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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SIGNAL GENERATOR SG-1207/U (HEWLETT-PACKARD, MODEL 8642M)

Headquarters, Department of the Army, Washington, DC
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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.

			Paragraph	Page
SECTION	I.	IDENTIFICATION AND DESCRIPTION		
		Test instrument identification	1	2
		Forms, records, and reports	2	2
		Calibration description	3	2
	II.	EQUIPMENT REQUIREMENTS		
		Equipment required	4	4
		Accessories required	5	4
	III.	CALIBRATION PROCESS		
		Preliminary instructions	6	5
		Equipment setup	7	5
		Line stability	8	6
		Frequency accuracy	9	6
		RF output	10	7
		Output level flatness	11	8
		Attenuation	12	9
		Spectral purity	13	10
		Pulse modulation	14	11
		Amplitude modulation	15	13
		Frequency modulation	16	14
		Phase modulation	17	16
		Internal oscillator	18	17
		Power supply	19	18
		Final procedure	20	19

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SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Signal Generator, SG-1207/U (Hewlett-Packard, Model 8642M). TM 11-6625-3165-14 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 6 hours, using the dc and low frequency and microwave technique.

2. Forms, Records, and Reports. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

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
Frequency	Range: 100 kHz to 2000 MHz Accuracy: ±10 PPM Time stability: ±0.05 PPM/hour[1] Line stability: ±0.05 PPM, 10% line change[2]
RF output	Range: >15 to -140 dBm[3] Flatness: ±1.5 dB (100 kHz to 500 MHz) ±2 dB (500 to 1000 MHz) ±2.5 dB (1 to 2 GHz) Attenuator accuracy: ±2.0 dB
Spectral purity	Harmonics range — Accuracy- 100 kHz to 1057.5 MHz — <+13 dBm, <-25 dBc 1057.5 to 2000 MHz — <+7 dBm, <-25 dBc Sub harmonic range — Accuracy 100 kHz to 1057.5 MHz — <-100 dBc 1057.5 to 2000 MHz — <-45 dBc Spurious signal range — Accuracy 100 kHz to 132.1875 MHz — <-70 dBc 132.1875 to 1057.5 MHz — <-90 dBc

See footnote at end of table.

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Pulse modulation	Pulse range: 10 to 2000 MHz Pulse rate: Dc to 50 kHz Pulse envelope on/off ratio (10 to 2000 MHz) Accuracy >40 dB Pulse envelope rise/falltime <0.5 microsecond (10% to 90%)
Amplitude modulation	Frequency range: 100 kHz to 1057.5 MHz Depth: 0 to 99.9% in .1% increments Accuracy: ±5% of setting +1% Distortion: <1.5%, 0 to 30% depth, 1 kHz rate <3%, 30 to 70% depth, 1 kHz rate <5%, 70 to 90% depth, 1 kHz rate Incidental FM: <200 Hz (30% at 1 kHz)
Frequency modulation	Frequency Response: Dc to 100 kHz external, 20 Hz to 100 kHz internal in 1% increments Deviation range: (Modulating rate between dc and 100 kHz Accuracy: ≤300 kHz (30 to 132.1875 MHz) ≤375 kHz (132.1875 to 528.75 MHz) ≤1.5 MHz (528.75 MHz & above) Incidental AM: <0.3% (>400 kHz carrier, 20 kHz peak deviation, 1 kHz rate) Distortion: ≤4% for maximum dc coupled deviation ≤2% for 1/2 maximum dc coupled deviation ≤0.4% for 1/15 maximum dc coupled deviation (for a modulating rate between 20 Hz and 100 kHz) Indicator range: (Rates 20 Hz to 100 kHz) Accuracy: ±(5% of setting +10 Hz)
Phase modulation	Maximum deviation: 100 radians, 100 kHz to 132.1875 MHz 25 radians, 132.1875 to 264.375 MHz 50 radians, 264.375 to 528.75 MHz 100 radians, 528.75 to 1057.5 MHz 200 radians, 1057.5 to 2000 MHz Accuracy: ±(5% of setting +0.09 radians) 1 kHz rate Distortion: <0.4% at 1 kHz rate
Internal oscillator	Frequency Range: 20 Hz to 100 kHz Accuracy: ±2% of setting Distortion: <0.02%, 20 Hz to 15.8 kHz (>0.5 V peak) <0.15%, 15.8 to 100 kHz

[1]Time stability not verified due to insufficient environmental control.

