*TB 9-6625-2011-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR PULSE GENERATOR SG-1105/U AND HEWLETT-PACKARD MODEL 8013B

Headquarters, Department of the Army, Washington, DC
14 March 2003

Approved for public release; distribution is unlimited.

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, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028, 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 provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our FAX number is: DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. For the World Wide Web, use: https://amcom2028.redstone.army.mil.

*This bulletin supersedes TB 9-6625-2011-35, 31 March 1989.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Pulse Generator, SG-1105/U and Hewlett-Packard, Model 8013B. The manufacturer's 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. None.

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
Repetition rate	Range: 1 Hz to 50 MHz
Pulse delay	<35 ns to 1 s
Pulse width	<10 ns to 1 s
Pulse shape	
Rise and falltime	<3.5 ns
Preshoot	<5%
Overshoot	<5%
Ringing	<5%
Double pulse	Equal pulses when spaced at least 20 ns

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.

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)
FREQUENCY COUNTER	Range: 0.7 Hz to 51.5 MHz Accuracy: ±1%	John Fluke, Model PM6681/656 (PM6681/656)
MULTIMETER	Range: -17.1 to 17.1 V dc Accuracy: ±0.1%	John Fluke, Model 8840A/AF-05/09 (AN/GSM-64D)
OSCILLOSCOPE	Range: 3.5 ns to 1 s Accuracy: ±3%	Tektronix, Type 2465BOPT46 (2465BOPT46)

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 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

NOTE

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 to 115 V ac power source.

b. Press **LINE** pushbutton to **ON** and allow at least 30 minutes for TI to reach operating temperature.

8. Repetition Rate

a. Performance Check

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

(a) **PULSE PERIOD(S)** switch to **20n-1**m and **VERNIER** control fully ccw.

(b) **PULSE DOUBLE/NORM** switch to **NORM**.

(c) **PULSE DELAY(S)** switch to **35n-1**m and **VERNIER** control fully ccw.

(d) **PULSE WIDTH(S)** switch to **10n-1**m and **VERNIER** control fully ccw.

(e) **AMPLITUDE** (negative) switch to **5.0-2.0** and **VERNIER** control fully cw.

(f) **OFFSET** (negative) switch to **OFF**

(g) **AMPLITUDE** (positive) switch to **5.0-2.0** and **VERNIER** control fully cw.

(h) **OFFSET** (positive) switch to **OFF**

(i) **NORM/COMPL** switch to **NORM.**

(j) **INT LOAD** switch to **IN**.

(k) **EXT WIDTH/NORM/RZ** switch (rear panel) to **NORM**.

(2) Connect **TRIGGER OUTPUT** to frequency counter. If frequency counter does not indicate greater than 50 MHz, perform **b** below.

(3) Position controls as listed in table 3. Frequency counter will indicate within limit specified.

Table 3. Repetition Rate

Test Instrument				Frequency counter indications
PULSE PERIOD(S) switch settings	**PULSE PERIOD VERNIER** control positions	**PULSE WIDTH(S)** switch settings	**PULSE WIDTH VERNIER** control positions	
20n - 1 µ	cw	10n - 1 µ	ccw	<1 MHz
1 µ - .1 m	ccw	10n - 1 µ	ccw	>1 MHz
1 µ - .1 m	cw	1 µ- .1 m	ccw	<10 kHz
.1 m - 10m	ccw	1 µ- .1 m	ccw	>10 kHz
.1 m - 10m [1]	cw	.1m - 10m	ccw	>10 ms
10m - 1	ccw	.1m - 10m	ccw	<10 ms
10m - 1	cw	10m - 1	Center	>1 s

[1]Set frequency counter for time measurement, dc coupling, single ON, Holdoff ON, set input trigger level to 1.0 V and press restart to begin measurement.

b. Adjustments. Adjust A5C24 (fig. 1) for an indication of 51.5 MHz on frequency counter (R).

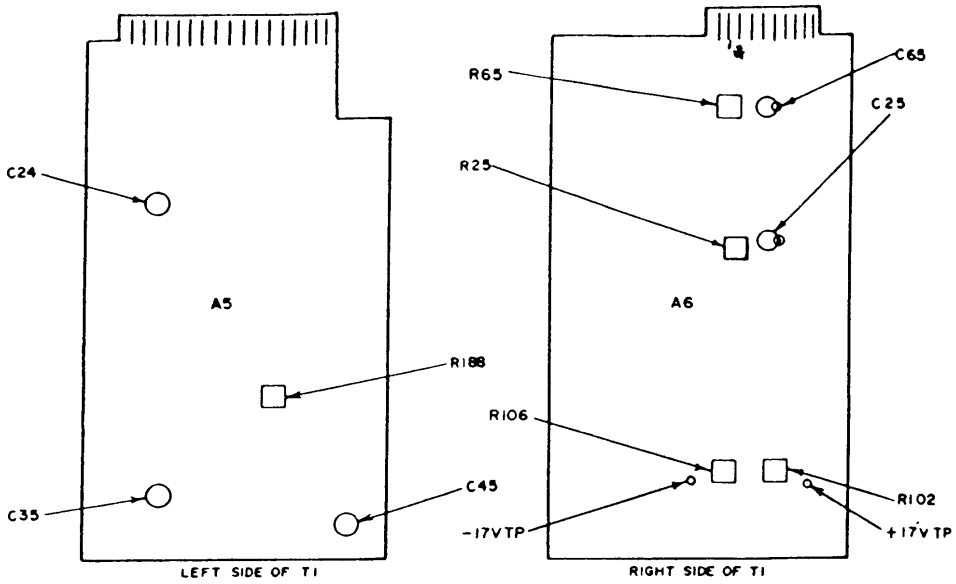

Figure 1. Boards A5 and A6 - adjustment locations.

