TECHNICAL MANUAL

CALIBRATION PROCEDURE

FOR

SYNTHESIZED SIGNAL GENERATOR

8642A(), 8642B()

(HEWLETT-PACKARD)

This publication replaces T.O. 33K4-4-260-1 dated 30 May 1994 and all subsequent changes.

Published under Authority of the Secretary of the Air Force

30 OCTOBER 1995

35

SYNTHESIZED SIGNAL GENERATOR

8642A(), 8642B()

(HEWLETT-PACKARD)

1 CALIBRATION DESCRIPTION:

Table 1.

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Reference Oscillator (10 MHz Aging Offset)	Range. Aging Offset. STD: Must be less than 2×10^{-6} (Not adjusted) OPT 001: Must be less than 1×10^{-9} Accuracy: Adjusted for minimum CRT movement, as required, to insure TI is better than worse case Aging Offset	TI compared to a Frequency Standard and adjusted for minimum movement on CRT to return oscillator to 10 MHz Clock Frequency
Frequency Display 8642A	Range: 100 kHz to 1057.5 MHz	Not Calibrated
8642B	Range. 100 kHz to 2115 MHz Accuracy: Same as Reference Oscillator	
RF Output Power 8642A	Range +20 to -140 dBm, Bands 1 through 7, +18 to -140 dBm, Band 8, +16 to -140 dBm, Band 9	Measured with a Sensor Module and Measuring Receiver
8642B	Range: +20 to -140 dBm, Bands 1 through 7; +19 to -140 dBm, Band 8; +18 to -140 dBm, HET Band; +17 to -140 dBm, Band 9; +16 to -140 dBm, Band 10	
Absolute Level	Range: ≥-127 dBm Output Accuracy: ±1 dB	Measured with a Sensor Module and Measuring Receiver
Flatness	Range: +10 dBm Output Level Accuracy: <±0.75 dB	

Table 1 (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Harmonics	Range: Bands 1 through 9, HET Accuracy: -30 dBc, @ ≤+10 dBm, -20 dBc, @ ≤+16 dBm Range: Band 10, 8642B only Accuracy: -25 dBc, @ ≤+10 dBm, -20 dBc, @ ≤+16 dBm	Harmonics measured with a Sensor Module Measuring Receiver
Subharmonics	Range: Bands 1 through 9, HET Accuracy: None Range: Band 10, 8642B only Accuracy: -45 dBc	Subharmonics measured with Sensor Module and Measuring Receiver
Spurious Signals	Range: Bands 1 through 9 Accuracy: -100 dBc Range: Band 10, 8642B only Accuracy: -94 dBc	Non-Harmonics measured on a Spectrum Analyzer
SSB Phase Noise System	Range: 20 kHz offset from carrier Accuracy: Band 10: -125 dBc/Hz Band 9: -134 dBc/Hz (-130 dBc)* Band 8: -137 dBc/Hz Band 7: -141 dBc/Hz Band 6: -144 dBc/Hz Band 5: -145 dBc/Hz (-137 dBc)* Band 4: -146 dBc/Hz (-137 dBc)* Band 3: -147 dBc/Hz (-137 dBc)* Band 2: -148 dBc/Hz (-137 dBc)* *Band 1: -137 dBc/Hz HET: -125 dBc/Hz	Measured with a Phase Noise Measurement

* The specification in parenthesis is the limit of the Phase Noise Measurement System. This is the accuracy that must be applied to the TI and annotated on the Limited Certification Form. *Band 1 not calibrated due to the frequency range of the Phase Noise Measurement System. Annotate same on Limited Certification Form.

Table 1 (Cont.)

Test Instrument (TI) Characteristics	**Performance Specifications**	**Test Method**
SSB Phase Noise System	Range: 200 kHz offset from carrier Accuracy: Band 10: -134 dBc/Hz Band 9: -143 dBc/Hz (-130 dBc)* Band 8: -144 dBc/Hz (-137 dBc)* Band 7: -144 dBc/Hz (-142 dBc)* Band 6: -145 dBc/Hz Band 5: -145 dBc/Hz (-137 dBc)* Band 4: -147 dBc/Hz (-137 dBc)* Band 3: -148 dBc/Hz (-137 dBc)* Band 2: -149 dBc/Hz (-137 dBc)* *Band 1: -138 dBc/Hz HET: -137 dBc/Hz	Measured with a Phase Noise Measurement
Amplitude Modulation	Range: 0 to 99.9% depth Accuracy: See Indicator Accuracy	Measured with a Measuring Receiver
AM Distortion		
8642A	Range: Bands 1 through 8 Accuracy: <1% @ 0 - 30% AM; <2% @ 30 - 70% AM, <4% @ 70 - 90% AM Range: Band 9, HET Accuracy: <2% @ 0 - 30% AM; <4% @ 30 - 70% AM, <6% @ 70 - 90% AM	
8642B	Range: Bands 1 through 9 Accuracy: <1% @ 0 - 30% AM; <2% @ 30 - 70% AM; <4% @ 70 - 90% AM Range: Band 10, HET Accuracy: <2% @ 0 - 30% AM; <4% @ 30 - 70% AM; <6% @ 70 - 90% AM	

* The specification in parenthesis is the limit of the Phase Noise Measurement System. This is the accuracy that must be applied to the TI and annotated on the Limited Certification Form. *Band 1 not calibrated due to the frequency range of the Phase Noise Measurement System. Annotate same on Limited Certification Form.

Table 1 (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Indicator Accuracy		
8642A	Range: Bands 1 through 8, HET	
8642B	Range. Bands 1 through 9,HET Accuracy: ±(3.5% of reading + 1% AM)	
8642A	Range. Band 9	
8642B	Range. Band 10 Accuracy: ±(5% of reading + 1% AM)	
Incidental ϕ M	Range: 1 kHz Rate 30% AM Accuracy: 0.2 radians peak	
Phase Deviation	Range: Band 10, 8642B only, 200 radians; Band 9. 100 radians; Band 8: 50 radians, Band 7: 25 radians; Band 6: 12.5 radians, Band 5: 6.25 radians; Band 4. 3.125 radians; Band 3: 1.5625 radians. Band 2. 0.78125 radians, Band 1: 6.25 radians. HET: 100 radians Accuracy: ±(5% of reading + 0.09 radians)	Measured with a Measuring Receiver
ϕM Distortion	Range: 1 kHz Rate Accuracy: <0.4%	

Table 1 (Cont.)