[2]Line stability verified to 8.7% line change.

[3]Range verified to –110 dBm.

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, 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 provided 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 is shown in parenthesis.

5. Accessories Required. The accessories required for the calibration are common usage accessories, issued as indicated in paragraph **4** above, and are not listed in this calibration procedure. The following peculiar accessories are also required for the calibration: Semiconductor Device (coaxial crystal detector), Hewlett-Packard, Model 423AOPT03.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AUDIO ANALYZER	Frequency measurement: Range: 20 Hz to 100 kHz Accuracy: ±0.5% Distortion capability: ≤.02%	Boonton, Model 1121 (1121)
AUTOTRANSFORMER	Range: 105 to 125 V ac	Ridge, Model 9020A (9020A)
FREQUENCY COUNTER	Range: 20 Hz to 1900 MHz Accuracy: ±2.5 ppm or .00025%	Fluke, Model PM6681/656 (PM6681/656)
MEASURING RECEIVER	Power measurement: (+15 dB to -110 dB) ±.5 dB Flatness measurement: (100 kHz to 450 MHz) ±.375 dB (550 MHz to 950 MHz) ±.5 dB (1500 MHz to 2000 MHz) ±.625 dB	Measuring receiver system N5530S consisting of: Spectrum Analyzer, Agilent Model E4440A (E4440A), Power meter, Agilent Model E4419B (E4419B), and Sensor module, Agilent Model N5532A opt. 504 (504), 518 (518), 526 (526)
MULTIMETER	Range: 50 to -15 V dc Accuracy: ±.25%	Fluke, Model 8840A/AF05 (AN/GSM-64D)
OSCILLOSCOPE	Range: 50 Hz Accuracy: <125 ns risetime	(OS-303/G)
PULSE GENERATOR	Amplitude: 5 V Period: 10 ms to 20 µs Width: 5 ms to 6 µs	LeCroy, Model 9210MOD200 (9210MOD200) w/plug-ins, LeCroy, Models 9211 (9211) and 9215 (9215) (MIS 45839)
SPECTRUM ANALYZER	Range: 450 kHz to 2 GHz (13 to -90 dB) Accuracy: ±1.0 dB/10 dB step, 1.0 dB maximum	(AN/USM-677)

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 11-6625-3165-14 for this TI.

d. When indications specified in paragraphs **7** through **18** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **7** through **18**. 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. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

NOTE

Before connecting TI, the protective earth terminal of the instrument must be connected to the protective conductor of the line power cord. The line plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.

NOTE

When indications specified in this procedure are not within tolerance, perform the power supply check prior to making adjustments.

a. Connect TI to autotransformer.

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

c. Set TI **POWER** switch to **ON** and allow at least 30 minutes for to stabilize.

8. Line Stability

a. Performance Check

(1) Connect frequency counter input **A** to TI **OUTPUT RF**.

(2) Set up frequency counter to read frequency.

(3) Press TI pushbuttons as listed in (a) through (c) below:

(a) **INSTR PRESET**.
(b) **ENTRY - AMPTD**.
(c) **DATA – 0 dBm**.

(4) Record frequency counter indication.

(5) For each row in table 3, vary autotransformer voltage. Frequency counter will indicate within limits specified in table 3 of the recorded value in (4) above.

Table 3. Line Stability

Autotransformer voltage indications	Frequency counter indication at 100 MHz ±(Hz)
125 Vac	5
120 Vac	5
110 Vac	5
105 Vac	5

(6) Adjust autotransformer to 115 V ac.

b. Adjustments. No adjustments can be made.

9. Frequency Accuracy

a. Performance Check

(1) For each row in table 4, press TI **ENTRY - FREQ** pushbutton and enter **DATA** frequency. Frequency counter will indicate within the limits specified.

(2) Press **RF OFF/ON** pushbutton to **OFF**.

(3) Move connection on frequency counter from input **A** to input **C**.

(4) Press **RF OFF/ON** pushbutton to **ON**.

(5) For each row in table 5, press TI **ENTRY - FREQ** pushbutton and enter **DATA** frequency. Frequency counter will indicate within the limits specified.

