Agilent Technologies 8935 Series E6380A CDMA Cellular/PCS Base Station Test Set

Assembly Level Repair

Firmware Version B.03.10 and above

Agilent Technologies

Agilent Part Number: E6380-90015
CD-ROM Part Number: E6380-90027

Revision E
Printed in UK
January 2001

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Contents

1 General Information

This chapter contains generic information about the product, safety, warranty, sales and service offices, power-cables, and other information.

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 the following sound pressure emission specification:

- sound pressure Lp <70 dB(A)
- at the operator position
- under 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).

Safety Considerations

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product has been designed and tested in accordance with IEC Publication 61010-1+A1+A2:1992 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use 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.

SAFETY EARTH GROUND

A uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set.

CHASSIS GROUND TERMINAL

To prevent a potential shock hazard, always connect the rear-panel chassis ground terminal to earth ground when operating this instrument from a dc power source.

SAFETY SYMBOLS

⚠ Indicates instrument damage can occur if indicated operating limits are exceeded. Refer to the instructions in this guide.

⚡ Indicates hazardous voltages.

⏚ Indicates earth (ground) terminal

WARNING **A WARNING note 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 A CAUTION note denotes a hazard. It calls attention to an operation procedure, practice, 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 an CAUTION note until the indicated conditions are fully understood and met.

Safety Considerations for this Instrument

WARNING

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an autotransformer (for voltage reduction), make sure the common terminal is connected to the earth terminal of the power source.

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

No operator serviceable parts in this product. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

Servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the product from all voltage sources while it is being opened.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

For Continued protection against fire hazard, replace the line fuse(s) with T 250 V 5.0 A fuse(s) or the same current rating and type. Do not use repaired fuses or short circuited fuseholders.

WARNING ⚠ **This product is a Safety Class I instrument (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

WARNING

Always use the three-prong ac power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause personal injury and/or product damage.

This product is designed for use in Installation Category II and Pollution Degree 3 per IEC 61010 and IEC 60664 respectively.

This product has autoranging line voltage input, be sure the supply voltage is within the specified range.

To prevent electrical shock, disconnect instrument from mains (line) before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

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.

Product Markings

The CE mark shows that the product complies with all relevant European legal Directives (if accompanied by a year, it signifies when the design was proven).

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 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.

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: **Agilent Technologies**

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

declares that the product

Product Name:	Agilent Technologies 8935 CDMA Cellular/PCS Base Station Test Set
Model Number:	Agilent Technologies E6380A
Product Options:	All

conforms to the following Product specifications:

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

EMC: CISPR 11:1990/EN 55011:1991- Group 1, Class A
IEC 1000-3-2:1995 / EN 61000-3-2: 1995
IEC 1000-3-2:1995 / EN 61000-3-3: 1994
EN 50082-1:1992
IEC 801-2:1991 4kV CD, 8kV AD
IEC 801-3:1984 3V/m
IEC 801-4:1988 0.5 kV Sig. Lines, 1 kV Power Lines

Supplementary Information:

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 CE-marking accordingly.

Spokane, Washington USA November 20,1998

Vince Roland
Reliability & Regulatory
Engineer

European Contact: Your local Agilent Technologies and Service Office or Agilent Technologies GmbH Department ZQ/Standards Europe, Herrenberger Strasse 130, D-71034 Böblinger, Germany (FAX+49-7031-14-3143)

Agilent Technolgies Warranty Statement for Commercial Products

E6380A CDMA/Cellular PCS Base Station Test Set

Duration of Warranty: 1 Year

1. Agilent warrants Agilent hardware, accessories and supplies against defects in materials and workmanship for the period specified above. If Agilent receives notice of such defects during the warranty period, Agilent 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 warrants that Agilent 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 receives notice of such defects during the warranty period, Agilent will replace software media which does not execute its programming instructions due to such defects.

3. Agilent does not warrant that the operation of Agilent products will be uninterrupted or error free. If Agilent 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 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. If customer schedules or delays Agilent 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, (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 WARRANTY OR CONDITION, WHETHER WRITTEN OR ORAL IS EXPRESSED OR IMPLIED AND Agilent SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OR MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.
8. Agilent 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 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 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.

By internet, phone, or fax, get assistance with all your test and measurement needs.

Table 1-1 Contacting Agilent

Online assistance: www.agilent.com/find/assist

United States	Latin America	Canada	Europe
(tel) 1 800 452 4844	(tel) (305) 269 7500 (fax) (305) 269 7599	(tel) 1 877 894 4414 (fax) (905) 282-6495	(tel) (+31) 20 547 2323 (fax) (+31) 20 547 2390
New Zealand	**Japan**	**Australia**	
(tel) 0 800 738 378 (fax) (+64) 4 495 8950	(tel) (+81) 426 56 7832 (fax) (+81) 426 56 7840	(tel) 1 800 629 485 (fax) (+61) 3 9210 5947	

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

Power Cables

Table 1-2 Power Cables

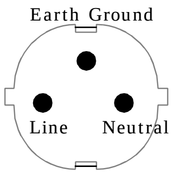
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-1689 8120-1692	79 inches, mint gray 79 inches, mint gray
Used in the following locations			
Afghanistan, Albania, Algeria, Angola, Armenia, Austria, Azerbaijan, Azores			
Bangladesh, 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 Indian Ocean 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.Pierce Islands			
Sweden, Syria			

Table 1-2 Power Cables

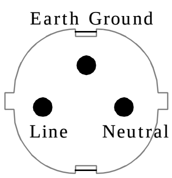
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	**Straight/Straight** **Straight/90°**	**8120-1689** **8120-1692**	**79 inches, mint gray** **79 inches, mint gray**
Tajikistan, Thailand, Togo, Tunisia, Turkey, Turkmenistan			
USSR, Ukraine, Uzbekistan			
Western Africa, Western Sahara			
Yugoslavia			
Zaire			

Table 1-3 Power Cables

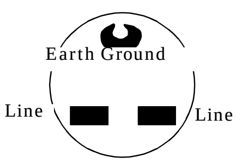
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	Straight/Straight	8120-0698	90 inches, black
Used in the following locations			
Peru			

Table 1-4 Power Cables

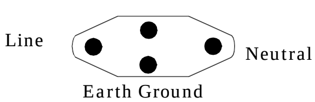
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-2104 8120-2296	79 inches, gray 79 inches, gray
Used in the following locations			
Switzerland			

Table 1-5 Power Cables

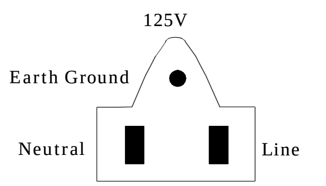
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90 Straight/Straight	8120-1378 8120-1521 8120-1751	90 inches, jade gray 90 inches, jade gray 90 inches, jade gray
Used in the following locations			
American Samoa			
Bahamas, Barbados, 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 of Pacific Islands			
Turks Island			
United States			
Venezuela, Vietnam, Virgin Islands of the US			
Wake Island			

Table 1-6 Power Cables

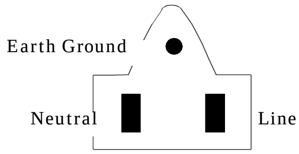
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
JIS C 8303, 100 V 	Straight/Straight Straight/90°	8120-4753 8120-4754	90 inches, dark gray 90 inches, dark gray
Used in the following locations			
Japan			

Table 1-7 Power Cables

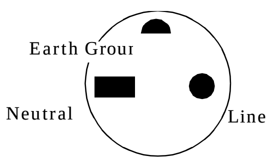
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	90° /STRAIGHT 90°/90° Straight/Straight	8120-2956 8120-2957 8120-3997	79 inches, gray 79 inches, gray 79 inches, gray
Used in the following locations			
Denmark			
Greenland			

Table 1-8 Power Cables

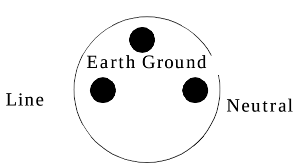
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-4211 8120-4600	79 inches, mint gray 79 inches, mint gray
Used in the following locations			
Botswana			
India			

Table 1-8 Power Cables

Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
Lesotho			
Malawi			
South-West Africa (Namibia), Swaziland			
Zambia, Zimbabwe			

Table 1-9 Power Cables

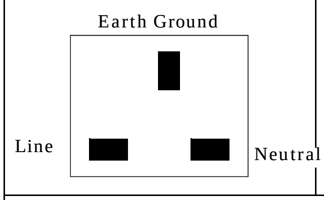
Plug Type (Male)	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	90°/Straight 90°/90°	8120-1351 8120-1703	90 inches, mint gray 90 inches, mint gray
Used in the following locations			
Bahrain, British Indian Ocean Terr., Brunei			
Canton, Cyprus			
Enderbury Island, Equatorial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

Table 1-10 Power Cables

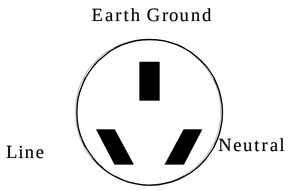
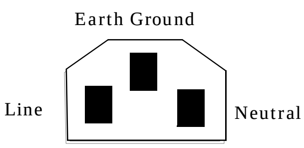
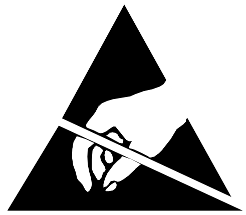
Plug Type	Plug Descriptions male/female	Agilent Part # (cable & plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-1369 8120-0696	79 inches, gray 80 inches, gray
Used in the following locations			
Argentina, Australia			
China (People's Republic)			
New Zealand			
Papua New Guinea			
Uruguay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

Table 1-11 Power Cables

Plug Type	Plug Descriptions male/female	Agilent 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			



ATTENTION

Static Sensitive
Devices

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

Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity of a static charge. The result can cause 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.

Documentation

Conventions Used in This Manual

The following conventions are used throughout this manual to help clarify instructions and reduce unnecessary text:

- "Test Set" refers to the Agilent 8935 CDMA Cellular/PCS Base Station Test Set.
- Test Set keys are indicated like this: **Preset**
- Test Set screen information, such as a measurement result or an error message, is shown like this: `TX Channel Power -1.3 dBm`

NOTE HP-IB and GPIB are one and the same.

What Is In This Manual

Chapter 1 , "General Information," on page 11.

This chapter contains generic information about the product, safety, warranty, sales, and service offices, power-cables, and other information.

Chapter 2 , "Product Information," on page 35.

This chapter contains general information about the Test Set and how to service it.

Chapter 3 , "Troubleshooting," on page 47.

This chapter explains how to isolate a problem to the defective assembly. Troubleshooting uses the Test Set's built-in diagnostics. If diagnostics can't identify the faulty assembly, supplementary information in the form of manual troubleshooting procedures is provided.

Chapter 4 , "Preventative Maintenance," on page 93.

This chapter describes the preventative maintenance procedures recommended for the Test Set.

Chapter 5 , "Disassembly," on page 101.

This chapter explains how to disassemble the Test Set for major assembly replacement.

Chapter 6 , “Replaceable Parts,” on page 135.

This chapter contains the replaceable assembly and component information for the Test Set. Use the illustrations in this chapter to identify the replaceable parts and the “Parts List” on page 150 for part numbers.

Chapter 7 , “Periodic Adjustments,” on page 157.

This chapter contains the periodic adjustment procedures for the Test Set.

Chapter 8 , “Performance Tests,” on page 173.

This chapter contains the performance test procedures for the Test Set. The tests in this chapter verify that the Test Set performs to its published specifications.

Chapter 9 , “Performance Test Records,” on page 233.

Use this chapter to record the results of the performance tests in Chapter 8 , “Performance Tests,” on page 173.

Chapter 10 , “Block Diagrams,” on page 283.

This chapter contains 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 Test Set’s diagnostic programs are unable to do so.

Which Document is Required?

The following documents are part of the Agilent 8935 document set. Use the table to help you decide which document you need.

Table 1-12 Document Navigation

Document	Part Number	Usage
CDMA Application Guide	E6380-90016	Use this manual for basic CDMA measurements and for getting started with the Test Set.
AMPS Application Guide	E6380-90017	Use this manual for making AMPS base station measurements.
Reference Guide	E6380-90019	Use this manual for screen and field descriptions and general operation information about the Test Set.
GPIB Syntax Reference Guide	E6380-90073	Use this manual as a reference to the syntax and use of all available GPIB commands.
Programmer's Guide	E6380-90018	Use this manual to learn GPIB syntax and for learning how to program the Test Set.
Assembly Level Repair Guide (this manual)	E6380-90015	Use this manual to perform calibration on the Test Set and for general service information.
Technical Specifications Publication	5966-0512E	Test Set's specifications data sheet
CDROM	E6380-90027	Includes all of the above documents.

Trademark Acknowledgements

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Microsoft, Windows®, and MS-DOS®, are registered trademarks of Microsoft Corporation.

ProComm, is a registered trademark of DataStorm Technologies, Inc.

HyperTerminal© is a registered trademark of Hilgraeve, Incorporated.

Pentium® is a registered trademark of Intel Corporation.

2 Product Information

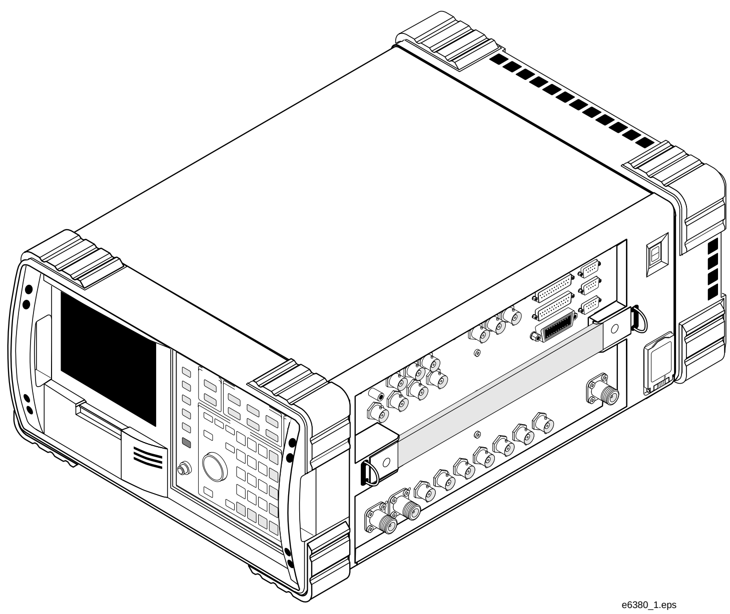
This chapter contains general information about the Test Set and how to service it.

Instrument Description

The Agilent 8935 CDMA Cellular/PCS Base Station Test Set is a one-box tool designed to meet the needs of installation teams, service providers, and network manufacturers when installing, testing, and maintaining CDMA base stations at both the cellular and PCS frequency bands. It also can be used to test AMPS base stations. Features include:

- Waveform quality rho (ρ), frequency error, code domain power, timing, and phase analysis
- Analog and digital (CDMA) capabilities
- Firmware upgradeable via PCMCIA to flash memory
- Automation software to increase measurement repeatability
- Built-in AWGN source for calibrated Eb/No settings

Figure 2-1 The Agilent 8935 CDMA Cellular/PCS Base Station Test Set



This Test Set utilizes a bright electroluminescent display for reading data. All connectors are recessed and mounted on one side allowing unobstructed, out-of-the-way hook up. Its rugged design includes a hand strap for portability, a membrane keypad, gasketed display, stand up operation, filtered airflow, and a rugged exterior to help the Test Set from bumps and shocks.

The user interface features pull down menus, one-key measurement execution, and fast measurement speed. Measurement data can be output to a printer or a PCMCIA memory card.

The Test Set's firmware is user upgradeable with a PCMCIA card to flash memory. Thus, new features and capabilities can be added without returning the unit to the service center.

The Test Set contains a CDMA signal generator and a frequency translator which allow generation of CDMA signals at both cellular and PCS frequencies. CDMA tools include:

- Code Domain Analyzer
- CDMA Analyzer
- CDMA Generator
- Power Meter (both wideband and channel)

Other test tools include:

- Spectrum Analyzer
- Oscilloscope
- AMPS Analyzer
- AC/DC Voltmeter
- Audio and RF Generators
- Built-in IBASIC Controller

For documentation on this Test Set, see "Manuals" on page 45.

Instrument Assemblies

Table 2-1 and Figure 2-2 on page 39 describe the assemblies of the Agilent 8935 CDMA Cellular/PCS Base Station Test Set.

Table 2-1 **Chapter 1 , "General Information," on page 11.**

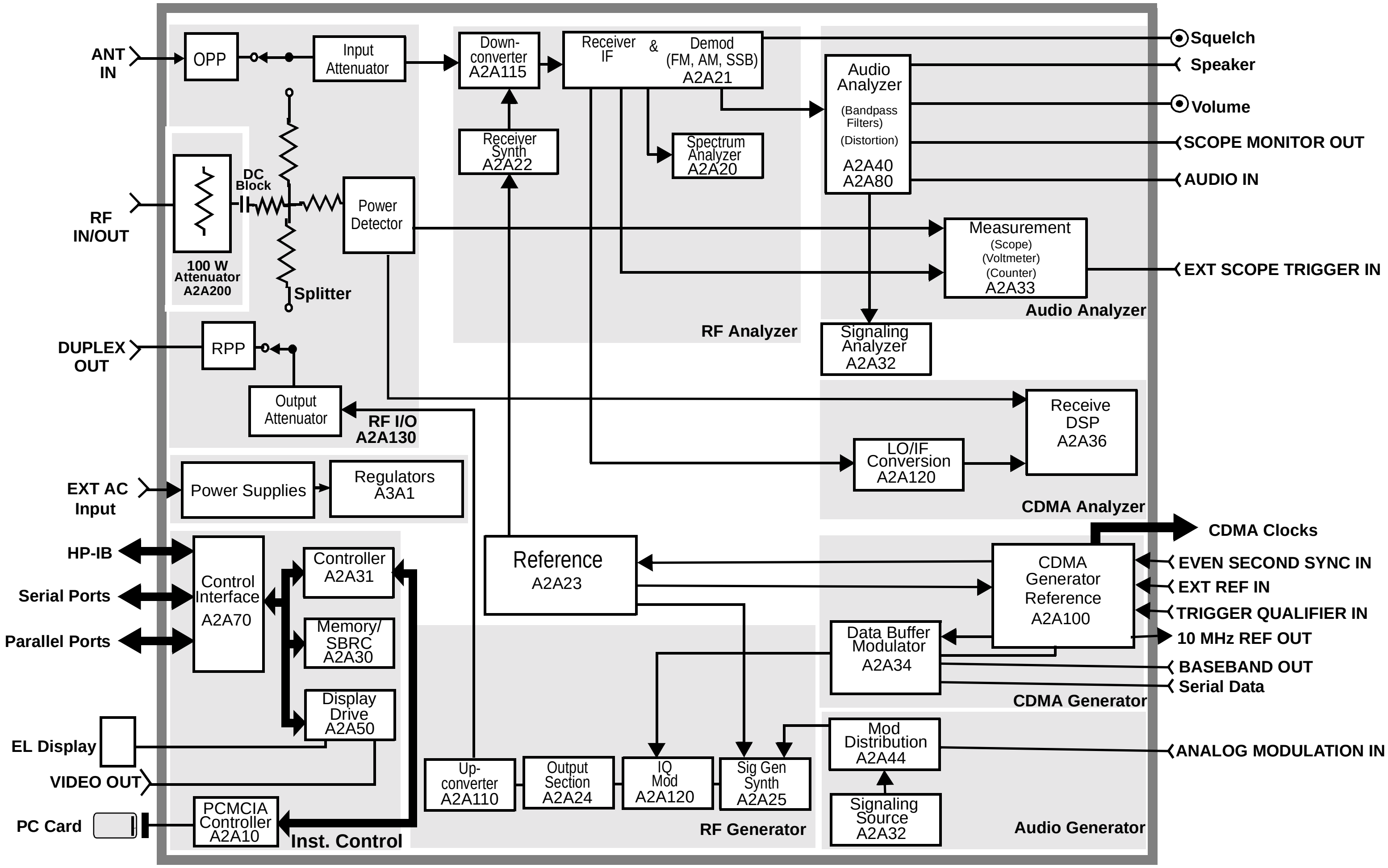
Reference Designator	Assembly Name	Function
A1	Front Panel Assembly	Contains display and keyboard sub assemblies
A1A3	RPG Board	Interface for front-panel-knob rotary pulse generator
A2A1	Motherboard	Provides connection and interface for assemblies
A2A10	PCMCIA	Control of PC card reader
A2A20	Spectrum Analyzer	Signal spectrum analyzer
A2A21	Receiver	IF filtering and demodulation
A2A22	Receiver Synthesizer	Supplies LO signal for IF creation
A2A23	Reference	Standard or high-stability reference oscillator
A2A24	Output Section	Conditions signal for output of instrument
A2A25	Signal Generator Synthesizer	Provides CW signal for RF generator
A2A30	Memory/SBRC	Test Set's RAM and gated bus control
A2A31	Controller	Overall instrument control
A2A32	Signaling Source and Analyzer	Source for the RF generator system and analyzer for the audio analyzer system
A2A33	Measurement	Provides oscilloscope, voltmeter, and counter functions
A2A34	Data Buffer	Provides data buffering and reverse link modulation
A2A36	Receive DSP (RX DSP)	Digital signal processing for the CDMA Analyzer
A2A40	Audio Analyzer 2	Provides audio distortion analysis
A2A44	Modulation Distribution	Source of FM
A2A50	Display Drive	Controls EL display
A2A70	Control Interface	Interface between instrument and side-panel parts
A2A80	Audio Analyzer 1	Provides audio filtering
A2A80A1	C-Message Filter	Audio filter
A2A80A2	6 kHz Bandpass Filter	Audio filter

Table 2-1 Chapter 1 , "General Information," on page 11.

Reference Designator	Assembly Name	Function
A2A100	Generator Reference (Gen Ref)	CDMA data generation and instrument reference master (with external reference)
A2A110	Upconverter	Converts output signal to PCS frequencies
A2A115	Downconverter	Converts input frequencies to instrument level IF
A2A120	LO IF/IQ Modulator	Receive-path IF downconversion and generator-path IQ modulation
A2A130	RF Input/Output	RF input and output is directed through one assembly
A2A200	100 W Attenuator	Provides high-power RF attenuation
A2U1	DC Block Assembly	Standard AC Coupled feature on the RF Input / Output connector. Test sets with a serial prefix greater than GB4005xxxx included this feature and can be recognized by the AC Coupled label by the RF IN/Out connector
A3	Power Supply assembly	Contains power supply, regulator, and fan assemblies
A3A1	Power Supply Regulator	Regulates the power supply voltages

Figure 2-2 Overall Block Diagram

CDMA BASE STATION TEST SET OVERALL BLOCK DIAGRAM



OPP - Over Power Protection

RPP - Reverse Power Protection
SBRC - Serial Bus Receiver Chip

Upgrades

Hardware and Firmware Enhancements

The hardware and firmware for this Test Set are being enhanced on a continuous basis. Hardware can be upgraded by ordering a specific retrofit kit. Firmware is upgraded by downloading new software or installing new PROMs. The firmware for this Test Set has gone through several revisions to improve performance and fix problems.

It is recommended that the firmware be upgraded to the latest revision whenever the Test Set is repaired or a performance problem is found. This is important especially if an assembly-level repair is performed by the exchange of assemblies - the replacement assemblies may require a later revision of the firmware for the assembly and/or Test Set to function correctly.

When downloading new firmware, a program is used that downloads the new firmware files from a PC memory card to the instrument. Table 2-2 and Table 2-3 list the upgrade kits available. For ordering information, see "Service Information" on page 46.

Table 2-2 Firmware Upgrade Kits

Kit	Description
E6380ART R58	Agilent 8935 CDMA Cellular/PCS Base Station Test Set Firmware (for customer)
E6380ART RD5	Agilent 8935 CDMA Cellular/PCS Base Station Test Set Firmware (for Agilent support personnel)

Table 2-3 Hardware Upgrade Kit

Kit	Description
Agilent 8935 RD5 E6380A RD5 E6380ART R20 E6380ART R23 E6380ART R2K	• High Stability Timebase • DC Block • Side Impact • CDMA_2000

Load the Host Firmware

The following procedure loads the host firmware.

1. Power the Test Set off.
2. Insert the E6380-10001 memory card into the Test Set.
3. Power on the Test Set.

4. Follow the instructions on the screen.
5. After the firmware is downloaded, be sure to cycle the Test Set's power off-and-on to complete this procedure.

Load the DSP Firmware

The following procedure loads the digital signal processor firmware.

1. Press the **Preset** key.
2. Insert the E6380-10002 memory card into the Test Set.
3. Press the **Menu** key.
4. Set the `Select Procedure Location:` field to `Card`.
5. Set the `Select Procedure Filename` field to `DLFIRM`.
6. Select `Run Test` (**k1**).
7. Follow the instructions on the screen.

After the firmware is downloaded, be sure to cycle the Test System's power.

CDMA 2000 Enable Process

The following procedure will allow you to enable the CDMA 2000 feature for the 8935 CDMA Base Station Test Set, (E6380A option 200):

1. Verify the test set is turned off.
2. Insert the Host FW card 1 of 2 into the PCMCIA card slot on the front of the test set.
3. Power the unit on. Follow the on screen directions to start the Host FW download procedure.
4. Once the second card is loaded, select the Menu screen.
5. Insert the DSP card 1of 1 into the PCMCIA card slot.
6. On the Menu screen, choose Card for Procedure Location.
7. Select DLFIRM for Procedure Filename.
8. Load and run the program by pressing the Run Test soft key, **K1**.
9. Once the DSP code is loaded, remove the DSP card and cycle power.
10. Insert the Config. Program card into the PCMCIA slot.
11. From the Menu screen select Card location and Config Filename.
12. Load and run the program by pressing the Run Test softkey, **K1**.
13. Follow the on screen direction to enable Option 200 (IS2000_CDMA).

14.Enter the firmware code word: This code word is unit specific and can only be used with the unit for which it was ordered. If you have more than one test set to upgrade you must associate the upgrade kit with the serial number of the test set for which it was ordered.

15.Once the codeword is entered the program will prompt you to cycle power to enable the CDMA 2000 feature.

After the Test set has fully booted you must choose the IS-2000 function by selecting the Inst Config screen:

Move the cursor to the CDMA Std field on the Instrument Configure screen and select IS-2000 to enable the CDMA 2000 functionality.

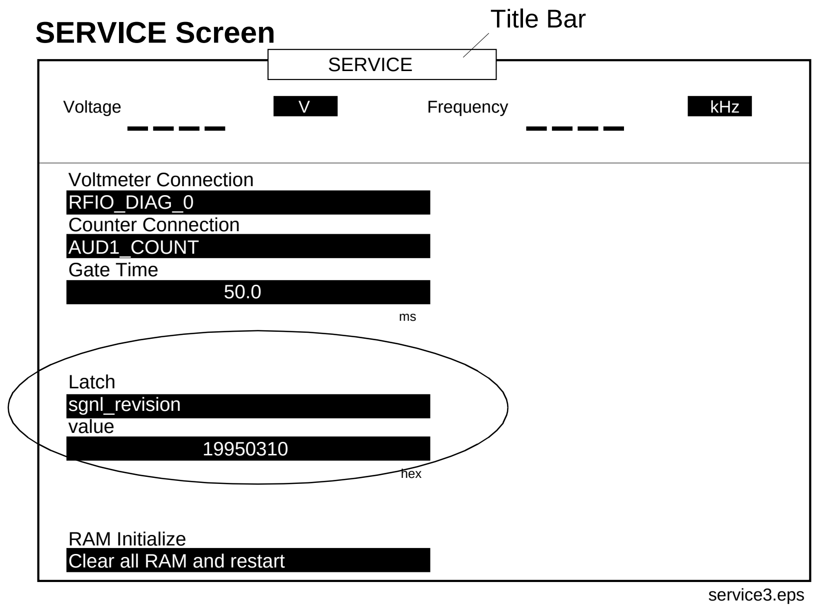
If you encounter any difficulty with this upgrade please email or call Technical Support for additional assistance.

Checking Firmware Version

The following procedure checks the current version of firmware in the Test Set.

1. Power on the Test Set.
2. Press the **Inst Config** key. The INSTRUMENT CONFIGURE screen appears. The host firmware level appears in the upper right corner of this screen.
3. To find the Receive (RX) DSP firmware revision level, select the title bar of the INSTRUMENT CONFIGURE screen. A drop down menu appears.
4. Select SERVICE. The SERVICE screen appears, see Figure 2-3 on page 43.

Figure 2-3 SERVICE Screen



5. Select the `Latch` field.
6. Move the cursor to `rx_dsp_revision` under the `Choices:` menu and press the knob.
7. Read the `Value` data field. This is the RX DSP firmware revision level. The value is actually a date in the form YYYYMMDD (Y=year, M=month, D=day).

Repair Process

WARNING **SHOCK HAZARD. NO OPERATOR SERVICEABLE PARTS INSIDE METALLIC ENCLOSURE. SERVICE BY QUALIFIED PERSONNEL ONLY.**

Repairing the Test Set consists of the following steps:

1. Isolate the problem to a faulty assembly within the Test Set. Refer to Chapter 3 , "Troubleshooting," on page 47.
2. Replace the faulty assembly.
3. Calibrate the Test System by regenerating calibration data, see Chapter 7 , "Periodic Adjustments," on page 157.
4. Verify the performance of the Test Set, see Chapter 8 , "Performance Tests," on page 173.

Lifting and Handling

When lifting and handling the Agilent 8935 CDMA Cellular/PCS Base Station Test Set use ergonomically correct procedures. Lift and carry by the strap on the side panel.

When moving the Test Set more than a few feet, be sure to replace the front screen cover.

Consumables

Two AA alkalyne batteries are supplied with the Test Set and must be replaced periodically. When replacing batteries always dispose of old batteries in a conscientious manner, following manufacturer's instructions.

Manuals

Operation and servicing the Agilent 8935 CDMA Cellular/PCS Base Station Test Set are discussed in the following manuals:

- CDMA Application Guide E6380-90016
  This manual explains how to use the Agilent 8935 Test Set to manually test a CDMA Base Station. This document presents a step-by-step approach to CDMA base station testing using the Test Set, including what you need to know before you can start testing.
- Programmer's Guide E6380-90018
  How to perform IBASIC programming operations, such as writing, editing, copying, or cataloguing programs.
- Assembly Level Repair Manual (ALR) - this manual E6380-90015
  Includes assembly, troubleshooting, diagnostics, and repair procedures and descriptions for the Test Set.
- Technical Specifications Publication 5966-0512E
- Reference Guide E6380-90019
- *Agilent 8935 CDMA Cellular/PCS Base Station Test Set E6380-90027* CD-ROM (Includes all or most of the above mentioned manuals).

Service Information

Factory Support

Troubleshooting assistance is available by e-mail (electronic mail), website, or telephone:

- Internet e-mail address
  `support_wsp@agilent.com`
- Agilent Support Website
  Use the URL: `http://www.agilent.com`, select **Products & Services**, then select **Test & Measurement** and finally select **Technical Support**. A wide range of documentation, hardware drivers and support information is available, including a part number search engine.
- U.S.A. and Canada only, M-F 8am -5 pm PST,
  toll free 1-800-827-3848 or 1-800-452-4844
- Outside North America, M-F 8 am - 5 pm PST,
  phone 509-921-3848
- Application Support, M-F 8 am -5 pm PST,
  phone 1-800-922-8920 or 1-800-452-4844

Ordering Parts

To order parts, call Agilent Global Support Logistics (GSL):

- U.S.A only,
  Agilent Direct Parts Ordering, phone877-447-7278
- U.S.A and international,
  Agilent Service Parts Identification, phone877-447-7278

Repair and Calibration/ Instrument Support Center

- USA only, 800-403-0801

Test & Measurement Call Center

- USA only, 800-452-4844

3 Troubleshooting

This chapter explains how to isolate a problem to the defective assembly. Troubleshooting uses the Test Set's built-in diagnostics. If diagnostics can't identify the faulty assembly, supplementary information in the form of manual troubleshooting procedures is provided.

How to Troubleshoot the Test Set

Document the result of each step in case you need to contact Agilent Technologies for service assistance. General troubleshooting steps are illustrated in Figure 3-2 on page 49.

NOTE Periodic Adjustment Interval

The calibration programs Periodic Calibration, IQ Calibration and Eb/No Calibration should be performed after the replacement of any assembly referred to in Table 7-1 on page 159, or at least every 24 months. See Chapter 7 , "Periodic Adjustments," on page 157 for details.

On power-up, the Test Set runs the Self-Test Diagnostic. Most of the Test Set's digital control functions are tested. The outcome of the test appears on the display (if operating) and on four LEDs viewable through an access hole in the top internal cover, see Figure 3-1.

Figure 3-1 LEDs

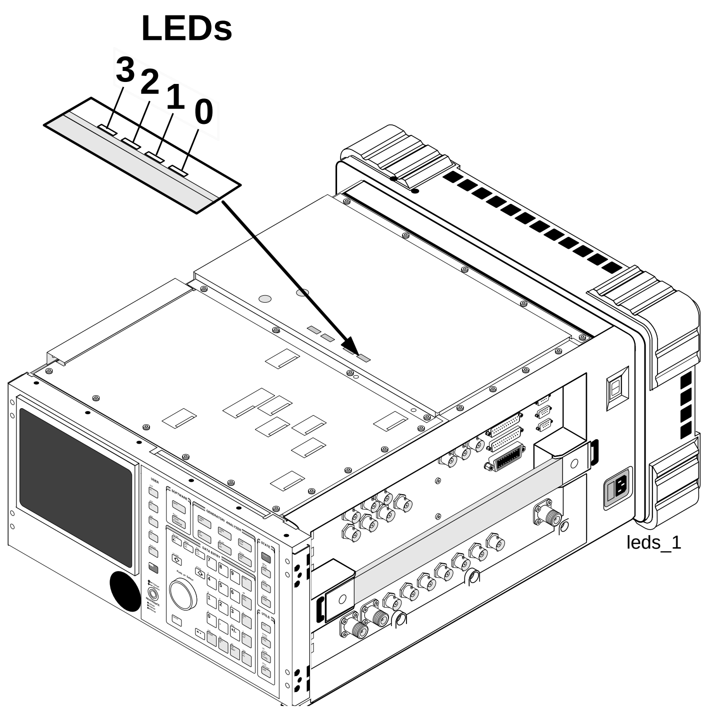
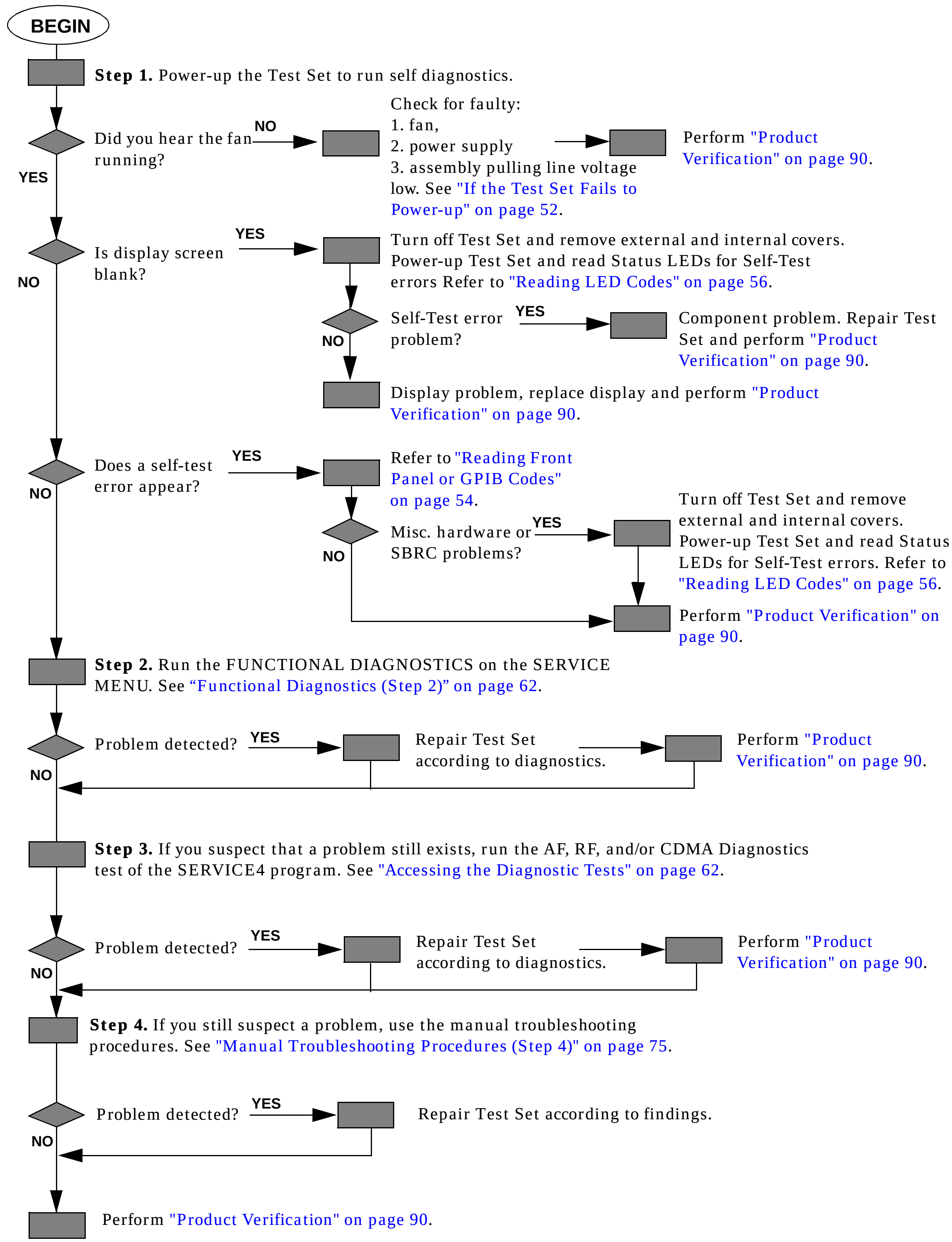


Figure 3-2 Agilent 8935 Test Set Troubleshooting Flowchart



Self-Test Diagnostics (Step 1)

On power-up the Test Set runs a self-test diagnostic test. Most of the Test Set's digital functions are tested. The outcome of the test appears on the display (if operating) and on four LEDs viewable through an access hole on the top internal cover.

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.

   During the test, coded failure information is displayed on four LEDs on the top of the Controller (A2A31) assembly, see Figure 3-5 on page 53. The Test Set's cover must be removed to view these LEDs. See chapter 3 for disassembly and replacement instructions.

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 the `Self Test menu item of the Functional Diagnostics menu` is selected.

To Start Troubleshooting

1. Turn on the Test Set to automatically run the self test diagnostics.

   - If the Test Set does not power up, see "If the Test Set Fails to Power-up" on page 52.
   - If all self-test diagnostics pass, and the front-panel keys and knob work, you can assume that the digital control assemblies work.

2. After power-up, the top line of the Test Set's display should show copyright information and the firmware revision code. The second line should display `All self tests passed`.

   - If the Test Set powers-up with "`One or more self-tests failed. Error code:<hexadecimal error code>:`", see "Reading Front Panel or GPIB Codes" on page 54.
   - See "Frequently Encountered Diagnostic Messages" on page 73. for other error messages that might appear on the second line of the display.

3. The CDMA ANALYZER screen should be displayed. Two conditions cause a different screen to be displayed on power-up:

   ❏ A SAVE/RECALL register named POWERON was saved to automatically power-up the Test Set in a different state. Press the **Preset** key before proceeding; this will restore the Test Set to the factory power-up condition.

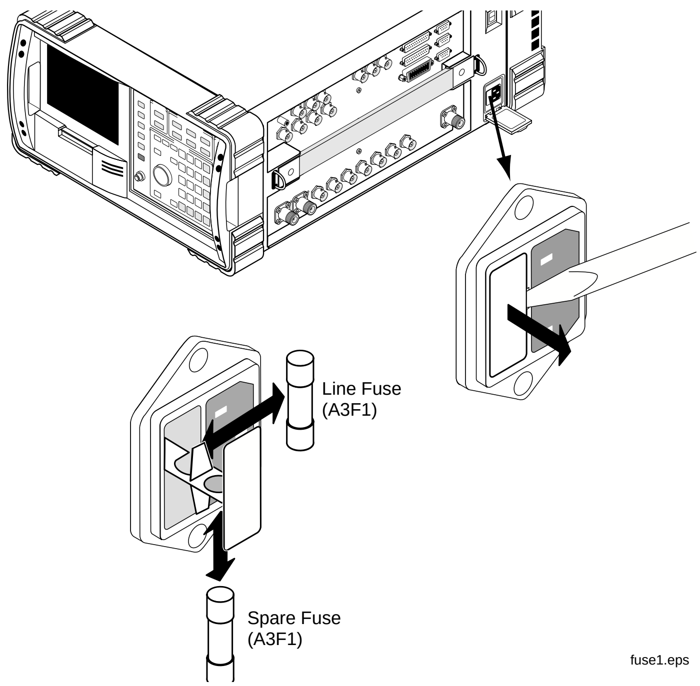
   ❏ The `Autostart Test Procedure on Power-Up:` field (of the "TESTS [Execution Conditions]" screen) is set to `On` to automatically run a loaded program. Press the **Shift** key, then press the **Cancel** key to stop the program. Press the **Preset** key to restore the Test Set to the factory power-up condition.

   To turn the autostart function off, press the **Menu** key, then select `Execution Cond` (under the `SET UP TEST SET:` heading). The autostart function is at the bottom of the screen; turn it `Off`.

If the Test Set Fails to Power-up

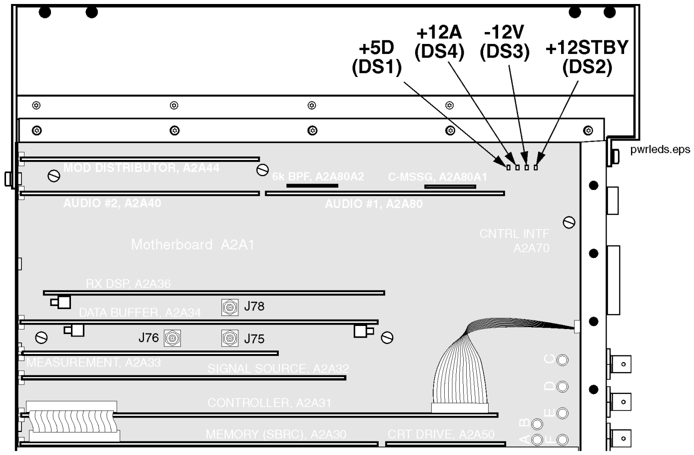
1. Is the Test Set plugged in? Listen for fan operation. If you don't hear it, check the line fuse (Figure 3-3) and the GFI reset button, see "Reset and GFI-Test Buttons (older units with GFI circuit)" on page 98.

Figure 3-3 Fuse



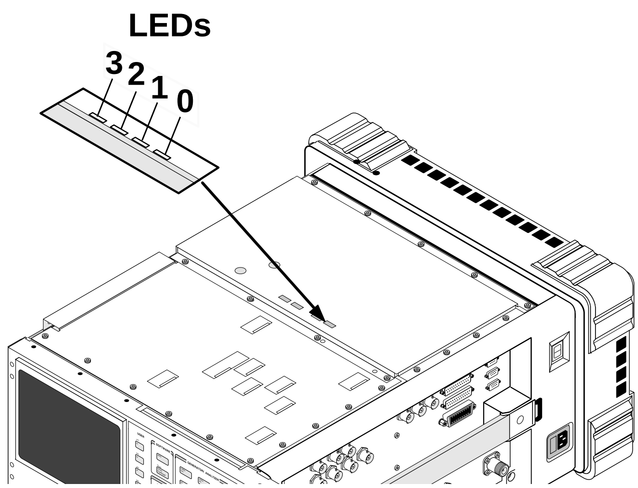
2. If there is no image on the display, remove the Test Set's covers and check the power supply LEDs: +5V, –12V, +12V (see Figure 3-4). If one is out, the power supply or regulator board is faulty. If no LEDs are lit, confirm that the Test Set is connected to the main power source. (Also, see step 5.)

Figure 3-4 Power Supply LEDs



3. Check the LEDs on the A2A31 Controller assembly, see Figure 3-5 on page 53. The LEDs should all light up immediately on power-up, and then go off several seconds after a beep is heard. If the LEDs do not light when the Test Set is powered-up, either the Controller or the Memory/SBRC (A2A30) assembly is faulty.

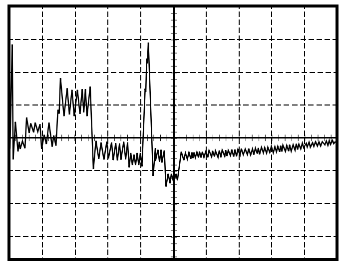
Figure 3-5 A2A31 Controller Assembly



4. If the Test Set does not power-up properly, but the fan operates and the power supply voltages are correct on the Power Supply Regulator (A3A1) outputs, the Controller (A2A31) may be failing. Check TP2 on the Controller for +5V. If +5V is present, the Controller assembly is faulty.

5. If there is no display, but VIDEO OUT port on the side-panel has the signal shown in Figure 3-6, then the A1A1 Display assembly is faulty. If the signal is not present, then Display Drive A2A50 assembly is faulty.

Figure 3-6 VIDEO OUT Signal



500mV/div.

500µs/div.

Reading Front Panel or GPIB Codes

Failure codes are listed in the table below. 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 3-1 Return Values for Self-Test Diagnostic Failures

Detected Failure Failed Assembly		Returned Error Code	
		Hexadecimal (displayed)	Decimal (GPIB)
Microprocessor	A2A31 Controller	0002	2
ROM	A2A31 Controller	0004	4
RAM	A2A30 Memory/SBRC	0008	8
RAM	A2A30 Memory/SBRC	0010	16
Timer	A2A31 Controller	0020	32
Real-Time Clock	A2A30 Memory	0040	64
Keyboard (stuck key)	A1A2 Keypad[1]	0080	128
RS-232 I/O	A2A30 Memory/SBRC	0100	256
Serial Bus Communication	Any Non-Optional assembly [2]	0200	512
Signaling Board Self-Test	A2A32 Signaling Source/Analyzer	0400	1024
Display Drive Self-Test	A2A50 Display Drive	0800	2048
Miscellaneous Hardware	Several Possible Assemblies [3]	1000	4096

1. Could also be the A2A31 Controller with a faulty key-down detector.
2. This checks the ability of the Controller to communicate with any hardware on the bus.
3. This message occurs if expected hardware is absent or not 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 A2A31 Controller assembly. The failure codes are sent out as code sequences. Figure 3-7 on page 58 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 decode 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 when running the functional 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 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 3-1 on page 55. Figure 3-8, "First LED Patterns," on page 59 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: see Figure 3-9 on page 60 and Figure 3-10 on page 61.
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 (labeled 0) is the least-significant bit (see Figure 3-7 on page 58).

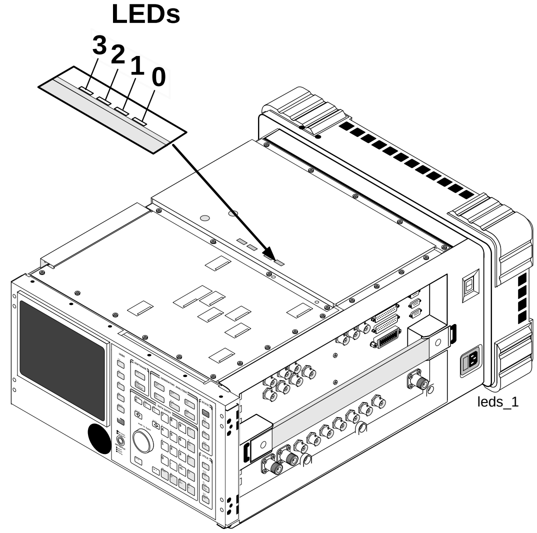
For example if the LEDs blinking pattern is Off, On, On, On (reading left-to-right or LEDs “3 2 1 0”), the binary number is 0111 or decimal 7. The error codes shown in Table 3-1 on page 55 are weighted by the binary value. The weighted value for this example is decimal $2^7 = 128$ or hexadecimal 80. (This failure is easy to simulate; simply power-up the Test Set while holding down a key.)

Figure 3-7 Reading the Self-Test Diagnostic. The Internal LEDs

1. Remove the Test Set's external cover.
2. Turn power on.
3. Read the LED sequence (see illustration on right) and compare with the patterns below.

NOTE

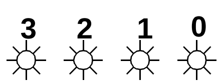
For multiple failures, the failure patterns described below will repeat for all failures detected.



LED Sequences

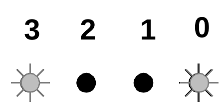
No Failures...

- The LEDs will light for approximately 10 seconds, then all will turn off.



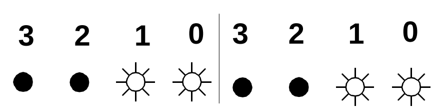
Failures... three patterns are displayed:

- The first blinks rapidly and indicates the type of failure.



See the following tables. (This example indicates a Serial Bus Communication problem.)

- The second and third patterns blink slowly and indicate failure details.



(This example indicates a faulty A2A80 Audio Analyzer 1 assembly.)

LED Legend
● = off
= rapid blink
= steady on or slow blink

Figure 3-8 First LED Patterns

If the first LED pattern displayed is... 3	2	1	0	Then the failure is...
off	off	off	rapid blink	Microprocessor
off	off	rapid blink	off	ROM Checksum (See note 1.)
off	off	rapid blink	rapid blink	RAM (See note 2.)
off	rapid blink	off	off	RAM (See note 3.)
off	rapid blink	off	rapid blink	Timer
off	rapid blink	rapid blink	off	Real-Time Clock
off	rapid blink	rapid blink	rapid blink	Keyboard (stuck key or faulty key-down detector)
rapid blink	off	off	off	Control Interface, A2A70 (See note 4.)
rapid blink	off	off	rapid blink	Serial Bus Communication (see figure 3-9 on page 60)
rapid blink	off	rapid blink	off	Signaling Board Self Test
rapid blink	off	rapid blink	rapid blink	Display Drive Self Test
rapid blink	rapid blink	off	off	Miscellaneous Hardware (see figure 3-10 on page 61)

LED Legend
- ● = off
- ☼ (shaded) = rapid blink
- ☼ (open) = steady on or slow blink

NOTES

1. Second and third LED failure patterns:
   0001 and 0001 for any main ROM failure
   0001 and 0002 for boot ROM failure

2. Second and third LED failure patterns:
   0001 and 0001 for A2A30 Memory/SBRC board RAM failure
   0001 and 0002 for A2A31 Controller board RAM failure

3. Second and third LED failure patterns:
   0001 and 0001 for A2A30 Memory/SBRC board RAM failure
   0001 and 0010 for A2A30 Memory/SBRC board RAM failure

4. Second and third LED failure patterns for Control Interface:
   0001 and 0001 for Serial Port 9 failure
   0001 and 0010 for Serial Port 10 failure

Figure 3-9 Non-blinking LED Codes For Serial Bus Communication Failure

If the second and third LED patterns displayed are....								Then the failure is...
3	2	1	0	3	2	1	0	
●	●	●	☼	●	●	●	☼	A2A44 Modulation Distribution
●	●	☼	●	●	●	☼	●	A2A24 Output Section
●	●	☼	☼	●	●	☼	☼	A2A80 Audio Analyzer 1
●	☼	●	●	●	☼	●	●	A2A40 Audio Analyzer 2
●	☼	●	☼	●	☼	●	☼	A2A23 Reference
●	☼	☼	●	●	☼	☼	●	A2A130 RF Input/Output
●	☼	☼	☼	●	☼	☼	☼	A2A115 Downconverter
☼	●	●	●	☼	●	●	●	A2A21 Receiver
☼	●	●	☼	☼	●	●	☼	A2A20 Spectrum Analyzer
☼	●	☼	●	☼	●	☼	●	A2A25 Signal Generator Synthesizer
☼	●	☼	☼	☼	●	☼	☼	A2A22 Receiver Synthesizer
☼	☼	●	●	☼	☼	●	●	A2A110 Upconverter
●	●	●	☼	☼	☼	☼	●	A2A120 LO IF/IQ Modulator
●	●	●	☼	☼	☼	●	☼	A2A100 CDMA Generator Reference
●	●	●	☼	☼	☼	●	●	A2A34 Data Buffer

LED Legend
● = off
☼ (grey) = rapid blink
☼ = steady on or slow blink

Figure 3-10 Non-Blinking LED Codes for Miscellaneous Hardware Failure

If the second and third LED patterns displayed								Then the failure is...
3	2	1	0	3	2	1	0	
●	●	●	☼	●	●	●	☼	A2A23 Reference
●	●	●	☼	●	●	☼	●	A2A80A1 Audio Filter 1 - C-Message Filter
●	●	●	☼	●	●	☼	☼	A2A80A2 Audio Filter 2 - 6 kHz BPF
●	●	☼	●	⊗	⊗	⊗	⊗	A2A36 Receive DSP
●	●	●	☼	☼	☼	☼	●	A2A34 Data Buffer

LED Legend

- ● = off
- ☼ (grey) = rapid blink
- ☼ = steady on or slow blink
- ⊗ = don't care

Functional Diagnostics (Step 2)

The Functional Diagnostics (of the SERVICE MENU, shown in Figure 3-11 on page 65) check whether or not major portions of the Test Set are functioning. They may pinpoint faults in the circuitry to the faulty assembly, or they may direct the use of any or all of the AF, RF, CDMA diagnostics to more extensively test the circuitry.

Accessing the Diagnostic Tests

CAUTION A fifteen minute warm up is required. The measurement limits of the SERVICE4 diagnostic tests are valid only at room temperature; that is, 20° to 25°C (65° to 75°F).

1. Press the **Preset** key.
2. Press the **Menu** key. The SOFTWARE MENU screen appears, see Figure 3-11 on page 65.
3. Set the `Select Procedure Location:` field to `ROM`.
4. Set the `Select Procedure Filename:` field to `SERVICE4`.
5. To define test conditions, see "Define Test Conditions" on page 63. To configure the Test Set for a printer, see "Configuring a Printer" on page 64.
6. On the SOFTWARE MENU, select the `Run Test` field (or press **k1**), and wait for the SERVICE MENU screen.
7. Choose the diagnostic test (Functional, AF, RF, or CDMA) to run by turning the knob to move the pointer and then pressing the knob to select the test.
8. Follow the instructions on the screen.

As some of the tests run, you may be offered the options to alter test execution conditions by selecting:

- `Loop` to run the test continuously
- `Pause` to pause the tests
- `Stp Fail` (stop-failure) to stop on a failure
- `Sgl Step` (single-step) to pause the test after each measurement

For descriptions of the diagnostic options, refer to:

- "Functional Diagnostics Menu" on page 66.
- "AF Diagnostics" on page 68.
- "RF Diagnostics" on page 70.
- "CDMA Diagnostics" on page 72.

Define Test Conditions

1. On the SOFTWARE MENU screen (see Figure 3-11 on page 65), select Execution Cond to access the TESTS (Execution Conditions) screen.
2. Set up the Output Results To: field. Select:
   - Crt to view measurements only on the display.
   - Select Printer to print the test results as well as display them on the CRT.
3. Set the Output Results For: field to All
4. Set up the If Unit-Under-Test Fails: field.
   - Select Continue to continue to the next test point.
   - Select Stop to pause testing at that point.
5. Set up the Test Procedure Run Mode: field.
   - Select Continuous to run the tests continuously.
   - Select Single Step to pause after each measurement.
6. Verify that the Autostart Test Procedure on Power-Up: setting is Off.

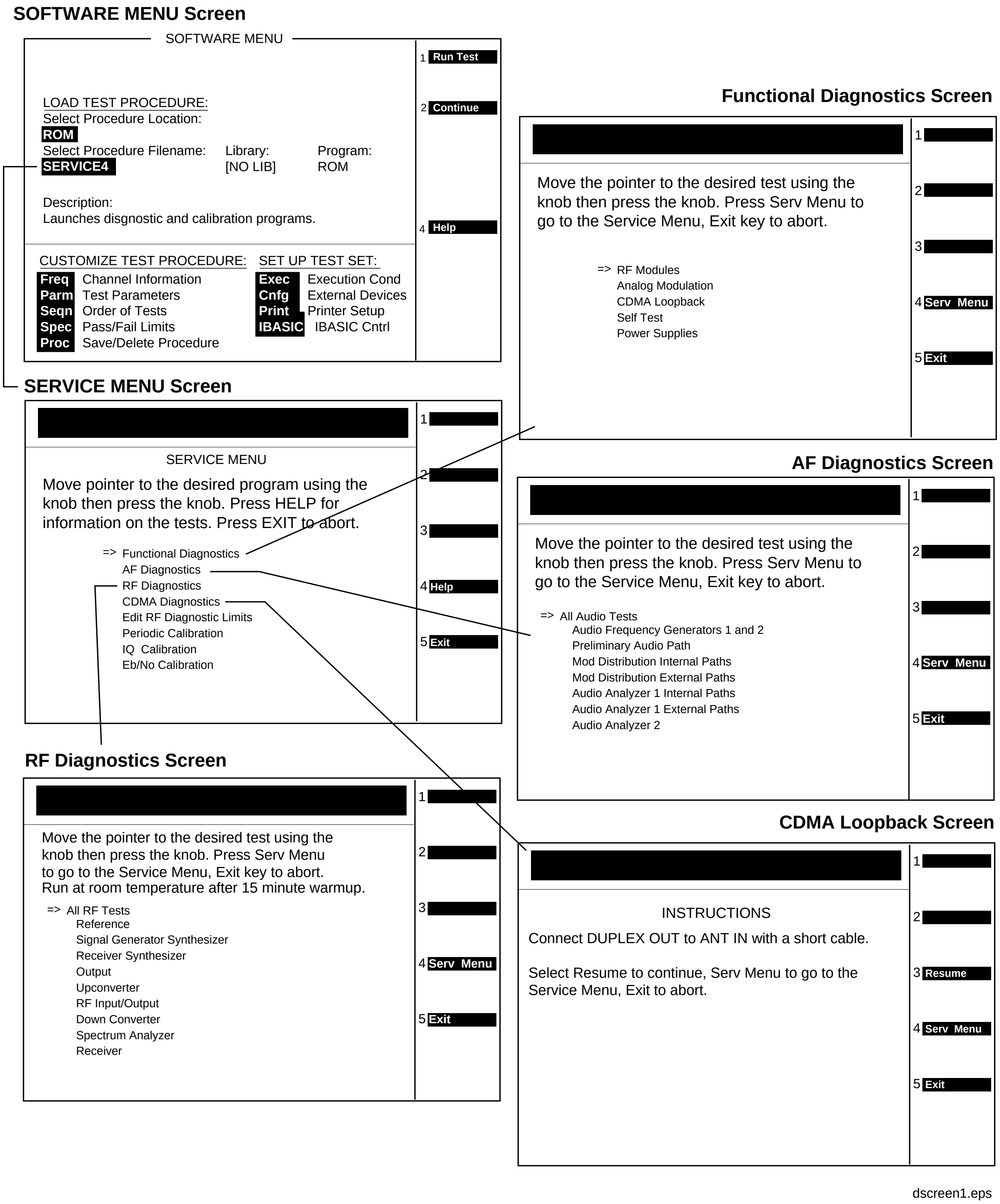
Configuring a Printer

Only perform the following steps if you want to print test results to a printer.

1. If you are not already at the SOFTWARE MENU screen, press the **Menu** key.
2. Under `SET UP TEST SET:`, select `Print` to access the "TESTS (Printer Setup)" screen.
3. Under `PRINT SETUP:`, select `Model:` and the printer of your choice.
4. Set the `Printer Port:` for the side-panel connector your printer is connected to (Parallel 15, Serial 9, or GPIB).

   If an GPIB printer is used, you need to enter the printer's two-digit bus address when the `Printer Adrs` field appears (Example; enter 1 or `01` for bus address 701). Also, press the **Shift** key, then the **INST CONFIG** key to access the I\O CONFIGURE screen, and set the `Mode` field to `Control`.
5. Under `PAGE CONTROL:`, set the `Lines/Page:` and Form Feed (`FF at Start:`, and `FF at End:`) parameters if necessary.

Figure 3-11 SERVICE4 Program Screens



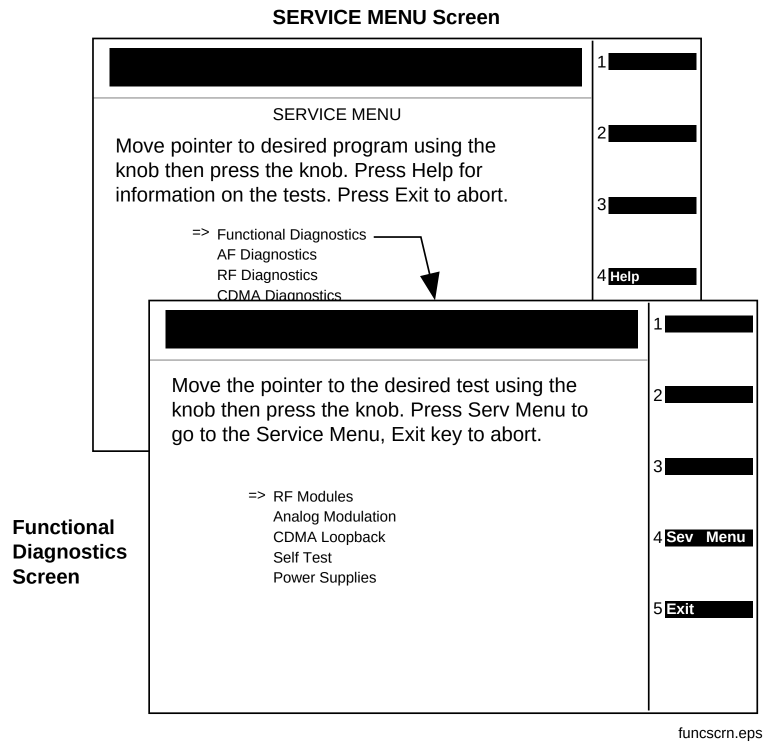
Functional Diagnostics Menu

To run the functional diagnostics, see “Accessing the Diagnostic Tests” on page 62.

NOTE The diagnostics are intended to help in locating the source of catastrophic failures. Occasionally, a test will fail with the test results being only slightly out of limits. Such failures do not necessarily indicate that the Test Set is operating outside of its published specifications or that it is otherwise faulty. Further testing (such as running the performance tests) will be required in such cases.

NOTE Many of the internal diagnostic and calibration procedures use low-level latch commands to control the instrument settings. Many latch settings persist even through a preset. They can only be reset by an instrument power down or by explicitly reseting each latch. This phenomenon is the reason the message “`Direct latch write occurred. Cycle power when done servicing`.” is displayed the first time a latch is written to. Because latch settings persist, problems can arise in running these programs. For example, prematurely terminating a test in a diagnostic (using the Pause and Exit keys) and restarting another test may cause failures in that test because of improper latch settings. It is best to run tests to completion before starting another one. Also, be sure to cycle the power off and on when done servicing the Test Set.

Figure 3-12 Functional Diagnostics Screen



RF Modules

The Average and TX power meters, RF analyzer, IF analyzer, DSP analyzer, and spectrum analyzer are used to test the signal generator. Both the internal and external paths of the RF/IO assembly are used in the tests.

Analog Modulation

The demodulator in the RF analyzer, and the spectrum analyzer are used to check the accuracy, distortion, and residuals of the FM and AM frequencies. The counter is used to measure the audio frequency.

CDMA Loopback

CDMA Analyzer is used to measure Rho, Time Offset, Frequency Error, and Carrier Feedthrough on a signal from the CDMA Generator.

Self Test

The power-up Self-Test Diagnostics are run. Refer to "Self-Test Diagnostics (Step 1)" on page 50.

Power Supplies

The different levels of the power supply are measured with the internal voltmeter.

AF, RF, & CDMA Diagnostics (Step 3)

NOTE The diagnostics are intended to help in locating the source of catastrophic failures. Occasionally, a test will fail with the test results being only slightly out of limits. Such failures do not necessarily indicate that the Test Set is operating outside of its published specifications or that it is otherwise faulty. Further testing (such as running the performance tests) will be required in such cases.

