T.O. 33K4-4-260-1

TECHNICAL MANUAL

CALIBRATION PROCEDURE

FOR

SYNTHESIZED SIGNAL GENERATOR

8642A (), 8642B ()

(HEWLETT-PACKARD)

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SYNTHESIZED SIGNAL GENERATOR

8642A (), 8642B ()

(HEWLETT-PACKARD)

1 CALIBRATION DESCRIPTION:

Table 1.

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Frequency Accuracy		
Reference Oscillator	Range: 10 MHz Accuracy: (STD) * Aging/year: ±2 X 10^{-6} (Not adjusted) * Temperature: ±4 X 10^{-6} (0 to 55 °C) * Line Voltage: ±1 X 10^{-7} *for a +5% to -10% change in line voltage* Accuracy: (OPT 001) Aging/day: <1 X 10^{-9} * Temperature: ±7 X 10^{-9} (0 to 55 °C) * Line Voltage: ±3 X 10^{-9} *for a +5% to -10% change in line voltage*	TI compared to a Frequency Standard
Display		
8642A	Range: 100 kHz to 1057.5 MHz Accuracy: ±1 count of LSD	Compared to an Electronic Counter
8642B	Range: 100 kHz to 2115 MHz Accuracy: ±1 count of LSD	
RF Output Power		
8642A	Range: +20 to -140 dBm, Bands 1 through 7; +18 to -140 dBm, Band 8, HET Band; +16 to -140 dBm, Band 9	Measured with a Sensor Module and Microwave Measurement System
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 Microwave Measurement System
Flatness	Range: +10 dBm Output Level Accuracy: <±0.75 dB	

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Spurious Signals		
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	Measured with a Spectrum Analyzer
Subharmonics	Range: Bands 1 through 9, HET Accuracy: None Range: Band 10, (8642B only) Accuracy: ≤-45 dBc	Measured with a Spectrum Analyzer
Non-Harmonics	Range: Bands 1 through 9 @ >10 kHz from the carrier Accuracy: ≤-100 dBc Range: Band 10, (8642B only) @ >10 kHz from the carrier Accuracy: ≤-94 dBc	Measured with a Spectrum Analyzer
SSB Phase Noise	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 System

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
SSB Phase Noise *(Cont.)*	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 System
Amplitude Modulation	Range: 0 to 99.9% depth Accuracy: See Indicator Accuracy	Measured with a Microwave Measurement System
Indicator Accuracy		
8642A	Range: Bands 1 through 8, HET	
8642B	Range: Bands 1 through 9, HET Accuracy: ±(3.5% of setting +1% AM) @ 1 kHz rate, up to 90% AM	
8642A	Range: Band 9	
8642B	Range: Band 10 Accuracy: ±(5% of setting +1% AM) @ 1 kHz rate, up to 90% AM	
Incidental ∅ M	Range: 1 kHz rate and 30% AM Accuracy: <0.2 radians peak	
AM Distortion		Measured with a Microwave Measurement System
8642A	Range: Bands 1 through 8 Accuracy: <1% @ 0 to 30% AM; <2% @ 30 to 70% AM; <4% @ 70 to 90% AM	

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Amplitude Modulation *(Cont.)*		Measured with a Microwave Measurement System
AM Distortion *(Cont.)*		
8642A *(Cont.)*	Range: Band 9, HET Accuracy: <2% @ 0 to 30% AM; <4% @ 30 to 70% AM; <6% @ 70 to 90% AM	
8642B	Range: Bands 1 through 9 Accuracy: <1% @ 0 to 30% AM; <2% @ 30 to 70% AM; <4% @ 70 to 90% AM Range: Band 10, HET Accuracy: <2% @ 0 to 30% AM; <4% @ 30 to 70% AM; <6% @ 70 to 90% AM	
Phase Modulation		
Maximum Phase Deviation	Range: Band 10: 200 radians, (8642B only); 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 setting +0.09 radians) @ 1 kHz rate	Measured with a Microwave Measurement System
∅ M Distortion	Range: 1 kHz rate Accuracy: <0.4% @ 1 kHz rate	

