TECHNICAL MANUAL

CALIBRATION PROCEDURE

FOR

AM/FM SIGNAL GENERATOR

2024 ( )

(MARCONI)

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AM/FM SIGNAL GENERATOR

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1 CALIBRATION DESCRIPTION:

Table 1.

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Frequency Accuracy and Display		
Reference Oscillator	Range: 10 MHz Accuracy: Standard, Aging/year: ±1 X 10^{-6}; Temperature: ±5 X 10^{-7} (0 to 55 °C) * Option 4, Aging/day: ±5 X 10^{-9}, Aging/year: ±2.5 X 10^{-7}; Temperature: ±5 X 10^{-8} (0 to 50 °C) *	TI compared to a Frequency Standard
Display	Range: 9 kHz to 2.4 GHz Accuracy: ±1 count of LSD	Measured with a Frequency Counter
Frequency Response	Range: 9 kHz to 2.4 GHz, -137 to +13 dBm Accuracy: For output levels >-127 dBm, ±0.8 dB, 9 kHz to 1.2 GHz; ±1.6 dB, >1.2 GHz to 2.4 GHz; Option 3, ±1.0 dB, 9 kHz to 1.2 GHz; ±2.0 dB, >1.2 GHz to 2.4 GHz	Measured with an AC Measurement Standard and Power Meter/Power Sensor
ALC Linearity	Range: 9 kHz to 2.4 GHz, -4 dBm to +13 dBm; Option 3: 9 kHz to 1.2 GHz, -4 dBm to +25 dBm; >1.2 GHz to 2.4 GHz, -4 dBm to +19 dBm Accuracy: ±0.8 dB, 9 kHz to 1.2 GHz; ±1.6 dB, >1.2 GHz to 2.4 GHz; Option 3: ±1.0 dB, 9 kHz to 1.2 GHz; ±2.0 dB, >1.2 GHz to 2.4 GHz	Measured with a Power Meter and Power Sensor

See footnotes at end of Table.

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Attenuator	Range: -137 dBm to 0 dBm; **	Measured with the Microwave Measurement System
	Accuracy: ±0.8 dB, 9 kHz to 1.2 GHz; ±1.6 dB, >1.2 GHz to 2.4 GHz; Option 3, ±1.0 dB, 9 kHz to 1.2 GHz; ±2.0 dB, >1.2 GHz to 2.4 GHz	
Spectral Purity		
Non-harmonics	Range: 9 kHz to 2.4 GHz	Measured with a Spectrum Analyzer
	Accuracy: >-70 dBc up to 1 GHz; >-64 dBc, 1 GHz to 2 GHz; >-60 dBc, >2 GHz	
Residual FM	Range: 9 kHz to 2.4 GHz	Measured with the Microwave Measurement System
	Accuracy: <4.5 Hz rms in a 300 Hz to 3.4 kHz bandwidth @ a carrier frequency of 1 GHz	
Single Sideband Phase Noise	Range: 9 kHz to 2.4 GHz	Measured with the Phase Noise Measurement System
	Accuracy: >-124 dBc/Hz @ 20 kHz offset from a 470 MHz carrier	
Frequency Modulation		
Deviation	Range: 0 to 100 kHz	Measured with the Microwave Measurement System
	Accuracy: ±5% @ 1 kHz modulation rate	
Distortion	Range: 0 to 100 kHz	Measured with the Microwave Measurement System and Audio Analyzer
	Accuracy: <3% @ 1 kHz rate	
Carrier Error	Range: 1.2 GHz carrier, 100 kHz deviation	Measured with the Microwave Measurement System
	Accuracy: <1 kHz	
Bandwidth	Range: DC to 100 kHz (DC coupled); 10 Hz to 100 kHz (AC coupled); 20 Hz to 100 kHz (AC coupled with ALC)	
	Accuracy: ±1 dB	

See footnotes at end of Table.

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Phase Modulation		
Radians	Range: 0 to 10 radians Accuracy: ±5% @ 1 kHz modulation rate	Measured with the Microwave Measurement System
Distortion	Range: 0 to 10 radians Accuracy: <3% @ 10 radians @ 1 kHz	
Bandwidth	Range: 100 Hz to 9 kHz Accuracy: ±3 dB	
Amplitude Modulation (<500 MHz, usable to 2 GHz)		
Depth	Range: 0 to 99.9% Accuracy: ±5% of set depth @ 1 kHz	
Distortion	Range: 0 to 80% Accuracy: <1.5% @ 1 kHz, 0 to 30%; <2.5% @ 1 kHz, >30 to 80%	
Bandwidth	Range: DC to 30 kHz (DC coupled); 10 Hz to 30 kHz (AC coupled); 20 Hz to 30 kHz (AC coupled with ALC) Accuracy: ±1 dB	Measured with the Microwave Measurement System and Power Meter and Power Sensor
Pulse Modulation		
RF Level	Range: 32 MHz to 2.4 GHz, +8 dBm max output Accuracy: ±1.3 dBm, 32 MHz to 1.2 GHz; ±2.1 dBm, >1.2 GHz to 2.4 GHz	Measured with a Power Meter and Power Sensor
ON/OFF Ratio	Range: 32 MHz to 2.4 GHz Accuracy: >45 dB, 32 MHz to 1.2 GHz; >40 dB, >1.2 GHz	Measured with a Spectrum Analyzer

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Pulse Modulation *(Cont.)*		
Rise and Fall Time	Range: 32 MHz to 2.4 GHz Accuracy: <10 μs	Measured with an Oscilloscope
Modulation Oscillator Distortion	Range: 0.01 Hz to 20 kHz Accuracy: <0.1% @ 1 kHz	Measured with the Microwave Measurement System and Audio Analyzer
External Frequency Standard Input	Range: 220 mV rms to 1.8 V rms Accuracy: No error messages	Apply known input signals

* Typical or Operational specifications. Not calibrated.

** Range limited to -125.1 dBm

2 EQUIPMENT REQUIREMENTS:

	Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.1	AC MEASUREMENT STANDARD	Range: 9 kHz to 30 MHz, 175 mV to 2.7 VAC Accuracy: ±5 mV	Fluke 5790A	
2.2	POWER METER/ POWER SENSOR	Range: 2.5 MHz to 2.4 GHz, -9.1 dBm to +16 dBm Accuracy: 2.5 to 10 MHz, ±4%; 10 to 50 MHz, ±4.7%; 50 MHz to 2 GHz, ±4.5%; 2 to 2.4 GHz, ±4.6% TAR 1.8:1	Hewlett-Packard 436A w/8482A	
2.3	MICROWAVE MEASUREMENT SYSTEM (MMS)	Range: 0 dBm to -126 dBm; 2.6 MHz to 2.4 GHz Accuracy: ±0.2 dB	Hewlett-Packard 8902MS	
2.4	ELECTRONIC COUNTER	Range: 10 MHz Accuracy: $\leq 1.25 \times 10^{-9}$	Hewlett-Packard 5345A	

Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.5 SPECTRUM ANALYZER	Range: 9 kHz to 2.4 GHz, 0 to -70 dB Accuracy: ± 1 dB	Hewlett-Packard 8566A	
2.6 AUDIO ANALYZER	Range: 30 Hz to 100 kHz Accuracy: 0.75%	Hewlett-Packard 8903B	
2.7 FUNCTION GENERATOR	Range: DC to 100 kHz sinewave, 10 kHz squarewave Accuracy: ±0.6 dB flatness	Hewlett-Packard 3325B	
2.8 DIGITAL MULTIMETER	Range: +1.5 to -1.5 VDC Accuracy: 0.00015%	Hewlett-Packard 3458A	
2.9 ATTENUATOR	Range: 10 dB Accuracy: Charted	Hewlett-Packard 8491A010	
2.10 TERMINATION	Range: 50 Ω Accuracy: N/A	Hewlett-Packard 11593A	
2.11 PHASE NOISE MEASUREMENT SYSTEM	Range: 0 to -124 dB Accuracy: ±2 dB	Hewlett-Packard 3048MS	
2.12 FREQUENCY STANDARD	Range: 10 MHz Accuracy: $\leq 1.25 \times 10^{-9}$	Austron 2100F	
2.13 FREQUENCY DIFFERENCE METER	Range: 1×10^{-7} to 1×10^{-11} Accuracy: N/A	Tracor 527E	
2.14 FREQUENCY COUNTER	Range: 10 MHz to 2.4 GHz Accuracy: Aging/day $< 1.25 \times 10^{-9}$	Hewlett-Packard 5343A	
2.15 OSCILLOSCOPE	Range: DC to 140 kHz, <10 μs Rise Time and Fall Time Accuracy: Rise Time and Fall Time, <2.50 μs	Tektronix 2246 MOD A	

3 PRELIMINARY OPERATIONS:

3.1 Review and become familiar with entire procedure before beginning Calibration Process.

WARNING

Unless otherwise designated, and prior to beginning the Calibration Process, ensure that all test equipment voltage and /or current outputs are set to zero (0) or turned off, where applicable. Ensure that all equipment switches are set to the proper position before making connections or applying power. If not strictly observed, could result in injury to, or death of, personnel or long term health hazards.

3.2 Connect TI and test equipment to the appropriate power source, set POWER switches ON and allow a 30 minute warm-up period.

3.3 All TI controls (hardkeys) will be in capital letters. Submenu keys (softkeys) will be in italics.

3.4 Use only that portion of the calibration procedure that pertains to the TI being calibrated.

3.5 Due to available standards the TI Attenuator range is limited to -125.1 dBm. A Limited Certification Label must be used with this limitation stated.

3.6 Using the appropriate equipment chart the Attenuator (2.9) at 2.5, 60, 180, 300, 420, 500, 540, 660, 780, 900, 1020, 1140, 1200, 1201, 1260, 1380, 1500, 1620, 1740, 1860, 1980, 2340, and 2400 MHz.

4 CALIBRATION PROCESS:

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding.

NOTE

Each test procedure relies on the TI being set to its power-up condition. To avoid switching the TI off and back on, reset the TI by pressing the RCL key, enter 999 using the numeric keys, and press ENTER.

