HP 70620B/HP 70621A
Preamplifier
Service Manual

Service Manual

HP 70620B/HP 70621A Preamplifier
including HP 70620B Option 001

hp HEWLETT
PACKARD

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 Hewlett-Packard. Buyer shall prepay shipping charges to Hewlett-Packard and Hewlett-Packard shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Hewlett-Packard from another country.

Hewlett-Packard warrants that its software and firmware designated by Hewlett-Packard for use with an instrument will execute its programming instructions when properly installed on that instrument. Hewlett-Packard 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. HEWLETT-PACKARD 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. HEWLETT-PACKARD 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 agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office.

Safety Symbols

The following safety symbols are used throughout this manual. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Caution	The *caution* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a *caution* sign until the indicated conditions are fully understood and met.
Warning	The *warning* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a *warning* sign until the indicated conditions are fully understood and met.

General Safety Considerations

Warning	*Before this instrument is switched on*, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.
Warning	There are many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.
Caution	*Before this instrument is switched on*, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

HP 70000 Modular Measurement System Documentation Outline

Instruments and modules of the HP 70000 Modular Measurement System are documented to varying levels of detail. Modules that serve as masters of an instrument require operation information in addition to installation and verification instructions. Modules that function as slaves in a system require only a subset of installation and verification information.

Manuals Supplied with Module

Installation and Verification Manual

Topics covered by this manual include installation, specifications, verification of module operation, and some troubleshooting techniques. Manuals for modules that serve as instrument masters will supply information in all these areas; manuals for slave modules will contain only information needed for slave module installation and verification. Master module documentation may also include some system-level information.

Operation Manual

Operation Manuals usually pertain to multiple- and single-module instrument systems. Topics include preparation for module use, module functions, and softkey definitions.

Programming Manual

Programming Manuals also pertain to multiple- and single-module instrument systems. Programming Manual topics include programming fundamentals and definitions for remote programming commands.

Service Manual, Available Separately

This manual provides service information for a module, including module adjustments and verification tests, replaceable parts lists, and replacement procedures. For ordering information, contact a Hewlett-Packard Sales and Service Office. This manual is not always immediately available for new products. (NOTE: Some earlier service manuals are titled *Technical Reference.*)

Contents

Figures

Tables

General Information

Introduction

This is the service manual for the HP 70620B and HP 70621A preamplifiers. This manual contains information needed to test, adjust, and service the HP 70620B and HP 70621A preamplifiers to the assembly level.

Manual Conventions

The following text conventions are used throughout this manual:

Keys physically on an instrument are represented in this way: (KEY)

Softkeys, keys defined by software or firmware, are represented in this way: softkey

Text that appears on the display screen is represented in this way: screen text

Manual Organization

This manual is divided into the following eight chapters:

Chapter 1, "General Information," contains lists of service kit contents, recommended test equipment, and sales and service offices. Also included are instructions for returning an instrument for service, and information about electrostatic discharge (ESD).

Chapter 2, "Verification Software," contains information needed to use the HP 70620B/HP 70621A Module Verification software.

Chapter 3, "Adjustments and Verification Tests," contains information on the module adjustment procedures and tests used to verify the electrical operation of the module.

Chapter 4, "Troubleshooting," contains error-code definitions and troubleshooting information, including ROM replacement and WRITE/PROTECT switch location information.

Chapter 5, "Replacement Procedures," contains removal and replacement information for the major assemblies.

Chapter 6, "Replaceable Parts," contains the information needed to order mechanical parts and replacement assemblies for the module.

Chapter 7, "Major Assembly and Cable Locations," contains figures identifying all major assemblies and cables.

Safety Considerations

Before servicing this module, read the safety markings on the instrument and the safety instructions in the manual. Refer to the summary of safety information in the front of the manual.

The instrument is manufactured and tested to international safety standards. However, to prevent instrument damage and ensure your personal safety, all cautions and warnings must be heeded.

Serial-Number Label

Attached to the front frame of the module is a serial-number label. The serial number is in two parts. The first four digits and letter are the prefix; the last five digits are the suffix. The prefix changes only when a major change is made to the module. The suffix is assigned sequentially and is different for each module.

Module Options

The HP 70620B and HP 70621A modules both have the following module options available.

Option 098	This option adds the HP 70900A MEM+ Controller Board Upgrade Kit. This option is required if the existing system HP 70900A contains firmware version 860203 or earlier.
Option 099	This option adds the HP 70900A RAM/ROM upgrade kit. This option is required if the existing system HP 70900A contains firmware version 861015 or 870501. (Option 099 is not necessary if ordering Option 098.)
Option 910	This option adds another set of the manuals that normally ship with the module.
Option 915	This option adds the module service documentation and module verification software.

The following module option applies to the HP 70620B only.

Option 001	This option adds an RF amplifier assembly, two high/low band switch assemblies, and associated cables.

Firmware Compatibility

For the HP 70620B or HP 70621A to function properly in an HP 70000 Modular Measurement System, the HP 70900A local oscillator must have a firmware version of 900314 or later. A firmware-upgrade kit is included when either module option 098 or 099 is ordered. Refer to "Module Options" for more information.

Module Verification Software

The HP 70620B/HP 70621A Module Verification software documented in this manual is available through Hewlett- Packard Sales and Service Offices. The HP 70620B/HP 70621A Module Verification software contains the verification tests and adjustments used to service the HP 70620B and HP 70621A preamplifiers.

Directions for using the HP 70620B/HP 70621A Module Verification software are in Chapter 2. Adjustments and verification test information is in Chapter 3.

Service Kit

The HP 71000 System Service Kit (HP part number 71000-60002) is the general service kit for HP 70000 Modular Measurement System modules. This kit includes servicing tools, used to repair all HP 70000 Modular Measurement System modules, and a modification procedure for the HP 70001A Mainframe. The modification allows access to HP 70000 Modular Measurement System modules during bench testing and repair. Refer to the latest version of Service Note 70001A-1 for a full listing of the HP 71000 System Service Kit contents.

Recommended Test Equipment

Table 1-1 is a list of standard test equipment needed when testing or adjusting the HP 70620B or HP 70621A preamplifiers.

Only equipment listed in Table 1-1 may be used during the adjustments and verification tests. If equipment other than the recommended models is used, Hewlett-Packard will not be responsible for the accuracy of the tests or adjustments.

Table 1-1. Recommended Test Equipment

Equipment	Recommended Model or HP Part Number	Verif. Tests	Adj. Proc.
Power Sensor	HP 8485A	√	
Power Meter	HP 436A	√	
Microwave Source	HP 8340A or B	√	√
Noise Figure Meter	HP 8970B	√	
Microwave Network Analyzer	HP 8757A	√	√
Controller	HP 9000 Series 200/300	√	√
HP 70000 Series Mainframe*	HP 70001A	√	√
Precision DVM	HP 3456A	√	√
Local Oscillator	HP 70900B	√	√
Accessories			
Amplifier	HP 8449B	√	
6 dB Attenuator	HP 8493C, Option 006	√	√
10 dB Attenuator	HP 33340C, Option 010	√	√
Module Service Extender*	70001-60013		√
Excess Noise Source	HP 346C	√	
Mixer	0955-0307	√	
Power Splitter	HP 11667B	√	√
Directional Bridge	HP 85027B	√	
Detector *(2 required)*	HP 11664E	√	√
Calibrated Open/Short	85027-60004	√	
Adapters			
APC-3.5 (m) to APC-3.5 (m)	1250-1748	√	
Type N (m) to APC-3.5 (m)	1250-1743	√	√
Type N (m) to APC-3.5 (f)	1250-1744	√	
APC-3.5 (f) to APC-3.5 (m)	85027-60002	√	
Type N (m) to SMA (f)	1250-1250	√	
SMA (m) to SMA (m)	1250-1159	√	
APC-3.5 (f) to APC-3.5 (f) *(4 required)*	5061-5311	√	√
BNC (f) to dual banana plug	1251-2277	√	√
Cables			
BNC (m) to BNC (m)	HP 10503A	√	√
APC-3.5 (m) to APC-3.5 (m) *(3 required)*	8120-4921	√	√

*Either an extender module or a modified mainframe is required.
Refer to "Service Kit" in this chapter.

Returning Instruments for Service

The original shipping containers and materials, or the equivalent, must be used when repackaging the mainframe with modules, or modules alone. Packaging materials identical to the original factory packaging can be purchased through any Hewlett-Packard office (refer to Figure 1-1). However, if these shipping materials are not available, instruments can be repackaged for shipment using the information below.

Figure 1-1 shows the packaging materials. When ordering packaging materials to ship modules, it is necessary to order the proper number of foam inserts. No foam inserts are required for a 3/8-width module such as the HP 70205A Graphics Display. One foam insert is required for a 2/8-width module such as the HP 70900A Local Oscillator. Two foam inserts are required for a 1/8-width module such as the HP 70902A IF Section. (Note that the HP 70620B and HP 70621A Preamplifiers are 1/8-width modules.)

Caution	Instrument damage can result from using packaging materials other the original shipping materials or equivalent. Never use styrene pellets as packaging materials. They do not adequately cushion the instrument or prevent it from shifting in the carton. They cause instrument damage by generating static electricity.

Use the following procedure to prepare the instrument for shipment:

1. Fill out a blue repair card (located at the end of this chapter) and attach it to the instrument. Also send copies of any error messages and performance data recorded for the instrument. If a blue repair card is not available, send the following information with the returned instrument:

   a. Type of service required
   b. Description of the problem; state if the problem is constant or intermittent
   c. Name and phone number of technical contact person
   d. Return address
   e. Model number of returned instrument
   f. Full serial number of returned instrument
   g. List of any accessories returned with instrument

2. Pack the instrument in the original shipping materials (or the equivalent). However, if these are not available, instruments can be repackaged for shipment using the following instructions.

Caution	Inappropriate packaging of instruments may result in damage to the instruments during transit.

   a. Wrap the instrument in antistatic plastic to reduce the possibility of ESD-caused damage.
   b. For instruments that weigh less than 54 kg (120 lb), use a double-walled, corrugated cardboard carton of 159 kg (350 lb) test strength. The carton must be large enough and strong enough to accommodate the instrument. Allow at least 3 to 4 inches on all sides of the instrument for packing material.
   c. Surround the equipment with 3 to 4 inches of packing material to protect the instrument and prevent it from moving in the carton. If packing foam is not available,

the best alternative is S.D.-240 Air Cap^{TM} from Sealed Air Corporation (Commerce, California 90001). Air Cap is a plastic sheet filled with 1-1/4 inch air bubbles. Use the pink (antistatic) Air Cap to reduce static electricity. Wrapping the instrument several times in this material should both protect the instrument and prevent it from moving in the carton.

3. Seal the carton with strong nylon adhesive tape.

4. Mark the carton "FRAGILE, HANDLE WITH CARE."

5. Retain copies of all shipping papers.

(2 PLACES)
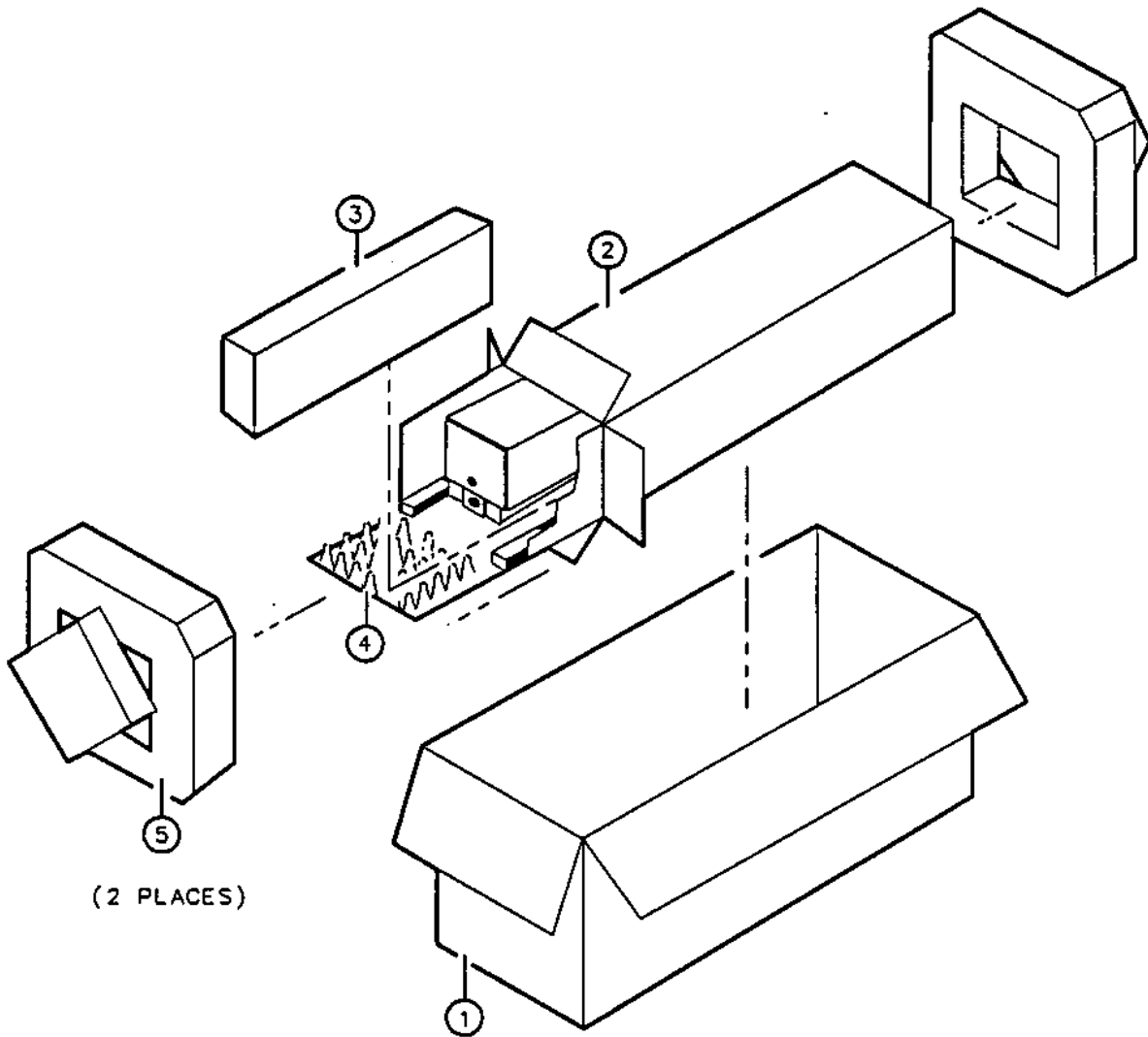
Item	Qty	HP Part Number	Description
1	1	9211-5118	Outer Carton
2	1	9211-5119	Inner Carton
3	1	5180-2369	Slider Carton
4		4208-0493	Foam Insert
			(see text for quantity)
5	2	5180-2370	Foam Pads

Figure 1-1. Packaging Materials for Modules

Electrostatic Discharge Information

Electrostatic discharge (ESD) can damage or destroy electronic components. Therefore, all work performed on assemblies consisting of electronic components should be done at a static-safe work station.

Figure 1-2 shows an example of a static-safe work station. Two types of ESD protection are shown: (a) conductive table mat and wrist strap combination, and (b) conductive floor mat and heel strap combination. The two types *must* be used together to ensure adequate ESD protection. Refer to Table 1-2 for a list of static-safe accessories and their part numbers.
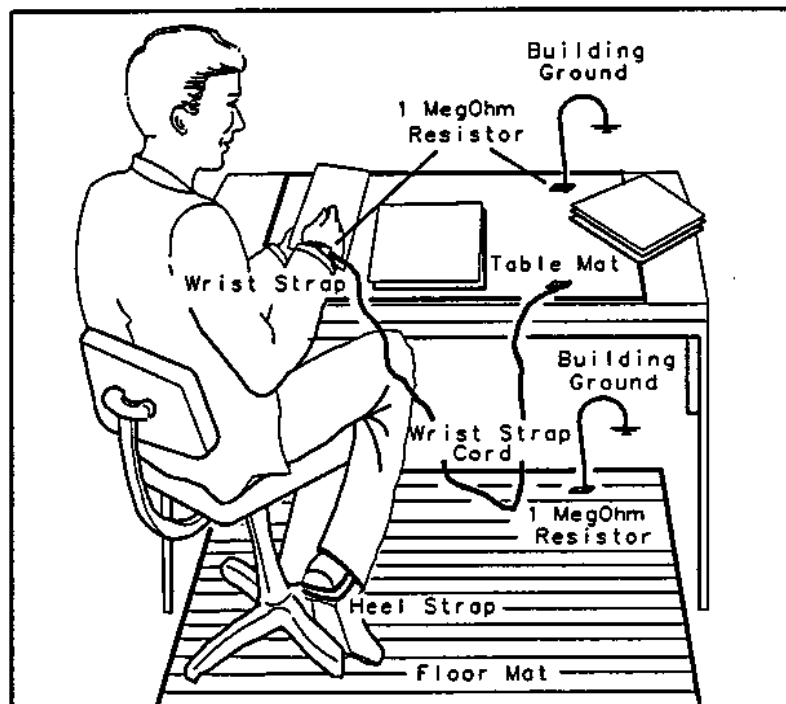
Figure 1-2. Static-Safe Work Station

Reducing ESD Damage

Below are suggestions that may help reduce the amount of ESD damage that occurs during testing and servicing instruments.

PC Board Assemblies and Electronic Components

■ Handle these items at a static-safe work station.

■ Store or transport these items in static-shielding containers.

Caution

Do not use erasers to clean the edge connector contacts. Erasers generate static electricity and degrade the electrical quality of the contacts by removing the thin gold plating.

Do not use paper of any kind to clean the edge-connector contacts. Paper or lint particles left on the contact surface can cause intermittent electrical connections.

Do not touch the edge-connector contacts or trace surfaces with bare hands. Always handle board assemblies by the edges.

PC board assembly edge-connector contacts may be cleaned by using a lint-free cloth with a solution of 80% electronics-grade isopropyl alcohol and 20% deionized water. This procedure should be performed at a static-safe work station.

Test Equipment

- Before connecting any coaxial cable to an instrument connector for the first time each day, *momentarily* short the center and outer conductors of the cable together.

- Personnel should be grounded with a resistor-isolated wrist strap before touching the center pin of any connector and before removing any assembly from the instrument.

- Be sure that all instruments are properly earth-grounded to prevent buildup of static charge.

Static-Safe Accessories

Table 1-2. Static-Safe Accessories

Accessory	Description	HP Part Number
Static-control mat and ground wire	Set includes: 3M static-control mat, 0.6m × 1.2m (2 ft × 4 ft) ground wire, 4.6m (15 ft) (The wrist strap and wrist-strap cord are *not* included. They must be ordered separately.)	9300-0797
Wrist-strap cord	1.5m (5 ft)	9300-0980
Wrist strap	Black, stainless steel with four adjustable links and 7-mm post-type connector (The wrist- strap cord is *not* included.)	9300-1383
ESD heel strap	Reusable 6 to 12 months	9300-1169
Hard-surface static-control mat*	Large, black, 1.2m × 1.5m (4 ft × 5 ft)	92175A
	Small, black, 0.9m × 1.2m (3 ft × 4 ft)	92175C
Soft-surface static-control mat*	Brown, 1.2m × 2.4m (4 ft × 8 ft)	92175B
Tabletop static-control mat*	58 cm × 76 cm (23 in. × 30 in.)	92175T
Antistatic carpet*	Small, 1.2m × 1.8m (4 ft × 6 ft) natural color russet color Large, 1.2m × 2.4m (4 ft × 8 ft) natural color russet color	 92176A 92176C 92176B 92176D

*These accessories can be ordered either through a Hewlett-Packard Sales Office or through HP DIRECT Phone Order Service. In the USA, the HP DIRECT phone number is (800) 538-8787. Contact your nearest Hewlett-Packard Sales Office for more information about HP DIRECT availability in other countries.

Sales and Service Offices

Hewlett-Packard has sales and service offices around the world providing complete support for Hewlett-Packard products. To obtain servicing information, or to order replacement parts, contact the nearest Hewlett-Packard Sales and Service Office listed in Table 1-3.

In any correspondence, be sure to include the pertinent information about model numbers, serial numbers, and assembly part numbers.

Note	Within the USA, a toll-free phone number is available for ordering replacement parts. Refer to "Ordering Information" in Chapter 6 for the phone number and more information.

Table 1-3. Hewlett-Packard Spectrum Analyzer Sales and Service Offices

US FIELD OPERATIONS HEADQUARTERS
Hewlett-Packard Company
19320 Pruneridge Avenue
Cupertino, CA 95014, USA
(408) 973-1919

California
Hewlett-Packard Co.
1421 South Manhattan Ave.
Fullerton, CA 92631
(714) 999-6700

Hewlett-Packard Co.
301 E. Evelyn
Mountain View, CA 94041
(415) 694-2000

Colorado
Hewlett-Packard Co.
24 Inverness Place, East
Englewood, CO 80112
(303) 649-5000

Georgia
Hewlett-Packard Co.
2000 South Park Place
Atlanta, GA 30339
(404) 955-1500

Illinois
Hewlett-Packard Co.
5201 Tollview Drive
Rolling Meadows, IL 60008
(708) 255-9800

New Jersey
Hewlett-Packard Co.
120 W. Century Road
Paramus, NJ 07653
(201) 599-5000

Texas
Hewlett-Packard Co.
930 E. Campbell Rd.
Richardson, TX 75081
(214) 231-6101

EUROPEAN OPERATION HEADQUARTERS
Hewlett-Packard S.A.
150, Route du Nant-d'Avril
1217 Meyrin 2/Geneva
Switzerland
(41 22) 780.8111

France
Hewlett-Packard France
1 Avenue Du Canada
Zone D'Activite De Courtaboeuf
F-91947 Les Ulis Cedex
France
(33 1) 69 82 60 60

Germany
Hewlett-Packard GmbH
Berner Strasse 117
6000 Frankfurt 56
West Germany
(49 69) 500006-0

Great Britain
Hewlett-Packard Ltd.
Eskdale Road, Winnersh Triangle
Wokingham, Berkshire RG11 5DZ
England
(44 734) 696622

INTERCON OPERATIONS HEADQUARTERS
Hewlett-Packard Company
3495 Deer Creek Rd.
Palo Alto, California 94304-1316
(415) 857-5027

Australia
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
(61 3) 895-2895

Canada
Hewlett-Packard (Canada) Ltd.
17500 South Service Road
Trans-Canada Highway
Kirkland, Quebec H9J 2X8
Canada
(514) 697-4232

Japan
Yokogawa-Hewlett-Packard Ltd.
1-27-15 Yabe, Sagamihara
Kanagawa 229, Japan
(81 427) 59-1311

People's Republic of China
China Hewlett-Packard, Ltd.
38 Bei San Huan X1 Road
Shuang Yu Shu
Hai Dian District
Beijing, China
(86 1) 256-6888

Singapore
Hewlett-Packard Singapore
Pte. Ltd.
1150 Depot Road
Singapore 0410
(65) 273 7388

Taiwan
Hewlett-Packard Taiwan
8th Floor, H-P Building
337 Fu Hsing North Road
Taipei, Taiwan
(886 2) 712-0404

Verification Software

Introduction

Verification Software is the program designed to automate the module's verification tests and adjustment procedures. Included in this chapter is a step-by-step procedure to load the software and get the verification tests or adjustment procedures underway. For more detailed information, refer to the sections regarding individual menus. Listed below are the major divisions of this chapter.

General Information

This documentation supports Module Verification Software, Revision B.00.00 or greater. Use this software with slave modules that have an HP 70900 local oscillator as a master. A softkey-driven menu and user-interface screens control the software. The disks included with this module provide programs that test whether the module meets its characteristics for system operation.

The *Installation and Verification Manual* for the HP 70900 local oscillator contains configuration information for predefined models of HP 70000 Modular Spectrum Analyzers. The software automatically reads your system configuration data from the HP-MSIB (Hewlett-Packard Modular System Interface Bus) to determine which system or modules you are using.

Refer to "Verification Tests" in Chapter 3 and "Adjustment Procedures" in Chapter 4 for individual test setups and test descriptions. Chapter 1 contains a list of recommended test equipment.

Computer Compatibility

Module Verification Software is written in HP 9000 Series BASIC 5.0 and can run on the following HP 9000 Series 200/300 computers. Minimum RAM requirement is 2.5 megabytes.

HP 9816	HP 9920 (with HP 35721A Monitor)
HP 9836	HP 9000 Series 300 computer

When using an HP 9000 Series 300 computer, a medium-resolution monitor and either an HP 98203C or an HP 46020A keyboard are required. A high-resolution monitor will preclude printing graphical test results. Due to the various keyboards supported, some minor text differences appear in the menus and softkeys displayed on-screen. Refer to "Alternate Key Labels," below.

Computer Language Compatibility

The software program runs on HP BASIC 5.0, or later, with the BIN files in RAM that are listed below. A procedure for loading HP BASIC is provided in "Installing Verification Software" later in this chapter.

CLOCK	ERR	HPIB	MAT
CS80*	GRAPH	IO	MS
DISK†	GRAPHX	KBD	PDEV‡

*Optional – supports Winchester disk drives.
†Optional – supports microfloppies and older Winchester disk drives.
‡Optional – provides debugging features for program development.

In an SRM (shared resource management) environment, the following BIN files are also required:

DCOMM

SRM

Note	If you have set up some RAM memory for specific usage, be aware that this program uses RAM memory Volume ":MEMORY, 0, 15". Move any information stored at this Volume to another location before running the Verification Software program.

Printer Compatibility

Module Verification Software supports any HP-IB printer; however, many of the printed test results require a graphics printer. Graphical test results are not output to a non-graphics printer.

Alternate Key Labels

For simplicity in this document, we assume that you are using an HP 9000 Series 200 keyboard. Refer to the list below if your keyboard key labels do not match the ones used in text.

Keyboard Key Labels   **Alternate Key Labels**

(EXECUTE) .... (RETURN)

(ENTER) .... (RETURN)

(RUN) .... press (SYSTEM), then RUN

(CONTINUE) .... press (SYSTEM), then CONTINUE

Configuring the Hardware

Procedure

1. Connect the HP 70000 Modular Spectrum Analyzer to the computer port determined by the following criteria:

   a. For computers with an HP 98624A HP-IB Interface, connect your analyzer to the port labeled HP-IB SELECT CODE 8. Check that the address switch on the HP 98624A HP-IB Interface board assembly matches the HP-IB controller device address. If needed, refer to the *HP 9000 Series 200/300 Peripheral Installation Guide, Volume 1*.

   b. For computers without an HP 98624A HP-IB Interface, connect the HP 70000 Modular Spectrum Analyzer to the port labeled HP-IB SELECT CODE 7.

