

*TB 9-6625-1914-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SPECTRUM ANALYZER, IF, LF, AND RF PLUG-IN UNITS, HEWLETT-PACKARD, MODELS 8552(), 8553(), 8554(), 8555(), AND 8556()

Headquarters, Department of the Army, Washington, DC
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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 provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. For the World Wide Web, use <https://amcom2028.redstone.army.mil/>.

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**SECTION I
IDENTIFICATION AND DESCRIPTION**

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Spectrum Analyzer IF, LF, and RF Plug-in Units, Hewlett-Packard, Models 8552(), 8553(), 8554(), 8555(), and 8556(). 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. Variations among models are described in text, tables, and figures.

b. Time and Technique. The time required for this calibration is approximately 2 hours for each plug-in, using the dc and low frequency technique for Models 8552(), 8553(), and 8556(); and the dc and low frequency and microwave technique for Models 8554(), and 8555().

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
Model 8552()	
Amplitude stability vs IF bandwidth change	±5.8% on linear display (Model 8552A)
	±5.8% at .1 to 300 kHz (Model 8552B)
	±12% at .03 to 300 kHz (Model 8552B)
	±19% at .01 to 300 kHz (Model 8552B)
Amplitude display accuracy	0.25 dB/dB over entire 70 dB display range with ±1.5 dB total cumulative error
Bandwidth accuracy	±20% at 3 dB points (except at 10 kHz, ±5%)

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Model 8552() - continued	
Calibrator output: Amplitude Frequency	-30 dBm \pm 0.3 dB (All models) 30 MHz \pm 300 kHz (Model 8552A) 30 MHz \pm 3 kHz (Model 8552B)
Scan time accuracy	\pm 10% at 0.1 to 20 ms/div \pm 20% at 50 ms/div to 10 s/div
Model 8553 ()	
Frequency range	1 kHz to 110 MHz (Model 8553B has two ranges: 0 to 11 MHz and 1 kHz to 110 MHz)
Center frequency accuracy	\pm 1 MHz of center frequency dial indication (Model 8553B, 0 to 11 MHz \pm 200 kHz with FINE TUNE control centered)
Input impedance	50 Ω (models prefixed H01 and H02, 75 Ω)
Noise sidebands	>70 dB below CW signal, 50 kHz or more away from CW signal with 1 kHz IF bandwidth
Frequency response	\pm 0.5 dB from 1 kHz to 110 MHz for attenuator settings >10 dB
Average noise level (sensitivity)	Model 8553L: -110 dBm-bandwidth = 10 kHz Model 8553B: -100 dBm-bandwidth = 10 kHz
Local oscillator stability	Stabilized: <20 Hz p-p Unstabilized: <1 kHz p-p
Scan width accuracy	\pm 3% between 2 points except ranges between 50 kHz/div and 1 MHz/div \pm 10%
Spurious responses	>70 dB below -40 dBm RF signal between 2 and 110 MHz
Model 8554()	
Frequency range	100 kHz to 1250 MHz (Model 8554L, 500 kHz to 1250 MHz)
Center frequency accuracy	\pm 10%
Input impedance	50 Ω (models prefixed H01 and H02, 75 Ω)
Noise sidebands	>70 dB below CW signal, 50 kHz away from signal with 1 kHz bandwidth (Model 8554L, >60 dB below CW signal, 20 kHz away with 1 kHz bandwidth)
Frequency response	\pm 1 dB from 100 kHz to 1250 MHz (Model 8554L, 500 kHz to 1250 MHz)
Average noise level (sensitivity)	-102 dBm with 10 kHz IF bandwidth
Local oscillator stability	Stabilized: \pm 10 kHz/10 min Unstabilized: \pm 50 kHz/10 min
Scan width accuracy	Error between 2 points on display is <10% of the indicated separation
Spurious responses	>60 dB below a -40 dBm input RF signal (Model 8554B, >65 dB below -40 dBm input)
Model 8555()	
Dial accuracy	\pm 15 MHz on fundamental mixing bands
Frequency range	0.01 to 18 GHz
Noise sidebands	At least 70 dB below CW signal level 30 kHz away from signal using a 1 kHz IF bandwidth and 100 Hz video filter

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Model 8555() - continued	
Residual FM	Stabilized: <100 Hz p-p Unstabilized: <10 kHz p-p
Residual response	<-90 dBm
Scan accuracy	Frequency error between any two points on display is <±10% of indicated frequency difference.
Sensitivity	Average noise level for a 10 kHz bandwidth varies from -107 dBm at 0.01 GHz to -80 dBm at 18.00 GHz
Model 8556()	
Average noise level	<400 μV (4th graticule on display)
Center frequency accuracy	±500 Hz, 0-30 kHz, ±3 kHz, 0-300 kHz (with model 8552B) ±1 kHz, 0-30 kHz; ±5 kHz, 0-300 kHz (with Model 8552A)
Frequency response	±2.3% from 20 Hz to 300 kHz
Marker accuracy	Every 20 kHz ±0.01%
Scan width accuracy	±3% between any 2 display points w/Model 8552B ±5% between any 2 display points w/Model 8552A
Spurious responses	>70 dB below a -40 dBm signal at 2 and 100 kHz
Tracking generator amplitude	Accuracy: 100 ±3.5 mV Frequency response: 100 ±5 mV

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 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.

Table 2. Minimum Specifications of Equipment Required

Common name (official nomenclature)	Minimum use specifications	Manufacturer and model (part number)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	General Radio, Type W10MT3AS3 (7910809) or Ridge, Model 9020A (9020A) or Ridge, Model 9020F (9020F)

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Table 2. Minimum Specifications of Equipment Required - Continued

Common name (official nomenclature)	Minimum use specifications	Manufacturer and model (part number)
FREQUENCY COUNTER	Range: 0 to 2000 MHz Accuracy: $\pm 0.2\%$	Fluke, Model PM6681/656 (PM6681/656)
FUNCTION/ARBITRARY GENERATOR	Range: 1 μ Hz to 80 MHz Accuracy: ± 1 ppm/yr	Agilent, Model 33250A (33250A)
FUNCTION GENERATOR	Range: 10 Hz to 100 kHz Accuracy: $\pm 0.3\%$	(SG-1288/G)
MEASURING RECEIVER	Range: 0.1 MHz to 2.6 GHz Accuracy: ± 0.04 dBm	Hewlett-Packard, Model 8902A (8902A) with sensor, Hewlett-Packard, Model 11722A (11722A)
MULTIMETER	Range: -20 to +20 V dc and 0.5 mV ac Accuracy: $\pm 0.02\%$	Hewlett-Packard, Model 3458A (3458A)
POWER METER	Range: -10 to +10 dBm Accuracy: $\pm 0.05\%$	Hewlett-Packard, Model E12-432A (MIS-30525) w/thermistor mount, Hewlett-Packard, Model H75-478A (7915907) or 8478B (8478B)
SIGNAL GENERATOR	Range: 100 kHz to 2000 MHz Accuracy: ± 10 PPM	(SG-1207/U)

**SECTION III
CALIBRATION PROCESS FOR
SPECTRUM ANALYZER IF PLUG-IN
HEWLETT-PACKARD, MODEL 8552()**

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. When indications specified in paragraphs **8** through **12** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **12**. Do not perform power supply check if all other parameters are within tolerance.

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

7. Equipment Setup

WARNING

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

- a. Mate TI with RF plug-in and install in display section.
- b. Connect display section to autotransformer.
- c. Connect autotransformer to a 115 V ac source and adjust for a 115 V ac output.
- d. Energize equipment and allow 1 hour for equipment to warm-up and stabilize.
- e. Adjust display section **INTENSITY** and **FOCUS** controls to approximately 1 o'clock position.
- f. Position RF plug-in controls as listed in (1) through (8) below:
 - (1) **RANGE MHz** switch to **0-110** (not on all models).
 - (2) **FREQUENCY** control to **40 MHz**.
 - (3) **FREQUENCY FINE TUNE** control centered.
 - (4) **BANDWIDTH** switch to **300 kHz** (100 kHz on Model 8554()).
 - (5) **SCAN WIDTH** (red) switch to **0 - 100 MHz** (PER DIVISION on Model 8554()).
 - (6) **SCAN WIDTH PER DIVISION** switch to **10 MHz**.
 - (7) **INPUT ATTENUATION** switch to **10 dB**.
 - (8) **TUNING STABILIZER** switch to **ON** (up).
- g. Position TI controls as listed in (1) through (9) below:
 - (1) **BASE LINE CLIPPER** control fully ccw.
 - (2) **SCAN TIME PER DIVISION** switch to **10 SECONDS**.
 - (3) **LOG REF LEVEL** switch fully ccw.
 - (4) **LOG REF LEVEL (LINEAR SENSITIVITY VERNIER)** vernier control to zero (0).
 - (5) **LOG/LINEAR** switch to **LOG** (10 dB LOG on Model 8552B).
 - (6) **VIDEO FILTER** switch to **10 kHz**.

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- (7) **SCAN MODE** switch to **MAN** (not on all models).
- (8) **SCAN TRIGGER** switch to **AUTO**.
- (9) **MANUAL SCAN** control to midrange (not on all models).
- h. Adjust display section **FOCUS** and **ASTIGMATISM** controls for smallest round spot display possible.
- i. Set **SCAN MODE** switch to **INT** (not on all models) and **SCAN TIME PER DIVISION** switch to **1 ms** (**2 ms** on Model 8552B).
- j. Adjust display section **TRACE ALIGN** control until horizontal base line trace is exactly parallel to horizontal graticule lines.
- k. Position TI controls as listed in (1) through (5) below:
 - (1) **DISPLAY ADJUST VERTICAL POSITION** control adjusted to place trace on bottom horizontal graticule line.
 - (2) **LOG REF LEVEL** switch to **0 dBm**.
 - (3) **DISPLAY ADJUST HORIZONTAL POSITION** control adjusted to center trace on display.
 - (4) **DISPLAY ADJUST HORIZONTAL GAIN** control adjusted for a 10-division **SCAN WIDTH** display.

NOTE

DISPLAY ADJUST HORIZONTAL POSITION and **DISPLAY ADJUST HORIZONTAL GAIN** controls interact. Adjustment of one may necessitate readjustment of the other.

- (5) Repeat **k** (1) above.
- l. Connect RF plug-in **RF INPUT** to **TI CAL OUTPUT**, using cable (and adapter for Model 8554B). Display section will indicate as shown in figure 1.
- m. Position RF plug-in controls as listed in (1) through (5) below:
 - (1) Model 8553() only: **FREQUENCY** control adjusted to position inverted marker under **CAL OUTPUT 30 MHZ** marker (fig. 1).
 - (2) **SCAN WIDTH PER DIVISION** switch to **0.05 MHz** (50 kHz on Model 8554B).
 - (3) **BANDWIDTH** switch to **10 kHz**.
 - (4) **SCAN WIDTH** (red) switch to **PER DIVISION**.

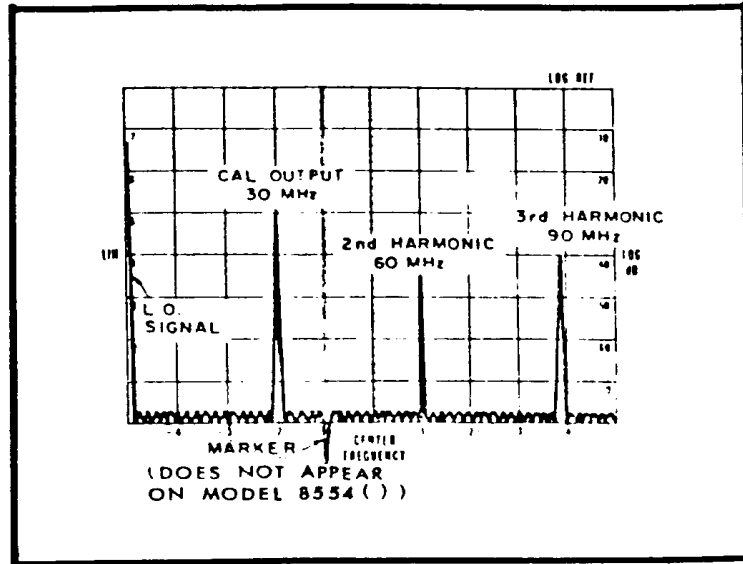


Figure 1. 30 MHz calibration signal and harmonics.

(5) **FREQUENCY** control adjusted to center **CAL OUTPUT 30-MHz** marker (fig. 1) on display.

NOTE

Use RF plug-in **FREQUENCY FINE TUNE** control to keep **CAL OUTPUT 30 MHz** marker centered on display.

n. Set **LOG REF LEVEL** switch until displayed signal amplitude is exactly on -70 dB graticule line.

NOTE

LOG and **LIN** scales are not on some display sections. If not, use figure 1 as guideline.

o. Rotate **LOG REF LEVEL** switch seven steps cw. If displayed signal amplitude does not increase in increments of one division per 10 dB step, perform p and q below. If signal amplitude is proper, perform r below.

p. Adjust **DISPLAY ADJUST VERTICAL GAIN** control to position signal amplitude display exactly on **LOG REF** (top) graticule line (fig. 1).

q. Repeat m through o above as necessary to obtain optimum adjustment of **DISPLAY ADJUST VERTICAL GAIN** control.

r. Position TI controls as listed in (1) and (2) below:

(1) **LOG/LINEAR** switch to **LINEAR**.

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- (2) **LINEAR SENSITIVITY** control to **1 mV/DIV** (1 mV X 1).
- s. Position RF plug-in controls as listed in (1) through (4) below:
- (1) **AMPL CAL** control adjusted for a 7.1 division signal amplitude display.
 - (2) **SCAN WIDTH** (red) switch to **0-100 MHz** (0-1250 MHz on Model 8554()).
 - (3) **SCAN WIDTH PER DIVISION** switch to **10 MHz**.
 - (4) **BANDWIDTH** switch to **10 kHz**.
- t. Set **TI LOG/LINEAR** switch to **LOG** (10 dB LOG on Model 8552B) and **LOG REF LEVEL** switch to **-10 dBm**.
- u. Rotate **BASE LINE CLIPPER** control fully cw. Display section will have at least two blank divisions on bottom of display.
- v. Rotate **BASE LINE CLIPPER** control fully ccw.
- w. Set **SCAN TIME PER DIVISION** switch to all positions while observing display. Scan should occur in each position.
- x. Set **SCAN TIME PER DIVISION** switch to **20 ms**.
- y. Set spectrum analyzer RF plug-in **SCAN WIDTH** (red) switch to **PER DIVISION**. **DISPLAY UNCAL** lamp will illuminate and **CAL OUTPUT 30 MHz** marker and its harmonics will be visible on display.
- z. Adjust RF plug-in **FREQUENCY** controls to center **CAL OUTPUT 30 MHz** marker on display.
- aa. Set RF plug-in **SCAN WIDTH PER DIVISION** switch to **20 kHz** (200 kHz on model 8554()). Signal will remain centered on display. It may be necessary to adjust spectrum analyzer RF plug-in **FREQUENCY FINE TUNE** control to keep signal centered on display.
- bb. Carefully adjust RF plug-in coarse **FREQUENCY** control. Displayed signal will jump to left or right in approximate increments of 100 kHz (approximately 1 MHz for Model 8554()). This represents proper operation of reference oscillator, automatic phase control circuit, and tuning stabilizer circuits.
- cc. Adjust RF plug-in **FREQUENCY** and **FREQUENCY FINE TUNE** controls as necessary to center display.

8. Calibrator Output Amplitude

CAUTION

Damage may occur if any of the spectrum analyzer IF plug-ins display section outputs are connected to RF plug-ins.