4.1 FREQUENCY ACCURACY AND DISPLAY CALIBRATION:

NOTE

Adjustment of the Time Base Oscillator is normal due to the Aging Rate of the crystal. This is common to all Quartz Oscillators. However, in order to ensure reliability of the TI, the following action will be taken: If TI passes the following applicable steps, NO ADJUSTMENT ACTION should be entered into the Maintenance Data Collection System. If the TI failed, perform the applicable steps listed in Appendix A and enter appropriate ADJUSTMENT ACTION into the Maintenance Data Collection System.

4.1.1 Connect Frequency Standard 10 MHz REF OUT to the Electronic Counter EXT FREQ STD INPUT (1-10 MHz). Set Electronic Counter INT STD/EXT STD switch to EXT STD.

4.1.2 Connect TI 10 MHz (rear panel) output to the Electronic Counter CH A input. Set Electronic Counter 50 Ω/1M Ω switch to 50 Ω.

NOTE

The values in the following step are derived from multiplication of the Aging Rate to determine the offset at one year. Use these calculated twelve month values regardless of the length of the calibration interval for this TI in T.O. 33K-1-100-1/2.

4.1.3 Adjust Electronic Counter controls as required for a stable display indication and then push RESET. Verify Electronic Counter indication for the TCXO is 9 999 990 to 10 000 010 Hz and for the Option 4 OCXO is 9 999 997.5 to 10 000 002.5 Hz.

4.1.4 Set Electronic Counter INT STD/EXT STD switch to INT STD and disconnect test setup.

4.1.5 Connect equipment as shown in Figure 1.

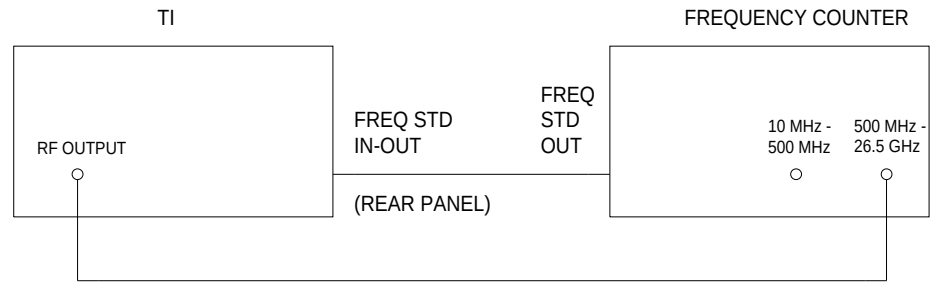

Figure 1.

4.1.6 On the TI, press MENU and select *Frequency/Sweep*. Using the NEXT key, select *Frequency Standard*. Then select *Ext 10 MHz indirect*.

4.1.7 Set Frequency Counter for 1 Hz display resolution.

4.1.8 Set TI CARR FREQ to 1 GHz and RF LEVEL to 0 dBm. Press SET Δ and then CARR FREQ to select *Freq Step*. Enter 111 111 kHz and press ENTER.

4.1.9 The Frequency Counter must indicate 1.000 000 GHz ±1 count of LSD.

4.1.10 Using the appropriate key, step the TI from 1.000 000 GHz to 2.400 000 GHz in 111 111 kHz steps and read Frequency Counter frequency at each step.

4.1.11 The Frequency Counter reading must agree with the TI front panel reading within ±1 count.

4.1.12 On the TI, press MENU and select *Frequency/Sweep*. Using the NEXT key, select *Frequency Standard*. Then select *Int 10 MHz*.

4.1.13 Set the TI RF LEVEL to minimum and disconnect the equipment shown in Figure 1.

4.2 FREQUENCY RESPONSE CALIBRATION:

4.2.1 Connect the TI RF OUTPUT to the AC Measurement Standard WIDEBAND Input.

4.2.2 Press the TI CARR FREQ key and set to 9 kHz using the numeric/unit keys.

4.2.3 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys.

4.2.4 Set the AC Measurement Standard to AUTO.

4.2.5 The AC Measurement Standard must indicate within the values listed in the Limits column of Table 2 for the Option being tested.

4.2.6 Press the TI CARR FREQ and RF LEVEL keys. Use the numeric/unit keys set to the next values listed in the Applied column of Table 2 for the Option being tested.

4.2.7 The AC Measurement Standard must indicate within the corresponding values listed in the Limits column of Table 2 for the Option being tested.

4.2.8 Repeat steps 4.2.6 and 4.2.7 for the remaining values listed in the Applied column of Table 2.

Table 2.

Applied	Option	Limits
0 dBm @ 9 kHz	1, 2, 4, 5	203.93 to 245.18 mV
0 dBm @ 30 kHz	1, 2, 4, 5	203.93 to 245.18 mV
0 dBm @ 33 kHz	1, 2, 4, 5	203.93 to 245.18 mV
0 dBm @ 1 MHz	1, 2, 4, 5	203.93 to 245.18 mV
0 dBm @ 10 MHz	1, 2, 4, 5	203.93 to 245.18 mV
0 dBm @ 30 MHz	1, 2, 4, 5	203.93 to 245.18 mV
0 dBm @ 9 kHz	3	199.29 to 250.89 mV
0 dBm @ 30 kHz	3	199.29 to 250.89 mV
0 dBm @ 33 kHz	3	199.29 to 250.89 mV
0 dBm @ 1 MHz	3	199.29 to 250.89 mV
0 dBm @ 10 MHz	3	199.29 to 250.89 mV
0 dBm @ 30 MHz	3	199.29 to 250.89 mV
+7 dBm @ 9 kHz	1, 2, 4, 5	456.55 to 548.89 mV
+7 dBm @ 30 kHz	1, 2, 4, 5	456.55 to 548.89 mV
+7 dBm @ 33 kHz	1, 2, 4, 5	456.55 to 548.89 mV
+7 dBm @ 1 MHz	1, 2, 4, 5	456.55 to 548.89 mV
+7 dBm @ 10 MHz	1, 2, 4, 5	456.55 to 548.89 mV
+7 dBm @ 30 MHz	1, 2, 4, 5	456.55 to 548.89 mV

Table 2. (Cont.)

Applied	Option	Limits
+7 dBm @ 9 kHz	3	446.15 to 561.67 mV
+7 dBm @ 30 kHz	3	446.15 to 561.67 mV
+7 dBm @ 33 kHz	3	446.15 to 561.67 mV
+7 dBm @ 1 MHz	3	446.15 to 561.67 mV
+7 dBm @ 10 MHz	3	446.15 to 561.67 mV
+7 dBm @ 30 MHz	3	446.15 to 561.67 mV
+13 dBm @ 9 kHz	1, 2, 4, 5	910.93 to 1095.18 mV
+13 dBm @ 30 kHz	1, 2, 4, 5	910.93 to 1095.18 mV
+13 dBm @ 33 kHz	1, 2, 4, 5	910.93 to 1095.18 mV
+13 dBm @ 1 MHz	1, 2, 4, 5	910.93 to 1095.18 mV
+13 dBm @ 10 MHz	1, 2, 4, 5	910.93 to 1095.18 mV
+13 dBm @ 30 MHz	1, 2, 4, 5	910.93 to 1095.18 mV
+13 dBm @ 9 kHz	3	890.19 to 1120.69 mV
+13 dBm @ 30 kHz	3	890.19 to 1120.69 mV
+13 dBm @ 33 kHz	3	890.19 to 1120.69 mV
+13 dBm @ 1 MHz	3	890.19 to 1120.69 mV
+13 dBm @ 10 MHz	3	890.19 to 1120.69 mV
+13 dBm @ 30 MHz	3	890.19 to 1120.69 mV
+25 dBm @ 9 kHz	3	3543.93 to 4461.54 mV
+25 dBm @ 30 kHz	3	3543.93 to 4461.54 mV
+25 dBm @ 33 kHz	3	3543.93 to 4461.54 mV
+25 dBm @ 1 MHz	3	3543.93 to 4461.54 mV
+25 dBm @ 10 MHz	3	3543.93 to 4461.54 mV
+25 dBm @ 30 MHz	3	3543.93 to 4461.54 mV

4.2.9 Set the TI RF OUTPUT to OFF and disconnect equipment.

4.2.10 Standardize the Power Meter and Power Sensor.

4.2.11 Connect the TI RF OUTPUT through the Power Sensor to the Power Meter.

4.2.12 Set the Power Meter CAL FACTOR dial to the appropriate value for the Power Sensor.

4.2.13 Press the TI CARR FREQ key and set to 60 MHz using the numeric/unit keys.

4.2.14 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys and set RF OUTPUT to ON.

4.2.15 The Power Meter must indicate within the values listed in the Limits column of Table 3, (Table 4 for Option 3).

4.2.16 Press the TI CARR FREQ key and using the numeric/unit keys set to the next value listed in the Carrier Frequency Column of Table 3, (Table 4 for Option 3).

4.2.17 The Power Meter must indicate within the corresponding values listed in the Limits column of Table 3, (Table 4 for Option 3).

4.2.18 Repeat steps 4.2.16 and 4.2.17 for the remaining values listed in the Carrier Frequency Column of Table 3, (Table 4 for Option 3).

Table 3.

RF OUTPUT at 0 dBm (Option 1, 2, 4, 5)

Carrier Frequency	Limits
60 MHz	-0.8 to +0.8 dBm
180 MHz	-0.8 to +0.8 dBm
300 MHz	-0.8 to +0.8 dBm
420 MHz	-0.8 to +0.8 dBm
540 MHz	-0.8 to +0.8 dBm
660 MHz	-0.8 to +0.8 dBm
780 MHz	-0.8 to +0.8 dBm
900 MHz	-0.8 to +0.8 dBm
1020 MHz	-0.8 to +0.8 dBm
1140 MHz	-0.8 to +0.8 dBm
1200 MHz	-0.8 to +0.8 dBm
1201 MHz	-1.6 to +1.6 dBm
1260 MHz	-1.6 to +1.6 dBm
1380 MHz	-1.6 to +1.6 dBm

Table 3. (Cont.)

RF OUTPUT at 0 dBm (Option 1, 2, 4, 5)	
Carrier Frequency	**Limits**
1500 MHz	-1.6 to +1.6 dBm
1620 MHz	-1.6 to +1.6 dBm
1740 MHz	-1.6 to +1.6 dBm
1860 MHz	-1.6 to +1.6 dBm
1980 MHz	-1.6 to +1.6 dBm
2220 MHz	-1.6 to +1.6 dBm
2340 MHz	-1.6 to +1.6 dBm
2400 MHz	-1.6 to +1.6 dBm

Table 4.

