Service Guide

HP 70600A/70601A

Preselector

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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 product or the user's work. 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 to the user. Do not proceed beyond a *WARNING* sign until the indicated conditions are fully understood and met.**
DANGER	**The *DANGER* sign denotes an imminent hazard to people. It warns the reader of a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a *DANGER* sign until the indicated conditions are fully understood and met.**

General Safety Considerations

WARNING

- **The instructions in this document are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.**
- **The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**
- **The power cord is connected to internal capacitors that may remain live for five seconds after disconnecting the plug from its power supply.**
- **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.**
- **For continued protection against fire hazard, replace fuse only with same type and ratings, (type nA/nV). The use of other fuses or materials is prohibited.**

WARNING

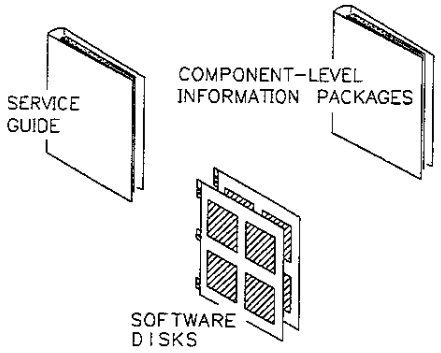
- **Before this instrument is switched on, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact.**

  Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.
- **Before this instrument is switched on, make sure its primary power circuitry has been adapted to the voltage of the ac power source.**

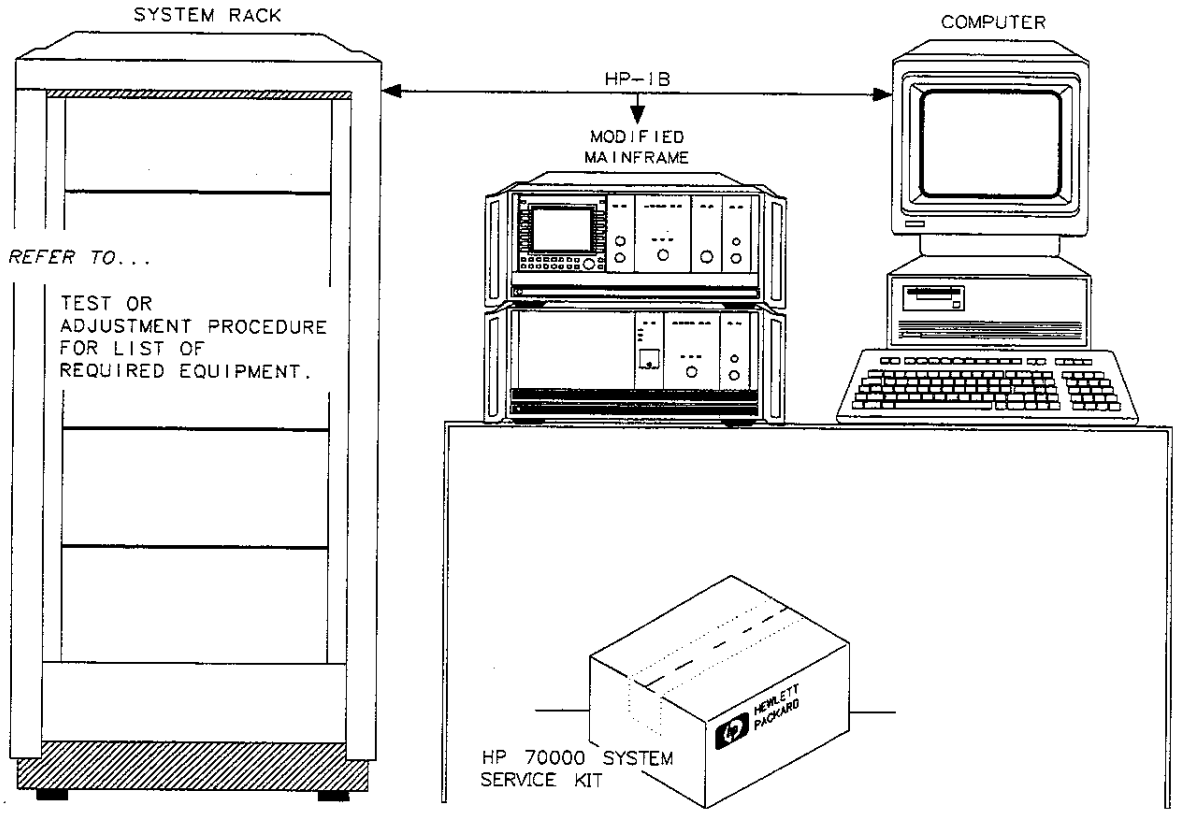
  Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

Servicing at a Glance

DOCUMENTATION AND SOFTWARE SUPPLIED



TOOLS AND EQUIPMENT NEEDED



glance

The HP 70600A/70601A preselector is a MMS module that is used in HP 70000 Series modular measurement systems such as an HP 71200C modular spectrum analyzer. A standard modular spectrum analyzer system includes a mainframe with an RF section, IF section, local oscillator, an optional display, and an optional precision frequency reference.

Software and documentation supplied

This service guide is part of an Option OB3 package which includes:

- *HP 70600A/70601A Service Guide*
- *HP 70600A/70601A Component Level Information Packages*
- Module verification software disks.

Tools needed

Before servicing, refer to Chapter 5 for a list of the tools and accessories that may be needed during servicing.

Antistatic precautions

Electrical components are easily damaged by small amounts of static electricity. If possible, work at a static-safe work station. For further information, refer to "Preparing a Static-Safe Work Station" in Chapter 4.

In This Book

This book describes all of the service procedures necessary to test, adjust, calibrate, troubleshoot, and repair your preselector in an HP 70000 Series modular measurement system.

Each module in the HP 70000 Series modular measurement system has its own service guide. For further information related to the servicing of additional and alternate modules that can be used in this system, refer to that module's service guide.

This service guide is part of an Option OB3 package which consists of two manuals.

Manual 1

Chapter 1 provides information to help get you started so that your preselector is serviced properly.

Chapter 2 contains information needed to use module verification software while servicing your preselector.

Chapter 3 contains information to help identify and resolve some common problems that may occur with your preselector before extensive servicing.

Chapter 4 contains information about troubleshooting your preselector. It presents information on preparing a static-safe work station and then it presents a set of troubleshooting procedures that can be used to optimize repair time.

Chapter 5 contains tables with a complete listing of all equipment that may be required for servicing.

Chapter 6 would have contained information needed to perform all adjustment procedures, but the adjustments are documented along with the module verification tests in Chapter 7.

This chapter was retained to keep this service guide's format consistent with other MMS service guides.

Chapter 7 contains the setups for all module verification tests that are used to optimize module performance when assemblies are changed, repaired, or adjusted.

Information about adjustments is also covered in this chapter.

Chapter 8 contains the setups for all equipment calibration procedures that must be performed in order to optimize module performance when assemblies are changed, repaired, or adjusted.

Chapter 9 contains procedures for removal and replacement of major assemblies in your preselector. It also contains information needed to order mechanical parts for your preselector.

Chapter 10 contains information on all overall parts identification drawings that should be used when performing the troubleshooting procedures descibed in this service guide.

An index is also added at the end of this service guide to aid the user in finding key items of interest.

Manual 2

Manual 2 contains packets of component-level repair information for each preselector board assembly that has field-replaceable parts. Each packet includes the parts list, component-location drawing, and schematics for a specific board-assembly part number. This manual also contains a table that can be used to cross reference different board assemblies that have different serial prefix breaks.

Before you begin servicing, you must become familiar with module verification software. For information on how to use this module verification software, refer to Chapter 2.

Contents

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Tables

1

Getting Started

This chapter provides information to help get you started so that your preselector is serviced properly.

This chapter answers the questions "What Is Servicing?" and "When Is Servicing Needed?". It then describes the procedures used to return your preselector to Hewlett-Packard for servicing.

What Is Servicing?

Servicing includes testing, adjusting, calibrating, troubleshooting, and repairing.

There are different categories of testing available. These categories are module verification tests, system verification of operation tests, and system performance tests.

Module Verification Tests Module verification tests are used to test modules so that when assembled into a system, the system meets the system's specifications. These sets of tests are used during servicing.

System Verification of Operation Tests System verification of operation tests are used to verify the proper operation of an instrument and to verify that the instrument meets approximately 80% of its measurement related specifications. These sets of tests are subsets of system performance tests.

System Performance Tests System performance tests are used to verify the proper operation of a complete modular measurement system (MMS) to full system specifications.

This service guide provides information related to testing, adjusting, calibrating, troubleshooting, and repairing your preselector; it also provides information on module verification tests. These sets of tests are used during servicing.

For information related to system verification of operation tests, refer to the *HP 70000 Modular Spectrum Analyzer Installation and Verification Manual*, and for information related to system performance tests, refer to the documentation for HP 11990A system performance test software.

When Is Servicing Needed?

Servicing is needed:

- if error messages are displayed on your HP 70000 Series display
- if an ERROR LED or FAULT LED is on
- to perform repairs or adjustments or both
- to verify the correct operation of your preselector
- or, if applicable, when upgrading firmware

If you determine that your preselector needs servicing, you can perform the servicing yourself using the information in this manual or, you can return your preselector to a Hewlett-Packard service center.

If You Want Hewlett-Packard to Service Your Preselector

Before calling Hewlett-Packard or returning your preselector for service, please read your warranty information. Warranty information is printed at the front of this service guide.

In any correspondence or telephone conversations, refer to the preselector by its full model number and full serial number. With this information, the Hewlett-Packard representative can determine whether your unit is still within its warranty period.

Determining Your Preselector's Serial Number

When a module is manufactured by Hewlett-Packard, it is given a unique serial number. This serial number is attached to a label on the front frame or front panel of the module. A serial number label is in two parts. (Refer to Figure 1-1.) The first part makes up the serial number prefix and consists of four digits and a letter. The second part makes up the serial number suffix and consists of the last five digits on the serial number label. The serial number prefix is the same for all identical modules; it only changes when a change in the electrical or physical functionality is made. The serial number suffix, however, changes sequentially and is different for each module.

Figure 1-1. Typical Serial Number Label

Table 1-1. Hewlett-Packard Sales and Service Offices

US FIELD OPERATIONS HEADQUARTERS
Hewlett-Packard Company
19320 Pruneridge Avenue
Cupertino, CA 95014, USA
(800) 752-0900

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) 342-2000

New Jersey
Hewlett-Packard Co.
150 Green Pond Road
Rockaway, NJ 07866
(201) 586-5400

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

EUROPEAN OPERATIONS 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
Hewlett-Packard-Strasse
61352 Bad Homburg
Germany
(+49 6172) 16-0

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 (P.O. Box 221)
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

China
China Hewlett-Packard, Co.
38 Bei San Huan X1 Road
Shuang Yu Shu
Hai Dian District
Beijing, China
(86 1) 256-6888

Singapore
Hewlett-Packard Singapore
Pte. Ltd.
Alexandra P.O. Box 87
Singapore 9115
(65) 271-9444

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

Returning Your Preselector for Service

Hewlett-Packard has sales and service offices around the world to provide complete support for your preselector. To obtain servicing information or to order replacement parts, contact the nearest Hewlett-Packard sales and service office listed in Table 1-1.

Use the following procedure to return your preselector to Hewlett-Packard for service:

1. Fill out a service tag (available at the end of this service guide) and attach it to the instrument. Please be as specific as possible about the nature of the problem. Send a copy of any or all of the following information:
   - any error messages that appeared on the HP 70000 Series display
   - a completed Performance Test record
   - any other specific data on the performance of the preselector

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CAUTION Damage can result if the original packaging materials are not used. Packaging materials should be anti-static and should cushion the preselector on all sides.

Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the instrument or prevent it from moving in the shipping container. Styrene pellets can also cause equipment damage by generating static electricity or by lodging in fan motors.

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2. Place the preselector in its original packaging materials.

   If the original packaging materials are not available, you can contact a Hewlett-Packard sales and service office to obtain information on packaging materials or you may use an alternative packing material referred to as "bubble-pack". One of the companies that makes bubble-pack is Sealed Air Corporation of Hayward, California, 94545.

3. Surround the preselector with at least 3 to 4 inches of its original packing material or bubble-pack to prevent the preselector from moving in its shipping container.

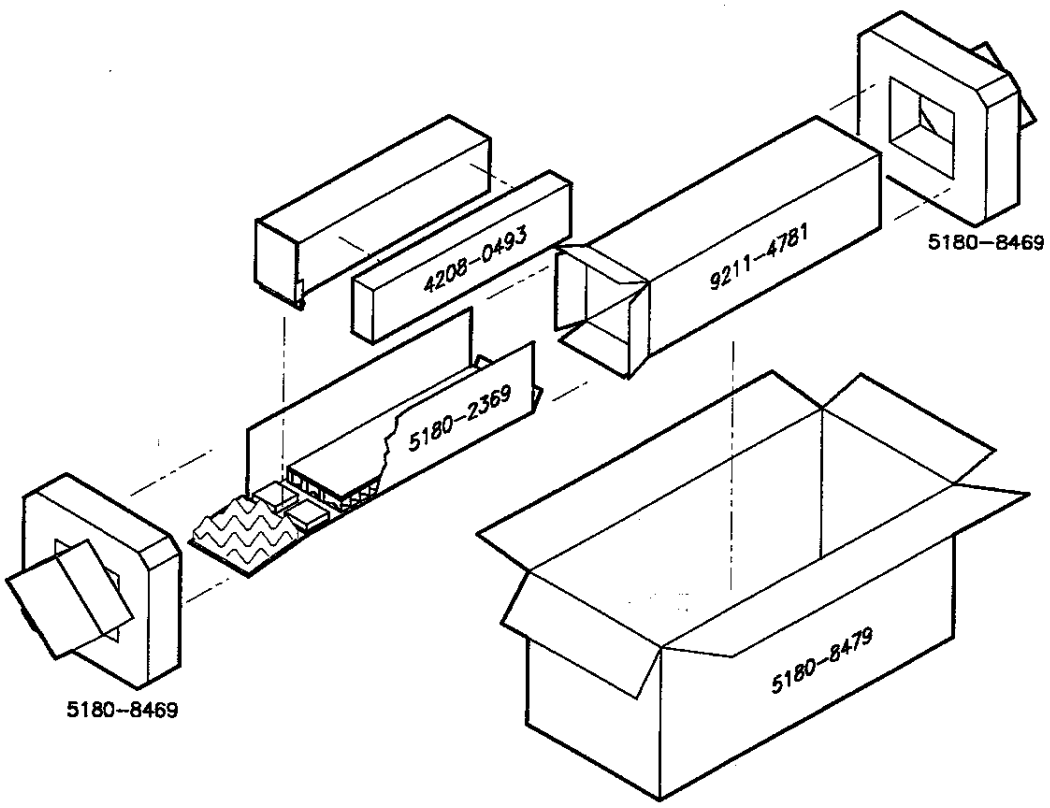
4. Place the preselector, after wrapping it with packing material, in its original shipping container or a strong shipping container that is made of double-walled corrugated cardboard with 159 kg (350 lb) bursting strength.

   The shipping container must be both large enough and strong enough to accommodate your preselector and allow at least 3 to 4 inches on all sides for packing material.

5. Seal the shipping container securely with strong nylon adhesive tape.

6. Mark the shipping container "FRAGILE, HANDLE WITH CARE" to help ensure careful handling.

7. Retain copies of all shipping papers.



packing2

Table 1-2. Packaging for a 2/8 Module

Item	Description	HP Part Number	Qty
1	Carton-outer	5180-8479	1
2	Carton-inner	9211-4781	1
3	Carton-sliders	5180-2369	1
4	Foam inserts	4208-0493	1
5	Foam pads	5180-8469	2

2

Module Verification Software

Module Verification Software is a program that is designed to automate module 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.

This documentation supports Module Verification Software, Revision A.02.00 or greater. Use this software with slave modules that have an HP 70900A/B local oscillator source as a master. This software is controlled by a softkey-driven menu and user-interface screens. The disks included with this module provide programs that test whether the module meets its characteristics for system operation.

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

Computer Compatibility

Module Verification Software is written in HP BASIC 4.0 and can run on the following HP 9000 Series 200/300 controllers. Minimum RAM requirement is 2.5 megabytes.

HP 9816	HP 9920 (with HP 35721A monitor)
HP 9836	HP 9000 Series 300 controller

When using an HP 9000 Series 300 controller, 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" for an explanation of keyboard differences.)

Alternate Key Labels

For simplicity in this document, we assume that you are using an HP 9000 Series 200 controller 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

Computer Language Compatibility

Module Verification Software runs on HP BASIC 4.0, or later, with the BIN files in RAM that are listed below. A procedure for loading HP BASIC is provided in "Installing Module Verification Software".

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 a shared resource management (SRM) 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 Module Verification Software.

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.

Configuring the Hardware

1. Connect the HP 70000 Series modular spectrum analyzer system to the computer port determined by the following criteria:
   - For computers with an HP 98624A HP-IB interface, connect your spectrum 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 controller Peripheral Installation Guide, Volume 1.*
   - For computers without an HP 98624A HP-IB interface, connect the HP 70000 Series modular spectrum analyzer system 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 HP 10833D BNC 0.5 meter HP-IB cable, 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 Series modular spectrum analyzer system 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 Module 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.

1. 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. A.02.00`

2. Locate the program part number printed on the disk labels.
3. Load HP BASIC 4.0 or later, with the appropriate binaries, into an HP 9000 Series 200/300 controller. 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 single disk.

4. 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"`
5. Insert Executive Disk 1 into the assigned default drive. Type the following command line: `LOAD "MOD_VERF",1`
6. Press (EXECUTE). The software version number appears in the screen that is next displayed.
7. Follow the on-screen prompts and load Executive Disk 2. Press (CONTINUE). Loading Executive Disk 2 may require up to two minutes.

Note Be sure the Executive Disk 3 you load is the disk that belongs with the module you wish to test.

8. Replace Executive Disk 2 with Executive Disk 3, then press PROCEED. 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.)
9. If you are using your module's software for the first time, a message appears stating that mass storage data is needed. Press PROCEED and follow the on-screen prompts to create a mass storage data file. Once mass storage data is stored, this message will not reappear.
10. 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.
11. 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 Disks into the drive specified on-screen.
12. Load all Driver Disks. Insert each Driver Disk and press PROCEED. This process may require up to six minutes.
13. 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.

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14. 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, and so on). Refer to "Equipment Menu" under "Menus" in this chapter.
- Press test menu to choose between verification tests or adjustment procedures. 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

Module 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.

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 ... and so forth`
- `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:

Main Menu
Mass Storage Menu
Parameter Menu
Equipment Menu
Edit Calibration Data
HP-MSIB Address Menu
Test Menu

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, and so on. 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, and so on.

Edit and Command Screen Menus

The following softkeys are present for menus that appear in Figure 2-1 through Figure 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 that no further sub-level softkey menus exist for that softkey.

Edit Screen Menus

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

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 Executive Disk 3 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.

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 main menu to return to the Main Menu screen, or press EDIT 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, and so on. Use the SELECT/TOGGLE 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 SELECT/TOGGLE. 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 SELECT/TOGGLE. 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 SELECT/TOGGLE. Enter a number from 50 to 70 to set the number of lines per printed page.
Line Frequency:	Valid frequency selections are 50 Hz, 60 Hz, and 400 Hz. Press SELECT/TOGGLE 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 SELECT/TOGGLE. 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 SELECT/TOGGLE 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 SELECT/TOGGLE, 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 SELECT/TOGGLE. 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 8757C scalar network analyzers, and so on).

Chapter 4 contains a table of required test equipment. Using preferred models of test equipment assures the most complete verification and adjustment testing. Refer to Chapter 7 and Chapter 6 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 Series modular spectrum analyzer system 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.

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.

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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 Series modular spectrum analyzer system that you may select to test. 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. 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, and so on. 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.

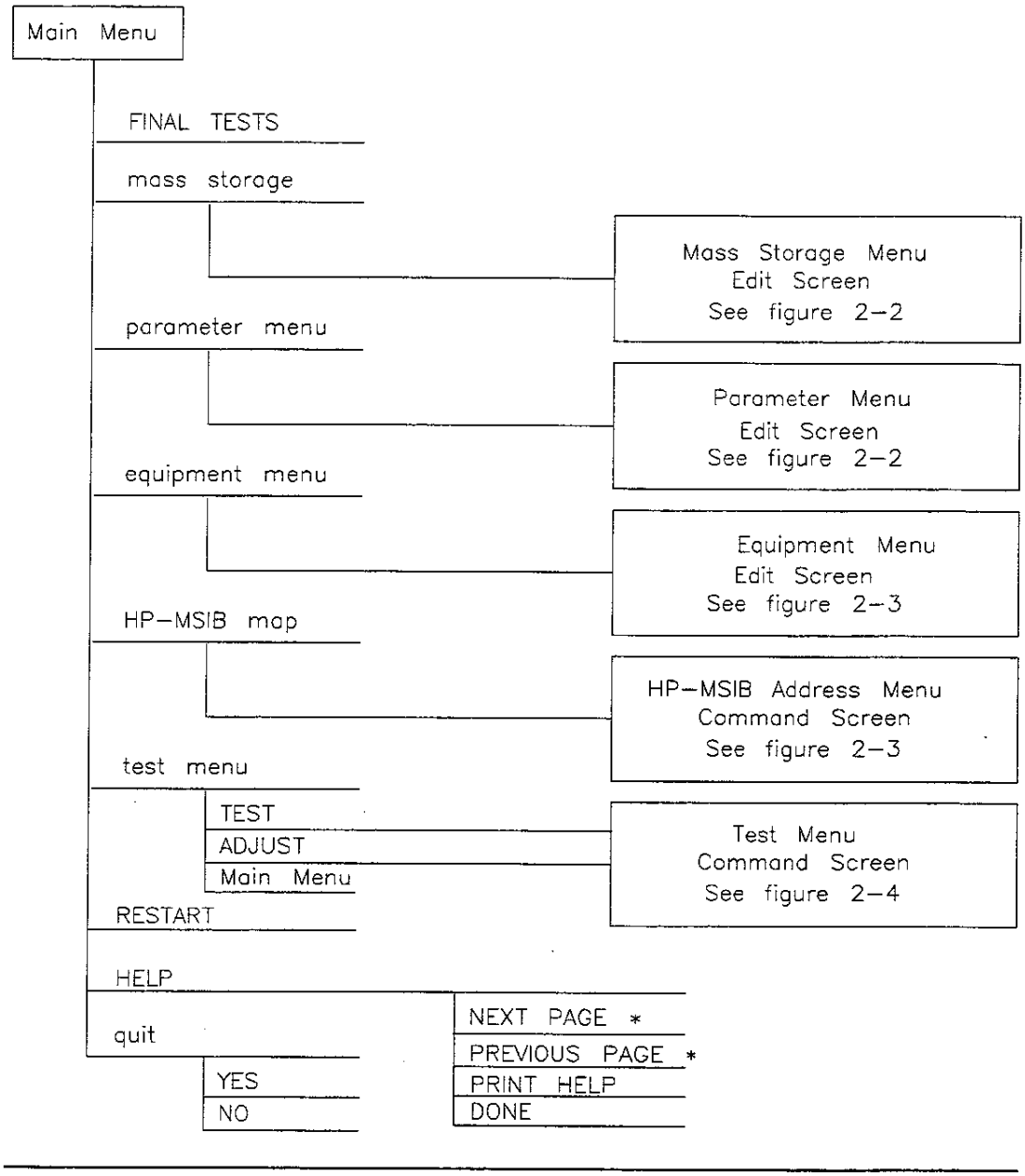
END SEQUENCE — interrupts the test sequence at the end of the test in progress, then displays the Test Menu. \ABORT\ ends the testing process and displays the Test Menu. From there you may choose some other action.

