DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DOWN CONVERTER, CV-3427(V) 1/U (HEWLETT-PACKARD, MODEL 3730A WITH PLUG-IN OSCILLATORS MODELS 3736A, 3737A, 3738A, AND 3739A)

Headquarters, Department of the Army, Washington, DC
31 August 78

REPORTING OF ERRORS

You can help improve this manual by calling attention to errors and by recommending improvements and stating your reasons for the recommendations. Your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) should be mailed direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-MA-Q, Fort Monmouth, NJ 07703. A reply will be furnished direct to you.

* This bulletin supersedes TB 11-6626-2768-50, 25 January 1977.

SECTION I
INTRODUCTION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Down Converter, CV-3427(V) 1/U (Hewlett-Packard Model 3730A with Plug-in Oscillators, Models 3736A, 3737A, 3738A, and 3739A). The manufacturer's instruction manuals were used as prime data sources in compiling these instructions. The above equipment will be referred to as the TI (test instrument) throughout this bulletin.

a. *Model Variations*. Model variations are described in text.

b. *Time and Technique*. The time required for this calibration is approximately 4 hours, using the microwave technique.

2. Calibration Data Card (DA Form 2416)

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TM 38-750. DA Form 2416 must be annotated in accordance with TM 38-750 for each calibration performed.

b. Adjustments to be reported on DA Form 2416 are designated (R) at the end of the sentence in which they appear. 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
Oscillator frequency range:	3736A Band 1:1.7 to 3 0 GHz Band 2: 2.9 to 4.2 GHz 3737A Band 1: 3.3 to 5 0 GHz Band 2: 4 8 to 6.5 GHz 3738A Band 1: 6.3 to 7.4 GHz Band 2: 7.4 to 8.5 GHz 3739A 10.7 to 11.7 GHz
Accuracy:	± 20 MHz
Meter	
Range:	45 to 95 MHz
Accuracy:	± 0.5 MHz to 70 MHz, ± 2 MHz over rest of scale

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment used in this calibration procedure. This equipment is issued with Secondary Transfer Standards Calibration Sets NSN 6695-00-621-7878 (Level A) and 4931-01-019-1829 (AN/GSM-259), and is to be used in performing this procedure. Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI.

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

Table 2. Minimum Specifications of Equipment Required

Item	Common name and/or (official nomenclature)	Minimum use specifications	Manufacturer, model, and part number	
			Level A	AN/GSM-259
A1	AC VOLTMETER (VOLTMETER)	Range: 0 to 50 mV rms Accuracy: ± 1%	Hewlett-Packard, Model Y10-3400AMOD (7911058-3)	Hewlett-Packard, Model 400EL (400EL)
A2	DC VOLTMETER (DIGITAL VOLTMETER)	Range: -15 to +100V Accuracy: ± 1%	Dana, Model 5703-S-2127 (7912606)	Hewlett-Packard, Model 3490AOPT060 (3490-AOPT060)
A3	FREQUENCY COUNTER (ELECTRONIC DIGITAL COUNTER)	Range: 1 to 12 GHz Accuracy: ± 0.1%	Systron-Donner, Model 1037M (7910823) w/frequency converter, Model 1292 (7910648)	Hewlett-Packard, Model 5340AOPT908 (5340-AOPT908)
A4	SIGNAL SOURCE SYSTEM	Frequency range: 1 to 12 GHz Output: At least 1 mW	Signal source system (7923114) Synchronizer Sage, Model 243A (7923102), Power Supply, PRD Model 816-S10 (7923105) RF Head Assemblies L7006 (7923021) ; S7006 (7923022) CX7006 (7923023), and accessories required for leveled operations.	Hewlett-Packard, Model 8620COPT908C03 (8620-COPT908C03) w/Plug-ins, Models 86222A (86222A) and 86290A (86290A)
A5	VARIABLE POWER TRANSFORMER	Range:105 to 125 Vac Accuracy: ± 3%	General Radio, Model W10MT3AS3 (7910809)	Same as Level A

[1]The calibration equipment utilized in this procedure was selected from those known to be available at Department of Defense facilities, and the listing by make and model number carries no implication of preference, recommendation, or approval by the Department of Defense for use by any other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in the procedure.