NOTE

Perform measuring receiver sensor zero and calibration prior to making measurements in this paragraph.

a. Performance Check

- (1) Connect measuring receiver sensor to **TI CAL OUTPUT** connector.
- (2) Press measuring receiver **FREQ** pushbutton to acquire 30 MHz TI cal output signal.
- (3) Press measuring receiver yellow **S** key then **RF POWER** key. Both keys should be lit.
- (4) If power meter indication is not between -29.7 and -30.3 dBm, perform **b** below.

b. Adjustments

- (1) Connect TI to extender (supplied with TI) and connect extender to display section.
- (2) Adjust A6R54 (fig. 2 and fig. 3) for a -30 dBm ± 0.3 dB indication on measuring receiver (R).

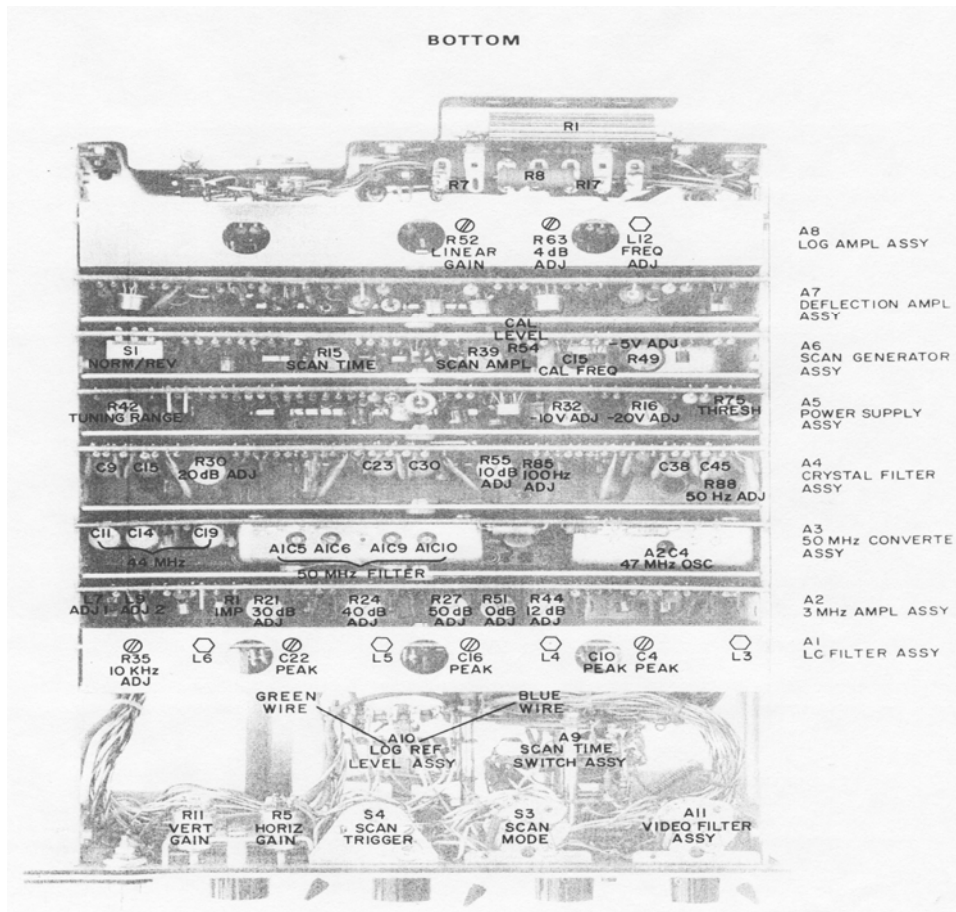


Figure 2. Model 8552A adjustment locations - bottom view.

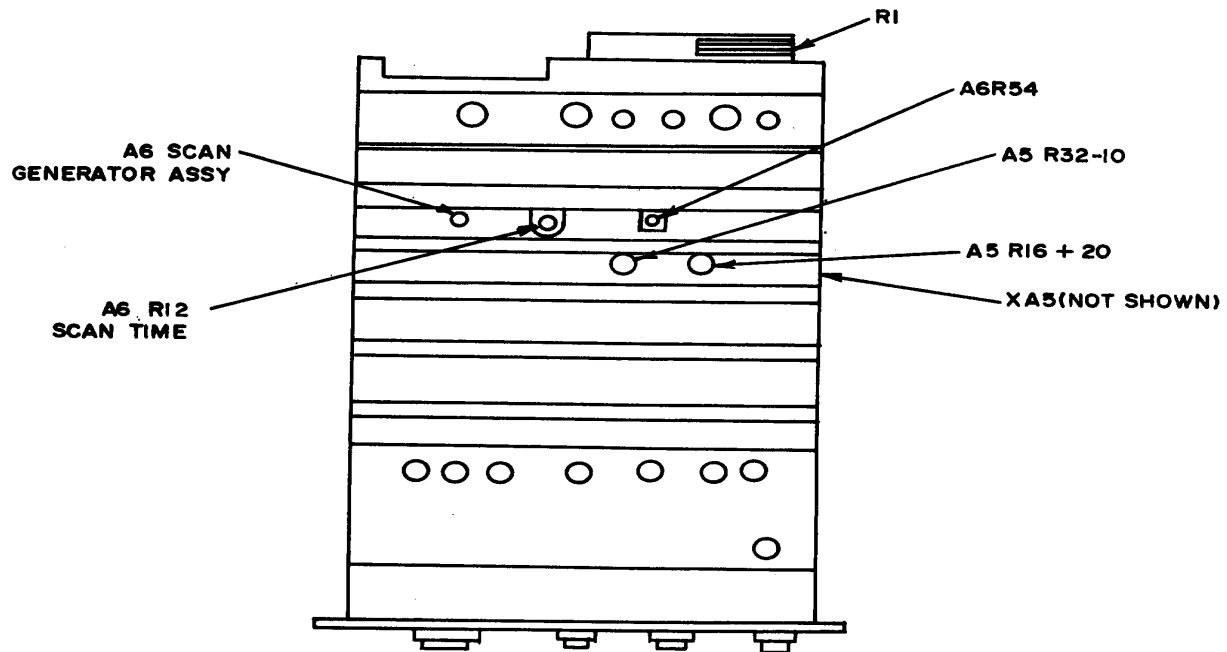


Figure 3. Model 8552B adjustment locations - bottom view.

9. Calibrator Output Frequency Accuracy

a. Performance Check

(1) Connect signal generator **RF OUTPUT** to TI **RF INPUT** using cable and BNC tee adapter. Adjust signal generator and TI for 30.000 MHz at -30 dBm.

(2) Connect TI **CAL OUTPUT** to other end of BNC tee adapter using cable. Superimpose signal marker pips on TI display. If signal generator frequency does not indicate between 29.7 and 30.3 MHz (29.997 and 30.003 MHz for Model 8552B), perform **b** below.

b. Adjustments

(1) Connect TI to extender and connect extender to display section.

(2) Adjust A6C15 (fig. 2 or fig 4) for indication specified in **a** (2) above (R).

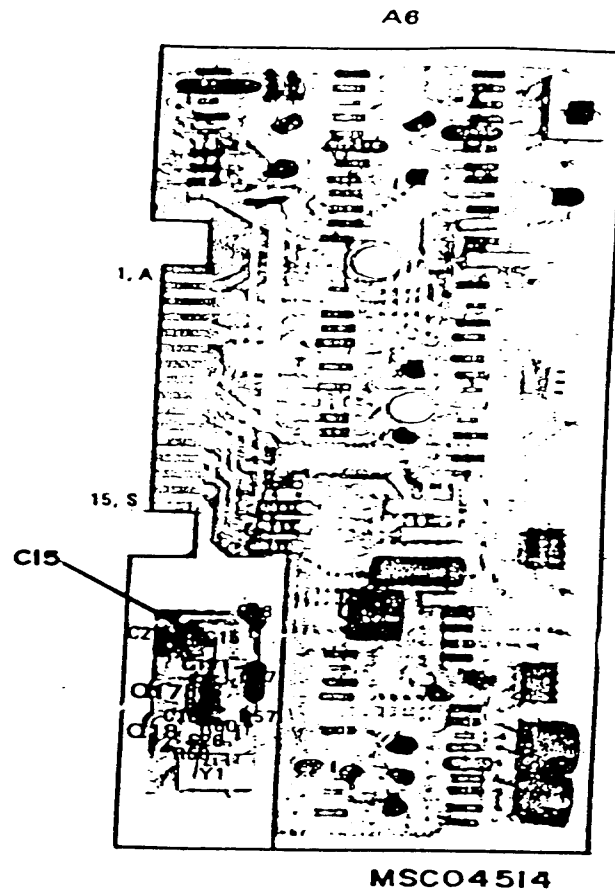


Figure 4. Test instrument - board A6 adjustment locations.

10. Bandwidth Accuracy

a. Performance Check

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

- (a) **RANGE MHz** switch (Model 8553B only) to **0-110**.
- (b) **FREQUENCY** control to **30 MHz**.
- (c) **BANDWIDTH** switch to **100 kHz**.
- (d) **SCAN WIDTH** (red) switch to **PER DIVISION**.
- (e) **SCAN WIDTH PER DIVISION** switch to **0.05 MHz** (50 kHz on Model 8554B).
- (f) **INPUT ATTENUATION** switch to **10 dB**.
- (g) **TUNING STABILIZER** switch to **ON** (up).

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

- (a) **VIDEO FILTER** switch to **10 kHz**.
- (b) **SCAN TIME PER DIVISION** switch to **2 ms**.
- (c) **BASE LINE CLIPPER** control fully ccw.
- (d) **LINEAR SENSITIVITY** switch to **2 mV/DIV**.
- (e) **LINEAR SENSITIVITY (LOG REF LEVEL vernier)** vernier control to **1**.
- (f) **LOG/LINEAR** switch to **LINEAR**.
- (g) **SCAN MODE** switch to **INT**.
- (h) **SCAN TRIGGER** switch to **AUTO**.

(3) Connect signal generator output to **RF INPUT**, using cable.

(4) Set signal generator for 30 MHz and -30dBm output.

(5) Adjust RF plug-in **FREQUENCY FINE TUNE** control until 30 MHz signal is centered on display.

(6) Adjust **LINEAR SENSITIVITY (LOG REF LEVEL vernier)** vernier control for a 5.7 division signal on display.

(7) Measure half-power point bandwidth. (Measure at the 4.0 vertical division mark.) Bandwidth will be between 80 and 120 kHz (between 1.6 and 2.4 divisions). Note bandwidth value.

(8) Repeat technique of (5) and (6) above, using TI settings and RF plug-in switch settings listed in table 4. Measured bandwidths will be within limits specified.

Table 4. Bandwidth Accuracy

RF plug-in switch positions		Test instrument switch positions	Measured bandwidth (kHz)	
BANDWIDTH (kHz)	SCAN WIDTH PER DIVISION (kHz)	SCAN TIME PER DIVISION	Min	Max
30	5	5 ms	24	36
3	0.5	5 ms	2.4	3.6
1	0.2	5 ms	0.8	1.2
0.3	0.05	5 ms	0.24	0.36
0.1 ¹	0.02	0.2 s	0.08	0.12
0.05 ¹	0.02	1 s	0.04	0.06
0.03 ¹	0.02	1 s	0.024	0.036
0.01 ¹	0.02	1 s	0.008	0.012

¹These positions are not included on some models. When measuring .03 and .01-kHz bandwidths, set SCAN MODE switch to SINGLE, PRESISTENCE switch (if applicable) to MAX, and press SINGLE SCAN pushbutton. When finished, set SCAN MODE switch to INT and PRESISTENCE switch to MIN.

NOTE

It may be necessary to retune the fine tune frequency control to midrange.

- (9) Position RF plug-in controls as listed in (a) through (d) below:
- (a) **BANDWIDTH** switch to **10 kHz**.
 - (b) **SCAN WIDTH PER DIVISION** switch to **0.2 MHz**.
 - (c) **TUNING STABILIZER** switch to **ON** (up).
 - (d) Set **SCAN TIME PER DIVISION** switch to **2 ms**.
- (10) Position RF plug-in controls as listed in (a) through (d) below:
- (a) **FREQUENCY FINE TUNE** control adjusted until signal is centered on display.
 - (b) **SCAN WIDTH PER DIVISION** switch to **20 kHz**.
 - (c) **SCAN WIDTH** (red) switch to **0**.
 - (d) Set **VIDEO FILTER** switch to **10 kHz** (Model 8552B only).
- (11) Adjust RF plug-in **FREQUENCY FINE TUNE** control for best signal display.
- (12) Adjust **LINEAR SENSITIVITY (LOG REF LEVEL vernier)** vernier control for a 7.1 division signal amplitude on display.
- (13) Decrease signal generator frequency slowly until display amplitude reduces to 5.0 divisions. Note signal generator frequency.
- (14) Increase signal generator frequency until display amplitude peaks and again reduces to 5.0 divisions. Note signal generator frequency and compare with frequency noted in (16) above. Frequency difference will be between 9.5 and 10.5 kHz.
- b. Adjustments.** No adjustments can be made.

11. Amplitude Display Accuracy**a. Performance Check**

- (1) Position RF plug-in controls as listed in (a) through (g) below:
- (a) **RANGE MHz** switch to **0-110** (Model 8553B only).
 - (b) **FREQUENCY** control to **30 MHz**.
 - (c) **FREQUENCY FINE TUNE** control to midrange.
 - (d) **BANDWIDTH** switch to **100 kHz**.
 - (e) **SCAN WIDTH** (red) switch to **PER DIVISION**.

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- (f) **SCAN WIDTH PER DIVISION** switch to **0.5 MHz**.
- (g) **INPUT ATTENUATION** switch to **20 dB**.

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

- (a) **SCAN TIME PER DIVISION** switch to **5 ms**.
- (b) **BASE LINE CLIPPER** control fully ccw.
- (c) **LOG/LINEAR** switch to **LOG** (10 dB LOG on Model 8552B) (**LINEAR** for linear circuit check).
- (d) **LOG REF LEVEL** switch to **-20 dBm**.
- (e) **VIDEO FILTER** switch to **OFF**.
- (f) **SCAN MODE** switch to **INT**.
- (g) **SCAN TRIGGER** switch to **AUTO**.

(3) Connect signal generator RF output to RF plug-in **RF INPUT**.

(4) Adjust signal generator for output of 30 MHz at -30 dBm.

(5) Adjust RF plug-in **FREQUENCY** control until signal is centered on display.

(6) Adjust **LOG REF LEVEL (LINEAR SENSITIVITY vernier)** vernier control for an 8.0 division signal amplitude on display.

(7) Change **LOG REF LEVEL** switch setting to reduce signal amplitude display by 10 dB. Signal amplitude display will decrease to between 6.85 and 7.15 divisions.

(8) Repeat technique of (7) above for values listed in table 5. Signal display amplitude will be within limits specified.

NOTE

To check operation of the **LINEAR** circuits, repeat paragraph **11 a** (1) through (8) above.

Table 5. Amplitude Display Accuracy

Change LOG REF LEVEL switch setting in (7) above by:	Signal display amplitude (divisions of vertical deflection)	
	Min	Max
20 dB	5.85	6.15
30 dB	4.85	5.15
40 dB	3.85	4.15
50 dB	2.85	3.15
60 dB	1.85	2.15
70 dB	0.85	1.15

b. Adjustments. No adjustments can be made.

12. Scan Time Accuracy

a. Performance Check

- (1) Connect equipment as shown in figure 5.

