

Errata

Title & Document Type: 85685A Operations, Tests, and Adjustments Manual

Manual Part Number: 85685-90003

Revision Date: July 1985

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

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Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

SERVICE NOTE

Supersedes

None

HP MODEL 85685A PRESELECTOR

All Serials

SPECTRUM ANALYZER COMPATIBILITY

The HP Model 85685A Preselector is fully compatible with any HP 8566B or 8568B Spectrum Analyzer with the following revisions of firmware.

HP 8566B: REV. (D) 5.5 85 or later

HP 8568B: REV. (C) 14.1.85 or later

day month year

The firmware revision of a particular HP 8566B or 8568B Spectrum Analyzer is displayed on the CRT (along with the HP-IB address) each time the LINE switch is switched from STANDBY to ON.

To update the spectrum analyzer firmware, replace the A15 Controller Assembly as follows:

CAUTION

When replacing the A15 Controller Assembly, use an approved static-free work station to avoid component damage due to electrostatic discharge. Store the A15 Controller Assembly in a nonconductive antistatic bag to prevent damage and battery discharge.

PROCEDURE:

1. Remove power cords from rear of spectrum analyzer.
2. Place spectrum analyzer top-side down and remove bottom rear feet and cover.

E/NS/WN

6/85-53/TM

HEWLETT
PACKARD

FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 OR WRITE, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303 IN EUROPE, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE OR WRITE, Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2-Geneva, Switzerland IN JAPAN, Yokogawa-Hewlett Packard Ltd., 1-27-15, Yabe Sagami-hara-City, Kanagawa Prefecture, Japan 229.

3. Locate and remove controller cover to gain access to A15 Controller Assembly.
4. Remove A15 Controller Assembly, noting routing of two ribbon cables. Carefully disconnect both ribbon cables.

CAUTION

Care should be taken when inserting A15 Controller Assembly to avoid damaging or pinching ribbon cables.

5. Install new A15 Controller Assembly. Be sure to properly route both ribbon cables.
6. Reconnect power cords and connect jumper from STATUS (ST) Test Point to GROUND (GND) Test Point on A15 Controller Assembly. (Refer to spectrum analyzer troubleshooting and repair manual to determine correct location of test points on A15 Controller Board.)
7. Set LINE switch to ON for several seconds, then back to STANDBY. Remove jumper from ST to GND.
8. Reinstall controller cover, spectrum analyzer bottom cover, and two rear feet.
9. To ensure proper exchange credit, return A15 Controller Assembly in original pre-addressed packaging. Consult your nearest Hewlett-Packard Sales Office for assistance.

OPERATIONS, TESTS, AND ADJUSTMENTS

85685A
RF PRESELECTOR

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 2510A.

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1212 VALLEY HOUSE DRIVE, ROHNERT PARK, CALIFORNIA, 94928-4999, U.S.A.

MANUAL PART NUMBER: 85685-90003
Microfiche Part Number: 85685-90004

Printed: July 1985

CERTIFICATION

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

WARRANTY

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

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

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

LIMITATION OF WARRANTY

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

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

EXCLUSIVE REMEDIES

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

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

SAFETY SYMBOLS

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



Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the instrument against damage. Location of pertinent information within the manual is indicated by use of this symbol in the table of contents.



Indicates dangerous voltages are present. Be extremely careful.

CAUTION

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

WARNING

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

GENERAL SAFETY CONSIDERATIONS

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

WARNING

There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

HP 85685A RF PRESELECTOR DOCUMENTATION OUTLINE

Included with the HP Model 85685A RF Preselector are two manuals: the Operating and Programming Manual and the Operations, Tests, and Adjustments Manual. Not included with the instrument, but available at no charge upon return of the enclosed order card, is the Troubleshooting and Repair Manual.

OPERATING AND PROGRAMMING MANUAL (HP Part Number 85685-90001)

Contents: Manual and remote operation, including complete syntax and command descriptions. Accompanying this manual are two separate, pocket-sized Quick Reference Guides.

OPERATIONS, TESTS, AND ADJUSTMENTS MANUAL (HP Part Number 85685-90003)

Contents: General information (including specifications), installation, diagnostics, performance verification, and adjustments.

TROUBLESHOOTING AND REPAIR MANUAL (HP Part Number 85685-90005)

Contents: Service information.

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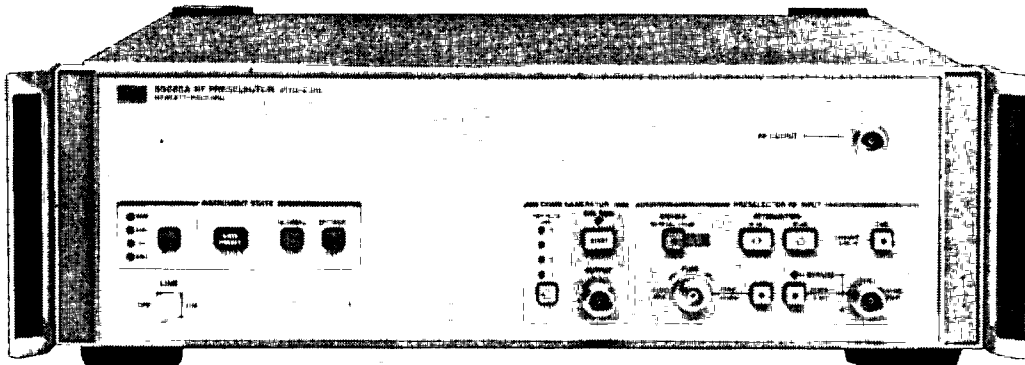
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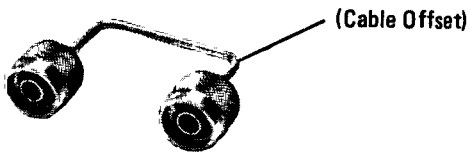
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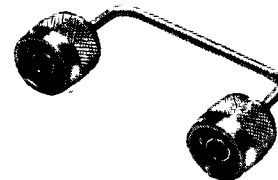




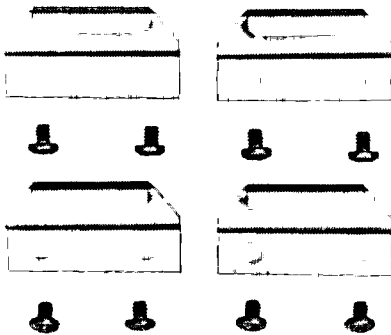
HP 85685A



Semirigid Input Cable
for HP 8566B
HP Part Number
85685-20062

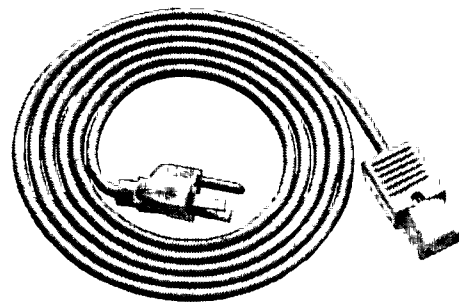


Semirigid Input Cable
for HP 8568B
HP Part Number
85685-20055



Lock Links
HP Part Number
1600-0367

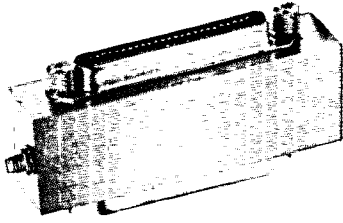
Lock Link Screws
HP Part Number
0515-0887



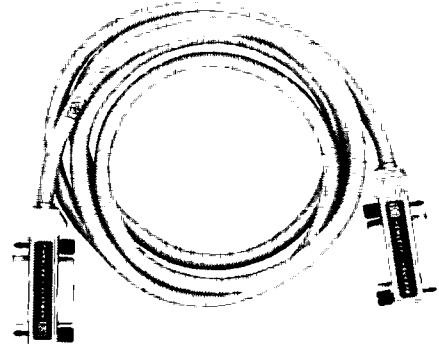
Line Power Cable
(Refer to Table 3
in Installation section
for HP Part Number)

Figure 1. HP 85685A RF Preselector and Accessories Supplied (1 of 2)

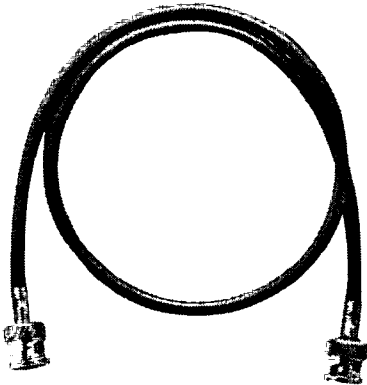
GENERAL INFORMATION



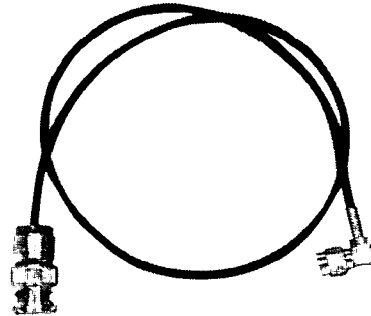
Connector-Converter
HP Part Number
85685-80009



HP-IB Cable
HP10833D



BNC-BNC Coax Cable
HP Part Number
8120-1839



Cable Assembly Converter
HP Part Number
85685-60068

Accessories Supplied but Not Shown

Spare Input 1 Fuse
Spare Line Fuse 1A
Spare Line Fuse 500 mA
Operating and Programming Manual
Operations, Tests, and Adjustments Manual

HP Part Number

2110-0301 or 1535-3716
2110-0001
2110-0012
85685-90001
85685-90003

Figure 1. HP 85685A RF Preselector and Accessories Supplied (2 of 2)

GENERAL INFORMATION

INTRODUCTION

The Operations, Tests, and Adjustments Manual contains information required to install, operate, test, and adjust the HP 85685A RF Preselector. This manual contains the following sections: General Information, Installation, Diagnostics, Performance Verification, and Adjustments.

This section covers instrument identification and other basic information.

SAFETY CONSIDERATIONS

Before operating this instrument, you should familiarize yourself with the safety markings on the instrument and the safety instructions in this manual. The instrument has been manufactured and tested in accordance with international safety standards. However, to ensure safe operation of the instrument and personal safety of the user and service personnel, the cautions and warnings in this manual must be followed. Refer to the summary of safety information, located at the front of this manual, for detailed notation concerning the use of the instrument.

INSTRUMENT IDENTIFICATION

Attached to the rear section of the instrument is a serial number plate. The serial number is in two parts. The first four digits and letter are the serial number prefix; the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a production change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

MANUAL UPDATING

An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. An unlisted serial number prefix indicates that the instrument differs from those described in this manual. The manual for the newer instrument is accompanied by a yellow Manual Updating supplement. This supplement contains "change information" that explains how to adapt the manual to the newer instrument. It may also contain information for correcting errors.

To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Updating supplement. Each manual has a separate supplement identified by the manual print date and part number, both of which appear on the title page of the manual. Copies of the supplement are available at no cost from Hewlett-Packard. Addresses of Hewlett-Packard offices are located at the rear of each manual.

EQUIPMENT REQUIRED BUT NOT SUPPLIED

To enable detection and measurement, the HP 85685A RF Preselector must be interconnected to an HP 8566B or HP 8568B Spectrum Analyzer. In order to make full use of the capabilities of the preselector, the firmware of the HP 8566B must be dated 5.5.85 or later, and for the HP 8568B it must be dated 14.1.85 or later. Cycling the power off and on displays the firmware revision number and date code on the spectrum analyzer display.

Option 066 is set up to upgrade the firmware for an HP 8566B Spectrum Analyzer that has firmware dated earlier than 5.5.85. Option 068 upgrades the firmware for an HP 8568B that has firmware dated earlier than 14.1.85.

Hewlett-Packard does not recommend using spectrum analyzer models HP 8566A or HP 8568A, or models HP 8566B or HP 8568B with earlier firmware than stated above, because their use reduces system performance. Retrofit kits are available for modifying these spectrum analyzer models: HP Model 8566A + 01K and HP Model 8568A + 01K. Contact your nearest Hewlett-Packard Sales and Service Office for more information.

CALIBRATION SEQUENCE

Prior to performing CISPR emission measurements, the system should be properly calibrated. For further information on CISPR emission measurements and the calibration sequence, refer to Application Notes in the HP 85685A Operating and Programming Manual.

COMB CALIBRATION

The internal comb generator of this instrument requires periodic verification of performance. A complete performance verification of the comb generator should be performed at least every six months. Refer to Comb Calibration in the Adjustments section of this manual for further information on calibrating the comb generator.

If the ambient temperature varies significantly while making measurements with the comb generator, the Comb Calibration procedure must be performed again prior to making additional measurements.

ELECTROSTATIC DISCHARGE

Electrostatic discharge (ESD) can damage and/or destroy electronic components. Therefore, work performed on any assemblies consisting of electronic components should be done at a static-free workstation. All anti-static safeguards must conform to state and federal safety standards and statutes. Refer to Figure 2 for an example of a static-free workstation.

CONTROLLERS

The HP 85685A is fully HP-IB programmable. Consult your local Hewlett-Packard Service Representative for recommended controllers and available software. For a list of recommended equipment required for performance verification and adjustments, see Table 1 in this section.

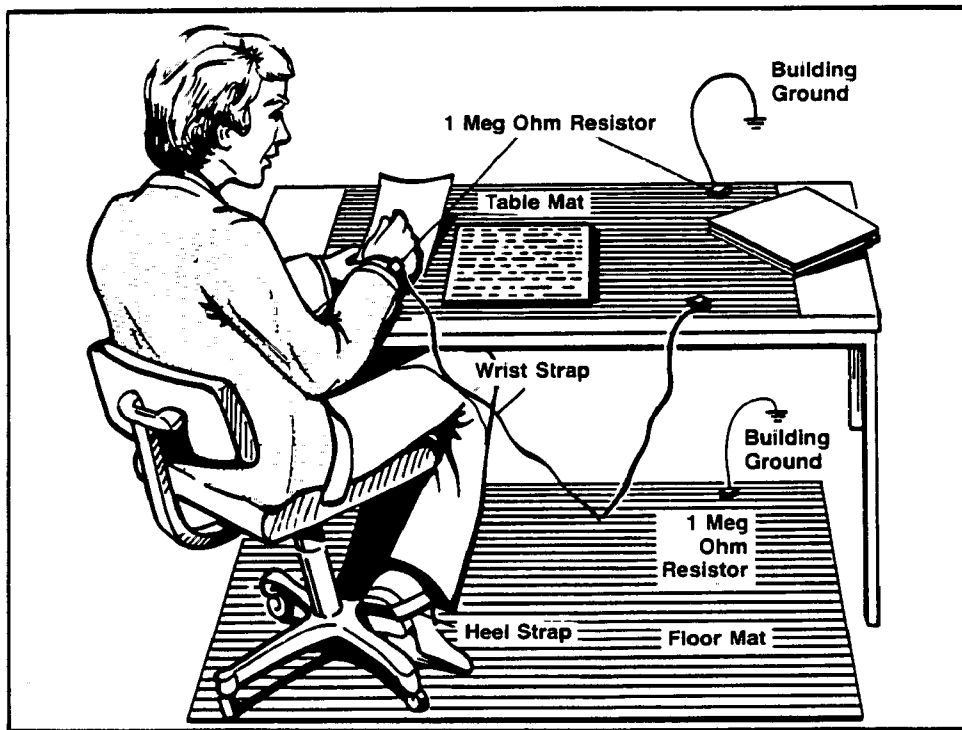


Figure 2. Static-Free Workstation

SOFTWARE

The software provided at the front of this manual is necessary for the adjustment procedure of the preselector. Refer to the Adjustments section of this manual for further information.

HP 85650A QUASI-PEAK ADAPTER

The HP 85650A adds resolution bandwidth filters and quasi-peak detection capabilities specified by CISPR to the spectrum analyzer. Together, the quasi-peak adapter and the spectrum analyzer provide many of the elements needed for an EMI receiver system.

SERVICE ACCESSORIES

A service accessories package for the instrument is available for convenience in troubleshooting the instrument. The complete package can be obtained from Hewlett-Packard by ordering HP Part Number 85685-60070.

TROUBLESHOOTING AND REPAIR MANUAL

Service information for the HP 85685A is available in this manual, HP Part Number 85685-90005. It includes circuit descriptions, block diagrams, component location illustrations, schematic diagrams, repair procedures, and troubleshooting information.

GENERAL INFORMATION

OPTIONS

Documentation

Option 910: Additional copies of Operating and Programming Manual (HP Part Number 85685-90001) and Operations, Tests, and Adjustments Manual (HP Part Number 85685-90003)

Firmware

Option 068: Firmware revision for HP 8568B Spectrum Analyzer (firmware dated earlier than 14. 1. 85)

Option 066: Firmware revision for HP 8566B Spectrum Analyzer (firmware dated earlier than 5. 5. 85)

Rack Mounting Kits

Option 908: Rack Mount Flange Kit Without Handles

Option 913: Rack Mount Flange Kit With Handles

Option 010: Rack Mount Slide Kit

Option 010: Rack Mount Slide Kit

Table 1. Recommended Test Equipment (1 of 2)

Instrument	Critical Specifications for Equipment Substitution	Recommended Model	Perf. Test	Adj.
SIGNAL SOURCES				
Synthesized Sweeper	Frequency: 10 MHz to 21 GHz Output Power: +10 dBm maximum (leveled <13.5 GHz) +3 dBm maximum (leveled) Aging Rate: <1 x 10 ⁻⁹ /day Spurious Signals: <-35 dBc (<7 GHz) <-25 dBc (<20 GHz) Amplitude Modulation: dc to 100 kHz Leveling: Internal, External Power Meter	HP 8340A	X	X
Frequency Synthesizer	Frequency: 200 Hz to 80 MHz Stability: ±1 x 10 ⁻⁹ /day Amplitude Range: +13 to -86 dBm with 0.01 dB resolution Attenuator Accuracy: <±0.07 dB (+13 to -47 dBm)	HP 3335A	X	X
ANALYZERS				
Spectrum Analyzer	Frequency: 100 Hz to 2.5 GHz	HP 8566B	X	X
Spectrum Analyzer	Frequency: 100 Hz to 1.5 GHz	HP 8568B		X
Tracking Generator	Tracking generator compatible with spectrum analyzer	HP 8444A, Option 059		X
METERS				
Power Meter	Range: -20 to +10 dBm Accuracy: ±0.02 dB HP-IB-compatible	HP 436A	X	X
Power Sensor	Frequency: 100 kHz to 4.2 GHz Compatible with HP 436A Power Meter	HP 8482A	X	X
ATTENUATORS				
20 dB Attenuator	Frequency: 200 Hz to 18 GHz Type N connectors	HP 8491B, Option 020	X	
TERMINATIONS				
Termination	Short, BNC (m) Impedance: 50Ω	HP 1250-0774	X	
Termination	Short, Type N (m) Impedance: 50Ω	HP 11512A	X	
Termination	Type N connector (m) Frequency: dc to 18 GHz Impedance: 50Ω	HP 909A, Option 012	X	

Table 1. Recommended Test Equipment (2 of 2)

Instrument	Critical Specifications for Equipment Substitution	Recommended Model	Perf. Test	Adj.
SPECIAL DEVICES				
Directional Bridge	Frequency: 100 kHz to 110 MHz	HP 8721A	X	
Dual Directional Coupler	Frequency: 100 MHz to 2.0 GHz	HP 778D	X	
CABLES				
Cable Assembly	Frequency Range: 200 Hz to 22 GHz SMA (m) connectors Length: 61 cm (24 inches) SWR: <1.4 at 22 GHz	HP 5061-1086	X	X
Cable Assembly (3 required)	UG-21 D/U Type N (m) connectors	HP 11500A/B	X	X
ADAPTERS				
Adapter (2 required)	Type N (m) to BNC (m)	HP 1250-0082	X	X
Adapter	SMA (f) to SMA (f)	HP 1250-1158	X	X
Adapter	Type N (f) to BNC (f)	HP 1250-1474	X	X
Adapter	APC-3.5 (f) to Type N (f)	HP 1250-1745	X	X

SPECIFICATIONS

The following specifications tables describe the warranted performance of the HP 85685A RF Preselector over the range of 0°C to +55°C, unless otherwise noted.

- Table 2, RF Preselector Specifications, applies only to the HP 85685A RF Preselector (RFP).
- Table 3, Test Receiver Specifications, applies when the HP 85685A RF Preselector operates with the HP 8566B or HP 8568B Spectrum Analyzer (SA), and with or without the HP 85650A Quasi-Peak Adapter (QPA).
- Table 4, CISPR EMI Receiver Specifications, applies when the HP 85685A RF Preselector operates with the HP 8566B or HP 8568B Spectrum Analyzer, and with the HP 85650A Quasi-Peak Adapter.

GENERAL INFORMATION

Table 2. Preselector Specifications

PARAMETER	SPECIFICATION	
INPUT		
Frequency Range	Input 1	Input 2
	20 Hz – 50 MHz	20 MHz – 2 GHz
Fuse Blow Time	<0.1 sec for > +35 dBm	N/A
Maximum Safe Input Power Average Power Impulse Signals, ≥10 dB RFP atten.	+ 30 dBm (1 Watt)	
	100 Watts peak for a 10 μsec pulse	
SWR ¹ , ≥10 dB RFP atten.	<1.5:1	<1.5:1
OUTPUT		
HP-IB Interface ² Private Controller Bus HP-IB Interface Functions (HP-IB)	Digital bus and sweep control between RFP and SA IEEE 488-1978 bus SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E1	
GENERAL		
Temperature	0°C to +55°C operating –40°C to +75°C storage	
Warm-up Time	Thirty minutes after cold start	
Temperature Equilibrium	Two hours after warm-up	
EMI	Conducted and radiated interference is in compliance with MIL-STD 461A Methods CE03 and RE02, CISPR publication 11 (1975), and Messemphaenger-Postverfuegung 526/527/79 (Kennzeichnung Mit F-Nummer/Funkschutzzeichen).	
Firmware Compatibility for RFP Operation with: HP 8566B, firmware date ≥5.5.85 HP 8566B, firmware date <5.5.85 HP 8566A, any firmware date HP 8568B, firmware date ≥14.1.85 HP 8568B, firmware date <14.1.85 HP 8568A, any firmware date	Compatible HP 85685A Option 066 required HP 8566A + 01K Retrofit Kit required Compatible HP 85685A Option 068 required HP 8568A + 01K Retrofit Kit required	
¹ SWR is measured at the tuned frequency of the spectrum analyzer. ² Full \$1000.00 credit is given if old firmware board is returned within 90 days. Request M62 exchange board credit when ordering HP 85685A – one credit per order		

Table 3. Test Receiver Specifications

PARAMETER	SPECIFICATION
FREQUENCY	
Frequency Range	20 Hz–1.5 GHz with HP 8568B 20 Hz–2.0 GHz with HP 8566B
Frequency Resolution (SA)	1 Hz
Frequency Accuracy (SA)	\pm [tuned frequency x frequency reference error] Hz for SA zero span
Frequency Reference Error (SA)	Stability ¹ $< 10^{-8}$ Drift $< 2 \times 10^{-7}$ /year
Frequency Selectivity ² 3 dB resolution BW (SA)	10 Hz–3 MHz in 1, 3, 10 sequence
AMPLITUDE	
Displayed Average Noise Level (0 dB atten. for RFP and SA, 10 Hz resolution BW)	< -132 dBm (-25 dB μ V) for input 9 kHz–1 MHz ³ < -150 dBm (-43 dB μ V) for input = 1–1500 MHz < -147 dBm (-40 dB μ V) for input ≤ 2.0 GHz
Residual Responses (RFP input terminated, 0 dB atten. for RFP and SA)	< -90 dBm for input 2 kHz–1 MHz < -112 dBm for input ≥ 1 MHz
Amplitude Accuracy ⁴ (+10°C to +30°C, 10 dB SA atten., 0–20 dB RFP atten.)	± 2.0 dB for input < 1.0 GHz ± 3.0 dB for input ≥ 1.0 GHz
¹ Refer to SA Tests and Adjustments Manual for correct frequency reference adjustment. ² Refer to SA data sheet for filter BW accuracy and filter shape. ³ 17 dB higher with HP 8566B for frequency < 50 kHz. ⁴ Specifications apply after system calibration with the comb generator in the HP 85685A. Refer to the HP 85685A Operating and Programming Manual for correct amplitude measurement technique.	

Table 4. CISPR EMI Receiver Specifications (1 of 2)

PARAMETER		SPECIFICATION
FREQUENCY		
Frequency Range		10 kHz – 1 GHz
Frequency Resolution (SA)		1 Hz
Frequency Accuracy (SA)		\pm [tuned frequency x frequency reference error] Hz
Frequency Reference Error (SA)		Settability ¹ $< 10^{-8}$ Drift $< 2 \times 10^{-7}$ /year
Frequency Selectivity ² CISPR 6 dB bandwidth (QPA)		200 Hz for input = 10–150 kHz (Band A) 9 kHz for input = 150 kHz–30 MHz (Band B) 120 kHz for input = 30–1000 MHz (Bands C, D)
AMPLITUDE		
Measurement Range		+137 dB μ V to noise floor (see Amplitude Sensitivity)
Amplitude Accuracy ³ (+10°C to +30°C, 0–20 dB RFP atten.)		± 2.0 dB for 10 dB SA atten. ± 2.5 dB for 0 dB SA atten.
Calibration ⁴		Automatic calibration for absolute amplitude with comb generator (RFP)
Linearity Check		3 dB input attenuator test for system overload and distortion (RFP)
Impulse Signal Tolerance		Input 1 withstands LISN transients (RFP) Input 2 withstands CISPR calibration pulses (RFP)
Detection ²		Peak and Average (SA), Quasi-Peak (QPA)
Audio Output		Speaker with volume control (QPA)
AMPLITUDE SENSITIVITY		
EMI Receiver		Average Noise⁵ (RFP/SA atten. = 0 dB)
Frequency Band	Resolution BW (6 dB)	
10–150 kHz (Band A)	200 Hz	–12 dB μ V ⁶
150 kHz–1 MHz (Band B)	9 kHz	+4 dB μ V
1–30 MHz (Band B)	9 kHz	–13 dB μ V
30–1000 MHz (Bands C and D)	120 kHz	–1 dB μ V

Table 4. CISPR EMI Receiver Specifications (2 of 2)**NOTES**

- ¹ Refer to SA Tests and Adjustments Manual for correct frequency reference adjustment.
- ² The system meets CISPR Publication 16 recommendations for resolution BW, detector time constant, and detector pulse response.
- ³ Specifications apply after system calibration with the comb generator in the HP 85685A. Refer to the HP 85685A Operating and Programming Manual for correct amplitude measurement technique.
- ⁴ System calibration can be verified with an external CISPR Standard Pulse Calibration Generator.
- ⁵ Peak noise is nominally 8 dB higher than average noise.
- ⁶ 17 dB higher with the HP 8566B for frequency <50 kHz.



