufacturer, model, and part number
AUTOTRANSFORMER	Range: 105 to 125 V ac	Ridge, Model 9020A (9020A)
CALIBRATOR	Range: 0 to 2 V dc	Fluke, Model 5720A (5720A) (p/o MIS-35947)
DC CURRENT SHUNT	Range: 0.1 A Accuracy: 0.1%	Guildline, Model 9711 (7912323)
FREQUENCY COUNTER	Range: 952.38 to 1052.6 Hz Accuracy: ± 1.25%	Fluke, Model PM6681/656 (PM6681/656)
MULTIMETER	Range: 20 mv; 108.7 V	Agilent, Model 3458A (3458A)
OSCILLOSCOPE	Range: 10 mV to 60 V p-p Accuracy: ± 3% Risetime: 1 ns	Agilent, OS-303/G (OS-303/G)
RESISTANCE STANDARD	Range: 1 M Ω Accuracy: ± 0.1%	Biddle-Gray, Model 71-631 (7910328)

SECTION IV
CALIBRATION PROCESS

6. Preliminary Instructions

a. The instructions outlined in paragraphs **6** and **7** preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name and item identification number as listed in table 2.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration.

Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturer's manual.

d. When indications specified in paragraphs **8** through **14** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **14**. Do not perform power supply check if all other parameters are within tolerance.

e. Unless otherwise specified, all controls and control settings refer to the TI.

7. Equipment Setup

WARNING

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

a. Set TI DC ⎍ SWITCH (internal (fig. 1)) to DC (up) position.

b. Install TI into power module.

c. Connect power module to autotransformer, and leave connected throughout entire calibration.

d. Connect autotransformer to a 115 V ac source and adjust autotransformer for a 115 V output.

e. Energize power module by pulling the power button out (located on left edge of front panel).

f. Set TI model switch to **STD AMPL** and turn **AMPLITUDE** switch to **10**. Allow at least 20 minutes for equipment to warm-up.

g. Depress **VARIABLE** (out) control. **DEFLECTION ERROR** display will be extinguished.