Table 4. Frequency

Test instrument **DATA** frequency	Frequency counter indications	
	Min	Max
100 kHz	99.999 kHz	100.001 kHz
500 kHz	499.995 kHz	500.005 kHz
1 MHz	999.990 kHz	1.000010 MHz
5 MHz	4.99995 MHz	5.000050 MHz
10 MHz	9.999900 MHz	10.000100 MHz
50 MHz	49.999500 MHz	50.000500 MHz
100 MHz	99.999000 MHz	100.001000 MHz

Table 5. Frequency

Test instrument **DATA** frequency	Frequency counter indications	
	Min	Max
500 MHz	499.995000	500.005000
1300 MHz	1299.987000	1300.013000
1900 MHz	1899.981000	1900.019000

(6) Press **RF OFF/ON** pushbutton to **OFF**.

(7) Disconnect equipment setup.

b. Adjustments. No adjustments can be made.

10. RF Output

a. Performance Check

(1) Set measuring receiver with sensor module to measure RF power with 0.01 db resolution.

NOTE

Zero and calibrate sensor module as necessary.

(2) Connect sensor module to TI OUTPUT RF connector.

(3) Connect TI **10 MHz OUT** (rear panel) to measuring receiver external reference input.

(4) Press TI pushbuttons as listed in (a) through (c) below:

(a) **INSTR PRESET**.
(b) **ENTRY** - **FREQ**.
(c) **DATA** - **30 MHz**.

(5) Press TI **ENTRY – AMPTD** pushbutton and enter **DATA** amplitude for each row in table 6. Using measuring receiver and RF power measurement techniques, measured power will indicate within limits specified.

Table 6. RF Output

Test instrument **DATA** amplitude	Measuring receiver indications (dBm)	
	Min	Max
15 dBm	13	17
10 dBm	8	12
5 dBm	3	7
0 dBm[1]	2	-2
-10 dBm	-8	-12
-20 dBm	-18	-22
-30 dBm	-28	-32
-40 dBm	-38	-42
-50 dBm	-48	-52
-60 dBm	-58	-62
-70 dBm	-68	-72
-80 dBm	-78	-82
-90 dBm	-88	-92
-100 dBm	-98	-102
-110 dBm	-108	-112

[1]Setup measuring receiver for tuned RF level cal techniques and wait for receiver to calibrate.

(6) Press **RF OFF/ON** pushbutton to **OFF**.

b. Adjustments. No adjustments can be made.

11. Output Level Flatness

a. Performance Check

(1) Set measuring receiver with sensor module to measure RF power with 0.01 db resolution.

(2) Press pushbuttons **ENTRY – AMPTD** and **DATA – (+10 dBm)**.

(3) Measure and record the RF power using the measuring receiver, while using the **ENTRY – FREQ** key and the **DATA** key pad to select frequencies between the start and stop frequencies listed in table 7.

(4) Calculate the flatness using the formula below. The flatness will be less than or equal to the maximum limits listed in table 7.

Flatness = (highest – lowest)/2

(5) Repeat technique of (3) and (4) above for remaining rows in table 7.

Table 7. Output Level Flatness

Start frequency (Hz)	Stop frequency (Hz)	Calculated flatness (dB)	Maximum limit ±(dB)
100 k	450 M		1.5
550 M	950 M		2
1200 M	2000 M		2.5

(6) Press **RF OFF/ON** pushbutton to **OFF**.

b. Adjustments. No adjustments can be made.

12. Attenuation

a. Performance Check

(1) Press TI pushbuttons as listed in (a) through (c) below:

(a) **INSTR PRESET**.
(b) **ENTRY** – **AMPD**.
(c) **DATA** - **0dBm**.

(2) Set measuring receiver with sensor module to measure Tuned RF power with 0.01 db resolution.

(3) Set measuring receiver to Zero reference.

(4) Press TI **ENTRY – AMPTD** pushbutton and enter **DATA** amplitude for each row in table 8. Using measuring receiver and tuned RF level power measurement techniques measuring receiver will indicate within limits specified.

NOTE
RECAL (CALIBRATE) as necessary.