INSTALLATION

INTRODUCTION

This section contains information on initial inspection, installation, operating conditions, and storage and/or shipment procedures for the HP 85685A RF Preselector.

INITIAL INSPECTION

Inspect the shipping containers and the cushioning materials for damage. If there is any damage to these items, they should be kept until the contents of the shipment have been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1 in the General Information section. If the contents are incomplete, or if there is any damage or defect to the instrument or accessories, notify the nearest Hewlett-Packard office. The HP office will arrange for repair or replacement without waiting for claim settlement. Keep the shipping materials for the inspection of the carrier.

OPERATING CONDITIONS

The instrument operating, storage, and shipment limitations are as shown below:

Table 1. Environmental Limitations

	Temperature	Relative Humidity	Altitude
Operating	0°C to 55°C	30% to 70%	<4572 meters (15,000 feet)
Storage and/or shipment	-40°C to +75°C	20% to 90%	<15,240 meters (50,000 feet)

However, the instrument should be protected from temperature and/or humidity extremes which may cause condensation within the instrument.

The HP 85685A requires a power source of 100, 120, 220, or 240 Vrms +5%, -10%; 50 to 400 Hz. Power consumption is less than 35 volt-amperes.

INSTALLATION

PHYSICAL SPECIFICATIONS

Figure 1 shows the physical dimensions of the instrument. The weight of the HP 85685A is 42 pounds. Use caution when moving or installing the instrument.

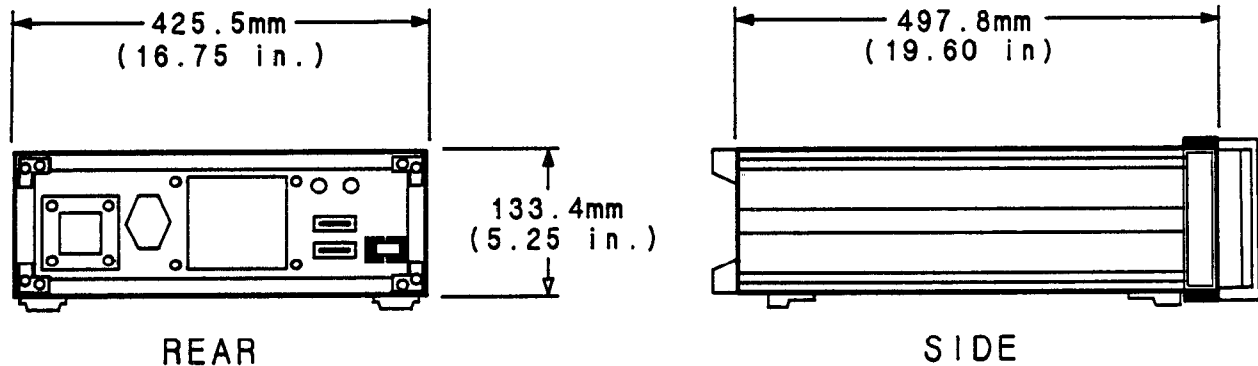


Figure 1. Physical Dimensions

LINE VOLTAGE AND FUSE SELECTION


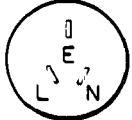
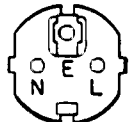

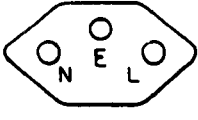
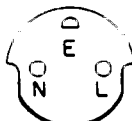
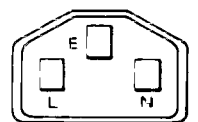
WARNING

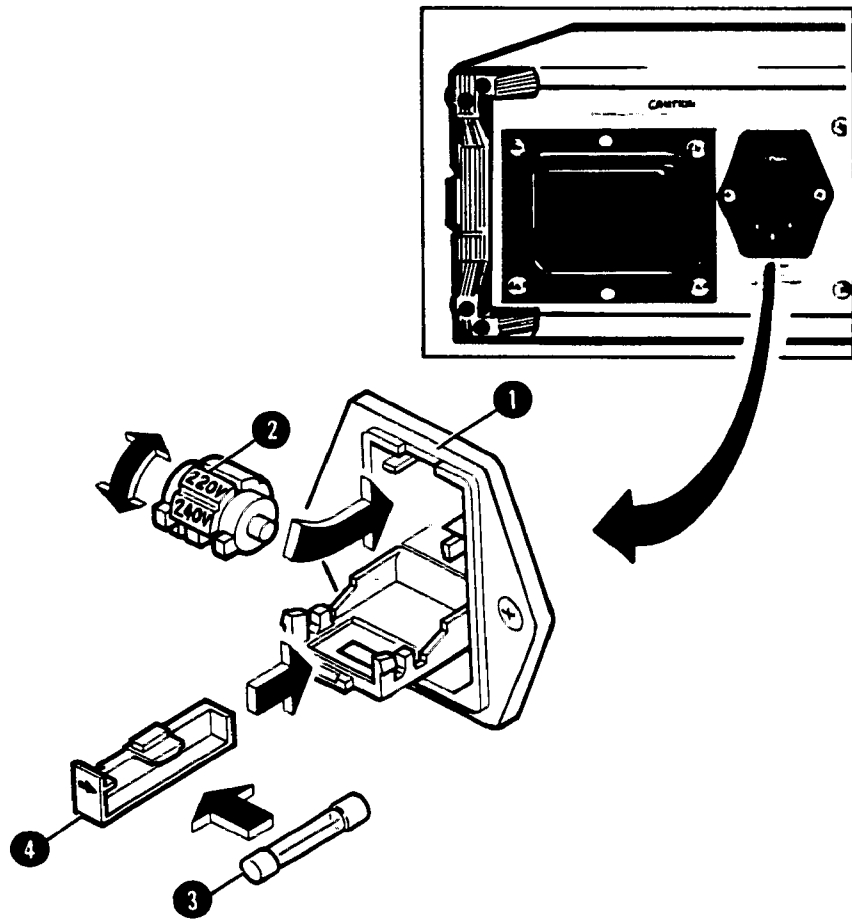
BEFORE SWITCHING ON THIS INSTRUMENT, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. The earth-grounding protection should not be interrupted by using extension cables, power cables, or autotransformers without protective ground conductors. Failure to ground the instrument properly can result in serious personal injury.

CAUTION

BEFORE SWITCHING ON THIS INSTRUMENT, make sure it is adapted to the voltage of the ac power source. You must correctly set the HP 85685A rear-panel voltage selector switch to adapt the HP 85685A to the power source. Failure to set the ac power input of the instrument for the correct voltage level could cause damage to the instrument when it is switched on.

Table 2. AC Power Cables and Plugs

Plug Type**	Cable HP Part Number	Plug Description	Cable Length cm (inches)	Cable Color	For Use In Country
<p>250V</p> 	8120-1351 8120-1703	Straight*BS1363A 90°	229 (90) 229 (90)	Mint Gray Mint Gray	Great Britain, Cyprus, Nigeria, Rhodesia, Singapore, So. Africa, India
<p>250V</p> 	8120-1369 8120-0696	Straight*NZSS198/ASC112 90°	201 (79) 221 (87)	Gray Gray	Australia, New Zealand
<p>250V</p> 	8120-1689 8120-1692	Straight*CEE7-Y11 90°	201 (79) 201 (79)	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, United Arab Republic (unpolarized in many nations)
<p>125V</p> 	8120-1348 8120-1398 8120-1754	Straight*NEMA5-15P 90° Straight*NEMA5-15P	203 (80) 203 (80) 91 (36)	Black Black Black	United States Canada, Japan (100 or 200V), Mexico, Phillipines, Taiwan
	8120-1378 8120-1521 8120-1676	Straight*NEMA5-15P 90° Straight*NEMA5-15P	203 (80) 203 (80) 91 (36)	Jade Gray Jade Gray Jade Gray	
<p>250V</p> 	8120-2104	Straight*SEV1011 1959-24507 Type 12	201 (79)	Gray	Switzerland
<p>220V</p> 	8120-0698	Straight*NEMA6-15P			
<p>250V</p> 	8120-1860	Straight*CEEE22-VI			
<p>* Part number shown for plug is industry identifier for plug only Number shown for cable is HP Part Number for complete cable, including plug. ** E = Earth Ground; L = Line; N = Neutral.</p>					



1. OPEN THE POWER CORD RECEPTACLE HOUSING COVER **1**, USING A SMALL SCREWDRIVER.
2. THE LINE VOLTAGE CAN BE CHANGED BY ROTATING THE VOLTAGE TUMBLER **2**.
3. THE LINE FUSE **3** CAN BE CHANGED AND/OR REPLACED BY REMOVING THE FUSEHOLDER **4** FROM THE POWER CORD RECEPTACLE HOUSING.

Figure 2. Line Voltage Selection and Fuse Removal

Select the line voltage and fuse as follows:

1. Measure the ac line voltage to determine the line voltage to be used.
2. Set the rear-panel voltage selector switch to the correct line voltage (100V, 120V, 220V, or 240V). See Figure 2. The line voltage must be within +5% or -10% of the voltage setting. If the line voltage is not within these limits, an autotransformer must be connected between the ac source and the HP 85685A. Table 2 shows the types of plugs available on ac power cables supplied with HP instruments.
3. Make sure the correct fuse is installed in the fuse holder. The required fuse rating depends on the ac line voltage, and is indicated in the following table.

Table 3. Line Voltage Fuses

Voltage	RF Preselector	HP Part Number
100/120	1 ampere FAST BLO	2110-0001
220/240	500 mA FAST BLO	2110-0012

FUSE REPLACEMENT

The line fuse for the 85685A is located inside the power cord receptacle housing on the rear panel. A spare fuse is also stored in this housing. Figure 2 shows removal and/or replacement of the line fuse.

INPUT FUSE REPLACEMENT

The INPUT 1 fuse can be replaced as follows:

1. Remove the INPUT 1 connector using a 7/16-inch open-end wrench. See Figure 3.
2. Remove the blown fuse, using long-nose pliers if necessary.

NOTE

The blown fuse should be marked in some manner to distinguish it from the new fuse.

3. Clip the leads of a new fuse (HP Part Number 2110-0301 or 1535-3716) to the same length as the blown fuse. Overall length should be approximately 1/2 inch.
4. Using a small file, bevel the ends of both leads to a 45° angle.

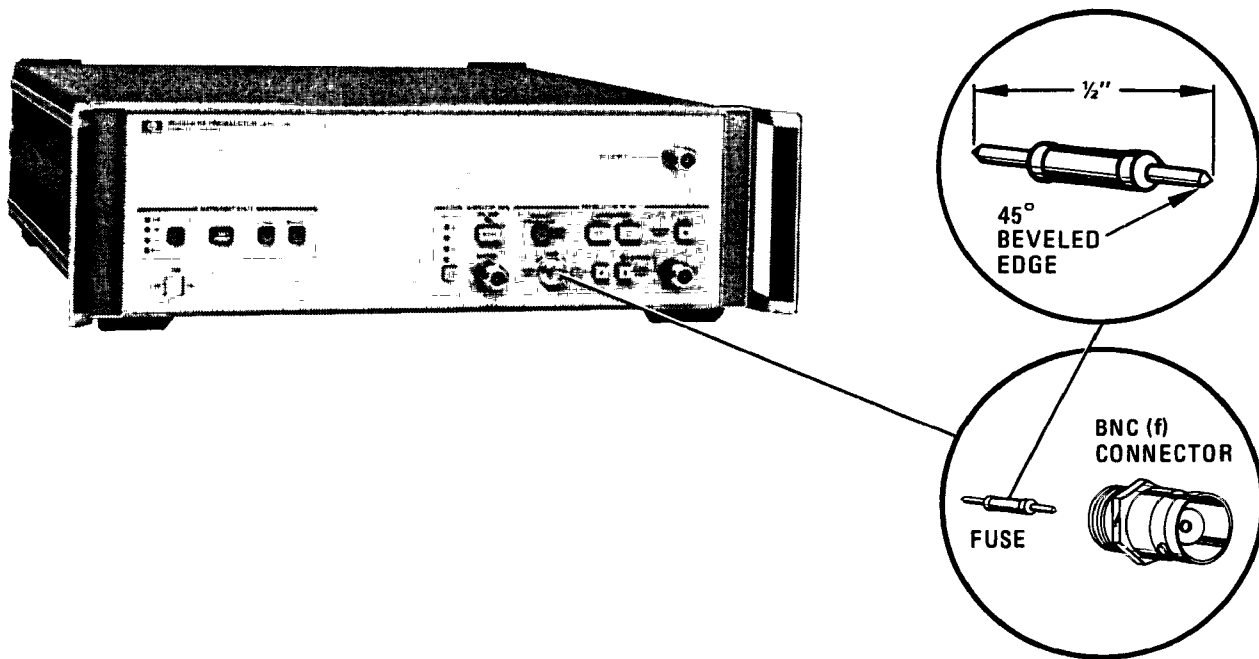


Figure 3. INPUT 1 Fuse Replacement

5. Carefully insert one end of the new fuse into the small hole in the threaded end of the BNC connector. Approximately half of the fuse should extend beyond the BNC connector body, when the fuse is properly seated.
6. Carefully replace the BNC connector (with the new fuse) on INPUT 1.

CAUTION

Do not overtighten the BNC connector on INPUT 1.

7. Snugly tighten the connector with a 7/16-inch open-end wrench, without exceeding 45 inch-pounds of torque.

POWER CABLES

In accordance with international safety standards, this instrument is equipped with a three-wire ac power cable. When connected to an appropriate ac power outlet, this cable grounds the instrument cabinet. Table 2 shows the styles of plugs available on ac power cables supplied with HP instruments. The numbers for the plugs are part numbers for complete ac power cables.

WARNING

If this instrument is to be energized through an autotransformer, make sure that the common terminal of the autotransformer is connected to the protective earth contact of the power source outlet socket.

MATING CONNECTORS

A list of connectors on the front and rear panels of the HP 85685A is given in Table 4. The industry identification, HP part number, and alternate source for each mating connector are listed.

Table 4. HP 85685A Mating Connectors

Connector on Front Panel	Mating Connector		
	Industry Identification	HP Part Number	Alternate Source
A1J1	Type N, male connector UG-21G/U	1250-0882	Specialty connector 25 P117-2
A1J2	Type N, male connector UG-21G/U	1250-0882	Specialty connector 25 P117-2
A1J3	Type BNC, male connector UG-88/U	1250-0256	Specialty connector 28 P118-1
A1J4	Type N, male connector UG-21G/U	1250-0882	Specialty connector 25 P117-2
Connector on Rear Panel	Mating Connector		
	Industry Identification	HP Part Number	Alternate Source
A13J1	Type BNC, male connector UG-88/U	1250-0256	Specialty connector 28 P118-1
A13J2	Type BNC, male connector UG-88/U	1250-0256	Specialty connector 28 P118-1
A13A2J3	Series D, male connector 24 contact, 2 rows	10833A/B/C/D (cables)	None
A13A2J4	Series D, male connector 24 contact, 2 rows	10833A/B/C/D (cables)	None

INTERCONNECTION OF SECTIONS

The HP 85685A is designed to fit securely below the HP 8566 or the HP 8568 Spectrum Analyzer. Therefore, the instruments should be prepared for installation using the following procedure.

WARNING

When interconnecting the HP 85685A with the spectrum analyzer, the instruments are extremely heavy. Be careful when lifting or moving these instruments, to avoid personal injury.

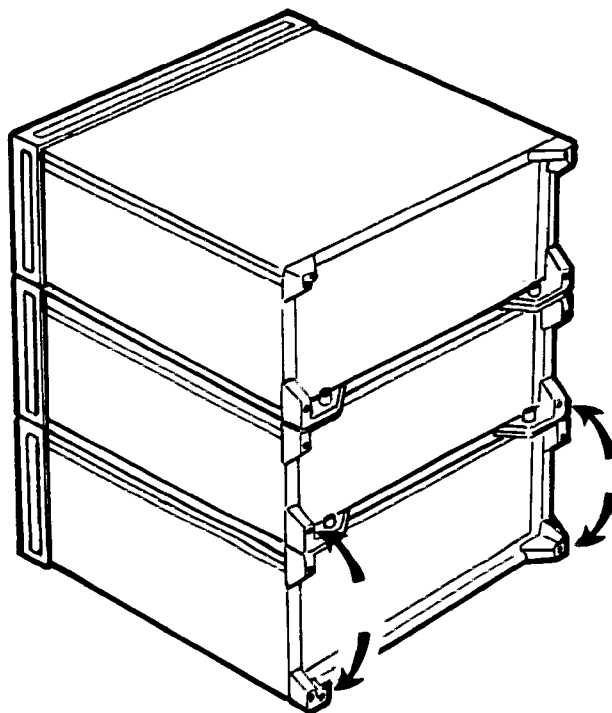
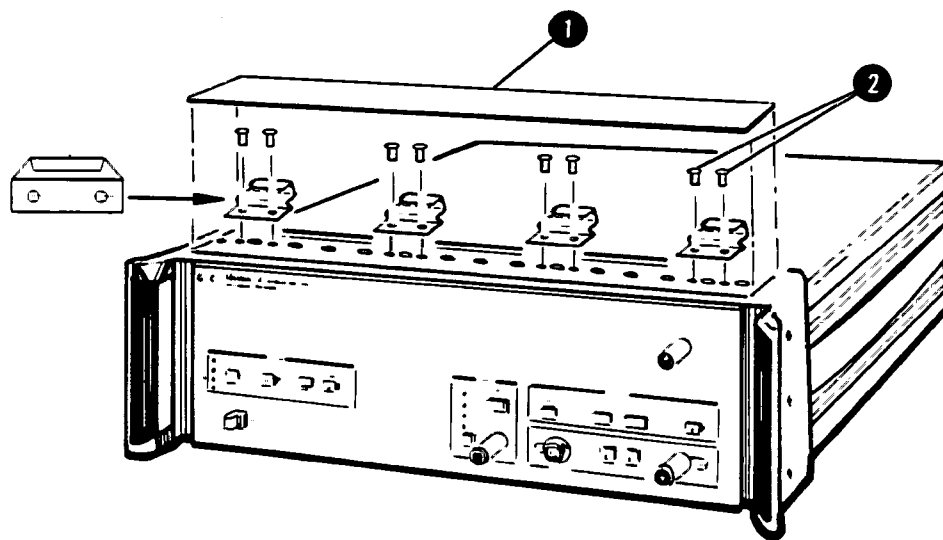


Figure 4. Exchanging Rear Bottom Feet

1. Set the spectrum analyzer line switch to OFF.
2. Remove the line cord, any HP-IB cables, the bottom feet, and the information card tray from the spectrum analyzer.
3. Exchange the feet from the rear bottom of the spectrum analyzer with the rear bottom lock feet of the preselector. See Figure 4.
4. Install the lock links to the top of the preselector, as shown in Figure 5.

CAUTION

When attaching the lock links, use of screws other than those provided may cause damage to the instrument, resulting in costly repair. If replacement of these screws is necessary, be sure replacement does not exceed specified length.



1. REMOVE TRIM PIECE FROM TOP OF INSTRUMENT. ①
2. INSTALL LOCK LINKS USING TWO M3.5 x 0.6 x 6 PAN HEAD SCREWS PER LOCK LINK. ②

Figure 5. Lock Link Installation

5. Install the bottom feet and information card tray from the spectrum analyzer onto the bottom of the preselector.
6. Position the preselector below the spectrum analyzer, using the lock links to secure the instruments.
7. Secure the lock feet of the spectrum analyzer and the preselector together with the thumbscrews. See Figure 6.

NOTE

When positioning the instruments on top of each other, all rear locking feet may need to be loosened in order to align the thumbscrews.

8. Install line cords and set line switches to ON.

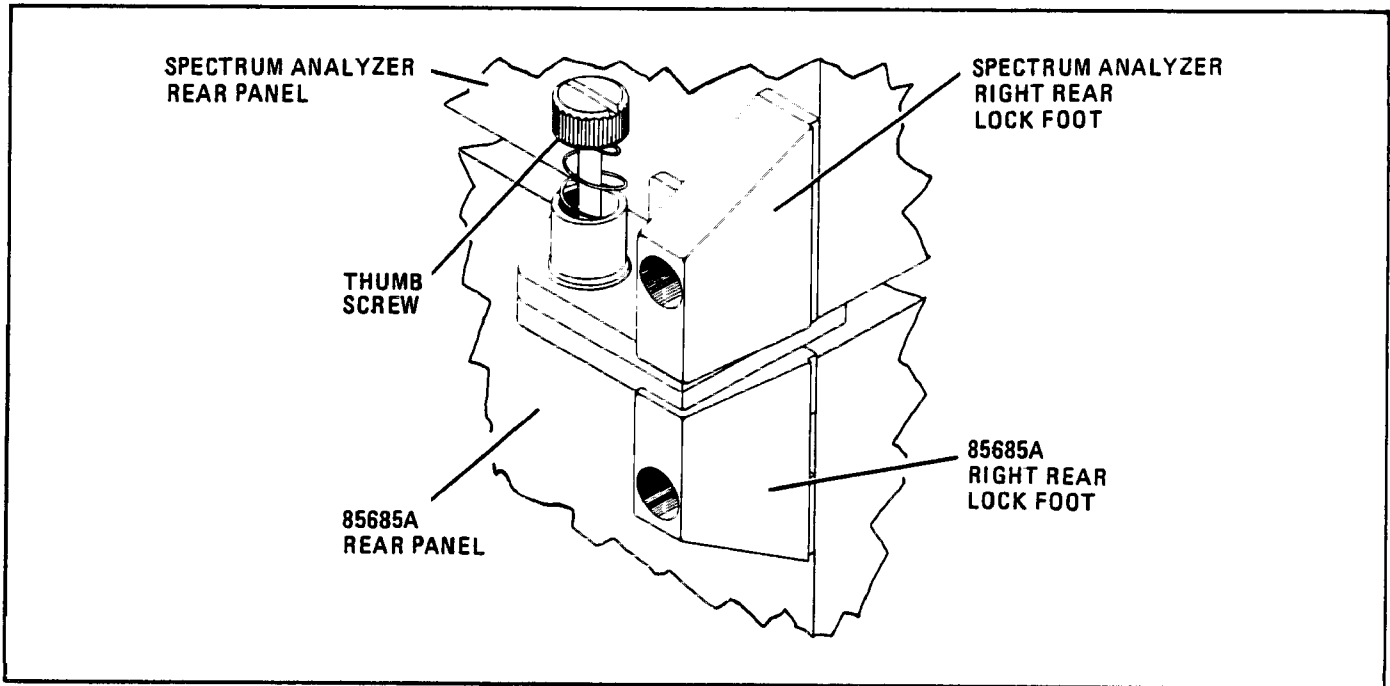


Figure 6. Securing Lock Feet

CABLE CONNECTIONS

Three cable connections are required to interconnect the HP 85685A with the spectrum analyzer. See Figure 7. These cables are provided and should be connected as indicated in Table 5. A connector-converter must also be inserted between the 50-pin interconnect cable and connector.

Table 5. Interconnect Cables

Reference Designator	RF Preselector	Spectrum Analyzer
W24	HSWP (A13J2)	Cable Adapter
W25	HORIZ (A13J1)	Sweep Recorder Output
W26	To Spectrum Analyzer (A13A2J3)	HP-IB

SYSTEM CONFIGURATIONS

The two system configurations shown in Figure 8 are for use in manual operations and automated systems operations. The use of each configuration is explained in more detail in the following section.

