

SECTION 1 - CALIBRATION

1-1 GENERAL

This section contains calibration procedures for the following assemblies and systems:

PARA	TITLE	PAGE
1-8-1	POWER SUPPLY CALIBRATION	1-5
1-8-2	TCXO/OCXO CALIBRATION	1-7
1-8-3	DVM CALIBRATION	1-9
1-8-4	GENERATOR OUTPUT LEVEL CALIBRATION	1-11
1-8-5	DISTORTION METER CALIBRATION	1-14
1-8-6	SINAD METER CALIBRATION	1-16
1-8-7	RF GENERATE FM DEVIATION CALIBRATION	1-18
1-8-8	RF GENERATE PM DEVIATION CALIBRATION	1-21
1-8-9	RF GENERATE AM MODULATION CALIBRATION	1-23
1-8-10	RF GENERATE EXTERNAL MODULATION CALIBRATION	1-25
1-8-11	SPECTRUM ANALYZER CALIBRATION	1-29
1-8-12	MIXER NULL CALIBRATION	1-36
1-8-13	FM DEVIATION METER CALIBRATION	1-38
1-8-14	PM DEVIATION METER CALIBRATION	1-41
1-8-15	AM MODULATION METER CALIBRATION	1-43
1-8-16	POWER METER CALIBRATION	1-45

These procedures should be performed as a result of one or more of the following conditions:

- If, during the course of normal operation, the COM-120B or any major function thereof fails to meet the performance specifications.
- If a module is found to be defective and requires replacement.
- If the recommended 12 month calibration interval is due.

Figure 1-1 lists the calibration procedures required based on the replacement of a specific module. All procedures must be performed for the annual calibration.

1-1-1 SAFETY PRECAUTIONS

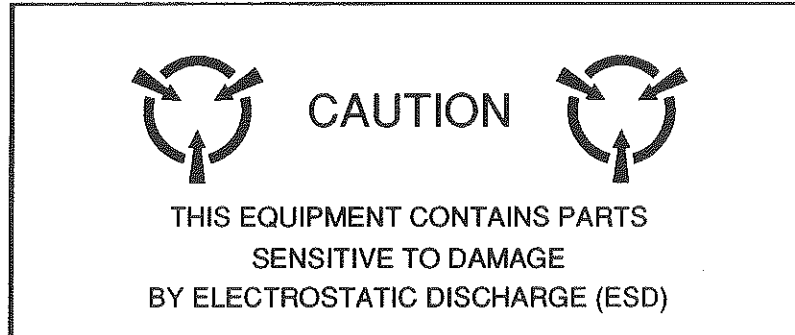
As with any piece of electronic equipment, extreme caution should be taken when working with "live" circuits. When performing the calibration procedures in this section, be sure to observe the following precautions:

WARNING: REMOVE ALL JEWELRY BEFORE PERFORMING ANY CALIBRATION PROCEDURES INVOLVING LIVE CIRCUITS.

HEED ALL WARNINGS AND CAUTIONS CONCERNING MAXIMUM VOLTAGES AND POWER INPUTS.

1-1-2 ESD PRECAUTIONS

CAUTION: THESE CALIBRATION PROCEDURES SHOULD ONLY BE PERFORMED IN AN ESD ENVIRONMENT AND ALL PERSONNEL PERFORMING THIE PROCEDURES SHOULD KNOW ACCEPTED ESD PRACTICES OR BE ESD CERTIFIED.



1-2 TEST EQUIPMENT REQUIREMENTS

Table 1-1 contains a comprehensive list of test equipment suitable for performing any of the procedures listed in this manual. Any other equipment meeting the specifications listed in Table 1-1 may be substituted in place of the recommended models.

NOTE: For certain procedures contained in this manual, the equipment listed in Appendix A may exceed the minimum required specifications.

1-3 DISASSEMBLY REQUIREMENTS

To perform the calibration procedures, the case assembly must be removed.

1-4 CALIBRATION ADJUSTMENTS

Before making adjustments, always observe the measurement. If the measurement is within the tolerances given, do not proceed with the adjustment. When an adjustment is required, attempt to obtain a precise measurement, instead of just within tolerance.

1-5 CONTROLS, CONNECTORS AND INDICATORS

The front and rear panel controls, connectors and indicators specified in the calibration procedures are followed by an item number. Refer to Figures 3-1 and 3-2 in the COM-120B Operation Manual for the location of these items.

1-6 COMPLETION OF CALIBRATION TEST PROCEDURES

Upon completion of a specific calibration procedure, the calibration procedure may be terminated. Control settings, operating commands and test equipment do not carry over from one procedure to another and are not assumed at the beginning of a procedure.

1-7 CALIBRATION RECORD

A Calibration Record is provided for recording the results obtained while performing the Calibration Procedures. It is recommended the technician reproduce the Calibration Record, rather than use the copy in this manual.

Type	Model	Specifications
Digital Multimeter (DMM)	HP34401A or equivalent	
Calibrator	Fluke 5100B or equivalent	
Audio Analyzer	HP8903B or equivalent	Frequency Range: 20 Hz to 20 kHz Accuracy ±0.1 dB
Frequency Counter	Phillips PM6669 or equivalent	Frequency: 10 Hz to 1.3 GHz Resolution: ≥7 digits
Measuring Receiver	HP8902A (opt. 30, 32, 37) or equivalent	RF Power: -20 to +30 dBm RF Power Range: .1 to 1 GHz RF Level: Tuned 0 to -127 dBm RF Power Accuracy: ±0.1 dB
Measuring Receiver Sensor	HP11722A or equivalent	
Modulation Analyzer	HP8901A or equivalent	FM Meter Range: 20 Hz to 200 kHz FM Meter Accuracy: ±1% ±1 digit Phase Meter Range: to 200 Radians Phase Meter Accuracy: ±3% ±1 digit
10 MHz Standard		Accuracy: ±2 X 10 ⁻⁹ (Traceable to NIST)
COM-120 Maintenance Kit	P/N 7001-8743-800	
Signal Generator	HP8657A or equivalent	
10 W RF Amplifier	Amplifier Research 10W1000 or equivalent	Gain: 40 dB Nominal Bandwidth: 1 MHz to 1 GHz
200 W RF Amplifier	ENI 5100L or equivalent	Gain: 50 dB Nominal Bandwidth: 1.5 to 150 MHz

Table 1-1 Test Equipment Requirements

<div> <div>IF THIS ASSEMBLY IS REPAIRED OR REPLACED</div> <div>THE FOLLOWING CALIBRATION PROCEDURES MUST BE PERFORMED</div> </div>	POWER SUPPLY CALIBRATION	TCXO/OCXO CALIBRATION	DVM CALIBRATION	GENERATOR OUTPUT LEVEL CALIBRATION	DISTORTION METER CALIBRATION	SINAD METER CALIBRATION	RF GENERATE FM DEVIATION CALIBRATION	RF GENERATE PM DEVIATION CALIBRATION	RF GENERATE AM MODULATION CALIBRATION	RF GENERATE EXT MODULATION CALIBRATION	SPECTRUM ANALYZER CALIBRATION	MIXER NULL CALIBRATION	FM DEVIATION METER CALIBRATION	PM DEVIATION METER CALIBRATION	AM MODULATION METER CALIBRATION	POWER METER CALIBRATION
	1-8-1	1-8-2	1-8-3	1-8-4	1-8-5	1-8-6	1-8-7	1-8-8	1-8-9	1-8-10	1-8-11	1-8-12	1-8-13	1-8-14	1-8-15	1-8-16
MOTHERBOARD PC BOARD ASSEMBLY																
ATTENUATOR CONTROL PC BOARD ASSEMBLY																
FRONT PANEL ASSEMBLY																
DIGITAL TRAY											●					
CONTROLLER TRAY											●	●				
ANALYZER TRAY											●	●				
RECEIVER TRAY													●	●	●	
SYNTHESIZER TRAY		●		●	●	●	●	●	●	●	●	●	●	●	●	
GENERATOR TRAY				●			●	●	●	●						
POWER TERMINATION ASSEMBLY																●
GENERATOR OUTPUT ASSEMBLY				●			●	●	●	●						
CONVERTER ASSEMBLY				●			●	●	●	●						
REFERENCE FREQUENCY ASSEMBLY		●														
FAN ASSEMBLY																
POWER SUPPLY ASSEMBLY	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Figure 1-1 Module Replacement and Calibration Requirements

1-8 CALIBRATION PROCEDURES

1-8-1 POWER SUPPLY CALIBRATION

PREREQUISITES: NONE

EQUIPMENT REQUIRED: 1 DIGITAL MULTIMETER (DMM)

FIGURES: 1-2

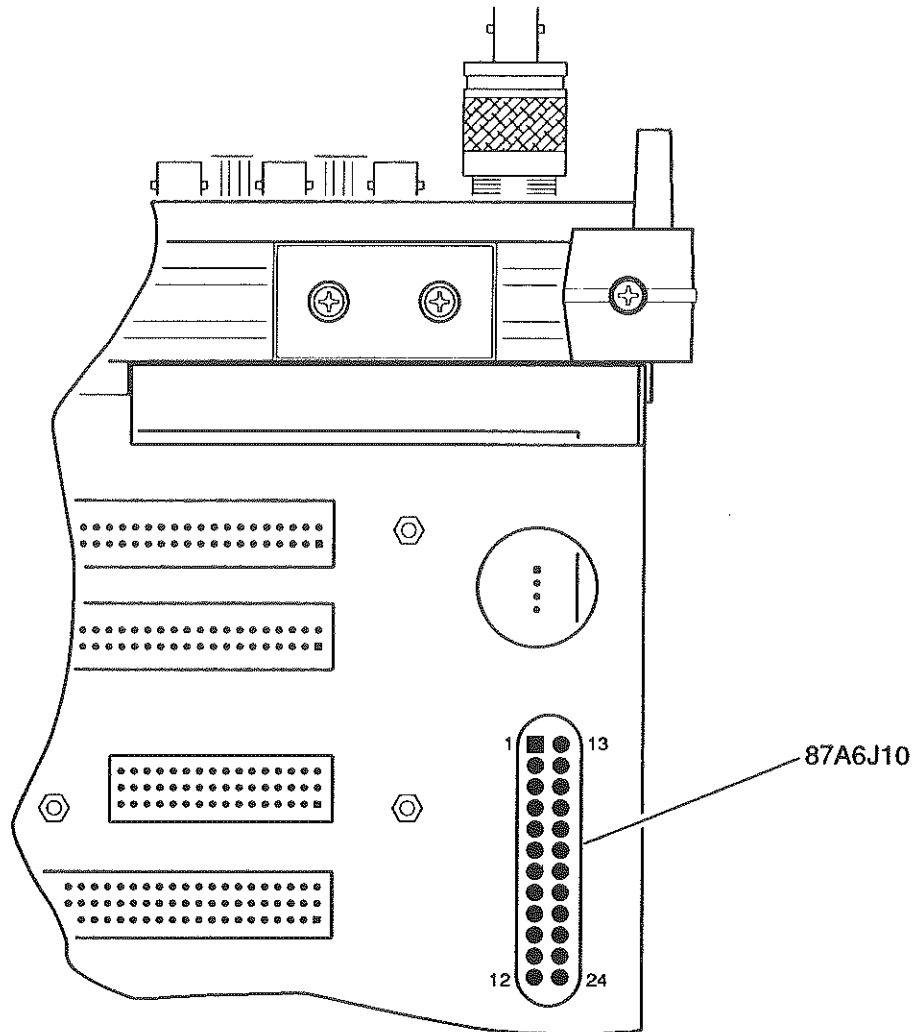
STEP	PROCEDURE
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1. Apply Power to COM-120B. Allow 30 minute warm-up period.
2. Verify Voltages at Motherboard Connector 87A6J10 per Table 1-2 using DMM. Refer to Figure 1-2 for pin locations. Use Chassis for ground.