RF OUTPUT at 0 dBm (Option 3)	
Carrier Frequency	**Limits**
60 MHz	-1 to +1 dBm
180 MHz	-1 to +1 dBm
300 MHz	-1 to +1 dBm
420 MHz	-1 to +1 dBm
540 MHz	-1 to +1 dBm
660 MHz	-1 to +1 dBm
780 MHz	-1 to +1 dBm
900 MHz	-1 to +1 dBm
1020 MHz	-1 to +1 dBm
1140 MHz	-1 to +1 dBm
1200 MHz	-1 to +1 dBm
1201 MHz	-2 to +2 dBm

Table 4. (Cont.)

RF OUTPUT at 0 dBm (Option 3)	
Carrier Frequency	**Limits**
1260 MHz	-2 to +2 dBm
1380 MHz	-2 to +2 dBm
1500 MHz	-2 to +2 dBm
1620 MHz	-2 to +2 dBm
1740 MHz	-2 to +2 dBm
1860 MHz	-2 to +2 dBm
1980 MHz	-2 to +2 dBm
2220 MHz	-2 to +2 dBm
2340 MHz	-2 to +2 dBm
2400 MHz	-2 to +2 dBm

4.2.19 Press the TI CARR FREQ key and set to 60 MHz using the numeric/unit keys.

4.2.20 Press the TI RF LEVEL key and set to +7 dBm using the numeric/unit keys.

4.2.21 Repeat steps 4.2.16 and 4.2.17 using Table 5, (Table 6 for Option 3).

Table 5.

RF OUTPUT at +7 dBm (Option 1, 2, 4, 5)	
Carrier Frequency	**Limits**
60 MHz	+6.2 to +7.8 dBm
180 MHz	+6.2 to +7.8 dBm
300 MHz	+6.2 to +7.8 dBm
420 MHz	+6.2 to +7.8 dBm
540 MHz	+6.2 to +7.8 dBm
660 MHz	+6.2 to +7.8 dBm
780 MHz	+6.2 to +7.8 dBm

Table 5. (Cont.)

RF OUTPUT at +7 dBm (Option 1, 2, 4, 5)	
Carrier Frequency	**Limits**
900 MHz	+6.2 to +7.8 dBm
1020 MHz	+6.2 to +7.8 dBm
1140 MHz	+6.2 to +7.8 dBm
1200 MHz	+6.2 to +7.8 dBm
1201 MHz	+5.4 to +8.6 dBm
1260 MHz	+5.4 to +8.6 dBm
1380 MHz	+5.4 to +8.6 dBm
1500 MHz	+5.4 to +8.6 dBm
1620 MHz	+5.4 to +8.6 dBm
1740 MHz	+5.4 to +8.6 dBm
1860 MHz	+5.4 to +8.6 dBm
1980 MHz	+5.4 to +8.6 dBm
2220 MHz	+5.4 to +8.6 dBm
2340 MHz	+5.4 to +8.6 dBm
2400 MHz	+5.4 to +8.6 dBm

Table 6.

RF OUTPUT at +7 dBm (Option 3)	
Carrier Frequency	**Limits**
60 MHz	+6 to +8 dBm
180 MHz	+6 to +8 dBm
300 MHz	+6 to +8 dBm
420 MHz	+6 to +8 dBm
540 MHz	+6 to +8 dBm

Table 6. (Cont.)

RF OUTPUT at +7 dBm (Option 3)	
Carrier Frequency	**Limits**
660 MHz	+6 to +8 dBm
780 MHz	+6 to +8 dBm
900 MHz	+6 to +8 dBm
1020 MHz	+6 to +8 dBm
1140 MHz	+6 to +8 dBm
1200 MHz	+6 to +8 dBm
1201 MHz	+5 to +9 dBm
1260 MHz	+5 to +9 dBm
1380 MHz	+5 to +9 dBm
1500 MHz	+5 to +9 dBm
1620 MHz	+5 to +9 dBm
1740 MHz	+5 to +9 dBm
1860 MHz	+5 to +9 dBm
1980 MHz	+5 to +9 dBm
2220 MHz	+5 to +9 dBm
2340 MHz	+5 to +9 dBm
2400 MHz	+5 to +9 dBm

4.2.22 Press the TI CARR FREQ key and set to 60 MHz using the numeric/unit keys.

4.2.23 Press the TI RF LEVEL key and set to +13 dBm using the numeric/unit keys.

4.2.24 Repeat steps 4.2.16 and 4.2.17 using Table 7, (Table 8 for Option 3).

Table 7.

RF OUTPUT at +13 dBm (Option 1, 2, 4, 5)	
Carrier Frequency	**Limits**
60 MHz	+12.2 to +13.8 dBm
180 MHz	+12.2 to +13.8 dBm
300 MHz	+12.2 to +13.8 dBm
420 MHz	+12.2 to +13.8 dBm
540 MHz	+12.2 to +13.8 dBm
660 MHz	+12.2 to +13.8 dBm
780 MHz	+12.2 to +13.8 dBm
900 MHz	+12.2 to +13.8 dBm
1020 MHz	+12.2 to +13.8 dBm
1140 MHz	+12.2 to +13.8 dBm
1200 MHz	+12.2 to +13.8 dBm
1201 MHz	+11.4 to +14.6 dBm
1260 MHz	+11.4 to +14.6 dBm
1380 MHz	+11.4 to +14.6 dBm
1500 MHz	+11.4 to +14.6 dBm
1620 MHz	+11.4 to +14.6 dBm
1740 MHz	+11.4 to +14.6 dBm
1860 MHz	+11.4 to +14.6 dBm
1980 MHz	+11.4 to +14.6 dBm
2220 MHz	+11.4 to +14.6 dBm
2340 MHz	+11.4 to +14.6 dBm
2400 MHz	+11.4 to +14.6 dBm

Table 8.

RF OUTPUT at +13 dBm (Option 3)	
Carrier Frequency	**Limits**
60 MHz	+12 to +14 dBm
180 MHz	+12 to +14 dBm
300 MHz	+12 to +14 dBm
420 MHz	+12 to +14 dBm
540 MHz	+12 to +14 dBm
660 MHz	+12 to +14 dBm
780 MHz	+12 to +14 dBm
900 MHz	+12 to +14 dBm
1020 MHz	+12 to +14 dBm
1140 MHz	+12 to +14 dBm
1200 MHz	+12 to +14 dBm
1201 MHz	+11 to +15 dBm
1260 MHz	+11 to +15 dBm
1380 MHz	+11 to +15 dBm
1500 MHz	+11 to +15 dBm
1620 MHz	+11 to +15 dBm
1740 MHz	+11 to +15 dBm
1860 MHz	+11 to +15 dBm
1980 MHz	+11 to +15 dBm
2220 MHz	+11 to +15 dBm
2340 MHz	+11 to +15 dBm
2400 MHz	+11 to +15 dBm

4.2.25 For Option 3, continue with step 4.2.26. For all other options, set the TI RF OUTPUT to OFF, disconnect equipment and proceed to para 4.3.

4.2.26 Insert the Attenuator between the TI RF OUTPUT and the Power Sensor.

4.2.27 Press the TI CARR FREQ key and set to 60 MHz using the numeric/unit keys.

4.2.28 Set TI RF OUTPUT to ON and press the TI RF LEVEL key and set to +25 dBm using the numeric/unit keys, decrease the RF Level to +19 dBm when testing at carrier frequencies above 1.2 GHz.

4.2.29 Taking into account the value of the 10 dB Attenuator, the Power Meter must indicate within the values listed in the Limits column of Table 9.

4.2.30 Press the TI CARR FREQ key and using the numeric/unit keys set to the next value listed in the Carrier Frequency column of Table 9.

4.2.31 Taking into account the value of the Attenuator, the Power Meter must indicate within the corresponding values listed in the Limits column of Table 9.

4.2.32 Repeat steps 4.2.30 and 4.2.31 for the remaining values listed in the Carrier Frequency column of Table 9.

Table 9.

RF OUTPUT at +25 dBm, +19 dBm above 1200 MHz (Option 3)

Carrier Frequency	Limits
60 MHz	+14 to +16 dBm
180 MHz	+14 to +16 dBm
300 MHz	+14 to +16 dBm
420 MHz	+14 to +16 dBm
540 MHz	+14 to +16 dBm
660 MHz	+14 to +16 dBm
780 MHz	+14 to +16 dBm
900 MHz	+14 to +16 dBm
1020 MHz	+14 to +16 dBm
1140 MHz	+14 to +16 dBm
1200 MHz	+14 to +16 dBm
1201 MHz	+7 to +11 dBm
1260 MHz	+7 to +11 dBm
1380 MHz	+7 to +11 dBm
1500 MHz	+7 to +11 dBm
1620 MHz	+7 to +11 dBm

Table 9. (Cont.)

RF OUTPUT at +25 dBm, +19 dBm above 1200 MHz (Option 3)	
Carrier Frequency	**Limits**
1740 MHz	+7 to +11 dBm
1860 MHz	+7 to +11 dBm
1980 MHz	+7 to +11 dBm
2340 MHz	+7 to +11 dBm
2400 MHz	+7 to +11 dBm

4.2.33 Set the TI RF OUTPUT to OFF and disconnect equipment.

4.3 ALC LINEARITY CALIBRATION:

4.3.1 Connect the TI RF OUTPUT through the Power Sensor to the Power Meter.

NOTE

For Option 3, connect the TI RF OUTPUT through the Attenuator and the Power Sensor to the Power Meter. When verifying the TI limits, take the Attenuator value into account for the frequency being tested.

4.3.2 Press the TI CARR FREQ key and set to 2.5 MHz using the numeric/unit keys.

4.3.3 Set TI RF OUTPUT to ON and press the TI RF LEVEL key and set to -4 dBm using the numeric/unit key.

4.3.4 The Power Meter must indicate within the corresponding values listed in the Limits column of Table 10, (Table 11 for Option 3).

4.3.5 Press the TI RF LEVEL key and using the numeric/unit keys set to the next value listed in the RF Level column of Table 10, (Table 11 for Option 3).

