# Errata

**Title & Document Type:** 8753E Network Analyzer Service Guide

**Manual Part Number:** 08753-90374

**Revision Date:** February 1999

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## 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.

## About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

## Support for Your Product

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.

Agilent Technologies

Service Guide

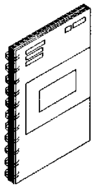
# HP 8753E Network Analyzer

HEWLETT
PACKARD

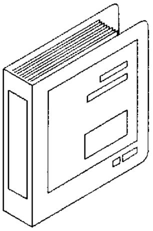
Printed in USA

HP part number: 08753-90374 Supersedes October 1998
Printed in USA February 1999

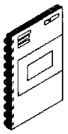
# Network Analyzer Documentation Set



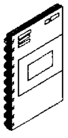
**The Installation and Quick Start Guide** familiarizes you with the network analyzer's front and rear panels, electrical and environmental operating requirements, as well as procedures for installing, configuring, and verifying the operation of the analyzer.



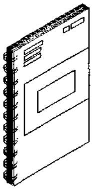
**The User's Guide** shows how to make measurements, explains commonly-used features, and tells you how to get the most performance from your analyzer.



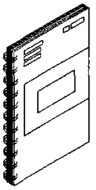
**The Quick Reference Guide** provides a summary of selected user features.



**The HP-IB Programming and Command Reference Guide** provides programming information for operation of the network analyzer under HP-IB control.



**The HP BASIC Programming Examples Guide** provides a tutorial introduction using BASIC programming examples to demonstrate the remote operation of the network analyzer.



**The System Verification and Test Guide** provides the system verification and performance tests and the Performance Test Record for your analyzer.

# Contents

## 6. Digital Control Troubleshooting

## 15. Safety and Licensing

# Figures

# Tables

# 1

# Service Equipment and Analyzer Options

## Table of Service Test Equipment

**Table 1-1. Required Tools**

| |
|---|
| T-8, T-10, T-15, T-20, and T-25 TORX screwdrivers |
| Flat-blade screwdrivers-small, medium, and large |
| 5/16-inch open-end wrench (for SMA nuts) |
| 2-mm extended bit allen wrench |
| 3/16, 5/16, and 9/16-inch hex nut drivers |
| 5/16-inch open-end torque wrench (set to 10 in-lb) |
| 2.5-mm hex-key driver |
| Non-conductive and non-ferrous adjustment tool |
| Needle-nose pliers |
| Tweezers |
| Antistatic work mat with wrist-strap |

## Table 1-2. Service Test Equipment

| **Required** Equipment | **Critical Specifications** | **Recommended Model** | Use* |
|---|---|---|---|
| Spectrum Analyzer | Freq. Accuracy **±7 Hz** | HP **8563E** | **A, T** |
| Spectrum Analyzer | | BP **8595E** | **P** |
| Frequency Counter | Frequency: 300 **kHz - 3 GHz (6 GHz** for Option 006) | **HP 5350B/51B/52B** | **P** |
| Synthesized Sweeper | **Maximum spurious** input: < -30 **dBc** Residual **FM: <20 kHz** | HP **83620A** | **P** |
| **Oscilloscope** | Bandwidth: **100 MHz** Accuracy: 10% | **any** | T |
| **Digital** Voltmeter | **Resolution:** 10 **mV** | **any** | T |
| lbol Kit | No substitute | HP part number 0876340023 | T |
| Power Meter **(HP-IB)** | | **HP 436A/437/438A** | **A, P, T** |
| Power Meter **(HP-IB)** | Single channel, **437B** emulation mode | **EPM-441A** | **A, P, T** |
| Power **Sensor** | Frequency: 300 **kHz-3 GHz, 50Ω** | **HP 8482A** | **A, P, T** |
| Power **Sensor** (for Option 006) | Frequency: 3 **GHz-6 GHz** | **HP 8481A** | **A, P, T** |
| Power **Sensor** | **Frequency:** 303 **kHz-3 GHz,** 760 | **HP 8483A Opt. H03** | **A, P** |
| Photometer | | **Tektronix J16** | A |
| Photometer Probe | | **Tektronix** 56603 | A |
| **Light Occluder** | | **Tektronix** 016030640 | A |
| **Printer** | | HP **ThinkJet,** DeskJet, **LaserJet** | **P** |
| Floppy **Disk** | **3.5-inch** | **HP 92192A** (box of 10) | A |
| **Calibration** Kit 7 mm, 600 | No **substitute** | HP **85031B** | **P** |
| Calibration Bit N-Type, 600 | No substitute | HP **85032B** | **P** |
| Calibration Bit Type-N, **75Ω** | No substitute | HP **85036B** | **P** |
| Verification **Kit** 7 mm | No substitute | HP **85029B** | **P** |
| Low **Pass Filter** | **>50 dB @** 2.06 **Hz** and **passband** that includes **800 MHz** | **HP P/N 9135-0198** | A |
| Step Attenuator | No **substitute** | HP **8496A** Opt. 001, **H18** | **P** |

*** P -** Performance **Tests**
A - Adjustment
T - Troubleshooting

# Table 1-2. Service Test Equipment (2 of 3)

| Required Equipment | Critical Specifications | Recommended Model | Use* |
|---|---|---|---|
| Attenuators (tied): | Return loss: ≥32 dB APC-7 20 dB (2) | HP 8492A Opt. 020 | P, T |
| Attenuators (tied): | Type-N 20 dB (2) | HP 8491A Opt. 020 | P, T |
| Power splitter | 2-Way, 50Ω | BP 11667A | P, T |
| Minimum Loss Pad | Type-N, 50Ω to 75Ω | HP 11852B | P, T, A |
| Adapter | APC-7 to Type-N (f) | HP 11524A | A, P |
| Adapter (2) | APC-7 to Type-N (m) | HP 11525A | A, P |
| Adapter | APC-7 to 3.6 nun (m) | HP P/N 1250-1746 | A, P |
| Adapter | APC-7 to 3.6 mm (f) | HP P/N 1250-1747 | A, P |
| Adapter | BNC to Alligator Clip | HP P/N 8120-1292 | A |
| Adapter | APC-3.5 (m) to Type-N (f) | HP P/N 1250-1750 | A, P |
| Adapter | APC-3.5 (f) to Type-N (f) | HP P/N 1250-1745 | A, P |
| Adapter | BNC (m) to Type-N (f) | HP P/N 1250-1477 | P |
| Adapter | Type-N (f) to Type-N (f) | HP P/N 1250-0777 | P |
| RF Cable (2 each) | 24-inch, APC-7 | HP P/N 8120-4779 | A, P |
| RF Cable Bet | APC-7, 50Ω | HP 11857D | A, P |
| RF Cable | 24-inch, APC-7, 50Ω (2) | HP P/N 8120-4779 | P, A |
| RF Cable | 24-inch, Type-N, 75Ω (2) | HP P/N 8120-2408 | A, P |
| RF Cable | 24-inch, Type-N, 50Ω (3) | HP P/N 8120-4781 | A, P |
| RF Cable Bet | Type-N, 50Ω | HP 11851B | P, A |
| HP-IB Cable | | HP 10833A/B/C/D | A |
| Coax Cable | BNC | HP P/N 8120-1840 | A |
| Coax cable | BNC (m) to BNC (m), 600 | HP 10503A | A |

* P - Performance Tests
A - Adjustment
T - Troubleshooting

## Table 1-2. Service Test Equipment (3 of 3)

| Required Equipment | Critical Specifications | Recommended Model | Use* |
|---|---|---|---|
| Antistatic wrist Strap | | HP P/N 9300-1367 | A, T, P |
| Antistatic wrist strap cord | | HP P/N 9300-0980 | A, T, P |
| Static-control Table Mat and Earth Ground Wire | | HP P/N 9300-0797 | A, T, P |
| Non-Metalic Adjustment Tool | | HP P/N 8830-0024 | A |
| BNC Alligator Clip Adapter | | HP P/N 8120-1292 | A |
| BNC-to-BNC Cable | | HP P/N 8120-1840 | A |

* P - Performance Tests
A - Adjustment
T - Troubleshooting

## Principles of Microwave Connector Care

Proper connector care and connection techniques are critical for accurate, repeatable measurements.

Refer to the calibration kit documentation for connector care information. Prior to making connections to the network analyzer, **carefully** review the information about inspecting, cleaning, and gaging connectors.

Having good connector care and connection techniques extends the life of these devices. In addition, you obtain the most accurate measurements.

This type of information is typically located in Chapter 3 of the calibration kit manuals

For additional connector care instruction, contact your local Hewlett-Packard Sales and Service Office about course numbers HP **85050A** + **24A** and HP **85050A** + **24D.**

See the following table for quick reference tips about connector care.

## Table 1-3. Connector Care Quick Reference

| Do | Do Not |
|---|---|
| **Handling and Storage** | |
| Keep connectors clean<br>Extend sleeve or connector nut<br>Use plastic end-caps during storage | Touch mating-plane surfaces<br>Set connectors contact-end down |
| **Visual Inspection** | |
| Inspect all connectors carefully<br>Look for metal particles, scratches, and dents | Use a damaged connector-ever |
| **Connector Cleaning** | |
| Try compressed air first<br>Use isopropyl alcohol<br>Clean connector threads | Use any abrasives<br>Get liquid into plastic support beads |
| **Gaging Connectors** | |
| Clean and zero the gage before use<br>Use the correct gage type<br>Use correct end of calibration block<br>Gage all connectors before first use | Use an out-of-spec connector |
| **Making Connections** | |
| Align connectors carefully<br>Make preliminary connection lightly<br>Turn only the connector nut<br>Use a torque wrench for final connect | Apply bending force to connection<br>Over tighten preliminary connection<br>Twist or screw any connection<br>Tighten past torque wrench "break" point |

# Analyzer Options Available

## Option 1D5, High Stability Frequency Reference

This option offers ±0.05 ppm temperature stability from 0 to 60° C (referenced to 25° C).

## Option 002, Harmonic Mode

This option provides measurement of second or third harmonics of the test device's fundamental output signal. Frequency and power sweep are supported in this mode. Harmonic frequencies can be measured up to the maximum frequency of the receiver. However, the fundamental frequency may not be lower than 16 MHz.

## Option 006, 6 GHz Operation

This option extends the maximum source and receiver frequency of the analyzer to 6 GHz.

## Option 010, Time Domain

This option displays the time domain response of a network by computing the inverse Fourier transform of the frequency domain response. It shows the response of a test device as a function of time or distance. Displaying the reflection coefficient of a network versus time determines the magnitude and location of each discontinuity. Displaying the transmission coefficient of a network versus time determines the characteristics of individual transmission paths Time domain operation retains all accuracy inherent with the correction that is active in of such devices as SAW filters, SAW delay lines, RF cables, and RF antennas.

## Option 011, Receiver Configuration

This option allows front panel access to the R, A, and B samplers and receivers. The transfer switch, couplers, and bias tees have been removed. Therefore, external accessories are required to make most measurements

## Option 075, **75Ω** Impedance

This option offers 75 ohm impedance bridges with type-N test port connectors.

## Option **1DT,** Delete Display

This option removes the built-in flat panel display, allowing measurement results to be viewed with an external VGA monitor only.

## Option **1CM,** Rack Mount Flange Kit Without Handles

This option is a rack mount kit containing a **pair** of flanges and the necessary hardware to mount the instrument, with handles detached, in an equipment rack with 482.6 mm (19 inches) horizontal spacing.

## Option **1CP,** Rack Mount Flange Kit With Handles

This option is a rack mount kit containing a pair of flanges and the necessary hardware to mount the instrument with handles attached in an equipment rack with 482.6 mm (19 inches) spacing.

## Service and Support Options

The analyzer automatically includes a three-year warranty for repair at a Hewlett-Packard facility.

The following service and support options are also available. Contact your local sales or service office.

### Option **W32**

This option provides three years of return to HP calibration service.

### Option **W34**

This option provides three years of return to HP Standards Compliant Calibration.

2

# System Verification and Performance Tests

The performance of the HP 8753E network analyzer is specified in two ways:

- *System Specifications*:
  Specifies warranted performance of the *measurement* system when making error-corrected S-parameter measurements. The measurement system includes the analyzer, test cables, and calibration kit. The System Verification Procedure is used to **confirm** performance of the measurement system to the System **Specifications.**
- *Instrument Specifications:*
  Specifies the network analyzer's output and input behavior and its uncorrected measurement port characteristics. Performance tests are used to confirm performance of the analyzer to the Instrument Specifications.

## System Specifications

System Specifications, also called Measurement Port Specifications, are described in Chapter 7 of the *HP 8753E* User's *Guides.* They specify warranted performance of the entire *measurement system* when making error-corrected S-parameter measurements The measurement system includes the analyzer, test cables, and calibration kit. System Specifications are expressed in two ways:

- graphs of measurement uncertainty versus reflection and transmission coefficients
- residual errors of the measurement system-the *corrected* Measurement Port Characteristics

System Specifications, **confirmed** by the System Verification Procedure, are applicable when the measurement system is used to make error-corrected S-parameter measurements

## Instrument Specifications

Instrument specifications comprise the following sections and tables in Chapter 7, "Specifications and Measurement Uncertainties, " of the HP 8753E User's Guide:

- all **specifications** in the section "Instrument Specifications"
- **Table** 7-3 "Measurement Port Characteristics (uncorrected) for HP 8753E **(50Ω)** with **7-mm Test** Ports"
- **Table** 7-7 "Measurement Port Characteristics (uncorrected) for HP 8753E **(75Ω)** with **7-mm** Test Ports"

These specifications apply when the analyzer is used to make measurements ***other than*** error-corrected S-parameter measurements An example would be the measurement of amplifier gain compression. In such cases, the analyzer's output and input behavior-such as source power, receiver accuracy, and receiver linearity-are important and are covered by Instrument Specifications.

