*TB 9-6625-080-50

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR ELECTRONIC COUNTER HEWLETT-PACKARD, MODELS 5232A (CP-798/G) AND 5532A

Headquarters, Department of the Army, Washington, DC
3 September 1969

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*This bulletin supersedes TB 9-6625-080-50, 20 December 1966.

SECTION I
GENERAL

1. Purpose and Scope. This bulletin provides information for the periodic calibration of electronic counter, Hewlett-Packard Models 5232A (CP-798/G) and 5532A. It is to be used by personnel trained and qualified in the use of calibration equipment.

2. Descriptive Data

a. Identification

Nomenclature	ELECTRONIC COUNTER
Military designation	CP-798/G (Model 5232A)
Manufacturer	Hewlett-Packard
Model numbers	5232A and 5532A
Reference	Manufacturer's instrumentation manual.

b. Specifications

Power input requirements	115 or 230 v ±10%, 50 to 60 Hz, 40 w.
Frequency measurement:	
Sensitivity	0.1 v rms sine wave
Range	2 Hz to 1.2 MHz
Accuracy	±1 count, ± time base accuracy
Gate time	0.01,0.1, and 10 sec
Period measurement:	
Sensitivity[1]	0.1 v rms sine wave
Range	2 Hz to 10 kHz in 1 period, 2 Hz to 1.2 MHz in 100-period average and above.
Accuracy[2]	±1 count, ± time base accuracy, ± trigger error/period averaged.
Time base:	
Output frequency	1 MHz
Amplitude[1]	Greater than 3 v pp into 1000 ohms.
Stability	2 parts in 10^7 /month
External input	1 v rms into 500 ohms, 100 Hz to 1.2 MHz.
Ratio and multiple ratio:	
Range[1]	f_1: 100 Hz to 1.2 MHz at 1 v rms into 500 ohms f_2: 2 Hz to 1.2 MHz
Reads	(f_1/ f_2) x period multiplier
Accuracy[2]	±1 count of f_1, ± trigger error of f_2/period multiplier.

c. Calibration

Time required	2 hr (approx.)
Technique	Dc and low frequency

[1]This specification is for information only and is not necessarily verified in this procedure.
[2]Trigger error for 0.1 v rms sine wave input is 0.3% for signal with 40-db signal-to-noise ratio. Trigger error decreases with increased signal amplitude and slope.

3. General Instructions

a. DA Form 2416 (Calibration Data Card). During the use of this bulletin, annotate DA Form 2416 in accordance with TM 38-750 for only those parameters which have an annotation note in the performance checks.

b. Unit Under Test. Electronic counter, Hewlett-Packard Models 5232A (CP-798/G) and 5532A, will be referred to as the UUT (unit under test) throughout this bulletin.

c. Equipment and Accessory Identification. The equipment and accessories referred to throughout this bulletin are identified in tables 1 and 2 and section III.

d. Equipment Setup. Disconnect instructions are not contained in this bulletin.

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

4. Differences Among Models. Model 5232A CP-798/G displays measurements on six-place neon column readouts. Model 5532A displays measurements on six-place in-line Nixie readouts.

SECTION II
CALIBRATION

5. Equipment and Accessories Required. Table 1 lists minimum use specifications of equipment required for calibration performance checks and adjustments. Table 2 lists required accessories. Tables 1 and 2 are provided to assist in the selection of required equipment and accessories. For specific item identification, refer to section III.

Table 1. Minimum Specifications of Equipment Required

Item number	Common name	Minimum use specifications
A1	TEST OSCILLATOR	RANGE: 10 Hz to 1.2 MHz
A2	DC VOLTMETER	RANGE: 0 to 160 vdc ACCURACY: ±0.8%
A3	RECEIVER	RANGE: 1 MHz ACCURACY: 1 part in 10^{-7}
A4	AUTOTRANSFORMER	RANGE: 105 to 125 vac ACCURACY: ±1%
A5	AC VOLTMETER	RANGE: 0 to 1 v rms ACCURACY: ±2%

