*TB 9-6625-2071-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DIGITAL ELECTRONIC COUNTER, AN/USM-459 (TS-3662/U) AND UNIVERSAL COUNTER, HEWLETT-PACKARD, MODELS 5328A( ), 5328AF096 AND 5328A041-H69

Headquarters, Department of the Army, Washington, DC
16 October 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.

*This bulletin supersedes TB 9-6625-2071-35 dated 27 October 2004, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Digital Electronic Counter, AN/USM-459 (TS-3662/U) and Universal Counter, Hewlett-Packard, Models 5328A( ) 5328AF096 and 5328A041-H69. TM 11-6625-2941-14&P and 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

(1) Model 5328A may have the following options:

010	Oven Controlled Crystal Oscillator
011	IEEE-488 Interface
021	High Performance DVM
030	Channel C Frequency Measurement to 512 MHz
041	Programmable A and B Inputs
H60	Rear A and B Inputs

(2) Models 5328AF096, 5328A/H99, and 5328AMOD are equivalent to model 5328A w/options 010, 011, 030, and 041.

(3) Models 5328AF096, 5328A/H99, and 5328AMOD are alike for calibration purposes.

b. Time and Technique. The time required for this calibration is approximately 2 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
Time base stability: Option 010, AN/USM-459, and 5328AF096	Frequency: 10 MHz Aging rate (after 24 hr warm-up): $<5 \times 10^{-10}$/24 hours Line voltage stability (for 10% variation): $<\pm 5 \times 10^{-9}$

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Channel A and B sensitivity: AN/USM-459 and 5328AF096	25 mVrms: Dc to 40 MHz (dc coupled) 20 Hz to 40 MHz (ac coupled) 50 mVrms: 40 to 100 MHz 15 mVrms: Dc to 35 MHz (dc coupled) 20 Hz to 35 MHz (ac coupled) 50 mVrms: 35 to 100 MHz
Channel C sensitivity: Option 030 AN/USM-459 and 5328AF096	 15 mVrms: 5 to 512 MHz 15 mVrms: 30 to 500 MHz
Digital voltmeter: Option 021	Range: 10, 100, 1000 V dc and auto ranging Accuracy: 10, 100 V ranges: ±0.03% of reading ±0.004% of range 1000 V range: ±0.087% of reading ±0.004% of range
Remote trigger levels: Option 010, AN/USM-459, and 5328AF096	Range: -2 to +2 V Accuracy: ±35 mV

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 actual 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.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AUTOTRANSFORMER	Range: 105 to 125 V ac	Ridge, Model 9020A (9020A)
CALIBRATOR	Range: -9.5 to 950 V dc Accuracy: ±0.0085%	Fluke, Model 5720A (5720A) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)
FREQUENCY DIFFERENCE METER	Range: ±5 part in 10^{10}	Tracor, Model 527E (527E)
FUNCTION GENERATOR	Range: 10 Hz to 1 MHz Amplitude: 1 mV to 6 Vp-p	(SG-1288/G)
MULTIMETER	Range: -2 to +2 V dc Accuracy: ±0.01%	Fluke, Model 8840A/AF05 (AN/GSM-64D)
OSCILLOSCOPE	Vertical: 500 mV to 6 Vp-p Horizontal: 100 Hz to 20 kHz Accuracy: ±3%	Agilent,OS-303/G (OS-303/G)

Table 2. Minimum Specifications of Equipment Required - Continued

Common name	Minimum use specifications	Manufacturer and model (part number)
RESISTANCE STANDARD	Range: 0 to 1 MΩ	Biddle-Gray, Model 71-631 (7910328)
SIGNAL GENERATOR	Range: 5 to 512 MHz Amplitude: 1 to 50 mVrms	Aeroflex, Model 2023B (2023B) or (SG-1207/U)
TIME/FREQUENCY WORKSTATION	Range: 1 MHz Accuracy: ±1.25 parts in 10^{10} per day	Datum, Model ET6000-75 (13589305)

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 TM 11-6625-2941-14&P and the manufacturers' manuals 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 autotransformer.

b. Connect autotransformer to a 115 V ac power source and adjust output to 115 V.

c. Set power switch to **ON** and allow at least 1 hour for warm-up. If TI has been disconnected from line power for more than 24 hours, allow at least 24 hours for warm-up before beginning calibration.

d. Position controls as listed in (1) through (12) below:

(1) **FUNCTION** switch to **FREQ A**.

(2) **FREQ RESOLUTION, N** switch to **1Hz, 10^6**.

(3) **SAMPLE RATE** control fully ccw.

(4) **LEVEL A** and **LEVEL B** controls to **PRESET**.

(5) **CHANNEL A** and **B DC/AC** switches to **DC**.

(6) **CHANNEL A** and **B ATTEN** switches to **X1**.

(7) **CHANNEL A** and **B SLOPE** switches to **+**.

(8) **COM A/SEP** switch to **SEP**.