NOTE Many of the internal diagnostic and calibration procedures use low-level latch commands to control the instrument settings. Many latch settings persist even through a preset. They can only be reset by an instrument power down or by explicitly reseting each latch. This phenomenon is the reason the message “`Direct latch write occurred. Cycle power when done servicing`.” is displayed the first time a latch is written to. Because latch settings persist, problems can arise in running these programs. For example, prematurely terminating a test in a diagnostic (using the Pause and Exit keys) and restarting another test may cause failures in that test because of improper latch settings. It is best to run tests to completion before starting another one. Also, be sure to cycle the power off and on when done servicing the Test Set.

AF Diagnostics

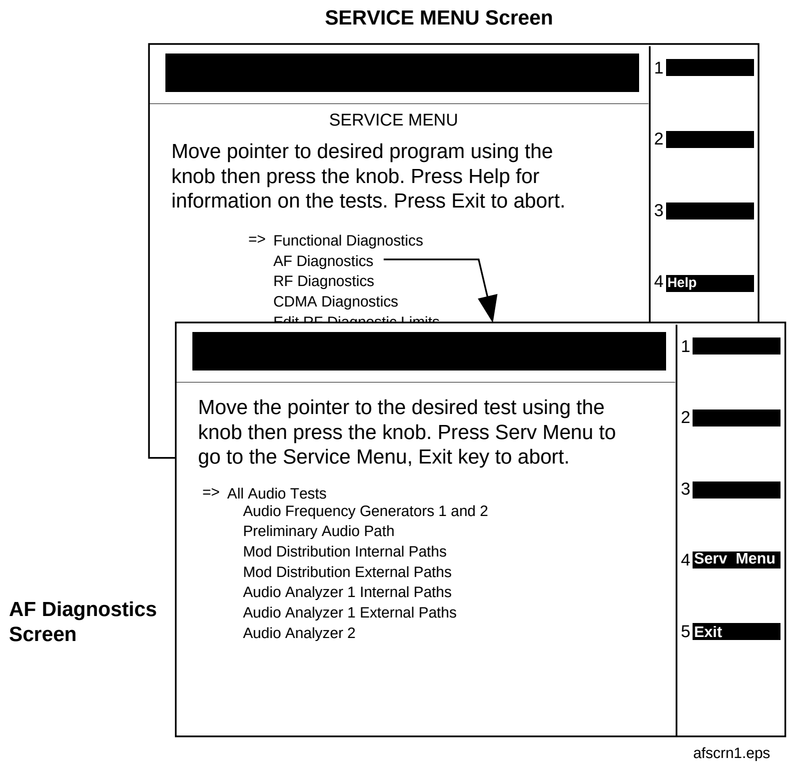
This program tests the audio functions of the following assemblies:

- A2A40 Audio Analyzer 2
- A2A80 Audio Analyzer 1
- A2A44 Modulation Distribution
- A2A32 Signaling Source/Analyzer (AF Generators 1 and 2 only)
- A2A33 Measurement (only a few selected inputs)

After initial cabling, all tests can be run in a loop mode without further intervention. This makes it easier to catch intermittent failures. To run the AF diagnostics, see “Accessing the Diagnostic Tests” on page 62.

NOTE A fifteen minute warm up is required. The measurement limits of the SERVICE4 diagnostic tests are valid only at room temperature; that is, 20° to 25°C (65° to 75°F).

Figure 3-13 AF Diagnostics Screen



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 of the confidence (high, medium, or low) of the diagnosis.

RF Diagnostics

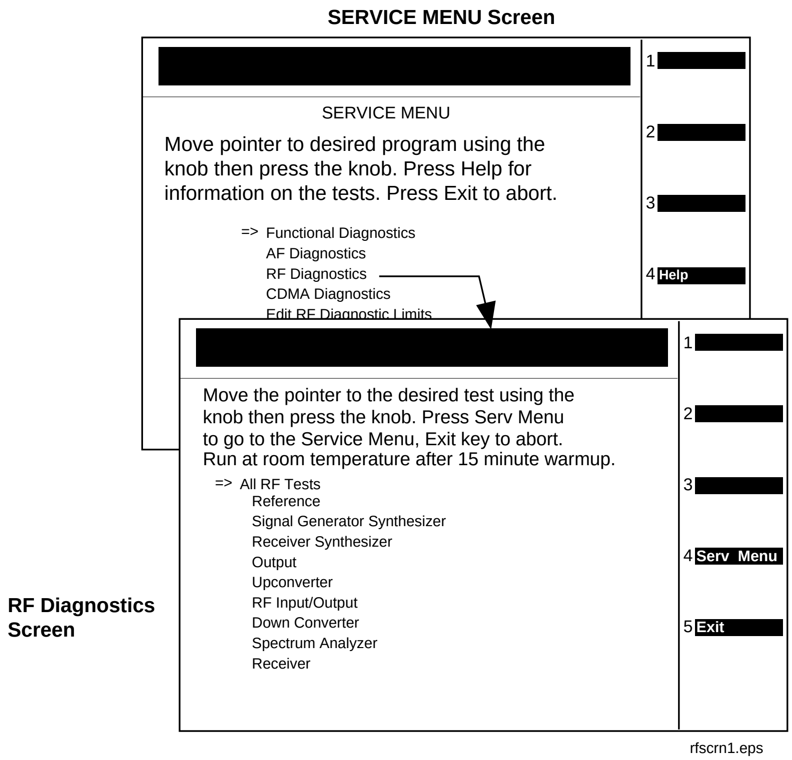
This program tests the RF functions of the following assemblies:

- A2A115 Downconverter
- A2A24 RF Output
- A2A25 Signal Generator Synthesizer
- A2A23 Reference
- A2A21 Receiver
- A2A22 Receiver Synthesizer
- A2A20 Spectrum Analyzer
- A2A130 RF I/O
- A2A110 Upconverter

Some tests require cabling before the RF Diagnostics can be run; but all tests can be run in a loop mode without further intervention. Running in loop mode makes it easier to catch intermittent failures. To run these diagnostics, see “RF Diagnostics” on page 70.

NOTE A fifteen minute warm up is required. The measurement limits of the SERVICE4 diagnostic tests are valid only at room temperature; that is, 20° to 25°C (65° to 75°F).

Figure 3-14 RF Diagnostics Screen



When a test fails, a diagnosis is given as:

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

CDMA Diagnostics

This program tests the local oscillators and the power supplies of the following assemblies:

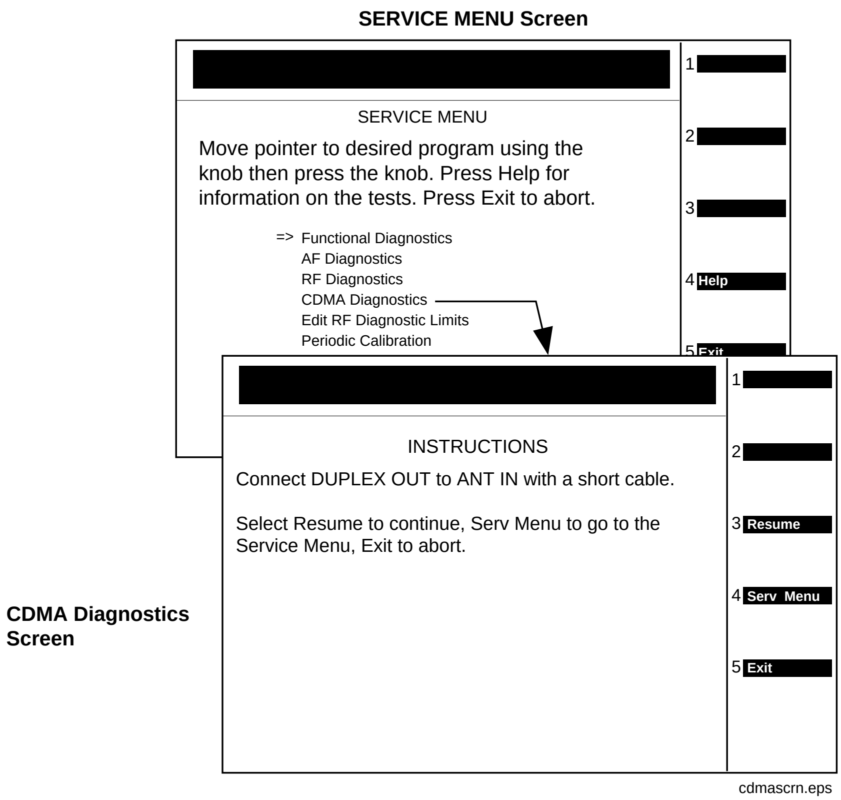
- A2A120 LO IF/IQ Modulator - LO IF portion only
- A2A100 CDMA Generator Reference

To run CDMA diagnostics, see "CDMA Diagnostics" on page 72.

NOTE Before ordering a replacement assembly...

Before ordering an assembly based on the results of the diagnostics, you should verify the diagnostics by other means if possible. This could include using manual troubleshooting procedures and descriptions of the AF, RF, and CDMA diagnostics in this chapter, and/or block diagrams in Chapter 10 , "Block Diagrams," on page 283. If you still lack confidence in troubleshooting or diagnosing the problem or faulty assembly, call "Factory Support" on page 46, for troubleshooting assistance.

Figure 3-15 CDMA Diagnostics Screen



Frequently Encountered Diagnostic Messages

Warning/Error Messages

Error messages that appear on the second line of the Test Set's display frequently occur while any of the SERVICE4 program diagnostic tests are running. The most complete and general list of error messages is in the "Error Messages" chapter of the Test Set's *Reference Guide*. (Some messages relating specifically to troubleshooting can be found in Appendix A , "Error Messages," on page 321.) Some of the messages you can expect to occur while running the SERVICE4 program diagnostic tests are as follows:

- `Direct latch write occurred. Cycle power when done servicing.` The SERVICE4 program commonly generates this message. This message appears the first time the diagnostic program directly addresses a latch. The message should be ignored and cleared when you 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.
- `Change Ref Level, Input Port or Attenuator (if using "Hold").` This message, and similar messages, can be generally ignored.
- `Printer does not respond.` This usually indicates that one or more settings on the TESTS (Printer Setup) screen are set incorrectly for your printer. Also, check that the printer's power is on and that it is correctly cabled. For GPIB printers make sure the printer is correctly addressed. If a serial printer is used, you may have to change the serial communication settings on the I/O CONFIGURE screen (press **Shift** then **Inst Config** to get to this screen). The message times out after a few seconds, and the output destination is changed to CRT by the program.
- `ERROR 173 IN XXXX Active/system controller req'd` (where "XXXX" represents a line number). Indicates that the Test Set's internal IBASIC computer must be set as a system controller for some reason. This usually indicates that the `Printer Port` field of the TESTS (Printer Setup) screen was set to `HP-IB` but the `Mode` field on the I/O CONFIGURE screen is set to `Talk&Lstn` instead of `Control`. Change the mode setting to `Control` and run the diagnostic again.

Time-outs

Certain failures may cause a frequency or voltage reading to time out, 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 A2A33 Measurement assembly may be at fault.
- If most measurements fail, the A2A23 Reference assembly may be supplying faulty clock signals to the A2A33 Measurement assembly.
- Re-run the test to see if the timeout is intermittent.

Manual Troubleshooting Procedures (Step 4)

If you are not sure a problem exists, you should attempt to duplicate the suspected problem. This is especially important if the Test Set is being used in a new application where misapplication, or incorrect operation of the Test Set may be involved.

An Agilent 8924C Mobile Station Test Set combined with an Agilent 83236B Cellular Adapter can be used to simulate a high performance CDMA base station and may be useful in attempting to duplicate the problem.

Refer to following table to determine which diagnostic tests, performance tests, and periodic self calibration adjustments apply to an assembly. Downloading calibration data is discussed in Chapter 7 , "Periodic Adjustments," on page 157.

Table 3-2 Relating Assemblies to Troubleshooting Aids

Ref. Designator	Assembly Name	SERVICE4 Program Diagnostic Test: Sub-Test	Performance Test to Perform[1]	Periodic Calibration[2] Program	Cal.-Data Needed[3]
A1A2	Keypad	Functional Diagnostics: Self Test			No
A1A1	Display				No
A2A200	100W Attenuator	Functional Diagnostics: RF Modules		PCMCIA Program System Power E6380-61811	Yes
A2A130	RF Input/Output	RF Diagnostics: RF Input/Output	RF Generator: Level Accuracy	PCMCIA Program System Power E6380-61811	Yes
A2A34	Data Buffer	Functional Diagnostics: CDMA Loopback		SERVICE4: IQ Modulator, Eb/No	Yes
A2A110	Upconverter	RF Diagnostics: Upconverter			Yes
A1A2	RPG Assembly				No
A1	Front Panel				No
A2A36	Receive DSP	Functional Diagnostics: CDMA Loopback			No
A2A10	PCMCIA				No

Table 3-2 Relating Assemblies to Troubleshooting Aids

Ref. Designator	Assembly Name	SERVICE4 Program Diagnostic Test: Sub-Test	Performance Test to Perform[1]	Periodic Calibration[2] Program	Cal.-Data Needed[3]
A2A32	Signaling Source/Analyzer	AF Diagnostics: Audio Frequency Generators 1 and 2			No
A2A31	Controller	Functional Diagnostics: Self Test			Yes
A2A30	Memory/SBRC	Functional Diagnostics: Self Test			No
A2A115	Downconverter	RF Diagnostics: Downconverter			Yes
A3A1	Power Supply Regulator	Functional Diagnostics: Self Test			No
A21	Fan				No
A2A50	Display Drive	Functional Diagnostics: Self Test			No
A23	Power Supply	Functional Diagnostics: Self Test			No
A2A25	Signal Generator Synthesizer	RF Diagnostics: Signal Generator Synthesizer	RF Generator: Harmonic and Spurious Spectral Purity		Yes
A2A120	LO-IF/IQ Modulator	CDMA Diagnostics LO_IF/IQ Mod.		SERVICE4: IQ Modulator, Eb/No	Yes
A2A24	RF Output	RF Diagnostics: Output			Yes
A2A23	Reference	RF Diagnostics: Reference	RF Generator: Residual FM		Yes
A2A22	Receiver Synthesizer	RF Diagnostics: Receiver Synthesizer	RF Analyzer: Residual FM		Yes
A2A100	CDMA Generator Reference	CDMA Diagnostics: CDMA Gen. Ref.		SERVICE4: IQ Modulator, Eb/No	Yes
A2A21	Receiver	RF Diagnostics: Receiver	RF Analyzer: FM Accuracy		Yes
A3	Power Supply				No

Table 3-2 Relating Assemblies to Troubleshooting Aids

Ref. Designator	Assembly Name	SERVICE4 Program Diagnostic Test: Sub-Test	Performance Test to Perform[1]	Periodic Calibration[2] Program	Cal.-Data Needed[3]
A2A20	Spectrum Analyzer	RF Diagnostics: Spectrum Analyzer	Spectrum Analyzer		Yes
A2A70	Control Interface	Functional Diagnostics: Self Test			No
A2A44	Modulation Distribution	AF Diagnostics: Mod Distribution Internal Paths	AF Generator: AC Level Accuracy	SERVICE4: Periodic Calibration: AF Gen Gain, EXT Mod Path Gain	Yes
A2A80	Audio Analyzer 1	AF Diagnostics: Audio Analyzer 1 Internal Paths		SERVICE4: Periodic Calibration: Audio Analyzer Offset	Yes
A2A40	Audio Analyzer 2	AF Diagnostics: Audio Analyzer 2	AF Analyzer: AC Voltage Accuracy	SERVICE4: Periodic Calibration: VFN	Yes
A2A33	Measurement [4]	Functional Diagnostics: Self Test	Oscilloscope	SERVICE4: Periodic Calibration: Voltmeter Reference	Yes
A2A1	Motherboard				No

1. See Chapter 4 , “Preventative Maintenance,” on page 93.
2. SeeChapter 7 , "Periodic Adjustments" on page 157.
3. See Table 7-1 on page 159.
4. Measurement checked indirectly by all diagnostics.

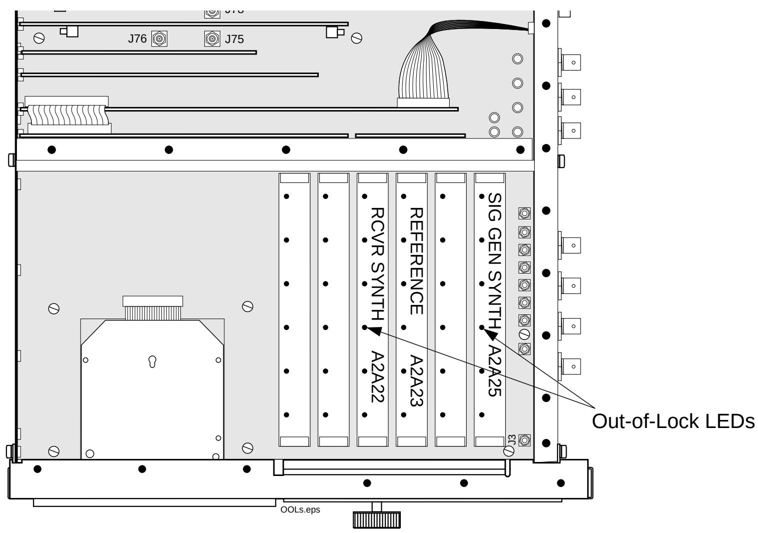
Verify Test Set's Reference Path

Out-of-Lock (OOL) LEDs

Out-of-lock (OOL) LEDs light when a phase-locked loop inside an assembly is failing. The Signal Generator Synthesizer, A2A25, and the Receiver Synthesizer, A2A22, assemblies have these LEDs mounted close to the top of the modules. The location of each LED is labeled on the assembly.

Verify that the CDMA Generator Reference (A2A100) and the Reference (A2A23) are working before troubleshooting the Receiver Synthesizer (A2A22) and/or the Signal Generator Synthesizer (A2A25) assemblies.

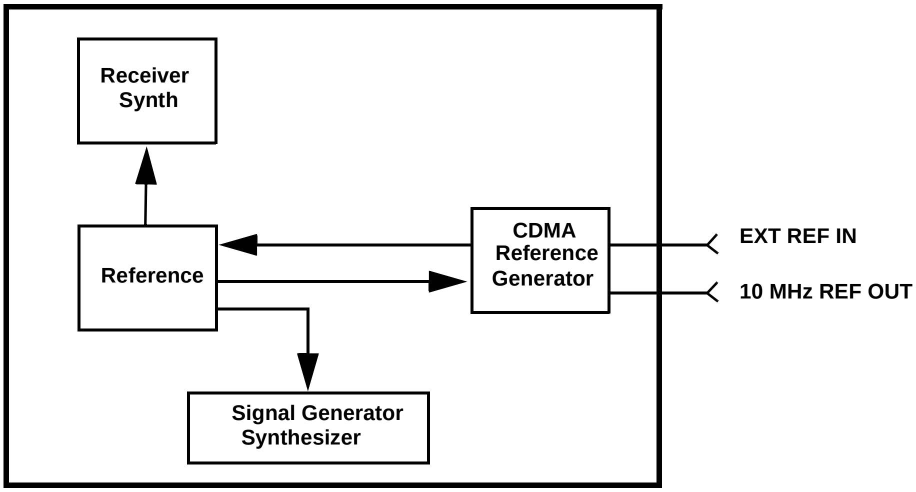
Figure 3-16



CDMA Generator Reference (A2A100) Verification

- Verify that a 1, 2, 5, or 10 MHz signal of >0.15 Vrms is being applied to the EXT REF IN connector.
- Verify that the 10 MHz REF OUT connector, outputs a 10 MHz signal of >0.5 Vrms.

Figure 3-17 Simplified Reference Path Block Diagram



If the 10 MHz signal is present, then this verifies the reference path through the CDMA Generator Reference and the Reference (A2A22) assemblies.

NOTE There are other functions on these assemblies that are NOT verified.

CDMA Generator Reference (A2A100) Assembly Verification

1. Turn the Test Set off and remove the external cover.
2. Remove the bottom cover and verify that the cable is connected between the EXT REF IN connector and J17 on the CDMA Generator Reference assembly.
3. Turn the Test Set on and verify that a 10 MHz signal is present on J15 of the CDMA Generator Reference assembly.

   If no signal or a poor signal appears at this connector, then the CDMA Generator Reference assembly is faulty.
4. Turn the Test Set off and remove the top covers.
5. Use screwdrivers to remove the Reference assembly.
6. Turn the Test Set on and verify that a 10 MHz signal is present on pin 20 of J63 and pin 19 of J18. This is the reference signal from the CDMA Generator Reference (A2A100) assembly.

If the 10 MHz signal is not present at all, then the CDMA Generator Reference (A2A100) assembly is faulty.

If the signal is present on pin 20 but not pin 19, then the Motherboard (A2A1) assembly is faulty (open or short).

Reference, A2A23, Verification

1. Turn the Test Set off and re-install the Reference assembly.
2. Use screwdrivers to remove the Receiver Synthesizer (A2A22) assembly.
3. Turn the Test Set on and verify that a 1 MHz signal of approximately –1 dBm is present on pin 3 of J21. This is the reference signal from the Reference assembly.
4. If the 1 MHz signal is not present, then the Reference assembly is probably faulty.

It is also possible that an open or shorted trace on the motherboard assembly exists. Check the motherboard for continuity between J21 pin 3 under the Receiver Synthesizer A2A22 assembly and J18 pin 2 under the Reference assembly, and verify that the trace is not shorted to ground.

Receiver Synthesizer, A2A22, Unlocked

If the 1 MHz signal is present on pin 3 of J21, then the Receiver Synthesizer assembly is faulty.

Signal Generator Synthesizer, A2A25, Unlocked

1. Turn the Test Set off and use screwdrivers to remove the Signal Generator Synthesizer assembly.
2. If the signal is present, then the Signal Generator Synthesizer assembly is faulty.
3. Turn the Test Set on and verify that a 1 MHz signal of about –20 dBm is present on pin 3 of J12. This is the reference signal from the Reference (A2A23) assembly.

If the 1 MHz signal is not present, then the Reference (A2A23) assembly is probably faulty.

It is also possible that an open or shorted trace on the Motherboard (A2A1) assembly exists. Check the motherboard for continuity between J12 pin 3 (under the Signal Generator Synthesizer assembly) and J34 pin 1 (under the Reference, A2A23, assembly), and verify that the trace is not shorted to ground.

Swapping Known-Good Assemblies

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 the original assemblies 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 A2A31 Controller. If the controller is replaced or swapped, the original EEPROM must be put in the new Test Set's Controller. Should the EEPROM lose its data, the entire instrument will require a factory recuperation.

The assemblies that require downloaded calibration data from a memory card are:

- A2A20 Spectrum Analyzer
- A2A33 Measurement
- A2A200 100W Attenuator

Swapping these assemblies may cause some performance specification failures if the swapped in assembly's calibration data cannot be downloaded.

The assemblies that require on-board calibration loaded at the factory are:

- A2A115 Downconverter
- A2A110 Upconverter
- A2A130 RF Input/Output
- A2A44 Output Section
- A2A21 Receiver
- A2A25 Signal Generator Synthesizer
- A2A22 Receiver Synthesizer
- A2A23 Reference

Swapping these assemblies should not cause a performance problem, as their calibration data resides with the assembly.

The assemblies that require a periodic calibration procedure are:

- A2A100 CDMA Generator Reference
- A2A130 RF Input/Output
- A2A120 LO IF/IQ Modulator
- A2A200 100W Attenuator
- A2A34 Data Buffer
- A2A80 Audio Analyzer 1
- A2A40 Audio Analyzer 2
- A2A33 Measurement
- A2A44 Modulation Distribution

Generally, these assemblies can be swapped without an immediate need of recalibration. In some cases though, a recalibration may be necessary to properly troubleshoot the instrument.

Further Isolating RF Failures

Isolating failures in the RF assemblies of the Test Set can be difficult. One problem occurs when the diagnostics 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.

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

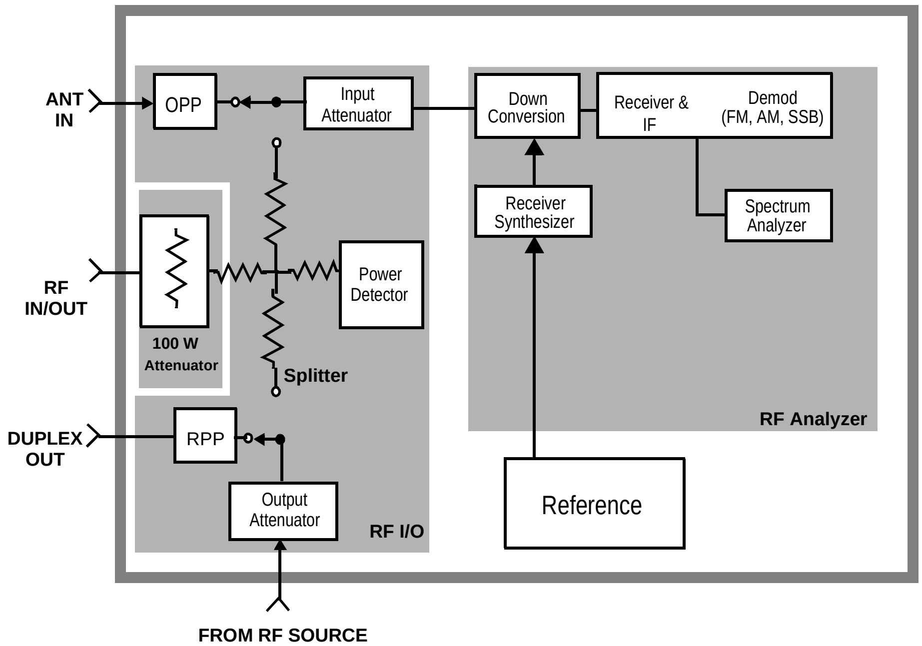
- RF signal generator
- RF modulation analyzer or spectrum analyzer.

Isolating the RF Analyzer

The RF Analyzer function uses the following assemblies. Refer to Figure 3-18 on page 83 and the block diagrams in Chapter 10 , “Block Diagrams,” on page 283.

- A2A115 Downconverter
- A2A21 Receiver
- A2A22 Receiver Synthesizer
- A2A20 Spectrum Analyzer

Figure 3-18 Isolating the RF Analyzer



To isolate an RF analyzer problem:

1. On the Test Set:
   a. Press **Preset**.
   b. Press the **Inst Config** to access the INSTRUMENT CONFIGURE screen.
      - Set the `RF Display` field to `Freq`.
      - Set the `RF Offset` field to `Off`.
   c. Press the **RF Anl** key (to go to the analog RF ANALYZER screen).
      - Set the `Tune Freq` to `100 MHz`.
      - Set the `Input Port` to `RF IN`.
2. On the external RF signal generator:
   a. Set the frequency to 100 MHz CW.
   b. Set the amplitude to 0 dBm.
   c. Connect the output to the Test Set's RF IN/OUT connector.

3. Set the RF signal generator's frequency to 100, then 500, 900, and 1800 MHz. For each frequency reset the `Tune Freq` to that frequency. The Test Set's measurements should read as follows:

    a. `TX Power` should read approximately 0.001 W for each frequency.

    b. `Frequency` should read 100, 500, 900, and 1800 MHz respectively.

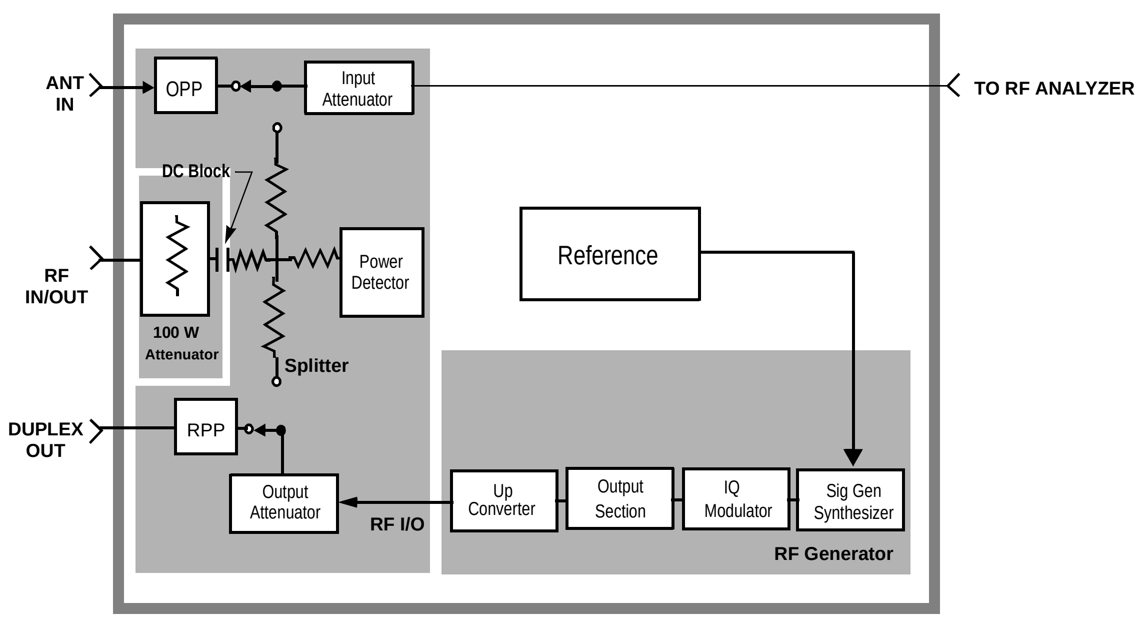
    c. Press the **Spec Anl** key to access the analog spectrum analyzer. Observe the level and frequency of the signal.

Isolating the RF Source

The RF Generator function uses the following assemblies. Refer to Figure 3-19 and the block diagrams in Chapter 10 , "Block Diagrams," on page 283.

- A2A120 LO IF/IQ Modulator
- A2A25 Signal Generator Synthesizer
- A2A24 Output Section
- A2A110 Upconverter

Figure 3-19 Isolating the RF Source



To isolate the RF Source:

1. On the Test Set:

   a. Press **Preset**.

   b. Press the **Inst Config** key to access the INSTRUMENT CONFIGURE screen.

      - Set the `RF Display` field to `Freq`.
      - Set the `RF Offset` field to `Off`.

   c. Press the **RF Gen** key (to go to the analog RF GENERATOR screen).

   d. Set `RF Gen Freq` to `1800 MHz`.

   e. Set `Amplitude` to `0 dBm`.

   f. Set `Output Port` to `Dupl`.

2. On the external RF modulation analyzer or spectrum analyzer:

   a. Set the tuning for the signal generated by the Test Set.

   b. Connect the analyzer's input to the Test Set's DUPLEX OUT connector.

3. Set the Test Set's `RF Gen Freq` to 1800, then 600, 300, and 150 MHz. For each frequency, the external RF analyzer should read as follows:

   a. Power should read approximately 0.001 W for each frequency.

   b. Frequency should read 1800, 600, 300, and 150 MHz respectively.

Service Screen

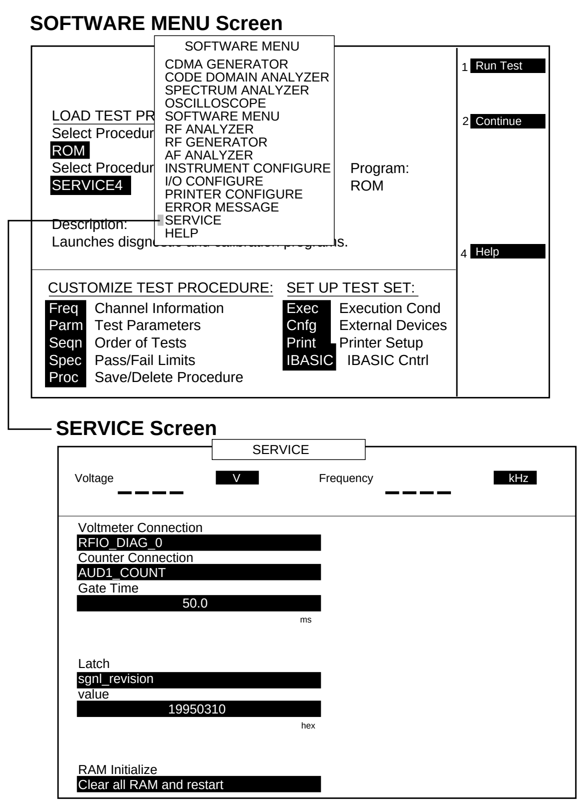
A large number of latch and DAC settings used throughout the Test Set can also be read and/or set to alter standard operation. The Service screen uses the internal voltmeter and frequency counter functions to monitor specific nodes in most assemblies. These functions are primarily intended to allow the automated internal diagnostic routines to verify proper instrument operation, and to allow the internal periodic adjustment routines to modify Test Set operation.

Use these functions for further troubleshooting when the diagnostics cannot isolate a failure to a specific assembly. To do this, you must understand how to operate the Test Set and, especially, understand how the assemblies in the Test Set work together.

How to Access the SERVICE Screen

1. Press the **Preset** key.
2. Rotate the knob to the screen's title bar and select it (press knob). A drop down menu appears, see Figure 3-20.

Figure 3-20 Service Screen



3. Rotate the knob and select SERVICE.

The SERVICE screen appears. For field descriptions, see "Field Names and Descriptions" on page 87.

Field Names and Descriptions

Voltmeter Connection

This field selects the desired circuit node for voltage measurements. To change the voltmeter connection, use the knob to select the Voltmeter Connection field. A Choices menu will appear. Move the cursor to the desired circuit node in the list and push the cursor control knob. The reading is displayed in the Voltage measurement field at the top- left of the display.

Because the nodes being measured must be in the range of 0 to ±5 volts, the measurement of some points are scaled to that measurement range. For example; the +12 Volt reference (MEAS_12V_REF) should measure about +5volts. The –12 Volt reference (MEAS_NEG_12V_REF) should measure about –5 volts. Many of the voltage measurements are only valid after a number of instrument settings are changed.

When run, the diagnostic routines make the necessary circuit changes and measurements automatically, comparing the measurements to known limits for each node.

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 at the top right of the display.

To change the counter connection, use the knob to select the Counter Connection field. A Choices menu will appear. Select the desired circuit node.

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, use the knob to select the Gate Time field. When you select the field a flashing >> cursor is displayed. Rotate the cursor control knob until the desired gate time (10 to 1000 ms in 10 ms increments) is displayed, then press the cursor control knob.

Latch

This field is used to manually select 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:

1. Use the knob to select the `Latch` field. A `Choices` menu will appear.
2. Move the cursor to the desired latch name and press the knob to select it.
3. Use the knob to select the `Value` field. A flashing >> cursor is displayed.
4. 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: A2A44 Modulation Distribution
- aud1: A2A80 Audio Analyzer 1
- aud2: A2A40 Audio Analyzer 2
- refs: A2A23 Reference
- rfio: A2A130 RF Input/Output
- dcvt: A2A115 Downconverter
- ucvt: A2A110 Upconverter
- out: A2A24 Output Section
- rcvr: A2A21 Receiver
- gsyn: A2A25 Signal Generator Synthesizer
- rsyn: A2A22 Receiver Synthesizer
- spec: A2A20 Spectrum Analyzer
- genRef: A2A100 CDMA Generator Reference
- genRef2: A2A100 CDMA Generator Reference
- lo_if: A2A120 LO IF/IQ Modulator
- meas: A2A33 Measurement
- metron: A2A33 Measurement
- afg1: A2A32 Signaling Source/Analyzer
- afg2: A2A32 Signaling Source/Analyzer
- buffModN: A2A34 Data Buffer

Value (hex)

This field displays and changes the hexadecimal value for the latch shown in the Latch field.

RAM Initialize

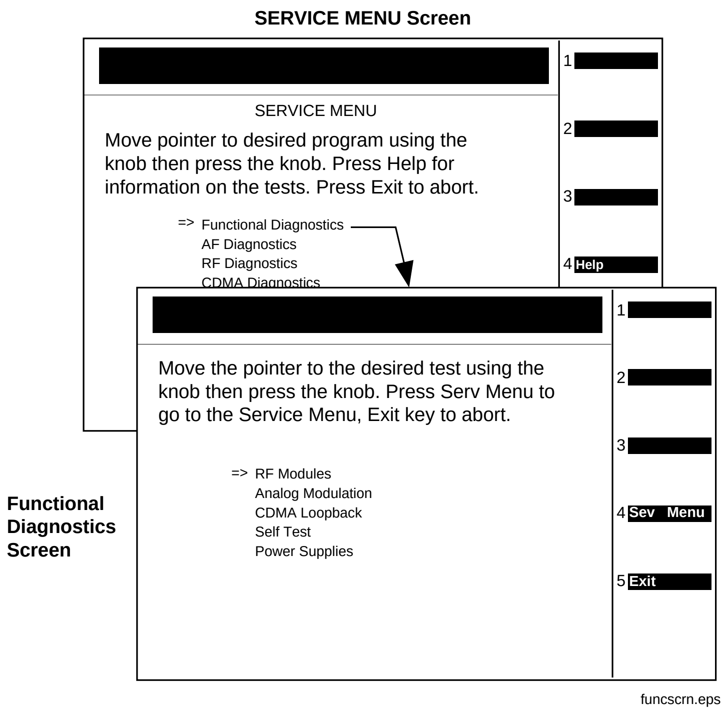
Selecting this field clears all SAVE registers and test programs, and any initialized RAM disk(s), that may be in RAM. It also resets all latches to their factory power-up configuration. If you have saved one or more instrument setups using the SAVE function, using this function will permanently remove them.

Product Verification

This section provides steps for verifying the Test Set's operation after a repair. Although in most cases this will be sufficient, this does not verify the ability of the instruments to meet CDMA Cellular/PCS Base Station specifications. Only by performing all of the Performance Tests in Chapter 8 , "Performance Tests," on page 173 can you verify the instrument's performance. The following steps are suggested, you may choose to do more.

1. Run the Functional Diagnostics test of the SERVICE MENU (SERVICE4 program), see figure 3-21. The Functional Diagnostics tests verify the function of most of the assemblies in the Test Set.

Figure 3-21 Functional Diagnostics



2. Perform a wideband sweep:

   a. Press **Preset** then press **Spec Anal** to get the SPECTRUM ANALYZER screen.

   b. Set the `RF Gen` controls to `Track`, and the `Port/Sweep` field to `Dupl`. This directs the tracking generator to the DUPLEX OUT port.

   c. Connect the DUPLEX OUT port to the ANT IN port.

   d. Set the `Main` control to `Ant`.

   e. Set the `Center Freq` to 501 MHz, and the `Span` to 1 GHz. You should see a (roughly) flat line across the screen, varying about 4 dB. “`Generator sweep truncated`” may appear, but does not indicate a problem.

3. Run the Performance Tests associated with the repair as indicated in Table 3-2 on page 75, or run all the tests in Chapter 8 , “Performance Tests,” on page 173 to verify that the Test Set meets its overall performance specifications.

4 Preventative Maintenance

This chapter describes the preventative maintenance procedures recommended for the Test Set.

Hardware Maintenance

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

NOTE Periodic Adjustment Interval

The adjustment programs Periodic Calibration, IQ Calibration, and Eb/No Calibration should be performed after any assembly referred to in Table 7-1 on page 159 is replaced, or at least every 24 months. These program can be run anytime to optimize the performance of the Test Set. See Chapter 7 , “Periodic Adjustments,” on page 157 for details.

NOTE Performance Test Interval

The performance tests in Chapter 8 , “Performance Tests,” on page 173 should be performed when certain assemblies are repaired or replaced, or at least every 24 months. See Table 3-2 on page 75 for those assemblies requiring performance testing/calibration.

Adjustments

- Periodic Adjustments

  Adjustments for calibration are part of the automated routines: Periodic Calibration, IQ Calibration, and Eb/No Calibration. To run these routines see “Running the Periodic, IQ, or Eb/No Calibration Programs” on page 163. Running these routines will adjust internal calibration and circuit paths for optimum performance. These routines can be run on any interval from six months to two years, depending on the severity of the application environment. These routines should also be run whenever a significant change to instrument’s hardware configuration is made. For instructions on running the periodic adjustment routines see Chapter 7 , “Periodic Adjustments,” on page 157.

- Real Time Clock

  The Test Set operates with a real-time clock that is user set. 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 INSTRUMENT CONFIGURE screen. The `Date` field is a numerical number using the MMDDYY format. The `Time` field is a numerical number using a 24-hour military standard (example: 3:00 pm is 15.00 in military time). The date and time are maintained as part of RAM memory with battery backup.

Cleaning

- The Test Set contains an internal air filter. The filter requires periodic cleaning to remove dust and debris. Refer to “Cleaning the Air Filter” on page 97.
- RF assemblies A2A20 through A2A25 (see Figure 5-8 on page 113) should be removed and the bottom edges of the metal case cleaned with isopropyl alcohol or a mild cleaner. Cleaning the metal edges will insure that RF leakage protection is maintained.

Functionality

The Test Set has the capability to perform self tests for hardware failure and functionality. The self test diagnostics should be run whenever preventive maintenance, calibration, or repair has been performed. Self test diagnostics will help to insure that the instrument is performing reliably.

There are three diagnostic routines located in ROM of the Test Set: Functional Diagnostics, AF Diagnostics, and RF Diagnostics. Run these programs and follow the instructions listed on the screen. For instructions on running these diagnostics routines, see “Accessing the Diagnostic Tests” on page 62.

Integrity

The Test Set has been designed for rugged conditions, however parts can become loose or damaged over time and may require repair or maintenance.

- 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's cover and check that boards align with the printed guides on the internal sheet metal covers. Ensure that each of the six RF module cases are firmly seated and locked in with their module bracket(s).

- Type-N Connectors

  The Test Set's RF IN/OUT, ANT IN, and DUPLEX OUT connectors should be checked for damage or looseness. Damage can occur to the center conductor pin or the connector itself might become loosened. If damaged, the connector should be replaced. A loose connector can be re-tightened with the nut on the back side of the side panel. Refer to Chapter 5 , "Disassembly," on page 101 for information on the side-panel connectors.

- Internal Cables and RF Connectors

  The Test Set contains numerous cables and connectors that should be periodically checked for proper insertion and tightness. Remove the Test Set's cover and visually check for any cables that may not be properly inserted. Check each RF cable connection for tightness, tighten where needed. Refer to Chapter 5 , "Disassembly," on page 101 for information on the various cables and assemblies.

Maintenance Procedures

Cleaning the Air Filter

NOTE 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 clean, well maintained facility.

The Test Set's internal air filter requires periodic cleaning. Failure to periodically clean this filter may result in decreased internal airflow, increased internal operating temperature, and early failure of the Test Set.

1. Remove the front frame and external cover to access the air filter, see Figure 4-1 on page 99. It is not necessary to remove the rear frame. Refer to Chapter 5 , "Disassembly," on page 101 for removing the front frame and external cover.
2. Lift the filter from the Test Set's chassis. Use a vacuum to clean the filter. Use only a static-free vacuum cleaner or ionized air for the removal of dust and debris.

Memory Backup AA Battery

Two battery sources are used to maintain the contents of the Test Set's memory when power is disrupted. One source is a set of two AA batteries mounted behind the rear frame of the Test Set. You must periodically change these batteries. The second battery source acts as a backup to the AA batteries. It is internally mounted and is not user serviceable.

CAUTION Replace these batteries every 2-3 years. Failure to take prompt action may result in loss of RAM data including IBASIC programs and SAVE/RECALL states stored in the RAM.

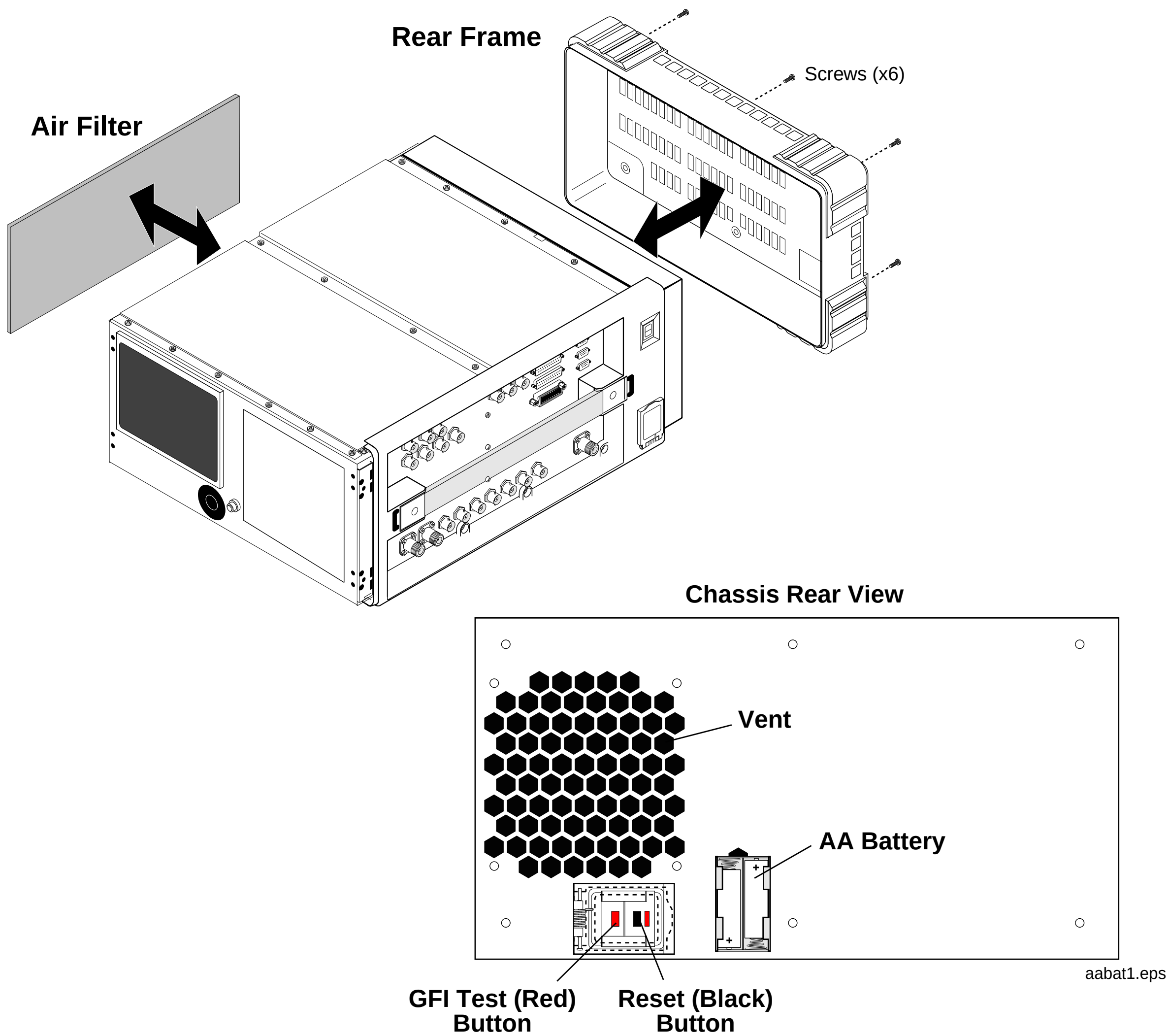
To change the AA batteries, use the following procedure:

1. Switch power off and unplug the Test Set.
2. Remove the six TX-15 torx screws in the rear frame, see Figure 4-1 on page 99. It is not necessary to remove the front frame or external cover.
3. Remove the rear frame.
4. Replace the AA batteries. Do not use rechargeable batteries, and dispose the used batteries properly.
5. Re-install the rear frame.

Reset and GFI-Test Buttons (older units with GFI circuit)

1. Remove the rear frame. It is not necessary to remove the front frame or external cover.
2. To reset the Test Set, press the black button. To test the ground fault interrupter, press the red button.
3. Re-install the rear frame.

Figure 4-1 AA Batteries, Air Filter, and GFI Reset/Test Buttons

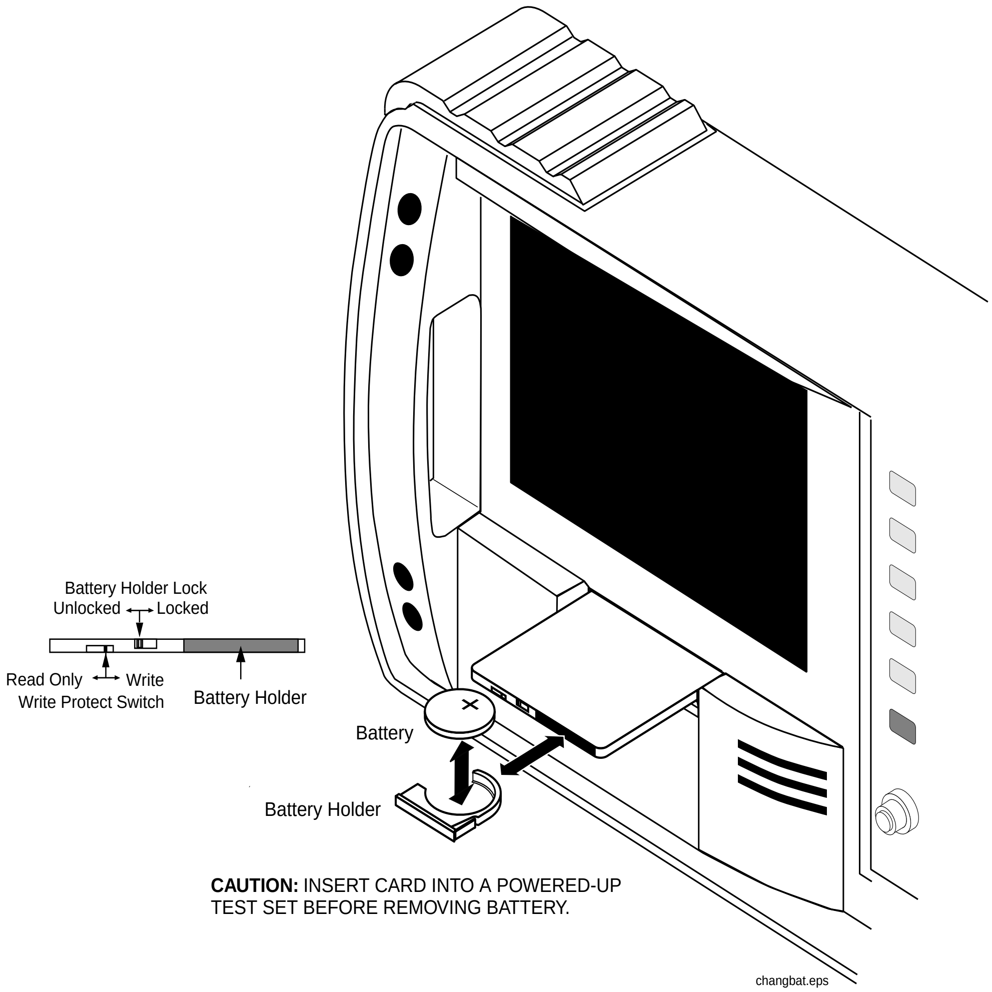


PC Card Battery

CAUTION BEFORE REMOVING THE BATTERY from the PC card, insert the card into a powered-up Test Set. Removing the battery without an alternate power source will destroy the data in the card.

External PC card (PCMCIA) contain batteries which require replacement. These batteries should be replaced every 12 months or whenever signs of lost data are noted. See Figure 4-2 for battery replacement.

Figure 4-2 PCMCIA Card Battery Replacement



5 Disassembly

This chapter explains how to disassemble the Test Set for major assembly replacement.

Service Tools

Tools

One or more of the following tools may be required to access and/or remove various internal assemblies in the Test Set:

- TX-10 torx screwdriver
- TX-15 torx screwdriver
- Flat blade screwdriver
- 1/16-inch allen wrench
- 3/16-inch socket wrench
- 5/16-inch open-end wrench (for SMC connectors)
- 15/64-inch open-end wrench (for SMA connectors)
- 9/16-inch open-end wrench (for BNC connectors)
- 3/4-inch open-end wrench (for Type-N connectors)

Recommended Torque

- Tighten screws until snug. Overtightening can strip screws.
- SMA (RF) connectors: 9.0 lb-in. (102 N-cm)
- SMC (RF) connectors: 6.0 lb-in. (68 N-cm)
- Nuts holding semi-rigid coax to motherboard: 6.0 lb-in. (68 N-cm)

Assembly Replacements

With some assemblies you will receive a memory card that contains factory-generated calibration data for that assembly. For new replacements, there will also be an instruction sheet for loading the calibration data into your Test Set.

External equipment is not required for running the diagnostic routines. If diagnostic routines cannot isolate the problem, an oscilloscope, voltmeter, and spectrum analyzer may be required for further troubleshooting. A second Test Set is helpful for troubleshooting performance test failures.

Table 3-2 on page 75 and Table 7-1 on page 159 show which assemblies need calibration data as well as which performance tests and periodic self-calibration adjustments are recommended after replacing an assembly.

NOTE Periodic Adjustment Intervals

The adjustment programs Periodic Calibration, IQ Calibration, and Eb/No Calibration should be performed after any assembly referred to in Table 7-1 on page 159 is replaced, or at least every 24 months. These program can be run anytime to optimize the performance of the Test Set. See Chapter 7 , “Periodic Adjustments,” on page 157 for details.

NOTE Performance Test Intervals

The performance tests in Chapter 8 , “Performance Tests,” on page 173 should be performed when certain assemblies are repaired or replaced, or at least every 24 months. See Table 3-2 on page 75 for those assemblies requiring performance testing/calibration.

Replacement Parts

For replacement part numbers, see Chapter 6 , “Replaceable Parts,” on page 135. For cable routing information refer to Table 5-2 on page 130.

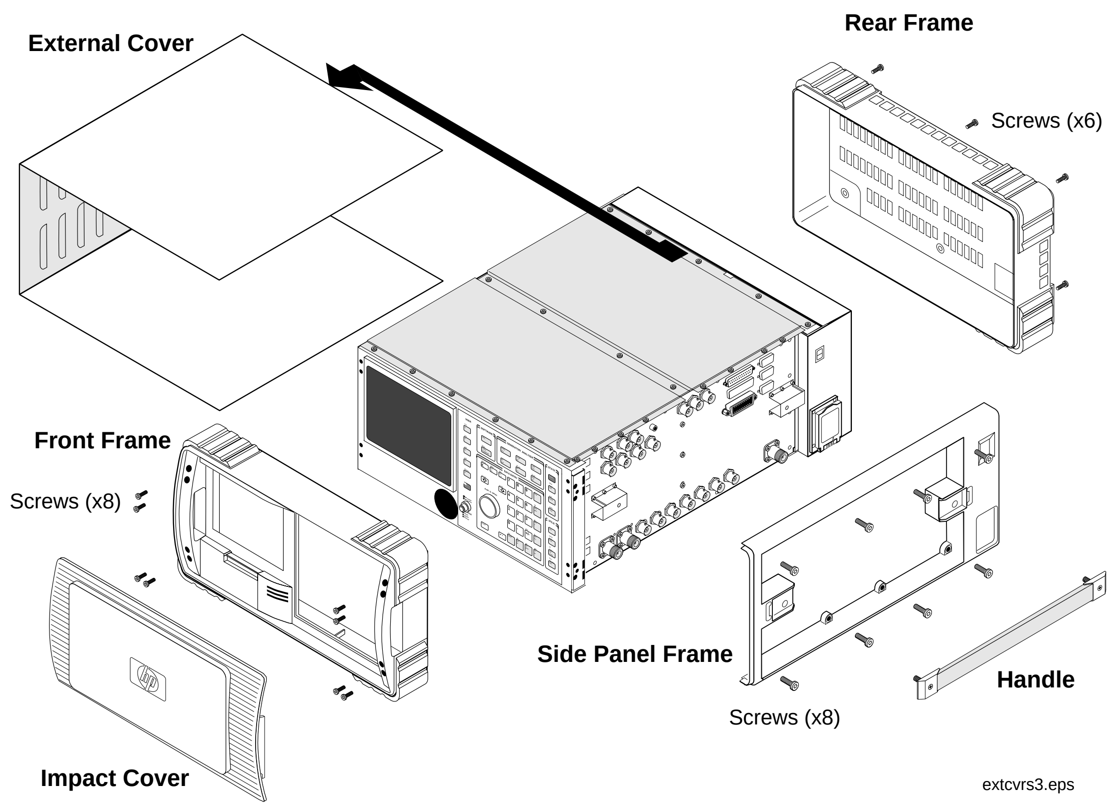
Removing the External and Internal Covers

To access most of the components inside the Test Set, you must remove the front frame, external cover, and internal covers (see Figure 5-1 and Figure 5-2). It is not necessary to remove the side panel or rear frames in most cases. You must remove the rear frame to access the memory AA backup-batteries, power supply assemblies, or to test and/or reset the ground fault interrupter (GFI).

External Covers

1. To remove the front frame, remove the eight screws securing it and pull it away from the chassis, see Figure 5-1.
2. After removing the front frame, remove the external cover by sliding it slightly forward and away from the chassis.
3. To access the backup batteries, power supply, or GFI, remove the rear frame by removing the 6 screws securing it to the chassis. Pull the rear frame away from the chassis.
4. To remove the side panel frame, remove the handle and eight screws securing this frame to the chassis.

Figure 5-1 External Cover Removal



Internal Covers

There are internal covers protecting the top- and bottom-side assemblies of the Test Set. To remove the top covers, see Figure 5-2 below. To remove the bottom cover, see "Bottom Internal Cover" on page 108.

Top Internal Covers

1. Remove the front frame and external cover, see "External Covers" on page 104. Side panel and rear frame removal is not necessary.
2. To access the top-side assemblies, remove the MP13 and MP12 internal covers by removing the screws securing these covers to the chassis, Figure 5-2.
3. Lift the MP14 cover to access the PCB assemblies.

Refer to Figure 5-3 on page 107 to help you identify the assemblies and components in the Test Set.

Figure 5-2 Top Internal Covers

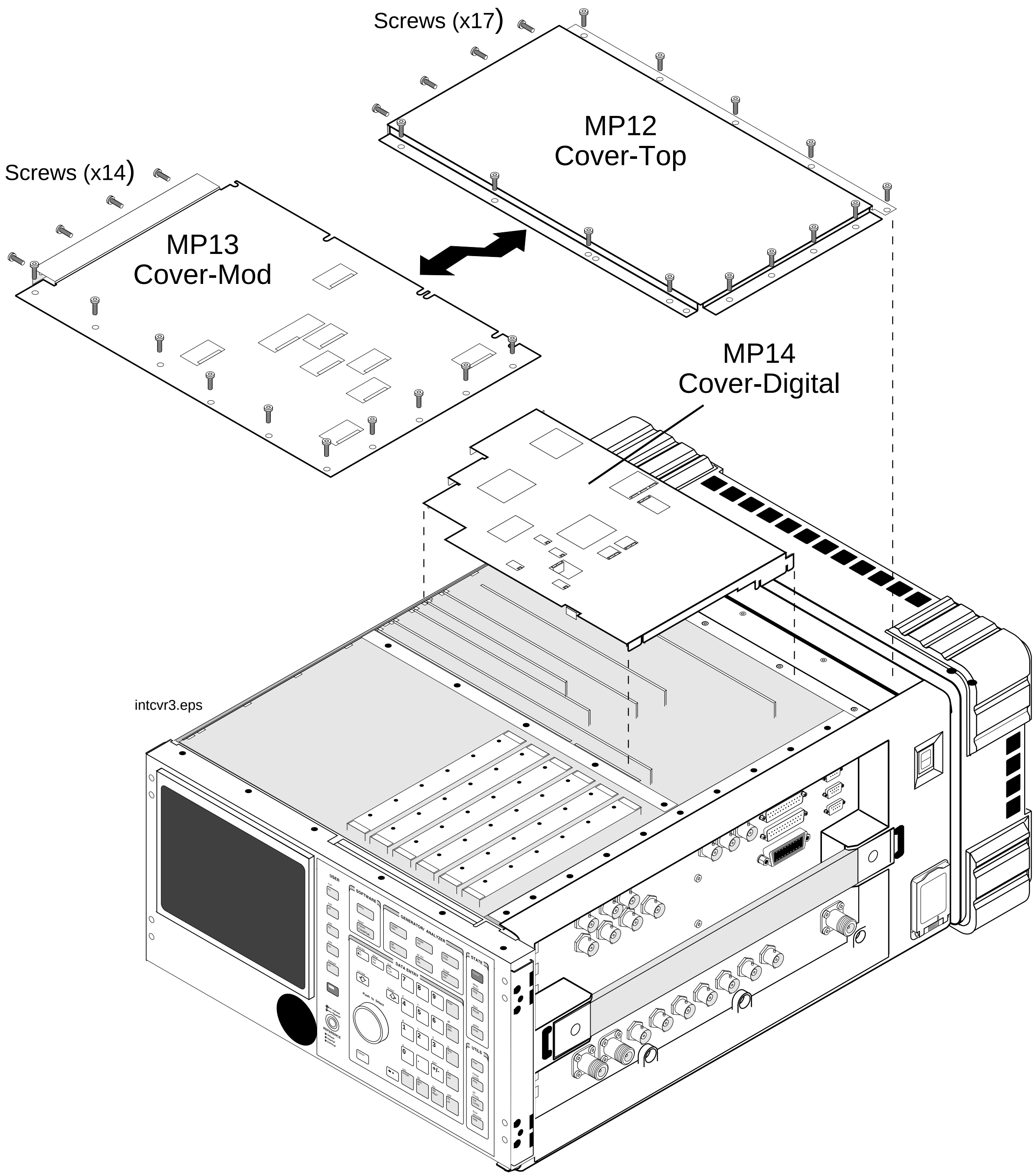
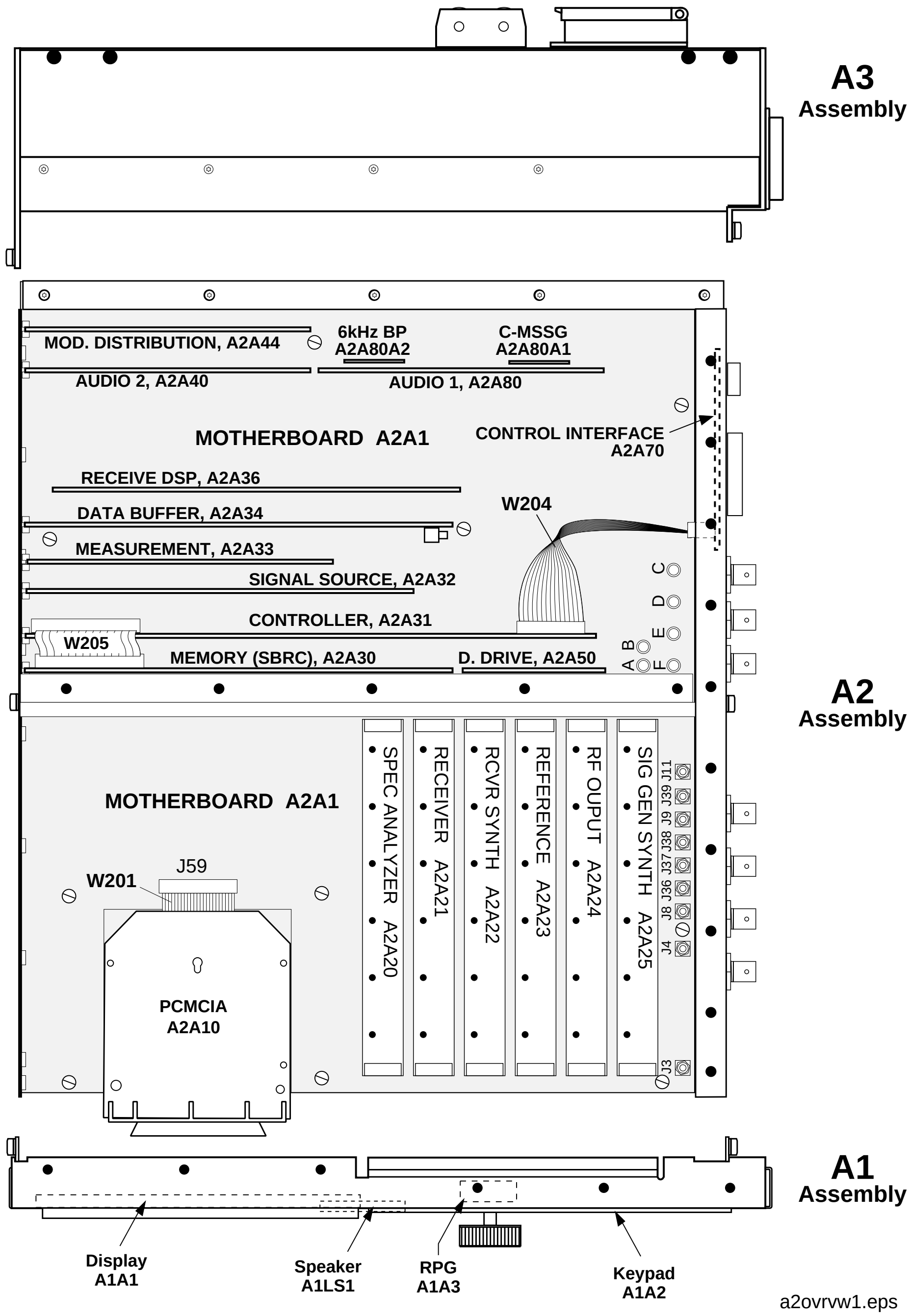


Figure 5-3 Topside View of Test Set



Bottom Internal Cover

To access the assemblies on the bottom side of the Test Set, turn the Test Set over, remove the screws shown in Figure 5-4, and lift the bottom internal cover from the chassis.

