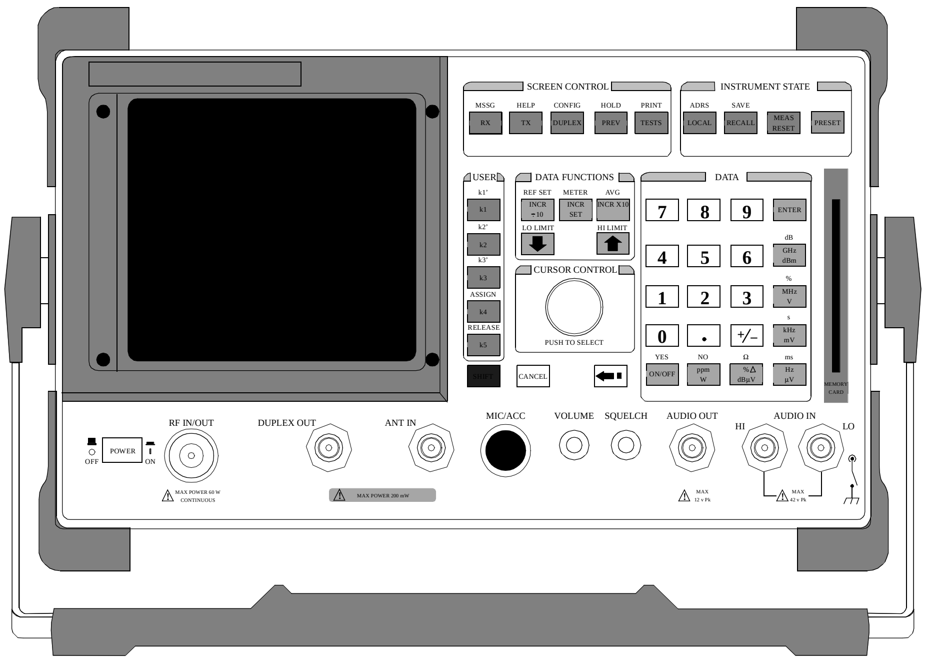
Agilent Technologies 8920A/B RF Communication Test Set
Agilent Technologies 8921A Cell Site Test Set

Assembly Level Repair

Firmware Version
8920A A.14.07 and above
8920B B.01.07 and above
8921A A.14.07 and above



Agilent Part No. 08920-90168
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Rev. F

Notice

Information contained in this document is subject to change without notice.

Agilent Technologies
Learning Products Department
24001 E. Mission
Liberty Lake, WA 99019-9599
U.S.A.

Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies Inc. assumes no liability for the customer’s failure to comply with these requirements.

GENERAL

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

This product has been designed and tested in accordance with *IEC Publication 1010*, "Safety Requirements for Electronic Measuring Apparatus," and has been supplied in a safe condition. This instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

ENVIRONMENTAL CONDITIONS

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Ventilation Requirements: When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4° C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described under Safety Symbols.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

DO NOT REMOVE THE INSTRUMENT COVER

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

WARNING: **The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.**

CAUTION: The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Safety Symbols

Caution, refer to accompanying documents

Warning, risk of electric shock

Earth (ground) terminal

Alternating current

Frame or chassis terminal

Standby (supply). Units with this symbol are not completely disconnected from ac mains when this switch is off.

To completely disconnect the unit from ac mains, either disconnect the power cord, or have a qualified electrician install an external switch.

Product Markings

CE - the CE mark is a registered trademark of the European Community. A CE mark accompanied by a year indicated the year the design was proven.

CSA - the CSA mark is a registered trademark of the Canadian Standards Association.

CERTIFICATION

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members

Agilent Technologies 08920 RF Communications Test Set

Duration of Warranty: 1 year

1. Agilent Technologies warrants Agilent Technologies hardware, accessories and supplies against defects in materials and workmanship for the period specified above. If Agilent Technologies receives notice of such defects during the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.

2 Agilent Technologies warrants that Agilent Technologies software will not fail to execute its programming instructions, for the period specified above, due to defects in material and workmanship when properly installed and used. If Agilent Technologies receives notice of such defects during the warranty period, Agilent Technologies will replace software media which does not execute its programming instructions due to such defects.

3. Agilent Technologies does not warrant that the operation of Agilent Technologies products will be uninterrupted or error free. If Agilent Technologies is unable, within a reasonable time, to repair or replace any product to a condition as warranted, customer will be entitled to a refund of the purchase price upon prompt return of the product.

4 Agilent Technologies products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

5. The warranty period begins on the date of delivery or on the date of installation if installed by Agilent Technologies. If customer schedules or delays Agilent Technologies installation more than 30 days after delivery, warranty begins on the 31st day from delivery.

6 Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by Agilent Technologies, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

7 TO THE EXTENT ALLOWED BY LOCAL LAW, THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTYOR CONDITION, WHETHER WRITTEN OR ORAL IS EXPRESSED OR IMPLIED AND AGILENT TECHNOLOGIES SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OR MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.

8. Agilent Technologies will be liable for damage to tangible property per incident up to the greater of $300,000 or the actual amount paid for the product that is the subject of the claim, and for damages for bodily injury or death, to the extent that all such damages are determined by a court of competent jurisdiction to have been directly caused by a defective Agilent Technologies product.

9. TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL AGILENT TECHNOLOGIES OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE.

   FOR CONSUMER TRANSACTIONS IN AUSTRALIA AND NEW ZEALAND: THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products. For any assistance, contact your nearest Agilent Technologies Sales and Service Office.

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: **Agilent Technologies**

Manufacturer's Address: **24001 E. Mission Avenue**
Liberty Lake, Washington 99019-9599
USA

declares that the product

Product Name: CDMA Mobile Station Test Set

Model Number: Agilent Technologies 8920

Product Options: This declaration covers all options of the above product.

conforms to the following Product specifications:

Safety: IEC 1010-1:1990+A1+A2/EN 61010-1:1993

EMC: CISPR 11:1990 / EN 55011:1991 Group 1, Class A
EN50082-1:1992
IEC 801-2:1991 - 4 kV CD, 8 kV AD
IEC 801-3:1984 - 3V/m
IEC 801-4:1988 - 0.5 kV Sig. Lines, 1 kV Power Lines

Supplementary Information:

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

This product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CD-marking accordingly.

Spokane, Washington USA November 20, 1995 Vince Roland/Quality Manager

Table 1 Regional Sales Offices

United States of America: Agilent Technologies Test and Measurement Call Center P.O. Box 4026 Englewood, CO 80155-4026 (tel) 1 800 452 4844	Canada: Agilent Technologies Canada Inc. 5150 Spectrum Way Mississauga, Ontario L4W 5G1 (tel) 1 877 894 4414	Europe: Agilent Technologies European Marketing Organization P.O. Box 999 1180 AZ Amstelveen The Netherlands (tel) (3120) 547 9999
Japan: Agilent Technologies Japan Ltd. Measurement Assistance Center 9-1 Takakura-Cho, Hachioji-Shi, Tokyo 192-8510, Japan (tel) (81) 456-56-7832 (fax) (81) 426-56-7840	Latin America: Agilent Technologies Latin America Region Headquarters 5200 Blue Lagoon Drive, Suite #950 Miami, Florida 33126 U.S. A. (tel) (305) 267 4245 (fax) (305) 267 4286	Australia/New Zealand: Agilent Technologies Australia Pty Ltd. 347 Burwood Highway Forest Hill, Victoria 3131 Australia (tel) 1 800 629 485 (fax) (61 3) 9272 0749 New Zealand (tel) 0 800 738 378 (fax) (64 4) 802 6881
Asia Pacific: Agilent Technologies 24/F, Cityplaza One, 111 Kings Road, Taikoo Shing, Hong Kong (tel) (852) 3197 7777 (fax) (852) 2506 9233		

Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center. You can find a list of local service representatives on the Web at:

http://www.agilent-tech.com/services/English/index.html

If you do not have access to the Internet, one of these centers can direct you to your nearest representative:

Table 2

United States Test and Measurement Call Center (Toll free in US)	(800) 452-4844
Europe	(31 20) 547 9900
Canada	(905) 206-4725
Japan Measurement Assistance Center	(81) 426 56 7832 |(81) 426 56 7840 (FAX)
Latin America	(305) 267 4288 (FAX)
Australia/New Zealand	1 800 629 485 (Australia) 0800 738 378 (New Zealand)
Asia-Pacific	(852) 2599 7777 (852) 2506 9285 (FAX)

Manufacturer’s Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive, from 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB(A).

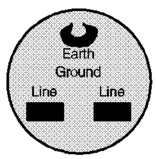
- Sound Pressure Lp < 70 dB(A).
- At Operator Position.
- Normal Operation.
- According to ISO 7779:1988/EN 27779:1991 (Type Test).

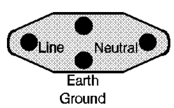
Herstellerbescheinigung

Diese Information steht im Zusammenhang mit den Anforderungen der Maschinenlärminformationsverordnung vom 18 Januar 1991.

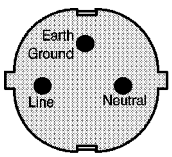
- Schalldruckpegel Lp < 70 dB(A).
- Am Arbeitsplatz.
- Normaler Betrieb.
- Nach ISO 7779:1988/EN 27779:1991 (Typprüfung).

Power Cables

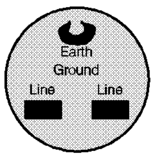
Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight	8120-0698	90 inches, black
Used in the following locations			
Peru			

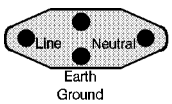
Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-2104 8120-2296	79 inches, gray 79 inches, gray
Used in the following locations			
Switzerland			

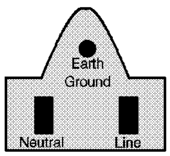
Power Cables

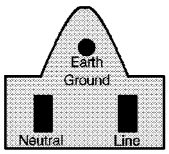
Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-1689 8120-1692	79 inches, mint gray 79 inches, mint gray

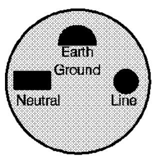
Used in the following locations
Afghanistan, Albania, Algeria, Angola, Armenia,Austria, Azerbaijan, Azores
Bangladesh, Belgium, Benin, Bolivia,Boznia-Herzegovina, Bulgaria, Burkina Faso, Burma, Burundi,Byelarus
Cameroon, Canary Islands, Central AfricanRepublic, Chad, Chile, Comoros, Congo, Croatia, Czech Republic,Czechoslovakia
Denmark, Djibouti
East Germany, Egypt, Estonia, Ethiopia
Finland, France, French Guiana, French IndianOcean Areas
Gabon, Gaza Strip, Georgia, Germany, Gozo, Greece
Hungary
Iceland, Indonesia, Iran, Iraq, Israel, Italy,Ivory Coast
Jordan
Kazakhstan, Korea, Kyrgystan
Latvia, Lebanon, Libya, Lithuania, Luxembourg
Macedonia, Madeira Islands, Malagasy Republic,Mali, Malta, Mauritania, Miquelon, Moldova, Mongolia, Morocco,Mozambique
Nepal, Netherlands, Netherlands Antilles, Niger,Norway
Oman
Pakistan, Paraguay, Poland, Portugal
Rep. South Africa, Romania, Russia, Rwanda
Saudi Arabia (220V), Senegal, Slovak Republic,Slovenia, Somalia, Spain, Spanish Africa, Sri Lanka, St. Pierre Islands
Sweden, Syria
Tajikistan, Thailand, Togo, Tunisia, Turkey,Turkmenistan
USSR, Ukraine, Uzbekistan
Western Africa, Western Sahara
Yugoslavia
Zaire

Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight	8120-0698	90 inches, black
Used in the following locations			
Peru			

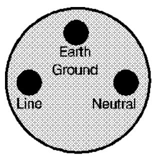
Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-2104 8120-2296	79 inches, gray 79 inches, gray
Used in the following locations			
Switzerland			

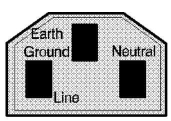
Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
125V 	Straight/Straight Straight/90° Straight/Straight	8120-1378 8120-1521 8120-1751	90 inches, jade gray 90 inches, jade gray 90 inches, jade gray
Used in the following locations			
American Samoa			
Bahamas, Barbados, Belize, Bermuda, Brazil,			
Caicos, Cambodia, Canada, Cayman Islands,Columbia, Costa Rica, Cuba			
Dominican Republic			
Ecuador, El Salvador			
French West Indies			
Guam, Guatemala, Guyana			
Haiti, Honduras			
Jamaica			
Korea			
Laos, Leeward and Windward Is., Liberia			
Mexico, Midway Islands			
Nicaragua			
Other Pacific Islands			
Panama, Philippines, Puerto Rico			
Saudi Arabia (115V,127V), Suriname			
Taiwan, Tobago, Trinidad, Trust Territories ofPacific Islands			
Turks Island			
United States			
Venezuela, Vietnam, Virgin Islands of the US			
Wake Island			

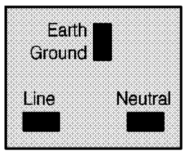
Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
JIS C 8303, 100 V 	Straight/Straight Straight/90°	8120-4753 8120-4754	90 inches, dark gray 90 inches, dark gray
Used in the following locations			
Japan			

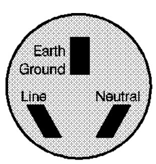
Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	90°/Straight 90°/90° Straight/Straight	8120-2956 8120-2957 8120-3997	79 inches, gray 79 inches, gray 79 inches, gray
Used in the following locations			
Denmark			
Greenland			

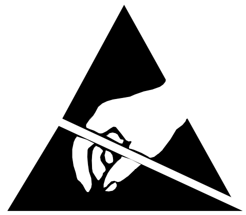
Power Cables

Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-4211 8120-4600	79 inches, mint gray 79 inches, mint gray
Used in the following locations			
Botswana			
India			
Lesotho			
Malawi			
South-West Africa (Namibia), Swaziland			
Zambia, Zimbabwe			

Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/Straight Straight/90° Straight/90°	8120-1860 8120-1575 8120-2191 8120-4379	60 inches, jade gray 30 inches, jade gray 60 inches, jade gray 15.5 inches, jade gray
Used in the following locations			
System Cabinets			

Plug Type (Male)	Plug Descriptions male/female	Part # (cable& plug)	Cable Descriptions
	90°/Straight 90°/90°	8120-1351 8120-1703	90 inches, mint gray 90 inches, mint gray
Used in the following locations			
Bahrain, British Indian Ocean Terr., Brunei			
Canton, Cyprus			
Enderbury Island, Equatorial Guinea			
Falkland Islands, French Pacific Islands			
Gambia, Ghana, Gibraltar, Guinea			
Hong Kong			
Ireland			
Kenya, Kuwait			
Macao, Malaysia, Mauritius			
Nigeria			
Qatar			
Seychelles, Sierra Leone, Singapore, SouthernAsia, Southern Pacific Islands, St. Helena, Sudan			
Tanzania			
Uganda, United Arab Emirates, United Kingdom			
Yeman (Aden & Sana)			

Plug Type	Plug Descriptions male/female	Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-1369 8120-0696	79 inches, gray 80 inches, gray
Used in the following locations			
Argentina, Australia			
China (People’s Republic)			
New Zealand			
Papua New Guinea			
Uruguay			
Western Samoa			



ATTENTION
Static Sensitive
Devices

This instrument was constructed in as ESD (electro-static discharge) protected environment. This is because most of the semi-conductor devices used in this instrument are susceptible to damage by static discharge.

Depending on the magnitude of the charge, device substrates can punctured or destroyed by contact or mere proximity of a static charge. The result can caused degradation of device performance, early failure, or immediate destruction.

These charges are generated in numerous ways such as simple contact, separation of materials, and normal motions of persons working with static sensitive devices.

When handling or servicing equipment containing static sensitive devices, adequate precautions must be taken to prevent device damage or destruction.

Only those who are thoroughly familiar with industry accepted techniques for handling static sensitive devices should attempt to service circuitry with these devices.

In all instances, measures must be taken to prevent static charge build-up on work surfaces and persons handling the devices.

Contents

1

Introduction

This manual tells how to service the Agilent Technologies 8920A and 8920B RF Communications Test Sets and the 8921A Cell Site Test Set.

Conventions Used

Throughout this manual the 8920A, 8920B and 8921A will be referred to as the Test Set unless reference to a specific model number is required. Also, throughout this manual a Test Set with a Digital Cellular Adapter (such as an 83204A, 83205A or 83206A) attached to it will be referred to as the Test System.

Manual Contents

This manual includes:

Procedures

- Troubleshooting
- Repair
- Preventative Maintenance
- Calibration
- Performance Tests

Reference

- Specifications
- Service Screen
- Block Diagrams
- Replaceable Parts
- Diagnostics Descriptions
- Error Messages

The Repair section includes calibration downloading and disassembly procedures. Calibration includes periodic calibration and performance tests. The Block Diagram section includes block diagrams, theory of operation, I/O signal descriptions, and power supply voltage distribution information.

Test Set Description

The Test Set integrates twenty-two complete instruments in one box. It is designed to meet the communication test needs of both service and manufacturing, offering the functionality needed to test analog and digital (when used with a Cellular Adapter) communications systems such as land mobile radios and dual-mode cellular phones. Some of the instruments in the Test Set (some may be optional) include:

- Synthesized AM and FM signal generator
- AM and FM Modulation analyzer
- Duplex offset generator
- SSB demodulator
- RF power meter
- Audio and RF frequency counter and RF frequency error meter
- AC and DC voltmeter
- Distortion, SINAD, and signal-to-noise-ratio meters
- Two variable audio sources
- Oscilloscope
- Spectrum analyzer and tracking generator (optional in some Test Sets)
- Signaling encoder and decoder (optional in some Test Sets)
- DC current meter (optional in some Test Sets)

The Test Set contains approximately twenty-five replaceable assemblies. Most assemblies are plug-in printed-circuit boards. Several of the internal instruments are implemented all or in part by digital techniques.

All instrument functions are internally controlled by a microprocessor, which also interfaces with external inputs. The Test Set can be part of an externally-controlled system or the Test Set itself can function as the controller for a system. IBASIC is built into the Test Set.

When a Cellular Adapter is attached to the top of the Test Set to form a Test System, the Test Set acts as an RF source and analyzer for the Cellular Adapter which modulates and demodulates the signal according to the format of the cellular system it simulates. The diagnostics for testing the Cellular Adapter (the top box) reside in the Test Set (the bottom box, the host controller); therefore, the Test Set must have firmware compatible with the Cellular Adapter.

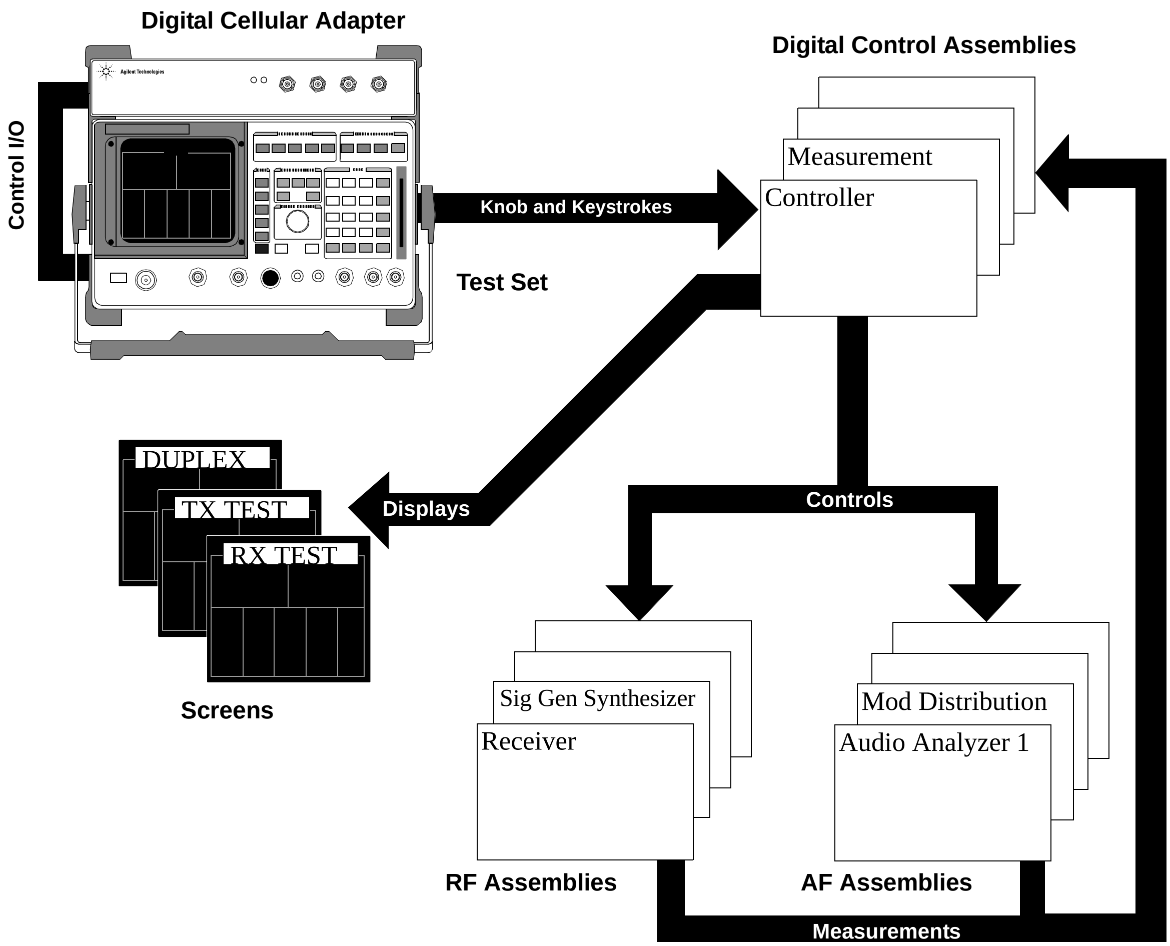


Figure 1 **Test Set Description**

Troubleshooting

You can repair the Test Set yourself or send it to your local Agilent Technologies sales and service office. Before starting a repair, you should become familiar with basic Test Set (or Test System) operation. Refer to the applicable User’s Guide.

The troubleshooting documented in this manual is centered around built-in diagnostics. Because the diagnostic results may be ambiguous, further interpretation and testing may be required. There are three categories of diagnostics built into the Test Set:

- Power-up self-test diagnostics to test controller functioning
- Internal RF (Radio Frequency) and AF (Audio Frequency) circuits diagnostics
- Diagnostics for the Cellular Adapter (if appropriate)

Troubleshooting hints in this manual include:

- Instructions on how to begin troubleshooting (see **chapter 2, "Troubleshooting"**)
- Block diagrams and theory of operation (see **chapter 9, "Block Diagrams"**)
- Detailed information about the built-in diagnostics (see **chapter 11, "Diagnostics Descriptions"**)
- Error message explanations (**see "General Information About Error Messages" on page 660**)

Instructions for troubleshooting Cellular Adapters are found in the Cellular Adapter’s Assembly Level Repair manual.

Repair Process

Repairing the Test Set consists of:

- Identifying the faulty instrument in the case of a Test System, (**see chapter 2, "Troubleshooting"**)
- Identifying the faulty assembly if the fault is in the Test Set, (**see chapter 2, "Troubleshooting"**)
- Ordering a replacement assembly (**see chapter 10, "Replaceable Parts"**)
- Replacing the faulty assembly (**see chapter 3, "Repair"**)
- Downloading calibration data (**see chapter 3, "Repair"**)
- Performing periodic calibration (**see chapter 5, "Calibration"**)
- Verifying Test Set performance (**see chapter 5, "Calibration"**)

Calibration

The Test Set periodically requires some maintenance to assure that it meets its published specifications. Periodic calibration consists of running several built-in calibration programs. An external frequency standard and dc voltmeter are required. There are no screwdriver-type adjustments in the Test Set.

Run the Performance Tests at least once every two years. Run the Periodic Calibration procedures at least every two years (**see chapter 5, "Calibration"**).

Cellular Adapters may also require periodic calibration. See the Cellular Adapter's Assembly Level Repair manual for details.

Several assemblies, when replaced, require running specific periodic calibration procedures to create calibration factors for that assembly. In other cases, the calibration data will be included with the replacement assembly on a memory card. Instructions that come with the replacement assembly explain how to download the calibration data. (This is not considered part of periodic calibration.)

NOTE: When troubleshooting the Test Set, it is sometimes desirable to swap a known-good assembly (from another Test Set) for a suspected-faulty assembly. If the swapped assembly requires calibration data, most assemblies will operate well enough with the original assembly's calibration data to troubleshoot and run the diagnostics. However, do not expect the Test Set to meet its specifications and note that some assemblies may appear to fail because of incorrect calibration data. For more details **see "Step 4 - Verify Test Set Functioning," in chapter 2, on page 52**.

Service Tools, Equipment and Documentation

Tools

One or more of the following tools may be required to access and remove various internal assemblies within the Test Set.

- TX-10 Torx screwdriver
- TX-15 Torx screwdriver
- Flat blade screwdriver
- 4-mm allen wrench
- 7-mm socket wrench
- 1/16-inch allen wrench
- 3/16-inch socket wrench
- 5/16-inch open-end wrench

Equipment

One or more of the following pieces of test equipment may be required to service various internal assemblies within the Test Set.

- Frequency Standard or Electronic Counter (**see chapter 5, "Calibration"**)
- DC Voltmeter (**see chapter 5, "Calibration"**)
- RF Assembly Extender Board: P/N 08920-60137 (**see chapter 5, "Calibration"**)

Documentation

This manual is part of a set consisting of the following manuals:

- User’s Guide
- Programmer’s Guide
- IBASIC Reference
- Assembly Level Repair

Self-Support Information

For U.S. customers that wish to repair their own Test Sets, a special toll-free number (1 800 827 3848) is available for hardware troubleshooting assistance. This is a special service specifically designed for customers that repair their own Test Sets. For a Test Set under warranty, there is no charge for troubleshooting assistance, and repair parts covered under warranty will be sent directly to the customer. If the Test Set is out of warranty, there will be a charge for parts.

The documentation supplied with your test set is an excellent source of reference, applications, and service information. Please use these manuals if you are experiencing technical problems.

If you have used the manuals and still have application questions, contact your local Agilent Technologies Sales Representative.

Repair assistance is available from the factory by phone and e-mail. Parts information is also available from Agilent Technologies.

When calling for repair assistance, please have the following information ready:

- Instrument model number (892nX).
- Instrument Serial Number (tag located on the rear panel).
- Installed options - if any (tag located on the rear panel).
- Instrument firmware revision (displayed at the top of the screen when the Test Set is powered up, and is also displayed on the CONFIGURE screen).

Support Contacts

Troubleshooting and application assistance is available for the Test Set from the factory by phone and e-mail. Internal Agilent Technologies users can contact the factory through Desk. Parts information is also available from Agilent Technologies.

- Telephone

  1 800 827 3848 (RF Comms Service Assistance, U.S. only)
  1 509 921 3848 (RF Comms Service Assistance, International)
  1 800 922 8920 (RF Comms Applications Assistance, U.S. only)
  1 800 227 8164 (Direct Parts Ordering, U.S. only)
  1 800 403 0801 (Agilent Instrument Support Center, U.S. only)
  1 916 783 0804 (Service Parts Identification, U.S. & Intl.)

- Electronic mail (Internet): spokane_service@agilent.com

Hardware and Firmware Enhancements

The hardware and firmware of these Test Sets are being enhanced on a continuous basis. Some hardware for these products can be upgraded by ordering specific retrofit kits (refer to the specific User’s Guide for your Test Set). The firmware for these Test Sets has gone through several revisions to improve performance and fix problems. It is recommended that the firmware be upgraded to the latest revision whenever a Test Set is repaired or a performance problem is found. This is important if an assembly-level repair is performed because exchange assemblies, which may be of a later revision than the one being replaced, may require a later revision of the firmware to function correctly.

2

Troubleshooting

This chapter tells how to troubleshoot the Test Set to isolate a problem to the defective assembly.

The troubleshooting is centered around the built-in diagnostics. Because the built-in diagnostics may be unable to pinpoint the assembly causing the failure, this manual contains supplementary information in the form of detailed diagnostics descriptions (**see chapter 11, "Diagnostics Descriptions"**) procedures, and suggestions for further manual troubleshooting.

The Test Set may be part of a Test System, that is, it may have a Cellular Adapter attached to it. You should disable the Cellular Adapter before troubleshooting the Test Set. If you suspect that the Cellular Adapter is faulty, it is recommended that you still verify the operation of the Test Set and then troubleshoot the Cellular Adapter using its own documentation.

Four Basic Steps In Troubleshooting the Test Set

The following steps are recommended as an efficient way to troubleshoot the Test Set. It is advisable to document the outcome of each of these steps before contacting Agilent Technologies for service assistance. The four steps are summarized as follows:

Step 1 - Disable the Cellular Adapter

To troubleshoot the Test Set (bottom box), it is essential to isolate it from any Cellular Adapter (top box) that may be attached.

Step 2 - Run the Self-Test Diagnostic

On power-up, the Test Set runs a Self-Test Diagnostic. Most of the Test Set’s digital control functions are tested. The outcome of the test appears on the CRT (if operating) and on four LEDs under the top cover.

Step 3 - Run the Functional Diagnostics

Running the Functional Diagnostics is a quick and convenient way to accumulate a lot of information about the operation of the Test Set.

Step 4 - Verify Test Set Functionality

Suggestions of things to try include: running the Performance Tests, running certain periodic calibration procedures, emulating the application where the Test Set fails, swapping assemblies, etc.

The four steps are illustrated in **figure 2, "The Four Steps of Troubleshooting the Test Set," on page 48**. Instructions for performing these steps are given in this chapter. Explanation of the results is cross-referenced to other chapters in this manual.

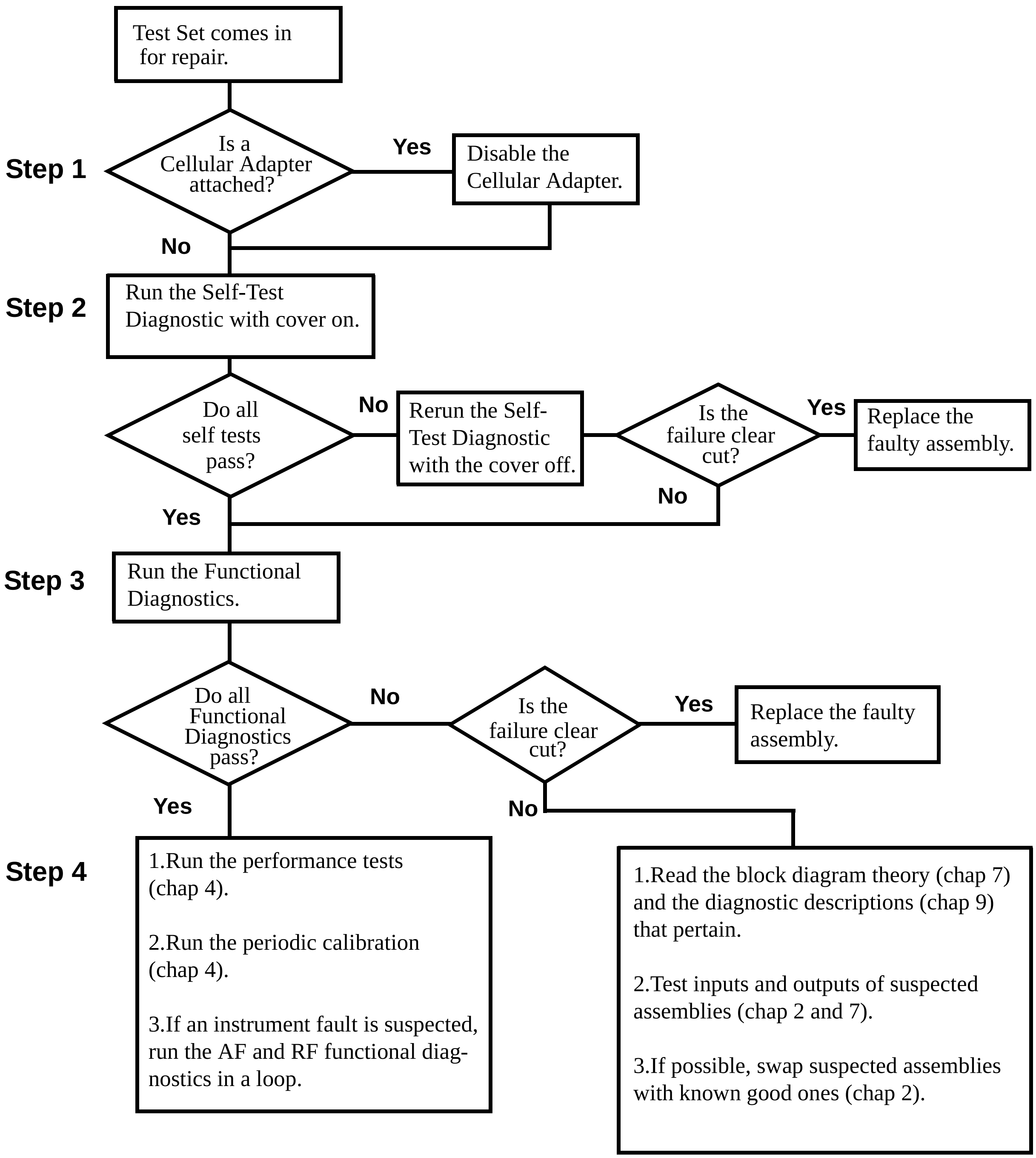


Figure 2 **The Four Steps of Troubleshooting the Test Set**

Step 1 - Disable the Cellular Adapter.

If the Test Set has a Cellular Adapter attached, disable it as follows:

- Disconnect all of the rear-panel cables that connect the Test Set to the Cellular Adapter.
- Unplug the Cellular Adapter’s power cord.
- On the Test Set’s rear panel, connect a coaxial cable between the IQ RF IN and CW RF OUT connectors.

Step 2 - Run the Self-Test Diagnostic.

If the Test Set has no Cellular Adapter or if the Cellular Adapter has been disabled, begin troubleshooting the Test Set by following these steps:

- Initiate the Self-Test Diagnostic by turning the Test Set on.
- After power-up, the top line of the Test Set’s display should show: (1) the copyright date, (2) Agilent Technologies, and (3) the firmware revision code.
- After power-up, the second line of the Test Set’s display should show: “**`All self tests passed`** .”
- The Test Set should power-up to the RX TEST screen. (RX TEST is the default screen; however, the Test Set can be altered to power-up to some other screen.)

If the Test Set powers up with the message “**`All self tests passed`**.”: Run the Functional Diagnostics as described in step 3 below. Also **see "More About Step 3 - Run the Functional Diagnostics" on page 55**, later in this chapter.

If the Test Set powers up with an error condition: **see "More About Step 2 - Run the Self-Test Diagnostic" on page 53**, later in this chapter.

Step 3 - Run the Functional Diagnostics.

The Functional Diagnostics make a series of internal measurements which test the integrity of many of the circuits within the Test Set. There are three Functional Diagnostics. The first two (Audio and RF Diagnostics) can be run continuously in a loop after an initial setup. This is useful for trapping intermittent failures. The third diagnostic (Miscellaneous Diagnostics) requires a different setup for each test.

The Functional Diagnostics should be able to pinpoint faults in the audio and RF circuits to the faulty assembly. When a measurement is out of limits, the diagnostics post a message on the screen that suggests which assembly to replace and what the certainty is of that suggestion (low, medium, or high). Before ordering replacement parts (especially when the probability is medium or low) or if you have difficulty in understanding or running the Functional Diagnostics,**see "More About Step 3 - Run the Functional Diagnostics" on page 55**, later in this chapter. For a cross reference between Functional Diagnostic and assembly tested **see chapter 3, "Repair"**.

NOTE: The measurement limits of the Functional Diagnostic tests are valid only at room temperature; that is, 20 to 25°C or 65 to 75°F.

To run the Functional Diagnostics.

- Press the PRESET key.
- Press the TESTS key.
- Set the **`Select Procedure Location`**: field to **`ROM`**.
- Set the **`Select Procedure Filename`**: field to:
  - **`AFDIAGS2`** or **`AF_DIAGS`** (to run the Audio Diagnostics),
  - **`RFDIAGS2`** or **`RF_DIAGS`** (to run the RF Diagnostics), or
  - **`MSDIAGS2`** or **`MS_DIAGS`** (to run the Miscellaneous Diagnostics).
- Set **`SET UP TEST SET`**: field to **`Exec`**, then press the cursor control knob.

- Set **Output Results To**:
  - **Crt** to send the measurement information to the display only.
  - **Printer** to send the measurement information to both the display and to a printer. (The Test Set and the printer must both be configured correctly.)
- Set test execution conditions:
  - On **If Unit-Under-Test-Fails**: (this can be altered as the test runs)
    - **Continue** to keep running when a failure occurs.
    - **Stop** to pause when a failure occurs.
  - On **Test Procedure Run Mode** (this can be altered as the test runs)
    - **Continuous** to run the tests continuously.
    - **Single Step** to pause after each measurement.
- Select the **Run Test** field.
- Choose the test or tests you want to run by selecting **Up** or **Down** to move the pointer then choosing **Select**. (It is recommended to select **All Audio Tests** and **All RF Tests** when running the Audio and RF Diagnostics for the first time.)
- Follow the instructions on the screen.
- As the tests run, you can alter test execution conditions by selecting:
  - **Loop** to rerun the test continuously.
  - **Pause** to pause the running of the tests.
  - **Stp Fail**, that is, stop-on-failure to pause the tests when a failure is detected.
  - **Sgl Step**, that is, single-step to pause the test after each measurement.

If all Functional Diagnostics pass:

Verify the Test Set’s functioning as described in step 4.

If any Functional Diagnostic fails: **see "Step 3 - Run the Functional Diagnostics." on page 50**.

Step 4 - Verify Test Set Functioning

Suggestions:

1. Run all or a selected group of the Performance Tests. **See chapter 5, "Calibration"**
2. Run selected Periodic Calibration procedures. **See chapter 5, "Calibration"**.
3. If the problem occurs on a few specific screen or screen combinations, check **table 3, "The Relationship Between Screens and Hardware" on page 61**.
4. Swap suspected assemblies with known-good ones. **See "Swapping Known-Good Assemblies" on page 63** .

More About Step 2 - Run the Self-Test Diagnostic

If the Test Set powers up with the message:

`”All self tests passed.”`, it is still possible to have the following digital problems:

- Intermittent failure in any digital assembly.
- A22 CRT Drive failure.
- Input or output failure on any I/O port of the A21 assembly (optional on some Test Sets).
- Key failure (other than stuck keys) on the A1 Keyboard.

If all Self-Test Diagnostic passes and the front-panel keys and knob work, you can assume that the digital control assemblies work.

If the Test Set powers up with the message:

`”One or more self-tests failed. Error code:<hexadecimal error code>”`: **See "Description Of Self-Test Diagnostic" in chapter 11, "Diagnostics Descriptions"** for further details on troubleshooting with the Self-Test Diagnostic.

If the error code is 1000 and a Cellular Adapter is present and enabled, the Cellular Adapter may be at fault. Disable the Cellular Adapter and run the Self-Test Diagnostic again.

If the Test Set fails to power-up at all:

- If there is no image on the CRT, troubleshoot using **figure 3, "Troubleshooting the CRT Flowchart," on page 54**.
- If there is no image on the CRT or the Test Set appears to be locked up, the Test Set may be set to power-up to a custom procedure (rather than the default RX Test screen) and that procedure may have errors. (This is the Autostart feature which is initiated by setting **`Autostart`** to **`On`** from the TESTS screen.) Correct this fault by turning the power off, then hold down the MEAS RESET and Hz keys while switching the power back on. Note that this will erase all programs and Save Settings information in RAM.
- If the Test Set does not power-up properly but there seems to be signs of life, there is likely a digital control problem with one of the digital assemblies. It may be possible to run the Self-Test Diagnostic and read the test results through the diagnostic LEDs on the A7 Controller assembly. **See "Description Of Self-Test Diagnostic" in chapter 11, "Diagnostics Descriptions"** for details.

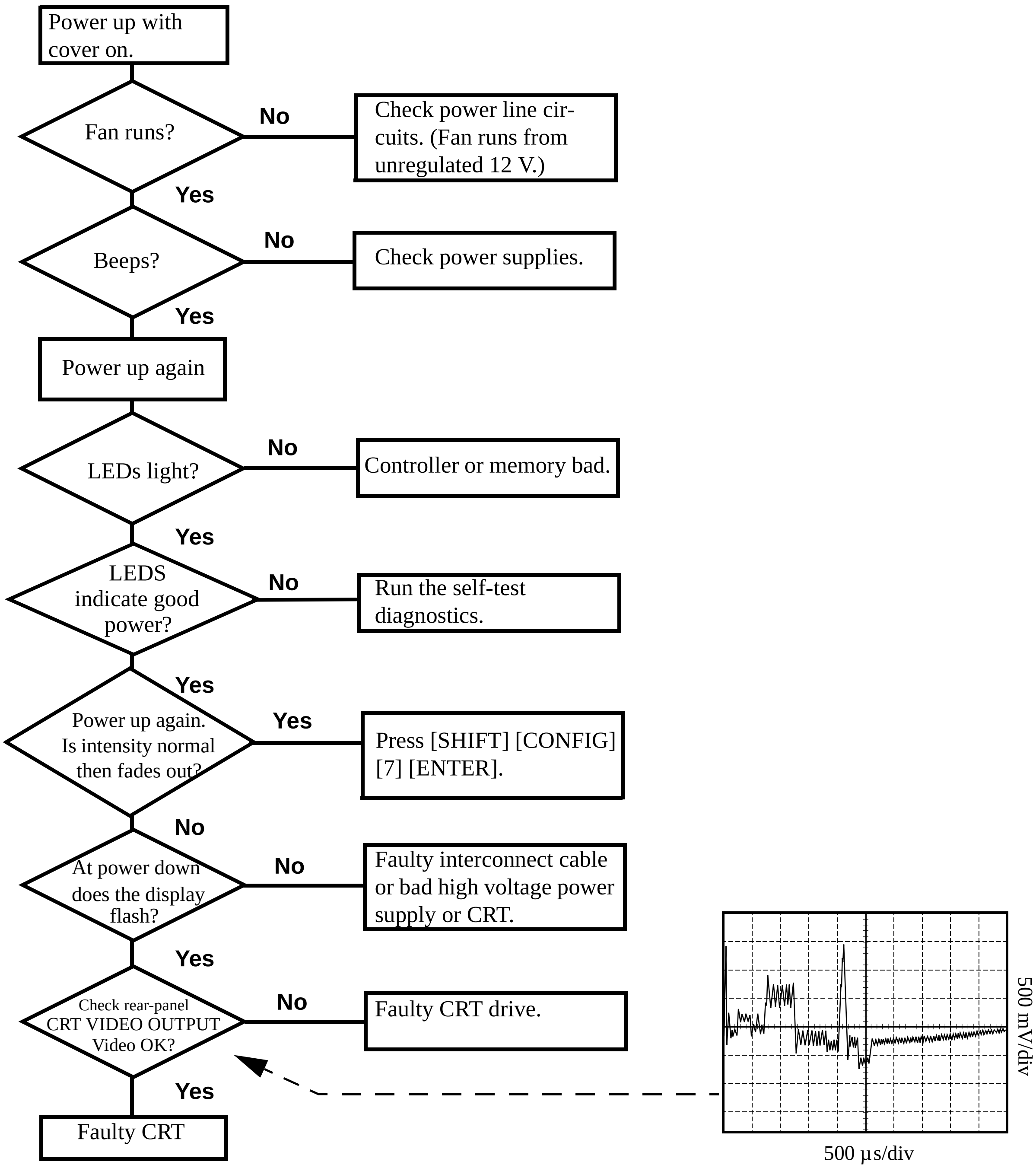


Figure 3 **Troubleshooting the CRT Flowchart**

More About Step 3 - Run the Functional Diagnostics

Memory Requirements

If the Test Set does not have 512 KBytes or more of extended RAM (optional in some Test Sets), there is a chance that the memory required to load and run the diagnostic program will overflow memory. This is particularly true of the RF Diagnostics. If there is a memory overflow, the error message **`ERROR 2 Memory overflow`** will appear possibly followed by other error messages. (Press SHIFT MSSG to review the messages.)

The Functional Diagnostics reside in the Test Set's firmware (that is, they are stored in ROM). When a Functional Diagnostic is selected, the program is first loaded into the Test Set's RAM and then it is run. The loading and running of the program both use RAM. This RAM is also shared with the Save Settings registers and a few other Test Set settings.

To run the diagnostics program when there is insufficient memory, RAM must first be cleared. **This will also clear the Save Settings registers**, and the register data cannot be stored elsewhere. The Test Set will also lose its TX Power Zero setting which can easily be reacquired.

To clear RAM:

- Select the CONFIGURE screen by pressing SHIFT CONFIG.
- Move the cursor to SERVICE in the lower-right corner of the screen and press the knob.
- Move the cursor to Clear all RAM and restart at the bottom of the screen and press the knob.
- Press the YES key.
- Re-run the diagnostics program.

USER Keys

USER keys provide the easiest method when making test selections. The default assignments for the USER keys on the TESTS screen match the positions of the selection fields in the upper-right corner of the screen. The key number precedes the field. However, key assignments are easily altered by the ASSIGN key.

If the USER keys do not match the selection fields, either reassign the keys or use the knob to place the cursor in front of the desired field and press the knob.

Frequently Encountered Error Messages

Error messages that appear on the second line of the Test Set’s display frequently occur while the Functional Diagnostics are running. The most complete and general list of error messages is in the *Error Messages* chapter of the Test Set’s *User’s Guide* and in the Test Set’s *Programmer’s Guide*. Some messages relating specifically to troubleshooting can be found in the *Error Messages* chapter of this manual. Some of the messages you can expect to occur while running the Functional Diagnostics are as follows:

Functional Diagnostics measurements commonly generate the message **”Direct latch write occurred. Cycle power when done servicing.”** The message appears the first time the diagnostic program directly addresses a latch. The message should be ignored until you wish to make a normal (not a diagnostic) measurement with the Test Set. To clear this message the Test Set should be turned off and back on again.

The message **”Printer does not respond.”** usually indicates that an GPIB printer has been selected as the output destination on the **TESTS** screen and that the printer doesn’t respond. Check that the printer is on and correctly cabled and addressed. (After a few seconds when the message times out, the output destination is changed to CRT by the program.)

The message **”Needs I/O to print.”** indicates that a printer has been selected as the output destination on the **TESTS** screen but that there is no I/O port installed in the Test Set. (After the message times out, the output destination is changed to CRT by the program.)

Some error messages you might encounter when running the Functional Diagnostics are the following:

”ERROR 173 IN XXXX Active/system controller req’d” (where **”XXXX”** represents a line number) usually indicates that a printer has been selected as the output destination on the TESTS screen and that the controller Mode on the I/O CONFIGURE screen is set to Talk&Lstn instead of Control . Change the setting and run the diagnostic again.

Timeouts

Certain failures may cause a frequency or voltage reading to timeout, that is, the time required for the measurement will be unreasonably long. If a timeout occurs, measurement execution will stop and an error message will be displayed.

- If frequency or voltage readings have been successfully made before the timeout, the assembly currently being tested or a multiplexer on the A19 Measurement Assembly may be at fault.
- If most measurements fail, the A15 Reference Assembly may be faulty in supplying clock signals to the A19 Measurement Assembly.
- Re-run the test to see if the timeout is intermittent.

The Three Functional Diagnostics

The Functional Diagnostics are contained in three independent program files. Before ordering a replacement assembly based on the diagnostics, you should read the descriptions of the diagnostic tests. **See chapter 11, "Diagnostics Descriptions"** also **see chapter 9, "Block Diagrams"**.

Audio Diagnostics (AF_DIAGS or AFDIAGS2)

This program tests the audio functions of the following assemblies:

- A2 Audio Analyzer 2
- A3 Audio Analyzer 1
- A4 Modulation Distribution
- A6 Signalling Source/Analyzer (AF Generators 1 and 2 only)
- A19 Measurement (only a few selected inputs)

After initial cabling, all tests can be run in a loop without further intervention. This makes it easier to catch intermittent failures. The measurement limits of these tests are valid only when operated at nominal room temperature.

When a test fails, a diagnosis is given in three parts:

- A diagnostic code.
- The name of the assembly or assemblies most likely to have failed.
- A rating (high or low) of the confidence of the diagnosis.

Before ordering an assembly based on the diagnosis, you should read the description of the diagnostic test and details of the diagnosis based on the diagnostic code. **See chapter 11, "Diagnostics Descriptions"**. Also **see chapter 9, "Block Diagrams"**.

RF Diagnostics (RF_DIAGS or RFDIAGS2)

This program tests the RF functions of the following assemblies:

- A11 Receiver Mixer
- A13 Output
- A14 Signal Generator Synthesizer
- A15 Reference
- A16 Receiver
- A17 Receiver Synthesizer
- A18 Spectrum Analyzer (optional in some Test Sets)
- A23 Input

Some test selections require initial cabling before running the RF Diagnostics; but all tests can be run in a loop without further intervention. This makes it easier to catch intermittent failures. The measurement limits of these tests are valid only when operated at room temperature.

When a test fails, a diagnosis is given in two parts:

- The name of the assembly or assemblies most likely to have failed.
- A rating (high, medium, or low) of the confidence of the diagnosis.

The diagnosis given by the RF Diagnostics should be verified by other means before ordering and replacing parts. This particularly applies to the Spectrum Analyzer, Receiver, and Receiver Mixer assemblies. Some suggestions for doing this are as follows:

- Become familiar with the block diagram and theory of operation of the assemblies in **see chapter 9, "Block Diagrams"**.
- Read the description of the diagnostic test in **see chapter 11, "Diagnostics Descriptions"**.
- Follow the suggestions in *Further Isolating RF Failures* in this chapter.

Miscellaneous Diagnostics (MS_DIAGS or MSDIAGS2)

This program verifies the following:

- The ability of the A15 Reference to detect the presence of an external reference connected to the rear-panel 10 MHz REF INPUT connector and whether it can lock to that signal.
- The integrity of the front-panel RF IN/OUT, DUPLEX OUT and ANT IN connectors.
- The Self-Test Diagnostics, and power supply voltages. The Self-Test Diagnostic is described in detail **see "Description Of Self-Test Diagnostic" in chapter 11, "Diagnostics Descriptions."**.

Note that the Miscellaneous Diagnostics cannot be run in a loop.

Before ordering a replacement assembly based on the diagnostics, you should read the description of the diagnostic test. **See chapter 11, "Diagnostics Descriptions"**. Also **see chapter 9, "Block Diagrams"**.

More About Step 4 - Verify Test Set Functioning

Relating Test Set Functions To Hardware

Table 3 relates the simplified block diagram to the Test Set’s control and display screens:

Table 3 The Relationship Between Screens and Hardware

Screen	Hardware Block					
	AF Analyzer	AF Generator	RF Analyzer	RF Generator	Spectrum Analyzer	Digital
RX TEST	X	X		X		X
TX TEST	X	X	X			X
DUPLEX TEST	X	X	X	X		X
RF GENERATOR				X		X
RF ANALYZER			X			X
AF ANALYZER	X					X
OSCILLOSCOPE	X					X
SPECTRUM ANALYZER			X		X	X
ENCODER		X				X
DECODER	X					X
RADIO INTERFACE						X
CONFIGURE						X

Out-of-Lock (OOL) Detectors

Two out-of-lock LEDs, one located on the A14 Signal Generator Synthesizer and the other on the A17 Receiver Synthesizer are found within the Test Set. The LEDs light when the phase-lock loops are not locked and therefore not functioning properly. The location of the LED annunciators is shown in **figure 4, "Location of the Out-of-Lock Annunciators," on page 62**.

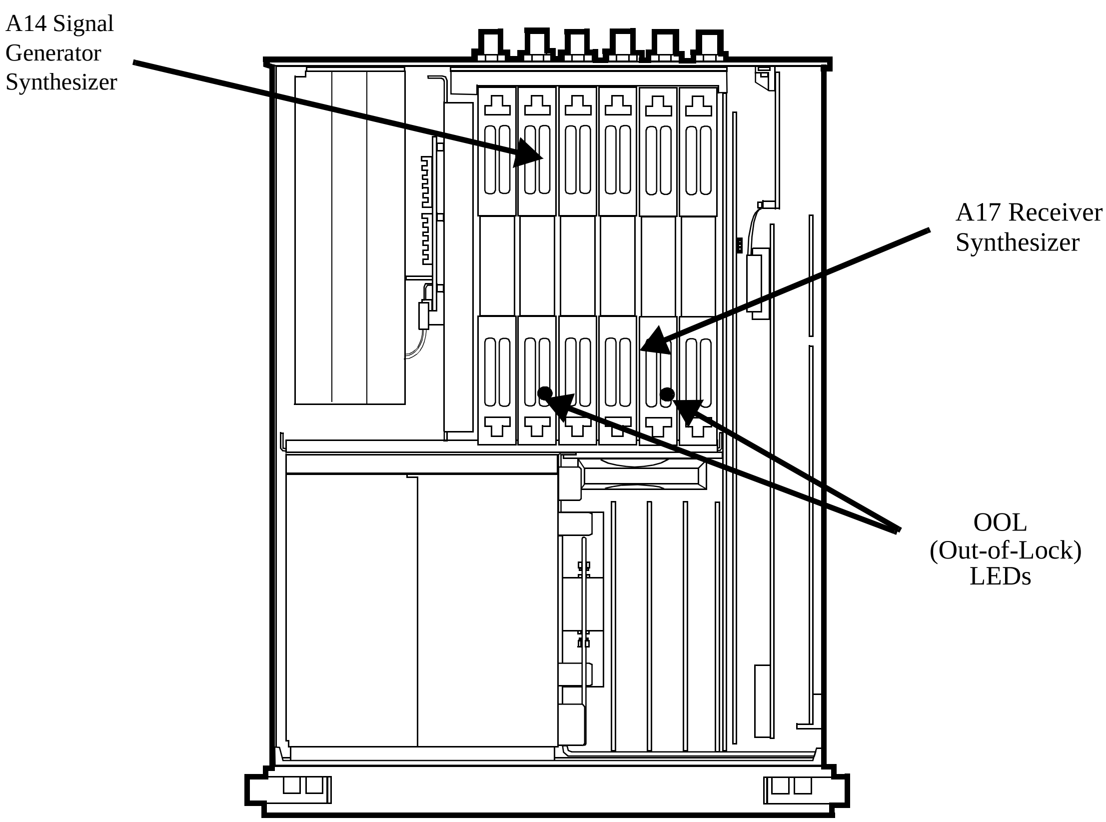


Figure 4 **Location of the Out-of-Lock Annunciators**

Swapping Known-Good Assemblies

Swapping a known-good assembly for a suspected faulty assembly must be performed with good judgement. Most swapped assemblies, which use calibration data, will operate well enough with the original assembly's calibration data to troubleshoot and to run the diagnostics. Do not expect the Test Set to meet its specifications. Some assemblies may appear to fail because of incorrect calibration data. It is also important to keep track of which assemblies are in the Test Set. If calibration data is lost, the assembly will have to be sent back to the factory.

Calibration data is generally stored in a socketed EEPROM on the A7 Controller. If the Controller is replaced or swapped, the original EEPROM must be in the Test Set's Controller. Should the EEPROM lose its data, the entire instrument will require a factory recalibration.

The assemblies that require down-loaded calibration data from a memory card are:

- A11 Receiver Mixer
- A13 Output
- A14 Signal Generator Synthesizer
- A15 Reference
- A16 Receiver
- A17 Receiver Synthesizer
- A18 Spectrum Analyzer (optional assembly in some Test Sets)
- A19 Measurement
- A21 GPIB/RS-232/Current Sense (optional assembly in some Test Sets)
- A23 Input Section
- A24 High Power Attenuator

Of these assemblies the A23 Input Section is the least likely to simulate a working assembly without its own calibration data.

The A18 Spectrum Analyzer may also pose difficulties. The Spectrum Analyzer can be checked by measuring the Tracking Generator ported to the DUPLEX OUT and connected to the ANT IN. Make the check with the center frequency set to 501 MHz and a span of 1 GHz.

Some assemblies require that a periodic calibration procedure be run. These are:

- A2 Audio Analyzer 2 (variable-frequency notch filter null if present)
- A3 Audio Analyzer 1 (DC offset)
- A4 Modulation Distribution (DC offset, external amplifier gain)
- A15 Reference (time base frequency)
- A19 Measurement (voltage references)

For general troubleshooting, these assemblies can generally be swapped without an immediate need of recalibration.

Further Isolating RF Failures

Isolating failures in the RF assemblies of the Test Set is generally more difficult than for the rest of the instrument. One problem is that the RF Diagnostics sometimes use the built-in RF analyzer to test the built-in RF source, and vice versa. This is necessary to make the diagnostics self-contained, that is, they run without external equipment.

Before using the helps in this section, run the RF Diagnostics in their entirety. (**See "Step 3 - Run the Functional Diagnostics." on page 50**, earlier in this chapter.) It will also be helpful to become familiar with:

- the RF source and analyzer block diagrams and theory of operation in **chapter 9, "Block Diagrams"**.
- the description of the RF and Miscellaneous Diagnostic tests in **chapter 11, "Diagnostics Descriptions"**.

Some general-purpose, RF test equipment will be needed:

- RF signal generator
- RF modulation analyzer or spectrum analyzer.

Isolating Input and Output Failures

If all RF diagnostic tests pass, there could still be a problem with the input and output paths (including reverse-power and overpower protection). Run the Miscellaneous Diagnostics test titled RF Input Output Test. A failure indicates that the Input Section or front-panel connection is faulty.

Isolating the RF Analyzer

The RF Analyzer includes the following assemblies. (Refer to block diagrams 3 and 4 in **chapter 9, "Block Diagrams"**.)

- A23 Input Section
- A11 Receiver First Mixer
- A16 Receiver
- A17 Receiver Synthesizer
- A18 Spectrum Analyzer (optional on some Test Sets)

To isolate the RF Analyzer:

- On the Test Set:
  - Press PRESET.
  - Press TX.
  - Set **`Tune Mode`** to **`Manual.`** .
  - Set **`Tune Freq`** to **`100 MHz`**.
  - Set **`Input Port`** to **`Ant`**.
- On the external RF signal generator:
  - Set the frequency to 100 MHz CW.
  - Set the amplitude to 0 dBm.
  - Connect the output to the Test Set's ANT IN connector.
- Set the RF signal generator frequency to 100, 500, and 900 MHz. For each frequency, the TX TEST display on the Test Set should read as follows:
  - TX POWER should read approximately 0.001 Ω for each frequency.
  - TX FREQUENCY should read 100, 500, and 900 MHz respectively.
  - If the Test Set has a Spectrum Analyzer, temporarily select SPEC ANL and note the level and frequency of the signal's fundamental component. (Press TX to return to the TX TEST screen.)

Refer to block diagram BD4 in **chapter 9, "Block Diagrams"**. The down-conversion frequencies for the three input frequencies are shown in the following table.

Table 4 The Relationship Between Screens and Hardware

Input Frequency (MHz)	First LO Frequency (MHz)	IF From First Mixer (MHz)
100	714.3	614.3
500	614.3	114.3
900	785.7	114.3

Isolating the RF Source

The RF Source includes the following assemblies. Refer to block diagrams BD3 and BD4 in **chapter 9, "Block Diagrams"**.

- A15 Reference
- A14 Signal Generator Synthesizer
- A13 Output Section
- A23 Input Section

To isolate the RF Source:

- On the Test Set:
  - Press PRESET.
  - Press RX.
  - Set **`RF Gen Freq Mode`** to **`600 MHz`**.
  - Set **`Amplitude`** to **`0 dBm`**.
  - Set **`Output Port`** to **`Dupl`**.
- On the external RF modulation analyzer or spectrum analyzer:
  - Set the tuning for a 600 MHz 0 dBm input signal.
  - Connect the input to the Test Set’s DUPLEX OUT connector.
- Set the Test Set’s generator frequency to 600, 300, and 150 MHz. For each frequency, the external RF analyzer should read as follows:
  - Power should read approximately 0.001 Ω for each frequency.
  - Frequency should read 600, 300, and 150 MHz respectively.

3

Repair

Introduction

Repair of a Test Set (or Test System) is straightforward. It involves troubleshooting a problem to an assembly by running diagnostics and then replacing the defective assembly. This section contains tools required, hints, and drawings to help you perform these tasks effectively. Detailed step-by-step procedures are not given. A procedure for downloading calibration data is also included in this section.

CAUTION: Perform the following procedures only at a static-safe work station. The printed circuit assemblies in this instrument are sensitive to STATIC ELECTRICITY DAMAGE. Wear an anti-static wrist strap that is connected to earth ground.

Recommended Torque

- Screws: Tighten until just snug. Do not to strip threads.
- RF connectors
  SMA: 9.0 lb-in. (102 N-cm)
  SMC: 6.0 lb-in. (68 N-cm)
- Nuts holding semi-rigid coax to motherboard: 6.0 lb-in. (68 N-cm)

Downloading Calibration Data

Most assemblies in the Test Set require calibration data. To insure that the Test Set remains calibrated after an assembly is replaced, new calibration data must be downloaded. Depending on the vintage and model number of the Test Set this may be done with either an 'Epson-style' memory card (early 8920As and 8921As) or a PCMCIA memory card (8920Bs). Newer Test Sets can, when powered-up, automatically download calibration data directly from assemblies with on-board calibration data.

Instructions for downloading calibration data are listed below. They are also included with a replacement assembly.

- Switch the Test Set's power off. Remove the original assembly.
- Install the replacement assembly. Switch the Test Set's power on.
- Insert the memory card (Epson-style or PCMCIA) into the Test Set.
- Press the TESTS key.
- Set the **`Select Procedure Location`**: field to **`Card`**.
- Set the **`Select Procedure Filename`**: field to: **`DNLDCAL`**.
- Press the k1 (Run Test) key.
- Follow the instructions on the screen.

Troubleshooting Aids for Assemblies

Refer to following table to determine out which Diagnostic Tests, Performance Tests, and Periodic Self Calibration adjustments apply to an assembly you have replaced.

Table 5 Relating Assemblies To Troubleshooting Aids

Ref. Des.	Assembly Name	Troubleshooting with Diagnostics (Chap 2)		Performance Tests (Chap 4)	Periodic Self Cal	Cal Data Needed After Replacement ?
		Power-Up Self Tests [a]	ROM			
A1	Keyboard	X	MS_DIAGS: (Self Test)			NO
A2	Audio Analyzer 2		AF_DIAGS: (Audio Analyzer 2)	AF Analyzer (AC Voltage Accuracy)	Variable Frequency Notch Filter	YES, E[b]
A3	Audio Analyzer 1		AF_DIAGS: (Audio Analyzer 1 Internal Paths)		Audio Analyzer Offset	NO
A4	Modulation Distribution		AF_DIAGS: (Mod Distribution Internal Paths)	AF Generator: (AC Level Accuracy)	AF Gen Gain EXT Mod Path Gain	NO
A5	Serial I/O	X	MS_DIAGS: (Self Test)			NO
A6	Signaling Source Analyzer	X	AF_DIAGS: (Audio Frequency Generators 1 and 2)			NO

Table 5 Relating Assemblies To Troubleshooting Aids (Continued)

Ref. Des.	Assembly Name	Troubleshooting with Diagnostics (Chap 2)		Performance Tests (Chap 4)	Periodic Self Cal	Cal Data Needed After Replacement ?
		Power-Up Self Tests [a]	ROM			
A7	Controller	X	MS_DIAGS: (Self Test)			NO
A8	Memory	X	MS_DIAGS: (Self Test)			NO
A9	Power Supply		MS_DIAGS: (Self Test)			NO
A10	Power Supply Regulator		MS_DIAGS: (Self Test)			NO
A11	Receiver Mixer		RF_DIAGS: (Receiver)			YES, E[b], P[c]
A12	Radio Interface (Opt. 020)		MS_ DIAGS: (Self Test)			NO
A13	Output		RF_DIAGS: (Output)	AF Generator: (AM Accuracy)		YES, E[b], OB[c]
A14	Sig Gen Synthesizer		RF_DIAGS: (Signal Generator Synthesizer)	RF Generator: (Harmonic and Spurious Spectral Purity)		YES, E[b],OB[c]
A15	Reference		RF_DIAGS: (Reference)	RF Generator| (Residual FM)	Timebase Reference	YES, E[b], OB[c]
A16	Receiver		RF_DIAGS: (Receiver)	RF Analyzer: (AM Accuracy and FM Accuracy)		YES, E[b], OB[c]

Table 5 Relating Assemblies To Troubleshooting Aids (Continued)

Ref. Des.	Assembly Name	Troubleshooting with Diagnostics (Chap 2)		Performance Tests (Chap 4)	Periodic Self Cal	Cal Data Needed After Replacement ?
		Power-Up Self Tests [a]	ROM			
A17	Receiver Synthesizer		RF_DIAGS: (Receiver Synthesizer)	RF Analyzer: (Residual FM)		YES, E[b], OB[c]
A18	Spectrum Analyzer (Opt. 102)		RF_DIAGS: (Spectrum Analyzer)	Spectrum Analyzer		YES, E[b], P[c]
A19	Measure-ment [d]	X	MS_DIAGS: (Self Test)	Oscilloscope	Voltmeter-Reference	YES, E[b], P[c]
A20	CRT Drive	X	MS_DIAGS: (Self Test)			NO
A21	GPIB/RS-232/Current Sense (Opt. 103)	X	MS_DIAGS: (Self Test)			YES, E[b], P[c]
A22	CRT					NO
A23	Input Section		RF_DIAGS: (Input)	RF Generator (Level Accuracy)		YES, E[b], P[c]
A24	High Power Attenuator		MS_DIAGS: (RF Input/ Output)			YES, E[b], P[c]
A25	Motherboard					NO
A26	Terminator [e]					NO

a. Besides checking the assemblies marked X, the power-up self test checks the serial data lines which the controller uses to send control signals to and receive status signals from the RF and AF assemblies.
b. 8920A and 8921A: E=Epson-style smart card.
c. 8920B: P=PCMCIA-style smart card, OB=EEPROM on board.
d. Measurement board checked indirectly by all diagnostics.

e. A26 is a 50Ω termination assembly that plugs into the A18 Spectrum Analyzer position in a test set that does not have a Spectrum Analyzer.

Disassembly and Replacement Procedures

Ordering Replacement Parts: See **chapter 10, "Replaceable Parts"**.

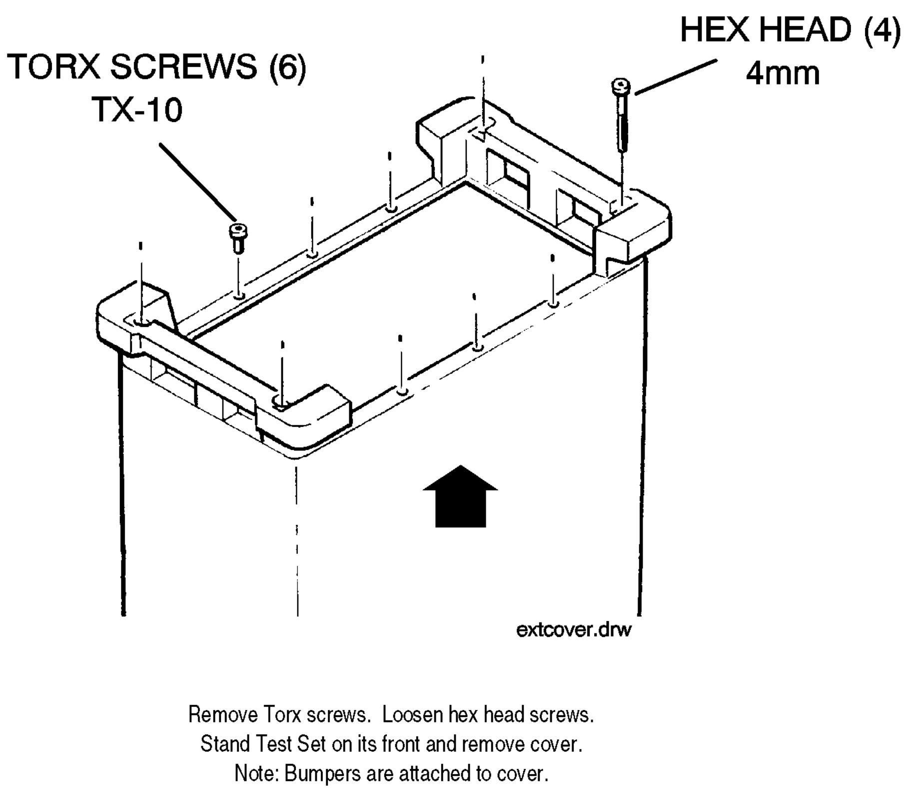


Figure 5 **Removing External Cover**

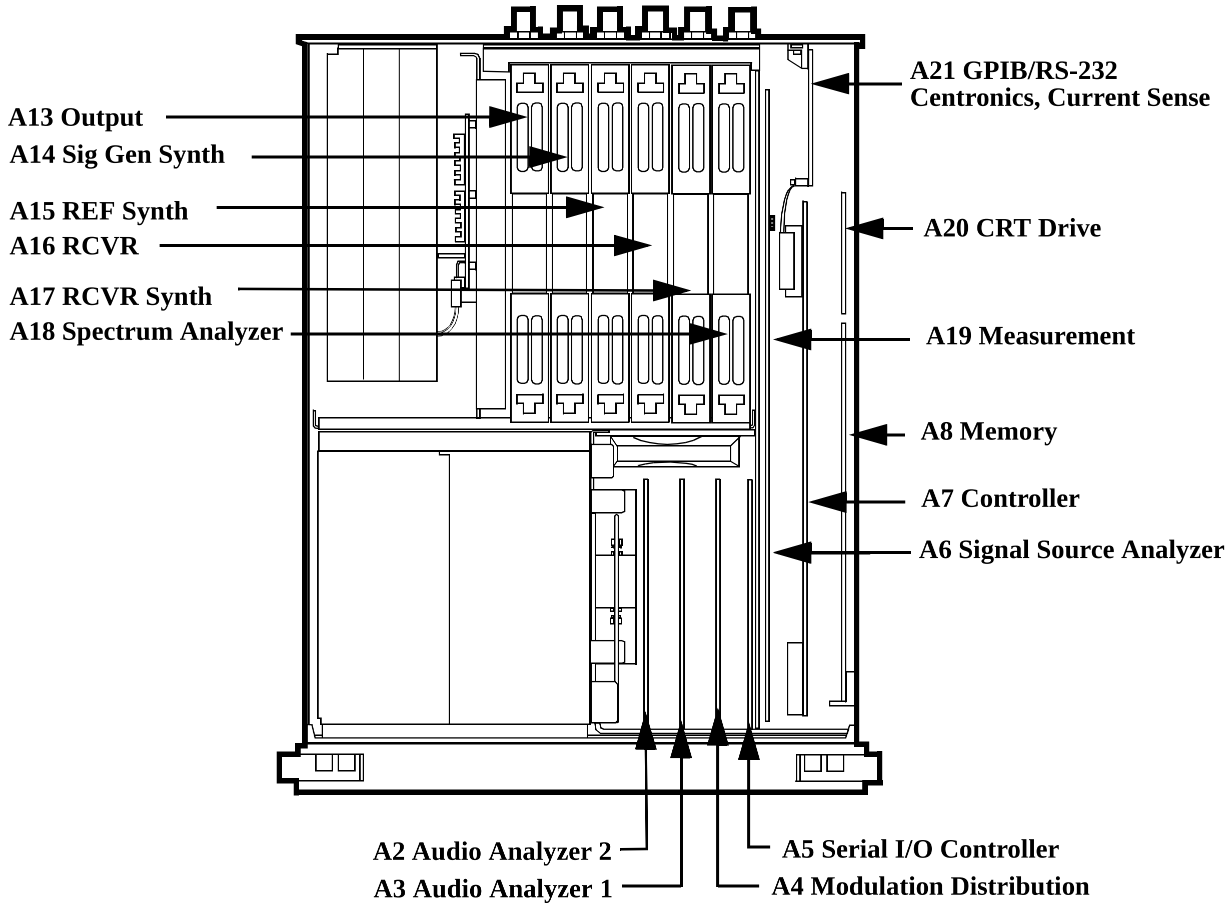


Figure 6 **AF, Digital, and Most RF Assemblies**

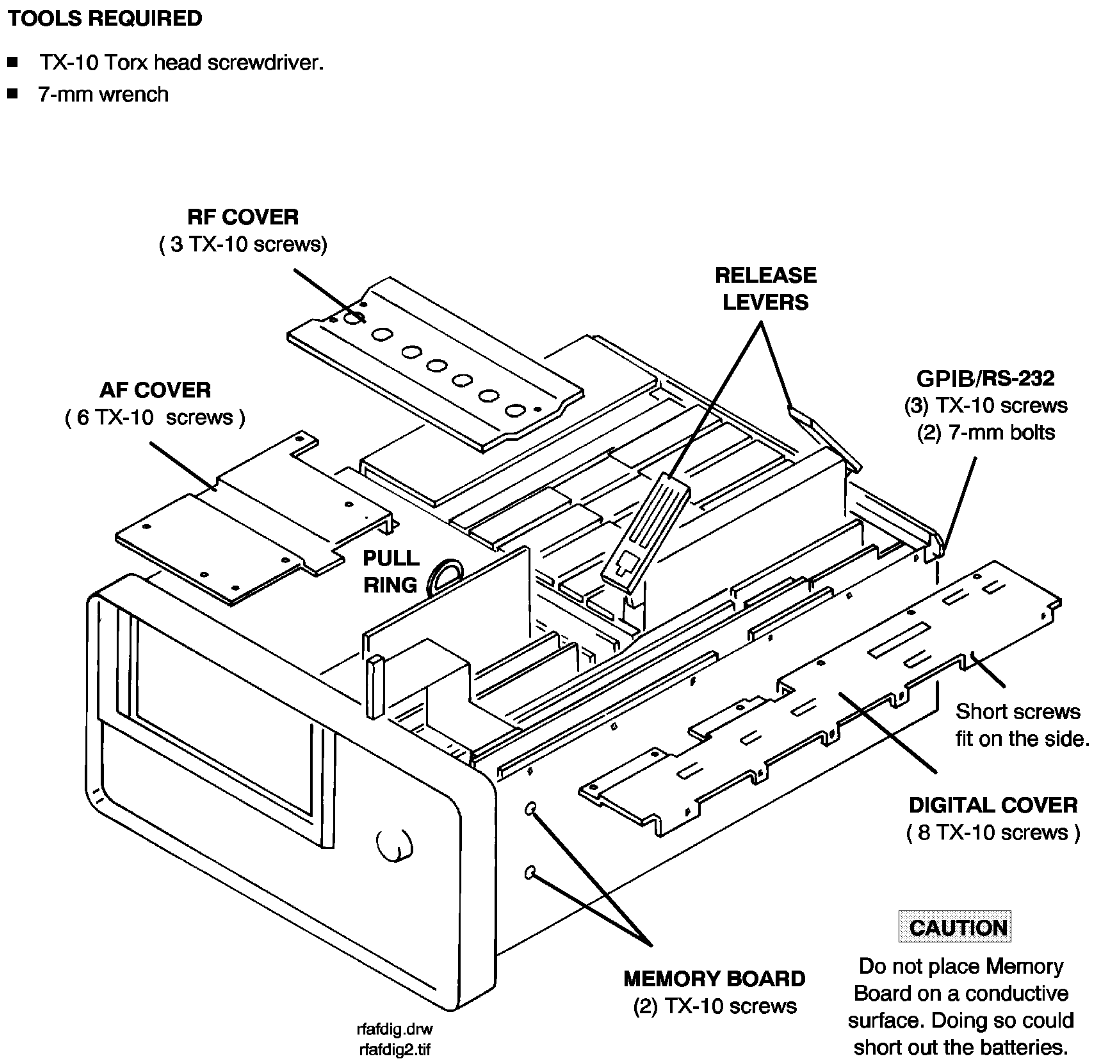


Figure 7 **Internal Covers**

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

A23 RF Input Assembly

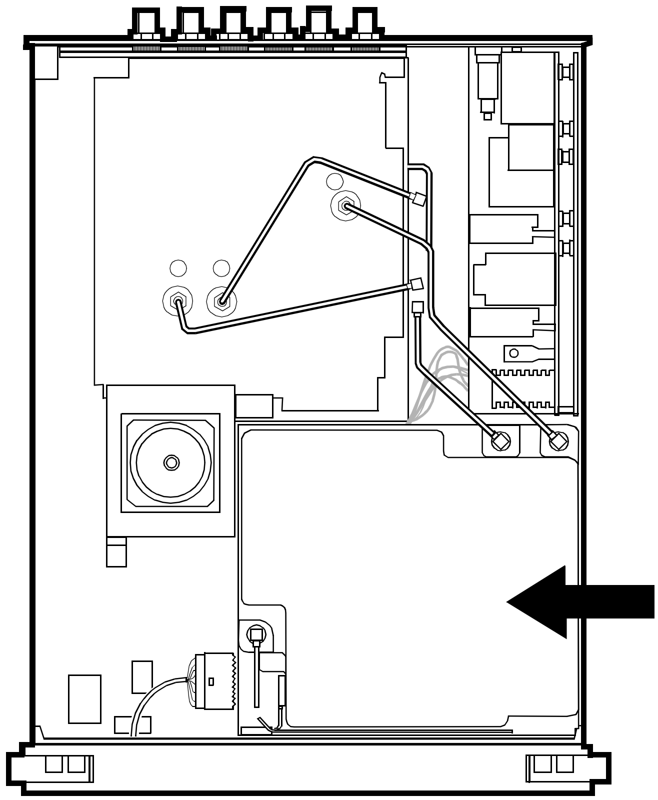
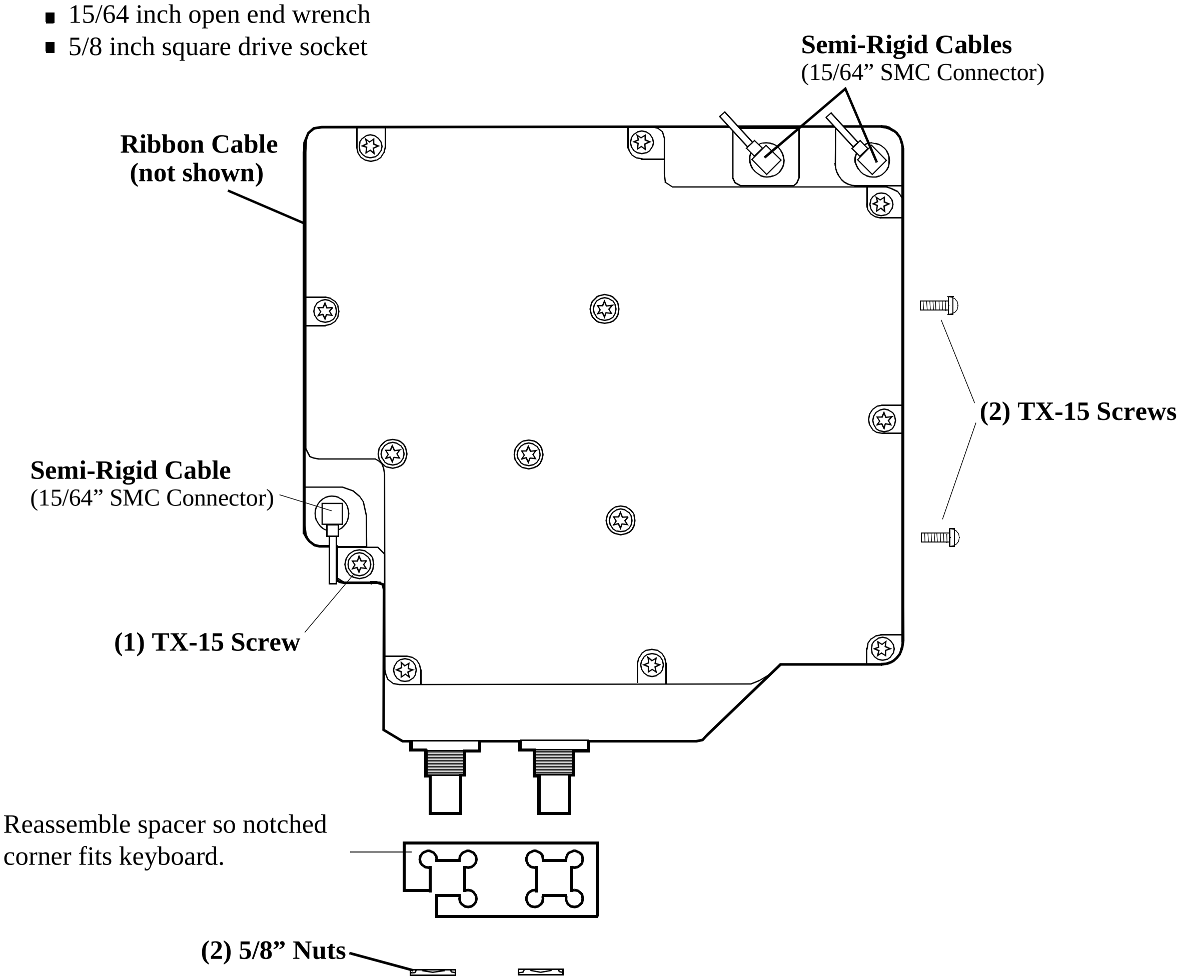


Figure 8 **A23 RF Input Assembly**

Tools Required

- TX-15 Torx head screwdriver
- 15/64 inch open end wrench
- 5/8 inch square drive socket



Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

Calibration Data: The Test Set requires new cal data when the Input section is replaced. A cal data memory card comes with the replacement assembly.

A1 Front Panel (includes keyboard)

Hints: The A1 Keyboard assembly is held to the front panel by TX-10 screws and the cursor control knob. Use a 1/16-inch allen wrench to remove the knob.
Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

TOOLS REQUIRED

- **TX-15 Torx head screwdriver**
- **TX-10 Torx head screwdriver**
- **1/16 inch allen wrench**
- **5/16 inch open end wrench**
- **5/8 inch nut driver**

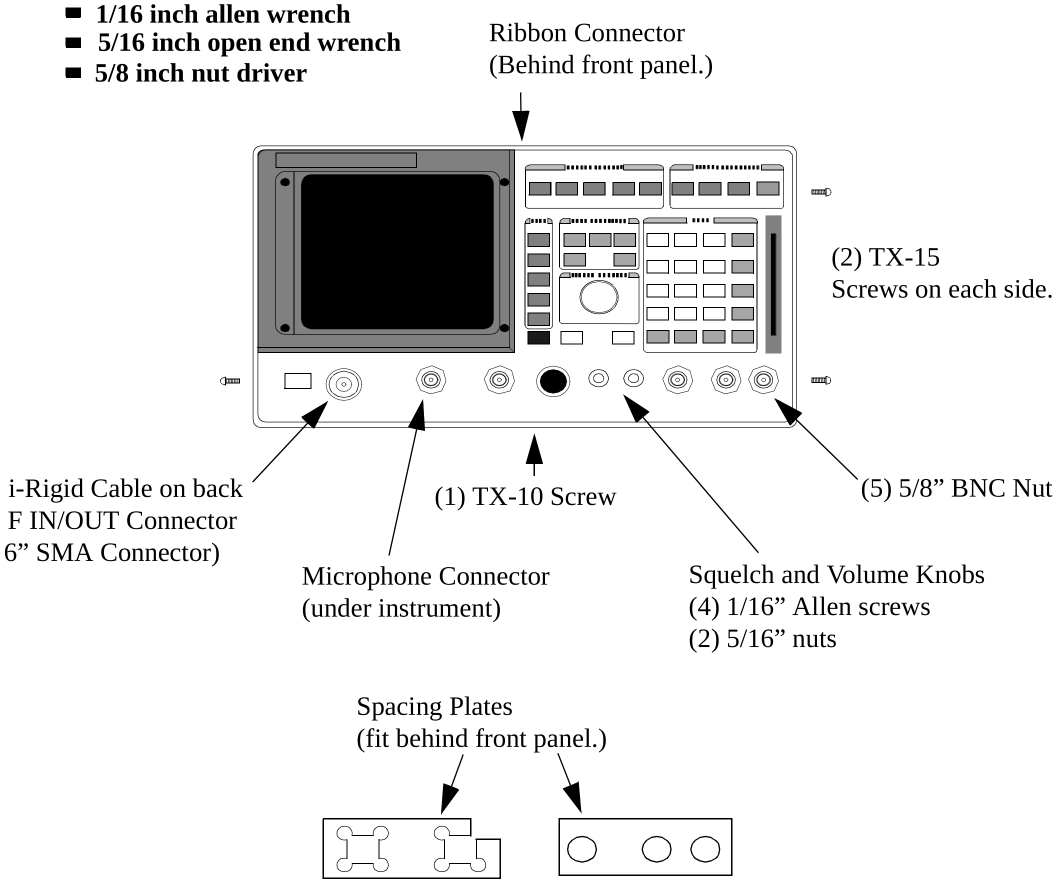
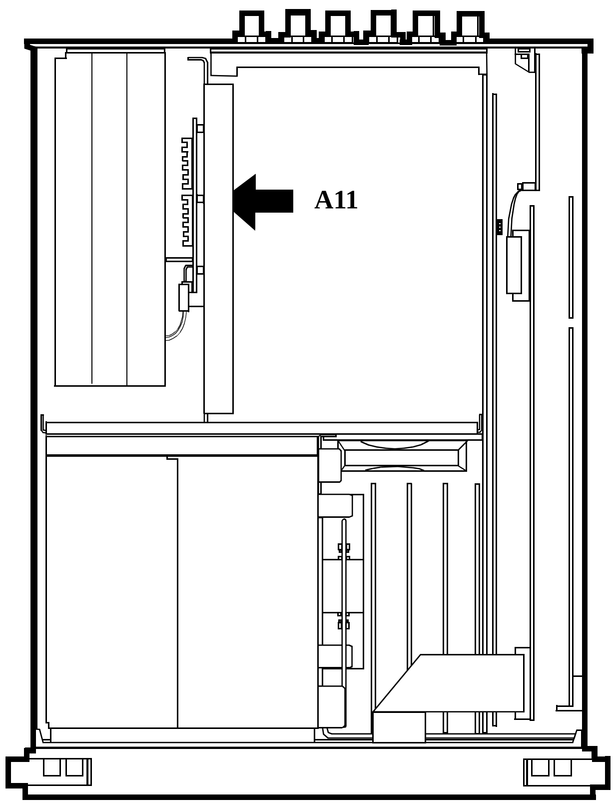
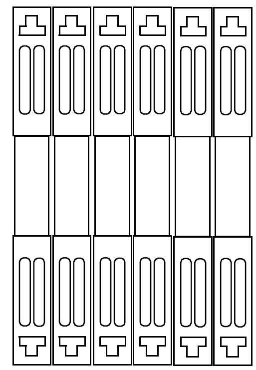


Figure 9 **Front Panel**

A11 Receiver Mixer





Remove RF assemblies.

Figure 10 **A11 Receiver Mixer**

Hints: To identify specific RF assemblies see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

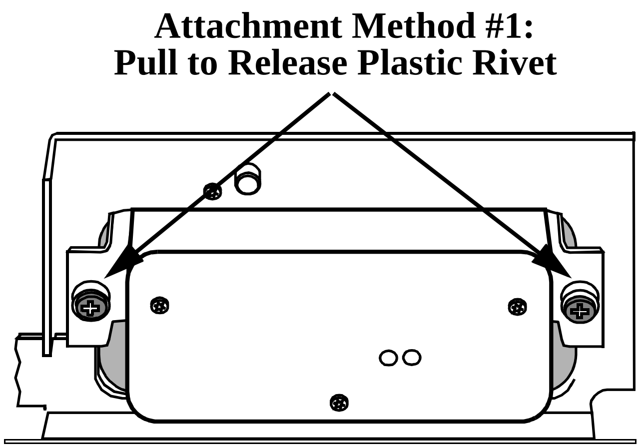
Calibration Data: The Test Set requires new cal data when the Receiver Mixer assembly is replaced. A cal data memory card comes with the replacement assembly.

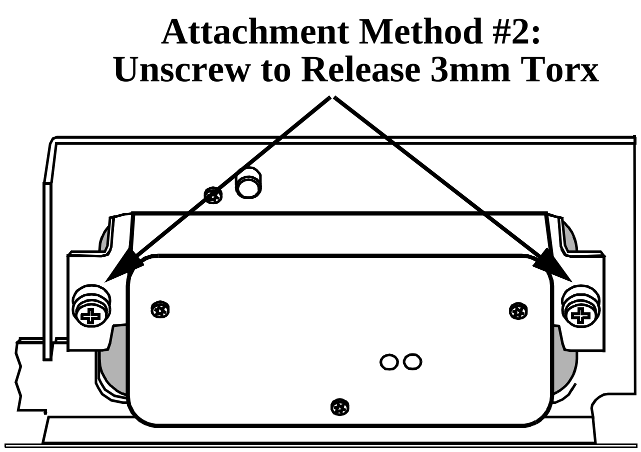
Tools Required

- 15/64 inch open and wrench (for RF cable connectors)
- TX-10 Torx head screwdriver

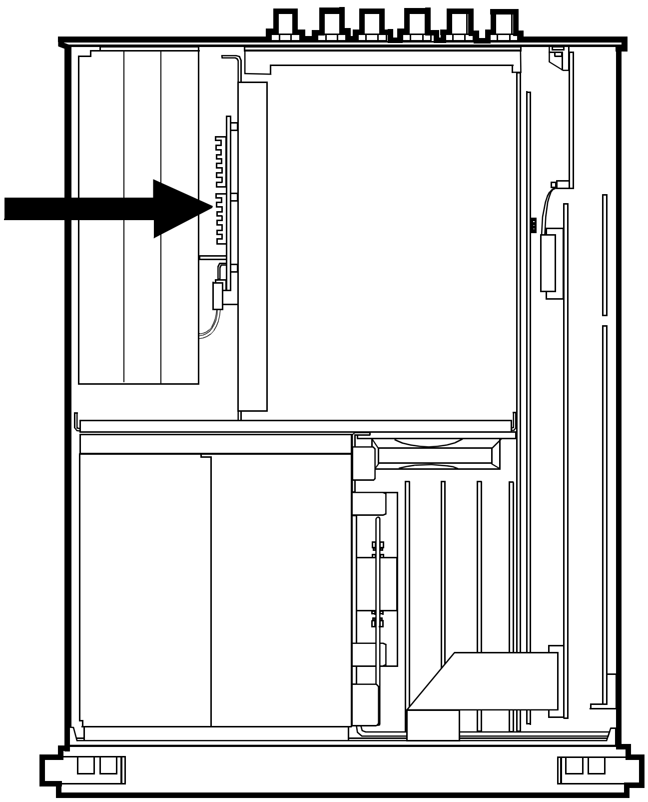
Disconnect (3) RF cables and the red wire that connects to the Regulator assembly.

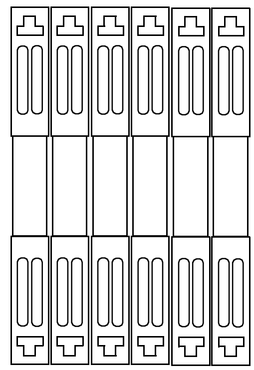
(RF cables are accessed from the bottom of the Test Set.)





A10 Power Supply Regulator





Remove RF assemblies.

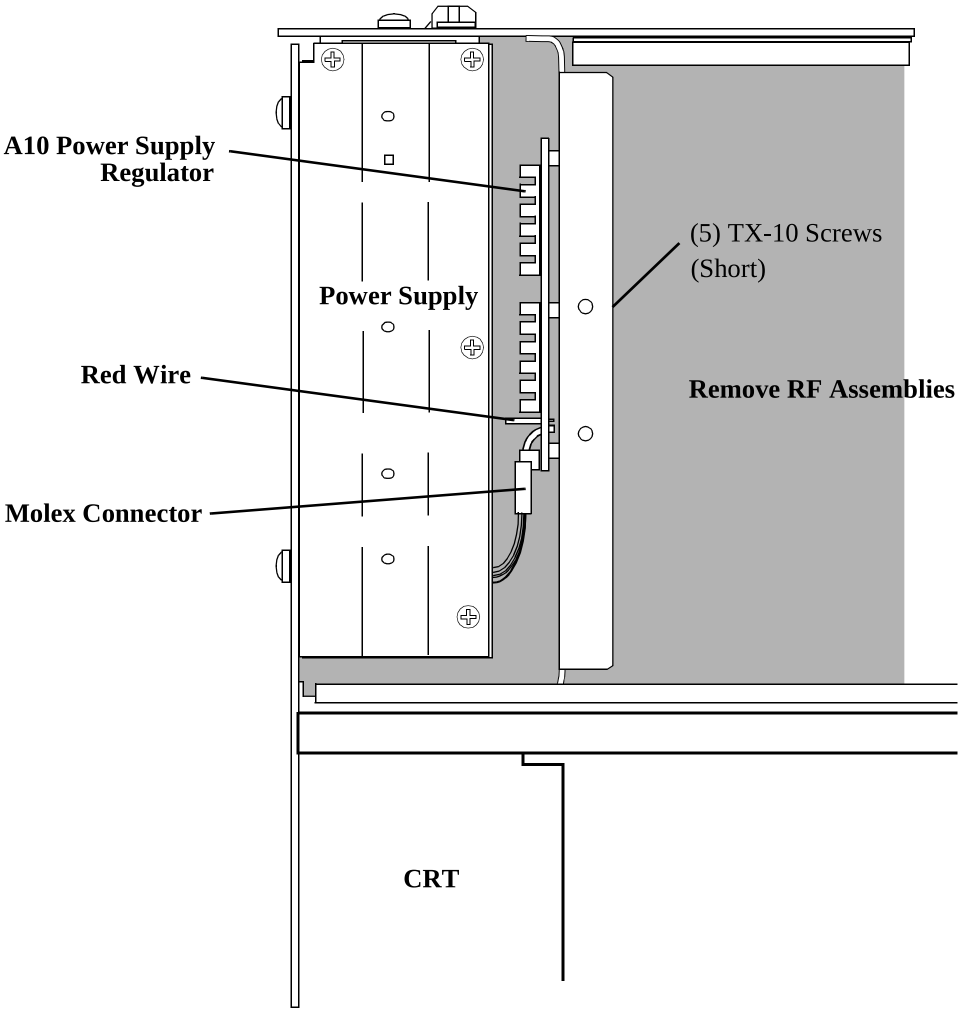
Figure 11 **A10 Power Supply Regulator**

Hints: To identify specific RF assemblies see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

Tools Required

- TX-10 Torx head screwdriver


A10 Power Supply Regulator
(5) TX-10 Screws (Short)
Power Supply
Red Wire
Remove RF Assemblies
Molex Connector
CRT

A9 Power Supply

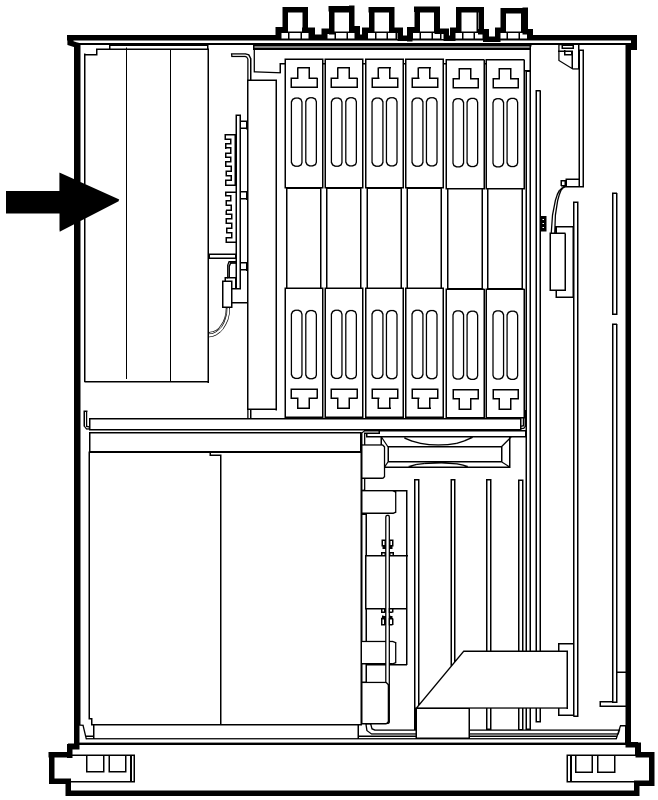


Figure 12 **A9 Power Supply**

Use the following sequence to remove the Power Supply:

1. Remove the Input assembly (see **figure 8, "A23 RF Input Assembly," on page 77**).
2. Pull the POWER switch shaft forward from the power supply, then pull it out back toward the rear of the Test Set.
3. Remove the screws and molex connector.
4. Slide the power supply out from the bottom of the Test Set.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

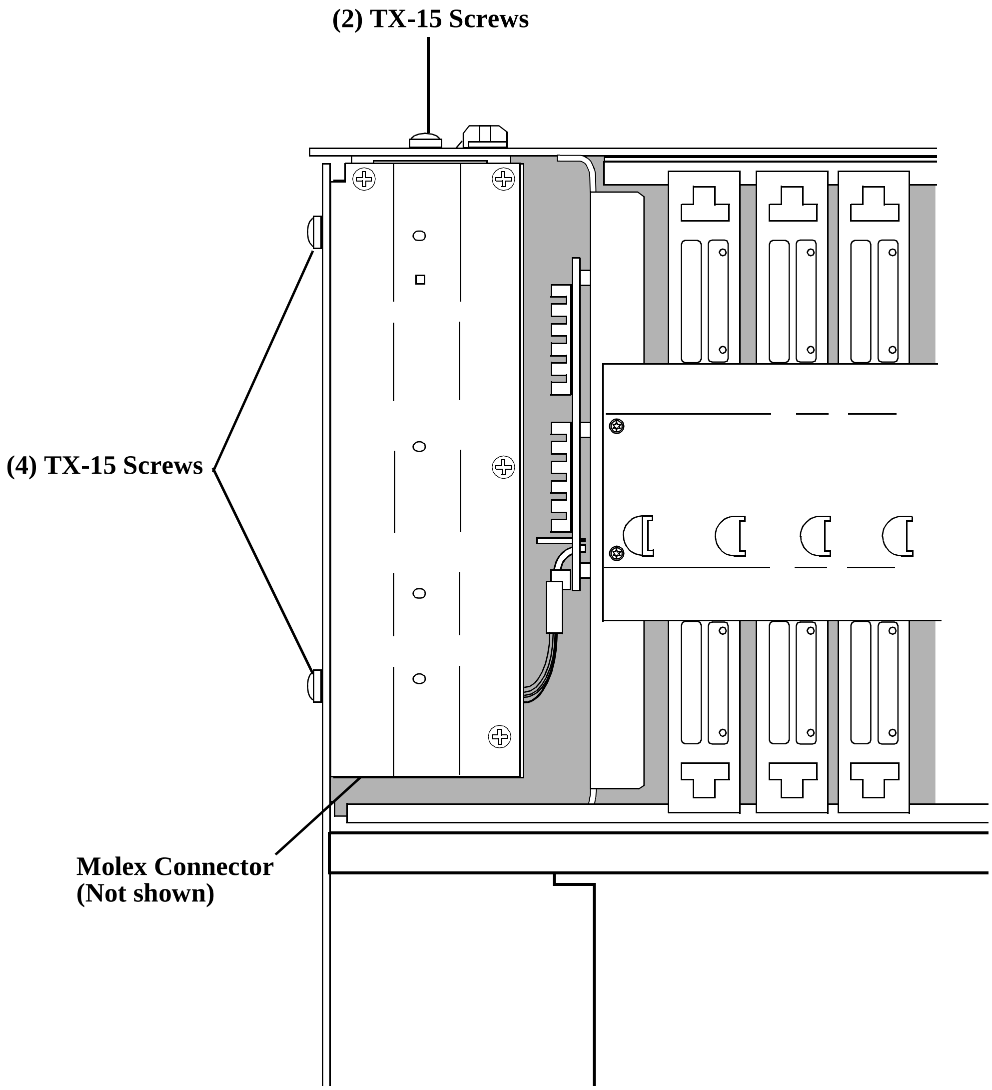


Figure 13 **(upper left corner of test set)**

A25 Motherboard

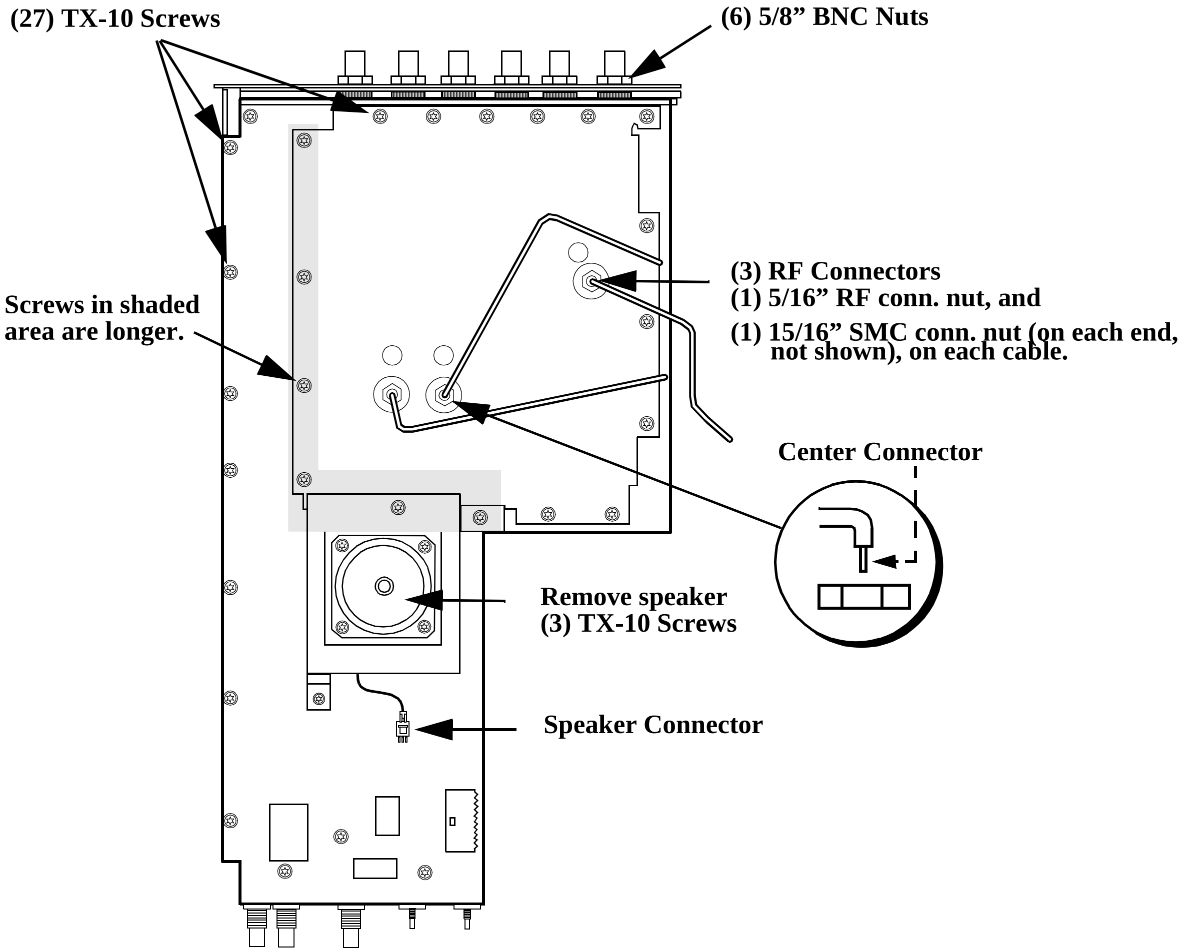


Figure 14 **A25 Motherboard**

Use the following sequence to remove the motherboard:

1. Remove all RF, AF, and digital assemblies that plug in to the motherboard (see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**).
2. Remove the RF cables on the bottom of the motherboard. To do this, unscrew the nuts and pull the cable straight out (you may have to pull hard). Be careful not to bend the center conductor.
3. Remove the screws.
4. Remove the front panel (see **figure 9, "Front Panel," on page 80**).
5. Remove the rear-panel BNC nuts.
6. Lift the motherboard slightly away from the chassis and unplug the cables from the top of the motherboard.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

Fan

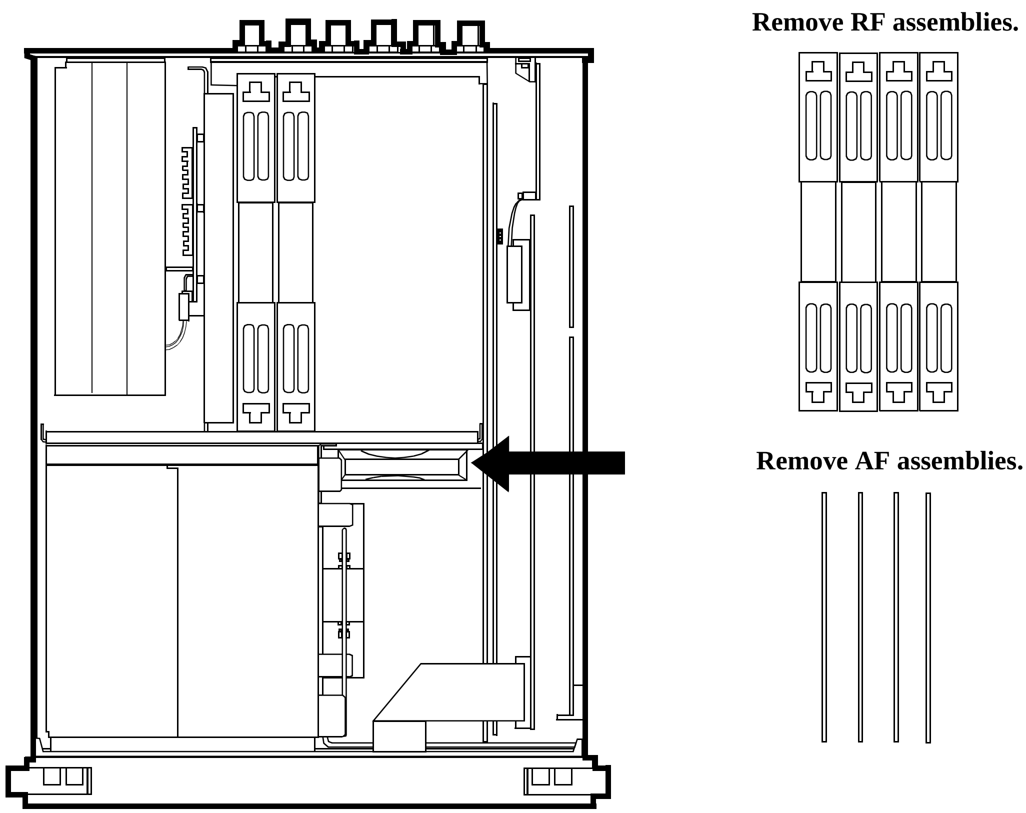


Figure 15 **Fan**

Hints: To remove AF and RF Assemblies see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

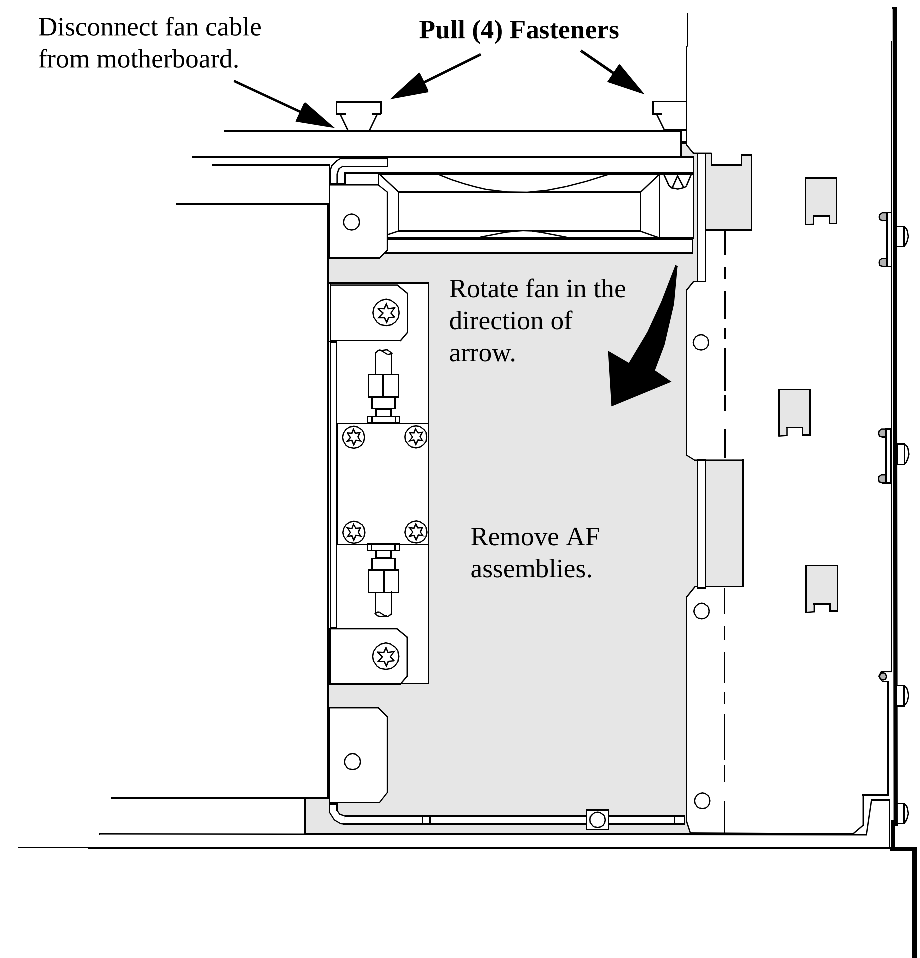


Figure 16 **(close-up view of fan)**

High-Power Attenuator

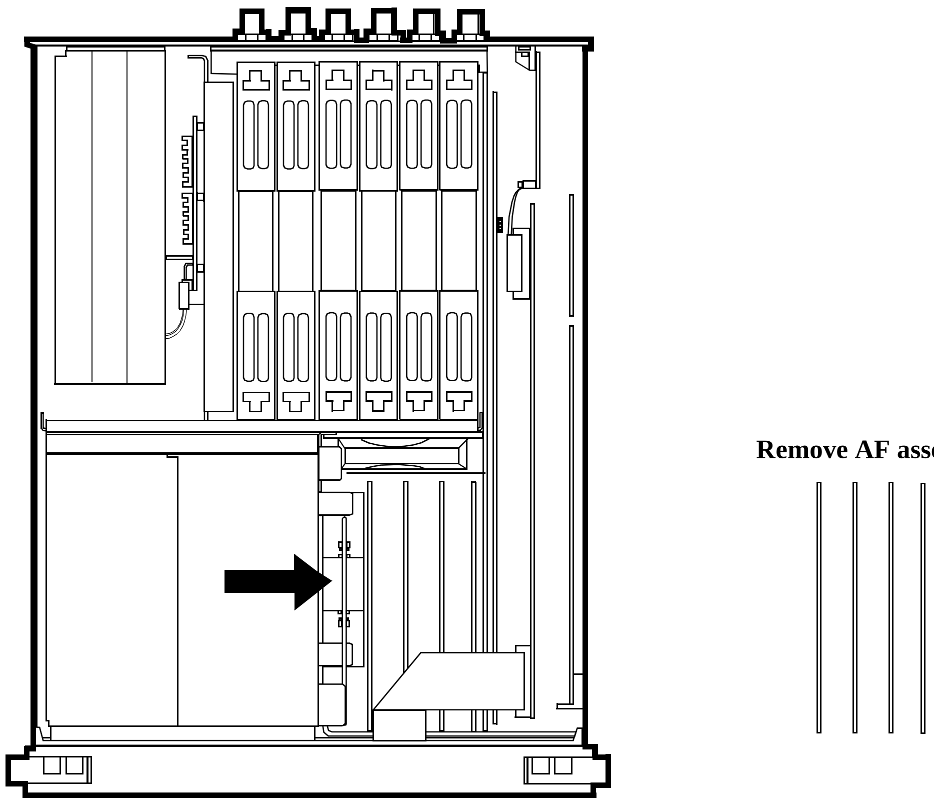


Figure 17 **High-Power Attenuator**

Hints: To remove AF assemblies see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

Calibration Data: The Test Set requires new cal data when the High-Power Attenuator assembly is replaced. A cal data memory card comes with the replacement assembly.

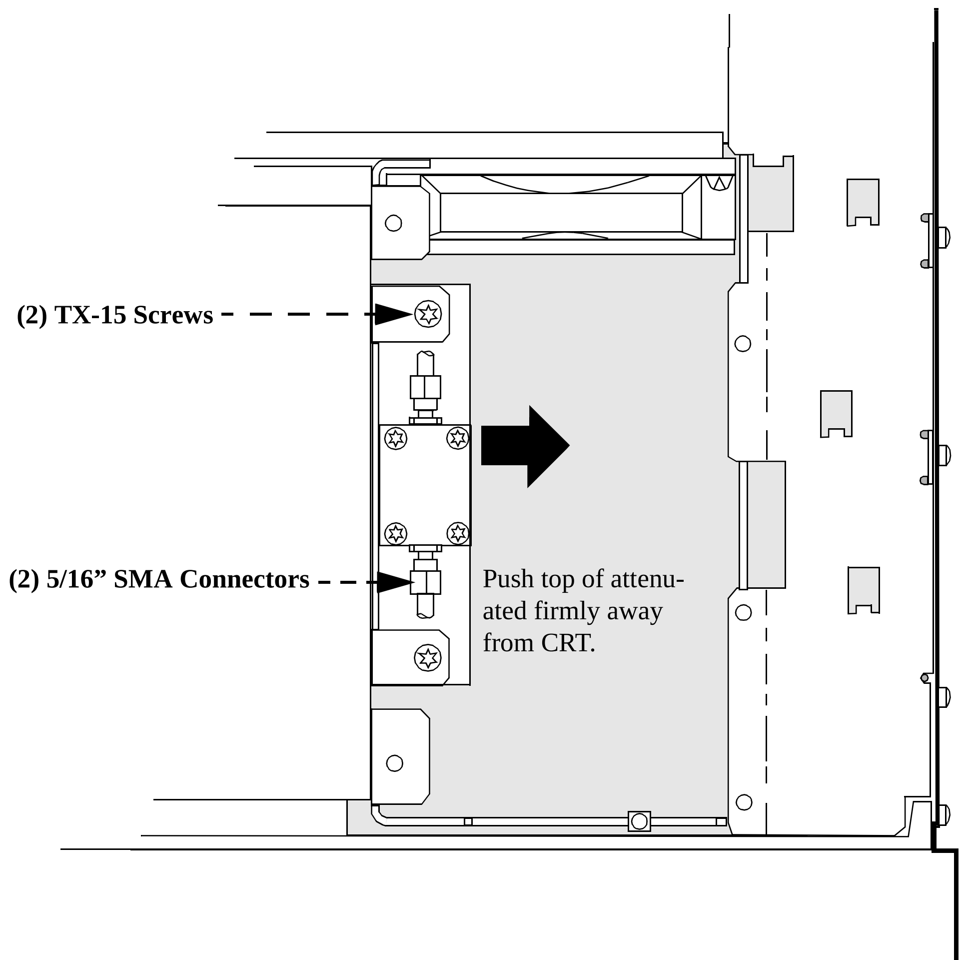


Figure 18 **(close-up view of attenuator assembly)**

A20 Display (CRT)

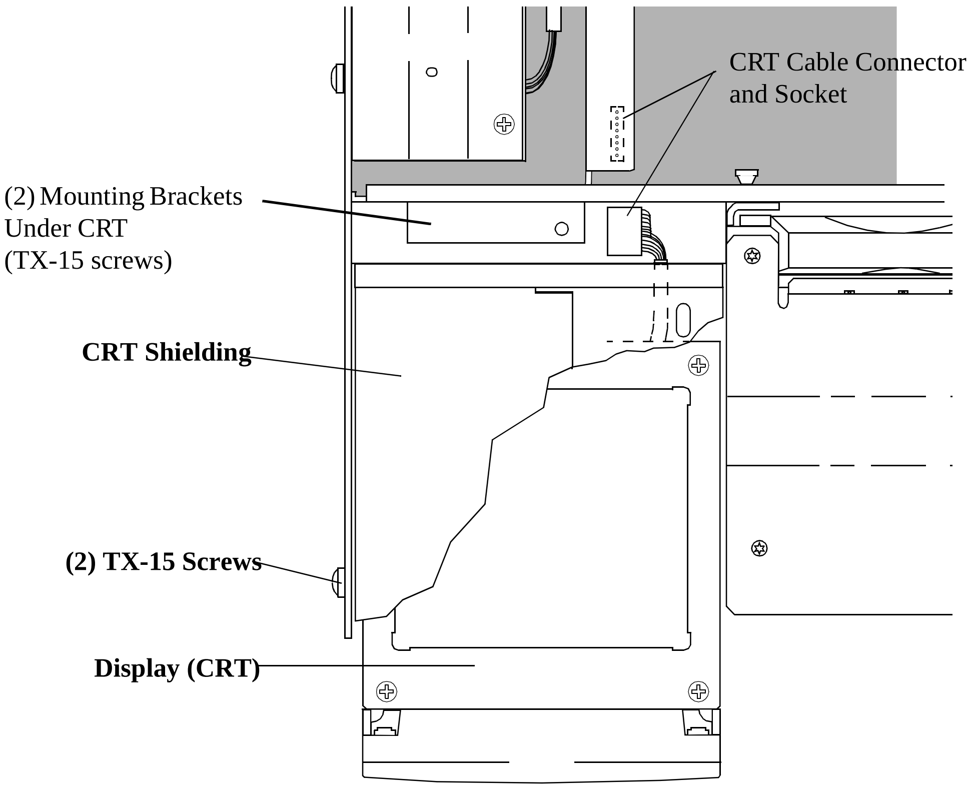


Figure 19 **A20 Display (CRT)**

Use the following sequence to remove the Display (CRT):

1. Remove the Input assembly (see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**).
2. Remove the front panel (see **figure 9, "Front Panel," on page 80**).
3. Remove the RF assemblies that plug into the motherboard (see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**).
4. Unplug the cable.
5. Remove the bottom and side screws from the display.
6. Slide the display to the front.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**

A7 Controller

Hints: To identify and access Controller assembly see **figure 6, "AF, Digital, and Most RF Assemblies," on page 75**.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**.