## System **Verification** Procedure

The System **Verification** Procedure tests the network analyzer measurement system, as **defined** above, against the System **Specifications.** If conllrmation is successful, the measurement system is capable of making S-parameter measurements to the accuracy specified by the graphs of measurement uncertainty. An outline of the System Verification Procedure follows:

- The measurement system is calibrated with the calibration kit to be used for future measurements The measurement system's systematic errors are determined by this procedure.
- The S-parameters of verification-kit test-devices are measured with error correction applied.
- These measurements are compared to measurement data stored on a unique, serial-numbered data disk included with the verification **kit.**
- The measurement system passes the System Verification Procedure if the measurements of the test devices differ from the measurement data on the data disk by less than specified test limits. The test limits account for the specified accuracy of the measurement system and the measurement uncertainties attributed to the stored data for the test devices.

**Note** Calibration kits are different from verification kits. *Calibration* kits are used to determine the systematic errors of a network analyzer measurement system. *Verification* kits are used to confirm system specifications and are not used to generate error-correction. For example, the HP 85031B is a 7-mm calibration kit, but the HP 85029B is a 7-mm verification kit.

## Performance Tests

Performance tests are used to confirm analyzer performance against the Instrument Specifications. If confirmation is successful, the analyzer meets the Instrument Specifications as defined above. If the calibration kit to be used for measurements is also certified, successful completion of the Performance Tests also ensures that the network analyzer measurement system meets the System Specifications.

### How to Confirm Performance to System Specifications

- Complete the System Verification Procedure in this chapter using a certified verification kit, or
- Complete all of the performance tests and certify (or re-certify) the calibration kit to be used for future measurements. This alternative verifies both the System Specifications and the Instrument Specifications for the analyzer.

### How to Confirm Performance to Instrument Specifications

- Complete the Performance Tests

## Certificate of Calibration

Hewlett-Packard will issue a Certificate of Calibration for the product upon successful completion of System **Verification** or completion of the Performance Tests. The Certificate of Calibration will include a ***System Attachment*** if the System Verification Procedure is used to **confirm** the System **Specifications.** If the Performance Tests are used to **confirm** Instrument Specifications, the **Certificate** of Calibration will not include a System Attachment. The equipment and measurement standards used for the tests must be **certified** and must be traceable to recognized standards.

**Note** If you have a measurement application that does not use all of the measurement capabilities of the analyzer, you may ask your local Hewlett-Packard Customer Service Center to verify only a subset of the **specifications.** However, this creates the possibility of making inaccurate measurements if you then use the analyzer in an application requiring additional capabilities.

## Sections in This Chapter

- **System Verification**
- **Performance Tests**

1. Test Port Output **Frequency** Range and Accuracy
2. External Source Mode kequency Range
3. Test Port Output Power Accuracy
4. Test Port Output Power Range and Linearity
5. Minimum R Channel Level
6. Test Port Input Noise **Floor** Level
7. Test Port Input Frequency Response
8. Test Port Crosstalk
9. Calibration Coefficients
10. System Trace Noise **(Only** for Analyzers **without** Option 006)
11. System Trace Noise **(Only** for Analyzers ***with*** Option 006)
12. Test Port Input Impedance
13. Test Port Receiver Magnitude Dynamic Accuracy
14. Test Port Receiver Magnitude Compression
15. Test Port Receiver Phase Compression
16. **Test** Port Output/Input Harmonics (Option 002 Analyzers ***without*** Option 006 only)
17. Test Port Output/Input Harmonics (Option 002 Analyzers ***with*** Option 006 **only)**
18. Test Port Output Harmonics (Analyzers **without** Option 002)

## Performance Test Record

Find and use the appropriate "Performance Test Record" in the following subchapters:

- Performance Test Record for 30 kHz to 3 GHz
- Performance Test Record for 30 kHz to 6 GHz

## System Verification Cycle and Kit Re-certification

Hewlett-Packard recommends that you verify your network analyzer measurement system every six months. Hewlett-Packard also suggests that you get your verification kit re-certified annually. Refer to ***HP 85029B 7-mm Verification Kit Operating and Service Manual*** for more information.

| Note | The system **verification** procedures can also apply to analyzers with Option 075 (75 ohm analyzers) if minimum loss pads and type-N (m) to **APC-7** adapters are used. |
|---|---|

Check to see how the **verification** kit floppy disk is labeled:

- If your **verification** disk is labeled `HP 8753D Verification Data Disk`, or `HP 8753D & HP 8753E Verification Data Disk`, you may proceed with the system verification.
- If your **verification** disk is not labeled as indicated above, you may send your HP **85029B 7-mm verification** kit to the nearest service center for **recertification,** which includes a data disk that you can use with the HP 8753E.

## HP 8753E System Verification

### Equipment Required

Calibration Kit, 7-mm ............................................ HP 85031B
Verification Kit, 7-mm ............................................ .HP 85029B
Test Port Extension Cable Set, 7-mm ............................. HP 11857D
Printer ......................................... HP ThinkJet/DeskJet/LaserJet

### Additional Equipment Required for Option 075 Analyzers

Minimum Loss Pad (2), 50 Ω to 75 Ω ................................. HP 11852B
Adapter (2), APC-7 to Type-N (m) ....................................... HP 11525A

***Analyzer warmup time: 1* hour**

This system **verification** consists of three separate procedures:

1. Initialization
2. Measurement Calibration
3. Device Verification

## Initialization

1. Clear all internal memory.

---

**Caution** **This will erase all instrument states that may be stored in internal memory.**

Perform the following steps to save any instrument states that are stored in internal memory to a floppy disk.

a. Press (Save/Recall) SELECT DISK INTERNAL MEMORY RETURN.

b. Select an instrument state and press RECALL STATE.

c. Press SELECT DISK INTERNAL DISK RETURN SAVE STATE.

d. If the instrument state file was not saved to disk with the same name that it had while in internal memory, you may wish to rename the file.

Press FILE UTILITIES RENAME FILE enter the desired name, and press DONE.

e. Repeat steps a through d for each instrument state that you wish to save.

---

To clear all internal memory, press (System) SERVICE MENU PEEK/POKE RESET MEMORY (Preset).

2. Connect the equipment as shown in **Figure 2-1.** Let the analyzer warm up for one hour

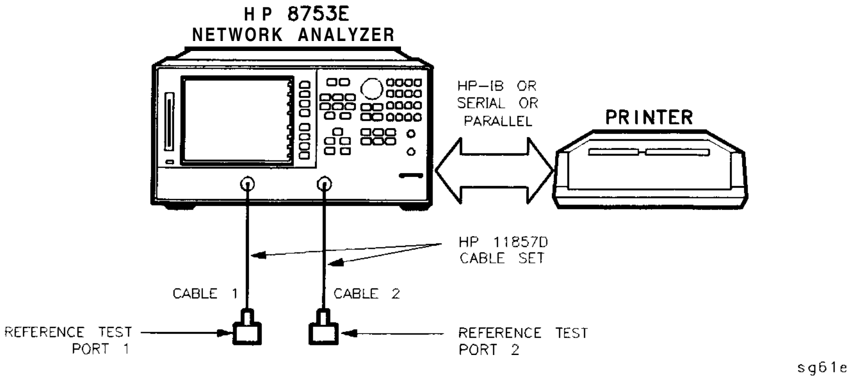



**Figure 2-1. System Verification Test Setup**

3. **While** the equipment is warming up, review the "Connector Care Quick Reference" information in Chapter 1. Good connections and clean, undamaged connectors are **critical** for accurate measurement results.
4. Insert the verification kit disk into the **analyzer** disk drive.
5. **Press** (Preset) (Save/Recall) SELECT DISK INTERNAL DISK.
6. **If you want a printout of the verification data for all the devices, press** (System) SERVICE MENU TEST OPTIONS RECORD ON.

Note — If you switch on the record function, you *CANNOT* switch it off during the verification procedure.

7. Position the paper in the printer so that **printing** starts at the top of the **page.**

8. If you have difficulty with the printer:
   - If the interface on your printer is HP-IB, verify that the printer address is set to 1 (or change the setting in the analyzer to match the printer).
   - If the interface on your printer is serial or parallel, be sure that you selected the printer port and the printer type correctly (refer to the HP *8753E Network Analyzer* User's *Guide* for more information on how to perform these tasks).
9. **Press** (System) **SERVICE MENU** **TESTS** **SYS VER TESTS** **EXECUTE TEST**.
10. The analyzer displays Sys Ver **Init** DONE; the initialization procedure is complete.

---

**Caution** *DO NOT* press (Preset or **recall** another instrument state. You must use the instrument state that you loaded during the initialization procedure.

---

## Measurement Calibration

11. **Press** (Cal) **CAL KIT** **SELECT CAL KIT** **CAL KIT:7mm** **RETURN** **RETURN** **CALIBRATE MENU** **FULL 2-PORT**.
12. **Press** **ISOLATION** **OMIT ISOLATION**.
13. **Press** **REFLECTION**.
14. Connect the "open" end of the open/short combination (supplied in the calibration kit) to reference test port 1, as shown in Figure 2-2.

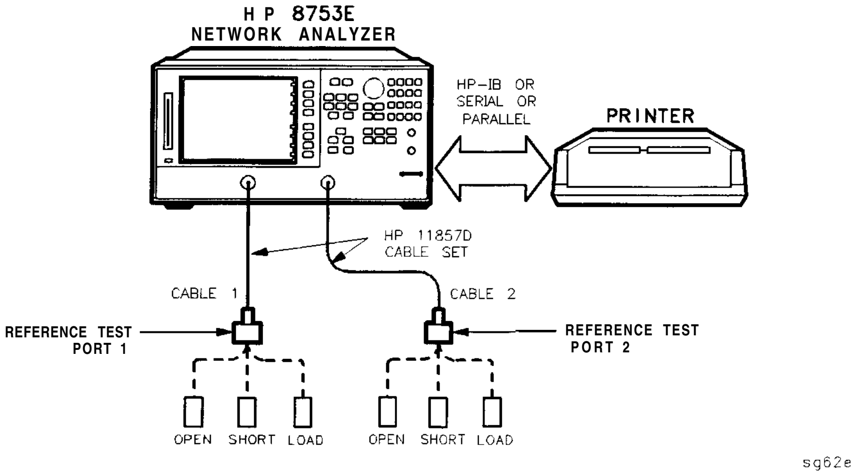



**Figure 2-2. Connections for Measurement Calibration Standards**

15. Press **FORWARD:OPEN**.
16. When the analyzer finishes measuring the standard, connect the "short" end of the open/short combination to reference test port 1.
17. Press **FORWARD:SHORT**.
18. When the analyzer finishes measuring the standard, connect the 50 ohm termination (supplied in the calibration kit) to reference test port 1.
19. Press **FORWARD:LOAD**.
20. When the analyzer finishes measuring the standard, connect the "open" end of the open/short combination to reference test port 2.
21. Press **REVERSE:OPEN**.
22. When the analyzer finishes measuring the standard, connect the "short" end of the open/short combination to reference test port 2.
23. Press **REVERSE:SHORT**.
24. When the analyzer finishes measuring the standard, connect the 50 ohm termination to reference test port 2.
25. Press **REVERSE:LOAD**.

26. **When the analyzer finishes measuring the standard, press** STANDARDS DONE.

The analyzer briefly displays COMPUTING CAL COEFFICIENTS.

27. **Connect** the test port cables as shown **Figure 2-3.**

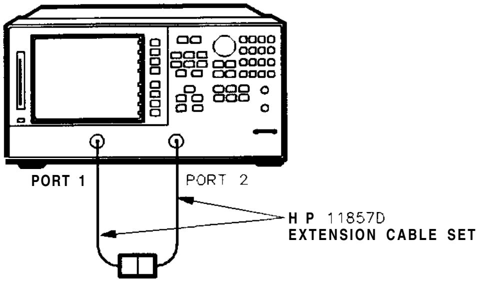



**Figure 2-3. Transmission Calibration Setup**

28. Press TRANSMISSION DO BOTH FWD + REV.

29. Press DONE 2-PORT CAL.

30. Press (Save/Recall) SELECT DISK INTERNAL MEMORY RETURN SAVE STATE to save the calibration into the analyzer internal memory.

31. **When the analyzer finishes saving the** instrument state, **press** SELECT DISK INTERNAL DISK.

32. Press (System) **SERVICE MENU** **TESTS** (28) (x1) **EXECUTE TEST**.

33. At the prompt, connect the 20 **dB** attenuator (supplied in the verification kit) as shown in Figure 2-4.

34. Press **CONTINUE** to run the test:

- If you switched OFF the record function, you have to press **CONTINUE** after each S-parameter measurement.
- If you switched ON the record function, the analyzer measures all S-parameters (magnitude and phase) without pausing. Also, the analyzer only displays and prints the PASS/FAIL information for the S-parameter measurements that are valid for system verification.

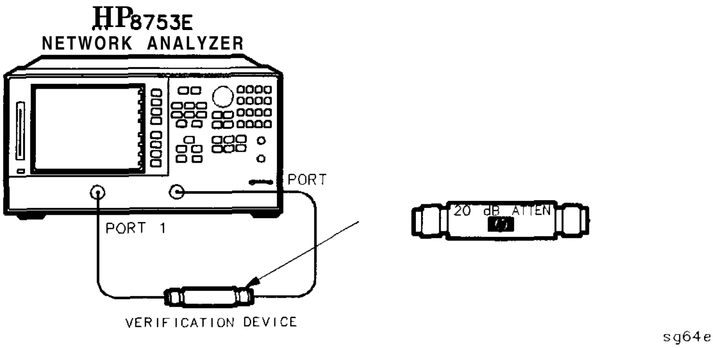



**Figure 2-4. Connections for the 20 dB Verification Device**

35. When the analyzer fmishes all the measurements, connect the 50 **dB** attenuator (supplied in the **verification** kit), as shown in **Figure** 2-5.

