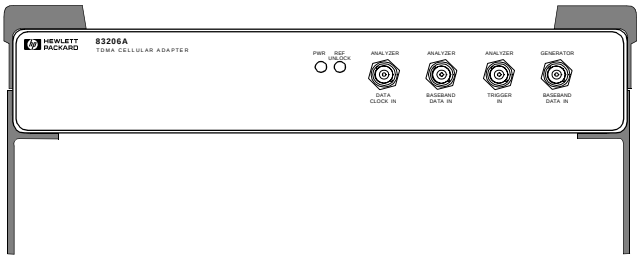
HP 83206A TDMA
Cellular Adapter



HP Part No. 83206-90009
Printed in U. S. A.
May, 1997

Rev B

Notice

Hewlett-Packard Company
Learning Products Department
24001 E. Mission
Liberty Lake, WA 99019-9599
U.S.A.

Manufacturer’s Declaration

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

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

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

Herstellerbescheinigung

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

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

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

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 instruction 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:

This product is a Safety Class I instrument (provided with a protective earthing ground incorporated in the power cord). The main 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.

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 are 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.

The power cord is connected to internal capacitors that my remain live for 5 seconds after disconnecting the plug from its power supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250 V fuse(s) or the same current rating and type (for example, normal blow or time delay). Do not use repaired fuses or short circuited fuseholders.

CAUTION: 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 product damage.

This product is designed for use in Installation Category II and Pollution Degree 2 per *IEC 1010* and *IEC 664* respectively. For indoor use only.

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

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

Product Markings

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

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

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard 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.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

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

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: **Hewlett-Packard Co.**

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

declares that the product

Product Name: TDMA Cellular Adapter

Model Number: HP 83206A

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

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
EN 55082-1 : 1992
IEC 801-2:1991 - 4 kV CD, 8 kV AD
IEC 801-3:1984 - 3V/m
IEC 801-4:1988 - 0.5 kV Sig. Lines, 1 kV Power Lines

Supplementary Information:

This 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 5, 1996

Vince Roland
Reliability & Regulatory
Engineering Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department ZQ/Standards Europe, Herrenbergen Strasse 130, D-71034 Böblingen, Germany (FAX+49-7031-14-3143)

HP Support Contacts

The documentation supplied with your Test Set and Cellular Adapter is an excellent source of reference, applications, and service information. Please use these manuals if you are experiencing technical problems:

- *HP 8920B RF Communications Test Set User's Guide*, HP P/N 08920-90221
- *HP 8920, HP 8921 Assembly Level Repair Guide*, HP P/N 08920-90168
- *HP 8920B, HP 8921 Programmer's Guide*, HP P/N 08920-90222
- *HP 83206A Cellular Adapter Software User's Guide*, HP P/N 83206-90002

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

Repair assistance is available for the HP 8920B RF Communications Test Set and HP 83206A TDMA Cellular Adapter from the factory by phone and e-mail. Internal Hewlett-Packard users can contact the factory through HP Desk or cc:Mail© (Lotus Corporation). Parts information is also available from Hewlett-Packard.

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

- Instrument model number (HP 83206A)
- Instrument Serial Number (tag located on the rear panel).
- Installed options - if any (tag located on the rear panel).
- Instrument firmware revision (displayed at the top of the screen when the Test Set is powered up, and is also displayed on the CONFIGURE screen).

Support Telephone Numbers:

1 800 827 3848 (Spokane Division Service Assistance, U.S. only)
1 509 921 3848 (Spokane Division Service Assistance, International)
1 800 227 8164 (HP Direct Parts Ordering, U.S. only)
1 916 783 0804 (HP Service Parts Identification, U.S. & Intl.)

Electronic mail (Internet): Spokane_Service@spk.hp.com

HP Desk: Spokane Service / HP1000/21

cc:Mail: SERVICE, SPOKANE /HP-Spokane,desk1

Table 1 Regional Sales and Service Offices

United States of America U.S. Instrument Support Center For Test & Measurement Equipment Repair & Calibration. Hewlett-Packard Company Englewood, Colorado 80112 Telephone: (800) 403-0801 Fax: (888) 857-8161	United States of America Customer Information Center For Assistance On All HP Products. Hewlett-Packard Company Tel: (800) 752-0900 6:00am to 5:00pm Pacific Time Parts Direct: (800) 227-8164	
South Eastern Europe Sales and Service Hewlett-Packard Ges. m.b.h. Liebigasse 1 P.O. Box 72 A-1222 Vienna, Austria Telephone: 43 222 2500 0 Telex: 13 4425	European Multicountry Region Sales and Service Hewlett-Packard S.A. P.O. Box 95 150, Route dv Nant_dl_AVRIL CH-1217 Meyrin 2 Geneva, Switzerland Telephone: (41/22) 780-8111 Fax: (41/22) 780-8542	Northern Europe Sales and Service Hewlett-Packard Nederland B.V. Startbaan 16 1187 XR Amstelveen, The Netherlands P.O. Box 667 Telephone: 31/20 5476911 X 6631 Fax: 31-20-6471825NL
Asia Sales and Service Hewlett-Packard Asia Ltd. 22-30/F Peregrine Tower Lippo Center 89 Queensway, Central Hong Kong G.P.O. Box 863 Hong Kong Telephone: 852-848-7777 Fax: 852-868-4997	Japan Hewlett-Packard Japan, Ltd. Measurement Assistance Center 9-1, Takakura-Cho, Hachioji-Shi Tokyo 192-8510, Japan Telephone: (81)-426-56-7832 Fax: (81)-426-56-7840	International Sales Branch Headquarters Sales and Service Hewlett-Packard S.A. 39 Rue Veyrot P.O. Box 365 1217 Meyrin 1 Geneva, Switzerland Telephone: 41-22-780-4111 Fax: 41-22-780-4770
Australia, New Zealand Sales and Service Hewlett-Packard Ltd. P.O. Box 221 31-41 Joseph Street Blackburn, Victoria 3130 Telephone: (61/3) 895-2895 Fax: (61/3) 898-9257	Canada Sales and Service Hewlett-Packard (Canada) Ltd. 5150 Spectrum Way Mississauga, Ontario L4W 5G1 Canada Telephone: (416) 206-4725 Fax: (416) 206-4739	Canada Service Center Hewlett-Packard Company 17500 Transcanada Highway S. Serv Road Kirkland, Quebec H9J 2X8 Canada Telephone: (416) 206-3295

Table 1 Regional Sales and Service Offices

Canada
Service Center
Hewlett-Packard Ltd.
11120 178 Street
Edmonton, Alberta T5S 1P2
Canada

Telephone: (403) 486-6666
Fax: (403) 489-8764

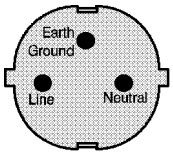
Latin America
Hewlett-Packard Company
LAHQ Mexico City
Col. Lomas de Virreyes
11000 Mexico D.F.
Mexico

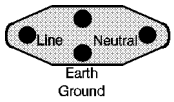
Telephone: (52/5) 326-4000
Fax: (52/5) 202 7718

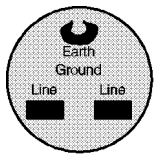
United Kingdom
Sales and Service
Hewlett-Packard Ltd.
Cain Road
Amen Corner
Bracknell, Berkshire
RG12 1HN
United Kingdom

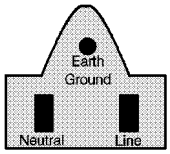
Telephone: 44 344 360000
Fax: 44 344 363344

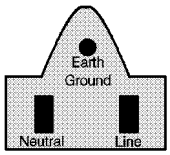
Power Cables

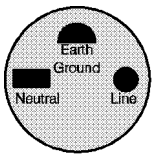
Plug Type	Plug Descriptions male/female	HP Part # (cable &plug)	Cable Descriptions
	Straight/Straight Straight/90º	8120-1689 8120-1692	79 inches, mint gray 79 inches, mint gray
Used in the following locations			
Afghanistan, Albania, Algeria, Angola, Armenia, Austria, Azerbaijan, Azores			
Bangladesh, Belgium, Benin, Bolivia, Boznia-Herzegovina, Bulgaria, Burkina Faso, Burma, Burundi, Byelarus			
Cameroon, Canary Islands, Central African Republic, 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. Pierre Islands			
Sweden, Syria			
Tajikistan, Thailand, Togo, Tunisia, Turkey, Turkmenistan			
USSR, Ukraine, Uzbekistan			
Western Africa, Western Sahara			
Yugoslavia			
Zaire			

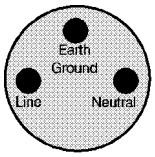
Plug Type	Plug Descriptions male/female	HP Part # (cable &plug)	Cable Descriptions
	Straight/Straight Straight/90°	8120-2104 8120-2296	79 inches, gray 79 inches, gray
Used in the following locations			
Switzerland			

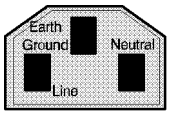
Plug Type	Plug Descriptions male/female	HP Part # (cable &plug)	Cable Descriptions
	Straight/Straight	8120-0698	90 inches, black
Used in the following locations			
Peru			

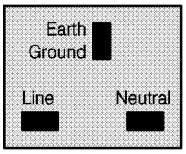
Plug Type	Plug Descriptions male/female	HP Part # (cable &plug)	Cable Descriptions
	Straight/Straight Straight/90º Straight/Straight	8120-1378 8120-6177 8120-1751	90 inches, jade gray 90 inches, jade gray 90 inches, jade gray
Used in the following locations			
American Samoa			
Bahamas, Barbados, Belize, 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), Surname			
Taiwan, Tobago, Trinidad, Trust Territories of Pacific Islands			
Turks Island			
United States			
Venezuela, Vietnam, Virgin Islands of the US			
Wake Island			

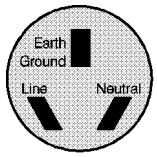
Plug Type	Plug Descriptions male/female	HP Part # (cable &plug)	Cable Descriptions
	Straight/Straight Straight/90º	8120-4753 8120-4754	90 inches, dark gray 90 inches, dark gray
Used in the following locations			
Japan			

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

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

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

Plug Type (Male)	Plug Descriptions male/female	HP 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 Territories, 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)			

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

ATTENTION
Static Sensitive Devices

This instrument was constructed in 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.

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

In This Book

This manual contains the following information to help you repair, calibrate, and verify correct operation of the HP 83206A TDMA Cellular Adapter.

Chapter 1 - Introduction. This chapter provides a general description of the Cellular Adapter and general information concerning troubleshooting, repair, and calibration of the Cellular Adapter. HP service and support information is also provided.

Chapter 2 - Troubleshooting. The procedures for isolating a failure to the faulty assembly are discussed in this chapter. The Cellular Adapter's automated diagnostics are described. The descriptions help you understand what has been checked by the diagnostics in case the diagnostics cannot identify a probable failure. Further investigation may require manually troubleshooting the Cellular Adapter.

Chapter 3 - Disassembly and Replacement. This chapter provides procedures and illustrations for disassembly of the Cellular Adapter.

Chapter 4 - Modifications. This chapter explains how to verify and/or upgrade the firmware of the Cellular Adapter.

Chapter 5 - Block Diagrams. Diagrams are provided illustrating the general operation of the Cellular Adapter. This information is given to better understand the operation of the Cellular Adapter when manually troubleshooting it (in case the automated diagnostics cannot identify a faulty assembly).

Chapter 6 - Replaceable Parts. Contains illustrations for identifying the various assemblies and components of the Cellular Adapter. Part numbers for each replaceable part are also provided.

Chapter 7 - Periodic Calibration and Performance Tests. Contains Cellular Adapter calibration and performance test procedures.

Chapter 8 - Specifications. Lists the warranted specifications of the Cellular Adapter.

Glossary. Provides a list of common acronyms, terms, and definitions used in cellular communications.

Conventions Used in this Manual

The HP 83206A TDMA Cellular Adapter is referred to as the Cellular Adapter.

The HP 8920B RF Communication Test Set is referred to as the Test Set.

The HP 83206A TDMA Cellular Adapter combined with the HP 8920B RF Communication Test Set is referred to as the Test System.

Other Manuals Required

When troubleshooting the Test System, the following manuals may be necessary:

- *HP 8920B RF Communications Test Set User's Guide*, HP P/N 08920-90221
- *HP 8920, HP 8921 Assembly Level Repair Guide*, HP P/N 08920-90168
- *HP 8920B, HP 8921 Programmer's Guide*, HP P/N 08920-90222
- *HP 83206A Cellular Adapter User's Guide*, HP P/N 83206-90002

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

Contents

1

Introduction

This chapter contains a general description of the HP 83206A Cellular Adapter, and general information about troubleshooting, calibrating, and servicing the Cellular Adapter. Lists of equipment (including documentation) required to service the Cellular Adapter are also provided.

Test System Description

The HP 83206A Cellular Adapter (see **figure 1**) is an accessory to the HP 8920B RF Communications Test Set. The Cellular Adapter and Test Set are connected together via rear-panel cables and work together as a system. The Cellular Adapter adds digital signal generation and analysis to the Test Set's analog test capabilities.

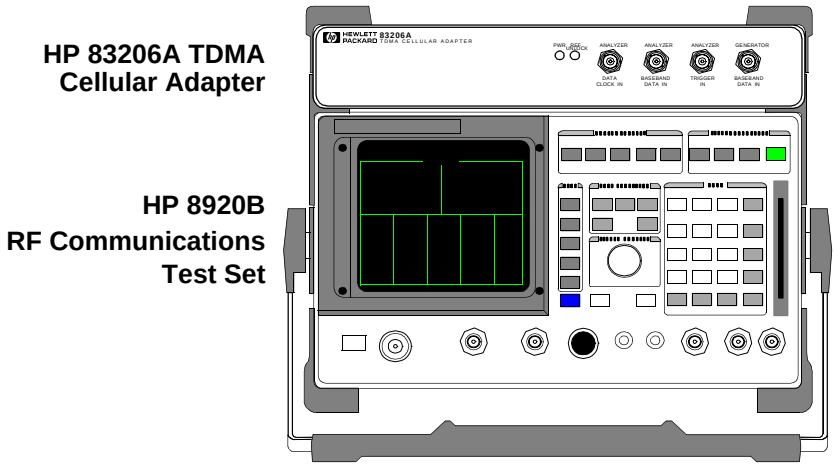


Figure 1 **HP 83206A TDMA Cellular Adapter & HP 8920B Test Set**

The HP 83206A TDMA Cellular Adapter adds TDMA DAMPS/DCCH (IS-136) mobile measurement capability to the HP 8920B RF Communications Test Set. The Cellular Adapter provides a complete π/4 DQPSK signal generator, π/4 DQPSK modulation analyzer, data source, and BER (Bit Error Rate) analyzer for TDMA measurements on DAMPS (IS-54) and DCCH (IS-136) phones. The HP 83206A replaces the HP 83201B TDMA Cellular Adapter (HP 8920B Option 500) for making measurements on TDMA dual-mode DAMPS phones, adding signal digital control channel test features to fully characterize DCCH phones. Each Cellular Adapter has the following major assemblies:

- A2 Receiver Digital Signal Processing (RX DSP)
- A3 Motherboard
- A4 Premodulator Filter
- A5 Protocol Processor
- A8 Power Supply
- A9 IQ Modulator/Reference (This assembly includes the A6 Reference and A7 IQ Modulator assemblies. The A6 and A7 assemblies cannot be separately replaced.)

TDMA Cellular Adapters

The HP 83206A TDMA Cellular Adapter includes DSP (Digital Signal Processing) hardware and firmware to test the transmitter and receiver portions of Time Division Multiple Access (TDMA) base stations. Systems using the TDMA format use encoders and decoders to digitize speech and add call processing information.

TDMA digital cellular systems use frequency channelization (comparable to current analog systems with 30 kHz spacing) and time domain multiplexing to increase system capacity. Each channel is shared in time by up to three users.

For transmitting, TDMA uses:

- a Vector Sum Excited Linear Predictive (VSELP) speech coder
- a Channel coder
- a π/4 Differential Quadrature Phase Shift Keying (π/4 DQPSK) modulator
- a Filter and RF amplifier

The VSELP speech coder uses VSELP coding to digitize speech, using complex algorithms to minimize the amount of data needed to represent the voice information. The channel coder adds TDMA data for channel coding, such as the phone's subscriber number, and the channel (frequency) to use. The π/4 DQPSK modulator provides π/4 differential quadrature phase shift keying modulation, using the local oscillator to up-convert the signal to the cellular frequency band. The modulated carrier is filtered, amplified, and sent to the antenna for transmission.

For receiving, TDMA uses:

- a RF tuned receiver and filter
- an IQ demodulator
- a channel decoder
- a VSELP speech decoder

When the TDMA signal is received, it is filtered, down-converted to an intermediate frequency (IF), is filtered again, and input to the IQ demodulator. The demodulated data enters the channel decoder to remove the channel information. The VSELP speech decoder reconstructs the remaining data into speech.

Troubleshooting

The Cellular Adapter is normally sent in for service connected to its companion Test Set. The Test Set's internal ROM contains programs for verifying the Cellular Adapter's performance and for calibrating the Cellular Adapter and Test Set interface.

Diagnostic programs for servicing the Cellular Adapter also reside in the Test Set's firmware (ROM). Two types of built in diagnostics are available to aid in troubleshooting: power-up diagnostics which check the Test Set and Cellular Adapter's internal control circuitry, and TDMA functional diagnostics which check analog and digital signal generation and analysis circuitry.

Chapter 7, "Periodic Calibration and Performance Tests" on page 113 explains the calibration and performance programs. **Chapter 2, "Troubleshooting" on page 41** explains the power-up and TDMA diagnostics programs.

Repair Process

Repair of the Cellular Adapter consists of the following steps:

1. Isolate the fault or problem to the Cellular Adapter or the Test Set (see **chapter 2, "Troubleshooting" on page 41**). If the problem is with the Test Set, refer to the Test Set's Assembly Level Repair Manual (08920-90168).
2. Isolate the problem to a faulty assembly within the Cellular Adapter (see **chapter 2, "Troubleshooting" on page 41**).
3. Replace the faulty assembly (see **chapter 3, "Disassembly and Replacement" on page 59**).
4. Calibrate the Cellular Adapter (see **chapter 7, "Periodic Calibration and Performance Tests" on page 113**).
5. Verify the performance of the Cellular Adapter (see **chapter 7, "Periodic Calibration and Performance Tests" on page 113**).

Periodic Calibration and Performance Tests

To calibrate the Cellular Adapter run the automatic self-calibration program. This program, PER_CALD, resides in the Test Set's ROM as part of its firmware. This calibration program does not require external equipment or manual adjustments in the Cellular Adapter. Performance tests are also provided. Performance tests verify that the Cellular Adapter performs to its specifications. For calibration and performance procedures, refer to **chapter 7, "Periodic Calibration and Performance Tests" on page 113**.

NOTE: CALIBRATION INTERVAL

The calibration program PER_CALD (**see "Periodic Calibration" on page 114**) should be performed anytime the Cellular Adapter is disconnected and re-attached to the Test Set, after any assembly is replaced, or at least every 12 months.

NOTE: PERFORMANCE TEST INTERVAL

The performance tests in **"Performance Test Procedures" on page 116** should be performed anytime an assembly is replaced, or at least every 24 months.

Service Tools and Equipment

Equipment

External equipment is not required for the periodic calibration of the Cellular Adapter or for running the diagnostic routines. However, additional test instruments are is required for the performance tests (see **"Performance Test Procedures" on page 116**). If diagnostic routines can not isolate the problem, an oscilloscope, voltmeter, and spectrum analyzer are the only instruments usually needed for further troubleshooting. A second Test System (Cellular Adapter and Test Set) is helpful for troubleshooting performance test failures.

Tools

The following tools are needed for assembly removal and replacement:

- TX-10 Torx screwdriver
- 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)

User’s Guides

Cellular Adapter

The HP 83206A TDMA Cellular Adapter’s software information is documented in the *HP 83206A User’s Guide*, HP part number 83206-90002.

Test Set

The HP 8920B RF Communications Test’s repair and calibration information is documented in the *HP 8920, HP 8921 Assembly Level Repair Guide*, HP P/N 08920-900168

Other manuals that may be of interest are:

- *HP 8920, HP 8921 Programmer’s Guide*, HP P/N 08920-90222
- *HP 8920 RF Communications Test Set User’s Guide*, HP P/N 08920-90221

Service Information

Test Set Documentation

The Cellular Adapter along with a Test Set form a test system. Servicing the Cellular Adapter is discussed in this manual. Servicing the HP 8920B RF Communications Test Set is documented in the *HP 8920, HP 8921 Assembly Level Repair* manual (HP part number 08920-90168).

Factory Support

Troubleshooting assistance is available for Test Sets and Cellular Adapters by email (electronic mail) or telephone:

- Internet e-mail address: **spokane_service@spk.hp.com**
- Spokane Division Website
  WWW home page - HP personnel only: **http://www.spk.hp.com**
- U.S.A. and Canada only, M-F, 8AM-5PM PST,
  toll free: **800-827-3848**
- Outside North America, M-F, 8AM-5PM PST,
  phone: **509-921-3848**
- Application Support, M-F, 8AM-5PM PST,
  phone: **800-922-8920**

Ordering Parts

To order parts, call HP Support Materials Organization (SMO):

- U.S.A only,
  HP Direct Parts Ordering, phone: **800-227-8164**
- U.S.A and international,
  HP Service Parts Identification, phone: **916-783-8004**

2

Troubleshooting

This chapter contains troubleshooting procedures for the HP 83206A TDMA Cellular Adapter.

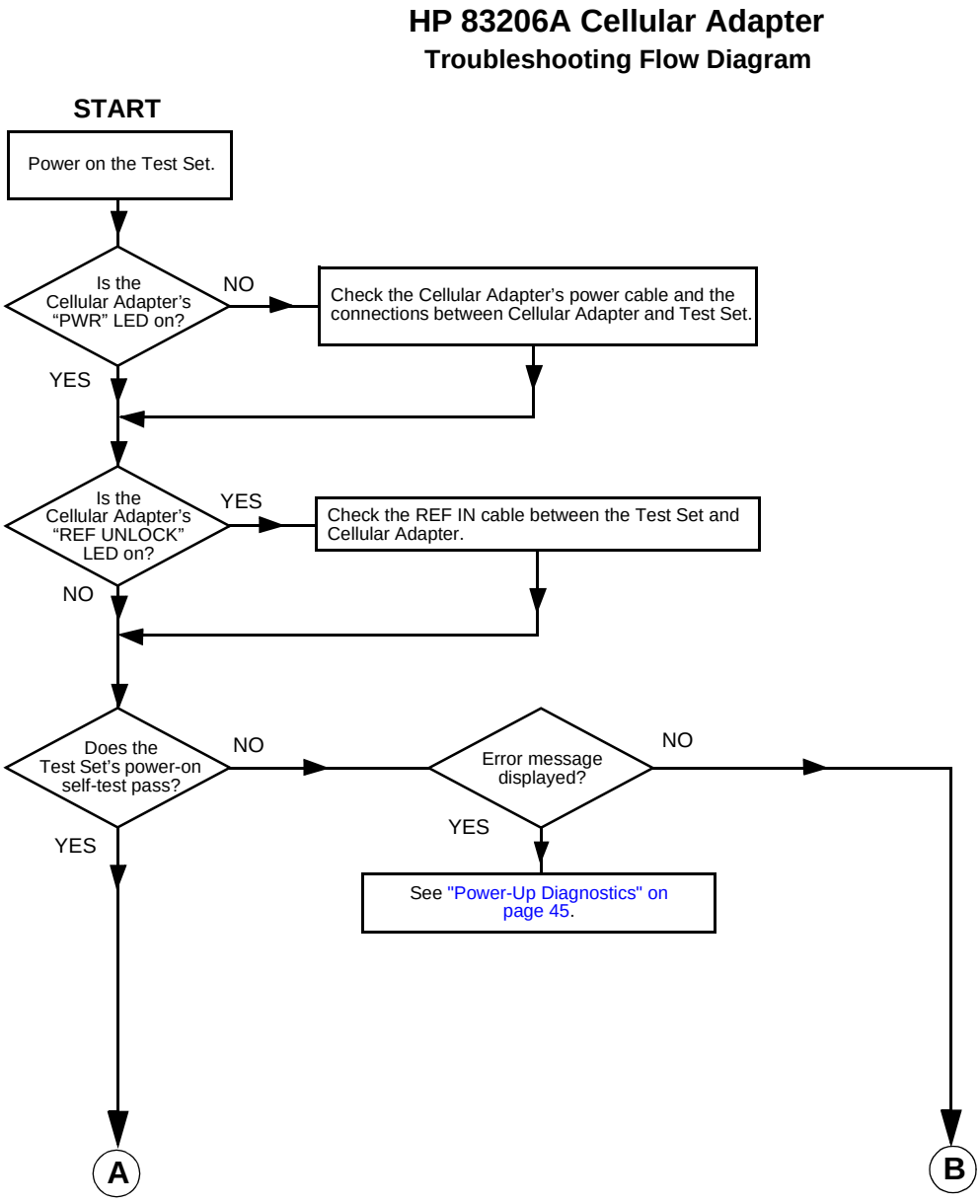
Test System Troubleshooting

Before troubleshooting the Cellular Adapter, ensure that the Test Set is operating correctly independent of the Cellular Adapter. The Test Set has, resident in ROM, diagnostic programs to help you isolate a failure in the Test Set. These programs do not require external equipment. Refer to the Test Set's Assembly Level Repair manual for detailed troubleshooting procedures (HP part number 08920-90168).

The Test Set also has diagnostic programs resident in ROM to help you isolate a failure in the Cellular Adapter. These programs don't require external equipment, however, external connections between the Test Set and the Cellular Adapter may be required. These diagnostic programs help isolate the most common Cellular Adapter failures to the defective assembly.

- **Power-Up Diagnostics**
  Every time the Cellular Adapter is powered on, self-test diagnostics are run. A failure detected in the Cellular Adapter or Test Set by the power-up diagnostics is displayed on the Test Set's screen as an error message and code. If the problem lies in the Cellular Adapter, further investigation of the problem involves removing the cover of the Test Set to view troubleshooting LEDs within the Test Set. Details are explained later in this chapter.
- **TDMA Diagnostic Programs**
  DMCDIAGL (**see page 50**) and DMCDIAGN (**see page 54**) are IBASIC TDMA diagnostic programs stored in the Test Set's ROM. When these programs are run, the results are displayed on the Test Set's screen. These tests compare the Cellular Adapter's current state against expected limits defined in the diagnostic software. When test measurements are not within the expected limits, the diagnostics list the assembly that has failed, and give an indication of the certainty of the failure.

Use the flow diagram in **figure 2 on page 43** to assist you in troubleshooting the Cellular Adapter.



See TDMA Diagnostic Path in figure 3 on page 44.

See Test Set Diagnostic Path in figure 3 on page 44.