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 tests 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.

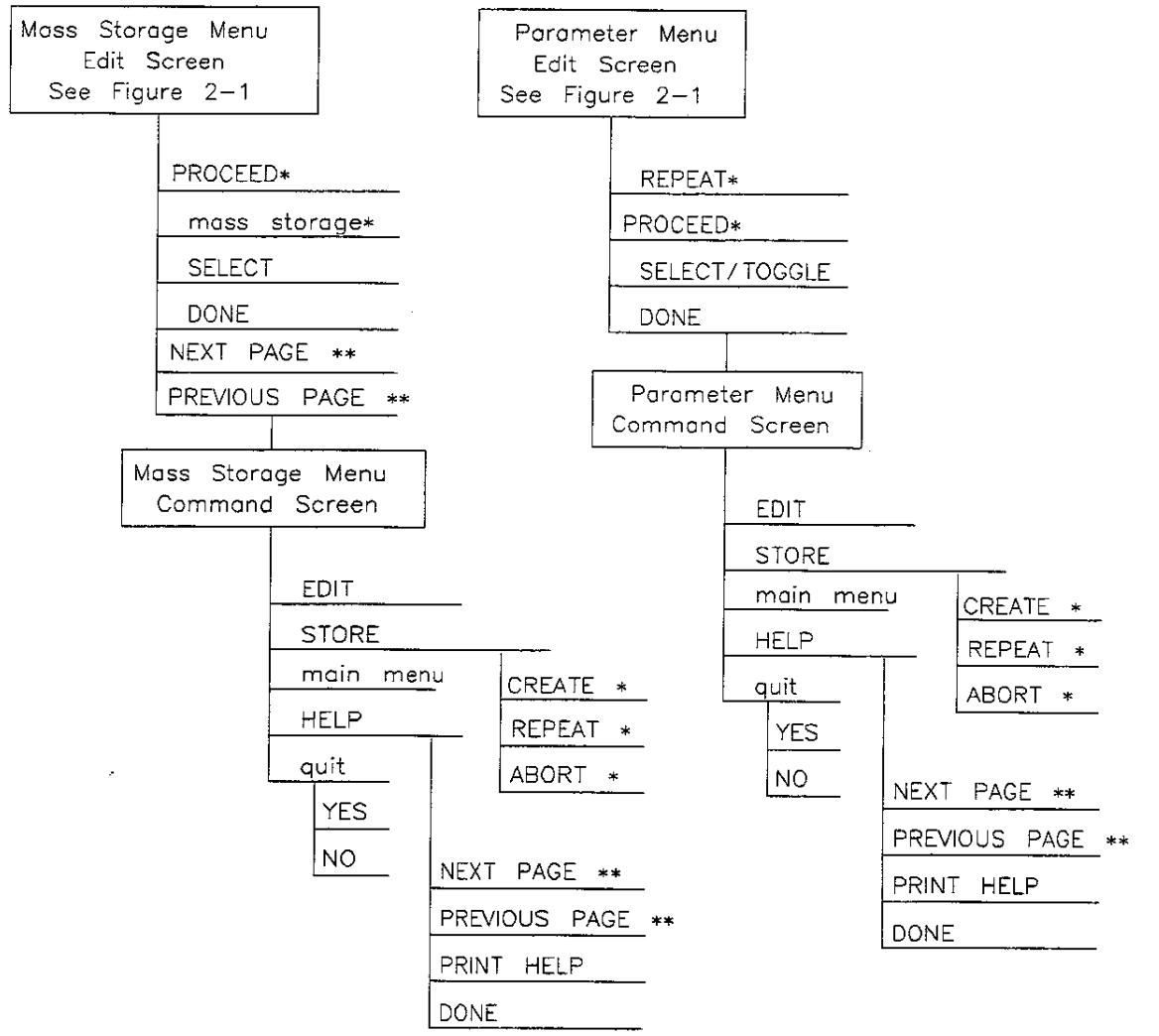
PURGE CAL DATA — Pressing this softkey deletes stored calibration data for the spectrum analyzer and any other calibration routines used for testing. Before module verification tests can be run again, equipment calibration routines have to be redone.



* Present when more pages of information are available.

mvmain

Figure 2-1. Main Menu Softkeys

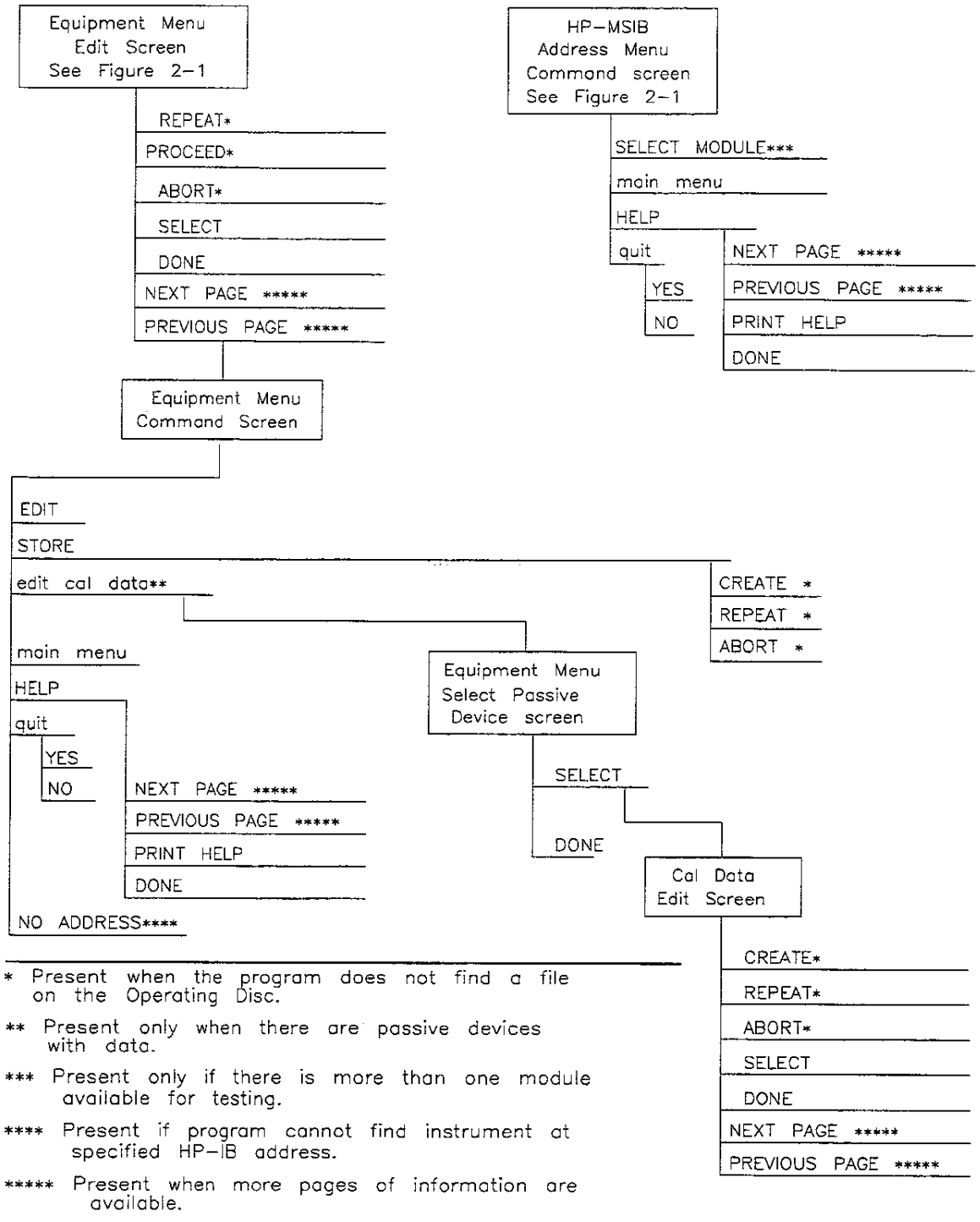


* Present when the program does not find a file on the Operating Disc.

** Present when more pages of information are available.

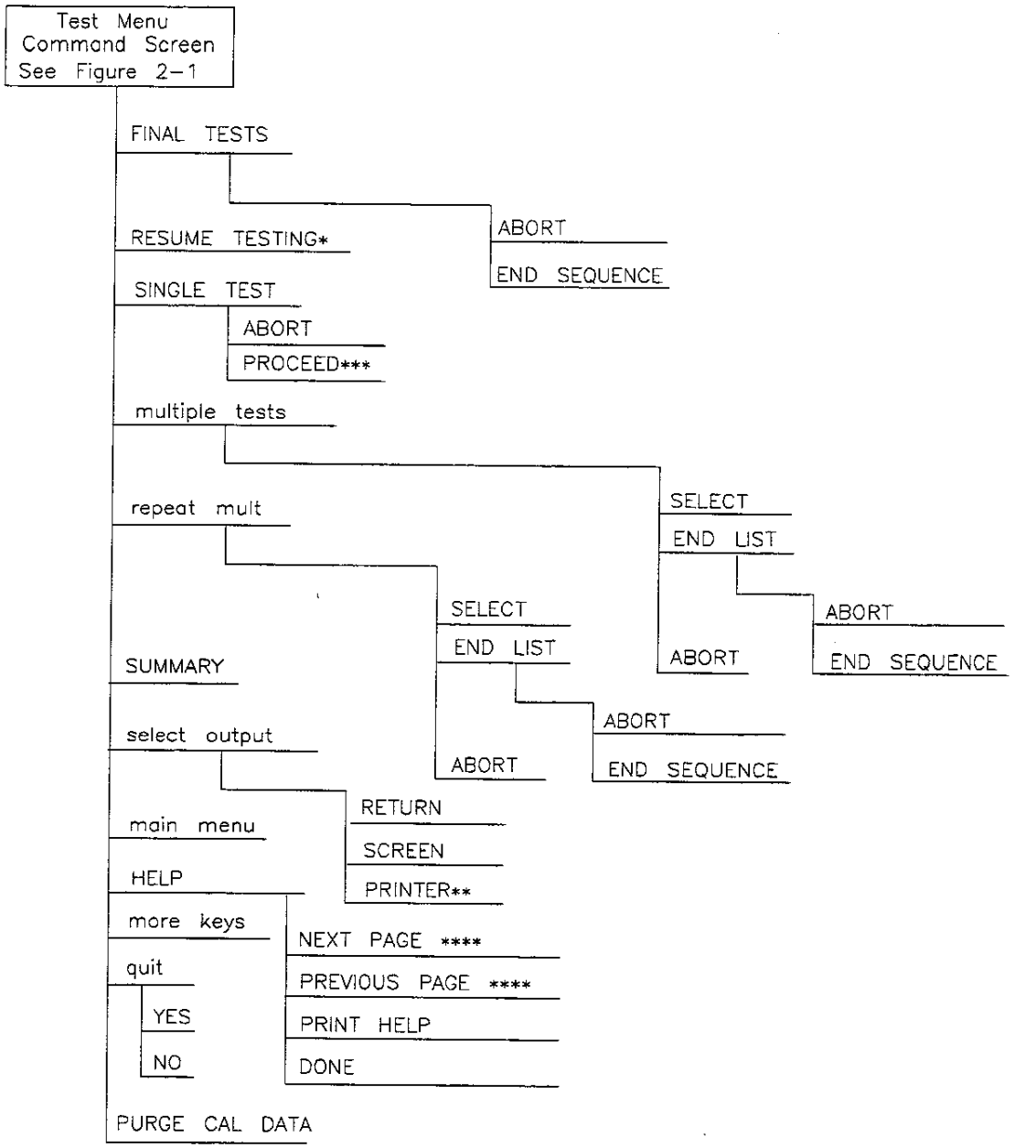
mvmass

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



mvequp

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



* 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.

**** Present when more pages of information are available.

mvtest

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, and system conditions. 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 5 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 *Santa Rosa Systems 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 *Santa Rosa Systems 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 *Santa Rosa Systems 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 measuring receiver. 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 *Santa Rosa Systems 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 synthesizer/level generator 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

Before Extensive Servicing

This chapter contains information to help identify and resolve some common problems that may occur with your preselector before extensive servicing.

Symptoms to various problems are listed at the top of each page. Most symptoms have a brief description or explanation to help provide more insight into their cause. A possible cause for the symptom and a checklist of possible solutions are then presented. Use this checklist as an aid to correct the problem.

If you determine that your preselector needs further servicing and your preselector is not experiencing any of the symptoms presented in this chapter, refer to "Performing Related Adjustments and Verification Tests" in Chapter 4 to determine which adjustments and veification tests must be performed and also Table 5-1 for a list of recommended test equipment to use when assemblies are changed, repaired, or adjusted.

Note

If you decide to perform the servicing yourself, prepare a static-safe work station before you begin any servicing procedures. (Refer to "Preparing a Static-Safe Work Station" in Chapter 4.)

If you do not wish to perform the servicing yourself, return your preselector to a Hewlett-Packard service center. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If the System's Power-On Self Test Fails

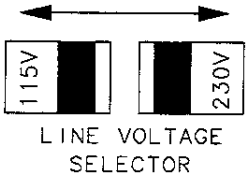
Each time the HP 70000 Series modular spectrum analyzer system is turned on, the system runs through an initializing routine (power-on self test) during which the front panel STATUS LEDs on each module flash on momentarily and then turn off.

If the system passes the power-on self test, the MEASURE LED on the local oscillator module begins blinking on and off (triggered by the system sweep), and the ACT LED on each active module's front panel is turned on.

If any module fails the self test, it will not establish a link with the display. If the front panel LEDs on the HP 70900B local oscillator source flash on and off, it means the instrument has failed the power-on self test.

To solve this problem:

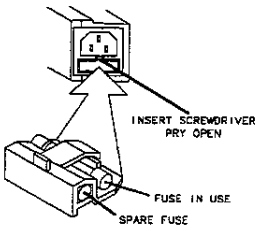
- ☐ Check that the HP 70900B local oscillator source is powered on.
- ☐ Check that the HP 70000 Series modular spectrum analyzer system display and mainframe are plugged into the proper ac line voltage.
- ☐ Check that the line socket has ac line voltage.
- ☐ Check that the line voltage selector switch is set to the correct voltage for the ac line voltage being used. The line voltage selector switch is located on the left side of the HP 70004A color display, on the bottom of the HP 70001A mainframe, or on the rear panel of the HP 70206A system graphics display.



lineselect

Figure 3-1. Line Voltage Selector

- ☐ Check the line fuse on the display or the mainframe to ensure that it is not damaged. The line fuse is located inside the power-cord receptacle housing on the rear of the display and mainframe. Also included in this housing is a spare fuse. The fuse is a 5 by 20 mm fuse rated at 6.3 A, 250 V (HP part number 2110-0703). This line fuse can be used with both 120 V and 230 V line voltage.



fuseee

Figure 3-2. Line Fuse Removal and Replacement

- ☐ Check the A3 power supply by removing the module from the mainframe and installing it on an extender cable (HP part number 70001-60013). With the power turned off, remove the module's outer cover. Confirm that the yellow and green LEDs on the top of the A3 power supply are lit. If any of these LEDs is not lit, the A3 power supply may need servicing.
- ☐ Check the address map. (Refer to Table 3-1.)
- ☐ Check the system interconnections.
- ☐ If necessary, obtain service from Hewlett-Packard. Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.

Table 3-1. Default HP-MSIB Address Map

	Column 18	Column 19	Column 20
Row 7	blank	HP 70310	blank
Row 6	RF sections[1]	HP 70300	HP 70620 or HP 70621[2]
Row 5	HP 70907	HP 70301	blank
Row 4	HP 70903	blank	HP 70810 Option 850
Row 3	HP 70911	HP 70620 or HP 70621[3]	HP 70810
Row 2	HP 70700	HP 70600 or HP 70601	blank
Row 1	HP 70902	blank	blank
Row 0	HP 70900	blank	blank

1 This includes: HP 70904A RF section, HP 70905A/B RF section, HP 70906A/B RF section, HP 70908A RF section, HP 70909A or HP 70910A RF section.

2 When preamplifying the lightwave section's input signal.

3 When preamplifying the preselector's or RF section's input signal.

For more information about addressing criteria, refer to *HP 70000 Modular Spectrum Analyzer Installation and Verification Manual.*

If Your HP 70600A/70601A Preselector is Powered On But Not Responding Correctly

If the HP 70600A preselector or HP 70601A preselector does not complete its power-up sequence, or if it causes the bus to hang up, the following procedure may be used to help troubleshoot the problem.

To solve this problem:

- ☐ Set the mainframe line switch to off. Remove the preselector from the mainframe, then remove the left-hand side cover from the module to gain access to the A12 YTF driver.
- ☐ Install the module service extender (HP part number 70001-60013) and connect the preselector to the extender cable.
- ☐ Set the mainframe line switch to on.
- ☐ Verify that A12DS1 (the green LED near the center of the board) is on.
- ☐ If A12DS1 is off, refer to the A12 YTF driver troubleshooting information.
  - ☐ If it is on, check for +5V at A12U4 pin 26. If +5V is present, then the problem is probably on the A7 switch driver.
  - ☐ If the voltage is not present, refer to the A12 YTF driver troubleshooting information.
- ☐ If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If the STATUS ERR Indicator LED on the Preselector is Flashing

The HP 70600A/70601A preselector communicates with the HP 70000 Series modular spectrum analyzer system over the HP-MSIB. When the STATUS ERR indicator LED on the HP 70600A/70601A preselector flashes at a 1 Hz rate, the module cannot communicate over the HP-MSIB.

To solve this problem:

- ☐ Try turning off the power to the system and then turning it on again.
- ☐ If front panel keys are still responding, check the address map to see that all modules are located in their designated coordinates.
- ☐ If front panel keys are not responding and the address map cannot be checked, power-down the system, pull out each module and check its address setting by looking at its address switches.

  All modules should conform to the required coordinates on the address map. (Refer to Table 3-1.)
- ☐ If your system contains more than one mainframe, check that the HP-MSIB cables are connected such that two cable connections are made to each mainframe. If these cable connections look correct, you may try replacing the HP-MSIB cables with new ones.
- ☐ If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If More Than One Module's Error Indicator Is Flashing

The HP 70600A/70601A preselector communicates with the HP 70000 Series modular spectrum analyzer system over the HP-MSIB. When the STATUS ERR indicator LED on a particular module flashes at a 1 Hz rate, the module cannot communicate over the HP-MSIB.

To solve this problem:

- ☐ Try turning off the power to the system and then turning it on again.
- ☐ If front panel keys are still responding, check the address map to see that all modules are located in their designated coordinates.
- ☐ If front panel keys are not responding and the address map cannot be checked, power-down the system, pull out each module and check its address setting by looking at its address switches.

  All modules should conform to the required coordinates on the address map. (Refer to Table 3-1.)
- ☐ If your system contains more than one mainframe, check that the HP-MSIB cables are connected such that two cable connections are made to each mainframe. If these cable connections look correct, you may try replacing the HP-MSIB cables with new ones.
- ☐ If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

4

Troubleshooting

This chapter contains information about troubleshooting your preselector. It presents information on preparing a static-safe work station and then it presents a set of troubleshooting procedures that can be used to optimize repair time.

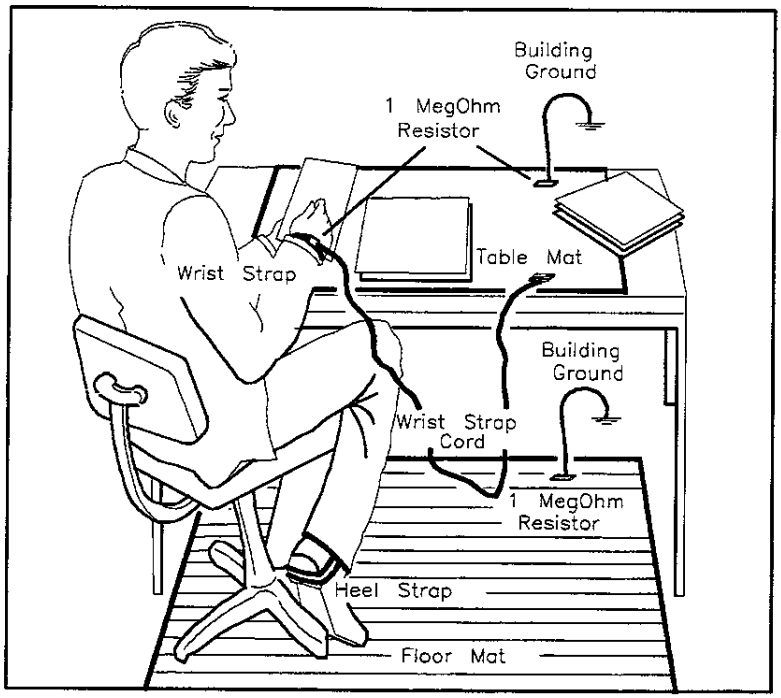
A listing of adjustments and verification tests that must be performed, as well as the recommended test equipment that should be used when assemblies are changed, repaired, or adjusted are presented at the end of this chapter.

Preparing a Static-Safe Work Station

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 4-1 shows an example of a static-safe work station. Two types of ESD protection are shown:

- a conductive table mat and wrist strap combination
- a conductive floor mat and heel strap combination



ESDPARTS

Figure 4-1. Static-Safe Work Station

These two types of ESD protection must be used together. Refer to Table 4-1 for a list of static-safe accessories and their HP part numbers.

CAUTION

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

Reducing ESD Damage

To help reduce the amount of ESD damage that occurs during testing and servicing use the following guidelines:

- Be sure that all instruments are properly earth-grounded to prevent buildup of static charge.
- Personnel should be grounded with a resistor-isolated wrist strap before touching the center pin of any connector and before removing any assembly from a piece of equipment.