Table 6 Controller Switch Settings

Test Set	Switch 1	Switch 2	Switch 3	Switch 4
8920A	Closed	Not Used	Not Used	Not Used
8920B	Closed	Open	Open	Not Used
8921A	Closed	Not Used	Not Used	Not Used

Switch 1: Write Calibration EEPROM (Open=Disabled, Closed=Enabled) Switch 2: Smart Card (Open=PCMCIA, Closed=Epson) Switch 3: Run from Flash/OTP (Open=Flash, Closed=OTP) Switch 4: Not Used

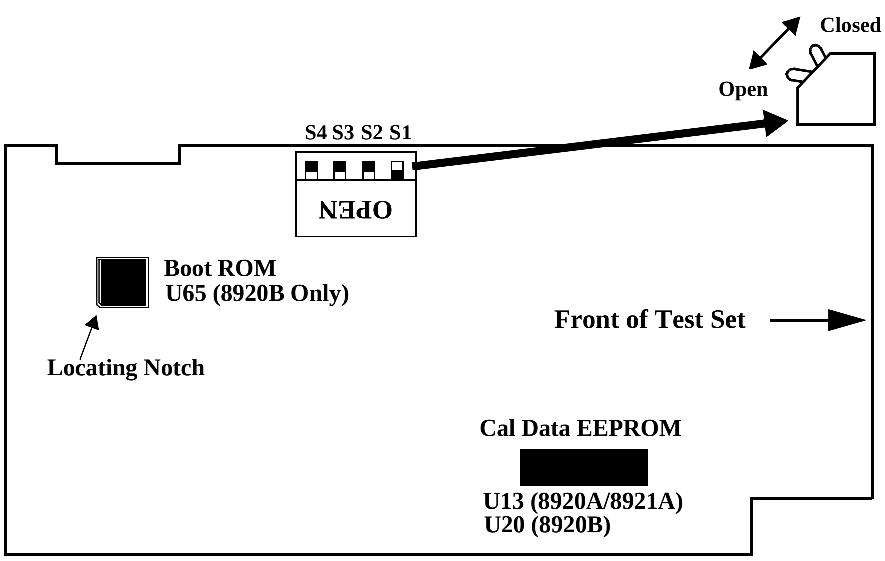


Figure 20 A7 Controller

A8 Memory Assembly

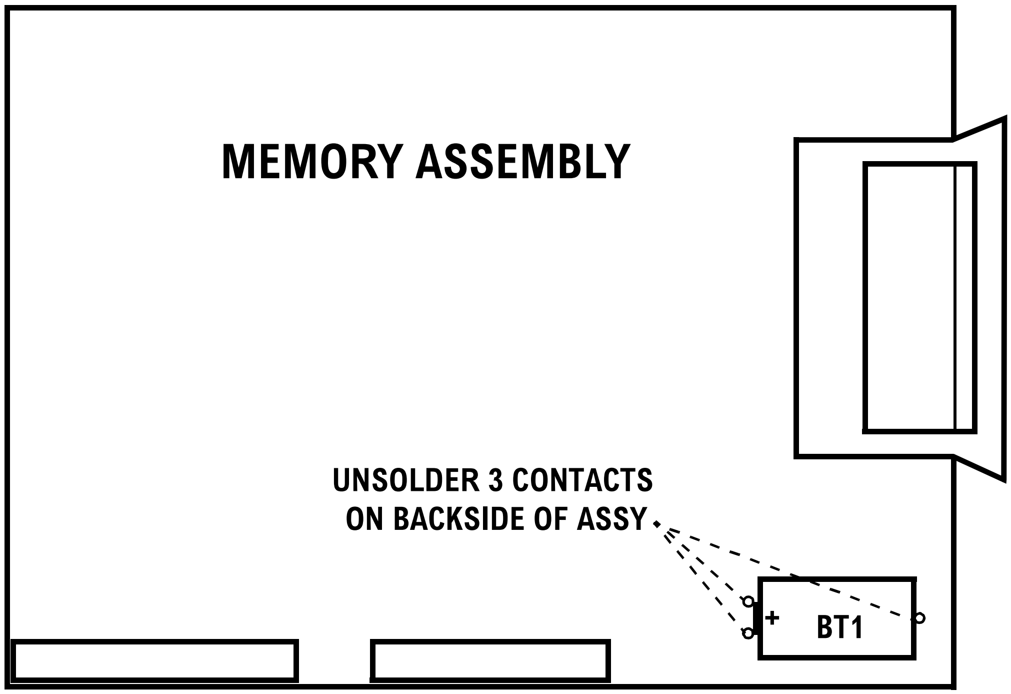


Figure 21 **A8 Memory Assembly**

Use the following procedure to remove the batteries on the Memory assembly:

1. Remove the external cover (**see figure 5, "Removing External Cover," on page 74**).
2. Remove the internal covers (**see figure 7, "Internal Covers," on page 76**).
3. Remove the A8 Memory assembly that plugs into the motherboard (see **figure 6 on page 75** for assembly removal and **figure 7 on page 76** for location of side-mounted screws).
4. Place the assembly component-side down on a static-free surface. Unsolder, remove and properly dispose batttery (some memory assemblies may contain two batteries). Replace battery BT1 with part number **1420-0338**.
5. Reinstall Memory assembly, internal and external covers.

Ordering Replacement Parts: **see chapter 10, "Replaceable Parts"**

4

Preventative Maintenance

This chapter describes what preventative maintenance procedures are recommended for the 8920A, 8920B, and 8921A Test Sets.

Hardware Maintenance

The following procedures should be performed on a regular basis to insure that your Test Set maintains optimum performance.

Adjustments

- **Periodic Calibration**

Adjustments for calibration are part of automated routines, PER_CAL and PER_CALD, contained in instrument ROM based software. Running PER_CAL routines will adjust internal calibration and circuit paths for optimum performance. The PER_CAL routines can be run on any interval from six months to two years, depending on the severity of the application environment. The PER_CAL routines should also be run whenever a significant change to instrument hardware configuration has been made, (example: changing an internal module or changing a Cellular Adaptor like the 83204A).

For instructions on running the PER_CAL routines **see "Running the Periodic Calibration Program," in chapter 5, on page 109** .

- **Real Time Clock**

The Test Set operates with a Real Time Clock that is user settable. The Real Time Clock consists of both a numerical date and a time of day setting which may require changing due to repair (such as a battery or hardware repair) or shipping to a different time zone. The clock and date should be checked as part of routine maintenance. Incorrect settings may be an indication of faulty battery backup.

The date and time settings are entered by using the SHIFT CONFIG screen. The DATE field is a numerical number using the MMDDYY format. The TIME field is a numerical number using a 24 hour military type standard (example: 3:00PM is 15.00 in military time). The date and time are maintained as part of RAM memory with battery backup.

- **Serial Number**

All Test Sets beginning with operating firmware revision A.14.07 and above have the capability to report the instrument serial number from the CONFIG screen or by the GPIB bus. As part of routine maintenance the CONFIG screen should be checked to see if the serial number is reported correctly. The serial number is located in the top right hand corner of the CONFIG screen.

If the serial number reported contains all 'zeros' it can easily be updated by running the SER_NUM software located in instrument ROM. From the TESTS screen select procedure location as ROM and procedure filename as SER_NUM. Run the program and follow the instructions printed on the screen.

If the serial number reported in the CONFIG screen does not contain all 'zeros' or does not match the serial number on the rear panel of the Test Set the instrument may contain mismatched calibration data. The serial number and calibration data is stored together in EEPROM on the A7 Controller assembly. An incorrect serial number may be an indication of improper repair or calibration during the instruments support life. Contact 8920 Service Department at 1-800-827-3848 or 1-509-921-3848 for further help in resolving a possible serial number mismatch.

Cleaning

- **Fan and Internal Assemblies**

The Test Set does not contain any air filtration hardware. The instrument requires periodic cleaning to remove dust and debris that will build up over time. The cleaning interval is dependent on the environmental conditions and application, it can be as often as six months in extremely dusty or dirty environments or as long as two years in a well maintained facility.

Refer to the Repair section of the manual, (**see "Disassembly and Replacement Procedures" on page 74**) for information on removing covers and hardware for cleaning. Pay attention to the fan and the assemblies in the area of the fan. Use only a static-free vacuum cleaner or ionized air for the removal of dust and debris.

RF modules A13 through A18 (**see figure 6, "AF, Digital, and Most RF Assemblies," on page 75**), should be removed and the bottom edges of the metal can cleaned with isopropal alcohol or a mild cleaner. Cleaning the metal edges will insure that RF leakage integrity is maintained.

- **CRT Window**

With long periods of operation the Test Set may build up dust on the inside surface of the CRT window. The dust content may become severe enough to obscure the display.

To remove the window requires removal of the display bezel, four T-10 Torx screws, the window clamp and nine T-8 torx screws. Use caution when removing or installing the T-8 Torx screws to prevent breakage.

Clean the both sides of the plastic window and the CRT screen with a mild plastic cleaner. DO NOT use abrasives or chemicals which may damage the plastic or RF shield coating.

Functionality

- **Functional Diagnostics**

The 8920/21 products have the capability to perform self tests for hardware failure and functionality. The self test diagnostics should be run whenever preventive maintenance, calibration, or repair is being performed. Self test diagnostics will help to insure that the instrument is performing reliably.

There are two diagnostic routines located in ROM based software in the instrument. From the TESTS screen select procedure location as ROM and procedure filename as one of the following:

AF_DIAGS - this procedure tests audio circuitry; RF_DIAGS - this procedure tests RF circuitry; MS_DIAGS - this procedure tests digital circuitry. Run the program selected and follow the instructions listed on the screen.

For instructions on running diagnostics routines **see "Step 3 - Run the Functional Diagnostics.," in chapter 2, on page 50** .

- **External Supplemental Diagnostics**

Software on a memory card is available from Agilent Technologies for testing hardware and functions not accessible using internal diagnostic routines. The software has been specifically developed to test the following hardware or functions:

A23 Input Module relays - software tests the integrity and performance of twelve mechanical relays used in the A23 assembly. AM/FM/SINAD - software tests performance of modulation accuracy, distortion, and noise.

The external confidence software kit can be obtained by ordering part number 08920-61173. The kit contains memory cards for both the 8920/21A and the 8920B, and all cables and adapters required. One kit can be used to support multiple 8920/21 instruments.

Integrity

Internal hardware should be periodically checked for proper assembly insertion, tight cable connections, loose parts or screws. The Test Set has been designed for rugged conditions, however parts can become loose or damaged over time and require repair or maintenance. The following items should be routinely checked:

- **Module Insertion and Alignment**

The Test set contains circuit assemblies and RF modules that are mounted in sockets and board guides. It is extremely important that these assemblies be firmly seated and aligned in their guides. Remove the Test Set cover and check that boards align with the printed guides on the internal sheet metal covers. Insure that each of the six RF module cans are firmly seated and locked in with the module bracket(s).

- **RF In/Out Connector**

The RF IN/OUT connector located on the front panel of the Test Set should be checked for damage and mounting tightness (torque). Damage can occur to the center conductor pin and the connector itself may become loosened over time. If damaged, the connector should be replaced. A loose connector can be re-torqued by tightening the nut on the back side of the front panel. Refer to the Repair section of the manual, (**see "Front Panel," in chapter 3, on page 80** for information on the front panel assembly.

- **Internal Cables and RF Connectors**

The Test Set contains numerous cables and connectors that should be periodically checked for insertion and tightness. Remove the Test Set cover and visually check for any cables that may not be properly inserted. Check each RF cable connection for tightness, re-torque where needed.

- **Fan Disk Mounting**

The cooling fan on all 8920As with Option 050, and 8920Bs, and 8921As has a small metal disk mounted for magnetic spurious shielding. This metal disk has been found to come loose or fall off in some early production instruments. A service note has been issued to cover this particular failure (Service Notes: 8920A-12, 8920B-03, 8921A-05). The Test Set should be checked for proper installation of the fan disk. RF Assemblies A16, A17, and A18 may require removal to inspect the fan. Refer to the Repair section of the manual (**see "AF, Digital, and Most RF Assemblies," in chapter 3, on page 75**) for information on assembly removal and installation. If the fan disk is missing the instrument should be very carefully checked to see if the disk has become lodged elsewhere. Electrical damage can occur as a result of a loose disk. The fan disk can be replaced by ordering part number 08921-00003.

Firmware and Memory Assembly Maintenance

The following procedures should be performed on a regular basis to insure that your Test Set maintains optimum performance.

FW Upgrade Kits

- 08920-61058 (3MB version, ROMs only)
- 08920-61870 (4MB version, ROMs only)

Memory Assembly Upgrade (3MB to 4MB)

Contact Agilent Technologies at 1 800 827 3848 or 1 509 921 3848 for information and part numbers.

Memory Assembly Battery

The Test Set contains non-volatile memory on the A8 Memory assembly which is backed up by a battery (early Memory assemblies may contain two batteries). The battery should be replaced every 3 years or whenever it shows signs of deterioration. **See "A8 Memory Assembly" on page 95** for battery replacement instructions.

Smart Card Battery

External memory cards (Epson-style and PCMCIA) contain batteries which require replacement. These batteries should be replaced every 12 months or whenever signs of deterioration are noted.

5

Calibration

Introduction

This chapter includes procedures to perform periodic calibration and performance tests. The performance tests verify that the Test Set performs to its specifications.

Periodic Calibration

Some assemblies or combination of assemblies require calibration to compensate for variations in circuit performance. Traditionally, calibration has been in the form of manual, screwdriver-type adjustments. No manual adjustments are required in the Test Set. (The few manual-adjustment devices in the Test Set are set at the factory and should never be readjusted.)

There are two types of calibration data:

- Factory-generated digital data either on memory cards, or on ROMs (which are on the assemblies themselves)
- Data generated internally by running calibration programs

In either case calibration data is loaded into non-volatile memory on the A7 Controller.

NOTE: Calibration data resides on the A7 Controller assembly. It is important that when an assembly is replaced that the data is transferred from the original assembly to the new one. The calibration data resides in a socketed EEPROM which can be moved with little danger of losing its contents. Refer to the instructions with the replacement assembly for details.

The internal calibration programs should be run whenever an assembly which requires calibration is replaced. It is also recommended that all the procedures in the periodic calibration program be run at least every two years.

To download calibration data supplied on a memory card, follow the instructions that come with the replacement assembly. To create and download calibration data for assemblies requiring an internal calibration program (PER_CAL or PER_CAL2), follow the steps later in this chapter. For a summary of assemblies and their calibration requirements, **table 7, "Assemblies and Their Calibration Requirements" on page 106**.

The Test Set may also contain calibration programs for Cellular Adapters which sit on top of and are bolted to the Test Set. Documentation for these programs can be found in the individual Cellular Adapter’s manuals. PER_CALD is an example of a Cellular Adapter periodic calibration program.

Table 7 Assemblies and Their Calibration Requirements

Where Calibration Data Is Located:			
Assembly	Memory Card	Assembly	Periodic Calibration Program
A2 Audio Analyzer 2			Variable Frequency Notch Filter (if present)
A3 Audio Analyzer 1			Audio Analyzer 1 Offset
A4 Modulation Distribution			External Modulation Path Gain Analyzer 1 Offset Audio Frequency Generator Gain
A11 Receiver Mixer	X		
A13 Output	X[a]	X	
A14 Signal Generator Synthesizer	X	X	
A15 Reference	X[b]	X	Timebase Reference
A16 Receiver	X	X	
A17 Receiver Synthesizer	X	X	
A18 Spectrum Analyzer	X		
A19 Measurement	X		Voltmeter References
A21 GPIB/RS-232/Current Sense	X		
A23 Input Section	X		
A24 High Power Attenuator	X		

a. Calibration data that comes with replacement assemblies may be on either memory card or the assembly itself depending on model number and serial number.
b. Same as footnote 1, except routine calibration is also available in the periodic calibration program.

Write-Protected Calibration Data

Data in non-volatile ROM can be write protected by setting a switch on the controller assembly. This prevents calibration data from being accidentally overwritten. The switch is normally not set to protect data. The calibration programs check the setting of the write-protect switch. If the write-protect switch is set, instructions are displayed explaining how to disable write protection. (Access to the write-protect switch requires removing the Test Set’s cover. The location of the write-protect switch is shown in **figure 22** .) Write-protect status is checked again before exiting the program.

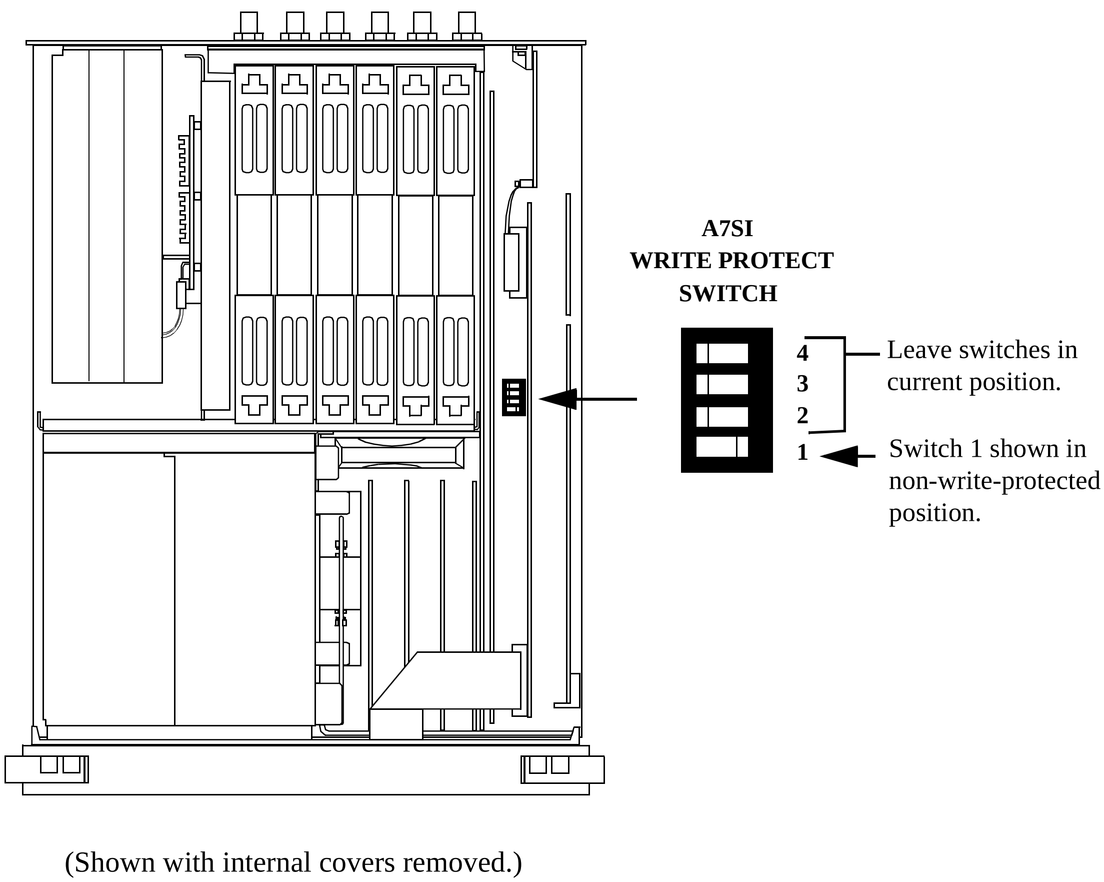


Figure 22 **Location of the Write-Protect Switch On the Controller Assembly**

Equipment

For the *Timebase Reference Using a Counter* calibration, you will need to connect a frequency counter to the rear-panel 10 MHz REF OUTPUT connector. The accuracy of the counter will determine the accuracy of the Test Set's internal reference. You will use the counter to set the Timebase Reference DACs.

For the *Timebase Reference Using a Source* calibration you will need to connect a signal generator to the front-panel ANT IN connector. The quality of this source is described in the description for the *Timebase Reference Using a Source* calibration procedure.

For the *Voltmeter References* calibration you will need a DC voltmeter with ±0.015% accuracy.

Running the Periodic Calibration Program

Press TESTS to access the TESTS screen.

Select the field under **`Select Procedure Location:`**.

Select **`ROM`** under the **`Choices`**: menu.

Select the field under **`Select Procedure Filename:`**.

Select PER_CAL for the 8920A/8921A, or Per_CAL2 for the 8920B, from the **`Choices`**: menu.

Select Run Test (USER key k1).

Follow the instructions on the screen.

Periodic Calibration Program (PER_CAL and PER_CAL2)

Descriptions

NOTE: Use PER_CAL for the 8920A/8921A; use PER_CAL2 for the 8920B. **Timebase Reference Using a Counter**

These program are provided as a convenience for manually tuning the timebase reference using a frequency counter as the time standard. The procedure has two basic steps:

1. Manual adjustment of the two (coarse and fine) timebase tuning DACs.
2. Downloading the DAC settings into the Test Set.

If you have not already adjusted the two timebase tuning DACs, exit the program if needed (by selecting the Adj USER key), and follow the *Setting the Timebase Latches* instructions later in this chapter.

If you have adjusted the timebase DACs, run this program and select the Cal USER key to make the setting permanent.

Alternatively, you can select *Timebase Calibration Using a Source* and adjust the timebase to a time standard connect to the front-panel ANT IN connector.

Timebase Reference Using a Source

This program automatically tunes the timebase tuning DACs to a signal at the front-panel ANT IN connector, which is assumed to be at the frequency that is keyed in from the front-panel keypad. If an external 10 MHz reference is being used, it must be disconnected.

In order for the calibration to be valid, the signal applied to the ANT IN connector must have the following characteristics.

1. The level should be between –30 and +14 dBm (0.001 and 100 mW).
2. The frequency should be between 10 and 1000 MHz.
3. The frequency must be as accurate as the use of the Test Set requires.
4. The Test Set must be able to tune to within 10 or 100 kHz of the reference signal with the Test Set’s current timebase reference settings. If this condition is not met, either the keyed-in frequency is incorrect or the Test Set is faulty.

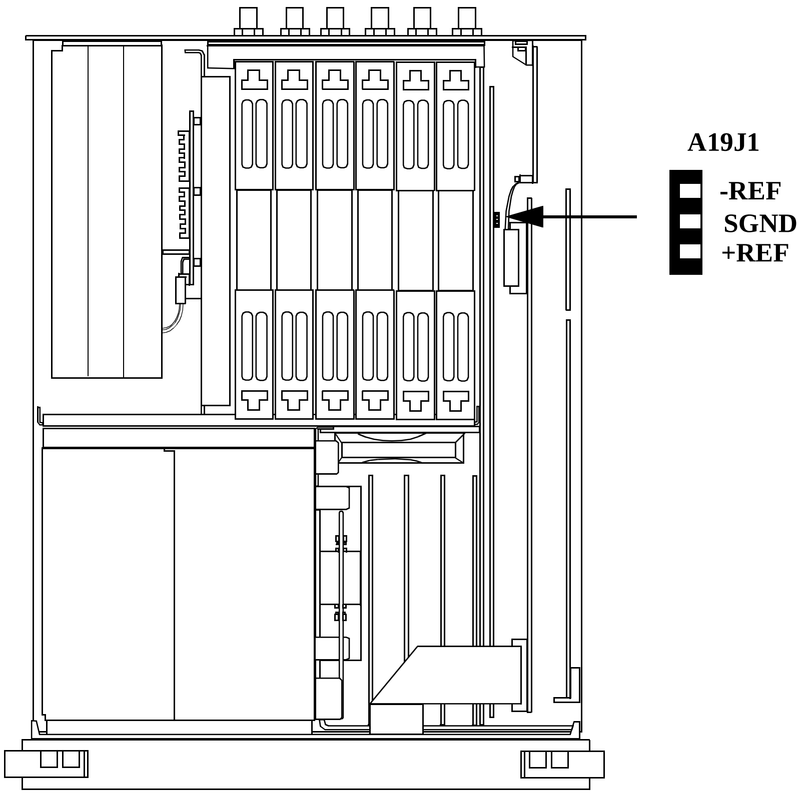
5. The signal must be a CW signal. Specifically, any FM must be less than 100 Hz peak as measured by the Test Set.
6. The coarse tune DAC must be between 3 and 250 (decimal); otherwise, the frequency of the source is out of reach by the tuning DAC.

After the coarse and fine tune DAC settings have been determined, the values are downloaded into the Test Set's memory.

Voltmeter References

Instructions are displayed explaining how to measure the negative and positive references with an external voltmeter. The user is then required to key in the readings. If the readings are reasonable, the two values are downloaded.

For the Test Set to meet published specifications, the external DC voltmeter must be 0.015% accurate. The voltmeter is connected to the test points shown in **figure 23** .



(Shown with some internal covers removed.)

Figure 23 **Location of the Voltmeter Connections on the Measurement Assembly**

Audio Frequency Generator Gain

The gain of the following paths is calibrated:

1. The internal paths that run from Audio Frequency Generators 1 and 2 (individually) through the Modulation Distribution assembly, to the monitor select output, then onto Audio Analyzer 1 to the DVM.
2. The paths that run from Audio Frequency Generators 1 and 2 (individually) through the Modulation Distribution assembly to the AUDIO OUT connector, externally to the rear-panel MODULATION IN connector, then again through the Modulation Distribution assembly to the monitor select output and to the DVM.

The above-measured levels are used to adjust the output level of the audio generators so that they produce a calibrated level to the modulation inputs of the RF Generator. These measurements are made at dc. Both positive and negative levels are measured to produce an optimum calibration factor.

External Modulation Path Gain

The *Audio Frequency Generator Gain* program should be run first.

The path in this program runs from the external MODULATION IN connector through the Modulation Distribution assembly, through the Monitor Select Switch, then through Audio Analyzer 1 to the Test Set’s internal DVM. The dc source is Audio Frequency Generator 1 through the AUDIO IN connector and an external cable.

The goal of this procedure is to set the External Level Amplifier gain DAC (on the Modulation Distribution assembly) to produce a gain of exactly 4 between the MODULATION IN connector and output of the Monitor Select Switch. This requires measuring the input and output levels, calculating the gain, changing the DAC setting, and then repeating the process until the calculated gain equals 4.

Audio Analyzer 1 Offset

Two dc offsets are measured and downloaded as calibration factors to the Audio Analyzer 1 assembly:

1. Input Select Switch grounded.
2. Audio Input selected with return conductor grounded

Variable Frequency Notch Filter

The calibration factors for tuning the variable-frequency notch filter are determined: The input to the filter is set to 10 evenly-spaced frequencies between 300 and 10 000 Hz. The DAC that tunes the notch filter is adjusted for best null of the tune error voltage. From this data, three coefficients of a parabola which best fit the tuning data are calculated using a least-squares curve fit. The coefficients are then downloaded into the Test Set's non-volatile memory.

Setting the Timebase Latches

The following procedure is to be used in conjunction with running the *Periodic Calibration* procedure, *Timebase Calibration Using a Counter*, earlier in this chapter.

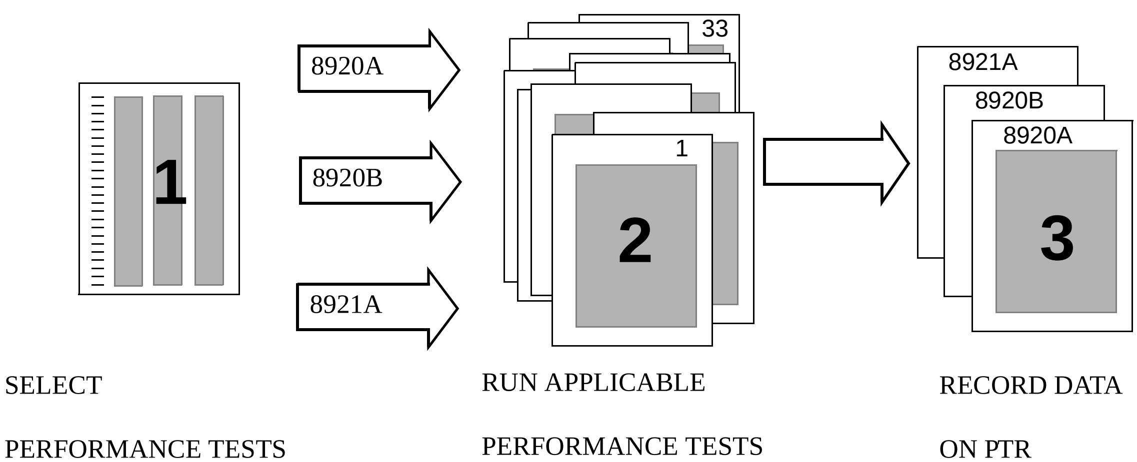
1. Press SHIFT,DUPLEX CONFIG to access the CONFIGURE screen.
2. Select SERVICE under the **`To Screen`** menu.
3. Connect a frequency counter to the rear-panel 10 MHz REF OUTPUT connector.
4. Select the **`Latch`** field.
5. Select **`refs_DAC_coarse`** under the **`Choices:`** menu.
6. Select the **`Value`** field.
7. Rotate the knob until the counter reads as close to 10 MHz as possible.
8. Select the **`Latch`** field.
9. Select **`refs_DAC_fine`** under the **`Choices:`** menu.
10. Select the **`Value`** field.
11. Rotate the knob until the counter reads as close to 10 MHz as possible.
12. Store the new DAC values (timebase calibration data) in non-volatile memory by selecting and running the *Timebase Reference Using a Counter* routine from PER_CAL.

The refs_DAC_coarse and ref_DAC_fine values adjust the frequency of the Test Set’s internal 10 MHz reference. They are stored in memory. The Controller reads the values and sends the appropriate adjustment to the A15 Reference assembly.

Performance Tests

How To Use The Performance Tests

There is one set of Performance Tests used to verify the performance of three different Test Sets (8920A, 8920B, 8921A). The model number and installed options determines which specific Performance Test you should perform. Three separate Performance Test Records (PTR) have been provided. Use the process described below to perform the tests.



- Select the group of Performance Tests for your instrument and options from **table 9, "Required Performance Tests For Each Model Number" on page 118**.
  .
- Run the required Performance Tests using the specified Test Equipment from **table 8, "Required Test Equipment" on page 118**.
- Record the data for each test onto the applicable Performance Test Record (PTR) for your instrument.

Test Set Operation

To perform the test procedures you need to know basic Test Set operation. You should be familiar with the front panel, the various CRT screens, and knob operation (cursor control). You should be able to operate the Test Set's RF Generator, RF Analyzer, AF Generators, AF Analyzer, and Oscilloscope.

NOTE: Press PRESET on the Test Set before beginning each test.

Equipment

The following test equipment is needed to do all of the performance tests. The set-up drawings at the beginning of each test procedure show the equipment needed for each test. Generic names of the equipment used for each test are shown on the set-up drawings for each test. To find alternatives to the equipment listed below, look up their specifications in the Agilent Technologies Test and Measurement Catalog and use the specifications to find equivalent instruments. If you want to do functional checks for the Test Set you can use the test procedures with functionally equivalent equipment.

Test Equipment Operation

The test procedures give critical instrument settings and connections, but they don't tell how to operate the instruments. Refer to each instrument's operating manual.

Table 8 Required Test Equipment

Agilent Technologies Model # (or equivalent)	Model Name	Performance Test #
3458A	Digital Voltmeter	13, 14, 17, 20, 23
8116A	Function Generator	24
8562A	RF Spectrum Analyzer	11, 12
8902A	Measuring Receiver	1-6,7[a], 8-10, 22, 24-26, 8-30
8903B	Audio Analyzer	725, 15,17, 21, 23, 25,28-30
11715A	AM/FM Test Source	25-31
11722A	Sensor Module	8-10, 24
778D	Dual Directional Coupler	24
8642A, 8657A/B	Synthesized Signal Generator	32, 33
5316A	Universal Counter	16, 21

a. For Performance Test 7 the Measuring Receiver requires connections for an external LO, included as part of Option 003 or 030. For Option 030 it does not matter which filters are installed (only the switching of the LO is important).

Table 9 Required Performance Tests For Each Model Number

Performance Test Description	Perf Test	8920A	8920B	8921A
RF Gen AM Distortion [a]	1	X	X	
RF Gen AM Accuracy	2	X	X	
RF Gen AM Flatness	3	X	X	

Table 9 Required Performance Tests For Each Model Number (Continued)

Performance Test Description	Perf Test	8920A	8920B	8921A
RF Gen FM Distortion [b]	4	X	X	X
RF Gen FM Accuracy	5	X	X	X
RF Gen FM Flatness	6	X	X	X
RF Gen Residual FM	7	X	X	X
RF Gen Duplex Output High Level Accuracy	8	X	X	X
RF Gen Duplex Output Low Level Accuracy	9	X	X	X
RF Gen RF IN/OUT Level Accuracy	10	X	X	X
RF Gen Harmonics Spectral Purity	11	X	X	X
RF Gen Spurious Spectral Purity	12	X	X	X
AF Gen AC Level Accuracy	13	X	X	X
AF Gen DC Level Accuracy	14	X	X	X
AF Gen Residual Distortion	15	X	X	X
AF Gen Frequency Accuracy	16	X	X	X
AF Analyzer AC Voltage Accuracy	17	X	X	X
AF Analyzer Residual Noise	18	X	X	X
AF Analyzer Distortion, SINAD, and SNR	19	X [c]	X	X
AF Analyzer DC Level Accuracy	20	X	X	X
AF Analyzer Frequency Accuracy to 100 kHz	21	X	X	X
AF Analyzer Frequency Accuracy at 400 kHz	22	X	X	X
Oscilloscope	23	X	X	X
RF Analyzer Level Accuracy	24	X	X	X
RF Analyzer AM Accuracy	25	X	X	
RF Analyzer AM Distortion	26	X	X [d]	
RF Analyzer Residual AM	27	X	X [e]	

Table 9 Required Performance Tests For Each Model Number (Continued)

Performance Test Description	Perf Test	8920A	8920B	8921A
RF Analyzer FM Accuracy	28	X	X	X
RF Analyzer FM Distortion	29	X	X	X
RF Analyzer FM Bandwidth	30	X	X	X
RF Analyzer Residual FM [f]	31	X	X	X
RF Analyzer SSB Demodulation	32	X	X	X
Spectrum Analyzer Image Rejection [g]	33	X	X	X

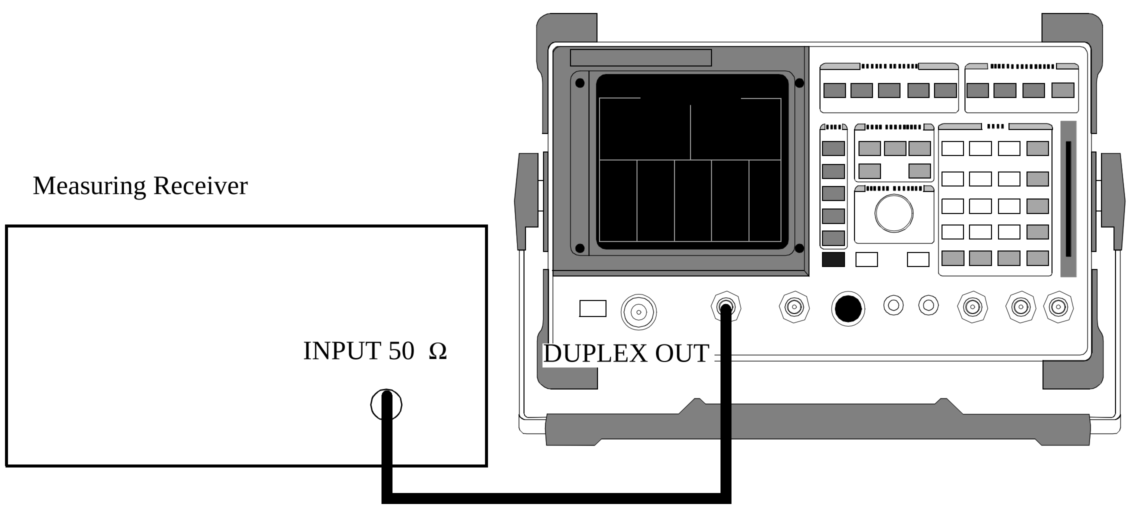
a. Test applicable for 8920A, 8920A Option 050, and 8920B.
b. Test includes separate limits for 8920A, 8920A Option 050, 8920B and 8921A.
c. SNR function not available on 8920As serial prefix 3344A and below.
d. RF Analyzer AM Distortion Test is not required for 8920B Options 006, 007, and 016.
e. RF Analyzer Residual AM Test is not required for 8920B Options 006, 007, and 016.
f. Test includes separate limits for 8920A, 8920A Option 050, 8920B and 8921A.
g. Option 002 or 102 only.

RF Gen AM Distortion Performance Test 1

Description

The AM distortion of the RF generator is measured directly by the AM demodulator in the measuring receiver. The Test Set's internal audio generator provides the modulation source.

Setup

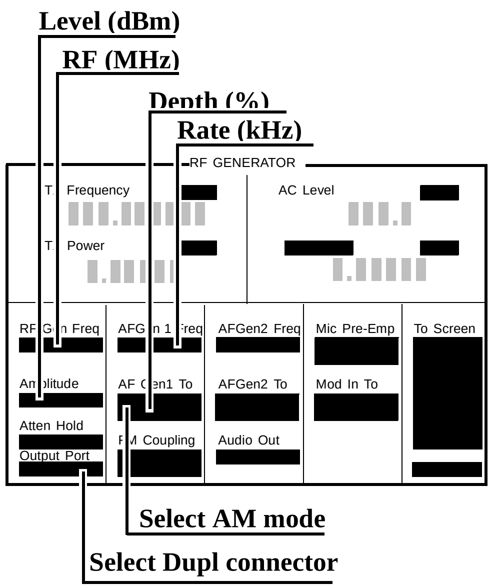


Make the following measuring receiver settings:

- Reset the measuring receiver
- 300 Hz High-Pass Filter
- 3 kHz Low-Pass Filter
- AM mode
- Audio distortion mode

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To field to AM.
3. Set the Output Port field to Dupl.



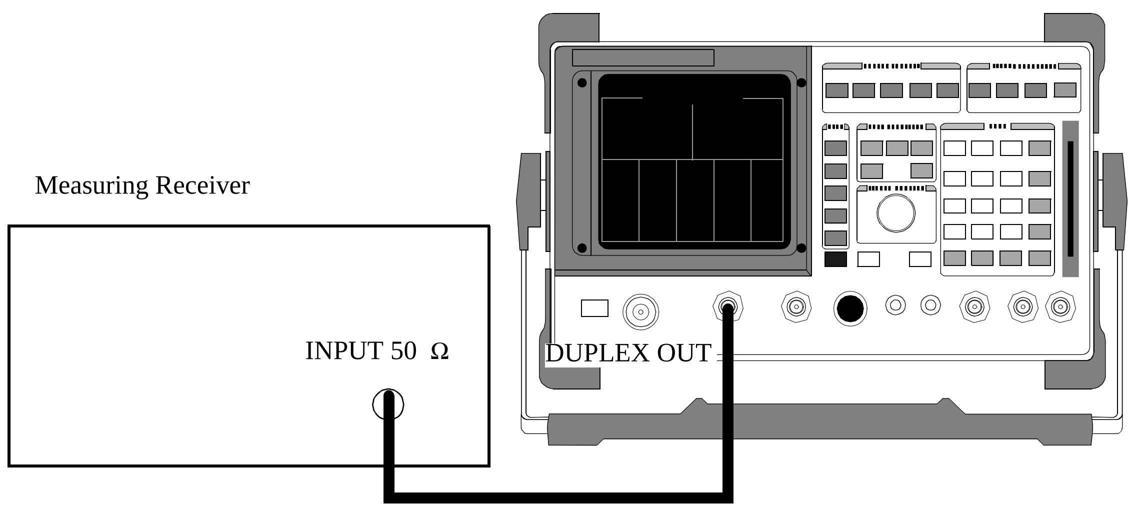
4. Measure the AM distortion (audio distortion) at the RF levels, frequencies, depths, and rate shown in the Performance Test Record (PTR) and compare the measured distortion to the limits shown in the PTR.

RF Gen AM Accuracy Performance Test 2

Description

The AM accuracy of the RF generator is measured directly by the measuring receiver. An Test Set’s internal audio generator provides the modulation source. A maximum AM depth of 70% is used.

Setup

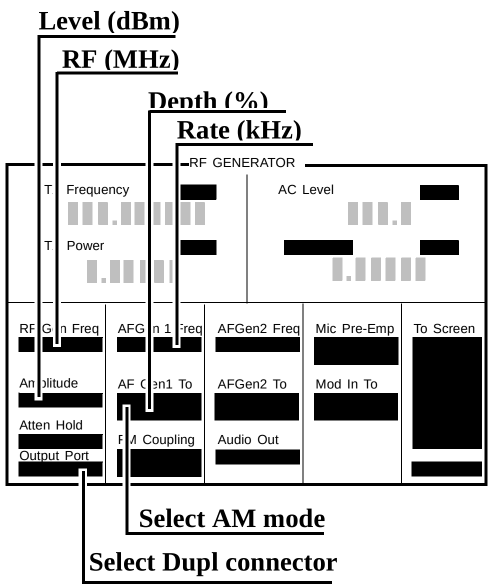


Make the following measuring receiver settings:

- Reset the measuring receiver
- 300 Hz High-Pass filter
- 3 kHz Low-Pass Filter
- AM mode

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To field to AM.
3. Set the Output Port field to Dupl.



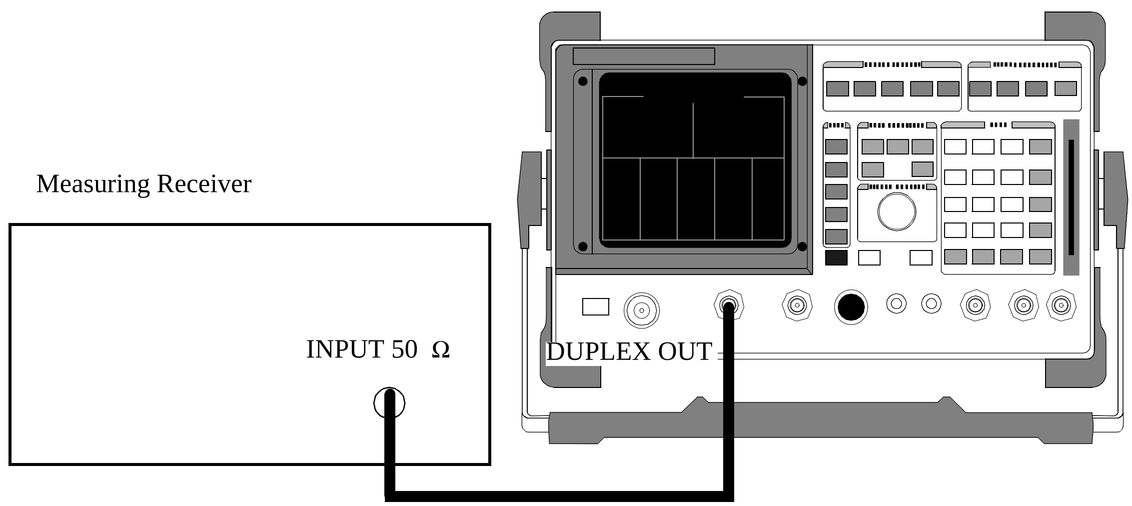
4. Measure the AM percent at the RF levels, frequencies, depths, and rate shown in the PTR and compare the measured AM percent to the limits shown in the PTR.

RF Gen AM Flatness Performance Test 3

Description

The AM flatness of the RF generator is measured directly by the measuring receiver. The Test Set’s internal audio generator provides the modulation source.

Setup

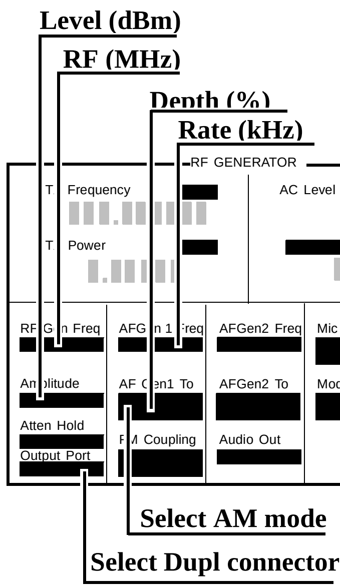


Make the following measuring receiver settings:

- Reset the measuring receiver
- Filters off
- AM mode

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To field to AM.
3. Set the Output Port field to Dupl.



4. Measure the AM depth at the RF levels, frequency, depth, and rates, shown in the PTR.
5. Convert the measurement results to dB as follows:

$$\text{db} = 20\log\frac{\text{measure \% AM}}{\text{measure \% AM at 1 kHz}}$$

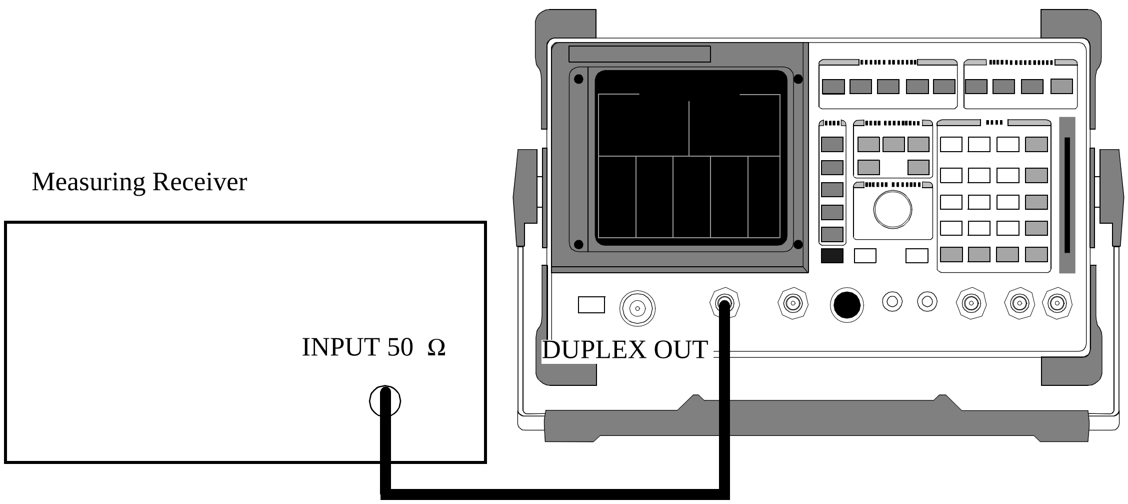
6. Record the results in the PTR. The computed value must be 0 ±3 dB.

RF Gen FM Distortion Performance Test 4

Description

The FM distortion of the RF generator is measured directly by the measuring receiver. The Test Set's internal audio generator provides the modulation source.

Setup

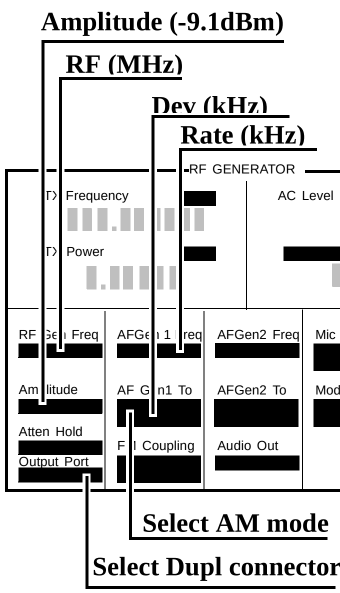


Make the following measuring receiver settings:

- Reset the measuring receiver
- 300 Hz High-Pass Filter
- 3 kHz Low-Pass Filter
- FM mode
- Distortion analyzer mode

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To field to FM.
3. Set the Output Port field to Dupl.



4. Measure the FM distortion at the RF level, frequencies, deviations, and rate shown in the PTR and compare the measured distortion to the limits shown in the PTR.

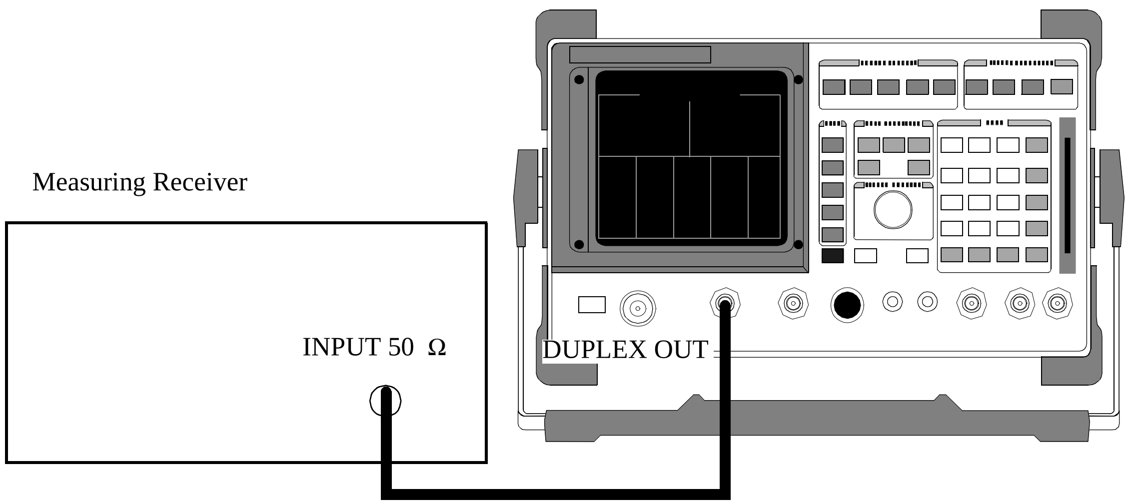
NOTE: Use STD upper and lower limits for instruments without Option 050. Use 050 upper and lower limits for instruments with Option 050.

RF Gen FM Accuracy Performance Test 5

Description

The FM distortion of the RF generator is measured directly by the measuring receiver. The Test Set’s internal audio generator provides the modulation source.

Setup

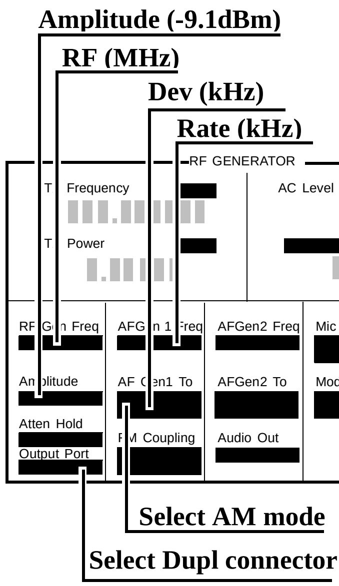


Make the following measuring receiver settings:

- Reset the measuring receiver
- 300 Hz High-Pass Filter
- 3 kHz Low-Pass Filter
- FM mode
- FM de-emphasis off

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To field to FM.
3. Set the Output Port field to Dupl.



4. Measure the deviations at the RF level, frequencies, deviations, and rate shown in the PTR and compare the measured deviation to the limits shown in the PTR.

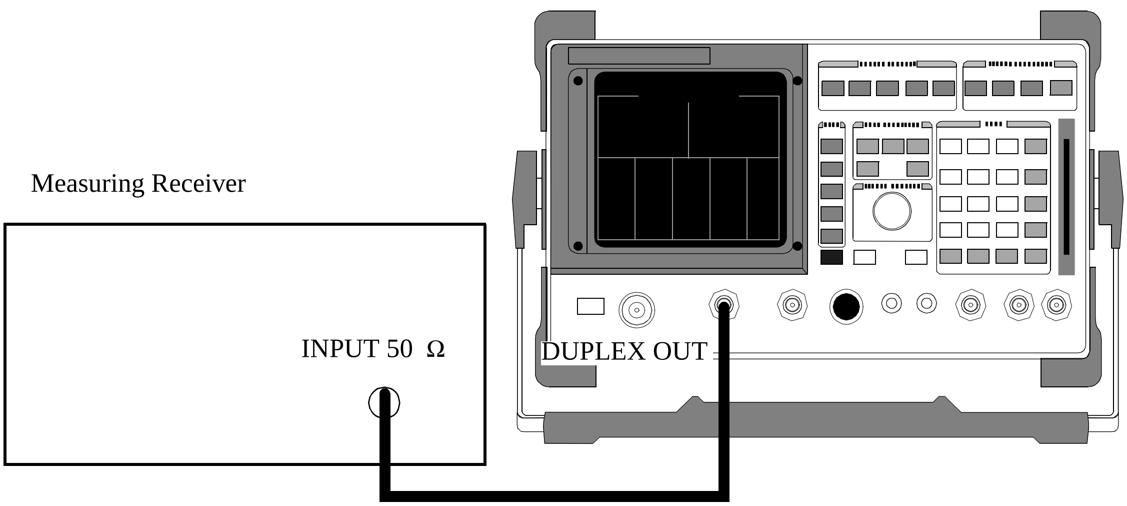
NOTE: Use STD upper and lower limits for instruments without Option 050. Use 050 upper and lower limits for instruments with Option 050.

RF Gen FM Flatness Performance Test 6

Description

The FM flatness of the RF generator is measured directly by the measuring receiver. The Test Set's internal audio generator provides the modulation source.

Setup

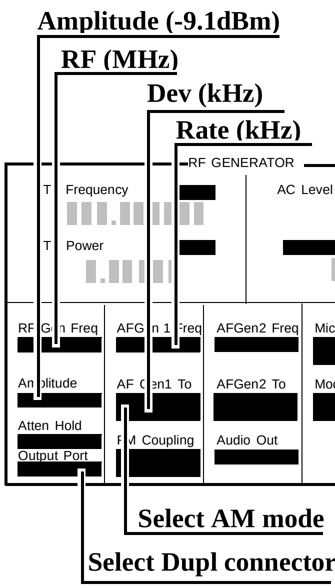


Make the following measuring receiver settings:

- Reset the measuring receiver
- FM mode

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To field to FM.
3. Set the Output Port field to Dupl.



4. Measure the FM deviation at the RF level, frequencies, deviations, and rates shown in the PTR.
5. Convert the measurement results to dB referenced to the deviation measured at 1 kHz as follows:

$$dB = 20\log\frac{\text{Deviation}}{\text{Deviation at 1 kHz}}$$

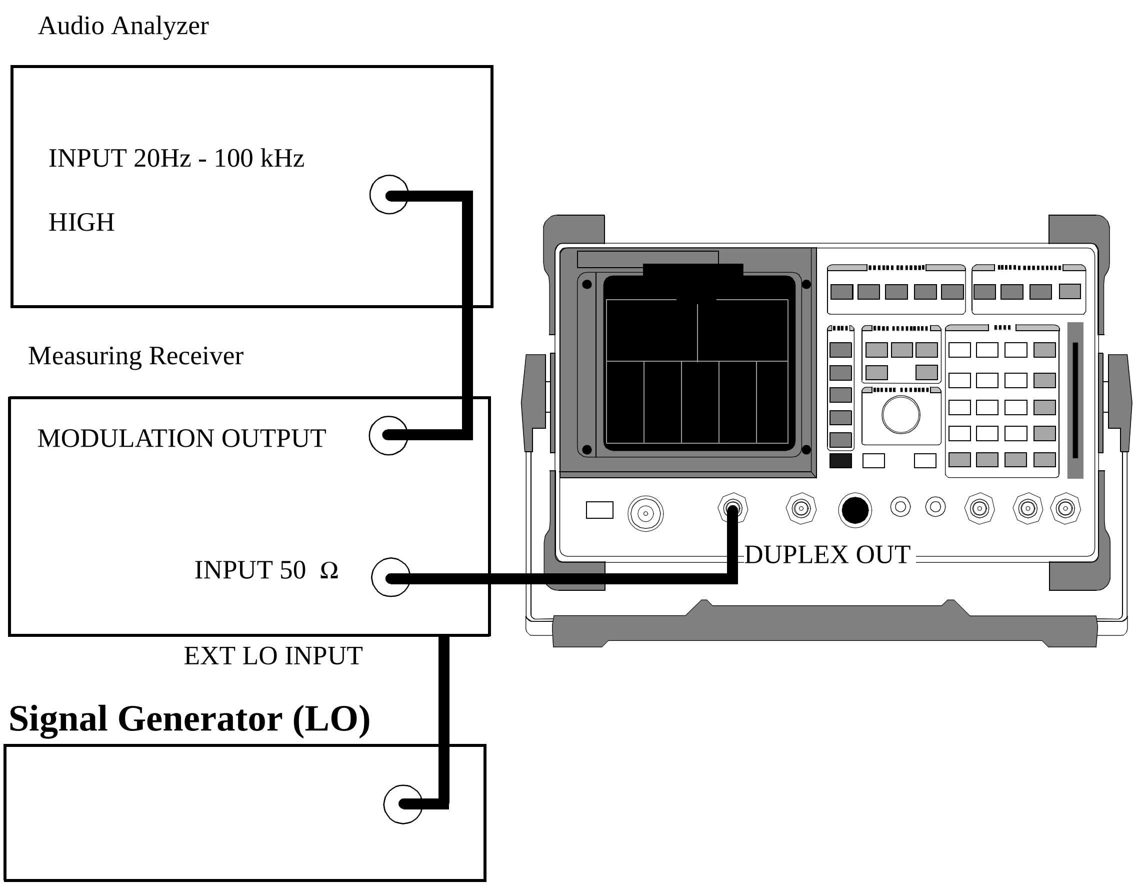
(The computed values must be 0, ±1 dB.)

RF Gen Residual FM Performance Test 7

Description

The residual FM of the RF generator is demodulated by the measuring receiver. An audio analyzer with a CCITT psophometric filter is required to measure the demodulated residual FM.

Setup



Make the following measuring receiver settings:

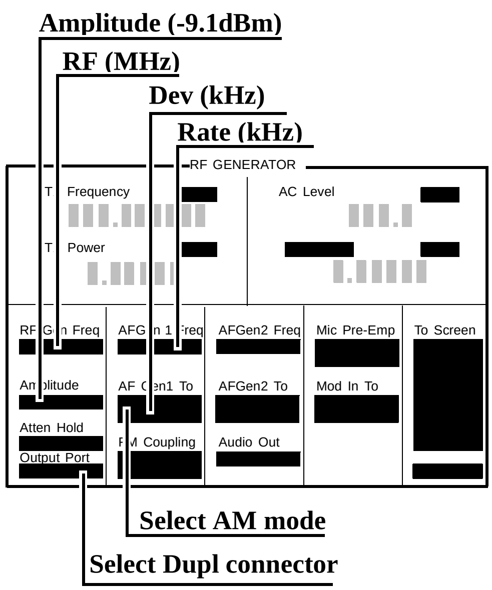
- Reset the measuring receiver
- 1.5 MHz IF (For testing 8920A Option 050, 8920B, 8921A)
- FM mode
- RMS detector
- 50 Hz High-Pass Filter
- 15 kHz Low-Pass Filter
- Enable the external LO mode (For testing 8920A Option 050, 8920B, 8921A)

Make the following audio analyzer settings:

- Reset the audio analyzer
- AC level
- CCITT Weighting Filter
- 30 kHz Low-Pass Filter

Procedure

1. Select the RF GENERATOR screen.
2. Set the Output Port field to Dupl.
3. Set the Amplitude field to –9.1 dBm.
4. Set the AFGen1 To field to FM.
5. Set the AFGen1 and AFGen2 deviation to Off.



6. Set the signal generator (used as an external LO for the measuring receiver) to the LO frequencies shown in the PTR.
7. Set the Test Set to the RF frequencies shown in the PTR and measure the ac level, in millivolts, on the audio analyzer.
8. Multiply the measured ac levels by 1000 to convert to FM deviation in Hz and compare the computed results to the limits shown in the PTR.

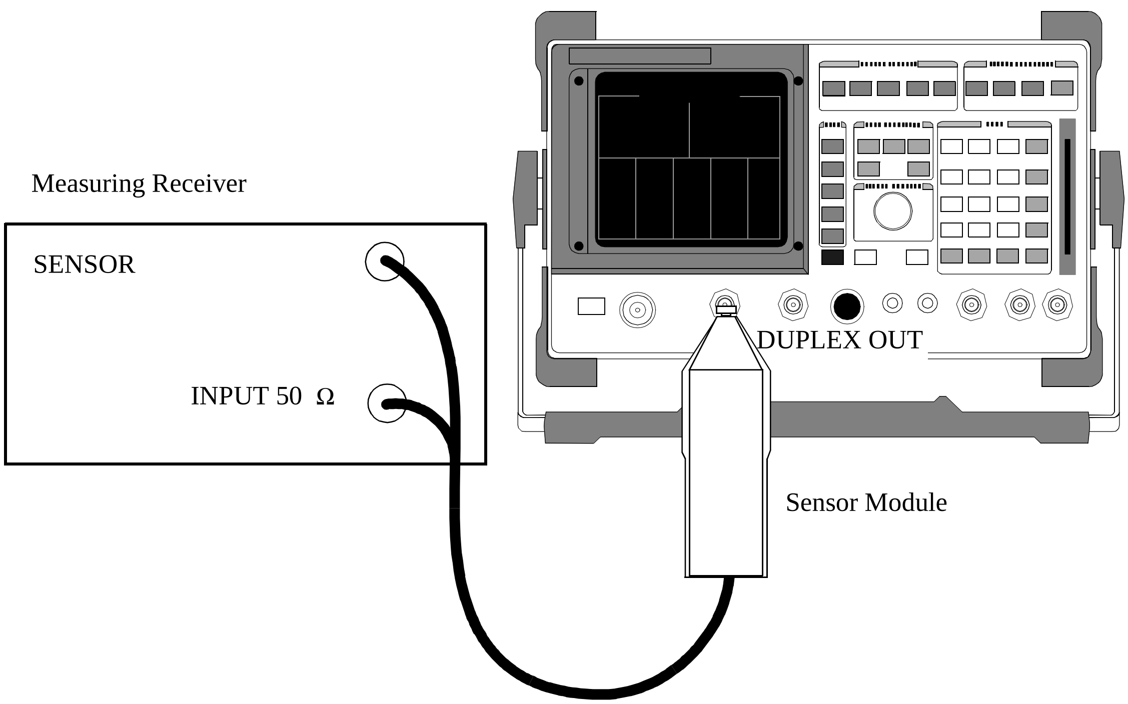
NOTE: Use STD upper and lower limits for standard 8920As. Use 050 upper and lower limits for 8920A Option 050, 8920B and 8921A.

RF Gen Duplex Output High Level Accuracy Performance Test 8

Description

The level of the RF generator, set to 1 and 3.5dBm, at the duplex output is measured at numerous frequencies by the sensor module of the measuring receiver.

Setup



Make the following measuring receiver settings:

- Reset the measuring receiver
- RF power mode
- Log display

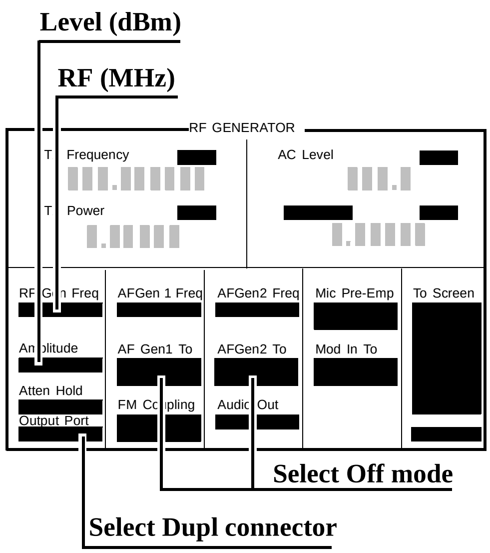
NOTE: Make sure to enter the power sensor's calibration data into the measuring receiver and zero the sensor module. Refer to the measuring receiver's and the sensor module's operating manuals.

Procedure

1. Select the RF GENERATOR screen.

2. Set the Output Port field to Dupl.

3. Set the AFGEN1 To and AFGEN2 To fields to Off.



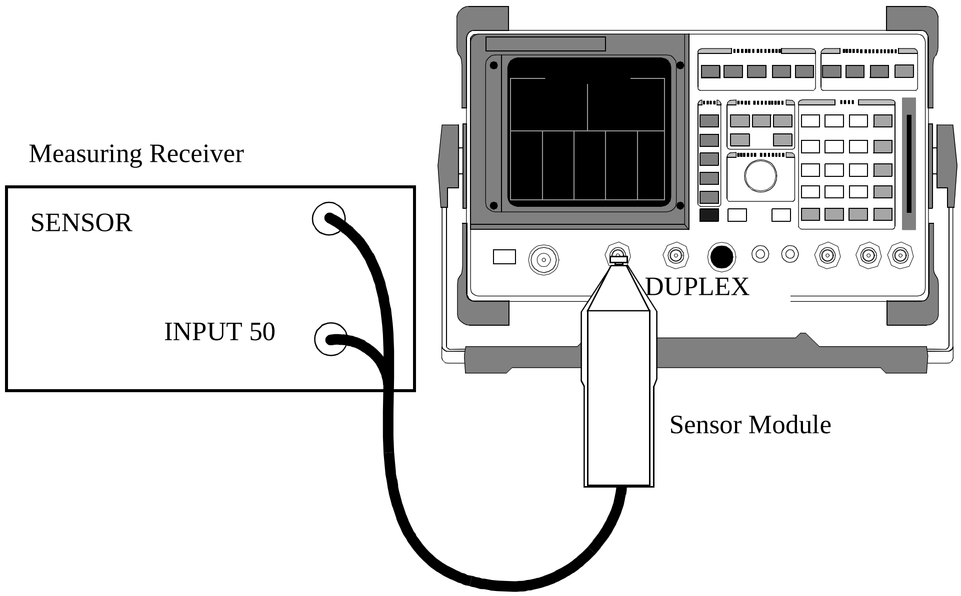
4. Measure the RF power at the frequencies and levels shown in the PTR and compare the measured RF power to the limits shown in the PTR.

RF Gen Duplex Output Low Level Accuracy Performance Test 9

Description

The Duplex output is set to selected frequencies and to levels between 1 and –124 dBm (in 5 dB steps) and measured by the tuned RF level feature of the measuring receiver. As the test proceeds you may be required to recalibrate the measuring receiver.

Setup



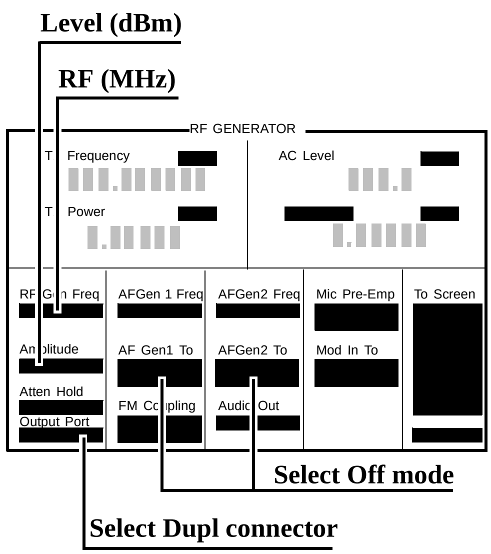
Make the following measuring receiver settings:

- Reset the measuring receiver
- Tuned RF Level power measurement
- Log display

NOTE: Make sure to enter the power sensor's calibration data into the measuring receiver and zero the power sensor. Refer to the measuring receiver's operating manual. The procedure for making tuned RF level measurements is also in the measuring receiver's manual.

Procedure

1. Select the RF GENERATOR screen.
2. Set the Output Port field to Dupl.
3. Set the AFGen1 To and AFGen2 To fields to Off.



4. Measure the RF level at the frequencies and levels shown in the PTR and compare measured RF level to the limits shown in the PTR.
5. If the Test Set is to be used with an 83236A PCS Interface, measure the signal level at the additional frequencies shown in the PTR; for each measurement subtract the nominal level from the measured value and record the difference. (For example, if the level for -9 dBm reads -9.2 dBm, record the value -0.2 dBm.) When finished, find the maximum and minimum values, subtract the maximum from the minimum, and divide the result by 2.

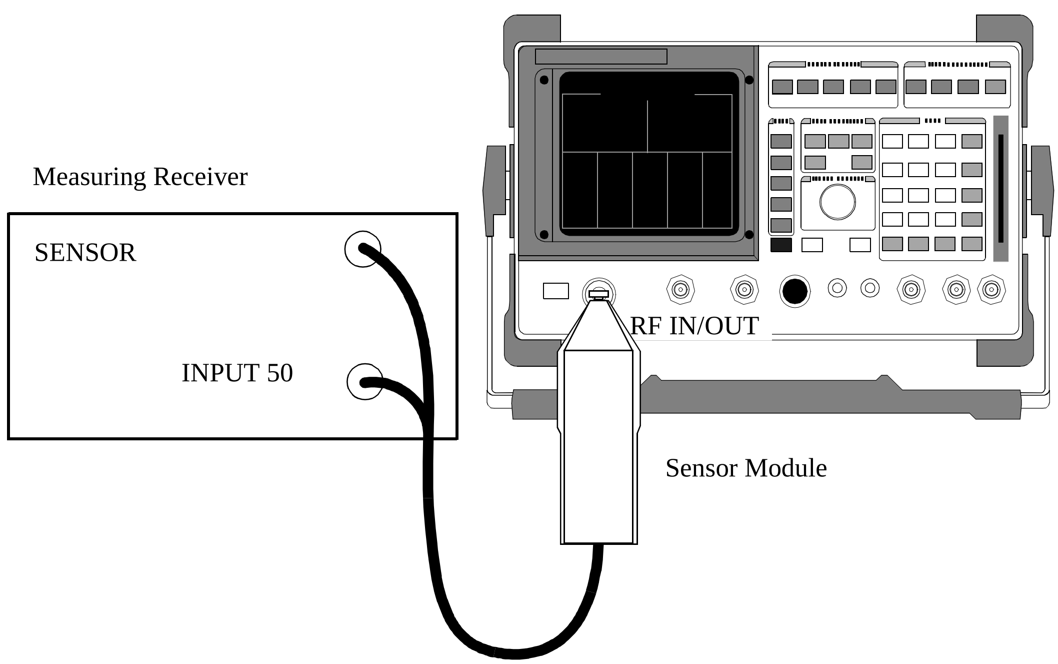
$$\text{Actual (dB)} = \left(\frac{\text{Minimum Value - Max Value}}{2}\right)$$

RF Gen RF IN/OUT Level Accuracy Performance Test 10

Description

The RF output is set to selected frequencies and to levels between –19 and –124 dBm (in 5 dB steps) and measured by the tuned RF level feature of the measuring receiver. As the test proceeds you may be required to recalibrate the measuring receiver.

Setup



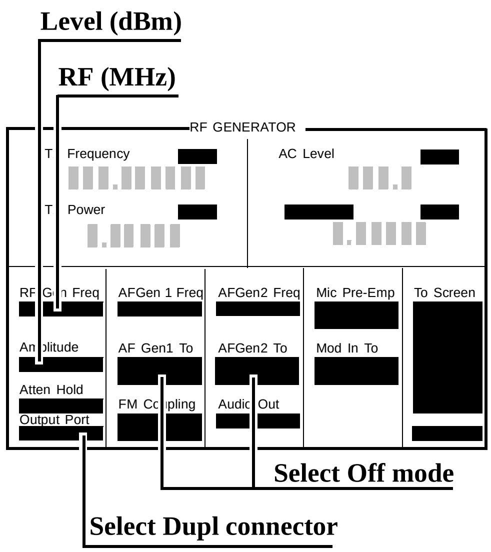
Make the following measuring receiver settings:

- Reset the measuring receiver
- Tuned RF Level power measurement
- Log display

NOTE: Make sure to enter the power sensor’s calibration data into the measuring receiver, and zero the power sensor. Refer to the measuring receiver’s operating manual. The procedure for making tuned RF Level measurements is also in the measuring receiver’s manual.

Procedure

1. Select the RF GENERATOR screen.
2. Set the Output Port field to RF Out.
3. Set the AFGen1 To and AFGen2 To fields to Off.



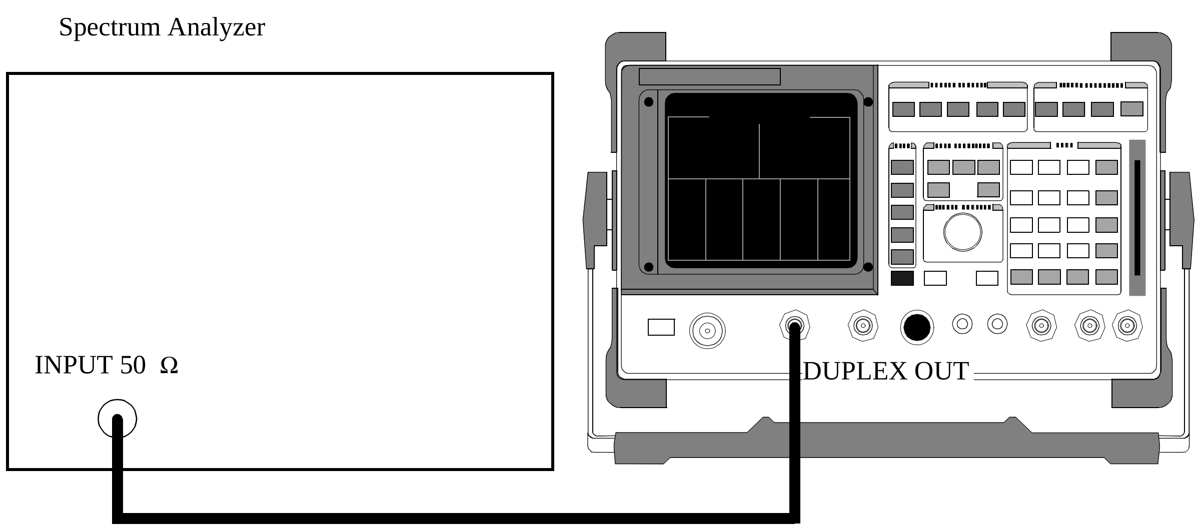
4. Measure the RF Level at the frequencies and levels shown in the PTR and compare the measured RF level to the limits shown in the PTR.

RF Gen Harmonics Spectral Purity Performance Test 11

Description

Harmonic signals with the carrier set to several frequencies and two different levels (maximum output and minimum level vernier) are searched for by an RF spectrum analyzer.

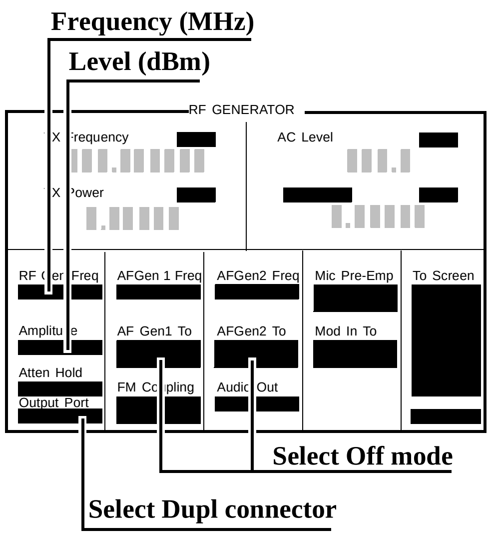
Setup



Refer to the spectrum analyzer’s operating manual to set up the spectrum analyzer.

Procedure

1. Select the RF GENERATOR screen.
2. Set the Output Port field to Dupl.
3. Set the AFGen1 and AFGen2 levels to Off.



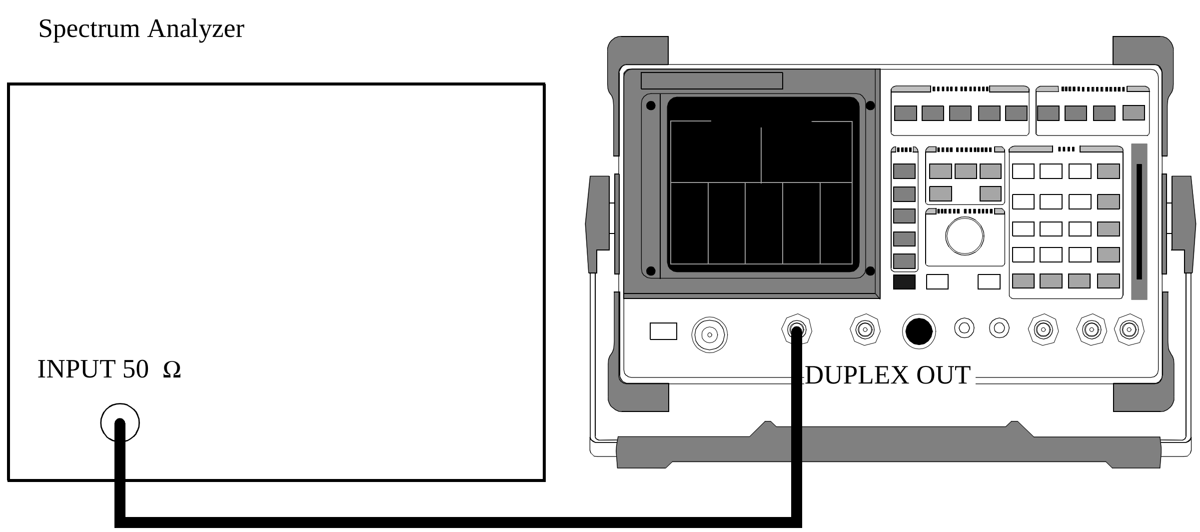
4. Set the Test Set to the RF Generator frequencies and level shown in the PTR, and measure the level of the second and third harmonics and the half-harmonics also shown in the PTR.
5. Convert the harmonic levels to decibels below the fundamental (dBc) and compare the computed levels to the limits shown in the PTR.

RF Gen Spurious Spectral Purity Performance Test 12

Description

Spurious signals with the carrier set to several frequencies and two different levels (maximum output and minimum level vernier) are searched for by an RF spectrum analyzer.

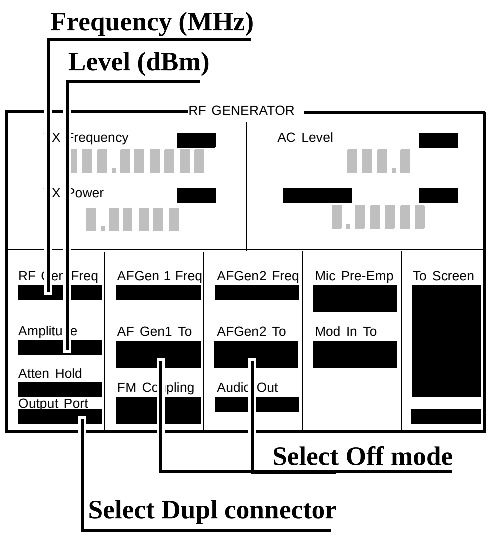
Setup



Refer to the spectrum analyzer’s operating manual to set up the spectrum analyzer.

Procedure

1. Select the RF GENERATOR screen.
2. Set the Output Port field to Dupl.
3. Set the AFGen1 and AFGen2 levels to Off.



4. Set the Test Set to the RF Generator frequencies and levels (+1 dBm or –4 dBm) shown in the PTR, and measure the levels of the spurious signals at the frequencies shown in the PTR.
5. Convert the measured levels to decibels below the carrier (dBc), and compare the computed results to the limits shown in the PTR.

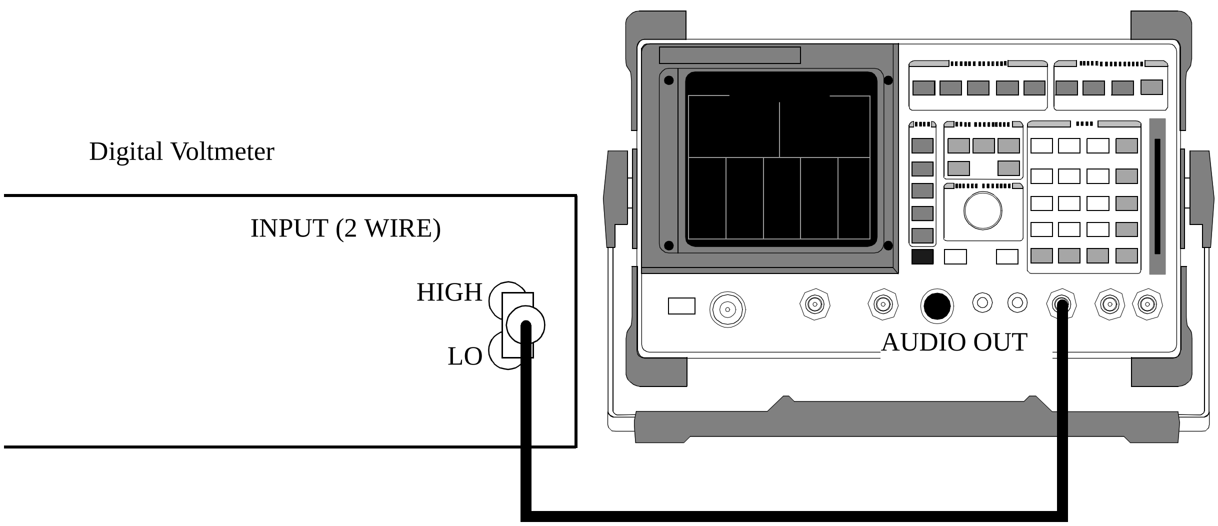
NOTE: Ignore the spur source column of the PTR. That information is for help in troubleshooting.

AF Gen AC Level Accuracy Performance Test 13

Description

There are two audio generators. AC level accuracy is measured directly by a digital voltmeter.

Setup

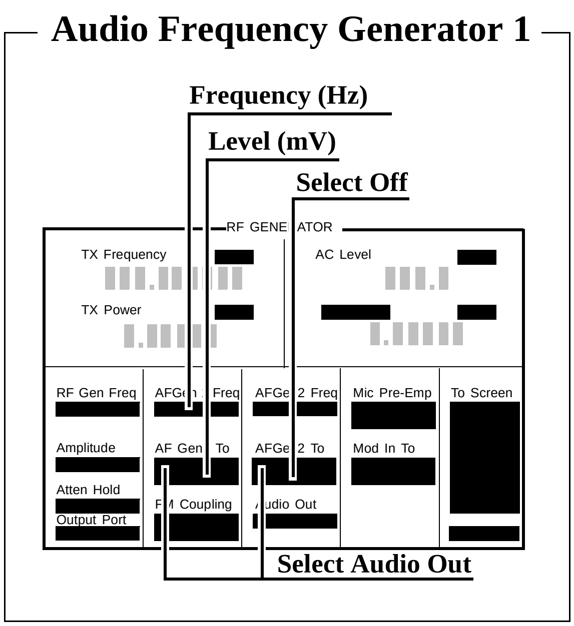


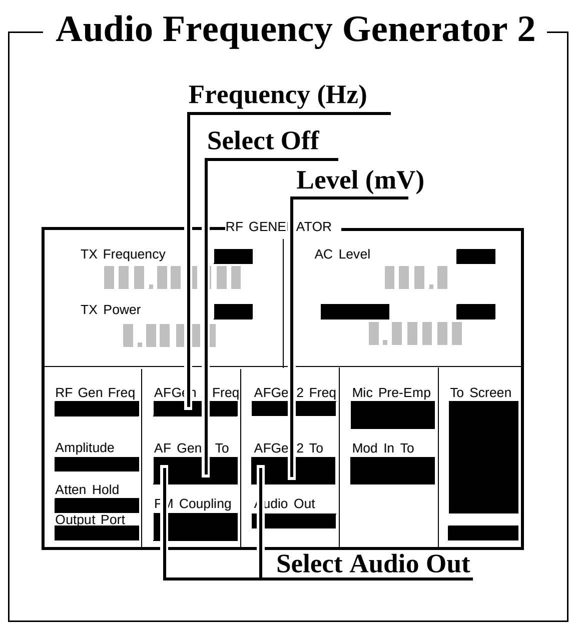
Make the following digital voltmeter setting:

- AC Volts

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To and AFGen2 To fields to Audio Out.
3. Set the Audio Out field to AC.





4. Audio Frequency Generator 1: Set the AFGen2 level to Off. Measure the AC voltage at the frequencies and levels shown in the PTR and compare the measured voltage to the limits shown in the PTR.

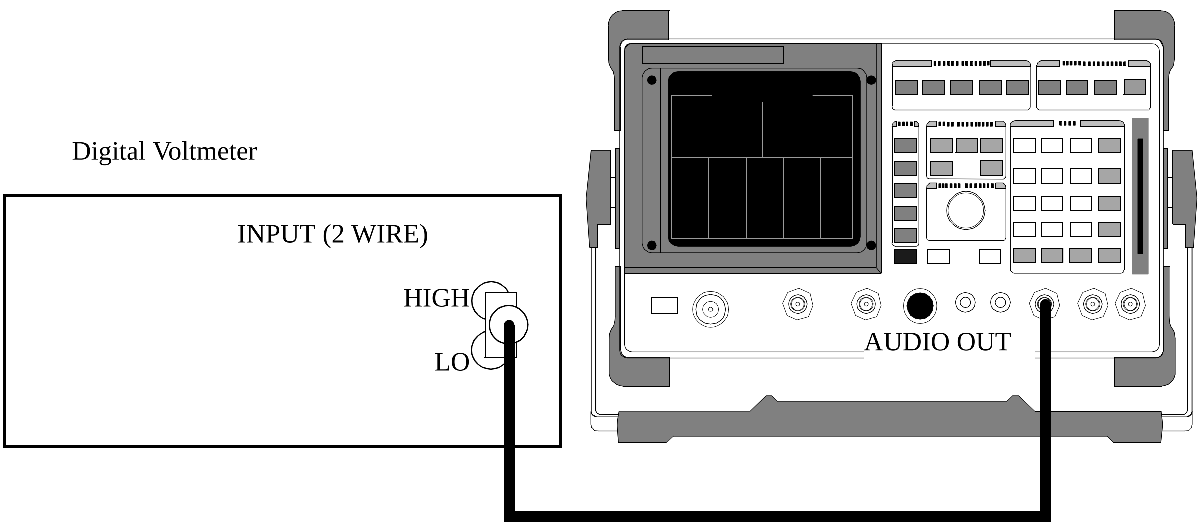
   Audio Frequency Generator 2: Set the AFGen1 level to Off. Measure the AC voltage at the frequencies and levels shown in the PTR and compare the measured voltage to the limits shown in the PTR.

AF Gen DC Level Accuracy Performance Test 14

Description

There are two audio generators. DC level accuracy is measured directly by a digital voltmeter.

Setup

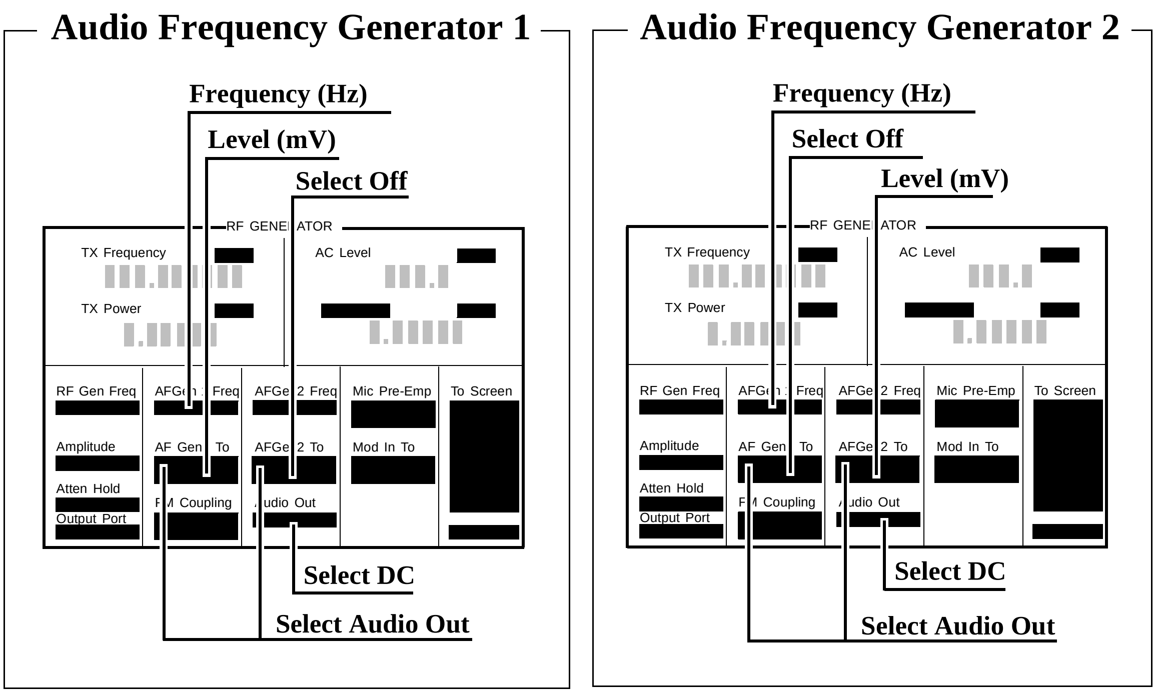


Make the following digital voltmeter setting:

- DC Volts

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To and AFGen2 To fields to Audio Out.
3. Set the AFGEN1 Freq and AFGen2 Freq fields to 0.0 Hz.
4. Set the Audio Out field to dc.



5. Audio Frequency Generator 1: Set the AFGen2 level to Off. Measure the dc voltage at the levels shown in the PTR and compare the measured voltage to the limits shown in the PTR.

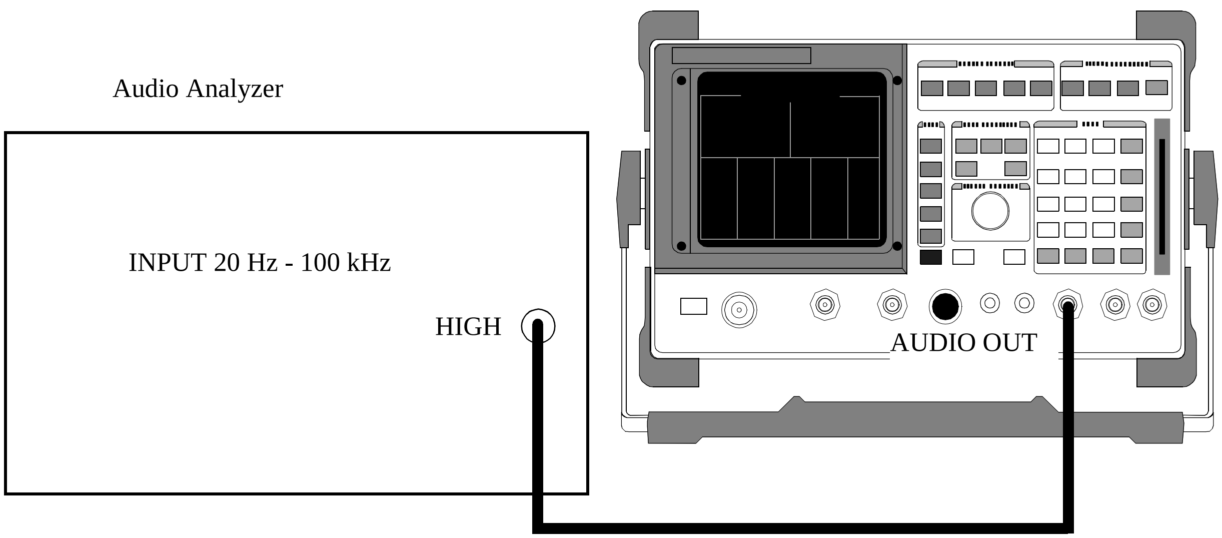
   Audio Frequency Generator 2: Set the AFGen1 level to Off. Measure the dc voltage at the levels shown in the PTR and compare the measured voltage to the limits shown in the PTR.

AF Gen Residual Distortion Performance Test 15

Description

Audio distortion is measured directly by an audio analyzer.

Setup

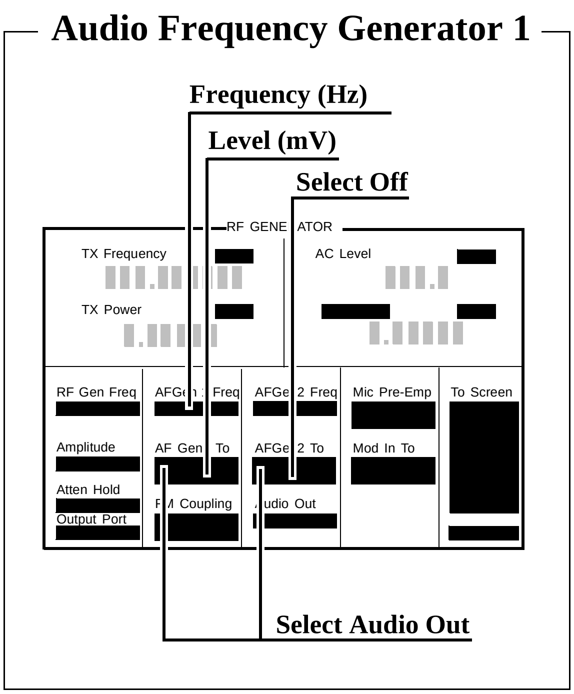


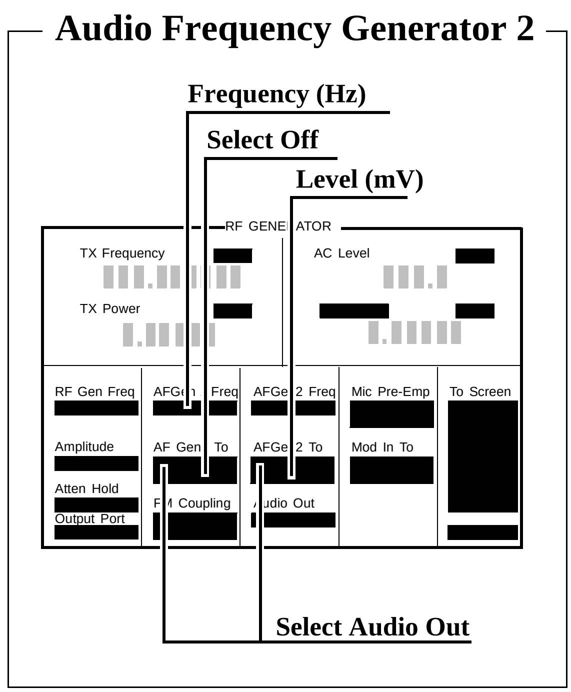
Make the following audio analyzer settings:

- Reset the audio analyzer
- 80 kHz Low-Pass Filter
- Distortion mode

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To and AFGen2 To fields to Audio Out.





3. Audio Frequency Generator 1: Set the AFGen2 level to Off. Measure the audio distortion at the frequencies and levels shown in the PTR and compare the measured distortion to the limits shown in the PTR.

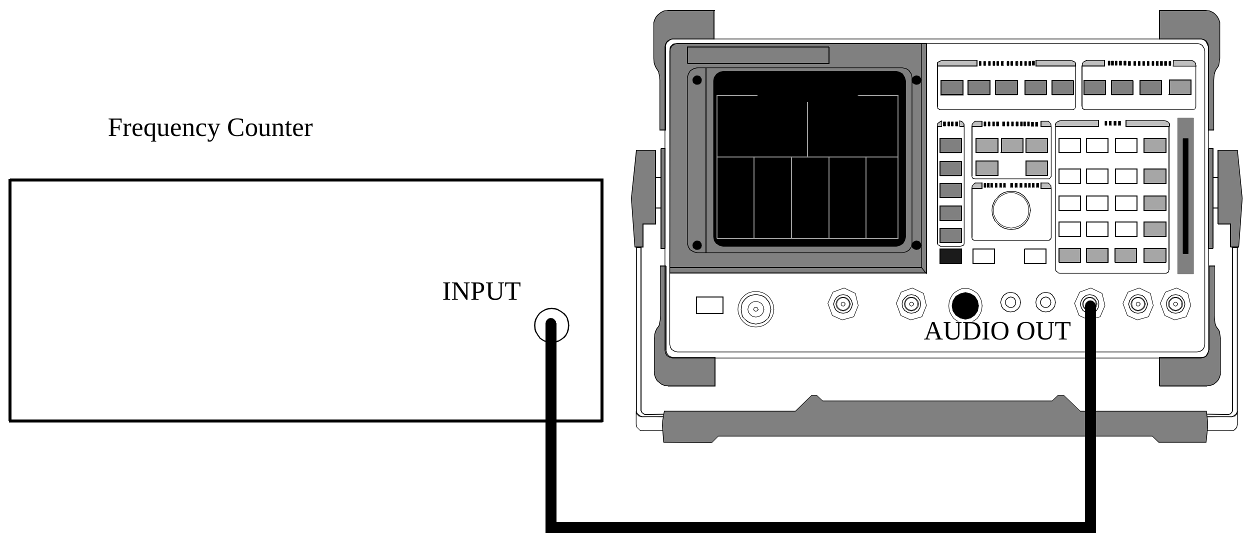
   Audio Frequency Generator 2: Set the AFGen1 level to Off. Measure the audio distortion at the frequencies and levels shown in the PTR and compare the measured distortion to the limits shown in the PTR.

AF Gen Frequency Accuracy Performance Test 16

Description

Frequency accuracy is measured directly by a frequency counter. The counter must be able to resolve 0.005% at 20 Hz.

Setup

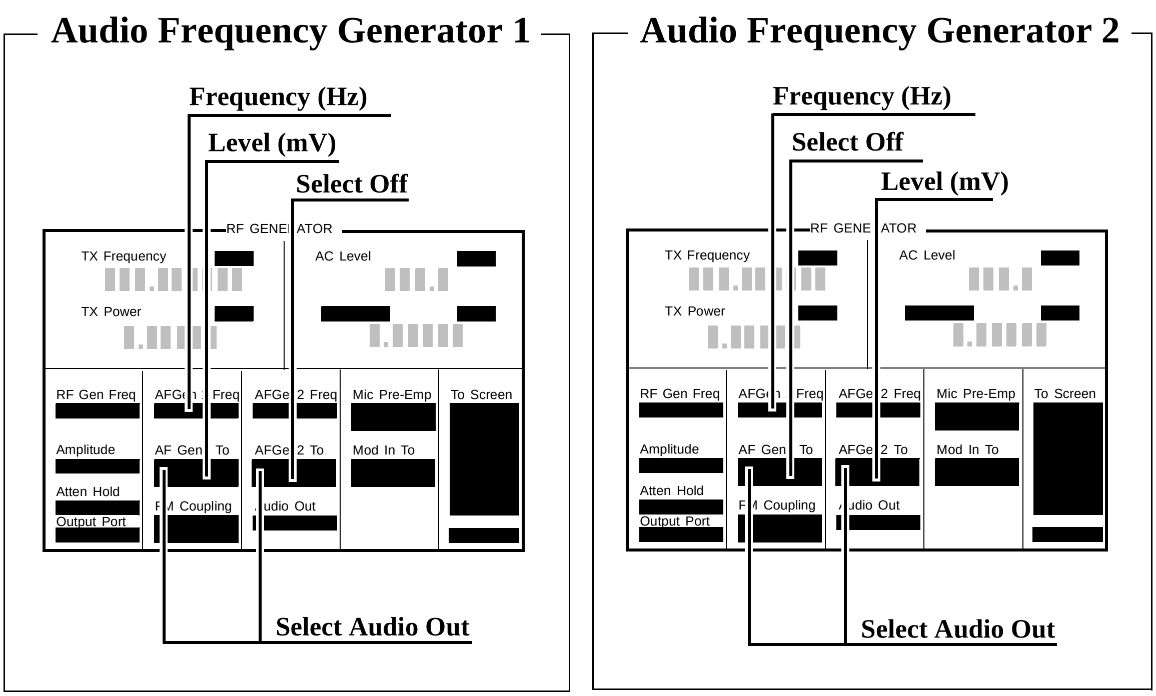


Make the following frequency counter settings:

- Select the counter to measure frequency.

Procedure

1. Select the RF GENERATOR screen.
2. Set the AFGen1 To and AFGen2 To fields to Audio Out.



3. Audio Frequency Generator 1: Set the AFGen2 to Off, and AFGen1 level to 1 V. Measure the audio frequency at the frequencies shown in the PTR and compare the results to the PTR.

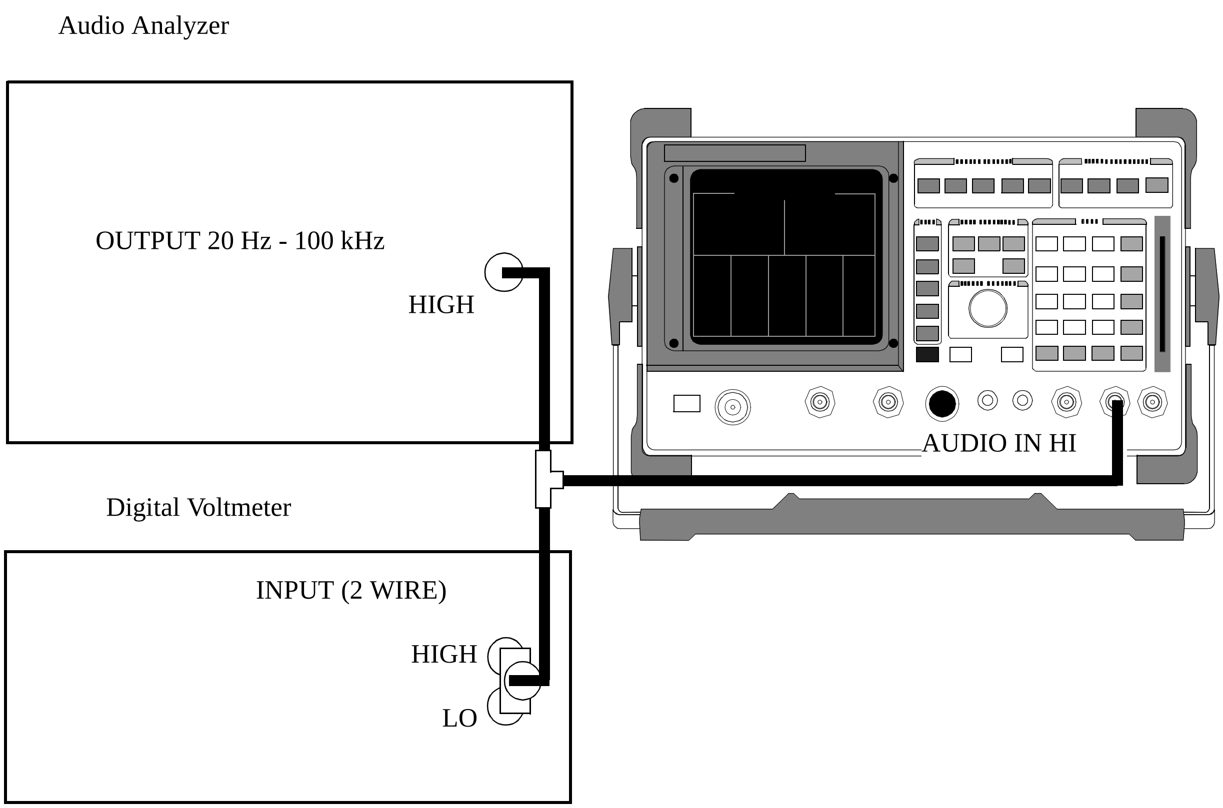
   Audio Frequency Generator 2: Set the AFGen1 to Off, and AFGen2 level to 1 V. Measure the audio frequency at the frequencies shown in the PTR and compare the results to the PTR.

AF Analyzer AC Voltage Accuracy Performance Test 17

Description

To measure ac voltage accuracy, an ac signal is measured by an external multimeter and compared to the Test Set's internal ac voltmeter reading.

Setup

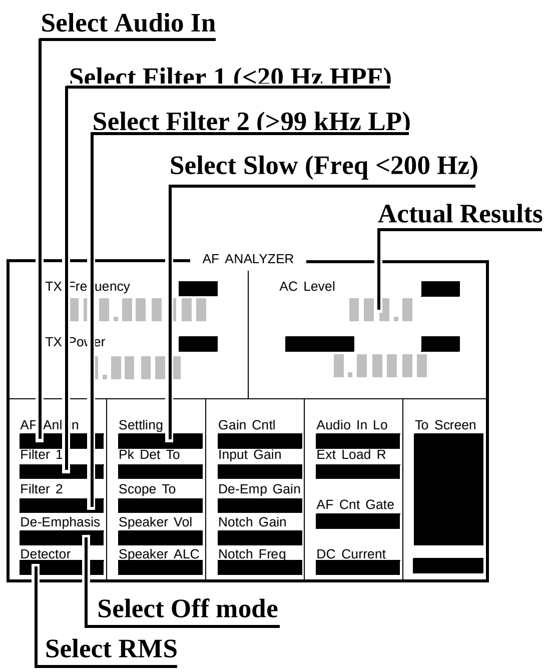


Make the following digital voltmeter setting:

- AC Volts

Procedure

1. Select the AF ANALYZER screen.
2. Set the AF Anl In field to Audio In.
3. Set Filter 1 to < 20 Hz HPF, and Filter 2 to > 99 kHz LPF.
4. Set the De-Emphasis field to Off.
5. Set the Detector field to RMS.
6. Set the Settling field to SLOW for frequencies < 200 Hz.



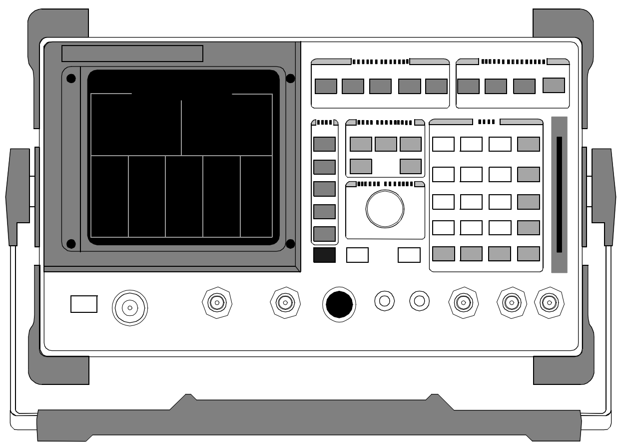
7. Set the audio analyzer’s source to the frequencies and levels shown in the PTR (adjust the level until the DVM reads the correct level).
8. Measure the ac level on the Test Set.
9. Compare the measured ac level to the limits shown in the PTR.

AF Analyzer Residual Noise Performance Test 18

Description

The ac level of the audio input is measured with no signal source connected.

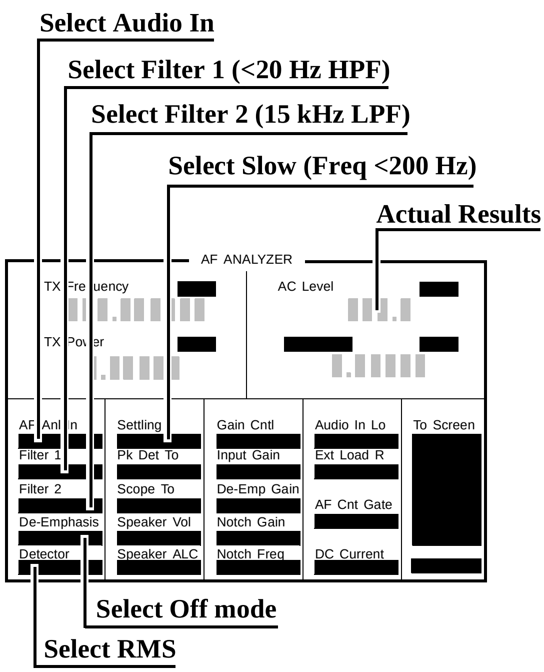
Setup



This test does not need external equipment or connections.

Procedure

1. Select the AF ANALYZER screen.
2. Set the AF Anl In field in field to Audio In.
3. Set Filter 1 to <20 Hz HPF and Filter 2 to 15 kHz LPF.
4. Set the De-Emphasis field to Off.
5. Set the detector field to RMS.



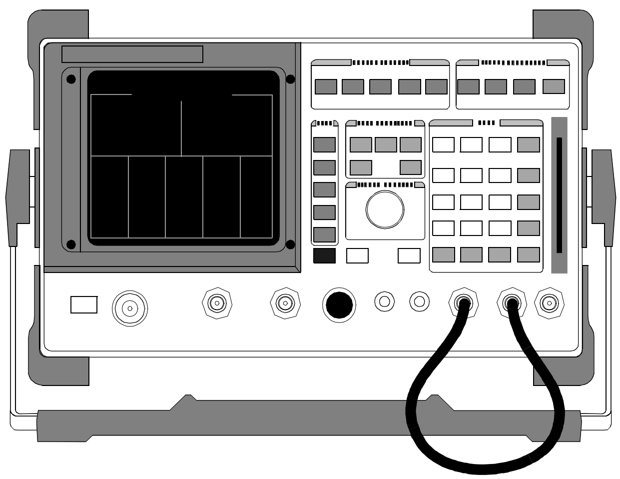
6. Measure ac level (Residual Noise). The upper limit is 150 µV.

AF Analyzer Distortion and SINAD Accuracy Performance Test 19

Description

A calibrated distortion source is created by summing the two internal audio generators. Levels are measured separately by the internal ac voltmeter. One source is set to a harmonic two or three times the frequency of the other. The measured distortion is compared with the calculated value.

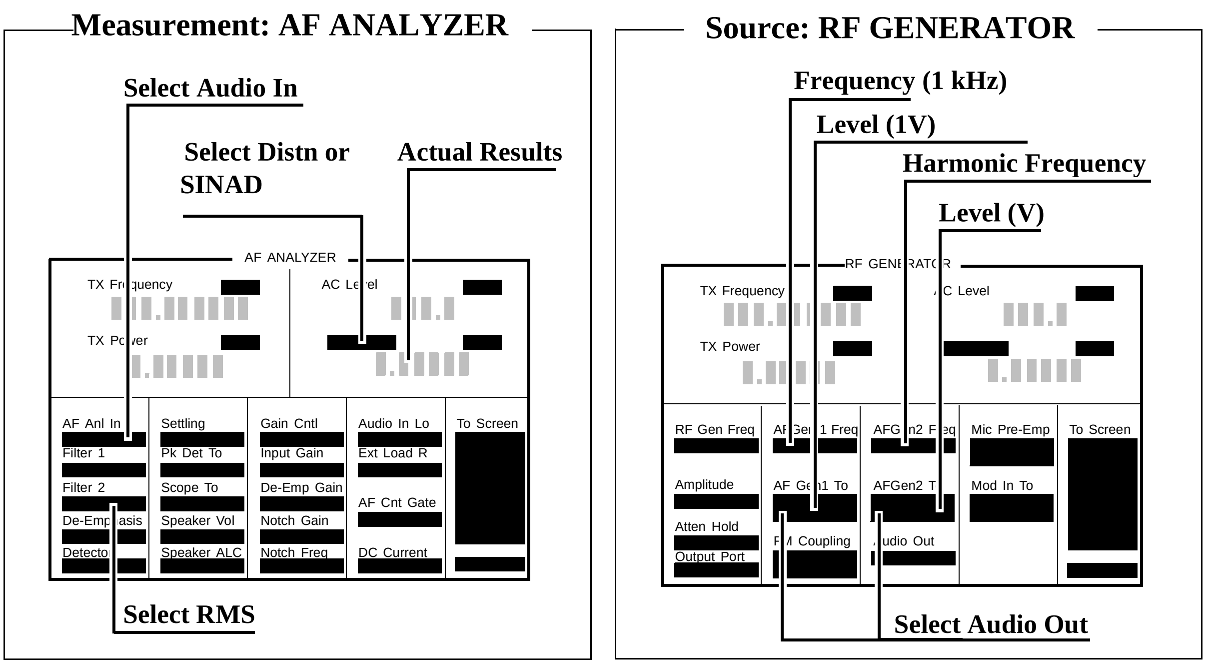
Setup



This test does not require external equipment.

Procedure

1. Select the AF ANALYZER screen and set Filter 2 to 15 kHz LPF.
2. Select the RF GENERATOR screen and set the AFGen1 To and AFGen2 To fields to Audio Out.



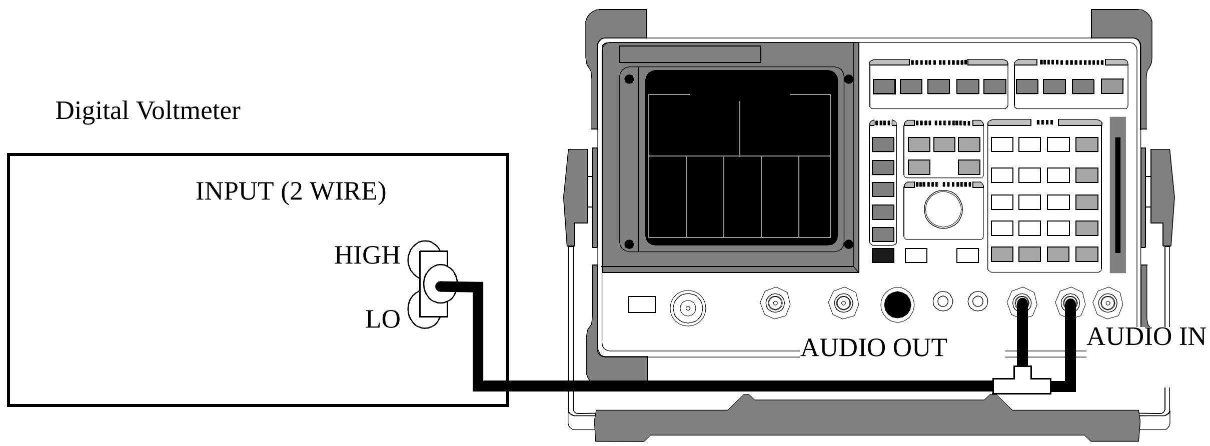
3. Set AFGen1 Freq to 1 kHz and the AFGen1 level to 1 V.
4. Set AFGen2 Freq to the Harmonic frequencies shown in the PTR, and the AFGen2 level to the distortion product levels shown in the PTR.
5. Measure the distortion and SINAD at each frequency and level, and compare the measured results with the limits shown in the PTR.

AF Analyzer DC Level Accuracy Performance Test 20

Description

To measure dc level accuracy, a dc signal is measured by an external digital voltmeter and compared to the Test Set's internal dc voltmeter reading.

