*TB 9-4931-506-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR CALIBRATION FIXTURE, TEKTRONIX TYPE 067-0680-00

Headquarters, Department of the Army, Washington, DC
23 April 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.

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*This bulletin supersedes TB 9-4931-506-50, dated 26 October 1979, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Calibration Fixture, Tektronix Type 067-0680-00. The manufacturer's manual was used as the prime data 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 3 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
VERT or HORIZ STEP RESPONSE:	
Risetime[1]	600 ps or less
Amplitude	At least 6 div of display (300 mV)
Gain accuracy	0.3% with no ±30 V supply error
Frequency response (CW IN)	3 to 100 MHz sine wave input
Repetition rate accuracy	20% of rate selected

[1]Checked to 800 ps.

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 or 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, the actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories listed in table 3 are issued as indicated in paragraph **4** above and are to be used in this calibration procedure. When necessary, these items may be substituted by equivalent items unless specifically prohibited.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
MULTIMETER	Range: -250.75 mV dc to +30 V dc Accuracy: ±0.75%	Hewlett Packard, Model 3458A (3458A)
OSCILLOSCOPE[1]	Must be compatible with TI	Tektronix, Type R5440 (MIS-28706-1)
SAMPLING UNIT[1]	Range: 800 ps or less	Tektronix, Type 5S14N (MIS-28706-5)
TIME BASE UNIT[1]	Range: 0.2 μs to 2 ms	Tektronix Type 5B42 (MIS-288706-4)

[1] Item supplied by customer.

Table 3. Accessories Required

Common name	Description (part number)
CABLE	BNC plug to peltola connector, Tektronix, Type 034-3113-00
EXTENDER	Tektronix, Type 067-0645-03
STEPPER CIRCUIT SWITCH	Tektronix, Type 035-5034-00
TEST EXTENDER	Tektronix, Type 035-0105-00

SECTION III
CALIBRATION PROCESS

6. Preliminary Instructions

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

b. Items of equipment used in this procedure are referenced within the text by common name 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 for this TI.

d. 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. Connect TI to oscilloscope left compartment, using extender and remove TI protective covers.

b. Install time base unit into oscilloscope right compartment.

c. Pull oscilloscope **POWER** switch to on and allow 15 minutes for equipment to warm-up and stabilize.

d. Position TI controls as listed in (1) through (4) below:

(1) **POSITION** control to midrange.

(2) **AMPLITUDE** control to midrange.

(3) **REP RATE 1 kHz** (kilohertz) pushbutton pressed.

(4) **TEST** switch to **VERT OR HORIZ COM MODE**.

e. Position time base controls as listed in (1) through (8) below:

(1) **AUTO TRIG** pushbutton pressed.

(2) **TRIG SOURCE LEFT** pushbutton pressed.

(3) **+SLOPE** pushbutton pressed.

(4) **DISPLAY MODE MAIN SWP** pushbutton pressed.

(5) All other pushbuttons to out position.

(6) **MAIN SEC/DIV** switch to 0.1 ms.

(7) **CAL** control fully cw (clockwise).

(8) All other controls to midrange.

f. Connect multimeter to oscilloscope chassis ground power supply test points listed in table 4. Multimeter will indicate within limits specified. Refer to TB 9-4931-501-24 for location of oscilloscope power supply test points and adjustments.

Table 4. Oscilloscope Test Points

Oscilloscope test points[1]	Digital voltmeter indications (V dc)		Adjustments[1]
	Min	Max	
-30V	-30.00	-30.00	-30V R950
+30V	+30.00	+30.00	+30V R920
+15V	+14.85	+15.15	---
+5V	+4.9	+5.1	---
-15V	-14.85	-15.15	---

[1]Refer to figure 2 in TB 9-4931-501-24.

8. Vertical and Horizontal POSITION Ranges

a. Performance Check

(1) With **TEST** switch set to **VERT OR HORIZ COM MODE**, rotate **POSITION** control throughout its range. Trace on oscilloscope will not move.

(2) Set **TEST** switch to **VERT OR HORIZ GAIN** and rotate **POSITION** control throughout its range. Trace on oscilloscope will move at least 1 division.

(3) Set **TEST** switch to **VERT OR HORIZ STEP RESP +**, **VERT OR HORIZ STEP RESP-**, **VERT OR HORIZ FREQ RESP** and **VERT OR HORIZ STEP AUX IN** positions. At each position, rotate **POSITION** control throughout its range and observe that oscilloscope trace moves at least ±4 divisions.

b. Adjustments. No adjustments can be made.

9. Step Amplitude

a. Performance Check

(1) Set **TEST** switch to **VERT OR HORIZ STEP RESP +** and **AMPLITUDE** control fully cw. Step on oscilloscope display will be at least 8 divisions.

(2) Set **AMPLITUDE** control fully ccw (counterclockwise). Oscilloscope display will not have a step.

b. Adjustments. No adjustments can be made.

10. Pulse Repetition Rate

a. Performance Check

(1) Adjust **AMPLITUDE** control for a 4 division step on oscilloscope.

