*TB 9-6625-2235-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SPECTRUM ANALYZER HEWLETT-PACKARD, MODEL 8558B

Headquarters, Department of the Army, Washington, DC
24 March 2009

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 technical bulletin supersedes TB 9-6625-2235-35 dated 3 December 1990.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Spectrum Analyzer, Hewlett-Packard, Model 8558B. 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 6 hours, using the dc and low frequency and microwave 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
Calibrator	Frequency: 280 MHz Power output: -30 dBm Frequency accuracy: ± 300 kHz (SN 2118A and below ±50 kHz) Power output accuracy: ±1 dBm
Sweep time	Range: 0.1 ms/div to 50 ms Accuracy: ±10%
Span width	Frequency range: 5 kHz to 100 MHz Accuracy: Frequency error between any two points is less than ±5% of the indicated frequency separation
Frequency	Range: 100 kHz to 1500 MHz Accuracy: 0 to 195 MHz, ±(l MHz +20% of freq span/div switch setting) 195 to 1500 MHz, ±(5 MHz +20% of freq span/div switch setting)
Resolution bandwidth	Range: 1 kHz to 3 MHz Accuracy: ±20%
Input attenuator	Range: 0 to 70 dB at 30 MHz Accuracy: ±.5 dB per 10 dB step Maximum cumulate error: 0 to 70 dB <=±1.0 dB

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Reference level	Range: -112 to +60 dBm Step accuracy: Steps referenced with 0 dB input attenuation: -10 to -80 dBm: ±0.5 dB -10 to -100 dBm: ±1.0 dB Vernier accuracy: ±0.5 dB
Frequency response	Range: 100 kHz to 1500 MHz Accuracy: ±1 dB with 10 dB input attenuation
Residual FM	Less than 1 kHz peak-to-peak for time < 0.1 s
Noise sidebands	Sidebands existing more than 50 kHz from 400 MHz signal will be more than -65 dB from reference with 1 kHz resolution bandwidth and full video filtering

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 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. Where the four-to-one ratio cannot be met, the four-to-one accuracy will be listed, and 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. The following peculiar accessories are also required for this calibration and must be supplied with TI: Display Mainframe, Hewlett-Packard, Model 180 series with 807 Option and Extender Cable Assembly, Hewlett-Packard, Model 5060-0303.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
ATTENUATOR (FIXED)	Range: 10 dB Frequency: 100 kHz to 1500 MHz Accuracy: ±0.5 dB	Weinschel, Model 9918-10 dB (9918-10dB)
COMB GENERATOR	Frequency: 500 to 1500 MHz Accuracy: ±0.5%	Tektronix, Type 067-0885-00 (067-0885-00)
FREQUENCY COUNTER	Range: 0.9 to 540 ms Accuracy: ±1.9% Range: 279.7 to 280.05 MHz Accuracy: ±0.005%	Fluke, Model PM6681/656 (PM6681/656)

Table 2. Minimum Specifications of Equipment Required - Continued

Common name	Minimum use specifications	Manufacturer and model (part number)
MEASURING RECEIVER	Range: 0 to 75.5 dB Frequency: 0.30 GHz Accuracy: ±0.125 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)
MULTIMETER	Range: 92 mV to 14.52 V dc Accuracy: ±0.03%	Hewlett-Packard, Model 3458A (3458A)
OSCILLOSCOPE	Time: 2 ms per division Amplitude: 2 V per division Range: -5 to +5 V dc Accuracy: ±3%	(OS-303/G)
POWER METER	Frequency range: 10 to 1500 MHz Accuracy: ±.25 dB (±.7 dB) Power range: -16.7 to - 10 dBm	Hewlett-Packard, Model E12-432A (MIS-30525) w/thermistor mount, Hewlett-Packard, Model H75-478A (7915907) or 8478B (8478B)
POWER SPLITTER	Frequency range: 279.7 to 280.3 MHz Output tracking between ports: ±0.15 dB	Weinschel, Model 1870A (7916839)
SIGNAL GENERATOR	Range: 80 to 1505.2 MHz Accuracy: ±0.09% Power range: +10 to -30 dBm	Aeroflex, Model 2023B (2023B) or SG-1207/U
SYNTHESIZER/LEVEL GENERATOR	Range: 5 kHz to 80 MHz Accuracy: Frequency ±0.5% Flatness ±.25 dB Amplitude range: -70.5 to 10 dBm	Hewlett-Packard, Model 3335AOPT 001-KO6 (MIS-35938)
VARIABLE ATTENUATOR	Range: 0 to 60 dB Accuracy: ±0.02 dB per 10 dB step with correction chart	Weinschel, Model AF117A-69-34 (AF117A-69-34)

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. 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.

CAUTION

To avoid damage to test instrument do not exceed +30 dBm, (1 W, 7.1 V rms) to INPUT 50 Ω connector.

Do not use **FIND BEAM** control of display mainframe when TI is installed in oscilloscope.

a. Press display mainframe **LINE** pushbutton to **OFF** position.

b. Install extender cable (Hewlett-Packard, Model 5060-0303) between TI and display mainframe. Remove orange (pin 3) and yellow (pin 4) on A15 board (spectrum analyzer rear) and connect extender cable insulated alligator clips to pins 3 and 4.

c. Connect display mainframe to ac power source and press **LINE** pushbutton to **ON** position. Allow TI to warm-up for 30 minutes.

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

(1) **INPUT ATTEN (dB)** switch to **10 dB** (push knob to engage) (for older plugins, **OPTIMUM INPUT** to **-30 dBm).**

(2) **REFERENCE LEVEL** switch to **0 dBm**.

(3) **REF LEVEL FINE** control to **0 dBm**.

(4) Press **LIN** pushbutton in.

(5) **FREQ SPAN/DIV** switch to **10 MHz** (uncoupled).

(6) **RESOLUTION BW** switch to **1 MHz** (uncoupled).

(7) **SWEEP TIME/DIV** switch to **AUTO**.

(8) **SWEEP TRIGGER** switch to **FREE RUN**.

(9) **CENTER-START** pushbutton to **CENTER**.

(10) **TUNING** control to **>60 MHz**.

(11) **BASELINE CLIPPER** control to **OFF** position.

(12) **VIDEO FILTER** control to **OFF** position.

e. Position display mainframe controls as listed in (1) through (5) below:

(1) **DISPLAY** switch to **INT**.

(2) **MAGNIFIER** switch to **X1**.

(3) **SCALE (180TR, 182T)** control to **OFF**.

(4) **PERSISTENCE (181T/TR)** control to **MIN**.

(5) **DISPLAY MODE (180T/TR) switch** to **WRITE**.

f. Position crt trace on horizontal graticule line near crt center with **VERTICAL POSN** control and reduce amount of intensity to prevent burning crt phosphor.

g. Set **SWEEP TIME/DIV** switch to **MAN** and center crt dot with **MAN SWEEP** control.

CAUTION

A high intensity dot left on crt for prolonged periods can burn the phosphor.

h. Adjust **FOCUS** and **ASTIG** controls for smallest round dot possible.

i. Set **SWEEP TIME/DIV** switch to **AUTO** and increase amount of intensity for an optimum crt trace.

j. Center crt trace with **HORIZONTAL POSITION** control. Adjust **HORIZ GAIN** control (located on TI rear panel) for exactly 10 divisions.

k. Position crt trace parallel to horizontal graticule line with **TRACE ALIGN** control, and adjust **VERTICAL POSN** control to align crt trace with bottom graticule line.

l. Center **LO** feedthrough signal on crt with **TUNING** control and press **FREQUENCY CAL** pushbutton three times.

m. Set **FREQ SPAN/DIV** switch to **200 kHz** and press **FREQUENCY CAL** pushbutton.

n. Position signal peak near top crt graticule line with **REF LEVEL FINE** control.

o. Center **LO** feedthrough signal on crt with **TUNING** control and adjust **FREQUENCY ZERO** control for 00.0 MHz indication on **FREQUENCY MHz** readout display.

p. Set **FREQ SPAN/DIV** switch to **1 MHz** and **REF LEVEL FINE** control to **0**.

q. Adjust **TUNING** control for **FREQUENCY MHz** indication of approximately 280 MHz.

r. Press **10 dB/DIV** pushbutton in and set **REFERENCE LEVEL** switch to **-20 dBm**.

s. Connect **280 MHz CAL OUTPUT** to TI **INPUT 50Ω**.

t. Center signal on crt with **TUNING** control and press **FREQUENCY CAL** pushbutton three times. **FREQUENCY MHz** readout will indicate between 275 and 285 MHz.

u. Press **LIN** pushbutton in.

v. Position signal peak at top crt graticule line with **REF LEVEL FINE** control.

w. Press **10 dB/DIV** pushbutton in and adjust **VERTICAL GAIN** control to position signal peak at top crt graticule line.

x. Repeat (u) through (w) above until signal peak remains at top crt graticule line when amplitude scale is changed from **10 dB/ DIV** to **LIN** and back to **10dB/DIV**.

y. Set **REF LEVEL FINE** control to **0**, and **REFERENCE LEVEL** switch to **-30 dBm**.

z. Press **LIN** pushbutton in and position signal peak at top crt graticule line with **REF LEVEL CAL** control.

NOTE

Refer to major assembly location (fig. 1) for board location.

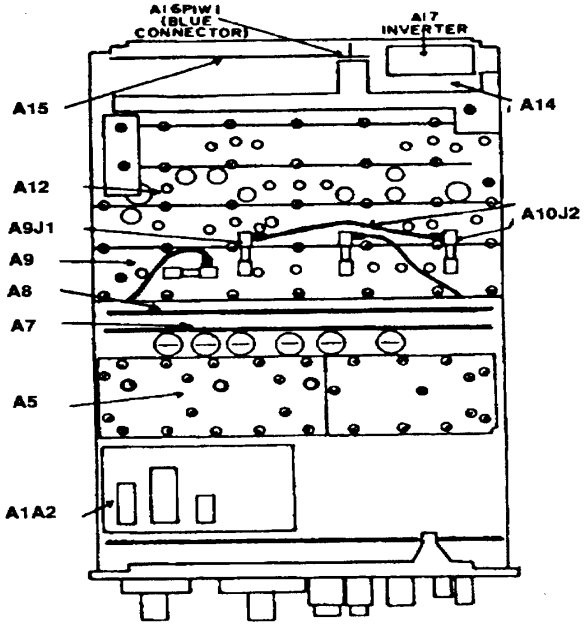

Figure 1. Major assembly locations.

8. Calibrator Output Accuracy

a. Performance Check

(1) Connect **280 MHz CAL OUTPUT** to **INPUT 50Ω**.