Supply	Voltage	Location
+13 V	+13 Vdc (± 0.25 V)	87A6J10 PIN 1,13
+35 V	+35 Vdc (± 1 V)	87A6J10 PIN 2,14
-10.5 V	-10.5 Vdc (± 0.5 V)	87A6J10 PIN 3,15
+10.5 V	+10.5 Vdc (± 0.25 V)	87A6J10 PIN 4,16
+5 V Analog	+5 Vdc (+0.2 V/-0.0 V)	87A6J10 PIN 5,17
+5 V Digital	+5 Vdc (+0.2 V/-0.0 V)	87A6J10 PIN 7,19
+12 V EL	+12 Vdc (± 0.25 V)	87A6J10 PIN 9,21

Table 1-2 Power Supply Voltages and Locations

3. Set COM-120B to OFF and disconnect test equipment.



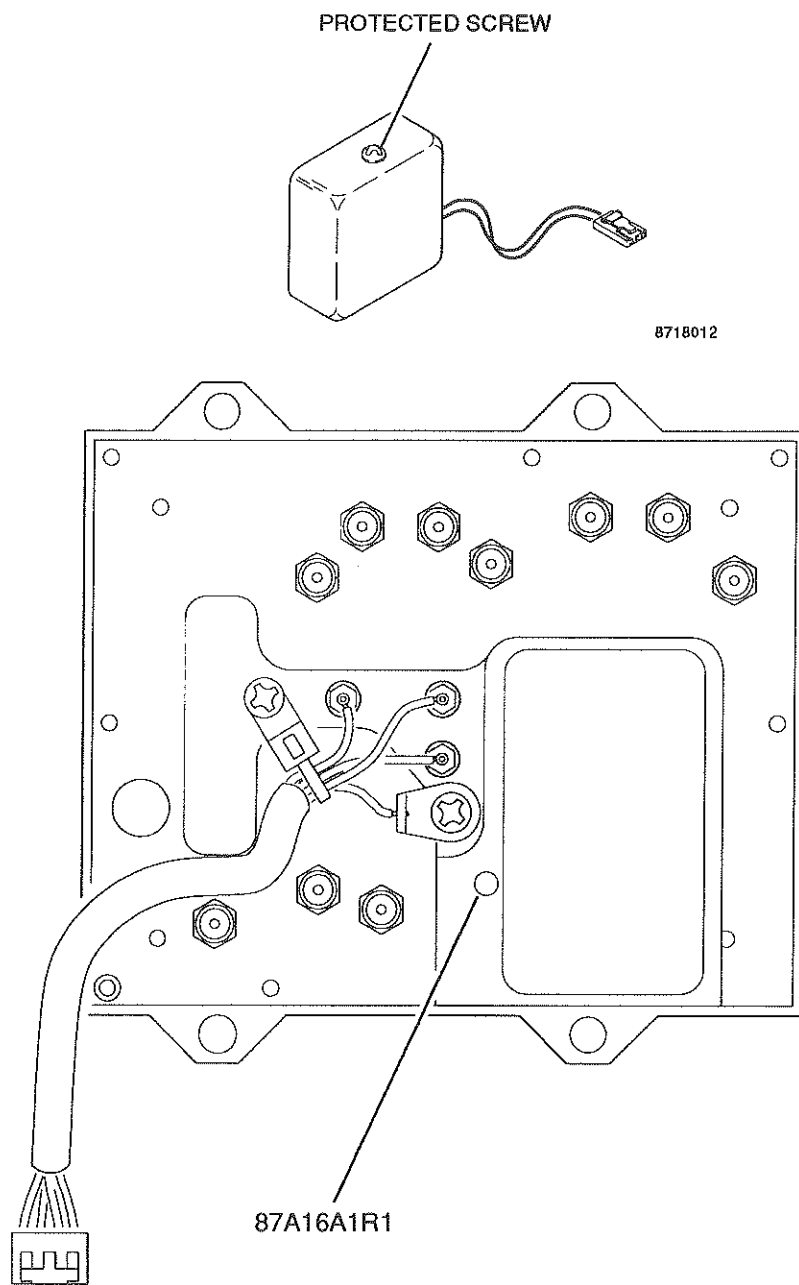
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Figure 1-2 Power Supply Voltage Locations (87A6J10)

1-8-2 TCXO/OCXO CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
EQUIPMENT REQUIRED: 1 FREQUENCY COUNTER
FIGURES: 1-3

STEP	PROCEDURE
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.
2.	Connect Frequency Counter to AUX RF OUT Connector (13).
3.	Press GEN Test Mode Key (3) to access RF Generate Operation Screen.
4.	Set RF Field to 998.0000 MHz .
5.	Set Output to AUX and Output Level to -13 dBm .
6.	Set all Modulation Sources to OFF.
7.	If OCXO is installed, go to Step 10.
8.	Verify Frequency Counter reads 998.0000 (± 199.6 Hz). Adjust 87A16A1R1 as required (Figure 1-3).
9.	Set COM-120B Power to OFF and disconnect test equipment.
10.	If OCXO is installed, verify Frequency Counter reads 998.0000 (± 10 Hz). If not, go to Step 12.
11.	Set COM-120B Power to OFF and disconnect test equipment.
12.	Remove Protected Screw from OCXO to access adjustment. Adjust OCXO until Frequency Counter reads 998.0000 (± 10 Hz).
13.	Replace Protected Screw, set COM-120B Power to OFF and disconnect test equipment.



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Figure 1-3 TCXO/OCXO Adjustments

1-8-3 DVM CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION

EQUIPMENT REQUIRED: 1 CALIBRATOR

FIGURES: NONE

STEP	PROCEDURE
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1. Apply Power to COM-120B. Allow 5 minute warm-up period.
2. Connect Calibrator to SCOPE/DVM Connector (20).
3. Press MTRS Instruments Key (4).
4. Select "3. DVM" on Meters Menu.
5. Set Peak Hold to **OFF**.
6. Set Average to **OFF**.
7. Set Source to **SC/DVM AC**.
8. Set Meter Reading Units to **Vrms**.
9. Set Range as shown in Table 1-3. For each Range setting, set Calibrator for stated input. Verify Meter Reading matches input within specified tolerance. If not, go to Step 13.

Range	Calibrator Input	Frequency	Reading Tolerance
200 V	190 Vrms	50 Hz	±10.1 V
20 V	19 Vrms	1 kHz	±1.02 V
2 V	1.9 Vrms	20 kHz	±106 mV

Table 1-3 SC/DVM AC Range Settings

10. Set Source to **SC/DVM DC**.
11. Set Range as shown in Table 1-4. For each Range setting, set Calibrator for stated input. Verify Meter Reading matches input within specified tolerance. If not, go to Step 13.

Range	Calibrator Input	Reading Tolerance
200 V	190 Vdc	±10.1 V
20 V	19 Vdc	±1.02 V
2 V	1.9 Vdc	±106 mV

Table 1-4 SC/DVM DC Range Settings

STEP

PROCEDURE

12. Set COM-120B to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

13. Press SETUP MEMORY Key (21).
14. Select "1. Calibration" from Setup Screen.
15. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
16. Select "1. DVM" to access DVM METER CALIBRATION Screen.
17. Move cursor to AC RANGE X1.
18. Set Calibrator to 1.000 Vrms at 60 Hz.
19. Press ENTER Key twice and wait until current Field displays **CALIBRATED**.
20. Move cursor to AC RANGE X10.
21. Set Calibrator to 10.00 Vrms at 60 Hz.
22. Press ENTER Key twice and wait until current Field displays **CALIBRATED**.
23. Move cursor to AC RANGE X100.
24. Set Calibrator to 100.0 Vrms at 60 Hz.
25. Press ENTER Key twice and wait until current Field displays **CALIBRATED**.
26. Move cursor to DC RANGE X1.
27. Set Calibrator to 2.000 Vdc.
28. Press ENTER Key twice and wait until current Field displays **CALIBRATED**.
29. Press RETURN Soft Function Key F6.
30. Press MTRS Instruments Key (4).
31. Select "3. DVM" on Meters Menu.
32. Proceed at Step 7.

1-8-4 GENERATOR OUTPUT LEVEL CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION

EQUIPMENT REQUIRED: 1 MEASURING RECEIVER

FIGURES: NONE

STEP	PROCEDURE
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.
2.	Press GEN Test Mode Key (3) to access RF Generate Operation Screen.
3.	Set RF Field to 405.5000 MHz.
4.	Set all Modulation Sources to OFF.
5.	Set Output to <i>T/R</i> and connect Measuring Receiver to T/R Connector. Set Measuring Receiver for Automatic Tuning and Tuned RF Level Measurement.
6.	Set Output Level to -20 dBm . Verify Measuring Receiver reads -20 dBm (± 2 dB). If not, go to Step 14.
7.	Set Output Level to -90 dBm . Verify Measuring Receiver reads -90 dBm (± 2 dB). If not, go to Step 14.
8.	Set Output Level to -130 dBm . Verify Measuring Receiver reads -130 dBm (± 2.5 dB). If not, go to Step 14.
9.	Set Output to AUX and connect Measuring Receiver to AUX RF OUT Connector (13).
10.	Set Output Level to -20 dBm . Verify Measuring Receiver reads -20 dBm (± 2 dB). If not, go to Step 14.
11.	Set Output Level to -90 dBm . Verify Measuring Receiver reads -90 dBm (± 2 dB). If not, go to Step 14.
12.	Set Output Level to -130 dBm . Verify Measuring Receiver reads -130 dBm (± 2.5 dB). If not, go to Step 14.
13.	Set COM-120B to OFF and disconnect test equipment.
PERFORM THE FOLLOWING ONLY WHEN REQUIRED.	
14.	Press SETUP MEMORY Key (21).
15.	Select "1. Calibration" from Setup Screen.
16.	Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
17.	Select "6. RF GENERATOR - OUTPUT LEVEL" to access RF GENERATOR LEVEL CALIBRATION Screen.

STEP

PROCEDURE

18. Press LEVEL Soft Function Key F2, if displayed.
19. Connect Measuring Receiver to T/R Connector.
20. Move cursor to -20 dBm Field. Press ENTER Key to access Data Field.
21. Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -20 dBm.
22. Press ENTER Key and wait until -20 dBm Field displays **CALIBRATED**.
23. Move cursor to -22 dBm Field. Press ENTER Key to access Data Field.
24. Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -22 dBm.
25. Press ENTER Key and wait until -22 dBm Field displays **CALIBRATED**.
26. Move cursor to -24 dBm Field. Press ENTER Key to access Data Field.
27. Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -24 dBm.
28. Press ENTER Key and wait until -24 dBm Field displays **CALIBRATED**.
29. Move cursor to -26 dBm Field. Press ENTER Key to access Data Field.
30. Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -26 dBm.
31. Press ENTER Key and wait until -26 dBm Field displays **CALIBRATED**.
32. Move cursor to -28 dBm Field. Press ENTER Key to access Data Field.
33. Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -28 dBm.
34. Press ENTER Key and wait until -28 dBm Field displays **CALIBRATED**.
35. Move cursor to -29.9 dBm Field. Press ENTER Key to access Data Field.
36. Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -29.9 dBm.
37. Press ENTER Key and wait until -29.9 dBm Field displays **CALIBRATED**.
38. Press T/R Soft Function Key F3. Set Measuring Receiver for RF Power Measurement.