2. Connect the HP-IB cables from the test equipment to the computer's HP-IB SELECT CODE 7 port.

3. Use a 0.5 meter HP-IB cable (HP 10833D, or similar cable) to connect the external disk drive's HP-IB to the HP-IB SELECT CODE 7 port.

Note   Occasionally disk drives exhibit unpredictable behavior when sharing the HP-IB with instruments. If you find this occurring, connect the disk drive to a separate HP-IB interface.

---

4. Set the external test equipment and the HP 70000 Modular Spectrum Analyzer line switches to ON. Allow the equipment to warm up as specified for the verification tests or adjustment procedures.

5. Turn the disk drive (if used) and computer ON.

Installing Verification Software

Use the following steps to get the program loaded and running. Later sections of this chapter contain more specific program-operation information.

Two assumptions are made with the Module Verification Software. One is that you are using standard HP-IB addresses for the active devices of the microwave test station. The second is that all passive devices for the microwave test station are available. If either of these assumptions is inaccurate, you are prompted for data during program execution.

Software Version

View the version number of the software program after loading the first program disk. Look in the right-hand side of the initial display. Specific numbers vary, but the version number looks like this: Rev. B.00.00

Locate the program part number printed on the disk labels.

Procedure

1. Load BASIC 5.0 or later, with the appropriate binaries, into an HP 9000 Series 200/300 Computer. If necessary, refer to an HP BASIC reference manual.

Caution

Make backup copies of all write-protected disks. If the program data on an individual disk should become altered, it cannot be ordered separately. The entire set of disks must be ordered to replace any one. Before making backup copies of the write-protected disks, ensure that the backup disks have been initialized as follows:

INITIALIZE ":,700,0",2,3

Note that Format Option 3 must be used; however, the MSVS and Interleave Factor are specific to your system.

---

2. Assign the MSI (mass storage is) to the drive you will use as the default drive. As an example, assigning the MSI to a disk drive looks like this: MSI ":,700,0"

3. Insert the Executive Disk into the assigned default drive. Type the following command line: LOAD "MOD_VERF",1

4. Press (EXECUTE). The software version number appears in the screen that is next displayed.

5. If the date and time prompt appears, enter the date and time in the specified format. (This message appears only if date and time are not current.)

6. If you are using your module's software for the first time, or have not previously stored the mass storage data file, a message appears stating that mass storage data is needed. Press PROCEED and follow the on-screen prompts to use the default mass storage. Once the mass storage data file is stored, this message will not reappear.

7. An error message may be displayed at this point. If the DUT (device under test) does not match the module listed in the HP-MSIB Address Map, or if the software you are using belongs to another module of your system, refer to "Error Messages" at the end of this chapter to determine a course of action.

8. Load the Operating Disk as directed. The Operating Disk probably needs to remain in the drive specified as the MSI default drive. Load the Driver Disk into the drive specified on-screen.

9. Load the Driver Disk and press PROCEED. This process may require up to three minutes.

10. If you have not entered serial numbers for passive devices that require calibration data for test purposes, on-screen prompts request the data now. Enter the data via the Calibration Data screen. Press CREATE to access this screen. For a detailed explanation of entering calibration data, refer to "Edit Calibration Data" under "Menus" in this chapter. Enter the serial number for each device specified, or bypass the device to continue if it is not used now. After entering and storing data for passive devices, this prompt screen will not reappear.

Note	In the future, you can access calibration data stored on Operating Disks, rather than enter the data for passive devices of a given serial number each time you begin testing. The program displays any additional passive devices requiring serial numbers and calibration data. Serial numbers are only required for passive devices that need their calibration data stored on the Operating Disk. You are prompted to enter serial numbers for these devices only.

11. You may perform any of the items listed below after satisfying the above conditions:

- Select ▒FINAL TEST▒ to perform procedures for which the required test equipment is present, automatically.

- Press ▒equipment menu▒ and return to the Equipment Menu. From here you can modify the status of the equipment in the menu (make it unavailable, readdress it, change the private bus, etc.). Refer to "Equipment Menu" under "Menus" in this chapter.

- Press ▒test menu▒ to choose between verification tests or adjustment procedures.

Note	The softkey used to access the adjustment procedure menu is present only if automated adjustment procedures exist for the module.

If you have already entered either the verification test or adjustment menus, the screen allowing you to choose one or the other does not reappear. To retrieve the Test or Adjust selection screen, select ▒main menu▒ from the Test Menu softkeys. In the Main Menu, press ▒RESTART▒. Be aware that pressing ▒RESTART▒ purges status information for any tests you have already run. You determine individual tests or individual adjustments to perform via the menu you select.

- Press ▒MAIN MENU▒ to customize your test process via any other menu.

Module Verification Software Overview

Testing Multiple Modules

Verification Software tests only one module at a time. If you have more than one module to test in your system, test them separately. If you have tested a module and want to change the module being tested without turning off the controller, follow the steps below.

1. Get to the Main Menu, then press ▓equipment menu▓.

2. In the Equipment Menu edit screen, move the item indicator to the Device Model number column next to the Module Under Test.

3. Press ▓SELECT▓, modify the model number, and press (ENTER).

4. Press ▓DONE▓, then ▓main menu▓.

5. From the Main Menu, press ▓test menu▓. If ERROR MESSAGE: Selected instrument under test is _____; but the software supports the _____ module appears, press either ▓RELOAD▓ and follow the on-screen prompts to load test software, or ▓CHANGE DUT▓ to gain access to the Equipment Menu or HP-MSIB Address Menu. From the Equipment Menu, you can select the module under test's model number and modify it to the module number of the software now loaded. From the HP-MSIB Address Menu, select the module to test that matches the software you already have loaded. Otherwise, press ▓ABORT▓.

Error Messages or Warnings Defined

There are three kinds of error messages or warnings generated by the program.

- One appears briefly at the bottom of the CRT display. The program then goes automatically to a menu that asks you for corrections or modifications.

- Another type of error message begins with ERROR MESSAGE and provides special softkeys. These errors are user-correctable and anticipated by the program. There is usually a Possible Fix message displayed to help you clear the problem.

- The final type begins with ERROR and provides no special softkeys. The message informs you of an unanticipated error. There is no suggested fix displayed. If you cannot recover from one of these errors, please contact your Hewlett-Packard Sales and Service Office.

Final Tests Defined

Tests defined as Final Tests are a subset of all available verification tests for a given module. After *any* module-level adjustment or repair, run Final Tests. Once a module has passed the Final Tests, install it into any mainframe and expect performance within its specified characteristics. Perform tests classified as Additional Tests after troubleshooting or adjustments to be sure of the proper operation of specific assemblies. The ▓FINAL TEST▓ softkey has no defined purpose while performing adjustments.

Single Tests Defined

You may select individual tests with this program. Refer to "Test Menu" under "Menus" in this chapter for a description of selecting individual tests. As explained in "Final Tests," specific assembly performance is checked by running assembly-associated performance tests. Refer to Chapter 5, "Troubleshooting," for a cross-reference of tests to perform versus assembly adjusted, repaired, or changed.

Printing Test Results

The program shows whether each procedure passed or failed. You may configure the computer operations to format and print test results via the Parameter Menu. If an HP-IB printer is on the bus and an address is provided in the Equipment Menu, and you configured the Parameter Menu to print test results, the program automatically prints the test results. The printout includes a title and summary page.

The title page lists the following data:

- Module software used and the test date.

- Serial number of the module tested.

- Firmware version of the module tested.

- Power line frequency.

- Test person's identification.

- Test equipment model numbers and names, addresses, and ID or serial number.

The Summary Page lists total test time beside the titles of tests performed. The Summary Page also includes test results beneath one of the following categories:

- Not all Final Tests have been completed ... etc.

- The following Final Tests need to be completed:

- The following tests showed insufficient performance:

- The following tests met the appropriate requirements:

- The following additional tests were not completed:

Menus

Menu Structure

The first menu presented allows you to go to the Main Menu, to begin Final Tests, or to return to the Equipment Menu. From the Main Menu, access any of the following menus:

Except for the Test Menu, these menus are configuration menus through which you initialize the software for program operation. Via these menus, you enter information about disk drives, environment conditions, test equipment, the module under test, etc. Refer to the information following the menu name in this chapter for details.

In the Test Menu, you select and execute module-related procedures. The Test Menu provides some testing options. Refer to "Test Menu" in this chapter for details.

The Mass Storage Menu, the Parameter Menu, and the Equipment Menu have two menu screens. One is the edit screen, the other is the command screen. (The previously mentioned menus use only the command screen.)

- In edit screens, you can edit displayed data or input data to the screen.

- In command screens, you may perform various menu-specific functions, which include storing edited data, selecting test mode, accessing the help screen, accessing the Main Menu, etc.

Edit and Command Screen Menus

The following softkeys are present for menus that appear in Figures 2-1 through 2-4. Not all of the menus have edit screens, but all have command screens. When softkey labels are written in lowercase letters, a sub-level softkey menu exists for that particular softkey. Softkey labels written in uppercase letters indicate there no further sub-level softkey menus exist for that softkey.

Edit Screen Menus

The following softkeys are present for edit menus that appear in Figures 2-1 through 2-4.

SELECT OR SELECT/TOGGLE — either one of these keys appears in the Edit Menu. SELECT activates the column item where the cursor is located, while SELECT/TOGGLE activates predefined choices in the menu.

DONE — exits the edit screen, then displays the menu's command screen.

Command Screen Menus

The following softkeys are present for the command menus pictured in Figures 2-1 through 2-4. An additional softkey, ▓edit cal data▓, appears only in the Equipment Menu command screen. Refer to "Equipment Menu Command Screen" for information about this softkey.

▓main menu▓   returns you to the "Main Menu." Refer to "Main Menu" in this chapter for details.

▓EDIT▓   appears if there is an edit screen in the menu you are working in. Pressing this key returns you to the menu's edit screen.

▓STORE▓   appears if you have data that needs to be stored on the OPERATING VOLUME. The HP-MSIB Address Menu does not require this softkey, therefore it does not appear in that command menu.

      ▓CREATE▓   appears if you tried to store data without an existing file available. ▓CREATE▓ activates the store function and creates a file on the OPERATING VOLUME.

      ▓REPEAT▓   appears if the correct Operating Disk containing calibration data is not in the disk drive. This key allows you to insert the Operating Disk into the disk drive and try again.

      ▓ABORT▓   displays the Main Menu screen. ▓ABORT▓ is available in various special task screens but never in a menu screen. In general, pressing this key a time or two will display the Main Menu, which has a ▓quit▓ softkey.

                      If the Main Menu has not appeared for the first time, pressing ▓ABORT▓ produces a message asking you to press (RUN), which returns you to where you were when you pressed ▓ABORT▓.

▓HELP▓   accesses menu and softkey descriptions. Listed below are softkey selections and functions available via this softkey.

      ▓NEXT PAGE▓   takes you to the top of the next available menu page.

      ▓PREVIOUS PAGE▓   returns you to the top of the preceding menu page.

      ▓PRINT HELP▓   generates a printout of help-screen information.

      ▓DONE▓   returns you to the command or edit screen of the menu you were previously in.

▓quit▓   displays the quit screen. This softkey is available only from menu command screens. After you press ▓quit▓, you are asked if you really want to return to BASIC operating system. The following two softkey selections are available via the ▓quit▓ softkey.

      ▓YES▓   stops the program, retains any data files you stored before pressing ▓quit▓, and returns you to BASIC operating system. (You can press (RUN) to restart the program and return to the Main Menu. The program retains all previously entered and stored data.)

NO displays the edit screen of the previous menu, or the command screen if there is no edit screen.

Cursor Keys and Menu Selections

When a cursor is present, use either the cursor arrow-keys or the RPG (rotary pulse generator) knob to position the cursor at the column item you wish to edit.

Note	In most cases, there are more selections available than are displayed on-screen. Be sure to move the cursor to the right and down as far as you can. NEXT PAGE and PREVIOUS PAGE keys are provided to speed your vertical searches.

Main Menu

From the Main Menu screen you can access all other menus. There is no edit screen for this menu. Figure 2-1 illustrates the Main Menu softkey organization.

Main Menu Softkeys

Aside from the common softkeys, there are two special softkeys presented in the Main Menu. One is FINAL TESTS, which begins the final test sequence for a module. The second is the RESTART softkey. Press RESTART to reconfigure the program and retest a module, or to test a different module. Pressing this key affects the test status column of both the Test Menu edit screen and HP-MSIB address screen. The remaining Main Menu softkeys include mass storage, parameter menu, and equipment menu. Each of these menus is explained in detail in their sections of this chapter.

If you have stored calibration data on another HP 70000 Software Product Operating Disk, replace your current Operating Disk with that one and access the data. Be sure to return the Operating Disk belonging with your module under test to the default drive.

Mass Storage Menu

The BASIC operating system can use a number of mass storage devices. These include internal disk drives, external disk drives, and SRM systems. You are prompted to assign the areas where the program stores system and operation data. You do this by assigning Volume Labels to an msus (mass storage unit specifier). An msus is a string expression that points to a mass storage location. A mass storage Volume is composed of one or more files. Files are data items or subprograms. A Volume might consist entirely of files on a floppy disk, or some number of files on a small portion of a hard disk. The Mass Storage Menu lists Volume Labels that show the location of certain types of program information. These Volume Labels are explained below.

- DATA is where the test results are temporarily stored.

- ERROR LOG is where unanticipated errors are recorded for possible future use.

- OPERATING is where all the program data is stored.

The program retrieves specific information from the following Volume Labels:

- SYSTEM contains the Test Disk 1 program code. There must be an msus assigned to this Volume Label.

- OPERATING contains the menu configuration files and calibration data.

- DRIVER DISK contains the driver instrument control program code. There must be an msus assigned to this Volume Label.

- TEST DISK contains the module performance tests programs.

- ADJUST DISK contains the module adjustment procedures. Note that ADJUST DISK is present only if automated adjustment procedures exist for the module.

Volume Labels each have a default msus. From the Mass Storage Menu, you can reassign the current msus or directory path designation to another designation. You cannot edit Volume Labels, but you may edit their msus designations and directory path data fields.

Mass Storage Menu Edit Screen

The Mass Storage Menu softkeys and their functions are described below.

SELECT   activates the column item where the cursor is located.

DONE   exits the edit screen, then displays the Mass Storage Menu command screen.

1. Use either the keyboard arrow keys or the RPG knob to position the cursor next to the column item you wish to edit. The annotations <=more and more=> indicate that you must scroll the screen left or right to view off-screen column items.

2. Press SELECT. Key in the new location (msus or Directory Path). Press (ENTER) when data entry for the selected item is complete.

Note   Leave the Directory Path field blank unless you are using an SRM system, or HP BASIC 5.0 (or later version) that uses directory path hierarchy.

---

3. Repeat steps 1 and 2 until you have finished editing. Press DONE to display the Mass Storage Menu command screen.

The Data Volume is predefined to use RAM DISK ":MEMORY,0,0". If this RAM disk is not initialized to at least 1040 records, or contains additional files not required by module verification, BASIC error 64 may occur. Either reinitialize the RAM disk or use the Mass Storage Menu edit screen to select another medium.

Mass Storage Menu Command Screen

From the command screen, you can press STORE to save the edited data. Saving Mass Storage Menu data for the first time causes an error message prompting you to create a file. Do this simply by pressing CREATE.

Next, press ▓▓▓▓▓▓ to return to the Main Menu screen, or press ▓▓▓▓ and return to the Mass Storage Menu edit screen.

Parameter Menu

You may determine some operating conditions of the software program in the Parameter Menu. You can select the printer and its output parameters, decide whether you want the program beep feature on or off, include a message on the test-results output, etc. Use the ▓▓▓▓▓▓▓▓ softkey to select the parameter item and enter data, or toggle to a predefined state. The parameter items and their appropriate selections are defined below.

Parameter Menu Edit Screen

Results sent to:
> Your choices are Screen or Printer. Press ▓▓▓▓▓▓▓▓. When Screen is displayed, the test results appear on the CRT. When Printer is displayed, test results are displayed on-screen and printed out.

Output Format:
> Your choices are Graph or Table. Press ▓▓▓▓▓▓▓▓. When Graph is displayed, test results are generated in a graph format if appropriate for the particular test results (a graphics printer is required if Printer and Graph are both selected). When Table is displayed, the test results are output in a table format.

Printer Lines:
> Lines allowed are from 50 to 70. Press ▓▓▓▓▓▓▓▓. Enter a number from 50 to 70 to set the number of lines per printed page.

Line Frequency:
> Valid frequency selections are 50, 60, and 400 Hz. Press ▓▓▓▓▓▓▓▓ until the power line frequency for your system is displayed. The line frequency value affects some test results.

Beeper to be activated:
> Your choices are Yes or No. Press ▓▓▓▓▓▓▓▓. When Yes is displayed, the warning and time-lapse reminder beeps are activated. When No is displayed, the program's beep feature is disabled.

Verify equipment on HP-IB:
> Your choices are Yes or No. Press ▓▓▓▓▓▓▓▓ to indicate your choice. Yes causes the program to verify the presence of each instrument on HP-IB at the address shown in the Equipment Menu. Select No to bypass this feature.

Test person's ID:
> Press ▓▓▓▓▓▓▓▓, then enter your name or ID number to include it on the output report.

Number lines added:
> Lets you include a printed message with the test results. Depending on the program, you can enter up to 30 lines, with no more than 30 characters per line. Enter the message you wish to have printed in this screen by selecting User Line.

User Line:
> 1. Position the cursor to the left-hand side of a User Line in the menu. Press ▓▓▓▓▓▓▓▓.

2. The prompt, **Enter additional information**, appears. Type in your message (up to 30 characters per line), then press (ENTER).

3. After you have entered your message, reposition the cursor at **Number lines added:**. Enter the number of user lines your message occupies, then press (ENTER).

Parameter Menu Command Screen

Press **DONE** when you are finished with the Parameter Menu edit screen. The next screen displayed is the command screen. Press **STORE** to save any edited Parameter Menu data, **EDIT** to return to the edit screen, or **main menu** to return to the Main Menu screen.

Saving Parameter Menu data for the first time causes an error message. The message prompts you to create a file. Do this simply by pressing **CREATE**.

Equipment Menu

The Equipment Menu edit screen displays a list of all the equipment required to test your DUT completely. Next to each DEVICE TYPE in the equipment list is a column labeled DEVICE MODEL for the model number, ADDRESS for the HP-IB address, SERIAL or ID NO. (for example, calibration lab number), and PRIVATE BUS for private bus designation (as for HP 8757A Network Analyzers, etc.).

Chapter 1 contains a table of required test equipment. Using preferred models of test equipment assures the most complete verification and adjustment testing. Refer to "Verification Tests" in Chapter 3 and "Adjustment Procedures" in Chapter 4 for individual test descriptions and test setups.

Equipment Menu Edit Screen

From the Equipment Menu edit screen you can enter data about your test equipment. You cannot edit the DEVICE TYPE column.

You may use either the cursor arrow keys or the RPG knob to position the cursor at the column item you wish to edit.

1. Edit a DEVICE MODEL item by locating the cursor beside the model number you wish to edit. Press **SELECT**, type the model number, then press (ENTER).

2. Edit an ADDRESS by locating the cursor beside the address you want to edit. Press **SELECT**, edit the address, then press (ENTER).

   If the DEVICE MODEL has no address in the ADDRESS column, **Missing ETE** is included in the Status column next to the tests that required the device. Tests tagged with **Missing ETE** are not performed.

   Valid active device addresses are restricted to the following ranges:

   - 700 to 730 and 800 to 830 for an HP 70000 Modular Spectrum Analyzer master module.

   - 700 to 730 for any other device type.

These three-digit HP-IB address include the HP-IB select code and the actual HP-IB address. For example, an HP 70000 Modular Spectrum Analyzer HP-IB select code of 8 and an HP-IB address of 21 yields an address of 821. The addresses of DUTs that function as slaves should match their master device's address.

Address passive devices (non-programmable devices such as sensors, directional bridges, and detectors) as either Available or Not Available. For some of the passive devices, entering Available in the address column requires entering calibration data and a serial number for the device. The calibration data for a passive device is stored on Operating Disks.

Passive devices tagged Not Available in the address column cause Missing ETE to be printed next to the test names on the test results that are output for any procedure that required the missing device. Tests tagged with Missing ETE are not performed.

3. Edit a SERIAL NUMBER by locating the cursor beside the serial number. Press SELECT, enter the new serial number (10 digits or less), then press (ENTER). Some passive devices that have Available displayed in the address column must also have a serial-number entry.

4. Enter 19 in the PRIVATE BUS column if you are to use a Microwave or Full Microwave source with a network analyzer. Configure these instruments by connecting the source's HP-IB cable to the network analyzer's SYSTEM INTERFACE connection.

   a. Move the cursor through the DEVICE TYPE column until you reach the Full Microwave or Microwave source, then move horizontally to the PRIVATE BUS column.

   b. Enter 19 and press (ENTER). The program enters the ADDRESS column data for the selected source when 19 appears in the PRIVATE BUS column. Nineteen is the only allowable address for sources on a private bus. Refer to the network analyzer's manual for addressing information.

Module Verification Equipment Menu Example. After proceeding to the Equipment Menu Edit Screen your computer display should resemble Table 2-1. If the Device Type includes a Full Microwave Source and you connect it to a Microwave Network Analyzer the following example will apply. Table 2-1 provides an example of how the Module Verification Equipment Menu should be set up. This example shows the proper address arrangement for the Full Microwave Source connected to the Microwave Network Analyzer System Interface Bus.

Table 2-1. Equipment Menu Edit Screen Example

Device Type	Device Model	Address	Serial or ID Number	PRIVATE BUS
Module Under Test	HP70904A	718		
Printer	Graphics	701		
Full Microwave Source	HP8340A	717*		719
Microwave Source	HP8340A	729		
Local Oscillator Source	HP70900A	718		
Cal'd Spec. Analyzer	HP8566B	728		
Microwave Net. Analyzer	HP8757A	716		

*This entry is explained in item 4 below.

1. The HP 8757A (internal) SWEEPER address and the HP 8340A HP-IB address must be the same. To determine the address to which the HP 8757A (internal) SWEEPER address is set, press (LOCAL), then SWEEPER. For the example above this should be 19. To determine the address to which the HP 8340A is set to, press (SHIFT), then (LOCAL). For the example above this should also be 19. The HP 8757A (internal) SWEEPER address must be set to the same address as the HP 8340A that is connected to the HP 8757A System Interface Bus.

2. The HP-IB address of the HP 8340A that is on the HP 8757A System Interface Bus must be entered in the PRIVATE BUS column adjacent to the Full Microwave Source HP 8340A in the Equipment Menu of the Module Verification Software. If this entry is not made, the Flatness Calibration and Return Loss tests will not work.

3. The Full Microwave Source HP 8340A HP-IB address 719 was set using the front panel of the instrument. Since the Full Microwave Source HP 8340A is on the pass-through of the HP 8757A, the actual address of the Full Microwave Source HP 8340A will be changed internal to the HP 8757A. The controller sees the HP 8340A that is on the HP 8757A System Interface Bus as the HP 8757A address + 1 (if even), or the HP 8757A address −1 (if odd).

4. It is not necessary to make an entry in the Address column adjacent to the Full Microwave Source HP 8340A when the HP 8340A is connected to the HP 8757A System Interface Bus. The software will generate and enter this address. In the example, the Full Microwave Source HP 8340A address 717 was derived this way.

Note 👆 If only one HP 8340A is used for both the Full Microwave Source and the Microwave Source, and the HP 8340A is connected to the HP 8757A System Interface Bus, then the Microwave Source HP 8340A would be addressed the same way as the Full Microwave Source HP 8340A described above.

Equipment Menu Command Screen

After you have finished editing the Equipment Menu, press ░DONE░ to enter the Equipment Menu command screen. Press ░STORE░ to save the edited data.

Saving Equipment Menu data for the first time generates an error message prompting you to create a file. Do this simply by pressing ░CREATE░.

This command screen displays the following additional softkeys:

░edit cal data░   displays the Select Passive Device screen. From this screen, move the cursor to the passive device that needs its calibration data edited. Press ░SELECT░, then enter the required data. Refer to "Edit Calibration Data" in this chapter for more information.

░NO ADDRESS░   appears only if the program cannot find an instrument at a specified HP-IB address. To check which instruments are not responding, follow the steps below.

1. Access the Equipment Menu edit screen.

2. Scroll the ADDRESS column for flashing addresses, then be sure that the instrument is on.

3. ░SELECT░ the flashing address and either correct the address or press ░NO ADDRESS░ to delete all fault-addresses from the edit menu.

Note   Either exiting the Equipment Menu or entering the Test Menu causes the program to search the addresses in the Equipment Menu for instruments assigned to HP-IB, if this feature is selected in the Parameter Menu.

---

4. Press ░main menu░ to return to the Main Menu, or ░edit cal data░ to enter calibration data for passive devices. Pressing ░edit cal data░ displays the Select Passive Device screen. Refer to the following section for more information.

Edit Calibration Data

The Select Passive Device screen displays all passive devices needing calibration data entered. Press ░edit cal data░ to enter the Select Passive Device screen. The program requires calibration data for some of the passive devices listed in the Equipment Menu edit screen.

Note	Selecting a passive device needing a serial number generates a prompt requesting that you enter the number via the Equipment Menu. If you have formerly entered calibration data for a passive device of a given serial number and you would rather not reenter the data, replace your current Operating Disk with one containing data for passive devices from previous testing. Press REPEAT to access the calibration data from that disk. If you only need to enter the passive device's calibration data, press CREATE to enter the Edit Calibration Data screen, then begin at step 4.

1. Locate the cursor beside the device and press SELECT. The next screen displayed allows you to delete or edit data related to the passive device.

Note	Not all frequencies are listed on the screen at once. Be sure to enter calibration data for frequencies listed on the next pages of the display.

2. If you edit the factory default FREQUENCY or CAL FACTORS values, enter valid calibration factors for each frequency edited.

