

# \*TB 9-4931-495-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

## CALIBRATION PROCEDURE FOR SWEEP OSCILLATOR HEWLETT-PACKARD, MODELS 8620A AND 8620C (SG-1121V1U) WITH RF PLUG-INS, MODELS 86200 AND 86300 SERIES; AND MODULES 8621A AND 8621B

Headquarters, Department of the Army, Washington, DC  
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### REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

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## SECTION I IDENTIFICATION AND DESCRIPTION

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Sweep Oscillator, Hewlett-Packard, Models 8620A and 8620C (SG1121V1U) with RF Plug-Ins, Models 86200 and 86300 Series; and Models 8621A and 8621B. The manufacturers' manuals were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

**a. Model Variations.** Text was written using the Hewlett-Packard, Model 8620C mainframe. Control names may differ for other models. Adjustments for models 8620A are shown in parentheses. The option H80 is a standard model plug-in, which has been modified to make it compatible with the Hewlett-Packard, Model 3790 Series microwave

link analyzers. The H80 option provides rear panel inputs that allow the TI to be swept and frequency modulated by the outputs of the microwave link analyzer.

**b. Time and Technique.** The time required for this calibration is approximately 6 hours, using the 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

Model	Frequency		Stability		Power output	
	Range	Accuracy	10% line change	10 dB power change	Leveled	Variation
8620A and C	Determined By Plug-In					
86210A	3 to 350 MHz	Cw, ±7 MHz Swp, ±10 MHz	±20 kHz	±20 kHz	13 dBm ±0.35 dB	±0.35 dB
86220A-H80	10 to 1300 MHz	Cw, ±10 MHz Swp, ±15 MHz	±20 kHz	±20 kHz	10 dBm 1 dB	±0.5 dB, int
86222A	0.01 to 2.4 GHz	Cw, ±10 MHz Swp, ±15 MHz	±20 kHz	±100 kHz	13 dBm (20 mW) ±1 dB	±0.25 dB, int ±0.1 dB, ext
86222B	0.01 to 2.4 GHz	Cw, ±10 MHz Swp, ±15 MHz	±20 kHz	±100 kHz	13 dBm (20 mW) ±1 dB	±0.25 dB, int ±0.1 dB, ext
86230B-H80	1.8 to 4.2 GHz	Cw, ±10 MHz Swp, ±15 MHz	±20 kHz	±1 MHz	10 dBm	±1.2 dB, int ±0.1 dB, ext
86241A-H80	3.2 to 6.5 GHz	Cw, ±30 MHz Swp, ±33 MHz	±30 kHz	±1 MHz	4 dBm	±0.7 dB, int ±0.1 dB, ext
86242A-H80	5.9 to 9 GHz	Cw, ±35 MHz Swp, ±40 MHz	±40 kHz	±4 MHz	10 dBm	±1 dB, int
86250B-H80	8 to 12.4	Cw, ±40 MHz Swp, ±50 MHz	±40 kHz	±2 MHz	8 dBm	±1 dB, int
86250A-H80	12.4 to 18 GHz	Cw, ±50 MHz Swp, ±70 MHz	±180 kHz	±6 MHz	7 dBm (5 mW)	±0.1 dB, ext 0.6 dB, int

Table 1. Calibration Description - Continued

Model	Frequency		Stability		Power output	
	Range	Accuracy	10% line change	10 dB power change	Leveled	Variation
86290A w/8620C	2 to 18 GHz in 4 bands	Cw, ±20 MHz except ±80 MHz on band 4 Swp, ±30 MHz except ±80 MHz on band 4	±100 kHz	±200 kHz band 1 ±400 kHz, band 2 600 kHz, bands 3 and 4	±5 dBm (3.1 mW)	±0.8 dB, int
86320A w/8621A or B	0.1 to 2 GHz	Cw, ±20 MHz Swp, ±25 MHz	±100 kHz	±1 MHz	13 dBm	±0.8 dB, int
86330A w/8621A or B	1.8 to 4.2 GHz	Cw, ±20 MHz Swp, ±25 MHz	±100 kHz	±1 MHz	10 dBm	±0.8 dB, int
86341B w/8621A or B	3.2 to 6.4 GHz	Cw, ±30 MHz Swp, ±33 MHz	±30 kHz	±1 MHz	10 dBm (10 mW)	±0.8 dB, int

## SECTION II EQUIPMENT REQUIREMENTS

**4. Equipment Required.** Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Set AN/GSM-286; AN/GSM-287; or AN/GSM-705. Alternate items may be used by the calibrating activity. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, 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 the calibration procedure. The following peculiar accessories are also required for this calibration: Hewlett-Packard, Model 423A (7923182-2)(10 MHz to 12.4 GHz) and diode semi-conduction device (7923241) (12.4 to 18 GHz).

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
ATTENUATOR (FIXED)	10 MHz to 18 GHz	Weinschel, Model 9918-10dB, (9918)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	Ridge, Model 9020A (9020A)

Table 2. Minimum Specifications of Equipment Required - Continued

Common name	Minimum use specifications	Manufacturer and model (part number)
MULTIMETER	Range: $\pm 1$ mV to $\pm 40$ V Accuracy: $\pm 0.02\%$	Hewlett-Packard, Model 3458A (3458A)
MICROWAVE FREQUENCY COUNTER	Range: 1 kHz to 18 GHz Accuracy: $\pm 0.1\%$	Anritsu, Model MF2414B (MF2414B)
POWER METER	Range: -32 to 13.5 dB Accuracy: $\pm 5\%$	Hewlett-Packard, Model E12-432A (MIS-30525) w/thermistor mount, Hewlett-Packard, Model H75-478A (7915907) or 8478B
POWER SPLITTER	10 MHz to 18 GHz	Weinschel, Model 1870A (7916839)

### 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 applicable sections 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. Additional maintenance information is contained in the manufacturers' manuals.

d. Unless otherwise specified, all controls and control settings refer to TI.

#### 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

The mainframe with plug-ins and modules will be referred to as the TI throughout all sections.

#### 7. Equipment Setup

a. Install appropriate plug-in into mainframe.

b. Do not remove TI cover unless necessary to gain access to test points or adjustments.

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- c. Connect mainframe to autotransformer.
- d. Connect autotransformer to 115 V ac source and adjust autotransformer for 115 V output.
- e. Energize equipment and allow at least 30 minutes for equipment to reach operating temperature.

**SECTION IV  
CALIBRATION PROCESS FOR SWEEP OSCILLATOR MODELS 8620A AND C**

**NOTE**

When indications specified in paragraphs 8 through 16 are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs 8 through 16. Do not perform power supply check if all other parameters are within tolerance.

**8. Amplitude Modulation**

**a. Performance Check**

- (1) Set **POWER LEVEL** control fully ccw.
- (2) Connect **RF OUTPUT** to microwave frequency counter, using attenuator (fixed) and crystal detector.

**NOTE**

Attenuator (fixed) not required when using model 86290A plug-in.

- (3) Set **1 kHz SW WV/OFF (AM-MOD)** switch (rear panel) to **1 kHz SQ WV (1 kHz)**.
- (4) Press **CW** pushbutton and set **RF** switch to **ON**.
- (5) Adjust **POWER LEVEL** control cw to drive microwave frequency counter. If microwave frequency counter does not indicate between 0.95 and 1.05 kHz, perform **b** below.

**b. Adjustments.** Adjust 1 kHz A7R27 (fig. 1) (A7R23 or A7R33, fig. 2) for 1.00 kHz indication on microwave frequency counter (R).