STEP

PROCEDURE

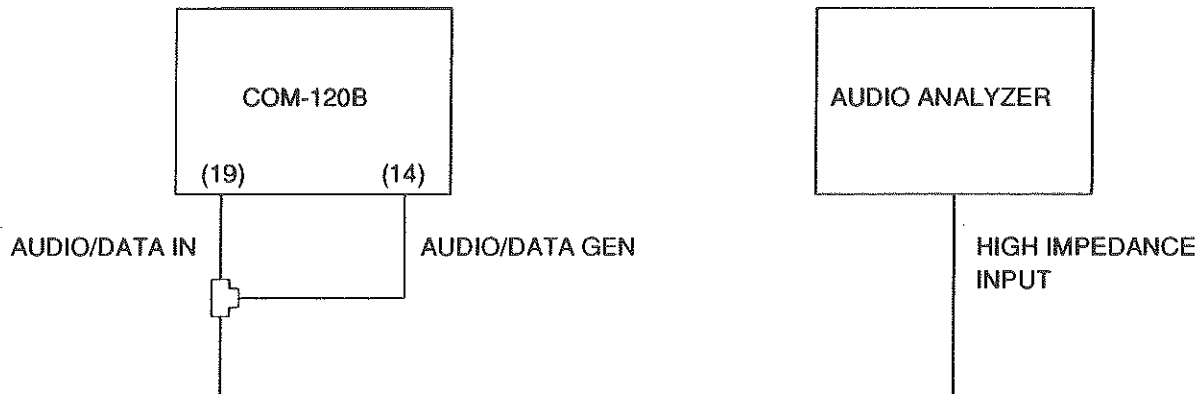
39. Access each Data Field for frequencies 0.2500 to 999.9999 MHz. For each Data Field, perform following:
 - Press ENTER Key to access Data Field.
 - Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -20 dBm.
 - Press ENTER Key and wait until current Field displays ***CALIBRATED***.
 - Continue with next Field.
40. Press AUX Soft Function Key F4.
41. Connect Measuring Receiver to AUX RF OUT Connector (13).
42. Access each Data Field for frequencies 0.2500 to 999.9999 MHz. For each Data Field, perform following:
 - Press ENTER Key to access Data Field.
 - Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to -13 dBm.
 - Press ENTER Key and wait until current Field displays ***CALIBRATED***.
 - Continue with next Field.
43. If Optional Amplifier is installed, press AUX AMP Soft Function Key F5.
44. Access each Data Field for frequencies 0.2500 to 999.9999 MHz. For each Data Field, perform following:
 - Press ENTER Key to access Data Field.
 - Edit Data Field using DATA SCROLL Keys (17) for Measuring Receiver reading closest to 0.0 dBm.
 - Press ENTER Key and wait until current Field displays ***CALIBRATED***.
 - Continue with next Field.
45. Press RETURN Soft Function Key F6.
46. Press GEN Test Mode Key (3).
47. Continue at Step 2.

1-8-5 DISTORTION METER CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION

EQUIPMENT REQUIRED: 1 AUDIO ANALYZER

FIGURES: 1-4



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Figure 1-4 Distortion/SINAD Meter Test Equipment Setup

STEP	PROCEDURE
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.
2.	Connect Test Equipment as shown in Figure 1-4.
3.	Press AUDIO GEN Instruments Key (4).
4.	Set Audio Generator 2 to ON .
5.	If Optional Audio Generator 2 is installed, set Tone Frequency for 1000.0 Hz and Shape to SINE .
6.	Set Audio Generator 2 Level for 1.41 Vp .
7.	Set Audio Generator 1 to ON .
8.	Set Audio Generator 1 Format to TONE .
9.	Set Audio Generator 1 Tone Frequency to 2800.0 Hz .
10.	Set Audio Generator 1 Shape to SINE .
11.	Set Audio Generator 1 Level to 0.14 Vp .
12.	Set Audio Generator 1 Mode to CONT .

STEP

PROCEDURE

13. Set Audio Analyzer to measure Distortion with all filters off.
14. Verify Audio Analyzer reads approximately 10% Distortion.
15. Press MTRS Instruments Key (4).
16. Select Distortion Meter Operation.
17. Set Distortion Meter Source to **AUDIO/DATA-IN**.
18. Set Peak Hold to **OFF**.
19. Set Average to **OFF**.
20. Set Low-Pass Filter to **20 kHz**.
21. Verify Distortion Meter Reading matches Audio Analyzer ($\pm 0.6\%$). If not, go to Step 23.
22. Set COM-120B Power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

23. Set Audio Generator 2 for **1.41 Vp**.
24. Set Audio Generator 1 for **0.14 Vp**.
25. Press SETUP MEMORY Key (21).
26. Select "1. Calibration" from Setup Screen.
27. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
28. Select "2. DISTORTION METER" to access DISTORTION METER CALIBRATION Screen.
29. Enter Audio Analyzer Reading using DATA ENTRY Keys (5). Press ENTER Key.
30. Go to Step 15.

1-8-6 SINAD METER CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION

EQUIPMENT REQUIRED: 1 AUDIO ANALYZER

FIGURES: 1-4

STEP	PROCEDURE
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.
2.	Connect Test Equipment as shown in Figure 1-4.
3.	Press AUDIO GEN Instruments Key (4).
4.	Set Audio Generator 2 to ON .
5.	If Optional Audio Generator 2 is installed, set Tone Frequency for 1000.0 Hz and Shape to SINE .
6.	Set Audio Generator 2 Level for 1.41 Vp .
7.	Set Audio Generator 1 to ON .
8.	Set Audio Generator 1 Format to TONE .
9.	Set Audio Generator 1 Tone Frequency to 2800.0 Hz .
10.	Set Audio Generator 1 Shape to SINE .
11.	Set Audio Generator 1 Level to 0.14 Vp .
12.	Set Audio Generator 1 Mode to CONT .
13.	Set Audio Analyzer to measure SINAD with filters off.
14.	Verify Audio Analyzer reads approximately 20 dB SINAD.
15.	Press MTRS Instruments Key (4).
16.	Select SINAD Meter Operation.
17.	Set SINAD Meter Source to AUDIO/DATA-IN .
18.	Set Peak Hold to OFF .
19.	Set Average to OFF .
20.	Set Low-Pass Filter to 20 kHz .
21.	Verify SINAD Meter Reading matches Audio Analyzer (± 1.1 dB). If not, go to Step 23.
22.	Set COM-120B Power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

23. Set Audio Generator 2 for *1.41 Vp*.
24. Set Audio Generator 1 for *0.14 Vp*.
25. Press SETUP MEMORY Key (21).
26. Select "1. Calibration" from Setup Screen.
27. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
28. Select "3. SINAD METER" to access SINAD METER CALIBRATION Screen.
29. Enter Audio Analyzer Reading using Data Entry Keys (5). Press ENTER Key.
30. Go to Step 15.

1-8-7 RF GENERATE FM DEVIATION CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION

EQUIPMENT REQUIRED: 1 MODULATION ANALYZER

FIGURES: NONE

STEP	PROCEDURE
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.
2.	Connect T/R Connector (12) to Modulation Analyzer Input.
3.	Press GEN Test Mode Key (3) to access RF Generate Operation Screen.
4.	Set RF Field to 101.0000 MHz .
5.	Set Output to T/R and Output Level to -20.0 dBm .
6.	Set All Modulation Sources to OFF.
7.	Set Modulation Analyzer to 101 MHz RF. Set Modulation Analyzer for 3 kHz Low-Pass Filter, Peak+ and FM Measurement. Record Residual on Modulation Analyzer.
8.	Set GEN1 Modulation Type for FM .
9.	Set Deviation for 10.0 kHz .
10.	Set Format for TONE . With Cursor on Format, press CONT Soft Function Key F2.
11.	Set Tone Freq for 10.0 Hz .
12.	Set Shape to SINE .
13.	Verify Modulation Analyzer reads 10 kHz Deviation (± 600 Hz + residual [Step 7]). If not, go to Step 45.
14.	Engage 300 Hz High-Pass Filter on Modulation Analyzer.
15.	Set GEN1 Modulation Type to OFF . Record Residual on Modulation Analyzer.
16.	Set GEN1 Modulation Type to FM .
17.	Set Tone Freq to 1000.0 Hz .
18.	Verify Modulation Analyzer reads 10 kHz Deviation (± 600 Hz + residual [Step 15]). If not, go to Step 45.
19.	Set Modulation Analyzer Low-Pass Filter to 20 kHz.
20.	Set GEN1 Modulation Type to OFF . Record Residual on Modulation Analyzer.
21.	Set GEN1 Modulation Type to FM .

STEP	PROCEDURE
22.	Set Tone Freq to 10000.0 Hz .
23.	Verify Modulation Analyzer reads 10 kHz Deviation (± 600 Hz + residual [Step 20]). If not, go to Step 45.
24.	Set Tone Freq to 15000.0 Hz .
25.	Verify Modulation Analyzer reads 10 kHz Deviation (± 600 Hz + residual [Step 20]). If not, go to Step 45.
26.	Set Modulation Analyzer High-Pass Filter to NONE and Low-Pass Filter to 3 kHz.
27.	Set GEN1 Modulation Type to OFF . Record Residual on Modulation Analyzer.
28.	Set GEN1 Modulation Type to FM .
29.	Set Tone Freq to 10.0 Hz .
30.	Set Deviation for 100.0 kHz .
31.	Verify Modulation Analyzer reads 100 kHz Deviation (± 5.5 kHz + residual [Step 27]). If not, go to Step 45.
32.	Set Modulation Analyzer High-Pass Filter to 300 Hz.
33.	Set GEN1 Modulation Type to OFF . Record Residual on Modulation Analyzer.
34.	Set GEN1 Modulation Type to FM .
35.	Set Tone Freq to 1000.0 Hz .
36.	Verify Modulation Analyzer reads 100 kHz Deviation (± 5.5 kHz + residual [Step 33]). If not, go to Step 45.
37.	Set Modulation Analyzer Low-Pass Filter to 20 kHz.
38.	Set GEN1 Modulation Type to OFF . Record Residual on Modulation Analyzer.
39.	Set GEN1 Modulation Type to FM .
40.	Set Tone Freq to 10 kHz .
41.	Verify Modulation Analyzer reads 100 kHz Deviation (± 5.5 kHz + residual [Step 38]). If not, go to Step 45.
42.	Set Tone Freq to 15000.0 Hz .
43.	Verify Modulation Analyzer reads 100 kHz Deviation (± 5.5 kHz + residual [Step 38]). If not, go to Step 45.
44.	Set COM-120B power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

45. Set Modulation Analyzer for 300 Hz High-Pass Filter and 3 kHz Low-Pass Filter.
46. Press SETUP MEMORY Key (21).
47. Select "1. Calibration" from Setup Screen.
48. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
49. Select "7. RF GENERATOR - FM DEVIATION" to access RF GENERATOR - FM DEVIATION CALIBRATION Screen.
50. With cursor on "FM DEVIATION 50 kHz," press ENTER Key.
51. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 50 kHz Deviation.
52. Press ENTER Key and wait until Field displays **CALIBRATED**.
53. With cursor on "FM DEVIATION 15 kHz," press ENTER Key.
54. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 15 kHz Deviation.
55. Press ENTER Key and wait until Field displays **CALIBRATED**.
56. With cursor on "FM DEVIATION 10 kHz," press ENTER Key.
57. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 10 kHz Deviation.
58. Press ENTER Key and wait until Field displays **CALIBRATED**.
59. With cursor on "FM DEVIATION 1 kHz," press ENTER Key.
60. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 1 kHz Deviation.
61. Press ENTER Key and wait until Field displays **CALIBRATED**.
62. Repeat steps 50 through 61 then go to Step 63.
63. Press RETURN Soft Function Key F6 to return to Calibration Screen. Go to Step 3.

