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***TB 9-6625-149-50**

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR OSCILLOSCOPE, TEKTRONIX TYPE 541A (AN/USM-164) AND CURRENT PROBE AMPLIFIER, TEKTRONIX TYPES 131-1 THROUGH -4, WITH CURRENT PROBE, TEKTRONIX TYPE P6016

Headquarters, Department of the Army, Washington, DC
4 April 1974

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*This bulletin supersedes TB 9-6625-149-50, 12 November 1969.

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SECTION I IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Oscilloscope, Tektronix Type 541A, (AN/USM-164) Current Probe Amplifier, Tektronix Types 131-1 through -4, with Current Probe, Tektronix Type P6016. The manufacturer's instruction 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. AN/USM-164 is the same as Tektronix Type 541A.

b. Time and Technique. The time required for this calibration is approximately 2 hours, using the dc and low frequency technique.

2. Calibration Data Card, DA Form 2416

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TM 38-750. DA Form 2416 must be annotated in accordance with TM 38-750 for each calibration performed.

b. Adjustments to be reported on DA Form 2416 are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) will follow 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.
Oscilloscope, Tektronix Type 541A (AN/USM - 164)	
Power input requirements	117 or 234 vac $\pm$ 10%, 50 to 60 Hz
Sweep rates	.1 μ sec/cm to 5 sec/cm in 24 calibrated steps
Accuracy	$\pm$ 3%
Sweep magnification	Increases the sweep amplifier gain 5 times
Accuracy	$\pm$ 5%
Triggering facilities	Provides for manual control, preset stability control, and fully automatic triggering.
Horizontal deflection system: Deflection factor	Continuously variable from approximately .2 v/cm to 15 v/cm. Dc to 240 kHz or better
Frequency response	
Amplitude calibrator: Output voltages Accuracy	0.2 mv to 100 v p-p in 18 steps $\pm$ 3%
Current Probe Amplifier, Tektronix Types 131-1 through -4 with Current Probe, Tektronix Type P6016	
Power requirements	115 vac $\pm$ 10 v, 50 to 60 Hz, 1 w
Sensitivity	1 ma/div to 1 amp/div in 10 calibrated steps
Accuracy	$\pm$ 3%
Low Frequency Response	50 Hz at 3 db down
Rise time	20 nsec
Maximum current rating	15 amps p-p

SECTION II EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment used in this calibration procedure. This equipment is issued with secondary transfer calibration standards set 4931-621-7877 and is to be used in performing this procedure. Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available. 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 accuracy 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 with secondary transfer calibration standards set 4931-621-7877 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 Required

Item	Common name	Minimum use specifications.	Manufacturer, model, and part number.
A1	AC CALIBRATOR	Range: 34.29 to 36.41 v rms Accuracy: $\pm .75\%$	Hewlett-Packard, Model 745A (MIS-10342).
A2	AC/DC VOLTMETER	Range: 0.097 to 515 vdc and 34.29 to 36.41 vac. Accuracy: $\pm .75\%$	Dana, Model 5703-S-2127 (7912606).
A3	AUTOTRANSFORMER	Range: 105 to 125 vac Accuracy: $\pm 1\%$	General Radio, Model W10MT3AS3 (7910809)
A4	CALIBRATION ADAPTER	Rise Time: 3 nsec or less	Tektronix, Type TU-7 (7912279).
A5	DC VOLTMETER	Range: -1310 to -1390 vdc Accuracy: $\pm .75\%$	EIS, Model ESV (MIS-10276).
A6	DECADE RESISTOR	Range: 24.5 kilohms	Biddle-Gray, Model 601147-1 (7910328).
A7	OSCILLOSCOPE ¹	Must be compatible with current probe.	Tektronix, Type 540 series
A8	PLUG-IN ²	Range: 0.05 v/cm p-p Rise time: 12 nsec or less	Tektronix, Type K or equivalent
A9	SQUARE WAVE GENERATOR.	Range: 500 kHz Rise time 12 nsec or less	Tektronix, Type 106 (MIS-10284)
A10	TIME-MARK GENERATOR.	Range: 5 sec to 20 nsec Accuracy: $\pm .75\%$	Tektronix, Type 184 (7910242-1).

¹Additional equipment required; available at site of TI and should be items normally used with TI.

²Additional equipment required.

Table 3. Accessories Required

Item	Common name	Description and part number
B1	ADAPTER ¹	Single banana jack to alligator clip (7907560)
B2	ADAPTER	UHF jack to BNC plug (8109698)
B3	ADAPTER	BNC plug to double banana jack (7909401)
B4	CABLE ²	36-in., RG-58()/U; BNC plug and double banana plug terminations (7907471).
B5	CABLE	30-in., RG-58()/U; BNC plug terminations (7907467)
B6	LEAD ¹	12-in., single banana plug terminations (7907496)

¹Two required.²Three required.

SECTION III PRELIMINARY OPERATIONS FOR OSCILLOSCOPE, TEKTRONIX TYPE 541A

6. Preliminary Instructions

a. The instructions outlined in this section are preparatory to the calibration process. Personnel should become familiar with sections I through IV of this 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 tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

WARNING

HIGH VOLTAGE is used during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions.

7. Equipment Setup

- a.** Remove protective covers of TI.
- b.** Insert calibration adapter (A4) into TI.
- c.** Connect TI to autotransformer (A3).
- d.** Connect autotransformer to 115-volt ac source and adjust controls for 115 volts ac.
- e.** Energize TI and allow sufficient time for equipment to warm up and stabilize.
- f.** Position TI controls as listed in (1) through (11) below:
 - (1) **HORIZONTAL DISPLAY** switch to **NORM**.
 - (2) **SCALE ILLUM** control as desired.