

TECHNICAL MANUAL
CALIBRATION PROCEDURE
FOR
RADIO COMMUNICATIONS TEST SET
2955R, 2955B
(MARCONI INSTRUMENTS)



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TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 50, CONSISTING OF THE FOLLOWING:

Page No.	* Change No.	Page No.	* Change No.	Page No.	* Change No.
Title.....	2				
A.....	2				
1 - 17.....	0				
18 - 20.....	1				
21 - 39.....	0				
40.....	2				
41 - 45.....	0				
46 Blank.....	0				
A-1.....	0				
A-2 Blank.....	0				

*Zero in this column indicates an original page

RADIO COMMUNICATIONS TEST SET

2955R, 2955B

(MARCONI INSTRUMENTS)

1 CALIBRATION DESCRIPTION:

Table 1.

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Frequency		
Internal Frequency Standard	Range: 10 MHz Accuracy: $\pm 6 \times 10^{-7}$; * ¹ Aging Rate: $\leq \pm 5 \times 10^{-8}$ /month * ² Temperature: * ³ $\leq \pm 5 \times 10^{-8}$, 5 to 55 °C; $\leq \pm 5 \times 10^{-9}$, 55 to 70 °C	Verified with a Frequency Standard
Display	Range: 0.4 to 1000 MHz Accuracy: ± 1 count LSD	Verified with an Electronic Counter
RF Signal Generator		
Output Level	Range: 0.4 to 1000 MHz N socket: -135 to -15 dBm; BNC socket: -115 to +5 dBm; One-port duplex: -140 to -21.5 dBm; Two-port duplex: -115 to -15 dBm Accuracy: ± 1.8 dB, >-127 dBm at 18 to 28 °C (± 2 dB, >-127 dBm at 0 to 50 °C for 2955R only)	Measured with a Power Meter with Power Sensor and a Microwave Measurement System
Spectral Purity		
Residual FM	Range: 0.4 to 1000 MHz Accuracy: (0.3 to 3.4 kHz bandwidth), 0.4 to 520 MHz: <23 Hz for 2955R, up to 500 MHz: <13 Hz for 2955B; 520 to 1000 MHz: <45 Hz for 2955R, up to 1000 MHz: <26 Hz for 2955B	Measured with Microwave Measurement System

See Footnotes at the end of the Table.

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
RF Signal Generator (Cont.)		
Spectral Purity (Cont.)		
Harmonics	Range: 0.4 to 1000 MHz Accuracy: <-20 dBc, 0.4 to 1.5 MHz; <-25 dBc, 1.5 to 250 MHz; <-20 dBc, 250 to 1000 MHz	Measured with Spectrum Analyzer
Subharmonics	Range: 0.4 to 1000 MHz Accuracy: None up to 530 MHz; <-25 dBc, 530 to 1000 MHz	Measured with Spectrum Analyzer
Spurious Signals	Range: 0.4 to 1000 MHz Accuracy: Carrier up to 88 MHz: <-45 dBc, below 110 MHz; <-35 dBc, above 110 MHz; Carrier up to 1000 MHz (960 MHz for 2955B): <-60 dBc	Measured with Spectrum Analyzer
Single Sideband Phase Noise	Range: 0.4 to 1000 MHz Accuracy: (20 kHz offset) 2955R: <-106 dB/Hz, 0.4 to 500 MHz; <-100 dB/Hz, 500 to 1000 MHz; 2955B: <-110 dBc/Hz, 0.4 to 500 MHz; <-104 dBc/Hz, 500 to 1000 MHz	Measured with a Phase Noise Calibration System
Modulation Generator		
Amplitude Modulation	Range: 1.5 to 400 MHz	
Depth	Range: 0 to 99%, 20 Hz to 20 kHz Accuracy: ±7% of setting ±1 digit at 1 kHz, 0 to 85% AM; ±10% of setting ±1 digit, 50 Hz to 5 kHz, 0 to 70% AM; ±15% of setting ±1 digit, 50 Hz to 15 kHz, 0 to 85% AM	Measured with Microwave Measurement System

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Modulation Generator (Cont.)		
Amplitude Modulation (Cont.) Range: 1.5 to 400 MHz		
Distortion	Range: 30% AM Accuracy: <2% THD at 1 kHz in a 0.3 to 3.4 kHz bandwidth	Measured with an Audio Analyzer and Microwave Measurement System
External Sensitivity	Range: 0 to 99 %, 20 Hz to 20 kHz Accuracy: 50 Hz to 5 kHz, up to 70% AM: 1.5 V p-p for 30% AM $\pm 10\%$, $\pm 1\%$ AM; 50 Hz to 15 kHz, up to 85% AM: 1.5 V p-p for 30% AM $\pm 15\%$, $\pm 1\%$ AM	Verified with Microwave Measurement System and Synthesized Function Generator
Frequency Modulation		
Range: 0.4 to 1000 MHz		
Deviation	Range: 0 to 25 kHz deviation, 20 Hz to 20 kHz Accuracy: $\pm 7\%$ of rdg ± 10 Hz at 1 kHz; $\pm 10\%$ of rdg, 50 Hz to 15 kHz	Measured with Microwave Measurement System
Distortion	Range: 5 kHz deviation Accuracy: <1% THD at 1 kHz in a 0.3 to 3.4 kHz bandwidth	Measured with an Audio Analyzer and Microwave Measurement System
External Sensitivity	Range: 0 to 30 kHz deviation, 1 Hz to 50 kHz Accuracy: 1 V p-p for 5 kHz deviation, $\pm 10\%$	Measured with Frequency Synthesizer and Microwave Measurement System
Phase Modulation		
Range: 0.4 to 1000 MHz		
Deviation	Range: 0 to 10 radians, 0.3 to 3.4 kHz Accuracy: $\pm 8\%$ of rdg at 1 kHz; $\pm 11\%$ of rdg from 0.3 to 3.4 kHz	Measured with Microwave Measurement System
Distortion	Range: 5 radians Accuracy: <2% THD at 1 kHz in a 0.3 to 3.4 kHz bandwidth	Measured with an Audio Analyzer

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Modulation Generator (Cont.)		
Phase Modulation (Cont.)	Range: 0.4 to 1000 MHz	
External Sensitivity	Range: 0 to 10 radians, 0.3 to 3.4 kHz Accuracy: 1.0 V p-p for 5 radians at $\pm 12\%$ at 1 kHz	Measured with Frequency Synthesizer and Microwave Measurement System
RF Frequency Meter	Range: 1.5 to 1000 MHz Accuracy: Same as Internal Frequency Standard ± 1 digit	Verified during Internal Frequency Standard and Display calibration
Sensitivity	Range: 1.5 to 1000 MHz Accuracy: N socket, ≤ 5 mW (transmitter test mode selected); ≤ 20 mW (one-port duplex mode)	Verified with Signal Generator and Power Meter w/Power Sensor
AF Generator		
Frequency	Range: 50 Hz to 15 kHz, usable 10 Hz to 20 kHz Accuracy: ± 0.01 Hz, from 10 to 100 Hz; ± 0.1 Hz from 100 Hz to 20 kHz	Measured with Electronic Counter
Output Level	Range: 50 Hz to 15 kHz, 0.1 mV to 4.095 V rms (Sine and Square Wave); 0.1 mV to 4.095 V peak (Triangle and Saw-tooth Wave) Accuracy: $\pm 5\%$ of rdg ± 1 step (0.1 mV steps from 0.1 to 409.0 mV, 1 mV step from 409 mV to 4.095 V)	Measured with Digital Multimeter
Distortion (Sine only)	Range: 50 Hz to 15 kHz Accuracy: (2955R) <0.5% THD at 1 kHz; <1.0% THD from 50 Hz to 15 kHz Accuracy: (2955B) (excluding residual noise) <0.3% THD at 1 kHz; <0.6% THD from 50 Hz to 15 kHz	Measured with an Audio Analyzer

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
RF Power Meter	Range: N-type socket 0.05 to 150 W, 1.5 to 1000 MHz Accuracy: ±10% of rdg ±1 digit, 1.5 to 500 MHz; ±15% of rdg ±1 digit, 500 to 960 MHz; ±20% of rdg ±1 digit, 960 to 1000 MHz; ±1.25 dB ±1 digit, ≥5 mW (5 to 50 mW for 2955B) over the ranges 825 to 905 MHz from +15 to +25 °C	Verified with Signal Generator and Power Meter
Modulation Meter		
Amplitude Modulation	Range: 1.5 to 400 MHz	
Depth	Range: 0 to 90% below 100 MHz, 0 to 80% from 100 to 400 MHz, 50 Hz to 10 kHz (10 Hz to 15 kHz for 2955R) Accuracy: ±5% of rdg ±1 digit at 1 kHz; ±8.5% of rdg ±1 digit from 50 Hz to 10 kHz (1 digit is 1% AM depth)	Verified with a Signal Generator and Microwave Measurement System
Demodulation Distortion	Range: 30% AM, 1 kHz, 0.3 to 3.4 kHz bandwidth Accuracy: <2% THD at ≥21 MHz carrier; <5% THD at <21 MHz carrier	Verified with an Audio Analyzer and Signal Generator
Residual AM	Range: >10 mW (N socket), or >0.1 mW (BNC socket) Accuracy: <1% for inputs in a 0.3 to 3.4 kHz bandwidth	Verified on the TI display
Frequency Modulation	Range: 1.5 to 1000 MHz	
Deviation	Range: 0 to 25 kHz deviation, 50 Hz to 10 kHz (10 Hz to 15 kHz for 2955R) Accuracy: ±5% of rdg ±1 digit at 1 kHz; ±7.5% of rdg ±1 digit from 50 Hz to 10 kHz (1 digit is 0.01 kHz up to 2.5 kHz, 1% up to 25 kHz)	Verified with a Signal Generator and Microwave Measurement System

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Modulation Meter (Cont.)		
Frequency Modulation (Cont.) Range: 1.5 to 1000 MHz		
Demodulation Distortion	Range: 5 kHz deviation Accuracy: <1.5% THD at 1 kHz in 0.3 to 3.4 bandwidth	Verified with an Audio Analyzer and Signal Generator
Residual FM	Range: >20 mW (N socket) or >0.2 mW (BNC socket) Accuracy: *4 (in a 0.3 to 3.4 kHz bandwidth) 2955R: <23 Hz rms up to 500 MHz, <45 Hz rms up to 1000 MHz; 2955B: <15 Hz rms up to 500 MHz; <30 Hz rms up to 1000 MHz	Verified on the TI display
Phase Modulation		
Deviation	Range: 1.5 to 1000 MHz Range: 0 to 10 radians, 0.3 to 3.4 kHz Accuracy: $\pm 5\%$ of rdg ± 1 digit at 1 kHz; $\pm 7.5\%$ of rdg ± 1 digit from 0.3 to 3.4 kHz (with respect to 750 μ s de-emphasis)	Verified with a Signal Generator and Microwave Measurement System
Distortion and Noise Meter		
Distortion	Range: 0 to 10% and 0 to 30%, 1 kHz Accuracy: $\pm 5\%$ of rdg $\pm 0.5\%$ distortion	Verified with a known signal inserted onto another known signal
SINAD	Range: 0 to 18 dB and 0 to 50 dB, 1 kHz Accuracy: ± 1 dB	Verified with a known signal inserted onto another known signal

See Footnotes at the end of the Table.

