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DEPARTMENT OF THE AMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SPECTRUM ANALYZER AN/USM-620 (TEKTRONIX, MODEL 495P)

Headquarters, Department of the Army, Washington, DC
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SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Spectrum Analyzer, AN/USM-620 (Tektronix, Model 495P). TM 11-6625-3278-40 and TM 11-6625-3278-12 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. None.

b. Time and Technique. The time required for this calibration is approximately 9 hours, using the dc and low frequency and microwave technique.

2. Forms, Records, and Reports

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

b. Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

3. Calibration Description. TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Calibrator amplitude	Range: –20 dBm Accuracy: ± 0.3 dB
Calibrator frequency	Range: 100 MHz Accuracy: ±20 Hz
Center frequency	Range: 100 Hz to 1.8 GHz Accuracy: ±20% of Span/Div or resolution bandwidth (whichever is greater). Tuning resolution: $\leq$ 10% of the Span/Div setting ($\leq$ 1% of total span).
Frequency stability	< 50 Hz per minute after 1 hour warm up, with a span of $\leq$ 200 kHz
Frequency readout resolution	With counter, $\leq$ 10% of the Span/Div setting ($\leq$ 1% of total span).
Span accuracy	Within ±5% of center eight divisions.
Resolution bandwidth	Measured at –6 dB points: Accuracy: ±20% of selected bandwidth
Display accuracy	Range: 10 dB/Div Accuracy: ±1.0 dB/10 dB to a maximum of ±2.0 dB/80 dB Range: 2 dB/Div Accuracy: ±0.4 dB/2 dB to a maximum of ±1.0 dB/16 dB
Display accuracy (linear)	±5% of full scale
Display flatness (Frequency response)	Range: 100 Hz to 1.8 GHz Accuracy: ±1.0 dB when measured with 10 dB of attenuation
Spurious response	Residual: $\leq$ 100 dBm with input terminated into 50Ω Harmonic distortion: –60 dBc for a –30 dB signal in minimum distortion mode Third order intermodulation distortion: $\leq$ 70 dB down from two full screen signals with any frequency span in minimum distortion mode
Input noise sensitivity	Range: Center frequency $\geq$ 1 MHz Bandwidth setting: 1 kHz resolution; 100 Hz resolution; 10 Hz resolution; at least –115 dBm at least –125 dBm at least –131 dBm
Shape factor	Resolution bandwidth $\geq$ 100 Hz: < 7.5:1 at 60 dB and 6 dB points Resolution bandwidth 10 Hz: $\leq$ 150 Hz wide at 60 dB points
Input attenuator	Range: 0 dB to 60 dB in 10 dB steps Accuracy: ±0.5 dB/10 dB step, 1.0 dB maximum
Sweep time	Range: 20 μs/Div to 10 s/Div (10 s/Div only in auto sweep mode) Accuracy: within ±5% of setting
Tracking generator	Frequency range: 100 kHz to 1.8 GHz Output level: 0 dBm ±0.5 dB Flatness: ±2.25 dB from 100 kHz to 1.8 GHz Spurious outputs: 20 dBc harmonic and 40 dBc non-harmonic

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-287 and 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.

5. Accessories Required. The accessories required for this calibration are common usage accessories, issued as indicated in paragraph **4** above, and are not listed in this calibration procedure. The following peculiar accessory is also required for this calibration: 50 Ω, 20 Watt dummy load.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
ELECTRONIC COUNTER	Range: 20 ms to 200 s Accuracy: ± 10%	John Fluke, Model PM6681/656 (PM6681/656)
GPS TIME/FREQUENCY GENERATOR	Resolution: 1×10^{-10}	Datrum, Model 9390-6000
LOW-PASS FILTER	fc 125 MHz	TLC 125
MEASURING RECEIVER	Frequency range: 300 MHz Accuracy: ±300 Hz dBm range: -9.7 to -10.3 Accuracy: ±0.075 dBm	Consisting of: Measuring Receiver Hewlett-Packard, Model 8902A (8902A), Microwave Converter Hewlett-Packard, Sensor Module Hewlett-Packard, Model 11722A (11722A)
OSCILLOSCOPE CALIBRATOR	Markers: 20 ns to 20 ms Accuracy: ±1.25%	(MIS38938) John Fluke, Model 5820A (5820A-5C-GHz)
POWER SPLITTER	Range: 20 MHz to 18 GHz	Weinschel, Model 1870A
PULSE GENERATOR	Pulse: 10 ns Accuracy: : ±1.25%	LeCroy, Model 9210
SIGNAL GENERATOR #1	Frequency range: 90 MHz to 1.8 GHz Power range: 0 to -30 dBm Accuracy: ±2 dBm	(SG-1207/U)
SIGNAL GENERATOR #2	Frequency range: 200.5 MHz Power range: 0 to -10 dBm Accuracy: ±2 dBm	(SG-1207/U)
SPECTRUM ANALYZER	Frequency: 0 to 2 GHz Input level: ±10 dBm Display range: 60 dB	(AN/USM-489A)
SYNTHESIZER/LEVEL GENERATOR	Frequency range: 10 kHz to 50 MHz Amplitude range: -80 to +10 dBm Accuracy: ±0.02 dB per 10 dB step	Hewlett-Packard, Model 3335AOPT001-KO6 (MIS-35938)

SECTION III
CALIBRATION PROCESS

6. Preliminary Instructions

a. The instructions outlined in paragraphs **6** and **7** are preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name as listed in table 2.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturer's manuals for this TI.

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

CAUTION
Before connecting TI to power source, make sure TI is set to the power source line voltage as shown on rear of TI.

a. Connect TI spectrum analyzer and TI tracking generator to 115 V ac power source.

b. Depress TI spectrum analyzer **POWER** key to **ON** and set TI tracking generator switch to **ON**. Allow at least 30 minutes for TI to reach operating temperature.

8. Calibrator Frequency

a. Performance Check

(1) Connect GPS time/frequency generator **10 MHz OUTPUT** to electronic counter **REFERENCE IN**.

(2) Connect TI **CAL OUT** to electronic counter input **C**.

(3) If electronic counter indication is not between 99,999,980 Hz and 100,000,020 Hz, perform **b** below.

(4) Disconnect equipment setup.

   b. **Adjustments.**

   (1) Disconnect equipment setup.

   (2) Press and release TI spectrum analyzer **POWER** key to **OFF**.

   (3) Disconnect TI power cord.

   (4) Set TI spectrum analyzer on its front panel.

   (5) Loosen four screws through the back rubber feet.

   (6) Pull cover up and off.

   (7) Place TI on its top and reconnect power cord.

   (8) Connect TI **CAL OUT** to electronic counter input **C**.

   (9) Depress TI spectrum analyzer **POWER** key to **ON**.

   (10) Remove the access screw from A1A37 (fig. 1) and adjust oscillator for a 100,000,000 Hz indication on electronic counter.
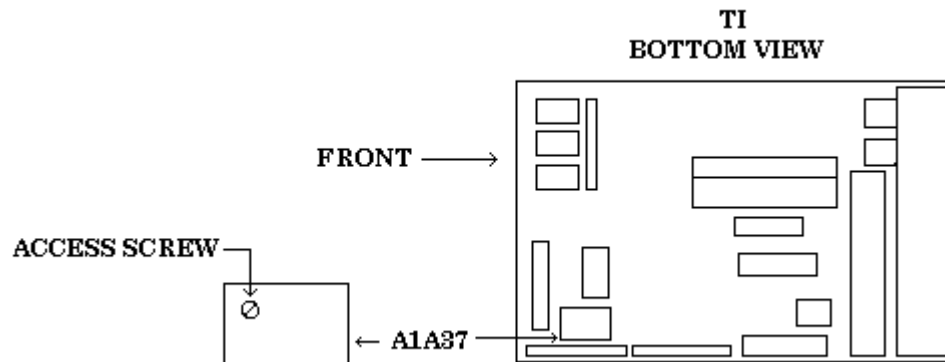
Figure 1. Cal out frequency adjustment.

   (11) Disconnect TI **CAL OUT** from electronic counter **INPUT 2**.

   (12) Press and release TI spectrum analyzer **POWER** key to **OFF**.

   (13) Disconnect power cord.

   (14) Reinstall access screw on A1A37 module.

   (15) Set TI spectrum analyzer on its front panel.

   (16) Replace TI outer cover.

   (17) Tighten four screws through back rubber feet.

   (18) Place TI in its normal orientation and reconnect power cord.

   (19) Depress TI spectrum analyzer **POWER** key to **ON**.

9. Calibrator Amplitude

 a. Performance Check

(1) Connect HP 11722A sensor module to measuring receiver **CALIBRATION RF POWER OUTPUT**.

(2) Zero and cal the sensor module.

(3) Disconnect sensor module from measuring receiver **CALIBRATION RF POWER OUTPUT** connector.

(4) Connect measuring receiver sensor module to TI **CAL OUTPUT**.

(5) Set up measuring receiver to measure power at 100 MHz. If displayed power measurement is not between −20.3 dBm and −19.7 dBm, perform **b** below.

(6) Disconnect equipment setup.

 b. Adjustments.

(1) Disconnect equipment setup.

(2) Press and release TI spectrum analyzer **POWER** key to **OFF**.

(3) Disconnect TI power cord.

(4) Set TI spectrum analyzer on its front panel.

(5) Loosen four screws through the back rubber feet.

(6) Pull cover up and off.

(7) Place TI on its top and reconnect power cord.

(8) Connect measurement receiver power sensor to TI **CAL OUT**.

(9) Depress TI spectrum analyzer **POWER** key to **ON**.

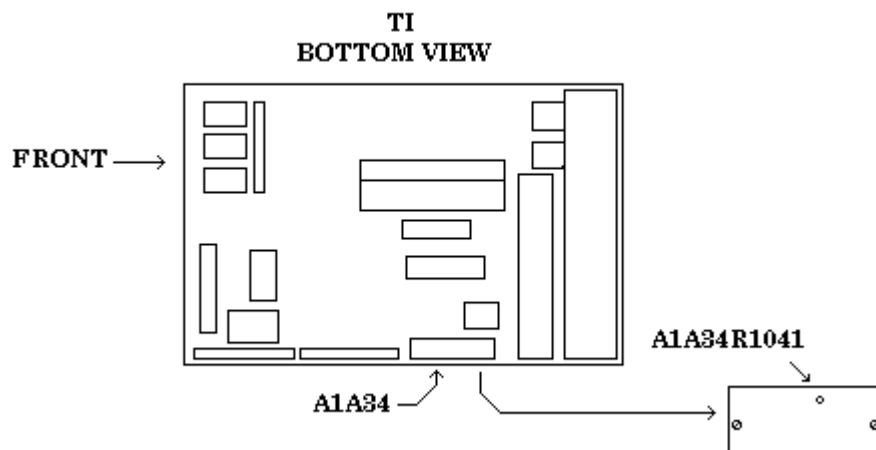(10) Adjust A1A34R1041 (fig. 2) for a −20.0 ±0.3 dBm indication on measuring receiver (R).

Figure 2. Cal out level adjustment.

(11) Disconnect measurement receiver power sensor from TI **CAL OUT**.

(12) Press and release TI spectrum analyzer **POWER** key to **OFF**.