Table 8. Attenuator at 100 MHz

Test instrument **DATA** amplitude (dBm)	Measuring receiver indications (dBm)	
	Min	Max
-10	-8	-12
-20	-18	-22
-30	-28	-32
-40	-38	-42
-50	-48	-52
-60	-58	-62
-70	-68	-72
-80	-78	-82
-90	-88	-92
-100	-98	-102
-110	-108	-112

(5) Press **RF OFF/ON** pushbutton to **OFF**.

(6) Disconnect measuring receiver from TI **OUTPUT RF**.

b. Adjustments. No adjustments can be made.

13. Spectral Purity

a. Performance Check

(1) Connect spectrum analyzer **INPUT 50 Ω** to TI **OUTPUT RF**.

(2) Connect TI **EXT REF INPUT** (rear panel) to spectrum analyzer **10 MHz REF OUT** (rear panel).

(3) Press **INSTR PRESET** pushbutton.

(4) Perform steps as listed in (a) through (c) below for each row in table 9 below:

(a) Press **ENTRY - FREQ** pushbutton and enter **DATA** frequency listed.
(b) Press **ENTRY – AMPTD** pushbutton and enter **DATA** amplitude listed.
(c) Set spectrum analyzer to TI frequency, set power reference then tune to harmonic frequency listed. Power amplitude will be less than dBc specified limit.

NOTE

Some spurious signals may be generated by the spectrum analyzer. If a spurious signal is present, change TI frequency. If it disappears, it most likely is from the TI. If the spurious signal moves with the TI frequency it most likely is in the spectrum analyzer.

Table 9. Spectral Purity

Test instrument		Spectrum analyzer	
DATA amplitude (dBm)	**DATA** frequency (MHz)	Harmonic frequency (MHz)	dBc
5	.450	.900	<-25
5	.450	1.35	<-25
5	1	2	<-25
5	1	3	<-25
5	1.5	3	<-25
5	166.666667	333.333333	<-25
5	166.666667	500	<-25
5	250	500	<-25
5	333.333333	666.666666	<-25
5	333.333333	1000	<-25
5	500	1000	<-25
5	2000	4000	<-25
5	2000	1000	<-25

(5) Perform steps as listed in (a) through (c) below for each row in table 10 below.

(a) Press **ENTRY - FREQ** pushbutton and enter **DATA** frequency listed.
(b) Press **ENTRY – AMPTD** pushbutton and enter **DATA** amplitude listed**.**
(c) Set spectrum analyzer to TI frequency, set power reference then tune to harmonic frequency listed. Power amplitude will be less than dBc specified limit.

Table 10. Spurious Signals

Test instrument		Spectrum analyzer	
DATA amplitude (dBm)	**DATA** frequency (MHz)	Harmonic frequency (MHz)	dBc
20	4.130000	85.870000	<-70
20	4.130000	3.700000	<-70
20	4.130000	0.430000	<-70
20	4.130000	4.560000	<-70
20	4.130000	5.870000	<-70
20	4.130000	45.000000	<-70
20	4.130 000	225.000 000	<-70
20	90.000 000	112.500 000	<-70
20	600.000 000	596.313 600	<-90
20	600.000 000	599.078 400	<-90
20	571.144000	572.796000	<-90
20	610.519000	612.171000	<-90
20	745.951000	747.608000	<-90
20	775.184.000	776.836000	<-90
20	780.184000	781.840000	<-90
20	797.878000	799.536000	<-90
20	965.416000	967.076000	<-90
20	1012.000000	788.000000	<-90
20	976.000000	742.500000	<-90
20	562.000000	606.500000	<-90
20	563.000000	540.500000	<-90
20	1057.500000	1012.500000	<-90
20	1057.500000	1057.375000	<-90

(6) Press **RF OFF/ ON** pushbutton to **OFF**.

b. Adjustments. No adjustments can be made.

14. Pulse Modulation

a. Performance Check

(1) Connect pulse generator, with plug-in module (9211) **OUTPUT A** to TI **PULSE IN** (rear panel).

(2) Press pulse generator pushbuttons for a pulse output as listed in (a) through (h) below.

(a) **CHANNEL A**.
(b) **Period** and enter **10 m/kHz** from data keyboard.
(c) **Width** and enter **5 m/kHz** from data keyboard.
(d) **Vhigh** and **5 ENTER/HZ** from data keyboard.
(e) **Vlow** and **0 ENTER/HZ** from data keyboard.
(f) **Delay** and enter **0 n/GHz** from data keyboard.
(g) **2 Pulse** and **OFF ENTER/Hz** from data keyboard.
(h) On plug-in output module, 9211, **Disable** red (off) light.

