

CALIBRATION

CALIBRATION/VERIFICATION SCHEDULE

The Calibration/Verification Procedures should be performed when:

Failure to Meet Specifications	If, during the course of normal operation, the Test Set or any major function thereof fails to meet the performance specifications.
Module/Assembly Replacement	If one or more of the Test Set assemblies are replaced.
Annual Calibration/Verification	Aeroflex recommends an annual Calibration/Verification on the Test Set to maintain proper testing standards.

TESTING CONDITIONS

The Calibration/Verification Procedures should be performed at room ambient temperature (+20°C to +30°C).

TEST EQUIPMENT FOR CALIBRATION/VERIFICATION

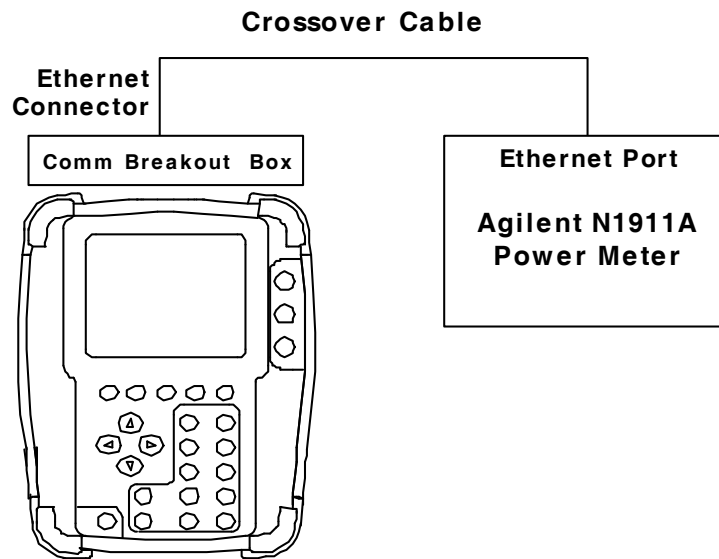
TYPE	MODEL
Digital Multimeter	HP 34401A or Equivalent
Universal Counter	Agilent 53131A or Equivalent
Frequency Counter	
Power Meter	Agilent N1911A or Equivalent
Power Meter Sensor	Agilent E4412A or Equivalent
Function Generator	HP 3325B or Equivalent
Comm Breakout Box	Aeroflex (7005-6242-900)
Broadband Resistive Power Splitter	Weinschel 93459 Model 1870A
TNC to N Adapter	PE 9446
TNC to N Adapter	Amphenol RF Division 79825 Adapter
TNC (M) to TNC (M) Adapter	PE 9443
Crossover Ethernet Cable	
TNC to BNC Cable	
RF Signal Generator	HP 8648C or Equivalent
RF Power Amplifier (50 W)	
Power Splitter (2-Way, Resistive)	
Directional Coupler	Narda 3020A or Equivalent
100 MHz Low-Pass Filter	
300 MHz Low-Pass Filter	
700 MHz Low-Pass Filter	
1200 MHz Low-Pass Filter	
50 Ω Termination	
10 dB Attenuator (10 W)	
Stub Tuner	Murray Microwave 1778E or 1778EQ
Short-Open-Load VSWR Calibrator	Aeroflex 2901-0000-054

CALIBRATION PROCEDURES

A. Calibration Setup (using the Agilent N1911A Power Meter)

TEST EQUIPMENT: Agilent N1911A Power Meter
Agilent E4412A Power Meter Sensor

1. Turn on both the Test Set and the Agilent N1911A Power Meter, and then connect a Crossover Cable between the Test Set and the Agilent N1911A Power Meter:



2. Perform the following steps to set the IP Address of the Agilent N1911A Power Meter:
Press the "System" -> "Remote Interface" -> "Network Manual" Buttons.
Use the Arrow and Select Keys to set information for the Power Meter:
IP Address: **10.10.10.10**
Subnet Mask: **255.255.0.0**
Default Gateway: **10.10.10.1**
3. Zero and calibrate the Agilent N1911A Power Meter.
4. With the System Menu displayed, press the F5 "Util" Key to display the Utilities Menu.
5. Press the 2 Key to display the Remote Screen.
6. Move the cursor to the IP field. Note IP Address.
7. Press the F1 "Edit" Key to highlight the field. Enter IP Address (**10 10 10 193**). Press the F1 "Done" Key to store the setting.
8. Move the cursor to the Subnet Mask: field. Note Subnet Mask Address.
9. Press the F1 "Edit" Key to highlight the field. Enter Subnet Mask Address (**255 255 0 0**). Press the F1 "Done" Key to store the setting.
10. Move the cursor to the Gateway field. Note Gateway Address.