4.3.6 The Power Meter must indicate within the corresponding values listed in the Limits column of Table 10, (Table 11 for Option 3).

4.3.7 Repeat steps 4.3.5 and 4.3.6 for the remaining values listed in the RF Level column of Table 10, (Table 11 for Option 3).

Table 10.

ALC Linearity at 2.5 and 500 MHz (Option 1, 2, 4, 5)	
RF Level (dBm)	**Limits (dBm)**
-4	-4.8 to -3.2
-3	-3.8 to -2.2
-2	-2.8 to -1.2

Table 10. (Cont.)

ALC Linearity at 2.5 and 500 MHz (Option 1, 2, 4, 5)	
RF Level (dBm)	**Limits (dBm)**
-1	-1.8 to -0.2
-0	-0.8 to +0.8
1	+0.2 to +1.8
2	+1.2 to +2.8
3	+2.2 to +3.8
4	+3.2 to +4.8
5	+4.2 to +5.8
6	+5.2 to +6.8
7	+6.2 to +7.8
8	+7.2 to +8.8
9	+8.2 to +9.8
10	+9.2 to +10.8
11	+10.2 to +11.8
12	+11.2 to +12.8
12.1	+11.3 to +12.9
12.2	+11.4 to +13
12.3	+11.5 to +13.1
12.4	+11.6 to +13.2
12.5	+11.7 to +13.3
12.6	+11.8 to +13.4
12.7	+11.9 to +13.5
12.8	+12 to +13.6
12.9	+12.1 to +13.7
13	+12.2 to +13.8

Table 11.

ALC Linearity at 2.5 and 500 MHz (Option 3)

RF Level (dBm)	Limits (dBm)
-4	-5 to -3
-3	-4 to -2
-2	-3 to -1
-1	-2 to 0
0	-1 to +1
1	0 to +2
2	1 to 3
3	2 to 4
4	3 to 5
5	4 to 6
6	5 to 7
7	6 to 8
8	7 to 9
9	8 to 10
10	9 to 11
11	10 to 12
12	11 to 13
12.1	11.1 to 13.1
12.2	11.2 to 13.2
12.3	11.3 to 13.3
12.4	11.4 to 13.4
12.5	11.5 to 13.5
12.6	11.6 to 13.6
12.7	11.7 to 13.7

Table 11. (Cont.)

ALC Linearity at 2.5 and 500 MHz (Option 3)	
RF Level (dBm)	**Limits (dBm)**
12.8	11.8 to 13.8
12.9	11.9 to 13.9
13	12 to 14
14	13 to 15
15	14 to 16
16	15 to 17
17	16 to 18
18	17 to 19
19	18 to 20
20	19 to 21
21	20 to 22
22	21 to 23
23	22 to 24
24	23 to 25
25	24 to 26

4.3.8 Press the TI CARR FREQ key and set to 500 MHz using the numeric/unit keys.

4.3.9 Press the TI RF LEVEL key and set to -4 dBm using the numeric/unit keys.

4.3.10 The Power Meter must indicate within the corresponding values listed in the Limits column of Table 10, (Table 11 for Option 3).

4.3.11 Repeat steps 4.3.5 and 4.3.6 for the remaining values listed in the RF Level column of Table 10, (Table 11 for Option 3).

4.3.12 Press the TI CARR FREQ key and set to 2400 MHz using the numeric/unit keys.

4.3.13 Press the TI RF LEVEL key and set to -4 dBm using the numeric/unit keys.

4.3.14 The Power Meter must indicate within the corresponding values listed in the Limits column of Table 12, (Table 13 for Option 3).

4.3.15 Repeat steps 4.3.5 and 4.3.6 for the remaining values listed in the RF Level column of Table 12, (Table 13 for Option 3).

Table 12.

ALC Linearity at 2400 MHz (Option 1, 2, 4, 5)

RF Level (dBm)	Limits (dBm)
-4	-5.6 to -2.4
-3	-4.6 to -1.4
-2	-3.6 to -0.4
-1	-2.6 to +0.6
-0	-1.6 to +1.6
1	-0.6 to +2.6
2	+0.4 to +3.6
3	+1.4 to +4.6
4	+2.4 to +5.6
5	+3.4 to +6.6
6	+4.4 to +7.6
7	+5.4 to +8.6
8	+6.4 to +9.6
9	+7.4 to +10.6
10	+8.4 to +11.6
11	+9.4 to +12.6
12	+10.4 to +13.6
12.1	+10.5 to +13.7
12.2	+10.6 to +13.8
12.3	+10.7 to +13.9
12.4	+10.8 to +14
12.5	+10.9 to +14.1
12.6	+11 to +14.2
12.7	+11.1 to +14.3

Table 12. (Cont.)

ALC Linearity at 2400 MHz (Option 1, 2, 4, 5)	
RF Level (dBm)	**Limits (dBm)**
12.8	+11.2 to +14.4
12.9	+11.3 to +14.5
13	+11.4 to +14.6

Table 13.

ALC Linearity at 2400 MHz (Option 3)	
RF Level (dBm)	**Limits (dBm)**
-4	-6 to -2
-3	-5 to -1
-2	-4 to 0
-1	-3 to 1
0	-2 to 2
1	-1 to 3
2	0 to 4
3	1 to 5
4	2 to 6
5	3 to 7
6	4 to 8
7	5 to 9
8	6 to 10
9	7 to 11
10	8 to 12
11	9 to 13
12	10 to 14

Table 13. (Cont.)

ALC Linearity at 2400 MHz (Option 3)	
RF Level (dBm)	**Limits (dBm)**
12.1	10.1 to 14.1
12.2	10.2 to 14.2
12.3	10.3 to 14.3
12.4	10.4 to 14.4
12.5	10.5 to 14.5
12.6	10.6 to 14.6
12.7	10.7 to 14.7
12.8	10.8 to 14.8
12.9	10.9 to 14.9
13	11 to 15
14	12 to 16
15	13 to 17
16	14 to 18
17	15 to 19
18	16 to 20
19	17 to 21

4.3.16 Set TI RF OUTPUT to OFF and disconnect equipment.

4.4 ATTENUATOR CALIBRATION: (Option 2, 3, 4, 5)

4.4.1 Connect the TI RF OUTPUT, through the 10 dB Attenuator, to the 8902 Microwave Measurement System RF INPUT on the Microwave Converter Panel, using adapters supplied with the System.

4.4.2 Press the TI CARR FREQ key and set to 2.6 MHz using the numeric/unit keys.

4.4.3 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys, then set RF OUTPUT to ON.

4.4.4 Press the TI SET Δ, RF LEVEL keys and select *Levl Step*. Then press the TI 1, 1, ENTER, and RF LEVEL keys.

4.4.5 On the Measurement Receiver press Blue Key, then INST PRESET. Verify the Measurement Receiver is indicating the TI CW Frequency. Press GOLD S Key, then TUNED RF LEVEL Key. Press LOG/LIN Key and verify Measurement Receiver indication is in dBm.

4.4.6 On Measurement Receiver press BLUE Key, then SET REF Key and verify Display indication is 0.00 dB.

4.4.7 Press the TI RF LEVEL key and set to -4.1 dBm using the numeric/unit keys.

4.4.8 The Measuring Receiver must indicate within the values listed in the Limits column of Table 14, (Table 15 for Option 3).

4.4.9 On TI press the X10 ⇓ key to reduce the output level by 11 dB increments.

4.4.10 On TI set to each of the values shown in the Applied column of Table 14, (Table 15 for Option 3). Verify the Measurement Receiver indicates within the corresponding values listed in the Limits column of Table 14, (Table 15 for Option 3).

NOTE

When RECAL appears in Measurement Receiver Display press the CALIBRATION Key and wait for a stable display before proceeding. Allow TI and MMS to stabilize 20 to 30 seconds between each 11 dB step.

Table 14.

Attenuator Test at 2.6 MHz, 540 MHz and 1140 MHz (Option 2, 4, 5)

RF Level (dBm)	Limits (dBm)
0	Reference
-4.1	-4.9 to -3.3
-15.1	-15.9 to -14.3
-26.1	-26.9 to -25.3
-37.1	-37.9 to -36.3
-48.1	-48.9 to -47.3
-59.1	-59.9 to -58.3
-70.1	-70.9 to -69.3
-81.1	-81.9 to -80.3
-92.1	-92.9 to -91.3
-103.1	-103.9 to -102.3
-114.1	-114.9 to -113.3
-125.1	-125.9 to -124.3

Table 15.

Attenuator Test at 2.6 MHz, 540 MHz and 1140 MHz (Option 3)	
RF Level (dBm)	**Limits (dBm)**
0	Reference
-4.1	-5.1 to -3.1
-15.1	-16.1 to -14.1
-26.1	-27.1 to -25.1
-37.1	-38.1 to -36.1
-48.1	-49.1 to -47.1
59.1	-60.1 to -58.1
-70.1	-71.1 to -69.1
-81.1	-82.1 to -80.1
-92.1	-93.1 to -91.1
-103.1	-104.1 to -102.1
-114.1	-115.1 to -113.1
-125.1	-126.1 to -124.1

4.4.11 Press the TI CARR FREQ key and set to 540 MHz using the numeric/unit keys.

4.4.12 Repeat steps 4.4.3 through 4.4.10.

4.4.13 Press the TI CARR FREQ key and set to 1140 MHz using the numeric/unit keys.

4.4.14 Repeat steps 4.4.3 through 4.4.10.

4.4.15 Press the TI CARR FREQ key and set to 1740 MHz using the numeric/unit keys.

4.4.16 On Measurement Receiver press BLUE Key, then INST PRESET.

4.4.17 On Measurement System Local Oscillator press FREQUENCY and enter 1860.53 MHz, at a +8 dBm Power Level. On Measurement Receiver press 27.3 SPCL, then enter 1860.53 MHz.

4.4.18 Verify Measurement Receiver is indicating TI CW Frequency. Press GOLD S key, then TUNED RF LEVEL Key. Press LOG/LIN Key and verify Measurement Receiver indication is in dBm.

4.4.19 Repeat Steps 4.4.3 and 4.4.10 using Table 16, (Table 17 for Option 3).

Table 16.