1-8-8 RF GENERATE PM DEVIATION CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION

EQUIPMENT REQUIRED: 1 MODULATION ANALYZER

FIGURES: NONE

STEP	PROCEDURE
------	-----------

- | | |
|-----|--|
| 1. | Apply Power to COM-120B. Allow 5 minute warm-up period. |
| 2. | Connect T/R Connector (12) to Modulation Analyzer Input. |
| 3. | Press GEN Test Mode Key (3) to access RF Generate Operation Screen. |
| 4. | Set RF Field to 101.0000 MHz . |
| 5. | Set Output to T/R and Output Level to -20.0 dBm . |
| 6. | Set All Modulation Sources to OFF. |
| 7. | Set Modulation Analyzer for 101 MHz RF. Set Modulation Analyzer for 20 kHz Low-Pass Filter, 300 Hz High-Pass Filter, Peak+ and PM Measurement. Record Residual on Modulation Analyzer. |
| 8. | Set GEN1 Modulation Type for PM . |
| 9. | Set Deviation for 8.0 Rad . |
| 10. | Set Format for TONE . With Cursor on Format, press CONT Soft Function Key F2. |
| 11. | Set Tone Freq for 5000.0 Hz . |
| 12. | Set Shape to SINE . |
| 13. | Verify Modulation Analyzer reads 8 Radians Deviation (± 0.5 Radians + residual [Step 7]). If not, go to Step 15. |
| 14. | Set COM-120B power to OFF and disconnect test equipment. |

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

- | | |
|-----|--|
| 15. | Press SETUP MEMORY Key (21). |
| 16. | Select "1. Calibration" from Setup Screen. |
| 17. | Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key. |
| 18. | Set Modulation Analyzer for 300 Hz High-Pass Filter and 3 kHz Low-Pass Filter. |
| 19. | Select "8. RF GENERATOR - PM DEVIATION" to access RF GENERATOR - PM DEVIATION CALIBRATION Screen. |

STEP**PROCEDURE**

20. With cursor on "PM DEVIATION 15 RAD," press ENTER Key.
21. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 15 Radians.
22. Press ENTER Key and wait until Field displays ***CALIBRATED***.
23. With cursor on "PM DEVIATION 10 RAD," press ENTER Key.
24. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 10 Radians.
25. Press ENTER Key and wait until Field displays ***CALIBRATED***.
26. With cursor on "PM DEVIATION 1 RAD," press ENTER Key.
27. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 1 Radian.
28. Press ENTER Key and wait until Field displays ***CALIBRATED***.
29. Press RETURN Soft Function Key F6 to return to Calibration Screen. Go to Step 3.

1-8-9 RF GENERATE AM MODULATION CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION

EQUIPMENT REQUIRED: 1 MODULATION ANALYZER

FIGURES: NONE

STEP	PROCEDURE
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.
2.	Connect T/R Connector (12) to Modulation Analyzer Input.
3.	Press GEN Test Mode Key (3) to access RF Generate Operation Screen.
4.	Set RF Field to 101.0000 MHz .
5.	Set Output to T/R and Output Level to -20 dBm .
6.	Set All Modulation Sources to OFF.
7.	Set Modulation Analyzer for 101 MHz RF. Set Modulation Analyzer for 3 kHz Low-Pass Filter, 300 Hz High-Pass Filter, Peak+ and AM Measurement. Record Residual on Modulation Analyzer.
8.	Set GEN1 Modulation Type for AM .
9.	Set Modulation for 30% .
10.	Set Format for TONE . With Cursor on Format, press CONT Soft Function Key F2.
11.	Set Tone Freq for 1000.0 Hz .
12.	Set Shape to SINE .
13.	Verify Modulation Analyzer reads 30% Modulation ($\pm 6\%$ + residual [Step 7]). If not, go to Step 21.
14.	Set Modulation to 50% .
15.	Verify Modulation Analyzer reads 50% Modulation ($\pm 6\%$ + residual [Step 7]). If not, go to Step 21.
16.	Set Modulation to 70% .
17.	Verify Modulation Analyzer reads 70% Modulation ($\pm 6\%$ + residual [Step 7]). If not, go to Step 21.
18.	Set Modulation to 90% .
19.	Verify Modulation Analyzer reads 90% Modulation ($\pm 6\%$ + residual [Step 7]). If not, go to Step 21.

STEP**PROCEDURE**

20. Set COM-120B power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

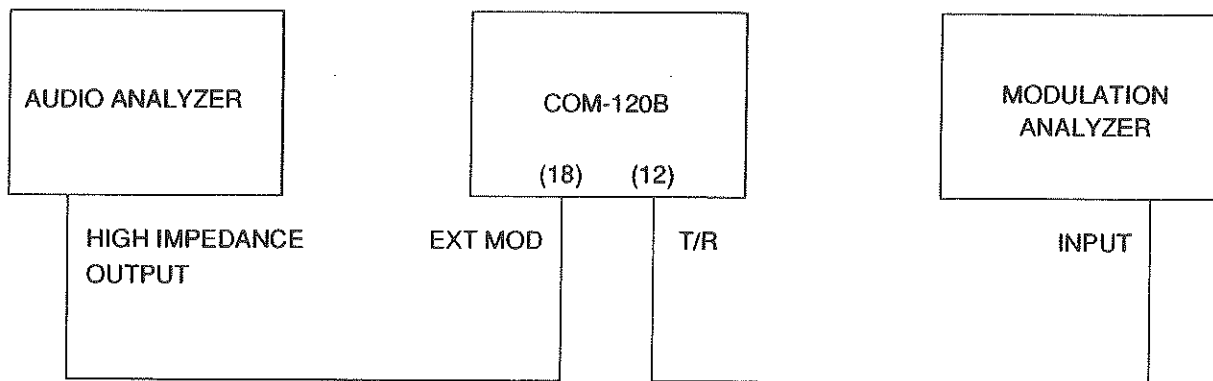
21. Set Modulation Analyzer for 300 Hz High-Pass Filter and 3 kHz Low-Pass Filter.
22. Press SETUP MEMORY Key (21).
23. Select "1. Calibration" from Setup Screen.
24. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
25. Select "9. RF GENERATOR - AM MODULATION" to access RF GENERATOR - AM MODULATION CALIBRATION Screen.
26. Press ENTER Key. Edit Data Field using DATA SCROLL Keys (17) for Modulation Analyzer reading closest to 70% Modulation.
27. Press ENTER Key and wait until Field displays ***CALIBRATED***.
28. Press RETURN Soft Function Key F6 to return to Calibration Screen. Go to Step 3.

1-8-10 RF GENERATE EXTERNAL MODULATION CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
 1-8-7 RF GENERATE FM DEVIATION CALIBRATION
 1-8-8 RF GENERATE PM DEVIATION CALIBRATION
 1-8-9 RF GENERATE AM MODULATION CALIBRATION

EQUIPMENT REQUIRED: 1 AUDIO ANALYZER
 1 MODULATION ANALYZER

FIGURES: 1-5



00603002

Figure 1-5 External Modulation Calibration Setup

STEP	PROCEDURE
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.
2.	Connect Test Equipment as shown in Figure 1-5.
3.	Press GEN Test Mode Key (3) to access RF Generate Operation Screen.
4.	Set RF Field to 101.0000 MHz .
5.	Set Output to T/R and Output Level to -20 dBm .
6.	Set All Modulation Sources to OFF.
7.	Set Modulation Analyzer for 3 kHz Low-Pass Filter, 300 Hz High-Pass Filter, Peak+ and AM Measurement.
8.	Set EXT Modulation Type for AM .
9.	Set Audio Analyzer for 1 kHz tone at approximately 5.657 Vrms output. Adjust Audio Analyzer for Modulation Analyzer reading of 80%.

STEP**PROCEDURE**

10. Verify COM-120B Modulation Reading is 80% ($\pm 10\%$). If not, go to Step 32.
11. Set EXT Modulation Type for **FM**. Set Modulation Analyzer for FM Measurement.
12. Set Deviation Range for **NAR 1**.
13. Adjust Audio Analyzer for Modulation Analyzer reading of 16 kHz.
14. Verify COM-120B Modulation Reading is 16 kHz (± 1.6 kHz). If not, go to Step 32.
15. Set Deviation Range for **NAR 2**.
16. Adjust Audio Analyzer for Modulation Analyzer reading of 8 kHz.
17. Verify COM-120B Modulation Reading is 8 kHz (± 0.8 kHz). If not, go to Step 32.
18. Set Deviation Range for **NAR 3**.
19. Adjust Audio Analyzer for Modulation Analyzer reading of 1.55 kHz.
20. Verify COM-120B Modulation Reading is 1.55 kHz (± 0.155 kHz). If not, go to Step 32.
21. Set Deviation Range for **WIDE**.
22. Adjust Audio Analyzer for Modulation Analyzer reading of 80 kHz.
23. Verify COM-120B Modulation Reading is 80 kHz (± 8 kHz). If not, go to Step 32.
24. Set EXT Modulation Type for **PM**. Set Modulation Analyzer for PM Measurement.
25. Set Deviation Range for **NAR 1**.
26. Verify COM-120B Modulation Reading is 16 Radians (± 1.6 Radians). If not, go to Step 32.
27. Set Deviation Range for **NAR 2**.
28. Verify COM-120B Modulation Reading is 8 Radians (± 0.8 Radians). If not, go to Step 32.
29. Set Deviation Range for **NAR 3**.
30. Verify COM-120B Modulation Reading is 1.55 Radians (± 0.155 Radians). If not, go to Step 32.
31. Set COM-120B power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

32. Press SETUP MEMORY Key (21).
33. Select "1. Calibration" from Setup Screen.

STEP

PROCEDURE

34. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
35. Select "10. RF GENERATOR - EXTERNAL MODULATION" and press ENTER to access EXTERNAL MODULATION CALIBRATION SCREEN.
36. Cursor to EXTERNAL MODULATION Field and press ENTER.
37. Scroll to **AM**. Press ENTER.
38. Set Audio Analyzer 1 kHz tone to approximately 5.8 Vrms for 80% Modulation on the Modulation Analyzer. Adjust Audio Analyzer output as required.
39. Cursor to MEASURED MODULATION Field and press ENTER.
40. Use DATA ENTRY Keypad to enter Modulation Analyzer reading.
41. Press ENTER Key and wait until Field displays **CALIBRATED**.
42. Cursor to EXTERNAL MODULATION Field and press ENTER.
43. Scroll to **FM NARR 1**. Press ENTER.
44. Set Audio Analyzer 1 kHz tone to approximately 5.45 Vrms for 15 kHz Deviation on the Modulation Analyzer. Adjust Audio Analyzer output as required.
45. Cursor to MEASURED DEVIATION Field and press ENTER.
46. Use DATA ENTRY Keypad to enter Modulation Analyzer reading.
47. Press ENTER Key and wait until Field displays **CALIBRATED**.
48. Repeat Steps 43 through 47 for the remaining FM calibrations using this table as a guide:

External Modulation	Deviation Range (kHz)	Audio Analyzer (~Vrms)
FM NARR 2	10	7.20
FM NARR 3	1	3.63
FM WIDE	50	3.66

49. Cursor to EXTERNAL MODULATION Field and press ENTER.
50. Scroll to **PM NARR 1**. Press ENTER.
51. Set Audio Analyzer 1 kHz tone to approximately 5.45 Vrms for 15 Rad Deviation on the Modulation Analyzer. Adjust Audio Analyzer output as required.