Test Instrument (TI) Characteristics	**Performance Specifications**	**Test Method**
Frequency Modulation		Measured with a Measuring Receiver
Maximum Peak Deviation	Range: N/A	
	Accuracy: Band 10 (8642B only), 3 MHz; Band 9, HET, 1.5 MHz, Band 8, 750 kHz; Band 7, 375 kHz; Band 6, 187 kHz, Bands 5.1, 93.8 kHz, Band 4, 46.9 kHz, Band 3, 23.4 kHz, Band 2, 11.7 kHz	
Indicator Accuracy	Range: 100 kHz Rates	Measured with a Measuring Receiver
	Accuracy: ±(5% of reading + 10 Hz)	
FM Distortion	Range: 20 Hz to 100 kHz Rates	
	Accuracy: 4% for max dc-coupled deviation, 2% for 1/2 max dc-coupled; 0.4% for 1/15 dc-coupled	
Incidental AM	Range: 20 kHz peak deviation, 1 kHz rate, >400 kHz carrier	
	Accuracy: 0.3%	
Pulse Modulation		
ON/OFF Ratio	Range: Bands 1 through 9, HET	Verified on a Measuring Receiver
	Accuracy: >30 dB	
	Range: Band 10, 8642B only	
	Accuracy: >45 dB	
Residual Test		Measured with a Measuring Receiver
Residual AM	Range: 0.3 to 3 kHz BW	
	Accuracy: <0.01% AM rms	

Table 1 (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Residual FM	Range: 0.3 to 3 kHz BW Accuracy: Band 10, 8642B only, <5.0 Hz rms; Band 9, <2.0 Hz rms; Band 8, <1.2 Hz rms, Bands 1 - 7, <1.0 Hz rms, Band HET, <3.5 Hz rms Range: 0.05 to 15 kHz BW Accuracy, Band 10, 8642B only, <9.0 Hz rms; Band 9, <5.0 Hz rms, Band 8, <2.0 Hz rms, Bands 1 - 7, <1.2 Hz rms; Band HET, <5.0 Hz rms	
Internal Modulation Oscillator	Range: 20 Hz to 100 kHz Accuracy: 2% of reading Range: 0 to 3 Volts peak Accuracy, ±(4% of setting + 15 mV)	Measured with an Audio Analyzer
Distortion	Range: 0.02 to 15.8 kHz Accuracy: <0.02% Range: >15.8 kHz Accuracy: <0.15%	

2 EQUIPMENT REQUIREMENTS:

	Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.1	FREQUENCY STANDARD	Range: 10 MHz Accuracy: 1×10^{-10}	Austron 2100F	HP 5061
2.2	OSCILLOSCOPE W/PLUG-INS	Range: DC to 100 MHz Sweep Speed to 0.01 µsec/dev Accuracy: ±3%	Tektronix 7904 Opt 02 W/ 7A26 and 7B92A	Tek 465M

	Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.3	MICROWAVE MEASUREMENT SYSTEM	Range: 0.15 to 2115 MHz Accuracy: N/A Range: +20 to -20 dBm Accuracy: ±0.2 dB Frequency Range (Tuned Power, 2.5 to 1300 MHz) Range: 0 to -127 dBm Accuracy: ±0.5 dB Modulation Accuracy ±2% of reading, FM Rejection: <0.2% AM (50 kHz FM), AM Rejection: <30 Hz at 50% AM (3 kHz BW), Audio Distortion (Typical Residual): <-60 dB	Hewlett Packard 8902MS	
2.4	SENSOR MODULE	Range: -20 to +30 dBm Accuracy: ±3%	Hewlett Packard 11722A	
2.5	AUDIO ANALYZER	Range: 20 Hz to 100 kHz Accuracy: The higher of 0.01% (-80 dB) or 30 µV, 20 Hz to 20 kHz, 80 kHz BW; The higher of 0.032% (-70 dB) or 95 µV, 20 to 50 kHz, 500 kHz BW; The higher of 0.056% (-65 dB) or 169 µV, 50 to 100 kHz, 500 kHz BW	Hewlett Packard 8903B	
2.6	SPECTRUM ANALYZER	Range: 100 kHz to 2115 MHz Accuracy: ±1 dB	Hewlett Packard 8566B	
2.7	PHASE NOISE MEASUREMENT SYSTEM	Range: 5 MHz to 2 GHz Accuracy: ±2 dB TAR: 1 to 1	Hewlett-Packard 3048MS	

3 PRELIMINARY OPERATIONS:

3.1 Review and become familiar with the entire procedure before beginning the 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.

3.2 Connect the TI to appropriate power source and allow a thirty minute warm- up.

3.3 TIME BASE AGING OFFSET CHECK, Opt 001 Only:

NOTE

Before Aging Rate Tests are performed, the TI must have a 8 day warm-up if it has been disconnected from the main power source for more than 24 hours, or if it has been disconnected from the main power source for less than 24 hours it must have a 24 hour warm-up.

3.3.1 Connect TI 10 MHz OSC OUTPUT (on rear panel) to Oscilloscope CH 1 INPUT. Connect Oscilloscope EXT TRIG IN to Frequency Standard 10 MHz FREQ OUT.

3.3.2 Adjust Oscilloscope controls as required to obtain a trace on CRT at the sweep speeds shown below.

3.3.3 Adjust TI OSC ADJ for minimum movement of the Oscilloscope trace (1×10^{-9}). The TI offset from the reference frequency can be determined by following the Note and example as shown.

NOTE

	SWEEP SPEED			
MOVEMENT	1 µs/div	0.1 µs/div	0.01 µs/div	NOTE
1 div/sec	1×10^{-6}	1×10^{-7}	1×10^{-8}	Time Scope Trace movement with second hand of watch or clock
1 div/10 sec	1×10^{-7}	1×10^{-8}	1×10^{-9}	
1 div/100 sec	1×10^{-8}	1×10^{-9}	1×10^{-10}	

For example: If the trace moves 1 centimeter in 10 seconds and the sweep speed is 0.01 µs/div, the oscillator is within 1×10^{-9} of the reference frequency. Adjustment of the Time Base Oscillator is normal due to the aging rate of the crystal. This is common to all Quartz Oscillators. NO REPAIR OR ADJUSTMENT ACTION should be entered into the Maintenance Data Collection System
unless TI will not adjust to the minimum offset shown in Table 1.

3.3.4 Allow TI 10 MHz Oscillator a minimum of 1 hour to restabilize and repeat steps 3.3.2 and 3.3.3 as required.

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

3.5 Due to the Standards available TI SSB Phase Noise is limited to the specifications shown in parenthesis in Table 1 for 20 and 200 kHz offsets. TI SSB Phase Noise Band 1 is not calibrated. Attached a Limited Certification Label annotating these limitations.

4 CALIBRATION PROCESS:

NOTE

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

4.1 RF POWER OUTPUT CALIBRATION:

4.1.1 Using the instructions in the 8902A Measuring Receiver Basic Operation and Application Guide, enter the Calibration Factors of the Sensor Module to be used in this procedure.

4.1.2 Zero the Measuring Receiver and calibrate it for RF Power mode.

4.1.3 Connect Sensor Module cable to Measuring Receiver and Sensor to TI RF OUTPUT. Connect TI 10 MHz OUTPUT to Measuring Receiver EXT REF INPUT.