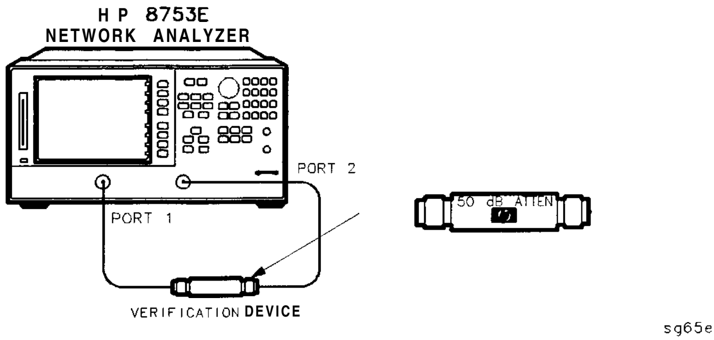



**Figure 2-5. Connections for the 50 dB Verification Device**

36. Press (⇑) (29) (x1) EXECUTE TEST CONTINUE.

37. When all measurements are complete, replace the verification device with the verification mismatch, as shown in Figure 2-6. Be sure that you connect Port A of the verification mismatch to reference test port 1.

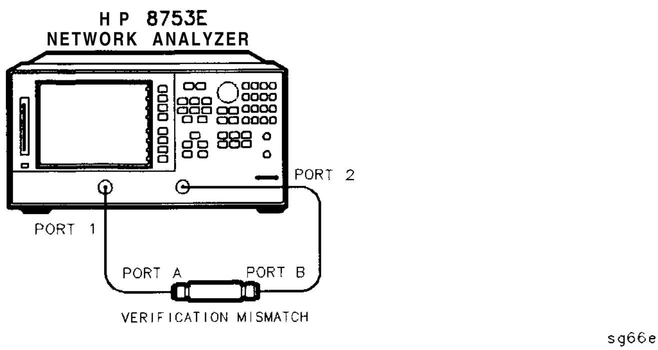



**Figure 2-6. Mismatch Device Verification Setup 1**

38. Press RETURN TESTS (30) (x1) EXECUTE TEST CONTINUE.

39. When the analyzer finishes all the measurements, connect the mismatch verification device, as shown in Figure 2-7. Notice that Port B is now connected to reference test port 1.

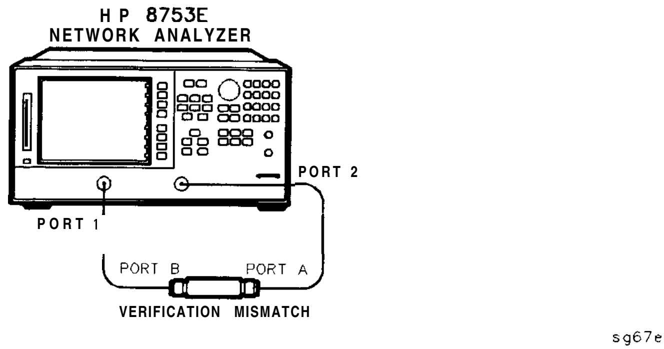



**Figure 2-7. Mismatch Device Verification Setup 2**

40. Press **RETURN** **TESTS** (31) (x1) **EXECUTE TEST** **CONTINUE**.

41. You have completed the system verification procedure when the analyzer displays Ver Def 4 DONE.

## In Case of Difficulty

1. Inspect **all** connections.

---

Caution — ***DO*** NOT disconnect the cables from the analyzer test ports. Doing so ***WILL INVALIDATE*** the calibration that you have done earlier.

---

2. **Press** (Preset) (Save/Recall) SELECT DISK INTERNAL MEMORY RETURN. **Using the** front panel knob, highlight **the title** of the full **2-Port** calibration that you have done earlier, then press RECALL STATE.
3. Repeat the "Device Verification" procedure.
4. If the analyzer still fails the test, check the measurement calibration as follows:

   a. Press [preset).

   b. **Recall the calibration by pressing** (Save/Recall) SELECT DISK INTERNAL MEMORY RETURN.

   c. **Use the front panel knob to highlight the calibration you want to recall and press** RECALL STATE.

   d. Connect the short to reference test port 1.

   e. **Press** (Meas) Refl: FWD S11 (A/R) (Menu) TRIGGER MENU CONTINUOUS.

   f. **Press** (Scale Ref) SCALE/DIV (.05) (x1).

   g. Check that the trace response is 0.00 ± 0.05 **dB.**

   h. Disconnect the short and connect it to reference test port 2.

   i. **Press** (Meas) Refl: REV S22(B/R).

   j. Check that the trace response is 0.00 ± 0.05 **dB.**

   k. If any of the trace responses are out of the specified limits, repeat the "Measurement Calibration" and "Device Verification" procedures.

5. Refer to Chapter 4, "Start Troubleshooting Here," for more troubleshooting information.

## 1. Test Port Output Frequency Range and Accuracy

### Specifications

| Frequency Range | Frequency Accuracy[1] |
|---|---|
| 30 kHz to 3 GHz | ±10 ppm |
| 3 GHz to 6 GHz[2] | ±10 ppm |

1 At 25° C ±5° C.

2 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

### Required Equipment

kequency Counter (30 kHz to 500 MHz) . . . . . . . . . . . . . . . . . . . . HP 5350B/51B/52B
Frequency Counter (500 MHz to 6 GHz) . . . . . . . . . . . . . . . . . . . . .HP 5350B/51B/52B
Cable, 500 Type-N, 24-inch . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP P/N 81204781
Adapter, APC-3.5 (f) to Type-N (f) . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 1250-1745
Adapter, APC-7 to Type-N (f) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 11524A
Adapter, Type-N (f) to BNC (m) . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 1250-1477

### Additional equipment needed for an HP 8753E with Option 075

Minimum Loss Pad, 50Ω to 75Ω . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 11852B

*Analyzer warmup time: 30* **minutes**

Perform this test to verify the frequency accuracy of the HP 8753E over its entire operating frequency range.

1. Connect the equipment as shown in Figure 2-8.

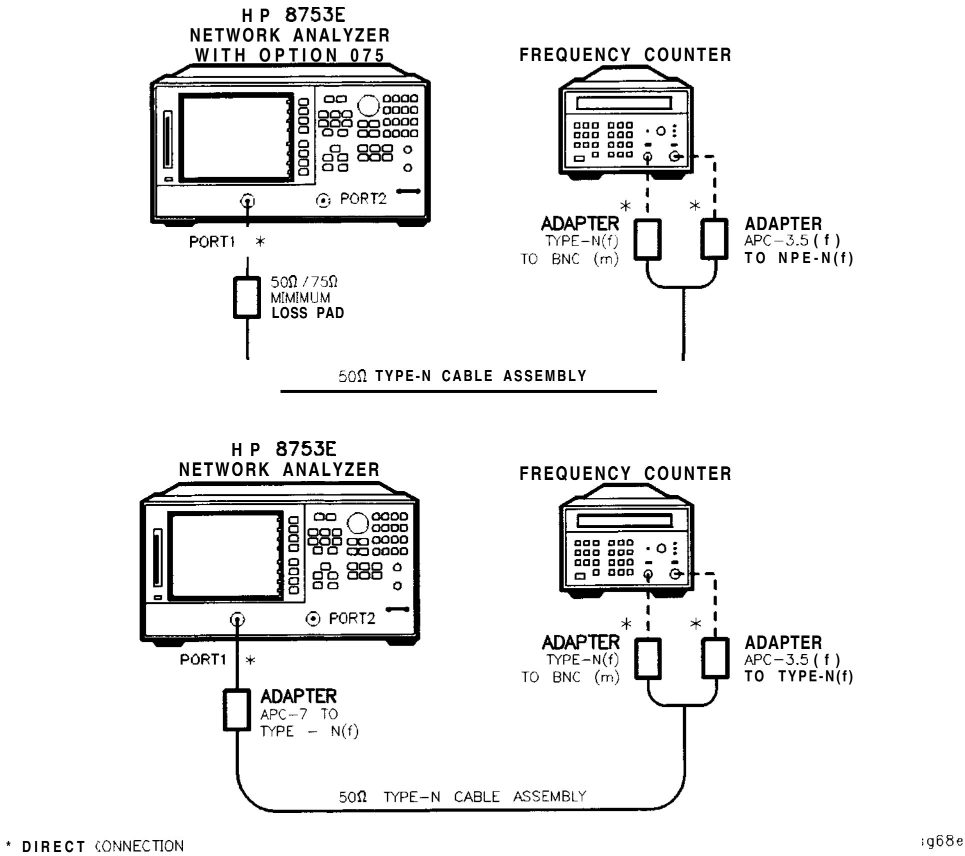



**Figure 2-8. Test Port Output Frequency Range and Accuracy Test Setup**

2. Press (Preset) [Menu) CW FREQ.

3. Press (30) (k/m) and write the frequency counter reading on the "Performance Test Record."

4. Repeat step 3 for each instrument frequency listed in the "Performance Test Record."

## In Case of Difficulty

1. If any measured frequency is close to the specification limits, check the time base accuracy of the counter used.
2. If the analyzer fails by a significant margin at *all* frequencies (especially if the deviation increases with frequency), the master time base probably needs adjustment. In this case, refer to the "Frequency Accuracy Adjustment" procedure, located in Chapter 3, "Adjustments and Correction Constants." The "Fractional-N **Frequency** Range Adjustment" also affects frequency accuracy.
3. Refer to Chapter 7, "Source Troubleshooting," for related troubleshooting information.

# 2. External Source Mode Frequency Range

## Specifications

| Frequency Range |
|---|
| 300 kHz to 3 GHz |
| 300 kHz to 6 GHz[1] |

1 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

## Equipment Required

External Source .......................................... HP 83620A
Cable, APC-7, 24-inch .......................................... HP P/N 8120-4779
Adapter, APC-3.5 (f) to APC-7 .......................................... HP P/N 1250-1747
Adapter, APC-3.5 (m) to APC-7 .......................................... HP P/N 1250-1746

***Analyzer warmup time:* 30 minutes**

Perform this test to verify that the analyzer's reference channel, input R, is capable of phase locking to an external CW signal.

1. On the external source, press (Preset) (CW) (10) (MHz/µsec) [POWER LEVEL] (−/←) (20) (GHz/dB(m)).
2. Connect the equipment as shown in Figure 2-9.

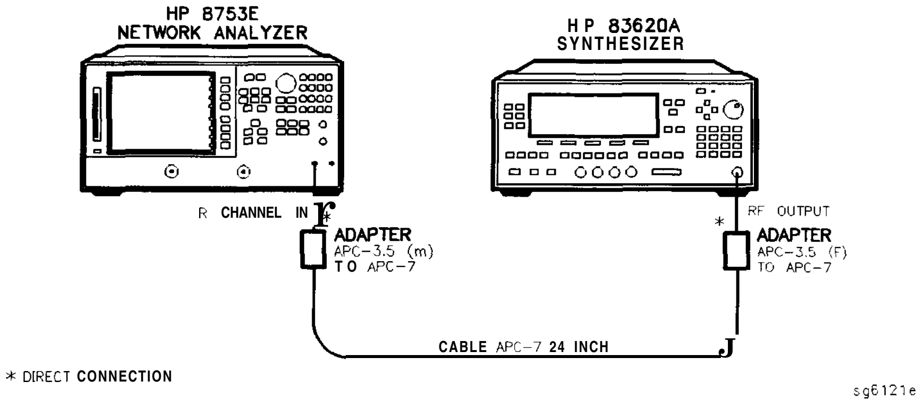



**Figure 2-9. External Source Mode Frequency Range Test Setup**

3. On the network analyzer, press (Preset) (Meas) INPUT PORTS R.

4. Press (System) INSTRUMENT MODE EXT SOURCE AUTO (Menu) CW FREQ (10) (M/μ).

5. Check to see if the analyzer is phase locking to the external CW signal:
   - If the analyzer displays any phase lock error messages, write "unlock" in the "Performance Test Record" for the set CW signal.
   - If the analyzer does not display any phase lock error messages, write "lock" in the "Performance Test Record" for the set CW signal.

6. On the external source, press (CW) (20) (MHz/μ).

7. On the analyzer, press (20) (M/μ).

8. Repeat step 5 through 7 for the other external source CW frequencies listed in the "Performance Test Record."

## In Case of Difficulty

If the analyzer displayed any phase lock error messages:

1. Be sure the external source power is set within 0 to -25 **dBm.**
2. Make sure the analyzer's "Ext Source Auto" feature is selected. In addition, verify that the analyzer is set to measure its input channel R.
3. Verify that all connections are tight.

# 3. Test Port Output Power Accuracy

## Specifications

| Frequency Range | Test Port Output Power Accuracy[1] |
|---|---|
| 300 kHz to 3 GHz | ±1.0 dB |
| 3 GHz to 6 GHz[2] | ±1.0 dB |

1 At 0 dBm and 25° C ±5° C

2 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

### Equipment Required for 50Ω Analyzers

Power Meter .......... HP 436A/437B/438A
Power Sensor .......... HP 8482A
Adapter, APC-7 to Type-N (f) .......... HP 11524A

### Additional Equipment Required for Analyzers with Option 006

Power Sensor .......... HP 8481A

### Equipment Required for 75Ω Analyzers

Power Meter .......... HP 436A/437B/438A
Power Sensor .......... HP 8483A Option H03

*Analyzer warmup time:* **30 minutes**

Perform this test to confirm the accuracy of the HP 8753E source output power.

1. Zero and calibrate the power meter. For more information of how to perform this task, refer to the power meter operating manual.
2. Connect the equipment as shown in Figure 2-10.