A. Calibration Setup (using the Agilent N1911A Power Meter) (cont)

11. Press the F1 "Edit" Key to highlight the field. Enter Gateway Address (10 10 10 1). Press the F1 "Done" Key to store the setting.
12. Press the F5 "Config" Key.
13. Press the F2 "Return" Key to display the Utilities Menu.
14. Press the F3 "System" Key to display the System Menu.

B. Generator Calibration

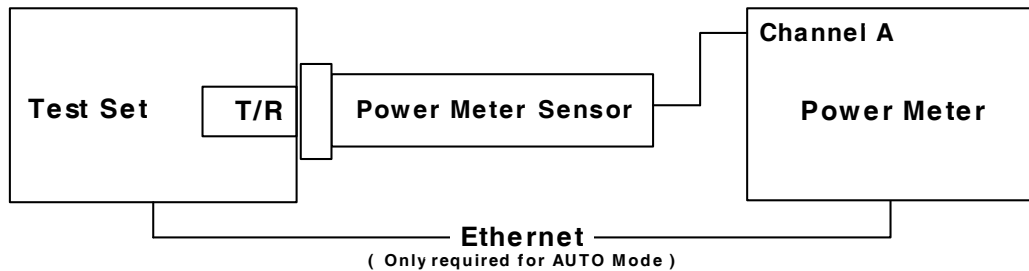
TEST EQUIPMENT: Power Meter
Power Meter Sensor

1. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
2. Press the 3 Key to display the Calibration Screen.
3. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
4. Press the 7 Key (GEN CAL) to display the Generator Calibration Screen.
5. With the cursor on the Mode field, set the Mode selection based on the Power Meter used:

AUTO Agilent N1911A Power Meter / Agilent E4412 Power Sensor
MANUAL Other Power Meter / Power Meter Sensor.

T/R CONNECTOR

6. Establish the following test setup:



7. Press the F3 "CAL" Key.
8. Press the F2 "T/R" Key and follow the instructions on the screen to calibrate the UUT T/R Port.

In MANUAL Mode the Test Set prompts the user to enter readings from the Power Meter.

NOTE

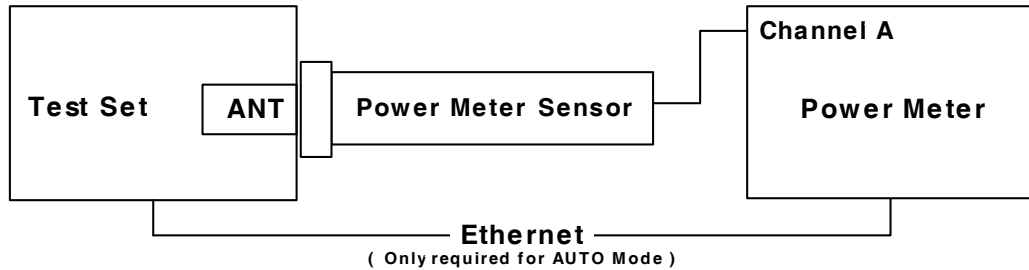
This is an interactive process. At each frequency the output level is adjusted based upon the Power Meter reading entered by the user until the reading is within acceptable limits.

9. When the message "CALIBRATION COMPLETED" appears, press the F5 "Enter" Key to display the Generator Calibration Screen.

B. Generator Calibration (cont)

ANT CONNECTOR

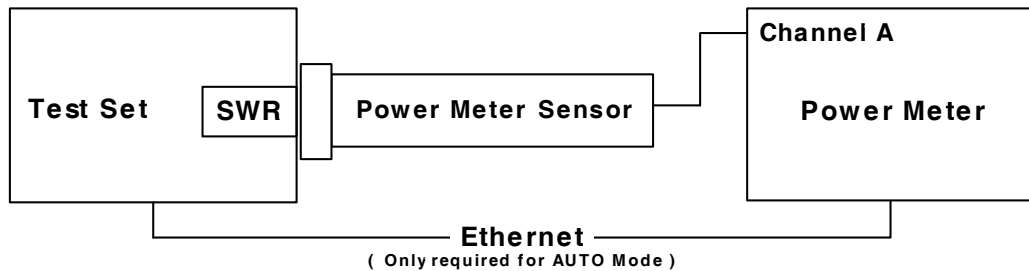
10. Establish the following test setup:



11. Press the F3 "CAL" Key.
12. Press the F1 "ANT" Key and follow the instructions on the screen to calibrate the UUT ANT Port.
13. When the message "CALIBRATION COMPLETED" appears, press the F1 "Enter" Key to display the Generator Calibration Screen.