  Use a resistor-isolated wrist strap that is connected to the HP 70000 Series modular spectrum analyzer system mainframe's chassis. If you do not have a resistor-isolated wrist strap, touch the chassis frequently to equalize any static charge.
- 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.
- Handle all PC board assemblies and electronic components only at static-safe work stations.
- Store or transport PC board assemblies and electronic components in static-shielding containers.
- PC board assembly edge-connector contacts may be cleaned by using a lintfree 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.

Static-Safe ESD Accessories

Table 4-1. Static-Safe ESD Accessories

HP Part Number	Description
9300-0797	Set includes: 3M static control mat 0.6 m × 1.2 m (2 ft × 4 ft) and 4.6 m (15 ft) ground wire. (The wrist-strap and wrist-strap cord are not included. They must be ordered separately.)
9300-0865	Ground wire, 4.6 m (15 ft)
9300-0980	Wrist-strap cord 1.5 m (5 ft)
9300-1383	Wrist-strap, color black, stainless steel, without cord, has four adjustable links and a 7 mm post-type connection.
9300-1169	ESD heel-strap (reusable 6 to 12 months).
Order the following by calling HP DIRECT at (800) 538-8787 or through any Hewlett-Packard Sales and Service Office.	

If Operating Errors Messages (2000–2999) Occur

Operating errors are generated when a module in the HP 70000 Series modular spectrum analyzer system is not used properly. These errors can occur at any time, but are most common during remote operation. Operating errors range from 2000–2999.

The A12 YTF driver received a command it did not recognize and caused the HP 70000 Series modular spectrum analyzer system to display one or more of the following operating errors:

2001 **Illegal command (illegal cmd)**

2002 **Illegal parameter**

2006 **Parameter out of range**

2009 **Protocol error**

These operating errors occur when the processor on the A12 YTF driver recieves an unrecognizable command.

To solve this problem:

1. Check that the remote command being sent is a legal command.
2. Check that the remote command being sent contains only legal parameters.
3. Check that the remote command's parameter is within its specified range.
4. Check that the protocol of the remote command being sent is correct.
5. Check that the cable connection (W16) to the rear-panel connector is making a good connection.
6. Check for an open or short in the interconnect cable that connects the rear panel to the A12 YTF driver.
7. Otherwise, troubleshoot the A12 YTF driver.
8. If necessary, obtain service from Hewlett-Packard. Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.

If Hardware Warning Error 6000 Occurs

Hardware-warning errors occur when the hardware is faulty. The spectrum analyzer can still make measurements, but the accuracy of the measurement cannot be guaranteed.

6000 **EAROM unprotected**

This hardware warning error occurs when the memory-enable write switch is set to the WRITE position. It is not set to the PROTECT position.

To solve this problem:

1. Check the A12SW2 write-protect switch located on A12 YTF driver.
2. Set the A12SW2 write-protect switch to PROTECT, if it is not already.
3. Otherwise, troubleshoot the A12 YTF driver. (Refer to "A12 YTF Driver Troubleshooting".)
4. If necessary, obtain service from Hewlett-Packard. Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.

If Hardware Error Messages (7000–7999) Occur

Hardware errors are generated when a module in the HP 70000 Series modular spectrum analyzer system is not working properly. These errors can occur at any time. Hardware errors range from 7000–7999.

One or more of the following hardware error messages may appear on your system display:

7000 **ROM check error**

This hardware error occurs when A12U8 is bad or there is a problem on the A12 YTF driver.

To solve this problem:

1. Replace A12U8.
2. Refer to "A12 YTF Driver Troubleshooting".
3. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

7077 **YTF drive error**

This error is reported when Sweep-Ready line A12TP4-5 is false (TTL low) at the beginning of a sweep, or when the preselector is crossing bands. The sweep-ready signal originates from A12 YTF driver. This error is an indication that either the power-up current limiting circuit on A12 YTF driver is still in limit mode, or that A9 YTF has not settled before the start of the sweep.

To solve this problem:

1. Refer to "A12 YTF Driver Troubleshooting".
2. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

7078 **Tune + Span error**

This error results when the voltage at A12U20 pin 9 goes more positive than 2.5 V. It is an indication that the Tune + Span signal is not reaching the A12 YTF driver, causing the voltage at A12U27 pin 8 to exceed the voltage at A12U27 pin 9. As a result, the voltage at A12U27 pin 14 goes TTL low.

To solve this problem:

1. Refer to "A12 YTF Driver Troubleshooting".
2. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

7009 **ROM#2 check sum**

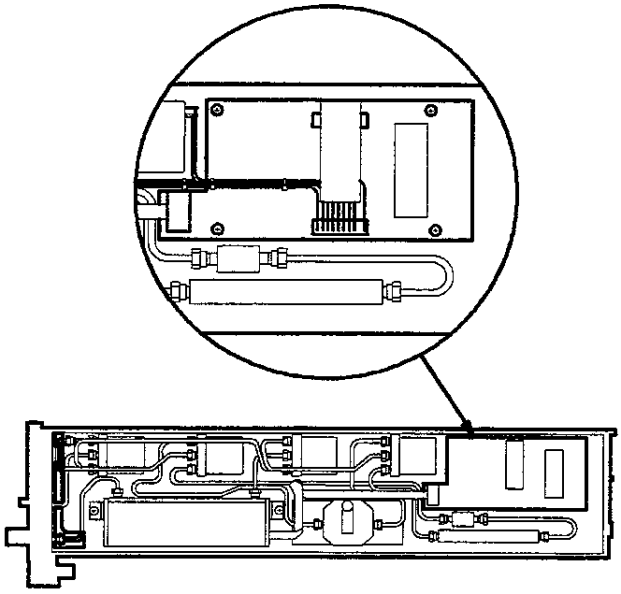
Usually, A12U8 is faulty when this error is reported. If replacing A12U8 does not eliminate the trouble, then the problem is probably on the A12 YTF driver.

To solve this problem:

1. Replace A12U8.
2. Refer to "A12 YTF Driver Troubleshooting".
3. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

A7 Switch Driver Troubleshooting

The A7 switch driver is responsible for latching the switch and attenuator logic signals from the A12 YTF driver and converting that TTL information to 0V and +32V drive levels. The A7 switch driver provides +32 VS and +5 VS supplies which are designed to maintain post power-down voltages, longer than standard power supplies do. Maintaining these voltages allows the A8 input attenuator to be set to 70 dB of attenuation. This attenuation level protects the first mixer in the system while power is off. The LRESET to TTL low is the event that triggers the power-down sequence. The Attenuator/Switch Service Detector senses the momentary change in +32 VS supply if a switch, or A8 input attenuator, changes position. The voltage drop due to the change momentarily causes A7U2C output to go TTL high. The TTL high remains for less than one second, or until the +32 VS supply recovers. The Attenuator/Switch Service Detector is checked during System Diagnostics only.



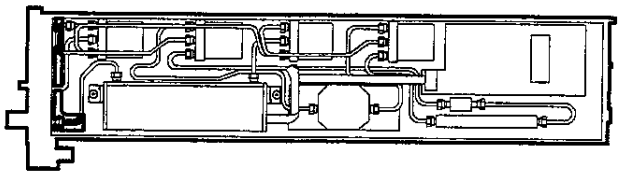
fixo7

Figure 4-2. A7 Switch Driver Troubleshooting

For detailed information on removing and replacing the A7 switch driver, refer to "A7 Switch Driver" in Chapter 9.

A8 Input Attenuator Troubleshooting

The input attenuator has four programmable sections. These sections consist of three 20 dB sections and one 10 dB section. The switching logic originates on the A12 YTF driver, via A12J2, to A7 switch driver. The A7 switch driver provides the drive level to the input attenuator.



fixa8

Figure 4-3. A8 Input Attenuator Troubleshooting

For detailed information on removing and replacing the A8 input attenuator, refer to "A8 Input Attenuator" in Chapter 9.

A9 YTF Troubleshooting

With the modular spectrum analyzer in the preselected mode, the A9 YTF is in the 2.7 to 22 GHz signal path for the HP 70600A preselector, or the 2.7 to 26.5 GHz signal path for the HP 70601A preselector.

Note The polarity indicated at the TUNE connections may vary between modules. However, the No. 2 wire is always connected to the positive terminal on the YTF and the No. 5 wire is always connected to the negative terminal.

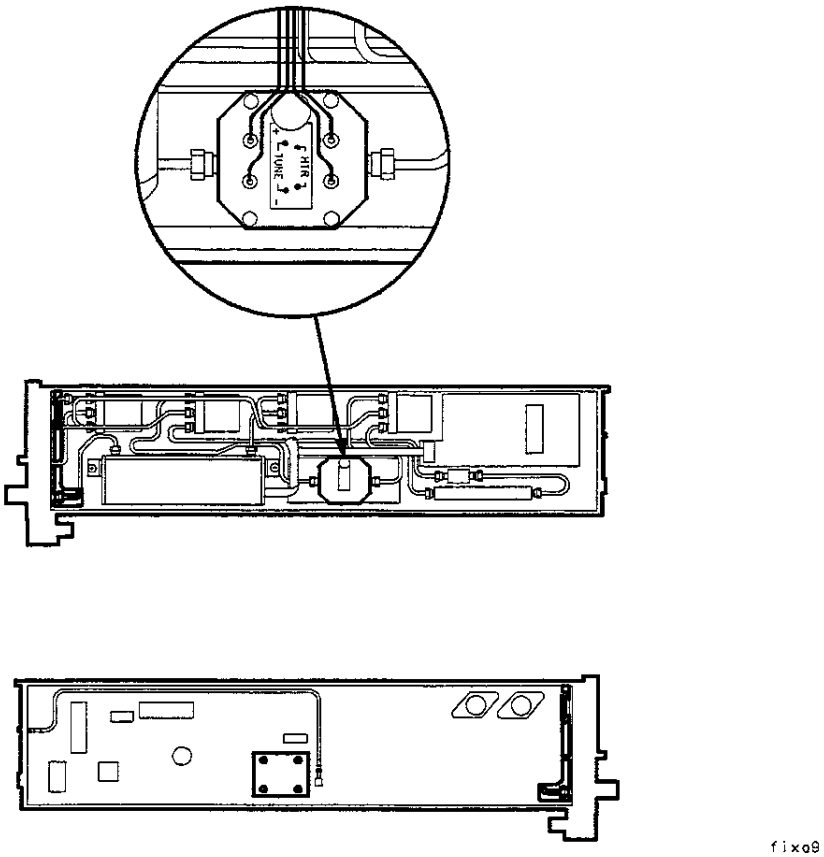


Figure 4-4. A9 YTF Troubleshooting

For detailed information on removing and replacing the A9 YTF, refer to "A9 YTF" in Chapter 9.

A10 Limiter Troubleshooting

The A10 limiter protects the first mixer in the 0.0 to 2.9 GHz signal path from damage should excessive power be applied to the RF input with the preselector in 0.0 to 2.9 GHz mode.

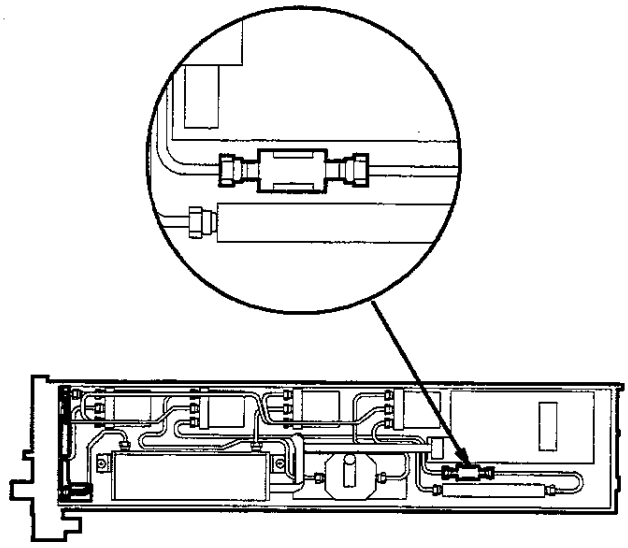


Figure 4-5. A10 Limiter Troubleshooting

For detailed information on removing and replacing the A10 limiter, refer to "A10 Limiter" in Chapter 9.

A11 LPF Troubleshooting

The A11 LPF helps prevent the base-line lift that would result if a 3.6214 GHz signal were applied to the HP 70000 Series modular spectrum analyzer system with the 0 to 2.9 GHz path enabled. It also helps to attenuate LO frequency output emissions that may occur when this path is enabled.

Note There is no particular orientation for the YTF input or output connections.

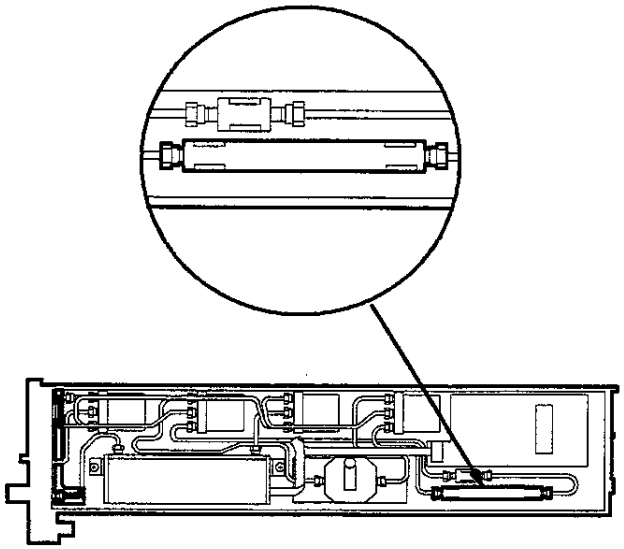
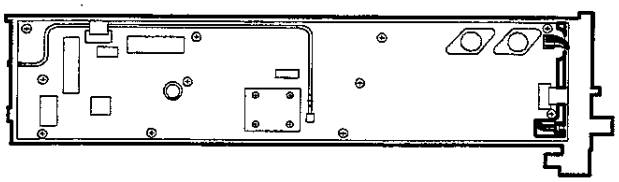


Figure 4-6. A11 LPF Troubleshooting

For detailed information on removing and replacing the A11 LPF, refer to "A11 LPF" in Chapter 9.

A12 YTF Driver Troubleshooting

The A12 YTF driver is responsible for multiple functions. It provides +38V, +15V, +5V, and 15V supplies for the preselector, and houses the controller circuitry. It also provides the A9 YTF drive signal path that originates from the local oscillator's 1.5 V/GHz Tune + Span signal.



fixa12

Figure 4-7. A12 YTF Driver Troubleshooting

For detailed information on removing and replacing the A12 YTF driver, refer to "A12 YTF Driver" in Chapter 9.

Additional Functions of A12 YTF Driver

The A12 YTF driver supplies additional functions to the preselector module. These functions and the troubleshooting information related to these functions are described below.

If all of the power supplies measure at or near 0V, check the fuse located on the A12 YTF driver. Replace it if it is blown. Set the mainframe line switch to OFF and install the extender module. Connect the preselector to the extender cable and remove the cables listed below.

Cable	Connection
A12J2	A7 switch driver
A12J4	A9 YTF
A12J5	A1A1 front panel

Set the mainframe line switch to ON. If the voltages are still incorrect, the problem is probably on the A12 YTF driver. If the voltages are correct, reconnect A12J2, A12J4, and A12J5, one at a time, until the problem appears. Troubleshoot or replace the faulty assembly.

Controller

The controller is responsible for the following functions:

- Changing all DAC settings (these include delay compensation, slope adjust, and preselector peak)
- YTF drive-signal band attenuation and IF offsets
- A8 input attenuator and signal path switch settings
- Fault detector servicing
- HP-MSIB interface between the preselector and the controller in the master element.

A12 YTF driver

The A12 YTF driver receives the local oscillator's 1.5 V/GHz Tune + Span signal, then attenuates and changes its slope to match the response of A9 YTF. The signal is further attenuated and the required dc offset is added by A12U23 based on the activated band. Refer to block L of the "Overall Block Diagram of Preselector" for the attenuator IF offset-vs-band information.

Table 4-2. A12U23 Output Channels

EN	A0	A1	DRAIN A	OUTPUT CHANNEL	DRAIN B	OUTPUT CHANNEL
H	L	L	A3S1A	BAND 1L–	A3S1A	BAND 1L–
H	H	L	A4S2A	BAND 2L–	A4S2A	BAND 2L–
H	L	H	A5S3A	BAND 3L+	A5S3A	BAND 3L–
H	H	H	A5S4A	BAND 4L+	A6S4A	BAND 4L+
L	X	X	HOLD MODE	No channel selected.	HOLD MODE	No channel selected.

The preselector DAC allows the filter to be tuned above and below its nominal frequency to aid in fine-tuning the A9 YTF. The heater current-limiting circuit limits the current level into the A9 YTF heater during module turn-on. The current-limiting function should cease within 10 seconds after turn-on.

The voltage drop across A12R341 and A12R342 should never exceed a 0.6 to 0.7 V range. During normal operation, the voltage drop is about 0.1V. The power-up current limiting circuit turns off the A9 YTF main coil current at module turn-on. When the voltage across the A9 YTF heater element reaches 20V or more, the current into the A9 YTF main coil is enabled.

The Sweep Monitor (schematic diagram block (E)) reports to the controller if either one of the following conditions are true:

- the power-up current-limit or heater current-limit circuits are active
- the voltage across the A9 YTF main coil is greater than +53 V, referenced to ground

The controller checks whether the sweep-ready line is true (TTL high) during the prepare-to-sweep sequence. If it is false, the controller reports a YTF drive error to the master element. (Refer to "If Hardware Error Messages (7000–7999) Occur".)

If You Have Verification Test Failures

The following troubleshooting instructions are grouped according to module verification tests. If the preselector fails a verification test, look up the test in the list and follow the instructions. Before troubleshooting, always check to ensure that the failure is not caused by the test equipment.

Note The troubleshooting information included here assumes that power supplies are correct and that failures are not due to faulty test equipment. Refer to the individual verification tests for information about the module function being tested.

If Test 01. Front Panel LEDs Fails

The purpose of this verification test is to verify visually that the front panel LEDs are functioning properly. The ability of the internal processor to control the LEDs is tested as well. The error/diagnostics sensing capability is not tested.

To solve this problem:

1. Check functionality of A1A1 front panel by measuring front panel voltages.
2. Check W15 ribbon cable (A1A1 front panel to A12 YTF driver).
3. Check A12 YTF driver voltages at TP2-3 and TP2-4.
4. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 02. Switching Diagnostics Fails

The switch diagnostic and the attenuator diagnostic tests are routines stored in the HP 70600A/70601A preselector's ROM. The tests monitor the ATTEN DIAG line from A7J2 pin 2 to A12J2 pin 2, then to A12U11A. This line is momentarily at TTL high when the A8 input attenuator, or one of the switches (A3S1, A4S2, A5S3, or A6S4), changes position. The tests look for this TTL high. The Tune + Span test verifies a TTL high on the TS READY line when a Tune + Span signal is connected to the TUNE SPAN INPUT on the preselector. The TS READY line is monitored via the A12U11A latch.

To solve this problem:

1. Check W12 ribbon cable (A9 YTF to A7 switch driver).
2. Otherwise, refer to "A7 Switch Driver Troubleshooting".
3. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 03. DAC Calibration Fails

Refer to the YTF Driver portion of A12 YTF driver troubleshooting information. The A12 YTF driver or the A9 YTF is probably the cause. Refer to the following information for more detail.

Offset DAC	There is usually a problem with the A12 YTF driver if this test fails. The failure may also be caused by problems with A12U17, A12U23, the controller block, or YTF the driver block of A12 YTF driver. The A9 YTF may also cause this test to fail.
Slope DAC	Suspect that the problem is with A12U14 or the driver block of the A12 YTF driver. Recheck the Coarse and Offset DAC calibrations by rerunning Test 03. DAC Calibration. The A9 YTF may also cause this test to fail.
Delay DAC	The problem is probably a faulty A12U14. The A9 YTF may also cause this test to fail.

If Test 04. YTF Tracking Error Fails

Run Test 03. DAC Calibration if the tracking portion of this test fails. If Test 03. DAC Calibration passes and the Test 04. YTF Tracking Error test continues to fail, refer to "A12 YTF Driver Troubleshooting". The problem is probably with A12 YTF driver or the A9 YTF. If the bandwidth portion of this test fails, then the problem is with the A9 YTF.

To solve this problem:

1. Check A12 YTF driver, refer to "A12 YTF Driver Troubleshooting".
2. Otherwise, refer to "A9 YTF Troubleshooting".
3. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 05. Gain Calibration Fails

The purpose of this verification test is to measure the bypass, lowpass, and YTF path insertion losses of the HP 70600A preselector. Amplitude-correction data is created and the values are subtracted from the insertion loss data generated at a reference frequency. The subtracted value is used to generate the flatness data.

To solve this problem:

1. If only bypass path, check: A8 input attenuator, W7 simi-rigid (A5S3 RF switch 3 to A8 input attenuator), A5S3 RF switch 3, W3 simi-rigid (A3S1 RF switch 1 to A5S3 RF switch 3), and A3S1 RF switch 1.
2. If only lowpass path, check: A6S4 RF switch 4, W10 simi-rigid (A6S4 RF switch 4 to A11 LPF), A11 LPF, A10 limiter, A4S2 RF switch 2.
3. If only YTF path, check: A6S4 RF switch 4, W9 simi-rigid (A6S4 RF switch 4 to A9 YTF), A9 YTF, W5 simi-rigid (A9 YTF to A4S2 RF switch 2), A4S2 RF switch 2.
4. If both lowpass and YTF paths, check: W8 simi-rigid (A5S3 RF switch 3 to A6S4 RF switch 4), A6S4 RF switch 4, A4S2 RF switch 2, W1 simi-rigid (A2 6 dB attenuator to A3S1 RF switch 1), A2 6 dB attenuator, A3S1 RF switch 1.
5. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 06. Peak DAC Deviation Fails

The purpose of this verification test is to measure the YTF frequency change when the peak DAC is varied over its full range. This test verifies whether the peak DAC is operating correctly.

There is usually a problem with A12U9 or associated circuitry if this test fails.

To solve this problem:

1. Check A12U9.
2. Check A9 YTF, refer to "A9 YTF Troubleshooting".
3. Otherwise, troubleshoot "A12 YTF Driver Troubleshooting".
4. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 07. LPF Attenuation at 1st IF Fails

The purpose of this verification test is to measure the lowpass filter attenuation at the first IF frequency. The measurement is relative to the passband insertion loss at 10 MHz.

The A11 LPF usually causes this test to fail. Cracked solder joints on cables or loose connectors can also degrade first IF frequency attenuation performance.

To solve this problem:

1. Check W10 simi-rigid (A6S4 RF switch 4 to A11 LPF)
2. Check W11 simi-rigid (A10 limiter to A11 LPF)
3. Otherwise, refer to "A11 LPF Troubleshooting".
4. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 08. YTF Image Rejection Fails

The purpose of this verification test is to measure the YTF attenuation of a frequency that would produce an image response.

The A9 YTF usually causes this test to fail. Cracked solder joints on cables or loose connectors may also cause degradation of this parameter.