CAUTION If the top covers are off, be careful. The exposed digital boards can be easily damaged. Some of the digital boards have pull-rings that can easily get hooked and pull assemblies from their connections.

Use Figure 5-5 on page 109 to identify the assemblies on the bottom side of the Test Set.

Figure 5-4 Bottom Internal Cover

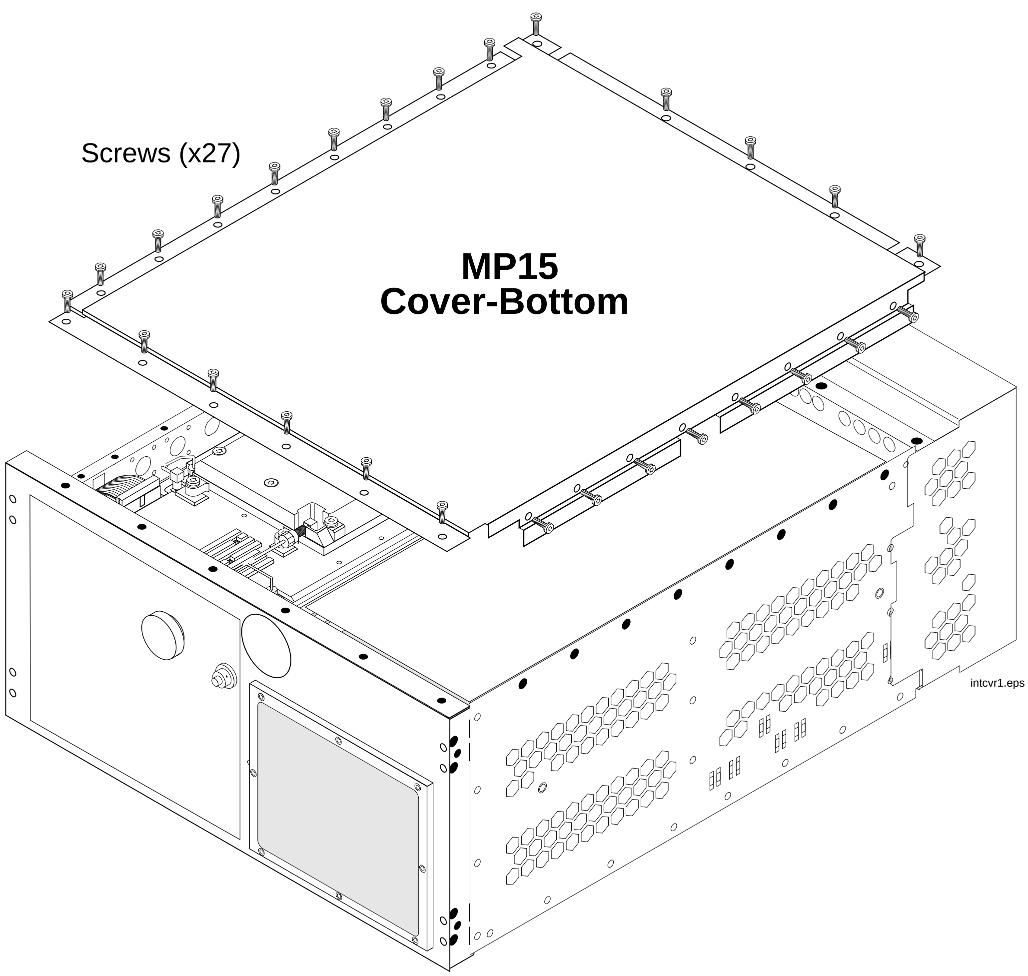
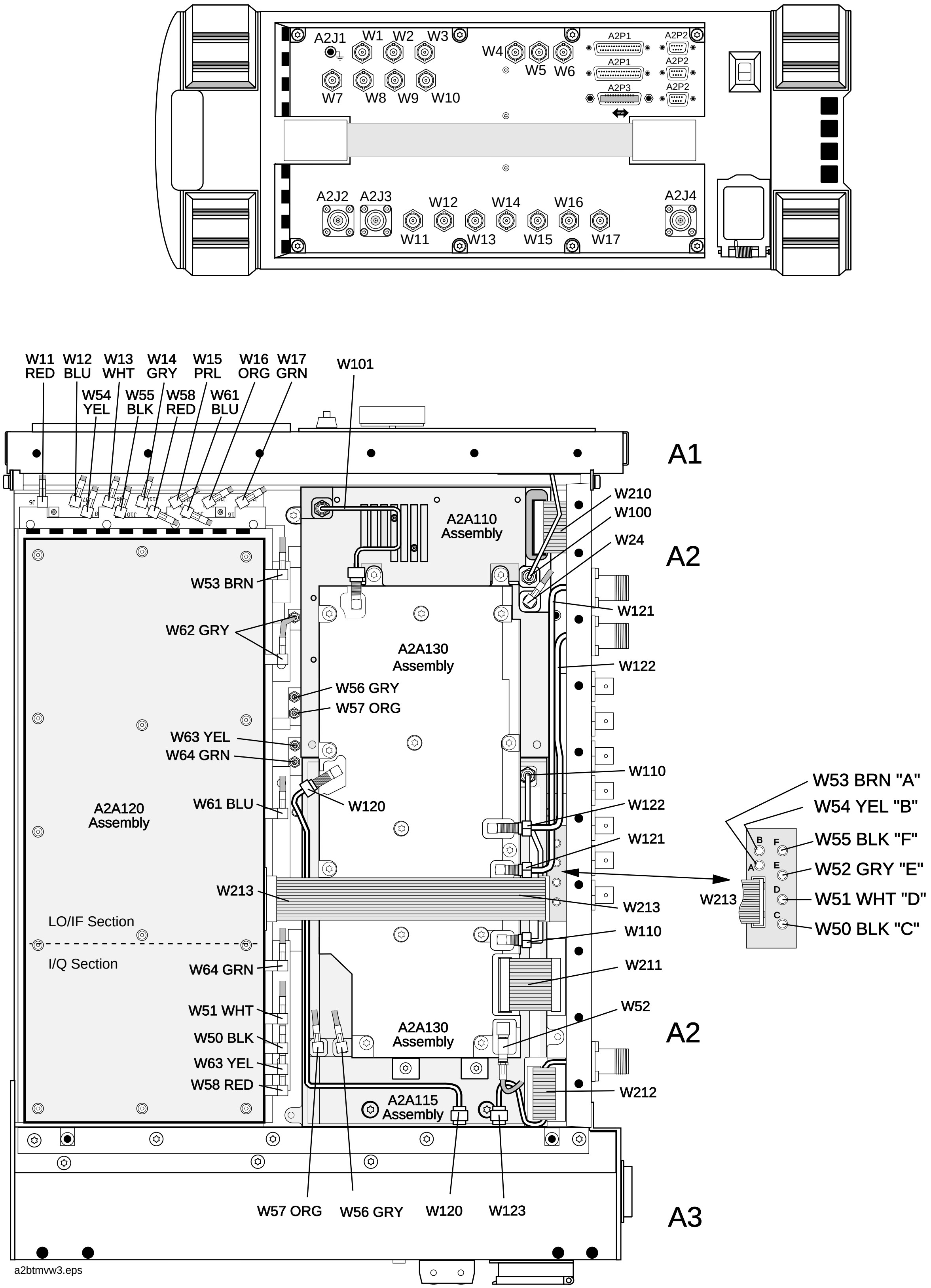


Figure 5-5 Bottom View of Test Set (without Bottom Cover)



A1 Disassembly

1. Remove the front frame, external cover, and internal top and bottom covers, see "Removing the External and Internal Covers" on page 104.
2. Remove the eight screws securing the A1 assembly to the A2 assembly, see Figure 5-6.
3. Disconnect cables W200 and W202 from connectors J79 and J49 on the A2A1 motherboard.

To replace a component or subassembly on the A1 assembly, see Figure 5-7 on page 111.

Figure 5-6 A1 Assembly

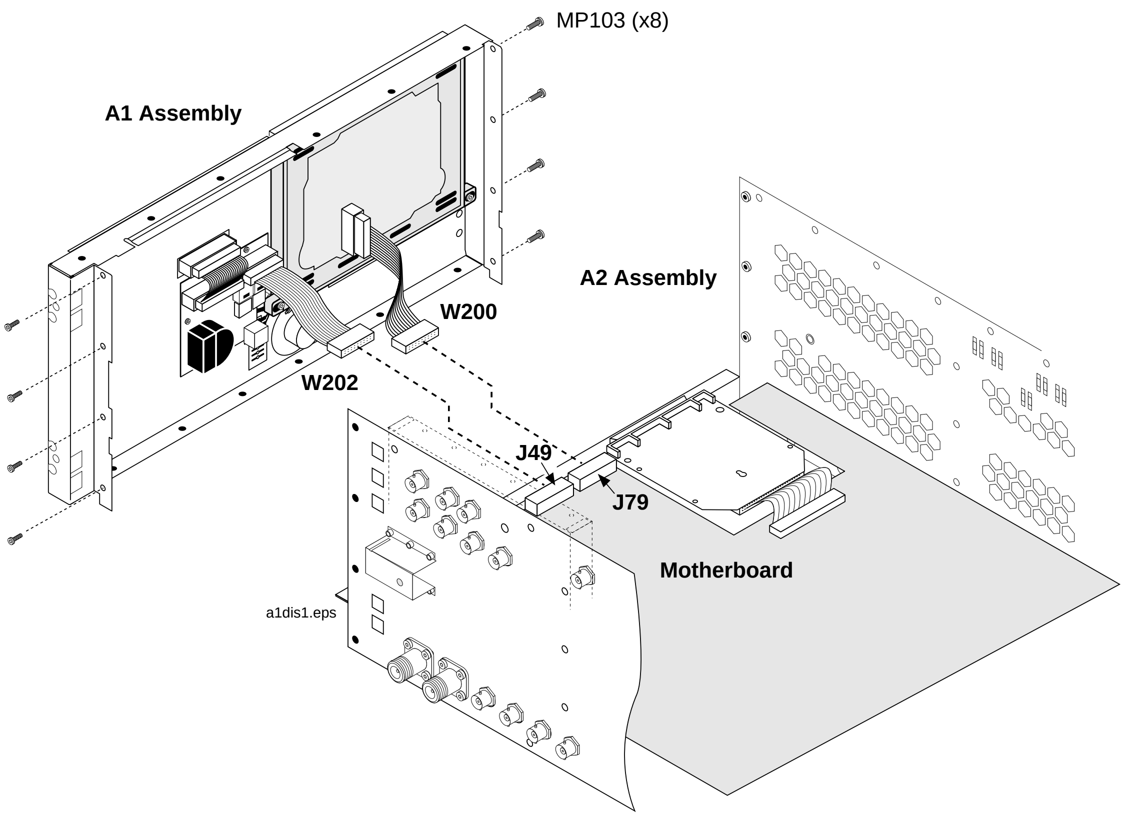
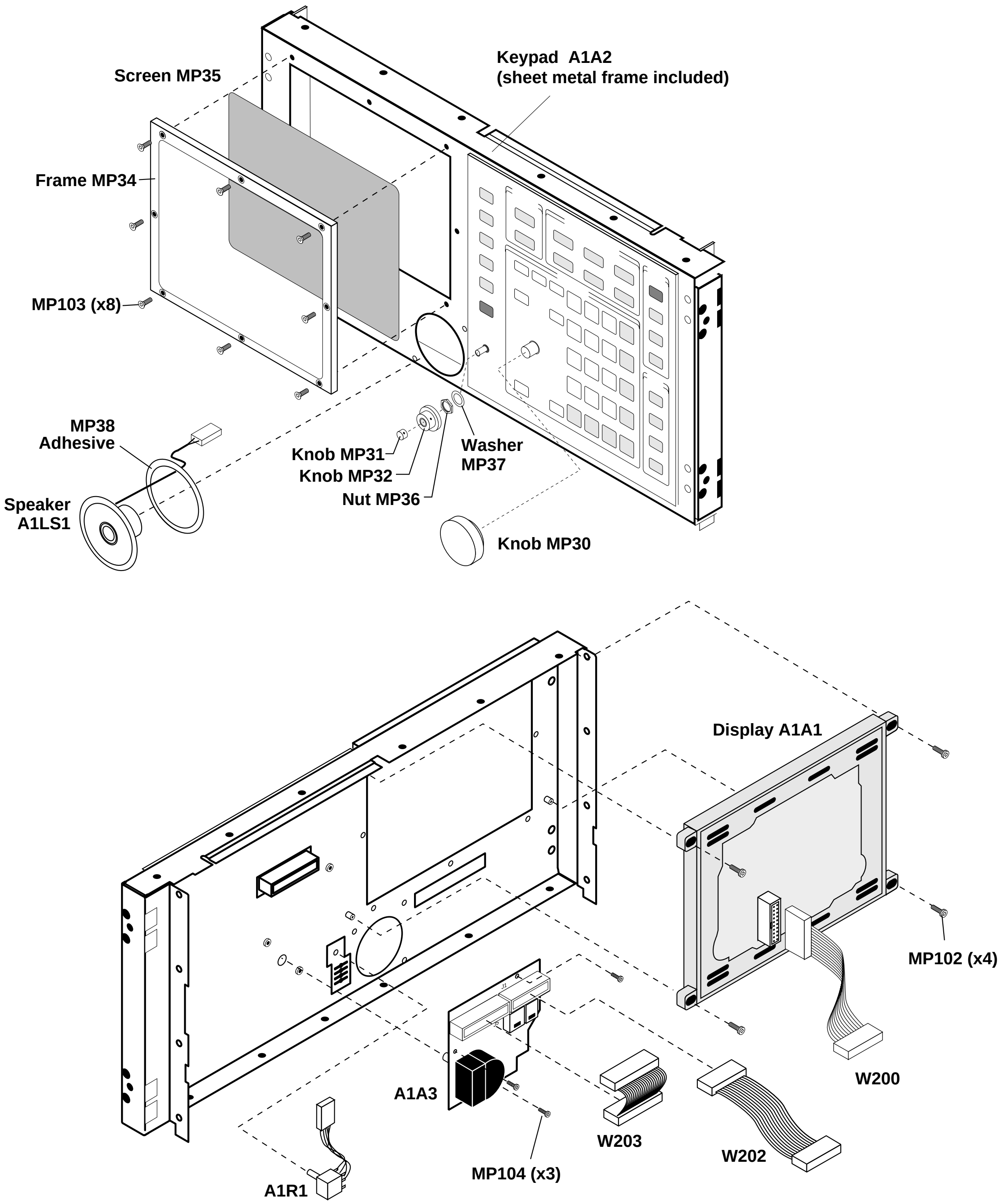


Figure 5-7 A1 Assemblies and Components



a1parts1.eps

A2 Disassembly

This section describes how to disassemble the A2 assembly. Use Table 5-1 below to see which assemblies are replaceable.

NOTE Periodic Adjustment Intervals

The adjustment programs Periodic Calibration, IQ Calibration, and Eb/No Calibration should be performed after any assembly referred to in Table 7-1 on page 159 is replaced, or at least every 24 months. These program can be run anytime to optimize the performance of the Test Set. See Chapter 7 , "Periodic Adjustments," on page 157 for details.

NOTE Performance Test Intervals

The performance tests in Chapter 8 , "Performance Tests," on page 173 should be performed when certain assemblies are repaired or replaced, or at least every 24 months. See Table 3-2 on page 75 for those assemblies requiring performance testing/calibration.

Table 5-1 A2 Assemblies

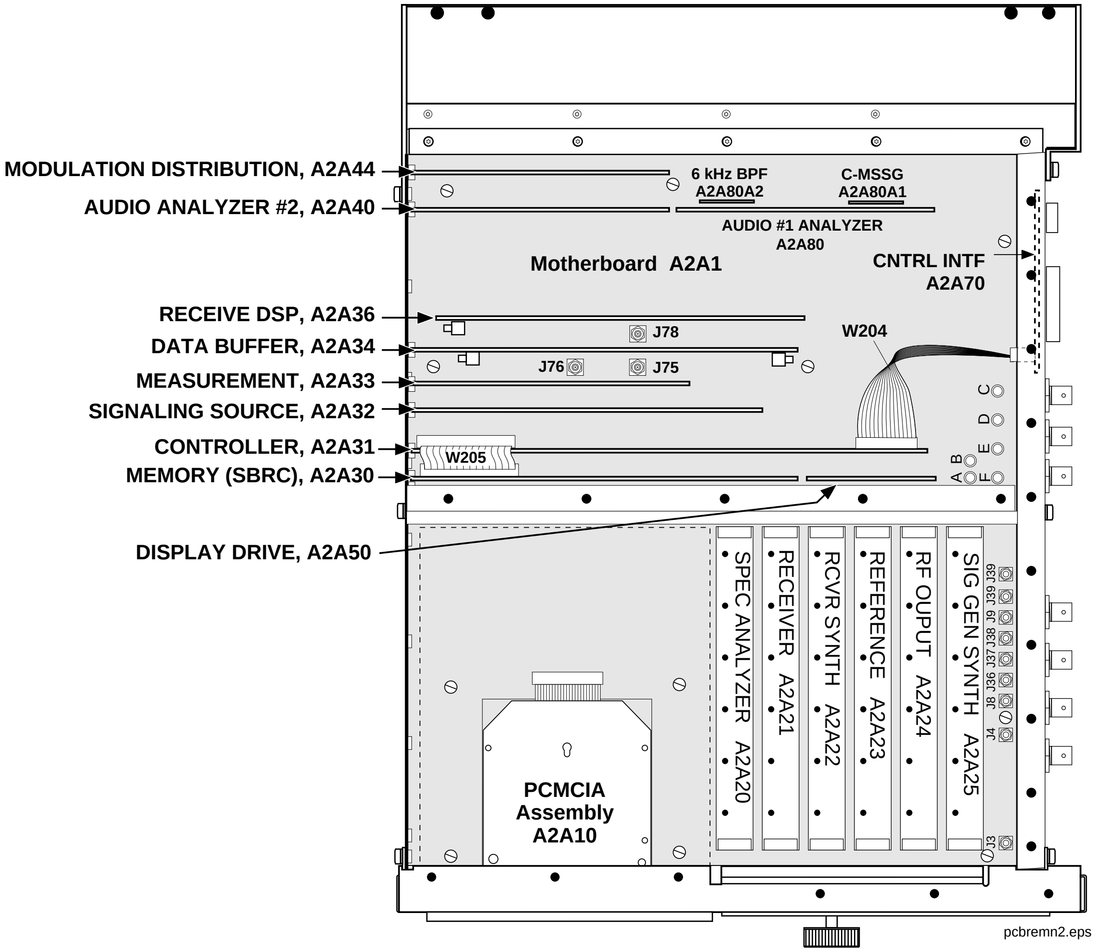
Module and PC Board Assemblies	see page 112
Control Interface Assembly	see page 117
PCMCIA Assembly	see page 116
RF Input/Output, Upconverter, & Downconverter Assemblies	see page 118
LO IF/IQ Modulator and CDMA Generator Reference (Gen Ref) Assemblies	see page 120
	see page 122
	see page 124

Module and PC Board Assemblies

1. Remove the Test Set's external and top internal covers, see "Removing the External and Internal Covers" on page 104.
2. Remove modules using a flat-blade screwdriver to pry them upward from the chassis, see Figure 5-8 on page 113.
3. Remove PC board assemblies by lifting them from the chassis (some assemblies have pull rings) and then disconnect any cables that may be attached to it. See Figure 5-9 on page 114 for cable connections.

NOTE For cable routing information see Table 5-2 on page 130.

Figure 5-8 Module and PC Board Assemblies



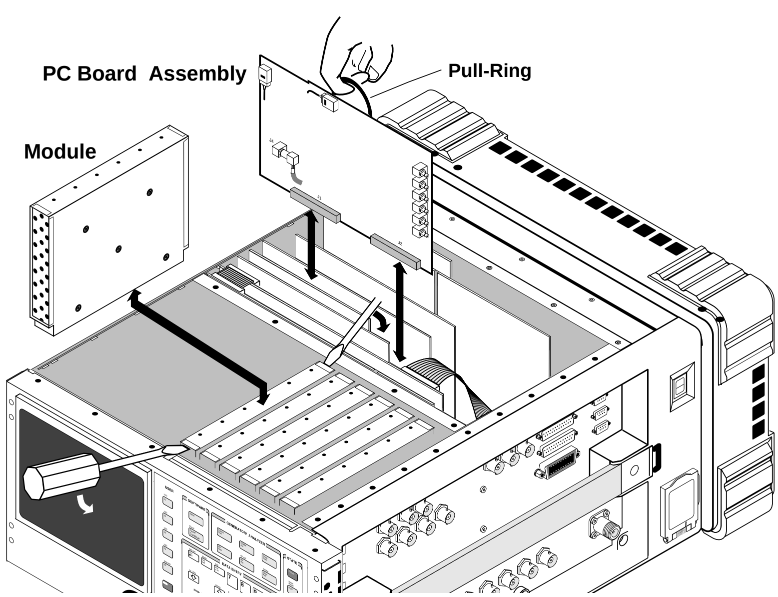
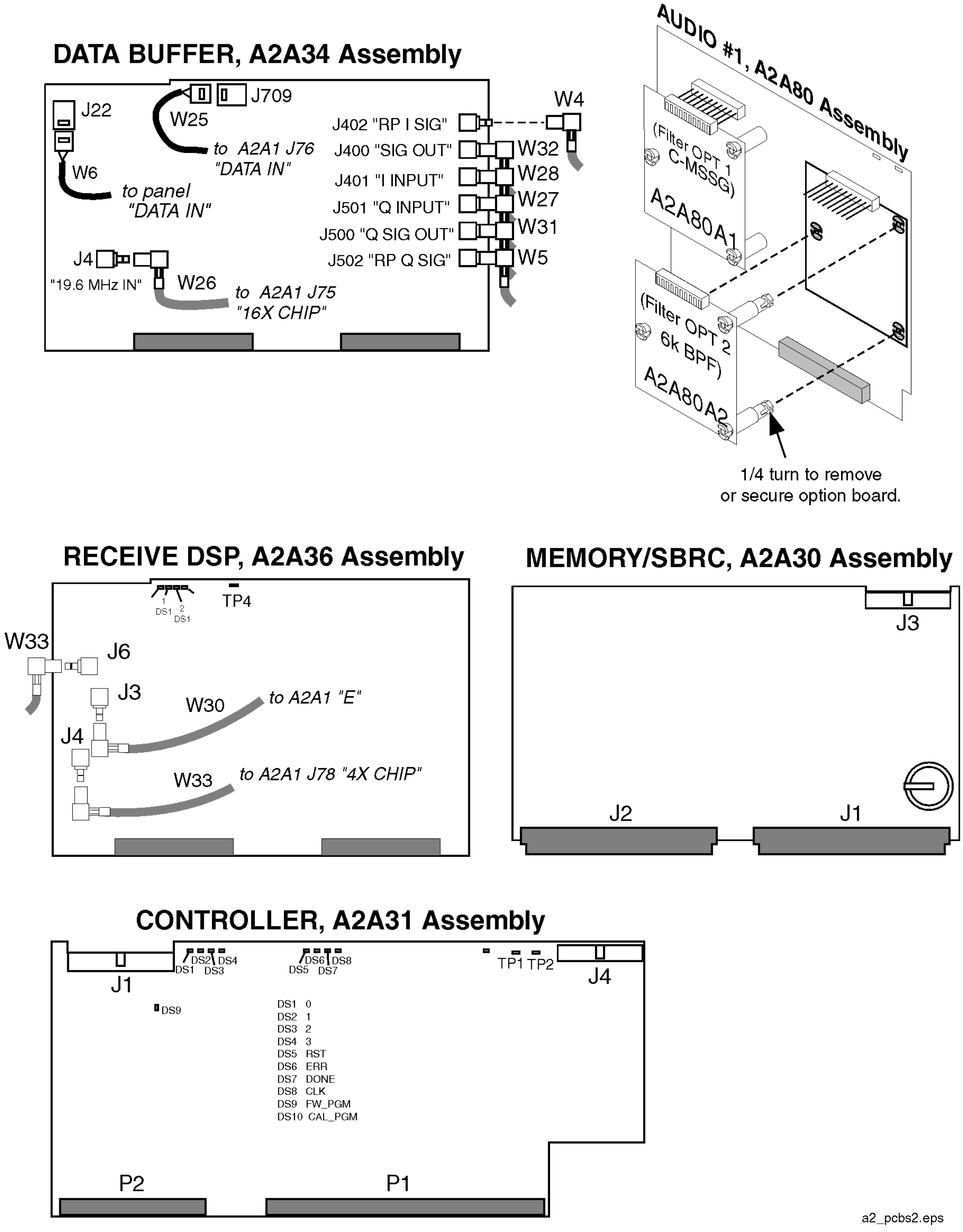


Figure 5-9 PC Board Assemblies

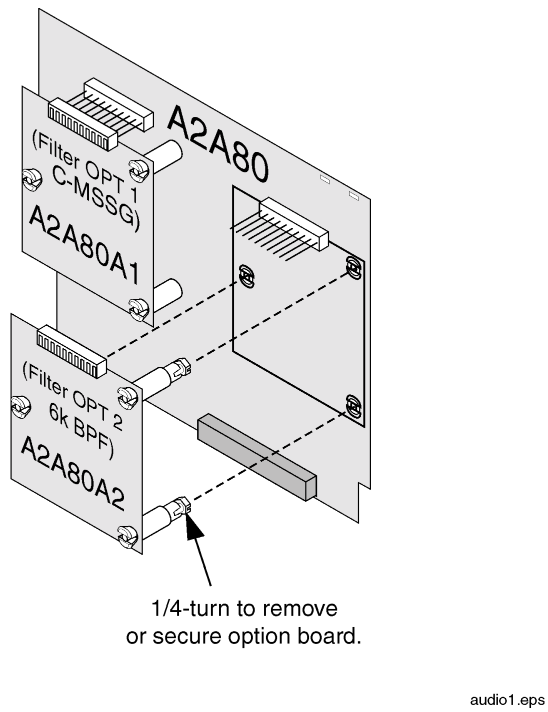


A2A80A1 and A2A80A2 Filter Assembly Removal

To remove either of the filter option assemblies on the A2A80 Audio Analyzer 1 assembly:

1. Remove the A2A80 assembly from the Test Set.
2. Turn the plastic hex nut on each standoff a quarter turn and push the standoffs through their holes to release the filter board from the host board, see Figure 5-10. It may be necessary to compress or squeeze the expandable flanges to slide them through the mounting holes.

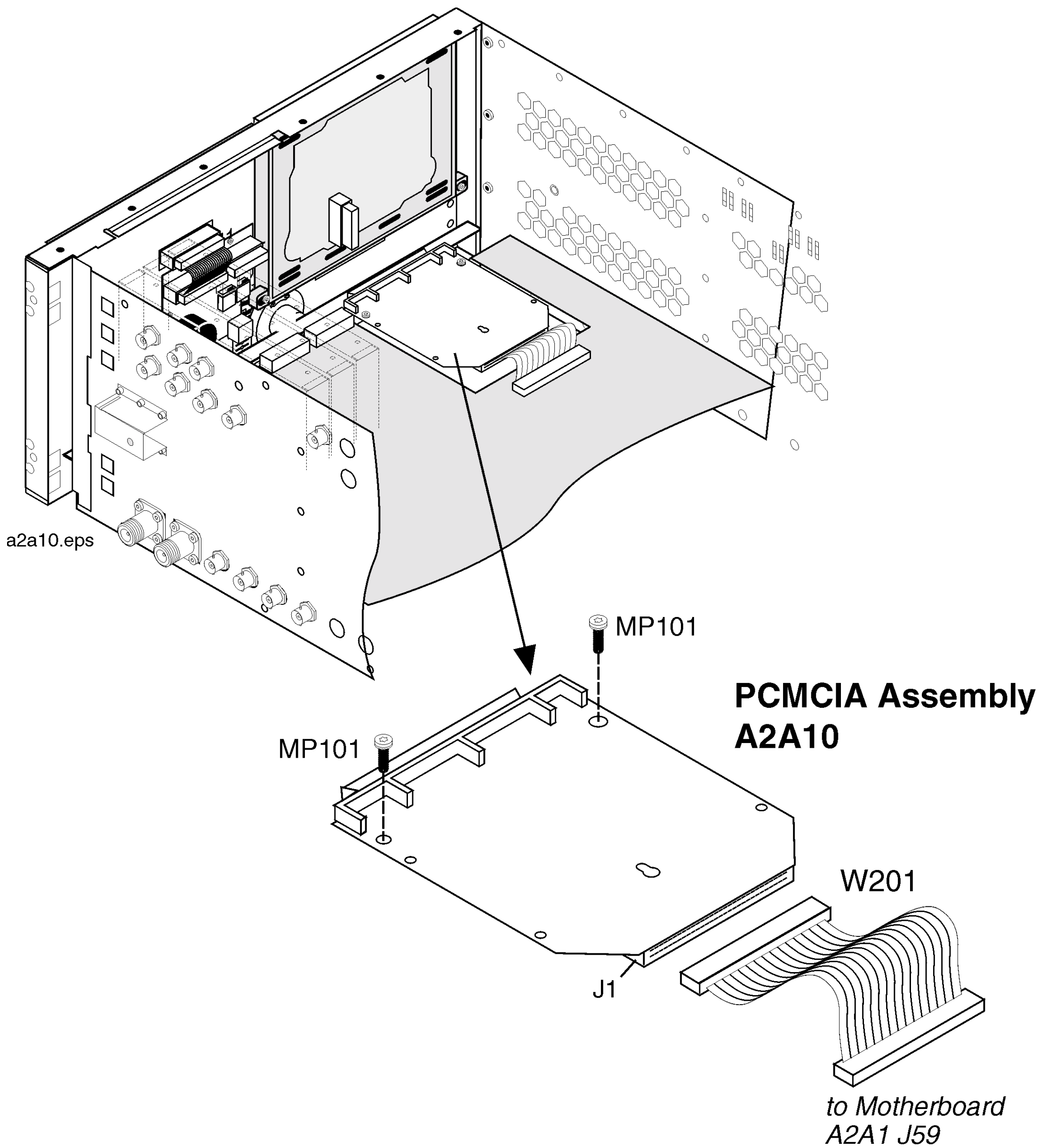
Figure 5-10 A2A80 Audio Analyzer 1 Assembly



PCMCIA Assembly

1. Remove the front frame, external cover, and the front internal cover from the Test Set, see "Top Internal Covers" on page 105.
2. Remove the memory card from the card slot.
3. See Figure 5-11. Remove the two screws and disconnect ribbon cable W201 from the PCMCIA assembly. Lift the assembly from the chassis.

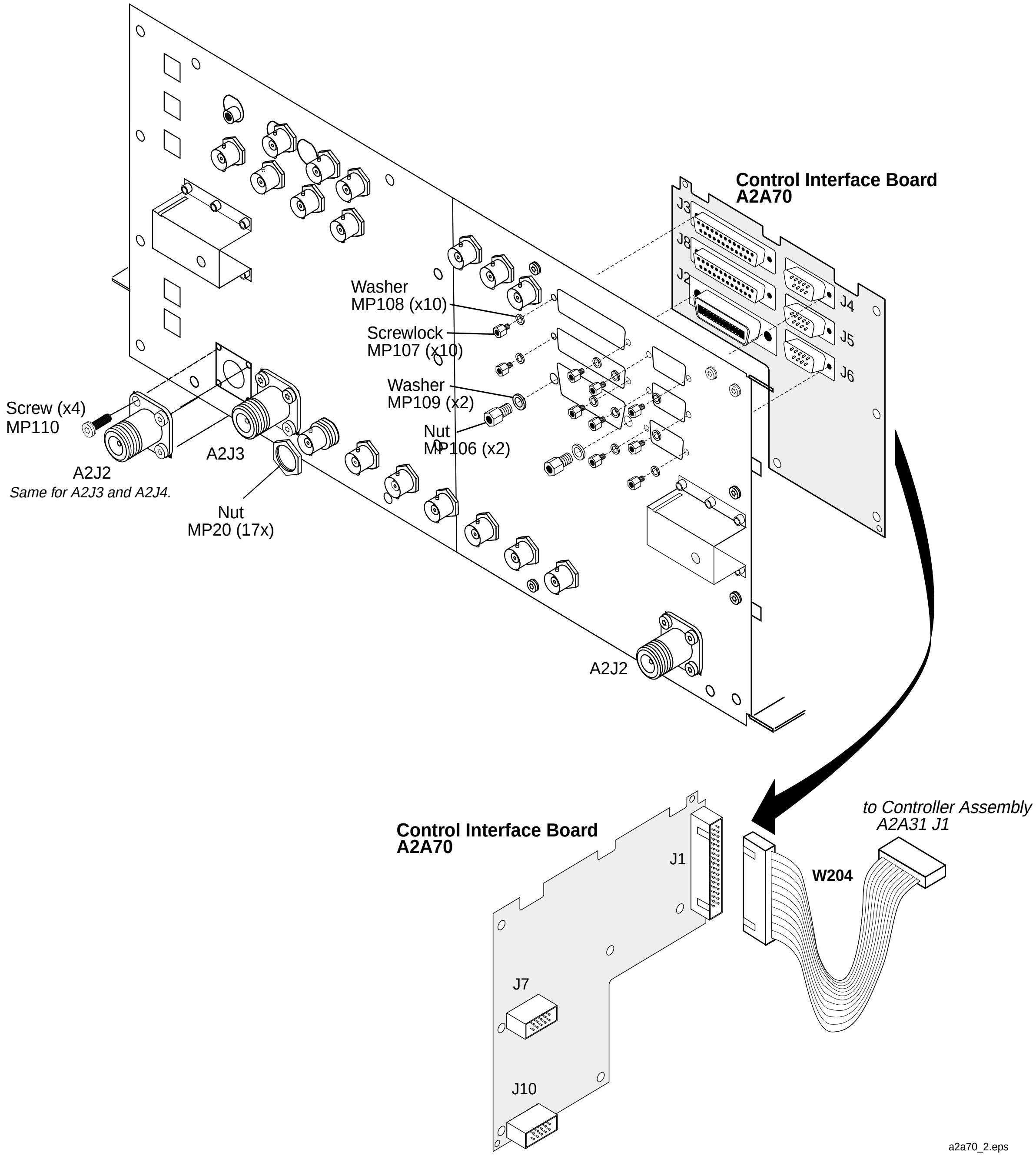
Figure 5-11 PCMCIA Assembly Removal



Control Interface Assembly

1. Remove the standoffs and screwlocks from the connector panel as shown in Figure 5-12 on page 117 from the Test Set.
2. Disconnect ribbon cable W204 from the A2A70 assembly to remove the assembly.

Figure 5-12 Control Interface Assembly Removal



RF Input/Output, Upconverter, & Downconverter Assemblies

The RF Input/Output A2A130, Upconverter A2A130, and Downconverter A2A115 assemblies are secured in an interlocking manner and are disassembled in the following order:

RF Input/Out Assembly Removal

1. Remove the bottom cover of the Test Set. See "Removing the External and Internal Covers" on page 104.
2. Disconnect cables: W101, W122, W121, W110, W211, W67, and W120. See Figure 5-13 on page 119.
3. Remove the four torx screws (MP101) securing the RF Input/Output assembly to the other assemblies.
4. Slide the RF Input/Output assembly away from the Downconverter assembly's slot to remove the assembly.

Upconverter Assembly Removal

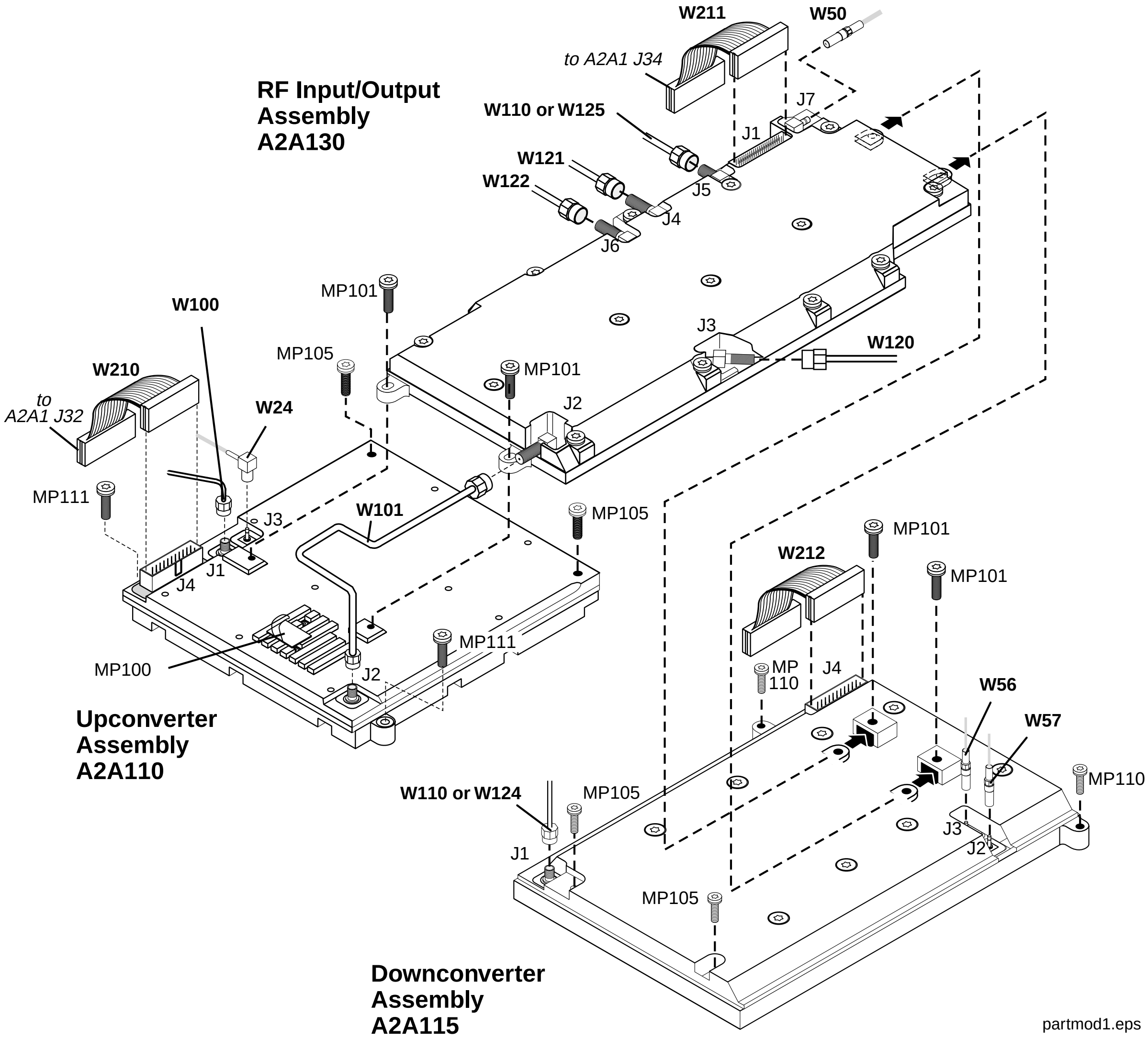
1. Remove the RF Input/Output as previously instructed.
2. Disconnect cables: W101, W210, W100, and W24. See Figure 5-13 on page 119.
3. Remove the four torx screws securing this assembly and lift it away from the chassis.

Downconverter Assembly Removal

1. Remove the RF Input/Output and Upconverter assemblies as previously instructed.
2. Disconnect cables: W110, W212, W56, and W57. See Figure 5-13 on page 119.
3. Remove the four torx screws securing this assembly and lift it away from the chassis.

When reassembling, reverse the order of disassembly, that is, install the Downconverter assembly first, the Upconverter second, and the RF Input/Output assembly last. For wire/cable routing information, see Table 5-2 on page 130.

Figure 5-13 RF Input/Output, Upconverter, & Downconverter Removal



LO IF/IQ Modulator and CDMA Generator Reference (Gen Ref) Assemblies

The LO IF/IQ Modulator and Gen Ref assemblies need to be removed in the following order. See Figure 5-14 on page 121.

Removing the LO IF/IQ Modulator Assembly

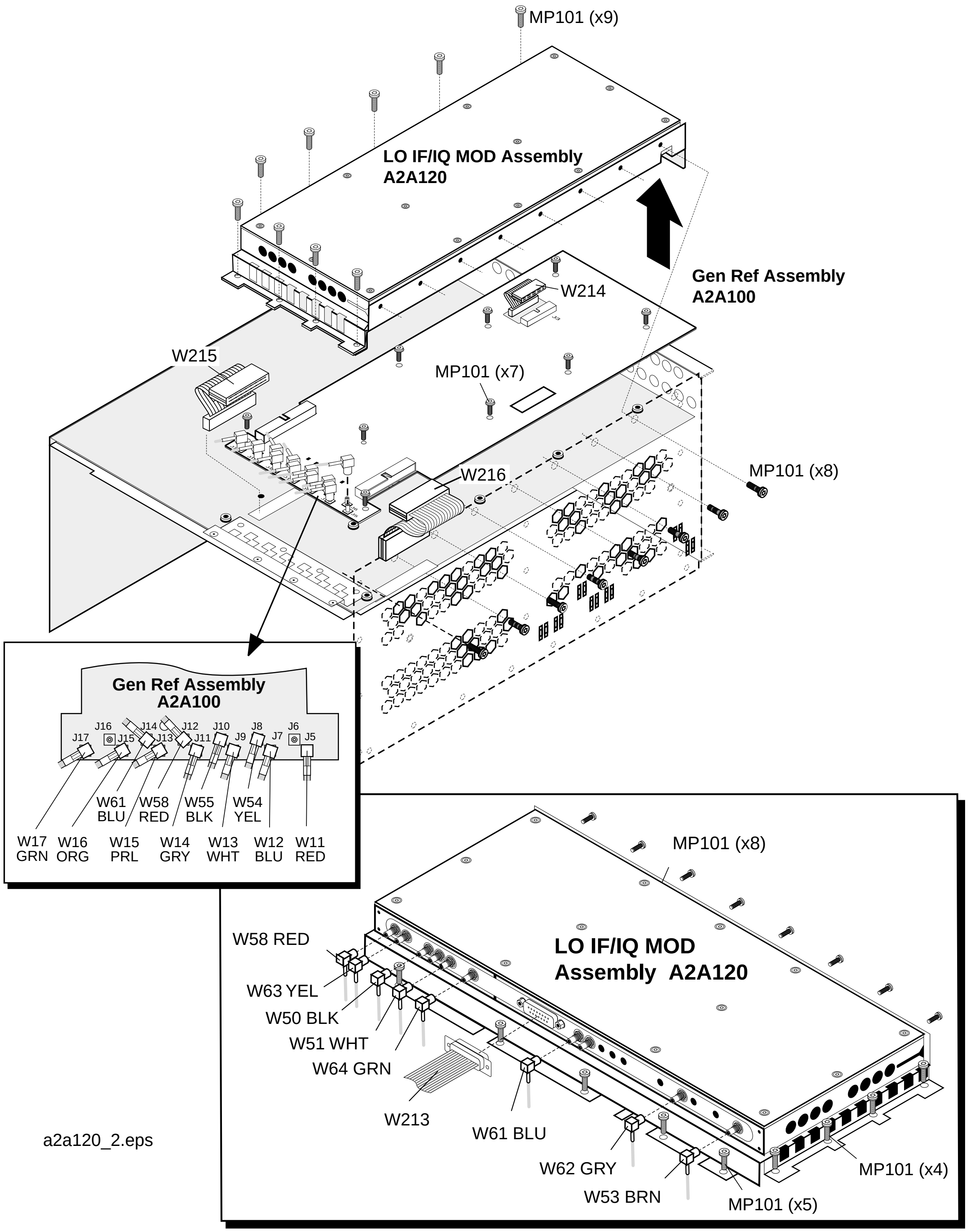
1. Remove the bottom cover, see “Bottom Internal Cover” on page 108.
2. Disconnect the cables shown in Figure 5-14 on page 121.
3. Remove the nine torx screws that secure this assembly to the chassis.

Removing the Gen Ref Assembly

1. Remove the LO IF/IQ Modulator assembly.
2. Disconnect the cables shown in Figure 5-14 on page 121.
3. Remove the nine torx screws securing the assembly to the chassis and lift the assembly.

When re-installing the assemblies, install the Gen Ref assembly first.

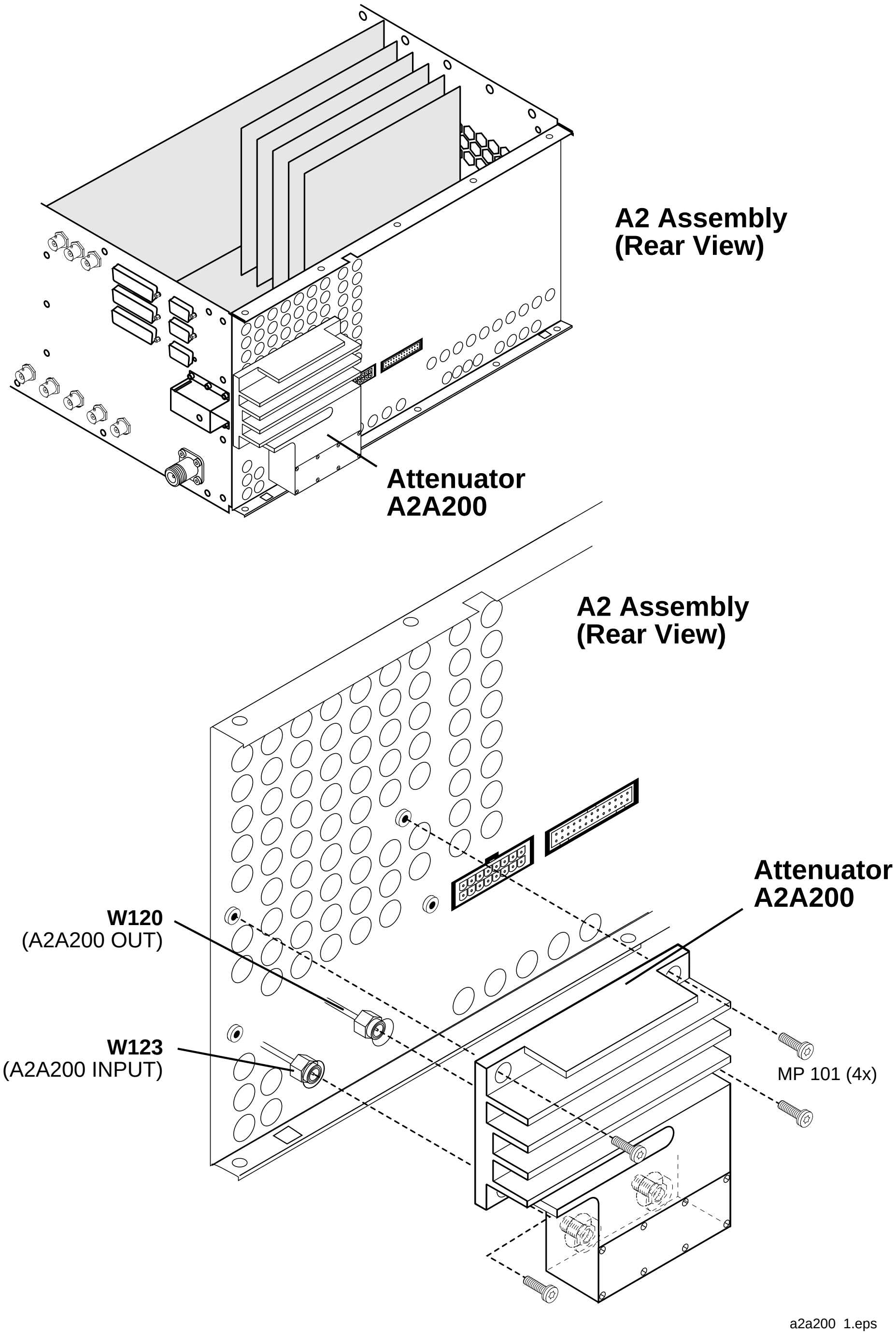
Figure 5-14 LO IF/IQ Modulator & CDMA Generator Reference Removal



Attenuator Assembly

1. Remove the front, side, and rear external covers, and the top and bottom internal covers, see “Removing the External and Internal Covers” on page 104.
2. Remove the power supply assembly, see “A3 Disassembly” on page 126.
3. Turn the Test Set over and disconnect flex connectors W120 and W123 from the attenuator, see Figure 5-15.
4. Remove the four screws that secure the attenuator to the chassis, see Figure 5-15.

Figure 5-15 Attenuator Assembly Removal

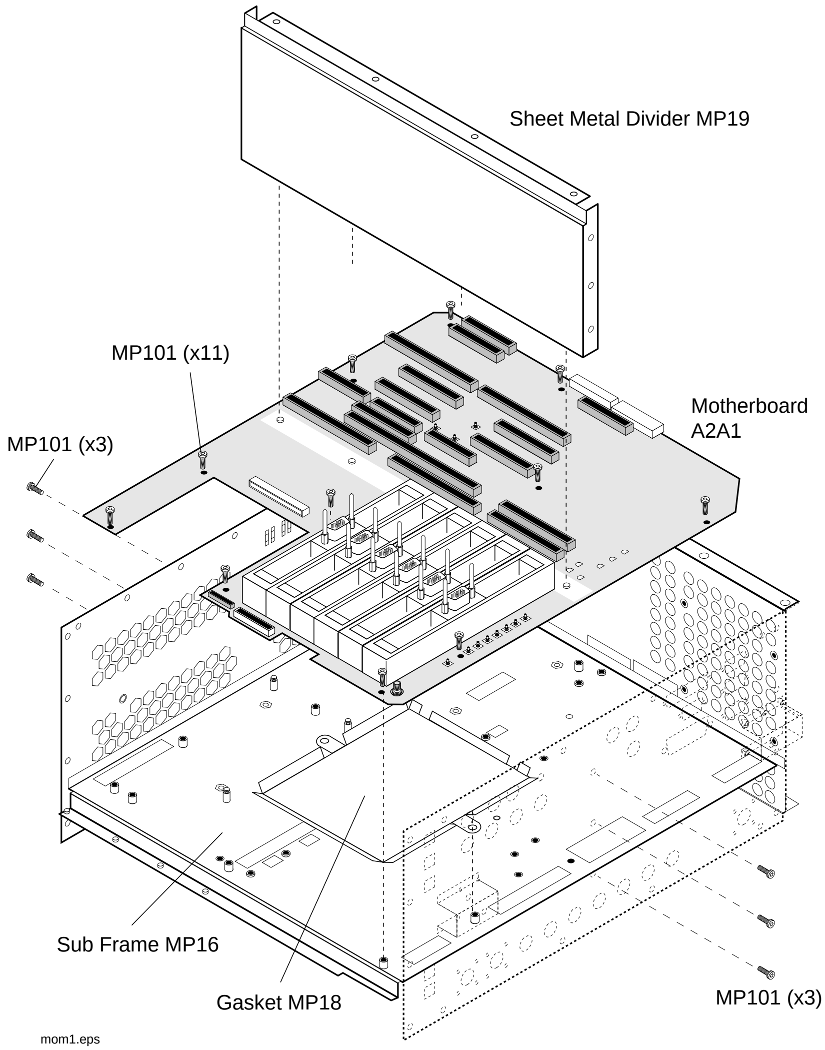


Motherboard Assembly

1. Remove the all external and internal (top and bottom) covers from the Test Set, see "Removing the External and Internal Covers" on page 104.
2. Remove all the modules and PC board assemblies. See "Module and PC Board Assemblies" on page 112.
3. Remove the A1 front panel and A3 rear panel assemblies. See "A1 Disassembly" on page 110 and "A3 Disassembly" on page 126.
4. Remove the six torx screws securing the sheet metal divider and then remove the divider, see Figure 5-16 on page 125.
5. Disconnect all the connectors on the topside of the motherboard.
6. Disconnect all the connectors on the bottom side of the motherboard.
7. Remove the 11 torx screws securing the motherboard to the chassis and lift it up to remove it.

To reassemble the Test Set, perform the previous steps in reverse order. For wire/cable routing information, see Table 5-2 on page 130.

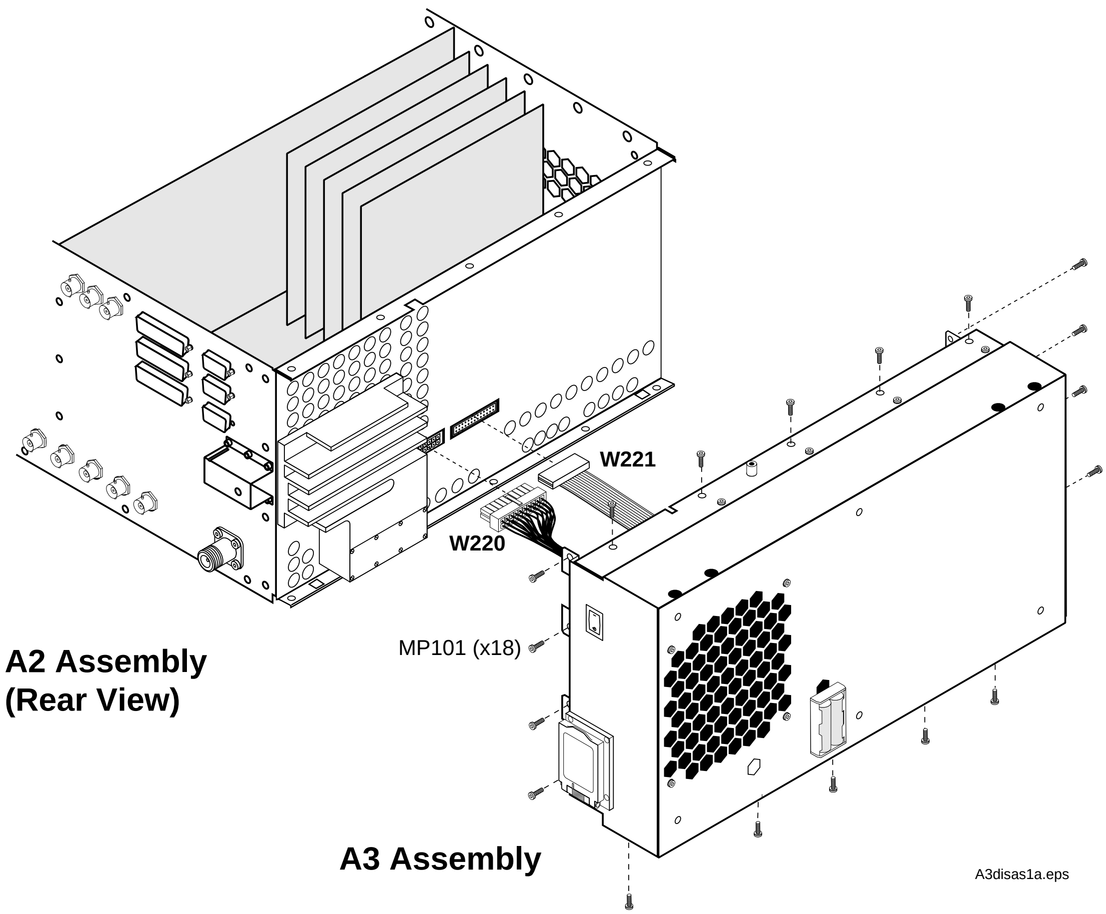
Figure 5-16 Motherboard Removal



A3 Disassembly

1. Remove the Test Set's external and internal covers, see "Removing the External and Internal Covers" on page 104.
2. Remove the eighteen torx screws securing the A3 assembly to the A2 assembly, see Figure 5-17.
3. Move the A3 assembly away from the A2 assembly and disconnect cables W220 and W221.

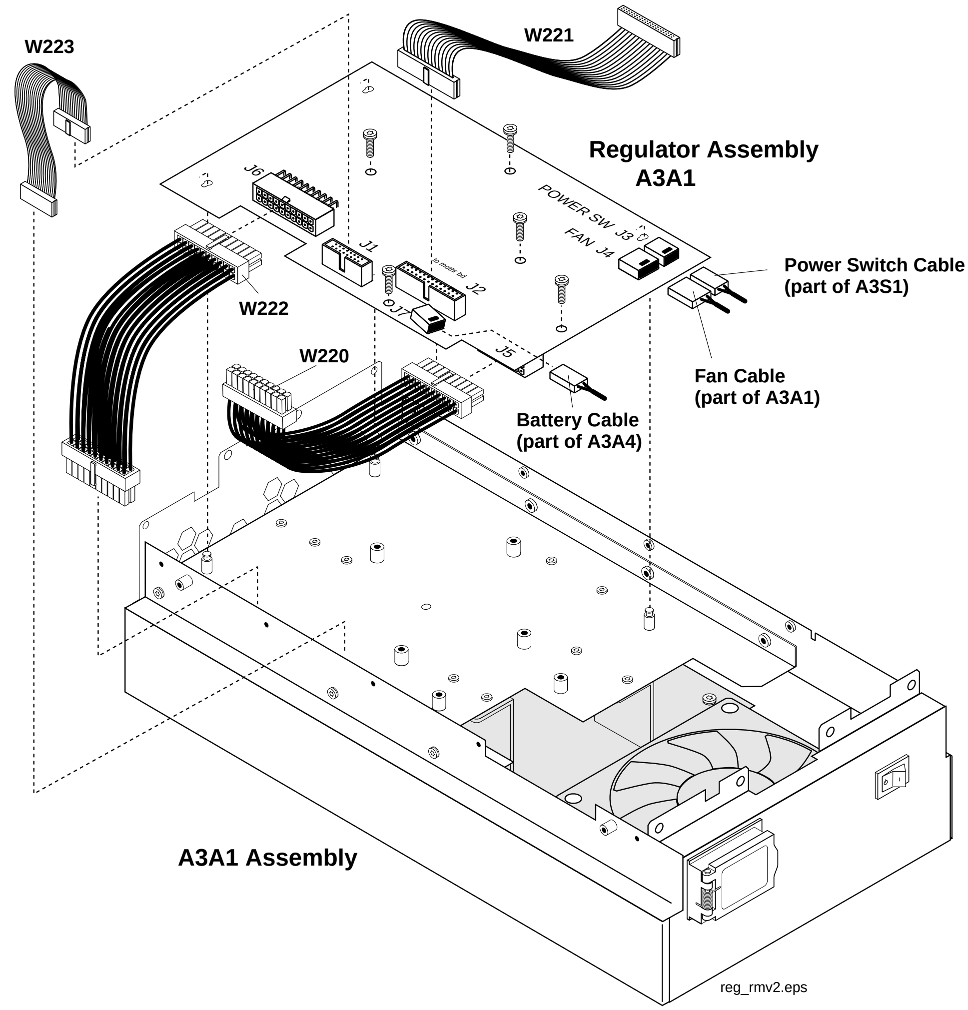
Figure 5-17 A3 Rear Panel Assembly



Removing the Power Supply Regulator Assembly

To remove the A3A1 regulator assembly, disconnect the cables and the four torx screws shown in Figure 5-18.

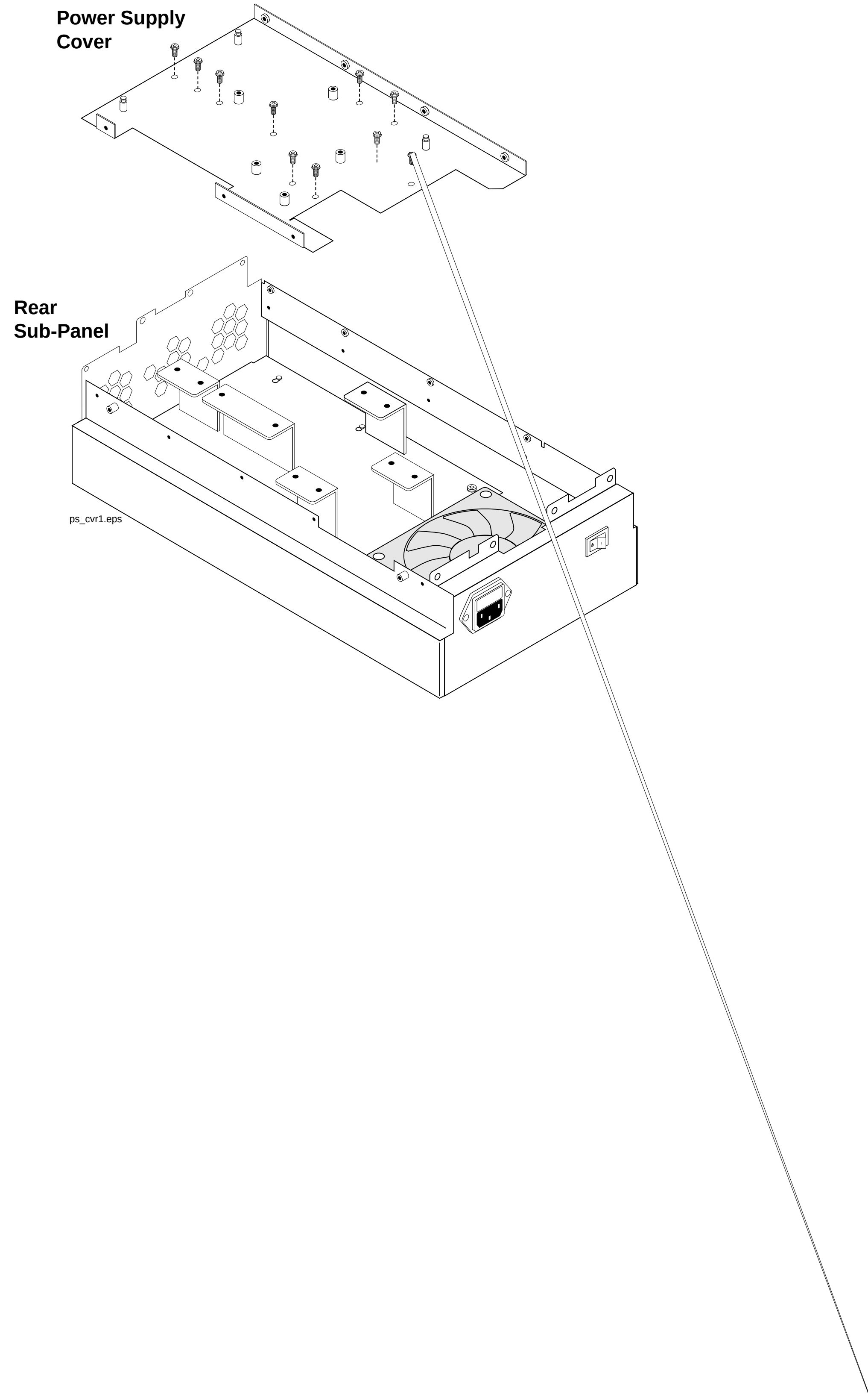
Figure 5-18 A3A1 Regulator Assembly



Removing the Power Supply Assembly

1. Remove the regulator assembly.
2. Remove the power supply cover from the A3 assembly, see Figure 5-19 on page 128.
3. Disconnect cables W222, W223, and GFI-assembly cable at J7.
4. Remove the four screws securing the power supply to the rear sub panel.