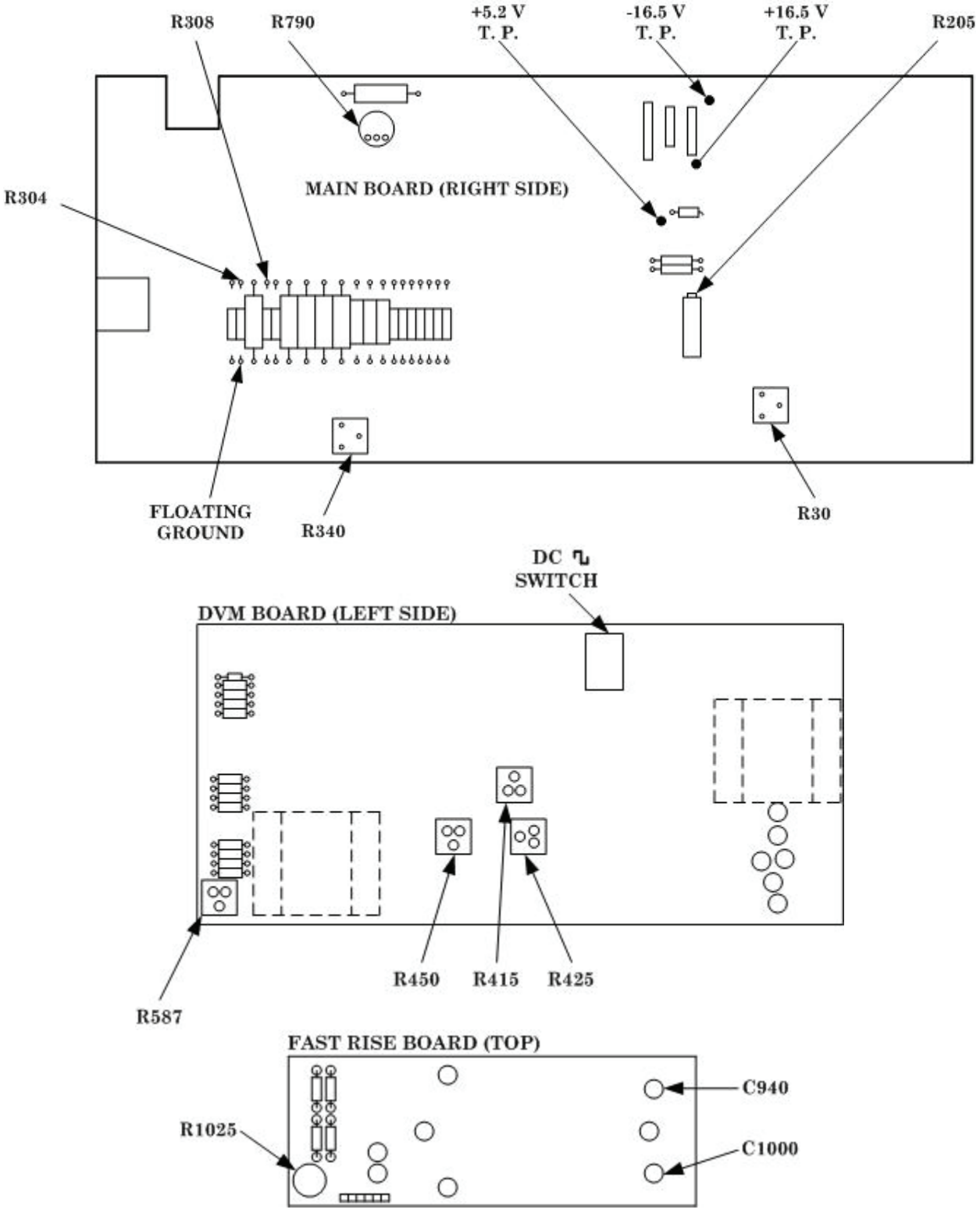

Figure 1. Calibration generator - adjustment locations.

8. Amplitude Output and Regulation

a. Performance Check

(1) Connect resistance standard to TI **AMPL OUTPUT** connector.

(2) Connect multimeter across resistance standard.

(3) Adjust resistance standard to 1 megohm.

(4) Turn **AMPLITUDE** switch to **100**. If multimeter does not indicate between 99.75 and 100.25 V dc, perform **b** (1) below.

(5) Turn **AMPLITUDE** switch to **10**. If multimeter does not indicate between 9.975 and 10.025 V dc, perform **b** (2) below.

(6) Record multimeter indication.

(7) Adjust autotransformer for a 105 V output.

(8) Multimeter indication will remain within ±4 mV of value recorded in (6) above.

(9) Adjust autotransformer for a 125 V output.

(10) Repeat (8) above.

(11) Adjust autotransformer for a 115 V output.

(12) Repeat technique of (5) above at TI **AMPLITUDE** switch positions listed in table 3. Multimeter will indicate within limits specified.

Table 3. Amplitude Output

Test instrument **AMPLITUDE** switch positions (V)	Dc voltmeter indications (V dc)	
	Min	Max
50	49.875	50.125
20	19.95	20.05
5	4.9875	5.0125
2	1.995	2.005
1	0.9975	1.0025
0.5	0.49875	0.50125
0.2	0.1995	0.2005
0.1	0.09975	0.10025

(13) Record multimeter indication on 0.1 volt **AMPLITUDE** switch position.

(14) Deenergize power module and remove TI.

(15) Connect equipment as shown in figure 2.