SWR CONNECTOR

14. Establish the following test setup:



15. Press the F3 "CAL" Key.
16. Press the F3 "SWR" Key and follow the instructions on the screen to calibrate the UUT SWR Port.
17. When the message "CALIBRATION COMPLETED" appears, press the F5 "Enter" Key to display the Generator Calibration Screen.
18. Cycle power on the Test Set.

C. Receiver Calibration

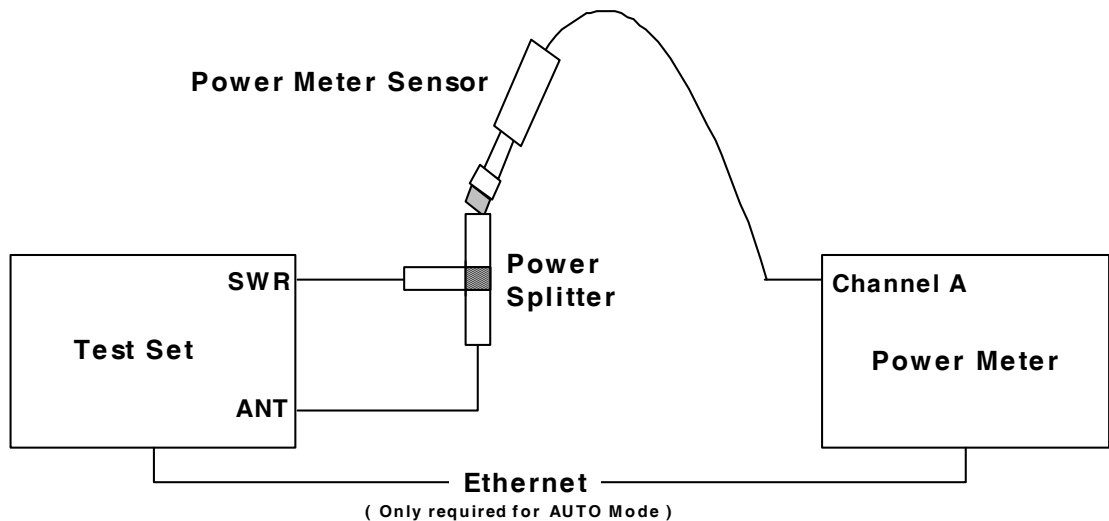
TEST EQUIPMENT: Power Meter
Power Meter Sensor
Power Splitter (2-Way Resistive)

1. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
2. Press the 3 Key to display the Calibration Screen.
3. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
4. Press the 8 Key (REC CAL AUTO) to display the Receiver Calibration Screen.
5. With the cursor on the Mode field, set the Mode selection based on the Power Meter used:

AUTO Agilent N1911A Power Meter / Agilent E4412 Power Sensor
MANUAL Other Power Meter / Power Meter Sensor.

ANT CONNECTOR

6. Establish the following test setup:



7. Press the F3 "CAL" Key.
8. Press the F1 "ANT" Key and follow the instructions on the screen to calibrate the UUT ANT Port.

In MANUAL Mode the Test Set prompts the user to enter readings from the Power Meter.

NOTE

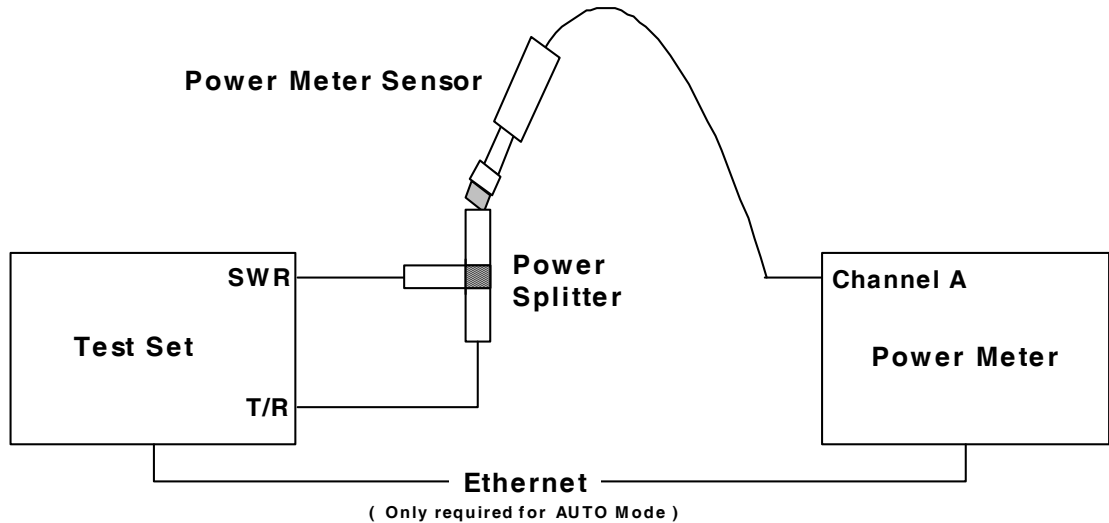
This is an interactive process. At each frequency the output level is adjusted based upon the Power Meter reading entered by the user until the reading is within acceptable limits.