4.1.4 On TI, press INSTRUMENT PRESET and set to +10.0 dBm.

4.1.5 On the Measuring Receiver, press INSTRUMENT PRESET, measurement mode to RF POWER and display to LOG (dBm).

4.1.6 Set the RF Frequency of the TI and the Measuring Receiver to the frequencies listed in Table 2.

4.1.7 Read and record the dB value on the Measuring Receiver at each setting listed in the Frequency column of Table 2.

Table 2.

Frequency (MHz)	Results (dBm)
0.15	
0.3	
1.0	
3.0	
10.0	
30.0	
100.0	
200.0	
300.0	
400.0	
500.0	

Table 2 (Cont.)

Frequency (MHz)	Results (dBm)
600.0	
700.0	
800.0	
900.0	
1000.0	
2000.0 (8642B only)	

4.1.8 In the readings taken above identify the maximum (P_{max}) and minimum (P_{min}) power levels. Compute the worst case flatness error using the formula:

$$dB = \left(\frac{P_{MAX} - P_{MIN}}{2} \right)$$

4.1.9 The worst case flatness must be less than 0.75 dB.

4.1.10 To check the TI HET band level accuracy key in SPCL 8 to enable the HET Band and set frequency to 0.1 MHz.

4.1.11 Set the Measuring Receiver to 0.1 MHz and display to linear.

4.1.12 Set the TI to the amplitude levels listed in Table 3 and verify that the readings displayed on the Measuring Receiver are within the limits given for each level

Table 3.

Band	Applied (dBm)	Limits (mW) Min	Max
HET	+18	50.12	79.43
	+9.9	7.762	12.30
	+5.0	2.510	3.981
	0	0.7943	1.259
	-10.0	0.07943	0.1259
	-20.0	0.007943	0.01259

4.1.13 On the TI key in SPCL 0 to disable the HET band Set the TI (Band, Ampltd dBm, and TI Freq MHz) and the Measuring Receiver (Measuring Receiver and Measuring Receiver Mode) to the values listed in the appropriate columns of Table 4.

NOTE

The frequency range of the Measuring Receiver in the TUNED RF mode is 150 kHz to 1300 MHz. The frequency range of the Measuring Receiver with the Sensor 11722A for RF POWER measurements is 100 kHz to 2.6 GHz. The calibration factors entered in step 4.1.1 are for the 100 kHz to 2.6 GHz frequency range.

All measurements in this paragraph are using the Measurement Receiver and the Sensor 11722A

In the following steps, at all 0 amplitude settings, change Measuring Receiver measurement mode to TUNED RF, and on the TI key in INCR SET, 10 dBm. This will enable the step function to be used. Also, on the Measuring Receiver return to 0 dBm at the end of each band and store the instrument configuration.

4.1.14 Verify that the indications on the Measurement Receiver are within the values listed in the Results (Watts) column of Table 4.

Table 4.

Band	Amptd dBm	TI Freq MHz	Measuring Receiver Receiver MHz	Measuring Mode	Results (Watts) Min	Max
1	+20	3	3	RF POWER	79.43E-03	125.9E-03
	+9.9	3	3	RF POWER	7.762E-03	12.30E-03
	+5	3	3	RF POWER	2.510E-03	3.981E-03
1	0[1]	3	3	TUNED RF	0.794E-06	1.259E-03
	-10	3	3	TUNED RF	79.43E-06	125.9E-06
	-20	3	3	TUNED RF	7.943E-06	12.59E-06
	-30	3	3	TUNED RF	794.3E-09	1.259E-06
	-40[1]	3	3	TUNED RF	79.43E-09	125.9E-09
	-50	3	3	TUNED RF	7.943E-09	12.59E-09
	-60	3	3	TUNED RF	794.3E-12	1.259E-09
	-70	3	3	TUNED RF	79.43E-12	125.9E-12
	-80[1]	3	3	TUNED RF	7.943E-12	12.59E-12
	-90	3	3	TUNED RF	794.3E-15	1.259E-12

Table 4 (Cont.)

Band	Amptd dBm	TI Freq MHz	Measuring Receiver Receiver MHz	Measuring Mode	Results (Watts) Min	Max
	-100	3	3	TUNED RF	79.43E-15	125.9E-15
	-110	3	3	TUNED RF	7.943E-15	12.59E-15
	-120	3	3	TUNED RF	794.3E-18	1.259E-15
	-127	3	3	TUNED RF	158.5E-18	251.2E-18
	0[2]	3	3	TUNED RF	------	------
3	+20	10	10	RF POWER	79.43E-03	125.9E-03
	+9.9	10	10	RF POWER	7.762E-03	12.30E-03
	+5	10	10	RF POWER	2.510E-03	3.981E-03
3	0[1]	10	10	TUNED RF	794.3E-06	1.259E-03
	-10	10	10	TUNED RF	79.43E-06	125.9E-06
	-20	10	10	TUNED RF	7.943E-06	12.59E-06
	-30	10	10	TUNED RF	794.3E-09	1.259E-06
	-40[1]	10	10	TUNED RF	79.43E-09	125.9E-09
	-50	10	10	TUNED RF	7.943E-09	12.59E-09
	-60	10	10	TUNED RF	794.3E-12	1.259E-09
	-70	10	10	TUNED RF	79.43E-12	125.9E-12
	-80[1]	10	10	TUNED RF	7.943E-12	12.59E-12
	-90	10	10	TUNED RF	794.3E-15	1.259E-12
	-100	10	10	TUNED RF	79.43E-15	125.9E-15
	-110	10	10	TUNED RF	7.943E-15	12.59E-15
	-120	10	10	TUNED RF	794.3E-18	1.259E-15
	-127	10	10	TUNED RF	158.5E-18	251.2E-18
	0[3]	10	10	TUNED RF	------	------

[1] On the Measuring Receiver press CALIBRATE before continuing test.

[2, 3] On the Measuring Receiver, press blue SHIFT, STORE, followed by the numeric key indicated by the note number.

Table 4 (Cont.)