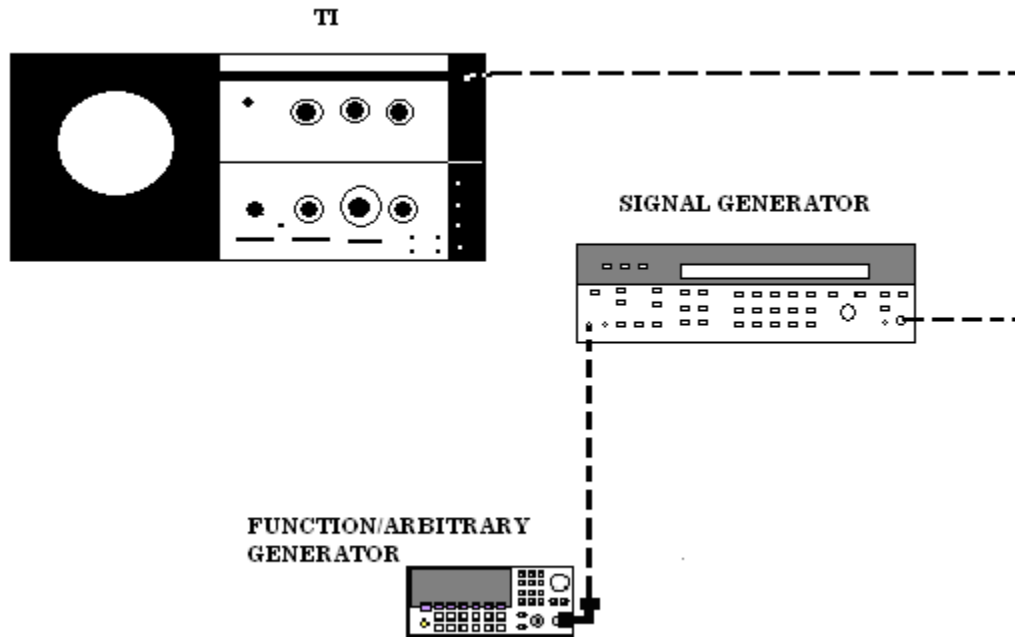


Figure 5. Scan time accuracy - equipment setup.

- (2) Position RF plug-in controls as listed in (a) through (c) below.
- (a) **FREQUENCY** control to **30 MHz**.
 - (b) **SCAN WIDTH** (red) switch to **ZERO**.
 - (c) **INPUT ATTENUATION** switch to **0 dB**.
- (3) Position TI controls as listed in (a) through (g) below:
- (a) **SCAN TIME PER DIVISION** switch to **1 ms**.
 - (b) **LINEAR SENSITIVITY** switch **1 mV/DIV**.
 - (c) **LOG/LINEAR** switch to **LINEAR**.
 - (d) **BASE LINE CLIPPER** control fully ccw.
 - (e) **VIDEO FILTER** switch to **10 kHz**.
 - (f) **SCAN MODE** switch to **INT**.

(g) **SCAN TRIGGER** switch to **VIDEO**.

- (4) Adjust signal generator for output of 30 MHz at -30 dBm.
- (5) Set signal generator controls as necessary for external modulation.
- (6) Adjust function/arbitrary generator controls to provide 90 percent modulation of signal generator at 1 kHz.
- (7) Fine tune signal generator frequency controls for best display.
- (8) Adjust **LINEAR SENSITIVITY (LOG REF LEVEL vernier)** vernier control for a convenient display height.
- (9) Adjust **DISPLAY ADJUST HORIZONTAL POSITION** control to position first modulation peak directly on -5 graticule line (left of centerline).
- (10) Adjust function/arbitrary generator frequency controls to align 10th modulation peak with +4 graticule line. If function/arbitrary generator frequency is not between .89 and 1.11 kHz, perform **b** below.
- (11) Repeat technique of (4) through (10) above, using **SCAN TIME PER DIVISION** switch settings listed in table 6. If function/arbitrary generator indication is not within limits specified, perform **b** below.

Table 6. Scan Time Accuracy

Test instrument SCAN TIME PER DIVISION switch settings	Function/arbitrary generator frequency indications	
	Min	Max
0.1 ms	9 kHz	11 kHz
0.2 ms	4.5 kHz	5.5 kHz
0.5 ms	1.8 kHz	2.2 kHz
1 ms	0.9 kHz	1.1 kHz
2 ms	450 Hz	550 Hz
5 ms	180 Hz	220 Hz
10 ms	90 Hz	110 Hz
20 ms	45 Hz	55 Hz
50 ms	16 Hz	24 Hz
0.1 s	8 Hz	12 Hz
0.2 s	4 Hz	6 Hz

b. Adjustments

- (1) Connect TI and RF plug-in to extender and connect extender (supplied with TI) to display section.
- (2) Adjust function/arbitrary generator frequency to 1 kHz and adjust A6R12 SCAN TIME (fig. 3) or A6R15 SCAN TIME (fig. 2) to align 10th modulation peak with +4 graticule line (R).
- (3) Readjust A6R12 **SCAN TIME** or A6R15 **SCAN TIME** as necessary for best compromise at all **SCAN TIME PER DIVISION** switch settings.

13. Power Supply Check

NOTE

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

a. Performance Check

- (1) Connect TI to extender and connect extender to display section.
- (2) Connect multimeter between TI pin 11 of connector XA5 (fig. 3 or fig. 4) (white/black/red/white) and chassis ground, using adapter and cable (B4 and B12).
- (3) Adjust multimeter for dc measurement and slowly vary autotransformer output between 105 and 125 V ac while observing multimeter. If multimeter does not remain between +19.9 and +20.1 V dc, perform **b** (1) below.
- (4) Adjust autotransformer for 115 V ac and measure ripple voltage. Multimeter will indicate less than 0.5 mV ac.
- (5) Connect multimeter between TI pin 8 of connector XA5 (fig. 3 or fig. 4) (white/black/violet wire) and chassis ground.
- (6) Slowly vary autotransformer output between 105 and 125 V ac while measuring dc voltage. If multimeter does not remain between -9.99 and -10.01 V ac, perform **b** (2) below.
- (7) Adjust autotransformer for 115 V ac and measure ripple voltage. Multimeter will indicate less than 0.5 mV ac.

b. Adjustments

- (1) Adjust A5R16 + 20 ADJ (fig. 3 or fig. 4) for a +20.00 V dc indication on multimeter.
- (2) Adjust A5R32 -10 V ADJ (fig. 3 or fig. 4) for a -10.00 V dc indication on multimeter.

14. Final Procedure

- a. Deenergize and disconnect all equipment.
- b. Annotate and affix DA label/form in accordance with TB 750-25.

**SECTION IV
CALIBRATION PROCESS FOR
SPECTRUM ANALYZER RF PLUG-IN
HEWLETT-PACKARD, MODEL 8553()**

15. Preliminary Instructions

a. The instructions outlined in paragraphs **15** and **16** are preparatory to the calibration process. Personnel should become familiar with the applicable section 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.

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

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.

NOTE

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

16. Equipment Setup

- a.** Mate TI with IF plug-in and install in display section.
- b.** Perform section III, paragraph **7 b** through **7 cc** before beginning with paragraph **17**.

17. Scan Width Accuracy

a. Performance Check

- (1) Connect signal generator to **RF INPUT**.
- (2) Position TI controls as listed in (a) through (h) below:
 - (a) **RANGE MHz** switch to **0-110** (not on all models).

- (b) **FREQUENCY** control to **60 MHz**.
 - (c) **FREQUENCY FINE TUNE** control centered.
 - (d) **BANDWIDTH** switch to **300 kHz**.
 - (e) **SCAN WIDTH** (red) switch to **PER DIVISION**.
 - (f) **SCAN WIDTH PER DIVISION** switch to **10 MHz**.
 - (g) **INPUT ATTENUATION** switch to **0 dB**.
 - (h) **TUNING STABILIZER** switch to **OFF**.
- (3) Position IF plug-in controls as listed in (a) through (h) below:
- (a) **BASE LINE CLIPPER** control fully ccw.
 - (b) **SCAN TIME PER DIVISION** switch to **2 ms**.
 - (c) **LOG REF LEVEL** switch to **-20 dBm**.
 - (d) **LOG REF LEVEL** vernier control to **0**.
 - (e) **LOG/LINEAR** switch to **LOG** (10 dB LOG on Model 8552B).
 - (f) **VIDEO FILTER** switch to **OFF**.
 - (g) **SCAN MODE** switch to **INT**.
 - (h) **SCAN TRIGGER** switch to **AUTO**.
- (4) Adjust signal generator frequency and amplitude controls until signal display is aligned with far left graticule line on display. Record signal generator frequency.
- (5) Increase signal generator frequency 80 MHz above frequency recorded in (4) above. Signal display will move within ± 0.24 division of the eighth graticule line to the right.
- (6) Set **BANDWIDTH** switch to **3 kHz** and **SCAN WIDTH PER DIVISION** switch to **.05 MHz**.
- (7) Set IF plug-in **SCAN TIME PER DIVISION** switch to **10 ms**.
- (8) Connect equipment as shown in figure 5.
- (9) Set signal generator controls as necessary for external modulation.
- (10) Adjust signal generator output to 60 MHz and adjust function/arbitrary generator output to 50 kHz.
- (11) Adjust signal generator and function/arbitrary generator amplitude controls until a signal pip is displayed every 50 kHz across the display.
- (12) Adjust **FREQUENCY** and **FREQUENCY FINE TUNE** controls until a 50 kHz signal pip is aligned with far left graticule line on display. A 50 kHz signal pip will appear within ± 0.8 division of eighth graticule line to right.

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- (13) Set **SCAN TIME PER DIVISION** switch to **5 ms**.
- (14) Set **SCAN WIDTH PER DIVISION** switch to **20 kHz**.
- (15) Adjust function/arbitrary generator frequency to **20 kHz**.
- (16) Adjust signal generator and function/arbitrary generator amplitude controls until a signal pip is displayed every 20 kHz across display.
- (17) Repeat technique of (11) above for 20 kHz signal pips. A 20 kHz pip will appear within $\pm.24$ division of eighth graticule line to right.

b. Adjustments. No adjustments can be made.

18. Tuning Dial Accuracy and Range

a. Performance Check

- (1) Connect signal generator to **RF INPUT**.
- (2) Position TI controls as listed in (a) through (e) below:
 - (a) **FREQUENCY** control to **5 MHz**.
 - (b) **BANDWIDTH** switch to **30 kHz**.
 - (c) **SCAN WIDTH PER DIVISION** switch to **1 MHz**.
 - (d) **INPUT ATTENUATION** switch to **0 dB**.
 - (e) **RANGE MHz** switch to **0-110** (not on all models).
- (3) Position IF plug-in switches as listed in (a) through (f) below:
 - (a) **LOG REF LEVEL** to **-40 dBm**.
 - (b) **SCAN TIME PER DIVISION** to **2 ms**.
 - (c) **VIDEO FILTER** to **OFF**.
 - (d) **SCAN MODE** to **INT**.
 - (e) **SCAN TRIGGER** to **AUTO**.
 - (f) **LOG/LINEAR** to **LOG** (10 dB LOG on Model 8552B).
- (4) Adjust **FREQUENCY FINE TUNE** control until half of local oscillator feed-through signal pip appears at left graticule line on display.
- (5) Adjust signal generator frequency to align signal pip with right graticule line on display. If signal generator does not indicate between 9 and 11 MHz, perform **b** (1) through (8) below.
- (6) Adjust **FREQUENCY** control to **100 MHz** and **FREQUENCY FINE TUNE** control to center of range.

(7) Adjust signal generator frequency to 100 MHz. If signal pip does not align with center graticule line ± 1 division, perform **b** (9) below.

(8) Adjust **FREQUENCY** control to positions listed in table 7 and adjust signal generator frequency to align signal pip with right graticule line on display. If signal generator frequency does not indicate within limits specified, perform adjustment listed for corresponding control position, using technique listed in **b** (10) through (14) below.

Table 7. Tuning Dial Accuracy

Test instrument FREQUENCY control positions (MHz)	Frequency counter indications (MHz)			Adjustments (fig. 6) (R)
	Min	Nominal	Max	
15	19	20	21	A5A1R38
25	29	30	31	A5A1R41
35	39	40	41	A5A1R44
45	49	50	51	A5A1R47
55	59	60	61	A5A1R50
65	69	70	71	A5A1R53
75	79	80	81	A5A1R56
85	89	90	91	A5A1R59
95	99	100	101	A5A1R62
105	109	110	111	A5A1R65

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

- (a) **SCAN WIDTH** (red) switch to **0-100 MHz**.
- (b) **FREQUENCY** control to **50 MHz**.
- (c) **BANDWIDTH** switch to **300 kHz**.
- (d) **SCAN WIDTH PER DIVISION** switch to **1 MHz**.

(10) Adjust signal generator frequency to 50 MHz. If signal pip does not align with center graticule line +0.40 division on display, perform **b** (15) below.

NOTE

Steps (11) through (13) below are applicable only to model 8553B.

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

- (a) **SCAN WIDTH** (red) switch to **PER DIVISION**.
- (b) **BANDWIDTH** switch to **30 kHz**.
- (c) **RANGE MHz** switch to **0-11**.

(d) **FREQUENCY FINE TUNE** control centered.

(12) Adjust **FREQUENCY** control to 0 MHz. If local oscillator feed-through signal does not appear at center graticule line ± 0.2 division on display, perform **b** (16) below.

(13) Adjust **FREQUENCY** control to 11 MHz and signal generator frequency to 11 MHz. If signal pip does not align with center graticule line ± 0.2 division on display, perform **b** (17) below.

b. Adjustments

(1) Connect TI and IF plug-in to extender and connect extender to display section.

(2) Adjust **FREQUENCY** control to 0 MHz.

(3) Set **SCAN WIDTH** (red) switch to **ZERO** and center **TUNING RANGE** adjustment A5A1R13 (fig. 6).

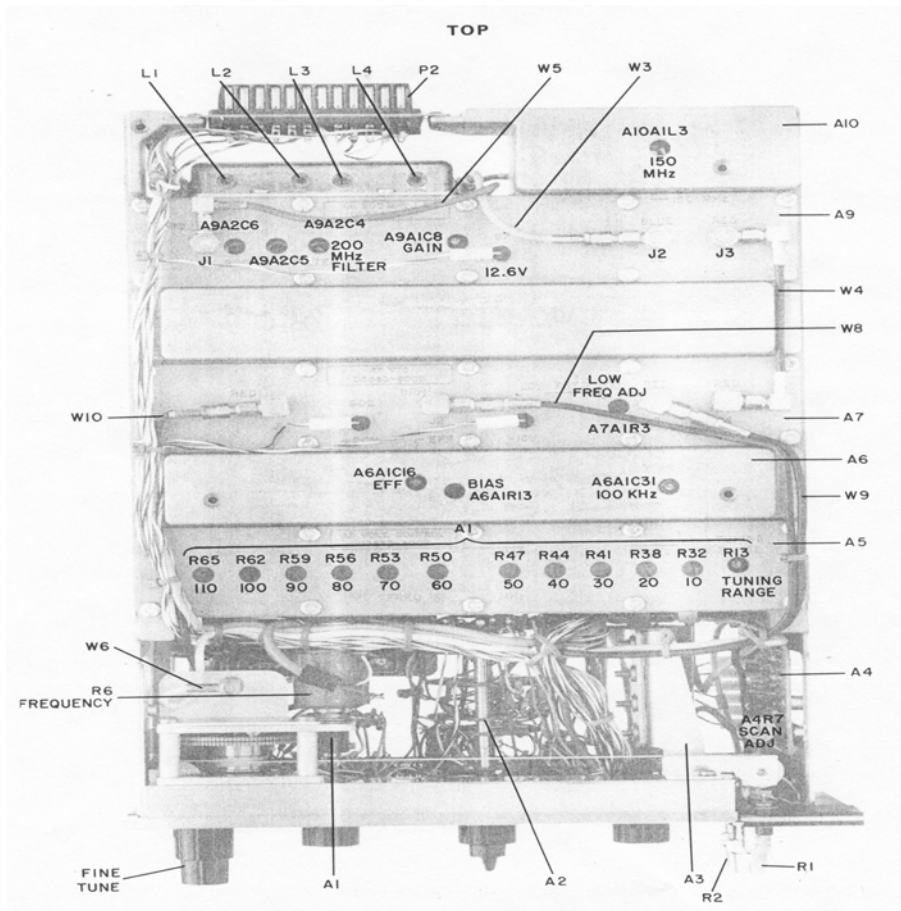


Figure 6. Model 8553() - adjustment locations.