Table 3. Accessories Required

Item	Common name and/or (official nomenclature)	Description and part number	
		Level A	AN/GSM-259
B1	ADAPTER (CONNECTOR ADAPTER)	N type tee, two jacks, one plug UG-107B/U (7907472)	Same as Level A
B2	ADAPTER (CONNECTOR ADAPTER)	BNC plug to N jack UG-349A/U (10519458)	Same as Level A
B3	ADAPTER (CONNECTOR ADAPTER)	N plug to N plug UG-57B/U (MS15507-57B)	Same as Level A
B4 [1]	CABLE ASSEMBLY [1] (RF CABLE ASSEMBLY)	36-in., UG-21E/U, N plug terminations (10519061)	Same as Level A
B5	CABLE ASSEMBLY (RF CABLE ASSEMBLY)	36-in., RG-58/U, BNC plug w/alligator clips AL-C-BNC-36 (7909410)	Same as Level A

Table 3. Accessories Required - Continued

Item	Common name and/or (official nomenclature)	Description and part number	
		Level A	AN/GSM-259
B6	ISOLATOR (RF REFLECTION ISOLATOR)	Coaxial type: 1 to 2 GHz 157A27 (7913127-1) 2 to 4 GHz 157A28 (7913127-2) 4 to 8 GHz 157A29 (7913127-3)	Coaxials not available
		Waveguide type: 8 to 12.4 GHz w/two each coaxial to waveguide adapters PRD, Model 354C, (10519423)	Microlab/FXR, Model X157A (X157A) w/two each coaxial to waveguide adapters, UG-446A/U (UG-446 A/U)

[1] Two required.

SECTION III
PRELIMINARY OPERATIONS

6. Preliminary Instructions

a. The instructions outlined in this section are preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name and item identification number as listed in tables 2 and 3. For the identification of equipment referenced by items numbers prefixed with A, see table 2, and for prefix B, see table 3.

WARNING

HIGH VOLTAGE is used during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions.

NOTE

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

7. Equipment Setup

a. Remove TI protective covers.

b. Insert appropriate oscillator into TI.

c. Connect TI to variable power transformer (A5) and adjust for 115 V (volt) ac (alternating current).

d. Set power switch to ON and allow approximately 15 minutes for temperature stabilization.

NOTE

Unless otherwise specified, verify the results 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.

8. Frequency Accuracy

a. Performance Check

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

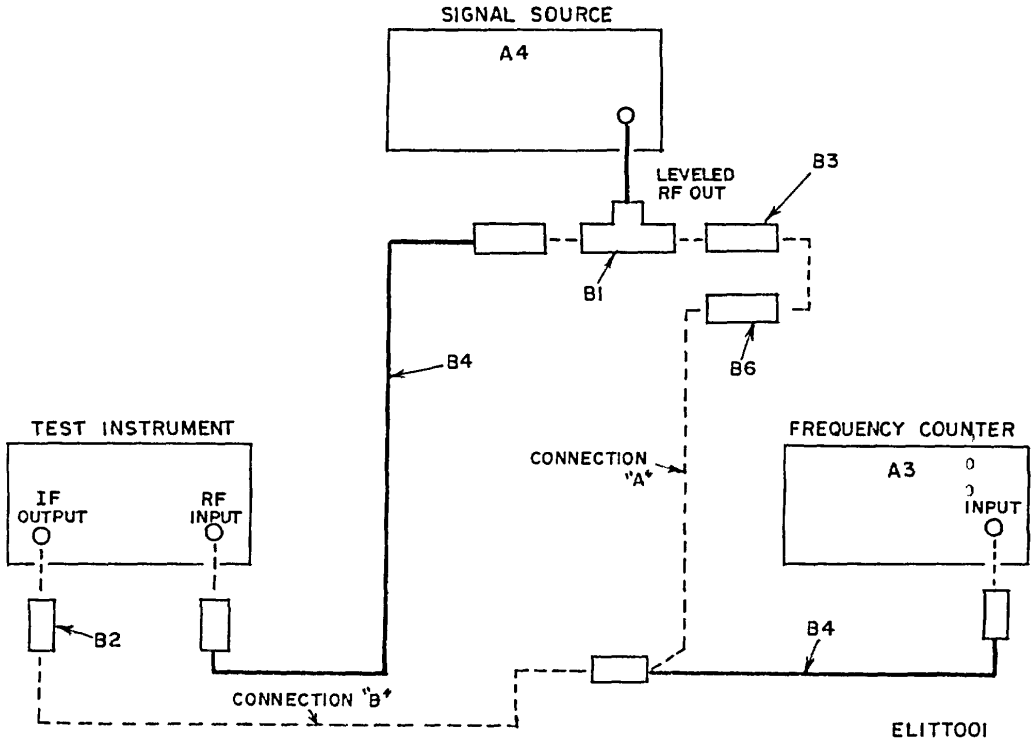

Figure 1. Frequency accuracy and meter calibration - equipment setup.

