TB 9-6625-2182-35

CHANGE 1

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
1 August 2003

Approved for public release; distribution is unlimited.

TB 9-6625-2182-35, 29 October 2001, is changed as follows:

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Remove Pages	Insert Pages
1 and 2	1 and 2
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17 and 18	17 and 18

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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 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.

CHANGE 1

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 (10% to 90%) <0.5 microsecond
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. 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	Distortion capability: ≤.02% Range: 20 Hz to 100 kHz	Boonton, Model 1120-S/10 (MIS-35954/2)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	General Radio, Type W10MT3AS3 (7910809) or Ridge, Model 9020A (9020A) or Ridge, Model 9020F (9020F)
FREQUENCY COUNTER	Range: 20 Hz to 500 MHz Accuracy: ±2.5 ppm or .00025%	Hewlett-Packard, Model 5345A (MIS-28754/1 Type 1)
MEASURING RECEIVER	Frequency measurement: Range: 1100 to 1900 MHz Accuracy: ±2.25 ppm 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	Hewlett-Packard, Model 8902A w/sensors, Hewlett-Packard, Model 11722A (11722A) and 11792A (11792A), and microwave converter, model 11793A (11793A), and signal generator, Hewlett-Packard Model 8643M (SG1219).
MULTIMETER	Range: 50 to -15 V dc Accuracy: ±.25%	John Fluke, Model 8840A/AF-05/09 (AN/GSM-64D)
OSCILLOSCOPE	Range: 50 Hz Accuracy: <125 ns risetime	(OS-291/G)

Table 2. Minimum Specifications of Equipment Required - Continued

Common name	Minimum use specifications	Manufacturer and model (part number)
PULSE GENERATOR	Amplitude: 5 V Period: 10 ms to 20 µs Width: 5 ms to 6 µs	LeCroy, Model 9210 (9210) w/plug-ins, Lecroy, Models 9211 (9211) and 9215 (9215)
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-489A)

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.

NOTE

For the remainder of this procedure the SG-1219/U connected to the measuring receiver will be called the local oscillator.

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 **CHANNEL 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.

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
500 MHz	499.995000 MHz	500.005000 MHz

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

(3) Disconnect frequency counter from TI **OUTPUT RF**.

(4) Connect measuring receiver with sensor module (11792A) to TI **OUTPUT RF**.

NOTE

If necessary, zero, calibrate, and save sensor values.

(5) Set up measuring receiver to measure frequency at 10 Hz resolution (7.1 SPCL).

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

(7) Press **ENTRY – FREQ** pushbutton and enter **DATA** frequency for each row in table 5. Using measuring receiver and frequency measurement techniques, frequency will indicate within limits specified.

NOTE

In table 5, set up measuring receiver for frequency offset measurement when necessary.

Table 5. Frequency

Test instrument **DATA** frequency	Measuring receiver indications (MHz)	
	Min	Max
1300 MHz	1299.987000	1300.013000
1900 MHz	1899.981000	1900.019000

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

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

b. Adjustments. No adjustments can be made.

10. RF Output

a. Performance Check

(1) Set measuring receiver as listed in (a) through (f) below:

(a) Connect sensor module (11722A) to measuring receiver.
(b) Zero, calibrate, and save sensor values.
(c) Press **INSTR PRESET** pushbutton.
(d) Press **LOG/LIN** to **LOG** (dBm) pushbutton.
(e) Enter **32.0 SPCL** (0.01 dB resolution).
(f) Connect sensor module (11722A) to TI **OUTPUT RF** connector.

(2) Connect TI **EXT REF INPUT** (rear panel) to measuring receiver local oscillator **10 MHz OUT** (rear panel).

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

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

(4) 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

Table 6. RF Output - Continued

Test instrument **DATA** amplitude	Measuring receiver indications (dBm)	
	Min	Max
-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.

(5) 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 (11722A) to measure RF power in logarithmic mode, then select the 0.01 dB mode using special function 32.0.

(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 (11722A) to measure tuned RF level in logarithmic mode, then select 0.01 dB mode using special function 32.0.

(3) Press measuring receiver **CALIBRATE**, and **SET REF** keys.

(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**W to TI **OUTPUT RF**.

(2) Connect TI **EXT REF INPUT** (rear panel) to spectrum analyzer **10 MHz REF IN/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	<-45
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 (g) below:

(a) **INSTR PRESET**.
(b) **AMPLITUDE – REF LVL**.
(c) **DATA - (+10 dBM).**
(d) **FREQUENCY - CENTER FREQ**.
(e) **DATA - 1 GHz**.
(f) **SPAN**.
(g) **DATA - 1.5 MHz**.

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

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

(a) **CONTROL - BW**.
(b) **RES BW**.
(c) **DATA - 100 kHz**.
(d) **VIDEO BW**.
(e) **DATA - 1 kHz**.
(f) **MARKER - ON**.
(g) **SPAN**.
(h) **DATA - 0 Hz**.
(i) **CONTROL - SWEEP**.
(j) **DATA - 30 ms**.
(k) **CONTROL - TRIG**.
(l) **VIDEO**.
(m) **DATA - (-10 dBm)**.
(n) **MARKER – ON**.
(o) Adjust **MARKER** control to top of squarewave.
(p) **MARKER DELTA**.
(q) Adjust **DELTA** control 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 CH 1 to TI **OUTPUT RF**, using crystal detector.

(12) Adjust pulse generator ouput 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 (11722A) to TI **OUTPUT RF**.

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

(3) Connect measuring receiver **MODULATION OUTPUT/AUDIO INPUT** to audio analyzer **INPUT HIGH**.

(4) 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)**.

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

(6) 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

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

(8) Set audio analyzer to measure distortion.

(9) 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

(10) Press TI **ENTRY – AM** pushbutton and enter **DATA** percent of modulation for each row in table 16. Using audio analyzer, 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	Audio analyzer distortion indications (<%)
30%	1.5
60%	3
90%	5

(11 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/**F **M**.

(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) Set audio analyzer to measure distortion.

(7) 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**.

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

Table 18. Audio FM Distortion

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

(9) Perform steps (a) throught (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			Modulation analyzer 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) Set audio analyzer to measure distortion.

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

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

(4) Perform steps (a) through (c) below for each row in table 20:

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

(b) Press **SHIFT -** F **M** 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

(5) Perform steps (a) through (c) below for each row in table 21:

(a) Press **ENTRY – FREQ** and enter **DATA** carrier frequency.
(b) Press **SHIFT -** F **M** and enter **DATA** rad.
(c) Using audio analyzer, 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	Audio analyzer distortion indications (< %)
8 MHz	75 rad	0.4
1050MHz	100 rad	0.4
500 kHz	100 rad	0.4

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

(7) 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** positive lead to test points listed in table 24 and connect **LO INPUT** negative lead 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:

Official:

JOHN M. KEANE
General, United States Army
Acting Chief of Staff

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0124803

Distribution:

To be distributed in accordance with IDN requirements for calibration procedure TB 9-6625-2182-35.

THESE ARE THE INSTRUCTIONS FOR SENDING 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@avma27.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**: 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
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.

PIN: 063109-000