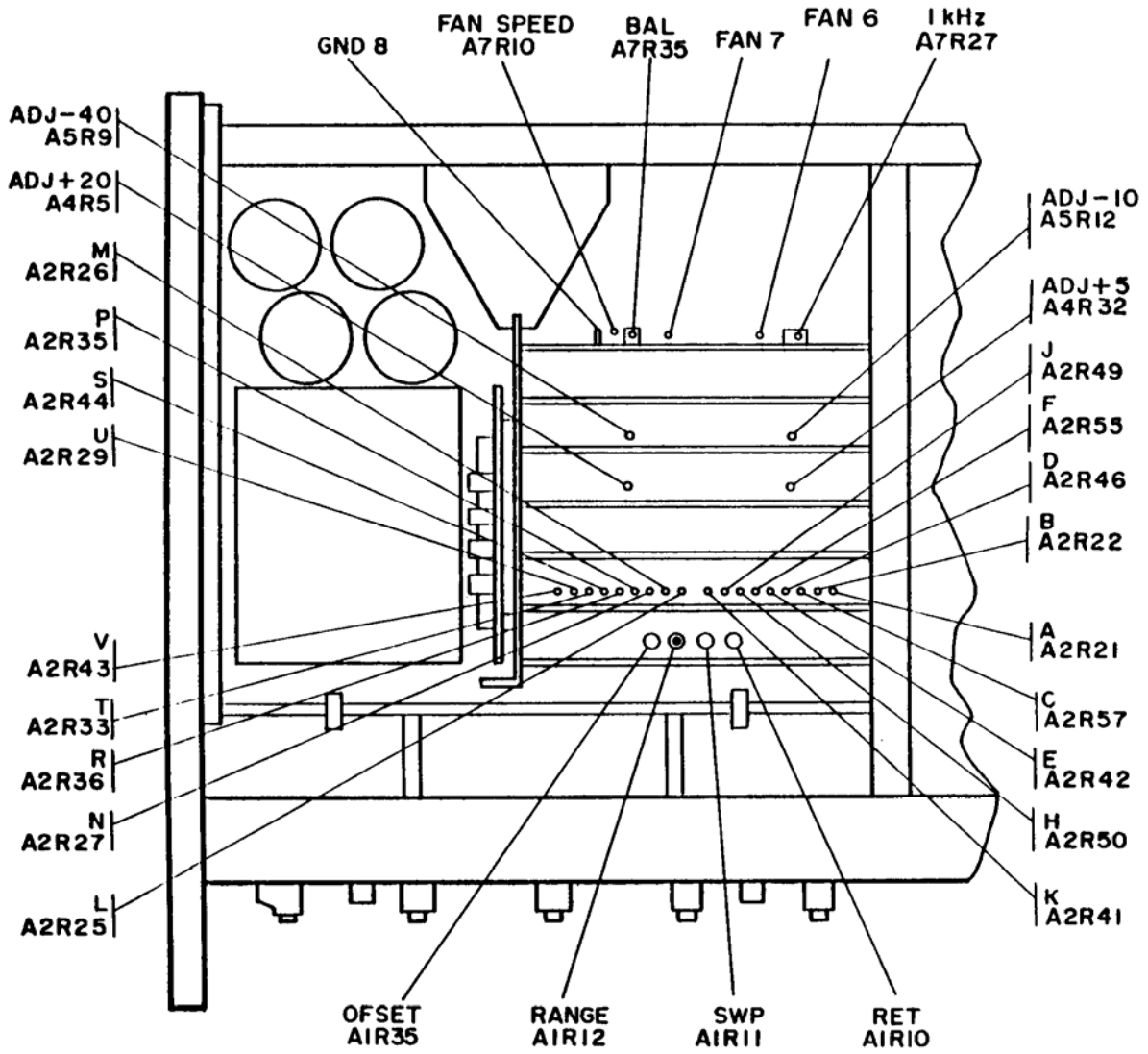


Figure 1. Model 8620C - partial top view.

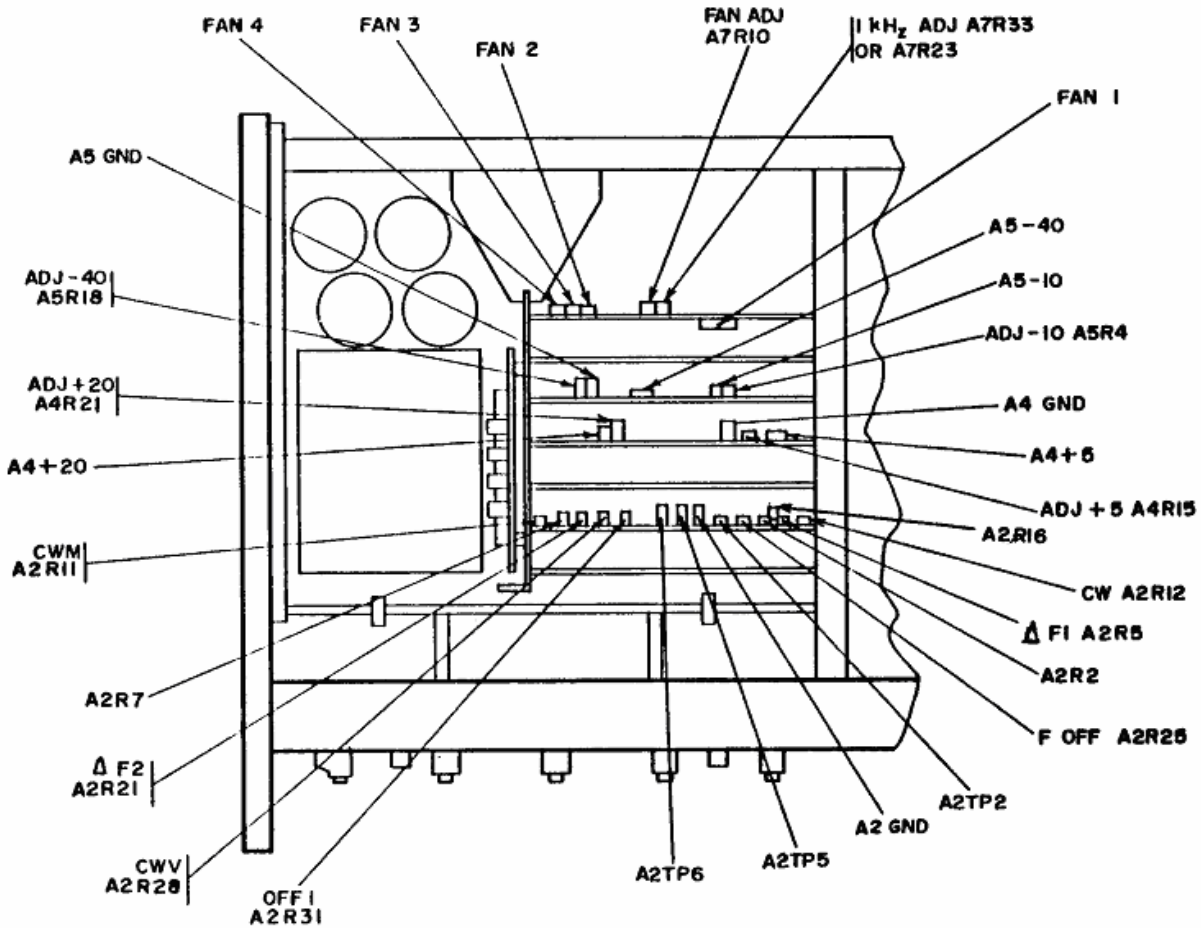


Figure 2. Model 8620A - partial top view.

## 9. Full Sweep (Model 8620C)

### a. Performance Check

#### NOTE

If necessary, zero TI using standard zeroing techniques.

- (1) Select calibration scale with **BAND** selector.
- (2) Connect multimeter between A2TP3 and A4 GND (fig. 3).

#### NOTE

On models prefixed with 1716, connect to chassis ground.



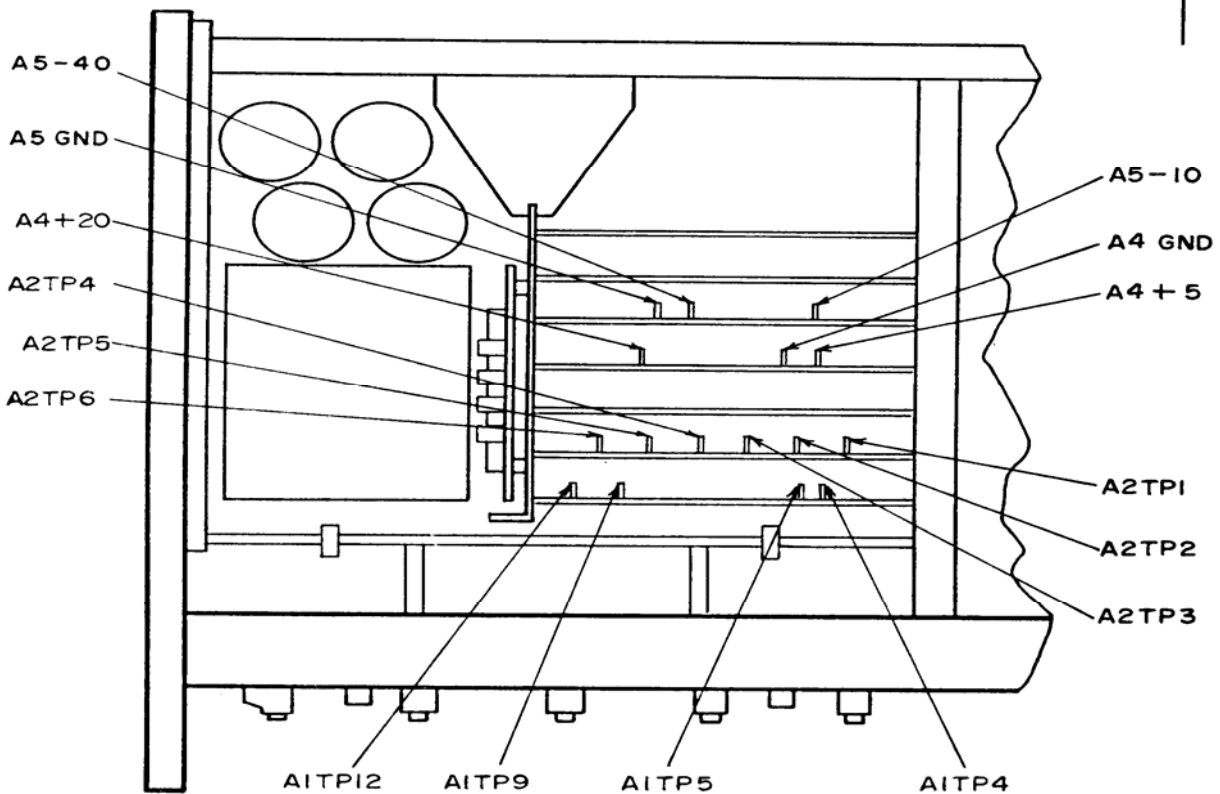


Figure 3. Model 8620C - partial top view.

(3) Press **FULL SWEEP** pushbutton. Set sweep **MODE** switch to **MANUAL** and **MANUAL** control fully ccw. If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (1) below.