(2) Center 280 MHz signal on crt with **TUNING** control and press **FREQUENCY CAL** pushbutton.

NOTE

Adjust **INPUT ATTEN** control (if necessary) for a measurable signal.

(3) Press in **1 dB/DIV** pushbutton and recenter signal on crt with **TUNING** control.

(4) Position signal peak on top crt graticule line with **REFERENCE LEVEL** and **REF LEVEL FINE** controls.

NOTE

Signal position and amplitude established in (3) and (4) above will be used as references in (7) below.

(5) Disconnect **280 MHz CAL OUTPUT** to **INPUT 50Ω** and connect equipment as shown in figure 2 (connection A).

(6) Set variable attenuator to 20 dB.

(7) Adjust signal generator frequency and power output level to match references established in (3) and (4) above.

(8) If power meter indication is not between -9 and -11 dBm, perform **b** (1) through (3) below.

NOTE

Variable attenuator and power splitter errors must be included in (8) above.

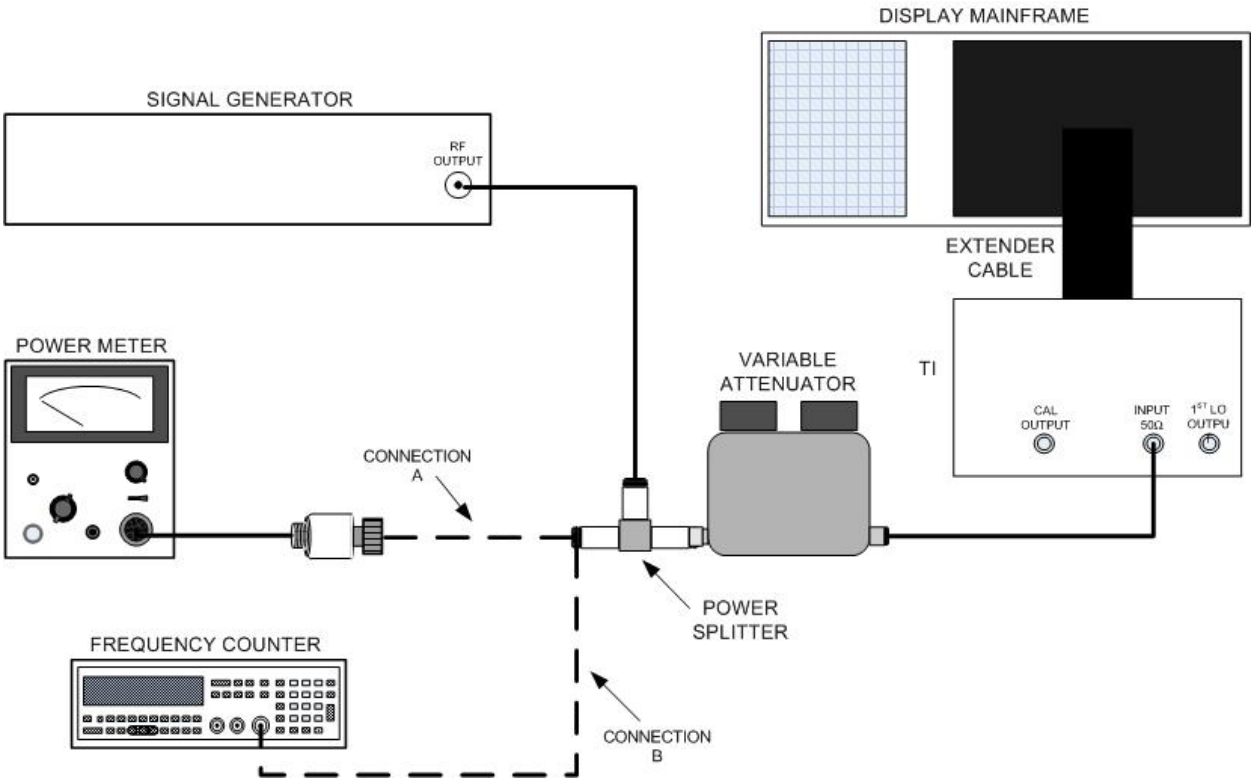

Figure 2. Calibrator levels - equipment setup.

(9) Connect equipment as shown in figure 2 (connection B). If frequency counter does not indicate between 279.7 and 280.3 MHz (SN 2118A and below, 279.95 and 280.05 MHz), perform **b** (4) through (6) below.

b. Adjustments

(1) Adjust signal generator frequency to 280 MHz and output RF level for a -10 dBm indication on power meter. Record signal position and amplitude on crt.

NOTE

Variable attenuator and power splitter errors must be included in **b** (1) above.

(2) Disconnect equipment as shown in figure 2 and connect **280 MHz CAL OUTPUT** to **INPUT 50Ω**.

(3) Adjust A9R5 (fig. 3) to position signal peak to reference established in (1) above (R).

(4) Connect **CAL OUTPUT** to **INPUT 50Ω**.

(5) Center 280 MHz signal on TI display.

(6) Adjust A9L4 (fig. 3) for a maximum signal amplitude indication on TI display (R).

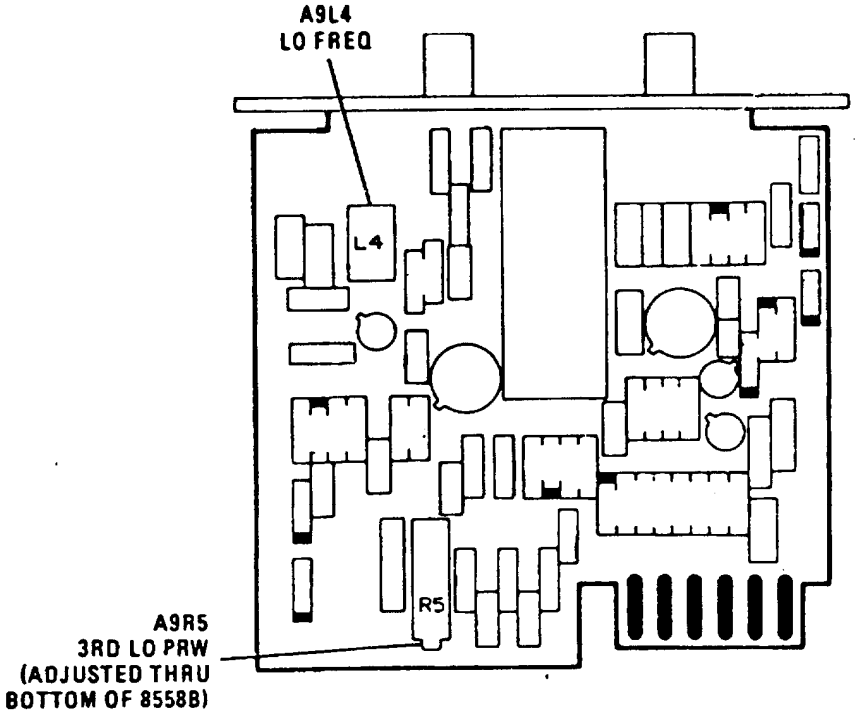

Figure 3. Adjustment location.

9. Sweep Time

a. Performance Check

(1) Connect equipment as shown in figure 4.

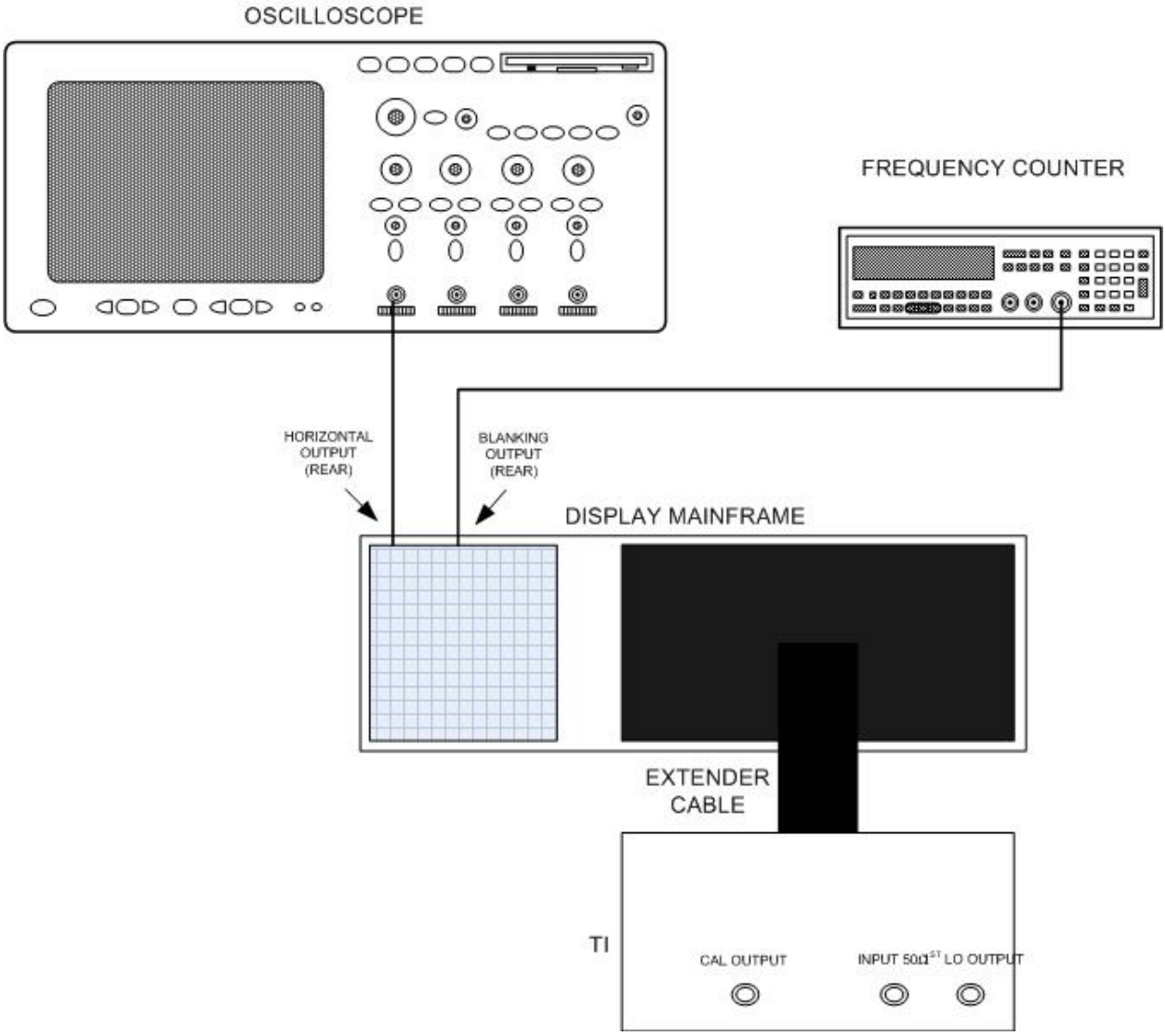

Figure 4. Sweep time - equipment setup.