Figure 2 HP 83206A Cellular Adapter Troubleshooting Procedure

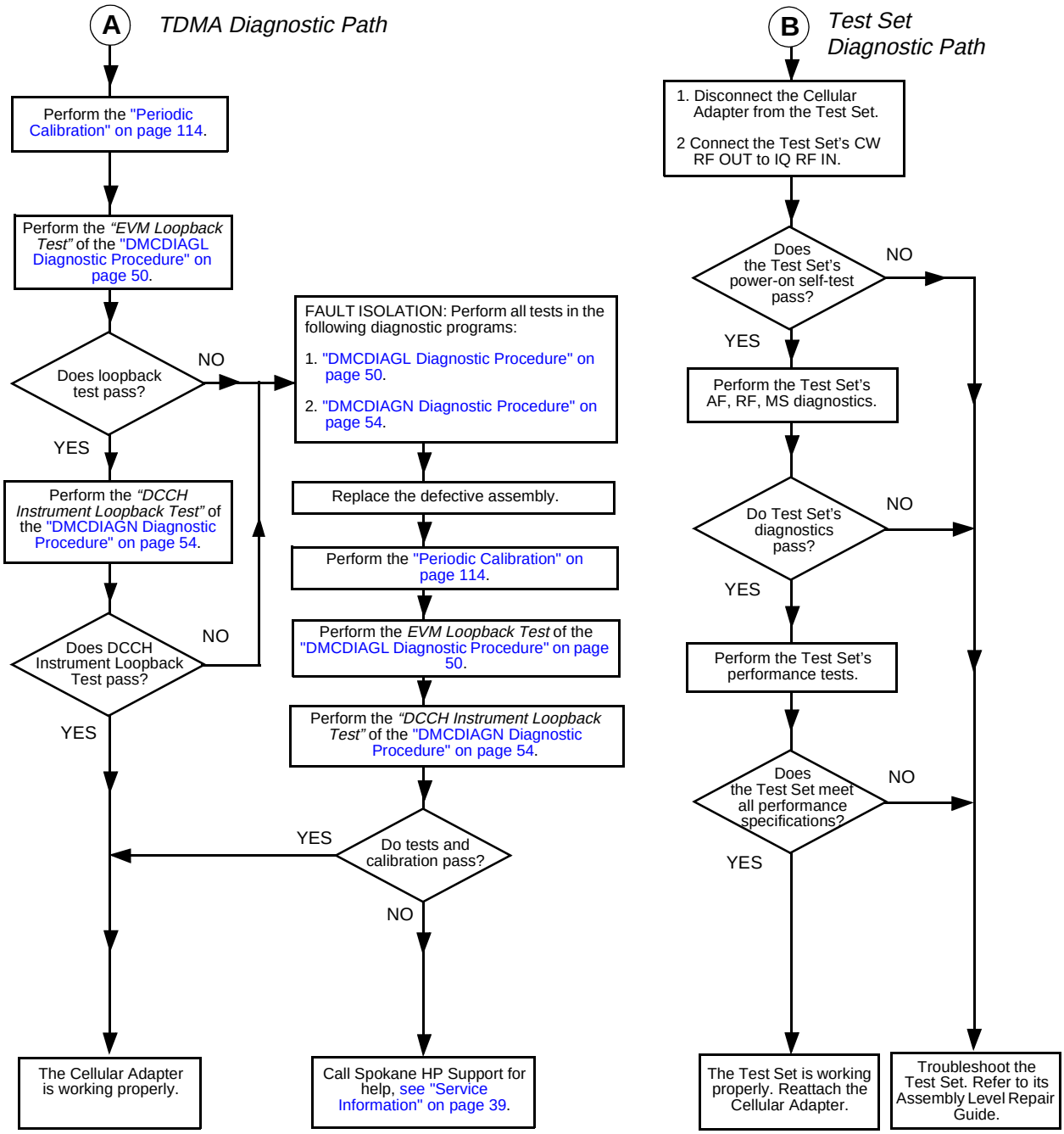


Figure 3 **HP 83206A Cellular Adapter Troubleshooting Procedure**

Power-Up Diagnostics

Test System Power-Up Diagnostics

Use the table below to interpret the power-up diagnostics failure message:

```
one or more self tests failed nnnn
```

(where nnnn is the error code). The following table gives the values for individual failures. Multiple failures produce the sum of the individual failures.

Table 2 Power-Up Self-Test Failure Error Codes

Detect Error	Error Code
68000 Processor Failure	0002
ROM Checksum Failure	0004
Standard Non-Volatile System RAM Failure	0008
Optional Non-Volatile System RAM Failure	0010
68040 Timer Chip Failure	0020
Real-time Clock Chip Failure	0040
Keyboard Failure (stuck key)	0080
RS-232 Chip (I/O option installed and not functioning correctly)	0100
Serial Bus Communication Failure with a Standard Board	0200
Signaling Board Self-Test Failure	0400
CRT Controller Self-Test Failure	0800
Miscellaneous Hardware Failure or HP 83206A Failure[1]	1000

1. The Cellular Adapter's only self-test error code number is 1000. However this code can also be a self-test error code number for the Test Set.

Cellular Adapter Power-Up Diagnostics

Power-up diagnostic information for the Cellular Adapter is only interpretable through visual observation of the LEDs on the A7 assembly of the Test Set. Observation of these LEDs requires removing the Test Set's cover. Accessing and interpreting the LEDs is explained in the following steps:

Step 1. Detach the Cellular Adapter from the Test Set.

Disconnect the cables between the Cellular Adapter and the Test Set, and remove the screws shown in **figure 4** to detach the Cellular Adapter from the Test Set.

Step 2. Removing the Test Set's cover.

Remove the rear-panel screws shown in **figure 4** and slide the Test Set's cover off. (For detailed instructions refer to the HP 8920, 8921 Assembly Level Repair manual.)

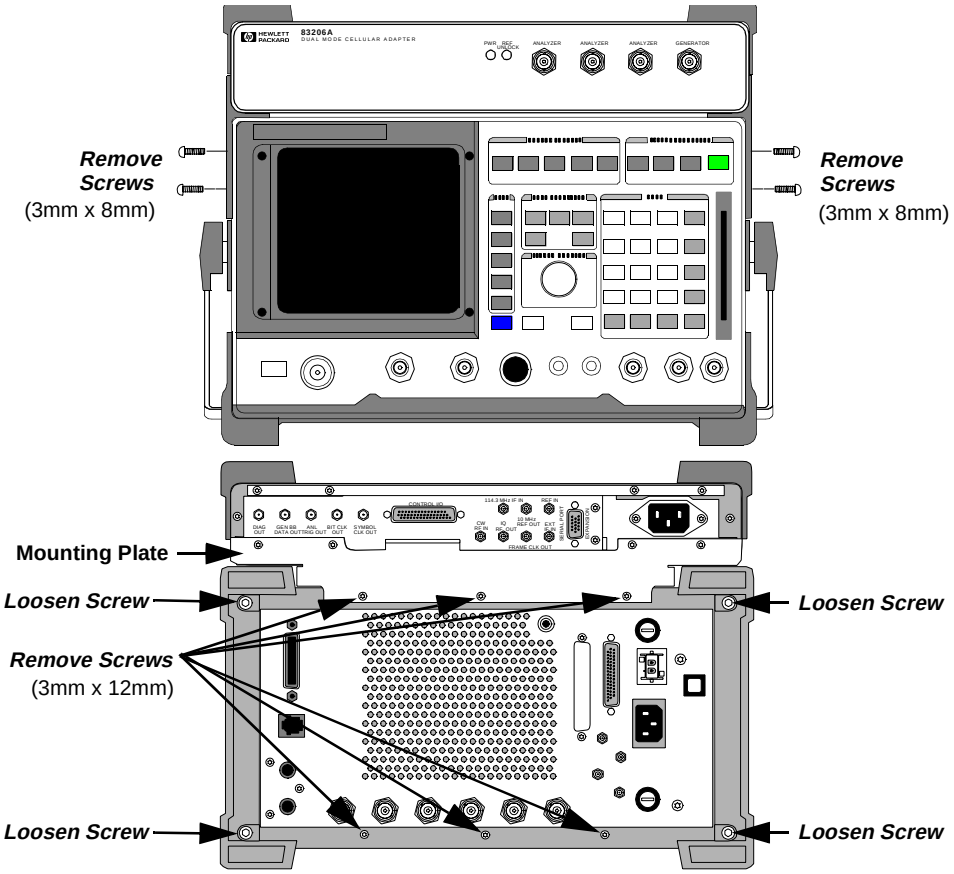


Figure 4 **Detaching the Cellular Adapter and Removing the Test Set's Cover**

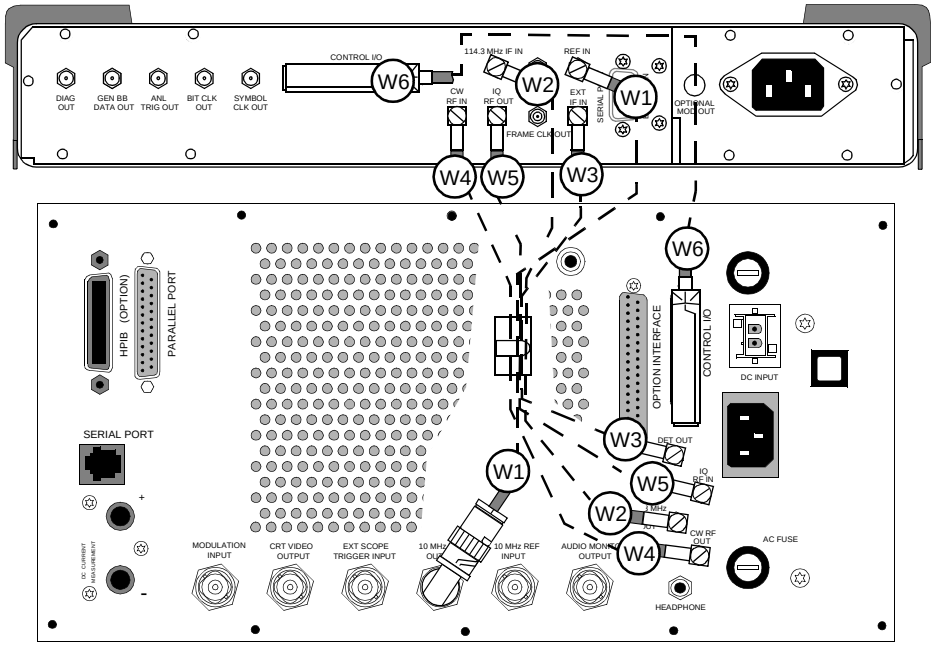
Step 3. Reconnect the cabling between the Test Set and Cellular Adapter.

See **figure 5** below.

HP 83206A Cellular Adapter

HP 8920B Test Set

(rear panel, without cover)



HP 8920B Test Set	Wire No.	HP 83206A Cellular Adapter
10 MHz REF OUT	W1	REF IN
114.3 MHz IF OUT	W2	114.3 MHz IF IN
DET OUT	W3	EXT IF IN
CW RF OUT	W4	CW RF IN
IQ RF IN	W5	IQ RF OUT
CONTROL I/O	W6	CONTROL I/O

Figure 5 **Test Set and Cellular Adapter Cabling**

Step 4. Power up the Test Set. Observe and record the patterns of the LEDs on the A7 assembly of the Test Set.

See **figure 6**.

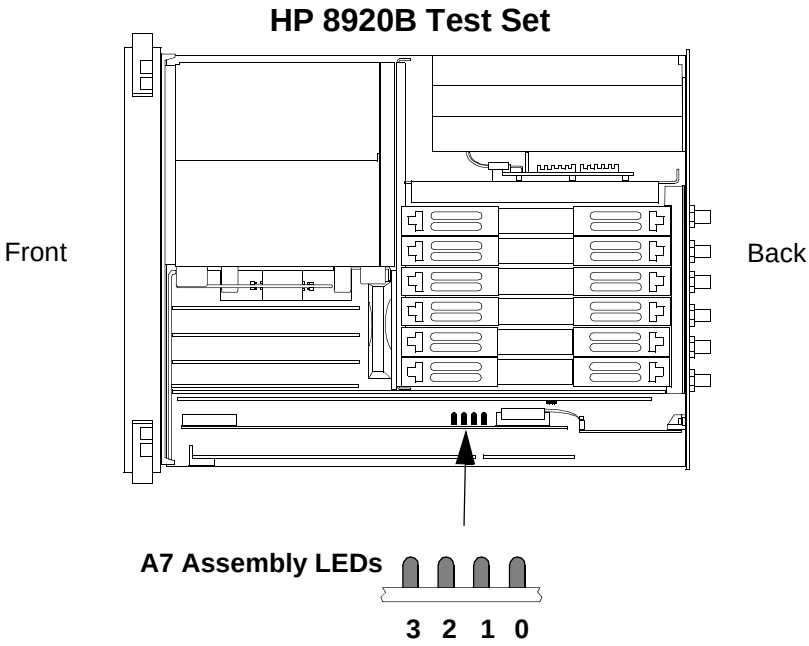


Figure 6 **Test Set LEDs**

Step 5. Interpret the A7 LEDs of the Test Set.

During initial power-up, all the LEDs will light for approximately 10 seconds and then turn off. If a Cellular Adapter failure is detected after initial power-up, the first LED pattern (**see figure 7 on page 49**) will blink rapidly and represent a miscellaneous hardware pattern. The second and third LED patterns are non-blinking and represent failure details.

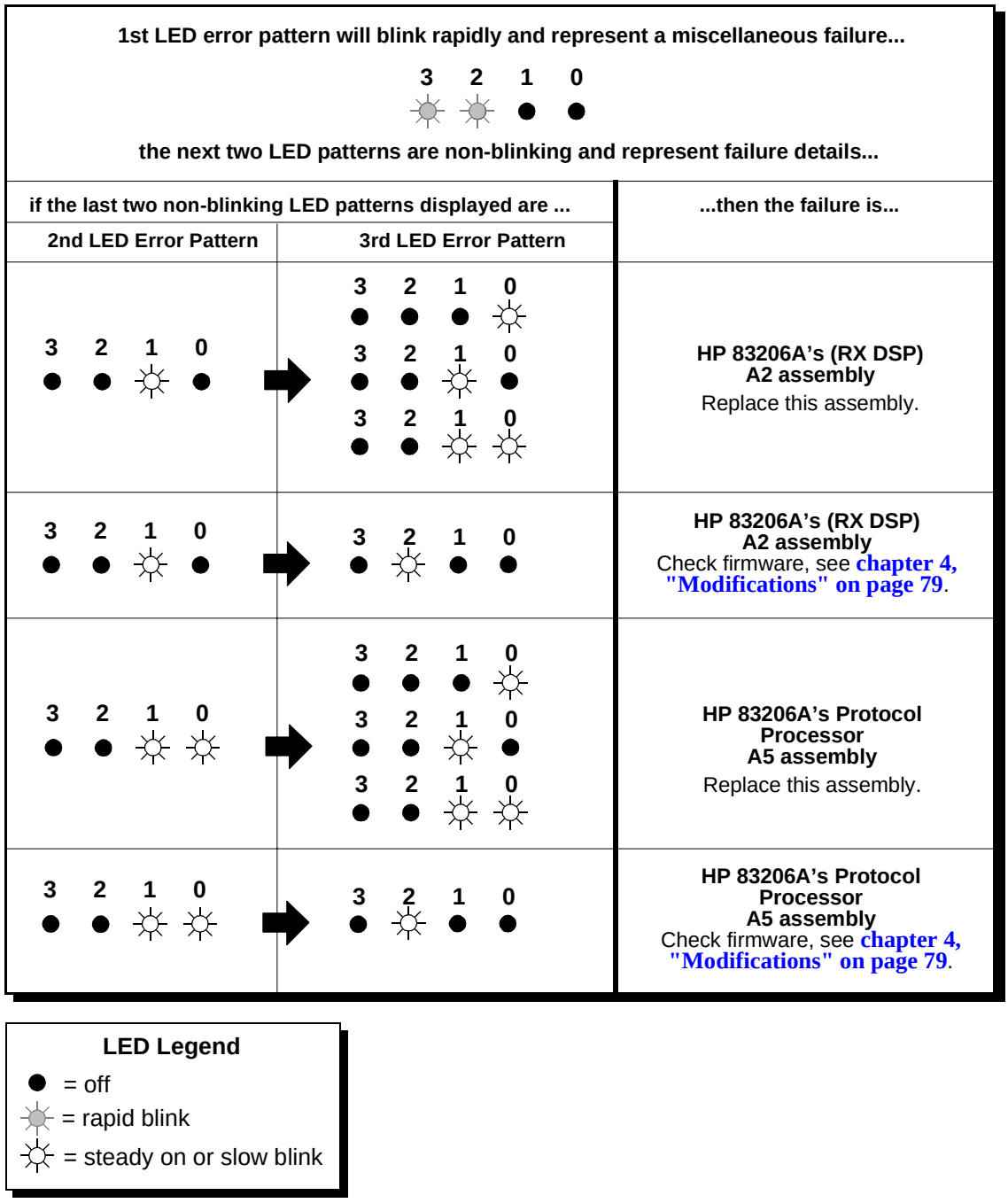


Figure 7 **Hardware Failure Table**

TDMA Troubleshooting

There are two diagnostic programs for the Cellular Adapter: DMCDIAGL and DMCDIAGN.

DMCDIAGL Diagnostic Procedure

You must verify that the Test Set is operating correctly before this program is performed on the Cellular Adapter. The DMCDIAGL diagnostic program performs general and global tests on the TDMA Cellular Adapter. (This diagnostic program is usually performed before the DMCDIAGN diagnostic program.) Use **figure 8** for making the necessary external cable connections between the Test Set and Cellular Adapter.

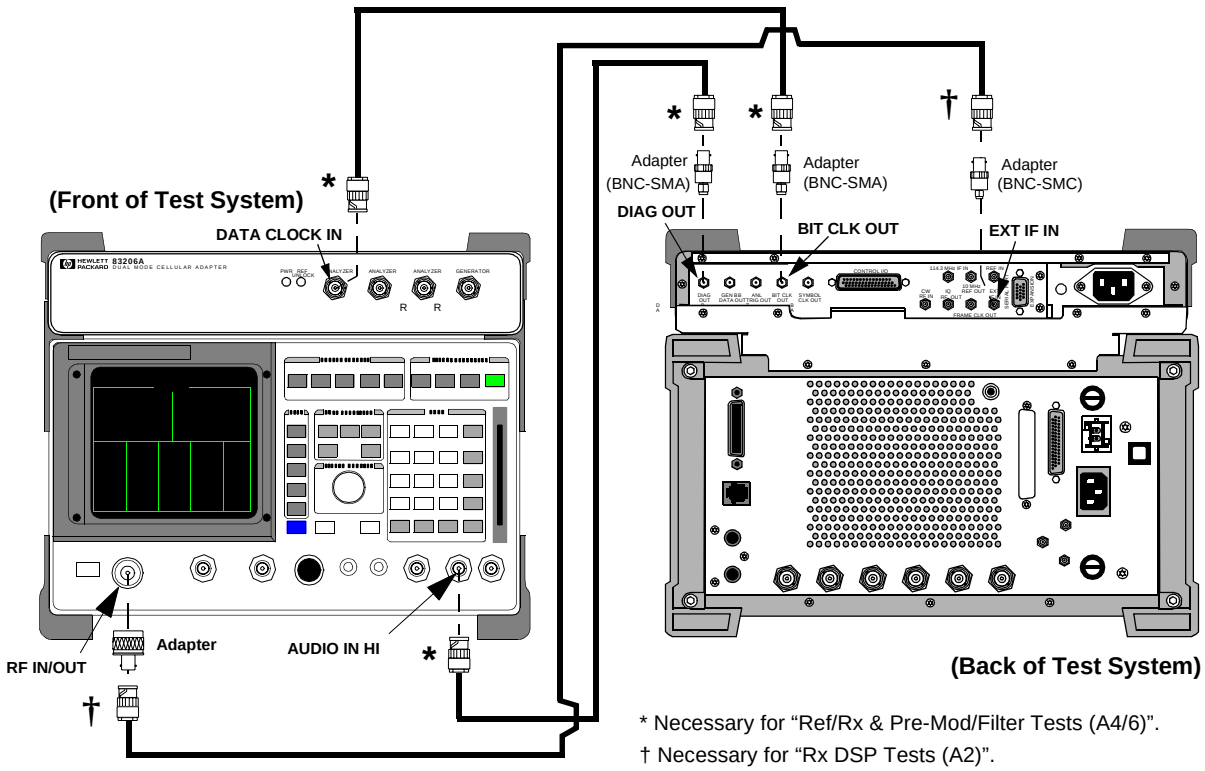


Figure 8 **DMCDIAGL Test Setup**

Step 1. Access the TESTS (Main Menu) Screen.

Press the TESTS key. The TESTS (Main Menu) screen appears on the Test Set, **see figure 9**.

Step 2. Select the Test Procedure.

Select **`ROM`** as procedure location of the diagnostic program, and then select **`DMCDIAGL`** as the procedure filename. See **figure 9** as reference.

Step 3. Run the Test Procedure.

Follow the instructions on the Test Set's display. Select one or all of the tests and press the k1 (**`Run Test`**) key to run the tests. For a description of each DMCDIAGL test, **see "DMCDIAGL Tests Descriptions" on page 53**.

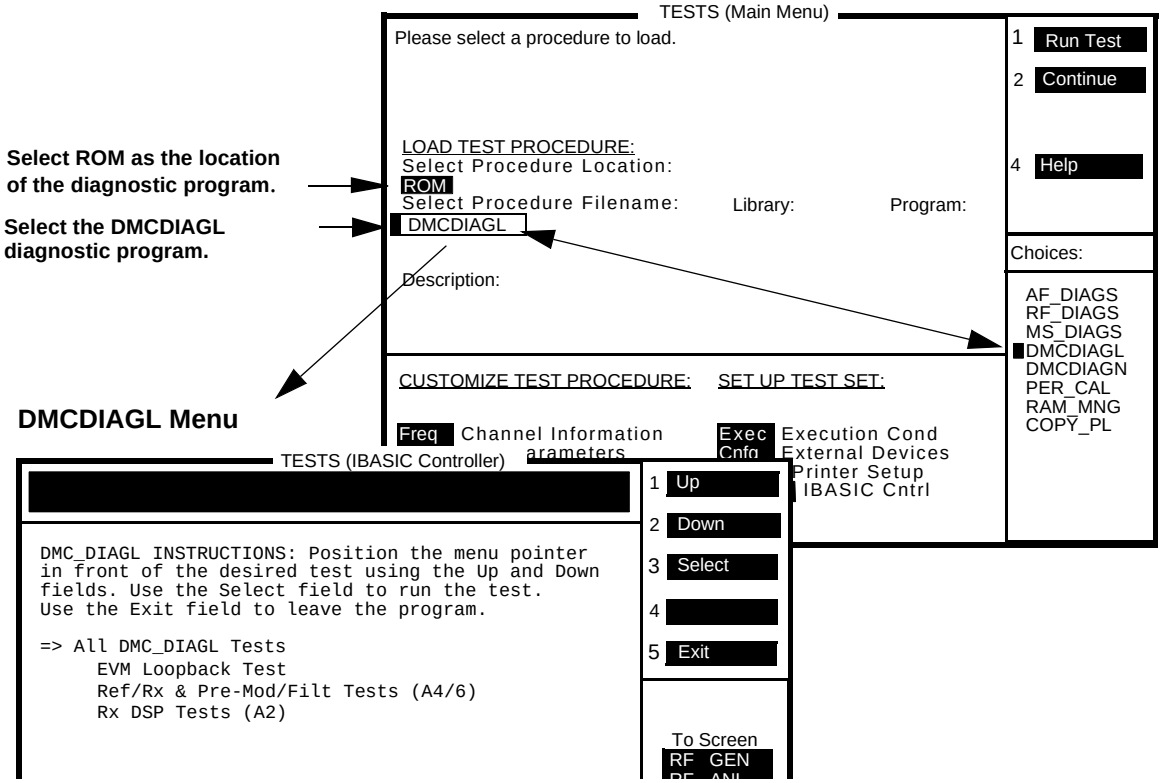


Figure 9 DMCDIAGL Screen

Step 4. Interpreting the Diagnostic Test Results

Replace the assembly designated by the fault report, see **figure 10**. Use the "Probability" factor as a guideline in prioritizing the probability of failure. If more than one assembly is listed, replace one assembly at a time, from highest to lowest probability. Re-run the test procedure after each assembly replacement.

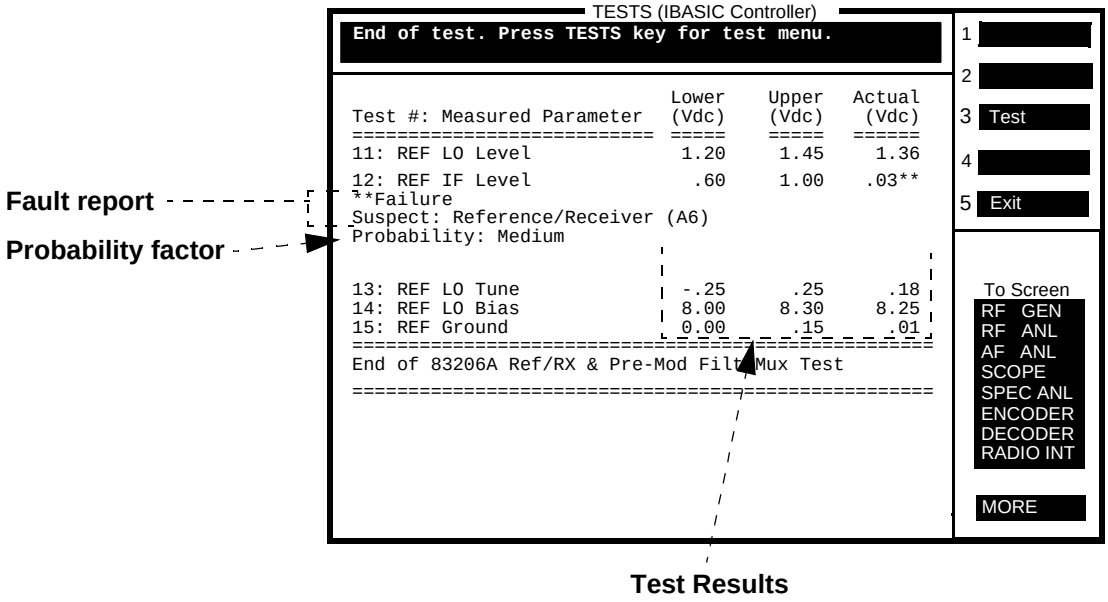


Figure 10 **Interpreting Test Results for the DMCDIAGL Tests**

DMCDIAGL Tests Descriptions

All DMC_DIAGL Tests

This routine performs the EVM Loopback Test, Ref/RX & Pre-Mod/Filter Tests, and RX DSP Tests. By connecting external cables between the Cellular Adapter and the Test Set (**see figure 8 on page 50**), all the previously mentioned tests are performed without further interaction. The external cable connections (displayed on the screen when this program choice is initiated) permit the use of the “loop” option during the diagnostics. Looping is especially useful for finding intermittent or temperature related problems.