Setup

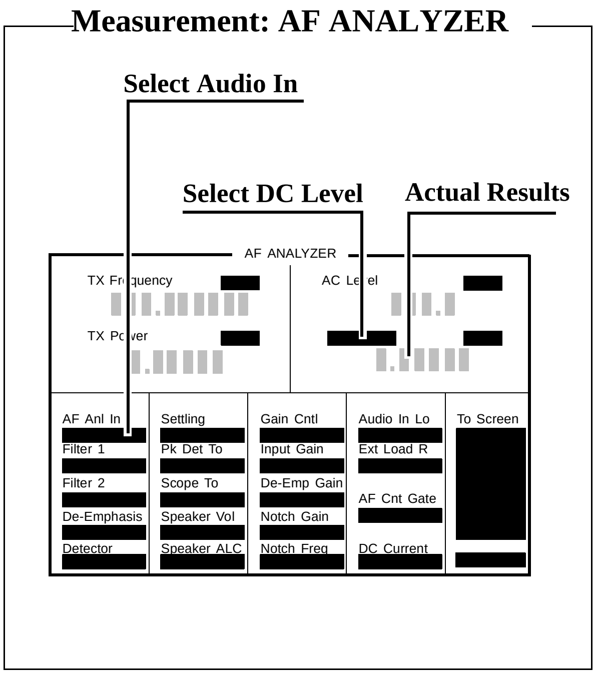


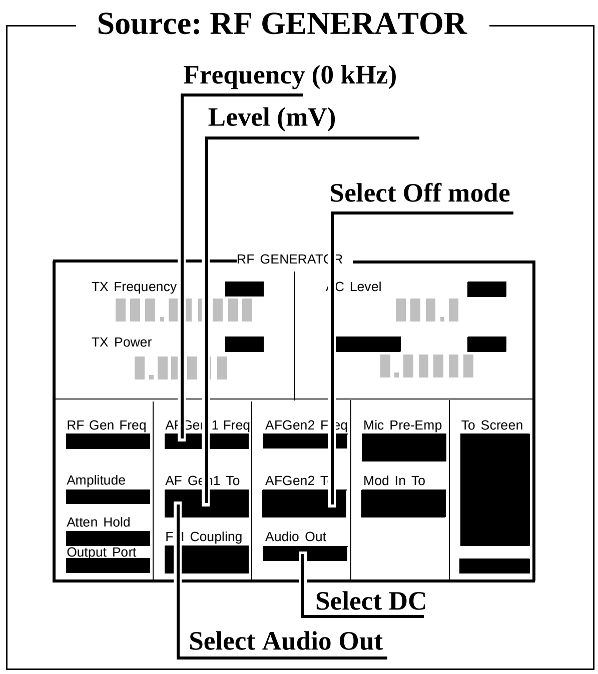
Make the following digital voltmeter setting:

- DC Volts

Procedure

1. Select the AF ANALYZER screen and set the AF Anl In field to Audio In, and the lower-right display to **`DC Level`**.
2. Select the RF GENERATOR screen, and set the AFGen1 Freq to 0 kHz, the AFGen1 To field to Audio Out, the AFGen2 To to Off, and the Audio Out field to **`DC`**.





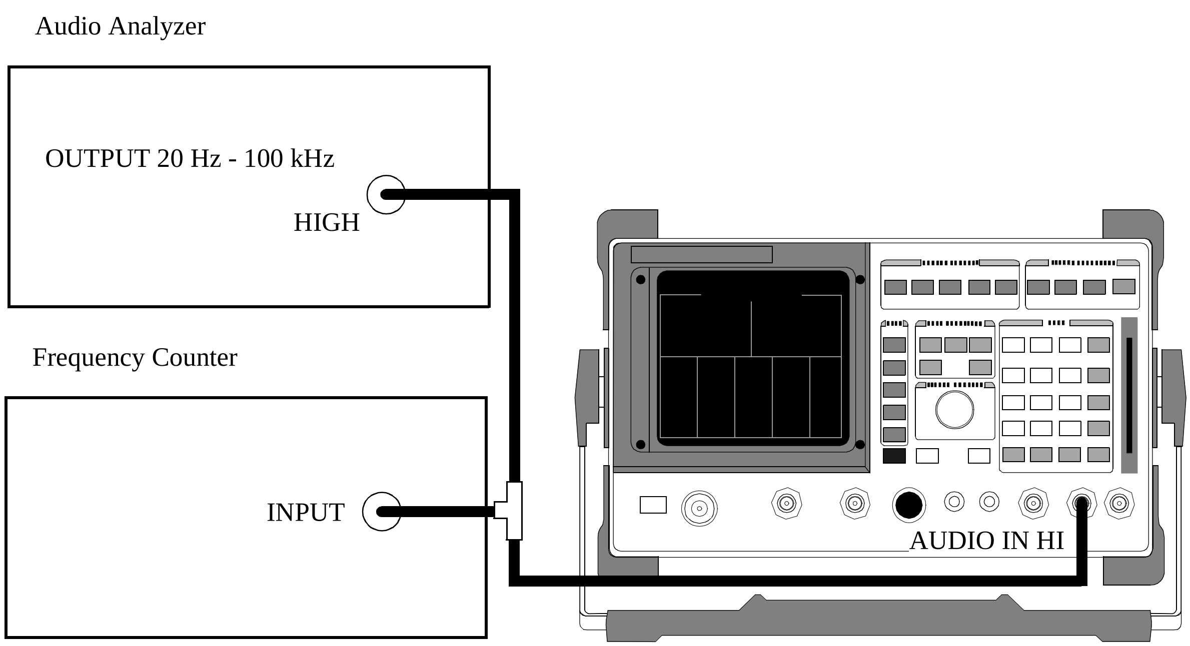
3. Set the AFGen1 level to the levels shown in the PTR (adjust until the voltmeter reads the correct level).
4. Read the dc level and compare the reading to the limits shown in the PTR.

AF Analyzer Frequency Accuracy to 100 kHz Performance Test 21

Description

To measure frequency accuracy up to 100 kHz, an ac signal at the audio output is measured by the frequency counter and compared to the Test Set's internal audio frequency counter.

Setup

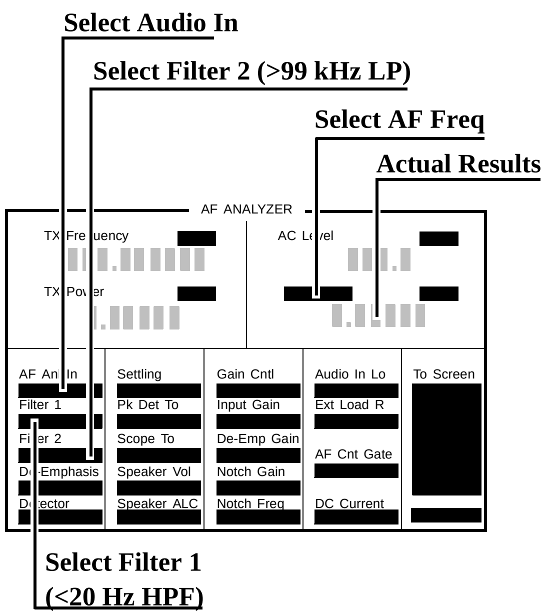


Make the following frequency counter settings:

- Select frequency

Procedure

1. Select the AF ANALYZER screen and set the AF Anl In field to Audio In, Filter 1 to <20 Hz HPF, Filter 2 to >99 Hz LPF, and the lower-right display to AF Freq.



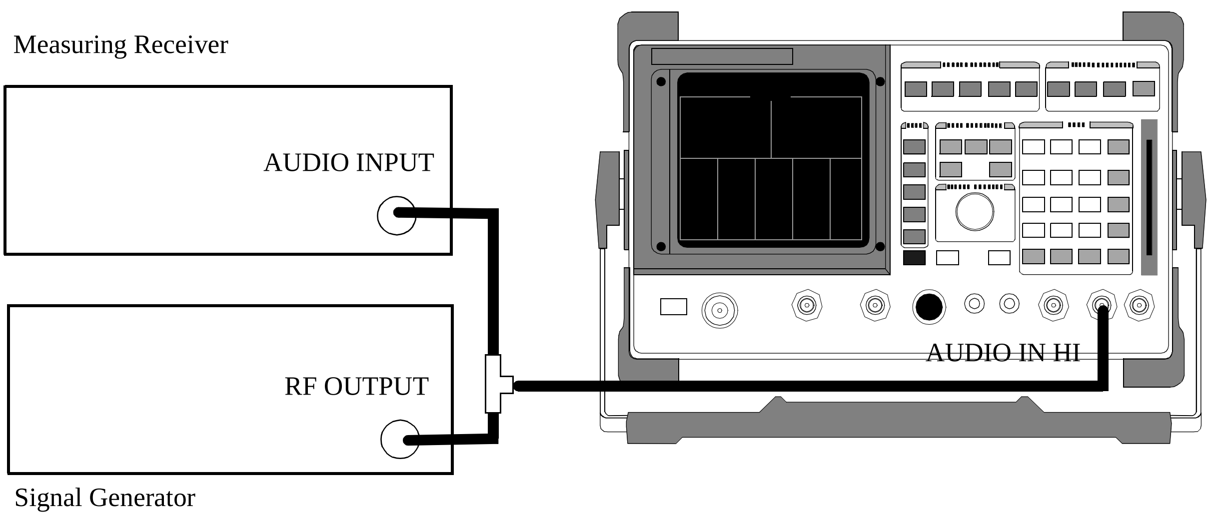
2. Set the audio analyzer's source amplitude to 1 V, and the frequency to the values shown in the PTR (adjust until the frequency counter reads the correct frequencies).
3. Read the AF frequency on the frequency counter and compare the reading to the limits shown in the PTR.

AF Analyzer Frequency Accuracy at 400 kHz Performance Test 22

Description

To measure frequency accuracy at 400 kHz, a signal from a signal generator is measured by the frequency counter in the measuring receiver and compared to the Test Set's internal RF counter.

Setup



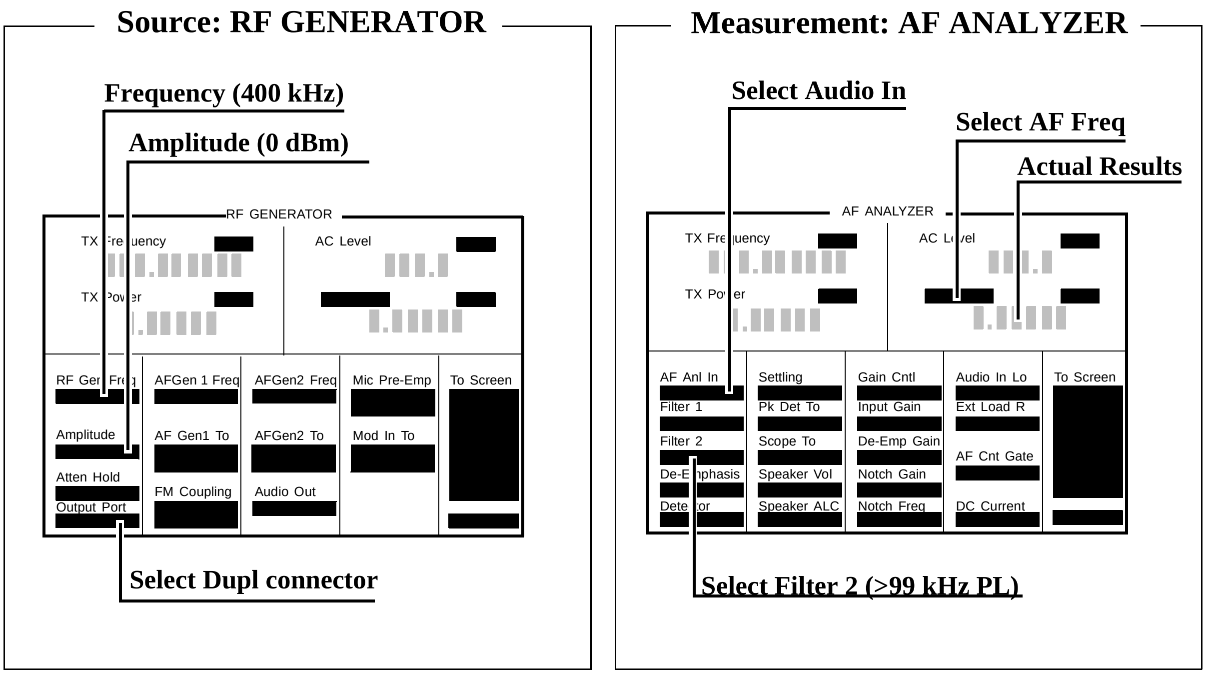
Make the following measuring receiver settings:

- Reset the measuring receiver
- Select Audio Freq
- Select Audio Input

Make the following signal generator settings:

- Frequency 400 kHz CW.
- Level 0 dBm.

Procedure



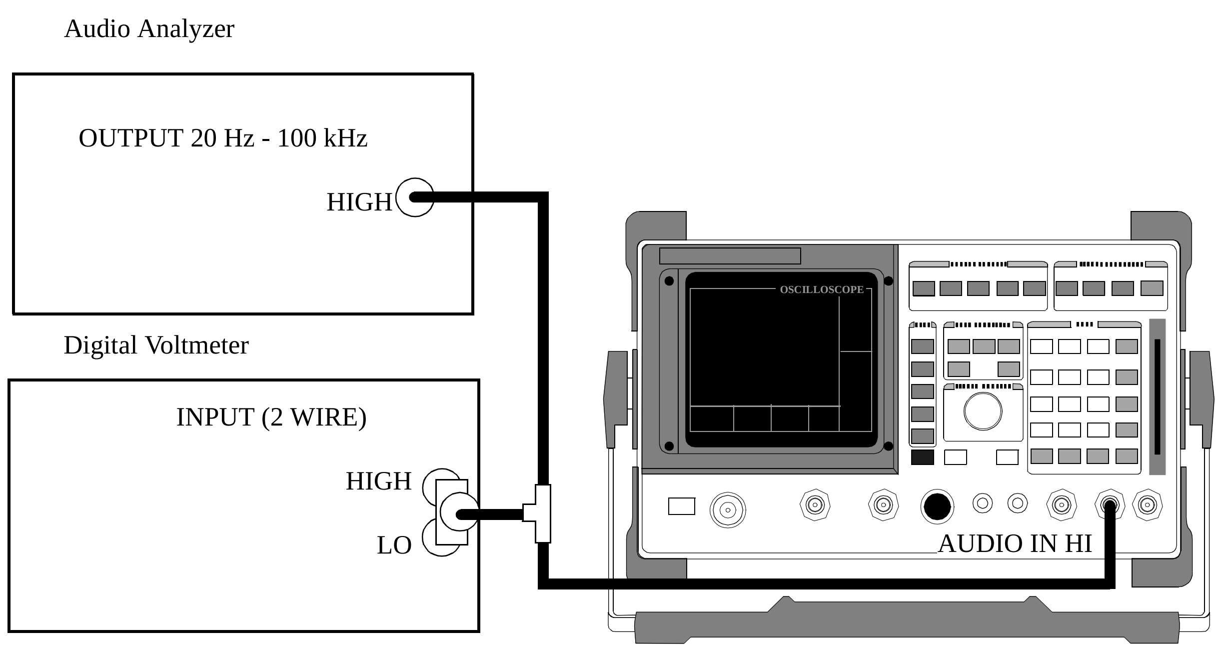
1. Select the AF ANALYZER screen, and set the AF Anl In field to Audio In, Filter 2 to >99 kHz LP, and the lower-right display to AF Freq.
2. Read the AF Freq on the Test Set and compare the reading to the limits shown in the PTR.

Oscilloscope Performance Test 23

Description

A 5 V ac signal from the audio analyzer is measured by both an external ac voltmeter and the Test Set’s internal ac voltmeter. The measurement results are compared. Since the external ac voltmeter measures the RMS level, its level is multiplied by the square root of two to obtain the peak value measured by the oscilloscope.

Setup

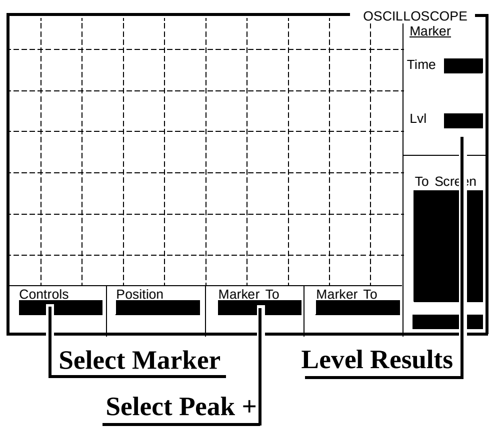


Make the following digital voltmeter setting:

- AC Volts

Procedure

1. Select the AF ANALYZER screen. Set Filter 2 to >99 kHz and the AF Anl In field to Audio In.
2. Select the OSCILLOSCOPE screen.
3. Set the Controls field to Marker and move the cursor to the Marker To Peak+ field.



4. Set the audio analyzer’s source to 5 V (adjust until the digital voltmeter reads 5 V). Adjust the frequency to the frequencies shown in the PTR.
5. Each time the frequency is changed, adjust the Time/Div on the Test Set to display 2 to 3 waveforms.
6. At each frequency, push the knob (with the cursor at the Marker To Peak+ field), to move the marker to the peak of the waveform. Read the Marker Lvl and compare the reading to the limits shown in the PTR.

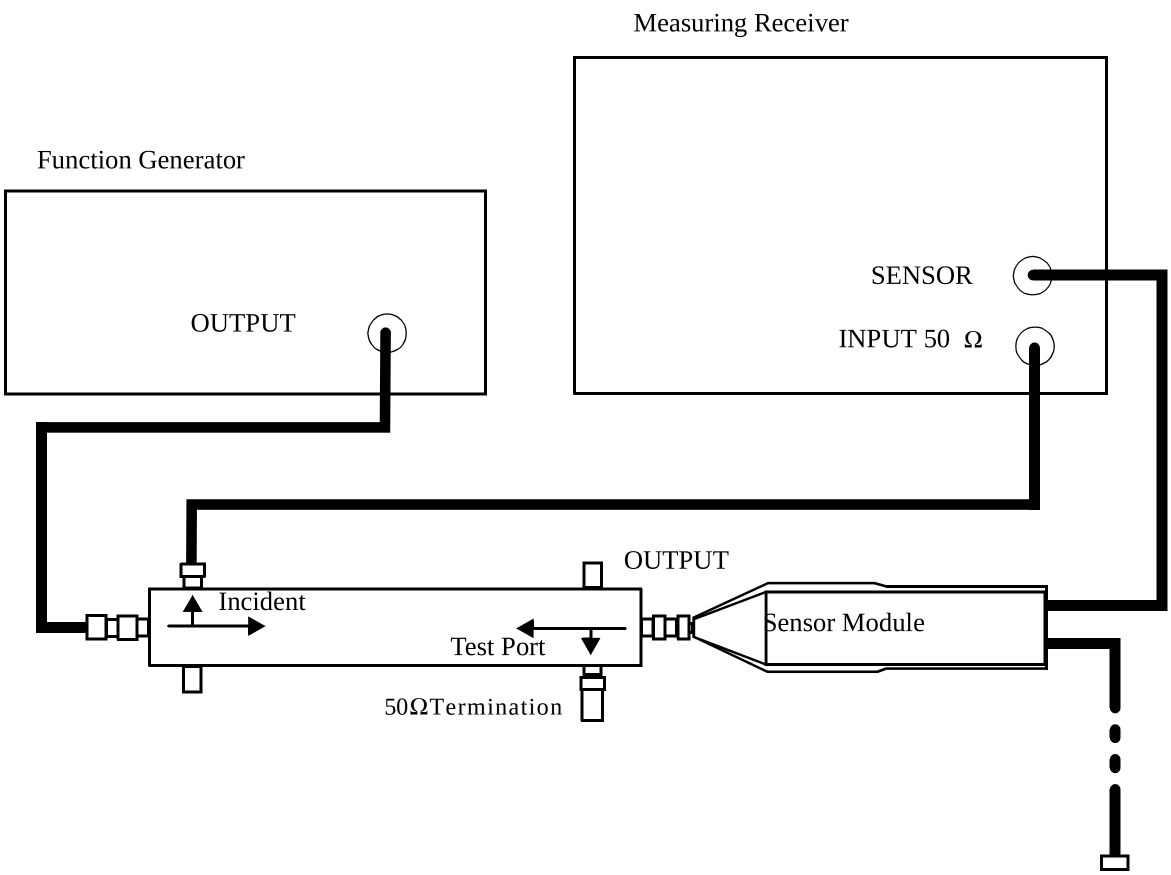
RF Analyzer Level Accuracy Performance Test 24

Description

A function generator's level is set to approximately 500 mW and measured with a power meter. Then, the power is measured with the unit-under-test, and the two measurements are compared.

A dual directional coupler is used to minimize mismatch uncertainty.

Calibration setup



Make the following function generator settings:

- Frequency: 50 MHz
- Level: 14 V
- Waveform: Sine

NOTE: Make sure the function generator is warmed up so the frequency doesn't drift excessively during the measurement.

Make the following measuring receiver settings:

- Input frequency: 50 MHz
- Track mode
- RF Power measurement
- 4.4 SPCL
- 8.3 SPCL

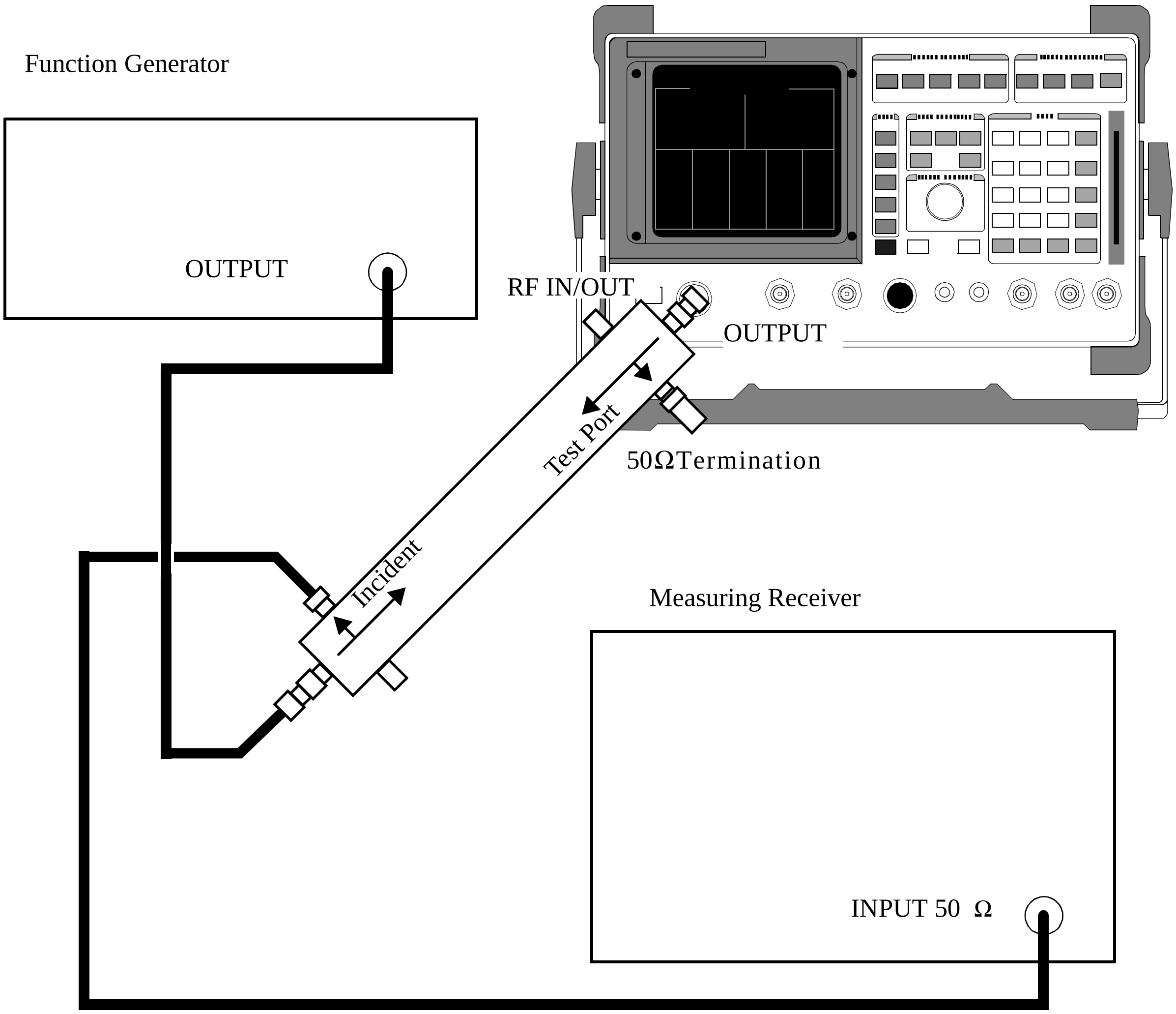
Calibration procedure

1. Make an RF POWER measurement, in watts, with the measuring receiver. Record the measured power as Reference power in step 9 of the *Measurement Procedure*.

2. Disconnect the sensor cable at the measuring receiver (leave the sensor connected to the directional coupler so it will be terminated into 50 Ω.

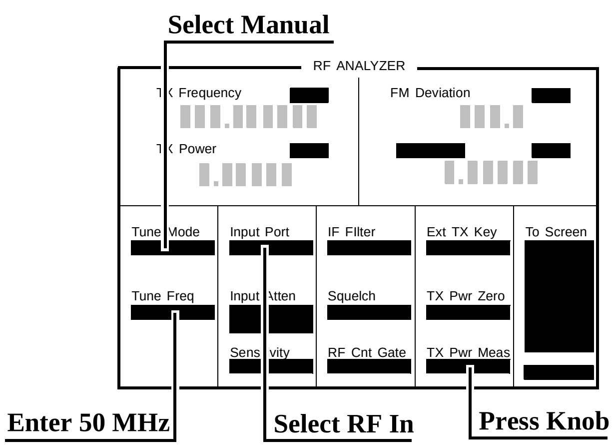
3. Make a TUNED RF LEVEL measurement, in watts, with the measuring receiver. Record the measured level as Tuned RF #1 in step 9 of the *Measurement Procedure*.

Measurement setup



Measurement procedure

1. Make a TUNED RF LEVEL measurement, in watts, with the measuring receiver. Record the measured level as Tuned RF #2 in step 9 of the *Measurement Procedure*.
2. Select the RF ANALYZER screen.
3. Set the Tune Mode field to Manual.
4. Set the Tune Freq field to 50 MHz.
5. Set the Input Port field to RF In.
6. Zero the power meter:
   - **.1** Temporarily disconnect the unit-under-test's input.
   - **.2** Move the cursor to the TX Pwr Zero field and press the knob.



7. Connect the output of the directional coupler to the unit-under-test's RF IN/OUT connector. Connect the directional coupler directly to the unit-under-test without using a cable.
8. Read the TX Power field, in watts, and record it as UUT Power in step 9 of the *Measurement Procedure*.
9. Calculate the Measured Power as follows:

$$\text{Measured Power} = 500\text{ mW} * \left[\left(\frac{\text{UUT Power}}{\text{Reference Power}}\right)\left(\frac{\text{Tuned RF \#1}}{\text{Tuned RF \#2}}\right)\right]$$

   The result is in mW. Record the results in the PTR.

10. Set the Function Generator to 8.90 V.
11. Repeat the Calibration and Measurement procedures substituting 200 mW in the formula of step 9.

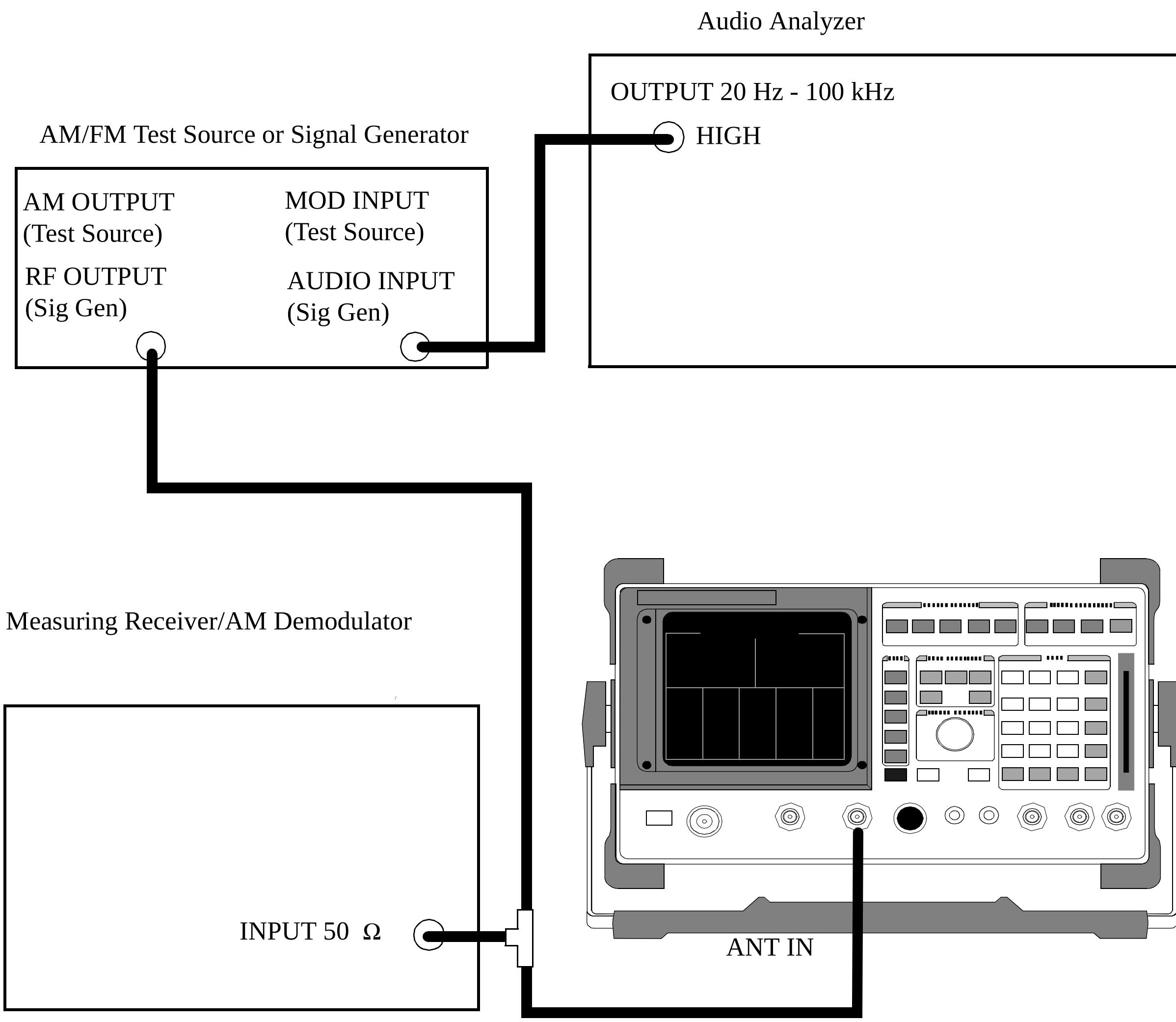
RF Analyzer AM Accuracy Performance Test 25

Description

The AM/FM test source or signal generator provides the RF signal with AM. The signal is measured both by the Test Set’s internal RF analyzer and the measuring receiver.

The AM signal comes from the external audio source in the audio analyzer. The audio level is varied until the modulation is at the desired level as measured by the measuring receiver.

Setup



Make the following AM/FM test source setting:

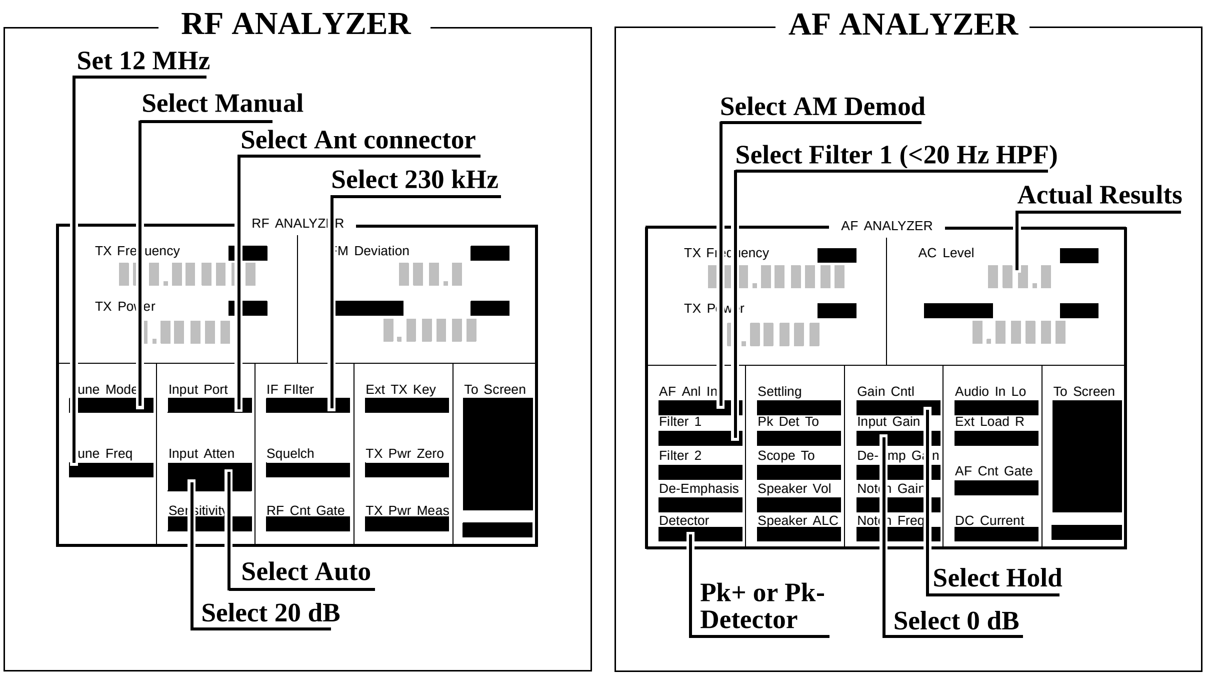
- Test Mode: AM
- Tune to 12 MHz

Make the following measuring receiver settings:

- Reset the measuring receiver
- <20 Hz High-Pass Filter
- AM Mode
- Frequency 30 MHz
- Level 0 dBm
- External AM Modulation

Procedure

1. Select the RF ANALYZER screen and set the Tune Mode to Manual, Tune Freq to 12 MHz, the Input Port to Ant, Input Atten to Auto and 20 dB, and the IF filter to 230 kHz.
2. Select the AF ANALYZER screen and set the AF Anl In field to AM Demod, Filter 1 to <20 Hz HPF, the Gain Cntl to Hold, and the Input Gain to 0 dB.



3. Set the AF Analyzer Detector field to PK+ or PK– as shown in the PTR and set the audio analyzer’s audio output amplitude and frequency to the depths and rates shown in the PTR.
4. Adjust the audio analyzer’s audio output amplitude until the measuring receiver display indicates the correct depth.
5. Read the Test Set AM depth and compare the reading to the limits shown in the PTR.

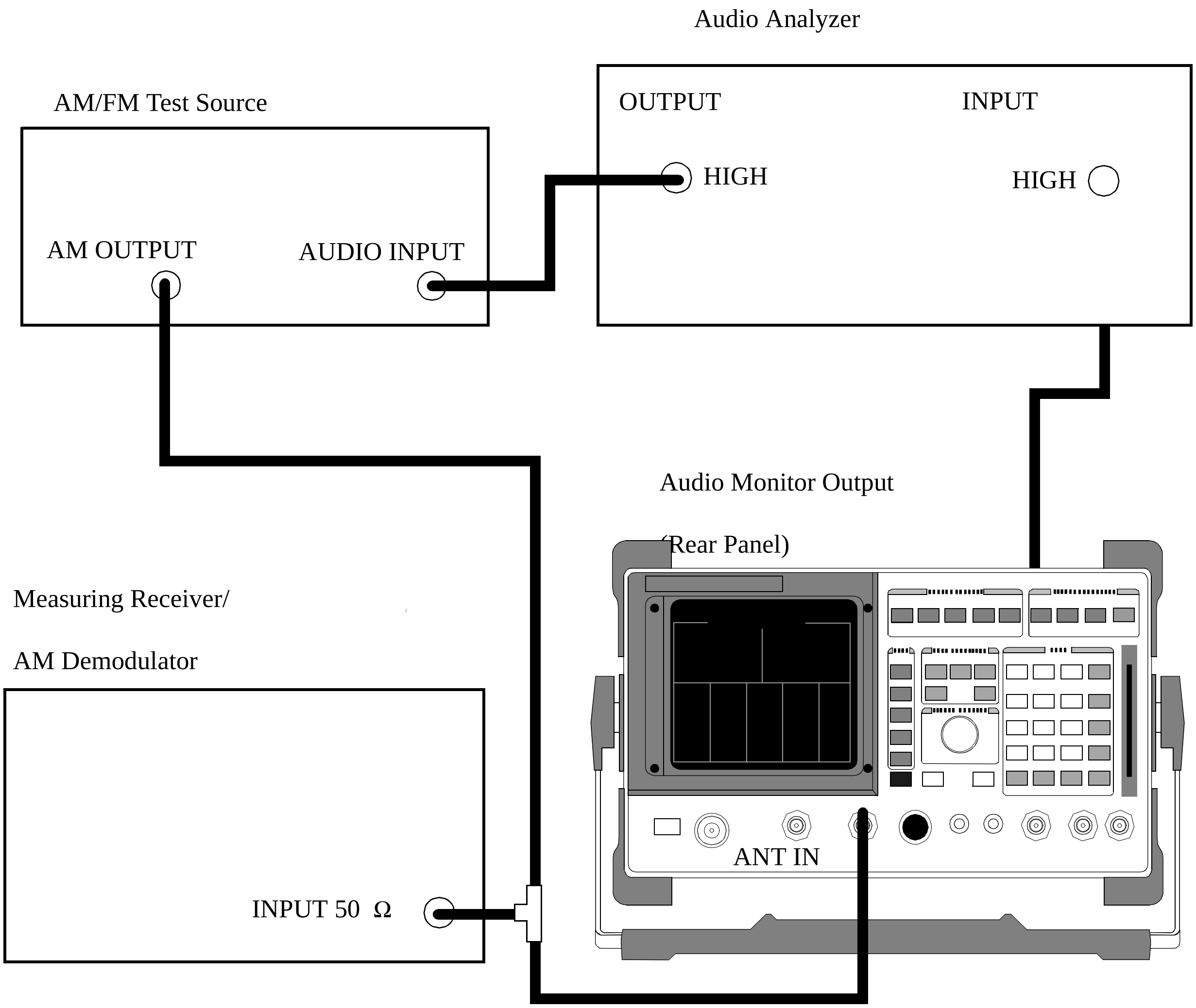
RF Analyzer AM Distortion Performance Test 26

Description

The AM source in the AM/FM test source provides the RF signal with AM. The signal is measured both by the Test Set's internal RF analyzer and the measuring receiver's AM demodulator.

The AM signal comes from the external audio source in the audio analyzer. The audio level is varied until the modulation is at the desired AM depth as measured by the AM demodulator. The distortion of the demodulated AM is measured by the external audio analyzer. The signal from the AM/FM test source has much lower AM distortion, lower noise, and wider bandwidth than the receiver in the Test Set's internal RF analyzer.

Setup


Audio Analyzer
AM/FM Test Source
OUTPUT
INPUT
HIGH
HIGH
AM OUTPUT
AUDIO INPUT
Audio Monitor Output
(Rear Panel)
Measuring Receiver/
AM Demodulator
ANT IN
INPUT 50 Ω

Make the following AM/FM test source setting:

- Test Mode: AM

Make the following measuring receiver settings:

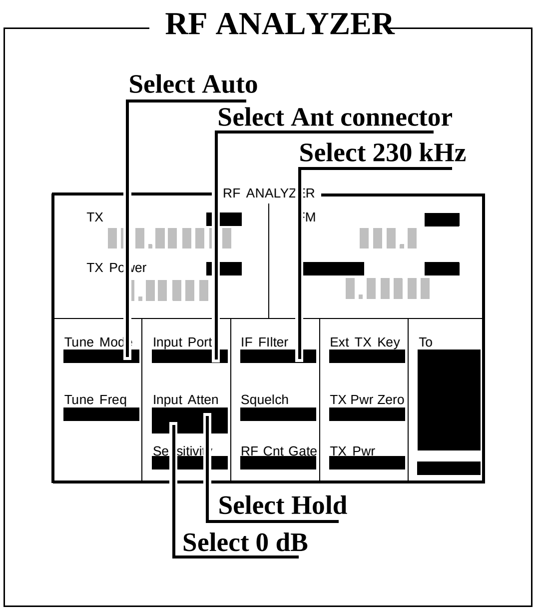
- Reset the measuring receiver
- AM Mode

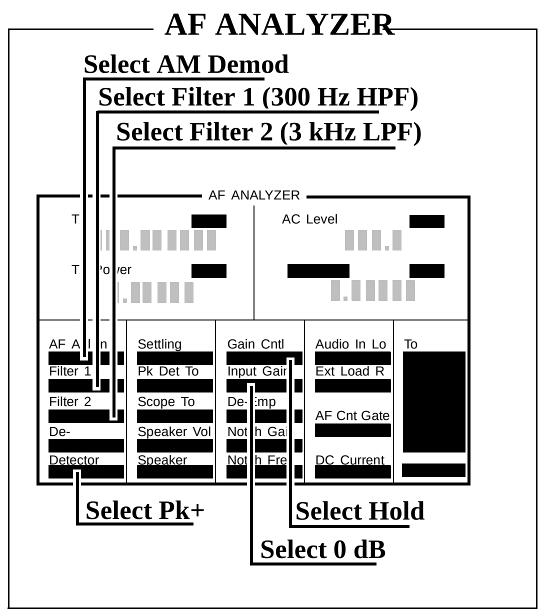
Make the following audio analyzer source settings:

- Frequency: 1 kHz
- Distortion

Procedure

1. Select the RF ANALYZER screen and set the Tune Mode to Auto, the Input Port to Ant, the Input Atten to Hold and 0 dB, and IF Filter to 230 kHz.
2. Select the AF ANALYZER screen and set the AF Anl In field to AM Demod Filter 1 to 300 Hz HPF, Filter 2 to 3 kHz LPF, the Detector to Pk+, Gain Cntl to Hold and the Input Gain to 0 dB.





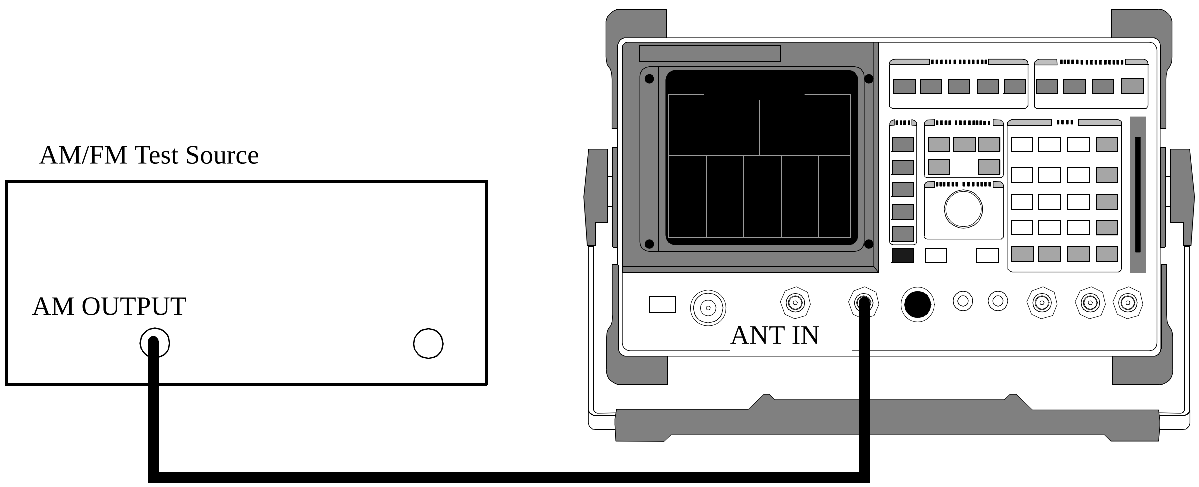
3. Set the audio analyzer's source's amplitude for the depths listed in the PTR (as measured by the measuring receiver).
4. Read the distortion for each depth on the audio analyzer and compare the reading to the limits shown in the PTR.

RF Analyzer Residual AM Performance Test 27

Description

The AM/FM test source provides a CW signal with little residual AM. The AM is measured by the Test Set's internal RF Analyzer.

Setup

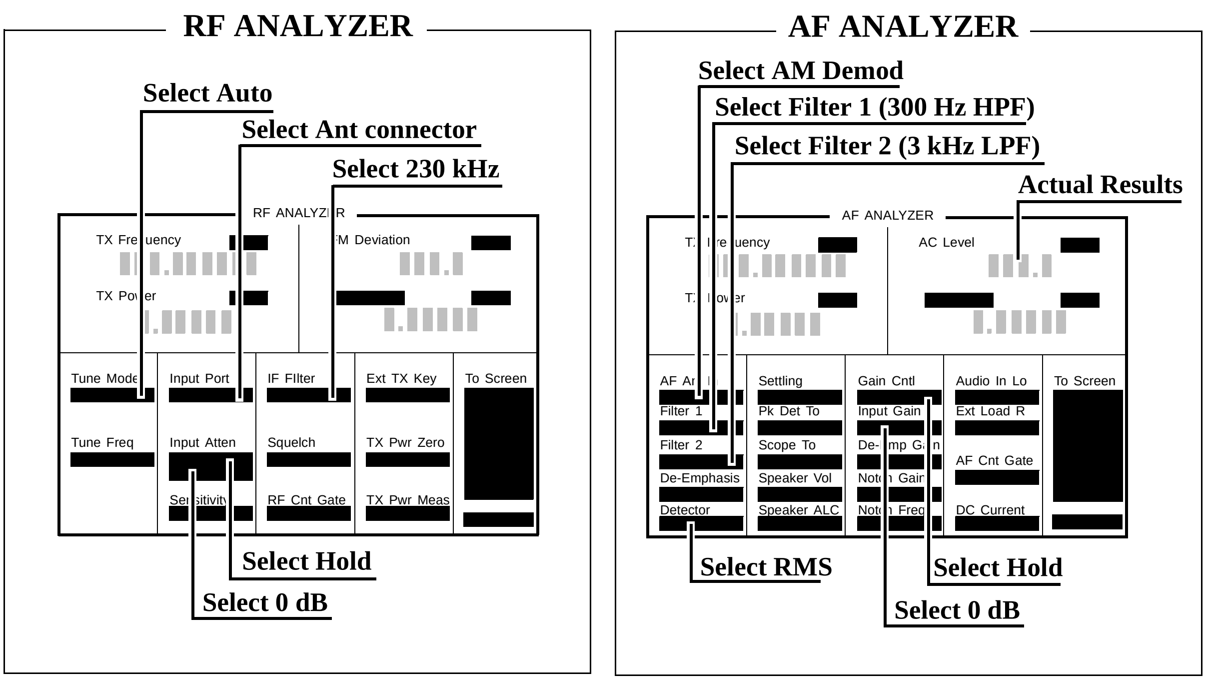


Make the following AM/FM test source setting:

- Test Mode: AM

Procedure

1. Select the RF ANALYZER screen and set the Tune Mode to Auto, the Input Port to Ant, the Input Atten to Hold and 0 dB, and the IF Filter to 230 kHz.
2. Select the AF ANALYZER screen and set the AF Anl In field to AM Demod, Filter 1 to 300 Hz LPF, Filter 2 to 3 kHz LPF, the Detector to RMS, Gain Cntl to Hold and the Input Gain to 0 dB.



3. Measure the residual AM on the AM Depth display. It must be less than 0.2%

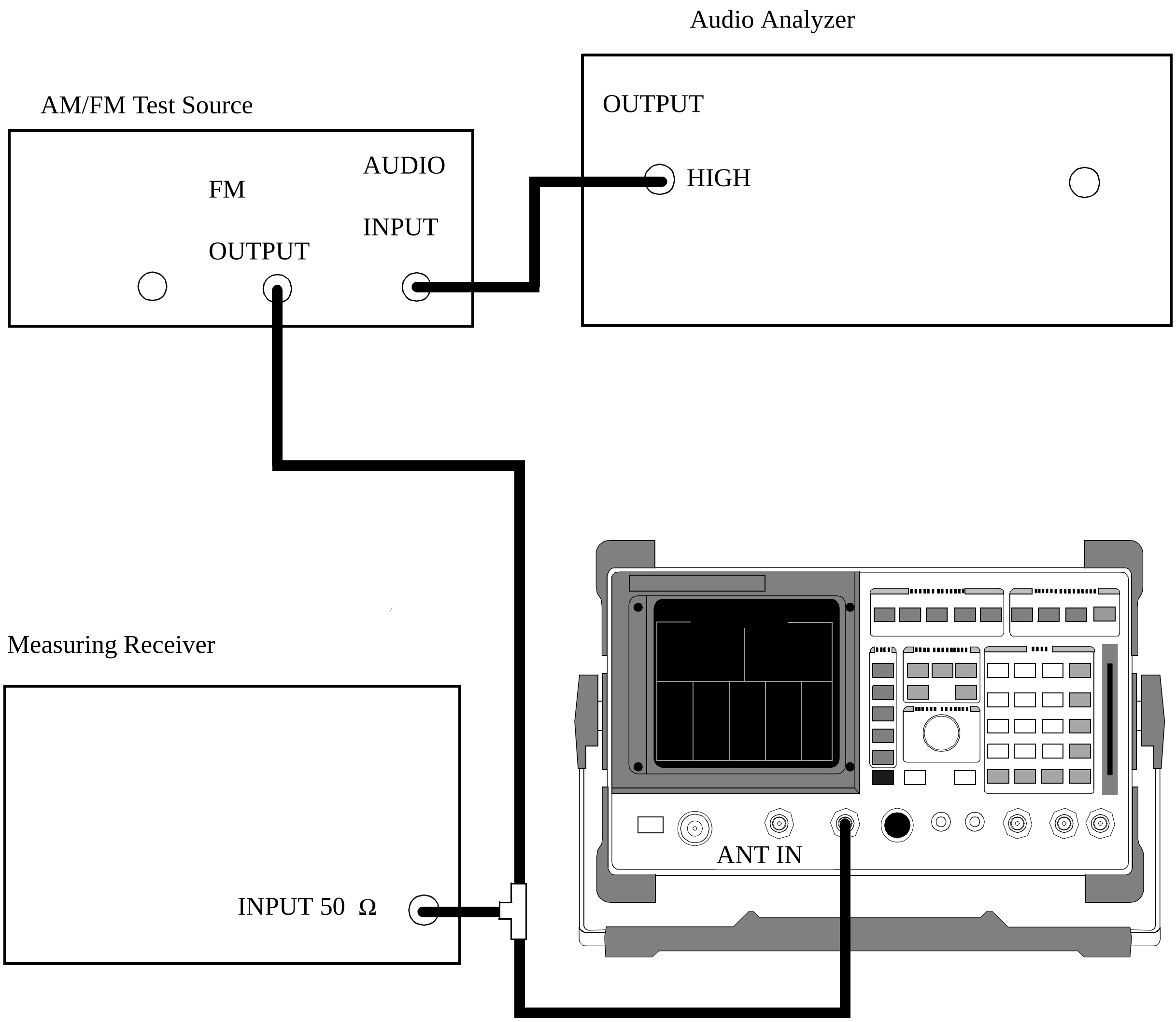
RF Analyzer FM Accuracy Performance Test 28

Description

The AM/FM test source provides the RF signal with FM. The signal is measured both by the Test Set's internal RF analyzer and the measuring receiver's FM demodulator. The FM signal is generated from the audio analyzer's source. The audio level is varied until the modulation is at the desired level as measured by the measuring receiver. The signal from the AM/FM test source has much lower FM distortion, lower noise, and wider bandwidth than the receiver in the Test Set's internal RF analyzer.

NOTE: Use the AM/FM test source output labeled FM÷32 for 12.5 MHz and the output labeled FM for 400 MHz. You can measure the frequency with the measuring receiver and adjust it with the CARRIER FREQUENCY TUNE knob, but the exact frequency isn't critical.

Setup



Make the following AM/FM test source setting:

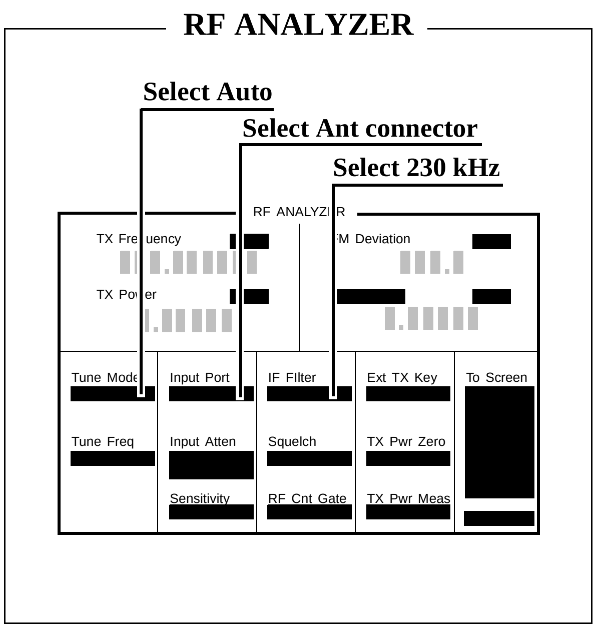
- Test Mode: FM

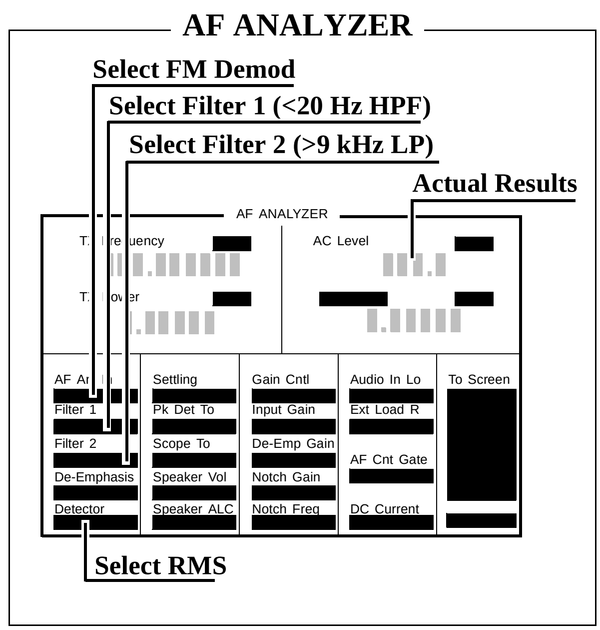
Make the following measuring receiver settings:

- Reset the measuring receiver
- FM Mode
- RMS Detector

Procedure

1. Select the RF ANALYZER screen and set Tune Mode to Auto, the Input Port to Ant, and the IF filter to 230 kHz.
2. Select the AF ANALYZER screen and set the AF Anl In field to FM Demod, Filter 1 to <20 Hz HPF, Filter 2 to >99 kHz LP, and the Detector to RMS.





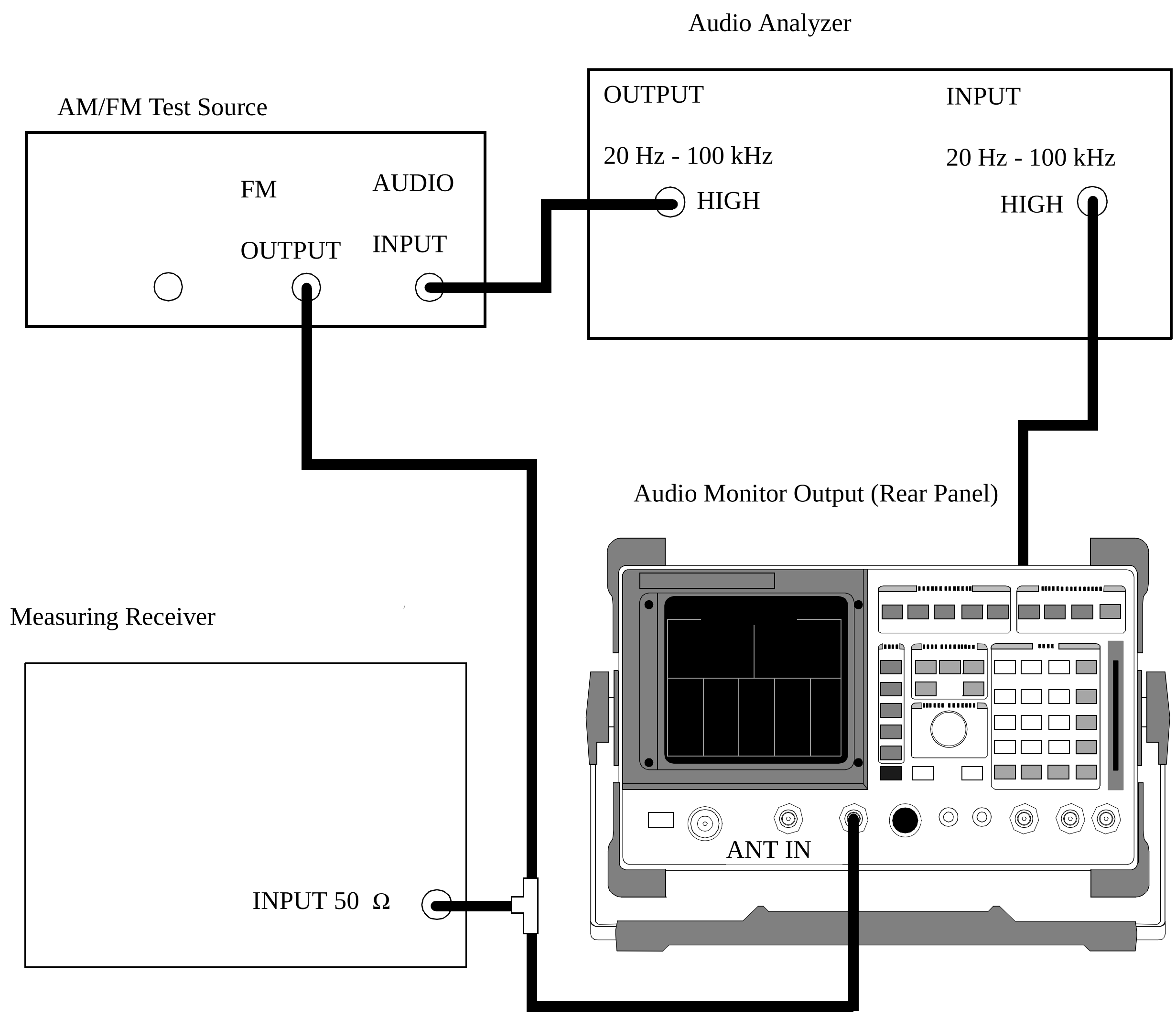
3. Set the audio analyzer to the frequency (audio rate) shown in the PTR (adjust the audio analyzer’s amplitude until the measuring receiver reads the correct deviation).
4. Read the FM deviation on the Test Set and compare it to the limits shown in the PTR.

RF Analyzer FM Distortion Performance Test 29

Description

The AM/FM test source provides the RF signal with FM. The signal is measured both by the Test Set’s internal RF analyzer and the measuring receiver. The FM signal comes from the external audio analyzer. The audio level is varied until the modulation is at the desired FM deviation as measured by the measuring receiver. The distortion of the demodulated FM is measured by the external audio analyzer. The signal from the AM/FM test source has much lower FM distortion, lower noise, and wider bandwidth than the receiver in the Test Set’s internal RF analyzer.

Setup


Audio Analyzer
OUTPUT
20 Hz - 100 kHz
HIGH
INPUT
20 Hz - 100 kHz
HIGH
AM/FM Test Source
FM
OUTPUT
AUDIO
INPUT
Audio Monitor Output (Rear Panel)
Measuring Receiver
INPUT 50 Ω
ANT IN

Make the following AM/FM test source setting:

- Test Mode: FM

Make the following measuring receiver settings:

- Reset the measuring receiver
- FM Mode
- 300 Hz High-Pass Filter
- 3 kHz Low-Pass Filter

Make the following audio source setting in the audio analyzer:

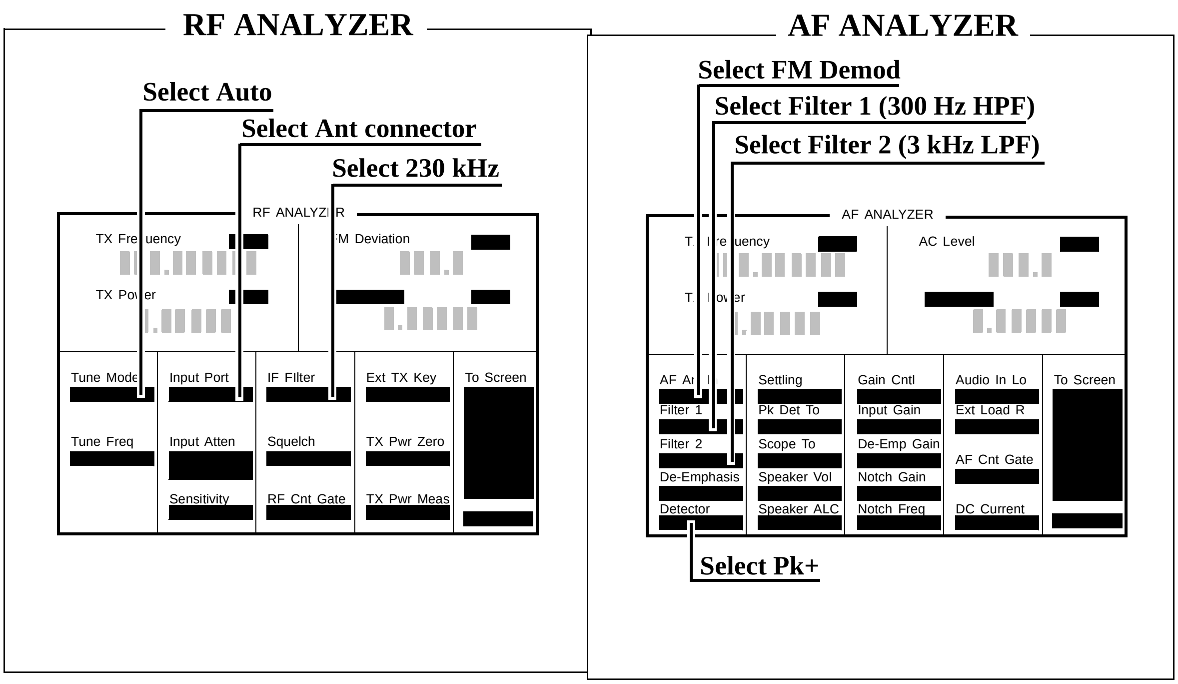
- Frequency: 1 kHz

Make the following audio analyzer setting:

- Distortion

Procedure

1. Select the RF ANALYZER screen and set the Tune Mode to Auto, the Input Port to Ant, and the IF Filter to 230 kHz.
2. Select the AF ANALYZER screen and set the AF Anl In field to FM Demod, Filter 1 to 300 Hz HPF, Filter 2 to 3 kHz LPF, and the Detector to Pk+.



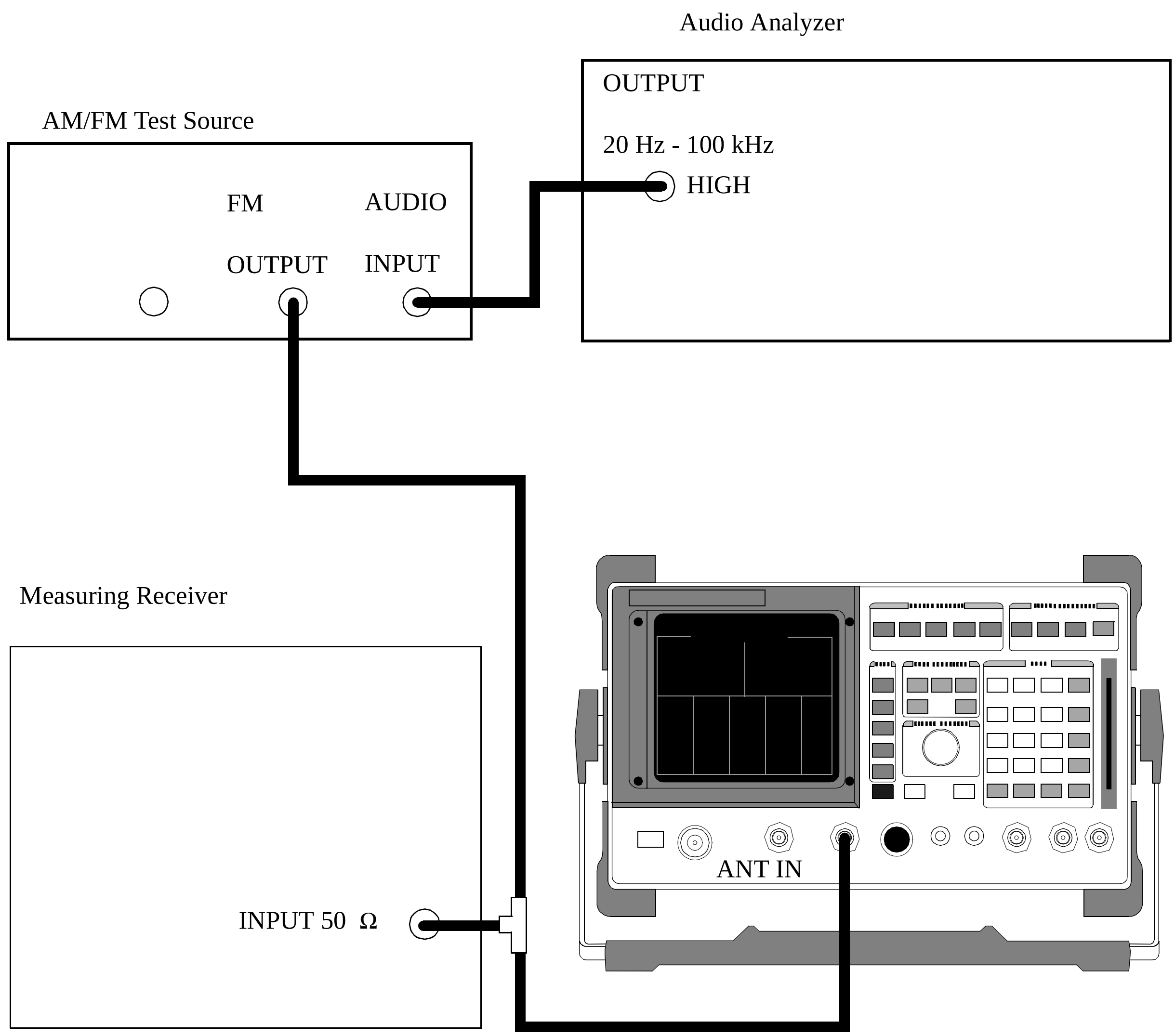
3. Adjust the audio source of the audio analyzer's amplitude until the measuring receiver measures the deviation shown in the PTR.
4. Read the distortion on the audio analyzer and compare the reading to the limits shown in the PTR.

RF Analyzer FM Bandwidth Performance Test 30

Description

The AM/FM test source provides the RF signal with FM. The signal is measured both by the Test Set’s internal RF analyzer and the measuring receiver. The FM signal comes from the external audio analyzer. The audio level is varied until the modulation is at the desired level as measured by the measuring receiver. The audio rate is varied in several steps from 20 Hz to 70 kHz. The difference between the maximum and minimum FM peak deviation is noted. The signal from the AM/FM test source has much lower FM distortion, lower noise, and wider bandwidth than the receiver in the Test Set’s internal RF analyzer.

Setup


Audio Analyzer
OUTPUT
20 Hz - 100 kHz
HIGH
AM/FM Test Source
FM
OUTPUT
AUDIO
INPUT
Measuring Receiver
INPUT 50 Ω
ANT IN

Make the following AM/FM test source setting:

- Test Mode: FM

Make the following measuring receiver settings:

- Reset the measuring receiver
- FM Mode
- Filters off

Make the following audio analyzer settings:

- Frequency: 1 kHz
- Impedance: 50 µ
- Amplitude: 50 mV

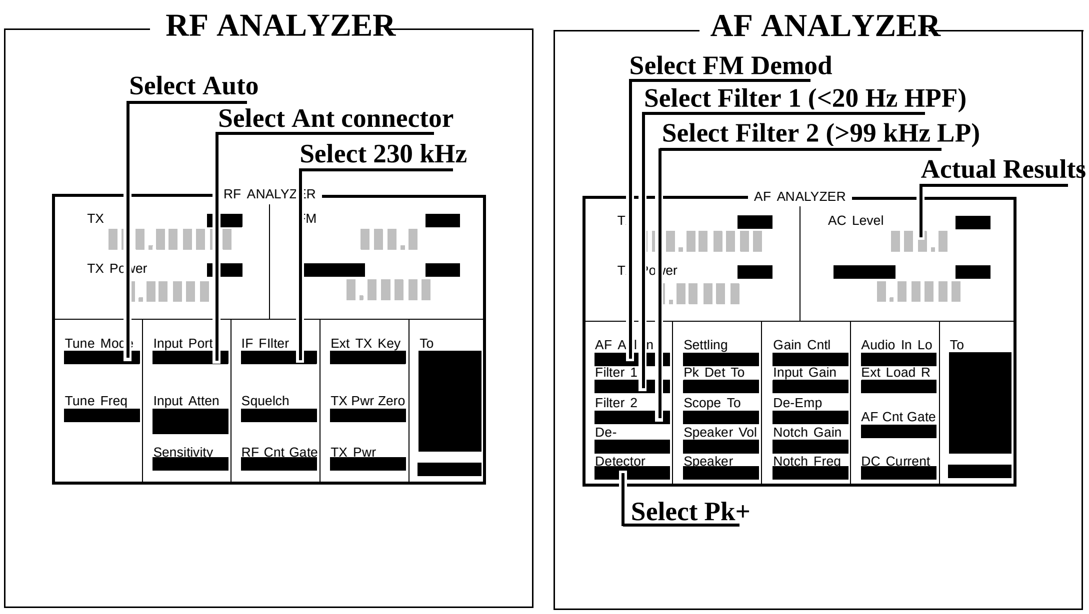
OR

- Frequency: 1 kHz
- Impedance: 600 µ
- Amplitude: 300 mV

These settings should result in a deviation reading of about 25 kHz on the measuring receiver. Fine adjust the amplitude for 25 kHz deviation as read on the measuring receiver.

Procedure

1. Select the RF ANALYZER screen and set the Tune Mode to Auto, the Input Port to Ant, and the IF Filter to 230 kHz, squelch open.
2. Allow the Test Set to tune to the input signal and then set the Tune Mode to Manual.
3. Select the AF ANALYZER screen and set the AF Anl In field to FM Demod, Filter 1 to < 20 Hz HPF, Filter 2 to >99 kHz LPF, and the Detector to Pk+.



4. Set the audio analyzer to the following frequencies and record the FM deviation displayed on the measuring receiver for each frequency (check the deviation measured by the measuring receiver at each frequency and adjust the audio analyzer amplitude if needed to make sure it is 25 kHz): 20 Hz, 100 Hz, 1000 Hz, 10000 Hz, 35000 Hz, 70000 Hz.
5. The result of this test is the ratio of the maximum to the minimum measured deviation. Calculate the ratio in dB as follows:

$$\text{Result(dB)} = 20\log\frac{\text{max. deviation}}{\text{min. deviation}}$$

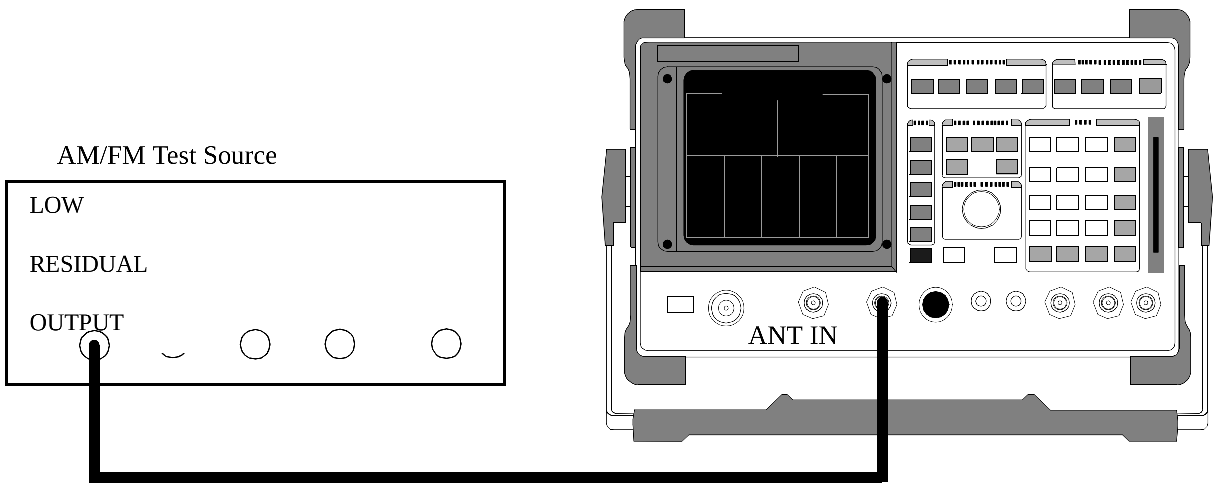
The test set limit is 0 to 3 db.

RF Analyzer Residual FM Performance Test 31

Description

The AM/FM test source provides a CW signal with minimal residual FM. The FM is measured by the Test Set's internal RF analyzer.

Setup

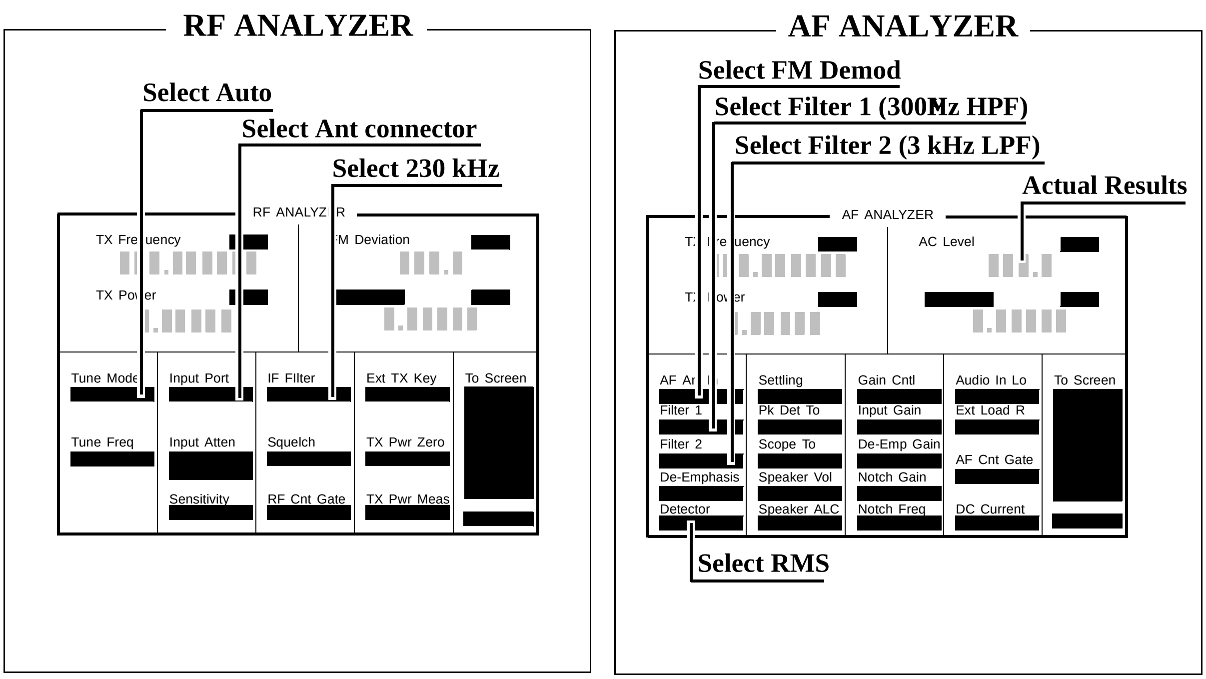


Make the following AM/FM test source setting:

- Test Mode: Residual FM

Procedure

1. Select the RF ANALYZER screen and set the Tune Mode to Auto, the Input Port to Ant, and the IF Filter to 230 kHz.
2. Select the AF ANALYZER screen and set the AF Anl In field to FM Demod, Filter 1 to 300 Hz HPF, Filter 2 to 3 kHz LPF, and the Detector to RMS.



3. Read the FM Deviation (residual FM) and compare to the limits shown in the PTR.

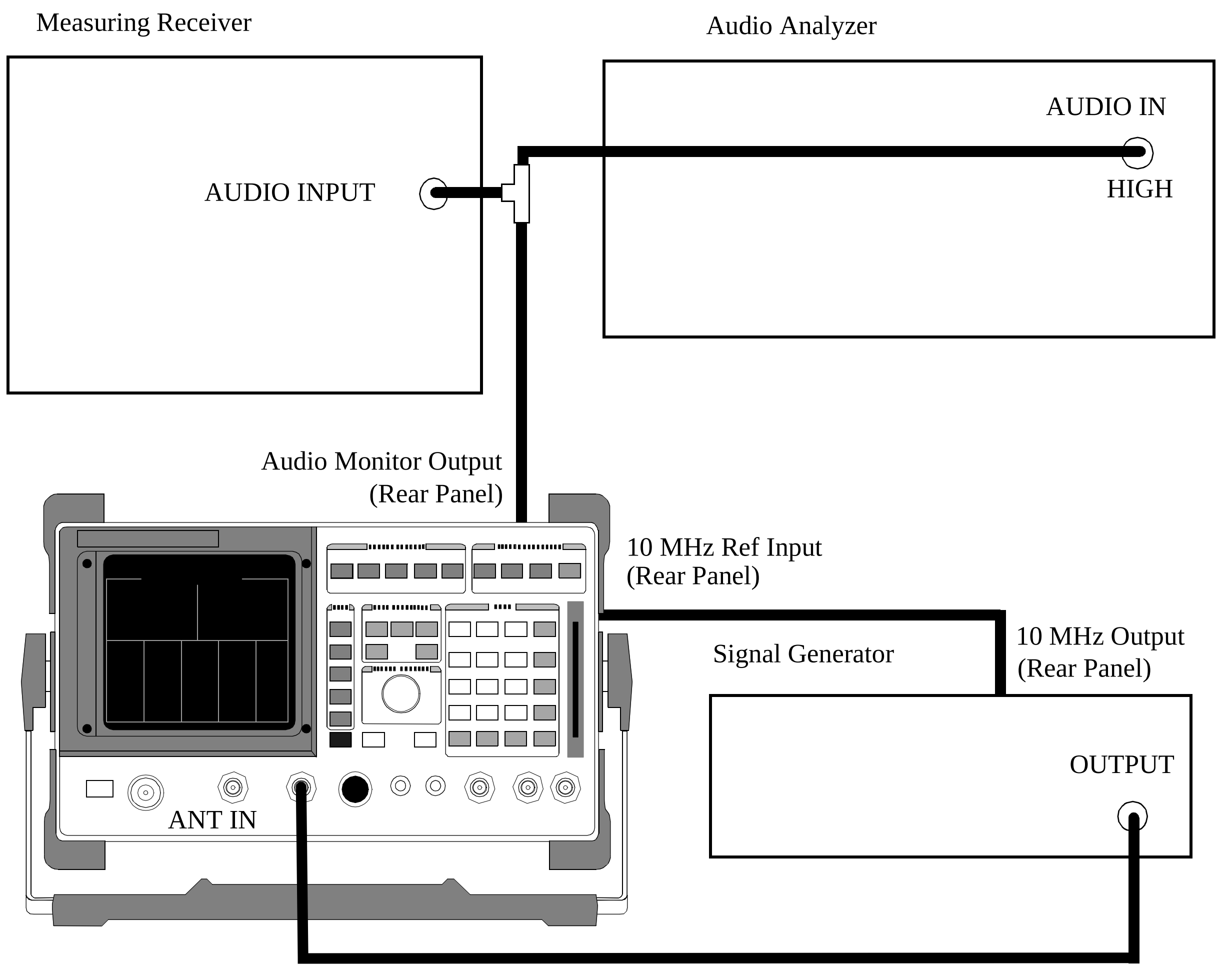
RF Analyzer SSB Demodulation Performance Test 32

Description

This test has two parts. The first part measures SSB demodulator distortion. An RF carrier is applied to the RF analyzer which is tuned 1 kHz away from the carrier frequency. Audio distortion of the demodulated 1 kHz signal is measured with a measuring receiver.

The second part measures SSB demodulator flatness. An RF carrier is applied to the RF analyzer and the RF analyzer is tuned to several frequencies so that the demodulated signal will span the RF analyzer’s audio range. The flatness is measured on an audio analyzer.

Setup



Make the following measuring receiver settings:

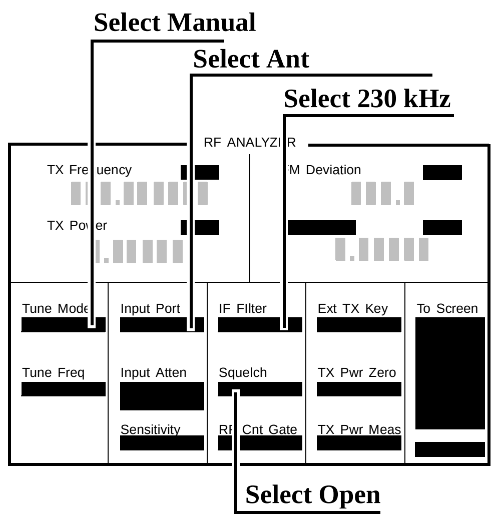
- Audio Distortion - 1 kHz
- Audio Input
- RMS

Make the following audio analyzer settings:

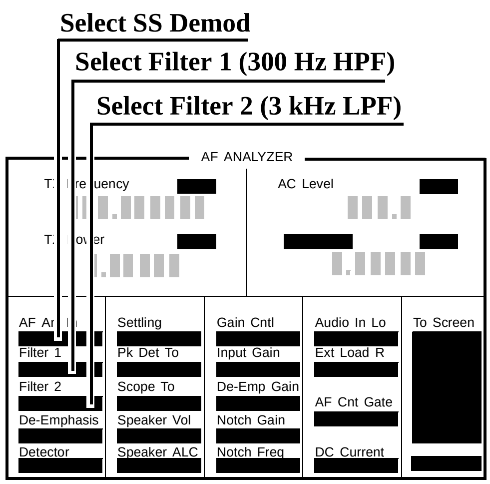
- Low-Pass filters: OFF
- AC Volts
- LOG

Distortion procedure

1. Select the RF ANALYZER screen.
2. Set the Tune Mode field to Manual.
3. Set the Input Port field to Ant.
4. Set the IF Filter field to 230 kHz.
5. Set the Squelch field to Open.



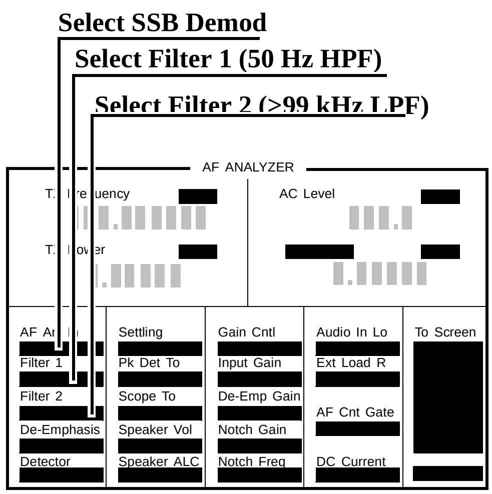
6. Select the AF ANALYZER screen.
7. Set the AF Anl In field to SSB Demod.
8. Set the Filter 1 field to 300 Hz HPF.
9. Set the Filter 2 field to 3 kHz LPF.



10. Set the Signal Generator’s frequency and level, and the Test Set’s RF analyzer’s tune frequency according to the PTR. Read the audio distortion on the measuring receiver and compare it to the limits shown in the PTR.

Flatness procedure

1. Set the Signal Generator frequency to 501 MHz.
2. Set the Signal Generator amplitude to –19 dBm.
3. Select the Test Set’s AF ANALYZER screen.
4. Set the AF Anl In field to SSB Demod.
5. Set the Filter 1 field to 50 Hz HPF.
6. Set the Filter 2 field to >99 kHz LPF.



7. Select the Test Set’s RF ANALYZER screen.
8. Set the Tune Freq field to the RF Analyzer frequencies listed in the PTR and measure the demodulated signal voltage, in dBv, on the audio analyzer.
9. Calculate the flatness, in dB, by subtracting the highest measured voltage from the lowest measured voltage and compare it to the limits shown in the PTR.

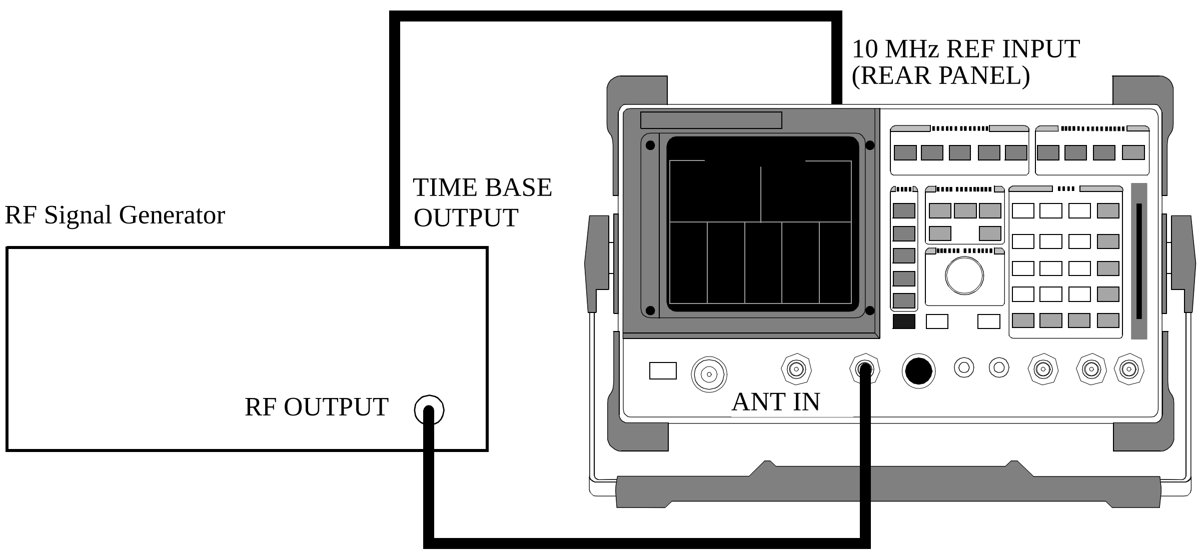
Spectrum Analyzer Image Rejection Performance Test 33

Description

This test has two parts. The first part measures the spectrum analyzer's ability to reject image frequencies. The spectrum analyzer is tuned to a signal frequency while an image signal is applied to the ANT IN connector from a signal generator.

The second part measures the spectrum analyzer's residual response at several frequencies.

Setup

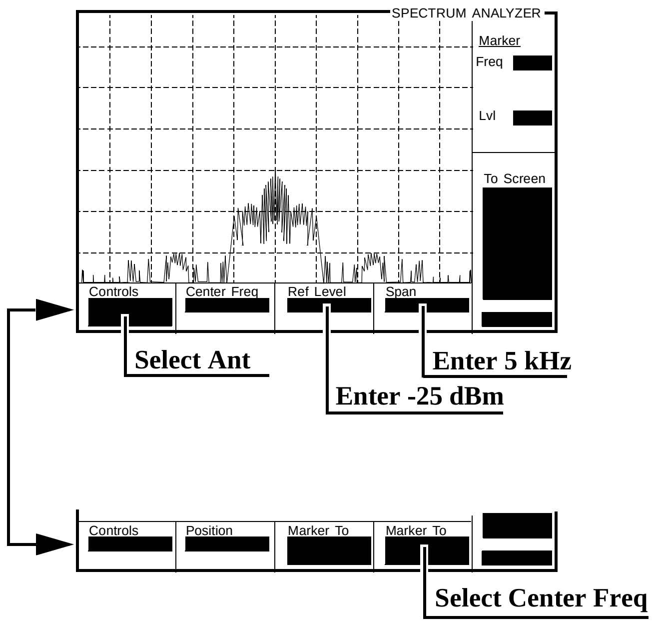


Make the following signal generator settings:

- Power: –20 dBm
- Modulation: OFF

Image rejection procedure

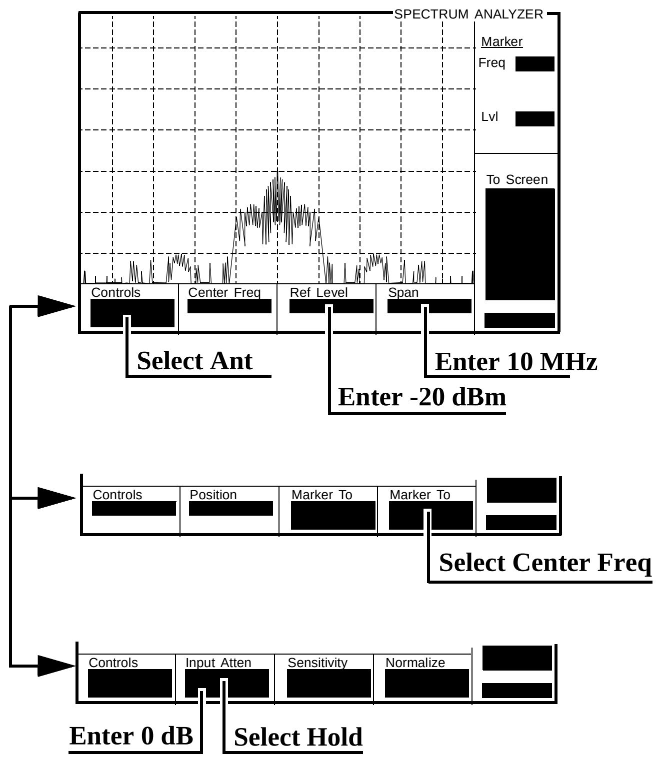
1. Select the SPECTRUM ANALYZER screen.
2. Set the RF In/Ant field to Ant.
3. Set the Ref Level field to –25 dBm.
4. Set the Span field to 5 kHz.
5. Set the Controls field to Marker and select Center Frequency.
6. Set the Controls field to Main.



7. Set the signal generator’s frequency and the spectrum analyzer’s center frequency to the frequencies shown in the PTR and measure the image response on the spectrum analyzer. The image response is the spectrum analyzer’s marker level plus the signal generator’s output level (20 dB).

Residual response procedure

1. Disconnect the signal generator from the Test Set's ANT IN connector.
2. Set the Controls field to Auxiliary and the Input Atten field to Hold and 0 dB.
3. Set the Controls field to Marker and set the Marker To field to Center Freq.
4. Set the Controls field to Main.
5. Set the Span field to 10 MHz.
6. Set the Ref Level field to –20 dBm.



7. Set the Center Freq field to the frequencies shown in the PTR and measure the residual response on the spectrum analyzer's marker level field.

6

Performance Test Records

8920A Performance Test Record

8920A RF Communications Test Set

Tested By ____________ Serial Number ____________ Date ____________
Temp ____________ Humidity ____________ Time ____________

8920A RF Gen AM Distortion Performance Test 1

Table 10 RF Gen AM Distortion Table

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Distortion Limits (%)		
				Lower	Upper	Actual
-9.1	1.5 (Opt 055)	30	1	0.00	2.00	
-9.1	1.5 (Opt 055)	90	1	0.00	3.00	
-9.1	19.99	30	1	0.00	2.00	
-9.1	19.99	90	1	0.00	3.00	
-9.1	50	30	1	0.00	2.00	
-9.1	50	90	1	0.00	3.00	
-9.1	100	30	1	0.00	2.00	
-9.1	100	90	1	0.00	3.00	
-9.1	150	30	1	0.00	2.00	
-9.1	150	90	1	0.00	3.00	
-9.1	250	30	1	0.00	2.00	
-9.1	250	90	1	0.00	3.00	
-9.1	900	30	1	0.00	2.00	
-9.1	900	90	1	0.00	3.00	
-9.1	1000	30	1	0.00	2.00	
-9.1	1000	90	1	0.00	3.00	
-14	1.5 (Opt 055)	30	1	0.00	2.00	
-14	1.5 (Opt 055)	90	1	0.00	3.00	
-14	19.99	30	1	0.00	2.00	
-14	19.99	90	1	0.00	3.00	

Table 10 RF Gen AM Distortion Table (Continued)

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Distortion Limits (%)		
				Lower	Upper	Actual
-14	50	30	1	0.00	2.00	
-14	50	90	1	0.00	3.00	
-14	100	30	1	0.00	2.00	
-14	100	90	1	0.00	3.00	
-14	150	30	1	0.00	2.00	
-14	150	90	1	0.00	3.00	
-14	250	30	1	0.00	2.00	
-14	250	90	1	0.00	3.00	
-14	900	30	1	0.00	2.00	
-14	900	90	1	0.00	3.00	
-14	1000	30	1	0.00	2.00	
-14	1000	90	1	0.00	3.00	

8920A
RF Gen AM Accuracy
Performance Test 2

Table 11 RF Gen AM Accuracy Table

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Limits (%)		
				Lower	Upper	Actual
-9.1	1.5 (Opt 055)	30	1	27.0	33.0	
-9.1	1.5 (Opt 055)	70	1	65.0	75.0	
-9.1	19.99	30	1	27.0	33.0	
-9.1	19.99	70	1	65.0	75.0	
-9.1	50	30	1	27.0	33.0	
-9.1	50	70	1	65.0	75.0	
-9.1	100	30	1	27.0	33.0	
-9.1	100	70	1	65.0	75.0	
-9.1	150	30	1	27.0	33.0	
-9.1	150	70	1	65.0	75.0	
-9.1	250	30	1	27.0	33.0	
-9.1	250	70	1	65.0	75.0	
-9.1	900	30	1	27.0	33.0	
-9.1	900	70	1	65.0	75.0	
-9.1	1000	30	1	27.0	33.0	
-9.1	1000	70	1	65.0	75.0	
-14	1.5 (Opt 055)	30	1	27.0	33.0	
-14	1.5 (Opt 055)	70	1	65.0	75.0	
-14	19.99	30	1	27.0	33.0	
-14	19.99	70	1	65.0	75.0	

Table 11 RF Gen AM Accuracy Table (Continued)

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Limits (%)		
				Lower	Upper	Actual
-14	50	30	1	27.0	33.0	
-14	50	70	1	65.0	75.0	
-14	100	30	1	27.0	33.0	
-14	100	70	1	65.0	75.0	
-14	150	30	1	27.0	33.0	
-14	150	70	1	65.0	75.0	
-14	250	30	1	27.0	33.0	
-14	250	70	1	65.0	75.0	
-14	900	30	1	27.0	33.0	
-14	900	70	1	65.0	75.0	
-14	1000	30	1	27.0	33.0	
-14	1000	70	1	65.0	75.0	

8920A RF Gen AM Flatness Performance Test 3

Table 12 RF Gen AM Flatness Table

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Results (dB)
-9.1	500	50	1	0 dB
-9.1	500	50	10	
-9.1	500	50	20	
-9.1	500	50	25	
-14.1	500	50	1	0 dB
-14.1	500	50	10	
-14.1	500	50	20	
-14.1	500	50	25	

8920A RF Gen FM Distortion Performance Test 4

Table 13 RF Gen FM Distortion Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Limits (%)			
				Lower (STD/050)	Upper (STD)	Upper (050)	Actual
-9.1	10 (Opt 055)	99	1	0.00	1.00	0.50	
-9.1	10 (Opt 055)	5	1	0.00	1.00	0.50	
-9.1	312.5	5	1	0.00	1.00	0.50	
-9.1	425	50	1	0.00	1.00	0.50	
-9.1	501	99	1	0.00	1.00	0.50	
-9.1	501	50	1	0.00	1.00	0.50	
-9.1	501	5	1	0.00	1.00	0.50	
-9.1	568.75	50	1	0.00	1.00	0.50	
-9.1	656.25	99	1	0.00	1.00	0.50	
-9.1	656.25	50	1	0.00	1.00	0.50	
-9.1	656.25	5	1	0.00	1.00	0.50	
-9.1	750	99	1	0.00	1.00	0.50	
-9.1	750	50	1	0.00	1.00	0.50	
-9.1	750	5	1	0.00	1.00	0.50	
-9.1	856.25	99	1	0.00	1.00	0.50	
-9.1	856.25	50	1	0.00	1.00	0.50	
-9.1	856.25	5	1	0.00	1.00	0.50	
-9.1	956.25	50	1	0.00	1.00	0.50	
-9.1	976.002	5	1	0.00	1.00	0.50	

Table 13 RF Gen FM Distortion Table (Continued)

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Limits (%)			
				Lower (STD/050)	Upper (STD)	Upper (050)	Actual
-9.1	1000	99	1	0.00	1.00	0.50	
-9.1	1000	50	1	0.00	1.00	0.50	
-9.1	1000	11	1	0.00	1.00	0.50	
-9.1	1000	5	1	0.00	1.00	0.50	
-9.1	1000	6	1	0.00	1.00	0.50	
-9.1	1000	7	1	0.00	1.00	0.50	
-9.1	1000	8	1	0.00	1.00	0.50	
-9.1	1000	9	1	0.00	1.00	0.50	
-9.1	998.401	8	1	0.00	1.00	0.50	
-9.1	768.001	8	1	0.00	1.00	0.50	
-9.1	512.001	8	1	0.00	1.00	0.50	
-9.1	511.601	8	1	0.00	1.00	0.50	
-9.1	511.201	8	1	0.00	1.00	0.50	

8920A RF Gen FM Accuracy Performance Test 5

Table 14 RF Gen FM Accuracy Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Deviation Limits (kHz)				
				Lower (STD)	Upper (STD)	Lower (050)	Upper (050)	Actual
-9.1	10 (Opt 055)	99	1	91.075	106.925	95.035	102.965	
-9.1	10 (Opt 055)	3	1	2.725	3.275	2.845	3.155	
-9.1	312.5	3	1	2.725	3.275	2.845	3.155	
-9.1	425	50	1	45.750	54.250	47.750	52.250	
-9.1	501	99	1	91.075	106.925	95.035	102.965	
-9.1	501	50	1	45.750	54.250	47.750	52.250	
-9.1	501	3	1	2.725	3.275	2.845	3.155	
-9.1	568.75	50	1	45.750	54.250	47.750	52.250	
-9.1	656.25	99	1	91.075	106.925	95.035	102.965	
-9.1	656.25	50	1	45.750	54.250	47.750	52.250	
-9.1	656.25	3	1	2.725	3.275	2.845	3.155	
-9.1	750	99	1	91.075	106.925	95.035	102.965	
-9.1	750	50	1	45.750	54.250	47.750	52.250	
-9.1	750	3	1	2.725	3.275	2.845	3.155	
-9.1	856.25	99	1	91.075	106.925	95.035	102.965	
-9.1	856.25	50	1	45.750	54.250	47.750	52.250	
-9.1	856.25	3	1	2.725	3.275	2.845	3.155	
-9.1	956.25	50	1	45.750	54.250	47.750	52.250	
-9.1	976.002	3	1	2.725	3.275	2.845	3.155	

Table 14 RF Gen FM Accuracy Table (Continued)

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Deviation Limits (kHz)				
				Lower (STD)	Upper (STD)	Lower (050)	Upper (050)	Actual
-9.1	1000	99	1	91.075	106.925	95.035	102.965	
-9.1	1000	50	1	45.750	54.250	47.750	52.250	
-9.1	1000	11	1	9.675	12.325	10.115	11.885	
-9.1	1000	3	1	2.725	3.275	2.845	3.155	

8920A
RF Gen FM Flatness
Performance Test 6

Table 15 RF Gen FM Flatness Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate	Computed FM Flatness Limits (dB)		Measured Reading (kHz)	Computed Results (dB)
				Lower	Upper		
-9.1	521	50	1 kHz	-1.0	1.0		0 dB
-9.1	521	50	100 Hz	-1.0	1.0		
-9.1	521	50	200 Hz	-1.0	1.0		
-9.1	521	50	2 kHz	-1.0	1.0		
-9.1	521	50	10 kHz	-1.0	1.0		
-9.1	521	50	25 kHz	-1.0	1.0		
-9.1	975.5	50	1 kHz	-1.0	1.0		0 dB
-9.1	975.5	50	100 Hz	-1.0	1.0		
-9.1	975.5	50	200 Hz	-1.0	1.0		
-9.1	975.5	50	2 kHz	-1.0	1.0		
-9.1	975.5	50	10 kHz	-1.0	1.0		
-9.1	975.5	50	25 kHz	-1.0	1.0		

8920A RF Gen Residual FM Performance Test 7

Table 16 RF Gen Residual FM Table

LO (MHz) (Opt 050)	RF (MHz)	Misread Residual FM LImits (Hz)		
		Upper (STD)	Upper (050)	Actual
11.5 (Opt 055)	10 (Opt 055)	20	7	
101.5	100	20	7	
249.5	248	20	7	
251.5	250	10	4	
401.5	400	10	4	
501.5	500	10	4	
502.5	501	20	7	
512.701	511.201	20	7	
513.101	511.601	20	7	
513.501	512.001	20	7	
626.5	625	20	7	
736.5	735	20	7	
741.5	740	20	7	
746.5	745	20	7	
751.5	750	20	7	
769.501	768.001	20	7	
846.5	845	20	7	
851.5	850	20	7	

Table 16 RF Gen Residual FM Table (Continued)

LO (MHz) (Opt 050)	RF (MHz)	Misread Residual FM LImits (Hz)		
		Upper (STD)	Upper (050)	Actual
856.5	855	20	7	
866.5	865	20	7	
901.5	900	20	7	
999.901	998.401	20	7	
1001.5	1000	20	7	

8920A
RF Gen Duplex Output High Level Accuracy
Performance Test 8

Table 17 RF Gen High Level Accuracy at Duplex Output Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
0.375 (Opt 055)	5	5.500	8.500	
0.375 (Opt 055)	1	-.500	2.500	
1 (Opt 055)	5	5.500	8.500	
1 (Opt 055)	1	-.500	2.500	
3 (Opt 055)	5	5.500	8.500	
3 (Opt 055)	1	-.500	2.500	
10 (Opt 055)	5	5.500	8.500	
10 (Opt 055)	1	-.500	2.500	
30	5	5.500	8.500	
30	1	-.500	2.500	
100	5	-.500	8.500	
100	1	-.500	2.500	
300	5	5.500	8.500	
300	1	-.500	2.500	
687.5	5	5.500	8.500	
687.5	1	-.500	2.500	
800	5	5.500	8.500	
800	1	-.500	2.500	
900	5	5.500	8.500	
900	1	-.500	2.500	

Table 17 RF Gen High Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
1000	5	5.500	8.500	
1000	1	-.500	2.500	

8920A
RF Gen Duplex Output Low Level Accuracy
Performance Test 9

Table 18 RF Gen Low Level Accuracy at Duplex Output Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	1	-.500	2.500	
3 (Opt 055)	-4	-5.500	-2.500	
3 (Opt 055)	-9	-10.500	-7.500	
3 (Opt 055)	-14	-15.500	-12.500	
3 (Opt 055)	-19	-20.500	-17.500	
3 (Opt 055)	-24	-25.500	-22.500	
3 (Opt 055)	-29	-30.500	-27.500	
3 (Opt 055)	-34	-35.500	-32.500	
3 (Opt 055)	-39	-40.500	-37.500	
3 (Opt 055)	-44	-45.500	-42.500	
3 (Opt 055)	-49	-50.500	-47.500	
3 (Opt 055)	-54	-55.500	-52.500	
3 (Opt 055)	-59	-60.500	-57.500	
3 (Opt 055)	-64	-65.500	-62.500	
3 (Opt 055)	-69	-70.500	-67.500	
3 (Opt 055)	-74	-75.500	-72.500	
3 (Opt 055)	-79	-80.500	-77.500	
3 (Opt 055)	-84	-85.500	-82.500	
3 (Opt 055)	-89	-90.500	-87.500	
3 (Opt 055)	-94	-95.500	-92.500	

Table 18 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	-99	-100.500	-97.500	
3 (Opt 055)	-104	-105.500	-102.500	
3 (Opt 055)	-109	-110.500	-107.500	
3 (Opt 055)	-114	-115.500	-112.500	
3 (Opt 055)	-119	-120.500	-117.500	
3 (Opt 055)	-124	-125.500	-122.500	
687.5	1	-.500	2.500	
687.5	-4	-5.500	-2.500	
687.5	-9	-10.500	-7.500	
687.5	-14	-15.500	-12.500	
687.5	-19	-20.500	-17.500	
687.5	-24	-25.500	-22.500	
687.5	-29	-30.500	-27.500	
687.5	-34	-35.500	-32.500	
687.5	-39	-40.500	-37.500	
687.5	-44	-45.500	-42.500	
687.5	-49	-50.500	-47.500	
687.5	-54	-55.500	-52.500	
687.5	-59	-60.500	-57.500	
687.5	-64	-65.500	-62.500	
687.5	-69	-75.500	-67.500	
687.5	-74	-75.500	-72.500	
687.5	-79	-80.500	-77.500	
687.5	-84	-85.500	-82.500	

Table 18 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
687.5	-89	-90.500	-87.500	
687.5	-94	-95.500	-92.500	
687.5	-99	-100.500	-97.500	
687.5	-104	-105.500	-102.500	
687.5	-109	-110.500	-107.500	
687.5	-114	-115.500	-112.500	
687.5	-119	-120.500	-117.500	
687.5	-124	-125.500	-122.500	
1000	1	-.500	2.500	
1000	-4	-5.500	-2.500	
1000	-9	-10.500	-7.500	
1000	-14	-15.500	-12.500	
1000	-19	-20.500	-17.500	
1000	-24	-25.500	-22.500	
1000	-29	-30.500	-27.500	
1000	-34	-35.500	-32.500	
1000	-39	-40.500	-37.500	
1000	-44	-45.500	-42.500	
1000	-49	-50.500	-47.500	
1000	-54	-55.500	-52.500	
1000	-59	-60.500	-57.500	
1000	-64	-65.500	-62.500	
1000	-69	-70.500	-67.500	
1000	-74	-75.500	-72.500	

Table 18 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
1000	-79	-80.500	-77.500	
1000	-84	-85.500	-82.500	
1000	-89	-90.500	-87.500	
1000	-94	-95.500	-92.500	
1000	-99	-100.500	-97.500	
1000	-104	-105.500	-102.500	
1000	-109	-110.500	-107.500	
1000	-114	-115.500	-112.500	
1000	-119	-120.500	-117.500	
1000	-124	-125.500	-122.500	

Table 19 RF Gen Level Accuracy at Duplex Output Table (Additional Frequencies For 83236A PCS Interface)

Level (dBm)	Frequency (MHz)		
	824	859	894
-7			
-8			
-9			
-10			
-11			
-12			
-13			
-14			
-15			
-16			
-17			
-22			
-27			
-32			
-37			
-42			
-47			
-52			
-57			
-62			
-67			

Table 20

One-half Maximum Minus Minimum (dB)	
Upper	**Actual**
0.63	

8920A
RF Gen RF IN/OUT Level Accuracy
Performance Test 10

Table 21 RF Gen Level Accuracy at RF INPUT/OUTPUT Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	-19	-20.800	-17.200	
3 (Opt 055)	-24	-25.800	-22.200	
3 (Opt 055)	-29	-30.800	-27.200	
3 (Opt 055)	-34	-35.800	-32.200	
3 (Opt 055)	-39	-40.800	-37.200	
3 (Opt 055)	-44	-45.800	-42.200	
3 (Opt 055)	-49	-50.800	-47.200	
3 (Opt 055)	-54	-55.800	-52.200	
3 (Opt 055)	-59	-60.800	-57.200	
3 (Opt 055)	-64	-65.800	-62.200	
3 (Opt 055)	-69	-70.800	-67.200	
3 (Opt 055)	-74	-75.800	-72.200	
3 (Opt 055)	-79	-80.800	-77.200	
3 (Opt 055)	-84	-85.800	-82.200	
3 (Opt 055)	-89	-90.800	-87.200	
3 (Opt 055)	-94	-95.800	-92.200	
3 (Opt 055)	-99	-100.800	-97.200	
3 (Opt 055)	-104	-105.800	-102.200	
3 (Opt 055)	-109	-110.800	-107.200	
3 (Opt 055)	-114	-115.800	-112.200	

Table 21 RF Gen Level Accuracy at RF INPUT/OUTPUT Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	-119	-120.800	-117.200	
3 (Opt 055)	-124	-125.800	-122.200	
687.5	-21	-20.800	-17.200	
687.5	-24	-25.800	-22.200	
687.5	-29	-30.800	-27.200	
687.5	-34	-35.800	-32.200	
687.5	-39	-40.800	-37.200	
687.5	-44	-45.800	-42.200	
687.5	-49	-50.800	-47.200	
687.5	-54	-55.800	-52.200	
687.5	-59	-60.800	-57.200	
687.5	-64	-65.800	-62.200	
687.5	-69	-70.800	-67.200	
687.5	-74	-75.800	-72.200	
687.5	-79	-80.800	-77.200	
687.5	-84	-85.800	-82.200	
687.5	-89	-90.800	-87.200	
687.5	-94	-95.800	-92.200	
687.5	-99	-100.800	-97.200	
687.5	-104	-105.800	-102.200	
687.5	-109	-110.800	-107.200	
687.5	-114	-115.800	-112.200	
687.5	-119	-120.800	-117.200	
687.5	-124	-125.800	-122.200	

Table 21 RF Gen Level Accuracy at RF INPUT/OUTPUT Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
1000	-21	-20.800	-17.200	
1000	-24	-25.800	-22.200	
1000	-29	-30.800	-27.200	
1000	-34	-35.800	-32.200	
1000	-39	-40.800	-37.200	
1000	-44	-45.800	-42.200	
1000	-49	-50.800	-47.200	
1000	-54	-55.800	-52.200	
1000	-59	-60.800	-57.200	
1000	-64	-65.800	-62.200	
1000	-69	-70.800	-67.200	
1000	-74	-75.800	-72.200	
1000	-79	-80.800	-77.200	
1000	-84	-85.800	-82.200	
1000	-89	-90.800	-87.200	
1000	-94	-95.800	-92.200	
1000	-99	-100.800	-97.200	
1000	-104	-105.800	-102.200	
1000	-109	-110.800	-107.200	
1000	-114	-115.800	-112.200	
1000	-119	-120.800	-117.200	
1000	-124	-125.800	-122.200	

8920A RF Gen Harmonics Spectral Purity Performance Test 11

Table 22 RF Gen Harmonics at +1 dBm Table

Level (dBm)	RF (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
+1	1 (Opt 055)	2nd	-30.000	
+1	1 (Opt 055)	3rd	-30.000	
+1	2 (Opt 055)	2nd	-30.000	
+1	2 (Opt 055)	3rd	-30.000	
+1	5 (Opt 055)	2nd	-30.000	
+1	5 (Opt 055)	3rd	-30.000	
+1	10 (Opt 055)	2nd	-30.000	
+1	10 (Opt 055)	3rd	-30.000	
+1	20 (Opt 055)	2nd	-30.000	
+1	20 (Opt 055)	3rd	-30.000	
+1	50	2nd	-30.000	
+1	50	3rd	-30.000	
+1	100	2nd	-30.000	
+1	100	3rd	-30.000	
+1	200	2nd	-30.000	
+1	200	3rd	-30.000	
+1	300	2nd	-30.000	
+1	300	3rd	-30.000	
+1	400	2nd	-30.000	
+1	400	3rd	-30.000	

Table 22 RF Gen Harmonics at +1 dBm Table (Continued)

Level (dBm)	RF (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
+1	500	2nd	-30.000	
+1	500	3rd	-30.000	
+1	600	2nd	-30.000	
+1	600	3rd	-30.000	
+1	700	2nd	-30.000	
+1	700	3rd	-30.000	
+1	800	2nd	-30.000	
+1	800	3rd	-30.000	
+1	900	2nd	-30.000	
+1	900	3rd	-30.000	
+1	1000	2nd	-30.000	
+1	1000	3rd	-30.000	

Table 23 RF Gen Harmonics at –4 dBm Table

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-4	1 (Opt 055)	2nd	-30.000	
-4	1 (Opt 055)	3rd	-30.000	
-4	2 (Opt 055)	2nd	-30.000	
-4	2 (Opt 055)	3rd	-30.000	
-4	5 (Opt 055)	2nd	-30.000	
-4	5 (Opt 055)	3rd	-30.000	
-4	10 (Opt 055)	2nd	-30.000	
-4	10 (Opt 055)	3rd	-30.000	

Table 23 RF Gen Harmonics at –4 dBm Table (Continued)

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-4	20 (Opt 055)	2nd	-30.000	
-4	20 (Opt 055)	3rd	-30.000	
-4	50	2nd	-30.000	
-4	50	3rd	-30.000	
-4	100	2nd	-30.000	
-4	100	3rd	-30.000	
-4	200	2nd	-30.000	
-4	200	3rd	-30.000	
-4	300	2nd	-30.000	
-4	300	3rd	-30.000	
-4	400	2nd	-30.000	
-4	400	3rd	-30.000	
-4	500	2nd	-30.000	
-4	500	3rd	-30.000	
-4	600	2nd	-30.000	
-4	600	3rd	-30.000	
-4	700	2nd	-30.000	
-4	700	3rd	-30.000	
-4	800	2nd	-30.000	
-4	800	3rd	-30.000	
-4	900	2nd	-30.000	
-4	900	3rd	-30.000	
-4	1000	2nd	-30.000	
-4	1000	3rd	-30.000	

Table 24 RF Gen Half-Harmonics at +1 dBm Table

Level (dBm)	RF (MHz)	Half Frequency (MHz)	Half-Harmonic Limits (dBc)	
			Upper	Actual
+1	501	250.5	-60.000	
+1	850	425	-60.000	
+1	1000	500	-60.000	

Table 25 RF Gen Half-Harmonics at −4 dBm Table

Level (dBm)	RF (MHz)	Half Frequency (MHz)	Half-Harmonic Limits (dBc)	
			Upper	Actual
-4	501	250.5	-60.000	
-4	850	425	-60.000	
-4	1000	500	-60.000	

8920A
RF Gen Spurious Spectral Purity
Performance Test 12

Table 26 RF Gen Spurious Signal at +1 dBm Table

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at +1 dBm Limits (dBc)	
			Upper	Actual
3/2 Mixer	242	274	-60.000	
3/2 Mixer	247	259	-60.000	

Table 27 RF Gen Spurious Signal at –4 dBm Table

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at –4 dBm Limits (dBc)	
			Upper	Actual
Supply	100	100.03	-60.000	
Supply	400	400.03	-60.000	
Supply	501	501.03	-60.000	
Supply	1000	999.97	-60.000	
Supply	100	.03	-60.000	
RF Feedthru	1 (Opt 055)	999	-60.000	
LO Feedthru	1 (Opt 055)	1000	-60.000	
RF Feedthru	11 (Opt 055)	989	-60.000	
RF Feedthru	21 (Opt 055)	979	-60.000	
RF Feedthru	41	959	-60.000	
RF Feedthru	61	939	-60.000	
RF Feedthru	81	919	-60.000	
RF Feedthru	91	909	-60.000	

Table 27 RF Gen Spurious Signal at –4 dBm Table (Continued)