Note	For power sensors, you must enter a frequency and calibration factor for 10 MHz and 300 MHz, even if the device has no factor listed at 10 MHz or 300 MHz. Enter the values from the list of valid factors, below. Other frequencies outside the normal range of the device may also be required. Prior to using your device, you may need to calibrate it at these frequencies to ensure accurate measurement results.

Passive Device   **Calibration Factors**

Mixers .... 16 to 24 dB
Directional Couplers .... 8 to 11 dB
Noise Sources .... 12 to 16 dB
Sensors .... 0.3 to 1.6 (stored as a percentage by the program)

Edit Calibration Data Edit Screen

1. Move the cursor to a column item and press SELECT. Enter the new frequency or calibration factor, then press (ENTER). (It is not necessary to enter new frequency values in numeric order. The program sorts them before storing them on the Operating Disk.)

2. To delete an item, move the cursor to the column item. Press SELECT, clear the line, then move to another item. Repeat the above process as needed to edit frequency values or calibration data for any passive devices.

Edit Calibration Data Command Screen

1. After you have entered the necessary data, press ░DONE░. The Equipment Menu command screen is displayed.

2. From the command screen, you can press ░main menu░ when you are ready to continue with the program.

HP-MSIB Address Menu

The HP-MSIB Address Menu lists the names and HP-MSIB addresses of the modules in the HP 70000 Modular Spectrum Analyzer that you may select to test.

Note If the HP 70621A is part of the HP 70000 Modular Spectrum Analyzer, you must, when prompted, specify whether or not it is an Option H50. The prompt will not be repeated until the ░RUN░ or ░RESTART░ key is pressed from the main menu.

The HP-MSIB address of the master and the system are the same. In other words, the address of the master module determines the address of the system. For information on configuring the software to test a specific module, refer to "Equipment Menu" in this chapter.

There is no edit screen for this menu. The command screen has a ░SELECT MODULE░ softkey but requires no ░STORE░ softkey. Locate the cursor next to the module you wish to test. Press ░SELECT MODULE░. Be sure the module selected here matches the Module Under Test listed in the Equipment Menu.

Test Menu

Pressing ░test menu░ from the Main Menu screen accesses the Test or Adjust selection screen. If ERROR MESSAGE: The ░░░░░ is listed as the DUT in the Equipment Menu, but the ░░░░░ is selected in the HP-MSIB Address Menu appears, the possible fix information suggests you select either ░MODIFY MODULE░ to enter new ROM data or ░CHANGE DUT░ to select the module you wish to test.

If you press ░MODIFY MODULE░, on-screen commands help you change the model and serial number to the module you want to test. If you press ░CHANGE DUT░, go either to the Equipment Menu to change the model number or to the HP-MSIB Address Map to select the module number you want to test.

To begin the testing process, select ░TEST░ to run verification tests or ░ADJUST░ to perform adjustments procedures.

Note The ░ADJUST░ softkey is present only if automated adjustment procedures exist for the module.

Press ░main menu░ to return to the Main Menu.

If you have pressed ▓FINAL TEST▓, and wish to get to the adjustment procedures, press ▓main menu▓, ▓RESTART▓, ▓TEST MENU▓, then ▓ADJUST▓. If you are in the adjustment procedures and want to get to the verification tests, press ▓main menu▓, ▓RESTART▓, ▓TEST MENU▓, then ▓TEST▓.

Caution

Pressing either ▓RESTART▓ or ▓equipment menu▓ any time after testing begins purges Test Menu Status column information. Selecting a new module to test in the HP-MSIB Map Screen Menu also deletes the Status column data. The assumption is that verification-test status will most likely be modified if you are moving between modules, ETE model numbers, or to the adjustment procedures.

After selecting **Tests**, the names of the verification tests are displayed. Review the Status column for tests performed.

Additional test equipment is required to perform tests beside which **Missing** ETE is listed. To review which additional test equipment is required, locate the cursor beside the test name, then press ▓SINGLE TEST▓. The Missing ETE screen displays the missing test equipment for that test.

A message stating that calibration data for passive devices is missing may also appear. If the correct Operating Disk is in the default drive, store the calibration data there. Press ▓CREATE▓ to build the data file. After the problem is cleared, the Test Menu is displayed.

Test Menu Command Screen

The Test Menu only has a command screen. It deviates from the command screen formats previously described. The following list defines the softkeys available in this menu.

▓FINAL TEST▓   begins a sequence of final tests, which are a subset of verification tests. A full calibration requires all verification tests. Review the Test Menu Test Name list for all available tests. During the final test sequence, the keys listed below are also available.

    ▓END SEQUENCE▓   interrupts the test sequence at the end of the test in progress. The Test Menu is displayed with an additional softkey labeled ▓RESUME TESTING▓. Press this key to resume the test sequence where the program left off.

    ▓ABORT▓   ends the testing process and displays the Test Menu. From there you may choose some other action.

▓RESUME TESTING▓   allows you to continue the final test sequence after you have pressed ▓FINAL TEST▓ followed by ▓END SEQUENCE▓.

▓SINGLE TEST▓   lets you select an individual test to run. If **Missing** ETE is listed in the Status column, you can review which test equipment is missing. Locate the cursor beside that test name, then press ▓SINGLE TEST▓. The Missing ETE screen is displayed. If you choose to return to the Test Equipment Menu via the Test Menu to install the missing test equipment, you lose the status of any tests that have run. To run a single test that has

the necessary ETE, locate the cursor beside the test name and press
SINGLE TEST.

multiple test   softkey lets you organize a group of tests sequentially. Locate the cursor beside the test you want to run. Press SELECT to assign the first number of the series to that test. Continue to locate the cursor and press SELECT until you have organized the tests you want to run. Press END LIST when you are ready to begin testing. During testing, the following softkeys are also available.

END SEQUENCE   interrupts the test sequence at the end of the test in progress, then displays the Test Menu.

ABORT   ends the testing process and displays the Test Menu. From there you may choose some other action.

repeat mult   softkey allows you to select a test sequence (you determine the quantity and order). The tests loop through this sequence until you decide to stop them. Locate the cursor beside the test you want to run, press SELECT, move the cursor to the next test, press SELECT, etc. Continue selecting tests until you are ready to begin testing. It is acceptable to select the same test for repeated testing. Press END LIST to start the test sequence. During testing, the following softkeys are also available.

END SEQUENCE   interrupts the test sequence at the end of the test in progress, then displays the Test Menu.

ABORT   ends the testing process and displays the Test Menu. From there you may choose some other action.

more keys   toggles between SUMMARY, select output, and PURGE CAL DATA and the previously explained Test Menu command screen softkeys.

SUMMARY   gives you a printout of the current test(s) run.

select output   chooses an output device. You can print test results by pressing PRINTER, or you can print the current display by pressing SCREEN. Press RETURN to return to the previous set of softkeys in the Test Menu command screen.

PURGE CAL DATA   deletes stored calibration data for the spectrum analyzer and any other calibration routines used for testing. Before module verification tests can be run again, equipment calibration routines have to be redone.

ADJUST MENU   toggles between the test and adjustment menu. This softkey is present only if automated adjustment procedures exist for the module.

MODIFY SERIAL #   allows you to change the module serial number.
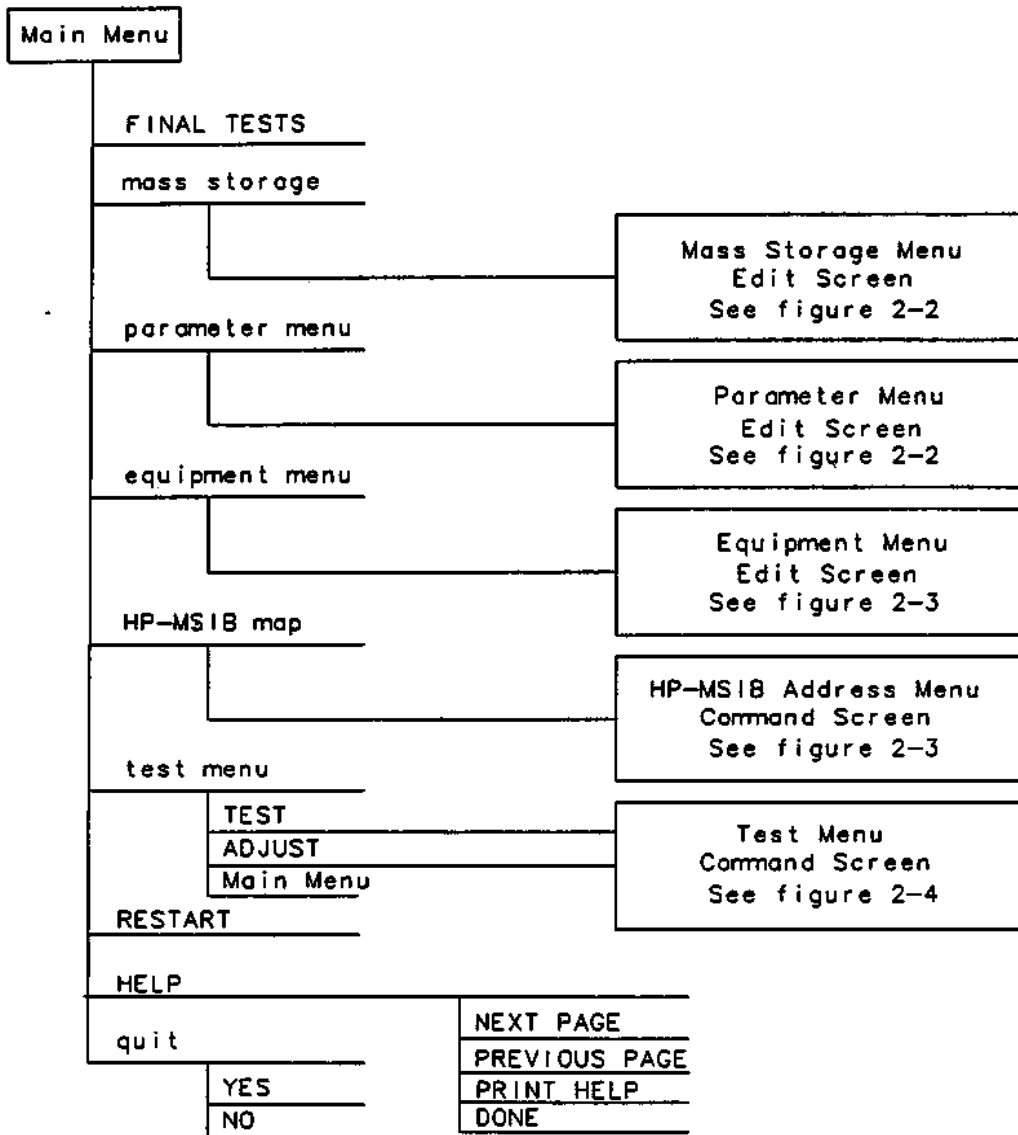
Figure 2-1. Main Menu Softkeys

```
┌─────────────────────────┐                    ┌─────────────────────────┐
│  Mass  Storage  Menu    │                    │   Parameter  Menu       │
│     Edit  Screen        │                    │     Edit  Screen        │
│   See  Figure  2—1      │                    │   See  Figure  2—1      │
└─────────────────────────┘                    └─────────────────────────┘

       PROCEED*                                        REPEAT*

       mass  storage*                                  PROCEED*

       SELECT                                          SELECT/TOGGLE

       DONE                                            DONE

       NEXT  PAGE                              ┌─────────────────────────┐
                                               │   Parameter  Menu       │
       PREVIOUS  PAGE                          │   Command  Screen       │
                                               └─────────────────────────┘
┌─────────────────────────┐
│  Mass  Storage  Menu    │                            EDIT
│    Command  Screen      │
└─────────────────────────┘                            STORE

                                                       main  menu         CREATE
       EDIT
                                                       HELP               REPEAT
       STORE
                                                       quit               ABORT
       main  menu       CREATE
                                                         YES
       HELP             REPEAT
                                                         NO
       quit             ABORT
                                                                  NEXT  PAGE
         YES
                                                                  PREVIOUS  PAGE
         NO       NEXT  PAGE
                                                                  PRINT  HELP
                  PREVIOUS  PAGE
                                                                  DONE
                  PRINT  HELP

                  DONE
```

* Present when the program does not find a file on the Operating Disc.

Figure 2-2. Mass Storage Menu and Parameter Menu Softkeys

Equipment Menu
Edit Screen
See Figure 2-1

REPEAT*
PROCEED*
ABORT*
SELECT
DONE
NEXT PAGE
PREVIOUS PAGE

HP-MSIB
Address Menu
Command screen
See Figure 2-1

SELECT MODULE***
main menu
HELP
quit
    NEXT PAGE
    PREVIOUS PAGE
    PRINT HELP
    DONE
YES
NO

Equipment Menu
Command Screen

EDIT
STORE
edit cal data**
    CREATE
    REPEAT
    ABORT
main menu
HELP
quit
    YES
    NO

Equipment Menu
Select Passive
Device screen

NEXT PAGE
PREVIOUS PAGE
PRINT HELP
DONE

SELECT
DONE

Cal Data
Edit Screen

NO ADDRESS****

* Present when the program does not
  find a file on the Operating Disc.

** Present only when there are passive
   devices with data.

*** Present only if there is more than
    one module available for testing.

**** Present if program cannot find
     instrument at specified HP-IB address.

CREATE*
REPEAT*
ABORT*
SELECT
DONE
NEXT PAGE
PREVIOUS PAGE

Figure 2-3. Equipment Menu and HP-MSIB Map Screen Menu Softkeys

```
┌─────────────────┐
│ Test Menu       │
│ Command Screen  │
│ See Figure 2-1  │
└─────────────────┘

FINAL TESTS
                              ABORT
RESUME TESTING*               END SEQUENCE
SINGLE TEST
          ABORT
          PROCEED***
multiple tests
                                          SELECT
repeat mult                               END LIST
                         SELECT                      ABORT
                         END LIST                    END SEQUENCE
SUMMARY                            ABORT
                                   END SEQUENCE
select output            ABORT
               RETURN
main menu      SCREEN
HELP           PRINTER**
more keys    NEXT PAGE
quit         PREVIOUS PAGE
       YES   PRINT HELP
       NO    DONE
PURGE CAL DATA
```
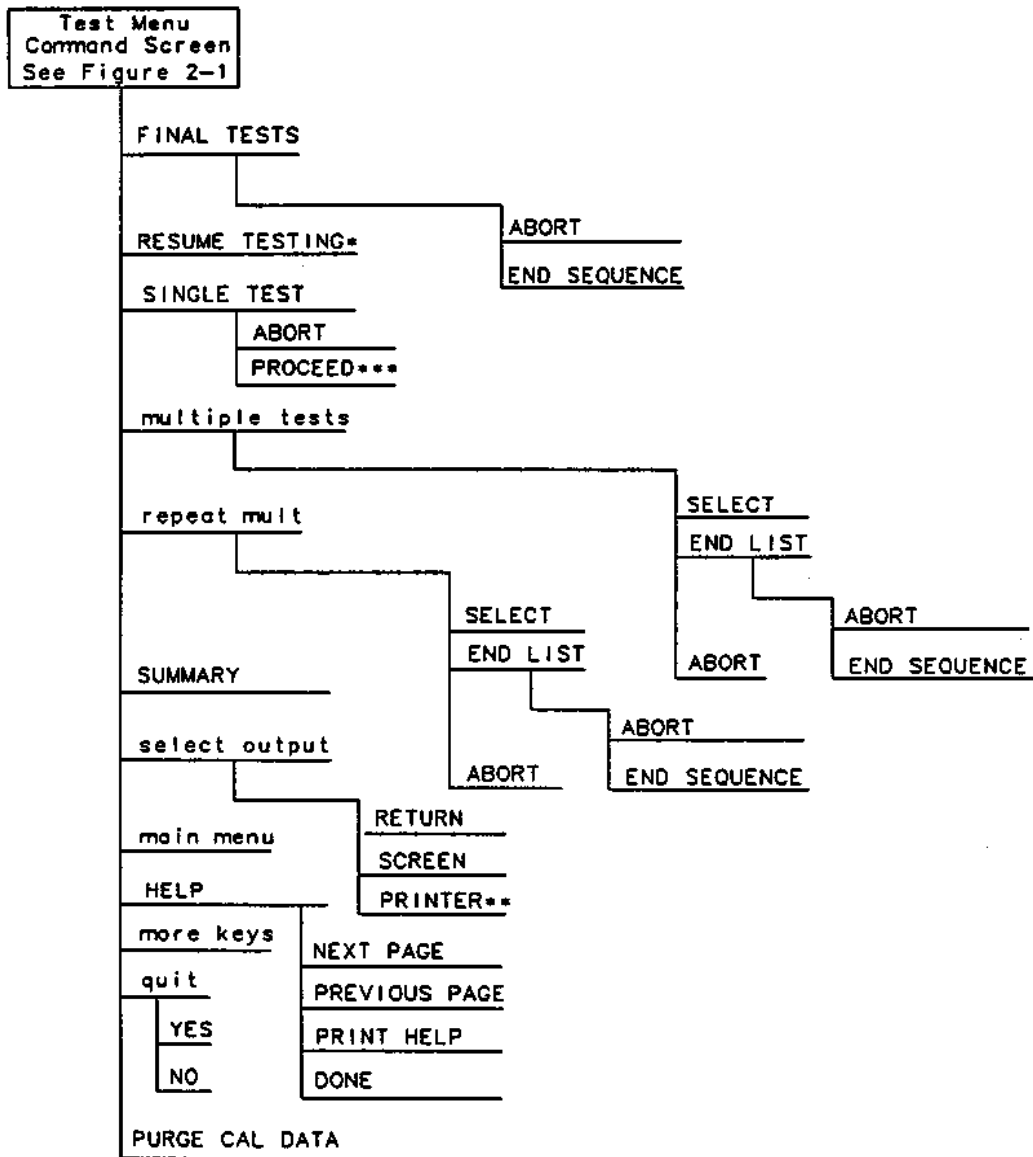
*Present only if END SEQUENCE was previously selected for FINAL TESTS.

**Present only if a printer address is available in Equipment Menu.

***Present when you've selected SINGLE TEST for a test having
   Missing ETE in the status column.

Figure 2-4. Test Menu Softkeys

Error and Status Messages

User interface messages used with HP 70000 Series software products are alphabetized in this section. The messages are designed to provide information about test results, operator errors, system conditions, etc. Refer to your *HP BASIC Language Reference* for system error information.

Aborted

You aborted the test indicated.

EEPROM for _____ is defective.

The EEPROM needs to be replaced.

Failed

The module under test needs adjustment or repair to pass the test number indicated.

CAUTION: Passthru address is incorrect. (See Edit Screen).

The address of the microwave source is not set to 19, or the address specified in the Equipment Menu does not match the address of the synthesized source. Return to the edit screen of the Equipment Menu to modify addresses in either the address column or the private bus column.

CAUTION: Some Model #'s are not supported. (See Edit Screen).

You have model numbers in the Equipment Menu that are not supported by the software. Ignore this caution if you are sure program memory contains a driver for these models. A driver that is required but missing causes the error message Undefined function or subprogram to appear on-screen. You are returned to the Test Menu.

Equipment list is not acceptable.

You attempted to enter the Test Menu, but the program could not locate all the instruments for which you have specified HP-IB addresses. Verify that the indicated equipment is turned on, then return to the Equipment Menu edit screen to verify accuracy of addresses that are flashing in either the address column or the private bus column.

Equipment list shows no analyzer to test.

The DUT has no assigned HP-IB address. Return to the Equipment Menu and edit the Address column.

ERROR: Address matches system disk drive.

You entered an HP-IB address matching that of the computer's external disk drive. HP-IB protocol allows only one instrument per address.

Address not in acceptable range.

You entered an HP-IB address outside the range 700 to 730, inclusive.

ERROR: Duplicate HP-IB address.

You attempted to exit the Equipment Menu after assigning the same HP-IB address to different model numbers. HP-IB protocol allows only one instrument per address. (It is acceptable to assign the same address to identical model numbers, implying multiple use of the same instrument.)

ERROR: Non-responding HP-IB address.

You attempted to exit the Equipment Menu after assigning an HP-IB address to an instrument not responding on HP-IB.

ERROR: Search for _____ unsuccessful.

The program tried to find the disk identified but could not. Either assign a drive to the disk and press REPEAT or insert the required disk into its appropriate drive. Press REPEAT.

ERROR: Some devices listed as Available require serial numbers.

You pressed View Cal Data, then selected a device to which you have not assigned a required serial number. Display the Equipment Menu edit screen and assign the serial number.

ERROR MESSAGE: Address is HP-IB controller address.

You entered an HP-IB address matching the computer's address. HP-IB protocol allows only one instrument per address.

ERROR MESSAGE: Attempt to close file _____ failed.

There is a problem with the data file on the Operating Disk. Correct the problem, then do one of the following:

- Press REPEAT to try again.
- Press CREATE to create a new file.
- Press ABORT to return to the Main Menu.

ERROR MESSAGE: Attempt to create file _____ failed.

There is a problem with the data file on the Operating Disk. Correct the problem, then do one of the following:

- Press REPEAT to try again.
- Press CREATE to create a new file.
- Press ABORT to return to the Main Menu.

ERROR MESSAGE: Attempt to Edit Mass Storage failed.

Your edits to the Mass Storage Menu were not valid. Return to this menu and correct the errors.

ERROR MESSAGE: Attempt to store Mass Storage failed.

You pressed ABORT after pressing STORE mass storage. The Mass Storage Menu failed. Press ABORT to return to the Main Menu.

ERROR MESSAGE: Bad instrument address in equipment list. Address matches controller.

You entered an HP-IB address matching that of the controller. HP-IB protocol allows only one instrument per address and only one controller per HP-IB system. (The factory preset controller address is 21.)

ERROR MESSAGE: Calibration data frequency exceed acceptable limits.

Return to the Calibration Data edit screen and correct the data entries that are flashing.

ERROR MESSAGE: Calibration data frequency is less than minimum range of _____.

The frequency entered next to the device in the Cal Data edit screen is out of the device's operating range. The return to this screen is automatic. Enter valid frequencies for the values that are flashing.

ERROR MESSAGE: Calibration data frequency is greater than maximum range of _____.

The frequency entered next to the device in the Cal Data edit screen is out of the device's operating range. The return to this screen is automatic. Enter valid frequencies for the values that are flashing.

ERROR MESSAGE: Calibration data for _____ is blank for some frequencies listed.

Return to the Calibration Data edit screen to enter the calibration data for frequencies indicated with flashing markers.

ERROR MESSAGE: Calibration data for _____ is less than minimum range of _____.

The factor entered next to the device in the Cal Data edit screen is out of the device's operating range. The return to this screen is automatic. Enter valid values for the ones that are flashing.

ERROR MESSAGE: Calibration data for _____ is greater than maximum range of _____.

The factor entered next to the device in the Cal Data edit screen is out of the device's operating range. The return to this screen is automatic. Enter valid values for the ones that are flashing.

ERROR MESSAGE: Calibration data file not found for _____ with serial number _____.

The data file cannot be found or there is a problem with the data file on the Operating Disk. Correct the problem, then either press ▒REPEAT▒ to try again or press (CONTINUE).

ERROR MESSAGE: DUT does not have an address.

You attempted to leave the Test Equipment Menu, but the program cannot verify the DUT at the specified HP-IB address. First check the address. If the address is correct, cycle the main power of the system under test.

ERROR MESSAGE: DUT was not at address in the equipment list. DUT was expected at address _____.

The DUT is not at the specified address, or HP-IB is at fault, or main power is off on the DUT. Press ▒ABORT▒, then return to the Equipment Menu to verify the address.

ERROR MESSAGE: DUT was not found at address in equipment list.

The address specified for the DUT is not valid. Press ▒ABORT▒, then return to the Equipment Menu to verify the address.

ERROR MESSAGE: Equipment address matches external disk drive.

You entered an equipment address matching that of the external disk drive. HP-IB protocol allows only one instrument per address.

ERROR MESSAGE: Equipment Menu data not found on _____.

The program could not find the Equipment Menu data file on the Operating Disk. Possible Fix instructions appear with the on-screen error message. If the data file is available in a location other than the one currently specified in the Mass Storage Menu, return to that menu and change the msus and/or the directory path of the Operating Disk. It may also be that the Operating Disk accessed by the program is not the one containing the Equipment Menu file. Insert the correct Operating Disk, then press REPEAT or (CONTINUE).

ERROR MESSAGE: Equipment does not have an address.

There is no address assigned to the DUT. Return to the Equipment Menu edit screen and verify or enter an address in the Address column.

ERROR MESSAGE: ERROR XXX in XXXXX ____ .

An unanticipated occurrence in the program caused a program failure. For clarification, call your Hewlett-Packard Sales and Service Office.

ERROR MESSAGE: File ____ not found while assigning I/O path.

You attempted to STORE a list (equipment, mass storage, or parameter) for the first time on the current Operating Disk. Possible Fix instructions appear with the on-screen error message. Follow the on-screen instructions or return to the Mass Storage Menu to change the location of the Operating Disk.

ERROR MESSAGE: Incorrect Volume found. ____ required.

The wrong disk is in the required storage medium. Either correct the fault and press REPEAT to retry, or select mass storage to return to the Mass Storage Menu. From here you can indicate a different mass storage drive.

ERROR MESSAGE: Parameter Menu data not found on ____.

The program could not find Parameter Menu data file on the Operating Disk. Possible Fix instructions appear with the on-screen error message. If the data file is available in a location other than the one currently specified in the Mass Storage Menu, return to that menu and change the msus and/or the directory path of the Operating Disk. It may also be that the Operating Disk accessed by the program is not the one containing the Parameter Menu data file. Insert the correct Operating Disk, then press REPEAT or (CONTINUE).

ERROR MESSAGE: Read ____ data from file ____ failed.

There is a problem with the data file on the Operating Disk. Correct the problem, then either press REPEAT to try again or (CONTINUE) to use default values.

ERROR MESSAGE: Selected instrument under test is ____; but the software supports the ____.

The module entered in the HP-MSIB map is not currently supported by software. Either load the correct software or select a different module in the Equipment Menu or HP-MSIB Map Menu.

ERROR MESSAGE: Sensor model # ____ not supported.