EVM Loopback Test

(Error-Vector Magnitude Loopback Test)

This routine performs a global test that exercises all the assemblies in the Cellular Adapter. An error-vector magnitude measurement is made on the received data by generating IQ data, and internally looping that data into the Test Set’s receiver (via the Test Set’s internal splitter). Information about the necessary cable connections is presented on the display when this test is initiated.

Ref/RX & Pre-Mod/Filt Tests (A4/A6)

(Reference/Receiver and Pre-Modulation/Filter Tests, for A4 and A6 Assemblies)

This routine tests the DC and low frequency signals available through the analog multiplexers on the Reference/Receiver and Premodulator/Filter assemblies. Information about the necessary cable connections is presented on the display when this test is initiated.

RX DSP Tests (A2)

(Receiver Digital Signal Processor Tests, for A2 Assembly)

This routine tests the Receiver DSP assembly of the Cellular Adapter. An error vector magnitude measurement is made on the received data by generating a 700 kHz + 3.0375 kHz (24.3/8 kHz) signal into the EXT IF IN connector to simulate an IQ-modulated signal with a data stream of all zeros. Information about necessary cable connections is presented on the display when this test is initiated.

DMCDIAGN Diagnostic Procedure

The DMCDIAGN diagnostic program tests the individual assemblies of the Cellular Adapter and the functions of Digital Control Channel's (DCCH) measurement processing. DMCDIAGN is used as a fault isolation tool, and its tests require several different external cable connections. The tests are loopable when performed individually. Each test will prompt you to make the necessary cable connections. Also, some of the DMCDIAGN tests use the Test Set's "latch" commands which will require the Test Set's power to be cycled off and on after each test is completed.

Step 1. Access the TESTS (Main Menu) Screen.

Press the TESTS key. The TESTS (Main Menu) screen appears on the Test Set. See **figure 11**.

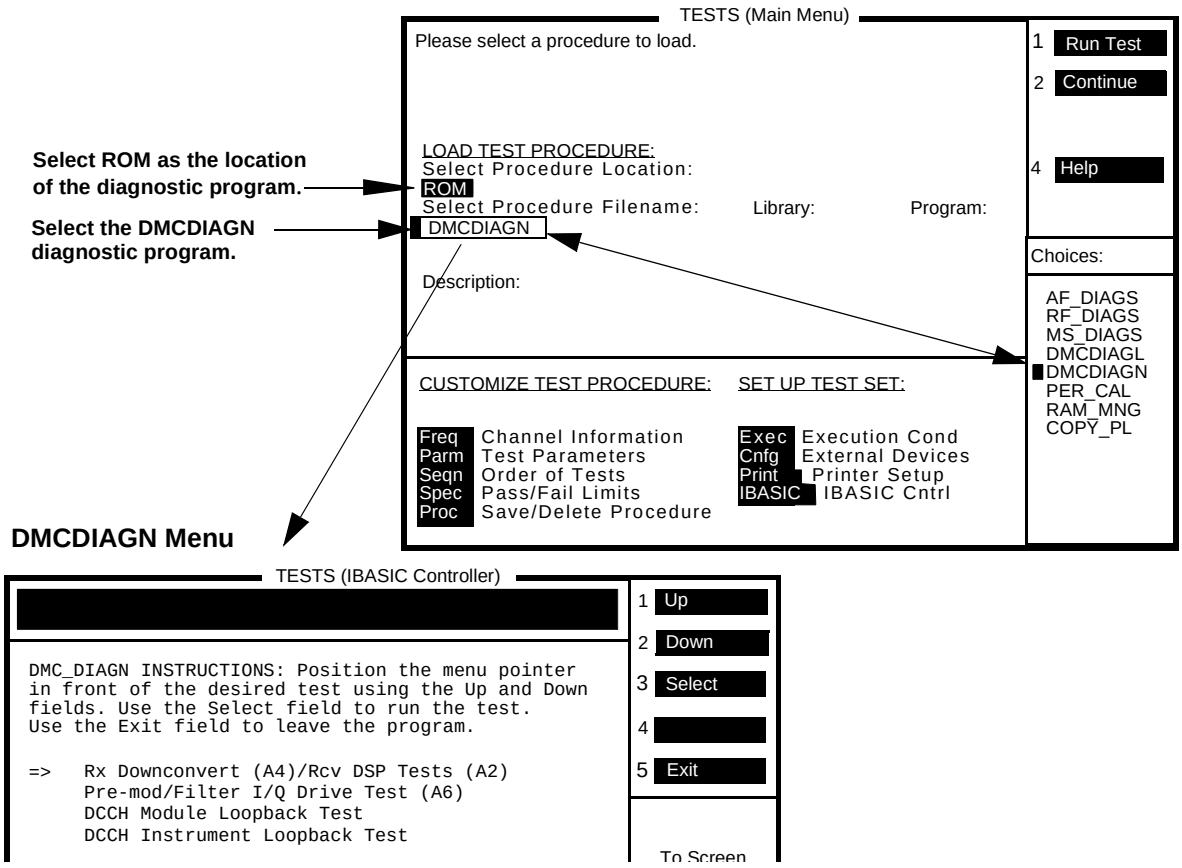


Figure 11 DMCDIAGN Screen

Step 2. Select the Test Procedure.

Select **ROM** as procedure location of the diagnostic procedure, and then select **DMCDIAGN** as the procedure filename. See **figure 11 on page 54**.

Step 3. Run the Test Procedure.

Press the k1 (**Run Test**) key to access the DMCDIAGN screen and follow the instructions on the CRT. For a description of each diagnostic test, **see "DMCDIAGN Tests Descriptions" on page 56**.

Step 4. Interpreting the Diagnostic Test Results.

Replace the assembly suspected by the fault report as being the failure, see **figure 12**. Use the "Probability" factor as a guideline in prioritizing the probability of failure. If more than one assembly is listed, replace one assembly at a time, from highest to lowest probability. Re-run the test procedure after each assembly replacement.

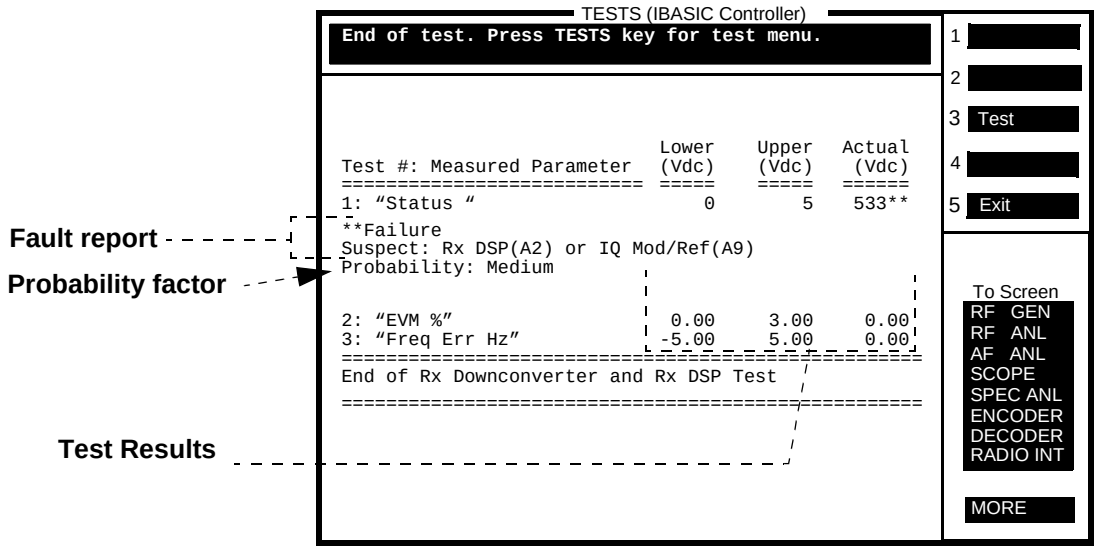


Figure 12 **Interpreting the Test Results for the DMCDIAGN Tests**

DMCDIAGN Tests Descriptions

RX Downconvert (A4)/Rcv DSP Tests (A2)

(Receiver Downconverter (A4 Assembly) and Receiver Digital Signal Processor (A2) Assembly Tests)

This routine tests the receiver downconverter on the A4 assembly and the receiver digital signal processor on the A2 assembly. An EVM measurement is made and compared to the expected limits to verify the functionality of the downconverter by setting the Test Set's RF generator to 114.3 MHz + 3.0375 kHz to simulate a zero bit stream pattern IQ modulation. The Test Set's RF IN/OUT port is connected to the Cellular Adapter's 114.3 MHz IF IN port for this test procedure.

When all zeros are transmitted, the Test Set can have difficulty detecting the phase of the data clock. This will result in the following message being displayed: **`Symbol clock is weak: accuracy is degraded`**. A measurement will still be taken and results returned, however, performance may be degraded. Since this routine is a functional and not a performance verification degraded performance is acceptable.

Pre-mod/Filter I/Q Drive Test (A6)

This routine tests the IQ modulation drive signals. The frequency of the drive signal is measured by setting the Premod Filter assembly's internal bits to output a stream of zeros into the modulator. The correct frequency is 3.075 kHz. The Test Set's AUDIO IN HI port is connected to the Cellular Adapter's rear panel DIAG OUT port for this test procedure.

DCCH Module Loopback Test

This routine tests the basic functionality of the A5 Protocol Processor (DCCH) assembly. The Protocol Processor is put into a special board level loopback mode where digital data is transmitted and received within the module. A bit-error-rate (BER) measurement is made on 10,000 bits, and there must be no bit errors for a properly functioning module. No external cable connections are needed for this test.

DCCH Instrument Loopback Test

This routine tests the full functionality of the A5 Protocol Processor (DCCH) assembly, including its ability to transmit and receive data. The Protocol Processor is put into a special instrument-level mode, and digital data is transmitted and received using the full path through the Test Set and Cellular Adapter. The Protocol Processor transmits and receives baseband digital data, the Cellular Adapter performs the modulation and demodulation, and the Test Set provides the 850 MHz carrier and modulation receiver. A bit-error-rate (BER) measurement is made on 10,000 bits, and there must be no errors for a properly functioning assembly. The Test Set's DUPLEX OUT and ANT IN ports are connected together for this test.

Because the digital data in this special instrument-level mode is a non-standard signal, the Test Set can have difficulty calculating the actual signal level. This will result in the following message being displayed: **`Analyzer is underdriven. Increase signal level or gain`**. This is not an error and has no effect on the digital data in the BER measurement.

3

Disassembly and Replacement

This chapter explains how to disassemble the HP 83206A TDMA Cellular Adapter for the purpose of replacing failed parts. For part numbers, **see chapter 6, "Replaceable Parts" on page 99**.

Disassembly of the Cellular Adapter

Use **table 3** to help you access the assemblies of the Cellular Adapter.

Table 3 Cellular Adapter Disassembly Table

To...	see...
remove the adapter's cover...	**"Separating Units and Removing Cover" on page 61**.
operate the adapter without its cover...	**"Operation Without Cover" on page 63**.
remove the A8 power supply...	**"Removing the A8 Power Supply Assembly" on page 64**.
remove the fuse holder, fan, or power supply cables...	**"Disconnecting Subassembly Power Connectors" on page 65**.
remove the front panel...	**"Removing the Front Panel" on page 66**.
remove the rear panel...	**"Removing the Rear Panel" on page 68**.
remove the A4 assembly[1]...	**"Removing the A4 Premod Filter Assembly" on page 70**.
remove the A9 assembly[1]...	**"Removing the A9 IQ Modulator/Reference Assembly" on page 72**.
remove the A4 and A9 assemblies as a unit...	**"Removing the A4 and A9 Assemblies as a Unit" on page 74**.
remove the A2 or A5 assembly...	**"Removing the A2 RX DSP and A5 Protocol Processor Assemblies" on page 76**.
remove the A3 motherboard...	**"Removing the A3 Motherboard Assembly" on page 78**.

1. To remove the A4 and A9 assemblies as one unit, **see "Removing the A4 and A9 Assemblies as a Unit" on page 74**.

Separating Units and Removing Cover

To separate the Cellular Adapter from the Test Set and to remove the adapter's cover:

1. Disconnect all power and interconnecting cables from the Cellular Adapter.
2. Separate the Cellular Adapter from the Test Set after removing the 7 screws that secure the units together, **see figure 13**:
   - 4 screws from the side brackets
   - 3 screws from the rear mounting plate

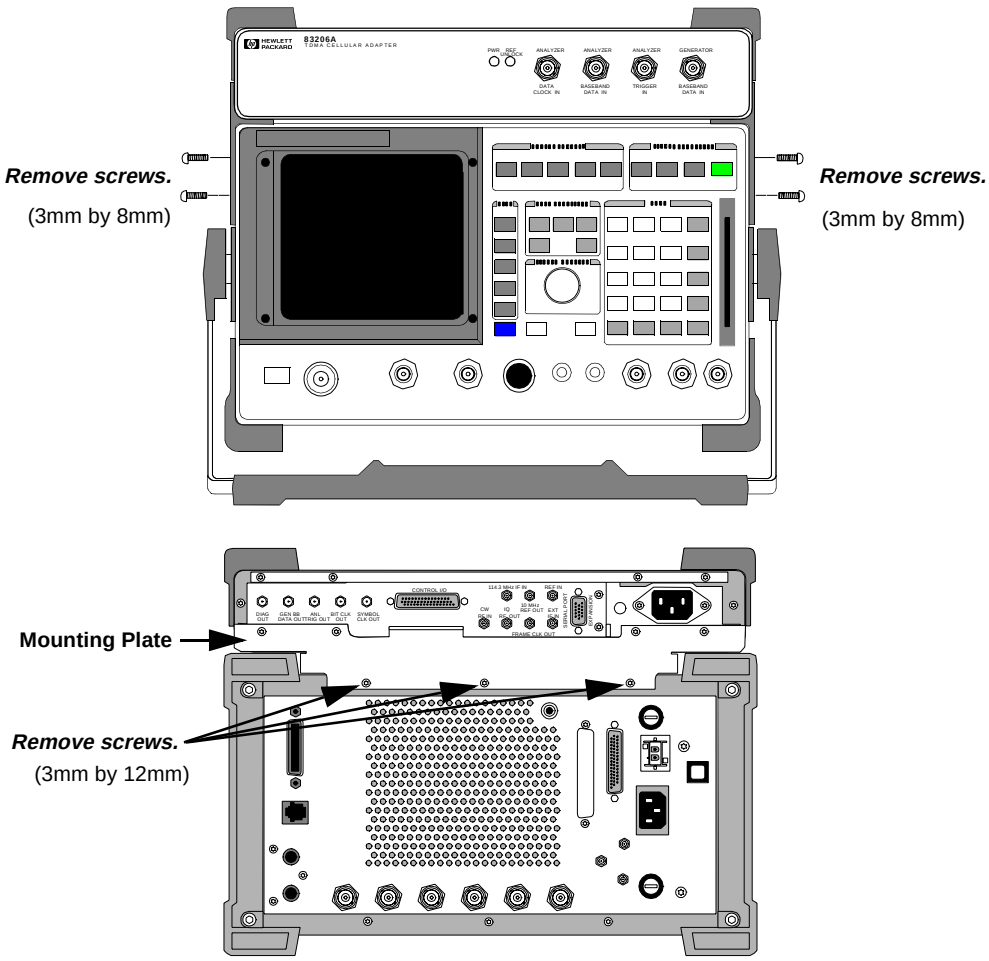


Figure 13 **Removing the Cellular Adapter's Mounting Screws**

3. Remove the cross bar and mounting plate from the Cellular Adapter by removing the screws shown in **figure 14**.
4. Slide the cover from the Cellular Adapter's deck, **see figure 15**.

This concludes the procedure for removing the cover from the Cellular Adapter.

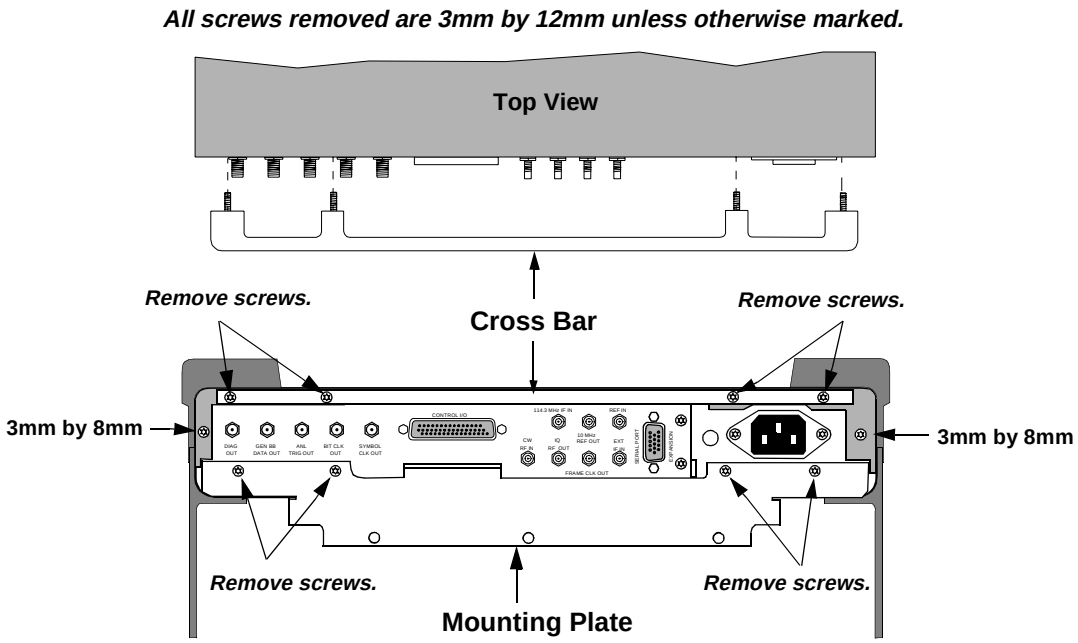


Figure 14 **Removing the Cross Bar and Mounting Plate**

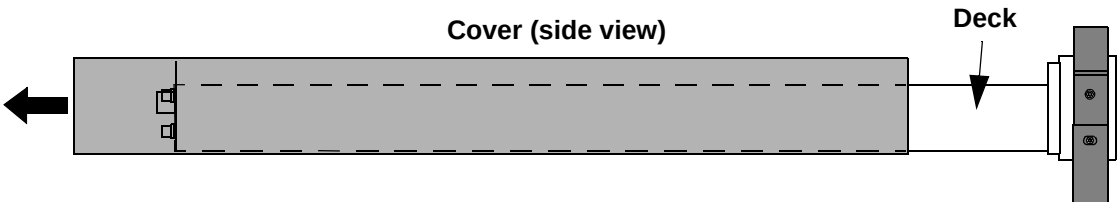
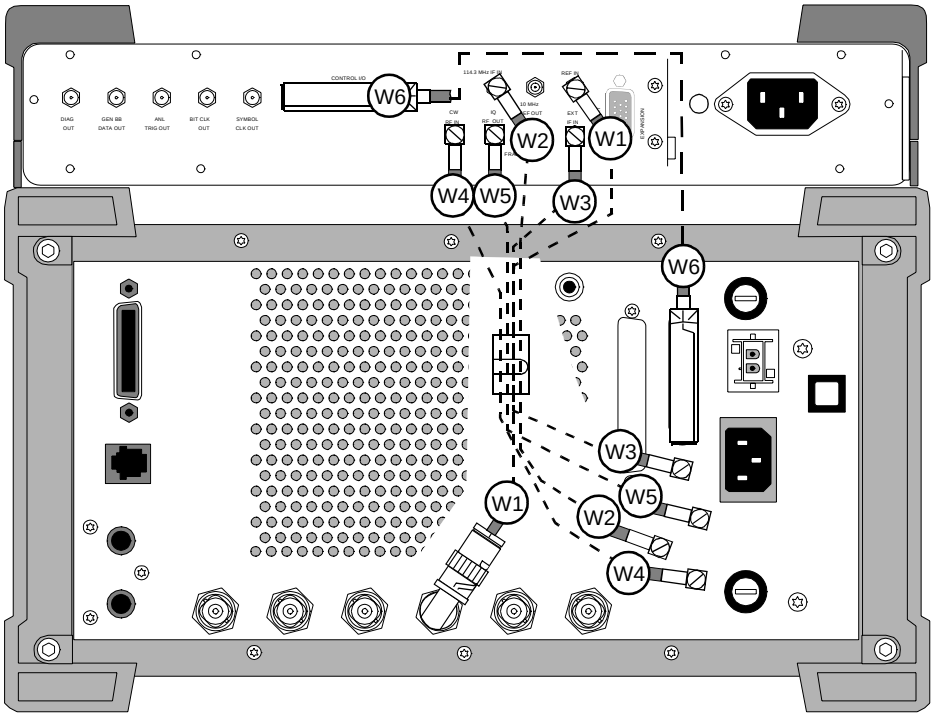


Figure 15 **Removing the Cover**

Operation Without Cover

To operate the Cellular Adapter without its cover, place the Cellular Adapter on the Test Set without installing the screws that secure it to the Test Set, and then reconnect the cables as shown in **figure 16**.



HP 8920B Test Set	Wire No.	HP 83206A Cellular Adapter
10 MHz REF OUT	W1	REF IN
114.3 MHz IF OUT	W2	114.3 MHz IF IN
DET OUT	W3	EXT IF IN
CW RF OUT	W4	CW RF IN
IQ RF IN	W5	IQ RF OUT
CONTROL I/O	W6	CONTROL I/O

Figure 16 **Rear Panel Cable Connections for Test Set and HP 83206A Cellular Adapter**

Removing the A8 Power Supply Assembly

To remove the A8 power supply assembly:

1. Disconnect the power connector from the A8 power assembly, see **figure 17**.
2. Disconnect the primary cable from the A8 assembly.
3. Remove 4 screws and lift the A8 assembly from the deck.

This concludes the procedure for removal of the A8 power supply assembly.

All screws removed are 3mm by 8mm.

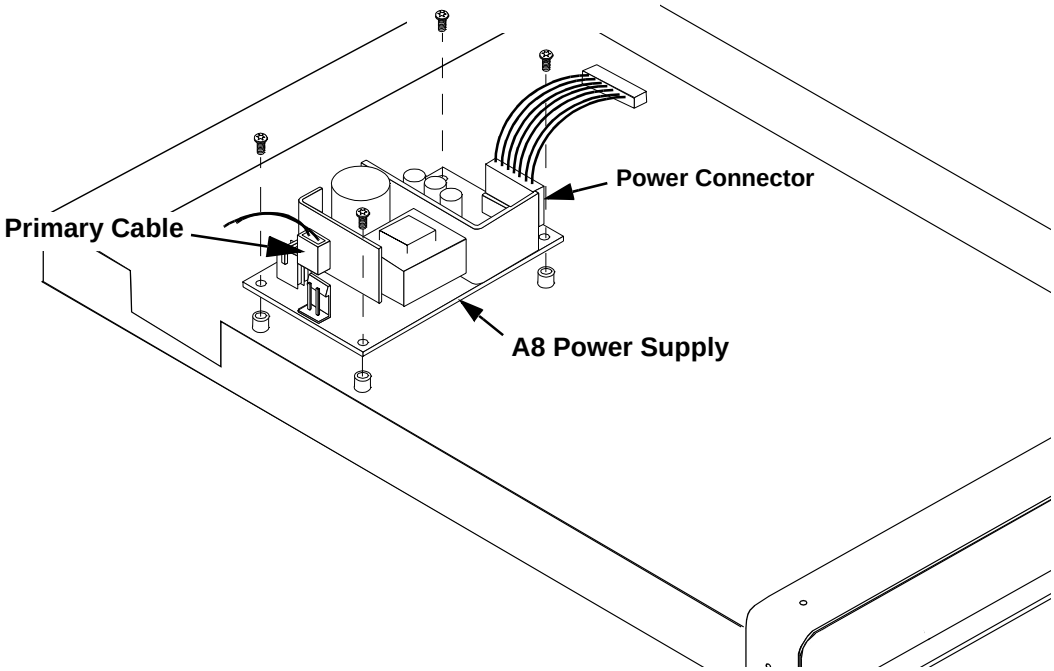


Figure 17 **Removing the A8 Power Supply Assembly**

Disconnecting Subassembly Power Connectors

Disconnect the connectors shown in **table 4** and **figure 18** if you need to replace the fan, fuse holder, A8 power supply assembly, or A3 motherboard assembly.

Table 4 Subassembly Connections

If replacing...	Disconnect connector...
Fan	(A4 assembly) J20
Fuse holder	(A3 assembly) J7
Power supply assembly	Primary and Output Power connectors (Also **see "Removing the A8 Power Supply Assembly" on page 64**.)
A3 motherboard	(A3 assembly) J1 and J7 connectors

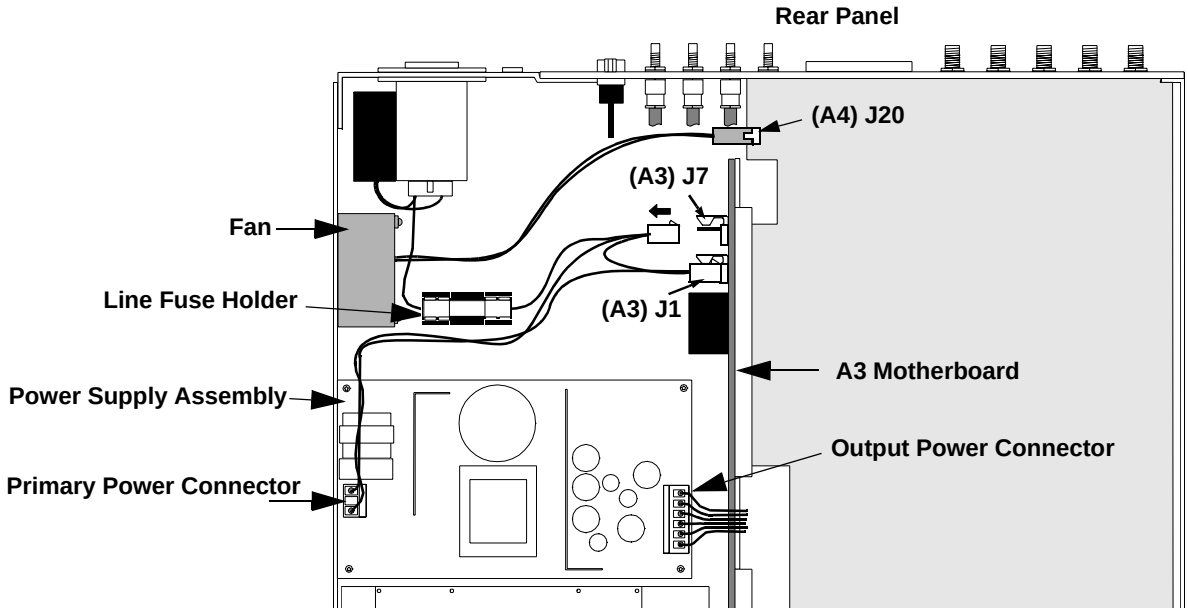


Figure 18 Removing the Power Connectors

Removing the Front Panel

Removal of the front panel is necessary for access to or removal of the A2, A5, or A4/A9 assemblies of the Cellular Adapter.