(13) Disconnect power cord.

(14) Set TI spectrum analyzer on its front panel.

(15) Replace TI outer cover.

(16) Tighten four screws through back rubber feet.

(17) Place TI in its normal orientation and reconnect power cord.

(18) Depress TI spectrum analyzer **POWER** key to **ON**.

10. Self Calibration

a. Performance Check

(1) Press TI **BLUE SHIFT** then **RESET** keys.

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

    (a) **MIN RF ATTEN dB** to **0 NORM**.
    (b) **PEAK AVERAGE** fully counterclockwise.
    (c) **TIME/DIV** to **AUTO**.
    (d) **REFERENCE LEVEL** to **–20 dBm**.

(3) Connect TI **CAL OUT** to TI **RF INPUT 50 Ω**.

(4) Press TI keys as listed in (a) through (e) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **1**, **0**, **0**, **MHz +dBX**.
    (c) **BLUE SHIFT**, **SPAN/DIV**, **1**, **0**, **0**, **MHz +dBX**.
    (d) **BLUE SHIFT**.
    (e) **CAL**.

(5) Perform instructions as displayed on TI spectrum analyzer CRT.

(6) Upon completion of TI self calibration, disconnect TI **CAL OUT** from TI **RF INPUT 50 Ω**.

b. Adjustments. None

11. Marker Frequency and Counter Accuracy

a. Performance Check

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

(2) Connect GPS time/frequency generator **10 MHz OUTPUT** to signal generator #1 **EXT REF INPUT** (rear panel).

(3) Press TI **BLUE SHIFT** then **RESET** keys.

(4) Press signal generator #1 **INSTRUMENT PRESET** key.

(5) Set signal generator #1 for an output frequency of 500 MHz at an amplitude of 0 dBm.

(6) Press TI keys as listed in (a) through (f) below:

    (a) **MARKER MENU**, **5**.
    (b) **8**, **0**, **kHz –dBX**.
    (c) **BLUE SHIFT**.
    (d) **FREQ**, **5**, **0**, **0**, **MHz +dBX**.
    (e) **BLUE SHIFT**.
    (f) **SPAN/DIV**, **5**, **0**, **Hz dB**.

(7) Press TI **SINGLE SWEEP** key twice.

(8) When sweep is completed, press TI **GREEN SHIFT** then **PEAK FIND** keys.

(9) Marker frequency displayed on TI CRT will be within limits specified in first row of table 3.

(10) Repeat technique of (5), (6) (c), (6) (d) then (7) and (8) above for remaining signal generator #1 and TI settings in table 3. Marker frequency displayed on TI CRT will be within limits specified in table 3.

Table 3. Marker Frequency Accuracy

Signal generator #1		Test Instrument			
Frequency	Amplitude (dBm)	Frequency	Span/Div	Marker Freq. Display (MHz)	
				Min	Max
500 MHz	0	500 MHz	50 Hz	499.999865	500.000135
1.00GHz	0	1.00GHz	50 Hz	999.999756	1000.000235
1.50GHz	0	1.50GHz	50 Hz	1499.999665	1500.000335

(11) Press TI keys as listed in (a) through (g) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **5**, **0**, **0**, **MHz +dBX**.
    (c) **BLUE SHIFT**.
    (d) **SPAN/DIV**, **1**, **MHz +dBX**.
    (e) **COUNT** (illuminated).
    (f) **BLUE SHIFT**.
    (g) **COUNT RESOLN**, **1**, **Hz dB**.

(12) Set signal generator #1 for an output frequency of 500 MHz at an amplitude of 0 dBm.

(13) Press TI **SINGLE SWEEP** key twice.

(14) Marker frequency displayed on TI CRT will be within limits specified in first row of table 4.

(15) Repeat technique of (11) (a), (11) (b) then (12) and (13) above for remaining signal generator #1 and TI settings in table 4. Marker frequency displayed on TI CRT will be within limits specified in table 4.

Table 4. Counter Accuracy

Signal generator #1		Test instrument		
Frequency	Amplitude (dBm)	Frequency	Counter Display (MHz)	
			Min	Max
500 MHz	0	500 MHz	499.999888	500.000112
1.0 GHz	0	1.0GHz	999.999788	1000.000212
1.5 GHz	0	1.5GHz	1499.999688	1500.000312

(16) Press TI keys as listed in (a) through (f) below:

    (a) **BLUE SHIFT**.
    (b) **SPAN/DIV**, **1**, **kHz –dBX**.
    (c) **COUNT** (twice).
    (d) **SINGLE SWEEP** (twice and wait for sweep completion).
    (e) **GREEN SHIFT**.
    (f) **PEAK FIND**.

(17) Marker frequency displayed on TI CRT will be between 1499.999000 and 1500.001000.

(18) Press signal generator #1 **INSTR PRESET** key.

(19) Disconnect equipment setup.

b. Adjustments. None

12. Center Frequency Stability

a. Performance Check

(1) Press TI keys as listed in (a) through (i) below:

    (a) **BLUE SHIFT**, **RESET**.
    (b) **BLUE SHIFT**.
    (c) **FREQ**, **1**, **0**, **0**, **MHz +dBX**.
    (d) **BLUE SHIFT**.
    (e) **SPAN/DIV**, **5**, **0**, **Hz dB**.
    (f) **VERTICAL DISPLAY 2dB/DIV**.
    (g) **BLUE SHIFT**.
    (h) **REF LEVEL**, **2**, **0**, **kHz –dBX**.
    (i) **AUTO RESOLN** (not illuminated).

(2) Set TI controls as listed in (a) and (b) below:

    (a) **TIME/DIV** to **AUTO**.
    (b) **RESOLUTION BANDWIDTH** to **100 Hz**.

(3) Connect TI **CAL OUT** to TI **RF INPUT 50Ω**.

(4) Press TI keys as listed in (a) through (g) below:

    (a) **BLUE SHIFT**.
    (b) **PULSE STRETCHER**, **6**.
    (c) **GREEN SHIFT**.
    (d) **PEAK FIND**.
    (e) **GREEN SHIFT**.
    (f) **Δ MKR**.
    (g) **SAVE A**.

(5) Wait 60 seconds, and then press TI keys as listed in (a) through (c) below:

    (a) **SINGLE SWEEP** (twice and wait for sweep completion).
    (b) **GREEN SHIFT**.
    (c) **PEAK FIND**.

(6) TI **MARKER FREQUENCY** displayed on top of CRT will be ≤ 50 Hz.

(7) Press TI **BLUE SHIFT** then **RESET** keys.

(8) Disconnect equipment setup.

  b. Adjustments. None

13. Span/Div Accuracy

a. Performance Check

(1) Connect pulse generator **OUTPUT** to TI **RF INPUT 50Ω.**

(2) Press TI keys as listed in (a) through (e) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **1**, **GHz**.
    (c) **BLUE SHIFT**.
    (d) **SPAN/DIV**, **1**, **0**, **0**, **MHz +dBX**.
    (e) **BLUE SHIFT**, **REF LEVEL**, **2**, **0**, **kHz –dBX**.

(3) Set pulse generator for an output pulse of 10 ns at an amplitude of 2.00 V.

(4) Use TI **CENTER/MARKER FREQUENCY** knob to align 600 MHz marker (2nd marker from left) to second vertical graticule line.

(5) Check alignment of markers to graticule lines over TI center eight divisions. If alignment error exceeds ±2 minor divisions, perform **b** below.

(6) Disconnect TI **RF INPUT 50Ω** from pulse generator **OUTPUT**.

(7) Connect TI **RF INPUT 50Ω** to oscilloscope calibrator **SOURCE/MEASURE CHAN 1**.

(8) Press TI keys as listed in (a) through (f) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **3**, **0**, **0**, **MHz +dBX**.
    (c) **BLUE SHIFT**.

(d) **SPAN/DIV**, **5**, **0**, **MHz +dBX**.

(e) **BLUE SHIFT**.

(f) **REF LEVEL**, **0**, **kHz –dBX**.

(9) Set oscilloscope calibrator for a 20 ns **MARKER** output.

(10) Use TI **CENTER/MARKER FREQUENCY** knob to align markers on graticule lines.

(11) Check alignment of markers to graticule lines over TI center eight divisions. If alignment error is not within limits specified in first row of table 5, perform **b** below.

(12) Repeat technique of (8) (a) through (d) and (9) through (11) above for remaining TI settings and oscilloscope calibrator outputs in table 5 below. If TI alignment is not within limits specified in table 5, perform **b** below.

NOTE

Throughout this check use of TI **REFERENCE LEVEL** knob, to adjust TI reference level, will be required to keep trace on screen.

Table 5. Span/Div Accuracy

Oscilloscope calibrator	Test instrument		
Marker output	Frequency	Span/Div	Marker alignment error (minor divisions)
20ns	300 MHz	50MHz	±2
50ns	100 MHz	20MHz	±2
100 ns	0 Hz	10MHz	±2
200 ns	0 Hz	5MHz	±2
500 ns	0 Hz	2MHz	±2
1µs	0 Hz	1MHz	±2
2µs	0 Hz	500kHz	±2
5µs	0 Hz	200kHz	±2
10µs	0 Hz	100kHz	±2
20µs	0 Hz	50kHz	±2
50µs	0 Hz	20kHz	±2
100 µs	0 Hz	10kHz	±2
200 µs	0 Hz	5kHz	±2
500 µs	0 Hz	2kHz	±2
1ms	0 Hz	1kHz	±2
2ms	0 Hz	500Hz	±2
5ms	0 Hz	200Hz	±2
10ms	0 Hz	100Hz	±2
20ms	0 Hz	50Hz	±2

(13) Reduce outputs to minimum and disconnect equipment setup.

b. Adjustments

(1) Press and release TI spectrum analyzer **POWER** key to **OFF**.

(2) Disconnect all connections made to TI spectrum analyzer.

(3) Set TI spectrum analyzer on front panel.

(4) Loosen four screws through back rubber feet.

(5) Pull cover up and off.

(6) Place TI on bottom and reconnect power cord.

(7) Depress TI spectrum analyzer **POWER** key to **ON**.

(8) Connect pulse generator **OUTPUT** to TI **RF INPUT 50Ω**.

(9) Press TI keys as listed in (a) through (h) below:
   (a) **BLUE SHIFT**.
   (b) **RESET**.
   (c) **BLUE SHIFT**.
   (d) **FREQ**, **6**, **0**, **0**, **MHz +dBX**.
   (e) **BLUE SHIFT**.
   (f) **SPAN/DIV**, **1**, **0**, **0**, **MHz +dBX**.
   (g) **BLUE SHIFT**.
   (h) **REF LEVEL**, **0**, **kHz –dBX**.

(10) Set pulse generator for a 10 ns output at an amplitude of 2.00 V.

(11) Use TI **CENTER/MARKER FREQUENCY** knob to align 2nd marker from left to TI second vertical graticule line.

(12) Adjust A1A48A1R1065 (fig. 3) for one marker per division over center eight divisions of CRT (R).

Figure 3. Span/div adjustment.

(13) Reduce pulse generator output to minimum and disconnect from TI **RF INPUT 50Ω**.

(14) Connect oscilloscope calibrator **SOURCE/MEASURE CHAN 1** to TI **RF INPUT 50Ω**.

