

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

**CALIBRATION PROCEDURE FOR
AMPLIFIER, AUDIO FREQUENCY-RADIO
FREQUENCY AM-4825/U
AND
AM-4825A/U (HEWLETT-PACKARD MODEL 461A)
(NSN 6625-00-982-2977)**

Headquarters, Department of the Army, Washington, D.C.
16 August 1977

REPORTING OF ERRORS

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S E C T I O N I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument. This bulletin provides instructions for the calibration of Audio Frequency-Radio Frequency Amplifier AM-4825/U and AM-4825A/U (Hewlett-Packard Model 461A). The manufacturer's instruction 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. All data herein applies to both models of the amplifier.

b. Time and Technique. The time required for this calibration is approximately 2 hours, using dc and

low frequency technique.

2. DA Form 2416 (Calibration Data Card). 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

TI parameters	Performance specifications
Frequency range	1 kHz to 150 MHz.
Frequency response	+ 1 db, 1 kHz to 150 MHz, into 50 ohms (500 kHz reference).
Gain at 500 kHz	40 db +0.5 db, 20 db + 1.0 db
Output	0.5 volts rms into 50 ohms
Distortion	Less than 5% at maximum output and rated load.
Maximum input*	1 volt rms or 2 volts p-p.
Input impedance*	50 ohms, nominal
Equivalent input noise	Less than 40 microvolts (40 db position).
Power requirements*	115 or 230 volts ±10%, 50 to 100 Hz, 5 watts.

*For information only; not necessarily verified in this procedure.

SECTION II EQUIPMENT REQUIREMENTS

4. **Equipment** Required Table 2 identifies the specific equipment used in this calibration procedure. This equipment was selected from those known to be available in AN/TSM-55(V)2 and AN/TSM-55(V)5. 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 accuracy ratio between the standard and test instrument. Where

the four-to-one accuracy ratio cannot be met, the actual accuracy of the equipment selected is shown in parenthesis.

5. **Accessories** Required. The accessories used for the calibration was selected from those known to be available in AN/TSM-55(V)2 and AN/TSM-55(V)5. The listing by make or model number carries no implication of preference, recommendation, or approval by the Department of Defense for use by other agencies. Equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in the procedure.

Table 2. Minimum Specification of

Item	Common name	Minimum use specifications	Manufacturer, model, and part number
A1	AUTOTRANSFORMER	105 to 125 vac ± 3%.	Variable Power Transformer TF-510/U (General Radio, Model W10MT3A).
A2	STEP ATTENUATOR	0 to 60 db ±0.3 db, at 1 kHz.	Variable Attenuator CN-1128/U (Hewlett-Packard, Model 355D).
A3	VOLTMETER	-60 to +10 db ±1%, 1 kHz to 500 kHz.	Electronic Voltmeter AN/USM-265 (Hewlett-Packard, Model 90EL-02).
A4	SIGNAL GENERATOR	1 kHz to 10 MHz ±2%, 0 to 3 vrms, less than 1% distortion.	Signal Generator AN/USM-264 (Hewlett-Packard, Model 652A).
A5	DISTORTION ANALYZER	5% at 600 kHz.	Distortion Indicator AN/URM-180 (Hewlett-Packard, Model 333A).
A6	MULTIMETER	0 to 0.5 vac ±3%, 1 kHz to 100 MHz.	Multimeter ME-338/U (Ballantine, Model 345).
A7	OSCILLATOR	10 MHz to 50 MHz, 0 to 0.3 vrms.	Signal Generator AN/USM-313 (General Radio, Model 1211C).
A8	OSCILLATOR	50 MHz to 150 MHz, 0 to 0.3 vrms.	Signal Generator AN/USM-252 (General Radio, Model 1215C).
A9	POWER SUPPLY	6.3 vac, 4A and 300 vdc, 70 mA.	Power Supply PP-6239/U (General Radio, Model 1201C).
A10	POWER METER	0 to 10 mw, 10 MHz to 150 MHz.	Radio Frequency Power Test Set AN/USM-260 (Hewlett-Packard, Model 431C) with Thermistor Mount MX-7772/U (Hewlett-Packard, Model 478A).