(4) Adjust A7A1R3 (fig. 6) for maximum baseline lift on display. This will indicate signal coincidence with **ZERO SCAN WIDTH** selected (R).

- (5) Set **SCAN WIDTH** (red) switch to **PER DIVISION** and adjust **FREQUENCY** control to 5 MHz.
- (6) Adjust **FREQUENCY FINE TUNE** control until half the local oscillator feed-through signal appears at left graticule line on display.
- (7) Adjust signal generator frequency to 10 MHz.
- (8) Adjust A5A1R32 (fig. 6) to align signal pip with right graticule line on display (R).
- (9) Readjust **FREQUENCY FINE TUNE** control as necessary to keep half of local oscillator feed-through signal aligned with left graticule line on display.
- (10) Adjust A5A1R13 (fig. 6) to align signal pip (100 MHz) with center graticule line on display.
- (11) Adjust signal generator to a frequency 10 MHz below nominal value listed in table 7.
- (12) Adjust **FREQUENCY FINE TUNE** control to align signal pip with left graticule line on display.
- (13) Adjust signal generator frequency to nominal values listed in table 7 and make corresponding adjustment until signal pip is aligned with right graticule line on display.
- (14) Repeat (10) through (12) above until no further adjustment is required.
- (15) Adjust A4R7 (fig. 6) until signal pip is aligned with center graticule line (R).
- (16) Adjust A13R5 (fig. 6) until local oscillator feed-through signal is aligned with center graticule line (R).
- (17) Adjust A13R2 (fig. 6) until signal pip is aligned with center graticule line (R).

19. Frequency Response

a. Performance Check

- (1) Connect equipment as shown in figure 7.
- (2) Position TI controls as listed in (a) through (f) below:
 - (a) **RANGE MHz** switch to **0-110** (not on all models).
 - (b) **FREQUENCY** control to **60 MHz**.
 - (c) **BANDWIDTH** switch to **100 kHz**.
 - (d) **SCAN WIDTH** (red) switch to **PER DIVISION**.
 - (e) **SCAN WIDTH PER DIVISION** switch to **10 MHz**.
 - (f) **INPUT ATTENUATION** switch to **30 dB**.

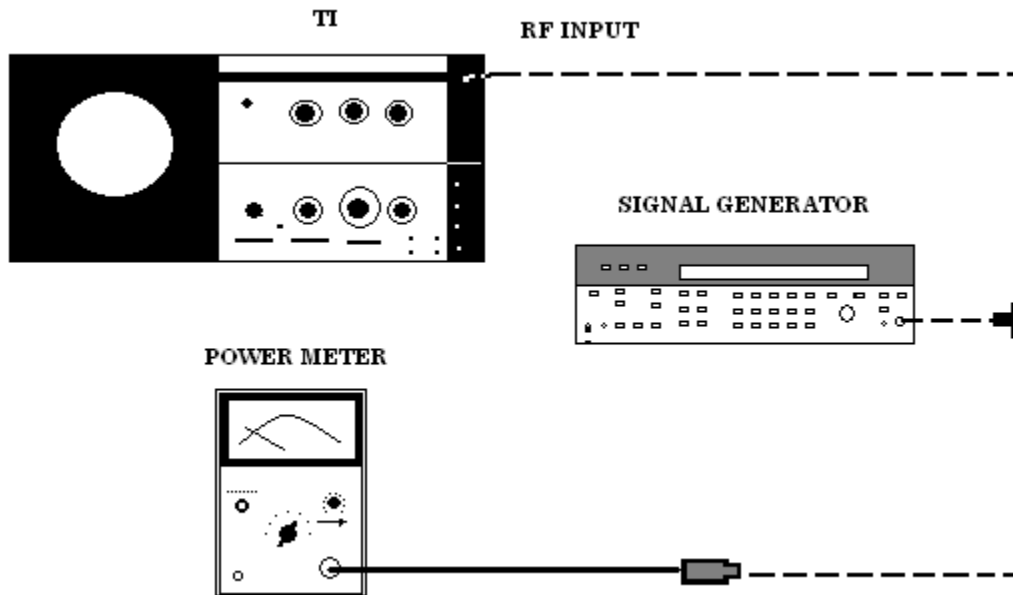


Figure 7. Frequency response (10 to 110 MHz) - equipment setup.

(3) Position IF plug-in switches as listed in (a) through (f) below:

- (a) **SCAN TIME PER DIVISION** to **5 ms**.
- (b) **LOG/LINEAR** to **LINEAR**.
- (c) **LINEAR SENSITIVITY** to **2 mV/DIV**.
- (d) **VIDEO FILTER** to **OFF**.
- (e) **SCAN MODE** to **INT**.
- (f) **SCAN TRIGGER** to **AUTO**.

(4) Adjust signal generator frequency to 10 MHz and amplitude for -28.5 dBm.

(5) Adjust TI **FREQUENCY** control to place 10 MHz input signal on the far left (-5) graticule line and IF plug-in **LINEAR SENSITIVITY (LOG REF LEVEL vernier)** vernier control for a 7 division signal amplitude on display.

(6) Slowly adjust signal generator frequency from 10 to 110 MHz keeping its amplitude constant by monitoring power meter. Signal pip will remain between 6.6 and 7.4 divisions on display.

(7) Return signal generator frequency to 10 MHz and note exact amplitude on display.

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

- (a) **BANDWIDTH** switch to **30 kHz**.
- (b) **SCAN WIDTH PER DIVISION** switch to **1 MHz**.
- (c) **RANGE MHz** switch to **0-11** (not on some models).

(9) Substitute signal generator for function/arbitrary generator set for 10 MHz at – 28.5 dBm.

(10) Adjust TI **FREQUENCY** control to place 10 MHz input signal on the far right (+5) graticule line.

(11) Adjust function/arbitrary generator level to obtain same display amplitude as measured in step 7.

(12) Adjust frequency from 10 MHz to 1 MHz while observing power meter to ensure signal generator output amplitude remains constant. Signal pip amplitude displayed will remain between 6.6 and 7.4 divisions.

NOTE

If signal pip peaks above 7.4 divisions, readjust function/arbitrary generator level control for 7.4 divisions at that point and continue checking the frequency response in the steps below.

(13) Repeat technique of step 10 through 12 to check 1 MHz to 100 kHz setting the IF **BANDWIDTH** to 10 kHz and **SCAN WIDTH PER DIVISIONS** to .1 MHz.

(14) Repeat technique of step 10 through 12 to check 100 kHz to 10 kHz setting the IF **BANDWIDTH** to 1 kHz, **SCAN WIDTH PER DIVISIONS** to 10 kHz and TI **FREQUENCY** control to place the LO signal on the far left (-5) graticule line.

(15) Repeat technique of step 10 through 12 to check 10 kHz to 1 kHz setting the IF **BANDWIDTH** to .1 kHz, **SCAN WIDTH PER DIVISIONS** to 1 kHz and TI **FREQUENCY** control to place the LO signal on the far left (-5) graticule line.

(16) If the function/arbitrary generator had to be readjusted per NOTE above, then repeat the response test from 10 MHz to 110 MHz by setting the signal generator amplitude at 10 MHz to correspond with the displayed amplitude of the function/arbitrary generator at 10 MHz and repeat steps 1-6.

b. Adjustments. No adjustments can be made.

20. Average Noise Level (Sensitivity)

a. Performance Check

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

- (a) **RANGE MHz** switch to **0-110** (not on some models).

- (b) **FREQUENCY** control to **110 MHz**.
 - (c) **BANDWIDTH** switch to **10 kHz**.
 - (d) **SCAN WIDTH** (red) switch to **ZERO**.
 - (e) **INPUT ATTENUATION** switch to **0 dB**.
- (2) Position IF plug-in controls as listed in (a) through (h) below:
- (a) **BASE LINE CLIPPER** control fully ccw.
 - (b) **SCAN TIME PER DIVISION** switch to **50 ms**.
 - (c) **LOG REF LEVEL** switch to **60 dBm**.
 - (d) **LOG REF LEVEL (LINEAR SENSITIVITY vernier)** vernier control to **0**.
 - (e) **LOG/LINEAR** switch to **LOG** (10 dB LOG on model 8552B).
 - (f) **VIDEO FILTER** switch to **100 Hz**.
 - (g) **SCAN MODE** switch to **INT**.
 - (h) **SCAN TRIGGER** switch to **AUTO**.
- (3) Slowly adjust **FREQUENCY** control from 110 to 1 MHz while observing display. Average noise power level will be lower than -110 dBm (as shown in figure 8).

b. Adjustments. No adjustments can be made.

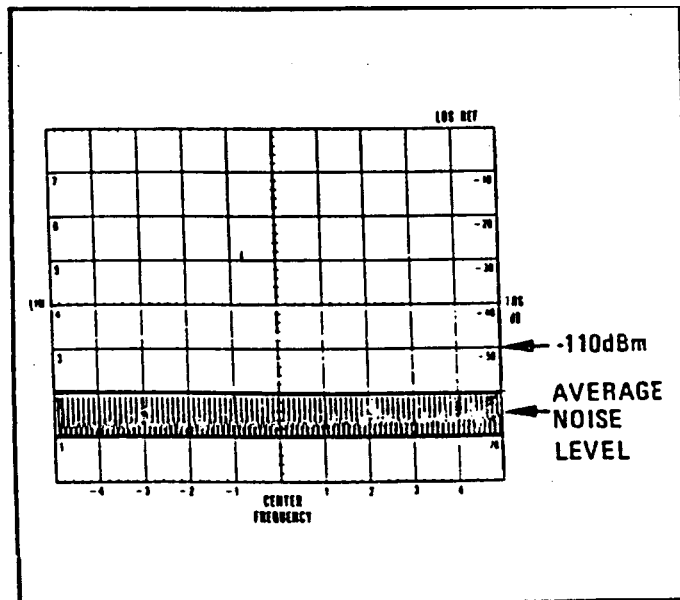


Figure 8. Noise level limit indication.

21. Spurious Response

a. Performance Check

- (1) Connect equipment as shown in figure 9.
- (2) Position TI controls as listed in (a) through (g) below:
 - (a) **RANGE MHz** switch to **0-110** (not on all models).
 - (b) **BANDWIDTH** switch to **1 kHz**.
 - (c) **SCAN WIDTH** (red) switch to **PER DIVISION**.
 - (d) **SCAN WIDTH PER DIVISION** switch to **20 kHz**.
 - (e) **FREQUENCY** control to **10 MHz**.
 - (f) **INPUT ATTENUATION** switch to **0 dB**.
 - (g) **TUNING STABILIZER** switch to **ON** (up).

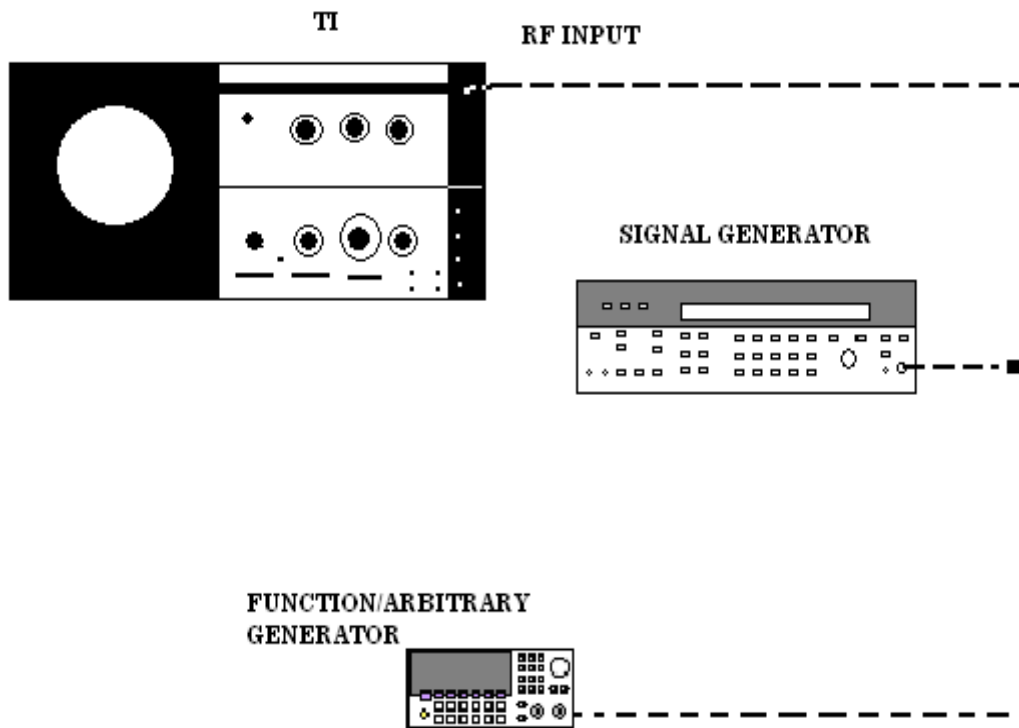


Figure 9. Spurious response - equipment setup.

- (3) Position IF plug-in switches as listed in (a) through (e) below:
 - (a) **SCAN TIME PER DIVISION** to **2 ms**.

- (b) **LOG REF LEVEL** to **-40 dBm**.
- (c) **VIDEO FILTER** to **OFF**.
- (d) **SCAN MODE** to **INT**.
- (e) **SCAN TRIGGER** to **AUTO**.

(4) Adjust signal generator frequency to center a signal pip (approximately 10 MHz) on display.

(5) Set **SCAN TIME/DIV** to 50 ms, and adjust function/arbitrary generator frequency to place a signal pip at a point 50 kHz below signal generator pip (approximately 9.95 MHz).

(6) Adjust amplitude controls of signal generator and function/arbitrary generator until both signal amplitude displays peak 3 dB below the LOG REF graticule line (-43 dBm).

(7) Adjust **FREQUENCY** control to observe display at 19.95, 10.05, 9.9, 29.95, and 29.9 MHz. Spurious response appearing on display at the above points will not be larger than -110 dBm LOG REF line (-70 dB down from -40 dB LOG REF graticule line).

b. Adjustments. No adjustments can be made.

22. Local Oscillator Stability

a. Performance Check

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

- (a) **FREQUENCY** control to **0 MHz** (local oscillator feed-through).
- (b) **BANDWIDTH** switch to **.1 kHz**.
- (c) **SCAN WIDTH** (red) switch to **PER DIVISION**.
- (d) **SCAN WIDTH PER DIVISION** switch to **0.2 kHz**.
- (e) **INPUT ATTENUATION** switch to **0 dB**.
- (f) **TUNING STABILIZER** switch to **ON** (up).

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

- (a) **SCAN TIME PER DIVISION** switch to **50 ms**.
- (b) **LOG-LINEAR** switch to **LINEAR**.
- (c) **LINEAR SENSITIVITY (LOG REF LEVEL)** switch and vernier controls for a full 8 division vertical display of local oscillator feed-through signal.
- (d) **VIDEO FILTER** switch to **OFF**.
- (d) **SCAN MODE** switch to **INT**.
- (e) **SCAN TRIGGER** switch to **AUTO**.

(3) Adjust **FREQUENCY** control until upward slope of signal pip intersects **CENTER FREQUENCY** graticule line one division from top graticule line as shown in figure 10. Note where slope of display intersects center horizontal graticule line.