(2) Set **SWEEP TIME/DIV** switch to **1 ms** and **SWEEP TRIGGER** switch to **FREE RUN**.

(3) Measure ramp and dead time with oscilloscope. Ramp voltage will be approximately -5 to +5 V and dead time will be between 0.25 and 0.40 ms. Record actual dead time value.

(4) Set **SWEEP TIME/DIV** switch to **5 ms (2 ms** for SN prefixed 2215A and below). Measure and record dead time of ramp. Dead time of ramp will be between 6 and 9 ms.

(5) Set **SWEEP TIME/DIV** switch to **1 ms**. If frequency counter does not indicate 10 ms + dead time of ramp [(3) above] ±0.8 Ms, perform **b** (1) below.

(6) Set **SWEEP TIME/DIV** switch to **5 ms (2 ms** for SN prefixed 2215A and below). If frequency counter does not indicate 50 ms + dead time of ramp [(4) above] ±4.0 ms (20 ms + dead time of ramp [(4) above] ±1.5 ms for SN prefixed 2215A and below), perform b (2) below.

(7) Set **SWEEP TIME/DIV** switch to settings listed in table 3, and after subtracting dead time from frequency counter indication. If difference is not within specified limits, perform the listed adjustment step.

Table 3. Sweep Time

Test instrument		Frequency counter period indication minus dead time (ms)		Adjustment step
SWEEP TIME/DIV switch	Dead time			
settings (ms)	(step)	Min	Max	(b)
.1	3	0.9	1.1	1
.2	3	1.8	2.2	1
.5	3	4.6	5.4	1
1	3	9.2	10.8	1
2	4	18.5	21.5	1
5	4	46	54	2
10	4	92	108	2
20	4	184	216	2
50	4	460	540	2

b. Adjustments

NOTE

Repeat measurements and adjustments as listed in table 3 until all sweep times are within specified limits.

Adjustments for SN prefix 2215A and below are shown at figure 5 and SN prefix 2332A are shown at figure 6.

(1) Subtract dead time value recorded in (3) above from frequency counter indication and adjust A8R10 (SN prefix 2215A and below, fig. 5) or (SN prefix 2332A, fig. 6) for frequency counter in limits indication listed in table 3.

(2) Subtract dead time recorded in (4) above from frequency counter indication and adjust A8R13 (SN prefix 2215A and below, fig. 5) or (SN prefix 2332A, fig. 6) for frequency counter in limits indication listed in table 3.

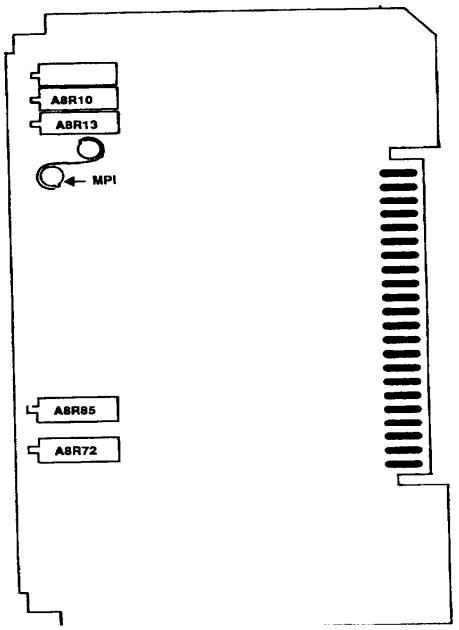

Figure 5. A8 sweep generator - component and test point locations (SN prefix 2215A and below

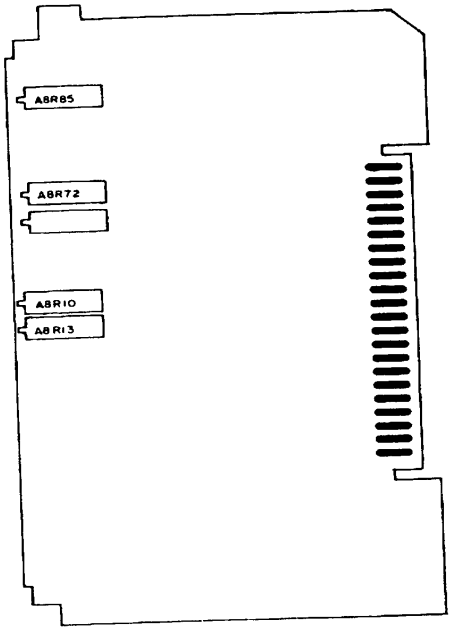

Figure 6. A8 sweep generator assembly - component locations (SN prefix 2332A)

10. Span Width and Frequency Accuracy

a. Performance Check

(1) Connect equipment as shown in figure 7.

(2) Position controls as listed in (a) through (g) below.

(a) **FREQ SPAN/DIV** switch to **20 MHz**.

(b) **RESOLUTION BW** (**RES BW**) switch pushed in to **OPTIMUM** (coupled).

(c) **INPUT ATTEN** switch to **0 dB** (**OPTIMUM INPUT** switch to **-40 dBm**).

(d) **REFERENCE LEVEL** switch to **-20 dBm**.

(e) **10 dB/DIV** pushbutton pressed in.

(f) **TIME/DIV** switch to **AUTO**.

(g) **SWEEP TRIGGER** switch to **FREE RUN**.

(3) Position **LO** feedthrough signal on center crt vertical graticule line with **TUNING** control.

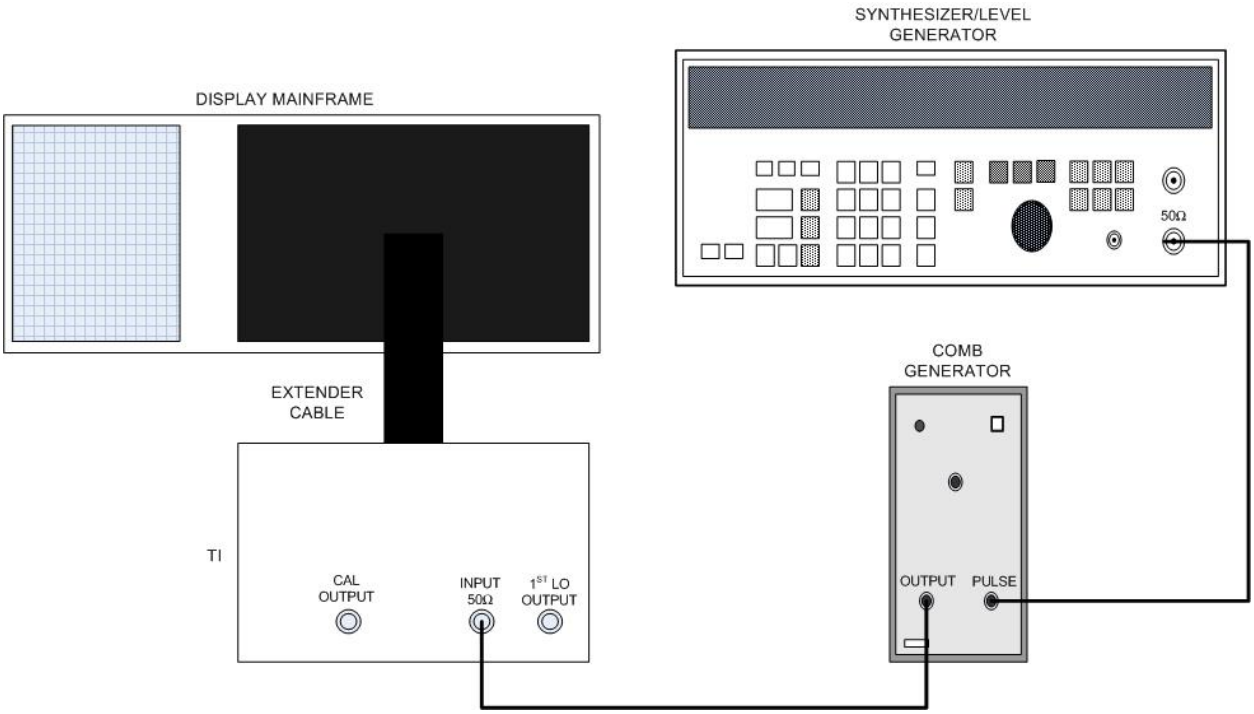

Figure 7. Span width and frequency accuracy - equipment setup.

(4) Depress **FREQUENCY CAL** pushbutton and adjust **FREQUENCY ZERO** control for zero indication on **FREQUENCY MHz** readout.

(5) Repeat (3) and (4) above until **LO** feedthrough signal remains positioned on center vertical graticule line of crt.

(6) Adjust synthesizer/level generator frequency to 20 MHz and amplitude output level to +10 dBm.

(7) Adjust **TUNING** control for 500 MHz indication on **FREQUENCY MHz** readout.

(8) Press **FREQUENCY CAL** pushbutton and center 500 MHz comb signal on crt with **TUNING** control.

(9) Adjust **RESOLUTION BW** and **INPUT ATTEN** (**OPTIMUM INPUT**) switches to view 20 MHz comb signal on crt.

(10) Adjust **TUNING** control to position a 20 MHz comb signal on lst vertical graticule line (fig. 8).

(11) Press **FREQUENCY CAL** pushbutton.

(12) Repeat (10) above.

(13) The 9th spectral signal will be within ±0.4 division of 9th vertical graticule line (fig. 8); if not, perform **b** below.