STEP

PROCEDURE

52. Cursor to MEASURED DEVIATION Field and press ENTER.
53. Use DATA ENTRY Keypad to enter Modulation Analyzer reading.
54. Press ENTER Key and wait until Field displays **CALIBRATED**.
55. Repeat Steps 51 through 54 for the remaining PM calibrations using this table as a guide:

External Modulation	Deviation Range (Rad)	Audio Analyzer ($\approx V_{rms}$)
PM NARR 2	10	7.20
PM NARR 3	1	3.66

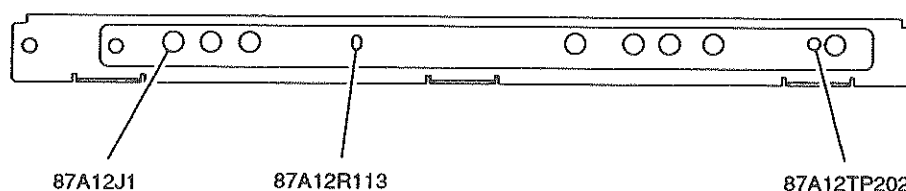
56. Disconnect coaxial cable from EXT MOD IN Connector.
57. Perform procedures in para 1-8-7 through para 1-8-10 until no adjustments are required.
58. Set COM-120B power to OFF and disconnect test equipment.

1-8-11 SPECTRUM ANALYZER CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
1-8-2 TCXO/OCXO CALIBRATION

EQUIPMENT REQUIRED: 1 COM-120B MAINTENANCE KIT
1 DIGITAL MULTIMETER (DMM)
1 SIGNAL GENERATOR

FIGURES: 1-6
1-7



8707012

Figure 1-6 Analyzer Tray Calibration Points

STEP	PROCEDURE
------	-----------

- | | |
|----|--|
| 1. | Apply Power to COM-120B. Allow 5 minute warm-up period. |
| 2. | Press ANALYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen. |
| 3. | Set Spectrum Analyzer Fields as follows: |

Scan Width	1 kHz
Logarithmic Function	dBm
Tracking Generator	OFF
Mode	LIVE
Attenuation	0 dB
RF Input	ANT
Scale	10 dB
Center Frequency	100.0000 MHz

- | | |
|----|--|
| 4. | Verify top of screen is -30 dBm. If not, move cursor to Reference. Press ENTER Key. Press DATA SCROLL Keys (17) until -30 dBm is top of screen. Press ENTER Key. |
| 5. | Disconnect W24 from 87A12J1 (Figure 1-6). |

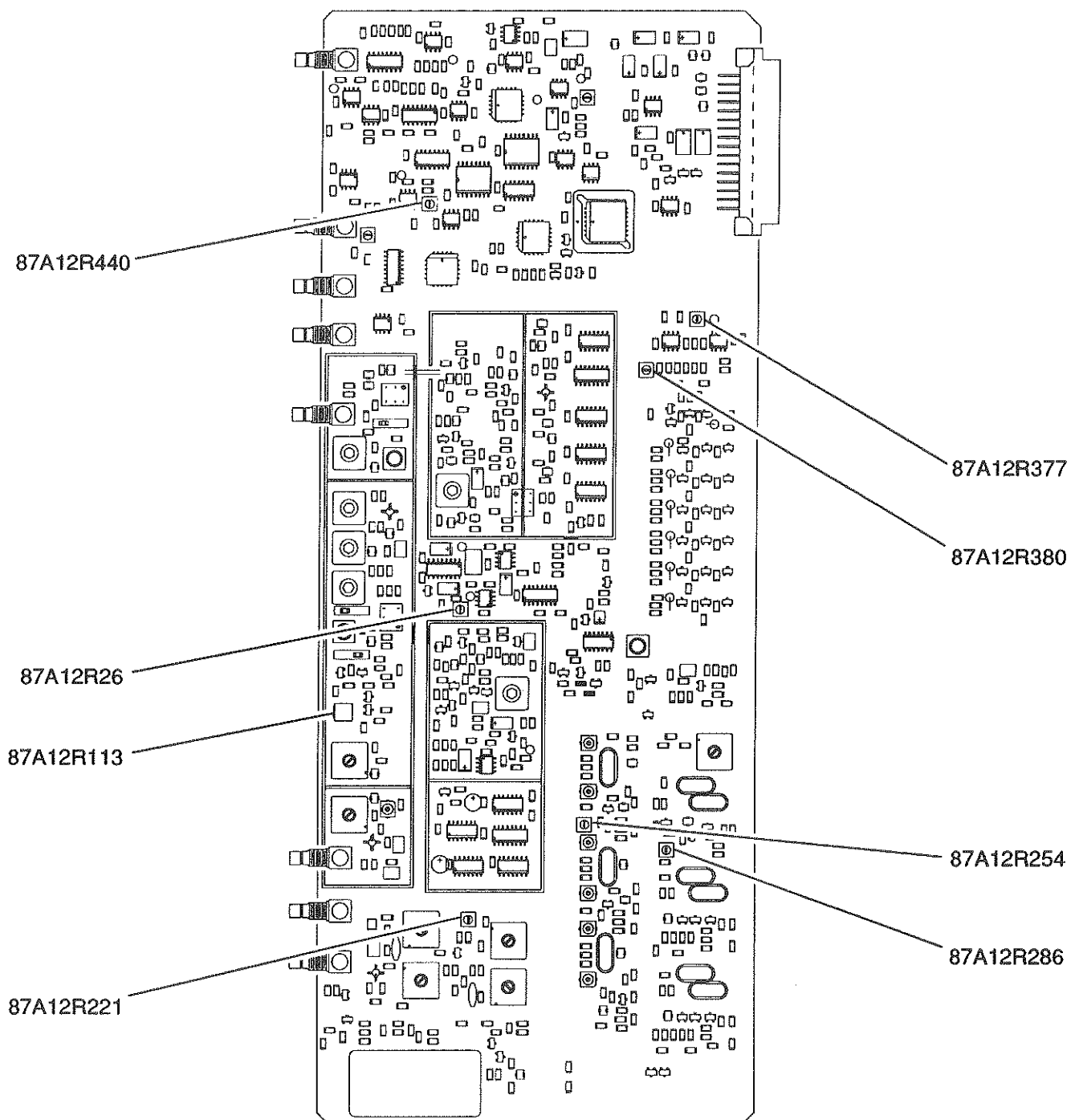
STEP

PROCEDURE

6. Connect Signal Generator to 87A12J1 (Figure 1-6). Set Signal Generator for 10.7 MHz signal at -20 dBm.
7. Measure dc voltage at 87A12TP202 (Figure 1-6). Adjust Signal Generator Output for 1.4 Vdc on DMM.
8. Cursor to Center Frequency, press Set Ref Soft Function Key F1. Note Trace peak level.
9. Disconnect Signal Generator from 87A12J1 (Figure 1-6). Connect W24 to 87A12J1 (Figure 1-6).
10. Set Signal Generator for 100 MHz at -40 dBm. Connect Signal Generator to ANTENNA Connector (7).
11. Verify Trace peak level matches reference level from Step 8 (± 2 dBm). Adjust 87A12R113 (Figure 1-6) as required. Labeled as Analyzer IF Gain.
12. With Cursor on Center Frequency, press Set Ref Soft Function Key F1.
13. Set Scan Width to **100 kHz**. Note Signal Level.
14. Set Scan Width to **10 MHz**, **500 kHz**, **10 kHz** and **1 kHz**. Verify Signal Level matches Reference (Step 12) for each Scan Width setting (± 2 dB). If in tolerance, go to Step 32.

PERFORM STEPS 15 THROUGH 32 ONLY WHEN REQUIRED.

15. Set COM-120B Main Power Switch to OFF.
16. Disconnect coaxial cables from Analyzer Tray.
17. Remove Analyzer Tray from COM-120B. Install Analyzer Tray Extender Card in COM-120B. Install Analyzer Tray on Analyzer Tray Extender Card.
18. Connect Extender Coaxial Cables to Analyzer Tray coaxial cables using SMB-SMB adapters. Install Extender Coaxial Cables to Analyzer Tray.
19. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
20. Press ANLYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
21. Set Scan Width to **100 kHz**. Note Signal Level.
22. Set Scan Width to **500 kHz**. Verify Signal Level matches Reference (Step 21) (± 2 dB). Adjust 87A12R221 as necessary (Figure 1-7).
23. Set Scan Width to **10 kHz**. Verify Signal Level matches Reference (Step 21) (± 2 dB). Adjust 87A12R254 as necessary (Figure 1-7).
24. Set Scan Width to **1 kHz**. Verify Signal Level matches Reference (Step 21) (± 2 dB). Adjust 87A12R286 as necessary (Figure 1-7).
25. Set Scan Width to **10 MHz**. Note Signal Level.



8707014

Figure 1-7 Extended Analyzer Tray Calibration Points

STEP

PROCEDURE

26. Set COM-120B Main Power Switch to OFF.
27. Disconnect coaxial cables from Analyzer Tray.
28. Remove Analyzer Tray from Analyzer Tray Extender Card. Remove Analyzer Tray Extender Card from COM-120B. Install Analyzer Tray in COM-120B.
29. Remove Extender Coaxial Cables and SMB-SMB Adapters from Analyzer Tray coaxial cables. Install Analyzer Tray Coaxial Cables to Analyzer Tray.
30. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
31. Press ANLYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
32. Go to Step 13.
33. Set Scan Width to **100 kHz**.
34. Step Signal Generator from -30 to -90 dBm. Verify each 10 dB step decreases signal peak 10 dB (± 2 dB) from previous step. Use -40 dBm as reference. If in tolerance, go to Step 50.

PERFORM STEPS 35 THROUGH 49 ONLY WHEN REQUIRED.