Table 1. (Cont.)

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
AF Frequency Meter	Range: 20 Hz to 20 kHz Accuracy: Same as Internal Frequency Standard ± 1 digit, ± 0.1 Hz or 0.02% of rdg (whichever is greater)	Verified during Internal Frequency Standard and Display calibration
Sensitivity	Range: 20 Hz to 20 kHz Accuracy: ≤ 50 mV	Verified with Synthesized Function Generator
AF Voltmeter		
Level Accuracy	Range: 0 to 100 V at 50 Hz to 50 kHz (or DC) Accuracy: (50 Hz to 20 kHz or DC) $\pm 3\%$ of rdg ± 3 mV ± 1 digit	Verified with a Meter Calibrator
Oscilloscope	Range: DC to 50 kHz (from 3 Hz on AC)	
Voltage	Range: 10 mV/Div to 20 V/Div Accuracy: $\pm 5\%$ of rdg	Verified with a Meter Calibrator
FM	Range: ± 1.5 to ± 30 kHz Accuracy: $\pm 10\%$ of rdg	Measured with Microwave Measurement System
AM	Range: 5, 10, and 20%/Div Accuracy: $\pm 10\%$ of rdg	Measured with Microwave Measurement System
Φ M	Range: ± 1.5 to ± 15 radians Accuracy: $\pm 10\%$ of rdg	Measured with Microwave Measurement System

*¹ The accuracy listed, is the manufacturers calculated specification after one year. The accuracy specification is found by multiplying the longest term aging rate by the appropriate time interval to obtain one year.

*² $\pm 2 \times 10^{-7}$ /year after 1 month continuous use.

*³ Typical or Operational specification. Not calibrated.

*⁴ The TI is limited due to the resolution. Annotate a Limited Certification Label appropriately.

2 EQUIPMENT REQUIREMENTS:

Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.1 FREQUENCY STANDARD	Range: 10 MHz Accuracy: 1.25×10^{-8}	Austron 2100F	As Available
2.2 ELECTRONIC COUNTER W/ FREQUENCY CONVERTER	Range: 10 Hz to 1000 MHz Accuracy: $\pm 1.3 \times 10^{-6}$	Hewlett-Packard 5345A w/5354A	
2.3 MICROWAVE MEASUREMENT SYSTEM	<p>Range: (Tuned RF Level) 0.4 to 1000 MHz, 0 to -127 dBm</p> <p>Accuracy: ± 0.45 dB</p> <p>Range: (AM depth) 0 to 99% depth at 50 Hz to 20 kHz, CW 10 to 1000 MHz</p> <p>Accuracy: $\pm 1.25\%$ of rdg ± 1 digit</p> <p>Range: (FM deviation) 0.1 to 25 kHz, CW 10 to 1000 MHz</p> <p>Accuracy: $\pm 1.25\%$ of rdg ± 1 digit</p> <p>Range: (Phase deviation) 0 to 10 radians, CW 10 to 1000 MHz</p> <p>Accuracy: $\pm 2.75\%$ of rdg ± 1 digit</p> <p>TAR: 1.82:1</p> <p>Range: (Audio Filters) 50 Hz to >20 kHz</p> <p>Accuracy: 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</p>	Hewlett-Packard 8902MS	

Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.3 MICROWAVE MEASUREMENT SYSTEM (Cont.)	Range: (Residual AM) Accuracy: <0.01% Range: (Residual FM) Accuracy: <8 Hz rms at 1300 MHz, decreasing linearly with frequency to <1 Hz rms for 100 MHz and below TAR: 3.9:1	Hewlett-Packard 8902MS	
2.4 SPECTRUM ANALYZER	Range: 0.4 to 4000 MHz Accuracy: ± 1.6 dB (Scale Fidelity)	Hewlett-Packard 8563E	H-P 8566B
2.5 PHASE NOISE MEASUREMENT SYSTEM	Range: 100 Hz to 100 kHz offset Accuracy: ± 2 dB	Hewlett-Packard 3048MS	
2.6 SYNTHESIZED FUNCTION GENERATOR	Range: 20 Hz to 20 kHz, 0 to 1.5 V p-p, 0 to 1 V rms Accuracy: ± 1 dB	Hewlett-Packard 3325B	
2.7 SIGNAL GENERATOR	Range: 0.4 to 1000 MHz, at -30 to +10 dBm Accuracy: (Amplitude) $\pm 2.5\%$ of setting	Hewlett-Packard 8662A	
2.8 AUDIO ANALYZER	Range: 20 Hz to 100 kHz, 0.001 to 100 % THD Accuracy: ± 1 dB, 20 Hz to 20 kHz; ± 2 dB, 20 to 100 kHz	Hewlett-Packard 8903B	
2.9 DIGITAL MULTIMETER	Range: 0 to 10 V rms, 50 Hz to 15 kHz Accuracy: $\pm 0.5\%$ of rdg	Hewlett-Packard 3458A	
2.10 METER CALIBRATOR	Range: 0 to 100 VAC, 50 Hz to 10 kHz Accuracy: $\pm 0.05\%$ of setting	Fluke 5100B	

Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.11 POWER SPLITTER	Range: 1.5 to 400 MHz Accuracy: ≤ 0.15 dB	Hewlett-Packard 11667A	
2.12 POWER METER	Range: 1.5 to 1000 MHz, -30 to +20 dBm Accuracy: $\pm 2\%$ of rdg	Hewlett-Packard 436A	
2.13 POWER SENSOR	Range: 1.5 to 1000 MHz Accuracy: $\pm 2.7\%$ of charted value	Hewlett-Packard 8482A	
2.14 ATTENUATOR	Range: 10 dB Accuracy: Charted	Hewlett-Packard 8491B-010	
2.15 SYNTHESIZED SIGNAL GENERATOR	Range: 0 to +20 dBm, 0.4 to 1000 MHz Accuracy: (Amplitude) $\pm 2.5\%$ of setting Range: (Residual AM) Accuracy: $< 0.25\%$ Range: (Residual FM) Accuracy: < 5 Hz rms	Hewlett-Packard 8642B	
2.16 POWER AMPLIFIER	Range: 2 to 100 W, 10 to 400 MHz Accuracy: N/A	Microwave Products SSPA0240-22/6140	
2.17 COUPLER SET	Range: 10 to 400 MHz Accuracy: AFPSL Certified	Premier Microwave 1852A	
2.18 POWER METER	Range: 1 to 10 mW Accuracy: $\pm 2.5\%$ of rdg	Hewlett-Packard 432B-H05	
2.19 POWER DIVIDER	Range: 100 Hz to 20 kHz Accuracy: N/A	Weinschel 1506A	

Noun	Minimum Use Specifications	Calibration Equipment	Sub-Item
2.20 LEVEL GENERATOR	Range: 20 mV to 250 mV at 400 Hz Accuracy: N/A	Hewlett-Packard 3335A Opt 001	
2.21 FEEDTHROUGH TERMINATION	Range: 50 Ω Accuracy: $\pm 0.2\%$ of nominal	Hewlett-Packard 11048C	

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.

3.2 Connect the TI and test equipment to the appropriate power source and set all STANDBY/POWER switches to ON. Allow the TI a 24 hour warm-up period. Allow the test equipment the appropriate warm-up as determined by the manufacturer.

3.3 Perform TI SELF TEST before beginning calibration.

NOTE

Before implementing the self testing procedure, remove any leads which are connected to the coaxial connectors to prevent extraneous pick-up affecting the readings.

NOTE

In the RF Counter to RF Generator power test, the difference in the setting and reading levels is due to one-port duplex operation being selected for the test.

3.4 Press TI HELP key for SELF TEST Menu, press ALL TESTS soft key to initiate self tests.

3.5 The results of the thirteen individual tests must indicate PASSED.

3.6 Press TI RETURN soft key to view HELP menu.

3.7 Press **TI CHANGE PARAMETERS** soft key. Set the TI to **600 Ω BALANCED AF ACCESSORY** and then set the **20 dB AF ATTENUATOR** to **NOT FITTED**. Press the **RETURN** soft key twice to return to the main screen.

3.8 Chart the Attenuator at 10, 400, 800, 850 and 1000 MHz.

3.9 Annotate a Limited Certification Label with Residual FM limited to ≤ 0.03 kHz up to 500 MHz (≤ 0.02 kHz for 2955B) and ≤ 0.05 kHz up to 1000 MHz (≤ 0.03 kHz for 2955B).

4 CALIBRATION PROCESS:

NOTE

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

4.1 INTERNAL FREQUENCY STANDARD AND DISPLAY CALIBRATION:

NOTE

Overall TI accuracy depends upon the correct setting of the internal 10 MHz standard. The 10 MHz Time Base cannot be checked from a TI connector, therefore a 10 MHz RF output will be measured from the TI RF IN/OUT connector.

