TB 9-6625-2112-35

CHANGE 1

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR PULSE GENERATOR, SG-1205(V)1/U (SYSTRON DONNER, MODEL 114A-400 HZ)

HEADQUARTERS, DEPARTMENT OF THE ARMY, WASHINGTON, DC
16 JANUARY 1990

TB 9-6625-2112-35, 2 May 1988, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page.

2. File this change sheet in front of the publication for reference purposes. **This change incorporates DA Form 2028 dated 18 September 1989.**

By Order of the Secretary of the Army:

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Distribution:
To be distributed in accordance with DA Form 12-34C, Block No. 319, requirements for calibration procedures publications.

PIN: 055738-001

♦

REPRINT INCLUDES CHANGE 1

*TB 9-6625-2112-35

SUPERSEDED COPY 17 NOVEMBER 1986

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Headquarters Department of the Army, Washington, DC
2 May 1988

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♦REPORTING OF ERRORS♦

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*This bulletin supersedes TB 9-6625-2112-35, 17 November 1986

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Pulse Generator, SG1205(V)1/U, (Systron Donner, Model 114A-400 Hz). 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. Variations among models are described in text.

b. Time and Technique. The time required for this calibration is approximately 4 hours, using the dc and low frequency techniques.

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: 10 Hz to 1 MHz
Amplitude	Range: 80 mV to 100 V into 50Ω load
Pulse width	Range: 50 ns to 10 ms
Delay/advance	Range: 1 μs to 10 mS
Rise and fall time	Range: 0.1 MHz Accuracy: 13 ns or less for amplitude of 50 V and below
Aberrations	Overshoot: 5% or less Preshoot: 2% or less Droop: 6% or less

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-287. 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 ratio between the standard and TI.

5. Accessories Required. The accessories listed in table 3 are issued as indicated in paragraph 4 above and are used in this calibration procedure. When necessary, these items may be substituted by equivalent items, unless specifically prohibited.

Table 2. Minimum Specifications Required of Equipment

Item	Common name	Minimum use specifications	Manufacturer and model (part number)
A1	AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ± 1%	General Radio, Model W10MT3AS3 or Ridge, Model 9020F (7910809)
A2	DIGITAL VOLTMETER	Range: -210 to +36 V dc ± 0.02%	Hewlett-Packard, Model 3490AOPT060 (3490AOPT060) Dana, Model 5000, or Dana, Model 5000 w/641
A3	FREQUENCY COUNTER	Range: 10 Hz to 1 MHz	Hewlett-Packard, Model 5345A (MIS-28754/1 Type 1) w/5355A
A4	OSCILLOSCOPE	Range: 0 to 100 V 13 ns to 10 ms Accuracy: ± 3%	Tektronix. Type R5440 (MIS-28706/1 Type 1) w/5A48 (MIS-28706/3) and 5B42 (MIS-28706/4) and 5Sl4 (MIS-28706/5)

Table 3. Accessories Required

Item	Common name (official nomenclature)	Description (part number)
B1	ADAPTER	BNC T-type, 2 jacks, 1 plug (MS35173-274C)
B2	ADAPTER	N plug to BNC jack (10519457) (UG201A/U)
B3	ADAPTER (CALIBRATION FIXTURE)	Flexible T-type, 2 jacks, 1 plug (067-0525-01 or 067-0525-02)
B4	ATTENUATOR[1]	X10, Tektronix, Type 011-0059-02
B5	CABLE	6-in., RG-58/U; BNC plug terminations (7907487-1)
B6	CABLE[1]	30-in,, RG-58/U; BNC plug terminations (7907467)
B7	TERMINATION	Bird, Model 8085, 50W, 50Ω
B8	TEST LEAD[1]	Single banana plug to test hook (SKC-4850-14 or 7916122)

[1]Two required

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 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.

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

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.

a. Set 115/230 switch (rear panel) to 115.

b. Connect TI to autotransformer (A1).

c. Connect autotransformer to a 115-V ac source and adjust for a 115-V output.

d. Position controls as listed in (1) through (8) below:

(1) **REPETITION RATE** switch to **10 kHz** and vernier control fully cw.

(2) **DELAY/ADVANCE** switch to **1 μs** and vernier control fully ccw.

(3) **WIDTH** switch to **1 μs** and vernier control fully ccw.

(4) **AMPLITUDE VOLTS** switch to **2 V** and **VERNIER** control fully cw.