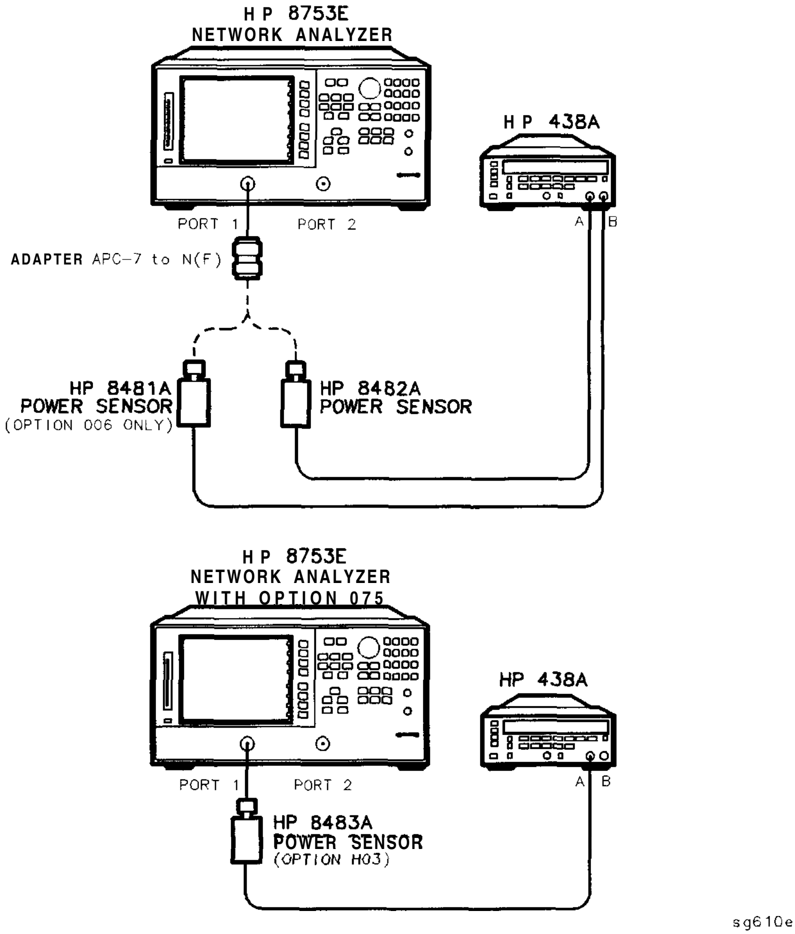



**Figure 2-10. Source Output Power Accuracy Test Setup**

3. Press (Preset).

**Note** The factory preset test port power is 0 dBm.

4. Press (Menu) **CW FREQ** (300) (k/m). Set the calibration factor on the power meter for this CW frequency.
5. Write the power meter reading on the "Performance Test Record."
6. Repeat steps 4 and 5 for each CW frequency listed in the "Performance Test Record." For analyzers with Option 006, use the HP 8481A power sensor for all frequencies above 3 GHz.

## In Case of Difficulty

1. Be sure the source power is switched on. Press (Menu) **POWER**. Check the **SOURCE PWR** softkey; "on" *should* be highlighted. Otherwise, press **SOURCE PWR** to switch on the source power.
2. Refer to Chapter 7, "Source Troubleshooting," for more troubleshooting information.

# 4. Test Port Output Power Range and Linearity

## Specifications

| Power Range | Power Level Linearity[1] |
|---|---|
| -15 to +5 dBm | ±0.2 dB |
| +5 to +10 dBm[2] | ±0.5 dB |
| +5 to +8 dBm[3] | ±0.5 dB |

1 Relative to 0 dBm output level.

2 Applies to instruments not using Option 076.

3 For Option 075 only.

## Required Equipment

Power Meter .................................................. HP 437B/438A
Power Sensor .................................................. HP 8482A
Adapter, APC-7 to Type-N (f) .................................... HP 11524A

## Additional Required Equipment for Analyzers with Option 006

Power Sensor .................................................. HP 8481A

## Additional Required Equipment for Analyzers with Option 075

Power Sensor ......................................... HP 8483A Option H03

***Analyzer warmup time:* 1 hour**

Perform this test to verify the analyzer's test port output power range and power level linearity at selected CW frequencies.

1. Zero and calibrate the power meter. Refer to the power meter operating manual for more information on how to do this task.
2. On the network analyzer, press (Preset) (Menu) **CW FREQ** (300) (k/m). Set the power meter calibration factor for this CW frequency.
3. Connect the equipment as shown in Figure 2-11.

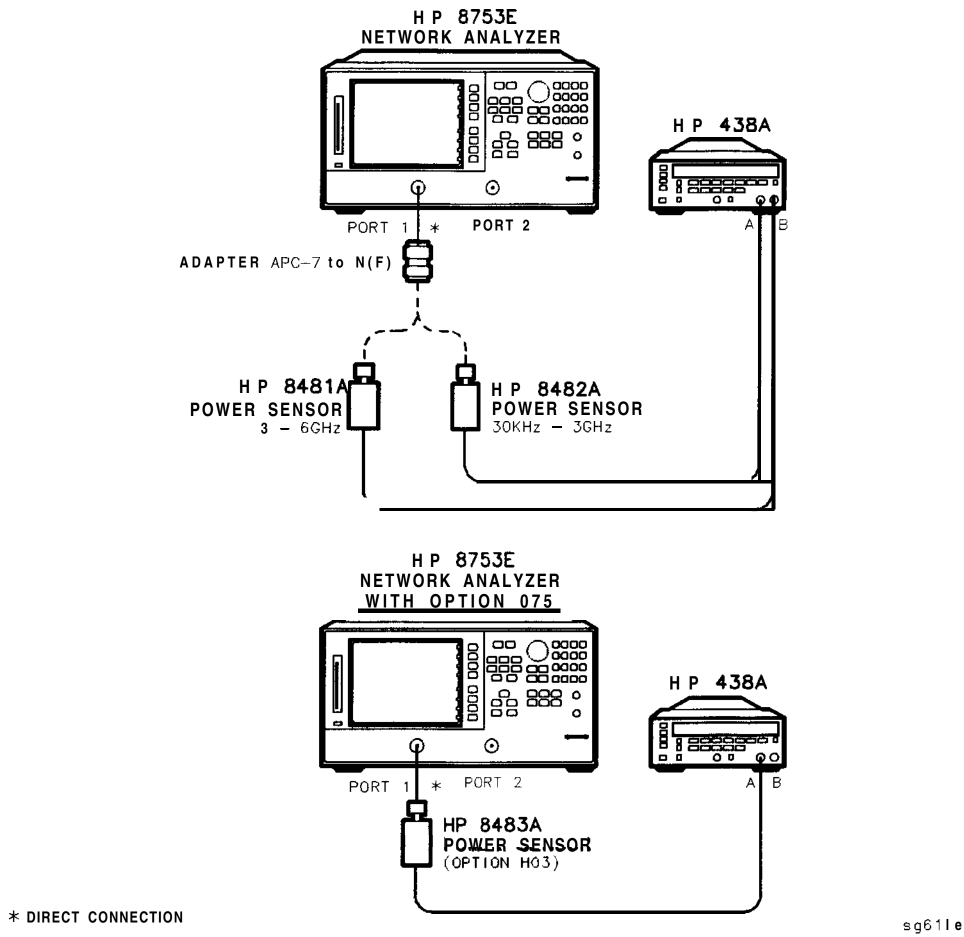



**Figure 2-11. Test Port Output Power Range and Accuracy Test Setup**

4. On the HP 438A, press (REL). This sets the current power level for relative power measurement.

5. On the network analyzer, press (Menu) POWER PWR RANGE MAN (−15) (x1).

6. Write the power meter reading in the "Results Measured" column on the "Performance Test Record."

7. Calculate the difference between the analyzer test port power (which appears on the analyzer's display) and the power meter reading. Write the result in the "Power Level Linearity" column on the "Performance Test Record."

8. Repeat steps 5 through 7 for the other power levels listed in the "Performance Test Record."

9. After all required power levels have been measured, press (0) (x1) to reset power to 0 dBm.

10. Press (Menu) CW FREQ (3) (G/n).

11. Set the power meter calibration factor for this CW frequency and press (REL) to set the reference at this new frequency.

12. Press (Menu) POWER (-15) (x1).

13. Write the power meter reading in the "Results Measured" column on the "Performance Test Record."

14. Calculate the difference between the analyzer test port power and the power meter reading. Write the result in the "Power Level Linearity" column of the "Performance Test Record."

15. Repeat steps 11 through 13 for the other power levels listed in the "Performance Test Record."

16. Repeat steps 9 through 13 for 6 GHz using 8481A sensor.

## In Case of Difficulty

1. Ensure that the power meter and power sensor(s) are operating to specifications. Be sure you set the power meter calibration factor for the CW frequency that you are testing.

2. Verify that there is power coming out of the analyzer's test port 1. Be sure you did not accidentally switch off **the analyzer's** internal source. If you did so, press (Menu) **POWER SOURCE PWR ON**.

3. Repeat this performance test.

## 5. Minimum R Channel Level

### Specifications

| Frequency Range | Minimum R Channel Level |
|---|---|
| 300 kHz to 3 GHz | <−35 dBm |
| 3 GHz to 6 GHz[1] | <−30 dBm |

1 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

### Required Equipment for 50Ω Analyzers

Adapter, **APC-3.5** (m) to **APC-7** ................,.......... HP P/N 1250-1746
Cable, **APC-7 24-inch** ........................................ HP P/N 8120-4779

### Required Equipment for 75 ohm Analyzers (Option 075)

Minimum Loss Pad, **50Ω** to **75Ω** ....,............................... HP **11852B**
Cable, **50Ω** Type-N, **24-inch** .................................HP P/N 8120-4781
Adapter, **APC-3.5** (m) to Type-N **(f)** ......................... HP P/N 1250-1750

***Analyzer warmup time: 1 hour***

Perform this test to determine the minimum R channel input power level at which phase lock can be accomplished.

1. Connect the equipment as shown in Figure 2-12.

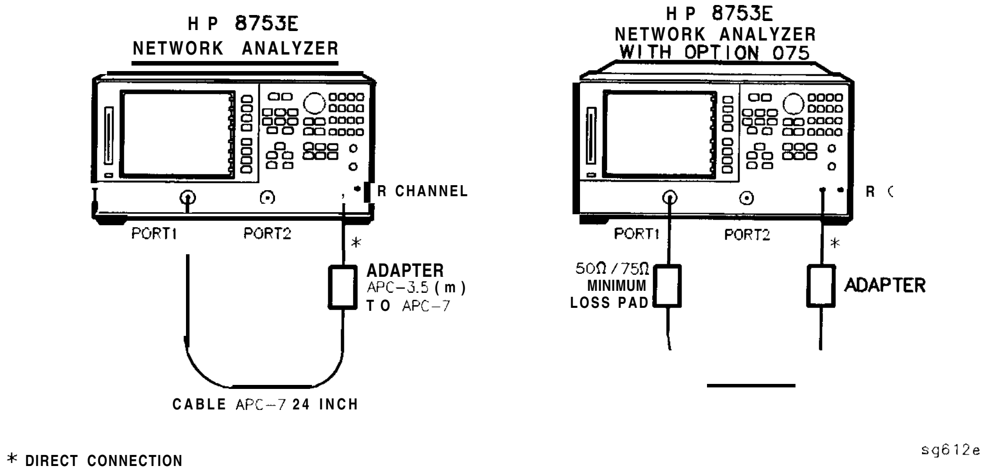



**Figure 2-12. Minimum R Channel Level Test Setup**

2. Press (Preset) (Meas) INPUT PORTS R.
3. Press (Menu) POWER PWR RANGE MAN POWER RANGES RANGE 4 -55 to -30.
4. Press (Scale Ref) REFERENCE VALUE (-70) (x1).
5. Press (Menu) CW FREQ (300) (k/m).
6. Press (Menu) POWER (-65) (x1).

   The analyzer displays the message CAUTION : NO IF FOUND : CHECK R INPUT LEVEL.
7. Press (⇧) to increase the test port power **by 1 dBm.**
8. If the analyzer displays a phase lock error **message,** continue increasing the test port power until phase lock is achieved.
9. Write the test port power, that is displayed on the analyzer, on the "Performance Test Record."
10. Repeat steps 5 through 9 for the other CW frequencies listed in the "Performance Test Record."

## In Case of **Difficulty**

1. Check the flexible RF cable **(W8,** as shown in Figure 2-13) between the R sampler assembly **(A4)** and the All phase lock assembly. Make sure it is connected between **A11J1** (PL IF IN) and **1st** IF Out.

---

Caution — ***Do not*** push cable **W8** down next to the All phase lock assembly.

---

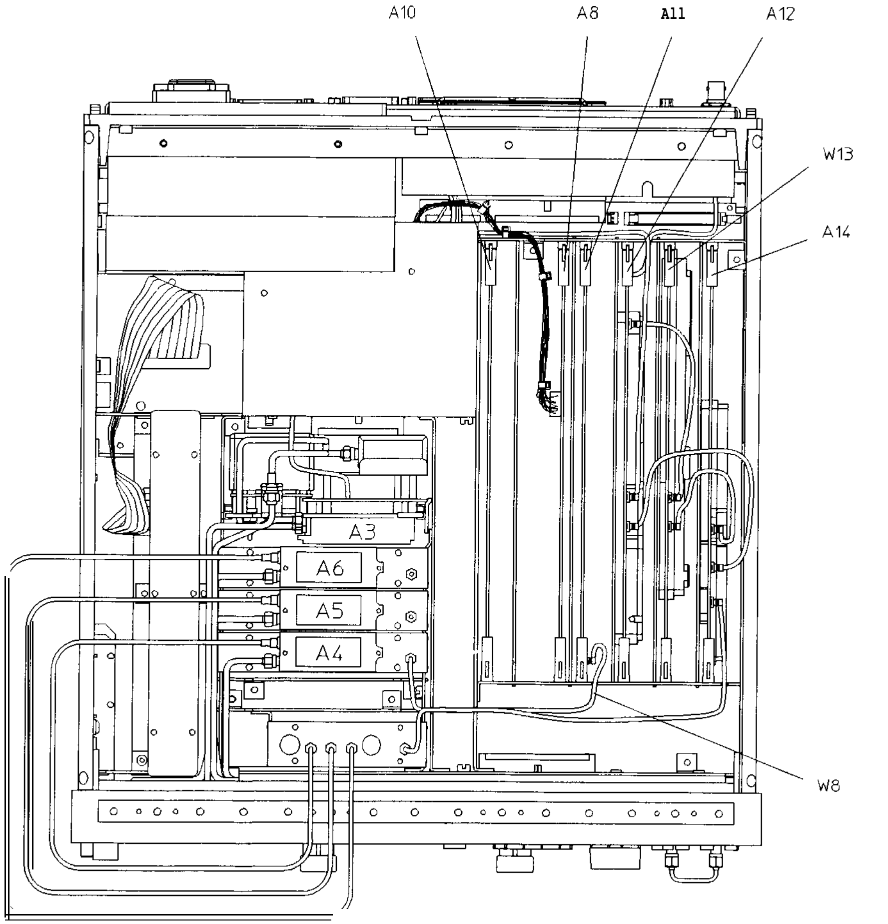



**Figure 2-13. Flexible RF Cable Location**

2. Using an ohmmeter, verify that the RF cable is not open. In addition, examine both the cable connectors-measure the resistance between the cable center pin and the cable connector and make sure it is ***not*** close to zero.