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at –4 dBm Limits (dBc)	
			Upper	Actual
RF Feedthru	101	899	-60.000	
RF Feedthru	111	889	-60.000	
RF Feedthru	121	879	-60.000	
3/2 Mixer	242	274	-60.000	
3/2 Mixer	247	259	-60.000	
4/3 Mixer	242	32	-60.000	
4/3 Mixer	247	12	-60.000	
5/4 Mixer	211	55	-60.000	
5/4 Mixer	217	85	-60.000	
5/4 Mixer	221	105	-60.000	
5/4 Mixer	227	135	-60.000	
5/4 Mixer	231	155	-60.000	
5/4 Mixer	237	185	-60.000	
Ref 10 MHz	165	175	-60.000	
Ref 200 kHz	150	150.2	-60.000	
Ref 200 kHz	150	149.8	-60.000	
Ref 200 kHz	150	150.4	-60.000	
Ref 200 kHz	150	149.6	-60.000	
Ref 200 kHz	150	150.6	-60.000	
Reference	150	149.4	-60.000	

8920A
AF Gen AC Level Accuracy
Performance Test 13

Table 28 AF Gen AC Level Accuracy Table

AF Gen	Frequency (Hz)	Level (mV)	Measured AC Level Accuracy Limits (mV)		
			Lower	Upper	Actual
1	25000	4000	3885.000	4115.000	
1	25000	700	682.500	717.500	
1	25000	75	70.000	80.000	
1	10000	4000	3885.000	4115.000	
1	10000	700	682.500	717.500	
1	10000	75	70.000	80.000	
1	1000	4000	3885.000	4115.000	
1	1000	700	682.500	717.500	
1	1000	75	70.000	80.000	
1	100	4000	3885.000	4115.000	
1	100	700	682.500	717.500	
1	100	75	70.000	80.000	
2	25000	4000	3885.000	4115.000	
2	25000	700	682.500	717.500	
2	25000	75	70.000	80.000	
2	10000	4000	3885.000	4115.000	
2	10000	700	682.500	717.500	
2	10000	75	70.000	80.000	
2	1000	4000	3885.000	4115.000	
2	1000	700	682.500	717.500	

Table 28 AF Gen AC Level Accuracy Table (Continued)

AF Gen	Frequency (Hz)	Level (mV)	Measured AC Level Accuracy Limits (mV)		
			Lower	Upper	Actual
2	1000	75	70.000	80.000	
2	100	4000	3885.000	4115.000	
2	100	700	682.500	717.500	
2	100	75	70.000	80.000	

8920A
AF Gen DC Level Accuracy
Performance Test 14

Table 29 **AF Gen DC Level Accuracy Table**

AFGen	Level (mV)	Measured DC Level Accuracy Limits (mV)		
		Lower	Upper	Actual
1	4000	3820.000	4180.000	
1	1000	925.000	1075.000	
2	4000	3820.000	4180.000	
2	1000	925.000	1075.000	

8920A AF Gen Residual Distortion Performance Test 15

Table 30 **AF Gen Residual Distortion Table**

AFGen	Frequency (Hz)	Level (mV)	Measured Residual Distortion (%)		
			Lower	Upper	Actual
1	25000	4000	0.000	.125	
1	25000	2000	0.000	.125	
1	25000	200	0.000	.125	
1	10000	4000	0.000	.125	
1	10000	2000	0.000	.125	
1	10000	200	0.000	.125	
1	1000	4000	0.000	.125	
1	1000	2000	0.000	.125	
1	1000	200	0.000	.125	
1	100	4000	0.000	.125	
1	100	2000	0.000	.125	
1	100	200	0.000	.125	
2	25000	4000	0.000	.125	
2	25000	2000	0.000	.125	
2	25000	200	0.000	.125	
2	10000	4000	0.000	.125	
2	10000	2000	0.000	.125	
2	10000	200	0.000	.125	
2	1000	4000	0.000	.125	
2	1000	2000	0.000	.125	

Table 30 AF Gen Residual Distortion Table (Continued)

AFGen	Frequency (Hz)	Level (mV)	Measured Residual Distortion (%)		
			Lower	Upper	Actual
2	1000	200	0.000	.125	
2	100	4000	0.000	.125	
2	100	2000	0.000	.125	
2	100	200	0.000	.125	

8920A AF Gen Frequency Accuracy Performance Test 16

Table 31 AF Gen Frequency Accuracy Table

AFGen	Frequency (Hz)	Measured Frequency (Hz)		
		Lower	Upper	Actual
1	25000	24993.750	25006.250	
1	10000	9997.500	10002.500	
1	5000	4998.750	5001.250	
1	2000	1999.500	2000.500	
1	1000	999.750	1000.250	
1	500	499.875	500.125	
1	200	199.950	200.050	
1	100	99.975	100.025	
1	50	49.988	50.012	
1	20	19.995	20.005	
2	25000	24993.750	25006.250	
2	10000	9997.500	10002.500	
2	5000	4998.750	5001.250	
2	2000	1999.500	2000.500	
2	1000	999.750	1000.250	
2	500	499.875	500.125	
2	200	199.950	200.050	
2	100	99.975	100.025	
2	50	49.988	50.012	
2	20	19.995	20.005	

8920A
AF Analyzer AC Voltage Accuracy
Performance Test 17

Table 32 AF Analyzer AC Voltage Accuracy Table

Frequency (Hz)	Level (mV)	AC Voltage Accuracy Limits (mV)		
		Lower	Upper	Actual
15000	5000	4849.850	5150.150	
2000	5000	4849.850	5150.150	
200	5000	4849.850	5150.150	
20	5000	4849.850	5150.150	
15000	500	484.850	515.150	
2000	500	484.850	515.150	
200	500	484.850	515.150	
20	500	484.850	515.150	
15000	50	48.350	51.650	
2000	50	48.350	51.650	
200	50	48.350	51.650	
20	50	48.350	51.650	

8920A
AF Analyzer Residual Noise
Performance Test 18

Table 33 AF Analyzer Residual Noise Table

Residual Noise (μV)	
Upper	**Actual**
150	

8920A AF Analyzer Distortion and SINAD Accuracy Performance Test 19

Table 34 AF Analyzer Distortion and SINAD Accuracy

Harmonic Frequency (kHz)	Harmonic Level(V)	Measurement Type	Distortion (%) and SINAD (dB) Accuracy Limits		
			Lower	Upper	Actual
2	.1	Distortion	8.856	11.144	
2	.1	SINAD	19.043	21.043	
3	.1	Distortion	8.856	11.144	
3	.1	SINAD	19.043	21.043	
2	.01	Distortion	.890	1.120	
2	.01	SINAD	39.000	41.000	
3	.01	Distortion	.890	1.120	
3	.01	SINAD	39.000	41.000	
2	.005	Distortion	.445	.560	
2	.005	SINAD	45.021	47.021	
3	.005	Distortion	.445	.560	
3	.005	SINAD	45.021	47.021	

8920A
AF Analyzer DC Level Accuracy
Performance Test 20

Table 35 AF Analyzer DC Voltage Accuracy

Level (mV)	DC Voltage Limits (mV)		
	Lower	Upper	Actual
5000	4905.000	5095.000	
500	450.000	550.000	

8920A
AF Analyzer Frequency Accuracy to 100 kHz
Performance Test 21

Table 36 AF Analyzer Frequency Accuracy to 100 kHz

Frequency (Hz)	8902A Counter Limits (Hz)		
	Lower	Upper	Actual
20	19.986	20.014	
100	99.970	100.030	
1000	999.790	1000.210	
10000	9997.90	10002.10	
100000	99979	100021	

8920A
AF Analyzer Frequency Accuracy at 400 kHz
Performance Test 22

Table 37 AF Analyzer Freq Acc at 400 kHz Table

Frequency Accuracy at 400 kHz (kHz)		
Lower	**Upper**	**Actual**
399.920	400.080	

8920A Oscilloscope Performance Test 23

Table 38 Oscilloscope Amplitude Accuracy Table

Frequency (kHz)	Level (V)	Amplitude Limits (V)		
		Lower	Upper	Actual
1	5	6.765	7.377	
10	5	6.765	7.377	
50	5	5.000	10.000	

8920A
RF Analyzer Level Accuracy
Performance Test 24

Table 39 RF Analyzer Level Accuracy Table

Power	Level Accuracy Limits (mW)		
	Lower	Upper	Actual
500 mW	449	551	
200 mW	179	221	

8920A
RF Analyzer AM Accuracy
Performance Test 25

Table 40 **RF Analyzer AM Accuracy Table**

Det	Depth (%)	Rate (Hz)	AM Accuracy Limits (%)		
			Lower	Upper	Actual
Pk+	10	50	8.000	12.000	
Pk-	10	50	8.000	12.000	
Pk+	10	1000	8.000	12.000	
Pk-	10	1000	8.000	12.000	
Pk+	10	10000	8.000	12.000	
Pk-	10	10000	8.000	12.000	
Pk+	30	50	27.000	33.000	
Pk-	30	50	27.000	33.000	
Pk+	30	1000	27.000	33.000	
Pk-	30	1000	27.000	33.000	
Pk+	30	10000	27.000	33.000	
Pk-	30	10000	27.000	33.000	
Pk+	50	50	46.000	54.000	
Pk-	50	50	46.000	54.000	
Pk+	50	1000	46.000	54.000	
Pk-	50	1000	46.000	54.000	
Pk+	50	10000	46.000	54.000	
Pk-	50	10000	46.000	54.000	
Pk+	70	50	65.000	75.000	
Pk-	70	50	65.000	75.000	

Table 40 RF Analyzer AM Accuracy Table (Continued)

Det	Depth (%)	Rate (Hz)	AM Accuracy Limits (%)		
			Lower	Upper	Actual
Pk+	70	1000	65.000	75.000	
Pk-	70	1000	65.000	75.000	
Pk+	70	10000	65.000	75.000	
Pk-	70	10000	65.000	75.000	
Pk+	80	50	74.500	85.500	
Pk-	80	50	74.500	85.500	
Pk+	80	1000	74.500	85.500	
Pk-	80	1000	74.500	85.500	
Pk+	80	10000	74.500	85.500	
Pk-	80	10000	74.500	85.500	

8920A
RF Analyzer AM Distortion
Performance Test 26

Table 41 RF Analyzer AM Distortion Table

AM Distortion	AM Distortion Limits (%)	
	Upper	Actual
Depth 10%	2.000	
Depth 30%	2.000	
Depth 50%	2.000	
Depth 70%	2.000	
Depth 80%	2.000	

8920A
RF Analyzer Residual AM
Performance Test 27

Table 42 RF Analyzer Residual AM Table

Residual AM (%)	
Upper	**Actual**
0.2	

8920A
RF Analyzer FM Accuracy
Performance Test 28

Table 43 RF Analyzer FM Accuracy Table

RF (MHz)	Deviation (kHz)	Rate (Hz)	FM Accuracy Limits (kHz)		
			Lower	**Upper**	**Actual**
12.5	1	50	.960	1.040	
12.5	1	1000	.960	1.040	
12.5	1	25000	.960	1.040	
12.5	10	50	9.600	10.400	
12.5	10	1000	9.600	10.400	
12.5	10	25000	9.600	10.400	
400	10	50	9.600	10.400	
400	10	1000	9.600	10.400	
400	10	25000	9.600	10.400	
400	17	50	16.320	17.680	
400	17	1000	16.320	17.680	
400	17	25000	16.320	17.680	

8920A RF Analyzer FM Distortion Performance Test 29

Table 44 RF Analyzer FM Distortion Table

Deviation (kHz)	FM Distortion Limits (%)	
	Upper	Actual
5	1.000	
25	1.000	
75	1.000	

8920A
RF Analyzer FM Bandwidth
Performance Test 30

Table 45 RF Analyzer FM Bandwidth Table

FM Bandwidth (dB)	
Upper	**Actual**
3.0	

8920A
RF Analyzer Residual FM Performance Test 31

Table 46 RF Analyzer Residual FM Table

Residual FM (Hz)	
Upper	**Actual**
20 (STD)	
10 (050)	

8920A
RF Analyzer SSB Demodulation Performance Test 32

Table 47 SSB Distortion Table

RF Generator Frequency (MHz)	RF Generator Amplitude (dBm)	RF Analyzer Frequency (MHz)	Measured Distortion (%)	
			Upper Limit	Actual
122	–19	122.001	3	
122	–33	122.001	3	
620	–19	620.001	3	
620	–33	620.001	3	
900	–19	900.001	3	
900	–33	900.001	3	

Table 48 SSB Flatness Table

RF Analyzer Frequency (MHz)	Audio Analyzer Reading (dBv)
501.001	
501.010	
501.050	
501.070	
Upper Limit (dB)	**Highest Lowest Reading (dB)**
3	

8920A Spectrum Analyzer Image Rejection Performance Test 33

Table 49 Image Rejection Table

Signal Generator Frequency (MHz) (image)	UUT Spectrum Analyzer Center Frequency (MHz) (signal)	Measure Image Response (dB)	
		Upper Limit	Actual
613.6	385.0	–50	
873.6	645.0	–50	
883.6	655.0	–50	
1023.6	795.0	–50	
1000.0	771.4	–50	
576.4	805.0	–50	
771.4	1000.0	–50	
319.02	300.0	–50	

Table 50 Residual Response Analyzer

UU T Spectrum Analyzer Center Frequency (MHz)	Measured Residual Response (dBm)	
	Upper Limit	Actual
5.534	–70	
10.0	–70	
20.0	–70	
21.4	–70	
107.126	–70	

Table 50 Residual Response Analyzer (Continued)

UU (Continued)**T Spectrum Analyzer Center Frequency (MHz)**	**Measured Residual Response (dBm)**	
	Upper Limit	**Actual**
164.28	–70	
257.139	–70	
271.4	–70	
347.607	–70	
500.0	–70	

8920B Performance Test Record

8920B RF Communications Test Set

Tested By _____________ Serial Number _____________ Date _____________

Temp _____________ Humidity _____________ Time _____________

8920B
RF Gen AM Distortion
Performance Test 1

Table 51 **RF Gen AM Distortion Table**

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Distortion Limits (%)		
				Lower	Upper	Actual
-9.1	30	30	1	0.00	2.00	
-9.1	30	70	1	0.00	3.00	
-9.1	100	30	1	0.00	2.00	
-9.1	100	70	1	0.00	3.00	
-9.1	150	30	1	0.00	2.00	
-9.1	150	70	1	0.00	3.00	
-9.1	250	30	1	0.00	2.00	
-9.1	250	70	1	0.00	3.00	
-9.1	900	30	1	0.00	2.00	
-9.1	900	70	1	0.00	3.00	
-9.1	1000	30	1	0.00	2.00	
-9.1	1000	70	1	0.00	3.00	
-14	30	30	1	0.00	2.00	
-14	30	70	1	0.00	3.00	
-14	100	30	1	0.00	2.00	
-14	100	70	1	0.00	3.00	
-14	150	30	1	0.00	2.00	
-14	150	70	1	0.00	3.00	
-14	250	30	1	0.00	2.00	
-14	250	70	1	0.00	3.00	

Table 51 RF Gen AM Distortion Table (Continued)

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Distortion Limits (%)		
				Lower	Upper	Actual
-14	900	30	1	0.00	2.00	
-14	900	70	1	0.00	3.00	
-14	1000	30	1	0.00	2.00	
-14	1000	70	1	0.00	3.00	

8920B RF Gen AM Accuracy Performance Test 2

Table 52 RF Gen AM Accuracy Table

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Limits (%)		
				Lower	Upper	Actual
-9.1	30	30	1	27.0	33.0	
-9.1	30	70	1	65.0	75.0	
-9.1	100	30	1	27.0	33.0	
-9.1	100	70	1	65.0	75.0	
-9.1	150	30	1	27.0	33.0	
-9.1	150	70	1	65.0	75.0	
-9.1	250	30	1	27.0	33.0	
-9.1	250	70	1	65.0	75.0	
-9.1	900	30	1	27.0	33.0	
-9.1	900	70	1	65.0	75.0	
-9.1	1000	30	1	27.0	33.0	
-9.1	1000	70	1	65.0	75.0	
-14	30	30	1	27.0	33.0	
-14	30	70	1	65.0	75.0	
-14	100	30	1	27.0	33.0	
-14	100	70	1	65.0	75.0	
-14	150	30	1	27.0	33.0	
-14	150	70	1	65.0	75.0	
-14	250	30	1	27.0	33.0	
-14	250	70	1	65.0	75.0	

Table 52 RF Gen AM Accuracy Table (Continued)

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Measured AM Limits (%)		
				Lower	Upper	Actual
-14	900	30	1	27.0	33.0	
-14	900	70	1	65.0	75.0	
-14	1000	30	1	27.0	33.0	
-14	1000	70	1	65.0	75.0	

8920B RF Gen AM Flatness Performance Test 3

Table 53 RF Gen AM Flatness Table

Level (dBm)	RF (MHz)	Depth (%)	Rate (kHz)	Results (dB)
-9.1	500	50	1	0 dB
-9.1	500	50	10	
-9.1	500	50	20	
-9.1	500	50	25	
-14.1	500	50	1	0 dB
-14.1	500	50	10	
-14.1	500	50	20	
-14.1	500	50	25	

8920B RF Gen FM Distortion Performance Test 4

Table 54 RF Gen FM Distortion Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Limits (%)	
				Upper	Actual
-9.1	30	99	1	0.50	
-9.1	30	5	1	0.50	
-9.1	312.5	5	1	0.50	
-9.1	425	50	1	0.50	
-9.1	501	99	1	0.50	
-9.1	501	50	1	0.50	
-9.1	501	5	1	0.50	
-9.1	568.75	50	1	0.50	
-9.1	656.25	99	1	0.50	
-9.1	656.25	50	1	0.50	
-9.1	656.25	5	1	0.50	
-9.1	750	99	1	0.50	
-9.1	750	50	1	0.50	
-9.1	750	5	1	0.50	
-9.1	856.25	99	1	0.50	
-9.1	856.25	50	1	0.50	
-9.1	856.25	5	1	0.50	
-9.1	956.25	50	1	0.50	
-9.1	976.002	5	1	0.50	
-9.1	1000	99	1	0.50	

Table 54 RF Gen FM Distortion Table (Continued)

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Limits (%)	
				Upper	Actual
-9.1	1000	50	1	0.50	
-9.1	1000	11	1	0.50	
-9.1	1000	5	1	0.50	
-9.1	1000	6	1	0.50	
-9.1	1000	7	1	0.50	
-9.1	1000	8	1	0.50	
-9.1	1000	9	1	0.50	
-9.1	998.401	8	1	0.50	
-9.1	768.001	8	1	0.50	
-9.1	512.001	8	1	0.50	
-9.1	511.601	8	1	0.50	
-9.1	511.201	8	1	0.50	

8920B
RF Gen FM Accuracy
Performance Test 5

Table 55 RF Gen FM Accuracy Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Deviation Limits (kHz)		
				Lower	Upper	Actual
-9.1	30	99	1	95.035	102.965	
-9.1	30	3	1	2.845	3.155	
-9.1	312.5	3	1	2.845	3.155	
-9.1	425	50	1	47.750	52.250	
-9.1	501	99	1	95.035	102.965	
-9.1	501	50	1	47.750	52.250	
-9.1	501	3	1	2.845	3.155	
-9.1	568.75	50	1	47.750	52.250	
-9.1	656.25	99	1	95.035	102.965	
-9.1	656.25	50	1	47.750	52.250	
-9.1	656.25	3	1	2.845	3.155	
-9.1	750	99	1	95.035	102.965	
-9.1	750	50	1	47.750	52.250	
-9.1	750	3	1	2.845	3.155	
-9.1	856.25	99	1	95.035	102.965	
-9.1	856.25	50	1	47.750	52.250	
-9.1	856.25	3	1	2.845	3.155	
-9.1	956.25	50	1	47.750	52.250	
-9.1	976.002	3	1	2.845	3.155	
-9.1	1000	99	1	95.035	102.965	

Table 55 RF Gen FM Accuracy Table (Continued)

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Deviation Limits (kHz)		
				Lower	Upper	Actual
-9.1	1000	50	1	47.750	52.250	
-9.1	1000	11	1	10.115	11.885	
-9.1	1000	3	1	2.845	3.155	

8920B RF Gen FM Flatness Performance Test 6

Table 56 RF Gen FM Flatness Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate	Computed FM Flatness Limits (dB)		Measured Reading (kHz)	Computed Results (dB)
				Lower	Upper		
-9.1	521	50	1 kHz	-1.0	1.0		0 dB
-9.1	521	50	100 Hz	-1.0	1.0		
-9.1	521	50	200 Hz	-1.0	1.0		
-9.1	521	50	2 kHz	-1.0	1.0		
-9.1	521	50	10 kHz	-1.0	1.0		
-9.1	521	50	25 kHz	-1.0	1.0		
-9.1	975.5	50	1 kHz	-1.0	1.0		0 dB
-9.1	975.5	50	100 Hz	-1.0	1.0		
-9.1	975.5	50	200 Hz	-1.0	1.0		
-9.1	975.5	50	2 kHz	-1.0	1.0		
-9.1	975.5	50	10 kHz	-1.0	1.0		
-9.1	975.5	50	25 kHz	-1.0	1.0		

8920B RF Gen Residual FM Performance Test 7

Table 57 RF Gen Residual FM Table

LO (MHz)	RF (MHz)	Measured Residual FM Limits (Hz)	
		Upper	Actual
31.5	30	7	
101.5	100	7	
249.5	248	7	
251.5	250	4	
401.5	400	4	
501.5	500	4	
502.5	501	7	
512.701	511.201	7	
513.101	511.601	7	
513.501	512.001	7	
626.5	625	7	
736.5	735	7	
741.5	740	7	
746.5	745	7	
751.5	750	7	
769.501	768.001	7	
846.5	845	7	
851.5	850	7	
856.5	855	7	
866.5	865	7	

Table 57 RF Gen Residual FM Table (Continued)

LO (MHz)	RF (MHz)	Measured Residual FM Limits (Hz)	
		Upper	Actual
901.5	900	7	
999.901	998.401	7	
1001.5	1000	7	

8920B
RF Gen Duplex Output High Level Accuracy
Performance Test 8

Table 58 RF Gen High Level Accuracy at Duplex Output Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
30	3.5	2.500	4.500	
30	1	0.000	2.000	
100	3.5	2.500	4.500	
100	1	0.000	2.000	
300	3.5	2.500	4.500	
300	1	0.000	2.000	
687.5	3.5	2.500	4.500	
687.5	1	0.000	2.000	
800	3.5	2.500	4.500	
800	1	0.000	2.000	
900	3.5	2.500	4.500	

Table 58 RF Gen High Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
900	1	0.000	2.000	
1000	3.5	6.000	8.000	
1000	1	0.000	2.000	

8920B RF Gen Duplex Output Low Level Accuracy Performance Test 9

Table 59 RF Gen Low Level Accuracy at Duplex Output Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
687.5	1	0.000	2.000	
687.5	-4	-5.000	-3.000	
687.5	-9	-10.000	-8.000	
687.5	-14	-15.000	-13.000	
687.5	-19	-20.000	-18.000	
687.5	-24	-25.000	-23.000	
687.5	-29	-30.000	-28.000	
687.5	-34	-35.000	-33.000	
687.5	-39	-40.000	-38.000	
687.5	-44	-45.000	-43.000	
687.5	-49	-50.000	-48.000	
687.5	-54	-55.000	-53.000	
687.5	-59	-60.000	-58.000	
687.5	-64	-65.000	-63.000	
687.5	-69	-70.000	-68.000	
687.5	-74	-75.000	-73.000	
687.5	-79	-80.000	-78.000	
687.5	-84	-85.000	-83.000	

Table 59 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
687.5	-89	-90.000	-88.000	
687.5	-94	-95.000	-93.000	
687.5	-99	-100.000	-98.000	
687.5	-104	-105.000	-103.000	
687.5	-109	-110.000	-108.000	
687.5	-114	-115.000	-113.000	
687.5	-119	-120.000	-118.000	
687.5	-124	-125.000	-123.000	
1000	1	0.000	2.000	
1000	-4	-5.000	-3.000	
1000	-9	-10.000	-8.000	
1000	-14	-15.000	-13.000	
1000	-19	-20.000	-18.000	
1000	-24	-25.000	-23.000	
1000	-29	-30.000	-28.000	
1000	-34	-35.000	-33.000	
1000	-39	-40.000	-38.000	
1000	-44	-45.000	-43.000	
1000	-49	-50.000	-48.000	
1000	-54	-55.000	-53.000	
1000	-59	-60.000	-58.000	
1000	-64	-65.000	-63.000	
1000	-69	-70.000	-68.000	

Table 59 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
1000	-74	-75.000	-73.000	
1000	-79	-80.000	-78.000	
1000	-84	-85.000	-83.000	
1000	-89	-90.000	-88.000	
1000	-94	-95.000	-93.000	
1000	-99	-100.000	-98.000	
1000	-104	-105.000	-103.000	
1000	-109	-110.000	-108.000	
1000	-114	-115.000	-113.000	
1000	-119	-120.000	-118.000	
1000	-124	-125.000	-123.000	

Table 60 RF Gen Level Accuracy at Duplex Output Table (Additional Frequencies For 83236A PCS Interface)

Level (dBm)	Frequency (MHz)		
	824	**859**	**894**
-7			
-8			
-9			
-10			
-11			
-12			
-13			
-14			
-15			
-16			
-17			
-22			
-27			
-32			
-37			
-42			
-47			
-52			
-57			
-62			
-67			

Table 61

One-half Maximum Minus Minimum (dB)	
Upper	**Actual**
0.63	

8920B RF Gen RF IN/OUT Level Accuracy Performance Test 10

Table 62 RF Gen Level Accuracy at RF INPUT/OUTPUT

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
687.5	-19	-20.200	-17.800	
687.5	-24	-25.200	-22.800	
687.5	-29	-30.200	-27.800	
687.5	-34	-35.200	-32.800	
687.5	-39	-40.200	-37.800	
687.5	-44	-45.200	-42.800	
687.5	-49	-50.200	-47.800	
687.5	-54	-55.200	-52.800	
687.5	-59	-60.200	-57.800	
687.5	-64	-65.200	-62.800	
687.5	-69	-70.200	-67.800	
687.5	-74	-75.200	-72.800	
687.5	-79	-80.200	-77.800	
687.5	-84	-85.200	-82.800	
687.5	-89	-90.200	-87.800	
687.5	-94	-95.200	-92.800	
687.5	-99	-100.200	-97.800	
687.5	-104	-105.200	-102.800	
687.5	-109	-110.200	-107.800	
687.5	-114	-115.200	-112.800	
687.5	-119	-120.200	-117.800	

Table 62 RF Gen Level Accuracy at RF INPUT/OUTPUT (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
687.5	-124	-125.200	-122.800	
1000	-19	-20.200	-17.800	
1000	-24	-25.200	-22.800	
1000	-29	-30.200	-27.800	
1000	-34	-35.200	-32.800	
1000	-39	-40.200	-37.800	
1000	-44	-45.200	-42.800	
1000	-49	-50.200	-47.800	
1000	-54	-55.200	-52.800	
1000	-59	-60.200	-57.800	
1000	-64	-65.200	-62.800	
1000	-69	-70.200	-67.800	
1000	-74	-75.200	-72.800	
1000	-79	-80.200	-77.800	
1000	-84	-85.200	-82.800	
1000	-89	-90.200	-87.800	
1000	-94	-95.200	-92.800	
1000	-99	-100.200	-97.800	
1000	-104	-105.200	-102.800	
1000	-109	-110.200	-107.800	
1000	-114	-115.200	-112.800	
1000	-119	-120.200	-117.800	
1000	-124	-125.200	-122.800	

8920B
RF Gen Harmonics Spectral Purity Performance Test 11

Table 63 RF Gen Harmonics at -2.5 dBm Table

Level (dBm)	RF (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-2.5	50	2nd	-30.000	
-2.5	50	3rd	-30.000	
-2.5	100	2nd	-30.000	
-2.5	100	3rd	-30.000	
-2.5	200	2nd	-30.000	
-2.5	200	3rd	-30.000	
-2.5	300	2nd	-30.000	
-2.5	300	3rd	-30.000	
-2.5	400	2nd	-30.000	
-2.5	400	3rd	-30.000	
-2.5	500	2nd	-30.000	
-2.5	500	3rd	-30.000	
-2.5	600	2nd	-30.000	
-2.5	600	3rd	-30.000	
-2.5	700	2nd	-30.000	
-2.5	700	3rd	-30.000	
-2.5	800	2nd	-30.000	
-2.5	800	3rd	-30.000	
-2.5	900	2nd	-30.000	
-2.5	900	3rd	-30.000	

Table 63 RF Gen Harmonics at -2.5 dBm Table (Continued)

Level (dBm)	RF (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-2.5	1000	2nd	-30.000	
-2.5	1000	3rd	-30.000	

Table 64 RF Gen Harmonics at −4 dBm Table

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-4	50	2nd	-30.000	
-4	50	3rd	-30.000	
-4	100	2nd	-30.000	
-4	100	3rd	-30.000	
-4	200	2nd	-30.000	
-4	200	3rd	-30.000	
-4	300	2nd	-30.000	
-4	300	3rd	-30.000	
-4	400	2nd	-30.000	
-4	400	3rd	-30.000	
-4	500	2nd	-30.000	
-4	500	3rd	-30.000	
-4	600	2nd	-30.000	
-4	600	3rd	-30.000	
-4	700	2nd	-30.000	
-4	700	3rd	-30.000	
-4	800	2nd	-30.000	
-4	800	3rd	-30.000	

Table 64 **RF Gen Harmonics at –4 dBm Table** (Continued)

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-4	900	2nd	-30.000	
-4	900	3rd	-30.000	
-4	1000	2nd	-30.000	
-4	1000	3rd	-30.000	

Table 65 **RF Gen Half-Harmonics at -2.5 dBm Table**

Level (dBm)	RF (MHz)	Half Frequency (MHz)	Half-Harmonic Limits (dBc)	
			Upper	Actual
-2.5	501	250.5	-60.000	
-2.5	850	425	-60.000	
-2.5	1000	500	-60.000	

Table 66 **RF Gen Half-Harmonics at –4 dBm Table**

Level (dBm)	RF (MHz)	Half Frequency (MHz)	Half-Harmonic Limits (dBc)	
			Upper	Actual
-4	501	250.5	-60.000	
-4	850	425	-60.000	
-4	1000	500	-60.000	

8920B
RF Gen Spurious Spectral Purity
Performance Test 12

Table 67 RF Gen Spurious Signal at -2.5 dBm Table

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at +1 dBm Limits (dBc)	
			Upper	Actual
3/2 Mixer	242	274	-60.000	
3/2 Mixer	247	259	-60.000	

Table 68 RF Gen Spurious Signal at – 4 dBm Table

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at –4 dBm Limits (dBc)	
			Upper	Actual
Supply	100	100.03	-60.000	
Supply	400	400.03	-60.000	
Supply	501	501.03	-60.000	
Supply	1000	999.97	-60.000	
Supply	100	.03	-60.000	
RF Feedthru	41	959	-60.000	
RF Feedthru	61	939	-60.000	
RF Feedthru	81	919	-60.000	
RF Feedthru	91	909	-60.000	
RF Feedthru	101	899	-60.000	
RF Feedthru	111	889	-60.000	
RF Feedthru	121	879	-60.000	
3/2 Mixer	242	274	-60.000	

Table 68 **RF Gen Spurious Signal at – 4 dBm Table** (Continued)

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at –4 dBm Limits (dBc)	
			Upper	Actual
3/2 Mixer	247	259	-60.000	
4/3 Mixer	242	32	-60.000	
4/3 Mixer	247	12	-60.000	
5/4 Mixer	211	55	-60.000	
5/4 Mixer	217	85	-60.000	
5/4 Mixer	221	105	-60.000	
5/4 Mixer	227	135	-60.000	
5/4 Mixer	231	155	-60.000	
5/4 Mixer	237	185	-60.000	
Ref 10 MHz	165	175	-60.000	
Ref 200 kHz	150	150.2	-60.000	
Ref 200 kHz	150	149.8	-60.000	
Ref 200 kHz	150	150.4	-60.000	
Ref 200 kHz	150	149.6	-60.000	
Ref 200 kHz	150	150.6	-60.000	
Reference	150	149.4	-60.000	

8920B
AF Gen AC Level Accuracy
Performance Test 13

Table 69 AF Gen AC Level Accuracy Table

AF Gen	Frequency (Hz)	Level (mV)	Measured AC Level Accuracy Limits (mV)		
			Lower	Upper	Actual
1	25000	4000	3885.000	4115.000	
1	25000	700	682.500	717.500	
1	25000	75	70.000	80.000	
1	10000	4000	3885.000	4115.000	
1	10000	700	682.500	717.500	
1	10000	75	70.000	80.000	
1	1000	4000	3885.000	4115.000	
1	1000	700	682.500	717.500	
1	1000	75	70.000	80.000	
1	100	4000	3885.000	4115.000	
1	100	700	682.500	717.500	
1	100	75	70.000	80.000	
2	25000	4000	3885.000	4115.000	
2	25000	700	682.500	717.500	
2	25000	75	70.000	80.000	
2	10000	4000	3885.000	4115.000	
2	10000	700	682.500	717.500	
2	10000	75	70.000	80.000	
2	1000	4000	3885.000	4115.000	
2	1000	700	682.500	717.500	

Table 69 AF Gen AC Level Accuracy Table (Continued)

AF Gen	Frequency (Hz)	Level (mV)	Measured AC Level Accuracy Limits (mV)		
			Lower	Upper	Actual
2	1000	75	70.000	80.000	
2	100	4000	3885.000	4115.000	
2	100	700	682.500	717.500	
2	100	75	70.000	80.000	

8920B AF Gen DC Level Accuracy Performance Test 14

Table 70 AF Gen DC Level Accuracy Table

AFGen	Level (mV)	Measured DC Level Accuracy Limits (mV)		
		Lower	Upper	Actual
1	4000	3820.000	4180.000	
1	1000	925.000	1075.000	
2	4000	3820.000	4180.000	
2	1000	925.000	1075.000	

8920B
AF Gen Residual Distortion
Performance Test 15

Table 71 AF Gen Residual Distortion Table

AFGen	Frequency (Hz)	Level (mV)	Measured Residual Distortion (%)		
			Lower	Upper	Actual
1	25000	4000	0.000	.125	
1	25000	2000	0.000	.125	
1	25000	200	0.000	.125	
1	10000	4000	0.000	.125	
1	10000	2000	0.000	.125	
1	10000	200	0.000	.125	
1	1000	4000	0.000	.125	
1	1000	2000	0.000	.125	
1	1000	200	0.000	.125	
1	100	4000	0.000	.125	
1	100	2000	0.000	.125	
1	100	200	0.000	.125	
2	25000	4000	0.000	.125	
2	25000	2000	0.000	.125	
2	25000	200	0.000	.125	
2	10000	4000	0.000	.125	
2	10000	2000	0.000	.125	
2	10000	200	0.000	.125	
2	1000	4000	0.000	.125	
2	1000	2000	0.000	.125	

Table 71 AF Gen Residual Distortion Table (Continued)

AFGen	Frequency (Hz)	Level (mV)	Measured Residual Distortion (%)		
			Lower	Upper	Actual
2	1000	200	0.000	.125	
2	100	4000	0.000	.125	
2	100	2000	0.000	.125	
2	100	200	0.000	.125	

8920B
AF Gen Frequency Accuracy
Performance Test 16

Table 72 AF Gen Frequency Accuracy Table

AFGen	Frequency (Hz)	Measured Frequency (Hz)		
		Lower	Upper	Actual
1	25000	24993.750	25006.250	
1	10000	9997.500	10002.500	
1	5000	4998.750	5001.250	
1	2000	1999.500	2000.500	
1	1000	999.750	1000.250	
1	500	499.875	500.125	
1	200	199.950	200.050	
1	100	99.975	100.025	
1	50	49.988	50.012	
1	20	19.995	20.005	
2	25000	24993.750	25006.250	
2	10000	9997.500	10002.500	
2	5000	4998.750	5001.250	
2	2000	1999.500	2000.500	
2	1000	999.750	1000.250	
2	500	499.875	500.125	
2	200	199.950	200.050	
2	100	99.975	100.025	
2	50	49.988	50.012	
2	20	19.995	20.005	

8920B AF Analyzer AC Voltage Accuracy Performance Test 17

Table 73 AF Analyzer AC Voltage Accuracy Table

Frequency (Hz)	Level (mV)	AC Voltage Accuracy Limits (mV)		
		Lower	Upper	Actual
15000	5000	4849.850	5150.150	
2000	5000	4849.850	5150.150	
200	5000	4849.850	5150.150	
20	5000	4849.850	5150.150	
15000	500	484.850	515.150	
2000	500	484.850	515.150	
200	500	484.850	515.150	
20	500	484.850	515.150	
15000	50	48.350	51.650	
2000	50	48.350	51.650	
200	50	48.350	51.650	
20	50	48.350	51.650	

8920B
AF Analyzer Residual Noise Performance Test 18

Table 74 AF Analyzer Residual Noise Table

Residual Noise (μV)	
Upper	**Actual**
150	

8920B AF Analyzer Distortion and SINAD Accuracy Performance Test 19

Table 75 AF Analyzer Distortion and SINAD Accuracy

Harmonic Frequency (kHz)	Harmonic Level (V)	Measurement Type	Distortion (%) and SINAD (dB) Accuracy Limits		
			Lower	Upper	Actual
2	.1	Distortion	8.856	11.144	
2	.1	SINAD	19.043	21.043	
3	.1	Distortion	8.856	11.144	
3	.1	SINAD	19.043	21.043	
2	.01	Distortion	.890	1.120	
2	.01	SINAD	39.000	41.000	
3	.01	Distortion	.890	1.120	
3	.01	SINAD	39.000	41.000	
2	.005	Distortion	.445	.560	
2	.005	SINAD	45.021	47.021	
3	.005	Distortion	.445	.560	
3	.005	SINAD	45.021	47.021	

8920B
AF Analyzer DC Level Accuracy
Performance Test 20

Table 76 AF Analyzer DC Voltage Accuracy

Level (mV)	DC Voltage Limits (mV)		
	Lower	Upper	Actual
5000	4905.000	5095.000	
500	450.000	550.000	

8920B
AF Analyzer Frequency Accuracy to 100 kHz
Performance Test 21

Table 77 AF Analyzer Frequency Accuracy to 100 kHz

Frequency (Hz)	8902A Counter Limits (Hz)		
	Lower	Upper	Actual
20	19.986	20.014	
100	99.970	100.030	
1000	999.790	1000.210	
10000	9997.90	10002.10	
100000	99979	100021	

8920B
AF Analyzer Frequency Accuracy at 400 kHz
Performance Test 22

Table 78 AF Analyzer Freq Acc at 400 kHz Table

Frequency Accuracy at 400 kHz (kHz)		
Lower	**Upper**	**Actual**
399.920	400.080	

8920B Oscilloscope Performance Test 23

Table 79 Oscilloscope Amplitude Accuracy Table

Frequency (kHz)	Level (Vrms)	Amplitude Limits (Vpk)		
		Lower	Upper	Actual
1	5	6.765	7.377	
10	5	6.765	7.377	
50	5	5.000	10.000	

8920B
RF Analyzer Level Accuracy
Performance Test 24

Table 80 RF Analyzer Level Accuracy Table

Power	Level Accuracy Limits (mW)		
	Lower	**Upper**	**Actual**
500 mW	475	525	
200 mW	190	210	

8920B
RF Analyzer AM Accuracy
Performance Test 25

Table 81 RF Analyzer AM Accuracy Table

Det	Depth (%)	Rate (Hz)	AM Accuracy Limits (%)		
			Lower	Upper	Actual
Pk+	10	50	8.000	12.000	
Pk-	10	50	8.000	12.000	
Pk+	10	1000	8.000	12.000	
Pk-	10	1000	8.000	12.000	
Pk+	10	10000	8.000	12.000	
Pk-	10	10000	8.000	12.000	
Pk+	30	50	27.000	33.000	
Pk-	30	50	27.000	33.000	
Pk+	30	1000	27.000	33.000	
Pk-	30	1000	27.000	33.000	
Pk+	30	10000	27.000	33.000	
Pk-	30	10000	27.000	33.000	
Pk+	50	50	46.000	54.000	
Pk-	50	50	46.000	54.000	
Pk+	50	1000	46.000	54.000	
Pk-	50	1000	46.000	54.000	
Pk+	50	10000	46.000	54.000	
Pk-	50	10000	46.000	54.000	
Pk+	70	50	65.000	75.000	
Pk-	70	50	65.000	75.000	

Table 81 RF Analyzer AM Accuracy Table (Continued)

Det	Depth (%)	Rate (Hz)	AM Accuracy Limits (%)		
			Lower	Upper	Actual
Pk+	70	1000	65.000	75.000	
Pk-	70	1000	65.000	75.000	
Pk+	70	10000	65.000	75.000	
Pk-	70	10000	65.000	75.000	
Pk+	80	50	74.500	85.500	
Pk-	80	50	74.500	85.500	
Pk+	80	1000	74.500	85.500	
Pk-	80	1000	74.500	85.500	
Pk+	80	10000	74.500	85.500	
Pk-	80	10000	74.500	85.500	

8920B RF Analyzer AM Distortion Performance Test 26

NOTE: **RF Analyzer AM Distortion is not required for 8920B Options 006, 007, and 009.**

Table 82 RF Analyzer AM Distortion Table

AM Distortion	AM Distortion Limits (%)	
	Upper	Actual
Depth 10%	2.000	
Depth 30%	2.000	
Depth 50%	2.000	
Depth 70%	2.000	
Depth 80%	2.000	

8920B
RF Analyzer Residual AM
Performance Test 27

NOTE: **RF Analyzer Residual AM is not required for 8920B Options 006, 007, and 009.**

Table 83 RF Analyzer Residual AM Table

Residual AM (%)	
Upper	**Actual**
0.2	

8920B
RF Analyzer FM Accuracy
Performance Test 28

Table 84 **RF Analyzer FM Accuracy Table**

RF (MHz)	Deviation (kHz)	Rate (Hz)	FM Accuracy Limits (kHz)		
			Lower	Upper	Actual
400	10	50	9.600	10.400	
400	10	1000	9.600	10.400	
400	10	25000	9.600	10.400	
400	17	50	16.320	17.680	
400	17	1000	16.320	17.680	
400	17	25000	16.320	17.680	

8920B RF Analyzer FM Distortion Performance Test 29

Table 85 RF Analyzer FM Distortion Table

Deviation (kHz)	FM Distortion Limits (%)	
	Upper	Actual
5	1.000	
25	1.000	
75	1.000	

8920B RF Analyzer FM Bandwidth Performance Test 30

Table 86 RF Analyzer FM Bandwidth Table

FM bandwidth (dB)	
Upper	**Actual**
3.0	

8920B
RF Analyzer Residual FM
Performance Test 31

Table 87 RF Analyzer Residual FM Table

Residual FM (Hz)	
Upper	**Actual**
7	

8920B RF Analyzer SSB Demodulation Performance Test 32

Table 88 SSB Distortion Table

RF Generator Frequency (MHz)	RF Generator Amplitude (dBm)	RF Analyzer Frequency (MHz)	Measured Distortion (%)	
			Upper Limit	Actual
122	–19	122.001	3	
122	–33	122.001	3	
620	–19	620.001	3	
620	–33	620.001	3	
900	–19	900.001	3	
900	–33	900.001	3	

Table 89 SSB Flatness Table

RF Analyzer Frequency (MHz)	Audio Analyzer Reading (dBv)
501.001	
501.010	
501.050	
501.070	
Upper Limits (dB)	**Highest Lowest Reading (dB)**
3	

8920B
Spectrum Analyzer Image Rejection Performance Test 33

Table 90 Image Rejection Table

Signal Generator Frequency (MHz) (image)	UUT Spectrum Analyzer Center Frequency (MHz) (signal)	Measure Image Response (dB)	
		Upper Limit	Actual
613.6	385.0	–50	
873.6	645.0	–50	
883.6	655.0	–50	
1023.6	795.0	–50	
1000.0	771.4	–50	
576.4	805.0	–50	
771.4	1000.0	–50	
319.02	300.0	–50	

Table 91 Residual Response Analyzer

UUT Spectrum Analyzer Center Frequency (MHz)	Measured Residual Response (dBm)	
	Upper Limit	Actual
107.126	–70	
164.28	–70	
257.139	–70	
271.4	–70	
347.607	–70	
500.0	–70	

8921A Performance Test Record

8921A Cell Site Test Set

Tested By _____________ Serial Number _____________ Date _____________

Temp _____________ Humidity _____________ Time _____________

NOTE: **The following Performance Test are not required for the 8921A:**

Performance Test 1 - RF Gen AM Distortion

Performance Test 2 - RF Gen AM Accuracy

Performance Test 3 - RF Gen AM Flatness

Performance Test 25 - RF Analyzer AM Accuracy

Performance Test 26 - RF Analyzer AM Distortion

Performance Test 27 - RF Analyzer Residual AM

8921A RF Gen FM Distortion Performance Test 4

Table 92 RF Gen FM Distortion Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Limits (%)		
				Lower	Upper	Actual
-9.1	30	99	1	0.00	0.50	
-9.1	30	5	1	0.00	0.50	
-9.1	312.5	5	1	0.00	0.50	
-9.1	425	50	1	0.00	0.50	
-9.1	501	99	1	0.00	0.50	
-9.1	501	50	1	0.00	0.50	
-9.1	501	5	1	0.00	0.50	
-9.1	568.75	50	1	0.00	0.50	
-9.1	656.25	99	1	0.00	0.50	
-9.1	656.25	50	1	0.00	0.50	
-9.1	656.25	5	1	0.00	0.50	
-9.1	750	99	1	0.00	0.50	
-9.1	750	50	1	0.00	0.50	
-9.1	750	5	1	0.00	0.50	
-9.1	856.25	99	1	0.00	0.50	
-9.1	856.25	50	1	0.00	0.50	
-9.1	856.25	5	1	0.00	0.50	
-9.1	956.25	50	1	0.00	0.50	
-9.1	976.002	5	1	0.00	0.50	
-9.1	1000	99	1	0.00	0.50	

Table 92 RF Gen FM Distortion Table (Continued)

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Measured FM Limits (%)		
				Lower	Upper	Actual
-9.1	1000	50	1	0.00	0.50	
-9.1	1000	11	1	0.00	0.50	
-9.1	1000	5	1	0.00	0.50	
-9.1	1000	6	1	0.00	0.50	
-9.1	1000	7	1	0.00	0.50	
-9.1	1000	8	1	0.00	0.50	
-9.1	1000	9	1	0.00	0.50	
-9.1	998.401	8	1	0.00	0.50	
-9.1	768.001	8	1	0.00	0.50	
-9.1	512.001	8	1	0.00	0.50	
-9.1	511.601	8	1	0.00	0.50	
-9.1	511.201	8	1	0.00	0.50	

8921A RF Gen FM Accuracy Performance Test 5

Table 93 RF Gen FM Accuracy Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)			
				Lower	Upper	Actual
-9.1	30	99	1	95.035	102.965	
-9.1	30	3	1	2.845	3.155	
-9.1	312.5	3	1	2.845	3.155	
-9.1	425	50	1	47.750	52.250	
-9.1	501	99	1	95.035	102.965	
-9.1	501	50	1	47.750	52.250	
-9.1	501	3	1	2.845	3.155	
-9.1	568.75	50	1	47.750	52.250	
-9.1	656.25	99	1	95.035	102.965	
-9.1	656.25	50	1	47.750	52.250	
-9.1	656.25	3	1	2.845	3.155	
-9.1	750	99	1	95.035	102.965	
-9.1	750	50	1	47.750	52.250	
-9.1	750	3	1	2.845	3.155	
-9.1	856.25	99	1	95.035	102.965	
-9.1	856.25	50	1	47.750	52.250	
-9.1	856.25	3	1	2.845	3.155	
-9.1	956.25	50	1	47.750	52.250	
-9.1	976.002	3	1	2.845	3.155	

Table 93 RF Gen FM Accuracy Table (Continued)

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Lower	Upper	Actual
-9.1	1000	99	1	95.035	102.965	
-9.1	1000	50	1	47.750	52.250	
-9.1	1000	11	1	10.115	11.885	
-9.1	1000	3	1	2.845	3.155	

8921A
RF Gen FM Flatness
Performance Test 6

Table 94 RF Gen FM Flatness Table

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate	Computed FM Flatness Limits (dB)		Measured Reading (kHz)	Computed Results (dB)
				Lower	Upper		
-9.1	521	50	1 kHz	-1.0	1.0		0 dB
-9.1	521	50	100 Hz	-1.0	1.0		
-9.1	521	50	200 Hz	-1.0	1.0		
-9.1	521	50	2 kHz	-1.0	1.0		
-9.1	521	50	10 kHz	-1.0	1.0		
-9.1	521	50	25 kHz	-1.0	1.0		
-9.1	975.5	50	1 kHz	-1.0	1.0		0 dB
-9.1	975.5	50	100 Hz	-1.0	1.0		
-9.1	975.5	50	200 Hz	-1.0	1.0		
-9.1	975.5	50	2 kHz	-1.0	1.0		
-9.1	975.5	50	10 kHz	-1.0	1.0		
-9.1	975.5	50	25 kHz	-1.0	1.0		

8921A RF Gen Residual FM Performance Test 7

Table 95 RF Gen Residual FM Table

LO (MHz)	RF (MHz)	Measured Residual FM LImits (Hz)	
		Upper	Actual
11.5	30	7	
101.5	100	7	
249.5	248	7	
251.5	250	4	
401.5	400	4	
501.5	500	4	
502.5	501	7	
512.701	511.201	7	
513.101	511.601	7	
513.501	512.001	7	
626.5	625	7	
736.5	735	7	
741.5	740	7	
746.5	745	7	
751.5	750	7	
769.501	768.001	7	
846.5	845	7	
851.5	850	7	
856.5	855	7	
866.5	865	7	

Table 95 RF Gen Residual FM Table (Continued)

LO (MHz)	RF (MHz)	Measured Residual FM LImits (Hz)	
		Upper	Actual
901.5	900	7	
999.901	998.401	7	
1001.5	1000	7	

8921A
RF Gen Duplex Output High Level Accuracy
Performance Test 8

Table 96 RF Gen High Level Accuracy at Duplex Output Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
0.375	5	3.500	6.500	
0.375	1	-.500	2.500	
1	5	3.500	6.500	
1	1	-.500	2.500	
3	5	3.500	6.500	
3	1	-.500	2.500	
10	5	3.500	6.500	
10	1	-.500	2.500	
30	5	3.500	6.500	
30	1	-.500	2.500	
100	5	3.500	6.500	
100	1	-.500	2.500	
300	5	3.500	6.500	
300	1	-.500	2.500	
687.5	5	3.500	6.500	
687.5	1	-.500	2.500	
800	5	3.500	6.500	
800	1	-.500	2.500	
900	5	3.500	6.500	

Table 96 RF Gen High Level Accuracy at Duplex Output Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
900	1	-.500	2.500	
1000	5	3.500	6.500	
1000	1	-.500	2.500	

8921A RF Gen Duplex Output Low Level Accuracy Performance Test 9

Table 97 RF Gen Low Level Accuracy at Duplex Output Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	1	-.500	2.500	
3 (Opt 055)	-4	-5.500	-2.500	
3 (Opt 055)	-9	-10.500	-7.500	
3 (Opt 055)	-14	-15.500	-12.500	
3 (Opt 055)	-19	-20.500	-17.500	
3 (Opt 055)	-24	-25.500	-22.500	
3 (Opt 055)	-29	-30.500	-27.500	
3 (Opt 055)	-34	-35.500	-32.500	
3 (Opt 055)	-39	-40.500	-37.500	
3 (Opt 055)	-44	-45.500	-42.500	
3 (Opt 055)	-49	-50.500	-47.500	
3 (Opt 055)	-54	-55.500	-52.500	
3 (Opt 055)	-59	-60.500	-57.500	
3 (Opt 055)	-64	-65.500	-62.500	
3 (Opt 055)	-69	-70.500	-67.500	
3 (Opt 055)	-74	-75.500	-72.500	
3 (Opt 055)	-79	-80.500	-77.500	
3 (Opt 055)	-84	-85.500	-82.500	
3 (Opt 055)	-89	-90.500	-87.500	

Table 97 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	-94	-95.500	-92.500	
3 (Opt 055)	-99	-100.500	-97.500	
3 (Opt 055)	-104	-105.500	-102.500	
3 (Opt 055)	-109	-110.500	-107.500	
3 (Opt 055)	-114	-115.500	-112.500	
3 (Opt 055)	-119	-120.500	-117.500	
3 (Opt 055)	-124	-125.500	-122.500	
687.5	1	-.500	2.500	
687.5	-4	-5.500	-2.500	
687.5	-9	-10.500	-7.500	
687.5	-14	-15.500	-12.500	
687.5	-19	-20.500	-17.500	
687.5	-24	-25.500	-22.500	
687.5	-29	-30.500	-27.500	
687.5	-34	-35.500	-32.500	
687.5	-39	-40.500	-37.500	
687.5	-44	-45.500	-42.500	
687.5	-49	-50.500	-47.500	
687.5	-54	-55.500	-52.500	
687.5	-59	-60.500	-57.500	
687.5	-64	-65.500	-62.500	
687.5	-69	-75.500	-67.500	
687.5	-74	-75.500	-72.500	

Table 97 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
687.5	-79	-80.500	-77.500	
687.5	-84	-85.500	-82.500	
687.5	-89	-90.500	-87.500	
687.5	-94	-95.500	-92.500	
687.5	-99	-100.500	-97.500	
687.5	-104	-105.500	-102.500	
687.5	-109	-110.500	-107.500	
687.5	-114	-115.500	-112.500	
687.5	-119	-120.500	-117.500	
687.5	-124	-125.500	-122.500	
1000	1	-.500	2.500	
1000	-4	-5.500	-2.500	
1000	-9	-10.500	-7.500	
1000	-14	-15.500	-12.500	
1000	-19	-20.500	-17.500	
1000	-24	-25.500	-22.500	
1000	-29	-30.500	-27.500	
1000	-34	-35.500	-32.500	
1000	-39	-40.500	-37.500	
1000	-44	-45.500	-42.500	
1000	-49	-50.500	-47.500	
1000	-54	-55.500	-52.500	
1000	-59	-60.500	-57.500	

Table 97 RF Gen Low Level Accuracy at Duplex Output Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
1000	-64	-65.500	-62.500	
1000	-69	-70.500	-67.500	
1000	-74	-75.500	-72.500	
1000	-79	-80.500	-77.500	
1000	-84	-85.500	-82.500	
1000	-89	-90.500	-87.500	
1000	-94	-95.500	-92.500	
1000	-99	-100.500	-97.500	
1000	-104	-105.500	-102.500	
1000	-109	-110.500	-107.500	
1000	-114	-115.500	-112.500	
1000	-119	-120.500	-117.500	
1000	-124	-125.500	-122.500	

Table 98 RF Gen Level Accuracy at Duplex Output Table (Additional Frequencies For 83236A PCS Interface)

Level (dBm)	Frequency (MHz)		
	824	859	894
-7			
-8			
-9			
-10			
-11			
-12			
-13			
-14			
-15			
-16			
-17			
-22			
-27			
-32			
-37			
-42			
-47			
-52			
-57			
-62			
-67			

Table 99

One-half Maximum Minus Minimum (dB)	
Upper	**Actual**
0.63	

8921A RF Gen RF IN/OUT Level Accuracy Performance Test 10

Table 100 RF Gen Level Accuracy at RF INPUT/OUTPUT Table

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	-21	-20.800	-17.200	
3 (Opt 055)	-24	-25.800	-22.200	
3 (Opt 055)	-29	-30.800	-27.200	
3 (Opt 055)	-34	-35.800	-32.200	
3 (Opt 055)	-39	-40.800	-37.200	
3 (Opt 055)	-44	-45.800	-42.200	
3 (Opt 055)	-49	-50.800	-47.200	
3 (Opt 055)	-54	-55.800	-52.200	
3 (Opt 055)	-59	-60.800	-57.200	
3 (Opt 055)	-64	-65.800	-62.200	
3 (Opt 055)	-69	-70.800	-67.200	
3 (Opt 055)	-74	-75.800	-72.200	
3 (Opt 055)	-79	-80.800	-77.200	
3 (Opt 055)	-84	-85.800	-82.200	
3 (Opt 055)	-89	-90.800	-87.200	
3 (Opt 055)	-94	-95.800	-92.200	
3 (Opt 055)	-99	-100.800	-97.200	
3 (Opt 055)	-104	-105.800	-102.200	
3 (Opt 055)	-109	-110.800	-107.200	
3 (Opt 055)	-114	-115.800	-112.200	

Table 100 RF Gen Level Accuracy at RF INPUT/OUTPUT Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
3 (Opt 055)	-119	-120.800	-117.200	
3 (Opt 055)	-124	-125.800	-122.200	
687.5	-21	-20.800	-17.200	
687.5	-24	-25.800	-22.200	
687.5	-29	-30.800	-27.200	
687.5	-34	-35.800	-32.200	
687.5	-39	-40.800	-37.200	
687.5	-44	-45.800	-42.200	
687.5	-49	-50.800	-47.200	
687.5	-54	-55.800	-52.200	
687.5	-59	-60.800	-57.200	
687.5	-64	-65.800	-62.200	
687.5	-69	-70.800	-67.200	
687.5	-74	-75.800	-72.200	
687.5	-79	-80.800	-77.200	
687.5	-84	-85.800	-82.200	
687.5	-89	-90.800	-87.200	
687.5	-94	-95.800	-92.200	
687.5	-99	-100.800	-97.200	
687.5	-104	-105.800	-102.200	
687.5	-109	-110.800	-107.200	
687.5	-114	-115.800	-112.200	
687.5	-119	-120.800	-117.200	

Table 100 RF Gen Level Accuracy at RF INPUT/OUTPUT Table (Continued)

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
687.5	-124	-125.800	-122.200	
1000	-19	-20.800	-17.200	
1000	-24	-25.800	-22.200	
1000	-29	-30.800	-27.200	
1000	-34	-35.800	-32.200	
1000	-39	-40.800	-37.200	
1000	-44	-45.800	-42.200	
1000	-49	-50.800	-47.200	
1000	-54	-55.800	-52.200	
1000	-59	-60.800	-57.200	
1000	-64	-65.800	-62.200	
1000	-69	-70.800	-67.200	
1000	-74	-75.800	-72.200	
1000	-79	-80.800	-77.200	
1000	-84	-85.800	-82.200	
1000	-89	-90.800	-87.200	
1000	-94	-95.800	-92.200	
1000	-99	-100.800	-97.200	
1000	-104	-105.800	-102.200	
1000	-109	-110.800	-107.200	
1000	-114	-115.800	-112.200	
1000	-119	-120.800	-117.200	
1000	-124	-125.800	-122.200	

8921A RF Gen Harmonics Spectral Purity Performance Test 11

Table 101 RF Gen Harmonics at +1 dBm Table

Level (dBm)	RF (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
+1	1 (Opt 055)	2nd	-30.000	
+1	1 (Opt 055)	3rd	-30.000	
+1	2 (Opt 055)	2nd	-30.000	
+1	2 (Opt 055)	3rd	-30.000	
+1	5 (Opt 055)	2nd	-30.000	
+1	5 (Opt 055)	3rd	-30.000	
+1	10 (Opt 055)	2nd	-30.000	
+1	10 (Opt 055)	3rd	-30.000	
+1	20 (Opt 055)	2nd	-30.000	
+1	20 (Opt 055)	3rd	-30.000	
+1	50	2nd	-30.000	
+1	50	3rd	-30.000	
+1	100	2nd	-30.000	
+1	100	3rd	-30.000	
+1	200	2nd	-30.000	
+1	200	3rd	-30.000	
+1	300	2nd	-30.000	
+1	300	3rd	-30.000	
+1	400	2nd	-30.000	
+1	400	3rd	-30.000	

Table 101 RF Gen Harmonics at +1 dBm Table (Continued)

Level (dBm)	RF (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
+1	500	2nd	-30.000	
+1	500	3rd	-30.000	
+1	600	2nd	-30.000	
+1	600	3rd	-30.000	
+1	700	2nd	-30.000	
+1	700	3rd	-30.000	
+1	800	2nd	-30.000	
+1	800	3rd	-30.000	
+1	900	2nd	-30.000	
+1	900	3rd	-30.000	
+1	1000	2nd	-30.000	
+1	1000	3rd	-30.000	

Table 102 RF Gen Harmonics at –4 dBm Table

Level (dBm)	RF Freq (MHz)	Frequency (MHz)	Harmonic Limits (dBc)	
			Upper	Actual
-4	1 (Opt 055)	2nd	-30.000	
-4	1 (Opt 055)	3rd	-30.000	
-4	2 (Opt 055)	2nd	-30.000	
-4	2 (Opt 055)	3rd	-30.000	
-4	5 (Opt 055)	2nd	-30.000	
-4	5 (Opt 055)	3rd	-30.000	
-4	10 (Opt 055)	2nd	-30.000	
-4	10 (Opt 055)	3rd	-30.000	

Table 102 RF Gen Harmonics at –4 dBm Table

Level (dBm)	RF Freq (MHz)	Frequency (MHz)	Harmonic Limits (dBc)	
			Upper	Actual
-4	20 (Opt 055)	2nd	-30.000	
-4	20 (Opt 055)	3rd	-30.000	
-4	50	2nd	-30.000	
-4	50	3rd	-30.000	
-4	100	2nd	-30.000	
-4	100	3rd	-30.000	
-4	200	2nd	-30.000	
-4	200	3rd	-30.000	
-4	300	2nd	-30.000	
-4	300	3rd	-30.000	
-4	400	2nd	-30.000	
-4	400	3rd	-30.000	
-4	500	2nd	-30.000	
-4	500	3rd	-30.000	
-4	600	2nd	-30.000	
-4	600	3rd	-30.000	
-4	700	2nd	-30.000	
-4	700	3rd	-30.000	
-4	800	2nd	-30.000	
-4	800	3rd	-30.000	
-4	900	2nd	-30.000	
-4	900	3rd	-30.000	
-4	1000	2nd	-30.000	
-4	1000	3rd	-30.000	

Table 103 RF Gen Half-Harmonics at +1 dBm Table

Level (dBm)	RF (MHz)	Half Frequency (MHz)	Half-Harmonic Limits (dBc)	
			Upper	Actual
+1	501	250.5	-60.000	
+1	850	425	-60.000	
+1	1000	500	-60.000	

Table 104 RF Gen Half-Harmonics at –4 dBm Table

Level (dBm)	RF (MHz)	Half Frequency (MHz)	Half-Harmonic Limits (dBc)	
			Upper	Actual
-4	501	250.5	-60.000	
-4	850	425	-60.000	
-4	1000	500	-60.000	

8921A
RF Gen Spurious Spectral Purity Performance Test 12

Table 105 RF Gen Spurious Signal at +1 dBm (Opt 055) Table

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at +1 dBm Limits (dBc)	
			Upper	Actual
3/2 Mixer	242	274	-60.000	
3/2 Mixer	247	259	-60.000	

Table 106 RF Gen Spurious Signal at – 4 dBm (Std) Table

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at –4 dBm Limits (dBc)	
			Upper	Actual
Supply	100	100.03	-60.000	
Supply	400	400.03	-60.000	
Supply	501	501.03	-60.000	
Supply	1000	999.97	-60.000	
Supply	100	.03	-60.000	
RF Feedthru	1	999	-60.000	
LO Feedthru	1	1000	-60.000	
RF Feedthru	11	989	-60.000	
RF Feedthru	21	979	-60.000	
RF Feedthru	41	959	-60.000	
RF Feedthru	61	939	-60.000	
RF Feedthru	81	919	-60.000	
RF Feedthru	91	909	-60.000	

Table 106 RF Gen Spurious Signal at – 4 dBm (Std) Table (Continued)

Spur Source	RF (MHz)	Spur Freq (MHz)	Spurious Signal at –4 dBm Limits (dBc)	
			Upper	Actual
RF Feedthru	101	899	-60.000	
RF Feedthru	111	889	-60.000	
RF Feedthru	121	879	-60.000	
3/2 Mixer	242	274	-60.000	
3/2 Mixer	247	259	-60.000	
4/3 Mixer	242	32	-60.000	
4/3 Mixer	247	12	-60.000	
5/4 Mixer	211	55	-60.000	
5/4 Mixer	217	85	-60.000	
5/4 Mixer	221	105	-60.000	
5/4 Mixer	227	135	-60.000	
5/4 Mixer	231	155	-60.000	
5/4 Mixer	237	185	-60.000	
Ref 10 MHz	165	175	-60.000	
Ref 200 kHz	150	150.2	-60.000	
Ref 200 kHz	150	149.8	-60.000	
Ref 200 kHz	150	150.4	-60.000	
Ref 200 kHz	150	149.6	-60.000	
Ref 200 kHz	150	150.6	-60.000	
Reference	150	149.4	-60.000	

8921A
AF Gen AC Level Accuracy
Performance Test 13

Table 107 AF Gen AC Level Accuracy Table

AF Gen	Frequency (Hz)	Level (mV)	Measured AC Level Accuracy Limits (mV)		
			Lower	Upper	Actual
1	25000	4000	3885.000	4115.000	
1	25000	700	682.500	717.500	
1	25000	75	70.000	80.000	
1	10000	4000	3885.000	4115.000	
1	10000	700	682.500	717.500	
1	10000	75	70.000	80.000	
1	1000	4000	3885.000	4115.000	
1	1000	700	682.500	717.500	
1	1000	75	70.000	80.000	
1	100	4000	3885.000	4115.000	
1	100	700	682.500	717.500	
1	100	75	70.000	80.000	
2	25000	4000	3885.000	4115.000	
2	25000	700	682.500	717.500	
2	25000	75	70.000	80.000	
2	10000	4000	3885.000	4115.000	
2	10000	700	682.500	717.500	
2	10000	75	70.000	80.000	
2	1000	4000	3885.000	4115.000	
2	1000	700	682.500	717.500	

Table 107 AF Gen AC Level Accuracy Table (Continued)

AF Gen	Frequency (Hz)	Level (mV)	Measured AC Level Accuracy Limits (mV)		
			Lower	Upper	Actual
2	1000	75	70.000	80.000	
2	100	4000	3885.000	4115.000	
2	100	700	682.500	717.500	
2	100	75	70.000	80.000	

8921A AF Gen DC Level Accuracy Performance Test 14

Table 108 AF Gen DC Level Accuracy Table

AFGen	Level (mV)	Measured DC Level Accuracy Limits (mV)		
		Lower	Upper	Actual
1	4000	3820.000	4180.000	
1	1000	925.000	1075.000	
2	4000	3820.000	4180.000	
2	1000	925.000	1075.000	

8921A AF Gen Residual Distortion Performance Test 15

Table 109 AF Gen Residual Distortion Table

AF Gen	Frequency (Hz)	Level (mV)	Measured Residual Distortion (%)		
			Lower	Upper	Actual
1	25000	4000	0.000	.125	
1	25000	2000	0.000	.125	
1	25000	200	0.000	.125	
1	10000	4000	0.000	.125	
1	10000	2000	0.000	.125	
1	10000	200	0.000	.125	
1	1000	4000	0.000	.125	
1	1000	2000	0.000	.125	
1	1000	200	0.000	.125	
1	100	4000	0.000	.125	
1	100	2000	0.000	.125	
1	100	200	0.000	.125	
2	25000	4000	0.000	.125	
2	25000	2000	0.000	.125	
2	25000	200	0.000	.125	
2	10000	4000	0.000	.125	
2	10000	2000	0.000	.125	
2	10000	200	0.000	.125	
2	1000	4000	0.000	.125	
2	1000	2000	0.000	.125	

Table 109 AF Gen Residual Distortion Table (Continued)

AF Gen	Frequency (Hz)	Level (mV)	Measured Residual Distortion (%)		
			Lower	Upper	Actual
2	1000	200	0.000	.125	
2	100	4000	0.000	.125	
2	100	2000	0.000	.125	
2	100	200	0.000	.125	

8921A AF Gen Frequency Accuracy Performance Test 16

Table 110 AF Gen Frequency Accuracy Table

AFGen	Frequency (Hz)	Measured Frequency (Hz)		
		Lower	Upper	Actual
1	25000	24993.750	25006.250	
1	10000	9997.500	10002.500	
1	5000	4998.750	5001.250	
1	2000	1999.500	2000.500	
1	1000	999.750	1000.250	
1	500	499.875	500.125	
1	200	199.950	200.050	
1	100	99.975	100.025	
1	50	49.988	50.012	
1	20	19.995	20.005	
2	25000	24993.750	25006.250	
2	10000	9997.500	10002.500	
2	5000	4998.750	5001.250	
2	2000	1999.500	2000.500	
2	1000	999.750	1000.250	
2	500	499.875	500.125	
2	200	199.950	200.050	
2	100	99.975	100.025	
2	50	49.988	50.012	
2	20	19.995	20.005	

8921A
AF Analyzer AC Voltage Accuracy Performance Test 17

Table 111 AF Analyzer AC Voltage Accuracy Table

Frequency (Hz)	Level (mV)	AC Voltage Accuracy Limits (mV)		
		Lower	Upper	Actual
15000	5000	4849.850	5150.150	
2000	5000	4849.850	5150.150	
200	5000	4849.850	5150.150	
20	5000	4849.850	5150.150	
15000	500	484.850	515.150	
2000	500	484.850	515.150	
200	500	484.850	515.150	
20	500	484.850	515.150	
15000	50	48.350	51.650	
2000	50	48.350	51.650	
200	50	48.350	51.650	
20	50	48.350	51.650	

8921A
AF Analyzer Residual Noise
Performance Test 18

Table 112 AF Analyzer Residual Noise Table

Residual Noise (μV)	
Upper	**Actual**
150	

8921A
AF Analyzer Distortion and SINAD Accuracy
Performance Test 19

Table 113 AF Analyzer Distortion and SINAD Accuracy

Harmonic Frequency (kHz)	Harmonic Level(V)	Measurement Type	Distortion (%) and SINAD (dB) Accuracy Limits		
			Lower	Upper	Actual
2	.1	Distortion	8.856	11.144	
2	.1	SINAD	19.043	21.043	
3	.1	Distortion	8.856	11.144	
3	.1	SINAD	19.043	21.043	
2	.01	Distortion	.890	1.120	
2	.01	SINAD	39.000	41.000	
3	.01	Distortion	.890	1.120	
3	.01	SINAD	39.000	41.000	
2	.005	Distortion	.445	.560	
2	.005	SINAD	45.021	47.021	
3	.005	Distortion	.445	.560	
3	.005	SINAD	45.021	47.021	

Table 114 SNR (Signal to Noise Ratio)

Harmonic Frequency (kHz)	Harmonic Level(V)	Measurement Type	SNR dB Accuracy Limits		
			Lower	Upper	Actual
2	.1	SNR	19.000	21.000	
2	.01	SNR	39.000	41.000	

8921A AF Analyzer DC Level Accuracy Performance Test 20

Table 115 AF Analyzer DC Voltage Accuracy

Level (μV)	DC Voltage Limits (μV)		
	Lower	Upper	Actual
5000	4905.000	5095.000	
500	450.000	550.000	

8921A
AF Analyzer Frequency Accuracy to 100 kHz
Performance Test 21

Table 116 AF Analyzer Frequency Accuracy to 100 kHz

Frequency (Hz)	8902A Counter Limits (Hz)		
	Lower	Upper	Actual
20	19.986	20.014	
100	99.970	100.030	
1000	999.790	1000.210	
10000	9997.90	10002.10	
100000	99979	100021	

8921A AF Analyzer Frequency Accuracy at 400 kHz Performance Test 22

Table 117 AF Analyzer Freq Acc at 400 kHz Table

Frequency Accuracy at 400 kHz (kHz)		
Lower	**Upper**	**Actual**
399.920	400.080	

8921A Oscilloscope Performance Test 23

Table 118 Oscilloscope Amplitude Accuracy Table

Frequency (kHz)	Level (V)	Amplitude Limits (V)		
		Lower	Upper	Actual
1	5	6.765	7.377	
10	5	6.765	7.377	
50	5	5.000	10.000	

8921A RF Analyzer Level Accuracy Performance Test 24

Table 119 RF Analyzer Level Accuracy Table

Power	Level Accuracy Limits (mW)		
	Lower	Upper	Actual
500 mW	474	526	
200 mW	189	211	

8921A
RF Analyzer FM Accuracy
Performance Test 28

Table 120 RF Analyzer FM Accuracy Table

RF (MHz)	Deviation (kHz)	Rate (Hz)	FM Accuracy Limits (kHz)		
			Lower	Upper	Actual
12.5	1	50	.960	1.040	
12.5	1	1000	.960	1.040	
12.5	1	25000	.960	1.040	
12.5	10	50	9.600	10.400	
12.5	10	1000	9.600	10.400	
12.5	10	25000	9.600	10.400	
400	10	50	9.600	10.400	
400	10	1000	9.600	10.400	
400	10	25000	9.600	10.400	
400	17	50	16.320	17.680	
400	17	1000	16.320	17.680	
400	17	25000	16.320	17.680	

8921A RF Analyzer FM Distortion Performance Test 29

Table 121 RF Analyzer FM Distortion Table

Deviation (kHz)	FM Distortion Limits (%)	
	Upper	Actual
5	1.000	
25	1.000	
75	1.000	

8921A RF Analyzer FM Bandwidth Performance Test 30

Table 122 RF Analyzer FM Bandwidth Table

FM Bandwidth (dB)	
Upper	**Actual**
3.0	

8921A
RF Analyzer Residual FM
Performance Test 31

Table 123 RF Analyzer Residual FM Table

Residual FM (Hz)	
Upper	**Actual**
10	

8921A
RF Analyzer SSB Demodulation Performance Test 32

Table 124 SSB Distortion Table

RF Generator Frequency (MHz)	RF Generator Amplitude (dBm)	RF Analyzer Frequency (MHz)	Measured Distortion (%)	
			Upper Limit	Actual
122	–19	122.001	3	
122	–33	122.001	3	
620	–19	620.001	3	
620	–33	620.001	3	
900	–19	900.001	3	
900	–33	900.001	3	

Table 125 SSB Flatness Table

RF Analyzer Frequency (MHz)	Audio Analyzer Reading (dBv)
501.001	
501.010	
501.050	
501.070	
Upper Limits (dB)	**Highest Lowest Reading (dB)**
3	

8921A
Spectrum Analyzer Image Rejection Performance Test 33

Table 126 Image Rejection Table

Signal Generator Frequency (MHz) (image)	UUT Spectrum Analyzer Center Frequency (MHz) (signal)	Measure Image Response (dB)	
		Upper Limit	Actual
613.6	385.0	−50	
873.6	645.0	−50	
883.6	655.0	−50	
1023.6	795.0	−50	
1000.0	771.4	−50	
576.4	805.0	−50	
771.4	1000.0	−50	
319.02	300.0	−50	

Table 127 Residual Response Analyzer

UUT Spectrum Analyzer CenterFrequency (MHz)	Measured Residual Response (dBm)	
	Upper Limit	Actual
5.534	–70	
10.0	–70	
20.0	–70	
21.4	–70	
107.126	–70	
164.28	–70	
257.139	–70	
271.4	–70	
347.607	–70	
500.0	–70	

7

Specifications

Specifications describe the test set’s warranted performance and are valid over the entire operating/environmental range unless otherwise noted.

Specifications for each test set (8920A, 8920B, 8921A) are listed separately.

Supplemental Characteristics are intended to provide additional information useful in applying the instrument by giving typical, but non-warranted performance parameters. These characteristics are shown in *italics* and are sometimes labeled “typical”, “usable to”, or “nominal”.

8920A

Signal Generator Specifications

RF Frequency

Range: 30 MHz to 1 GHz (Standard)
: 250 kHz to 1 GHz (Opt 055)
Accuracy and Stability: Same as reference oscillator ±0.015 Hz
Switching Speed: <150 ms to within 100 Hz of carrier frequency
Resolution: 1 Hz

Output

RF IN/OUT Connector:

Standard:

Level Range: −137 to −20.5 dBm into 50 Ω
Level Range: −137 to −19 dBm into 50 Ω (w/Opt 055)
Level Accuracy:

±1.8 dB (level ≥ −127 dBm) If RF analyzer is also connected add ±0.1dB*(typical ±1.0 dB for all levels)*

Reverse Power:

60 W continuous
100 W for 10 seconds/minute

Option 007:

Level Range: −137 to −6.5 dBm into 50 Ω
Level Range: −137 to −5 dBm into 50 Ω (w/Opt 055)
Reverse Power:

2.4 W continuous
4.0 W for 10 seconds/minute

Option 008:

Level Range: −137 to −10.5 dBm into 50 Ω
Level Range: −137 to −9 dBm into 50 Ω (w/Opt 055)
Reverse Power:

6.0 W continuous
10 W for 10 seconds/minute

Option 016:

Level Range: –137 to –22.5 dBm into 50 Ω
Level Range: –137 to –21 dBm into 50 Ω (w/Opt 055)
Reverse Power:

100 W continuous (< +25°C)
125 W for 10 seconds/minute

DUPLEX OUT Connector:

Level Range: –127 to +5 dBm into 50 Ω (Standard)
: –127 to +7 dBm into 50 Ω (Opt 055)
Level Accuracy: ±1.5 dB *(typical ±1.0 dB for all levels)*
Reverse Power: 200 mW maximum

SWR:

RF IN/OUT: <1.5:1
DUPLEX OUT: <2.0:1 (level <–4 dBm)

Resolution: 0.1 dB

Spectral Purity

Spurious Signals:

For the following output levels:

Option	DUPLEX OUT	RF IN/OUT
Standard	≤–2.5 dBm	≤–26.5 dBm
007	≤–2.5 dBm	≤–12.5 dBm
007 with Opt 055	≤–1.0 dBm	≤–11.0 dBm
008	≤–2.5 dBm	≤–16.5 dBm
008 with Opt 055	≤–1.0 dBm	≤–15.0 dBm
016	≤–2.5 dBm	≤–28.5 dBm
016 with Opt 055	≤–1.0 dBm	≤–27.0 dBm
055	≤–1.0 dBm	≤–25 dBm

Harmonics: <–30 dBc
Non-Harmonic Spurious: <–60 dBc (at >5 kHz offset from carrier)

Residual FM (rms, CCITT):

Frequency Range	8920A Standard	8920A Opt. 050 or 8920D
250 kHz ≤ f_c < 249 MHz	< 20 Hz	< 7 Hz
249 MHz ≤ f_c < 501 MHz	< 10 Hz	< 4 Hz
501 MHz ≤ f_c ≤ 1000 MHz	< 20 Hz	< 7 Hz

SSB Phase Noise:

Offset (1 GHz carrier)	8920A Standard	8920A Opt.050 or 8920D
>20 kHz	*<−110 dBc/Hz*	*<−116 dBc/Hz*

FM

FM Deviation:

Rates >25 Hz
100 kHz: for f_c from 30 to < 249 MHz (Standard, Opt 007/008/016)
: for f_c from 0.25 to < 249 MHz (Opt 055)
50 kHz: for f_c from 249 to < 501 MHz (All)
100 kHz: for f_c from 501 to 1000 MHz (All)
FM not specified for (f_c minus FM dev.) <250 kHz

FM Rate:

1 kHz reference:
Internal: DC to 25 kHz (1 dB BW)
External, AC Coupled: 20 Hz to 75 kHz (*typical 3 dB BW*)
External, DC Coupled: dc to 75 kHz (*typical 3 dB BW*)

FM Accuracy:

≤10 kHz dev, 1 kHz rate:
±7.5% of setting ±50 Hz
±3.5% of setting ±50 Hz (with 8920A Option 050 or 8920D)
>10 kHz dev, 1 kHz rate:
±7.5% of setting ±500 Hz
±3.5% of setting ±500 Hz (with 8920A Option 050 or 8920D)

FM Distortion:

THD + Noise, 0.3 to 3 kHz BW:
<1.0% at >4 kHz deviation and 1 kHz rate
<0.5% at >4 kHz deviation and 1 kHz rate (8920A Option 050 or 8920D)

Center Frequency Accuracy in DC FM Mode:

External source impedance <1 kΩ:
±500 Hz (after DCFM zero) *(typical ±50 Hz)*
Ext. Mod. Input Impedance: 600 Ω nominal
Resolution:
50 Hz for <10 kHz deviation
500 Hz for ≥10 kHz deviation

AM

Frequency Range: 30 to 1000 MHz (Standard)

: 1.5 to 1000 MHz (*usable to 250 kHz*) (Opt 055)

AM Depth:

RF IN/OUT levels ≤–26.5 dBm or DUPLEX OUT levels ≤–2.5 dBm (Standard):

RF IN/OUT levels ≤–27 dBm or DUPLEX OUT levels ≤1.0 dBm (Opt 055):

0 to 90% *(usable to 99%)*
0 to 70% *(usable to 90%)* (8920A Option 050 or 8920D)

AM Rate: 20 Hz to 25 kHz (3 dB bandwidth)

AM Accuracy:

≤10% AM: ±5% of setting ±1.0% AM at 1 kHz rate
>10% AM: ±5% of setting ±1.5% AM at 1 kHz rate

AM Distortion:

THD+Noise, 0.3 to 3 kHz BW:
<2% at 1 kHz rate, <30% AM
<3% at 1 kHz rate, ≤90% AM
Ext. Mod. Input Impedance: 600 Ω nominal
Residual AM: <0.1% in a 50 Hz to 15 kHz BW
Resolution:
0.05% AM for 0 to 10% AM
0.5% AM for 10 to 100% AM

TDMA Signal Generator

(8920D or 8920A with Option 050 and 83201A)

Frequency Range: 824 MHz to 894 MHz
Output Level Range:
RF In/Out: –22 dBm to –127 dBm
Duplex Out: +4 dBm to –127 dBm
Residual Error Vector Magnitude: <3.0%
Residual Phase Error: <2.6°
Residual Magnitude Error: <2.6%
IQ Origin Offset: <–30 dBc within 15°C of last calibration
Frequency Error: ±4 Hz plus reference

Audio Source Specifications

(These specifications apply to both internal sources)

Frequency

Range: dc to 25 kHz
Accuracy: 0.025% of setting
Resolution: 0.1 Hz

Output Level

Range: 0.1 mV to 4 Vrms

Maximum Output Current: 20 mA peak

Output Impedance: <1Ω (1 kHz)

Accuracy: ±2% of setting plus resolution

Residual Distortion: 0.125%; for tones 20 Hz to 25 kHz in an 80 kHz BW (THD plus noise, amplitude >200 mVrms)

Resolution:
- *Level ≤0.01 V: ±50 µV*
- *Level ≤0.1 V: ±.5 mV*
- *Level ≤1 V: ±5 mV*
- *Level >1 V: ±50 mV*

Offset in DC Coupled Mode: <50 mV

RF Analyzer Specifications

RF Power Measurement

Standard

Frequency Range: 10 MHz to 1 GHz (Std)
: 400 kHz to 1 GHz (Opt 055)

Measurement Range:
1 mW to 60 W continuous
100 W for 10 seconds/minute (measured at RF IN/OUT connector)

Accuracy: ±10% of reading ±0.01 mW± 1 count

SWR: <1.5:1

Resolution:
Power <10 W: 1 mW
Power ≥10 W: 10 mW

Option 007

Frequency Range: 10 MHz to 1 GHz (Std)
: 400 kHz to 1 GHz (Opt 055)

Measurement Range:
40µW to 2.4 W continuous
4.0 W for 10 seconds/minute

Accuracy: ±10% of reading ±.40 µW± 1 count

SWR: < 1.5:1

Resolution:
P < 400 mW: 40 µW
P ≥ 400 mW: 400µW

Option 008

Frequency Range: 10 MHz to 1 GHz (Std)
: 400 kHz to 1 GHz (Opt 055)

Measurement Range:
0.1 mW to 6 W continuous
10 W for 10 seconds/minute

Accuracy: ±10% of reading ±0.001 mW± 1 count

SWR: < 1.5:1

Resolution:
P < 1 W: 0.1 mW
P ≥ 1 W: 1.0 mW

Option 016

Frequency Range: 10 MHz to 1 GHz (Std)
: 400 kHz to 1 GHz (Opt 055)

Measurement Range:
1.6 mW to 100W continuous (< +25°C)
125 W for 10 seconds/minute

Accuracy: ±10% of reading ±0.016 mW± 1 count

SWR: < 1.5:1
Resolution:
P < 12.5 W: 1.25 mW
P ≥ 12.5 W: 12.5 mW

Frequency Measurement

Measurement Range: 400 kHz to 1 GHz (Std)

: 10 MHz to 1 GHz (Opt 055)

Level Range:

RF IN/OUT:
Standard:
1 mW to 60 W continuous
100 W for 10 seconds/minute
Option 007:
40 µW to 2.4 W continuous
4.0 W for 10 seconds/minute
Option 008:
0.1 mW to 6 W continuous
10 W for 10 seconds/minute
Option 016:
1.6 mW to100 W continuous (< +25°C)
125 W for 10 seconds/minute
ANT IN: –36 dBm to +20 dBm

Accuracy: ±1 Hz plus timebase accuracy

Frequency Resolution: 1 Hz

FM Measurement

Frequency Range: 5 MHz to 1 GHz (*usable to 400 kHz*) (Std)
: 10MHz to 1 GHz (*usable to 400 kHz*) (Opt 055)
Deviation: 20 Hz to 75 kHz
Sensitivity: 2µV (15 kHz IF BW, High Sensitivity Mode, 0.3 to 3 kHz BW) *(typical <1 µV (12 dB SINAD, f_c ≥10 MHz))*
Accuracy: ±4% of reading plus residual FM and noise contribution (20 Hz to 25 kHz rates, deviation ≤25 kHz)
Bandwidth: 2 Hz to 70 kHz (3 dB) DCFM measurements also available
THD+Noise: <1% for ≥5 kHz deviation and 1 kHz rate in a 0.3 to 3 kHz BW
Input Level Range for Specified Accuracy:
Standard:
–18 to +50 dBm at RF IN/OUT (0.016 mW to 100 W)
–50 to +14 dBm at ANT IN
Option 007:

−32 to 36 dBm at RF IN/OUT (0.63μW to 4.0 W)
Option 008:
−28 to 40 dBm at RF IN/OUT (1.6μW to 10 W)
Option 016:
−16 to 50 dBm at RF IN/OUT (25μW to 100 W)
Residual FM and Noise:
0.3 to 3 kHz, rms:
< 20 Hz
< 7 Hz (8920A Option 050 or 8920D)
Resolution:
f <10 kHz: 1 Hz
f ≥10 kHz: 10 Hz

AM Measurement

Frequency Range: 10 MHz to 1 GHz (*usable to 400 kHz)*

Depth: 0 to 95%

Accuracy: ±5% of reading ±1.5% AM (50 Hz to 10 kHz rates, modulation ≤80%)

THD+Noise: <2% rms for modulation ≤80% AM (1 kHz rate in a 0.3 to 3 kHz BW)

Input Level for Specified Accuracy (levels in PEP):

Standard:
−18 to +50 dBm at RF IN/OUT (0.016 mW to 60 W)
−50 to +14 dBm at ANT IN
Option 007:
−32 to 36 dBm at RF IN/OUT (0.63 μW to 2.4 W)
Option 008:
−28 to 40 dBm at RF IN/OUT (1.6μW to 10 W)
Option 016:
−16 to 50 dBm at RF IN/OUT (25μW to 100 W)

Residual AM: <0.2% in a 0.3 to 3 kHz BW

Resolution: 0.1%

SSB Measurement

Frequency Range: 10 MHz to 1 GHz (Std)

: 400 kHz to 1 GHz (Opt 055)

Bandwidth (3 dB): 20 Hz to 70 kHz

Distortion and Noise: <3% at 1 kHz rate in a 0.3 to 3 kHz BW

TDMA Analyzer

(8920D or 8920A with Option 050 and 83201A)

Frequency Range: 824 MHz to 894 MHz
Input Level Range:
RF In/Out: 1 mW to 60W (0 to +47.8 dBm)
Antenna: –36 to +17 dBm
Input Frequency Setting Error: 1 kHz
RX DSP Level Setting Range: –23 to 0 dB full scale
Residual Error Vector Magnitude: <1.3%
Error Vector Magnitude Measurement Accuracy: ±0.4% plus 2% of reading
Residual Phase Error:<1.0°
Residual Magnitude Error: <0.9%
I/Q Origin Offset Accuracy: ±0.5 dB for values to –40 dBc
Frequency Error Accuracy: ±2.5 Hz plus timebase accuracy

AF Analyzer Specifications

Frequency Measurement

Measurement Range: 20 Hz to 400 kHz
Accuracy: ±0.02% plus resolution plus timebase accuracy
External Input: 20 mV to 30 Vrms
Resolution:
f <10 kHz: 0.01 Hz
f <100 kHz: 0.1 Hz
f ≥100 kHz: 1 Hz

AC Voltage Measurement

Measurement Range: 0 to 30 Vrms
Accuracy: ±3% of reading (20 Hz to 15 kHz, inputs ≥1 mV)
Residual Noise: 150μV (15 kHz BW)
3 dB Bandwidth: Typically 2 Hz to 100 kHz
Nominal Input Impedance: switchable between 1 M Ω in parallel with 95 pF, and 600 Ω floating
Resolution:
4 digits for inputs ≥100 mV
3 digits for inputs <100 mV

DC Voltage Measurement

Voltage Range: 100 mV to 42 V
Accuracy: ±1.0% of reading plus DC offset
DC Offset: ±45 mV
Resolution: 1 mV

Distortion Measurement

Fundamental Frequency: 1 kHz ±5 Hz
Optional Frequency Range: 300 Hz to 10 kHz ±5% (Option 019)
Input Level Range: 30 mV to 30 Vrms
Display Range: 0.1% to 100%
Accuracy:

±1 dB (0.5 to 100% distortion) for tones from 300 to 1500 Hz measured with the 15 kHz LPF

±1.5 dB (1.5 to 100% distortion) for tones from 300 Hz to 10 kHz measured with the >99 kHz LPF

Residual THD+Noise:

−60 dBc or 150 μV, whichever is greater, for tones from 300 to 1500 Hz measured with the 15 kHz LPF

−57 dBc or 450 μV, whichever is greater, for tones from 300 Hz to 10 kHz measured with the >99 kHz LPF

Resolution: 0.1% Distortion

SINAD Measurement

Fundamental Frequency: 1 kHz ±5 Hz
Optional Frequency Range: 300 Hz to 10 kHz ±5% (Option 019)
Input Level Range: 30 mV to 30 Vrms
Display Range: 0 to 60 dB
Accuracy:

±1 dB (0 to 46 dB SINAD) for tones from 300 to 1500 Hz measured with the 15 kHz LPF

±1.5 dB (0 to 36 dB SINAD) for tones from 300 Hz to 10 kHz measured with the >99 kHz LPF

Residual THD+Noise:

−60 dB or 150 μV, whichever is greater, for tones from 300 to 1500 Hz measured with the 15 kHz LPF

−57 dBc or 450 μV, whichever is greater, for tones from 300 Hz to 10 kHz measured with the >99 kHz LPF

Resolution: 0.01 dB

Audio Filters

Standard

< 20 Hz HPF
50 Hz HPF
300 Hz HPF
300 Hz LPF
3 kHz LPF
15 kHz LPF
> 99 kHz LPF
750 µ de-emphasis
1 kHz notch

Optional

C-Message
CCITT
400 Hz HPF
4 kHz BPF
6 kHz BPF
300 Hz to 10 kHz (variable, option 019)

Audio Detectors:

RMS, RMS*SQRT2, Pk+, Pk–, Pk+hold, Pk–hold, Pk±/2, Pk±/2 hold, Pk±max, Pk±maxhold

Oscilloscope Specifications

Frequency Range: 2 Hz to 50 kHz (3 dB BW)

Scale/Division: 10 mV to 10 V

Amplitude Accuracy: ±1.5% of reading ±0.1 division. (20 Hz to 10 kHz)

Time/Division: 1 µsec to 200 msec

3 dB Bandwidth: Typically >100 kHz

Internal DC Offset: ≤0.1 div (≥50 µV/div sensitivity)

Spectrum Analyzer Specifications (Option 102)

Frequency

Frequency Range: 10 MHz to 1 GHz (Std)
: 400 kHz to 1 GHz (Opt 055)
Frequency Span/Resolution Bandwidth (coupled):

Span	Bandwidth
< 50 kHz	300 Hz
< 200 kHz	1 kHz
< 1.5 MHz	3 kHz
< 18 MHz	30 kHz
≥ 18 MHz	300 kHz
Full span	

Display: Log with 10 dB/div, 2 dB/div, or 1 dB/div
Display Range: 80 dB
Reference Level Range: +50 to –50 dBm
Residual Responses: <–70 dBm (no input signal, 0 dB attenuation)
Image Rejection: >50 dB
Non-harmonic Spurious Responses: >70 dB (for input signals ≤–30 dBm)
Level Accuracy: ±2.5 dB
Displayed Average Noise Level: <–114 dBm for ≤ 50 kHz spans
Log Scale Linearity: ±2 dB (for input levels ≤ –30 dBm or 60 dB range)

Tracking Generator

(Included with Option 102)

Frequency Range: 10 MHz to 1 GHz (Std)
: 400 kHz to 1 GHz (Opt 055)
Frequency Offset: Frequency span endpoints ± frequency offset cannot be [< 400 kHz (Opt 055) or <10 MHz (Std)] or ≥ 1 GHz
Output Level Range: Same as signal generator
Sweep Modes: Normal and inverted

Adjacent Channel Power

(Included with Option 102)

Relative Measurements:
Level Range:
Antenna In: –40 dBm to +20 dBm

RF/Input:
Standard: 1 mw to 60 W continuous or up to 60 W for 10 seconds/minute
Opt 006: 50µW to 10 W continuous or up to 15W for 10 seconds/minute
Opt 007: 40µW to 2.4 W continuous or up to 4 W for 10 seconds/minute
Opt 016: 1.6 mw to 100 W continuous or up to 125 W for 10 seconds/minute

Dynamic Range: Typical values for channel offsets

Channel Offset	**Resolution Bandwidth**	**Dynamic Range**
12.5 kHz	*8.5 kHz*	*– 65 dBc*
20 kHz	*14 kHz*	*– 68 dBc*
25 kHz	*16 kHz*	*– 68 dBc*
30 kHz	*16 kHz*	*– 68 dBc*
60 kHz	*30 kHz*	*– 65 dBc*

Relative Accuracy: ±2.0 dB

Absolute Level Measurements:

Level: Results of absolute power in Watts or dBm are met by adding the ACP ratio from the spectrum analyzer to the carrier power from the input section RF power detector.

Level Range:

Antenna: Not applicable

RF/Input:
Standard: 1 mw to 60 W continuous or up to 60 W for 10 seconds/minute
Opt 006: 50μW to 10 W continuous or up to 15W for 10 seconds/minute
Opt 007: 40μW to 2.4 W continuous or up to 4 W for 10 seconds/minute
Opt 016: 1.6 mw to 100 W continuous or up to 125 W for 10 seconds/minute

Dynamic Range: Typical values for channel offsets

Channel Offset	**Resolution Bandwidth**	**Dynamic Range**
12.5 kHz	*8.5 kHz*	*– 65 dBc*
20 kHz	*14 kHz*	*– 68 dBc*
25 kHz	*16 kHz*	*– 68 dBc*
30 kHz	*16 kHz*	*– 68 dBc*
60 kHz	*30 kHz*	*– 65 dBc*

Absolute Accuracy: RF power measurement accuracy for absolute in-channel power: (for inputs > 200 mW): ±10% of reading ±1 mW (in dB) plus ACP relative accuracy of ±2.0 dB

Signaling (Option 004)

Capability for generating and analyzing the following formats:

CDCSS, DTMF, 1 TONE, 2 TONE, 5/6 TONE SEQUENTIAL, RPC1, POCSAG, EIA, CCITT, CCIR, ZVEI, DZVEI, GOLAY, EEA, AMPS/EAMPS/NAMPS, TACS/ETACS, JTACS/NTACS, NMT-450, NMT-900, LTR®[1], EDACS™, MPT 1327, and TDMA dual-mode

LTR® is a registered trademark of the E. F. Johnson Company; EDACS™ is a trademark of Erickson/GE.

[1] over 15° to 35°C for analyzing

A General Purpose Function Generator with the following waveforms is included: sine, square, triangle, ramp, dc, Gaussian white noise, uniform white noise.

Frequency Range and Level: Same as audio source

DC Current Meter (Option 103)

Measurement Range: 0 to 10 A (*usable to 20 A*)

Accuracy: The greater of 10% of reading after zeroing or 30 mA (levels > 100 mA)

Remote Programming (Option 103)

GPIB: Agilent Technologies' implementation of IEEE Standard 488.2

Functions Implemented: SH1, AH1, T6, L4, SR1, RL1, LE0, TE0, PP0, DC1, DT1, C4, C11, E2

RS-232: Six-wire RJ-11 connector provides two three-wire serial ports for serial data in and out (no hardware handshake capability).

Baud Rates: 150, 300, 600, 1200, 2400, 4800, 9600, and 19200 Hz

Parallel (Centronics) connector: A standard 25-pin, sub-min D female connector with right-angle adapter is included. NOTE: Retrofittable only for 8920A units with serial number prefix of 3501 and greater.

Reference Oscillator Specifications

TCXO (Standard)

Temperature: 1 ppm (0 to +55°C)

Aging: < 2 ppm/year

Warm-up Time: < 30 seconds to be within ±2 ppm of final frequency

OCXO (Option 001)

Temperature: 0.05 ppm (0 to +55°C)

Aging: < 0.5 ppm/year (< 1 ppm in first year)

Warm-up Time: < 15 minutes to be within ±0.1 ppm of final frequency

Rear Panel BNC connectors:

Input Frequency: 1,2,5,10 MHz
Input Level[1]*: > 0.15 Vrms*
Output Frequency: 10 MHz
Output Level: > 0.5 Vrms

1. Electrostatic Discharges to the 10 MHz Ref Input port of 0.5 kV or above may cause degradation of performance, requiring operator intervention.

Save/Recall Registers

Approximately 928 kilobytes RAM available for non-volatile save/recall of settings. This typically will allow you to save >500 sets of instrument settings, depending on the type of information saved.

General Specifications

Size: 7.5 H x 13 W x 19 inches (188 H x 330 W x 456 D mm)

Weight: 35 lbs (17.1 kg) fully optioned

CRT Size: 7 x 10 cm

Operating Temperature: 0 to +55°C

Storage Temperature: –55 to +75°C

Power:

- **AC:** 100 to 240 V, 48 to 440 Hz, *nominally 80 watts*
- **DC:** 11 to 28 V, *nominally 120 watts*

Leakage: At Signal Generator output frequency and level <–40 dBm, typical leakage is <0.5 µV induced in a resonant dipole antenna 1 inch from any surface except the rear panel. This corresponds to approximately 0.05 µV when measured with a 25-mm, two-turn loop. Spurious leakage levels are typically < 1 µ V in a resonant dipole antenna.

8920B

8920B Specifications

This section provides the options and specifications for the 8920B RF Communication Test Set:

Standard Instrument

The following specifications describe a standard 8920B RF Communications Test Set with no options. An electronic attenuator is included with Standard, Options 006, 007, and 016 instruments. An optional mechanical attenuator (Opt 055), which provides wider frequency and power ranges, is available for all options. All specifications are valid over the instrument's entire operating/environmental range unless otherwise noted, and apply after a 30 minute warm-up.

Supplemental characteristics are intended to provide additional information useful in applying the instrument by giving typical, but non-warranted performance parameters. These are shown in italics or labeled as "typical", "usable to", or "nominal".

**8920B
RFCommunications
Test Set**

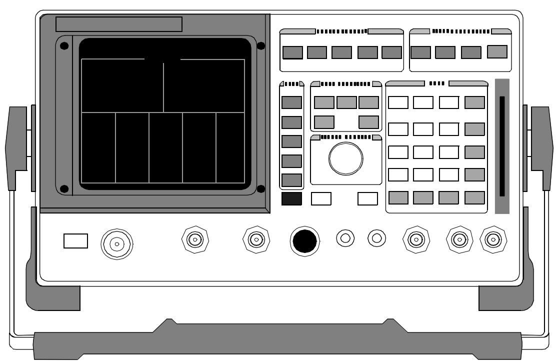


Figure 24 **8920B RF Communications Test Set (Standard Instrument)**

Signal Generator Specifications

RF Frequency

Frequency Range	30 to 1000 MHz (Standardd) 0.25 to 1000 MHz (Opt 055)
Step Attenuator Type	Electronic (Std) Electro-mechanical (Opt 055)
Accuracy & Stability	Same as reference oscillator: ±0.015 Hz

Temperature Controlled Crystal Oscillator (TCXO)	
Temperature Aging Warm-up Time	±1ppm (0° to +55°C) <2 ppm/year <30s to be within ±2 ppm of final frequency.
Supplemental Characteristics	
Switching Speed	*<150 ms to be within 100 Hz of carrier frequency.*
Resolution	*1 Hz (displayed)*

Output

RF IN/OUT Connector	
Level Accuracy	±1.2 dB (level ≥ –127 dBm). If RF analyzer is also connected, add ±0.1 dB. Typically ±1.0 dB for all levels.
Level Range	-137 to -20.5 dBm into 50Ω (Standard) -137 to -19 dBm into 50Ω (Opt 055)
Reverse Power Continuous Peak (10 seconds/minute)	 60 watts 100 watts
Step Attenuator Type	Electro-mechanical
DUPLEX OUT Connector	
Level Accuracy	±1.0 dB
Level Range	-127 to 3.5 dBm into 50Ω (Standard) -127 to 7 dBm into 50Ω (Opt 055)
Reverse Power	200 mW max.
SWR	
RF IN/OUT	<1.5:1
DUPLEX OUT	<2.0:1 (level <-4 dBm)
Supplemental Characteristics	
Resolution	*0.1 dB*

Spectral Purity

Spurious Signals for ≤–27 dBm output level at RF IN/OUT, or for ≤1.0 dBm output level at DUPLEX OUT (Standard) for ≤–25 dBm output level at RF IN/OUT, or for ≤1.0 dBm output level at DUPLEX OUT (Opt 055)	
Harmonics	<–30 dBc
Non-Harmonics Spurious	<–60 dBc (at >5 kHz from carrier)
Residual FM (rms, CCITT)	
250 kHz ≤ fc < 249 MHz	<7 Hz
249 MHz ≤ fc < 501 MHz	<4 Hz
501 MHz ≤ fc ≤ 1000 MHz	<7 Hz
Supplemental Characteristics	
SSB Phase Noise *(for >20 kHz offsets at 1 GHz)*	*<–116 dB/Hz*

Frequency Modulation

FM Deviation Maximum (for rates >25 Hz)	100 kHz: for fc from 30 to <249 MHz (Std) 100 kHz: for fc from 0.25 to <249 MHz (Opt 055) 50 kHz: for fc from 249 to <501 MHz 100 kHz: for fc from 501 to 1000 MHz (FM not specified for [fc-FM dev.] <250 kHz)
FM Rate (1 kHz reference) Internal External	DC to 25 kHz (1 dB BW) AC coupled: 20 Hz to 75 kHz (typical 3 dB BW) DC coupled: DC to 75 kHz (typical 3 dB BW)
FM Accuracy (1 kHz rate)	≤10 kHz dev: ±3.5% of setting ±50 Hz >10 kHz dev: ±3.5% of setting ±500 Hz
FM Distortion (THD + Noise, in a 0.3 to 3 kHz BW)	<0.5% at >4kHz deviation and 1 kHz rate.
Center Frequency Accuracy in DC FM Mode (External source impedance <1 kΩ)	±500 Hz (after DC FM zero), typically ±50 Hz
Supplemental Characteristics	
Ext. Mod. Input Impedance	*600Ω nominal*
Resolution	*50 Hz for <10 kHz deviation* *500 Hz for ≥10 kHz deviation*

Amplitude Modulation

Frequency Range	30 to 1000 MHz (Standard) 1.5 to 1000 MHz (Opt 055)
AM Depth RF IN/OUT DUPLEX OUT RF IN/OUT (with 8920B Option 051, rear panel connector for TDMA testing.	 0 to 90% (usable to 99%) for level ≤–26.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤–2.5 dBm (055) 0 to 90% (usable to 99%) for level ≤-2.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤1 dBm (055) 0 to 70% (usable to 90%) for level ≤ 26.5 dBm
AM Rate	20 Hz to 25 kHz (3 db BW)
AM Accuracy (1 kHz rate)	≤10% AM: ±5% of setting, ±1.0% AM >10% AM: ±5% of setting, ±1.5% AM
AM Distortion (THD + Noise, in a 0.3 to 3 kHz BW)	<2% at 1 kHz rate, <30% AM <3% at 1 kHz rate, ≤90% AM
Supplemental Characteristics	
Ext. Mod. Input Impedance	*600Ω nominal*
Residual AM	*<0.1% in a 50 Hz to 15 kHz BW*
Resolution	*0.05% AM for 0 to 10% AM* *0.5% AM for 10 to 100% AM*

Audio Source Specifications

Audio Source Frequency and Output Level

Range	dc to 25 kHz
Accuracy	0.025% of setting
Supplemental Characteristics	
Resolution	*0.1 Hz*

Range	0.1 mV to 4 Vrms
Maximum Output Current	20 mA peak
Output Impedance	<1 Ω (1 kHz)
Accuracy	±2% of setting plus resolution
Residual Distortion	0.125% (THD plus noise, for amplitudes > 200 mVrms), for tones 20 Hz to 25 kHz measured in an 80 kHz BW.
Supplemental Characteristics	
Resolution	*Level ≤0.01 V: ±50 µV* *Level ≤0.1 V: ±0.5 mV* *Level ≤1.0 V: ±5 mV* *Level >1.0 V: ±50 mV*
Offset in DC Coupled Mode	*<50 mV*

RF Analyzer Specifications

RF Frequency Measurements

Measurement Range	10 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)
Level Range RF IN/OUT Continuous Peak (10 seconds/minute) ANT IN	 0 to 48 dBm (Standard or Opt 055) 1 mW to 60 W continuous 100 W –36 dBm to +20 dBm in auto-tune mode
Accuracy	±1 Hz plus timebase accuracy
Supplemental Characteristics	
Frequency Resolution	*1 Hz*

RF Power Measurements

Measurement Range	10 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)
SWR	RF IN/OUT port <1.5:1
RF IN/OUT Measurement Range[a] Continuous Peak (10 seconds/minute)	0 to 48 dBm (Standard or Opt 055) 1 mW to 60 W 100 W
Accuracy	±5% of reading ±0.01 mW ±1 count for temperature range of 25 ±10°C. Accuracy: ±10% of reading for operating temperature range.
Supplemental Characteristics	
Resolution	
P>10W	*10 mW*
P<10W	*1 mW*
P<100 mW	*0.1 mW*
P<10 mW	*0.01 mW*

a. To achieve the specified accuracy when measuring power at the RF IN/OUT port, the internal signal generator level must be 60 dB below the measured power or less the -20dBm at the DUPLEX OUT port.

FM Measurement

Frequency Range	30 to 1000 MHz *(usable to 400 kHz)* (Standard) 10 to 1000 MHz *(usable to 5 MHz)* (Opt 055)
Deviation	20 Hz to 75 kHz
Sensitivity	2 µV (15 kHz IF BW, high sensitivity mode, 0.3 to 3 kHz BW) *typically: <1 µV (12 SINAD, fc >10 MHz)*
Accuracy	±4% of reading plus residual FM and noise contribution (20 Hz to 25 kHz rates, deviation ≤25 kHz).
Bandwidth (3 dB)	2 Hz to 70 kHz (DC FM measurements also available).
THD+Noise	<1% rms (for deviation ≤5 kHz and at a rate of 1 kHz in a 0.3 to 3 kHz BW)
Input Level for Specified Accuracy RF IN/OUT ANT IN	 –14 to +48 dBm (0.04 mW to 60W continuous) –50 to +14 dBm
Residual FM and Noise	<7 Hz (0.3 to 3 kHz, rms)
Supplemental Characteristics	
Resolution	*1 Hz, f<10 kHz* *10 Hz, f≥10 kHz*

AM Measurement

Frequency Range	10 to 1000 MHz *(usable to 400 kHz)*
Depth	0 to 95%
Accuracy	±5% of reading ±1.5% AM (50 Hz to 10 kHz rates, modulation ≤80%).
THD+Noise	<2% rms for modulation ≤80% (at 1 kHz in a 0.3 to 3 kHz BW)
Input Level for Specified Accuracy RF IN/OUT ANT IN	 –14 to +48 dBm (0.04 mW to 100 W continuous) –50 to +14 dBm
Residual AM	<0.2% in a 0.3 to 3 kHz BW
Supplemental Characteristics	
Resolution	*0.1%*

SSB Measurement

Frequency Range	30 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)
Bandwidth (3 dB)	20 Hz to 70 kHz
Distortion & Noise	*<3% (at 1 kHz rate in a 0.3 to 3 kHz BW)*

AF Analyzer Specifications

Frequency Measurement

Measurement Range	20 Hz to 400 kHz
Accuracy	±0.02% plus resolution plus reference accuracy
External Input	20 mV to 30Vrms
Supplemental Characteristics	
Resolution	*0.01 Hz for f <10kHz* *0.1 Hz for f <100 kHz* *1 Hz for f Š100 kHz*

AC Voltage Measurement

Measurement Range	0 to 30 Vrms
Accuracy	±3% of reading (20 Hz to 15 kHz, inputs ≥1 mV)
Residual Noise	150 µV (15 kHz BW)
Supplemental Characteristics	
3 dB Bandwidth	*Typically 2 Hz to 100 kHz*
Nominal Input Impedance	*Switchable between 1 MΩ in parallel with 95 pF or 600 Ω floating*
Resolution	*4 digits for inputs Š100 mV* *3 digits for inputs <100 mV*

DC Voltage Measurement

Voltage Range	100 mV to 42 V
Accuracy	±1.0% of reading plus DC offset
DC Offset	±45 mV
Supplemental Characteristics	
Resolution	*1 mV*

Distortion Measurement

Frequency Range	300 Hz to 10 kHz ±5%
Input Level Range	30 mV to 30 Vrms
Display Range	0.1% to 100%
Accuracy	±1 dB (0.5 to 100% distortion) for tones from 300 to 1500 Hz measured with the 15 kHz LPF. ±1.5 dB (1.5 to 100% distortion) for tones from 300 Hz to 10 kHz measured with >99 kHz LPF.
Residual THD+Noise	–60 dB or 150 μV, whichever is greater, for tones from 300 to 1500 Hz measured with the 15 kHz LPF. –57 dB or 450 μV, whichever is greater, for tones from 300 Hz to 10 kHz measured with >99 kHz LPF.
Supplemental Characteristics	
Resolution	*0.1% Distortion*

SINAD Measurement

Frequency Range	300 Hz to 10 kHz ±5%
Input Level Range	30 mV to 30 Vrms
Display Range	0 to 60 dB
Accuracy	±1 dB (0 to 46 dB SINAD) for tones from 300 to 1500 Hz measured with the 15 kHz LPF. ±1.5 dB (0 to 36 dB SINAD) for tones from 300 Hz to 10 kHz measured with >99 kHz LPF.
Residual THD+Noise	–60 dB or 150 μV, whichever is greater, for tones from 300 to 1500 Hz measured with the 15 kHz LPF. –57 dB or 450 μV, whichever is greater, for tones from 300 Hz to 10 kHz measured with >99 kHz LPF.
Supplemental Characteristics	
Resolution	*0.01 dB*

Audio Filters, Variable Frequency Notch Filter, & Audio Detectors

Audio Filters - Standard	<20 Hz HPF 50 Hz HPF 300 Hz HPF 300 Hz LPF 3 kHz LPF 15 kHz LPF >99 kHz LPF 750 µsec de-emphasis
Audio Filters - Optional	C-Message CCITT 400 Hz HPF 4 kHz BPF 6 kHz BPF

Variable Frequency Notch Filter	
Frequency Range	300 Hz to 10 kHz
Notch Depth	>60 Hz
Notch Width	*Typically ±5%*

Audio Detectors	RMS, RMS*SQRT2, Pk+, Pk–, Pk+hold, Pk–hold, Pk±/2, Pk±/2 hold, Pk±max, Pk±maxhold

Oscilloscope Specifications

Frequency Range	2 Hz to 50 kHz (3 dB BW)
Scale/Division	10 mV to 10V
Amplitude Accuracy	±1.5% of reading ±0.1 div. (20 Hz to 10 kHz)
Time/Division	1 µsec to 200 msec
Trigger Delay Range	20 µsec to 3.2 seconds
Supplemental Characteristics	
3 dB Bandwidth	*Typically >100 kHz*
Internal DC Offset	*≤0.1 div. (≥50 µV/div. sensitivity)*

Standard User Memory, RAM

Approximately 928 Kbytes of RAM are available for nonvolatile save/recall of settings. This typically will allow you to save greater than 500 sets of instrument settings; depending on the type of information saved.

Standard Rear Panel Interface

Current Sensing and I/O: GPIB/RS-232/Parallel (Centronics).

DC Current Meter

Measurement Range: 0 to 10 A *(usable to 20 A)*

Accuracy: The greater of ±10% of reading after zeroing or 30 mA (levels >100mA)

Remote Programming

GPIB	Agilent Technologies' implementation of IEEE Standard 488.2. Functions implemented: SH1, AH1, T6, L4, SR1, RL1, LE0, TE0, PP0, DC1, DT1, C4, C11, E2.
RS-232	Two serial ports through RJ-11 connector used for serial data in and out. Baud Rates: 150, 300, 600, 1200, 2400, 4800, 9600, and 19.2 kHz

Memory Card Specifications

Card Compatibility: Single industry standard PCMCIA slot accepts Type I or Type II SRAM and ROM memory cards.

Storage Compatibility: Allows for the storage and retrieval of IBASIC program parameter and results data, input of new calibration data, and long-term storage of Store/Recall information.

Firmware Upgrades: Accepts PCMCIA flash memory cards (4 Mbytes) to allow automatic loading of new firmware for the host CPU from the front panel. Upgrade time is about 2 minutes.

Option 001, Oven Controlled Crystal Oscillator

Option 001 replaces the standard TCXO (Temperature Controlled Crystal Oscillator) timebase with an OCXO (Oven Controlled Crystal Oscillator) timebase. Specifications are given below.

Reference Oscillator

Oven Controlled Crystal Oscillator (OCXO)	
Temperature	0.05 ppm (0° to +55°C)
Aging	<0.5 ppm/year (<1 ppm in first year)
Warm-up Time	<15 minutes to be within ±0.1 ppm of final frequency.
Supplemental Characteristics	
Rear Panel BNC Connectors	
Input frequency	*1, 2, 5, and 10 MHz*
Input Level	*>0.15 Vrms*
Output frequency	*10 MHz*
Output Level	*>0.5 Vrms*

Option 004, Tone/Digital Signaling

Option 004 adds tone/digital signaling functionality with the following capabilities:

- Generation and analysis of the communication formats listed in the table below.
- The signal generator serves as a general purpose function generator for producing various waveforms and noise generation: sine, square, triangular, or ramp waveforms, D.C., and, Gaussian or uniform white-noise.
- Frequency range and level: same as audio source

Formats		
CDCSS	CCITT	LTR
DTMF	CCIR	AMPS/EAMPS/NAMPS
1-TONE	ZVEI	TACS/ETACS
2-TONE	DZVEI	JTACS
5/6 TONE SEQUENTIAL	GOLAY	NTACS
RPC1	EEA	EDACS
POCSAG	NMT-450	MPT 1327
EIA	NMT-900	TDMA Dual Mode

Option 006, Cellular Power Option

Option 006 replaces the standard 14 dB attenuator with a 6 db attenuator at the RF IN/OUT port. This option reduces the maximum continuous input power of the 8920B Test Set to 4.75 watts. With the exception of the following specifications, Option 006 has the same specifications as the standard instrument, **see "Standard Instrument" on page 387**.

Option 006 is designed to optimize the measurement range for cellular mobile station test, and enables average power measurements on TDMA signals using the 83206A Cellular Adapter (**see "Option 800, Dual Mode TDMA Cellular Adapter - EIA/TIA IS-54 DAMPS, and IS-136 DCCH" on page 422**). Option 006 is required for IS-136 testing. For TDMA specifications, see **"TDMA Specifications" on page 423**.