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Frequency Modulation		
Maximum Peak Deviation	Range: N/A Accuracy: Band 10: 3 MHz (8642B only); Band 9 and HET: 1.5 MHz; Band 8: 750 kHz; Band 7: 375 kHz; Band 6: 187.5 kHz; Bands 5 and 1: 93.75 kHz; Band 4: 46.875 kHz; Band 3: 23.437 kHz; Band 2: 11.718 kHz	Measured with a Microwave Measurement System
Indicator Accuracy	Range: 20 Hz to 100 kHz rates Accuracy: ±(5% of setting + 10 Hz)	Measured with a Microwave Measurement System
Incidental AM	Range: 20 kHz peak deviation, 1 kHz rate, >400 kHz carrier frequency, Output Level ≤+15 dBm Accuracy: 0.3%	
FM Distortion	Range: 20 Hz to 100 kHz rates Accuracy: 4% for max dc-coupled deviation; 2% for 1/2 max dc-coupled deviation; 0.4% for 1/15 dc-coupled deviation	
Pulse Modulation		
ON/OFF Ratio	Range: Bands 1 through 9, HET, Output Level ≤+15 dBm Accuracy: >30 dB (S/N 2509A to 2550A); >40 dB (S/N >2551A) Range: Band 10, Output Level ≤+15 dBm (8642B only) Accuracy: >45 dB (S/N 2509A to 2550A); >80 dB (S/N >2551A)	Verified on a Microwave Measurement System
Rise/Fall Time	Range: Bands 1 through 10, HET, @ 10 to 90% Accuracy: <3.5 µs, (S/N 2509A to 2550A); <400 ns, (S/N >2551A)	Measured with an Oscilloscope

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Pulse Modulation *(Cont.)*		
Pulse Width	Range: Bands 1 through 10, HET	Measured with an Oscilloscope
	Accuracy: ≥6 µs, (S/N 2509A to 2550A); ≥2 µs, (S/N >2551A)	
Residual Test		Measured with a Microwave Measurement System
Residual AM	Range: 0.3 to 3 kHz BW	
	Accuracy: <0.01% AM rms	
Residual FM	Range: 0.3 to 3 kHz BW	
	Band 10, <5.0 Hz rms (8642B only); Band 9, <2.0 Hz rms; Band 8, <1.2 Hz rms; Bands 1 to 7, <1.0 Hz rms; Band HET, <3.5 Hz rms	
	Range: 0.05 to 15 kHz BW	
	Accuracy: Band 10, <9.0 Hz rms (8642B only); Band 9, <5.0 Hz rms; Band 8, <2.0 Hz rms; Bands 1 to 7, <1.2 Hz rms; Band HET, <5.0 Hz rms	
Internal Modulation Oscillator		
Frequency	Range: 20 Hz to 100 kHz	Measured with an Audio Analyzer
	Accuracy: 2% of setting	
Output Level	Range: 0 to 3.3 Volts pk	
	Accuracy: ±(4% + 15 mV)	
Distortion	Range: 0.02 to 15.8 kHz	Measured with an Audio Analyzer
	Accuracy: <0.02%	
	Range: >15.8 kHz	
	Accuracy: <0.15%	

* Typical or Operational specifications. Not calibrated.

** The specification in parentheses 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.

2 EQUIPMENT REQUIREMENTS:

	Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.1	FREQUENCY STANDARD	Range: 10 MHz Accuracy: 2.5 X 10^{-10}	Austron 2100F	H-P 5061
2.2	ELECTRONIC COUNTER	Range: 10 MHz Accuracy: ≤5 X 10^{-10}/day	Hewlett-Packard 5345A Opt 001	As Available
2.3	FREQUENCY COUNTER	Range: 100 kHz to 2115 MHz Accuracy: <1 X 10^{-7}/month	Hewlett-Packard 5343A	
2.4	OSCILLOSCOPE	Range: DC to 100 MHz Sweep Speed to 0.01 µsec/div Accuracy: ±3%	Tektronix 2465B	
2.5	SAMPLING OSCILLOSCOPE	Range: 100 kHz to 2115 MHz Accuracy: Rise/Fall Time <100 nsec	Tektronix 11801B	
2.6	MICROWAVE MEASUREMENT SYSTEM	Range: (RF Power) -20 to +20 dBm Accuracy: ±2% Range: (Tuned RF Level) 0 to -127 dB at 3 to 1300 MHz Accuracy: ±0.25 dB Range: (AM) 30 to 90% Accuracy: ±1.11% of setting Range: (FM) ≤400 kHz peak deviation Accuracy: ±1.25% (±5.0% @ 20 to 50 Hz modulation frequency) TAR: 1:1 at 20 to 50 Hz modulation frequency only (4:1 otherwise) Range: (Audio Distortion) 20 Hz to 50 kHz bandwidth Accuracy: ±1 dB of reading	Hewlett-Packard 8902MS	