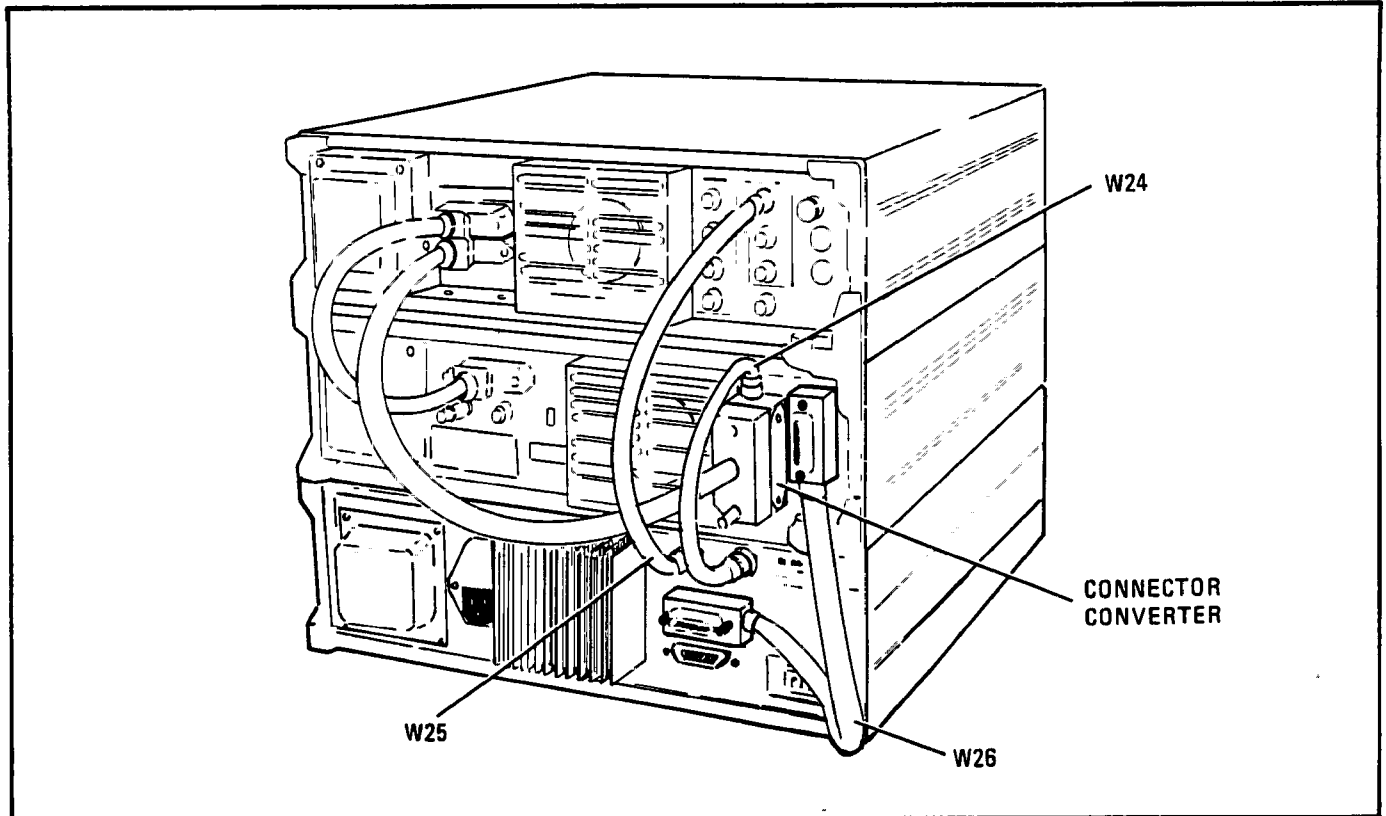


Figure 7. Rear Panel Interconnections

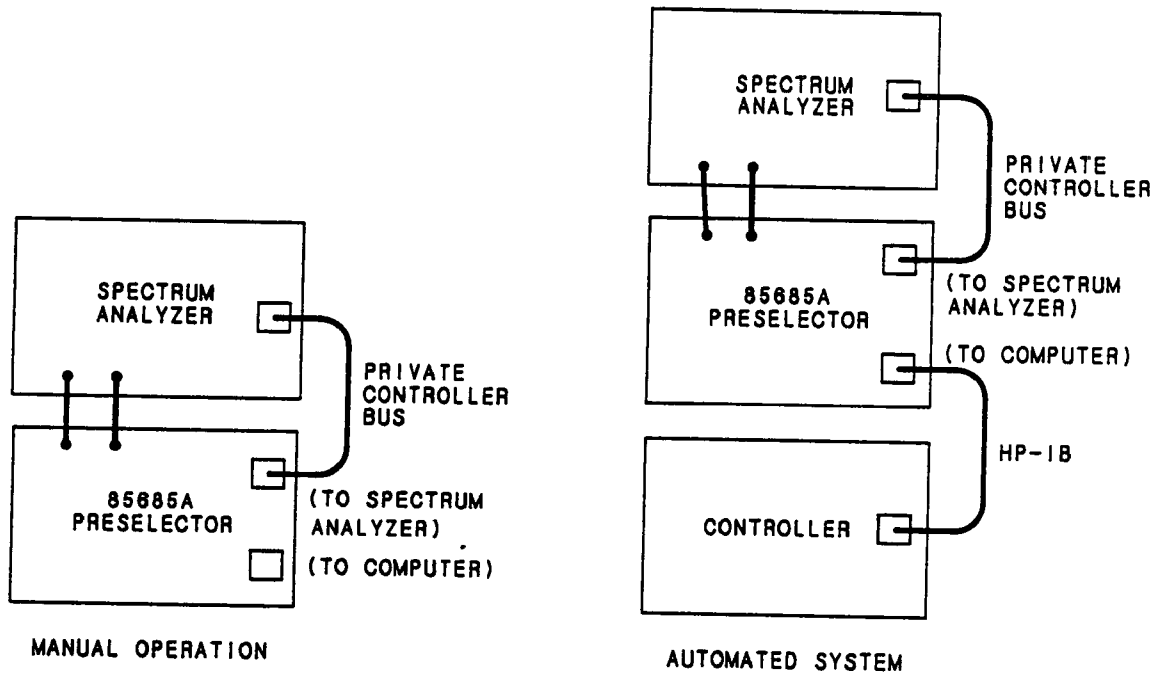


Figure 8. System Configurations

HP-IB ADDRESS SELECTION

HP-IB ADDRESS SELECTION

The HP-IB address for the HP 85685A is preset at the factory by the eight-segment address switch located on the rear panel. Two HP-IB control buses, the private controller bus and the HP-IB, are controlled by the setting of the address switch. When the switch is set to an odd address, only the HP-IB is enabled; when the switch is set to an even address, both the private controller bus and the HP-IB are enabled. The private controller bus address of the preselector is 21 and cannot be changed. The HP-IB address of the preselector is set by the address switch, which determines the address of the preselector itself and the address of the "pass-through" path for the spectrum analyzer.

Table 6. ASCII, Decimal, and Binary Address Codes

ASCII CHARACTER		DECIMAL VALUE	5-BIT BINARY EQUIVALENT
@	SP	00	00000
A	!	01	00001
B	"	02	00010
C	#	03	00011
D	\$	04	00100
E	%	05	00101
F	&	06	00110
G	'	07	00111
H	(08	01000
I)	09	01001
J	*	10	01010
K	+	11	01011
L	,	12	01100
M	-	13	01101
N	.	14	01110
O	/	15	01111
P	0	16	10000
Q	1	17	10001
R	2	18	10010
S	3	19	10011
T	4	20	10100
U	5	21	10101
V	6	22	10110
W	7	23	10111
X	8	24	11000
Y	9	25	11001
Z	:	26	11010
[;	27	11011
\	<	28	11100
]	=	29	11101
	>	30	11110

When the preselector address switch is set to an even address, the preselector is in dual mode. In this mode, the preselector HP-IB has two addresses. The even address is for the "pass-through" path to the spectrum analyzer and the next higher odd address is the actual address of the preselector. Both the private controller bus and the HP-IB of the preselector are activated when the preselector is in dual mode.

When the preselector address switch is set to an odd address, the private HP-IB bus is disabled and the address of the preselector is the same as the switch setting. At this time, only the HP-IB control bus is active.

The preselector HP-IB address switch is preset to the binary number 00010010, which corresponds to a decimal equivalent of 18. Therefore, the preselector HP-IB control bus has two HP-IB addresses designated to it: 1) the "pass-through" path address 18; and 2) the preselector address 19.

The HP-IB address may be changed to any of the addresses listed in Table 6 by resetting the HP-IB address switch to correspond to the binary equivalent of the desired ASCII character or decimal value. However, the preselector HP-IB even address in order to activate the private controller bus. The activated private controller bus enables direct communication between the preselector and spectrum analyzer.

Whenever the preselector address switch is changed, a front panel INSTRUMENT PRESET or an instrument power on/off cycle must always be executed in order for the new address to be read.

The eight-segment address switch, illustrated in Figure 9, is shown in its preset position (decimal 18). The switch should always be in NORMAL mode for normal operation of the preselector and in TEST mode only for diagnostic use.

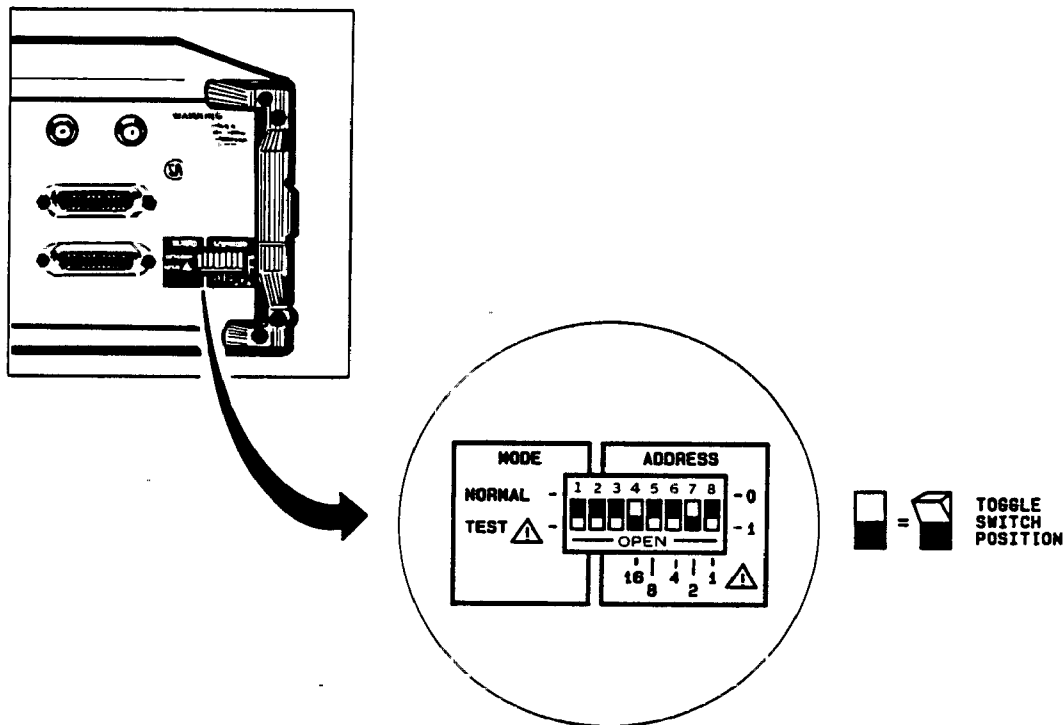


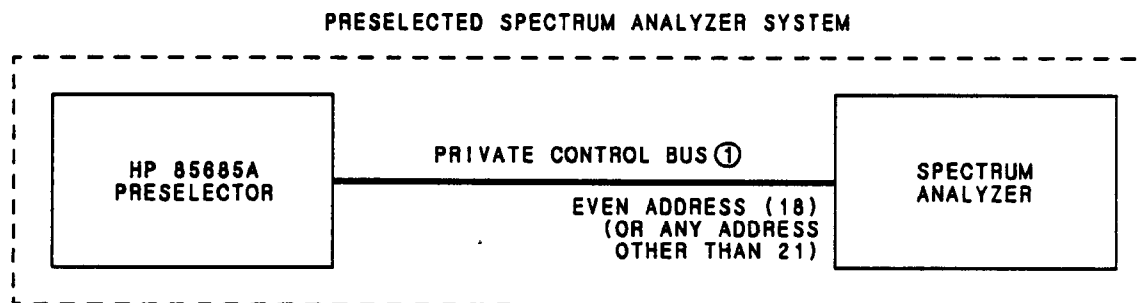
Figure 9. HP-IB Address Switch (Factory Preset Position)

Private Controller Bus

Connecting an HP-IB cable between the preselector (TO SPECTRUM ANALYZER) and the spectrum analyzer enables the instruments to communicate by means of the private controller bus. This only occurs if 1) the preselector HP-IB address switch is set to an even address, and 2) the spectrum analyzer is at an address other than 21. Since the address of the preselector on the private controller bus is 21, it should not be used for the spectrum analyzer.

The preselector uses the private controller bus to monitor frequency changes of the spectrum analyzer when the "pass-through" path in the preselector is not in use. Therefore, the preselector acts as a controller in that it interprets data (via the private controller bus) from the spectrum analyzer in order to track the local oscillator. For example, when the frequency span of the spectrum analyzer is changed, an "SRQ" prompt appears on the CRT display of the analyzer. The preselector automatically interprets the frequency change and immediately updates its own data to continue tracking the spectrum analyzer local oscillator.

During manual operation of the preselector and spectrum analyzer, the preselector HP-IB address switch must be set to an even address so that the private controller bus is activated. This enables the preselector and the spectrum analyzer to interact directly.



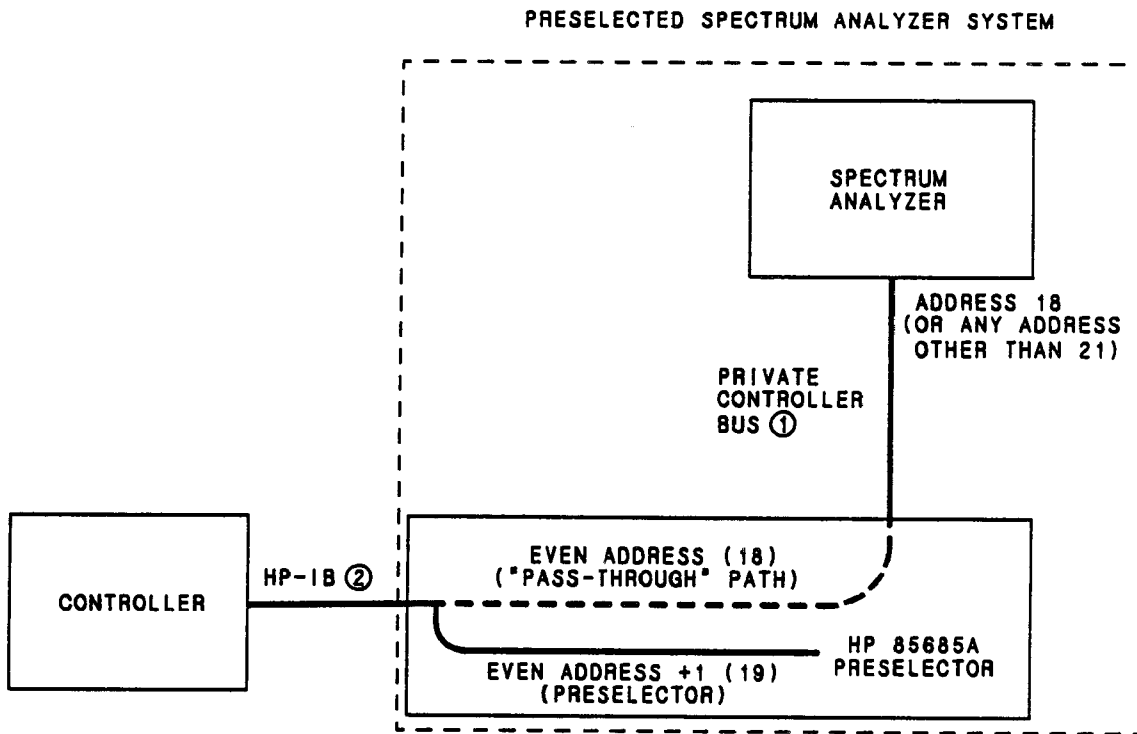
① THE PRIVATE CONTROL BUS CONNECTS THE SPECTRUM ANALYZER TO A13A2J3 ON THE PRESELECTOR (TO SPECTRUM ANALYZER).

Figure 10. Private Control Bus

HP-IB

In addition to the private controller bus, an HP-IB connection is necessary for remote operation of the preselector. When an HP-IB cable is connected between the preselector (TO COMPUTER) and a controller, the preselector and the spectrum analyzer can both be controlled remotely. However, this only occurs when the preselector HP-IB address switch is set to an even address, which allows the controller a "pass-through" path through the preselector in order to communicate with the spectrum analyzer. See Figure 11.

When the HP-IB is connected and the preselector address switch is at an even address, the private controller bus is enabled, and the controller can communicate with either the preselector or spectrum analyzer by means of the HP-IB. The controller can communicate with either instrument by using the appropriate HP-IB address. For example, with the preselector address switch set at 18, the controller can "talk to" the spectrum analyzer by address 18 and "talk to" the preselector by address 19. When the controller "talks to" the spectrum analyzer, it does so by address 18 via the preselector. This even address 18 is a direct path through the preselector and goes to the spectrum analyzer by means of the private controller bus. When the private controller bus is enabled, the address of the spectrum analyzer can be anything other than 21. Thus, the preselector acts as a controller to the spectrum analyzer, provided the spectrum analyzer is connected to the private controller bus.



- ① THE PRIVATE CONTROL BUS CONNECTS THE SPECTRUM ANALYZER TO A13A2J3 ON THE PRESELECTOR (TO SPECTRUM ANALYZER).
- ② THE HP-IB BUS CONNECTS THE CONTROLLER TO A13A2J4 ON THE PRESELECTOR (TO COMPUTER). THE PRESELECTOR ADDRESS SWITCH MUST BE SET TO ANY EVEN ADDRESS OTHER THAN 20.

Figure 11. HP-IB Control Bus

RACK MOUNTING (OPTIONS 908 AND 913)

Instrument Options 908 and 913 contain the necessary hardware to mount the HP 85685A in a rack of 497.8 mm (19.6 inches) spacing. Option 908 is for mounting without handles (see Figure 13) and Option 913 is for mounting with handles (see Figure 14).

RACK MOUNTING WITH SLIDES (OPTION 010)

Instrument Option 010 contains the necessary hardware to mount the HP 85685A with slides in a rack of 497.8 mm (19.6 inches) spacing. The kit also contains a slide adapter kit for mounting in non-HP racks. The slides provide extra support at the sides of the instrument in the rack and are recommended because of the weight of the instrument. Refer to Figure 15 and the following instructions to install the slides.

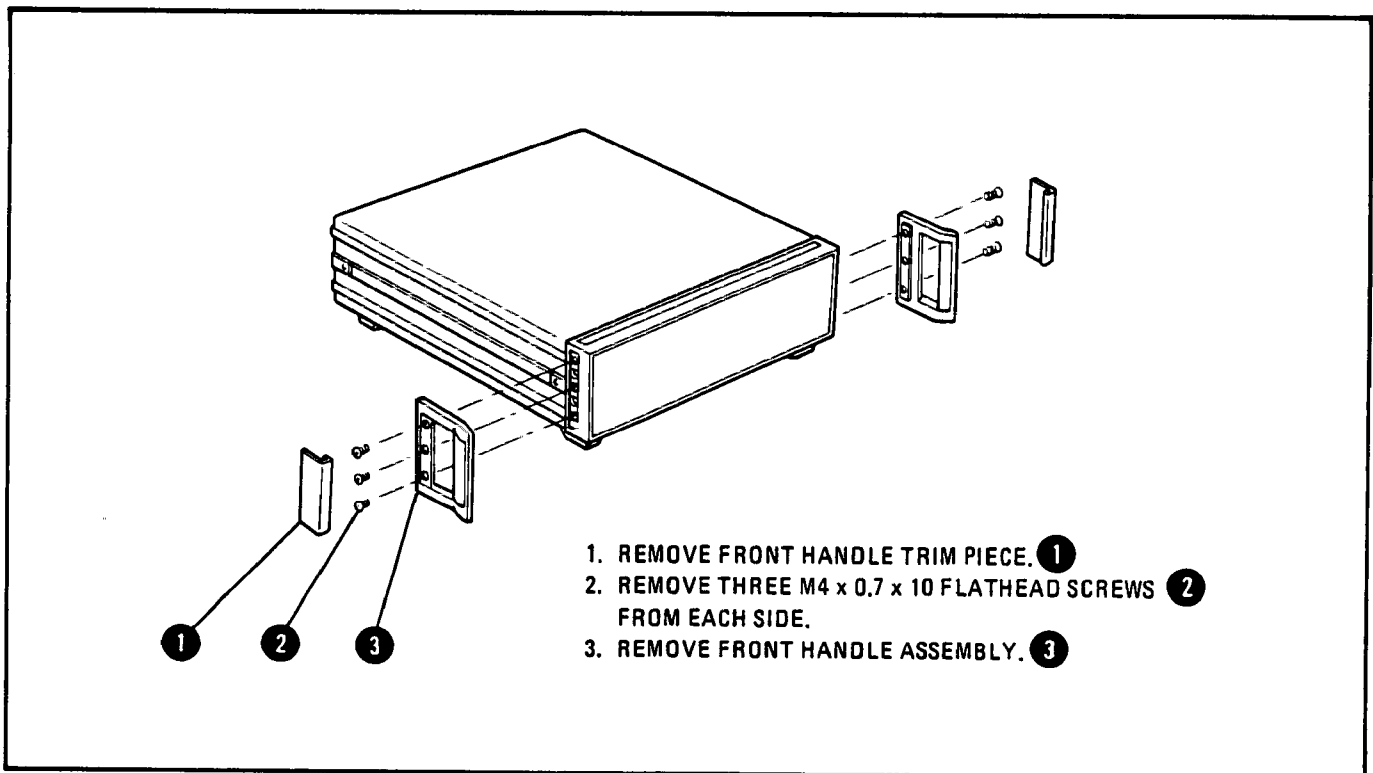


Figure 12. Front Handle Removal

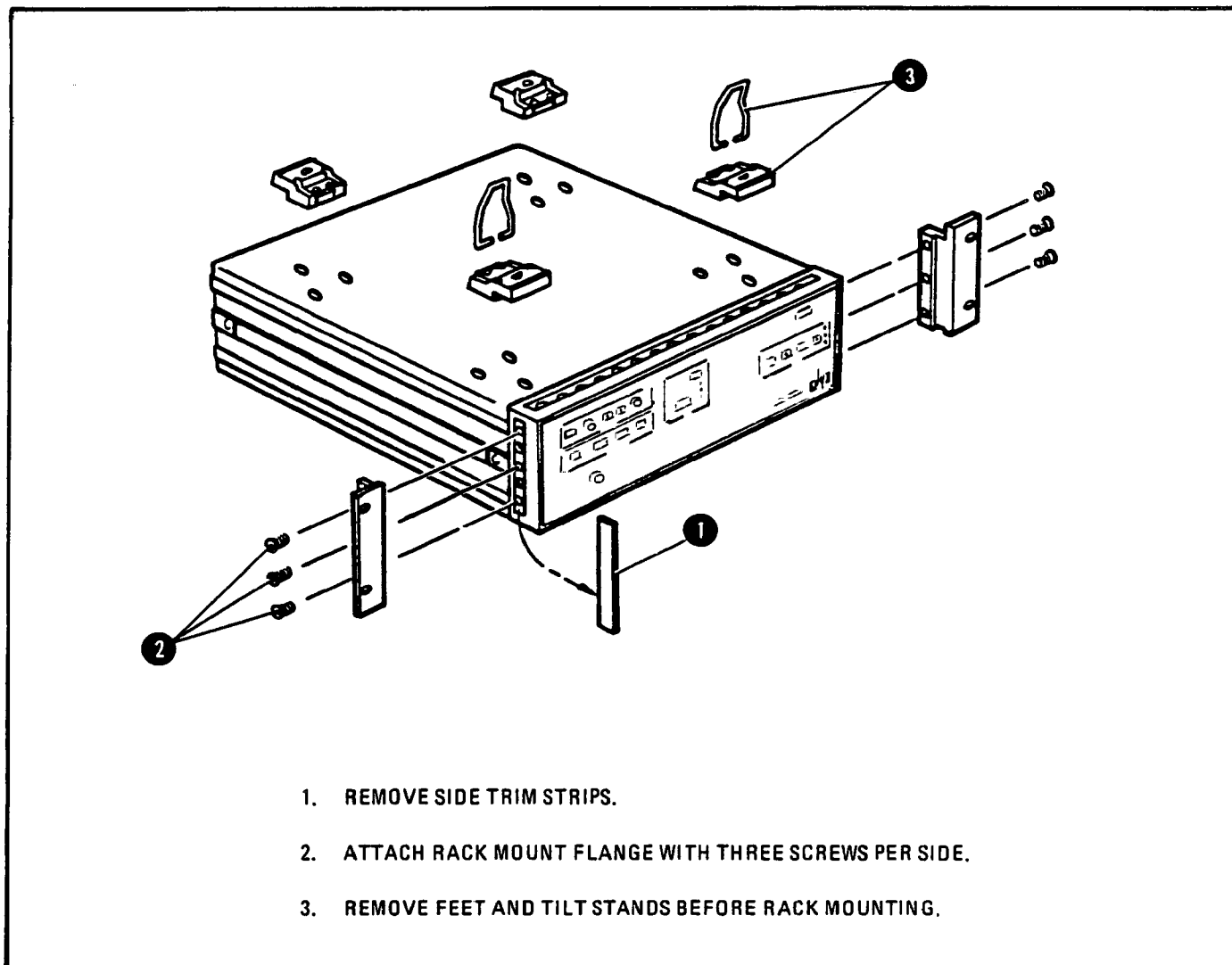
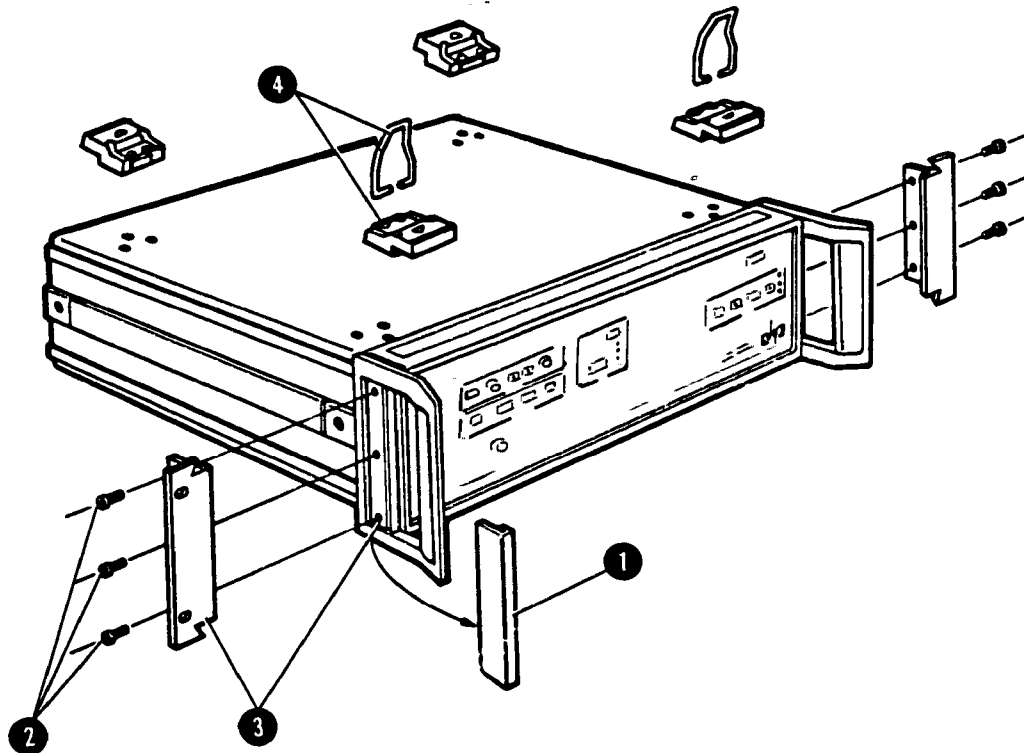


Figure 13. Option 908 Attaching Rack Mount Flanges without Handles



1. REMOVE SIDE TRIM STRIPS.
2. REMOVE THREE SCREWS PER SIDE.
3. ATTACH RACK MOUNT FLANGE AND FRONT HANDLE WITH THREE NEW LONGER SCREWS PER SIDE.
4. REMOVE FEET AND TILT STANDS BEFORE RACK MOUNTING.