To solve this problem:

1. Check A9 YTF voltages.
2. Otherwise, refer to "A12 YTF Driver Troubleshooting".
3. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 09. Low Frequency Flatness Fails

The purpose of this verification test is to measure the flatness below 10 MHz of the HP 70600A/70601A preselector.

Refer to the "Overall Block Diagram of Preselector" and use a scalar network analyzer to trace the path of the signal that is failing. If the dc switching logic is suspect, refer to "A7 Switch Driver Troubleshooting".

To solve this problem:

1. Check dc resistance of switches and cables in the LP and BYPASS paths.
2. Check for loose or damaged connectors.
3. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 10. Input Attenuator Accuracy Fails

The purpose of this verification test is to measure the amplitude accuracy of the RF input attenuator settings as referenced to the 10 dB attenuation setting. The attenuator settings range from 0 dB to 70 dB in 10 dB increments.

A problem with the A8 input attenuator usually causes this test to fail. The attenuator switching logic originates on A7 switch driver and is supplied by the controller on A12 YTF driver. Therefore, the source of the problem may be with the A12 YTF driver or the A7 switch driver circuitry related to the A8 input attenuator.

To solve this problem:

1. Check A8 input attenuator.
2. Check A7 switch driver.
3. Otherwise, refer to "A12 YTF Driver Troubleshooting".
4. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 11. Input Return Loss Fails

The purpose of this verification test is to measure the RF input return loss. The return loss for the bypass and lowpass paths are measured at 0 dB and 10 dB attenuator settings. To run this test, the preselector must be functioning properly, with no error conditions being reported. System Return Loss Calibration (part of Chapter 8), and Test 03. DAC Calibration must be completed before this test is initiated.

Damaged or loose connectors and cables usually cause this test to fail. If the cables and connectors appear to be intact, refer to "Overall Block Diagram of Preselector" to determine which switches in the signal path may be at fault.

To solve this problem:

1. Refer to "If Test 05. Gain Calibration Fails".
2. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

If Test 12. Output Return Loss Fails

The purpose of this verification test is to measure the preselector RF output return loss. The return loss for the bypass, lowpass, and YTF paths is measured with the input attenuator set to 10 dB.

To solve this problem:

1. Refer to "If Test 05. Gain Calibration Fails".
2. If necessary, obtain service from Hewlett-Packard. (Refer to "If You Want Hewlett-Packard to Service Your Preselector" in Chapter 1.)

Performing Related Adjustments and Verification Tests

After an assembly has been repaired, replaced, or adjusted, there are a set of related adjustments and verification tests that must be performed to ensure proper operation.

If an assembly has been repaired, changed, or adjusted, perform the related verification tests listed after each assembly name.

Note If you decide to perform the servicing yourself, prepare a static-safe work station before you begin any servicing procedures. (Refer to "Preparing a Static-Safe Work Station".)

A1A1 front panel

Perform the following related verification tests:

Test 01. Front Panel LEDs

A7 switch driver

Perform the following related verification tests:

Test 02. Switching Diagnostics

A8 input attenuator

Perform the following related verification tests:

Test 02. Switching Diagnostics
Test 05. Gain Calibration
Test 09. Low Frequency Flatness
Test 10. Input Attenuator Accuracy
Test 11. Input Return Loss

A9 YTF

Perform the following related verification tests:

Test 03. DAC Calibration
Test 04. YTF Tracking Error
Test 05. Gain Calibration
Test 06. Peak DAC Deviation
Test 08. YTF Image Rejection
Test 11. Input Return Loss

A10 limiter

Perform the following related verification tests:

Test 05. Gain Calibration
Test 09. Low Frequency Flatness
Test 11. Input Return Loss

A11 LPF

Perform the following related verification tests:

Test 05. Gain Calibration
Test 07. LPF Attenuation at 1st IF
Test 09. Low Frequency Flatness
Test 11. Input Return Loss

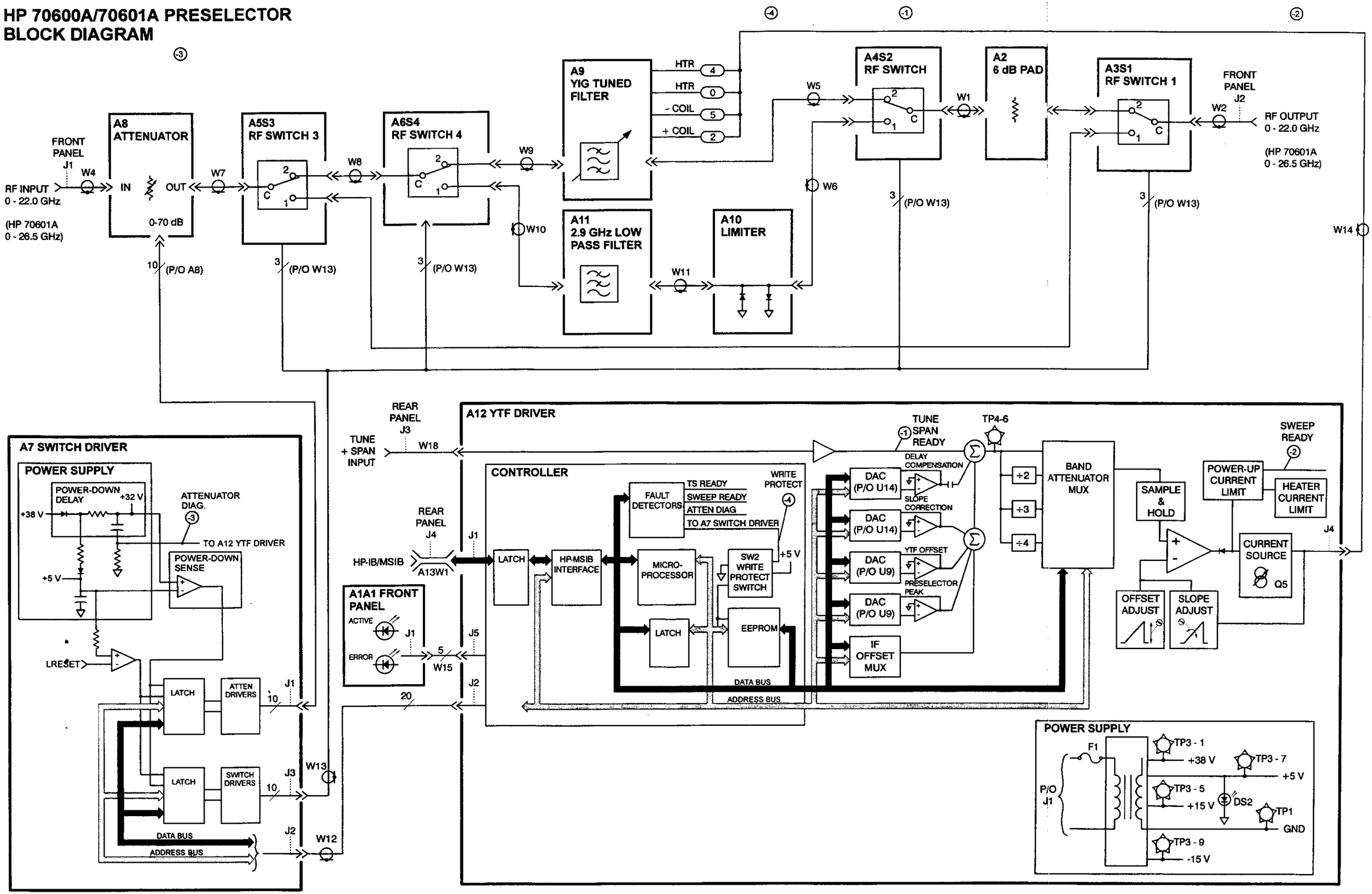
Performing Related Adjustments and Verification Tests

A12 YTF driver

Perform the following related verification tests:

Test 01. Front Panel LEDs
Test 02. Switching Diagnostics
Test 03. DAC Calibration
Test 04. YTF Tracking Error
Test 05. Gain Calibration
Test 06. Peak DAC Deviation
Test 10. Input Attenuator Accuracy
Test 11. Input Return Loss

HP 70600A/70601A PRESELECTOR BLOCK DIAGRAM



70600bd.cdr
7/27/95

HP 70600A/70601A Preselector Block Diagram

6

Adjustment Procedures

Note All adjustment procedures for this module are documented with the module verification tests in Chapter 7.

This chapter was retained to keep this service guide's format consistent with other MMS service guides.

7

Module Verification Tests

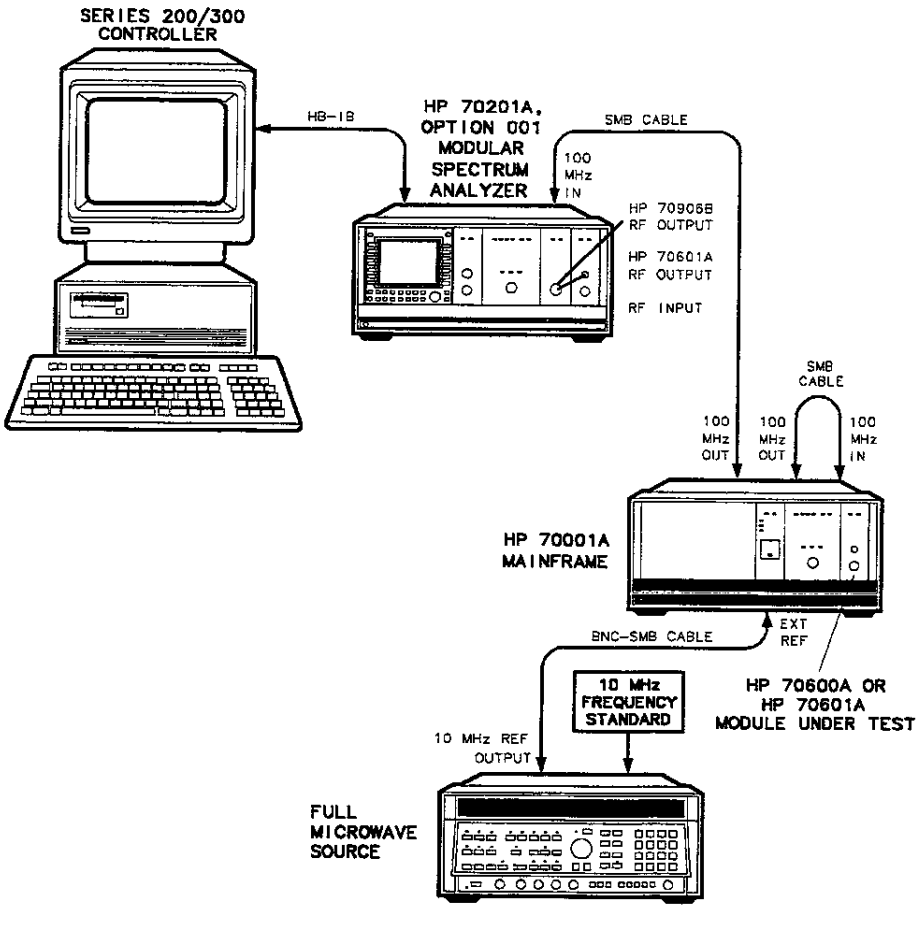
This chapter contains the setups for all module verification tests that are used to optimize module performance when assemblies are changed, repaired, or adjusted. All of the setups described in this chapter are automated. These automated setups require a controller and are run with software that is described in Chapter 2.

A procedure is considered an adjustment when the cover plate of a module must be removed to perform a repair or an adjustment. A procedure is also considered an adjustment when a module is replaced.

Conversely, a procedure is considered a test when checks are performed on a module and cover plates and modules are not removed from a system.

Note *HP Module Verification Software* must be loaded and the preselector warmed up for at least one hour before beginning these tests.

Overall Test Setup

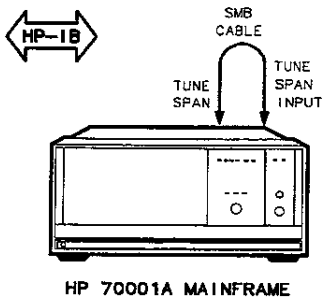


Overall Test Setup

Test Equipment	**Preferred Model Numbers**
Controller	HP 9000 Series 200/300 controller
Full microwave source	HP 8340A synthesized sweeper
Mainframe *(2 required)*	HP 70001A mainframe
IF section	HP 70902A IF section
RF section	HP 70906B RF section
Display	HP 70004A color display
Local oscillator *(2 required)*	HP 70900B local oscillator source
Preselector *(2 required for the HP 70601A preselector)*	HP 70601A preselector
Precision frequency reference	HP 70301A Option 001 microwave tracking generator
External frequency reference	HP 70310A precision frequency reference
Cable	HP 85680-60093 123 cm (48.4 in) 50Ω BNC(m) to SMB(f)
Cable	HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
System configuration cables	(Refer to the *HP 70000 Modular Spectrum Analyzer Installation and Verification Manual.*)

The preselector is tested as configured in the mainframe for all of the verification tests. A few tests require using a mainframe with the modified cover installed. Refer to the service kit part numbers in Chapter 5 for the part number of the modified covers. The HP 71201A Option 001 modular spectrum analyzer is calibrated and used to test the HP 70600A/70601A preselector. The overall test setup shown above is maintained throughout the verification test series. Although the controller is not illustrated in each test setup, leave it connected throughout the test process. The test setups use the HP 70600A preselector to illustrate the module under test. If you are testing an HP 70601A preselector, the adapter illustrated at the input to the preselector can be eliminated.

Test 01. Front Panel LEDs



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Front-Panel LEDs Test Setup

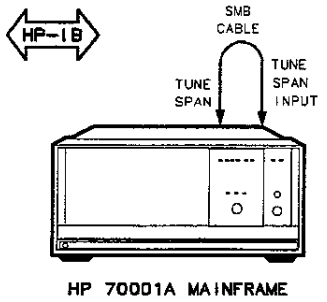
Test Equipment	**Preferred Model Numbers**
Local oscillator	HP 70900B local oscillator source
Controller *(not shown)*	HP 9000 Series 200/300 controller
Cable	HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

The purpose of this verification test is to verify visually that the front panel LEDs are functioning properly. The ability of the internal processor to control the LEDs is tested as well. The error/diagnostics sensing capability is not tested.

To run this test, the preselector must be functioning properly, with no error conditions being reported.

The operator is prompted to make a softkey selection that agrees with the state of the LEDs at the beginning of the test. The address map is accessed via the display of the HP 70000 Series modular measurement system to activate the ACT (active) LED. The Tune Span input is removed from the preselector to verify operation of the ERR (error) LED.

Test 02. Switching Diagnostics



efa3_6t

Switching Diagnostics Setup

Test Equipment	Preferred Model Numbers
Local oscillator	HP 70900B local oscillator source
Controller *(not shown)*	HP 9000 Series 200/300 controller
Cable	HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

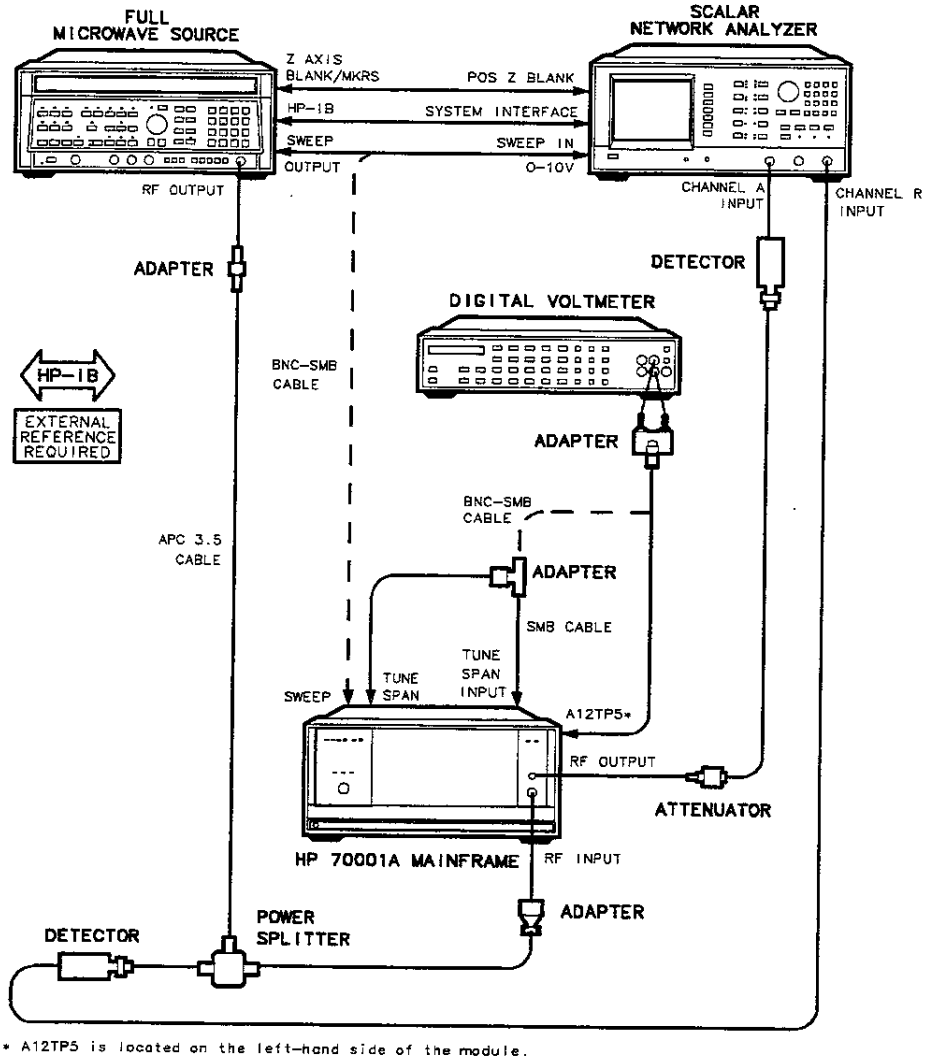
The purpose of this verification test is to verify that the diagnostic detectors are operational.

To run this test, the preselector must be functioning properly, with no error conditions being reported.

The Tune-Span detector level is read. If the preselector reports the absence of an input signal, the operator is prompted to check the test setup. If the error remains, the test fails then exits.

If the detector passes, the test continues with the internal self-check of the RF switches and attenuator.

Test 03. DAC Calibration



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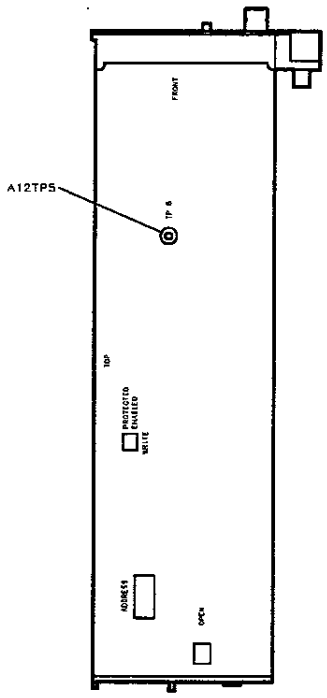
DAC Calibration Setup



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Adjustment Location

Test Equipment	Preferred Model Numbers
Local oscillator	HP 70900B local oscillator source
Precision DVM	HP 3456A digital multimeter
Full microwave source	HP 8340A synthesized sweeper
MW network analyzer	HP 8757C scalar network analyzer
Power splitter	HP 11667B power splitter
Detector *(2 required)*	HP 11664E detector
10 dB Attenuator	HP 8493C Option 010 coaxial fixed attenuator
Controller *(not shown)*	HP 9000 Series 200/300 controller
Adapter *(for testing HP 70600A preselector)*	HP 1250-1743 50Ω APC-3.5(m) to N(m)
Adapter	HP 1250-1391 50Ω SMB tee(f) (m) (m)
Adapter	HP 1251-2277 50Ω BNC(f) to dual banana plug
Adapter	HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Cable	HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable	HP 85680-60093 123 cm (48.4 in) 50Ω BNC(m) to SMB(f)

Test 03. DAC Calibration

The purpose of this verification test is to adjust the offset, slope, and delay DACs of the preselector. These are adjusted to achieve optimum static and dynamic tracking of the YTF with the tune-span voltage provided by the HP 70900B local oscillator source. The optimum DAC values for each frequency band are stored, then written into the EEPROM of the preselector.

To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 must also be completed before this test is initiated.

Note The preselector requires a one hour warm-up before running this test. If the warm-up time is less, the correction data written into the EEPROM may be faulty.

The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity. (This test takes about thirty minutes to run.)

Coarse Adjustment

The operator is prompted to adjust the offset and slope potentiometers to coarse-tune the YTF.

To adjust the offset, the tune-span voltage is set for a YTF frequency of 3 GHz, the YTF is set to path-band 0, and the offset, slope, delay, and peak DACs are set to nominal values. A hysteresis pulse is initiated, then the operator is instructed to adjust the offset potentiometer until the adjustment crosshair is within the adjustment box, putting the 3 dB center frequency within test limits of 3 GHz.

After the offset adjustment is completed, the tune-span voltage is set for a YTF frequency of 22 GHz. The YTF is set to path-band 3. The offset, slope, delay, and peak DACs are set to nominal values, and a hysteresis pulse is initiated. The operator is instructed to adjust the slope potentiometer until the adjustment crosshair is within the adjustment box, putting the 3 dB center frequency within test limits of 22 GHz.

The offset and slope adjustments are interactive, therefore the program iterates between these adjustments until the operator indicates completion. At completion, the average 3 dB center frequency of the YTF is checked and the status is compared with test limits. If the status is within test limits, the program continues, otherwise the operator is prompted to readjust the offset and slope as described above.

There is a time limit on the slope adjustment. This limit prevents the rising temperature resulting from high current drain to affect the alignment. If the adjustment time is exceeded, the program defaults to the offset adjustment.

Offset and Slope Adjustments

A waiting period is initiated with the YTF tuned to 3 GHz. The waiting period allows the YTF to cool and an internal condition to be established so that the YTF can be calibrated. A voltage-vs-frequency measurement is made at the end of the waiting period.