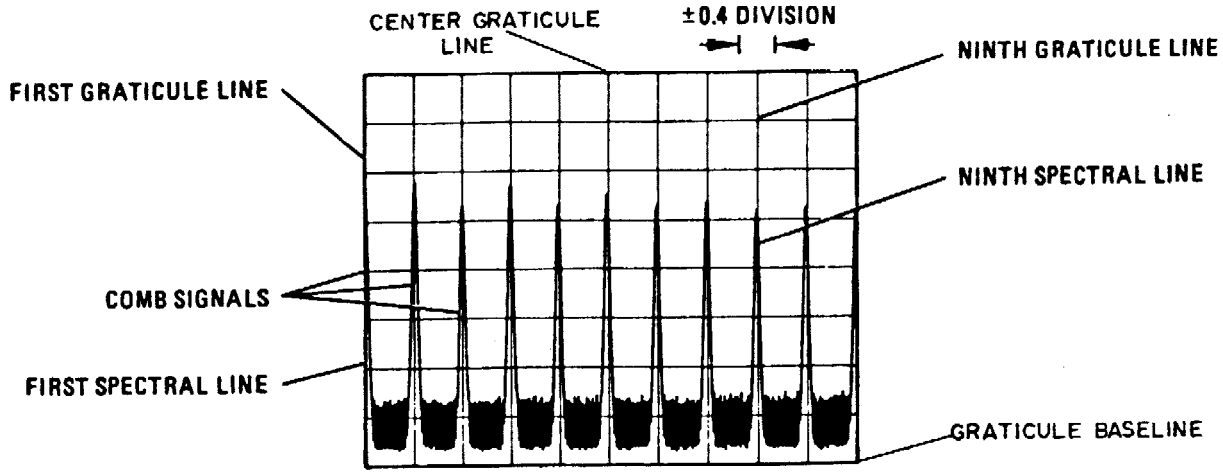

Figure 8. Frequency span accuracy measurement for 9th spectral line.

(14) Repeat technique of (10) through (13) above for **FREQ SPAN/DIV** switch settings and synthesizer/level generator frequencies as listed in table 4.

NOTE

Adjust **RESOLUTION BW** switch, as necessary, to view signal.

(15) Disconnect synthesizer/level generator output from pulse 50Ω input of comb generator and set **FREQ SPAN/DIV** switch to **100 MHz.**

Table 4. Frequency Span Accuracy

Test instrument **FREQ SPAN/DIV** switch settings	Synthesizer/level generator frequencies
10 MHz	10 MHz
5 MHz	5 MHz
2 MHz	2 MHz
1 MHz	1 MHz
500 kHz	500 kHz
100 kHz	100 kHz
20 kHz	20 kHz
5 kHz	5 kHz

(16) Adjust **TUNING** control for **1000 MHz** indication on **FREQUENCY MHz** display and position a 500 MHz comb signal on lst vertical graticule line (fig. 8).

(17) Press **FREQUENCY CAL** pushbutton and repeat (16) above.

(18) If the second comb signal (1000 MHz) is not within ±0.2 division of center vertical graticule line (fig. 8), perform **b** below.

(19) Center **LO** feedthrough signal on crt with **TUNING** control.

(20) Press **FREQUENCY CAL** pushbutton and repeat (19) above.

(21) Adjust **FREQUENCY ZERO** control for 00.00 indication on **FREQUENCY MHz** readout.

(22) Disconnect comb generator output from **TI INPUT 5OΩ.**

(23) Connect synthesizer/level generator 50Ω output to **TI INPUT 50Ω**.

(24) Adjust synthesizer/level generator frequency to 2 MHz and output amplitude level to -10 dBm.

(25) Set **FREQ SPAN/DIV** switch to **100 kHz.**

(26) Adjust **TUNING** control for 2 MHz indication on **FREQUENCY MHz** readout.

NOTE

Adjust **INPUT ATTEN (OPTIMUM INPUT)** switch for workable signal level.

(27) Press **FREQUENCY CAL** pushbutton.

(28) Center signal on crt with synthesizer/level generator frequency controls. If synthesizer/level generator indication is not between .980 and 3.02 MHz, perform **b** below.

(29) Repeat technique of (24) through (28) above for **FREQUENCY MHz** readout, **FREQ SPAN/DIV** switch settings, synthesizer/level generator, and signal generator frequencies listed in table 5.

Table 5. Frequency Accuracy

Test instrument		Synthesizer/level generator or signal generator frequency (MHz)	
FREQUENCY MHz readout (MHz)	**FREQ SPAN/DIV** switch settings	Min	Max
10	200 kHz	8.96	11.04
50	200 kHz	48.96	51.04

Table 5. Frequency Accuracy - Continued

Test instrument		Synthesizer/level generator or signal generator frequency (MHz)	
FREQUENCY MHz readout (MHz)	**FREQ SPAN/DIV** switch settings	Min	Max
100[1]	200 kHz	98.96	101.04
140	200 kHz	138.96	141.04
180	200 kHz	178.96	181.04
200	1 MHz	194.8	205.2
400	1 MHz	394.8	405.2
600	1 MHz	594.8	605.2
800	1 MHz	794.8	805.2
1000	1 MHz	994.8	1005.2
1200	1 MHz	1194.8	1205.2
1400	1 MHz	1394.8	1405.2
1500	1 MHz	1494.8	1505.2

[1]Replace synthesizer/level generator with signal generator.

b. Adjustments

(1) Connect multimeter to A7TP7 (fig. 9) and chassis ground. Adjust A7R5 (fig. 9) for a multimeter indication between 14.48 and 14.52 V dc (R).

(2) Disconnect multimeter from A7TP7 (fig. 9) and connect to A7TP6 (fig. 9) and adjust A7R4 (fig. 9) for a multimeter indication between 5.99 and 6.01 V dc (R).

(3) Set **FREQ SPAN/DIV** switch to **5 MHz** and **RESOLUTION BW** switch to **100 kHz**.

(4) Turn **FREQUENCY ZERO** control fully ccw.

(5) Adjust **TUNING** control for **FREQUENCY MHz** readout of approximately -16.0.

(6) Press **FREQUENCY CAL** pushbutton and adjust A7R3 (fig. 9) to center **LO** feedthrough (within ±1 division) on crt (R).

NOTE

Press **FREQUENCY CAL** pushbutton whenever **TUNING** control is adjusted. Disconnect comb generator, when necessary, to center **LO** feedthrough.

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

(a) **FREQ SPAN/DIV** switch in to couple position.

(b) **RESOLUTION BW** switch in to couple position.

(c) **FREQ SPAN/DIV** switch to **100 MHz/DIV**.

(d) **TUNING** control to **500 MHz** indication on **FREQUENCY MHz** readout.

(8) Connect comb generator to TI **INPUT 50Ω**.

(9) Adjust **TUNING** control, A7R1 and A7R2 (fig. 9) to position a comb signal on lst vertical graticule line and a second comb signal on 6th (center) vertical graticule line (R).

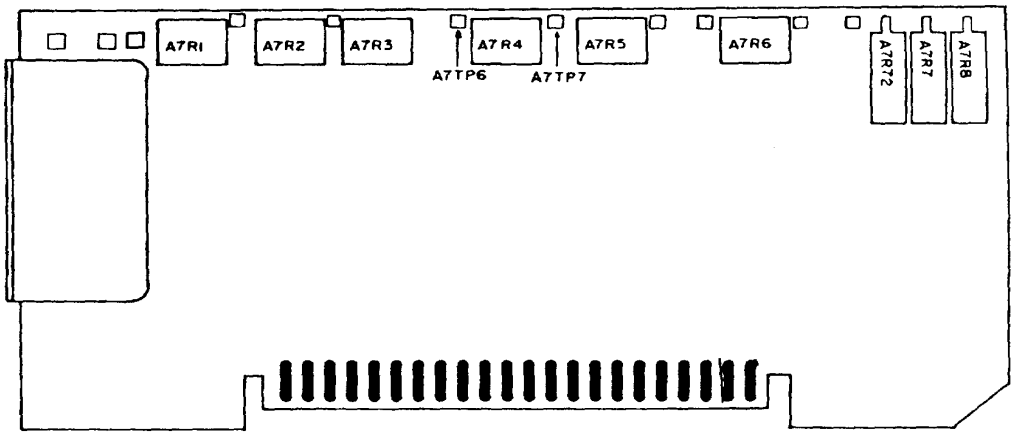

Figure 9. A7 frequency control - adjustment locations.

(10) Repeat (5) and (6) above.

(11) Connect equipment as shown in figure 7.

(12) Adjust synthesizer/level generator frequency to 1 MHz and RF output amplitude to +10 dBm.

(13) Set **FREQ SPAN/DIV** switch to **1 MHz**.

(14) Adjust **TUNING** control to approximately 11 MHz for view of one comb signal per division and press **FREQUENCY CAL** pushbutton.

(15) Adjust A7R6 (fig. 9) to align comb signals (one per division) on vertical graticule lines (R).

(16) Disconnect equipment shown in figure 7 and connect signal generator RF output to TI **INPUT 5OΩ**.

(17) Adjust signal generator frequency to 1500 MHz and RF output level to -10 dBm.

NOTE

RF output level for signal generator will remain at -10 dBm for frequencies of 190 and 200 MHz.

(18) Set **FREQ SPAN/DIV** switch to **500 kHz**.

(19) Center **LO** feedthrough signal on crt with **TUNING** control.

(20) Press **FREQUENCY CAL** pushbutton.

(21) Repeat (19) above.

(22) Adjust **FREQUENCY ZERO** control for 00.0 indication on **FREQUENCY MHz** readout.

(23) Adjust **INPUT ATTEN (OPTIMUM INPUT)** switch for workable signal level on crt.

(24) Adjust **TUNING** control to center 1500 MHz signal on crt.

(25) Press **FREQUENCY CAL** pushbutton and recenter 1500 MHz signal with **TUNING** control. Adjust A1A2R3 (located on A1A2 board) for **FREQUENCY MHz** readout indication between 1499 and 1501 MHz (R).

(26) Adjust signal generator frequency to 190 MHz.

(27) Adjust **TUNING** control to center 190 MHz signal on crt.

(28) Press **FREQUENCY CAL** pushbutton.

(29) Repeat (27) above and adjust A7R7 (fig. 9) for **FREQUENCY MHz** readout indication of 190.0 (R).

(30) Adjust **TUNING** control for **FREQUENCY MHz** readout indication of 198.5 and slowly adjust A7R8 (fig. 9) ccw until range switches (no decimal on **FREQUENCY MHz** readout (R).

(31) Center **LO** feedthrough signal on crt with **TUNING** control.

(32) Press **FREQUENCY CAL** pushbutton.

(33) Repeat (31) above.

(34) Adjust signal generator frequency to 200 MHz.

(35) Center 200 MHz signal on crt with **TUNING** control.

(36) Press **FREQUENCY CAL** pushbutton.

(37) Repeat (35) above and adjust A7R72 (fig. 9) for **FREQUENCY MHz** readout indication of 200.0 (R).

(38) Repeat (17) through (37) above until 190.0, 200, and 1500 MHz readout indications are within specified limits on **FREQUENCY MHZ** readout.

11. Resolution Bandwidth Accuracy

a. Performance Check

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

(a) **TUNING** control to **10 MHz**.