Attenuator Test at 1740 MHz and 2400 MHz (Option 2, 4, 5)

RF Level (dBm)	Limits (dBm)
0	Reference
-4.1	-5.7 to -2.5
-15.1	-16.7 to -13.5
-26.1	-27.7 to -24.5
-37.1	-38.7 to -35.5
-48.1	-49.7 to -46.5
-59.1	-60.7 to -57.5
-70.1	-71.7 to -68.5
-81.1	-82.7 to -79.5
-92.1	-93.7 to -90.5
-103.1	-104.7 to -101.5
-114.1	-115.7 to -112.5
-125.1	-126.7 to -123.5

Table 17.

Attenuator Test at 1740 MHz and 2400 MHz (Option 3)

RF Level (dBm)	Limits (dBm)
0	Reference
-4.1	-6.1 to -2.1
-15.1	-17.1 to -13.1
-26.1	-28.1 to -24.1
-37.1	-39.1 to -35.1
-48.1	-50.1 to -46.1
-59.1	-61.1 to -57.1
-70.1	-72.1 to -68.1

Table 17. (Cont.)

Attenuator Test at 1740 MHz and 2400 MHz (Option 3)	
RF Level (dBm)	**Limits (dBm)**
-81.1	-83.1 to -79.1
-92.1	-94.1 to -90.1
-103.1	-105.1 to -101.1
-114.1	-116.1 to -112.1
-125.1	-127.1 to -123.1

4.4.20 Press the TI CARR FREQ key and set to 2400 MHz using the numeric/unit keys.

4.4.21 On Measurement Receiver press BLUE Key, then INST PRESET.

4.4.22 On Measurement System Local Oscillator press FREQUENCY and enter 2520.53 MHz, at a +8 dBm Power Level. On Measurement Receiver press 27.3 SPCL, then enter 2520.53 MHz.

4.4.23 Verify Measurement Receiver is indicating TI Frequency. Press GOLD S key, then TUNED RF LEVEL Key. Press LOG/LIN Key and verify Measurement Receiver indication is in dBm.

4.4.24 Repeat Steps 4.4.3 and 4.4.10. using Table 16, (Table 17 for Option 3).

4.4.25 Set TI RF OUTPUT to OFF and disconnect equipment.

4.4.26 Due to available Standards the TI Attenuator range is limited to -125.1 dBm. A Limited Certification Label must be used with this limitation stated.

4.5 SPECTRAL PURITY CALIBRATION:

4.5.1 NON-HARMONICS AND RESIDUAL FM CALIBRATION:

4.5.1.1 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys.

4.5.1.2 Connect the TI RF OUTPUT to the Spectrum Analyzer Input, then set RF OUTPUT to ON.

4.5.1.3 Press the TI CARR FREQ key and set to 1201 MHz using the numeric/unit keys.

4.5.1.4 Measure the corresponding non-harmonics with the Spectrum Analyzer at each of the non-harmonic frequencies listed in Table 18. Verify the results are within the corresponding values listed in the Limits column of Table 18.

4.5.1.5 Repeat steps 4.5.1.3 and 4.5.1.4 for the remaining frequencies listed in the Carrier Frequency column of Table 18.

Table 18.

Carrier Non-harmonic Test

Carrier Frequency (MHz)	Non-harmonic Frequency (MHz)	Non-harmonic Frequency (MHz)	Limits
1201	800.6667	1601.3333	≤64 dBc
1201	400.3333	2001.6667	≤64 dBc
1599	1066	2132	≤64 dBc
1599	533	2665	≤64 dBc
1601	1200.75	2001.25	≤64 dBc
1601	800.5	2401.5	≤64 dBc
1999	1499.25	2498.75	≤64 dBc
1999	999.5	2998.5	≤64 dBc
2001	1600.8	2401.2	≤60 dBc
2001	1200.6	2801.4	≤60 dBc
2400	1920	2880	≤60 dBc
2400	1440	3360	≤60 dBc
9.9	100.000032	109.900036	≤70 dBc

4.5.1.6 Set TI RF OUTPUT to OFF and disconnect equipment.

4.5.1.7 Connect the TI RF OUTPUT to the Measuring Receiver RF INPUT.

4.5.1.8 Press the TI CARR FREQ key and set to 1 GHz using the numeric/unit keys.

4.5.1.9 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys, then set RF OUTPUT to ON.

4.5.1.10 On the Measuring Receiver, select FM, 300 Hz HP FILTER and 3 kHz LP FILTER. Press the Blue Shift key and the RMS (AVG) key.

4.5.1.11 The measured Residual FM must be <4.5 Hz rms.

4.5.1.12 Set TI RF OUTPUT to OFF and disconnect equipment.

4.5.2 SINGLE SIDEBAND PHASE NOISE CALIBRATION:

4.5.2.1 Connect the TI RF OUTPUT to the 11792A Microwave Test Signal input of the Phase Noise Measurement System.

4.5.2.2 On the TI, press CARR FREQ key and set to 470 MHz using the numeric/unit keys. Press RF LEVEL key and set to 0 dBm using the numeric/unit keys, then set RF OUTPUT to ON.

4.5.2.3 Verify Phase Noise Measurement System with automation package, CPIN number 88M-3048MS/NOISE-F001-00A, with the correct revision, as per COMPENDIUM 80-1-88 is used to calibrate single-sideband phase noise. The Main Menu should be present on the screen when the computer is turned on.

4.5.2.4 On Phase Noise Measurement System select Type/Range of Measurement to obtain the Measurement Type and Frequency Range Specifications. Select Phase Noise Using Phase Lock Loop Measurement type. Set Start Frequency to 10 Hz, Stop Frequency to 150.E+03 (150 kHz) and Minimum Number of Averages to 4. Press ESC to return to Main Menu.

4.5.2.5 On Phase Noise Measurement System select Parameters to obtain the Source and Interface Entry Menu. Select Low Frequency Phase Detector (5 MHz to 1600 MHz). Select the following:

Carrier Frequency	4.7E+08 Hz
Detector Input Frequency	4.7E+08 Hz
VCO Tune Constant	2.35 Hz/Volt
Center Voltage of VCO Tune Curve	0 Volts
Tuning Range of VCO	10 Volts
VCO Tune Port Input Resistance	1.E+06 Ohms

Press ESC to return to Main Menu when done with selections.

NOTE

The VCO Tune Constant is obtained by the following formula:

VCO Tune Constant = 5 E-9 X Carrier Frequency

example: 470.0 E+6 X 5 E-9 = 2.35 Hz/Volts

4.5.2.6 On Phase Noise Measurement System select Calibration Technique. Insure that Measure the Detector Constant, Measure the Tune Constant and Will are highlighted on the Display screen. Press ESC to return to the Main Menu.

4.5.2.7 On Phase Noise Measurement System select Instrument Control to obtain the source control for measurement. Using a Phase Lock Loop Menu. Select UUT USERS SRCE MANUAL CTRL and REF SOURCE 8663A SYSTEM CTRL, under EFC control. Press ESC to return to the Main Menu.

4.5.2.8 On Phase Noise Measurement System press Define Graph. Enter graph title as appropriate for your setup. Enter the following data in the proper blocks:

Minimum X coordinate	10
Maximum X coordinate	150.E+03 Hz
Maximum Y coordinate	-50
Minimum Y coordinate	-140

Select Single Sideband Phase Noise (dBc/Hz) for Graph Type. Press ESC.

4.5.2.9 On Phase Noise Measurement System select New Measurement. Press Y. The equipment should be connected as shown on the Display screen. Verify a Beat Note below the value on the screen is present on the Signal Analyzer. Then press F1 Proceed softkey.

NOTE

When needing to up or down range the Analyzers use the ↑↓ keys to control the Dynamic Signal Analyzer and the ← → keys to control the Spectrum Analyzer.

4.5.2.10 If REF #11 appears on the screen press P to proceed. The Phase Noise Measurement System should proceed without error. If the Theoretical And Actual Loop Suppression Factors chart appears on the Display screen and none of the factors are highlighted proceed by pressing F1.

4.5.2.11 After measurement is completed, the Phase Noise Plot should appear on the Display screen. The Single Sideband Phase Noise at 20 kHz offset must be <-124 dBc/Hz. If desired, the Marker function may be used to obtain specific offset frequencies and phase noise measurements on the graph. Press M twice to obtain the Marker function.

NOTE

The ← → keys are the fine controls for moving the cursor and the keys ↑↓ are the coarse controls for moving the cursor.

4.5.2.12 To print the TI Phase Noise Plot and the pertinent measurement parameters on Phase Noise Measurement System press SHIFT and F4 keys. Press ESC to return to the Main Menu.

4.5.2.13 On the TI, select a minimum output and set the RF OUTPUT to OFF. Disconnect the TI from the Phase Noise Measurement System.

4.6 FREQUENCY MODULATION CALIBRATION:

4.6.1 Connect the TI RF OUTPUT to the Measuring Receiver RF INPUT.

4.6.2 Connect the Measuring Receiver MODULATION OUTPUT/AUDIO INPUT to the Audio Analyzer INPUT.

4.6.3 Press the TI CARR FREQ key and set to 10 MHz using the numeric/unit keys.

4.6.4 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys, then set RF OUTPUT to ON.

4.6.5 Press the TI MOD key and set to 100 kHz using the numeric/unit keys.

4.6.6 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.6.7 Press the Measuring Receiver FM key and the green AUTOMATIC OPERATION key to put the Measuring Receiver in FM mode. Press the 300 Hz HP FILTER and the 3 kHz LP FILTER keys.

4.6.8 Measure the FM Deviation with the Measuring Receiver and the Distortion with the Audio Analyzer. The results must be within the values listed in the corresponding FM Deviation Limits and Distortion Limits columns of Table 19.

4.6.9 Press the TI CARR FREQ key and using the numeric/unit keys set the frequency to the next value listed in the Carrier Frequency column of Table 19.

4.6.10 Repeat steps 4.6.8 and 4.6.9 for the remaining frequencies listed in the Carrier Frequency column of Table 19.

Table 19.