Figure 14. Option 913 Attaching Rack Mount Flanges with Handles

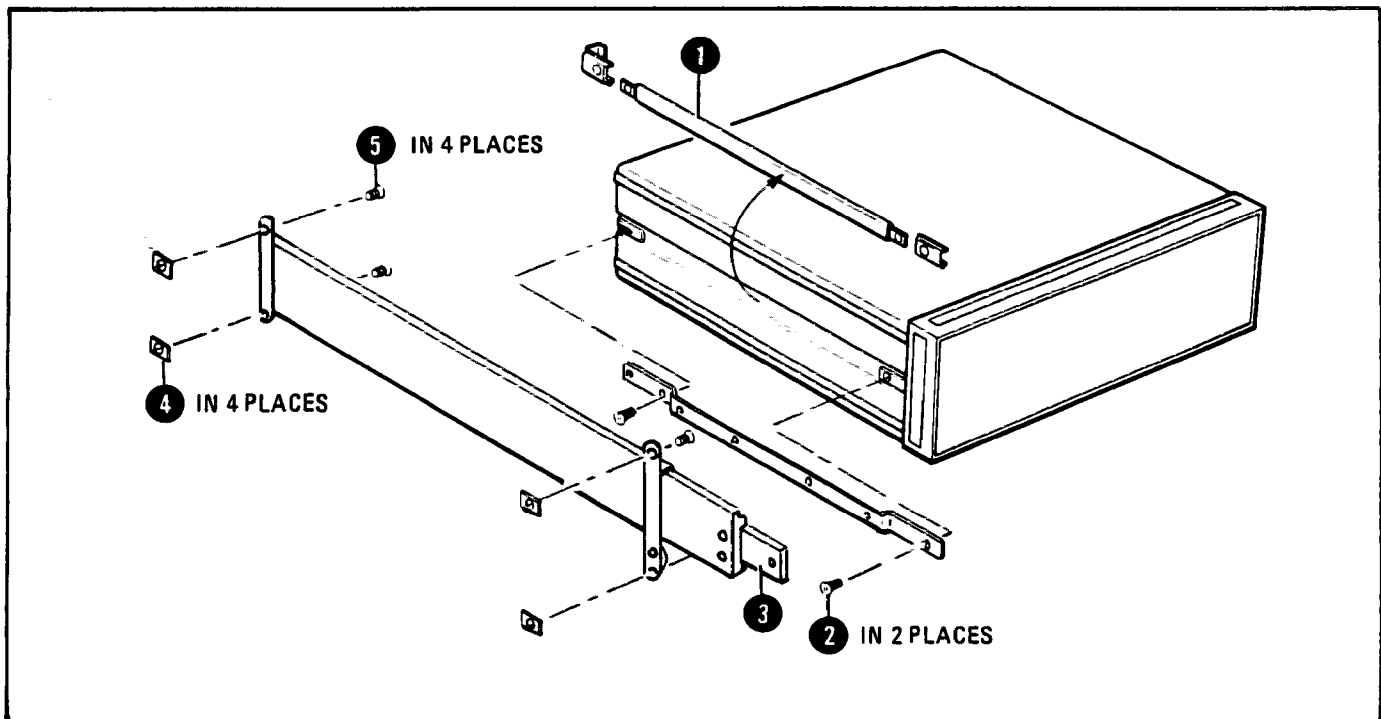


Figure 15. Option 010 Attaching Rack Mount Slides

1. Remove front handles (see Figure 12) and side strap handles.
2. Attach one slide inner member bracket to each side of the instrument, using two M5x0.8x10 pan-head screws per side (see Figure 15).
3. Remove the inner slide from each slide mount. Mount these slide brackets to each slide inner member bracket, using four M5x0.8x12 flat-head screws per side.

NOTE

When using non-HP system cabinets, skip steps 4 through 6 and proceed to step 7.

4. Insert two Unistrut nuts into each of the four vertical columns of the systems cabinet (using four nuts in each side).
5. Bolt the outer slide mount to the Unistrut nuts to each side of the systems cabinet, using four M5x0.8x12 pan-head screws per side.
6. Mount the instrument into the system cabinet by lining up on each side the inner slides on the instrument and the outer slide mount of the system cabinet.

NOTE

If any binding occurs in the slides, remove the instrument and loosen the screws to the Unistrut nuts on each side (adapter end brackets for non-HP cabinets). Adjust the slides until they operate freely and re-tighten the screws.

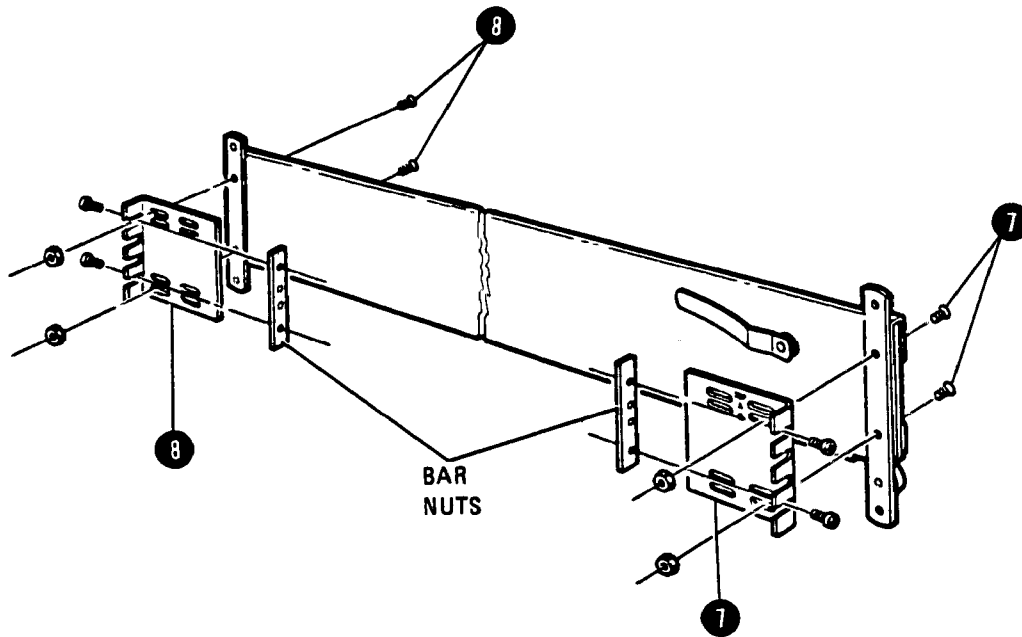


Figure 16. Installing End Brackets for Non-HP Cabinets

7. Attach end brackets for non-HP cabinets using hole pattern "B". Mount end brackets to the front of each outer slide mount using two M5x0.8x12 flat-head screws and nuts with washers per side. See Figure 16.
8. Mount end brackets to the rear of each outer slide mount using two M5x0.8x12 pan-head screws and nuts with washers per side. See Figure 16.
9. Bolt the outer slide mount to each side of the system cabinet, using M5x0.8x12 pan-head screws. Use the bar nuts if the rack mounting strips have through-holes.
10. Perform step 6.

PACKAGING

Original Packaging

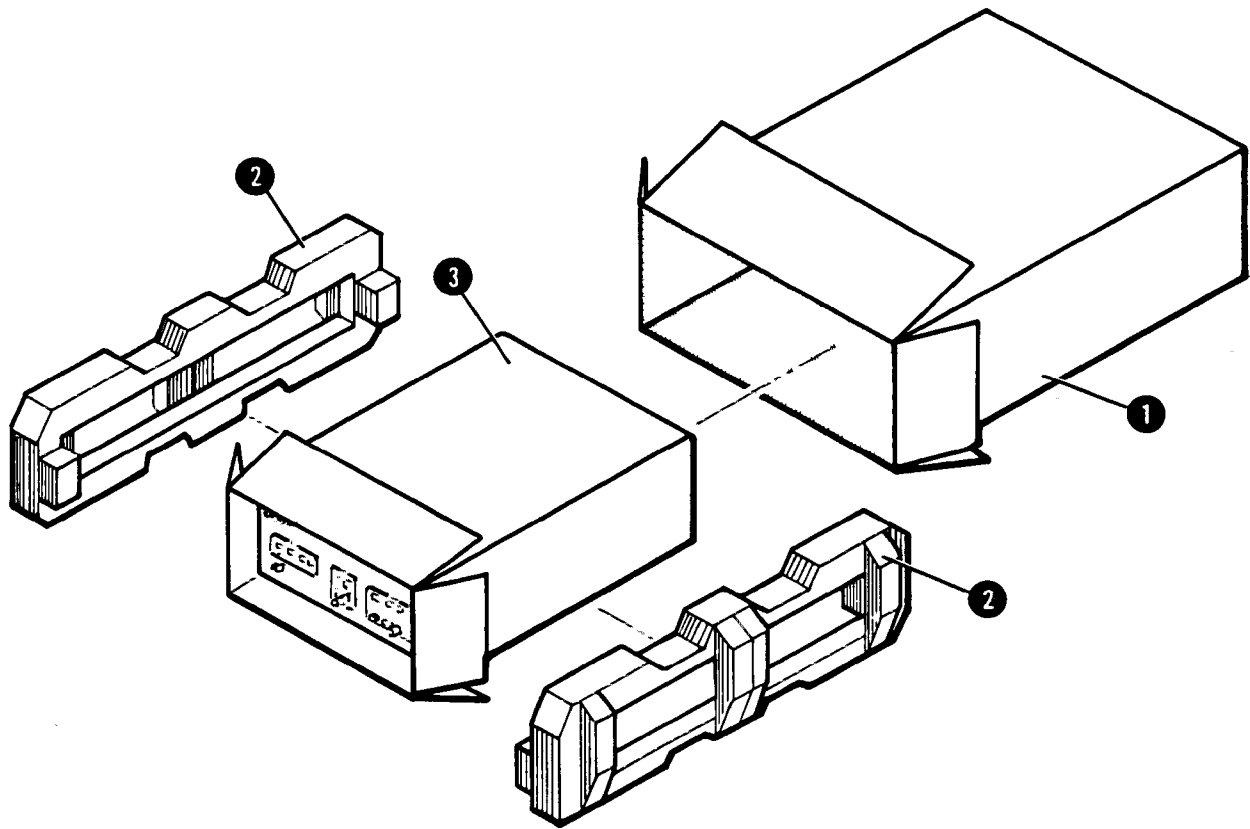
It is recommended that the original factory packaging materials be retained for use when shipping the instrument. If original packaging material cannot be retained, packaging materials identical to those used in factory packaging are available through the Hewlett-Packard offices. Part numbers and descriptions of the packaging materials are listed in Figure 17.

If the instrument is being returned to Hewlett-Packard for servicing, attach a tag to the carton indicating the type of service required, return address, model number, and full serial number. For your convenience, a supply of tags is included at the end of this section. Also, mark the carton FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

Other Packaging

If it is necessary to use packaging materials other than the type used in original factory packaging, the following general instructions should be followed.

1. Wrap the instrument in heavy paper or plastic.
2. Place the instrument in containers with 8 to 10 cm (3 to 4 inches) of shock-absorbing material around all sides to provide firm cushioning and prevent movement inside the container. Protect the front panel with cardboard. Double-walled corrugated cartons of 125 kg (275 lbs) bursting strength are sufficient for shipping containers.
3. Seal the container securely and, if shipping to a Hewlett-Packard office or service center, attach a tag to the container indicating the type of service required, return address, model number, and full serial number. For your convenience, a supply of tags is included at the end of this section.
4. Mark the container FRAGILE to assure careful handling.



NOTE

FRONT HANDLES MUST BE MOUNTED FOR SHIPMENT.

Item	HP Part Number	C D	Qty	Description	Manufacturer Code	Mfr. Part Number
1	9211-4487	3	1	Outer Box	28480	9211-4487
2	5180-2319	5	2	Inner Foam Pad	28480	5180-2319
3	5180-2320	8	1	Inner Box	28480	5180-2320

Figure 17. Packaging for Shipment Using Factory Packaging Materials



DIAGNOSTICS

Diagnostic mode can be selected by setting the most significant bit (MSB) of the HP-IB address switch to TEST mode (logic=1). The other bits of the address switch determine which diagnostic test is selected. See Figure 1.

To execute a diagnostic test, the instrument power must be cycled off and on or the INSTRUMENT PRESET key on the front panel may be manually pressed. All front-panel LEDs will then flash three times, indicating that a diagnostic test is to begin. Unless otherwise indicated in the individual test descriptions, the SRQ LED remains on while the test is in progress and a flashing SRQ LED indicates that the test is completed. Refer to Table 1 to determine the switch bit settings for each diagnostic test.

The following diagnostic test descriptions are for evaluation purposes only. Refer to Figure 2 for corresponding LEDs used in these diagnostic tests. For further service information on the preselector, refer to the HP 85685A RF Preselector Troubleshooting and Repair Manual, HP Part Number 85685-90005.

Table 1. Diagnostic Tests and Switch Bit Settings

Diagnostic	Address Switch Bits							
	1	2	3	4	5	6	7	8
1 Primary Control Check	1	X	X	X	0	0	0	0
2 Control Amplifier Check	1	X	X	X	0	0	0	1
3 RAM Memory Check	1	X	X	X	0	0	1	0
4 ROM Checksum	1	X	X	X	0	0	1	1
5 EEROM Memory Check	1	X	X	X	0	1	0	0
6 Cycle Check	1	X	X	X	0	1	0	1
7 CPU Wait State Generation	1	X	X	X	0	1	1	0
8 LED Check	1	X	X	X	0	1	1	1
9 Keyboard Check	1	X	X	X	1	0	0	0
10 Timer Check	1	X	X	X	1	0	0	1
11 Relay Check	1	X	X	X	1	0	1	0
12 Group A Latched Data Check	1	X	X	X	1	0	1	1
13 Comb Generator Check	1	X	X	X	1	1	0	0
14 Group B Latched Data Check	1	X	X	X	1	1	0	1
15 HP-IB Port Check	1	X	X	X	1	1	1	0
16 Data Bus Signature Analysis Check	1	X	X	X	1	1	1	1

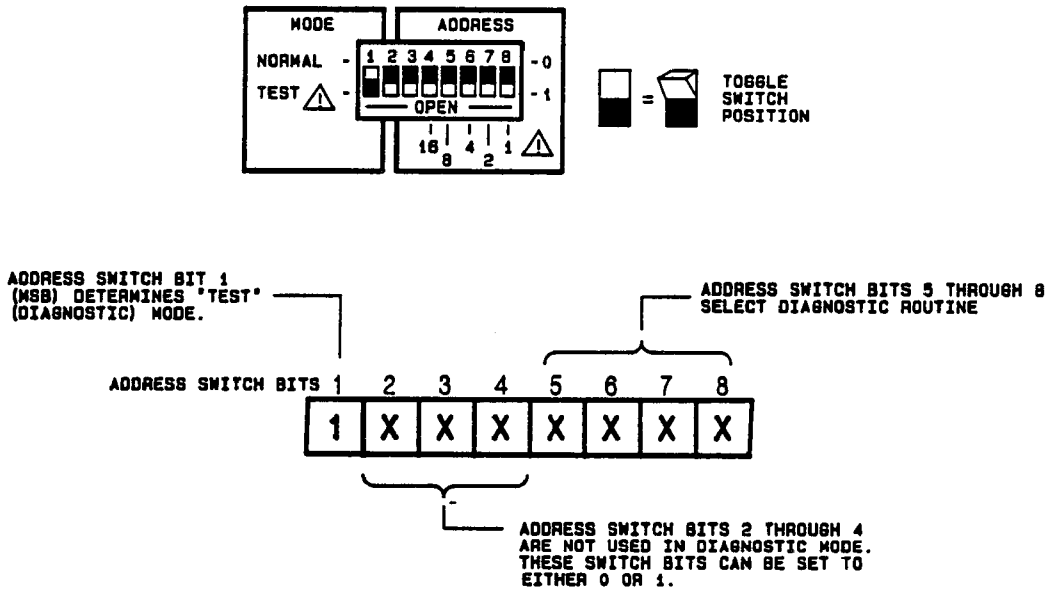


Figure 1. Diagnostic Switch Bit Settings

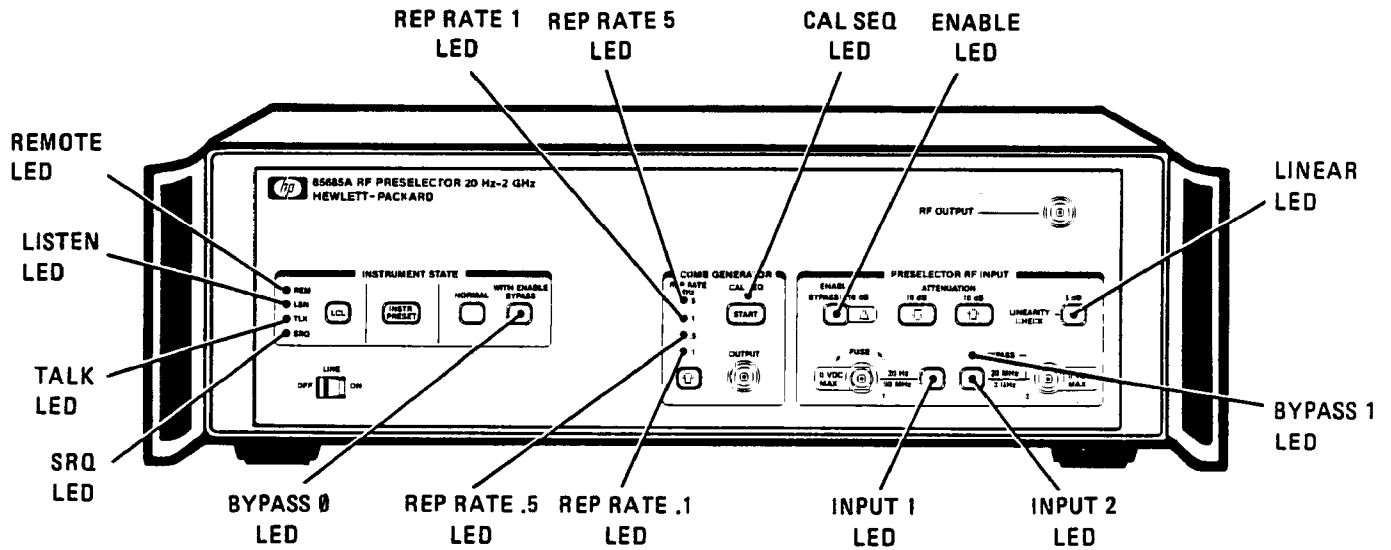


Figure 2. Front-Panel LEDs

1 Primary Control Check

1	X	X	X	0	0	0	0
---	---	---	---	---	---	---	---

The Primary Control Check is the main diagnostic routine for the Processor and DAC assemblies. This test verifies gain, linearity, and offset characteristics of the 10 DAC control amplifiers. In performing this diagnostic routine, 80 percent of the control hardware on both assemblies is verified. The output test voltage of each control amplifier is compared to TRAC DAC U15 by the internal tracking A/D Comparators. Failures are indicated by lighted LEDs on the front panel. Refer to Table 2 for a cross-reference of control amplifiers and corresponding LEDs.

Table 2. Control Amplifiers

Control Amplifier	Corresponding LED	Expected Voltages
50V Tune 0	REP RATE 5	9.214V \pm 275 mV
50V Tune 1	REP RATE 1	9.214V \pm 275 mV
50V Tune 2	REP RATE .5	9.214V \pm 275 mV
30V Tune 0	REP RATE .1	8.449V \pm 254 mV
30V Tune 1	CAL SEQ	8.449V \pm 254 mV
30V Tune 2	ENABLE	8.449V \pm 254 mV
Low VCA	Input 1	9.524V \pm 286 mV
Mid VCA	Bypass 1	9.524V \pm 286 mV
Hi VCA	Input 2	9.524V \pm 286 mV
YIG	Linear	9.516V \pm 286 mV

The gain of each control amplifier is checked by a full-scale test to verify that the output level is within 3 percent of the specified voltage. The linearity is checked by a half-scale test to verify that each control amplifier is operating linearly from half to full scale. A zero level test verifies that each control amplifier has an acceptable offset.

After the Primary Control Check has been completed (indicated by a flashing SRQ LED), the voltage of TRAC DAC U15 can be verified. TRAC DAC U15 is set at the factory to full-scale, +11.4V, and can be verified or adjusted at this time by monitoring A12TP8.

The voltage of TRAC DAC U15 can only be verified after performing the Primary Control Check or Control Amplifier Check diagnostic routines.

2 Control Amplifier Check

1	X	X	X	0	0	0	1
---	---	---	---	---	---	---	---

The Control Amplifier Check selects any of the 10 DAC control amplifiers or the TRAC DAC amplifier for individual diagnosis. The REP RATE key of the Comb Generator is used to sequentially select one of the 11 control amplifiers to be ramped or set to a dc level. The lit LED indicates the control amplifier to be tested, beginning with TRAC DAC U15. This is the only test in which the operation of TRAC DAC U15 can be viewed. Refer to Table 3 for a cross-reference of control amplifiers, TRAC DAC U15, and LEDs.

Table 3. TRAC DAC U15 and Control Amplifier

Control Amplifier	Corresponding LED
TRAC DAC U15	Bypass 0
50V Tune 0	REP RATE 5
50V Tune 1	REP RATE 1
50V Tune 2	REP RATE .5
30V Tune 0	REP RATE .1
30V Tune 1	CAL SEQ
30V Tune 2	ENABLE
Low VCA	Input 1
Mid VCA	Bypass 1
Hi VCA	Input 2
YIG	Linear

The digital value output to any selected DAC control amplifier can be changed by using six of the front-panel keys as follows:

Value	Key
4095 (full-scale)	Input 2
2048 (mid-scale)	ENABLE
0 (zero-scale)	Input 1
+128 (increment)	10 dB UP
-128 (decrement)	10 dB DOWN
ramp continuously	Linearity Check

By manipulating the keys above, the bits of a selected DAC control amplifier can be evaluated

3 RAM Memory Check

1	X	X	X	0	0	1	0
---	---	---	---	---	---	---	---

The RAM Memory Check verifies the RAM memory on the Processor assembly. If data errors are found within the RAM memory, Table 4 lists the corresponding LED that will be lit at the end of the test. A flashing SRQ LED indicates that the test is completed.

Table 4. RAM Memory

Data Bus Line*	Corresponding LED
D0 – D3 (U39)	REP RATE .1
D4 – D7 (U39)	REP RATE .5
D8 – D11 (U38)	REP RATE 1
D12 – D15 (U38)	REP RATE 5
D0 – D3 (U41)	ENABLE
D4 – D7 (U41)	Input 1
D8 – D11 (U40)	Input 2
D12 – D15 (U40)	Linear

* ICs are located on A11 Processor.

If an address error occurs without a data error, then the CAL SEQ LED will remain lit at the end of the test.

4 ROM Checksum

1	X	X	X	0	0	1	1
---	---	---	---	---	---	---	---

The ROM Checksum routine performs four checksums of the EPROM memory and two checksums of the EEROM memory, one for each integrated circuit. All ROM memory is located on the Processor assembly. The checksum routines are used to verify the four sub-sections of the ROM memory and the low and high bytes of the EEROM memory. Front-panel LEDs are used to indicate faulty ROM and EEROM integrated circuits. Table 5 lists the integrated circuit and the corresponding LED.

Table 5. ROM Checksum

Memory	Corresponding LED
U35 EPROM	REP RATE .1
U34 EPROM	REP RATE .5
U37 EPROM	REP RATE 1
U36 EPROM	REP RATE 5
U43 EEROM	Input 1
U42 EEROM	Input 2

5 EEROM Memory Check

1	X	X	X	0	1	0	0
---	---	---	---	---	---	---	---

The EEROM Memory Check verifies the EEROM memory on the Processor assembly. This test is destructive to the contents of EEROM calibration data and is FOR SERVICE USE ONLY.

6 Cycle Check

1	X	X	X	0	1	0	1
---	---	---	---	---	---	---	---

The Cycle Check routine continuously cycles the CPU and RAM on the Processor assembly. The SRQ LED remains on while the test is in progress and the BYPASS 0 LED will flash for valid checks. As errors occur, the ten LEDs in the Comb Generator and Preselector RF Input function blocks serve as a counter in noting the number of errors that occur while the test is in process. If no errors are detected, the ten front-panel LEDs will remain off and the routine will continuously cycle until another diagnostic routine is activated or the diagnostic mode is terminated.