(b) **FREQ SPAN/DIV** switch to **0**.

(c) **RESOLUTION BW** switch to **3 MHz**.

(d) **INPUT ATTEN** switch to **20 dB (OPTIMUM INPUT** switch to **-20 dBm)**.

(e) **REFERENCE LEVEL** switch to **0 dBm**.

(f) **LIN** pushbutton pressed in.

(g) **SWEEP TIME/DIV** switch to **5 Ms**.

(h) **SWEEP TRIGGER** switch to **FREE RUN**.

(2) Connect synthesizer/level generator 50Ω output to TI **INPUT 50Ω**.

(3) Adjust synthesizer/level generator frequency to 10 MHz and output amplitude power level to 0 dBm.

(4) Adjust **TUNING** control to center 10 MHz signal peak on crt. (Reduce synthesizer/level generator output amplitude, if necessary.

(5) Adjust synthesizer/level generator output amplitude control to position trace 7.1 divisions above graticule baseline.

(6) Increase synthesizer/level generator frequency until trace drops to 5 divisions above graticule baseline and record synthesizer/level generator frequency.

(7) Adjust synthesizer/level generator frequency in direction opposite to that in (6) above until trace peaks (7.1 divisions above graticule baseline) and then drops to 5 divisions above graticule baseline. Record synthesizer/level generator frequency.

(8) Subtract frequency recorded in (7) above from frequency recorded in (6) above. If difference is not between 2.40 and 3.60 MHz, perform **b** below.

(9) Set **RESOLUTION BW** switch to **1 MHz** and repeat (3) through (8) above. If difference is not between 800 and 1200 kHz, perform **b** below.

(10) Set **RESOLUTION BW** switch to **300 kHz** and repeat (3) through (8) above. If difference is not between 240 and 360 kHz, and perform **b** below.

(11) Set **RESOLUTION BW** switch to **100 kHz** and repeat (3) through (8) above. If difference is not between 80 and 120 kHz, and perform **b** below.

(12) Disconnect synthesizer/level generator **50Ω OUTPUT** from TI.

(13) Disconnect W7 (red) cable (fig. 1) from A10J2 connector (fig. 1) and connect signal generator RF output to W7 (red) cable (fig. 1).

(14) Adjust signal generator frequency to 301.4 MHz and RF output level to -12 dBm.

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

(a) **INPUT ATTEN** switch to **0 dB** (**OPTIMUM INPUT** switch to **-40 dBm**).

(b) **REFERENCE LEVEL** switch to **-10 dBm**.

(c) **RESOLUTION BW** to **30 kHz**.

(16) Adjust signal generator frequency until TI trace is at peak and adjust signal generator RF output level control to position trace 7.1 divisions above graticule baseline.

(17) Increase signal generator frequency until trace drops to 5 divisions above graticule baseline. Record signal generator frequency.

(18) Adjust signal generator frequency in direction opposite to that of (17) above until trace peaks and then drops to 5 divisions above graticule baseline. Record signal generator frequency.

(19) Subtract frequency recorded in (18) above from (17) above. If difference is not between 24 and 36 kHz, perform **b** below.

(20) Set **RESOLUTION BW** switch to **10 kHz** and repeat (16) through (19) above. If difference is not between 8 and 12 kHz, perform **b** below.

(21) Set **RESOLUTION BW** switch to **3 kHz** and repeat (16) through (19) above. If difference is not between 2.4 and 3.6 kHz, perform **b** below.

(22) Set **RESOLUTION BW** switch to 1 **kHz** and repeat (16) through (19) above. If difference is not between 0.8 and 1.2 kHz, perform **b** below.

(23) Reconnect cable W7P1 (fig. 1) to A10J2 (fig. 1) connector.

b. Adjustments

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

(a) **TUNING** control to **280 MHz**.

(b) **FREQ SPAN/DIV** switch to **200 kHz**.

(c) **RESOLUTION BW** switch to **1 MHz**.

(d) **INPUT ATTEN** switch to **0 dB** (**OPTIMUM INPUT** switch to **-40 dBm**).

(e) **REFERENCE LEVEL** switch to **-20 dBm**.

(2) Connect **CAL OUTPUT** to **INPUT 50Ω**.

(3) Adjust **REF LEVEL FINE** control to position signal level 7.1 divisions above graticule baseline.

(4) Adjust A8R85 (fig. 5 for SN prefixed 2215A and below), (fig. 6 for SN prefixed 2332A), or A8R4 for SN prefixed 1707A (located on A8 board) to set bandwidth of 5 divisions wide at 5th graticule line above graticule baseline (R).

NOTE

Perform (5) through (21) below for SN prefixed 1707A only.
Perform (22) through (44) below for SN prefixed 2332A, 2215A, and below.

(5) Set **RESOLUTION BW** switch to **100 kHz** and **FREQ SPAN/DIV** switch to **20 kHz**.

(6) Adjust signal level to 7.1 divisions with **REF LEVEL FINE** control.

(7) Adjust A8R3 (located on A8 board) for a 5-division wide signal at the 5th graticule line above graticule baseline (R).

(8) Set **RESOLUTION BW** switch to **30 kHz** and **FREQ SPAN/DIV** switch to **5 kHz**, and repeat (6) above.

(9) Adjust A8R2 (located on A8 board) for a 6 division wide signal at 5th graticule line above graticule baseline (R).

(10) Disconnect **CAL OUTPUT** from **INPUT 50Ω**.

(11) Disconnect W7P1 (red) cable from A10J2 connector (located on Al0 assembly) and connect signal generator RF output to W7P1 (red) cable.

(12) Adjust signal generator frequency to 301.4 MHz and RF output level controls to -30 dBm.

(13) Set **RESOLUTION BW** switch to **1 MHz** and adjust signal generator frequency controls to peak signal on crt.

(14) Adjust signal generator RF output level controls to position signal 7.1 divisions above graticule baseline.

(15) Set **RESOLUTION BW** switch to **1 kHz** and adjust signal generator frequency controls to peak signal on crt.

(16) If signal is not positioned 7.1 graticules above graticule baseline, adjust A11R2 (located on A11 board) and A13R2 (located on A13 board) equally for a signal 7.1 divisions above graticule baseline(R).

(17) Record signal generator frequency.

(18) Adjust signal generator frequency 500 Hz below value recorded in (17) above.

(19) Adjust A8R1 (located on A8 board) to position the signal level on the 5th graticule line from the graticule baseline (R).

(20) Repeat (15) through (19) above until frequency change from center frequency at 7.1 divisions to the 3 dB point of the 5th graticule line is between 450 and 550 Hz.

(21) Connect W7P1 (red) cable to A10J2 (located on A10 assembly).

NOTE

Perform (22) through (44) below for SN prefixed 2332A, 2215A, and below.

(22) Set **RESOLUTION BW** and **FREQ SPAN/DIV** switches to settings as listed in table 6. If bandwidth at 5th graticule line above graticule baseline is not within the specified limits, perform (23) below.

(23) Adjust A8R85 (fig. 5 for SN prefixed 2215A and below) (fig. 6 for SN prefixed 2332A) for the best compromise for **300 kHz**, **1** and **3 MHz RESOLUTION BW** switch settings.

Table 6. Bandwidth Adjustments

Test instrument		
RESOLUTION BW switch settings	**FREQ SPAN/ DIV** switch settings (kHz)	Bandwidth at 5th graticule line above graticule baseline
3 MHz	500	5.4 to 6.6
300 kHz	50	5.4 to 6.6
100 kHz	20	4.3 to 5.7
30 kHz	5	5.2 to 6.8

(24) Disconnect **CAL OUTPUT** from **INPUT 50Ω**.

(25) Disconnect W7P2 (red) cable (fig. 1) from A9J1 connector (fig. 1) and connect signal generator RF output to A9J1 (fig. 1).

(26) Adjust signal generator frequency to 301.4 MHz and RF output level controls to -30 dBm.

(27) Set **RESOLUTION BW** switch to **1 MHz** and adjust signal generator frequency controls to peak signal on TI crt.

(28) Adjust signal generator RF output level controls to position signal 7.1 divisions above graticule baseline.

(29) Set **RESOLUTION BW** switch to **3 kHz** and adjust signal generator frequency controls to peak signal on TI crt. Record signal generator frequency.

(30) Adjust **REF LEVEL FINE** control to position signal 7.1 divisions above graticule baseline.

(31) Adjust signal generator frequency 1500 Hz below value recorded in (28) above. Record signal generator frequency.

(32) Adjust A8R72 (fig. 5 for SN prefixed 2215A and below) (fig. 6 for SN prefixed 2332A) to position signal 5 divisions above graticule baseline (R).

(33) Increase signal generator frequency until TI trace peaks and then drops to 5 divisions above graticule baseline. Record signal generator frequency.

(34) Subtract the value recorded in (31) above from the value recorded in (33) above. If the difference is not between 2800 and 3200 Hz, slightly readjust A8R72 (fig. 5 for SN prefixed 2215A and below) (fig. 6 for SN prefixed 2332A) and repeat (29) through (34) until the specified limits are achieved.

(35) Set **RESOLUTION BW** switch to **10 kHz** and adjust signal generator frequency controls to peak signal on TI crt.

(36) Position signal 7.1 divisions above graticule baseline with **REF LEVEL FINE** controls. Record signal generator frequency.

(37) Adjust signal generator frequency 5 kHz below frequency recorded in (36) above. Record signal generator frequency.

(38) Increase signal generator frequency until signal peaks and then decreases to the 5th division above graticule baseline. Record signal generator frequency.

(39) Subtract frequency recorded in (37) above from frequency recorded in (38) above, if difference is not between 9.000 and 11.000 kHz, slightly readjust A8R72 (fig. 5 for SN prefixed 2215A and below) (fig. 6 for SN prefixed 2332A) and repeat (35) through (39) until the specified limits are achieved.

NOTE

If A8R72 is adjusted in (39) above, the 3 kHz bandwidth must be between 2700 and 3300 Hz.

(40) Set **RESOLUTION BW** switch to **1 kHz** and adjust signal generator frequency controls for a signal peak on TI crt.

(41) Position signal 7.1 divisions above graticule baseline with **REF LEVEL FINE** control. Record signal generator frequency.

(42) Increase signal generator frequency until signal on crt decreases to 5 divisions above graticule baseline. Record signal generator frequency.

(43) Subtract frequency recorded in (41) above from the frequency recorded in (42) above, the difference will be between 450 and 550 Hz.

(44) Reconnect W7P2 (red) cable (fig. 1) to A9J1 (fig. 1).