Table 3. Accessories Required

Item	Common name	Description and part number
B1	TERMINATION	50 Ω BNC feedthrough (Electrical Dummy Load DA-471/U, Hewlett-Packard Model 11048B).
B2	ADAPTER	Tee, BNC plug to 2 BNC jacks (Connector Adapter UG-274B/U, Amphenol Model UG-274B/U).
B3	CABLE ASSEMBLY (3 required)	36 inch, RG-58C/U BNC plug to BNC plug (Pomona Electronics Model BNC-C-36).
B4	ADAPTER (2 required)	BNC jack to double banana plug (Connector Adapter UG-1887/U, Pomona Electronics Model 1269).
B5	ADAPTER	BNC plug to N jack (Connector Adapter UG-349B/U, Amphenol Model UG-349B/U).
B6	TERMINATION	50 Ω N plug (Fixed Attenuator CN-1127/U, Weinschel Model 535MN).
B7	ADAPTER	50 Ω tee (Connector Adapter UG-1885/U, Ballantine Model 1345).
B8	ATTENUATOR	10 db, N plug to N jack (Fixed Attenuator CN-1200/U, Weinschel Model 50-10).
B9	ADAPTER	GR-874 to N jack (Connector Adapter UG-1865/U, General Radio Model 874-QNJA).
B10	ADAPTER	BNC jack to N plug (Connector Adapter UG-201A/U, Amphenol Model UG-201A/U).

SECTION III

CALIBRATION PROCESS

6. Preliminary Instructions. a. The instructions outlined in this paragraph are preparatory to the calibration process. Personnel should become familiar with sections I, II, and III before beginning the calibration.

b. Items of equipment and accessories 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 item numbers prefixed with A, see table 2 and for prefix B, see table 3.

CAUTION

During this procedure, if more than 10 mw is applied to power meter (A10), damage could result that would produce an unsatisfactory calibration performance.

Equipment Setup. a. Energize equipment and allow sufficient time for equipment to warm up and stabilize.

b. Adjust autotransformer (A1) output voltage control to minimum.

c. Connect TI power cord to autotransformer.

d. Adjust autotransformer output voltage control for a meter indication of 115 vac.

e. Set TI gain (DB) switch to 40 and allow 10 minutes warmup.

NOTE

When TI is not within tolerance, perform the specified adjustment and continue the performance check. When the TI is not within tolerance and no adjustment is specified, the deficiency must be corrected before continuing with the procedure.

8. Gain and Output Voltage. a. *Performance Check.*

(1) Connect equipment as shown in figure L

(2) Set step attenuator (A2) DB switch to 60.
 (3) Set voltmeter (A3) RANGE switch to -50 dB.
 (4) Adjust signal generator (A4) FREQUENCY and OUTPUT AMPLITUDE controls for 500 kHz output and voltmeter indication of 0 on the DECIBEL scale.

(5) Set voltmeter RANGE switch to -10 DB.
 (6) Disconnect voltmeter cable assembly (B3) from adapter (B2) and connect to termination (B 1).
 (7) Voltmeter indicates between -0.6 and +0.5 DECIBELS.

(8) Set TI GAIN (DB) switch to 20.
 (9) Set voltmeter RANGE switch to -30 DB.
 (10) Voltmeter indicates between -1.0 and + 1.0 DECIBELS.

(11) Adjust autotransformer output control for meter indication of 105,125, and 115 vac. Voltmeter indicates between -1.0 and +1.0 DECIBELS at each setting.

(12) Disconnect voltmeter cable assembly (B3) from termination (B1) and reconnect to adapter (B2).

(13) Set voltmeter RANGE switch to -40 DB.

(14) Set step attenuator DB switch to 50.

(15) Adjust signal generator OUTPUT AMPLITUDE controls for voltmeter indication of -3.8 DECIBELS.

(16) Set TI GAIN (DB) switch to 40.

(17) Set voltmeter RANGE switch to 0 DB.

(18) Disconnect voltmeter cable assembly (B3) from adapter (B2) and connect to termination (B 1).

(19) Voltmeter indicates between -4.8 and -28 DECIBELS.