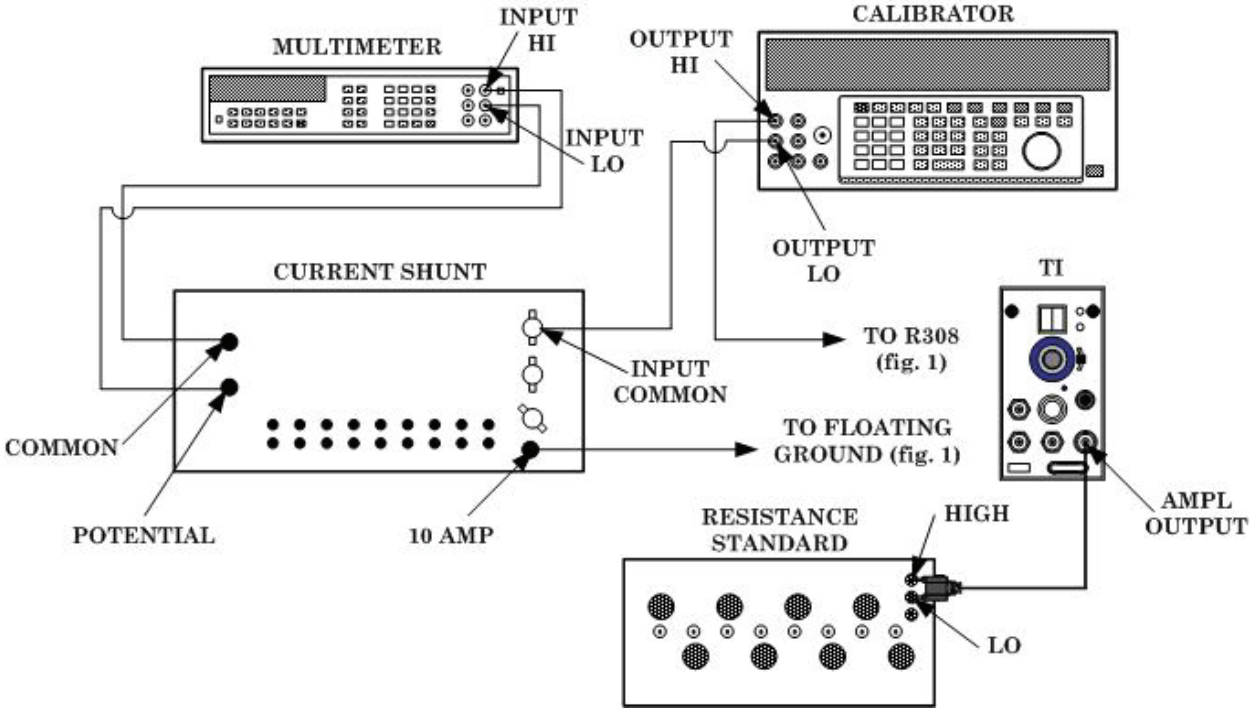

Figure 2. Amplitude output - equipment setup.

(16) Position dc current shunt range plugs to 0.1 ampere.

(17) Adjust resistance standard to 1 MΩ.

(18) Adjust calibrator until multimeter indicates 20 mV.

(19) Disconnect multimeter from dc current shunt and connect it across the resistance standard.

NOTE

Verify the multimeter indication at the common and potential terminals on the dc current shunt (fig. 2) when setting levels in (20) and (24) below and when changing **AMPLITUDE** setting in (21) and (25) below.

(20) Readjust calibrator until multimeter indicates exactly 10 times the value recorded in (13) above.

(21) Turn **AMPLITUDE** switch to **10m**. Multimeter will indicate between 99.75 and 100.25 mV.

(22) Record multimeter indication.

(23) Disconnect lead from R308 and connect to R304 (fig 1).

(24) Adjust calibrator until multimeter indicates exactly 10 times the value recorded in (22) above.

(25) Turn **AMPLITUDE** switch to **1m**. Multimeter will indicate between 99.75 and 100.25 mV.

b. Adjustments

(1) Adjust R205 (fig. 1) until multimeter indicates 100.00 V (R).

(2) Adjust R340 (fig. 1) until multimeter indicates 10.000 V (R).

9. Deflection Error Readout

a. Performance Check

(1) Install TI into power module.

(2) Connect resistance standard to TI **AMPL OUTPUT** connector, using precision cable supplied with TI.

(3) Connect multimeter across resistance standard.

(4) Adjust resistance standard to 1 MΩ.

(5) Energize power module by pulling power button out. Allow 10 minutes for warm-up.

(6) Turn **AMPLITUDE** switch to **100** and release **VARIABLE** (out) control.

(7) Adjust **VARIABLE** (out) control until multimeter indicates 100.00 V. If **DEFLECTION ERROR** does not indicate between 0.1% **LOW** to 0.1% **HIGH**, perform **b** (1) below.

(8) Repeat technique of (7) above at multimeter indications listed in table 4. **DEFLECTION ERROR** will indicate within limits specified.