(15) Press TI keys as listed in (a) through (d) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **5**, **0**, **MHz +dBX**.
    (c) **BLUE SHIFT**.
    (d) **SPAN/DIV**, **5**, **MHz +dBX**.

(16) Set oscilloscope calibrator for a 200 ns **MARKER** output.

(17) Use TI **CENTER/MARKER FREQUENCY** knob to align 2nd marker from left to TI second vertical graticule line.

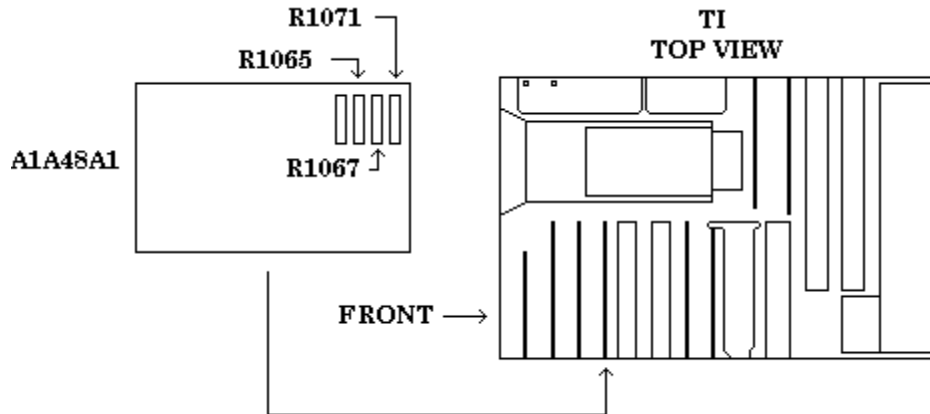(18) Adjust A1A48A1R1071 (fig. 3) for one marker per division over center eight divisions of CRT (R).

(19) Press TI keys as listed in (a) through (d) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **2**, **0**, **0**, **kHz –dBX**.
    (c) **BLUE SHIFT**.
    (d) **SPAN/DIV**, **2**, **0**, **kHz –dBX**.

(20) Use TI **CENTER/MARKER FREQUENCY** knob to align 2nd marker from left to TI second vertical graticule line.

(21) Adjust A1A48A1R1067 (fig. 3) for one marker per division over center eight divisions of CRT (R).

(22) Set oscilloscope calibrator to standby.

(23) Press TI **BLUE SHIFT** then **RESET** keys.

(24) Disconnect oscilloscope calibrator **SOURCE/MEASURE CHAN 1** from TI **RF INPUT 50Ω**.

(25) Adjust A1A72R1052 (fig. 4) dot marker over 0 Hz response as shown in example waveform in fig 4 (R).
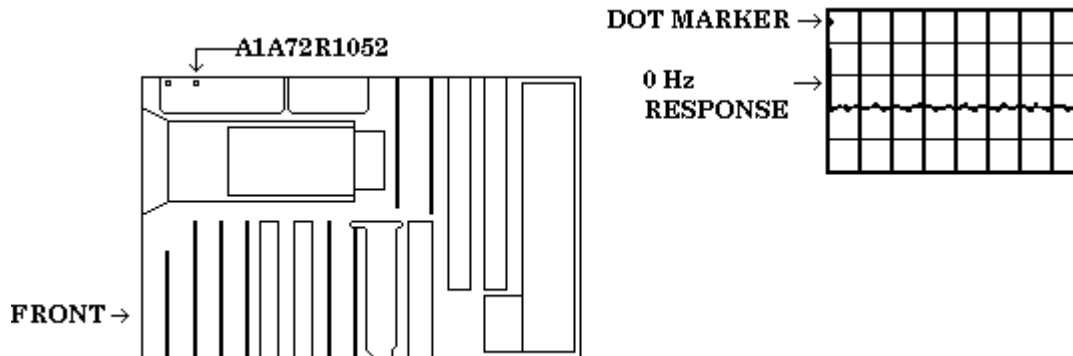

Figure 4. 0 Hz adjustment.

(26) Press and release TI spectrum analyzer **POWER** key to **OFF**.

(27) Disconnect TI power cord.

(28) Set TI spectrum analyzer on front panel.

(29) Slide outer cover onto TI.

(30) Tighten four screws through back rubber feet.

(31) Place TI in its normal orientation and reconnect power cord.

(32) Depress TI spectrum analyzer **POWER** key to **ON**.

14. Sweep Time Accuracy

a. Performance Check

(1) Press TI **BLUE SHIFT** then **RESET** keys.

(2) Connect equipment as shown in figure 5 below.
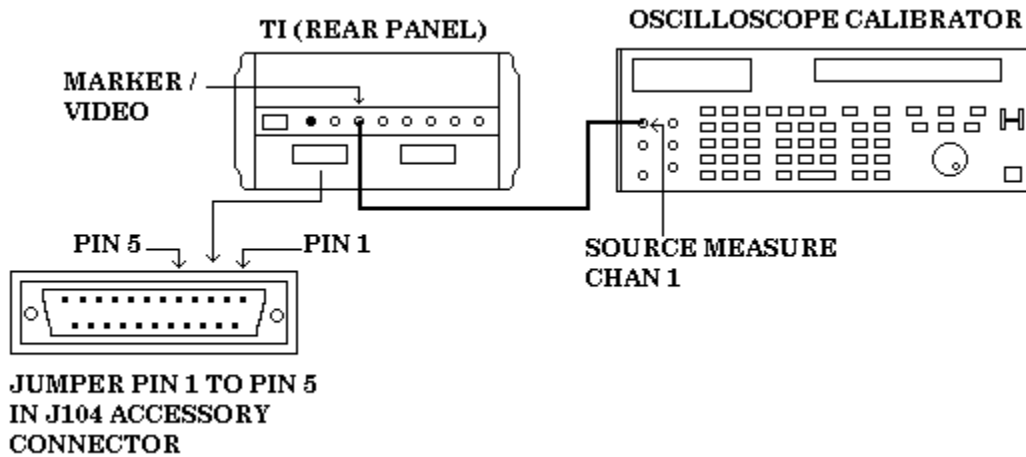
Figure 5. Sweep time setup.

(3) Press TI keys as listed in (a) through (d) below:

    (a) **ZERO SPAN** (illuminated).
    (b) **TRIGGERING INT** (illuminated).
    (c) **VIEW A** (not illuminated).
    (d) **VIEW B** (not illuminated).

(4) Rotate TI **TIME/DIV** knob to **20 µs**.

(5) Set oscilloscope calibrator for a 20 µs **MARKER** output.

NOTE
Adjust TI intensity as necessary to view markers.

(6) Use TI ◄►**POSITION** control to align marker on first graticule line.

(7) Check alignment of markers to graticule lines over TI center eight divisions. If alignment error is not within limits specified in first row of table 6, perform **b** below.

(8) Repeat technique of (4) through (7) above for remaining oscilloscope calibrator outputs and TI settings in table 6. If alignment error is not within limits specified in table 6, perform **b** below.

Table 6. Sweep Time Accuracy

Oscilloscope calibrator	Test instrument	
Marker output	Time/Div	Marker alignment error (minor divisions)
20 μs	20 μs	±2
50 μs	50 μs	±2
100 μs	.1 ms	±2
200 μs	.2 ms	±2
500 μs	.5 ms	±2
1 ms	1 ms	±2
2 ms	2 ms	±2
5 ms	5 ms	±2
10 ms	10 ms[1]	±2
20 ms	20 ms[1]	±2
50 ms	50 ms[1]	±2
100 ms	.1 s[1]	±2
200 ms	.2 s[1]	±2
500 ms	.5 s[1]	±2
1 s	1 s[1]	±2
2 s	2 s[1]	±2
5 s	5 s[1]	±2

[1]. Digital storage may be turned on (press **VIEW A** key) for sweep
    times slower than 5 ms per division.

(9) Press TI keys as listed in (a) through (d) below:

   (a) **BLUE SHIFT**.
   (b) **RESET**.
   (c) **AUTO RESOLN** (not illuminated).
   (d) **VIDEO FILTER NARROW** (illuminated).

(10) Set TI controls as listed in (a) through (c) below:

   (a) **RESOLUTION BANDWIDTH** to **10 Hz**.
   (b) **PEAK AVERAGE** fully counter clockwise.
   (c) **TIME/DIV** to **AUTO**.

(11) Set oscilloscope calibrator for a 5s **MARKER** output.

(12) Use TI ◄►**POSITION** control to align marker on first graticule line. (There will be two markers per division).

(13) Check alignment of markers to graticule lines over TI center eight divisions. If alignment error is not within ±2 minor divisions, perform **b** below.

(14) Press TI keys as listed in (a) and (b) below:

  (a) **BLUE SHIFT**.
  (b) **SPAN/DIV**, **1**, **0**, **0**, **MHz +dBX**.

(15) Use TI ◄►**POSITION** control to realign dot to center graticule of CRT.

(16) Reduce all outputs to minimum and disconnect equipment setup.

b. Adjustments

(1) Press and release TI spectrum analyzer **POWER** key to **OFF**.

(2) Disconnect all connections made to TI spectrum analyzer.

(3) Set TI spectrum analyzer on front panel.

(4) Loosen four screws through back rubber feet.

(5) Pull cover up and off.

(6) Place TI on bottom and reconnect power cord.

(7) Depress TI spectrum analyzer **POWER** key to **ON**.

(8) Connect equipment as shown in figure 6 below.
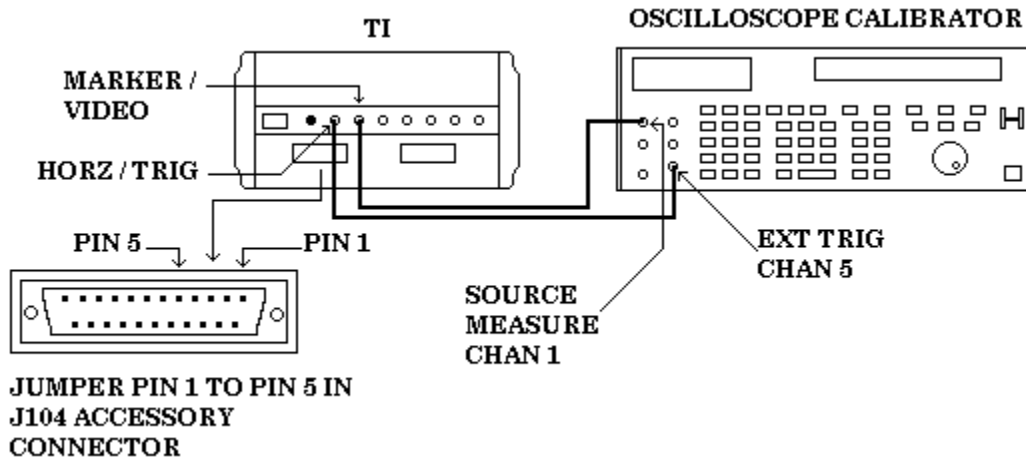

Figure 6. Sweep time adjustment setup.