(9) **1M/50Ω** switch to **1M** (option 041).

(10) **ARM** switch (rear panel) to **OFF**.

(11) **OSC** switch (rear panel) to **INT** (5328A).

(12) **CHANNEL A** and **B** rear inputs terminated with 50Ω loads supplied with TI (option H60).

8. Time Base Stability (Option 010, AN/USM-459, and 5328AF096)

a. Performance Check

(1) Connect time/frequency workstation **OUTPUT 1 MHz** to frequency difference meter **REF INPUT**.

(2) Connect TI rear panel **FREQ STD OUTPUT** (**10MHz OUT** for AN/USM-459 and 5328AF096) to frequency difference meter **SIG INPUT** using a 50 Ω feedthrough termination.

(3) Adjust FREQ ADJ (fig. 1) and A3R14 (fig. 1) for AN/USM-459 and 5328AF096) for minimum difference indication on frequency difference meter. Record frequency difference meter indication.

(4) After 24 hour stabilization, frequency difference meter indication will be <5 parts in 10^{10} of indication recorded in (3) above. Record frequency difference meter indication.

NOTE

It may be necessary to wait 5 minutes after each voltage change in (5) below for oscillator to stabilize.

(5) Adjust autotransformer from 105 to 125 V ac and verify frequency difference meter indication remains within <±5 parts in 10^9 of indication recorded in (4) above.

(6) Adjust autotransformer to 115 V ac.

b. Adjustments. No further adjustments can be made.

9. Channel A Sensitivity

a. Performance Check

(1) Connect function generator **Function Outputs Unbalanced** to TI **INPUT A** using 50 Ω feedthrough termination (omit termination for option H60).

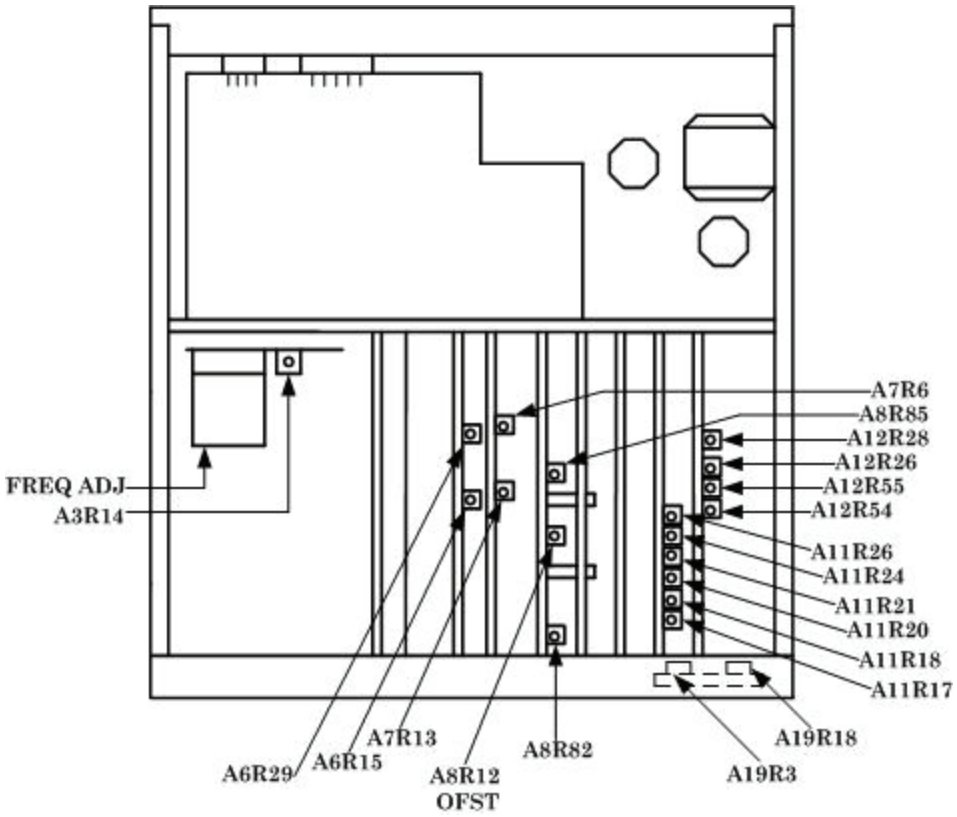

Figure 1. Test instrument - top view.

(2) Set function generator for sine wave outputs listed in table 3. Slowly increase function generator amplitude until TI indication is stable. If adjusted function generator amplitude exceeds limits specified in table 3, perform **b** (1) through (4) below (**b** (5) through (10) below for AN/USM-459 and 5328AF096).

Table 3. Channel A Sensitivity

Function generator output		Adjusted function generator amplitude
(kHz)	(mVp-p)	(mVp-p)
10.00	1.0	≤71[1]
.01	1.0	≤71[1]
1.00	1.0	≤71[1]
100.00	1.0	≤71[1]
1000.00	1.0	≤71[1]

[1] ≤42 mVp-p for AN/USM-459 and 5328AF096.