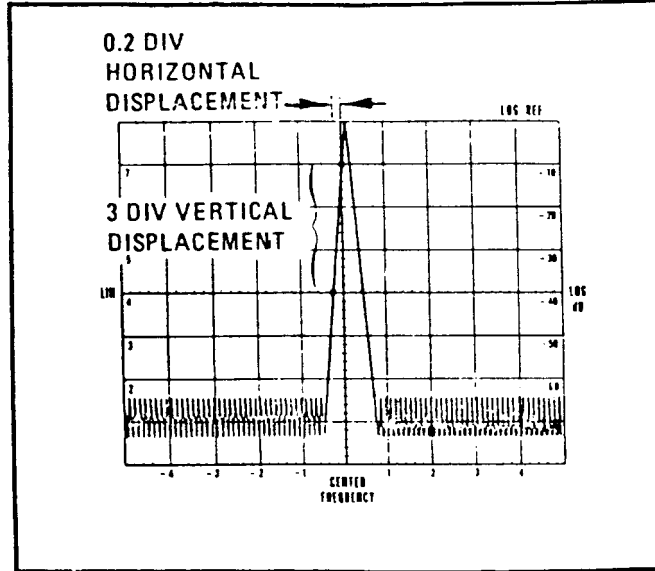


Figure 10. Local oscillator stability.

(4) Multiply horizontal displacement noted in (3) above by the setting of the **SCAN WIDTH PER DIVISION** switch to convert horizontal displacement into Hz.

Example: $(0.2 \text{ kHz}) \times (0.2 \text{ div}) = 40 \text{ Hz}$
 Where: $0.2 \text{ kHz} =$ setting of **SCAN WIDTH PER DIVISION** switch
 $0.2 \text{ div} =$ horizontal displacement from (3) above

(5) Calculate demodulation sensitivity by dividing vertical displacement in divisions into horizontal displacement in Hz calculated in (4) above.

Example: $\frac{40 \text{ Hz}}{3 \text{ div}} = 13.3 \text{ Hz/div}$

(6) Set **SCAN WIDTH** (red) switch to **ZERO** and adjust **FREQUENCY FINE TUNE** control for a response level within the calibrated 3-division range (1 division from top to center horizontal graticule line).

(7) Measure p-p deviation and multiply demodulation sensitivity obtained in (5) above. The stabilized residual FM calculated must be less than 20 Hz p-p.

Example: $0.5 \text{ div p-p signal deviation} \times 13.3 \text{ Hz/div} = \text{p-p residual FM}$

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(8) Set **BANDWIDTH** switch to 1 kHz and **SCAN WIDTH** (red) switch to **PER DIVISION**.

(9) Repeat (3) through (5) above to calculate demodulation sensitivity. (A typical value for demodulation sensitivity with control settings given is 135 Hz/div.)

(10) Set **TUNING STABILIZER** switch to **OFF** and repeat (6) above.

(11) Measure vertical displacement and multiply by demodulation sensitivity obtained in (9) above. Destabilized residual FM calculated must be less than 1 kHz p-p.

b. Adjustments. No adjustments can be made.

23. 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 SPECTRUM ANALYZER, RF PLUG-IN HEWLETT-PACKARD, MODEL 8554()

24. Preliminary Instructions

a. The instructions outlined in paragraphs 24 and 25 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.

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

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.

NOTE

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

25. Equipment Setup

- a. Mate TI with IF plug-in and install in display section.
- b. Perform Section III, paragraph 7 b through 7 cc.

26. Scan Width Accuracy**a. Performance Check**

- (1) Connect signal generator to **RF INPUT**.
- (2) Position TI controls as listed in (a) through (g) below:
 - (a) **FREQUENCY** control to **600 MHz**.
 - (b) **FREQUENCY FINE TUNE** control centered.
 - (c) **BANDWIDTH** switch to **300 kHz**.
 - (d) **SCAN WIDTH** (red) switch to **PER DIVISION**.
 - (e) **SCAN WIDTH PER DIVISION** switch to **100 MHz**.
 - (f) **INPUT ATTENUATION** switch to **0 dB**.
 - (g) **TUNING STABILIZER** switch to **OFF**.
- (3) Position IF plug-in controls as listed in (a) through (i) below:
 - (a) **BASE LINE CLIPPER** control fully ccw.
 - (b) **SCAN TIME PER DIVISION** switch to **10 ms**.
 - (c) **LOG REF LEVEL** switch to **-20 dB**.
 - (d) **LOG REF LEVEL (LINEAR SENSITIVITY vernier)** vernier control to **0**.
 - (e) **LOG/LINEAR** switch to **LOG** (10 dB LOG on model 8552B).
 - (f) **VIDEO FILTER** switch to **OFF**.
 - (h) **SCAN MODE** switch to **INT**.
 - (i) **SCAN TRIGGER** switch to **AUTO**.
- (4) Adjust signal generator frequency and amplitude controls until signal display aligns with far left graticule line on display. Record signal generator frequency (approximately 100 MHz).
- (5) Increase signal generator frequency 200 MHz above frequency recorded in (4) above. Signal display will move to within ± 0.3 division of second graticule line to right.

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(6) Adjust signal generator frequency and amplitude control as necessary to set frequency 900 MHz above frequency recorded in (4) above. Signal pip will move to within ± 0.9 division of ninth graticule line to right.

(7) Adjust **FREQUENCY** control to **200 MHz** and set **SCAN WIDTH PER DIVISION** switch to **10 MHz**.

(8) Adjust signal generator frequency to align signal pip with far left graticule line on display (-5) (approximately 150 MHz). Record signal generator frequency indication on frequency counter.

(9) Increase signal generator frequency 80 MHz above frequency recorded in (8) above. Signal pip will move within ± 0.8 division of ninth graticule line to right (± 3).

(10) Set **SCAN WIDTH PER DIVISION** switch to **1 MHz** and **BANDWIDTH** switch to **10 kHz**.

(11) Repeat (4) and (9) above except in (4) above the approximate frequency will be 195 MHz and in (9) above increase signal generated by 8 MHz.

(12) Connect equipment as shown in figure 5.

(13) Set signal generator controls as necessary for external modulation.

(14) Set **SCAN WIDTH PER DIVISION** switch to **50 kHz** and **BANDWIDTH** switch to **3 kHz**.

(15) Set **TUNING STABILIZER** to **ON** (up).

(16) Adjust function/arbitrary generator frequency to 50 kHz and amplitude control, as necessary, to produce 50 kHz modulation pips on display.

(17) Adjust **FREQUENCY FINE TUNE** control to align a 50 kHz modulation pip with the far left graticule line. Eighth modulation pip to the right will coincide within ± 0.8 division of ninth graticule line to right (± 3).

(18) Set **SCAN WIDTH PER DIVISION** switch to 20 kHz.

(19) Adjust function/arbitrary generator to 20 kHz and repeat technique of (15) above.

b. Adjustments

(1) Connect TI to extender (supplied with TI) and connect extender to display section.

(2) Adjustments for this check are included in paragraph **27 b**. Perform paragraph **27 a** before making adjustments.

27. Tuning Dial Accuracy

a. Performance Check

(1) Connect signal generator to **RF INPUT**.

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

- (a) **FREQUENCY** control to **200 MHz**.
- (b) **BANDWIDTH** switch to **30 kHz**.
- (c) **SCAN WIDTH** (red) switch to **PER DIVISION**.
- (d) **SCAN WIDTH PER DIVISION** switch to **10 MHz**.
- (e) **TUNING STABILIZER** switch to **OFF**.
- (f) **FREQUENCY FINE TUNE** control centered.

(3) Adjust signal generator frequency and amplitude controls as necessary for a 200 MHz output. If signal pip display is not within ± 1 division of center graticule line, perform **b** below.

(4) Repeat (2) and (3) above for frequencies of 400, 600, 800, and 1000 MHz.

b. Adjustments

(1) Connect frequency counter to 1500 MHz A8J1 (fig. 11), using cable (Hewlett-Packard, Model 115926001, part of service kit). NOTCH FILTER FL2 assembly (fig. 11) must be disconnected and removed for this connection.

(2) Adjust **2ND LO ADJ** (fig. 11) as necessary to obtain frequency counter indication between 1499.9 and 1500.1 MHz (R).

(3) Disconnect frequency counter and reinstall NOTCH FILTER FL2 assembly removed in (1) above.

(4) Set **BANDWIDTH** switch to **100 kHz** and **SCAN WIDTH PER DIVISION** switch to **20 MHz**.

(5) Set IF plug-in **SCAN TRIGGER** switch to **LINE**.

(6) Adjust **FREQUENCY** control to **0 MHz**.

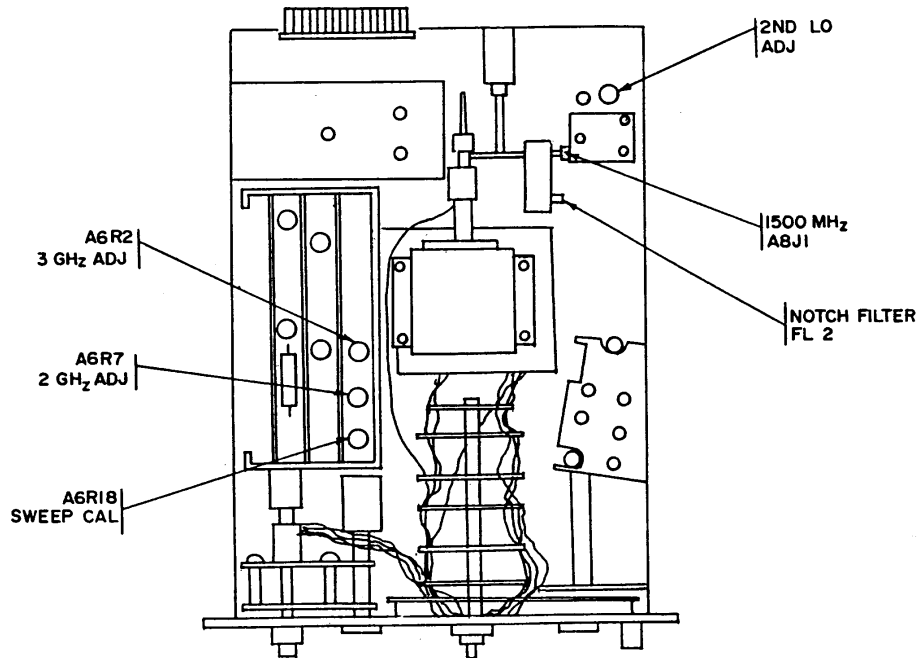


Figure 11. Test instrument - adjustment locations.

(7) Adjust **A6R2 3 GHz ADJ** (fig. 11) to place local oscillator feed-through signal at center graticule line on display (R).

(8) Adjust **FREQUENCY** control for 1000.0 MHz.

(9) Adjust **A6R7 2 GHz ADJ** (fig. 11) to place 1000 MHz signal pip at center graticule line on display (R).

(10) Set **SCAN WIDTH PER DIVISION** switch to **2 MHz** and repeat (6) through (9) above until displayed pip appears within ± 1 division of center graticule line with **FREQUENCY** control settings of 0 and 1000 MHz.

(11) Set **BANDWIDTH** switch to **300 kHz** and **SCAN WIDTH PER DIVISION** switch to **100 MHz**.

(12) Adjust **FREQUENCY** and **FREQUENCY FINE TUNE** controls to place local oscillator feed-through signal at left graticule line.

(13) Adjust signal generator for output frequencies of 200, 400, 600, 800, and 1000 MHz, respectively. Note position of signal pips on display.

(14) Adjust **A6R18 SWEEP CAL** (fig. 11) to position pips to coincide with their respective graticule lines (R).

(15) Repeat paragraphs **26 a** through **27 a** above.

28. Frequency Response

a. Performance Check

(1) Connect equipment as shown in figure 12.

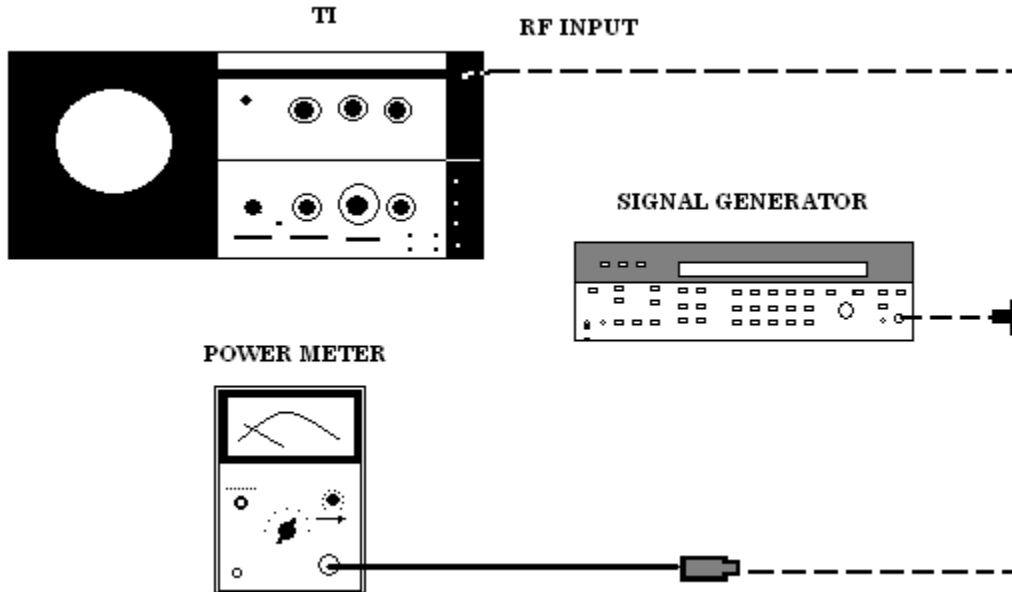


Figure 12. Frequency Response - equipment setup.

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

- (a) **FREQUENCY** control to **0 MHz**.
- (b) **BANDWIDTH** switch to **300 kHz**.
- (c) **SCAN WIDTH** (red) switch to **0-1250 MHz**.
- (d) **INPUT ATTENUATION** switch to **20 dB**.

(3) Set IF plug-in **LOG/LINEAR** switch to **LINEAR** and **LINEAR SENSITIVITY (LOG REF LEVEL)** switch to **1 mV/DIV**.

(4) Adjust signal generator frequency to 100 MHz and output level to produce a 7-division signal pip display. Note output level of signal generator.

(5) Slowly increase signal generator frequency to 500 MHz while maintaining output level noted in (4) above. Note frequency which produces highest signal pip amplitude.

(6) Adjust signal generator output level to produce an 8-division signal pip display at frequency noted in (5) above. Note signal generator output level at this frequency.

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(7) Slowly vary signal generator frequency between 100 and 500 MHz while maintaining output level noted in (6) above. TI signal pip display will remain between 6.3 and 8 division.

(8) Repeat technique of (2) through (7) above for frequency range of 500 to 1000 MHz.

b. Adjustments. No adjustments can be made.

29. Average Noise Level (Sensitivity)

a. Performance Check

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

(a) **FREQUENCY** control to **1250 MHz**.

(b) **BANDWIDTH** switch to **10 kHz**.

(c) **SCAN WIDTH** (red) switch to **ZERO**.

(d) **INPUT ATTENUATION** switch to **0 dB**.

(2) Position IF plug-in controls as listed in (a) through (h) below:

(a) **BASE LINE CLIPPER** control fully cew.

(b) **SCAN TIME PER DIVISION** switch to **50 ms**.

(c) **LOG/LINEAR** switch to **LOG** (10 dB LOG on model 8552B).

(d) **LOG REF LEVEL** switch to **-60 dBm**.

(e) **LOG REF LEVEL (LINEAR SENSITIVITY vernier)** vernier control to **0**.

(f) **VIDEO FILTER** switch to **100 Hz**.

(g) **SCAN MODE** switch to **INT**.

(h) **SCAN TRIGGER** switch to **AUTO**.