(9) Press TI keys as listed in (a) through (g) below:

  (a) **BLUE SHIFT**.
  (b) **RESET**.
  (c) **BLUE SHIFT**.
  (d) **SPAN/DIV**, **1**, **0**, **MHz +dBX**.
  (e) **BLUE SHIFT**.
  (f) **REF LEVEL**, **2**, **0**, **kHz –dBX**.
  (g) **TRIGGERING EXT**.

(10) Set **TIME/DIV** control to **10 ms**.

(11) Set oscilloscope calibrator for a 10 ms **MARKER** output.

(12) Adjust A1A72R1062 (fig. 7) for one marker per division (R).
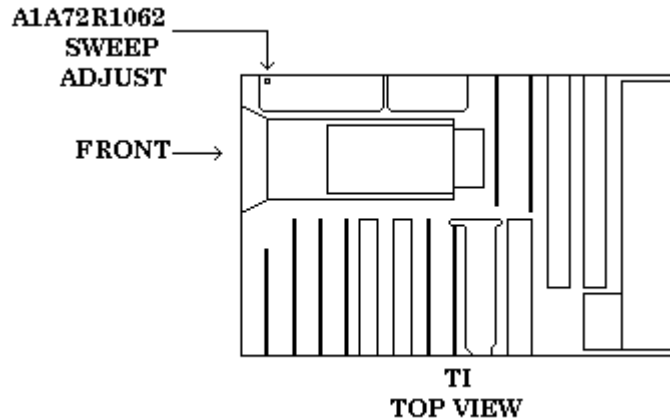
Figure 7. Sweep adjustment.

(13) Reduce all outputs to minimum and disconnect equipment setup.

(14) Press and release TI spectrum analyzer **POWER** key to **OFF**.

(15) Disconnect TI power cord.

(16) Set TI spectrum analyzer on front panel.

(17) Slide outer cover onto TI.

(18) Tighten four screws through back rubber feet.

(19) Place TI in its normal orientation and reconnect power cord.

(20) Depress TI spectrum analyzer **POWER** key to **ON**.

15. Resolution BW and Shape Factor

a. Performance Check

(1) Connect TI **CAL OUT** to TI **RF INPUT 50Ω**.

(2) Press TI keys as listed in (a) through (j) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.
    (c) **BLUE SHIFT**.
    (d) **FREQ**, **1**, **0**, **0**, **MHz +dBX**.
    (e) **BLUE SHIFT**.
    (f) **REF LEVEL**, **2**, **0**, **kHz –dBX**.
    (g) **BLUE SHIFT**.

(h) **SPAN DIV**, **1**, **MHz +dBX**.
(i) **VERTICAL DISPLAY 2dB/DIV**.
(j) **AUTO RESOLN** (not illuminated).

(3) Set TI controls as listed in (a) through (c) below:

(a) **RESOLUTION BANDWIDTH** to **3 MHz**.
(b) **TIME/DIV** to **AUTO**.
(c) **PEAK AVERAGE** to fully clockwise.

(4) Press TI keys as listed in (a) through (h) below:

(a) **GREEN SHIFT**.
(b) **BANDWIDTH**.
(c) **MARKER MENU**.
(d) **7**.
(e) **6**, **Hz dB**.
(f) **SINGLE SWEEP** (twice).
(g) **GREEN SHIFT**.
(h) **PEAK FIND**.

(5) Marker frequency displayed on TI CRT will be within limits specified in first row of table 7. Record displayed marker frequency indication in actual indication column of table 7 for future reference.

(6) Press TI **FREE RUN** key.

(7) Repeat technique of (2) (g), (2) (h), (3) (a) and (4) (g) through (6) above for remaining TI settings in table 7. TI will be within limits specified.

Table 7. 6dB Bandwidth

Test Instrument				
Span/Div	Resolution bandwidth	Actual indication	Min	Max
1 MHz	3 MHz		2.40 MHz	3.60 MHz
200 kHz	1 MHz		800 kHz	1.20 MHz
20 kHz	100 kHz		80.00 kHz	120.0 kHz
2 kHz	10 kHz		8.00 kHz	12.00 kHz
200 Hz	1 kHz		800 Hz	1.200 kHz
20 Hz	100 Hz		80 Hz	120 Hz

(8) Press TI keys as listed in (a) through (i) below:

(a) **FREE RUN**.
(b) **VERTICAL DISPLAY 10dB/DIV**.
(c) **MARKER MENU**.
(d) **7**.
(e) **6**, **0**, **Hz dB**.
(f) **VIDEO FILTER WIDE** (illuminated).

(g) **AUTO RESOLN** (not illuminated).

(h) **BLUE SHIFT**.

(i) **SPAN DIV**, **2**, **MHz +dBX**.

(9) Rotate TI **RESOLUTION BANDWIDTH** control to **3 MHz**.

(10) Press TI keys as listed in (a) through (c) below:

(a) **SINGLE SWEEP** (twice and wait for sweep completion).

(b) **GREEN SHIFT**.

(c) **PEAK FIND**.

(11) Record displayed marker frequency indication in first row actual indication column of table 8 for future reference.

(12) Press TI **FREE RUN** key.

(13) Repeat technique of (8) (g), (8) (h) and (9) through (12) above for remaining TI settings listed in table 8 below.

Table 8. 60dB Bandwidth

Test nstrument		
Span/Div	Resolution bandwidth	Actual indication
2 MHz	3 MHz	
1 MHz	3 MHz	
200 kHz	1 MHz	
20 kHz	100 kHz	
2 kHz	10 kHz	
200 Hz	1 kHz	
20 Hz	100 Hz	

(14) Calculate shape factor for each filter using actual indication values recorded in tables 7 and 8 above in the formula below. Shape factor calculated ratio must be <7.5:1.

Shape factor ratio = 60 dB bandwidth ÷ 6dB bandwidth

(15) Press TI keys as listed in (a) through (c) below:

(a) **FREE RUN**.

(b) **BLUE SHIFT**.

(c) **SPAN/DIV**, **5**, **0**, **Hz dB**.

(16) Rotate TI **RESOLUTION BANDWIDTH** control to **10 Hz**.

(17) Marker frequency displayed on TI CRT will be ≤ 150 Hz.

(18) Press TI keys as listed in (a) through (e) below:

(a) **MARKER MENU**.

(b) **7**.

(c) **0**, **Hz dB**.

(d) **BLUE SHIFT**.

(e) **RESET**.

(19) Disconnect equipment setup.

b. Adjustments. None

16. Noise Sideband Amplitude

a. Performance Check

(1) Connect TI **CAL OUT** to TI **RF INPUT 50Ω**.

(2) Press TI keys as listed in (a) through (j) below:

   .   (a) **BLUE SHIFT**.
      (b) **RESET**.
      (c) **AUTO RESOLN** (not illuminated).
      (d) **BLUE SHIFT**.
      (e) **FREQ**, **1**, **0**, **0**, **MHz +dBX**.
      (f) **BLUE SHIFT**.
      (g) **SPAN/DIV**, **1**, **0**, **0**, **Hz dB**.
      (h) **BLUE SHIFT**.
      (i) **REF LEVEL**, 4, **0**, **kHz –dBX**.
      (j) **VIDEO FILTER WIDE** (illuminated).

(3) Ensure TI **TIME/DIV** is set to **AUTO** position and **PEAK AVERAGE** control is fully clockwise.

(4) Rotate TI **RESOLUTION BANDWIDTH** control to **10 Hz.**

(5) Press TI **SINGLE SWEEP** key twice.

(5) When sweep is completed (ready light off), press TI **BLUE SHIFT** then **MKR⇒CENTER** keys.

(6) Rotate TI **CENTER/MARKER FREQUENCY** control until TI **MARKER FREQUENCY** displayed on CRT is 100.00030 MHz.

(7) While observing TI **MKR LEVEL** displayed on CRT, slowly continue to rotate **CENTER/MARKER FREQUENCY** control up to a **MARKER FREQUENCY** indication of 100.00050 MHz. Displayed **MKR LEVEL** indication will be within limits specified in first row of table 9.

(8) Rotate TI **CENTER/MARKER FREQUENCY** control until TI **MARKER FREQUENCY** displayed on CRT is 99.99970 MHz.

(9) While observing TI **MKR LEVEL** displayed on CRT, slowly continue to rotate **CENTER/MARKER FREQUENCY** control up to a **MARKER FREQUENCY** indication of 99.99950 MHz. Displayed **MKR LEVEL** indication will be within limits specified in first row of table 9.

(10) Press TI keys as listed in (a) through (c) below:

      (a) **FREE RUN**.
      (b) **BLUE SHIFT**.
      (c) **MKR OFF**.

(11) Repeat technique of (2) (f), (2) (g) and (4) through (10) above for remaining TI settings and frequencies listed in table 9. Displayed **MKR LEVEL** will be within limits specified in first row of table 9.

Table 9. Noise Sideband Amplitude

Test instrument				
Span/Div	Resolution bandwidth	Upper frequencies (MHz)	Lower frequencies (MHz)	Mkr level limit (dBm)
100 Hz	10 Hz	100.00030 – 100.00050	99.99970 – 99.99950	≤–90
1 kHz	100 Hz	100.0030 – 100.0050	99.9970 – 99.9950	≤–90
10 kHz	1 kHz	100.030 – 100.050	99.970 – 99.950	≤–95
100 kHz	10 kHz	100.30 – 100.50	99.70 – 99.50	≤–95
1 MHz	100 kHz	103.0 – 105.0	97.0 – 95.0	≤–95

(12) Disconnect equipment setup.

b. Adjustments. None

17. Frequency Response

a. Performance Check

(1) Press TI keys as listed in (a) through (j) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.
    (c) **BLUE SHIFT**.
    (d) **FREQ**, **1**, **0**, **0**, **kHz –dBX**.
    (e) **BLUE SHIFT**.
    (f) **SPAN/DIV**, **2**, **kHz –dBX**.
    (g) **BLUE SHIFT**.
    (h) **REF LEVEL**, **8**, **kHz –dBX**.
    (i) **BLUE SHIFT**.
    (j) **dB/DIV**, **1**, **Hz dB**.

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

(3) Set synthesizer/level generator for an output frequency of 100 kHz at an amplitude of –10 dBm.

(4) Press TI keys as listed in (a) through (e) below:

    (a) **SINGLE SWEEP** (twice).
    (b) **GREEN SHIFT**.
    (c) **PEAK FIND**.
    (d) **GREEN SHIFT**.
    (e) **ΔMKR**.

(5) Change synthesizer/level generator output frequency to 200 kHz.

(6) Press TI keys as listed in (a) through (e) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **2**, **0**, **0**, **kHz –dBX**.
    (c) **SINGLE SWEEP**.
    (d) **GREEN SHIFT**.
    (e) **PEAK FIND**.

(7) TI **MKR LEVEL** indication will be within limits specified in first row of table 10.

(8) Repeat technique of (5) and (6) above for remaining synthesizer/level generator frequencies and test instrument settings in table 10. TI **MKR LEVEL** indications will be within limits specified in table 10.