		Minimum Use	Calibration	Sub-

Item	Noun	Specifications	Equipment
2.6	MICROWAVE MEASUREMENT SYSTEM *(Cont.)*	Audio Filters: 50 Hz High-Pass Filter, <1% at rates ≥200 Hz; 300 Hz High-Pass Filter, <1% at rates ≥1 kHz; 3 kHz Low-Pass Filter, <1% at rates ≤1 kHz; 15 kHz Low-Pass Filter, <1% at rates ≤10 kHz; >20 kHz Low-Pass Filter, <1% at rates ≤10 kHz Range: (Phase Modulation) Accuracy: ±2.75% of reading ±1 digit TAR: 1.82:1	Hewlett-Packard 8902MS
2.7	AUDIO ANALYZER	Range: 20 Hz to 100 kHz Accuracy: The higher of 0.01% (-80 dB) or 30 mV, 20 Hz to 20 kHz, 80 kHz BW; The higher of 0.032% (-70 dB) or 95 mV, 20 to 50 kHz, 500 kHz BW; The higher of 0.056% (-65 dB) or 169 mV, 50 to 100 kHz, 500 kHz BW	Hewlett-Packard 8903B
2.8	SENSOR MODULE (P/O MICROWAVE MEASUREMENT SYSTEM)	Range: -20 to +30 dBm Accuracy: ±3%	Hewlett-Packard 11722A
2.9	SPECTRUM ANALYZER	Range: 100 kHz to 2115 MHz Accuracy: ±1 dB	Hewlett-Packard 8563E
2.10	PHASE NOISE MEASUREMENT SYSTEM	Range: 5 MHz to 2 GHz Accuracy: ±2 dB TAR: 1 to 1	Hewlett-Packard 3048MS
2.11	SYNTHESIZED FUNCTION GENERATOR	Range: 100 kHz; 1 V pk Accuracy: Rise/Fall Time ≤100 ns	Hewlett-Packard 8116A

3 <u>PRELIMINARY OPERATIONS:</u>

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.

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

3.3 Connect the TI to appropriate power source, and ensure that the POWER switch is ON.

NOTE

The TI must have a 24 hour warm-up if it has been disconnected from the power source for less than 24 hours. If TI has been disconnected from the power source for 24 hours or more, the TI technically should be warmed up for 8 days. This may not be practical. Experience has shown that approximately 85% of new units and 95% of older units will be within specifications after a 24 hour warm-up. After a 24 hour warm-up, determine if the TI Reference Oscillator is warmed up to meet Aging Rate specifications by performing the Internal Time Base Aging Rate Test outline in the Performance Test of the MTO. If the Aging Rate is $\pm<1 \times 10^{-9}$/day, proceed with the calibration.

3.4 Connect test equipment to the appropriate power source, set all POWER switches to ON and allow warm-up period as required by manufacturer of test equipment.

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.

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 (except for STD TI, no adjustment of the Oscillator is possible) and enter appropriate ADJUSTMENT ACTION into the Maintenance Data Collection System.

4.1.1 Connect Frequency Standard 10 MHz REF OUT to Electronic Counter EXT FREQ STD INPUT (1-10 MHz) (rear panel) of Electronic Counter. Connect TI 10 MHz OUT (rear panel) to Electronic Counter CH A 50 Ω INPUT connector.

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 the 33K-1-100-1/2.

4.1.2 Adjust Electronic Counter controls as required for a stable display indication and then push RESET. Verify Electronic Counter indication is 9 999 996.4 to 10 000 003.6 Hz, OPT 001 (9 999 998 to 10 000 002 Hz STD TI, this is a typical, but verified specification).

4.1.3 Connect equipment as shown in Figure 1. Remove FREQ STANDARD jumper so that the connection can be made to TI EXT REF INPUT connector.

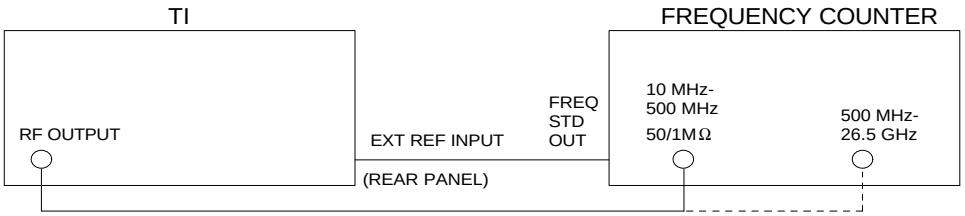

Figure 1.