1. Remove the Cellular Adapter's cover. See **"Separating Units and Removing Cover" on page 61**.
2. Remove the 2 bumpers and 2 brackets from the front frame as shown in **figure 19**.
3. Remove the 5 frame screws shown in **figure 20**.

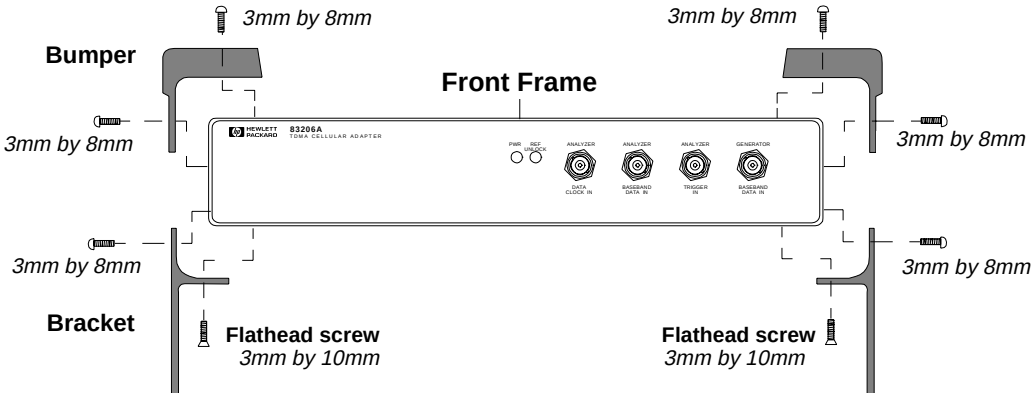


Figure 19 **Removing the Bumpers and Brackets**

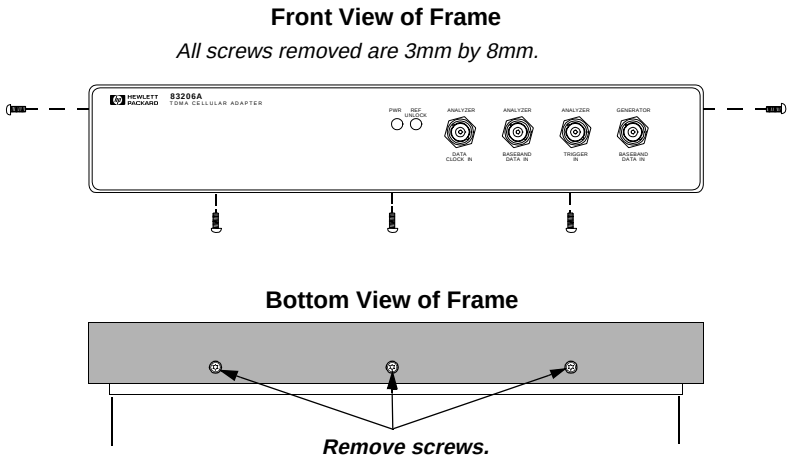


Figure 20 **Removing the Frame Screws**

4. Pull the frame away from the deck and disconnect the coaxial cables from the A4 assembly, see **figure 21**.

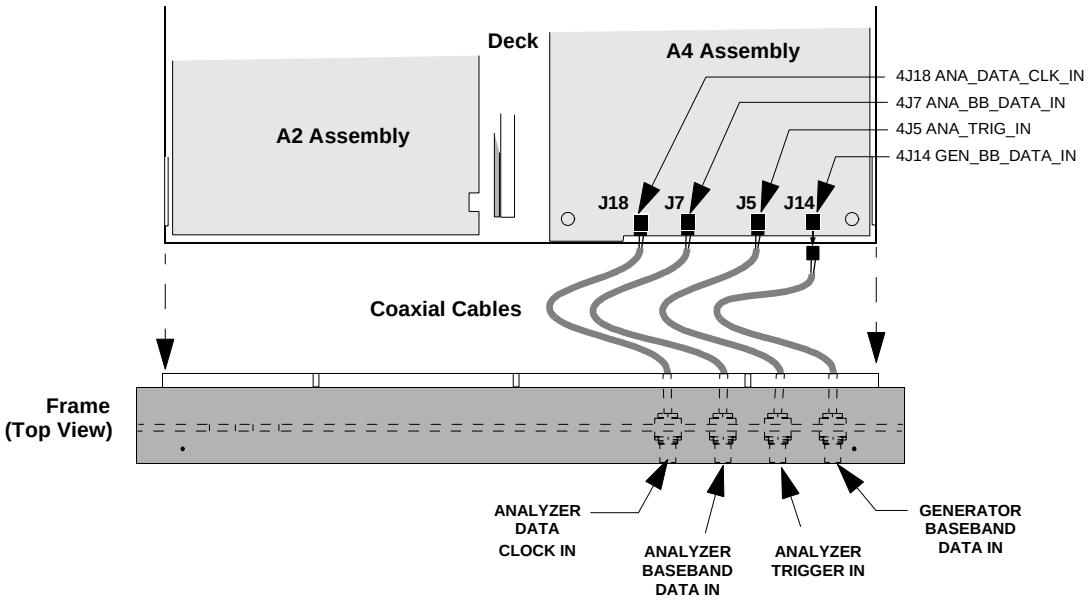


Figure 21 **Disconnecting the Coaxial Cables from the A4 Assembly**

This completes the procedure for removing the front panel. When reassembling the front panel frame, use **table 5** and **figure 21** to reconnect the cables of the front panel to the A4 assembly.

NOTE: When reinstalling the front cover, route the cables carefully to avoid crimping them.

Table 5 **Front Panel and A4 Assembly Connections**

Connector/Cable of Front Panel	goes to A4 connector...
ANALYZER - DATA CLOCK IN	J18 (ANA_DATA_CLK_IN)
ANALYZER - BASEBAND DATA IN	J7 (ANA_BB_DATA_IN)
ANALYZER - TRIGGER IN	J5 (ANA_TRIG_IN)
GENERATOR - BASEBAND DATA IN	J14 (GEN_BB_DATA_IN)

Removing the Rear Panel

In order to remove the A4 assembly and/or A9 assembly of the Cellular Adapter, it is necessary to remove the rear panel. You need a 3/16-, 1/4-, and 5/16-inch wrench or nut driver for this procedure.

1. Remove the Cellular Adapter's cover. See **"Separating Units and Removing Cover" on page 61**.
2. Remove the 3/16-inch connector locks and two 3mm by 12mm screws shown in **figure 22** and **figure 23**.
3. With a 5/16-inch wrench or nut driver remove five SMA nuts and lock washers and pull the rear panel away from the deck as shown in **figure 23**.

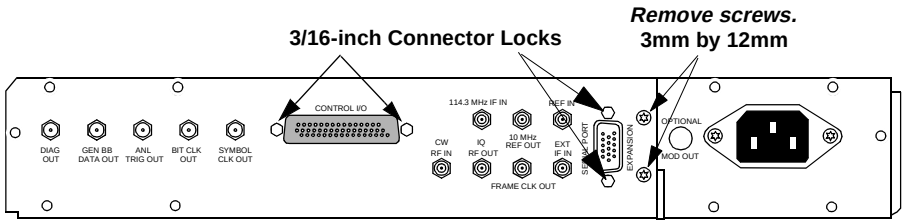


Figure 22 **Removing the Rear Panel Connector Locks and Screws**

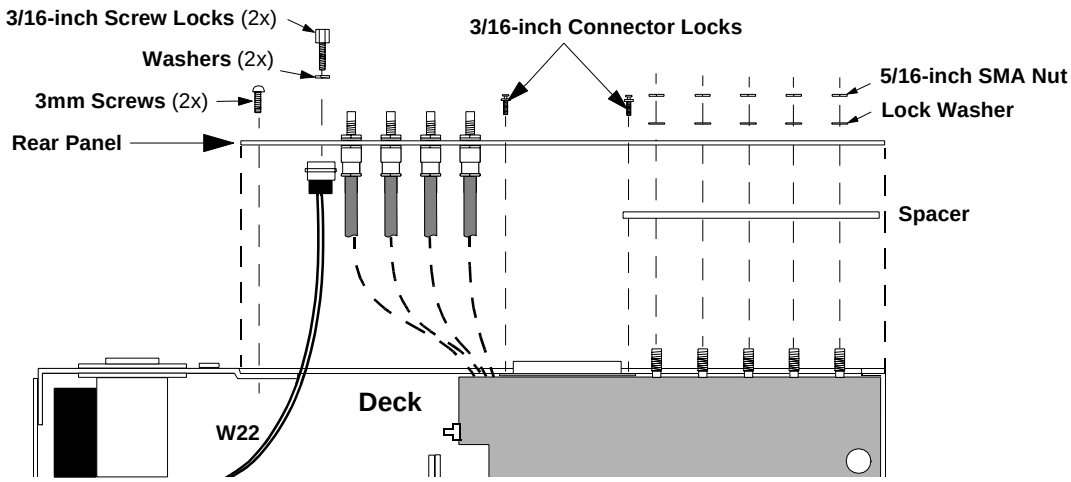


Figure 23 **Removing the Rear Panel**

4. Access to other assemblies on the deck is possible without removing the SMC connectors (shown in **figure 24**) from the rear panel. If complete removal of the rear panel is necessary, use a 1/4-inch wrench or deep nut-driver to disconnect the SMC connectors from the rear panel.

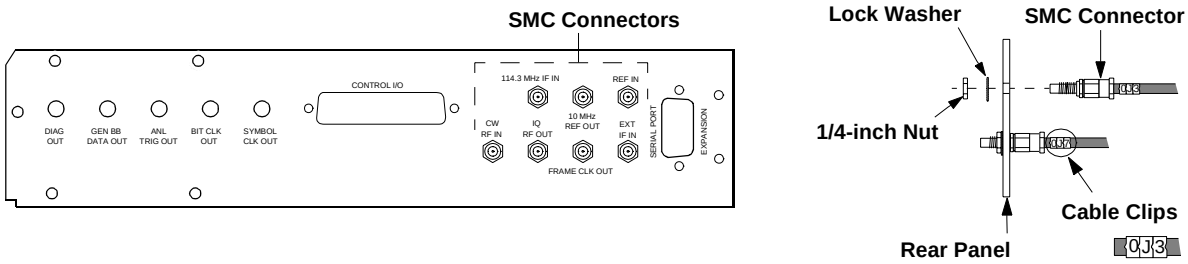


Figure 24 **Rear Panel SMC Connector Removal**

This completes the procedure for the removal of the rear panel. Cable clips identify the location of each SMC connector on the rear panel (**see figure 24**). If the connectors are removed from the rear panel, use **table 6** below to identify the location of the connectors when reinstalling the panel.

Table 6 **Rear Panel Connector Locations**

Rear Panel Label	Cable Clip Number
114.3 MHz IF IN	OJ1
10 MHz REF OUT	OJ2
REF IN	OJ3
CW RF IN	OJ4
IQ RF OUT	OJ5
FRAME CLK OUT	OJ6
EXT IF IN	OJ7

Removing the A4 Premod Filter Assembly

The following instructions explain how to remove the A4 Premod Filter assembly from the Cellular Adapter's deck. An alternative to using the following procedure is to remove the A4 and A9 assemblies as one unit, see **"Removing the A4 and A9 Assemblies as a Unit" on page 74**.

NOTE. Perform the periodic calibration, PER_CALD, after replacing the A4 assembly (**see "PER_CALD Calibration Procedure" on page 115**).

To remove the A4 assembly:

1. Remove the cover from the Cellular Adapter. See **"Separating Units and Removing Cover" on page 61**.
2. Remove the Cellular Adapter's front panel, see **"Removing the Front Panel" on page 66**.
3. Remove the rear panel, see **"Removing the Rear Panel" on page 68**.
4. Remove the seven screws that secure the A4 assembly to the A9 assembly, see **figure 25 on page 71**.
5. Disconnect the following connectors from the A4 assembly, **see figure 25**:
   - fan cable at J20
   - power cable at J9
   - ribbon cable W16 at J10
   - wires A1W1 through A1W4
6. Carefully unplug the A4 assembly from the A3 motherboard's J2 connector. You will have to lift the opposite side of the A4 assembly over the edge of the deck to unplug it.
7. Disconnect the SMB coaxial cables from the A4 assembly and lift the A4 assembly. Cable clips identify each SMB connector. The cable clips identify the assembly and "J" connector on the assembly that the SMB connector goes to. For example, SMB cable with cable clips "4J3" means the SMB connector goes to A4 assembly, connector J3.

This completes the procedure for the removal of the A4 assembly. Use **figure 25** to identify the location of the connectors and cables when reinstalling the A4 assembly.

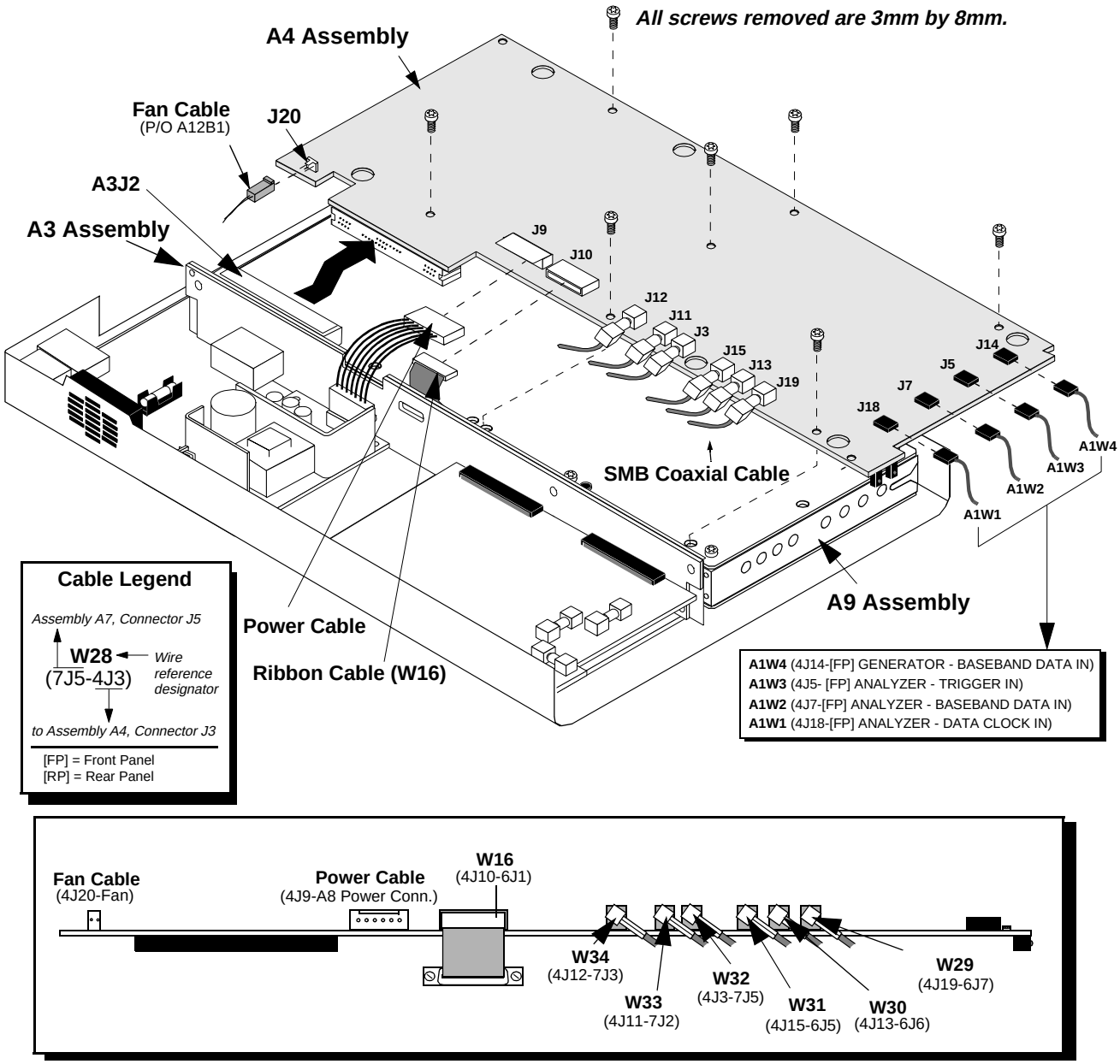


Figure 25 **Removing the A4 Assembly**

Removing the A9 IQ Modulator/Reference Assembly

The following instructions remove the A9 IQ Modulator/Reference assembly from the Cellular Adapter's deck. An alternative to this procedure is to remove the A4 assembly and A9 assembly as a unit, see **"Removing the A4 and A9 Assemblies as a Unit" on page 74**.

NOTE: Perform the periodic calibration, PER_CALD, after replacing the A9 assembly (**see "PER_CALD Calibration Procedure" on page 115**).

1. Remove the cover from the Cellular Adapter. See**"Separating Units and Removing Cover" on page 61**.
2. Remove the front panel. **See "Removing the Front Panel" on page 66**.
3. Remove the rear panel. **See "Removing the Rear Panel" on page 68**.
4. Remove the A4 assembly. **See "Removing the A4 Premod Filter Assembly" on page 70**.
5. Remove the 6 screws that secure the A9 assembly to the deck, see **figure 26 on page 73**. The A9 assembly can now be lifted from the deck.
6. Disconnect all the SMB connectors from the A9 assembly, see **figure 26**. Cable clips identify each SMB connector. The cable clips identify the assembly and "J" connector on the assembly that the SMB connector goes to. For example, SMB cable with cable clips "9J5" means the SMB connectors goes to A9 assembly, connector J5.
7. With a small flat blade screwdriver, disconnect the W16 ribbon cable from the A9 assembly.

This completes the procedure for the removal and disassembly of the A9 assembly. When reassembling the A9 assembly, use **figure 26** to help you determine the location of the SMB connector/coaxial cables.

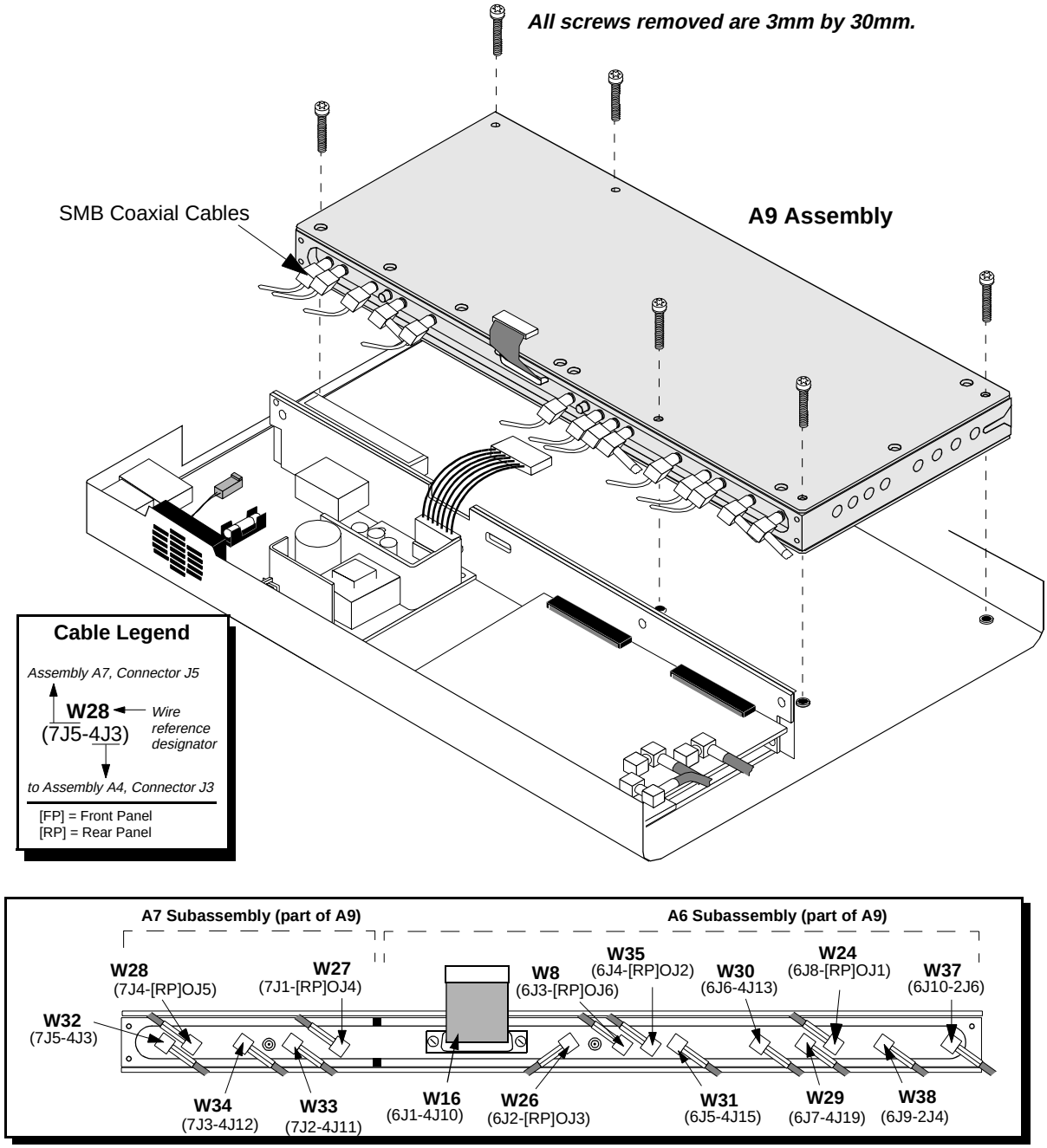


Figure 26 **Removing the A9 Assembly**

Removing the A4 and A9 Assemblies as a Unit

To remove the A4 and A9 assemblies as a unit:

NOTE: Perform the periodic calibration, PER_CALD, after reinstalling the A4/A9 assembly (**see "PER_CALD Calibration Procedure" on page 115**).

1. Remove the cover from the Cellular Adapter, see **"Separating Units and Removing Cover" on page 61**.
2. Remove the front panel. **See "Removing the Front Panel" on page 66**.
3. Remove the rear panel. **See "Removing the Rear Panel" on page 68**.
4. Remove the 6 screws that secure the A4/A9 assembly to the deck, see **figure 27 on page 75**.
5. Disconnect all the connectors and cables shown in **figure 27** from the A4 and A9 assemblies. Removing the SMB connectors from the A2 assembly is optional. To disconnect the SMB connectors from the A4/A9, you will have to disconnect the A4/A9 assembly from the A3 Motherboard (see step 6).
6. Carefully lift the A4/A9 assembly over the edge of the deck to disconnect the A4 assembly's J6 connector from the A3 motherboard.

This completes the procedure for the removal of the A4/A9 assembly unit.

Reinstalling the A4/A9 Assembly

To reinstall the A4/A9 assembly, reverse the steps of the previous section:

1. Use **figure 27** to help you reconnect the SMB coaxial connectors on the A4/A9 and A2 assemblies. Cable clips identify each SMB connector. The cable clips identify the assembly and "J" connector on the assembly that the SMB connector goes to. For example, SMB cable with cable clips "9J5" means the SMB connectors goes to A9 assembly, connector J5.
2. Carefully plug the A4/A9 assembly into the A3 motherboard. *Ensure that the assembly is squarely plugged in. Do not get a cable caught under the A4/A9 assembly or you will have difficulty trying to fasten down the assembly.*
3. Secure the assembly with the six screws (3mm by 30mm) previously removed.
4. Reconnect the power (J9) and fan (J20) connectors, and wires A1W1 through A1W4 to the A4 assembly.
5. Reinstall the rear and front panels.

This concludes the procedure for reassembly of the Cellular Adapter.

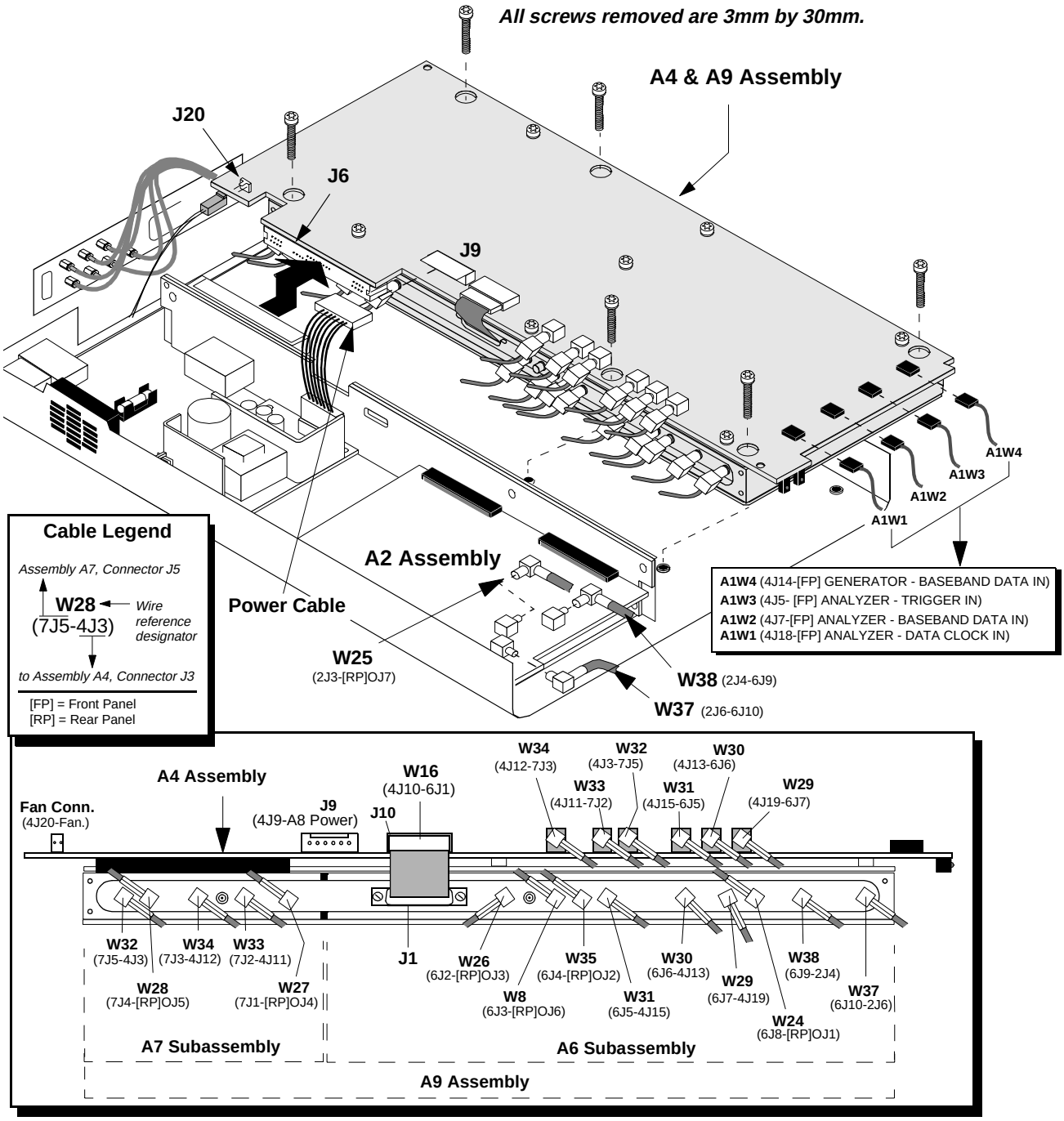


Figure 27 **Removing the A4/A9 Assembly**

Removing the A2 RX DSP and A5 Protocol Processor Assemblies

To remove the A2 RCV DSP or A5 Protocol Processor assembly:

1. Remove the cover from the Cellular Adapter. See **"Separating Units and Removing Cover" on page 61**.
2. Remove the front panel of the Cellular Adapter Cellular Adapter. **See "Removing the Front Panel" on page 66**.
3. Disconnect the SMB connectors W25, W37, and W38 from the A2 assembly, see **figure 28**.
4. Remove the 2 screws securing the A2 (and A5) assembly to the deck, see **figure 29**. There are 2 spacers attached under the A2 assembly.