3. Check the R sampler by substituting it with the B sampler **(A6).**

   a. Move cable **W8** to the B sampler **(A6),** as shown in **Figure** 2-14.

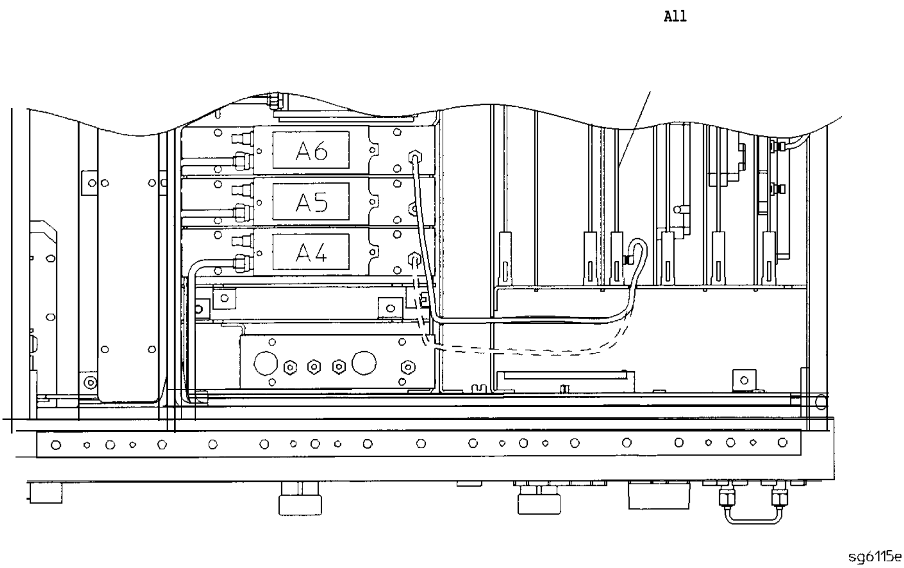



**Figure 2-14. Connections for Substituting the R Sampler (A4)**

4. Connect the equipment as shown in **Figure** 2-15.

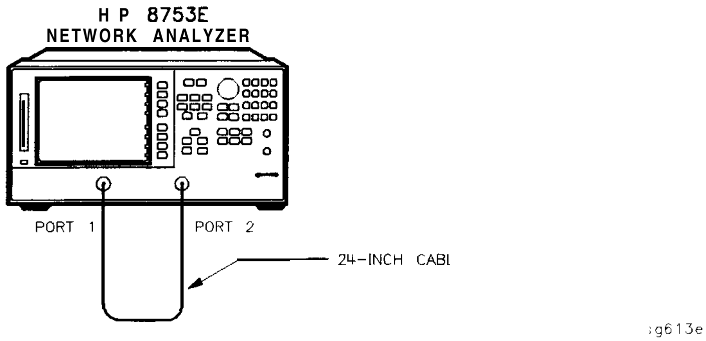



**Figure 2-15. Setup for Checking the R Sampler (A4)**

5. Repeat the test, but select the B sampler (A6) by pressing (Meas) INPUT PORTS B in step 2. Use the following specifications:

   **300 kHz** to 3 **GHz <−27 dBm**
   **3 GHz** to 6 **GHz <−22 dBm**

6. If the analyzer fails the test, replace the All assembly.
7. Verify that the **high/low** band adjustments are still within specifications For more information on how to perform this task, refer to the "High/Low Band Transition Adjustment" located in Chapter 3, "Adjustments and Correction Constants "
8. Refer to Chapter 7, "Source Troubleshooting," for more troubleshooting information.

# 6. Test Port Input Noise Floor Level

### Specifications

| Frequency Range | Test Port | IF Bandwidth | Average Noise Level |
|---|---|---|---|
| 300 kHz to 3.0 GHz | Port 1 | 3 kHz | -82 dBm |
| 300 kHz to 3.0 GHz | Port 1 | 10 Hz | -102 dBm |
| 300 kHz to 3.0 GHz | Port 2 | 3 kHz | -82 dBm |
| 300 kHz to 3.0 GHz | Port 2 | 10 Hz | -102 dBm |
| 3.0 GHz to 6.0 GHz[1] | Port 1 | 3 kHz | -77 dBm |
| 3.0 GHz to 6.0 GHz[1] | Port 1 | 10 Hz | -97 dBm |
| 3.0 GHz to 6.0 GHz[1] | Port 2 | 3 kHz | -77 dBm |
| 3.0 GHz to 6.0 GHz[1] | Port 2 | 10 Hz | -97 dBm |

1 Only for analyzer with Option 006 – 30 kHz to 6 GHz range.

### Equipment Required for 50Ω Analyzers

Calibration Kit, 7-mm ........................,...................... HP 85031B

### Equipment Required for 75 ohm Analyzers

Calibration Kit, Type-N ............................................ HP 85036B

***Analyzer warmup time:* 1 hour**

Perform this test to determine the HP 8753E port 1 and port 2 noise floor levels at the input test ports

## Port 1 Noise Floor Level from 300 kHz to 3 GHz (IF BW = 3 kHz)

1. Connect the equipment as shown in Figure 2-16.

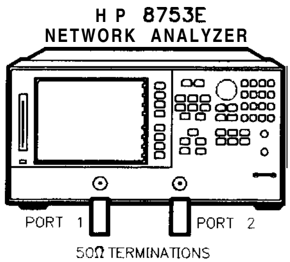



**Figure 2-16. Source Input Noise Floor Test Setup**

2. Press (Preset) (Avg) IFBW (3000) (x1) (Menu) POWER (-85) (x1) (Start) (300) (k/m) (Stop) (3) (G/n).
3. Press (Meas) INPUT PORTS A TESTPORT 2 (Format) LIN MAG (Scale Ref) AUTO SCALE.
4. Press (Marker Fctn) MARKER MODE MENU STATS ON (Menu) TRIGGER MENU SINGLE.
5. When the analyzer finishes the sweep, notice the mean value (which appears on the analyzer display).
6. Convert the measured linear magnitude mean value to log magnitude, using this equation.

*Power (dBm) = 20* * [log&near *magnitude mean* value)]

| Note | Notice that the mean value that is displayed on the analyzer is in $\mu$Units. So, for example, if the displayed value is 62 $\mu$U, the value that you would put in the equation is (62 x $10^{-6}$). |
|---|---|

7. Write this calculated value on the "Performance Test Record."

## Port 1 Noise Floor Level from 300 kHz to 3 GHz (IF BW = 10 Hz)

8. Press (Avg) IF BW (10) (x1) to change the IF bandwidth to 10 Hz.
9. Press (Menu) TRIGGER MENU SINGLE.
10. When the analyzer finishes the sweep, notice the mean value.
11. Convert the measured linear magnitude mean value to log magnitude, using this equation.

    $$Power\ (dBm) = 20 * [\log_{10}(linear\ magnitude\ mean\ value)]$$

12. Write this calculated value on the "Performance Test Record."

## Port 2 Noise Floor Level from 300 kHz to 3 GHz (IF BW = 10 Hz)

13. Press (Meas) INPUT PORTS B TESTPORT 1 (Format) LIN MAG.
14. Press (Menu) TRIGGER MENU SINGLE.
15. When the analyzer finishes the sweep, notice the mean value.
16. Convert the measured linear magnitude mean value to log magnitude, using this equation.

    $$Power\ (dBm) = 20 * [\log_{10}(linear\ magnitude\ mean\ value)]$$

17. Write this calculated value on the "Performance Test Record."

## Port 2 Noise Floor Level from 300 kHz to 3 GHz (IF BW = 3 kHz)

18. Press (Avg) **IF BW** (3) (k/m) to change the IF bandwidth to 3 **kHz.**
19. Press (Menu) **TRIGGER MENU SINGLE**.
20. When the analyzer **finishes** the sweep, notice the mean value.
21. Convert the measured linear magnitude mean value to log magnitude, using this equation.

$$Power\ (dBm) = 20 * [\log_{10}(linear\ magnitude\ mean\ value)]$$

22. Write this calculated value on the "Performance Test Record."
23. This completes the "Test Port Input Noise Floor Level" procedure if your analyzer does not have Option 006. Otherwise continue with the next section.

## Port 2 Noise Floor Level from 3 GHz to 6 GHz (IF BW = 3 kHz)

24. Press (Start) (3) (G/n) (Stop) (6) (G/n).
25. Press (Menu) **TRIGGER MENU SINGLE**.
26. When the **analyzer finishes** the sweep, notice the mean value.
27. Convert the measured linear magnitude mean value to log magnitude, using this equation.

$$Power\ (dBm) = 20 * [\log_{10}(linear\ magnitude\ mean\ value)]$$

28. Write this calculated value on the "Performance Test Record."

## Port 2 Noise Floor Level from 3 GHz to 6 GHz (IF BW = 10 Hz)

29. Press (Avg) IF BW (10) [xl] to change the IF bandwidth to 10 Hz.

30. Press (Menu) TRIGGER MENU SINGLE.

31. When the analyzer finishes the sweep, notice the mean value.

32. Convert the measured linear magnitude mean value to log magnitude, using this equation.

$$Power\ (dBm) = 20 * [\log_{10}(linear\ magnitude\ mean\ value)]$$

33. Write this calculated value on the "Performance Test Record."

## Port 1 Noise Floor Level for 3 GHz to 6 GHz (IF BW = 10 Hz)

34. Press (Meas) INPUT PORTS A TESTPORT 2.

35. Press (Menu) TRIGGER MENU SINGLE.

36. When the analyzer finishes the sweep, notice the mean value.

37. Convert the measured linear magnitude mean value to log magnitude, using this equation.

$$Power\ (dBm) = 20 * [\log_{10}(linear\ magnitude\ mean\ value)]$$

38. Write this calculated value on the "Performance Test Record."

## Port 1 Noise Floor Level from 3 GHz to 6 GHz (IF BW = 3 kHz)

39. Press (Avg) IF BW (3) (k/m).

40. Press (Menu) TRIGGER MENU SINGLE.

41. When the analyzer finishes the sweep, notice the mean value.

42. Convert the measured linear magnitude mean value to log magnitude, using this equation.

$$Power\ (dBm) = 20 * [\log_{10}(linear\ magnitude\ mean\ value)]$$

43. Write this calculated value on the "Performance Test Record."

## In Case of Difficulty

1. Perform the "ADC Linearity Correction Constants (Test 52)," located in Chapter 3, "Adjustments and Correction Constants"
2. Repeat the "Test Port Input Noise Floor Level" procedure.
3. Suspect the A10 Digital IF assembly if the analyzer fails both test port input noise floor tests.
4. Refer to Chapter 8, "Receiver Troubleshooting," for more troubleshooting information.

# 7. Test Port Input Frequency Response

## Specifications

| Frequency Range | Test Port | Input Frequency Response |
|---|---|---|
| 300 kHz to 3 GHz | Port 1 | ±1 dB |
| 300 kHz to 3 GHz | Port 2 | ±1 dB |
| 3 GHz to 6 GHz[1] | Port 1 | ±2 dB |
| 3 GHz to 6 GHz[1] | Port 2 | ±2 dB |

1 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

### Equipment Required for 50Ω Analyzers

Power Meter .......................................... HP 436A/437B/438A
Power Sensor .......................................... HP 8482A
Cable, APC-7 24-inch .......................................... HP P/N 81204779
Adapter, APC-7 to Type-N (f) .......................................... HP 11524A

### Additional Equipment Required for Analyzers with Option 006

Power Sensor .........,............,.......................... HP 8481A

### Equipment Required for 75Ω Analyzers

Power Meter .......................................... HP 436A/437B/438A
Power Sensor .......................................... HP 8483A Option H03
Cable, Type-N .......................................... HP P/N 8120-2408

***Analyzer warmup time:*** **1 hour**

Perform this test to examine the vector sum of all test setup error vectors in both magnitude and phase change as a function of frequency.