(2) Position TI controls as listed in (*a*) through (*d*) below:

(*a*) AFC switch to OFF.

(*b*) FREQUENCY SELECTOR dial to low end, of range.

(*c*) INPUT FREQUENCY dial to low end of frequency range.

(*d*) All IF ATTENUATOR pushbuttons pressed (option 010 only).

(3) Adjust signal source system (A4) for a leveled 1-mW (milliwatt) output at the same frequency as the TI oscillator dial setting.

(4) Fine tune the signal source system frequency control until the IF CENTER MHz meter indicates 70 MHz (megahertz).

(5) To confirm the correct input frequency, set AFC switch to ON. If the IF CENTER MHz meter does not remain at 70 MHz, reset AFC switch to OFF and readjust signal source system frequency control to give another 70 MHz tuning point.

(6) When the true input frequency is confirmed, set AFC switch to OFF. If frequency counter (A3) does not indicate the TI oscillator INPUT FREQUENCY dial setting ± 20 MHz, perform b below.

(7) Repeat (2) through (6) above at the TI frequency settings shown in table 4.

Table 4. Frequency Accuracy

TI FUNCTION selector	Frequency settings (GHz)	Frequency counter indications (GHz)	
		Min	Max
Plug-In Model 3736A			
Band 1: 1.7 to 3 0 GHz	2.0	1.980	2.020
	2.5	2.480	2.520
	3.0	2.980	3.020
Band 2: 2.9 to 4 2 GHz	3.5	3.480	3.520
	4.0	3.980	4.020
	4.2	4.180	4.220
Plug-In Model 3737A			
Band 1: 3.3 to 5.0 GHz	3.3	3.280	3.320
	4.0	3.980	4.020
	5.0	4.980	5.020
Band 2: 4.8 to 6.5 GHz	4.8	4.780	4.820
	5.5	5.480	5.520
	6.5	6.480	6.520
Plug-In Model 3738A			
Band 1: 6.3 to 7.4 GHz	6.5	6.480	6.520
	7.0	6.980	7.020
	7.4	7.380	7.420
Band 2: 7.4 to 8.5 GHz	7.5	7.480	7.520
	8.0	7.980	8.020
	8.5	8.480	8.520
Plug-In Model 3739A			
10.7 to 11.7 GHz	11.0	10.980	11.020
	11.4	11.380	11.420
	11.7	11.680	11.720

b. Adjustments

(1) Set INPUT FREQUENCY dial to the low end of the frequency range and adjust signal source system frequency control for the same frequency indication on frequency counter.

(2) Connect frequency counter to the TI IF OUTPUT connector.

(3) Adjust BAND 1 LF (Fig. 2, 3, and 4 for oscillator Models 3736A, 3737A, 3738A, and 3739A, respectively), to give a 70-MHz $\pm$1 MHz indication on frequency counter. Verify this as the true 70-MHz tuning point as shown in *a*(5) above. (R)

(4) Repeat b(l) through (3) above at the upper and lower ends of TI frequency range (both bands), and make appropriate adjustment as shown in figures 2, 3, and 4 for plug-in Models 3736A, 3737A, 3738A, and 3739A, respectively.