4.1.4 Set Frequency Counter for 1 Hz display resolution.

4.1.5 Set TI FREQ to 4 MHz, and the AMPTD to 0 dBm, and the TI RF OFF/ON to ON.

4.1.6 The Frequency Counter must indicate 4 MHz ±1 count.

4.1.7 Increase the TI FREQ 1 Hz, then decrease the FREQ 1 Hz while observing the Frequency Counter. Ensure that the TI Output Frequency is within ±1 count.

4.1.8 Repeat step 4.1.7 using frequencies listed in the Applied FREQ column of Table 2.

Table 2.

Applied FREQ (Hz)	Limits
4 000 000	±1 count of LSD
8 000 000	±1 count of LSD
16 000 000	±1 count of LSD
33 000 000	±1 count of LSD
66 000 000	±1 count of LSD

Table 2. (Cont.)

Applied FREQ (Hz)	Limits

132 000 000	±1 count of LSD
264 000 000	±1 count of LSD
* 528 000 000	±1 count of LSD
1057 000 000	±1 count of LSD
** 2115 000 000	±1 count of LSD

* Connect TI RF OUTPUT to Frequency Counter 500 MHz to 26.5 GHz Input, as per dotted line in Figure 1.
** 8642B only.

4.1.9 Turn the TI RF OFF/ON to OFF. Disconnect the equipment shown in Figure 1.

4.2 RF POWER OUTPUT CALIBRATION:

4.2.1 On the Measuring Receiver (part of the Microwave Measurement System), enter the Calibration Factors of the Sensor Module to be used in this procedure.

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

4.2.3 Connect Sensor Module cable to Measuring Receiver and Sensor to TI RF OUTPUT. Connect TI 10 MHz OUT (rear panel) to Measuring Receiver EXT REF INPUT.

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

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

4.2.6 Set the RF FREQ of the TI and the Measuring Receiver to the frequencies listed in Table 3.

4.2.7 Read and record the dB value on the Measuring Receiver at each setting listed in the FREQ column of Table 3.

Table 3.

FREQ (MHz)	Results (dBm)
0.15	_____
0.3	_____
1.0	_____
3.0	_____
10.0	_____
30.0	_____
100.0	_____
200.0	_____

Table 3. (Cont.)

FREQ (MHz)	Results (dBm)

300.0	_____
400.0	_____
500.0	_____
600.0	_____
700.0	_____
800.0	_____
900.0	_____
1000.0	_____
2000.0 (8642B only)	_____

4.2.8 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:

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

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

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

4.2.11 Set the Measuring Receiver to 0.1 MHz and display to LINEAR.

4.2.12 Set the TI to the AMPTD levels listed in Table 4 and verify that the readings displayed on the Measuring Receiver are within the limits given for each level.

Table 4.

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

4.2.13 On the TI key in SPCL 0 to disable the HET band. Set the TI (Band, AMPTD 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 5.

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 4.2.1 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 AMPTD 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.

4.2.14 Verify that the indications on the Measurement Receiver are within the values listed in the Results (Watts) column of Table 5.

4.2.15 In Table 5 some Min and Max values are blank. For these values, the Measuring Receiver will be set up to store the settings. This is done as follows:

4.2.15.1 On the Measuring Receiver, press Blue Shift, then STORE. Enter a number (start at 1 and continue counting up as needed, i.e. 1, 2, etc.)

4.2.15.2 Record the number entered, along with the TI settings for that stored setup.

4.2.15.3 Repeat steps 4.2.15.1 and 4.2.15.2 for each Min and Max listed in Table 5 as a blank, using the next number, as required, to store the value in the Measuring Receiver.

Table 5.

Band	TI AMPTD dBm	FREQ MHz	Measuring Receiver MHz	Measuring Receiver 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
	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

Table 5. (Cont.)

TI AMPTD	FREQ	Measureing Receiver	Measuring Receiver	Results (Watts)

Band	dBm	MHz	MHz	Mode	Min	Max
1	-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
	-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
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
	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

Table 5. (Cont.)

	TI		Measureing	Measuring	Results (Watts)	
	AMPTD	FREQ	Receiver	Receiver		

Band	dBm	MHz	MHz	Mode	Min	Max
3	-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
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
	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
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

Table 5. (Cont.)