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

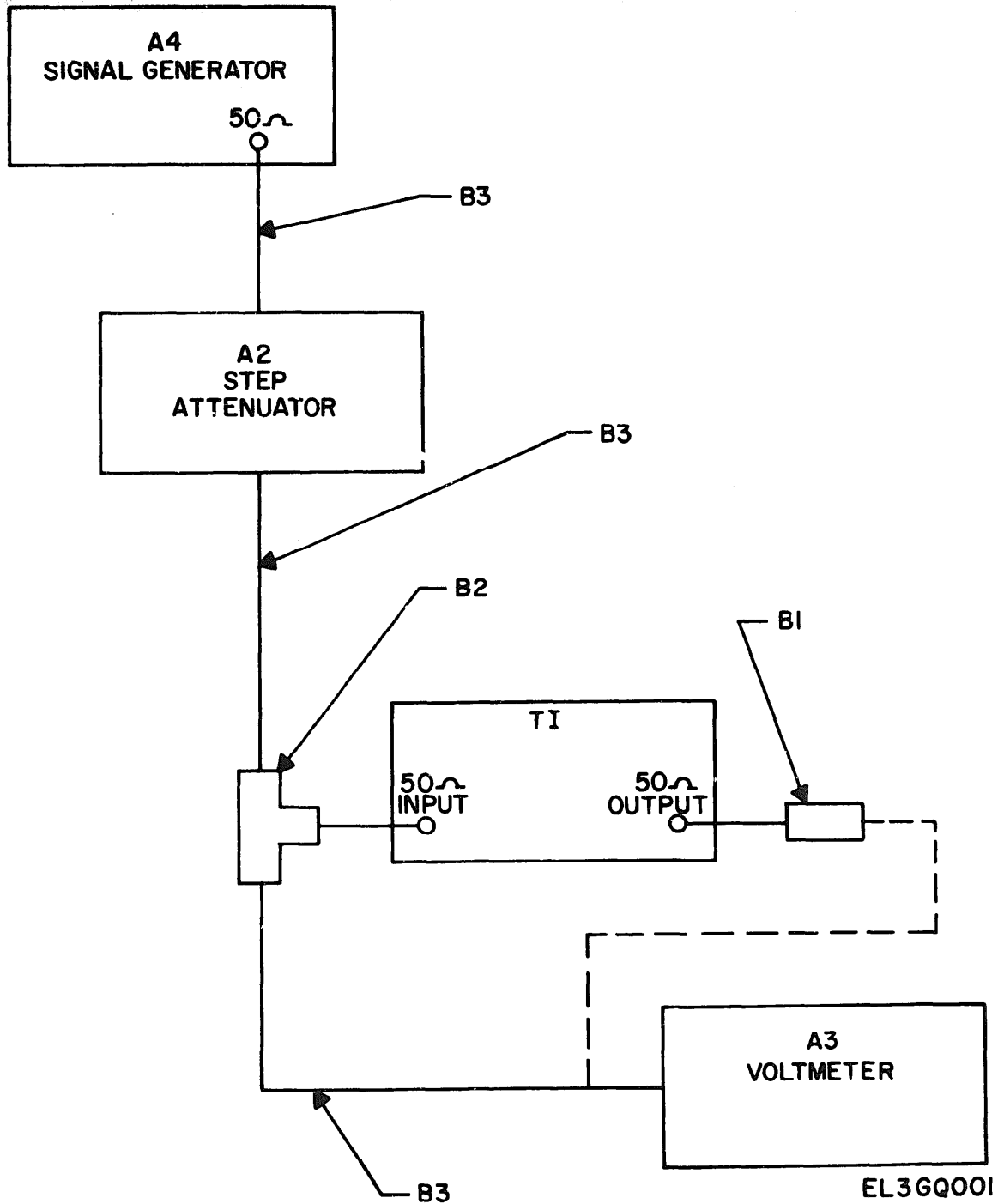


Figure 1. Gain Setup.

9. Distortion. a. Performance Check.

- (1) Set step attenuator DB switch to 40.
- (2) Adjust signal generator OUTPUT AMPLITUDE control for voltmeter indication of 0.5 volts rms.

- (3) Disconnect cable assembly (B3) from voltmeter and connect to distortion analyzer (AS) input with adapter (B4).

- (4) Distortion analyzer indicates less than 5 percent distortion.

- (6) Disconnect equipment.
 b. *Adjustments* No adjustments can be made.
10. Noise. a. *Performance Check.*
 (1) Connect voltmeter to TI 50 OUTPUT connector with cable assembly (B3).