(4) Adjust **MANUAL** control fully cw. If multimeter does not indicate between 9.995 and 10.005 V dc, perform **b** (2) below.

#### **b. Adjustments**

(1) Adjust A A2R21 (fig. 1) for 0.000 V dc on multimeter (R).

(2) Adjust B A2R22 (fig. 1) for 10.000 V dc on multimeter (R).

### **10. Start Marker/Stop Marker (Model 8620C)**

#### **a. Performance Check**

(1) Set **STOP MARKER** (red pointer) to the **0-V** mark on calibration scale.

(2) Connect multimeter to A2TP2 (fig. 3) and ground. If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (1) below.

(3) Set **STOP MARKER** pointer to the **10-V** mark on calibration scale. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (2) below.

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(4) Set **START MARKER** pointer to the **0-V** mark on calibration scale and connect multimeter to A2TP1 (fig. 3). If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (3) below.

(5) Set **START MARKER** pointer to the **10-V** mark on calibration scale. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (4) below.

### **b. Adjustments**

- (1) Adjust S A2R44 (fig. 1) for 0.000 V dc on multimeter (R).
- (2) Adjust P A2R35 (fig. 1) for 10.000 V dc on multimeter (R).
- (3) Adjust K A2R41 (fig. 1) for 0.000 V dc on multimeter (R).
- (4) Adjust N A2R27 (fig. 1) for 10.000 V dc on multimeter (R).

## 11. CW Marker (Model 8620A)

### **a. Performance Check**

- (1) Connect multimeter to A2TP5 and A2 GND (fig. 2). Press **CW** pushbutton.
- (2) Set white **CW** pointer to right end of scale (10 V) and make fine adjustments for +10  $\pm$ 0.001 V dc indication on multimeter.
- (3) Move positive lead to A2TP6 (fig. 2) and press **START** pushbutton. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** below.
- (4) Move positive lead to A2TP5 (fig. 2).
- (5) Press **CW** pushbutton and adjust **CW** control for 4.000  $\pm$ 0.001 V dc indication on multimeter.
- (6) Move positive lead to A2TP6 and press **START** pushbutton. If multimeter does not indicate between +3.990 and +4.010 V dc, perform **b** (2) below.

### **b. Adjustments**

- (1) Adjust CWM A2R11 (fig. 2) for 10.000 V dc on multimeter (R).
- (2) Adjust CWM A2R11 (fig. 2) for 4.000 V dc on multimeter and repeat **a** (1) through (6) above (R).

## 12. Marker Sweep (Model 8620C)

### **a. Performance Check**

- (1) Set **STOP MARKER** pointer to the **5-V** mark on calibration scale and adjust **MANUAL** control full ccw.
- (2) Set **START MARKER** pointer to the **0-V** mark on calibration scale and press **MARKER SWEEP** pushbutton.
- (3) Move multimeter positive lead to A2TP5 (fig. 3). If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (1) below.
- (4) Set **START MARKER** pointer to the **10-V** mark on calibration scale. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (2) below.

(5) Set **STOP MARKER** pointer to the **0-V** mark on calibration scale and turn **MANUAL** control fully cw. If multimeter does not indicate between -0.005 and +0.005 V dc, perform **b** (3) below.

(6) Set **STOP MARKER** pointer to the **10-V** mark on calibration scale. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (4) below.

#### **b. Adjustments**

- (1) Adjust F A2R55 (fig. 1) for 0.000 V dc on multimeter (R).
- (2) Adjust M A2R26 (fig. 1) for 10.000 V dc on multimeter (R).
- (3) Adjust L A2R25 (fig. 1) for 0.000 V dc on multimeter (R).
- (4) Adjust R A2R36 (fig. 1) for 10.000 V dc on multimeter (R).

### **13. CW and CW Vernier**

#### **a. Performance Check**

#### **NOTE**

Steps (1), (2), and (3) pertain to model 8620C only.

- (1) Connect multimeter to A2TP4 and A4 GND (fig. 3).
- (2) Set **CW MARKER** pointer to the **0-V** mark on calibration scale and press **FULL SWEEP** pushbutton. If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (1) below.
- (3) Set **CW MARKER** pointer to the **10-V** mark on calibration scale. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (2) below.
- (4) Set **CW MARKER** pointer to the **0-V** mark on the calibration scale, and press **CW** pushbutton.
- (5) For model 8620A, connect multimeter between A2TP5 and A2 GND (fig. 2) and for model 8620C, between A2TP5 and A4 GND (fig. 3). If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (3) below.
- (6) Set **CW MARKER** pointer to the **10-V** mark on calibration scale. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (4) below.
- (7) Set **CW MARKER** pointer for a multimeter indication of  $0 \pm 0.001$  V dc.
- (8) Set **CW VERNIER** pointer to the **+5-V** mark on calibration scale, and **CW VERNIER** multiplier to **X1**.
- (9) Press **CW VERNIER** pushbutton. Multimeter will indicate between +0.497 and +0.507 V dc. Record indication.
- (10) Set **CW VERNIER** pointer to the **-5-V** mark on calibration scale. If multimeter does not indicate within 0.002 V of indication recorded in (9) above, but of opposite polarity, perform **b** (5) below.
- (11) Reset **CW VERNIER** pointer to the **0-V** mark on calibration scale. If multimeter does not indicate between -0.01 and +0.01 V dc, recheck (9) and (10) above.

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### b. Adjustments

- (1) Adjust V A2R43 (fig. 1) for 0.000 V dc on multimeter (model 8620C only) (R).
- (2) Adjust T A2R33 (fig. 1) for 10.000 V dc on multimeter (model 8620C only) (R).
- (3) Adjust H A2R50 (fig. 1) or OFF 1 A2R31 (fig. 2) for 0.000 V dc on multimeter (R).
- (4) Adjust U A2R29 (fig. 1) or CW A2R12 (fig. 2) for 10.000 V dc on multimeter (R).
- (5) Adjust C A2R57 (fig. 1) CWV A2R28 (fig. 2) for an indication of the same magnitude, but of opposite polarity (R).

## 14. Start/Stop (Model 8620A)

### a. Performance Check

- (1) Connect multimeter to A2TP5 and A2 GND (fig. 2). Press **START** pushbutton.
- (2) Set **START** pointer to end of frequency scale (+10 V) and set **STOP** pointer to low end of scale (0 V).
- (3) Set **MODE** switch to **MANUAL** and turn **MANUAL** control fully ccw. If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (1) below.
- (4) Adjust **MANUAL** control fully cw. If multimeter does not indicate between -0.005 and +0.005 V dc, perform **b** (2) below.
- (5) Set **STOP** pointer to high end of frequency scale (10 V). If multimeter does not indicate between +9.995 and +10.005 V dc, perform **b** (3) below.
- (6) Adjust **START** pointer from high to low end of frequency scale. If indication on multimeter changes more than 10 mV dc, repeat paragraph 15 above.

### b. Adjustments

- (1) Adjust A2R7 (fig. 2) for 10.000 V dc on multimeter (R).
- (2) Adjust A2R2 (fig. 2) for 0.000 V dc on multimeter (R).
- (3) Adjust A2R16 (fig. 2) for 10.000 V dc on multimeter (R).

## 15. $\Delta F$ Operations (Model 8620C)

### a. Performance Check

- (1) Connect multimeter to A2TP5 and A4 GND (fig. 3).
- (2) Adjust **CW** and **CW VERNIER** controls for a +5.000  $\pm$ 0.001 V dc indication on multimeter.
- (3) Set  **$\Delta F$**  pointer to the **0-V** mark on calibration scale and set  **$\Delta F$**  multiplier to **X10**.
- (4) Move positive lead to A2TP3 (fig. 3). Press  **$\Delta F$**  pushbutton and adjust **MANUAL** control for multimeter indication between +4.995 and +5.005 V dc.
- (5) Move positive lead to A2TP6 (fig. 3). If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (1) below.

(6) Move positive lead to A2TP5 (fig. 3) and set  $\Delta F$  pointer to the **5-V** mark on calibration scale. While rotating **MANUAL** control from fully cw to fully ccw position, adjust J A2R49 (fig. 1) for test symmetry, i.e., same difference above and below 5.000 V dc.

(7) Rotate **MANUAL** control fully cw then fully ccw. If multimeter does not indicate between -0.001 and +0.001 V dc at the ccw position and between +9.999 and +10.001 V dc at the cw position, perform **b** (2) below.

#### **b. Adjustments**

(1) Adjust D A2R46 (fig. 1) for 0.000 V dc on multimeter (R).

(2) Adjust E A2R42 (fig. 1) for a 10.000 V dc indication on multimeter with **MANUAL** control fully cw, and 0.000 V dc with **MANUAL** control fully ccw (R).

### **16. $\Delta F$ Operations (Model 8620A)**

#### **a. Performance Check**

(1) Connect multimeter between A2TP5 and A2 GND (fig. 2).

(2) Press **CW** pushbutton and set **CW** pointer to the **0-V** mark on calibration scale and make fine adjustment for  $0 \pm 0.001$  V dc.

(3) Press  **$\Delta F$**  pushbutton and set  **$\Delta F$**  multiplier switch to **X1**. Set  **$\Delta F$**  pointer to the **5-V** mark on calibration scale.