C. Receiver Calibration (cont)

9. When the message "CALIBRATION COMPLETED" appears, press the F5 "Enter" Key to display the Receiver Calibration Screen.

T/R CONNECTOR

10. Establish the following test setup:



11. Press the F3 "CAL" Key.
12. Press the F2 "T/R" Key and follow the instructions on the screen to calibrate the UUT T/R Port.
13. When the message "CALIBRATION COMPLETED" appears, press the F5 "Enter" Key to display the Receiver Calibration Screen.

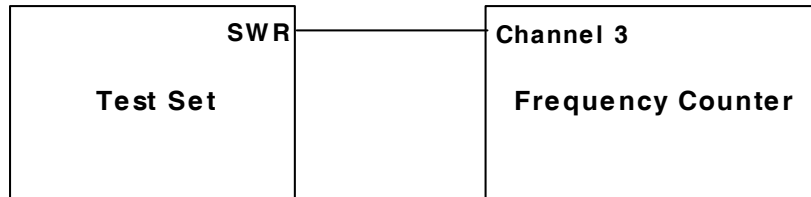
PRE AMP

14. Press the F3 "CAL" Key.
15. Press the F3 "AMP" Key and follow the instructions on the screen.
16. When the message "CALIBRATION COMPLETED" appears, press the F5 "Enter" Key to display the Receiver Calibration Screen.
17. Cycle power on the Test Set.
18. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
19. Press the 3 Key to display the Calibration Screen.
20. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
21. Press the 8 Key (REC CAL AUTO) to display the Receiver Calibration Screen.
22. Press the F4 "Pre Norm" Key to to normalize the UUT Receiver.
23. Verify Normalize Numbers are within acceptable range of -15 to -10.
24. Cycle power on the Test Set.

D. TCXO Calibration

TEST EQUIPMENT: Frequency Counter

1. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
2. Press the 3 Key to display the Calibration Screen.
3. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
4. Press the 6 Key (TCXO CAL ADJUSTMENT) to display the TCXO Calibration Screen.
5. Establish the following test setup:



6. Move the cursor to the TXCO: field. Press the F1 "Edit" Key to highlight the field. Enter the TXCO Value (**2100**) as the initial value.
7. Adjust the TCXO Value as needed so the reading on the Frequency Counter is as close to 500 MHz as possible. Press the F1 "Done" Key to save the field setting.
8. Press the F3 "Save" Key.
9. Cycle power on the Test Set.

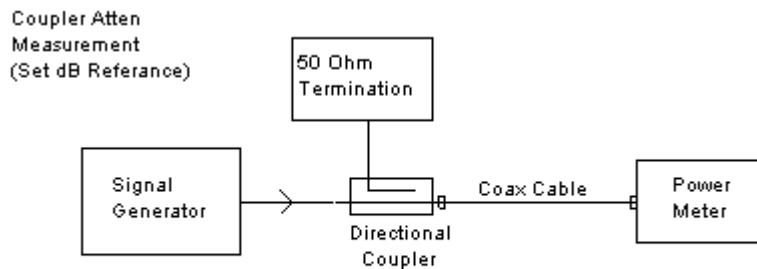
E. RF Power Meter Calibration

TEST EQUIPMENT: RF Signal Generator
RF Power Meter
RF Power Amplifier (50 W)
Coupler
100 MHz Low-Pass Filter
300 MHz Low-Pass Filter
700 MHz Low-Pass Filter
1200 MHz Low-Pass Filter
50 Ω Termination
Stub Tuner
10 dB Attenuator (10 W)

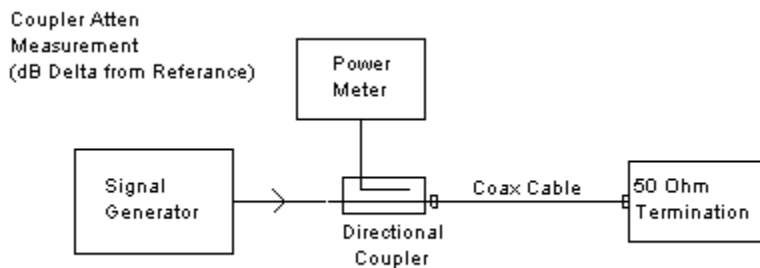
The following steps must be performed in the order shown.