Band	Amptd dBm	TI Freq MHz	Measuring Receiver Receiver MHz	Measuring Mode	Results (Watts) Min	Max
6	+20	100	100	RF POWER	79.43E-03	125.9E-03
	+9.9	100	100	RF POWER	7.762E-03	12.30E-03
	+5	100	100	RF POWER	2.510E-03	3.981E-03
6	0[1]	100	100	TUNED RF	794.3E-06	1.259E-03
	-10	100	100	TUNED RF	79.43E-06	125.9E-06
	-20	100	100	TUNED RF	7.943E-06	12.59E-06
	-30	100	100	TUNED RF	794.3E-09	1.259E-06
	-40[1]	100	100	TUNED RF	79.43E-09	125.9E-09
	-50	100	100	TUNED RF	7.943E-09	12.59E-09
	-60	100	100	TUNED RF	794.3E-12	1.259E-09
	-70	100	100	TUNED RF	79.43E-12	125.9E-12
	-80[1]	100	100	TUNED RF	7.943E-12	12.59E-12
	-90	100	100	TUNED RF	794.3E-15	1.259E-12
	-100	100	100	TUNED RF	79.43E-15	125.9E-15
	-110	100	100	TUNED RF	7.943E-15	12.59E-15
	-120	100	100	TUNED RF	794.3E-18	1.259E-15
	-127	100	100	TUNED RF	158.5E-18	251.2E-18
	0[4]	100	100	TUNED RF	------	------
8	+19[8]	500	500	RF POWER	63.09E-03	100.0E-03
	+18[9]	500	500	RF POWER	50.12E-03	79.43E-03
	+9.9	500	500	RF POWER	7.762E-03	12.30E-03
	+5	500	500	RF POWER	2.510E-03	3.981E-03
8	0[1]	500	500	TUNED RF	794.3E-06	1.259E-03
	-10	500	500	TUNED RF	79.43E-06	125.9E-06
	-20	500	500	TUNED RF	7.943E-06	12.59E-06

Table 4 (Cont.)

Band	Amptd dBm	TI Freq MHz	Measuring Receiver Receiver MHz	Measuring Mode	Results (Watts) Min	Max
	-30	500	500	TUNED RF	794.3E-09	1.259E-06
	-40[1]	500	500	TUNED RF	79.43E-09	125.9E-09
	-50	500	500	TUNED RF	7.943E-09	12.59E-09
	-60	500	500	TUNED RF	794.3E-12	1.259E-09
	-70	500	500	TUNED RF	79.43E-12	125.9E-12
	-80[1]	500	500	TUNED RF	7.943E-12	12.59E-12
	-90	500	500	TUNED RF	794.3E-15	1.259E-12
	-100	500	500	TUNED RF	79.43E-15	125.9E-15
	-110	500	500	TUNED RF	7.943E-15	12.59E-15
	-120	500	500	TUNED RF	794.3E-18	1.259E-15
	-127	500	500	TUNED RF	158.5E-18	251.2E-18
	0[5]	500	500	TUNED RF	------	------

[1] On the Measuring Receiver press CALIBRATE before continuing test.

[4], [5] On the Measuring Receiver, press blue SHIFT, STORE, followed by the numeric key indicated by the note number.

[8] 8642B only

[9] 8642A only

9	+17[8]	1000	1000	RF POWER	39.81E-03	63.09E-03
	+16[9]	1000	1000	RF POWER	31.62E-03	50.12E-03
	+9.9	1000	1000	RF POWER	7.762E-03	12.30E-03
	+5	1000	1000	RF POWER	2.510E-03	3.981E-03
9	0[1]	1000	1000	TUNED RF	794.3E-06	1.259E-03
	-10	1000	1000	TUNED RF	79.43E-06	125.9E-06
	-20	1000	1000	TUNED RF	7.943E-06	12.59E-06
	-30	1000	1000	TUNED RF	794.3E-09	1.259E-06
	-40[1]	1000	1000	TUNED RF	79.43E-09	125.9E-09

Table 4 (Cont.)

Band	Amptd dBm	TI Freq MHz	Measuring Receiver Receiver MHz	Measuring Mode	Results (Watts) Min	Max
	-50	1000	1000	TUNED RF	7.943E-09	12.59E-09
	-60	1000	1000	TUNED RF	794.3E-12	1.259E-09
	-70	1000	1000	TUNED RF	79.43E-12	125.9E-12
	-80[1]	1000	1000	TUNED RF	7.943E-12	12.59E-12
	-90	1000	1000	TUNED RF	794.3E-15	1.259E-12
	-100	1000	1000	TUNED RF	79.43E-15	125.9E-15
	-110	1000	1000	TUNED RF	7.943E-15	12.59E-15
	-120	1000	1000	TUNED RF	794.3E-18	1.259E-15
	-127	1000	1000	TUNED RF	158.5E-18	251.2E-18
	0[6]	1000	1000	TUNED RF	------	------
10^8	+16	1300	1300	RF POWER	31.62E-03	52.12E-03
	0[1]	1300	1300	TUNED RF	794.3E-06	1.259E-03
	-10	1300	1300	TUNED RF	79.43E-06	125.9E-06
	-20	1300	1300	TUNED RF	7.943E-06	12.59E-06
	-30	1300	1300	TUNED RF	794.3E-09	1.259E-06
	-40[1]	1300	1300	TUNED RF	79.43E-09	125.9E-09
	-50	1300	1300	TUNED RF	7.943E-09	12.59E-09
	-60	1300	1300	TUNED RF	794.3E-12	1.259E-09
	-70	1300	1300	TUNED RF	79.43E-12	125.9E-12
	-80[1]	1300	1300	TUNED RF	7.943E-12	12.59E-12
	-90	1300	1300	TUNED RF	794.3E-15	1.259E-12
	-100	1300	1300	TUNED RF	79.43E-15	125.9E-15
	-110	1300	1300	TUNED RF	7.943E-15	12.59E-15
	-120	1300	1300	TUNED RF	794.3E-18	1.259E-15
	-127	1300	1300	TUNED RF	158.5E-18	251.2E-18

Table 4 (Cont.)

Band	Amptd dBm	TI Freq MHz	Measuring Receiver Receiver MHz	Measuring Mode	Results (Watts) Min	Max
	0[7]	1300	1300	TUNED RF	------	------
10[8]	+16	2000	2000	RF POWER	31.62E-03	50.12E-03
	+9.9	2000	2000	RF POWER	7.762E-03	12.30E-03
	+5	2000	2000	RF POWER	2.510E-03	3.981E-03
	0	2000	2000	RF POWER	794.3E-06	1.259E-03
	-10	2000	2000	RF POWER	79.43E-06	125.9E-06
	-20	2000	2000	RF POWER	7.943E-06	12.59E-06

[1] On the Measuring Receiver press CALIBRATE before continuing test.

[6], [7] On the Measuring Receiver, press blue SHIFT, STORE, followed by the numeric key indicated by the note number.

[8] 8642B only

[9] 8642A only

4.2 HARMONICS, SUBHARMONICS, AND NON-HARMONICS CALIBRATION:

4.2.1 With the equipment still connected as previously instructed, press INSTRUMENT PRESET on the TI and the Measuring Receiver.

NOTE

In this procedure the Measuring Receiver is used to measure the power level at the harmonic or sub-harmonic frequency. To do this, the Measuring Receiver must have been calibrated over the full power measurement range at that frequency. If the Measuring Receiver was just used in the Level Accuracy Calibration, this requirement has been met.

4.2.2 Set the Measuring Receiver to TUNED RF LEVEL mode.

4.2.3 Set the TI amplitude and frequency to the values in Table 5. Set the Measuring Receiver to the frequencies in the third column of Table 5, Harmonic/Sub-Harmonic (MHz). Verify that the displayed level is below the specified minimum listed in Table 5.