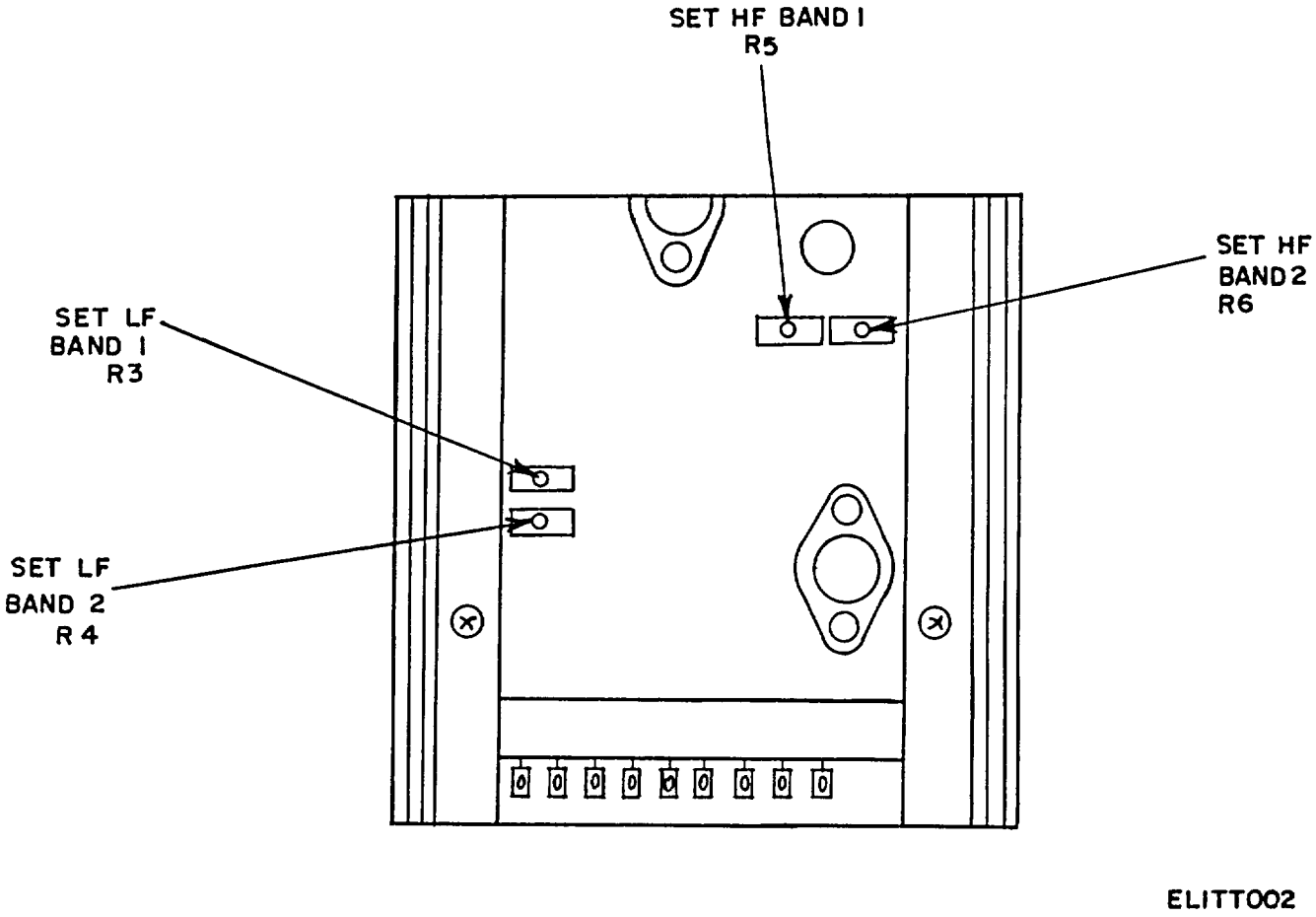

Figure 2. Adjustment locations, HP Models 3736A and 3737A.

