

# TB 9-6625-2347-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

## CALIBRATION PROCEDURE FOR OSCILLOSCOPE TEKTRONIX, MODEL 2213

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## SECTION I IDENTIFICATION AND DESCRIPTION

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Oscilloscope Tektronix, Models 2213. The manufacturers' 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.** Variations among models are listed in text.

**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                                                                                                         |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Vertical<br>Deflection     | Range: 2 mV/div to 10 V/div<br>Accuracy: $\pm 3\%$                                                                                 |
| Bandwidth                  | Range: 2 mV/div to 10 mV/div<br>Accuracy: Dc to at least 50 MHz<br>Range: 20 mV/div to 10 V/div<br>Accuracy: Dc to at least 60 MHz |

Table 1. Calibration Description - Continued

| Test instrument parameters | Performance specifications                                                                                                    |              |                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------|
| Horizontal                 |                                                                                                                               |              |                 |
| A sweep timing             | Range: 0.5 s/div to 0.05 $\mu$ s/div<br>Accuracy: $\pm 3\%$<br>Range: (X10 mag): 50 ms/div to 5 ns/div<br>Accuracy: $\pm 5\%$ |              |                 |
| Sweep linearity            | Accuracy: $\pm 3\%$ (measured over any 2 of the center 8 divisions)                                                           |              |                 |
| Deflection (X-Axis)        | Range: 2 mV/div to 10 V/div<br>Accuracy: $\pm 5\%$                                                                            |              |                 |
| A trigger sensitivity      | Frequency                                                                                                                     | $\leq 2$ MHz | 2 MHz to 60 MHz |
|                            | Internal                                                                                                                      | 0.4 div      | 1.5 div         |
|                            | External                                                                                                                      | 50 mV        | 250 mV          |
| Probe adjust               | Range: 0.5 V p-p<br>Accuracy: $\pm 20\%$                                                                                      |              |                 |

## 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, 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 four-to-one 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 accessory is also required for this calibration: standardizer, 5-80 pF.

Table 2. Minimum Specifications of Equipment Required

| Common name             | Minimum use specifications                                                                                                                                                               | Manufacturer and model (part number)                 |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| DIGITAL MULTIMETER      | Range: -8.64 to < 0.1 V dc<br>Accuracy: $\pm 0.25\%$                                                                                                                                     | John Fluke, Model 8840A/AF-05/09<br>(AN/GSM-64D)     |
| OSCILLOSCOPE CALIBRATOR | Volts out:<br>Range: 10 mV to 50 V<br>Accuracy: $\pm 0.75\%$<br>Time markers:<br>Range: 5 ns/D to 0.5 s/D<br>Accuracy: $\pm 0.75\%$<br>Sine wave frequency:<br>Range: 50 kHz to >100 MHz | John Fluke, Model 5820A, MIS-38938<br>(5820A-5C-GHZ) |

### **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 the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturers' manuals for this TI.

**d.** When indications specified in paragraphs **8** through **11** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **11**. Do not perform power supply check if all other parameters are within tolerance.

**e.** Unless otherwise specified, all controls and control settings refer to 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 protective cover from TI only when necessary to make adjustments. Replace cover after completing the adjustments.

**b.** Connect TI to a 115 V ac source.

**c.** Position TI controls as listed in (1) through (15) below:

- (1) **AUTO INTENSITY** fully ccw.
- (2) **CH 1** and **CH 2**  $\updownarrow$  **POSITION** to midrange.
- (3)  $\Leftarrow$ **POSITION** $\Rightarrow$  to midrange.
- (4) **VERTICAL MODE CH 1 BOTH CH 2** to **CH1**.
- (5) **CH1** and **CH2 VOLTS/DIV** variable fully cw to detent.
- (6) **CH2 INVERT** pushbutton to out position.
- (7) **CH1** and **CH2 AC GND DC** switches to **DC**.
- (8) **HORIZONTAL MODE** switch to **NO DLY**.