7 CPU Wait State Generation

1	X	X	X	0	1	1	0
---	---	---	---	---	---	---	---

The CPU Wait State Generation Check is a routine that verifies the microprocessor timing hardware on the Processor assembly. This check performs continuous reads at different addresses to allow observation of wait-state generations. This diagnostic test is FOR SERVICE USE ONLY.

8 LED Check

1	X	X	X	0	1	1	1
---	---	---	---	---	---	---	---

The LED Check is a routine that toggles all front-panel LEDs simultaneously to verify operation. The LEDs will flash on and off continuously until another diagnostic routine is activated or the diagnostic mode is terminated.

9 Keyboard Check

1	X	X	X	1	0	0	0
---	---	---	---	---	---	---	---

The Keyboard Check routine verifies proper operation of front-panel keys. By pressing the keys in the proper order, all the front-panel LEDs alternately toggle on or off as each key is pressed. If a key is pressed out of order, the LEDs hold in their current state until the correct key is pressed, at which time they toggle to the opposite state. Keys should be pressed beginning with the top row, left to right, then bottom row, left to right (omitting the preset key).

10 Timer Check

1	X	X	X	1	0	0	1
---	---	---	---	---	---	---	---

The Timer Check routine verifies that timer chip A11U15 is generating the correct time delays. The test utilizes timer interrupts to toggle the front-panel LEDs at a variable rate. When each interrupt occurs, the LEDs will toggle. The period in which the interrupts occur can be adjusted up to 1 sec and down to 4 msec. The 10 dB Attenuation UP/DOWN keys double or halve the time interval between timer interrupts.

11 Relay Check

1	X	X	X	1	0	1	0
---	---	---	---	---	---	---	---

The Relay Check routine selectively toggles one of the 10 magnetic relays of the attenuator, bypass, and hi-low relay switches. As each relay is toggled, an audio check verifies proper operation. The relay to be verified can be selected by pressing one of the front-panel keys, excluding the LCL and INSTR PRESET keys. The selected relay is activated on key depression and deactivated on key release. Table 6 lists the relay and corresponding front-panel key.

Table 6. Relay Check

Relay	Corresponding Key
Hi-Low	NORMAL
Bypass	Bypass
LF 3 dB ¹	REP RATE UP
LF 10 dB ¹	CAL SEQ
LF 20 dB (B) ¹	Input 1
LF 20 dB (A) ¹	Input 2
HF 3 dB ²	ENABLE
HF 10 dB ²	10 dB DOWN
HF 20 dB (B) ²	10 dB UP
HF 20 dB (A) ²	Linear

¹ Low frequency attenuator relays are located on A3 RF Attenuator.

² High frequency attenuator relays are located on AT1 Attenuator.

12 Group A Latched Data Check

1	X	X	X	1	0	1	1
---	---	---	---	---	---	---	---

The Group A Latched Data Check toggles all of the latched data used by the preselector hardware and is FOR SERVICE USE ONLY.

13 Comb Generator Check

1	X	X	X	1	1	0	0
---	---	---	---	---	---	---	---

The Comb Generator Check routine continuously cycles the comb generator to OFF, 100 kHz, 500 kHz, 1 MHz, and 5 MHz. The test continues to cycle until another diagnostic routine is activated or the diagnostic mode is terminated.

14 Group B Latched Data Check

1	X	X	X	1	1	0	1
---	---	---	---	---	---	---	---

The Group B Latched Data Check toggles the attenuator and hi-low relay switch drive bits in order to pretest the DAC assembly at the factory. FOR SERVICE USE ONLY.

15 HP-IB Port Check

1	X	X	X	1	1	1	0
---	---	---	---	---	---	---	---

The HP-IB Port Check routine verifies operation of the HP-IB port and Private Controller Bus port connections via the rear panel. An HP-IB cable must be connected between the HP-IB and Private Controller Bus ports before performing this check. This routine performs various functional tests of the two ports by sending information back and forth. As function operations are verified, front-panel LEDs turn off one at a time. Any LEDs that do not turn off indicate a possible error. Table 7 lists the LEDs and corresponding errors that may occur.

Table 7. HP-IB Errors

Errors	Corresponding LED
Data Transmission	REP RATE 5
Data Transmission	REP RATE 1
Data Transmission	REP RATE .5
Data Transmission	REP RATE .1
Service Request (SRQ)	CAL SEQ
End or Identify (EOI)	ENABLE
Remote Enable (REN)	Input 1
Attenuator (ATN)	Input 2
Interface Clear (IFC)	Bypass 1
Interrupt	Linear

The HP-IB Port Check routine operates in the sequence as indicated in Table 7. Therefore, if a data transfer does not occur (i.e., private bus → public bus data transfer), all the LEDs corresponding to the subsequent functions still to be verified will remain lit.

If any of the errors listed in Table 7 occur, any one or a combination of the following may be the source of failure:

- 1) HP-IB cable
- 2) Rear-panel connector
- 3) Two ribbon cables connecting Processor and rear-panel assemblies
- 4) U7 and U8 on A11 Processor
- 5) U1 through U4 on A11 Processor

16 Data Bus Signature Analysis Check

1	X	X	X	1	1	1	1
---	---	---	---	---	---	---	---

The Data Bus Signature Analysis Check routine cycles the data bus and latches on the Processor and DAC assemblies in order to perform signature analysis troubleshooting. FOR SERVICE USE ONLY.



PERFORMANCE VERIFICATION

INTRODUCTION

The procedures in this section test the electrical performance of the instrument using the specifications (located at the end of the General Information section) as the performance standards. None of the tests require access to the interior of the instrument.

EQUIPMENT REQUIRED

Equipment required for performance verification is listed in the General Information section in Table 1, Recommended Test Equipment. Any equipment that satisfies the critical specifications listed in Table 1 may be substituted for the recommended model.

PERFORMANCE VERIFICATION RECORD

When the performance verification tests are performed, the results of these tests may be tabulated on the HP 85685A Performance Verification Record at the end of this section. The HP 85685A Performance Verification Record lists all of the tested specifications and the acceptable ranges for the results obtained during the tests.

NOTE

Allow one-half hour warm-up time for the HP 85685A before beginning the performance tests.

1. DISPLAYED AVERAGE NOISE

SPECIFICATIONS

(0 dB attenuation for RF preselector and spectrum analyzer; 10 Hz resolution bandwidth)

- <-125 dBm (-25 dB μ V) for input 2 kHz to 500 kHz
- <-134 dBm (-25 dB μ V) for input 500 kHz to 1 MHz
- <-150 dBm (-43 dB μ V) for input 1 MHz to 1500 MHz
- <-147 dBm (-40 dB μ V) for input 1500 MHz to 2 GHz

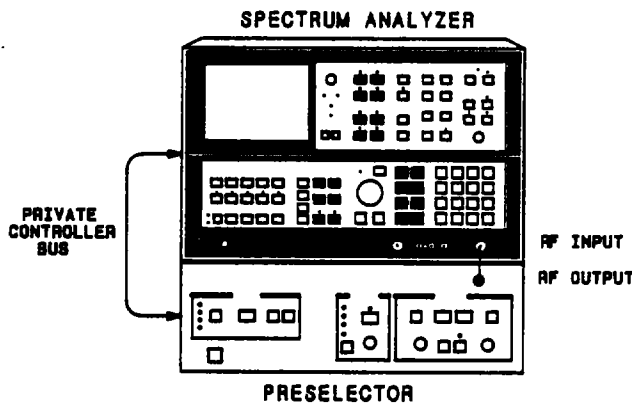


Figure 1. Displayed Average Noise Test Setup

DESCRIPTION

The displayed average noise level is measured in a 10 Hz bandwidth at various frequencies with no signal applied to the preselector inputs.

EQUIPMENT

Spectrum Analyzer	HP 8566B
50-Ohm Termination	HP 11593A
Adapter	HP 1250-0780

PROCEDURE

1. Connect equipment as shown in Figure 1.
2. Connect the spectrum analyzer RF INPUT to the preselector RF OUTPUT with the semi-rigid input cable.

3. Press [INSTR PRESET] on the preselector.
4. Select Input 1 of the preselector and terminate with a 50-ohm termination.
5. Set the preselector to 0 dB attenuation by pressing the 10 dB attenuation DOWN key, the 0 dB ENABLE key, and the 10 dB attenuation DOWN key again.
6. Set the spectrum analyzer to 0 dB attenuation by pressing [ATTEN] 0 dB.
7. Key in the spectrum analyzer settings as follows:

```

[STOP FREQ] . . . . . 10.1 kHz
[START FREQ] . . . . . 2 kHz
[REFERENCE LEVEL] . . . . . -100 dBm
[CLEAR-WRITE] Trace A
Video Average (KSG) . . . . . 10 Hz
MARKER [NORMAL]
MARKER [PEAK SEARCH]
    
```

8. Note marker frequency and record in Table 1.
9. Key in the spectrum analyzer settings as follows:

```

[FREQUENCY SPAN] . . . . . 0 Hz
[CENTER FREQUENCY] . . . . . MARKER frequency (from step 8)
[RES BW] . . . . . 10 Hz
[VIDEO BW] . . . . . 1 Hz
[CLEAR-WRITE] Trace A
    
```

10. Set the display line to the maximum amplitude listed in Table 1 by pressing Display Line [ENTER] -125 dBm.
11. Note the noise level amplitude and record in Table 1. The value should be less than the maximum amplitude listed in Table 1.
12. Any uncoupled function (indicated by a lighted LED in the Coupled Functions section of the spectrum analyzer) should be coupled by pressing [AUTO].
13. Repeat steps 7 through 12 for frequencies listed in Table 1.
14. Press [INSTR PRESET] on the preselector. Note that Input 2 is selected. Terminate with a 50-ohm termination.
15. Set the preselector to 0 dB attenuation by pressing the 10 dB attenuation DOWN key, the 0 dB ENABLE key, and the 10 dB attenuation DOWN key again.
16. Set the spectrum analyzer to 0 dB attenuation by pressing [ATTEN] 0 dB.

Table 1. Input 1 Low Frequency

Start Frequency	Stop Frequency	MARKER Frequency	Actual Amplitude (dBm)	Maximum Amplitude
9.0 kHz	50.0 kHz	_____	_____	- 115 dBm
50.0 kHz	74.0 kHz	_____	_____	- 132 dBm
74.0 kHz	197.5 kHz	_____	_____	- 132 dBm
197.5 kHz	500 kHz	_____	_____	- 132 dBm
500 kHz	525 kHz	_____	_____	- 132 dBm
525 kHz	1.0 MHz	_____	_____	- 132 dBm
1.0 MHz	1.025 MHz	_____	_____	- 150 dBm
1.025 MHz	1.5 MHz	_____	_____	- 150 dBm
1.5 MHz	1.975 MHz	_____	_____	- 150 dBm
1.975 MHz	5.83 MHz	_____	_____	- 150 dBm
5.83 MHz	17.33 MHz	_____	_____	- 150 dBm
17.33 MHz	28.73 MHz	_____	_____	- 150 dBm
28.73 MHz	50 MHz	_____	_____	- 150 dBm

17. Key in the spectrum analyzer settings as follows:

[STOP FREQ] 28.86 MHz
 [START FREQ] 20 MHz
 [REFERENCE LEVEL] -100 dBm
 [CLEAR-WRITE] Trace A
 Video Average (KSG) 10 Hz
 MARKER [NORMAL]
 MARKER [PEAK SEARCH]

18. Note marker frequency and record in Table 2.

19. Key in the following spectrum analyzer settings:

[FREQUENCY SPAN] 0 Hz
 [CENTER FREQUENCY] MARKER frequency (from step 18)
 [RES BW] 10 Hz
 [VIDEO BW] 1 Hz
 [SWEEP TIME] 500 msec
 Display Line [ENTER] -150 dBm
 [CLEAR-WRITE] Trace A

20. Set the display line to the maximum amplitude listed in Table 2 by pressing Display Line [ENTER] -150 dBm.

21. Note the noise level amplitude and record in Table 2. The value should be less than the maximum amplitude listed in Table 2.
22. Any uncoupled function (indicated by a lighted LED in the Coupled Functions section of the spectrum analyzer) should be coupled by pressing [AUTO].
23. Repeat steps 17 through 22 for frequencies listed in Table 2.

Table 2. Input 2 High Frequency

Start Frequency (MHz)	Stop Frequency (MHz)	MARKER Frequency	Actual Amplitude (dBm)	Maximum Amplitude
20	28.73	_____	_____	- 150 dBm
28.73	51.73	_____	_____	- 150 dBm
51.73	97.83	_____	_____	- 150 dBm
97.83	152.33	_____	_____	- 150 dBm
152.33	216.33	_____	_____	- 150 dBm
216.33	332.23	_____	_____	- 150 dBm
332.23	500	_____	_____	- 150 dBm
500	1500	_____	_____	- 150 dBm
1500	2000	_____	_____	- 147 dBm

2. STANDING WAVE RATIO

SPECIFICATIONS

Standing wave ratio (SWR): ≥ 10 dB RF Preselector attenuation
 For Inputs 1 and 2 (≤ 1.5 GHz): $< 1.5:1$
 (SWR is measured at the tuned frequency of the spectrum analyzer.)

DESCRIPTION

By measuring the return loss at discrete frequencies across the input frequency range of the preselector, the return loss can be calculated:

$$\text{return loss} = -20 \log \rho$$

The return loss can then be used to determine the SWR at each swept frequency.

$$\text{SWR} = \frac{1 + \rho}{1 - \rho}$$

where ρ = reflection coefficient

A directional coupler is used to separate the transmitted and reflected signals; the preselector is the load receiving the transmitted signal and the spectrum analyzer is used to measure the reflected signal.

The reference is set using a short as the coupler load. The preselector is then connected as the coupler load, at which time the return loss is measured off of the spectrum analyzer display.

Per the equation above, the calculated return loss should be less than 14 dBm to be within preselector specifications.

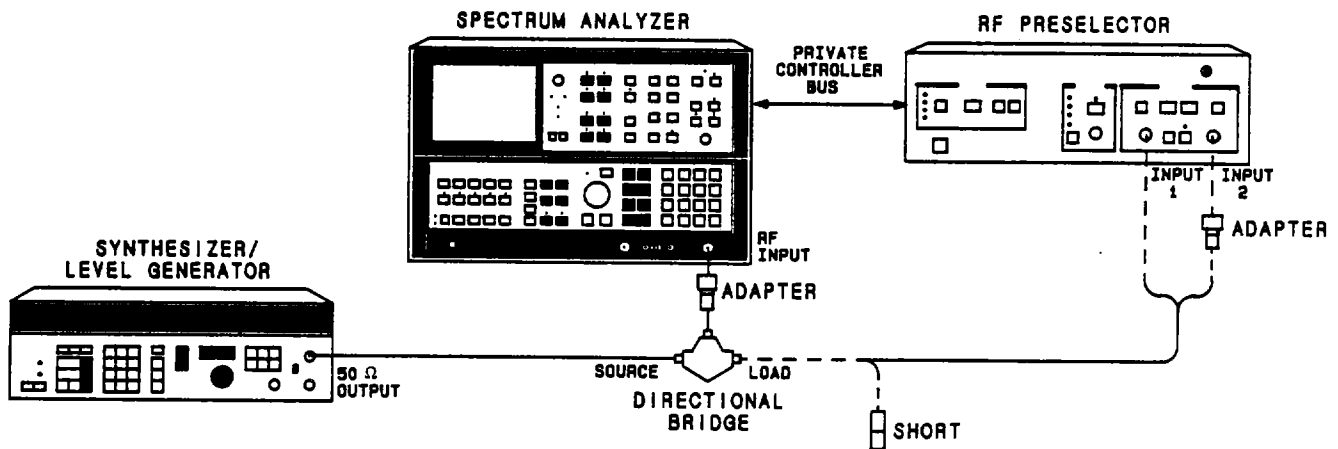


Figure 2. SWR Test Setup Below 80 MHz

NOTE

Equipment listed is for test setups in Figures 2 and 3.

EQUIPMENT

Spectrum Analyzer	HP 8566B
Synthesizer/Level Generator	HP 3335A
Synthesized Sweeper	HP 8340A
Directional Bridge	HP 8721A
Dual-Directional Coupler	HP 778D
Adapter, Type N (m) to BNC (m) (2 required)	HP 1250-0082
Adapter, BNC (f) to BNC (f)	HP 1250-0080
Adapter, SMA (f) to SMA (f)	HP 1250-1158
Adapter, Type N (f) to BNC (f)	HP 1250-1474
Adapter, APC-3.5 (f) to Type N (f)	HP 1250-1745
Short, BNC (m)	HP 1250-0774
Cable Assembly, UG-21 D/U Type N (m) connectors (3 required).	HP 11500A/B

PROCEDURE

Input 1: 100 kHz to 50 MHz

1. Connect equipment as shown in Figure 2, using the short.
2. Press [INSTR PRESET] on the preselector.
3. Press the 10 dB attenuation DOWN key on the preselector and select Input 1.
4. Set the controls of the level generator as follows:

Amplitude	-10 dBm
Frequency	100 kHz

5. Set the controls of the spectrum analyzer as follows:

[CENTER FREQUENCY]	100 kHz
[FREQUENCY SPAN]	50 kHz
[REFERENCE LEVEL]	-20 dBm
SCALE Log [ENTER dB/DIV]	5 dB/DIV

6. Press MARKER [PEAK SEARCH] on the spectrum analyzer and note the marker amplitude. Record this amplitude in Table 3, Column II.

NOTE

The signal amplitude must be within the top graticule division for this measurement. The spectrum analyzer reference level may be adjusted to position the signal amplitude as required.

PERFORMANCE VERIFICATION

7. Set the frequency of the level generator and the center frequency of the spectrum analyzer to 180 kHz. Record the marker amplitude in Table 3, Column II.
8. Repeat step 7 for all frequencies listed in Table 3, Column I.

Table 3. Input 1 SWR, 100 kHz to 50 MHz

Column I	Column II	Column III	Column IV
Frequency (MHz)	MARKER Amplitude (dBm)	85685A (Load) Amplitude (dBm)	Return Loss (dBm)
.100	_____	_____	_____
.180	_____	_____	_____
.200	_____	_____	_____
.500	_____	_____	_____
.600	_____	_____	_____
.750	_____	_____	_____
1.00	_____	_____	_____
1.20	_____	_____	_____
1.60	_____	_____	_____
1.90	_____	_____	_____
2.00	_____	_____	_____
3.50	_____	_____	_____
5.50	_____	_____	_____
6.00	_____	_____	_____
9.00	_____	_____	_____
14.00	_____	_____	_____
17.00	_____	_____	_____
18.00	_____	_____	_____
23.00	_____	_____	_____
26.00	_____	_____	_____
30.00	_____	_____	_____
35.00	_____	_____	_____
40.00	_____	_____	_____
45.00	_____	_____	_____
50.00	_____	_____	_____

9. Remove the short and connect Input 1 of the preselector to the directional bridge. See Figure 2.
10. Set the frequency of the level generator and the spectrum analyzer center frequency to 100 kHz. Record the preselector amplitude in Table 3, Column III.
11. Repeat step 10 for all frequencies listed in Table 3, Column I.
12. Calculate the return loss for each frequency listed in Table 3 by subtracting Column II from Column III.
13. To be within preselector specifications, the values in Table 3, Column IV, should be greater than 14 dBm.

Input 2: 23 MHz to 80 MHz

14. Disconnect the preselector and terminate the directional bridge load port with the short. See Figure 2.
15. Set the frequency of the level generator and the spectrum analyzer center frequency to 23.0 MHz. Record the marker amplitude in Table 4, Column II.
16. Repeat step 14 for all frequencies listed in Table 4, Column I.

Table 4. Input 2 SWR, 23 MHz to 80 MHz

Column I	Column II	Column III	Column IV
Frequency (MHz)	MARKER Amplitude (dBm)	85685A (Load) Amplitude (dBm)	Return Loss (dBm)
23.00	_____	_____	_____
26.00	_____	_____	_____
30.00	_____	_____	_____
35.00	_____	_____	_____
40.00	_____	_____	_____
45.00	_____	_____	_____
50.00	_____	_____	_____
53.00	_____	_____	_____
60.00	_____	_____	_____
70.00	_____	_____	_____
80.00	_____	_____	_____

17. Remove the short and connect Input 2 of the preselector to the directional bridge. Select Input 2 on the preselector.
18. Set the frequency of the level generator and the spectrum analyzer center frequency to 23.0 MHz. Record the preselector amplitude in Table 4, Column III.

19. Repeat step 17 for all frequencies listed in Table 4, Column I.
20. Calculate the return loss for each frequency listed in Table 4 by subtracting Column II from Column III.
21. To be within preselector specifications, the values in Table 4, Column IV, should be greater than 14 dBm.

Input 2: 100 MHz to 1.5 GHz

22. Connect equipment as shown in Figure 3, using the short.
23. Press [INSTR PRESET] on the preselector.
24. Press the 10 dB Attenuation DOWN key on the preselector and select Input 2.

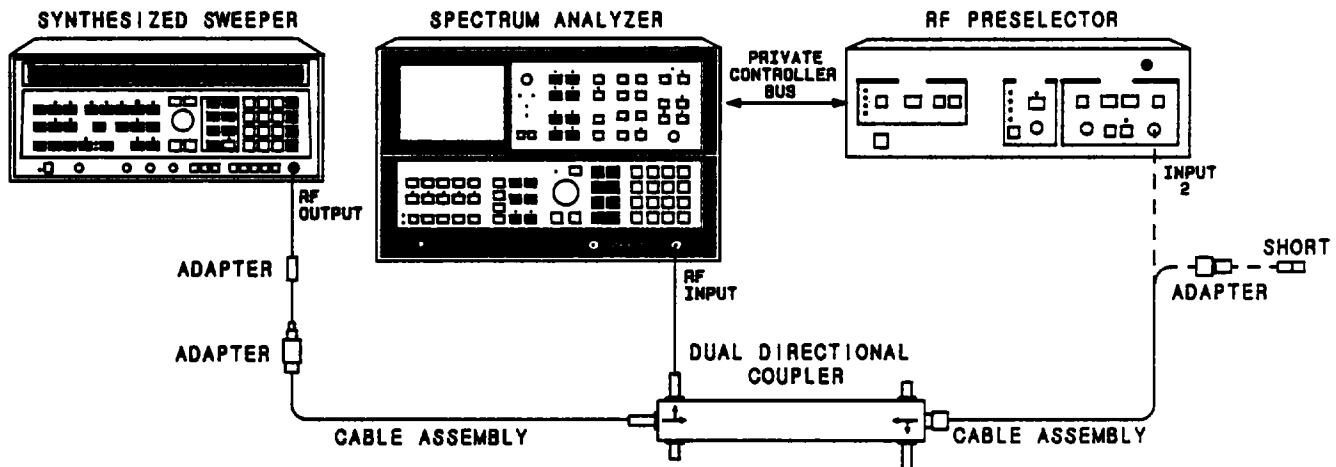


Figure 3. SWR Test Setup Above 80 MHz

25. Set the controls of the synthesized sweeper as follows:

Instrument Preset	
CW (Frequency)	100 MHz
Power Level	-10 dBm

26. Set the controls of the spectrum analyzer as follows:

[CENTER FREQUENCY]	100 MHz
[FREQUENCY SPAN]	50 kHz
[REFERENCE LEVEL]	-30 dBm
SCALE Log [ENTER dB/DIV]	5 dB/DIV

27. Press MARKER [PEAK SEARCH] on the spectrum analyzer and note the marker amplitude. Record this amplitude in Table 5, Column II.

NOTE

The signal amplitude must be within the top graticule division for this measurement. The spectrum analyzer reference level may be adjusted to position the signal amplitude as required.

28. Set the frequency of the synthesized sweeper and the spectrum analyzer center frequency to 120 MHz. Record the marker amplitude in Table 5, Column II.
29. Repeat step 26 for all frequencies listed in Table 5, Column I.
30. Remove the short and connect Input 2 of the preselector to the dual-directional coupler. See Figure 3.
31. Set the frequency of the synthesized sweeper and the spectrum analyzer center frequency to 100 MHz. Record the preselector amplitude in Table 5, Column III.
32. Repeat step 29 for all frequencies listed in Table 5, Column I.
33. Calculate the return loss for each frequency listed in Table 5 by subtracting Column II from Column III.
34. To be within preselector specifications, the values in Table 5, Column IV, should be greater than 14 dBm.

Table 5. Input 2 SWR, 100 MHz to 1.5 GHz

Column I	Column II	Column III	Column IV
Frequency (MHz)	MARKER Amplitude (dBm)	85685A (Load) Amplitude (dBm)	Return Loss (dBm)
100.00	_____	_____	_____
120.00	_____	_____	_____
140.00	_____	_____	_____
150.00	_____	_____	_____
160.00	_____	_____	_____
180.00	_____	_____	_____
200.00	_____	_____	_____
215.00	_____	_____	_____
220.00	_____	_____	_____
250.00	_____	_____	_____
280.00	_____	_____	_____
300.00	_____	_____	_____
330.00	_____	_____	_____
350.00	_____	_____	_____
400.00	_____	_____	_____
450.00	_____	_____	_____
500.00	_____	_____	_____
600.00	_____	_____	_____
700.00	_____	_____	_____
800.00	_____	_____	_____
900.00	_____	_____	_____
1000.00	_____	_____	_____
1100.00	_____	_____	_____
1200.00	_____	_____	_____
1300.00	_____	_____	_____
1400.00	_____	_____	_____
1500.00	_____	_____	_____

3. RESIDUAL RESPONSES

SPECIFICATION

<-90 dBm for input >2 kHz and <1 MHz
 <-112 dBm for input \geq 1 MHz
 (RF preselector input terminated; 0 dB attenuation for the RF preselector and spectrum analyzer)

DESCRIPTION

The preselector is checked for residual responses across its frequency range with no signal applied to the input and with 0 dB input attenuation.