9. Pulse Delay

a. Performance Check

(1) Connect equipment as shown in figure 2 and set oscilloscope to trigger off channel 2.

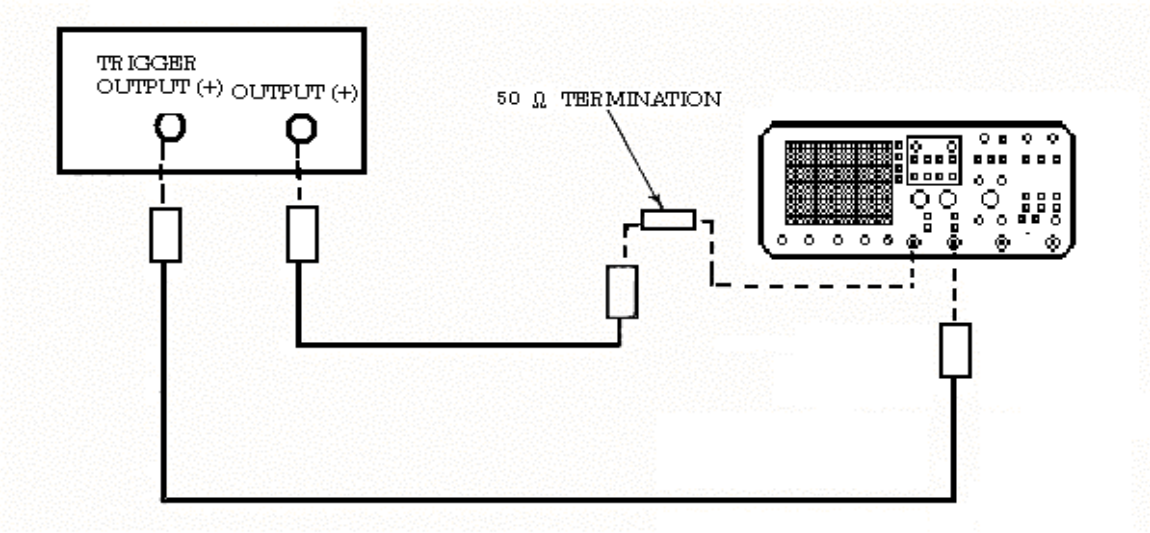

Figure 2. Pulse delay - equipment setup.

(2) Position controls as listed in (a) and (b) below.

(a) **PULSE PERIOD(S)** switch to **1m-.1m** and **VERNIER** control fully cw.

(b) **PULSE WIDTH(S)** switch to **1m-.1m** and **VERNIER** control to center.

(3) Adjust **PULSE DELAY VERNIER** control fully ccw. Measure delay between trigger output and pulse at 50 percent amplitude as indicated on oscilloscope. Pulse delay will be less than 35 ns, similar to display on figure 3.

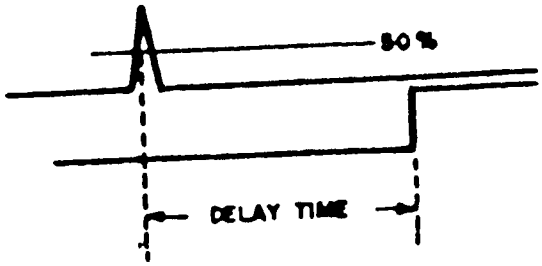

Figure 3. Pulse delay - measurement.

(4) Adjust **PULSE DELAY VERNIER** control fully cw. If delay, as indicated on oscilloscope, is not between 1.1 and 1.35 µs, perform **b** below.

(5) Repeat technique of (2) through (4) above, using TI settings listed in table 4. Pulse delay will be within limits specified.

Table 4. Pulse Delay

Test instrument				Oscilloscope indications
PULSE DELAY(S) switch settings	**PULSE PERIOD(S)** switch settings	**PULSE WIDTH(S)** switch settings	**PULSE DELAY VERNIER** control position	
1 µ- . 1m	. 1m - 10m	1 µ - .1m	cw	>100 µs
1 µ- . 1m	. 1m - 10m	1 µ - .1m	ccw	<1 µs
. 1m - 10m	10m-1 [1]	. 1m - 10m	cw	>10 ms
. 1m - 10m	. 1m - 10m	. 1m - 10m	ccw	<100 µs
10m - 1	(+) **EXT** (Press **MAN**)	.1 - 10m	cw	>1 s
10m - 1	10m - 1	.1m - 10m	ccw	<10 ms

[1]Adjust **PULSE PERIOD VERNIER** control to midposition. Return to cw position after this check.

b. Adjustments. Adjust A5C35 (fig. 1) for a pulse delay of 1.2 µs (R).