NOTE

Adjustment of the Time Base Oscillator is normal due to the Aging Rate of the crystals. This is common to all Quartz Oscillators. The adjustment actions taken during this calibration will ensure the greatest reliability of the TI by adjusting the time base reference to the nominal value each time it is calibrated.

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

4.1.2 Connect the TI RF IN/OUT BNC connector to Electronic Counter CHANNEL A input connector.

4.1.3 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 10 MHz, MOD to OFF, RF IN/OUT connector to BNC and LEVEL to -10 dBm.

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 one year values regardless of the length of the calibration interval for this TI in T.O. 33K-1-100-1/2. The longest aging rate specification not to exceed 1 year has been used to calculate the limits.

- 4.1.4 Adjust the Electronic Counter controls as required for a stable display indication and then push RESET. Verify the Electronic Counter indication is 9 999 994 to 10 000 006 Hz \pm 1 count of LSD.
- 4.1.5 Set the TI LEVEL to minimum and disconnect the test setup.
- 4.1.6 Connect the Frequency Standard 1 MHz REF OUT to the Electronic Counter EXT FREQ STD input and the TI EXT. STD 1 MHz input (rear panel).
- 4.1.7 Connect the TI RF IN/OUT BNC connector to Electronic Counter CHANNEL A input connector.
- 4.1.8 On the TI, press the RF IN/OUT SELECT to select the BNC output.
- 4.1.9 Set the Electronic Counter resolution, as required, to 1 Hz.
- 4.1.10 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 0.400 MHz, LEVEL to -10 dBm, and MOD to OFF.
- 4.1.11 The Electronic Counter must indicate within the values listed in the Limits column of Table 2.
- 4.1.12 Repeat steps 4.1.10 and 4.1.11 for the remaining values listed in Table 2.

NOTE

For frequencies above 500 MHz, connect the TI BNC connector to the Frequency Converter INPUT and use, as required, with the Electronic Counter.

Table 2.

TI Freq (MHz)	Limits (Hz)
0.400	399 999 to 400 001
500.0000	499 999 999 to 500 000 001
999.0000	998 999 999 to 999 000 001

- 4.1.13 Set the TI LEVEL to minimum and disconnect the test setup.
- 4.1.14 To ensure reliability of the TI, the following action will be taken: If TI passed the above steps, perform the applicable adjustment steps in Appendix A, and enter NO ADJUSTMENT ACTION into the Maintenance Data Collection System. If TI failed, perform the applicable steps listed in Appendix A and enter appropriate ADJUSTMENT ACTION into the Maintenance Data Collection System.

4.2 RF SIGNAL GENERATOR CALIBRATION:

4.2.1 OUTPUT LEVEL CALIBRATION:

- 4.2.1.1 Standardize Power Meter (2.12) and Power Sensor as required for a power measurement of +10 dBm (10 mW).

NOTE

Set Power Meter (2.12) Calibration Factor as required for the TI output frequency being verified.

- 4.2.1.2 Connect the TI RF IN/OUT BNC connector through the Power Sensor to the Power Meter (2.12).
- 4.2.1.3 Set the TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 300 MHz, INC to 10 dB, MOD to OFF, RF IN/OUT SELECT to select BNC and LEVEL to the first value listed in the Level column of Table 3.
- 4.2.1.4 Verify the Power Meter (2.12) indication is within the values listed in the Limits column of Table 3.
- 4.2.1.5 Repeat steps 4.2.1.3 and 4.2.1.4 for the remaining value listed in Table 3.

Table 3.

Level (dBm)	Limits (dBm)
+5.0	+3.2 to +6.8
0.0	-1.8 to +1.8 *

* Record the exact Power Meter (2.12) indication.

- 4.2.1.6 Set the TI LEVEL to minimum and disconnect the test setup.
- 4.2.1.7 Connect TI RF IN/OUT BNC connector to the Measuring Receiver (part of the Microwave Measurement System) INPUT 50 Ω connector.
- 4.2.1.8 Set the TI LEVEL to 0.0 dBm.
- 4.2.1.9 Set the Measuring Receiver, as required, for a Tuned RF Level measurement at 300 MHz.
- 4.2.1.10 On the Measuring Receiver, press the Blue shift key and then the SET REF key. Verify that the Measuring Receiver indicates 0.00 \pm 0.02 dB.
- 4.2.1.11 Decrease the TI LEVEL with the level decrement key until the Measuring Receiver RECAL light is illuminated. When the Measuring Receiver RECAL light illuminates press the CALIBRATE key and wait for a new reading.
- 4.2.1.12 Continue to decrease the TI LEVEL with the level decrement key until the Measuring Receiver RECAL light is illuminated again. When the Measuring Receiver RECAL light illuminates the second time, press the CALIBRATE key and wait for a new reading.
- 4.2.1.13 Set the TI LEVEL to 0.0 dBm.
- 4.2.1.14 On the Measuring Receiver, press the Blue shift key and then the SET REF key. Verify that the Measuring Receiver indicates 0.00 \pm 0.02 dB.

4.2.1.15 Set the TI LEVEL to each of the values listed in the Applied column of Table 4. Algebraically add the value recorded from Table 3 to the Measuring Receiver indication and verify the results are within the values listed in the Limits column of Table 4 for each Applied value.

Table 4.

Applied (dBm)	Limits (dBm)
0	Reference
-10	-8.2 to -11.8
-20	-18.2 to -21.8
-30	-28.2 to -31.8
-40	-38.2 to -41.8
-50	-48.2 to -51.8
-60	-58.2 to -61.8
-70	-68.2 to -71.8
-80	-78.2 to -81.8
-90	-88.2 to -91.8
-100	-98.2 to -101.8
-110	-108.2 to -111.8

4.2.1.16 Set the TI LEVEL to minimum. Disconnect the test setup.

4.2.1.17 Press TI RF IN/OUT SELECT for Type N connector and connect TI Type N through the Power Sensor to the Power Meter (2.12).

4.2.1.18 Set TI LEVEL for -15 dBm.

4.2.1.19 Verify the Power Meter (2.12) indication is within -13.2 to -16.8 dBm. Record the Power Meter (2.12) indication.

4.2.1.20 Set the TI LEVEL to minimum. Disconnect the test setup.

4.2.1.21 Connect TI RF IN/OUT Type N connector to the Measuring Receiver INPUT 50 Ω connector.

4.2.1.22 Set the TI LEVEL to -15 dBm.

4.2.1.23 On the Measuring Receiver, press the Blue shift key and then the SET REF key. Verify that the Measuring Receiver indicates 0.00 ± 0.02 dB.

4.2.1.24 Set the TI LEVEL to each of the values listed in the Applied column of Table 5. Algebraically add the value recorded in 4.2.1.19 to the Measuring Receiver indication and verify the results are within the values listed in the Limits column of Table 5 for each Applied value.

Table 5.

Applied (dBm)	Limits (dBm)
-15	Reference
-25	-23.2 to -26.8
-35	-33.2 to -36.8
-45	-43.2 to -46.8
-55	-53.2 to -56.8
-65	-63.2 to -66.8
-75	-73.2 to -76.8
-85	-83.2 to -86.8
-95	-93.2 to -96.8
-105	-103.2 to -106.8
-115	-113.2 to -116.8
-125	-123.2 to -126.8

4.2.1.25 Repeat steps 4.2.1.2 through 4.2.1.24 with the TI frequency set to 1000 MHz.

4.2.1.26 Set the TI LEVEL to minimum and disconnect the test setup.

4.2.2 SPECTRAL PURITY CALIBRATION:

4.2.2.1 RESIDUAL FM CALIBRATION:

4.2.2.1.1 Connect TI RF IN/OUT BNC connector to the Measuring Receiver INPUT 50 Ω connector.

4.2.2.1.2 Set the TI MODE to Rx TEST 2955R or RECEIVER TEST for 2955B, GEN FREQ to 500 MHz, MOD to AM, MOD to OFF, RF IN/OUT to BNC and LEVEL to 0 dBm.

4.2.2.1.3 Press Measuring Receiver INSTR PRESET, FM, 300 Hz LP FILTER, 3 kHz HP FILTER, Blue shift and then RMS (AVG) keys.

4.2.2.1.4 The Measuring Receiver must indicate within the appropriate values listed in the Limits column of Table 6.

4.2.2.1.5 Set TI GEN FREQ to 1000 MHz. Repeat steps 4.2.2.1.3 and 4.2.2.1.4.

Table 6.

GEN FREQ (MHz)	Limits (Hz rms)	
	2955R	2955B
500	<23	<13
1000	<45	<26

4.2.2.1.6 Set the TI LEVEL to minimum.

4.2.2.1.7 Disconnect the test setup.

4.2.2.2 HARMONICS, SUBHARMONICS AND SPURIOUS SIGNALS CALIBRATION:

4.2.2.2.1 Connect TI RF IN/OUT BNC connector to Spectrum Analyzer INPUT 50 Ω .

4.2.2.2.2 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 1.0 MHz, MOD to AM, MOD to OFF, RF IN/OUT to BNC and LEVEL to 0 dBm.

4.2.2.2.3 Set Spectrum Analyzer as required to display TI carrier Frequency, harmonics, sub-harmonics and spurious signals and establish a reference level.

4.2.2.2.4 Manually sweep TI across entire frequency range while checking the Spectrum Analyzer for harmonics, sub-harmonic and spurious signals.

4.2.2.2.5 The Spectrum Analyzer display must be within the values listed in the Limits column of Table 7.

4.2.2.2.6 Set the TI LEVEL to minimum.

Table 7.

Applied (MHz)	Signals	Limits (dBc)
0.4 to 1.5	Harmonics	<-20
>1.5 to 250	Harmonics	<-25
>250 to 1000	Harmonics	<-20
0.4 to 530	Subharmonics	None

Table 7. (Cont.)

Applied (MHz)	Signals	Limits (dBc)
>530 to 1000	Subharmonics	<-25
0.4 to 88	Spurious Signals below 110 MHz	<-45
	above 110 MHz	<-35
88 to 1000 (960 for 2955B)	Spurious Signals	<-60

4.2.2.2.7 Disconnect the test setup.

4.2.2.3 SINGLE SIDEBAND PHASE NOISE CALIBRATION:

4.2.2.3.1 Connect the TI RF IN/OUT BNC connector to the 5 MHz to 1.6 GHz R Phase Detector input of the Phase Noise Measurement System.