Table 10. Frequency Response 200 kHz to 80 MHz

Synthesizer/level generator	Test instrument		
Output frequency	Frequency	Mkr level indication (dB)	
		Min	Max
200 kHz	200 kHz	−1.0	1.0
300 kHz	300 kHz	−1.0	1.0
400 kHz	400 kHz	−1.0	1.0
500 kHz	500 kHz	−1.0	1.0
600 kHz	600 kHz	−1.0	1.0
700 kHz	700 kHz	−1.0	1.0
800 kHz	800 kHz	−1.0	1.0
900 kHz	900 kHz	−1.0	1.0
1 MHz	1 MHz	−1.0	1.0
10 MHz	10 MHz	−1.0	1.0
20 MHz	20 MHz	−1.0	1.0
30 MHz	30 MHz	−1.0	1.0
40 MHz	40 MHz	−1.0	1.0
50 MHz	50 MHz	−1.0	1.0
60 MHz	60 MHz	−1.0	1.0
70 MHz	70 MHz	−1.0	1.0
80 MHz	80 MHz	−1.0	1.0

(9) Reduce synthesizer/level generator output to minimum and disconnect synthesizer/level generator **OUTPUT 50Ω** from TI **RF INPUT 50Ω**.

(10) Connect 11722A sensor module to measuring receiver **RF POWER OUTPUT**.

(11) Zero and calibrate sensor module.

(12) Connect equipment as shown in figure 8 below.
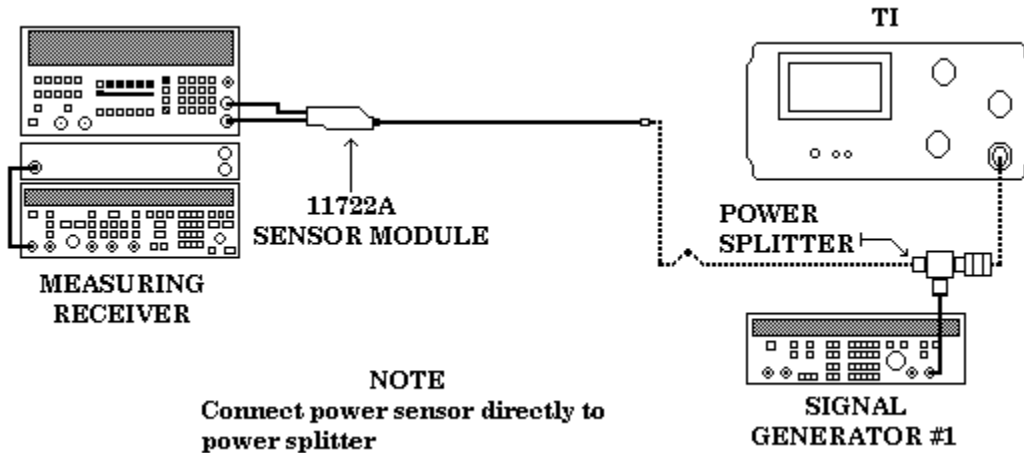
Figure 8. Frequency response setup

(13) Set signal generator #1 for an output frequency of 90 MHz at an amplitude of –5 dBm.

(14) Set measuring receiver to measure **RF POWER** in dBm at 90 MHz.

(15) Adjust signal generator #1 output amplitude for a measuring receiver of –10.0 ±0.1 dBm.

(16) Press TI keys as listed in (a) through (e) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **9**, **0**, **MHz +dBX**.
    (c) **SINGLE SWEEP**.
    (d) **GREEN SHIFT**.
    (e) **PEAK FIND**.

(17) TI **MKR LEVEL** indication will be within limits specified in first row of table 11.

(18) Repeat technique of (13) and (16) above for remaining signal generator #1 frequencies and test instrument settings in table 11. TI **MKR LEVEL** indications will be within limits specified in table 11.

Table 11. Frequency Response 90 MHz to 1.8 GHz

Signal generator #1	Test instrument		
Output frequency	Frequency	Mkr level indication (dB)	
		Min	Max
90 MHz	90 MHz	−1.0	1.0
100 MHz	100 MHz	−1.0	1.0
500 MHz	500 MHz	−1.0	1.0
1.0 GHz	1.0 GHz	−1.0	1.0
1.5 GHz	1.5 GHz	−1.0	1.0
1.8 GHz	1.8 GHz	−1.0	1.0

(19) Reduce all outputs to minimum and disconnect equipment setup.

b. Adjustments. None

18. Dynamic Range and Accuracy

a. Performance Check

(1) Press TI keys as listed in (a) through (i) below:

(a) **BLUE SHIFT**.
(b) **RESET**.
(c) **BLUE SHIFT**.
(d) **FREQ**, **8**, **0**, **MHz +dBX**.
(e) **BLUE SHIFT**.
(f) **SPAN/DIV**, **2**, **kHz –dBX**.
(g) **BLUE SHIFT**.
(h) **REF LEVEL**, **1**, **0**, **MHz +dBX**.
(i) **VIDEO FILTER WIDE**.

(2) Rotate TI **PEAK AVERAGE** control fully clockwise.

(3) Connect TI **RF INPUT 50Ω** to synthesizer/level generator **OUTPUT 50Ω**.

(4) Set synthesizer/level generator for an output frequency of 80 MHz at an amplitude of +10 dBm.

(5) Adjust synthesizer/level generator output amplitude to position the displayed signal peak to TI reference level (top) graticule line.

(6) Press TI keys as listed in (a) through (f) below:

(a) **SINGLE SWEEP** (twice).
(b) **GREEN SHIFT**.
(c) **PEAK FIND**.

      (d) **GREEN SHIFT**.

      (e) **Δ MKR**.

      (f) **SAVE A** (illuminated).

  (7) Decrease synthesizer/level generator output amplitude by 10 dBm.

  (8) Press TI **SINGLE SWEEP** key.

  (9) TI **MKR LEVEL** indication and displayed trace will be within limits specified in first row of table 12.

  (10) Press TI keys as listed in (a) through (i) below:

      (a) **SAVE A** (not illuminated).

      (b) **SINGLE SWEEP**.

      (c) **BLUE SHIFT**.

      (d) **MKR OFF**.

      (e) **GREEN SHIFT**.

      (f) **PEAK FIND**.

      (g) **GREEN SHIFT**.

      (h) **Δ MKR**.

      (i) **SAVE A** (illuminated).

  (11) Decrease synthesizer/level generator output amplitude by 10 dBm.

  (12) Press TI **SINGLE SWEEP** key.

  (13) TI **MKR LEVEL** indication and displayed trace will be within limits specified in second row of table 12.

  (13) Repeat technique of (10) through (12) above for remaining synthesizer/level generator output amplitudes in table 12. TI **MKR LEVEL** indications and displayed trace will be within limits specified in table 12.

Table 12. Dynamic Range and Accuracy @ 10 dBm

Synthesizer/evel generator	Test instrument			
Output amplitude below ref. (dBm)	Mkr level indication (dB)		Displayed trace (dB below top graticule line)	
	Min	Max	Min	Max
−10	−11	−9	−11	−9
−20	−11	−9	−22	−18
−30	−11	−9	−32	−28
−40	−11	−9	−42	−38
−50	−11	−9	−52	−48
−60	−11	−9	−62	−58
−70	−11	−9	−72	−68
−80	−11	−9	−82	−78

(14) Press TI keys as listed in (a) through (e) below:

      (a) **FREE RUN**.
      (b) **SAVE A** (not illuminated).
      (c) **BLUE SHIFT**.
      (d) **MKR OFF**.
      (e) **VERTICAL DISPLAY 2dB/DIV**.

(15) Adjust synthesizer/level generator output amplitude to position the displayed signal peak to TI reference level (top) graticule line.

(16) Press TI keys as listed in (a) through (f) below:

      (a) **SINGLE SWEEP** (twice).
      (b) **GREEN SHIFT**.
      (c) **PEAK FIND**.
      (d) **GREEN SHIFT**.
      (e) **Δ MKR**.
      (f) **SAVE A** (illuminated).

(17) Decrease synthesizer/level generator output amplitude by 2 dBm.

(18) Press TI **SINGLE SWEEP** key.

(19) TI **MKR LEVEL** indication and displayed trace will be within limits specified in first row of table 13.

(20) Press TI keys as listed in (a) through (i) below:

      (a) **SAVE A** (not illuminated).
      (b) **SINGLE SWEEP**.
      (c) **BLUE SHIFT**.
      (d) **MKR OFF**.
      (e) **GREEN SHIFT**.
      (f) **PEAK FIND**.
      (g) **GREEN SHIFT**.
      (h) **Δ MKR**.
      (i) **SAVE A** (illuminated).

(21) Decrease synthesizer/level generator output amplitude by 2 dBm.

(22) Press TI **SINGLE SWEEP** key.

(23) TI **MKR LEVEL** indication and displayed trace will be within limits specified in second row of table 13.

(24) Repeat technique of (10) through (12) above for remaining synthesizer/level generator output amplitudes in table 13. TI **MKR LEVEL** indications and displayed trace will be within limits specified in table 13.

Table 13. Dynamic Range and Accuracy @ 2 dBm

Synthesizer/level generator	Test instrument			
Output amplitude below ref. (dBm)	Mkr level indication (dB)		Displayed trace (dB below top graticule line)	
	Min	Max	Min	Max
−2	−2.4	−1.6	−2.4	−1.6
−4	−2.4	−1.6	−4.8	−3.2
−6	−2.4	−1.6	−7.0	−5.0
−8	−2.4	−1.6	−9.0	−7.0
−10	−2.4	−1.6	−11.0	−9.0
−12	−2.4	−1.6	−13.0	−11.0
−14	−2.4	−1.6	−15.0	−13.0
−16	−2.4	−1.6	−17.0	−15.0

(25) Press TI keys as listed in (a) through (e) below:

   (a) **FREE RUN**.
   (b) **SAVE A** (not illuminated).
   (c) **BLUE SHIFT**.
   (d) **MKR OFF**.
   (e) **VERTICAL DISPLAY LIN**.

(26) Adjust synthesizer/level generator output amplitude to position the displayed signal peak to TI reference level (top) graticule line.

(27) Press TI keys as listed in (a) through (f) below:

   (a) **SINGLE SWEEP** (twice).
   (b) **GREEN SHIFT**.
   (c) **PEAK FIND**.
   (d) **GREEN SHIFT**.
   (e) **Δ MKR**.
   (f) **SAVE A** (illuminated).

(28) Decrease synthesizer/level generator output amplitude by 6 dBm.

(29) Press TI **SINGLE SWEEP** key.

(30) TI **MKR LEVEL** indication will be within limits specified in first row of table 14.

(31) Repeat technique of (28) and (29) above for remaining synthesizer/level generator output amplitudes in table 14. TI **MKR LEVEL** indications and displayed trace will be within limits specified in table 14.

Table 14. Dynamic Range and Accuracy (Lin)

Synthesizer/level generator	Test instrument			
Output amplitude below ref. (dBm)	Mkr level indication (mV)		Displayed trace (Div below top graticule line)	
	Min	Max	Min	Max
–6	–392	–321	–4.4	–3.6
–12	–581	–450	–6.4	–5.6
–18	–660	–588	–7.4	–6.6

(32) Reduce all outputs to minimum and disconnect equipment setup.

b. Adjustments. None

19. RF Attenuator Accuracy

a. Performance Check

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

(2) Set synthesizer/level generator for an output frequency of 50 MHz at a level of –60 dBm with 10 dB increment steps.