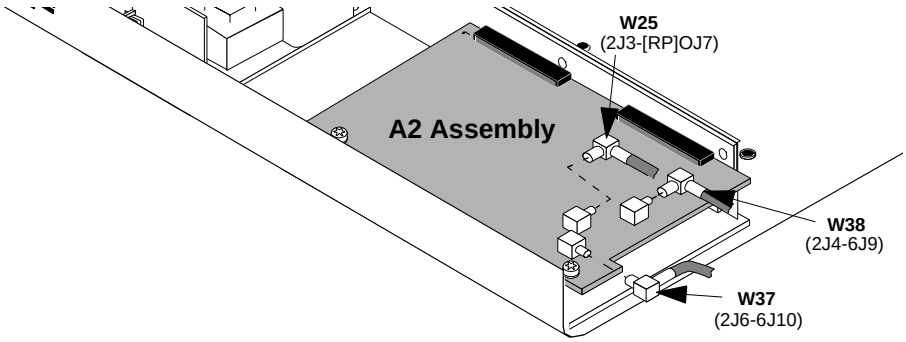


Figure 28 **Removing A2 Assembly Connectors**

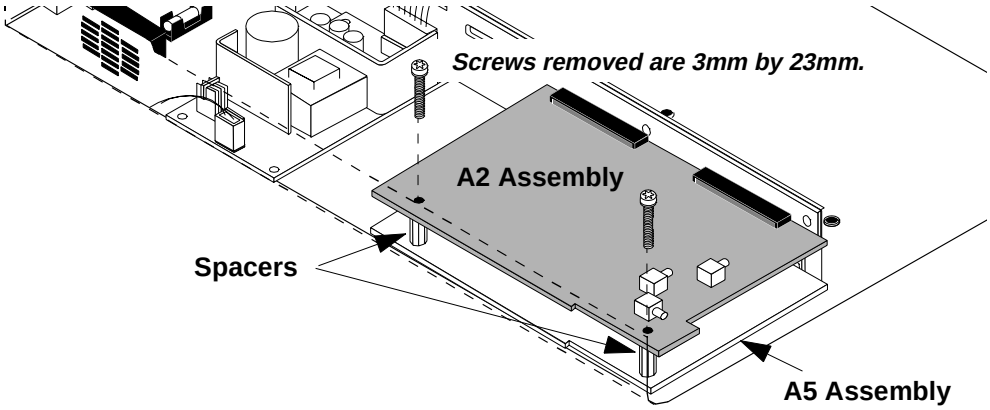


Figure 29 **Removing A2 Assembly Screws**

5. With a flat blade screwdriver wedged between the A2 assembly and the A3 motherboard assembly, carefully push and tilt the end of the A2 assembly over the edge of the deck to unplug it from the J3 and J4 connectors of the A3 assembly, see **figure 30**.
6. Before removing the A5 Protocol Processor assembly, disconnect the W22 cable from the assembly, see **figure 31**.
7. Using a flat-blade screwdriver, carefully tilt the end of the A5 assembly over the edge of the deck and unplug it from the J5 and J6 connectors of the A3 assembly, see **figure 31**.

This completes the procedure for the removal of the A2 and A5 assemblies. To reassemble the Cellular Adapter, perform the previous steps in reverse order.

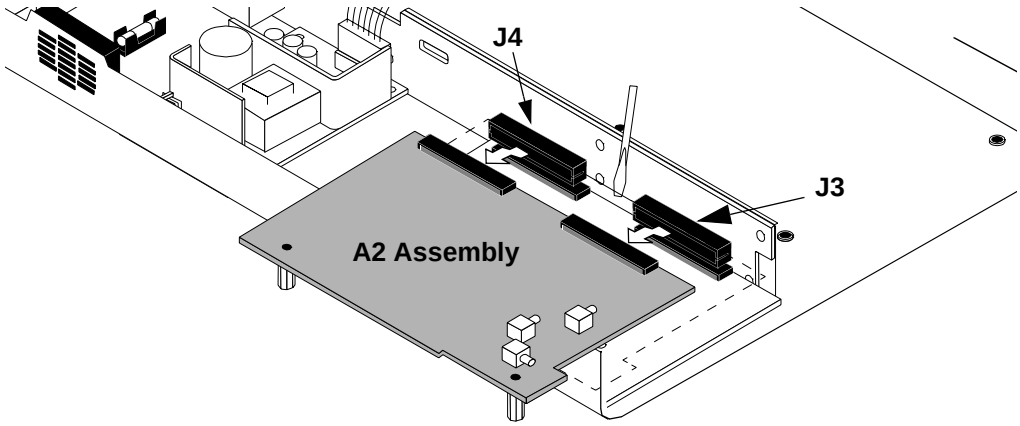


Figure 30 **Removing the A2 Assembly**

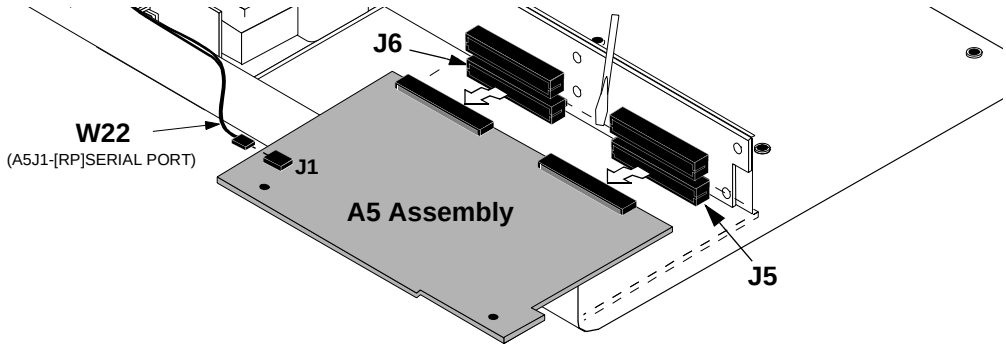


Figure 31 **Removing the A5 Assembly**

Removing the A3 Motherboard Assembly

To remove the A3 Motherboard assembly:

1. Remove the cover from the Cellular Adapter. See **"Separating Units and Removing Cover" on page 61**.
2. Remove the front panel, **see "Removing the Front Panel" on page 66**.
3. Remove the rear panel, **see "Removing the Rear Panel" on page 68**.
4. Remove the A4 assembly, **see "Removing the A4 Premod Filter Assembly" on page 70**.
5. Remove the A9 assembly, **see "Removing the A9 IQ Modulator/Reference Assembly" on page 72**.
6. Remove the A2 and A5 assemblies, **see "Removing the A2 RX DSP and A5 Protocol Processor Assemblies" on page 76**.
7. Remove the power connectors from the J7 and J1 connectors on the A3 assembly, see **figure 32**.
8. Remove the 4 screws securing the A3 assembly to the deck, see **figure 32**, and lift the A3 assembly from the deck.

This completes the procedure for the removal of the A3 assembly. To reassemble the Cellular Adapter, perform the previous steps in reverse order.

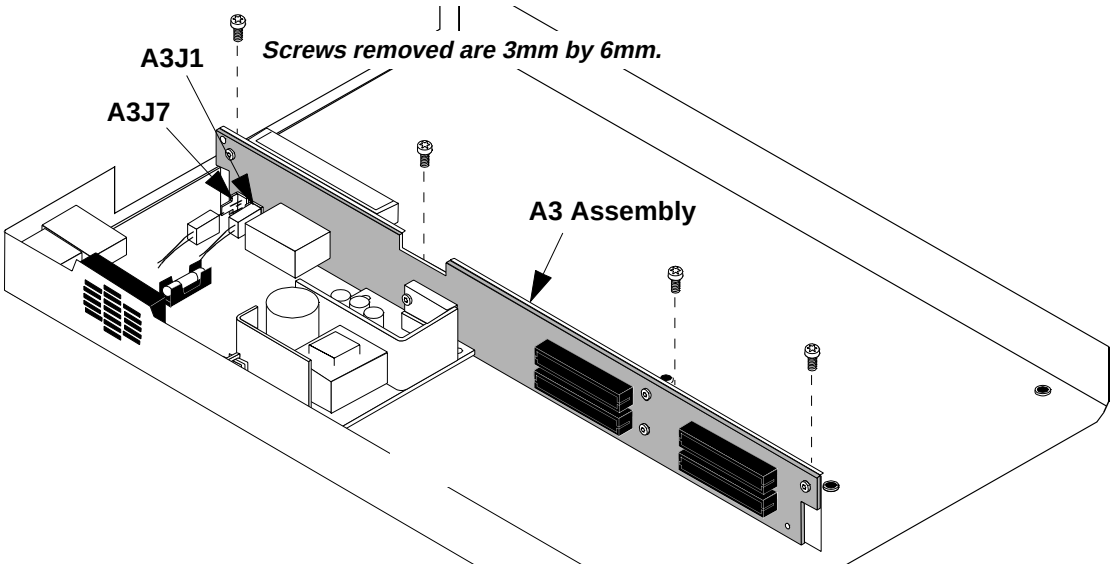


Figure 32 **Removing the A3 Motherboard Assembly**

4

Modifications

This chapter explains how to load and verify firmware upgrades on the HP 83206A Cellular Adapter.

Firmware Upgrades

Firmware in the HP 83206A Cellular Adapter and its companion HP 8920B Test Set should be upgraded to the latest revision any time a repair is made or a performance problem is discovered.

The Test Set's firmware is upgraded by running a program on a PCMCIA memory card that automatically downloads firmware. The Cellular Adapter's firmware is upgraded by running a program that downloads the new firmware files from memory cards to the EEPROMs of the Cellular Adapter. **Table 7** lists the upgrade kits available. For ordering information, **see "Ordering Parts" on page 39**.

Table 7 Firmware Upgrade Kits

Kit	Description
83206-61801	HP 83206A Cellular Adapter & HP 8920B RF Communications Test Set firmware upgrade kit
HP 8920B R58	HP 8920B RF Communications Test Set firmware upgrade
HP 83206A R99	Same as 83206-61801 kit above.

Firmware Loading and Verification Procedures

This section contains procedures for loading Receive DSP (A2) firmware and Protocol Processing (A5) firmware, and for verifying the Test Set's and the Cellular Adapter's firmware. The Cellular Adapter's firmware comes on two memory cards.

Loading Firmware

Use this procedure for loading firmware to the Cellular Adapter. The Test Set and Cellular Adapter must be connected.

1. Power off the Test System.
2. Insert the memory card 83206-10002 into the Test Set.
3. Power on the Test System.
4. Follow the instructions on the display.
5. Power the Test System off and then back on.
6. Insert the memory card 83206-10001 into the Test Set.
7. Press the TESTS key.
8. Set the **`Select Procedure Location:`** field to **`Card`**.
9. Set the **`Select Procedure Filename:`** field to **`DLFIRM`**.
10. Press k1 **`(Run Test)`**.
11. Follow the instructions on the display.
12. Power the Test System off and then back on.

This completes the loading of firmware.

Verifying Firmware Version

The following procedure checks the version of firmware in the Test Set and checks the RX DSP and Protocol Processor revision levels of the Cellular Adapter.

1. Power up the Test System.
2. The Test Set's firmware version level appears in the upper part of the RX TEST screen. The version level must be B.4.00 *or higher*. To order new firmware, **see "Ordering Parts" on page 39**.
3. Press the SHIFT key, then the DUPLEX key. The CONFIGURE screen appears.
4. Select **SERVICE** under the **To Screen** menu. The SERVICE screen appears.
5. Select the **Latch** field.
6. Move the cursor to **rx_dsp_revision** under the **Choices:** menu and select it.
7. Read the RX DSP firmware version number in the **Value** field. Select the **Latch** field.
8. Move the cursor to **protocol_fw_revision** under the **Choices:** menu and select it.
9. Read the Protocol Processor firmware version number in the **Value** field.

Verification of the firmware is complete.

5

Block Diagrams

This chapter provides information for helping you understand the operation of the HP 83206A TDMA Cellular Adapter.

Instrument Description

The HP 83206A TDMA Cellular Adapter is an add-on-instrument for the HP 8920B RF Communications Test Set. The Cellular Adapter is controlled by the Test Set's host processor through the Test Set's front-panel selections or HP-IB commands to the Test Set.

The Cellular Adapter contains TDMA (Time Division Multiple Access) digital signal processing hardware and firmware to test the transmitter and receiver portions of TDMA mobile phones. Adding this TDMA Cellular Adapter to the Test Set creates a system for testing radios to the IS-136 standard. The IS-136 standard uses the same digital compression technology as the older IS-54 standard but adds a digital control channel.

The digital control channel expands the features available to cellular manufacturers. These features include: public, semi-public and private cells, short message service, battery-saving sleep mode, as well as other features.

The Cellular Adapter permits the selective addition of IQ modulation to the Test Set's RF output to accommodate the TDMA format. The Cellular Adapter provides a number of TDMA functions. These include IQ demodulation and analysis capability, IQ encoding and modulation, and timing generation and synchronization.

TDMA Analysis

The analysis is accomplished by downconverting a 114.3 MHz IF signal from the Test Set to 700 kHz for processing by the Cellular Adapter's Receiver DSP board. See **figure 33**. Synchronization information is then passed to the protocol processor.

TDMA Generation

The Cellular Adapter generates data with the Protocol Processor (A5) board, encodes the data using $\pi/4$ DQPSK, and then modulates the signal using the IQ modulator before passing the signal to the Test Set. The Cellular Adapter will lock to several different time base reference frequencies. For instance, it can lock to the unit-under-test (for example, an NADC base station) or to the Test Set itself.

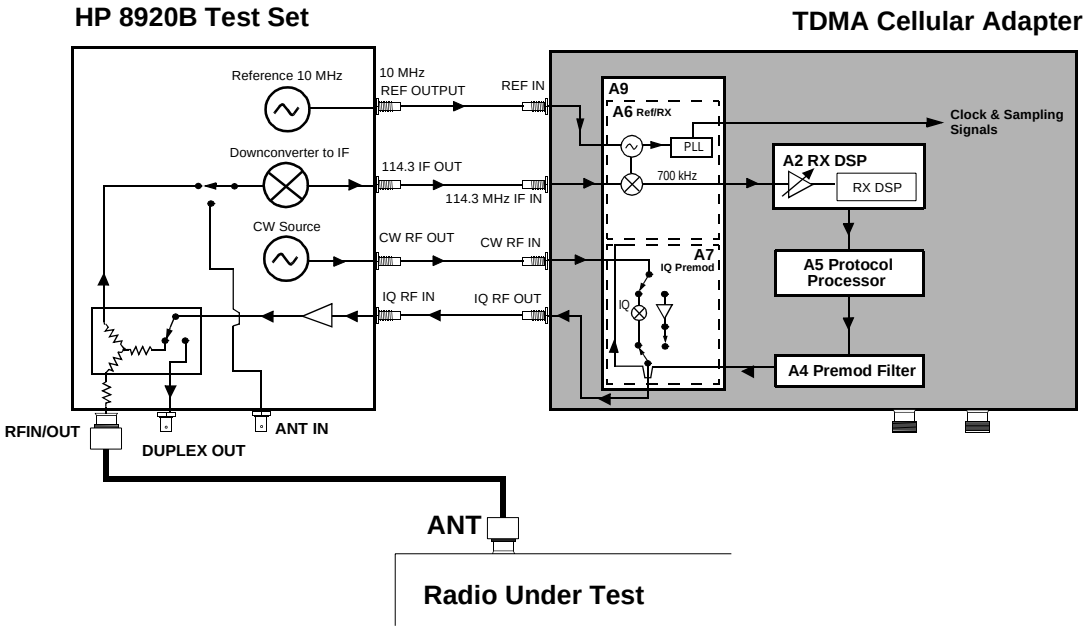


Figure 33 TDMA Test System Overview

Assembly Descriptions

Table 8 describes the major assemblies and subassemblies that make up the Cellular Adapter. Use the diagram shown in **figure 34 on page 87** for a visual overview of the instrument.

Table 8 Quick Reference of Assemblies

Reference Designator	Assembly Name	Function
A2	Receiver DSP (Digital Signal Processor)	Data analyzer
A4	Premodulation Filter	Encodes and filters the IQ channels
A5	Protocol Processor	Data generator/protocol engine
A9	IQ Modular/Reference	Houses the A6 & A7 assemblies
A9/A6	Reference/Receiver	Time base reference and receiver/down converter
A9/A7	IQ Modulator	Modulates the RF carrier with $\pi/4$ DQPSK

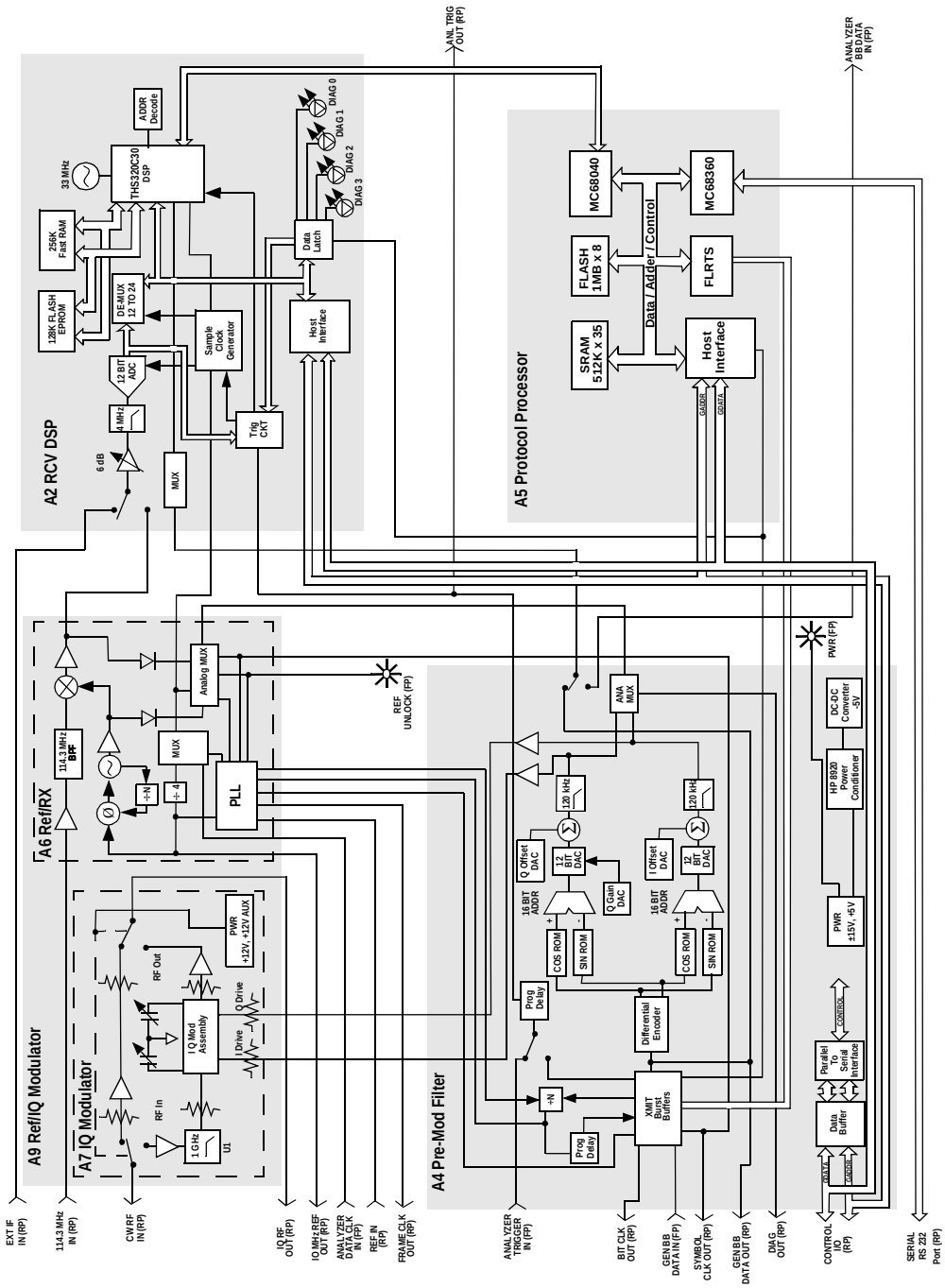


Figure 34 **HP 83206A TDMA Cellular Adapter Block Diagram**

A2 RX DSP Assembly

This data analyzing assembly is known as the receiver digital signal processor (RX DSP). Included on this board are the digital signal processor, analog-to-digital converter (ADC), attenuator, and filter.

The DSP firmware code is stored in flash EPROM. This code can be loaded into the Cellular Adapter's flash EPROM from the memory card inserted in the Test Set, **see "Firmware Upgrades," in chapter 4, on page 80**.

A3 Motherboard

This assembly interconnects the assemblies of the Cellular Adapter. It distributes the AC/DC voltages and control signals. The Test Set controls the A3 assembly's power relay to apply or disconnect AC power to the Cellular Adapter.

A4 Premodulator Filter Assembly

This assembly selects the data stream's source, buffers the data, differentially encodes the data, and filters it using a digital Nyquist filter. The resulting I and Q channel drive signals go to the IQ Modulator (A7) after their gain and offset are adjusted by multiplying DACs.

Many of the timing, delay, and data selection fields available on the Test Set's screen are implemented on the A4 assembly. See **table 9** for a description of the signals and waveforms expected from the connectors of the A4 assembly.

The premodulation filter includes an analog multiplexer for access to diagnostic signals. These signals are utilized by the Test Set's internal diagnostic programs DMC_DIAGL and DMC_DIAGN, **see chapter 2, "Troubleshooting" on page 41** for details on these programs.

Table 9 A4 Assembly Signals and Waveforms

	Description
J5	ANALYZER TRIGGER IN (front panel) - allows external triggering of the digital analyzer: TTL levels, 100 KΩ
J2	Bit Clk Out (rear panel, CMOS levels) - 50-ohm square wave output from the bit clock used to synchronize external equipment. Frequency: 48.6 kHz (NADC)
J14	Gen Baseband Data In (CMOS levels)
J1	SYMBOL CLK OUT (rear panel, CMOS levels); output for the symbol clock to synchronize external equipment to the digital generator 50-ohm data rate: 24.3 kHz (NADC)
J4	Gen Baseband Data Out (rear panel, CMOS levels); monitors the digital signal applied to the Premod Filter & I/O Modulator. Data rate: 48.3 kbit/s (NADC)
J6	Control I/O (rear panel): provides the data communication between the Test Set and the Cellular Adapter. This connection provides +12 Vdc to the IQ MOD bypass path when the Cellular Adapter is not connected to line power.
J19	Anal_Data_Clk In to A6J7 Ref; connects Analyzer Data Clk In to the reference board.
J15	A_Mux_In from A6J5; passes the analog signals from the ref. board mux to the switch on the Pre_Mod Filter.
J16	Diag Out (rear panel): Used for servicing and diagnostics. Usually connected to the Test Set's AUDIO IN during diagnostic and calibration tests. Passes analog frequency and voltages.
J18	Analyzer Data Clk In (front panel): initiates the Digital Analyzer to sample the analyzer's base band data input Clk frequency 48.6 kHz (NADC) TTL levels 100k ohms.
J13	16 x Symbol from A6J6 REF; provides reference to the XMIT Burst Buffers in the Premod Filter.
J17	Analyzer Trigger Out (rear panel, TTL levels); outputs the signal used to synchronize General purpose connector, 2 x frame clk, or Ext Analyzer Trigger

A5 Protocol Processor Assembly

The Protocol Processor (A5) assembly provides the necessary processing power to handle the advanced functions of IS-136. The protocol processor assembly is sometimes referred to as the digital control channel (DCCH) assembly, and provides the operation and control for the call processing firmware.

This assembly sends transmit data to the premod filter assembly. The transmit data is synchronized to the bit clock and frame clock signals before being passed to the IQ modulator. Demodulated data is received by the protocol processor via the Receiver DSP (A2) assembly. This data is processed as part of the communication loop.

Power Up LEDs

The red LEDs on the Protocol Processor assembly can be used for troubleshooting. When initial power is applied, this assembly proceeds through a series of power-on self-tests. The state of these tests can be determined by observing the changing state of four LEDs located on the board (see **figure 35**). This assembly is fully operational when LED 3 is blinking at a steady state (once every second) while the other LEDs (0, 1, and 2) are turned off. For power-up LED patterns, see **table 10 on page 91**.

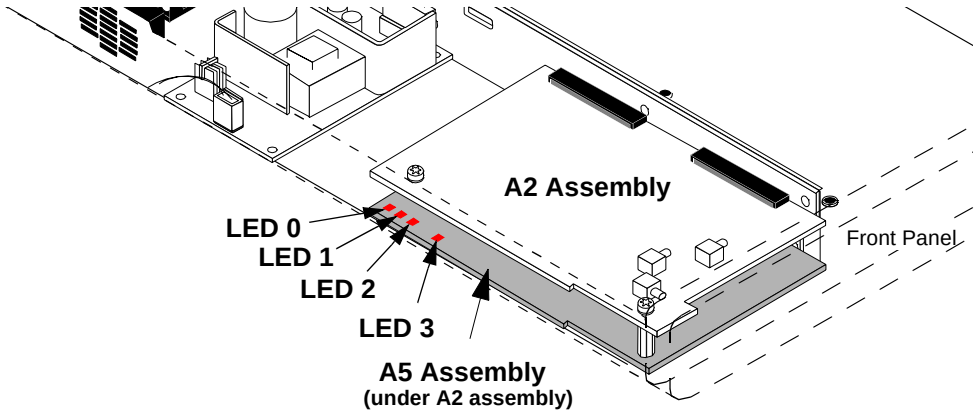


Figure 35 **A5 Protocol Processor Assembly LEDs**

Table 10 Protocol Processor (A5) LEDs

STATE	LED # **0 1 2 3**	**Description of LED Pattern.**
Power-up	1 1 1 1[a]	This is the power-on default state.
	0 0 0 1	The board has successfully come out of the reset state and the MC68xx040 and the MC68360 are communicating. The MC68360 has been configured correctly. At this point the MC68xx040 will attempt to detect the memory configuration of the board and perform a RAM test. If the RAM test fails, the MC68xx040 will halt.
	0 0 1 0	Control will be passed to the VxWorks start-up functions. When VxWorks begins the usrInit() function the status LEDs will change.
	0 0 1 1	At this point VxWorks will configure the Protocol Processor system hardware (that is, FLERTS programmed and other hardware are put in a known state.)
	0 1 0 0	VxWorks will begin the root task.
	0 1 0 1	Multi-tasking and other RTOS services are now available and the system timer is running.
	0 1 1 0	Before configuring the IPC-LAN hardware and firmware, this status will be turned off. If configuration fails, VxWorks will pause for 10 seconds.
Power-Up Completion	0 0 0 1[b]	Once the VxWorks command shell begins executing, the status LEDs will turn off. The root task will blink LED 3 once a second.

a. 1 = on, 0 = off
b. LED 3 blinking once every second.