	TI AMPTD	FREQ	Measureing Receiver	Measuring Receiver	Results (Watts)

Band	dBm	MHz	MHz	Mode	Min	Max
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
	-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
9	+17[2]	1000	1000	RF POWER	39.81E-03	63.09E-03
	+16[3]	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
	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 5. (Cont.)

	TI		Measureing	Measuring	Results (Watts)
	AMPTD	FREQ	Receiver	Receiver	

Band	dBm	MHz	MHz	Mode	Min	Max
9	-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	1000	1000	TUNED RF	----------	----------
10[2]	+16	1300	1300	RF POWER	31.62E-03	50.12E-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

Table 5. (Cont.)

	TI		Measureing	Measuring	Results (Watts)
AMPTD	FREQ		Receiver	Receiver	

Band	dBm	MHz	MHz	Mode	Min	Max
10[2]	-120	1300	1300	TUNED RF	794.3E-18	1.259E-15
	-127	1300	1300	TUNED RF	158.5E-18	251.2E-18
	0	1300	1300	TUNED RF	----------	----------
	+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.

[2] (8642B only)

[3] (8642A only)

4.2.16 Set all Outputs to minimum. Disconnect the test setup.

4.3 HARMONICS, SUBHARMONICS, AND NON-HARMONICS CALIBRATION:

4.3.1 Connect TI RF OUTPUT to Spectrum Analyzer INPUT 50 Ω.

4.3.2 Set the TI AMPTD and FREQ to the values listed in Table 6.

4.3.3 Set the Spectrum Analyzer to view the Harmonic and Sub-harmonic values listed in Table 6.

4.3.4 Verify that the Harmonic and Sub-harmonic levels are below the specified minimum listed in the Limits columns in Table 6.

Table 6.

TI AMPTD	TI FREQ	Harmonic/Sub-Harmonic	Limits	
			Harmonic	Sub-Harmonic

(dBm)	(MHz)	(MHz)	(dBc)	(dBc)
+14	1.000000	3.0	≤-20	None
+14	1.500000	3.0	≤-20	None
+14	166.666667	500.0	≤-20	None
+14	250.000000	500.0	≤-20	None
+14	500.000000	1000.0	≤-20	None
+14	333.333333	1000.0	≤-20	None
+14	*2000.000000	1000.0	≤-20	≤45
+10	1.000000	3.0	≤-30	None
+10	1.500000	3.0	≤-30	None
+10	166.666667	500.0	≤-30	None
+10	250.000000	500.0	≤-30	None
+10	500.000000	1000.0	≤-30	None
+10	333.333333	1000.0	≤-30	None
+10	*2000.000000	1000.0	≤-25	≤45

*(8642B only)

4.3.6 Set Spectrum Analyzer controls as follows:

INSTRUMENT PRESET	
SPAN	0 kHz
RESOLUTION BANDWIDTH	10 Hz

4.3.7 On the TI press INSTRUMENT PRESET.

4.3.8 On the TI, set the FREQ and AMPTD to the values listed in Table 7. Set the Spectrum Analyzer's reference Level and Frequency to the values given in Table 7.
4.3.9 All Spurious Signals must be below the level stated in the TI Minimum column in Table 7.

Table 7.

TI	TI	Spectrum Analyzer		
AMPTD	**FREQ**	**Center Freq**	**Ref Level**	**Minimum**

(dBm)	(MHz)	(MHz)	(dBm)	(dBc)
+16	4.130000	85.870000	+10	-80
+16	4.130000	3.700000	+10	-80
+16	4.130000	0.430000	+10	-80
+16	4.130000	4.560000	+10	-80
+16	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	596.313600	-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

4.3.10 Set the TI RF OFF/ON to OFF. Disconnect the TI from the Spectrum Analyzer.

4.4 SINGLE-SIDEBAND PHASE NOISE CALIBRATION:

4.4.1 Connect TI RF OUTPUT to the Phase Noise Measurement System INPUT.

4.4.2 Preset TI, set FREQ to 5 MHz and RF LEVEL to 0 dBm.

4.4.3 Verify the Phase Noise Measurement System is using the Software Package, CPIN 88M-3048MS/NOISE-F001-00A, with the correct revision, as per COMPENDUM 80-1-88 for calibration of Single-Sideband Phase Noise. The Main Menu should be present on the screen when the computer is turned on.