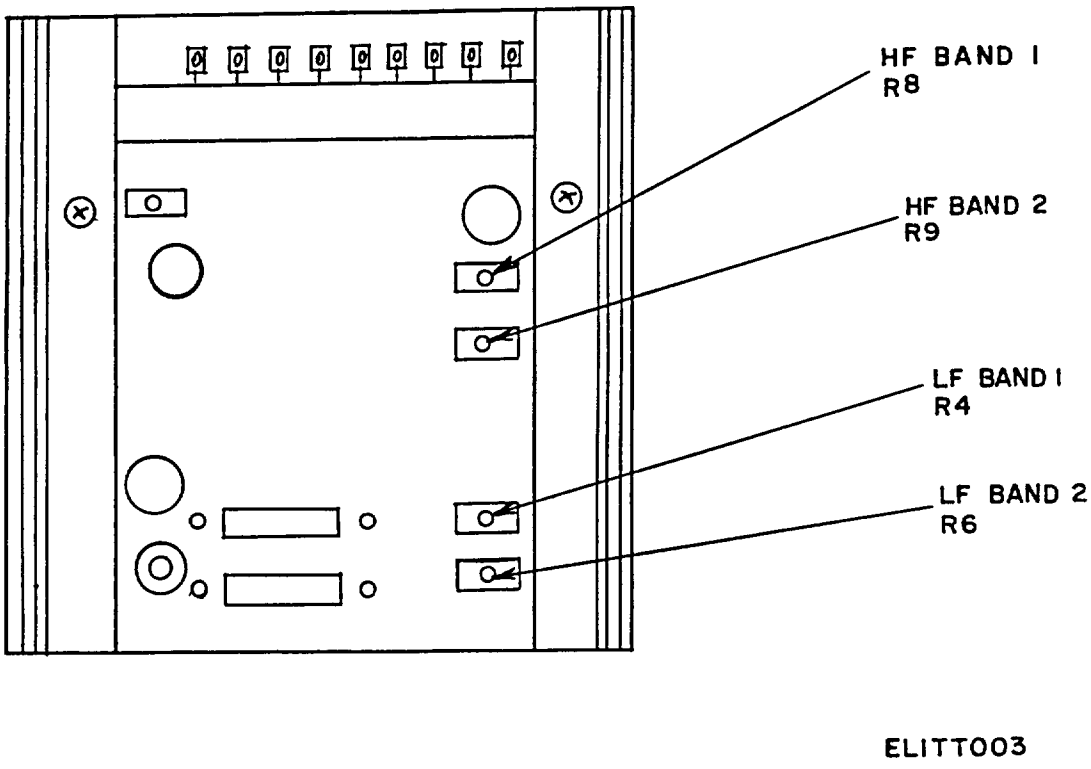

Figure 3. Adjustment locations, HP Model 3738A

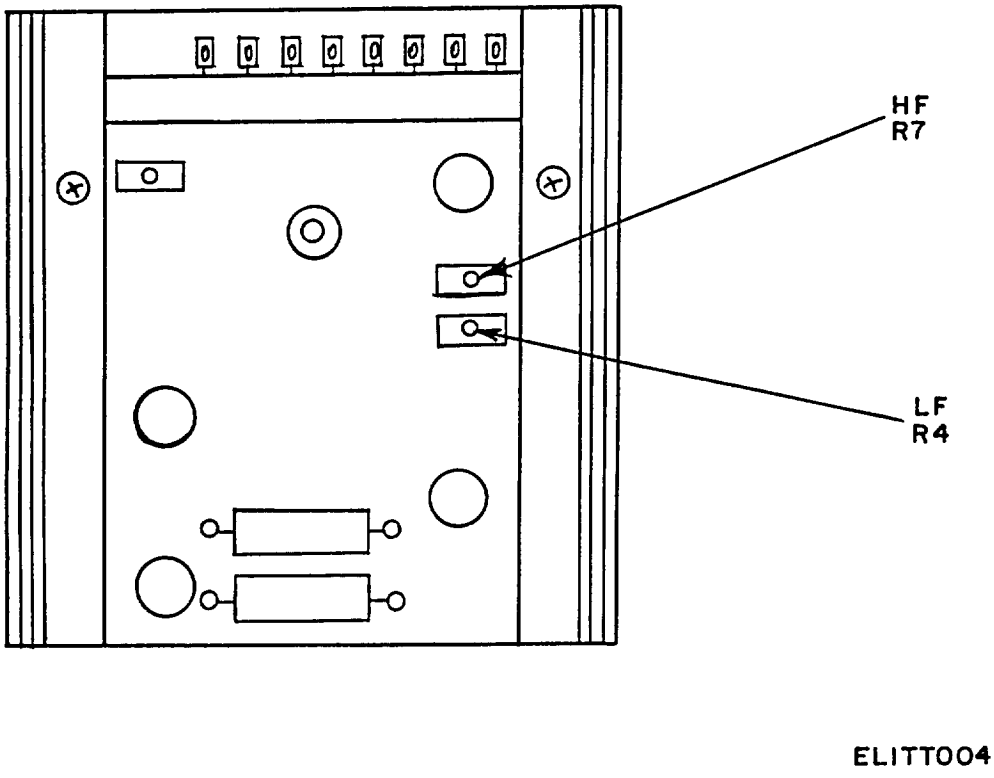

Figure 4. Adjustment locations, HP Model 3739A.

9. Meter Calibration

a. Performance Check

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

(2) Set FREQUENCY SELECTOR and INPUT FREQUENCY dial to the upper end of frequency range.

(3) Adjust signal source system (A4) to the same frequency as the TI oscillator dial setting with one mw of output power.

(4) Fine tune signal source system frequency control until TI IF CENTER MHz meter indicates 70 MHz.