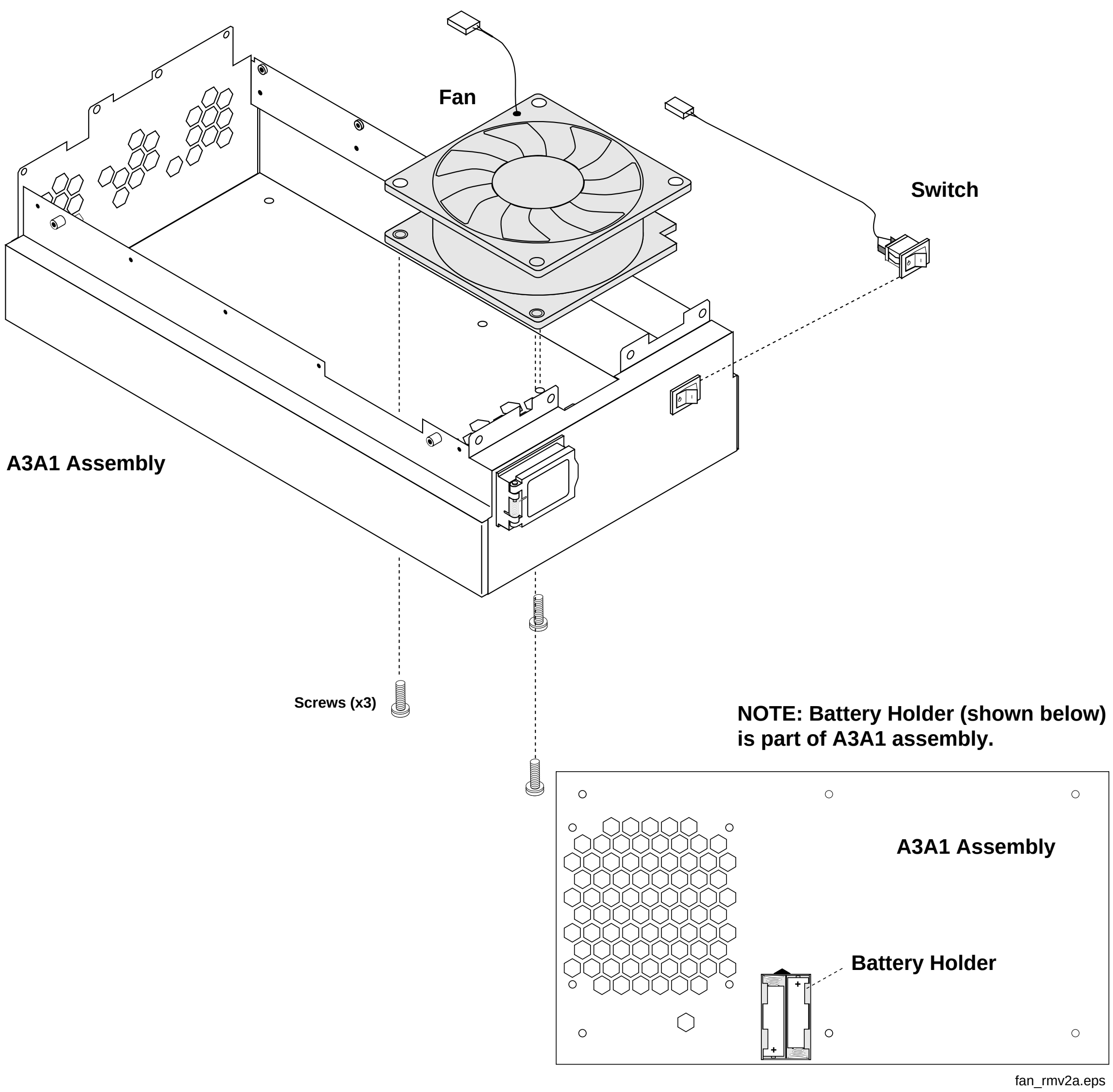
Figure 5-19 Power Supply Removal



Power Supply Switch, Fan, & Battery Holder Assemblies

1. Remove the regulator assembly, see "Removing the Power Supply Regulator Assembly" on page 127, and power-supply cover and subassemblies, see "Removing the Power Supply Assembly" on page 127.
2. To remove the fan, remove the three screws shown in Figure 5-20
3. The A3S1 power switch assembly is normally riveted in place. However this assembly is replaceable and screws can be used to replace the rivets, see Figure 5-20.

Figure 5-20 Fan and Power Switch Assemblies



Wire/Cable Information

Table 5-2 Wire/Cable List

Wire #	From	To	Part Number
W1	"AUDIO OUT" (Panel)	A2A1 J8	E6380-61039
W2	"AUDIO IN - HI" (Panel)	A2A1 J9	E6380-61039
W3	"AUDIO IN - LO" (Panel)	A2A1 J11	E6380-61039
W4	"BASEBAND OUT - I" (Panel)	A2A34 J402	E6380-61043
W5	"BASEBAND OUT - Q" (Panel)	A2A34 J502	E6380-61043
W6	"DATA IN" (Panel)	A2A34 J22	E6380-61045
W7	"ANALOG MODULATION IN" (Panel)	A2A1 J36	E6380-61039
W8	"SCOPE MONITOR OUT" (Panel)	A2A1 J37	E6380-61039
W9	"EXT SCOPE TRIG IN" (Panel)	A2A1 J38	E6380-61039
W10	"VIDEO OUT" (Panel)	A2A1 J39	E6380-61039
W11	A2A100 J5 (RED)	"16X CHIP CLOCK 19.6608 MHz OUT" (RED - Panel)	E6380-61073
(future use)	A2A100 J6	N/A	N/A
(future use)	A2A100 J16	N/A	N/A
W12	A2A100 J7 (BLU)	"CHIP CLOCK 1.2288 MHz OUT" (BLU - Panel)	E6380-61074
W13	A2A100 J9 (WHT)	"FRAME CLOCK OUT" (WHT - Panel)	E6380-61072
W14	A2A100 J11 (GRY)	"EVEN SECOND SYNC IN" (GRY - Panel)	8120-5837
W15	A2A100 J13 (PRL)	"TRIGGER QUALIFIER IN" (PRL - Panel)	E6380-61075
W16	A2A100 J15 (ORG)	"10 MHz REF OUT" (ORG - Panel)	E6380-61076
W17	A2A100 J17	"EXT REF IN" (GRN - Panel)	E6380-61077
W18-W23	NOT USED		N/A
W24	A2A1 J4 (GRY)	A2A110 J3	E6380-61047

Table 5-2 Wire/Cable List

Wire #	From	To	Part Number
W25	A2A1 J76	A2A34 J709 "1.2200 MHz_DATA_OUT"	E6380-61044
W26	A2A1 J75	A2A34 J4 "19.6 MHz IN"	E6380-61042
W27	A2A1 "B"	A2A34 J501	E6380-61040
W28	A2A1 "F"	A2A34 J401	E6380-61040
W29	A2A1 "A"	A2A36 J6	E6380-61041
W30	A2A1 "E"	A2A36 J3	E6380-61041
W31	A2A1 "D"	A2A34 J500	E6380-61040
W32	A2A1 "C"	A2A34 J400	E6380-61040
W33	A2A1 J78	A2A36 J4	E6380-61042
W34-W49	NOT USED		N/A
W50	A2A1 "C" (BLK)	A2A120 J3 I/Q "I IN" (BLK)	E6380-61055
W51	A2A1 "D" (WHT)	A2A120 J2 I/Q "Q IN" (WHT)	E6380-61065
W52	A2A1 "E" (GRY)	A2A130 J7 (RF I/O - GRY)	E6380-61051
W53	A2A1 "A" (BRN)	A2A120 J4 LO/IF "3.69 MIF" (BRN)	E6380-61066
W54	A2A1 "B" (YEL)	A2A100 J8 (YEL)	E6380-61078
W55	A2A1 "F" (BLK)	A2A100 J10 (BLK)	E6380-61046
W56	A2A115 J3 (GRY)	A2A1 J2 "RCVR LO" (GRY)	E6380-61050
W57	A2A115 J2 (ORG)	A2A1 J1 "RCVR IN" (ORG)	E6380-61064
W58	A2A120 J5 "QTUNE" (RED)	A2A100 J12 (RED)	E6380-61063
W59-W60	NOT USED		N/A
W61	A2A100 J14 (BLU)	A2A120 J2 "REF IN" (BLU)	E6380-61061
W62	A2A120 J3 LO/IF "114.3 M IF IN" (GRY)	A2A1 J5 "114.3 MHz IF OUT" (GRY)	E6380-61060
W63	A2A120 J4 "IQ RF OUT" (YLW)	A2A1 J7 "I\Q OUT" (YLW)	E6380-61059
W64	A2A120 J1 "CW RF IN" (GRN)	A2A1 J6 "I\Q IN" (GRN)	E6380-61059

Table 5-2 Wire/Cable List

Wire #	From	To	Part Number
W65-W99	NOT USED		N/A
W100	A2A1 J3 "RF OUT"	A2A110 J1	E6380-61021
W101	A2A110 J2	A2A130 J2	E6380-61020
W102-W109	NOT USED		N/A
W110	A2A115 J1	A2A130 J5	E6380-61034
W120	NOT USED		E6380-61017
W121	A2A130 J4	A2 J2 "ANT IN" (Panel)	E6380-61019
W122	A2A130 J6	A2 J3 "DUPLEX OUT" (Panel)	E6380-61018
W123	A2 J4 "RF IN/OUT" (Panel)	A2A200 "INPUT"	E6380-61016
W124	A2U1 “DC BLOCK”	A2A200 “OUT”	E6380-61111
W125	A2A130 J3	A2U1 “DC BLOCK”	E6380-61112
W126-W199	NOT USED		N/A
W200	A2A1 J79	A1A1 J2	E6380-61062
W201	A2A1 J59	A2A10 J1	E6380-61015
W202	A2A1 J49	A1A3	E6380-61022
W203	A1A3 J2	A1A2 (keypad assembly)	E6380-61068
W204	A2A31 J1	A2A70 J1	E6380-61023
W205	A2A31 J4	A2A30 J3	E6380-61052
W206-W209	NOT USED		N/A
W210	A2A110 J4	A2A1 J32 "Up Converter"	E6380-61029
W211	A2A130 J1	A2A1 J34	E6380-61029
W212	A2A115 J4	A2A1 J31	E6380-61029
W213	A2A120 J1	A2A1 J35	E6380-61028
W214	A2A1 J64	A2A100 J3	E6380-61027
W215	A2A1 J63	A2A100 J1	E6380-61026
W216	A2A1 J62	A2A100 J2	E6380-61026
W217-W219	NOT USED		N/A
W220	A3A1 J2	A2A1 J54	E6380-61071

Table 5-2 Wire/Cable List

Wire #	From	To	Part Number
W221	A3A1 J5	A2A1 J73 (multiconductor power cable)	E6380-61036
W222	A3A1 J6	POWER SUPPLY, A3A2 J14	E6380-61049
W223	A3A1 J1	POWER SUPPLY, A3A2 J13	E6380-61035
(cable part of A3A4 assembly)	BATTERY HOLDER ASSEMBLY, A3A4	A3A1 J7	N/A
(cable part of A3S1 assembly)	POWER SWITCH, A3S1	A3A1 J3	N/A
(cable part of A3B1 assembly)	FAN ASSEMBLY, A3B1	A3A1 J4	N/A
(cable part of A3A3 assembly)	LINE MODULE ASSEMBLY, A3A3	OEM POWER SUPPLY, J7	N/A

6 Replaceable Parts

This chapter contains the replaceable assembly and component information for the Test Set. Use the illustrations in this chapter to identify the replaceable parts and the “Parts List” on page 150 for part numbers.

Replacement & Ordering Parts

Direct Parts Ordering

See "Factory Support" on page 46. The Agilent Support Materials Organization can help you order and identify parts.

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.

NOTE Periodic Adjustment Interval

The adjustment programs Periodic Calibration, IQ Calibration, and Eb/No Calibration should be performed after any assembly referred to in Table 7-1 on page 159 is replaced, or at least every 24 months. These program can be run anytime to optimize the performance of the Test Set. See Chapter 7 , "Periodic Adjustments," on page 157 for details.

NOTE Performance Test Interval

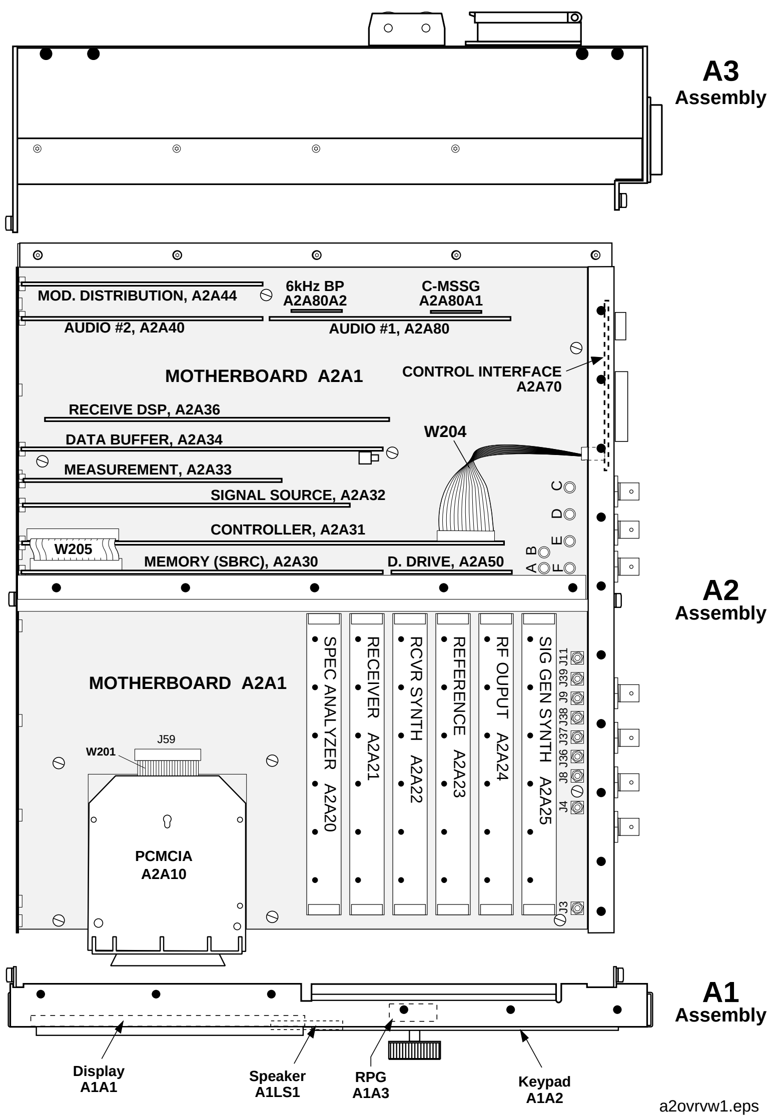
The performance tests in Chapter 8 , "Performance Tests," on page 173 should be performed when certain assemblies are repaired or replaced, or at least every 24 months. See Table 3-2 on page 75 for those assemblies requiring performance testing/calibration.

Parts Identification

Major Assembly Overview

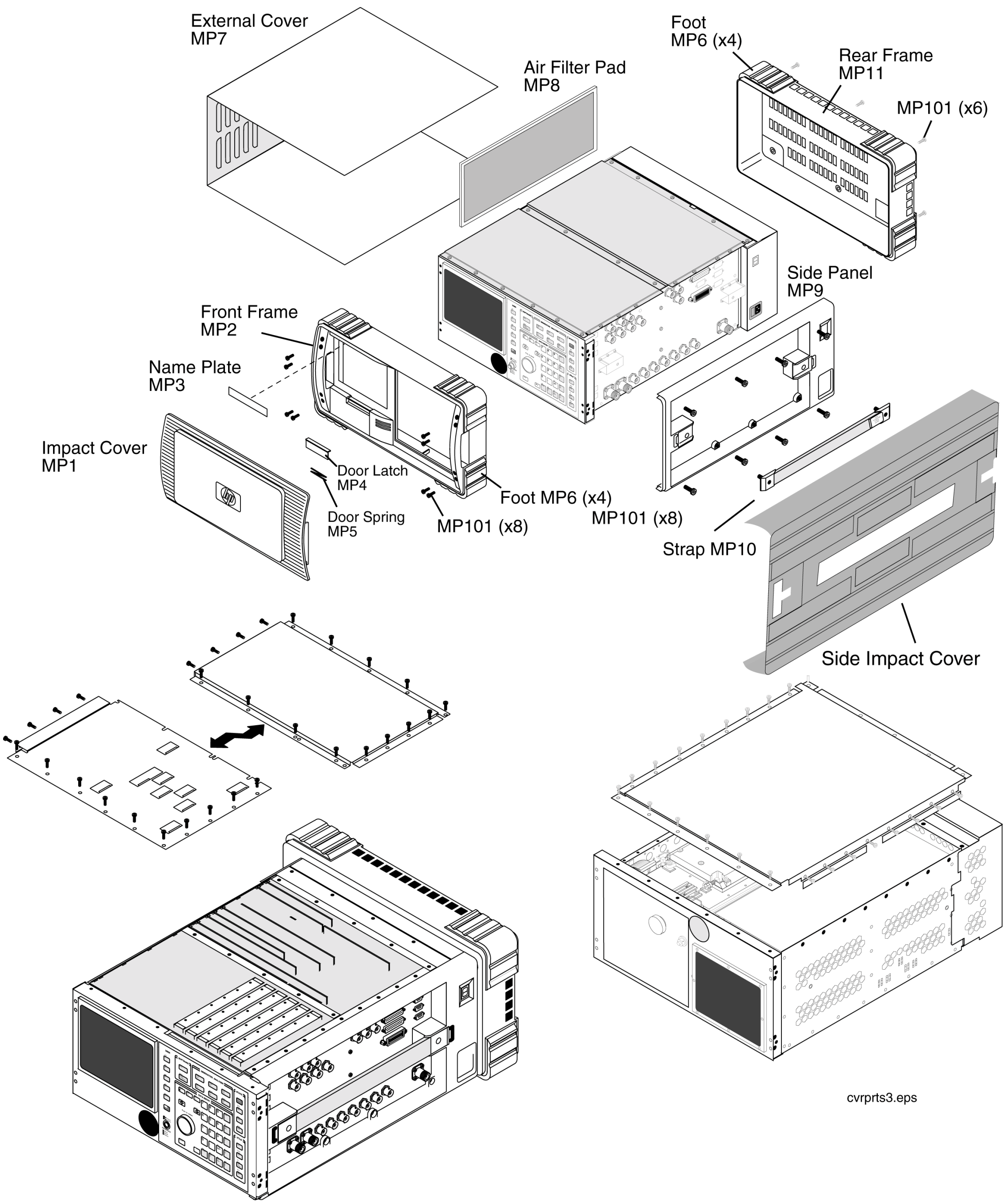
Shown below is a top view of the Test Set with external and internal covers removed. The Test Set can be separated into three major assemblies designated: A1, A2, and A3. Throughout this chapter the reference designator for each sub assembly is prefixed with its major assembly's designator. Take for example the PCMCIA assembly's reference designator A2A10: "A2" refers to the A2 major assembly and "A10" refers to the PCMCIA sub assembly which is part of A2.

Figure 6-1 **Major Assemblies**



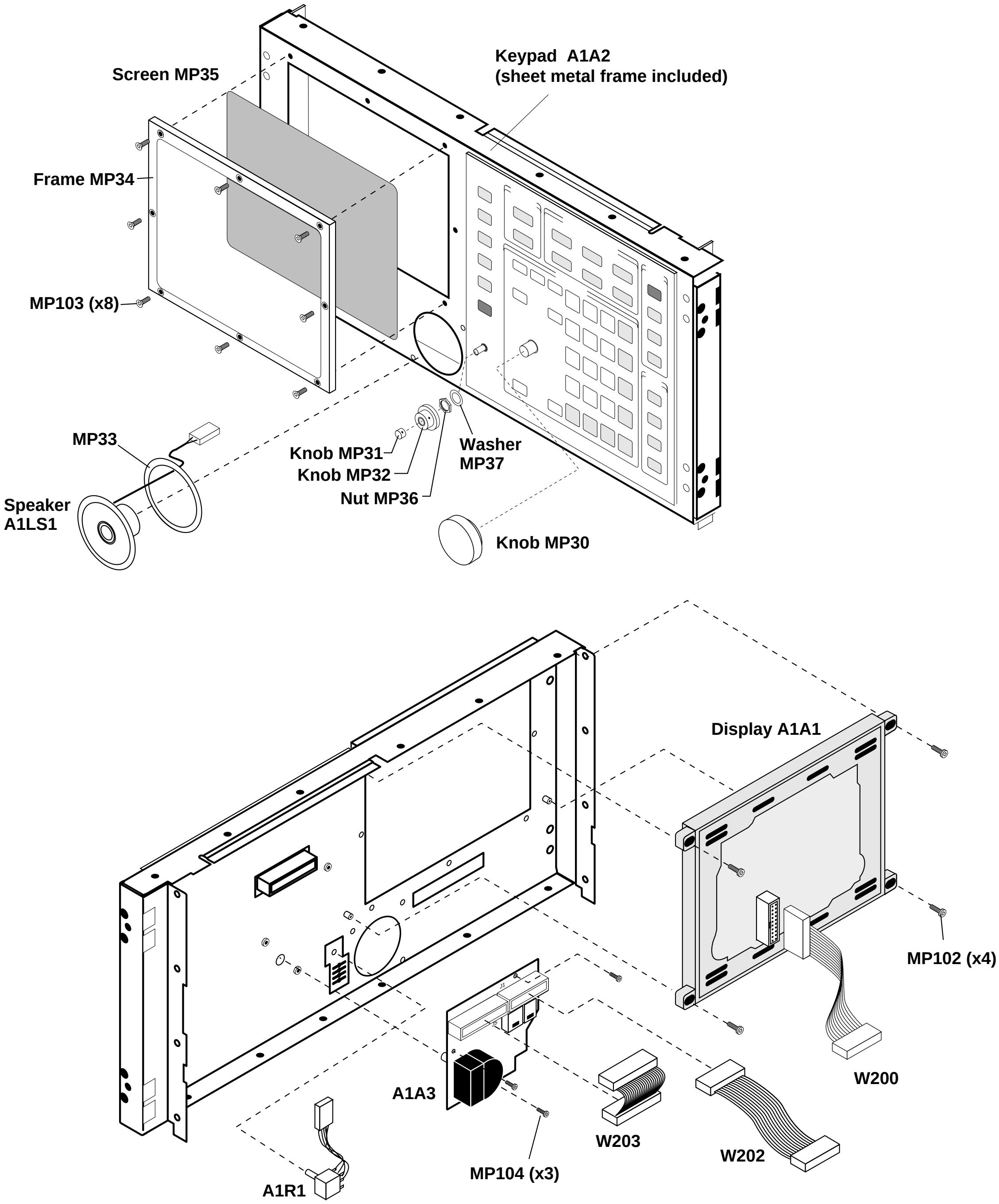
Covers and Chassis Parts

Figure 6-2 External and Internal Covers



A1 Assemblies

Figure 6-3 A1 Assembly - Front Panel

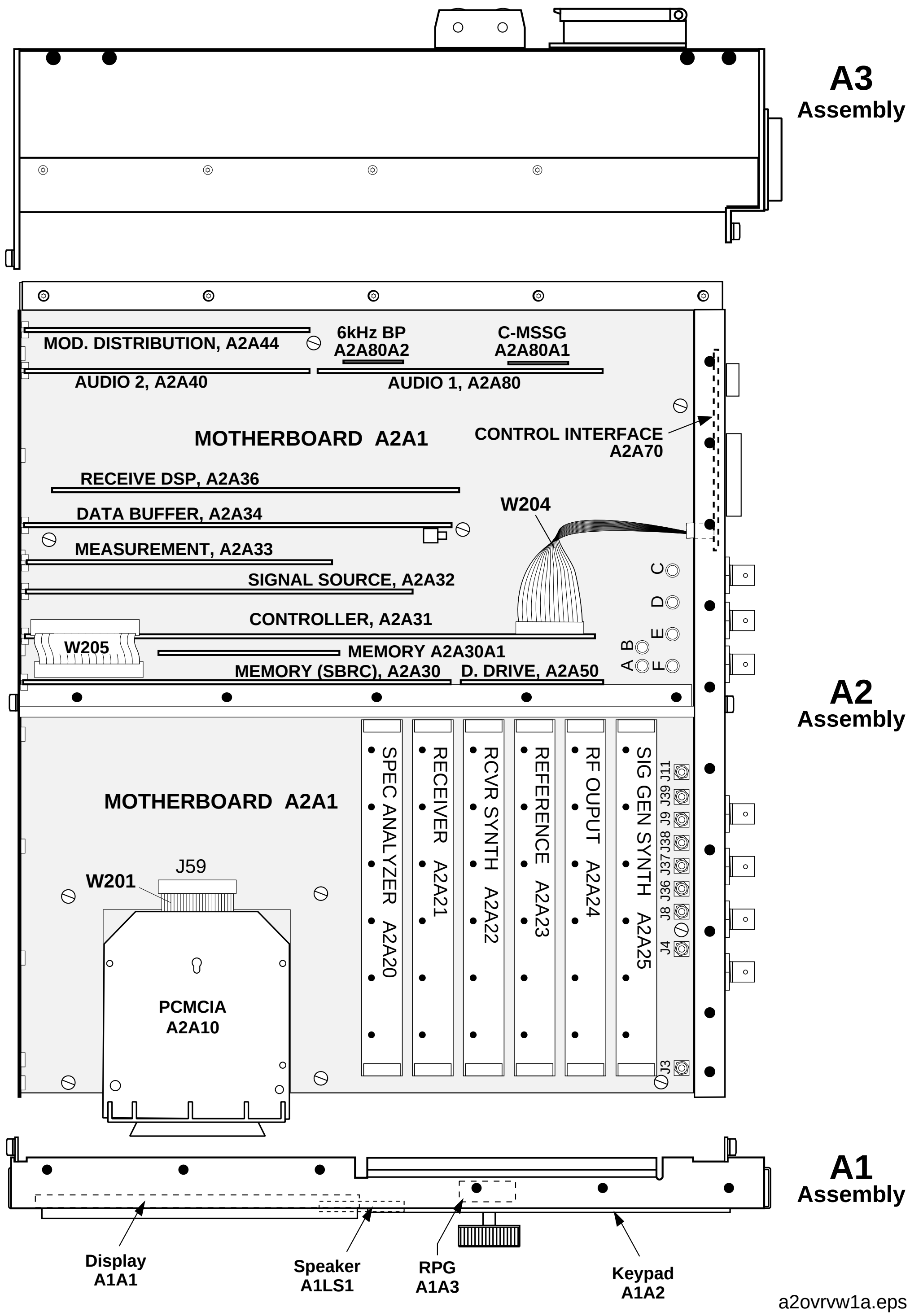


a1parts1.eps

A2 Assemblies

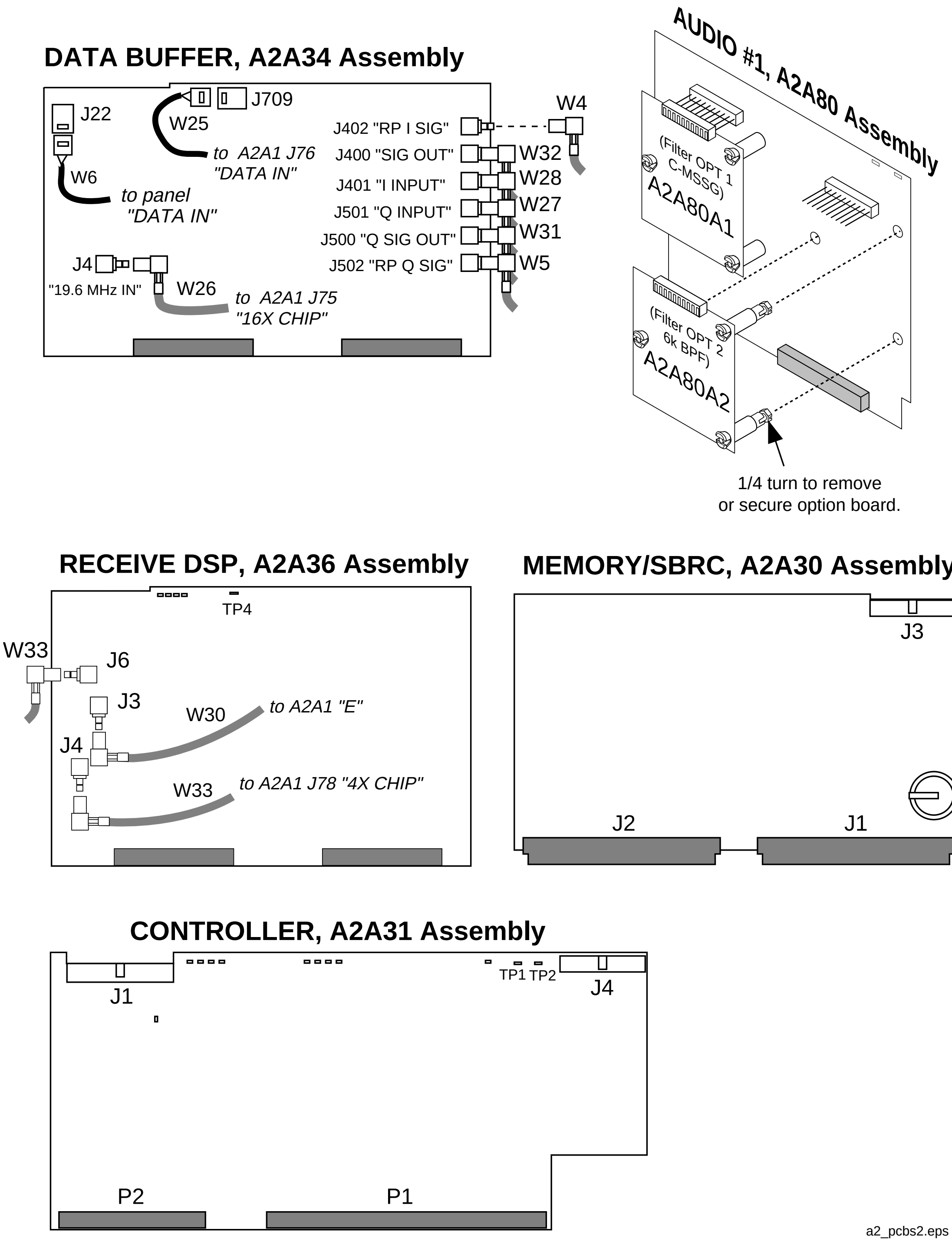
Module and PCB Board Assemblies

Figure 6-4



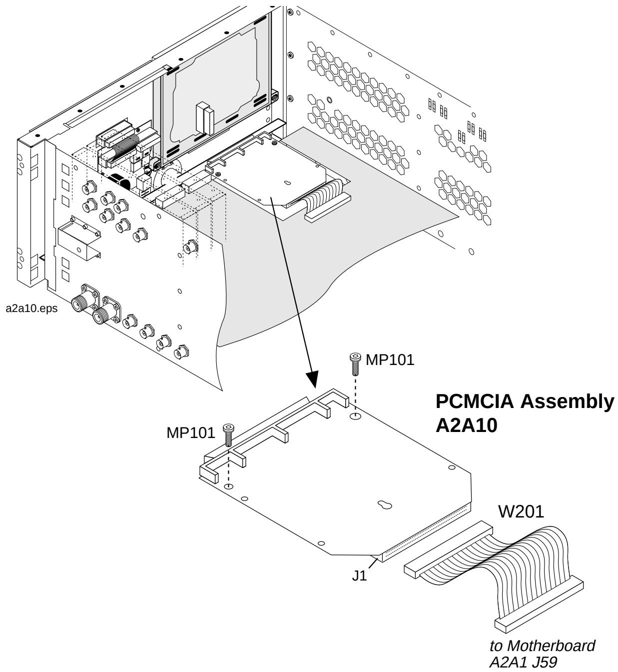
PCB Assemblies

Figure 6-5



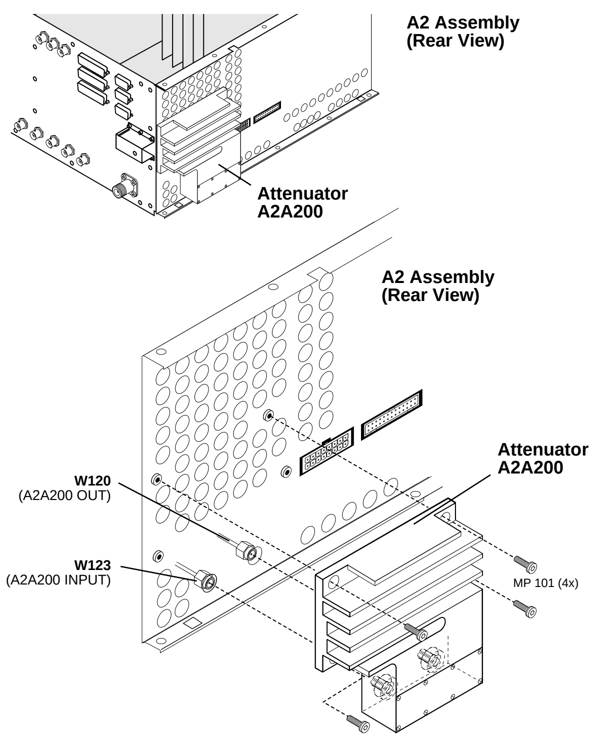
PCMCIA Assembly

Figure 6-6



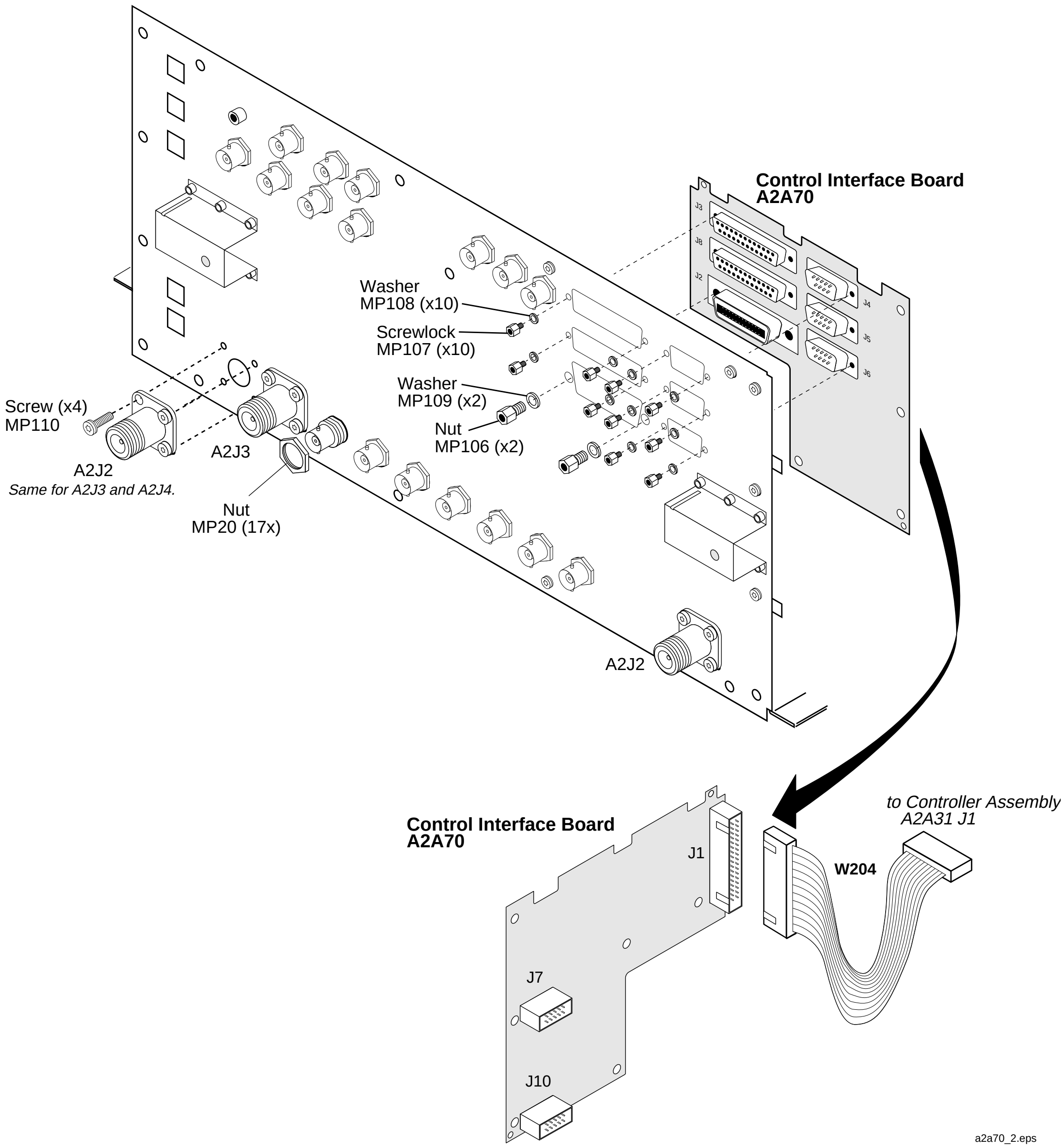
Attenuator Assembly

Figure 6-7



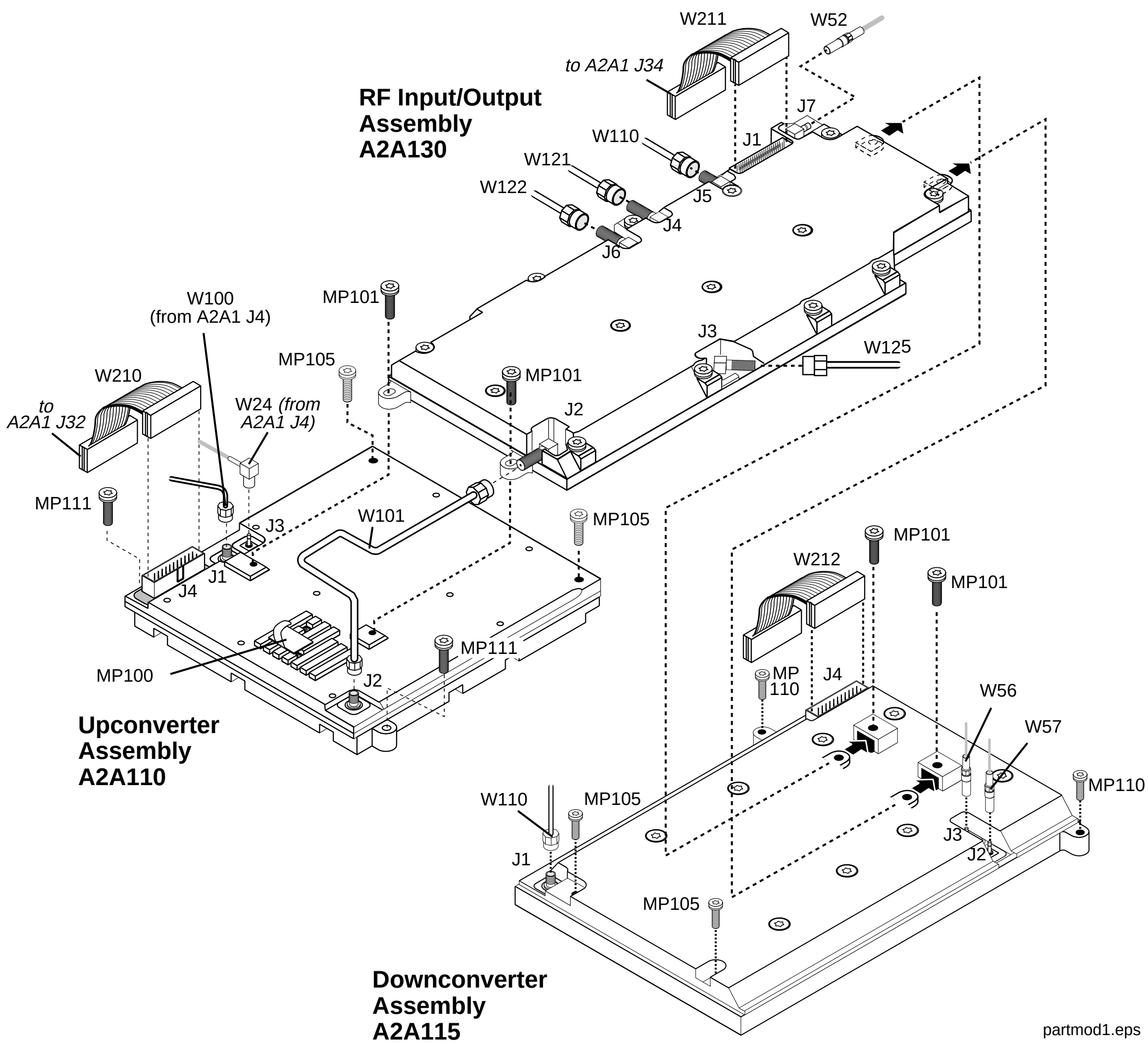
Control Interface Assembly & Connectors

Figure 6-8



RF/IO, Up Converter, and Down Converter Assemblies

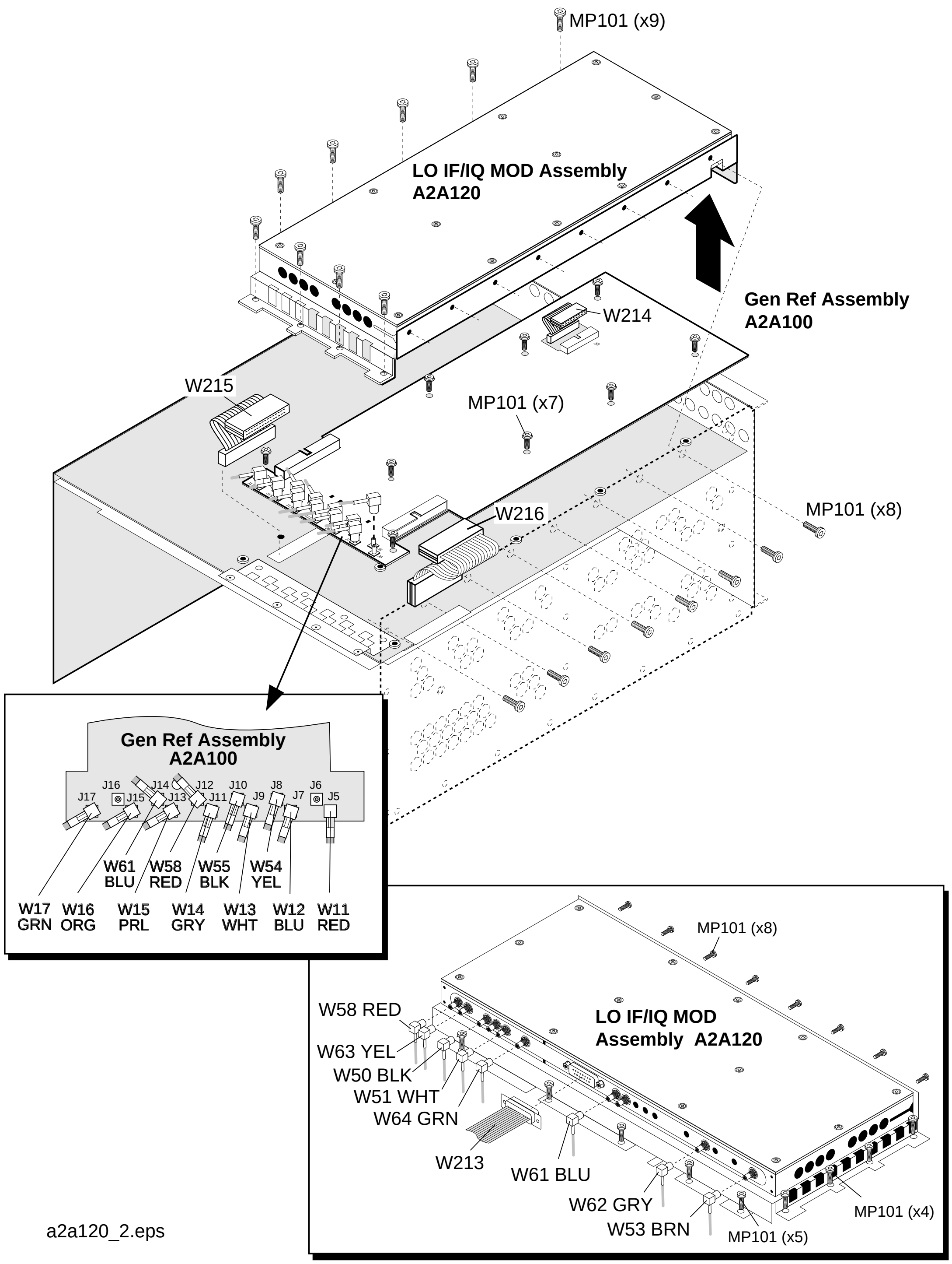
Figure 6-9



partmod1.eps

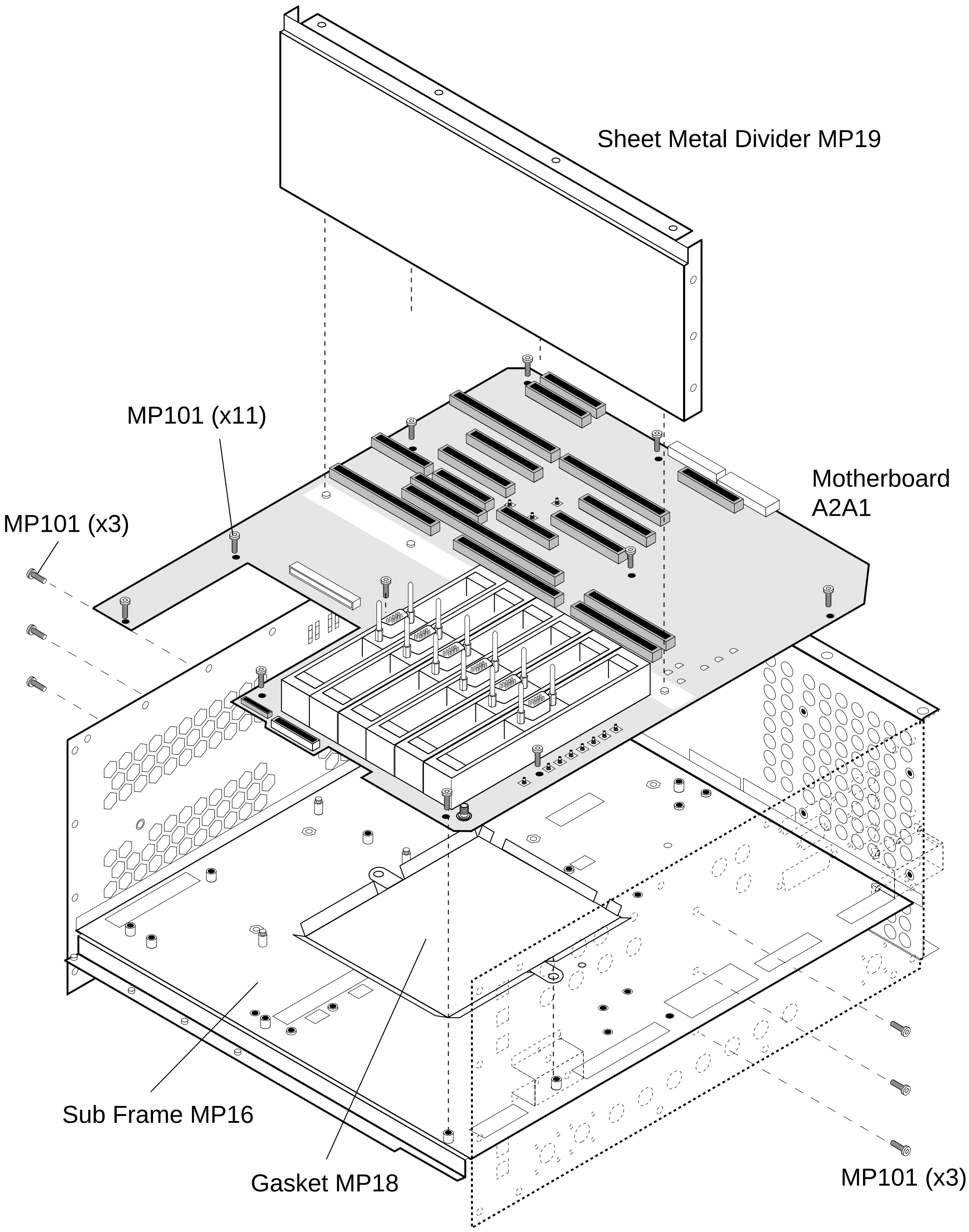
LO IF/IQ MOD and GEN REF Assemblies

Figure 6-10



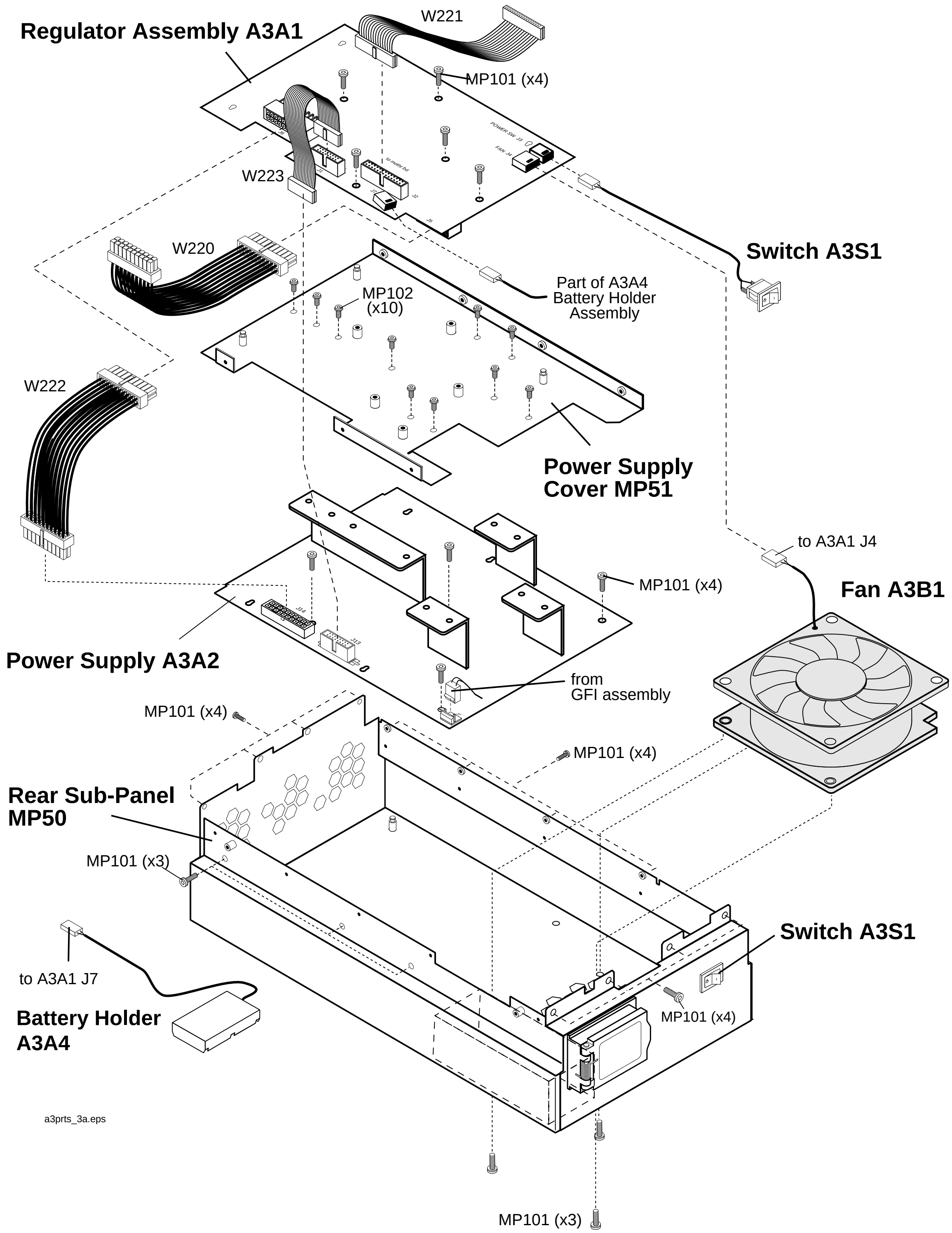
Motherboard and Sub Frame

Figure 6-11



A3 Rear Panel Assembly

Figure 6-12



Cable Assemblies

Figure 6-13 Cables, Top View

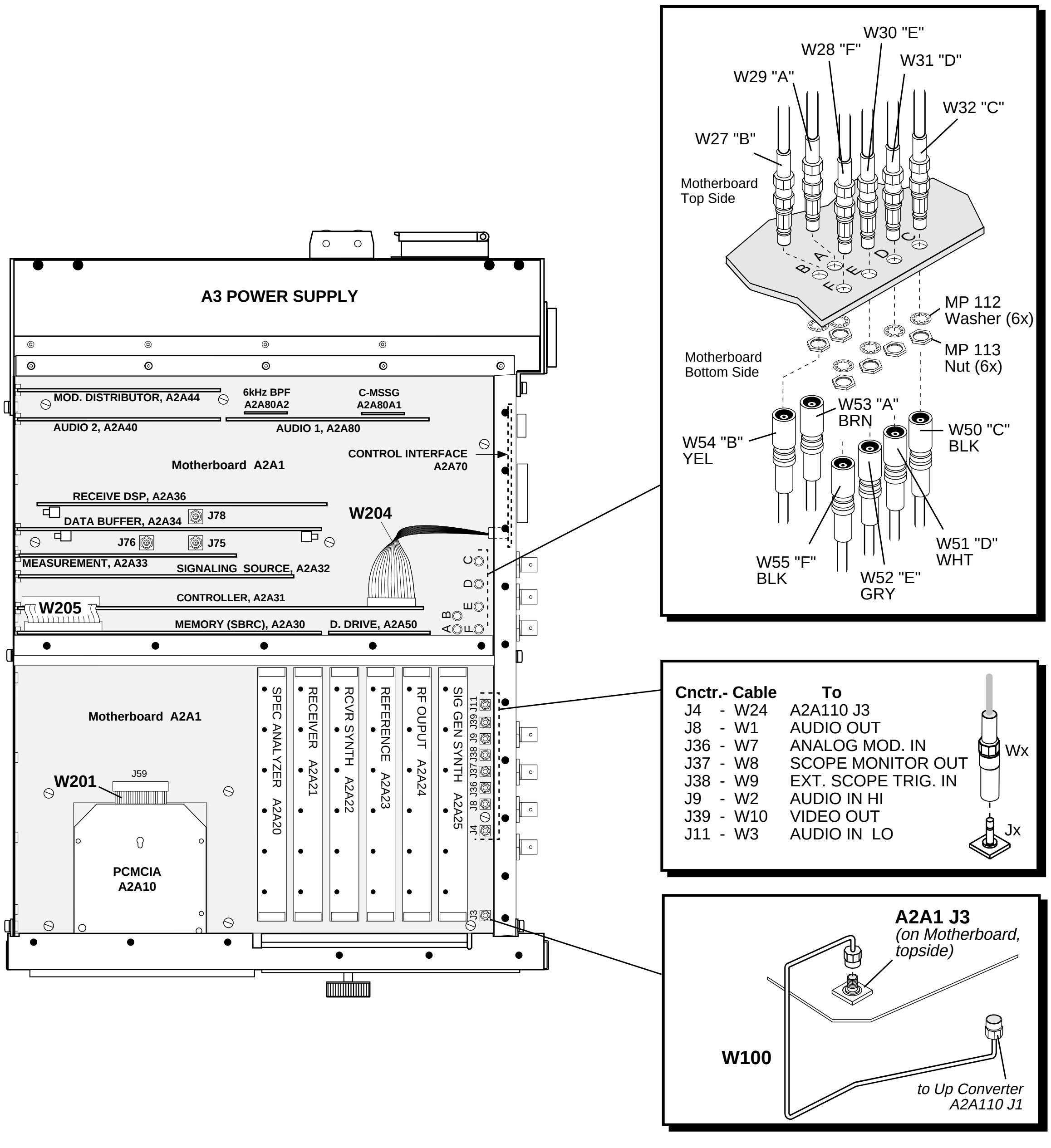
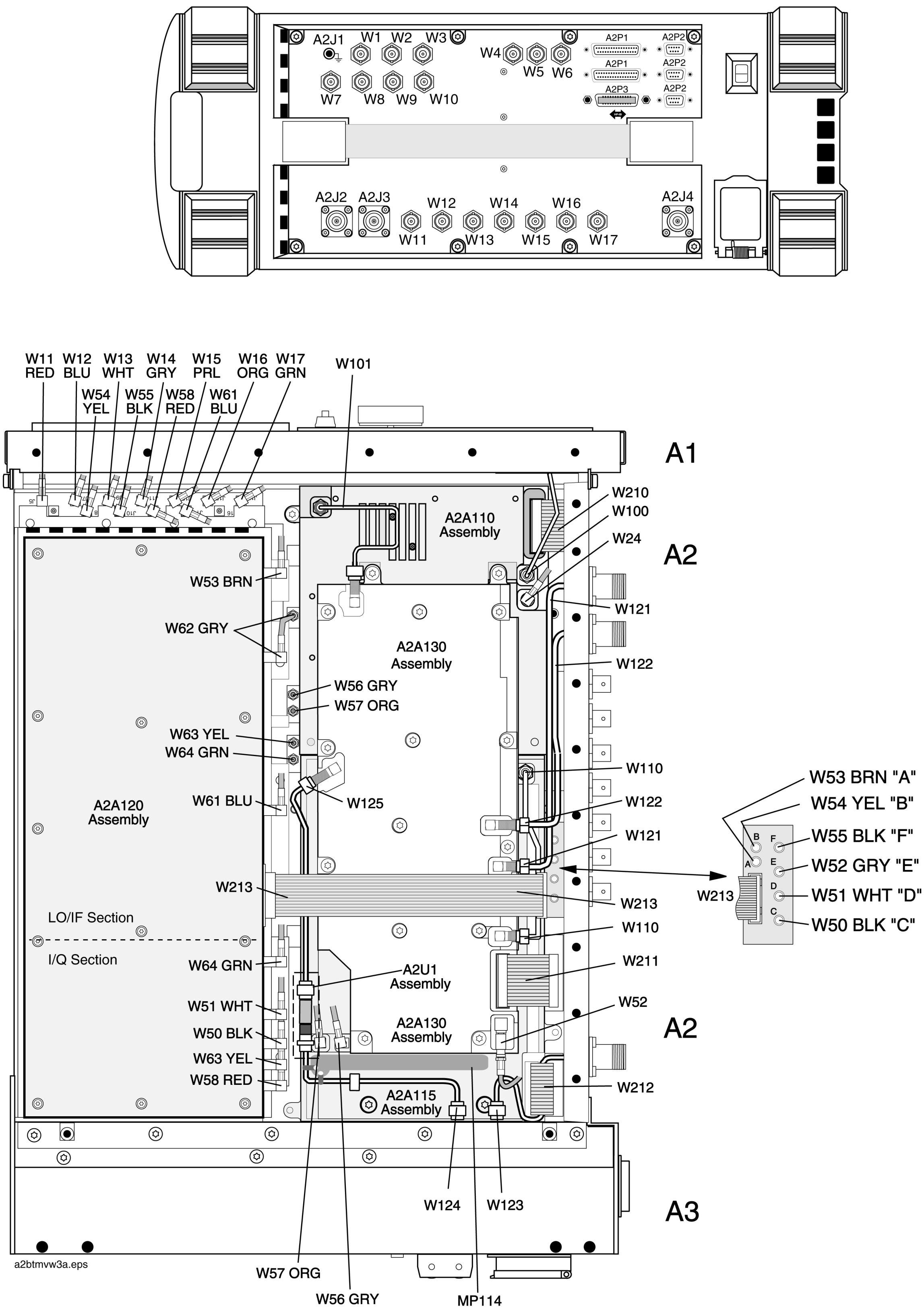


Figure 6-14 Cables, Panel and Bottom Side Views



Parts List

Table 6-1

Ref. Des.	Description	Part Number
A1	FRNT PNL KIT	E6380-61891
A1A1	EL DISPLAY 6.5IN	2090-0573
A1A2	KEYPAD W/FRAME KIT	E6380-61856
A1A3	RPG BD KIT	E6380-61805
A1LS1	SPEAKER ASSEMBLY	E6380-61037
A1R1	HARN SPKR ASSY	E6380-61057
A2A1	MTHR BD KIT	E6380-61802
A2A10	PCMCIA KIT	E6380-61803
A2A20	SPECTRUM ANAL #002/102	08920-61852
A2A21	RECEIVER KIT	E6380-61866
A2A22	RCVR SYNTH KIT	08921-61820
A2A23	HI STB REFERENCE KT	08920-61835
A2A23	REFERENCE KIT	08920-61829
A2A24	RF OUTPUT KIT	E6380-61832
A2A25	SIGGEN SYNTH KIT	08921-61819
A2A30	MEMORY (SBRC) KIT	E6380-61801
A2A30A1	RAM DAUGHTER BD	E6380-60114
A2A31	CONTROLLER KIT	E6380-61812
A2A32	SIGNAL SOURCE KIT	08920-61850
A2A33	MEASUREMENT KIT	08920-61836
A2A34	DATA BUFFER KIT	E6380-61896
A2A36	RX/DSP KIT	E6380-61895
A2A40	AUDIO ANALYZER 2 KIT	08920-61853
A2A44	MOD DISTRIBUTION KIT	08920-61809
A2A50	DISPLAY DRIVER KIT	E6380-61816
A2A70	CONTROL INTERFACE KIT	E6380-61815

Table 6-1

Ref. Des.	Description	Part Number
A2A80	AUDIO ANALYZER #1 KIT	08920-61811
A2A90A1	1C-MESS FLTR	08920-61056
A2A90A2	6KHZ BP FLT	08920-61063
A2A100	GEN/REF KIT	E6380-61807
A2A110	UPCONV KIT	E6380-61809
A2A115	DNCONV KIT	E6380-61808
A2A120	LO_IF/IQ_MOD KT	E6380-61817
A2A130	RF/IO KIT	E6380-61810
A2A200	100W ATTEN KIT	E6380-61892
A2J1	BDG POST ASSY	1510-0038
A2J2,A2J3, A2J4	ADPTR-COAX SMA-N	1250-2621
A2U1	DC BLOCK ASSEMBLY	0955-1125
A3	REAR PANEL KIT	E6380-61899
A3A1	POWER SUPPLY REG KIT	E6380-61804
A3A2	POWER SUPPLY	0950-3690
A3A3	HRN LINE MOD	E6380-61097
A3A4	CA AY-HARN,BTRY	E6380-61025
A3B1	FAN AY	E6380-61091
A3F1	FUSE, T 5.0A	2110-0882
A3S1	HRN PWR SWITCH	E6380-61014
ACC1	CD-ROM MANUALS	E6380-90027
ACC2	ALR MANUAL	E6380-90015
ACC3	PROG GUIDE	E6380-90018
ACC4	REF GUIDE	E6380-90019
ACC5	AMPS APP GUIDE	E6380-90017
ACC6	CDMA APP GUIDE	E6380-90016

Table 6-1

Ref. Des.	Description	Part Number
ACC7	FW REPLMT KIT	E6380-61858
ACC8	KIT-SYS PWR CAL	E6380-61811
MP1	AY-IMPACT COVER	E6380-61099
MP2	AY FRONT FRAME	E6380-61080
MP3	NAMEPLATE	E6380-00002
MP4	CARD DOOR	E6380-40006
MP5	SPRING-COVER	E6380-21028
MP6	FOOT	E6380-40009
MP7	COVER-EXT	E6380-00019
MP8	FILTER-AIR	E6380-00042
MP9	AY-SIDE FRAME	E6380-61098
MP10	AY-STRAP HANDLE	E6380-61079
MP11	REAR FRAME AY	E6380-61097
MP12	COVER-TOP	E6380-00014
MP13	COVER AY-MODULE	E6380-61095
MP14	COVER-DIGITAL	E6380-00037
MP15	COVER-BOTTOM	E6380-00015
MP16	AY-SUB FRAME	E6380-61008
MP18	GASKET-MOTHER BD	E6380-00034
MP19	DIVIDER	E6380-00009
MP20	NUT-HEX 15/32-32	0590-2332
MP30	KNOB BASE.250 JG	0370-2110
MP31	KNOB-06.5	E6380-40012
MP32	KNOB-016.3	E6380-40011
MP33	FOAM SPACER-SPKR	E6380-00038
MP34	FRAME-WINDOW	E6380-21011
MP35	WINDOW-DISPLAY	E6380-21009
MP36	NUT HEX 1/4-36	2950-0196

Table 6-1

Ref. Des.	Description	Part Number
MP37	WSHR LK .256ID	2190-0027
MP50	SUBPANEL-REAR	E6380-61107
MP51	COVER-POWER SUPPLY	E6380-00064
MP100	CLAMP-CABLE	1400-1391
MP101	SMM4.0 10SEMPNTX	0515-0380
MP102	SMM3.0 8SEMPNTX	0515-0374
MP103	SMM3.0 6 FL TX	0515-1227
MP104	SMM3.0 6SEMPNTX	0515-2126
MP105	SMM4.0 20MML	0515-0456
MP106	STDF .327L 6-32	0380-0644
MP107	CONN SCREWLOCK F	0380-2079
MP108	WSHR-LK HLCL #4	2190-0003
MP109	WSHR LK .1941D	2190-0577
MP110	SMM4.0 12SEMPNTX	0515-2243
MP111	SMM4.0 16SEMPNTX	0515-2245
MP112	WSHR-LK IN T #10	2190-0124
MP113	NUT-HEX 10-32	2950-0078
MP114	DC BLOCK BRKT	E6380-00069
MP115	TIE WRAP	1400-0249
MP116	MODULE COVER ASSEMBLY	E6380-61086
W1,W2,W3, W7, W8,W9,W10	CX F BNC-SMB 150	E6380-61039
W4,W5	CX F BNC-SMB 200	E6380-61043
W6	CX F BNC-PST 425	E6380-61045
W11	CA F SMB-BNC 525	E6380-61073
W12	CA F SMB-BNC 525	E6380-61074
W13	CA AY-BNC-SMB	E6380-61072
W14	CA AY-SMB BNC	8120-5837

Table 6-1

Ref. Des.	Description	Part Number
W15	CA F SMB-BNC 525	E6380-61075
W16	CA AY-BNC-SMB	E6380-61076
W17	CA F SMB-BNC 525	E6380-61077
W24	CX F SMB-SMB 250	E6380-61047
W25	CX F SMB-PST 175	E6380-61044
W26,W33	CX F SMB-SMB 175	E6380-61042
W27,W28, W31, W32,W55	CX F SMB-SMB 250	E6380-61040
W29,W30	CX F SMB-SMB 450	E6380-61041
W50	CX F SMB-SMB 310	E6380-61055
W51	CX F SMB-SMB 750	E6380-61065
W52	CX F SMC-SMB	E6380-61051
W53	CX F SMB-SMB 550	E6380-61066
W54	CA AY MCNDCT 16	E6380-61078
W56	CX F SMB-SMB 275	E6380-61050
W57	CX F SMB-SMB 280	E6380-61064
W58	CX F SMB-SMC 440	E6380-61063
W61	CX F SMB-SMB 240	E6380-61061
W62	CX F SMB-SMB M80	E6380-61060
W63	CX F SMC-SMB 250	E6380-61059
W64	CX F SMC-SMB 165	E6380-61058
W100	SR 2.18 SMA-SMA	E6380-61021
W101	SR 2.18 SMA-SMA	E6380-61020
W110	SR 3.58 SMA-SMA	E6380-61034
W120	CA AY-SR,ATTN RFIO	E6380-61017
W121	SR 3.58 SMA-SMA	E6380-61019
W122	SR 3.58 SMA-SMA	E6380-61018
W123	SR 3.58 SMA-SMA	E6380-61016

Table 6-1

Ref. Des.	Description	Part Number
W124	S/R CABLE to A2A200	E6380-61111
W125	S/R CABLE to A2A130	E6380-61112
W200	RBN 10CNDCT28AWG	1252-8299
W201	RBN 68CNDCT30AWG	E6380-61015
W202	RBN 40CNDCT28AWG	E6380-61022
W203	CA AY-RIBBON	E6380-61068
W204	CA AY-RBN,HPIB/DCU	E6380-61023
W205	CA AY-RBN	E6380-61052
W210,W211, W212	RBN 20CNDCT28AWG	E6380-61029
W213	RBN 15CNDCT28AWG	E6380-61028
W214	RBN 20CNDCT28AWG	E6380-61027
W215,W216	RBN 40CNDCT28AWG	E6380-61026
W220,W223	CA AY	E6380-61071
W221	CA AY-RBN,26COND	E6380-61036
W222	CA AY-HARN 20 COND	E6380-61049

7 Periodic Adjustments

This chapter contains the periodic adjustment procedures for the Test Set.