## Power Meter Calibration for Test Port 1 from 300 kHz to 3 GHz

1. Zero and calibrate the power meter.
2. Connect the equipment as shown in Figure 2-17.

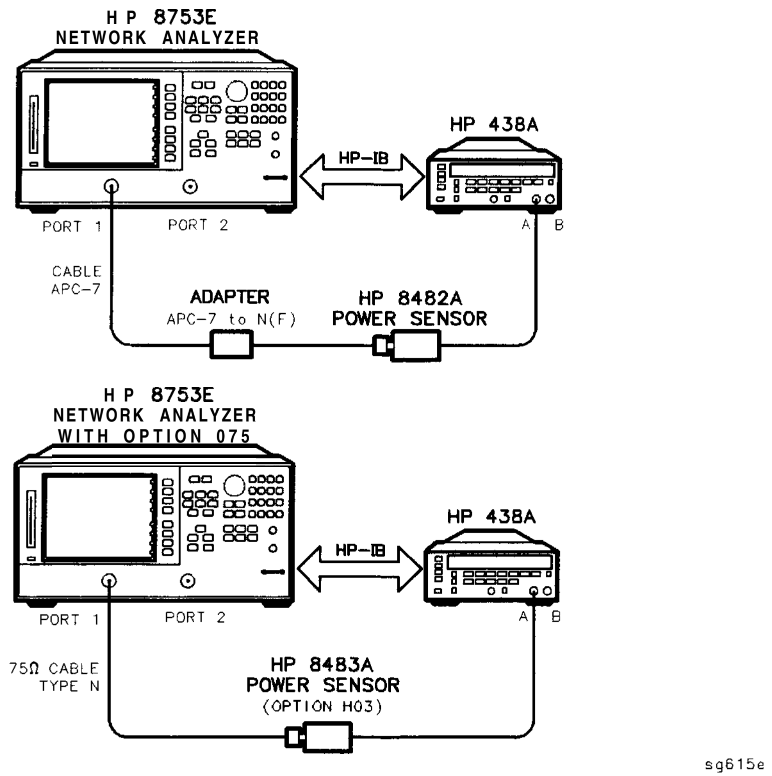



**Figure 2-17. Setup for Power Meter Calibration on Test Port 1**

3. Press (Preset) (Start) (300) (k/m).
4. **Only for Analyzers with Option 006: Press (Stop) (3) (G/n).**
5. Press (Local) SYSTEM CONTROLLER.
6. Press SET ADDRESSES and POWER MTR until the analyzer shows the correct power meter model.

7. Press **ADDRESS: P MTR/HPIB**. The default power meter HP-IB address is 13. Make sure it is the same as your power meter HP-IB address. Otherwise, use the analyzer front panel keypad to enter the correct HP-IB address for your power meter.

8. Press (Menu) **NUMBER of POINTS** (51) (x1).

9. Press **POWER** **PWR RANGE MAN** to turn the auto power range off.

---

Note — The analyzer displays the **PRm** annotation, indicating that the analyzer power range is set to MANUAL.

---

10. Press **PORT POWER** to uncouple the test port output power.

11. Press (Cal) **PWRMTR CAL**.

12. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR A**. Refer to the back of the power sensor to locate the different calibration factor values along with their corresponding frequencies.

---

Note — The analyzer's calibration factor sensor table can hold a *maximum* of 12 calibration factor data points

---

The following softkeys are included in the sensor calibration factor entries menu:

| | |
|---|---|
| **SEGMENT** | press to select a point where you can use the front panel knob or entry keys to enter a value. |
| **EDIT** | press to edit or change a previously entered value. |
| **DELETE** | press to delete a point from the sensor calibration factor table. |
| **ADD** | select this key to add a point into the sensor calibration factor table. |
| **CLEAR LIST** | select this key to erase the entire sensor calibration factor table. |
| **DONE** | select this key when done entering points to the sensor calibration factor table. |

As an example, the following are the keystrokes for entering the first two calibration factor data points for the HP 8482A power sensor (assuming CF% = 96.4 at 100 kHz and CF% = 98.4 at 300 kHz):

a. From the sensor calibration factor entries menu, press ADD.

b. Press FREQUENCY (100) (k/m). If you make an entry error, press (←) and re-enter the correct value again.

c. Press CAL FACTOR (96.4) (x1).

d. Press DONE to terminate the first calibration factor data point entry.

e. To enter the second cal factor data point, press ADD.

f. Press FREQUENCY (300) (k/m).

g. Press CAL FACTOR (98.4) (x1).

h. To terminate the second calibration factor data point entry, press DONE.

i. Press SEGMENT and use the front panel knob to scroll through the sensor calibration factors table. Check to be sure all values are entered correctly. If you spot an error, use the front panel knob to point to the data point you want to modify and press EDIT.

13. Press the appropriate softkeys to create a power sensor calibration factors table.
14. Press DONE to exit the sensor calibration factor entries menu.
15. Press RETURN ONE SWEEP TAKE CAL SWEEP to start the power meter calibration.

    Wait until the analyzer finishes the sweep, then continue with this procedure.

---

**Note** The analyzer displays the PC annotation, indicating the power meter calibration is done and the error correction is active.

---

## Test Port 2 Input Frequency Response from 300 kHz to 3 GHz

16. Connect the equipment as shown in Figure 2-18.

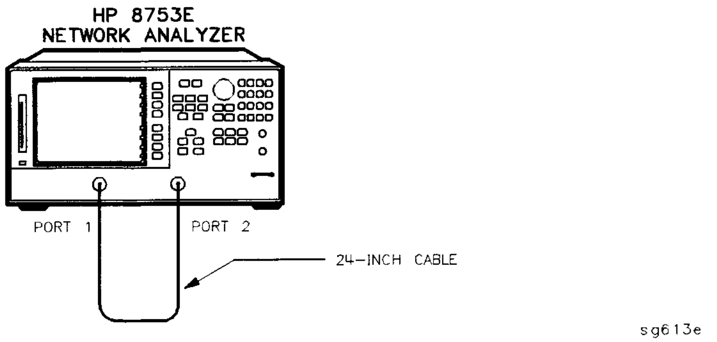



**Figure 2-18. Test Port 2 Input Frequency Response Test Setup**

17. Press (Meas) INPUT PORTS B.
18. Press (Scale Ref) SCALE/DIV (1) (x1).
19. Press (Marker) MARKER 1 (Marker Fctn) MKR SEARCH SEARCH:MIN to put marker 1 at the minimum magnitude location of the trace.
20. Press (Marker) MARKER 2 (Marker Fctn) MKR SEARCH SEARCH:MAX to position marker 2 at the maximum magnitude location of the trace.
21. Write the marker 1 or marker 2 value (which appears on the analyzer display), whichever has the larger absolute magnitude, in the "Performance Test Record."

## Power Meter Calibration on Port 2 from 300 kHz to 3 GHz

22. Connect the equipment as shown Figure 2-19.

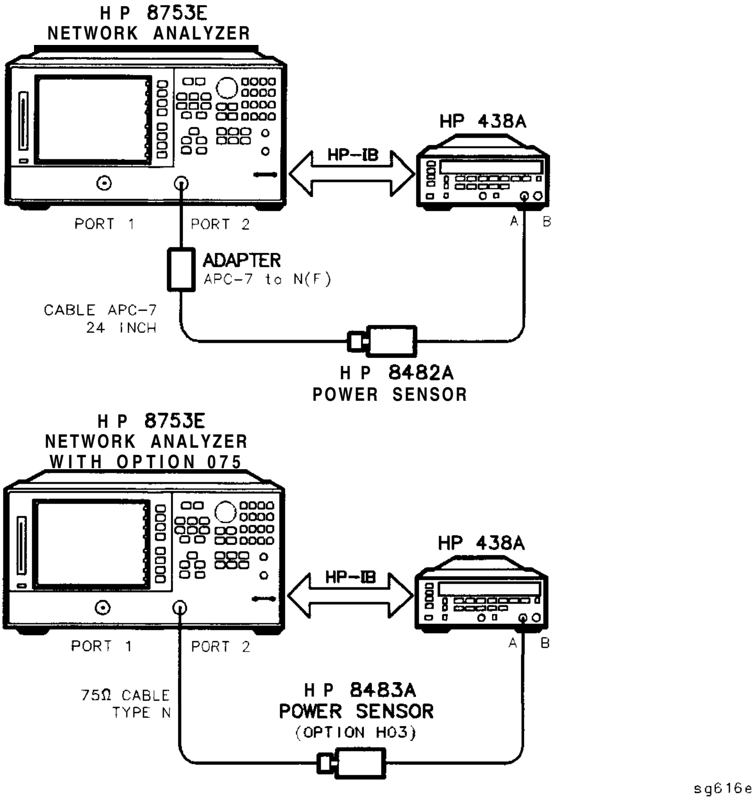



**Figure 2-19. Setup for Power Meter Calibration on Test Port 2**

23. Press (Meas) INPUT PORTS TESTPORT 2.

24. Press (Cal) PWRMTR ONE SWEEP TAKE CAL SWEEP to start the power meter calibration for test port 2.

25. When the analyzer displays the message POWER METER CALIBRATION SWEEP DONE, connect the equipment as shown as in Figure 2-20.

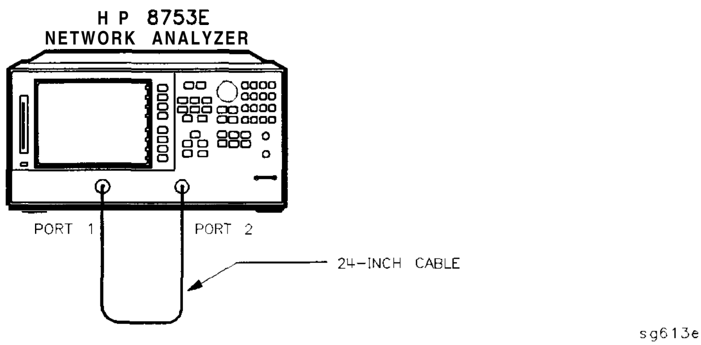



**Figure 2-20. Test Port 1 Input Frequency Response Test Setup**

## Test Port 1 Input Frequency Response from 300 kHz to 3 GHz

26. Press (Meas) INPUT PORTS A.
27. Press (Marker) MARKER 1 (Marker Fctn) MKR SEARCH SEARCH:MIN.
28. Press (Marker) MARKER 2 (Marker Fctn) MKR SEARCH SEARCH:MAX.
29. Write the marker 1 or marker 2 reading, whichever has the larger absolute magnitude, in the " Performance Test Record. "
30. This completes the "Test Port Input Frequency Response" procedure if your analyzer does not have Option 006. Otherwise continue with the next sections

## Power Meter Calibration for Test Port 2 from 3 GHz to 6 GHz

31. Replace the power sensor with the HP 8481A, and then setup the power meter:
    - If the power meter is an HP 438A, press (LCL).
    - If the power meter is an HP 437B, press (PRESET/LOCAL).
    - If the power meter is an HP 436A, cycle the line power.
32. Connect the equipment as shown in Figure 2-21.

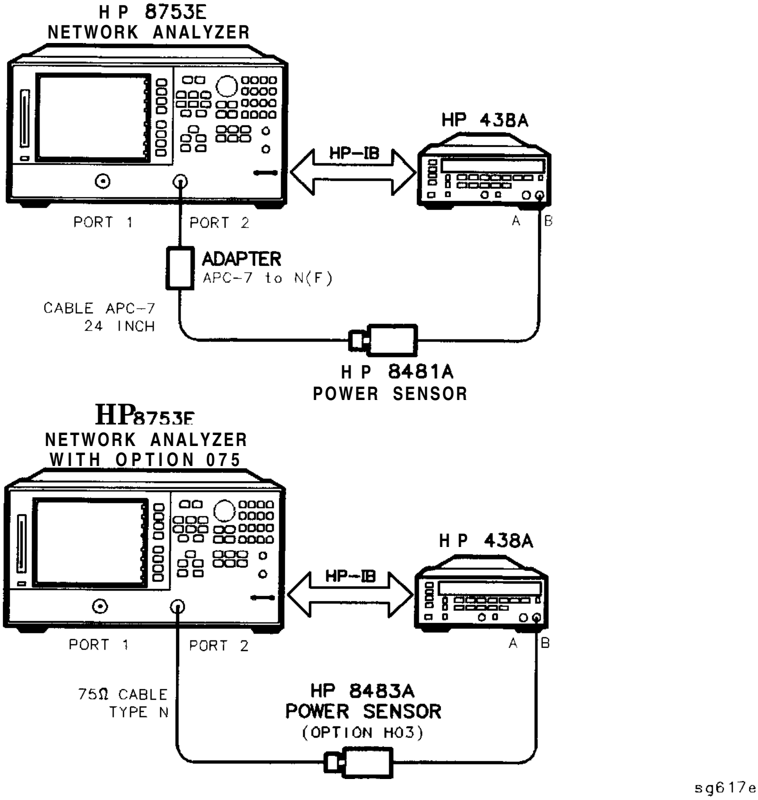



**Figure 2-21. Setup for Power Meter Calibration on Test Port 2**

33. Press (Start) (3) (G/n) (Stop) (6) (G/n).
34. Press (Cal) PWRMTR CAL.
35. Press LOSS/SENSR LISTS CAL FACTOR SENSOR B Repeat step 12 to build a calibration factor sensor table for the HP 8481A power sensor.
36. Press DONE to exit the sensor calibration factor entries menu.
37. To select the HP 8481A power sensor, press USE SENSOR B.
38. Press RETURN TAKE CAL SWEEP to start the power meter calibration.

## Test Port 1 Input Frequency Response from 3 GHz to 6 GHz

39. When the analyzer finishes the calibration sweep, connect the equipment as shown in Figure 2-22.

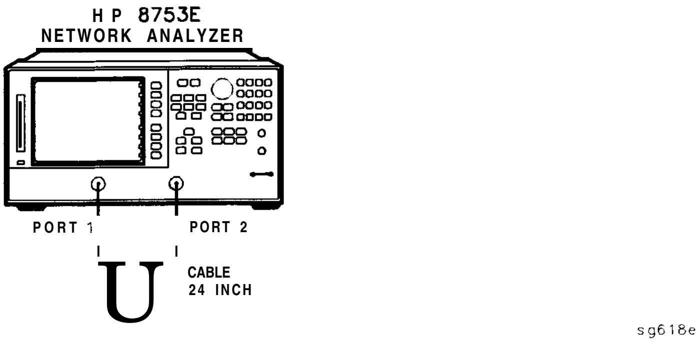



**Figure 2-22. Setup for Test Port 1 Input Frequency Response**

40. Press (Meas) **INPUT PORTS** **A**.
41. Press (Marker) **MARKER 1** (Marker Fctn) **MKR SEARCH** **SEARCH:MIN** to put marker 1 at the minimum magnitude location of the trace.
42. Press (Marker) **MARKER 2** (Marker Fctn) **MKR SEARCH** **SEARCH:MAX** to position marker 2 at the maximum magnitude location of the trace.
43. Write the marker 1 or marker 2 reading, whichever has the largest absolute magnitude, in the "Performance Test Record."