Table 2. Accessories Required

Item number	Common name	Description
B1	ADAPTER	600-ohm double banana jack to 50-ohm BNC jack
B2	ADAPTER	BNC jack to UHF plug
B3	ADAPTER	BNC T type; 2 jacks, 1 plug
B4	CABLE	30-in., RG-58()/U; BNC plug terminations

6. Preliminary Procedure

NOTE

Personnel should familiarize themselves with the entire bulletin prior to performing calibration.

a. Remove top and bottom cover from UUT. Use extender board (supplied with UUT) as necessary in making adjustments.

b. Connect UUT to autotransformer (A4, table 1).

c. Connect autotransformer to 115-volt ac source and adjust controls of autotransformer for 115 volts ac.

d. Position UUT controls as listed in (1) through (5) below:

(1) STD switch (rear panel) to INT.

(2) STORAGE switch (rear panel) to STORAGE.

(3) Power switch to ON.

(4) DISPLAY control fully counterclockwise.

(5) SENSITIVITY switch to .1.

e. Allow 1 hour for equipment to warm up and stabilize.

NOTE

When the UUT is not within tolerance, perform the specified adjustment and continue the performance check. When the UUT is not within tolerance and no adjustment is specified, the deficiency must be corrected before continuing with the procedure.

WARNING

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

7. Oscillator Frequency and Stability

a. Performance Check

(1) Connect UUT STD connector (rear panel) to receiver (A3, table 1), using cable (B4, table 2).

(2) Observe indication on receiver crt for partial circle rotation of one revolution per second or less. If not, adjust OSC FREQ C3 (C10 on some models) (fig. 1) for least rotation of partial circle.

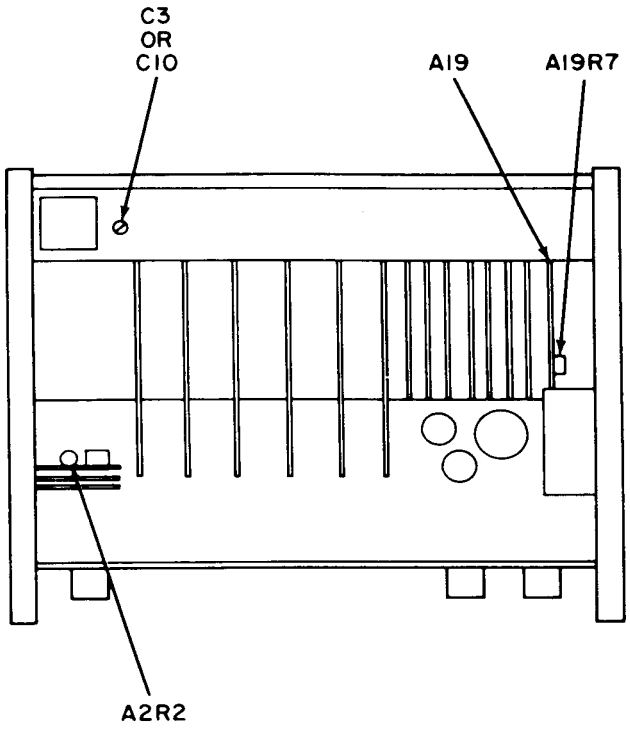

Figure 1. Electronic counter - top view

(3) Vary autotransformer between 105 and 125 volts. Indication as observed on receiver crt will remain as specified in (2) above.

(4) Adjust autotransformer for 115 volts.

NOTE

If an out-of-tolerance condition was observed during the preceding performance check, annotate DA Form 2416 in accordance with TM 38-750.

b. Adjustments. No further adjustments can be made.

8. Self-Check

a. Performance Check

(1) Turn UUT sensitivity switch to CHECK and function switch to PERIOD 10. UUT will indicate 00.0010.

(2) Repeat (1) above, using function switch settings listed in table 3. UUT will indicate as specified.

Table 3. Self-Check

Unit under test function switch position	Unit under test indication (±1 count)
PERIOD 100	0.00100
PERIOD 1K	001.000
PERIOD 10K	01.0000
PERIOD 100K	1.00000
FREQUENCY .01	00100.0
FREQUENCY .1	0100.00
FREQUENCY 1	100.000
FREQUENCY 10	00.0000

(3) Turn UUT function switch to MANUAL START. UUT will indicate continuous 10-Hz counting.