Periodic Adjustments

Some assemblies or combinations of assemblies require periodic adjustments to compensate for variations in circuit performance due to age or environment.

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 A2A31 Controller.

NOTE Because calibration data resides on the A2A31 Controller assembly, it is important that whenever the assembly is replaced that the data be 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 accompanying the replacement assembly for details.

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 a periodic adjustment, follow the steps later in this chapter. For a summary of assemblies and their calibration requirements, see Table 7-1 on page 159.

Table 7-1 Assembly Calibration Information

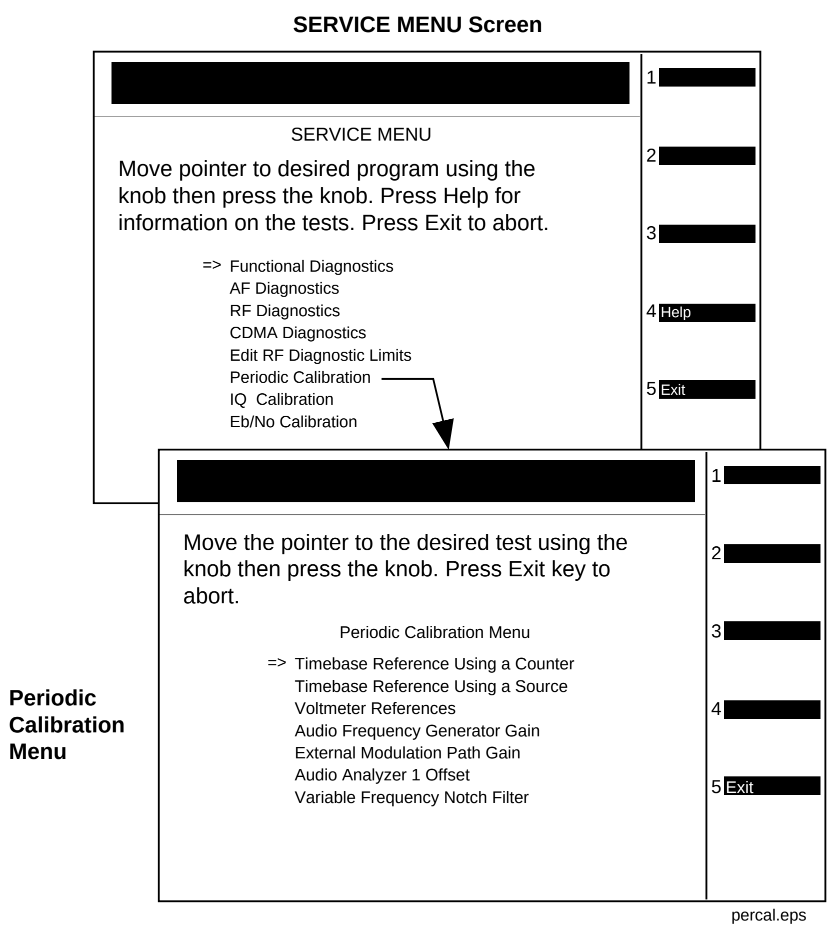
Assembly	Where calibration data is located.		Calibration Program: Sub Program
	Memory Card	on Assembly	
A2A80 Audio Analyzer 1			Periodic Calibration: Audio Analyzer 1 Offset
A2A44 Modulation Distribution			Periodic Calibration: External Modulation Path Gain, and, AF GEN Gain
A2A110 Upconverter		X	
A2A24 Output Section		X	
A2A25 Signal Generator Synthesizer		X	
A2A23 Reference		X	Periodic Calibration: Timebase Reference
A2A21 Receiver		X	
A2A22 Receiver Synthesizer		X	
A2A20 Spectrum Analyzer	X		
A2A115 Downconverter		X	
A2A33 Measurement	X		Periodic Calibration: Voltmeter References
A2A130 RF Input/Output		X	System Power Calibration
A2A200 100 W Attenuator	X		System Power Calibration
A2A100 CDMA Generator Reference			IQ Calibration, and Eb/No Calibration
A2A31 Controller		X	
A2A120 LO IF/IQ Modulator			IQ Calibration, and Eb/No Calibration
A2A34 Data Buffer			IQ Calibration, and Eb/No Calibration
A2A40 Audio Analyzer 2			Periodic Calibration: Variable Frequency Notch Filter

Equipment

Equipment for the Periodic Adjustments Programs

- 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.
- For the `Voltmeter References` calibration you will need a DC voltmeter that can measure ±5 V with ±0.015% accuracy.

Figure 7-1 Periodic Adjustments Menu



Equipment Needed for the System Power Calibration Program

For the `System Power Calibration` program you will need the equipment listed in Table 7-2. Because this calibration program is written specifically for this equipment, no substitutions are possible.

Table 7-2 Equipment List for System Power Calibration Program

Equipment Type	Model
Signal Generator	Agilent 8648B Option 1EA
Power Meter	Agilent 436A Agilent 437B Agilent 438A Agilent EPM-441A Agilent EPM-442A Agilent 8901B Agilent 8902A
Power Sensor	Agilent 8482A Agilent ECP-E18A Agilent 11722A
Power Splitter	Agilent 11667A
GPIB Cables (2 cables required, 3 if GPIB printer is used.)	Any GPIB cable
Printer (optional)	Any serial, parallel, or GPIB printer

A Word About Storing Calibration Factors

You should understand the calibration-factor-storage process before running any of the following programs: Periodic Calibration, IQ Calibration, Eb/No Calibration, or System Power Calibration.

As a program runs, calibration factors are computed and applied. When all the calibration factors have been acquired, the program stops and asks if the user wants the calibration factors to be stored. At this point, it should be emphasized that the new calibration factors are now being used by the Test Set. If you do not store them at this point, they will be used by the Test Set until the power is switched off even though they have not been stored.

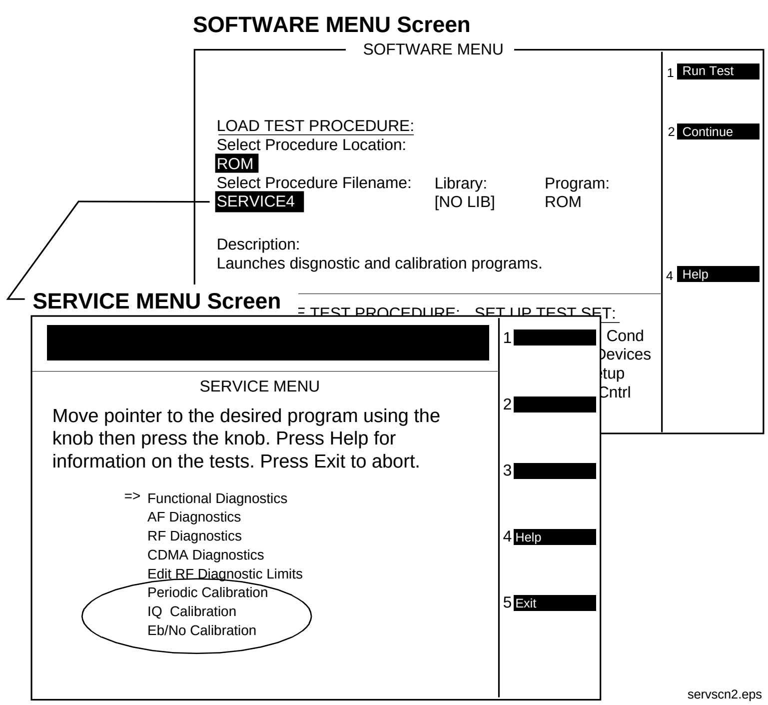
If you do not store the calibration factors but run another calibration program and then store the calibration factors, the calibration factors from the previous program will be stored along with the calibration factors just acquired unless the power is cycled between the tests. Storing calibration factors copies the calibration factors from volatile to non-volatile memory (that is, memory that is not erased when the power is turned off).

Also, when storing calibration factors, be sure to wait for the message Updating Flash Calibration Files... DO NOT Interrupt Power! to disappear before continuing. Depending on the number of calibration factors being stored, this may take several minutes.

Running the Periodic, IQ, or Eb/No Calibration Programs

1. Press Menu to access the SOFTWARE MENU screen.
2. Select the field under `Select Procedure Location:`.
3. Select `ROM` under the `Choices:` menu.
4. Select the field under `Select Procedure Filename:`.
5. Select `SERVICE4`, see Figure 7-2 on page 163.
6. Select `Run Test` (key **k1**).
7. From the SERVICE MENU, select the desired calibration program to perform.
   - `Periodic Calibration` - for more detailed information, see "Periodic Calibration Menu Descriptions" on page 165.
   - `IQ Calibration` - for more detailed information, see "IQ Calibration Program Description" on page 170.
   - `Eb/No Calibration` - for more detailed information, see "Eb/No Calibration Program Description" on page 171.
8. Follow the instructions on the screen.

Figure 7-2 SERVICE MENU Screen



Running the System Power Calibration Program

This adjustment program is not found in ROM of the Test Set. This program resides on a PCMCIA Memory Card, part-number E6380-61811. It has to be downloaded from the memory card.

This program generates system power calibration factors for the Test Set. The purpose of this program is to generate calibration factors for the RF Input/Output Section module, high power attenuator, and cables. This assures that the Test Set will meet its power measurement accuracy specifications after repair.

An RF signal generator and a power splitter produce two signals with the same power level. One signal is measured by the power meter, the other is applied to the input of the Test Set. The program measures these levels at selected frequencies and then generates calibration factors so the Test Set readings match the power readings. These calibration factors are stored in the Test Set.

Communication between the active instrument(s) is through the Test Set's GPIB port. An optional printer can be connected to the Test Set's GPIB, serial, or parallel port. Typically this is done from the Printer Setup field of the SOFTWARE menu screen.

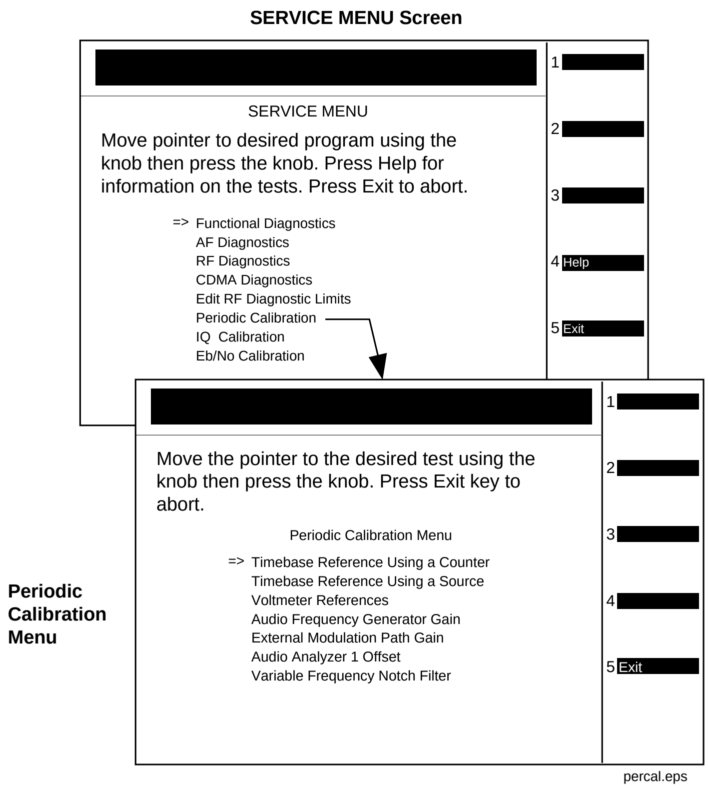
To run the System Power Calibration program:

1. Connect GPIB cables from the Test Set to the signal generator and power meter.
2. Insert the PCMCIA Memory Card, P/N E6380-61811, into the Test Set's memory card slot.
3. Press **Menu** to access the SOFTWARE MENU screen.
4. Select the field under `Select Procedure Location:`
5. Select `Card` under the `Choices`: menu.
6. Select the field under `Select Procedure Filename:`
7. Select `SYSPWR0`
8. Select `Run Test` (key **k1**).
9. Follow the instructions on the screen.

Periodic Calibration Menu Descriptions

This section describes the adjustment programs listed under the Periodic Calibration menu.

Figure 7-3 Periodic Calibration



Timebase Reference Using a Counter

This program is used to manually tune the timebase reference using a frequency counter as the time standard. This 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 instructions in “Setting the Timebase Latches” on page 169.

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

As an alternate method, you can select the option `Timebase Reference Using a Source` (see following section) 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 the signal at the front-panel ANT IN connector, which is input 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 +20 dBm (0.001 and 100 mW).
2. The frequency should be between 0.4 and 1000 MHz.
3. The frequency must be as accurate as the application 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.

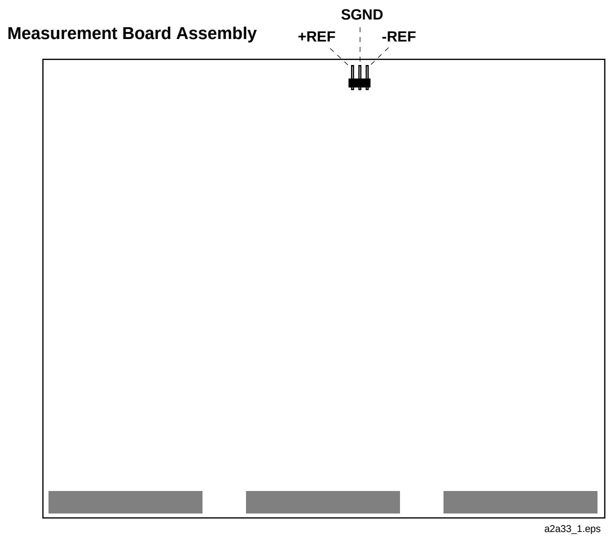
After the coarse and fine tune DAC settings have been determined, the values are downloaded into the Test Set's memory.

Voltmeter References

When you select the Voltmeter Reference calibration, instructions are displayed explaining how to measure the negative and positive references with an external voltmeter. The user is required to key in the readings. If the readings are within range, the two values are automatically downloaded.

For the Test Set to meet published specifications, the external DC voltmeter must be ±0.015% accurate when measuring ±5 V. The voltmeter is connected to the test points on the Measurement board, A2A33 assembly, see Figure 7-4 on page 167.

Figure 7-4 Measurement (A2A33) Assembly Test Points



Audio Frequency Generator Gain

The gain of the following paths is calibrated:

- 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.
- 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 performed before running the `External Modulation Path Gain` program.

The "path" in this program runs from the external MODULATION IN connector through the Modulation Distribution assembly, through the Monitor Select Switch, and 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. These measurements are determined under the following conditions:

- Input-select switch grounded
- AUDIO INPUT selected with return conductor grounded

Variable Frequency Notch Filter

The calibration factors for tuning the variable-frequency notch filter are determined as follows:

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 automatically downloaded into the Test Set's non-volatile memory.

Setting the Timebase Latches

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 A2A23 Reference assembly.

The following procedure is to be used when running the program "Timebase Reference Using a Counter" on page 165.

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 the Periodic Calibration Menu. See "Timebase Reference Using a Counter" on page 165.

IQ Calibration Program Description

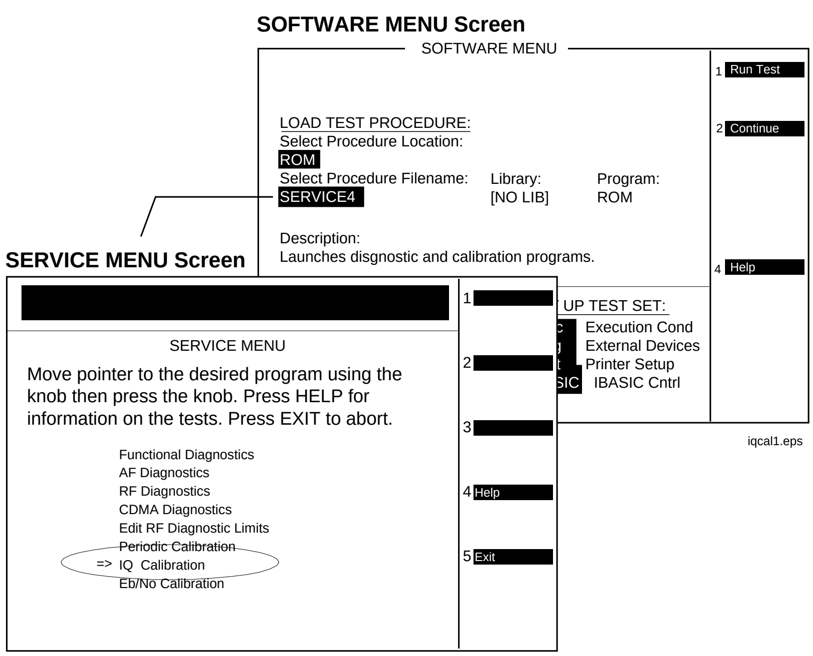
The goal of IQ Calibration is to minimize the carrier feedthrough while maximizing the Rho of the IQ signal. There are four DACs involved in this adjustment:

- buffModN_I_DC_offset_DAC,
- buffModN_Q_DC_offset DAC,
- buffModN_signal_delta_DAC,
- genRef_IQ_quad_DAC

The I and Q dc offset DACs and the signal delta DAC are on the A2A34 Data Buffer assembly and the Quad DAC is on the A2A100 CDMA Generator Reference. These DACs can be accessed in the list of Latches on the SERVICE screen. All the DACs are initially set to 127 before starting the calibration adjustment, and the calibration is carried out at several equally spaced frequencies between 800 and 1000 MHz.

The instrument is set into a CDMA loopback mode and the calibration is carried out by first adjusting the I and Q dc offset DACs while monitoring the carrier feedthrough (CFT). Both CFT and rho are measured by the A2A36 Receive DSP. Once the CFT is minimized (through an iterative process), the signal delta and the quad DACs are adjusted while monitoring rho. When rho is maximized (again through an iterative process), the calibration adjustment is complete. At power down, each DAC setting at each frequency is downloaded to the calibration ROM on the A2A31 Controller assembly.

Figure 7-5 IQ Calibration

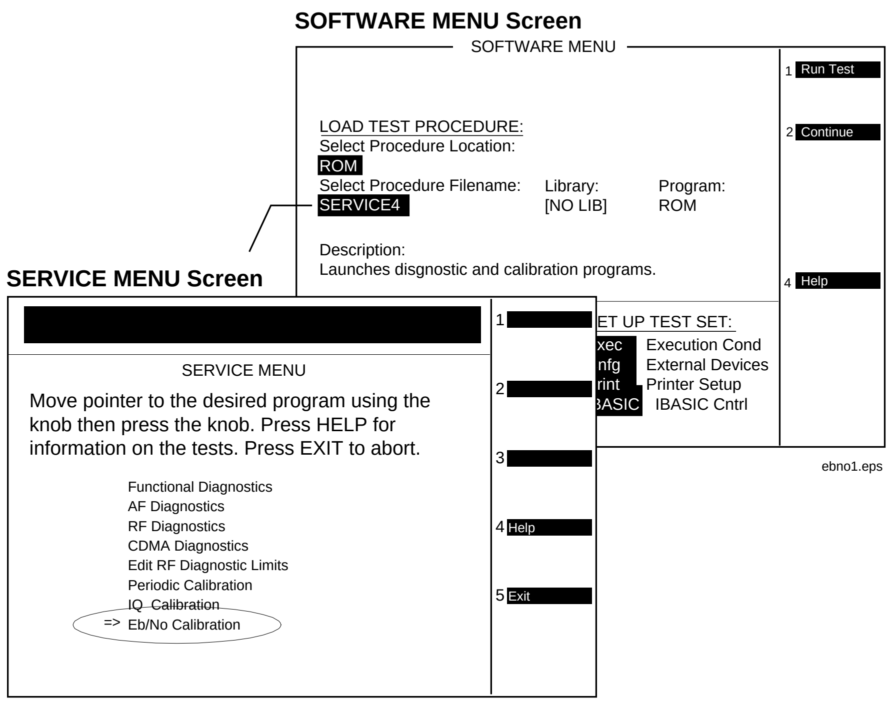


Eb/No Calibration Program Description

The Eb/No calibration is a CDMA loopback measurement. Before the Eb/No measurement begins, four preliminary measurements are made with the CDMA generator in the data mode: (1) The difference in channel power between forward and reverse modes is measured to determine the loss to be accounted for when the all-pass filter is in forward mode. (2) Rho is measured in both the forward and reverse paths. (3) The time offset is measured and its value entered. (4) Fast power is measured to assure that the signal is "noiseless."

The generator is then set to the Eb/No mode at values of 7, 10, 12, 14, 16, 18, and 20 dB, and one hundred measurements of fast power are made at each value. (This takes several minutes to complete.) The measured data is then processed and converted into calibration factors.

Figure 7-6 Eb/No Calibration



8 Performance Tests

This chapter contains the performance test procedures for the Test Set. The tests in this chapter verify that the Test Set performs to its published specifications.

Procedure and Equipment

How to Use the Performance Tests

- Run the Performance Tests in Table 8-2, “Performance Tests & Records Location,” on page 176 using the specified Test Equipment from Table 8-1, “Required Test Equipment by Model,” on page 175.
- Compare and record the data for each test onto the applicable Performance Test Record (PTR). Table 8-2, “Performance Tests & Records Location,” on page 176 shows the page number of the PTR associated with each performance test.

Test Set Operation

To perform the following performance test procedures you need to know basic Test Set operation. You should be familiar with the front panel, the various display screens, and knob operation (cursor control). You should be able to operate the Test Set’s RF generator, RF analyzer, AF generators, AF analyzer, spectrum analyzer, and oscilloscope.

NOTE Press **Preset** on the Test Set before beginning each test.

Test Equipment and Operation

The test equipment shown in Table 8-1, “Required Test Equipment by Model,” on page 175 is needed to do all of the performance tests. Usually, a setup drawing at the beginning of each test procedure shows the equipment and hook-up needed for that particular test. Generic names are used for the test equipment shown in the setup drawings.

To find alternatives to the equipment listed in Table 8-1 on page 175, look up their specifications in the Agilent Technologies Test and Measurement Catalog and use the specifications to find equivalent instruments.

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 8-1 Required Test Equipment by Model

Model Number	Model Name	Test Number
Mini-Circuits ZFL-2000 or equivalent[1]	Amplifier 1	5
GTC RF Products GRF 5016 or equivalent[2]	Amplifier 2	27, 28
Agilent 3458A	Multimeter	8-9, 12, 15, 18
Agilent 5316A	Counter	11, 16
Agilent 8562A	Spectrum Analyzer	6-7
Agilent 8663A	Signal Generator (High Performance)	4
Agilent 8648B Option 1EA	Signal Generator	19
Agilent 8902A	Measuring Receiver	1-5, 17, 19-22, 25, 27, 28
Agilent 8903B	Audio Analyzer	4, 10, 12, 16, 18, 20-22
Agilent 11667A	Power Splitter	19, 27, 28
Agilent 11715A	AM/FM Test Source	20-23
Agilent 11722A	Sensor Module	5, 19, 25, 27, 28
Agilent 11793A	Microwave Converter	1-5
Agilent E4420B	Signal Generator	1-5, 24, 27, 28
Agilent E6380-61811[3]	System Power Calibration Program Software Kit	19
Agilent 89441A with options AYA, AY9, UFG	Vector Signal Analyzer	26, 29

1. Required amplifier specifications are frequency range 1.7 to 2.0 GHz, gain >18 dB, noise figure <5 dB. For more information about Mini-Circuits, contact them at (718) 934-4500 or http://www.minicircuits.com.
2. Required amplifier specifications are frequency range 1.0 to 2.0 GHz, gain of 43 dB, output power of +20 dBm. For more information about GTC, contact them at (310) 673-8422 or GTC@primenet.com.
3. To order the System Power Calibration Card see “Ordering Parts” on page 46.

Table 8-2 **Performance Tests & Records Location**

Table 8-2 Performance Tests & Records Location

Performance Test (in this chapter)	**Test Record in Chapter 7 , "Periodic Adjustments, " on page 157**
"CDMA Generator Modulation Accuracy Performance Test 26" on page 223	page 278
"CDMA Analyzer Average Power Level Accuracy Performance Test 27" on page 225	page 279
"CDMA Analyzer Channel Power Level Accuracy Performance Test 28" on page 227	page 280
"CDMA Analyzer Modulation Accuracy Performance Test 29" on page 229	page 281

RF Generator FM Distortion Performance Test 1

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-1, "RF Generator FM Distortion Test 1 Record," on page 234. 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.

NOTE Two setups are shown below. The first setup can measure signals to 1 GHz. Since the FM generator in the Test Set translates FM in the lower band directly into the 1.7 to 2 GHz range, testing to 1 GHz is adequate when verifying a repair. The second setup has a microwave converter which covers the full measurement range of FM signals to 2 GHz.

Initial Setup

Figure 8-1 Setup for Measurements to 1 GHz

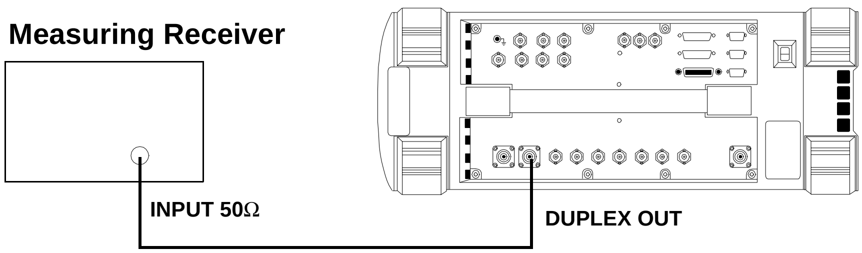
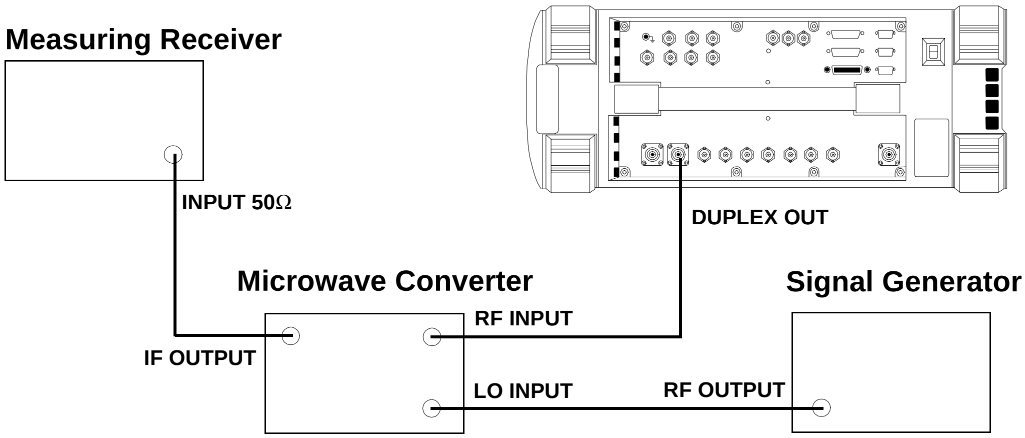


Figure 8-2 Setup for Measurements to 2 GHz Using a Microwave Converter



Procedure

Steps 1, 2, and 3 in the following procedure apply to both of the setups (shown in Figure 8-1 and Figure 8-2 on page 178).

1. On the measuring receiver:
   a. Reset the instrument.
   b. Set the high-pass filter to 300 Hz.
   c. Set the low-pass filter to 3 kHz.
   d. Set the measurement mode to FM.
   e. Set the measurement mode to audio distortion.
   f. If the microwave converter is being used, set the frequency offset mode to exit the mode (27.0 Special).
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF GENERATOR screen.
   g. Set the `RF Gen Freq` to `10 MHz`.
   h. Set the `Amplitude` to `-10 dBm`.
   i. Set the `AFGen1 To` field to `FM` at `99 kHz` deviation with the FM set to `On`.
3. For frequencies up to 1000 MHz measure the FM distortion (audio distortion) at the RF frequencies and deviations shown in the Performance Test Record (PTR) and compare the measured distortion to the limits.

   The following steps are for measurements to 2 GHz.
4. On the signal generator:
   a. Set the frequency to 1500 MHz CW.
   b. Set the level to +8 dBm or whatever level is suitable for the microwave converter’s LO input.

5. On the measuring receiver:

    a. Set the frequency offset mode to enter and enable the LO frequency (27.3 Special).

    b. Key in the LO frequency (in MHz) which is 1500.

6. On the Test Set, for frequencies of 1700 and 2000 MHz, measure the FM distortion at the deviations shown in the PTR and compare the measured distortion to the limits.

RF Generator FM Accuracy Performance Test 2

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-2, "RF Generator FM Accuracy Test 2 Record," on page 236. The FM accuracy of the RF generator is measured directly by the measuring receiver. The Test Set's internal audio generator provides the modulation source.

NOTE Two setups are shown below. The first setup can measure signals to 1 GHz. Since the FM generator in the Test Set translates FM in the lower band directly into the 1.7 to 2 GHz range, testing to 1 GHz is adequate when verifying a repair. The second setup has a microwave converter which covers the full measurement range of FM signals to 2 GHz.

Initial Setup

Figure 8-3 Setup for Measurements to 1 GHz

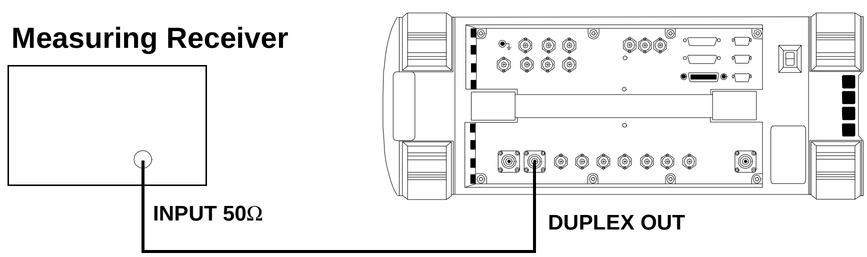
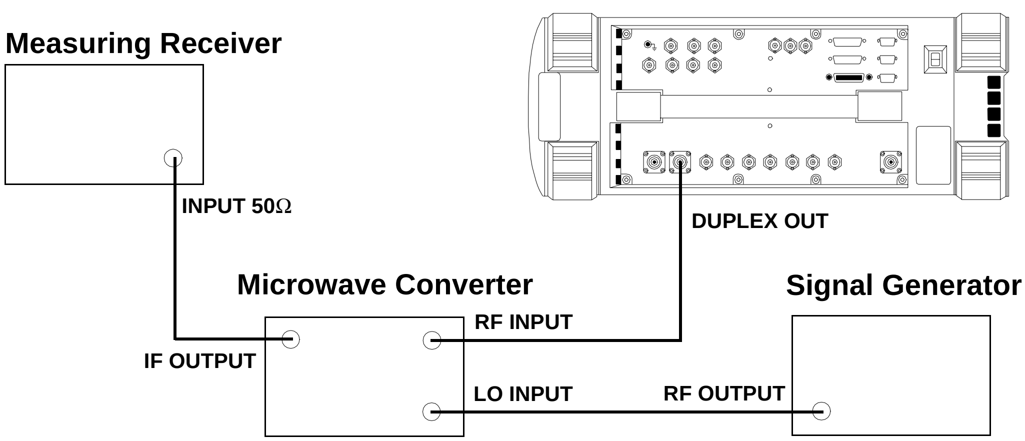


Figure 8-4 Setup for Measurements to 2 GHz Using a Microwave Converter



Procedure

Steps 1, 2, and 3 in the following procedure apply to both of the setups (shown in Figure 8-3 and Figure 8-4 on page 181).

1. On the measuring receiver:
   a. Reset the instrument.
   b. Set the high-pass filter to 300 Hz.
   c. Set the low-pass filter to 3 kHz.
   d. Set the measurement mode to FM.
   e. Set the FM de-emphasis off.
   f. If the microwave converter is being used, set the frequency offset mode to exit the mode (27.0 Special).
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF GENERATOR screen.
   g. Set the `RF Gen Freq` to `10 MHz`.
   h. Set the `Amplitude` to `-10 dBm`.
   i. Set the `AFGen1 To` field to `FM` at `99 kHz` deviation with the FM set to `On`.
3. For frequencies up to 1000 MHz measure the FM deviation at the RF frequencies and deviations shown in the Performance Test Record (PTR) and compare the measured deviation to the limits.

   The following steps are for measurements to 2 GHz.
4. On the signal generator:

   a. Set the frequency to 1500 MHz CW.

   b. Set the level to +8 dBm or whatever level is suitable for the microwave converter’s LO input.

5. On the measuring receiver:

   a. Set the frequency offset mode to enter and enable the LO frequency (27.3 Special).

   b. Key in the LO frequency (in MHz) which is 1500.

6. On the Test Set, for frequencies of 1700 and 2000 MHz, measure the FM at the deviations shown in the PTR and compare the measured deviation to the limits.

RF Generator FM Flatness Performance Test 3

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-3, "RF Generator FM Flatness Test 3 Record," on page 238. 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.

NOTE Two setups are shown below. The first setup can measure signals to 1 GHz. Since the FM generator in the Test Set translates FM in the lower band directly into the 1.7 to 2 GHz range, testing to 1 GHz is adequate when verifying a repair. The second setup has a microwave converter which covers the full measurement range of FM signals to 2 GHz.

Initial Setup

Figure 8-5 Setup for Measurements to 1 GHz

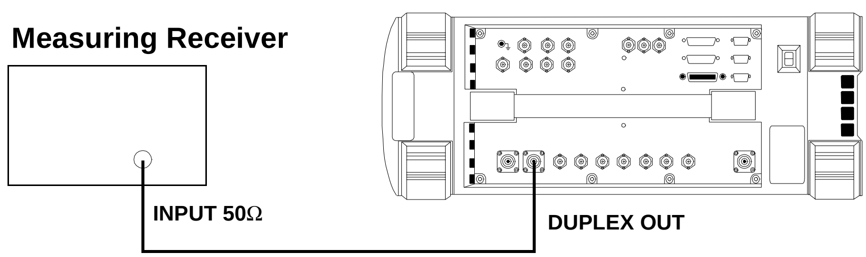
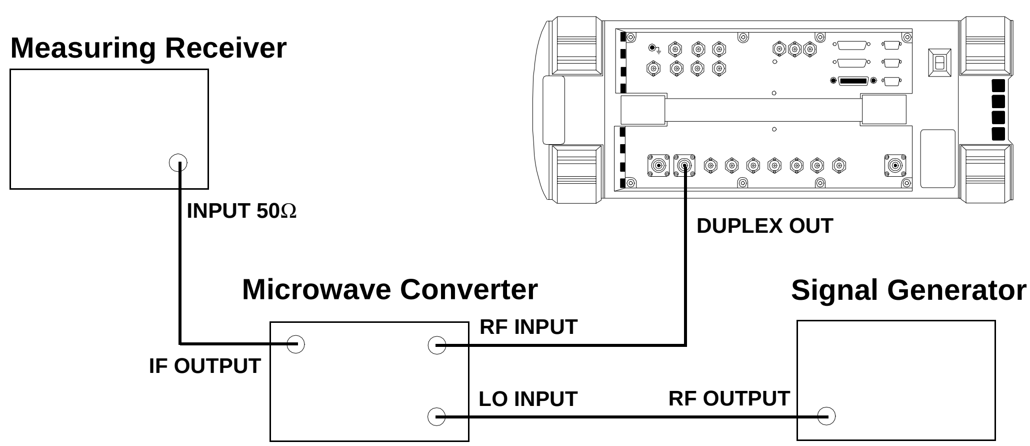


Figure 8-6 Setup for Measurements to 2 GHz Using a Microwave Converter



Procedure

Steps 1, 2, and 3 in the following procedure apply to both of the setups (shown in Figure 8-5 and Figure 8-6 on page 184).

1. On the measuring receiver:
   a. Reset the instrument.
   b. Set the measurement mode to FM.
   c. If the microwave converter is being used, set the frequency offset mode to exit the mode (27.0 Special).
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF GENERATOR screen.
   g. Set the `RF Gen Freq` to `521 MHz`.
   h. Set the `Amplitude` to `-10 dBm`.
   i. Set the `AFGen1 To` field to `FM` at `50 kHz` deviation with the FM set to `On`.
3. For frequencies up to 1000 MHz measure the FM deviation at the RF frequencies and rates shown in the Performance Test Record (PTR). Convert the measurement results to dB referenced to the deviation measured at 1 kHz using the following formula and compare the calculated deviation to the limits in the PTR.

Equation 8-1

$$dB = 20 \bullet \log\left(\frac{\text{Deviation}}{\text{Deviation at 1 kHz}}\right)$$

The following steps are for measurements to 2 GHz.

4. On the signal generator:
   a. Set the frequency to 1500 MHz CW.
   b. Set the level to +8 dBm or whatever level is suitable for the microwave converter’s LO input.

5. On the measuring receiver:
   a. Set the frequency offset mode to enter and enable the LO frequency (27.3 Special).
   b. Key in the LO frequency (in MHz) which is 1500.
6. On the Test Set, for frequencies of 1700 and 2000 MHz, measure the FM deviation at the rates shown in the PTR. Convert the measurement results as was done in step 3 and compare the calculated deviation to the limits.

RF Generator Residual FM Performance Test 4

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-4, "RF Generator Residual FM Test 4 Record," on page 240. The residual FM of the RF generator is measured directly by the measuring receiver. An external LO is used to improve the residual FM of the measuring receiver. An audio analyzer with a CCITT psophometric filter is required to measure the demodulated FM.

NOTE Two setups are shown below and on the following page. The first setup is capable of measuring signals to 1 GHz. The second setup has a microwave converter which covers the full measurement range of FM signals to 2 GHz. The microwave converter's LO must be a low residual FM synthesizer.

Initial Setup

Figure 8-7 Setup for Measurements to 1 GHz

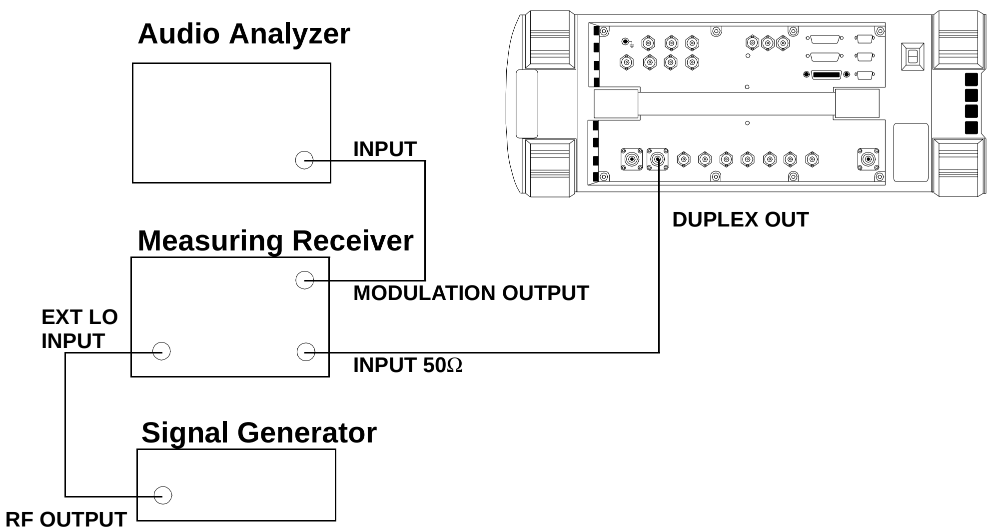
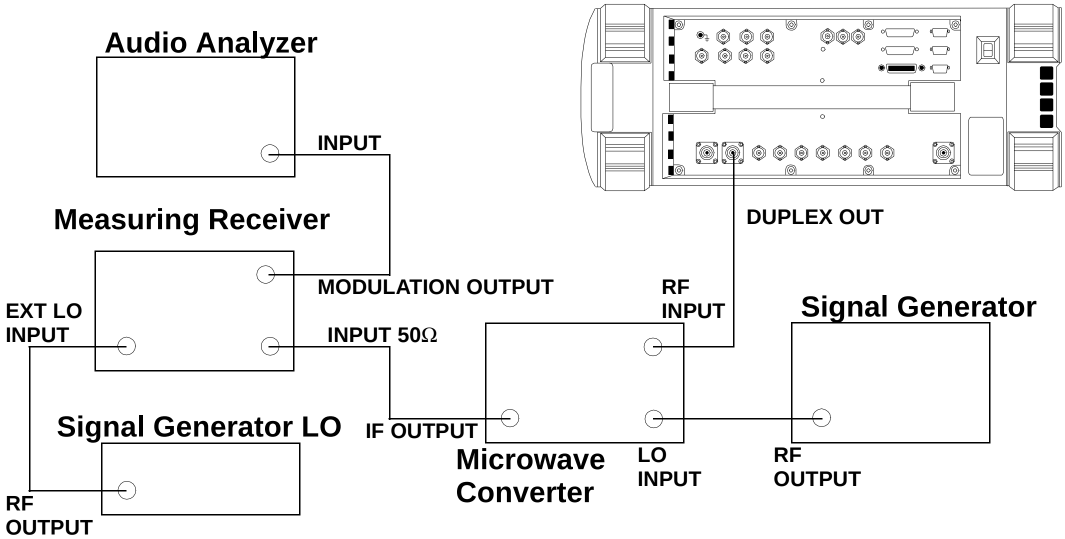


Figure 8-8 Setup for Measurements to 2 GHz Using a Microwave Converter



Procedure

Steps 1 to 5 in the following procedure apply to both setups (shown in Figure 8-7 and Figure 8-8 on page 188).

1. On the signal generator (to be used as the measuring receiver's LO):
   a. Set the frequency to 11.5 MHz.
   b. Set the level to 0 dBm.
2. On the measuring receiver:
   a. Reset the instrument.
   b. Set the IF to 1.5 MHz (3.2 Special).
   c. Set the high-pass filter to 50 Hz.
   d. Set the low-pass filter to 15 kHz.
   e. Set the measurement mode to FM.
   f. If the instrument has an external LO switch, enable the external LO mode (23.1 Special).
   g. If the microwave converter is being used, set the frequency offset mode to exit the mode (27.0 Special).
3. On the audio analyzer:
   a. Reset the instrument.
   b. Set the measurement mode to AC level.
   c. Select the CCITT Weighting filter.

   d. Set the low-pass filter to 30 kHz.

4. On the Test Set:

   a. Press **Preset**.

   b. Select the INSTRUMENT CONFIGURE screen.

   c. Set the `RF Display` field to `Freq`.

   d. Select the CDMA GENERATOR screen.

   e. Set the `CW RF Path` field to `Bypass`.

   f. Select the RF GENERATOR screen.

   g. Set the `RF Gen Freq` to `10 MHz`.

   h. Set the `Amplitude` to `-10 dBm`.

5. For frequencies up to 1000 MHz and for each line in the Performance Test Record (PTR) do the following:

   a. Set the signal generator (used as an LO for the measuring receiver) to the LO frequency shown in the PTR.

   b. Set the Test Set to the RF frequencies shown in the PTR.

   c. Measure the ac level (in mV) on the audio analyzer.

   d. Multiply the measured ac levels by 1000 to convert them to FM deviation in Hz and compare the computed results to the limits shown in the PTR.

The following steps are for measurements to 2 GHz.

6. On the signal generator:

   a. Set the frequency to 1500 MHz CW for 1700 MHz, 1800 MHz CW for 2000 MHz.

   b. Set the level to +8 dBm or whatever level is suitable for the microwave converter’s LO input.

7. On the measuring receiver:

   a. Set the frequency offset mode to enter and enable the LO frequency (27.3 Special).

   b. Key in the LO frequency (in MHz) which is 1500 MHz.

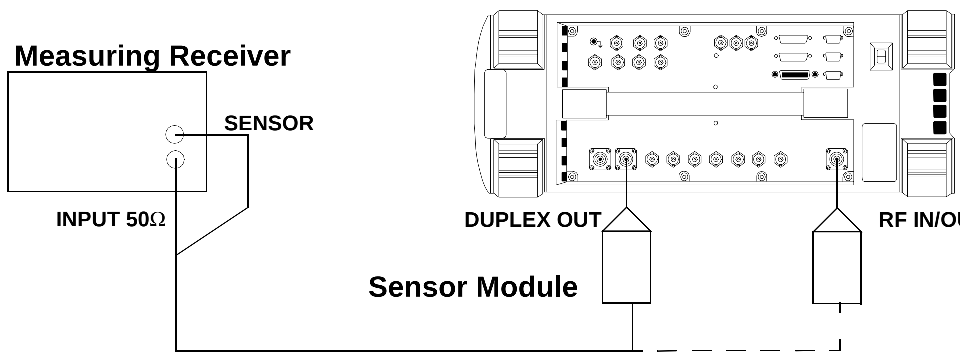
8. On the Test Set, for frequencies of 1700 and 2000 MHz, continue on as in step 5.

RF Generator Level Accuracy Performance Test 5

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-5, “RF Generator Level Accuracy Test 5 Record,” on page 242. Using a measuring receiver and sensor module, at several frequencies up to 1 GHz the Test Set is set to generate levels between –10 and 125 dBm (in 5 dB steps) at it’s DUPLEX OUT connector. The level is measured with the tuned RF level feature of the measuring receiver. At each frequency the measuring receiver connection is moved to the RF IN/OUT and the level measured from -40 to –125 dBm. As the test proceeds you may be required to recalibrate the measuring receiver.

To extend the measurement frequency to 2 GHz the second method uses a microwave converter and amplifier to extend the measurement range (see Figure 8-10 on page 192).

Figure 8-9 Setup 1 for Measurements to 1 GHz



Procedure 1

Steps 1 to 5 in the following procedure apply to Setup 1 shown in Figure 8-9 on page 190.

1. Before connecting the test set to the measuring receiver:

   a. Reset the instrument.

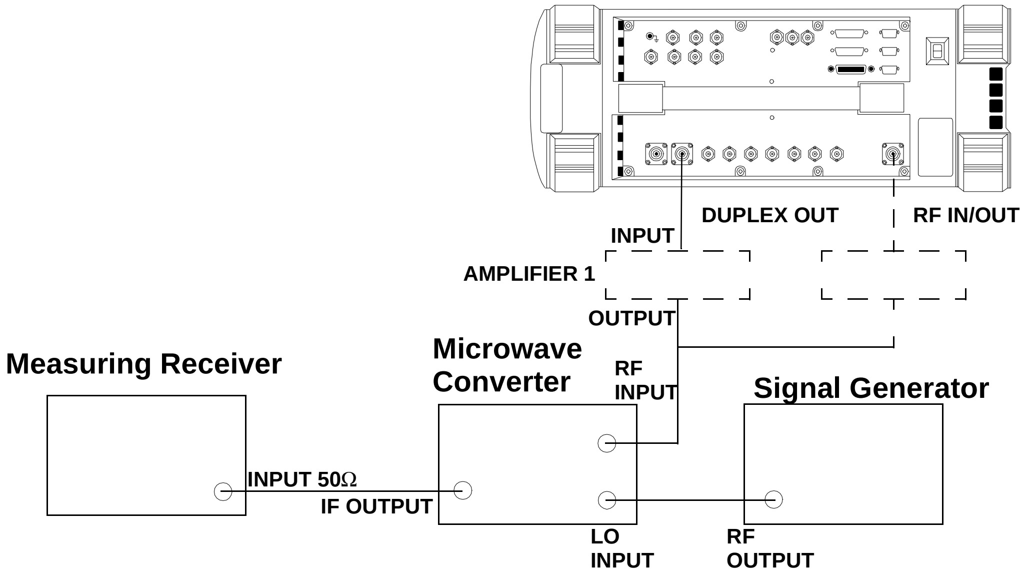
   b. Zero and calibrate the sensor module.

NOTE Make sure the sensor module’s calibration data is entered into the measuring receiver.

2. Connect the equipment as shown in Setup 1 whether intending to measure frequencies to 1 GHz or 2 GHz.

3. On the measuring receiver:
   a. Set the measurement mode to RF Power.
   b. Set the display to log.
4. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF GENERATOR screen.
   g. Set the `RF Gen Freq` to `3 MHz`.
   h. Set the `Amplitude` to `-10 dBm`.
5. For each frequency in the Performance Test Record (PTR) do the following:
   a. Set the measuring receiver to measure frequency.
   b. Set the Test Set level to –10 dBm.
   c. After the measuring receiver has acquired the signal, set the measuring receiver to measure tuned RF level.
   d. Measure the RF level at the levels shown in the PTR at the Test Set's DUPLEX OUT port and compare the measured RF level to the limits. If the measuring receiver displays the need to recalibrate, press the CALIBRATE key and wait for calibration to be completed.
   e. Move the sensor module to the Test Set's RF IN/OUT port.
   f. On the Test Set set the Output Port field to RF Out and repeat the measurements for the levels shown in the PTR and compare the measured RF level to the limits.
   g. Move the sensor module back to the Test Set's DUPLEX OUT port and set the Output Port to Dupl.

Figure 8-10 Setup 2 for Measurements of 1700 and 2000 MHz



Procedure 2

Steps 1 to 5 in the following procedure apply to Setup 1 shown in Figure 8-9 on page 190.

1. Connect the sensor module on the measuring receiver to the DUPLEX OUT port of the Test Set.
2. On the Test Set:
   a. Set the `Amplitude` to `-10 dBm`.
   b. Set the `RF Gen Freq` to `1700 MHz`.
3. On the measuring receiver:
   a. Set the measurement mode to RF power.
   b. Key in 1700 MHz.
   c. Measure and record the RF power at the DUPLEX OUT port.
4. On the Test Set set the RF Gen Freq to 2000 MHz.
5. On the measuring receiver:
   a. Key in 2000 MHz.
   b. Measure and record the RF power at the DUPLEX OUT port.

   Steps 6 to 8 apply to Setup 2 shown in Figure 8-10 on page 192.
6. Make the connections shown in Setup 2.

7. On the signal generator set the level to +8 dBm or whatever level is suitable for the microwave converter’s LO input.
8. For frequencies of 1700 and 2000 MHz perform the following:
    a. On the signal generator set the frequency to 1900 MHz CW and 2200 MHz CW respectively.
    b. Reset the measuring receiver.
    c. On the measuring receiver set the frequency offset mode to enter and enable the LO frequency (27.3 Special) then key in the signal generator (LO) frequency (in MHz) which is 1900 or 2200 MHz respectively.
    d. On the measuring receiver set the measurement mode to tuned RF level and the measurement units to dBm then press SET REF.
    e. Measure and record the RF level at the levels down to and including -80 dBm shown in the PTR at the Test Set's DUPLEX OUT port. If the measuring receiver displays the need to recalibrate, press the CALIBRATE key and wait for calibration to be completed.
    f. After recording the reading at -80 dBm insert an RF amplifier into the output of the Test Set.
    g. Record the new measured level at -80 dBm.
    h. Continue measuring the level down to -125 dBm.
    i. Move the input to the microwave converter to the RF IN/OUT port without the amplifier inserted.
    j. Measure and record the RF level at the levels down to and including -80 dBm shown in the PTR at the Test Set's RF IN/OUT port.
    k. After recording the reading at -80 dBm insert an RF amplifier into the output of the Test Set.
    l. Record the new measured level at -80 dBm.
    m. Continue measuring the level down to -125 dBm.
    n. Correct the measured reading for each level measured without the amplifier as follows: Add the RF power measured in step 3c or 5b to the measured level. (For example, if the level in step 3c is -10.2 dBm and the level at -55 dBm is -45.1 dB, record a level of -10.2 + (-45.1) = 55.3 dBm.) Compare the corrected values with the limits in the PTR.
    o. Correct the measured reading for each level measured with the amplifier by summing the following values:

        + RF power measured at -10 dBm in step 3c or 5b

+ RF level measured at -80 dBm in step 8i

– RF level measured at -80 dBm in step 8j

+ RF level measured in step 8k

For example, if:

RF power measured at –10 dBm in step 3b or 5b = –10.2 dBm

RF level measured at –80 dBm in step 8i = –70.1 dB

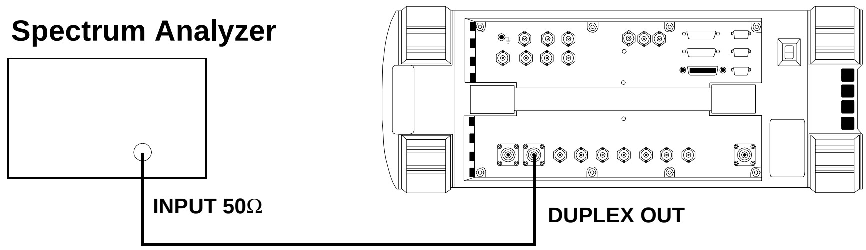
RF level measured at -80 dBm in step 8j = –52.6 dB

RF level measured at -100 dBm in step 8k = –73.2 dB the corrected level at –100 dBm is –10.2 + (–70.1) – (–52.6) + (–73.2) = 100.9 dBm. Compare the corrected values with the limits in the PTR.

RF Generator Harmonics Spectral Purity Performance Test 6

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-6, "RF Generator Harmonics Spectral Purity Test 6 Record," on page 250. 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.

Figure 8-11 **Setup**



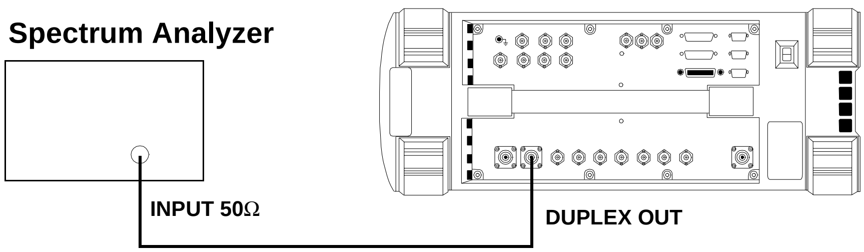
Procedure

1. Set up the spectrum analyzer in accordance with its operating manual.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF GENERATOR screen.
   g. Set the `RF Gen Freq` to `1 MHz`.
   h. Set the `Amplitude` to `-10 dBm`.
3. Set the test set's RF generator to the frequencies and levels shown in the Performance Test Record (PTR) and measure the second and third harmonics. For each measurement convert the harmonic level to dB below the fundamental (dBc) and compare the computed levels to the limits.

RF Generator Spurious Spectral Purity Performance Test 7

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-7, "RF Generator Spurious Spectral Purity Test 7 Record," on page 254. 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.

Figure 8-12 Setup



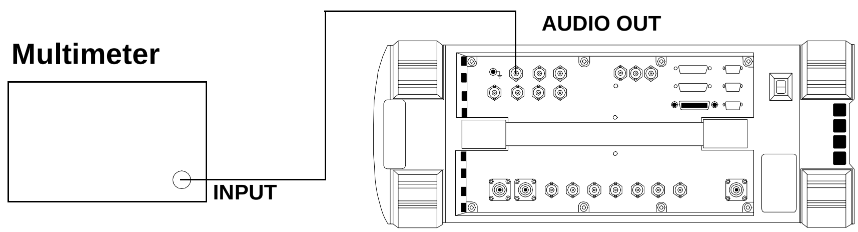
Procedure

1. Set up the spectrum analyzer in accordance with its operating manual.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF GENERATOR screen.
   g. Set the `RF Gen Freq` to `242 MHz`.
   h. Set the `Amplitude` to `-10 dBm`.
3. Set the test set's RF generator to the frequencies and levels shown in the Performance Test Record (PTR) and measure the level of the spurious signals at the frequencies shown. For each measurement convert the harmonic level to dB below the fundamental (dBc) and compare the computed levels to the limits.

AF Generator AC Level Accuracy Performance Test 8

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-8, "AF Generator AC Level Accuracy Test 8 Record," on page 256. There are two audio generators. AC level accuracy is measured directly with a digital multi meter.

Figure 8-13 Setup



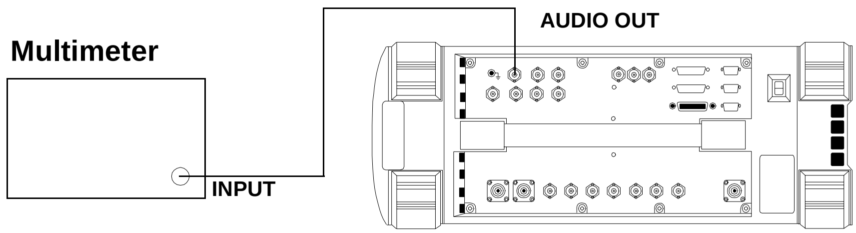
Procedure

1. Set the multimeter to measure AC volts.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the RF GENERATOR screen.
   c. Set the `AFGen1 To` and `AFGen2 To` fields to Audio Out.
3. On the Test Set for Audio Frequency Generator 1 do the following:
   a. Set the `AFGen2 To` level field to Off.
   b. Set the audio frequency and level as shown in the Performance Test Record (PTR) and measure the AC level. Compare the measured voltage to the limits.
4. On the Test Set for Audio Frequency Generator 2 do the following:
   a. Set the `AFGen1 To` level field to Off and `AFGen2 To` level field to On.
   b. Set the audio frequency and level as shown in the PTR and measure the AC level. Compare the measured voltage to the limits.

AF Generator DC Level Accuracy Performance Test 9

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-9, "AF Generator DC Level Accuracy Test 9 Record," on page 258. There are two DC generators. DC level accuracy is measured directly with a digital multi meter.

Figure 8-14 **Setup**



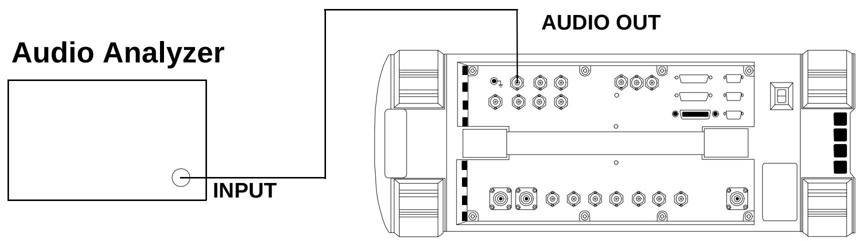
Procedure

1. Set the multimeter to measure DC volts.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the RF GENERATOR screen.
   c. Set the AFGen1 To and AFGen2 To fields to Audio Out.
   d. Set the AFGen1 Freq and AFGen2 Freq fields to 0.0 Hz.
   e. Set the Audio Out field to DC.
3. On the Test Set for Audio Frequency Generator 1 do the following:
   a. Set the AFGen2 To level field to Off.
   b. Set the audio frequency and level as shown in the Performance Test Record (PTR) and measure the DC level. Compare the measured voltage to the limits.
4. On the Test Set for Audio Frequency Generator 2 do the following:
   a. Set the AFGen1 To level field to Off and AFGen2 To level field to on.
   b. Set the audio frequency and level as shown in the PTR and measure the DC level. Compare the measured voltage to the limits.

AF Generator Residual Distortion Performance Test 10

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-10, "AF Generator Residual Distortion Test 10 Record," on page 259. Audio distortion is measured directly with an audio analyzer.

Figure 8-15 Setup



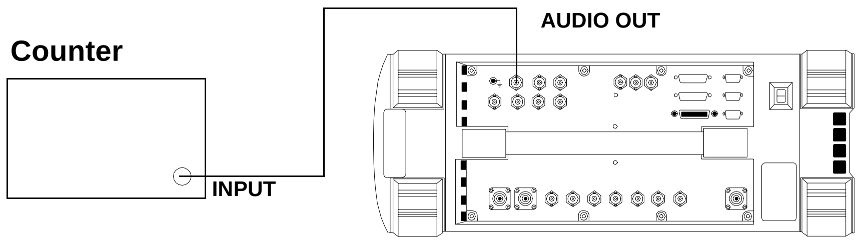
Procedure

1. On the audio analyzer:
   a. Reset the instrument.
   b. Select the 80 kHz low-pass filter.
   c. Set the measurement mode to distortion.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the RF GENERATOR screen.
   c. Set the `AFGen1 To` and `AFGen2 To` fields to Audio Out.
3. On the Test Set for Audio Frequency Generator 1 do the following:
   a. Set the `AFGen2 To` level field to Off.
   b. Set the audio frequency and level as shown in the Performance Test Record (PTR) and measure the audio distortion. Compare the measured distortion to the limits.
4. On the Test Set for Audio Frequency Generator 2 do the following:
   a. Set the `AFGen1 To` level field to Off and `AFGen2 To` level field to on.
   b. Set the audio frequency and level as shown in the PTR and measure the audio distortion. Compare the measured distortion to the limits.