(3) Vary **FREQUENCY** control from 1250 MHz to 100 kHz while observing average noise level on display. Average noise level will be below -102 dBm graticule line (-42 dB LOG dB line added to the -60 dBm **LOG REF LEVEL** switch setting).

b. Adjustments. No adjustments can be made.

30. Spurious Response

a. Performance Check

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

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

(b) **BANDWIDTH** switch to **1 kHz**

- (c) **SCAN WIDTH** (red) switch to **PER DIVISION**.
- (d) **SCAN WIDTH PER DIVISION** switch to **0.5 MHz**.
- (2) Position IF plug-in controls as listed in (a) through (c) below:
 - (a) **SCAN TIME PER DIVISION** switch to **0.1 SEC**.
 - (b) **LOG REF LEVEL** switch to **-40 dBm**.
 - (c) **VIDEO FILTER** switch to **OFF**.
- (3) Connect equipment as shown in figure 13.

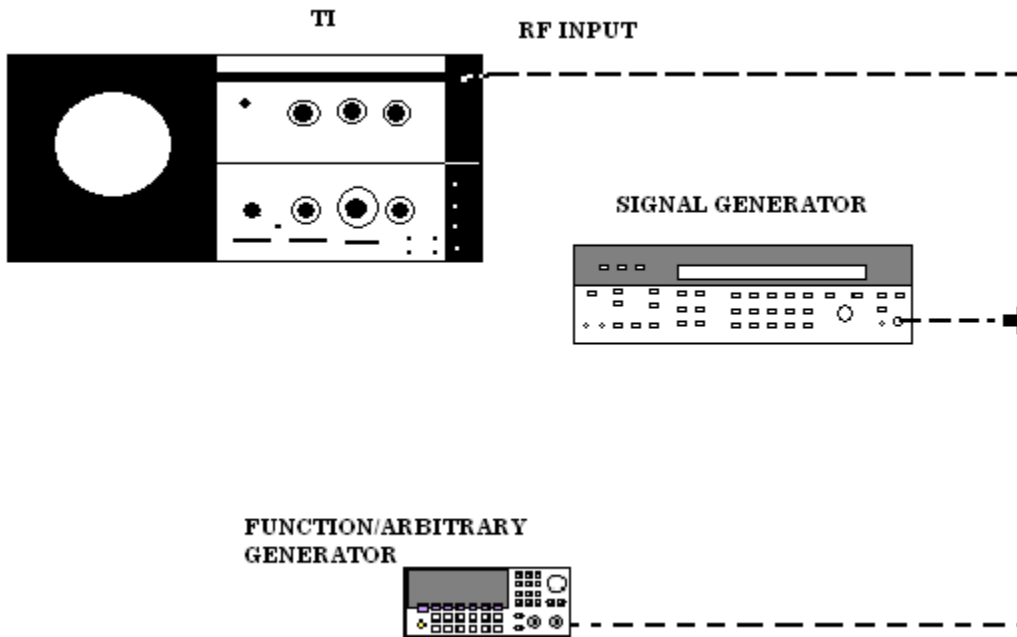


Figure 13. Spurious response - equipment setup.

- (4) Adjust signal generator for an output 10 MHz at -40 dBm.
- (5) Adjust function/arbitrary generator frequency for 9.95 MHz at -40 dBm.
- (6) Reduce **SCAN WIDTH PER DIVISION** switch setting to 50 kHz while keeping two signal pips centered with **FREQUENCY FINE TUNE** control.
- (7) Adjust **FREQUENCY** control to **19.95 MHz** and observe signal display for second-order intermodulation products (between signal generator second harmonics). Displayed signal pips amplitude will be below -60 dB graticule line (-65 dB graticule line for model 8554B).

NOTE

Signal generator exhibits harmonic distortion typically about 35 dB below fundamental level. Harmonic distortion will occur at multiples of 9.950 and 10 MHz. Care must be taken not to confuse harmonic distortion produced by the source with intermodulation distortion produced by the input mixer.

(8) Repeat technique of (7) above for third-order intermodulation products at TI frequencies of 10.050, 9.900, 29.950, and 29.900 MHz.

b. Adjustments. No adjustments can be made.

31. Local Oscillator Stability

a. Performance Check

- (1) Connect signal generator RF output to TI **RF INPUT**.
- (2) Position TI controls as listed in (a) through (e) below:
 - (a) **FREQUENCY** control to **100 MHz**.
 - (b) **BANDWIDTH** switch to **10 kHz**.
 - (c) **SCAN WIDTH** (red) switch to **PER DIVISION**.
 - (d) **SCAN WIDTH PER DIVISION** switch to **20 kHz**.
 - (e) **TUNING STABILIZER** switch to **OFF**.
- (3) Set IF plug-in **SCAN TIME PER DIVISION** switch to 2 ms and **LOG/LINEAR** switch to **LINEAR**.
- (4) Adjust signal generator output for 100 MHz CW at -30 dBm.
- (5) Adjust **LINEAR SENSITIVITY** control and **LINEAR SENSITIVITY (LOG REF LEVEL vernier)** vernier control as necessary to obtain a full 8-division display.
- (6) Adjust **FREQUENCY** and **FREQUENCY FINE TUNE** controls as necessary to center display.
- (7) Readjust **FREQUENCY** controls until upward slope of signal pip intersects **CENTER** graticule line one division from top graticule line as shown in figure 14. Note where slope of display intersects center horizontal graticule line and record horizontal displacement (fig. 14).

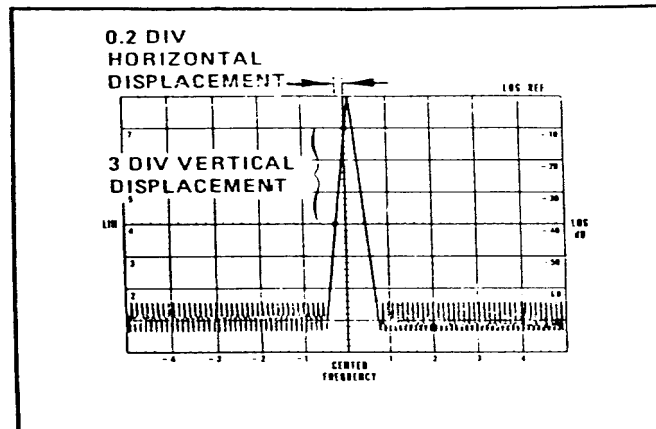


Figure 14. Local oscillator stability

(8) Calculate horizontal displacement in Hz by multiplying **SCAN WIDTH** (red) switch setting (20 kHz) by divisions recorded in (7) above.

Example: $20 \text{ kHz} \times 0.3 \text{ div} = 6000 \text{ Hz}$

(9) Calculate the demodulation sensitivity by dividing vertical displacement (3 divisions) into horizontal displacement in Hz calculated in (8) above.

Example: $\frac{6000 \text{ Hz}}{3 \text{ div}} = 2000 \text{ Hz/div}$

(10) Set **SCAN WIDTH** (red) switch to **ZERO** and adjust **FREQUENCY FINE TUNE** control to position signal display line so that it appears in the three-division range mentioned in (7), (8), and (9) above (fig. 14).

(11) Measure p-p vertical displacement and multiply by demodulation sensitivity obtained in (9) above. Calculated value will be 10 kHz p-p or less.

b. Adjustments. No adjustments can be made.

32. 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
SPECTRUM ANALYZER RF PLUG-IN
HEWLETT-PACKARD, MODEL 8555()**

33. Preliminary Instructions

a. The instructions outlined in paragraphs **33** and **34** are preparatory to the calibration process. Personnel should become familiar with the applicable section 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.

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

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.

NOTE

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

34. Equipment Setup

- a. Mate TI with IF plug-in and install in display section.
- b. Connect display section to autotransformer.
- c. Connect autotransformer to a 115 V ac source and adjust for a 115 V ac output.
- d. Energize equipment and allow 1 hour for equipment to warm-up and stabilize.
- e. Position TI controls as listed in (1) through (9) below:
 - (1) **BAND** switch to **.01-2.05 GHz**.
 - (2) **FREQUENCY** control to **50 MHz**.
 - (3) **FINE TUNE** control centered.
 - (4) **BANDWIDTH** switch to **100 kHz**.

- (5) **SCAN WIDTH** switch to **PER DIVISION**.
 - (6) **SCAN WIDTH PER DIVISION** switch to **10 MHz**.
 - (7) **INPUT ATTENUATION** control to **10 dB**.
 - (8) **TUNING STABILIZER** switch to **ON** (up).
 - (9) **SIGNAL IDENTIFIER** switch to **OFF**.
- f. Position IF plug-in as listed in (1) through (9) below:
- (1) **TRIGGER** switch to **LINE**.
 - (2) **BASE LINE CLIPPER** control cew.
 - (3) **SCAN TIME PER DIVISION** switch to **5 ms**.
 - (4) **LOG/LINEAR** switch to **LOG** (10 dB LOG).
 - (5) **LOG REF LEVEL** switch to **0 dBm**.
 - (6) **LOG REF LEVEL VERNIER** control to **0**.
 - (7) **VIDEO FILTER** switch to **10 kHz**.
 - (8) **SCAN MODE** switch to **INT**.
 - (9) **SCAN INTENSITY** control adjusted for normal display.
- g. Connect IF CAL OUTPUT connector to TI **RF INPUT** connector.
- h. Adjust TI **FREQUENCY** control until display indicates a local oscillator feed-through signal along with the first, second, and third harmonic of the 30 MHz calibrator output signal.
- i. Readjust TI **FREQUENCY** control until local oscillator feed-through signal aligns with third left (-3) graticule line (30 MHz signal should be near the center graticule line).
- j. Perform the following display adjustment procedure as listed in (1) and (2) below.
- (1) Set **SCAN TIME PER DIVISION** switch to 10 seconds. Adjust **FOCUS** and **ASTIGMATISM** controls for normal display.
 - (2) Reset **SCAN TIME PER DIVISION** switch to 5 ms and adjust **TRACE ALIGN** control to position trace parallel with horizontal graticule lines.
- k. Perform the following RF and IF section adjustments listed in (1) through (13) below.
- (1) Adjust **VERTICAL** position control to place crt trace on bottom horizontal graticule line.
 - (2) Adjust **HORIZONTAL POSITION** control to center the display.
 - (3) Adjust **HORIZONTAL GAIN** control for a 10-division trace display. The horizontal position and gain controls may interact.
 - (4) Adjust **FREQUENCY** control to center the 30 MHz calibrator output signal at center graticule line.

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(5) Set **SCAN WIDTH PER DIVISION** switch to 10 kHz and center the 30 MHz signal, using **TI FINE TUNE** control.

(6) Set **BANDWIDTH** switch to 10 kHz, using **FINE TUNE** control to keep the 30 MHz signal centered on the display.

(7) Adjust **LOG REF LEVEL** controls so that 30 MHz signal peak aligns with the -70 dBm graticule line near ccw limit. It may be necessary to readjust **AMPL CAL** control.

(8) Rotate **LOG REF LEVEL** switch seven steps in a cw direction. Signal amplitude should increase by one division (10 dB) at each step.

(9) Adjust **VERTICAL GAIN** control to place the 30 MHz signal peak exactly even with **LOG REF** (top) graticule line.

(10) Repeat (7) through (9) above until no further adjustment of **VERTICAL GAIN** control is necessary.

(11) Set **LOG REF LEVEL** controls to -30 dBm and adjust **AMPL CAL** control to align the 30 MHz signal peak on top graticule line.

(12) Set **LINEAR SENSITIVITY** controls to **1mV/DIV** and set **TI LOG/LINEAR** switch to **LINEAR**.

(13) Readjust **AMPL CAL** control for signal display of 7.1 divisions.

35. Dial Accuracy

a. Performance Check

(1) Connect signal generator to **TI RF INPUT**.

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

(a) **BANDWIDTH** switch to **30 kHz**.

(b) **SCAN WIDTH PER DIVISION** switch to **10 MHz**.

(c) **INPUT ATTENUATION** control to **20 dB**.

(3) Position **IF** plug-in switches as listed in (a) and (b) below:

(a) **LOG/LINEAR** to **LOG** (LOG to 10 dB).

(b) **VIDEO FILTER** to **OFF**.

(4) Adjust **TI FREQUENCY** control to **100 MHz**.

(5) Adjust signal generator for frequency of 100 MHz and amplitude for a usable display on crt. Signal display will align within ± 1.5 divisions of center graticule line.

(6) Repeat technique of (4) and (5) above at 200 MHz intervals across entire **TI** band.

b. Adjustments. No adjustments can be made.

36. Scan Accuracy

a. Performance Check

- (1) Position TI controls as listed in (a) through (d) below:
 - (a) **FREQUENCY** controls to **700 MHz**.
 - (b) **BANDWIDTH** switch to **300 kHz**.
 - (c) **SCAN WIDTH PER DIVISION** switch to **100 MHz**.
 - (d) **INPUT ATTENUATION** switch to **0 dB**.
- (2) Position IF plug-in controls as listed in (a) through (d) below:
 - (a) **SCAN TIME PER DIVISION** switch to 10 ms.
 - (b) **LOG REF LEVEL** controls to **+10 dBm**.
 - (c) **VIDEO FILTER** switch to **ON**.
 - (d) **SCAN TRIGGER** switch to **AUTO**.
- (3) Adjust signal generator for frequency of 500 MHz and amplitude to produce a usable display on crt.
- (4) Adjust TI frequency control to align the 500 MHz signal pip with the -2 graticule line on crt. Readjust TI **INPUT ATTENUATION** and **LOG REF LEVEL** controls as necessary.
- (5) Adjust signal generator 1000 MHz. The signal pip will align within ± 0.5 division of +3 graticule line.
- (6) Set **SCAN WIDTH PER DIVISION** switch to **10 MHz**.
- (7) Adjust signal generator for frequency of 650 MHz. Readjust TI **FREQUENCY** control to align signal pip with the -5 graticule line.
- (8) Adjust signal generator frequency to 730 MHz. Signal pip will align within ± 0.8 division of +3 graticule line.
- (9) Set **SCAN WIDTH PER DIVISION** switch to 1 MHz and repeat (7) and (8) above, substituting frequencies of 695 MHz in (7) and 703 MHz in (8).
- (10) Connect equipment as shown in figure 5.
- (11) Position TI controls as listed in (a) through (e) below:
 - (a) **BANDWIDTH** switch to **3 kHz**.
 - (b) **FREQUENCY** control to **400 MHz**.
 - (c) **VIDEO FILTER** switch to **OFF**.
 - (d) **TUNING STABILIZER** switch to **OFF**.
 - (e) **SCAN WIDTH PER DIVISION** switch to **50 kHz**.

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(12) Adjust signal generator frequency and amplitude controls for cw operation at 400 MHz and usable display on crt.

(13) Adjust TI **FREQUENCY** controls to center switch pip display.

(14) Adjust signal generator for AM modulation operation.

(15) Adjust frequency and amplitude controls of function/arbitrary generator as necessary to provide amplitude modulation of at least 90 percent at 50 kHz. A signal pip should now appear at 50 kHz intervals across crt display.

(16) Adjust TI **FINE TUNE** frequency control to align one of the 50 kHz signal pips with the -4 graticule line. Readjust signal generator output amplitude as necessary. Observe that the eighth signal pip to the right aligns within ± 0.8 division of the +4 graticule line.

(17) Set **TUNING STABILIZER** to ON (up) and repeat (16) above.

b. Adjustments. No adjustments can be made.

37. Noise Sidebands

a. Performance Check

(1) Connect signal generator to TI **RF INPUT** connector.

(2) Adjust signal generator for cw operation at 100 MHz.

(3) Position TI controls as listed in (a) through (e) below.

(a) **FREQUENCY** controls to **100 MHz**.

(b) **TUNING STABILIZER** to ON (up).

(c) **BANDWIDTH** switch to **100 kHz**.

(d) **SCAN WIDTH PER DIVISION** switch to **5 MHz**.