Software does not support the sensor model number entered for the Signal Sensor in the Equipment Menu. Return to the Equipment Menu and select a sensor with a model number that is supported. (Refer to Chapter 1 for a list of supported equipment.)

ERROR MESSAGE: Test Parameter data file not found on ____.

The program could not find parameter-list data file on the Operating Disk. Possible Fix instructions appear with the on-screen error message. If the data file is available in a location other than the one currently specified in the Mass Storage Menu, return to that menu and change the msus and/or the directory path of the Operating Disk. It may also be that the Operating Disk being accessed by the program is not the one containing the parameter-list data file. Insert the correct Operating Disk, then press `REPEAT` or `CONTINUE`.

ERROR MESSAGE: The ____ is listed as the DUT in the Equipment Menu, but the ____ is selected in the HP-MSIB Address Menu.

The DUT and the model selected in the HP-MSIB Address Map do not agree. You are given suggested fix instructions either to modify the module or change the DUT.

ERROR MESSAGE: The Operating Disk is write protected.

Make a working copy of the Operating Disk and store the original in a safe place, or remove the write-protect.

ERROR MESSAGE: Too many Cal Data frequencies were eliminated. There must be at least two frequencies.

Only one Cal Frequency remains in the Cal Data edit screen. Return to that screen and enter more frequencies in the Frequency column.

ERROR MESSAGE: Write ____ data to file ____ failed.

There is a problem with the data file on the Operating Disk. Correct the problem, then do one of the following:

- Press `REPEAT` to try again.
- Press `CREATE` to create a new file.
- Press `ABORT` to return to the Main Menu.

ERROR MESSAGE: Wrong device at specified address. DUT was expected at address ____.

The address specified for the DUT is actually that of a test instrument. Possible Fix instructions appear with the on-screen error message. If necessary, return to the Equipment Menu.

ERROR MESSAGE: ____ Volume was not located.

The program cannot access the listed Volume. If the Volume is correct, press `REPEAT` to retry. If the Volume is incorrect, press `mass storage` to return to the Mass Storage Menu. From here you can indicate a different mass storage medium for the Volume in question.

FORMAT ERROR: Observe date format and character position.

You entered the date/time in an unacceptable format. Enter date/time in the format dd mmm yyyy and hh:mm, then press `ENTER`.

Hdw Broken

Actual test results far exceed the expected results. This is often an indication of a hardware failure (hardware broken) or incorrect connections.

`Logging errors to ERRORLOG failed. Operating Disk is write protected.`

The program tried to store error data onto the Operating Disk and could not because of the write-protect. Make a working copy of the Operating Disk and store the original in a safe place, or remove the write-protect.

`KEYBOARD SYSTEM CRASH WITH KEYBOARD: ____.`

The software program does not support the current keyboard. Install a keyboard having one of the part numbers listed at the beginning of this chapter, then restart the program.

`Passed`

The module meets the tested characteristics.

`PAUSED. PRESS CONTINUE.`

You pressed (PAUSE) on the computer keyboard. Press (CONTINUE) to resume program execution.

`PRGM ERROR`

The program detected an error within itself. For clarification contact Hewlett-Packard Signal Analysis Division.

`Reading errors from ERRORLOG failed. Check disk at ____.`

The program tried to read error data from the Operating Disk. Check that the Operating Disk is installed in the drive specified in the error message.

`Return to Equipment Menu to enter serial number for ____.`

You must return to the Equipment Menu edit screen and enter a SERIAL or ID NO. for the passive device selected before you can edit the device's calibration data.

`Setup Error`

The program aborted the test after attempting to verify the test setup. Ensure that all required ETE is present, has been turned on, and is properly connected.

`SORRY, but your SERIAL NUMBER must end in a NUMERIC -- This is ____.`

Contact Hewlett-Packard Signal Analysis Division for assistance.

`Test can not be done.`

Required ETE is missing. Return to the Equipment Menu and enter all ETE listed as required for the current test.

`TEST_LIST is not compatible.`

A bad test list exists. Contact Hewlett-Packard Signal Analysis Division for assistance.

`The controller does not have sufficient memory. This software cannot load. See the computer hardware system documentation for information on adding additional memory.`

Either refer to the appropriate manual to extend the memory capability of your system, or off-load some data to make room for the program.

`The _____ at address _____ was not found on HP-IB.`

When Verify HP-IB is set to ON in the Parameter Menu, this error message displays the ETE with the address that is either missing or not set to ON.

The 436A is in lowest range, waiting 10 seconds.

The current power measurement requires the lowest power-meter range. Program execution will resume in 10 seconds.

The 8902A needs repair (Error 6).

There is a problem related to the HP 8902A. Correct the fault or return to the Equipment Menu where you can enter a different model number.

The DUT must have an HP-IB address.

You attempted to leave the Equipment Menu, but the program cannot find the HP 70000 system at the assigned HP-IB address.

THIS COLUMN CAN NOT BE EDITED.

You pressed SELECT with the cursor positioned in the first column of the Mass Storage edit screen or the Equipment Menu edit screen. This column cannot be edited.

THIS IS _____ AND FOUND DUPLICATE FILES: _____.

Contact Hewlett-Packard Signal Analysis Division for assistance.

This test can not be selected because of missing ETE.

You were in either Multiple Tests or Repeat Multiple, then tried to select a test that has missing ETE. This is not allowed. Check the Status column of the Test Menu to verify a Missing ETE tag next to the test name you attempted to select.

Timed Out

The program aborted the test.

WARNING: Duplicate Address

You entered a duplicate HP-IB address to an item in the Equipment Menu. (You may have to scroll through the menu to find the duplication.)

WARNING: Duplication may exclude specific tests.

You assigned two generic device functions to one ETE. (For example, the TOI test will not be run if you assign a single HP 3335A as both the required level generator and the required general source.)

WARNING: String is too long. It has been truncated.

You entered too many characters in a user's line of the Parameter Menu edit screen. Select the line and enter 30 or fewer characters.

Write protected.

You attempted to store data on a write-protected disk. After correcting the fault, press (CONTINUE).

3

Adjustments and Verification Tests

Introduction

This chapter contains a listing of the adjustments and verification tests for the HP 70620B and the HP 70621A preamplifiers. The adjustments and tests are automated; they are run using the HP 70620B/HP 70621A Module Verification software. The preamplifiers do not have module specifications, so the tests in this chapter verify module operation to ensure modularity of the system. All of the adjustments and tests for the preamplifier are listed below; final tests are listed in **bold**.

Caution

The preamplifier module contains assemblies that can be damaged by electrostatic discharge. All work performed on the preamplifier should be done at a static-safe work station. Refer to "Electrostatic Discharge Information" in Chapter 1.

Recommended Test Equipment

Table 1-1, Recommended Test Equipment, lists test equipment and accessories required to perform the adjustment procedures. Any equipment that satisfies the critical specifications given in the table may be substituted for the preferred test equipment. HP 70620B/HP 70621A Module Verification software contains only the drivers for equipment listed in the table. Additional drivers have to be written by the user to support substituted test equipment.

Adjustment Equipment

Service accessories and electrostatic discharge (ESD) accessories are listed in Chapter 1. For adjustments that require a nonmetallic tuning tool, use the fiber tuning tool, HP part number 8170-0033. Never try to force the adjustment of any component. This is especially critical when tuning slug-tuned inductors or variable capacitors.

Caution	Turn off the mainframe line power before connecting or disconnecting the module service extender cable. The mainframe line fuse or a module fuse may be blown (opened) if the mainframe power is on when the module service extender cable is connected or disconnected.

Preparing for Adjustments

1. With the mainframe line switch off, remove the preamplifier.

2. Install the module service extender into the mainframe and connect the module service extender cable to the preamplifier.

3. Connect the equipment as illustrated in the appropriate test setup, then set the mainframe line switch to on.

Note	The test equipment must be allowed to warm up for 1 hour (or longer if required by the instrument) before proceeding with an adjustment.

4. Load and run the appropriate adjustment routine. Refer to Chapter 2, "Verification Software," for information related to loading the software or initiating an adjustment routine. Refer to "Recommended Test Equipment" in Chapter 1 for information about the standard and specialized test equipment needed for the adjustments and verification tests.

Electronic Test Equipment Calibration

The verification tests require characterization of the sources, and

microwave network analyzer and noise figure meter calibration. The routines store characterization data for verification tests measurement correction in controller common memory.

The HP 70620B/70621A Module Verification software automatically initiates and executes the ETE (Electronic Test Equipment) calibration routines. The software verifies the presence of calibration factors for the required test equipment, and if the factors are not present, invocation of a calibration routine is automatic.

Return Loss Test Block Calibration

This routine provides open and short calibration of the directional bridge, reference detector, and the microwave network analyzer used in return loss performance tests. The particular return loss test determines the calibration frequency ranges. The calibration data is stored in controller common memory. Refer to Figure 3-1.

Required Equipment

Full Microwave Source .... HP 8340A
Microwave Network Analyzer .... HP 8757A
Power Splitter .... HP 11667B
Directional Bridge .... HP 85027B
Detector *(2 required)* .... HP 11664E
Calibrated Open/Short 85027-60004
APC-3.5 (m) to APC-3.5 (m) Cable 8120-4921
APC-3.5 (f) to APC-3.5 (f) Adapter 5061-5311
APC-3.5 (f) to APC-3.5 (m) Adapter *(2 required)* 85027-60002
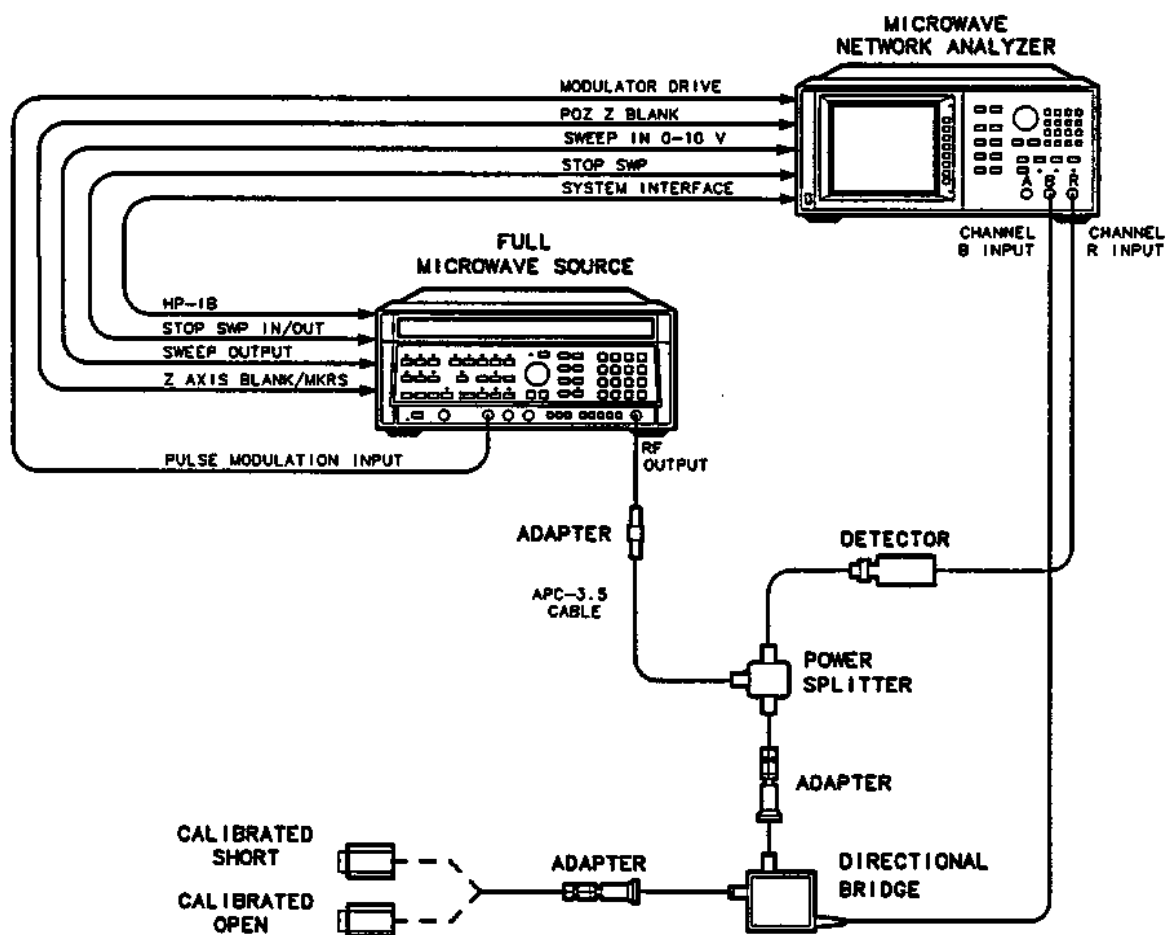
Figure 3-1. Return Loss Test Block Calibration Setup

The microwave network analyzer is in B/R ratio mode for all return loss measurements. The microwave source provides the incident signal.

The operator connects the calibrated short to the directional bridge test port, then chooses to calibrate either an individual port calibration or all test ports. The full microwave source and microwave network analyzer combination sweeps over a port-dependent frequency range given in the test descriptions. The operator then connects the calibrated open to the test port. The routine saves the responses from the two setups.

The routine converts the short and open data from logarithmic to linear, averages the converted data, then converts back to logarithmic data. The averaged logarithmic data is stored in controller common memory.

Gain Calibration

This routine calibrates the microwave network analyzer for corrected frequency response measurements. Refer to Figure 3-2.

Required Equipment
Full Microwave Source .... HP 8340A
Microwave Network Analyzer .... HP 8757A
Power Splitter .... HP 11667B
Detector *(2 required)* .... HP 11664E
10 dB Attenuator .... HP 33340C, Option 010
6 dB Attenuator .... HP 8493C, Option 006
APC-3.5 (f) to APC-3.5 (f) Adapter 5061-5311
APC-3.5 (m) to APC-3.5 (m) Cable 8120-4921
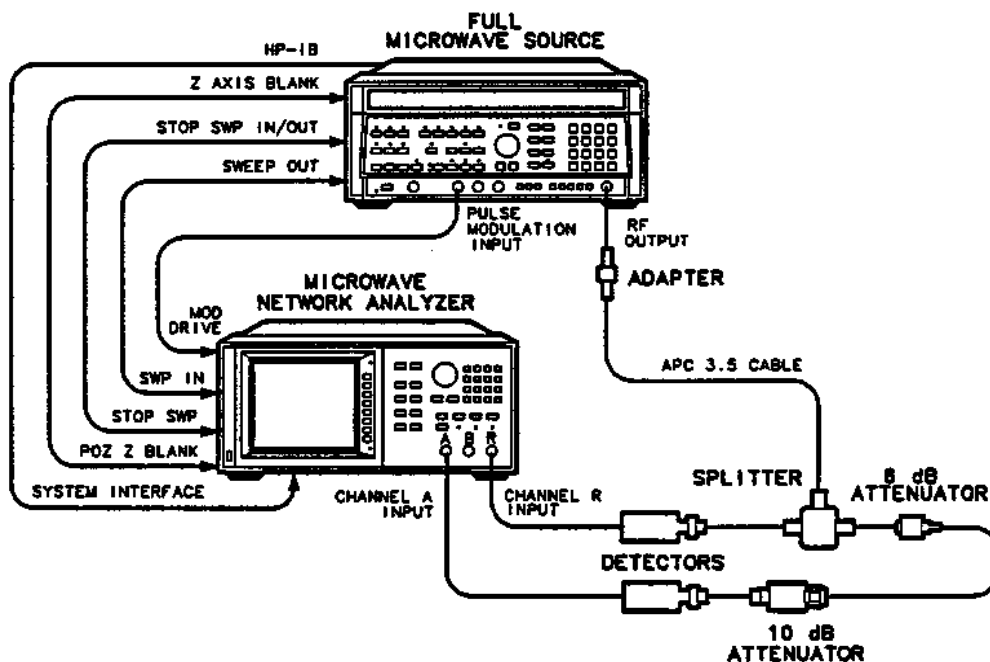
Figure 3-2. Gain Calibration Setup

External Amplifier Calibration

This routine characterizes the frequency response of the full microwave source, the external amplifier, and the APC-3.5 cable assemblies. Refer to Figure 3-3.

Required Equipment

Full Microwave Source	HP 8340A
Amplifier	HP 8449B
Power Sensor	HP 8485A
Power Meter	HP 436A
APC-3.5 (f) to APC-3.5 (f) Adapter *(4 required)*	5061-5311
APC-3.5 (m) to APC-3.5 (m) Cable *(2 required)*	8120-4921
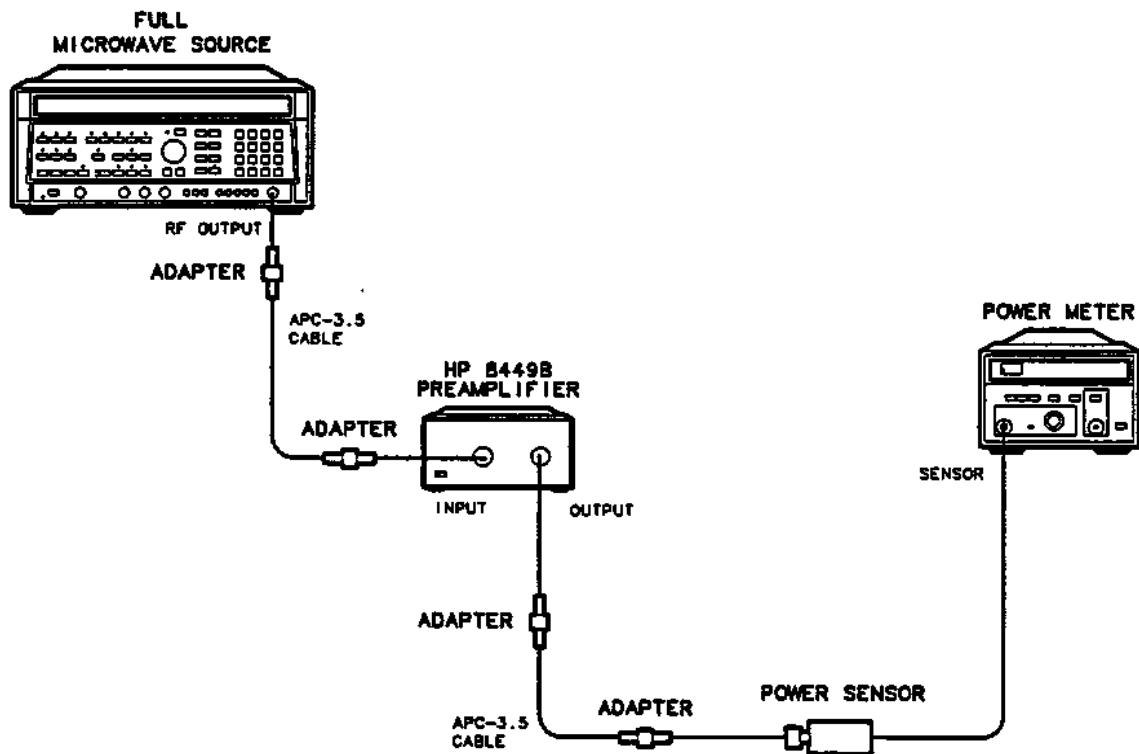
Figure 3-3. External Amplitude Calibration Setup

The full microwave source steps in discrete CW frequencies from 10 MHz to 26.5 GHz. At each frequency, the amplitude of the full microwave source adjusts until the power meter reads either +9 or +8 dBm, depending on the step frequency. The routine stores the full microwave source amplitudes in controller common memory.

Low Frequency Noise Figure Test System Calibration

This routine calibrates the noise figure test system used to perform noise figure measurements on the HP 70621A Preamplifier. Refer to Figure 3-4.

Required Equipment

Noise Figure Meter	HP 8970B
Excess Noise Source	HP 346C
Type N (m) to APC-3.5 (f) Adapter	1250-1744
APC-3.5 (f) to APC-3.5 (f) Adapter	5061-5311
BNC (m) to BNC (m) Cable	HP 10503A
APC-3.5 (m) to APC-3.5 (m) Cable	8120-4921
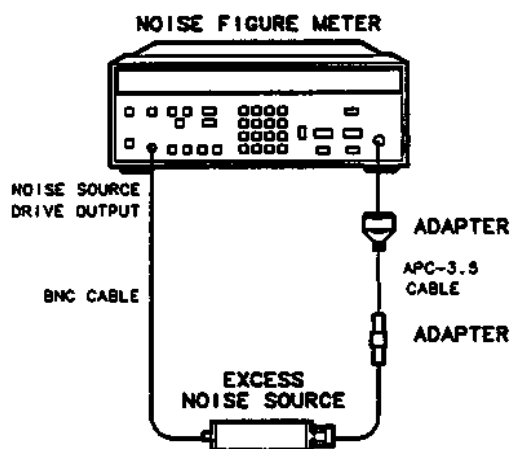
Figure 3-4. Low Frequency Noise Figure Test System Calibration Setup

High Frequency Noise Figure Test System Calibration

This routine calibrates the noise figure test system used to perform noise figure measurements on the HP 70620B Preamplifier. Refer to Figure 3-5.

Note	The noise figure test routine for the HP 70620B Option 001 (only) includes a noise figure test system calibration routine.

Required Equipment

Full Microwave Source	HP 8340A
Noise Figure Meter	HP 8970B
Amplifier	HP 8449B
Excess Noise Source	HP 346C
Mixer	0955-0307
Type N (m) to APC-3.5 (f) Adapter	1250-1744
APC-3.5 (f) to APC-3.5 (f) Adapter *(3 required)*	5061-5311
Type N (m) to SMA (f) Adapter	1250-1250
BNC (m) to BNC (m) Cable	HP 10503A
APC-3.5 (m) to APC-3.5 (m) Cable *(3 required)*	8120-4921
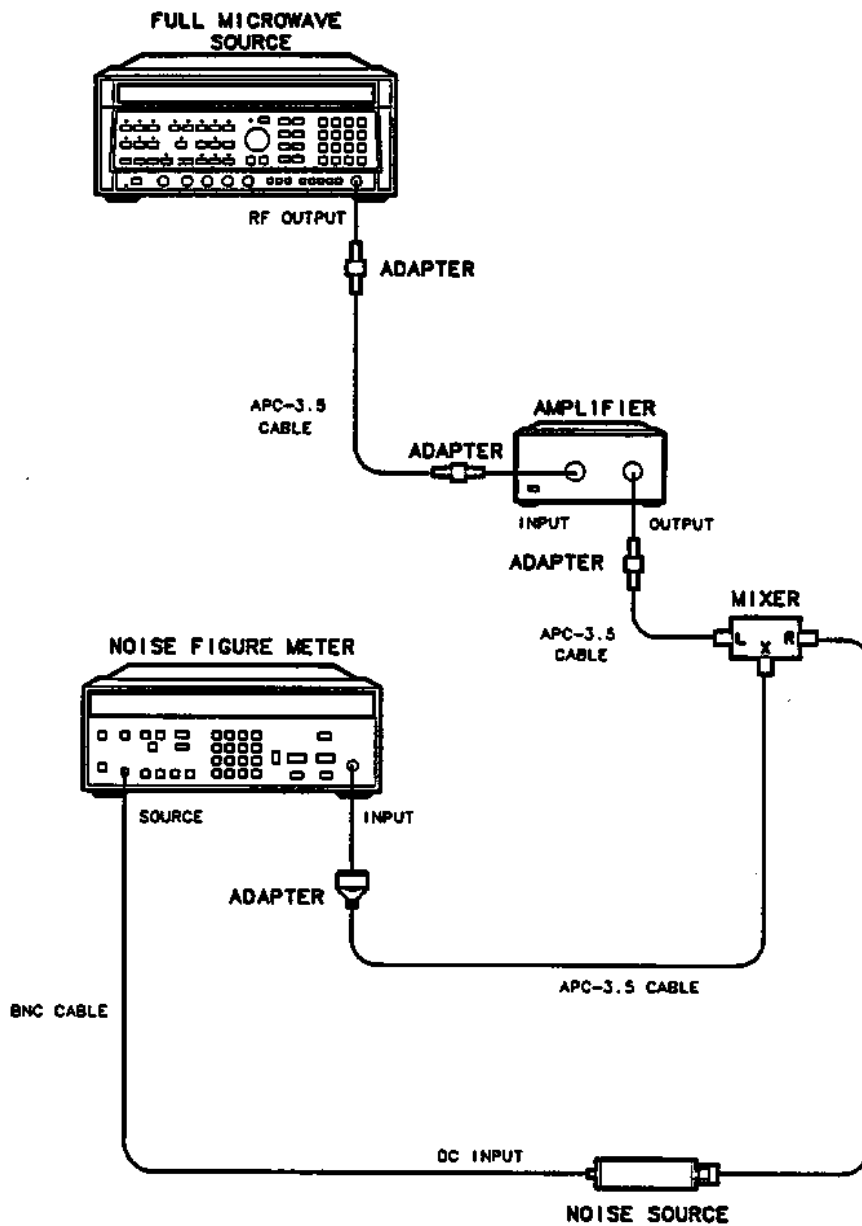
Figure 3-5. High Frequency Noise Figure Test System Calibration Setup

1. RF Amplifier Bias Adjustment

Note

This adjustment is done only for the HP 70621A or the HP 70620B Option 001.

Purpose

This routine permits the adjustment of the −5 V dc RF amplifier bias voltage.

Description

After removing the left side cover, the digital voltmeter is connected to A2TP3-8. The operator is prompted to adjust A2R126 (left side of module), −5V ADJ, for a reading of −5 V dc ±500 mV.