(3) Press TI pushbuttons as listed in (a) through (h) below:

(a) **INSTR PRESET**.
(b) **ENTRY - FREQ**.
(c) **DATA - 1 GHz**.
(d) **ENTRY - AMPTD**.
(e) **DATA - (+10 dBm)**.
(f) **SHIFT**.
(g) **ENTRY - PULSE**.
(h) **MODULATION SOURCE - EXT DC**.

(4) Press spectrum analyzer pushbuttons as listed in (a) through (d) below:

(a) **Preset**.
(b) **AMPLITUDE**, **Ref Level**, **1**, **0**, **dBm**.
(c) **FREQUENCY**, **Center Freq**, **1**, **GHz**.
(d) **SPAN**, **1**, **.**, **5**, **MHz**.

(5) Press **ENTRY - OFF/ON** pushbutton to pulse **ON**.

(6) Press spectrum analyzer pushbuttons as listed in (a) through (i) below:

(a) **BW/Avg**, **Res BW**, **1**, **0**, **0**, **kHz**.
(b) **Video BW**, **1**, **kHz**.
(c) **MARKER**.
(d) **SPAN**, **0**, **Hz**.
(e) **Sweep, Sweep Time**, **3**, **0**, **ms**.
(f) **TRIG**, **Video**, **1**, **0**, **–dBm**.
(g) Adjust marker to top of squarewave.
(h) **Marker, Delta**.
(i) Adjust delta marker to bottom of squarewave.

(7) Using spectrum analyzer, measure top to bottom of square wave in dB. Pulse envelope on/off ratio will indicate within limits specified in table 11.

Table 11. Pulse Modulation On/Off Ratio

Spectrum analyzer > dB
40

(8) Press **RF OFF/ON** to **OFF** pushbutton.

(9) Disconnect TI **EXT REF INPUT** (rear panel) from spectrum analyzer.

(10) Disconnect TI **OUTPUT RF** from spectrum analyzer.

(11) Connect oscilloscope **Vertical 1** input to TI **OUTPUT RF**, using crystal detector.

(12) Adjust pulse generator output for a period of 20 ms and a width of 6 ms.

(13) Press **RF OFF/ON** to **ON** pushbutton.

(14) Using oscilloscope measurement techniques, verify that the risetime of displayed envelope is within limits listed in table 12.

Table 12. Pulse Modulation Risetime

Oscilloscope indication < u Sec
0 .5

(15) Using oscilloscope measurement techniques, verify that the falltime of displayed envelope is within limits listed in table 13.

Table 13. Pulse Modulation Falltime

Oscilloscope < u Sec
0.5

(16) Press **RF OFF/ON** pushbutton to **OFF**.

(17) Disconnect pulse generator and oscilloscope from circuit.

b. Adjustments. No adjustments can be made.

15. Amplitude Modulation

a. Performance Check

(1) Connect measuring receiver with sensor module to TI **OUTPUT RF**.

(2) Connect **OUTPUT MOD** to **INPUT AM**.

(3) Press TI pushbuttons as listed in (a) through (m) below.

(a) **INSTR PRESET**.
(b) **ENTRY - FREQ**.
(c) **DATA - 1 GHz**.
(d) **ENTRY - AMPTD**.
(e) **DATA - (+13 dBm)**.
(f) **ENTRY - AM**.
(g) **DATA - 30%**.
(h) **MODULATION SOURCE - EXT DC**.
(i) **ENTRY – MOD FREQ**.
(j) **DATA - 1 kHz**.
(k) **SHIFT**.
(l) **ENTRY – MOD OUT**.
(m) **DATA – (+1V)**.

(4) Set measuring receiver to measure FM with a 300 Hz high pass filter and a 3 kHz low pass filter.

(5) Measuring receiver will indicate within limits specified in table 14.

Table 14. Incidental FM

Carrier frequency	Modulation rate	Modulation %	Measuring receiver <Hz
1 GHz	1 KHz	30	200

(6) Set measuring receiver to measure AM with a low pass filter of 15 kHz.