4.4.4 On Phase Noise Measurement System select File System. Select "Load File" and Enter *.PRM for the path information. Select "Microwave vs HP8662A and HP11729C. Press ESC to return to Main Menu.

4.4.5 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.

4.4.6 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	10.E+03 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.

NOTE

The VCO Tune Constant is obtained by the following formula:

VCO Tune Constant = 5 E-9 X Carrier Frequency

example: 500.0 E+6 X 5 E-9 = 2.5 Hz/Volts

4.4.7 Select Calibration Technique and press F1 to select Measure the Detector Constant. Press F2 to select Calculate from Expected Tune Constant. Press ESC to return to the Main Menu.

4.4.8 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 to return to the Main Menu.

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

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

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

4.4.10 On Phase Noise Measurement System select New Measurement. Press Y. The equipment should be connected as shown on the Display screen. Set TI RF ON/OFF switch to ON. Verify a Beat Note below the value on the screen is present on the Signal Analyzer. Then press F1 Proceed softkey.

NOTE

To change the range on the Analyzers use the following: the ↑, ↓ keys control the Dynamic Signal Analyzer ranges and the ←, → keys control the Spectrum Analyzer ranges (both Analyzers are part of the Phase Noise Measurement System).

4.4.11 When 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.

4.4.12 The Phase Noise Plot should appear on the Display screen. After Measurement Complete the phase noise plot and spurious signals must be less than the specifications listed in Table 1. 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

Due to the limitations of the Phase Noise Measurement System, the TI Band 1 is not calibrated, and the Single Sideband Phase Noise is limited. A Limited Certification Form must be annotated for both conditions.

NOTE

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

4.4.13 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.

4.4.14 On the Phase Noise Measurement System select Parameters to change Carrier Frequency, Detector Input Frequency and VCO Tune Constant appropriately repeating steps 4.4.10 through 4.4.13 for TI Frequencies of 6, 12, 24, 50, 100, 200, 400, and 800 MHz.

4.4.15 For 8642B only, set FREQ to 2 GHz. From Main Menu select Instrument Control and select DN Converter 11729C under system control. Repeat 4.4.6 through 4.4.13 for 2 GHz.

4.4.16 Set TI RF ON/OFF control to OFF and disconnect TI from the Phase Noise Measurement System.

4.5 AMPLITUDE MODULATION CALIBRATION:

4.5.1 Connect TI 10 MHz OUT (rear panel) to Measuring Receiver REF EXT INPUT. Connect Sensor Module to Measuring Receiver and to TI RF OUTPUT.

4.5.2 Preset the instruments.

4.5.3 Press the TI INSTR PRESET, and set the TI AMPTD to +10.0 dBm.

4.5.4 Set the Measuring Receiver controls as follows:

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

4.5.5 Set the TI AM to 90%. Set the TI FREQ to the values in Table 8 and verify that the Measuring Receiver readings are within the limits specified in Table 8.

Table 8.

TI FREQ (MHz)	AM (%)	Limits (%)
0.15	90	85.8 to 94.2
5.00	90	85.8 to 94.2
1050[1]	90	84.5 to 95.5
1300[2]	90	84.5 to 95.5

[1] (8642A only)

[2] (8642B only)

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

4.5.7 Set the TI FREQ to 8.0000 MHz and verify that the Measuring Receiver reading is less than 0.20 rad.

4.5.8 Repeat step 4.5.6 for 1300 MHz (8642B only).

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

4.5.10 Set the TI FREQ and AM Depth to the values listed in Table 9 and verify that the Measuring Receiver readings are less than the maximum value listed in Table 9.

Table 9.

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)

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

4.5.12 Turn off the TI AM. Set the RF FREQ and ∅ M deviation to the first value in Table 10. Verify that the Measuring Receiver reading for phase deviation is within the limits listed in Table 10.

4.5.13 Set the Measuring Receiver to distortion mode and verify that the distortion reading does not exceed maximum distortion listed in Table 10.

Table 10.

FREQ (MHz)	M (RAD)	Phase Deviation (∅ M)	Distortion (%)
8.00	0.781	0.652 to 0.910	<0.4
1050	100.0	94.9 to 105.1	<0.4
0.15	100.0	94.9 to 105.1	<0.4

4.5.14 Repeat steps 4.5.11 and 4.5.12 for the remaining frequencies in Table 10.

4.6 FREQUENCY MODULATION CALIBRATION:

4.6.1 With the equipment still connected, preset the instruments.

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

4.6.3 Set TI AMPTD to +10 dBm. Set the TI MOD FREQ, RF FREQ, and FM to the values given in Table 11 and verify that the deviation readings on the Measuring Receiver are within the limits given in Table 11.