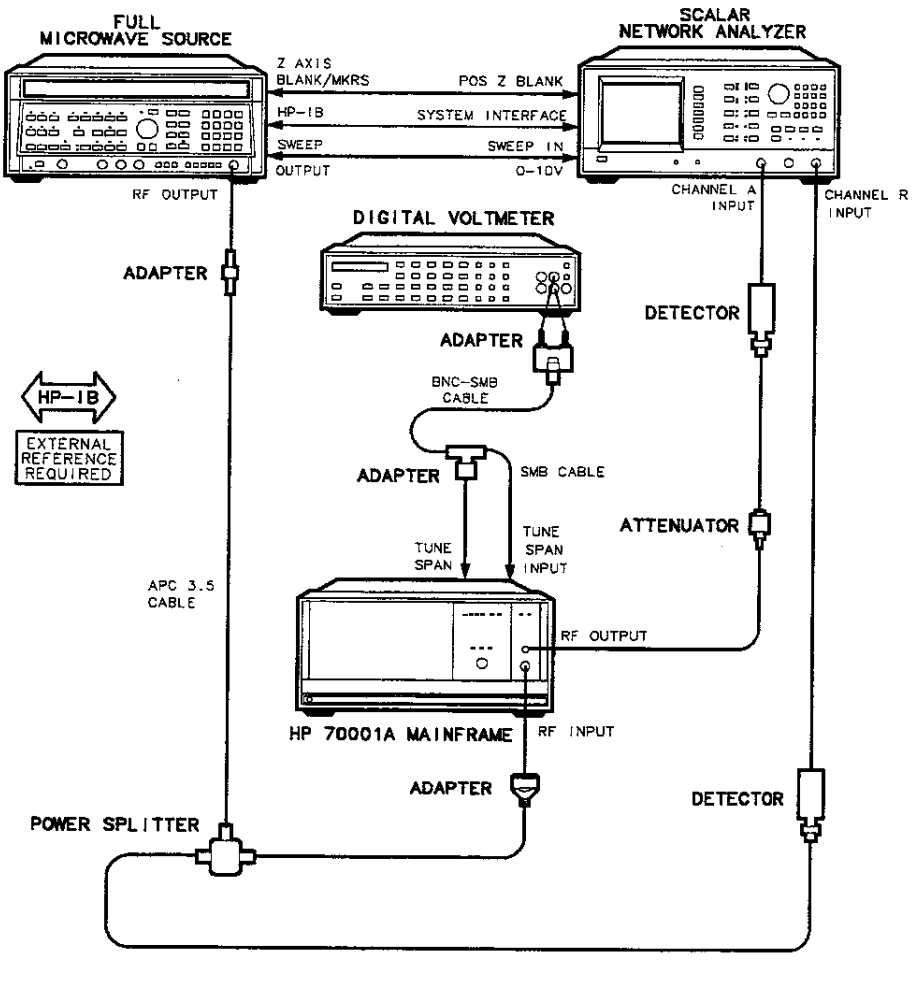
The results of the voltage-vs-frequency calculation is used to adjust the offset, then the slope DACs and to adjust the YTF static tracking of the tune-span voltage to an optimum level.

Delay DAC Adjustment

The HP 70900B local oscillator source is used to drive the horizontal sweep of the scalar network analyzer then the tune-span sweeps the YTF. The YTF frequency then becomes the horizontal axis on the network analyzer display. Delay DAC adjustments are made at the beginning, middle, and end of each frequency band. The DAC adjustment value for each band is determined by taking the average of three measured optimum delay DAC values.

The program stores the optimum slope, offset, and delay DAC values for each band on the program disk, then compares these values with test limits. If the values are within limits, the information is written into the preselector's EEPROM.

Test 04. YTF Tracking Error



YTF Tracking Error Setup

Test Equipment	**Preferred Model Numbers**
Local oscillator	HP 70900B local oscillator source
Precision DVM	HP 3456A digital multimeter
Full microwave source	HP 8340A synthesized sweeper
MW network analyzer	HP 8757C scalar network analyzer
Power splitter	HP 11667B power splitter
Detector *(2 required)*	HP 11664E detector
10 dB Attenuator	HP 8493C Option 010 coaxial fixed attenuator
Controller *(not shown)*	HP 9000 Series 200/300 controller
Adapter *(for testing HP 70600A preselector)*	HP 1250-1743 50Ω APC-3.5(m) to N(m)
Adapter	HP 1250-1391 50Ω SMB tee(f) (m) (m)
Adapter	HP 1251-2277 50Ω BNC(f) to dual banana plug
Adapter	HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Cable	HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable	HP 85680-60093 123 cm (48.4 in) 50Ω BNC(m) to SMB(f)
Cable	HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

The purpose of this verification test is to verify that the preselector tunes the YTF to the proper frequency. This tuning requires that the preselector use both the DAC values in the EEPROM and the tune-span voltage from the local oscillator. These are adjusted to achieve optimum static and dynamic tracking of the YTF. The minimum bandwidth requirement of the YTF is also checked in this test.

To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 and Test 03. DAC Calibration must be completed before this test is initiated.

Note The preselector requires a one hour warm-up before running this test. If the warm-up time is less, the correction data written into the EEPROM may be faulty.

The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity. (This test takes about thirty minutes to complete.)

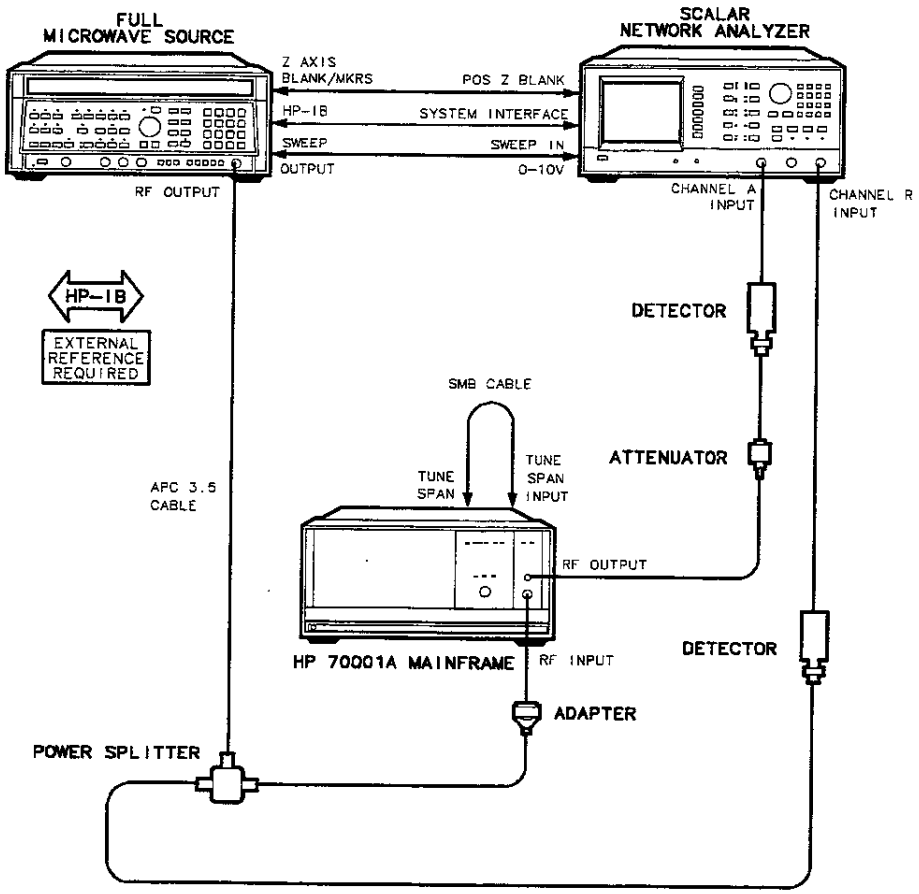
Tracking Error Measurement

A waiting period is initiated with the YTF tuned to 3 GHz. The waiting period allows the YTF to cool and internal conditions to be established that duplicate the conditions at which the YTF was calibrated. A tune-span voltage-vs-YTF frequency measurement is made at the end of the waiting period.

The YTF frequency is incremented as a hysteresis pulse is initiated. At each increment the YTF center frequency and the tune-span voltage are measured. The tracking error is determined by the difference between the measured YTF center frequency and the RF frequency that corresponds to the tune-span voltage.

The results are compared with test limits.

Test 05. Gain Calibration



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Gain Calibration Setup

Test Equipment **Preferred Model Numbers**

Local oscillator ..... HP 70900B local oscillator source
Full microwave source .....HP 8340A synthesized sweeper
MW network analyzer .....HP 8757C scalar network analyzer
Power splitter .....HP 11667B power splitter
Detector *(2 required)* .....HP 11664E detector
10 dB Attenuator ..... HP 8493C Option 010 coaxial fixed attenuator
Controller *(not shown)* .....HP 9000 Series 200/300 controller
Adapter (for HP 70600A preselector) .....HP 1250-1743 50Ω APC-3.5(m) to N(m)
Cable .....HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable ..... HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

The purpose of this verification test is to measure the bypass, lowpass, and YTF path insertion losses of the HP 70600A preselector. Amplitude-correction data is created and the values are subtracted from the insertion loss data generated at a reference frequency. The subtracted value is used to generate the flatness data.

The flatness data is compared with test limits, then written into the EEPROM.

To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 and Test 03. DAC Calibration must be completed before this test is initiated.

Note The preselector requires a one hour warm-up before beginning this test. If the warm-up time is less, the correction data written into the EEPROM may be faulty.

The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity. RF switch and attenuator contacts are exercised to ensure they are operating properly.

Bypass Path Insertion Loss

The preselector is set to 10 dB attenuation and the bypass mode is activated. An A/R measurement of the insertion loss is made from the bypass start to stop frequency. The program calculates the insertion loss using the following equation:

Bypass Loss Data = Bypass Trace Data Bypass Calibration Data + 10 dB

(The 10 dB constant is added to the measured loss to satisfy the local oscillator amplitude correction algorithm.)

Lowpass Path Insertion Loss

The preselector is set to 10 dB attenuation and the lowpass mode is activated. An A/R measurement of the insertion loss is made from the lowpass start to stop frequency. The program calculates the insertion loss using the following equation:

Lowpass Loss Data = Lowpass Trace Data Lowpass Calibration Data + 10 dB

(The 10 dB constant is added to the measured loss to satisfy the local oscillator amplitude correction algorithm.)

YTF Path Insertion Loss

For each of the 4 bands measured, 10 dB attenuation is added and a hysteresis pulse is initiated. The microwave source center frequency is incremented and the network analyzer measures the YTF passband response. This is accomplished by averaging the passband response over four sweeps to minimize the noise effect on the measurement. Maximum amplitude is measured after the passband response has been averaged. The program uses the following equation to calculate the YTF path loss:

YTF Loss Data = Maximum Amplitude YTF Calibration Data + 10 dB

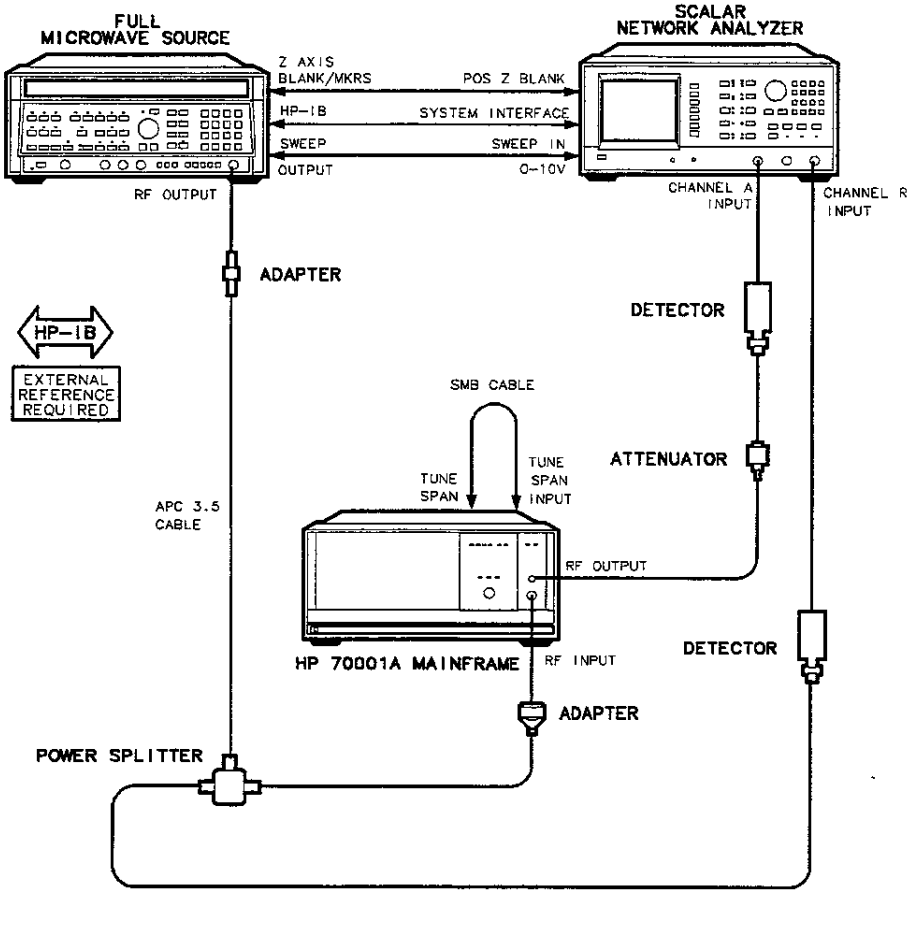
(The 10 dB constant is added to the measured loss to satisfy the local oscillator amplitude correction algorithm.)

With the above measurements completed, the YTF frequency is set to a known level (3 GHz) so that the current draw is minimum. (Heat in the YTF affects the measurements.)

Test 05. Gain Calibration

Amplitude-correction factors are calculated, then subtracted from insertion loss data to generate the flatness data. The insertion loss and flatness data are compared with test limits.

Test 06. Peak DAC Deviation



Peak DAC Deviation Setup

Test Equipment	**Preferred Model Numbers**
Local oscillator	HP 70900B local oscillator source
Full microwave source	HP 8340A synthesized sweeper
Scalar network analyzer	HP 8757C scalar network analyzer
Power splitter	HP 11667B power splitter
Detector *(2 required)*	HP 11664E detector
10 dB Attenuator	HP 8493C Option 010 coaxial fixed attenuator
Controller *(not shown)*	HP 9000 Series 200/300 controller
Adapter *(for testing HP 70600A preselector)*	HP 1250-1743 50Ω APC-3.5(m) to N(m)
Cable	HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable	HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

The purpose of this verification test is to measure the YTF frequency change when the peak DAC is varied over its full range. This test verifies whether the peak DAC is operating correctly.

To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 must be completed before this test is initiated.

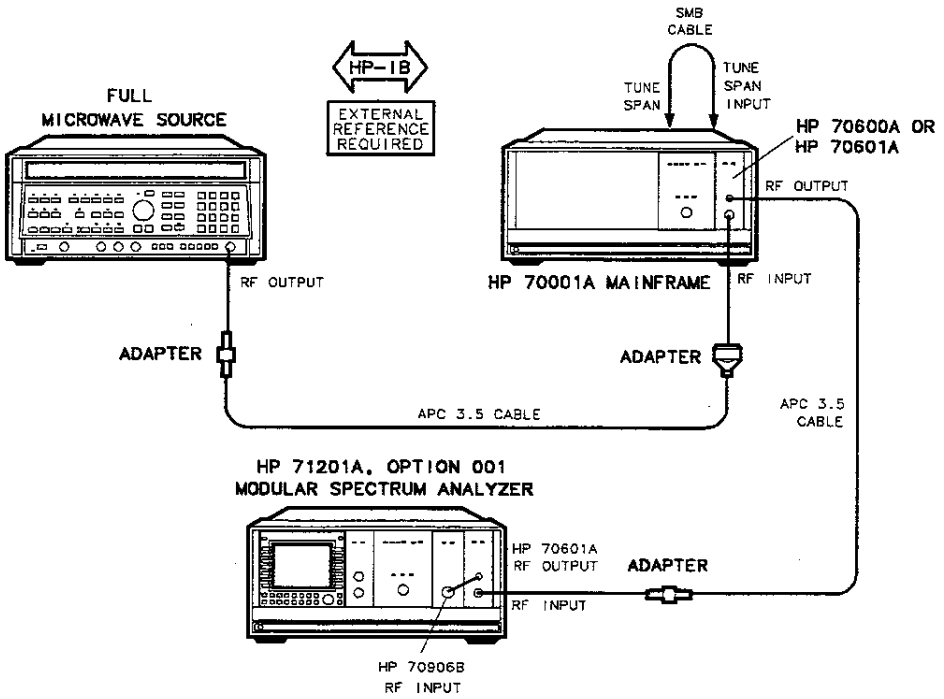
Test 06. Peak DAC Deviation

The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity.

The preselector YTF path is activated at 0 dB attenuation. The peak DAC is set to its nominal position and the YTF is tuned to the center of the band. The scalar network analyzer measures the frequency of the YTF. The peak DAC is changed to the lowest, then highest, setting and the YTF frequency is measured at each setting.

The measurement is repeated in each YTF band, then the results are compared with test limits.

Test 07. LPF Attenuation at 1st IF



LPF Attenuation at First IF Setup

Test Equipment **Preferred Model Numbers**

Local oscillator ..... HP 70900B local oscillator source
Full microwave source .....HP 8340A synthesized sweeper
Calibrated spectrum analyzer .....HP 71201A Option 001 modular spectrum analyzer
Controller *(not shown)* ..... HP 9000 Series 200/300 controller
Adapter *(for testing HP 70600A preselector)* ..... HP 1250-1743 50Ω APC-3.5(m) to N(m)
Adapter *(2 required for the HP 70601A preselector)* ..... HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Cable *(2 required)* .....HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable ..... HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

Test 07. LPF Attenuation at 1st IF

The purpose of this verification test is to measure the lowpass filter attenuation at the first IF frequency. The measurement is relative to the passband insertion loss at 10 MHz. To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 must be completed before this test is initiated.

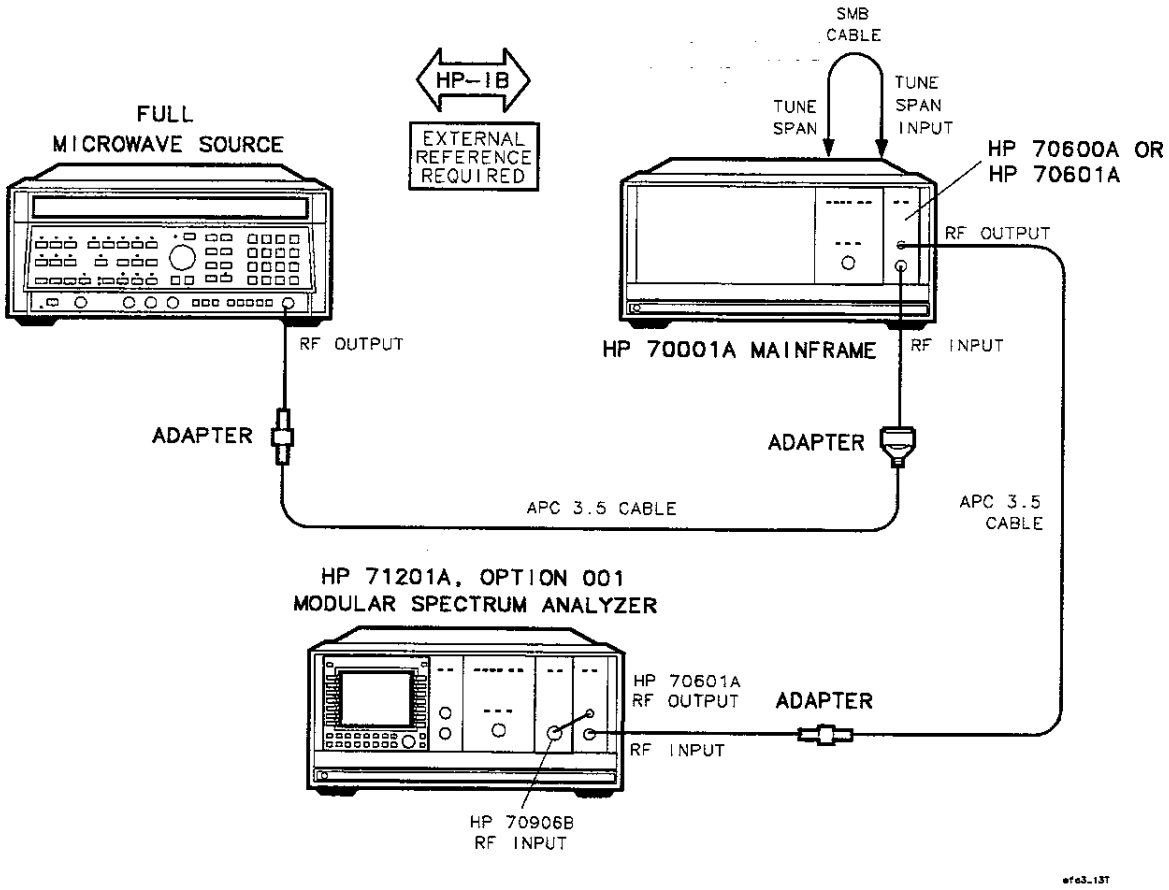
The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity.

The offset frequency for the test equipment is determined then the preselector lowpass filter mode is initiated with 10 dB attenuation. The spectrum analyzer is set to a narrow resolution bandwidth at 0 Hz span. The full microwave source and the spectrum analyzer are tuned to 10 MHz and the amplitude is measured to establish a reference. To reduce log fidelity errors, the reference level is made equal to the reference amplitude before beginning this measurement. The microwave source and the spectrum analyzer are then tuned to the first IF frequency. The signal amplitude is measured, the reference level is made equal to the signal amplitude, and the preselector of the spectrum analyzer is peaked. A final amplitude measurement is taken and the first IF attenuation is calculated using the following equation:

First IF Attenuation = Signal Amplitude Reference Amplitude System Calibration Data

The attenuation data is compared with test limits.

Test 08. YTF Image Rejection



YTF Image Rejection Setup

Test Equipment	Preferred Model Numbers
Local oscillator	HP 70900B local oscillator source
Full microwave source	HP 8340A synthesized sweeper
Calibrated spectrum analyzer	HP 71201A Option 001 modular spectrum analyzer
Controller *(not shown)*	HP 9000 Series 200/300 controller
Adapter *(for testing HP 70600A preselector)*	HP 1250-1743 50Ω APC-3.5(m) to N(m)
Adapter *(3 required when testing HP 70601A preselector)*	HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Cable	HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable	HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

Test 08. YTF Image Rejection

The purpose of this verification test is to measure the YTF attenuation of a frequency that would produce an image response.

To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 must be completed before this test is initiated.

The operator is prompted to make appropriate instrument settings. The RF and dc connectors are checked automatically to ensure measurement integrity.