(3) Press TI keys as listed in (a) through (j) below:

   (a) **BLUE SHIFT**.
   (b) **RESET**.
   (c) **BLUE SHIFT**.
   (d) **FREQ**, **5**, **0**, **MHz +dBX**.
   (e) **BLUE SHIFT**.
   (f) **REF LEVEL**, **6**, **0**, **kHz –dBX**.
   (g) **VERTICAL DISPLAY 2dB/DIV**.
   (h) **BLUE SHIFT**.
   (i) **SPAN/DIV**, **5**, **0**, **0**, **Hz dB**.
   (j) **AUTO RESOLN** (not illuminated).

(4) Rotate TI **RESOLUTION BANDWIDTH** knob to **1 kHz**.

(5) Press TI keys as listed in (a) through (f) below:

   (a) **SINGLE SWEEP** (twice).
   (b) **GREEN SHIFT**.
   (c) **PEAK FIND**.
   (d) **GREEN SHIFT**.
   (e) **ΔMKR**.
   (f) **SAVE A** (illuminated).

(6) Press synthesizer/level generator **INCR ⇑** key.

(7) Rotate TI **MIN RF ATTEN dB** knob to **10**.

(8) Press TI keys as listed in (a) through (e) below:

    (a) **BLUE SHIFT**.
    (b) **REF LEVEL**, **5**, **0**, **kHz –dBX**.
    (c) **SINGLE SWEEP**.
    (d) **GREEN SHIFT**.
    (e) **PEAK FIND**.

(9) TI **MKR LEVEL** indication will be within limits specified in first row of table 15.

(10) Press TI keys as listed in (a) through (c) below:

    (a) **BLUE SHIFT**.
    (b) **MKR OFF**.
    (c) **SAVE A** (not illuminated).

(11) Repeat technique of (5) through (10) above for remaining synthesizer/level generator output amplitudes and TI settings in table 15. TI **MKR LEVEL** indications and displayed trace will be within limits specified in table 15.

Table 15. RF Attenuator Accuracy

Synthesizer/level generator	Test instrument			
Amplitude	Ref level	Min RF Atten	Mkr level indication (dB)	
(dBm)	(dBm)	(dB)	Min	Max
–60	–60	0	9.5	10.5
–50	–50	10	9.5	10.5
–40	–40	20	9.5	10.5
–30	–30	30	9.5	10.5
–20	–20	40	9.5	10.5
–10	–10	50	9.5	10.5
0	0	60	9.5	10.5

(12) Rotate TI **MIN RF ATTEN dB** knob to **0 NORM** position.

(13) Set all outputs to minimum and disconnect equipment.

b. Adjustments. None

20. IF Gain Accuracy

a. Performance Check

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

(2) Set synthesizer/level generator for an output frequency of 80 MHz at a level of –22 dBm.

(3) Press TI keys as listed in (a) through (k) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.

    (c) **BLUE SHIFT**.
    (d) **FREQ**, **8**, **0**, **MHz +dBX**.
    (e) **BLUE SHIFT**.
    (f) **REF LEVEL**, **2**, **0**, **kHz –dBX**.
    (g) **ZERO SPAN** (illuminated).
    (h) **VIDEO FILTER NARROW** (illuminated).
    (i) **BLUE SHIFT**.
    (j) **dB/DIV**, **1**, **Hz dB**.
    (k) **AUTO RESOLN** (not illuminated).

(4) Rotate TI **RESOLUTION BANDWIDTH** knob to **1 kHz**.

(5) Rotate TI **PEAK AVERAGE** knob fully clockwise.

(6) Adjust synthesizer/level generator amplitude to align signal two divisions below top graticule line.

(7) Set synthesizer/level generator for amplitude increments of 1 dB.

(8) Press TI keys as listed in (a) through (h) below:

    (a) **SINGLE SWEEP** (twice).
    (b) **GREEN SHIFT**.
    (c) **PEAK FIND**.
    (d) **GREEN SHIFT**.
    (e) **ΔMKR**.
    (f) **SAVE A** (illuminated).
    (g) **BLUE SHIFT**.
    (h) **REF LEVEL**, **2**, **1**, **kHz –dBX**.

(9) Press synthesizer/level generator **INCR⇓**.

(10) Press TI **SINGLE SWEEP** key.

(11) TI **MKR LEVEL** indication will be within limits specified in first row of table 16 ΔMKR indication column.

(12) Press TI **GREEN SHIFT** key, then **ΔMKR** key.

(13) TI **MKR LEVEL** indication will be within limits specified in first row of table 16 ΔMKR below ref column.

(14) Press TI keys as listed in (a) through (c) below:

    (a) **BLUE SHIFT**.
    (b) **MKR OFF**.
    (c) **SAVE A** (not illuminated).

(15) Repeat technique of (8) through (14) above for remaining TI settings in table 16. TI **MKR LEVEL** indications will be within limits specified in table 16 ΔMKR indication and ΔMKR below ref columns.

Table 16. IF gain accuracy @ 1 dB steps

Test instrument				
Ref level setting (dBm)	ΔMKR indication (dBm)		ΔMKR below ref (dBm)	
	Min	Max	Min	Max
–21	–1.2	–0.8	–23.3	–22.7
–22	–1.2	–0.8	–24.4	–23.6
–23	–1.2	–0.8	–25.5	–24.5
–24	–1.2	–0.8	–26.5	–25.5
–25	–1.2	–0.8	–27.5	–26.5
–26	–1.2	–0.8	–28.5	–27.5
–27	–1.2	–0.8	–29.5	–28.5
–28	–1.2	–0.8	–30.5	–29.5
–29	–1.2	–0.8	–31.5	–30.5
–30	–1.5	–0.5	–33.0	–31.0

(16) Press TI keys as listed in (a) through (f) below:

    (a) **BLUE SHIFT**.
    (b) **MKR OFF**.
    (c) **SAVE A** (not illuminated).
    (d) **BLUE SHIFT**.
    (e) **REF LEVEL**, **2**, **0**, **kHz dBX**.
    (f) **FREE RUN**.

(17) Set synthesizer/level generator output amplitude to –22 dBm and amplitude increments for 10 dBm.

(18) Adjust synthesizer/level generator amplitude to align signal two divisions below top graticule line.

(19) Press TI keys as listed in (a) through (h) below:

    (a) **SINGLE SWEEP** (twice).
    (b) **GREEN SHIFT**.
    (c) **PEAK FIND**.
    (d) **GREEN SHIFT**.
    (e) **ΔMKR**.
    (f) **SAVE A** (illuminated).
    (g) **BLUE SHIFT**.
    (h) **REF LEVEL**, **3**, **0**, **kHz –dBX**.

(20) Press synthesizer/level generator **INCR⇓**.

(21) Press TI **SINGLE SWEEP** key.

(22) TI **MKR LEVEL** indication will be within limits specified in first row of table 17 ΔMKR indication column.

(23) Press TI **GREEN SHIFT** key, then **ΔMKR** key.

(24) TI **MKR LEVEL** indication will be within limits specified in first row of table 17 ΔMKR below ref column.

(25) Press TI keys as listed in (a) through (c) below:

    (a) **BLUE SHIFT**.
    (b) **MKR OFF**.
    (c) **SAVE A** (not illuminated).

(26) Repeat technique of (19) through (26) above for remaining TI settings in table 17. TI **MKR LEVEL** indications will be within limits specified in table 17 ΔMKR indication and ΔMKR below ref columns.

Table 17. IF Gain Accuracy @ 10 dB Steps

| | Test instrument | | | |
| Ref level setting (dBm) | ΔMKR indication (dBm) | | ΔMKR below ref (dBm) | |
	Min	Max	Min	Max
−30	−11.5	−9.5	−33.0	−31.0
−40	−12.0	−8.0	−44.0	−40.0
−50	−12.0	−8.0	−54.0	−50.0
−60	−12.0	−8.0	−64.0	−60.0
−70	−12.0	−8.0	−74.0	−70.0
−80	−12.0	−8.0	−84.0	−80.0

(27) Reduce all outputs to minimum and disconnect equipment setup.

  b. Adjustments. None

21. Gain Variation

  a. Performance Check

(1) Connect TI **CAL OUT** to TI **RF INPUT 50Ω**.

(2) Press TI keys as listed in (a) through (l) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.
    (c) **BLUE SHIFT**.
    (d) **FREQ**, **1**, **0**, **0**, **MHZ +dBX**.
    (e) **BLUE SHIFT**.
    (f) **SPAN/DIV**, **1**, **MHZ +dBX**.
    (g) **BLUE SHIFT**.
    (h) **REF LEVEL**, **1**, **8**, **kHz –dBX**.
    (i) **BLUE SHIFT**.
    (j) **dB/DIV**, **1**, **Hz dB**.
    (k) **VIDEO FILTER WIDE** (illuminated).
    (l) **AUTO RESOLN** (not illuminated).

(3) Rotate TI **RESOLUTION BANDWIDTH** control to **3 MHz**.

(4) Press TI keys as listed in (a) through (h) below:

    (a) **SAVE A** (illuminated).
    (b) **GREEN SHIFT**.
    (c) **PEAK FIND**.
    (d) **GREEN SHIFT**.
    (e) **ΔMKR**.

(5) Rotate TI **RESOLUTION BANDWIDTH** control to **1 MHz**.

(6) Press TI keys as listed in (a) through (d) below:

    (a) **BLUE SHIFT**.
    (b) **SPAN/DIV**, **2**, **0**, **0**, **kHz –dBX**.
    (c) **GREEN SHIFT**.
    (d) **PEAK FIND**.

(7) TI **MKR LEVEL** indication will be within limits specified in first row of table 18.

(8) Repeat technique of (5) and (6) above for remaining TI settings in table 18. TI **MKR LEVEL** indications will be within limits specified in table 18.

Table 18. Gain Variation

Test instrument			
Resolution bandwidth setting	Span/div setting	MKR level indication (dB)	
		Min	Max
1 MHz	200 kHz	−0.4	0.4
100 kHz	20 kHz	−0.4	0.4
10 kHz	2 kHz	−0.4	0.4
1 kHz	200 Hz	−0.4	0.4
100 Hz	20 Hz	−0.4	0.4
10 Hz	10 Hz	−0.4	0.4

(9) Disconnect TI **CAL OUT** from **RF INPUT 50Ω**.

b. Adjustments. None

22. Sensitivity and Residual Response

a. Performance Check

(1) Connect 50Ω 20-watt termination to TI **RF INPUT 50Ω**.

(2) Press TI keys as listed in (a) through (f) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.
    (c) **BLUE SHIFT**.
    (d) **REF LEVEL**, **8**, **0**, **kHz –dBX**.
    (e) **VIDEO FILTER NARROW**.

(f)   **VERTICAL DISPLAY 2dB/DIV**.

(3) Rotate TI **TIME/DIV** knob to **1 s.**

(4) Press TI **AUTO RESOLN** (not illuminated).

(5) Rotate TI **RESOLUTION BANDWIDTH** knob to **3 MHz**.

(6) Rotate TI **PEAK AVERAGE** knob fully clockwise.

(7) Press TI **TUNE** key. Wait for sweep completion.

(8) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

NOTE
Throughout this check use of TI **REFERENCE LEVEL** knob, to adjust TI reference level, will be required to keep trace on screen.