Table 4. Deflection Error

Multimeter indications (V dc)	Test instrument **DEFLECTION ERROR** indications
108.7	7.9 to 8.1 % LOW
107.3	6.7 to 6.9 % LOW[1]
106.5	6.0 to 6.2 % LOW
105.6	5.2 to 5.4 % LOW
104.6	4.3 to 4.5 % LOW
103.2	3.0 to 3.2 % LOW
96.9	3.1 to 3.3 % HIGH
95.6	4.5 to 4.7 % HIGH
94.7	5.5 to 5.7 % HIGH
93.9	6.4 to 6.6 % HIGH
93.2	7.1 to 7.4 % HIGH[2]
92.6	7.9 to 8.1 % HIGH

[1]Perform **b** (2) if required.
[2]Perform **b** (3) if required.

b. Adjustments

(1) Adjust R450 (fig 1) until **DEFLECTION ERROR** indicates 0.1% **HIGH**, then 0.1% **LOW**, and for a final adjustment of 0.0% with both **HIGH** and **LOW** indicator lights slightly illuminated (R).

(2) Adjust R425 (fig 1) until **DEFLECTION ERROR** indicates 6.8% **LOW**, then final adjustment to center of 6.8% **LOW** (R).

(3) Adjust R415 (fig 1) until **DEFLECTION ERROR** indicates 7.3% **HIGH**, then final adjust to center of 7.3% **HIGH** (R).

10. Period

a. Performance Check

(1) Deenergize power module.

(2) Set TI DC ⊓ SWITCH (internal (fig. 1)) to ⊓ (down) position.

(3) Energize power module.

(4) Turn TI **AMPLITUDE** switch to **10**.

(5) Connect frequency counter to TI **AMPL OUTPUT**. If frequency counter does not indicate between 952.38 and 1052.6 hertz, perform **b** below.

b. Adjustments. Adjust R587 (fig. 1) until frequency counter indicates 1.00 millisecond (R).

11. High Amplitude Output

a. Performance Check

(1) Connect oscilloscope **Vertical 1** input to TI **AMPL OUTPUT**, using 50 Ω feedthrough termination.

(2) Turn **PERIOD** switch to **1 μs** and **PULSE AMPLITUDE** control fully clockwise. Set mode switch to **HIGH AMPL**.

(3) Adjust oscilloscope for a stable display with vertical scale set to 1 V. If oscilloscope does not indicate at least 5 volts peak-to-peak, perform **b** below.

(4) Repeat (3) above for each **PERIOD** switch position.

(5) Remove termination from equipment setup.

(6) Turn **PERIOD** switch to **1 μs**. Oscilloscope display amplitude will be at least 60 volts peak-to-peak.

(7) Turn **PULSE AMPLITUDE** control fully counterclockwise. Oscilloscope display amplitude will be 6 volts or less.

b. Adjustments. Adjust R790 (fig. 1) until oscilloscope display indicates 5.2 peak-to-peak (R).

12. Fast Rise Amplitude

a. Performance Check

(1) Connect TI positive **FAST RISE OUTPUTS** to oscilloscope **Vertical 1** input and TI negative **FAST RISE OUTPUTS** to oscilloscope **Vertical 2** input.

(2) Turn TI mode switch to **FAST RISE**.

(3) Adjust oscilloscope for a stable display, using 1 μs sweep speed, and 50 mV vertical scale settings.

(4) Measure amplitude of the larger signal. If amplitude of larger signal is not 100 millivolts or less peak-to-peak, perform **b** (2) below.

(5) Turn **PULSE AMPLITUDE** control fully clockwise. If amplitude of larger signal is not at least 1 volt peak-to-peak, perform **b** (1) and (2) below.

(6) Turn **PULSE AMPLITUDE** control fully clockwise.

b. Adjustments

(1) Turn **PULSE AMPLITUDE** control fully counterclockwise.

(2) Adjust R1025 (fig. 1) until amplitude of larger signal is 80 millivolts (R).

13. Fast Risetime

a. Performance Check

(1) Connect TI positive **FAST RISE OUTPUTS** to oscilloscope **Vertical 1** input.