Internal FM Deviation and Distortion Test at 100 kHz Deviation

Carrier Frequency (MHz)	FM Deviation Limits (kHz)	Distortion Limits
10	95 to 105	<3%
10.144	95 to 105	<3%
10.292	95 to 105	<3%
10.441	95 to 105	<3%
10.592	95 to 105	<3%
10.746	95 to 105	<3%
10.901	95 to 105	<3%
11.059	95 to 105	<3%
11.22	95 to 105	<3%
11.382	95 to 105	<3%
11.547	95 to 105	<3%
11.714	95 to 105	<3%
11.884	95 to 105	<3%
12.056	95 to 105	<3%
12.23	95 to 105	<3%
12.5	95 to 105	<3%
12.587	95 to 105	<3%
12.77	95 to 105	<3%
12.995	95 to 105	<3%
13.143	95 to 105	<3%
13.333	95 to 105	<3%

4.6.11 Press the TI CARR FREQ key and set to 15 MHz using the numeric/unit keys.

4.6.12 Press the TI MOD key and set to 100 kHz using the numeric/unit keys.

4.6.13 Measure the FM Deviation with the Measuring Receiver. The results must be within the values listed in the corresponding Limits column of Table 20.

4.6.14 Press the TI MOD key and using the numeric/unit keys set to the next frequency listed in the FM Deviation column of Table 20.

4.6.15 Repeat steps 4.6.13 and 4.6.14 for the remaining frequencies listed in the FM Deviation column of Table 20.

Table 20.

FM Scale Shape Test at 15 MHz Carrier

FM Deviation	Limits
100 kHz	95 to 105 kHz
71 kHz	67.45 to 74.55 kHz
56 kHz	53.2 to 58.8 kHz
44 kHz	41.8 to 46.2 kHz
34 kHz	32.3 to 35.7 kHz
27 kHz	25.65 to 28.35 kHz
21 kHz	19.95 to 22.05 kHz
16 kHz	15.2 to 16.8 kHz
13 kHz	12.35 to 13.65 kHz
11 kHz	10.45 to 11.55 kHz
10 kHz	9.5 to 10.5 kHz
1 kHz	0.95 to 1.05 kHz
100 Hz	95 to 105 Hz

4.6.16 Press the TI CARR FREQ key and set to 1200 MHz using the numeric/unit keys.

4.6.17 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys.

4.6.18 Press the TI SOURCE ON/OFF key to OFF, then press the MOD ON/OFF key to OFF.

4.6.19 Measure the Carrier Frequency with the Measuring Receiver. Record the result.

4.6.20 Press the TI MOD key and set to 100 kHz using the numeric/unit keys.

4.6.21 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.6.22 Press the TI MENU, 2, 0 and ENTER keys.

4.6.23 The TI will enter the Modulation Mode menu. Select *FM ext* using the NEXT key.

4.6.24 Press the TI MENU, 3, 0 and ENTER keys.

4.6.25 The TI will enter the Modulation Source menu. Select *Ext* using the NEXT key. Select *2* to select DC coupling.

4.6.26 Press the TI MENU, 2, 3 and ENTER keys. The TI will select the *DC FM Nulling* control.

4.6.27 Measure the Carrier Frequency with the Measuring Receiver. Record the result.

4.6.28 The difference between the results recorded in step 4.6.19 and 4.6.27 must be within the value in the Carrier Frequency Difference column of Table 21.

Table 21.

Applied	Carrier Frequency Difference
Modulation OFF then ON	<1 kHz

4.6.29 Connect the Function Generator OUTPUT through the 50 Ω Termination to the TI EXT MOD INPUT.

4.6.30 Press the TI CARR FREQ key and set to 15 MHz using the numeric/unit keys.

4.6.31 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys.

4.6.32 Press the TI MOD key and set to 50 kHz using the numeric/unit keys.

4.6.33 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.6.34 Press the TI MENU, 2, 0 and ENTER keys.

4.6.35 The TI will enter the Modulation Mode menu. Select *FM ext* using the NEXT key.

4.6.36 Press the TI MENU, 3, 0 and ENTER keys.

4.6.37 The TI will enter the Modulation Source menu. Select *Ext* using the NEXT key. Select *2* to select DC coupling.

4.6.38 Set the Function Generator controls for a 1 V rms, 1 kHz sinewave.

4.6.39 Measure the FM Deviation with the Measuring Receiver. The indication must be between 47.5 to 52.5 kHz.

4.6.40 Press the Measuring Receiver RATIO key and set LOG/LIN to LOG (dB measurement). Disengage all previously engaged filter keys on the Measuring Receiver.

4.6.41 Set the Function Generator to the next frequency listed in the Modulation Frequency column of Table 22.

4.6.42 Measure the Response Level with the Measuring Receiver. The result must be within the corresponding values listed in the Response Level Limits column of Table 22.

4.6.43 Repeat steps 4.6.41 and 4.6.42 for the remaining frequencies listed in the Modulation Frequency column of Table 22.

4.6.44 Measure the AF distortion with the Audio Analyzer at those frequencies where a limit is listed in the Distortion Limits column of Table 22. The distortion must be within the listed limits.

Table 22.

External FM Frequency Response (ALC off, DC Coupled), 50 kHz Deviation

Modulation Frequency	Response Level Limits	Distortion Limits
1 kHz	Reference	<3%
30 Hz	-1 to +1 dB	
100 Hz	-1 to +1 dB	<3%
300 Hz	-1 to +1 dB	
3 kHz	-1 to +1 dB	
5 kHz	-1 to +1 dB	<3%
10 kHz	-1 to +1 dB	
20 kHz	-1 to +1 dB	<3%
50 kHz	-1 to +1 dB	
100 kHz	-1 to +1 dB	
0 Hz	-1 to +1 dB	

NOTE

Measure the FM deviation at 0 Hz (DC), using the DC offset function of the Function Generator following steps 4.6.46 through 4.6.53.

4.6.45 Temporarily connect the Function Generator output to the Digital Multimeter and set the Function Generator output as close as possible to +1.4142 VDC as indicated on the Digital Multimeter. Disconnect the Digital Multimeter.

4.6.46 On the Measuring Receiver press the FREQ key and wait for a stable display, then press the MHz key. Press S and FREQ ERROR.

4.6.47 Temporarily connect the Function Generator output to the Digital Multimeter and adjust the Function Generator output as close as possible to -1.4142 V. Disconnect the Digital Multimeter.

4.6.48 Divide the FREQ ERROR indication on the Measuring Receiver by 2 and record as FM 1.

4.6.49 Reset the Function Generator controls for a 1 V rms, 1 kHz sinewave.

4.6.50 Set the Measuring Receiver, as required, to measure the FM deviation. Record the indication as FM 2.

4.6.51 Calculate the change in response by using the following formula. The result must be within the values listed in the Response Level Limits column of Table 22 for 0 Hz.

$$20 \text{ Log} \left\{ \frac{\text{FM 2}}{\text{FM 1}} \right\}$$

4.6.52 Press the TI MOD key and set to 10 kHz using the numeric/unit keys.

4.6.53 Press the TI MENU, 2, 0 and ENTER keys.

4.6.54 The TI will enter the Modulation Mode menu. Select *FM ext* using the NEXT key.

4.6.55 Press the TI MENU, 3, 0 and ENTER keys.

4.6.56 The TI will enter the Modulation Source menu. Select *Ext* using the NEXT key. Select *1* to select ALC.

4.6.57 Set the Function Generator controls for a 0.75 V rms, 1 kHz sinewave.

4.6.58 Measure the FM Deviation with the Measuring Receiver. The indication must be between 9.5 to 10.5 kHz.

4.6.59 Set the Measuring Receiver reference to 0 dBm.

4.6.60 Set the Function Generator to the next frequency listed in the Modulation Frequency column of Table 23.

4.6.61 Measure the Response Level with the Measuring Receiver. The result must be within the corresponding values listed in the Response Level Limits column of Table 23.

4.6.62 Repeat steps 4.6.60 and 4.6.61 for the remaining frequencies listed in the Modulation Frequency column of Table 23.

Table 23.

External FM Frequency Response (ALC on), 10 kHz Deviation, 0.75 V Input

Modulation Frequency	Response Level Limits
1 kHz	Reference
20 Hz	-1 to + 1 dB
100 Hz	-1 to + 1 dB
300 Hz	-1 to + 1 dB
3 kHz	-1 to + 1 dB
10 kHz	-1 to + 1 dB
30 kHz	-1 to + 1 dB
100 kHz	-1 to + 1 dB

4.6.63 Set the Function Generator controls for a 1.25 V rms, 1 kHz sinewave.

4.6.64 Repeat steps 4.6.59 through 4.6.62 using Table 24. Also, measure the AF distortion with the Audio Analyzer at those Frequencies where a limit is listed in the Distortion Limits column of Table 24. The distortion must be within the listed Limits.

Table 24.

External FM Frequency Response (ALC on), 10 kHz Deviation, 1.25 V Input		
Modulation Frequency	**Response Level Limits**	**Distortion Limits**
1 kHz	Reference	<3%
20 Hz	-1 to +1 dB	
100 Hz	-1 to +1 dB	<3%
300 Hz	-1 to +1 dB	
3 kHz	-1 to +1 dB	
5 kHz	-1 to +1 dB	<3%
10 kHz	-1 to +1 dB	
20 kHz	-1 to +1 dB	<3%
30 kHz	-1 to +1 dB	
100 kHz	-1 to +1 dB	

4.7 PHASE MODULATION CALIBRATION:

4.7.1 Press the TI CARR FREQ key and set to 10.5 MHz using the numeric/unit keys.

4.7.2 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys.

4.7.3 Press the TI MENU, 2, 0 and ENTER key.

4.7.4 The TI will enter the *Modulation Mode* menu. Select *ΦM int* using the NEXT key.

4.7.5 Press the TI MOD, 1, 0 and rad keys.

4.7.6 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.7.7 Press the Measuring Receiver ΦM key and the green AUTOMATIC OPERATION key to put the Measuring Receiver in ΦM mode.

4.7.8 Measure the ΦM Deviation with the Measuring Receiver and the Distortion with the Audio Analyzer. The ΦM Deviation must be within 9.5 to 10.5 rad and the Distortion must be <3%.

NOTE

For the Phase Modulation Flatness test the results are calculated from readings taken with the Measuring Receiver set to FM. No allowances need to be made for the modulation source frequency accuracy since it is derived from the reference oscillator in the TI.