Signal Generator Specifications

RF Frequency & Reference Oscillator

Frequency Range	30 to 1000 MHz (Standard) 0.25 to 1000 MHz (Opt 055)
Step Attenuator Type	Electronic (Standard) Electro-mechanical (Opt 055)

Signal Generator Output

RF IN/OUT Connector	
Level Range	-137 to -12.5 dBm into 50Ω (Standard) -137 to -11 dBm into 50Ω (Opt 055)
Reverse Power	
Continuous	5W
Peak (10 seconds/minute)	7.5W
DUPLEX OUT Connector	
Level Range	-127 to +3.5 dBm into 50Ω (Standard) -127 to +7 dBm into 50Ω (Opt 055)

Spectral Purity

Spurious Signals: for ≤–20.5 dBm output level at RF IN/OUT, or for ≤–2.5 dBm output level at DUPLEX OUT (Standard) for ≤–25 dBm output level at RF IN/OUT, or for ≤–1 dBm output level at DUPLEX OUT (Opt 055)	Harmonics: <–30 dBc Non-Harmonics Spurious: <–60 dBc (at >5 kHz from carrier)

Frequency Modulation

FM Deviation Maximum (for rates >25 Hz)
100 kHz: for fc from 30 MHz to <249 MHz (Standard) 100 kHz: for fc from 0.25 to <249 MHz (Opt 055)

Amplitude Modulation

Frequency Range	30 to 1000 MHz (Standard) 1.5 to 1000 MHz (Opt 055)
AM Depth	
RF IN/OUT	0 to 90% (usable to 99%) for level ≤ –18.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤ –2.5 dBm (Opt 055)
DUPLEX OUT	0 to 90% (usable to 99%) for level ≤ –2.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤ 1 dBm (Opt 055)

RF Analyzer Specifications

RF Frequency Measurements

Measurement Range	10 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)
Level Range RF IN/OUT Continuous Peak (10 seconds/minute)	-13 to 40 dBm (Standard or Opt 055) 50 µW to 5W 7.5W

RF Power Measurements

Measurement range	10 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)
RF IN/OUT Measurement Range[a] Continuous Peak (10 seconds/minute)	-13 to 40 dBm (Standard or Opt 055) 50 µW to 5W 7.5W

a. To achieve the specified accuracy when measuring power at the RF IN/OUT port, the internal signal generator level must be 60 dB below the measured power or less than -20 dBm at the DUPLEX OUT port.

FM Measurement

Frequency Range	30 to 1000 MHz *(usable to 400 kHz)* (Standard) 10 to 1000 MHz *(usable to 5 MHz)* (Opt 055)
Input Level for Specified Accuracy	
RF IN/OUT	–22 to 40 dBm (6.3 µW to 10W continuous)

AM Measurement

Frequency Range	30 to 1000 MHz (usable to 10 MHz)
Input Level for Specified Accuracy (levels in PEP)	
RF IN/OUT	– 22 to 40 dBm (6.3 µW to 10W continuous)

SSB Measurement

Frequency Range	30 to 1000 MHz

Option 007, Low Level Power Measurements

Option 007 removes the standard 14 dB attenuator at the RF IN/OUT port allowing lower-level, higher sensitivity measurements. This option also replaces the standard electro-mechanical (relay) step attenuator in the RF input module with an electronic (solid-state) step attenuator. This option reduces the maximum continuous input power of the 8920B Test Set to 1.2 watts. With the exception of the following specifications, Option 007 has the same specifications as the standard instrument, **see "Standard Instrument" on page 387**.

Signal Generator Specifications

RF Frequency & Reference Oscillator

Frequency Range	30 to 1000 MHz (Standard) 0.25 to 1000 MHz (Opt 055)
Step Attenuator Type	Electronic (Std) Electro-mechanical (Opt 055)

Signal Generator Output Levels

RF IN/OUT Connector	
Level Range	-137 to -6.5 dBm into 50Ω (Standard) -137 to -5 dBm into 50Ω (Opt 055)
Reverse Power	
Continuous	1.2W
Peak (10 seconds/minute)	2W
DUPLEX OUT Connector	
Level Range	-127 to 3.5 dBm into 50Ω (Standard) -127 to 7 dBm into 50Ω (Opt 055)

Spectral Purity

Spurious Signals for ≤–14.5 dBm output level at RF IN/OUT, or for ≤–2.5 dBm output level at DUPLEX OUT (Standard) for ≤–25 dBm output level at RF IN/OUT, or for ≤–1 dBm output level at DUPLEX OUT (Opt 055)	Harmonics: <–30 dBc Non-Harmonics Spurious: <–60 dBc (at >5 kHz from carrier)

Frequency Modulation

FM Deviation Maximum (for rates >25 Hz)	100 kHz: for fc from 30 to <249 MHz (Standard) 100 kHz: for fc from 0.25 to <249 MHz (Opt 055)

Amplitude Modulation

Frequency Range	30 to 1000 MHz (Standard) 1.5 to 1000 MHz (Opt 055)
AM Depth	
RF IN/OUT	0 to 90% (usable to 99%) for level ≤ –12.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤ –2.5 dBm (Opt 055)
DUPLEX OUT	0 to 90% (usable to 99%) for level ≤ –2.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤ 1 dBm (Opt 055)

RF Analyzer Specifications

RF Frequency Measurements

Measurement Range	10 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)
Level Range RF IN/OUT Continuous Peak (10 seconds /minute)	 -14 to 34 dBm (Standard or Opt 055) 40 µW to 1.2W 2W

RF Power Measurements

Measurement range	10 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)
RF IN/OUT Measurement Range[a] Continuous Peak (10 seconds/minute)	-14 to 34 dBm (Standard or Opt 055) 40 µW to 1.2W 2W

a. To achieve the specified accuracy when measuring power at the RF IN/OUT port, the internal signal generator level must be 60 dB below the measured power or less than -20 dBm at the DUPLEX OUT port.

FM Measurement

Frequency Range	30 to 1000 MHz *(usable to 400 kHz)* (Standard) 10 to 1000 MHz *(usable to 5 MHz)* (Opt 055)
Input Level for Specified Accuracy	
RF IN/OUT	–28 to 34 dBm (1.6 µW to 2.4W continuous)

AM Measurement

Frequency Range	30 to 1000 MHz *(usable to 400 kHz)* (Standard) 10 to 1000 MHz (Opt 055)
Input Level for Specified Accuracy (levels in PEP)	
RF IN/OUT	–28 to 34 dBm (1.6 µW to 2.4W continuous)

SSB Measurement

Frequency Range	30 to 1000 MHz (Standard) 0.4 to 1000 MHz (Opt 055)

Option 010, 400 Hz High Pass Filter

Option 011, CCITT Weighting Filter

Option 012, 4 kHz Bandpass Filter

Option 013, C-Message Weighted Filter

Option 014, 6 kHz Bandpass Filter

Option 016, High Level RF Power

Option 016 replaces the standard 14 dB attenuator with a 16 dB attenuator at the RF IN/OUT port. This option uses the standard electronic step attenuator in the RF input module. This option can test high power transmitters up to 100W continuous, 125W peak (10 seconds/minute) duty cycle. With the exception of the following specifications, Option 016 has the same specifications as the standard instrument, **see "Standard Instrument" on page 387**.

Signal Generator Specifications

Signal Generator Output Levels

RF Frequency & Reference Oscillator

Frequency Range	30 to 1000 MHz (Standard) 0.25 to 1000 MHz (Opt 055)
Step Attenuator Type	Electronic (Std) Electro-mechanical (Opt 055)

RF IN/OUT Connector Level Range	 -137 to -22.5 dBm into 50Ω (Standard) -137 to -21 dBm into 50Ω (Opt 055)
Reverse Power Continuous Peak (10 seconds/minute)	 100 watts (< +25°C) 125 watts

Spectral Purity

Spurious Signals for ≤–29 dBm output level at RF IN/OUT, or for ≤1 dBm output level at DUPLEX OUT (Standard) for ≤–27 dBm output level at RF IN/OUT, or for ≤1 dBm output level at DUPLEX OUT (Opt 055)	Harmonics: <–30 dBc Non-Harmonics Spurious: <–60 dBc (at >5 kHz from carrier)

Amplitude Modulation

Frequency Range	30 to 1000 MHz (Standard) 1.5 to 1000 MHz (Opt 055)
AM Depth	
RF IN/OUT	0 to 90% (usable to 99%) for level ≤ –28.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤ –27 dBm (Opt 055)
DUPLEX OUT	0 to 90% (usable to 99%) for level ≤ –2.5 dBm (Std) 0 to 90% (usable to 99%) for level ≤ 1 dBm (Opt 055)

RF Analyzer Specifications

RF Frequency Measurements

Level Range	
RF IN/OUT	
Continuous	2 to 50 dBm 1.6 mW to 100W (< +25°C)
Peak (10 seconds/minute)	125 W (< +25°C)

RF Power Measurements

RF IN/OUT Measurement Range[a]	
Continuous	2 to 50 dBm 1.6 mW to 100W (< +25°C)
Peak (10 seconds/minute)	125W (< +25°C)

a. To achieve the specified accuracy when measuring power at the RF IN/OUT port, the internal signal generator level must be 60 dB below the measured power or less than -20 dBm at the DUPLEX OUT port.

FM Measurement

Frequency Range	30 to 1000 MHz *(usable to 400 kHz)* (Standard) 10 to 1000 MHz *(usable to 5 MHz)* (Opt 055)
Input Level for Specified Accuracy	
RF IN/OUT	–12 to 50 dBm (6.3 µW to 100W continuous)

AM Measurement

Frequency Range	30 to 1000 MHz *(usable to 400 kHz)* (Standard) 10 to 1000 MHz *(usable to 5 MHz)* (Opt 055)
Input Level for Specified Accuracy	
RF IN/OUT	–12 to 50 dBm (6.3 µW to 100W continuous)

Option 020, Radio Interface Card

This adds a radio interface card for automating module and radio test. It contains 16 parallel data lines, two interrupts, and brings the audio IN/OUT lines and a relay closure out from the MIC/ACC connector on the front panel. These are controlled by the 8920B IBASIC control language.

Option 031, Delete Handle and Cover

Option 031 deletes the handle and protective front cover from the Test Set.

Option 051, Rear Panel Connectors

This option provides the necessary rear panel connectors to work with various Agilent Technologies Cellular Adapters, such as the 83201B or 83206A.

Option 102, Spectrum Analyzer with Tracking Generator and ACP

Option 102 adds a spectrum analyzer, tracking generator, and ACP (Adjacent Channel Power) measurement capability.

Tracking Generator and ACP

Frequency Range: Standard, Option 016 Option 006, 007, 009	 400 kHz to 1 GHz 30 MHz to 1 GHz
Frequency Span/Resolution Bandwidth (Coupled)	Span Bandwidth <50 kHz 300 Hz <200 kHz 1 kHz <1.5 kHz 3 kHz <18 kHz 30 kHz Š18 kHz 300 kHz, plus full span capability
Display	Log with 1, 2, and 10 dB/div.
Display Range	80 dB
Reference Level Range	+50 to –50 dBm
Residual Responses	<–70 dBm (no input signal, 0 dB attenuation)
Image Rejection	>50 dBm
Supplemental Characteristics	
Non-harmonic Spurious Responses	*>70 dB down (for input signals £ –30 dBm)*
Level Accuracy	*±2.5 dB*
Displayed Average Noise Level	*<–114 dBm for <50 kHz spans*
Log Scale Linearity	*±2 dB (for input levels £–30 dBm and/or 60 dB range)*

Tracking Generator

Frequency Range: Standard, Option 016 Options 006, 007, 009	 400 kHz to 1 GHz 30 MHz to 1 GHz
Frequency Offset	Frequency span end-points ± frequency offset cannot be <400 kHz or ≥1 Ghz
Output Level Range	Same as signal generator
Sweep Mode	Normal and inverted

Adjacent Channel Power

Relative Measurements

Level Range			
RF IN/OUT			
Standard	1 mW to 60W continuous 100W for 10 seconds/minute		
Option 006	50μW to 5W continuous 7.5W for 10 seconds/minute		
Option 007	40μW to 1.2W continuous 2W for 10 seconds/minute		
Option 009	1 mW to 30W continuous 50W for 10 seconds/minute		
Option 016	1.6 mW to 100W continuous 125W for 10 seconds/minute		
ANT IN	–40 dBm to +20 dBm		
Dynamic Range	Typical values for channel offsets:		
	Channel Offset	Channel BW	Dynamic Range
	12.5 kHz	8.5 kHz	–65 dBc
	20 kHz	14 kHz	–68 dBc
	25 kHz	16 kHz	–68 dBc
	30 kHz	16 kHz	–68 dBc
	60 kHz	30 kHz	–65 dBc
Relative Accuracy	±2.0 dB		

Absolute Level Measurements

Level: Results of absolute power in watts or dBm are met by adding the ACP ration from the spectrum analyzer to the carrier power from the input section RF power detector. See table below for other specifications.

Level Range			
RF IN/OUT			
Standard	1 mW to 60W continuous 100W for 10 seconds/minute		
Option 006	50µW to 5W continuous 7.5W for 10 seconds/minute		
Option 007	40µW to 1.2W continuous 2W for 10 seconds/minute		
Option 009	1 mW to 30W continuous 50W for 10 seconds/minute		
Option 016	1.6 mW to 100W continuous 125W for 10 seconds/minute		
ANT IN	N/A		
Dynamic Range	Typical values for channel offsets:		
	Channel Offset	Channel BW	Dynamic Range
	12.5 kHz	8.5 kHz	–65 dBc
	20 kHz	14 kHz	–68 dBc
	25 kHz	16 kHz	–68 dBc
	30 kHz	16 kHz	–68 dBc
	60 kHz	30 kHz	–65 dBc
Relative Accuracy	Equals the sum of RF power measurements accuracy found in the RF analyzer section and the ACP relative accuracy of ±2.0 dB.		

Option 500, Dual Mode TDMA Cellular Adapter - EIA/TIA IS-54 DAMPS

The 8920B Option 500 includes the 83201B Option 003 TDMA Cellular Adapter attached, tested, and calibrated with the 8920B Communications Test Set, see **figure 25** .

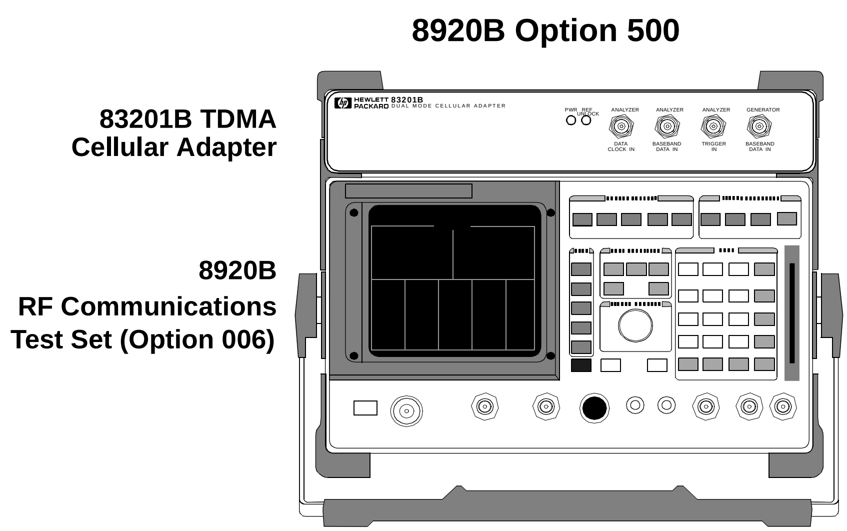


Figure 25 **8920B Option 500**

Option 800, Dual Mode TDMA Cellular Adapter - EIA/TIA IS-54 DAMPS, and IS-136 DCCH

Option 800 is designed optimize the measurement range for cellular mobile station test. The Test Set has electronic attenuation that increases the dynamic range of the instrument and enables average power measurements on TDMA signals using the 83206A Cellular Adapter (see **figure 26** , 8920B Option 800). Option 006 is required for IS-136 testing. For TDMA specifications, see **"TDMA Specifications" on page 423**.

This option has most of the same specifications as the standard instrument, see **"Standard Instrument" on page 387**, with exception of the following.

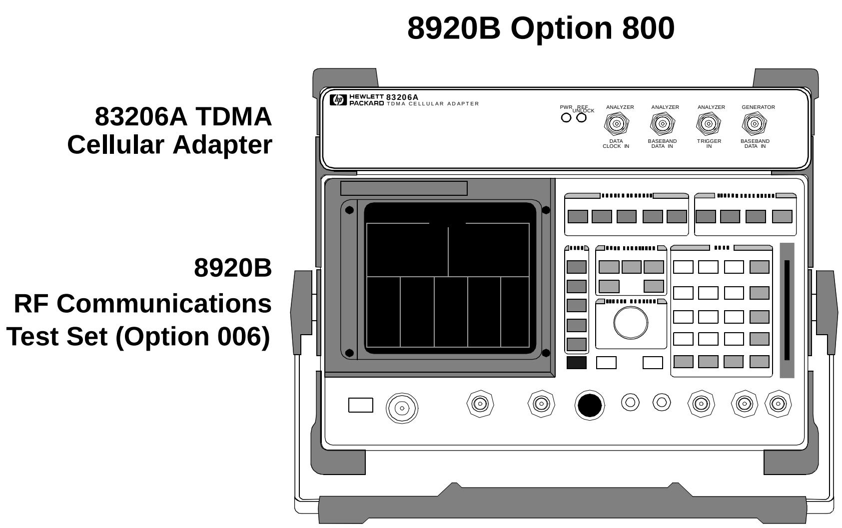


Figure 26 **8920B Option 800**

TDMA Specifications

TDMA Signal Generator Specifications

The specifications in the table below apply to test system configurations composed of: 8920B Test Set & 83201B Cellular Adapter or 8920B Test Set & 83206A Cellular Adapter

Frequency Range	824 MHz to 894 MHz
Output Level Range RF IN/OUT Standard, Option 016 Option 006, 007, 009 DUPLEX OUT Standard, Option 016 Option 006, 007, 009	 –22 dBm to –127 dBm –23.5 dBm to –127 dBm +4 dBm to –127 dBm +0.5 dBm to –127 dBm
Residual Error Vector Magnitude	<3.0%
Residual Phase Error	<2.6%
Residual Magnitude Error	<2.6%
IQ Origin Offset	<–30 dBc within 15°C of last calibration
Frequency Error Accuracy	±4 Hz plus reference error

TDMA Analyzer Specifications

The specifications in the table apply to test system configurations composed of: 8920B Test Set & 83201B Cellular Adapter or 8920B Test Set & 83206A Cellular Adapter

Frequency Range	824 MHz to 894 MHz
Input Level Range RF IN/OUT Standard Option 006 Option 007 Option 009 Option 016 ANTENNA IN	 1 mW to 60W continuous 100W for 10 seconds/minute 50 µW to 5W continuous 15W for 10 seconds/minute 40 µW to 1.2W continuous 4W for 10 seconds/minute 1 mW to 30W continuous 50W for 10 seconds/minute 1.6 mW to 100W continuous 125W for 10 seconds/minute
Input Frequency Setting Error	1 kHz
RX DSP Level Setting Range	–23 to 0 dB full scale
Residual Error Vector Magnitude	<1.3%
Error Vector Magnitude Measurement Accuracy	±0.4% plus 2% of reading
Residual Phase Error	<1.3%
Residual Magnitude Error	<0.9%
I/Q Origin Offset Accuracy	±0.5 dB for values to −40 dBc
Frequency Error Accuracy	±2.5 Hz plus reference accuracy

Physical Specifications

This section contains physical specifications on the standard 8920B and its options.

General Physical Specifications

CRT Size	7 x 10 cm
Operating Temperature	0 to +55°C
Storage Temperature	–55 to +75°C
Calibration Interval	2 years
Supplemental Characteristics *Leakage: Conducted and radiated interference meets CISPR 11.* *Typical 8920B Option 500 or 800 radiated leakage at signal generator output frequency is <2.0 µV induced in a resonant dipole antenna 25 mm (1 inch) from any surface except the rear panel for RF output levels <–40 dBm. Spurious leakage levels are typically <1µV in a resonant dipole antenna.*	

Dimensions

Configuration	H x W x D (inches)	H x W x D (mm)
8920B	7.5 x13 x 19	188 x 330 x 456
8920B Option 500 (83201B/Opt. 003 attached)	9.8 x 13 x 19	250 x 330 x 456
8920B Option 800 (83206A attached)	9.8 x 13 x 19	250 x 330 x 456

Weight

Configuration	lbs. net	kgs. net
8920B Shipping Weight	37 61	16.8 27.7
8920B Option 500 (83201B/Opt. 003 attached) Shipping Weight	50 80	22.7 36.3
8920B Option 800 (83206A attached) Shipping Weight	50 80	22.7 36.6

Power

Configuration	AC	DC
8920B	100V to 240V ±10%, 48 to 440 Hz, nominally 100 watts	11V to 28V, nominally 120 watts
8920B Option 500 (83201B [Opt. 003] attached)	100V to 240V ±10%, 48 to 440 Hz, nominally 120 watts	N/A
8920B Option 800 (83206A attached)	100V to 240V ±10%, 48 to 440 Hz, nominally 140 watts	N/A

8921A

Signal Generator Specifications

RF Frequency

Range: 250 kHz to 1 GHz (Standard)
: 30 MHz to 1 GHz (Opt 055)
Accuracy and Stability: Same as reference oscillator ±0.015 Hz
Switching Speed: < 150 ms to within 100 Hz of carrier frequency
Resolution: 1 Hz

Output

RF IN/OUT Connector:

Level Range: −137 to −20.5 dBm into 50 Ω (Standard)
: −137 to −19 dBm into 50 Ω (Opt 055)
Level Accuracy: ±1.8 dB (level ≥ −127 dBm) If RF analyzer is also connected add ±0.1dB *(typical ±1.0 dB for all levels)*
Reverse Power: 60 watts continuous, 100 watts for 10 seconds/minute
SWR:< 1.5:1

DUPLEX Out Connector:

Level Range: −127 to +5 dBm into 50 Ω (Standard)
Level Range: −127 to +7 dBm into 50 Ω (Opt 055)
Level Accuracy: ±1.5 dB *(typically ±1.0 dB for all levels)*
Reverse Power: 200 mW maximum
SWR:< 2.0:1 (level < −4 dBm)

Resolution: 0.1 dB

Spectral Purity

Spurious Signals: For ≤ -2.5 dBm output level at DUPLEX OUT or ≤ –27 dBm output level at RF IN/OUT (Standard)
: For ≤ +1 dBm output level at DUPLEX OUT or ≤ –25 dBm output level at RF IN/OUT (Opt 055)

Harmonics: < –30 dBc
Non-Harmonic Spurious: < –60 dBc (at >5 kHz offset from carrier)

Residual FM:

CCITT, rms

< 7 Hz for 250 kHz ≤ f_c < 249 MHz
< 4 Hz for 249 MHz ≤ f_c < 501 MHz
< 7 Hz for 501 MHz ≤ f_c ≤ 1000 MHz

SSB Phase Noise: < –116 dBc/Hz (for >20 kHz offsets at a 500 MHz carrier frequency).

FM

FM Deviation:

Rates >25 Hz
100 kHz: for f_c from 30 to < 249 MHz (Standard)
100 kHz: for f_c from 100 kHz to < 249 MHz (Opt 055)
50 kHz: for f_c from 249 to < 501 MHz
100 kHz: for f_c from 501 to 1000 MHz
FM not specified for (f_c minus FM dev.) <250 kHz

FM Rate:

1 kHz reference:
Internal: DC to 25 kHz (1 dB BW)
External, AC Coupled: 20 Hz to 75 kHz (*typical 3 dB BW*)
External, DC Coupled: dc to 75 kHz (*typical 3 dB BW*)

FM Accuracy:

≤10 kHz dev, 1 kHz rate:
±3.5% of setting ±50 Hz
>10 kHz dev, 1 kHz rate:
±3.5% of setting ±500 Hz

FM Distortion:

THD + Noise, 0.3 to 3 kHz BW:
<0.5% at >4 kHz deviation and 1 kHz rate

Center Frequency Accuracy in DC FM Mode:

±500 Hz (after DCFM zero) *(typical ±50 Hz)*
(external source impedance < 1 k Ω)
Ext. Mod. Input Impedance: 600 Ω nominal
Resolution:

50 Hz for < 10 kHz deviation

500 Hz for ≥ 10 kHz deviation

Audio Source Specifications

(The specifications apply to both internal sources)

Frequency

Range: dc to 25 kHz
Accuracy: 0.025% of setting
Resolution: 0.1 Hz

Output Level

Range: 0.1 mV to 4 Vrms
Maximum Output Current: 20 mA peak
Output Impedance: < 1Ω (at 1 kHz)
Accuracy: ±2% of setting plus resolution

Residual Distortion: < 0.125%; 20 Hz to 25 kHz in an 80 kHz BW (THD plus noise, amplitude ≥ 200 mVrms)

Resolution:

Level ≤ 0.01 V: ±50 μV
Level ≤ 0.1 V: ±.5 mV
Level ≤ 1 V: ±5 mV
Level >1 V: ±50 mV

Offset in DC Coupled Mode: < 50 mV

RF Analyzer Specifications

RF Power Measurement

Frequency Range: 30 MHz to 1 GHz
Measurement Range:
1 mW to 60 W continuous
100 W for 10 seconds/minute
Accuracy:
±5% of reading ±0.01 mW± 1count (for inputs ≥ 200 mW at 25° ±10°C)
±10% over full temperature range
SWR: < 1.5:1
Resolution:
Power < 10 W: 1 mW
Power ≥ 10 W: 10 mW

RF Frequency Measurement

Measurement Range: 10 MHz to 1 GHz (Standard)
: 400 kHz to 1 GHz (Opt 055)
Level Range
RF IN/OUT:
1 mW to 60 W continuous
100 W for 10 seconds/minute
ANT IN: −36 dBm to +20 dBm
Accuracy: ±1 Hz plus timebase accuracy
Resolution: 1 Hz

FM Measurement

Frequency Range: 10 MHz to 1 GHz (Standard)
: 5 MHz to 1 GHz (Opt 055) *(usable to 400 kHz)*
Deviation: 20 Hz to 75 kHz
Sensitivity: 2 μV (12 dB SINAD, fc ≥ 10 MHz) *(typical < 1 μV (30 kHz IF BW, High Sensitivity Mode, 0.3 to 3 kHz BW))*
Accuracy: ±4% of reading plus residual FM and noise contribution (20 Hz to 25 kHz rates, deviation ≤ 25 kHz)
Bandwidth: 2 Hz to 70 kHz (3 dB) (DCFM measurements also available)
THD+Noise: < 1% for ≥ 5 kHz deviation and 1 kHz rate in a 0.3 to 3 kHz BW
Input Level Range for Specified Accuracy:
−18 to +50 dBm at RF IN/OUT (0.04 mW to 100 W)
−54 to +14 dBm at ANT IN
Residual FM and Noise: < 7 Hz (0.3 to 3 kHz, rms)

Resolution:

f < 10 kHz: 1 Hz
f ≥ 10 kHz: 10 Hz

AF Analyzer Specifications

Frequency Measurement

Measurement Range: 20 Hz to 400 kHz
Accuracy: ±0.02% plus resolution plus reference oscillator accuracy
External Input: 20 mV to 30 Vrms
Resolution:
f < 10 kHz: 0.01 Hz
f < 100 kHz: 0.1 Hz
f ≥ 100 kHz: 1 Hz

AC Voltage Measurement

Measurement Range: 0 to 30 Vrms
Accuracy: ±3% of reading (20 Hz to 15 kHz, inputs ≥ 1 mV)
Residual THD + Noise: 150 µV (15 kHz BW)
3 dB Bandwidth: Typically 2 Hz to 100 kHz
Nominal Input Impedance: switchable between 1 M Ω in parallel with 95 pF, and 600 Ω floating
Resolution:
4 digits for inputs ≥ 100 mV
3 digits for inputs < 100 mV

DC Voltage Measurement

Voltage Range: 100 mV to 42 V
Accuracy: ±1.0% of reading plus DC offset
DC Offset: ±45 mV
Resolution: 1 mV

Distortion Measurement

Fundamental Frequency: 1 kHz ±5 Hz
Input Level Range: 30 mV to 30 Vrms
Display Range: 0.1% to 100%
Accuracy: ±1 dB (0.5 to 100% distortion)
Residual THD+Noise: –60 dB or 150 µV, whichever is greater (15 kHz BW)
Resolution: 0.01% Distortion

SINAD Measurement

Fundamental Frequency: 1 kHz ±5 Hz
Input Level Range: 30 mV to 30 Vrms
Display Range: 0 to 60 dB
Accuracy: ±1 dB (0 to 46 dB SINAD)
Residual THD+Noise: −60 dB or 150 µV, whichever is greater (15 kHz BW)
Resolution: 0.01 dB

Audio Filters

High-pass filters:
- < 20 Hz
- 50 Hz
- 300 Hz

Low-pass filters
- 300 Hz
- 3 kHz
- 15 kHz
- > 99 kHz

Additional Filters
- 750 µs de-emphasis
- 1 kHz notch
- C-Message weighting
- 6 kHz bandpass

Optional Filter
- CCITT weighting filter can be substituted for C-Message weighting filter.

Audio Detectors

RMS, RMS*SQRT2, Pk+, Pk-, Pk+hold, Pk-hold, Pk±/2, Pk±/2 hold, Pk±max, Pk±maxhold

Oscilloscope Specifications

Frequency Range: 2 Hz to 50 kHz (3 dB)

Scale/Division: 10 mV to 10 V

Amplitude Accuracy: ±1.5% of reading ±0.1 division. (20 Hz to 10 kHz)

Time/Division: 1 µsec to 200 msec

3 dB Bandwidth: Typically >100 kHz

Internal DC Offset: ≤ 0.1 div (≥ 50 µV/div sensitivity)

Spectrum Analyzer Specifications

Frequency Range: 400 kHz to 1 GHz
Frequency Span/Resolution Bandwidth (coupled):

Span	Bandwidth
< 50 kHz	300 Hz
< 200 kHz	1 kHz
< 1.5 MHz	3 kHz
< 18 MHz	30 kHz
≥ 18 MHz	300 kHz
Full span	

Display: Log with 10 dB/div, 2 dB/div, or 1 dB/div
Display Range: 80 dB
Reference Level Range: +50 to –50 dBm
Residual Responses: < –70 dBm (no input signal, 0 dB attenuation)
Image Rejection: >50 dB
Non-harmonic Spurious Responses: >70 dB (for input signals ≤ –30 dBm)
Level Accuracy: 2.5 dB
Displayed Average Noise Level: < –114 dBm (≤ 50 kHz spans)
Log Scale Linearity: 2 dB (for input levels ≤ –30 dBm and/or 60 dB range)
Other Features: peak hold, marker with frequency and level readout, marker to peak, marker to next, trace comparison A-B, adjacent-channel power

Tracking Generator

Frequency Range: 10 Mhz to 1 GHz (Standard)
: 400 kHz to 1 GHz (Opt 055)
Frequency Offset: Frequency span endpoints ± frequency offset cannot be < 400 kHz or > 1 GHz
Output Level Range: Same as signal generator
Sweep Modes: Normal and inverted
Other Features: Normalize

Adjacent Channel Power

Relative Measurements:

Level Range:
Antenna In: –40 dBm to +20 dBm
RF/Input: 0.16 mW (–8 dBm) to 60 W (47.8 dBm) continuous; or up to 100 mW (50 dBm) for 10 seconds/minute
Dynamic Range: Typical values for channel offsets

Channel Offset	Resolution Bandwidth	Dynamic Range
12.5 kHz	*8.5 kHz*	*– 65 dBc*
20 kHz	*14 kHz*	*– 68 dBc*
25 kHz	*16 kHz*	*– 68 dBc*
30 kHz	*16 kHz*	*– 68 dBc*
60 kHz	*30 kHz*	*– 65 dBc*

Relative Accuracy: ±2.0 dB

Absolute Level Measurements:

Level: Results of absolute power in Watts or dBm are met by adding the ACP ratio from the spectrum analyzer to the carrier power from the input section RF power detector.

Level Range:

Antenna: Not applicable

RF/Input: 1 mW (0 dBm) to 60 W (47.8 dBm) continuous; or up to 100 W (50 dBm) for 10 seconds/minute

Dynamic Range: Typical values for channel offsets

Channel Offset	Resolution Bandwidth	Dynamic Range
12.5 kHz	*8.5 kHz*	*– 65 dBc*
20 kHz	*14 kHz*	*– 68 dBc*
25 kHz	*16 kHz*	*– 68 dBc*
30 kHz	*16 kHz*	*– 68 dBc*
60 kHz	*30 kHz*	*– 65 dBc*

Absolute Accuracy: RF power measurement accuracy for absolute in-channel power: (for inputs > 200 mW): ±10% of reading ±1 mW (in dB) plus ACP relative accuracy of ±2.0 dB

Signaling

Capability for generating and analyzing the following formats:

CDCSS, DTMF, 1 TONE, 2 TONE, 5/6 TONE SEQUENTIAL, RPC1, POCSAG, EIA, CCITT, CCIR, ZVEI, DZVEI, GOLAY, EEA, AMPS/EAMPS/NAMPS, TACS/ETACS, JTACS/NTACS, NMT-450, NMT-900, LTR®[1], EDACS™, MPT 1327, and TDMA dual-mode

LTR® is a registered trademark of the E. F. Johnson Company; EDACS™ is a trademark of Erickson/GE.

[1] over 15° to 35°C for analyzing

General Purpose Function Generator with the following waveforms is included: sine, square, triangle, ramp, dc, Gaussian white noise, uniform white noise.

Function Generator Frequency Range and Level: Same as audio source

DC Current Meter

Measurement Range: 0 to 10 A (*usable to 20 A*)

Accuracy: 10% of reading after zeroing (levels > 100 mA)

Remote Programming

GPIB: Agilent Technologies' implementation of IEEE Standard 488.2

Functions Implemented: SH1, AH1, T6, L4, SR1, RL1, LE0, TE0, PP0, DC1, DT1, C4, C11, E2

RS-232: Six-wire RJ-11 connector provides two three-wire serial ports for serial data in and out (no hardware handshake capability)

Baud Rates: 300, 600, 1200, 2400, 4800, 9600, and 19200 Hz selectable

Parallel (Centronics) connector: A standard 25-pin, sub-min D female connector with right-angle adapter is included. NOTE: Retrofittable only for 8921A units with serial number prefix of 3501 and greater.

Save/Recall Registers

Approximately 928 kilobytes RAM available for non-volatile save/recall of settings. This typically will allow you to save >500 sets of instrument settings, depending on the type of information saved.

General Specifications

Size: 7.5 H x 13 W x 19 inches (188 H x 330 W x 456 D mm)

Weight: 35 lbs (17.1 kg)

CRT Size: 7 x 10 cm

Operating Temperature: 0 to +55°C

Storage Temperature: −55 to +75°C

Power:

AC: 100 to 240 V, 48 to 440 Hz approx. 80 watts
DC: 11 to 28 V, *nominally 120 watts*

Leakage: At Signal Generator output frequency and level <–40 dBm, typical leakage is <0.5µV induced in a resonant dipole antenna 1 inch from any surface except the rear panel. This corresponds to approximately 0.05 µV when measured with a 25-mm, two-turn loop. Spurious leakage levels are typically < 1 µV in a resonant dipole antenna.

8

Service Screen

Introduction

This section contains information about the Test Set’s Service Screen. This screen allows you to monitor individual circuit node measurements and change various MUX and DAC Latch settings for isolating faulty modules.

How to Access the Service Screen

- Press PRESET to preset the Test Set.
- Press SHIFT DUPLEX (CONFIG) to access the CONFIGURE screen.
- Select SERVICE under the To Screen menu with the cursor control knob.

Field Names and Descriptions

Voltmeter Connection

This field selects the desired circuit node for voltage measurements. The reading is displayed in the **`Voltage`** measurement field.

To change the voltmeter connection, move the cursor in front of the Voltmeter Connection field and push the cursor control knob. A Choices menu will appear, then move the cursor to the desired circuit node and push the cursor control knob.

Counter Connection

This field selects the desired circuit node to connect to the Test Set's internal frequency counter. The reading is displayed in the **`Frequency`** measurement field.

To change the counter connection, move the cursor in front of the Counter Connection field and push the cursor control knob. A Choices menu will appear, then move the cursor to the desired circuit node and push the cursor control knob.

Gate Time

This field is used to adjust the Test Set's internal frequency counter's gate time. A shorter gate time may enable you to see frequency fluctuations that might not be seen using a longer gate time.

To change the gate time, move the cursor in front of the Gate Time field and push the cursor control knob. Rotate the cursor control knob until the desired gate time (10 to 1000 msec in 10 msec increments) is displayed, then press the cursor control knob.

EEPROM Prot (8920A/8921A ONLY: Firmware Revision A.18.02 and above)

This field is used to set the EEPROM protection mode. Selecting the 'on' mode prevents inadvertent overwriting of module calibration data stored on the host processor EEPROM. Selecting the 'off' mode disables this feature. This setting is a non-volatile field (unaltered after power-up). The default setting is 'on'.

Latch

This field is used to manually alter the circuit latches that control switch, DAC and gain settings within the Test Set. The value of the selected latch is displayed and changed in the **`Value`** field. Some settings are read-only.

To set a switch, DAC or gain setting, move the cursor in front of the Latch field and push the cursor control knob. A Choices menu will appear; then move the cursor to the desired latch name and push the cursor control knob. Then, move the cursor in front of the Value field and push the cursor control knob. Rotate the cursor control knob to modify the value (hexadecimal).

NOTE: If any of the switches, DACs, or gain settings are changed with the Latch field, the Test Set will generate the message ”Direct latch write occurred. Cycle power when done servicing.”. To clear this message, cycle the Test Set’s power. Upon power-up, the internal controller will return the Test Set to its default settings and values.

The first part of the names in the Choices menu relates to the assembly where the switch, DAC, or gain setting is located. Some latch names are not listed here.

- dstr: A4 Modulation Distribution
- aud1: A3 Audio Analyzer 1
- aud2: A2 Audio Analyzer 2
- refs: A15 Reference
- inpt: A23 Input
- out: A13 RF Output
- rcvr: A16 Receiver
- gsyn: A14 Sig Gen Synthesizer
- rsyn: A17 Receiver Synthesizer
- spec: A18 Spectrum Analyzer
- rint: A12 Radio Interface
- meas: A19 Measurement
- metron: A19 Measurement
- afg1: A6 Signaling Source/Analyzer
- afg2: A6 Signaling Source/Analyzer
- sgnl: Displays version number of the Signaling Source/Analyzer firmware.

Value (hex)

This field displays and changes the value for the latch shown in the **`Latch`** field.

RAM Initialize

Selecting this field clears all SAVE registers and test programs that may be in RAM, and resets all latches to their factory power-up configuration.

Operating Considerations

If you have saved one or more instrument setups using the SAVE function, using this function will permanently remove them.

Displays

Voltage

This measurement field displays the voltage, measured by the Test Set's internal voltmeter, for the circuit node shown in the **`Voltmeter Connection`** field. The reading is not the exact voltage; it is scaled down to 5 V.

Frequency

This measurement field displays the frequency of the circuit node shown in the **`Counter Connection`** field.

9

Block Diagrams

Introduction

This chapter includes block diagrams and descriptions that focus on how the Test Set generates signals and makes measurements. It also has I/O signal and pin number information that can be used to help isolate a problem to the assembly level if the diagnostics are unable to do so.

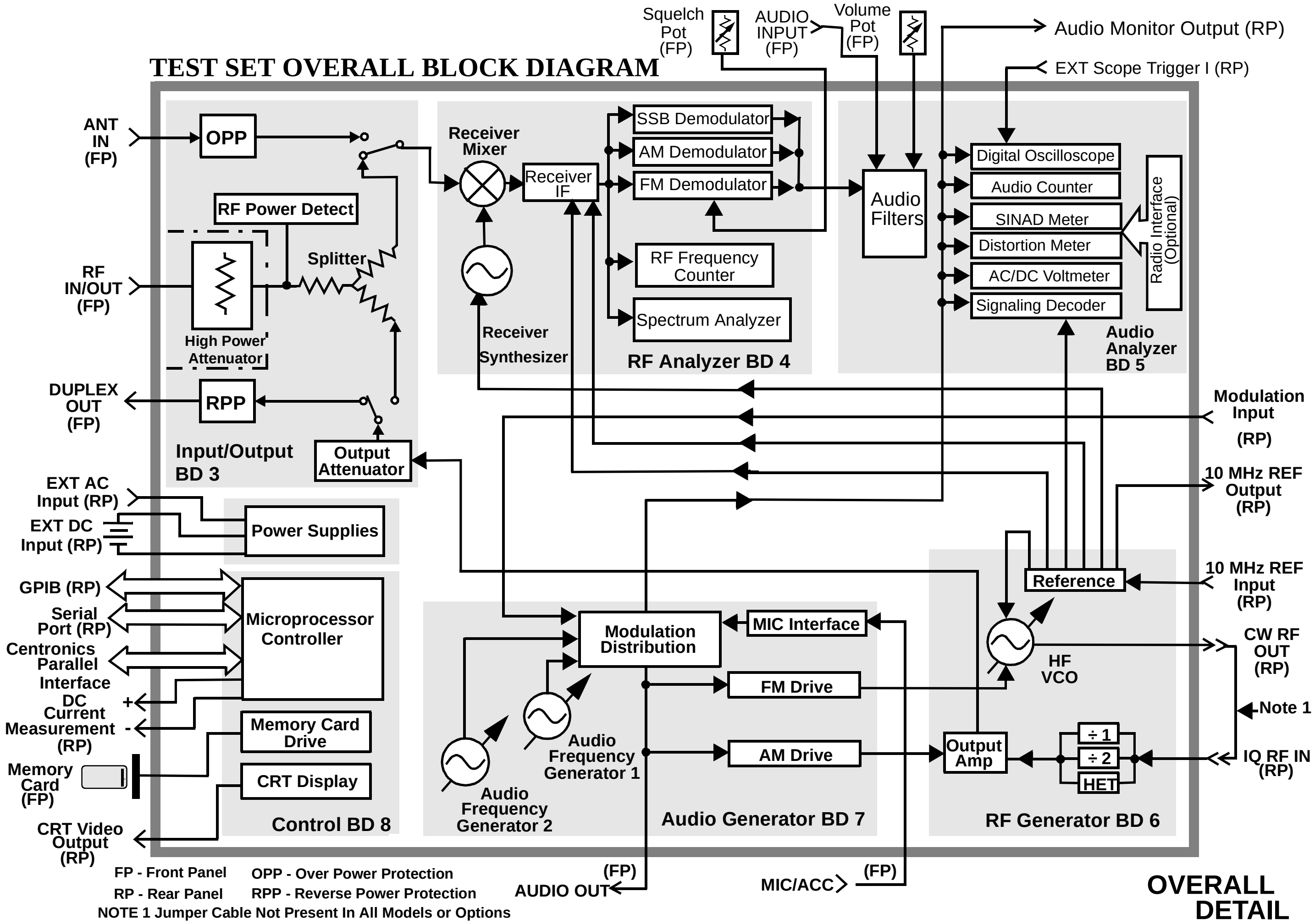
The chapter is organized as follows:

- **Test Set overall block diagrams 1 and 2.** A general view of the functional sections in the Test Set.
- **Section detail block diagrams 3 through 8.** A more detailed view of each functional section and a theory on the operation of each section.
- **Assembly detail block diagrams 9 through 28.** A detailed view of each individual assembly. Included are I/O specifications and switch information where applicable.

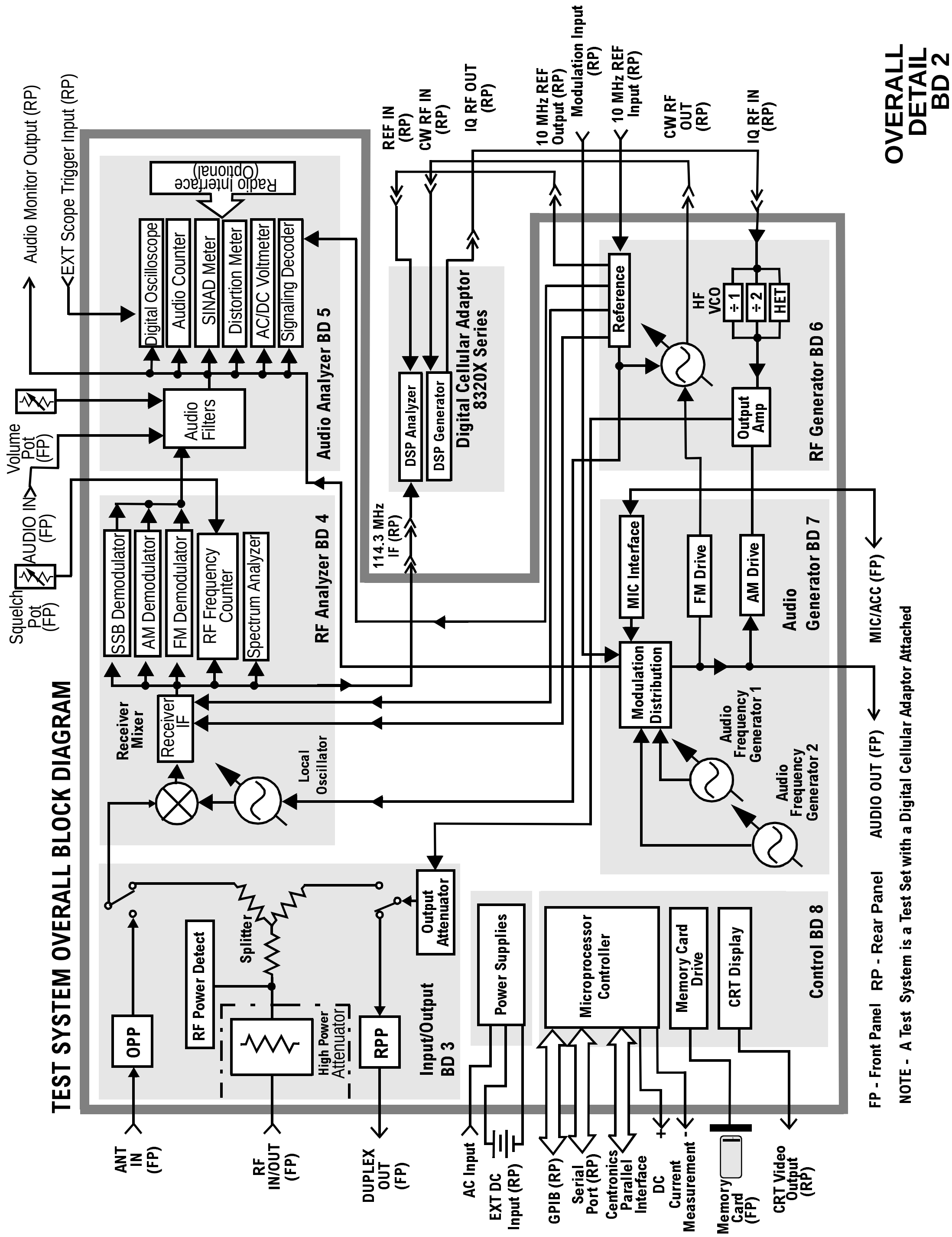
I/O Specifications and Switch Information

I/O and switch information is included to help you determine if voltages and signals are getting to the assemblies with the proper levels, shapes, and frequencies. Line names and connector pin numbers are given on the block diagrams.

TEST SET OVERALL BLOCK DIAGRAM



OVERALL DETAIL BD 1


TEST SYSTEM OVERALL BLOCK DIAGRAM
OVERALL DETAIL BD 2
Audio Monitor Output (RP)
EXT Scope Trigger Input (RP)
Volume Pot (FP)
AUDIO IN (FP)
Squelch Pot (FP)
Radio Interface (Optional)
Digital Oscilloscope
Audio Counter
SINAD Meter
Distortion Meter
AC/DC Voltmeter
Signaling Decoder
Audio Filters
Audio Analyzer BD 5
SSB Demodulator
AM Demodulator
FM Demodulator
RF Frequency Counter
Spectrum Analyzer
RF Analyzer BD 4
Receiver Mixer
Receiver IF
Local Oscillator
114.3 MHz IF (RP)
DSP Analyzer
DSP Generator
Digital Cellular Adaptor 8320X Series
REF IN (RP)
CW RF IN (RP)
IQ RF OUT (RP)
10 MHz REF Output (RP)
Modulation Input (RP)
10 MHz REF Input (RP)
CW RF OUT (RP)
IQ RF IN (RP)
Reference
HF VCO
÷ 1
÷ 2
HET
Output Amp
RF Generator BD 6
MIC Interface
FM Drive
AM Drive
Audio Generator BD 7
Modulation Distribution
Audio Frequency Generator 1
Audio Frequency Generator 2
MIC/ACC (FP)
AUDIO OUT (FP)
OPP
RF Power Detect
Splitter
High Power Attenuator
RPP
Output Attenuator
Input/Output BD 3
Power Supplies
Microprocessor Controller
Memory Card Drive
CRT Display
Control BD 8
ANT IN (FP)
RF IN/OUT (FP)
DUPLEX OUT (FP)
AC Input
EXT DC Input (RP)
GPIB (RP)
Serial Port (RP)
Centronics Parallel Interface
DC Current Measurement
Memory Card (FP)
CRT Video Output (RP)
FP - Front Panel RP - Rear Panel
NOTE - A Test System is a Test Set with a Digital Cellular Adaptor Attached

Input/Output Section

RF Power Measurement

The A23 Input assembly power splitter has one leg terminated by a 50 Ω load which has a diode peak detector across it and a temperature sensor near it. The output of the diode detector is sent to the A19 Measurement assembly where it is measured. The Controller converts the measured value to RF power and displays it.

A temperature sensor detects the presence of too much power at the RF IN/OUT connector. The output of the sensor is a DC voltage proportional to RF power. This voltage is measured by the A19 Measurement assembly and the value is compared to a reference limit by the Controller. If the voltage goes above the limit the Controller displays an overpower message. The temperature sensor is also used to temperature-compensate the RF power measurement.

Accuracy is insured by factory-generated calibration data which is stored in EEPROM. Unlike the level-control calibration data for the RF Generator, the calibration data is mathematically applied to the measurement results by the Controller. The following assemblies have calibration data which affects RF power measurement:

- A24 Attenuator
- A23 Input
- A19 Measurement

RF Frequency Measurement

The A23 Input assembly pre-scales the RF input frequency and sends it to the A19 Measurement assembly where it is counted. This measurement is used to automatically tune the local oscillator (LO) and to select the input RF filters. The IF is also counted by the A19 Measurement assembly via the A16 Receiver assembly. The controller calculates the RF frequency from the IF frequency measurement by taking into account the LO frequency. Accuracy is determined by the counter clock which is derived from the 10 MHz reference on the A15 Reference assembly.

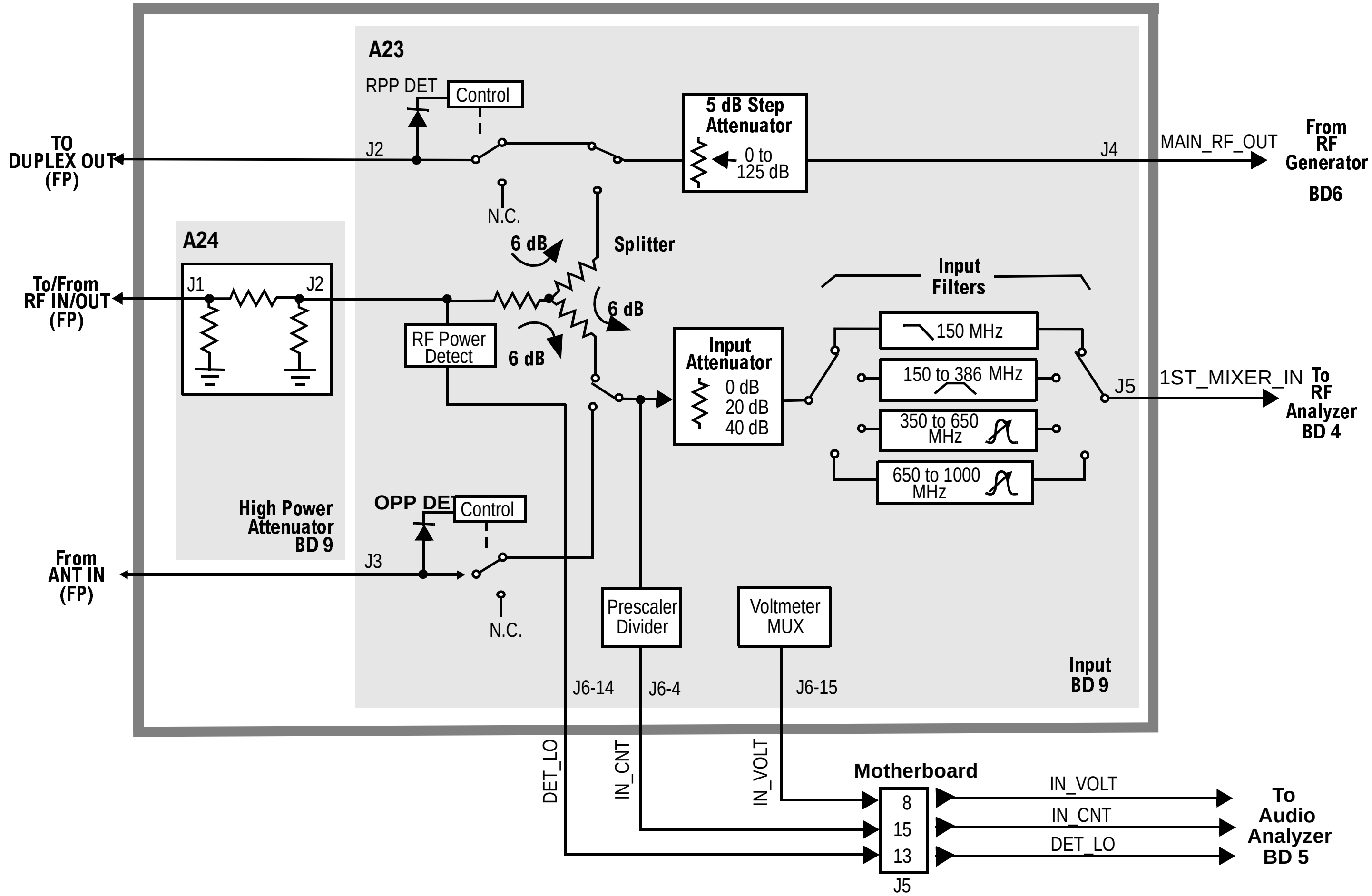
Input Gain Control

Step attenuators in the A23 Input section are switched in and out, manually or automatically. This keeps the input level within an optimum range for the mixers, IF amplifiers, and detectors.

Filters are automatically switched in to remove image- and other interfering signals. The frequency ranges of the filters are as follows:

- 150 MHz low-pass
- 150 MHz - 386 MHz bandpass
- 350 MHz - 650 MHz tuneable bandpass
- 650 MHz - 1000 MHz tuneable bandpass

INPUT/OUTPUT SECTION



SECTION DETAIL BD 3

RF Analyzer Section

Frequency Conversion

All frequencies are derived from the A15 Reference Assembly. The A11 Receiver Mixer produces an IF of 114.3 or 614.3 MHz. The LO and IF frequencies develop as follows:

Input RF (MHz)	1st LO (MHz)	IF (MHz)
0 to 385.7	614.7 to 1000	614.3
385.7 to 800	500 to 914.3	114.3
800 to 1000	685.7 to 885.7	114.3

The A11 assembly contains two IF Filters that are switched by a DC voltage applied to the semi-rigid coax cable that connects the A11 output to the A16 Receiver assembly. The A16 Receiver produces the voltage according to the IF frequency required.

Modulation Measurement

The A16 Receiver demodulates the IF into its FM, AM, and SSB components. The demodulated signal is sent to the Audio Analyzer section for measurement.

Spectrum Analysis

The LO on the A18 Spectrum Analyzer assembly is swept across the span by the Controller. The LO starts sweeping when the oscilloscope circuits on the A19 Measurement assembly trigger the display sweep to start. As the LO sweeps, the spectrum analyzer filters and then amplifies the IF signal in a logarithmic detector so the signal voltage will be proportional to the log of power. The signal voltage is measured by a sampler on the A19 Measurement assembly and displayed.

Span Width and Bandwidth

Spectrum analyzer resolution bandwidth is determined by switchable bandwidth IF filters on the A18 Spectrum Analyzer assembly. These filters are set by the Controller as a function of the span selected from the front panel.

Markers

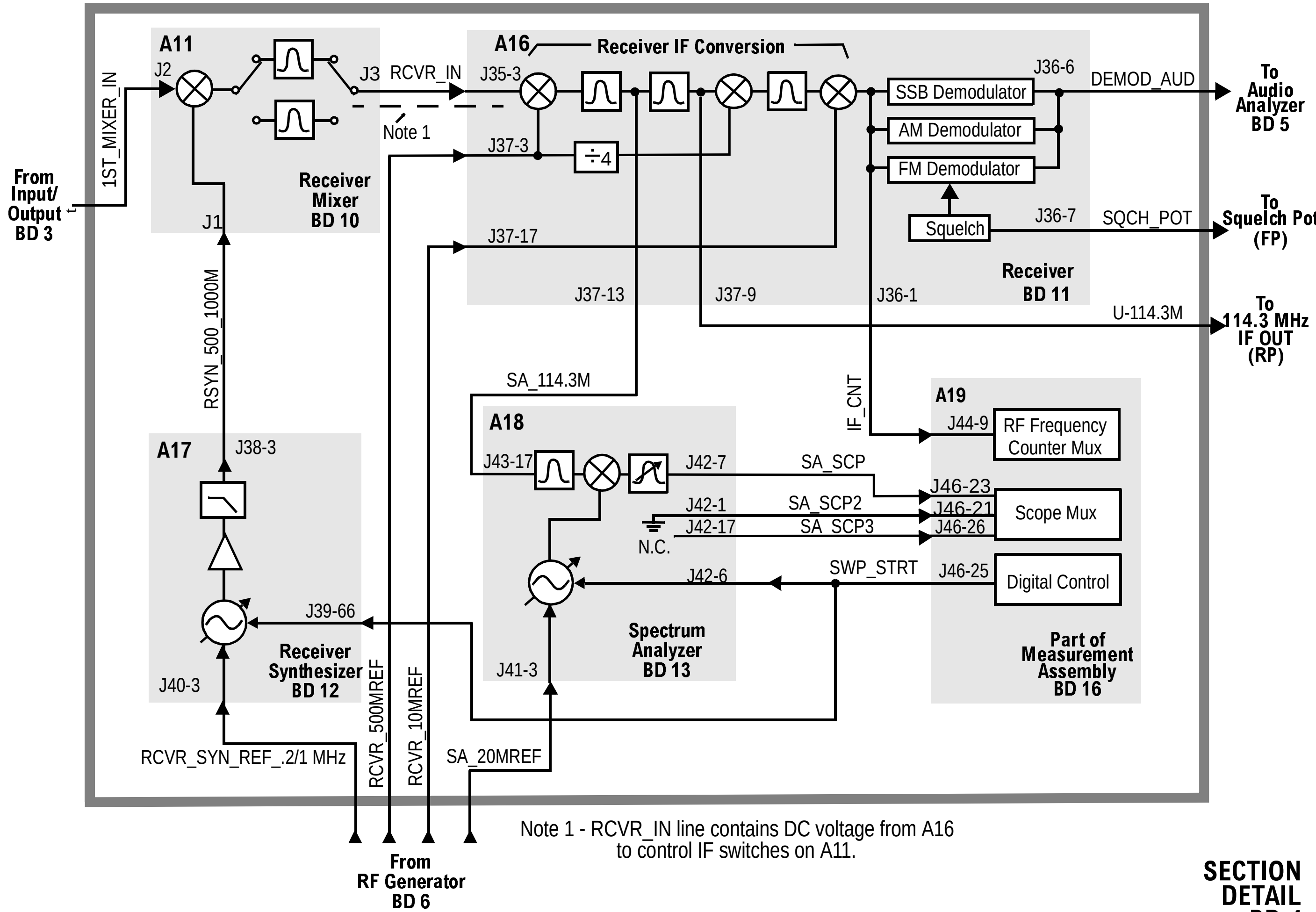
The Controller keeps track of the marker position set on the front panel and displays the frequency and level measured for that position. Frequency accuracy is the same as that of the A15 Reference assembly but it is limited by the resolution of the display.

Level accuracy can be affected by the logarithmic detector on the A18 Spectrum Analyzer assembly.

Tracking Generator

When the tracking generator function is selected, the Controller controls the spectrum analyzer and the RF generator together, causing them to track each other.

RF ANALYZER SECTION



Note 1 - RCVR_IN line contains DC voltage from A16
to control IF switches on A11.

SECTION DETAIL BD 4

Audio Analyzer Section

Input Level Control

Switchable gain amplifiers on the A3 Audio Analyzer 1 and A2 Audio Analyzer 2 assemblies keep the audio input signal within a range suitable for the detectors.

AC and DC Level Measurements

Detected voltages from the Peak+, Peak –, and RMS detectors are measured on the A19 Measurement assembly. The Controller calculates the displayed value taking into account the detector selected from the front panel, the gain of the amplifiers, and the source of the input signal (demodulators, front panel).

Distortion and SINAD Measurements

Distortion and SINAD can be measured on 300 Hz to 10 kHz audio signals. The Controller calculates Distortion and SINAD by comparing the ratio of the voltage after the variable notch filter to the ratio of the voltage before the notch filter.

Radio Interface (Optional)

The radio interface provides a special connection port to pass information to and from a radio. The information passed is used to control the radio during test.

Oscilloscope Functions

The Test Set has no specialized oscilloscope assemblies. The A2 and A3 Audio Analyzer assemblies, A19 Measurement assembly, and the Controller work together to perform the oscilloscope functions.

Display

The audio or dc signal to be displayed goes from the A2 Audio Analyzer 2 assembly to a sampler on the A19 Measurement assembly (the same sampler used by the Spectrum Analyzer). The Controller calculates the display level by taking into account the value of the measured signal at each point of the sweep, the gain of the signal path in the Audio Analyzer assemblies, and the volts-per-division setting.

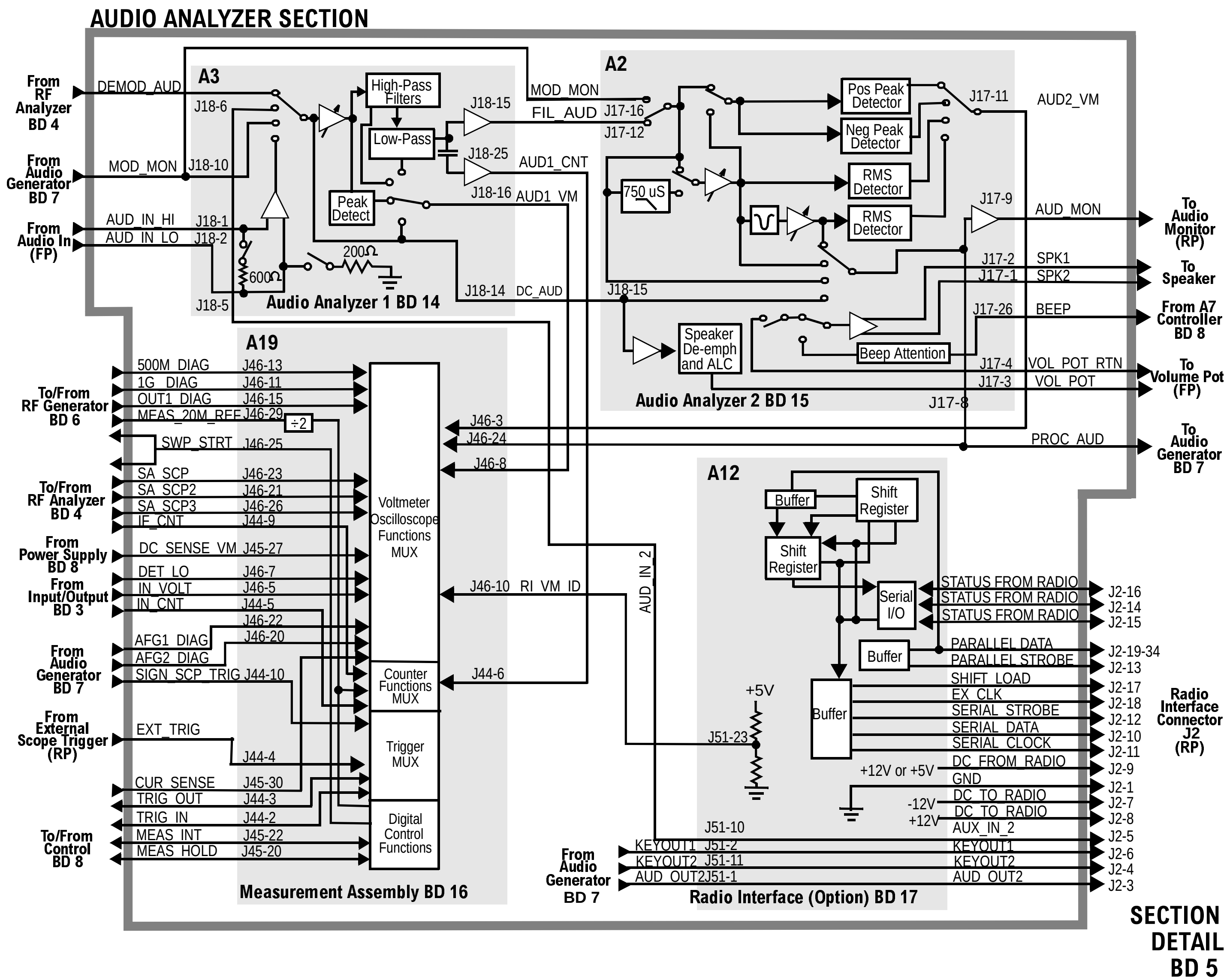
Trigger

The scope trigger signals from the rear-panel connector, the A6 Signaling Source/Analyzer assembly, and the internal trigger signal are used by the A19 Measurement assembly and the Controller to determine when to start the scope sweep. The Controller takes into account the pre-trigger time entered from the front panel.

Marker

The Controller keeps track of the marker position set on the front panel and displays the time and level measured for that position.

Time accuracy is the same as the frequency counter’s accuracy because the scope timing is derived from the A15 Reference assembly but it is limited by the resolution of the display.


AUDIO ANALYZER SECTION
A3
Audio Analyzer 1 BD 14
From RF Analyzer BD 4
DEMOD_AUD
From Audio Generator BD 7
MOD_MON
From Audio In (FP)
AUD_IN_HI
AUD_IN_LO
J18-6
J18-10
J18-1
J18-2
J18-5
600Ω
200Ω
High-Pass Filters
Low-Pass
Peak Detect
J18-15
J18-25
J18-16
J18-14
DC_AUD
AUD1_CNT
AUD1_VM
MOD_MON
FIL_AUD
A2
Audio Analyzer 2 BD 15
J17-16
J17-12
J18-15
Pos Peak Detector
Neg Peak Detector
RMS Detector
RMS Detector
750 uS
Speaker De-emph and ALC
Beep Attention
J17-11
AUD2_VM
J17-9
AUD_MON
J17-2
SPK1
J17-1
SPK2
J17-26
BEEP
J17-4
VOL_POT_RTN
J17-3
VOL_POT
J17-8
PROC_AUD
To Audio Monitor (RP)
To Speaker
From A7 Controller BD 8
To Volume Pot (FP)
To Audio Generator BD 7
A19
Measurement Assembly BD 16
To/From RF Generator BD 6
500M_DIAG J46-13
1G_DIAG J46-11
OUT1_DIAG J46-15
MEAS_20M_REF J46-29
÷2
SWP_STRT J46-25
To/From RF Analyzer BD 4
SA_SCP J46-23
SA_SCP2 J46-21
SA_SCP3 J46-26
IF_CNT J44-9
From Power Supply BD 8
DC_SENSE_VM J45-27
From Input/Output BD 3
DET_LO J46-7
IN_VOLT J46-5
IN_CNT J44-5
J46-22
J46-20
From Audio Generator BD 7
AFG1_DIAG
AFG2_DIAG
SIGN_SCP_TRIG J44-10
From External Scope Trigger (RP)
EXT_TRIG
J44-4
To/From Control BD 8
CUR_SENSE J45-30
TRIG_OUT J44-3
TRIG_IN J44-2
MEAS_INT J45-22
MEAS_HOLD J45-20
J46-3
J46-24
J46-8
J46-10 RI_VM_ID
J44-6
Voltmeter Oscilloscope Functions MUX
Counter Functions MUX
Trigger MUX
Digital Control Functions
AUD_IN_2
A12
Radio Interface (Option) BD 17
Buffer
Shift Register
Shift Register
Serial I/O
Buffer
Buffer
+5V
J51-23
J51-10
+12V or +5V
-12V
+12V
STATUS FROM RADIO J2-16
STATUS FROM RADIO J2-14
STATUS FROM RADIO J2-15
PARALLEL DATA J2-19-34
PARALLEL STROBE J2-13
SHIFT_LOAD J2-17
EX_CLK J2-18
SERIAL_STROBE J2-12
SERIAL_DATA J2-10
SERIAL_CLOCK J2-11
DC_FROM_RADIO J2-9
GND J2-1
DC_TO_RADIO J2-7
DC_TO_RADIO J2-8
AUX_IN_2 J2-5
KEYOUT1 J2-6
KEYOUT2 J2-4
AUD_OUT2 J2-3
From Audio Generator BD 7
KEYOUT1 J51-2
KEYOUT2 J51-11
AUD_OUT2 J51-1
Radio Interface Connector J2 (RP)
SECTION DETAIL BD 5

RF Generator Section

Frequency Generation

All frequencies are derived from a 10 MHz reference which can come from an external reference or from a 10 MHz crystal oscillator on the A15 Reference assembly. There are two versions of the Reference assembly. The standard Reference assembly has a temperature compensated crystal oscillator (TCXO), and the Option 001 (High Stability Time Base) Reference assembly has an oven controlled crystal oscillator (OCXO). The A15 Reference assembly develops the local oscillator (LO) and reference signals needed by the assemblies that make up the RF Generator, RF Analyzer, Spectrum Analyzer, and the A19 Measurement assembly.

The A14 Sig Gen Synthesizer develops a 500 MHz to 1000 MHz signal which is phase-locked to the 200 kHz reference from the A15 Reference Assembly. An out-of-lock indicator LED lights if the phase-lock-loop is out of lock. When you turn the Test Set’s power on the LED lights for a few seconds then goes out. If it stays on or comes on again, the loop is out of lock.

The A13 Output assembly develops the RF Generator’s full frequency range by mixing, dividing, or passing the 500 MHz to 1000 MHz from the A14 assembly. The frequencies are derived as follows:

Output Frequency	Derivation
250 kHz - 250 MHz	mix
250 MHz - 500 MHz	divide
500 MHz - 1 GHz	pass

Level Control

The A13 Output assembly has an automatic-level-control (ALC) loop that acts as a vernier control of RF level between –2 and +9 dBm. A step attenuator in the A23 Input assembly takes the level down to –127 dBm (–137 dBm at the RF IN/OUT connector) in 5 dB steps.

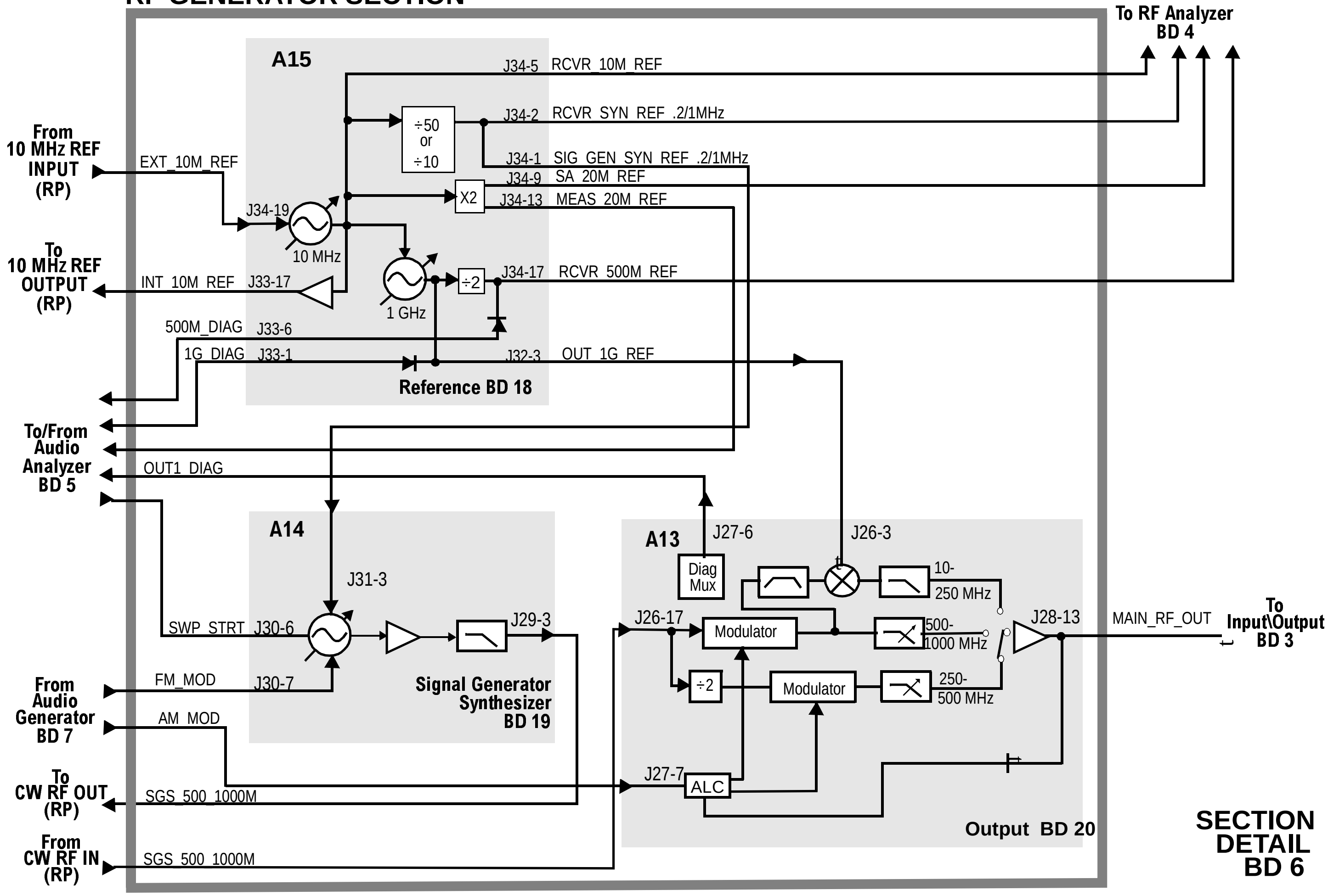
Assemblies that affect output level calibration have factory-generated calibration data stored in the Test Set’s EEPROM. Calibration data is fed to digital-to-analog-converters which control level-adjustable devices in the RF path. These assemblies are:

- A24 Attenuator
- A23 Input
- A13 Output

Modulation

Amplitude Modulation (AM) is done on the A13 Output assembly. The modulating signal from the A4 Modulation Distribution assembly is applied to the ALC loop’s control voltage.

RF GENERATOR SECTION



SECTION
DETAIL
BD 6

Audio Generator Section

Waveform Generation

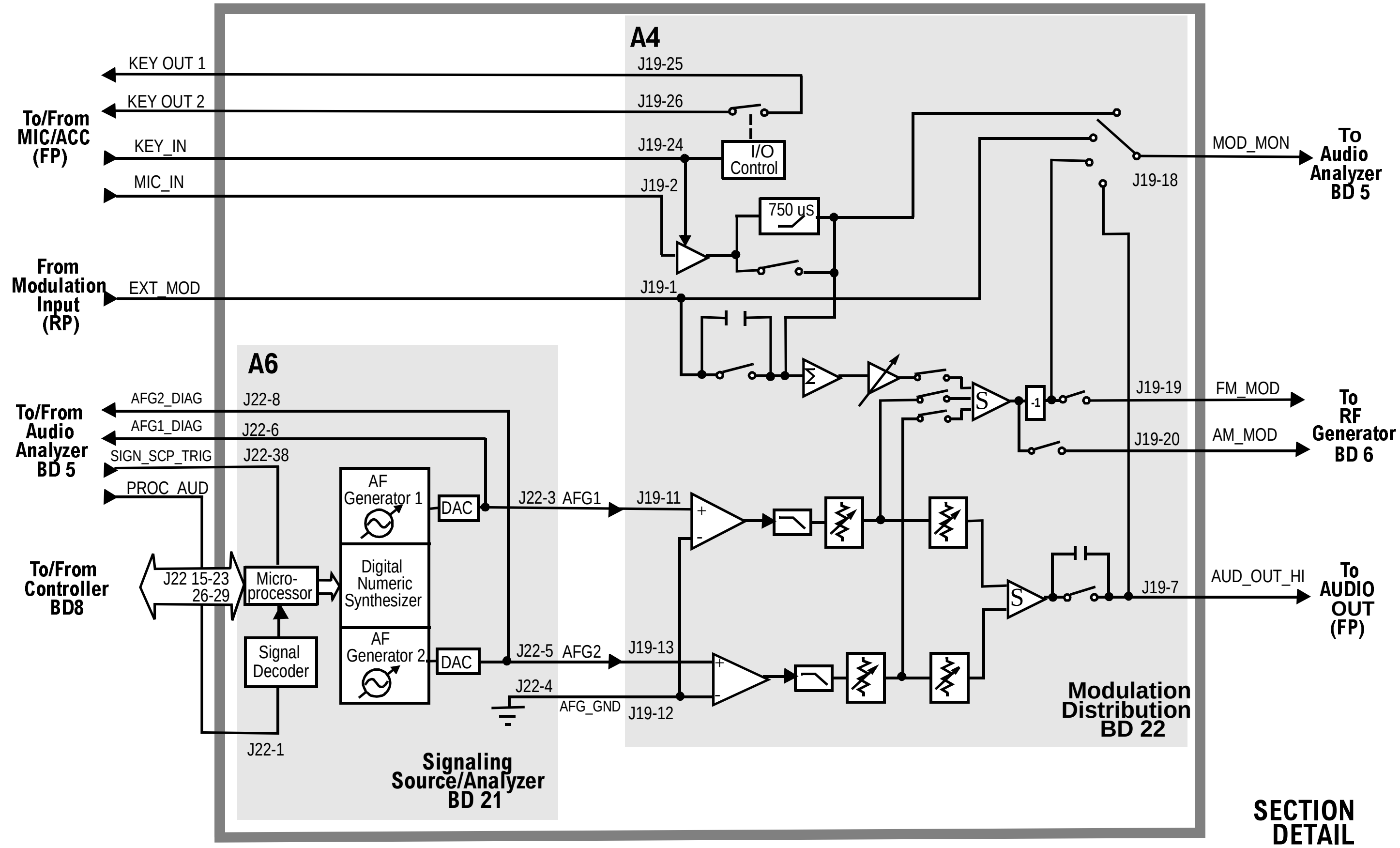
The A6 Signal Source and Analyzer gets frequency and waveshape information from the Controller. Waveform values are calculated real-time by a digital waveform synthesis IC. The AFGen1 output is always a sine-wave. The AFGen2 output is a sine-wave unless one of the function generator waveforms is selected, or signaling is selected from the front panel.

Signaling tones and sequences are generated by AFGen2 when Option 004 (Tone/ Digital Signaling) is installed. This option consists of a read-only-memory (ROM) IC that contains the program code for enabling the digital waveform synthesis IC to generate signaling. This ROM is on the A6 assembly.

Level Control

Audio level is controlled by the A4 Modulation Distribution assembly by using a DAC and variable attenuators. The leveled audio signal is passed on to the RF Generator section.

AUDIO GENERATOR SECTION



SECTION DETAIL BD 7

Power Supply, Display, and Control Section

Power Supply

The A9 Power Supply is a switching type supply. The power supply generates five different DC supplies. They are:

- +5.5 Vdc
- +13.4 Vdc
- −13.4 Vdc
- +43.5 Vdc
- −12 Vdc AUX

Power Supply voltages are distributed to all of the modules and assemblies through the motherboard.

Display

The Test Set’s Display data is first generated by the A7 Controller and then passed on to the A20 CRT drive. The A20 CRT drive converts the digital information into analog vertical and horizontal drive signals for the A22 CRT display. The A20 CRT drive also provides brightness and contrast signals for the A22 CRT display.

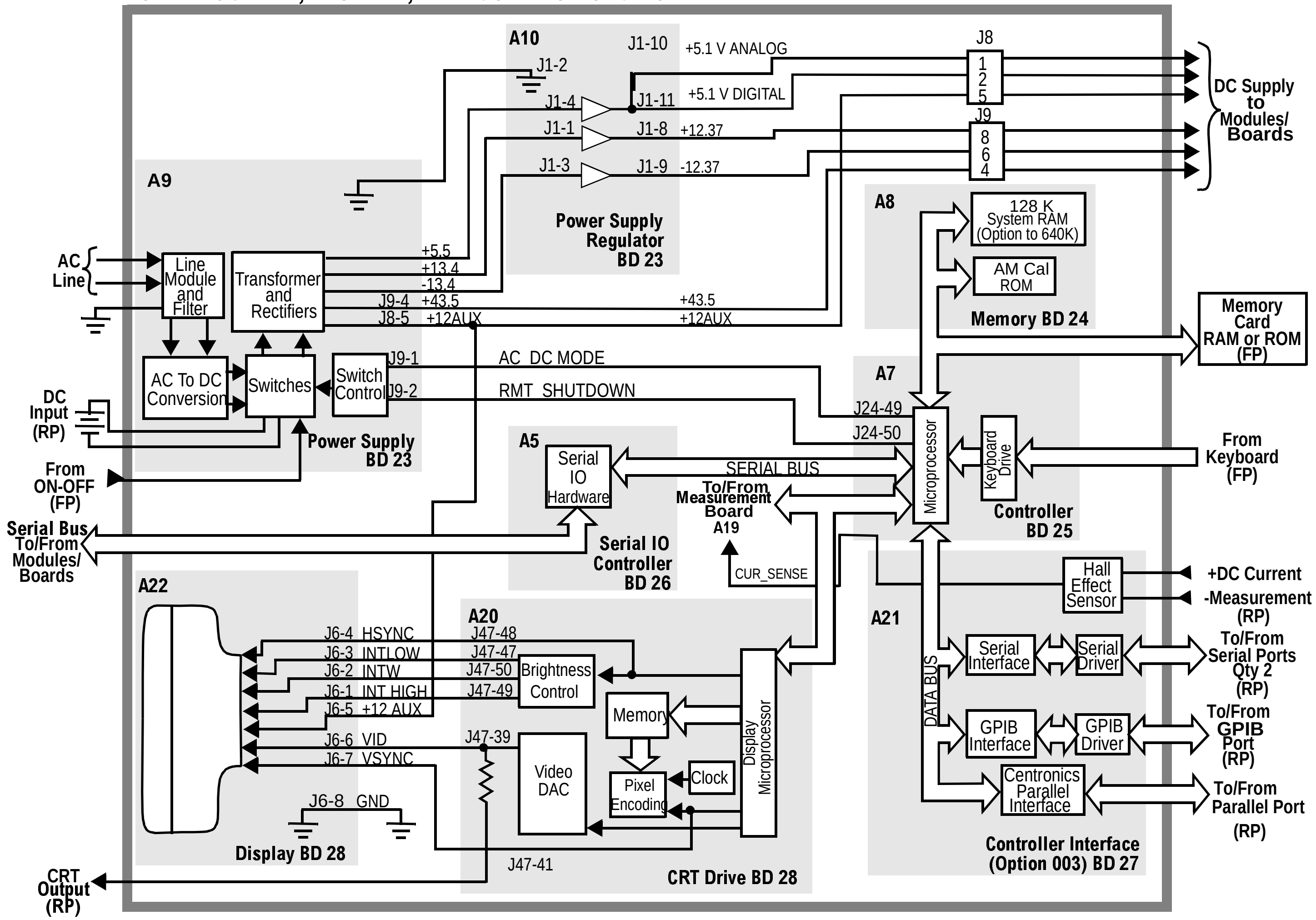
Control

The Test Set’s Digital Control is driven by three different assemblies. They are:

- A8 Memory
- A7 Controller
- A5 Serial I/O

The controller receives user control information by either the GPIB Bus or by the front panel. Operating firmware on the A8 Memory is then used by the A7 Controller to generate digital control for the Test Set. The digital control bus information is passed to the A5 Serial I/O which controls most of the Test Set’s modules and assemblies.

POWER SUPPLY, DISPLAY, AND CONTROL SECTION



SECTION DETAIL BD 8

Table 128 Switch Control BD9 A23 Input

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	inpt_dup_op_reset	a	1	Instrument MEAS RESET
		b	0	When Reverse Power Is Applied
2	inpt_duplex_switch	a	1	RF Generator Output Port to Duplex
		b	0	RF Generator Output Port to RF Out
3	Counter Connection	a		Service Screen Counter Connection to INPUT_ECL_COUNT
		b		Service Screen Counter Connection to INPUT_TTL_COUNT
4	inpt_antenna_switch	a	0	RF Analyzer Input Port to RF IN
		b	1	RF Analyzer Input Port to Antenna
5	inpt_filter_select	a	1D	RF Analyzer Tune Freq <150 MHz
		b	1B	RF Analyzer Tune Freq >150 MHz <380 MHz
		c	16	RF Analyzer Tune Freq >380 MHz <650 MHz
		d	E	RF Analyzer Tune Freq >650 MHz
6	inpt_filter_select	a	1D	RF Analyzer Tune Freq <150 MHz
		b	1B	RF Analyzer Tune Freq >150 MHz <380 MHz
		c	16	RF Analyzer Tune Freq >380 MHz <650 MHz
		d	E	RF Analyzer Tune Freq >650 MHz
7	inpt_ant_op_reset		1	Instrument MEAS RESET
		b	0	When Overpower is Applied

Table 129 **I/O Specs BD9 A23 Input**

Connector	Name	Type	Range	
			Min	Max
J1	RF IN/OUT	Input	.4 MHz	1000 MHz
				2.4 Watts
J2	DUPLEX OUT	Output	.4 MHz	1000 MHz
J3	ANTENNA IN	Input	.4 MHz	1000 MHz
				.10 Watts
J4	MAIN_RF_OUT	Input	.4 MHz	1000 MHz
				<1 dBm
J5	1ST_MIXER_IN	Output	.4 MHz	1000 MHz
			–22 dBm	–12 dBm

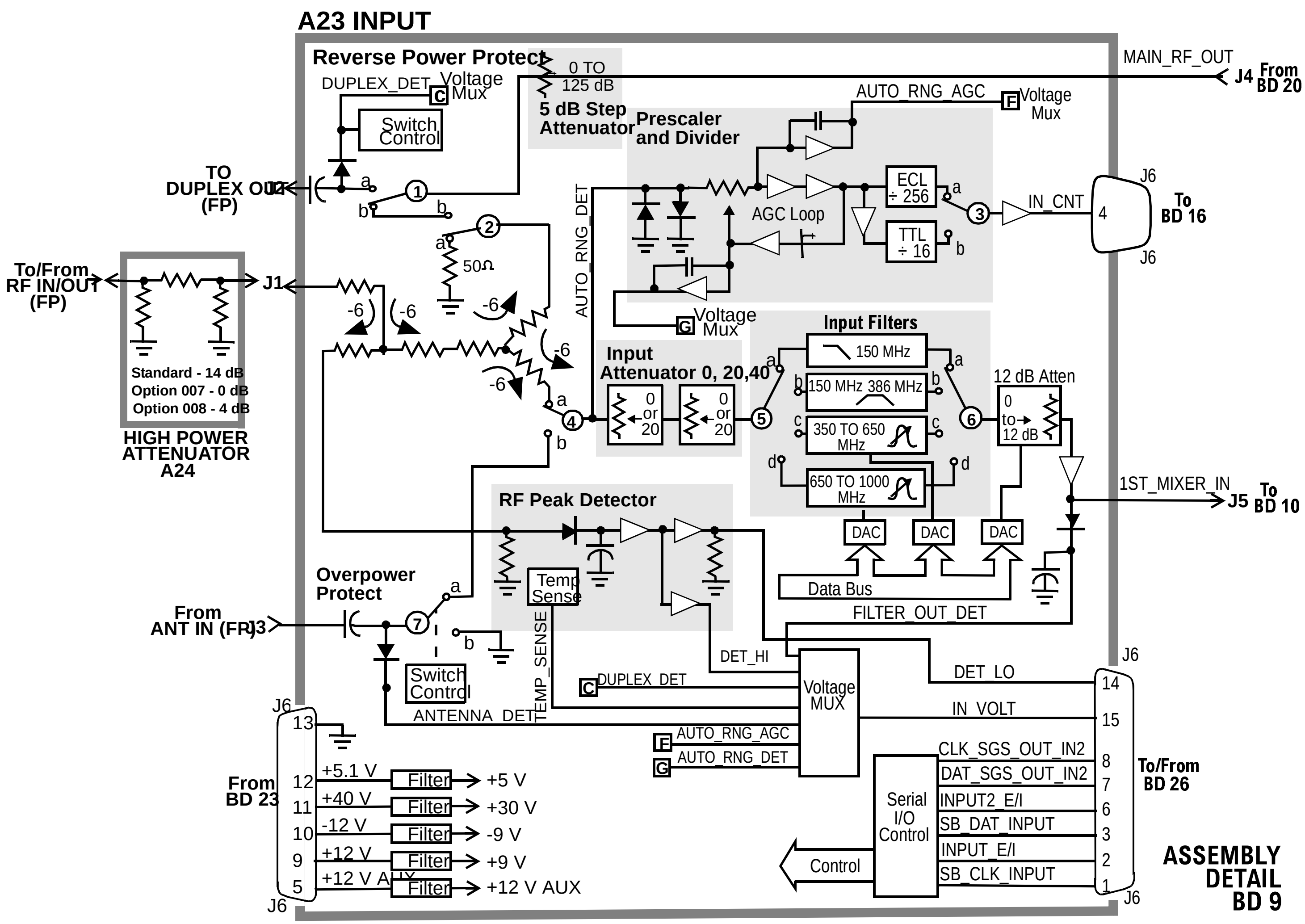

A23 INPUT
Reverse Power Protect
DUPLEX_DET
Voltage Mux
Switch Control
0 TO 125 dB
5 dB Step Attenuator
MAIN_RF_OUT
J4 From BD 20
AUTO_RNG_AGC
Voltage Mux
Prescaler and Divider
ECL ÷ 256
TTL ÷ 16
AGC Loop
IN_CNT
J6
To BD 16
TO DUPLEX OUT (FP)
J2
To/From RF IN/OUT (FP)
J1
50Ω
AUTO_RNG_DET
Voltage Mux
Input Attenuator 0, 20,40
0 or 20
Input Filters
150 MHz
150 MHz 386 MHz
350 TO 650 MHz
650 TO 1000 MHz
12 dB Atten
0 to 12 dB
1ST_MIXER_IN
J5 To BD 10
Standard - 14 dB
Option 007 - 0 dB
Option 008 - 4 dB
HIGH POWER ATTENUATOR A24
RF Peak Detector
Temp Sense
DAC
Data Bus
FILTER_OUT_DET
Overpower Protect
From ANT IN (FP)
J3
Switch Control
TEMP_SENSE
ANTENNA_DET
DET_HI
DUPLEX_DET
Voltage MUX
DET_LO
IN_VOLT
AUTO_RNG_AGC
AUTO_RNG_DET
Serial I/O Control
CLK_SGS_OUT_IN2
DAT_SGS_OUT_IN2
INPUT2_E/I
SB_DAT_INPUT
INPUT_E/I
SB_CLK_INPUT
Control
To/From BD 26
From BD 23
+5.1 V
+40 V
-12 V
+12 V
+12 V AUX
Filter
+5 V
+30 V
-9 V
+9 V
+12 V AUX
ASSEMBLY DETAIL BD 9

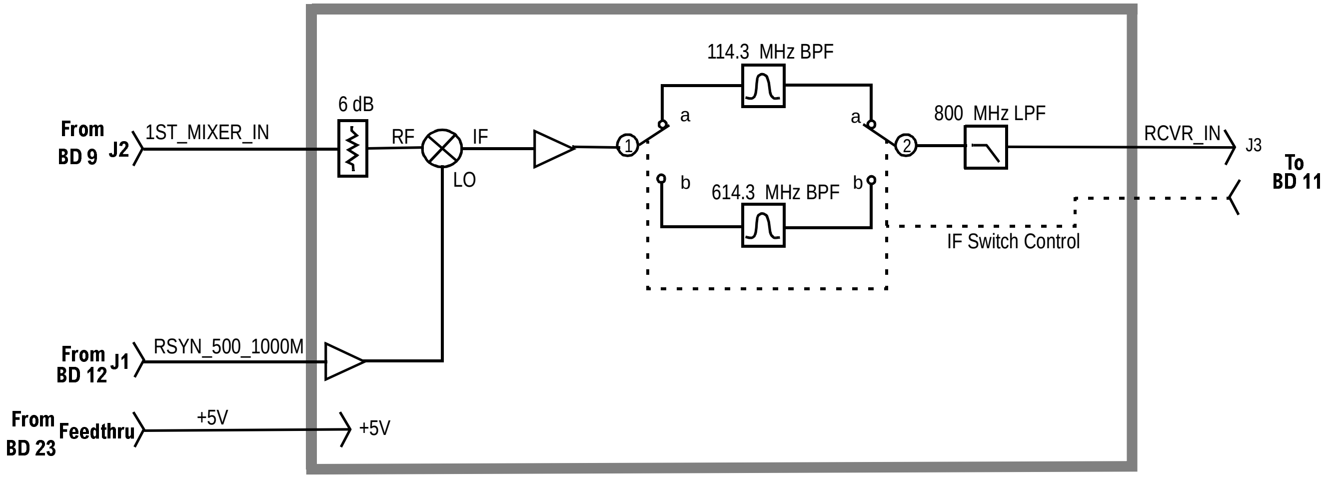
Table 130 Switch Control BD10 A11 Receiver Mixer

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	rcvr_if_path_select	a	2	RF Analyzer Tune Fre-quency≥380.7 MHz
		b	1	RF Analyzer Tune Frequency <380.7 MHz
2	rcvr_if_path_select	a	2	RF Analyzer Tune Frequency ≥380.7 MHz
		b	1	RF Analyzer Tune Frequency <380.7MHz

Table 131 I/O Specs BD10 A11 Receiver Mixer

Connector	Name	Type	Range	
			Min	Max
J1	RSYN_500_1000M	Input	500 MHz	1000 MHz
			0 dBm	+6 dBm
J2	1ST_MIXER_IN	Input	.4 MHz	10000 MHz
J3	RCVR_IN	Output	– 37 dBm	–14 dBm

A11 RECEIVER MIXER



ASSEMBLY DETAIL BD 10

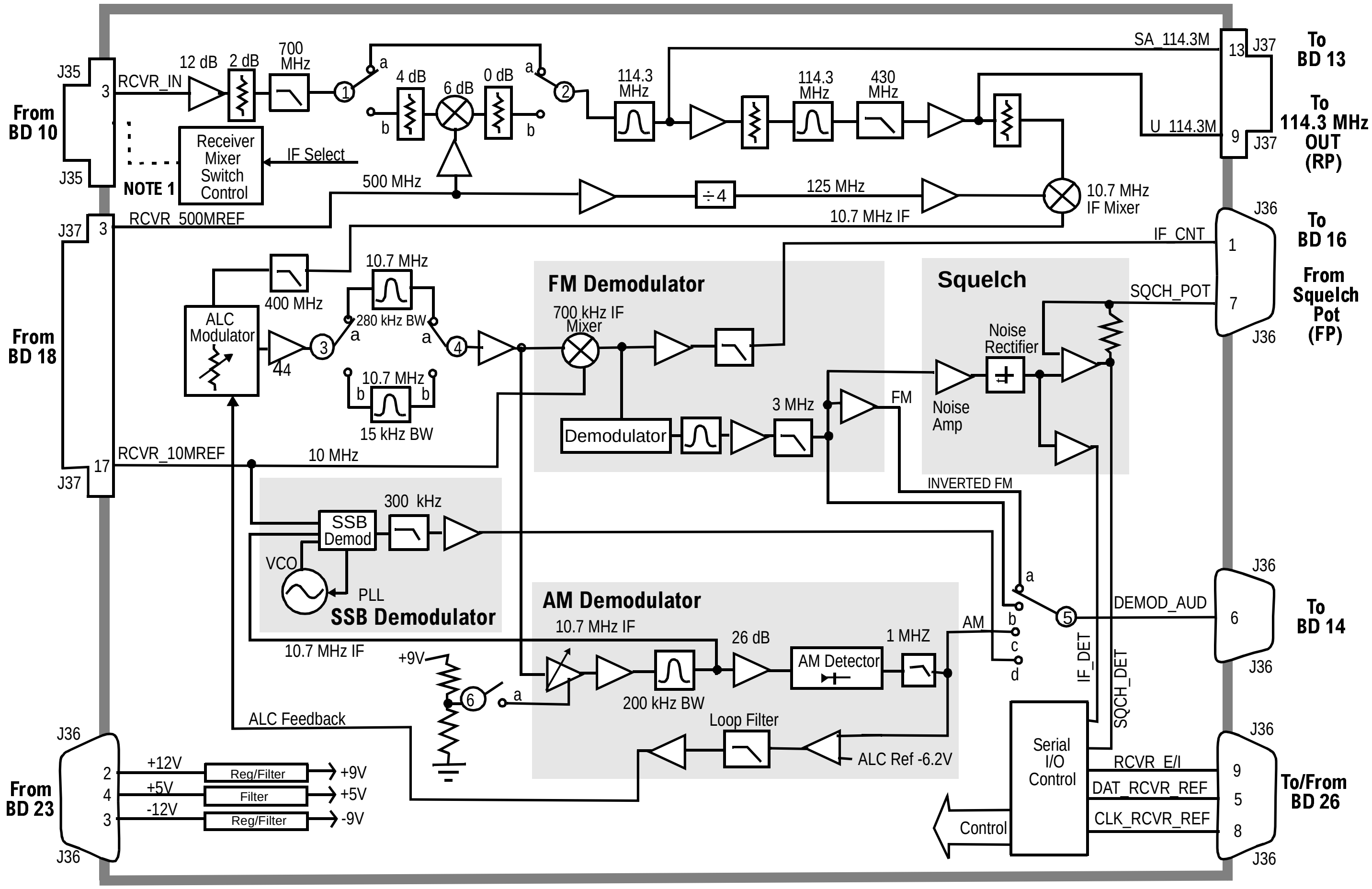
Table 132 Switch Control BD11 A16 Receiver

Switch No.	Switch Name	Position	Hex Value	Instrument Setting
1	rcvr_if_path_select	a	2	RF Analyzer Tune Frequency 380.7 MHz
		b	1	RF Analyzer tune Frequency <380.7MHz
2	rcvr-if_path_select	a	2	RF Analyzer Tune Frequency ≥380.7 MHz
		b	1	RF Analyzer Tune Frequency <380.7 MHz
3	rcvr_if_filter_select	a	2	RF Analyzer IF Filter To 15 kHz
		b	1	RF Analyzer IF Filter to 230 kHz
4	rcvr_if_filter_select	a	2	RF Analyzer IF Filter to 15 kHz
		b	1	RF Analyzer IF Filter to 230 kHz
5	rcvr_demod_select	a	0	AF Analyzer AF Anl IN to FMD Demod, Tune Frequency >710 MHz
		b	1	AF Analyzer AF Anl IN to FM Demod, Tune Frequency <710 MHz
		c	2	AF Analyzer AF Anl IN to AM Demod
		d	3	AF Analyzer AF Anl IN to SSB Demod
6	rcvr_alc_select	a	1	AF Analyzer AF Anl IN to AM Demod
		open	0	AF Analyzer AF Anl IN to FM Demod

Table 133 I/O Specs BD11 A16 Receiver

Connector	Name	Type	Range	
			Min	Max
J35-3	RCVR_IN	Input	–37 dBm	–14 dBm
J37-3	RCVR_500MREF	Input	–2 dBm	+2 dBm
J37-17	RCVR_10MREF	Input	–12 dBm	– 8 dBm
J37-13	SA_114.3M	Output	109.3 MHz	119.3 MHz
				–12 dBm
J37-9	J-114.3M	Output	109.3 MHz	119.3 MHz
J36-6	DEMOD_AUD	Output		12 Vp

A16 RECEIVER



NOTE 1- Receiver Mixer Switch Control is DC Voltage Carried on J35-3 Line

ASSEMBLY DETAIL BD 11

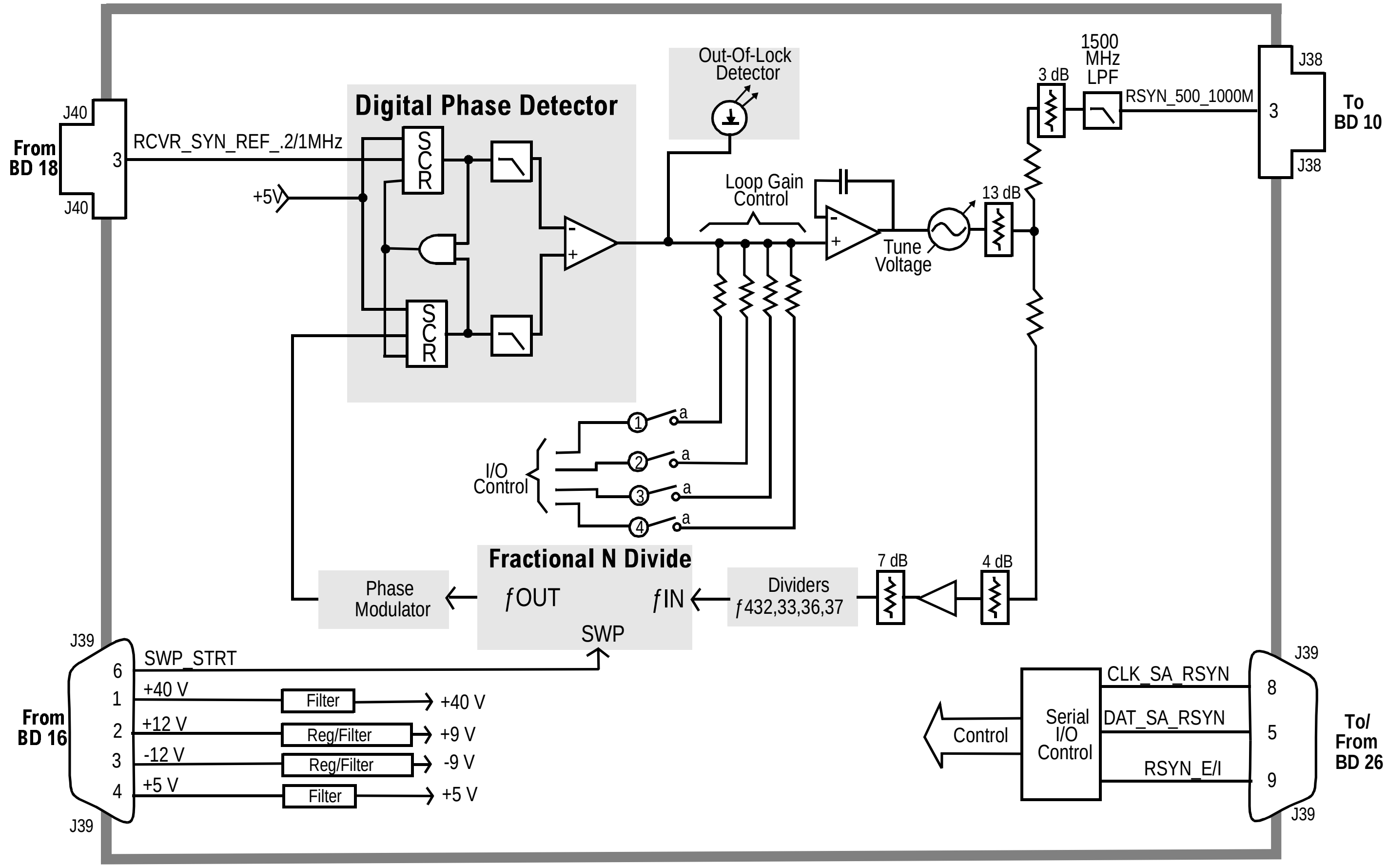
Table 134 Switch Control BD12 A17 Receiver Synthesizer

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	rsyn_gain _control	a		Note: Gain Control switches are set in either single position combinations according to receiver tuning frequency. Independent hexadecimal values are not applicable.
		open		
2	rsyn_gain _control	a		
		open		
3	rysn_gain _control	a		
		open		
4	rysn_gain _control	a		
		open		

Table 135 I/O Specs BD12 A17 Receiver

Connector	Name	Type	Range	
			Min	Max
J40-3	RCVR_SYN_REF_.2/1 MHz	Input	CMOS	CMOS
J39-6	SWP_STRT	Input	TTL	TTL
J38-3	RSYN_500_1000M	Output	–2 dBm	+2 dBm

A17 RECEIVER SYNTHESIZER



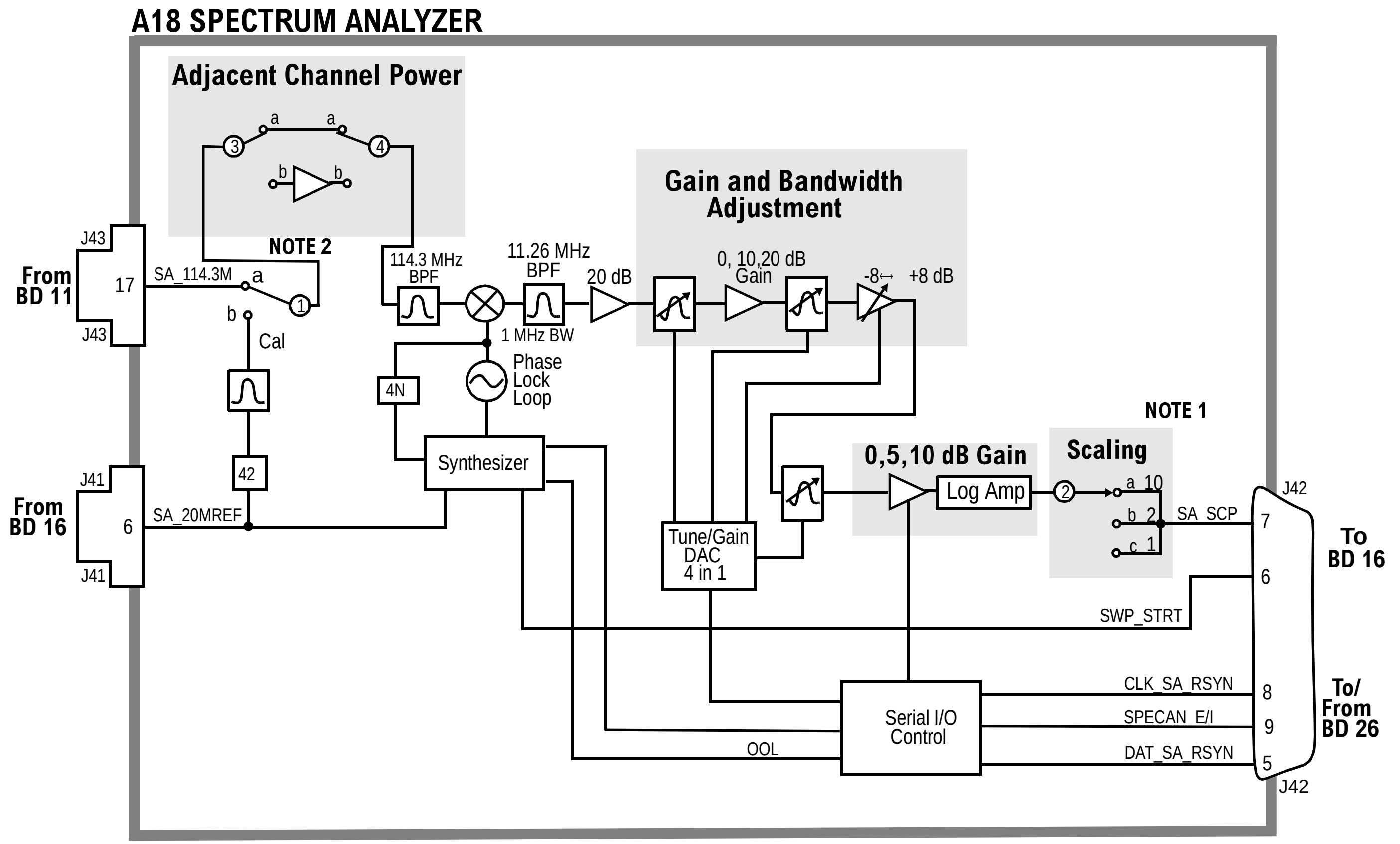
ASSEMBLY DETAIL BD 12

Table 136 Switch Control BD13 A18 Spectrum Analyzer

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	spec_cal_switch	a	0	Normal Operation
		b	1	Position Active During-Calibration Cycle
2	spec_log_amp_path	a	6	Spectrum Analyzer Sensitivity 10 dB div
		b	5	Spectrum Analyzer Sensitivity 2 dB div
		c	3	Spectrum Analyzer Sensitivity 1 dB div

Table 137 I/O Secs BD13 A18 Spectrum Analyzer

Connector	Name	Type	Range	
			Min	Max
J43-17	SA_114.3M	Input		–12 dBm
J41-6	SA_20M REF	Input	>+3 dBm	



NOTE 1-Available with Spectrum Analyzer Number 08920-60214 and Firmware Rev. A.06.01. NOTE 2-Adjacent Channel Power Available with Spectrum Analyzer 08920-60314 and Firmware Rev. A.12.04

ASSEMBLY DETAIL BD 13

Table 138 Switch Control BD14 A3 Audio Analyzer 1

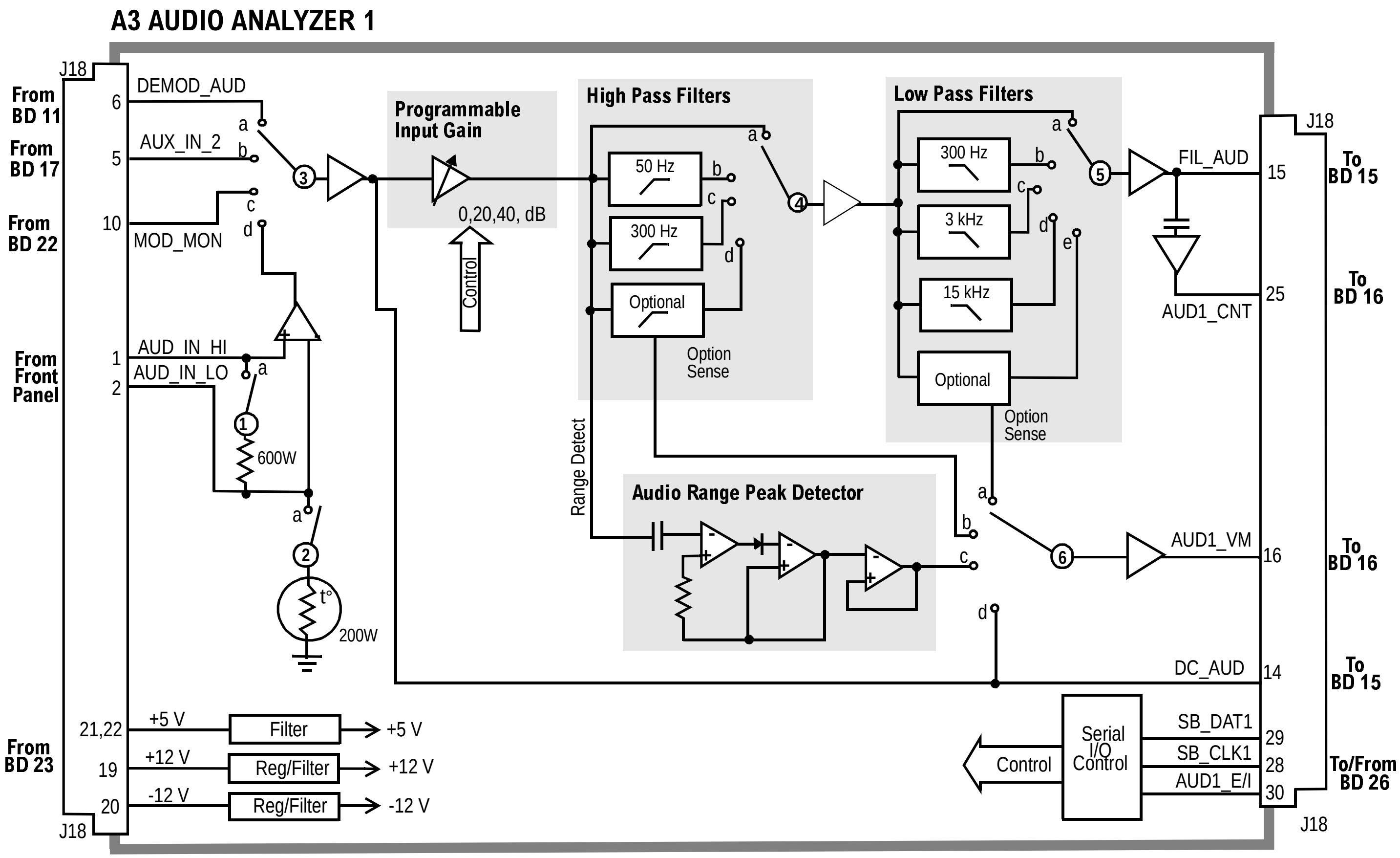
Switch No.	Switch Name	Position	Hex Value	Instrument Setting
1	aud1_input_impedance_switch	a	1	AF Analyzer Audio In Lo to 600 To Hi
		open	0	AF Analyzer Audio In Lo to GND or Float
2	aud1_input_float_gnd	a	1	AF Analyzer Audio In Lo to GND
		open	0	AF Analyzer Audio In Lo to Float or 600 To HI
3	aud1_input_select	a	0	AF Analyzer AF Anl In to FM Demod
		b	4	AF Analyzer AF Anl to Radio INT
		c	1	AF Analyzer AF Anl to EXT MOD
		d	2	AF Analyzer AF Anl to AUDIO IN
4	aud1_filter_1	a	0	AF Analyzer Filter 1 to <20 Hz HPF
		b	3	AF Analyzer Filter 1 to 50 Hz HPF
		c	1	AF Analyzer Filter 1 to 300 Hz HPF
		d	2	AF Analyzer Filter 1 to C-Message BPF
5	aud1_filter_2	a	1	AF Analyzer Filter 2 to >99 kHz LP
		b	0	AF Analyzer Filter 2 to 300 Hz LPF
		c	2	AF Analyzer Filter 2 to 3 kHz LPF

Table 138 Switch Control BD14 A3 Audio Analyzer 1 (Continued)

Switch No.	Switch Name	Position	Hex Value	Instrument Setting
		d	3	AF Analyzer Filter 2 to 15 kHz LPF
		e	4	AF Analyzer Filter 2 to 6 kHz LPF
6	Voltmeter Connection	a		Service Screen Voltmeter to OPTION FILTER 2
		b		Service Screen Voltmeter to OPTION FILTER1
		c		Service Screen Voltmeter to RANGE DETECT
		d		Service Screen Voltmeter to DC AUDIO

Table 139 I/O Specs BD14 A3 Audio Analyzer 1

Connector	Name	Type	Range	
			Min	Max
J18-6	DEMOD_AUD	Input	.02 kHz	75 kHz
				12 Vp
J18-5	AUX_IN_2	Input	.02 kHz	.75 kHz
				12 Vp
J18-10	MOD_MON	Input	.02 kHz	75 kHz
				12 Vp
J18-1	AUD_IN_HI	Input	.02 kHz	75 kHz
				42 Vp
J18-2	AUD_IN_LO	Input	.02 kHz	75 kHz
J18-15	FIL_AUD	Output	–5 Vp	+5 Vp
J8-14	DC_AUD	Output	– 5 Vp	+5 Vp