12. Frequency Response

a. Performance Check

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

(a) **RESOLUTION BW** switch to **1 MHz**.

(b) **FREQ SPAN/DIV** switch to **100 MHz**.

(c) **INPUT ATTEN** switch to **20 dB** (**OPTIMUM INPUT** switch to **-20 dBm**).

(d) **REFERENCE LEVEL** switch to **-10 dBm**.

(e) Press **1 dB/DIV** pushbutton in.

(2) Adjust **TUNING** control for an indication of 500 MHz on **FREQUENCY MHz** readout and press **FREQUENCY CAL** pushbutton.

(3) Connect equipment as shown in figure 10, connection A.

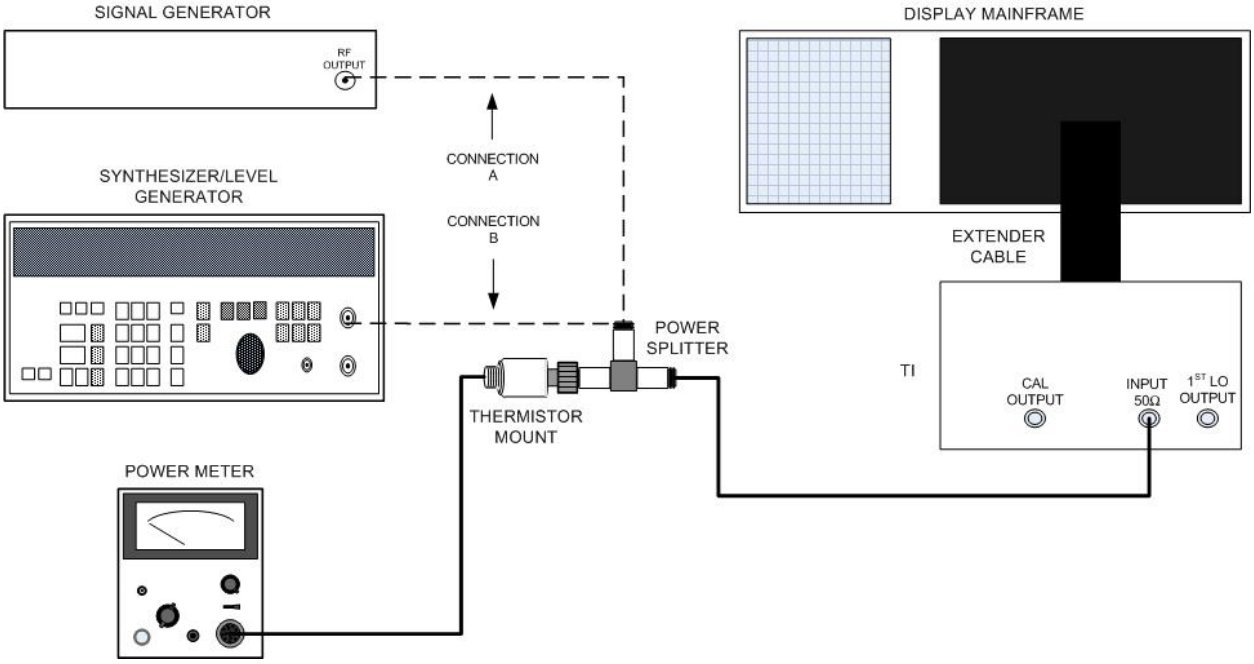

Figure 10. Frequency response - equipment setup.

(4) Adjust signal generator frequency controls to 500 MHz and RF output controls for a reference level signal peak on 6th division above graticule baseline.

(5) Record power meter indication (reference).

(6) Slowly adjust signal generator frequency and TI **TUNING** control from 80 to 1500 MHz while maintaining power meter reference level established in (5) above. The signal level will not exceed ±l division of 6th horizontal graticule line.

(7) Connect equipment as shown in figure 10, connection B.

(8) Set **RESOLUTION** switch to **100 kHz** and **FREQ SPAN/DIV** switch to **1 MHz**.

(9) Adjust **TUNING** control for **80 MHz** indication on **FREQUENCY MHz** readout and press **FREQUENCY CAL** pushbutton.

(10) Adjust synthesizer/level generator frequency controls to 80 MHz and adjust amplitude controls to reference established in (4) above on TI.

(11) Slowly adjust synthesizer/level generator frequency and TI **TUNING** controls from 80 MHz to 100 kHz**.** The signal level will not exceed ±1 division of 6th horizontal graticule line.

b. Adjustments. No adjustments can be made.

13. Input Attenuator

a. Performance Check

(1) Connect synthesizer/level generator output 50 Ω to TI **INPUT 50Ω**.

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

(a) **TUNING** control to **30 MHz**.

(b) **REQ SPAN/DIV** switch to **200 kHz**.

(c) **RESOLUTION BW** switch to **30 kHz**.

(d) **INPUT ATTEN** switch to **70 dB** (**OPTIMUM INPUT** switch to **30 dBm**).

(e) **REFERENCE LEVEL** switch to **0 dBm**.

(f) **VIDEO FILTER** control to **2 o'clock** position.

(3) Adjust synthesizer/level generator frequency controls to 30 MHz and amplitude controls to 0 dBm.

(4) Adjust signal peak to 6th horizontal line above graticule baseline with **REF LEVEL FINE** control (reference).

(5) Set **INPUT ATTEN** switch to settings as listed in table 7 and adjust synthesizer/level generator amplitude controls to position signal peak on 6th horizontal line above graticule baseline on TI crt. Synthesizer/level generator output amplitude display will indicate between specified limits.

b. Adjustments. No adjustments can be made.

Table 7. Input Attenuators

Test instrument		Synthesizer/level generator amplitude display indications (dBm)[1]	
0 dB INPUT ATTEN switch settings (dB)	**OPTIMUM INPUT** switch settings (dBm)	Min	Max
60	20	-9.5	-10.5
50	10	-19.5	-20.5
40	0	-29.5	-30.5

See footnote at end of table.

Table 7. Input Attenuators - Continued

Test instrument		Synthesizer/level generator amplitude display indications (dBm)[1]	
0 dB INPUT ATTEN switch settings (dB)	**OPTIMUM INPUT** switch settings (dBm)	Min	Max
30	-10	-39.5	-40.5
20	-20	-49.5	-50.5
10	-30	-59.5	-60.5
0	-40	-69.5	-70.5

[1]Maximum deviation will not exceed ±1.0 dB.

14. Reference Level Accuracy

a. Performance Check

NOTE

Verify the proper cal factors are loaded for the power sensor module being utilized.

(1) Connect power sensor to power reference output. Perform sensor zero and calibration.

(2) Connect equipment as shown in figure 11.

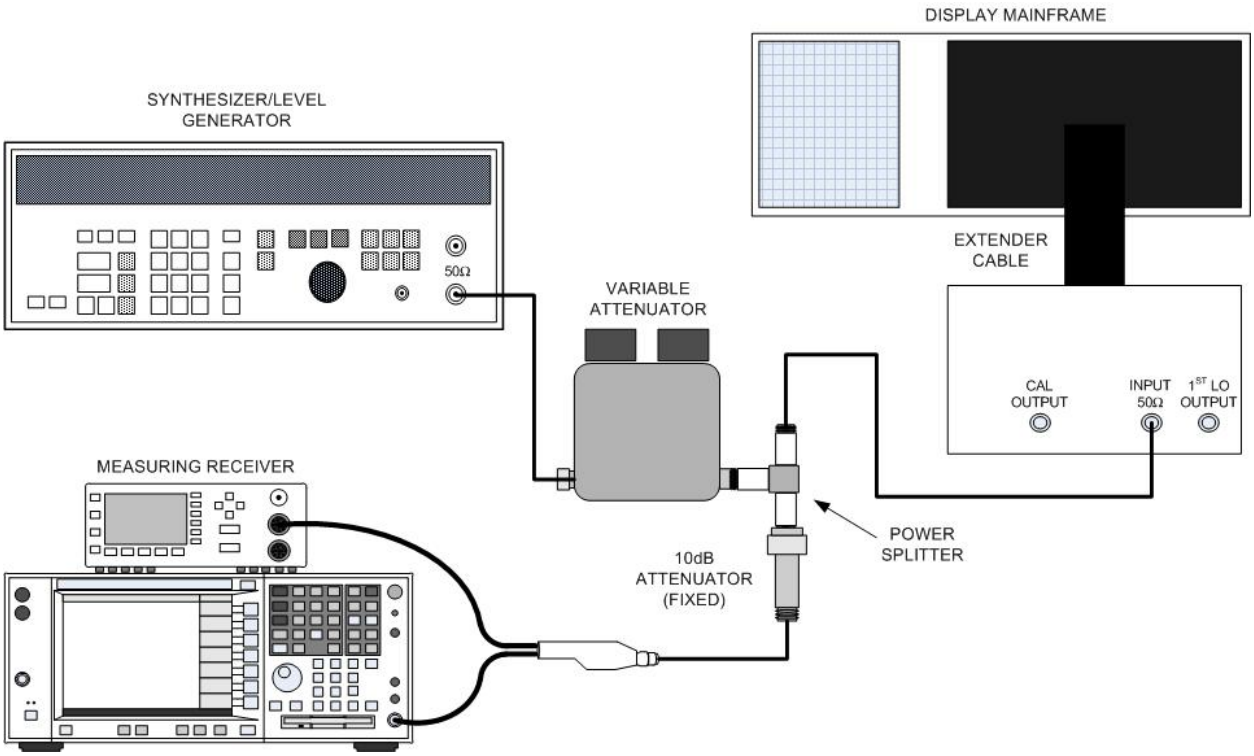

Figure 11. Reference level - equipment setup.

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

(a) **INPUT ATTEN** switch to **0 dB** (**OPTIMUM INPUT** switch to **-40 dBm**).

(b) **TUNING** control to **30 MHz**.

(c) **FREQ SPAN/DIV** switch to **5 kHz**.

(d) **RESOLUTION BW** switch to **3 kHz**.

(e) **REFERENCE LEVEL** switch to **-10 dBm**.

(f) Press **1 dB/DIV** pushbutton in.

(g) **SWEEP TIME/DIV** switch to **AUTO**.

(4) Set variable attenuator to 0.

(5) Configure measuring receiver to measure frequency at .030 GHz with a 00.0 dBm attenuation reference.

(6) Adjust synthesizer/level generator frequency controls to 30 MHz and amplitude controls to -10 dBm.

(7) Perform (a) through (e) below if signal on crt is difficult to locate:

(a) Press **RESOLUTION BW** switch in to coupled position.