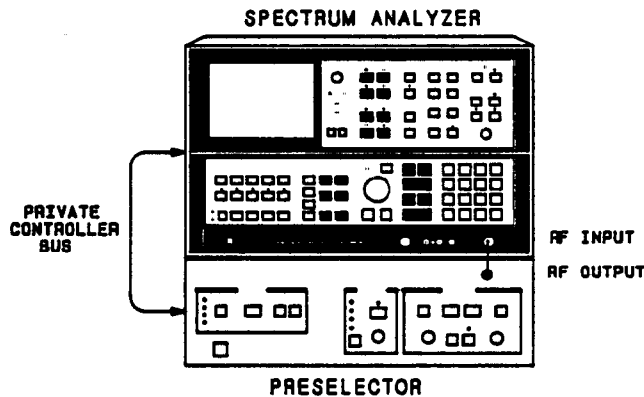


Figure 4. Residual Responses Test Setup

EQUIPMENT

Spectrum Analyzer	HP 8566B
50-Ohm Termination	HP 11593A
Adapter	HP 1250-0780

PROCEDURE

1. Connect equipment as shown in Figure 4.
2. Connect the spectrum analyzer RF INPUT to the preselector RF OUTPUT with the semi-rigid input cable.
3. Press [INSTR PRESET] on the preselector.
4. Select Input 1 of the preselector and terminate with a 50-ohm termination.
5. Set the preselector to 0 dB attenuation by pressing the 10 dB attenuation DOWN key, the 0 dB ENABLE key, and the 10 dB attenuation DOWN key again.

6. Key in the spectrum analyzer settings as follows:

[ATTEN]	0 dB
[STOP FREQ]	10 kHz
[START FREQ]	2 kHz
[REFERENCE LEVEL]	-70 dBm
[RES BW]	100 Hz
Display Line [ENTER]	-90 dBm

NOTE

There should be at least a 4 dB margin between the noise trace and the display line so that any residual responses may be distinguished from the noise. It may be necessary to reduce the resolution and/or video bandwidths from the settings suggested in this procedure to achieve this margin.

- 7. Turn the spectrum analyzer video averaging on (KSG) for three sweeps.
- 8. Wait for the completion of the video average sweeps and note any residual responses. Any residual response should be below the display line.

NOTE

Residual responses persist on repeated sweeps, but a noise peak will not. To check the validity of noise peaks, perform the Displayed Average Noise test.

- 9. Repeat steps 6 through 8 for the start/stop frequencies listed in Table 6.
- 10. If a response appears to be marginal, perform the following procedure to determine whether or not it exceeds the specification.

Key in the spectrum analyzer settings as follows:

- a. [SAVE] 1
 - b. MARKER [NORMAL] and place the marker on the peak of the response in question.
 - c. MARKER [MKR→CF]
 - d. Reduce the frequency span to resolve the signal while insuring that the upper and lower frequency limits are not exceeded. The amplitude of the response should be below the display line.
 - e. [RECALL] 1. Resume search for residuals.
- 11. Select Input 2 on the preselector and terminate with a 50-ohm termination.
 - 12. Repeat steps 6 through 8 for the start/stop frequencies listed in Table 7.
 - 13. Perform step 10 if a response appears to be marginal.

Table 6. Input 1, Low Frequency

Frequency (MHz)		Resolution Bandwidth (Hz)	Reference Level (dBm)	Display Line (dBm)	Within Specification? (Y or N)
Start	Stop				
.002	.0101	100	-70	-90	—
.0101	.074	100	-70	-90	—
.074	.1975	1000	-70	-90	—
.1975	.525	1000	-70	-90	—
.525	1.00	1000	-70	-90	—
1.00	1.025	1000	-80	-112	—
1.025	1.96	1000	-80	-112	—
1.96	5.83	3000	-80	-112	—
5.83	17.33	3000	-80	-112	—
17.33	28.73	3000	-80	-112	—
28.73	50.00	3000	-80	-112	—

Table 7. Input 2, High Frequency

Frequency (MHz)		Resolution Bandwidth (Hz)	Reference Level (dBm)	Display Line (dBm)	Within Specification? (Y or N)
Start	Stop				
20.00	28.73	3	-80	-112	—
28.73	51.73	3	-80	-112	—
51.73	97.83	3	-80	-112	—
97.83	152.33	3	-80	-112	—
152.33	216.33	3	-80	-112	—
216.33	332.23	3	-80	-112	—
332.23	500.00	3	-80	-112	—
500.00	1000.00	3	-80	-112	—
1000.00	1500.00	3	-80	-112	—
1500.00	2000.00	3	-80	-112	—

The following two additional procedures will be included in the final printed manual:

4 Test Receiver Amplitude Accuracy

5 CISPR EMI Receiver Amplitude Accuracy

The Performance Verification Record will also be included.



ADJUSTMENTS

The adjustment procedure in this section is to be performed only when the preselector has been serviced, after any assemblies have been removed, and/or after any components have been changed.

This adjustment procedure tunes the bandpass filters of the preselector automatically and stores the Digital-to-Analog Converter (DAC) data in the Electrically Erasable Read-Only Memory (EEROM). Each filter has a given number of data points within. Each of these data points have five corresponding DAC numbers (DACs 1--5) assigned to it: three DAC numbers for aligning the three poles of each filter data point, one DAC number for the gain of the bandpass, and one DAC number for the gain of the corresponding through-path data point.

The fixed bandpass filters, below 2 MHz, only use one DAC (gain DAC 4) for adjusting the gain. The varactor-tuned bandpass filters, 2 MHz to 500 MHz, use three DACs (tune DACs 1, 2, and 3) for aligning the bandpass of each data point and one DAC (gain DAC 4) for adjusting the gain. The YIG-tuned filter, 500 MHz to 2 GHz, uses one DAC (tune DAC 3) for tuning the frequency of the YIG and one DAC (gain DAC 4) for adjusting the gain. All through-paths use one DAC (gain DAC 5) for adjusting the gain.

Table 1. Preselector Filter Paths

Path Number	Start Frequency (MHz)	Stop Frequency (MHz)	Data Points	Frequency Stepping
1	0	.0655	0 to 1	2 ¹⁶
2	0101	.0756	2 to 3	2 ¹⁶
3	.074	.2051	4 to 6	2 ¹⁶
4	.1975	.5252	7 to 12	2 ¹⁶
5	.525	1.049	13 to 17	2 ¹⁷
6	1.025	2.074	18 to 22	2 ¹⁸
7	0	1.96	0 to 22	*
8	1.96	5.892	23 to 38	2 ¹⁸
9	5.83	17.364	39 to 50	2 ²⁰
10	1.96	17.33	23 to 50	*
11	17.33	28.864	51 to 62	2 ²⁰
12	28.73	51.799	63 to 74	2 ²¹
13	17.33	51.73	51 to 74	*
14	17.33	28.864	75 to 86	2 ²⁰
15	28.73	51.799	87 to 98	2 ²¹
16	17.33	51.73	75 to 98	*
17	51.73	97.867	99 to 110	2 ²²
18	97.83	152.356	111 to 124	2 ²²
19	51.73	152.33	99 to 124	2 ²²
20	152.33	219.439	125 to 133	2 ²³
21	216.33	333.771	134 to 148	2 ²³
22	332.23	500.002	149 to 169	2 ²³
23	152.33	500.002	125 to 169	2 ²³
24	500.0	2009.95	170 to 215	2 ²⁵

* The through-path frequency stepping is determined by the frequency stepping of the corresponding filter path for which the through-path covers.

ADJUSTMENTS

The adjustment procedure is set up in the following four sections: below 2 MHz (Input 1) are filter paths 3 through 6, with through-path 7; 2 to 50 MHz (Input 1) are filter paths 8 through 13, with through-paths 10 and 13; 20 MHz to 2 GHz (Input 2) are filter paths 14 through 24, with through-paths 16, 19, and 23; and in two parts--20 to 1500 MHz and 1500 MHz to 2 GHz--for filter path 24. The through-paths are adjusted simultaneously when each filter path is tuned. This occurs due to the overlap in frequencies of the filter paths and corresponding through-paths.

The HP 8568B Spectrum Analyzer and HP 3335A Synthesizer are used to adjust the preselector below 2 MHz. The HP 8568B Spectrum Analyzer and HP 8444 Option 059 Tracking Generator are used to adjust the preselector from 2 MHz up to 1500 MHz. The HP 8566B Spectrum Analyzer and HP 8340A Synthesized Sweeper are used to adjust it from 1500 MHz to 2 GHz. These three essential test setups are necessary to perform a complete adjustment of the preselector. Since the adjustment procedure is structured in four individual sections, any of the four sections may be adjusted, in any order, at any time the test setups are available.

The program for the adjustment procedure is provided on the disc that is located at the front of this manual. This disc must be placed in the controller and the file name of the program to be loaded and run is `FILTER_ADJ`. This adjustment procedure may only be performed using BASIC 2.1 or 3.0.

NOTE

Allow one-half hour warm-up time for the HP 85685A before beginning the adjustment procedure.

The following procedure lists the user prompts used by the program in adjusting the preselector and clarifies the statements in more detail.

This is the Adjustment Procedure for the HP 85685A RF Preselector.

Allow 120 minutes to complete a full instrument adjustment.

Always press `CONTINUE` to proceed.

The following equipment will be required:

EQUIPMENT	HP-IB ADDRESS
HP 85685A RF Preselector (to be adjusted)	719
HP 8568A/B Spectrum Analyzer	720
HP 3335A Synthesizer/Level Generator	704
HP 8444A Opt.059 Tracking Generator	
HP 8340A Synthesized Sweeper	717
HP 8566B Spectrum Analyzer	718

Do you want to change the HP-IB addresses? `continue=NO`

At this time, the HP-IB addresses of the test equipment may be changed if the addresses listed are not correct.

Connect equipment together via HP-IB.

NOTE: The 85685A RF Preselector HP-IB terminal labeled "TO SPECTRUM ANALYZER" is to be left vacant.

All equipment is run automatically by the controller and must therefore be interconnected via HP-IB.

Present firmware revision: _____

This instrument had the lowband last tuned on: _____, with firmware revision: _____

This instrument had the highband last tuned on: _____, with firmware revision: _____

This information indicates the firmware revision date of the preselector and when the lowband and the highband of the preselector were last adjusted. This information is stored in EEROM.

EEROM write-jumpers are not in place. To properly install jumpers, refer to 85685A Operations, Tests, and Adjustments Manual.

The All Processor EEROM write-jumpers must be properly positioned in order for this adjustment procedure to operate. Refer to Figure 1 for location of jumpers.

EEROM may or may not be written to, depending on the positioning of the dual-position jumpers. The two foremost pins (nearest the front of the instrument) allow the calibrated adjustment data to be stored in EEROM. Both jumpers must be in this position in order for the filter paths of the preselector to be adjusted. The latter pin jumper positioning protects EEROM from being written to; therefore, this jumper position must be used at all times except when the preselector filter paths are being tuned.

Interrogating the preselector for information, please stand by

The controller interrogates the preselector for information at this time by reading a table in the firmware.

Do you want to use any of the utilities? (continue=NO)

The user has three choices of utility aids, the first two of which are offered only at this time.

1) Do you want to transfer data from EEROM to disc? (continue=NO)

This utility aid interrogates the preselector and stores the data on disc. This utility is useful as a backup when servicing the preselector in that EEROM data may be stored on disc prior to any adjustments or EEROM rewriting.

At this time, all the data point DAC values are be transferred to the disc point by point. The three tuning DAC values, the gain DAC value, and the gain DAC value in the corresponding through-path are displayed for each data point.

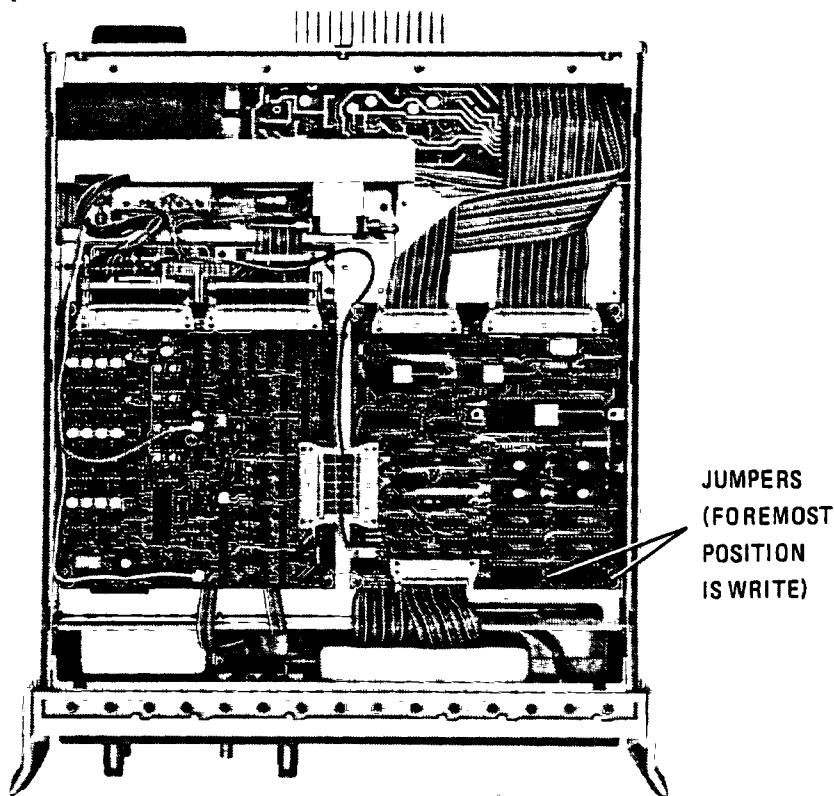


Figure 1. EEROM Write/Write-Protect Jumpers

All data points from 0 to 215 are displayed and may be reviewed more carefully by pressing PAUSE and scrolling the screen. This is the only time all five of the corresponding DAC values of each data point are displayed.

Enter name of disc file for calibration data storage? continue=DATA#

This is to be the name of the disc file for the calibrated data. Pressing continue automatically names the disc file DATA# (the # being the number of the instrument that is being adjusted). This information is obtained when the controller interrogates the preselector. Any other desired file name may be entered at this time but it is recommended that the serial number of the instrument be part of the file name (i.e., DATA22).

If this prompt appears:

NO SERIAL # IN PRESELECTOR
Enter COMPLETE serial # of instrument

then there is most likely a problem with EEROM in which the data stored has been altered and/or destroyed.

Creating a new file, please stand by

This prompt indicates that file space is being created on the disc to store the calibrated data.

Storing data on disc

2) Do you want to transfer data from disc to EEROM? (continue=NO)

This utility aid can only be used if the preselector calibration data has been stored on disc. This allows the user to transfer stored disc data to EEROM in the preselector

Enter name of disc file for calibration data? continue=DATA#

This is to be the name of the disc file in which the data is stored on disc. Previous to this prompt, the preselector is interrogated and the disc file is automatically named DATA# (# being the number of the instrument that is being calibrated). Any other desired file name may be entered at this time but it is recommended that the serial number of the instrument be part of the file name (i.e., DATA41).

Transferring data from disc to EEROM

3) Do you want to review data points? (continue=NO)

All data points are displayed for reviewing any specific filter.

Utility aid #3 is offered again at the end of the entire adjustment procedure. For further information on the use of this utility aid, refer to the end of this procedure.

- 0 Stops the adjustment procedure after each filter
- 1 Tunes all filters without stopping
- 2 Stops the adjustment procedure after each data point
- 3 Adjusts the gain of each filter, without stopping
- 4 Adjusts the gain of each filter, stopping after each filter

Select the adjustment mode desired

The desired mode of tuning the bandpass filters may be selected at this time. It is necessary for the user to be present when using modes 0, 2, and 4. Modes 1 and 3 tune the filter paths automatically and may be left unattended while in progress. The mode selected at this time to tune any of the filter paths is used throughout the entire adjustment procedure. The program must be restarted if the mode is to be changed at any time.

MODE 0

Input default data source for calibration data (NEW, EEROM), continue=NEW

The source for calibration data is either NEW data to be created or data that resides in EEROM already. If only minor servicing and/or repairs of the instrument were necessary, the calibration data stored in EEROM is probably still valid and may be used to retune the instrument. If major servicing was necessary, it is necessary to create NEW calibrated data to be stored in EEROM.

Below 2 MHz

Do you want to tune the preselector below
2 MHz? (NOTE: a 3335A is required) continue=YES

At this time, the bandpass filters below 2 MHz (paths 1 through 7) may be tuned by pressing CONTINUE. The other three sections to be tuned may be selected at this time by entering NO.

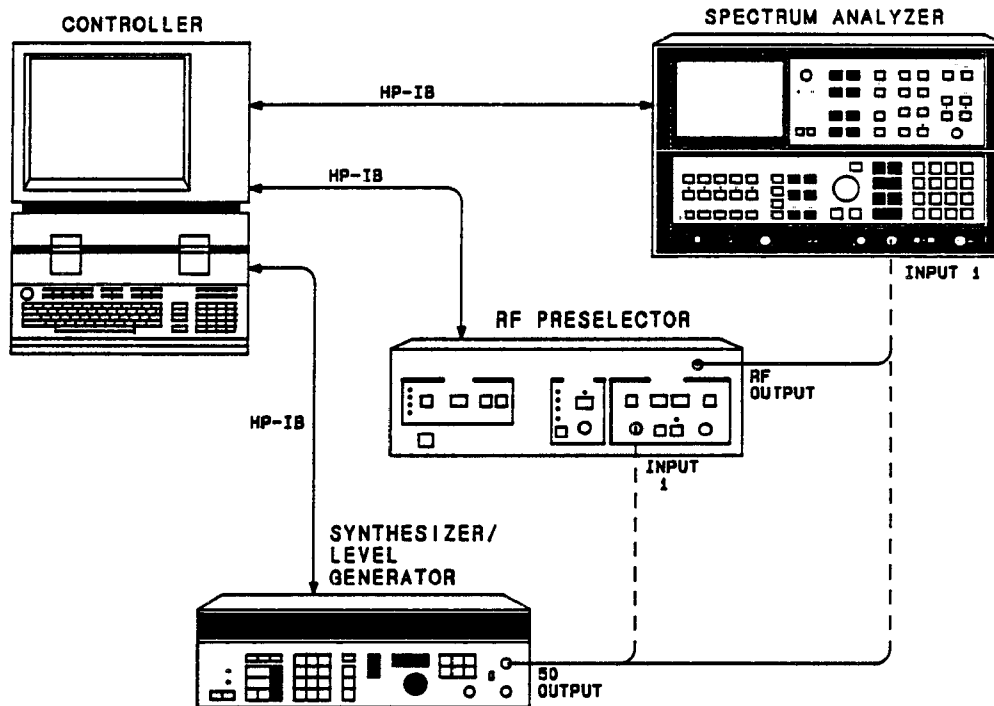


Figure 2. Below 2 MHz Adjustment Test Setup

Connect the 3335A Synthesizer 50-ohm OUTPUT to the 8568B Spectrum Analyzer low frequency input

Continue the program

The HP 3335A Synthesizer must be connected to the spectrum analyzer low frequency input in order for the procedure to continue.

Measuring the 3335/8568 flatness, please stand by

Connect the 3335A Synthesizer 50-ohm output to the low frequency input on the preselector

Connect the preselector RF OUTPUT to the 8568B Spectrum Analyzer low frequency input

Continue the program

After the proper connections are made, the adjustment procedure will begin.

Adjust the potentiometer on the A5 Low Frequency Filter/Amplifier board assembly for an output level of 0 dBm

Continue the program

Refer to Figure 3 for the location of A5R39.

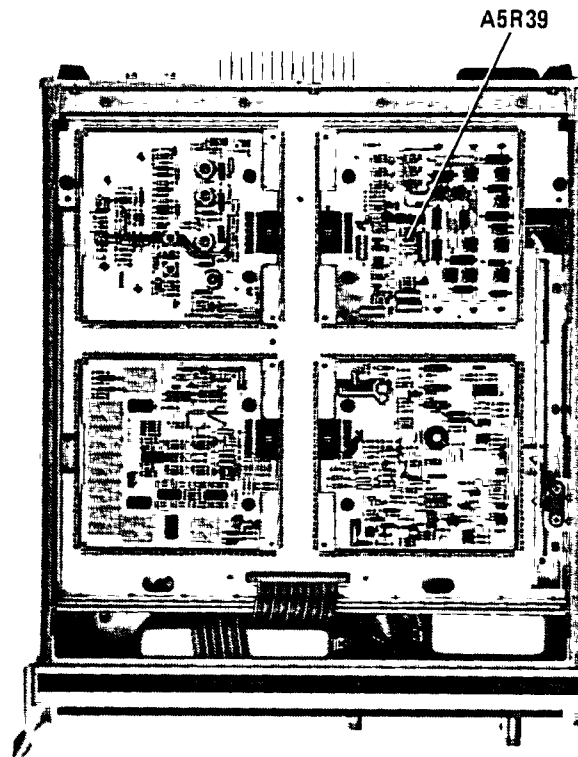


Figure 3. A5R39 Output Level Adjust

Calibration in progress

Path 3, .074 - .205072 MHz, Points 4 - 6 , Step 2 ^ 16

The controller is ready to begin tuning the bandpass filters below 2 MHz (paths 3 through 7).

The path number, frequency range, data points, and frequency stepping are displayed as each filter is tuned. Filter path 3 is tuned first. Filter paths 1 and 2 are then calibrated from the calibrated data of path 3.

Before tuning filter path 3, the prompt

Do you want to tune this filter? (continue=YES)

will appear. If this filter is to be tuned, the next prompt

Do you want to continue on from this filter without stopping? (continue=NO)

will appear. At this time, the remaining bandpass filters below 2 MHz may be tuned without stopping. The next prompt still refers to filter path 3 and will be asked prior to tuning each of the remaining filter paths below 2 MHz, if the adjustment procedure is stopped after each filter. The path number, frequency range, data points, and frequency stepping are displayed for each bandpass filter as it is being tuned.

ADJUSTMENTS

Data source for calibration data (EEROM, NEW) continue=EEROM

The data source for calibration data is EEROM for previously stored valid data or NEW for calibration data to be generated by the adjustment procedure. (This prompt appears only when modes 0, 1 or 2 are selected.) EEROM is always the data source for calibration when modes 3 or 4 are selected.

After this prompt is answered, the adjustment routine for filter path 3 is performed. The following two questions (prompts) refer directly to the path being tuned at this time.

Do you want to save this filter in EEROM? (continue=YES)

The calibrated data for the filter path must be saved in EEROM for the instrument to operate properly.

The adjustment procedure continues on with filter paths 4 through 6 of the Lowband. After completion of the filter paths below 2 MHz, the user then has the option of tuning from 2 to 50 MHz, 20 to 1500 MHz, or 1500 MHz to 2.0 GHz.

MODE 1

Mode 1 is basically the same as Mode 0 with the following exceptions: filter paths 3 through 7 are automatically adjusted without stopping, and the calibration data is automatically stored in EEROM.

As each filter is tuned, the path number, frequency range, data points, and frequency stepping are all displayed.

MODE 2

MODE 2 is the same as MODE 0 except that the adjustment procedure stops after tuning each data point. The user must therefore be present in order to initiate the adjustment of each data point in each filter. This mode is not recommended for use except for diagnostics.

MODE 3

MODE 3 is the same as MODE 1 except that only the gain of each data point is being tuned. The first three DAC numbers appear as 0, whereas the fourth number is the gain DAC value of the data point. (The three tune DAC values are not necessary when adjusting the gain DAC.)

MODE 4

MODE 4 is the same as MODE 3 except that the adjustment procedure stops after each filter path. The user must therefore be present in order to initiate the gain adjustment for each filter path.

2 to 50 MHz

After the filter paths below 2 MHz have been tuned, 2 to 50 MHz is now ready to be tuned. This prompt will appear:

Do you want to tune the Lowband from 2 - 50 MHz? (continue=YES)

This allows the four varactor-tuned filter paths 8, 9, 11, 12, and the through-paths for those filters, to be tuned. If NO is entered at this time, the Highband from 20 to 1500 MHz is selected to be tuned.

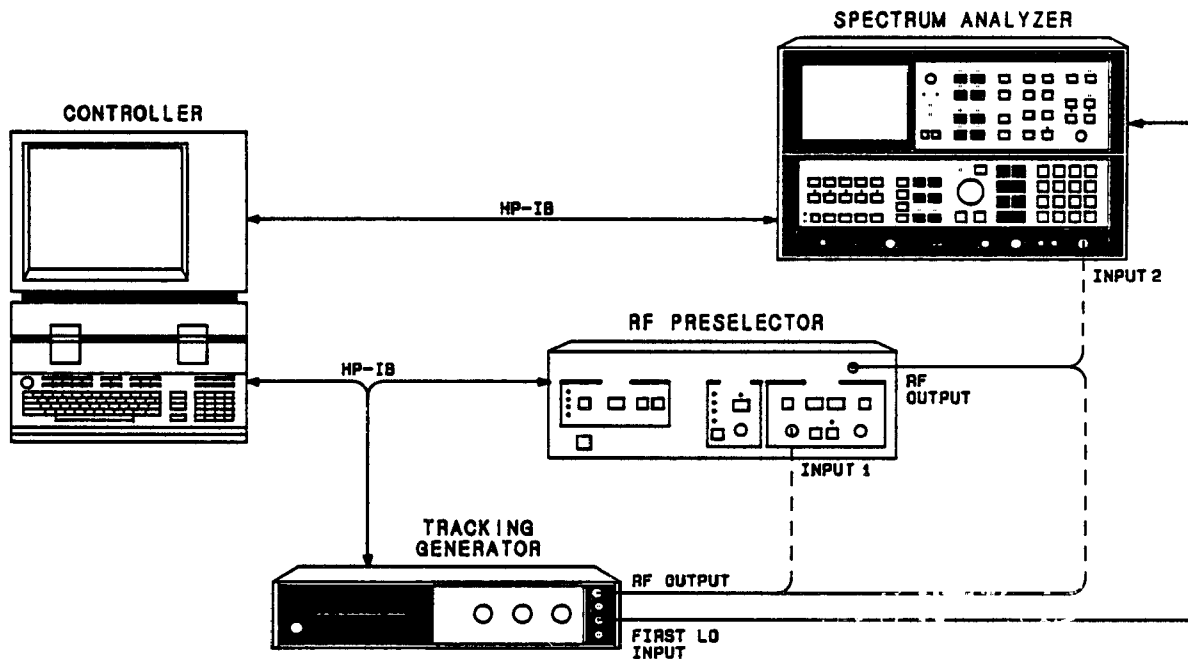


Figure 4. 2 to 50 MHz Adjustment Test Setup

Connect the 8444A Tracking Generator to the 8568B Spectrum Analyzer high frequency input

Peak the tracking generator with the Tracking Adjustment

Set the tracking generator amplitude with the LEVEL control to 0 dBm or the maximum level, whichever is less

Continue the program

Measuring the 8444/8568 flatness, please stand by

Connect the 8444A Tracking Generator output to the low frequency input on the preselector

Connect the preselector RF OUTPUT to the 8568B Spectrum Analyzer high frequency input

Continue the program

ADJUSTMENTS

Prior to beginning the adjustment procedure from 2 to 50 MHz, the date of the adjustment should be recorded. Therefore, the following prompts will appear:

Input the day of the month

Input the month of year (1 - 12)

Input the year (last two digits)

Entering the date is not required if the internal clock of the controller is current.