- (2) Voltmeter indicates less than 4 millivolts rms.
 b. *Adjustments.* No adjustments can be made.
11. Frequency Response. a. *Performance Check.*
 (1) Connect equipment as shown in figure 2

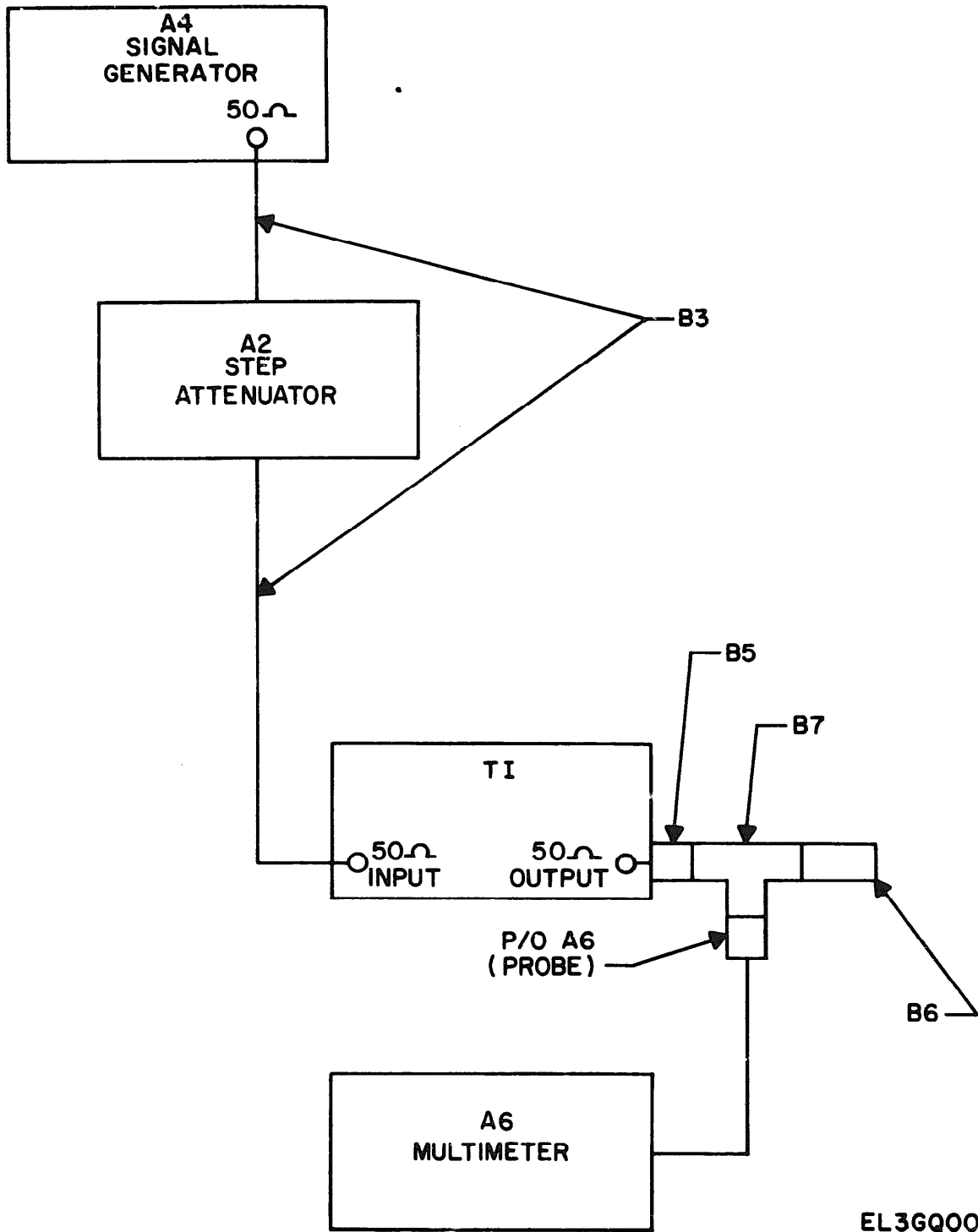


Figure 2. Low Frequency Response Setup.

EL3GQ00:

(2) Adjust signal generator OUTPUT AMPLITUDE control for panel meter indication of 0.3 vrms. Set step attenuator DB switch to 40.