ASSEMBLY
DETAIL
BD 14

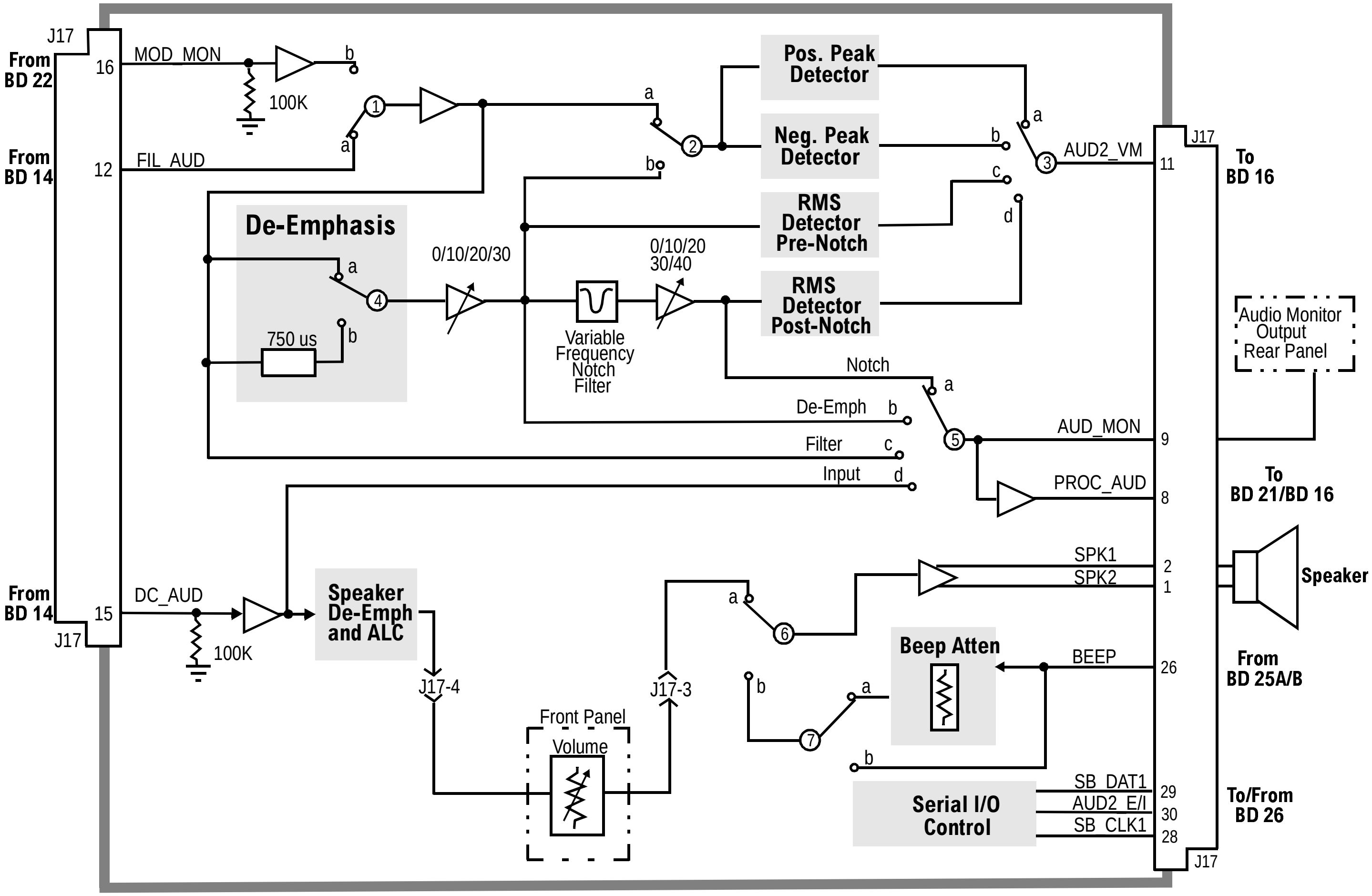
Table 140 **Switch Control BD15 A2 Audio Analyzer 2**

Switch No.	Switch Name	Position	Hex Value	Instrument Setting
1	aud2_input_select	a	0	Switched to under Normal Conditions
		b	1	Switched to under Diagnostic Test
2	aud2_pk_det_input	a	0	AF Analyzer PK Det to Filters
		b	1	AF Analyzers PK Det to De-Emp
3	aud2_vm_mux	a		Service Screen Voltmeter Connections to POS_PK_DET
		b		Service Screen Voltmeter Connection to NEG_PK_DET
		c		Service Screen Voltmeter Connection to PRE_NOTCH_RMS
		d		Service Screen Voltmeter Connection to POST_NOTCH_RMS
4	aud2_de_emphasis	a	0	AF Analyzer De-Emphasis to Off
		b	1	AF Analyzer De-Emphasis to 750 us
5	aud2_monitor_select	a	3	AF Analyzer Scope to Notch
		b	2	AF Analyzer Scope to De-Emph
		c	1	AF Analyzer Scope to Filter
		d	0	AF Analyzer Scope to Input
6	aud2_speaker_source	a	1	AF Analyzer Speaker Vol to Off
		b	0	AF Analyzer Speaker Vol to Pot
7	aud2_beep_volume	a	1	Configure Beeper to Quiet
		b	0	Configure Beeper to Loud

Table 141 I/O Specs BD15 A2 Audio Analyzer 2

Connector	Name	Type	Range	
			Min	Max
J17-16	MOD_MON	Input		100 kΩ
J17-12	FIL_AUD	Input	–5 Vp	+5 Vp
				1 mΩ
J17-15	DC_AUD	Input	–5 Vp	+5 Vp
				100 k Ω
J17-11	AUD2_VM	Output	–5 V	+5 V
J17-1,2	SPK1, SPK2	Output		.25 Vp
J17-8	AUD_MON	Output	–5 V	+5 V
J17-9	PROC_AUD	Output	–5 V	+5 V

A2 AUDIO ANALYZER 2



ASSEMBLY DETAIL BD 15

Table 142 Switch Control BD16 A19 Measurement

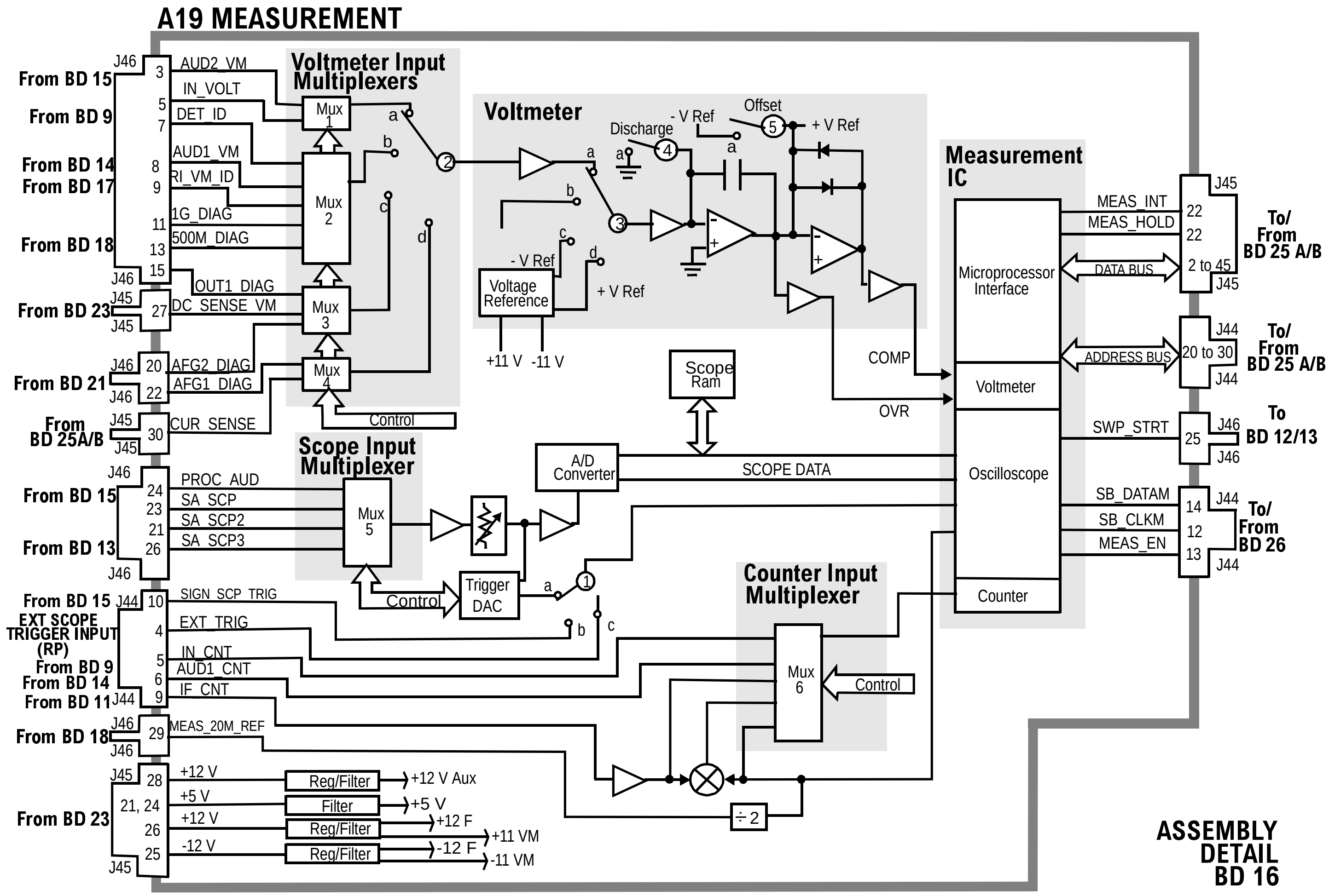
Switch No.	Switch Name	Position	Hex Value	Instrument Setting
1	meas_scope _trigger_sel	a	0	Oscilloscope Controls Trigger Internal
		b	1	Oscilloscope Controls to Trigger Encoder
		c	3	Oscilloscope Controls to Trigger EXT (TTL)
2	Voltmeter Connection	a		Service Screen Voltmeter Connection to POS_PK_DET
		b		Service Screen Voltmeter-Connection to REF_1GHz_DIAG
		c		Service Screen Voltmeter-Connection to AFG2_DIAG
		d		Service Screen Voltmeter-Connection to AFG1_DIAG
3	Voltmeter Connection	a		Service Screen Voltmeter Connection to Any Switch 2 Connect
		b		Service Screen Voltmeter-Connection to MEAS_SGND
		c		Done During Self Cal Every 3 Minutes
		d		Done During Self Cal Every 3 Minutes
4	Voltmeter Discharge Switch	a		Done After Every Measurement
		open		Normal Position

Table 142 Switch Control BD16 A19 Measurement (Continued)

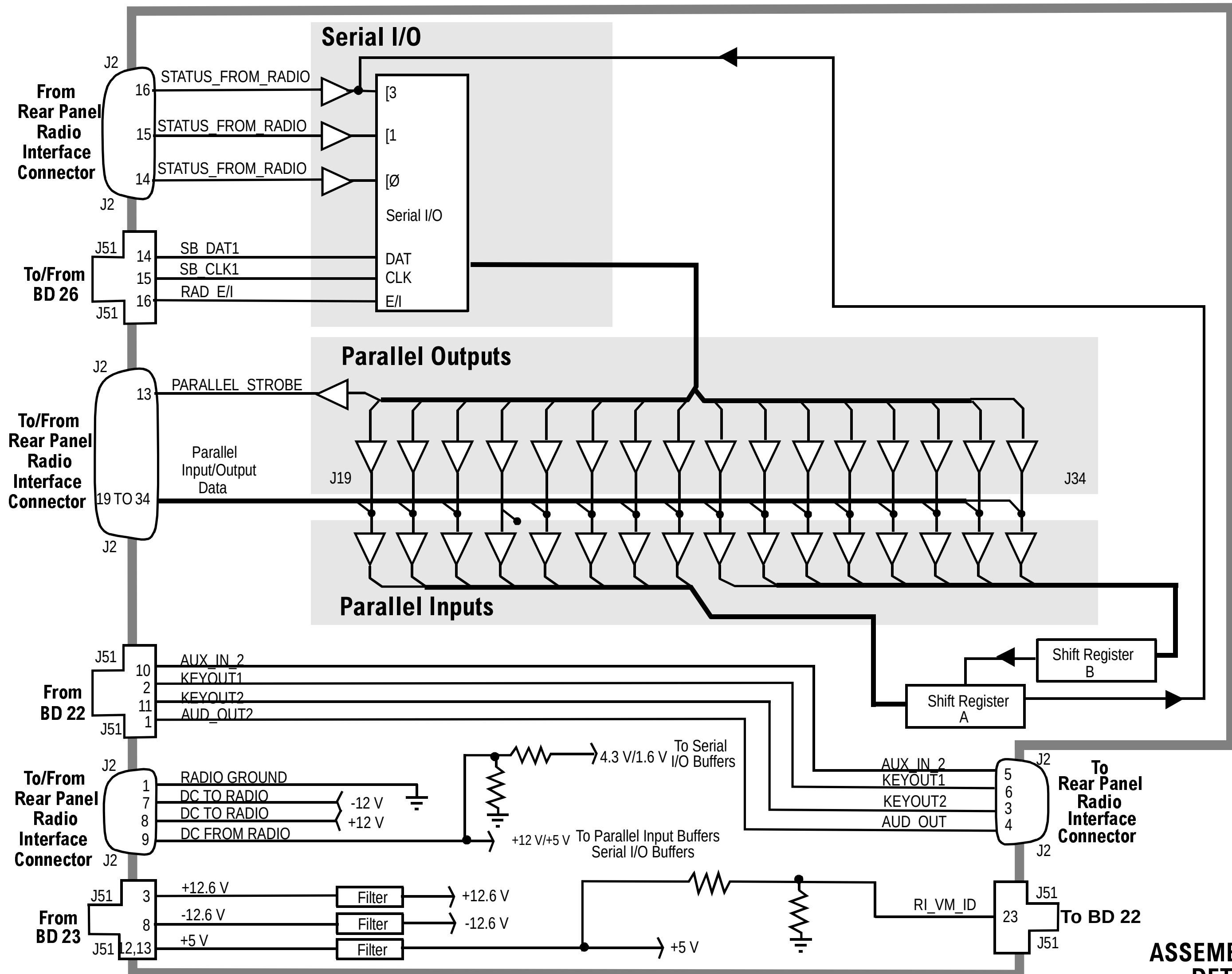
Switch No.	Switch Name	Position	Hex Value	Instrument Setting
5	Voltmeter Offset Switch	a		Done during Self Cal Every 3 Minutes
		open		Normal Position

Table 143 I/O Specs BD16 A19 Measurement

Connector	Name	Type	Range	
			Min	Max
J46-3,5,7	All Voltmeter	Input	–5 V	+5 V
J46-8,9,11	Inputs			
J46-13,15,20				
J46-22				
J45-27,30	All Voltmeter	Input	–5 V	+5 V
	Inputs			
J46-21,23	All Scope	Input	None	10V
J46-24,26	Inputs			
J44-5	IN_CNT	Input	100 mVp	
J44-6	AUD1_CNT	Input	100 mVp	
J44-9	IF_CNT	Input	100 mVp	
J46-29	MEAS_20m_REF	Input	>+5 dBm	
J44-10	SIGN_SCP_TRIG	Input	100 mVp	
J44-4	EXT_TRIG	Input	2.5 Vp	20 Vp


A19 MEASUREMENT
Voltmeter Input Multiplexers
Voltmeter
Measurement IC
Scope Input Multiplexer
Counter Input Multiplexer
From BD 15
From BD 9
From BD 14
From BD 17
From BD 18
From BD 23
From BD 21
From BD 25A/B
From BD 15
From BD 13
From BD 15
EXT SCOPE TRIGGER INPUT (RP)
From BD 9
From BD 14
From BD 11
From BD 18
From BD 23
AUD2_VM
IN_VOLT
DET_ID
AUD1_VM
RI_VM_ID
1G_DIAG
500M_DIAG
OUT1_DIAG
DC_SENSE_VM
AFG2_DIAG
AFG1_DIAG
CUR_SENSE
PROC_AUD
SA_SCP
SA_SCP2
SA_SCP3
SIGN_SCP_TRIG
EXT_TRIG
IN_CNT
AUD1_CNT
IF_CNT
MEAS_20M_REF
+12 V
+5 V
+12 V
-12 V
Mux 1
Mux 2
Mux 3
Mux 4
Mux 5
Mux 6
Control
Discharge
- V Ref
Offset
+ V Ref
Voltage Reference
+11 V
-11 V
Scope Ram
A/D Converter
SCOPE DATA
Trigger DAC
COMP
OVR
Microprocessor Interface
Voltmeter
Oscilloscope
Counter
MEAS_INT
MEAS_HOLD
DATA BUS
ADDRESS BUS
SWP_STRT
SB_DATAM
SB_CLKM
MEAS_EN
To/ From BD 25 A/B
To/ From BD 25 A/B
To BD 12/13
To/ From BD 26
Reg/Filter
Filter
Reg/Filter
Reg/Filter
+12 V Aux
+5 V
+12 F
+11 VM
-12 F
-11 VM
÷ 2
ASSEMBLY DETAIL BD 16

A12 RADIO INTERFACE (OPTION)



ASSEMBLY DETAIL BD 17

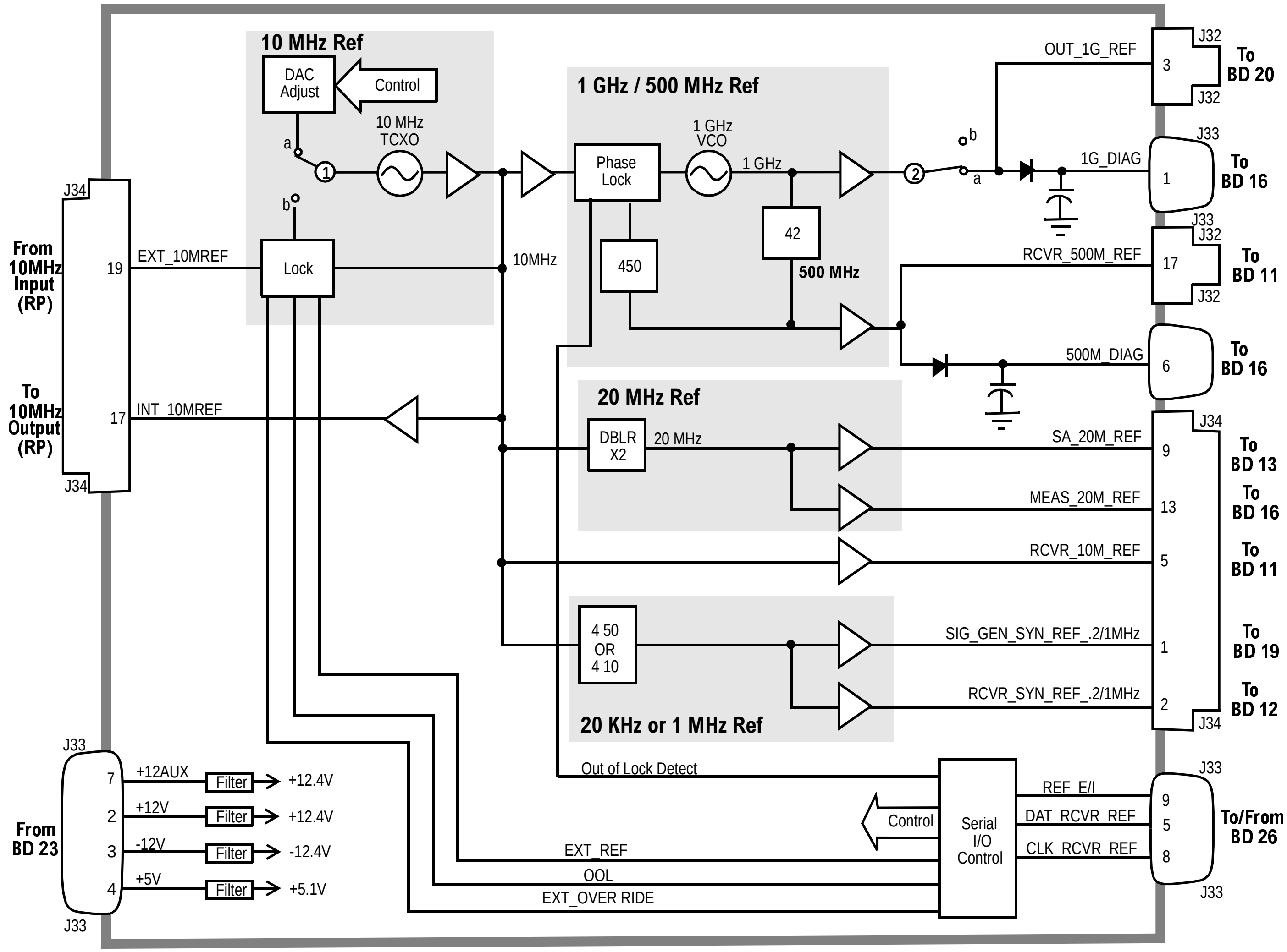
Table 144 Switch Control BD18 A15 Reference

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	refs_tbase_select	a	1	Normal Operation
		b	0	Automatic election if External T Base applied
2	refs_1GHz_switch	a	1	RF Generator RF Gen Freq <249 MHz
		open	0	RF Generator RF Gen Freq ≥249 MHz

Table 145 I/O Specs BD18 A15 Reference

Connector	Name	Type	Range	
			Min	Max
J34-1	SIG_GEN_SYN_REF_.2/1 MHz	Output	CMOS	CMOS
J34-2	RCVR_SYN_REF_.2/1 MHz	Output	CMOS	CMOS
J34-5	RCVR_10M_REF	Output	–12 dBm	–8 dBm
J34-9	SA_20M_REF	Output	>+5 dBm	
J34-13	MEAS_S0M_REF	Output	>+5 dBm	
J34-17	INT_10MREF	Output	>+7.5 dBm	
J34-19	EXT_10MREF	Input	–2.5 dBm	+23 dBm
J32-3	OUT_1G_REF	Output	– 1 dBm	+3 dBm
J32-17	RCVR_500M_REF	Output	–2 dBm	+2 dBm

A15 REFERENCE



ASSEMBLY DETAIL BD 18

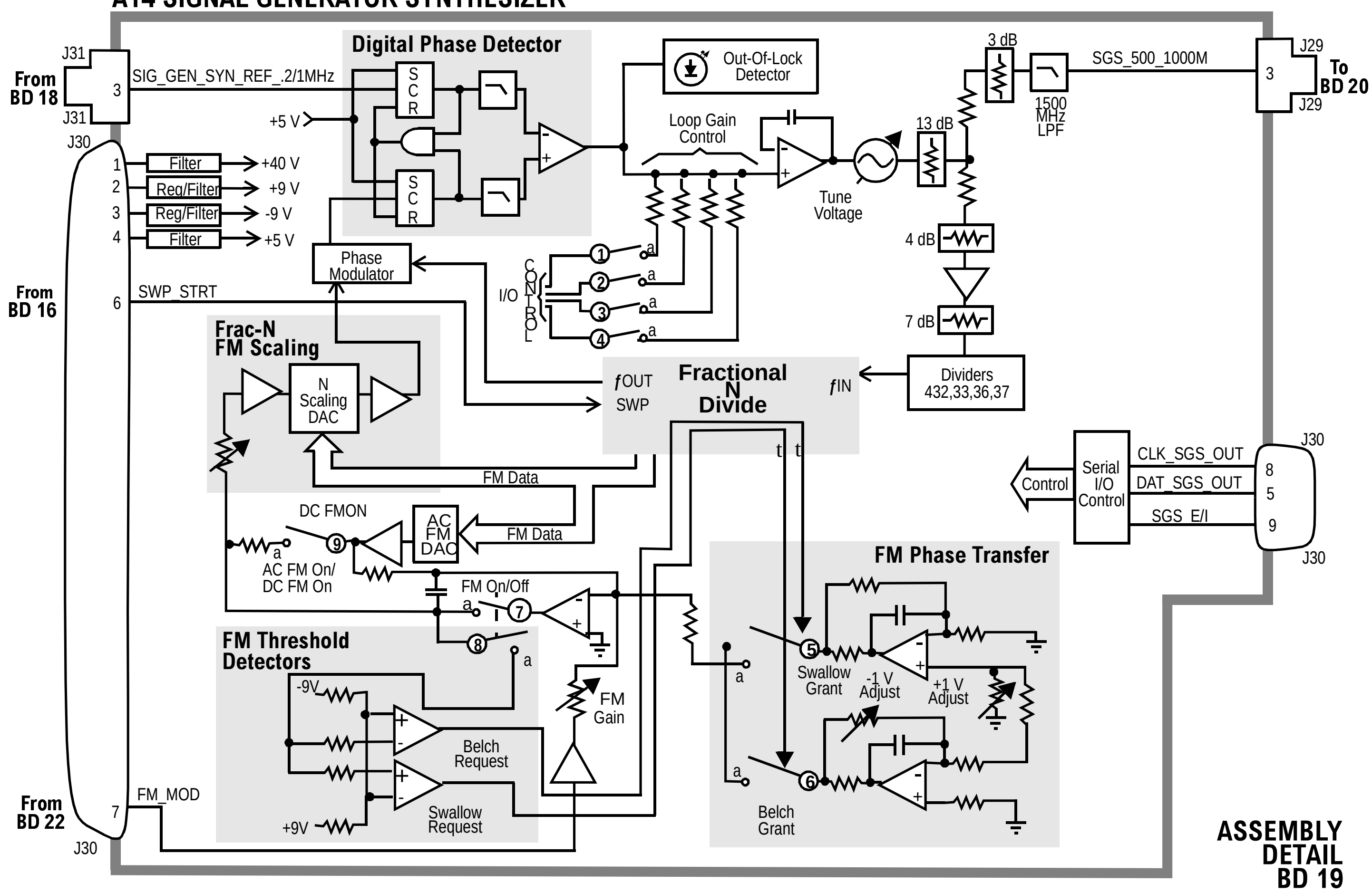
Table 146 Switch Control BD19 A14 Signal Generator Synthesizer

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	gsyn_gain_control	a		Note: Gain Control switches are set in either single positions or combinations according to receiver tuning frequency. Independent hexadecimal values aren't applicable.
		open		
2	gsyn_gain_control	a		
		open		
3	gsyn_gain_control	a		
		open		
4	gsyn_gain_control	a		
		open		
5	Swallow Grant	open	1	Part of FM Loop - No User Control
		a	0	Part of FM Loop - No User Control
6	Belch Grant	a	1	Part of FM Loop - No User Control
		open	0	Part of FM Loop - No User Control
7	gsyn_fm	a	1	RF Generator AF Gen1 to FM On
		open	0	RF Generator AF Gen1 to FM Off
8	gsyn_fm	a	1	RF Generator AF Gen1 to FM On
		open	0	RF Generator AF Gen1 to FM Off
9	gsyn_dc_fm_state	a	1	RF Generator FM Coupling AC
		open	0	RF Generator FM Coupling DC

Table 147 I/O Specs BD19 A14 Signal Generator Synthesizer

Connector	Name	Type	Range	
			Min	Max
J31-3	SIG_GEN_SYN_ REF_.2/1 MHz	Input	CMOS	CMOS
J30-6	SWP_STRT	Input	TTL	TTL
J30-7	FM_MOD	Input	O Vp	4 Vp
J29-3	SGS_500_1000M	Output	–2 dBm	+2 dBm

A14 SIGNAL GENERATOR SYNTHESIZER



ASSEMBLY DETAIL BD 19

(95081-19.DOC)

Table 148 Switch Control BD20 A13 Output

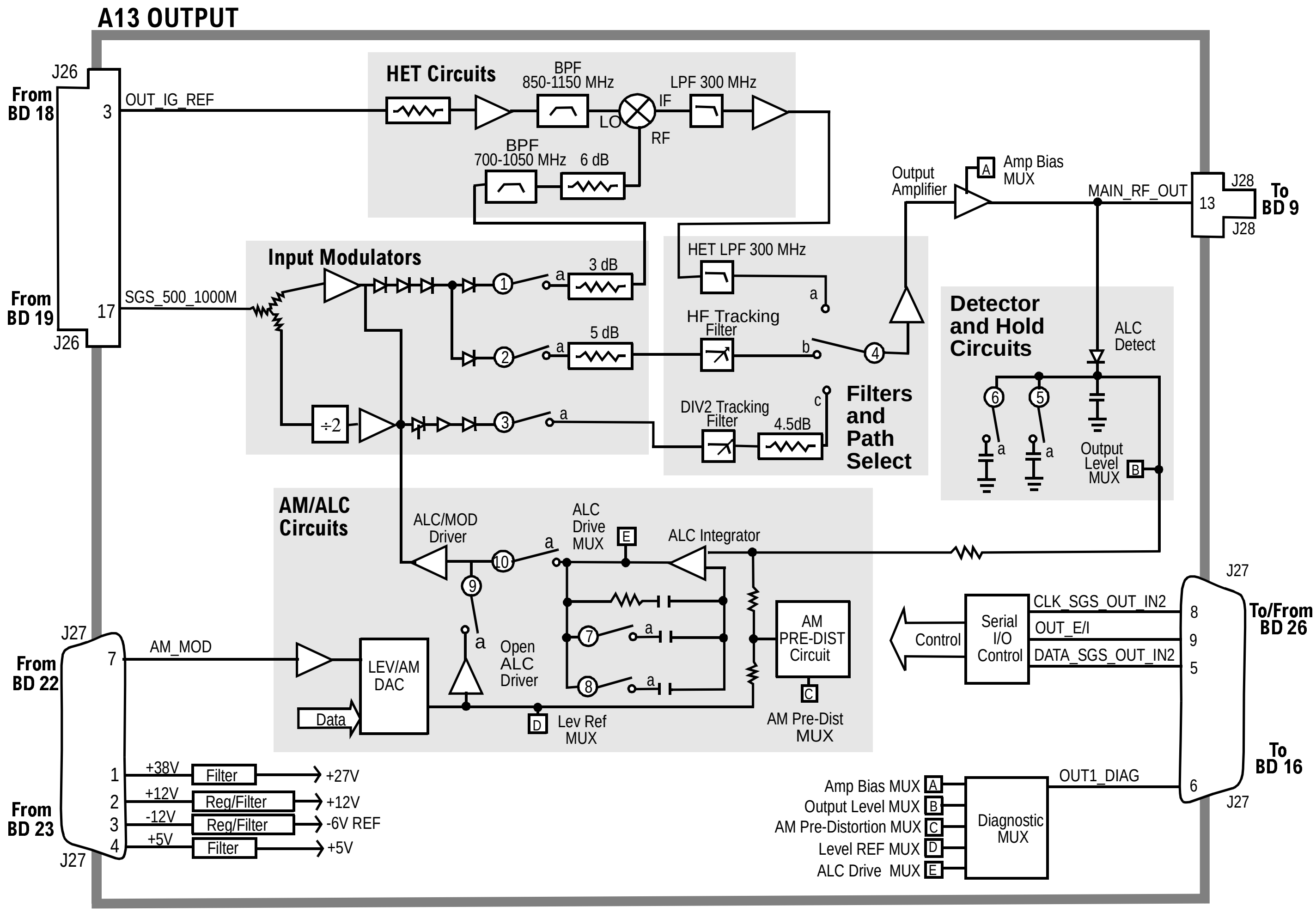
Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	out_band_select	a	4	RF Generator RF Gen Freq to <250 MHz
		open	Not 4	RF Generator RF Gen Freq to ≥250 MHz
2	out_band_select	a	1	RF Generator RF Gen Freq to ≥500 MHz
		open	Not 1	RF Generator RF Gen Freq to <500 MHz
3	out_band_select	a	2	RF Generator RF Gen Freq to ≥250 MHz <500 MHz
		open	Not 2	RF Generator RF Gen Freq to <250 MHz≥ 500 MHz
4	out_band_select	a	4	RF Generator RF Gen Freq to <250 MHz
		b	1	RF generator RF Gen Freq to ≥500 MHz
		c	2	RF generator RF Gen Freq to ≥250 MHz <500 MHz
5	out_det_time_cntl	a	1	RF Generator RF Gen Freq <1.5MHz
		open	2 or 3	RF Generator RF Gen Freq ≥1.5 MHz
6	out_det_time_cntl	a	2	RF Generator RF Gen Freq≥1.5 MHz <20 MHz
		open	1 or 3	RF Generator RF Gen Freq ≥20 MHz
7	out_ALC_bw_cntl	a	2	RF Generator RF Gen Freq 1.5 MHz

Table 148 Switch Control BD20 A13 Output (Continued)

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
		open	1	RF Generator AFGen1 to AM Off
8	out_ALC_bw_cntl	a	0	RF Generator AFGen1 to AM RF Gen Freq ≥1.5 MHz
		open	1	RF Generator AFGen1 to AM Off
9	out_ALC_state	a	1	Condition Not Used in 8920 Operation
		open	0	Normal Operation
10	out_ALC_state	a	0	Normal Operation
		open	1	Condition Not Used in 8920 Operation

Table 149 I/O Specs BD20 A13 Output

Connector	Name	Type	Range	
			Min	Max
J26-3	OUT_1G_REF	Input	–1 dBm	+3 dBm
J26-17	SGS_500_1000M	Input	–2 dBm	+2 dBm
J27-7	AM_MOD	Input	0 Vp	4 Vp
J28-13	MAIN_RF_OUT	Output	–6 dBm	+16 dBm

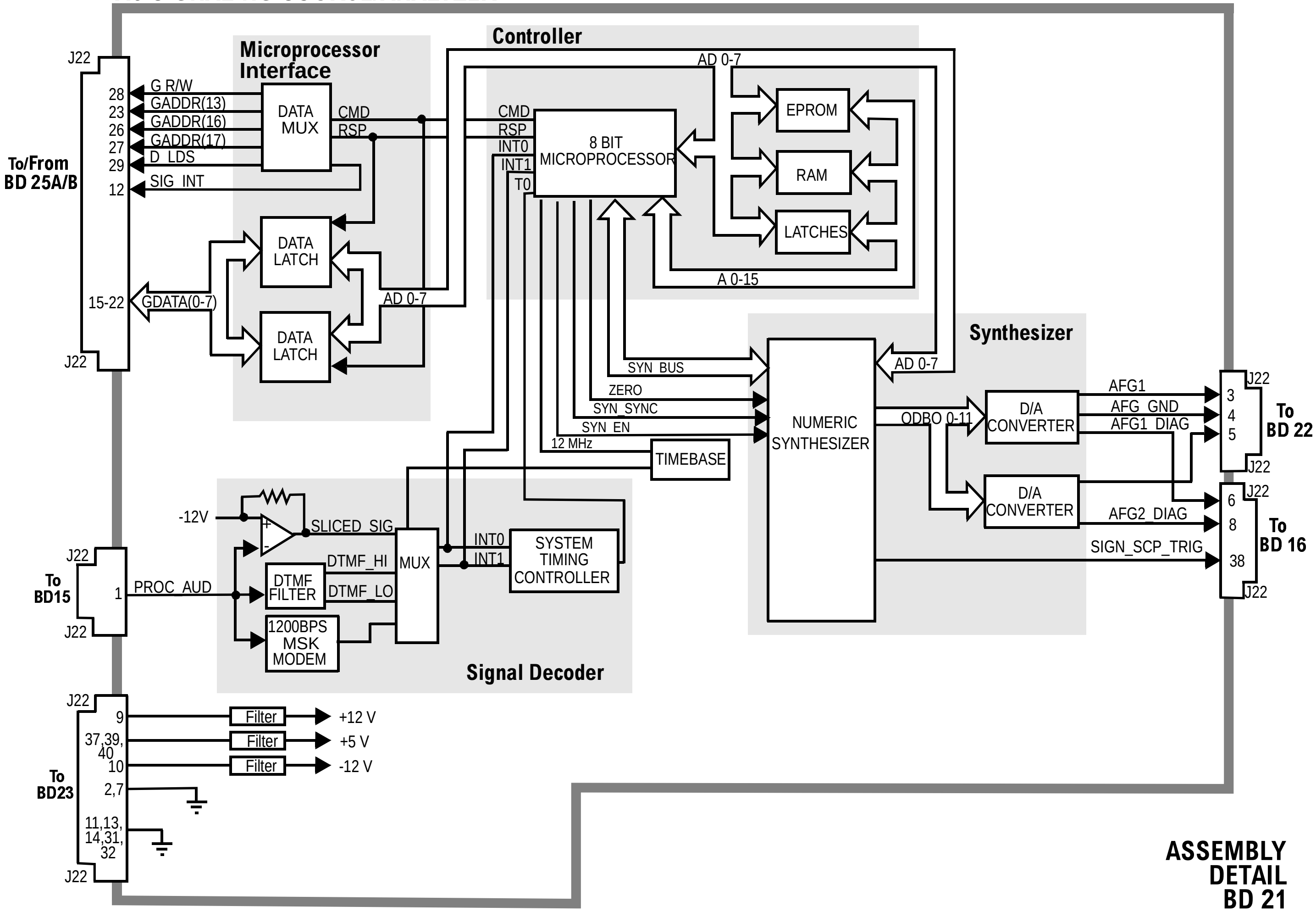


ASSEMBLY DETAIL BD 20

Table 150 I/O Specs BD21 A6 Signaling Source/Analyzer

Connector	Name	Type	Range	
			Min	Max
J22-1	PROC_AUD	Input	.2 Vp	5 Vp
J22-3	AFG1	Output	0 Vp	2.5 Vp
J22-5	AFG2	Output	0 Vp	2.5 Vp

A6 SIGNALING SOURCE/ANALYZER



ASSEMBLY DETAIL BD 21

(95081-21.DOC)

Table 151 Switch Control BD22 A4 Modulation Distribution

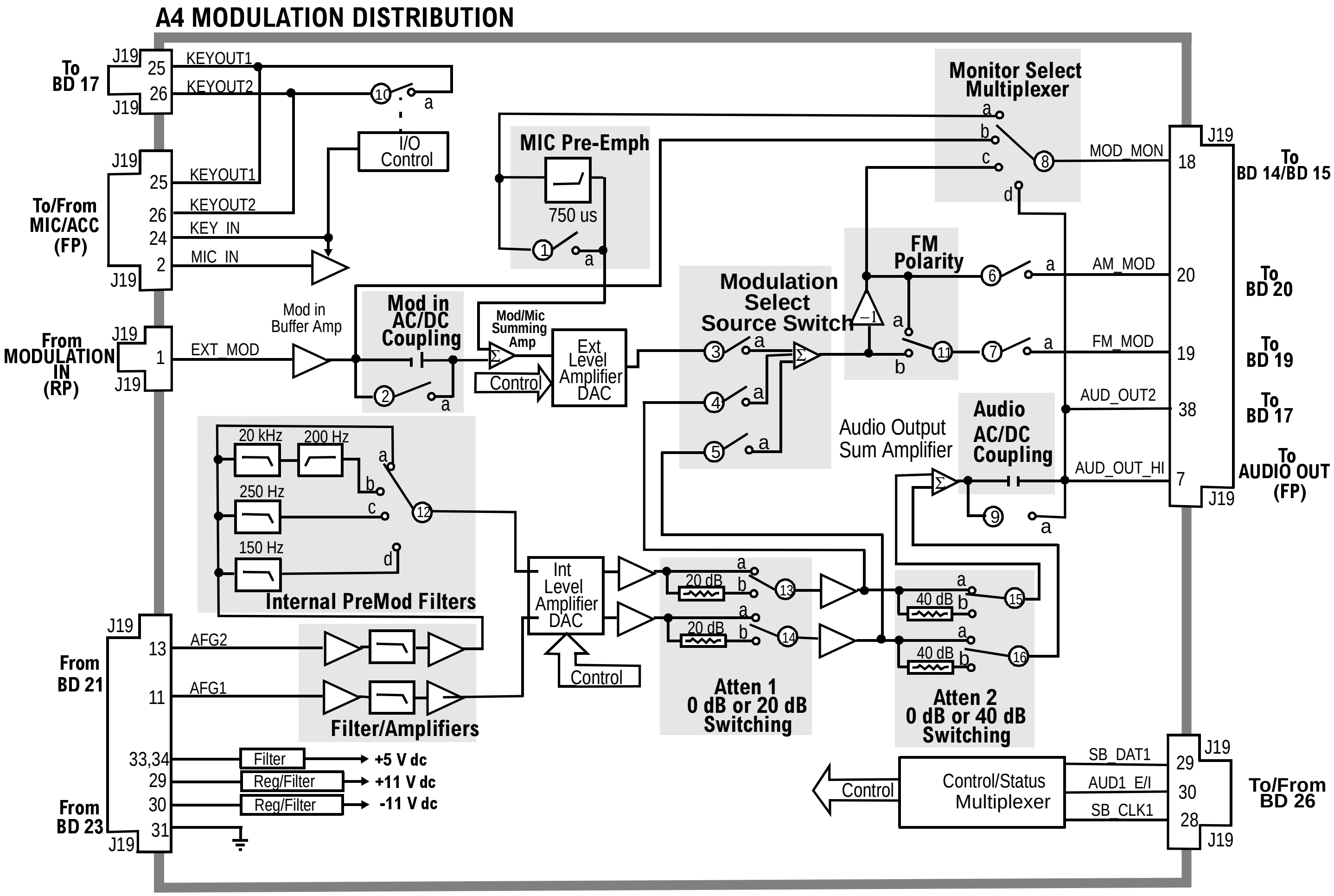
Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	dstr_pre_emphasis	a	1	RF Generator Mic Pre-Emp Off
		Open	0	RF Generator Mic Pre-Emp On
2	dstr_ext_mod_coupling	a	1	RF Generator FM Coupling DC
		open	0	RF Generator FM Coupling AC
3	dstr_ext_mod_to_mod	a	1	RF Generator Mod In to FM or AM
		open	0	RF Generator Mod In to Off
4	dstr_afg2_to_mod	a	0	RF Generator AFGen2 to On
		open	1	RF Generator AFGen2 to Off
5	dstr_afg1_to_mod	a	0	RF Generator AFGen1 to On
		open	1	RF Generator AFGen1 to Off
6	dstr_mod _destination	a	3	RF Generator AFGen1 to AM
		open	0	RF Generator AFGen1 to FM or Off
7	dstr_mod_destination	a	0	RF Generator AFGen2 to FM
		open	0	RF Generator AFGen2 to AM or Off
8	dstr_monitor_select	a	1	AF Analyzer AF Anl In to Mic Mod
		b	2	AF Analyzer AF Anl In to Ext
		c	3	AF Analyzer AF Anl In to FM Mod or AM Mod
		d	0	AF Analyzer AF Anl In to Audio Out
9	dstr_mod_coupling	a	1	RF Generator Audio Out to DC
		open	0	RF Generator Audio Out to AC
10	dstr_xmtr_key	a	1	TX Test Ext TX Key On
		open	0	TX Test Ext TX Key Off
11	dstr_mod_polarity	a	1	RF Generator RF Gen Freq < 249 MHz
		0	0	RF Generator RF Gen Freq ≥ 249 MHz

Table 151 Switch Control BD22 A4 Modulation Distribution (Continued)

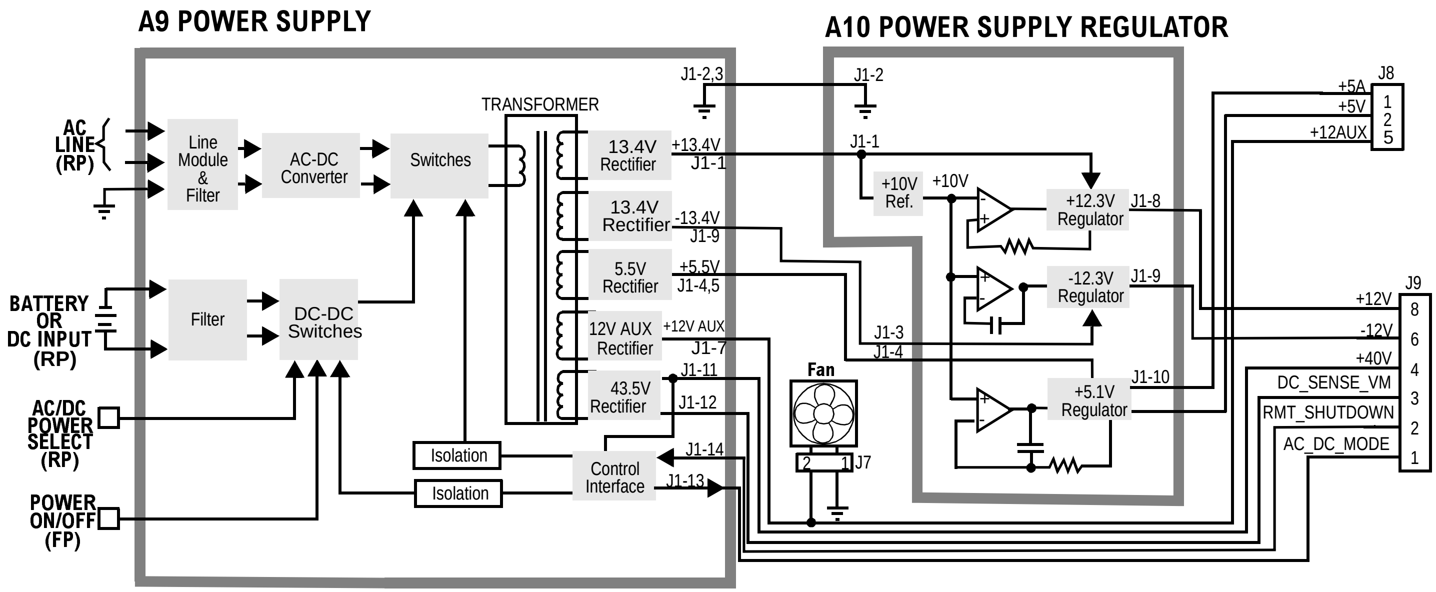
Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
12	dstr_premod_filter	a	0	Encoder Mode to Amps-Tacs, Channel to Voice
		b	1	Encoder Mode to Amps-Tacs, Channel to Cntl
		c	2	Encoder Mode to NAmps-NTacs, Channel to Voice
		d	3	Encoder Mode to LTR
13	dstr_afg2_1_atten	a	0	RF Generator AFGen2 to AM >10 or FM > 10 kHz
		b	1	RF Generator AFGen2 to AM≤10 or FM≤10 kHz
14	dstr_afg1_1_atten	a	0	RF Generator AFGen1 to AM>10 or FM > 10 kHz
		b	1	RF Generator AFGen1 to AM≤10 or FM ≤10 kHz
15	dstr_afg2_2_atten	a	1	RF Generator AFGen2 to Audio Out >72 mV
		b	2	RF Generator AFGen2 to Audio Out≤72 mV
16	dstr_afg1_2_atten	a	1	RF Generator AFGen1 to Audio Out > 72 mV
		b	2	RF Generator AFGen2 to Audio Out ≤72 mV

Table 152 I/O Specs BD22 A4 Modulation Distribution

Connector	Name	Type	Range			Connector	Name	Type	Range	
			Min	Max					Min	Max
J19-2	MIC_IN	Input	0 Vp	10 Vp		J19-20	AM_MOD	Out-put	0 Vp	4 Vp
J19-1	EXT_MOD	Input	0 Vp	12 Vp		J19-19	FM_MOD	Out-put	0 Vp	4 Vp
J19-11	AFG1	Input	0 Vp	2.5 Vp		J19-7	AUD_OUT_HI	Out-put	0 Vrms	5 Vrms
J19-13	AFG2	Input	0 Vp	2.5 Vp		J19-38	AUD_OUT2	Out-put	0 Vrms	5 Vrms
J19-18	MOD_MON	Out-put	0 Vp	12 Vp						

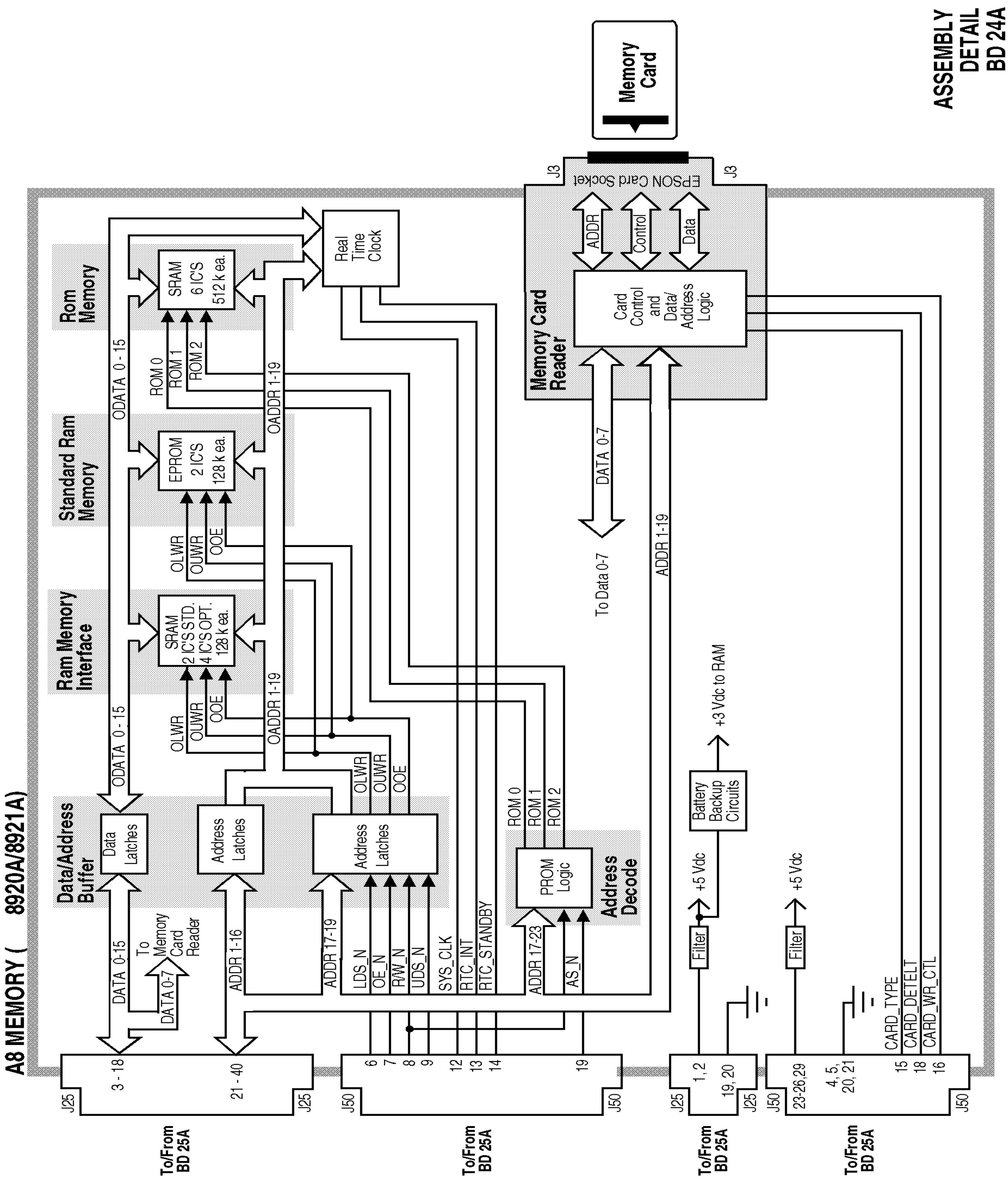


ASSEMBLY DETAIL BD 22



ASSEMBLY DETAIL BD 23

(95081-23.DOC)


A8 MEMORY (8920A/8921A)
ASSEMBLY DETAIL BD 24A
Memory Card
EPSON Card Socket
J3
ADDR
Control
Data
Card Control and Data/ Address Logic
Memory Card Reader
Real Time Clock
Rom Memory
SRAM 6 IC'S 512 k ea.
Standard Ram Memory
EPROM 2 IC'S 128 k ea.
Ram Memory Interface
SRAM 2 IC'S STD. 4 IC'S OPT. 128 k ea.
Data/Address Buffer
Data Latches
Address Latches
ODATA 0 - 15
OADDR 1-19
ROM 0
ROM 1
ROM 2
OLWR
OUWR
OOE
DATA 0-7
To Data 0-7
ADDR 1-19
+3 Vdc to RAM
Battery Backup Circuits
PROM Logic
Address Decode
Filter
+5 Vdc
DATA 0-15
To Memory Card Reader
ADDR 1-16
ADDR 17-19
LDS_N
OE_N
R/W_N
UDS_N
SYS_CLK
RTC_INT
RTC_STANDBY
ADDR 17-23
AS_N
CARD_TYPE
CARD_DETELT
CARD_WR_CTL
J25
J50
3 - 18
21 - 40
6
7
8
9
12
13
14
19
1, 2
19, 20
23-26,29
4, 5, 20, 21
15
18
16
To/From BD 25A

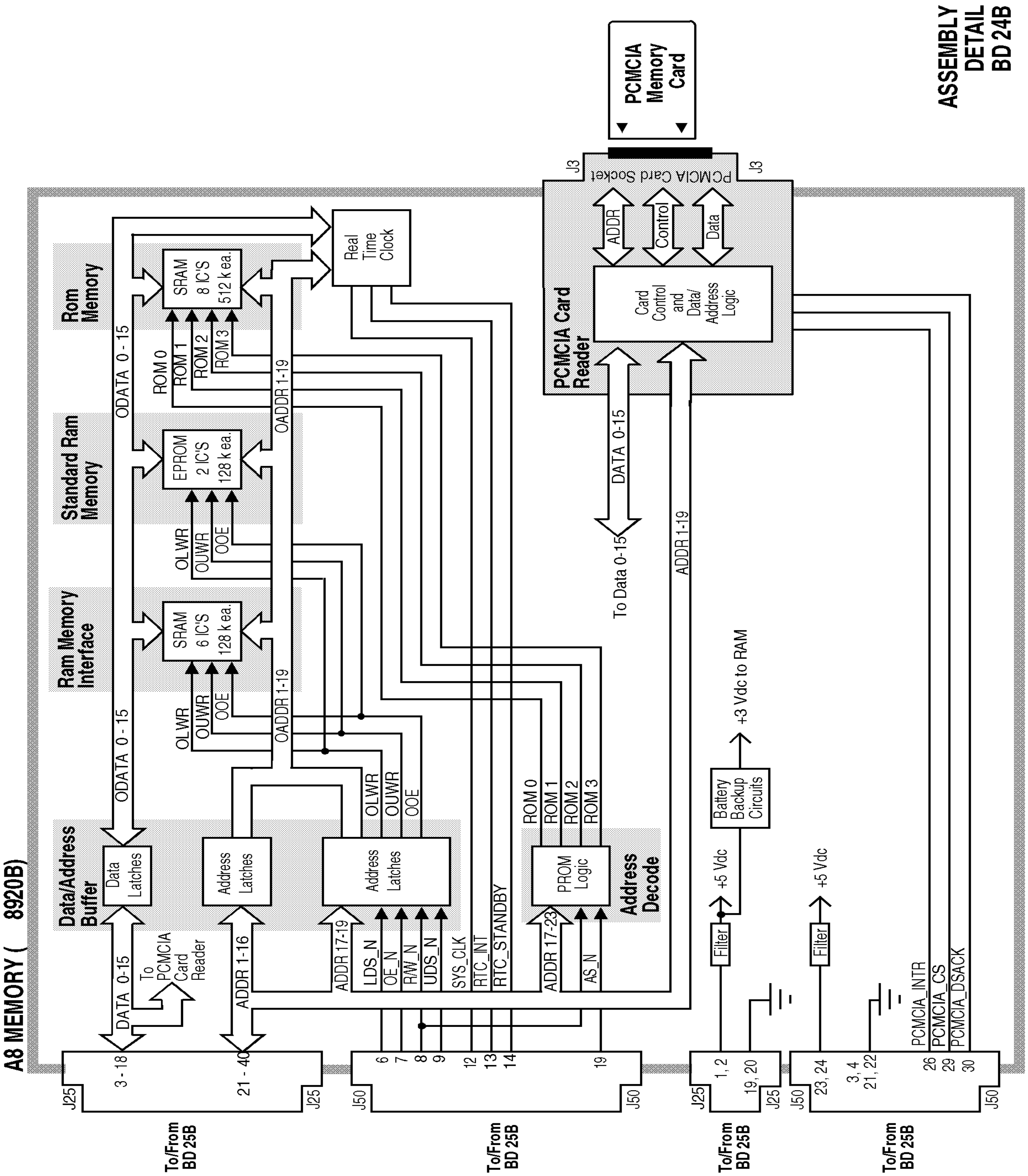

A8 MEMORY (8920B)
ASSEMBLY DETAIL BD 24B
PCMCIA Memory Card
PCMCIA Card Socket
J3
ADDR
Control
Data
Card Control and Data/ Address Logic
PCMCIA Card Reader
Real Time Clock
Rom Memory
SRAM 8 IC'S 512 k ea.
Standard Ram Memory
EPROM 2 IC'S 128 k ea.
Ram Memory Interface
SRAM 6 IC'S 128 k ea.
Data/Address Buffer
Data Latches
Address Latches
Address Latches
PROM Logic
Address Decode
ODATA 0 - 15
OADDR 1-19
ROM 0
ROM 1
ROM 2
ROM 3
OLWR
OUWR
OOE
DATA 0-15
To Data 0-15
ADDR 1-19
To PCMCIA Card Reader
ADDR 1-16
ADDR 17-19
LDS_N
OE_N
R/W_N
UDS_N
SYS_CLK
RTC_INT
RTC_STANDBY
ADDR 17-23
AS_N
Battery Backup Circuits
+3 Vdc to RAM
+5 Vdc
Filter
PCMCIA_INTR
PCMCIA_CS
PCMCIA_DSACK
J25
3 - 18
21 - 40
J50
6
7
8
9
12
13
14
19
1, 2
19, 20
23, 24
3, 4
21, 22
26
29
30
To/From BD 25B

Table 153 Switch Control BD25A A7 Controller

Switch No.	Switch Name	Position	Hexadecimal Value	Instrument Setting
1	Write Protect/ Unprotect	a		Manually Switched to Unprotected
		open		Manually Switch to Protected

A7 CONTROLLER (8920A/8921A)

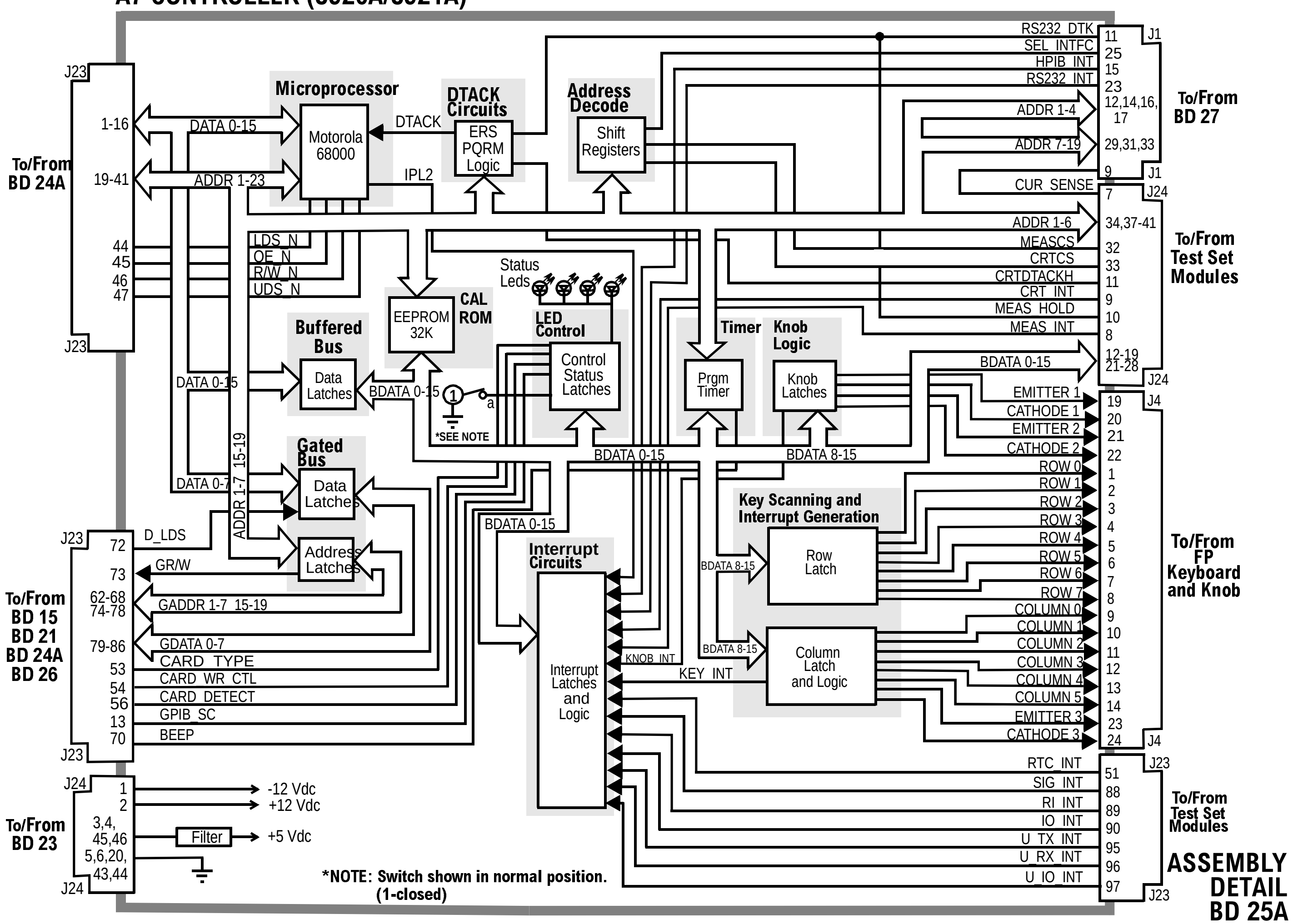
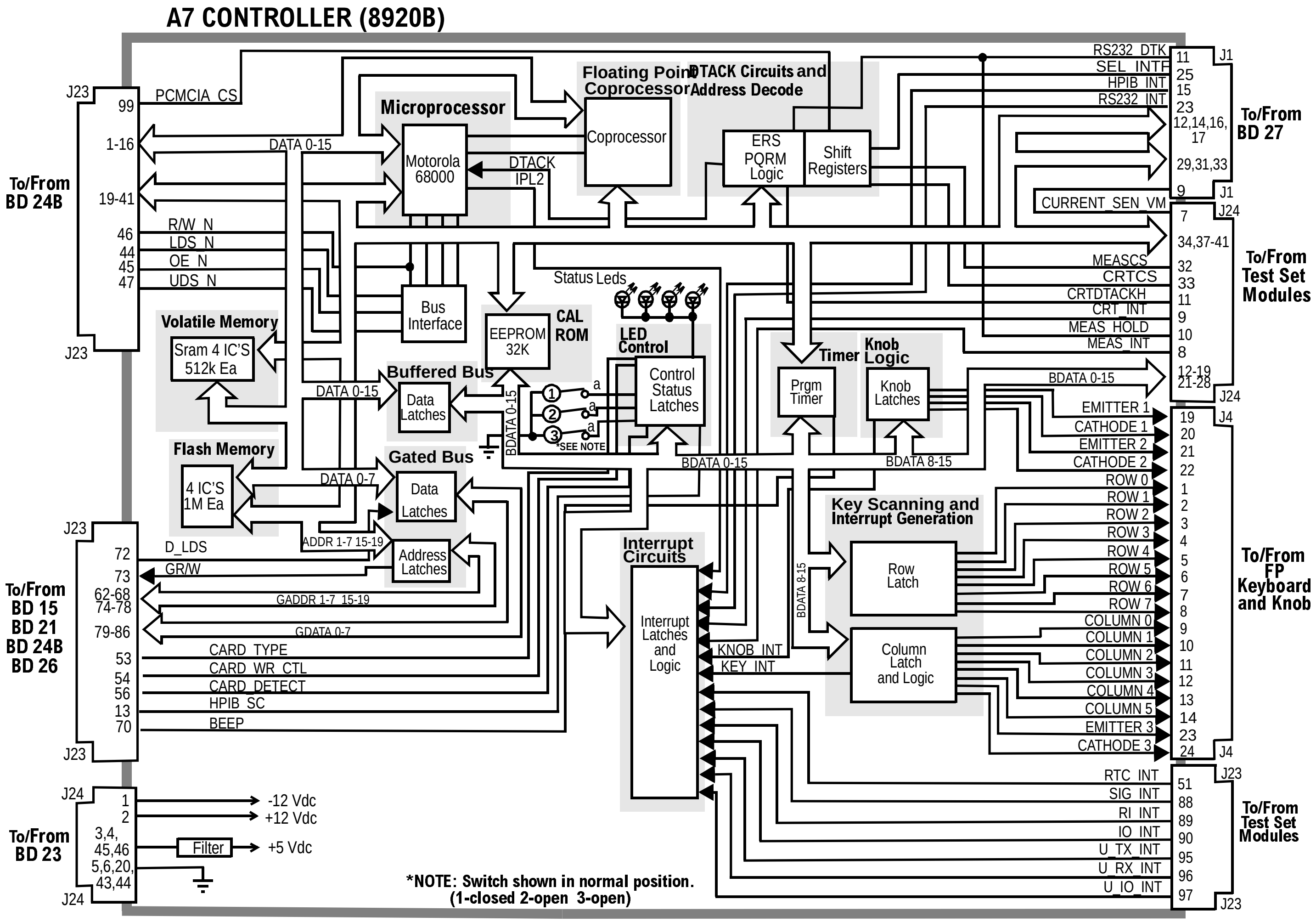


Table 154 Switch Control BD25B A7 Controller

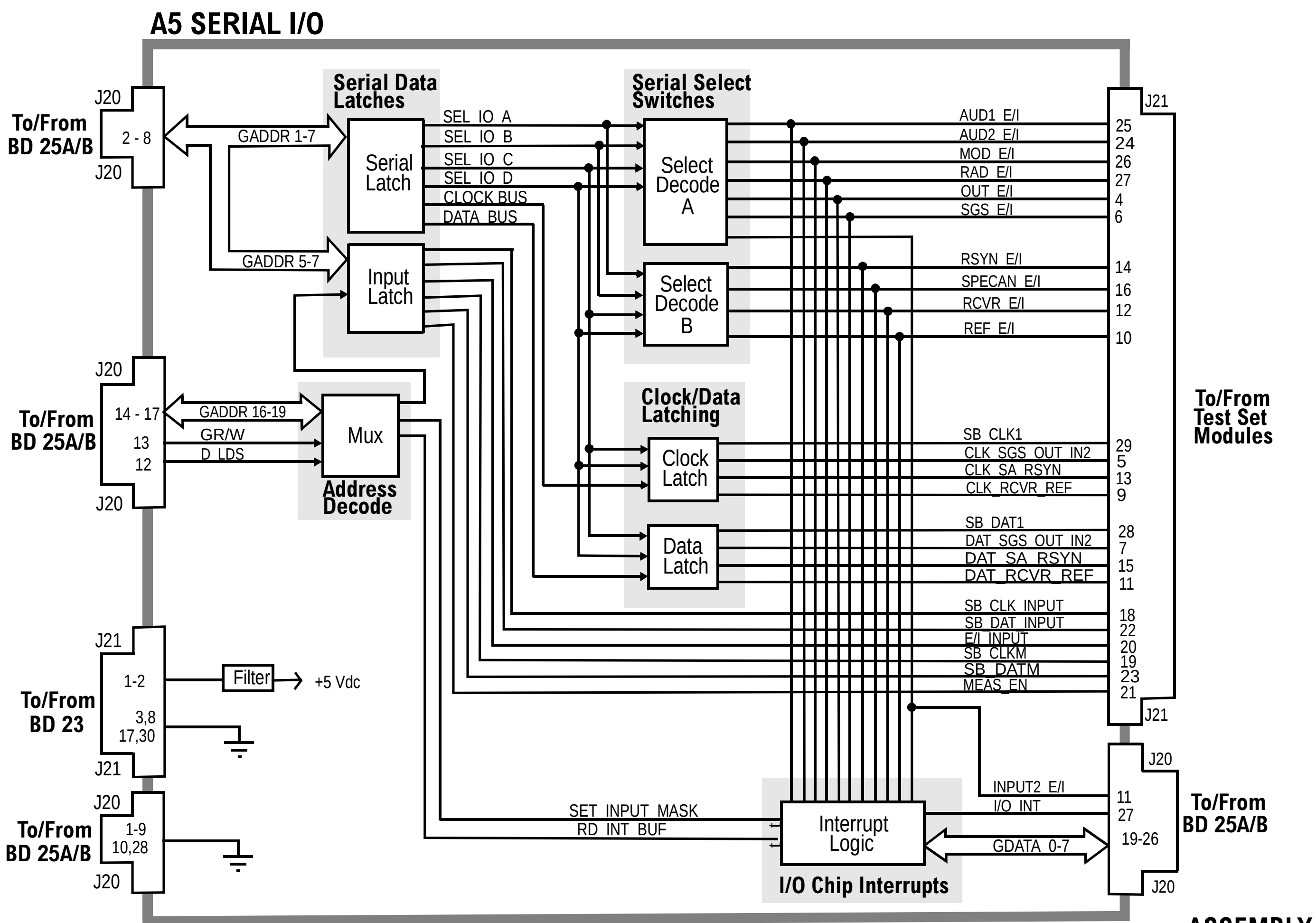
Switch No.	Switch Name	Position	Hex Value	Instrument Setting
1	Write Protect/ Unprotect	a		Manually Switched to Unprotected
		open		Manually Switch to Protected
2[a]	Smart Card Type	a		Manually Switched to Epson Type Reader
		open		Manually Switched to PCMCIA Type Reader
3[b]	Memory Type	a		Manually Switched to One Time Programmable ROM
		open		Manually Switched to Flash ROM

a. In 8920B application switch 2 and 3 must be in open position.
b. In 8920B application switch 2 and 3 must be in open position.

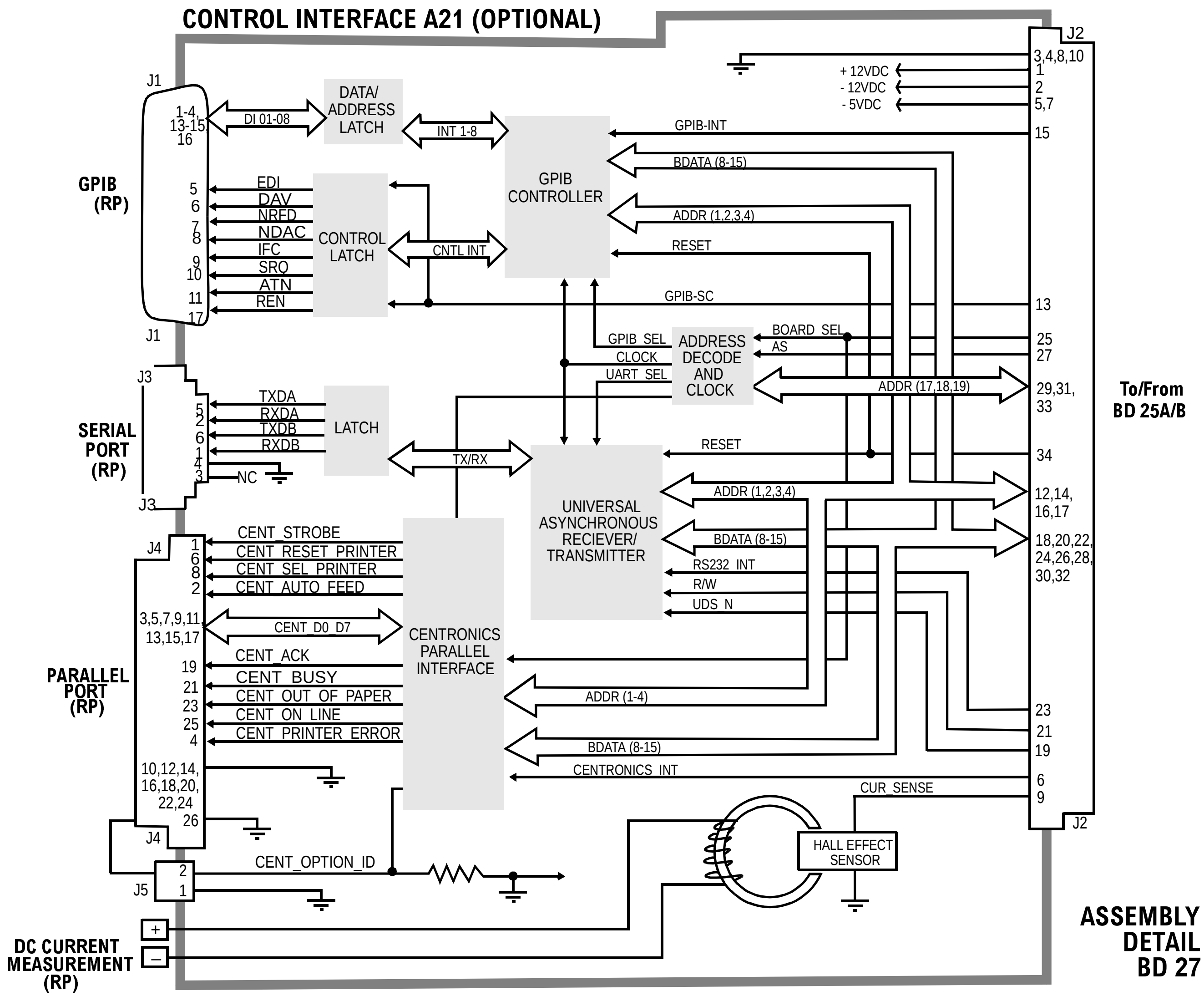


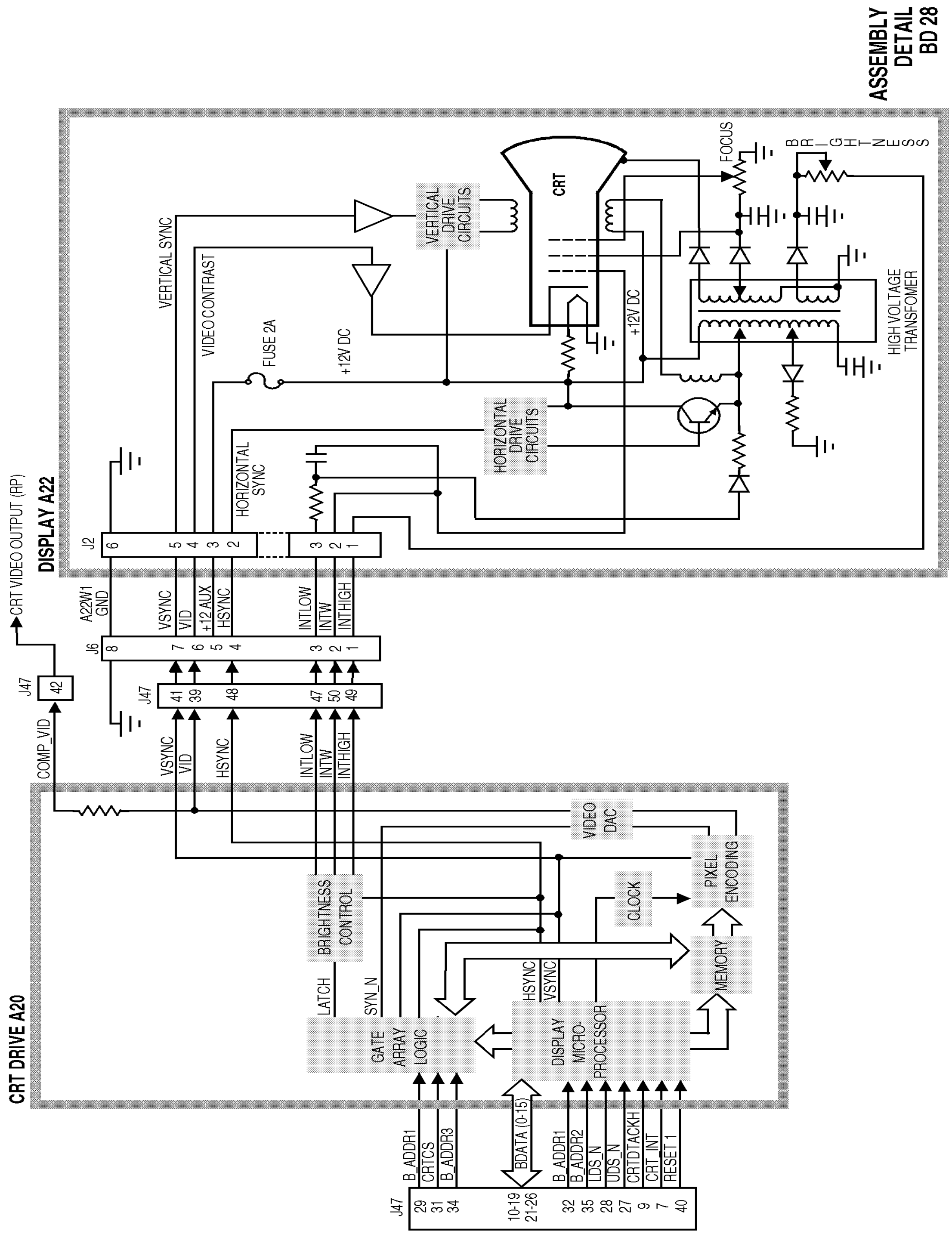
ASSEMBLY
DETAIL
BD 25B

(9508-25B.DOC)



ASSEMBLY
DETAIL
BD 26


CONTROL INTERFACE A21 (OPTIONAL)
GPIB (RP)
J1
1-4, 13-15, 16
DI 01-08
DATA/ ADDRESS LATCH
INT 1-8
GPIB CONTROLLER
5 EDI
6 DAV
7 NRFD
8 NDAC
9 IFC
10 SRQ
11 ATN
17 REN
CONTROL LATCH
CNTL INT
GPIB-INT
BDATA (8-15)
ADDR (1,2,3,4)
RESET
GPIB-SC
GPIB_SEL
CLOCK
UART_SEL
ADDRESS DECODE AND CLOCK
BOARD_SEL
AS
ADDR (17,18,19)
SERIAL PORT (RP)
J3
5 TXDA
2 RXDA
6 TXDB
1 RXDB
4
3 NC
LATCH
TX/RX
UNIVERSAL ASYNCHRONOUS RECIEVER/ TRANSMITTER
RESET
ADDR (1,2,3,4)
BDATA (8-15)
RS232_INT
R/W
UDS_N
PARALLEL PORT (RP)
J4
1 CENT_STROBE
6 CENT_RESET_PRINTER
8 CENT_SEL_PRINTER
2 CENT_AUTO_FEED
3,5,7,9,11, 13,15,17 CENT_D0_D7
19 CENT_ACK
21 CENT_BUSY
23 CENT_OUT_OF_PAPER
25 CENT_ON_LINE
4 CENT_PRINTER_ERROR
10,12,14, 16,18,20, 22,24
26
CENTRONICS PARALLEL INTERFACE
ADDR (1-4)
BDATA (8-15)
CENTRONICS_INT
CUR_SENSE
HALL EFFECT SENSOR
J5
2 CENT_OPTION_ID
1
DC CURRENT MEASUREMENT (RP)
+
−
J2
3,4,8,10
+ 12VDC 1
- 12VDC 2
- 5VDC 5,7
15
13
25
27
29,31, 33
34
12,14, 16,17
18,20,22, 24,26,28, 30,32
23
21
19
6
9
To/From BD 25A/B
ASSEMBLY DETAIL BD 27


ASSEMBLY
DETAIL
BD 28
DISPLAY A22
CRT DRIVE A20
CRT VIDEO OUTPUT (RP)
COMP_VID
J47
42
J2
J6
A22W1
GND
VSYNC
VID
+12 AUX
HSYNC
INTLOW
INTW
INTHIGH
VERTICAL SYNC
VIDEO CONTRAST
FUSE 2A
+12V DC
HORIZONTAL
SYNC
VERTICAL
DRIVE
CIRCUITS
HORIZONTAL
DRIVE
CIRCUITS
CRT
FOCUS
BRIGHTNESS
HIGH VOLTAGE
TRANSFOMER
VIDEO
DAC
PIXEL
ENCODING
CLOCK
MEMORY
BRIGHTNESS
CONTROL
LATCH
SYN_N
GATE
ARRAY
LOGIC
DISPLAY
MICRO-
PROCESSOR
B_ADDR1
CRTCS
B_ADDR3
BDATA (0-15)
B_ADDR1
B_ADDR2
LDS_N
UDS_N
CRTDTACKH
CRT_INT
RESET 1
10-19
21-26

10

Replaceable Parts

Introduction

In the U.S. you can order replacement parts by phone. There are two ways to do this. If your Test Set is under warranty you can use the Self-Support program to obtain replacement parts. The other method is to order the part directly. Outside the U.S. contact your local Agilent Technologies Sales and Service office

Self-Support Program

For U.S. customers that wish to repair their own Test Sets, a special toll-free number (1 800 827 3848) is available for hardware troubleshooting assistance. This is a special service specifically designed for Agilent Technologies customers that repair their own Test Sets. For a Test Set under warranty, there is no charge for troubleshooting assistance, and repair parts covered under warranty will be sent directly to the customer. If the Test Set is out of warranty, there will be a charge for parts.

Direct Parts Ordering

Call Agilent Technologies parts specialists at 1 800 227 8164. They can help you identify parts and can also take your order.

Assembly Replacements

With some assemblies you will receive a Memory Card that contains factory-generated calibration data for that assembly. There will also be an instruction sheet for loading the calibration data into your Test Set after you've replaced the assembly.

A table, *Relating Assemblies To Troubleshooting Aids*, at the beginning of chapter 3 - *Repair* shows which assemblies need calibration data as well as which performance tests and periodic self-calibration adjustments are recommended after replacing an assembly.

8920A Replaceable Parts List

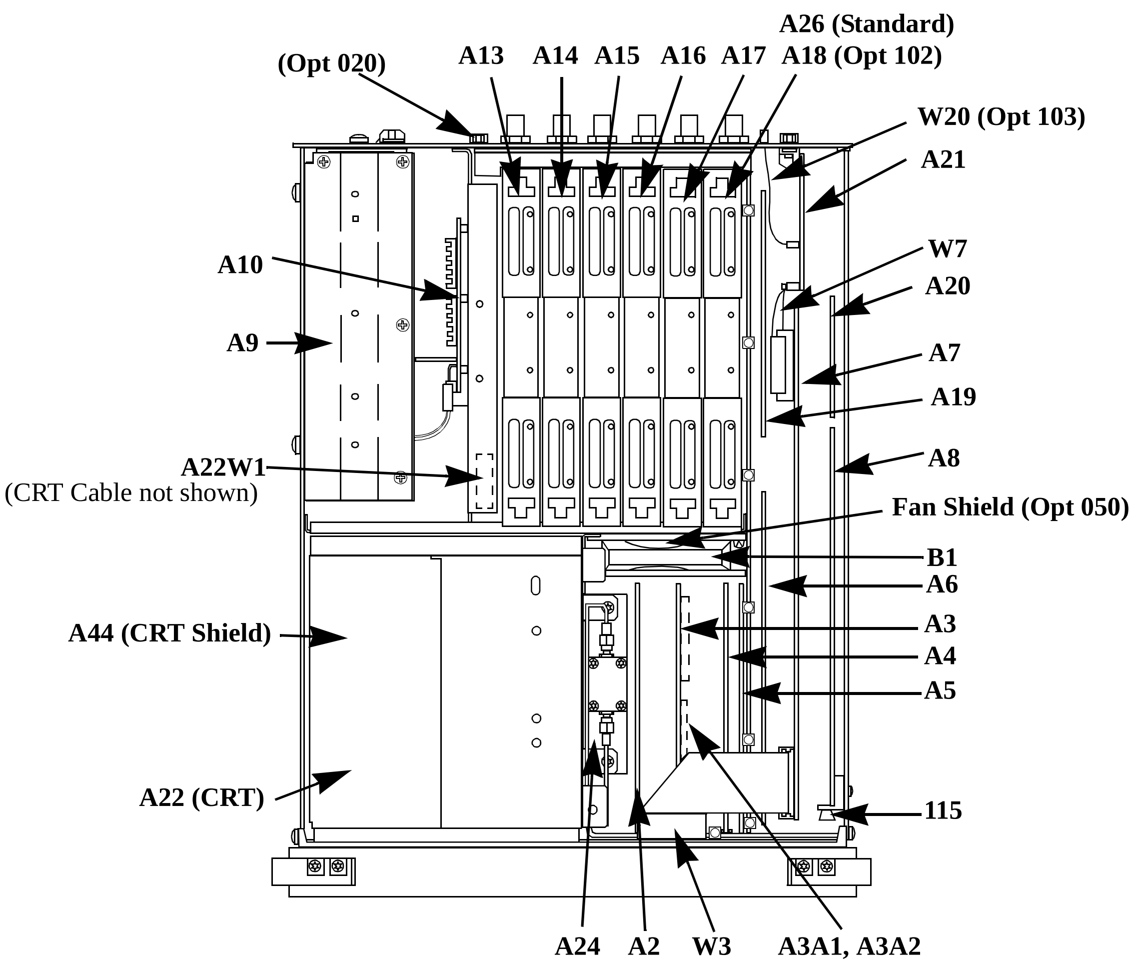


Figure 27 **Major Assemblies and Cables, Top View**

Table 155 8920A Replaceable Parts

Item	Description	Replacement Kit or Part Number
A2	AUDIO ANALYZER 2 (STD)	08920-61812
A2	AUDIO ANALYZER 2 (Variable Notch Filter) (Opt 019)	08920-61853
A3	AUDIO ANALYZER 1	08920-61811
A3A1 or A3A2	400 Hz HP FILTER (Opt 010)	08920-61054
A3A1 or A3A2	CCITT FILTER (Opt 011)	08920-61055
A3A1 or A3A2	4 kHz BP FILTER (Opt 012)	08920-61062
A3A1 or A3A2	C-MESSAGE FILTER (Opt 013)	08920-61056
A3A1 or A3A2	6 kHz BP FILTER (Opt 014)	08920-61063
A4	MODULATION DISTRIBUTION	08920-61809
A5	SERIAL I/O CONTROL	08920-61839
A6	SIGNALING SOURCE ANALYZER (Std)	08920-61849
A6	SIGNALING SOURCE ANALYZER (Opt 004)	08920-61850
A7	CONTROLLER (DCU)	08920-61807
A8	EPROM MEMORY STD (for serial prefix <3550, except R40)	08920-61865
A8	OTP MEMORY STD (for serial prefix ≥3550, or R40)	08920-61869
A8	EPROM MEMORY OPT. 005 (for serial prefix <3550, except R40)	08920-61866
A8	OTP MEMORY OPT. 005 (for serial prefix ≥3550, or R40)	08920-61869
A8BT1	BATTERY 3V	1420-0338
FW	EPROM FIRMWARE KIT (for serial prefix <3550, except R40)	08920-61058
FW	OTP FIRMWARE KIT (for serial prefix ≥3550, or R40)	08920-61870
A9	POWER SUPPLY	08920-61815

Table 155 8920A Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
A10	POWER SUPPLY REGULATOR	08920-61856
A12	RADIO INTERFACE (Opt 020)	08920-61825
A13	RF OUTPUT	08920-61831
A14	SIG GEN SYNTHESIZER (STD)	08920-61830
A14	SIG GEN SYNTHESIZER (Opt 050)	08921-61819
A15	REFERENCE (STD)	08920-61829
A15	REFERENCE (Opt 001 or Opt 050)	08920-61835
A16	RECEIVER	08920-61828
A17	RECEIVER SYNTHESIZER (STD)	08920-61827
A17	RECEIVER SYNTHESIZER (Opt 050)	08921-61820
A18	SPECTRUM ANALYZER (Opt 002 or Opt 102)	08920-61852
A19	MEASUREMENT	08920-61836
A20	DISPLAY PROCESSOR	08920-61824
A21	GPIB/RS-232/CURRENT SENSE (Opt 003 or Opt 103)	08920-61818
A22	DISPLAY (CRT)	08920-61005
A22-W1	CABLE ASSEMBLY	08920-61020
A24	HIGH POWER ATTENUATOR	08920-61810
A24	4dB ATTENUATOR (Opt 008)	08920-61848
A24	0 dB ATTENUATOR (Opt 007) CABLE ONLY	08920-61066
A24	16 dB ATTENUATOR (Opt 016)	08920-61882
A26	TERMINATOR (Except Opt 002 or Opt 102)	08920-60140
B1	FAN	3160-0597
	FAN SHIELD (Opt 050)	08921-00003
W3	RBN26CNDCT28AWG	08645-61027

Table 155 8920A Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
W7	RIBBON CABLE, DCU-GPIB	08920-61018
W20	CENTRONICS PRNTR CABLE (Serial Prefix ≤3501 Only)	08920-61146
44	CRT SHIELD	08920-00043
115	PRE-GUIDE SMT CD (P/O A8)	08920-40018

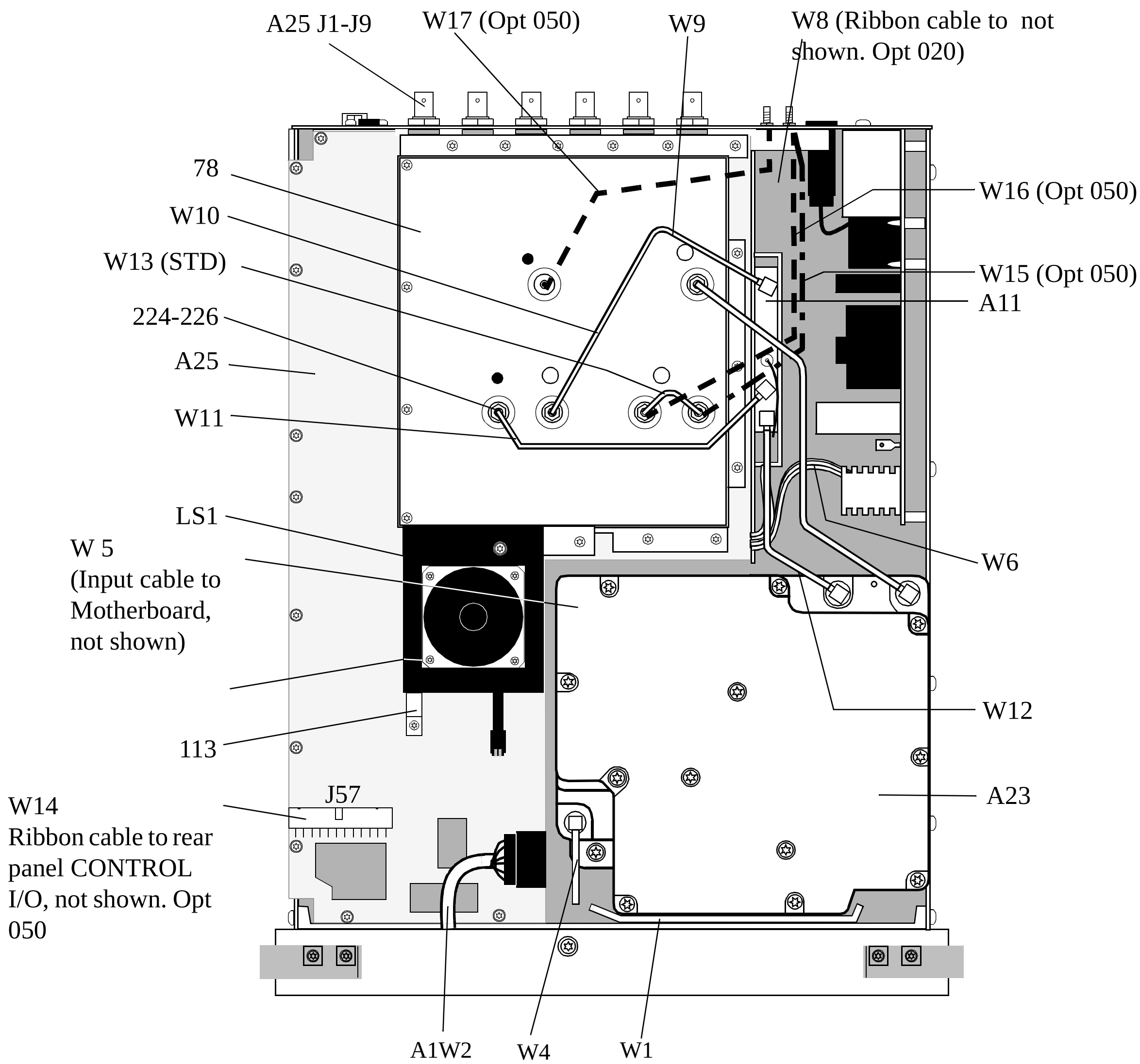


Figure 28 **Major Assemblies and Cables, Bottom View**

Table 156 8920A Replaceable Parts

Item	Description	Replacement Kit or Part Number
A11	RECEIVER MIXER	08920-61832
A23	INPUT SECTION (For serial prefix < 3501)	08920-61804
A23	INPUT SECTION (For serial prefix ≥3501)	08920-61874
A25	MOTHERBOARD	08920-61095
A25 J1-J9	BNC (AUDIO IN, etc.)	1250-1842
A1W2	CBL CABLE FRONT PANEL	08920-61007
LS1	SPEAKER ASSEMBLY	08920-61025
W1	SR 2.18 SMA-SMA (STD or Opt 008)	08920-61012
W1	CABLE ASSY-SR (Opt 007)	08920-61066
W4	SR CABLE HEAT SINK (STD or Opt 008)	08920-61013
W4	(Opt 007)	08920-61066
W5	RIBBON CABLE	08920-61017
W6	CABLE ASSEMBLY-POWER SUPPLY	08920-61019
W7	RIBBON CABLE, DCU TO GPIB	08920-61018
W8	CABLE ASSEMBLY (OPT. 020)	08920-61039
W9	SEMI-RIGID CABLE-SIG GEN OUT	08920-61014
W10	SEMI-RIGID CABLE-REC IN	08920-61015
W11	SR REC SYNTH - REC MIX	08920-61033
W12	SR INPUT - REC MIX	08920-61034
W13	SEMI-RIGID, JUMPER (STD) A25J55 to A25J56	08920-61076
W14	RIBBON CABLE (Opt 050) A25J57 to CONTROL I/O (Rear Panel)	08921-61004
W15	SEMI-RIGID SMC-NONE (Opt 050) A25J56 to IQ RF IN (Rear Panel)	08921-61001

Table 156 8920A Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
W16	SEMI-RIGID SMC -NONE (Opt 050) A25J55 to CW RF OUT (Rear Panel)	08921-61002
W17	SEMI-RIGID SMC-NONE (Opt 050) A25J54 to 114.3 MHz OUT (Rear Panel)	08921-61003
W19	CA ASSY HEADPHONE	08921-61042
78	MOTHER BD COVER	08920-00110
105-108	SCREW-MACH M3 X 0.5 6MM-LG PAN-HD	0515-0680
113	SPEAKER BRACKET AY	08920-61045
224-226	NUT-HEX DBL-CHAM M5 X 0.8 2.5 MM-THK	0535-0109

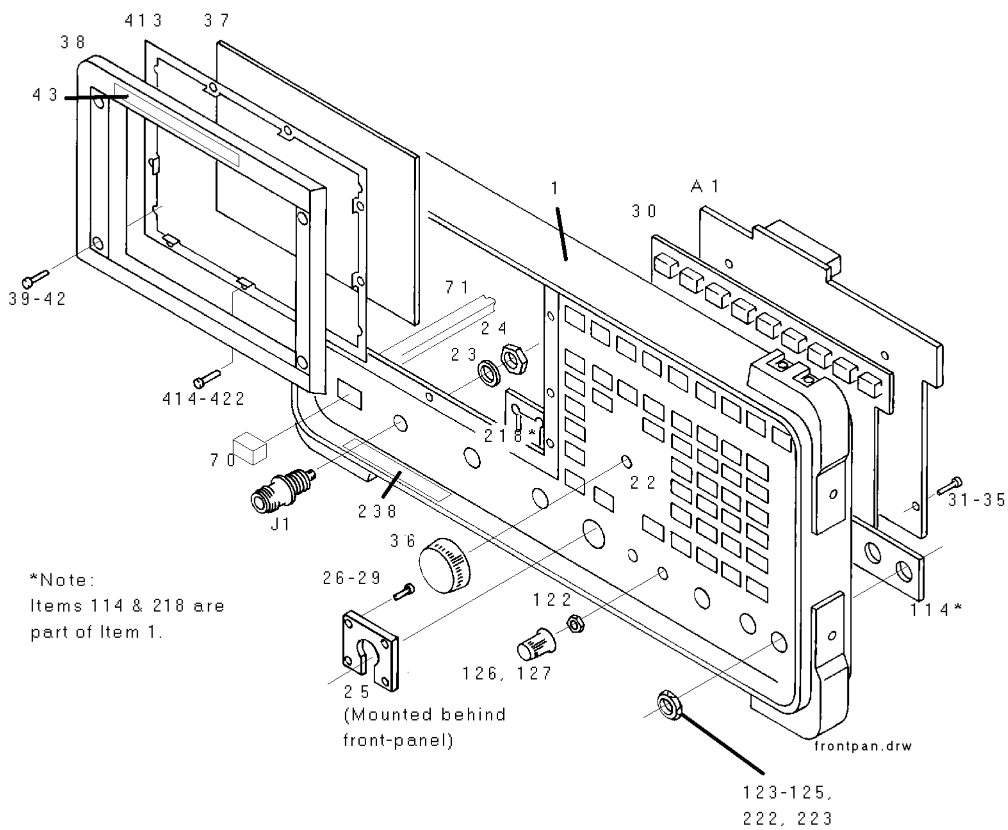


Figure 29 **Front Panel**

Table 157 8920A Replaceable Parts

Item	Description	Replacement Kit or Part Number
A1	KEYBOARD	08920-60201
J1	ADPT F N	1250-1811
1	FRAME FRONT	08920-21022
22	PANEL DRESS	08920-00018
23	WASH LOCK .50ID	2190-0068
24	NUT HEX 1/2-28	2950-0054
25	P/O A1W2	08920-61007
26-29	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
30	KEYPAD	08920-40001
31-35	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
36	KNOB BASE 1-1/8 JGK .25 IN.ID	0370-2110
37	WINDOW CRT FLTR	08920-21023
38	BEZEL,CRT	08920-40003
39-42	SCREW-MACH M3 X 0.5 10MM-LG	0515-2135
43	NAMEPLATE	08920-00019
70	KEY CAP “POWER”	5041-3621
71	PUSHROD	08920-40005
122	NUT HEX 1/4-36	2950-0196
123-125	NUT HEX 1/2-28	2950-0054
126,129	KNOB CONC BASE	0370-3079
222-223	NUT HEX 1/2-28	2950-0054
238	CAUTION LABEL	08920-00063
413	CLIP WINDOW	08920-00074
414-422	SMM2.5 6PCHPNTX	0515-1940

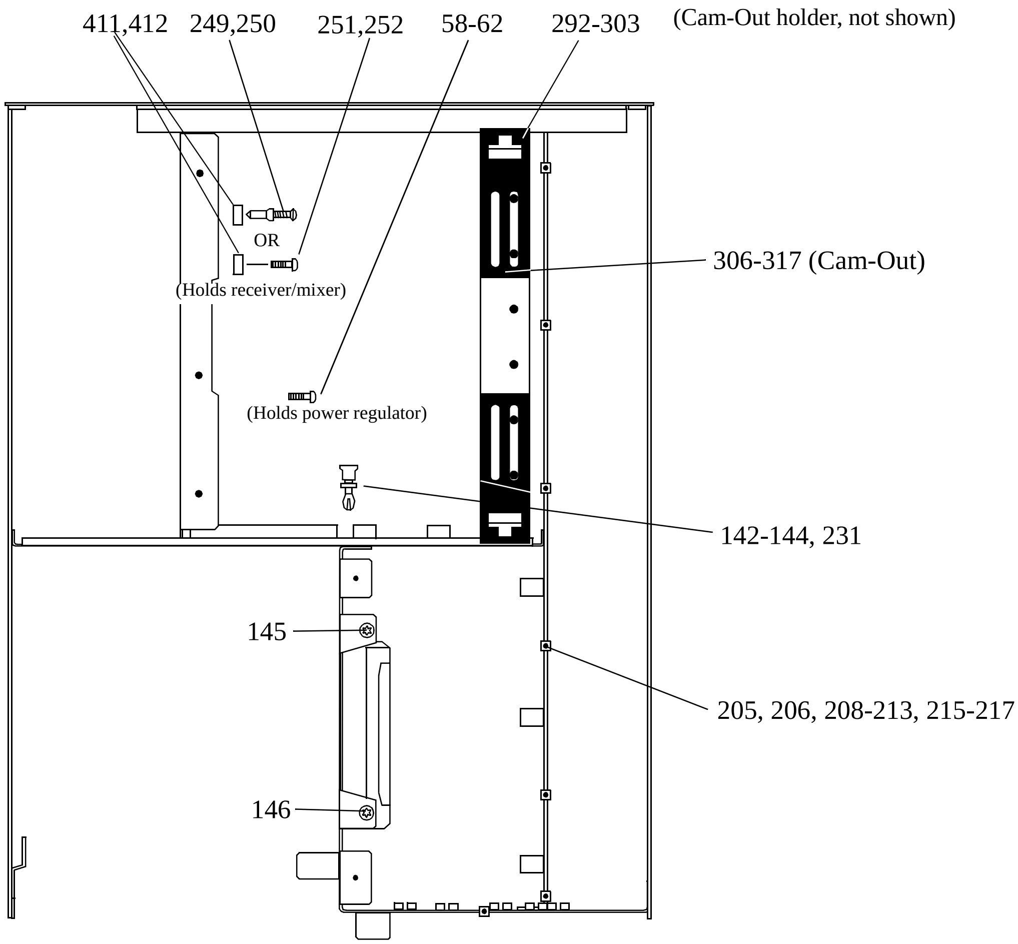


Figure 30 **Attaching Hardware, Top View**

Table 158 8920A Replaceable Parts

Item	Description	Replacement Kit or Part Number
58-62	SMM3.0 SSEMPNTX	0515-1950
142-144	RIVET PLASTIC FLH	0361-1341
145-146	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143
205,206	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
208-213	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
215-217	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
231	RIVET PLASTIC	0361-1341
249,250	RIVET-PLASTICOVH .187 DIA 6LG	0361-1313
292-303	CAM-OUT HOLDER	08920-40016
306-317	CAM-OUT	08920-40009
411-412	WSH FL .190ID	3050-1353
251,252	SCREW 3MM TORX	0515-0372

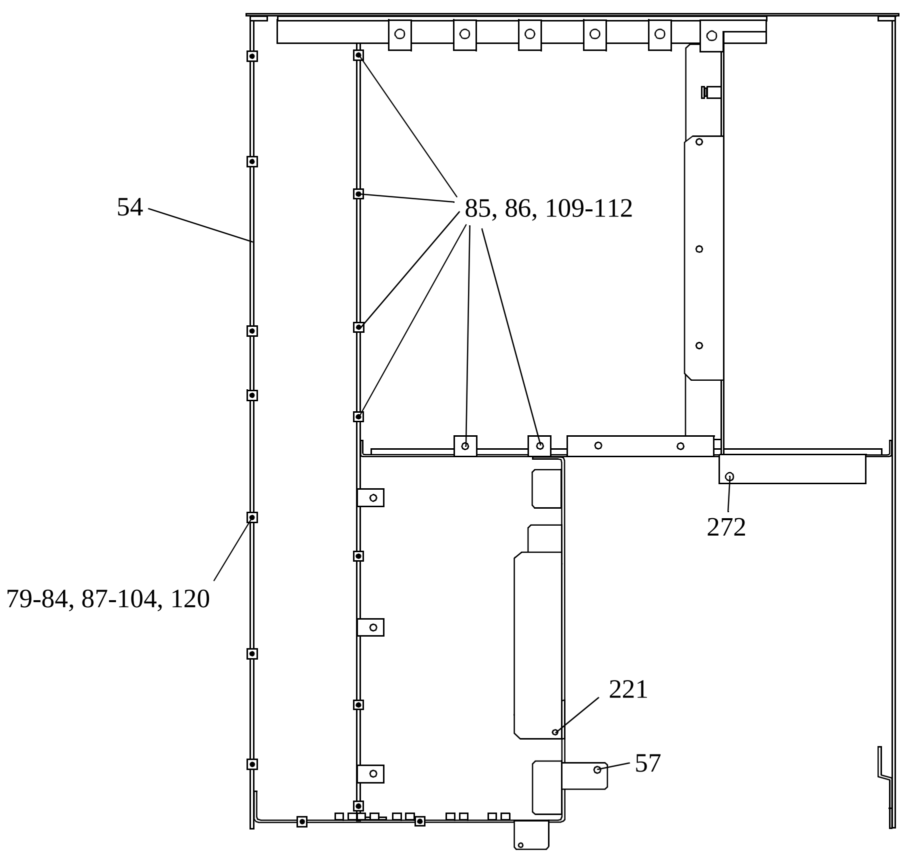


Figure 31 **Chassis and Attaching Hardware, Bottom View**

Table 159 8920A Replaceable Parts

Item	Description	Replacement Kit or Part Number
54	ASSEMBLY-CHASSIS For serial prefix < 3452 (Includes new covers and plates)	08920-61875
54	ASSEMBLY-CHASSIS For serial prefix ≥ 3452	08920-61145
57	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993
79-84	SMM3.0 8SEMPNTX	0515-1950
85-86	SCREW-MACH ASSEMBLY M3 X 0.5 12-MM LG	0515-0664
87-104	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
109-112	SCREW-MACH ASSEMBLY M3 X 0.5 12-MM LG	0515-0664
120	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
221	SCREW-MACH ASSBLY M4 X 0.7 20MM-LG	0515-0456
272	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993

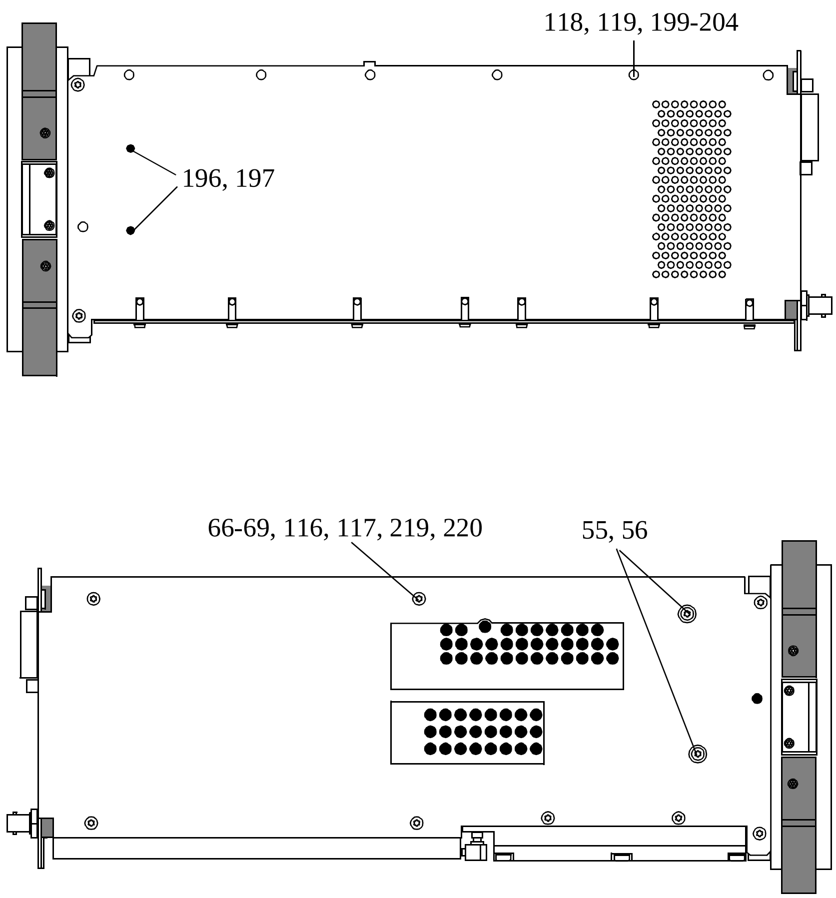


Figure 32 **Attaching Hardware, Side View**

Table 160 8920A Replaceable Parts

Item	Description	Replaceable Kit or Part Number
55,56	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993
66-69	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143
116-119	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143
196-197, 199-204	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
219-220	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143

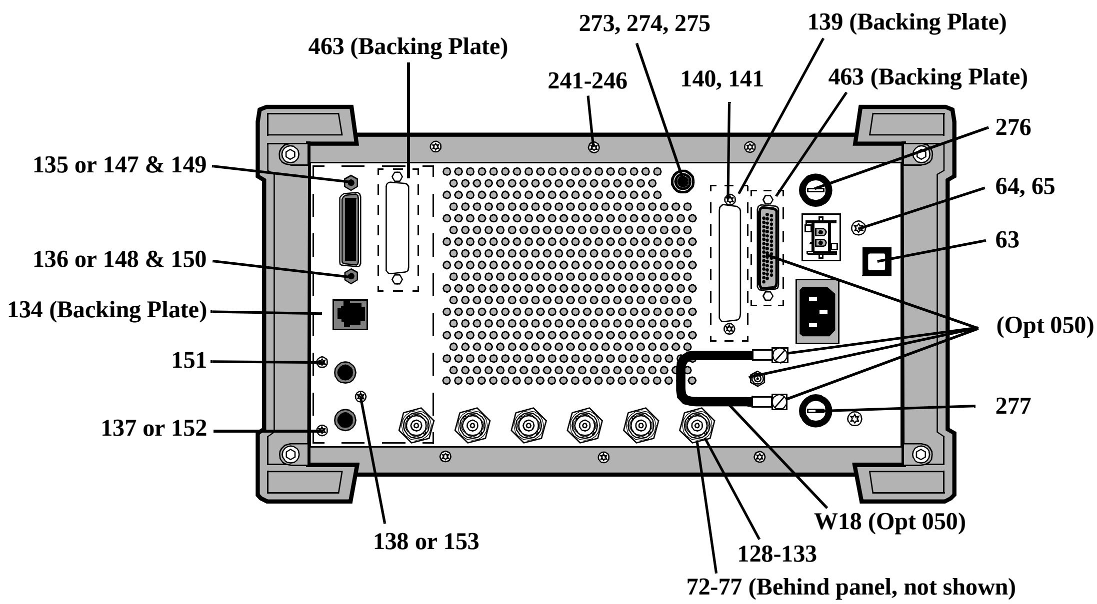


Figure 33 **Rear Panel**

Table 161 8920A Replaceable Parts

Item	Description	Replacement Kit or Part Number
63	QTR-CH-WHT	5041-0201
64,65	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143
72-77	NUT-KNRLD-R-1/2-28-THD .094-IN-THK	0590-1611
128-133	NUT HEX 1/2-28	2950-0054
134	PLATE-GPIB	08920-00177
135-138	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
139	RADIO INTF PLATE	08920-00031
140,141	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
147-148	STAND OFF .327 (OPT.103)	0380-0644
149,150	WSHR LK (OPT. 103)	2190-0577
151-153	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG (OPT. 103)	0515-1950
241-246	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
273	BDG POST ASSY	1510-0038
274	WSHR LK .256ID	2190-0027
275	NUT-HEX 1/4-32	2950-0006
276	DC FUSE, 15A/250V	2110-0054
277	AC FUSE, 5A/250V	2110-0010
463	BACKING PLATE	08922-00076
W18	CBL SMC-SMC (Opt 050)	8120-5816

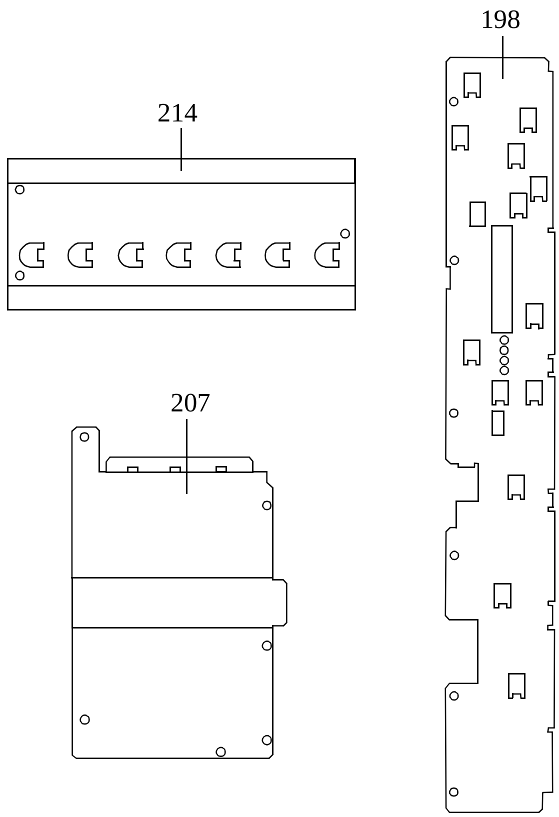


Figure 34 **Covers**

Table 162 **8920A Replaceable Parts**

Item	Description	Replacement Kit or Part Number
198	COVER DIGITAL (for serial prefix <3452)	08920-00142
198	COVER DIGITAL (for serial prefix ≥3452)	08920-00176
207	COVER-AUDIO BDS	08920-00143
214	COVER-CARDBOX	08920-00087

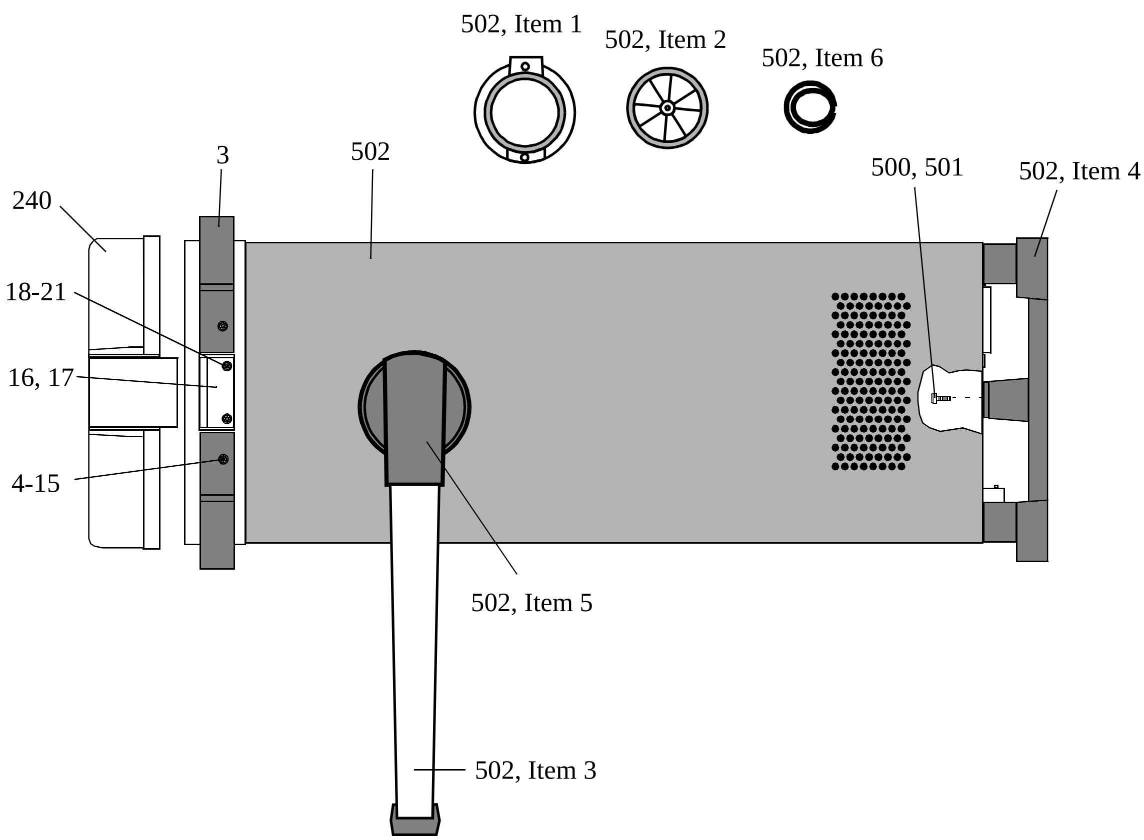


Figure 35 **Instrument Cover, Bumpers and Attaching Hardware**

Table 163 8920A Replaceable Parts

Item	Description	Replacement Kit or Part Number
3	BUMPER	5062-4806
4-15	MM3.08SEMPNTX	0515-0664
16,17	CATCH LATCH	5021-5483
18-21	SCREW-MACH ASSEMBLY M3 X 0.5 8MM-LG	0515-1940
240	IMPACT COVER AY	08920-61037
500,501	SCREW-MACH M4 X 0.7 10MM-LG PAN HD	0515-1114
502	COVER ASSY	08920-61091
502, Item 1	GEAR RING	5021-6343
502, Item 2	SPROCKET GEAR	5021-6344
502, Item 3	HANDLE	5041-3624
502, Item 4	REAR FOOT	5041-8907
502, Item 5	TRIM CAP-HANDLE	5041-8912
502, Item 6	SPRING	1460-2164