A8 Power Supply

This switching supply is a replaceable assembly and provides the +5 Vdc and ±15 Vdc for the Cellular Adapter. Replacement of the power supply fuse is not supported. **See "Power Supply and Voltage Distribution" on page 96** for power distribution information.

A9 IQ Modulator/Reference Assembly

The A9 assembly includes two circuit boards in a single cast frame with covers (RF shields). These two subassemblies are the A7 IQ Modulator and A6 Reference/Receiver. These subassemblies are not separately replaceable. See **table 11 on page 93** for a description of the signals and waveforms expected from the connectors of the A9 assembly.

The IQ modulator lies in the RF path of the Test Set. The CW RF IN signal is generated by the Test Set's signal generator synthesizer. If the RF level into the IQ modulator is too high, it will cause distortion and degrades the EVM performance.

The IQ modulator includes a switch that selects a bypass path or the IQ modulator. Both paths include buffer amplifiers. The IQ modulation path includes a modulator that modulates the RF signal with π/4 DQPSK encoded data.

In addition to the RF signal, the modulator also has two I and Q modulation drive signals from the pre-premod filter assembly. The modulator has two trim capacitors. These capacitors are adjusted at the factory and should not be re-adjusted.

The Test Set provides +12 Vdc to the IQ modulator board to power the bypass path and gain stages when the Cellular Adapter is not connected to line power. This supply is routed though the rear panel data cable and is replaced once the Cellular Adapter is powered up. Without this auxiliary supply, the Test Set's RF output would not meet specifications.

The Reference/Receiver includes two major circuits, the time base reference circuitry and the receiver downconverter circuitry. The time base reference circuits use a 10 MHz VCO that is phased locked to the external REF IN. If the Cellular Adapter Ext Ref is too low or not connected, then the REF UNLOCK front panel LED is turned on. The time base provides all the trigger and clock selections used on the RX DSP assembly.

The receiver down converter generates a 115 MHz LO. The LO is used to mix down the 114.3 MHz IF IN signal that comes from the Test Set's first receiver IF. The result of this mixing is the 700 kHz IF that is passed to the RX DSP assembly (analyzer). This downconverter includes buffer amps, a SAW filter, and the mixer itself.

The Reference/Receiver assembly also includes an analog multiplexer for access to diagnostic signals. This includes scaled frequencies from the PLLs, and their bias and tune voltages. These signals are utilized by the Test Set's internal ROM diagnostic programs, DMC_DIAGL and DMC_DIAGN.

Table 11 A9 Assembly Signals and Waveforms

	Descriptions
A7J1	CW RF IN Bypass path 500-1000 MHz IQ Modulator path 823-895 MHz
A7J4	IQ RF OUTPUT Bypass 500-1000 MHz, Gain >2 dB IQ Modulator 823-895 MHz, –8 to –11 dBm (quadrature set as center, 859 MHz)
A7J2, A7J3	I and Q Inputs –5 dBm input Input Impedance: 50 ohm
A6J10	700 kHz IF output Downconverted from the 114.3 MHz IF with π/4 DQPSK modulated carrier –25.5 to 5.5 dBm into 50 ohms.
A6J5	Analog MUX Out Various analog signals between +12V and – 12V. Frequencies are divided by 100 before being routed to the Test Set's counter/voltmeter for diagnostic purposes. The mux connectors are: • Vt10M (TCXO tune line) • VtSYM (Symbol Clock Cleanup VCO tune line) • ExtFs (HCMOS sample clks/100) • Lo_SENSE (115 MHz lo drive level to mixer) • DSP_IF_S (700 kHz IF level) • VtLO (115 MHz tune line) • Vb_S (115 MHz VCO transistor collector)

Table 11 A9 Assembly Signals and Waveforms

	Descriptions
A6J8	114.3 MHz In; Downconverted IF with π/4 DQPSK modulation from the Test Set's Receiver –15 dBm max level, *typical –53 to –25 dBm*
A6J7	RX_DATA_CLK; CMOS levels, various frequencies.
A6J2	EXE. REF. IN (CMOS levels); Freq. 25.0 Hz (PDC/NADC frame clk) 50.0 Hz (PDC/NADC 2 *frame clk) 200.0 Hz (PHP frame clk) 400.0 Hz (PHP 2 *frame clk) 21.0 kHz (PDC symbol clk) 24.3 kHz (NADC symbol clk) 192.0 kHz (PHP symbol clk) 42.0 kHz (PDC bit clk) 48.6 kHz (NADC bit clk) 3834.0 kHz (PHP bit clk) Frequency Range ±1PPM.
A6J9	FsCLK OUT (CMOS levels); freq. 5 × symbol (105.0 kHz/PDC) (121.5 kHz/NADC) (960.0 kHz/PHP) 1.0 MHz 2.0 MHz 2.5 MHz RX_DATA_CLK_ - various frequencies Input Impedance: 50 ohms
A6J4	10 MHz Out; Waveform - Sine Level > +5 dBm Frequency 10 MHz Frequency Stability same as EXT_REF.
A6J3	Frame Clk Out (CMOS levels); 25.0 Hz (PDC/NADC) 200.0 Hz (PHP), 50 ohms

Table 11 A9 Assembly Signals and Waveforms

	Descriptions
A6J6	16 x Symbol (CMOS levels); Frequency: 388.8 kHz (NADC) Input Impedance: 50 ohms
A6J1	PIN3 REF_LOCK (CMOS, 1=lock, 0=unlock) PIN5 SYMBOL_B (CMOS) 24.3 kHz (NADC) PIN$ FRM_RESET (CMOS) (CMOS levels, low for reset)

Power Supply and Voltage Distribution

The Cellular Adapter does not have its own power-up switch. The power-up command is received through the I/O CONTROL cable on the back panel. For an overview of power distribution, **see figure 36 on page 97**.

WARNING: There are AC voltages present inside the instrument when the power cord is connected to a power source. Extreme caution should be used in the area of the A3J1, A3J7, and A3K1 on the A3 Motherboard, and by the fuse holder near the power cord. The A8 power supply assembly does not have AC voltage present unless the POWER switch on the Test Set is pressed.

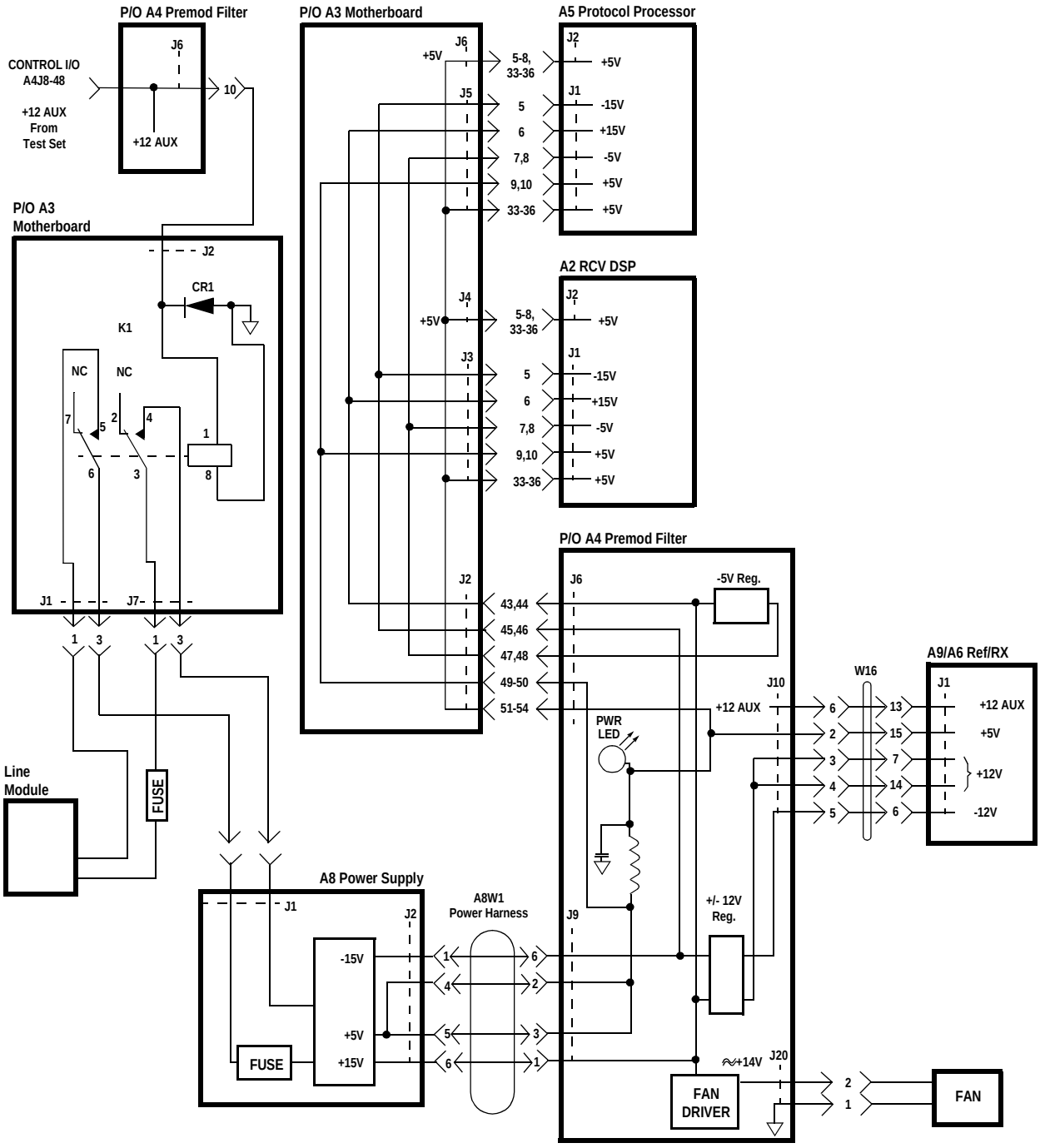


Figure 36 **HP 83206A Cellular Adapter Power Distribution**

6

Replaceable Parts

This chapter contains the replaceable assembly and component information for the HP 83206A TDMA Cellular Adapters. Use the illustrations on the following pages to identify the replaceable parts and the **"Parts List" on page 110** for part numbers.

Parts Identification

Major Assemblies

Shown below are the major assemblies for the HP 83206A TDMA Cellular Adapter.

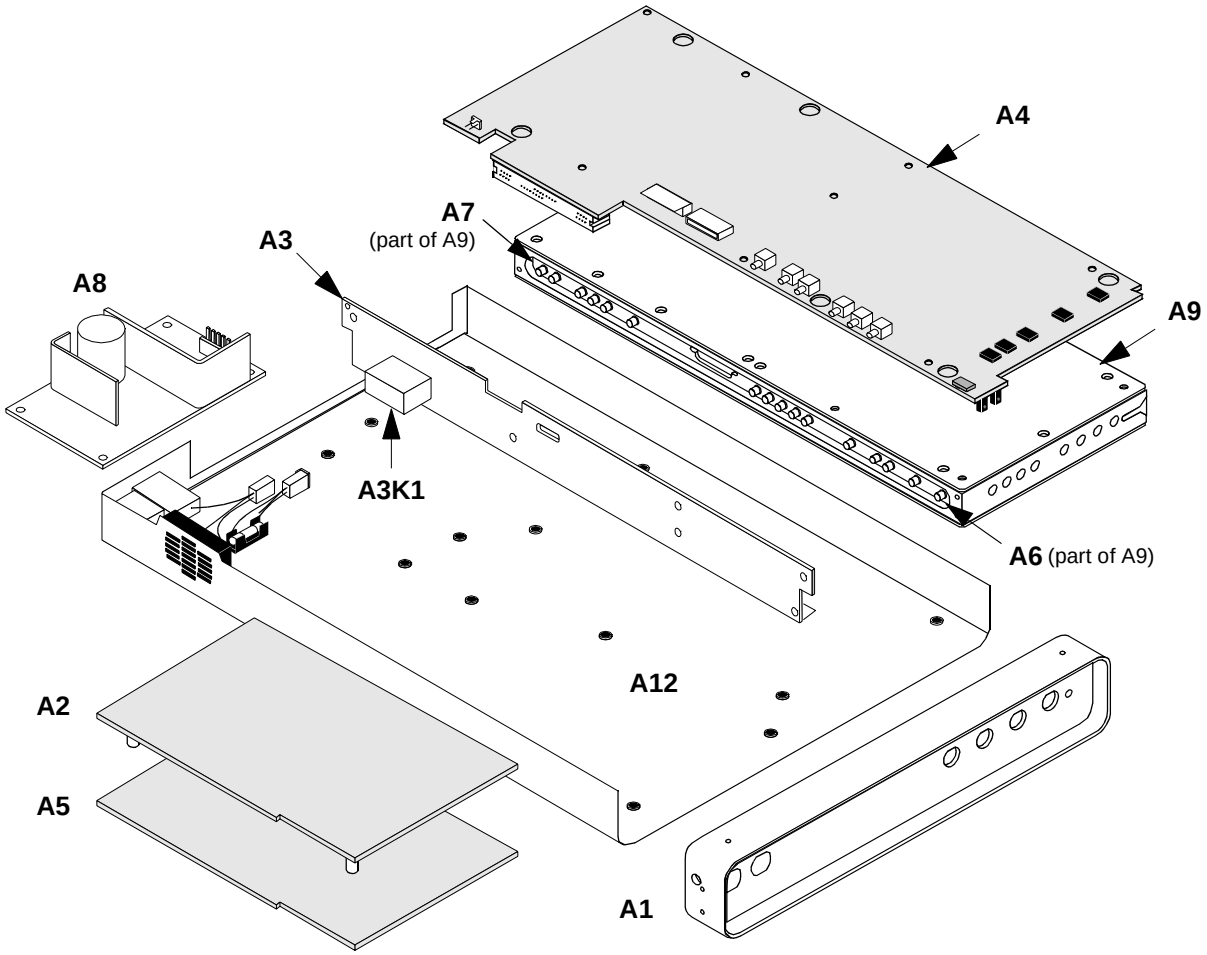


Figure 37 **HP 83206A Cellular Adapter Major Assemblies**

External Cables

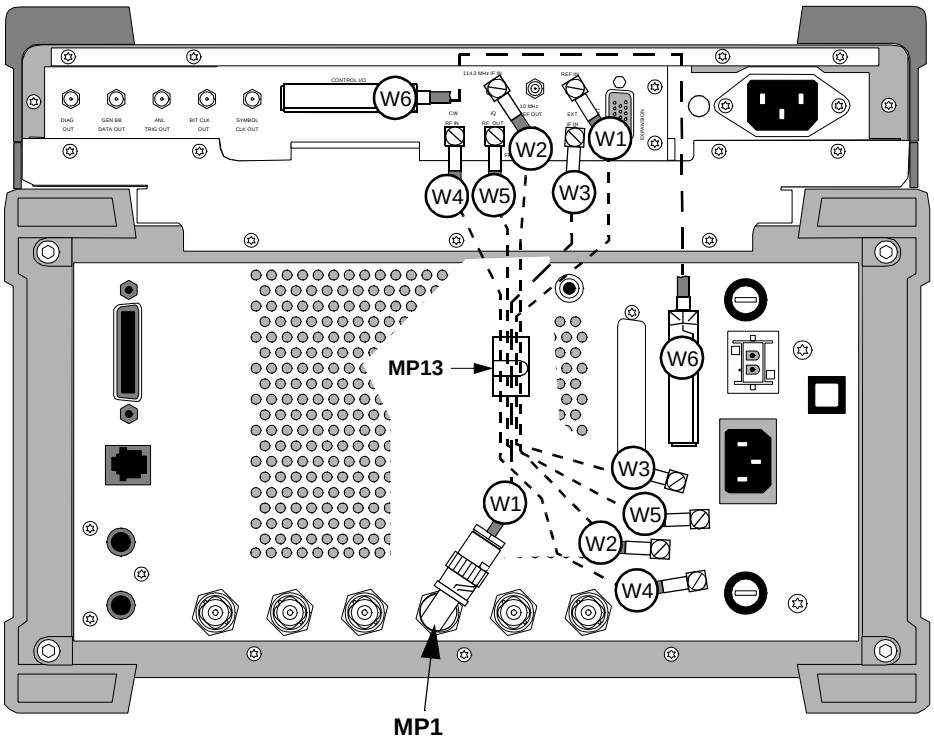


Figure 38 **Rear Panel Cables of HP 83206A Cellular Adapter and HP 8920B Test Set**