(b) Turn coupled controls **(FREQ SPAN/DIV** and **RESOLUTION BW** switches) cw until signal appears on crt.

(c) Press **FREQUENCY CAL** pushbutton.

(d) Center signal on crt with **TUNING** control.

(e) Return controls to positions called out in (2) above.

(8) Position crt trace 6 divisions above graticule baseline with synthesizer/level generator amplitude controls (reference).

(9) Adjust synthesizer/level generator amplitude output controls and variable attenuator switch settings to position crt trace to reference established in (6) above while setting **REFERENCE LEVEL** switch to values listed in table 8. If measuring receiver does not indicate within specified limits, perform **b** below.

(10) Press **LIN** pushbutton in and repeat (3) through (9) above.

Table 8. Reference Level (Log) Accuracy

Test instrument **REFERENCE LEVEL** switch settings (dBm)	Variable attenuator 10 dB step control setting (dB)	Measuring receiver indications[1] (dB)	
		Min	Max
-20	10	9.5	10.5
-30	20	19.5	20.5
-40	30	29.5	30.5
-50	40	39.5	40.5
-60	50[2]	49.5	50.5
-70	60	59.5	60.5
-80	70	69.5	70.5

[1]Variable attenuator error must be added algebraically.
[2]Reduce synthesizer/level generator attenuator setting.

b. Adjustments

NOTE

Adjustment steps (1) through (27) below are used for SN prefix 2436A only.

Adjustment steps (28) through (52) below are used for SN prefix 2332A and below.

(1) Connect equipment as shown in figure 12.

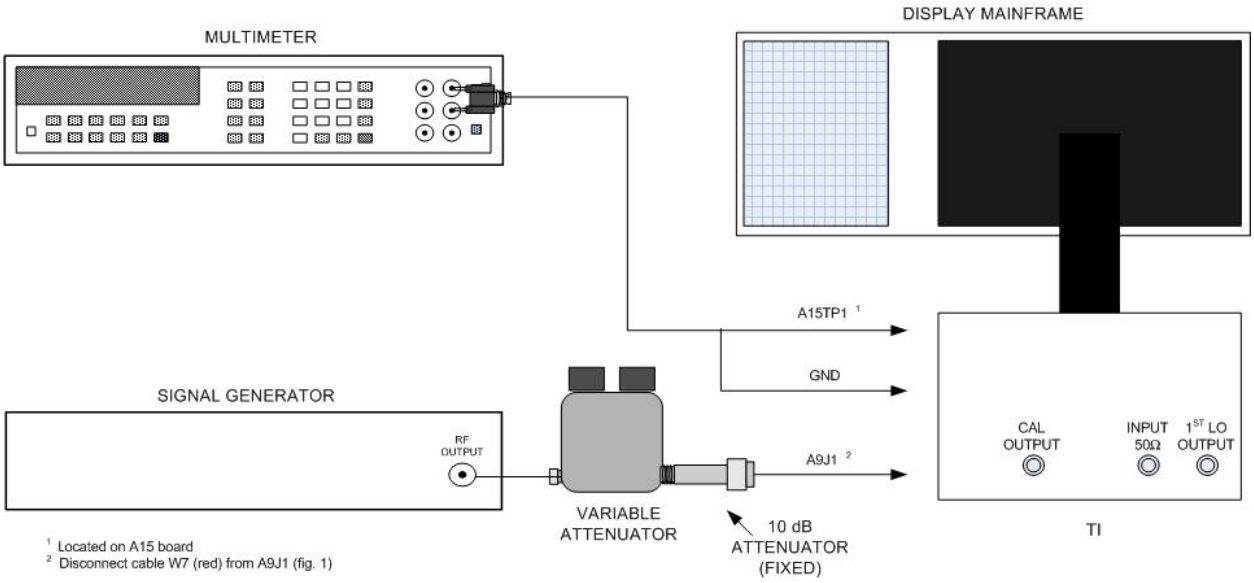

Figure 12. Log amplifier adjustments - equipment setup.

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

(a) **FREQ SPAN/DIV** switch to **0**.

(b) **RESOLUTION BW** switch to **300 kHz**.

(c) **INPUT ATTEN** switch to **10 dB** (**OPTIMUM INPUT** switch to **-30 dBm**).

(d) **REFERENCE LEVEL** switch to **-50 dBm**.

(e) Press **LIN** pushbutton in.

(3) Set variable attenuator 10 dB STEP control to 0 dB**.**

(4) Adjust signal generator frequency controls to 301.4 MHz and RF output level to -13 dBm.

(5) Set **TEST/NORM** switch (located on Al2 board) to **TEST** position.

(6) Adjust signal generator frequency controls for a maximum signal amplitude display on crt. (Reduce signal generator RF output if necessary).

(7) Press signal generator power switch to STBY position. Record multimeter indication as offset value.

(8) Press signal generator power switch to on position and adjust RF output controls for a multimeter indication of 800 mV, ±1 mV (plus offset value recorded in (7) above).

EXAMPLE #1: If offset value ((7) above) is +15 mV (dc):

800 mV
+15 mV
+815 mV (dc)

THEN: Adjust signal generator amplitude output controls for +815 mV indication on multimeter.

EXAMPLE #2: If offset value ((7) above) is -15 mV (dc):

800 mV
-15 mV
785 mV (dc)

THEN: Adjust signal generator amplitude output controls for +785 mV indication on multimeter.

(9) Press **10 dB/DIV** pushbutton in and adjust A14R23 (fig. 13) for a multimeter indication of 800 mV, ±1 mV (plus offset value recorded in (7) above) (R).

(10) Set variable attenuator 10 dB step control to 60 dB and adjust A14R10 (fig. 13) for a multimeter indication of 200 mV, ±l mV (plus offset voltage recorded in (7) above (R).

(11) Set variable attenuator 10 dB step control to 0.

(12) Repeat (9) through (11) above until no further adjustment is required.

(13) Set variable attenuator 10 dB step control to 30 dB and adjust A14R23 (fig. 13) for a multimeter indication of 500 mV, ±1 mV (plus offset voltage recorded in (7) above) (R).

(14) Set variable attenuator 10 dB step control to 0 dB and adjust A14R69 (fig. 13) for a multimeter indication of 800 mV ±l mV, (plus offset voltage recorded in (7) above) (R).

(15) Repeat (13) and (14) above until no further adjustment is required.

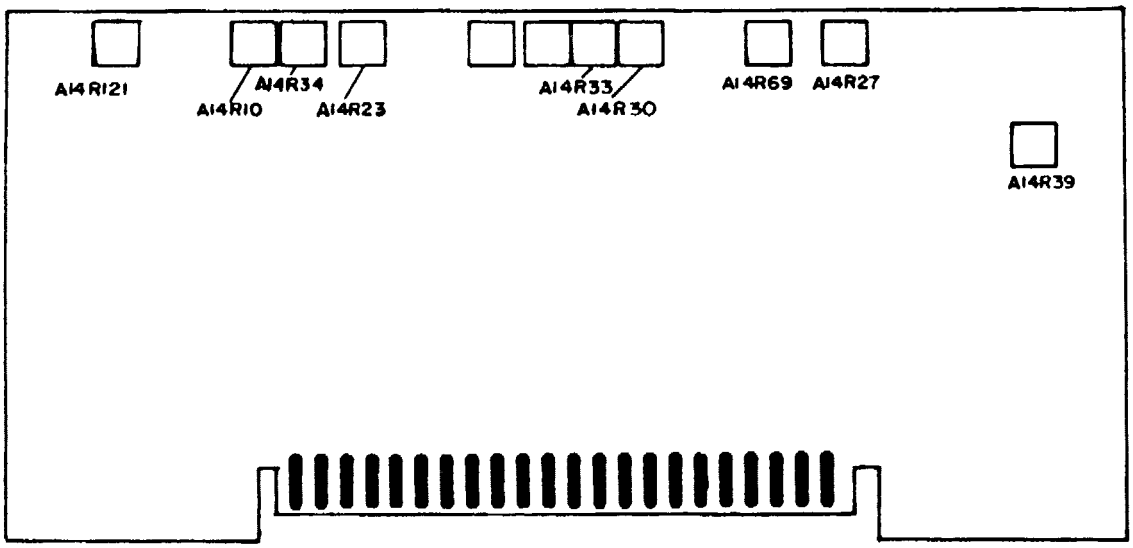

Figure 13. A14 log amplifier assembly adjustment locations for SN prefix 2436A.

(16) Set variable attenuator 10 dB step control to 10 dB and adjust A14R23 (fig. 13) for a multimeter indication of 700 mV, ±l mV (plus offset voltage recorded in (7) above) (R).

(17) Set variable attenuator 10 dB step control to 0 dB and adjust A14R39 (fig. 13) for a multimeter indication of 800 mV, ±l mV (plus offset voltage recorded in (7) above) (R).

(18) Repeat (16) and (17) above until no further adjustment is required.

(19) Set variable attenuator 10 dB step control to settings as listed in table 9. If multimeter does not indicate within specified limits, repeat (9) through (18) above.

Table 9. Log Fidelity Check

Variable attenuator 10 dB step control settings (dB)	Multimeter indication (plus offset recorded in (7) above (MV)	
	Min	Max
0	799	801
10	697	703
20	596	604
30	496	504
40	395	405
50	294	306
60	193	207
70	92	108

(20) Set **REFERENCE LEVEL** switch to **-50 dBm** and press **LIN** pushbutton in.

(21) Set variable attenuator 10 dB step control to 0 dB and adjust A14R34 (fig. 13) for a multimeter indication of 800 mV ±1 mV (plus offset voltage recorded in (7) above) (R).

(22) Set **REFERENCE LEVEL** switch and variable attenuator 10 dB step control to settings as listed in table 10. If multimeter indication is not within specified limits, perform adjustment listed.

(23) Set **REFERENCE LEVEL** switch to **-50 dBm** and press **1 dB/DIV** pushbutton in.

(24) Set variable attenuator 10 dB step control to 0 dB and adjust signal generator RF output controls for a multimeter indication of 800 mV, ±1 mV (plus offset voltage recorded in (7) above).

(25) Set variable attenuator 10 dB step control to 40 dB.

(26) Set **REFERENCE LEVEL** switch to **-90 dBm** and adjust A14R121 (fig. 13) for a multimeter indication of 800 mV, ±3 mV (plus offset voltage recorded in (7) above) (R).

(27) Return A12S1**TEST/NORM** switch (located on A12 board) to **NORM**. Remove test cable and reconnect W7 (red) cable to A9J1 (fig. 1).

NOTE

Adjustment steps (28) through (52) below are used for SN prefix 2142A and below.