35. Set COM-120B Main Power Switch to OFF.
36. Disconnect coaxial cables from Analyzer Tray.
37. Remove Analyzer Tray from COM-120B. Install Analyzer Tray Extender Card in COM-120B. Install Analyzer Tray on Analyzer Tray Extender Card.
38. Connect Extender Coaxial Cables to Analyzer Tray coaxial cables using SMB-SMB adapters. Install Extender Coaxial Cables to Analyzer Tray.
39. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
40. Press ANLYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
41. Set Signal Generator for -40 dBm output. Adjust 87A12R377 (Figure 1-7), as needed, for proper display.
42. Set Signal Generator for -90 dBm output. Adjust 87A12R380 (Figure 1-7), as needed, for proper display. Repeat Steps 40 and 41 as needed for proper display.
43. Set COM-120B Main Power Switch to OFF.
44. Disconnect coaxial cables from Analyzer Tray.
45. Remove Analyzer Tray from Analyzer Tray Extender Card. Remove Analyzer Tray Extender Card from COM-120B. Install Analyzer Tray in COM-120B.

STEP

PROCEDURE

-
46. Remove Extender Coaxial Cables and SMB-SMB Adapters from Analyzer Tray coaxial cables. Install Analyzer Tray Coaxial Cables to Analyzer Tray.
 47. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
 48. Press ANALYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
 49. Go to Step 34.
 50. Set Signal Generator for -40 dBm.
 51. Set Scan Width to **20 kHz**.
 52. Verify Signal Peak is on center graticule (± 0.5 Major Divisions). If in tolerance go to Step 67.

PERFORM STEPS 53 THROUGH 66 ONLY WHEN REQUIRED.

53. Set COM-120B Main Power Switch to OFF.
54. Disconnect coaxial cables from Analyzer Tray.
55. Remove Analyzer Tray from COM-120B. Install Analyzer Tray Extender Card in COM-120B. Install Analyzer Tray on Analyzer Tray Extender Card.
56. Connect Extender Coaxial Cables to Analyzer Tray coaxial cables using SMB-SMB adapters. Install Extender Coaxial Cables to Analyzer Tray.
57. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
58. Press ANALYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
59. Switch Scan Width between **20 kHz** and **200 kHz**, adjusting 87A12R440 for setting that allows both settings to be closest to center graticule.
60. Set COM-120B Main Power Switch to OFF.
61. Disconnect coaxial cables from Analyzer Tray.
62. Remove Analyzer Tray from Analyzer Tray Extender Card. Remove Analyzer Tray Extender Card from COM-120B. Install Analyzer Tray in COM-120B.
63. Remove Extender Coaxial Cables and SMB-SMB Adapters from Analyzer Tray coaxial cables. Install Analyzer Tray Coaxial Cables to Analyzer Tray.
64. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
65. Press ANALYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
66. Go to Step 52.

- 67. Press ANLYZ Instruments Key (4). Set Scan Width to **1 kHz**.
- 68. Verify Signal Peak is on center graticule (± 0.5 Major Divisions). If in tolerance, go to Step 76.

PERFORM STEPS 69 THROUGH 75 ONLY WHEN REQUIRED.

- 69. Press SETUP MEMORY Key (21).
- 70. Select "1. Calibration" from Setup Screen.
- 71. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
- 72. Select "5. SPECTRUM ANALYZER" to access SPECTRUM ANALYZER CALIBRATION Screen.
- 73. Press ENTER Key. Edit Data Field using DATA SCROLL Keys (17) until signal is centered.
- 74. Press ENTER Key and wait until Field displays **CALIBRATED**.
- 75. Press RETURN Soft Function Key F6 to return to Calibration Screen. Go to Step 68.
- 76. Set Signal Generator for 1 kHz tone at 5 kHz deviation.
- 77. Verify signal peaks on Major Divisions (± 0.5 Major Divisions). If in tolerance, go to Step 92.

PERFORM STEPS 78 THROUGH 91 ONLY WHEN REQUIRED.

- 78. Set COM-120B Main Power Switch to OFF.
- 79. Disconnect coaxial cables from Analyzer Tray.
- 80. Remove Analyzer Tray from COM-120B. Install Analyzer Tray Extender Card in COM-120B. Install Analyzer Tray on Analyzer Tray Extender Card.
- 81. Connect Extender Coaxial Cables to Analyzer Tray coaxial cables using SMB-SMB adapters. Install Extender Coaxial Cables to Analyzer Tray.
- 82. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
- 83. Press ANLYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
- 84. Adjust 87A12R26 (Figure 1-7) until signal peaks on Major Divisions.
- 85. Set COM-120B Main Power Switch to OFF.
- 86. Disconnect coaxial cables from Analyzer Tray.
- 87. Remove Analyzer Tray from Analyzer Tray Extender Card. Remove Analyzer Tray Extender Card from COM-120B. Install Analyzer Tray in COM-120B.

STEP**PROCEDURE**

88. Remove Extender Coaxial Cables and SMB-SMB Adapters from Analyzer Tray coaxial cables. Install Analyzer Tray Coaxial Cables to Analyzer Tray.
89. Set COM-120B Main Power Switch to ON. Apply Power to COM-120B. Allow 5 minute warm-up period.
90. Press ANALYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
91. Go to Step 77.
92. Set COM-120B power to OFF and disconnect test equipment.

1-8-12 MIXER NULL CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
1-8-2 TCXO/OCXO CALIBRATION

EQUIPMENT REQUIRED: NONE

FIGURES: 1-8

STEP	PROCEDURE
------	-----------

1. Apply Power to COM-120B. Allow 5 minute warm-up period.
2. Press ANALYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
3. Set Spectrum Analyzer Fields as follows:

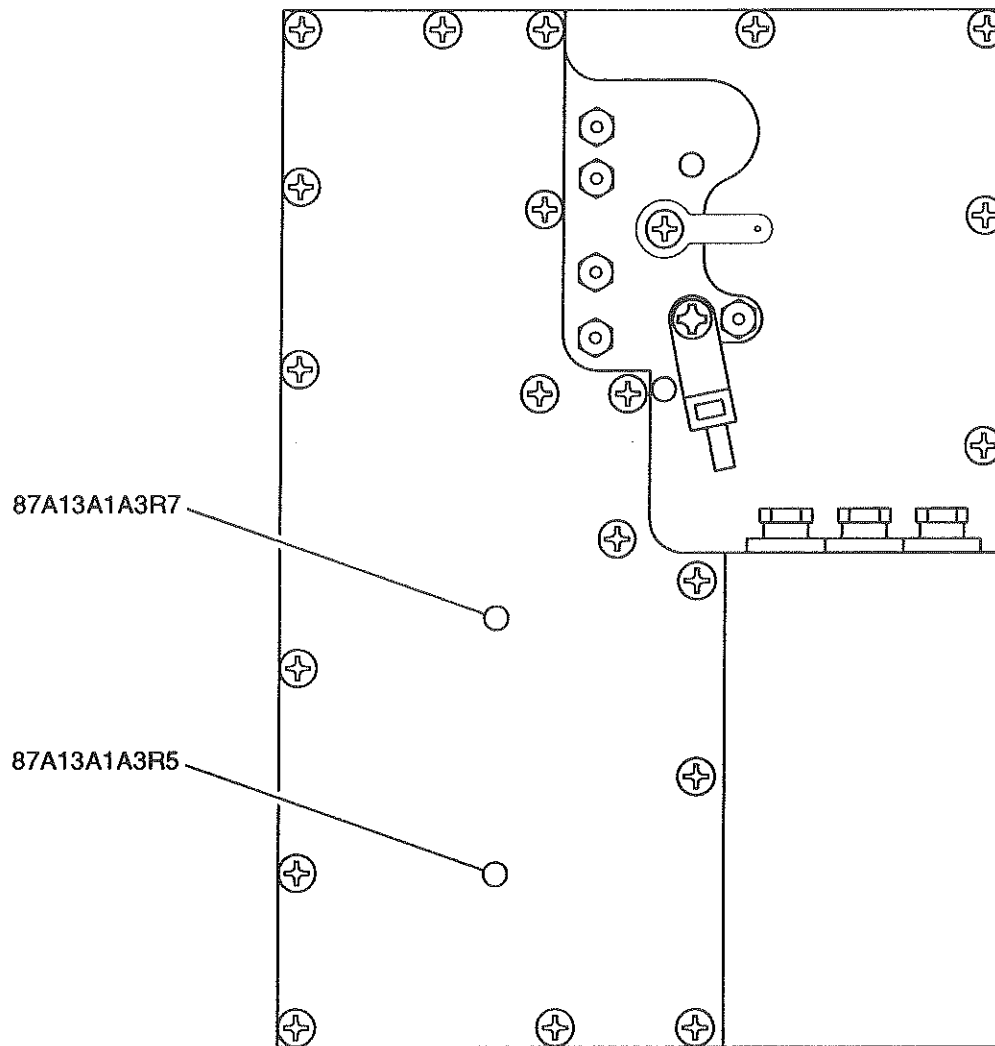
Scan Width	1 MHz
Logarithmic Function	dBm
Tracking Generator	OFF
Mode	LIVE
Attenuation	0 dB
RF Input	ANT
Scale	10 dB
Center Frequency	0.2500 MHz

4. Verify Zero Frequency Response is ≥ 1.5 Major Divisions down from top of screen. If not, go to Step 6.
5. Set COM-120B power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

6. Set COM-120B Main Power Switch (25) to OFF.
7. Disconnect coaxial cables and remove Receiver Tray from COM-120B.
8. Install Receiver Extender Tray into COM-120B. Install Receiver Ribbon Cable between Receiver Extender Tray and Receiver Tray. Connect coaxial cables.
9. Apply Power to COM-120B. Allow 5 minute warm-up period.
10. Press ANALYZ Instruments Key (4) to access Spectrum Analyzer Operation Screen.
11. Set Spectrum Analyzer Fields as follows:

Scan Width	1 MHz
Logarithmic Function	dBm
Tracking Generator	OFF
Mode	LIVE
Attenuation	0 dB
RF Input	ANT
Scale	10 dB
Center Frequency	0.250 MHz



8707011

Figure 1-8 Mixer Null Calibration Points

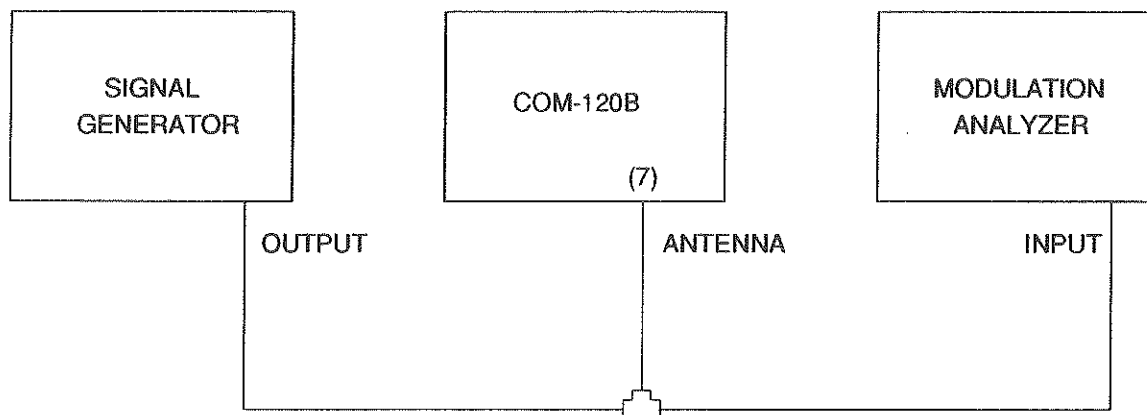
12. Adjust 87A13A1A3R5 and 87A13A1A3R7 (Figure 1-8) until Zero Frequency Response is ≥ 1.5 Major Divisions down from top of screen.
13. Set COM-120B Main Power Switch (25) to OFF.
14. Disconnect coaxial cables and Receiver Ribbon Cable from Receiver Tray. Remove Receiver Extender Card and Receiver Ribbon Cable from COM-120B.
15. Install Receiver Tray into COM-120B. Connect coaxial cables.
16. Go to Step 1.