Front Panel Components

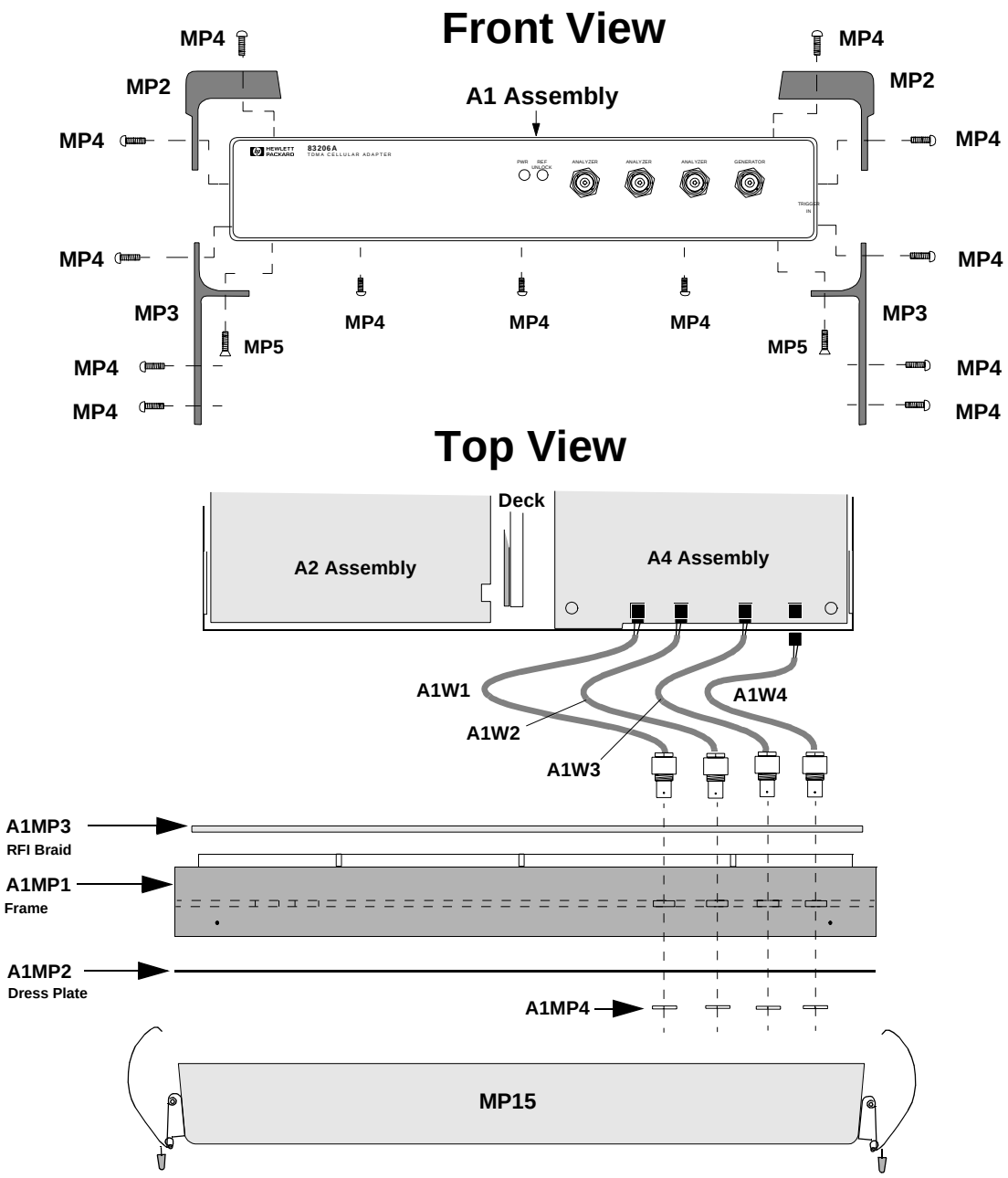


Figure 39 **Front Panel Components**

Cover and Rear Panel Components

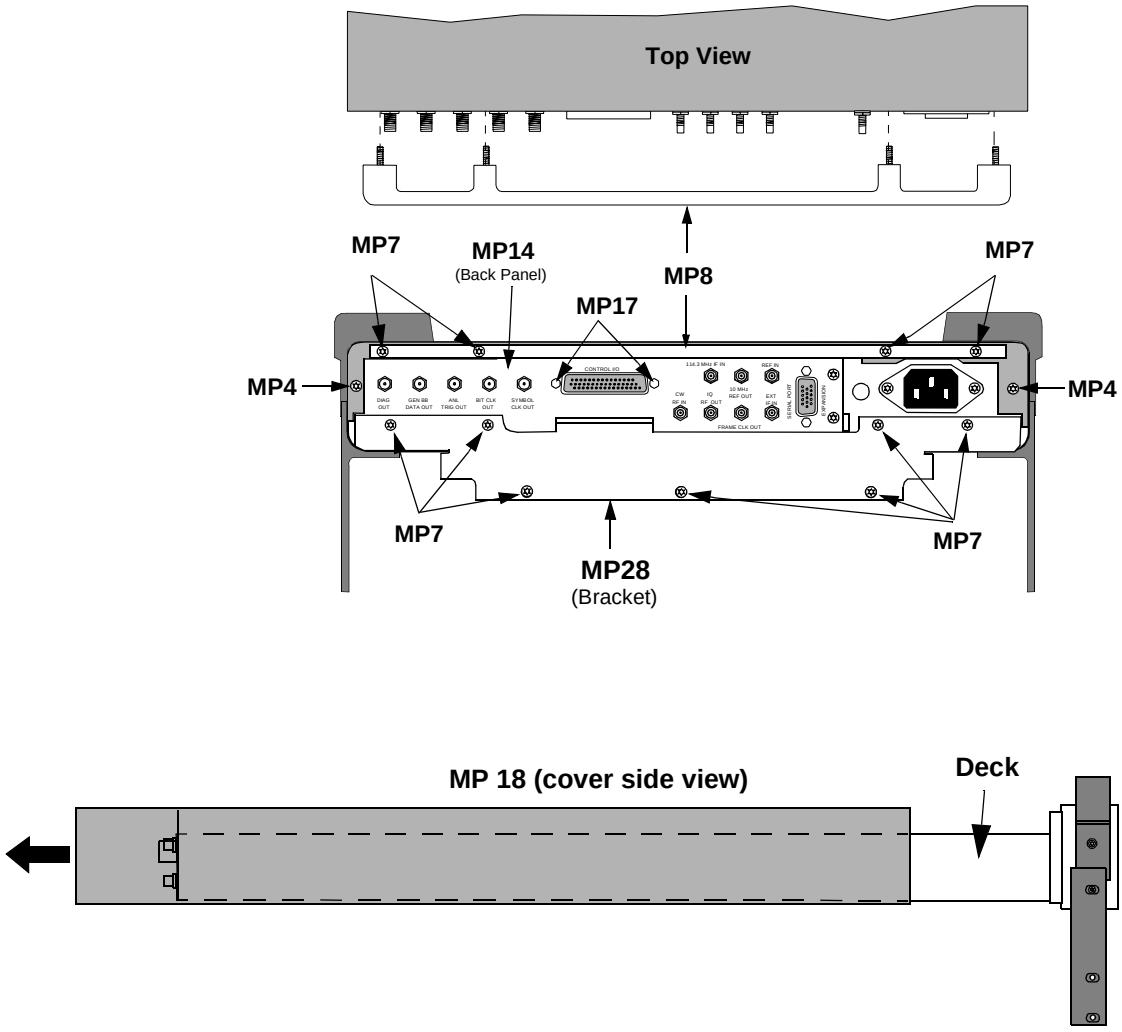


Figure 40 **Cover and Rear Panel Components**

Rear Panel Components

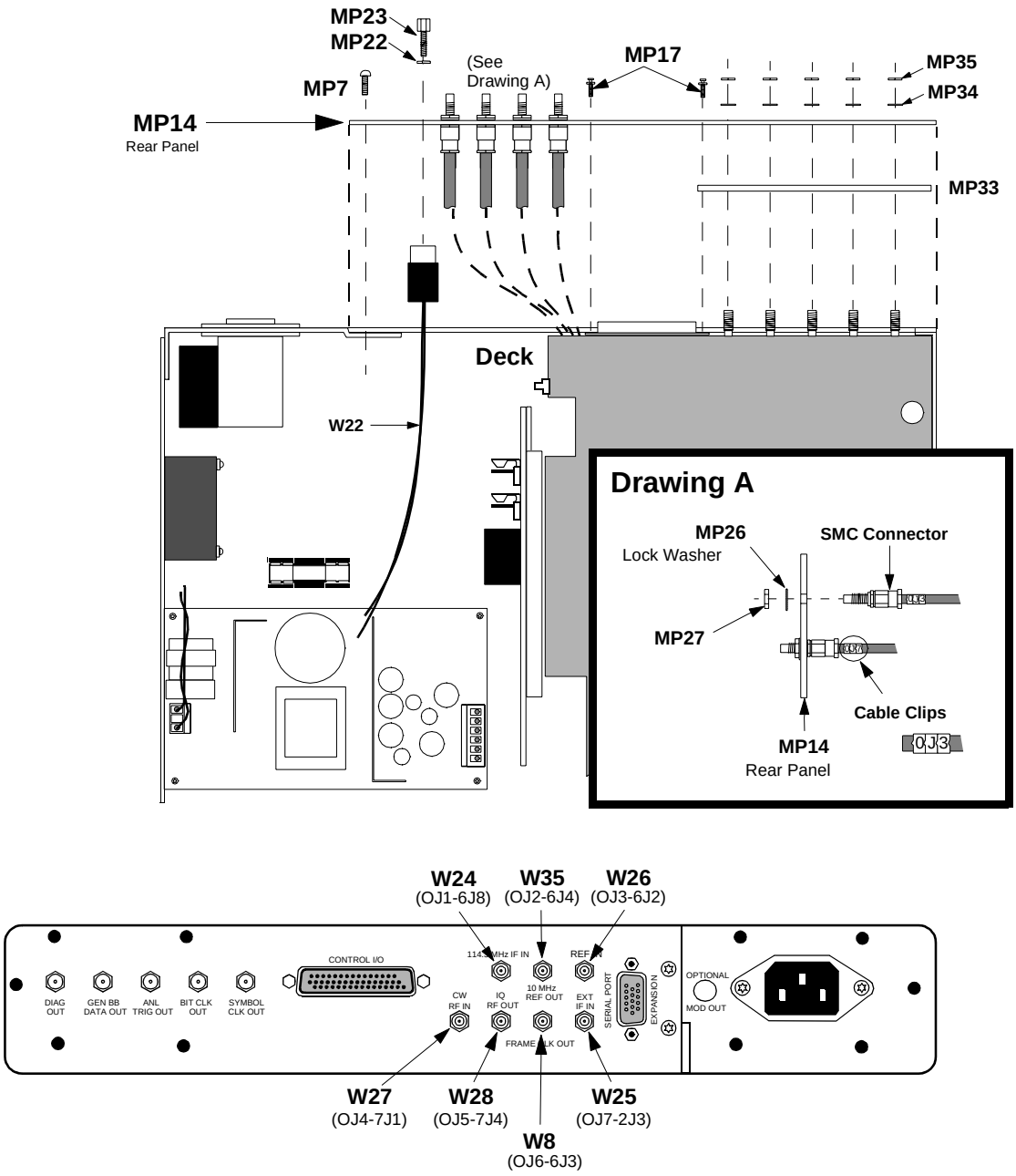


Figure 41 **Rear Panel Components**

A8 Power Supply Assembly & Miscellaneous Components

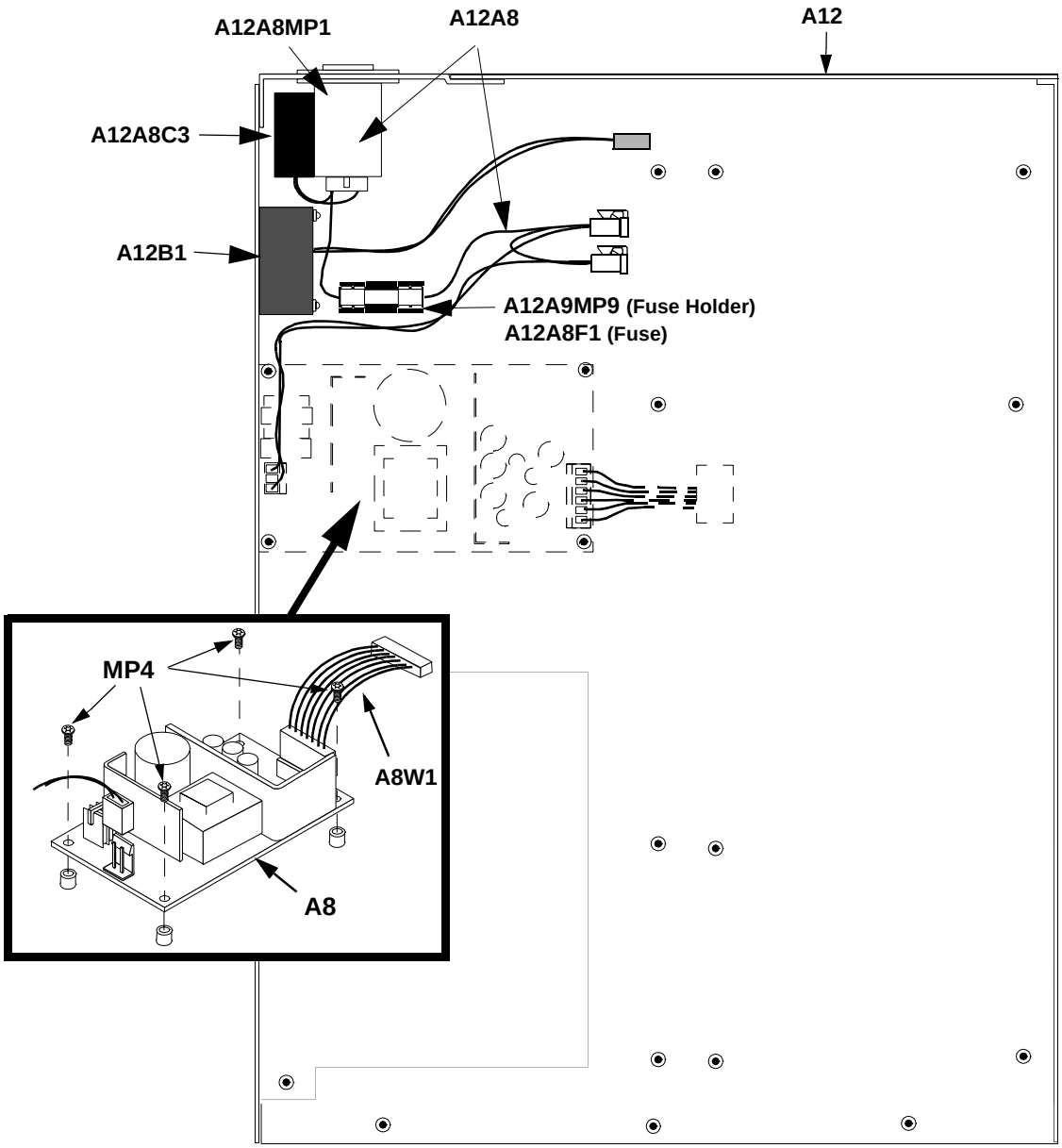


Figure 42 **A8 Power Supply Assembly & Miscellaneous Components**

A4 Premodulator/Filter Assembly

NOTE: Perform the PER_CALD calibration procedure after replacing the A9 assembly (**see "PER_CALD Calibration Procedure" on page 115**).

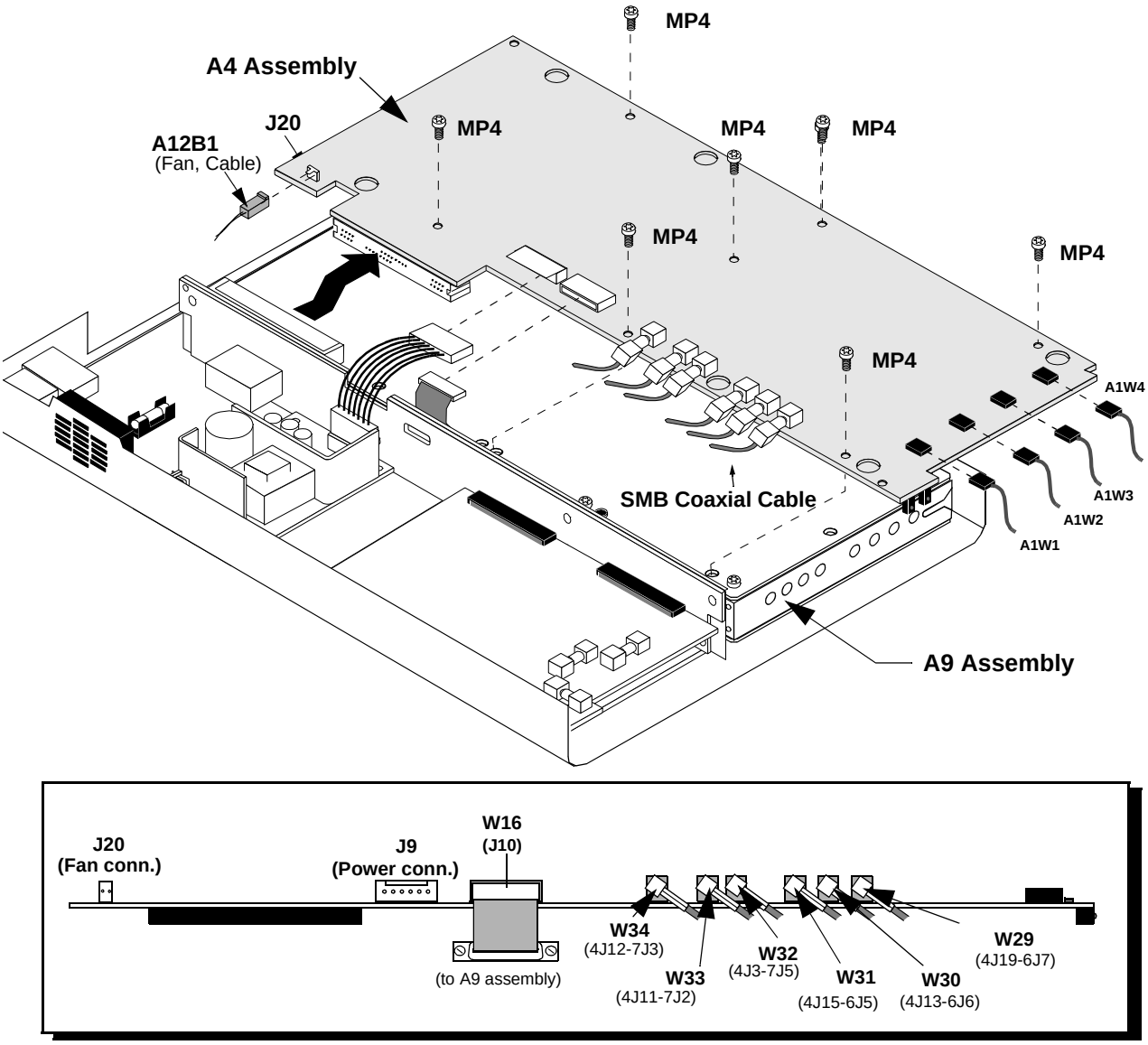


Figure 43 **A4 Premodulator Filter Assembly**

A9 I/Q Mod./Ref. Assembly

NOTE: Perform the PER_CALD calibration procedure after replacing the A9 assembly (**see "PER_CALD Calibration Procedure" on page 115**).

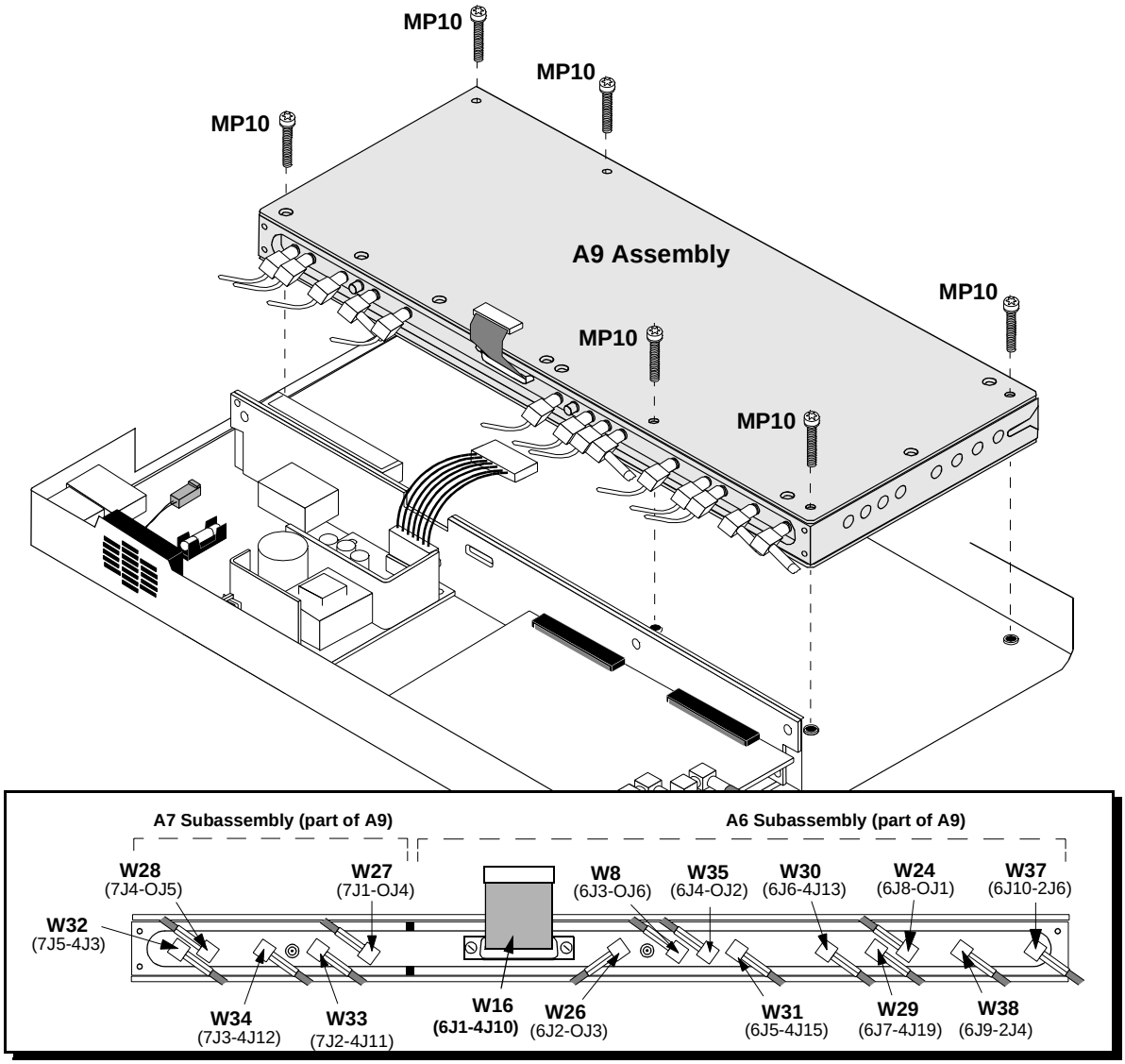


Figure 44 **A9 IQ Modulator/Reference Assembly**

A2 RX DSP Assembly

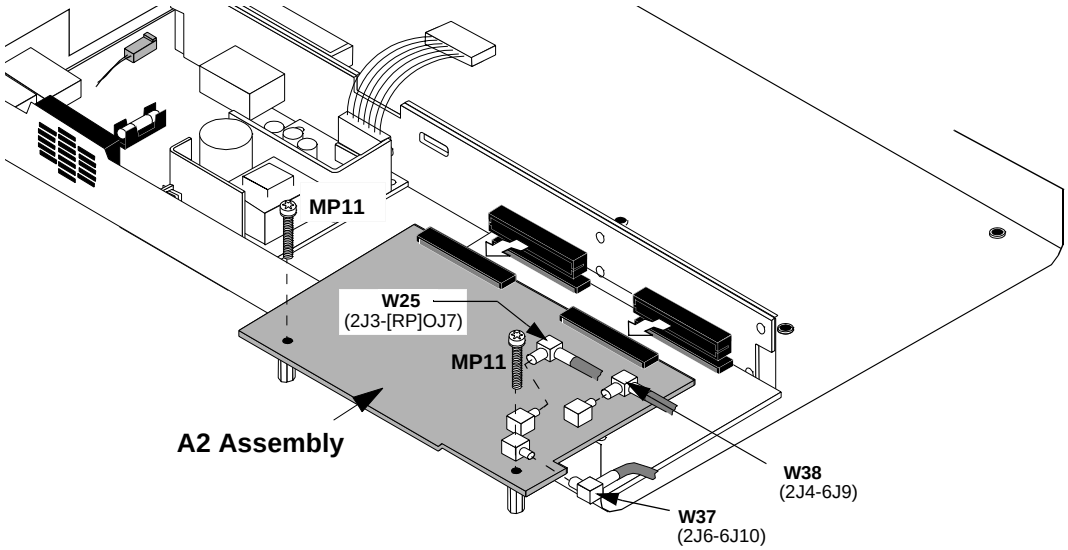


Figure 45 **A2 RX DSP Assembly**

A5 Protocol Processor Assembly

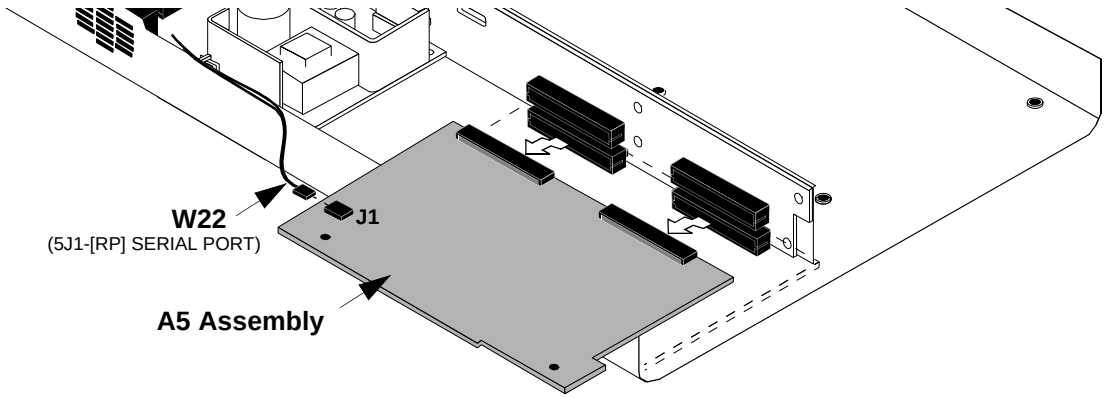


Figure 46 **A5 Protocol Processor Assembly**

A3 Motherboard Assembly

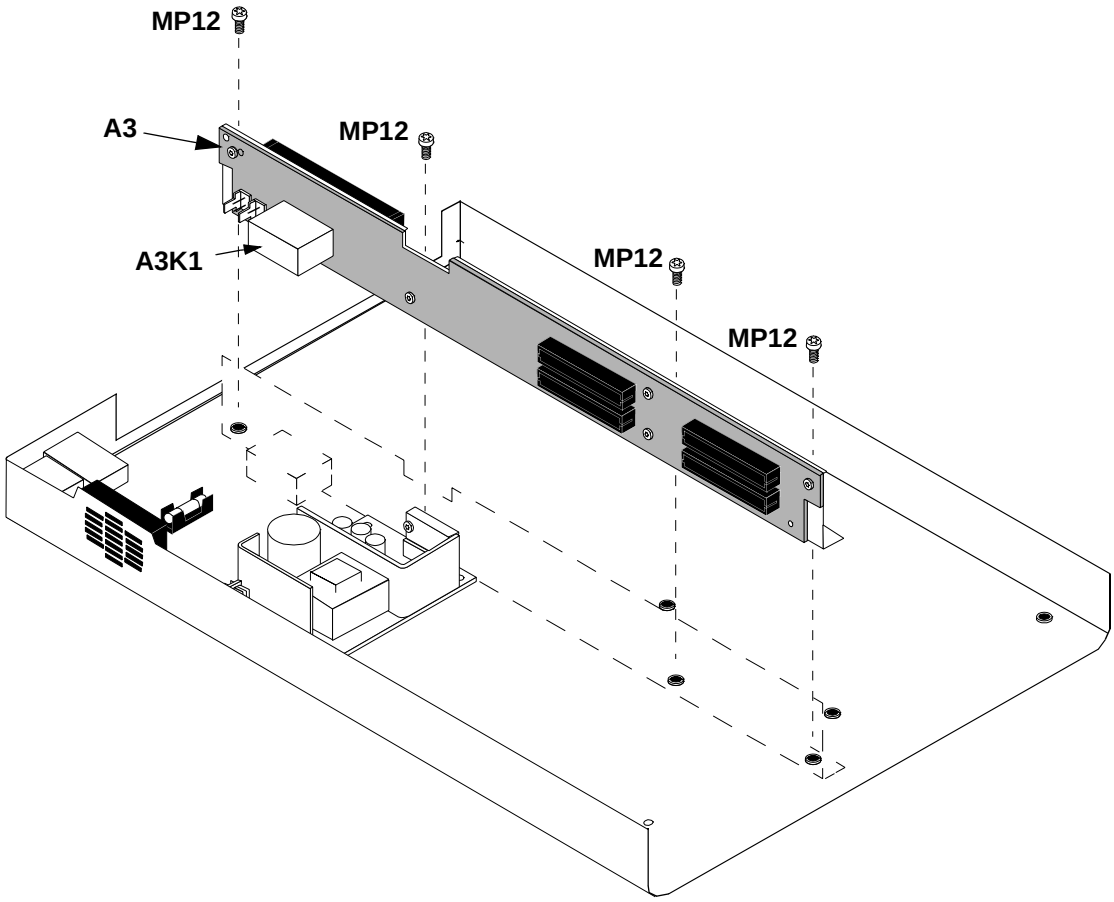


Figure 47 **A3 Motherboard Assembly**

Parts List

REFERENCE DESIGNATOR	DESCRIPTION	PART NUMBER
ACC1	ALR MANUAL	83206-90009
ACC2	USERS MANUAL	83206-90002
ACC4	DSP/AMB DGTL F/W UPGRADE	83206-61801
ACC6	KIT-RACK MOUNT	08921-61037
A1	AY-FRONT PANEL	83206-61001
A1MP1	FRAME FRONT	83201-21007
A1MP2	PANEL-DRESS,FRONT	83206-00002
A1MP3	RFI ROUND STRIP	8160-0520
A1MP4	NUT-HEX 15/32-32	2950-0035
A1W1-W4	CBL ASSY	83203-61005
A2	RX DSP KIT W/CODE	83206-61803
A3	MOTHERBD KIT	83206-61805
A3K1	RLY 5A 2C 12VDC	0490-1787
A4	PREMOD FILTER KIT	83206-61804
A5	AMB LITE KIT	83206-61802
A8	PWR SPLY 3 40W	0950-2023
A8W1	CA MCNDCT 6CKT	83201-61011
A9	IQ MOD/REF KIT	83204-61806

A12	DECK	83203-00021
A12A8	CABLE MAIN HARNESS	83203-61058
A12A8C3	C MPAP .47U 250V	0160-7716
A12A8F1	FUSE 2A 250V	2110-0002
A12A8MP1	FLTR-LINE 250V	9135-0242
A12A8MP9	FUHLR 15A 250V	2110-0776
A12B1	FAN ASSY	83201-61046
MP1	ADPT F BNC M BNC	1250-0076
MP2	BUMPER	5041-8928
MP3	BRACKET ATTACH	83201-21002
MP4	SMM3.0 8SEMPNTX	0515-0372
MP5	SMM3.0 10 FL TX	0515-1103
MP7	SMM3.0 12SEMPNTX	0515-0664
MP8	BAR-CONNECTOR	83201-21004
MP10	SCRMACH M3 30MML	0515-1349
MP11	SCR-MACH-M3.0X0.5	0515-2383
MP12	SMM3.0 6SEMPNTX	0515-2126
MP13	CLAMP-CABLE	1400-1391
MP14	PANEL REAR	83201-00019
MP15	AY-COVER,IMPACT	83201-61013
MP17	CONN LOCK SUB D	1251-0218

MP18	COVER AY	83203-61051
MP22	WSHR-LK HLCL #4	2190-0003
MP23	CONN SCREWLOCK F	0380-2079
MP26	WSHR-LK IN T #10	2190-0124
MP27	NUT-HEX 10-32	2950-0078
MP28	PLATE RR MTG	83203-00020
MP33	SPACER	83201-00013
MP34	WASHER-LOCK	1250-1142
MP35	NUT RF CONN SMA	1250-0569
W1	CABLE	8120-6285
W2, W3, W4, W5	CA CX A23A23 195	8120-5730
W6	CA IO	83201-61001
W16	RBN 15CNDCT 28AWG	83201-61004
W22	SUB HARNESS CA ASSM	83206-61003
W24, W35, W26, W8	FLEX CABLE	83203-61013
W25	CX F SMB-SMCBH 8	8120-6264
W27,W28	CX F SMC-SMCBH 8	8120-5857
W29-W31, W33, W34, W37, W38	CA CX A06A06 260	8120-5020
W32	CA CX A06A06 3108120-5021	

7

Periodic Calibration and Performance Tests

This chapter contains the periodic calibration and the performance test procedures for the HP 83206A TDMA Cellular Adapter.

Periodic Calibration

The HP 83206A Cellular Adapter is calibrated by running the PER_CALD calibration program. This program is stored in the Test Set's ROM and provides two calibration routines: IQ Modulator and Tx Power. The IQ Modulator routine should be run whenever the Cellular Adapter is installed on a Test Set and at least every 12 months after installation. The Tx Power routine should be run whenever the Cellular Adapter is installed on a Test Set without Option 006.

NOTE: **The IQ Modulator routine should be run whenever the Cellular Adapter is installed on a Test Set and at least every 12 months after installation.**

The IQ Modulator routine minimizes the Error Vector Magnitude (EVM) and frequency error of Cellular Adapter's IQ modulator. The Tx Power routine provides the Cellular Adapter (connected to a Test Set without Option 006) with the capability to make Tx Power measurements in dBm (displayed in dB) on the Digital Measurement screen.

When **`IQ Modulator`** is selected from the PER_CALD menu, the program will calibrate the IQ modulator from 800 to 1000 MHz in 20 MHz steps. Quadrature Gain Spur, Origin Offset Spur, Reference Level, and Maximum Absolute Power will be displayed for each frequency setting. A properly calibrated instrument will have a maximum absolute power of -10 dBm +/- 5 dB, a reference level that is 0 to 6 dB below the maximum absolute power, and spurs that are more than 50 dB below the reference level.

NOTE: **The Tx Power routine should be run ONLY when the Cellular Adapter is installed on a HP 8920B without Option 006.**

When selecting **`Tx Power`** from the PER_CALD menu, the value of the three calibration factors (0 dB, 20 dB, and 40 dB) will be displayed. An option is provided for zeroing these calibration factors or exiting before continuing the program. The initial factory default setting for these calibration factors is 0. It is required that the calibration factors are zero before running the Tx Power routine. Updated calibration factors will be displayed on the screen at the completion of the program. The calibration factors from a properly calibrated Test Set will be in steps of 20 +/- 1 from 0 to 60 (Example: 0 dB = 15.3966, 20 dB = 35.4610, and 40 dB = 55.3717). Each calibration factor has a range of 20 (Example: 0 dB = 0 to 20, 20 dB = 20 to 40, and 40 dB = 40 to 60).

PER_CALD Calibration Procedure

1. Press the TESTS key to access the TESTS screen.
2. Select the **Procedure Location:** field.
3. Select **ROM** under the **Choices:** menu.
4. Select the **Procedure Filename:** field.
5. Select **PER_CALD** under the **Choices:** menu.
6. Select **Run Test** (k1 key).
7. Follow the instructions on the screen.

Performance Test Procedures

There are two performance tests in this chapter.

- **"TDMA Analyzer Accuracy Performance Test 1" on page 117**
- **"TDMA Generator Accuracy Performance Test 2" on page 125**

The performance tests in this chapter verify that the HP 83206A TDMA Cellular Adapter performs to its specifications. The **"HP 83206A Performance Tests Record" on page 127** is provided for logging the results of these tests.

NOTE: Perform the **"Periodic Calibration" on page 114** before performing any of the following performance tests.

Additional Test Equipment

There are two test setup options for TDMA Analyzer Performance Test 1. **Table 12** lists the additional instruments required by each setup option. The following procedures in this chapter do not explain how to operate the test instruments listed. For operating instructions, refer to each instrument's operation manual.