## Power Meter Calibration on Test Port 1 from 3 GHz to 6 GHz

44. Connect the equipment as shown in Figure 2-23.

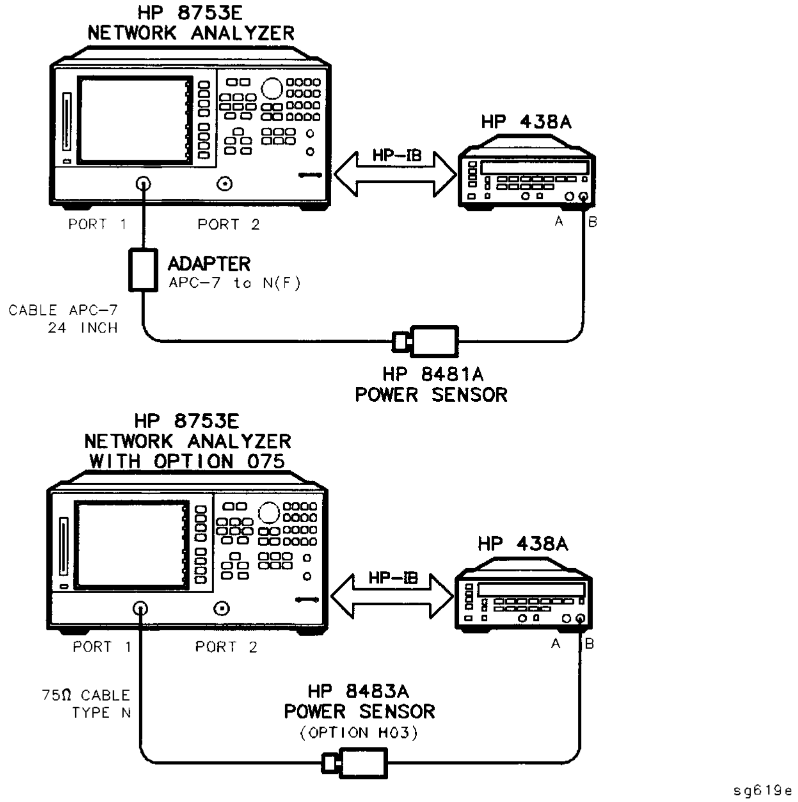



**Figure 2-23. Setup for Power Meter Calibration on Test Port 1**

45. Press (Meas) INPUT PORTS TESTPORT 1.

46. Press (Cal) PWRMTR ONE SWEEP TAKE CAL SWEEP to start the power meter calibration for output test port 1.

## Test Port 2 Input Frequency Response from 3 GHz to 6 GHz

47. When the analyzer displays the message POWER METER CALIBRATION SWEEP DONE, connect the equipment as shown as in Figure 2-24.

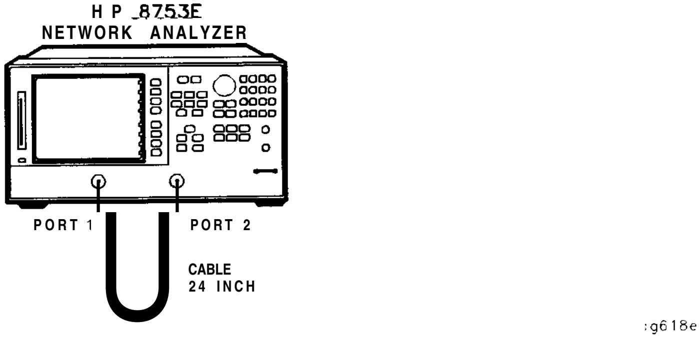



**Figure 2-24. Test Port 2 Input Frequency Response Test Setup**

48. Press (Meas) INPUT PORTS B.
49. Press (Marker) MARKER 1 (Marker Fctn) MKR SEARCH SEARCH:MIN.
50. Press (Marker) MARKER 2 (Marker Fctn) MKR SEARCH SEARCH:MAX.
51. Write the marker 1 or marker 2 reading, whichever has the largest magnitude, in the "Performance Test Record."

## In Case of Difficulty

1. Be sure you have used the correct power sensor for the frequency range.
2. Verify that the calibration factors that you have entered for the power sensors are correct.
3. Repeat this test with a "known good" through cable.

# 8. Test Port Crosstalk

## Specifications

| Frequency Range | Crosstalk[1] |
|---|---|
| 300 kHz to 3 GHz | 100 dB |
| 3 GHz to 6 GHz[2] | 90 dB |

1 At 25° C ±5° C.

2 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

### Required Equipment for 50 ohm Analyzers

Calibration Kit, 7-mm . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 85031B
Cable, APC-7 24-inch . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 8120-4779

### Required Equipment for 75Ω Analyzers

Calibration Kit, 75 ohm, Type-N . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP 85036B

***Analyzer warmup time: 1 hour***

Perform this test to verify the signal leakage between the analyzer's test ports.

1. Connect the equipment as shown in Figure 2-25.

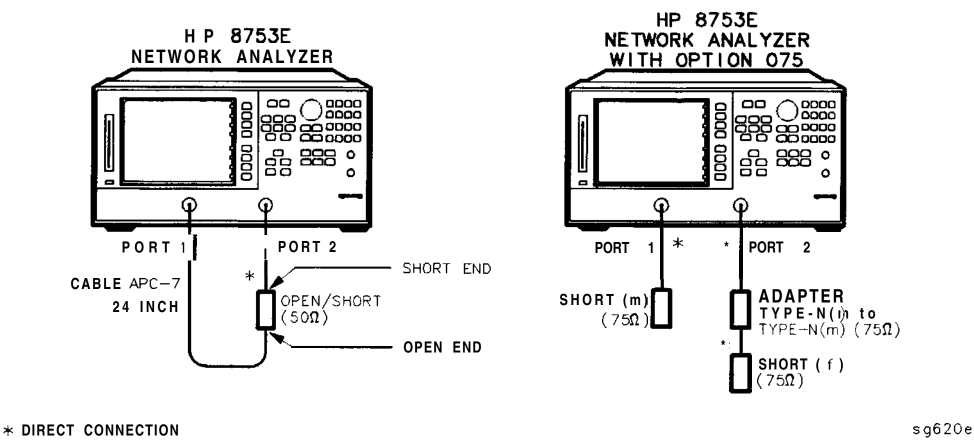



**Figure 2-25. Test Port Crosstalk Test Setup**

2. Press (Preset) (Menu) POWER (10) (x1).

3. Press (Avg) IF BW (10) (x1).

## Crosstalk to Test Port 2 from 300 kHz to 3 GHz

4. Press (Start) (300) (k/m) (Stop) (3) (G/n).

5. Press (Meas) Trans: FWD S21 (B/R).

6. Press (Scale Ref) REFERENCE VALUE (-100) (x1).

7. Press (Menu) TRIGGER MENU SINGLE.

8. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.

9. Write the marker value (which appears on the analyzer display) in the "Performance Test Record."

## Crosstalk to Test Port 1 from 300 kHz to 3 GHz

10. Press (Meas) Trans: REV S12 (A/R).

11. Press (Menu) TRIGGER MENU SINGLE.

12. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.

13. Write the marker value (which appears on the analyzer display) in the "Performance Test Record."

14. This completes the "Test Port Crosstalk" performance test if your analyzer does not have Option 006. Otherwise, proceed to the next section.

## Crosstalk to Test Port 1 from 3 GHz to 6 GHz

15. Press (Start) (3) (G/n) (Stop) (6) (G/n).

16. Press (Menu) TRIGGER MENU SINGLE.

17. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.

18. Write the marker value (which appears on the analyzer display) in the "Performance Test Record."

## Crosstalk to Test Port 2 from 3 GHz to 6 GHz

1. **Press** (Meas) Trans: FWD S21 (B/R).
2. **Press** (Menu) TRIGGER MENU SINGLE.
3. **Press** (Marker Fctn) MKR SEARCH SEARCH: MAX
4. Write the marker value (which appears on the analyzer display) in the "Performance Test Record."

## In Case of Difficulty

1. Remove the instrument top cover. Using an 8 lb-inch torque wrench, verify that *all* semirigid cables connected to the sampler/mixer assemblies are tight. In addition, tighten any loose screws on the sampler/mixer assemblies **(A4/5/6)** and the pulse generator assembly **(A7).**
2. Remove the instrument bottom cover. Refer to **Figure** 2-26. Verify that cables **W1, W31** and **W32** are tight.
3. Repeat this test.

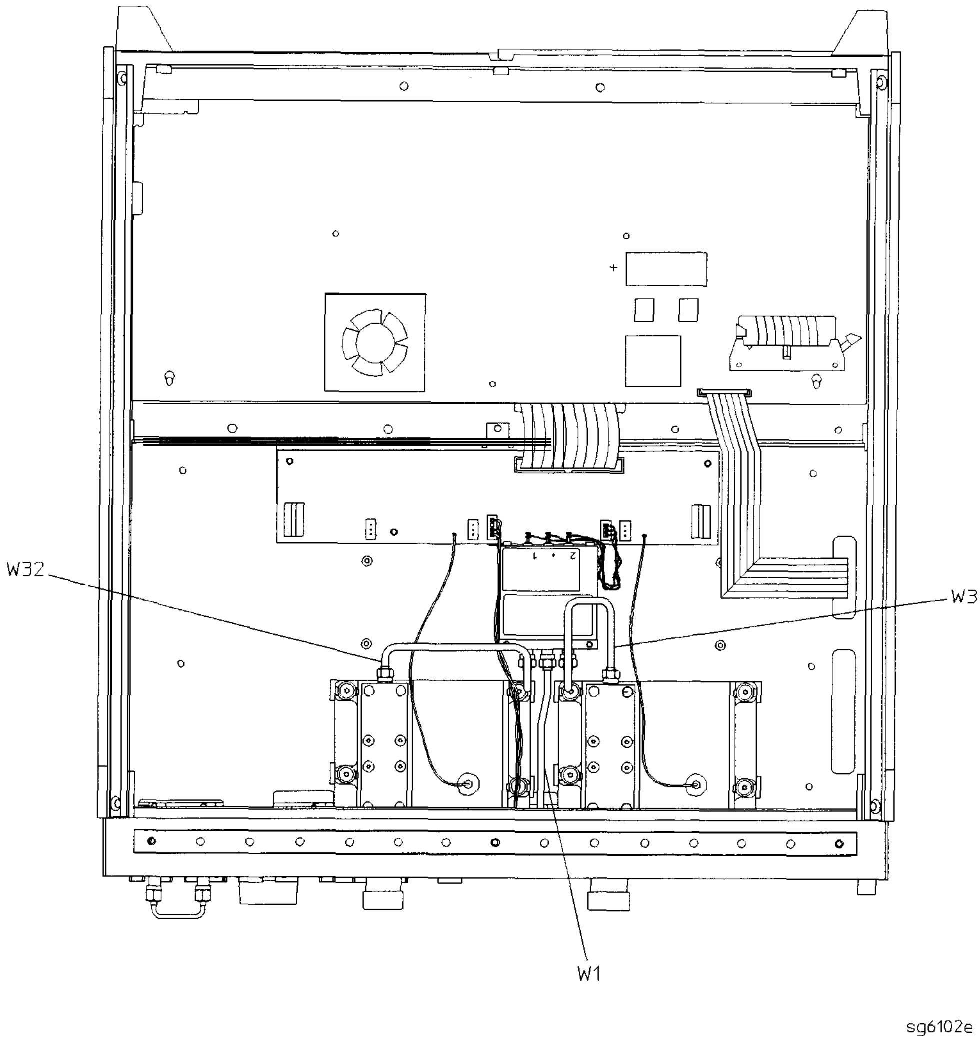



Figure 2-26. HP 8753E Bottom View

## 9. Calibration Coefficients

### Specifications

| Uncorrected[1] Error Terms | Frequency Range | | |
|---|---|---|---|
| | 300 kHz to 1.3 GHz | 1.3 GHz to 3 GHz | 3 GHz to 6 GHz[2] |
| Directivity | 35 dB | 30 dB | 25 dB |
| Source Match | 16 dB | 16 dB | 14 dB |
| Load Match | 18 dB | 16 dB | 14 dB |
| Transmission Tracking | ±1.5 dB | ±1.5 dB | ±2.5 dB |
| Reflection Tracking | ±1.5 dB | ±1.5 dB | ±2.5 dB |

1 At 25° ±5° C, with less than 1° C deviation from the measurement calibration temperature.

2 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

### Equipment Required for 50Ω Analyzers

Calibration Kit, 7-mm . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . , . . . . . . . . . HP 85031B
Cable, APC-7, 24-inch . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 81204779

### Equipment Required for 75Ω Analyzers

Calibration Kit, Type-N . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 85036B
Cable, Type-N, 24-inch . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 8120-4781

*Analyzer warmup time:* 30 minutes

Perform this procedure to verify the analyzer uncorrected test port characteristics.

**Note** The crosstalk calibration coefficients are omitted in this procedure. They are covered in the "Test Port Crosstalk" performance test.