RF COUPLED PORT ATTENUATION

1. Zero and calibrate the RF Power Meter.
2. Connect test equipment:



3. Set the RF Signal Generator to 100 MHz, CW and 0 dBm.
4. Set the RF Power Meter to 100 MHz.
5. Press Relative on the RF Power Meter to reference the output power level at the end of the coaxial cable.
6. Move the Power Sensor to the Coupler's forward-coupled port and move the 50 Ω Termination to the end of the coaxial cable:



E. RF Power Meter Calibration (cont)

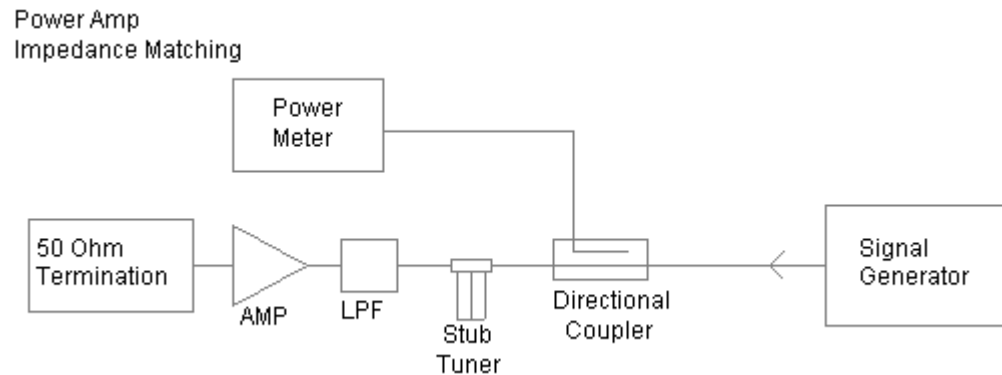
- Record the RF Power Meter relative dB value for 100 MHz:

Coupled Port Attenuation (dB)	
100 MHz	
300 MHz	
500 MHz	
700 MHz	
900 MHz	

- Repeat Steps 2 to 7 for 300 MHz.
- Repeat Steps 2 to 7 for 500 MHz.
- Repeat Steps 2 to 7 for 700 MHz.
- Repeat Steps 2 to 7 for 900 MHz.

RF COUPLED PORT ATTENUATION

- Connect test equipment:

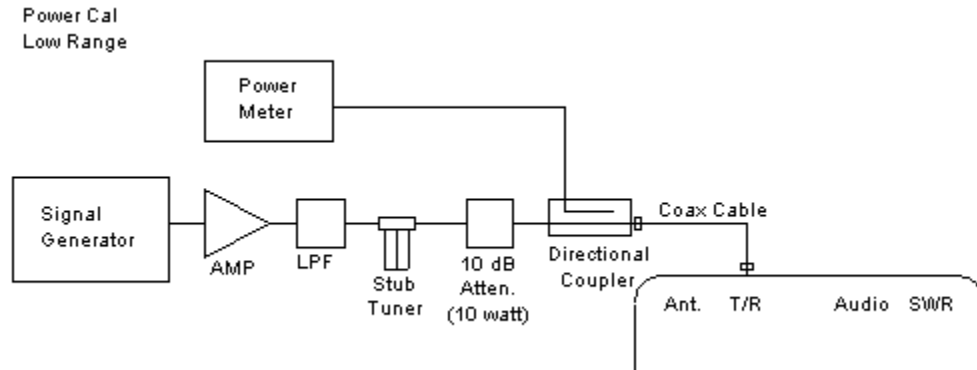


- Set the RF Signal Generator to 500 MHz, CW and 10 dBm.
- Set the RF Power Meter to 500 MHz, Relative OFF and Offset value to 500 MHz coupled port attenuation recorded in Step 7.
- Connect a 50 Ω Termination to the RF Power Amplifier input.
- Turn RF Power Amplifier to ON, set Gain to maximum and ALC to OFF.
- Adjust Stub Tuner for lowest RF Power Meter reading <-15 dBm (25 dB return loss).
- Turn RF Power Amplifier to OFF.

E. RF Power Meter Calibration (cont)

RF POWER CAL LOW RANGE

19. Connect test equipment:



20. Set the RF Signal Generator to 500 MHz, CW, -50 dBm and RF OFF.
21. Set the RF Power Meter to 500 MHz, Relative OFF and Offset value to 500 MHz coupled port attenuation recorded in Step 7.
22. Set RF Power Amplifier Gain to maximum, ALC to OFF and Power to OFF.
23. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
24. Press the 3 Key to display the Calibration Screen.
25. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
26. Press the 3 Key (POWER CAL LOW RANGE).
27. Press the F4 "Zero" Key and follow the instructions on the Test Set display.