Table 12 Additional Test Equipment Required

Equipment	Test Setup Option 1 See **figure 48 on page 118**.	Test Setup Option 2 See **figure 49 on page 120**.
HP ESG-D1000A Digital Signal Generator or equivalent[1]	X	
π/4 DQPSK I/Q Modulator		X
HP 8657D Signal Generator or equivalent[2]		X

1. HP ESG-D2000A/D3000A/D4000A
2. HP 8642A, HP 8644A/B, HP 8662A

TDMA Analyzer Accuracy Performance Test 1

Description

The purpose of this test is to verify the accuracy of the TDMA analyzer. A π/4 DQPSK I/Q Modulator is used to generate a TDMA modulated signal with low Error Vector Magnitude (EVM). The TDMA analyzer is then used to measure the EVM of the signal.

Equipment Setup

There are two test setup options for this performance test: **"Test Setup Option 1"** (below) and **"Test Setup Option 2" on page 119**.

Test Setup Option 1

Set up the test instruments as shown in **figure 48 on page 118**. **Table 13** below lists the critical settings for the signal generator.

After setting up the test instruments, go to **"Procedure" on page 121** to continue the Performance Test 1 procedure.

Table 13 Digital Signal Generator Settings

RF frequency	800 MHz
RF amplitude	0 dBm
RF ON/OFF	ON
Mode	NADC
NADC	ON
Phase Polarity	Normal
Filter	RNYQ
Data	EXT
Ext Data Clock	Symbol

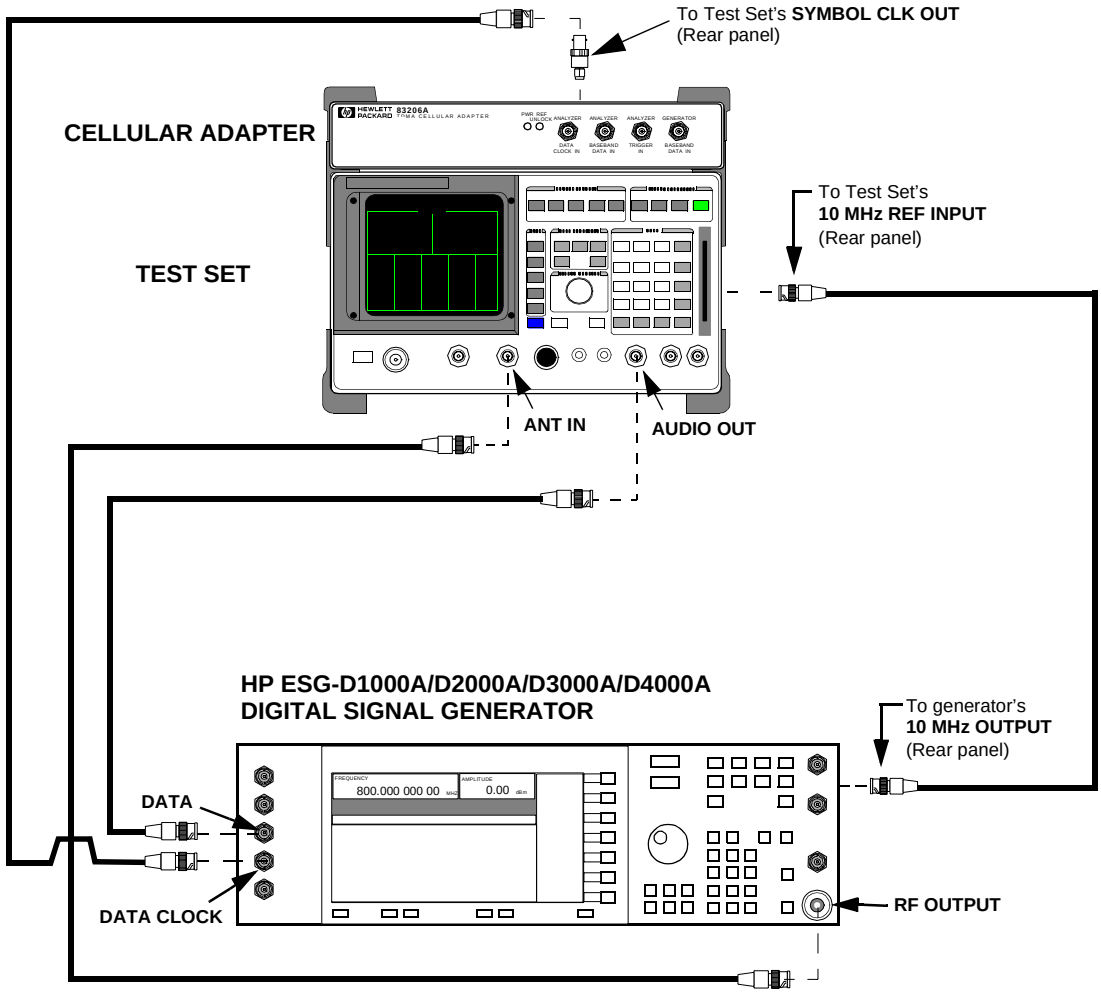


Figure 48 **Test Setup Option 1, for TDMA Analyzer Accuracy Performance Test 1**

Test Setup Option 2

Set up the test instruments as shown in **figure 49 on page 120**. **Table 14** below lists the critical settings for the signal generator and the π/4 DQPSK I/Q Modulator.

After setting up the test instruments, go to **"Procedure" on page 121** to perform the Performance Test 1 procedure.

Table 14 Test Equipment Settings

Signal Generator settings[1]:	
RF frequency	800 MHz
RF amplitude	0 dBm
All modulation	π/4 DQPSK
π/4 DQPSK I/Q Modulator settings:	
Polarity switch	Normal (switch out)
Filter switch	∝= 0.35 (switch out)
PREMOD FILTER CONTROL switch on rear panel, see **figure 49 on page 120**)	S1 = 1 S2 through S7 = 0

1. **See "RF Signal Generator Specifications"**.

NOTE: DO NOT USE the front-panel RF OUTPUT of the HP 8657D π/4 DQPSK Signal Generator (see **figure 49**) for either the CW 800 MHz signal or the modulated 800 MHz signal. This signal does not have sufficient accuracy to be used for the performance tests.

RF Signal Generator Specifications

The RF signal generator is used to provided a clean 800 MHz CW signal to the π/4 DQPSK I/Q Modulator. This 800 MHz CW source must have low residual FM to ensure that the modulated signal will have a good Error Vector Magnitude. The following sources provide an acceptable 800 MHz CW signal:

- HP 8657D back-panel port: 800 MHz OUTPUT
- HP 8642A front-panel port: RF OUTPUT
- HP 8644A/B front-panel port: RF OUTPUT
- HP 8662A front-panel port: RF OUTPUT

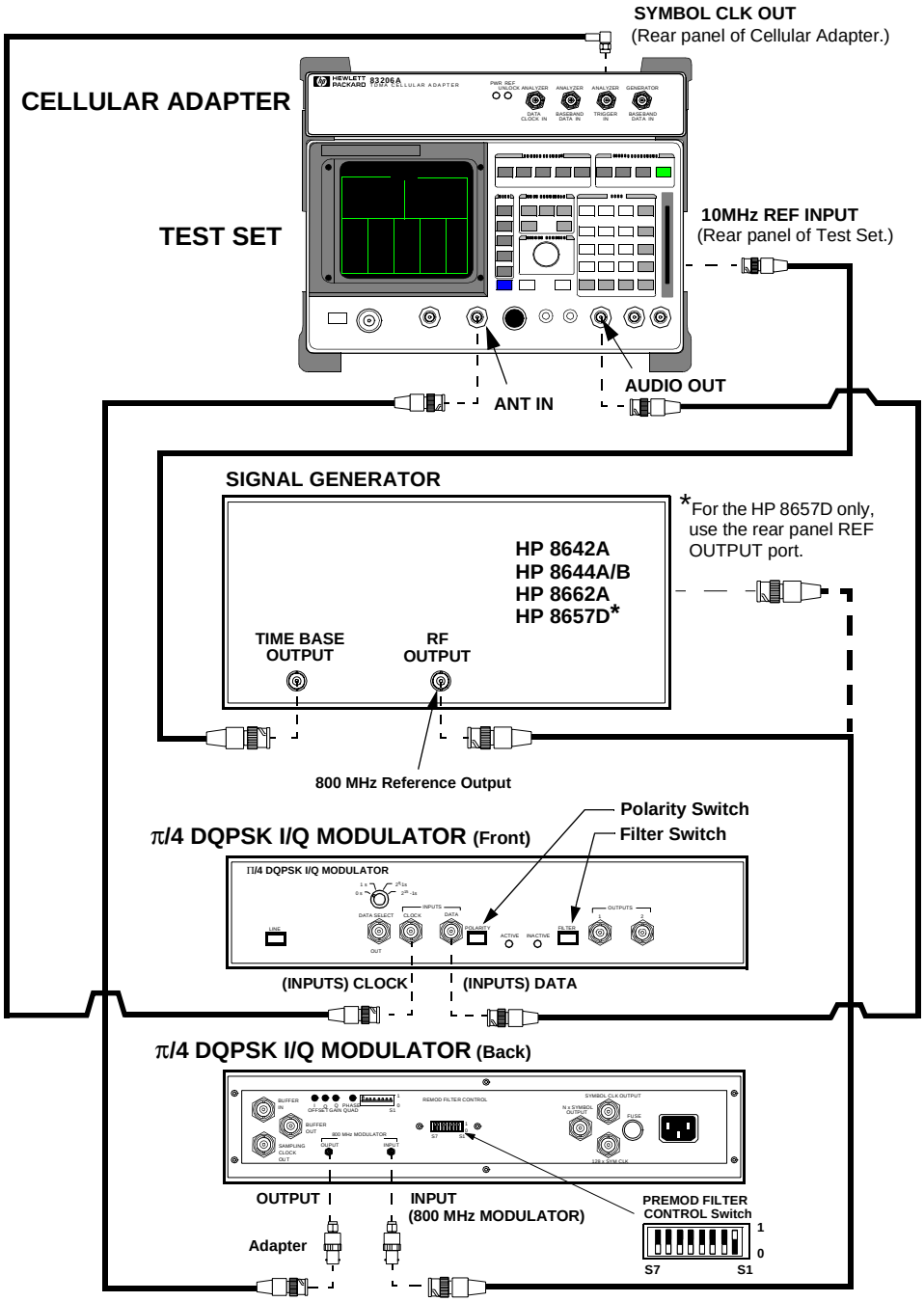


Figure 49 **Test Setup Option 2, for TDMA Analyzer Accuracy Performance Test 1**

Procedure

NOTE: Press the PRESET key on the Test Set before beginning.

Step 1. Setup the RX TEST screen (see figure 50).

a. Set the **`AFGen1 Freq`** field to **`14 kHz`**.

b. Set the **`AFGen1 To`** fields as follows:

- Designate: **`Audio Out`**.
- Set global user key k1'to **`AFGen1 To`** (press SHIFT, ASSIGN, SHIFT, k1).
- Set level to 4V.

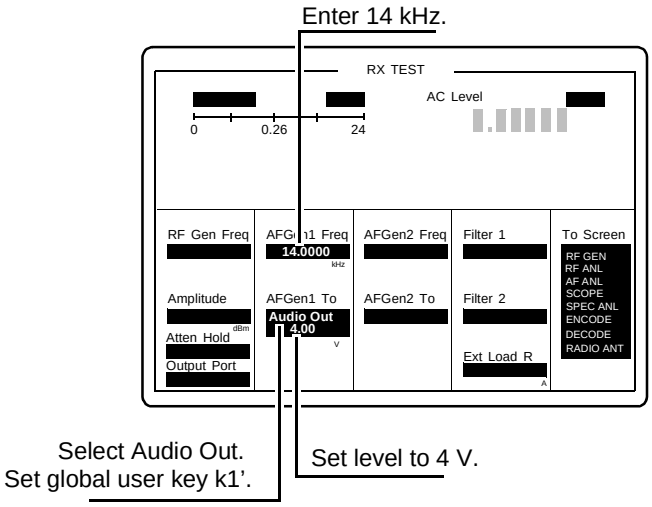


Figure 50 Setting up the RX TEST Screen

Step 2. Setup the RF ANALYZER screen (see figure 51).

a. Select **`RF ANL`** from to **`To Screen`** menu (the RF ANALYZER screen appears).

b. Set the **`Tune Mode`** field to **`Manual`**.

c. Set global user k2' key to **`Tune Freq`** (press SHIFT, ASSIGN, SHIFT, k2).

d. Set the **`Input Port`** field to **`Ant`**.

e. Set the **`IF Filter`** field to **`230 kHz`**.

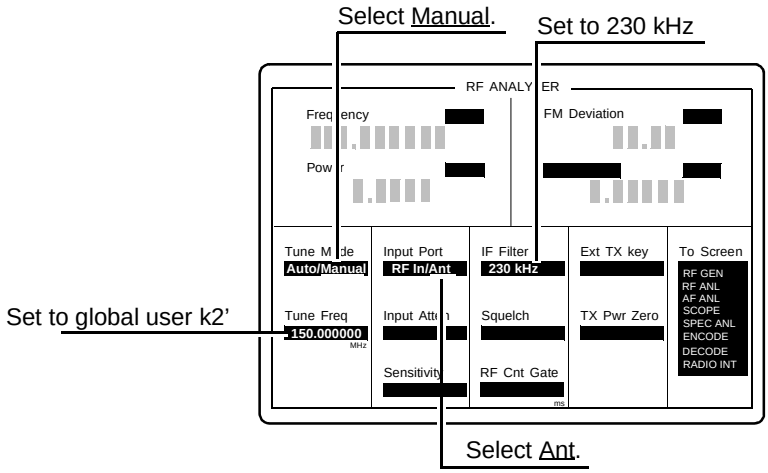


Figure 51 Setting up the RF ANALYZER Screen

Step 3. Setup the CALL CONTROL screen (see figure 52).

a. Select **`More`** from the screen menu then select **`CALL CNTL`** from the **`Choices`** menu, the CALL CONTROL screen appears.

b. Set the **`System Type`** field to **`DCCH`**.

c. Select **`CALL CNFG`** from the **`To Screen`** menu (the DCCH CALL CONFIGURE screen appears, shown in **figure 53**).

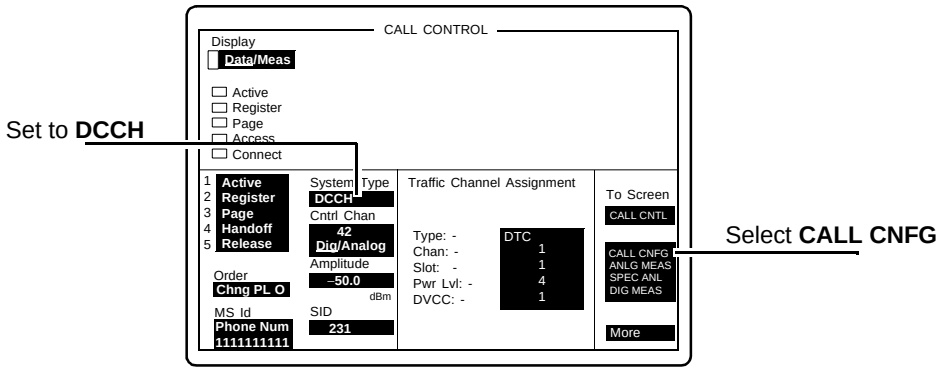


Figure 52 **Setting up the CALL CONTROL Screen**

Step 4. Setup the DCCH CALL CONFIGURE screen (see figure 53).

a. Set the **`Dig Signal`** field to **`NonStd`**.

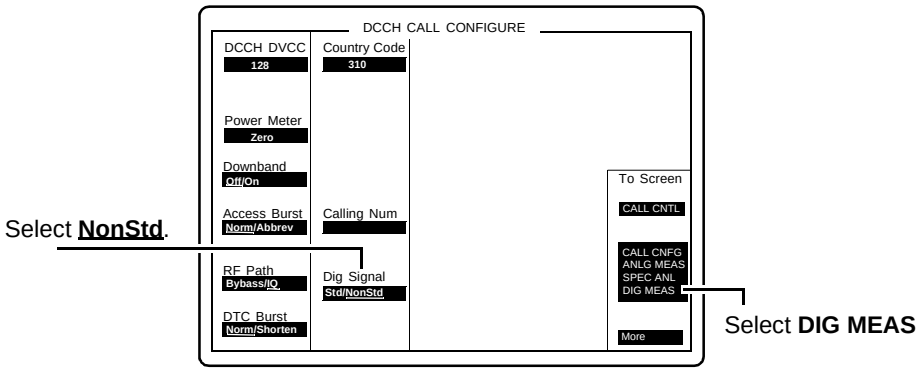


Figure 53 **DCCH CALL CONFIGURE Screen**

Step 5. Setup the DIGITAL MEASUREMENTS screen.

a. Select **`DIG MEAS`** from the **`To Screen`** menu (see **figure 53 on page 123**), the DIGITAL MEASUREMENTS screen appears (**see figure 54**).

b. Press the SHIFT key then the k1 key and change **`AF Gen 1 To`** (at top of screen) to **`Audio Out`**.

c. Press the SHIFT then the k2 key. **`Tune Freq xxx.000000 MHz`** appears at the top of the screen. Change **`Tune Freq`** to **`800 MHz`**

d. Record the analyzer's EVM accuracy under **"TDMA Performance Test 1 Analyzer EVM Measurement" on page 127**.

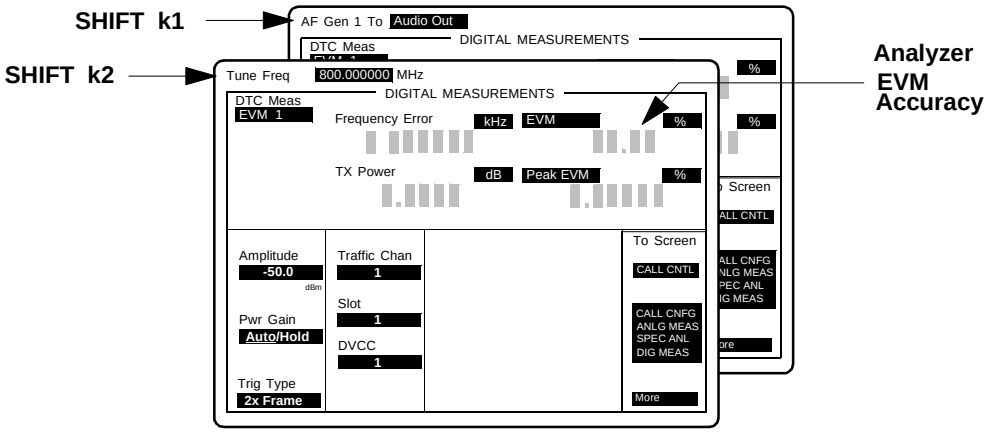


Figure 54 **DIGITAL MEASUREMENTS Screen**

TDMA Generator Accuracy Performance Test 2

Description

The UUT is set up to perform a loopback test. The digital generator is used to generate a TDMA signal. This signal is measured by the analyzer and the accuracy is reported.

Equipment Setup

Connect the Test Set's DUPLEX OUT to its ANT IN port. The rear panel connections between the Test Set and Cellular Adapter do not change (for rear panel connections, **see figure 16 on page 63**.)

Procedure

1. Press the PRESET key.
2. Press the TESTS key. The TESTS screen appears.
3. Select **`ROM`** for the **`Select Procedure Location`** field, **see figure 55**.
4. Select **`DMCDIAGL`** for the **`Select Procedure Name`** field.

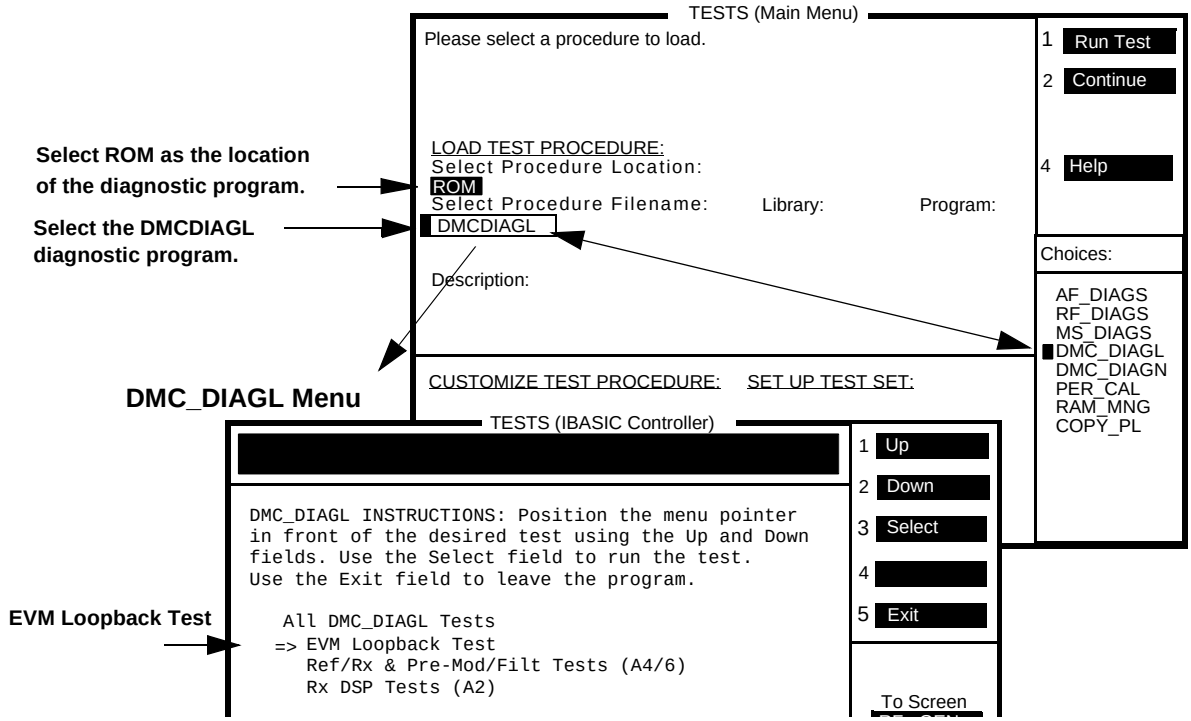


Figure 55 DMC_DIAGL Screen

5. Press k1 (**Run Test**). The TESTS (IBASIC Controller) screen appears, **see figure 55**.
6. Follow the instructions displayed and choose the **EVM Loopback Test**.
7. Disregard the cabling instructions displayed. Connect only the Test Set's DUPLEX OUT connector to the ANT IN connector. (The rear panel connections between the Test Set and Cellular Adapter should be in the correct positions.)
8. Press k3 (**Resume**) to perform the test.
9. After a few seconds, the ERROR VECTOR MAGNITUDE LOOPBACK TEST results appear, **see figure 56**.
10. Read the EVM%, it should read *less than 3%*. Record the measured EVM% under **"TDMA Performance Test 2 Generator EVM Measurement" on page 127**. If the EVM% is greater than 3%, troubleshoot the Cellular Adapter.

This completes the performance test.

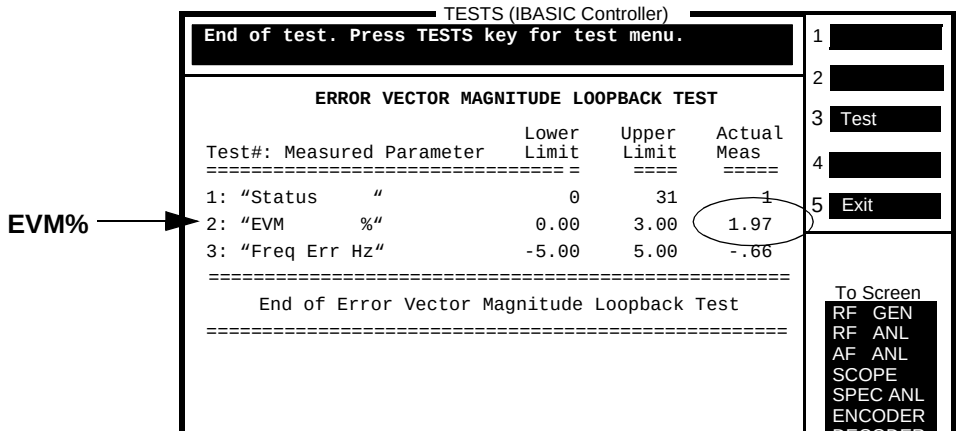


Figure 56 **ERROR VECTOR MAGNITUDE LOOPBACK TEST Results**

HP 83206A Performance Tests Record

Date: _____ Time:_____ Humidity: _____

Tested by: _____

Cellular Adapter Serial Number: _____

Test Set Serial Number: _____

Test Set Last Calibration Date: _____

TDMA Performance Test 1 Analyzer EVM Measurement

Frequency (MHz)	Measured EVM Limit (%)	
	Upper	Actual
800	≤ 2.4	

TDMA Performance Test 2 Generator EVM Measurement

Frequency (MHz)	Measured EVM Limit (%)	
	Upper	Actual
800	≤ 3.0	

8

Specifications

This chapter contains the specifications for the HP 8920B Option 800 Test System.

Test System Specifications

The following specifications are for the HP 8920B Option 800 Test System, that is, the HP 83206A TDMA Cellular Adapter and its companion HP 8920B RF Communications Test Set. The HP 83206A TDMA Cellular Adapter has no electrical specifications on its own.

TDMA Signal Generator

Frequency Range: 824 MHz to 894 MHz

Output Level Range:

- RF IN/OUT: –22 dBm to –127 dBm
- DUPLEX OUT: +4 dBm to –127 dBm

Residual Error Vector Magnitude: <3.0%

Residual Phase Error: <2.0°

Residual Magnitude Error: <2.6%

IQ Origin Offset: <–30 dBc within ±15 ° C of last calibration

Frequency Error: ±4 Hz plus reference accuracy

TDMA Analyzer

Frequency Range: 800 MHz to 900 MHz

Input Level Range:

- RF IN/OUT: 1 mW to 60 W (0 to +47.8 dBm)
- ANT IN: –36 dBm to +16 dBm

Input Frequency Setting Error: 1 kHz

Frequency Error Accuracy: ±2.5 Hz plus reference accuracy

Residual Error Vector Magnitude: <1.3%

Error Vector Magnitude Measurement Accuracy: ±0.4% +2% of reading

Residual Phase Error: <1.0°

Residual Magnitude Error: <0.9%

IQ Origin Offset Accuracy: ±0.5 dB for values greater than –40dBc

Physical Specifications for the Cellular Adapter

The following specifications are for the Cellular Adapter only.

Power requirements: 100 to 240 V; 50 to 60 Hz; 100 VA.

Operating temperature range: 0° to 55° C.

Leakage: Conducted and radiated interference meets CISPR 11.

Weight: 4.5 kg (10 lbs) net, 6.8 kg (15 lbs) shipping.

Dimensions: 62 H × 330 W × 456 D mm (2.4 H × 13 W × 18 D in).

Index

Index

Index

Index