(9) Press TI **ZERO SPAN** key.

(10) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(11) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(12) TI **MKR LEVEL** indication will be within limits specified in first row of table 19.

(13) Press TI **FREE RUN** key.

(14) Rotate TI **RESOLUTION BANDWIDTH** knob to **1 MHz**.

(15) Adjust TI **REFERENCE LEVEL** knob (if necessary).

(16) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(17) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(18) TI **MKR LEVEL** indication will be within limits specified in second row of table 19. Repeat technique of (13) through (17) for remaining TI settings in table 19.

Table 19. Sensitivity 3 MHz – 10 Hz @ 2dB/div

Test instrument	
Resolution bandwidth setting	Marker level indication limits (dBm)
3 MHz	≤ -80
1 MHz	≤ -85
100 kHz	≤ -95
10 kHz	≤ -105
1 kHz	≤ -115

(19) Press TI keys as listed in (a) through (c) below:
    (a) **FREE RUN**.
    (b) **BLUE SHIFT**.
    (c) **dB/DIV**, **5**, **Hz dB**.

(20) Rotate TI **RESOLUTION BANDWIDTH** knob to **100 Hz**.

(21) Adjust TI **REFERENCE LEVEL** knob (if necessary).

(22) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(23) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(24) TI **MKR LEVEL** indication will be within limits specified in first row of table 20.

(25) Repeat technique of (19) (a) and (20) through (24) for remaining TI settings in table 20. TI **MKR LEVEL** indication will be within limits specified in table 20.

Table 20. Sensitivity 1 MHz – 1.8 GHz @ 5dB/div

Test instrument	
Resolution bandwidth setting	Marker level indication limits (dBm)
100 Hz	≤ -125
10 Hz	≤ -131

(26) Press TI keys as listed in (a) through (d) below:

    (a) **FREE RUN**.
    (b) **BLUE SHIFT**.
    (c) **FREQ**, **1**, **0**, **0**, **kHz –dBX**.
    (d) **VERTICAL DISPLAY 2dB/DIV**.

(27) Rotate TI **RESOLUTION BANDWIDTH** knob to **10 kHz**.

(28) Adjust TI **REFERENCE LEVEL** knob (if necessary).

(29) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(30) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(31) TI **MKR LEVEL** indication will be within limits specified in first row of table 21.

(32) Repeat technique of (26) (a) and (27) through (30) for remaining TI settings in table 21. TI **MKR LEVEL** indication will be within limits specified in table 21.

Table 21. Sensitivity 100 kHz @ 2dB/div

Test instrument	
Resolution bandwidth setting	Marker level indication limits (dBm)
10 kHz	≤ −85
1 kHz	≤ −95

(33) Press TI keys as listed in (a) through (c) below:

    (a) **FREE RUN**.
    (b) **BLUE SHIFT**.
    (c) **dB/DIV**, **5**, **Hz dB**.

(34) Rotate TI **RESOLUTION BANDWIDTH** knob to **100 Hz**.

(35) Adjust TI **REFERENCE LEVEL** knob (if necessary).

(36) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(37) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(38) TI **MKR LEVEL** indication will be within limits specified in first row of table 22.

(39) Repeat technique of (33) (a) and (34) through (37) for remaining TI settings in table 22. TI **MKR LEVEL** indication will be within limits specified in table 22.

Table 22. Sensitivity 100kHz @ 5dB/div

Test instrument	
Resolution bandwidth setting	Marker level indication limits (dBm)
100 Hz	≤ −105
10 Hz	≤ −115

(40) Press TI keys as listed in (a) through (d) below:

    (a) **FREE RUN**.
    (b) **BLUE SHIFT**.
    (c) **FREQ**, **1**, **0**, **kHz −dBX**.
    (d) **VERTICAL DISPLAY 2dB/DIV**.

(41) Rotate TI **RESOLUTION BANDWIDTH** knob to **1 kHz**.

(42) Adjust TI **REFERENCE LEVEL** knob (if necessary).

(43) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(44) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(45) TI **MKR LEVEL** indication will be ≤ −80 dBm.

(46) Press TI keys as listed in (a) through (c) below:

    (a) **FREE RUN**.
    (b) **BLUE SHIFT**.
    (c) **dB/DIV**, **5**, **Hz dB**.

(47) Rotate TI **RESOLUTION BANDWIDTH** knob to **100 Hz**.

(48) Adjust TI **REFERENCE LEVEL** knob (if necessary).

(49) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(50) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(51) TI **MKR LEVEL** indication will be within limits specified in first row of table 23.

(52) Repeat technique of (46) (a) and (47) through (50) for remaining TI settings in table 23. TI **MKR LEVEL** indication will be within limits specified in table 23.

Table 23. Sensitivity 10 kHz @ 5dB/div

Test instrument	
Resolution bandwidth setting	Marker level indication limits (dBm)
100 Hz	≤ −90
10 Hz	≤ −100

(53) Press TI keys as listed in (a) through (c) below:

    (a) **FREE RUN**.
    (b) **BLUE SHIFT**.
    (c) **FREQ**, **1**, **kHz −dBX**.

(54) Rotate TI **RESOLUTION BANDWIDTH** knob to **100 Hz**.

(55) Adjust TI **REFERENCE LEVEL** knob (if necessary).

(56) Press TI **SINGLE SWEEP** key twice. Wait for sweep completion.

(57) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(58) TI **MKR LEVEL** indication will be within limits specified in first row of table 24.

(59) Repeat technique of (53) (a) and (54) through (57) for remaining TI settings in table 24. TI **MKR LEVEL** indication will be within limits specified in table 24.

Table 24. Sensitivity 1 kHz @ 5dB/div

Test instrument	
Resolution bandwidth setting	Marker level indication limits (dBm)
100 Hz	≤ −85
10 Hz	≤ −95

(60) Rotate TI **TIME/DIV** knob to **AUTO**.

(61) Press TI keys as listed in (a) through (j) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.
    (c) **BLUE SHIFT**.
    (d) **FREQ**, **5**, **0**, **MHz +dBX**.
    (e) **BLUE SHIFT**.
    (f) **REF LEVEL**, **5**, **0**, **kHz –dBX**.
    (g) **BLUE SHIFT**.
    (h) **SPAN/DIV**, **1**, **0**, **MHz +dBX**.
    (i) **VIDEO FILTER WIDE**.
    (j) **AUTO RESOLN** (not illuminated).

(62) Rotate TI **RESOLUTION BANDWIDTH** knob to **10 kHz**.

(63) Rotate TI **PEAK AVERAGE** knob fully counterclockwise.

(64) Press TI **SINGLE SWEEP** key (twice). Wait for sweep completion.

(65) Press TI **TUNE** key.

(66) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace (ignore zero Hz response).

(67) TI **MKR LEVEL** indication will be within limits specified in first row of table 25.

(68) Press TI keys as listed in (a) through (c) below:

    (a) **BLUE SHIFT**.
    (b) **FREQ**, **1**, **5**, **0**, **MHz + dBX**.
    (c) **SWEEP** (wait for sweep completion).

(69) Using TI **CENTER/MARKER FREQUENCY** knob, place marker on highest point of trace.

(70) TI **MKR LEVEL** indication will be within limits specified in 150 MHz row of table 25.

(71) Repeat (68) and (69) above for remaining frequencies listed in table 25. TI **MKR LEVEL** indication will be within limits specified in table 25.

Table 25. Residual response

Test instrument	
Center frequency (MHz)	Mkr level indication limit (dBm)
50	≤ -100
150	≤ -100
250	≤ -100
350	≤ -100
450	≤ -100
550	≤ -100
650	≤ -100
750	≤ -100
850	≤ -100
950	≤ -100
1050	≤ -100
1150	≤ -100
1250	≤ -100
1350	≤ -100
1450	≤ -100
1550	≤ -100
1650	≤ -100
1750	≤ -100

(72) Disconnect 50Ω 20-watt termination from TI **RF INPUT 50Ω**.

b. Adjustments. None

23. Harmonic and Intermodulation Distortion

a. Performance Check
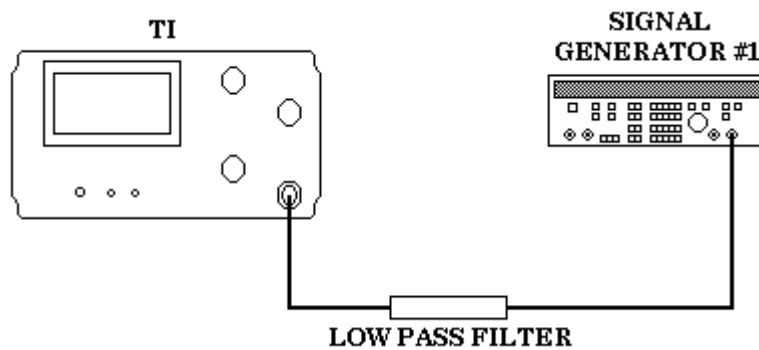
(1) Connect equipment as shown in figure 9 below.

Figure 9. Harmonic distortion setup.

(2) Press TI keys as listed in (a) through (j) below:

    (a) **BLUE SHIFT**.

    (b) **RESET**.

(c) **BLUE SHIFT**.

(d) **FREQ**, **1**, **1**, **0**, **MHz +dBX**.

(e) **BLUE SHIFT**.

(f) **REF LEVEL**, **3**, **0**, **kHz –dBX**.

(g) **BLUE SHIFT**.

(h) **SPAN/DIV**, **5**, **0**, **0**, **kHz –dBX**.

(i) **VIDEO FILTER WIDE**.

(j) **MIN DISTORTION** (not illuminated).

(3) Rotate TI **PEAK AVERAGE** knob fully counterclockwise.

(4) Set signal generator #1 for an output frequency of 110 MHz at an amplitude of –30 dBm.

(5) Adjust signal generator #1 output amplitude to position displayed trace at TI reference level (top) graticule line.

(6) Press TI keys as listed in (a) through (g) below:

(a) **SINGLE SWEEP** (twice).

(b) **GREEN SHIFT**.

(c) **STEP SIZE**.

(d) **GREEN SHIFT**.

(e) **PEAK FIND**.

(f) **+STEP**.

(g) **SINGLE SWEEP**.

(7) TI **MKR LEVEL** and **MARKER FREQUENCY** indications will be within limits specified in first row of table 26.

(8) Repeat technique of (6) (f) and (6) (g) above for remaining harmonics in table 26. TI **MKR LEVEL** and **MARKER FREQUENCY** indications will be within limits specified in table 26.

Table 26. Harmonic Distortion

Test instrument			
Harmonic	MKR LEVEL indication limit (dBm)	MARKER FREQUENCY indication limit (MHz)	
		Min	Max
2nd	≤ -90	219.91	220.09
3rd	≤ -90	329.91	330.09

(9) Reduce all outputs to minimum.