AF Generator Frequency Accuracy Performance Test 11

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-11, “AF Generator Frequency Accuracy Test 11 Record,” on page 261. Frequency accuracy is measured directly with a frequency counter. The counter must be able to resolve 0.005% at 20 Hz.

Figure 8-16 Setup



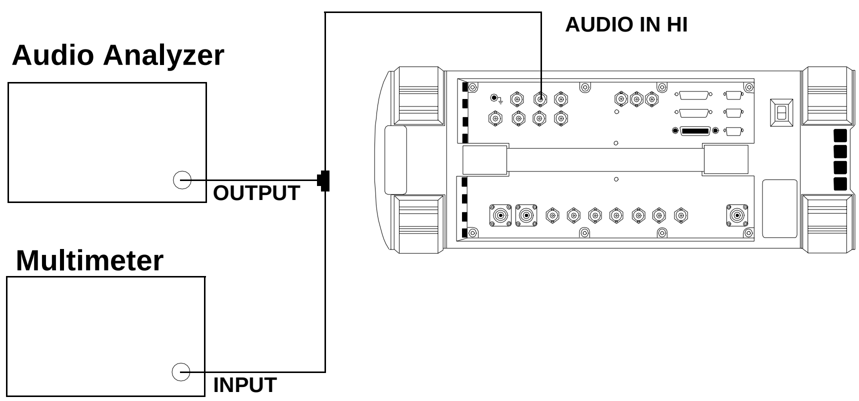
Procedure

1. Set the counter to measure frequency.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the RF GENERATOR screen.
   c. Set the `AFGen1 To` and `AFGen2 To` fields to Audio Out.
3. On the Test Set for Audio Frequency Generator 1 do the following:
   a. Set the `AFGen2 To` level field to Off.
   b. Set the audio frequency and level as shown in the Performance Test Record (PTR) and measure the audio frequency. Compare the measured frequency to the limits.
4. On the Test Set for Audio Frequency Generator 2 do the following:
   a. Set the `AFGen1 To` level field to Off and `AFGen2 To` level field to on.
   b. Set the audio frequency and level as shown in the PTR and measure the audio frequency. Compare the measured frequency to the limits.

AF Analyzer AC Level Accuracy Performance Test 12

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-12, “AF Analyzer AC Voltage Accuracy Test 12 Record,” on page 262. To measure AC voltage accuracy, an AC signal is measured by an external multi meter and compared to the Test Set’s internal AC voltmeter reading.

Figure 8-17 Setup



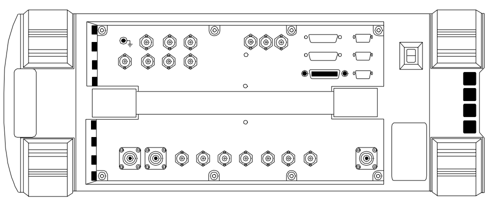
Procedure

1. Set the digital multimeter to measure AC volts.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the AF ANALYZER screen.
   c. Set the `AF Anl In` field to Audio In.
   d. Set the `Filter 2` field to `>99kHz LPF`.
   e. Set the `Audio In Lo` field to `Gnd`.
   f. Set the `Detector` field to `RMS`.
   g. Set the `Settling` field to `Slow`.
3. Set the audio analyzer’s source to the frequencies and levels shown in the Performance Test Record. (Adjust the level until the digital multimeter reads the correct level.)
4. Measure the AC level on the Test Set and compare the measured level to the limits.

AF Analyzer Residual Noise Performance Test 13

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-13, “AF Analyzer Residual Noise Test 13 Record,” on page 263. The AC level of the audio input is measured with no signal source connected.

Figure 8-18 Setup



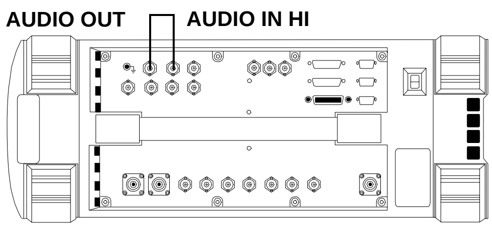
Procedure

1. On the Test Set:
    a. Press **Preset**.
    b. Select the AF ANALYZER screen.
    c. Set the `AF Anl In` field to Audio In.
    d. Set the `Filter 2` field to `15kHz LPF`.
    e. Set the `Audio In Lo` field to `Gnd`.
    f. Set the `Detector` field to `RMS`.
2. Measure the AC level (residual noise) on the Test Set and compare the measured level to the limits shown in the Performance Test Record.
3. Set the `Filter 2` field to `>99kHz LP`.
4. Measure the AC level (residual noise) on the Test Set and compare the measured level to the limits shown in the Performance Test Record.

AF Analyzer Distortion and SINAD Accuracy Performance Test 14

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-14, “AF Analyzer Distortion and SINAD Accuracy Test 14 Record,” on page 264. 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 and SINAD is compared with the calculated value.

Figure 8-19 Setup



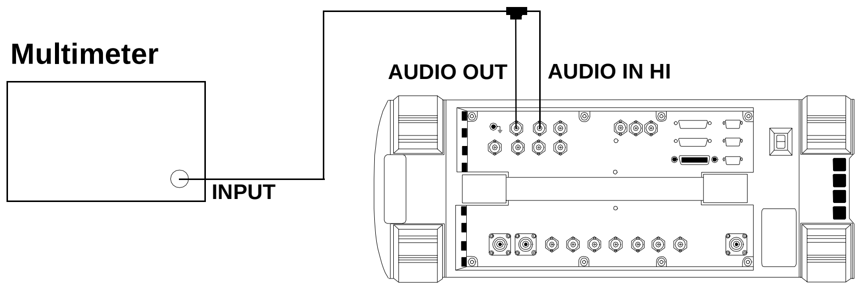
Procedure

1. On the Test Set:
   a. Press **Preset**.
   b. Select the AF ANALYZER screen.
   c. Set the `AF Anl In` field to Audio In.
   d. Set the `Audio In Lo` field to `Gnd`.
   e. Set the `Detector` field to `RMS`.
   f. Select the RF GENERATOR screen.
   g. Set the `AFGen1 To` field to `Audio Out`.
   h. Set the `AFGen1 To` level field to `1.00 V`.
   i. Set the `AFGen2 To` field to `Audio Out`.
2. For the frequency (the harmonic) and level settings of Audio Frequency Generator 2 shown in the Performance Test Record, measure the distortion and SINAD on the Test Set and compare the measured values to the limits.

AF Analyzer DC Level Accuracy Performance Test 15

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-15, “AF Analyzer DC Level Accuracy Test 15 Record,” on page 265. To measure DC level accuracy, a DC signal is measured by an external digital multi meter and compared to the Test Set’s internal DC voltmeter reading.

Figure 8-20 Setup



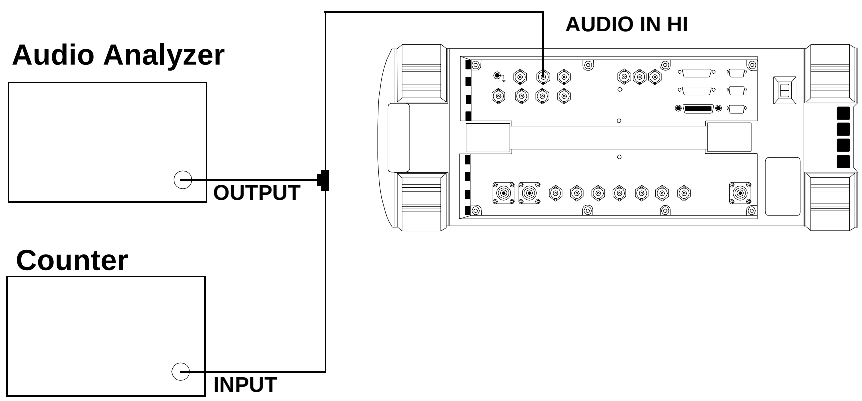
Procedure

1. Set the multimeter to measure DC volts.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the AF ANALYZER screen.
   c. Set the `AF Anl In` field to Audio In.
   d. Set the `Audio In Lo` field to `Gnd`.
   e. Select the RF GENERATOR screen.
   f. Set the `AFGen1 To` field to Audio Out.
   g. Set the `AFGen1 Freq` field to 0.0 Hz.
   h. Set the `Audio Out` field to `DC`.
   i. Set the level of Audio Frequency Generator 1 as shown in the Performance Test Record and measure the DC level. Compare the measured voltage to the limits.

AF Analyzer Frequency Accuracy to 100 kHz Performance Test 16

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-16, “AF Analyzer Frequency Accuracy to 100 kHz Test 16 Record,” on page 266. To measure frequency accuracy up to 100 kHz, an AC signal at the audio input is measured by an external frequency counter and compared to the Test Set’s internal audio frequency counter.

Figure 8-21 Setup



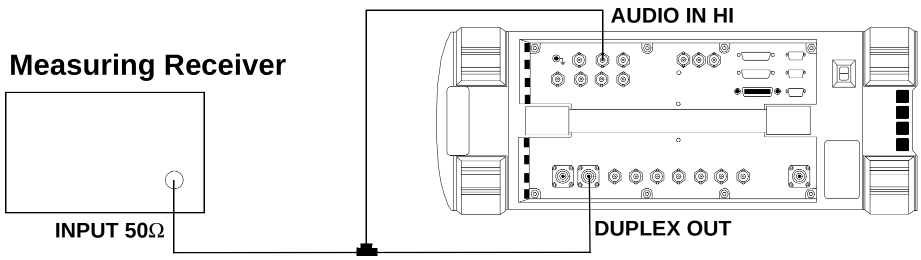
Procedure

1. Set the frequency counter to measure frequency.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the AF ANALYZER screen.
   c. Set the `AF Anl In` field to Audio In.
   d. Set the `Filter 2` field to `>99kHz LPF`.
   e. Set the `Audio In Lo` field to `Gnd`.
3. Set the audio analyzer’s source to 1 V and set the frequencies as shown in the Performance Test Record. Measure the frequency on the Test Set and compare the measured frequency to the limits.

AF Analyzer Frequency Accuracy at 400 kHz Performance Test 17

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-17, "AF Analyzer Frequency Accuracy at 400 kHz Test 17 Record," on page 267. To measure frequency accuracy at 400 kHz, the RF signal from the Test Set's DUPLEX OUT port is applied to the audio input and the input to the measuring receiver and the two measured frequencies are compared.

Figure 8-22 Setup



Procedure

1. On the measuring receiver:
   a. Reset the instrument.
   b. Set the measurement mode to frequency.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF GENERATOR screen.
   g. Set the `RF Gen Freq` to `0.4 MHz`.
   h. Set the `Amplitude` to `-21 dBm` (20 mV).
   i. Select the AF ANALYZER screen.
   j. Set the `AF Anl In` field to Audio In.
   k. Set the `Filter 2` field to `>99kHz LPF`.

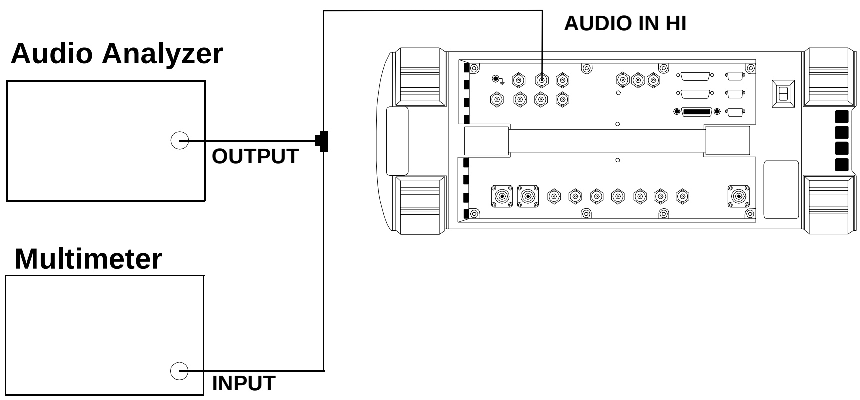
l. Set the `Audio In Lo` field to `Gnd`.

3. Measure the audio frequency on the measuring receiver and the Test Set and note the frequency difference. Compare the calculated difference to the limits shown in the Performance Test Record.

Oscilloscope Amplitude Accuracy Performance Test 18

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-18, "Oscilloscope Amplitude Accuracy Test 18 Record," on page 268. A 5 V ac signal from the audio analyzer is measured by both an external multi meter and by the Test Set's internal oscilloscope. Since the oscilloscope reads peak volts, the RMS reading of the multi meter is multiplied by the square root of two.

Figure 8-23 Setup



Procedure

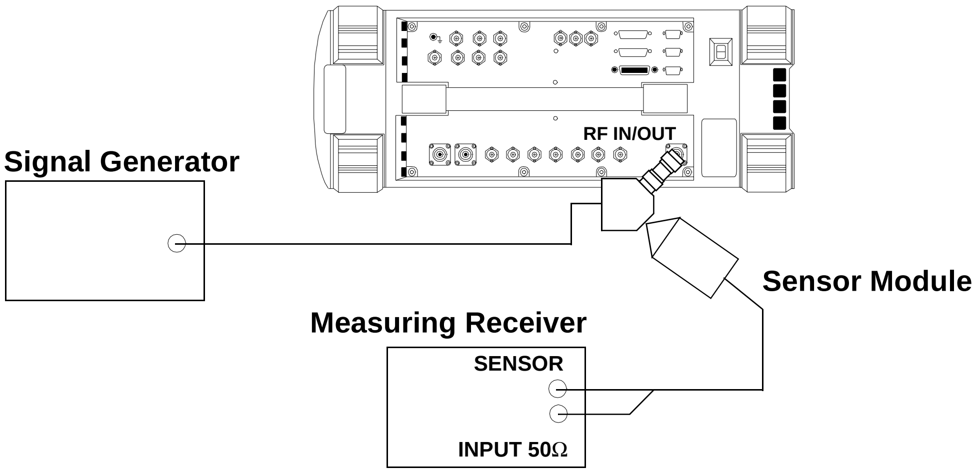
1. Set the digital multimeter to measure ac volts.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the AF ANALYZER screen.
   c. Set the `AF Anl In` field to Audio In.
   d. Set the `Filter 2` field to `>99kHz LPF`.
   e. Set the `Audio In Lo` field to `Gnd`.
   f. Select the SCOPE screen.
   g. Set the `Controls` field to `Marker` and move the cursor to the Marker To Peak+ field.
3. Set the audio analyzer's source to 1 kHz and 5 V and fine adjust the level until the voltmeter reads 5 V.

4. Set the frequency as shown in the Performance Test Record (PTR). For each setting, perform the following:
   a. Adjust the level until the digital multimeter reads 5 V.
   b. Set Controls to Main and adjust the Time/Div on the Test Set to display 2 to 3 cycles of the waveform.
   c. Set Controls to Marker and press the knob (with the cursor in the Marker To Peak+ field) to move the marker to the peak of the waveform.
   d. Read the Lvl and compare the reading to the limits in the PTR.

RF Analyzer Level Accuracy Performance Test 19

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-19, “RF Analyzer Level Accuracy Test 19 Record,” on page 269. Level accuracy is measured using a system power calibration program that resides on a memory card.

Figure 8-24 Setup



Procedure

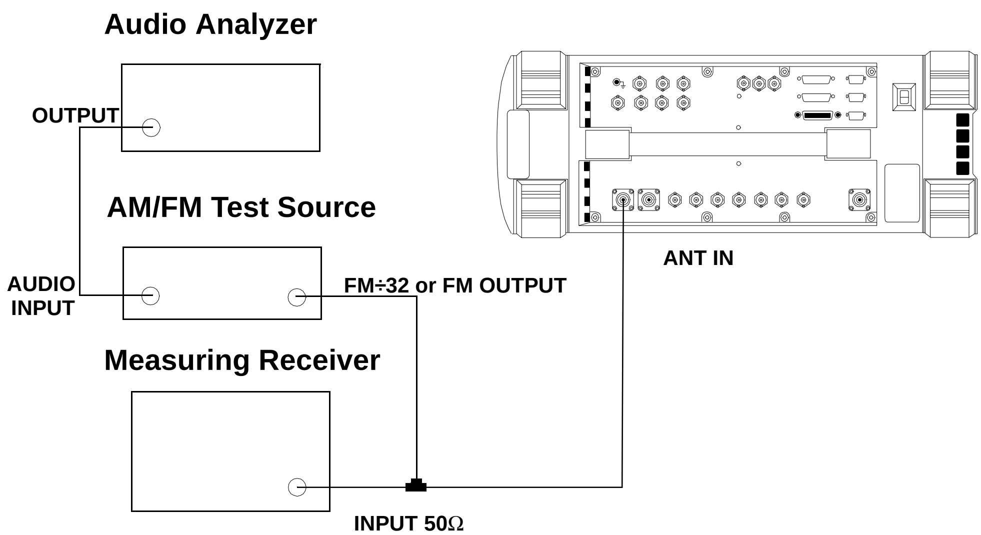
1. Obtain the memory card containing the System Power Calibration program. (To order see “Ordering Parts” on page 46).
2. Run the System Power Calibration as follows:
   a. Insert the memory card into the memory card slot.
   b. Select the SOFTWARE MENU screen.
   c. Set the `Select Procedure Location:` field to Card.
   d. Set the `Select Procedure Filename` field to `SYSPWR0`.
   e. Press the `Run Test` key.
3. Follow the instructions as they are presented. As the power difference is displayed, write these numbers in the Performance Test Record and compare them with the limits. (If two passes are chosen, average the two sets of data.) After the acquisition of levels is complete, select No when asked if you want the calibration factors downloaded into the Test Set’s memory.

RF Analyzer FM Accuracy Performance Test 20

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-20, “RF Analyzer FM Accuracy Test 20 Record,” on page 271. 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 source in the audio analyzer. The audio level is varied until the modulation is at the desired FM deviation as measured by the measuring receiver.

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 is not critical.

Figure 8-25 Setup



Procedure

1. On the AM/FM test source, set the test mode to FM.
2. On the measuring receiver:
   a. Reset the instrument.
   b. Set the measurement mode to FM.
   c. Set the detector to RMS.

3. On the audio analyzer:

   a. Reset the instrument.

   b. Set the output frequency to 50 Hz.

4. On the Test Set:

   a. Press **Preset**.

   b. Select the INSTRUMENT CONFIGURE screen.

   c. Set the `RF Display` field to `Freq`.

   d. Select the CDMA GENERATOR screen.

   e. Set the `CW RF Path` field to `Bypass`.

   f. Select the RF ANALYZER screen.

   g. Set the `Tune Freq` to `12.5 MHz`.

   h. Set the `Input Port` field to `Ant`.

   i. Set the `IF Filter` field to `230 kHz`.

   j. Select the AF ANALYZER screen.

   k. Set the `AF Anl In` field to `FM Demod`.

   l. Set the `Filter 2` field to `>99kHz LP`.

   m. Set the `Detector` field to `RMS`.

5. For each RF output from the AM/FM test source (12.5 MHz and 400 MHz corresponding to the FM÷32 and FM outputs) shown in the Performance Test Record (PTR), do the following:

   a. Set the audio analyzer’s frequency (rate) as shown in the PTR.

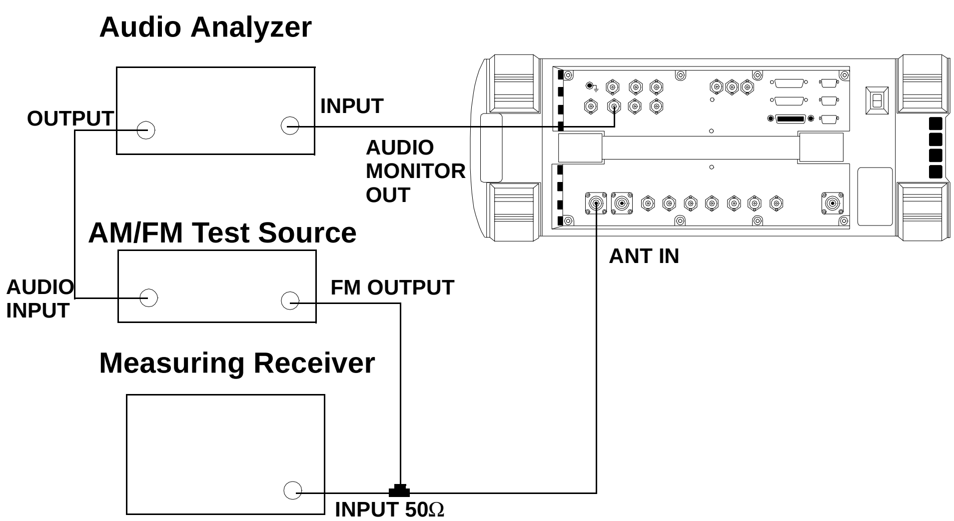
   b. Adjust the audio analyzer’s level until the measuring receiver reads the FM deviation shown in the PTR.

   c. Read the FM deviation on the Test Set and compare the results to the limits shown in the PTR.

RF Analyzer FM Distortion Performance Test 21

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-21, "RF Analyzer FM Distortion Test 21 Record," on page 272. An audio signal from the audio analyzer provides FM for the AM/FM test source. The AM/FM test source provides an RF signal (with FM) to the Test Set's internal RF analyzer. The measuring receiver is used to monitor FM deviation as the level of the audio signal from the audio analyzer is varied. The audio analyzer then measures distortion introduced by the Test Set.

Figure 8-26 Setup



Procedure

1. On the AM/FM test source, set the test mode to FM.
2. On the measuring receiver:
   a. Reset the instrument.
   b. Set the measurement mode to FM.
   c. Set the high-pass filter to 300 Hz.
   d. Set the low-pass filter to 3 kHz.
3. On the audio analyzer:
   a. Reset the instrument.

b. Set the output frequency to 1 kHz.

c. Set the measurement mode to distortion.

4. On the Test Set:

a. Press **Preset**.

b. Select the INSTRUMENT CONFIGURE screen.

c. Set the `RF Display` field to `Freq`.

d. Select the CDMA GENERATOR screen.

e. Set the `CW RF Path` field to `Bypass`.

f. Select the RF ANALYZER screen.

g. Set the `Tune Freq` to `400 MHz`.

h. Set the `Input Port` field to `Ant`.

i. Set the `IF Filter` field to `230 kHz`.

j. Select the AF ANALYZER screen.

k. Set the `AF Anl In` field to `FM Demod`.

l. Set the `Filter 1` field to `300Hz HPF`.

m. Set the `Filter 2` field to `3kHz LPF`.

n. Set the `Detector` field to `Pk+`.

5. For each FM deviation setting shown in the Performance Test Record (PTR) do the following:

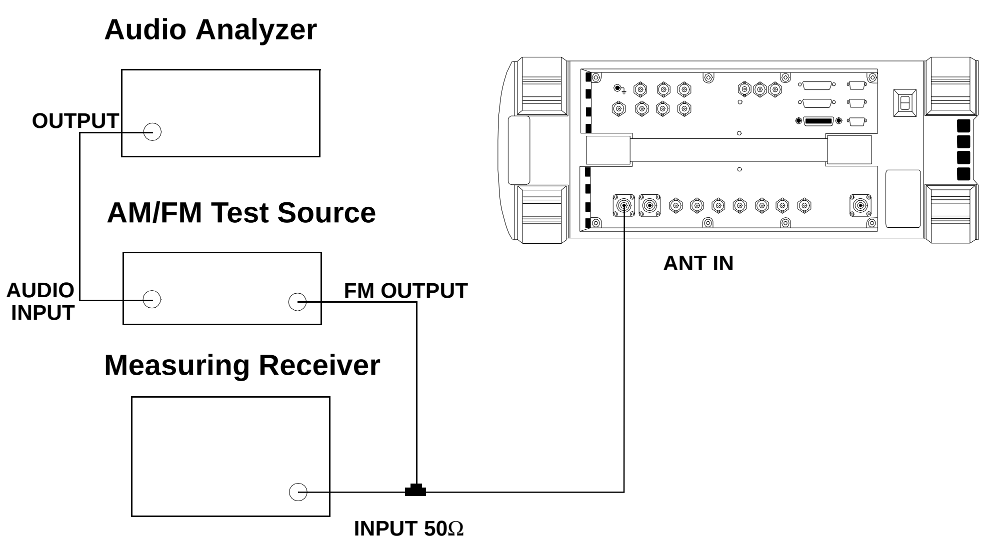
a. Adjust the audio analyzer's level until the measuring receiver reads the FM deviation shown in the PTR.

b. Read the distortion on the audio analyzer and compare the results to the limits shown in the PTR.

RF Analyzer FM Bandwidth Performance Test 22

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-22, “RF Analyzer FM Bandwidth Test 22 Record,” on page 273. An audio signal from the audio analyzer provides FM for the AM/FM test source. The AM/FM test source provides an RF signal (with FM) to the Test Set’s internal RF analyzer. The measuring receiver is used to monitor FM deviation as the level of the audio signal from the audio analyzer is varied. 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.

Figure 8-27 Setup



Procedure

1. On the AM/FM test source, set the test mode to FM.
2. On the measuring receiver:
   a. Reset the instrument.
   b. Set the measurement mode to FM.
   c. Set the all filters off.
3. On the audio analyzer:
   a. Reset the instrument.

b. Set the output frequency to 1 kHz.

4. On the Test Set:

a. Press **Preset**.

b. Select the INSTRUMENT CONFIGURE screen.

c. Set the `RF Display` field to `Freq`.

d. Select the CDMA GENERATOR screen.

e. Set the `CW RF Path` field to `Bypass`.

f. Select the RF ANALYZER screen.

g. Set the `Tune Freq` to `400 MHz`.

h. Set the `Input Port` field to `Ant`.

i. Set the `IF Filter` field to `230 kHz`.

j. Set the `Squelch` field to `Open`.

k. Select the AF ANALYZER screen.

l. Set the `AF Anl In` field to `FM Demod`.

m. Set the `Filter 2` field to `>99kHz LP`.

n. Set the `Detector` field to `Pk+`.

5. Set the audio analyzer to the following frequencies: 20 Hz, 100 Hz, 1 kHz, 10 kHz, 35 kHz, and 70 kHz. For each frequency adjust the audio analyzer's level until the measuring receiver reads 25 kHz FM deviation and record the deviation read on the Test Set.

6. Of the FM deviations measured by the Test Set find the maximum and minimum deviations and make the following calculation:

Equation 8-2

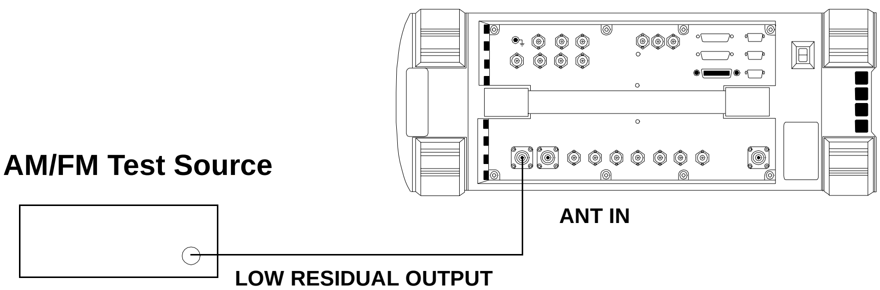
$$dB = 20 \bullet \log\left(\frac{\text{Maximum Deviation}}{\text{Minimum Deviation}}\right)$$

Record the dB difference in the Performance Test Record and compare it with the limits shown.

RF Analyzer Residual FM Performance Test 23

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-23, "RF Analyzer Residual FM Test 23 Record," on page 274. 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.

Figure 8-28 Setup



Procedure

1. On the AM/FM test source, set the test mode to residual FM.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.
   d. Select the CDMA GENERATOR screen.
   e. Set the `CW RF Path` field to `Bypass`.
   f. Select the RF ANALYZER screen.
   g. Set the `Tune Freq` to `560 MHz`.
   h. Set the `Input Port` field to `Ant`.
   i. Set the `IF Filter` field to `230 kHz`.
   j. Select the AF ANALYZER screen.
   k. Set the `AF Anl In` field to `FM Demod`.
   l. Set the `Filter 1` field to `300Hz HPF`.
   m. Set the `Filter 2` field to `3kHz LPF`.
   n. Set the `Detector` field to `RMS`.

3. Read the FM deviation (residual FM) and record the deviation read on the Test Set in the Performance Test Record and compare it to the limits.

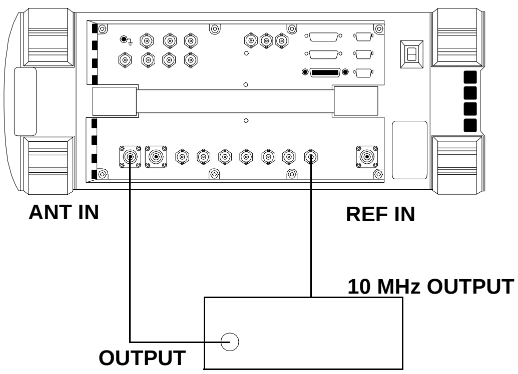
Spectrum Analyzer Image Rejection Performance Test 24

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-24, "Spectrum Analyzer Image Rejection (Image) Test 24 Record," on page 275. This test has two procedures. The first procedure measures the spectrum analyzer's ability to reject image frequencies. The spectrum analyzer is tuned to a signal frequency while an image signal from the signal generator is applied to the antenna input port.

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

Setup

Figure 8-29 Spectrum Analyzer Image Rejection Test 24



Procedure 1

1. On the signal generator:
   a. Set the level to -20 dBm.
   b. Set the frequency to 613.6 MHz.
   c. Set modulation off.
2. On the Test Set:
   a. Press **Preset**.
   b. Select the INSTRUMENT CONFIGURE screen.
   c. Set the `RF Display` field to `Freq`.

d. Select the CDMA GENERATOR screen.

e. Set the CW RF Path field to Bypass.

f. Select the SPEC ANL screen.

g. Set the RF In/Ant field to Ant.

h. Set the Ref Level field to -25 dBm.

i. Set the Span field to 5 kHz.

j. Set the Controls field to Marker.

k. Set the Marker To field to Center Freq.

l. Set the Controls field back to Main.

3. Set the signal generator's frequency and the Test Set's spectrum analyzer center frequency as shown in the Performance Test Record (PTR) and read the image response on the spectrum analyzer. The image response is the spectrum analyzer's marker level (in dBm) minus the signal generator's output level (minus –20 dBm). (In other words, add 20 dB to the marker level.) Compare the results to the limits.

Procedure 2

1. Disconnect the signal generator from the Test Set.
2. On the Test Set:

a. Set the Controls field to Auxiliary.

b. Set the Input Atten field to Hold at 0 dB.

c. Set the Controls field back to Marker.

d. Set the Marker To field to Center Freq.

e. Set the Controls field to Main.

f. Set the Span field to 10 MHz.

g. Set the Ref Level field to -20 dBm.

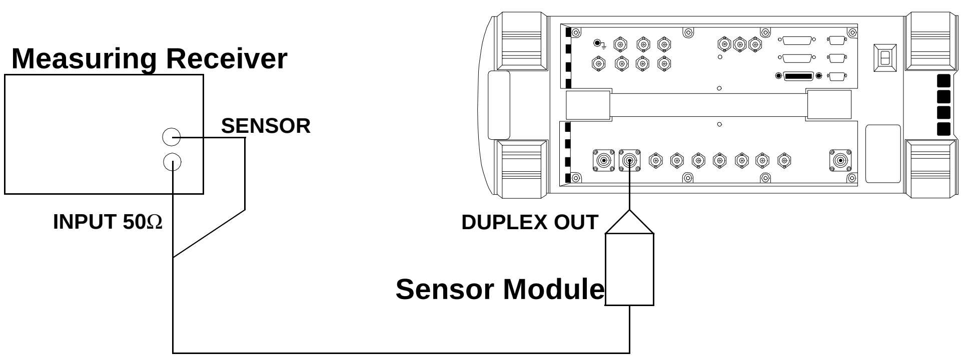
3. Set the Test Set's Center Freq field to the frequencies shown in the PTR and measure the residual response on the spectrum analyzer's marker field and compare it to the limits.

CDMA Generator Amplitude Level Accuracy Performance Test 25

The amplitude level accuracy of the CDMA generator is measured directly with a power meter. These measurements are made at the top and bottom of the CDMA generator's vernier range.

Setup 1

Figure 8-30 Setup 1 for Measurements to 1 GHz



Procedure 1

The following procedure applies to Setup 1 (shown in Figure 8-30 on page 221).

1. Before connecting the equipment, on the measuring receiver:
   a. Reset the instrument.
   b. Zero and calibrate the sensor module.

NOTE Make sure the sensor module's calibration data is entered into the measuring receiver.

2. Connect the equipment as shown in Setup 1.
3. On the measuring receiver:
   a. Set the measurement mode to RF Power.
   b. Set the display to log.

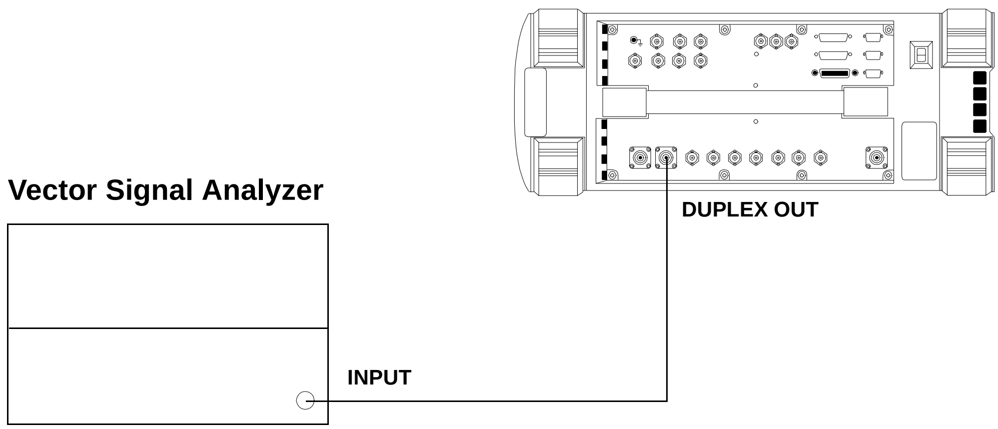
4. On the Test Set:
   a. Press **Preset**.
   b. Select the CDMA GENERATOR screen.
   c. Set the `RF Gen Freq` field to `836.52 MHz`.
   d. Set the `CW RF Path` field to `I/Q`.
   e. Set the Amplitude to `-10 dBm`.
5. Set the Test Set to the frequencies and levels listed in the PTR and record the values.

CDMA Generator Modulation Accuracy Performance Test 26

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-26, "CDMA Generator RF In/Out Test," on page 277. The modulation accuracy of the CDMA generator is directly measured with a vector signal analyzer at the DUPLEX OUT port. Because the vector signal analyzer cannot measure rho directly, the modulation accuracy is measured in EVM (Error Vector Magnitude) % rms and rho is calculated from the EVM data.

Setup

Figure 8-31 CDMA Generator Modulation Accuracy Test 26



Procedure

1. On the Test Set:

   a. Press **Preset**.

   b. Press **CDMA GEN** key

   c. Set `RF Gen Freq` to 836.52 MHz.

   d. Set `CW RF` path to `IQ`.

   e. Set `Output Port` to `Dupl`.

   f. Set `Amplitude` to –10 dBM.

   g. Set `Gen Dir` to `Rev`.

2. On the Vector Signal Analyzer:
   a. Press the **Frequency** key.
   b. Set center frequency to 836.52 MHz.
   c. Set the span to 2.6 MHz.
   d. Press the **Instrument Mode** key
   e. Press the **Digital Demodulation** (F4) key
   f. Press the **Demodulation Setup** (F5) key
   g. Press the **Demodulation Format** (F1) key
   h. Press the **Standard Setups** (F7) key.
   i. Press the **CDMA Mobile** (F7) key.
   j. Press the **D** key.
3. Use the following equation to calculate rho.

$$\rho = \frac{1}{1 + EVM^2}$$

$\rho = rho$
EVM = Error Vector Magnitude (% rms)

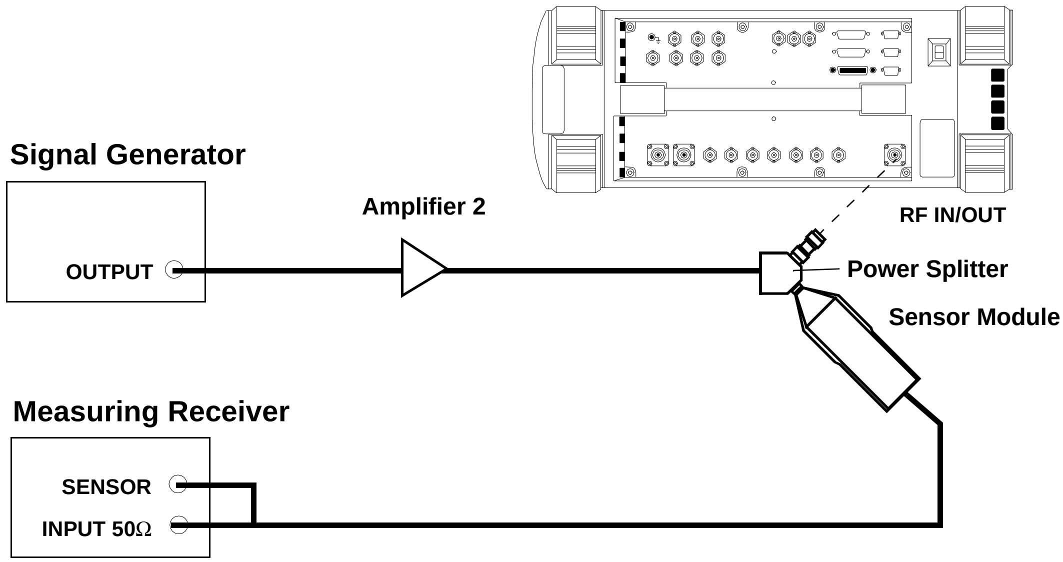
4. Compare and record the rho calculated in Table 9-27, "CDMA Generator Modulation Accuracy Test 26 Record," on page 278.
5. Set the CDMA GEN frequency on the Test Set and change the center frequency on the Vector Signal Analyzer to the 1851.25 MHz.
6. Calculate rho (using the above equation), and record the result (rho) in Table 9-27, "CDMA Generator Modulation Accuracy Test 26 Record," on page 278.

CDMA Analyzer Average Power Level Accuracy Performance Test 27

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-27, "CDMA Generator Modulation Accuracy Test 26 Record," on page 278. The CDMA average-power-level accuracy is verified by comparing the measured power in a CW signal with the power level measured by a power meter.

Setup

Figure 8-32 CDMA Analyzer Average Power Level Accuracy Test 27



Procedure

1. On the measuring receiver:
   a. Set the measurement mode to RF Power.
   b. Calibrate the power sensor.
2. On the signal generator:
   a. Set the frequency to 881.32 MHz.
   b. Set the amplitude so the measuring receiver reads 4 mW.

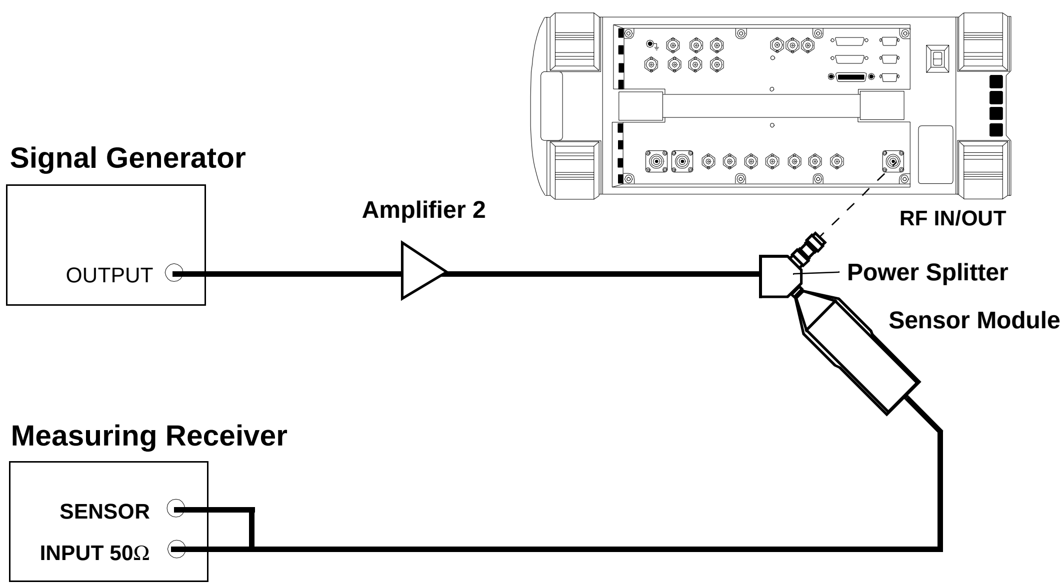
3. On the Test Set:
   a. Press **Preset**
   b. Set the `Avg Pwr Units` to `Watts`.
   c. Set **Tune Freq** to 881.32 MHz.
4. Record the `Avg Pwr` reading in the PTR (see Table 9-28, “CDMA Analyzer Average Power Level Accuracy Test 27 Record,” on page 279.
5. Repeat steps 2 and 3 for each of the frequencies and levels listed in the PTR.

CDMA Analyzer Channel Power Level Accuracy Performance Test 28

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-28, "CDMA Analyzer Average Power Level Accuracy Test 27 Record," on page 279. The tuned channel power level accuracy is verified by comparing the measured power in a CW signal with the power level measured by a measuring receiver.

Setup

Figure 8-33 CDMA Analyzer Channel Power Level Accuracy Test 28



Procedure

1. On the measuring receiver
   a. Set the display mode to LOG.
   b. Set the measurement mode to RF Level.
   c. Calibrate the power sensor.

2. On the signal generator:

    a. Set the frequency to 881.32 MHz.

    b. Set the output level so the measuring receiver reads 11 dBm

3. Push **Preset** on the Test Set.

4. On the Test Set:

    a. Change the `Avg Pwr` field to `Chan Pwr`.

    b. Set the `Tune Freq` to 881.32 MHz

    c. Select Calibrate under `Chn Pwr Cal`.

5. Record the `Chan Pwr` measurement in the PTR, see Table 9-29, "CDMA Analyzer Channel Power Level Accuracy Test 28 Record," on page 280.

6. Repeat steps 2 and 3 for each of the data points listed in the PTR.

NOTE The `Chan Pwr Cal` is only required when the frequency is changed.

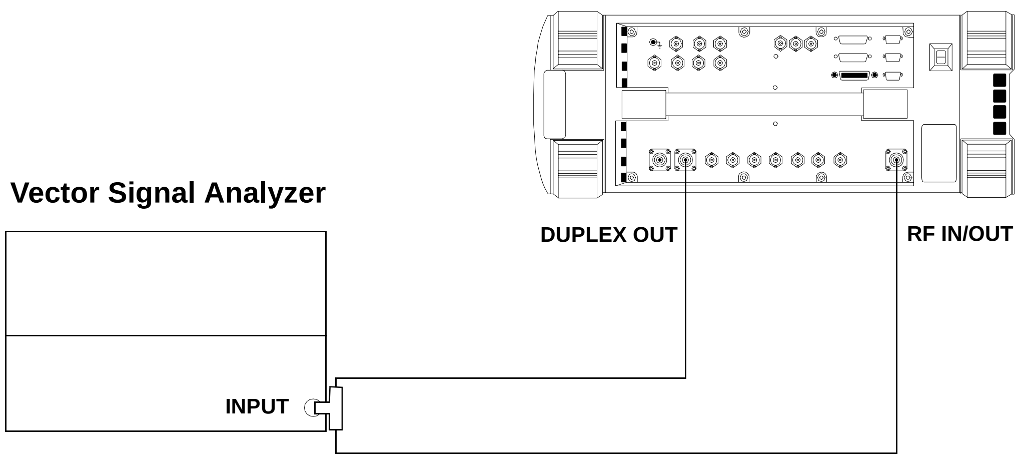
CDMA Analyzer Modulation Accuracy Performance Test 29

The purpose of this test is to verify that the Test Set meets the specification limits in PTR (Performance Test Record) Table 9-29, "CDMA Analyzer Channel Power Level Accuracy Test 28 Record," on page 280. This test verifies the performance of the Test Set's CDMA analyzer. The CDMA analyzer is performing properly if the rho values calculated as the results of the following procedure fall within the lower and upper limits specified in Table 9-29 on page 280.

To determine rho, the signal from the Test Set's CDMA generator is compared with a known-calibrated vector signal analyzer. This is done by setting the Test Set's CDMA generator in forward channel (QPSK) mode and then measuring modulation accuracy with the vector signal analyzer. Since the vector signal analyzer cannot measure rho directly, the EVM (Error Vector Magnitude) % rms is measured and rho is calculated from the EVM data.

Setup

Figure 8-34 CDMA Analyzer Modulation Accuracy Test 29



Procedure

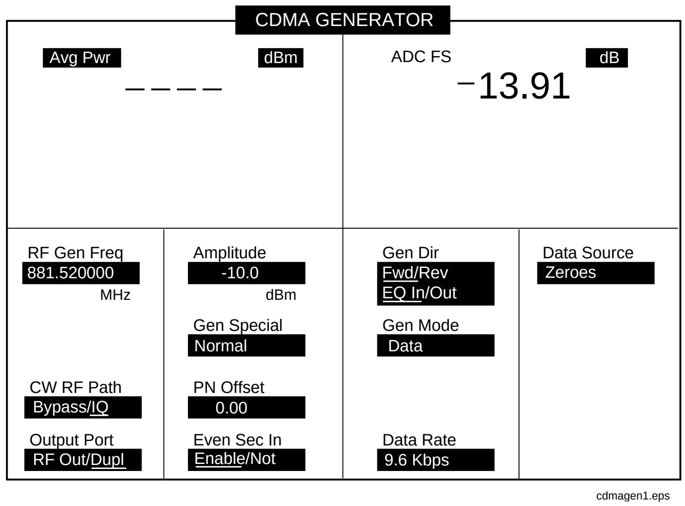
1. On the Test Set:
   a. Press the **Preset** key.
   b. Press the **CDMA Gen** key. The CDMA GENERATOR screen appears, see Figure 8-35.
   c. Set the `RF Gen Freq` to 881.52 MHz.

d. Ensure the `CW RF path` is set to `IQ`.

e. Ensure the `Output Port` is set to `Dupl`.

f. Set the `Amplitude` to −10 dBm.

Figure 8-35 CDMA GENERATOR Screen



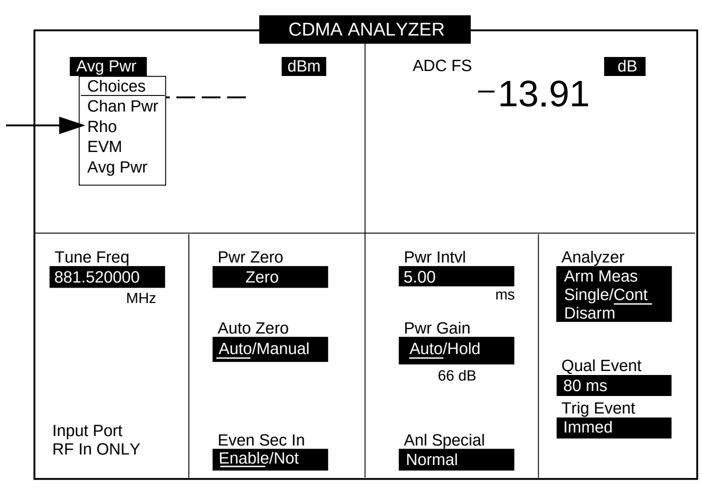
g. Set `Gen Dir` to `FWD` and `EQ In`, see Figure 8-35.

h. Press the **CDMA Anl** key. The CDMA ANALYZER screen appears, see Figure 8-36 on page 230.

i. Set the `Tune Freq` to 881.52 MHz.

j. Change measurement field from `Avg Pwr` to `Rho` see Figure 8-36 on page 230.

Figure 8-36 CDMA ANALYZER Screen



2. On the vector signal analyzer:
   a. Set the center frequency to 881.52 MHz.
   b. Set the span to 2.6 MHz.
   c. Press the **Instrument Mode** key.
   d. Press the **Digital Demodulation** (F4) key.
   e. Press the **Demodulation Setup** (F5) key.
   f. Press the **Demodulation Format** (F1) key.
   g. Press the **Standard Setups** (F7) key.
   h. Press the **CDMA Base** (F6) key.
   i. Press the **D** display button.
3. Use the following formula to calculate rho.

$$\rho = \frac{1}{1 + EVM^2}$$

ρ = *rho*
EVM = Error Vector Magnitude (%rms)

4. Compare and record the result in PTR Table 9-29, "CDMA Analyzer Channel Power Level Accuracy Test 28 Record," on page 280.
5. Repeat the previous steps for a frequency of 1851.25 MHz and record the results in PTR Table 9-29, "CDMA Analyzer Channel Power Level Accuracy Test 28 Record," on page 280.

9 Performance Test Records

Use this chapter to record the results of the performance tests in Chapter 8 , “Performance Tests,” on page 173.

RF Generator FM Distortion Performance Test 1 Record

For test procedure, see "RF Generator FM Distortion Performance Test 1" on page 178.

Table 9-1 RF Generator FM Distortion Test 1 Record

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	FM Distortion Limits (%)	
				Upper	Actual
−10	10	99	1	0.50	
−10	10	5	1	0.50	
−10	312.5	5	1	0.50	
−10	425	50	1	0.50	
−10	501	99	1	0.50	
−10	501	50	1	0.50	
−10	501	5	1	0.50	
−10	568.75	50	1	0.50	
−10	656.25	99	1	0.50	
−10	656.25	50	1	0.50	
−10	656.25	5	1	0.50	
−10	750	99	1	0.50	
−10	750	50	1	0.50	
−10	750	5	1	0.50	
−10	856.25	99	1	0.50	
−10	856.25	50	1	0.50	
−10	856.25	5	1	0.50	
−10	956.25	50	1	0.50	
−10	976.002	5	1	0.50	
−10	1000	99	1	0.50	
−10	1000	50	1	0.50	
−10	1000	11	1	0.50	
−10	1000	5	1	0.50	

Table 9-1 RF Generator FM Distortion Test 1 Record

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	FM Distortion Limits (%)	
				Upper	Actual
–10	1000	6	1	0.50	
–10	1000	7	1	0.50	
–10	1000	8	1	0.50	
–10	1000	9	1	0.50	
–10	998.401	8	1	0.50	
–10	768.001	8	1	0.50	
– 0	512.001	8	1	0.50	
–10	511.601	8	1	0.50	
–10	511.201	8	1	0.50	
The following entries are for the 2 GHz setup.					
–10	1700	99	1	1.00	
–10	1700	50	1	1.00	
–10	1700	5	1	1.00	
–10	2000	99	1	1.00	
–10	2000	50	1	1.00	
–10	2000	5	1	1.00	

RF Generator FM Accuracy Performance Test 2 Record

For test procedure, see "RF Generator FM Accuracy Performance Test 2" on page 181.

Table 9-2 RF Generator FM Accuracy Test 2 Record

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	FM Deviation Limits (kHz)		
				Lower	Upper	Actual
–10	10	99	1	95.035	102.965	
–10	10	3	1	2.845	3.155	
–10	312.5	3	1	2.845	3.155	
–10	425	50	1	47.750	52.25	
–10	501	99	1	95.035	102.965	
–10	501	50	1	47.750	52.25	
–10	501	3	1	2.845	3.155	
–10	568.75	50	1	47.750	52.25	
–10	656.25	99	1	95.035	102.965	
–10	656.25	50	1	47.750	52.25	
–10	656.25	3	1	2.845	3.155	
–10	750	99	1	95.035	102.965	
–10	750	50	1	47.750	52.25	
–10	750	3	1	2.845	3.155	
–10	856.25	99	1	95.035	102.965	
–10	856.25	50	1	47.750	52.25	
–10	856.25	3	1	2.845	3.155	
–10	956.25	50	1	47.750	52.25	
–10	976.002	3	1	2.845	3.155	
–10	1000	99	1	95.035	102.965	
–10	1000	50	1	47.750	52.25	
–10	1000	11	1	10.115	11.885	

Table 9-2 RF Generator FM Accuracy Test 2 Record

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	FM Deviation Limits (kHz)		
				Lower	Upper	Actual
-10	1000	3	1	2.845	3.155	
The following entries are for the 2 GHz setup.						
–10	1700	99	1	95.035	102.965	
–10	1700	50	1	47.750	52.25	
–10	1700	3	1	2.845	3.155	
–10	2000	99	1	95.035	102.965	
–10	2000	50	1	47.750	52.25	
–10	2000	3	1	2.845	3.155	

RF Generator FM Flatness Performance Test 3 Record

For test procedure, see "RF Generator FM Flatness Performance Test 3" on page 184.

Table 9-3 RF Generator FM Flatness Test 3 Record

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Computed FM Flatness Limits (dB)		Measured Reading (kHz)	Computed Results (dB)
				Lower	Upper	Reading	Computed
–10	521	50	1	Reference			0 dB
–10	521	50	0.1	–1	1		
–10	521	50	0.2	–1	1		
–10	521	50	2	–1	1		
–10	521	50	10	–1	1		
–10	521	50	25	–1	1		
–10	975.5	50		Reference			0 dB
–10	975.5	50	0.1	–1	1		
–10	975.5	50	0.2	–1	1		
–10	975.5	50	2	–1	1		
–10	975.5	50	10	–1	1		
–10	975.5	50	25	–1	1		
The following entries are for the 2 GHz setup.							
–10	1700	50		Reference			0 dB
–10	1700	50	0.1	–1	1		
–10	1700	50	0.2	–1	1		
–10	1700	50	2	–1	1		
–10	1700	50	10	–1	1		
–10	1700	50	25	–1	1		
–10	2000	50		Reference			0 dB
–10	2000	50	0.1	–1	1		

Table 9-3 RF Generator FM Flatness Test 3 Record

Level (dBm)	RF (MHz)	Deviation (kHz)	Rate (kHz)	Computed FM Flatness Limits (dB)		Measured Reading (kHz)	Computed Results (dB)
				Lower	Upper	Reading	Computed
–10	2000	50	0.2	–1	1		
–10	2000	50	2	–1	1		
–10	2000	50	10	–1	1		
–10	2000	50	25	–1	1		

RF Generator Residual FM Performance Test 4 Record

For test procedure, see "RF Generator Residual FM Performance Test 4" on page 187.

Table 9-4 RF Generator Residual FM Test 4 Record

LO (MHz)	RF (MHz)	Residual FM Limits (Hz)	
		Upper	Actual
11.5	10	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	
901.5	900	7	
999.901	998.401	7	

Table 9-4 RF Generator Residual FM Test 4 Record

LO (MHz)	RF (MHz)	Residual FM Limits (Hz)	
		Upper	Actual
1001.5	1000	7	
The following entries are for the 2 GHz setup.			
201.5	1700	14	
501.5	2000	14	

RF Generator Level Accuracy Performance Test 5 Record

For test procedure, see "RF Generator Level Accuracy Performance Test 5" on page 190.

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
The following entries are for Procedure 1.					
DUPLEX OUT	3	–10	–11.500	–8.500	
DUPLEX OUT	3	–15	–16.500	–13.500	
DUPLEX OUT	3	–20	–21.500	–18.500	
DUPLEX OUT	3	–25	–26.500	–23.500	
DUPLEX OUT	3	–30	–31.500	–28.500	
DUPLEX OUT	3	–35	–36.500	–33.500	
DUPLEX OUT	3	–40	–41.500	–38.500	
DUPLEX OUT	3	–45	–46.500	–43.500	
DUPLEX OUT	3	–50	–51.500	–48.500	
DUPLEX OUT	3	–55	–56.500	–53.500	
DUPLEX OUT	3	–60	–61.500	–58.500	
DUPLEX OUT	3	–65	–66.500	–63.500	
DUPLEX OUT	3	–70	–71.500	–68.500	
DUPLEX OUT	3	–75	–76.500	–73.500	
DUPLEX OUT	3	–80	–81.500	–78.500	
DUPLEX OUT	3	–85	–86.500	–83.500	
DUPLEX OUT	3	–90	–91.500	–88.500	
DUPLEX OUT	3	–95	–96.500	–93.500	
DUPLEX OUT	3	–100	–101.500	–98.500	
DUPLEX OUT	3	–105	–106.500	–103.500	
DUPLEX OUT	3	–110	–111.500	–108.500	
DUPLEX OUT	3	–115	–116.500	–113.500	

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
DUPLEX OUT	3	–120	–121.500	–118.500	
DUPLEX OUT	3	–125	–126.500	–123.500	
RF IN/OUT	3	–40	–41.000	–39.000	
RF IN/OUT	3	–45	–46.000	–44.000	
RF IN/OUT	3	–50	–51.000	–49.000	
RF IN/OUT	3	–55	–56.000	–54.000	
RF IN/OUT	3	–60	–61.000	–59.000	
RF IN/OUT	3	–65	–66.000	–64.000	
RF IN/OUT	3	–70	–71.000	–69.000	
RF IN/OUT	3	–75	–76.000	–74.000	
RF IN/OUT	3	–80	–81.000	–79.000	
RF IN/OUT	3	–85	–86.000	–84.000	
RF IN/OUT	3	–90	–91.000	–89.000	
RF IN/OUT	3	–95	–96.000	–94.000	
RF IN/OUT	3	–100	–101.000	–99.000	
RF IN/OUT	3	–105	–106.000	–104.000	
RF IN/OUT	3	–110	–111.000	–109.000	
RF IN/OUT	3	–115	–116.000	–114.000	
RF IN/OUT	3	–120	–121.000	–119.000	
RF IN/OUT	3	–125	–126.000	–124.000	
DUPLEX OUT	687.5	–10	–11.500	–8.500	
DUPLEX OUT	687.5	–15	–16.500	–13.500	
DUPLEX OUT	687.5	–20	–21.500	–18.500	
DUPLEX OUT	687.5	–25	–26.500	–23.500	
DUPLEX OUT	687.5	–30	–31.500	–28.500	
DUPLEX OUT	687.5	–35	–36.500	–33.500	
DUPLEX OUT	687.5	–40	–41.500	–38.500	
DUPLEX OUT	687.5	–45	–46.500	–43.500	

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
DUPLEX OUT	687.5	–50	–51.500	–48.500	
DUPLEX OUT	687.5	–55	–56.500	–53.500	
DUPLEX OUT	687.5	–60	–61.500	–58.500	
DUPLEX OUT	687.5	–65	–66.500	–63.500	
DUPLEX OUT	687.5	–70	–71.500	–68.500	
DUPLEX OUT	687.5	–75	–76.500	–73.500	
DUPLEX OUT	687.5	–80	–81.500	–78.500	
DUPLEX OUT	687.5	–85	–86.500	–83.500	
DUPLEX OUT	687.5	–90	–91.500	–88.500	
DUPLEX OUT	687.5	–95	–96.500	–93.500	
DUPLEX OUT	687.5	–100	–101.500	–98.500	
DUPLEX OUT	687.5	–105	–106.500	–103.500	
DUPLEX OUT	687.5	–110	–111.500	–108.500	
DUPLEX OUT	687.5	–115	–116.500	–113.500	
DUPLEX OUT	687.5	–120	–121.500	–118.500	
DUPLEX OUT	687.5	–125	–126.500	–123.500	
RF IN/OUT	687.5	–40	–41.000	–39.000	
RF IN/OUT	687.5	–45	–46.000	–44.000	
RF IN/OUT	687.5	–50	–51.000	–49.000	
RF IN/OUT	687.5	–55	–56.000	–54.000	
RF IN/OUT	687.5	–60	–61.000	–59.000	
RF IN/OUT	687.5	–65	–66.000	–64.000	
RF IN/OUT	687.5	–70	–71.000	–69.000	
RF IN/OUT	687.5	–75	–76.000	–74.000	
RF IN/OUT	687.5	–80	–81.000	–79.000	
RF IN/OUT	687.5	–85	–86.000	–84.000	
RF IN/OUT	687.5	–90	–91.000	–89.000	
RF IN/OUT	687.5	–95	–96.000	–94.000	

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
RF IN/OUT	687.5	–100	–101.000	–99.000	
RF IN/OUT	687.5	–105	–106.000	–104.000	
RF IN/OUT	687.5	–110	–111.000	–109.000	
RF IN/OUT	687.5	–115	–116.000	–114.000	
RF IN/OUT	687.5	–120	–121.000	–119.000	
RF IN/OUT	687.5	–125	–126.000	–124.000	
DUPLEX OUT	1000	–10	–11.500	–8.500	
DUPLEX OUT	1000	–15	–16.500	–13.500	
DUPLEX OUT	1000	–20	–21.500	–18.500	
DUPLEX OUT	1000	–25	–26.500	–23.500	
DUPLEX OUT	1000	–30	–31.500	–28.500	
DUPLEX OUT	1000	–35	–36.500	–33.500	
DUPLEX OUT	1000	–40	–41.500	–38.500	
DUPLEX OUT	1000	–45	–46.500	–43.500	
DUPLEX OUT	1000	–50	–51.500	–48.500	
DUPLEX OUT	1000	–55	–56.500	–53.500	
DUPLEX OUT	1000	–60	–61.500	–58.500	
DUPLEX OUT	1000	–65	–66.500	–63.500	
DUPLEX OUT	1000	–70	–71.500	–68.500	
DUPLEX OUT	1000	–75	–76.500	–73.500	
DUPLEX OUT	1000	–80	–81.500	–78.500	
DUPLEX OUT	1000	–85	–86.500	–83.500	
DUPLEX OUT	1000	–90	–91.500	–88.500	
DUPLEX OUT	1000	–95	–96.500	–93.500	
DUPLEX OUT	1000	–100	–101.500	–98.500	
DUPLEX OUT	1000	–105	–106.500	–103.500	
DUPLEX OUT	1000	–110	–111.500	–108.500	
DUPLEX OUT	1000	–115	–116.500	–113.500	

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
DUPLEX OUT	1000	–120	–121.500	–118.500	
DUPLEX OUT	1000	–125	–126.500	–123.500	
RF IN/OUT	1000	–40	–41.000	–39.000	
RF IN/OUT	1000	–45	–46.000	–44.000	
RF IN/OUT	1000	–50	–51.000	–49.000	
RF IN/OUT	1000	–55	–56.000	–54.000	
RF IN/OUT	1000	–60	–61.000	–59.000	
RF IN/OUT	1000	–65	–66.000	–64.000	
RF IN/OUT	1000	–70	–71.000	–69.000	
RF IN/OUT	1000	–75	–76.000	–74.000	
RF IN/OUT	1000	–80	–81.000	–79.000	
RF IN/OUT	1000	–85	–86.000	–84.000	
RF IN/OUT	1000	–90	–91.000	–89.000	
RF IN/OUT	1000	–95	–96.000	–94.000	
RF IN/OUT	1000	–100	–101.000	–99.000	
RF IN/OUT	1000	–105	–106.000	–104.000	
RF IN/OUT	1000	–110	–111.000	–109.000	
RF IN/OUT	1000	–115	–116.000	–114.000	
RF IN/OUT	1000	–120	–121.000	–119.000	
RF IN/OUT	1000	–125	–126.000	–124.000	
The following entries are for the 2 GHz setup					
DUPLEX OUT	1700	–10	–11.500	–8.500	
DUPLEX OUT	1700	–15	–16.500	–13.500	
DUPLEX OUT	1700	–20	–21.500	–18.500	
DUPLEX OUT	1700	–25	–26.500	–23.500	
DUPLEX OUT	1700	–30	–31.500	–28.500	
DUPLEX OUT	1700	–35	–36.500	–33.500	
DUPLEX OUT	1700	–40	–41.500	–38.500	

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
DUPLEX OUT	1700	–45	–46.500	–43.500	
DUPLEX OUT	1700	–50	–51.500	–48.500	
DUPLEX OUT	1700	–55	–56.500	–53.500	
DUPLEX OUT	1700	–60	–61.500	–58.500	
DUPLEX OUT	1700	–65	–66.500	–63.500	
DUPLEX OUT	1700	–70	–71.500	–68.500	
DUPLEX OUT	1700	–75	–76.500	–73.500	
DUPLEX OUT	1700	–80	–81.500	–78.500	
DUPLEX OUT	1700	–85	–86.500	–83.500	
DUPLEX OUT	1700	–90	–91.500	–88.500	
DUPLEX OUT	1700	–95	–96.500	–93.500	
DUPLEX OUT	1700	–100	–101.500	–98.500	
DUPLEX OUT	1700	–105	–106.500	–103.500	
DUPLEX OUT	1700	–110	–111.500	–108.500	
DUPLEX OUT	1700	–115	–116.500	–113.500	
DUPLEX OUT	1700	–120	–121.500	–118.500	
DUPLEX OUT	1700	–125	–126.500	–123.500	
RF IN/OUT	1700	–40	–41.000	–39.000	
RF IN/OUT	1700	–45	–46.000	–44.000	
RF IN/OUT	1700	–50	–51.000	–49.000	
RF IN/OUT	1700	–55	–56.000	–54.000	
RF IN/OUT	1700	–60	–61.000	–59.000	
RF IN/OUT	1700	–65	–66.000	–64.000	
RF IN/OUT	1700	–70	–71.000	–69.000	
RF IN/OUT	1700	–75	–76.000	–74.000	
RF IN/OUT	1700	–80	–81.000	–79.000	
RF IN/OUT	1700	–85	–86.000	–84.000	
RF IN/OUT	1700	–90	–91.000	–89.000	

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
RF IN/OUT	1700	–95	–96.000	–94.000	
RF IN/OUT	1700	–100	–101.000	–99.000	
RF IN/OUT	1700	–105	–106.000	–104.000	
RF IN/OUT	1700	–110	–111.000	–109.000	
RF IN/OUT	1700	–115	–116.000	–114.000	
RF IN/OUT	1700	–120	–121.000	–119.000	
RF IN/OUT	1700	–125	–126.000	–124.000	
DUPLEX OUT	2000	–10	–11.500	–8.500	
DUPLEX OUT	2000	–15	–16.500	–13.500	
DUPLEX OUT	2000	–20	–21.500	–18.500	
DUPLEX OUT	2000	–25	–26.500	–23.500	
DUPLEX OUT	2000	–30	–31.500	–28.500	
DUPLEX OUT	2000	–35	–36.500	–33.500	
DUPLEX OUT	2000	–40	–41.500	–38.500	
DUPLEX OUT	2000	–45	–46.500	–43.500	
DUPLEX OUT	2000	–50	–51.500	–48.500	
DUPLEX OUT	2000	–55	–56.500	–53.500	
DUPLEX OUT	2000	–60	–61.500	–58.500	
DUPLEX OUT	2000	–65	–66.500	–63.500	
DUPLEX OUT	2000	–70	–71.500	–68.500	
DUPLEX OUT	2000	–75	–76.500	–73.500	
DUPLEX OUT	2000	–80	–81.500	–78.500	
DUPLEX OUT	2000	–85	–86.500	–83.500	
DUPLEX OUT	2000	–90	–91.500	–88.500	
DUPLEX OUT	2000	–95	–96.500	–93.500	
DUPLEX OUT	2000	–100	–101.500	–98.500	
DUPLEX OUT	2000	–105	–106.500	–103.500	
DUPLEX OUT	2000	–110	–111.500	–108.500	

Table 9-5 RF Generator Level Accuracy Test 5 Record

Port	RF (MHz)	Level (dBm)	Level Limits (dBm)		
			Lower	Upper	Actual
DUPLEX OUT	2000	–115	–116.500	–113.500	
DUPLEX OUT	2000	–120	–121.500	–118.500	
DUPLEX OUT	2000	–125	–126.500	–123.500	
RF IN/OUT	2000	–40	–41.000	–39.000	
RF IN/OUT	2000	–45	–46.000	–44.000	
RF IN/OUT	2000	–50	–51.000	–49.000	
RF IN/OUT	2000	–55	–56.000	–54.000	
RF IN/OUT	2000	–60	–61.000	–59.000	
RF IN/OUT	2000	–65	–66.000	–64.000	
RF IN/OUT	2000	–70	–71.000	–69.000	
RF IN/OUT	2000	–75	–76.000	–74.000	
RF IN/OUT	2000	–80	–81.000	–79.000	
RF IN/OUT	2000	–85	–86.000	–84.000	
RF IN/OUT	2000	–90	–91.000	–89.000	
RF IN/OUT	2000	–95	–96.000	–94.000	
RF IN/OUT	2000	–100	–101.000	–99.000	
RF IN/OUT	2000	–105	–106.000	–104.000	
RF IN/OUT	2000	–110	–111.000	–109.000	
RF IN/OUT	2000	–115	–116.000	–114.000	
RF IN/OUT	2000	–120	–121.000	–119.000	
RF IN/OUT	2000	–125	–126.000	–124.000	

RF Generator Harmonics Spectral Purity Performance Test 6 Record

For test procedure, see "RF Generator Harmonics Spectral Purity Performance Test 6" on page 195.