Equipment

```
Controller ......................................... HP 9000 Series 200/300
Local Oscillator ................................................. HP 70900B
HP 70000 Series Mainframe ...................................... HP 70001A
Digital Voltmeter ................................................ HP 3456A
```

Accessories
```
Module Service Extender ...................................... 70001-60013
```

Adapters
```
BNC (f) to dual banana plug .................................... 1251-2277
BNC (f) to alligator clips ..................................... 1250-1292
```

Cables
```
BNC (m) to BNC (m) ........................................... HP 10503A
```

Procedure

Refer to "Preparing for Adjustments" in this chapter, then connect the equipment as shown in Figure 3-6. Load and run the RF Amplifier Bias routine. Make the adjustments as defined by the computer. Figure 3-7 illustrates the adjustment locations. Refer to Chapter 2, "Verification Software," for detailed information about loading and running the software.
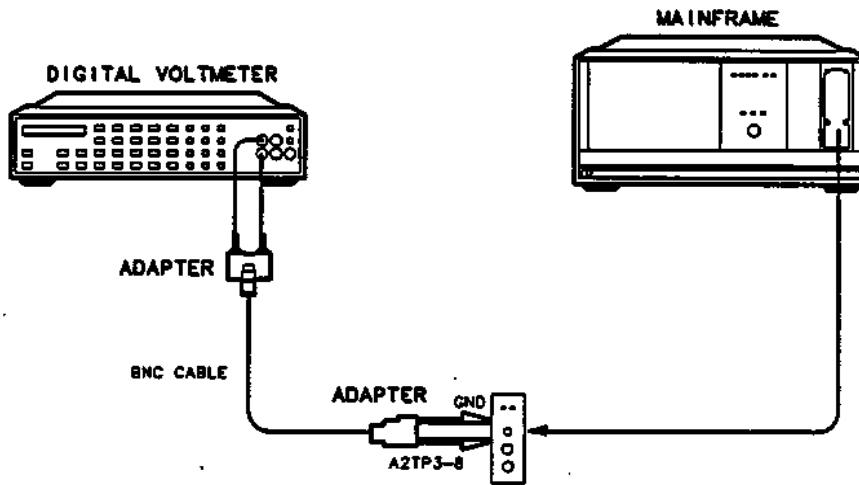
Figure 3-6. RF Amplifier Bias Adjustment Setup
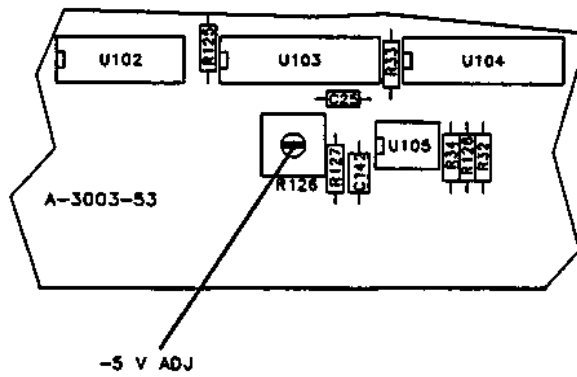
Figure 3-7. RF Amplifier Bias Adjustment Location

2. Input Return Loss

Purpose

This test verifies that the return loss at the input port of the module is sufficient to ensure no adverse affect on system performance.

This is a final test.

Description

A ratio method is used to measure the return loss of the module input. The power splitter provides information on the current amplitude of the source to the network analyzer channel R. The reflected power is measured on channel B by the bridge. The ratio B/R indicates relative reflected power.

The calibration values are subtracted from the measured reflected power, providing return loss data for the module. (Calibration data is derived from the mean of reflected signals from a calibrated open and a calibrated short. Data is taken over the respective frequency range for the measurement.)

Data is taken over the full specified frequency range, which may differ between bypass and amplification modes.

Equipment

Test Equipment	Preferred HP Model or Part Number
Controller	HP 9000 Series 200/300
HP 70000 Series Mainframe	HP 70001A
Local Oscillator	HP 70900B
Full Microwave Source	HP 8340A
Microwave Network Analyzer	HP 8757A

Accessories

Detector *(2 required)*	HP 11664E
Directional Bridge	HP 85027B
Power Splitter	HP 11667B
10 dB Attenuator	HP 33340C, Option 010

Adapters

APC-3.5 (m) to APC-3.5 (m)	1250-1748
APC-3.5 (f) to APC-3.5 (f) *(3 required for HP 70620B)*	5061-5311
Type N (m) to APC-3.5 (f) *(required for HP 70621A only)*	1250-1744

Cables

APC-3.5 (m) to APC-3.5 (m)	8120-4921

Figure 3-8. Input Return Loss Test Setup

3. Output Return Loss

Purpose

This test verifies that the return loss at the output port of the module is sufficient to ensure no adverse affect on system performance.

This is a final test.

Description

A ratio method is used to measure the return loss of the module output. The power splitter provides information on the current amplitude of the source to the network analyzer channel R. The reflected power is measured on channel B by the bridge. The ratio B/R indicates relative reflected power.

The calibration values are subtracted from the measured reflected power, providing return loss data for the module. (Calibration data is derived from the mean of reflected signals from a calibrated open and a calibrated short. Data is taken over the respective frequency range for the measurement.)

Data is taken over the full specified frequency range, which may differ between bypass and amplification modes.

Equipment

Test Equipment	Preferred HP Model or Part Number
Controller	HP 9000 Series 200/300
HP 70000 Series Mainframe	HP 70001A
Local Oscillator	HP 70900B
Full Microwave Source	HP 8340A
Microwave Network Analyzer	HP 8757A

Accessories	
Detector *(2 required)*	HP 11664E
Directional Bridge	HP 85027B
Power Splitter	HP 11667B
10 dB Attenuator	HP 33340C, Option 010

Adapters	
APC-3.5 (m) to APC-3.5 (m)	1250-1748
APC-3.5 (f) to APC-3.5 (f) *(3 required for HP 70620B)*	5061-5311
Type N (m) to APC-3.5 (f) *(required for HP 70621A only)*	1250-1744

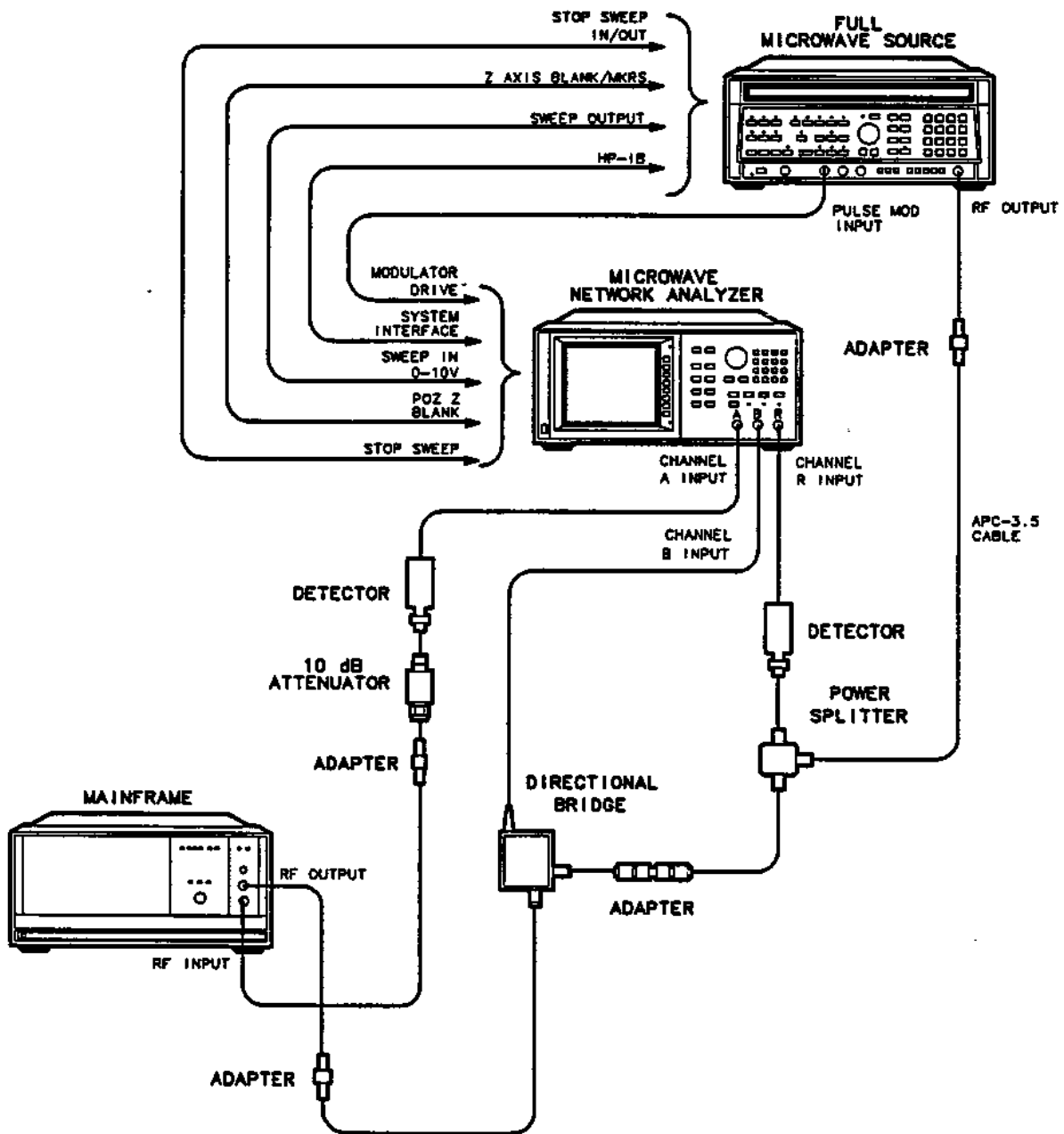| Cables	
APC-3.5 (m) to APC-3.5 (m)	8120-4921

Figure 3-9. Output Return Loss Test Setup

4. Gain and Flatness

Note

The module requires a 1 hour warm-up time before running the calibration procedure. Shorter warm-up times may result in faulty correction data. For optimum performance, run the Gain and Flatness Calibration at the temperature the module will be used. The Flatness specification for 20°C to 30°C will then apply at the calibration temperature. If the calibration is performed at a temperature other than 25°C (approximate mid-point), the full temperature specification may not be met.

Purpose

This test determines response by subtracting test-setup calibration data and preamplifier correction data from measured preamplifier response. Flatness is then the difference between maximum and minimum data points. Gain is the minimum response point. A routine compares insertion loss, gain, and flatness data with the preamplifier test limits.

This procedure stores amplitude-correction data into the module's EPROM. Data is stored for both the bypass and the amplifier paths.

This is a final test.

Description

The first time the adjustment is entered, a test-equipment calibration routine is initiated.

For test-setup calibration, the microwave source connects through a power splitter to both the network analyzer A and R ports. The program stores bypass-path calibration data and amplifier-path calibration data.

After the calibration routine, the microwave source connects through a power splitter to both the network analyzer R port and the preamplifier RF INPUT. The network analyzer A port connects to the preamplifier RF OUTPUT. Connections to the preamplifier should be direct (no cables). Before tests begin, a routine exercises the preamplifier switches to ensure good contact.

In bypass mode, the program reads from the network analyzer the results of an A/R measurement of insertion loss. The program calculates bypass mode insertion loss by subtracting bypass-path calibration data from measured data.

In amplifier mode, the program reads from the network analyzer the results of an A/R measurement of gain, then calculates preamplifier gain by subtraction amplifier-path calibration data from measured data.

Insertion loss measurements are performed on both of the module's RF paths: bypass and amplifier. The program then calculates amplitude-correction factors for each RF path. These factors are rounded to the nearest 0.1 dB. If the insertion loss, gain, and flatness are within limits, the program writes the amplitude-correction factors into the module's EPROM.

The preamplifiers are tested at the following frequencies.

   HP 70620B: 10 MHz to 26.5 GHz.
   HP 70620B Option 001: 10 MHz to 2.9 GHz and 2.7 GHz to 26.5 GHz.
   HP 70621A: 10 MHz to 2.9 GHz.

Equipment

Test Equipment	Preferred HP Model or Part Number
Controller	HP 9000 Series 200/300
HP 70000 Series Mainframe	HP 70001A
Local Oscillator	HP 70900B
Full Microwave Source	HP 8340A
Microwave Network Analyzer	HP 8757A

Accessories

Detector *(2 required)*	HP 11664E
10 dB Attenuator	HP 33340C, Option 010
6 dB Attenuator	HP 8493C, Option 006
Power Splitter	HP 11667B
Module Service Extender	70001-60013

Adapters

Type N (m) to APC-3.5 (m) *(required for HP 70621A only)*	1250-1743
APC-3.5 (f) to APC-3.5 (f) *(2 required for HP 70620B)*	5061-5311

Cables

APC-3.5 (m) to APC-3.5 (m)	8120-4921
BNC (m) to BNC (m) *(4 required)*	HP 10503A

Procedure

Refer to Chapter 2 for instructions on loading and running the verification software. The procedure below is to be used in addition to and along with the screen prompts that appear during the software program.

1. Select the Gain and Flatness Calibration procedure from the adjustment list in the software's test menu.

2. If this is the first time the adjustment is selected, the software will initiate the preamplifier gain calibration procedure to calibrate the test equipment. Skip to step 3 if the preamplifier gain calibration procedure is not initiated.

   a. Connect the equipment as shown in Figure 3-2. The preamplifier module should either be in a *modified* mainframe or connected to a module service extender.

   b. Press (LOCAL), (PRESET) on the HP 8757A.

   c. Press MODULATION (PULSE) on the HP 8340A.

   d. Press CHAN 2 OFF, (SCALE), AUTO SCALE on the HP 8757A. The displayed A/R response should not have any peaks or dips greater than 3 dB. Large peaks and dips indicate discontinuities caused by damaged cables or loose connectors.

3. Follow the instructions displayed on the computer display. Refer to Figure 3-10.

4. When the test is finished, the results are displayed in the following four graphs:

   ▪ Flatness Bypass Mode
   ▪ Flatness Amplifier Mode
   ▪ Gain Bypass Mode

4. Gain and Flatness

■ Gain Amplifier Mode

5. To load the calibration data into the module's EPROM, follow the instructions on the computer screen.

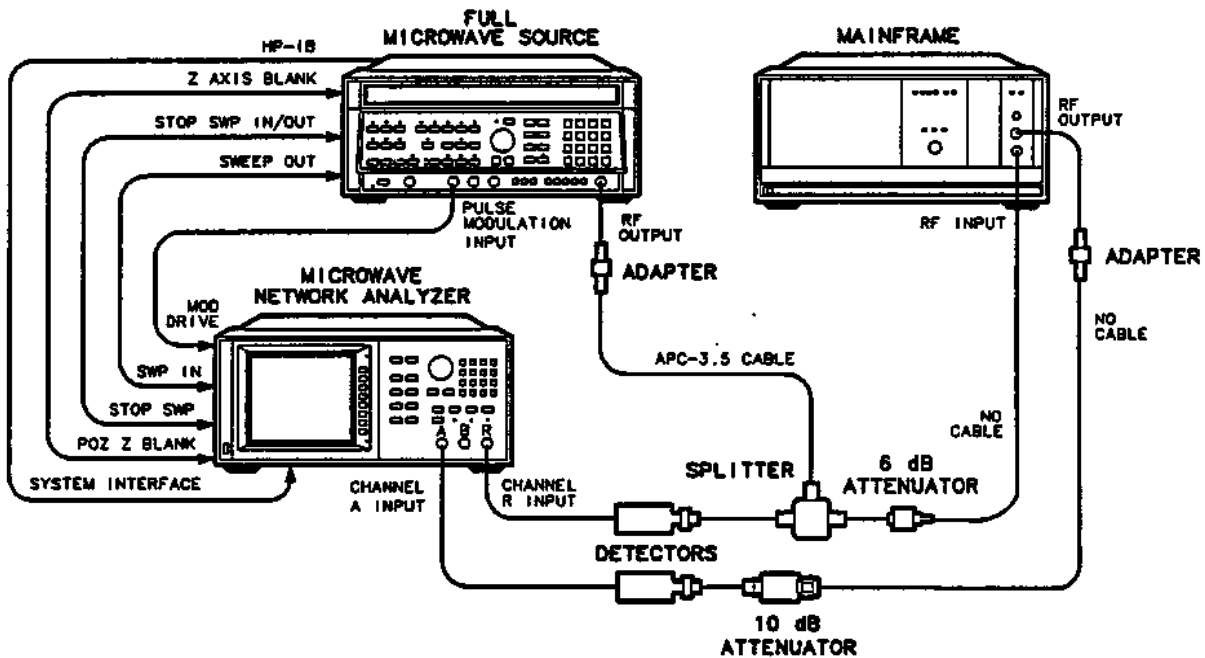|	
Note 👉	Ignore the module's ERR LED at this time. It is on because the module's write/protect switch is set to ENABLED.

Figure 3-10. Loss, Gain, and Flatness Test Setup

5. Noise Figure

Purpose

The low frequency noise figure test measures the preamplifier noise figure of the HP 70621A Preamplifier.

The high frequency noise figure test measures the preamplifier noise figure after first using an external mixer to down-convert the preamplifier output to the input frequency range of the noise figure meter.

These tests are dependent upon program routines that calibrate the entire test setup and the noise figure meter. Test calibration also involves a power meter calibration of the LO amplifier.

This is a final test.

Description

For low frequency noise figure test system calibration, the excess noise source connects to the input of the noise figure meter.

After the calibration routine, the excess noise source connects to the RF INPUT of the preamplifier. The RF OUTPUT of the preamplifier connects to the input of the noise figure meter. Refer to Figure 3-11.

The preamplifiers are tested at the following frequencies.

> **HP 70620B:** 1 GHz to 1.5 GHz in 100 MHz increments and 2 GHz to 26.5 GHz in 500 MHz increments.
> **HP 70620B Option 001:** 10 MHz, 100 MHz to 1.5 GHz in 100 MHz increments, 2.5 GHz to 2.9 GHz in 100 MHz increments (still in RF band), 2.7 GHz (in uW band), and 3 GHz to 26.5 GHz in 500 MHz increments.
> **HP 70621A:** 10 MHz, 100 MHz to 1.5 GHz in 100 MHz increments.

For high frequency noise figure test system calibration, the full microwave source connects to the amplifier input, the amplifier output to the mixer LO port (L). The excess noise source connects to the RF out port (R). The noise figure meter INPUT is connected to the IF port (X).

After the calibration routine, the full microwave source connects to the amplifier input, the amplifier output to the mixer LO port (L). The preamplifier RF OUTPUT connects to the RF out port (R). The noise figure meter INPUT connects to the IF port (X). The excess noise source connects to the preamplifier RF INPUT. Connections to the preamplifier should be direct (no cables). Refer to Figure 3-12.

An instrument preset routine precedes the equipment setup-test. The setup test verifies noise figure and gain measurement at 3 GHz. The program then steps the microwave source and the noise meter from 3 GHz to 26.5 GHz. A routine then compares an array of noise-figure results with the preamplifier test limits.

5. Noise Figure

Equipment

Test Equipment	Preferred HP Model or Part Number
Controller	HP 9000 Series 200/300
HP 70000 Series Mainframe	HP 70001A
Local Oscillator	HP 70900B
Full Microwave Source	HP 8340A
Noise Figure Meter	HP 8970A/B
Amplifier	HP 8449B

Accessories

Excess Noise Source	HP 346C
Mixer	0955-0307

Adapters

Type N (m) to APC-3.5 (f) *(required for HP 70621A only)*	1250-1744
Type N (m) to SMA (f)	1250-1250
APC-3.5 (f) to APC-3.5 (f) *(4 required for HP 70620B)*	5061-5311
SMA (m) to SMA (m) *(required for HP 70621A only)*	1250-1159

Cables

APC-3.5 (m) to APC-3.5 (m) *(3 required)*	8120-4921
BNC (m) to BNC (m)	HP 10503A
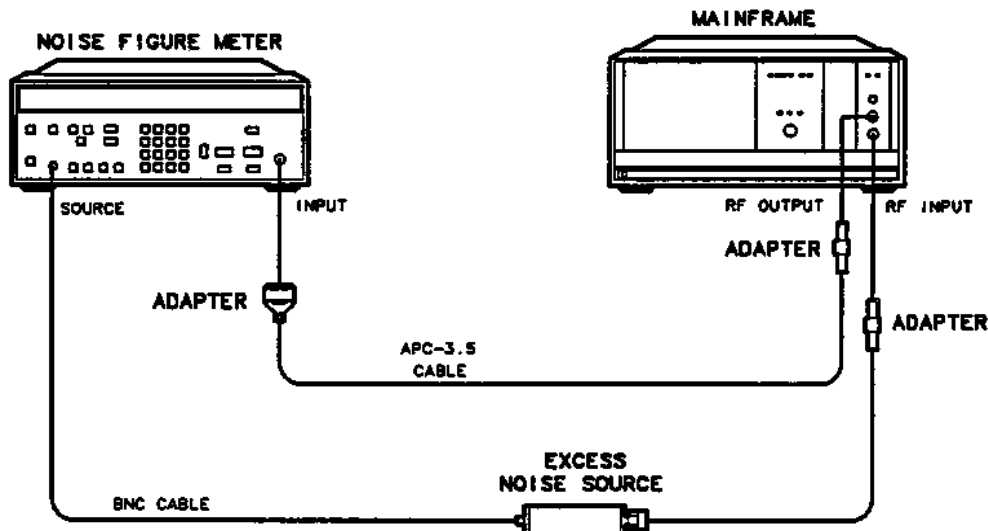
Figure 3-11. Low Frequency Noise Figure Test Setup
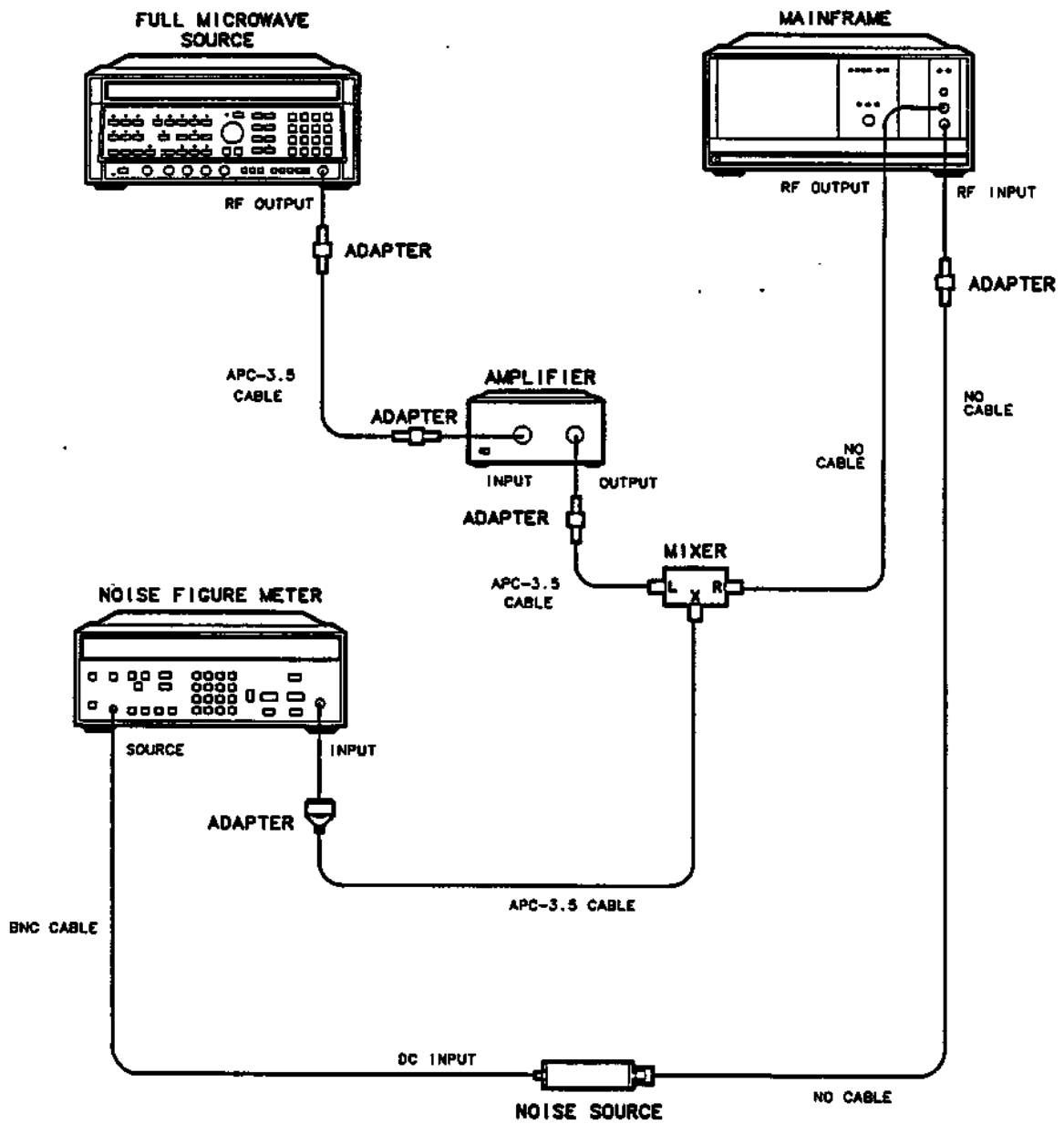
Figure 3-12. High Frequency Noise Figure Test Setup

6. +28 V dc Noise Source Drive Voltage Adjustment

Purpose

This test verifies that the +28 V dc noise source drive voltage is present at the preamplifier front-panel.

This is a final test.

Description

The +28 V dc noise source drive voltage is provided to allow relative noise figure measurements to be performed using a spectrum analyzer.

Equipment

Test Equipment	Preferred HP Model or Part Number
Controller	HP 9000 Series 200/300
HP 70000 Series Mainframe	HP 70001A
Local Oscillator	HP 70900B
Digital Voltmeter	HP 3456A

Adapters
BNC (f) to dual banana plug 1251-2277

Cables
BNC (m) to BNC (m) .... HP 10503A

Procedure

Refer to "Preparing for Adjustments" in this chapter, then connect the equipment as shown in Figure 3-13. Load and run the +28 V routine. Make the adjustments as defined by the computer. Figure 3-14 illustrates the adjustment locations. Refer to Chapter 2, "Verification Software," for detailed information about loading and running the software.
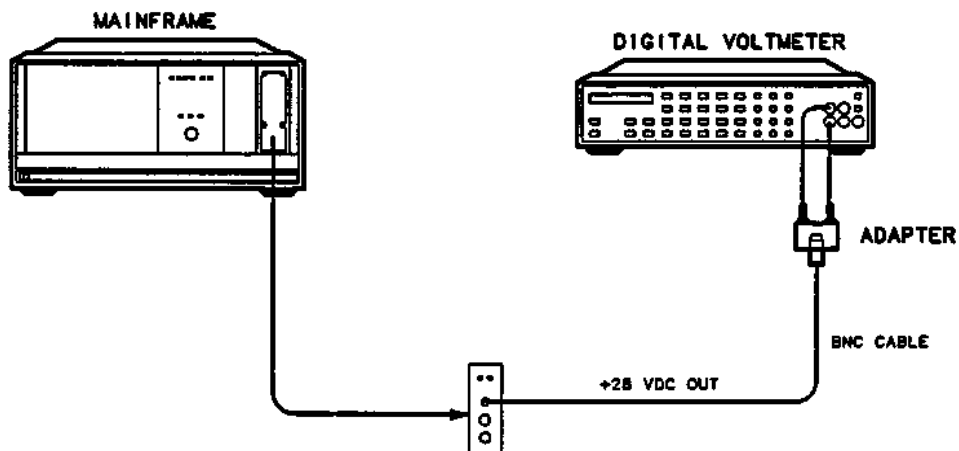
Figure 3-13. +28 V dc Noise Source Drive Test Setup

Figure 3-14. +28 V dc Adjustment Location

7. Front-Panel LED Check

Purpose

This test verifies proper operation of the front-panel active and error LEDs.