(4) Set **MODE** switch to **MANUAL** and adjust **MANUAL** control for  $0 \pm 0.001$  V dc.

(5) Set  **$\Delta F$**  pointer to the **0-V** mark on calibration scale. If multimeter does not indicate between -0.001 and +0.001 V dc, perform **b** (1) below.

(6) Set  **$\Delta F$**  pointer to the **5-V** mark on calibration scale. Adjust **MANUAL** control fully cw. Note indication on multimeter.

(7) Adjust **MANUAL** control fully ccw. If multimeter does not indicate between -0.001 and +0.001 V dc of indication noted in (6) above, but opposite polarity, perform **b** (2) below.

(8) Repeat (5) through (7) above until voltages are equal in magnitude.

(9) Rotate **MANUAL** control fully cw, then fully ccw. If multimeter does not indicate between -0.499 and -0.501 V dc at fully cw and between +0.499 and +0.501 V dc at fully ccw, perform **b** (3) below.

#### **b. Adjustments**

(1) Adjust  $\Delta F$  OFF A2R25 (fig. 2) for 0.000 V dc on multimeter (R).

(2) Adjust  $\Delta F1$  A2R5 (fig. 2) for 0.000 V dc on multimeter (R).

(3) Adjust  $\Delta F2$  A2R21 (fig. 2) for 0.500 V dc on multimeter (R).

**17. Power Supply**

**a. Performance Check**

**NOTE**

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

(1) Connect multimeter between A4+20 and A4 GND (fig. 2 or 3). If multimeter does not indicate between 19.994 and 20.006 V dc, perform **b** (2) below.

(2) Move positive lead to A4+5 (fig. 2 or 3). If multimeter does not indicate between 4.995 and 5.005 V dc, perform **b** (2) below.

(3) Move positive lead to A5-40 and negative lead to A5 GND (fig. 2 or 3). If multimeter does not indicate between -39.98 and -40.02 V dc, perform **b** (3) below.

(4) Move positive lead to A5-10 (fig. 2 or 3). If multimeter does not indicate between -9.996 and -10.004 V dc, perform **b** (4) below.

**b. Adjustments**

(1) Adjust ADJ+20 A4R5 (fig. 1) (A4R21 fig. 2) for 20.000 V dc on multimeter (R).

(2) Adjust ADJ+5 A4R32 (fig. 1) (A4R15, fig. 2) for 5.000 V dc on multimeter (R).

(3) Adjust ADJ-40 A5R9 (fig. 1) (A5R18 fig. 2) for -40.000 V dc on multimeter (R).

(4) Adjust ADJ-10 A5R12 (fig. 1) (A5R4, fig. 2) for -10.000 V dc on multimeter (R).

**18. Final Procedure**

**a.** Deenergize and disconnect all equipment.

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

**SECTION V**

**CALIBRATION PROCESS FOR RF PLUG-IN MODELS 86222A AND 86290A**

**19. Power Output (Model 86222A)**

**a. Performance Check**

(1) Connect power meter to **RF OUTPUT**, using attenuator (fixed).

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

(a) **START MARKER** pointer to **10 MHz**.

(b) **TOP MARKER** pointer to **2.4 GHz**.

(c) **CW MARKER** pointer to **1.2 GHz**.

(d) **MODE** switch to **AUTO**.

(e) **TIME-SECONDS** switch to **0.1-0.01**.

- (f) **TIME-SECONDS** vernier control fully cw.
- (g) **RF BLANKING-OFF** switch (rear panel) to **RF BLANKING**.
- (h) **TRIGGER** switch to **INT**.
- (i) **ALC** switch to **INT**.
- (j) **RF** switch to **ON**.
- (k) **1 kHz SW WV/OFF** switch (rear panel) to **OFF**.
- (l) **FM-NORM-PL** switch (rear panel) to **NORM**.

(3) Press **CW** pushbutton and adjust **POWER LEVEL** and **SLOPE** controls for maximum leveled power output.

(4) Adjust **POWER LEVEL** control to settings listed in table 3. if output power does not indicate within limits specified, perform **b** below.

Table 3. Power Output (Model 86222A)

Test Instrument <b>POWER LEVEL</b> settings	Output power		
	Power level (dB)		Power variation <b>a(5)</b> (dB)
	Min	Max	
0	-1	+1	0.25
9	8	10	0.25
13	12	14	0.25

(5) At each **POWER LEVEL** control setting listed in table 3, slowly rotate **CW** control through entire range. If output power variation does not indicate within limits specified, perform **b** below.

(6) Adjust **POWER LEVEL** control fully cw.

(7) Slowly rotate **CW** control through entire range. If minimum output power point is not greater than +13 dB, perform **b** below. Record minimum output power point.

(8) Adjust **CW** control to minimum output power point recorded in (7) above.

(9) Adjust **POWER LEVEL** control fully ccw. Record output power.

(10) Output power recorded in (9) above be at least 13 dB down output power recorded in (7) above.

**b. Adjustments**

(1) Adjust **POWER LEVEL** control to +13.

(2) Adjust A3R22 H PWR (fig. 4) for output power of 13 dB (R).

(3) Adjust **POWER LEVEL** control to 0.

(4) Adjust A3R1 L PWR (fig. 4) for output power of 0 dB (R).

(5) Repeat **a** (4) through (10) and (1) through (4) above for best in-tolerance reading.

## 20. Frequency Range (Model 86222A)

### a. Performance Check

- (1) Connect **RF OUTPUT** to microwave frequency counter, using attenuator (fixed).
- (2) Position controls as listed in (a) through (f) below:
  - (a) Set **POWER LEVEL** control to **+13 dBm**.
  - (b) **BAND** switch to **.01-2.4 GHz**.
  - (c) **START MARKER** pointer to **20 MHz**.
  - (d) **CW MARKER** pointer to **1.2 GHz**.
  - (e) **STOP MARKER** pointer to **2.4 GHz**.
  - (f) **MODE** switch to **MANUAL**.

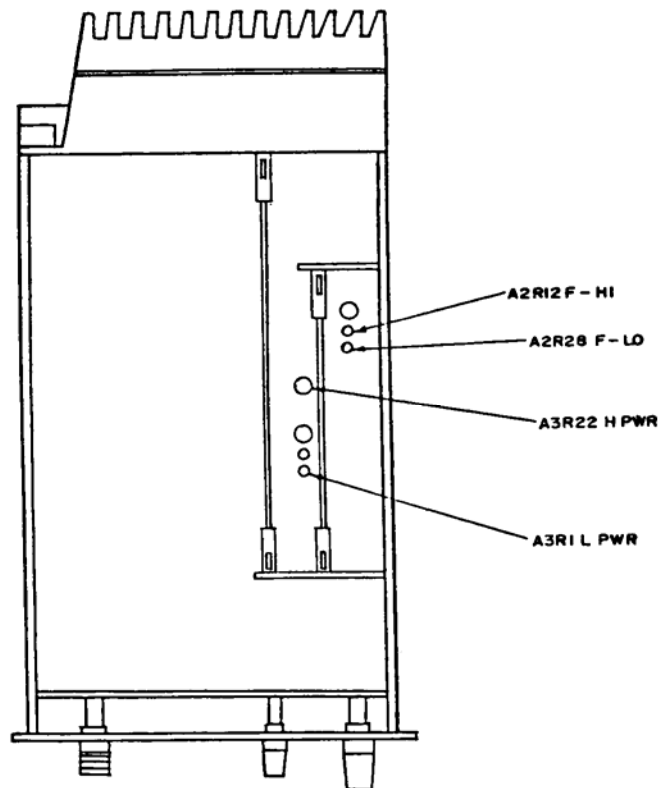


Figure 4. Model 86222A - top view.

- (3) Press **CW** pushbutton.
- (4) Set **CW MARKER** pointer to **10 MHz**. If microwave frequency counter does not indicate between 0.00 and 20 MHz, perform **b** below.
- (5) Repeat (4) above at 1.2 and 2.4 GHz. If microwave frequency counter does not indicate **CW MARKER** pointer setting  $\pm 10$  MHz, perform **b** below.



(6) Adjust **CW** pointer to **1200 MHz** and record microwave frequency counter indication.

(7) Adjust autotransformer from 105 to 125 V ac. Microwave frequency counter will not vary more than  $\pm 20$  kHz from value recorded in (6) above. Reset to 115 V ac.

(8) Decrease **POWER LEVEL** control from **+13** to **+3 dBm**. Microwave frequency counter will not change more than  $\pm 100$  kHz from value recorded in (6) above. Reset **POWER LEVEL** to **+13 dBm**.

(9) Press **FULL SWEEP (START)** pushbutton and set **MANUAL** control fully ccw. If microwave frequency counter does not indicate between 5 and 35 MHz, perform **b** below.

(10) Adjust **MANUAL** control fully cw. If microwave frequency counter does not indicate between 2.385 and 2.415 GHz, perform **b** below.

### **b. Adjustments**

(1) Connect multimeter between A2TP5 and A4 GND (fig. 3) on model 8620C.

(2) Adjust **FREQ CAL** control to midrange and **CW** control for multimeter indication of 0.00 V dc.

(3) Adjust A2R28 F-LO (fig. 4) for microwave frequency counter indication between 8 and 12 MHz (R).

### **NOTE**

The microwave frequency counter will indicate 10 MHz at two F LO settings. The correct setting is found by setting F LO fully cw and then ccw to the first 10 MHz reading.