(5) **GATE MODE** switch to **NON-GATED**.

(6) **PULSE MODE** control to **DELAY**.

(7) **SYNC POLARITY** switch to **POS**.

(8) **PULSE POLARITY** switch to **NEG**.

e. Set **POWER** switch to **ON** and allow at least 30 minutes for equipment to warm up and stabilize.

8. Repetition Rate

a. Performance Check

(1) Connect **PULSE OUTPUT** to frequency counter (A3), using cable (B6).

NOTE

Set frequency counter impedance switch to 50Ω.

(2) Measure repetition rate. Frequency counter will indicate 10 kHz or greater.

(3) Repeat technique in (2) above, using settings listed in table 4. Frequency counter will indicate within limits specified.

b. Adjustments. No adjustments can be made.

Table 4. Repetition Rate

Test Instrument		Frequency counter indications
Repetition rate switch settings	Repetition rate vernier control positions	
.1 kHz	ccw	10 Hz or less
.1 kHz	cw	100 Hz or greater
1 kHz	cw	1 kHz or greater
1 kHz	ccw	100 Hz or less
10 kHz	ccw	1 kHz or less
.1 MHz	ccw	10 kHz or less
.1 MHz	cw	100 kHz or greater
1 MHz	cw	1 MHz or greater
1 MHz	ccw	100 kHz or less

9. Amplitude

a. Performance Check

(1) Connect equipment as shown in figure 1.

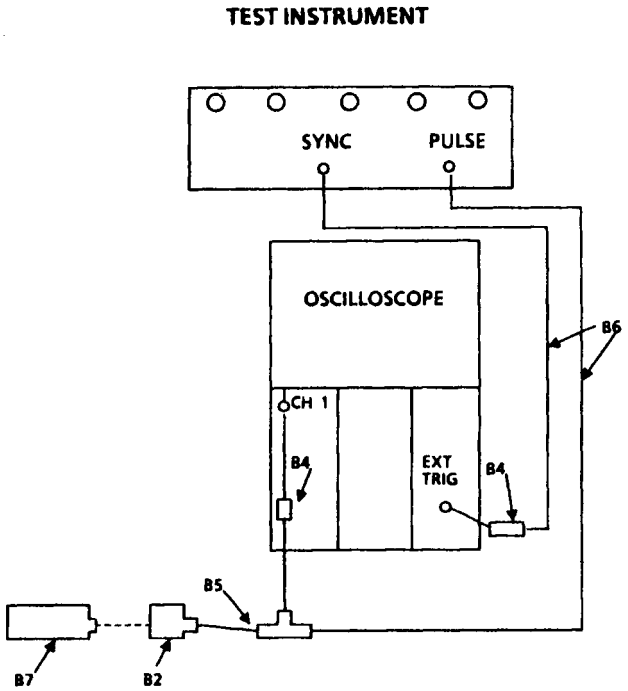

Figure 1. Amplitude-equipment setup.

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

(a) **REPETITION RATE** switch to **10 kHz** and vernier fully cw.

(b) **WIDTH** switch to **10 μsec**.

(c) **AMPLITUDE VERNIER** control fully ccw.

(d) **AMPLITUDE VOLTS** switch to **100 V**.

(e) **PULSE POLARITY** switch to **POS**.

(3) Adjust oscilloscope controls for a single pulse display.

(4) Adjust **AMPLITUDE VERNIER** control from minimum to maximum. If pulse amplitude as indicated on oscilloscope does not vary from 50 V or less to 100 V or more, perform **b** below.

(5) Set **PULSE POLARITY** switch to **NEG** and repeat technique in (4) above.

(6) Repeat technique in (3) through (5) above, using settings listed in table 5. Pulse amplitude as indicated on oscilloscope will be within limits specified.

Table 5. Amplitude

Test instrument		Oscilloscope indications (V peak)	
Amplitude volts switch settings	Pulse polarity switch settings	Equal to or less than	Equal to or more than
50[1]	+ and -	20	50
20	+ and -	10	20
10	+ and -	5	10
5	+ and -	2	5
2	+ and -	1	2
1	+ and -	0.5	1
0.5	+ and -	0.2	0.5
0.2	+ and -	0.8	0.2

[1]Remove attenuator (B4) from input to 5A48.

b. Adjustments. Adjust **AMPLITUDE VERNIER** control fully ccw and adjust R374 (fig. 2) for a pulse amplitude indication on oscilloscope of less than 50 V (R).

