

***TB 9-6625-2240-35**

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR OSCILLOSCOPE

OS261U (TEKTRONIX, TYPE 475), OS261A(V)1U (TEKTRONIX, TYPE 475 OPTION 7), OS261B(V)1U (TEKTRONIX, TYPE 475 OPTION 4), OS261C(V)1U (TEKTRONIX, TYPE 475 OPTION 4/7), AND TEKTRONIX, TYPE 475A (TEKTRONIX, TYPE R475A)

Headquarters, Department of the Army, Washington, DC
20 August 2001

Approved for public release; distribution is unlimited.

REPORTING OF ERRORS AND SUGGESTED IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedure, please let us know. Mail your letter or DA Form 2028 to: Commander, U. S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5230. 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 FAX 256-842-6546/DSN 788-6546

		Paragraph	Page
SECTION	I. IDENTIFICATION AND DESCRIPTION		
	Test instrument identification	1	2
	Forms, records, and reports	2	2
	Calibration description	3	2
	II. EQUIPMENT REQUIREMENTS		
	Equipment required	4	3
	Accessories required	5	3
	III. CALIBRATION PROCESS		
	Preliminary instructions	6	4
	Equipment Setup	7	4
	Vertical deflection.....	8	5
	Main sweep timing	9	8
	Delay time and differential time measurement ..	10	12
	Risetime and bandwidth.....	11	15
	Calibrator.....	12	20
	Power Supply	13	22
	Final procedure	14	23

*This bulletin supersedes TB 9-6625-2240-35, dated 7 November 1990.

SECTION I IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Oscilloscope, OS261U (Tektronix, Type 475), OS261A(V)1U (Tektronix, Type 475 Option 7), OS261B(V)1U (Tektronix, Type 475 Option 4), OS261C(V)1U (Tektronix, Type 475 Option 4/7) and Tektronix, Type 475A (Tektronix, Type R475A). The manufacturer's manuals were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. Model variations are identified in the text.

b. Time and Technique. The time required for this calibration is approximately 4 hours, using the dc and low 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 determined (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
Vertical deflection	Range: 2 mV/div to 5 V/div in 11 steps (5 mV/div to 10 V/div for Tektronix, Type 475A) Accuracy: $\pm 3\%$ with gain set at 5 mV/div
Time and linearity A sweep or B DLY'D sweep	Range: Unmag: 0.5 s/div to 0.01 μ s/div in 24 steps Mag: 0.5 s/div to 1 ns/div in 24 steps Accuracy: 5 ms/div to 0.01 μ s/div Unmag: $\pm 1\%$ Mag: $\pm 2\%$ 0.5 s/div to 10 ms/div Unmag: $\pm 2\%$ Mag: $\pm 3\%$
A delaying sweep (A intensified sweep)	Range: 0.5 s/div to 0.05 μ s/div in 22 steps Accuracy: Unmag: $\pm 2\%$ Mag: $\pm 3\%$

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Delay time and differential time measurement	Range: 5 s to 0.05 μ s after start of delaying A sweep Accuracy: ± 0.01 major dial divisions between dial settings of one major division or less $\pm 1\%$ between dial settings of more than 1 major dial division, increasing to $\pm 0.5\%$ over entire range
Risetime	Range: 1.75 ns with aberrations not to exceed +4% or -4%, and total p-p of 4% (1.4 ns for Tektronix, Type 475A)
Bandwidth	Dc to 200 MHz (Dc to 250 MHz for Tektronix, Type 475A)
Calibrator	Range: 300 mV, $\pm 1\%$

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 Set AN/GSM-286. 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.

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 accessory is also required for this calibration: 5-80 pF standardizer.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
OSCILLOSCOPE CALIBRATOR	Voltage output: Range: 12 mV to 60 V Frequency: 1 kHz Accuracy: $\pm 0.75\%$ Time markers: Range: 1 ns to 0.5 s Accuracy: $\pm 0.25\%$, .01 μ s to 5 ms $\pm 0.5\%$, 10 ms to 0.5 s Risetime: 437.5 ps Aberrations: $\pm 1\%$ Level sine wave: Reference frequency: 50 kHz Amplitude: 30 mV Capacity: >200 MHz	John Fluke, Model 5820A, (5820A-5C-GHZ), MIS-38938
DIGITAL MULTIMETER	Voltage input: Range: -15.23 to +113 V dc Accuracy: $\pm 0.375\%$	John Fluke, Model 8840A/AF-05/09, (AN/GSM-64D)

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 the 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 this 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. When indications specified in paragraphs **8** through **12** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **12**. 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. Remove TI protective cover as required for adjustment.

b. Position **CH1** and **CH2** controls as listed in (1) through (7) below:

(1) **FOCUS**, vertical **POSITION**, and **SCALE ILLUM** controls to midrange.

(2) **VOLTS/DIV** switches to **5 m** (**10 m** for Tektronix, Type 475A) and **VAR** controls fully cw (detent).

(3) **VERT MODE CH1** pushbutton pressed (in).

(4) **AC-GND-DC** switches to **GND**.

(5) **INTENSITY** control fully ccw.

(6) **INVERT** pushbutton out.