(4) Adjust **CW** control until multimeter indicates +10.00 V dc, and adjust A2R12 F-HI (fig. 4) until microwave frequency counter indicates 2400 MHz (R).

## **21. Frequency Range (Model 86290A)**

### **a. Performance Check**

### **NOTE**

Model 8620A mainframe must be modified to obtain the full capabilities of the model 86290A plug-in. The unmodified mainframe will operate cw and slow sweep rates. Refer to manufacturer's manual for applicable modification kit.

(1) Connect **RF OUTPUT** to microwave frequency counter using attenuator (fixed).

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

(a) **BAND** switch to **BAND 1**.

(b) **MODE** switch to **MANUAL**.

(c) **TRIGGER** switch to **INT**.

(d) **TIME-SECONDS** switch to **0.1-0.01**.

(e) **TIME-SECONDS** vernier control fully cw.

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- (f) **RF BLANKING-OFF** switch (rear panel) to **RF BLANKING**.
- (g) **RF** switch to **ON**.
- (h) **ALC** switch to **INT**.
- (i) **FM-NORM-PL** switch (rear panel) to **NORM**.
- (j) **POWER LEVEL** control to 12 o'clock position.

(3) Press **CW** pushbutton and set **CW MARKER** pointer and **BAND** switch to the settings listed in table 4. If microwave frequency counter does not indicate within limits specified, perform the appropriate adjustment in **b** below for band selected.

Table 4. Cw Mode Frequency Accuracy (Model 86290A)

Band	Low end frequency			Mid-Frequency			High end frequency		
	Cw marker pointer settings (GHz)	Frequency counter indications (GHz)		Cw marker pointer settings (GHz)	Frequency counter indications (GHz)		Cw marker pointer settings (GHz)	Frequency counter indications (GHz)	
		Min	Max		Min	Max		Min	Max
1	2	1.980	2.020	4.1	4.080	4.120	6.2	6.180	6.220
2	6	5.980	6.020	9.2	9.180	9.220	12.4	12.380	12.420
3	12	11.980	12.020	15	14.980	15.020	18	17.980	18.020
4	2	1.920	2.080	10	9.920	10.080	18	17.920	18.080

(4) Press **MARKER SWEEP** pushbutton and set **MANUAL** control fully ccw for low frequency and fully cw for high frequency check.

(5) Set **START MARKER** pointer and **BAND** switch to the settings listed in table 5. If microwave frequency counter does not indicate within limits specified in table 5, repeat **a** (1) through (4) above.

Table 5. Manual Sweep Accuracy (Model 86290A)

Band	Manual control fully ccw				Manual control fully cw				
	low end freq		high end freq		low end freq		high end freq		
	<b>START MARKER</b> pointer settings (GHz)	Frequency counter indications (GHz)	<b>STOP MARKER</b> pointer settings (GHz)	Frequency counter indications (GHz)	<b>START MARKER</b> pointer settings (GHz)	Frequency counter indications (GHz)	<b>STOP MARKER</b> pointer settings (GHz)	Frequency counter indications (GHz)	
		Min	Max		Min	Max		Min	Max
1	2.0	1.970	2.030	6.2	6.170	6.230			
2	6.0	5.970	6.030	12.4	12.370	12.430			
3	12.0	11.970	12.030	18.0	17.970	18.030			
4	2.0	1.920	2.080	18.0	17.920	18.080			

(6) Reset **BAND** switch to **BAND 1** press **CW** pushbutton, and set **CW MARKER** pointer to **4.1 GHz**. Note microwave frequency counter indication.

(7) Adjust autotransformer from 105 to 125 V ac. Frequency change from that noted in (6) above will be less than  $\pm 100$  kHz. Reset autotransformer to 115 V ac.

(8) Connect power meter and microwave frequency counter to **RF** output, using power splitter.

(9) Decrease **POWER LEVEL** control 10 dB as indicated on power meter microwave frequency counter will not change more than  $\pm 200$  kHz for **BAND 1**,  $\pm 400$  kHz for **BAND 2** and  $\pm 600$  kHz for **BANDS 3** and **4**.

**b. Adjustments**

(1) Adjust **BAND 1 LO A3R4** (fig. 5) for microwave frequency counter indication of 2.0 GHz, and **BAND 1 HI A3R3** (fig. 5) for 6.2 GHz (R).

(2) Adjust **BAND 2 LO A3R8** (fig. 5) for microwave frequency counter indication of 6.0 GHz, and **BAND 2 HI A3R7** (fig. 5) for 12.4 GHz (R).

(3) Adjust **BAND 3 LO A3R26** (fig. 5) for microwave frequency counter indication of 12.0 GHz, and **BAND 3 HI A3R25** (fig. 5) for 18.0 GHz (R).

**22. Sweep Frequency (Model 86290A)**

**a. Performance Check**

(1) Connect **TI RF OUT** to microwave frequency counter.

(2) Adjust **POWER LEVEL** control to 12 o'clock position, set **BAND** switch to **BAND 1**, press **CW** pushbutton, and adjust **CW MARKER** control for microwave frequency counter indication of 2 GHz.

(3) Press **FULL SWEEP (START)** pushbutton and set **MODE** switch to **AUTO**.

(4) Microwave frequency counter will indicate within limits specified in table 6.

(5) Repeat (1) through (4) above for the band and frequencies shown in table 6.

Table 6. Swept Frequency Endpoint and Marker Accuracy

Test instrument		Frequency counter indications (GHz)	
Band	Frequency (GHz)	Min	Max
1	2.0	1.970	2.030
1	6.2	6.170	6.230
2	6.0	5.970	6.030
2	12.4	12.370	12.430
3	12.4	12.370	12.430
3	18.0	17.970	18.030

(6) Set **BAND** switch to **BAND 1**, press **CW** pushbutton and adjust **CW MARKER** control for microwave frequency counter indication between 4.098 and 4.102 GHz.

(7) Set **START MARKER** pointer to **3 GHz** and **STOP MARKER** pointer to **5 GHz**.

(8) Press **MARKER SWEEP** pushbutton and set **MARKERS** switch to **AMPL**.

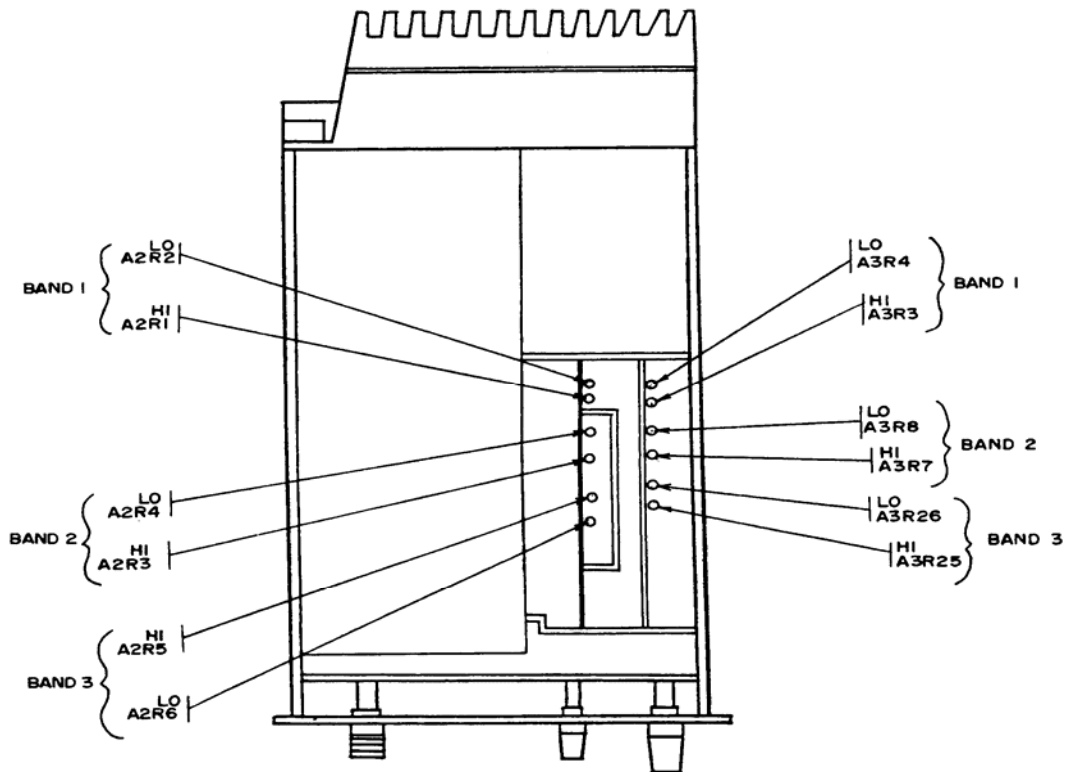


Figure 5. Model 86290A - top view.

- (9) Microwave frequency counter will indicate within limits specified in table 7.
- (10) Repeat-at (6) through (9) above for the bands and frequencies listed in table 7.

Table 7. Marker Accuracy

Band	Test Instrument			Microwave frequency counter indications (GHz)	
	CW MARKER pointer (marker frequency) (GHz)	START MARKER pointer (GHz)	STOP MARKER pointer (GHz)	Min	Max
1	4.1	3.0	5.0	4.070	4.130
2	9.2	8.0	10.0	9.170	9.230
3	15.0	14.0	16.0	14.970	15.030
4	10	9.0	11.0	9.920	10.080

**b. Adjustments.** No adjustments can be made.

### 23. Power Output (Model 86290A)

#### a. Performance Check

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

(a) **BAND** switch to **BAND 1**.