4.2.2.3.2 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 1000 MHz, MOD to AM, MOD to OFF, RF IN/OUT switch to BNC and LEVEL to 0 dBm.

4.2.2.3.3 Verify the Phase Noise Measurement System is using the current Software Package CPIN number 88M-3048MS/NOISE-F001-00A, with the latest revision, as per COMPENDIUM 80-1-88 or Q016.-110-WK-G01. The Main Menu should be present on the screen when the computer is turned on.

4.2.2.3.4 On Phase Noise Measurement System select Type/Range of Measurement to obtain the Measurement Type and Frequency Range Specifications. Select Phase Noise Using a 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.

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

Carrier Frequency	1.E+09 Hz
Detector Input Freq	1.E+09 Hz
VCO Tune Constant	As required
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.

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

4.2.2.3.7 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, under DCFM control. Press ESC to return to the Main Menu.

4.2.2.3.8 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.

4.2.2.3.9 On Phase Noise Measurement System select New Measurement. Press Y. Connect equipment 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 $\uparrow\downarrow$ keys to control the 3561A Dynamic Signal Analyzer and the $\leftarrow \rightarrow$ keys to control the Spectrum Analyzer.

4.2.2.3.10 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.

4.2.2.3.11 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 within the values listed in the Limits column of Table 8. 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 $\leftarrow \rightarrow$ keys are the fine controls for moving the cursor and the keys $\uparrow\downarrow$ are the coarse controls for moving the cursor.

4.2.2.3.12 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.

4.2.2.3.13 Set the TI GEN FREQ to the next value listed in the Applied column of Table 8.

4.2.2.3.14 On the Phase Noise Measurement System select Parameters to change Carrier Frequency, Detector Input Frequency and VCO Tune Constant appropriately and repeat steps 4.2.2.3.9 through 4.2.2.3.13 for the remaining values listed in the Applied column of Table 8.

Table 8.

Applied (MHz)	Limits (dBc/Hz)	
	2955R	2955B
1000	<-100	<-104
750	<-100	<-104
490	<-106	<-110
250	<-106	<-110
100	<-106	<-110

4.2.2.3.15 Set the TI LEVEL to minimum. Disconnect the test setup.

4.3 MODULATION GENERATOR CALIBRATION:

4.3.1 AMPLITUDE MODULATION CALIBRATION:

4.3.1.1 DEPTH AND DISTORTION CALIBRATION:

4.3.1.1.1 Connect the TI BNC IN/OUT BNC connector to the Measuring Receiver INPUT 50 Ω.

4.3.1.1.2 Press the Measuring Receiver INSTR PRESET, AM, 300 Hz HP and 3 kHz LP FILTERS keys.

4.3.1.1.3 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 10 MHz, MOD to AM, MOD to ON, RF IN/OUT to BNC and LEVEL to 0 dBm.

4.3.1.1.4 Set TI MOD FREQ to 1 kHz (the first value listed in the TI Mod Freq column of Table 9), set the TI LEVEL for 30% (the first value listed in the Mod Level column of Table 9), SHAPE to SINE and DIST'N, S/N and SINAD to OFF.

4.3.1.1.5 Verify the Measuring Receiver indicates within the values listed in the Limits column of Table 9.

4.3.1.1.6 Set the Measuring Receiver, as required, to measure audio distortion.

4.3.1.1.7 The Measuring Receiver must indicate <2.0%.

NOTE

The audio distortion is specified at 30% AM and 1 kHz only.

4.3.1.1.8 Repeat steps 4.3.1.1.2 through 4.3.1.1.5 for the remaining values listed in Table 9.

Table 9.

TI Freq (MHz)	TI Mod Freq (kHz)	Mod Level (%)	Limits (%)
10	1	30	26.90 to 33.10
10	1	50	45.5 to 54.5
10	1	70	64.1 to 75.9
10	0.100 * ¹	50	44.0 to 56.0
10	5 * ²	50	44.0 to 56.0
10	10 * ²	50	41.5 to 58.5
50	1	50	45.5 to 54.5
250	1	50	45.5 to 54.5
400	1	50	45.5 to 54.5

*¹ Set the Measuring Receiver HP FILTER to 50 Hz and the LP FILTER to 3 kHz.

*² Set the Measuring Receiver HP FILTER to 300 Hz and the LP FILTER to 15 kHz.

4.3.1.1.9 Set the TI LEVEL to minimum. Do not disconnect the test setup.

4.3.1.2 EXTERNAL SENSITIVITY CALIBRATION:

4.3.1.2.1 Connect the Synthesized Function Generator through the Feedthrough Termination to the TI EXT MOD INPUT connector.

4.3.1.2.2 Press the Measuring Receiver INSTR PRESET and AM keys.

NOTE

Set the Measuring Receiver LP and HP FILTERS as required for the external modulation frequency being calibrated.

4.3.1.2.3 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 10 MHz, MOD to AM, MOD to ON, RF IN/OUT to BNC and LEVEL to 0 dBm. Press MODE and select TONES, then press MOD SETUP softkey and select EXT MOD.

NOTE

Ensure all TI internal MOD sources are set to OFF.

4.3.1.2.4 Set the Synthesized Function Generator controls as required for a 1.5 V p-p at 1 kHz signal.

4.3.1.2.5 The Measuring Receiver must indicate within the values listed in the Limits column of Table 10.

4.3.1.2.6 Repeat steps 4.3.1.2.3 through 4.3.1.2.5 for the remaining values listed in Table 10.

Table 10.

TI		Synthesized Function Generator		
Freq (MHz)	Mod (%)	Frequency (kHz)	Level (V p-p)	Limits (%)
10	30	1	1.5	26.00 to 34.00
10	30	10	1.5	24.50 to 35.50
50	30	1	1.5	26.00 to 34.00
50	30	10	1.5	24.50 to 35.50
100	30	1	1.5	26.00 to 34.00
100	30	10	1.5	24.50 to 35.50

4.3.1.2.7 Set all outputs to minimum. Do not disconnect the test setup.

4.3.2 FREQUENCY MODULATION CALIBRATION:

4.3.2.1 DEVIATION AND DISTORTION CALIBRATION:

4.3.2.1.1 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 10 MHz, RF IN/OUT to BNC and LEVEL to 0 dBm.

4.3.2.1.2 Set the TI MOD to ON, MOD FREQ to 1 kHz, MOD LEVEL to 5 kHz, SHAPE to SINE and DIST'N, S/N and SINAD to OFF.

4.3.2.1.3 Press the Measuring Receiver INSTR PRESET, FM, 300 Hz HP FILTER, 3 kHz LP FILTER and PEAK ±/2 keys.

4.3.2.1.4 The Measuring Receiver must indicate within the values listed in the Limits column of Table 11.

4.3.2.1.5 Set the Measuring Receiver, as required, to measure the audio distortion.

4.3.2.1.6 The Measuring Receiver must indicate <1.0% audio distortion.

NOTE

The audio distortion is tested at 1 kHz modulation frequency, 5 kHz deviation only.

4.3.2.1.7 Repeat steps 4.3.2.1.2 through 4.3.2.1.4 for the remaining values listed in Table 11.

Table 11.

TI GEN FREQ (MHz)	TI MOD FREQ (kHz)	TI MOD LEVEL (kHz)	Limits (kHz)
10	1	5	4.64 to 5.36
10	1	10	9.29 to 10.71
10	1	25	23.24 to 26.76
10	0.100 * ¹	25	22.50 to 27.50
10	5 * ²	25	22.50 to 27.50
10	10 * ²	25	22.50 to 27.50
50	1	25	23.24 to 26.76
100	1	25	23.24 to 26.76
500	1	25	23.24 to 26.76
1000	1	25	23.24 to 26.76

*¹ Set the Measuring Receiver HP FILTER to 50 Hz and the LP FILTER to 3 kHz.

*² Set the Measuring Receiver HP FILTER to 300 Hz and the LP FILTER to 15 kHz.

4.3.2.1.8 Set the TI LEVEL to minimum. Do not disconnect the test setup.

4.3.2.2 EXTERNAL SENSITIVITY CALIBRATION:

4.3.2.2.1 Press Measuring Receiver INSTR PRESET, FM, 300 Hz HP and 3 kHz LP FILTERS keys.

4.3.2.2.2 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to the first value listed in the GEN FREQ column of Table 12, MOD to FM, MOD to ON, RF IN/OUT switch to BNC and LEVEL to 0 dBm. Press MODE and select TONES, then press MOD SETUP softkey and select EXT MOD.

NOTE

Ensure all TI internal MOD sources are set to OFF.

4.3.2.2.3 Set the Synthesized Function Generator controls, as required, for an output level of the first value listed in the Level column of Table 12 at 1 kHz.

4.3.2.2.4 The Measuring Receiver must indicate within the values listed in the Limits column of Table 12.

4.3.2.2.5 Repeat steps 4.3.2.2.2 through 4.3.2.2.4 for the remaining values listed in Table 12.

Table 12.

GEN FREQ (MHz)	Level (V p-p)	Limits (kHz)
10.0	1.0	4.50 to 5.50
500.0	1.0	4.50 to 5.50
1000.0	1.0	4.50 to 5.50

4.3.2.2.6 Set all outputs to minimum. Do not disconnect the test setup.

4.3.3 PHASE MODULATION:

4.3.3.1 DEVIATION AND DISTORTION CALIBRATION:

4.3.3.1.1 Set the TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to 500 MHz, MOD to Φ M, MOD FREQ to 1 kHz, LEVEL to 5 radians, SHAPE to SINE, DIST'N, S/N and SINAD to OFF, modulation source to INT, RF IN/OUT switch to BNC and LEVEL to 0 dBm.