Table 11.

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

4.6.4 Set the TI FREQ to 400.0 kHz and turn off the FM.

4.6.5 Set the Measuring Receiver to AM mode, with LP and HP Filters set as required for the modulation frequency applied, and the PEAK + Detector selected.

4.6.6 The Measuring Receiver indication must be less than 0.30%.

4.6.7 Set the TI to FM, to 20 kHz deviation, and MOD FREQ to 1 kHz.

4.6.8 Set the TI FREQ to the settings in Table 12 and verify that the Measuring Receiver readings are less than the limit column in Table 12.

Table 12.

FREQ (MHz)	Max Incidental AM (%)
100.0	0.30
1050.0	0.30
1300.0[1]	0.30

[1] (8642B only)

4.6.9 Preset the instruments. Set the Measuring Receiver to FM mode and Audio Distortion mode and turn off all Audio Filters.

4.6.10 Set the TI AMPTD to +10 dBm. Set the FREQ and FM to the values listed in Table 13 and verify that the Measuring Receiver readings are less than the specified maximum listed in Table 13.

Table 13.

FREQ (MHz)	FM (kHz)	Max Distortion (%)
1050	72.0	0.4
256	135.0	2.0
4	57.5	4.0

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

4.6.12 Set the TI controls as follows:

INSTR PRESET	
AMPTD	+10 dBm

4.6.13 Set the Measuring Receiver controls as follows:

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

4.6.14 Set the Audio Analyzer controls as follows:

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

4.6.15 Set the TI to the MOD FREQ, FREQ, and FM given in Table 14. Verify that the distortion readings on the Audio Analyzer are less than the maximums given in Table 14.

Table 14.

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

4.7 PULSE MODULATION CALIBRATION:

4.7.1 PULSE ON/OFF RATIO CALIBRATION:

4.7.1.1 Disconnect Audio Analyzer from test setup, keeping Measuring Receiver connected to TI RF OUTPUT and 10 MHz OUT (rear panel).

4.7.1.2 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 4.7.1.4. If Level Accuracy has not yet been done or you have changed Measuring Receivers then calibration is required. In this case, complete step 4.7.1.3 before continuing with paragraph 4.7.1.

4.7.1.3 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 9.

4.7.1.4 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.

4.7.1.5 Put the Measuring Receiver in Tuned RF Level mode.

4.7.1.6 Set the TI and Measuring Receiver frequency to the values listed in Table 15 and verify that the readings are lower than the specified maximum.

Table 15.

RF FREQ (MHz)	Max On/Off Ratio (W) S/N 2509A to 2550A	S/N >2551A
1000.0[1]	10.00E-6	1.000E-6
1300.0[2] (8642B only)	316.2E-9	10.00E-9

[1, 2] On the Measuring Receiver, press Blue Shift, RECALL, followed by the numeric key recorded in step 4.2.15.2 for the frequency specified. This will set the Measuring Receiver to a previously stored setup.

4.7.1.7 Set the TI RF OFF/ON to OFF. Disconnect the test setup.

4.7.2 RISE/FALL TIME, and WIDTH CALIBRATION:

4.7.2.1 Press the TI INSTR PRESET.

4.7.2.2 Connect the TI RF OUTPUT to the Sampling Oscilloscope Input, connect the Synthesized Function Generator Output to the TI AM/PULSE INPUT.

4.7.2.3 Set the TI controls as follows:

FREQ	1000 MHz
AMPTD	+13 dBm
EXT DC	On

4.7.2.4 Set the Synthesized Function Generator as follows:

Function	Pulse
Frequency	50 kHz (S/N 2509A to 2550A) 100 kHz (S/N >2550A)
Amplitude	1 V pk
Amplitude Offset	1 V
Pulse Width	6 μs (S/N 2509A to 2550A) 2 μs (S/N >2550A)

4.7.2.5 On the Sampling Oscilloscope, verify that the recovered Modulation Pulse Rise/Fall Time is <3.5 μs (S/N 2509A to 2550A); <400 ns (S/N >2550A) between 10 and 90%.