Table 5.

TI Amptd (dBm)	TI Freq (MHz)	Harmonic/Sub-Harmonic (MHz)	Minimum (Watts)
+14	1.000000	3.0[2]	25.12E-06
+14	1.500000	3.0	25.12E-06
+14	166.666667	500.0[5]	25.12E-06
+14	250.000000	500.0	25.12E-06
+10	2000.000000[1]	1000.0[6]	316.2E-09
+14	500.000000	1000.0	25.12E-06
+14	333.333333	1000.0	25.12E-06

[1] 8642B only

[2], [3], [5], [6] On the Measuring Receiver, press blue SHIFT, RECALL, followed by the numeric key indicated by this note.

4.2.4 To check the spurious signals, perform a center frequency calibration on the Spectrum Analyzer.

4.2.5 Disconnect test set-up and connect TI RF OUTPUT to Spectrum Analyzer RF INPUT. Connect TI 10 MHz OUTPUT to Spectrum Analyzer EXTERNAL REFERENCE.

4.2.6 Set Spectrum Analyzer controls as follows:

INSTRUMENT PRESET	
SPAN	0 kHz
RESOLUTION BANDWIDTH	10 Hz

4.2.7 On the TI press INSTRUMENT PRESET.

4.2.8 On the TI, set the frequency and amplitude to the values listed in Table 6. Set the Spectrum Analyzer's reference level and frequency to the values given in Table 6.

4.2.9 All spurious signals must be below the level stated in the TI Min. column in Table 6.

NOTE

In order to obtain the maximum sensitivity, this test requires driving the input of the Spectrum Analyzer above its optimum level. This could cause the generation of spurious signals in the Spectrum Analyzer. If a spurious signal is observed, change the TI frequency. If the spurious disappears, it most likely is from the TI. If the spurious moves with the TI signal, it is probably generated in the Spectrum Analyzer.

Table 6.

TI Amptd (dBm)	TI Freq (MHz)	Spectrum Analyzer Center Freq (MHz)	Ref Level (dBm)	Min (dBm)
+20	4.130000	85.870000	+10	-80
+20	4.130000	3.700000	+10	-80
+20	4.130000	0.430000	+10	-80
+20	4.130000	4.560000	+10	-80
+20	4.130000	5.870000	+10	-80
+5	4.130000	45.000000	-5	-95
+5	4.130000	225.000000	-5	-95
+6	90.000000	112.500000	-5	-94
+6	600.000000	596.313000	-5	-94
+6	600.000000	599.078400	-5	-94
+6	571.144000	572.796000	-5	-94
+6	610.519000	612.171000	-5	-94
+6	745.951000	747.608000	-5	-94
+6	775.184000	776.836000	-5	-94
+6	780.184000	781.840000	-5	-94
+6	797.878000	799.536000	-5	-94
+6	965.416000	967.076000	-5	-94
+6	1012.000000	788.000000	-5	-94
+6	967.000000	742.500000	-5	-94
+6	562.000000	606.500000	-5	-94
+6	1057.500000	1012.500000	-5	-94
+6	1057.500000	1057.375000	-5	-94
+6	563.000000	540.500000	-5	-94

4.2.10 Disconnect the TI from the Spectrum Analyzer.

4.3 SINGLE-SIDEBAND PHASE NOISE CALIBRATION:

NOTE

In order to meet the required accuracy for this parameter, the 3 Source Comparison Method must be used. This involves 3 measurements of 3 different pairs (i.e. A v B, A v C, and B v C) and storing the results. The System software will then manipulate the stored results to determine the phase noise of the TI.

4.3.1 Set TI FREQUENCY to 5 MHz and RF LEVEL to +0 dBm

4.3.2 The Phase Noise Measurement System with automation package, CPIN number 88M-3048MS/NOISE-F001-00A-001, is used to calibrate single-sideband phase noise. The Main Menu should be present on the screen when the computer is turned on.

4.3.3 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 Freq to 10 kHz, Stop Freq to 250.E+03 (250 kHz), and Average to 20. Press ESC to return to Main Menu.

4.3.4 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	5.E+06 Hz
Detector Input Frequency	5.E+06 Hz
VCO Tune Constant	05 Hz/Volt
Center Voltage of VCO Tune Curve	0 Volts
Tuning Range of VCO	10 Volts
VCO Tune Port Input Resistance	600 Ohms

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

4.3.5 Select Calibration Technique and press F2 to select Measure the Tune Constant. Press ESC to return to Main Menu when done with selection.

4.3.6 On Phase Noise Measurement System select Instrument Control to obtain the source control for Measurement Using a Phase Lock Loop Menu. Select UUT USER'S SRCE MANUAL CTRL and REF SOURCE 8663A SYSTEM CTRL. Select REF SOURCE 8663A to DCFM control. Press ESC.

4.3.7 On Phase Noise Measurement System press Define Graph. Enter graph title as appropriate for your set-up. Enter in the proper blocks the following data:

Minimum X coordinate	10.E+3
Maximum X coordinate	250.E+03
Maximum Y coordinate	-100
Minimum Y coordinate	-155

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

4.3.8 On Phase Noise Measurement System select New Measurement. The equipment should be connected as shown on the CRT. The RF OUT of the System Sources (referred to as A and B) are connected to INPUTS of the System Phase Noise Interface. Verify a Beat Note below the value on the screen is present on the Signal Analyzer. Then press F1 Proceed softkey.

4.3.9 When REF #11 appears on the screen press P to proceed. The Phase Noise Measurement System should proceed without error and the Phase Noise Plot should appear on the display screen.

4.3.10 From the Main Menu select File System, then Store File. Enter the path and type in a file name for A v B measurement. (Hint: Include the frequency of the measurement in the file name since several frequencies will be measured and stored.) Press ESC.

4.3.11 With Source A still connected to the System Interface, connect C (TI) FM/ϕ M INPUT to the Interface in place of B. On TI press EXT DC. Repeat steps 4.3.4 through 4.3.10 for A v C. Store data as A v C measurement.

4.3.12 With C (TI) still connected to the Interface, connect Source B to the System Interface. Repeat steps 4.3.4 through 4.3.10 for B v C. Store data as B v C measurement.

4.3.13 Return to Main Menu. Select Parameters to change Carrier Frequency, Detector Input Freq, and TI FREQUENCY to 6 MHz. Repeat steps 4.3.8 through 4.3.12 for 6 MHz.

4.3.14 Set TI FREQUENCY to 12 MHz. Return to Parameters and change Carrier Frequency and Detector Input Freq to 12 MHz. Repeat steps 4.3.8 through 4.3.12 for 12 MHz.

4.3.15 Set TI FREQUENCY to 24 MHz. Return to Parameters and change Carrier Frequency and Detector Input Freq to 24 MHz. Repeat steps 4.3.8 through 4.3.12 for 24 MHz.