(7) Press TI **ENTRY – AM** pushbutton and enter **DATA** percent of modulation for each row in table 15. Using measuring receiver, measure the AM percent of modulation indication will be within limits specified.

Table 15. AM accuracy at 1 kHz Modulation

Test instrument **DATA** percent of modulation	Measuring receiver modulation indications (%)	
	Min	Max
30%	27.5	32.5
60%	56	64
90%	84.5	95.5

(8) Press TI **ENTRY – AM** pushbutton and enter **DATA** percent of modulation for each row in table 16. Using measuring receiver, measure the AM distortion; indication will be within limits specified.

Table 16. AM Distortion at 1 kHz Modulation

Test instrument **DATA** percent of modulation levels	Measuring receiver distortion indications (<%)
30%	1.5
60%	3
90%	5

(9) Press **RF OFF/ON** pushbutton.

b. Adjustments. No adjustments can be made.

16. Frequency Modulation

a. Performance Check

(1) Disconnect **OUTPUT MOD** from **INPUT AM** and connect to **INPUT FM/ΦM**.

(2) Press TI pushbuttons as listed in (a) through (m) below.

(a) **INSTR PRESET**.
(b) **ENTRY - FREQ**.
(c) **DATA - 1 GHz**.
(d) **ENTRY - AMPTD**.
(e) **DATA - (+13 dBm)**.
(f) **ENTRY - FM**.
(g) **DATA – 20 kHz.**

(h) **MODULATION SOURCE - EXT DC**.
(i) **MOD - FREQ**.
(j) **DATA - 1 kHz**.
(k) **SHIFT**.
(l) **ENTRY – MOD OUT.**
(m) **DATA – (+1V).**

(3) Set measuring receiver to measure AM with a 300 Hz high pass filter and a 3 kHz low pass filter.

(4) Measuring receiver will indicate within limits specified in table 17.

Table 17. Incidental AM

Carrier frequency	Modulation rate	Peak deviation kHz	Measuring receiver indication < %
1 GHz	1 kHz	20	0.3

(5) Set measuring receiver to measure FM with all filters off.

(6) Press TI pushbuttons as listed in (a) through (f) below:

(a) **ENTRY - FREQ**.
(b) **DATA - 250 MHz**.
(c) **ENTRY - AMPTD**.
(d) **DATA - (+10 dBm)**.
(e) **ENTRY - FM**.
(f) **DATA - 300 kHz**.

(7) Press **ENTRY – MOD FREQ** pushbutton and enter **DATA** modulated frequency for each row listed in table 18. Distortion measurement on measuring receiver will indicate within limits specified.

Table 18. Audio FM Distortion

Test instrument **DATA** modulated frequency	Measure receiver distortion indications ≤ (%)
20 Hz	2
400 Hz	2
1 kHz	2
100 kHz	2

(8) Perform steps (a) through (d) below for each row in table 19:

(a) Press TI **ENTRY - FREQ** pushbutton and enter **DATA** carrier frequency as listed.
(b) Press TI **ENTRY – MOD FREQ** pushbutton and enter **DATA** modulation frequency as listed.
(c) Press TI **ENTRY – FM** pushbutton and enter **DATA** frequency modulation as listed.

(d) Using measuring receiver, measure FM deviation. Measuring receiver deviation will indicate within limits specified in table 19.

Table 19. FM Deviation

Test instrument			Measuring receiver indications (kHz deviations)	
DATA carrier frequency (MHz)	**DATA** modulation frequency (kHz)	**DATA** frequency modulation (FM) (kHz)	Min	Max
1050	100	100	95	105
256	100	25	23.7	26.3
256	100	187	177.6	196.4
256	100	375	356.2	393.8
50	10	150	142.5	157.5

b. Adjustments. No adjustments can be made.

17. Phase Modulation

a. Performance Check

(1) Set measuring receiver to measure FM with a 300 Hz high pass filter and a 15 kHz low pass filter.

(2) Press TI pushbuttons as listed in (a) through (k) below:

(a) **INSTR PRESET**.
(b) **ENTRY - AMPTD**.
(c) **DATA - (+10 dBm)**.
(d) **SHIFT**.
(e) **ENTRY - ΦM**.
(f) **MODULATION SOURCE - EXT DC**.
(g) **ENTRY - MOD FREQ**.
(h) **DATA - 1 kHz**.
(i) **SHIFT**.
(j) **ENTRY- MOD OUT**.
(k) **DATA - (+1 V)**.