(3) Set TI **CHANNEL A DC/AC** switch to **AC**.

(4) Repeat (2) above for settings in table 4.

Table 4. Channel A Sensitivity

Function generator output		Adjusted function generator output
(kHz)	(mVp-p)	(mVp-p)
0.02	1.0	≤71[1]
1.00	1.0	≤71[1]
10.00	1.0	≤71[1]
100.00	1.0	≤71[1]
1000.00	1.0	≤71[1]

[1] ≤42 mVp-p for AN/USM-459 and 5328AF096.

(5) Disconnect function generator from TI.

(6) Connect signal generator **RF OUTPUT** to TI **INPUT A** using 50 Ω feedthrough termination (omit termination for option H60).

(7) Set TI **FREQ RESOLUTION, N** switch to **10Hz, 10^5**.

(8) Set signal generator for each output listed in table 5, and slowly increase signal generator amplitude until TI indication is stable. If adjusted signal generator amplitude exceeds limits specified in Table 5, perform **b** (1) through (4) below (**b** (5) through (10) below for AN/USM-459 and 5328AF096).

Table 5 Channel A Sensitivity

Signal generator output		Adjusted signal generator amplitude
(MHz)	(mV)	(mV)
10	1.0	≤ 25[1]
34	1.0	≤ 25[1]
50	1.0	≤ 50
100	1.0	≤ 50

[1] ≤15 mV for AN/USM-459 and 5328AF096

(9) Set TI **CHANNEL A DC/AC** switch to **DC** and repeat (8) above.

b. Adjustments

(1) Connect signal generator **OUTPUT RF** to TI **INPUT A** using 50 Ω feedthrough termination (omit termination for option H60).

(2) Set signal generator for a 40 MHz, 25 mV output.

(3) Adjust A19R3 (fig. 1) (A12R26 (fig. 1) for option 041) for a stable TI indication of approximately 40 MHz (R).

NOTE

Do not adjust sensitivity below 10 mV.

(4) Slowly decrease signal generator output and repeat (3) above.

(5) Connect TI **CHANNEL A MARKER OUTPUT** to oscilloscope **Vertical 1** input using a 50 Ω feedthrough termination.

(6) Set oscilloscope channel 1 for DC input coupling, 1 MΩ input, 500mV/div amplitude and 10 μs/div sweep.

(7) Set oscilloscope triggering for positive slope, auto level, channel 1 source and DC coupling.

(8) Connect function generator **Function Outputs Unbalanced** to TI **INPUT A** using a 50 Ω feedthrough termination.

(9) Set function generator for a sine wave, 10 kHz, 42 mVp-p, 50 Ω output.

(10) Adjust oscilloscope controls as necessary to view waveform. Adjust A12R26 (fig. 1) for a symmetrical square wave on oscilloscope (R).

(11) Adjust A12R55 (fig. 1) for a stable TI indication of approximately 10 kHz (R).

10. Channel B Sensitivity

a. Performance Check

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

(a) **FUNCTION** switch to **RATIO B/A**.

(b) **FREQ RESOLUTION, N** switch to **1Hz, 10^6**.

(c) **CHANNEL A DC/AC** switch to **AC**.

(d) **CHANNEL A ATTEN** switch to **X10**.

(2) Connect TI rear panel **FREQ STD OUTPUT** (**10MHz OUT** for AN/USM-459 and 5328AF096) to TI **INPUT A** using 50 Ω feedthrough termination (omit termination for option H60).

(3) Connect function generator **Function Outputs Unbalanced** to TI **INPUT B** using 50 Ω feedthrough termination (omit termination for option H60).

NOTE

In (4) through (9) below the TI indications are not critical but should be stable. Only the channel B input sensitivity is being checked.

(4) Set function generator for each sine wave output listed in table 6. Slowly increase function generator amplitude until TI indicates as listed in table 6. If adjusted function generator amplitude exceeds limits specified, perform **b** (1) through (4) below (**b** (5) through (10) below for AN/USM-459 and 5328AF096).

Table 6. Channel B Sensitivity

Function generator output (50Ω)		Test instrument indication	Adjusted function generator output (mVp-p)
Frequency (KHz)	Amplitude (mVp-p)		
10.0	1.0	0.001000	≤ 71[1]
0.010	1.0	0.000001	≤ 71[1]
0.100	1.0	0.000010	≤ 71[1]
1.0	1.0	0.000100	≤ 71[1]
100.0	1.0	0.010000	≤ 71[1]
1000.0	1.0	0.100000	≤ 71[1]

[1] 42 mVp-p for AN/USM-459 and 5328AF096

(5) Disconnect function generator from TI.

(6) Connect signal generator **OUTPUT RF** to TI **INPUT B** using 50 Ω feedthrough termination (omit termination for option H60).