- (b) **MODE** switch to **AUTO**.
- (c) **TIME-SECONDS** vernier control fully cw.
- (d) **MARKERS** switch to **OFF**.

(2) Connect power meter to **RF OUTPUT**, using attenuator (fixed).

(3) Press **CW** pushbutton and set **POWER LEVEL** and **SLOPE** controls for maximum leveled power out.

(4) Set **PEAK** control to mechanical center, and slowly rotate **CW** control through the lower portion of band while observing power meter readings. If minimum power is not greater than +5 dBm, with variations of less than  $\pm 0.8$  dB, perform **b** (1) below.

(5) Rotate **CW MARKER** control through the upper portion of **BAND** while observing power meter reading. If power meter does not indicate more than +5 dBm with variations of less than  $\pm 0.8$  dB, perform **b** (2) below.

(6) Repeat (1) through (5) above for **BAND 2** and **BAND 3**, using appropriate hardware for the frequency range. If power meter does not indicate more than +5 dBm, perform appropriate adjustments in **b** (3) through (6) below.

#### **b. Adjustments**

(1) Adjust **BAND 1 LO A2R2** (fig. 5) for maximum power over lower portion of **BAND 1 (R)**.

(2) Adjust **BAND 1 HI A2R1** (fig. 5) for maximum power over upper portion of **BAND 1 (R)**.

(3) Adjust **BAND 2 LO A2R4** (fig. 5) for maximum power over lower portion of **BAND 2 (R)**.

(4) Adjust **BAND 2 HI A2R3** (fig. 5) for maximum power over upper portion of **BAND 2 (R)**.

(5) Adjust **BAND 3 LO A2R6** (fig. 5) for maximum power over lower portion of **BAND 3 (R)**.

(6) Adjust **BAND 3 HI A2R5** (fig. 5) for maximum power over upper portion of **BAND 3 (R)**.

### **24. Final Procedure**

**a.** Deenergize and disconnect all equipment.

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

## **SECTION VI CALIBRATION PROCESS FOR RF PLUG-IN MODELS 86200 SERIES**

### **25. Frequency Range**

#### **a. Performance Check**

(1) Connect equipment as shown in figure 6, CONNECTION A.

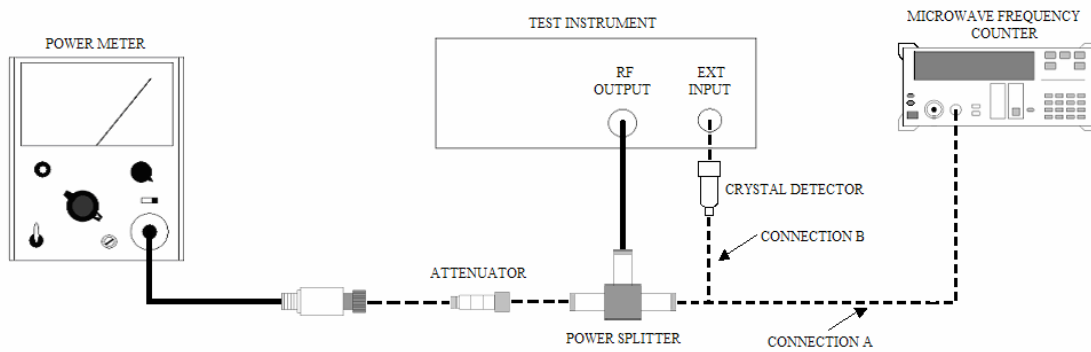


Figure 6. Frequency and power output - equipment setup.

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

- (a) **BAND** selector to the frequency of the plug-in installed.
- (b) **START MARKER** pointer to low end of frequency range.
- (c) **CW MARKER** pointer to midrange.
- (d) **STOP MARKER** pointer to high end of frequency range.
- (e) **MODE** switch to **MANUAL**.
- (f) **TRIGGER** switch to **INT**.
- (g) **TIME-SECONDS** switch to **0.1-0.01**.
- (h) **1 kHz SQ WV/OFF** (rear panel) to **OFF**.
- (i) **RF BLANKING** switch (rear panel) to **OFF**.
- (j) **ALC** switch to **INT** (or **EXT** if **INT** leveling option not applicable).
- (k) **RF** switch to **ON** (not applicable to some models).
- (l) **TIME-SECONDS** vernier control fully cw.

(m) **FM-NORM-PL** switch (rear panel) to **NORM** (not applicable to some models).

(3) Press **CW** pushbutton and turn **POWER LEVEL** control cw for maximum leveled power out.

#### NOTE

Adjust **CW MARKER** pointer from low to high end of frequency dial several times and approach the setting from the low frequency end.

(4) Set **CW MARKER** pointer to frequency settings listed in table 8. if microwave frequency counter does not indicate within limits specified, perform adjustments shown in table 8.

(5) Set **CW** pointer to midscale on frequency dial and note microwave frequency counter indication.

(6) Adjust autotransformer from 105 to 125 V ac. Indication on microwave frequency counter will not change more than the limits specified in table 9. Reset autotransformer to 115 V ac.

(7) Decrease **POWER LEVEL** control 10 dB as indicated on power meter. Indications on microwave frequency counter will not change more than limits specified in table 9.

(8) Press **MARKER SWEEP (START)** pushbutton and turn **MANUAL** control fully ccw. Microwave frequency counter will indicate within limits specified in table 10.

(9) Adjust **MANUAL** control fully cw. Microwave frequency counter will indicate within limits specified in table 10.

**b. Adjustments.** Perform adjustments as listed in table 8.

Table 8. Frequency Range and Accuracy (Model 86200 Series)

Model	Test instrument frequency dial settings	Microwave frequency counter indications (GHz)		Test instrument adjustments	Figures
		Min	Max		
86210A	0.003	- - -	<0.010	A1R21 (R)	7
	0.100	0.093	0.107	Compromise	
	0.350	0.343	0.357	A1R11 (R)	7
86220A-H80	0.01	- - -	<0.020	A1R21 (R)	7
	0.650 <sup>1</sup>	0.640	0.660	Compromise	
	1.30	1.290	1.310	A1R12 (R)	7
86230B-H80	1.8	1.790	1.815	A1R51 (R)	8
	3.0	2.990	3.010	Compromise	
	4.2	4.190	4.210	A1R47 (R)	8
86241A-H80	3.2	3.170	3.320	A1R51 (R)	8
	4.8	4.770	4.830	Compromise	
	6.5	6.470	6.530	A1R47 (R)	8
86242A-H80	5.9	5.865	5.935	A1R46 (R)	8
	7.5	7.465	7.535	Compromise	
	9.0	8.965	9.035	A1R43 (R)	8
86250B-H80	8.0	7.960	8.040	A1R46 (R)	8
	10.0	9.960	10.040	Compromise	
	12.4	12.360	12.440	A1R43 (R)	8
86260A-H80	12.4	12.350	12.450	A1R3 LO (R)	9
	16.0	15.950	16.050	Compromise	
	18.0	17.950	18.050	A1R6 HI (R)	9

<sup>1</sup>Switch CONNECTION A from MICROWAVE FREQUENCY COUNTER INPUT 2 to INPUT 1.

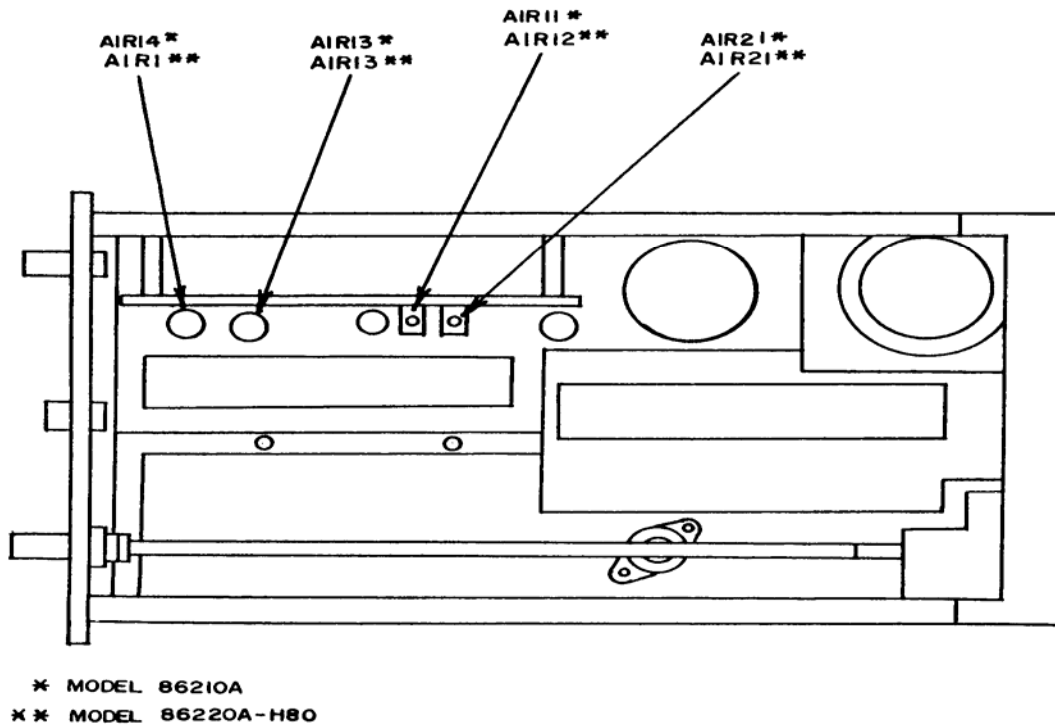


Figure 7. Models 86210A and 86220A-H80 - bottom view.