(3) Adjust multimeter AC BAL control for multimeter indication of 0.3 vrms.

(4) Maintain constant signal generator output amplitude and adjust for frequencies listed in table 4. At each frequency setting, multimeter indicates between 0.27 and 0.33 vrms.

(5) Connect equipment as shown in figure 3 with oscillator (A7).

Table 4. Frequency Response

<i>Signal generator frequency</i>
1 kHz
10 kHz
100 kHz
1 MHz
10 MHz*

*Record multimeter indication.

(6) Adjust oscillator (A7) frequency and output amplitude controls for 10 MHz, and multimeter indication recorded in (4) above. Record power meter (A 10) indication.

(7) Adjust oscillator (A7) for 50 MHz with output amplitude control adjusted for power meter indication recorded in (b) above. Multimeter indicates between 0.27 and 0.33 vrms.

(8) Repeat (7) above with oscillator (AS) adjusted for 100 MHz.

b. Adjustments. No adjustments can be made.

12. Final Procedure. a. Deenergize and disconnect all equipment.

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, or utilized with an appropriate correction chart, annotate and affix DA Form 2417 (Unserviceable or Limited Use) tag.

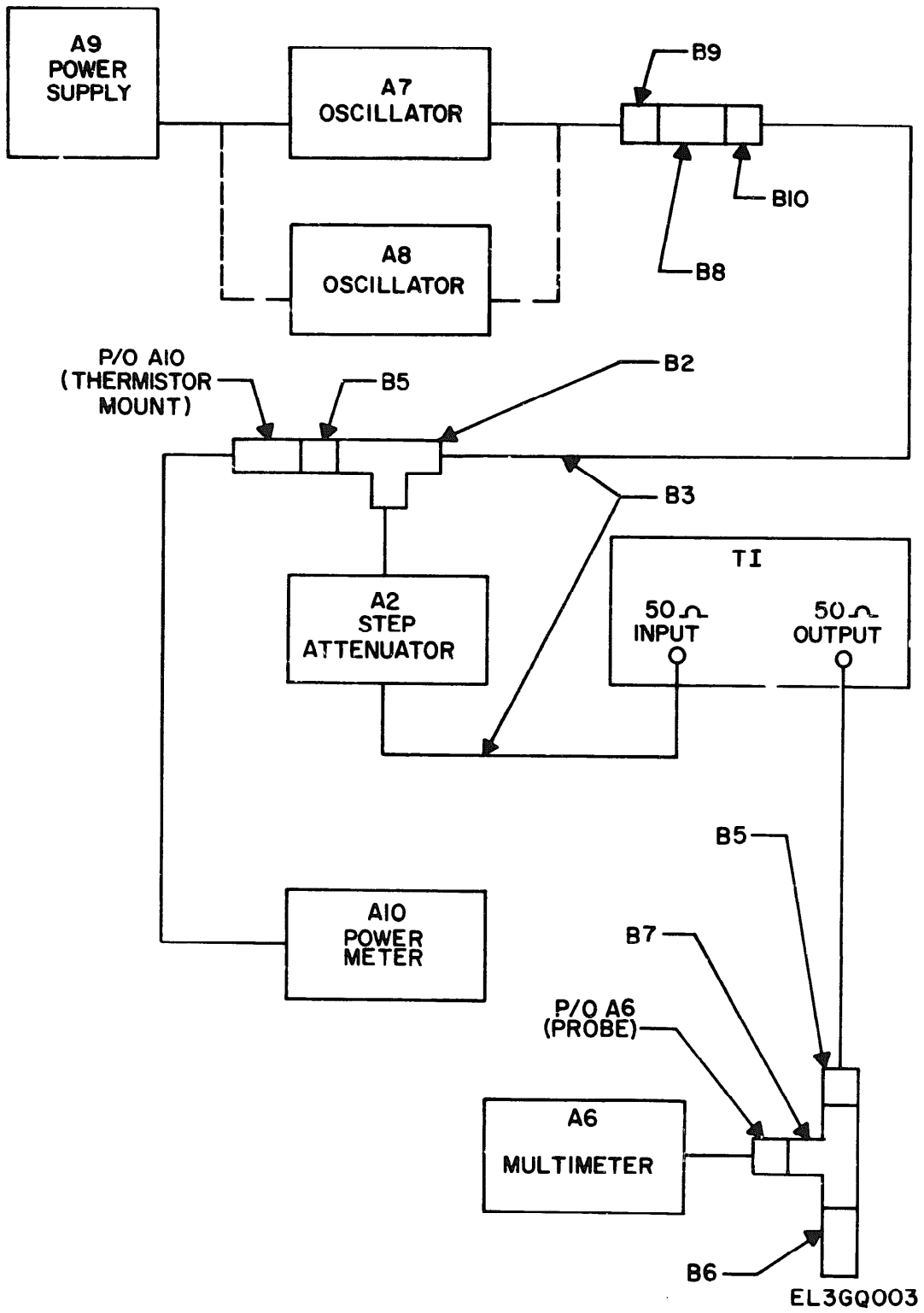


Figure 3. *High Frequency Response Setup.*

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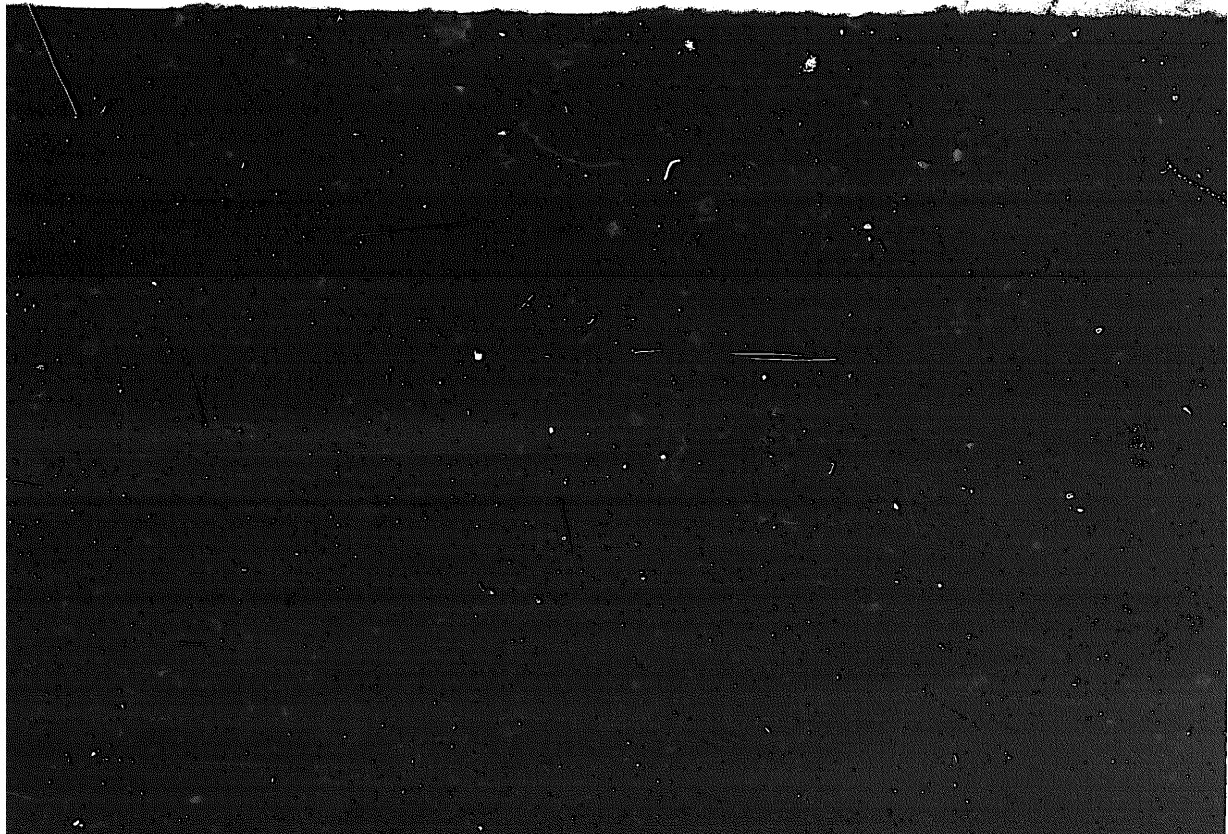
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