(7) Set TI **FREQ RESOLUTION, N** switch to **10Hz, 10^5**.

(8) Set signal generator for outputs listed in table 7. Slowly increase signal generator amplitude until TI indicates as listed in table 7. If adjusted signal generator amplitude exceeds limits specified, perform **b** (1) through (4) below (**b** (5) through (11) below for AN/USM-459 and 5328AF096).

Table 7. Channel B Sensitivity

Signal generator output		Test instrument indications	Adjusted signal generator output (mV)
Frequency (MHz)	Amplitude (mV)		
10	1.0	1.00000	≤25[1]
30	1.0	3.00000	≤25[1]
60	1.0	6.00000	≤50
90	1.0	9.00000	≤50
100	1.0	10.00000	≤50

[1] ≤15 mV for AN/USM-459 and 5328AF096.

(9) Disconnect signal generator from TI.

(10) Set TI **FREQ RESOLUTION**, **N** switch to **1Hz**, **106** and **CHANNEL B DC/AC** switch to **AC**.

(11) Connect function generator **Function Outputs Unbalanced** to TI **INPUT B** using 50 Ω feedthrough termination (omit termination for option H60).

NOTE

In (12) through (16) below the TI indications are not critical but should be stable. Only the channel B input sensitivity is being checked.

(12) Set function generator for each sine wave output listed in table 8. Slowly increase function generator amplitude until TI indicates as listed in table 8. If adjusted function generator amplitude exceeds limits specified, perform **b** (1) through (4) below (**b** (5) through (11) below for AN/USM-459 and 5328AF096).

Table 8. Channel B Sensitivity

Function generator output (50Ω)		Test instrument indication	Adjusted function generator output (mVp-p)
Frequency (KHz)	Amplitude (mVp-p)		
10.0	1.0	0.001000	≤71[1]
0.020	1.0	0.000002	≤71[1]
0.100	1.0	0.000010	≤71[1]
1.0	1.0	0.000100	≤71[1]
100.0	1.0	0.010000	≤71[1]
1000.0	1.0	0.100000	≤71[1]

[1] 42 mVp-p for AN/USM-459 and 5328AF096

(13) Disconnect function generator from TI.

(14) Connect signal generator **OUTPUT RF** to TI **INPUT B** using 50 Ω feedthrough termination (omit termination for option H60).

(15) Set TI **FREQ RESOLUTION**, **N** switch to **10Hz**, **105**.

(16) Set signal generator for outputs listed in table 9. Slowly increase signal generator amplitude until TI indicates as listed in table 9. If adjusted signal generator amplitude exceeds limits specified, perform **b** (1) through (4) below (**b** (5) through (11) below for AN/USM-459 and 5328AF096).

Table 9. Channel B Sensitivity

Signal generator output		Test instrument indications	Adjusted signal generator output (mV)
Frequency (MHz)	Amplitude (mV)		
10	1.0	1.00000	≤25[1]
30	1.0	3.00000	≤25[1]
60	1.0	6.00000	≤50
90	1.0	9.00000	≤50
100	1.0	10.00000	≤50

[1] ≤15 mV for AN/USM-459 and 5328AF096.

(17) Disconnect signal generator from TI.

b. Adjustments

(1) Connect signal generator **OUTPUT RF** to TI **INPUT B** using 50 Ω feedthrough termination (omit termination for option H60).

(2) Set signal generator for a 40 MHz, 25 mV output.

NOTE

Do not adjust sensitivity below 10 mV.

(3) Adjust A19Rl8 (fig. 1) (A12R28 (fig. 1) for option 041) for a stable TI 4.00000 indication (R).

(4) Slowly decrease signal generator output and repeat (3) above.

(5) Connect TI **CHANNEL B MARKER OUTPUT** to oscilloscope **Vertical 1** input using a 50 Ω feedthrough termination.

(6) Set oscilloscope channel 1 for DC input coupling, 1MΩ input, 500mV/div amplitude and 10 μs/div sweep.

(7) Set oscilloscope triggering for positive slope, auto level, channel 1 source and DC coupling.

(8) Connect function generator **Function Outputs Unbalanced** to TI **INPUT B** using 50 Ω feedthrough termination.

(9) Set function generator for a sine wave, 10 kHz, 42 mVp-p, 50 Ω output.

(10) Adjust oscilloscope controls as necessary to view waveform. Adjust A12R28 (fig. 1) for a symmetrical square wave on oscilloscope (R).

(11) Adjust A12R54 (fig. 1) for a stable TI 0.00100 indication (R).

11. Channel C Sensitivity (Option 030, AN/USM-459, and 5328AF096)

a. Performance Check

(1) Connect signal generator **OUTPUT RF** to TI **CHANNEL C** input.

(2) Set **FUNCTION** switch to **FREQ C** and **FREQ RESOLUTION, N** switch to **.1 kHz, 10^4**.