Calibration in progress

Path 8 , 1.96 - 5.89216 MHz, Points 23 - 38 , Step 2 ^ 18

Depending on the mode initially selected (0, 1, 2, 3, or 4), the adjustment procedure for 2 to 50 MHz continues to operate in that mode.

The 2 to 50 MHz adjustment procedure begins tuning at filter path 8. As each succeeding path is tuned, the path number, frequency, data points, and frequency stepping are displayed.

Frequency: 1.96 MHz

As each filter path is tuned, the frequency of each data point in that filter is displayed as the adjustment of that point begins.

Data point= 23, 3 dB BW= 367 kHz

DACs= 433 505 425 1651

After the data point is adjusted, the data point number, 3 dB bandwidth frequency, and four corresponding DAC values are displayed (tune DACs 1, 2, 3, and gain DAC 4).

20 to 1500 MHz

Do you want to tune the Highband from 20 - 1500 MHz? (continue=YES)

After the filter paths from 2 to 50 MHz are tuned, the paths from 20 to 1500 MHz (paths 14 through 24) are now ready to be tuned.

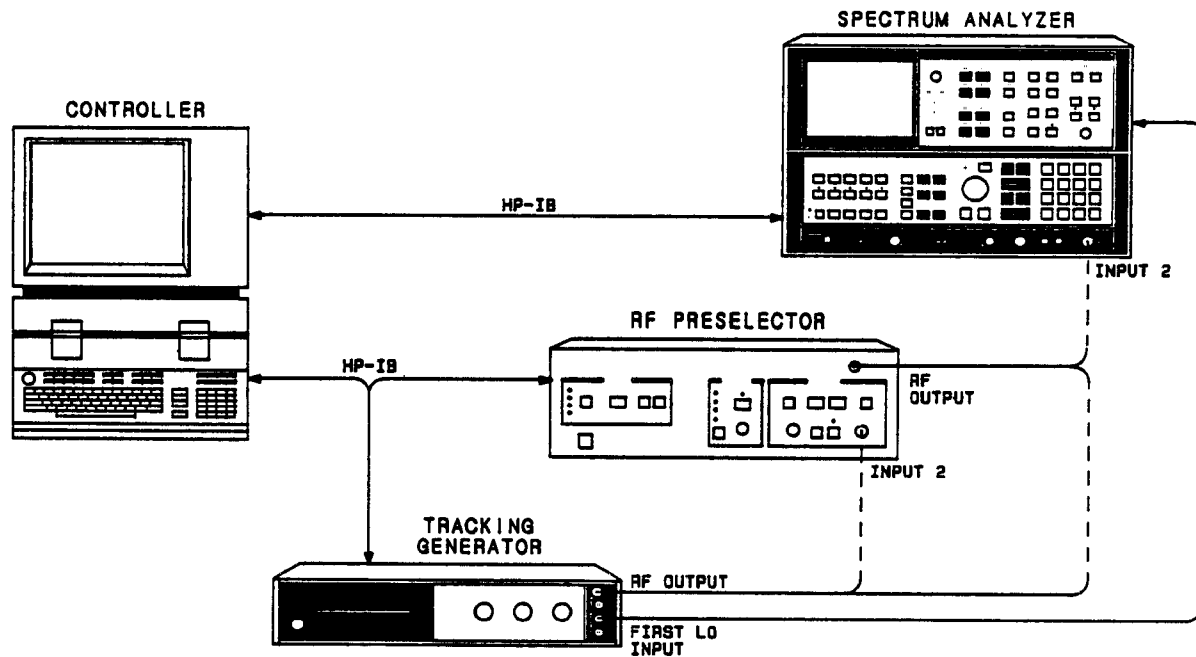


Figure 5. 20 to 1500 MHz Adjustment Test Setup

Connect the 8444A Tracking Generator to the 8568B Spectrum Analyzer high frequency input

Peak the tracking generator with the Tracking Adjustment

Set the tracking generator amplitude with the LEVEL control to 0 dBm or the maximum level, whichever is less

Continue the program

The calibration of the system for the frequency from 20 to 1500 MHz is the same as for the frequency from 2 to 50 MHz.

Measuring the 8444/8568 flatness, please stand by

Connect the 8444A Tracking Generator output to the high frequency input on the preselector

Connect the preselector RF OUTPUT to the 8568B Spectrum Analyzer high frequency input

Continue the program

Prior to beginning the adjustment procedure from 20 to 1500 MHz, the date of the adjustment should be recorded. Therefore, the following prompts will appear:

ADJUSTMENTS

Input the day of the month

Input the month of year (1 - 12)

Input the year (last two digits)

Entering the date is not required if the internal clock of the controller is current.

Calibration in progress

Path 14, 17.33 - 28.864336 MHz, Points 75 - 86, Step 2 ^ 20

Depending on the mode initially selected (0, 1, 2, 3, or 4), the adjustment procedure for 20 to 1500 MHz continues to operate in that mode.

The 20 to 1500 MHz adjustment procedure begins tuning at filter path 14. As each succeeding path is tuned, the path number, frequency, data points, and frequency stepping are displayed.

Frequency: 17.33 MHz

As each filter path is tuned, the frequency of each data point in that filter is displayed as the adjustment of that point begins.

Data point= 75, 3 dB BW= 1320 kHz

DACs= 808 768 692 1959

After the data point is adjusted, the data point number, 3 dB bandwidth frequency, and four corresponding DAC values are displayed (tune DACs 1, 2, 3, and gain DAC 4).

1500 to 2000 MHz

Do you want to tune from 1500 to 2000 MHz? (8566, 8340 required)? continue=YES

This portion of the adjustments procedure completes the tuning of filter path 24 from data points 201 to 215. If NO is chosen at this time, the procedure proceeds on to allow the user to review data points in filter paths 2 through 23.

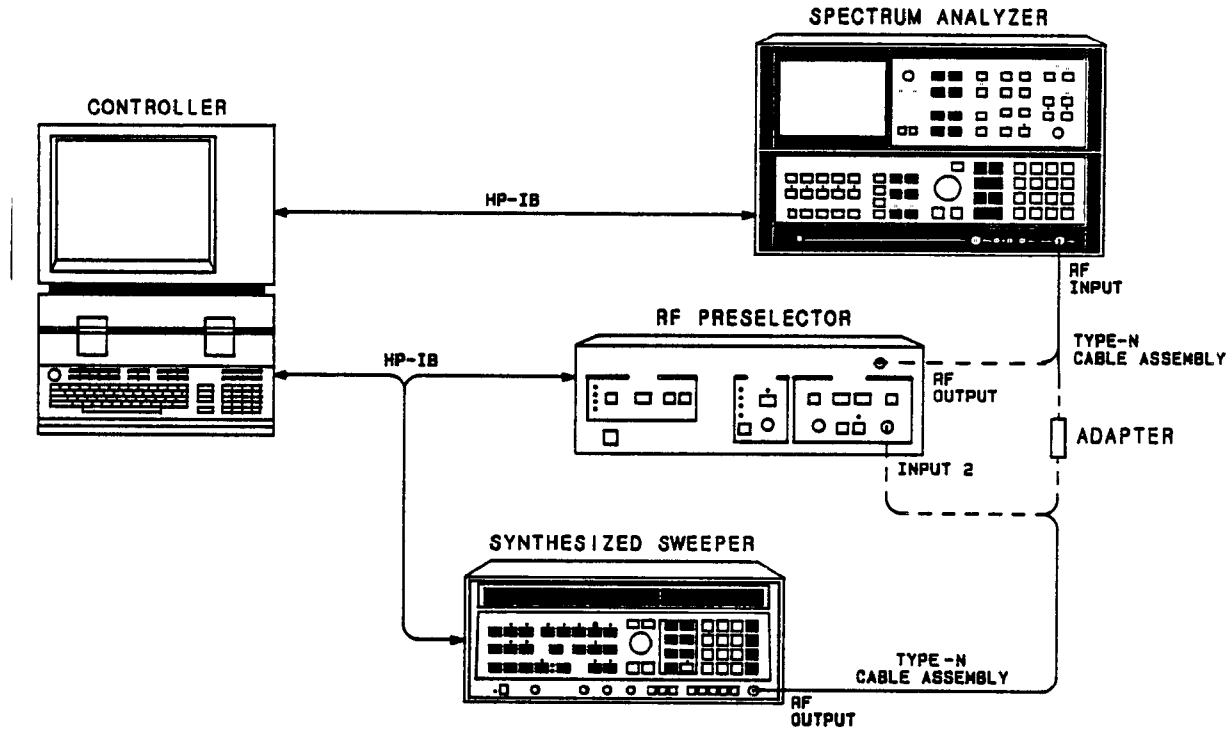


Figure 6. 1500 to 2000 MHz Adjustment Test Setup

This is the 85685A RF Preselector adjustment for frequencies 1500 to 2000 MHz.

Connect the following together via the HP-IB and verify the addresses are correct.

85685A RF Preselector	719
8566B Spectrum Analyzer	718
8340A Synthesized Sweeper	717

Connect a type-N cable to the 8566B RF INPUT.
 Connect a second type-N cable to the 8340A RF OUTPUT.
 Connect the other end of both cables using a type-N barrel.

Refer to Figure 6 for equipment setup.

All equipment is run automatically by the controller and must therefore be interconnected via HP-IB. Adjustment of filter path 24, 1500 to 2000 MHz, is performed automatically regardless of the mode initially selected.

Press CONTINUE when the proper connections have been made.

Calibrating....

ADJUSTMENTS

At this time, the procedure begins setting up reference amplitudes for each of the data points from 201 to 215 in filter path 24.

Connect Synthesized Sweeper RF OUTPUT to Preselector INPUT 2.

Connect Preselector RF OUTPUT to Spectrum Analyzer RF INPUT.

Press CONTINUE after these connections are made.

Setting the tune DAC for filter point 201...

Each filter point is now tuned to locate the center frequency.

A tune DAC value of _____ has been set.

This value indicates what the corresponding DAC value is for the center frequency of that filter point.

Now setting the gain DAC for filter point 201.

The gain for the filter point is now set.

The adjustment of 1500 to 2000 MHz is accomplished when the center frequency and gain for each filter point are determined. Then the corresponding DAC values are saved in EEROM.

Elapsed Time = 00:08:15

Checking for bad data

The elapsed time for the adjustment of 1500 to 2000 MHz to be performed is indicated.

The program then checks for any bad data, i.e., DAC values of 0 or 4095.

No bad data found

Continue when ready

This indicates that no bad DAC values were found. To continue allows the user to review data points in filter paths 2 through 23.

If data is printed out at this time, note the data points in question. These data points may be adjusted using the REVIEW section. For data point locations, refer to Table 1 at the beginning of this section.

Do you want to review data points? (continue=YES)

This allows the user to review data points in filter paths 2 through 23.

For further information on reviewing the filter path data points and use of the soft keys, refer to REVIEW at the end of this adjustment procedure.

Review of filter paths 2 through 23 is now available and the following three prompts indicate which section may be reviewed.

- 1) Do you want to review the preselector tuning below 2 MHz? (NOTE: a 3335A is required) continue=YES
- 2) Do you want to review the Lowband from 2 to 50 MHz? continue=YES
- 3) Do you want to review the Highband from 20 to 1500 MHz? continue=YES

If any of the sections are to be reviewed, note that the same test setups used to adjust the filter paths are required to review the filter paths.

After the equipment has been properly set up, the filter path, its frequency range, data points (which the path covers), and the frequency stepping are displayed. The user is given the option to review this particular filter path at this time.

Do you want to review this filter? (continue=YES)

When reviewing a filter path, the data point, the frequency at which it occurs, the three tune DAC values (tune DACs 1, 2, and 3), and the gain DAC value (gain DAC 4) are all displayed. The four numbers are valid DAC values and can be manipulated by the REVIEW soft keys. If any of the DAC values are manipulated at this time, the new values can then be stored in EEROM at the end of this review.

Point:	23	, Frequency:	1.96	MHz
	447		387	1902

NOTE

The REVIEW soft keys are enabled at this time. For further information on the use of the soft keys, refer to REVIEW at the end of this adjustment procedure.

The user may not call up a specific data point. Each data point in the filter path must be called up in succession until the desired data point is achieved.

After the last data point in a filter path, the user is given the option to review the portion of the through-path in which this filter path overlaps.

Do you want to look at the through-path?(continue=YES)

The same data points and frequency ranges as in the filter path are displayed. At this time, only the through-path gain DAC 5 is valid, can be manipulated by the REVIEW soft keys, and can be stored in EEROM at the end of this review.

ADJUSTMENTS

Point: 23 , Frequency: 1.96 MHz
0 0 0 1630

The zeroes represent tune DACs 1, 2, and 3 and are invalid at this time. The values may be manipulated, but they will not be stored in EEROM if the through-path gain DAC value is to be stored.

Do you want to save this filter in EEROM? (continue=YES)

This stores all data point values from the filter path and the corresponding through-path in EEROM.

Prior to the conclusion to the Adjustments procedure, the user has the option to print out all data.

Do you want to print out the data? continue=YES

Only filter paths that have been adjusted will have valid data printed out, otherwise the DAC values are represented with 0's. However, using utility aid #1 (transferring data from EEROM to disc) allows the user to print out stored data.

**This concludes the 85685A RF Preselector Adjustment Procedure.
Refer to the Operations, Tests, and Adjustments Manual to
re-install EEROM jumpers to write-protect data.**

The adjustment of the preselector is complete. If any adjustments need to be redone and/or if any further reviewing of the filter paths is necessary, the procedure must be restarted.

REVIEW

NOTE

The controller keyboard must have ten soft keys in order to use the Review procedure properly.

The soft keys may be used to review and/or diagnose the data points in filter paths 2 through 23. These keys allow the user to view individual filter data points and manipulate the values of the corresponding DAC numbers.

The soft keys appear when any of the following three prompts are used to review the filter path data points.

Do you want to review the preselector tuning below 2 MHz?
(NOTE: a 3335A is required) continue=YES

Do you want to review the Lowband from 2 to 50 MHz? continue=YES

Do you want to review the Highband from 20 to 1500 MHz? continue=YES

Step UP 1/20	Tune1 ENABLED	Tune2 ENABLED	Tune3 ENABLED	Zero/Max DACs
Step DOWN 1/20	3dB/Start Data	GAIN DISABLED	EnableDACs/SPN	Gain set/EXIT

Figure 7. REVIEW Soft Keys

The soft keys shown in Figure 7 correspond to the K0 through K9 keys in the upper left-hand corner of the controller. When used with the SHIFT key, each key has two functions.

K0 Step UP 1/20

This key increases all ENABLED DAC value(s) by 1, or by 20 when used with the SHIFT key. If the gain DAC is enabled at the same time the tune DACs are, only the gain DAC is affected. Therefore, the ENABLED tune DAC(s) are only affected when the gain DAC is DISABLED.

K1 Tune1 ENABLED (DISABLED)

This key enables only the first tune DAC and disables the other two tune DACs and the gain DAC. Tune DAC 1 can only be disabled when one of the other two tune DACs are selected.

The value of tune DAC 1 may be changed when used with the SHIFT key.

K2 Tune2 ENABLED (DISABLED)

This key enables only the second tune DAC and disables the other two tune DACs and the gain DAC. Tune DAC 2 can only be disabled when one of the other two tune DACs are selected.

The value of tune DAC 2 may be changed when used with the SHIFT key.

K3 Tune3 ENABLED (DISABLED)

This key enables only the third tune DAC and disables the other two tune DACs and the gain DAC. Tune DAC 3 can only be disabled when one of the other two tune DACs are selected.

The value of tune DAC 3 may be changed when used with the SHIFT key.

K4 Zero/Max DACs

This key sets the three tune DACs to 0, or to 4095 when used with the SHIFT key.

K5 Step DOWN 1/20

This key decreases all ENABLED DAC value(s) by 1, or by 20 when used with the SHIFT key. If the gain DAC is enabled at the same time the tune DACs are, only the gain DAC is affected. Therefore, the ENABLED tune DAC(s) are only affected when the gain DAC is DISABLED.

K6 3dB/Start Data

This key finds the 3 dB bandwidth of the data point being reviewed.

All original DAC values are replaced and displayed when using the SHIFT key.

K7 GAIN DISABLED (ENABLED)

This key enables and disables the gain DAC (DAC 4) which functions independently from the three tune DACs.

The value of gain DAC 4 may be changed when used with the SHIFT key, which also enables gain DAC 4 automatically.

K8 EnableDACs/SPN

This key enables all three of the tune DACs at once and disables the gain DAC.

The frequency span of the 8568A/B Spectrum Analyzer is increased by normal stepping when using the SHIFT key.

K9 Gain Set/EXIT

This key sets the gain DAC for 0 dB gain through the preselector (with 20 dB input attenuation) for the data point being reviewed.

The next data point within a filter path or the next filter path is called up when the SHIFT key is used.

COMB CALIBRATION

The comb calibration procedure in this section is to be performed only when the comb generator has been replaced and/or serviced, or after approximately six months since it has last been calibrated.

This calibration procedure measures the amplitudes of each comb using the HP 8566B Spectrum Analyzer and stores this data in the controller. Since the amplitudes of the comb are low in amplitude, neither the spectrum analyzer nor the power meter can measure the absolute amplitude of the combs with precision accuracy. (The spectrum analyzer cannot measure with enough accuracy and the power meter cannot measure low amplitudes.)

Therefore, calibration is accomplished by using an HP 3335A Synthesizer/Level Generator and HP 8340A Synthesized Sweeper, in series with two 20 dB precision attenuators, to match the amplitude of each comb. The power levels produced by the signal generators to match the comb amplitudes can then be measured accurately by the power meter.

The Comb Calibration procedure is provided on the disc that is located at the front of this manual. This disc must be placed in the controller. The file name of the program to be loaded and run is COMB. The Comb Calibration procedure may only be performed using BASIC 2.1 or 3.0.

NOTE

Allow one-half hour warm-up time for the HP 85685A before beginning the Comb Calibration procedure.

The following procedure lists the user prompts used by the program in adjusting the preselector and clarifies the statements in more detail.

Allow one hour for a complete Comb Calibration.

The following equipment is required:

Equipment	HP-IB Address
HP 85685A RF Preselector (device under test)	719
HP 8566B Spectrum Analyzer	718
HP 8340A Synthesized Sweeper	717
HP 3335A Synthesizer/Level Generator	704
HP 436A Power Meter	713
HP 8482A Power Sensor	
HP 8491A Opt.020 Attenuator (2 Required)	

Connect equipment via HP-IB.

NOTE: The HP-IB terminal on the Preselector labeled "TO SPECTRUM ANALYZER" should be left unconnected.

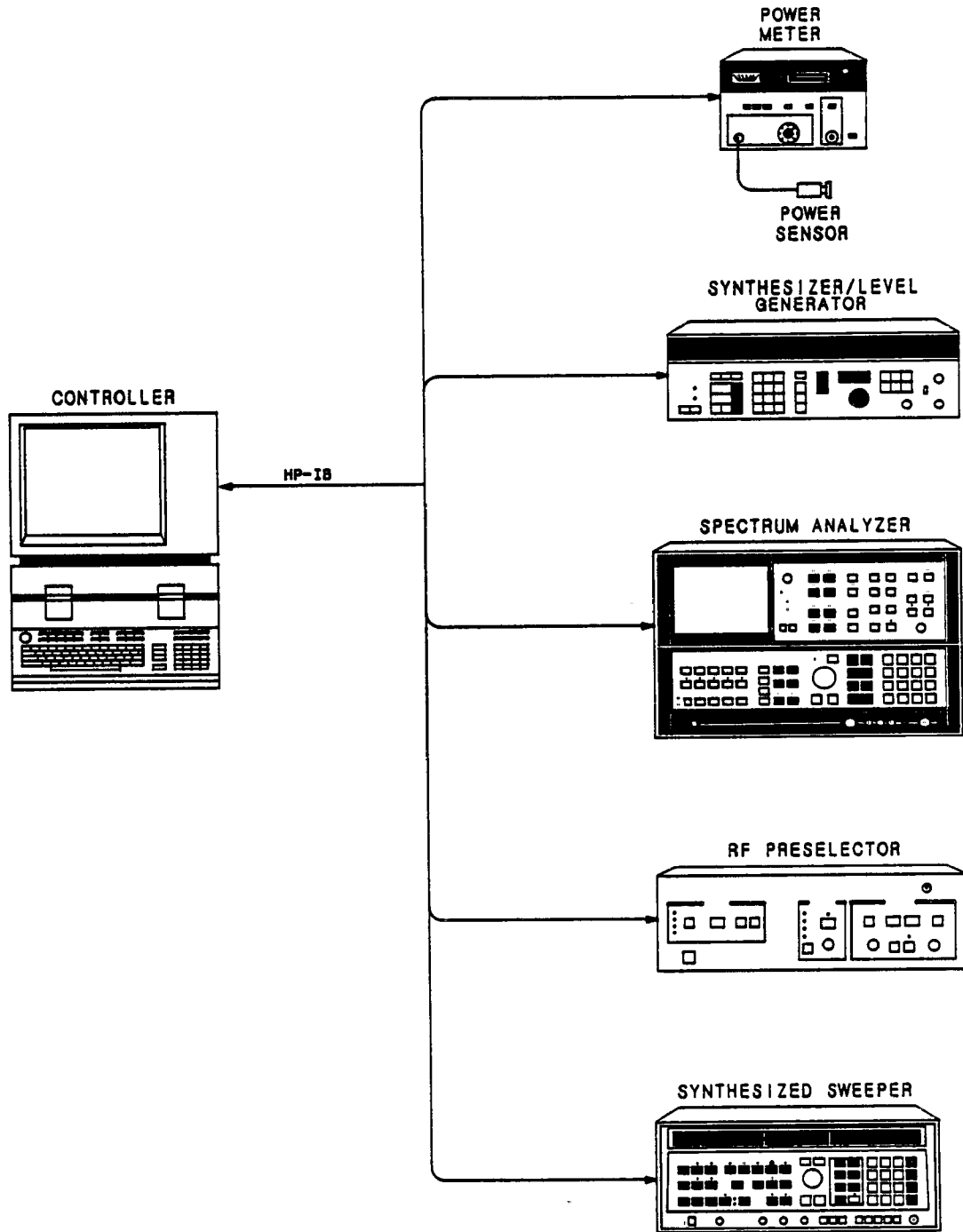


Figure 8. Comb Calibration Test Setup

ADJUSTMENTS

All equipment is run automatically by the controller and must therefore be interconnected via HP-IB. See Figure 8.

Always press CONTINUE to proceed.

Testing EEROM, please stand by

The controller interrogates the preselector to ensure that the EEROM write-jumpers have been properly positioned. If the jumpers have not been positioned on the two foremost pins, the following prompt will appear.

**EEROM write-jumpers are not in place. To properly install jumpers,
refer to 85685A Operations, Tests, and Adjustments Manual.**

The A11 Processor EEROM write-jumpers must be properly positioned in order for this comb calibration procedure to operate. Refer to Figure 9 for the location of the EEROM write-jumpers.

EEROM may or may not be written to, depending on the positioning of the dual-position jumpers. The two foremost pins (nearest the front of the instrument) allow the comb calibration data to be stored in EEROM. Both jumpers must be in this position in order for the comb generator in the preselector to be calibrated. The latter pin jumper positioning protects EEROM from being written to; therefore, this jumper position must be used at all times except when the comb generator is being calibrated.