4.3.3.1.2 Press Measuring Receiver INSTR PRESET, Φ M, 300 Hz HP and 3 kHz LP FILTERS.

4.3.3.1.3 The Measuring Receiver must indicate within the values listed in Limits column of Table 13.

4.3.3.1.4 Set the Measuring Receiver, as required, to measure the audio distortion.

4.3.3.1.5 The Measuring Receiver must indicate <2.0%.

NOTE

The audio distortion is tested at 1 kHz modulation frequency, 5 rad deviation only.

4.3.3.1.6 Repeat steps 4.3.3.1.1 through 4.3.3.1.3 for the remaining values listed in Table 13.

Table 13.

TI GEN FREQ (MHz)	TI MOD FREQ (kHz)	TI MOD LEVEL (rad)	Limits (rad)
500	1	5	4.6 to 5.4
500	1	10	9.2 to 10.8
500	0.300 * ¹	10	8.9 to 11.1
500	3 * ²	10	8.9 to 11.1

Table 13. (Cont.)

TI GEN FREQ (MHz)	TI MOD FREQ (kHz)	TI MOD LEVEL (rad)	Limits (rad)
10	1	10	9.2 to 10.8
50	1	10	9.2 to 10.8
100	1	10	9.2 to 10.8
1000	1	10	9.2 to 10.8

*¹ Set the Measuring Receiver HP FILTER to 50 Hz and the LP FILTER to 3 kHz.

*² Set the Measuring Receiver HP FILTER to 300 Hz and the LP FILTER to 15 kHz.

4.3.3.1.7 Set the TI LEVEL to minimum. Do not disconnect the test setup.

4.3.3.2 EXTERNAL SENSITIVITY CALIBRATION:

4.3.3.2.1 Press the Measuring Receiver INSTR PRESET, Φ M, 300 Hz HP and 3 kHz LP FILTERS keys.

4.3.3.2.2 Set TI MODE to Rx TEST for 2955R or RECEIVER TEST for 2955B, GEN FREQ to the first value listed in the GEN FREQ column of Table 14, MOD to Φ MOD, MOD to ON, RF IN/OUT switch to BNC and LEVEL to 0 dBm. Press MODE and select TONES, then press MOD SETUP softkey and select EXT MOD.

NOTE

Ensure all TI internal MOD sources are set to OFF.

4.3.3.2.3 Set the Synthesized Function Generator controls, as required, for an output level of the first value listed in the Level column of Table 14 at 1 kHz.

4.3.3.2.4 The Measuring Receiver must indicate within the values listed in the Limits column of Table 14.

4.3.3.2.5 Repeat steps 4.3.3.2.2 through 4.3.3.2.4 for the remaining values listed in Table 14.

Table 14.

GEN FREQ (MHz)	Level (V p-p)	Limits (rad)
10.0	1.0	4.40 to 5.60
100.0	1.0	4.40 to 5.60
500.0	1.0	4.40 to 5.60
1000.0	1.0	4.40 to 5.60

4.3.3.2.6 Set all outputs to minimum. Disconnect the test setup.

4.4 RF FREQUENCY METER SENSITIVITY CALIBRATION:

4.4.1 Set the TI MODE to the first setting listed in the MODE column of Table 15 and RF IN/OUT switch to N.

4.4.2 Connect the Synthesized Signal Generator output to the Power Splitter input. Connect one output of the Power Splitter to the TI RF IN/OUT N connector. Connect the other output of the Power Splitter through the Power Sensor to the Power Meter (2.12).

NOTE

The Power Splitter has a possible error of ≤ 0.15 dB between any two ports. Verify any failures by switching the outputs to TI and Power Meter (2.12). Apply this method outlined, throughout the remainder of this procedure.

4.4.3 Set the Power Meter (2.12) as required to measure Watts.

4.4.4 Set the Synthesized Signal Generator output to minimum at the first frequency listed in the Frequency column of Table 15.

4.4.5 Increase the Synthesized Signal Generator output until the TI indicates a stable indication of about the required frequency.

4.4.6 The Power Meter (2.12) must indicate within the values listed in the Limits column of Table 15.

4.4.7 Repeat steps 4.4.1 and 4.4.4 through 4.4.6 for the remaining values listed in Table 15.

Table 15.

Applied (MHz)	MODE	Limits (mW)
10.0000	Tx Test	≤ 5
100.0000	Tx Test	≤ 5
1000.0000	Tx Test	≤ 5
10.0000	Duplex *	≤ 20
100.0000	Duplex *	≤ 20
1000.0000	Duplex *	≤ 20

* When the Duplex Mode is selected (by pushing Duplex Test), the TI will default to TWO PORT. Press SELECT RF IN/OUT to set the TI to ONE PORT, N connector.

4.4.8 Set the Synthesized Signal Generator output to minimum and disconnect the test setup.

4.5 AF GENERATOR CALIBRATION:**4.5.1 FREQUENCY CALIBRATION:**

4.5.1.1 Connect the TI AF GEN OUTPUT to the Electronic Counter CHANNEL A input.

4.5.1.2 Set the TI MODE to AUDIO TEST, GEN 1 to ON and GEN 2 to OFF. Press the TI TONES and AUDIO SETUP keys. Set the GEN 1 FREQ to 15 kHz, LEVEL to 1 V and SHAPE to SINE.

4.5.1.3 Set the Electronic Counter, as required, for a stable and reliable frequency indication.

4.5.1.4 The Electronic Counter must indicate within the values listed in the Limits column of Table 16.

4.5.1.5 Repeat steps 4.5.1.2 through 4.5.1.4 for the remaining values listed in Table 16.

Table 16.

TI GEN FREQ (Hz)	Limits (Hz)
15 k	14.999 9 to 15.000 1 k
20 k	19.999 9 to 20.000 1 k
10 k	9.999 9 to 10.000 1 k
1000	999.9 to 1000.1
500	499.9 to 500.1
50	49.99 to 50.01

4.5.1.6 Set the TI GEN 1 to OFF and GEN 2 to ON, FREQ to 15 kHz, LEVEL to 1 V and SHAPE to SINE.

4.5.1.7 Repeat steps 4.5.1.3 through 4.5.1.5 for TI GEN 2.

4.5.1.8 Press TI FUNCTION OFF to disable RF IN/OUT output. Disconnect the test setup.

4.5.2 OUTPUT LEVEL CALIBRATION:

4.5.2.1 Connect the TI AF GEN OUTPUT to Digital Multimeter input.

4.5.2.2 Set TI MODE to Tx TEST on 2955R or AUDIO TEST on 2955B, FUNCTION to AF GEN, GEN 1 to ON and GEN 2 to OFF, press TONES and AUDIO SETUP keys. Set TI GEN 1 FREQ to the first value listed in the TI FREQ column of Table 17, LEVEL to the first value listed in the TI LEVEL column of Table 17 and SHAPE to the first value listed in the TI SHAPE column of Table 17.

4.5.2.3 The Digital Multimeter must indicate within the values listed in the Limits column of Table 17.

4.5.2.4 Repeat steps 4.5.2.2 and 4.5.2.3 for the remaining values listed in Table 17.

Table 17.

TI FREQ (Hz)	TI LEVEL (V rms)	TI SHAPE	Limits (V rms)
50	1	SINE	0.949 to 1.051
1 k	1	SINE	0.949 to 1.051
15 k	1	SINE	0.949 to 1.051
1 k	4	SINE	3.799 to 4.201
1 k	2	SINE	1.899 to 2.101
1 k	400 m	SINE	379.9 to 420.1 m
1 k	100 m	SINE	94.9 to 105.1 m
1 k	10 m	SINE	9.4 to 10.6 m
1 k	1	SQR	0.949 to 1.051
1 k	1 (peak)	TRI	0.5479 to 0.6068
1 k	1 (peak)	SAW	0.5479 to 0.6068

4.5.2.4 Repeat steps 4.5.2.2 through 4.5.2.4 for TI GEN 2.

4.5.2.5 Press TI FUNCTION OFF to disable RF IN/OUT output. Disconnect Digital Multimeter from TI.

4.5.3 DISTORTION CALIBRATION:

4.5.3.1 Connect the TI AF GEN OUTPUT to Audio Analyzer INPUT. Set Audio Analyzer controls as necessary to measure distortion.

4.5.3.2 Set the TI MODE to AUDIO TEST. Press the TONES and AUDIO SETUP keys. Set the GEN 2 FREQ to the first value listed in the GEN FREQ column of Table 18, LEVEL to 2 V and SHAPE to SINE.

4.5.3.3 The Audio Analyzer must indicate within the values listed in the appropriate Limits column of Table 18.

4.5.3.4 Repeat steps 4.5.3.2 and 4.5.3.3 for the remaining values listed in Table 18.

Table 18.

GEN FREQ (Hz)	Limits (%)	
	2955R	2955B *
50.0	<1.0	<0.6
1.0 k	<0.5	<0.3
5.0 k	<1.0	<0.6
15.0 k	<1.0	<0.6

* Excluding residual noise.

4.5.3.5 Repeat steps 4.5.3.2 through 4.5.3.4 for TI GEN 1.

4.5.3.6 Press TI FUNCTION OFF to disable RF IN/OUT output. Disconnect the test setup.

4.6 RF POWER METER CALIBRATION:

4.6.1 Set the TI MODE to Tx TEST and RF IN/OUT switch to N.

4.6.2 Standardize the Power Meter (2.12) and Power Sensor for 0.00 dBm indication.

4.6.3 Connect the Synthesized Signal Generator output, through a cable and the Attenuator, to the Power Meter (2.12).

4.6.4 Set the Synthesized Signal Generator output for the first value listed in the Level column of Table 19 at the first frequency listed in the Frequency column of Table 19. Set the Synthesized Signal Generator RF OFF/ON switch to ON.

4.6.5 Set the Synthesized Signal Generator for a Power Meter (2.12) indication of (20 dBm - the charted value of the Attenuator).

NOTE

For example: For an Attenuator charted value of 9.8 dB, set the Synthesized Signal Generator for a Power Meter (2.12) indication of 10.2 dBm (20 dBm - 9.8 dB).

4.6.6 Without disturbing the output of the Synthesized Signal Generator, disconnect it from the Attenuator.

4.6.7 Connect the Synthesized Signal Generator output to the TI RF IN/OUT N connector.

NOTE

Use the same cable that was connected to the Attenuator to connect the Synthesized Signal Generator to the TI.