8920B Replaceable Parts List

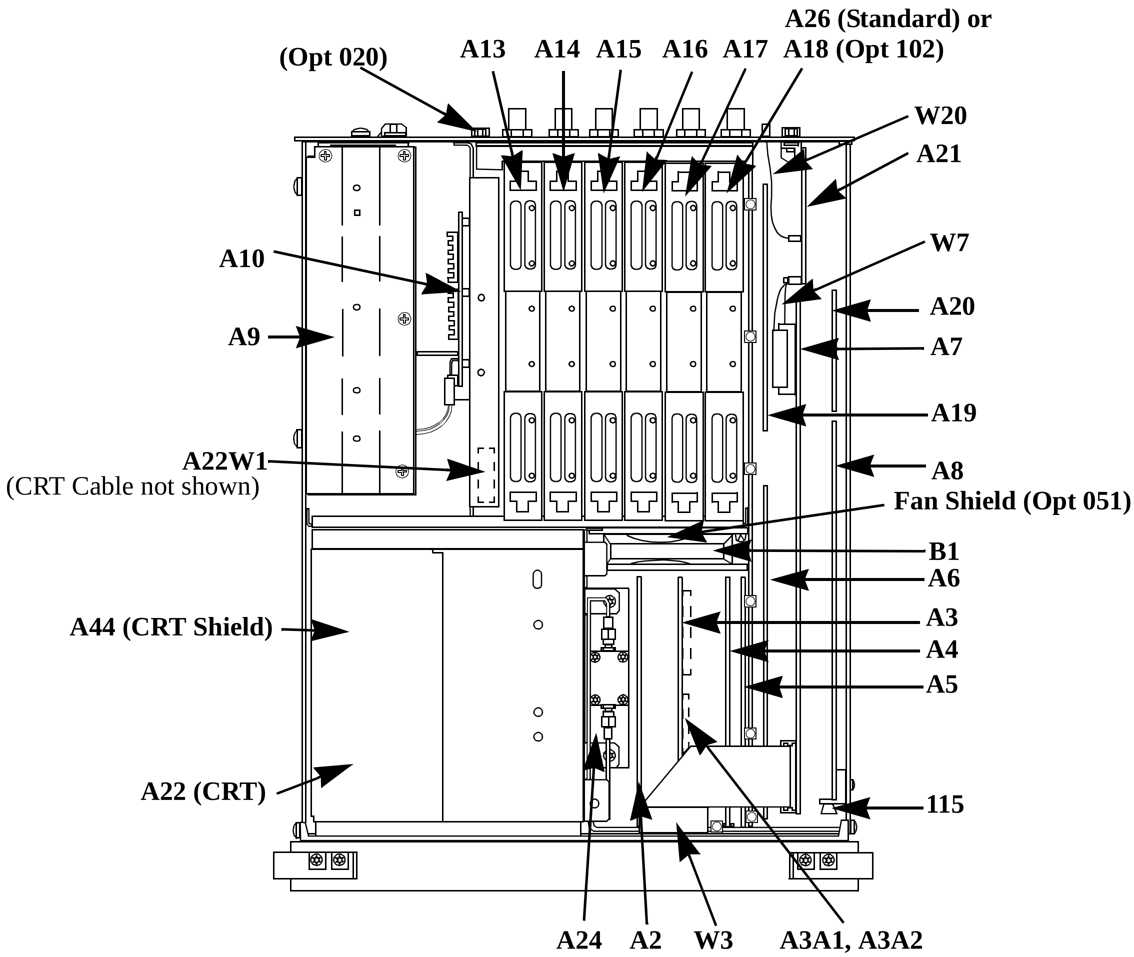


Figure 36 **Major Assemblies and Cables, Top View**

Table 164 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
A2	AUDIO ANALYZER 2 (VNF)	08920-61853
A3	AUDIO ANALYZER 1	08920-61811
A3A1 or A3A2	400 Hz HP FILTER (Opt 010)	08920-61054
A3A1 or A3A2	CCITT FILTER (Opt 011)	08920-61055
A3A1 or A3A2	4 kHz BP FILTER (Opt 012)	08920-61062
A3A1 or A3A2	C-MESSAGE FLTR (Opt 013)	08920-61056
A3A1 or A3A2	6 kHz BP Filter (Opt 014)	08920-61063
A4	MODULATION DISTRIBUTION	08920-61809
A5	SERIAL I/O CONTROL	08920-61839
A6	SIGNALING SOURCE ANALYZER (Std)	08920-61849
A6	SIGNALING SOURCE ANALYZER (Opt 004)	08920-61850
A7	CONTROLLER (DCU)	08920-61872
FW	FLASH FIRMWARE KIT	08920-61851
A8	MEMORY PCMCIA	08920-61871
A8BT1	BATTERY 3V	1420-0338
A9	POWER SUPPLY	08920-61815
A10	POWER SUPPLY REGULATOR	08920-61856
A12	RADIO INTERFACE (Opt 020)	08920-61825
A13	RF OUTPUT	08920-61831
A14	SIG GEN SYNTHESIZER	08921-61819
A15	REFERENCE (STD)	08920-61829
A15	REFERENCE (Opt 001)	08920-61835
A16	RECEIVER	08920-61828
A17	RECEIVER SYNTHESIZER	08921-61820

Table 164 8920B Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
A18	SPECTRUM ANALYZER (Opt 102)	08920-61852
A19	MEASUREMENT	08920-61836
A20	DISPLAY PROCESSOR	08920-61824
A21	GPIB/RS-232/CENTRONICS/CURRENT SENSE	08920-61818
A22	DISPLAY (CRT)	08920-61005
A22-W1	CABLE ASSEMBLY	08920-61020
A24	14 dB RF ATTENUATOR KIT (Std)	08920-61867
A24	14 dB RF ATTENUATOR KIT (Opt 009)	08920-61881
A24	6 dB RF ATTENUATOR KIT (Opt 006)	08920-61883
A24	0 dB RF ATTENUATOR KIT (Opt 007)	08920-61884
A24	16 dB RF ATTENUATOR KIT (Opt 016)	08920-61885
A26	TERMINATOR (Except Opt 102)	08920-60140
B1	FAN	3160-0597
	FAN SHIELD	08921-00003
W3	RBN26CNDCT28AWG	08645-61027
W7	RIBBON CABLE, DCU-GPIB	08920-61018
W20	CENTRONICS PRNTR CABLE	08920-61146
44	CRT SHIELD	08920-00043
115	PRE-GUIDE SMT CD (P/O A8)	08920-40018

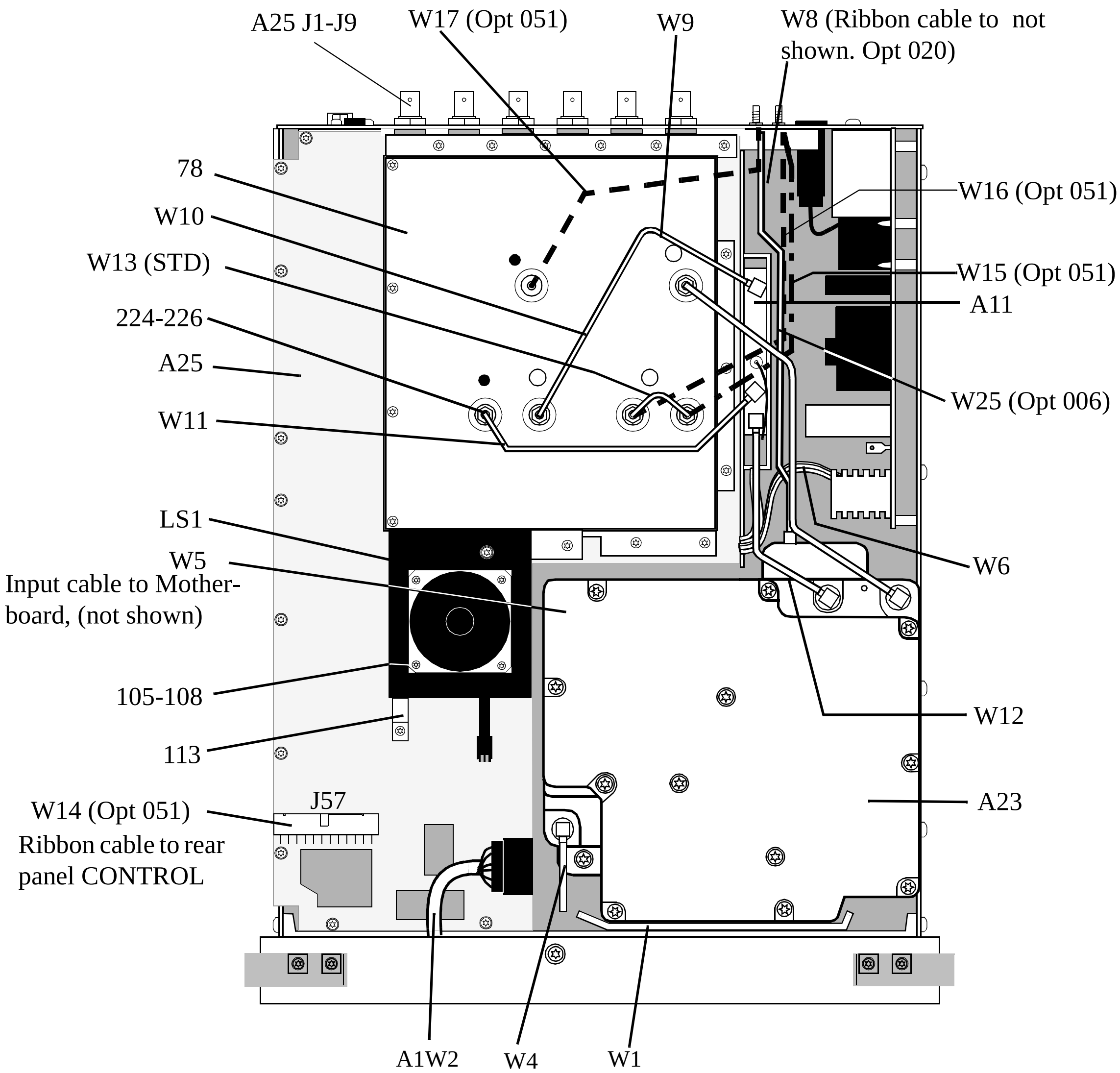


Figure 37 **Major Assemblies and Cables, Bottom View**

Table 165 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
A11	RECEIVER MIXER	08920-61832
A23	14 dB RF ATTENUATOR KIT (Std)	08920-61867
A23	14 dB RF ATTENUATOR KIT (Opt 009)	08920-61881
A23	6 dB RF ATTENUATOR KIT (Opt 006)	08920-61883
A23	0 dB RF ATTENUATOR KIT (Opt 007)	08920-61884
A23	16 dB RF ATTENUATOR KIT (Opt 016)	08920-61885
A25	MOTHERBOARD	08920-61095
A25 J1-J9	BNC (AUDIO IN, etc.)	1250-1842
LS1	SPEAKER ASSEMBLY	08920-61025
A1W2	CBL CABLE FRONT PANEL	08920-61007
W1	14 dB RF ATTENUATOR KIT (Std)	08920-61867
W1	14 dB RF ATTENUATOR KIT (Opt 009)	08920-61881
W1	6 dB RF ATTENUATOR KIT (Opt 006)	08920-61883
W1	0 dB RF ATTENUATOR KIT (Opt 007)	08920-61884
W1	16 dB RF ATTENUATOR KIT (Opt 016)	08920-61885
W4	14 dB RF ATTENUATOR KIT (Std)	08920-61867
W4	14 dB RF ATTENUATOR KIT (Opt 009)	08920-61881
W4	6 dB RF ATTENUATOR KIT (Opt 006)	08920-61883
W4	0 dB RF ATTENUATOR KIT (Opt 007)	08920-61884
W4	16 dB RF ATTENUATOR KIT (Opt 016)	08920-61885
W5	RIBBON CABLE	08920-61017
W6	CABLE ASSEMBLY-POWER SUPPLY	08920-61019
W7	RIBBON CABLE, DCU TO GPIB	08920-61018
W8	CABLE ASSEMBLY (OPT. 020)	08920-61039

Table 165 8920B Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
W9	SEMI-RIGID CABLE-SIG GEN OUT	08920-61014
W10	SEMI-RIGID CABLE-REC IN	08920-61015
W11	SR REC SYNTH - REC MIX	08920-61033
W12	SR INPUT - REC MIX	08920-61034
W13	SEMI-RIGID, JUMPER (STD) A25J55 to A25J56	08920-61076
W14	RIBBON CABLE (Opt 051) A25J57 to CONTROL I/O (Rear Panel)	08921-61004
W15	SEMI-RIGID SMC-NONE (Opt 051) A25J56 to IQ RF IN (Rear Panel)	08921-61001
W16	SEMI-RIGID SMC-NONE (Opt 051) A25J55 to CW RF OUT (Rear Panel)	08921-61002
W17	SEMI-RIGID SMC-NONE (Opt 051) A25J54 to 114.3 MHz OUT (Rear Panel)	08921-61003
78	MOTHER BD COVER	08920-00110
105-108	SCREW-MACH M3 X 0.5 6MM-LG PAN-HD	0515-0680
113	SPEAKER BRACKET AY	08920-61045
224-226	NUT-HEX DBL-CHAM M5 X 0.8 2.5 MM-THK	0535-0109
W25	SR CABLE, AVG PWR DETECTOR (Opt 006, 007, 009)	08920-61152

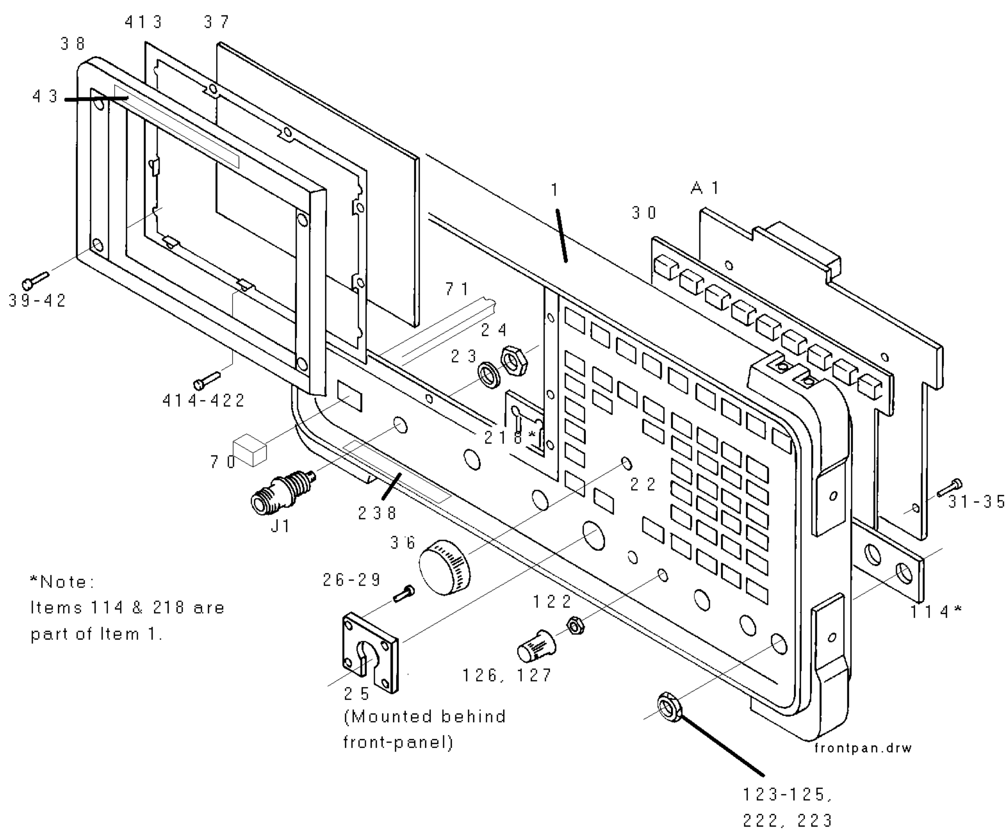


Figure 38 **Front Panel**

Table 166 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
A1	KEY BOARD	08920-60201
J1	ADPT F N	1250-1811
1	FRAME FRONT	08920-21046
22	PANEL DRESS	08920-00172
22	PANEL DRESS (Opt 007)	08920-00169
23	WASH LOCK .50ID	2190-0068
24	NUT HEX 1/2-28	2950-0054
25	P/O A1W2	08920-61007
26-29	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
30	KEYPAD	08920-40001
31-35	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
36	KNOB BASE 1-1/8 JGK .25 IN.ID	0370-2110
37	WINDOW CRT FLTR	08920-21023
38	BEZEL,CRT	08920-40003
39-42	SCREW-MACH M3 X 0.5 10MM-LG	0515-2135
43	NAMEPLATE	08920-00193
70	KEY CAP “POWER”	5041-3621
71	PUSHROD	08920-40005
122	NUT HEX 1/4-36	2950-0196
123-125	NUT HEX 1/2-28	2950-0054
126,129	KNOB CONC BASE	0370-3079
222-223	NUT HEX 1/2-28	2950-0054
238	CAUTION LABEL	08920-00063

Table 166 8920B Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
413	CLIP WINDOW	08920-00074
414-422	SMM2.5 6PCHPNTX	0515-1940

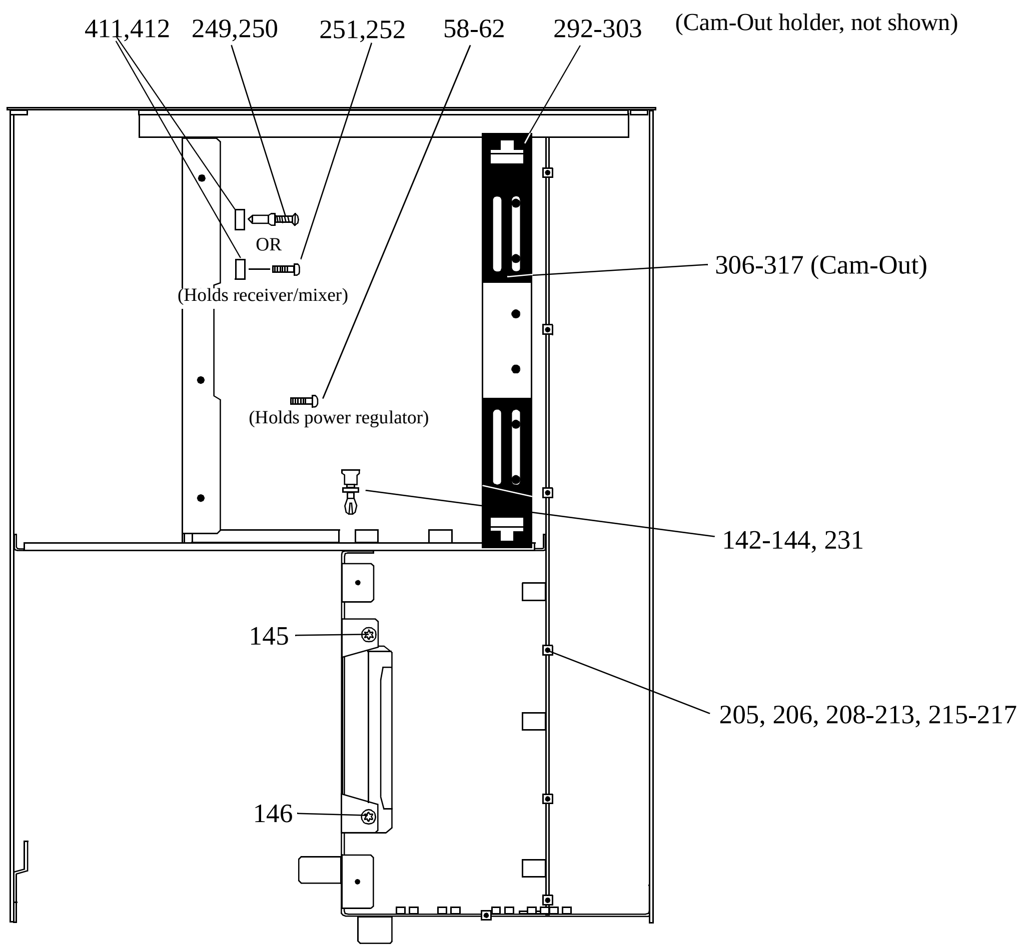


Figure 39 **Attaching Hardware, Top View**

Table 167 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
58-62	SMM3.0 SSEMPNTX	0515-1950
142-144	RIVET PLASTIC FLH	0361-1341
145-146	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143
205,206	SCREW-MACH ASSBLY M3 X 0.5 8 MM-LG	0515-1950
208-213	SCREW-MACH ASSBLY M3 X 0.5 8 MM-LG	0515-1950
215-217	SCREW-MACH ASSBLY M3 X 0.5 8 MM-LG	0515-1950
231	RIVET PLASTIC	0361-1341
249,250	RIVET-PLASTICOVH .187 DIA 6LG	0361-1313
292-303	CAM-OUT HOLDER	08920-40016
306-317	CAM-OUT	08920-40009
411-412	WSH FL .190ID	3050-1353
251,252	SCREW 3MM TORX	0515-0372

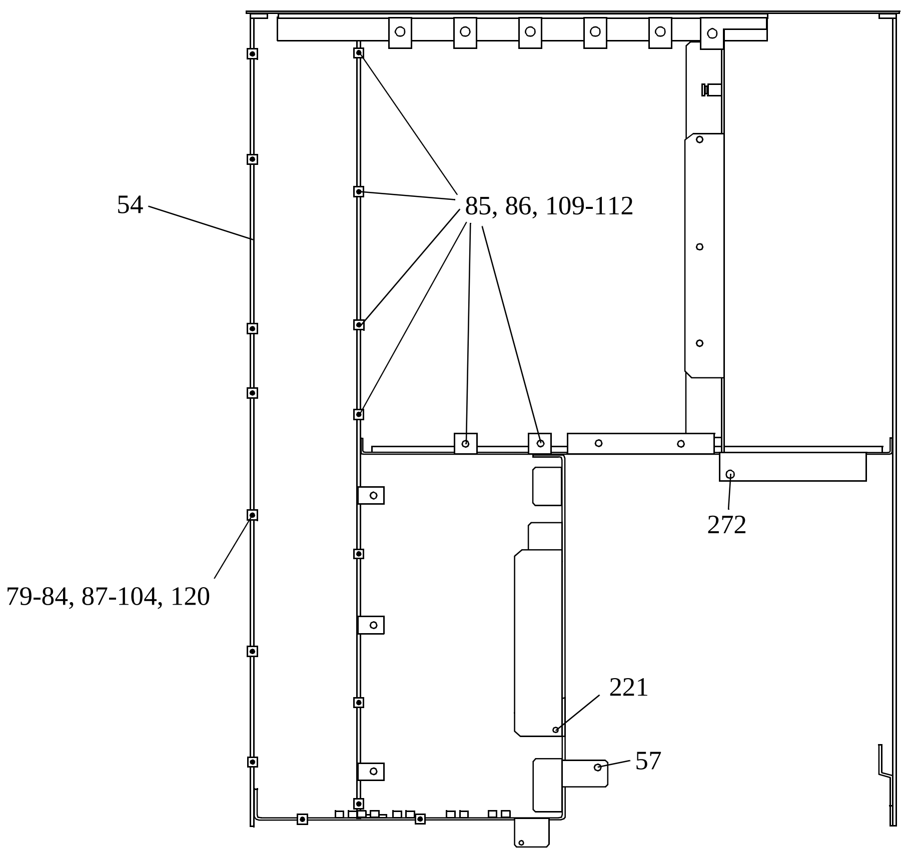


Figure 40 **Chassis and Attaching Hardware, Bottom View**

Table 168 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
54	ASSEMBLY-CHASSIS For serial prefix < 3542 (includes covers and plates)	08920-61875
54	ASSEMBLY-CHASSIS For serial prefix ≥ 3452	08920-61145
57	SCREW-THD-RLG-M4 x 0.7 10 MM-LG PANHEAD	0515-1993
79-84	SMM3.0 8SEMPNTX	0515-1950
85-86	SCREW-MACH ASSEMBLY M3 X 0.5 12-MM LG	0515-0664
87-104	SCREW-MACH ASSBLY M3 X 0.5 8 MM-LG	0515-1950
109-112	SCREW-MACH ASSEMBLY M3 X 0.5 12-MM LG	0515-0664
120	SCREW-MACH ASSBLY M3 X 0.5 8 MM-LG	0515-0372
221	SCREW-MACH ASSBLY M4 X 0.7 20 MM-LG	0515-0456
272	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993

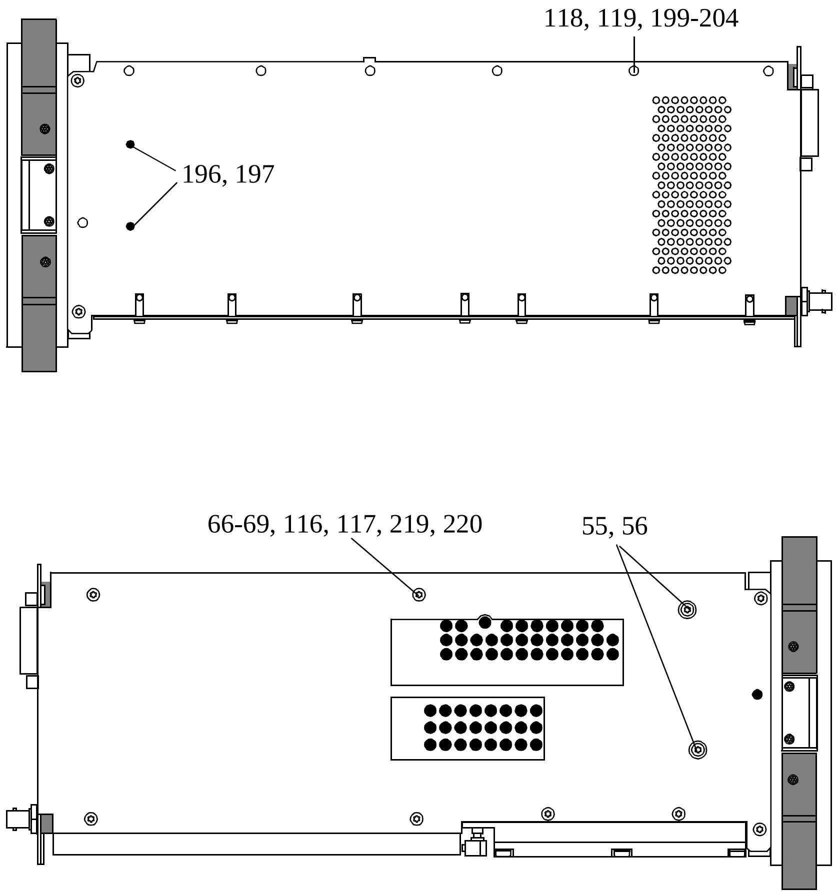


Figure 41 **Attaching Hardware, Side View**

Table 169 8920B Replaceable Parts

Item	Description	Replaceable Kit or Part Number
55,56	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993
66-69	SCREW-MACH M4 X 0.7 6MM-LGPAN-HD	0515-2143
116-119	SCREW-MACH M4 X 0.7 6MM-LGPAN-HD	0515-2143
196-197, 199-204	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
219-220	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143

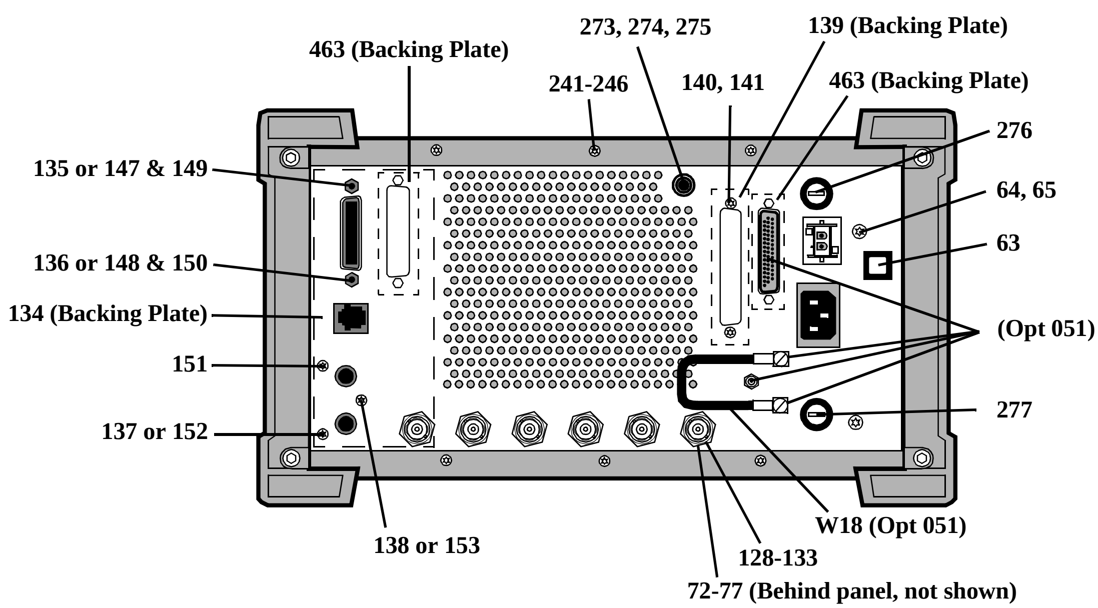


Figure 42 **Rear Panel**

Table 170 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
63	QTR-CH-WHT	5041-0201
64,65	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143
72-77	NUT-KNRLD-R-1/2-28-THD .094-IN-THK	0590-1611
128-133	NUT HEX 1/2-28	2950-0054
134	PLATE-GPIB	08920-00020
135-138	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
139	RADIO INTF PLATE	08920-00031
140,141	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
147-148	STAND OFF .327	0380-0644
149,150	WSHR LK	2190-0577
151-153	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
241-246	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
273	BDG POST ASSY	1510-0038
274	WSHR LK .256ID	2190-0027
275	NUT-HEX 1/4-32	2950-0006
276	AC FUSE, 15A/250V	2110-0054
277	DC FUSE, 5A/250V	2110-0010
463	BACKING PLATE (Opt 051)	08922-00076
W18	CBL SMC-SMC (Opt 051)	8120-5816

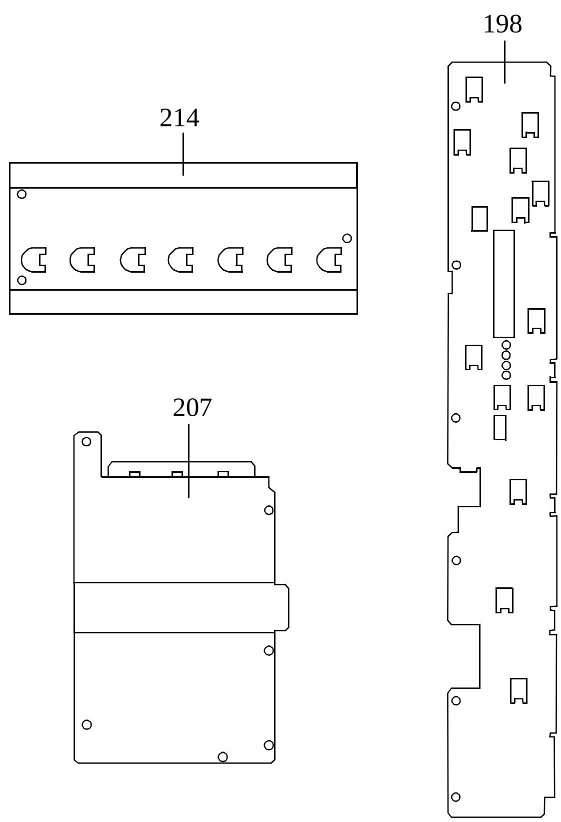


Figure 43 **Covers**

Table 171 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
198	COVER DIGITAL	08920-00176
207	COVER-AUDIO BDS	08920-00143
214	COVER-CARDBOX	08920-00087

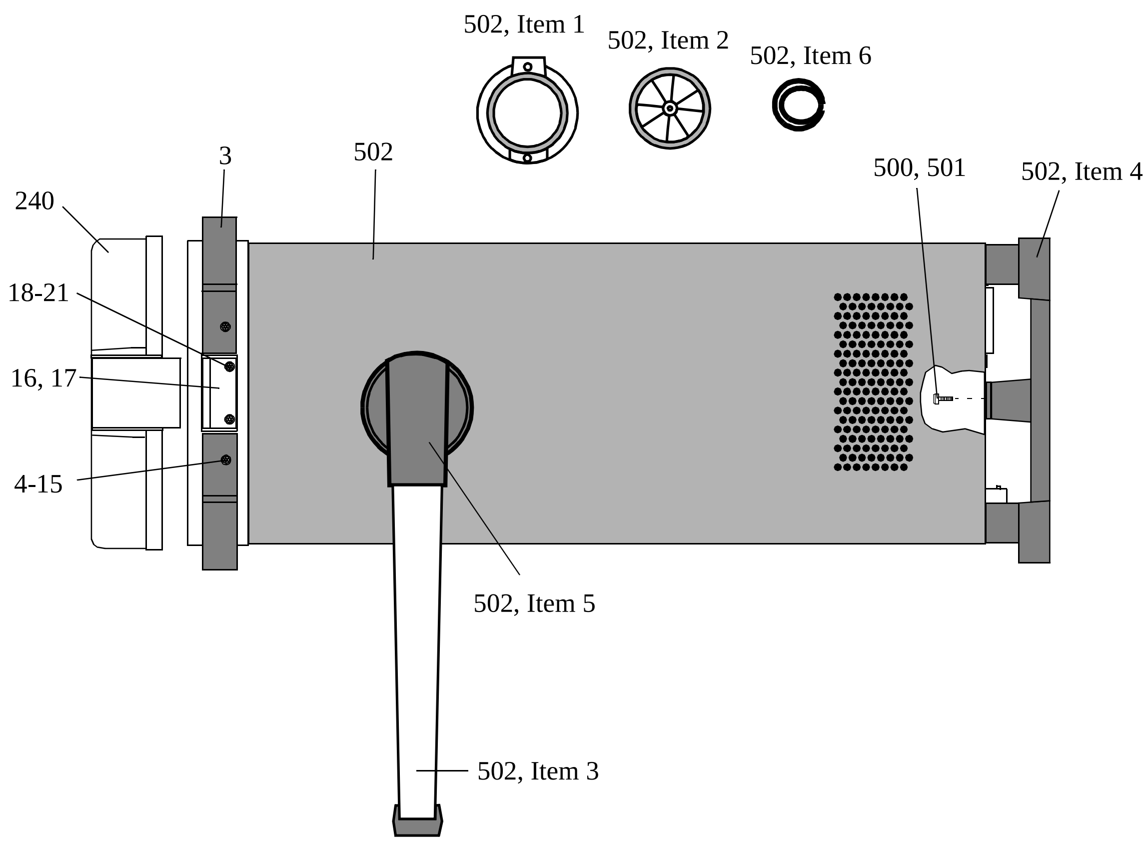


Figure 44 **Instrument Cover, Bumpers and Attaching Hardware**

Table 172 8920B Replaceable Parts

Item	Description	Replacement Kit or Part Number
3	BUMPER	5062-4806
4-15	MM3.08SEMPNTX	0515-0664
16,17	CATCH LATCH	5021-5483
18-21	SCREW-MACH ASSEMBLY M3 X 0.5 8MM-LG	0515-1940
240	IMPACT COVER AY	08920-61037
500,501	SCREW-MACH M4 X 0.7 10MM-LG PAN HD	0515-1114
502	COVER ASSY	08920-61091
502	COVER ASSY (Opt 031) NO HANDLE	08920-61153
502,Item 1	GEAR RING	5021-6343
502,Item 2	SPROCKET GEAR	5021-6344
502,Item 3	HANDLE	5041-3624
502 Item 4	REAR FOOT	5041-8907
502 Item 5	TRIM CAP-HANDLE	5041-8912
502, Item 6	SPRING	1460-2164

8921A Replaceable Parts List

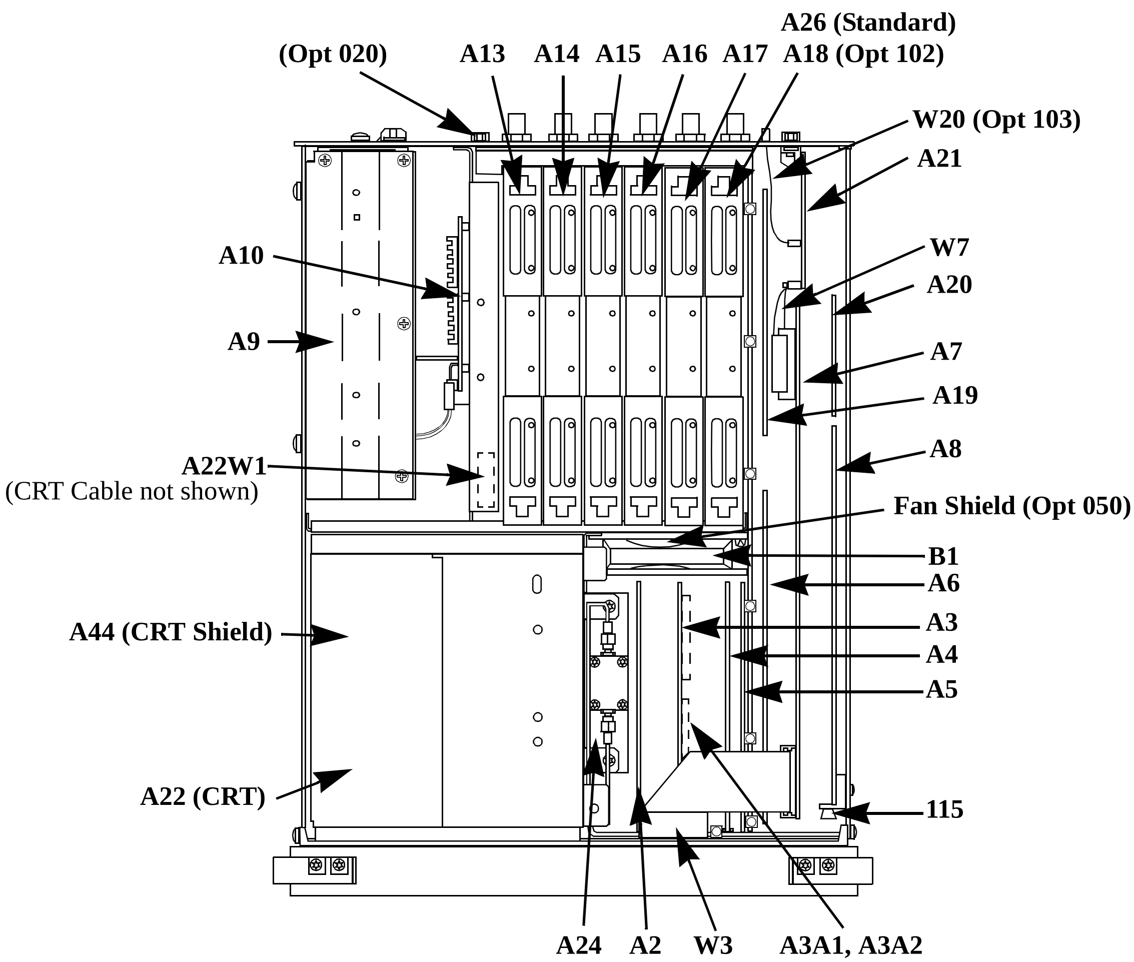


Figure 45 **Major Assemblies and Cables, Top View**

Table 173 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
A2	AUDIO ANALYZER 2 (STD)	08920-61812
A2	AUDIO ANALYZER 2 (VNF)	08920-61853
A3	AUDIO ANALYZER 1	08920-61811
A3A1 or A3A2	CCITT FILTER (Opt 011)	08920-61055
A3A1 or A3A2	C-MESSAGE FILTER	08920-61056
A3A1 or A3A2	6 kHz BP FILTER	08920-61063
A4	MODULATION DISTRIBUTION	08920-61809
A5	SERIAL I/O CONTROL	08920-61839
A6	SIGNALING SOURCE ANALYZER	08920-61850
A7	CONTROLLER (DCU)	08920-61807
A8	EPROM MEMORY (serial break <3546 except R40)	08920-61866
A8	OTP MEMORY (serial break ≥3546 or R40)	08920-61869
A8BT1	BATTERY 3V	1420-0338
FW	EPROM FIRMWARE KIT (serial break <3546 except R40)	08920-61058
FW	OTP FIRMWARE KIT (serial break ≥3546 or R40)	08920-61870
A9	POWER SUPPLY	08920-61815
A10	POWER SUPPLY REGULATOR	08920-61856
A12	RADIO INTERFACE (Opt. 020)	08920-61825
A12	ERICCSON PCM REFERENCE (OPT. 042)	08920-61842
A13	RF OUTPUT	08920-61831
A14	SIG GEN SYNTHESIZER	08921-61819
A15	REFERENCE, HIGH STABILTY	08920-61835
A16	RECEIVER	08920-61896

Table 173 8921A Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
A17	RECEIVER SYNTHESIZER	08921-61820
A18	SPECTRUM ANALYZER	08920-61852
A19	MEASUREMENT	08920-61836
A20	DISPLAY PROCESSOR	08920-61824
A21	GPIB/RS-232/CENTRONICS/CURRENT SENSE	08920-61818
A22	DISPLAY (CRT)	08920-61005
A22-W1	CABLE ASSEMBLY	08920-61020
A24	14 dB RF INPUT/ATTEN KIT (Std) SP<3501	08920-61894
A24	14 dB RF INPUT/ATTEN KIT (Std) SP ≥3501	08921-61826
B1	FAN	3160-0597
	FAN SHIELD	08921-00003
W3	RBN26CNDCT28AWG	08645-61027
W7	RIBBON CABLE, DCU-GPIB	08920-61018
W20	CENTRONICS PRNTR CABLE (Serial Prefix ≤3501 Only)	08920-61146
44	CRT SHIELD	08920-00043
115	PRE-GUIDE SMT CD (P/O A8)	08920-40018

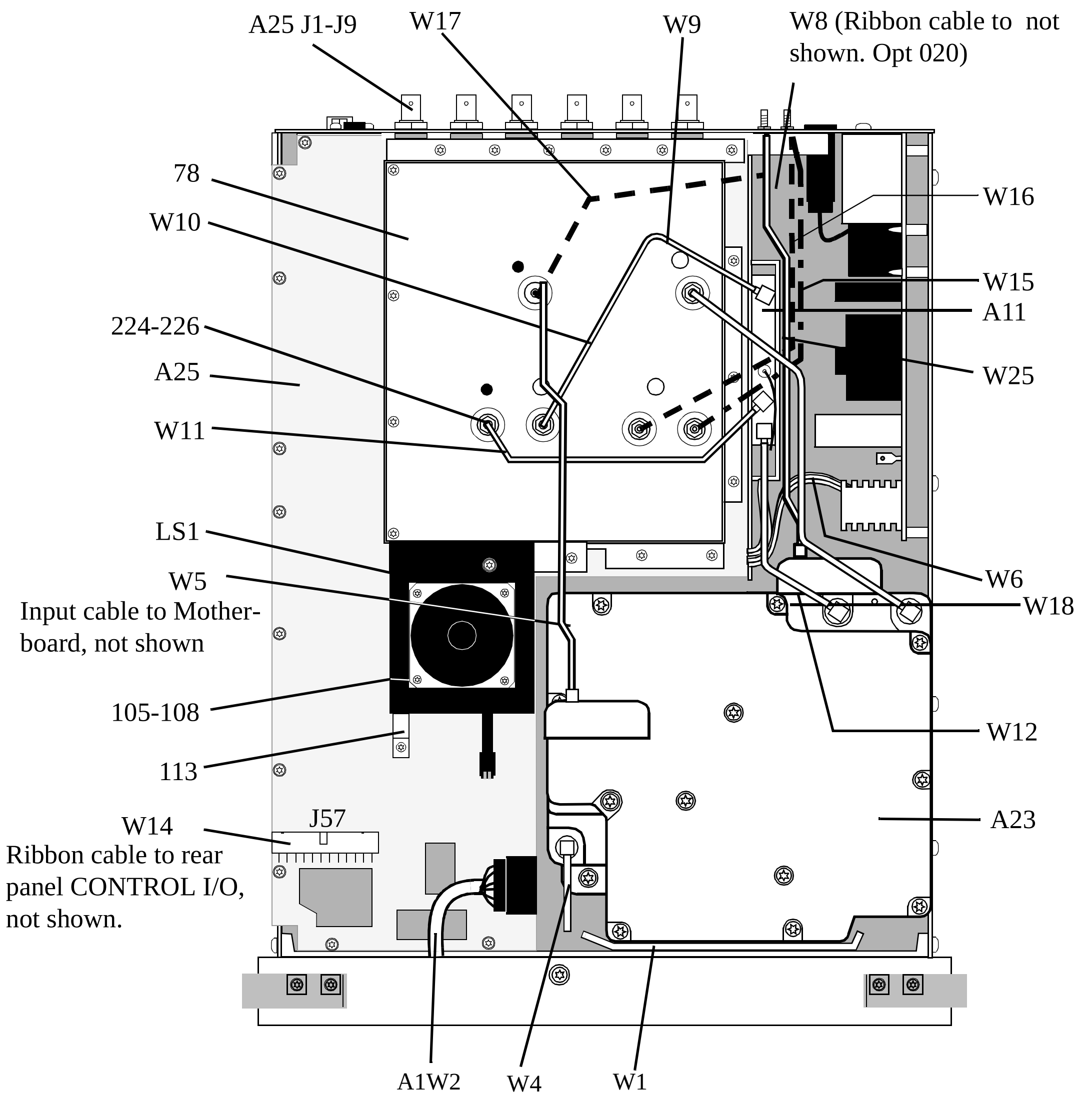


Figure 46 **Major Assemblies and Cables, Bottom View**

Table 174 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
A11	RECEIVER MIXER	08920-61832
A23	14 dB RF INPUT/ATTEN KIT (Std) SP<3501	08920-61894
A23	14 dB RF INPUT/ATTEN KIT (Std) SP ≥3501	08921-61826
A25	MOTHERBOARD	08920-61095
A25 J1-J9	BNC (AUDIO IN, etc.)	1250-1842
LS1	SPEAKER ASSEMBLY	08920-61025
W1	SR 2.18 SMA-SMA	08920-61012
A1W2	CBL CABLE FRONT PANEL	08920-61007
W4	SR CABLE HEAT SINK	08920-61013
W5	RIBBON CABLE	08920-61017
W6	CABLE ASSEMBLY-POWER SUPPLY	08920-61019
W7	RIBBON CABLE, DCU TO GPIB	08920-61018
W8	CABLE ASSEMBLY (OPT. 020 or OPT. 042)	08920-61039
W9	SEMI-RIGID CABLE-SIG GEN OUT	08920-61014
W10	SEMI-RIGID CABLE-REC IN	08920-61015
W11	SR REC SYNTH - REC MIX	08920-61033
W12	SR INPUT - REC MIX	08920-61034
W14	RIBBON CABLE A25J57 to CONTROL I/O (Rear Panel)	08921-61004
W15	SEMI-RIGID SMC-NONE A25J56 to IQ RF IN (Rear Panel)	08921-61001
W16	SEMI-RIGID SMC-NONE A25J55 to CW RF OUT (Rear Panel)	08921-61002
W17	SEMI-RIGID SMC-NONE A25J54 to 114.3 MHz OUT (Rear Panel)	08921-61003
W18	SR CABLE AVERAGE PWR	08920-61152

Table 174 8921A Replaceable Parts (Continued)

Item	Description	Replacement Kit or Part Number
W19	CA ASSY HEAD PHON	08921-61042
78	MOTHER BD COVER	08920-00110
105-108	SCREW-MACH M3 X 0.5 6MM-LG PAN-HD	0515-0680
113	SPEAKER BRACKETT AY	08920-61045
224-226	NUT-HEX DBL-CHAM M5 X 0.8 2.5 MM-THK	0535-0109
W25	SEMI-RIGID CABLE, AVERAGE POWER DETECTOR	08920-61152

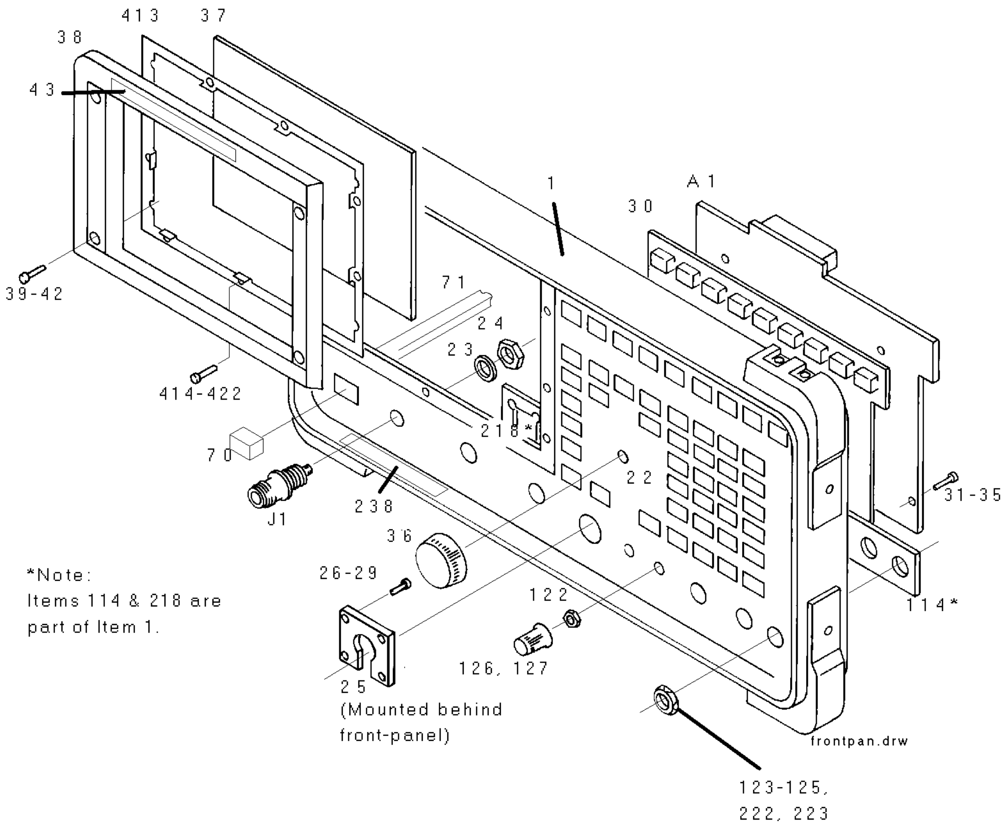


Figure 47 **Front Panel**

Table 175 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
A1	KEY BOARD	08920-60201
J1	ADPT F N	1250-1811
1	FRAME FRONT	08920-21022
22	PANEL DRESS	08920-00018
23	WASH LOCK .50ID	2190-0068
24	NUT HEX 1/2-28	2950-0054
25	P/O A1W2	08920-61007
26-29	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
30	KEYPAD	08920-40001
31-35	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
36	KNOB BASE 1-1/8 JGK .25 IN.ID	0370-2110
37	WINDOW CRT FLTR	08920-21023
38	BEZEL,CRT	08920-40003
39-42	SCREW-MACH M3 X 0.5 10MM-LG	0515-2135
43	NAMEPLATE	08921-00001
70	KEY CAP “POWER”	5041-3621
71	PUSHROD	08920-40005
122	NUT HEX 1/4-36	2950-0196
123-125	NUT HEX 1/2-28	2950-0054
126,129	KNOB CONC BASE	0370-3079
222-223	NUT HEX 1/2-28	2950-0054
238	CAUTION LABEL	08920-00063
413	CLIP WINDOW	08920-00074
414-422	SMM2.5 6PCHPNTX	0515-1940

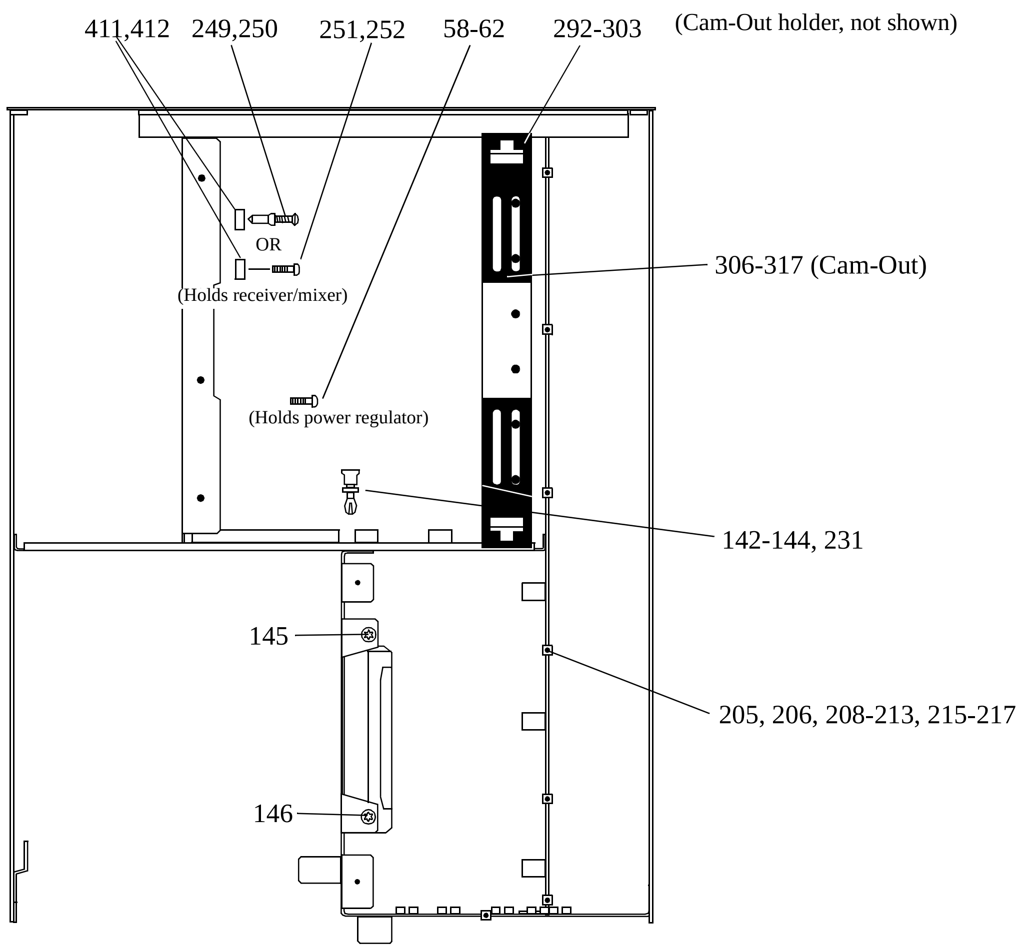


Figure 48 **Attaching Hardware, Top View**

Table 176 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
58-62	SMM3.0 SSEMPNTX	0515-1950
142-144	RIVET PLASTIC FLH	0361-1341
145-146	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143
205,206	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
208-213	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
215-217	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
231	RIVET PLASTIC	0361-1341
249,250	RIVET-PLASTICOVH .187 DIA 6LG	0361-1313
292-303	CAM-OUT HOLDER	08920-40016
306-317	CAM-OUT	08920-40009
411-412	WSH FL .190ID	3050-1353
251,252	SCREW 3MM TORX	0515-0372

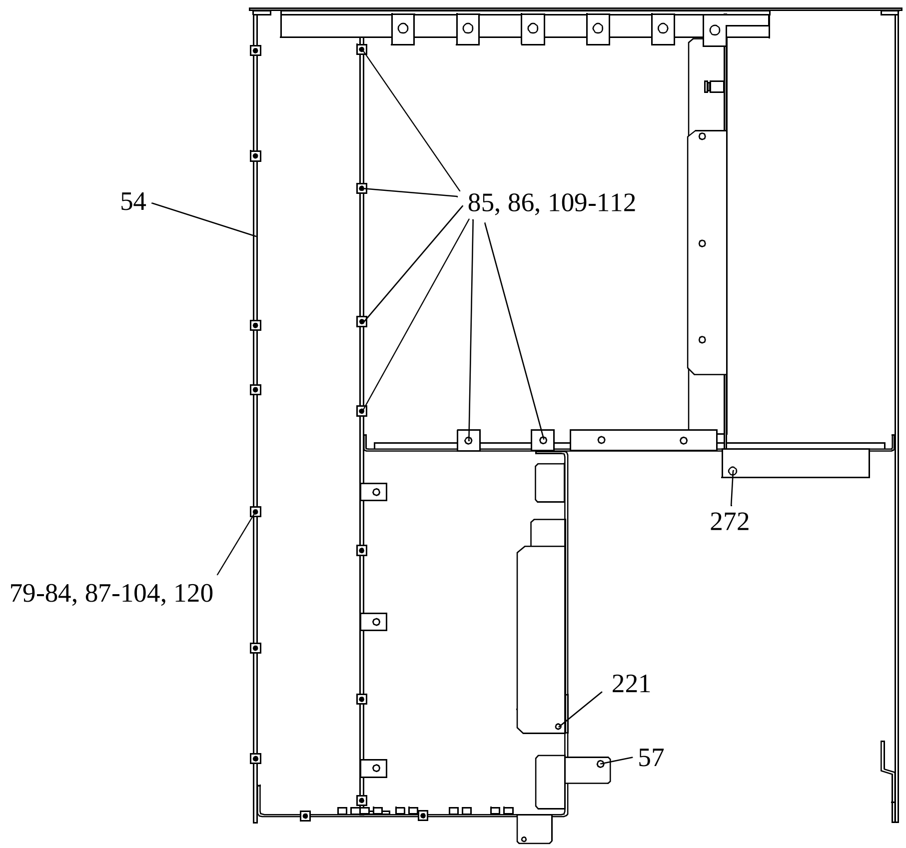


Figure 49 **Chassis and Attaching Hardware, Bottom View**

Table 177 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
54	ASSEMBLY-CHASSIS	08920-61145
57	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993
79-84	SMM3.0 8SEMPNTX	0515-1950
85-86	SCREW-MACH ASSEMBLY M3 X 0.5 12-MM LG	0515-0664
87-104	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
109-112	SCREW-MACH ASSEMBLY M3 X 0.5 12-MM LG	0515-0664
120	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
221	SCREW-MACH ASSBLY M4 X 0.7 20MM-LG	0515-0456
272	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993

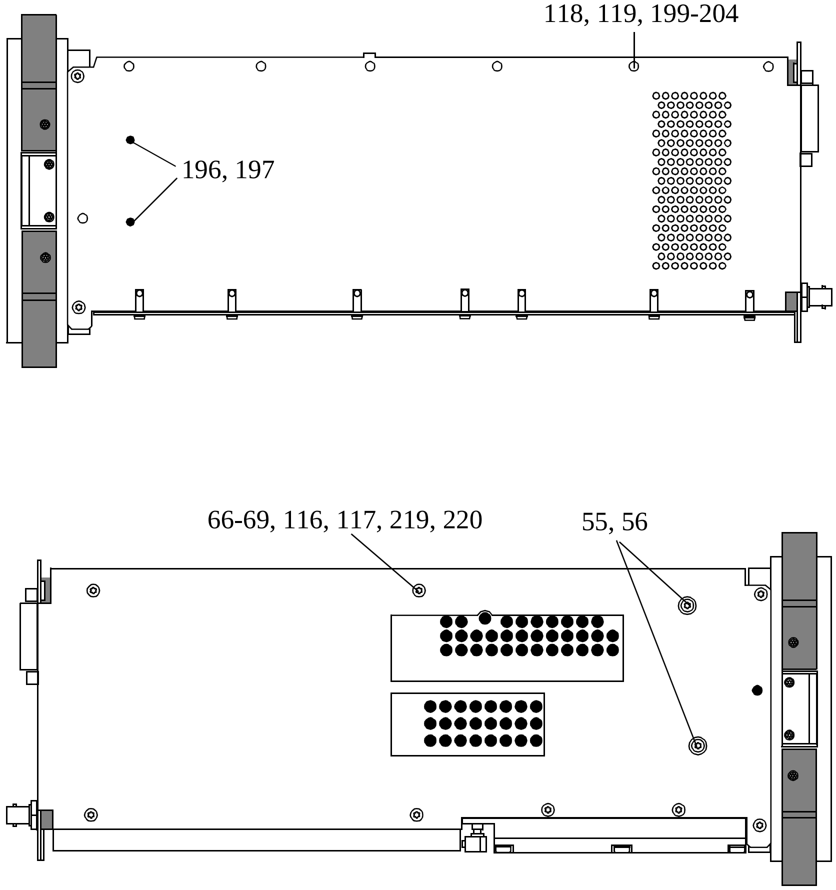


Figure 50 **Attaching Hardware, Side View**

Table 178 8921A Replaceable Parts

Item	Description	Replaceable Kit or Part Number
55,56	SCREW-THD-RLG-M4 x 0.7 10MM-LG PANHEAD	0515-1993
66-69	SCREW-MACH M4 X 0.7 6MM-LGPAN-HD	0515-2143
116-119	SCREW-MACH M4 X 0.7 6MM-LGPAN-HD	0515-2143
196-197, 199-204	SCREW-MACH ASSEMBLY M3 X 0.5 6MM-LG	0515-2126
219-220	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	0515-2143

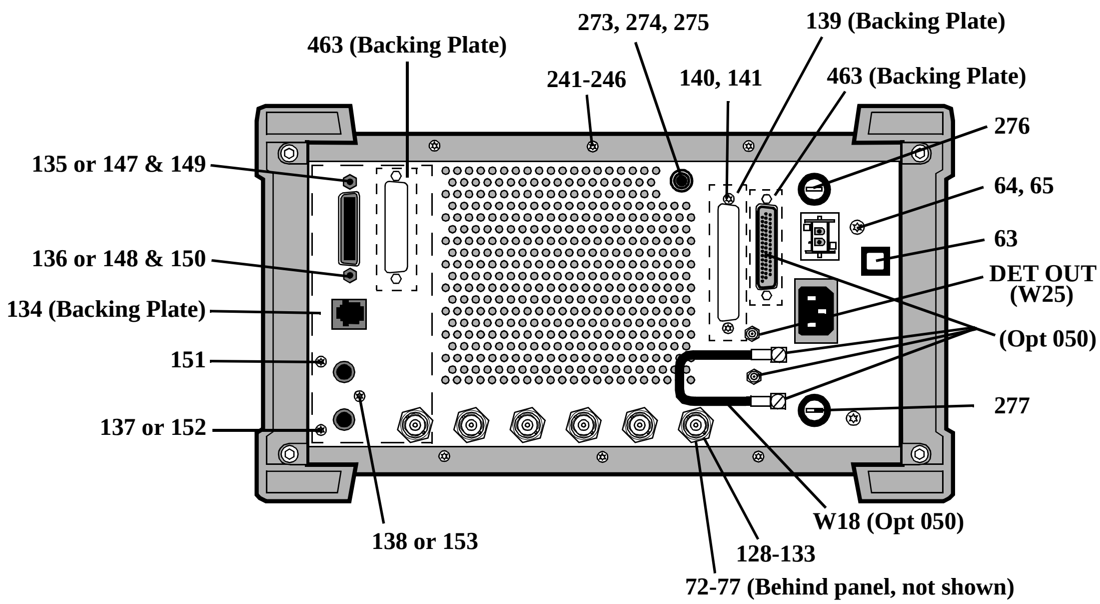


Figure 51 **Rear Panel**

Table 179 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
63	QTR-CH-WHT	5041-0201
64,65	SCREW-MACH M4 X 0.7 6MM-LGPAN-HD	0515-2143
72-77	NUT-KNRLD-R-1/2-28-THD .094-IN-THK	0590-1611
128-133	NUT HEX 1/2-28	2950-0054
134	PLATE-GPIB	08920-00020
135-138	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
139	RADIO INTF PLATE	08920-00031
140,141	SCREW-MACH ASSBLY M3 X 0.58MM-LG	0515-0372
147-148	STAND OFF .327	0380-0644
149,150	WSHR LK	2190-0577
151-153	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-1950
241-246	SCREW-MACH ASSBLY M3 X 0.5 8MM-LG	0515-0372
273	BDG POST ASSY	1510-0038
274	WSHR LK .256ID	2190-0027
275	NUT-HEX 1/4-32	2950-0006
276	FUSE, 15A/250V	2110-0054
277	FUSE, 5A/250V	2110-0010
W18	CBL SMC-SMC	8120-5816

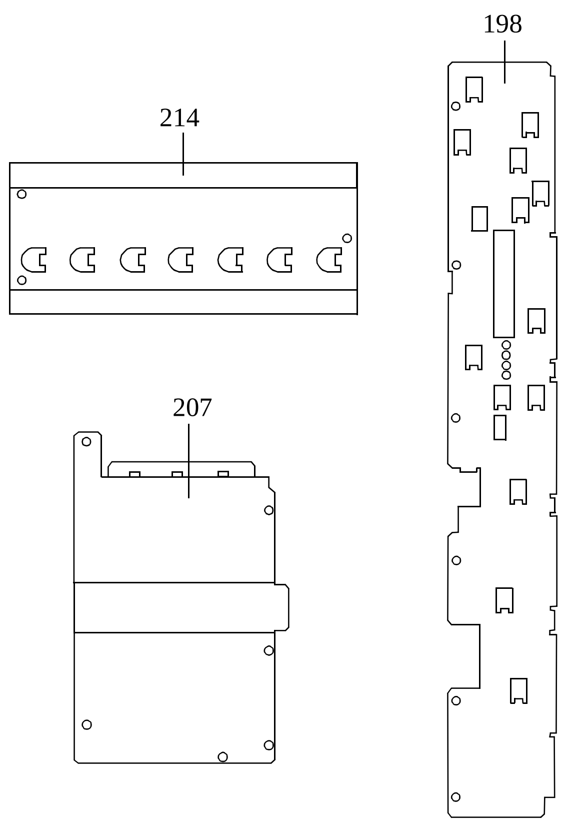


Figure 52 **Covers**

Table 180 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
198	COVER DIGITAL (for serial prefix <3501)	08920-00142
198	COVER DIGITAL (for serial prefix ≥3501)	08920-00176
207	COVER-AUDIO BDS	08920-00143
214	COVER-CARDBOX	08920-00087

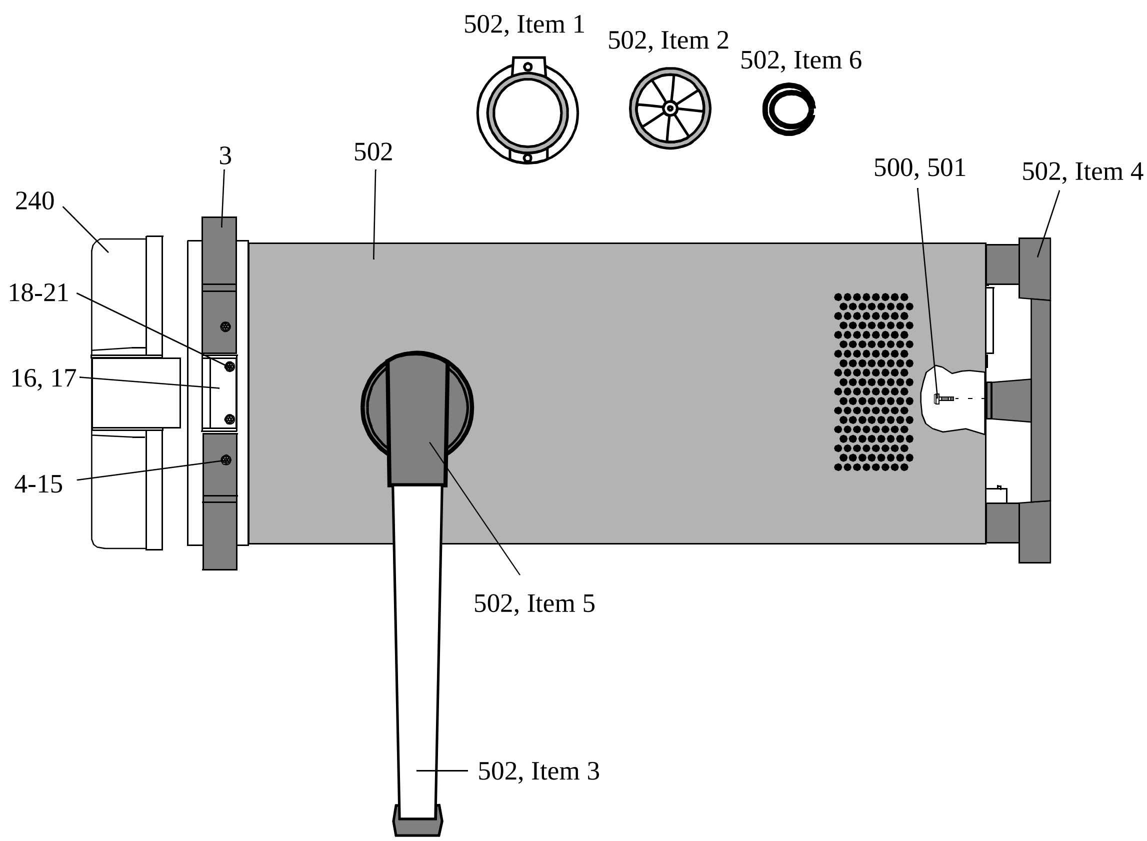


Figure 53 **Instrument Cover, Bumpers and Attaching Hardware**

Table 181 8921A Replaceable Parts

Item	Description	Replacement Kit or Part Number
3	BUMPER	5062-4806
4-15	MM3.08SEMPNTX	0515-0664
16,17	CATCH LATCH	5021-5483
18-21	SCREW-MACH ASSEMBLY M3 X 0.5 8MM-LG	0515-1940
240	IMPACT COVER AY	08920-61037
500,501	SCREW-MACH M4 X 0.7 10MM-LG PANHD	0515-1114
502	COVER ASSY	08920-61091
502,Item 1	GEAR RING	5021-6343
502,Item 2	SPROCKET GEAR	5021-6344
502,Item 3	HANDLE	5041-3624
502 Item 4	REAR FOOT	5041-8907
502 Item 5	TRIM CAP-HANDLE	5041-8912
502, Item 6	SPRING	1460-2164

11

Diagnostics Descriptions

This chapter contains detailed descriptions of the Self-Test Diagnostic and the three Functional Diagnostics.

- Audio Frequency Diagnostics (AF_DIAGS)
- RF Diagnostics (RF_DIAGS)
- Miscellaneous Diagnostics (MS_DIAGS)

  Use this information when your diagnosis is ambiguous or when you want further confirmation of your diagnosis before ordering replacement assemblies.

  To run the Diagnostics follow the procedures in **chapter 2, "Troubleshooting"** .

  For more information read the block-diagram theory of operation that applies to the Functional Diagnostic you are running. The theory of operation is found in **chapter 9, "Block Diagrams"**.

Description Of Self-Test Diagnostic

Introduction

The Self-Test Diagnostic can be run three ways:

1. The test runs automatically when the Test Set is turned on. After the Test Set powers up, a message appears at the top of the display. If one or more tests fail, the message reports the failure with a hexadecimal code.

As the tests proceed, failure information with greater detail than the displayed messages is coded (at power up only) on four LEDs on the top of the Controller assembly. To see them, the Test Set’s cover must be removed. **See chapter 3, "Repair"** for instructions on removing the Test Set’s cover.

2. The test runs when the Test Set receives the query **`*TST?`** over GPIB. The resultant decimal code can be read over the bus.

3. The test runs when Miscellaneous Diagnostics (MS_DIAGS) is run and the Self-Test is selected.

Reading Self-Test Diagnostic Failure Codes From the Front Panel or GPIB The failure codes are listed in **table 182**. If more than one failure occurs, the failure code will be the sum of the individual failure codes. The nature of the failure and the assembly most-likely at fault is also listed.

Table 182 Returned Values for Self-Test Diagnostic Failures

		Returned Error code	
Detected Failure	**Failed Assembly**	**Hexadecimal (displayed)**	**Decimal (GPIB)**
Microprocessor	A7 Controller	0002	2
ROM	A7 Controller or A8 Memory [a,b]	0004	4
RAM	A8 Memory [b]	0008	8
RAM	A8 Memory [b]	0010	16
Timer	A7 Controller	0020	32
Real-Time Clock	A8 Memory [b]	0040	64
Keyboard (stuck key)	A1 Keyboard [c]	0080	128
RS-232 I/O	A21 GPIB/RS-232/Curr Sense[b]	0100	256
Serial Bus Communication	Any Non-Optional assembly [b,d]	0200	512
Signaling Board Self-Test	A6 Signaling Source/Analyzer[b]	0400	1024
CRT Controller Self-Test	A20 CRT Drive	0800	2048
Miscellaneous Hardware	Several Possible Assemblies [b, e]	1000	4096

a. A7 Controller if 8920B; A8 Memory if 8920A or 8921A.
b. This assembly may be optional or there may be an optional version of it in some Test Sets.
c. Could also be the A7 Controller with a faulty key-down detector.
d. This checks the ability of the Controller to communicate with any hardware on the bus.
e. This message occurs if expected hardware is absent or non-responding to the Controller.

Reading LED Codes

When the Self-Test Diagnostic reports a failure, more information about the failure may be available inside the Test Set. This additional information is output to the four LEDs on the top of the Controller assembly. The failure codes are layered, that is, sent out as code sequences. **Figure 54, "Reading the Self-Test Diagnostic Using the Internal LEDs," on page 592** and the tables following it document some of the more useful code sequences. You may need to run the Self-Test Diagnostic several times to figure out a particular LED sequence.

NOTE: The LEDs output Self-Test Diagnostic codes only when the Test Set is powering up. The LEDs remain off when the Self-Test Diagnostic is initiated through programming or running the Miscellaneous Diagnostics. To read the LED codes, the Test Set's cover must be removed.

If the Test Set has no faults that can be detected by the Self-Test Diagnostic, the four LEDs on the Controller assembly will light and remain on for about ten seconds. During that period, a short beep will be heard. Then the LEDs will then extinguish and remain off.

If a fault is detected during the test:

1. The four LEDs will go on for about four seconds.
2. The LEDs will blink a failure code which corresponds to the error listed in . **Table 183, "Audio Generators 1 and 2 Failure Codes" on page 599** shows the blinking LED codes.
3. Two non-blinking LED codes will follow. The interpretation of these codes depends on the preceding blinking code. Two sets of the non-blinking codes are listed in **figure 56, "Non-blinking LED Codes For Serial Bus Communication Failure," on page 594** and **figure 57, "Non-Blinking LED Codes For Miscellaneous Hardware Failure," on page 595**.
4. If there is more than one failure, the test will loop back to step 2 and repeat until the last failure is reported.

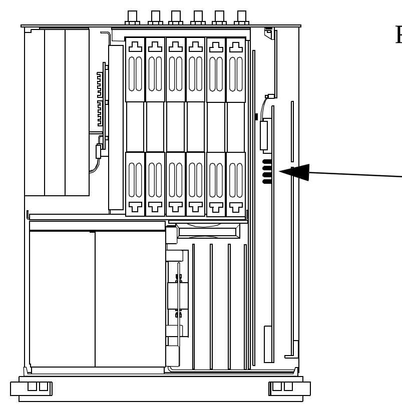
The pattern generated by the LEDs can be interpreted as a binary-weighting code. The LED closest to the rear of the instrument (labeled “0”) is the least-significant bit. For example if the LEDs output the blinking pattern: Off, On, On, On (reading front-to-back or LEDs “3 2 1 0”), the binary number is 0111 or decimal 7. The error codes shown in **table 182 on page 590** are weighted by the binary value. The weighted value for this example is decimal 2^7 = 128 or hexadecimal 80. (This example is easy to emulate; simply power-up the Test Set while holding a key down.)

1

Remove Test Set cover.

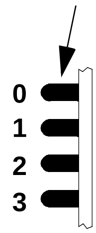
2

Turn power on.



3

Read LED sequence.

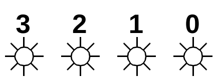


NOTE:For multiple failures, the failure patterns described below will repeat for all failures detected.

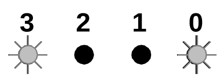
LED Sequences

No Failures ...

The LEDs will light for about 10 seconds, then all will turn off.



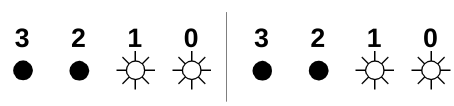
Failures ...Three patterns are displayed. The first blinks rapidly and indicates the type of failure.



See the following tables.

(The example indicates a Serial Bus Communication fault.)

The second and third patterns blink slowly and indicate failure details.



This manual covers only Serial Bus Communication and Miscellaneous Hardware failures.

(The example indicates a faulty A3 Audio Analyzer 1 assembly.)

LED Legend

● = off

= rapid blink

= steady on or slow blink

Figure 54 **Reading the Self-Test Diagnostic Using the Internal LEDs**

If the first LED pattern displayed is ...				Then the failure is ...
3	**2**	**1**	**0**	
●	●	●	✹	Microprocessor
●	●	✹	●	ROM Checksum (See note 1.)
●	●	✹	✹	RAM (See note 2.)
●	✹	●	●	RAM (See note 3.)
●	✹	●	✹	Timer
●	✹	✹	●	Real-Time Clock
●	✹	✹	✹	Keyboard (stuck key or faulty key-down detector)
✹	●	●	●	RS-232 I/O
✹	●	●	✹	Serial Bus Communication (See figure 52)
✹	●	✹	●	Signaling Board Self Test
✹	●	✹	✹	CRT Controller Self Test
✹	✹	●	●	Miscellaneous Hardware (See figure 53)

LED Legend
● = off
✹ = rapid blink
☼ = steady on or slow blink

NOTES
1.Second and third LED failure patterns:
8920A:0001 and 0001 for any ROM failure
8921A: 0001 and 0001 for any ROM failure
8920B: 0001 and 0001 for any main ROM failure
0001 and 0002 for boot ROM failure
2.Second and third LED failure patterns:
8920A:0001 and 0001 for A8 Memory board RAM failure
8921A: 0001 and 0001 for A8 Memory board RAM failure
8920B: 0001 and 0001 for A8 Memory board RAM failure
0001 and 0002 for A7 Controller board RAM failure
3.Second and third LED failure patterns:
0001 and 0001 for A8 Memory board RAM failure
0001 and 0010 for A8 Memory board RAM failure

Figure 55 **First LED Patterns**

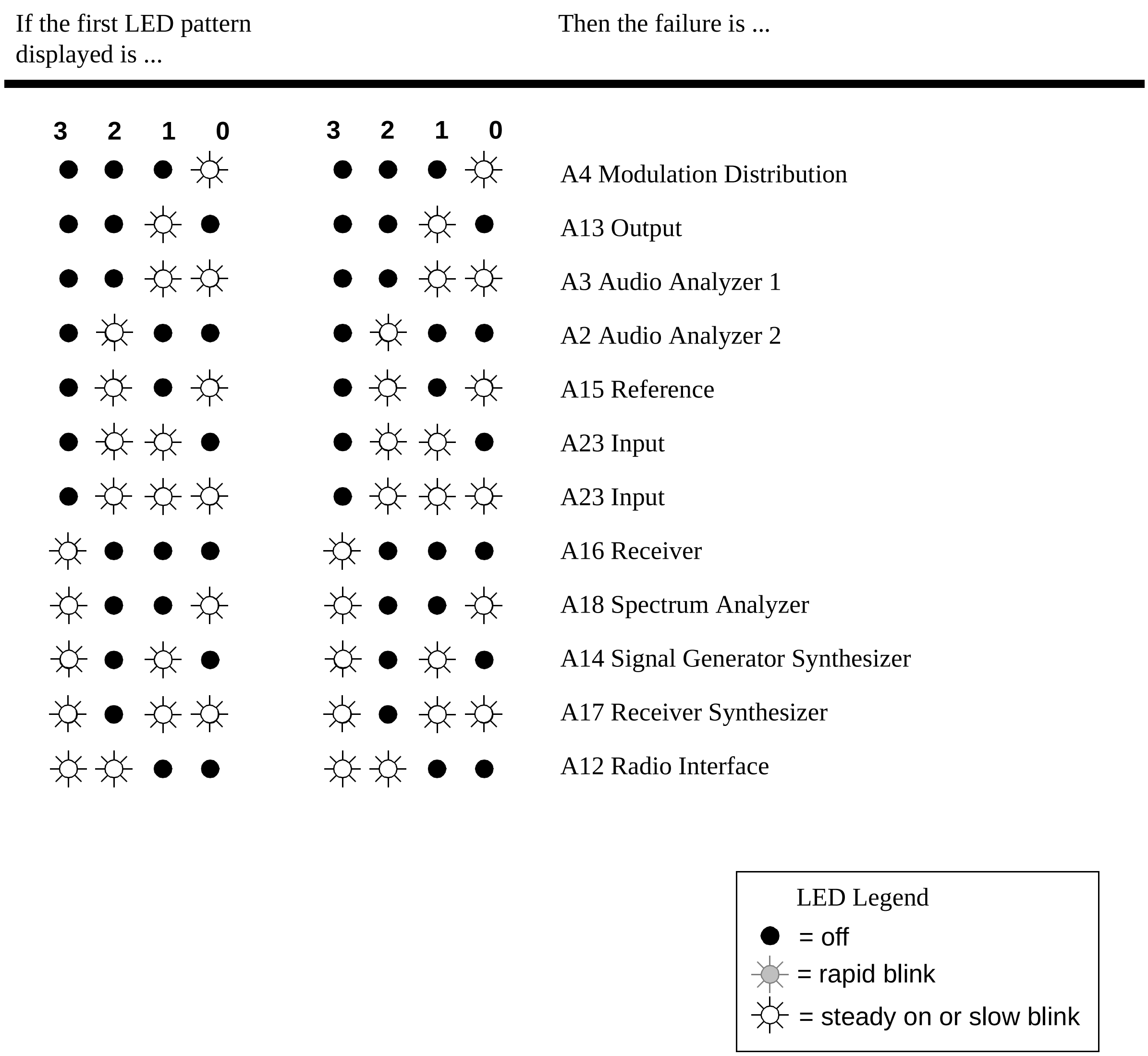


Figure 56 **Non-blinking LED Codes For Serial Bus Communication Failure**

If the first LED pattern displayed is ...								Then the failure is ...
3	**2**	**1**	**0**	**3**	**2**	**1**	**0**	
●	●	●	☼	●	●	●	☼	A15 Reference
●	●	●	☼	●	●	☼	●	A3A1 Audio Filter 1 - C-Message
●	●	●	☼	●	●	☼	☼	A3A2 Audio Filter 2 - 6 kHz BPF
●	●	●	☼	●	☼	●	●	A2 Audio Analyzer 2 - Var Freq Notch Filter
●	●	●	☼	●	☼	●	☼	A21 GPIB/RS-232/Current Sense - Centronics
●	●	☼	●	x	x	x	x	Cellular Adapter Analyzer Self Test Failure
●	●	☼	☼	x	x	x	x	Cellular Adapter Analyzer Generator Test Self Failure

x = denotes a state that depends on the Cellular Adapter attached to the test Set.

LED Legend
● = off
☼ = rapid blink
☼ = steady on or slow blink

Figure 57 **Non-Blinking LED Codes For Miscellaneous Hardware Failure**

Description Of Audio Diagnostics (AF_DIAGS)

Introduction

The Audio Diagnostics are divided into seven tests. In each test, a diagnosis of the failures is made at the end of all the measurements in that test. Even though each test is independent from the others, it is recommended that all tests be run in the order presented on the menu screen.

The failure codes are keyed to the circuit names in the block diagrams accompanying the test explanations. If an explanation is ranked **`(high)`**, there is a high probability that the assembly named is faulty. A rank of **`(medium)`** is shown when more than one assembly is listed and it is unclear which assembly is most likely at fault. A rank of **`(low)`** indicates that the assembly named is not the only suspect assembly.

Audio circuits not tested by the Audio Diagnostics are:

- A6 Signal Source/Analyzer - audio analyzer portion
- A4 Modulation Distribution -circuits associated with the MIC/ACC jack, AM and FM outputs
- A3 Audio Analyzer 1 - some of the inputs
- A2 Audio Analyzer 2 - speaker drive, volume control, ALC
- General - digital control

Audio Frequency Generators 1 and 2

This test checks the ability of Audio Frequency Generators 1 and 2 on the A6 Signaling Source/Analyzer assembly to generate the DC levels programmed into them.

The Audio Frequency Generators are located on the Signaling/Source Analyzer assembly.

In this test, a “walking 1” (that is, 0, 1, 2, 4,…, 1024) is input to the DAC. The DC output level is measured by the Test Set’s internal DVM through a dedicated multiplexer line. The output level should be proportional to the programmed input.

The following values are also input to the DAC:

- 2047 (which gives the highest positive output)
- 2048 (which outputs 0 V)
- 2049 (which produces the negative of the value for 2047 and is sufficient to verify that the output can accurately output a negative voltage)
- 4095

Note that the measurements are static (DC); an AC waveform should be accurate if the DC values are correct. (Other tests will implicitly confirm this.)

The measurement limits are ±10% of nominal ±16 mV offset. To keep the test simple, no attempt is made to check incremental stepping to improve accuracy at low settings. Failure information is simple enough so that it is possible to pinpoint the faulty assembly without elaborate diagnosis. The failure codes are as follows:

Table 183 Audio Generators 1 and 2 Failure Codes

Failure Codes	Probable Cause(s)
Code 1	Suspect Signaling Source/Analyzer assembly (medium). (AFG1 Level Setting DAC faulty.) O r Measurement assembly (medium) (Voltmeter multiplexer problem.)
Code 2	Suspect Signaling Source/Analyzer assembly (medium) (AFG2 Level Setting DAC faulty.) Or Measurement assembly (medium) (Voltmeter multiplexer problem.)
Code 3	Suspect Measurement assembly (high) (Voltmeter problem.)

Preliminary Audio Paths

This test checks the ability of the A4 Modulation Distribution assembly to route an audio signal from Audio Frequency Generators, to the monitor select switch, and to the AM and FM modulators. It checks that the audio leaves the A4 assembly, but does not check whether it actually gets to the AM and FM modulators. The test that follows this one (*Modulation Distribution Internal Paths*) does the fine-resolution testing of the circuits.

This is a test of the integrity of the Modulation Distribution assembly. It verifies the functioning of the signal-routing switches. The nine paths in this test are shown as heavy lines in **figure 58** through **figure 63** .

NOTE: In these figures, three circuits on the Modulation Distribution assembly (AFG1 Amplifier, AFG1 Level Amplifier, and AFG1 Attenuator 1) are combined into one circuit block labeled AFG1 Circuits. This also applies to AFG2. Refer to **figure 65, "Mod Distribution Internal Paths 5-8 (Paths 9-11 check Internal Pre Mod Filters)," on page 610** which explicitly shows these circuits.

Measurement limits are ±10% of nominal when a signal is expected at the output (Paths 1, 3, 5, 6, 7, and 9). The limits are ±20 mV when the signal should be absent (Paths 2, 4, and 8). It is also as important to check paths which are intended to block signals (that is, that expect no output) as it is to check paths that should pass signals.

Paths which block signals are open switches (in Paths 2 and 4) or blocking capacitors with DC applied (in Path 8).

All paths are stimulated with DC except Path 9. Path 9 checks the DC blocking capacitor that couples signal to the front-panel AUDIO OUT port. Path 9 is the only path that uses a Peak Detector.

All measurements in this test are made with fixed level and gain parameters. Only signal-routing switch settings and the waveform of Audio Frequency Generator 2 are changed. The fixed settings are as follows:

- Level of Audio Frequency Generators 1 and 2 (AFG1 and AFG2) set to 1 V.
- Frequency of Audio Frequency Generator 2 set to 1 kHz in AC.
- Gain of AFG 1 and 2 Level Amplifiers set to 0.784 (DAC set to 200 out of a maximum of 255).
- Attenuation of AFG1 and AFG2 Attenuator 1 set to 0 dB.
- Attenuation of AFG1 and AFG2 Attenuator 2 set to 0 dB.

These fixed final settings result in nominal DVM readings of:

- 1.725 V for Paths 1.
- 3.45 V for Path 5.
- 2.16 V for Paths 6, 7, and 9.
- 0 V for Paths 2, 4, and 8.

These settings are near optimum for the devices tested. The DAC setting of 200 (which sets the gain of the two AFG level amplifiers) is the nominal maximum. (Values between 201 and 215 are not normally used.)

The following example illustrates how the levels are determined. For Path 1:

- AFG1 input is 1 V.
- AFG1 Amplifier gain is 2.2 (6.85 dB).
- AFG1 Level Amplifier gain is set to 0.784 (-2.11 dB).
- AFG1 Attenuator 1 gain is set to 1 (0 dB).
- Modulation Select Sum Amplifier gain is 1 (0 dB).
- Other gains (switches and buffers) are 1 (0 dB).

Multiplying the these settings gives 1.725 V (4.74 dBV) at the input to the DVM.

The failure codes for the preliminary audio paths are as follows:

Table 184 Preliminary Audio Paths Failure Codes

Failure Codes	Probable Cause(s)
Code 2	Suspect Modulation Distribution assembly (high) (AFG1 Modulation Select Source Switch stays closed.)
Code 8	Suspect Modulation Distribution assembly (high) (AFG2 Modulation Select Source Switch stays closed.)
Code 17	Suspect Modulation Distribution assembly (high) (AFG1 Modulation Select Source Switch open.)
Code 20	Suspect Modulation Distribution assembly (high) (AFG2 Modulation Select Source Switch open.)
Code 21	Suspect Modulation Distribution assembly (high)\ (Modulation select output problem. Check Modulation Select Source Switch (including FM Polarity amplifier, not shown in figure).)
Code 31	Suspect Modulation Distribution assembly (high) (Monitor Select Multiplexer Switch stays in audio output position.)
Code 32	Suspect Modulation Distribution assembly (high) (AFG1 Atten 2 or Audio Output Sum Amplifier open.)
Code 49	Suspect Modulation Distribution assembly (high) (AFG1 path problem. Check AFG1 circuits Filter Amplifier, Int Level Amplifier DAC, and Atten 1.)
Code 96	Suspect Modulation Distribution assembly (high) (Audio AC/DC Coupling switch open.)
Code 117	Suspect Audio Analyzer 2 assembly (medium) (Problem with path from the Monitor Select Input to DVM OUT.) Or Measurement assembly (low) (Voltmeter multiplexer problem.)
Code 128	Suspect Modulation Distribution assembly (high) (Shorted Audio AC/DC Coupling switch or capacitor.)
Code 256	Suspect Modulation Distribution assembly (high) (Audio AC/DC Coupling capacitor open.) Or Audio Analyzer 2 assembly (low)(Problem with path from Monitor Select input to Pos Peak Detector.) Or Measurement assembly (low) (Voltmeter multiplexer problem.)

Table 184 Preliminary Audio Paths Failure Codes (Continued)

Failure Codes	Probable Cause(s)
Code 320	Suspect Modulation Distribution assembly (high) (AFG2 Atten 2 or Audio Output Sum Amplifier open.)
Code 340	Suspect Modulation Distribution assembly (high) (AFG2 path problem. Check AFG2 circuits Filter Amplifiers, Internal Level Amplifier DAC, and Atten 1.)
Code 352	Suspect Modulation Distribution assembly (high) (Audio output problem. Check Audio Output Sum Amplifier, and Monitor Select Multiplexer switch.)
Code 373	Suspect Modulation Distribution assembly (high) (Monitor Select Multiplexer switch open or stays in modulation input or Microphone input position (not shown in figure).) Or Measurement assembly (low) (Voltmeter multiplexer problem.)

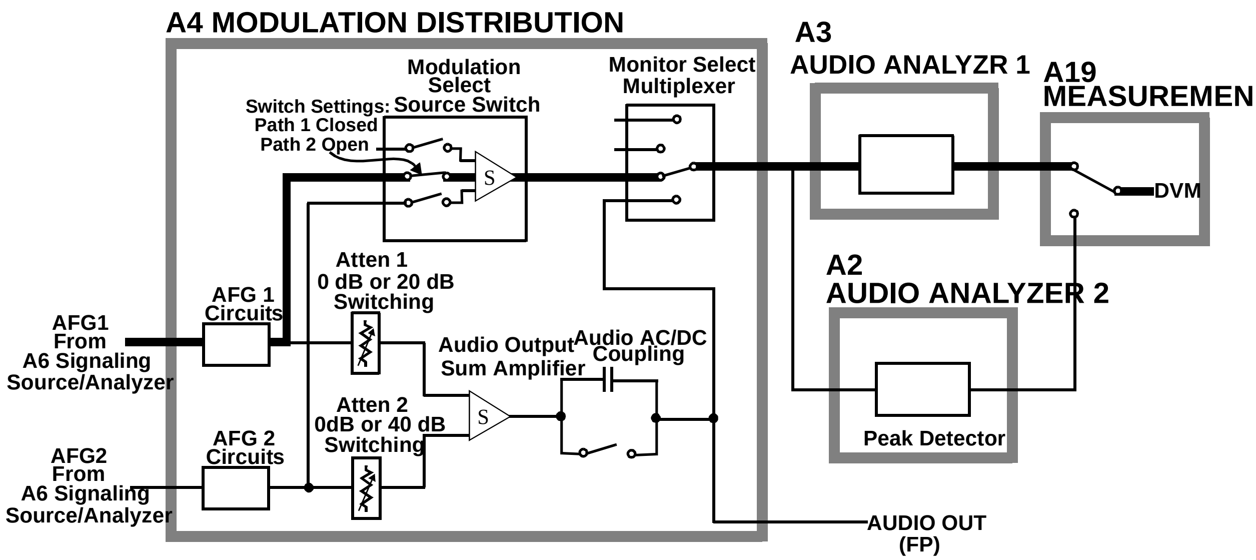


Figure 58 **Preliminary Audio Paths 1 and 2**

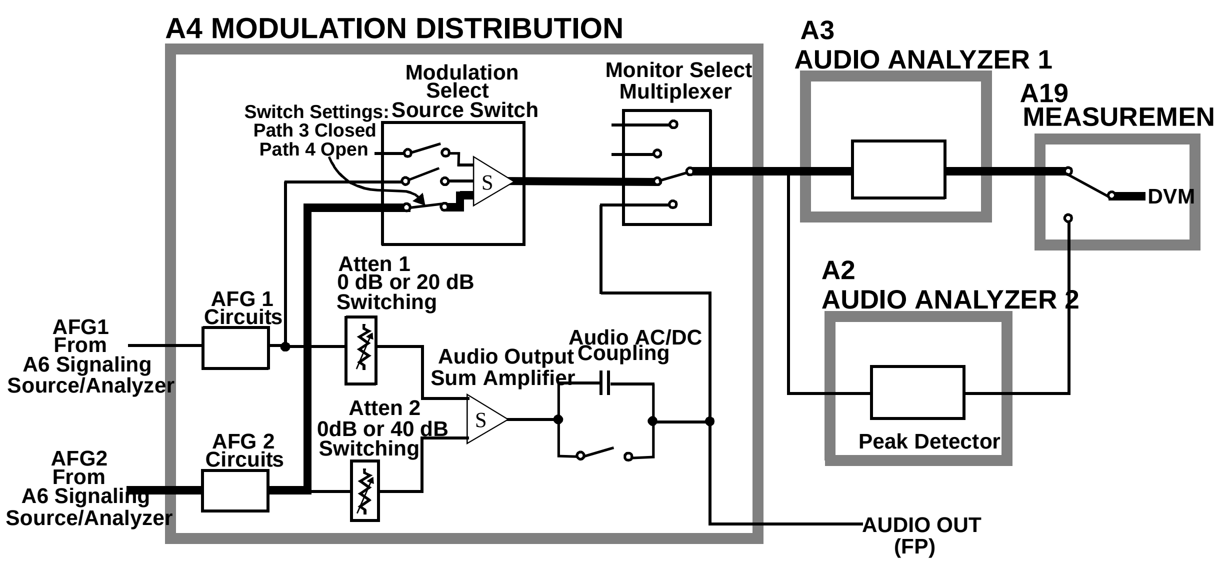


Figure 59 **Preliminary Audio Paths 3 and 4**

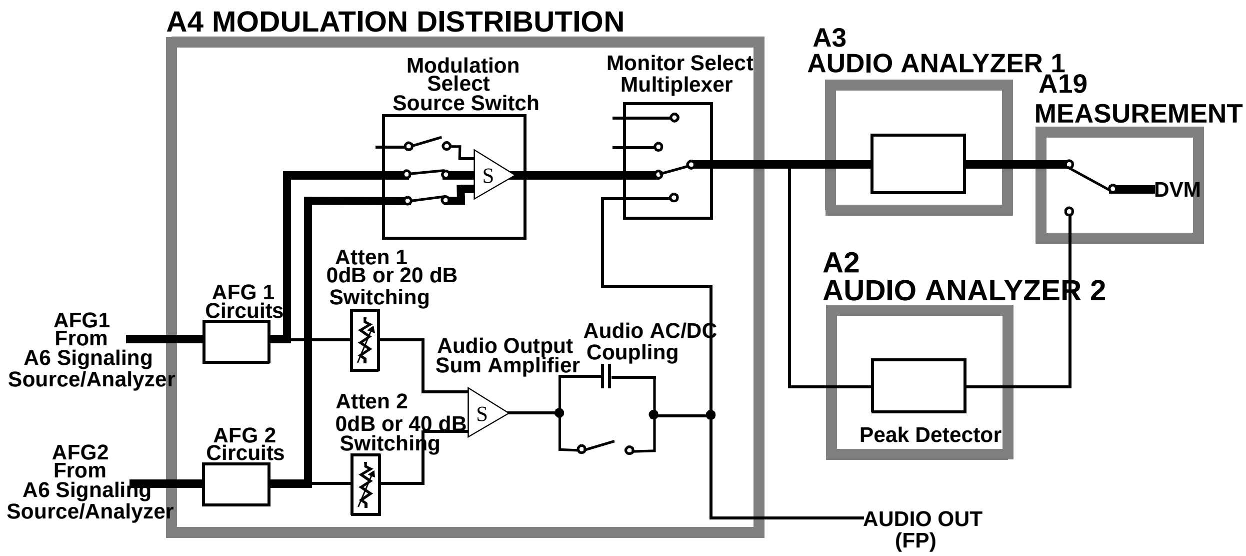


Figure 60 Preliminary Audio Path 5

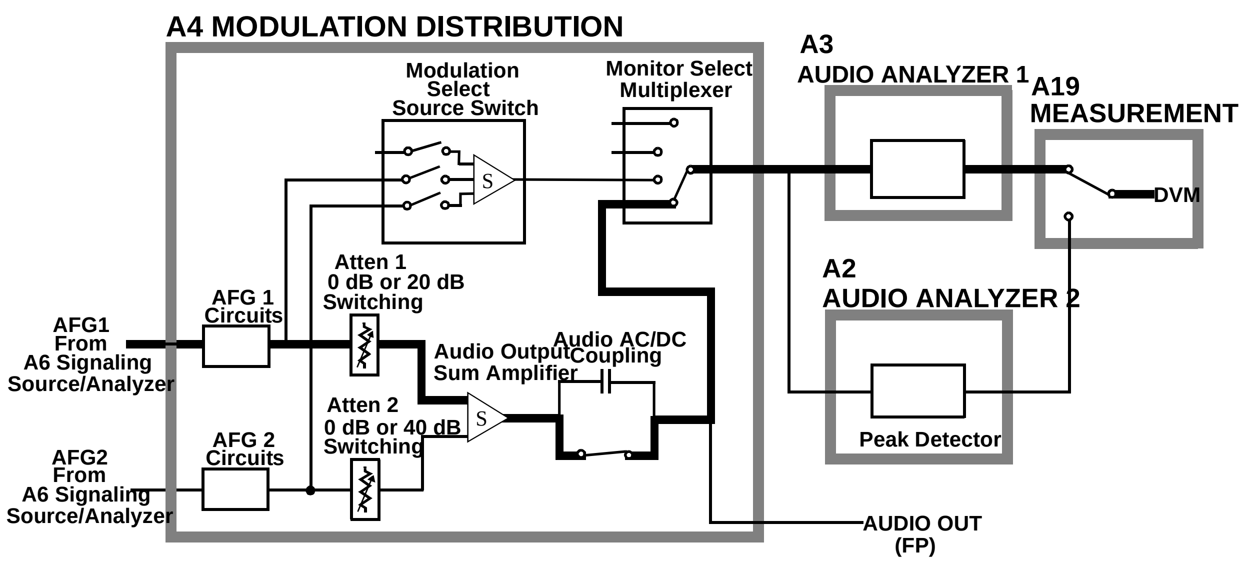


Figure 61 Preliminary Audio Path 6

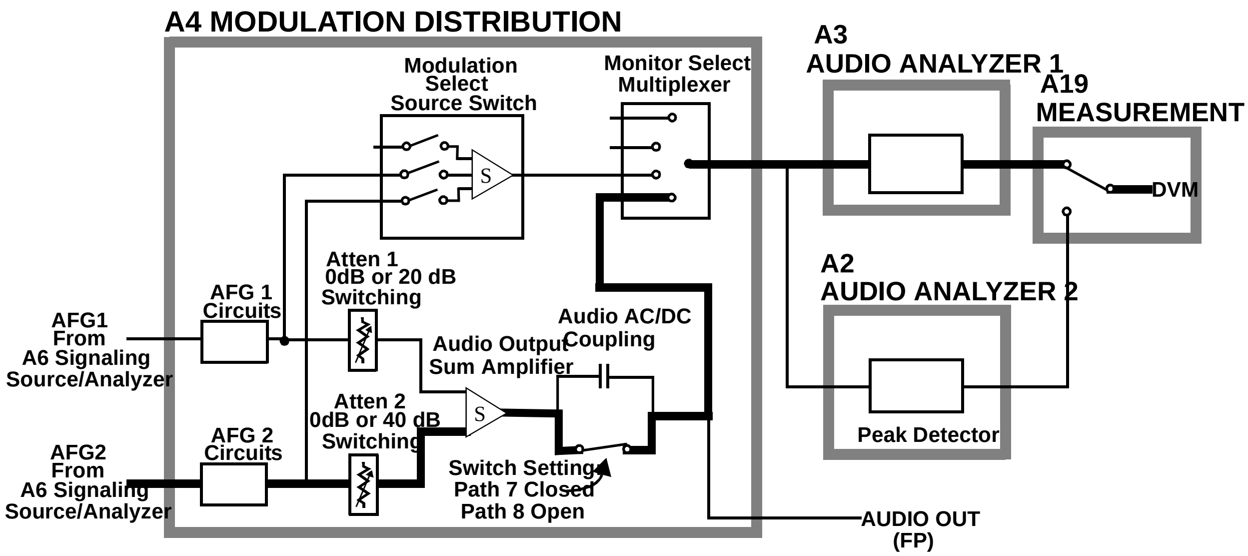


Figure 62 **Preliminary Audio Path 7 and 8**

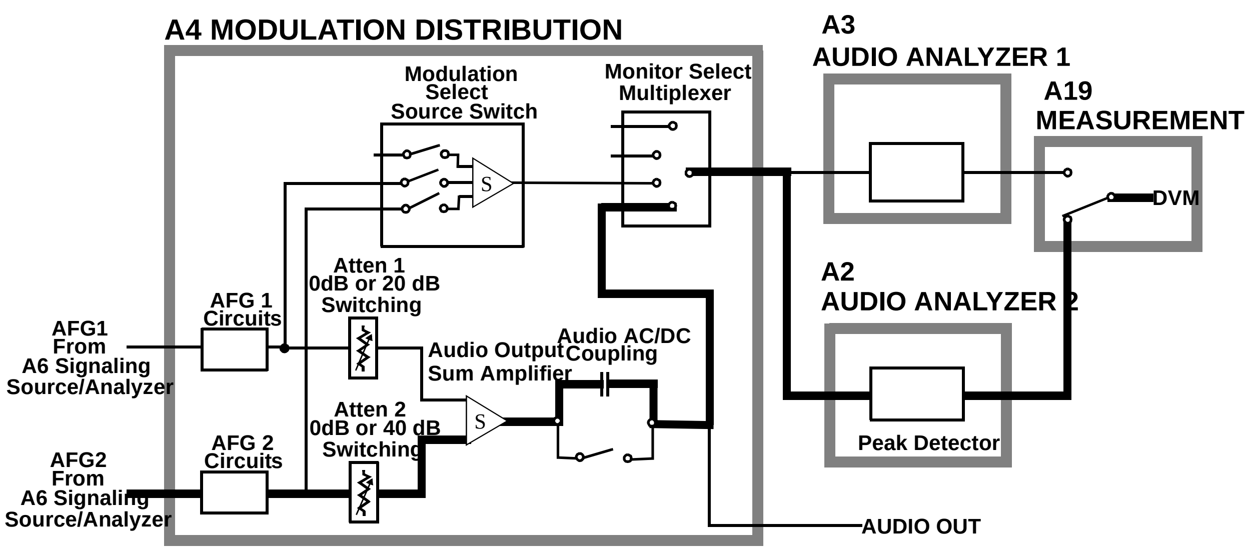


Figure 63 **Preliminary Audio Path 9**

Modulation Distribution Internal Paths

This test checks out the Modulation Distribution assembly for those paths which relate to inputs from the two Audio Frequency Generators. Basically the paths are the same as in the *Preliminary Audio Paths* test; however, the circuits are tested more thoroughly by varying settable parameters (gain and attenuation). The paths are illustrated in **figure 64, "Modulation Distribution Internal Paths 1 to 4," on page 609** and **figure 65, "Mod Distribution Internal Paths 5-8 (Paths 9-11 check Internal Pre Mod Filters)," on page 610**.

The audio sources are set to AC. The measurements at the DVM are always DC since the signal is routed to the Peak Detector in Audio Analyzer 2 (this is not shown in **figure 63** and **figure 64**). Measurement limits are ±10% of nominal ±10 mV offset when a signal is expected at the output and ±10 mV when the signal is absent (when Attenuator 2 is set to open).

In this test, a “walking 1” (that is, 0, 1, 2, 4,…, 128, 255) is programmed into the gain-control DAC of the Level Amplifiers. In normal use the highest DAC setting is 200. The system gain was discussed in the *Preliminary Audio Paths* test. Attenuator 1s are set to attenuation’s of 1 and 0.1. Attenuator 2s are set to attenuation’s of 1, 0.01, and open. Do not confuse Attenuators 1 and 2. There are two Attenuator 1s, AFG1 Attenuator 1 and AFG2 Attenuator 1; there are two Attenuator 2s, AFG1 Attenuator 2 and AFG2 Attenuator 2.

In newer Test Sets there are three low-pass filters (150 Hz, 250 Hz, and 20 kHz) in the path for AFG2. The three filters are tested if present in measurement paths 9, 10, and 11 (not shown in **figure 65**).

The failure codes for the Modulation Distribution assembly’s internal paths are as follows:

Table 185 Modulation Distribution Internal Paths Failure Codes

Failure Codes	Probable Cause(s)
Code 2	Suspect Modulation Distribution assembly (high) (AFG1 Atten 1 stays at gain=1.)
Code 5	Suspect Modulation Distribution assembly (high) (AFG1 Atten 1 stays at gain=0.1.)
Code 7	Suspect Modulation Distribution assembly (high) AFG1 path problem. Check AFG1 Filter/Amplifiers, Int Level Amplifier DAC, and Atten 1 and 2.)
Code 11	Suspect Modulation Distribution assembly (high) (AFG1 Atten 2 stays at gain=0.01.)
Code 12	Suspect Modulation Distribution assembly (high) (AFG1 Atten 2 stays at gain=1.)
Code 32	Suspect Modulation Distribution assembly (high) (AFG2 Atten 1 stays at gain=1.)
Code 80	Suspect Modulation Distribution assembly (high) (AFG2 Atten 1 stays at gain=0.1.)
Code 112	Suspect Modulation Distribution assembly (high) (AFG2 path problem. Check AFG2 Filter/Amplifiers, Int Level Amplifier DAC, and Atten 1 and 2.)
Code 119	Suspect Modulation Distribution assembly (high) (Path from Audio Output Sum Amplifier through Monitor Select Multiplexer open.) OR Audio Analyzer 2 assembly (low) (Path from the Monitor Select Input to DVM OUT faulty.)
Code 176	Suspect Modulation Distribution assembly (high) (AFG2 Atten 2 stays at gain=0.01.)
Code 192	Suspect Modulation Distribution assembly (high) (AFG2 Atten 2 stays at gain=1.)

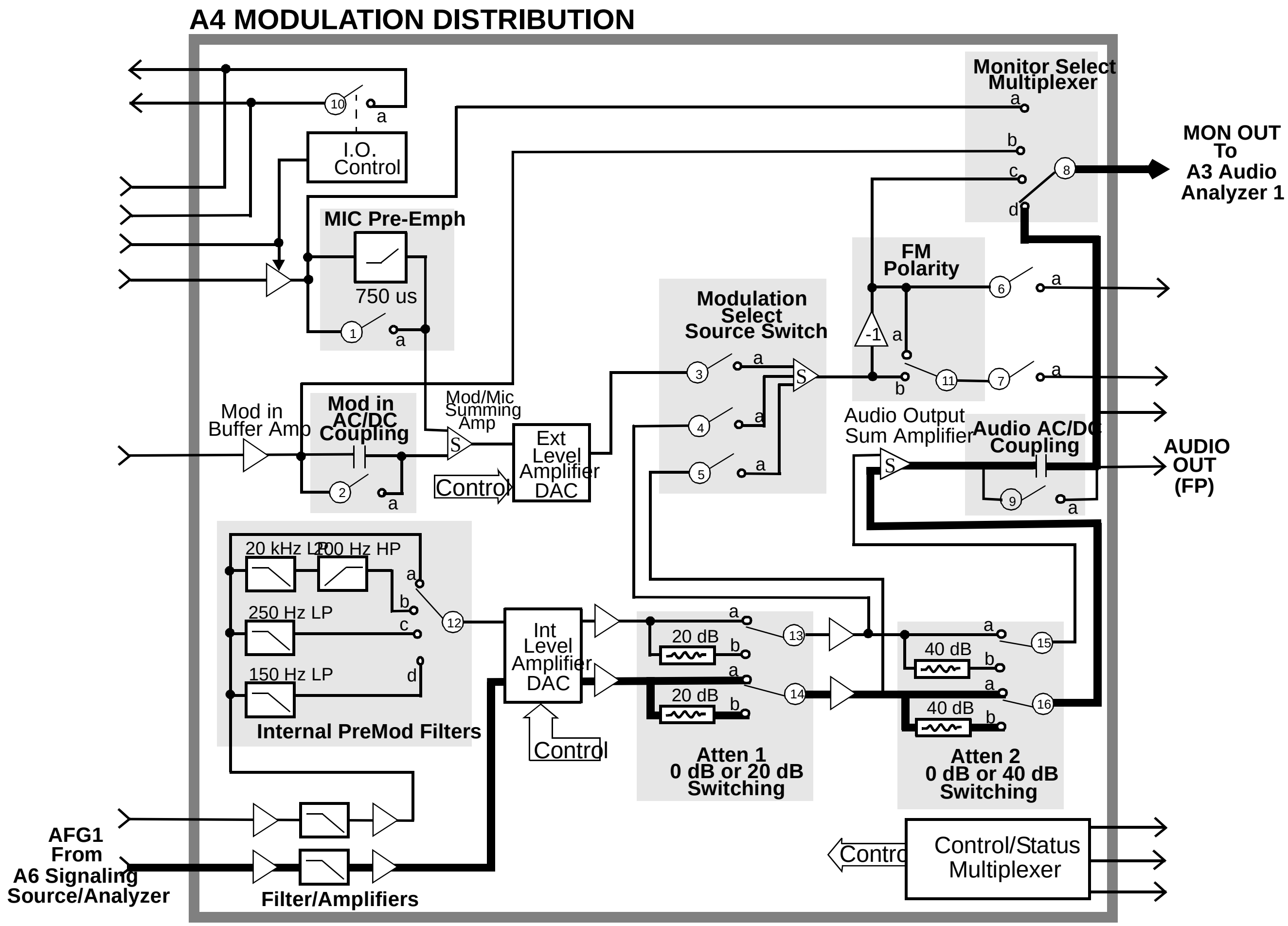


Figure 64 Modulation Distribution Internal Paths 1 to 4

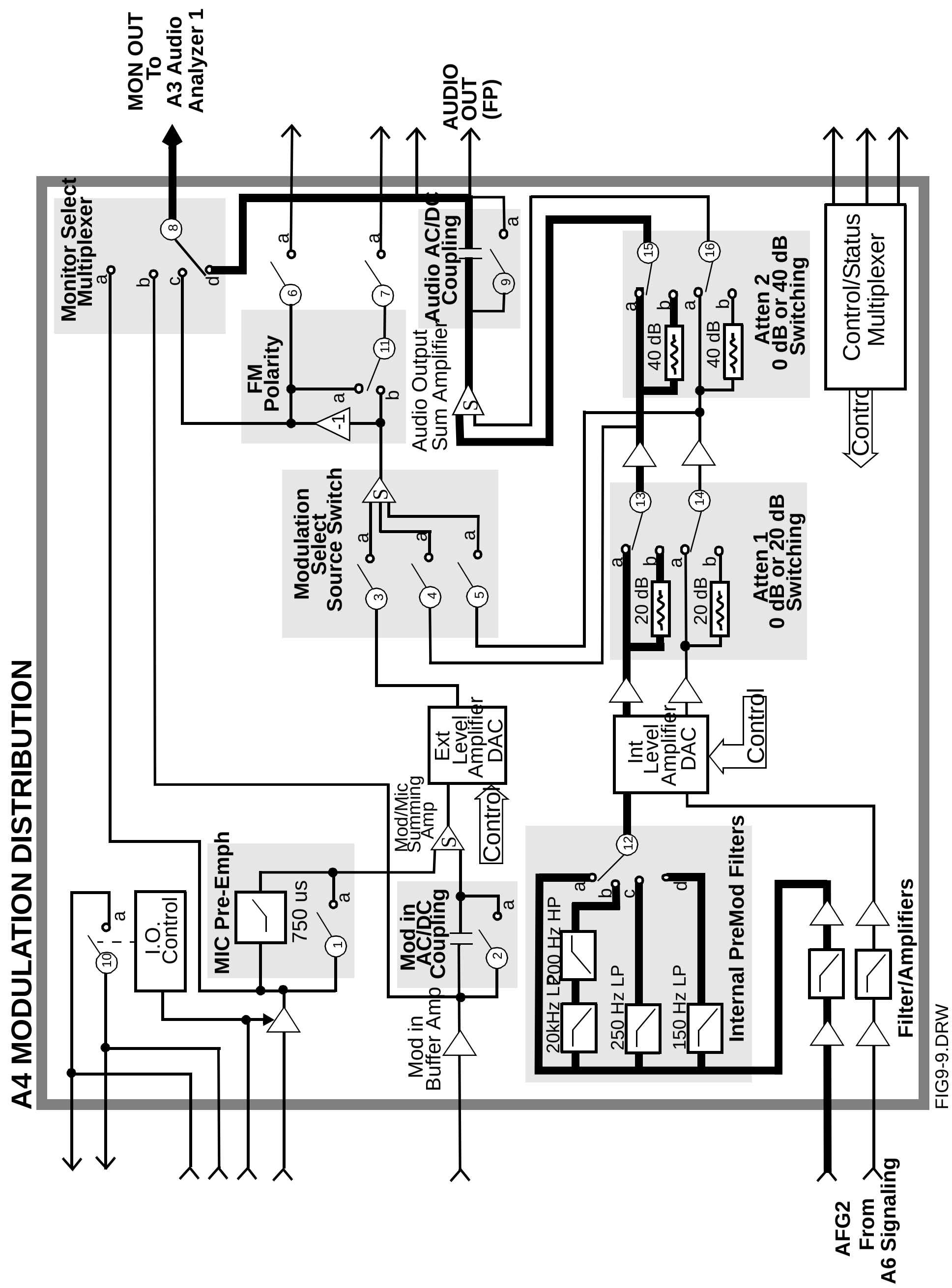


Figure 65 Mod Distribution Internal Paths 5-8 (Paths 9-11 check Internal Pre Mod Filters)

Modulation Distribution External Paths

This test checks the ability of the A4 Modulation Distribution assembly to route an external modulation signal to the monitor output of the A4 assembly. It also checks the ability of the A4 assembly to adjust the level of an external modulation signal. The paths which relate to internal inputs are checked in the previous test.