4.7.2.6 Readjust the Sampling Oscilloscope to measure the TI Pulse Width.

4.7.2.7 The TI Pulse Width must be ≥6 μs, (S/N 2509A to 2550A); ≥2 μs, (S/N >2551A).

4.8 RESIDUALS CALIBRATION:

4.8.1 Connect TI 10 MHz OUT (rear panel) to Measuring Receiver REF EXT INPUT. Connect Measuring Receiver INPUT 50 Ω to TI RF OUTPUT.

4.8.2 Preset the instruments. On the Measuring Receiver, enable the 300 Hz HP Filter and the 3 kHz LP Filter.

4.8.3 Put the Measuring Receiver in AM mode using the RMS Detector.

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

Table 16.

TI AMPTD (dBm)	TI FREQ (MHz)	Max Residual AM (% AM rms)
18	1.0	0.010
18	1000	0.010
16	1300[1]	0.010
5	1.0	0.010
5	1000	0.010
5	1300[1]	0.010

[1] (8642B only)

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

4.8.6 Set the TI to the levels and frequencies in Table 17 and verify that the Measuring Receiver reading is less than the specified maximum listed in Table 17.

Table 17.

TI AMPTD (dBm)	TI FREQ (MHz)	Max Residual FM (Hz rms)
10	250	1
10	500	1.2
10	1000	2
0	1300[1]	5

[1] (8642B only)

4.8.7 Set the TI Output to minimum. Disconnect the test setup.

4.9 INTERNAL MODULATION OSCILLATOR CALIBRATION:

4.9.1 Connect TI MOD OUTPUT to Audio Analyzer RF INPUT.

4.9.2 Set the Audio Analyzer Filters OFF.

4.9.3 Set the TI MOD FREQ and Modulation Output Level to the values listed in Table 18. Verify that the readings are within the limits given in Table 18.

Table 18.

MOD FREQ (kHz)	MOD AMPTD (V)	Limits (V)
0.020 *	50 m	46.6 m to 94.8 m
1.000 *	50 m	46.6 m to 94.8 m
100.0 *	50 m	46.6 m to 94.8 m
0.020 *	3.00	4.051 to 4.433
1.00 *	3.00	4.051 to 4.433
100.0	3.00	4.051 to 4.433

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

4.9.4 Set the TI MOD FREQ to the values listed in Table 19 and verify that the frequency indicated on the Audio Analyzer is within the limits listed in the table.

Table 19.

MOD FREQ (Hz)	Limits (Hz)
20.0	19.6 to 20.4
14.9 k	14.6 k to 15.2 k
15.1 k	14.8 k to 15.4 k
100.0 k	98.0 k to 102.0 k

4.9.5 Change the Audio Analyzer mode to distortion.

4.9.6 Set the TI MOD FREQ and modulation output level to the values listed in Table 20. Verify that the readings are less than the limits in the Maximum Distortion column in Table 20.

Table 20.

MOD FREQ (kHz)	MOD AMPTD (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

* Select Audio Analyzer 30 kHz low pass filter.

4.9.7 Set the TI RF OFF/ON to OFF.

4.9.8 Set all POWER switches to OFF/STANDBY, disconnect and secure all equipment.

4.9.9 Attached a Limited Certification Label as per step 3.2.

CALIBRATION PERFORMANCE TABLE

Not Required

APPENDIX A

NOTE

Appendix do not apply to the STD TI. STD TI Oscillator is not adjustable.

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

A.1.1 Connect Frequency Standard 10 MHz REF OUT to Electronic Counter EXT FREQ STD INPUT (1-10) on rear panel of Electronic Counter, with INT/EXT switch set to EXT position. Connect TI 10 MHz OSC OUTPUT to Electronic Counter CH A 50 Ω INPUT connector.

A.1.2 Adjust the TI OSC ADJ for a TI indication of 10 MHz ±1 count of LSD.

A.1.3 Allow TI 10 MHz Oscillator a minimum of one (1) hour to stabilize. Repeat step A.1.2 as required.

A.1.4 Disconnect the test setup and continue with paragraph 4.1.

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

A.2.1 Connect Frequency Standard 10 MHz REF OUT to Electronic Counter EXT FREQ STD INPUT (1-10) on rear panel of Electronic Counter, with INT/EXT switch set to EXT position. Connect TI 10 MHz OSC OUTPUT to Electronic Counter CH A 50 Ω INPUT connector.

A.2.2 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.2.3 Allow TI 10 MHz Oscillator a minimum of one (1) hour to stabilize. Repeat step A.2.2 as required.

A.2.4 Disconnect the test setup and continue with paragraph 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 OSC OUT 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 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 paragraph 4.1.