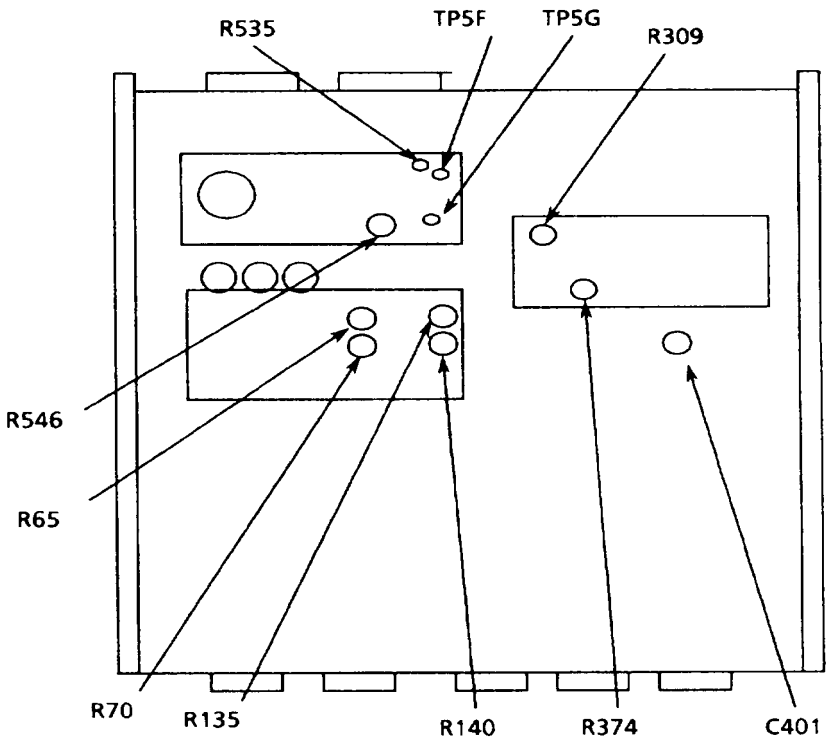

Figure 2. Test instrument - right view.

10. Pulse Width

a. Performance Check

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

(a) **REPETITION RATE** switch to **1 MHz**.

(b) **WIDTH** switch to **1 µs**.

(c) **AMPLITUDE VOLTS** switch to **20 V**.

(d) **AMPLITUDE VERNIER** control fully cw.

(e) **PULSE POLARITY** switch to **NEG**.

(2) Measure pulse width using standard measurement technique. If pulse width as indicated on oscilloscope (A4) is not 50 ns or less, perform **b**(1) below.

(3) Position **REPETITION RATE** switch to **1 kHz**, **WIDTH** switch to **100 µs** and adjust **WIDTH** vernier control fully cw. If pulse width as indicated on oscilloscope is not **100 µs** or greater, perform **b**(2) below.

(4) Measure pulse width, using settings listed in table 6. Oscilloscope indications will be within limits specified.

Table 6. Pulse Width

Test Instrument			Oscilloscope indications
Width switch settings	Width vernier control positions	Repetition rate switch settings	
1 µs	cw	.1 MHz	1 µs or greater
10 µs	ccw	.1 MHz	1 µs or less
10 µs	cw	10 kHz	10 µs or greater
100 µs	ccw	10 kHz	10 µs or less
1 ms	ccw	1 kHz	100 µs or less
1 m	cw	.1 kHz	1 ms or greater
10 ms	ccw	.1 kHz	1 ms or less
10 ms	cw	10 Hz[1]	10 ms or greater

[1] Some models do not have a 10 Hz switch setting. Set REPETITION RATE vernier control fully ccw.

CAUTION

To avoid overload, always decrease repetition rate before increasing pulse width and decrease pulse width before increasing repetition rate.

b. Adjustments

(1) Adjust R140 (fig. 2) for a pulse width indication on oscilloscope of 50 ns or less.

(2) Adjust R135 (fig. 2) for a pulse width indication on oscilloscope of 100 μs or greater.

11. Delay/Advance

a. Performance Check

(1) Disconnect cable with attenuator from input of **EXT TRIG** and reconnect to both **CH 2** and **EXT TRIG** of oscilloscope, using adapter (B3).