This test checks the Modulation Distribution assembly's path from the rear-panel MODULATION INPUT to the Monitor Select output. Before doing this, the path from Audio Frequency Generator 1 to the Monitor Select is checked to assure that the audio source can be used as an external test signal via the front-panel AUDIO OUT connector. The paths are illustrated in **figure 66** through **figure 69** .

Audio Generator 1 is the signal source for all measurements (internal or external). The signal is DC except where AC coupling is checked (Path 7). Measurement limits are ±10% of nominal when a signal is expected at the output, and ±40 mV when the signal is absent (this occurs when the Modulation Select Source Switch is set to open and when DC is applied to blocking capacitor of Mod In AC/DC coupling). However, the limit on DAC-gain controlled amplifiers is ±10% of nominal ±40 mV.

In Path 1 the integrity of the internal signal at the AUDIO OUT connector is tested. In Path 2 the signal is routed externally to the MODULATION INPUT connector where it is measured through the shortest path (which goes from the output of the Modulation Input Buffer Amplifier to the Monitor Multiplexer Select Source switch).

The strategy for checking the DAC-controlled external level amplifier is similar to the strategy for the previous test. This amplifier has two variable-gain stages: (1) a stage which sets the level based on user input and (2) a fine-adjustment stage which is factory- or user-calibrated to correct for variations in overall path gain. Stage 1 is tested with a “walking 1”; stage 2 is tested at one point (DAC set to 255).

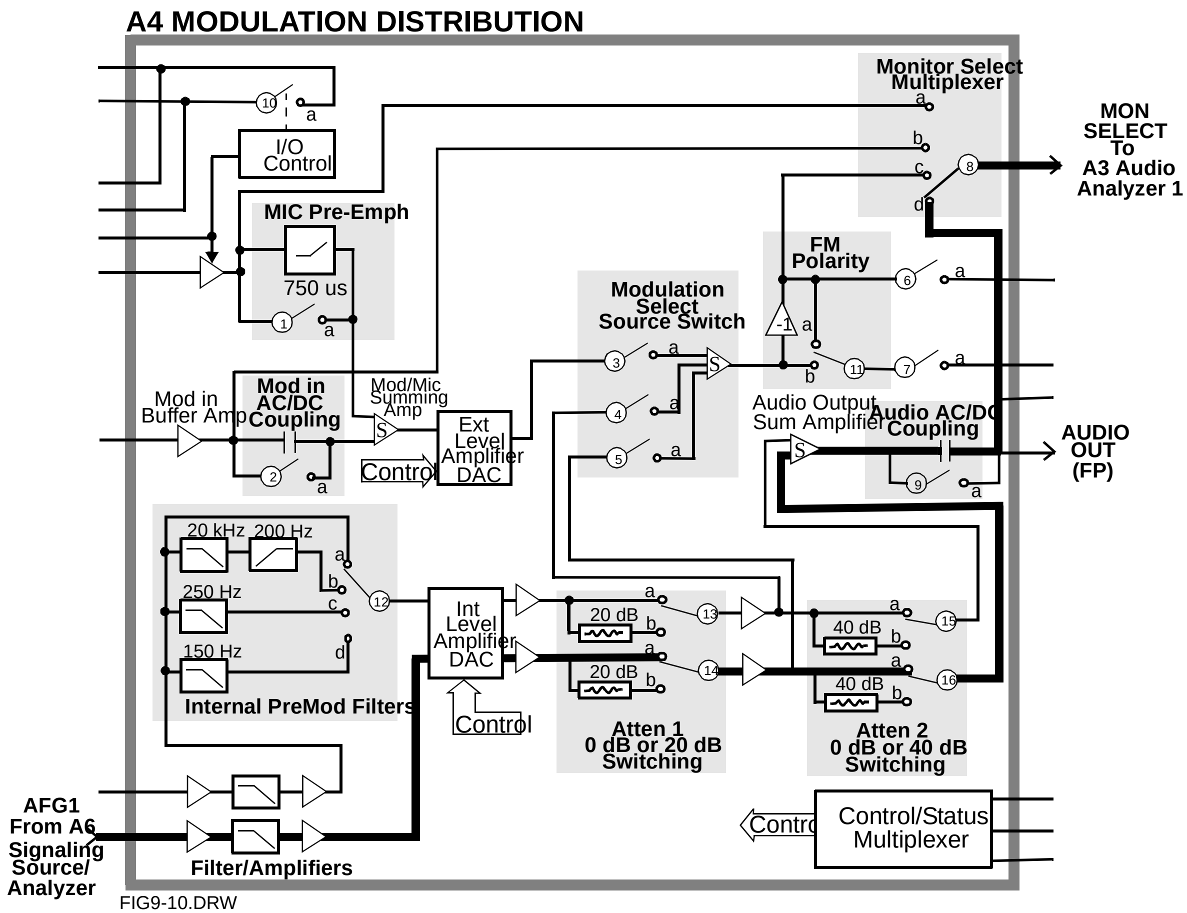
The external attenuator is checked for gains of 1 and 0.1.

The failure codes for the Modulation Distribution assembly's external paths are as follows:

Table 186 Modulation Distribution External Paths Failure Codes

Failure Codes	Probable Cause(s)
Code 1	Suspect Modulation Distribution assembly (high) (Audio output path problem from AUDIO OUT junction to Monitor Select Multiplexer output.)
Code 3	Suspect Modulation Distribution assembly (high) (Monitor Select Multiplexer switch stays in Mod Select position.)
Code 4	Suspect Modulation Distribution assembly (high) (The calibration portion of Ext Level Amplifier DAC stays at a low setting or has low gain.)
Code 8	Suspect Modulation Distribution assembly (high) (Ext Level Amplifier Attenuation stays at gain=1 or Ext Level Amplifier DAC stays at high gain.)
Code 12	Suspect Modulation Distribution assembly (high) (Mod In AC/DC Coupling switch is always open.)
Code 16	Suspect Modulation Distribution assembly (high) External switch 3 of Modulation Select Source stays closed.)
Code 32	Suspect Modulation Distribution assembly (high) (Mod In AC/DC Coupling switch or capacitor is shorted.)
Code 64	Suspect Modulation Distribution assembly (high) (The Mod In AC/DC Coupling capacitor is open.)
Code 68	Suspect Modulation Distribution assembly (high) (Ext Level Amplifier Attenuation stays at gain=0.1.)
Code 76	Suspect Modulation Distribution assembly (high) (The Modulation Input path is faulty. Check Modulation/Mic Summing Amp, Ext Level Amplifier DAC, Ext Level Amplifier Attenuation, and Modulation Select Source Switch summing amplifier or switches.)
Code 78	Suspect Modulation Distribution assembly (high) (The path from AUDIO OUT to MODULATION INPUT or Mod In Buffer Amp is faulty.)
Code 79	Suspect Modulation Distribution assembly (high) (AFG1 path problem. Check AFG1 Filter/Amplifiers, Int Level Amplifier DAC, and Atten 1 and 2.) Or path from Audio Output Sum Amplifier to Monitor Select Multiplexer output is faulty.) Or Measurement assembly (low) (Voltmeter multiplexer problem.)
Code 125	Suspect Modulation Distribution assembly (high) (Monitor Select Multiplexer switch stays in modulation input position **c**.)
Code 126	Suspect Modulation Distribution assembly (high) (Monitor Select Multiplexer switch stays in audio output position **d**.)

Figure 66 Modulation Distribution External Path 1



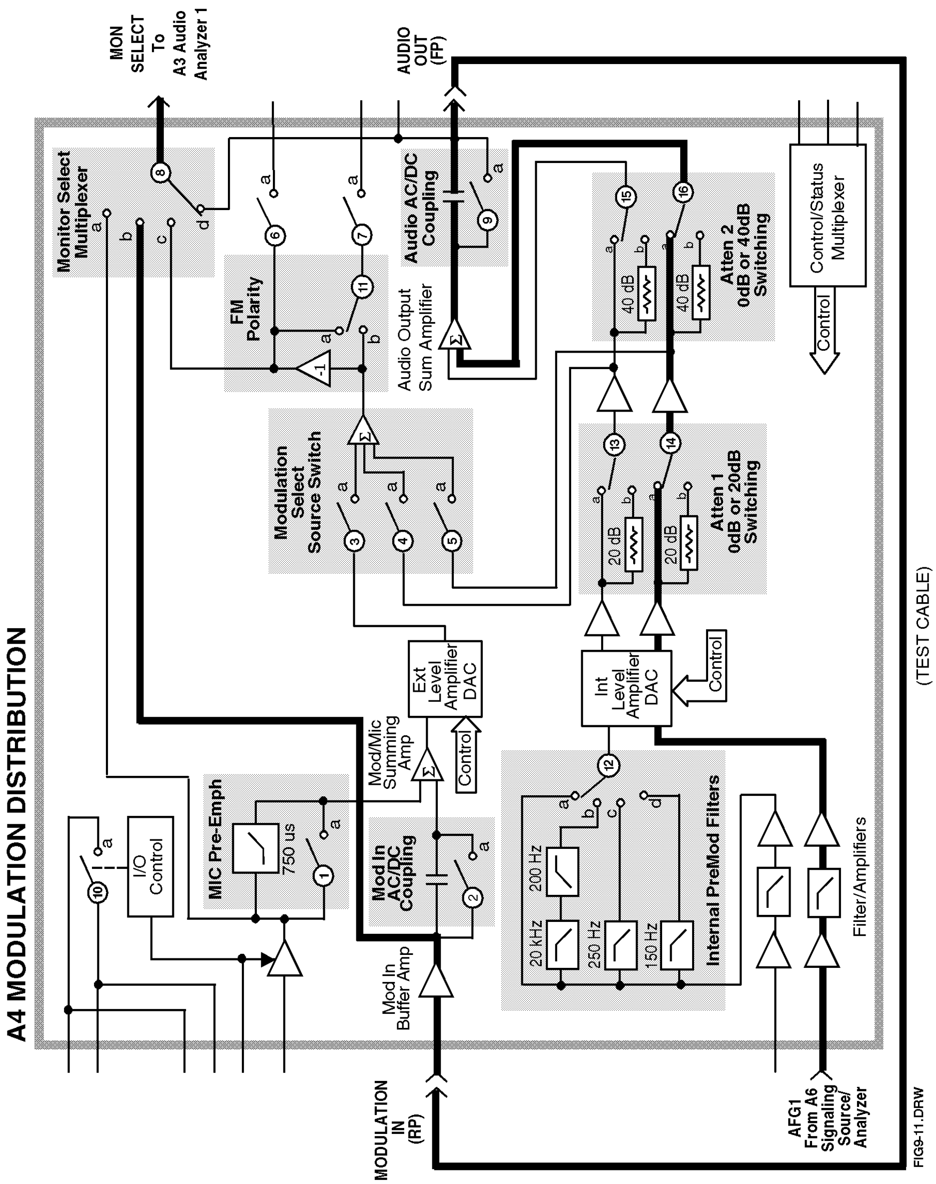


Figure 67 **Modulation Distribution External Path 2**

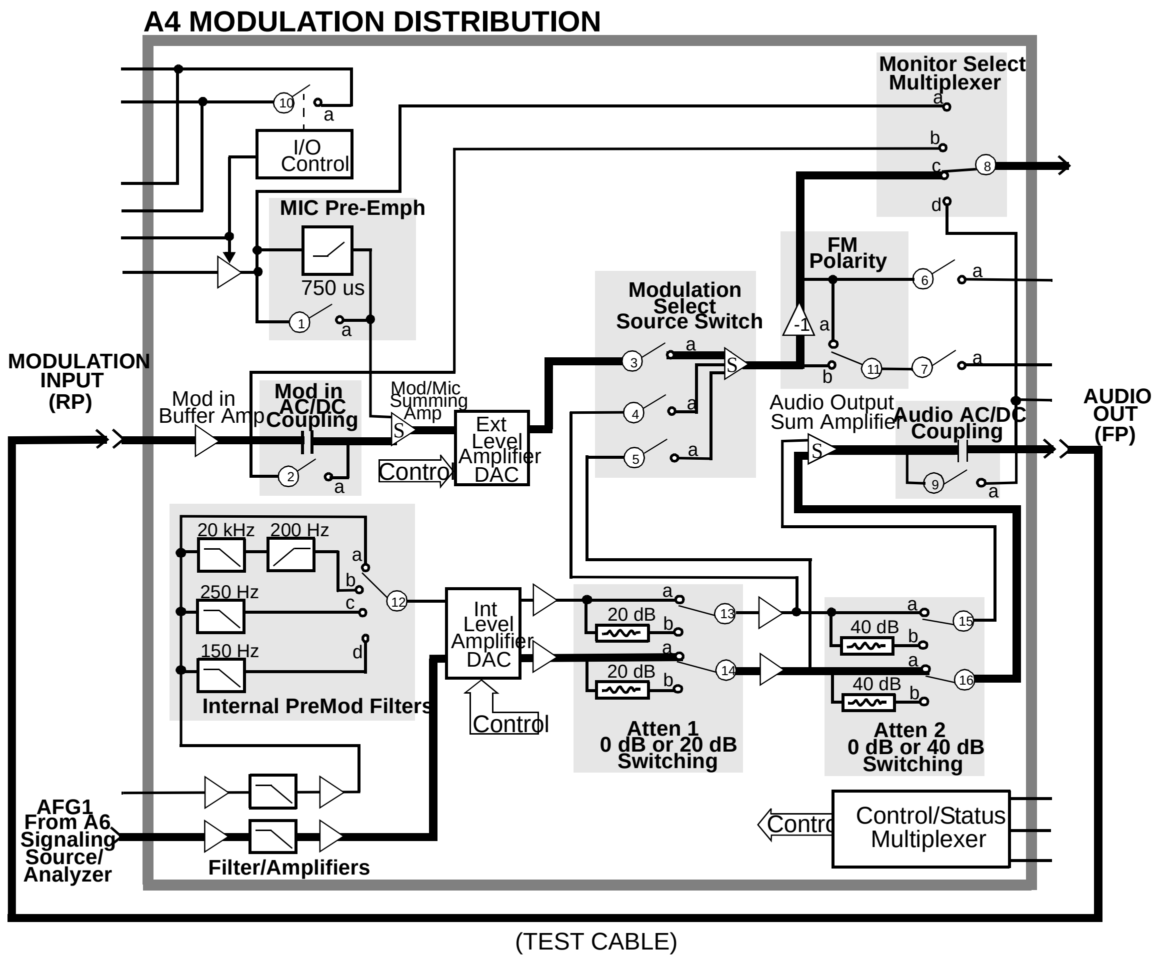


Figure 68 Modulation Distribution External Paths 3 to 7

Audio Analyzer 1 Internal Paths

This test checks Audio Analyzer 1's paths which receives the input from the Modulation Distribution assembly. The paths are illustrated in **figure 69, "Audio Analyzer 1 Internal Path 1," on page 619**, **figure 70, "Audio Analyzer 1 Internal Paths 2 to 4," on page 620**, and **figure 71, "Audio Analyzer 1 Internal Paths 5 to 12," on page 621**.

In Path 1, the audio source is set to DC. The simplest path through the Modulation Distribution assembly is chosen. The signal passes through Audio Analyzer 1 by this path to the DVM. In Path 2, the source is set to AC and the signal is peak detected before being measured by the DVM. In Paths 2 to 4, the gain of the Programmable Input Gain amplifier is tested for gains of 1, 10, and 100 (0, 20, 40 dB). The input signal is adjusted to keep the signal level in the range of the circuits that follow. In Paths 5 to 12, the frequency response of the filters are tested.

Paths 8 and 12 specifically test the optional filters. The presence and identification of the filters is determined by measuring a DC voltage from a resistive divider on the filter daughter-board. 0 V corresponds to no filter present; 0.95 to 1.1 V indicates the 400 Hz high-pass filter (Option 010); and so forth. Measurement limits are based on the specified frequency response.

The measurement limits are ±10% of nominal ±10 mV offset for levels not involved with frequency responses (Paths 1 to 5). Through the filters, the measurement limits vary: ±20% in the passband and much wider in the stopband (Paths 6 to 12).

The failure codes for Audio Analyzer 1's internal paths are as follows:

Table 187 Audio Analyzer 1 Internal Paths Failure Codes

Failure Codes	Probable Cause(s)
Code 1	Suspect Audio Analyzer 1 assembly (high) (Failure in path from Input Buffer Amplifier to DVM Select Switch Out.)
Code 12	Suspect Audio Analyzer 1 assembly (high) (Progammable Input Gain stays at gain=1.)
Code 14	Suspect Audio Analyzer 1 assembly (high) (Audio Range Peak Detector faulty.)
Code 15	Suspect Audio Analyzer 1 assembly (high) (DVM Select Switch faulty.)
Code 32	Suspect Audio Analyzer 1 assembly (high) (50 Hz HPF faulty.)
Code 64	Suspect Audio Analyzer 1 assembly (high) (300 Hz HPF faulty or HPF select switch stays at 50 Hz HPF.)
Code 96	Suspect Audio Analyzer 1 assembly (high) (HPF select switch stays in bypass.)
Code 256	Suspect Audio Analyzer 1 assembly (high) (300 Hz HPF faulty.)
Code 288	Suspect Audio Analyzer 1 assembly (high) (HPF select switch stays in 300 Hz HPF position.)
Code 512	Suspect Audio Analyzer 1 assembly (high) (3 kHz HPF faulty.)
Code 768	Suspect Audio Analyzer 1 assembly (high) (LPF select switch stays in 15 kHz LPF position.)
Code 1024	Suspect Audio Analyzer 1 assembly (high) (15 kHz HPF faulty.)
Code 1280	Suspect Audio Analyzer 1 assembly (high) (LPF select switch stays in 3 kHz LPF position.)
Code 1648	Suspect Audio Analyzer 1 assembly (high) (LPF select switch stays in 300 Hz LPF position.)
Code 1792	Suspect Audio Analyzer 1 assembly (high) (LPF select switch stays in bypass position.)

Table 187 Audio Analyzer 1 Internal Paths Failure Codes (Continued)

Failure Codes	Probable Cause(s)
Code 1904	Suspect Audio Analyzer 1 assembly (high) (HPF select switch open, LPF select switch open, or DVM Select Switch stays in Audio Range Peak Det position.) Or Audio Analyzer 2 assembly (low) (Path from Filtered Audio Input to DVM Select Output faulty.)
Code 1910	Suspect Audio Analyzer 1 assembly (high) (Programmable Input Gain stays at gain=100.)
Code 1914	Suspect Audio Analyzer 1 assembly (high) (Programmable Input Gain stays at gain=10.)
Code 1916	Suspect Audio Analyzer 1 assembly (high) (DVM Select Switch stays in Input Buffer Amplifier position **d**.)
Code 1918	Suspect Audio Analyzer 1 assembly (high) (Programmable Input Gain faulty.)
Code 1919	Suspect Audio Analyzer 1 assembly (high) (Input Select Switch, Input Buffer Amplifier, HPF select switch, filter buffer amplifier, LPF select switch, filtered output amplifier, or DVM Select Switch failed; or Optional High Pass or Low Pass filters missing.) Or Modulation Distribution assembly (low) (Faulty signal from Monitor Select Multiplexer output.)

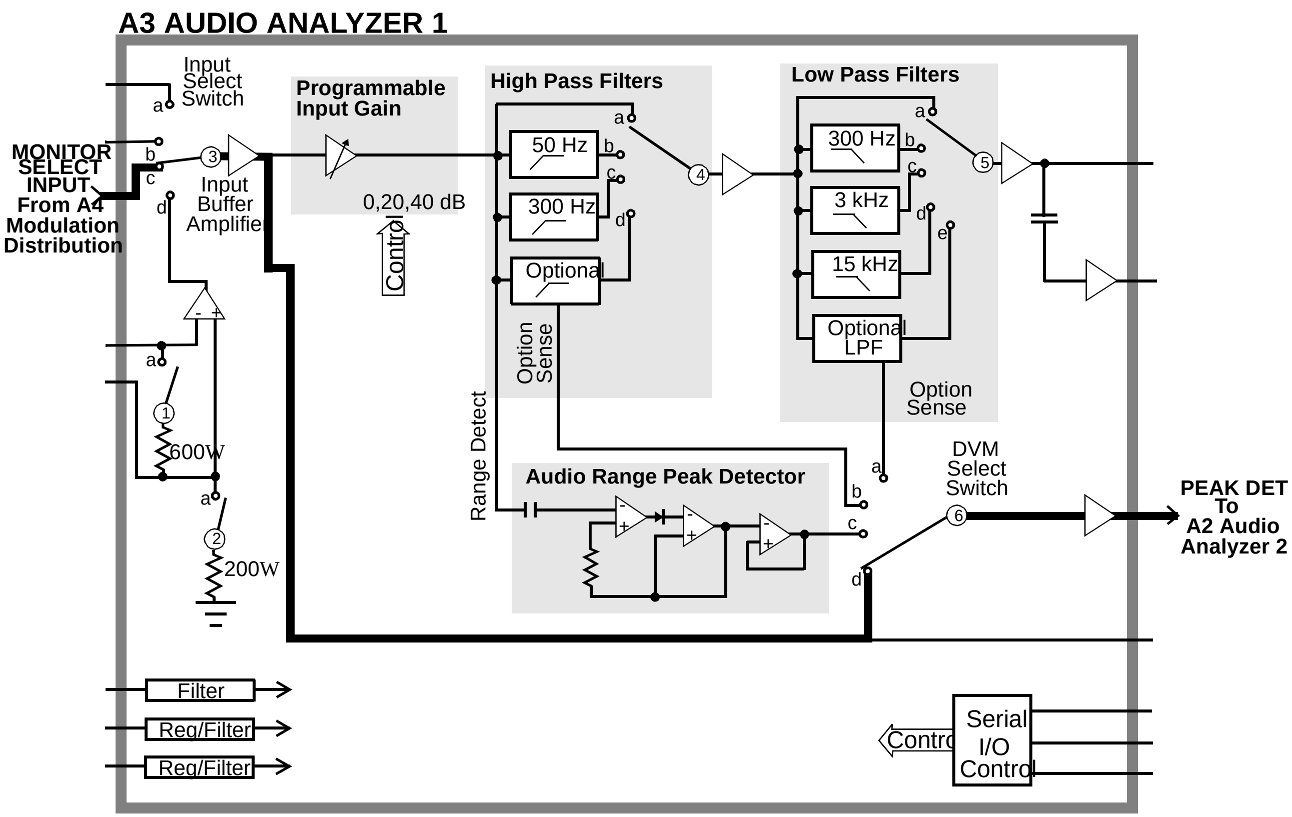


Figure 69 Audio Analyzer 1 Internal Path 1

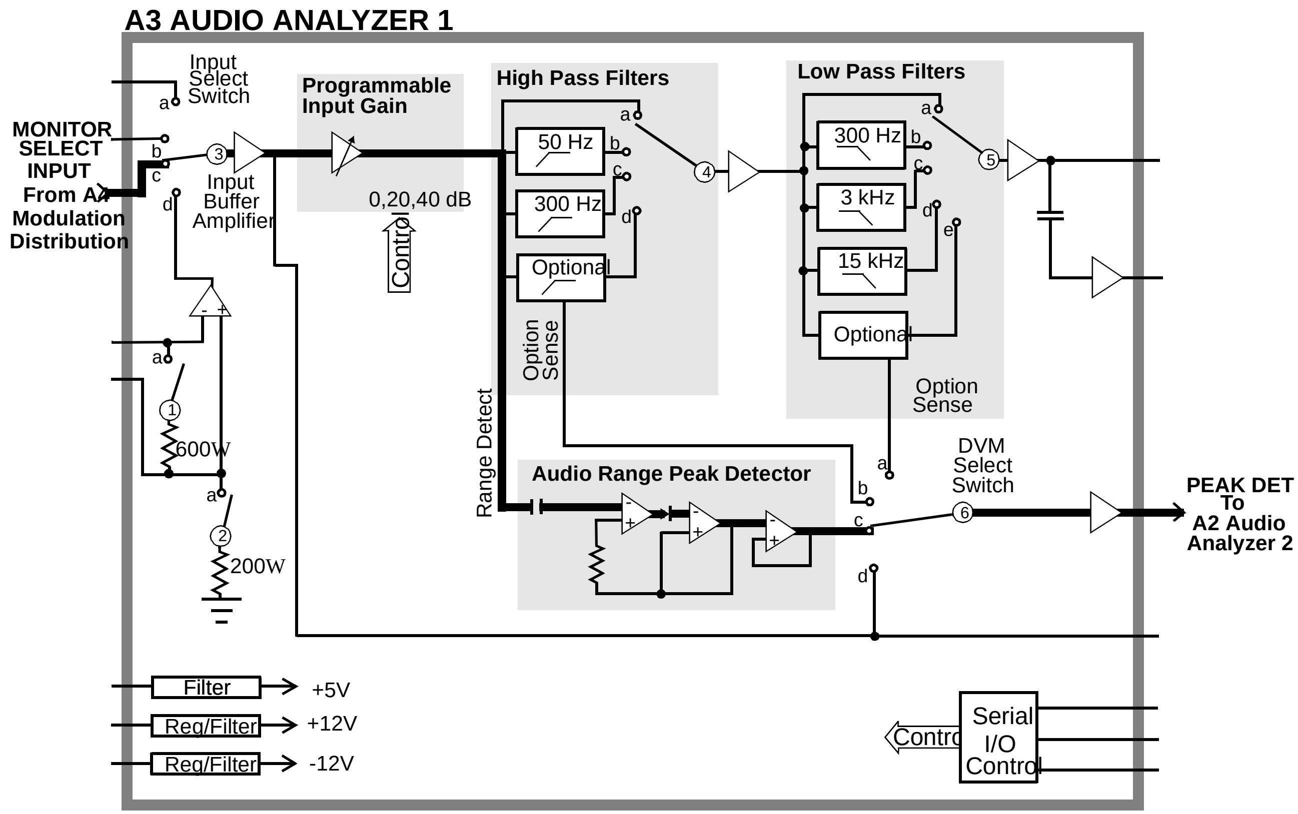


Figure 70 Audio Analyzer 1 Internal Paths 2 to 4

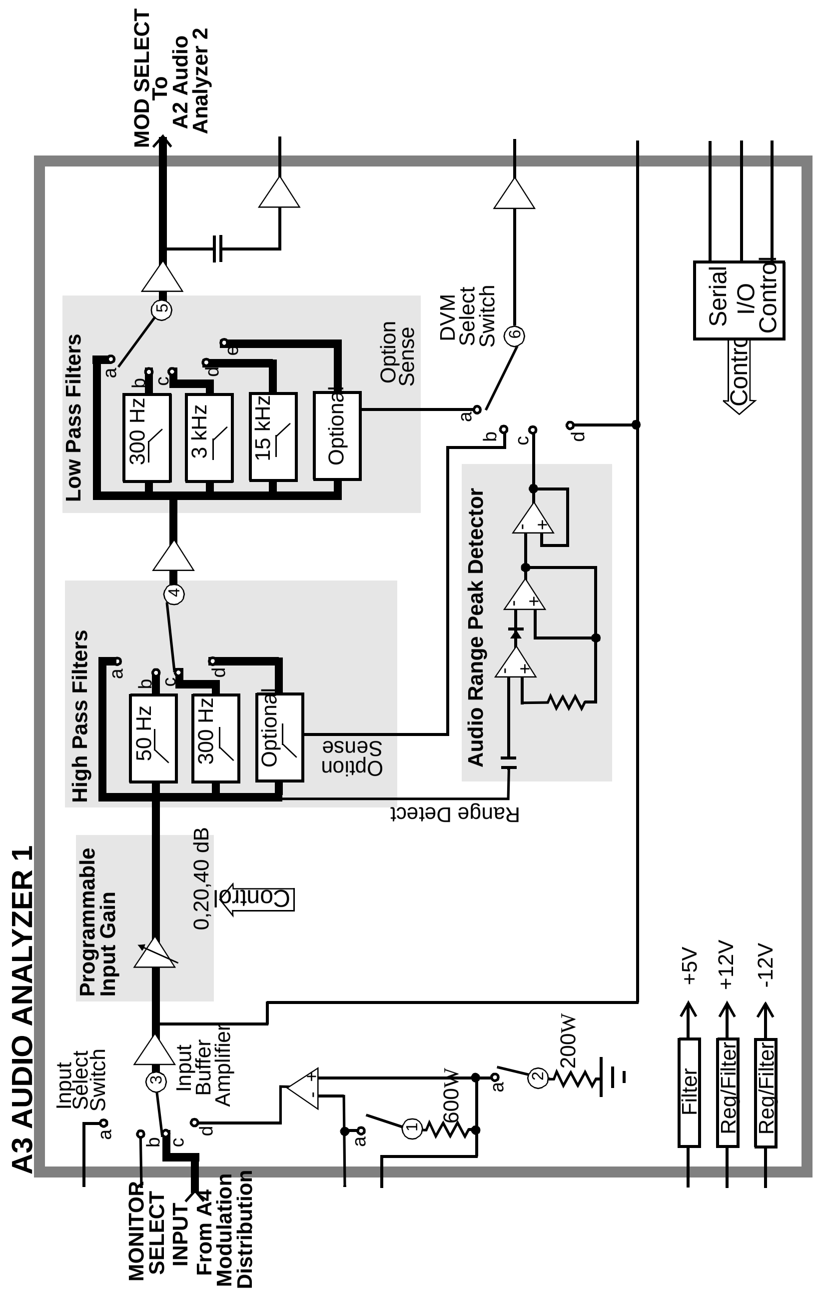


Figure 71 **Audio Analyzer 1 Internal Paths 5 to 12**

Audio Analyzer 1 External Paths

This test checks Audio Analyzer 1's path which receives its input from the front-panel AUDIO IN connector. The path which receives the internal inputs is checked in the previous test. The source for this test is the Audio Frequency Generator 1 which routes through the Modulation Distribution assembly and an external cable from the front-panel AUDIO OUT connector. The external path is illustrated in **figure 72, "Audio Analyzer 1 External Path 1," on page 623**. A check to verify that the input switch can switch out of the audio input position is performed. The check of the input switch is the same as depicted in **figure 70, "Audio Analyzer 1 Internal Paths 2 to 4," on page 620**.

The test limits for the audio input is ±10% of nominal. The limits for the decoupled audio input is ±20 mV. The Peak Detector converts the AC signal to DC.

The failure codes for the Audio Analyzer's external paths are as follows:

Table 188 Audio Analyzer 1 External Paths Failure Codes

Failure Codes	Probable Cause(s)
Code 1	Suspect Audio Analyzer assembly (high) (Input Select Switch stays in Audio Input position **d**.)
Code 2	Suspect Audio Analyzer 1 (medium) or cable (medium)

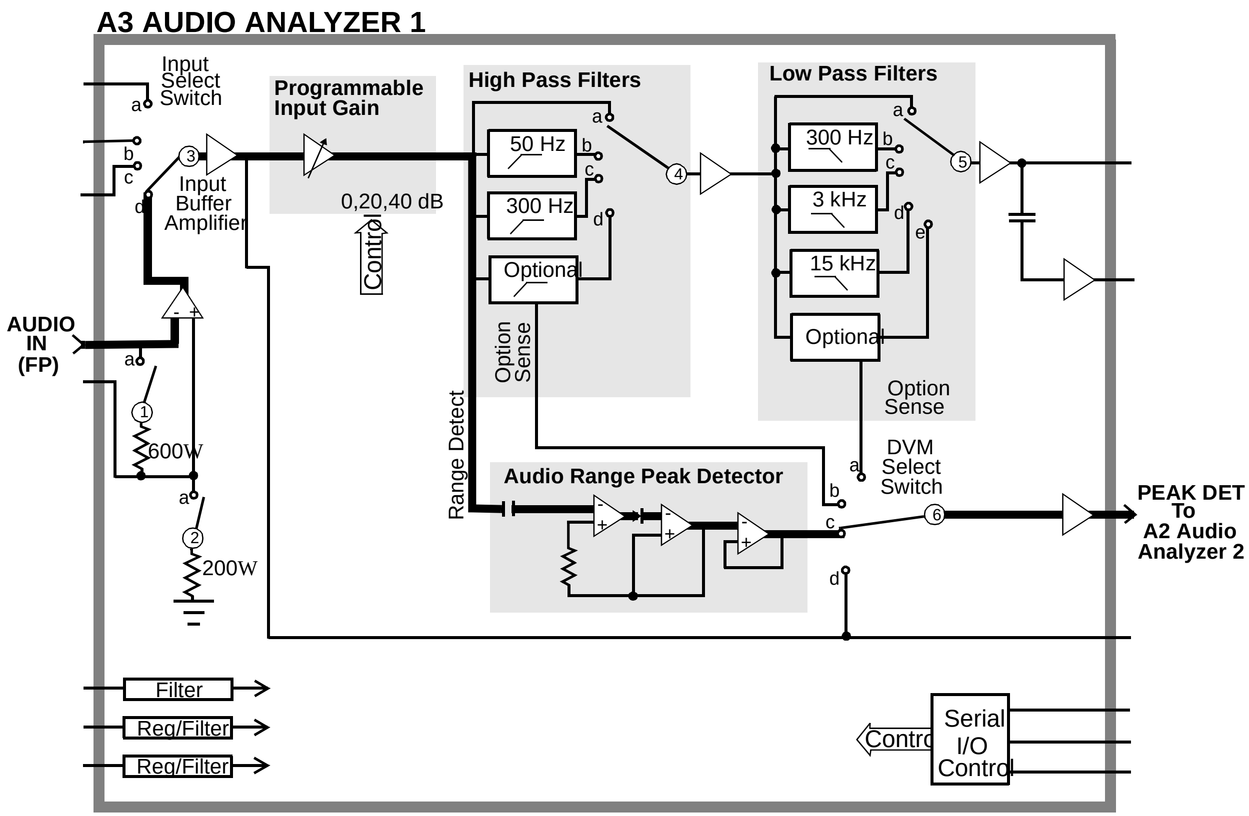


Figure 72 Audio Analyzer 1 External Path 1

Audio Analyzer 2 Paths

This test checks Audio Analyzer 2. The source for this test is Audio Frequency Generator 1 which is always set to AC. The signal from Audio Frequency Generator 1 passes through the Modulation Distribution assembly, through the Modulation Select Source Switch, and the Monitor Select Multiplexer. It bypasses Audio Analyzer 1. The test paths are illustrated in **figure 73** to **figure 78** .

The gain of the Detector Range Amplifier (Paths 5 to 7) is 3.16, 10, and 31.6 corresponding to gains of 10 dB, 20 dB, and 30 dB. The gain of the Post-Notch Amplifier (Paths 11 to 14 in **figure 75, "Audio Analyzer 2 Path 8," on page 629**) is similar.

At the beginning of this test, a check is made to determine if the variable-frequency Notch Filter is present. (This filter is standard in some Test Set models and optional in others). If the variable-frequency notch filter is present, the measurement for Path 9 is altered:

- For Test Sets with a fixed-frequency (1 kHz) notch filter, the input is set to 50 Hz (within the passband of the filter) and the output of the post-notch RMS Detector is measured.
- For Test Sets with the variable-frequency notch filter, the input is set to 1 kHz and the notch output is nulled using a notch-error detector in conjunction with a DAC-setting routine. (The notch-error detector is not shown in **figure 75, "Audio Analyzer 2 Path 8," on page 629**, but it is multiplexed with the pre-notch RMS detector.)

The test then proceeds as if the filter were fixed at 1 kHz and measurements are made at the output of the filter for input frequencies of 500, 1000, and 2000 Hz.

The failure codes for Audio Analyzer 2's paths are as follows:

Table 189 Audio Analyzer 2 Paths Failure Codes

Failure Codes	Probable Cause(s)
Code 1	Suspect Audio Analyzer 2 assembly (high) (Peak Detector Select Switch stays in position **b**.)
Code 2	Suspect Audio Analyzer 2 assembly (high) (Neg Peak Detector faulty or DVM Select Switch stays in position **b**.)
Code 3	Suspect Audio Analyzer 2 assembly (high) (Coupling capacitor following Peak Detector Buffer Amplifier faulty, not shown in figure.)
Code 8	Suspect Audio Analyzer 2 assembly (high) (De-Emphasis LPF faulty or De-Emphasis select switch stays in position **a**.)
Code 112	Suspect Audio Analyzer 2 assembly (high) (Detector Range Amplifier stays at gain=1.)
Code 120	Suspect Audio Analyzer 2 assembly (high) (Peak Detector Select Switch stays in position **a**.)
Code 125	Suspect Audio Analyzer 2 assembly (high) (Pos Peak Detector faulty or DVM Select Switch stays in position **a**.)
Code 127	Suspect Audio Analyzer 2 assembly (high) (Peak Detector Select Switch open.)
Code 128	Suspect Audio Analyzer 2 assembly (high) (Pre-notch RMS Detector faulty or DVM Select Switch stays in position **c**.)
Code 756	Suspect Audio Analyzer 2 assembly (high) (De-emphasis select switch stays in position **b**.)
Code 6912	Suspect Audio Analyzer 2 assembly (high) (Post-Notch Amplifier stays at gain=3.)
Code 12032	Suspect Audio Analyzer 2 assembly (high) (Post-Notch Amplifier stays at gain=30.)
Code 14080	Suspect Audio Analyzer 2 assembly (high) (Post-Notch Amplifier stays at gain=10.)
Code 15360	Suspect Audio Analyzer 2 assembly (high) (Post-Notch amplifier stays at gain=1.)

Table 189 Audio Analyzer 2 Paths Failure Codes (Continued)

Failure Codes	Probable Cause(s)
Code 16128	Suspect Audio Analyzer 2 assembly (high) (Notch Filter, Post-Notch Amplifier, or post-notch RMS Detector faulty or DVM Select Switch stays in position **d**.)
Code 16316	Suspect Audio Analyzer 2 assembly (high) (Detector Range Amplifier stays at gain=30.)
Code 16348	Suspect Audio Analyzer 2 assembly (high) (Detector Range Amplifier stays at gain=10.)
Code 16364	Suspect Audio Analyzer 2 assembly (high) (Detector Range Amplifier stays at gain=3.)
Code 16380	Suspect Audio Analyzer 2 assembly (high) (De-emphasis select switch open or Detector Range Amplifier faulty.)
Code 16382	Suspect Audio Analyzer 2 assembly (high) (Monitor Select Output Amplifier, Monitor Select output LPF, or input select switch faulty.) Or Modulation Distribution assembly (low) (Faulty signal from Monitor Select Multiplexer output.)

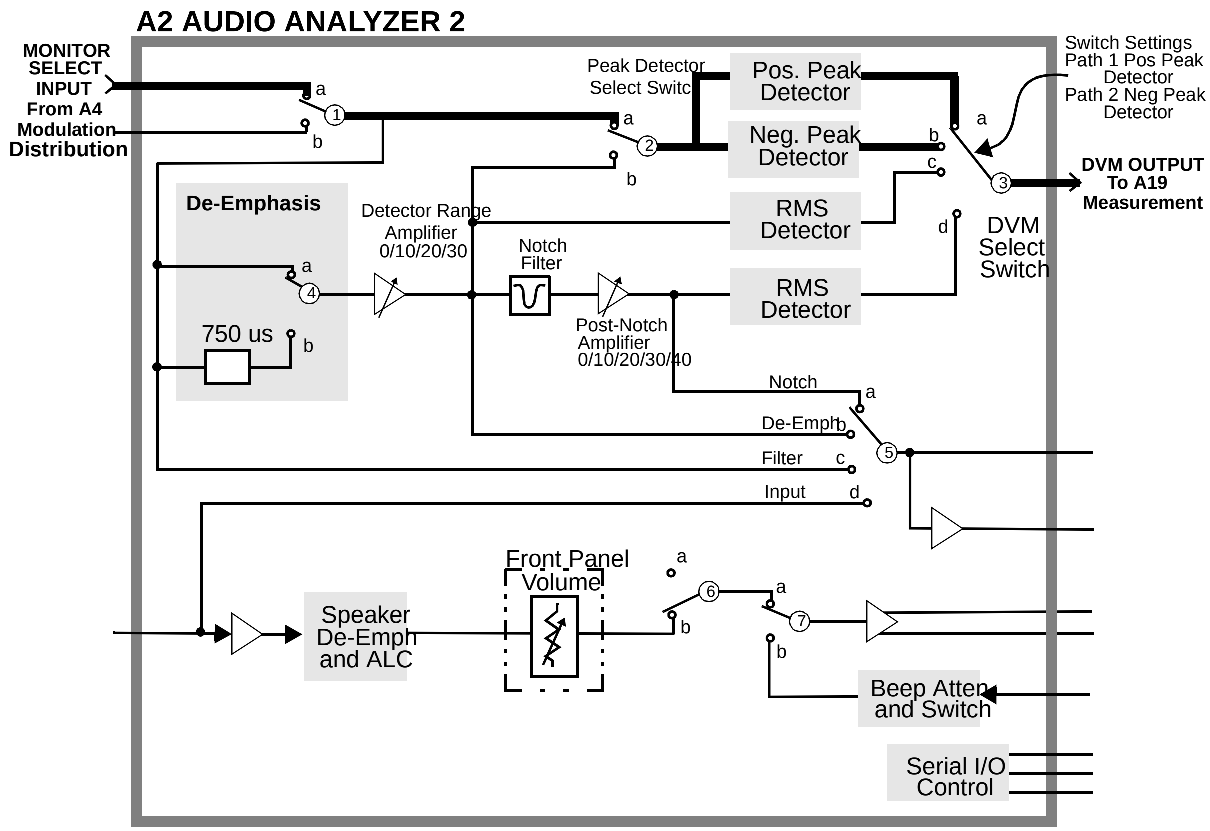


Figure 73 Audio Analyzer 2 Paths 1 and 2

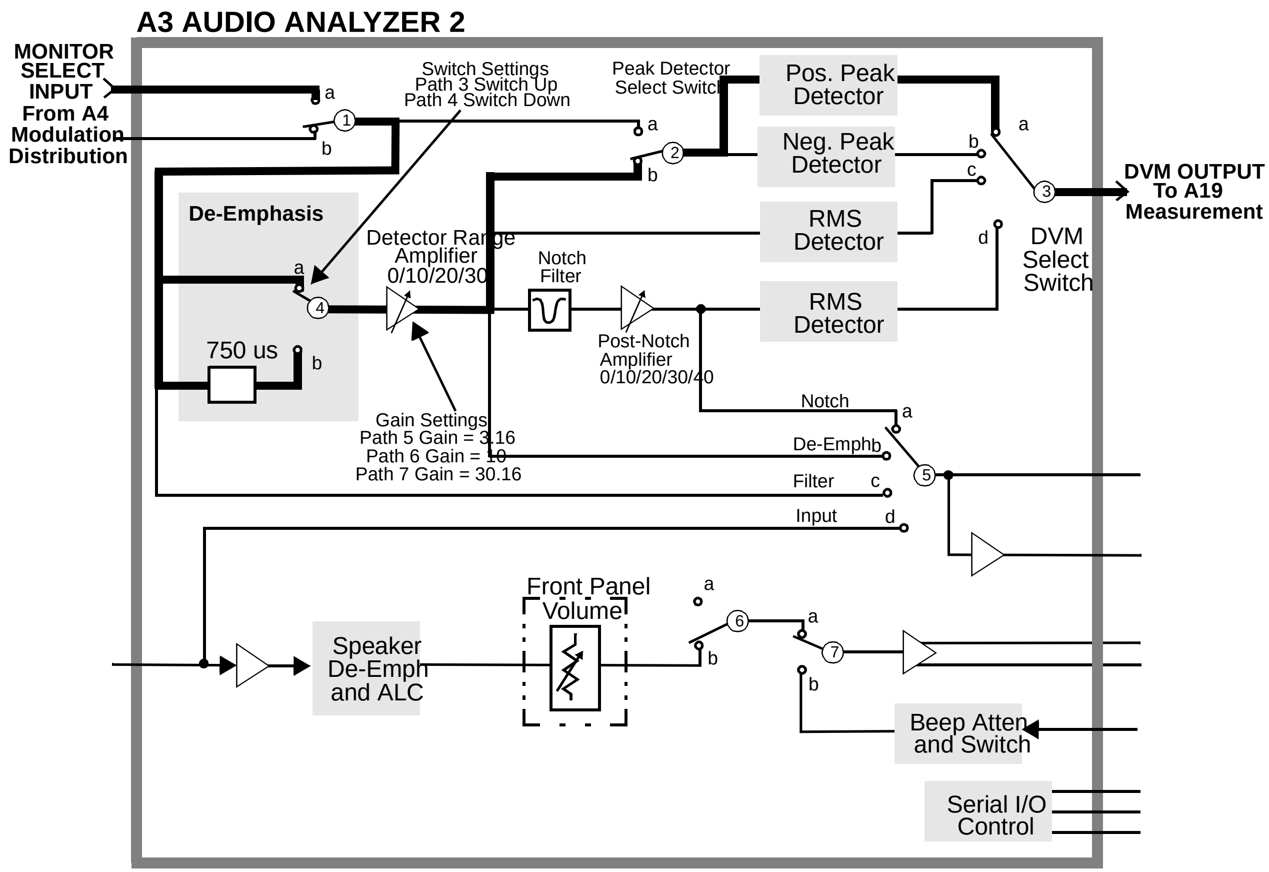


Figure 74 Audio Analyzer 2 Paths 3 to 7

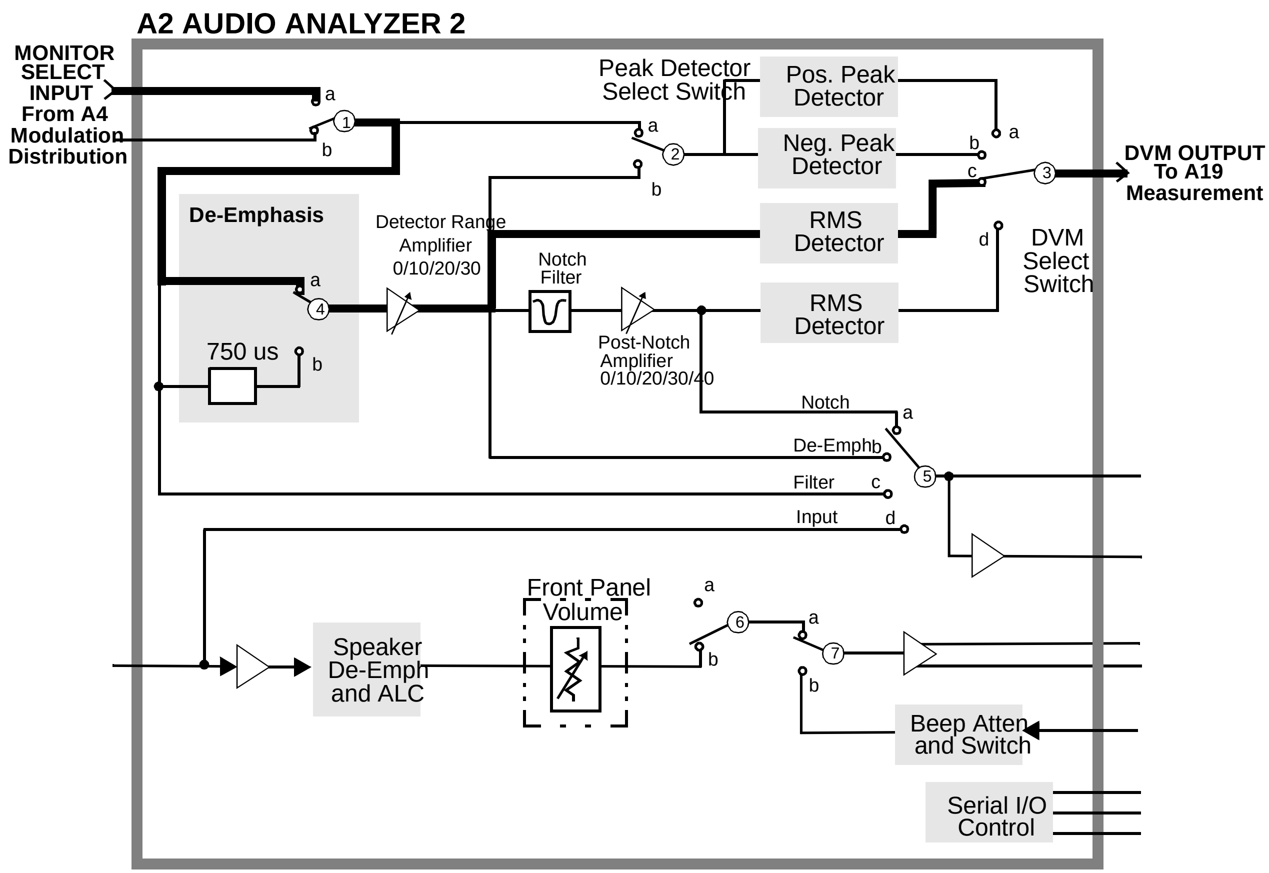


Figure 75 Audio Analyzer 2 Path 8

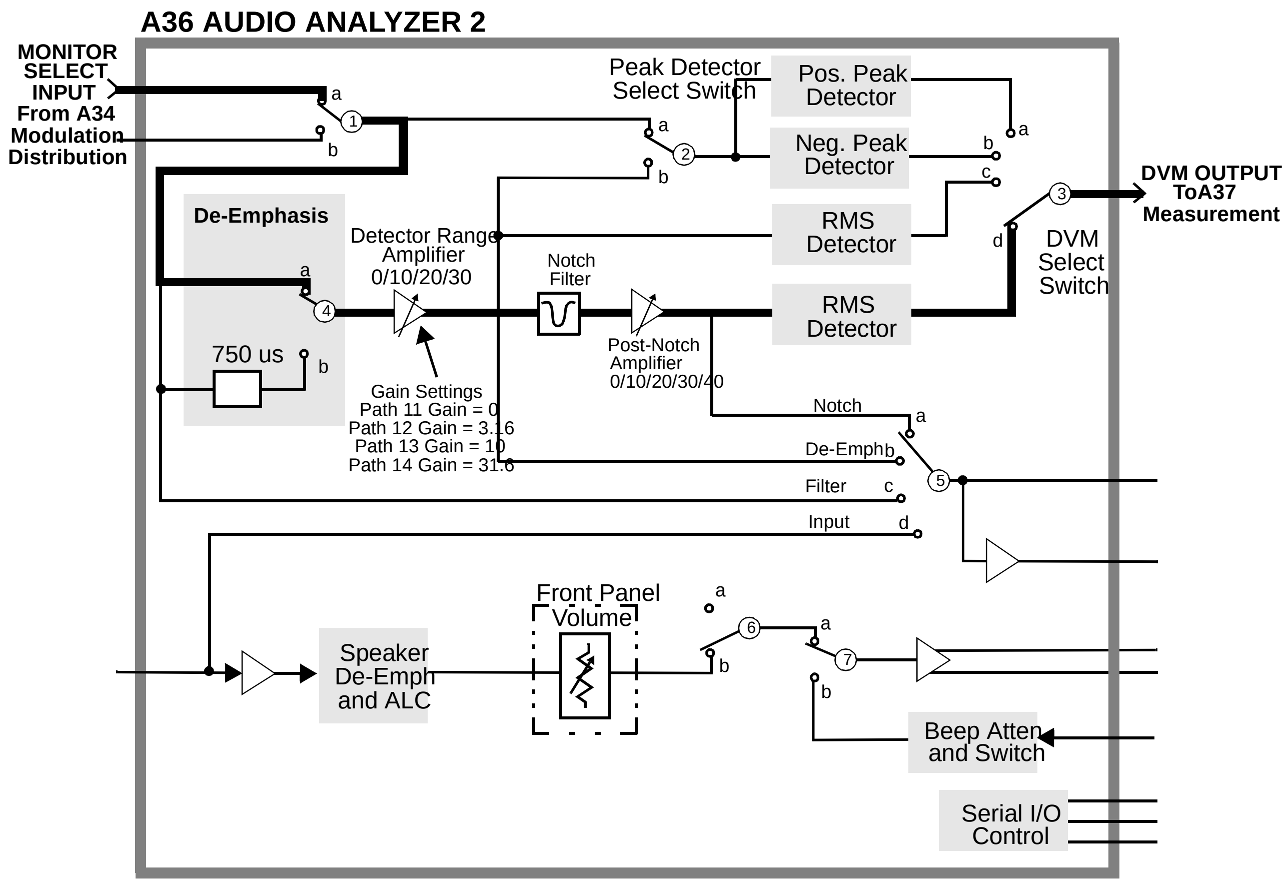


Figure 76 Audio analyzer 2 Paths 9 to 14

Description Of RF Diagnostics (RF_DIAGS)

Introduction

Unlike the Audio Diagnostics, the RF Diagnostics attempt to determine the faulty assembly when the first failure is noted. For this reason, the tests should be run in order. In the following tables of tests, the measurement point refers to **`Voltmeter Connection`** (DVM), **`Counter Connection`** (Counter), or **`Latch`** (Latch) readings on the SERVICE screen.

Reference

Table 190 Reference Tests

Measurement	Explanation and Suggestions	Measurement Point
10 MHz Lock Detector	The lock detector on the internal 10 MHz reference oscillator is read.	Latch:refs_10MHz_sense
10 MHz Time Base Count	The frequency of the 10 MHz reference is measured by the counter. Since the reference being measured is also the reference for the counter, a valid counter reading indicates only that the counter is functioning but is meaningless as to accuracy. If the counter loses its reference, this measurement will timeout and the diagnostic test will stop. If this happens, trace the 20 MHz signal from P3-13 of the A15 Reference to P3-29 of the A19 Measurement.	Counter:REF_10MHZ
1 GHz Oscillator Lock Detector	The lock detector on the 1 GHz Loop is read.	Latch:refs_1GHz_sense
1 GHz Enabled Output Level	The RF detector on the 1 GHz output with the 1 GHz switch closed is read.	DVM:REF_1GHZ_DIAG
1 GHz Disabled Output Level	Open the switch that routes the 1 GHz signal to the output of the board. The detector is after the switch so it should detect that the signal is no longer there. A long wait is needed before measuring the detector.	DVM:REF_1GHZ_DIAG
500 MHz Output Level	The RF detector on the 500 MHz output is read.	DVM:REF_500MHZ_ DIAG
200 kHz or 1 MHz Output	The Test Set is queried as to whether the reference output is set to 200 kHz or 1 MHz. (Some older Test Sets do not have the 1 MHz output.) The 200 kHz or 1 MHz outputs can be turned off by holding the output flip-flops in reset. The output detector is read with the output in the reset condition and in the normal operating condition. (Note: The Latch name is correct despite the “250_kHz” indication.)	Latch:refs_250_kHz_sense
10 MHz Fine and Coarse DACs	It is not possible to actually measure the 10 MHz frequency change caused by changing the DAC setting. Each DAC is set to a low value (0) and a high value (2000), and checked to make sure that the loop stays locked.	Latch:refs_10MHz_sense

Signal Generator Synthesizer

Table 191 Signal Generator Synthesizer Tests

Measurement	Explanation and Suggestions	Measurement Point
Reference Detector (Ref present)	The reference present detector is read with the 200 kHz reference signal enabled. If this measurement fails, trace the 200 kHz signal from P3-1 of the A15 Reference to P3-3 of the A14 Signal Generator Synthesizer.	Latch:gsyn_ref_not_present_sense
Out-of-Lock Detector (Locked)	The Out-of-Lock Detector is read with the loop set to be locked.	Latch:gsyn_out_of_lock_int_sense
Reference Detector (Reference NOT present)	The reference-present detector is read with the 200 kHz the Reference signal disabled at the Reference assembly.	Latch:gsyn_ref_not_present_sense
Out-of-Lock Detector (NOT locked)	The out-of-lock detector at the Reference assembly. This should cause the loop to be out of lock.	Latch:gsyn_out_of_lock_int_sense
Frequency Range	The 200 kHz Reference is enabled at the Reference assembly. Then the frequency of this loop is incremented from 500 to 1000 MHz in 50 MHz steps. The out-of-lock detector is read at each step.	Latch:gsyn_out_of_lock_int_sense

Receiver Synthesizer

Table 192 Receiver Synthesizer Tests

Measurement	Explanation and Suggestions	Measurement Point
Reference Detector (Ref present)	The reference-present detector is read with the 200 kHz reference signal enabled. If this measurement fails, trace the 200 kHz signal from P3-2 of the A15 Reference to P3-3 of the A17 Receiver Synthesizer.	Latch:rsyn_ref_not_present_sense
Out-of-Lock Detector (Locked)	The out-of-lock detector is read with the loop set to be locked.	Latch:rsyn_out_of_lock_int_sense
Reference Detector (Reference NOT present)	The reference-present detector is read with the 200 kHz Reference signal disable data the Reference assembly.	Latch:rsyn_ref_not_present_sense
Out-of-Lock Detector (NOT locked)	The out-of-lock detector is read with the 200 kHz Reference disabled at the Reference assembly. This should cause the loop to be out of lock.	Latch:rsyn_out_of_lock_int_sense
Frequency Range	The 200 kHz reference is enabled at the Reference assembly. Then the frequency of this loop is incremented from 500 to 1000 MHz in 50 MHz steps. The out-of-lock detector is read at each step.	Latch:rsyn_out_of_lock_int_sense

Output

Table 193 Output Tests

Measurement	Explanation and Suggestions	Measurement Point
+8 V Power Supply	The +8 Vdc supply generated on the Output assembly is measured. The voltage measured by the DVM is the actual voltage divided-by-2.	DVM:OUT_POS_8V
– 6 V Power Supply	The –6 Vdc supply generated on the Output assembly is measured. The voltage measured by the DVM is the actual voltage divided-by-2.	DVM:OUT_NEG_6V
Amplifier Bias Voltage	The bias voltage is measured on the output amplifier.	DVM:OUT_AMP_BIAS
Carrier Level DAC	The carrier level DAC is checked by turning on each bit, one at a time, and measuring the voltage output with each bit turned on. It is also checked with all bits on. The limits are calculated based on the actual voltage measured for the –6 V supply in a previous test. The bit value (B) is calculated as (–6 V actual) × 4 ÷ 6 ÷ 4096.	DVM:OUT_LEVEL_REF
Filter Tune DAC	The Filter Tune DAC is checked by turning on each bit one at a time and measuring the voltage output with each bit turned on. It is also checked with all bits on. The limits are calculated based on the actual voltage measured for the –6V supply in a previous test. The bit value (B) is calculated as -1 × (–6 V actual) × 2 × 422 ÷ 984 ÷ 4096.	DVM:OUT_TUNE_FILTER
Open Loop ALC Drive	This test opens the ALC Loop and checks that the voltage from the Level DAC appears at the modulator, input. The carrier level DAC is set to 4095 (full scale). The nominal output of the DAC (Ref) is calculated based on the actual voltage measured for the –6 V supply in a previous test. Ref = –1 × (–6 V actual) × 4 ÷6 × 100 ÷ 75 × 4095 ÷ 4096.	DVM:OUT_ALC_DRIVE

Table 193 Output Tests (Continued)

Measurement	Explanation and Suggestions	Measurement Point
Output Detector, Detector Caps	The detector is checked with the carrier level DAC at a high level (4000). Then the detector caps are switched in separately and together. The detector's voltage should not change as the caps are switched in and out. If the jumper coax between the output of the signal generator's Synthesizer and the input to the output section fails, the detector capacitors test will fail. This is a rather common failure.	DVM:OUT_OUTPUT_ LEVEL
Output Detector, Low Level	The carrier-level DAC is set to a low level (0) so there should be no RF signal reaching the RF detector.	DVM:OUT_OUTPUT_ LEVEL
Output Frequency Range, Loop Closed	The ALC loop is closed and the signal generator Synthesizer's frequency is set to all values from 1 to 1001 MHz in 100 MHz steps. The detector voltage is measured at each frequency.	DVM:OUT_OUTPUT_ LEVEL
Bandwidth Control	The bandwidth control bits are set to all combinations. This should not change the output level.	DVM:OUT_OUTPUT_ LEVEL
Tracking Filter Rejection	The ALC loop is opened and the tracking filters are checked by setting the RF frequency to the center of the 2 bands (375 and 750 MHz) that use these filters. Then the filter DAC is changed to tune the filters below the RF frequency. The RF level as measured by the output detector should be close to zero.	DVM:OUT_OUTPUT_ LEVEL

Input

Refer to **figure 77, "Input Tests: Duplex Detector, RF Detector, and Step Attenuator," on page 641** and **figure 78, "Input Tests: Ant, O/P Filter & Atten, Autorange Atten, Counter, Temp Sensor," on page 642** for signal flow and measurement points for the various measurement described in **table 194, "Input Tests" on page 638**.

Table 194 Input Tests

Measurement	Explanation and Suggestions	Measurement Point
Duplex Detector (No Signal)	See Path 1, Node 1 in **figure 77** . The signal from the signal generator synthesizer is set to 750 MHz at >+10 dBm. The step attenuator is set to zero attenuation. The duplex switch is set so this internal signal does NOT go to the detector on the duplex input so the detector should read close to zero. If this test fails, it could be that a signal is being applied to the front-panel BNC connector. A cable hanging from the DUPLEX IN connector can cause a failure.	DVM:DUPLEX_DET
Duplex Detector (Signal Present)	See Path 2, Node 1 in **figure 77** .The duplex switch is changed so the internal signal is applied to the duplex detector. The detector should read the signal level.	DVM:DUPLEX_DET
RF Detector (Low Power), No Signal	See Path 2, Node 2 in **figure 77** . The low power RF detector is checked with no signal present. The duplex switch from the previous test is not letting the signal reach the RF detector.	DVM:RF_PK_DET_LOW
RF Detector (Low Power), Signal Present	See Path 1, Node 2 in **figure 77** . The duplex switch is changed to route the signal to the RF detector.	DVM:RF_PK_DET_LOW
RF Detector (High Power), No Signal	See Path 2, Node 3 in **figure 77** . The high power RF detector is checked with no signal present. The duplex switch is set so it does not let the signal reach the RF detector.	DVM:RF_PK_DET_HIGH
RF Detector (High Power), Signal Present	See Path 1, Node 3 in **figure 77** . The duplex switch is changed to route the signal to the RF detector.	DVM:RF_PK_DET_HIGH

Table 194 Input Tests (Continued)

Measurement	Explanation and Suggestions	Measurement Point
Step Attenuator	See Path 1, Node 2 in **figure 77** . The step attenuator is checked by switching-in one pad at a time. The limits are set in terms of the no signal (RF Detector (Low Power), No Signal) reading obtained in the test and the difference between the readings obtained in the previous RF Detector (Low Power) Signal Present and No Signal tests.	DVM:RF_PK_DET_LOW
Antenna Input Detector	See Path 3, Node 4 in **figure 78** . The antenna input detector cannot read the internal signal level in the Input module. It is read anyway to be sure it is zero. If the test fails it could be because there is a signal being applied to the front-panel **ANT IN** connector.	DVM:ANTENNA_DET
Filter Output Detector, No Signal	See Path 3, Node 5 in **figure 78** . All the switches that connect the signal to the Receiver's output EXCEPT the antenna switch are set. Thus, there is NO signal yet on the filter output detector. The detector should read zero.	DVM:FILTER_OUT_DET
Filter Output Detector, Signal Present	See Path 4, Node 5 in **figure 78** . The filters are checked by setting the RF Analyzer and RF source to the same frequencies (1, 100,300, 600, 800, 1000 MHz). The frequencies are selected so each filter is checked. Setting the analyzer frequency's sets the right filter.	DVM:FILTER_OUT_DET
Output Filter Rejection	See Path 4, Node 5 in **figure 78** . Each filter is checked to see that it rejects signals outside of its passband. The filter is selected using the analyzer's frequency command.	DVM:FILTER_OUT_DET
Output Variable Attenuator	See Path 4, Node 5 in **figure 78** .The variable attenuator is checked by programming the DAC to full scale and reading the voltage on the output detector. Then the DAC is programmed to values which turn on the 5 most significant bits, 1 bit at a time, starting with the MSB. In each case the output detector is measured and checked to see if the voltage is less than the previous reading (last).	DVM:FILTER_OUT_DET

Table 194 Input Tests (Continued)

Measurement	Explanation and Suggestions	Measurement Point
Auto Range Attenuator	See Path 4, Node 5 in **figure 78** . The Auto Range Attenuator is programmed to its 3 possible values (+20 dB, 0 dB and -20 dB). At each setting the output detector is read.	DVM:FILTER_OUT_DET
Counter with TTL Divider	See Path 4, Node 6 in **figure 78** . The signal from the signal generator’s synthesizer is routed to the counter TTL prescaler. The frequency of the signal is set to all values between 1 and 51 MHz in 5 MHz steps. The count returned is the actual frequency in kHz, divided-by-16.	Counter:INPUT_TTL_COUNT
Counter with ECL Divider	See Path 4, Node 7 in **figure 78** . The signal from the signal generator’s synthesizer is routed to the counter’s ECL prescaler. The frequency of the signal is set to all values between 50 and 1000 MHz in 50 MHz steps. The count returned is the actual frequency in kHz, divided-by-256.	Counter:INPUT_ECL_COUNT
Temperature Sensor	See Node 8 in **figure 78** . The Temperature Sensor produces a DC voltage proportional to the internal temperature. The scale factor is 10 mV/°C	DVM:TEMP_SENSE

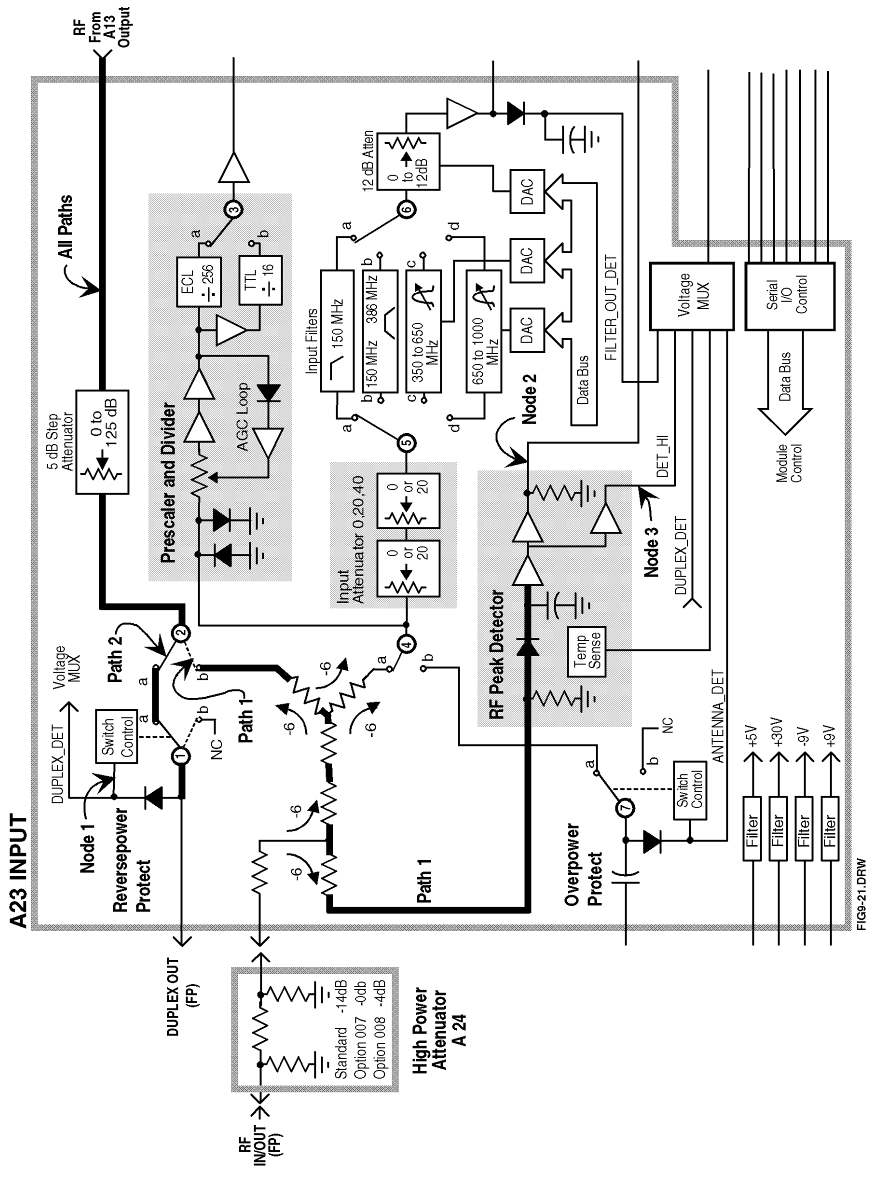


Figure 77 **Input Tests: Duplex Detector, RF Detector, and Step Attenuator**

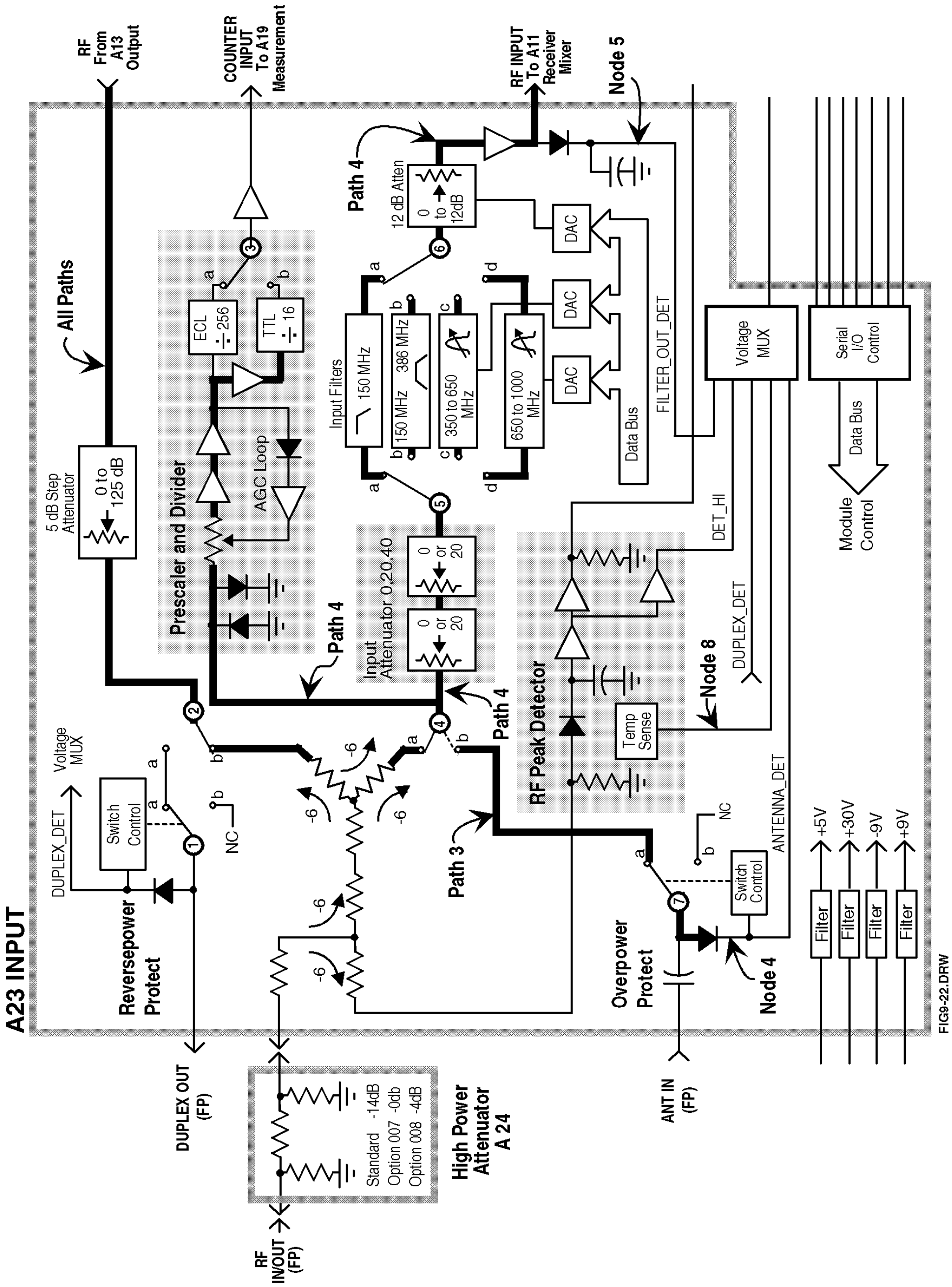


Figure 78 Input Tests: Ant, O/P Filter & Atten, Autorange Atten, Counter, Temp Sensor

Spectrum Analyzer Tests

Since the Spectrum Analyzer is optional on some Test Sets, these tests may be bypassed.

Table 195 Spectrum Analyzer Tests

Measurement	Explanation and Suggestions	Measurement Point
Detector Output, No Signal	The signal generator's signal is routed to the spectrum analyzer, but the level is set to – 100 dBm at the **RF IN/OUT** connector which produces a very small signal at the spectrum analyzer. The spectrum analyzer's detector should produce just an off -set voltage.	DVM:SCOPE2
Stepped Gain	Using the spectrum analyzer's internal calibration signal (110 MHz), the stepped-gain amplifiers are checked. Each gain step is turned on one step at a time. The sensitivity of the detector varies from 24 mV/dB to 6 mV/dB at the levels where the internal calibration signal could be. 3 dB of gain error is allowed for the steps. If this measurement fails, trace the 20 MHz signal from P3-9 of the A15 Reference to P1-3 of the A18 Spectrum Analyzer.	DVM:SCOPE2
IF Band Width	The IF bandwidth is set to all possible values. The spectrum analyzer LO is moved in increments of 10% of the bandwidth of the filter being tested to find a signal within each filter. The voltage read by the detector should be basically the same as the full scale reading (0 dB) in the stepped gain test above.	DVM:SCOPE2
Filter Rejection	The LO's frequency is set 10 × BW away from the normal center of each filter. Then the detector is read. The level at the detector should be low. A 0.55 V change is equivalent to a 27.5 dB change in signal level.	DVM:SCOPE2
Variable Gain IF Amplifier	The variable-gain IF amplifier is checked by turning on one bit at a time, the DAC which controls it. The least-significant bit is turned on first.	DVM:SCOPE2

Table 195 Spectrum Analyzer Tests (Continued)

Measurement	Explanation and Suggestions	Measurement Point
RF Input Signal	The internal calibration signal is disabled and the input signal path from the Receiver is enabled. The signal generator's synthesizer and the RF analyzer are set to 100 MHz. This provides an IF of 114.3 MHz at the input to the spectrum analyzer. The level is set so that the level at the RF IN/OUT connector is equivalent to − 120 dB at the **ANT IN** connector. This should produce a DVM reading of 1.892 Vdc from the spectrum analyzer's detector. Limits of ± 0.200 V are used which is equivalent to approximately a 10 dB variation in signal level. For newer Test Sets, additional measurements are made by setting a reference level then dropping the level 10, 2, and 1 dB with the vertical sensitivity set to 10, 2, and 1 dB/division respectively.	DVM:SCOPE2

Receiver

Refer to **figure 79** through **figure 85** for signal flow of the measurements described in **table 196, "Receiver Tests" on page 645**.

Table 196 Receiver Tests

Measurement	Explanation and Suggestions	Measurement Point
Down Converter	See **figure 79** . First, the instrument is checked to see if the spectrum analyzer (optional in some Test Sets) is installed. If it is not, this test is bypassed. If the Spectrum Analyzer is present, the internal RF generator frequency, set to 100 MHz and – 46 dBm CW, is fed into the first mixer (where it is downconverted to the 614.3 MHz IF) and the receiver (where it is downconverted to the 114.3 MHz IF). The IF is then fed into the spectrum analyzer. The test is repeated for 500 MHz and 900 MHz. Failures occurring in this test are inconclusive. Failures may be due to the receiver's first mixer, the receiver, or the spectrum analyzer.	Spectrum Analyzer center frequency
IF Counter	See **figure 80** . The internal RF generator is set to 100 MHz CW and fed into the receiver's input. The IF frequency is measured by the IF counter. The IF chain must operate properly through the FM demodulator for this test to pass. (If the spectrum analyzer option is not installed, this becomes the first test.)	Counter:REC_IF_COUNT
FM	See **figure 81** . The internal RF generator is set for FM at 10 kHz peak deviation and a 1 kHz rate. The peak deviation is measured by the receiver. This is the first test in which the internal audio source is applied to the signal generator synthesizer's FM modulator. If all the Audio Diagnostics run with no failures but this and/or the next test fails, check the path of the audio source from the output of the Modulation Select Multiplexer switch on the A4 Modulation Distribution assembly to the A14 Signal Generator Synthesizer's input.	DVM:POS_PK_DET
FM Inverted	See **figure 81** . Same as previous test except the demodulated FM is inverted.	DVM:POS_PK_DET

Table 196 Receiver Tests (Continued)

Measurement	Explanation and Suggestions	Measurement Point
Squelch	See **figure 82** . The internal RF generator is set for FM at 10 kHz peak deviation and 1 kHz rate. The RMS deviation is measured under the following four conditions. (High level is –80 dBm; lowlevel is –127 dBm.) Condition 1 - RF generator level high, squelch fixed. Condition 2 - RF generator level low, squelch fixed. Condition 3 - RF generator level high, squelch open. Condition 4 - RF generator level low, squelch open.	DVM:PRE_NOTCH_RMS
ALC On	See **figure 83** . The internal RF generator is set to CW. The receiver is set to measure AM. The ALC level is measured.	DVM:DC_AUDIO
ALC Off	See **figure 83** . Same as previous test except ALC is set to off.	DVM:DC_AUDIO
AM	See **figure 84** . The internal RF generator is set for AM at 50% and a 1 kHz rate. The AM depth is measured by the receiver. This is the first test in which the internal audio source is applied to the Output section’s AM modulator. If all the Audio Diagnostics run with no failures but this test does fail, check the path of the audio source from the output of the Modulation Select Multiplexer switch on the A4 Modulation Distribution assembly to the A13 Output section’s AM input.	DVM:POS_PK_DET
SSB Level	See **figure 85** . The internal RF generator is set to 100.001 MHz CW. The receiver is tuned to 100 MHz. The output of the SSB demodulator is the difference frequency, 1 kHz.	DVM:PRE_NOTCH_RMS
SSB Frequency	See **figure 85** . Same as previous test except the frequency (1 kHz) is measured.	Counter:AUD1_COUNT

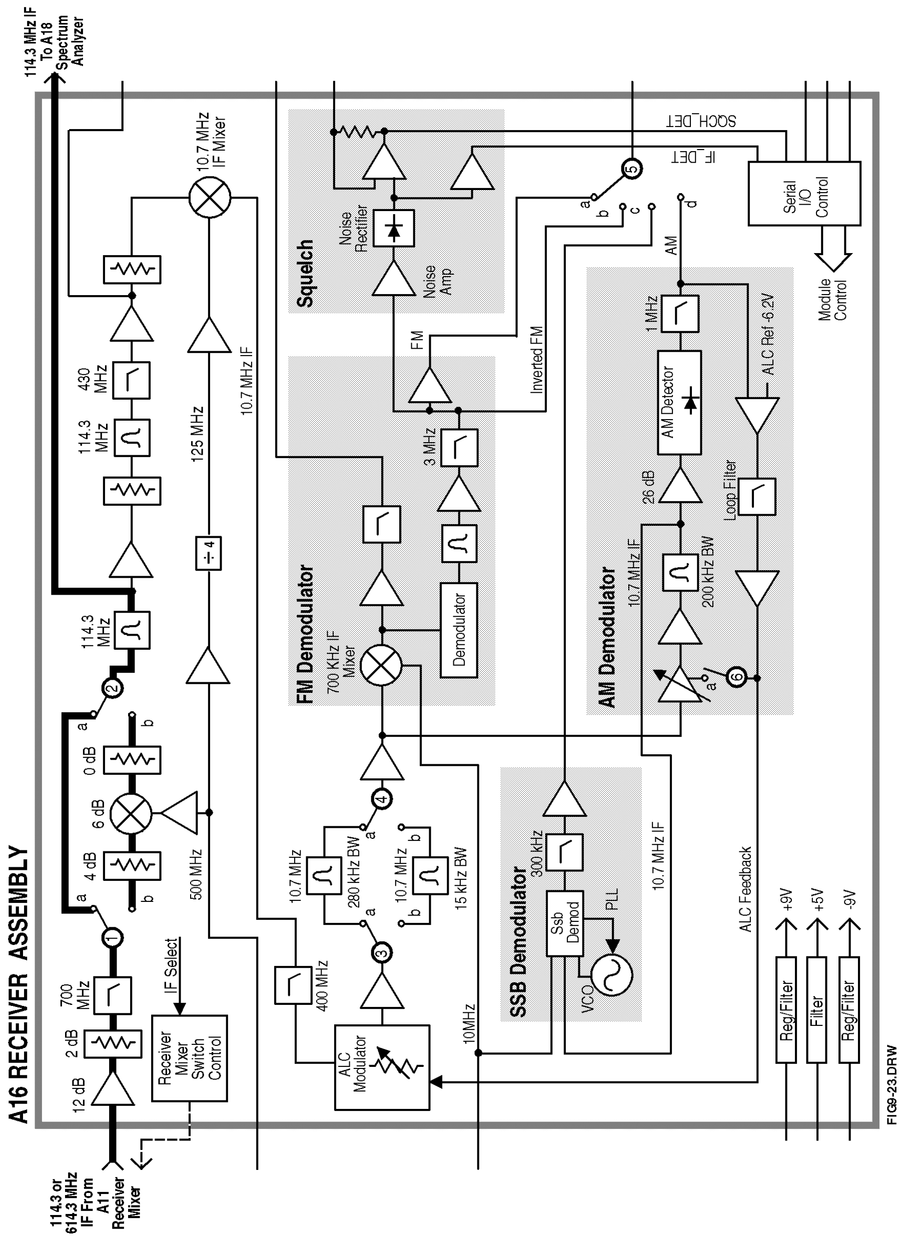


Figure 79 **Receiver Tests_Down Converter**

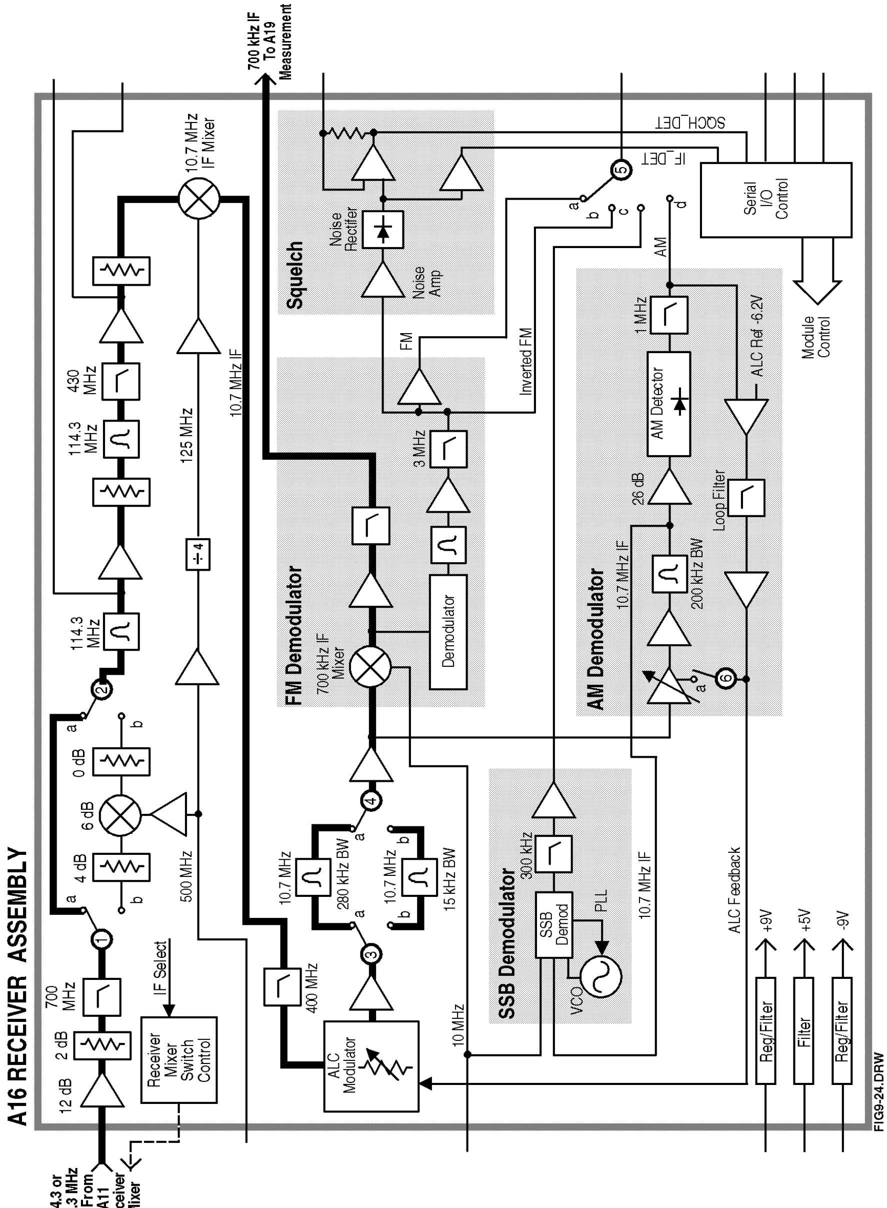


Figure 80 Receiver Tests_IF Counter

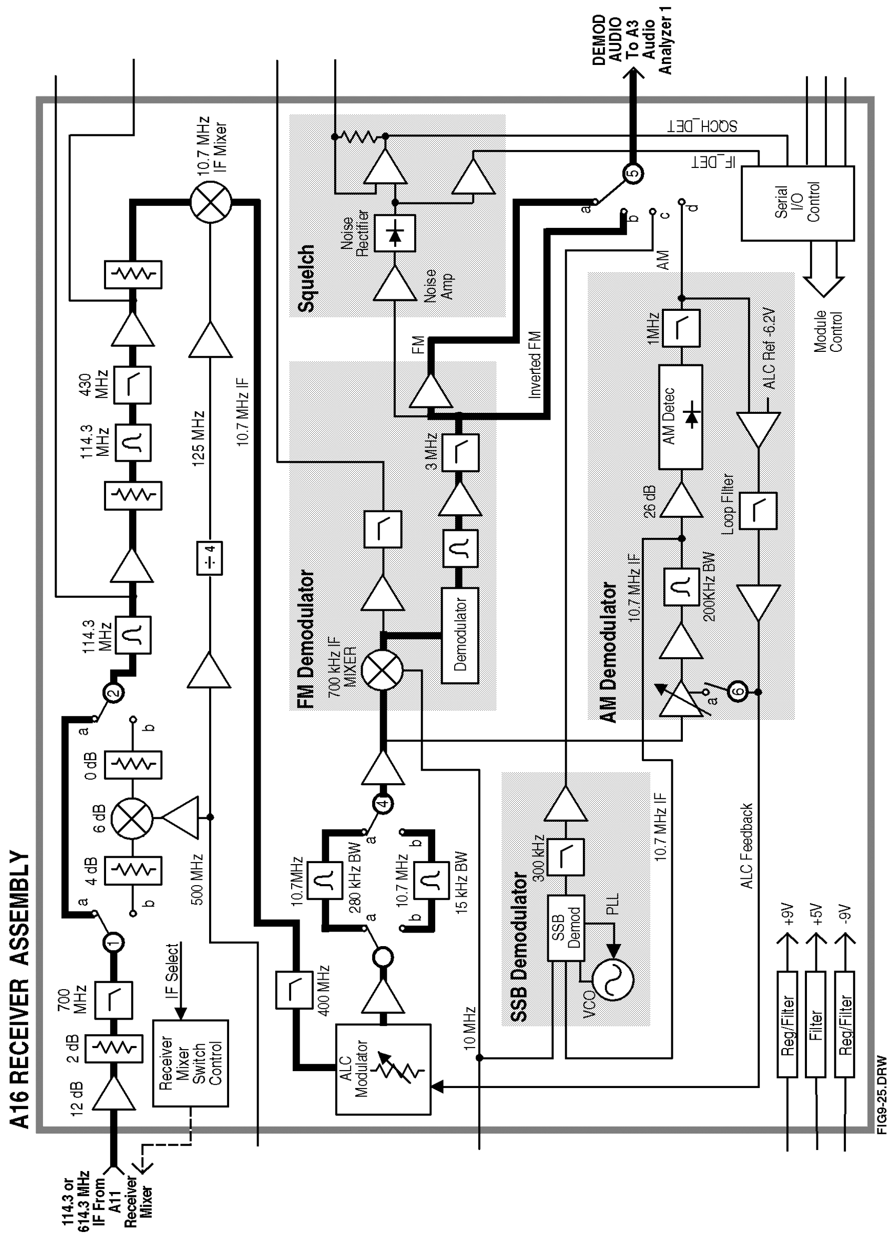


Figure 81 **Receiver Tests_FM**

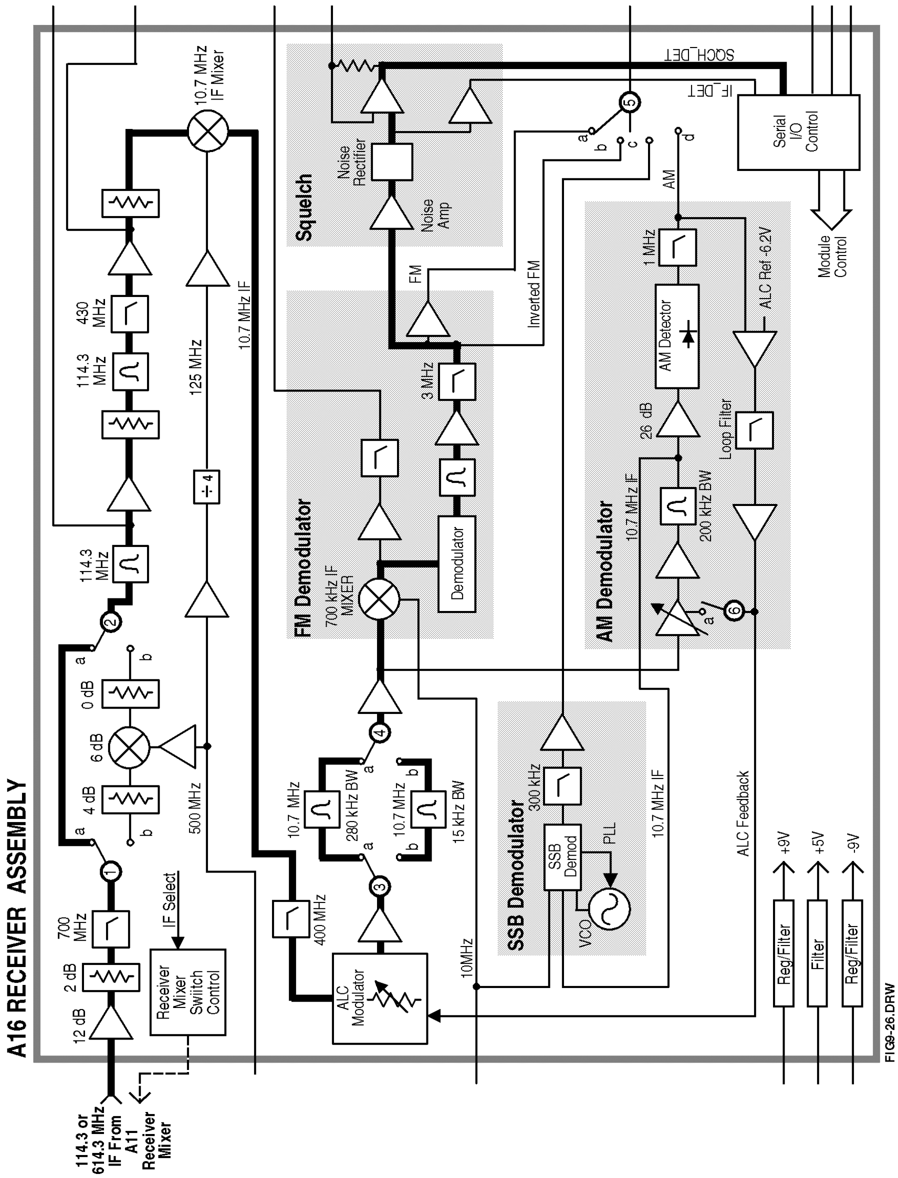


Figure 82 **Receiver Tests_Squelch**

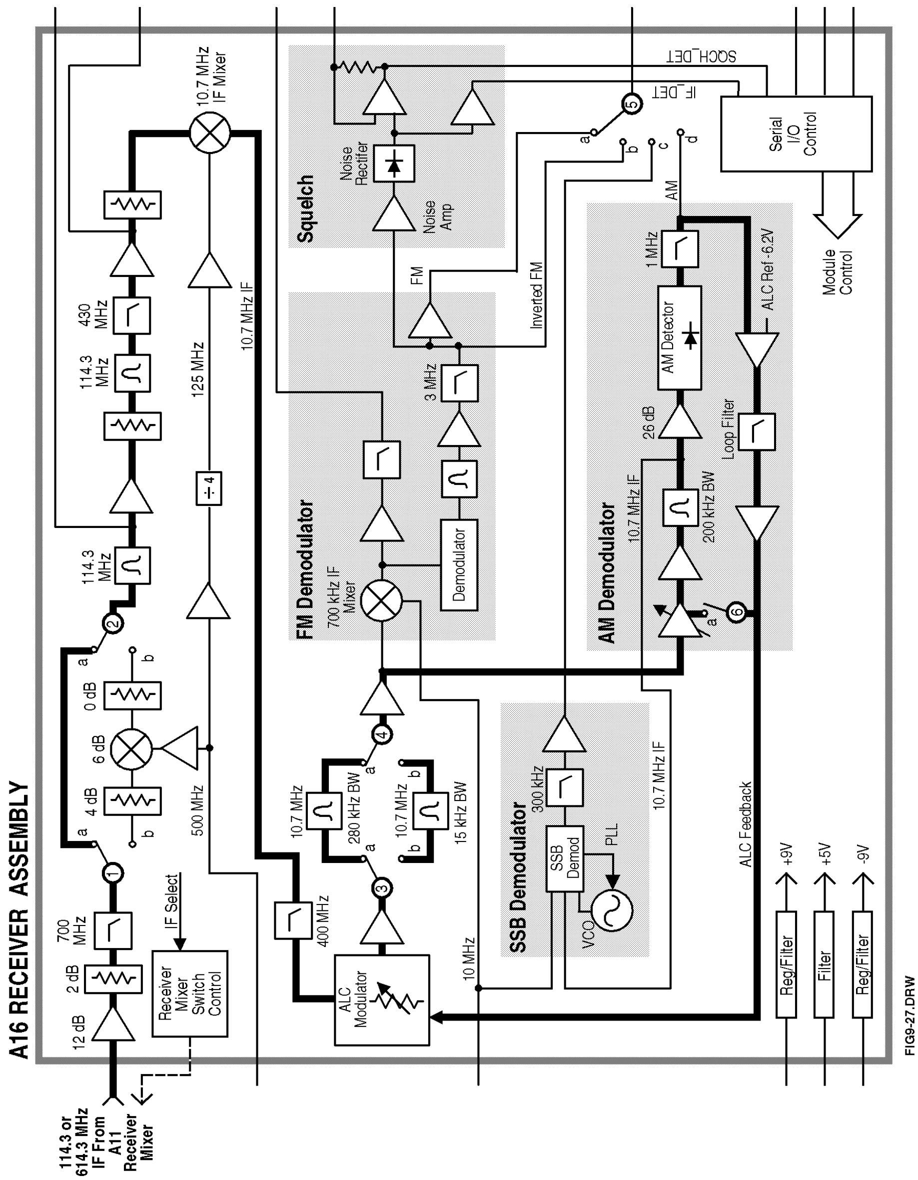


Figure 83 Receiver Tests_ALC

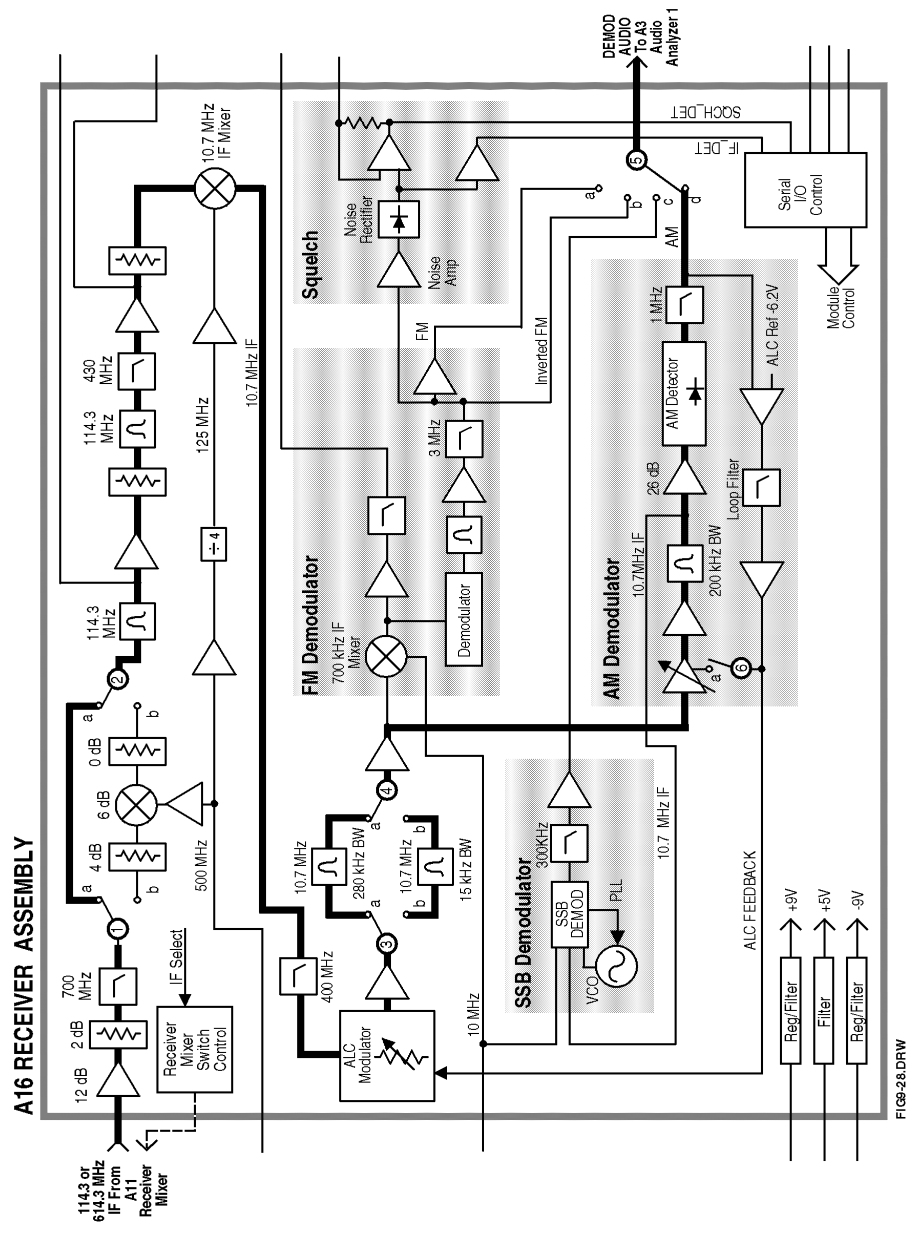


Figure 84 Receiver Tests_AM

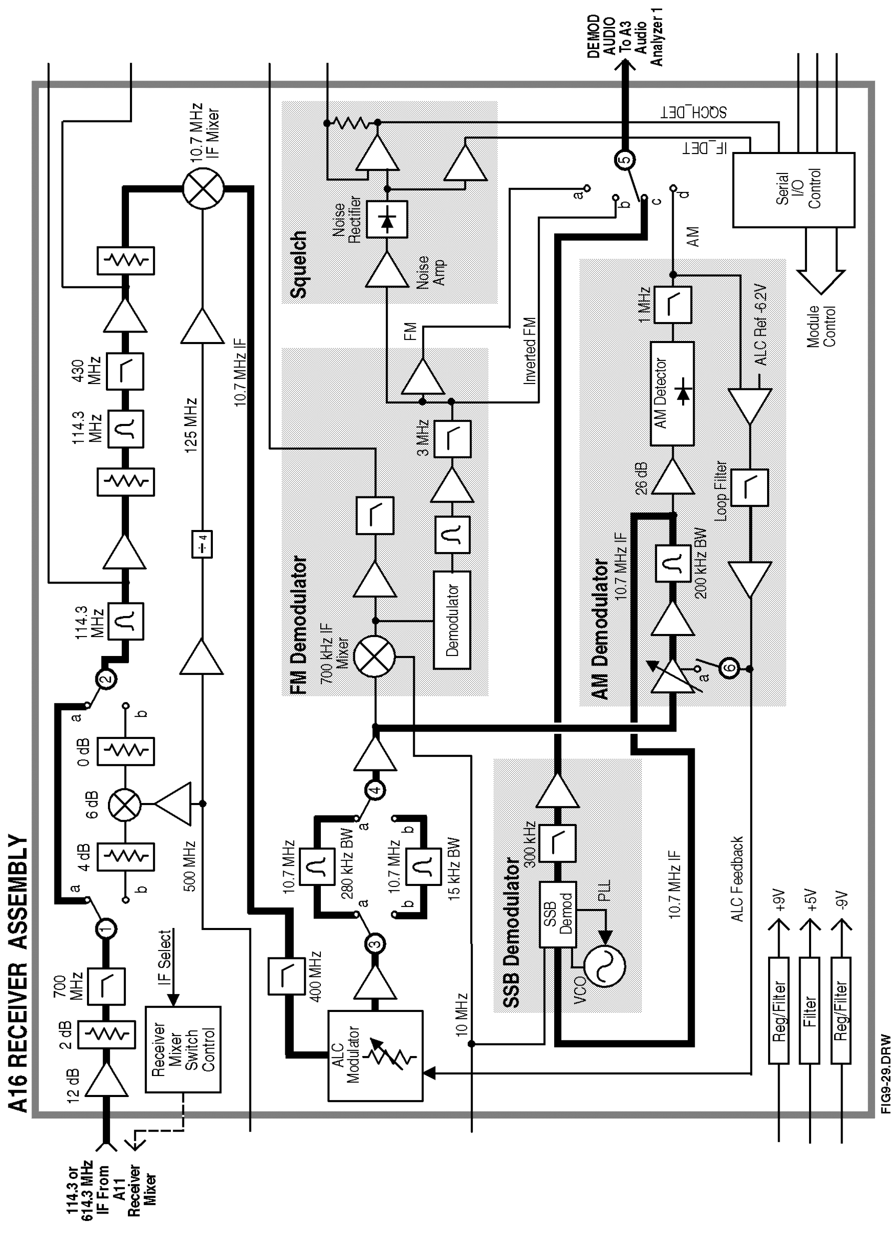


Figure 85 **Receiver Tests_SSB**

Description Of Miscellaneous Diagnostics (MS_DIAGS)

Introduction

The Miscellaneous Diagnostics are varied and cannot be run in a loop. In the following tables of tests, the measurement point refers to **`Voltmeter Connection (DVM)`** or **`Latch`** (Latch) readings on the SERVICE screen.

External Reference Test

Table 197 External Reference Test

Measurement	Explanation and Suggestions	Measurement Point
Ext Reference Present Detector	This test requires that an external reference signal be connected to the **10 MHz REF INPUT** (rear panel). The external reference sensor is checked.	Latch:refs_ext_ref_sense
Ext Reference Lock Detector	This test requires that an external reference signal be connected to the **10 MHz REFINPUT** (rear panel). The 10 MHz loop lock sensor is checked.	Latch:refs_10MHz_sense
Ext Reference Lock-out	The external reference can be locked out. The external reference sensor should not detect a signal if the lock-out works.	Latch:refs_ext_ref_sense

RF Input/Output Test

Table 198 RF Input/Output Test

Measurement	Explanation and Suggestions	Measurement Point
Duplex Out to RF I/O	The RF Generator is set to 100 MHz at −100 dBm to the **DUPLEX OUT**. The user must connect a cable from the **DUPLEX OUT** to the **RF IN/OUT** connector. The power meter is zeroed. Then the RF generator's amplitude is set to +10 dBm and the power meter is read.	GPIB "MEAS:RFR:POWER?" statement
Duplex Out to Ant In.	The RF generator is set to 100 MHz at +10 dBm to the **DUPLEX OUT**. The user must connect a cable from the DUPLEX OUT to the ANT IN connector. The signal is routed to the filter out detector in the input section.	DVM:FILTER_OUT_DET

Self-Test

Table 199 Self-Test

Measurement	Explanation and Suggestions	Measurement Point
Instrument Self-Test	The GPIB command, *TST?, is sent to the instrument. The instrument responds with a result in the range, 0 to 4094. If the result is not zero, then one or more instrument self tests failed. Individual bits in the result are set to 1 to indicate that certain tests failed. The program decodes the bits that are set and prints a message for each bit that is set to 1. The messages are listed below. **See "Description Of Self-Test Diagnostic" on page 588**. 1: Microprocessor Failure 2: ROM Failure 3: Standard RAM Failure 4: Option RAM Failure 5: Timer Failure 6: Real Time Clock Failure 7: Keyboard (stuck Key) Failure 8: RS-232 (option) Failure 9: Serial Comm Failure 10: Signaling Failure 11: CRT Controller Failure 12: Misc Hardware Failure	
Power Supplies On :\Power Supply, +5.1 V	Reads the actual +5.1 V power supply voltage on the Measurement Board.	DVM:MEAS_5V_REF
Power Supplies On :\Power Supply, +12.37 V	Reads the divided +12.37 V power supply voltage on the Measurement Board.	DVM:MEAS_12V_REF
Power Supplies On :\Power Supply, +41.5 V	Reads the divided +41.5 V power supply voltage on the Measurement Board.	DVM:MEAS_38V_REF
Power Supplies On :\Power Supply, –12.37 V	Reads the divided – 2.37 V power supply voltage on the Measurement Board.	DVM:MEAS_NEG_12V _REF
Power Supplies On :\Power Supply, +12.00 V	Reads the divided +12.00 V power supply voltage on the Measurement Board.	DVM:PS_12V_AUX

A

Error Messages

General Information About Error Messages

Information concerning error messages displayed by the Test Set may be found in one of the following manuals:

- *8920 or 8921 User’s Guides*
- *8920, 8921 Programmer’s Guide*
- *8920, 8921 Assembly Level Repair Manual*
- *Instrument BASIC User’s Handbook*:
  - 8920A or 8921A: *Instrument BASIC Users Handbook* (P/N E2083-90000)
  - 8920B: *Instrument BASIC Users Handbook Version 2.0* (P/N E2083-90005)

The format of the displayed message determines which manual contains information about the error message. There are four basic error message formats:

- Positive numbered error messages
- IBASIC error messages
- GPIB error messages
- Text only error messages

The following paragraphs give a brief description of each message format and direct you to the manual to look in for information about error messages displayed in that format.

Positive Numbered Error Messages

Positive numbered error messages are generally associated with IBASIC. Refer to the *Instrument BASIC User's Handbook* for information on IBASIC error messages.

Positive numbered error messages take the form: **`ERROR XX error message`**

For example:

- **`Error 54 Duplicate file name`**
  - or
- **`Error 80 in 632 Medium changed or not in drive`**

IBASIC Error Messages

IBASIC Error Messages are associated with IBASIC operation. IBASIC error messages can have both positive and negative numbers. Refer to the *Instrument BASIC User's Handbook* for information on positive numbered error messages. Refer to the GPIB Error Messages section of the *8920, 8921 Programmer's Guide* for information on negative numbered error messages (the error message associated with a negative number is the same for GPIB errors and IBASIC errors).

IBASIC error messages take the form: **`IBASIC Error: -XX error message`**

For example:

- **`IBASIC Error: -286 Program runtime error`**

GPIB Error Messages

GPIB Error Messages are associated with GPIB operation. Refer to the 8920, 8921 Programmers Guide for information on GPIB error messages.

GPIB error messages take the form: **`HP-IB Error: -XX error message`** or **`HP-IB Error error message`**

For example:

`HP-IB Error: -410 Query INTERRUPTED.`

or

`HP-IB Error: Input value out of range.`

Text Only Error Messages

Text only error messages are generally associated with manual operation of the Test Set. Refer to the *Agilent 8920 or 8921 User's Guide* for information on text only error messages.

Text only error messages can also be displayed while running the Test Set's built-in diagnostic or calibration utility programs. Refer to the *Agilent 8920, 8921 Assembly Level Repair* manual for information on text only error messages displayed while running the Test Set's built-in diagnostic or calibration utility programs.

Text only error messages take the form: **`This is an error message.`**

For example:

- **`Input value out of range.`**

The Message Display

During instrument operation, various messages may appear on the Test Set’s display. Prompt-type messages generally appear on the first line of the Test Set’s display. General operating and error messages usually appear on the second line of the display. Some messages are persistent; they remain displayed until the error condition no longer exists, or until another persistent message with greater priority occurs. Other messages are only displayed when the error first occurs; they are removed when a key is pressed or the knob is turned, or when an GPIB command is received. Many of the messages are displayed on the MESSAGE screen until the instrument is turned off.

Messages that are about error conditions may tell you what to do to correct the error (turn something off, reduce a field’s value, press a certain key, and so forth). Messages and prompts are sometimes accompanied by a beep or warble.

NOTE: **Warbles and Beeps**

A warble sound indicates that an **instrument-damaging event** is occurring. Beeps often occur only with the first occurrence of the message. Prompts are generally silent.

Non-Recoverable Firmware Error

The non-recoverable firmware error is very important. It appears when an unanticipated event occurs that the Test Set's firmware cannot handle. The message appears in the center of the Test Set's display and (except for the two lines in the second paragraph) has the form:

```
Non-recoverable firmware error.  Please record the 2 lines of
text below and contact Agilent Technolgies through your local
service center or by calling (800) 827-3848 (USA, collect) and
asking to speak to the 8920A Service Engineer.

 'Address error exception'
  at line number 0

To continue operation, turn POWER off and back on.
```

Follow the instructions in the message.

Unfortunately, you will not be able to recover from this condition. You must switch the Test Set off and back on. When you rerun the test where the Error Message occurred, it may not occur again. If it does reappear, record exactly what the configuration of the instrument was when the error appeared and contact Agilent Technologies.

Powerup Self-Test Error Messages

One or more self tests failed. Error code: 0080

A Test Set failure was detected when the Test Set was turned on. (For example, having a stuck front-panel key during turn-on.) The (hexadecimal) error code corresponds to the failure message (or messages) listed in **table 182, "Returned Values for Self-Test Diagnostic Failures" on page 590** . For example, error code 0080 corresponds to the message "keyboard Failure (stuck key)" .

Calibration Download Error Message

Cal file checksum incorrect. File reset to default values.

This message occurs at powerup when downloading of calibration data is unsuccessful. It indicates that the calibration data is corrupt, and although the Test Set will function, measurements will be inaccurate. Calibration data is downloaded from a memory card when certain assemblies are replaced, or it is generated when the Periodic Calibration program is run. This message will not occur again at powerup unless another unsuccessful downloading occurs.

Self-Calibration Error Messages

Voltmeter Self Calibration Failed. Error = 223, 0x0000ffff (EXAMPLE)

The example noted above is one of many messages that may occur during self-calibration. When the Test Set is powered up and at timed intervals for certain measurements, the Test Set calibrates itself internally. Calibration usually takes 20 to 30 ms. The following measurements are calibrated at these timed intervals:

- Voltmeter: approximately every 3 minutes
- Counter: approximately every 3 minutes
- Oscilloscope: approximately every 3 minutes
- Spectrum Analyzer: approximately every 4 minutes

Should a self-calibration fail, an error message is displayed. The error code (223, 0x0000ffff in the example above) will vary depending on the particular failure. Failures of this type are generally caused by hardware. Since a general self-calibration occurs immediately after power-up, these failures often appear as though they are power-up self-test errors.

When a self-calibration failure occurs, check the A19 Measurement assembly first since most of the measurement circuitry described above is located on it. However, in the case of the spectrum analyzer calibration, check the A18 Spectrum Analyzer assembly first. The A15 Reference assembly may also cause its own self-calibration failure or a Spectrum Analyzer error message. (The error message in the example above can be generated by unplugging the A15 Reference before powering up the Test Set.)

After displaying a self-calibration error message, the Test Set will proceed with the measurement using default calibration factors. Depending on the nature of the failure, subsequent measurements may look normal. The error message will persist.

Functional Diagnostics Failure Messages

Direct latch write occurred. Cycle power when done servicing.

This message will occur when initiating and running the Functional Diagnostics. It is one of several messages that are documented in **chapter 2, "Troubleshooting"** in the section *More About Step 3 - Run the Functional Diagnostics* under the subsection *Frequently Encountered Error Messages*.

Audio Diagnostics Messages

When a measurement is out of limits, a message is displayed at the end of the test which indicates the following:

- Suspected faulty assembly.
- Confidence level of the assertion (low, medium, high).
- Failure Code

A detailed description of the test including an interpretation of the failure codes and relevant block diagrams is located in **chapter 11, "Diagnostics Descriptions"** .

RF and Miscellaneous Diagnostics Messages

When a measurement is out of limits, a message is displayed at the end of the test which indicates the following:

- Suspected faulty assembly.
- Confidence level of the assertion (low, medium, high).

A detailed description of the test including an interpretation of the failure codes and relevant block diagrams is located in **chapter 11, "Diagnostics Descriptions"**.

Flash ROM Firmware Upgrade Error Messages (8920B only)

If the Test Set is an 8920B, firmware is stored in flash ROMs. With flash ROMs, the firmware can be quickly upgraded with new firmware from a PCMCIA memory card. It is not necessary to open the Test Set and replace individual ICs. Should problems arise in the process of uploading the new firmware, the user is notified by messages on the display which state the situation and suggest any actions to be taken.

The firmware upgrade process begins when the user inserts the firmware upgrade memory card into the front-panel memory card socket and turns the Test Set on. The Test Set notes the presence of a valid firmware upgrade card and proceeds to upload the firmware on the memory card into the flash ROMs on the A7 Controller assembly. Any failures that occur during the upload process are immediately reported and the upload is aborted.

The error messages that may be displayed during a firmware upgrade are listed below in alphabetical order. Supplemental fault information is included.

Memory Card Checksum Error

The memory card may be at fault. The card reader on the A8 Memory board could also be faulty.

Memory Card Read Error

This error will always appear if the user removes the memory card during the upload process. The memory card itself could be faulty or, less likely, the card reader on the A8 Memory board.

Memory Erase Error

This fault is most likely caused by either the flash ROMs themselves or the controller circuits. In either case replace the A7 Controller assembly.

Memory Write Error

This fault is most likely caused by either the flash ROMs themselves or the controller circuits. In either case replace the A7 Controller assembly.

Programming Voltage Error

The programming voltage is supplied to the flash ROMs from the power supply via the A7 Controller assembly. The fault is most likely on the A7 Controller but can be caused by the A10 Power Supply Regulator assembly.

ROM Checksum Error

With the new firmware loaded into the Test Set’s flash ROMs, the checksum on the ROM is tested. A faulty checksum is most likely caused by the flash ROMs themselves or possibly the controller circuits. In either case replace the A7 Controller assembly.