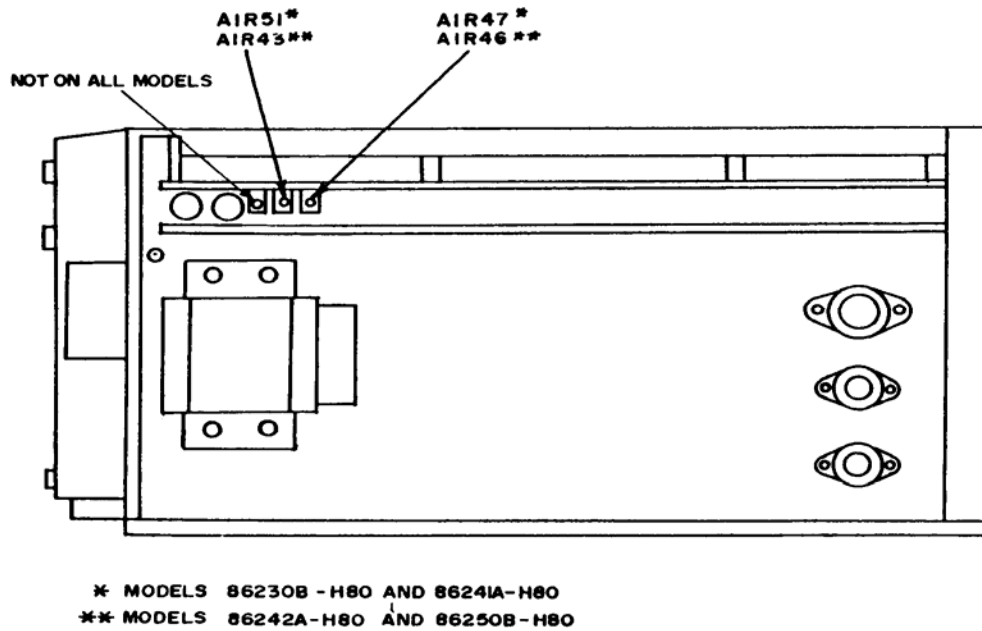


Figure 8. Models 86200 series - top view.



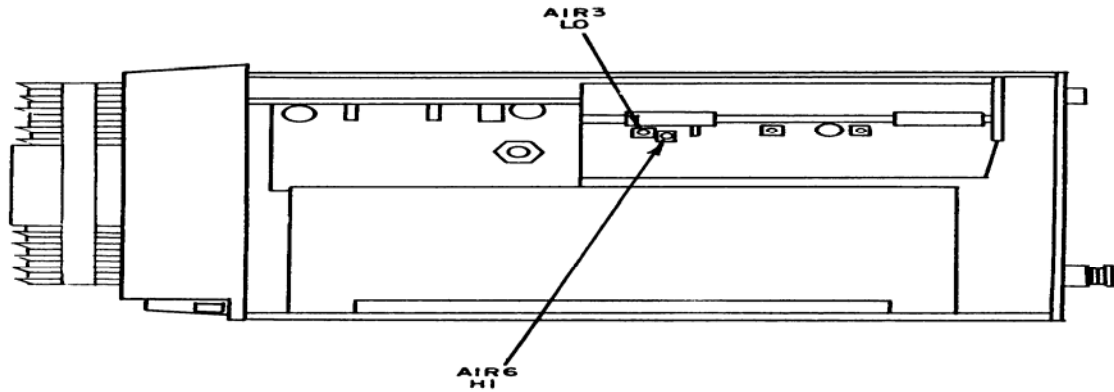


Figure 9. Model 86260A-H80 - top view.

Table 9. Frequency Stability Specifications

Test instrument		
Model	Voltage change from 105 to 125 V Ac	10 dB power level change
86210A	±20 kHz	±20 kHz
86220A-H80	±20 kHz	±20 kHz
86230B-H80	±20 kHz	±1 MHz
86241A-H80	±30 kHz	±1 MHz
86242A-H80	±40 kHz	±4 MHz
86250B-H80	±40 kHz	±2 MHz
86260A-H80	±180 kHz	±6 MHz

Table 10. Manual Sweep (Model 86200 Series)

Test instrument models	Test instrument <b>MANUAL</b> control fully ccw microwave frequency counter indications (GHz)		Test Instrument <b>MANUAL</b> control fully cw microwave frequency counter indications (GHz)	
	Min	Max	Min	Max
86210A	- - -	<0.010	0.340	0.360
86220A-H80	- - -	<0.020	1.285 <sup>1</sup>	1.315
86230B-H80	1.785	1.815	4.185	4.215
86241A-H80	3.177	3.233	6.477	6.533
86242A-H80	5.860	5.940	8.960	9.040
86250B-H80	7.950	8.050	12.350	12.450
86260A-H80	12.330	12.470	17.930	18.070

<sup>1</sup>Switch CONNECTION A from MICROWAVE FREQUENCY COUNTER INPUT 2 to INPUT 1.

## 26. Power Output

### a. Performance Check

- (1) Connect equipment as shown in figure 6, connection B.
- (2) Position controls as listed in (a) through (c) below:

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- (a) **MODE** switch to **AUTO**.
- (b) **ALC** switch to **EXT**.
- (c) **RF** switch to **ON**.

**NOTE**

Insure that polarity switch inside plug-in matches crystal detector being used when using external leveling mode.

(3) Press **CW** pushbutton and adjust **POWER LEVEL** control (and **SLOPE** and/or **GAIN** on some models) for maximum leveled power out. If power meter does not indicate within the limits specified in table 11, perform (b) below.

**NOTE**

Tolerances do not include losses due to frequency response of thermistor mount or other accessories.

(4) Slowly rotate **CW MARKER** control throughout frequency range while observing power meter indication. Power level will not vary more than limits specified in table 11.

Table 11. Power Output (Models 86200 Series)

Test instrument			
Model	Power output indications (dBm) <sup>1</sup>		Variations <sup>2</sup> across band (dB)
	Min	Max	
86210A	+12.65	+13.35	±0.35
86220A-H80	+9	+11	±0.5
86230B-H80	> +10.0	- - -	±1.2
86241A-H80	> +4.0	- - -	±0.7
86242A-H80	> +10.0	- - -	±1.0
86250B-H80	> +8.0	- - -	±1.0
86260A-H80	> +7.0	- - -	±0.6

<sup>1</sup>Values include power meter indication plus 10 dB attenuator (fixed) and power splitter value.

<sup>2</sup>Tolerance does not include variations due to thermistor mount and power splitter frequency response.

- (5) Connect power meter to **RF OUTPUT**, using attenuator (fixed).
- (6) Set **ALC** switch to **INT**.
- (7) Repeat technique of (3) and (4) above for models with internal leveling option.

**NOTE**

Steps (8) and (9) below are applicable to models with output attenuator (fixed) (option 002).

(8) Connect power meter to **RF OUTPUT**, and set output attenuator (fixed) to 0 dBm. Adjust **POWER LEVEL** control for a convenient reference on power meter (2 dB less than full scale).

(9) Change output attenuator (fixed) in 1 step (10 dB) meter range control in 10 dB increments to -30 dBm. Power meter will indicate within +2.0 dB of reference established in (8) above.

**b. Adjustments**

(1) Model 86210A

(a) Set **POWER LEVEL** control to +13 dBm and adjust A1R14 (fig. 7) for +13 dBm  $\pm$ 0.2 dB power output indication (R).

(b) Set **POWER LEVEL** control to 0 dBm and adjust A1R13 (fig. 7) for 0 dBm  $\pm$ 0.1 dB power output indication (R).

(2) Model 86220A-H80

(a) Set **POWER LEVEL** control to +10 dBm and adjust A1R1 (fig. 7) for +10 dBm  $\pm$ 0.1 dB power output indication (R).

(b) Set **POWER LEVEL** control to 0 dBm and adjust A1R13 (fig. 7) for 0 dBm  $\pm$ 0.1 dB power output indication (R).

(3) No adjustments can be made for models 86230B-H80, 86241A-H80, 86242A-H80, 86250B-H80, and 86260A-H80.

**27. Final Procedure**

a. Deenergize and disconnect all equipment.

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

**SECTION VII  
CALIBRATION PROCESS FOR RF PLUG-IN, MODELS 8621A AND 8621B WITH  
RF PLUG-IN MODULE MODELS 86320A, 86330A, AND 86341B**

**28. Frequency Range**

**a. Performance Check**

(1) Connect equipment as shown in figure 6, connection A.

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

(a) **BAND** selector to **BAND 1 (0.1 to 2 GHz)**.

(b) **START MARKER** pointer to **0.1 GHz**.

(c) **STOP MARKER** pointer to **2.0 GHz**.

(d) **MODE** switch to **MANUAL**.

(e) **TRIGGER** switch to **INT**.

(f) **TIME-SECONDS** switch to **0.1-0.01**.