This is a final test.

Description

The software alternately turns the module's active and error LEDs on and off while the operator confirms LED operation. The test confirms the ability of the module's internal processor to control the LEDs.

Configure an HP 70900B Local Oscillator and the preamplifier into the HP 70000 system mainframe. Select the test from the software's adjustment list and follow the instructions displayed on the screen.

Note	If a display is configured in the system, press the (DSP) key before running the procedure. (On HP 70206A and HP 70004A displays, press (DISPLAY).)

Equipment

Test Equipment	Preferred HP Model or Part Number
Controller	HP 9000 Series 200/300
HP 70000 Series Mainframe	HP 70001A
Local Oscillator	HP 70900B

8. Diagnostics

Purpose

This procedure tests RF switches for open or shorted solenoids.

This is a final test.

Description

Configure an HP 70900B Local Oscillator and the preamplifier into the HP 70000 system mainframe. Select the test from the software's adjustment list, and follow the instructions displayed on the screen.

Equipment

Test Equipment	Preferred HP Model or Part Number
Controller	HP 9000 Series 200/300
HP 70000 Series Mainframe	HP 70001A
Local Oscillator	HP 70900B

4

Troubleshooting

Introduction

This chapter contains assembly-level troubleshooting information for the HP 70620B and HP 70621A preamplifiers. This chapter contains the following sections:

- Power-Up Problems
- Status Indicators
- Error Codes
- Assembly-Level Troubleshooting
- Rom Replacement
- Wiring Harness Connections

The "Power-Up Problems," "Status Indicators," "Error Codes," and "Assembly-Level Troubleshooting" sections help identify faulty assemblies.

The "ROM Replacement" section tells where the ROM is located and what needs to be done after the ROM is replaced, either by itself or as part of the A2 board assembly.

Tables 4-2 through 4-4 in "Wiring Harness Connections" identify the connections for wiring harness W5.

The module-level block diagram and interconnect diagram are located at the end of this chapter.

Caution	To avoid hardware damage, do not bend or distort any semi-rigid cables. Before removing an assembly, always loosen both ends of any semi-rigid cable that is attached to the assembly.

Note	After repairing the module, perform the Gain and Flatness and the +28 V dc Noise Source Drive Voltage adjustments. Refer to Chapter 3.
	The power levels and voltages given in this chapter are for troubleshooting purposes only.

The parts lists, schematics, and component-location diagrams for the HP 70620B and HP 70621A modules' board assemblies are in the *HP 70620B/HP 70621A Component-Level Information* binder.

Caution	This module contains components that can be damaged or destroyed by electrostatic discharge. It should be serviced only at a static-safe work station. Refer to the electrostatic discharge information in Chapter 1.

Power-Up Problems

Use the following procedure if the module will not complete its power-up sequence, or if it causes the HP 70000 Modular Measurement System to hang up (become unresponsive) when the system is turned on. Refer to Figure 4-1 for items called out in the procedure. The component location and schematic diagram for A2 are in the *HP 70620B/HP 70621A Component-Level Information* binder.

1. Set the mainframe's line switch to OFF, then remove the module.

2. Remove the module's left-side cover.

3. Install a module service extender in the mainframe. (Refer to Table 1-1 in Chapter 1 for the module service extender part number.)

4. Connect the preamplifier module to the module service extender.

5. Set the mainframe's line switch to ON.

6. Measure the voltages on A2 at the locations listed below:

Test Point	Expected Voltage
A2TP3-1	+35 V
A2TP3-3	+6 V
A2TP3-5	+5 V
A2TP3-7	+15 VF
A2TP3-9	−15 V
A2U17 pin 2	+2.5 V

7. If any of the voltages measure at or near 0 V, set the mainframe's line switch to OFF. Then remove the following cables to isolate the A2 assembly from the other module assemblies.

Cable	Connection
W2 (to A1 front panel)	A2J4
W5 (to microcircuits)	A2J5

8. Replace A2F1 if it is blown.

9. Set the mainframe's line switch to ON.

10. Repeat step 6. If the voltages are still low, the A2 assembly is faulty. If the voltages are now correct, one of the other assemblies in the module was loading down the power supply. Isolate the problem by reconnecting the cables, one at a time, until the problem reappears. *Before* reconnecting each cable, set the mainframe's line switch to OFF.
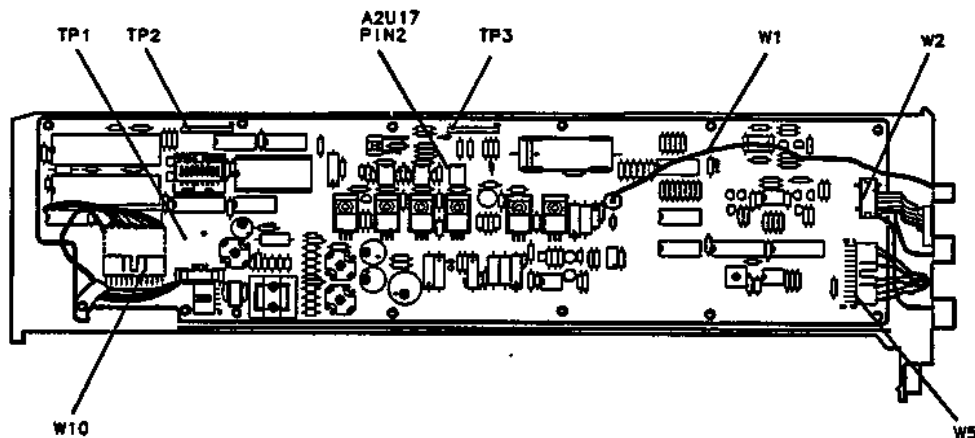
Figure 4-1. A2 Test Points and Cable Connections

Status Indicators

All elements and mainframes have status indicators. Status indicators that inform the operator of a problem are called error indicators. Indicators that tell the user which elements are communicating with a display element are called active indicators.

Error Indicators

The ERR (error) light indicates that the preamplifier has an error condition. Note that both the error light of the preamplifier and its master indicate the error condition. The error lights go out when the error condition no longer exists and it has been reported. Error conditions are reported either by an automatic error reporting routine, or when the operator presses the REPORT ERRORS key of the Display Menu.

An error indicator flashing at a 1 Hz rate indicates that the preamplifier could not communicate on the HP-MSIB at power-up. A flashing error indicator also occurs with other errors that are only present under certain measurement conditions (for example, locking errors when the spectrum analyzer sweeps). In this case, the error indicator flashes at the sweep rate.

Active Indicators

The ACT (active) light of the preamplifier turns on when the preamplifier is being accessed through the display keyboard. If the preamplifier is in self-test mode, the ACT light remains on until the test is completed.

The display letter A (active) turns on when the display menus are accessed with the display key (for example, (DISPLAY) for the HP 70206A or HP 70004A and (DSP) for the HP 70205A). When the display's ASSIGN WINDOW, ADDRESS MAP, and SELECT INSTRUMENT functions are operating, the active indicator turns on for the element that is selected. In all other display functions, the display letter A is on.

The active indicator turns on when the cursor of the display screen Address Map is at the HP-MSIB address of the preamplifier. Therefore, the HP-MSIB address of the preamplifier

may be identified by simply scrolling the cursor through the Address Map and observing the active indicator.

Error Codes

The error codes generated by the HP 70620B and HP 70621A are listed below in numerical order. For a complete list of all system error messages, refer to the Installation and Verification Manual for the system master.

Error Types   **Error Numbers**

Usage/Operating .... 2000 to 2999
Hardware Warning .... 6000 to 6999
Hardware Broken .... 7000 to 7999

Usage/Operating Errors

These errors occur when the instrument is used incorrectly.

2001 Illegal cmd — This error usually occurs in response to a user-generated system protocol error: the module has encountered a command that it does not recognize. This can be caused by the system master's sending such a command. However, if the error is repeated when the module is moved to another mainframe, the most probable cause is a faulty HP 70620B or HP 70621A A2 board assembly.

2002 Illegal parameter — Refer to 2001 Illegal Cmd.

2006 Param out of range — Refer to 2001 Illegal Cmd.

2009 Protocol error — Refer to 2001 Illegal Cmd.

Hardware Warning Errors

These error codes report the status of the preamplifier hardware or indicate that some of the hardware may be broken. Hardware warning errors typically indicate that the measurement accuracy may be impaired.

6000 EAROM unprotected — The module's write-protect switch is set to the write position. If this error occurs when the switch is in the protect position, the most probable cause is a faulty HP 70620B or HP 70621A A2 board assembly. Refer also to "ROM Replacement" in this chapter.

Hardware-Broken Messages

The following error codes are generated in response to hardware or firmware failures within the modules.

7000 ROM Check error — A test of the module's ROM has failed. Replace the ROM (A2U8) or the A2 board assembly. Refer to "ROM Replacement" in this chapter.

Assembly-Level Troubleshooting

The modules have two RF signal paths: amplifier and bypass. During power-down the module automatically switches to the bypass path.

The modules' frequency ranges for the two RF signal paths are given in Table 4-1.

Table 4-1. RF Path Frequency Ranges

Preamplifier	Preamplifier Path	Bypass Path
HP 70620B standard	1 GHz to 26.5 GHz	0 to 26.5 GHz
HP 70620B Option 001	100 kHz to 26.5 GHz	0 to 26.5 GHz
HP 70621A	100 kHz to 2.9 GHz	0 to 2.9 GHz

Note	The following information represents typical performance of the microcircuits or assemblies and in no way represents any warranted performance. This information is to be used in conjunction with the block diagrams found at the end of this chapter.

K1 Transfer Switch for Preamplifier or Bypass Selection

Insertion Loss: < 1.4 dB
Isolation: > 90 dB to 18 GHz; > 50 dB at 26.5 GHz

A4 and A6 High/Low Band Switch

Insertion Loss: < 1.8 dB (1.5 dB typical)

A5 Microwave Amplifier

Gain: > 29 dB
Flatness:
  <±3.2 dB at 1 to 26.5 GHz
  <±2.8 dB at 2 to 22 GHz
  < 2.8 dB at any 1 GHz range
Noise Figure:
  < 7 dB at 1 to 12.7 GHz
  < 10 dB at 12.7 to 22 GHz
  < 12 dB at 22 to 26.5 GHz

A7 RF Amplifier

Gain: > 27 dB
Flatness:
  <±2.2 dB
  < 1.8 dB at any 250 MHz range
Noise Figure: < 5.3 dB

ROM Replacement

The ROM, A2U8, is located on the left side of the module. See Figure 4-2 for parts location. Refer to Chapter 6, "Replaceable Parts" for the ROM part number.

Caution	The ROM is easily damaged or destroyed by electrostatic discharge and should be replaced only at a static-safe work station. Leave the new ROM in its static-safe packaging until right before you install it into the board assembly. Refer to the electrostatic discharge information in Chapter 1.

After A2U8 is replaced, either by itself or as part of the A2 board assembly, the module serial number must be written to the new A2U8. The procedure to do this is included in the HP 70620B/HP 70621A Module Verification software. Use a nonmetallic tool to change the WRITE/PROTECT switch to the WRITE position before running the software procedure. Remember to return the switch to the PROTECT position after running the software procedure. Figure 4-2 shows the location of the WRITE/PROTECT switch.
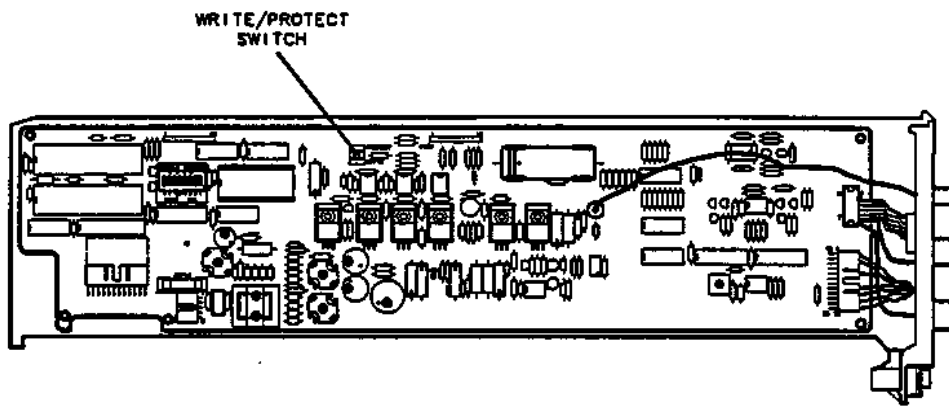
Figure 4-2. WRITE/PROTECT Switch Location

Wiring Harness Connections

Tables 4-2 through 4-4 identify the connections for W5, the wiring harness. Table 4-2 gives the connections for the standard HP 70620B module. Table 4-3 gives the connections for the HP 70620B Option 001 module. Table 4-4 gives the connections for the HP 70621A module. Refer to Chapter 6, "Replaceable Parts," for the wire harness part number.

Table 4-2. W5 Connections in a Standard HP 70620B

W5P1	Wire Color	Description	From	To
pin 1	—	No connection		
pin 2	black	A3 POS 1	A2J5, pin 2	A3, 1
pin 3	brown	+28VS	A2J5, pin 3	A3, C
pin 4	red	A3 POS 2	A2J5, pin 4	A3, 2
pin 5	orange	+6V to A5 Microwave Amplifier	A2J5, pin 5	through W5P2 pin 1 to A5J1, 1
pin 6	yellow	Ground to A5 Microwave Amplifier	A2J5, pin 6	through W5P2 pin 2 to A5J1, 2
pin 7	—	No connection		
pin 8	—	No connection		
pin 9	—	No connection		
pin 10	—	No connection		
pin 11	—	No connection		
pin 12	—	No connection		
pin 13	—	No connection		
pin 14	—	No connection		
pin 15	—	No connection		
pin 16	—	No connection		
pin 17	red	−5V to A7 RF Amplifier	A2J5, pin 17	through W5P4 pin 1 to A7J2, 1
pin 18	—	No connection		
pin 19	—	No connection		
pin 20	—	No connection		
pin 21	—	No connection		
pin 22	—	No connection		
pin 23	—	No connection		
pin 24	—	No connection		

Table 4-3. W5 Connections in an HP 70620B Option 001

W5P1	Wire Color	Description	From	To
pin 1	—	No connection		
pin 2	black	A3 POS 1	A2J5, pin 2	A3, 1
pin 3	brown	+28VS	A2J5, pin 3	A3, C
pin 4	red	A3 POS 2	A2J5, pin 4	A3, 2
pin 5	orange	+6V to A5 Microwave Amplifier	A2J5, pin 5	through W5P2 pin 1 to A5J1, 1
pin 6	yellow	Ground to A5 Microwave Amplifier	A2J5, pin 6	through W5P2 pin 2 to A5J1, 2
pin 7	green	−5V to A5 Microwave Amplifier	A2J5, pin 7	through W5P2 pin 3 to A5J1, 3
pin 8	—	No connection		
pin 9	blue	+15V bipolar bias to A7 RF Amplifier	A2J5, pin 9	through W5P3 pin 1 to A7J1, 1
pin 10	violet	SW-1 to A7 RF Amplifier	A2J5, pin 10	through W5P3 pin 3 to A7J1, 3
pin 11	gray	SW-2 to A7 RF Amplifier	A2J5, pin 11	through W5P3 pin 5 to A7J1, 5
pin 12	—	No connection		
pin 13	—	No connection		
pin 14	white	Input A4 High/Low Band Switch	A2J5, pin 14	through W5P5 pin 1 to A4
pin 15	black	Output A6 High/Low Band Switch	A2J5, pin 15	through W5P6 pin 1 to A6
pin 16	—	No connection		
pin 17	red	−5V to A7 RF Amplifier	A2J5, pin 17	through W5P4 pin 1 to A7J2, 1
pin 18	orange	+5V to A7 RF Amplifier	A2J5, pin 18	through W5P4 pin 3 to A7J2, 3
pin 19	—	No connection		
pin 20	—	No connection		
pin 21	—	No connection		
pin 22	—	No connection		
pin 23	—	No connection		
pin 24	—	No connection		

Table 4-4. W5 Connections in an HP 70621A

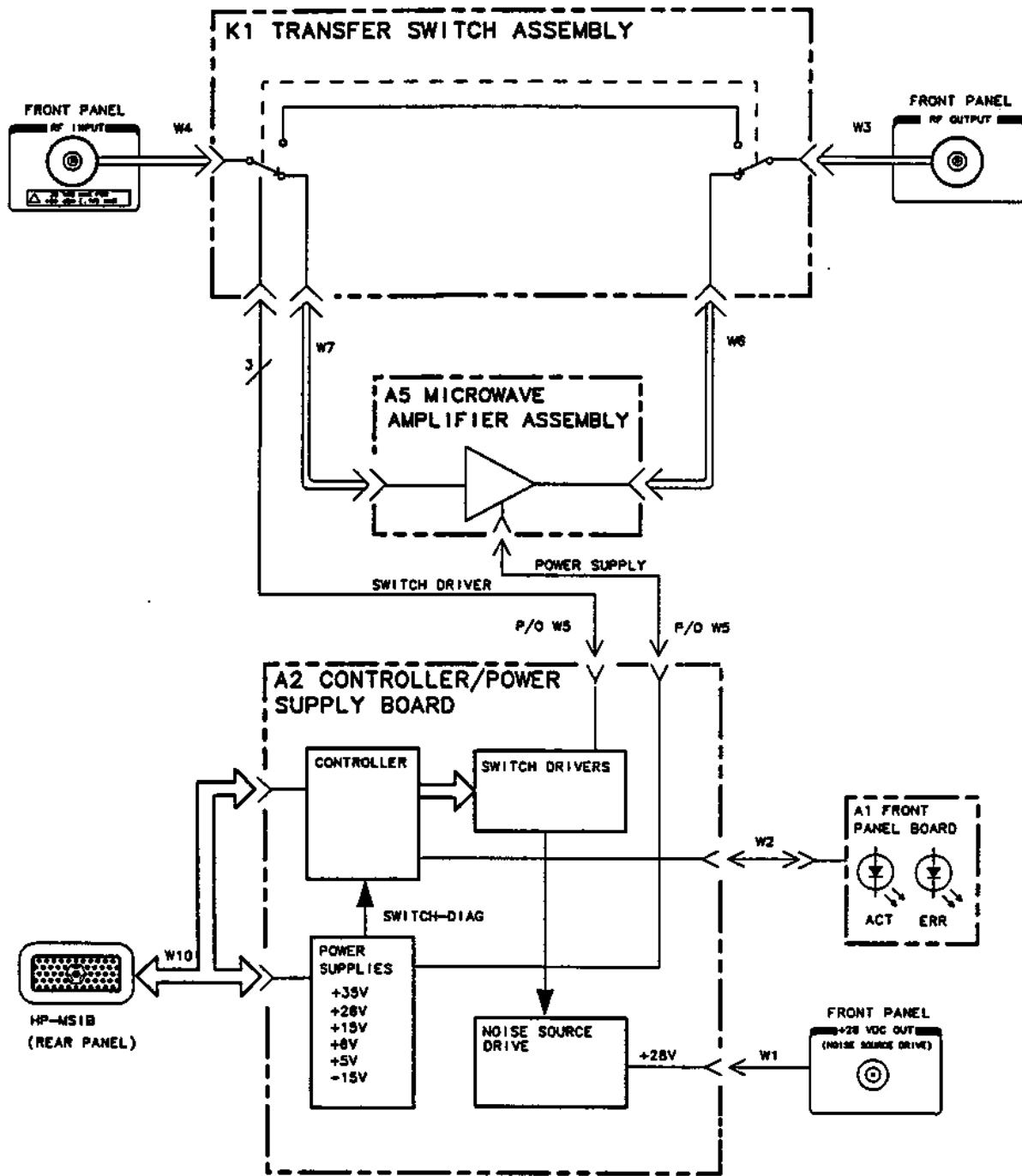| W5P1	Wire Color	Description	From	To
pin 1	—	No connection		
pin 2	black	A3 POS 1	A2J5, pin 2	A3, 1
pin 3	brown	+28VS	A2J5, pin 3	A3, C
pin 4	red	A3 POS 2	A2J5, pin 4	A3, 2
pin 5	—	No connection		
pin 6	—	No connection		
pin 7	—	No connection		
pin 8	—	No connection		
pin 9	blue	+15V bipolar bias to A7 RF Amplifier	A2J5, pin 9	through W5P3 pin 1 to A7J1, 1
pin 10	violet	SW-1 to A7 RF Amplifier	A2J5, pin 10	through W5P3 pin 3 to A7J1, 3
pin 11	gray	SW-2 to A7 RF Amplifier	A2J5, pin 11	through W5P3 pin 5 to A7J1, 5
pin 12	—	No connection		
pin 13	—	No connection		
pin 14	—	No connection		
pin 15	—	No connection		
pin 16	—	No connection		
pin 17	red	−5V to A7 RF Amplifier	A2J5, pin 17	through W5P4 pin 1 to A7J2, 1
pin 18	orange	+5V to A7 RF Amplifier	A2J5, pin 18	through W5P4 pin 3 to A7J2, 3
pin 19	—	No connection		
pin 20	—	No connection		
pin 21	—	No connection		
pin 22	—	No connection		
pin 23	—	No connection		
pin 24	—	No connection		

Figure 4-3. HP 70620B Overall Block Diagram
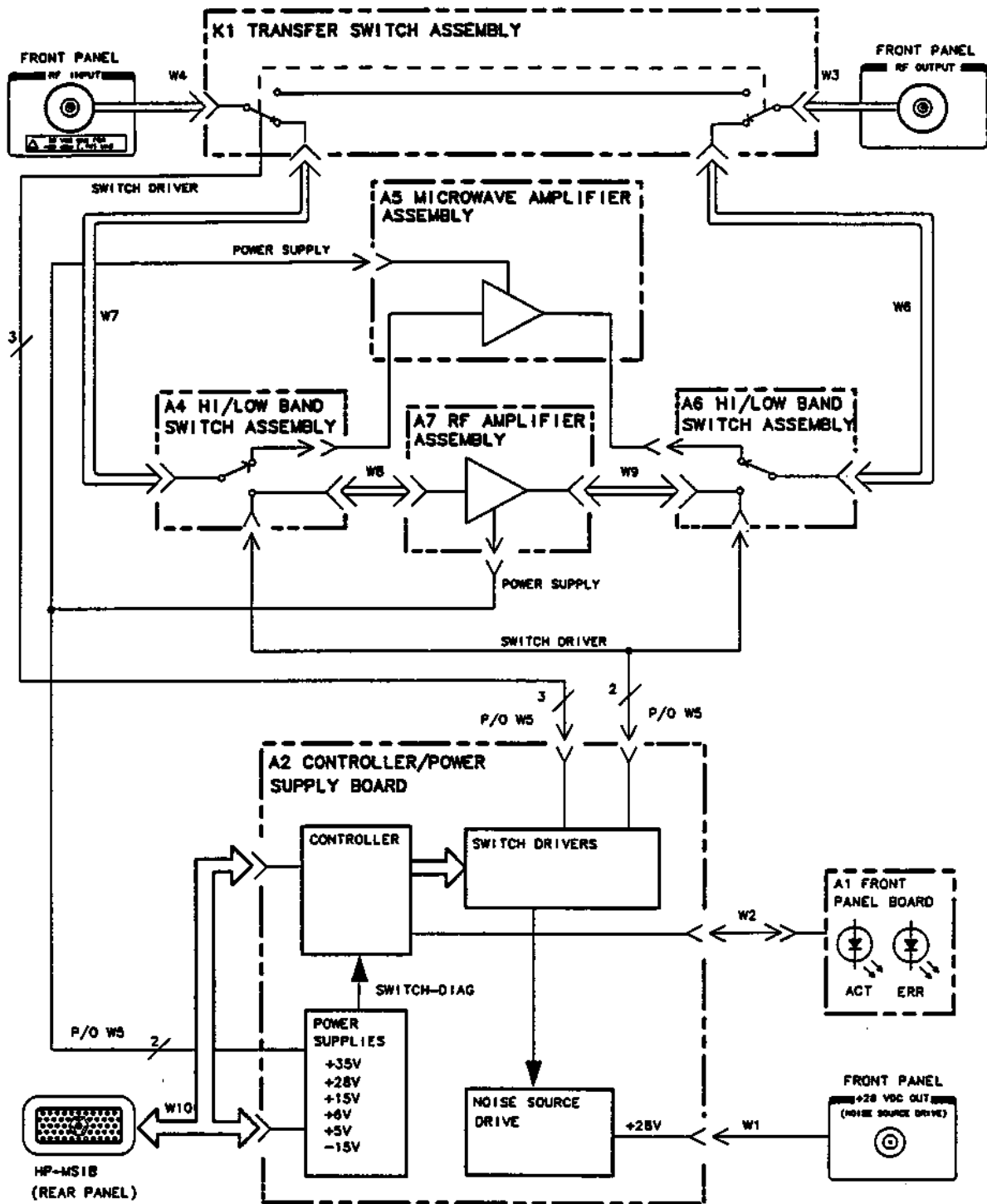
Figure 4-4. HP 70620B Option 001 Overall Block Diagram
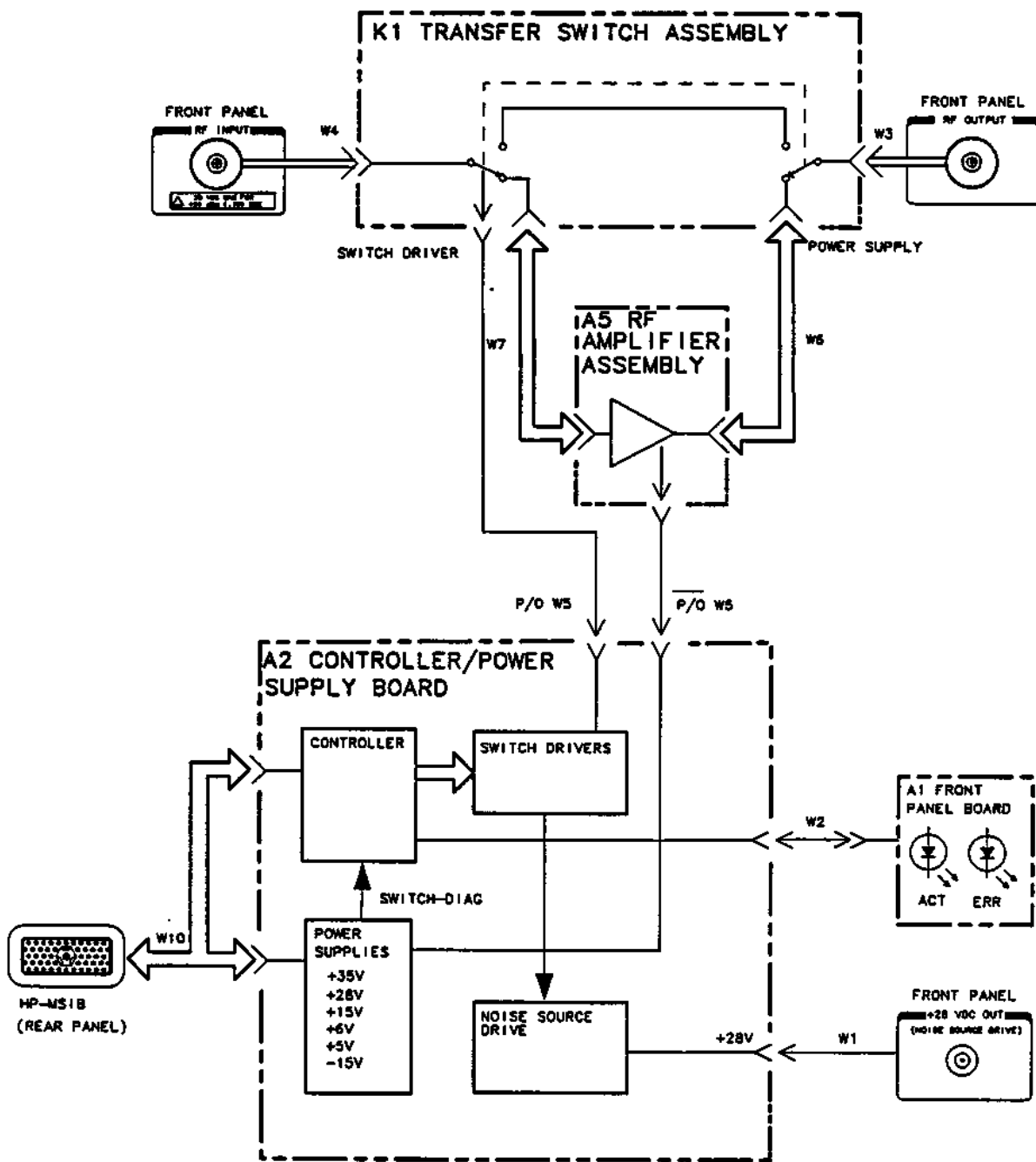
Figure 4-5. HP 70621A Overall Block Diagram

Replacement Procedures

Introduction

This chapter contains information needed to replace the major assemblies in the HP 70620B and HP 70621A preamplifiers. "Hardware Torque Information" applies to all of the assemblies in the module.