(e) **INPUT ATTENUATION** switch to **0 dB**.

(4) Position IF plug-in **LOG REF LEVEL** switch to **-20 dBm** and **VIDEO FILTER** switch to **OFF**.

(5) Adjust signal generator amplitude control and TI **FREQUENCY** control as necessary to center signal pip and place peak of pip at top graticule on crt.

(6) Reduce setting of **SCAN WIDTH PER DIVISION** switch to **100 kHz** and **BANDWIDTH** switch to **1 kHz**; keep signal pip centered with **FREQUENCY** control.

(7) Set IF plug-in **SCAN TIME PER DIVISION** switch to **0.2 second** and **VIDEO FILTER** switch to **100 Hz**. Noise level, displayed by 3 divisions or more away from crt center, will be at least 70 dB below signal peak set in (5) above.

b. Adjustments. No adjustments can be made.

38. Residual Responses**a. Performance Check**

- (1) Connect termination to **RF INPUT** connector.
- (2) Set **SCAN WIDTH** switch to **FULL** and **INPUT ATTENUATION** switch to **0 dB**.
- (3) Set IF plug-in **SCAN TIME PER DIVISION** switch to **10 sec** and **LOG REF LEVEL** switch to **-60 dBm**.
- (4) Observe sweep across entire band. No response will occur on display above level of -90 dBm (3 graticule lines from top of display). Disregard LO feed-through signal at left end of display.

b. Adjustments. No adjustments can be made.

39. Sensitivity**a. Performance Check**

- (1) Position TI controls as listed in (a) through (f) below:
 - (a) **BAND** switch to **1.50-3.55 GHz**.
 - (b) **FREQUENCY** control to **1.5 GHz**.
 - (c) **SIGNAL IDENTIFIER** switch to **OFF**.
 - (d) **BANDWIDTH** switch to **10 kHz**.
 - (e) **SCAN WIDTH** switch to **ZERO**.
 - (f) **INPUT ATTENUATION** control to **0 dB**.
- (2) Position IF plug-in controls as listed in (a) through (d) below:
 - (a) **BASE LINE CLIPPER** control fully ccw.
 - (b) **SCAN TIME PER DIVISION** switch to **20 ms**.
 - (c) **LOG REF LEVEL** controls to **-50 dBm**.
 - (d) **VIDEO FILTER** switch to **100 Hz**.
- (3) Slowly adjust **FREQUENCY** control throughout band range. The average noise level displayed on TI display will be below -107 dBm level (graticule line is now -50 dBm).

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(4) Repeat (3) above for bands listed in table 8. Noise level will be less than value listed for each band.

Table 8. Sensitivity Noise Levels

Band (GHz)	Noise level (dBm)
.01-2.05	-105
2.60-4.65	-107
4.11-6.15	-105
2.07-6.15	-98
6.17-10.25	-95
4.13-10.25	-93
8.23-14.35	-90
6.19-14.35	-85
10.29-18.45	-80

b. Adjustments. No adjustments can be made.

40. 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
SPECTRUM ANALYZER LF PLUG-IN
HEWLETT-PACKARD, MODEL 8556()**

41. Preliminary Instructions

- a. The instructions outlined in paragraphs 41 and 42 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.

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

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.

NOTE

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

42. Equipment Setup

- a. Mate TI with IF plug-in and install in display section.
- b. Connect display section to autotransformer.
- c. Connect autotransformer to a 115 V ac source and adjust for a 115 V ac output.
- d. Energize equipment and allow 1 hour for equipment to warm-up and stabilize.
- e. Adjust display section INTENSITY and FOCUS controls to approximately 1 o'clock position.
- f. Position TI controls as listed in (1) through (9) below:
 - (1) **RANGE MHz** switch to **0-300 kHz**.
 - (2) **FREQUENCY** control to **150 kHz**.
 - (3) **FREQUENCY FINE TUNE** control centered.
 - (4) **BANDWIDTH** switch to **10 kHz**.
 - (5) **SCAN WIDTH** (red) switch to **PER DIVISION**.
 - (6) **SCAN WIDTH PER DIVISION** switch to **20 kHz**.
 - (7) **INPUT ATTENUATION** switch to **-20 dB/dBV**.
 - (8) **dBm-dBV** switch to **dBV**.
 - (9) **20 kHz MARKERS** switch out.
- g. Position IF plug-in controls as listed in (1) through (11) below:
 - (1) **SCAN TIME PER DIVISION** switch to **5 ms**.
 - (2) **LOG REF LEVEL** switch to **10 dBV**.
 - (3) Vernier control fully ccw.
 - (4) **LOG/LINEAR** switch to **10 dB LOG**.
 - (5) **VIDEO FILTER** switch to **OFF**.

- (6) **SCAN MODE** switch to **INT**.
- (7) **SCAN TRIGGER** control to **AUTO**.
- (8) **BASE LINE CLIPPER** control fully ccw.
- (9) **WRITING SPEED-STD** pushbutton pressed.
- (10) **PERSISTENCE** switch to **MIN**.
- (11) **INTENSITY** control to 12 o'clock.

h. Set **LOG REF LEVEL** switch fully ccw, then position trace to a convenient graticule line, using **VERTICAL POSITION** control.

i. Set **SCAN MODE** switch to **MAN** (**INT** on model 8552A) and use **MANUAL SCAN** control to bring dot to center of display screen. Adjust **FOCUS** and **ASTIG** controls for smallest round dot possible.

j. Set **SCAN MODE** switch to **INT** and adjust **TRACE ALIGN** control to set trace parallel to horizontal graticule lines.

k. Alternately adjust **HORIZONTAL GAIN** and **HORIZONTAL POSITION** controls so that trace just fills horizontal graticule line.

l. Position trace to bottom graticule line, using **VERTICAL POSITION** control.

NOTE

Ignore any slight misalignment of the trace.

m. Connect **TRACKING GEN OUT** connector to **INPUT** connector.

n. Set **TRACKING GEN LEVEL** control to **CAL 100 mV** and **VIDEO FILTER** switch to **10 kHz**.

o. Position trace to -70 dB graticule line at center of display screen, using **LOG REF LEVEL** vernier.

NOTE

It may be necessary to adjust the **AMPL CAL** control to lower trace.

p. Turn **LOG REF LEVEL** switch cw 7 steps (without moving vernier) while observing the trace. Trace should move up in 10 dB steps. If trace does not move to top graticule line, adjust **VERTICAL GAIN** control until trace is positioned at top graticule line.

q. Turn **LOG REF LEVEL** switch fully ccw and repeat **o** and **p** above until no further adjustment is necessary.

r. Set **LOG REF LEVEL** switch to -20 dBV (vernier to zero) and adjust **AMPL CAL** control to position trace at top graticule line at center of display screen.

s. Set **LOG/LINEAR** switch to **LINEAR**, **LINEAR SENSITIVITY** control to **20 mV** per division, and adjust **AMPL CAL** control if necessary to bring trace to fifth graticule line.

t. Disconnect TRACKING GEN OUT from INPUT and position TI controls as listed in (1) through (7) below:

- (1) **FREQUENCY** dial to **0 kHz**.
- (2) **RANGE** switch to **0-30 kHz**.
- (3) **FINE TUNE** control centered.
- (4) **BANDWIDTH** switch to **300 Hz**.
- (5) **SCAN WIDTH** switch to **PER DIVISION**.
- (6) **PER DIVISION** switch to **1 kHz**.
- (7) **20 kHz MARKERS** switch **IN**.

u. Set **SCAN TIME PER DIVISION** switch to **50 ms** and **VIDEO FILTER** switch to **OFF**.

v. Center LO feed through signal at **CENTER FREQUENCY** graticule on display with **ZERO ADJ**. Dial should be accurately set to 0 kHz.

w. Set **RANGE** switch to **0-300 kHz** counting 20 kHz markers as they pass **CENTER FREQUENCY** graticule on display. Center the 15th marker (300 kHz) on **CENTER FREQUENCY** graticule line.

x. Adjust **300 kHz ADJ** so that dial reads **300 kHz** when the 15th marker is centered.

y. Repeat v through x above until no further adjustment is necessary.

43. Tracking Generator Amplitude

a. Performance Check

- (1) Connect multimeter to **TRACKING GEN OUT** connector.
- (2) Position TI controls as listed in (a) through (e) below:
 - (a) **RANGE** switch to **0-300 kHz**.
 - (b) **FREQUENCY** dial to **100 kHz**.
 - (c) **SCAN WIDTH** switch to **ZERO**.
 - (d) **TRACKING GEN LEVEL** switch to **CAL 100 mV**.
 - (e) **20 MHz MARKERS** switch **OUT**.
- (3) If multimeter does not indicate between 96.5 and 103.5 mV rms, perform **b** below.
- (4) Disconnect multimeter and connect TI to frequency counter.
- (5) Set **TRACKING GEN LEVEL** control fully cw, and adjust **FREQUENCY** dial and **FINE TUNE** controls for a 50 Hz indication on frequency counter.
- (6) Disconnect frequency counter and reconnect multimeter to TI **TRACKING GEN OUT**.
- (7) Set **TRACKING GEN LEVEL** control to **CAL 100 mV**.

(8) Slowly turn **FREQUENCY** control from 50 Hz to 300 kHz. If multimeter does not indicate between 95 and 105 mV rms through entire range, perform **b** below.

b. Adjustments

(1) Remove TI from display section and reconnect, using extender supplied with TI.

NOTE

If extender is not available, access to adjustments may be gained by removing top protective cover from TI. Replace cover after adjustments are made.

WARNING

When top protective cover is removed from TI, very high voltage connections are exposed. Extreme caution should be used in making adjustment.

(2) Adjust **AMPL ADJ** (fig. 13) for a multimeter indication of 100 mV rms (R).

(3) Set **FREQUENCY** controls to 300 kHz and adjust **FLATNESS ADJ** control (fig. 13) for an indication between 95 and 105 mV rms. Repeat **a** above for best compromise (R).

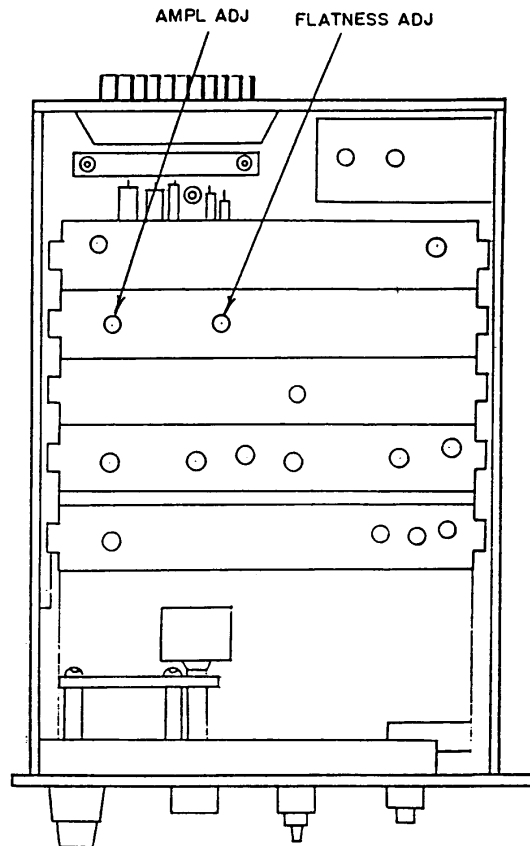


Figure 13. Adjustment locations.

44. Marker Accuracy

a. Performance Check

- (1) Connect **TRACKING GEN OUT** connector to **INPUT** connector, using cable.
- (2) Position TI controls as listed in (a) through (j) below:
 - (a) **RANGE** switch to **0-300 kHz**.
 - (b) **FREQUENCY** control to **300 kHz**.
 - (c) **FINE TUNE** control centered.
 - (d) **BANDWIDTH** switch to **10 Hz** (Model 8552B); **50 Hz** (Model 8552A).
 - (e) **SCAN WIDTH** switch to **ZERO**.
 - (f) **PER DIVISION** switch to **1 kHz**.
 - (g) **TRACKING GEN LEVEL** control to **CAL 100 mV**.
 - (h) **INPUT LEVEL** switch to **-20 dBm/dBV**.
 - (i) **dBm/dBV** switch to **dBV**.
 - (j) **20 kHz MARKERS** switch **OUT**.
- (3) Position IF plug-in controls as listed in (a) through (g) below:
 - (a) **SCAN TIME PER DIVISION** switch to **5 ms**.
 - (b) **LOG REF LEVEL** switch to **-10 dBV**.
 - (c) **LOG/LINEAR** switch to **10 dB LOG**.
 - (d) **VIDEO FILTER** switch to **OFF**.
 - (e) **SCAN MODE** switch to **INT**.
 - (f) **SCAN TRIGGER** control to **AUTO**.
 - (g) **BASE LINE CLIPPER** control fully ccw.
- (4) Adjust **TRACK ADJ** control to peak trace as high as possible on display screen.
- (5) Set **LOG/LINEAR** switch to **LINEAR** and **LINEAR SENSITIVITY** control to **20 mV/DIV**, and repeat (3) above.
- (6) Disconnect **TRACKING GEN OUT** connector from **TI INPUT** connector and connect to frequency counter.

NOTE

It may be necessary to increase setting of **TRACKING GEN LEVEL** control to obtain reading on frequency counter.

- (7) Position TI switches as listed in (a) through (c) below.
 - (a) **20 kHz MARKERS** pressed.

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(b) **BANDWIDTH** to **300 Hz**.

(c) **SCAN WIDTH** to **PER DIVISION**.

(8) Adjust **LINEAR SENSITIVITY** control to **2 mV/DIV** and set **SCAN TIME PER DIVISION** switch to **50 ms**.

(9) Adjust **FREQUENCY** and **FINE TUNE** controls to center 300 kHz marker on display screen.

NOTE

Perform (10), (11), (12), (15), and (16) below when using Model 8552B and (13), (14), and (17) below when using Model 8552A.

(10) Set **SCAN WIDTH** switch to **20 Hz** and **BANDWIDTH** switch to **10 Hz**.

(11) Set IF plug-in **SCAN MODE** switch to **MAN**.

(12) Adjust **MANUAL SCAN** control to set dot on display screen to peak of marker. Frequency counter will indicate between 299.97 and 300.03 kHz.

(13) Set **SCAN WIDTH** switch to **ZERO** and **SCAN MODE** switch to **INT**.

(14) Set **BANDWIDTH** switch to **50 Hz** and peak trace with **FINE TUNE** control. Frequency counter will indicate between 299.97 and 300.03 kHz.

(15) Set **SCAN MODE** switch to **INT** and tune **FREQUENCY** control down to next marker. (Should be at **280 kHz**).

(16) Set **SCAN MODE** switch to **MAN** and use **MANUAL SCAN** control to set dot on display screen to peak of marker. Frequency counter will indicate between 279.972 and 280.028 kHz.

(17) Tune **FREQUENCY** control down to next marker. Frequency counter will indicate between 279.972 and 280.028 kHz for model 8552A.

b. Adjustments. No adjustments can be made.

45. Scan Width Accuracy

a. Performance Check

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

(a) **RANGE** switch to **0-300 kHz**.

(b) **FREQUENCY** control to **100 kHz**.

(c) **FINE TUNE** control centered.

(d) **BANDWIDTH** switch to **1 kHz**.

- (e) **SCAN WIDTH** switch to **PER DIVISION**.
 - (f) **PER DIVISION** switch to **20 kHz**.
 - (g) **INPUT LEVEL** switch to **-20 dBm/dBV**.
 - (h) **dBm/dBV** switch to **dBV**.
 - (i) **20 kHz MARKERS** switch depressed.
- (2) Position IF plug-in controls as listed in (a) through (g) below:
- (a) **SCAN TIME PER DIVISION** switch to **50 ms**.
 - (b) **LOG REF LEVEL** switch to **-10 dBV**.
 - (c) **LOG/LINEAR** switch to **10 dB LOG**.
 - (d) **VIDEO FILTER** switch to **OFF**.
 - (e) **SCAN MODE** switch to **INT**.
 - (f) **SCAN TRIGGER** switch to **AUTO**.
 - (g) **BASE LINE CLIPPER** control fully cew.