(4) Turn function switch to MANUAL STOP. UUT will indicate continuous display of last count.

NOTE

If an out-of-tolerance condition was observed during the preceding performance check, annotate DA Form 2416 in accordance with TM 38-750.

b. Adjustments. No adjustments can be made.

9. Input Sensitivity

a. Performance Check

(1) Connect equipment as shown in figure 2.

(2) Turn UUT SENSITIVITY switch to .1 and function switch to FREQUENCY 1.

(3) Adjust test oscillator (A1, table 1) for 1 MHz output.

(4) Adjust test oscillator output level to 0.1 volt as indicated by ac voltmeter (A5, table 1) UUT will display stable count. If not, perform **b**(2) below.

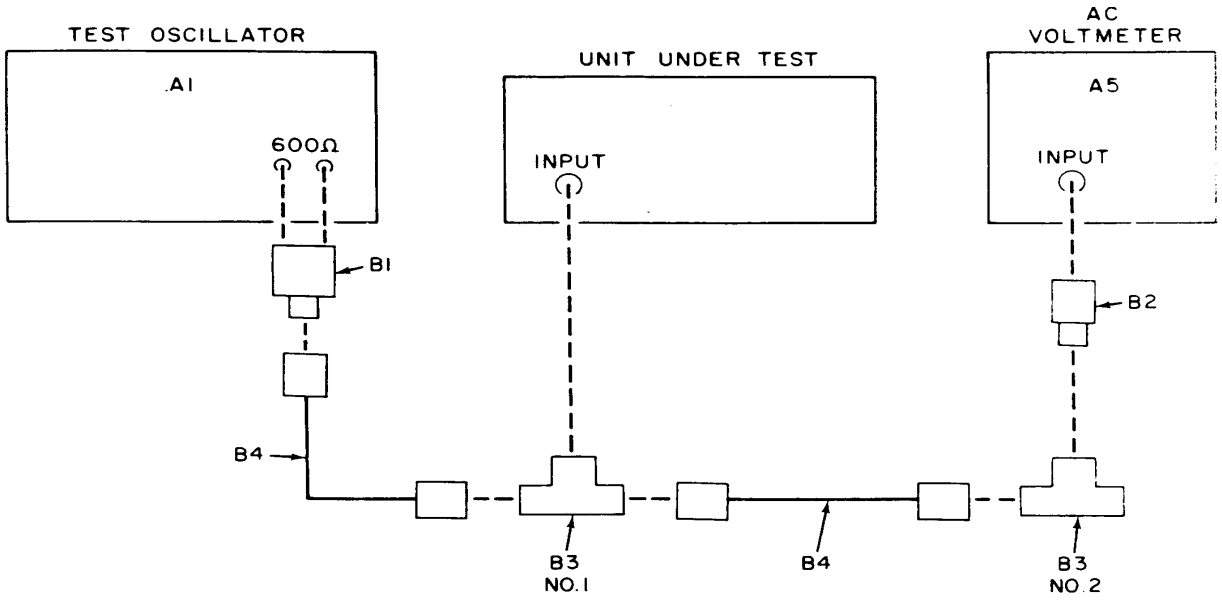

Figure 2. Input sensitivity - equipment setup.

(5) Slowly decrease test oscillator amplitude control until UUT stops counting or count display becomes unstable.

(6) Slowly increase test oscillator output level until UUT again displays a stable count. Ac voltmeter will indicate 0.1 volt or less.

(7) Repeat (3) through (6) above, using test oscillator frequencies 1.2 MHz, 500 kHz, 100 kHz, 10 kHz, 100 Hz and 10 Hz.

NOTE

If an out-of-tolerance condition was observed during the preceding performance check, annotate DA Form 2416 in accordance with TM 38-750.

b. Adjustments

(1) Repeat **a**(2) through (4) above.