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

(a) **WIDTH** switch to **1 μs** and vernier control fully ccw.

(b) **REPETITION RATE** switch to **10 kHz** and vernier control fully cw.

(c) **DELAY/ADVANCE** switch to **10 μs** and vernier control fully cw.

(d) **AMPLITUDE VOLTS** switch to **10 V** and **VERNIER** control fully cw.

(e) **PULSE MODE** switch to **DELAY**.

(f) **PULSE POLARITY** switch to **POS**.

(3) Measure pulse advance, using standard measurement techniques. If leading edge of pulse output indicated on oscilloscope is not 10 μs or greater to the right of sync pulse leading edge, perform **b**(1) below.

(4) Position controls as listed in (a) and (b) below:

(a) **REPETITION RATE** switch to **1 kHz**.

(b) **DELAY/ADVANCE** switch to **100 μs** and vernier control fully ccw.

(5) Measure pulse delay, using standard measurement techniques. If pulse delay indicated on oscilloscope is not 10 μs or less, perform **b**(2) below.

(6) Measure pulse delay/advance, using settings listed in table 7. Oscilloscope indications will be within limits specified.

Table 7. Delay/Advance

Test instrument				Oscilloscope indications
Delay/ advance switch settings	Delay/ advance vernier control positions	Repetition rate switch settings	Width switch settings	
1 µs	cw	.1 MHz	Minimum	1 µs or greater
10 µs	ccw	.1 MHz	Minimum	1 µs or less
10 µs	cw	10 kHz	1 µs[1]	10 µs or greater
100 µs	ccw	10 kHz	1 µs	10 µs or less
100 µs	cw	1 kHz	1 µs	100 µs or greater
1 ms	ccw	1 kHz	10 µs	100 µs or less
1 ms	cw	.1 kHz	10 µs	1 ms or greater
10 ms	ccw	.1 kHz	100 µs	1 ms or less
10 ms	cw	10 Hz[2]	1 ms	10 ms or greater

[1] **WIDTH** vernier control fully cw.
[2] Set **REPETITION RATE** vernier fully ccw.

b. Adjustments

(1) Adjust R65 (fig. 2) until leading edge of output pulse indicated on oscilloscope is 10 µs or more to the right of leading edge of sync pulse (R).

(2) Adjust R70 (fig. 2) until pulse delay indicated on oscilloscope is 10 µs or less (R).

12. Rise and Fall Time

a. Performance Check

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

(a) **WIDTH** switch to **10 µs** and vernier control fully ccw.

(b) **REPETITION RATE** switch to **.1 MHz** and vernier control fully cw.

(c) **DELAY/ADVANCE** controls to minimum.

(d) **AMPLITUDE VOLTS** switch to **2 V** and **VERNIER** control fully cw.

(e) **GATE MODE** switch to **NON-GATED**.

(f) **PULSE MODE** switch to **DELAY**.

(g) **PULSE POLARITY** switch to **NEG**.

(2) Connect **PULSE OUTPUT** to **CH 1** of sampling plug-in 5S14N (part of A4), using cable (B6).

(3) Measure rise and fall time, using standard measurement techniques. Rise and fall time indicated on oscilloscope will be 13 ns or less. If overshoot is not less than 5 percent, preshoot is not less than 2 percent and droop is not less 6 percent of pulse amplitude, perform **b** below.

b. Adjustments

(1) Adjust R309 (fig. 2) for minimum pulse aberrations (R).

(2) Adjust C401 (fig. 2) for minimum pulse overshoot (R).

13. Power Supply

NOTE

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

a. Performance Check

(1) Set **POWER** switch to **OFF** and remove top protective cover.

(2) Connect digital voltmeter (A2) negative terminal to circuit ground and positive terminal to TP5F (fig. 2), using two leads (B8).

(3) Set **POWER** switch to **ON**. If digital voltmeter indication is not between -190 and -210 V dc, perform **b**(1) below.

(4) Move digital voltmeter negative lead to TP5G (fig. 2). If digital voltmeter indication is not between 34 and 36 V dc, perform **b**(2) below.

b. Adjustments

(1) Adjust R535 (fig. 2) for a -200 V dc indication on digital voltmeter (R).

(2) Adjust R546 (fig. 2) for a 35 V dc indication on digital voltmeter (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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U.S. GOVERNMENT PRINTING OFFICE: 1988-530-022/80015

PIN: 055738-000