(5) To confirm the true frequency, set AFC switch to ON. If the IF CENTER MHz meter does not remain at 70 MHz, reset AFC switch to OFF and readjust signal source system frequency control to give another 70-MHz tuning point. When true frequency is confirmed, set AFC switch to OFF.

(6) If frequency counter (A3) does not indicate between 69.5 and 70.5 MHz, perform *b*(1) below.

(7) Adjust signal source system until TI IF CENTER MHz meter indicates 45 MHz. If frequency counter does not indicate between 43 and 47 MHz, perform b(2) below.

(8) Adjust signal source system frequency control until TI IF CENTER MHz meter indicates 9Q MHz. If frequency counter does not indicate between 88 and 92 MHz, perform *b*(3) below.

b. Adjustments (Fig. 5).

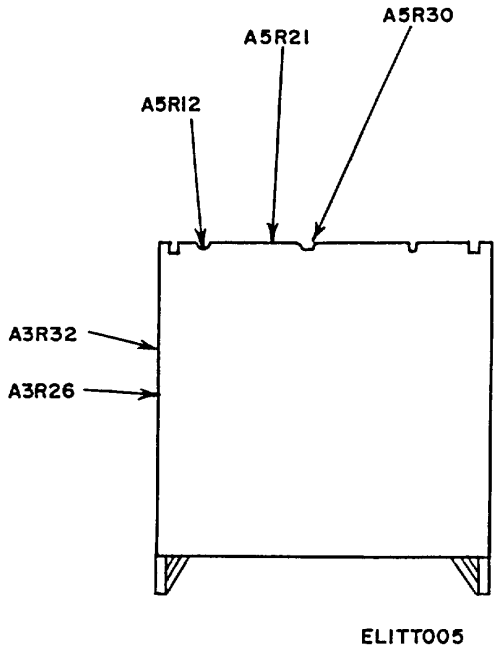

Figure 5. Adjustment locations.

(1) Adjust signal source system frequency control for a 70-MHz indication on frequency counter, and adjust A3R32 for a TI IF CENTER MHz meter indication of 70 MHz (R).

(2) Adjust signal source system frequency control for a 45-MHz indication on frequency counter, and adjust A3R26 for a TI IF CENTER MHz meter indication of 45 MHz (R).

(3) Repeat (1) and (2) above and alternately adjust A3R26 and A3R32 for minimum error across the scale of the TI meter.

10. Power Supply

a. Performance Check

(1) +15 Volt Check

(*a*) Connect ac voltmeter (A1) and dc (direct current) voltmeter (A2) in parallel between A5, pin 2 and ground, using cable assembly (B5). If dc voltmeter does not indicate +15 V ±30 mV (millivolts), perform *b*(1) below.

(*b*) Ripple voltage on ac voltmeter will not exceed 5 mV.

(2) -15 Volt Check.

(*a*) Connect ac and dc voltmeters in parallel between A5, pin 14 and ground, using cable assembly (B5). If dc voltmeter does not indicate 15 V ±30 mV, perform *b*(2) below.

(*b*) Ripple voltage on ac voltmeter will not exceed 5 mV.

(3) +20 Volt Check

(*a*) Connect ac and dc voltmeters in parallel between A5, pins 16 and 19, using cable assembly (B5). If dc voltmeter does not indicate +20 V, perform *b*(3) below.

(*b*) Ripple voltage on ac voltmeter will not exceed 5 mv.

(4) +100 Volt Check

(*a*) Connect ac and dc voltmeters in parallel between A5, pin 8 and ground, using cable assembly (B5). Dc voltmeter will indicate +100 V, ±15 V.

(*b*) Ripple voltage on ac voltmeter will not exceed 50 mV.

(5) + 5 Volt Check

(*a*) Connect ac and dc voltmeters in parallel between A5, pin 13 and ground, using cable assembly (B5). Dc voltmeter will indicate +5 V, -0.15 V.

(b) Ripple voltage on ac voltmeter will not exceed 20 mV.

b. Adjustments (Fig. 5)

(1) Adjust A5R12 for an indication of +15 V (R).

(2) Adjust A5R21 for an indication of 15 V (R).

(3) Adjust A5R30 for an indication of +20 V (R).

11. Final Procedure

a. Deenergize and disconnect all equipment and reinstall protective cover on TI.

b. in accordance with TM 38-750, annotate and affix DA Label 80 (US Army Calibration System). When the TI cannot be adjusted within tolerance, annotate and affix DA Form 2417 (Unserviceable or Limited Use) tag.

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