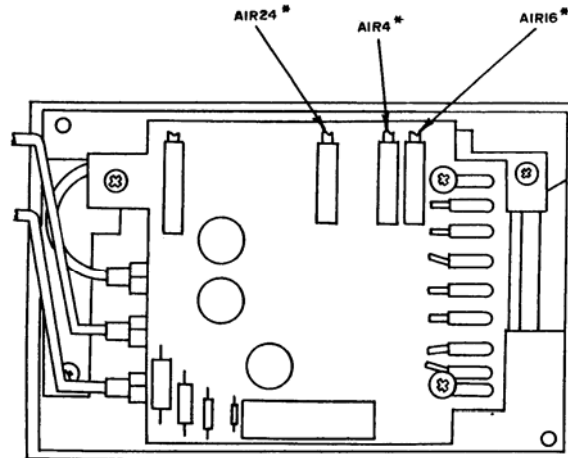
(g) **1 kHz SW WV** switch (rear panel) to **OFF**.

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- (h) **RF BLANKING** switch (rear panel) to **OFF**.
  - (i) **ALC** switch to **INT**.
  - (j) **RF** switch to **ON**.
  - (k) **FM-NORM-PL** switch (rear panel) to **NORM**.
- (3) Adjust **POWER LEVEL** control cw for maximum level power out.
- (4) Press **CW** pushbutton and adjust **CW MARKER** pointer from high to low end of frequency scale several times, then set **CW MARKER** pointer to **0.10 GHz**. If microwave frequency counter does not indicate within limits specified in table 12, perform the appropriate adjustment listed in table 12.
- (5) Repeat technique (4) above at frequency settings listed in table 12. If microwave frequency counter does not indicate within limits specified, perform adjustments shown in table 12.

Table 12. Frequency Range (Models 8621A and B)

Test instrument frequency dial settings (GHz)	Microwave frequency counter indications (GHz)		Test instrument adjustments	Figures
	Min	Max		
<b>BAND 1</b>				
0.10	0.080	0.120	A1R24 (R)	10
1.0	0.980	1.020	Compromise	
2.0	1.980	2.020	A1R16 (R)	10
<b>BAND 2</b>				
1.8	1.780	1.820	A2R10 (R)	11
3.0	2.980	3.020	Compromise	
4.2	4.180	4.220	A2R9 (R)	11
<b>BAND 3</b>				
3.2	3.170	3.230	A2R3 (R)	11
5.0	4.970	5.030	Compromise	
6.5	6.470	6.530	A2R8 (R)	11



\* REVERSED ON SOME AI ASSEMBLIES. REFER TO APPLICABLE MFG MANUAL FOR SN OF T1.

Figure 10. Model 86320A - adjustments.

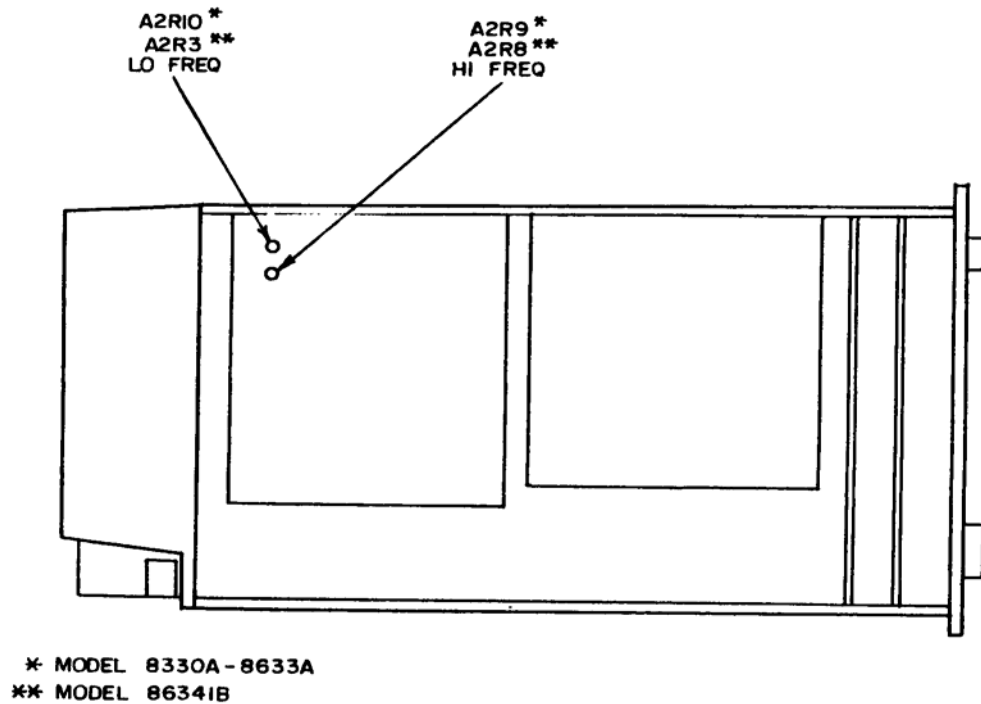


Figure 11. Models 86330A-8633A and 86341B - adjustments.

(6) Press **START MARKER** pushbutton and turn **MANUAL** control to settings listed in table 12a. Microwave frequency counter will indicate within limits specified in table 12a.

(7) Repeat technique (6) above for **MANUAL** control and **BAND** settings listed in table 12a. Microwave frequency counter will indicate within limits specified in table 12a.

Table 12a. Frequency Range (Models 8621A and B)

Test instrument <b>MANUAL</b> control settings	Test instrument <b>BAND</b> settings	Test instrument nominal value (GHz)	Microwave frequency counter indications (GHz)	
			Min	Max
ccw	<b>BAND 1</b>	0.100	0.075	0.125
ccw	<b>BAND 2</b> <sup>1</sup>	1.800	1.775	1.825
ccw	<b>BAND 3</b> <sup>2</sup>	3.200	3.167	3.233
cw	<b>BAND 1</b>	2.000	1.975	2.025
cw	<b>BAND 2</b> <sup>1</sup>	4.200	4.175	4.225
cw	<b>BAND 3</b> <sup>2</sup>	6.500	6.467	6.533

<sup>1</sup>Insure that **START** and **STOP MARKER** pointers are set to 1.8 and 4.2 GHz on **BAND 2**.

<sup>2</sup>Insure that **START** and **STOP MARKER** pointers are set to 3.2 and 6.5 GHz on **BAND 3**.

(8) Turn **BAND** switch to **BAND 1**, press **CW** pushbutton and set **CW MARKER** pointer to midrange on frequency dial. Note microwave frequency counter indication.

(9) Adjust autotransformer from 105 to 125 V ac. Indication on microwave frequency counter will not change more than  $\pm 100$  kHz from microwave frequency counter indication noted in (8) above. Reset autotransformer to 115 V ac.

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(10) Decrease **POWER LEVEL** control 10 dB as indicated on power meter. Indication on microwave frequency counter will not change more than  $\pm 1$  MHz.

(11) Repeat (8) through (10) above for **BANDS 2** and **3**.

**b. Adjustments.** No further adjustments can be made.

## 29. Power Output

### a. Performance Check

(1) Connect equipment as shown in figure 6, connection B.

(2) Set polarity switch (located at top front of RF plug-in) to match the polarity of the crystal detector being used.

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

(a) **BAND** selector to **BAND 1** (Model 86320A).

(b) **ALC** switch to **EXT**.

(4) Press **MARKER SWEEP (START)** pushbutton and adjust **POWER LEVEL** and **GAIN** controls for maximum leveled power output. Power meter will indicate +10 dBm or more for **BAND 1** (Model 86320A) (considering attenuator (fixed)).

### NOTE

Tolerances given do not include variations due to crystal detector and power splitter frequency response.

(5) Adjust **MANUAL** sweep control slowly throughout its range and note indications on power meter. Difference between minimum and maximum will be less than 0.4 dB.

### NOTE

Steps (6) and (7) below are applicable to models with option 001 (internal leveling).

(6) Set **ACL** switch to **INT** and adjust **POWER LEVEL** and **ALC GAIN** controls for maximum leveled power out.

(7) Repeat (4) and (5) above. Variation will be less than 0.8 dB.

(8) Repeat (3) through (7) above for **BAND 2** and **BAND 3**. Maximum leveled power out will be greater than +7.5 dBm for **BAND 2** (model 86330A) and +10 dBm for **BAND 3** (model 86341B).

### NOTE

Steps (9) through (11) below are applicable to models with option 010 (70 dB attenuator (fixed)).

### CAUTION

Always adjust power level fully ccw or **RF** switch to **OFF** before making connections.

(9) Remove attenuator (fixed) and connect power meter directly to **RF OUTPUT**. Press **CW** pushbutton and set **CW** pointer to midrange.

(10) Adjust **POWER LEVEL** control cw for a convenient reference on power meter (2 dB less than full scale with TI output attenuator (fixed) set to 0 dB).

(11) Change output attenuator (fixed) in 1 step (10 dB) increments, while simultaneously changing power meter in 2 step (10 dB) increments to -30 dBm. Power meter will indicate within  $\pm 1.0$  dB of reference established in (10) above.

**b. Adjustments.** No adjustments can be made.

### **30. 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*

0709506

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342066,  
requirements for calibration procedure TB 9-4931-495-24.



### 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](mailto: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.