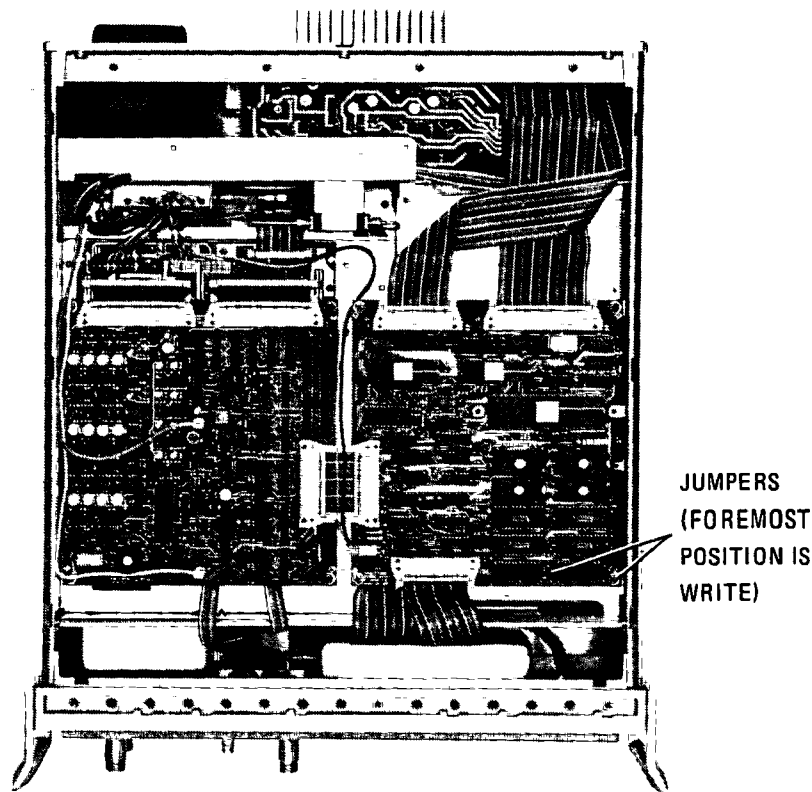


Figure 9. EEROM Write/Write-Protect Jumpers

Existing firmware revision: 16.04.85

The comb was last calibrated on: __.____.____
With firmware revision: _____._____.____

Interrogating the Preselector for information, please stand by

This information indicates the firmware revision date of the preselector and the date the preselector comb generator was last calibrated. This data is stored in EEROM.

The controller then interrogates the preselector for information by reading a table in the firmware.

Read the calibration factor from the table on the 8482A Power Sensor for .1 MHz, and enter it below. Continue= 100 %

Enter all calibration factors for the frequencies requested. If a value entered deviates greatly from 100%, then the following prompt will appear.

Calibration factor out of range, please re-enter

Enter 8491A Opt.020 Attenuator calibration chart data at 0 GHz.
Enter a calibration number for each attenuator (nn.n, nn.n).

Enter calibration numbers from the calibration charts on the attenuators for 0 GHz.

Enter 8491A Opt.020 Attenuator calibration chart data at 4 GHz.
Enter a calibration number for each attenuator (nn.n, nn.n) .

Enter calibration numbers from the calibration charts on the attenuators for 4 GHz.

Interpolating attenuator data, please stand by

The controller interpolates the attenuator data and creates data tables for use within the calibration procedure.

Do you want to use any of the utilities? (continue=NO)

The user has a choice of three utility aids at this time. All are offered only at this time.

1) Do you want to transfer data from EEROM to disc? (continue=NO)

This utility aid interrogates the preselector and stores the data on disc. It is useful as a backup when servicing the preselector in that EEROM data may be stored on disc prior to any adjustments or EEROM rewriting.

Reading EEROM

Point= 7 Frequency= .2 Reprate= 1 Amplitude= -51.03
Point= 8 Frequency= .3 Reprate= 1 Amplitude= -52.22

.
.
.

Point= 215 Frequency= 2010 Reprate= 4 Amplitude= -57.67

All EEROM data is displayed as the controller reads it. This is the only time that the user is able to view the comb calibration data stored in EEROM.

Do you want to save the comb calibration data on disc? continue=YES

Enter name of disc file for calibration data storage? continue=COMB#

This is to be the name of the disc file for the comb calibration data. Pressing CONTINUE automatically names the disc file COMB# (# being the number of the instrument that is being calibrated). This information is obtained when the controller interrogates the preselector. Any other desired file name may be entered at this time but it is recommended that the serial number of the instrument be part of the file name (i.e., COMB41).

If this prompt appears:

NO SERIAL # IN PRESECTOR
Enter COMPLETE serial # of instrument

then there is most likely a problem with EEROM in which the stored data has been altered and/or destroyed.

Storing data on disc

2) Do you want to transfer data from disc to EEROM? (continue=NO)

This utility aid can only be used if the comb calibration data has been stored on disc. This allows the user to transfer the stored disc data back to EEROM in the preselector.

Enter name of disc file for calibration data? continue=COMB#

This is to be the name of the disc file in which the comb calibration data is stored on disc. Previous to this prompt, the preselector is interrogated and the disc file is automatically named COMB# (# being the number of the instrument that is being calibrated). Any other desired file name may be entered at this time but it is recommended that the serial number of the instrument be part of the file name (i.e., COMB41).

If this prompt appears:

NO SERIAL # IN PRESECTOR
Enter COMPLETE serial # of instrument

then there is most likely a problem with EEROM in which the stored data has been altered and/or destroyed.

Storing data into EEROM

3) Do you want a printout of the comb data? (continue=NO)

Prior to printing out the comb calibration data, the user has one of two choices: to transfer the data either to EEROM or to disc.

Do you need to load comb data from EEROM? (continue=NO)

Do you need to load in comb data from disc? (continue=NO)

If neither of the these tasks are selected, a printout of the comb calibration data is still generated.

Point= _____ Frequency= _____ MHz Amplitude= _____ dBm

NOTE

A cable with less than 0.5 dB insertion loss at 2 GHz must be used.

Connect the RF Preselector Comb Generator OUTPUT to the spectrum analyzer RF INPUT.

See Figure 10.

Measuring the comb generator, (time: 20 minutes)

The combs are being measured by the spectrum analyzer for amplitude and frequency. This data is stored in the controller and is to be used as a comparison when setting up the HP 3335A Synthesizer/Level Generator and HP 8340A Synthesized Sweeper.

Connect the 8482A Power Sensor head to the 436A Power Ref OUTPUT

Make the following front panel selections:

Mode	Watt
Cal Factor	100%
Range Hold	OFF
Power Ref	OFF

This is to zero the power sensor to the power meter. See Figure 10.

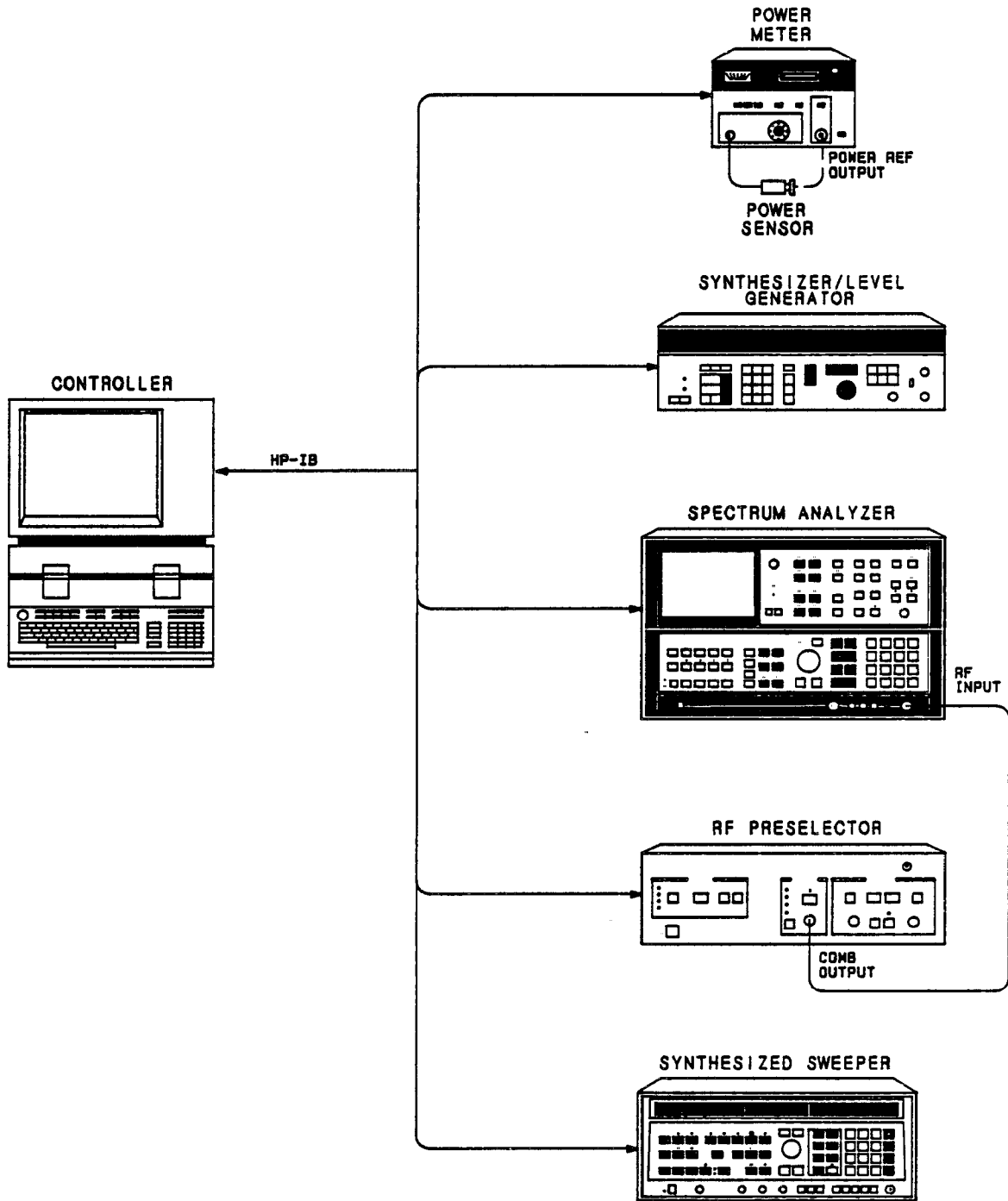


Figure 10. Comb Generator Amplitude and Frequency Measurement Test Setup

Zeroing the power sensor head, please stand by

Turn Power Reference on.

Adjust the "Cal Adj" until 1.000 is displayed

Turn Power Reference off.

The power sensor is being calibrated to the power meter at this time.

Connect the 3335A 50-ohm OUTPUT to Spectrum Analyzer RF INPUT through 40 dB attenuation

See Figure 11.

Setting Synthesizer/Level Generator, (time: 8 minutes)

The synthesizer/level generator is used to match the comb amplitudes stored in the controller below 80 MHz. The amplitude values of the synthesizer/level generator are then stored in the controller to be measured by the power meter.

Connect 8340A RF OUTPUT to spectrum analyzer RF INPUT through 40 dB attenuation.

Connect 8482A Power Sensor to 3335A 50-ohm OUTPUT.

See Figure 12.

Setting Synthesized Sweeper, (time: 15 minutes)

The synthesized sweeper is first used to match the comb amplitudes above 80 MHz. The synthesized sweeper amplitude values are then stored in the controller to be measured by the power meter.

The power meter is used to measure the amplitude settings (below 80 MHz) of the HP 3335A Synthesizer/Level Generator that were compared to the comb amplitudes previously. This data has been stored in the controller and is read back into the HP 3335A in order for the power meter to measure the amplitudes.

Connect the 8482A Power Sensor to the 8340A Synthesized Sweeper through the same cable used to input an 8340A signal into the spectrum analyzer.

NOTE: DO NOT CONNECT POWER SENSOR DIRECTLY TO 8340A AS INVALID DATA WILL RESULT!

See Figure 12.

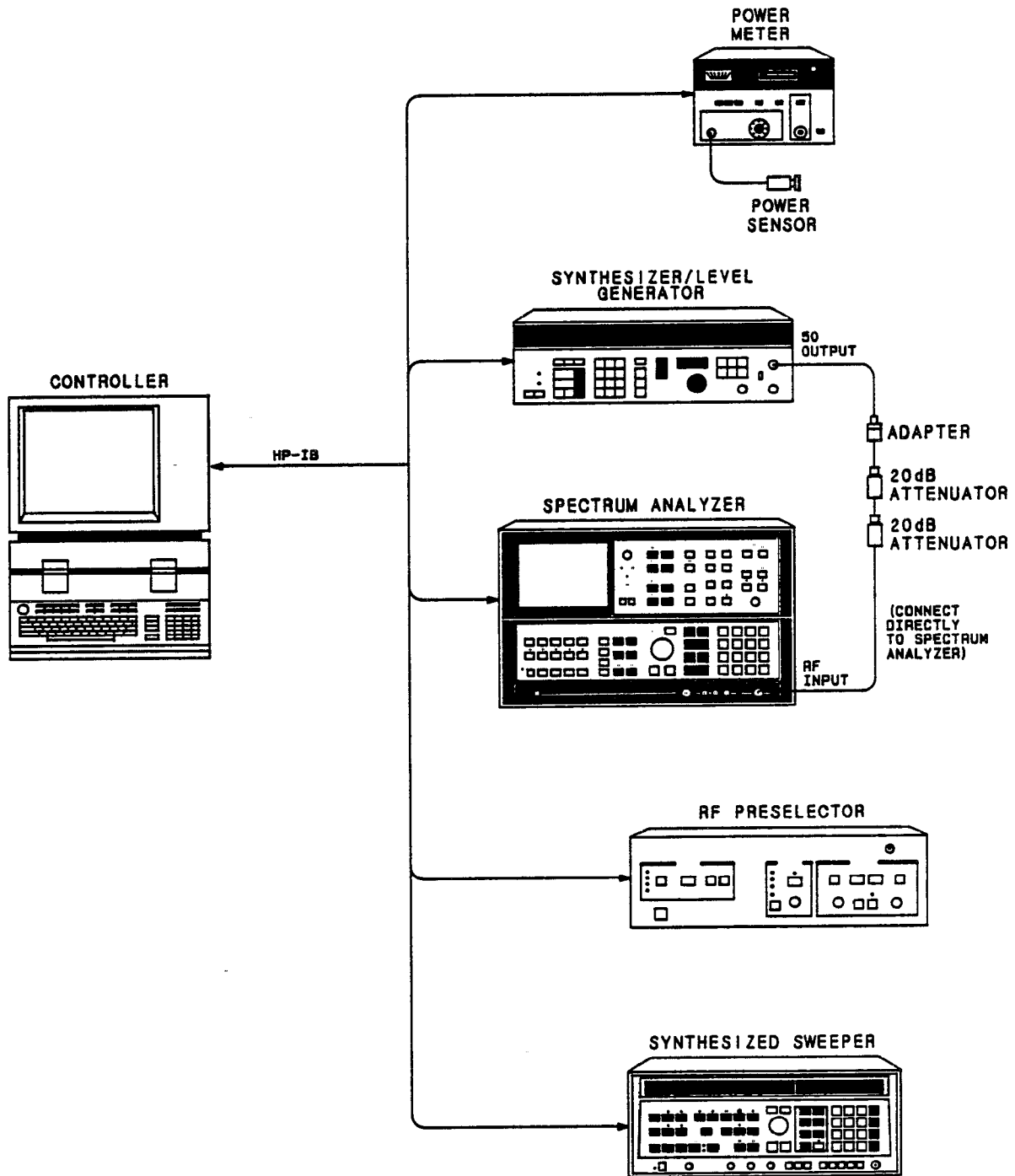


Figure 11. Signal Amplitude Test Setup (Below 80 MHz)

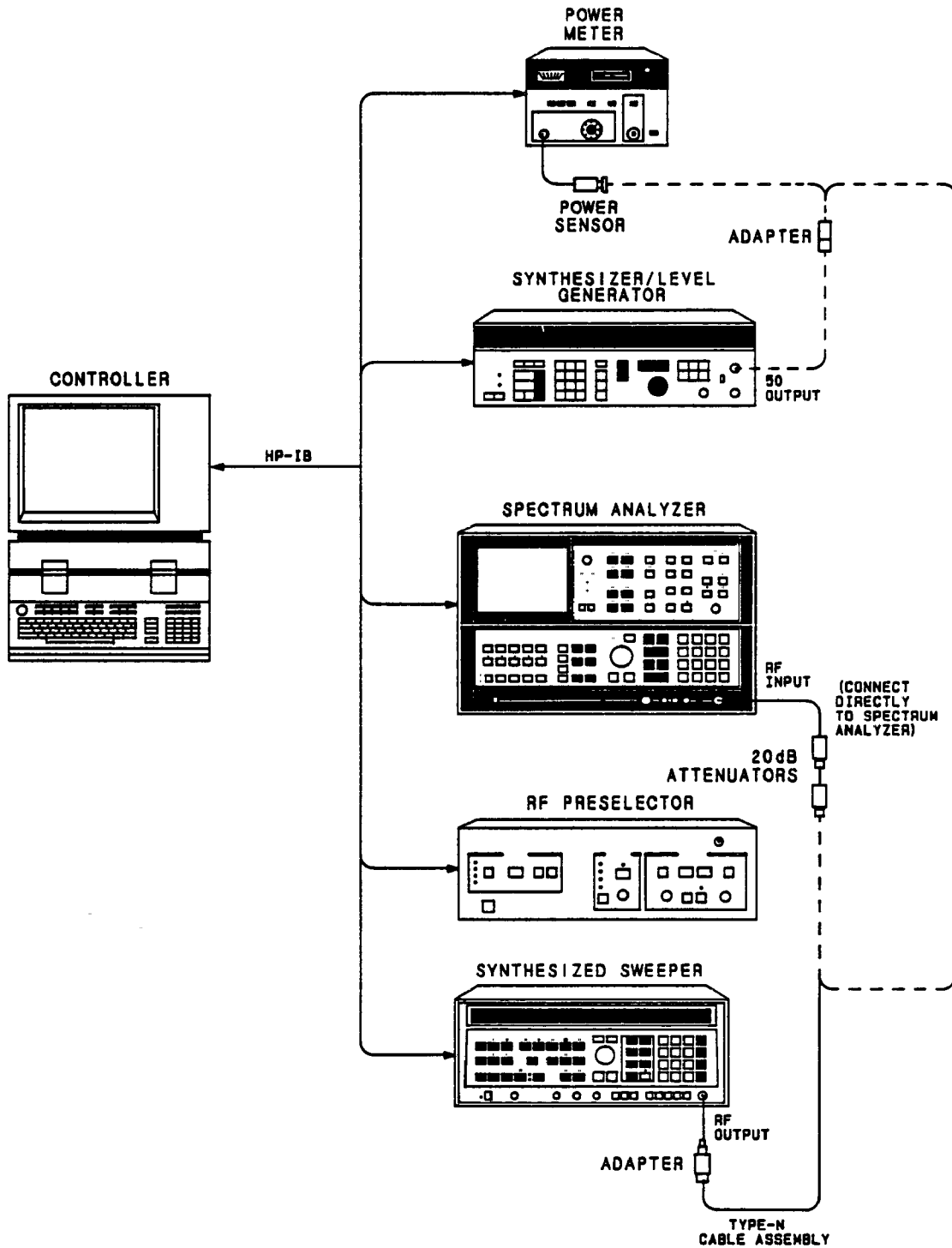


Figure 12. Signal Amplitude Test Setup (Above 80 MHz)

ADJUSTMENTS

Reading Synthesized Sweeper amplitudes, (time: 5 minutes)

The power meter is used to measure the amplitude settings (above 80 MHz) of the HP 8340A Synthesized Sweeper that were compared to the comb amplitudes previously. This data has been stored in the controller and is read back into the HP 8340A in order for the power meter to measure the amplitudes.

Input the day of the month

Input the month of the year (1-12)

Input the year

The date of this calibration will be stored in EEROM.

Entering the data is not required if the internal clock of the controller is current.

Storing data into EEROM

Stores the comb calibration data in EEROM automatically.

Do you want to save the comb calibration data on disc? continue=YES

If the comb calibration is to be saved on disc, a disc file name is necessary.

Enter name of disc file for calibration data storage? continue=COMB#

This will be the name of the file for the comb calibration data. Pressing CONTINUE automatically names the disc file COMB# (# being the number of the instrument that is being calibrated). This information is obtained when the controller interrogates the preselector. Any other desired file name may be entered at this time but it is recommended that the serial number of the instrument be part of the file name (i.e., COMB41).

If this prompt appears:

NO SERIAL # IN PRESELECTION
Enter COMPLETE serial # of instrument

then there is most likely a problem with EEROM in which the data stored has been altered and/or destroyed.

Storing data on disc

The disc file space is created at this time and the data is automatically stored.

Checking for bad data

If any amplitude values less than -65 dBm are found at this time, the comb (point), the frequency of the comb, the rep rate, and the amplitude are displayed as follows:

Point: 42 Freq: 8.9998 Reprate: 1 Ampl: -68.8615817812

At this time, readjustment and/or replacement of the comb generator assembly is necessary and the comb calibration procedure must be performed again. Refer to the end of this calibration procedure for information on readjustment of the comb generator.

No bad data found

This prompt is displayed if no bad data is found.

This concludes the 85685A RF Preselector Comb Calibration Procedure. Refer to the Operations, Tests, and Adjustments Manual to re-install EEROM jumpers to write-protect data.

Elapsed Time:01:49:24

COMB GENERATOR ADJUSTMENT

Equipment Required

Model

Digital Voltmeter (DVM)	HP 3455A
Spectrum Analyzer	HP 8566B

PROCEDURE

1. Access the comb generator board assembly to perform the required adjustments by using the following steps.
 - a. Remove top trim piece. Refer to Figure 13.
 - b. Remove six screws (three on top and three on bottom) to loosen the front panel.
 - c. Rotate the front panel so that it may be worked on from the bottom.
 - d. Loosen both ends of the semi-rigid cable connecting the comb generator assembly to the OUTPUT connector on the front panel.
 - e. Remove the semi-rigid cable from the comb generator assembly and rotate it to the side.

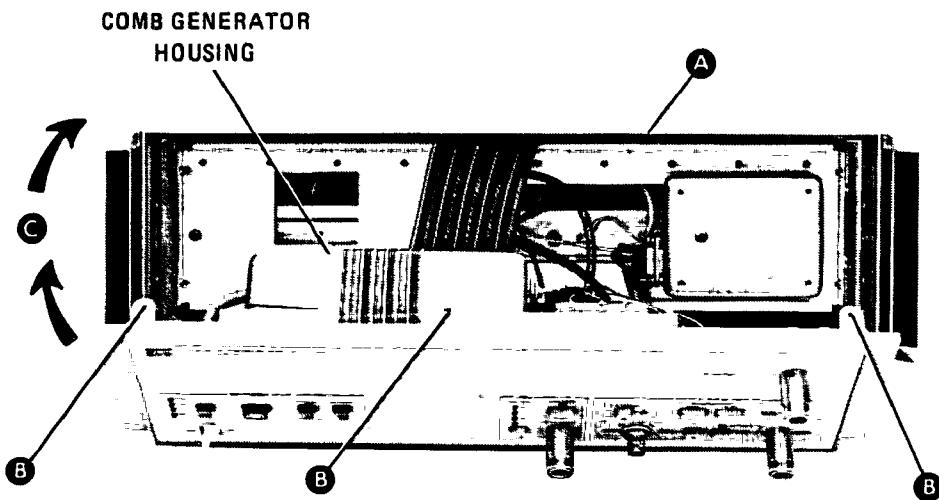


Figure 13. Comb Generator Assembly Removal

- f. Remove the one screw from the back of the comb generator housing.
 - g. Remove the comb generator housing from the front panel assembly.
2. Press [INSTR PRESET] on the preselector and select the 5 MHz REP RATE by using the UP key of the comb generator on the front panel.

NOTE

Refer to Figure 13 for all test point and component locations.

3. Connect the DVM as follows: (-) gnd to A14A1TP5; (+) to A14A1TP12.
4. Adjust A14A1R23 for approximately .75V.
5. Connect the DVM as follows: (-) gnd to chassis ground; (+) to A14A1TP11.
6. Adjust A14A1R23 for +4.0V.
7. Connect the comb generator OUTPUT to the spectrum analyzer RF INPUT using an SMA (f) to Type N cable.

NOTE

A cable with less than 0.5 dB insertion loss at 2 GHz must be used.

8. Set the controls of the spectrum analyzer as follows:

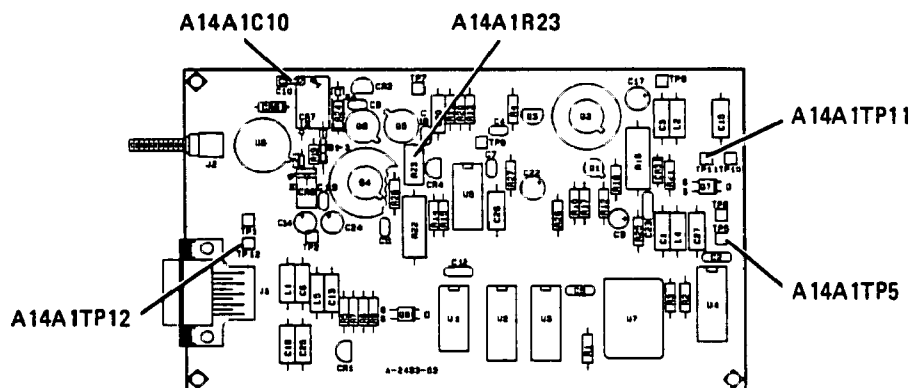


Figure 14. Comb Calibration Adjustment Locations

ADJUSTMENTS

[0-2.5 GHz]
[CENTER FREQUENCY] 2 GHz
[FREQUENCY SPAN] 2 MHz
[REFERENCE LEVEL] -40 dBm
SCALE Log [ENTER DB/DIV] 5 dB/DIV
MARKER [PEAK SEARCH]

9. Note the 2 GHz comb tooth on the spectrum analyzer display and adjust A14A1C10 to peak it.
10. Note the amplitude of the 2 GHz comb tooth. The amplitude should be greater than -65 dBm. The comb calibration procedure must be performed again to ensure that the comb generator is calibrated properly.

If the amplitude of the 2 GHz comb tooth is less than -65 dBm, then the comb generator board assembly must be repaired.

**MAJOR ASSEMBLY AND
COMPONENT LOCATIONS**

Attenuator	A1
Bypass Switch	A1K1
Charge Pump Assembly	A2
Comb Generator Assembly	A14
DAC	A12
DC Block	C1
Fixed BPF	A4
Front Panel Assembly	A1
HF Cavity Assembly	A9
Hi-Low Relay	A16
LF Filter/Amplifier	A5
LF Shield	A7A1
LF Tuneable Filters	A8
Motherboard	A10
Processor	A11
Rear Panel Assembly	A13
RF Amplifier	A6
RF Attenuator	A3
YTF	A15