(3) Perform steps (a) through (c) below for each row in table 20.

(a) Press **ENTRY – FREQ** and enter **DATA** carrier frequency.

(b) Press **SHIFT - ΦM** and enter **DATA** rad.

(c) Set the measuring receiver to measure the PM. Phase modulation will indicate within limits specified.

Table 20. PM Accuracy

Test instrument **DATA** carrier frequency	Test instrument **DATA** phase modulation	Measuring receiver phase modulation indications (rad)	
		Min	Max
8 MHz	75 rad	71.2	78.8
1050 MHz	100 rad	94.9	105.1
500 kHz	100 rad	94.9	105.1

(4) Perform steps (a) through (c) below for each row in table 21.

(a) Press **ENTRY – FREQ** and enter **DATA** carrier frequency.
(b) Press **SHIFT - ΦM** and enter **DATA** rad.
(c) Using measuring receiver, measure the audio distortion. Distortion will indicate within limits specified.

Table 21. Audio Distortion at 1 kHz Modulation Frequency

Test instrument **DATA** carrier frequency	Test instrument **DATA** phase modulation	Measuring receiver distortion indications (< %)
8 MHz	75 rad	0.4
1050 MHz	100 rad	0.4
500 kHz	100 rad	0.4

(5) Press **RF OFF/ON** pushbutton to **OFF**.

(6) Disconnect measuring receiver from TI **OUTPUT RF**.

b. Adjustments. No adjustments can be made.

18. Internal Oscillator

a. Performance Check

(1) Connect TI **OUTPUT MOD** to audio analyzer **INPUT HIGH**.

(2) Press TI pushbuttons as listed in (a) through (d) below:

(a) **INSTR PRESET**.
(b) **SHIFT**.
(c) **ENTRY - MOD OUT**.
(d) **DATA - (+1 V)**.

(3) Press TI **ENTRY – MOD FREQ** pushbutton and enter **DATA** modulated frequency for each row in table 22. Set audio analyzer to measure distortion. Audio analyzer will indicate within limits listed in table 22.

Table 22. Internal Oscillator Distortion

Test instrument **DATA** modulated frequency	Audio analyzer distortion indications <(%)
20 Hz	0.02
100 Hz	0.02
1 kHz	0.02
10 kHz	0.02
15 kHz	0.02
30 kHz	0.15
100 kHz	0.15

(4) Press TI **ENTRY – MOD FREQ** pushbutton and enter **DATA** modulated frequency for each row in table 23. Set audio analyzer to measure frequency. Audio analyzer will indicate within limits listed in table 23.

Table 23. Internal Oscillator Frequency

Test instrument **DATA** modulated frequency settings	Audio analyzer indications (Hz)	
	Min	Max
20 Hz	19.6	20.4
100 Hz	98	102
1 kHz	980	1020
10 kHz	9800	10200
50 kHz	49000	51000
100 kHz	98000	102000

(5) Disconnect audio analyzer from TI **OUTPUT MOD.**

b. Adjustments. No adjustments can be made.

19. Power Supply

a. Performance Check

NOTE

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

(1) Deenergize TI and remove top cover.

(2) Set **POWER** switch **ON** and allow sufficient time to warm-up.

(3) Connect multimeter **HI INPUT** to test points listed in table 24 and connect **LO INPUT** to chassis ground.

(4) If multimeter does not indicate within specifications listed in table 24, perform **b** below:

(5) Remove test leads and deenergize TI.

(6) Replace TI cover.

b. Adjustments

NOTE

Turn adjustment screw next to test points listed in table 24.

Table 24. Power Supply

Test point (**HI INPUT**)	Adjustments	Adjust to read V dc (R)	
		Min	Max
A17TP1	A17R18	+14.85	+15.15
A17TP2	A17R36	-14.85	-15.15
A17TP3	A17R53	+5.148	+5.252
A17TP4	A17R66	-5.148	-5.252
A17TP5	A17R76	+49.50	+50.50

20. Final Procedure

a. Deenergize and disconnect all equipment.

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

0812806

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342267, requirements for calibration procedure TB 9-6625-2182-24.

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.