(3) Set signal generator for outputs listed in Table 10. Slowly increase signal generator amplitude until TI indication is stable. If adjusted signal generator amplitude exceeds limits specified, perform **b** below.

Table 10. Channel C Sensitivity

Signal generator output		Adjusted signal generator amplitude
(MHz)	(mV)	(mV)
100	1.0	≤15
5	1.0	≤15
512	1.0	≤15
30[1]	1.0	≤15
500[1]	1.0	≤15

[1] AN/USM-459 and 5328AF096 only.

b. Adjustments

NOTE

For serial number prefix 2138A and greater containing A8 board number 05328-60045, perform only **b** (3) below.

(1) Set signal generator for a 100 MHz, 15 mV output. Adjust A8R82 (fig. 1) until TI indication is stable at approximately 100 MHz. Slowly decrease signal generator amplitude while adjusting A8R82 (fig. 1) until maximum sensitivity is obtained (R).

(2) Set signal generator for a 500 MHz, 15 mV output. Adjust A8R85 (fig. 1) until TI indication is stable at approximately 500 MHz. Slowly decrease signal generator amplitude while adjusting A8R85 (fig. 1) until maximum sensitivity is obtained (R).

(3) Set signal generator for a 100 MHz, 15 mV output. Adjust A8R12OFST (fig. 1) until TI displays a stable indication at approximately 100 MHz. Slowly decrease signal generator amplitude while adjusting A8R12OFST (fig. 1) until maximum sensitivity is obtained (R).

12. Digital Voltmeter (Option 021)

a. Performance Check

(1) Position controls as listed in (a) through (e) below:

(a) **FUNCTION** switch to **DVM**.

(b) **FREQ RESOLUTION, N** switch to **1Hz, 106**.

(c) **DCV RANGE** switch to **AUTO**.
(d) **FILTER** switch to **OFF**.
(e) **READ A** and **READ B** pushbuttons out.

(2) Short TI **HI** and **LO**. If TI display does not indicate between -0.0004 and +0.0004 V, perform **b** (1) below.

(3) Disconnect short from TI **HI** and **LO**.

(4) Connect calibrator **OUTPUT HI** and **LO** to TI **HI** and **LO**.

(5) Set calibrator output to settings listed in table 11. If TI does not indicate within limits specified, perform corresponding adjustment.

Table 11. Digital Voltmeter Check

Calibrator output settings (V dc)	Test instrument indications (V)		Adjustments
	Min	Max	
9.5	9.5033	9.4967	**b**(2)
-9.5	-9.5033	-9.4967	**b**(3)
95	+94.967	+95.033	**b**(4)
950	+949.13	+950.87	**b**(5)

b. Adjustments

(1) Adjust A6R28 (fig. 1) (DVM zero adjustment) through access hole on front panel for a TI indication between -0.0001 and +0.0001 V (R).

(2) Adjust A7R13 (fig. 1) for a TI indication between +9.4999 and +9.5001 V (R).

(3) Adjust A7R6 (fig. 1) for a TI indication between -9.4999 and -9.5001 V (R).

(4) Adjust A6R29 (fig. 1) for a TI indication between +94.999 and +95.001 (R).

(5) Adjust A6R15 (fig. 1) for a TI indication between +949.99 and +950.01 (R).

13. Remote Trigger Level (Option 041, AN/USM-459, and 5328AF096)

a. Performance Check

NOTE
Perform remote trigger level only if TI is used in an automated configuration.

NOTE
Remote trigger level can only be performed in an automated mode. The TI must be connected to a controller with a properly configured GPIB IEEE interface card.

NOTE
If you are using a controller and/or software other than the CALSETS fielded controller and ICE software, you will have to execute the TI command strings as required.

(1) Connect equipment as shown in figure 2.