An offset frequency is established using the following equation:

Offset Frequency = Center Frequency + Mixing Number X642.8 MHz

(Mixing Number = 1 for YTF bands 0 and 1)

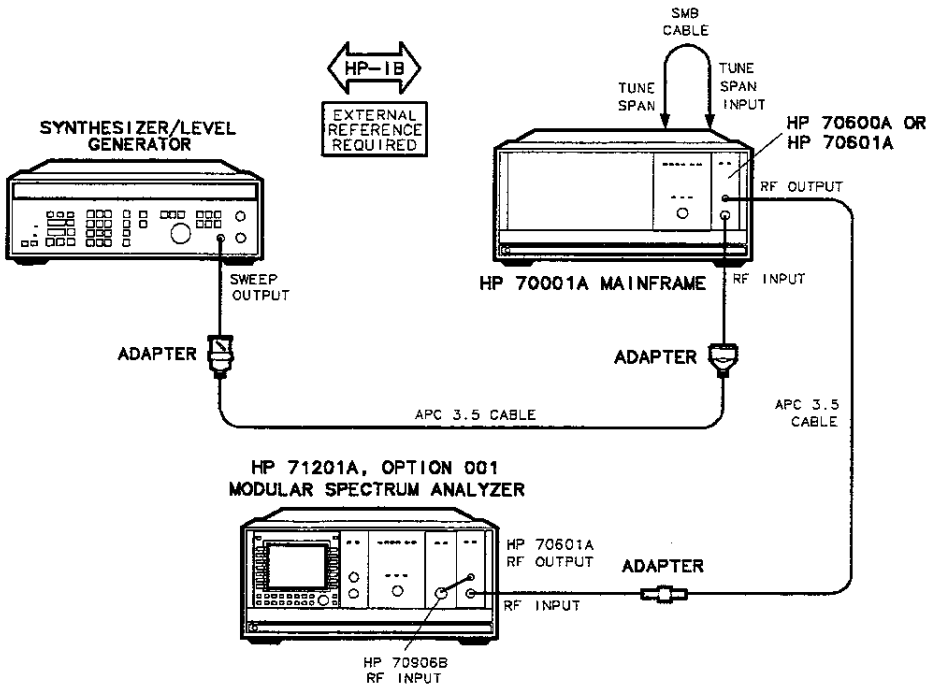
(Mixing Number = +1 for YTF bands 2 and 3)

The preselector's YTF is tuned to the calculated offset frequency, then the signal amplitude is measured and the reference level is made equal to the signal amplitude. The signal amplitude is again measured. This value is the image amplitude. The reference amplitude is measured at the peak of the YTF passband and the image attenuation is calculated using the following equation:

Image Attenuation = (image amplitude reference amplitude)

The image attenuation data is compared with test limits.

Test 09. Low Frequency Flatness



Low Frequency Flatness Setup

Test Equipment **Preferred Model Numbers**

Local oscillator ..... HP 70900B local oscillator source
Synthesizer/Level generator ..... HP 3335A synthesizer/level generator
Calibrated spectrum analyzer ..... HP 71201A Option 001 modular spectrum analyzer
Controller *(not shown)* ..... HP 9000 Series 200/300 controller
Adapter *(2 required)* ..... HP 1250-1743 50Ω APC-3.5(m) to N(m)
Adapter ..... HP 1250-1700 50Ω SMC(m) to SMA(f)
Adapter ..... HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Cable *(2 required for the HP 70601A preselector)* ..... HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable ..... HP 5061-5458 1.0 meter SMA(m) to SMA(m)

Test 09. Low Frequency Flatness

The purpose of this verification test is to measure the flatness below 10 MHz of the HP 70600A/70601A preselector.

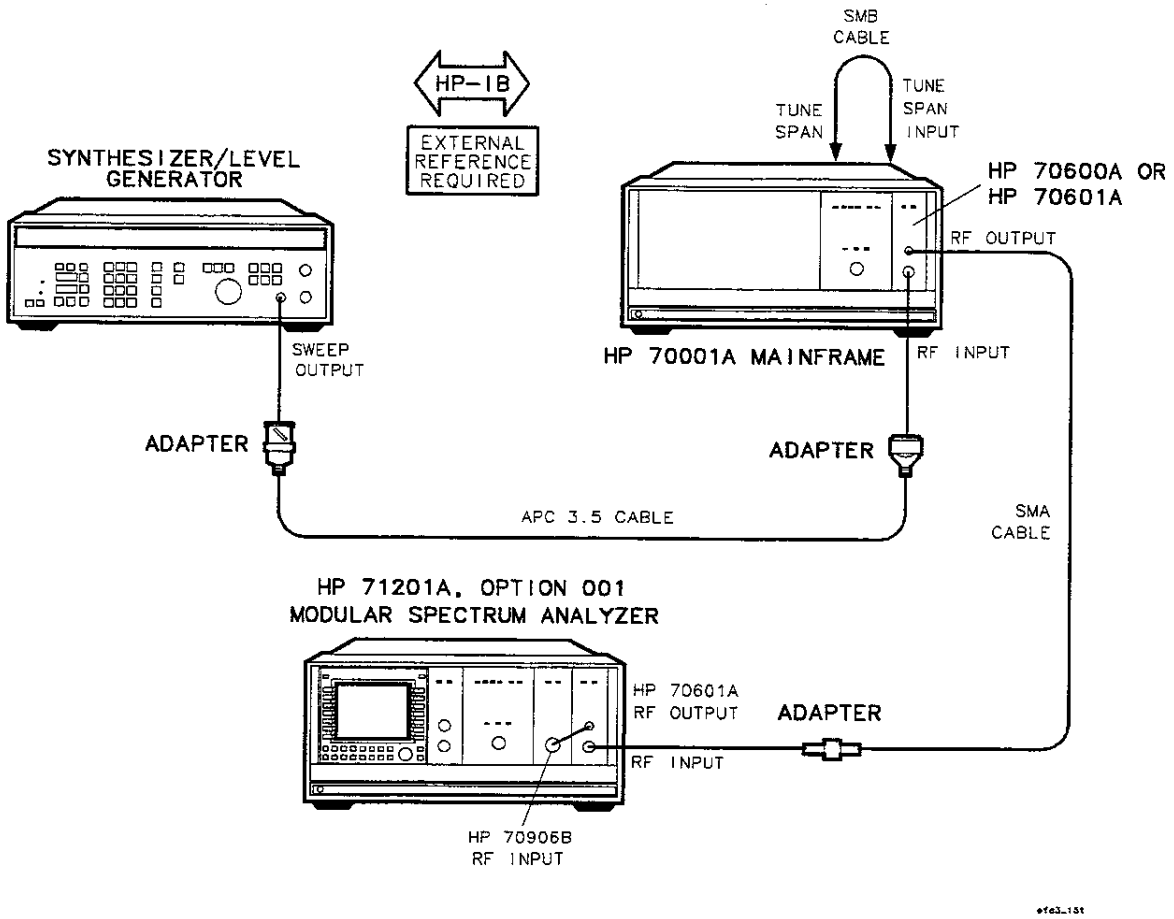
To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 must be completed before this test is initiated.

The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity.

The gain calibration data is retrieved and used in this test for the bypass and lowpass paths' flatness calculations. The preselector is set to 10 dB attenuation in either the bypass or lowpass mode. The test equipment is set up to measure the amplitude of the RF output signal from the preselector. The calibrated spectrum analyzer is set 4 dB above the measured signal level. The spectrum analyzer scale is set to 2.0 dB/DIV and the signal is remeasured then used as the reference. The input frequency is incremented while the spectrum analyzer measures the preselector's RF output. At each frequency increment, the flatness for either the bypass or lowpass mode is calculated.

The calculations are compared with test limits.

Test 10. Input Attenuator Accuracy



Input Attenuator Accuracy Setup

Test Equipment	Preferred Model Numbers
Local oscillator	HP 70900B local oscillator source
Synthesizer/Level generator	HP 3335A synthesizer/level generator
Calibrated spectrum analyzer	HP 71201A Option 001 modular spectrum analyzer
MW network analyzer	HP 8757C scalar network analyzer
Controller *(not shown)*	HP 9000 Series 200/300 controller
Adapter *(2 required for the HP 70601A preselector)*	HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Adapter	HP 1250-1700 50Ω SMC(m) to SMA(f)
Adapter *(for HP 70600A preselector)*	HP 1250-1743 50Ω APC-3.5(m) to N(m)
Cable	HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable	HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)
Cable	HP 5061-5458 1.0 meter SMA(m) to SMA(m)

Test 10. Input Attenuator Accuracy

The purpose of this verification test is to measure the amplitude accuracy of the RF input attenuator settings as referenced to the 10 dB attenuation setting. The attenuator settings range from 0 dB to 70 dB in 10 dB increments.

To run this test, the preselector must be functioning properly, with no error conditions being reported. Chapter 8 must be completed before this test is initiated.

The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity.

Initially, the attenuator is exercised. This is accomplished by selecting settings for a specified number of cycles. The preselector bypass path is activated and the input attenuator's 10 dB setting is enabled. The power level of the synthesizer/level generator is calculated. The signal level of the preselector is measured and the reference level of the spectrum analyzer is set 4 dB higher than the signal level. The average amplitude of the resulting signal becomes the 10 dB reference amplitude. The signal power is measured at the remaining attenuation levels. The synthesizer/level generator compares the signal power with an ideal power level and an amplitude error term is calculated using the following equation:

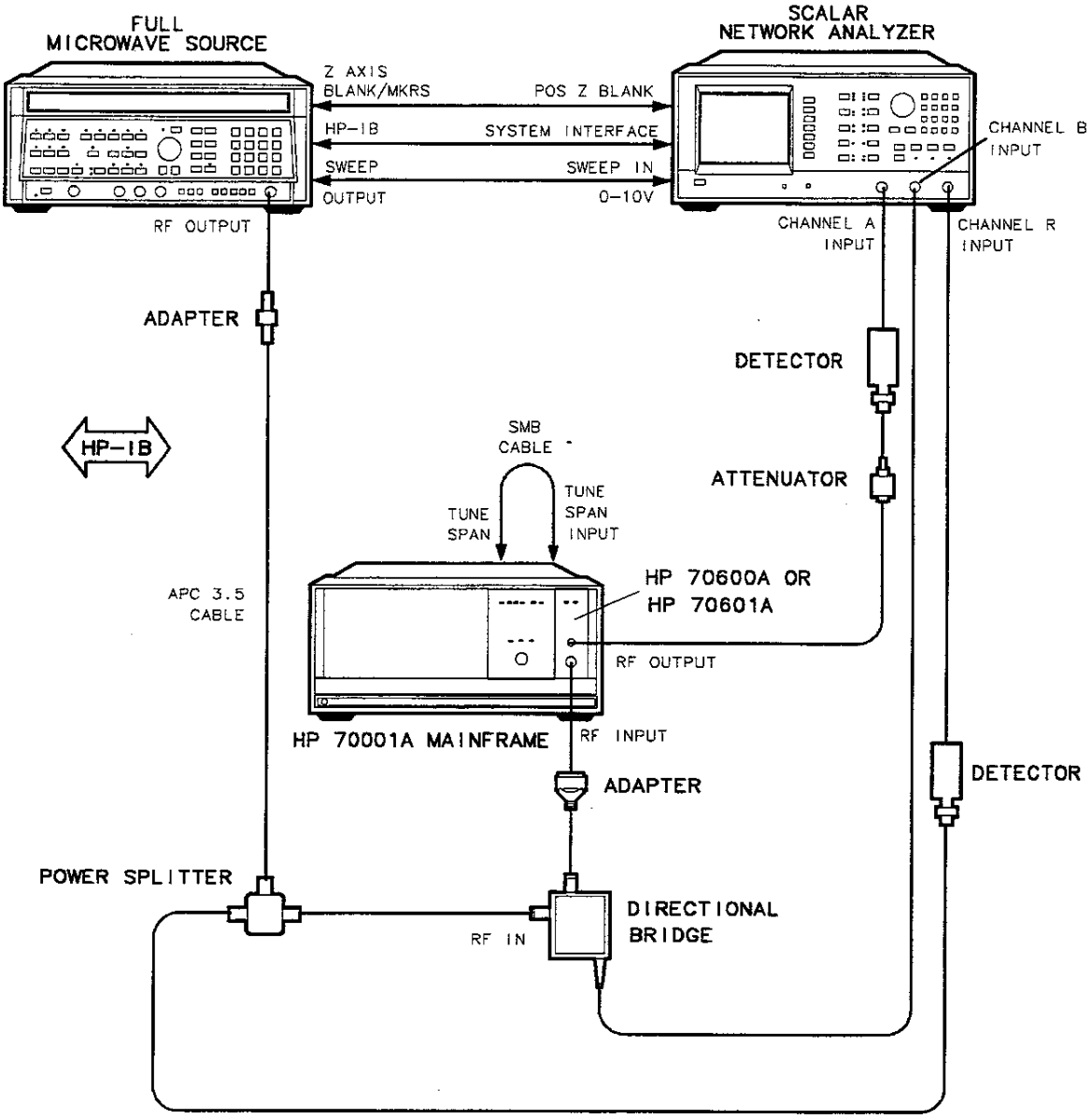
Amplitude Error = Average Amplitude 10 dB reference amplitude

If the resulting amplitude error is within test limits, the attenuator accuracy is calculated using the following equation:

Attenuator Accuracy = Final Synthesizer/Level Generator RF Power Ideal Synthesizer/Level Generator Power

The attenuator accuracy value is compared with test limits.

Test 11. Input Return Loss



Input Return Loss Setup

Test Equipment	Preferred Model Numbers
Local oscillator	HP 70900B local oscillator source
Full microwave source	HP 8340A synthesized sweeper
Scalar network analyzer	HP 8757C scalar network analyzer
Controller *(not shown)*	HP 9000 Series 200/300 controller
Power splitter	HP 11667B power splitter
Microwave directional bridge	HP 85027B directional bridge

Test 11. Input Return Loss

Detector *(2 required)* ..... HP 11664E detector
10 dB Attenuator ..... HP 8493C Option 010 coaxial fixed attenuator
Adapter *(for testing HP 70600A preselector)* ..... HP 1250-1743 50Ω APC-3.5(m) to N(m)
Adapter *(for testing HP 70601A preselector)* .....HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Cable .....HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable ..... HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

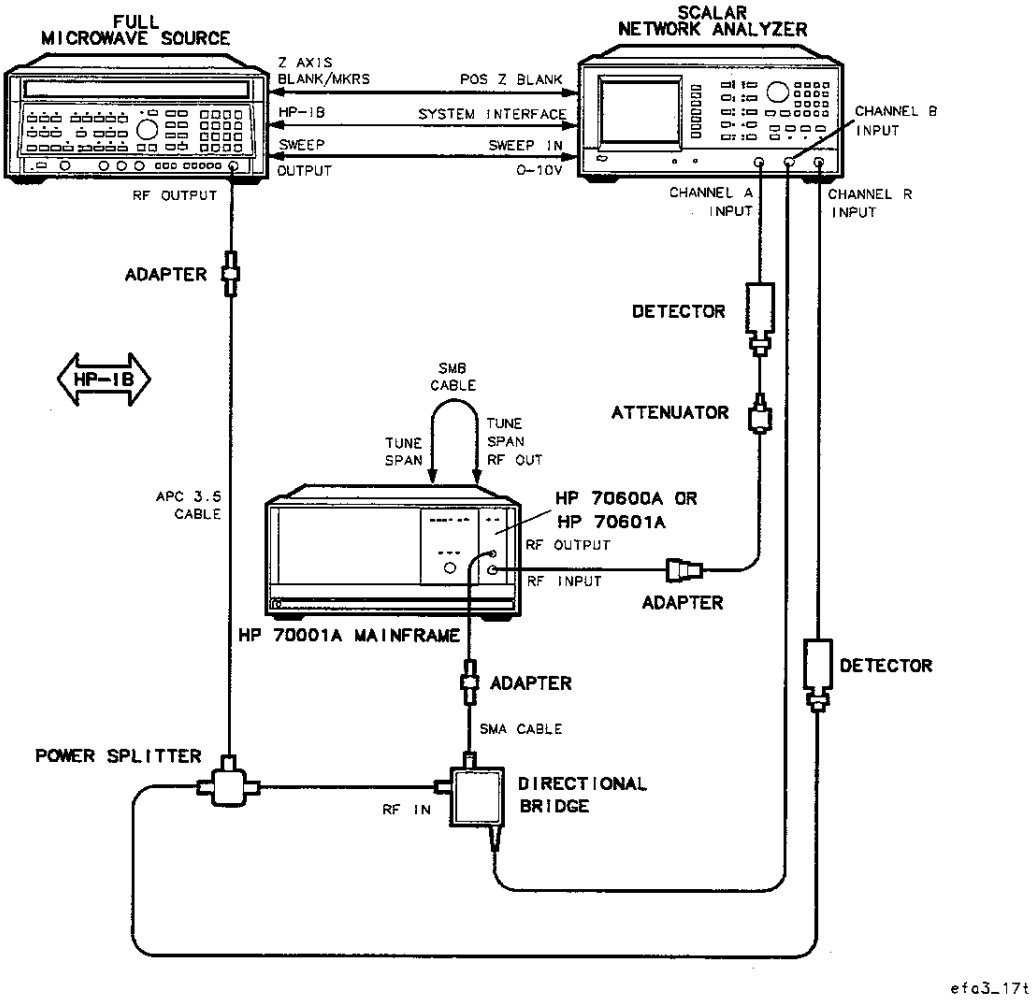
The purpose of this verification test is to measure the RF input return loss. The return loss for the bypass and lowpass paths are measured at 0 dB and 10 dB attenuator settings. To run this test, the preselector must be functioning properly, with no error conditions being reported. System Return Loss Calibration (part of Chapter 8), and Test 03. DAC Calibration must be completed before this test is initiated.

The operator is prompted to make appropriate instrument settings. The RF and dc connectors are checked automatically to ensure measurement integrity.

The scalar network analyzer makes B/R return loss measurements of the bypass, lowpass, and YTF 10 dB attenuation paths. In the bypass mode, the return loss measurements are made from 10 MHz to 22 GHz with the preselector attenuator at 0 dB, then at 10 dB attenuation. For the lowpass mode, the return loss measurements are made from 10 MHz to 2.9 GHz at both 0 dB and 10 dB attenuation settings. The return loss and insertion loss of the YTF path are measured with the preselector set to 0 dB attenuation, and the YTF is tuned to the frequency of the measurement.

The input return loss data values are compared with test limits.

Test 12. Output Return Loss



Output Return Loss Setup

Test Equipment **Preferred Model Numbers**

Local oscillator ..... HP 70900B local oscillator source
Full microwave source .....HP 8340A synthesized sweeper
Scalar network analyzer ..... HP 8757C scalar network analyzer
Controller *(not shown)* ..... HP 9000 Series 200/300 controller
Power splitter .....HP 11667B power splitter
Detector *(2 required)* .....HP 11664E detector
Microwave directional bridge .....HP 85027B directional bridge
10 dB Attenuator ..... HP 8493C Option 010 coaxial fixed attenuator
Adapter *(for testing HP 70600A preselector)* ..... HP 1250-1743 50Ω APC-3.5(m) to N(m)
Adapter *(2 required for the HP 70601A preselector)* ..... HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Cable .....HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)
Cable .....HP 8120-5016 160 mm (6.3 in) SMB(f) to SMB(f)

Test 12. Output Return Loss

The purpose of this verification test is to measure the preselector RF output return loss. The return loss for the bypass, lowpass, and YTF paths is measured with the input attenuator set to 10 dB.

To run this test, the preselector must be functioning properly, with no error conditions being reported. System Return Loss Calibration (part of the Chapter 8), and Test 03. DAC Calibration must be completed before this test is initiated.

The operator is prompted to make appropriate instrument settings. The RF and dc connectors are checked automatically to ensure measurement integrity. The scalar network analyzer makes B/R return loss measurements of the bypass and lowpass paths. In the bypass mode, the return loss measurements are made from 10 MHz to 22 GHz with the preselector attenuator at 10 dB attenuation. For the lowpass mode, the return loss measurements are made from 10 MHz to 2.9 GHz with a 10 dB attenuation setting. The return loss and insertion loss of the YTF path are measured with the preselector set to 0 dB attenuation and the YTF is tuned to the frequency of the measurement.

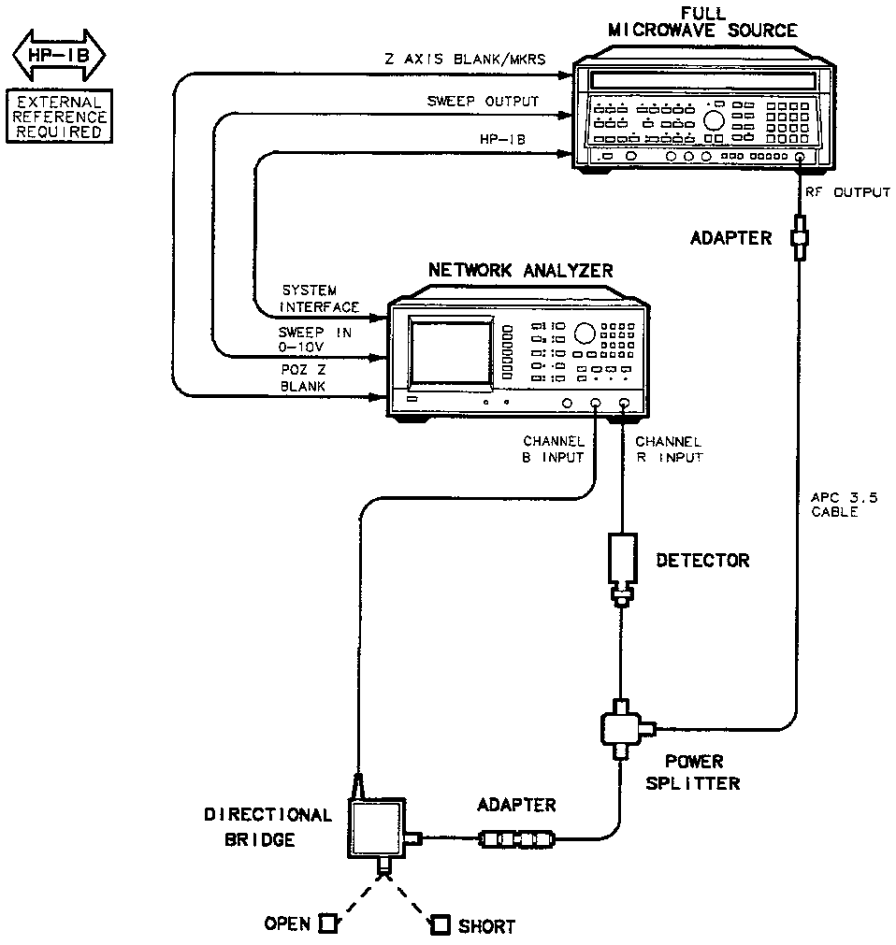
The output return loss data values are compared with test limits.