4.6.8 Verify the TI RF power meter indicates within the values listed in the Limits column of Table 19.

4.6.9 Set the Synthesized Signal Generator RF OFF/ON switch to OFF.

4.6.10 Repeat steps 4.6.3 through 4.6.9 for the remaining values listed in Table 19.

Table 19.

Synthesized Signal Generator		Limits (mW)
Level (dBm)	Frequency (MHz)	
+20	10	89 to 111
+20	400	89 to 111
+20	800	84 to 116
+17	850	41 to 59
+17	1000	39 to 61

4.6.11 Set the Synthesized Signal Generator output to minimum and disconnect the test setup.

4.6.12 Connect equipment as shown in Figure 1.

4.6.13 On the Power Meter (2.18), set to 40 dB Coupler and CAL FACTOR/Vernier controls to the appropriate value for the first frequency listed in the Frequency column of Table 20.

4.6.14 On the RF Power Amplifier, set the Filter Switching Unit BAND SELECT-MHz to the appropriate frequency range for the first frequency listed in the Frequency column of Table 20 and set the POWER ADJUST controls fully CCW.

4.6.15 Set Synthesized Signal Generator for a 0 dBm output at the first frequency listed in the Frequency column of Table 20.

4.6.16 On the RF Power Amplifier, set the Filter Switching Unit appropriate POWER ADJUST controls for an indication of the first value listed in the Applied column of Table 20 on the TI RF power meter.

4.6.17 The Power Meter (2.18) must indicate within the limit listed in the Limits column of Table 20.

4.6.18 Repeat steps 4.6.13 through 4.6.17 for the remaining values listed in Table 20.

CAUTION

Do not apply >75 W continuous to TI. For testing levels >75 W, apply power for 1 minute and allow 5 minutes between readings. Damage to the TI may occur if >75 W continuous is applied.

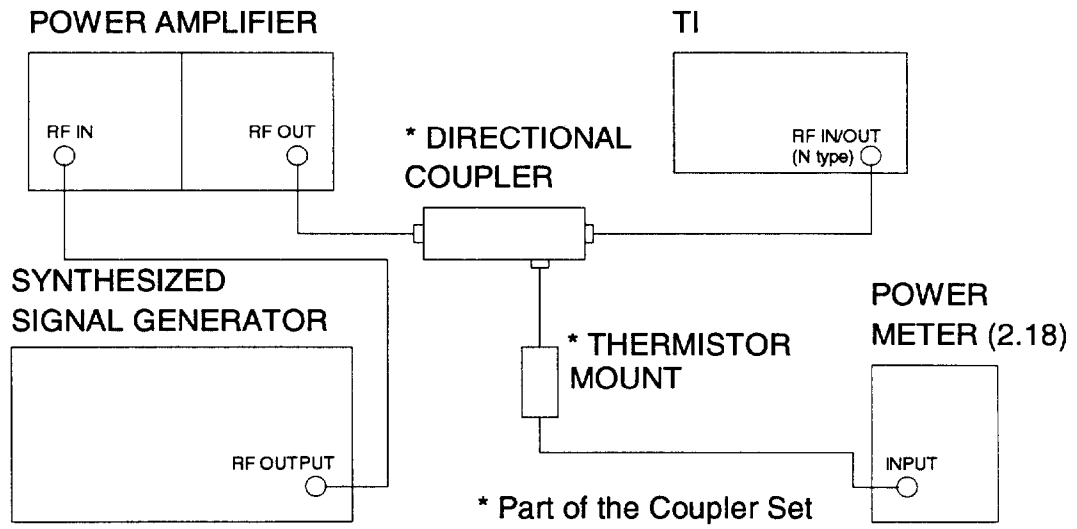


Figure 1.

NOTE

Set the Filter Switching Unit BAND SELECT-MHz to the appropriate band for the frequency being tested.

Table 20.

Frequency (MHz)	Applied (W)	Limits (W)
400.0000	100	89 to 111
400.0000	40	35 to 45
400.0000	20	17.9 to 22.1
400.0000	10	8.9 to 11.1
100.0000	100	89 to 111
100.0000	10	8.9 to 11.1
10.0000	100	89 to 111
10.0000	10	8.9 to 11.1

4.6.19 Set all outputs to minimum and disconnect the test setup.

4.6.20 Set the TI MODE to DUPLEX and select ONE PORT by pressing RF IN/OUT SELECT N connector.

4.6.21 Repeat steps 4.6.2 through 4.6.19.

4.7 MODULATION METER CALIBRATION:

4.7.1 AMPLITUDE MODULATION CALIBRATION:

4.7.1.1 DEPTH CALIBRATION:

4.7.1.1.1 Connect the Signal Generator to the Power Splitter input. Connect one output of the Power Splitter to the TI RF IN/OUT BNC connector. Connect the other output of the Power Splitter to the Measuring Receiver input.

4.7.1.1.2 Set the TI MODE to Tx TEST, MOD to AM, AF FILTERS to BAND PASS (0.3 to 3.4 kHz) and RF IN/OUT to BNC connector.

4.7.1.1.3 Set Measuring Receiver controls as necessary to measure AM modulation. Press the 300 Hz HP and 3 kHz LP FILTER keys.

4.7.1.1.4 Set Signal Generator output to 7 dBm at the first value listed in the Frequency column of Table 21. Set the Signal Generator modulation frequency to the first value listed in the Modulation Frequency column of Table 21. Set the modulation depth to the first value listed in the Modulation Level column of Table 21, as indicated on the Measuring Receiver.

4.7.1.1.5 Verify the TI MOD LEVEL is within the values listed in the Limits column of Table 21. Verify the TI AM bar chart indicates the AM being applied.

4.7.1.1.6 Repeat steps 4.7.1.1.3 through 4.7.1.1.5 for the remaining values listed in Table 21.

Table 21.

Carrier Frequency (MHz)	Modulation Frequency (kHz)	Modulation Level (%)	Limits (%)
100	1	80	75 to 85
100	1	50	46 to 54
100	1	30	27 to 33
1.5	1	50	46 to 54
10	1	50	46 to 54
200	1	50	46 to 54
400	1	50	46 to 54

Table 21. (Cont.)

Carrier Frequency (MHz)	Modulation Frequency (kHz)	Modulation Level (%)	Limits (%)
100	0.100 * ¹	50	45 to 55
100	10 * ²	50	45 to 55

*¹ On the TI, select the 300 Hz LP filter. On the Measuring Receiver, press the 50 Hz HP FILTER key.

*² On the TI, select the 15 kHz LP filter. On the Measuring Receiver, press the 15 kHz LP FILTER key.

4.7.1.1.7 Set all outputs to minimum. Disconnect the test setup.

4.7.1.2 DEMODULATION DISTORTION CALIBRATION:

4.7.1.2.1 Connect the Signal Generator to the TI RF IN/OUT BNC connector. Connect the Audio Analyzer to the TI DE-MOD OUT connector (Rear Panel).

4.7.1.2.2 Set the TI MODE to Tx TEST, MOD to AM, AF FILTERS to BAND PASS (0.3 to 3.4 kHz), and RF IN/OUT to BNC connector.

4.7.1.2.3 Set Signal Generator frequency to the first value listed in the Frequency column of Table 22, output level to 0 dBm, 30% of AM at 1 kHz internal modulation.

4.7.1.2.4 Set the Audio Analyzer as required to measure distortion.

4.7.1.2.5 The Audio Analyzer must indicate within the values listed in the Limits column of Table 22.

4.7.1.2.6 Repeat steps 4.7.1.2.3 through 4.7.1.2.5 for the remaining values listed in Table 22.

Table 22.

Frequency (MHz)	Limits (%)
100.0	<2.0
50.0	<2.0
10.0	<5.0

4.7.1.2.7 Set the Signal Generator output to minimum. Disconnect the test setup.

4.7.1.3 RESIDUAL AM CALIBRATION:

4.7.1.3.1 Connect the Synthesized Signal Generator output to the TI RF IN/OUT BNC connector.

4.7.1.3.2 Set the TI MODE to Tx TEST, MOD to AM, AF FILTERS to BAND PASS (0.3 to 3.4 kHz), and RF IN/OUT to BNC connector.

4.7.1.3.3 Set the Synthesized Signal Generator frequency to the first value listed in the Frequency column of Table 23, output level to 0 dBm. Set the internal modulation Off.

4.7.1.3.4 The TI MOD LEVEL must indicate within the values listed in the Limits column of Table 23.

4.7.1.3.5 Repeat steps 4.7.1.3.3 and 4.7.1.3.4 for the remaining values listed in Table 23.

Table 23.

Frequency (MHz)	Limits (%)
10.0	<1.0
100.0	<1.0

4.7.1.3.6 Set the Synthesized Signal Generator output to minimum.

4.7.1.3.7 Move the connection, from the Synthesized Signal Generator, from the TI RF IN/OUT BNC connector to the TI RF IN/OUT N type connector.

4.7.1.3.8 Set the Synthesized Signal Generator frequency to the first value listed in the Frequency column of Table 24, output level to +11 dBm. Set the internal modulation Off.

4.7.1.3.9 The TI MOD LEVEL must indicate within the values listed in the Limits column of Table 24.

4.7.1.3.10 Repeat steps 4.7.1.3.8 and 4.7.1.3.9 for the remaining values listed in Table 24.

Table 24.

Frequency (MHz)	Limits (%)
10.0	<1.0
100.0	<1.0

4.7.1.3.11 Set the Synthesized Signal Generator output to minimum. Disconnect the test setup.

4.7.2 FREQUENCY MODULATION CALIBRATION:

4.7.2.1 DEVIATION CALIBRATION:

4.7.2.1.1 Connect the Signal Generator to the Power Splitter input. Connect one output of the Power Splitter to the TI RF IN/OUT BNC connector. Connect the other output of the Power Splitter to the Measuring Receiver input.

4.7.2.1.2 Set the TI MODE to Tx TEST, MOD to FM, AF FILTERS to BAND PASS (0.3 to 3.4 kHz) and RF IN/OUT to BNC connector.