Table 9-6 RF Generator Harmonics Spectral Purity Test 6 Record

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-10	1	2nd	–25.000	
-10	1	3rd	–25.000	
-10	2	2nd	–25.000	
-10	2	3rd	–25.000	
-10	5	2nd	–25.000	
-10	5	3rd	–25.000	
-10	10	2nd	–25.000	
-10	10	3rd	–25.000	
-10	20	2nd	–25.000	
-10	20	3rd	–25.000	
-10	50	2nd	–25.000	
-10	50	3rd	–25.000	
-10	100	2nd	–25.000	
-10	100	3rd	–25.000	
-10	200	2nd	–25.000	
-10	200	3rd	–25.000	
-10	300	2nd	–25.000	
-10	300	3rd	–25.000	
-10	400	2nd	–25.000	
-10	400	3rd	–25.000	
-10	500	2nd	–25.000	
-10	500	3rd	–25.000	
-10	600	2nd	–25.000	

Table 9-6 RF Generator Harmonics Spectral Purity Test 6 Record

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-10	600	3rd	–25.000	
-10	700	2nd	–25.000	
-10	700	3rd	–25.000	
-10	800	2nd	–25.000	
-10	800	3rd	–25.000	
-10	900	2nd	–25.000	
-10	900	3rd	–25.000	
-10	1000	2nd	–25.000	
-10	1000	3rd	–25.000	
-10	1700	2nd	–25.000	
-10	1700	3rd	–25.000	
-10	1800	2nd	–25.000	
-10	1800	3rd	–25.000	
-10	1900	2nd	–25.000	
-10	1900	3rd	–25.000	
-10	2000	2nd	–25.000	
-10	2000	3rd	–25.000	
-11	1	2nd	–25.000	
-11	1	3rd	–25.000	
-11	2	2nd	–25.000	
-11	2	3rd	–25.000	
-11	5	2nd	–25.000	
-11	5	3rd	–25.000	
-11	10	2nd	–25.000	
-11	10	3rd	–25.000	
-11	20	2nd	–25.000	
-11	20	3rd	–25.000	
-11	50	2nd	–25.000	

Table 9-6 RF Generator Harmonics Spectral Purity Test 6 Record

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
-11	50	3rd	–25.000	
–11	100	2nd	–25.000	
–11	100	3rd	–25.000	
–11	200	2nd	–25.000	
–11	200	3rd	–25.000	
–11	300	2nd	–25.000	
–11	300	3rd	–25.000	
–11	400	2nd	–25.000	
–11	400	3rd	–25.000	
–11	500	2nd	–25.000	
–11	500	3rd	–25.000	
–11	600	2nd	–25.000	
–11	600	3rd	–25.000	
–11	700	2nd	–25.000	
–11	700	3rd	–25.000	
–11	800	2nd	–25.000	
–11	800	3rd	–25.000	
–11	900	2nd	–25.000	
–11	900	3rd	–25.000	
–11	1000	2nd	–25.000	
–11	1000	3rd	–25.000	
–12	1700	2nd	–25.000	
–12	1700	3rd	–25.000	
–12	1800	2nd	–25.000	
–12	1800	3rd	–25.000	
–12	1900	2nd	–25.000	
–12	1900	3rd	–25.000	
–12	2000	2nd	–25.000	

Table 9-6 RF Generator Harmonics Spectral Purity Test 6 Record

Level (dBm)	RF Freq (MHz)	Harmonic Number	Harmonic Limits (dBc)	
			Upper	Actual
–12	2000	3rd	–25.000	

RF Generator Spurious Spectral Purity Performance Test 7 Record

For test procedure, see "RF Generator Spurious Spectral Purity Performance Test 7" on page 196.

Table 9-7 RF Generator Spurious Spectral Purity Test 7 Record

Spurious Source	Level (dBm)	RF Freq (MHz)	Spur Freq (MHz)	Spurious Signal Limits (dBc)	
				Upper	Actual
3/2 Mixer	–10	242	274	–45.000	
3/2 Mixer	–10	247	259	–45.000	
Supply	–11	100	100.03	–45.000	
Supply	–11	400	400.03	–60.000	
Supply	–11	501	501.03	–60.000	
Supply	–11	1000	999.97	–60.000	
RF Feedthru	–11	1	999	–45.000	
LO Feedthru	–11	1	1000	–45.000	
RF Feedthru	–11	11	989	–45.000	
RF Feedthru	–11	21	979	–45.000	
RF Feedthru	–11	41	959	–45.000	
RF Feedthru	11	61	939	–45.000	
RF Feedthru	–11	81	919	–45.000	
RF Feedthru	–11	91	909	–45.000	
RF Feedthru	–11	101	899	–45.000	
RF Feedthru	–11	111	889	–45.000	
RF Feedthru	–11	121	879	–45.000	
3/2 Mixer	–11	242	274	–45.000	
3/2 Mixer	–11	247	259	–45.000	
4/3 Mixer	–11	242	32	–45.000	
4/3 Mixer	–11	247	12	–45.000	
5/4 Mixer	–11	211	55	–45.000	
5/4 Mixer	–11	217	85	–45.000	

Table 9-7 RF Generator Spurious Spectral Purity Test 7 Record

Spurious Source	Level (dBm)	RF Freq (MHz)	Spur Freq (MHz)	Spurious Signal Limits (dBc)	
				Upper	Actual
5/4 Mixer	–11	221	105	–45.000	
5/4 Mixer	–11	227	135	–45.000	
5/4 Mixer	–11	231	155	–45.000	
5/4 Mixer	–11	237	185	–45.000	
Ref 10 MHz	–11	165	175	–45.000	
Ref 1 MHz	–11	150	150.2	–45.000	
Ref 1 MHz	–11	150	149.8	–45.000	
Ref 1 MHz	–11	150	150.4	–45.000	
Ref 1 MHz	–11	150	149.6	–45.000	
Ref 1 MHz	–11	150	150.6	–45.000	
Reference	–11	150	149.4	–45.000	
Signal Feedthru	–10	1700	1000	–55.000	
Signal Feedthru	–10	1700	2000	–55.000	
LO Feedthru	–10	1700	2700	–55.000	
Signal Feedthru	–10	1851	800	–55.000	
Signal Feedthru	–10	1851	1600	–55.000	
LO Feedthru	–10	1851	1651	–55.000	

AF Generator AC Level Accuracy Performance Test 8 Record

For test procedure, see “AF Generator AC Level Accuracy Performance Test 8” on page 197.

Table 9-8 AF Generator AC Level Accuracy Test 8 Record

AF Generator	Frequency (Hz)	Level (mV)	AC Level 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	
2	1000	75	70.000	80.000	
2	100	4000	3885.000	4115.000	
2	100	700	682.500	717.500	

Table 9-8 AF Generator AC Level Accuracy Test 8 Record

AF Generator	Frequency (Hz)	Level (mV)	AC Level Limits (mV)		
			Lower	Upper	Actual
2	100	75	70.000	80.000	

AF Generator DC Level Accuracy Performance Test 9 Record

For test procedure, see "AF Generator DC Level Accuracy Performance Test 9" on page 198.

Table 9-9 AF Generator DC Level Accuracy Test 9 Record

AF Generator	Level (mV)	DC Level 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	

AF Generator Residual Distortion Performance Test 10 Record

For test procedure, see "AF Generator Residual Distortion Performance Test 10" on page 199.

Table 9-10 AF Generator Residual Distortion Test 10 Record

AF Generator	Frequency (Hz)	Level (mV)	Distortion Limits (%)	
			Upper	Actual
1	25000	4000	0.125	
1	25000	2000	0.125	
1	25000	200	0.125	
1	10000	4000	0.125	
1	10000	2000	0.125	
1	10000	200	0.125	
1	1000	4000	0.125	
1	1000	2000	0.125	
1	1000	200	0.125	
1	100	4000	0.125	
1	100	2000	0.125	
1	100	200	0.125	
2	25000	4000	0.125	
2	25000	2000	0.125	
2	25000	200	0.125	
2	10000	4000	0.125	
2	10000	2000	0.125	
2	10000	200	0.125	
2	1000	4000	0.125	
2	1000	2000	0.125	
2	1000	200	0.125	
2	100	4000	0.125	
2	100	2000	0.125	

Table 9-10 AF Generator Residual Distortion Test 10 Record

AF Generator	Frequency (Hz)	Level (mV)	Distortion Limits (%)	
			Upper	Actual
2	100	200	0.125	

AF Generator Frequency Accuracy Performance Test 11 Record

For test procedure, see "AF Generator Frequency Accuracy Performance Test 11" on page 200.

Table 9-11 AF Generator Frequency Accuracy Test 11 Record

AF Generator	Frequency (Hz)	Frequency Limits (Hz)		
		Lower	Upper	Actual
1	25000	24993.750	25006.250	
1	10000	9997.500	10002.500	
1	5000	4998.750	500.125	
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	500.125	
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	

AF Analyzer AC Level Accuracy Performance Test 12 Record

For test procedure, see "AF Analyzer AC Level Accuracy Performance Test 12" on page 201.

Table 9-12 AF Analyzer AC Voltage Accuracy Test 12 Record

Frequency (Hz)	Level (mV)	AC Voltage Limits (mV)		
		Lower	Upper	Actual
15000	5000	4849.550	5150.450	
2000	5000	4849.550	5150.450	
200	5000	4849.550	5150.450	
20	5000	4849.550	5150.450	
15000	500	484.550	515.450	
2000	500	484.550	515.450	
200	500	484.550	515.450	
20	500	484.550	515.450	
15000	50	48.050	51.950	
2000	50	48.050	51.950	
200	50	48.050	51.950	
20	50	48.050	51.950	

AF Analyzer Residual Noise Performance Test 13 Record

For test procedure, see "AF Analyzer Distortion and SINAD Accuracy Performance Test 14" on page 203.

Table 9-13 AF Analyzer Residual Noise Test 13 Record

Residual Noise Limits (μV)		
Filter 2	**Upper**	**Actual**
15 kHz LPF	150	
>99 kHz LP	450	

AF Analyzer Distortion and SINAD Accuracy Performance Test 14 Record

For test procedure, see "AF Analyzer Distortion and SINAD Accuracy Performance Test 14" on page 203.

Table 9-14 AF Analyzer Distortion and SINAD Accuracy Test 14 Record

AF Generator 2 Frequency (kHz)	AF Generator 2 Level (mV)	Measurement Type	Distortion and SINAD Limits		
			Lower	Upper	Actual
2	100	Distortion	8.856%	11.144%	
2	100	SINAD	19.043 dB	21.043 dB	
3	100	Distortion	8.856%	11.144%	
3	100	SINAD	19.043 dB	21.043 dB	
2	10	Distortion	0.890%	1.120%	
2	10	SINAD	39.000 dB	41.000 dB	
3	10	Distortion	0.890%	1.120%	
3	10	SINAD	39.000 dB	41.000 dB	
2	5	Distortion	0.445%	0.560%	
2	5	SINAD	45.021 dB	47.021 dB	
3	5	Distortion	0.445%	0.560%	
3	5	SINAD	45.021 dB	47.021 dB	

AF Analyzer DC Level Accuracy Performance Test 15 Record

For test procedure, see "AF Analyzer DC Level Accuracy Performance Test 15" on page 204.

Table 9-15 AF Analyzer DC Level Accuracy Test 15 Record

AF Generator 1 Level (mV)	DC Voltage Limits (mV)		
	Lower	Upper	Actual
5000	4905.000	5095.000	
500	450.000	550.000	

AF Analyzer Frequency Accuracy to 100 kHz Performance Test 16 Record

For test procedure, see "AF Analyzer Frequency Accuracy to 100 kHz Performance Test 16" on page 205.

Table 9-16 AF Analyzer Frequency Accuracy to 100 kHz Test 16 Record

Frequency (Hz)	Frequency Limits (Hz)		
	Lower	Upper	Actual
20	19.896	20.104	
100	99.880	100.120	
1000	999.700	1000.300	
10000	9997.90	10002.10	
100000	99979.9	100020.1	

AF Analyzer Frequency Accuracy at 400 kHz Performance Test 17 Record

For test procedure, see "AF Analyzer Frequency Accuracy at 400 kHz Performance Test 17" on page 206.

Table 9-17 AF Analyzer Frequency Accuracy at 400 kHz Test 17 Record

Frequency Difference Limits (kHz)		
Lower	**Upper**	**Actual**
–0.080	0.080	

Oscilloscope Amplitude Accuracy Performance Test 18 Record

For test procedure, see "Oscilloscope Amplitude Accuracy Performance Test 18" on page 208.

Table 9-18 Oscilloscope Amplitude Accuracy Test 18 Record

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

RF Analyzer Level Accuracy Performance Test 19 Record

For test procedure, see “RF Analyzer Level Accuracy Performance Test 19” on page 210.

Table 9-19 RF Analyzer Level Accuracy Test 19 Record

Frequency (MHz)	Level Difference Limits (dB)		
	Lower	Upper	Actual
30	–0.531	0.531	
50	–0.531	0.531	
100	–0.531	0.531	
150	–0.531	0.531	
200	–0.531	0.531	
250	–0.531	0.531	
300	–0.531	0.531	
350	–0.531	0.531	
400	–0.531	0.531	
450	–0.531	0.531	
500	–0.531	0.531	
550	–0.531	0.531	
600	–0.531	0.531	
650	–0.531	0.531	
700	–0.531	0.531	
750	–0.531	0.531	
800	–0.531	0.531	
850	–0.531	0.531	
900	–0.531	0.531	
950	–0.531	0.531	
1000	–0.531	0.531	
1700	–0.531	0.531	
1725	–0.531	0.531	

Table 9-19 RF Analyzer Level Accuracy Test 19 Record

Frequency (MHz)	Level Difference Limits (dB)		
	Lower	Upper	Actual
1750	–0.531	0.531	
1775	–0.531	0.531	
1800	–0.531	0.531	
1825	–0.531	0.531	
1850	–0.531	0.531	
1875	–0.531	0.531	
1900	–0.531	0.531	
1925	–0.531	0.531	
1950	–0.531	0.531	
1975	–0.531	0.531	
2000	–0.531	0.531	

RF Analyzer FM Accuracy Performance Test 20 Record

For test procedure, see "RF Analyzer FM Accuracy Performance Test 20" on page 211.

Table 9-20 RF Analyzer FM Accuracy Test 20 Record

RF (MHz)	Deviation (kHz)	Rate (Hz)	FM Deviation Limits (kHz)		
			Lower	Upper	Actual
12.5	1	50	0.960	1.040	
12.5	1	1000	0.960	1.040	
12.5	1	25000	0.960	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	

RF Analyzer FM Distortion Performance Test 21 Record

For test procedure, see "RF Analyzer FM Distortion Performance Test 21" on page 213.

Table 9-21 RF Analyzer FM Distortion Test 21 Record

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

RF Analyzer FM Bandwidth Performance Test 22 Record

For test procedure, see “RF Analyzer FM Bandwidth Performance Test 22” on page 215.

Table 9-22 RF Analyzer FM Bandwidth Test 22 Record

FM Deviation Difference Limits (dB)	
Upper	**Actual**
3.0	

RF Analyzer Residual FM Performance Test 23 Record

For test procedure, see "RF Analyzer Residual FM Performance Test 23" on page 217.

Table 9-23 RF Analyzer Residual FM Test 23 Record

FM Deviation Limits (Hz)	
Upper	**Actual**
7.0	

Spectrum Analyzer Image Rejection Performance Test 24 Record

For test procedure, see "Spectrum Analyzer Image Rejection Performance Test 24" on page 219.

Table 9-24 Spectrum Analyzer Image Rejection (Image) Test 24 Record

RF Generator Frequency (MHz)	Spectrum Analyzer Frequency (MHz)	Image Response Limits (dB)	
		Upper	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 9-25 Spectrum Analyzer Image Rejection (Residual) Test 24 Record

Spectrum Analyzer Center Frequency (MHz)	Residual Response Limits (dBm)	
	Upper	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	

Table 9-25 Spectrum Analyzer Image Rejection (Residual) Test 24 Record

Spectrum Analyzer Center Frequency (MHz)	Residual Response Limits (dBm)	
	Upper	Actual
500.0	–70	

CDMA Generator Amplitude Level Accuracy Performance Test 25 Record

For test procedure, see “CDMA Generator Amplitude Level Accuracy Performance Test 25” on page 221.

Table 9-26 CDMA Generator RF In/Out Test

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
836.52	–10	–11.5	–8.5	
836.52	–11	–12.5	–9.5	
1851.25	–11	–12.5	–9.5	
1851.25	–12	–13.5	–10.5	

CDMA Generator Modulation Accuracy Performance Test 26 Record

For test procedure, see "CDMA Generator Modulation Accuracy Performance Test 26" on page 223.

Table 9-27 CDMA Generator Modulation Accuracy Test 26 Record

RF (MHz)	Level (dBm)	Measured EVM (%rms)	Calculated Rho	
			Lower Limit	Actual
836.52	–10		0.96	
1851.25	–10		0.96	

CDMA Analyzer Average Power Level Accuracy Performance Test 27 Record

For test procedure, see "CDMA Analyzer Average Power Level Accuracy Performance Test 27" on page 225.

Table 9-28 CDMA Analyzer Average Power Level Accuracy Test 27 Record

RF (MHz)	Level (mW)	Measured Level Limits (mW)		
		Lower	Upper	Actual
881.52	4	3.65	4.35	
881.52	10	9.20	10.80	
1931.25	4	3.65	4.35	
1931.25	10	9.20	10.80	

CDMA Analyzer Channel Power Level Accuracy Performance Test 28 Record

For test procedure, see "CDMA Analyzer Channel Power Level Accuracy Performance Test 28" on page 227.

Table 9-29 CDMA Analyzer Channel Power Level Accuracy Test 28 Record

RF (MHz)	Level (dBm)	Measured Level Limits (dBm)		
		Lower	Upper	Actual
881.52	11	10.25	11.75	
881.52	6	5.25	6.75	
881.52	1	0.25	1.75	
881.52	−4	−4.75	−3.25	
881.52	−9	−9.75	−8.25	
881.52	−14	−14.75	−13.25	
881.52	−19	−19.75	−18.25	
1931.25	11	10.25	11.75	
1931.25	6	5.25	6.75	
1931.25	1	0.25	1.75	
1931.25	−4	−4.75	−3.25	
1931.25	−9	−9.75	−8.25	
1931.25	−14	−14.75	−13.25	
1931.25	−19	−19.75	−18.25	

CDMA Analyzer Modulation Accuracy Performance Test 29 Record

For test procedure, see "CDMA Analyzer Modulation Accuracy Performance Test 29" on page 229.

Table 9-30 CDMA Analyzer Modulation Accuracy Test 29 Record

RF (MHz)	Level (dBm)	Calculated Rho Error		
		Lower Limit	Upper Limit	Actual
881.52	–10	–0.005	0.005	
1931.25	–10	–0.005	0.005	

10 Block Diagrams

This chapter contains 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 Test Set's diagnostic programs are unable to do so.

Introduction

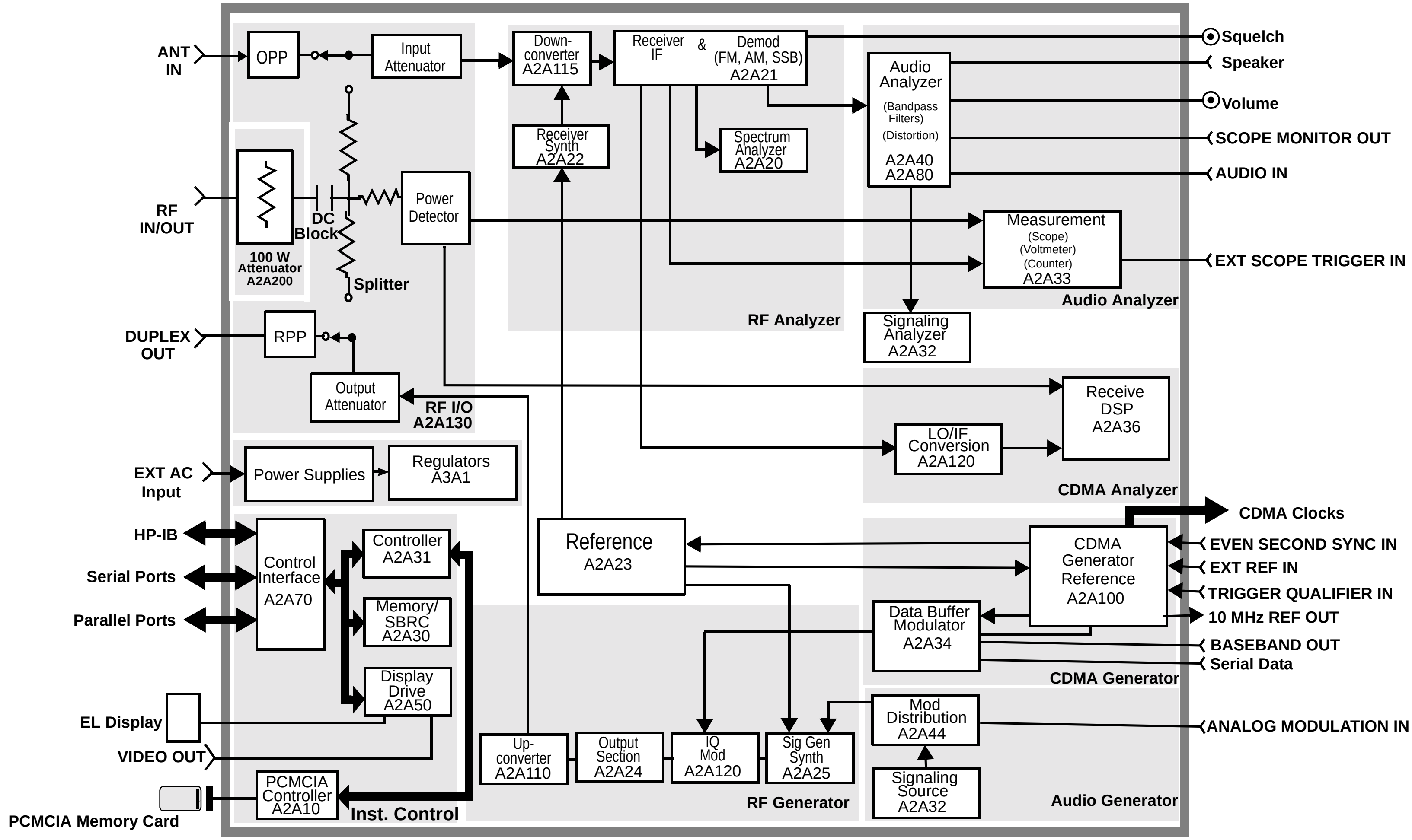
Shown in Figure 10-1 on page 285 is a block-diagram overview of the Test Set. This chapter is organized into the following sections which provide a detailed view of each individual assembly shown in the overview:

- RF Input/Output
- RF Analyzer
- Audio Analyzer
- CDMA Analyzer
- CDMA Generator
- Audio Generator
- RF Generator
- Reference/Regulator
- Instrument Control

Input/output 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 when applicable.

Figure 10-1 Test Set Overview Block Diagram

CDMA BASE STATION TEST SET OVERALL BLOCK DIAGRAM



OPP - Over Power Protection

RPP - Reverse Power Protection
SBRC - Serial Bus Receiver Chip

Note: DC Block ID is AC Couple on RF In/Out connector (side panel)

RF Input/Output Section

RF Power Measurement

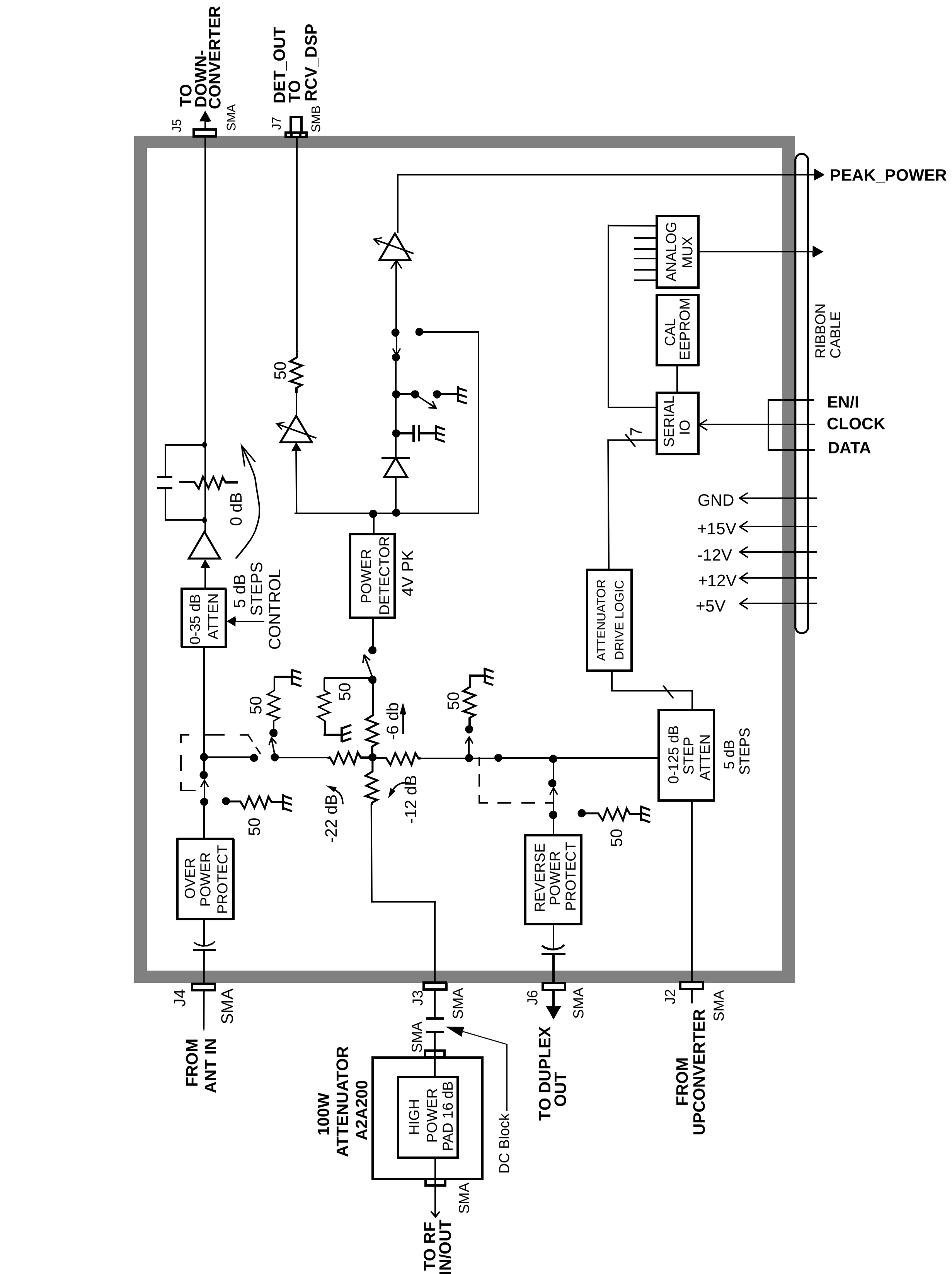
An RF power measurement can only be made by supplying a signal to the RF IN/OUT port of the Test Set. See Figure 10-2 on page 287. A power splitter then splits the signal between an RF analysis path and a power measurement path. The power detector has a direct path to the A2A36 Receive DSP where average power measurements are made. There's also a diode peak detector to provide a peak power measurement through the A2A33 Measurement assembly.

Accuracy is insured by factory-generated calibration data which is stored in CAL ROM. The A2A200 100W-attenuator also has calibration data which affects RF power measurements.

Input Gain Control

Step attenuators in the A2A130 Input/Output 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.

Figure 10-2 RF Input/Output Assembly, A2A130



RF Analyzer Section

Frequency Conversion

The A2A115 Downconverter, see Figure 10-3 on page 290, produces an IF of 114.3, 385.7 or 614.3 MHz. The LO is provided by the A2A22 Receiver Synthesizer, see Figure 10-4 on page 291. The IF frequencies developed are as follows in Table 10-1.

Table 10-1 IF Frequencies

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
1400 to 2200	1014.3 to 1814.3	385.7

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 tunable bandpass
- 650 MHz - 1000 MHz tunable bandpass
- 1400 MHZ - 2200 MHz tunable bandpass

Modulation Measurement

The A2A21 Receiver assembly demodulates the IF into its FM, AM, and SSB components, see Figure 10-5 on page 292. The demodulated signal is sent to the Audio Analyzer section for measurement.

Spectrum Analysis

The LO on the A2A20 Spectrum Analyzer is swept across the span by the Controller, see Figure 10-6 on page 293. The LO starts sweeping when the oscilloscope circuits on the A2A33 Measurement board 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 Measurement board and displayed.

Spectrum analyzer resolution bandwidth is determined by switching bandwidth IF filters on the A2A20 Spectrum Analyzer. These filters are set by the Controller as a function of the span selected from the front panel.

Figure 10-3 Downconverter Assembly, A2A115

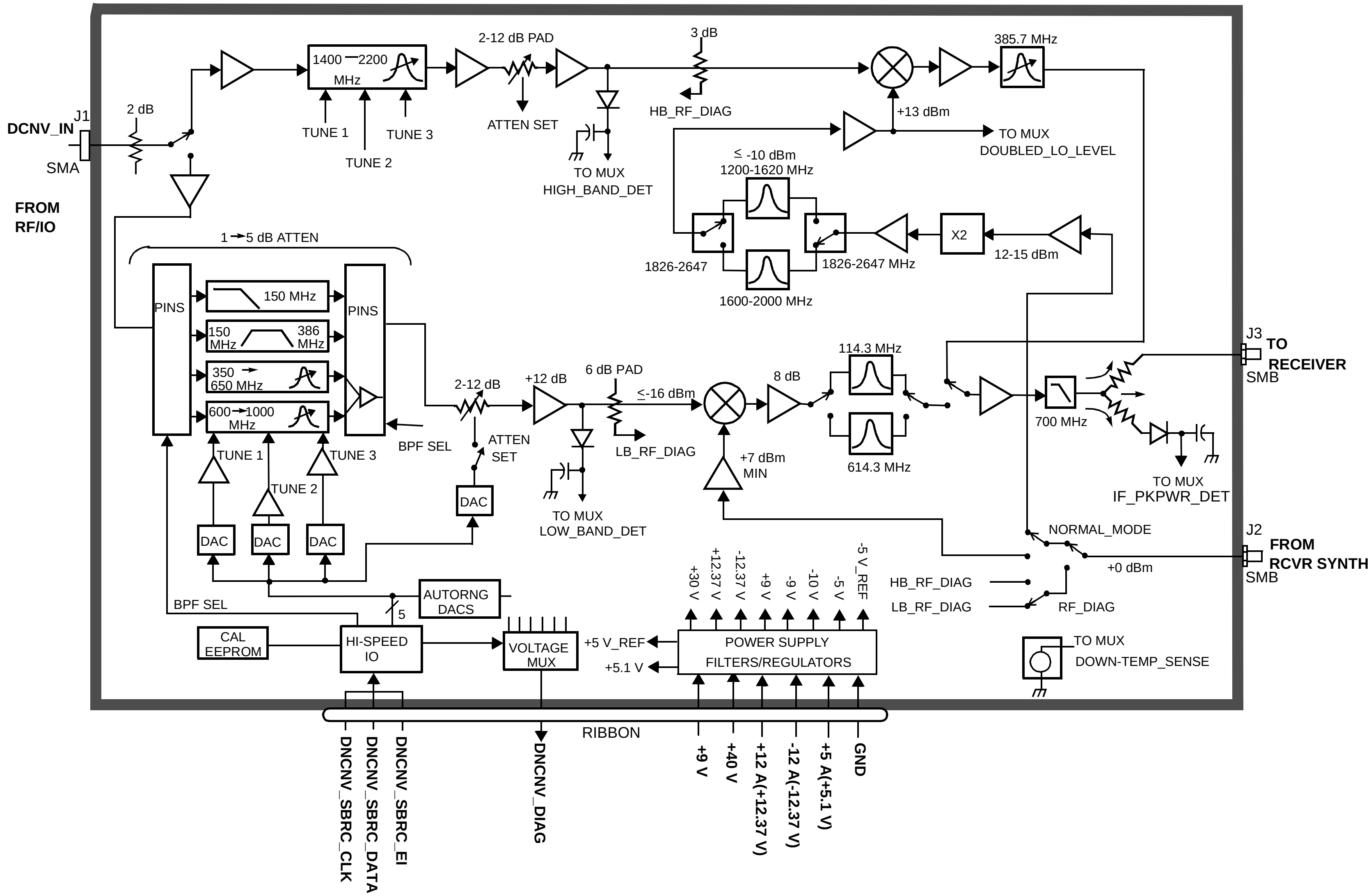
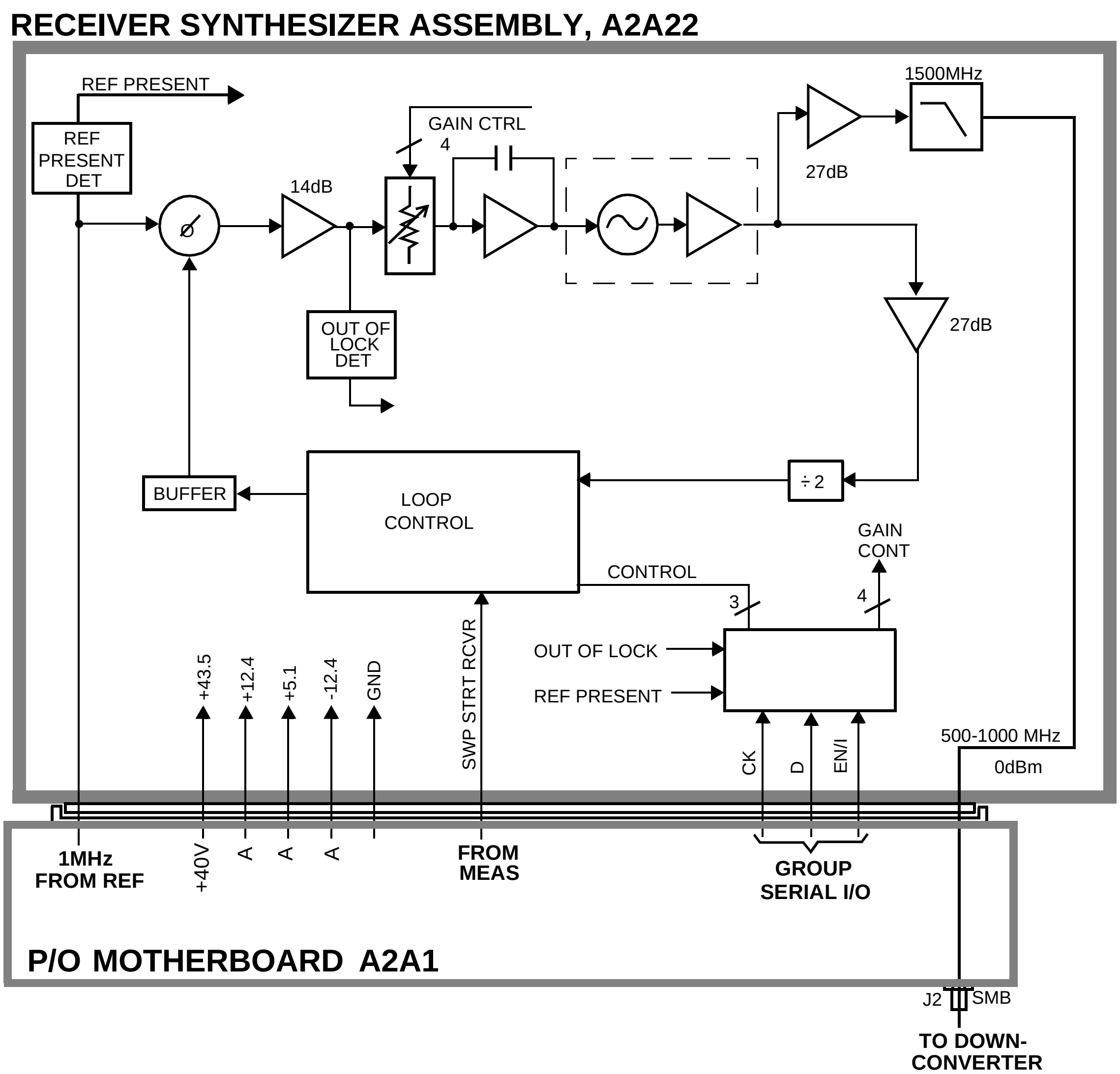


Figure 10-4 Receiver Synthesizer Assembly, A2A22



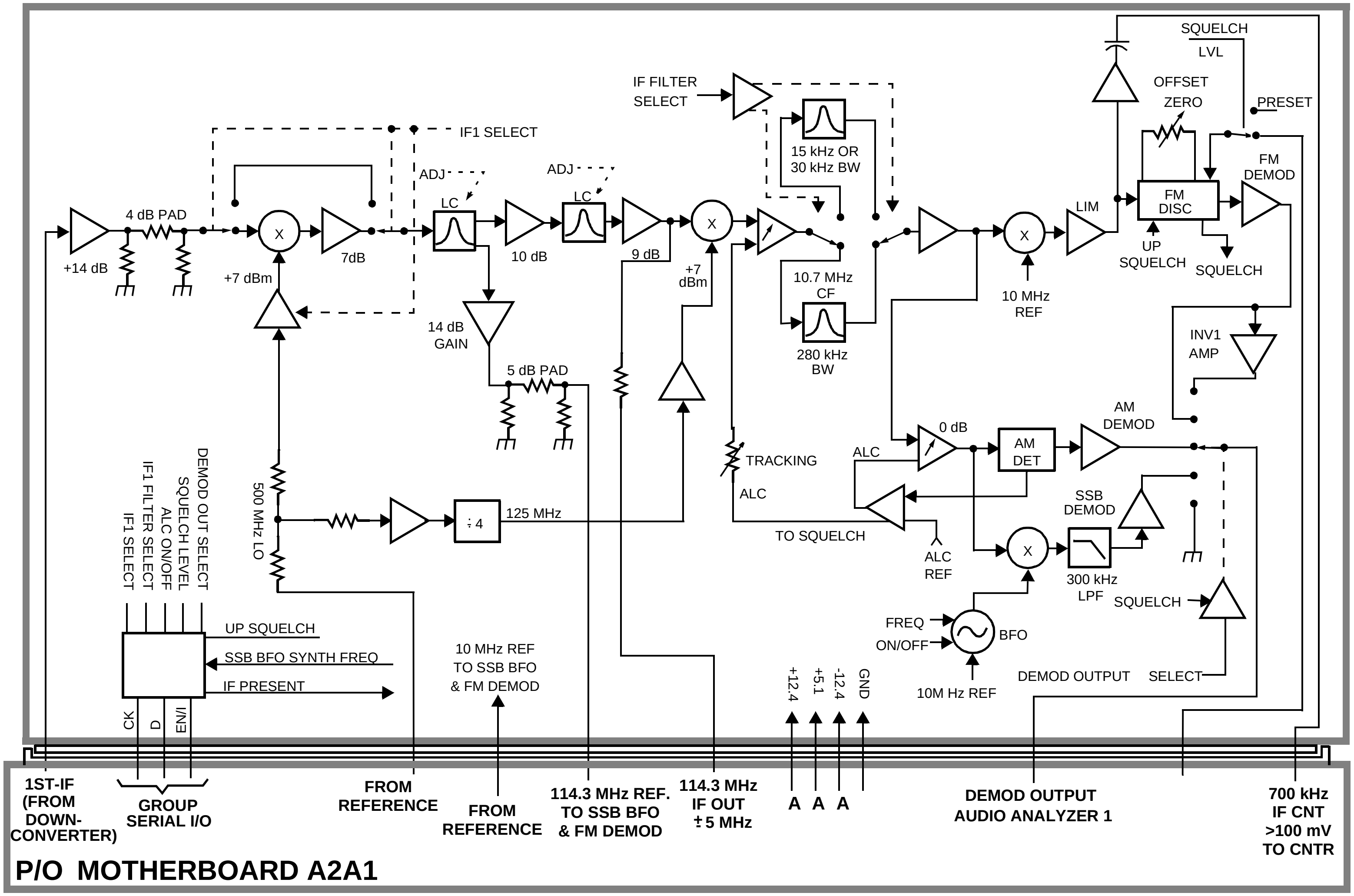
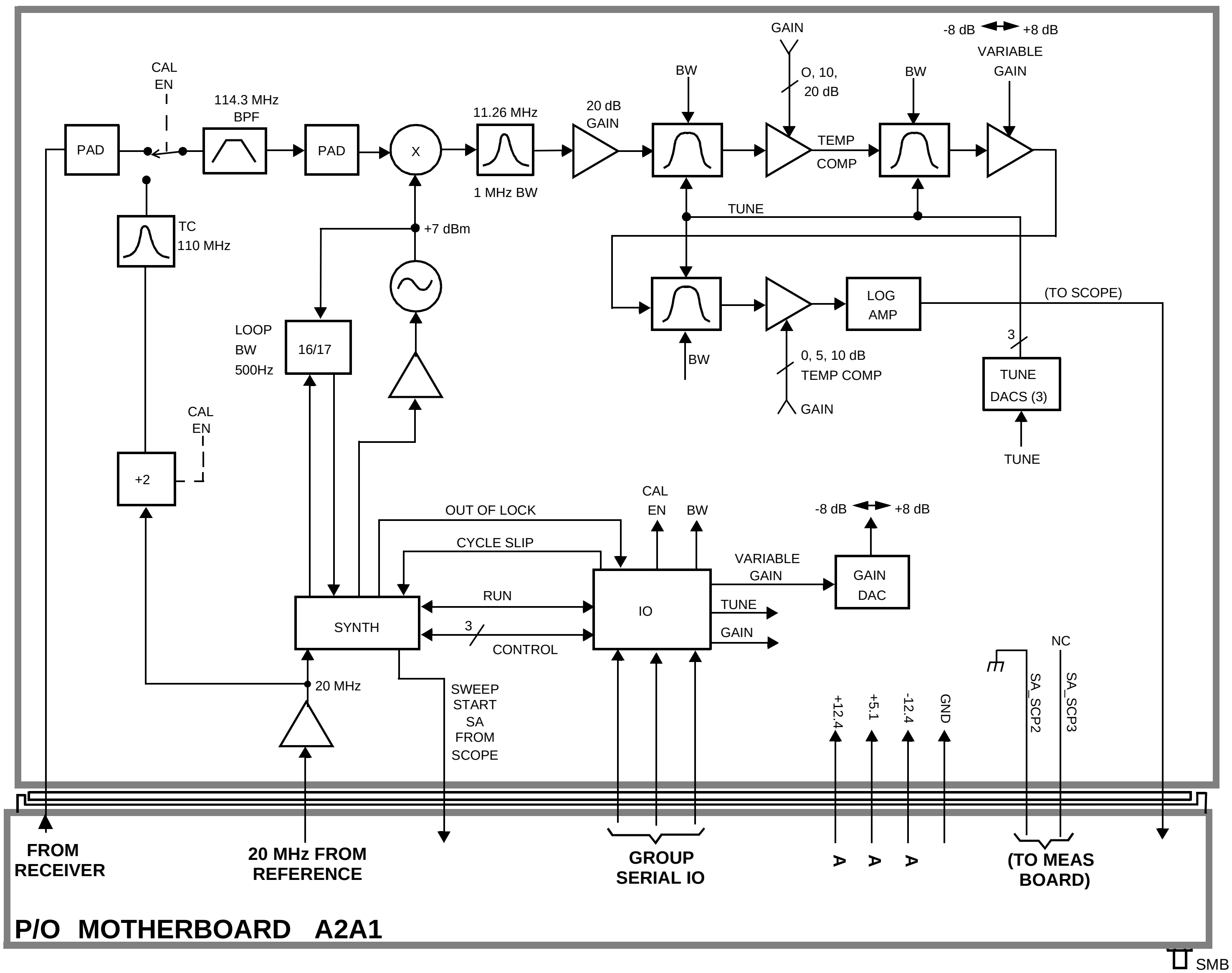


Figure 10-5 Receiver Assembly, A2A21

Figure 10-6 Spectrum Analyzer Assembly, A2A20



Audio Analyzer Section

Input Level Control

Switchable gain amplifiers on the A2A80 Audio Analyzer #1 (see Figure 10-7 on page 295) and A2A40 Audio Analyzer #2 (see Figure 10-8 on page 296) 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 A2A33 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.

Oscilloscope Functions

The Test Set has no specialized oscilloscope assemblies. The A2A80 and A2A40 Audio Analyzer assemblies, A2A33 Measurement assembly, and the Controller work together to perform the oscilloscope functions.

The audio or dc signal to be displayed goes from the A2A40 Audio Analyzer 2 assembly to a sampler on the A2A33 Measurement assembly (the same sampler used by the Spectrum Analyzer). The Controller calculates the display level by taking 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.

The oscilloscope's trigger signals from the side-panel connector, the A2A32 Signaling Source/Analyzer assembly, and the internal trigger signal are used by the A2A33 Measurement assembly and the Controller to determine when to start the scope sweep. The Controller adds the pre-triggering time entered from the front panel.

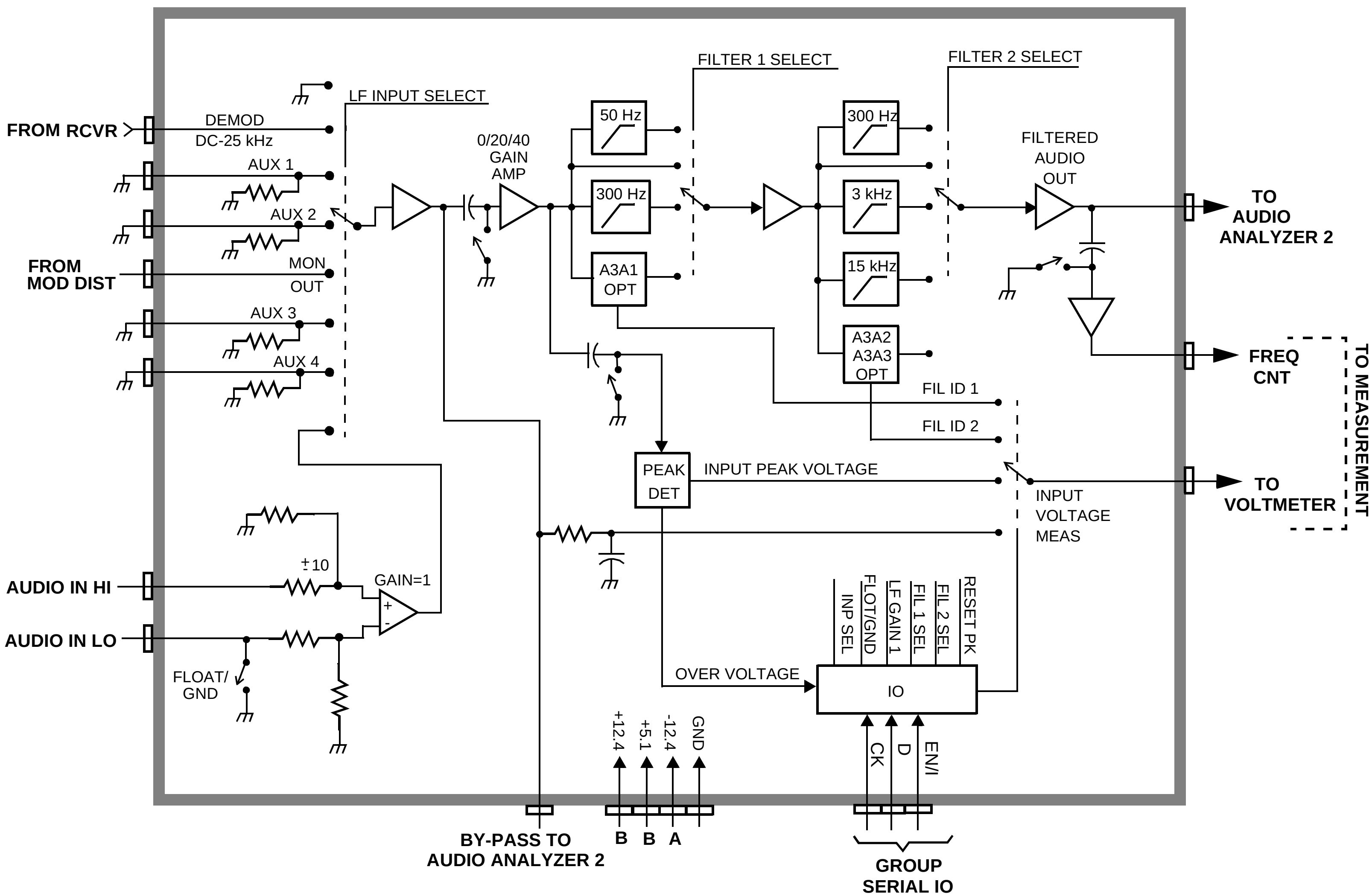


Figure 10-7 Audio Analyzer 1, A2A80

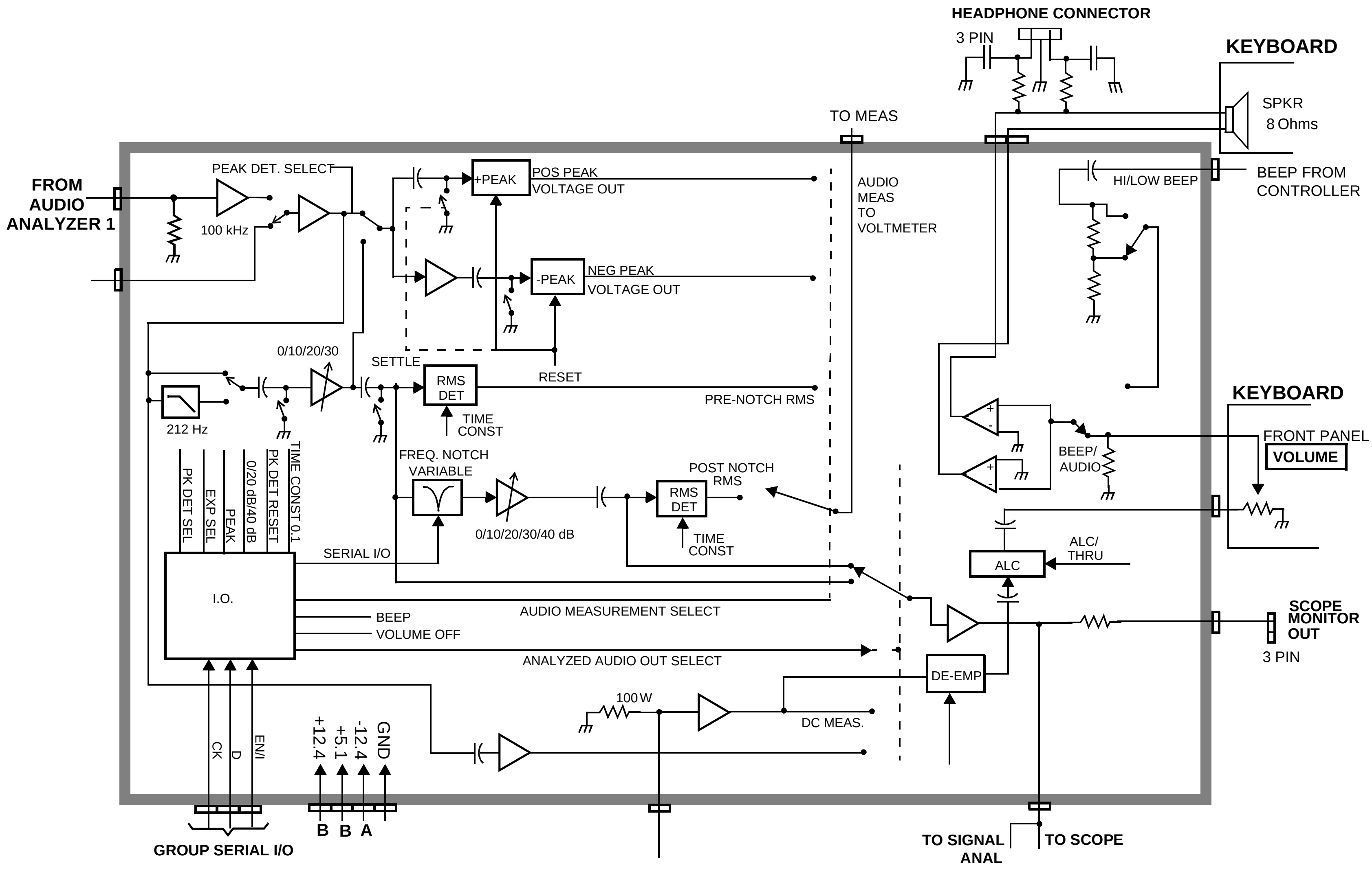


Figure 10-8 Audio Analyzer 2, A2A40

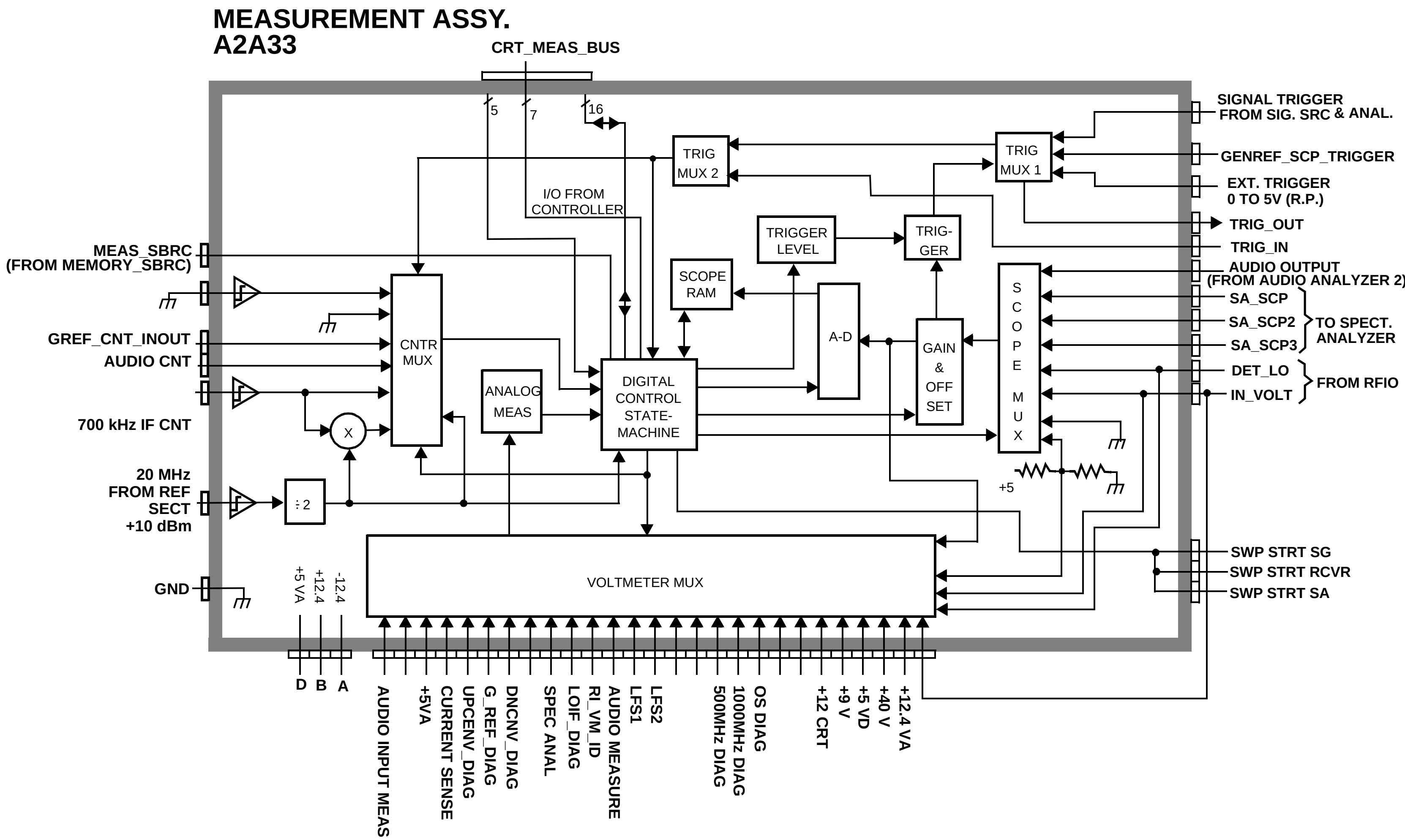
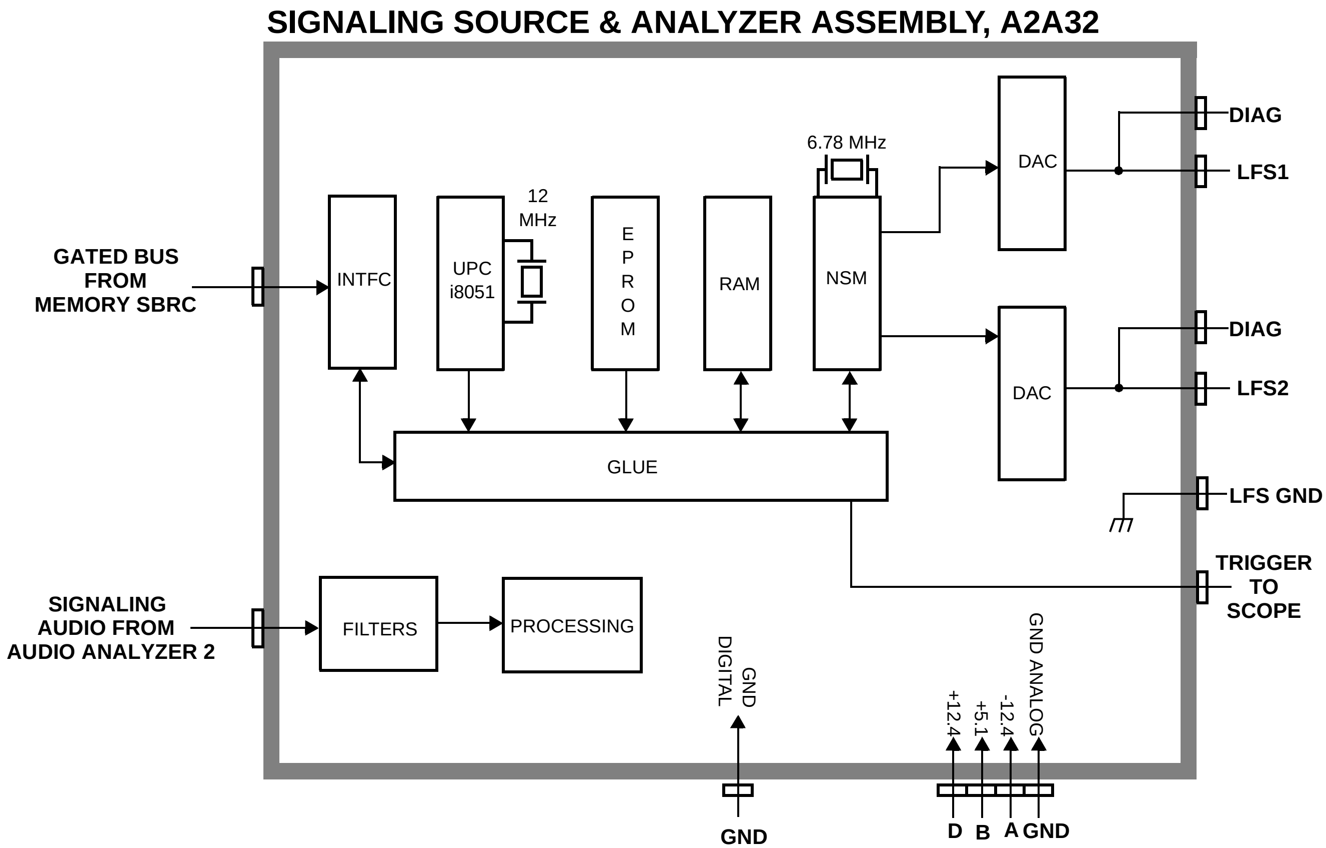


Figure 10-9 Measurement Assembly, A2A33

Figure 10-10 Signal Source & Analyzer Assembly, A2A32



CDMA Analyzer Section

IF Conversion

To down convert the CDMA the signal, the 114.3 MHz IF is mixed with a 110.6136 MHz LO to produce a 3.6864 MHz IF in the A2A120 LO IF/IQ Modulator assembly, see Figure 10-11 on page 300. The oscillator that produces the LO signal is phase locked to a 10 MHz signal from the A2A100 CDMA Generator Reference assembly, see Figure 10-13 on page 303.