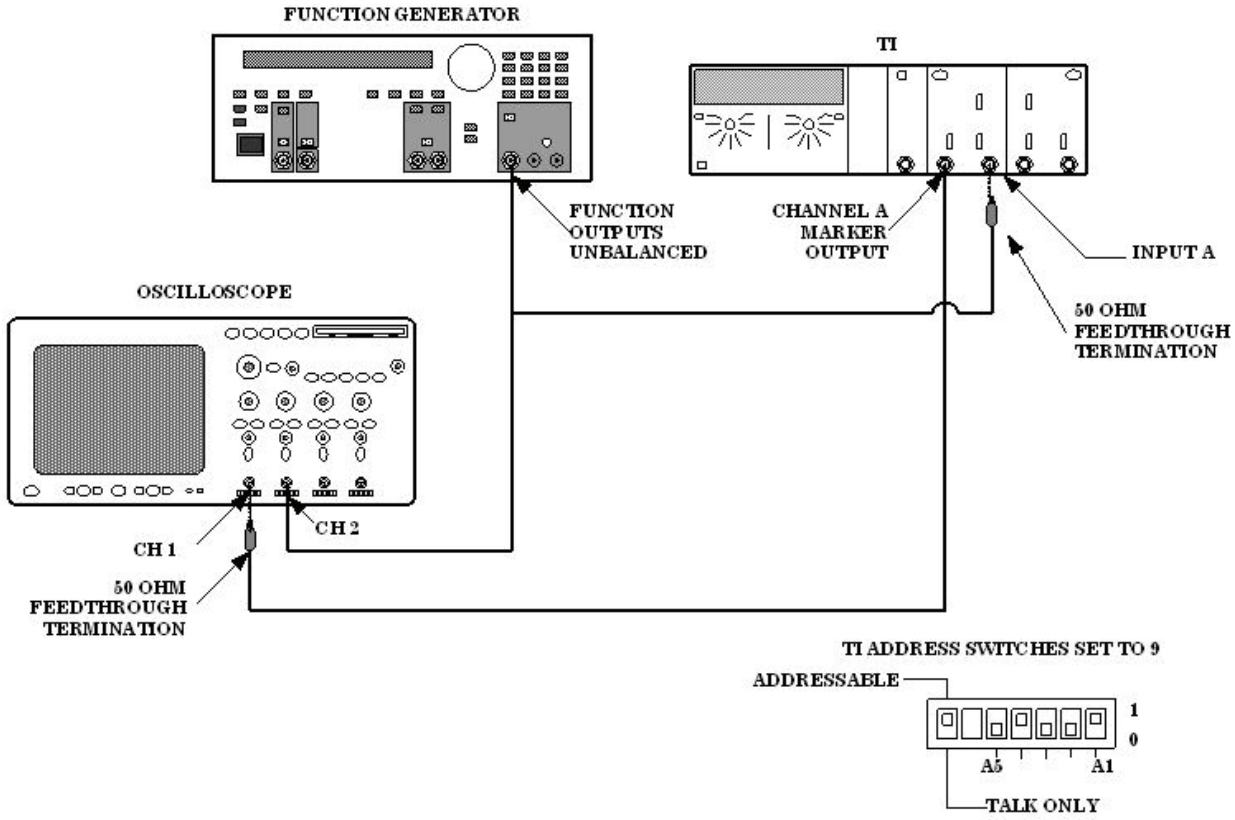

Figure 2. Remote trigger level - equipment setup.

(2) Set oscilloscope channel 1 for DC input coupling, 1 MΩ input, 500mV/div amplitude and 2 ms/div sweep.

(3) Turn oscilloscope channel 2 to on and set channel 2 for AC input coupling, 1 MΩ input and 1 V/div amplitude.

(4) Set oscilloscope triggering for positive slope, auto level, channel 2 source and DC coupling.

(5) Set function generator as listed in (a) through (e) below:

(a) **Function** to sine wave.

(b) **Frequency** to 100 Hz.

(c) **Offset** to 0 V dc.

(d) **Function Outputs** to **50 Ω**.

(e) **Amplitude** for a 6 Vp-p display on oscilloscope CH 2.

(6) Execute TI command string PF4G6S1S3A379+000*B37+000*R.

(7) Adjust oscilloscope **Vertical 1** ⬍ control so that the top of TI marker output waveform on channel 1 (fig. 3) just barely intersects both positive and negative slopes of sine wave on channel 2 (fig. 3). If this intersection does not occur at 0 V ±35 mV on sine wave, as shown in fig. 3, perform **b** below.

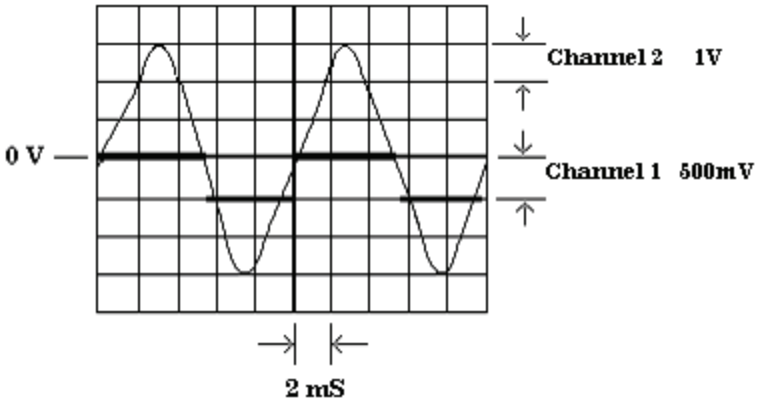

Figure 3. Remote trigger level - zero.

(8) Move oscilloscope **Vertical 1** connection from TI **CHANNEL A MARKER OUTPUT** to TI **CHANNEL B MARKER OUTPUT**.

(9) Repeat (7) above.

(10) Execute TI command string PF4G6S1S3A379+200*B37+200*R.

(11) Adjust oscilloscope **Vertical 1** ⬍ control so that the top of TI marker output waveform on channel 1 (fig. 4) just barely intersects both positive and negative slopes of sine wave on channel 2 (fig. 4). If this intersection does not occur at +2.00 V ±35 mV on sine wave, as shown in fig. 4, perform **b** below.