(3) Adjust **FREQUENCY** and **FINE TUNE** controls to center a marker on the -4 GRATICULE LINE (fig. 14). Note that a 20 kHz marker appears at about every major division on display screen.

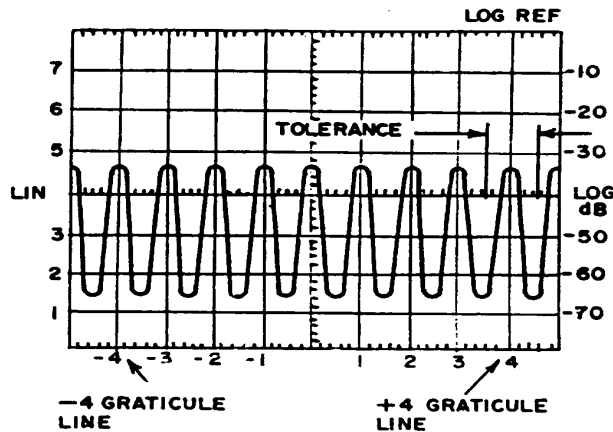


Figure 14. Scan width accuracy display.

(4) Measure amount of error, in divisions, that marker deviates from +4 graticule line. Deviation for model 8552B is +0.24 major division and +0.40 major division for model 8552A (fig. 14).

- (5) Position TI switches as listed in (a) through (c) below:
- (a) **BANDWIDTH** to **300 Hz**.

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(b) **SCAN TIME PER DIVISION** to 0.1 SEC.

(c) **SCAN WIDTH PER DIVISION** to 5 kHz.

(6) Adjust **FREQUENCY** and **FINE TUNE** controls to center a marker on -4 GRATICULE LINE.

(7) Repeat (3) above.

b. Adjustments. No adjustments can be made.

46. Center Frequency Accuracy

a. Performance Check

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

(a) **RANGE** switch to **0-300 kHz**.

(b) **FREQUENCY** control to **20 kHz**.

(c) **FINE TUNE** control centered.

(d) **BANDWIDTH** switch to **300 Hz**.

(e) **SCAN WIDTH** switch to **PER DIVISION**.

(f) **PER DIVISION** switch to **1 kHz**.

(g) **INPUT LEVEL** switch **-20 dBm/dBV**.

(h) **dBm/dBV** switch to **dBV**.

(i) **20 kHz MARKERS** switch **depressed**.

(2) Position IF plug-in controls as listed in (a) through (g) below:

(a) **SCAN TIME PER DIVISION** switch to 50 ms.

(b) **LOG REF LEVEL** switch to **-10 dBV**.

(c) **LOG/LINEAR** switch to **10 dB LOG**.

(d) **VIDEO FILTER** switch to **OFF**.

(e) **SCAN MODE** switch to **INT**.

(f) **SCAN TRIGGER** switch to **AUTO**.

(g) **BASE LINE CLIPPER** control fully ccw.

(3) Adjust **FREQUENCY** control to center dial marker on **CENTER FREQUENCY** dial every 20 kHz from 20 to 300 kHz. At each 20 kHz point, a 20 kHz marker should appear at **CENTER FREQUENCY** graticule within ± 3 major divisions for model 8552B (± 5 major divisions for model 8552A).

(4) Set **SCAN WIDTH PER DIVISION** switch to **500 Hz** and **RANGE** switch to **0-30 kHz**.

(5) Adjust **FREQUENCY** controls to **0 kHz** and adjust **ZERO ADJ** control to center local oscillator feed-through on **CENTER FREQUENCY** graticule.

(6) Adjust **FREQUENCY** control to center dial marker on **CENTER FREQUENCY** dial at 20 kHz. The 20 kHz marker will appear at **CENTER FREQUENCY** graticule ± 1 major division for model 8552B (± 2 major division for model 8552A).

b. Adjustments. No adjustments can be made.

47. Frequency Response

a. Performance Check

(1) Connect equipment as shown in figure 15.

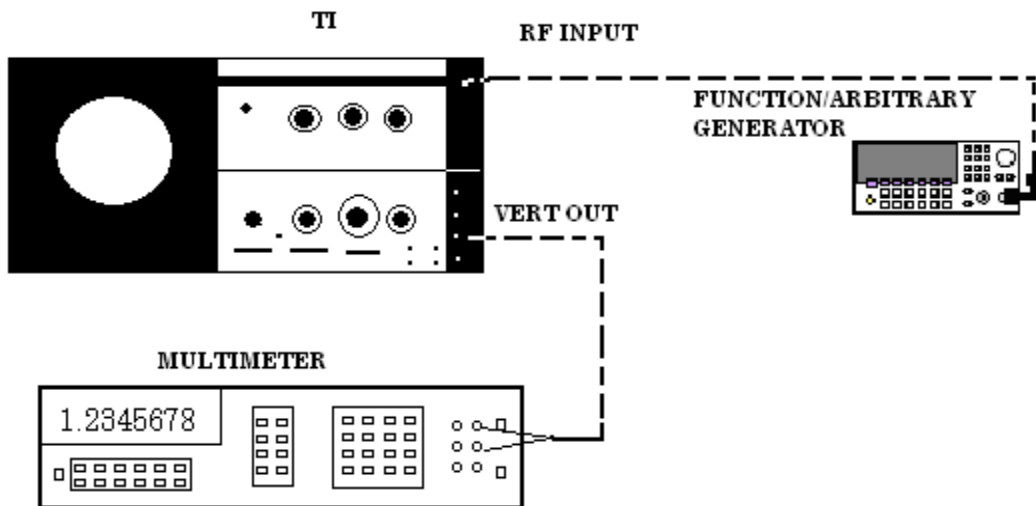


Figure 15. Frequency response - equipment setup.

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

- (a) **RANGE** switch to **0-30 kHz**.
- (b) **FREQUENCY** control to **5 kHz**.
- (c) **FINE TUNE** control centered.
- (d) **BANDWIDTH** switch to **300 Hz** for model 8552B or **50 Hz** for model 8552A.
- (e) **SCAN WIDTH** switch to **ZERO**.
- (f) **INPUT LEVEL** switch to **-40 dBm/dBV**.
- (g) **20 kHz MARKERS** switch out.

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

- (a) **SCAN TIME PER DIVISION** switch to **5 ms**.
- (b) **LOG/LINEAR** switch to **LINEAR**.
- (c) **LINEAR SENSITIVITY** control to **10 mV/DIV**.
- (d) **VIDEO FILTER** switch to **100 Hz**.
- (e) **SCAN MODE** switch to **INT**.
- (f) **SCAN TRIGGER** switch to **AUTO**.
- (g) **BASE LINE CLIPPER** control fully cew.

(4) Adjust function/arbitrary generator frequency for 5 kHz and a 30 mV reference indication.

(5) Carefully adjust **FINE TUNE** and **ZERO ADJ** controls for peak indications of function/arbitrary generator dc level on display screen.

(6) Adjust **LINEAR SENSITIVITY** control for an indication of 700.0 mV dc on multimeter.

(7) Set function/arbitrary generator to frequencies of 15 and then 30 kHz while maintaining 30 mV reference level, using technique noted in (4) and (5) above. Multimeter indication will be between 683.9 and 716.1 mV.

(8) Adjust function/arbitrary generator for an output of 50 kHz and a 30 mV reference indication.

(9) Set **RANGE** switch to **0-300 kHz** and repeat technique of (5) through (7) above at frequencies of 50, 150, and 300 kHz. Multimeter indication will be between 683.9 and 716.1 mV.

b. Adjustments. No adjustments can be made.

48. Average Noise Level

a. Performance Check

(1) Connect a 600 Ω feed-through termination to TI INPUT connector.

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

- (a) **RANGE** switch to **0-30 kHz**.
- (b) **FREQUENCY** control to **7 kHz**.
- (c) **FINE TUNE** control centered.

- (d) **BANDWIDTH** switch to **1 kHz**.
 - (e) **SCAN WIDTH** switch to **ZERO**.
 - (f) **INPUT LEVEL** switch to **-60 dBm/dBV**.
 - (g) **20 kHz MARKERS** switch released (out).
- (3) Position IF plug-in controls as listed in (a) through (h) below:
- (a) **SCAN TIME PER DIVISION** switch to **50 ms**.
 - (b) **LOG/LINEAR** switch to **LINEAR**.
 - (c) **LINEAR SENSITIVITY** control to **0.1 μ V/DIV**.
 - (d) **Vernier** control fully ccw.
 - (e) **VIDEO FILTER** switch to **10 Hz** with model 8552B, **100 Hz** with model 8552A.
 - (f) **SCAN MODE** switch to **INT**.
 - (g) **SCAN TRIGGER** switch to **AUTO**.
 - (h) **BASE LINE CLIPPER** control fully ccw.
- (4) Observe average noise level displayed on display section as frequency is varied from 7 to 300 kHz. The average noise level will be below the fourth graticule line throughout the range.

b. Adjustments. No adjustments can be made.

49. Spurious Responses

a. Performance Check

- (1) Position TI controls as listed in (a) through (i) below:
- (a) **RANGE** switch to **0-300 kHz**.
 - (b) **FREQUENCY** control to **100 kHz**.
 - (c) **FINE TUNE** control centered.
 - (d) **BANDWIDTH** switch to **300 Hz**.
 - (e) **SCAN WIDTH** switch to **PER DIVISION**.
 - (f) **PER DIVISION** switch to **20 kHz**.
 - (g) **INPUT LEVEL** switch to **-40 dBV**.
 - (h) **dBm-dBV** switch to **dBV**.
 - (i) **20 kHz MARKERS** switch **OUT**.

(2) Position IF plug-in controls as listed in (a) through (h) below:

(a) **SCAN TIME PER DIVISION** switch to **2 SECONDS**.

(b) **LOG/LINEAR** switch to **10 dB LOG**.

(c) **LOG REF LEVEL** switch to **-40 dBm/dBV**.

(d) **Vernier** control fully ccw.

(e) **BASE LINE CLIPPER** control fully ccw.

(f) **VIDEO FILTER** switch to **100 Hz**.

(g) **SCAN MODE** switch to **INT**.

(h) **SCAN TRIGGER** switch to **AUTO**.

(3) Connect equipment as shown in figure 16.

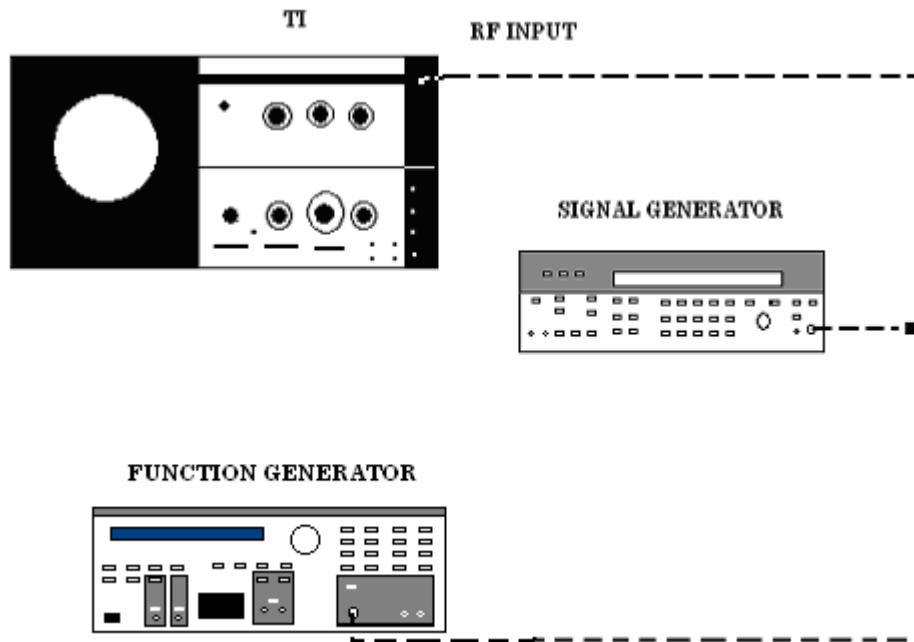


Figure 16. Spurious responses - equipment setup.

(4) Adjust function generator frequency for 70 kHz at 3 mV.

(5) Adjust signal generator frequency for 90 kHz at amplitude equal to that set in (4) above.

(6) Carefully adjust amplitudes of function generator and signal generator so that both signal peaks are 3 dB below LOG REF graticule on display screen. The signals at 140 kHz ($2f_1$) and 180 kHz ($2f_2$) (fig. 17) are second order harmonics. Any second order intermodulation product (due to analyzer) will occur at 160 kHz ($f_1 + f_2$). Any third order intermodulation products will occur at 50 kHz ($2f_1 - f_2$) and at 110 kHz ($2f_2 - f_1$). The intermodulation products should be below -70 dB graticule line.

(7) Repeat technique of (4) through (6) above with function generator at a frequency of 1.7 kHz and signal generator at a frequency of 2 kHz.

(8) Position **SCAN WIDTH PER DIVISION** switch to **500 Hz** and **BANDWIDTH** switch to **30 Hz** for model 8552B or **50 Hz** for model 8552A. Set **SCAN WIDTH** to **0-10f**.

NOTE

It may be necessary to tune ZERO ADJ control until local oscillator feed-through is centered at far left graticule line.

(9) Adjust function generator and signal generator controls to set both signal peaks 3 dB below LOG REF graticule on display screen. The signals at 3.4 kHz ($2f_1$) and 4.0 kHz ($2f_2$) are second order harmonics (fig. 17). Any second order intermodulation product (due to analyzer) will occur at 3.7 kHz ($2f_1 - f_2$). Any third order intermodulation product will occur at 1.4 kHz ($2f_1 - f_2$) and at 2.3 kHz ($2f_2 - f_1$). All intermodulation products should be below -60 dB graticule line.

b. Adjustments. No adjustments can be made.

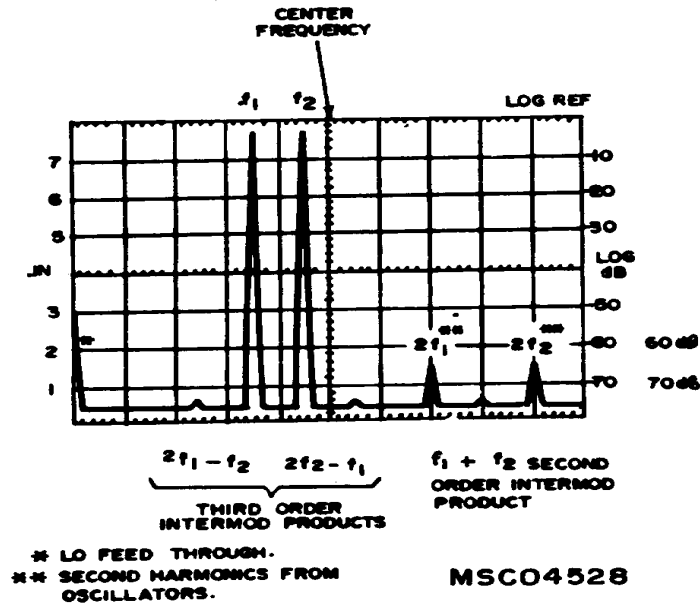


Figure 17. Intermodulation distortion products.

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50. Final Procedure

- a. Deenergize and disconnect all equipment.
- b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

Official:



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

0409102

PETER J. SCHOOMAKER
*General, United States Army
Chief of Staff*

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342142, requirements for TB 9-6625-1914-35.

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.