4.3.16 Set TI FREQUENCY to 50 MHz. Return to Parameters and change Carrier Frequency and Detector Input Freq to 50 MHz. Repeat steps 4.3.8 through 4.3.12 for 50 MHz.

4.3.17 Set TI FREQUENCY to 100 MHz. Return to Parameters and change Carrier Frequency and Detector Input Freq to 100 MHz. Repeat steps 4.3.8 through 4.3.12 for 100 MHz.

4.3.18 Set TI FREQUENCY to 200 MHz. Return to Parameters and change Carrier Frequency and Detector Input Freq to 200 MHz. Repeat steps 4.3.8 through 4.3.12 for 200 MHz.

4.3.19 Set TI FREQUENCY to 400 MHz. Return to Parameters and change Carrier Frequency and Detector Input Freq to 400 MHz. Repeat steps 4.3.8 through 4.3.12 for 400 MHz.

4.3.20 Set TI FREQUENCY to 800 MHz. Return to Parameters and change Carrier Frequency and Detector Input Freq to 800 MHz. Repeat steps 4.3.8 through 4.3.12 for 800 MHz.

4.3.21 For 8642B only, set FREQUENCY to 2 GHz. Press ESC. From Main Menu select Instrument Control and select DN Converter 11729C System Control. Press ESC to return to Main Menu.

4.3.22 Return to Parameters and change Carrier Frequency to 2 GHz and Detector Input Freq to 80 MHz. Repeat steps 4.3.8 through 4.3.12 for 2 GHz.

4.3.23 From Main Menu select Manipulate Results, then select 3 and 2 Osc Comparisons, Source Files for Computation and type in the file names as stored. Press ESC.

4.3.24 Select Destination Files for Results and type in desired file name. Press ESC and select 3 Oscillator Comparison.

4.3.25 After calculations are complete select File Functions to access the Results File. Select the Graph of Results menu to display the calculated noise. To print the Noise plot and the pertinent measurement parameters on Phase Noise Measurement System press SHIFT and F4 keys.

4.3.26 The result is the phase noise of the TI and must be within the accuracy in Table 1 for the measured frequency.

4.3.27 Repeat steps 4.3.23 through 4.3.26 for every measured frequency.

4.4 AM CALIBRATION:

4.4.1 Connect TI 10 MHz OUTPUT to Measuring Receiver REF EXT INPUT. Connect Sensor Module to Measuring Receiver and to TI RF OUTPUT.

4.4.2 Preset the instruments and set the TI Output Amplitude to +10.0 dBm.

4.4.3 Set the Measuring Receiver controls as follows.

MEASUREMENT MODE	AM
DETECTOR	PEAK +
HP FILTER	300 Hz
LP FILTER	15 kHz
FM DE-EMPHASIS	OFF

4.4.4 Set the TI AM to 90%. Set the TI Frequency to the values in Table 7 and verify that the Measuring Receiver readings are within the limits specified in Table 7

Table 7.

TI Freq (MHz)	AM (%)	Min (%)	Max (%)
0.15	90	85.8	94.2
5.00	90	85.8	94.2
1050[1]	90	84.5	95.5
1300[2]	90	84.5	95.5

[1] 8642A only

[2] 8642B only

4.4.5 To check Incidental ϕ M, set the TI AM to 30%. Set the Measuring Receiver to ϕ M mode and leave the 300 Hz HP Filter and 15 kHz LP Filter enabled.

4.4.6 Set the TI RF frequency to 8.0000 MHz and verify that the Measuring Receiver reading is less than or equal to 0.20 Rad.

4.4.7 Repeat step 4.4.6 for 1300 MHz (8642B only).

4.4.8 To measure the AM Distortion, set the Measuring Receiver back to AM then to Audio Distortion mode.

4.4.9 Set the TI frequency and AM depth to the values listed in Table 8 and verify that the Measuring Receiver readings are less than the maximum value listed in Table 8.

Table 8.

Freq (MHz)	AM (%)	Max Distortion (%)
0.15	30	1.0
0.15	70	2.0
0.15	90	4.0
1050[1]	30	2.0
1050[2]	70	4.0
1050[1]	90	6.0
1300[2]	30	2.0
1300[2]	70	4.0
1300[2]	90	6.0
500	30	1.0
500	70	2.0
500	90	4.0

[1] 8642A only

[2] 8642B only

4.4.10 Set the Measuring Receiver to ϕ M mode with the 300 Hz HP Filter and the 15 kHz LP Filter selected.

4.4.11 Turn off the TI AM. Set the RF frequency and ϕ M deviation to the first value in Table 9. Verify that the Measuring Receiver reading for phase deviation is within the specified limits.

4.4.12 Set the Measuring Receiver to distortion mode and verify that the distortion reading does not exceed maximum distortion listed in Table 9.

Table 9.

Freq (MHz)	ϕ M (Rad.)	Phase Deviation ϕ M Min	ϕ M Max	Max Distortion (%)
8.00	0.781	0.651	0.909	0.4
1050	100.0	94.9	105.1	0.4
0.15	100.0	94.9	105.1	0.4

4.4.13 Repeat steps 4.4.11 and 4.4.12 for the remaining frequencies in Table 9.

4.5 FM MODULATION CALIBRATION:

4.5.1 With the equipment still connected, preset the instruments.

4.5.2 Set the Measuring Receiver to FM mode with all Filters OFF.

4.5.3 Set TI amplitude to +10 dBm. Set the TI modulation frequency, RF frequency, and FM deviation to the values given in Table 10 and verify that the deviation readings on the Measuring Receiver are within the limits given in Table 10.

Table 10.

Mod Freq (kHz)	Freq (MHz)	FM (kHz)	Min (kHz)	Max (kHz)
0.02	8	1.35	1.28	1.42
100	1050	100.0	95.0	105.0
100	256	25.0	23.7	26.3
100	256	187.0	177.6	196.4
100	256	375.0	356.2	393.8
10	8	0.781	0.732	0.830
10	8	5.85	5.55	6.15
10	8	11.7	11.1	12.3
10	4	93.8	89.1	98.5

4.5.4 Set the TI frequency to 400.0 kHz and turn off the FM

4.5.5 Set the Measuring Receiver to AM mode with 300 Hz HP Filter, 15 kHz LP Filter and the PEAK + Detector selected.

4.5.6 The Measuring Receiver's reading must be less than 30%. If the reading is too high, it means the residual AM of the Measuring Receiver (or possibly of the TI) is too high to make the incidental AM measurement. Determine the cause of the high residual AM before proceeding

4.5.7 If the reading is less than 30%, set the TI to FM, to 20 kHz deviation, and modulation frequency to 1 kHz.

4.5.8 Set the TI frequency to the settings in Table 11 and verify that the Measuring Receiver readings are less than the limit column in Table 11.

Table 11.