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

(a) **FREQ SPAN/DIV** switch to **1 MHz**.

(b) **RESOLUTION BW** switch to **300 kHz**.

(c) **OPTIMUM INPUT** switch to **-30 dBm**.

(d) **REFERENCE LEVEL dBm** switch to **-50**.

(e) Press **LIN** pushbutton in.

Table 10. Linear Gain Adjustments

Test instrument **REFERENCE LEVEL dBm** switch settings (dBm)	Variable attenuator 10 dB step control setting (dB)	Multimeter indications plus offset voltage recorded in (7) above (MV)		Adjustments (fig. 12)
		Min	Max	
-50	0	799	801	A14R34(R)
-60	10	795	805	A14R33(R)
-70	20	795	805	A14R30(R)
-80	30	795	805	A14R27(RO
-90	40	790	810	- - -

(29) Connect equipment as shown in figure 12.

(30) Set variable attenuator 10 dB step control to 0 dB**.**

(31) Adjust signal generator frequency controls to 301.4 MHz and RF output level to -13 dBm.

(32) Set **TEST/NORM** switch (located on A12 board) to **TEST** position.

(33) Adjust signal generator frequency controls for a maximum signal amplitude display on crt. (Reduce signal generator RF output, if necessary.)

(34) Adjust signal generator RF output controls for a multimeter indication of 700 mV.

(35) Set **REFERENCE LEVEL** switch to **-80 dBm**.

(36) Set variable attenuator 10 dB step control to 30 dB and adjust A14R3 (fig. 14) for a multimeter indication of 700 mV (R).

(37) Repeat (34) through (36) above until multimeter indication is between 698 and 702 mV.

(38) Set **REFERENCE LEVEL** switch to **-50 dBm**.

(39) Set variable attenuator 10 dB step control to 0 dB.

(40) Set **REFERENCE LEVEL** switch and variable attenuator 10 dB step control to settings as listed in table 11. If any deviation from reference is not within specified limits, readjust A14R3 (fig. 14) for best (in limits) compromise (R).

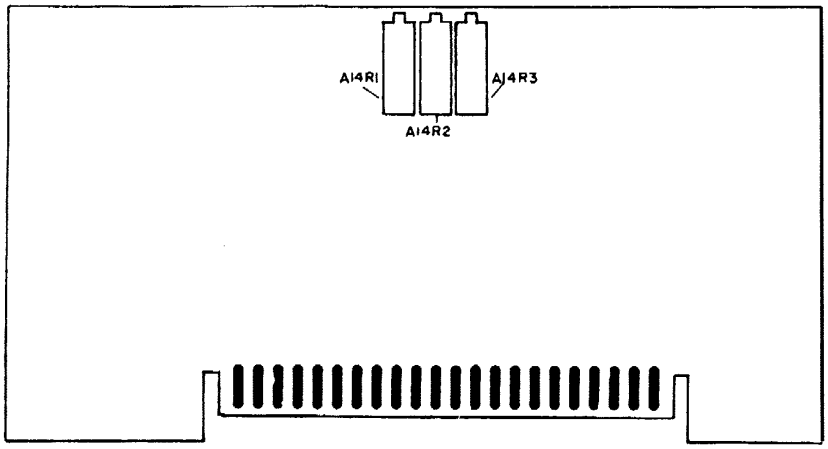

Figure 14. A14 log amplifier - adjustment locations (SN prefix 2142A and below).

Table 11. Linear Gain

Test instrument **REFERENCE LEVEL dBm** switch settings (dBm)	Variable attenuator 10 dB step control setting (dB)	Deviation from crt reference[1]
-50	0	±2 div
-60	10	±2 div
-70	20	±2 div
-80	30	±2 div
-90	40	±2 div

(41) Set signal generator RF output to STBY position. Record multimeter indication as offset value.

(42) Set signal generator RF output to on and press TI **10 dB/DIV** pushbutton in.

(43) Set variable attenuator 10 dB step control to 40 dB and adjust signal generator RF output controls for a multimeter indication of 400 mV plus offset value recorded in (41) above. (Refer to (8) above for examples on adding offset value to multimeter indication).

(44) Set variable attenuator 10 dB step control to 0 dB. Multimeter will indicate 800 mV, ±1 mV (plus offset value recorded in (41) above). If not, adjust A14R2 (fig. 14) for a multimeter indication of 800 mV plus offset value recorded in (41) above (R).

(45) Set variable attenuator 10 dB step control to values as listed in table 12. Record multimeter indication for each variable attenuator 10 dB step control setting. Correct multimeter indications by algebraically adding offset value recorded in (41) above and adjust A1 4R2 (fig. 14) to meet limits listed in table 12 (R).

NOTE
See examples 1 and 2 in **b** (8) above.

Table 12. Log Fidelity

Variable attenuator 10 dB step control settings (dB)	Multimeter indications corrected for offset (MV)
0	800 + offset ±l m V
10	700 + offset ±3 mv
20	600 + off set ±4 mV
30	500 + offset ±4 mV
40	400 + offset ±5 mV
50	300 + offset ±4 mV
60	200 + offset ±7 mV

(46) Set **REFERENCE LEVEL** switch to **-50**.

(47) Press **1 dB/DIV** pushbutton in and set variable attenuator 10 dB step control to 0 dB.

(48) Adjust signal generator RF output controls for a multimeter indication of 700 mV (do not include offset value).

(49) Set **REFERENCE LEVEL** switch to **-90**.

(50) Set variable step attenuator 10 dB step control to 40 dB and adjust A14R1 (fig. 14) for a multimeter indication of 700 mV (do not add offset value) (R).

(51) Set **REFERENCE LEVEL** switch and variable attenuator to settings as listed in table 13. If any deviation from reference is not within specified limits adjust A14Rl (fig. 13) for best (in limits) compromise (R).

Table 13. Log Gain

Test instrument **REFERENCE LEVEL dBm** switch settings (dBm)	Variable attenuator 10 dB step control settings (dB)	Deviation from crt reference[1]
-50	0	0.3 div
-60	10	0.3 div
-70	20	0.3 div
-80	30	0.3 div
-90	40	0.3 div

[1]Variable attenuator errors must be added algebraically.

(52) Return **TEST/NORM** switch (located on A12 board) to **NORM**. Remove test cable and reconnect W7 (red) cable to A9J1 (fig. 1).

15. Residual FM Test

a. Performance Check

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

(a) **FREQ SPAN/DIV** switch to **100 kHz**.

(b) **RESOLUTION BW** switch to **10 kHz**.

(c) **INPUT ATTEN** switch to **0 dB** (**OPTIMUM INPUT** switch to **-40 dBm**).

(d) **REFERENCE LEVEL** switch to **-20 dBm**.

(e) Press **LIN** pushbutton in.

(2) Connect comb generator output to **INPUT 50Ω**.

NOTE

Increase **INPUT ATTEN** switch setting if comb generator signal amplitude overdrives crt indication.

(3) Adjust **TUNING** control to center 500 MHz signal on crt and press **FREQUENCY CAL** pushbutton.

(4) Position signal peak at top crt horizontal line (fig. 15) with **REFERENCE LEVEL** switch and **REF LEVEL FINE** control.

(5) Maintain signal center on crt with **TUNING** control while reducing **FREQ SPAN/ DIV** switch to **0**.

(6) Set **RESOLUTION BW** switch to **10 kHz** and **SWEEP TIME/DIV** switch to **.1s**.

(7) Slightly adjust **TUNING FINE** control until trace appears between 4th and 7th vertical graticule from graticule baseline. Peak-to-peak variation of trace will not exceed one major vertical division for each major horizontal division.

b. Adjustments. No adjustments can be made.

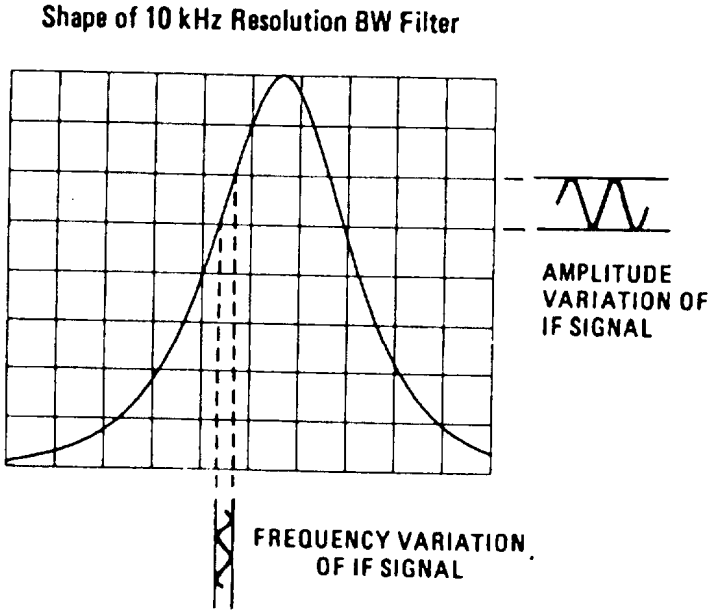

Figure 15. Residual FM.

16. Noise Sidebands Test

a. Performance Check

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

(a) **TUNING** control to **400 MHz**.

(b) **FREQ SPAN/DIV** switch to **1 MHz**.

(c) **RESOLUTION BW** switch to **30 kHz**.

(d) **INPUT ATTEN** switch to **10 dB** (**OPTIMUM INPUT** switch to **-30 dBm**).

(e) **REFERENCE LEVEL** switch to **-20 dBm**.

(f) Press **10 dB/DIV** pushbutton in.

(g) **SWEEP TIME/DIV** switch to **AUTO**.

(2) Connect signal generator RF output to TI **INPUT 50Ω**.

(3) Adjust signal generator frequency controls for 400 MHz and RF output controls for -20 dBm.

(4) Center signal on crt with **TUNING** control.

(5) Position signal peak at top crt horizontal graticule line with **REFERENCE LEVEL** and **REF LEVEL FINE** controls.

(6) Maintain signal center with **TUNING** control while setting **FREQ SPAN/ DIV** switch to **20 kHz** and **RESOLUTION BW** switch to **1 kHz**.

(7) Turn **VIDEO FILTER** control fully cw (not in detent).

(8) Measure noise sidebands existing more than 2.5 divisions (50 kHz) from 400 MHz signal. Noise sidebands will be greater than 65 dB (6.5 divisions) down from top horizontal graticule line.

b. Adjustments. No adjustment can be made.

17. 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
0719023

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344234, requirements for calibration procedure TB 9-6625-2235-24.

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.