NOTE

Corrected A2D value is 0 (± 5).

28. Press the F5 "Next" Key until the displayed Index is 0.

NOTE

Index: numbers increment by one and the Target dBm indicates the cal point power.

29. Using the Arrow Keys (\blacktriangleleft \blacktriangleright), move the cursor to the Table dBm Value.
30. Turn the RF Power Amplifier to ON.
31. Set the RF Signal Generator to RF ON.
32. Adjust the RF Signal Generator level until the power into the T/R Connector, displayed on the RF Power Meter, is equal to the Target dBm value (± 0.3 dB).
33. Press the F1 "Edit" Key to highlight the field. Change the Table dBm value to match the RF Power Meter value. Press the F1 "Done" Key to store the setting.

E. RF Power Meter Calibration (cont)

34. Press the F5 "Next" Key to move to the next cal point.

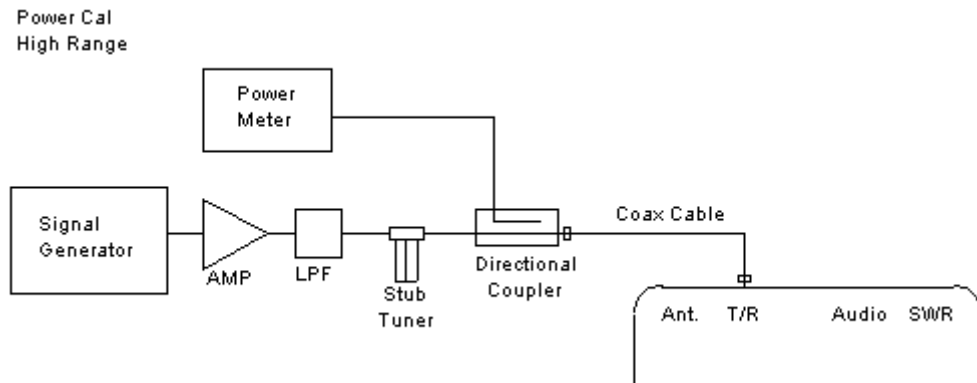
NOTE

Index: numbers increment by one and the Target dBm: indicates the next cal point level.

35. Repeat Steps 32 to 34 until the Index returns to 0.
36. Set the RF Signal Generator to RF OFF.
37. Set the RF Amplifier to OFF.
38. Press the F3 "Save" Key.
39. Cycle power on the Test Set.

RF POWER CAL HIGH RANGE

40. Connect test equipment:



41. Set the RF Signal Generator to 500 MHz, CW, -50 dBm and RF OFF.
42. Set the RF Power Meter to 500 MHz, Relative OFF and Offset value to 500 MHz coupled port attenuation recorded in Step 7.
43. Set RF Power Amplifier Gain to maximum, ALC to OFF and Power to OFF.
44. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
45. Press the 3 Key to display the Calibration Screen.
46. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
47. Press the 4 Key (POWER CAL HIGH RANGE).
48. Press the F4 "Zero" Key and follow the instructions on the Test Set display.

NOTE

Corrected A2D value is 0 (± 5).

E. RF Power Meter Calibration (cont)

49. Press the F5 "Next" Key until the displayed Index is 0.

NOTE

Index: numbers increment by one and the Target dBm: indicates the cal point power.

50. Using the Arrow Keys (◀ ▶), move the cursor to the Table dBm Value.
51. Turn the RF Power Amplifier to ON.
52. Set the RF Signal Generator to RF ON.
53. Adjust the RF Signal Generator level until the power into the T/R Connector, displayed on the RF Power Meter, is equal to the Target dBm value (± 0.3 dB).
54. Press the F1 "Edit" Key to highlight the field. Change the Table dBm value to match the RF Power Meter value. Press the F1 "Done" Key to store the setting.
55. Press the F5 "Next" Key to move to the next cal point.

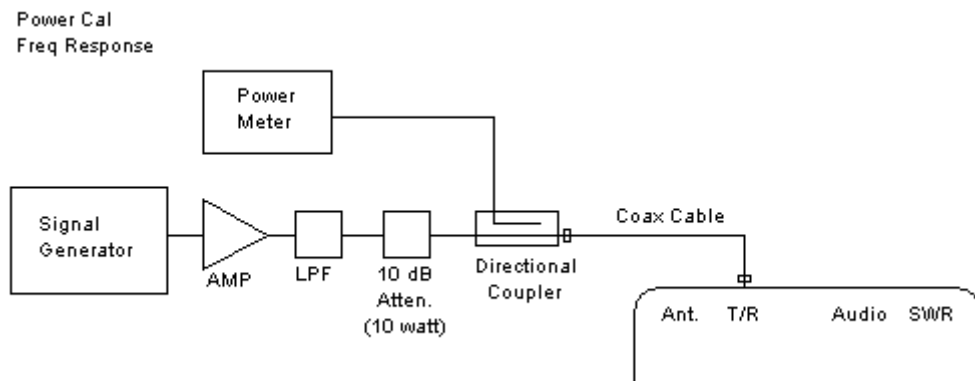
NOTE

Index: numbers increment by one and the Target dBm indicates the cal point power.