Freq (MHz)	Max Incidental AM (%)
100.0	0.30
1050.0	0.30
1300.0	0.30

4.5.9 Preset the instruments. Set the Measuring Receiver to FM mode Audio Distortion mode and turn off all audio filters.

4.5.10 Set the TI amplitude to +10 dBm. Set the RF frequency and FM deviation to the values listed in Table 12 and verify that the Measuring Receiver readings are less than the specified maximum listed in Table 12.

Table 12.

Freq (MHz)	FM (kHz)	Max Distortion (%)
1050	72.0	0.4
256	135.0	2.0
4	67.5	4.0

4.5.11 With TI and Measuring receiver still connected as previously instructed, connect the Audio Analyzer INPUT to Measuring Receiver MODULATION OUTPUT

4.5.12 Set the TI controls as follows.

INSTRUMENT PRESET	
AMPLITUDE	+10 dBm

4.5.13 Set the Measuring Receiver controls as follows.

INSTRUMENT PRESET	
MEASUREMENT MODE	FM
HP FILTER	ALL OFF
LP FILTER	ALL OFF
FM DE-EMPHASIS	OFF

4.5.14 Set the Audio Analyzer controls as follows.

INSTRUMENT PRESET	
MEASUREMENT MODE	DISTN
HP/BP FILTER	ALL OFF
LP FILTER	ALL OFF

4.5.15 Set the TI to the modulation frequency, RF frequency, and FM Deviation given in Table 13. Verify that the distortion readings on the Audio Analyzer are less than the maximums given in Table 13.

Table 13.

Mod Freq (kHz)	Freq (MHz)	FM (kHz)	Max Distortion (%)
0.02	8	1.35	4.0
100	1050	100.0	0.4
100	256	25.0	0.4
100	256	187.0	2.0
100	256	375.0	4.0
10	8	0.781	0.4
10	8	5.85	2.0
10	8	11.7	4.0
10	4	93.8	4.0

4.6 PULSE ON/OFF CALIBRATION:

4.6.1 Disconnect Audio Analyzer from test set-up, keeping Measuring Receiver connected to TI RF OUTPUT and 10 MHz OUTPUT.

4.6.2 Preset the instruments. Set the Measuring Receiver to Tuned RF Level mode. If the Level Accuracy Test has just been done with the same Measuring Receiver then continue with step 4.6.4. If Level Accuracy has not yet been done or you have changed Measuring Receivers then calibration is required. In this case, complete step 4.6.3 before continuing with paragraph 4.6.

4.6.3 Perform the Level Accuracy Test at 1000 MHz (also use 1300 MHz for 8642B), and 0, -40, and -80 dBm. For the Measuring Receiver store the calibration values when instructed by notes in Table 4.

4.6.4 On the TI key in AMPTD +10 dBm, SHIFT, PULSE, ON/OFF and EXT DC. This will put the TI in pulse modulation mode with the modulation waveform in its off state.

4.6.5 Put the Measuring Receiver in Tuned RF Level mode.

4.6.6 Set the TI and Measuring Receiver frequency to the values listed in Table 14 and verify that the readings are lower than the specified maximum.

Table 14.

RF Freq (MHz)	Max On/Off Ratio (W)
1000.0[6]	10.00E-6
1300.0[7] (8642B only)	316.2E-9

[6], [7] On the Measuring Receiver, press blue SHIFT, RECALL, followed by the numeric key indicated by this note.

4.7 RESIDUALS CALIBRATION:

4.7.1 With the equipment still connected as in previous test, preset the instruments. On the Measuring Receiver, enable the 300 Hz HP Filter and the 3 kHz LP Filter.

4.7.2 Put the Measuring Receiver in AM mode using the RMS Detector

4.7.3 Set the TI to the levels and frequencies in Table 15 and verify that the Measuring Receiver reading is less than the specified maximum.

Table 15.

TI Amptd (dBm)	TI Freq (MHz)	Max Residual AM (%)
18	1.0	0.010
18	1000	0.010
18	1300[1]	0.010
5	1.0	0.010
5	1000	0.010
5	1300[1]	0.010

[1] 8642B only

4.7.4 To measure residual FM, put the Measuring Receiver in FM mode and leave the RMS Detector enabled.

4.7.5 Set the TI to the levels and frequencies in Table 16 and verify that the Measuring Receiver reading is less than the specified maximum listed in Table 16.

Table 16.

TI Amptd (dBm)	TI Freq (MHz)	Max Residual FM (kHz)
10	250	0.0010
10	500	0.0012
10	1000	0.0020
10	1300 (8672B only)	0.0050

4.8 INTERNAL MODULATION OSCILLATOR CALIBRATION:

4.8.1 Connect TI MOD OUTPUT to Audio Analyzer RF INPUT.

4.8.2 Set the Audio Analyzer Filters OFF.

4.8.3 Set the TI modulation frequency and modulation output level to the values listed in Table 17. Verify that the readings are within the limits given in Table 17.

Table 17.

Modulation Frequency	Modulation Output Level	Limits Min	Max
0.020 kHz*	50 mV	46.6 mV	94.8 mV
1.000 kHz*	50 mV	46.6 mV	94.8 mV
100.0 kHz	50 mV	46.6 mV	94.8 mV
0.020 kHz*	3.00 V	4.051 V	4.433 V
1.00 kHz*	3.00 V	4.051 V	4.433 V
100.0 kHz	3.00 V	4.051 V	4.433 V

* Use the Audio Analyzer 30 kHz LP Filter at these points.

4.8.4 Set the TI modulation frequency to the values listed in Table 18 and verify that the frequency indicated on the Audio Analyzer is within the limits listed in the table.

Table 18.

Modulation Frequency	Limits Min	Max
20.0 Hz	19.6 Hz	20.4 Hz
14.9 kHz	14.6 kHz	15.2 kHz
15.1 kHz	14.8 kHz	15.4 kHz
100.0 kHz	98.0 kHz	102.0 kHz

4.8.5 Change the Audio Analyzer mode to distortion.

4.8.6 Set the TI modulation frequency and modulation output level to the values listed in Table 19. Verify that the readings are less than the limits in the maximum distortion column in Table 19.

Table 19.