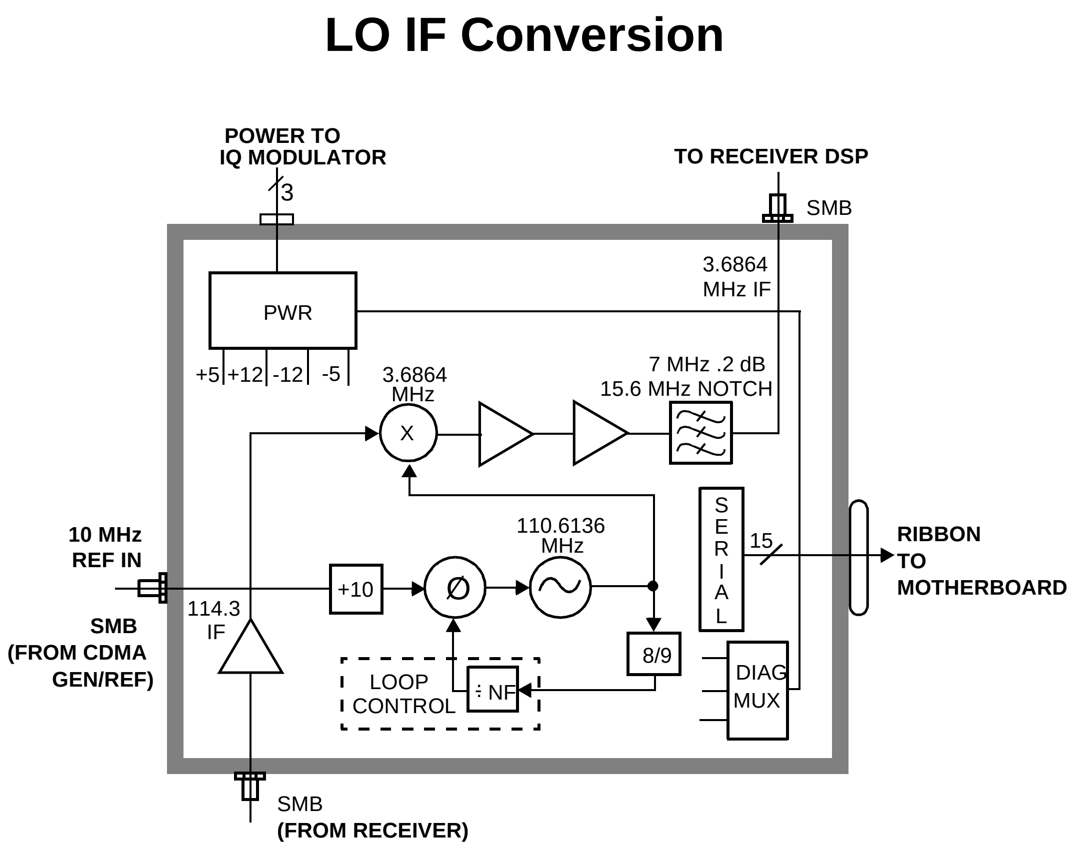
CDMA Signal Analysis

The 3.6864 MHz signal goes to the A2A36 Receive DSP assembly, see Figure 10-12 on page 301. The Receive DSP assembly analyzes the 3.6864 MHz signal to make IQ modulation measurements, such as rho, timing accuracy, carrier feed through, and phase error.

Power Measurements

The A2A36 Receive DSP assembly also makes average power measurements through a direct link from the A2A130 RF Input/Output assembly.

Figure 10-11 LO IF/IQ Modulator Assembly, A2A120



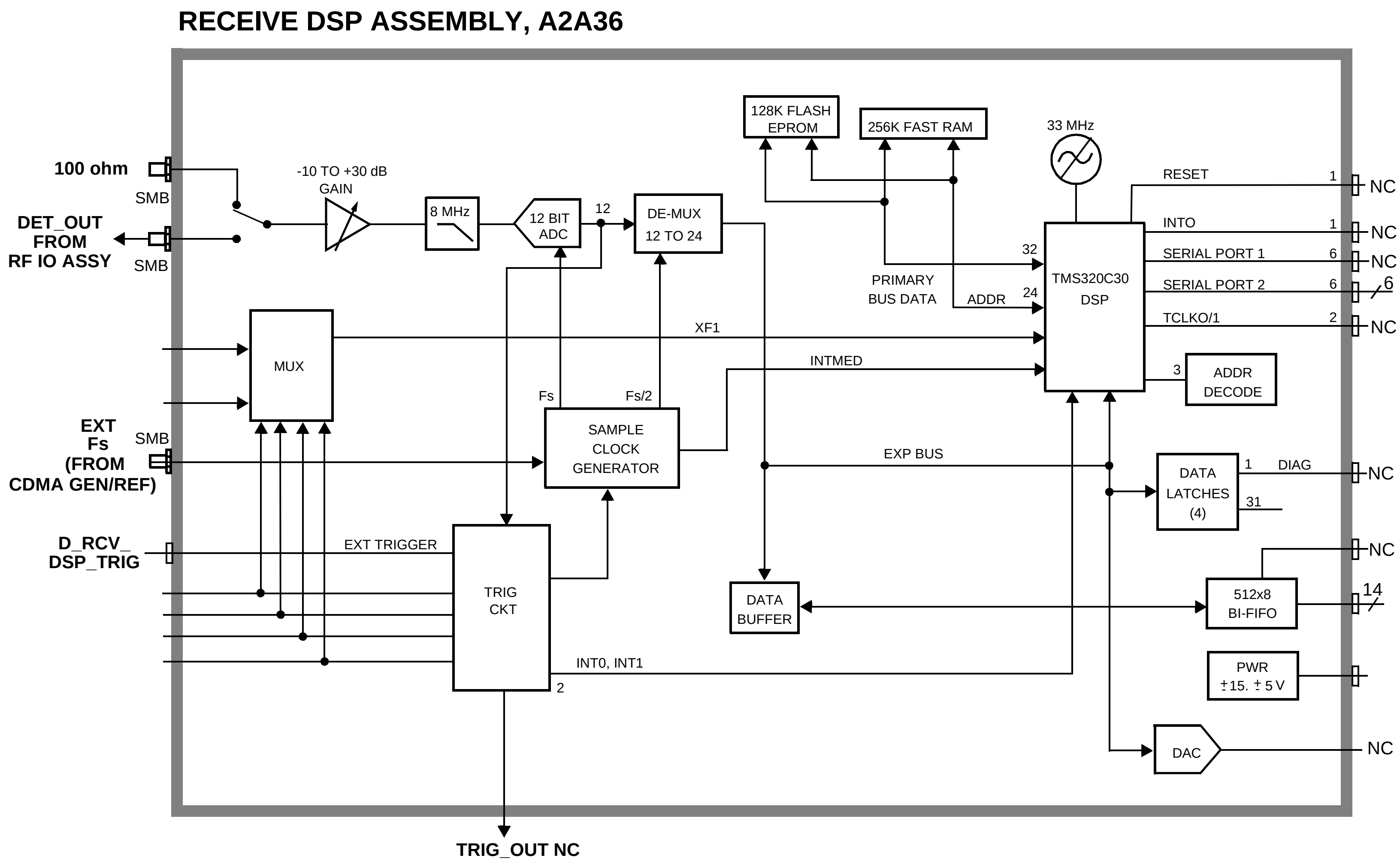


Figure 10-12 Receive DSP Assembly, A2A36

CDMA Generator Section

Data Generation

The A2A34 Data Buffer, see Figure 10-14 on page 304, generates or buffers external data that emulates a CDMA traffic channel and outputs this data to the A2A100 CDMA Generator Reference, see Figure 10-13 on page 303. The CDMA Generator Reference assembly converts the data into I and Q drive signals and sends it back to the Data Buffer to be summed with calibrated noise sources. The signals are then passed to the A2A120 LO IF/IQ Modulator for modulation with RF.

CDMA Reference

The A2A100 CDMA Generator Reference, see Figure 10-13 on page 303, supplies all the CDMA clocks for the A2A36 Receive DSP and the A2A34 Data Buffer. The CDMA Generator Reference also provides reference switching for an external or the internal reference source.

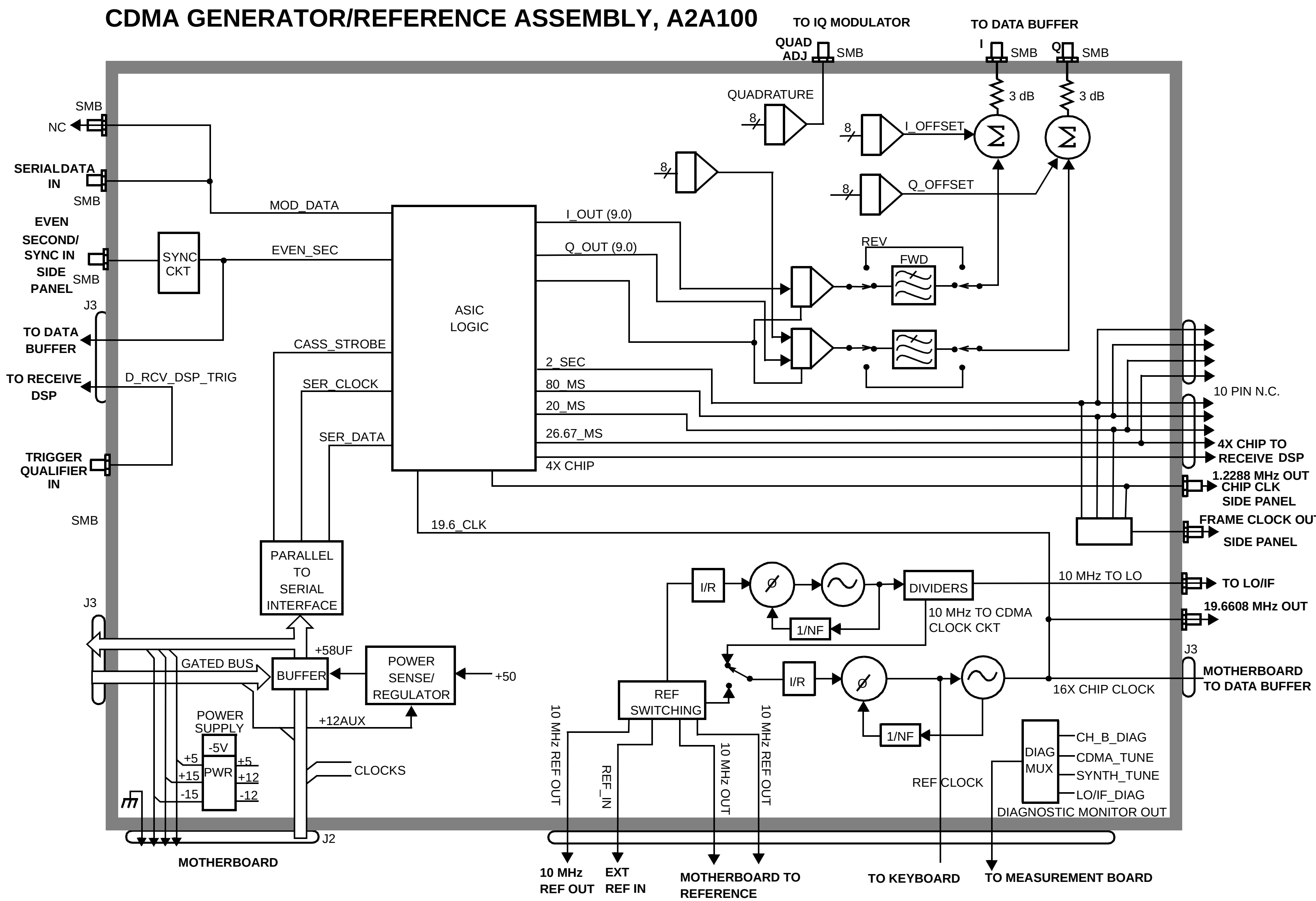
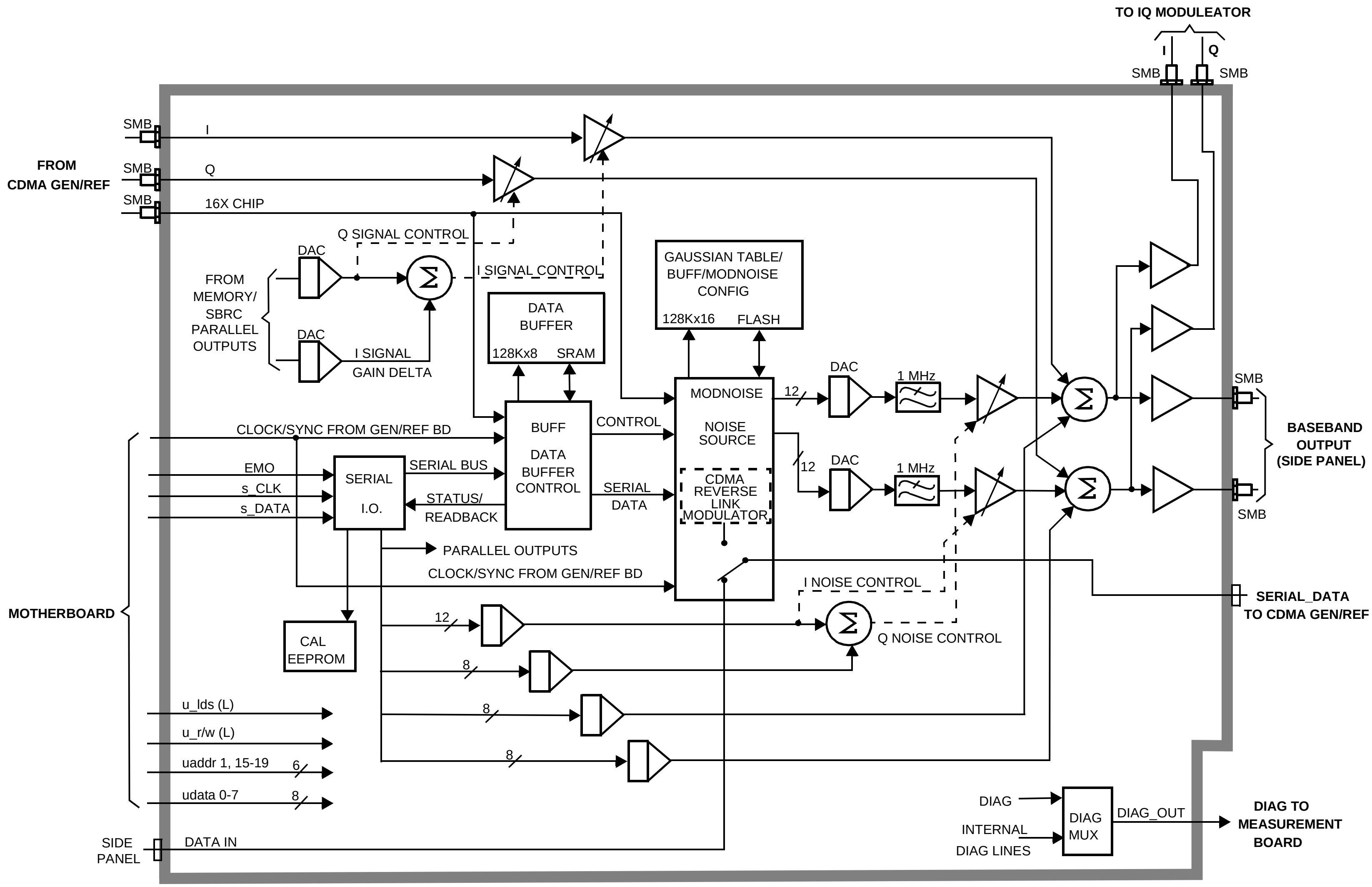


Figure 10-13 CDMA Generator/Reference Assembly, A2A100

Figure 10-14 Data Buffer Assembly, A2A34



Audio Generator Section

Waveform Generation

The A2A32 Signal Source and Analyzer, see Figure 10-15 on page 306, gets frequency and wave shape information from the Controller. Waveform values are calculated real-time by a digital waveform synthesis IC. The LFS1 output is always a sine-wave. The LFS2 output is a sine-wave unless one of the function generator waveforms is selected, or signaling is selected from the front panel.

Level Control

Audio level is controlled by the A2A44 Modulation Distribution assembly, see Figure 10-16 on page 307, by using a DAC and variable attenuators. The leveled audio signal is passed on to the RF Generator section.

Figure 10-15 Signal Source & Analyzer Assembly, A2A32

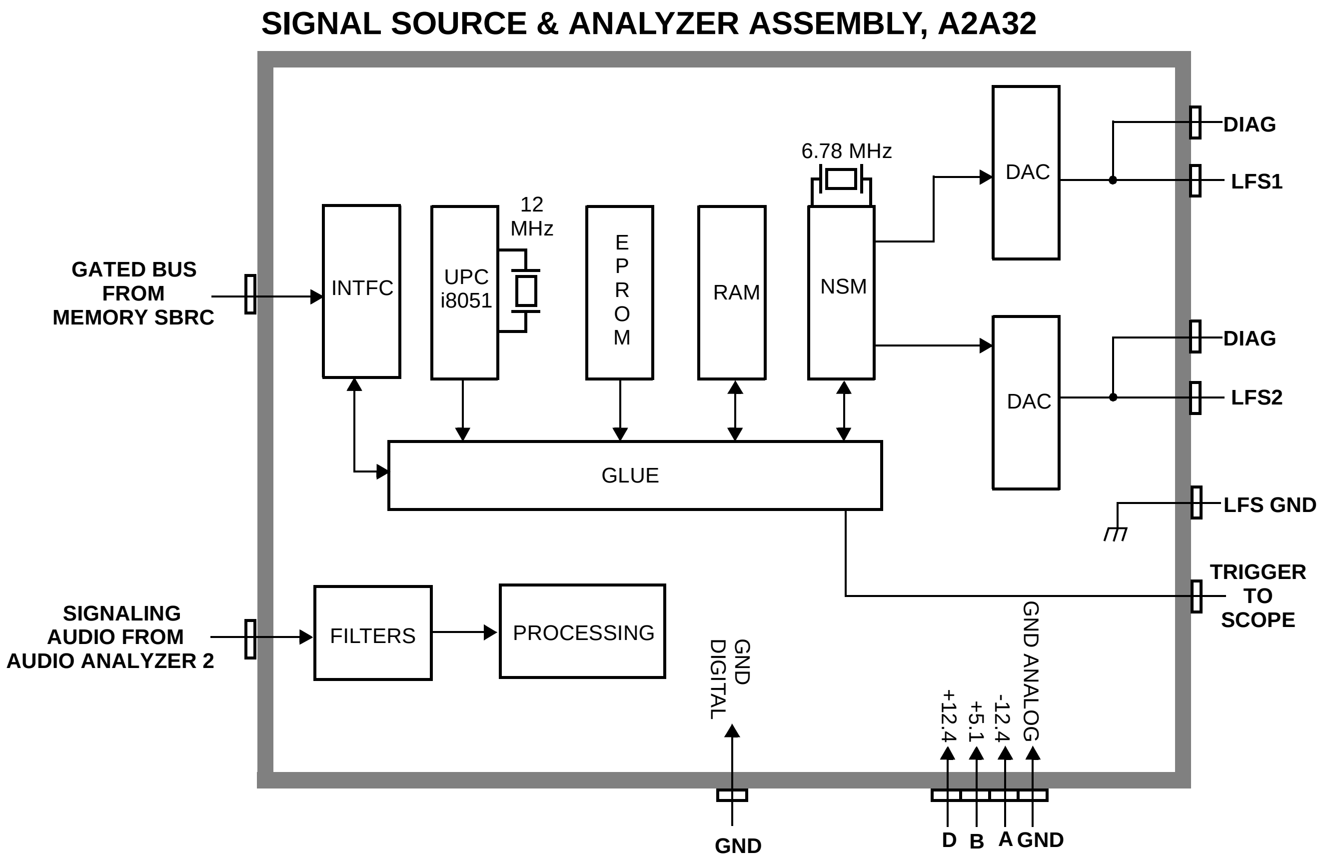
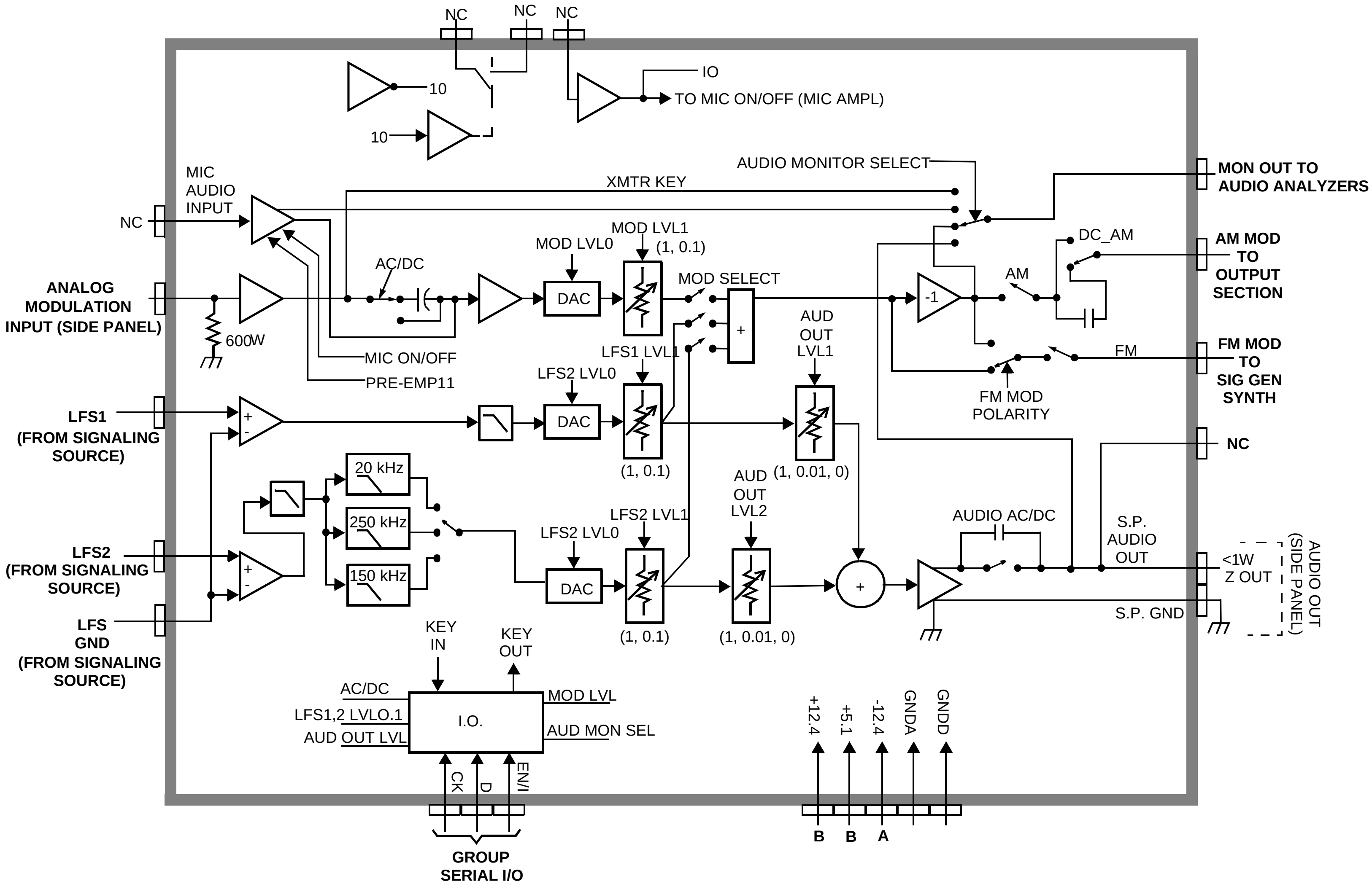


Figure 10-16 Modulation Distribution Assembly, A2A44



RF Generator Section

Frequency Generation

The A2A25 Signal Generator Synthesizer (Figure 10-17 on page 310) develops a 500 MHz to 1000 MHz signal which is phase-locked to the 200 kHz reference from the A2A23 Reference Assembly (Figure 10-21 on page 315). 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 A2A44 Output Section assembly (Figure 10-19 on page 312) develops the RF Generator's 0.4 to 000 MHz frequency range by mixing, dividing, or passing the 500 MHz to 1000 MHz from the Signal Generator Synthesizer. The frequencies are derived as shown in Table 10-2.

The A2A110 Upconverter assembly (Figure 10-20 on page 313) develops the RF generator's 1.2 to 2.0 GHz range by mixing the 800-1000 MHz signal from the output section with a 1.5-3.0 GHz LO.

Table 10-2 IF Frequencies

Output Frequency	Derivation
400 kHz - 250 MHz	mix
250 MHz - 500 MHz	divide
500 MHz - 1 GHz	pass
1.7 GHz - 2.0 GHz	mix

Level Control

The A2A44 Output Section assembly (Figure 10-19 on page 312) 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 A2A130 RF Input/Output 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:

- A2A200 100 W-Attenuator
- A2A130 RF Input/Output
- A2A24 Output Section
- A241 DC Block

Modulation

Amplitude modulation (AM) is done on the A2A24 Output Section assembly. The modulating signal from the A2A44 Modulation Distribution assembly is applied to the ALC loop’s control voltage.

IQ modulation is done on the A2A120 LO IF/IQ Modulator assembly. The IQ signal from the A2A34 Data Buffer is modulated onto the RF signal from the A2A25 Signal Generator Synthesizer assembly.

Figure 10-17 Signal Generator Synthesizer Assembly, A2A25

SIGNAL GENERATOR SYNTHESIZER ASSEMBLY, A2A25

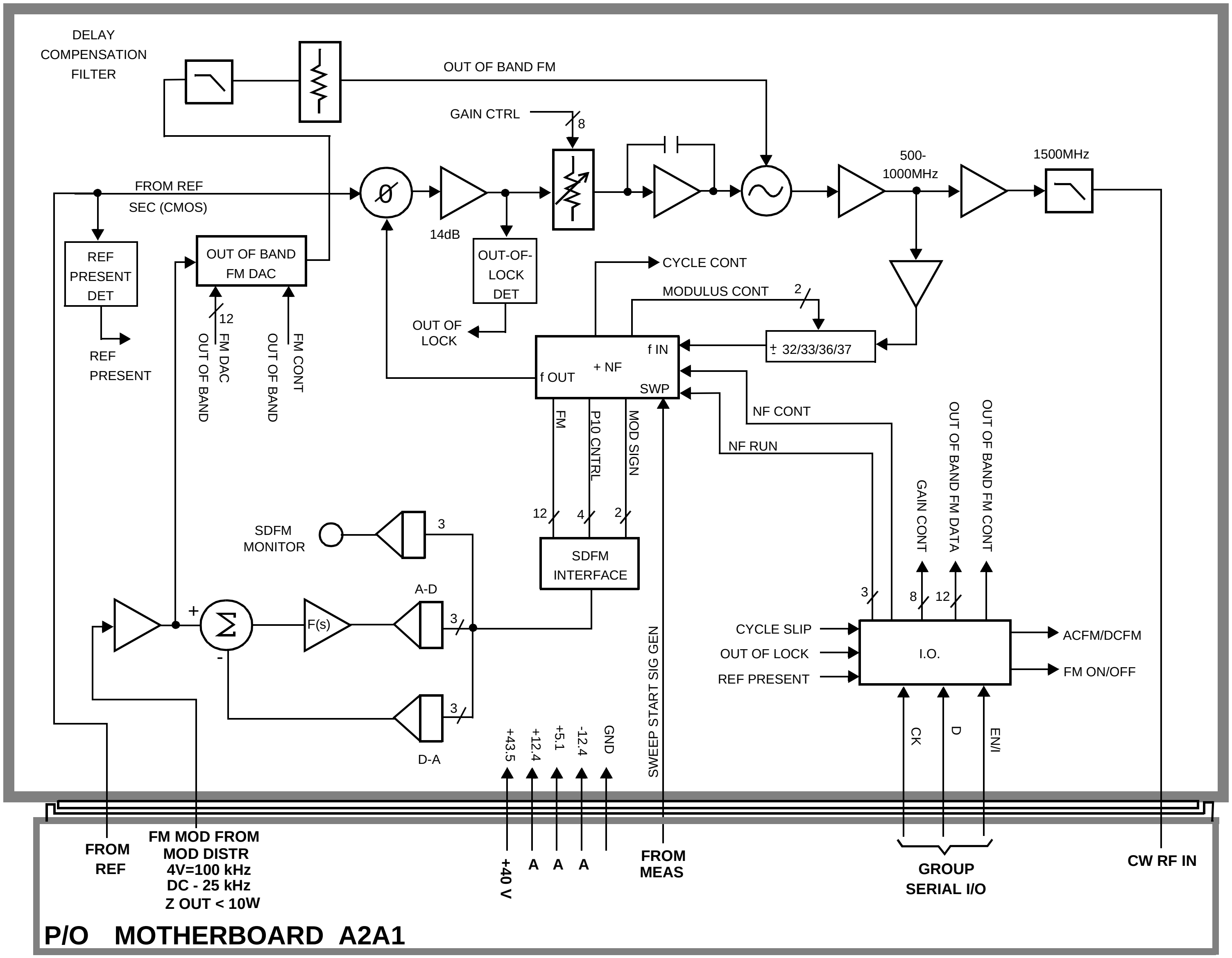
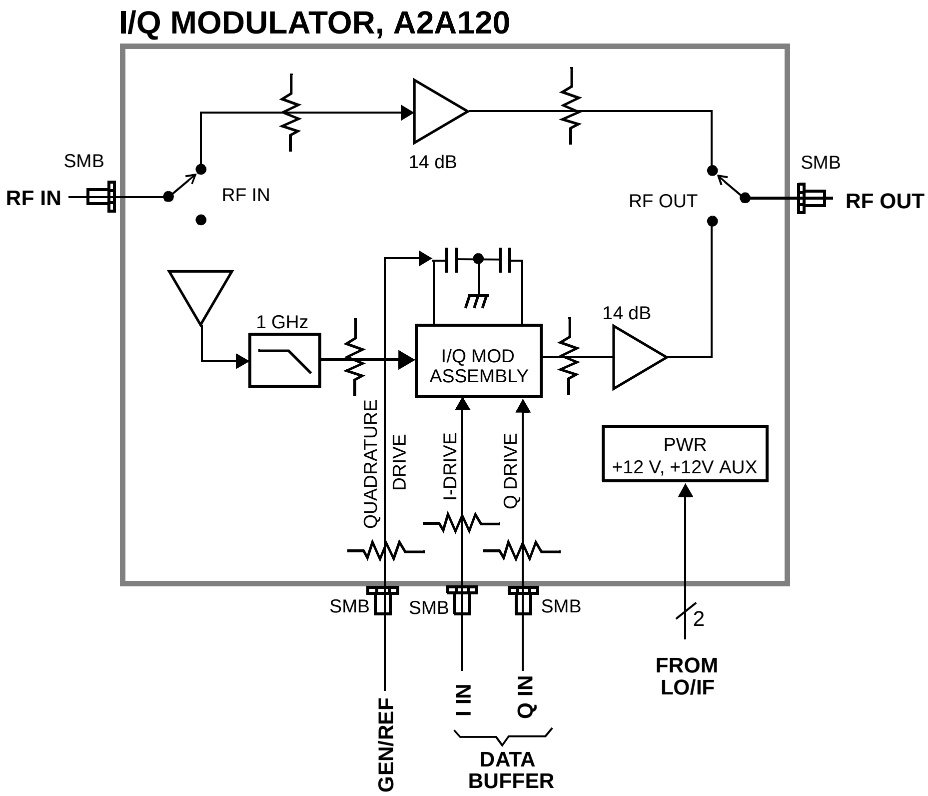


Figure 10-18 IQ Modulator Assembly (Part of LO IF/IQ Modulator Assembly), A2A120



OUTPUT SECTION ASSEMBLY, A2A24

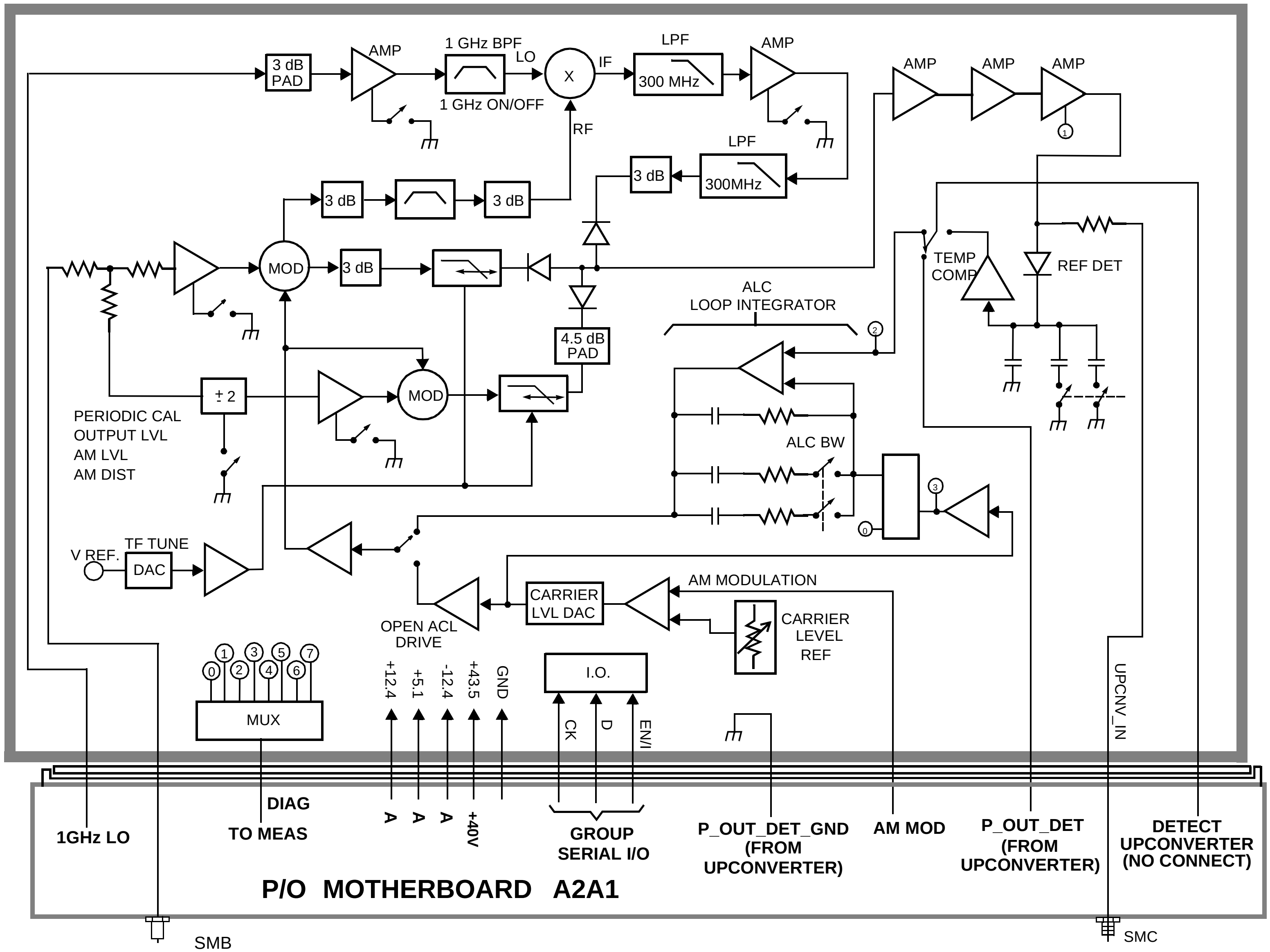


Figure 10-19 Output Section Assembly, A2A24

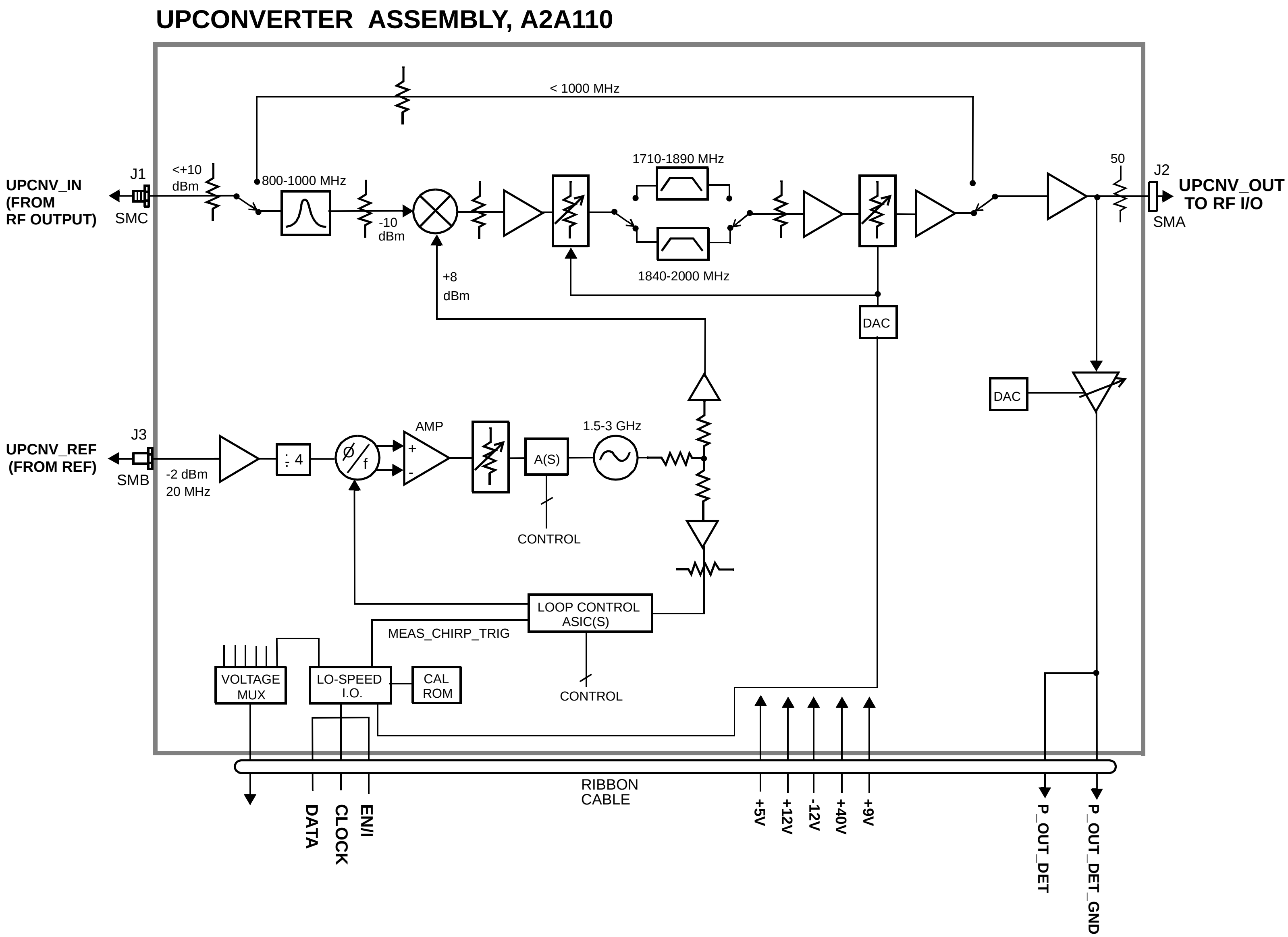


Figure 10-20 Upconverter Assembly, A2A110

Reference/Regulator Section

Reference

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 A2A23 Reference assembly. There are two versions of the Reference assembly. The standard Reference assembly has a temperature compensated crystal oscillator (TCXO), and the Option 005 (High Stability Time Base) Reference assembly has an oven controlled crystal oscillator (OCXO). The A2A23 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 A2A33 Measurement assembly.

Power Supply Regulators

Power supply regulators are distributed to all of the modules and assemblies by he A3A1 Power Supply Regulator assembly through the motherboard.

Power Supply

The A3A2 Power Supply assembly 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.

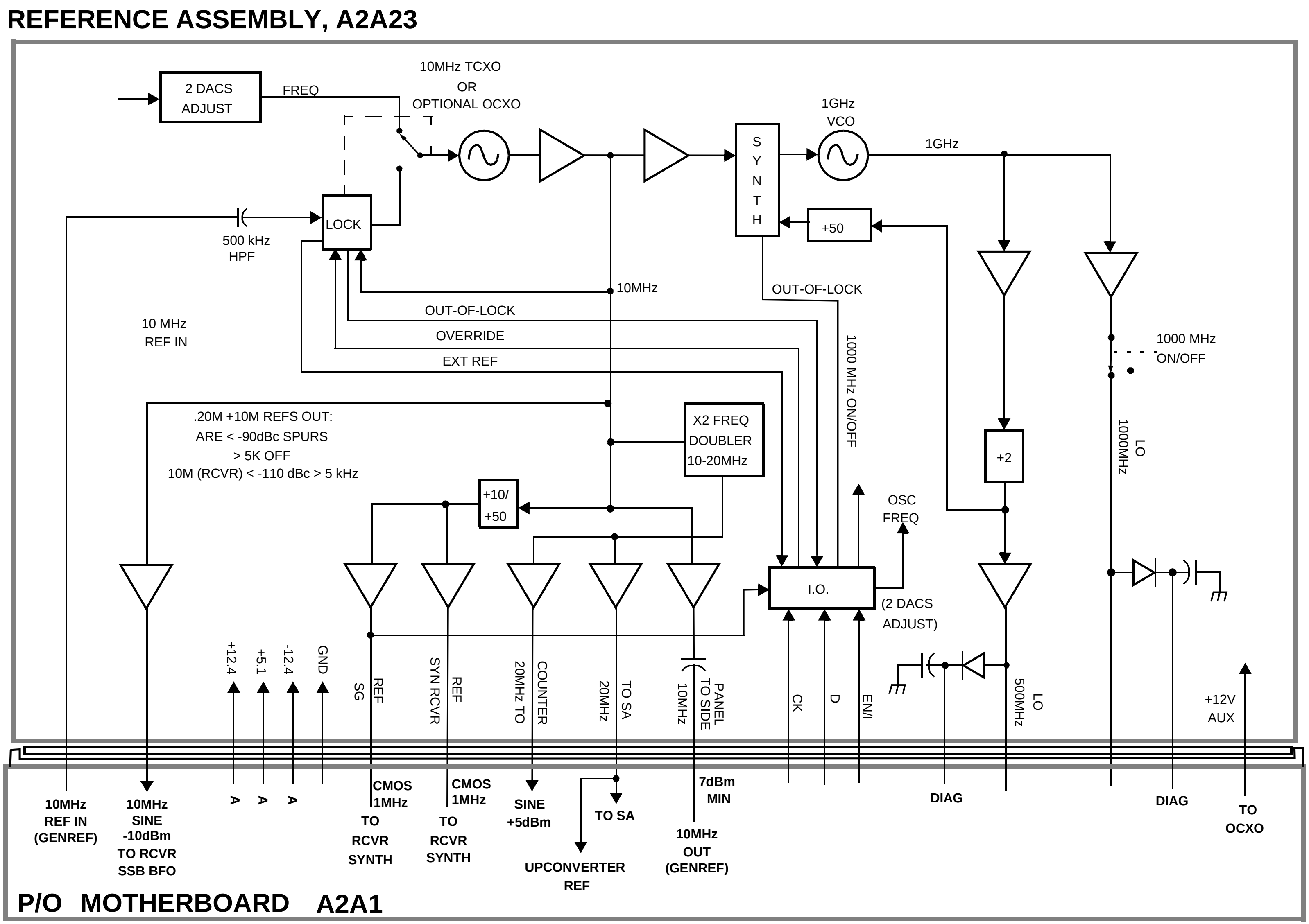
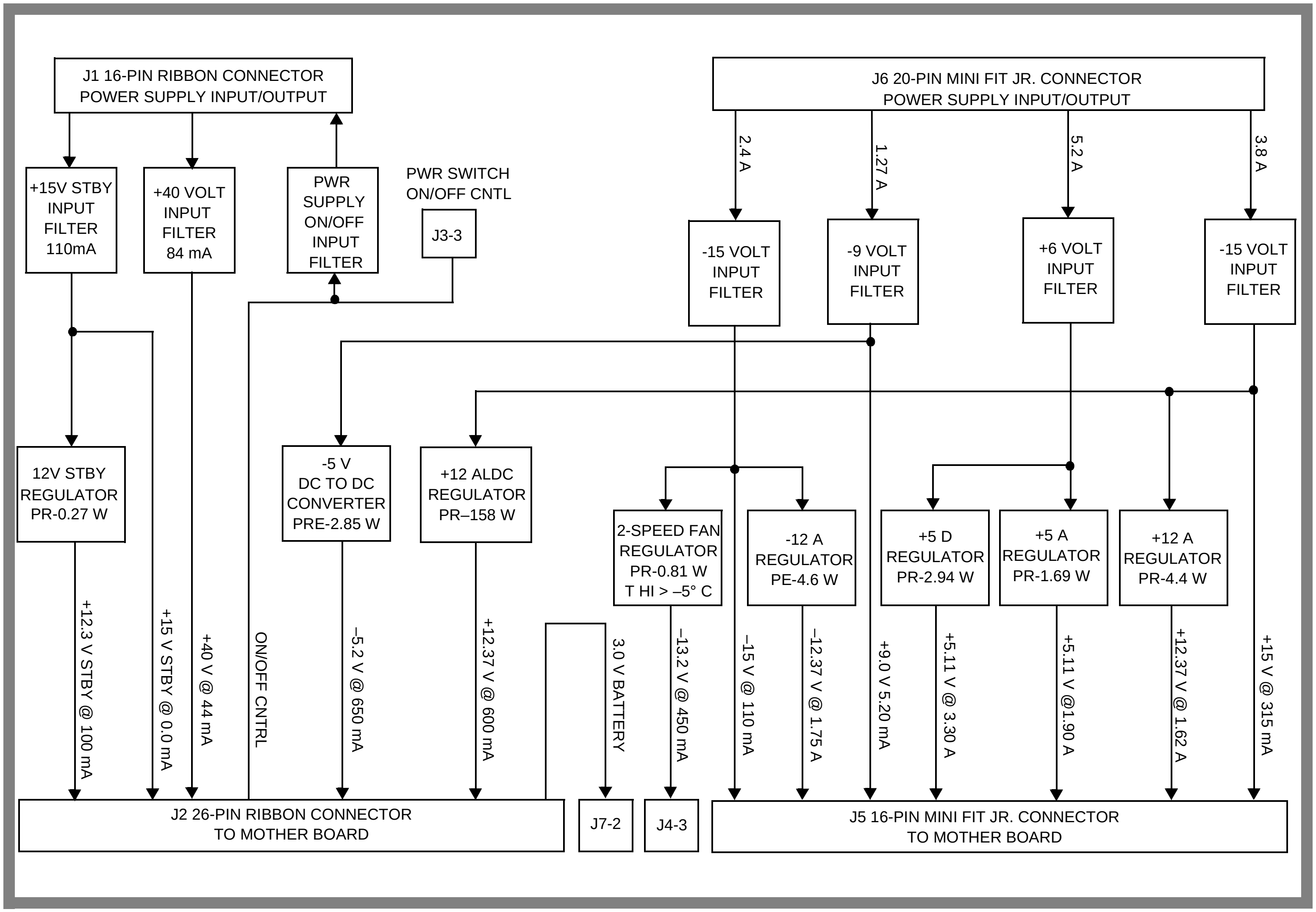


Figure 10-21 Reference Assembly, A2A23

Figure 10-22 Power Supply Regulator Assembly, A3A1

POWER SUPPLY REGULATOR ASSEMBLY, A3A1



Instrument Control Section

Digital Control

The Test Set's Digital Control is driven by two assemblies:

- A2A30 Memory/SBRC
- A2A31 Controller

The controller receives user control information by either the A2A70 Control Interface or by the front panel. Operating firmware on the A2A30 Memory/SBRC is then used by the A2A31 Controller to generate digital control for the Test Set. The digital control bus information is passed back to the A2A30 Memory/SBRC which controls most of the Test Set's modules and assemblies.

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.

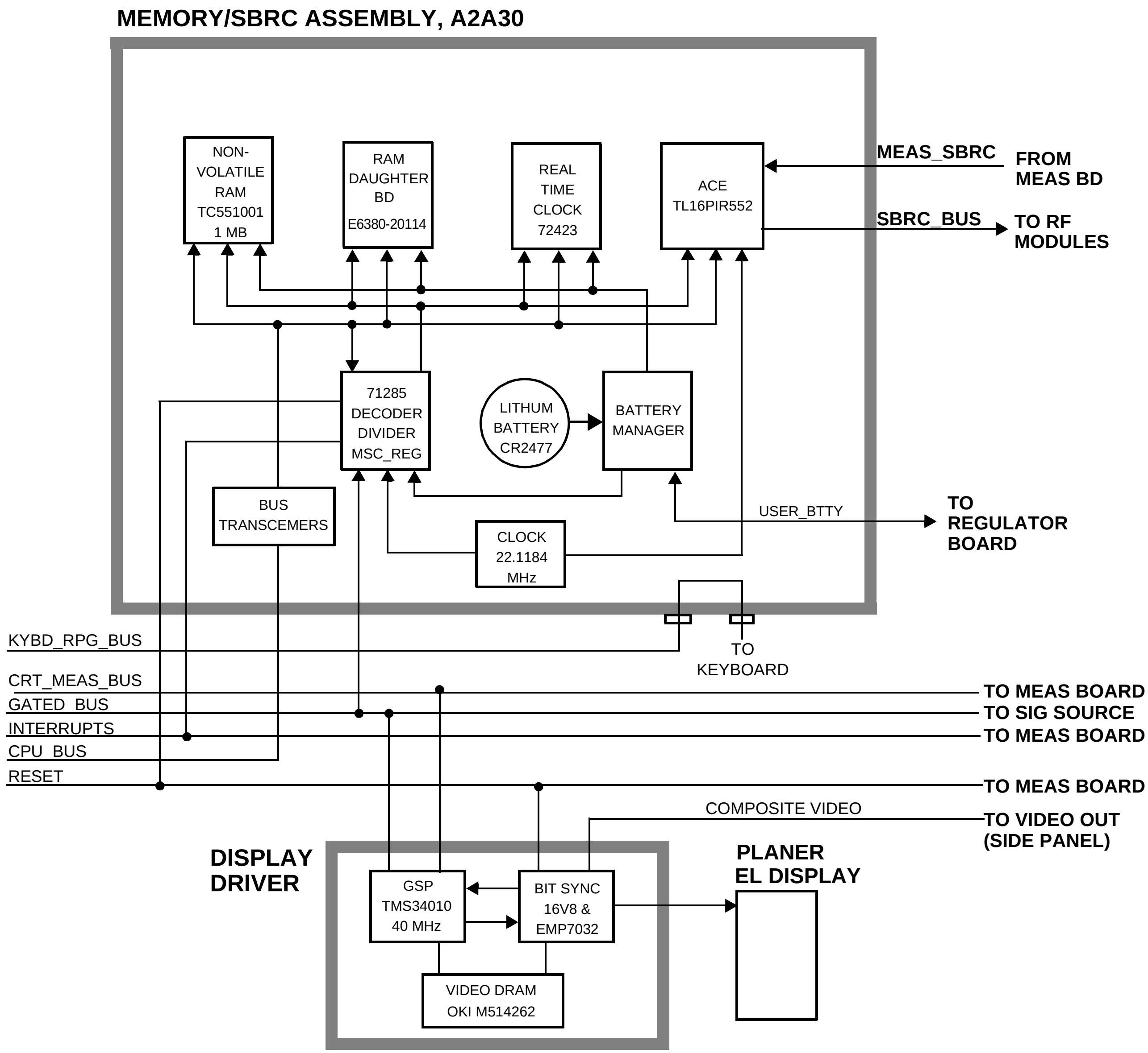
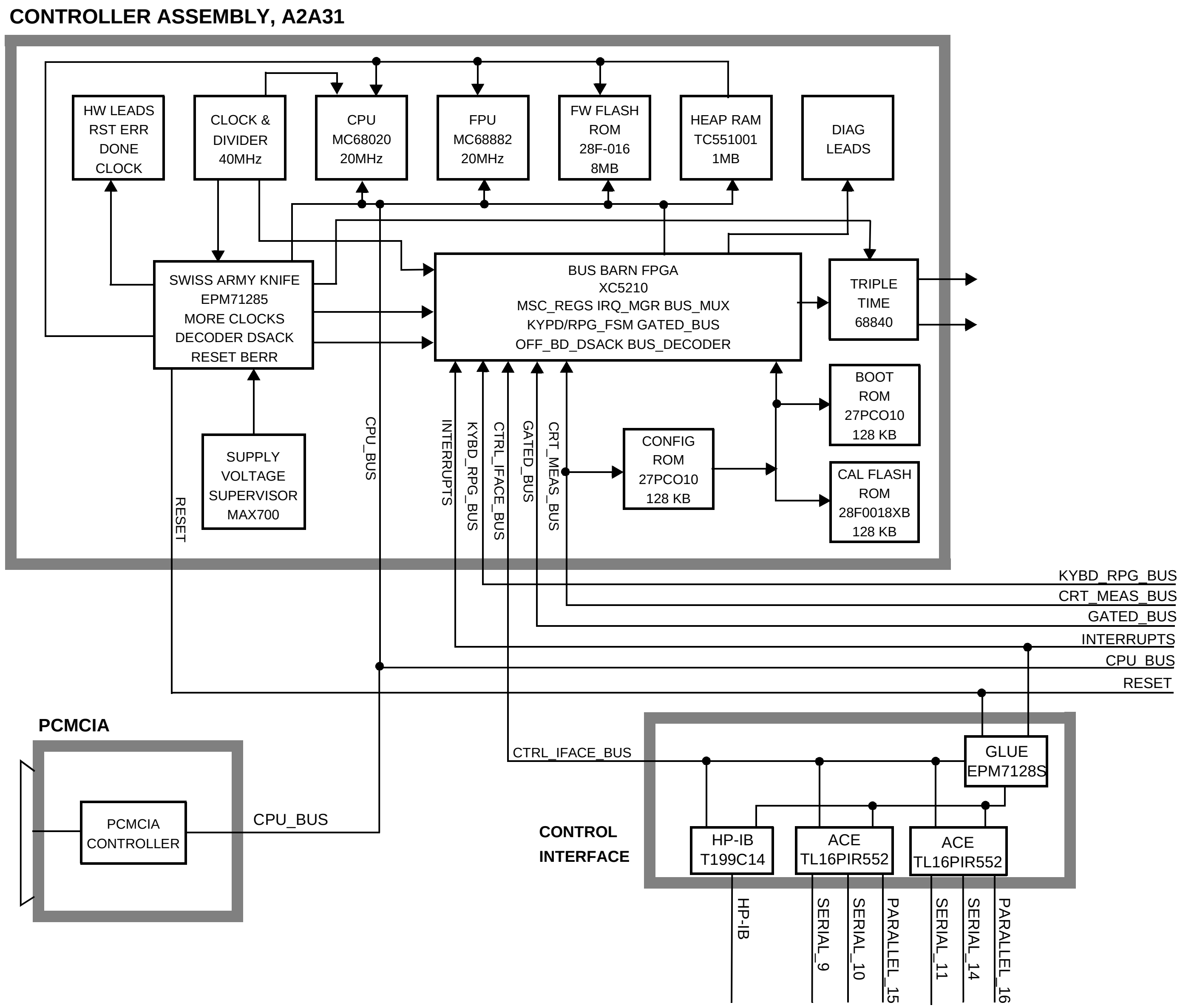


Figure 10-23 Memory/SBRC Assembly, A2A30

Figure 10-24 Controller Assembly, A2A31

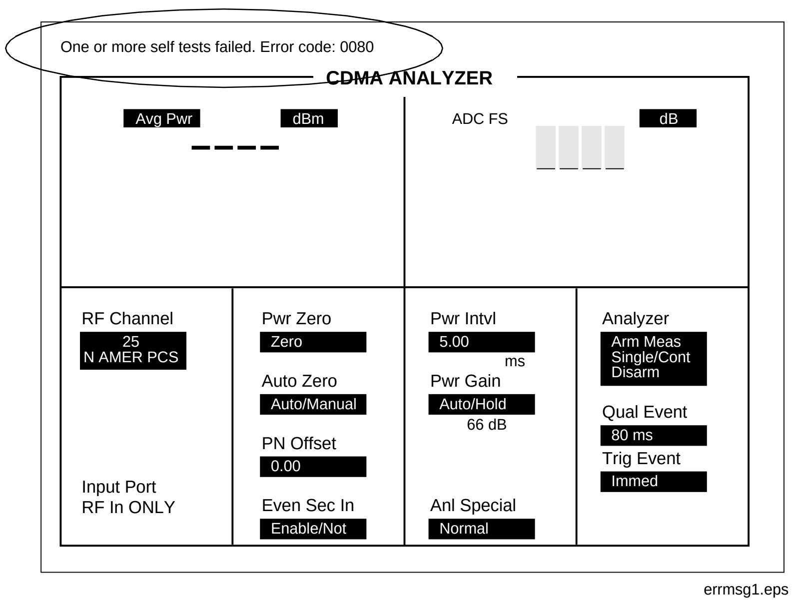


A Error Messages

General Information About Error Messages

Several types of messages may be displayed on the Test Set's screen. Error messages usually appear at the top of the start-up or default screen as shown in Figure A-1.

Figure A-1 Error Message Location



Error messages descriptions can be found in the following manuals:

- Agilent 8935A Reference Guide
- Agilent 8935A Assembly Level Repair Manual (this manual)
- *Agilent Instrument BASIC User's Handbook (Agilent P/N E2083-90005)*

The type of message determines which manual to refer to for more information. There are four types of messages:

- Positive numbered error messages
- IBASIC error messages
- GPIB error messages
- Text only 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.

NOTE BEEPER OPERATION: Messages are always accompanied by a BEEP from the internal speaker, unless the `Beeper` field on the INSTRUMENT CONFIGURE screen is set to `Off`.

CAUTION **IF YOU HEAR A LOUD SIREN OR WARBLING SOUND, THIS IS THE OVER POWER WARNING!**

Remove any connections to the side panel RF IN/OUT, DUPLEX OUT, and ANTENNA IN connectors. NEVER turn off the Test Set while RF power is being applied to these connectors. After RF power is removed, turn the Test Set off and then back on. The Test Set should power up in its factory preset state (unless a POWERON Save/Recall register was saved). The siren should not come back on.

Power-Up Self-Test Error Messages

The following message is typical of an error message you might encounter on the Test Set's power-up.

`One or more self tests failed. Error code: 0080`

In this example, the hexadecimal code 0080 corresponds to the error message "Keyboard Failure (stuck key)." For examples of other power-up error messages, see "Reading Front Panel or GPIB Codes" on page 54.

Diagnostics Messages

The following message may occur when initiating and running the Functional Diagnostics program.

```
Direct latch write occurred. Cycle power when done
servicing.
```

For other diagnostic messages see "Frequently Encountered Diagnostic Messages" on page 73.

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, or high
- Failure code

For a description of the test, including an interpretation of the failure codes, see Chapter 3 , "Troubleshooting," on page 47.

Calibration Download Failure Error Message

The following message occurs at powerup when the downloading of calibration data is unsuccessful.

`Cal file checksum incorrect. File reset to default values.`

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.

Flash ROM Firmware Upgrade Error Messages

Test Set's firmware is stored in flash ROMs. With flash ROMs, the firmware can be quickly upgraded with new firmware from a 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 A2A31 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 in alphabetical order in the following paragraphs. Supplemental fault information is included.

Memory Card Checksum Error

The memory card may be at fault. The card reader on the 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 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 A2A31 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 A2A31 Controller assembly.

Programming Voltage Error

The programming voltage is supplied to the flash ROMs from the power supply through the Controller assembly. The fault is most likely on the Controller but can be caused by the Filter/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 A2A31 Controller assembly.

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 A2A33 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 A2A20 Spectrum Analyzer assembly first. The A2A23 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 A2A23 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.

Text Only Error Messages

Text only error messages are generally associated with manual operation of the Test Set. Text only error messages can also be displayed while running the Test Set's built-in diagnostic or calibration utility programs. Diagnostic messages are described in "Frequently Encountered Diagnostic Messages" on page 73.

Text only error messages take the form:

```
This is an error message.
```

For example:

- `Input value out of range` - occurs when trying to set a value above or below its capability (such as attempting to set the `RF Gen Freq` field to 2 GHz).
- `Turn off either AM or FM setting` - occurs when trying to perform simultaneous AM and FM modulation.

Positive Numbered Error Messages

Positive numbered error messages usually occur when trying to save or retrieve an IBASIC file, or when trying to run a faulty IBASIC program. Refer to the Agilent 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` - occurs when trying to save a file to a device where a file with the same name already exists.
- `Error 5 Improper Context Terminator` - occurs when an END, SUBEND, or FNEND statement is not present in the program when required.

IBASIC Error Messages

IBASIC Error Messages are associated with IBASIC language operation. IBASIC error messages can have both positive and negative numbers (but always start with "IBASIC Error:"). Refer to the Agilent Instrument BASIC User's Handbook for information on positive numbered error messages. Refer to the GPIB Error Messages section of the *Agilent 8935 Reference 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 Agilent 8935 Syntax Reference Guide for information on GPIB error messages.

NOTE HP-IB and GPIB are used interchangably throughout this manual and all E6380A documentation.

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.
```

Non-Recoverable Firmware Error

This error occurs when the Test Set encounters a condition that the firmware doesn't understand - causing the Test Set to halt operation until power is cycled. 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 o
ftext below and contact Agilent Technologies through
your local service center or by calling 1-800-827-3848
(USA, toll-free)ask to speak to the 8935 Service Engineer.

  'Address error exception'
   at line number 0
```

Follow the instructions in the message.

Unfortunately, you cannot recover from this condition without turning the Test Set off. The error may not reoccur when you turn the Test Set back on and rerun the test where the error message first occurred. If the failure reoccurs, you should record exactly what the configuration of the instrument was when the error appeared, and contact Agilent. This information will help us determine the proper course of action for your repair.

If This Error Occurs at Power-Up

If the Test Set displays this error when first powered up, disabling Test Set operation, it could be related to the `Autostart` field on the main TESTS screen. This field causes the Test Set to automatically run the last program loaded in memory when the Test Set is powered up. If the program is corrupted, the Test Set will automatically "lock up."

The only way to recover from this condition is to clear the Test Set's operating RAM. This will clear any IBASIC program, Save/Recall registers, and RAM disks that have been saved, as well as three calibration factors. The calibration factors are easily re-entered; the IBASIC programs, Save/Recall registers, and RAM disks must be re-loaded or re-initialized after clearing memory.

To clear the Test Set's RAM:

1. Turn the Test Set off.
2. Hold the **Code Dom** and **HZ/ µV** keys down.
3. Turn the power on (with the buttons still held down) and wait until the initial power-up screen is displayed.

Use the following procedure to re-enter the three calibration factors that were erased when RAM is cleared. Use the GENERATOR ANALYZER screen keys (to the left of the cursor control knob) to access the required screens.

1. Access the RF GENERATOR screen and select `DC FM Zero` (under the `FM Coupling` field).
2. Disconnect any cables from the ANT IN or RF IN/OUT connectors.
3. Access the RF ANALYZER screen and select `Zero` under the `TX Pwr Zero` field.
4. Access the AF ANALYZER screen and select `Zero` under the `DC Current` field.

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