56. Repeat Steps 53 to 55 until the Index returns to 0.
57. Set the RF Signal Generator to RF OFF.
58. Set the RF Amplifier to OFF.
59. Press the F3 "Save" Key.
60. Cycle power on the Test Set.

FREQUENCY RESPONSE POWER CAL

61. Connect test equipment (using 100 MHz Low-Pass Filter):



E. RF Power Meter Calibration (cont)

62. Set the RF Signal Generator to 100 MHz, CW, -50 dBm and RF OFF.
63. Set the RF Power Meter to 100 MHz, Relative OFF and Offset value to 100 MHz coupled port attenuation recorded in Step 7.
64. Set RF Power Amplifier Gain to maximum, ALC to OFF and Power to OFF.
65. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
66. Press the 3 Key to display the Calibration Screen.
67. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
68. Press the 5 Key (POWER CAL FREQ RESPONSE).
69. Move the cursor to the RF Power Meter and press the F1 "Zoom" Key.
70. Move the cursor to the Units: field.
71. Press the F1 "Edit" Key to highlight the field. Using the Arrow Keys (▼ ▲), select dBm. Press the F1 "Done" Key to store the setting.
72. Press the F4 "Zero" Key. Follow instructions.
73. Press the F5 "Return" Key.
74. Press the F2 "Return" Key to display the Calibration Menu.
75. Press the 5 Key (POWER CAL FREQ RESPONSE).
76. Press the F4 "Zero" Key to clear the previous calibration values.
77. Press the F5 "Next" Key until the displayed Index is 0.

NOTE

Index: numbers increment by one and the MHz: indicates the cal point frequency.

78. Turn the RF Power Amplifier to ON.
79. Set the RF Signal Generator to RF ON.
80. Adjust the RF Signal Generator level until the power into the T/R Connector, displayed on the RF Power Meter, is equal to the Target dBm value (± 0.3 dB).
81. Move the cursor to the Actual dBm field. Press the F1 "Edit" Key to highlight the field. Change the Actual dBm value to match the RF Power Meter value. Press the F1 "Done" Key. Press the F4 "Copy" Key to store the setting.
82. Press the F5 "Next" Key to move to the next cal point.

NOTE

Index: numbers increment by one and the MHz: indicates the cal point frequency.

83. Set the RF Signal Generator to RF OFF.
84. Set the RF Amplifier to OFF.
85. Replace 100 MHz Low-Pass Filter with 300 MHz Low-Pass Filter in Test Setup.
86. Set the RF Signal Generator to 300 MHz.

E. RF Power Meter Calibration (cont)

87. Set the RF Power Meter to 300 MHz, Relative OFF and Offset value to 300 MHz coupled port attenuation recorded in Step 7.
88. Set RF Power Amplifier to ON.
89. Set RF Signal Generator to RF ON.
90. Adjust the RF Signal Generator level until the power into the T/R Connector, displayed on the RF Power Meter, is equal to the Target dBm value (± 0.3 dB).
91. Press the F1 "Edit" Key to highlight the field. Change the Actual dBm value to match the RF Power Meter value. Press the F1 "Done" Key. Press the F4 "Copy" Key to store the setting.
92. Press the F5 "Next" Key to move to the next cal point.

NOTE

Index: numbers increment by one and the MHz: indicates the cal point frequency.

93. Set the RF Signal Generator to RF OFF.
94. Set the RF Amplifier to OFF.
95. Replace 300 MHz Low-Pass Filter with 700 MHz Low-Pass Filter in Test Setup.
96. Set the RF Signal Generator to 500 MHz.
97. Set the RF Power Meter to 500 MHz, Relative OFF and Offset value to 500 MHz coupled port attenuation recorded in Step 7.
98. Set RF Power Amplifier to ON.
99. Set RF Signal Generator to RF ON.
100. Adjust the RF Signal Generator level until the power into the T/R Connector, displayed on the RF Power Meter, is equal to the Target dBm value (± 0.3 dB).
101. Press the F1 "Edit" Key to highlight the field. Change the Actual dBm value to match the RF Power Meter value. Press the F1 "Done" Key. Press the F4 "Copy" Key to store the setting.
102. Press the F5 "Next" Key to move to the next cal point.