Modulation Frequency (kHz)	Modulation Output Level (V)	Maximum Distortion (%)
0.020	0.50	0.02
15.80	0.50	0.02
100.0	0.50	0.15
0.020	3.00	0.02
15.80	3.00	0.02
100.0	3.00	0.15

4.8.7 Set all POWER switches to OFF, disconnect and secure all equipment.

4.8.8 Attached a Limited Certification Label as per step 3.5.

CALIBRATION PERFORMANCE TABLE

3.3 REFERENCE OSCILLATOR

Range (MHz)	Applied (MHz)	Limits
10	10	2×10^{-6} Std
		1×10^{-9} Opt 001

4.1 RF OUTPUT CALIBRATION

Level

	Range	Applied (dBm)	Limits (dB)
8642A,	Band 1 through 7	+20 to -140	±1
	Band 8, HET	+18 to -140	±1
	Band 9	+16 to -140	±1
8642B,	Band 1 through 7	+20 to -140	±1
	Band 8	+19 to -140	±1
	HET Band	+18 to -140	±1
	Band 9	+17 to -140	±1
	Band 10	+16 to -140	±1

Flatness

Range	Applied (dBm)	Limits (dB)
8642A, 100 kHz to 1057.5 MHz 8642B, 100 kHz to 2115 MHz	+10	±0.75

4.2 HARMONICS, SUBHARMONICS, and SPURIOUS CALIBRATION:

Harmonics

Range	Applied (dBm)	Limits (dBc)
Bands 1 - 9, HET	≤+10	-30
	≤+16	-20
Band 10, 8642B only	≤+10	-25
	≤+16	-20

CALIBRATION PERFORMANCE TABLE *(Cont.)*

4.2 HARMONICS, SUBHARMONICS, and SPURIOUS CALIBRATION: *(Cont.)*

Subharmonics

Range		Applied (dBm)		Limits (dBc)
Bands 1 - 9, HET	N/A		None	
Band 10, 8642B only		+10		-45

Spurious

Range	Applied (dBm)	Limits (dBc)
Bands 1 - 9	+20	-100
Band 10, 8642B only	+6	-94

4.3 SINGLE-SIDEBAND PHASE NOISE CALIBRATION.

Range		Applied (kHz offset)		Limits (dBc/Hz)
Band 10	20		-125	
Band 9		20		-130
Band 8		20		-137
Band 7		20		-141
Band 6		20		-144
Band 5		20		-137
Band 4		20		-137
Band 3		20		-137
Band 2		20		-137
Band 1		20		-137
HET		20		-125
Band 10	200		-134	
Band 9		200		-130
Band 8		200		-137
Band 7		200		-142
Band 6		200		-145
Band 5		200		-137

CALIBRATION PERFORMANCE TABLE *(Cont.)*

4.3 SINGLE-SIDEBAND PHASE NOISE CALIBRATION: *(Cont.)*

Band 4	200	-137
Band 3	200	-137
Band 2	200	-137
Band 1	200	-138
HET	200	-137

4.4 AMPLITUDE MODULATION CALIBRATION

AM Distortion

Range	Applied (%)	Limits (%)
8642A		
Bands 1 - 8	30	<1
	70	<2
	90	<4
Band 9, HET	30	<2
	70	<4
	90	<6
8642B		
Bands 1 - 9	30	<1
	70	<2
	90	<4
Band 10, HET	30	<2
	70	<4
	90	<6

Indicator Accuracy

Range	Applied (%)	Limits (%)
8642A		
Bands 1 - 8, HET	90	85.8 to 94.2
Band 9	90	84.5 to 95.5

CALIBRATION PERFORMANCE TABLE *(Cont.)*

4.4 AMPLITUDE MODULATION CALIBRATION: *(Cont.)*

Indicator Accuracy

Range		Applied (%)	Limits (%)
8642B			
Bands 1 - 9, HET	90		85.8 to 94.2
Band 10	90		84.5 to 95.5

Incidental ϕ M

Range (kHz)	Applied (% AM)	Limits (radians)
1	30	0.2

Phase Deviation

Range (MHz)	Applied (ϕ M)	Limits (radians)
8	0.781	0.651 to 0.909
1050	100.0	94.9 to 105.1
0.15	100.0	94.9 to 105.1

ϕ M Distortion

Range (MHz)	Applied (kHz)	Limits (%)
0.15 to 1050	1	0.4

4.5 FREQUENCY MODULATION CALIBRATION:

Indicator Accuracy

Range (MHz)	Applied (kHz)	Limits (kHz)
8	1.35	1.28 to 1.42
1050	100.0	95.0 to 105.0
256	25.0	23.7 to 26.3
256	187.0	177.6 to 196.4
256	375.0	356.2 to 393.8
8	0.781	0.732 to 0.830
8	5.85	5.55 to 6.15

CALIBRATION PERFORMANCE TABLE *(Cont.)*

4.5 FREQUENCY MODULATION CALIBRATION: *(Cont.)*

Indicator Accuracy

Range (MHz)	Applied (kHz)	Limits (kHz)
8	11.7	11.1 to 12.3
4	93.8	89.1 to 98.5

Incidental AM

Range (MHz)	Applied (kHz)	Limits (kHz)
100	1	0.30
1050	1	0.30
1300	1	0.30

FM Distortion

Range (MHz)	Applied (kHz)	Limits (kHz)
1050	72	0.4
256	135	2.0
4	67.5	4.0

4.6 PULSE MODULATION CALIBRATION:

ON/OFF Ratio

Range	Applied (MHz)	Limits (dB)
Bands 1 - 9, HET	1000	>30
Band 10, 8642B only	1300	>45

4.7 RESIDUAL CALIBRATION:

AM

Range (MHz)	Applied (dBm)	Limits (% AM)
1.0	18	0.010
1000	18	0.010
13000 (8642B only)	18	0.010
1.0	5	0.010
1000	5	0.010

CALIBRATION PERFORMANCE TABLE *(Cont.)*

4.7 RESIDUAL CALIBRATION: *(Cont.)*

AM

Range (MHz)	Applied (dBm)	Limits (% AM)
13000 (8642B)	5	0.010

FM

Range	Applied (kHz BW)		Limits (Hz rms)
Band 10 (8642B)	0.3 to 3	<5.0	
Band 9	0.3 to 3	<2.0	
Band 8	0.3 to 3	<1.2	
Bands 1 - 7	0.3 to 3	<1.0	
HET Band	0.3 to 3	<3.5	
Band 10 (8642B)	0.05 to 15	<9.0	
Band 9	0.05 to 15		<5.0
Band 8	0.05 to 15		<2.0
Bands 1 - 7	0.05 to 15		<1.2
HET Band	0.05 to 15		<5.0

4.8 INTERNAL MODULATION CALIBRATION:

Frequency

Range kHz	Applied (kHz Mod)	Limits (Hz)
0.02 to 100	0.02	19.6 to 20.4
	14.9	14.6k to 15.2k
	15.1	14.8k to 15.4k
	100	98k to 102k
0.020	50m	46.6m to 94.8m
1.000	50m	46.6m to 94.8m
100	50m	46.6m to 94.8m
0.020	3.0	4.051 to 4.433

CALIBRATION PERFORMANCE TABLE *(Cont.)*

4.8 INTERNAL MODULATION CALIBRATION: *(Cont.)*

Range kHz Mod	Applied (V)	Limits (%)
1.00	3.0	4.051 to 4.433
100	3.0	4.051 to 4.433
Distortion		
0.020	0.50	0.02
15.80	0.50	0.02
100.0	0.50	0.15
0.020	3.00	0.02
15.80	3.00	0.02
100.0	3.00	0.15