4.7.9 Press the TI CARR FREQ key and set to 15 MHz using the numeric/unit keys.

4.7.10 Repeat steps 4.7.2 through 4.7.6.

4.7.11 Press the Measuring Receiver FM key and the green AUTOMATIC OPERATION key to put the Measuring Receiver in FM mode.

4.7.12 Measure the FM deviation with the Measuring Receiver and calculate the phase modulation using the following formula. Record the result.

$$\Phi M = \left(\frac{\text{FM dev (Hz)}}{\text{mod freq (Hz)}} \right)$$

4.7.13 Press the TI MOD SOURCE key and using the numeric/unit keys set to the next frequency listed in the Modulation Frequency column of Table 25.

4.7.14 Repeat steps 4.7.12 and 4.7.13 for the remaining frequencies listed in the Modulation Frequency column of Table 27. Record the results.

4.7.15 Using the value recorded in step 4.7.14 as a reference, calculate the change in response at each modulation frequency using the following formula.

$$20 \log \left(\frac{\text{value recorded in step 4.7.14}}{\text{value recorded in step 4.7.12}} \right)$$

4.7.16 Verify the results are within the values listed in the Limits column of Table 25.

Table 25.

Modulation Frequency	Limits
1 kHz	Reference
100 Hz	-3 to + 3 dB
300 Hz	-3 to + 3 dB

Table 25. (Cont.)

Modulation Frequency	Limits
3 kHz	-3 to + 3 dB
10 kHz	-3 to + 3 dB

4.8 AMPLITUDE MODULATION CALIBRATION:

4.8.1 Press the TI CARR FREQ key and set to 1.5 MHz using the numeric/unit keys.

4.8.2 Press the TI RF LEVEL key and set to -4 dBm using the numeric/unit keys.

4.8.3 Press the TI MENU, 2, 0 and ENTER key.

4.8.4 The TI will enter the *Modulation Mode* menu. Select *AM int.*

4.8.5 Press the TI MOD key and set to 30% using the numeric/unit keys.

4.8.6 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.8.7 Press the Measuring Receiver AM key and the green AUTOMATIC OPERATION key to put the Measuring Receiver in AM mode.

4.8.8 Measure the AM Depth with the Measuring Receiver and the Distortion with the Audio Analyzer. The AM Depth and Distortion must be within the corresponding limits listed in Table 26.

4.8.9 Press the TI CARR FREQ key and using the numeric/unit keys set to the next frequency listed in the Carrier Frequency column of Table 26.

4.8.10 Repeat steps 4.8.8 and 4.8.9 for the remaining frequencies listed in the Carrier Frequency column of Table 26.

4.8.11 Press the TI CARR FREQ key and set to 1.5 MHz using the numeric/unit keys.

4.8.12 Press the TI MOD key and set to 80% using the numeric/unit keys.

4.8.13 Repeat steps 4.8.7 through 4.8.10.

4.8.14 Repeat steps 4.8.1 through 4.8.13 setting the TI RF LEVEL to 0 dBm using the numeric/unit keys.

4.8.15 Repeat steps 4.8.1 through 4.8.13 setting the TI RF LEVEL to +7 dBm using the numeric/unit keys.

Table 26.

Carrier Frequency	AM Depth 30% Limits	AM Depth 80% Limits	Distortion 30% Depth Limits	Distortion 80% Depth Limits
1.5 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%
5 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%
9 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%
11 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%
20 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%
50 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%

Table 26. (Cont.)

Carrier Frequency	AM Depth 30% Limits	AM Depth 80% Limits	Distortion 30% Depth Limits	Distortion 80% Depth Limits
100 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%
200 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%
500 MHz	28.5 to 31.5%	76 to 84%	<1.5%	<2.5%

4.8.16 Press the TI CARR FREQ key and set to 100 MHz using the numeric/unit keys.

4.8.17 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys.

4.8.18 Press the TI MENU, 2, 0 and ENTER key.

4.8.19 The TI will enter the *Modulation Mode* menu. Select *AM int* using the NEXT key.

4.8.20 Press the TI MOD key and set to 10% using the numeric/unit keys.

4.8.21 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.8.22 Measure the AM Depth with the Measuring Receiver. The AM Depth must be within the corresponding limits listed in Table 27.

4.8.23 Press the TI MOD key and using the numeric/unit keys set to the next depth listed in the AM Depth % column of Table 27.

4.8.24 Repeat steps 4.8.22 and 4.8.23 for the remaining depths listed in the AM Depth % column of Table 27.

Table 27.

AM Depth %	Limits %
10	9.5 to 10.5
20	19 to 21
30	28.5 to 31.5
40	38 to 42
50	47.5 to 52.5
60	57 to 63
70	66.5 to 73.5
80	76 to 84
85	80.75 to 89.25

4.8.25 Press the TI CARR FREQ key and set to 400 MHz using the numeric/unit keys.

4.8.26 Press the TI RF LEVEL key and set to -4 dBm using the numeric/unit keys.

4.8.27 Press the TI MENU, 2, 0 and ENTER key.

4.8.29 The TI will enter the *Modulation Mode* menu. Select *AM ext* using the NEXT key.

4.8.30 Press the TI MOD key and set to 80% using the numeric/unit keys.

4.8.31 Press the TI MENU, 3, 0 and ENTER key.

4.8.32 The TI will enter the *Modulation Source* menu. Select *Ext* using the NEXT key, then select *2* to select DC coupling then press the MOD key.

4.8.33 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.8.34 Set the Function Generator controls for a 1 V rms, 1 kHz sinewave.

4.8.35 Measure the AM Depth with the Measuring Receiver. The indication must be between 76% to 84%. Record the indication.

4.8.36 Set the Measuring Receiver reference to 0 dBm.

4.8.37 Set the Function Generator the next frequency listed in the Modulation Frequency column of Table 28.

4.8.38 Measure the Response Level with the Measuring Receiver. The result must be within the corresponding values listed in the Response Level Limits column of Table 28.

4.8.39 Repeat steps 4.8.37 and 4.8.38 for the remaining frequencies listed in the Modulation Frequency column of Table 28.

Table 28.

Modulation Frequency	Response Level Limits
1 kHz	Reference
100 Hz	-1 to +1 dB
300 Hz	-1 to +1 dB
10 kHz	-1 to +1 dB
20 kHz	-1 to +1 dB
30 kHz	-1 to +1 dB
0 Hz	-1 to +1 dB

NOTE

Measure the AM depth at DC, using the DC offset function of the Function Generator following steps 4.8.40 through 4.8.50.

4.8.40 Set the TI RF OUTPUT to OFF and disconnect from the Measuring Receiver RF INPUT.

4.8.41 Standardize the Power Meter and Power Sensor.

4.8.42 Connect the TI RF OUTPUT through the Power Sensor to the Power Meter.

4.8.43 Set the Power Meter CAL FACTOR dial to the appropriate value for the Power Sensor, then set TI RF OUTPUT to ON.

4.8.44 Temporarily connect the Function Generator output to the Digital Multimeter and adjust the Function Generator output as close as possible to +1.4142 VDC.

4.8.45 Measure the power with the Power Meter and record the indication.

4.8.46 Temporarily connect the Function Generator output to the Digital Multimeter and adjust the Function Generator output as close as possible to -1.4142 VDC.

4.8.47 Measure the power with the Power Meter and record the indication.

4.8.48 Subtract the indication recorded in step 4.8.47 from the indication recorded in step 4.8.45. Record the result as X.

4.8.49 Calculate the modulation depth using the following formula:

$$\mathrm{AM}(\%) = \left(\frac{1 - 10^{(-X/20)}}{1 + 10^{(-X/20)}} \right) X \ 100$$

4.8.50 Calculate the 0 Hz response relative to 1 kHz using the following formula. The result must be within the values listed in the Response Level Limits column of Table 28 for 0 Hz.

$$20 \log \left(\frac{\text{value recorded in step 4.8.35}}{\text{value recorded in step 4.8.49}} \right)$$

4.8.51 Press the TI RF LEVEL key and set to +7 dBm using the numeric/unit keys. Set the Function Generator DC Offset to 0 VDC.

4.8.52 Repeat steps 4.8.34 through 4.8.50.

4.8.53 Set TI RF OUTPUT to OFF and disconnect equipment.

4.9 PULSE MODULATION CALIBRATION:

4.9.1 Connect the Function Generator OUTPUT to the TI PULSE INPUT (rear panel).

4.9.2 Standardize the Power Meter and Power Sensor, then connect to the TI RF OUTPUT.

4.9.3 Press the TI CARR FREQ key and set to 32 MHz using the numeric/unit keys.

4.9.4 Press the TI RF LEVEL key and set to -7 dBm using the numeric/unit keys, then set RF OUTPUT to ON.

4.9.5 Press the TI MENU, 2, 2 and ENTER key.

4.9.6 The TI will enter the *Pulse Modulation* menu. Select *1* to enable Pulse Mod.

4.9.7 Press the TI MOD key three times to select to select *Pulse Mod.*

4.9.8 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.9.9 Set the Function Generator controls to provide +5 VDC. The RF Output will now be enabled.

4.9.10 Set the Power Meter CAL FACTOR dial to the Power Sensor value for the same frequency as the TI Carrier Frequency.

4.9.11 The Power Meter indication must be within the corresponding values listed in the Limits column of Table 29.

4.9.12 Press the TI CARR FREQ key and using the numeric/unit keys set to the next value listed in the Carrier Frequency column of Table 29.

4.9.13 Repeat steps 4.9.10 through 4.9.12 for the remaining carrier frequency values listed in Table 29.

Table 29.

Carrier Frequency (MHz)	Limits
32	-8.3 to -5.7 dBm
60	-8.3 to -5.7 dBm
180	-8.3 to -5.7 dBm
300	-8.3 to -5.7 dBm
420	-8.3 to -5.7 dBm
540	-8.3 to -5.7 dBm
660	-8.3 to -5.7 dBm
780	-8.3 to -5.7 dBm
900	-8.3 to -5.7 dBm
1020	-8.3 to -5.7 dBm
1140	-8.3 to -5.7 dBm
1200	-8.3 to -5.7 dBm
1201	-9.1 to -4.9 dBm
1260	-9.1 to -4.9 dBm
1380	-9.1 to -4.9 dBm
1500	-9.1 to -4.9 dBm

Table 29. (Cont.)