1-8-13 FM DEVIATION METER CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
 1-8-2 TCXO/OCXO CALIBRATION

EQUIPMENT REQUIRED: 1 MODULATION ANALYZER
 1 SIGNAL GENERATOR

FIGURES: 1-9



00603003

Figure 1-9 Modulation Meters Calibration Setup

STEP	PROCEDURE										
1.	Apply Power to COM-120B. Allow 5 minute warm-up period.										
2.	Press REC Test Mode Key (3) to access RF Receive Operation Screen.										
3.	Set Receive Operation Screen Parameters as follows:										
	<table><tr><td>RF Field</td><td>101.0000 MHz</td></tr><tr><td>Input</td><td>ANT</td></tr><tr><td>Attenuation</td><td>30 dB</td></tr><tr><td>Demodulation Type</td><td>FM</td></tr><tr><td>IF Bandwidth</td><td>300 kHz</td></tr></table>	RF Field	101.0000 MHz	Input	ANT	Attenuation	30 dB	Demodulation Type	FM	IF Bandwidth	300 kHz
RF Field	101.0000 MHz										
Input	ANT										
Attenuation	30 dB										
Demodulation Type	FM										
IF Bandwidth	300 kHz										
4.	Move cursor to Line.										
5.	Press CONFIG Soft Function Key F6 to access Receiver Audio/Data Filters Setup Menu.										
6.	Set Modulation Meters Filter Line High-Pass Filter for 300 Hz .										
7.	Set Modulation Meters Filter Line Low-Pass Filter for 4 kHz .										

STEP

PROCEDURE

8. Press EXEC Soft Function Key F5.
9. Press RETURN Soft Function Key F6 to return to RF Receive Operation Screen.
10. Connect Test Equipment as shown in Figure 1-9.
11. Access Full Screen Deviation Meter.
12. Set FM Deviation Meter Parameters as follows:

Scope/Demod Coupling	AC
Range	20 kHz
Peak Hold	OFF
Average	OFF
13. Set Signal Generator for 101 MHz Signal FM Modulated with 1 kHz tone at 10 kHz deviation at -10 output level.
14. Set Modulation Analyzer for FM Measurement with 300 Hz High-Pass Filter, 3 kHz Low-Pass Filter and Peak+ detector activated.
15. Verify Modulation Analyzer reading and FM Deviation Meter Reading match (± 1.1 kHz). If not, go to Step 18.
16. Set Range to **50 kHz**.
17. Set Signal Generator for 20 kHz Deviation.
18. Verify Modulation Analyzer reading and FM Deviation Meter Reading match (± 2.6 kHz). If not, go to Step 18.
19. Set Range to **100 kHz**.
20. Set Signal Generator for 50 kHz Deviation.
21. Verify Modulation Analyzer reading and FM Deviation Meter Reading match (± 5.1 kHz). If not, go to Step 18.
22. Set COM-120B power to OFF and disconnect test equipment.
- PERFORM THE FOLLOWING ONLY WHEN REQUIRED.**
23. Press SETUP MEMORY Key (21).
24. Select "1. Calibration" from Setup Screen.
25. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
26. Select "11. FM DEVIATION METER" to access FM DEVIATION METER CALIBRATION Screen.
27. Set Signal Generator for 10 kHz deviation.

STEP**PROCEDURE**

28. Move cursor to 10 kHz Field.
29. Enter Modulation Analyzer Reading in Data Field using DATA ENTRY Keys (5).
30. Press ENTER Key and wait until Field displays ***CALIBRATED***.
31. Set Signal Generator for 20 kHz deviation.
32. Move cursor to 20 kHz Field.
33. Enter Modulation Analyzer Reading in Data Field using DATA ENTRY Keys (5).
34. Press ENTER Key and wait until Field displays ***CALIBRATED***.
35. Set Signal Generator for 50 kHz deviation.
36. Move cursor to 50 kHz Field.
37. Enter Modulation Analyzer Reading in Data Field using DATA ENTRY Keys (5).
38. Press ENTER Key and wait until Field displays ***CALIBRATED***.
39. Set Signal Generator for 100 kHz deviation.
40. Move cursor to 100 kHz Field.
41. Enter Modulation Analyzer Reading in Data Field using DATA ENTRY Keys (5).
42. Press ENTER Key and wait until Field displays ***CALIBRATED***.
43. Press RETURN Soft Function Key F6. Go to Step 2.

1-8-14 PM DEVIATION METER CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
1-8-2 TCXO/OCXO CALIBRATION

EQUIPMENT REQUIRED: 1 MODULATION ANALYZER
1 SIGNAL GENERATOR

FIGURES: 1-9

STEP

PROCEDURE

1. Apply Power to COM-120B. Allow 5 minute warm-up period.
2. Press REC Test Mode Key (3) to access RF Receive Operation Screen.
3. Set Receive Operation Screen Parameters as follows:

RF Field	101.0000 MHz
Input	ANT
Attenuation	30 dB
Demodulation Type	PM
IF Bandwidth	300 kHz

4. Move cursor to Line.
5. Press CONFIG Soft Function Key F6 to access Receiver Audio/Data Filters Setup Menu.
6. Set Modulation Meters Filter Line High-Pass Filter for **300 Hz**.
7. Set Modulation Meters Filter Line Low-Pass Filter for **4 kHz**.
8. Press EXEC Soft Function Key F5.
9. Press RETURN Soft Function Key F6 to return to RF Receive Operation Screen.
10. Connect Test Equipment as shown in Figure 1-9.
11. Access Full Screen Phase Meter.
12. Set Phase Meter Parameters as follows:

Range	10 RAD
Peak Hold	OFF
Average	OFF
13. Set Signal Generator for 101 MHz Signal FM Modulated with 1 kHz tone at 5 kHz deviation at -10 dBm output level.
14. Set Modulation Analyzer for PM Measurement with 300 Hz High-Pass Filter, 3 kHz Low-Pass Filter and Peak+ detector activated.
15. Verify Modulation Analyzer reading and Phase Meter Reading match (± 0.7 Radians). If not, go to Step 12.

STEP**PROCEDURE**

16. Set COM-120B power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

17. Press SETUP MEMORY Key (21).
18. Select "1. Calibration" from Setup Screen.
19. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
20. Select "12. PM DEVIATION METER" to access PM DEVIATION METER CALIBRATION Screen.
21. Enter Modulation Analyzer Reading in Data Field using DATA ENTRY Keys (5).
22. Press ENTER Key and wait until Field displays ***CALIBRATED***.
23. Press RETURN Soft Function Key F6. Go to Step 2.

1-8-15 AM MODULATION METER CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
1-8-2 TCXO/OCXO CALIBRATION

EQUIPMENT REQUIRED: 1 MODULATION ANALYZER
1 SIGNAL GENERATOR

FIGURES: 1-9

STEP	PROCEDURE
------	-----------

1. Apply Power to COM-120B. Allow 5 minute warm-up period.
2. Press REC Test Mode Key (3) to access RF Receive Operation Screen.
3. Set Receive Operation Screen Parameters as follows:

RF Field	101 MHz
Input	ANT
Attenuation	30 dB
Demodulation Type	AM
IF Bandwidth	300 kHz

4. Move cursor to Line. Press CONFIG Soft Function Key F6 to access Receiver Audio/Data Filters Setup Menu. Set Modulation Meters Filter Line High-Pass Filter for **300 Hz**. Set Modulation Meters Filter Line Low-Pass Filter for **4 kHz**. Press EXEC Soft Function Key F5. Press RETURN Soft Function Key F6 to return to RF Receive Operation Screen.
5. Connect Test Equipment as shown in Figure 1-9.
6. Access Full Screen Modulation Meter.
7. Set AM Modulation Meter Parameters as follows:

Range	100%
Peak Hold	OFF
Average	OFF

8. Set Signal Generator for 101 MHz Signal AM Modulated with 1 kHz tone at 70% Modulation at -10 dBm output level.
9. Set Modulation Analyzer for AM Measurement with 300 Hz High-Pass Filter, 3 kHz Low-Pass Filter and Peak+ detector activated.
10. Verify Modulation Analyzer reading and AM Modulation Meter Reading match ($\pm 5.1\%$). If not, go to Step 12.
11. Set COM-120B power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

12. Press SETUP MEMORY Key (21).
13. Select "1. Calibration" from Setup Screen.

STEP**PROCEDURE**

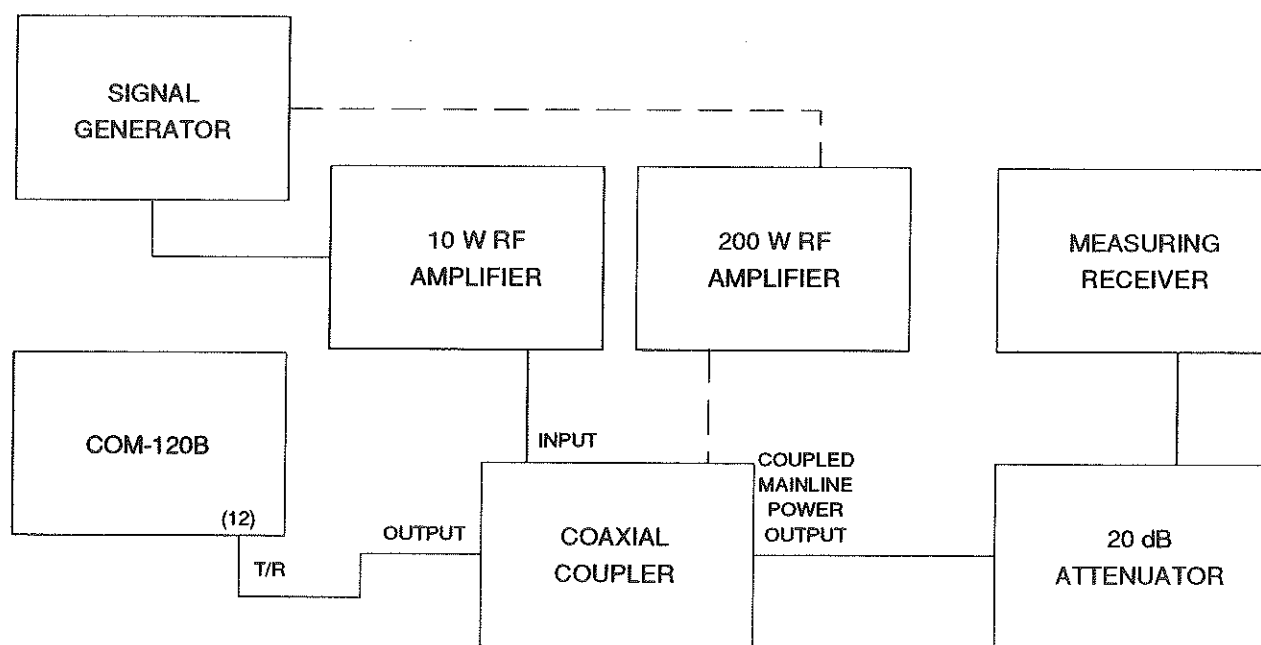
14. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
15. Select "13. AM MODULATION METER" to access AM MODULATION METER CALIBRATION Screen.
16. Enter Modulation Analyzer Reading in Data Field using DATA ENTRY Keys (5).
17. Press ENTER Key and wait until Field displays ***CALIBRATED***.
18. Press RETURN Soft Function Key F6. Go to Step 2.