(2) Press **1 MHz REP RATE** pushbutton and set time base **MAIN SEC/DIV** switch 0.2 μs. Oscilloscope will display 1 cycle between 4 and 6 divisions horizontally.

(3) Repeat technique of (1) and (2) above for **REP RATE** and time base **MAIN SEC/DIV** switch settings as listed in table 5. Oscilloscope will display 1 cycle between 4 and 6 divisions horizontally.

Table 5. Pulse REP RATE

Test instrument **REP RATE** switch settings	Time base **MAIN SEC/DIV** switch settings
100 kHz	2 μs
10 kHz	20 μs
1 kHz	0.2 μs
100 Hz	2 μs

b. Adjustments. No adjustments can be made.

11. Gain Accuracy

a. Performance Check

(1) Set **TEST** switch to **VERT OR HORIZ GAIN** and press **REP RATE 1 kHz** pushbutton.

(2) Set oscilloscope **POWER** switch to off.

(3) Remove U180 (fig. 1) and insert stepper circuit switch in its place.

(4) Connect positive input of multimeter to R345 and negative input to R346 as shown in figure 2.

(5) Pull oscilloscope **POWER** switch to on.

(6) Adjust **POSITION** control to midrange.

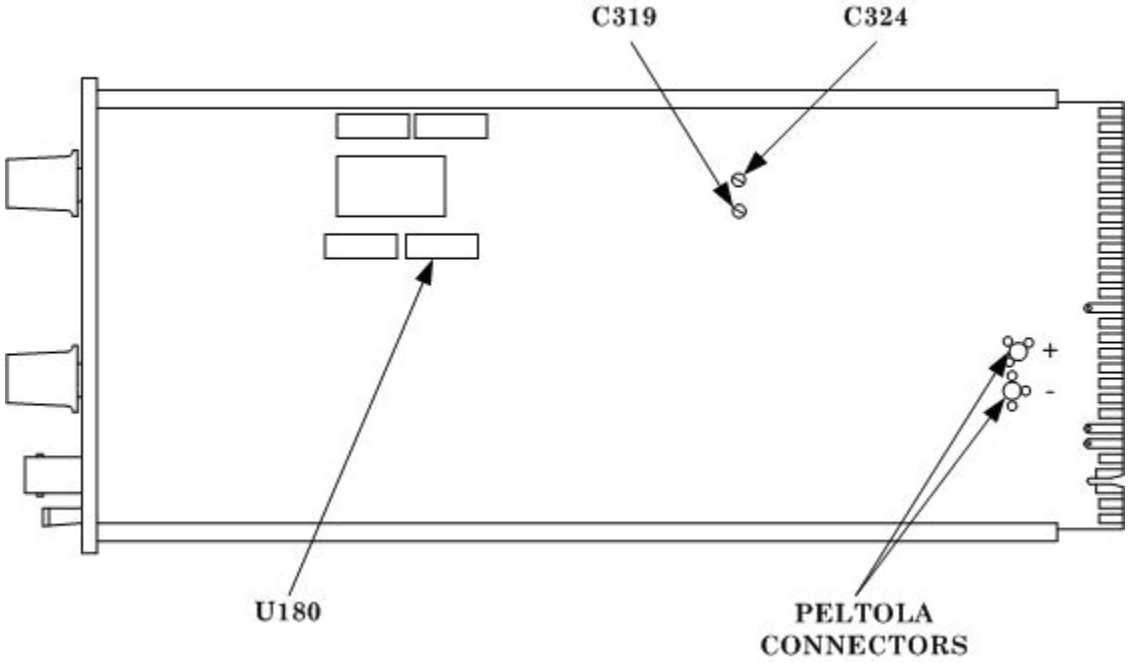

Figure 1. Calibration fixture - right side view.