Carrier Frequency (MHz)	Limits
1620	-9.1 to -4.9 dBm
1740	-9.1 to -4.9 dBm
1860	-9.1 to -4.9 dBm
1980	-9.1 to -4.9 dBm
2220	-9.1 to -4.9 dBm
2340	-9.1 to -4.9 dBm
2400	-9.1 to -4.9 dBm

4.9.14 Press the TI RF LEVEL key and set to +4 dBm using the numeric/unit keys.

4.9.15 Press the TI CARR FREQ key and using the numeric/unit keys set to 32 MHz.

4.9.16 Repeat steps 4.9.10 through 4.9.12 using Table 30.

Table 30.

Carrier Frequency (MHz)	Limits
32	+2.7 to +5.3 dBm
60	+2.7 to +5.3 dBm
180	+2.7 to +5.3 dBm
300	+2.7 to +5.3 dBm
420	+2.7 to +5.3 dBm
540	+2.7 to +5.3 dBm
660	+2.7 to +5.3 dBm
780	+2.7 to +5.3 dBm
900	+2.7 to +5.3 dBm
1020	+2.7 to +5.3 dBm
1140	+2.7 to +5.3 dBm
1200	+2.7 to +5.3 dBm

Table 30. (Cont.)

Carrier Frequency (MHz)	Limits
1201	+1.9 to +6.1 dBm
1260	+1.9 to +6.1 dBm
1380	+1.9 to +6.1 dBm
1500	+1.9 to +6.1 dBm
1620	+1.9 to +6.1 dBm
1740	+1.9 to +6.1 dBm
1860	+1.9 to +6.1 dBm
1980	+1.9 to +6.1 dBm
2220	+1.9 to +6.1 dBm
2340	+1.9 to +6.1 dBm
2400	+1.9 to +6.1 dBm

4.9.17 Set the TI RF Level to minimum and disconnect the Power Sensor from the TI RF OUTPUT.

4.9.18 Connect the Function Generator OUTPUT to the TI PULSE INPUT (rear panel).

4.9.19 Connect the TI RF OUTPUT to the Spectrum Analyzer RF INPUT.

4.9.20 Press the TI CARR FREQ key and set to 32 MHz using the numeric/unit keys.

4.9.21 Press the TI RF LEVEL key and set to 0 dBm using the numeric/unit keys.

4.9.22 Press the TI MENU, 2, 2 and ENTER key.

4.9.23 The TI will enter the *Pulse Modulation* menu. Select *1* to enable Pulse Mod.

4.9.24 Press the TI MOD key three times to select to select *Pulse Mod.*

4.9.25 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON.

4.9.26 Set the Function Generator controls to provide +5 VDC. The RF Output will now be enabled.

4.9.27 Tune the Spectrum Analyzer to the same frequency as the TI. Measure and record the Output Level.

4.9.28 Disconnect the Function Generator from the TI PULSE INPUT connector (rear panel).

4.9.29 Apply a short circuit to the TI PULSE INPUT (rear panel).

4.9.30 Measure the Output Level with the Spectrum Analyzer. Record the indication.

4.9.31 The difference between the values recorded in step 4.9.27 and 4.9.30 is the pulse mod on/off ratio. This value must be within the values listed in the Limits column of Table 31.

Table 31.

Carrier Frequency (MHz)	Limits
32	>45 dB
100	>45 dB
320	>45 dB
1000	>45 dB
1200	>45 dB
1500	>40 dB
1800	>40 dB
2100	>40 dB
2400	>40 dB

4.9.36 Set outputs to OFF or minimum and disconnect equipment.

4.9.37 Connect the TI RF OUTPUT to the Oscilloscope Input.

4.9.38 Press the TI CARR FREQ key and set to 50 MHz using the numeric/unit keys.

4.9.39 Press the TI RF LEVEL key and set to +7 dBm using the numeric/unit keys.

4.9.40 Press the TI MENU, 2, 2 and ENTER key.

4.9.41 The TI will enter the *Pulse Modulation* menu. Select *1* to enable Pulse Mod.

4.9.42 Press the TI MOD key three times to select *Pulse Mod.*

4.9.43 Press the TI SOURCE ON/OFF key to ON, then press the MOD ON/OFF key to ON. The RF Output will now be enabled.

4.9.44 Set the Function Generator controls to provide 10 kHz, 0 V to +5 V squarewave.

4.9.45 Adjust the Oscilloscope controls so that the rise time of the envelope can be measured.

4.9.46 Measure the rise time between the 10% to 90% points. The result must be within the value listed in the Limits column of Table 32.

4.9.47 Adjust the Oscilloscope controls so that the fall time of the envelope can be measured.

4.9.48 Measure the fall time between the 10% to 90% points. The result must be within the value listed in the Limits column of Table 32.

Table 32.

Function	Limits
Rise Time	<10 μs
Fall Time	<10 μs

4.9.49 Press the TI MENU, 2, 2 and ENTER keys.

4.9.50 The TI will enter the *Pulse Modulation* menu. Select *0* to disable Pulse Mod.

4.9.51 Press the TI MOD key three times to select to select *Pulse Mod.*

4.9.52 Press the TI SOURCE ON/OFF key to OFF, then press the MOD ON/OFF key to OFF.

4.9.53 Set outputs to off or minimum and disconnect equipment.

4.10 MODULATION OSCILLATOR CALIBRATION:

4.10.1 Connect the TI LF OUTPUT to the Audio Analyzer Input.

4.10.2 Press the TI MENU, 2, 0 and ENTER keys.

4.10.3 The TI will enter the *Modulation Source* menu. Select *FM int* using the NEXT key.

4.10.4 Set the TI SOURCE ON/OFF key to ON to enable modulation source.

4.10.5 Set the TI MOD ON/OFF key to ON and set the MOD SOURCE to 1 kHz.

4.10.6 Set the Audio Analyzer controls as required to measure distortion.

4.10.7 The measured distortion must be <0.1%.

4.10.8 Set outputs to off or minimum and disconnect equipment.

4.11 EXTERNAL FREQUENCY STANDARD INPUT CALIBRATION:

4.11.1 Connect the Function Generator OUTPUT to the TI FREQ STD IN-OUT.

4.11.2 Press the TI MENU key then select *Frequency/Sweep.*

4.11.3 Using the TI NEXT key, select *Frequency Standard*. Then select *2* to select *Ext 1 MHz indirect.*

NOTE

For Applied values of 10 MHz, select a *Frequency Standard* of *3*. This selects the *Ext 10 MHz indirect.*

4.11.4 Set the Function Generator controls for a 1 MHz, 220 mV sinewave.

4.11.5 There must be no external standard error messages displayed on the TI as indicated in the Limits column of Table 33.

4.11.6 Set the Function Generator to the next value listed in the Applied column of Table 33.

4.11.7 Repeat steps 4.11.5 and 4.11.6 for the remaining values listed in the Applied column of Table 33.

Table 33.

Applied	Limits
1 MHz @ 220 mV rms	No external standard error messages
1 MHz @ 1.8 V rms	No external standard error messages
10 MHz @ 1.8 V rms	No external standard error messages
10 MHz @ 220 mV rms	No external standard error messages

4.11.8 Set all outputs to OFF or minimum.

4.11.9 Set all POWER switches to STANDBY or OFF.

4.11.10 Disconnect and secure all equipment.

4.11.11 Attach Limited Certification Label per step 3.5.

CALIBRATION PERFORMANCE TABLE

Not Required

APPENDIX A

A.1 TIME BASE ADJUSTMENT: [Room Temperature Crystal Oscillator (RTXO)]

A.1.1 Connect Frequency Standard 10 MHz REF OUT to the Electronic Counter EXT FREQ STD INPUT (1-10 MHz). Set Electronic Counter INT STD/EXT STD switch to EXT STD.

A.1.2 Connect TI 10 MHz (rear panel) output to the Electronic Counter CH A input. Set Electronic Counter 50 Ω/1M Ω switch to 50 Ω.

A.1.3 Adjust the TI OSC ADJ for an Electronic Counter indication of 10 MHz ±1 count of LSD.

A.1.4 Allow TI 10 MHz Reference Oscillator a minimum of one (1) hour to stabilize. Repeat step A.1.3 as required.

A.1.5 Disconnect the test setup and continue with para 4.1.

A.2 TIME BASE ADJUSTMENT: [Temperature Compensated Crystal Oscillator (TCXO)]

A.2.1 Connect Frequency Standard 10 MHz REF OUT to the Electronic Counter EXT FREQ STD INPUT (1-10 MHz). Set Electronic Counter INT STD/EXT STD switch to EXT STD.

A.2.2 Connect TI 10 MHz (rear panel) output to the Electronic Counter CH A input. Set Electronic Counter 50 Ω/1M Ω switch to 50 Ω and GATE TIME to 1 sec.

A.2.3 Adjust the TI OSC ADJ for an Electronic Counter indication of 10 MHz ± the Offset labeled on the cover of the TCXO. For example: If the Offset is labeled +3.5 Hz, the TCXO should be adjusted for a frequency indication of 10.000 003.5 MHz on Electronic Counter.

A.2.4 Allow TI 10 MHz Reference Oscillator a minimum of one (1) hour to stabilize. Repeat step A.2.3 as required.

A.2.5 Disconnect the test setup and continue with para 4.1.

A.3 TIME BASE ADJUSTMENT: [Oven Controlled Crystal Oscillator (OCXO)]

A.3.1 Connect Frequency Standard 10 MHz FREQ OUT to Frequency Difference Meter (FDM) REF INPUT. Connect TI rear panel 10 MHz (rear panel) output to the FDM SIG INPUT connector.

A.3.2 Standardize the FDM as required. Set FDM METER RANGE switch as required for an on scale indication on the FDM.

A.3.3 Adjust TI OSC ADJ, as required for lowest possible null on the FDM meter.

A.3.4 Allow TI 10 MHz Reference Oscillator a minimum of one (1) hour to stabilize and repeat step A.3.3 as required.

A.3.5 Disconnect equipment from TI and continue with para 4.1.