1-8-16 POWER METER CALIBRATION

PREREQUISITES: 1-8-1 POWER SUPPLY CALIBRATION
1-8-2 TCXO/OCXO CALIBRATION

EQUIPMENT REQUIRED: 1 10 W RF AMPLIFIER
1 20 dB ATTENUATOR
1 50 Ω TERMINATION
1 200 W RF AMPLIFIER
1 COAXIAL COUPLER
1 MEASURING RECEIVER
1 SIGNAL GENERATOR

FIGURES: 1-10



00603004

Figure 1-10 Power Meter Calibration Setup

STEP	PROCEDURE
------	-----------

1. Apply Power to COM-120B. Allow 5 minute warm-up period.
2. Press REC Test Mode Key (3) to access RF Receive Operation Screen.
3. Set Receive Operation Screen Parameters as follows:

RF Field	101 MHz
Input	T/R
Attenuation	0 dB
IF Bandwidth	300 kHz

4. Access Full Screen RF Power Meter.

STEP

PROCEDURE

5. Set Power Meter Parameters as follows:

Range	20 mW
Peak Hold	OFF
Average	OFF
Cable Loss	0.0 dB

6. Connect 50 Ω Termination to T/R Connector (7). With cursor on Range, press RE-ZERO Soft Function Key F3.

7. Connect Test Equipment as shown in Figure 1-10.

8. Set Test Equipment for 101 MHz signal with 15 mW output level at connection to T/R Connector (7).

NOTE: Test Equipment must be characterized for accuracy of 2.5% of required setting.

9. Verify Power Meter Reads 15 mW (± 1.7 mW). If not, go to Step 21.

10. Set Range to **2 W**.

11. Connect 50 Ω Termination to T/R Connector (7). With cursor on range, press RE-ZERO Soft Function Key F3.

12. Connect Test Equipment as shown in Figure 1-9.

13. Set Test Equipment for 1.5 W output level at connection to T/R Connector (7).

NOTE: Test Equipment must be characterized for accuracy of 2.5% of required setting.

14. Verify Power Meter Reads 1.5 W (± 0.3 W). If not, go to Step 21.

15. Set Range to **50 W**.

16. Connect 50 Ω Termination to T/R Connector. With cursor on range, press RE-ZERO Soft Function Key F3.

17. Connect Test Equipment as shown in Figure 1-9.

18. Set Test Equipment for 40 W output level at connection to T/R Connector (7).

NOTE: Test Equipment must be characterized for accuracy of 2.5% of required setting.

19. Verify Power Meter Reads 40 W (± 4.1 W). If not, go to Step 21.

20. Set COM-120B power to OFF and disconnect test equipment.

PERFORM THE FOLLOWING ONLY WHEN REQUIRED.

21. Press SETUP MEMORY Key (21).

22. Select "1. Calibration" from Setup Screen.

STEP

PROCEDURE

23. Press ENTER Key to access Password Field. Press SHIFT, F, M, Y, S, V, C, D and SHIFT Data Entry Keys (5). Press ENTER Key.
24. Select "4. RF POWER METER" to access RF POWER METER CALIBRATION Screen.
25. Connect 50 Ω Termination to T/R Connector (7). With cursor on "WITHOUT ANY INPUT PRESS THE ZERO KEY" Field, press ZERO Soft Function Key F1.
26. Connect Test Equipment as shown in Figure 1-9.
27. Move Cursor to 15.0 mW Field.
28. Set Test Equipment for 101 MHz signal with 15 mW output level at connection to T/R Connector (7).

NOTE: Test Equipment must be characterized for accuracy of 2.5% of required setting.

29. Enter Power Level applied in Data Field using DATA ENTRY Keys (5).
30. Press ENTER Key and wait until Field displays **CALIBRATED**.
31. Move Cursor to 1.50 W Field.
32. Set Test Equipment for 1.5 W output level at connection to T/R Connector (7).

NOTE: Test Equipment must be characterized for accuracy of 2.5% of required setting.

33. Enter Power Level applied in Data Field using DATA ENTRY Keys (5).
34. Press ENTER Key and wait until Field displays **CALIBRATED**.
35. Move Cursor to 40 W Field.
36. Set Test Equipment for 40 W output level at connection to T/R Connector (7).

NOTE: Test Equipment must be characterized for accuracy of 2.5% of required setting.

37. Enter Power Level applied in Data Field using DATA ENTRY Keys (5).
38. Press ENTER Key and wait until Field displays **CALIBRATED**.
39. Press RETURN Soft Function Key F6. Go to Step 2.

COM-120B CALIBRATION RECORD

Technician: _____ S/N: _____

Date: _____

PARA	STEP	DATA	RESULT
1-8-1	2.	+13 Vdc (± 0.25 V), 87A6J10 PIN 1,13	_____
		+35 Vdc (± 1 V), 87A6J10 PIN 2,14	_____
		-10.5 Vdc (± 0.5 V), 87A6J10 PIN 3,15	_____
		+10.5 Vdc (± 0.25 V), 87A6J10 PIN 4,16	_____
		+5 Vdc (+0.2 V/-0.0 V), 87A6J10 PIN 5,17	_____
		+5 Vdc (+0.2 V/-0.0 V), 87A6J10 PIN 7,19	_____
		+12 Vdc (± 0.25 V), 87A6J10 PIN 9,21	_____
1-8-2	9.	998.0000 (± 199.6 Hz)	_____
	10.	998.0000 (± 10 Hz)	_____
	12.	998.0000 (± 10 Hz) (Adjustment Required)	_____
1-8-3	9.	190 Vrms (± 10.1 V)	_____
		19 Vrms (± 1.02 V)	_____
		1.9 Vrms (± 106 mV)	_____
	11.	190 Vdc (± 10.1 V)	_____
		19 Vdc (± 1.02 V)	_____
		1.9 Vdc (± 106 mV)	_____
1-8-4	6.	-20 dBm (± 2 dB)	_____
	7.	-90 dBm (± 2 dB)	_____
	8.	-130 dBm (± 2.5 dB)	_____
	10.	-20 dBm (± 2 dB)	_____
	11.	-90 dBm (± 2 dB)	_____
	12.	-130 dBm (± 2.5 dB)	_____

PARA	STEP	DATA	RESULT
1-8-5	14.	Audio Analyzer reads 10% Distortion.	_____
	21.	Readings match ($\pm 0.6\%$).	_____
1-8-6	14.	Audio Analyzer reads 20 dB SINAD.	_____
	21.	Readings match (± 1.1 dB).	_____
1-8-7	7.	Record Modulation Analyzer Residual.	_____
	13.	10 kHz Deviation (± 600 Hz + residual [Step 7])	_____
	15.	Record Modulation Analyzer Residual.	_____
	18.	Readings match (± 600 Hz + residual [Step 15])	_____
	20.	Record Modulation Analyzer Residual.	_____
	23.	10 kHz Deviation (± 600 Hz + residual [Step 20])	_____
	25.	10 kHz Deviation (± 600 Hz + residual [Step 20])	_____
	27.	Record Modulation Analyzer Residual.	_____
	31.	100 kHz Deviation (± 5.5 kHz + residual [Step 27])	_____
	33.	Record Modulation Analyzer Residual.	_____
	36.	100 kHz Deviation (± 5.5 kHz + residual [Step 33])	_____
	38.	Record Modulation Analyzer Residual.	_____
	41.	100 kHz Deviation (± 5.5 kHz + residual [Step 38])	_____
	43.	100 kHz Deviation (± 5.5 kHz + residual [Step 38])	_____
1-8-8	7.	Record Modulation Analyzer Residual.	_____
	13.	8 Radians Deviation (± 0.5 Radians + residual [Step 7])	_____
1-8-9	7.	Record Residual on Modulation Analyzer.	_____
	13.	30% Modulation ($\pm 6\%$ + residual [Step 7])	_____
	15.	50% Modulation ($\pm 6\%$ + residual [Step 7])	_____
	17.	70% Modulation ($\pm 6\%$ + residual [Step 7])	_____
	19.	90% Modulation ($\pm 6\%$ + residual [Step 7])	_____
1-8-10	10.	80% ($\pm 10\%$)	_____

PARA	STEP	DATA	RESULT
1-8-11	14.	16 kHz (± 1.6 kHz)	_____
	17.	8 kHz (± 0.8 kHz)	_____
	20.	1.55 kHz (± 0.155 kHz)	_____
	23.	80 kHz (± 8 kHz)	_____
	26.	16 Radians (± 1.6 Radians)	_____
	28.	8 Radians (± 0.8 Radians)	_____
	30.	1.55 Radians (± 0.155 Radians)	_____
	4.	Top of screen is -30 dBm.	_____
	8.	Note Trace peak level.	_____
	11.	Trace peak level matches reference level from Step 8 (± 2 dBm).	_____
	13.	Note Signal Level.	_____
	14.	Trace peak level matches reference level from Step 13 (± 2 dBm).	_____
		500 kHz	_____
		10 kHz	_____
		100 kHz	_____
		10 MHz	_____
1-8-12	34.	-30 to -40 dBm, decreases 10 dB (± 2 dB)	_____
		-40 to -50 dBm, decreases 10 dB (± 2 dB)	_____
		-50 to -60 dBm, decreases 10 dB (± 2 dB)	_____
		-60 to -70 dBm, decreases 10 dB (± 2 dB)	_____
		-70 to -80 dBm, decreases 10 dB (± 2 dB)	_____
		-80 to -90 dBm, decreases 10 dB (± 2 dB)	_____
	52.	Peak is on Center Graticule (± 0.5 Major Divisions).	_____
	68.	Peak is on Center Graticule (± 0.5 Major Divisions).	_____
	77.	Peaks are on Major Divisions (± 0.5 Major Divisions).	_____
	4.	Zero Frequency Response is ≥ 1.5 Major Divisions down from top of screen.	_____
1-8-13	10.	Readings match (± 1.1 kHz)	_____
	13.	Readings match (± 2.6 kHz)	_____
	16.	Readings match (± 5.1 kHz)	_____

PARA	STEP	DATA	RESULT
1-8-14	10.	Readings match (± 0.7 Radians)	_____
1-8-15	10.	Readings match ($\pm 5.1\%$)	_____
1-8-16	9.	15 mW (± 1.7 mW)	_____
	14.	1.5 W (± 0.3 W)	_____
	19.	40 W (± 4.1 W)	_____