(2) Adjust oscilloscope controls and TI **PULSE AMPLITUDE** control as required to obtain a typical waveform as shown in figure 3. The leading edge aberrations during the first 10 nanoseconds will be within 2 percent of the peak-to-peak amplitude or 10 millivolts, whichever is greater. If oscilloscope waveform does not meet requirement, perform **b** below.

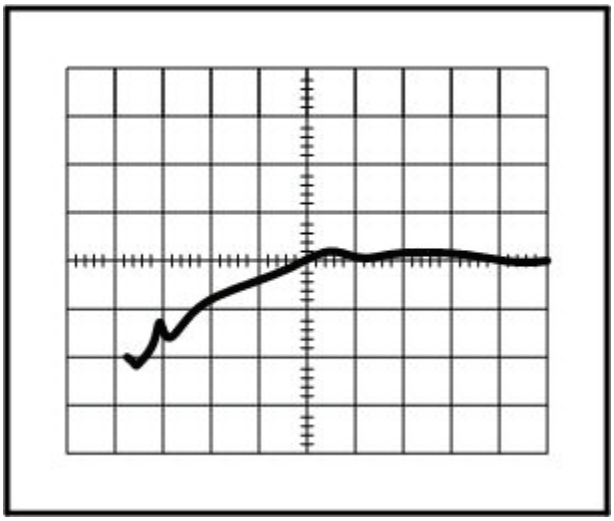

Figure 3. Fast risetime waveform.

(3) Adjust oscilloscope controls and TI **PULSE AMPLITUDE** control as required to obtain a waveform of approximately 1 volt peak-to-peak with a sweep time of 500 picoseconds. Measure risetime. If risetime is greater than 1 nanosecond, perform **b** below.

(4) Repeat (1) through (3) above for TI negative **FAST RISE OUTPUTS**.

b. Adjustments. Adjust C1000 (fig. 1) for best in-tolerance condition when checking positive **FAST RISE OUTPUTS** and C940 (fig. 1) when checking negative **FAST RISE OUTPUTS**.

14. High Amplitude Risetime

a. Performance Check

(1) Connect oscilloscope **Vertical 1** input to TI **AMPL OUTPUT**, using 50 Ω feedthrough termination.

(2) Turn TI **PULSE AMPLITUDE** control fully counterclockwise and set mode switch to **HIGH AMPL**.

(3) Adjust oscilloscope controls and TI **PULSE AMPLITUDE** control as required to obtain a stable waveform. The leading edge aberrations during the first 50 nanoseconds will be within 2 percent of the peak-to-peak amplitude or 50 millivolts, whichever is greater.

(4) Measure risetime. Risetime will be 10 nanoseconds or less.

b. Adjustments. No adjustments can be made.

15. Power Supply

a. Performance Check

NOTE

Do not perform power supply check if all other parameters are within tolerance.

(1) Position TI controls as listed in (a) through (c) below.

(a) Mode switch to **FAST RISE**.
(b) **AMPLITUDE** switch to 10 volts.
(c) DC ⎍ SWITCH (internal (fig. 1)) switch to DC (up) position

(2) Connect multimeter between positive and negative 16.5 volts TEST POINTS (fig. l). If multimeter does not indicate between 31 and 35 V dc, perform **b** below.

b. Adjustments. Adjust R30 (fig. 1) until multimeter indicates 33.00 V dc (R).

16. Final Procedure

a. Deenergize and disconnect all equipment.

b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0802820

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342805, requirements for calibration procedure TB 9-6625-1961-24.

Instructions for Submitting an Electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@redstone.army.mil
To: <2028@redstone.army.mil

Subject: DA Form 2028

1. **From**: Joe Smith
2. Unit: home
3. **Address**: 4300 Park
4. **City**: Hometown
5. **St**: MO
6. **Zip**: 77777
7. **Date Sent**: 19-OCT –93
8. **Pub no:** 55-2840-229-23
9. **Pub Title**: TM
10. **Publication Date**: 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. **Submitter FName**: Joe
14. Submitter MName: T
15. **Submitter LName**: Smith
16. **Submitter Phone**: 123-123-1234
17. **Problem**: 1
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. **Text**

This is the text for the problem below line 27.

PIN: 084627-000