Caution	The modules contain assemblies that can be damaged by electrostatic discharge (ESD). Therefore, all work performed on the modules should be done at a static-safe work station. Refer to "Electrostatic Discharge Information" in Chapter 1.
	Some of the hardware in the modules is measured in inches, and some is measured in metric units. Instrument damage can occur if incorrect hardware is used for reassembly of the module. Refer to Chapter 6, "Replaceable Parts," for identification of hardware types.
	The hardware in this module, including cables, can be damaged if too much force is used. Refer to "Hardware Torque Information" below for information needed to avoid hardware damage.
	When replacing any covers or assemblies, make sure not to damage the cables or wire harness.

Hardware Torque Information

Hardware not specified here should be tightened to 6 inch-pounds of torque.

- Front-panel assembly to center body connections: The four screws holding the front-panel assembly to the center body are tightened to 6 inch-pounds of torque.

- Front-panel connectors are attached using 25 inch-pounds of torque.

- Rear-panel assembly to center body connections: The large screw (top of the rear panel) is tightened to 6 inch-pounds of torque. The two small screws (at bottom of the rear panel) are tightened to 6 inch-pounds of torque.

- Mounting brackets to center body connections: The screws holding the RF mounting plate and switch bracket are tightened to 6 inch-pounds of torque.

- Microcircuits to mounting plate: The screws holding the microcircuits are tightened to 6 inch-pounds of torque.

- A2 board assembly to center body: The screws holding A2 are tightened to 6 inch-pounds of torque.

K1 Transfer Switch Assembly Replacement Procedure

Refer to Figure 5-1 while performing this procedure.

Removal

1. Unsolder the black, brown, and red wires from K1.

2. Disconnect the four semi-rigid cables from K1.

3. Remove the two screws ① securing K1 to the RF mounting plate.

Replacement

1. Secure K1 to the RF mounting plate using two screws ①.

2. Connect the four semi-rigid cables.

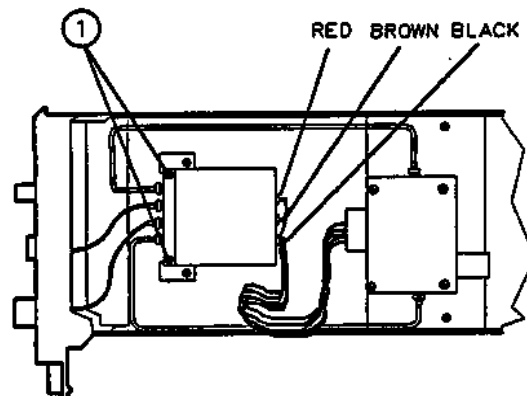3. Solder the three wires to K1 (refer to Figure 5-1 for correct location of each wire).

Figure 5-1. K1 Removal/Replacement

Replaceable Parts

Introduction

This chapter contains information for identifying and ordering replacement assemblies and mechanical parts for the HP 70620B and HP 70621A preamplifiers. (Assembly location information is given in Chapter 7.) Included in this chapter are the following tables and figures:

- Table 6-1 lists reference designations, abbreviations, and value multipliers used in the parts lists.

- Tables 6-2 and 6-3 list all major and cable assemblies by reference designation. Table 6-2 identifies HP 70620B assemblies and Table 6-3 identifies HP 70621A assemblies. These tables also identify the individual component-level information packet (CLIP) that documents each board assembly that has field-replaceable lower-level parts.

- Figures 6-1 through 6-8 contain illustrations of the module with a listing of the chassis mechanical parts that are identified in each figure.

Component-Level Information Packets

Parts lists, schematics, and component-location diagrams for the board assemblies that have field-replaceable lower level parts are available in the *HP 70620B/HP 70621A Component-Level Information* binder. This set contains a separate CLIP for each board assembly or board assembly version. Each individual CLIP can be ordered separately, or as part of the current CLIP set. The current CLIP set contains only those CLIPs that support the latest version of instrument assemblies and can be ordered using HP part number 70620-90026.

Note	CLIPs may not be available for recently introduced assemblies.

CLIPs are packaged in protective plastic envelopes. To use and store your CLIPs effectively, the following accessories are available:

    1-1/2 inch CLIP binder (for fewer than 15 packets) ... HP part number 9282-1132
    2 inch CLIP binder (for 15 to 25 packets) .... HP part number 9282-1133
    2-1/2 inch CLIP binder (for 25 to 30 packets) .... HP part number 9282-1134

Exchange Assemblies

The part numbers for any available rebuilt assemblies that may be replaced on an exchange basis are included in Tables 6-2 and 6-3. Exchange assemblies (factory repaired and tested) are available only on a trade-in basis when the defective assemblies are returned for credit. User spare-parts stock must be ordered by the new assembly part number.

Table and Parts Identification Formats

Major and Cable Assembly Table Format

Tables 6-2 and 6-3 give the following information for each assembly:

1. Assembly reference designation (Ref Des).
2. Hewlett-Packard part number for the assembly.
3. Description of the part.
4. Hewlett-Packard part number for the CLIP that documents the assembly. If the assembly does not have a CLIP, "n/a" is listed in this column.

Parts Identification Format

Figures 6-1 through 6-8 give the following information for the parts identified in each figure:

1. Item number of callout in figure.
2. Hewlett-Packard part number.
3. Total quantity (Qty) in the view shown.
4. Description of the part.

Ordering Information

To order an assembly or mechanical part listed in this chapter, quote the Hewlett-Packard part number and indicate the quantity required.

To order a part that is *not* listed, include the following information with the order:

- Module model number.
- Module serial number.
- Part description, including the following information:
  - where part is located.
  - what part looks like.
  - what function part serves (if known).
- Quantity needed.

Parts can be ordered by addressing the order to the nearest Hewlett-Packard office. Customers within the USA can also use either the direct mail-order system, or the direct phone-order system described below. The direct phone-order system has a toll-free phone number available.

Direct Mail-Order System

Within the USA, Hewlett-Packard can supply parts through a direct mail-order system. Advantages of using the system are as follows:

- Direct ordering and shipment from Hewlett-Packard.

- No maximum or minimum on any mail order. (There is a minimum order amount for parts ordered through a local HP office when the orders require billing and invoicing.)

- Prepaid transportation. (There is a small handling charge for each order.)

- No invoices.

To provide these advantages, a check or money order must accompany each order. Mail-order forms and specific ordering information are available through your local HP office.

Direct Phone-Order System

Within the USA, a phone order system is available for regular and hotline replacement parts service. Mastercard and Visa are accepted.

Regular Orders

The toll-free phone number, (800) 227-8164, is available Monday through Friday, 6 AM to 5 PM (Pacific time). Regular orders have a four-day delivery time.

Hotline Orders

Hotline service is available 24 hours a day, 365 days a year for emergency parts ordering. The toll-free phone number, (800) 227-8164, is available Monday through Friday, 6 AM to 5 PM (Pacific time). After-hours and on holidays, call (415) 968-2347.

To cover the cost of freight and special handing, there is an additional hotline charge on each order (three line items maximum per order). Hotline orders are normally delivered the next business day after they are ordered.

REFERENCE DESIGNATIONS		
A Assembly	F Fuse	RT Thermistor
AT Attenuator, Isolator,	FL Filter	S Switch
Limiter, Termination	HY Circulator	T Transformer
B Fan, Motor	J Electrical Connector	TB Terminal Board
BT Battery	(Stationary Portion),	TC Thermocouple
C Capacitor	Jack	TP Test Point
CP Coupler	K Relay	U Integrated Circuit,
CR Diode, Diode	L Coil, Inductor	Microcircuit
Thyristor, Step	M Meter	V Electron Tube
Recovery Diode,	MP Miscellaneous	VR Breakdown Diode
Varactor	Mechanical Part	(Zener),
DC Directional Coupler	P Electrical Connector	Voltage Regulator
DL Delay Line	(Movable Portion),	W Cable, Wire, Jumper
DS Annunciator, Lamp,	Plug	X Socket
Light Emitting	Q Silicon Controlled	Y Crystal Unit
Diode (LED),	Rectifier (SCR),	(Piezoelectric,
Signaling Device	Transistor,	Quartz)
(Visible)	Triode Thyristor	Z Tuned Cavity,
E Miscellaneous Electrical Part	R Resistor	Tuned Circuit

ABBREVIATIONS		
A	BSC Basic	CNDCT Conducting,
	BTN Button	Conductive,
A Across Flats, Acrylic,		Conductivity,
Air (Dry Method),	**C**	Conductor
Ampere		CONT Contact,
ADJ Adjust, Adjustment	C Capacitance,	Continuous,
ANSI American National	Capacitor,	Control,
Standards Institute	Center Tapped,	Controller
(formerly	Cermet, Cold,	CONV Converter
USASI-ASA)	Compression	CPRSN Compression
ASSY Assembly	CCP Carbon Composition	CUP-PT Cup Point
AWG American Wire Gage	Plastic	CW Clockwise,
	CD Cadmium, Card,	Continuous Wave
B	Cord	
	CER Ceramic	
BCD Binary Coded	CHAM Chamfer	
Decimal	CHAR Character,	**D**
BD Board, Bundle	Characteristic,	
BE-CU Beryllium Copper	Charcoal	D Deep, Depletion,
BNC Type of Connector	CMOS Complementary	Depth, Diameter,
BRG Bearing, Boring	Metal Oxide	Direct Current
BRS Brass	Semiconductor	DA Darlington

ABBREVIATIONS					
DAP-GL	Diallyl Phthalate Glass	FT	Current Gain Bandwidth Product (Transition Frequency), Feet, Foot	JFET	Junction Field Effect Transistor
DBL	Double				
DCDR	Decoder			**K**	
DEG	Degree				
D-HOLE	D-Shaped Hole	FXD	Fixed	K	Kelvin, Key, Kilo, Potassium
DIA	Diameter				
DIP	Dual In-Line Package	**G**		KNRLD	Knurled
DIP-SLDR	Dip Solder			KVDC	Kilovolts Direct Current
D-MODE	Depletion Mode	GEN	General, Generator		
DO	Package Type Designation	GND	Ground		
		GP	General Purpose, Group	**L**	
DP	Deep, Depth, Diametric Pitch, Dip			LED	Light Emitting Diode
DP3T	Double Pole Three Throw	**H**		LG	Length, Long
DPDT	Double Pole Double Throw	H	Henry, High	LIN	Linear, Linearity
		HDW	Hardware	LK	Link, Lock
DWL	Dowell	HEX	Hexadecimal, Hexagon, Hexagonal	LKG	Leakage, Locking
				LUM	Luminous
E		HLCL	Helical		
E-R	E-Ring	HP	Hewlett-Packard Company, High Pass	**M**	
EXT	Extended, Extension, External, Extinguish			M	Male, Maximum, Mega, Mil, Milli, Mode
		I			
F		IC	Collector Current, Integrated Circuit	MA	Milliampere
F	Fahrenheit, Farad, Female, Film (Resistor), Fixed, Flange, Frequency			MACH	Machined
		ID	Identification, Inside Diameter	MAX	Maximum
				MC	Molded Carbon Composition
FC	Carbon Film/ Composition, Edge of Cutoff Frequency, Face	IF	Forward Current, Intermediate Frequency	MET	Metal, Metallized
				MHZ	Megahertz
		IN	Inch	MINTR	Miniature
		INCL	Including	MIT	Miter
FDTHRU	Feedthrough	INT	Integral, Intensity, Internal	MLD	Mold, Molded
FEM	Female			MM	Magnetized Material, Millimeter
FIL-HD	Fillister Head				
FL	Flash, Flat, Fluid	**J**		MOM	Momentary
FLAT-PT	Flat Point			MTG	Mounting
FR	Front	J-FET	Junction Field Effect Transistor	MTLC	Metallic
FREQ	Frequency			MW	Milliwatt

ABBREVIATIONS					
N		PLSTC	Plastic	SMA	Subminiature,
		PNL	Panel		A Type (Threaded
N	Nano, None	PNP	Positive Negative		Connector)
N-CHAN	N-Channel		Positive (Transistor)	SMB	Subminiature,
NH	Nanohenry	POLYC	Polycarbonate		B Type (Slip-on
NM	Nanometer,	POLYE	Polyester		Connector)
	Nonmetallic	POT	Potentiometer	SMC	Subminiature,
NO	Normally Open,	POZI	Pozidriv Recess		C-Type (Threaded
	Number	PREC	Precision		Connector)
NOM	Nominal	PRP	Purple, Purpose	SPCG	Spacing
NPN	Negative Positive	PSTN	Piston	SPDT	Single Pole
	Negative (Transistor)	PT	Part, Point,		Double Throw
NS	Nanosecond,		Pulse Time	SPST	Single Pole
	Non-Shorting, Nose	PW	Pulse Width		Single Throw
NUM	Numeric			SQ	Square
NYL	Nylon (Polyamide)			SST	Stainless Steel
			Q	STL	Steel
	O			SUBMIN	Subminiature
		Q	Figure of Merit	SZ	Size
OA	Over-All				
OD	Outside Diameter		**R**		
OP AMP	Operational				
	Amplifier	R	Range, Red,		**T**
OPT	Optical, Option,		Resistance, Resistor,		
	Optional		Right, Ring	T	Teeth,
		REF	Reference		Temperature,
	P	RES	Resistance, Resistor		Thickness, Time,
		RF	Radio Frequency		Timed, Tooth,
PA	Picoampere, Power	RGD	Rigid		Typical
	Amplifier	RND	Round	TA	Ambient
PAN-HD	Pan Head	RR	Rear		Temperature,
PAR	Parallel, Parity	RVT	Rivet, Riveted		Tantalum
PB	Lead (Metal),			TC	Temperature
	Pushbutton		**S**		Coefficient
PC	Printed Circuit			THD	Thread, Threaded
PCB	Printed Circuit	SAWR	Surface Acoustic	THK	Thick
	Board		Wave Resonator	TO	Package Type
P-CHAN	P-Channel	SEG	Segment		Designation
PD	Pad, Power	SGL	Single	TPG	Tapping
	Dissipation	SI	Silicon,	TR-HD	Truss Head
PF	Picofarad, Power		Square Inch	TRMR	Trimmer
	Factor	SL	Slide, Slow	TRN	Turn, Turns
PKG	Package	SLT	Slot, Slotted	TRSN	Torsion

ABBREVIATIONS					
	U	VAR	Variable		**Y**
		VDC	Volts—Direct Current		
UCD	Microcandela			YIG	Yttrium-Iron-
UF	Microfarad				Garnet
UH	Microhenry		**W**		
UL	Microliter,				
	Underwriters'	W	Watt, Wattage,		**Z**
	Laboratories, Inc.		White, Wide, Width		
UNHDND	Unhardened	W/SW	With Switch	ZNR	Zener
		WW	Wire Wound		
	V				
			X		
V	Variable, Violet,				
	Volt, Voltage	X	By (Used with		
VAC	Vacuum, Volts—		Dimensions),		
	Alternating Current		Reactance		

MULTIPLIERS					
Abbreviation	Prefix	Multiple	Abbreviation	Prefix	Multiple
T	tera	10^{12}	m	milli	10^{-3}
G	giga	10^{9}	μ	micro	10^{-6}
M	mega	10^{6}	n	nano	10^{-9}
k	kilo	10^{3}	p	pico	10^{-12}
da	deka	10	f	femto	10^{-15}
d	deci	10^{-1}	a	atto	10^{-18}
c	centi	10^{-2}			

Table 6-2. HP 70620B Assemblies

Ref Des	Assembly HP Part Number	Description	CLIP HP Part Number
A1	70620-60101	Front Panel Board Assembly	70620-90029
A2	70620-60100	Controller/Power Supply Board Assembly	70620-90028
	70620-69100*	Rebuilt Controller/Power Supply Board Assembly	70620-90028
A2F1	2110-0700	Fuse 1 A 250 V	n/a
A2U8	70620-80029	Programmed EPROM	n/a
A3	Not Assigned		
A4[†]	5086-7857	Hi/Low Band Switch Assembly	n/a
A5	5086-7805	Microwave Amplifier Assembly	n/a
A6[†]	5086-7857	Hi/Low Band Switch Assembly	n/a
A7[†]	5086-7856	RF Amplifier Assembly	n/a
K1	33312C or	Transfer Switch Assembly	n/a
	33312-60002		
W1	8120-5027	+28 Vdc Cable Assembly (includes front-panel conn)	n/a
W2	70904-60017	Front Panel Ribbon Cable Assembly	n/a
W3	70620-20107	RF OUTPUT (to K1) Cable Assembly	n/a
W4	70620-20104	RF INPUT (to K1) Cable Assembly	n/a
W5	70620-60112	Wiring Harness Assembly	n/a
W6	70620-20113[‡]	A5 to Transfer Switch Cable Assembly	n/a
	70620-20106[†]	A6 to Transfer Switch Cable Assembly	n/a
W7	70620-20112[‡]	Transfer Switch to A5 Cable Assembly	n/a
	70620-20105[†]	Transfer Switch to A4 Cable Assembly	n/a
W8[†]	70620-20108	A4 to RF Amplifier Cable Assembly	n/a
W9[†]	70620-20109	RF Amplifier to A6 Cable Assembly	n/a
W10	70620-60111	HP-MSIB Cable Assembly	n/a

*Refer to "Exchange Assemblies" earlier in this chapter.
[†]Used only in HP 70620B Option 001.
[‡]Not used in HP 70620B Option 001.

Table 6-3. HP 70621A Assemblies

Ref Des	Assembly HP Part Number	Description	CLIP HP Part Number
A1	70620-60101	Front Panel Board Assembly	70620-90029
A2	70620-60100	Controller/Power Supply Board Assembly	70620-90028
	70620-69100*	Rebuilt Controller/Power Supply Board Assembly	70620-90028
A2F1	2110-0700	Fuse 1 A 250 V	n/a
A2U8	70620-80029	Programmed EPROM	n/a
A3	Not Assigned		
A4	Not Assigned		
A5	5086-7856	RF Amplifier Assembly	n/a
K1	33312A or 33312-60001	Transfer Switch Assembly	n/a
W1	8120-5027	+28 Vdc Cable Assembly (includes front-panel conn)	n/a
W2	70904-60017	Front Panel Ribbon Cable Assembly	n/a
W3	70621-20002	RF OUTPUT to K1 Cable Assembly	n/a
W4	70621-20001	RF INPUT to K1 Cable Assembly	n/a
W5	70621-60001	Wiring Harness Assembly	n/a
W6	70621-20004	A5 to K1 Transfer Switch Cable Assembly	n/a
W7	70621-20003	K1 to A5 RF Amplifier Cable Assembly	n/a
W8	Not Assigned		
W9	Not Assigned		
W10	70620-60111	HP-MSIB Cable Assembly	n/a

*Refer to "Exchange Assemblies" earlier in this chapter.