NOTE

Index: numbers increment by one and the MHz: indicates the cal point frequency.

103. Set the RF Signal Generator to RF OFF.
104. Set the RF Amplifier to OFF.
105. Set the RF Signal Generator to 700 MHz.
106. Set the RF Power Meter to 700 MHz, Relative OFF and Offset value to 700 MHz coupled port attenuation recorded in Step 7.
107. Set RF Power Amplifier to ON.
108. Set RF Signal Generator to RF ON.
109. Adjust the RF Signal Generator level until the power into the T/R Connector, displayed on the RF Power Meter, is equal to the Target dBm value (± 0.3 dB).

E. RF Power Meter Calibration (cont)

110. Press the F1 "Edit" Key to highlight the field. Change the Actual dBm value to match the RF Power Meter value. Press the F1 "Done" Key. Press the F4 "Copy" Key to store the setting.
111. Press the F5 "Next" Key to move to the next cal point.

NOTE

Index: numbers increment by one and the MHz: indicates the cal point frequency.

112. Set the RF Signal Generator to RF OFF.
113. Set the RF Amplifier to OFF.
114. Replace 700 MHz Low-Pass Filter with 1200 MHz Low-Pass Filter in Test Setup.
115. Set the RF Signal Generator to 900 MHz.
116. Set the RF Power Meter to 900 MHz, Relative OFF and Offset value to 900 MHz coupled port attenuation recorded in Step 7.
117. Set RF Power Amplifier to ON.
118. Set RF Signal Generator to RF ON.
119. Adjust the RF Signal Generator level until the power into the T/R Connector, displayed on the RF Power Meter, is equal to the Target dBm value (± 0.3 dB).
120. Press the F1 "Edit" Key to highlight the field. Change the Actual dBm value to match the RF Power Meter value. Press the F1 "Done" Key. Press the F4 "Copy" Key to store the setting.
121. Press the F3 "Save" Key.
122. Cycle power on the Test Set.
123. Set the RF Signal Generator to RF OFF.
124. Set the RF Amplifier to OFF.

F. SWR Phase Detector Calibration

TEST EQUIPMENT: Short-Open-Load VSWR Calibrator

1. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
2. Press the 3 Key to display the Calibration Screen.
3. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
4. Press the 0 Key (SWR PHASE DETECT CAL) to display the SWR Phase Detector Calibration Screen.
5. Press the F4 "CAL" Key and follow instructions.
6. When the message 'Calibration Complete' appears, press the F5 "Enter" Key to return to the SWR Phase Detector Calibration Screen.
7. Cycle power on the Test Set.

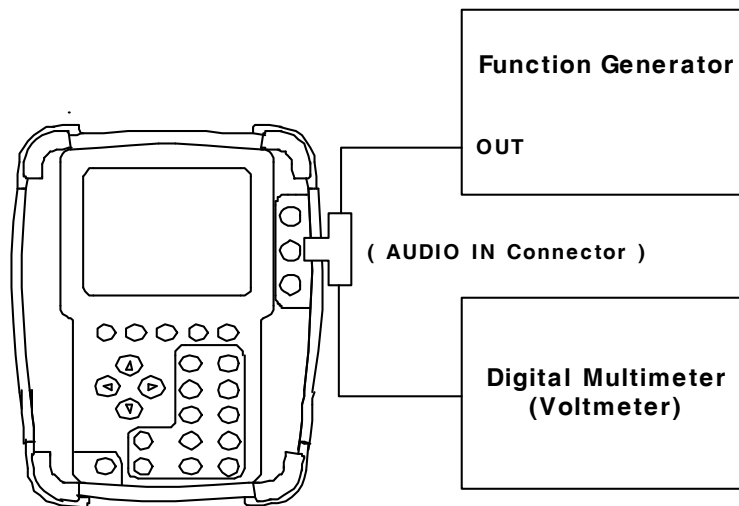
G. Audio Level Meter Calibration

TEST EQUIPMENT: Function Generator
 Digital Multimeter

NOTE

This procedure is for the 3500A only.

1. With the System Menu displayed, press the F4 "Selftest" Key to display the Self Test Menu.
2. Press the 3 Key to display the Calibration Screen.
3. Enter the Calibration Password (**30203**). Press the F1 "Done" Key to display the Internal Calibration Menu.
4. Press the 2 Key (AUDIO LEVEL CAL) to display the Audio Level Calibration Screen.
5. Establish the following test setup:



6. Press the F3 "CAL" Key and follow the instructions on the screen.
7. When the message "CALIBRATION COMPLETED" appears, press the F5 "Enter" Key to display the Audio Level Calibration Screen.
8. Cycle power on the Test Set.
9. Verify no errors are shown in the progress indicator.

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