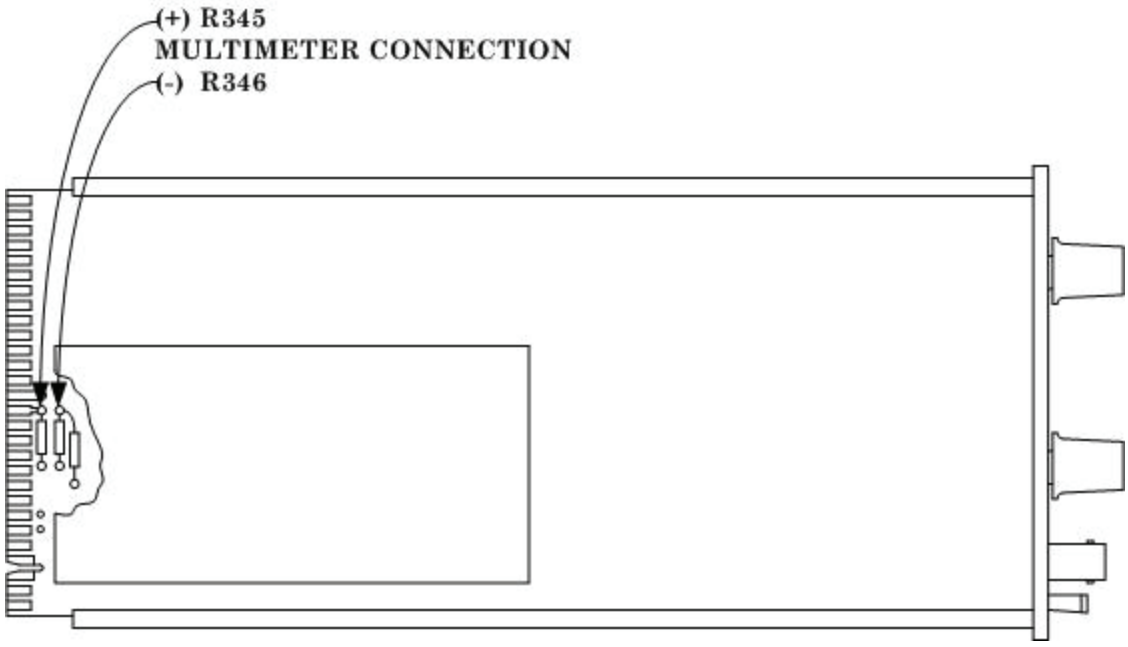

Figure 2. Calibration fixture - left view.

(7) Press and release stepper circuit switch until multimeter indicates approximately 0.00 mV (millivolt) dc. Adjust **POSITION** control until multimeter indicates 0.00 within ±0.05 mV dc.

(8) Press and release stepper circuit switch until TI mV dc ranges listed in table 6 are checked. Multimeter will indicate within specified limits.

Table 6. Gain Accuracy

Test instrument millivolt range	Digital voltmeter indications (mV dc)	
	Min	Max
+50.00	+49.85	+50.15
+100.00	+99.70	+100.30
+150.00	+149.55	+150.45
+200.00	+199.40	+200.60
+250.00	+249.25	+250.75
-50.00	-49.85	-50.15
-100.00	-99.70	-100.30
-150.00	-149.55	-150.45
-200.00	-199.40	-200.60
-250.00	-249.25	-250.75

(9) Set oscilloscope **POWER** switch to off.

(10) Remove stepper circuit switch and reinstall U180 (fig. 1).

b. Adjustments. No adjustments can be made.

12. Step Response Aberrations and Rise-time

a. Performance Check

(1) Remove extender and install test extender between TI and oscilloscope left compartment.

(2) Remove time base unit and install sampling unit in oscilloscope center and right compartments. Pull oscilloscope **POWER** switch to on.

(3) Position TI controls as listed in (a) through (c) below:

(a) **TEST** switch to **VERT OR HORIZ + STEP RESP**.

(b) **1 MHz REP RATE** pushbutton pressed.

(c) **POSITION** control to midrange.

(4) Connect **TRIG OUT** to sampling unit **EXT INPUT**.

(5) Connect sampling unit **CH1** input to + PELTOLA CONNECTOR (fig. 1).

(6) Position sampling unit controls as listed in (a) through (j) below:

(a) **CH1 VOLTS/DIV** switch to 50 mV.

(b) **DELAYING SWP** and **DELAYED SWP SEC/DIV** switches to 0.2 μs.

(c) All **CAL** controls fully ccw.

(d) **DELAY ZERO** (1st DOT) control fully ccw.

(e) **DELAY TIME MULTI** (2d DOT) dial to 0.00.

(f) **CH1** pushbutton pressed.

(g) **AUTO TRIG** pushbutton pressed.

(h) **+ SLOPE** pushbutton pressed.

(i) **REP** pushbutton pressed.

(j) All other pushbuttons out.

(7) Adjust sampling unit **TRIGGERING LEVEL** and **HOLD OFF** controls for a stable display on oscilloscope.

(8) Adjust sampling unit **DELAYED SWP SEC/DIV** switch and **CH1 VOLTS/DIV CAL** control for a convenient display. Adjust **DELAY TIME MULTI** (2nd DOT) and **DC OFFSET ±2 V** controls for a centered display on oscilloscope. If display has more than 0.2 division p-p (peak-to-peak) aberrations or rise time is greater than 800 ps (picoseconds), perform **b** (1) below.

(9) Move cable from + to - PELTOLA CONNECTOR (fig. 1).

(10) Repeat techniques of (7) and (8) above. If display has more than 0.2 division p-p aberrations or fall-time is greater than 800 ps, perform **b** (2) below.

b. Adjustments

NOTE

If sampling unit is not normally used with or has not been calibrated with oscilloscope, perform paragraph 19 (rise time check) in TB 9-4931-504-24 and repeat **12 a** above before performing the following adjustments.

(1) Adjust C324 (fig. 1) until aberrations are less than 0.2 division p-p and rise time is less than 800 ps (R).

(2) Adjust C319 (fig. 1) until aberrations are less than 0.2 division p-p and fall time is less than 800 ps (R).

13. Final Procedure

a. Deenergize and disconnect all equipment and reinstall protective covers on TI if necessary.

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

By Order of the Secretary of the Army:

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0806004

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342069 requirements for calibration procedure TB 9-4931-506-24.

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.