8

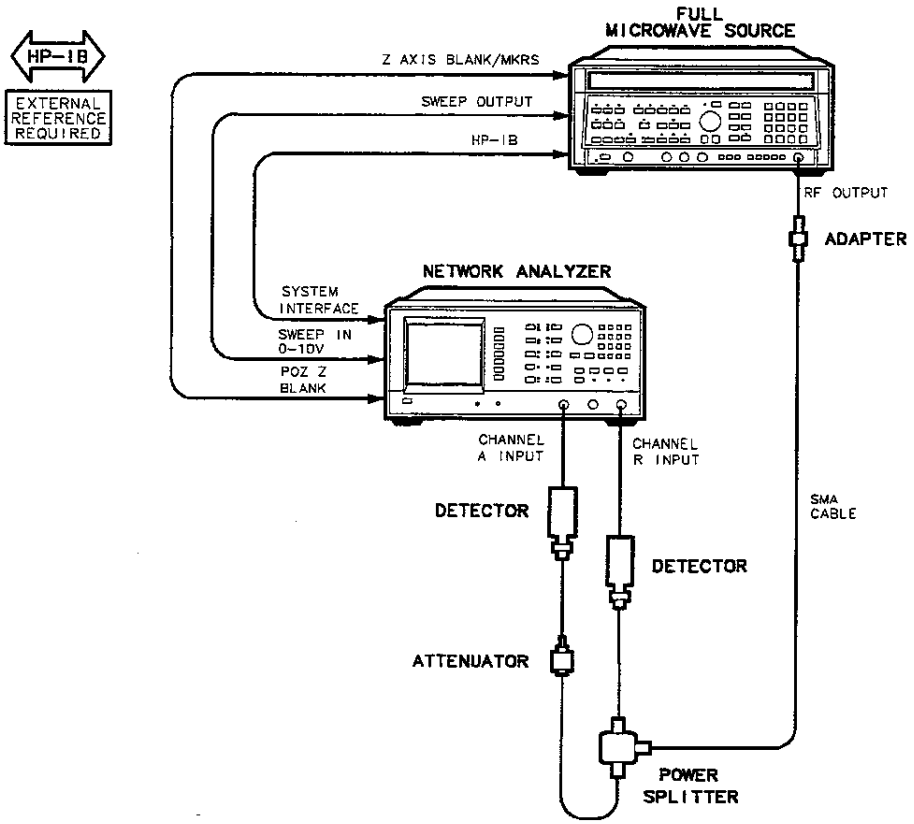
System Calibration

This chapter contains the setups for all system calibration procedures that must be performed in order to optimize module performance when assemblies are changed, repaired, or adjusted. All of the setups described in this chapter are automated. These automated setups require a controller and are run with software that is described in Chapter 2.

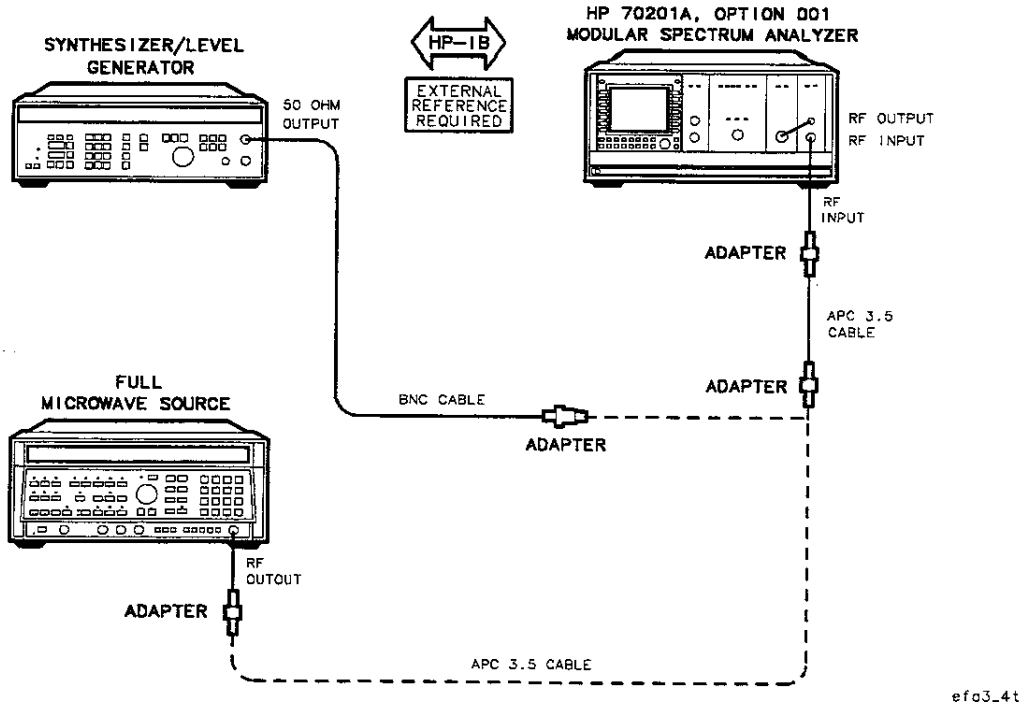
System Calibration Setups



System Calibration Setup for B/R Measurements (Setup #1)



System Calibration Setup for A/R Measurements (Setup #2)



System Calibration Setup for the HP 71201A Option 001 Modular Spectrum Analyzer (Setup #3)

Test Equipment	Preferred Model Numbers
Controller *(not shown)*	HP 9000 Series 200/300 controller
Network analyzer	HP 8757C scalar network analyzer
Full microwave source	HP 8340A synthesized sweeper
Microwave spectrum analyzer *(Setup #3)*	HP 71201A Option 001 modular spectrum analyzer
Synthesizer/Level generator *(Setup #3)*	HP 3335A synthesizer/level generator
Detector *(2 required in Setup #3)*	HP 11664E detector
Power splitter	HP 11667B power splitter
Microwave directional bridge	HP 85027B directional bridge
Open/Short Cal standard	HP 85027-60004 open/short calibration standard
Adapter *(3 required)*	HP 5061-5311 50Ω APC-3.5(f) to APC-3.5(f)
Adapter	HP 1250-1748 50Ω APC-3.5(m) to APC-3.5(m)
Adapter	HP 1250-1200 50Ω SMA(m) to BNC(f)
Adapter	HP 1250-1700 50Ω SMC(m) to SMA(f)
Adapter	HP 1250-1250 50Ω N(m) to SMA(f)
Cable *(2 required)*	HP 8120-4921 91 cm (35.8 in) 50Ω APC-3.5 mm(m) to APC-3.5 mm(m)

The purpose of this system calibration procedure is to calibrate the system for making B/R return loss measurements, A/R insertion loss measurements, and to calibrate the HP 71201A Option 001 modular spectrum analyzer for frequency and amplitude accuracy, images, and multiples. These calibration routines also provide calibration data for other verification tests. Cables that are required for making return-loss and insertion-loss measurements are connected so that the overall setup is calibrated. If this calibration is not current, the program will alert the operator to perform System Calibrations before beginning a verification test.

Setup 1 Description

The operator is prompted to make appropriate instrument settings, then to connect the calibration standard short to the TEST PORT of the microwave directional bridge. The connections are verified by the program to insure measurement integrity.

B/R measurements of the bypass and lowpass filter paths and the YTF path are made from start to stop frequencies of each path. The measurement data is stored in memory and used in appropriate verification tests.

B/R measurements are repeated for the bypass filter, the lowpass filter, and YTF paths with the open calibration standard connected to the TEST PORT. The data of this measurement is stored in memory. When all of the measurements are completed, the open and short data is arithmetically averaged.

Setup 2 Description

The operator is prompted to make appropriate instrument settings. The RF and dc connections are checked automatically to ensure measurement integrity.

A/R measurements of the bypass and lowpass filter paths are made from start to stop frequencies for each path. The YTF path insertion loss is calculated using the bypass calibration data. The resulting measurements and calculations are stored and used in appropriate verification tests.

Setup 3 Description

The synthesizer/level generator is connected to the HP 71201A Option 001 modular spectrum analyzer at the HP 70601A preselector's RF INPUT. Known amplitudes are used to calibrate settings within the modular spectrum analyzer that are used to test the preselector modules. Next, the microwave source is connected to the modular spectrum analyzer. Known frequency levels are generated and amplitude measurements are made to determine the correction factors used throughout the verification tests.

9

Replacing Major Assemblies

This chapter contains procedures for removal and replacement of major assemblies in your preselector. Instructions are given for the following assemblies:

- "HP 70600A/70601A Preselector"
- "A1A1 Front Panel"
- "A3S1, A4S2, A5S3, and A6S4 Switches"
- "A7 Switch Driver"
- "A8 Input Attenuator"
- "A9 YTF"
- "A10 Limiter"
- "A11 LPF"
- "A12 YTF Driver"
- "Rear Panel"

CAUTION This module contains static sensitive components. Refer to "Preparing a Static-Safe Work Station" in Chapter 4 for information before proceeding.

This service guide is part of an Option OB3 package which consists of two manuals. To obtain a list of all versions of all assemblies available for your preselector, refer to Manual 2.

HP 70600A/70601A Preselector

Note The HP 70600A preselector and its assemblies are generally shown in these replacement procedures. The HP 70601A preselector requires the same procedures and specific torque weights as stated for the HP 70600A preselector.

To Remove the HP 70600A/70601A Preselector:

1. Set the mainframe line switch (1) to OFF.
2. Disconnect the TUNE SPAN INPUT cable from the rear panel of the preselector.
3. Open the front panel door and loosen the hex-nut latch (2) using the hex-ball driver.
4. Slide the module out of the mainframe.

To Replace the HP 70600A/70601A Preselector:

1. Slide either the HP 70600A preselector or HP 70601A preselector into the mainframe and tighten the hex-nut latch.
2. Close the front panel door and connect the TUNE SPAN INPUT cable to the rear panel.
3. Set the mainframe line switch to ON.

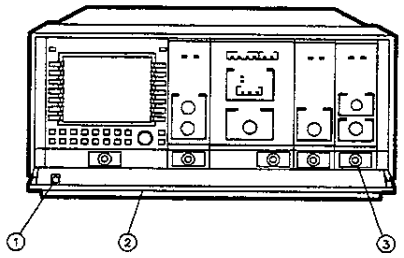


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Figure 9-1. HP 70600A/70601A Preselector Removal/Replacement

A1A1 Front Panel

To Remove the A1A1 Front Panel:

1. Remove both side covers from the preselector module.
2. Remove the A8 input attenuator so that W4 (1) can be removed from the front panel. (Refer to "A8 Input Attenuator".)
3. Remove W2 (2) from the RF OUTPUT connector.
4. Remove the two top and two bottom (3) screws that secure the front frame to the module.
5. Lift the front frame away from the module and disconnect W15 from A1A1J1 (4).
6. To remove the A1A1 front panel, remove the two screws (5) that secure the board assembly to the front frame.

To Replace the A1A1 Front Panel:

1. Replace the A1A1 front panel using the two screws (5).
2. Reconnect W15 to A1A1J1 (4), then set the front frame into place on the module.
3. Loosely tighten the two top and two bottom screws (3). Torque each screw to 6 inch-pounds.
4. Connect W4 (1) to the front panel and torque the SMA connector to 10 inch-pounds. Replace the A8 input attenuator. (Refer to "A8 Input Attenuator".)
5. Replace the side covers to the module.

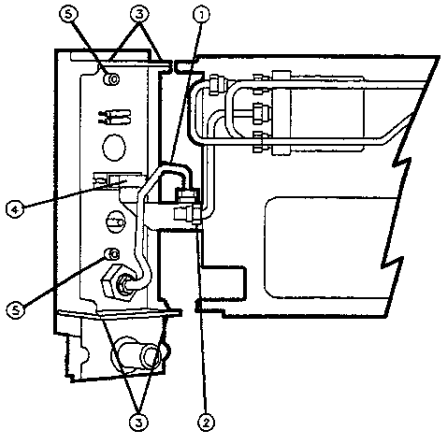

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Figure 9-2. A1A1 Front Panel Removal/Replacement

A3S1, A4S2, A5S3, and A6S4 Switches

Note The following steps may be used to remove any one of the four mechanical switches.

Note

Wire & Cable Connections

- When properly installed, cables W5 and W6 should lay flat against the center frame.
- Cables W1, W3, and W8 should lay flat (close to or touching) against the switches they cross over.
- Reverse the order of this procedure to replace the semi-rigid cable assemblies.

To Remove the A3S1, A4S2, A5S3, and A6S4 Switches:

1. Remove the right-side cover from the preselector module.
2. Disconnect both ends of the semi-rigid cables from the switch to be removed.

Note Do not bend the semi-rigid cables. It is necessary to remove some of the semi-rigid cables that cross over the switches in order to get them out of the module.

3. Remove the two screws (1) securing the switch to the module.
4. Unsolder the three wires connected to the switch's turret terminals.

To Replace the A3S1, A4S2, A5S3, and A6S4 Switches:

1. Solder the wires onto the switch's turret terminals.
2. Secure the switch to the module body with the two screws (1).
3. Replace the semi-rigid cables to the switch and torque each connector to 10 inch-pounds. Torque the A2 6 dB attenuator connectors to 10 inch-pounds if it was removed from A3SW1.
4. Torque each switch screw (1) to 6 inch-pounds. Replace and lock the preselector's right-side cover.

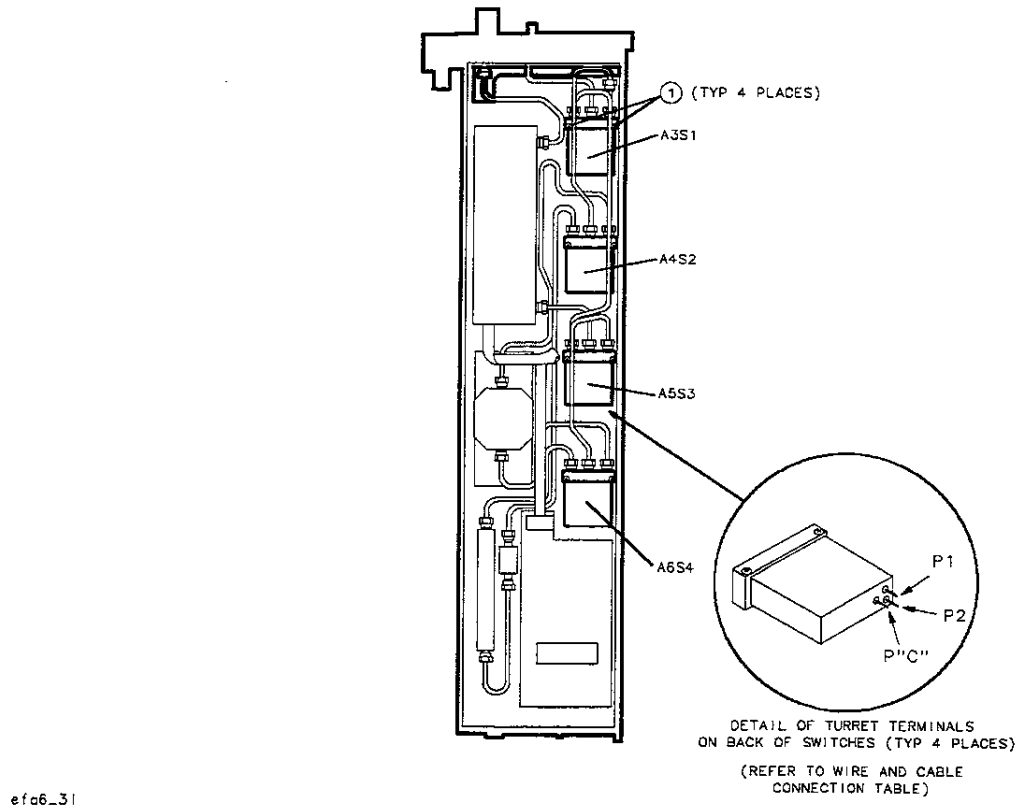

Figure 9-3. A3S1, A4S2, A5S3, and A6S4 Switches Removal/Replacement

A7 Switch Driver

To Remove the A7 Switch Driver:

1. Remove the right-side cover from the preselector module.
2. Disconnect W8 from A7J1 (1), W12 from A7J2 (2), and W13 from A7J3 (3).
3. Remove the four board-assembly screws (4) and lift the board assembly out of the module.

To Replace the A7 Switch Driver:

1. Place the A7 switch driver into the module and loosely tighten the four board-assembly screws (4).
2. Tighten each screws to 6 inch-pounds.
3. Connect W8 to A7J1 (1), W12 to A7J2 (2), and W13 to A7J3 (3).
4. Replace the right-side cover to the module and lock it into place.

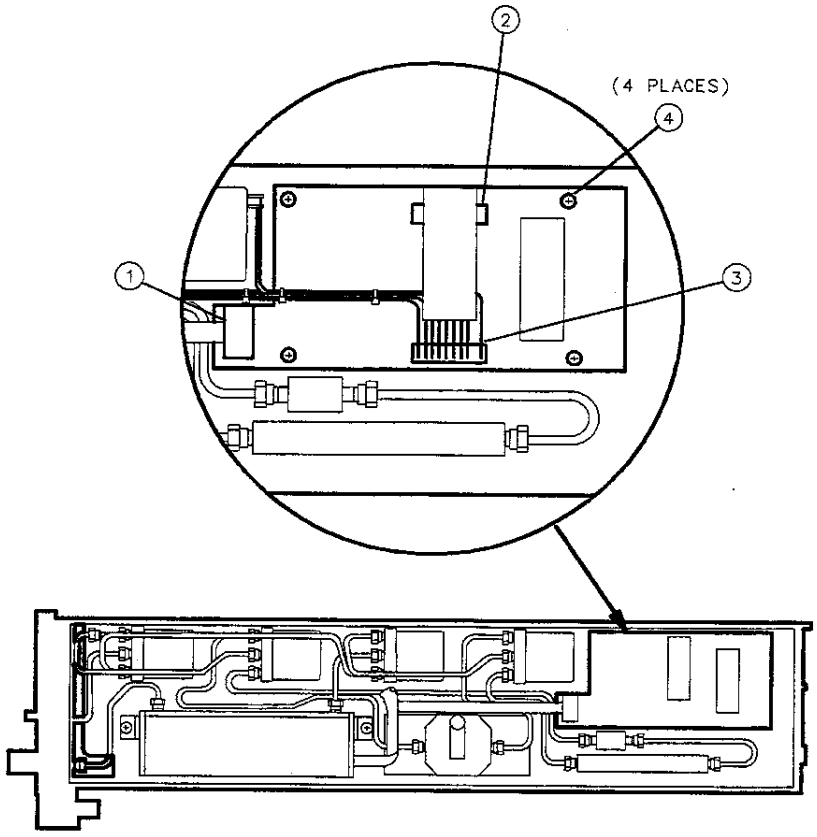

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Figure 9-4. A7 Switch Driver Removal/Replacement

A8 Input Attenuator

To Remove the A8 Input Attenuator:

1. Remove the right-side cover from the preselector module.
2. Loosen both ends of W4, then disconnect it from the attenuator input (1).
3. Loosen both ends of W7, then disconnect it from the attenuator output (2).
4. Disconnect W8 from A7J1 (3) and remove the two screws (4) and lock washers from the attenuator front and rear brackets.
5. Lift the attenuator out of the assembly.
6. Remove the allen screws from each attenuator bracket (5).

To Replace the A8 Input Attenuator:

1. Attach the shorter bracket to the attenuator end nearest the ribbon cable. Attach the longer bracket to the attenuator and torque the screws to 3 inch-pounds with a #8 Allen wrench.
2. Replace the attenuator into the preselector module having the two SMA connectors pointing toward the top of the module. Fit W4 (1) into the attenuator input connector and W7 (2) into the attenuator output connector.
3. Place the two screws and lock washers into the attenuator brackets and secure the attenuator to the module.
4. Connect W8 to A7J1 (3), then torque W7 and W4 (1) each to 10 inch-pounds. Torque the attenuator bracket screws to 20 inch-pounds.

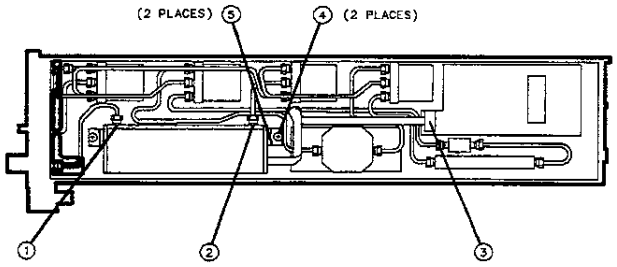

Figure 9-5. A8 Input Attenuator Removal/Replacement

A9 YTF

Note The polarity indicated at the TUNE connections may vary between modules. However, the No. 2 wire is always connected to the positive terminal on the YTF and the No. 5 wire is always connected to the negative terminal.

To Remove the A9 YTF:

1. Remove both the right- and left-side covers from the preselector module.
2. Remove the bushings from the YTF connector pins (1).
3. No. 2 wire from TUNE + (1)
4. No. 5 wire from TUNE (2)
5. No. 4 wire from HTR (3)
6. No. 0 wire from HTR (4)
7. Disconnect W5 (5) and W9 (6) from the YTF assembly connectors.
8. On the left-hand side of the module, remove the four screws (7) holding the YTF to the mounting bracket and remove the YTF from the module.

To Replace the A9 YTF:

1. Install the YTF into the mounting bracket with the serial number label and rubber bumper-foot toward the top of the module.
2. Loosely tighten the four screws (7) then torque each to 20 inch-pounds.
3. Connect W5 (5) and W9 (6) to the YTF and torque each connector to 10 inch-pounds.
4. Replace the connector pin bushings (1). Solder the four wires onto the YTF TUNE and HTR pins. Replace the rubber bumper-foot if it was removed. Refer to the list in step 2 for connections.

Note Clip the YTF terminal leads as short as possible to prevent them from shorting to the module cover.

5. Replace both side covers and push the locks into place.

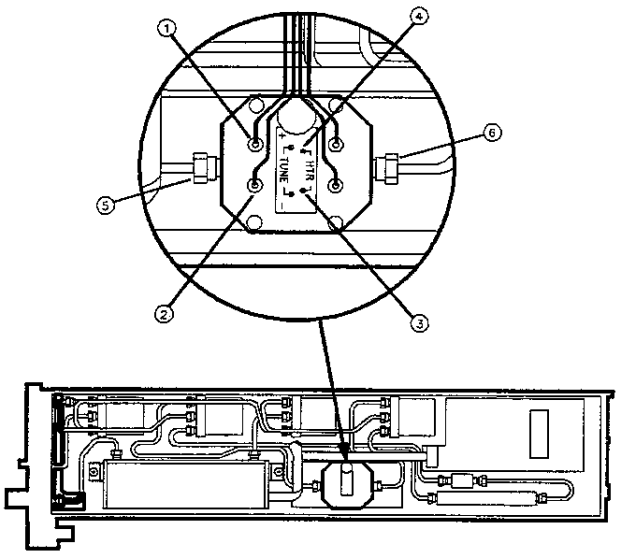

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Figure 9-6. A9 YTF Removal/Replacement (1 of 2)

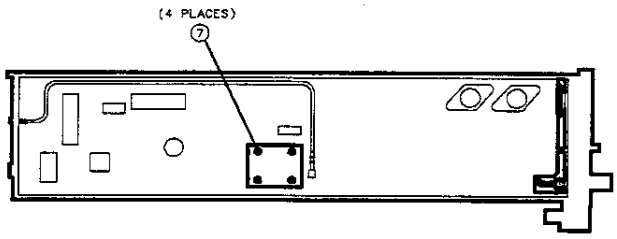

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Figure 9-7. A9 YTF Removal/Replacement (2 of 2)

A10 Limiter

To Remove the A10 Limiter:

1. Remove the right-side cover from the preselector module.
2. Disconnect W6 (1) from the limiter output and W11 (2) from the limiter input.
3. Snap the limiter out of the holding clips (3).