10. Pulse Width

a. Performance Check

(1) Connect equipment as shown on figure 2.

(2) Position controls as listed in (a) through (c) below:

(a) **PULSE PERIOD(S)** switch to **l**m-**.1m**.
(b) **PULSE DELAY(S)** switch to **35n-1**m
(c) **PULSE WIDTH(S)** switch to **10n-1**m.

(3) Adjust **PULSE WIDTH VERNIER** control fully cw. Measure pulse width, using standard measurement technique. If oscilloscope does not indicate a pulse width between 1.1 and 1.5 µs, perform **b** below.

(4) Repeat technique of (2) and (3) above, using TI settings listed in table 5. Pulse width will be within limits specified.

Table 5. Pulse Width

Test instrument			
PULSE WIDTH switch settings	PULSE PERIOD(S) switch settings	PULSE WIDTH VERNIER control positions	Oscilloscope indications
1 µ - . 1m	. 1m - 10m	cw	>.1 ms
1 µ - . 1m	1 µ - . 1m	ccw	<1 µs
. 1m - 10m	10m - 1	cw	>10 ms
. 1m - 10m	. 1m - 10m	ccw	<.1 ms
10m - 1	(+) **EXT** (Press **MAN**)	cw	>1 s
10m - 1	10m - 1	ccw	<10 ms
l0n-1µ	20n-1µ	ccw	<10 ns

b. Adjustments. Adjust A5C45 (fig. 1) for a pulse width of 1.3 µs. (R).

11. Pulse Shape

a. Performance Check

(1) Set pulse width to **SQUARE WAVE**.

(2) Measure rise and falltime, using standard measurement technique. Rise and falltime, as indicated on oscilloscope, will be less than 3.5 ns.

(3) Measure preshoot, overshoot, and ringing (fig. 4), using standard measurement technique. If preshoot, overshoot and ringing, are not less than 5 percent of pulse amplitude, perform **b**(1) below.

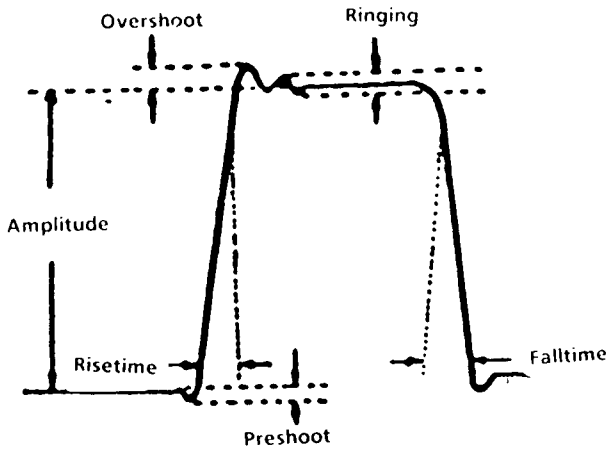

Figure 4. Output pulse characteristics.

(4) Disconnect oscilloscope from **OUTPUT (+)** and connect to **OUTPUT (-)**.

(5) Repeat (2) and (3) above. If preshoot, overshoot, and ringing are not less than 5 percent of pulse amplitude, perform **b**(2) below.

b. Adjustments

(1) Adjust A6C25 and A6R25 (fig. 1) until preshoot, overshoot, and ringing is less than 5 percent of pulse amplitude (R).

(2) Adjust A6C65 and A6R65 (fig. 1) until preshoot, overshoot, and ringing is less than 5 percent of pulse amplitude (R).

12. Double Pulse

a. Performance Check

(1) Adjust **PULSE PERIOD VERNIER** control for a display of one complete pulse on oscilloscope.

(2) Set **PULSE DOUBLE/NORM** switch to **DOUBLE**.

(3) Adjust **PULSE DELAY VERNIER** control to produce two pulses spaced at least 20 ns between leading edges. If width of each pulse is not the same, perform **b** below.

b. Adjustments. Adjust A5R188 (fig. 1) until width of first pulse is same as second pulse (R).

13. Power Supply

NOTE

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

a. Performance Check

(1) Connect multimeter between +17 V TP (fig. 1) and ground. If multimeter does not indicate between 16.9 and 17.1 V dc, perform **b**(1) below.

(2) Connect multimeter between -17 TP (fig. 1) and ground. If multimeter does not indicate between -16.9 and -17.1 V dc, perform **b**(2) below.

b. Adjustments

(1) Adjust A6R102 (fig. 1) for a 17.00 V dc indication on multimeter (R).

(2) Adjust A6R106 (fig. 1) for a 17.00 V dc indication on multimeter (R).

14. Final Procedure

a. Deenergize and disconnect all equipment.

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

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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**: TB 9-6625-xxxx-35
9. **Pub Title**: Calibration Procedure for ...
10. **Publication Date**:
11. Change Number:
12. **Submitted Rank**: MSG
13. **Sumitter Fname**: Joe
14. **Submitter Mname**: T
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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**:

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