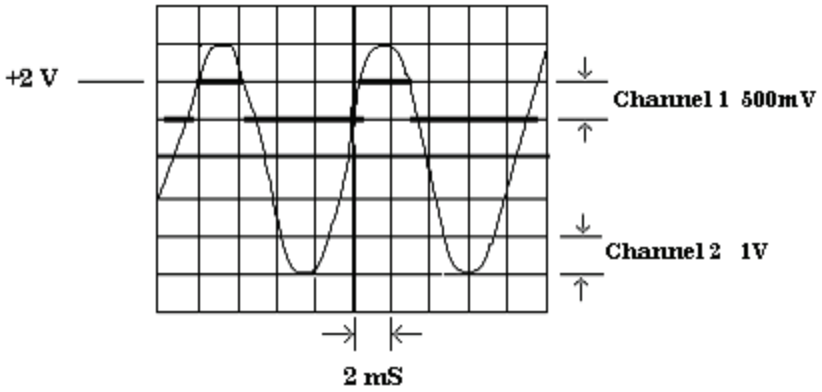

Figure 4. Remote trigger level - +2 V.

(12) Move oscilloscope **Vertical 1** connection from TI **CHANNEL B MARKER OUTPUT** to TI **CHANNEL A MARKER OUTPUT**.

(13) Repeat (11) above.

(14) Execute TI command string PF4G6S1S3A379-200*B37-200*R.

(15) Adjust oscilloscope **Vertical** 1 ⬍ control so that the top of TI marker output waveform on channel 1 (fig. 5) just barely intersects both positive and negative slopes of sine wave on channel 2 (fig. 5). If this intersection does not occur at -2.00 V ±35 mV on sine wave, as shown in fig. 5, perform **b** below.

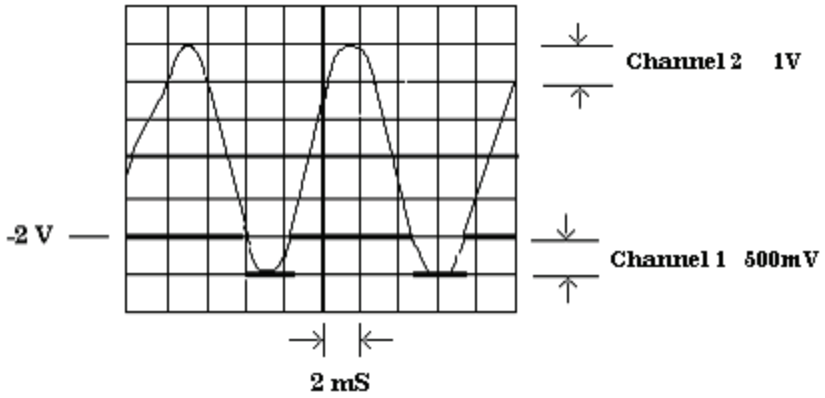

Figure 5. Remote trigger level - -2 V.

(16) Move oscilloscope **Vertical 1** connection from TI **CHANNEL A MARKER OUTPUT** to **TI CHANNEL B MARKER OUTPUT**.

(17) Repeat (15) above.

b. Adjustments

(1) Connect equipment as shown in figure 6.

(2) Set resistance standard to 0 Ω and multimeter to measure V dc, autorange.

(3) Set oscilloscope channel 2 off and channel 1 on. Set channel 1 for DC input coupling, 1 MΩ input, 500mV/div amplitude and 5 μs/div sweep.

(4) Set oscilloscope triggering for positive slope, auto level, channel 1 source and DC coupling.

(5) Set function generator as listed in (a) through (e) below:

(a) **Function** to sine wave.

(b) **Frequency** to 20 kHz.

(c) **Amplitude** to 70 mVp-p.

(d) **Offset** to 0 V dc.

(e) **Function Outputs** to **50 Ω**.

(6) Execute TI command string PF4G6S1S3A379+000*B37+000*R.

(7) Adjust oscilloscope controls as necessary to view waveform. Adjust A11R21 (fig. 1) for a 50 percent duty cycle on oscilloscope display (R).