To Replace the A10 Limiter:

1. Install the limiter into the mounting clips (3) with the output end facing the front of the module.
2. Connect W6 (1) to the output of the limiter and W11 (2) to the input of the limiter.
3. Torque each connector to 10 inch-pounds.

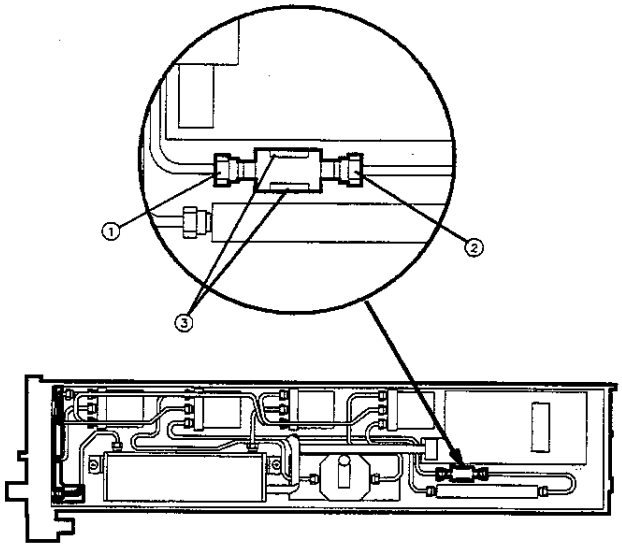

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Figure 9-8. A10 Limiter Removal/Replacement

A11 LPF

Note There is no particular orientation for the YTF input or output connections.

To Remove the A11 LPF:

1. Remove the right-side cover from the preselector module.
2. Disconnect W11 (1) and W10 (2) from the low-pass filter.
3. Snap the filter assembly out of the holding clips (3).

To Replace the A11 LPF:

1. Snap the filter into the holding clips (3).
2. Connect W11 (1) and W10 (2) to the filter assembly and torque the connectors to 10 inch-pounds each.

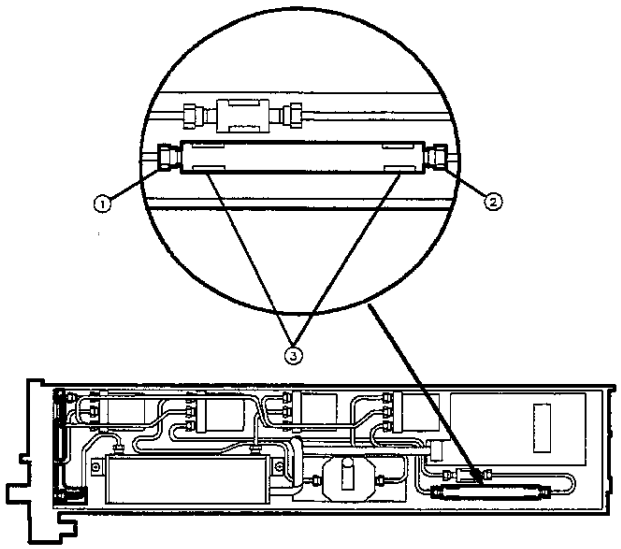

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Figure 9-9. A11 LPF Removal/Replacement

A12 YTF Driver

To Remove the A12 YTF Driver:

1. Remove the left-side cover from the preselector module.
2. A13W1 from A12J1 (1)
3. W12 from A12J2 (2)
4. W16 from A12J3 (3)
5. W14 from A12J4 (4)
6. W15 from A12J5 (5)
7. Remove the 11 board assembly screws (6).
8. Lift the edge of the board assembly at the front of the module up and pull it out, being careful to clear the rear panel TUNE SPAN INPUT connector (7).

To Replace the A12 YTF Driver:

1. Slide the A12 YTF driver into the module.
2. Loosely tighten the 11 board assembly screws (6) then torque each to 6 inch-pounds.
3. Refer to step 2 in this procedure and reconnect the cable assemblies to the connectors.
4. Replace the module cover and push the lock into place.

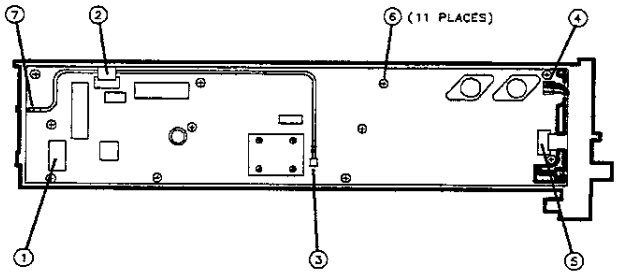

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Figure 9-10. A12 YTF Driver Removal/Replacement

Rear Panel

To Remove the Rear Panel:

1. Remove both the right- and left-side covers from the preselector module.
2. A13W1 from A12J1 (1)
3. W12 at A12J2 (to free W16) (2)
4. W16 from A12J3 (3)
5. Remove the one top (4) and two lower (5) screws that secure the rear panel to the module frame.
6. Remove the rear panel from the module.

To Replace the Rear Panel:

1. Lay the flex cables of A13W1 together (1) and toward the side.
2. Loosely tighten the rear frame to the module with the three screws (4 and 5).
3. Torque the two lower screws (5) to 6 inch-pounds and the upper screw (4) to 20 inch-pounds.
4. Lift W12 at A12J2 (2) and lay W16 coax cable beneath it.
5. Refer to step 2 in this procedure and reconnect the cable assemblies.
6. Replace both side covers and push the locks into place.

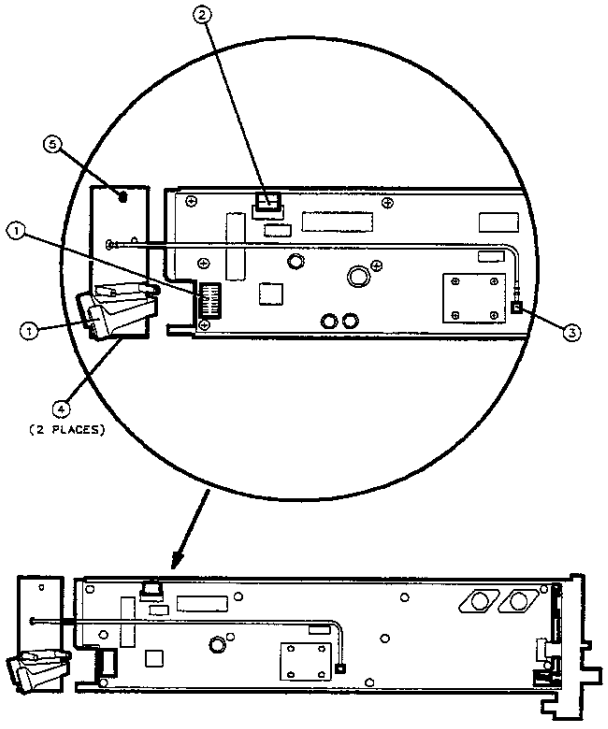

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Figure 9-11. Rear Panel Removal/Replacement

10

Overall Parts Identification Drawings

This chapter contains information on all overall parts identification drawings that should be used when performing the troubleshooting procedures described in this service guide.

This chapter contains the following sections:

- "Front-Panel View Identification"
- "Rear View Identification"
- "Right-Side View Identification"
- "Left-Side View Identification"

Because this service guide is part of an Option OB3 package which consists of two manuals, refer to Manual 2 of this option set for information on part listings and schematics.

Manual 2 contains packets of component-level repair information for each preselector board assembly that has field-replaceable parts. Each packet includes the parts list, component-location drawing, and schematics for a specific board-assembly part number. Manual 2 also contains a table that can be used to cross reference different board assemblies that have different serial prefix breaks.

Front-Panel View Identification

Overall Parts Identification Listing, Front-Panel View

Item	HP Part Number	CD	Description
1	0515-1244	9	RETAINER-PUSH ON CIRCULAR-EXT
2	0900-0012	4	O-RING 0.364-IN-ID-0.07-IN-XSCT-DIA
3	5022-0051	4	MODULE HEX LATCH
4	86290-60005	7	CONNECTOR, TYPE N (F) (for HP 70600A preselector)
4	1250-1976	3	CONNECTOR, APC 3.5 (M) TO APC 3.5 (F) (for HP 70601A preselector)
5	2190-0681	8	WASHER-LK-EXT-T (for HP 70600A/70601A preselector)
6	2950-0214	5	NUT-HEX-DBL-CHAM 7/16-28-THD (for HP 70600A/70601A preselector)
7	1250-1666	8	ADAPTER, SMA (F) TO SMA (F) (for HP 70600A preselector)
7	1250-2182	5	ADAPTER, K (F) TO K (F) (for HP 70601A preselector)
8	70904-20029	1	FRAME, FRONT for HP 70600A preselector
8	70906-20002	2	FRAME, FRONT for HP 70601A preselector
9	70600-00010	1	PANEL, FRONT for HP 70600A preselector
9	70601-00002	2	PANEL, FRONT for HP 70601A preselector
10	0515-1146	0	SCREW-MACH M3 x 0.05 6MM-LG PAN-HD
11	0535-0023	2	NUT-HEX-DBL-CHAM 4 x 0.7MM THD
12	3050-0893	9	WASHER, FL 4.4MM-ID 8.5MM-OD

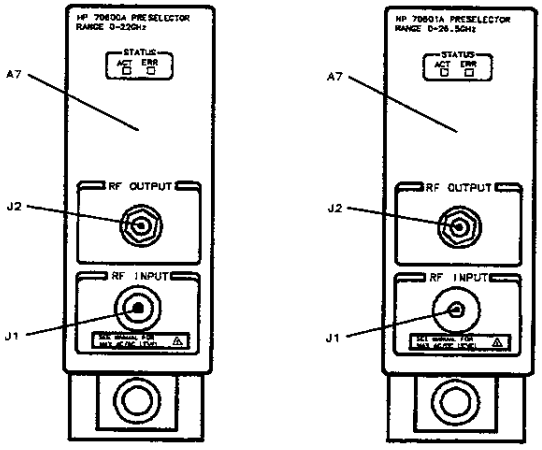

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Figure 10-1. Overall Parts Identification Drawing, Front Panel (1 of 3)

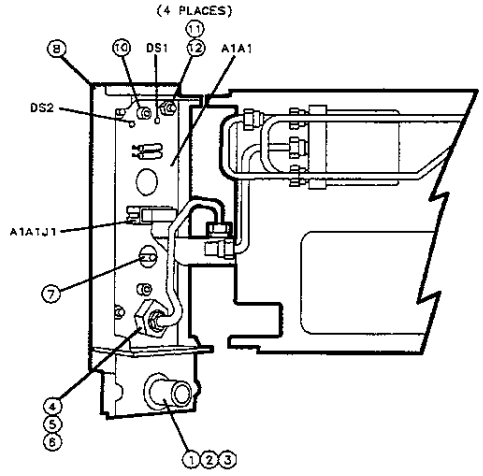

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Figure 10-2. Overall Parts Identification Drawing, Front Panel Inside-View (2 of 3)

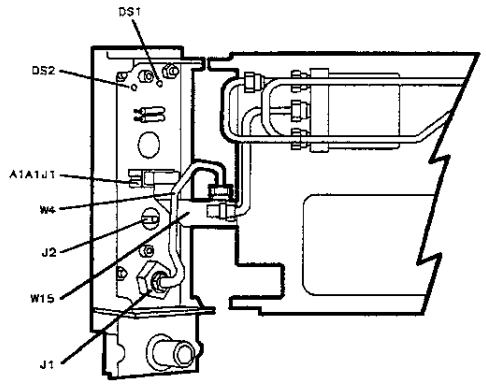

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Figure 10-3. Overall Parts Identification Drawing, Front Panel Inside-View (3 of 3)

Rear View Identification

Overall Parts Identification Listing, Rear Panel

Item	HP Part Number	CD	Description
1	70600-20004	2	FRAME, EAR (for HP 70600A preselector/601A)
2	0515-1583	9	SCREW-MACH M4 x 0.7 12MM-LG-PAN-HD
3	3050-0893	9	WASHER-FL-4.0MM-ID 8.85MM-OD
4	6960-0006	8	HOLE PLUG 0.25MM-OD
5	3050-1205	9	WAHSER-SH 0.194-IN-ID 0.34-IN-OD
6	0515-0894	3	SCREW-MACH M2.5 x 0.45 6MM-LG-PN-HD
7	0535-0042	5	NUT-HEX PLSTC-LKG M3 x 0.5 4MM-THK
8	1460-2095	4	SPRING-CPRSN 5.49MM-OD 6.8-MM-OA
9	5001-5840	5	GROUNDING SPRING
10	70904-60040	0	HP-MSIB CABLE ASSEMBLY
11	5001-5835	8	CONNECTOR BAR

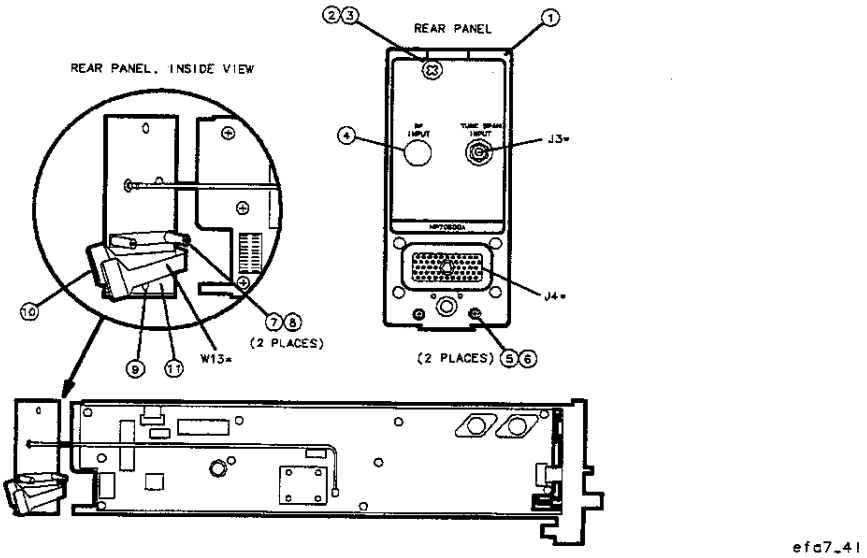

Figure 10-4. Overall Parts Identification Drawing, Rear Panel (1 of 3)

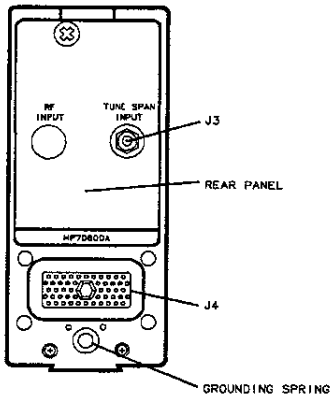

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Figure 10-5. Overall Parts Identification Drawing, Rear Panel (2 of 3)

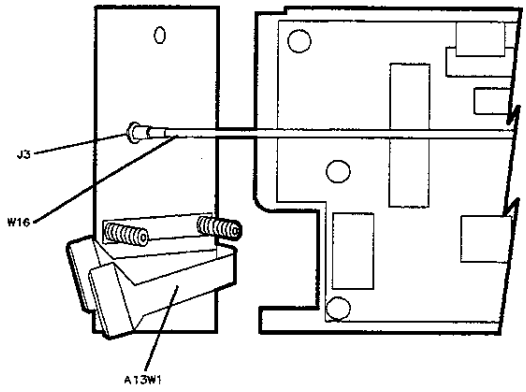

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Figure 10-6. Overall Parts Identification Drawing, Rear Panel (3 of 3)

Right-Side View Identification

Overall Parts Identification Listing, Right-Side View

Item	HP Part Number	CD	Description
1	1400-1374	4	CLAMP, 0.5-IN-DIA 0.385-IN-WD
2	70600-00003	2	INSULATOR
3	1400-1374	4	CLAMP, 0.5-IN-DIA 0.385-IN-WD
4	3050-0990	7	WASHER, FL 0.04-IN-ID 0.25-IN-OD
5	0403-0308	7	BUMPER FOOT 0.5±0.02-IN-DIA
6	0515-1583	9	SCREW M4 x 0.7 12MM-LG-PAN-HD
7	3050-0893	9	WASHER 4.4MM-ID 8.8MM-OD
8	5021-9372	8	BRACKET-ATTENUATOR, REAR
9	3030-0638	8	SCREW HEX 2-56 0.375-IN-LG
10	5021-3297	4	BRACKET-ATTENUATOR, FRONT
11	0515-1373	5	SCREW M2.5 x 0.45 16MM-LG-PAN-HD
12	0515-1146	0	SCREW M3 x 0.5 6MM-LG-PAN-HD
13	3050-0891	7	WASHER-FL 3.3MM-ID 6.85MM-OD

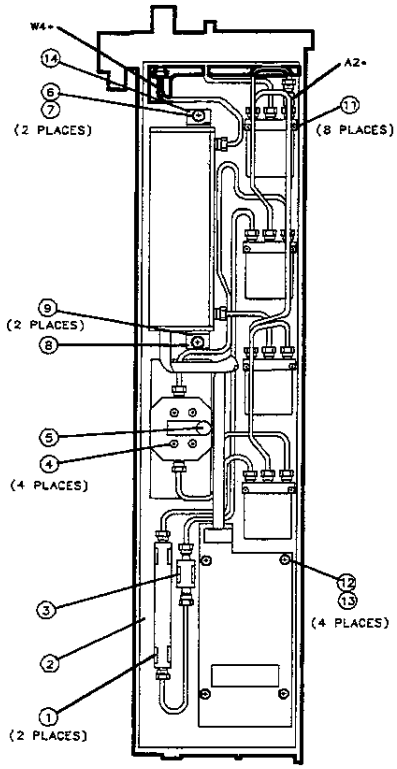

Figure 10-7. Overall Parts Identification Drawing, Right-Side View

Overall Parts Identification Drawing, Right-Side View (Cable Locations)

Item	HP Part Number	CD	Description
1	70600-20007	8	W1 simi-rigid (A2 6 dB attenuator to A3S1 RF switch 1)
2	70600-20005	6	W2 simi-rigid (A1A1 front panel RF out to A3S1 RF switch 1)
3	70600-20008	9	W3 simi-rigid (A3S1 RF switch 1 to A5S3 RF switch 3)
4	70600-20006	7	W4 simi-rigid (A1A1 front panel RF input to A8 input attenuator)
4	70601-20001	3	W4 simi-rigid (A1A1 front panel RF input to A8 input attenuator)
5	70600-20009	0	W5 simi-rigid (A9 YTF to A4S2 RF switch 2)
6	70600-20010	3	W6 simi-rigid (A4S2 RF switch 2 to A10 limiter)
7	70600-20011	4	W7 simi-rigid (A5S3 RF switch 3 to A8 input attenuator)
8	70600-20012	5	W8 simi-rigid (A5S3 RF switch 3 to A6S4 RF switch 4)
9	70600-20013	6	W9 simi-rigid (A6S4 RF switch 4 to A9 YTF)
10	70600-20014	7	W10 simi-rigid (A6S4 RF switch 4 to A11 LPF)
11	70600-20015	8	W11 simi-rigid (A10 limiter to A11 LPF)
12	70600-60003	8	W12 ribbon cable (A9 YTF to A7 switch driver)
13	70600-60005	0	W13 wiring harness (A7 switch driver to all switches)
14	70600-60012	9	W14 wiring harness (A9 YTF to A12 YTF driver)
15	70904-60017	4	W15 ribbon cable (A1A1 front panel to A12 YTF driver)
16	70600-60022	1	W16 COAX 4 (A12 YTF driver to rear panel TUNE + SPAN output)
17	5062-0701	5	W17 ribbon cable (8.8 inch attenuator)

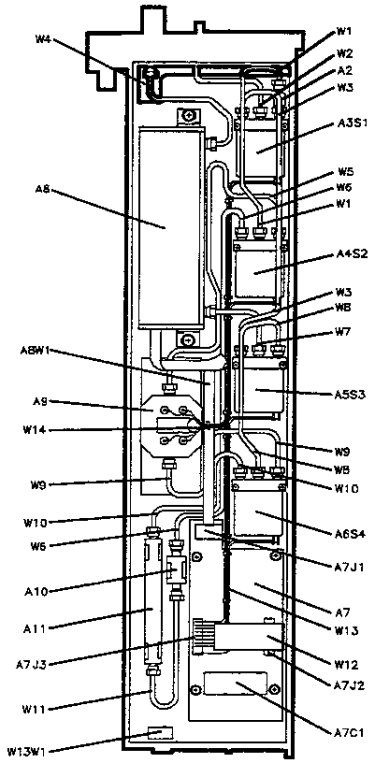

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Figure 10-8. Overall Parts Identification Drawing, Right-Side View (Cable Locations)

Left-Side View Identification

Overall Parts Identification Listing, Left-Side View

Item	HP Part Number	CD	Description
1	0515-1146	0	SCREW M3 6MM-LG-PAN-HD
2	3050-0891	7	WASHER-FL-3.3MM-ID 6.85MM-OD
3	70600-20003	4	CENTER FRAME ASSEMBLY
4	2360-0333	8	SCREW 6 x 32 0.25-IN-LG FL-HD
5	70600-00016	1	BRACKET-YTF

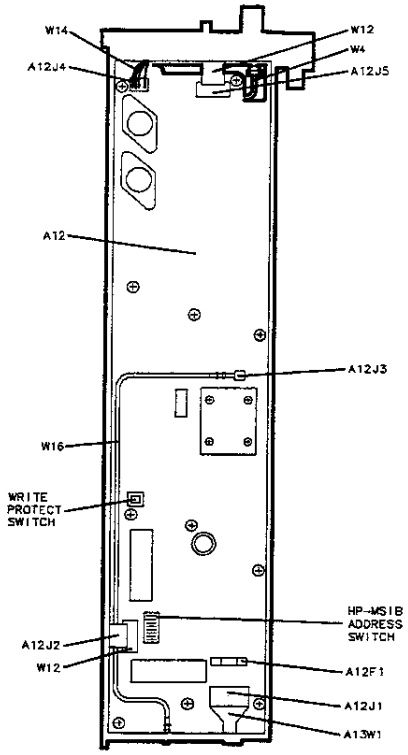

Figure 10-9. Overall Parts Identification Drawing, Left-Side View

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