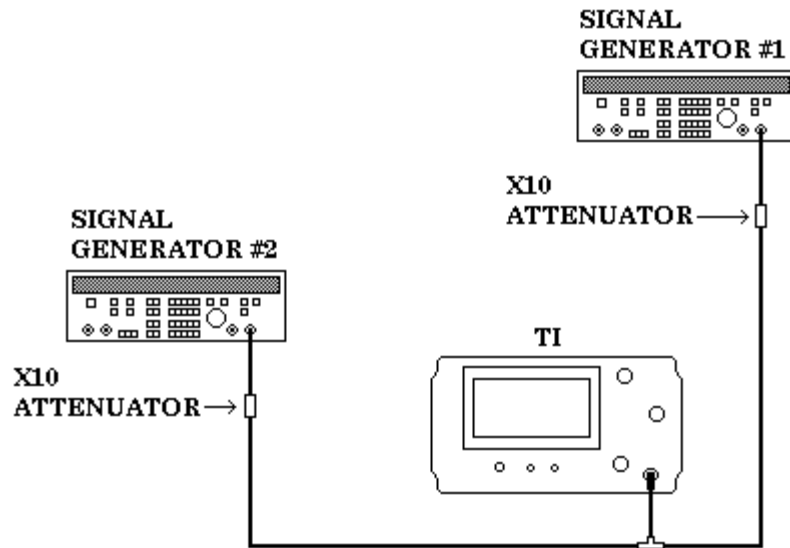(10) Connect equipment as shown in figure 10 below.

Figure 10. Third order intercept.

(11) Press TI keys as listed in (a) through (n) below:

    (a) **BLUE SHIFT**.

    (b) **RESET**.

    (c) **BLUE SHIFT**.

    (d) **FREQ**, **2**, **0**, **0**, **MHz +dBX**.

    (e) **BLUE SHIFT**.

    (f) **SPAN/DIV**, **5**, **0**, **0**, **kHz –dBX**.

    (g) **BLUE SHIFT**.

    (h) **REF LEVEL**, **3**, **0**, **kHz –dBX**.

(12) Set signal generator #1 for an output frequency of 199.5 MHz at an amplitude of –10 dBm.

(13) Set signal generator #2 for an output frequency of 200.5 MHz at an amplitude of –10 dBm.

(14) Adjust signal generator #1 output amplitude to position its signal peak at TI top graticule line.

(15) Adjust signal generator #2 output amplitude to position its signal peak at TI top graticule line.

(16) Press TI **AUTO RESOLN** key (not illuminated).

(17) Rotate TI **RESOLUTION BANDWIDTH** knob to **10 kHz**.

(18) Press TI **SINGLE SWEEP** key (twice) and wait for sweep completion.

(19) Press TI keys as listed in (a) and (b) below:

(a) **BLUE SHIFT**.

(b) **MKR→CENTER**.

(20) Rotate TI **CENTER/MARKER FREQUENCY** knob counterclockwise until TI **MARKER FREQUENCY** indication is **198.50 MHz**. TI **MKR LEVEL** indication will be ≤ −100 dBm.

(21) Rotate TI **CENTER/MARKER FREQUENCY** knob clockwise until TI **MARKER FREQUENCY** indication is **201.50 MHz**.

(22) TI **MKR LEVEL** indication will be ≤ −100 dBm.

(23) Reduce all outputs to minimum and disconnect equipment setup.

b. Adjustments. None

24. Tracking Generator Frequency Range

a. Performance Check

(1) Connect TI tracking generator **RF OUT 50Ω** to TI **RF INPUT 50Ω**.

(2) Connect TI **1st LO 50Ω OUTPUT** to TI tracking generator **1st LO IN**.

(3) Connect TI **2nd LO 50Ω OUTPUT** to TI tracking generator **2nd LO IN**.

(4) Adjust TI **VAR dB** control to **0**.

(5) Set TI **OUTPUT LEVEL –dBm** to **00**.

(6) Press TI **BLUE SHIFT** then **RESET** keys.

(7) Displayed trace must begin at left edge of TI CRT (100 kHz) and extend to right edge of TI CRT (1.8 GHz). See example in figure 11 below.
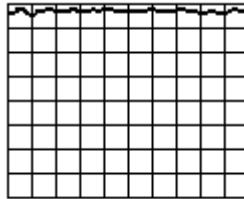

Figure 11. Frequency range

(8) Disconnect TI tracking generator **RF OUT 50Ω** from TI **RF INPUT 50Ω**.

b. Adjustments. None

25. Tracking Generator Output Level

a. Performance Check

(1) Connect measuring receiver sensor module to measuring receiver **CALIBRATION RF POWER OUTPUT**.

(2) Zero and calibrate sensor module.

(3) Disconnect measuring receiver sensor module from measuring receiver **CALIBRATION RF POWER OUTPUT**.

(4) Connect measuring receiver sensor module to TI **RF OUT 50Ω**.

(5) Press TI keys as listed in (a) through (e) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.
    (c) **BLUE SHIFT**.
    (d) **FREQ**, **1**, **0**, **0**, **MHz +dBX**.
    (e) **ZERO SPAN** (illuminated).

(6) Measure power at 100 MHz.

(7) Measuring receiver indication will be between –0.5 dBm and 0.5 dBm.

(8) Disconnect measuring receiver sensor module from TI **RF OUT 50Ω**.

  b. Adjustments. None

26. Tracking Generator Flatness

  a. Performance Check

(1) Connect TI **RF OUT 50Ω** to TI **RF INPUT 50Ω**.

(2) Press TI keys as listed in (a) through (f) below:

    (a) **BLUE SHIFT**.
    (b) **RESET**.
    (c) **BLUE SHIFT**.
    (d) **REF LEVEL**, **1**, **MHz +dBX**.
    (e) **BLUE SHIFT**.
    (f) **dB/DIV**, **1**, **Hz dB**.

(3) If necessary adjust TI **REFERENCE LEVEL** knob to move trace within TI graticule area.

(4) Press TI keys as listed in (a) through (c) below:

    (a) **SINGLE SWEEP** (twice and wait for sweep completion).
    (b) **GREEN SHIFT**.
    (c) **PEAK FIND**.

(5) Using TI **CENTER/MARKER FREQUENCY** knob, move marker to highest point on displayed trace. (Disregard 0 Hz response)

(6) Press TI keys as listed in (a) and (b) below:

    (a) **GREEN SHIFT**.
    (b) **ΔMKR**.

(7) Using TI **CENTER/MARKER FREQUENCY** knob, move active marker to lowest point on displayed trace.

(8) TI **MKR LEVEL** indication will be between 0 and –4.5 dB.

(9) Disconnect TI **RF OUT 50Ω** from TI **RF INPUT 50Ω**.

    b. Adjustments. None

27. Tracking Generator Spurious Signals

    a. Performance Checks

        (1) Connect equipment as shown in figure 12 below.
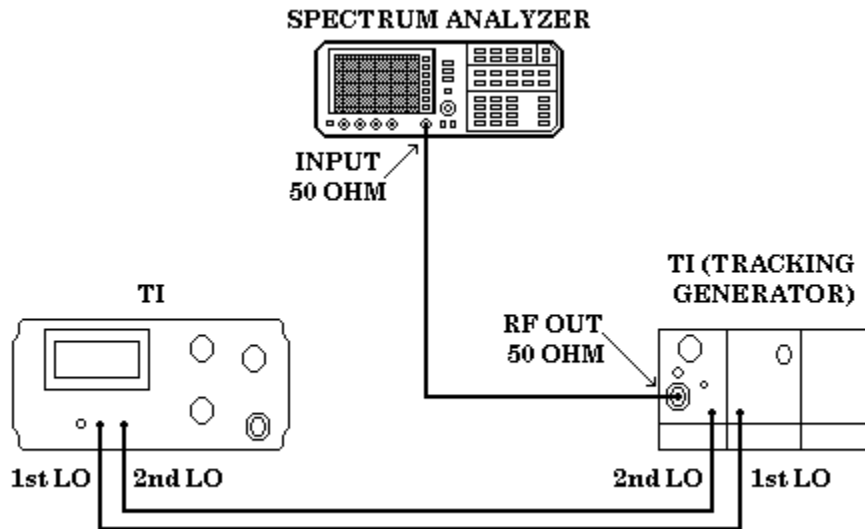

Figure 12. Spurious signals setup.

    (2) Adjust TI **MANUAL SCAN** knob to midrange.

    (3) Press TI keys as listed in (a) through (e) below:

        (a) **BLUE SHIFT**.
        (b) **RESET**.
        (c) **BLUE SHIFT**.
        (d) **FREQ**, **1**, **0**, **0**, **MHz +dBX**.
        (e) **ZERO SPAN** (illuminated).

    (4) Press spectrum analyzer keys as listed in (a) through (m) below:

        (a) **PRESET**.
        (b) **FREQUENCY**, **[CENTER FREQ]**, **1**, **0**, **0**, **MHz –dBm sec**.
        (c) **SPAN**, **[SPAN WIDTH]**, **2**, **0**, **MHz –dBm sec**.
        (d) **BW**, **[RES BW]**, **3**, **0**, **0**, **kHz mV ms**.
        (e) **[VIDEO BW]**, **1**, **0**, **kHz mV ms**.
        (f) **AMPLITUDE**, **[REF LEVEL]**, **0**, **MHz –dBm sec**.
        (g) **[LOG dB/DIV]**, **1**, **0**, **GHz dBm dB**.
        (h) **FREQUENCY**, **[CF STEP]**, **1**, **0**, **0**, **MHz –dBm sec**.
        (i) **[CENTER FREQ]**.

(j) **PEAK SEARCH**, **[MARKER DELTA]**.

(k) **FREQUENCY**.

(l) **STEP** ⇑.

(m) **PEAK SEARCH**.

(5) Spectrum analyzer **ΔMKR** indication will be within limits specified in first row of table 27.

(6) Repeat technique of (4) (l) and (m) above for remaining harmonics in table 27. Spectrum analyzer **ΔMKR** indication will be within limits specified in table 27.

Table 27. Harmonic Amplitude

Spectrum analyzer	
Harmonic	ΔMKR indication limit (dB)
2nd	≤ -20
3rd	≤ -20
4th	≤ -20
5th	≤ -20
6th	≤ -20
7th	≤ -20
8th	≤ -20
9th	≤ -20
10th	≤ -20
11th	≤ -20
12th	≤ -20
13th	≤ -20
14th	≤ -20
15th	≤ -20
16th	≤ -20
17th	≤ -20
18th	≤ -20

(7) Press TI keys as listed in (a) through (f) below:

(a) **FREQUENCY**, **[CENTER FREQ]**, **1**, **5**, **0**, **MHz –dBm sec**.

(b) **SPAN**, **[SPAN WIDTH]**, **9**, **0**, **MHz –dBm sec**.

(c) **PEAK SEARCH**, **[MARKER DELTA]**.

(d) **FREQUENCY**.

(e) **STEP** ⇑.

(f) **PEAK SEARCH**.

(8) Spectrum analyzer **ΔMKR** indication will be ≤ -40 dBm.

(9) Repeat technique of (7) (e) and (7) (f) above up to a spectrum analyzer center frequency of 1.850 GHz. Spectrum analyzer **ΔMKR** indication will be ≤ -40 dBm throughout.

b. Adjustments. None

28. 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:

JOHN M. KEANE
General, United States Army
Acting Chief of Staff

Official

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0318213

Distribution:
To be distributed in accordance with IDN 344783, requirements for calibration procedure TB 9-6625-2345-35.

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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.