RIGHT SIDE COVER
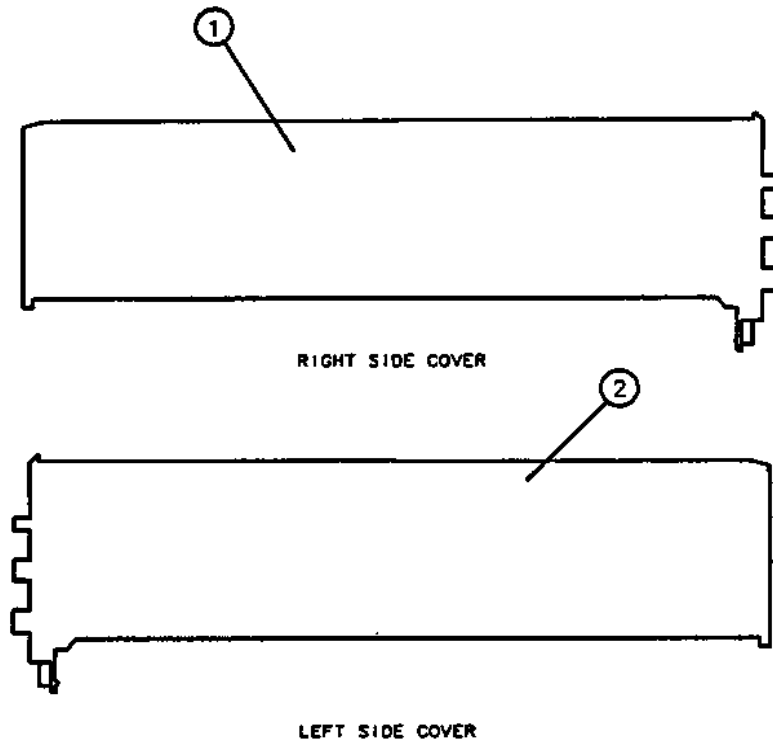
LEFT SIDE COVER

Item	HP Part Number	Qty	Description
1	5001-5839	1	Cover-Right
2	70620-00003	1	Cover-Left

Figure 6-1. HP 70620B and HP 70621A Module Parts ID, Side Covers

(2 PLACES)

①

TOP VIEW

(2 PLACES)

① ·
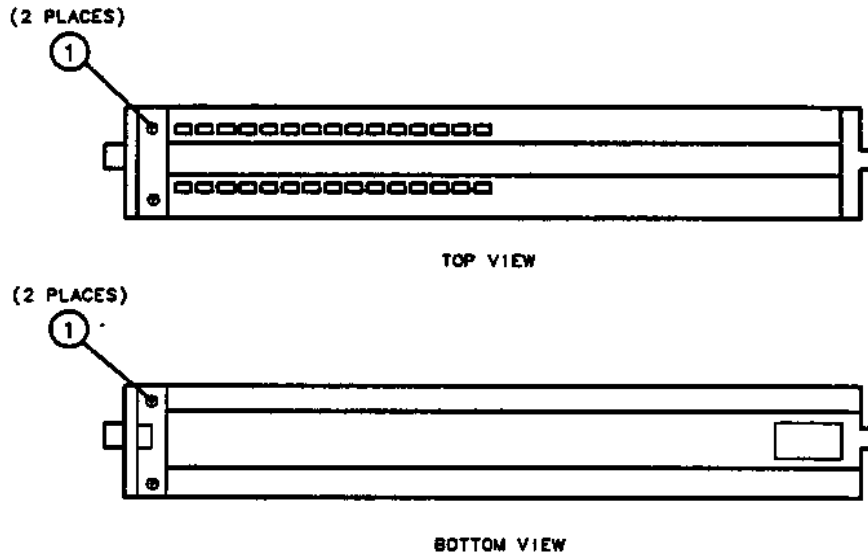
BOTTOM VIEW

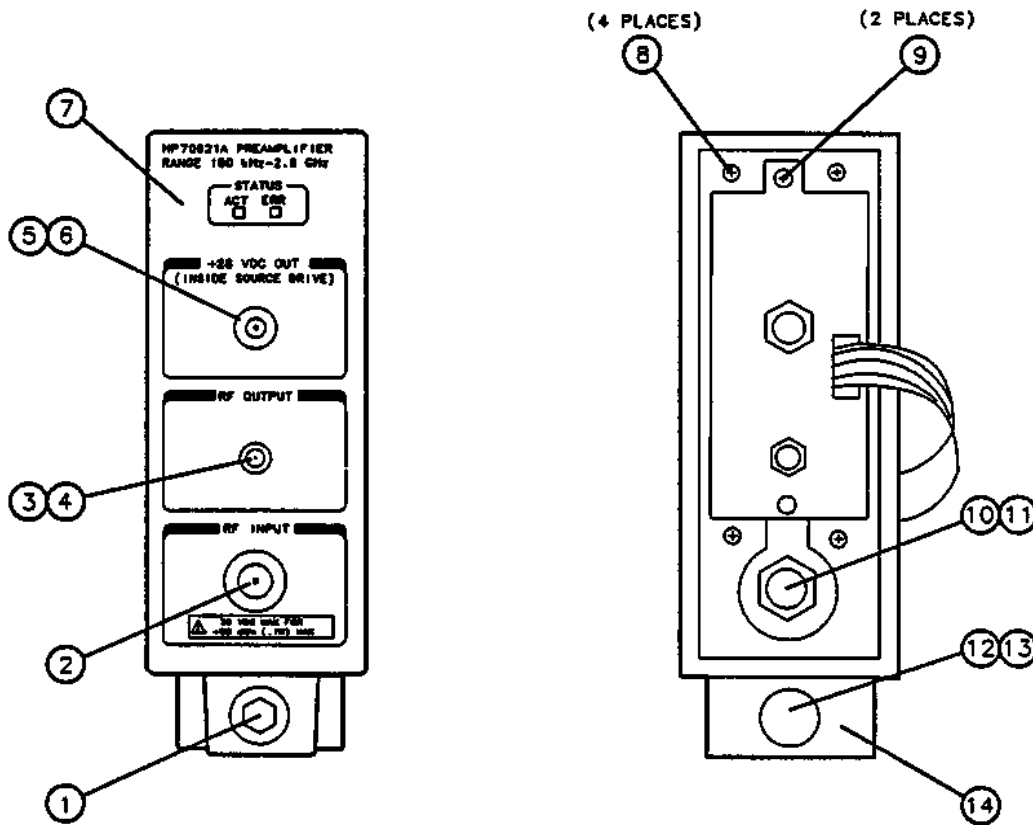| Item	HP Part Number	Qty	Description
1	0515-1459	4	Screw-Mach M3 X 0.50 8MM LG 90-DEG FL PD HD

Figure 6-2.
HP 70620B and HP 70621A Module Parts ID, Top and Bottom Views
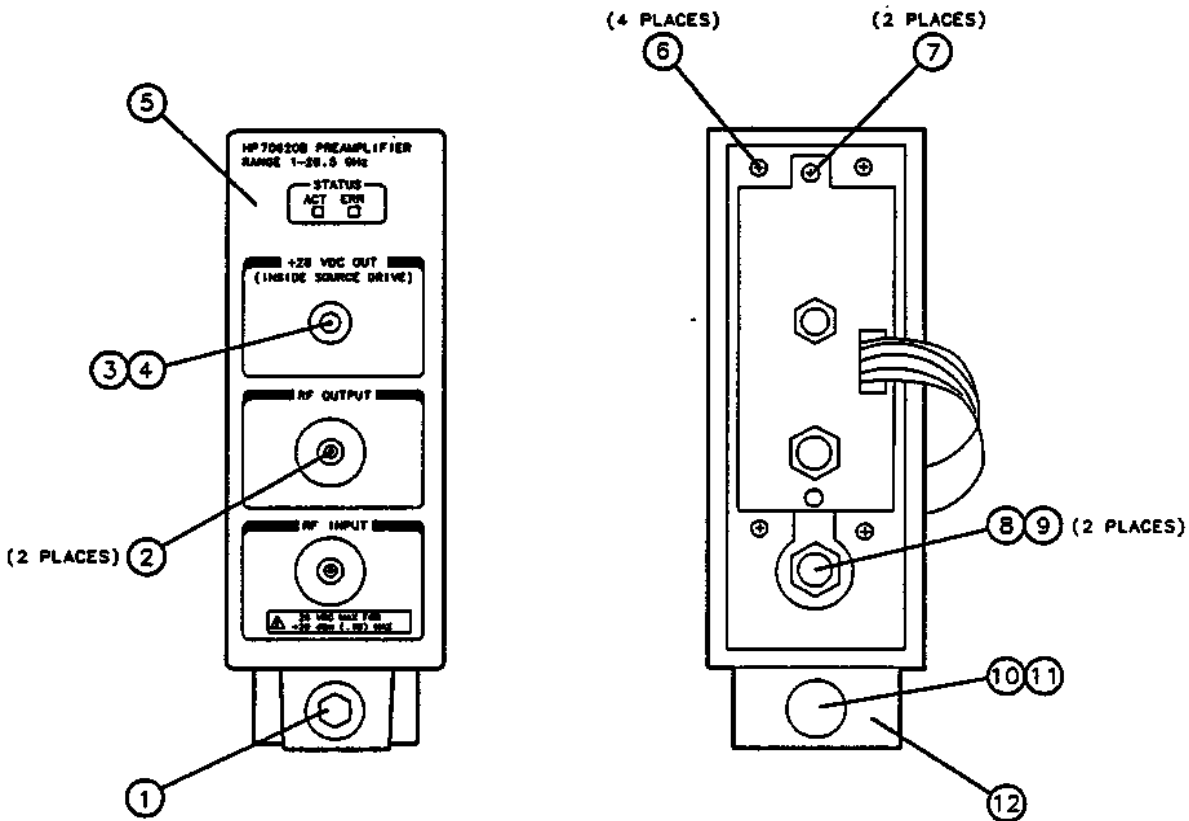
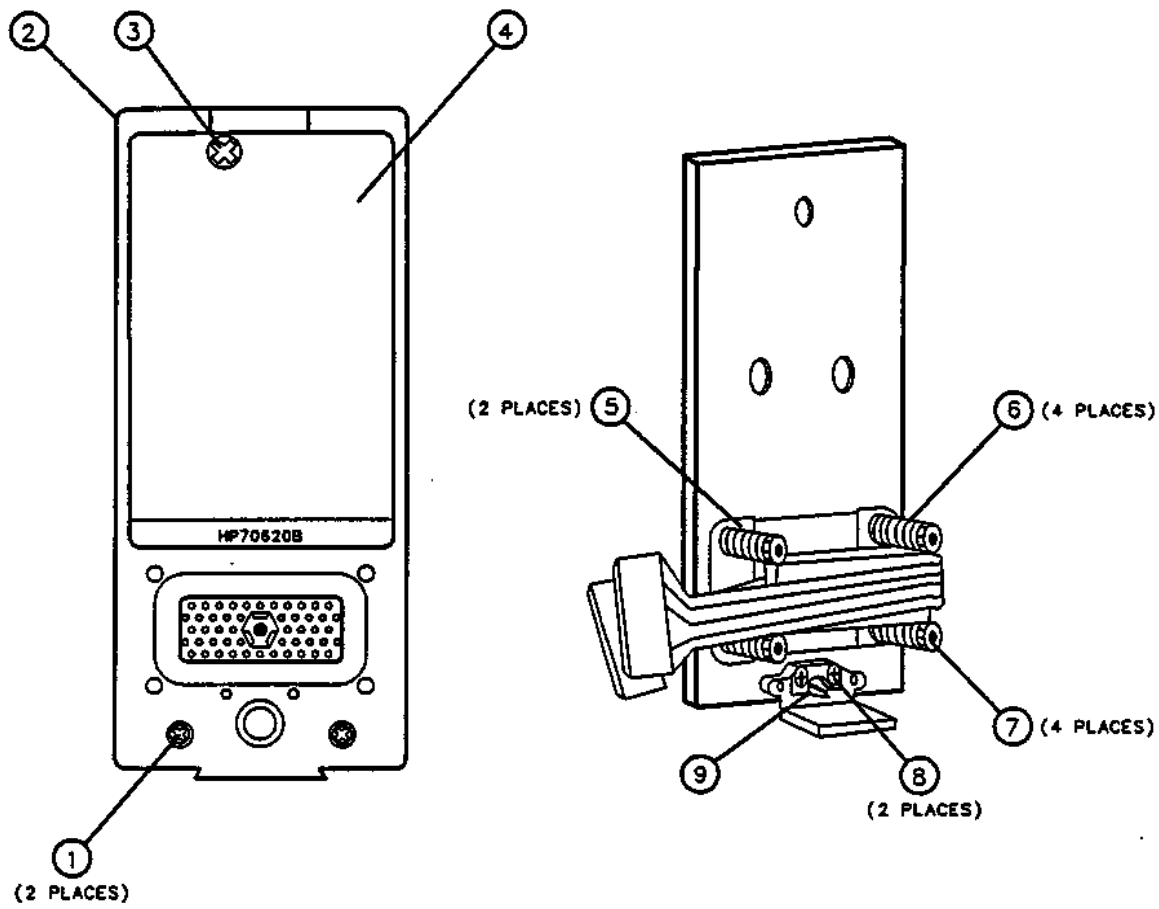| Item	HP Part Number	Qty	Description
1	5021-3290	1	Latch
2	08673-60040	2	Adapter-APC 3.5 (m)
3	2190-0104	1	Washer-Clip .439ID
4	0590-1251	1	Nut-Hex 15/32-32
5	70620-00105*	1	Panel-Front
	70620-00101†	1	Panel-Front
6	0535-0082	4	Nut-Hex M4
7	0515-0866	2	Screw-Mach M3.0 8CWPNPDS
8	2190-0016	2	Washer-Lock .377ID
9	2950-0001	2	Nut-Hex 3/8-32
10	0510-1244	1	Retainer Ring 10.5MMOD
11	0900-0012	1	O Ring 0.364ID
12	70620-20102	1	Frame-Front

*Not used in HP 70620B Option 001.
†Used in HP 70620B Option 001 only.

Figure 6-3. HP 70620B Module Parts ID, Front View

Figure 6-4. HP 70621A Module Parts ID, Front View

Item	HP Part Number	Qty	Description
1	5021-3290	1	Latch
2	08559-60002	1	Adapter-Type N (f)
3	2190-0761	1	Washer-Flat .250ID12
4	1250-1666	1	Adapter-SMA (f) (includes washer and nut)
5	2190-0104	1	Washer-Clip .439ID
6	0590-1251	1	Nut-Hex 15/32-32
7	70620-00001	1	Panel-Front
8	0535-0082	4	Nut-Hex M4.0
9	0515-0866	2	Screw-Mach M3.0 8CWPNPDS
10	2190-0681	1	Washer-Lock EXT T
11	2950-0214	1	Nut-Hex 7 16-28
12	0900-0012	1	O Ring 0.364ID
13	0510-1244	1	Retainer Ring 10.5MMOD
14	70904-20029	1	Frame-Front

Item	HP Part Number	Qty	Description
1	0515-1079	2	Screw-M3.0 8SEMPNPD
2	70600-20004	1	Frame-Rear
3	0515-0866	1	Screw-M3.0 8CWPNPDS
4	70620-80025*	1	Label-Rear Panel HP 70620B
	70620-80030†	1	Label-Rear Panel HP 70620B Option 001
	70621-80001‡	1	Label-Rear Panel HP 70621A
5	5001-5835	2	Bar-Connector
6	1460-2095	4	Spring-CPR 5.49MMOD
7	0535-0042	4	Nut-Plastic Lock M3.0S
8	0515-1717	2	Screw-M2.5 6SEMPNPD (hold grounding spring)
9	5001-5840	1	Spring-Grounding

*Not used in HP 70620B Option 001, or HP 70621A.
†Used in HP 70620B Option 001 only.
‡Used in HP 70621A only.

Figure 6-5. HP 70620B and HP 70621A Module Parts ID, Rear View
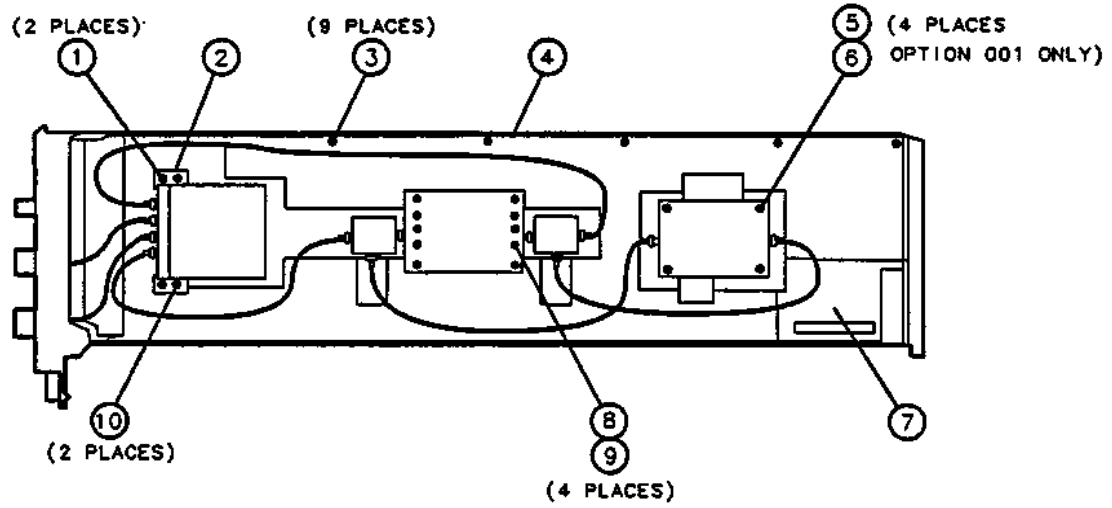
THE HP 70620B OPTION 001 IS SHOWN ABOVE

Item	HP Part Number	Qty	Description
1	0515-1778	2	Screw-M2.5 20SEMPNPD
2	70620-00104	1	Bracket-Switch Mounting
3	0515-0866	9	Screw-M3.0 8CWPNPDS
4	70620-20103	1	Plate-RF Mounting
5*	3050-0890	4	Washer-Flat M2.5ID
6*	0515-1776	4	Screw-M3.0 16SEMPNPD
7	70620-20111	1	Center Body
8	3050-0891	4	Washer-Flat M3.0ID
9	0515-1451	4	Screw-M3.0 16SEMPNPD
10	0515-0866	2	Screw-M3.0 8CWPNPDS
*Used in HP 70620B Option 001 only.			

Figure 6-6. HP 70620B Module Parts ID, Right-Side View
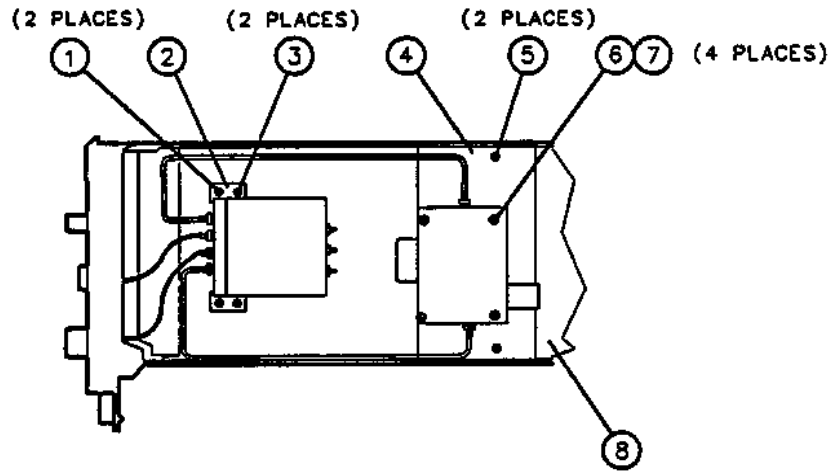
(2 PLACES)   (2 PLACES)   (2 PLACES)

① ② ③ ④ ⑤ ⑥⑦ (4 PLACES)

⑧

Item	HP Part Number	Qty	Description
1	0515-1778	2	Screw-M2.5 20SEMPNPD
2	70620-00104	1	Bracket-Amplifier/Switch Mounting
3	0515-0866	2	Screw-M3.0 8CWPNPDS
4	70621-20005	1	Plate-Mounting
5	0515-0866	2	Screw-M3.0 8CWPNPDS
6	3050-0890	4	Washer-Flat
7	0515-1776	4	Screw-M2.5 16SEMPNPD
8	70620-20111	1	Center Body

Figure 6-7. HP 70621A Module Parts ID, Right-Side View
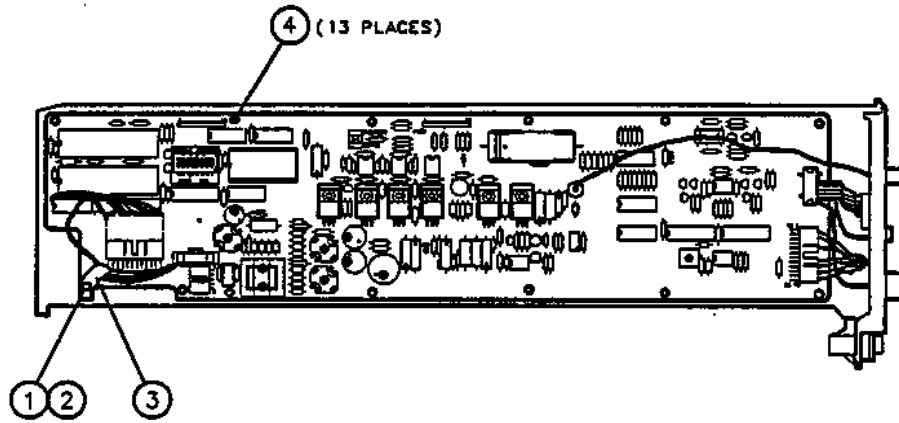
Item	HP Part Number	Qty	Description
1	0515-0866	1	Screw-M3.0 8CWPNPDS
2	3050-0891	1	Washer-M3.0ID
3	1400-0053	1	Clamp-Cable 0.17D 0.37W
4	0515-0866	13	Screw-M3.0 8CWPNPDS

Figure 6-8. HP 70620B and HP 70621A Module Parts ID, Left-Side View

7

Major Assembly and Cable Locations

Introduction

This chapter contains HP 70620B and HP 70621A assembly location information.

Figures 7-1, 7-2, and 7-3 show the locations of the major assemblies and cables of the HP 70620B, HP 70620B Option 001, and HP 70621A modules. A list of each module's assemblies and cables is given on the page facing the related figure.

HP 70620B Assemblies

A1 .... Front Panel Board Assembly
A2 .... Controller/Power Supply Board Assembly
A3 .... Not assigned
A4 .... Not assigned
A5 .... Microwave Amplifier Assembly
K1 .... Transfer Switch Assembly

W1 .... +28 Vdc Cable Assembly
W2 .... Front Panel Ribbon Cable Assembly
W3 .... RF OUTPUT to K1 Transfer Switch Cable Assembly
W4 .... RF INPUT to K1 Transfer Switch Cable Assembly
W5 .... Wire Harness Assembly
W6 .... A5 to K1 Transfer Switch Cable Assembly
W7 .... K1 to A5 Microwave Amplifier Cable Assembly
W8 .... Not assigned
W9 .... Not assigned
W10 .... HP-MSIB Connector Cable Assembly
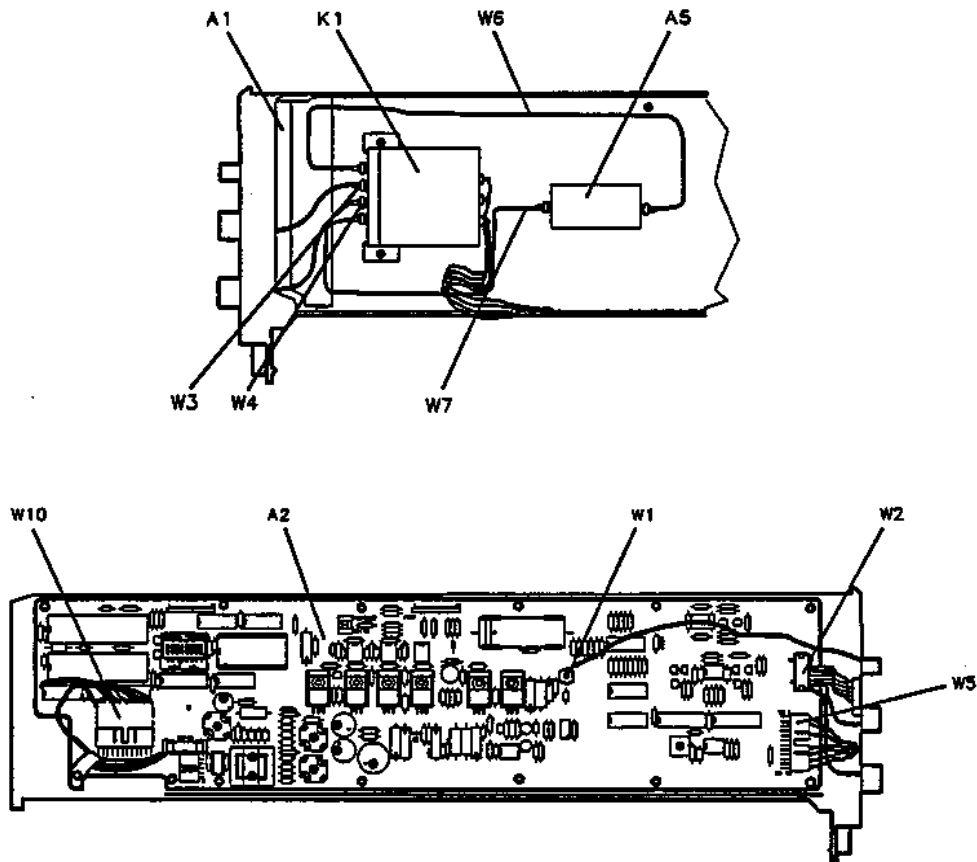
Figure 7-1. HP 70620B Major Assembly and Cable Locations

HP 70620B Option 001 Assemblies

A1 .... Front Panel Board Assembly
A2 .... Controller/Power Supply Board Assembly
A3 .... Not assigned
A4 .... Hi/Low Band Switch Assembly
A5 .... Microwave Amplifier Assembly
A6 .... Hi/Low Band Switch Assembly
A7 .... RF Amplifier Assembly
K1 .... Transfer Switch Assembly

W1 .... +28 Vdc Cable Assembly
W2 .... Front Panel Ribbon Cable Assembly
W3 .... RF OUTPUT to K1 Transfer Switch Cable Assembly
W4 .... RF INPUT to K1 Transfer Switch Cable Assembly
W5 .... Wire Harness Assembly
W6 .... A6 to K1 Transfer Switch Cable Assembly
W7 .... K1 to A4 Hi/Low Band Cable Assembly
W8 .... A4 to A7 RF Amplifier Cable Assembly
W9 .... A7 to A6 Hi/Low Band Switch Cable Assembly
W10 .... HP-MSIB Connector Cable Assembly
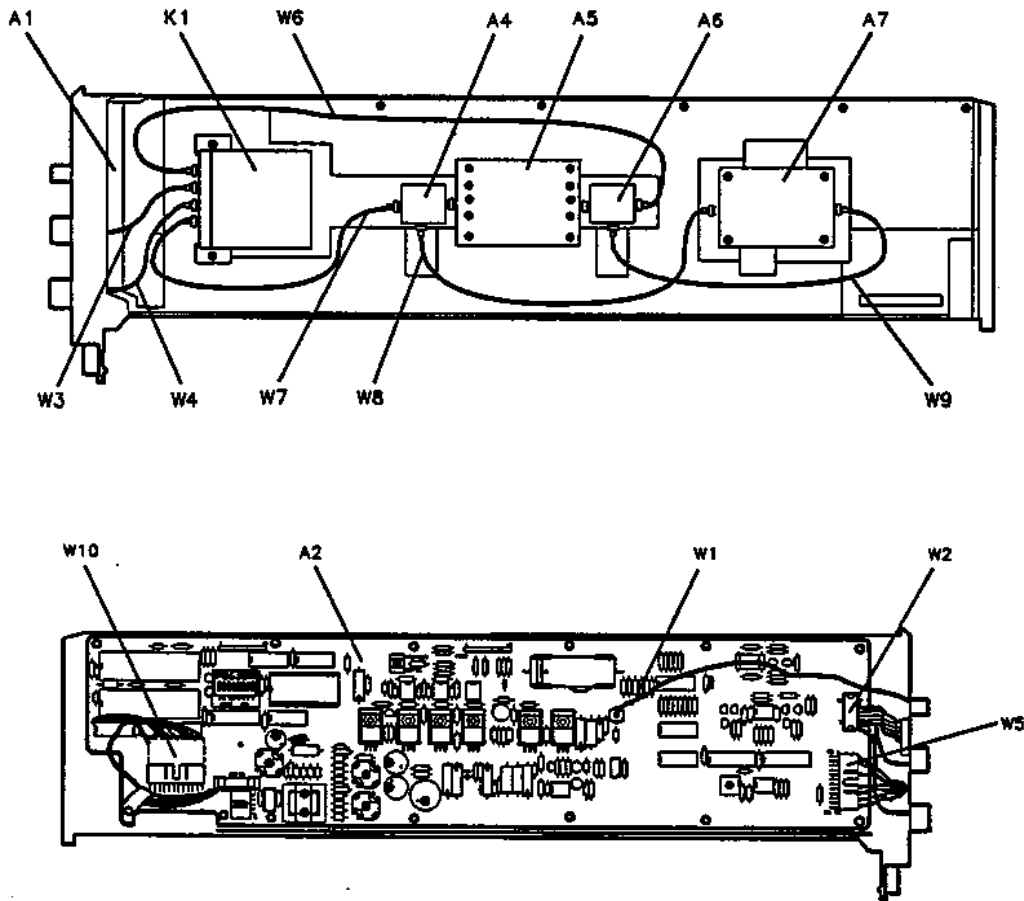
Figure 7-2. HP 70620B Option 001 Major Assembly and Cable Locations

HP 70621A Assemblies

Figure 7-3. HP 70621A Major Assembly and Cable Locations