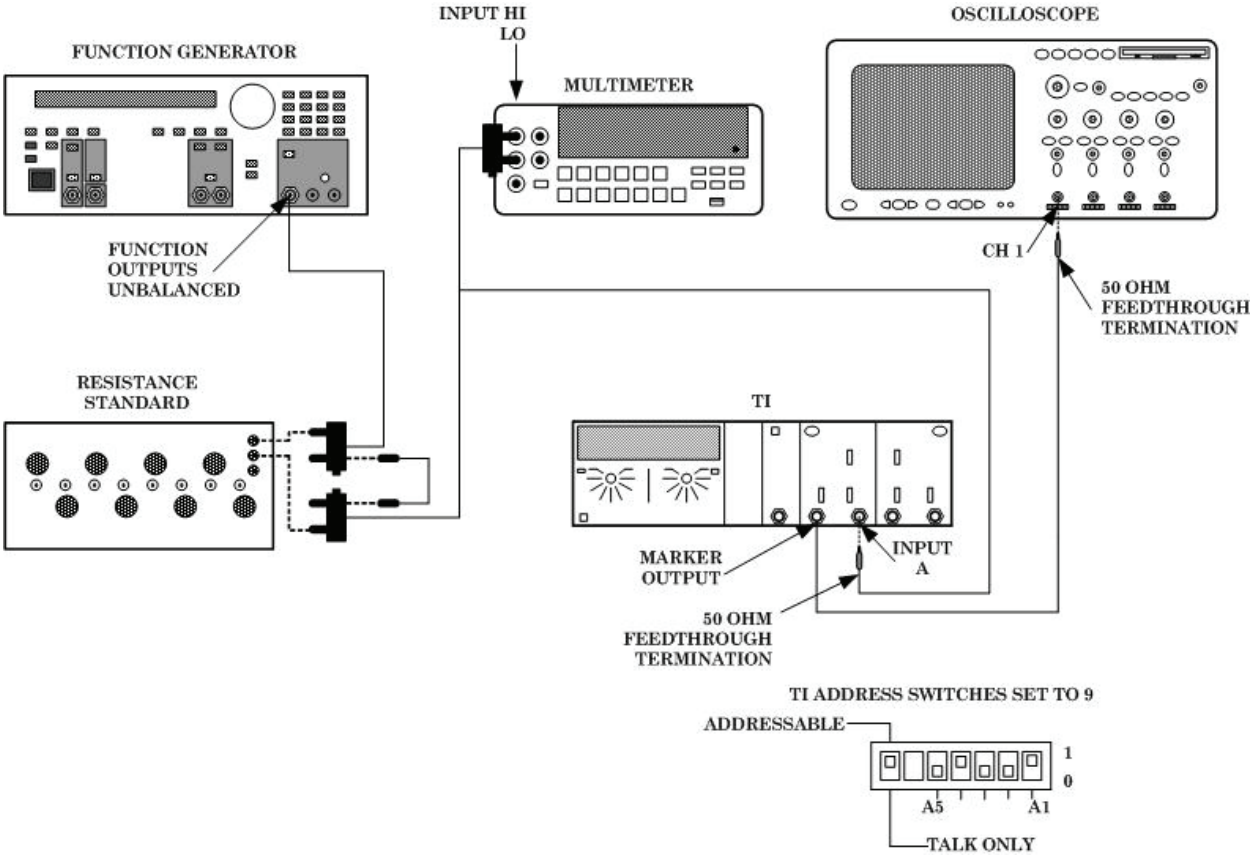

Figure 6. Trigger level adjustment - equipment setup.

(8) Move oscilloscope Vertical 1 connection from TI **CHANNEL A MARKER OUTPUT** to TI **CHANNEL B MARKER OUTPUT**.

(9) Adjust oscilloscope controls as necessary to view waveform. Adjust A11R20 (fig. 1) for a 50 percent duty cycle on oscilloscope display (R).

(10) Execute TI command string PF4G6S1S3A379+200*B37+200*R.

(11) Set function generator **Offset** to +2 V dc.

(12) Adjust resistance standard and function generator offset until multimeter indicates +2.000 V dc ±0.002 V dc.

(13) Adjust oscilloscope controls as necessary to view waveform. Adjust A11R18 (fig. 1) for a 50 percent duty cycle on oscilloscope display (R).

(14) Move oscilloscope **Vertical 1** connection from **TI CHANNEL B MARKER OUTPUT** to TI **CHANNEL A MARKER OUTPUT**.

(15) Adjust oscilloscope controls as necessary to view waveform. Adjust A11R24 (fig. 1) for a 50 percent duty cycle on oscilloscope display (R).

(16) Execute TI command string PF4G6S1S3A379-200*B37-200*R.

(17) Set function generator **Offset** to -2 V dc.

(18) Adjust resistance standard and function generator offset until multimeter indicates -2.000 V dc ±0.002 V dc.

(19) Adjust oscilloscope controls as necessary to view waveform. Adjust A11R26 (fig. 1) for a 50 percent duty cycle on oscilloscope display (R).

(20) Move oscilloscope **Vertical 1** connection from TI **CHANNEL A MARKER OUTPUT** to TI **CHANNEL B MARKER OUTPUT**.

(21) Adjust oscilloscope controls as necessary to view waveform. Adjust A11R17 (fig. 1) for a 50 percent duty cycle on oscilloscope display (R).

(22) Set function generator **Offset** to 0 V dc.

14. Final Procedure

a. Deenergize and disconnect all equipment and reinstall TI protective cover.

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

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0719014

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342215, requirements for calibration procedure TB 9-6625-2071-24.

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.