4.7.2.1.3 Set Measuring Receiver controls as necessary to measure FM modulation. Press the 300 Hz HP and 3 kHz LP FILTER keys.

4.7.2.1.4 Set Signal Generator carrier frequency to 100 MHz, OUTPUT level to 7 dBm, 25 kHz of FM at 1 kHz internal modulation as indicated on the Measuring Receiver.

4.7.2.1.5 Verify the TI MOD LEVEL is within the values listed in the Limits column of Table 25. Verify the TI FM bar chart indicates the FM being applied.

4.7.2.1.6 Repeat steps 4.7.2.1.3 through 4.7.2.1.5 for the remaining values listed in Table 25.

Table 25.

Carrier Frequency (MHz)	Modulation Frequency (kHz)	Modulation Level (kHz)	Limits (kHz)
100	1	25	23.50 to 26.50
100	1	10	9.4 to 10.6
100	1	5	4.70 to 5.30
100	1	1	0.94 to 1.06
10	1	25	23.50 to 26.50
500	1	25	23.50 to 26.50
1000	1	25	23.50 to 26.50
100	0.100 * ¹	25	22.87 to 27.13
100	10 * ²	25	22.87 to 27.13

*¹ On the TI, select the 300 Hz LP filter. On the Measuring Receiver, press the 50 Hz HP FILTER key.

*² On the TI, select the 15 kHz LP filter. On the Measuring Receiver, press the 15 kHz LP FILTER key.

4.7.2.1.7 Set all outputs to minimum. Disconnect the test setup.

4.7.2.2 DEMODULATION DISTORTION CALIBRATION:

4.7.2.2.1 Connect the Signal Generator to the TI RF IN/OUT BNC connector. Connect the Audio Analyzer to the TI DE-MOD OUT connector (Rear Panel).

4.7.2.2.2 Set the TI MODE to Tx TEST, MOD to FM, AF FILTERS to BAND PASS (0.3 to 3.4 kHz), and RF IN/OUT to BNC connector.

4.7.2.2.3 Set Signal Generator frequency to the first value listed in the Frequency column of Table 26, output level to 0 dBm, 5 kHz of FM at 1 kHz internal modulation.

4.7.2.2.4 Set the Audio Analyzer as required to measure distortion.

4.7.2.2.5 The Audio Analyzer must indicate within the values listed in the Limits column of Table 26.

4.7.2.2.6 Repeat steps 4.7.2.2.3 and 4.7.2.2.5 for the remaining values listed in Table 26.

Table 26.

Frequency (MHz)	Limits (%)
10.0	<1.5
100.0	<1.5

4.7.2.2.7 Set the Signal Generator output to minimum. Disconnect the test setup.

4.7.2.3 RESIDUAL FM CALIBRATION:

4.7.2.3.1 Connect the Synthesized Signal Generator output to the TI RF IN/OUT BNC connector.

4.7.2.3.2 Set the TI MODE to Tx TEST, MOD to FM, AF FILTERS to BAND PASS (0.3 to 3.4 kHz), and RF IN/OUT to BNC connector.

4.7.2.3.3 Set the Synthesized Signal Generator frequency to the first value listed in the Frequency column of Table 27, output level to 0 dBm. Set the internal modulation Off.

4.7.2.3.4 The TI MOD LEVEL must indicate within the appropriate values listed in the Limits column of Table 27.

4.7.2.3.5 Repeat steps 4.7.2.3.3 and 4.7.2.3.4 for the remaining value listed in Table 27.

Table 27.

Frequency (MHz)	Limits (kHz)	
	2955B	2955R
100.0	≤0.02	≤0.03
1000.0	≤0.03	≤0.05

4.7.2.3.6 Set the Synthesized Signal Generator output to minimum. Disconnect the test setup.

4.7.3 PHASE MODULATION CALIBRATION:**4.7.3.1 DEVIATION CALIBRATION:**

4.7.3.1.1 Connect the Signal Generator to the Power Splitter input. Connect one output of the Power Splitter to the TI RF IN/OUT BNC connector. Connect the other output of the Power Splitter to the Measuring Receiver input.

4.7.3.1.2 Set the TI MODE to Tx TEST, MOD to Φ M, AF FILTERS to BAND PASS (0.3 to 3.4 kHz), and RF IN/OUT to BNC connector.

4.7.3.1.3 Set Measuring Receiver controls as necessary to measure Φ M modulation. Press the 300 Hz HP and 3 kHz LP FILTER keys.

4.7.3.1.4 Set Signal Generator carrier frequency to 100 MHz, OUTPUT level to 0 dBm, 10 radians of Φ M at 1 kHz internal modulation as indicated on the Measuring Receiver.

4.7.3.1.5 Verify the TI MOD LEVEL is within the values listed in the Limits column of Table 28. Verify the TI Φ M bar chart indicates the Φ M being applied.

4.7.3.1.6 Repeat steps 4.7.3.1.3 through 4.7.3.1.5 for the remaining values listed in Table 28.

Table 28.

Carrier Frequency (MHz)	Modulation Frequency (kHz)	Modulation Level (rad)	Limits (rad)
100	1	10	9.4 to 10.6
100	1	5	4.6 to 5.4
100	1	1	0.94 to 1.06
1.5	1	10	9.4 to 10.6
10	1	10	9.4 to 10.6
200	1	10	9.4 to 10.6
400	1	10	9.4 to 10.6
100	3.4 *	10	9.1 to 10.9

* On the TI, select the 15 kHz LP filter. On the Measuring Receiver, press the 15 kHz LP FILTER key.

4.7.3.1.7 Set all outputs to minimum. Disconnect the test setup.

4.8 DISTORTION AND NOISE METER CALIBRATION:

4.8.1 Connect equipment as shown in Figure 2.

NOTE

It may be necessary to phase lock the Level Generator and the Synthesized Function Generator. Use the required test equipment as necessary.

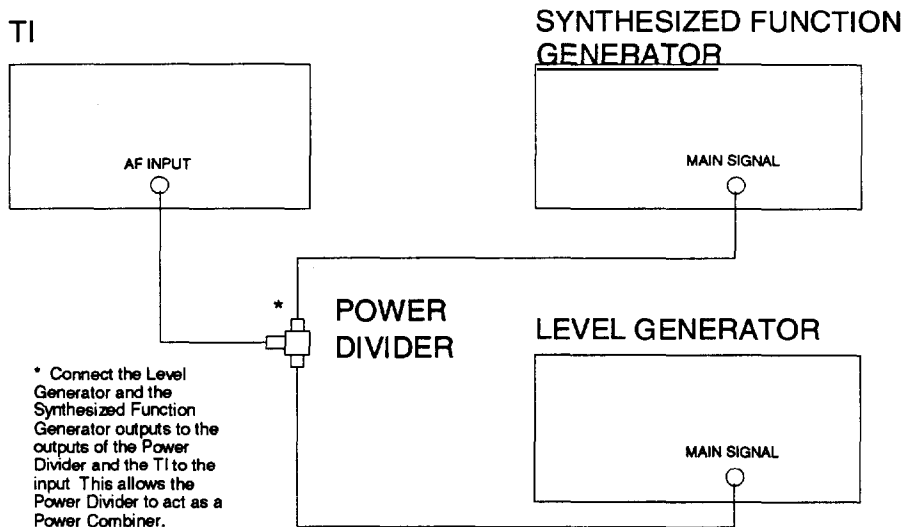


Figure 2.

4.8.2 Set the Synthesized Function Generator output, as required, to 1.000 V at 1 kHz.

4.8.3 Set the Level Generator output, as required, to the first value listed in the Level column of Table 29 at 400 Hz.

4.8.4 On the TI, press Return until the TI is back to the main Rx TEST menu. Press the first TI FUNCTION key listed in the Function column of Table 29.

4.8.5 The TI distortion meter must indicate within the values listed in the Limits column of Table 29.

4.8.6 Repeat steps 4.8.3 through 4.8.5 for the remaining values listed in Table 29.

Table 29.

Level (mV)	Function	Limits
20.0	DIST'N	1.4 to 2.6%
250.0	DIST'N	23.2 to 26.8%
250.0	SINAD	11 to 13 dB

4.8.7 Set all outputs to minimum and disconnect the test setup.

4.9 AF FREQUENCY METER SENSITIVITY CALIBRATION:

4.9.1 Connect the Synthesized Function Generator output through the Feedthrough Termination to the TI AF INPUT connector.

4.9.2 Set the TI MODE to Rx TEST on 2955R or AUDIO TEST on 2955B, FUNCTION to AF GEN AUDIO TEST, AC DC to DC AF FILTERS to LOW PASS (50 kHz) and DIST'N to OFF.

4.9.3 Set the Synthesized Function Generator output for minimum output at the first frequency listed in the Frequency column of Table 30.

4.9.4 Increase the Synthesized Function Generator output slowly until the TI FREQ METER indicates a stable indication.

4.9.5 The Synthesized Function Generator output must be less than or equal to the value listed in the Limits column of Table 30.

4.9.6 Repeat steps 4.9.3 through 4.9.5 for the remaining values listed in Table 30.

Table 30.

Frequency (Hz)	Limits (mV rms)
20	50
100	50
1 k	50
10 k	50
20 k	50

4.9.7 Set the Synthesized Function Generator output to minimum. Disconnect the test setup.

4.10 AF VOLTMETER LEVEL ACCURACY CALIBRATION:

- 4.10.1 Connect Meter Calibrator OUTPUT to the TI AF INPUT connector.
- 4.10.2 Set the TI MODE to Rx TEST on 2955R or AUDIO TEST on 2955B, FUNCTION to AF GEN AUDIO TEST, AC DC to DC AF FILTERS to LOW PASS (50 kHz) and DIST'N to OFF.
- 4.10.3 Set the Meter Calibrator, as required, for the first value listed in the Applied column of Table 31.
- 4.10.4 The TI AF VOLTMETER must indicate within the values listed in the Limits column of Table 31.
- 4.10.5 Repeat steps 4.10.3 and 4.10.4 for the remaining values listed in Table 31.