(2) Adjust A2R2 (fig. 1) fully clockwise and then slowly counterclockwise until UUT displays three or more stable counts.

10. Time Base External Input

a. Performance Check

(1) Connect UUT STD connector (rear panel) to adapter (B3, table 2) (No. 2, fig. 2) using cable (B4).

(2) Turn UUT function switch to PERIOD 10K and set STD switch to EXT.

(3) Adjust test oscillator (A1, table 1) output to 1 volt as indicated by ac voltmeter (A5).

(4) Vary test oscillator output frequency between 100 Hz and 1.2 MHz while maintaining 1-volt indication on ac voltmeter. UUT will indicate 10000 through range of 100 Hz to 1.3 MHz.

NOTE

If an out-of-tolerance condition was observed during the preceding performance check, annotate DA Form 2416 in accordance with TM 38-750.

b. Adjustments. No adjustments can be made.

11. Power Supply

a. Performance Check

NOTE

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

(1) Connect dc voltmeter (A2, table 1) leads between pin 15 of A19 (fig. 1) and chassis ground. Dc voltmeter will indicate between -34 and -36 volts. If not, perform **b** below.

(2) Repeat (1) above, using connections listed in table 4. Dc voltmeter will indicate within limits specified. If not, perform **b** below.

Table 4. Power Supply Check

Unit under test A19 module pin number	Dc voltmeter indication (Volts dc)	
	Min	Max
14	+140	+160
13	-2	-3
12	-25.5	-27.5
3	-140	-160

NOTE

If an out-of-tolerance condition was observed during the preceding performance check, annotate DA Form 2416 in accordance with TM 38-750.

b. Adjustments. Repeat **a**(1) above and adjust A19R7 (fig. 1) until dc voltmeter indicates -35 volts.

12. Final Procedure

a. Deenergize and disconnect all equipment and reinstall protective cover of UUT.

NOTE

If no out-of-tolerance condition was observed during the preceding performance checks, annotate DA Form 2416 in accordance with TM 38-750.

b. In accordance with TM 38-750, annotate and affix DA Label 80 (U.S. Army Calibration System). When the UUT cannot be adjusted within tolerance, annotate and affix DA Form 2417 (Unserviceable Test Instrument or Standard) (red tag).

SECTION III
SPECIFIC ITEM IDENTIFICATION

13. Identification. This section identifies specific equipment and accessories as issued with specific calibration standards sets or specific maintenance equipment groups.

14. Secondary Transfer Calibration Standards Set

a. Equipment Identification. Table 5 lists the equipment issued with secondary transfer calibration standards set 4931-621-7877 which meets the minimum use specifications shown in table 1. When any equipment listed in table 5 is not available, equivalent items may be substituted provided they meet the minimum use specifications listed in table 1.

Table 5. Equipment Identification

Item number	Nomenclature	Identifying number	Manufacturer and model number
A1	GENERATOR, SIGNAL	7659913	Hewlett-Packard, Model 650AR
A2	RATIOMETER, DIGITAL	7910588-3	Cimron, Models 7500A-162 and 6710A-163
A3	STANDARD FREQUENCY COMPARATOR	8616320	Lavoie, Model 800D
A4	TRANSFORMER, VARIABLE POWER	7910809	General Radio, Model W10MT3A
A5	VOLTMETER	7910329-2	John Fluke, Model 9l0A

b. Accessory Identification. Table 6 lists the accessories issued with secondary transfer calibration standards-set 4931-621-7877 which meet the descriptions in table 2. These accessories may be substituted unless specifically prohibited.

Table 6. Accessory Identification

Item Number	Nomenclature	Identifying Number	Description
B1	ADAPTER	7912056-1	600-ohm double banana jack to 50-ohm BNC jack.
B2	ADAPTER	105194.39	BNC jack to UHF plug
B3	ADAPTER, CONNECTOR[1]	MS 35173-274B & C	BNC T type; 2 jacks, 1 plug
B4	CABLE ASSEMBLY,[2] RADIO FREQUENCY	7907467	30-in., RG-58()/U; BNC plug terminations

[1]Two required.

[2]Three required.

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