Table 31.

Applied (VDC)	Limits (VDC)
90 m	83 to 97 m
270 m	258 to 282 m
0.90	0.86 to 0.94
2.70	2.58 to 2.82
3.3	3.1 to 3.5
7.0	6.7 to 7.3
9.0	8.6 to 9.4
27.0	25.8 to 28.2
90	86 to 94

- 4.10.6 Verify the proper operation of the TI Bar Chart.
- 4.10.7 Set TI AC DC switch to AC.
- 4.10.8 Set the Meter Calibrator, as required, for the first value listed in the Applied column of Table 32 at the first frequency listed in the Frequency column of Table 32.
- 4.10.9 The TI AF VOLTMETER must indicate within the values listed in the Limits column of Table 32.
- 4.10.10 Repeat steps 4.10.8 and 4.10.9 for the remaining values listed in Table 32.

Table 32.

Applied (VAC)	Frequency (Hz)	Limits (VDC)
90 m	50	83 to 97 m
90 m	1 k	83 to 97 m
90 m	20 k	83 to 97 m
270 m	50	258 to 282 m
270 m	1 k	258 to 282 m
270 m	20 k	258 to 282 m
0.90	50	0.86 to 0.94
0.90	1 k	0.86 to 0.94
0.90	20 k	0.86 to 0.94
2.70	50	2.58 to 2.82
2.70	1 k	2.58 to 2.82
2.70	20 k	2.58 to 2.82
9.0	50	8.6 to 9.4
3.3	1 k	3.1 to 3.5
7.0	1 k	6.7 to 7.3
9.0	1 k	8.6 to 9.4
9.0	20 k	8.6 to 9.4
27.0	50	25.8 to 28.2
27.0	1 k	25.8 to 28.2
27.0	20 k	25.8 to 28.2
90	50	86 to 94
90	1 k	86 to 94
90	20 k	86 to 94

4.10.11 Set the Meter Calibrator output level to minimum and disconnect test equipment.

4.11 OSCILLOSCOPE CALIBRATION:

4.11.1 VOLTAGE RANGES CALIBRATION:

4.11.1.1 Connect Meter Calibrator to the TI AF INPUT connector.

4.11.1.2 Set TI MODE to Rx TEST, SCOPE/BAR to SCOPE, AC/DC to DC, AF FILTER to LOW PASS (50 kHz), DIST'N, S/N and SINAD functions to OFF.

4.11.1.3 Use the vertical TI OSCILLOSCOPE POSITION control to move the trace to the bottom dotted graticule line.

4.11.1.4 Set TI VERT scale range to the first value listed in the TI VERT scale column of Table 33.

4.11.1.5 Set Meter Calibrator for +DC output and adjust the level until the OSCILLOSCOPE trace appears on the top dotted graticule line.

4.11.1.6 The Meter Calibrator output must indicate within the values listed in the Limits column of Table 33.

4.11.1.7 Set the Meter Calibrator output to +0.0 V.

4.11.1.8 Repeat steps 4.11.1.3 through 4.11.1.7 for the remaining values listed in Table 33.

NOTE

Utilize the TI VERT up/down push buttons to change the TI range, as required.

Table 33.

TI VERT scale (V/div)	Limits (VDC)
20	95 to 105
10	47.5 to 52.5
5	23.75 to 26.25
2	9.5 to 10.5
1	4.75 to 5.25
500 m	2.375 to 2.625
200 m	0.95 to 1.05
100 m	475 to 525 m

Table 33. (Cont.)

TI VERT scale (V/div)	Limits (VDC)
50 m	237.5 to 262.5 m
20 m	95 to 105 m
10 m	47.5 to 52.5 m

4.11.1.9 Set the Meter Calibrator output to STDBY. Disconnect the test setup.

4.11.2 FM RANGES CALIBRATION:

4.11.2.1 Connect the Signal Generator to the Power Splitter input. Connect one output of the Power Splitter to the TI RF IN/OUT BNC connector. Connect the other output of the Power Splitter to the Measuring Receiver input.

4.11.2.2 Set the TI MODE to Tx TEST, MOD to FM, SCOPE/BAR to SCOPE, AF FILTERS to BAND PASS (0.3 to 3.4 kHz) and RF IN/OUT to BNC connector.

4.11.2.3 Set Signal Generator frequency to 100 MHz, Output Level to +7 dBm, Modulation to FM and 1 kHz internal modulation.

4.11.2.4 Set Measuring Receiver controls as necessary to measure FM modulation.

4.11.2.5 Set TI OSCILLOSCOPE VERT scale range to >30 kHz deviation.

4.11.2.6 Adjust Signal Generator FM deviation until the FM deviation is shown on the TI OSCILLOSCOPE as 20 kHz.

4.11.2.7 The Measuring Receiver must indicate within the values listed in the Limits column of Table 34.

4.11.2.8 Repeat steps 4.11.2.5 through 4.11.2.7 for the remaining TI OSCILLOSCOPE ranges, listed in the Range column of Table 34. The deviation must be within the values in the Limits column of Table 34.

NOTE

Utilize the TI VERT up/down push buttons to change the TI range, as required.

Table 34.

Range (kHz)	Applied (kHz)	Limits (kHz)
30	20	18.0 to 22.0
15	10	9.0 to 11.0
6	4	3.6 to 4.4

Table 34. (Cont.)

Range (kHz)	Applied (kHz)	Limits (kHz)
6	2	1.8 to 2.2
3	2	1.8 to 2.2
1.5	1	0.9 to 1.1

4.11.2.9 Set the Signal Generator output to minimum. Leave the test equipment in the setup.

4.11.3 AM RANGES CALIBRATION:

4.11.3.1 Set TI MOD control to AM.

4.11.3.2 Set Signal Generator frequency to 100 MHz, Output Level to +7 dBm, Modulation to AM and 1 kHz internal modulation.

4.11.3.3 Set Measuring Receiver controls as necessary to measure AM modulation.

4.11.3.4 Set TI OSCILLOSCOPE VERT scale range to 20%/div.

4.11.3.5 Adjust the Signal Generator depth until the waveform is shown of the TI OSCILLOSCOPE as 80%.

4.11.3.6 The Measuring Receiver must indicate within the values listed in the Limits column of Table 35.

4.11.3.7 Repeat steps 4.11.3.4 through 4.11.3.6 for the remaining TI OSCILLOSCOPE ranges, listed in the Range column of Table 35. The modulation depth must be within the values in the Limits column of Table 35.

NOTE

Utilize the TI VERT up/down push buttons to change the TI range, as required.

Table 35.

Range (%/Div)	Applied (%)	Limits (%)
20	80	72.0 to 88.0
10	40	36.0 to 44.0
5	20	18.0 to 22.0

4.11.3.8 Set TI RF IN/OUT switch to OUT. Set the Signal Generator output to minimum.

4.11.4 Φ M RANGES CALIBRATION:

4.11.4.1 Connect the Signal Generator to the Power Splitter input. Connect one output of the Power Splitter to the TI RF IN/OUT BNC connector. Connect the other output of the Power Splitter to the Measuring Receiver input.

4.11.4.2 Set the TI MODE to Tx TEST, MOD to Φ M, SCOPE/BAR to SCOPE, AF FILTERS to BAND PASS (0.3 to 3.4 kHz) and RF IN/OUT to BNC connector.

4.11.4.3 Set Signal Generator frequency to 100 MHz, Output Level to +7 dBm, Modulation to Φ M and 1 kHz internal modulation.

4.11.4.4 Set Measuring Receiver controls as necessary to measure Φ M modulation.

4.11.4.5 Set TI OSCILLOSCOPE VERT scale range to >15 rad deviation.

4.11.4.6 Adjust Signal Generator Φ M deviation until the Φ M deviation as shown on the TI OSCILLOSCOPE is 10 radians.

4.11.4.7 The Measuring Receiver must indicate within the values listed in the Limits column of Table 36.

4.11.4.8 Repeat steps 4.11.4.5 through 4.11.4.7 for the remaining TI OSCILLOSCOPE ranges, listed in the Range column of Table 36. The deviation must be within the values in the Limits column of Table 36.

NOTE

Utilize the TI VERT up/down push buttons to change the TI range, as required.

Table 36.

Range (radians)	Applied (rad)	Limits (rad)
15	10	9.0 to 11.0
7.5	5	4.5 to 5.5
3	2	1.8 to 2.2
1.5	1	0.9 to 1.1

4.11.4.9 Set the Signal Generator output to minimum. Set all POWER switches to OFF or STDBY and disconnect and secure all equipment.

4.11.4.10 Annotate a Limited Certification Label with Residual FM limited to ≤ 0.03 kHz up to 500 MHz (≤ 0.02 kHz for 2955B) and ≤ 0.05 kHz up to 1000 MHz (≤ 0.03 kHz for 2955B).

CALIBRATION PERFORMANCE TABLE

Not Required

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

A.1.1 Connect Frequency Standard 1 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 EXT. STD 1 MHz input (rear panel) to the Electronic Counter CHANNEL A input. Set Electronic Counter 50 Ω /1M Ω switch to 50 Ω .

A.1.3 Adjust the TI Reference Oscillator Adjustment for an Electronic Counter indication as close as possible to 10 MHz.

A.1.4 Allow TI 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 4.2.

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

A.2.1 Connect Frequency Standard 1 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 EXT. STD 1 MHz input (rear panel) to the Electronic Counter CHANNEL 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 Reference Oscillator Adjustment for an Electronic Counter indication as close as possible to 1 MHz \pm the Offset labeled on the cover of the TCXO. For example: If the Offset is labeled +0.35 Hz, the TCXO should be adjusted as close as possible to a frequency indication of 1.000 000.35 MHz on Electronic Counter.

A.2.4 Allow TI 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 4.2.

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

A.3.1 Connect Frequency Standard 1 MHz FREQ OUT to Frequency Difference Meter (FDM) REF INPUT. Connect the TI EXT. STD 1 MHz input (rear panel) 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 Reference Oscillator Adjustment, as required for lowest possible null on the FDM meter.

A.3.4 Allow TI 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 4.2.