## First Full 2-Port Calibration

1. Connect the equipment as shown in **Figure** 2-27.

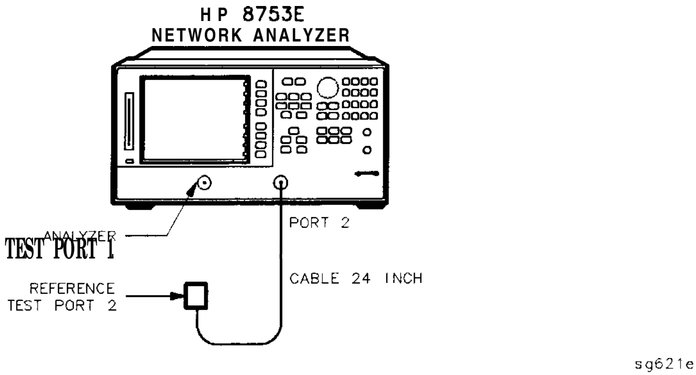



Figure 2-27. First Full **2-Port** Calibration **Test** Setup

2. **Press** (Preset) (Start) (300) (k/m).
3. **Press** (Cal) **CAL KIT** **SELECT CAL KIT** **CAL KIT:7mm** **RETURN** **RETURN** **CALIBRATE MENU** **FULL 2-PORT**.
4. **Press** **ISOLATION** **OMIT ISOLATION**.
5. Connect the "open" end of the open/short combination (supplied in the calibration kit) to analyzer test port 1.
6. **Press** **REFLECTION** **FORWARD:OPEN**.
7. Connect the "short" end of the open/short combination to analyzer test port 1.
8. **Press** **FORWARD:SHORT**.
9. Replace the open/short combination with the 50 ohm termination (supplied in the calibration kit).
10. **Press** **FORWARD:LOAD**.
11. Connect the "open" end of the open/short combination to the reference test port 2.

12. Press **REVERSE: OPEN**.

13. Connect the "short" end of the open/short combination to the reference test port 2.

14. Press **REVERSE: SHORT**.

15. Connect the 50 ohm termination to the reference test port 2.

16. Press **REVERSE: LOAD**.

17. Whentheanalyzer displays PRESS 'DONE' IF FINISHED WITH `STD(s)`, press **STANDARDS DONE**.

    Waitforthemessage COMPUTINGCAL COEFFICIENTS to disappearfromthe analyzer display before proceeding to the next step.

18. Connect the equipment as shown in Figure 2-28.

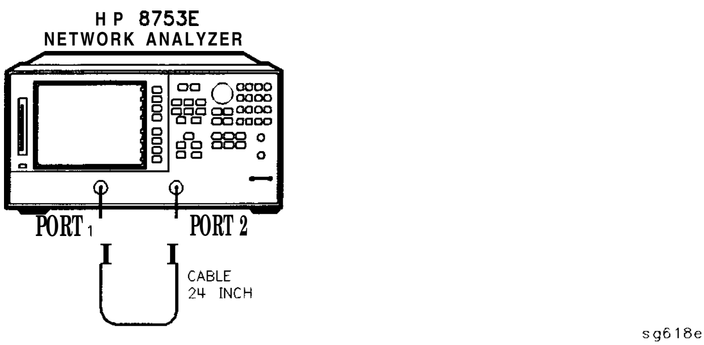



Figure 2-28. Transmission Calibration Test Setup

19. Press **TRANSMISSION** **DO BOTH FWD + REV**.

20. Press **DONE 2-PORT CAL**.

## Directivity (Forward) Calibration Coefficient

21. Press (System) SERVICE MENU TESTS (32) (x1) EXECUTE TEST.
22. When the analyzer finishes the test, press (Marker).
23. Using the front panel knob, locate the maximum value of the data trace for the 300 kHz to 1.3 GHz frequency range.
24. Write the maximum value in the "Performance Test Record."
25. Repeat the previous two steps for the other frequency range(s) listed on the "Performance Test Record."

## Source Match (Forward) Calibration Coefficient

26. Press (System) SERVICE MENU TESTS (33) (x1) EXECUTE TEST.
27. When the analyzer finishes the test, repeat steps 22 through 25.

## Transmission Tracking (Forward) Calibration Coefficient

28. Press (System) SERVICE MENU TESTS (37) (x1) EXECUTE TEST.
29. When the analyzer finishes the test, repeat steps 22 through 25.

## Reflection Tracking (Forward) Calibration Coefficient

30. Press (System) SERVICE MENU TESTS (34) (x1) EXECUTE TEST.
31. When the analyzer finishes the test, repeat steps 22 through 25.

## Load Match (Reverse) Calibration Coefficient

32. Press (System) SERVICE MENU TESTS (42) (x1) EXECUTE TEST.
33. When the analyzer finishes the test, repeat steps 22 through 25.

## Transmission Tracking (Reverse) Calibration Coefficient

34. Press (System) SERVICE MENU TESTS (43) (x1) EXECUTE TEST.
35. When the analyzer finishes the test, repeat steps 22 through 25.

## Second Full 2-Port Calibration

36. Connect the equipment as shown in Figure 2-29.

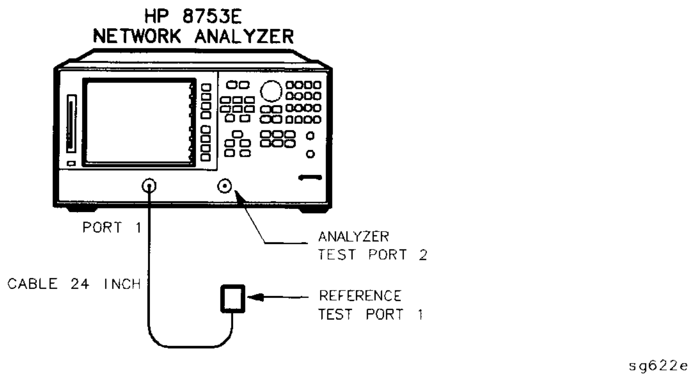



**Figure 2-29. Second Full 2-Port Calibration Test Setup**

37. Press (Preset) (Start) (300) (k/m).
38. Press (Cal) CAL KIT SELECT CAL KIT CAL KIT:7mm RETURN RETURN CALIBRATE MENU FULL 2-PORT.
39. Press ISOLATION OMIT ISOLATION.
40. Connect the "open" end of the open/short combination (supplied in the calibration kit) to reference test port 1.
41. Press REFLECTION FORWARD:OPEN.
42. Connect the "short" end of the open/short combination to reference test port 1.
43. Press FORWARD:SHORT.

44. Replace the open/short combination with the 50 ohm termination (supplied in the calibration kit).

45. Press **FORWARD:LOAD**.

46. Connect the "open" end of the open/short combination to the analyzer test port 2.

47. Press **REVERSE:OPEN**.

48. Connect the "short" end of the open/short combination to the analyzer test port 2.

49. Press **REVERSE: SHORT**

50. Connect the 50 ohm termination to the analyzer test port 2.

51. Press **REVERSE: LOAD**.

52. When the analyzer displays PRESS 'DONE' IF FINISHED WITH STD(s), press **STANDARDS DONE**.

    Wait for the message COMPUTING CAL COEFFICIENTS to disappear from the analyzer display before proceeding to the next step.

53. Connect the equipment as shown in Figure 2-30.

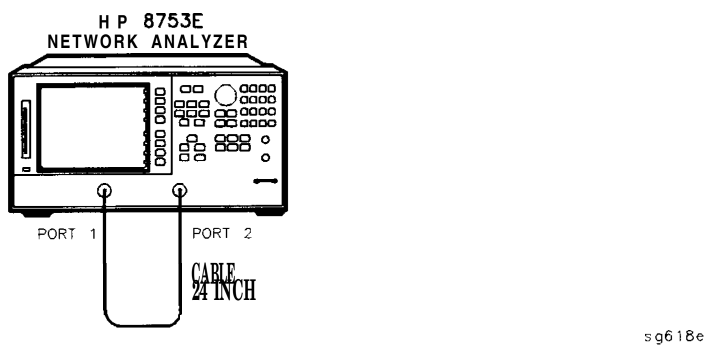



Figure 2-30. Transmission Calibration Test Setup

54. Press **TRANSMISSION** **DO BOTH FWD + REV**.

55. Press **DONE 2-PORT CAL**.

## Load Match (Forward) Calibration Coefficient

56. Press (System) SERVICE MENU TESTS (36) (x1) EXECUTE TEST.
57. When the test is done, press (Marker) MARKER 1.
58. Using the front panel knob, locate the maximum value of the data trace for the 300 kHz to 1.3 GHz frequency range.
59. Write the maximum value on the "Performance Test Record."
60. Repeat the previous three steps for the other frequency range(s) listed on the "Performance Test Record."

## Directivity (Reverse) Calibration Coefficient

61. Press (System) SERVICE MENU TESTS (38) (x1) EXECUTE TEST.
62. When the analyzer finishes the test, repeat steps 57 through 60.

## Source Match (Reverse) Calibration Coefficient

63. Press (System) SERVICE MENU TESTS (39) (x1). At the prompt, press EXECUTE TEST.
64. When the analyzer finishes the test, repeat steps 57 through 60.

## Reflection Tracking (Reverse) Calibration Coefficient

65. Press (System) SERVICE MENU TESTS (40) (x1) EXECUTE TEST.
66. When the analyzer finishes the test, repeat steps 57 through 60.

# 10. System Trace Noise (Only for Analyzers without Option 006)

| Frequency Range | Ratio | System Trace Noise **(Magnitude[1])** | System Trace Noise **(Phase[1])** |
|---|---|---|---|
| **30 kHz to 3 GHz** | A / R | **<0.006 dB** *rms* | **<0.038°** *rms* |
| *30* **kHz** to 3 **GHz** | B/R | **<0.006 dB** *rms* | **<0.038°** *rms* |

1 At **+ 5 dBm into** test port, 3 **kHz** IF bandwidth, and CW sweep.

Required Equipment for **50Ω** Analyzers

Cable, **APC-7, 24-inch** ........................................ HP P/N 8120-4779

Required Equipment for **75Ω** Analyzers

Cable, **75Ω,** Type-N **24-inch** .................................. HP P/N 8120-2408

***Analyzer** warmup time:* 1 hour

Perform this test to measure the system trace noise at a designated frequency in both the A/R and **B/R ratioed** measurements.

1. Connect the equipment as shown in Figure 2-31.

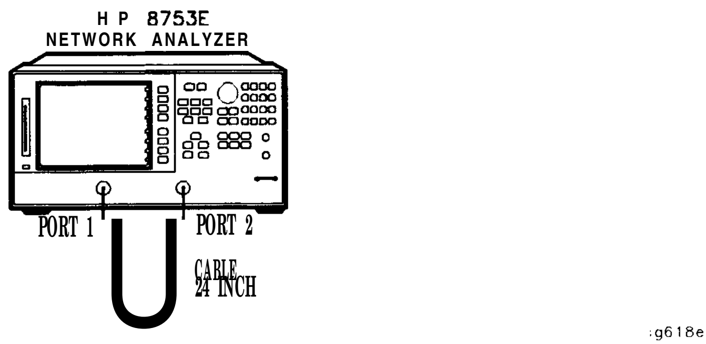



Figure 2-31. System Trace Noise **Test** Setup

2. **Press** (Preset) (Menu) **POWER** (5) (x1).

3. Press RETURN CW FREQ (3) (G/n) NUMBER of POINTS (1601) (x1).

4. Press (Marker Fctn) MARKER MODE MENU STATS ON to activate the instrument's statistic feature.

## System Trace Noise for A/R Magnitude

5. Press (Meas) Trans: REV S12 (A/R).

6. Press (Menu) TRIGGER MENU NUMBER of GROUPS (5) (x1).

7. When the analyzer displays the "Hld" annotation, press (Scale Ref) AUTO SCALE

8. Write the **s.dev** (standard deviation) value, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for A/R Phase

9. Press (Format) PHASE.

10. Press (Menu) TRIGGER MENU NUMBER of GROUPS (5) (x1).

11. When the analyzer finishes the number of sweeps, press (Scale Ref) AUTO SCALE.

12. Write the sdev value on the "Performance Test Record."

## System Trace Noise for B/R Magnitude

13. Press (Meas) Trans: FWD S21 (B/R).

14. Press (Menu) TRIGGER MENU NUMBER of GROUPS (5) (x1).

15. When the analyzer finishes the number of sweeps, press (Scale Ref) AUTO SCALE.

16. Write the sdev value on the "Performance Test Record."

## System Trace Noise for B/R Phase

17. Press (Format) **PHASE**.

18. Press (Menu) **TRIGGER MENU** **NUMBER of GROUPS** (5) (x1).

19. When the analyzer finishes the number of sweeps, press (Scale Ref) **AUTO SCALE**.

20. Write the sdev value on the "Performance Test Record."

## In Case of Difficulty

1. Perform the "ADC Offset Correction Constants" procedure, located Chapter 3, "Adjustments and Correction Constants."
2. Repeat this performance test.
3. Suspect the A10 Digital IF board assembly if the analyzer still fails the test.

## 11. System Trace Noise (Only for Analyzers with Option 006)

### Specifications

| Frequency Range | Ratio | System Trace Noise **(Magnitude[1])** | System Trace Noise **(Phase[1])** |
|---|---|---|---|
| *30* **kHz** to 3 **GHz** | A/R | **<0.006 dB rms** | **<0.038°** *rms* |
| *30* **kHz** to 3 **GHz** | B/R | **<0.006 dB rms** | **<0.038°** *rms* |
| **3 GHz to 6 GHz** | A/R | **<0.010 dB** rms | **<0.070°** *rms* |
| **3 GHz to 6 GHz** | B/R | **<0.010 dB** nns | **<0.070° rms** |

1 At + 5 **dBm** into test port, 3 **kHz** IF bandwidth, and CW sweep.

### Required Equipment

Cable, **APC-7, 24-inch** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 8120-4779

***Analyzer warmup time:* 1 hour**

Perform this test to measure the system trace noise at designated CW frequencies in both the A/R and B/R **ratioed** measurements.

1. Connect the equipment as shown in Figure 2-32.

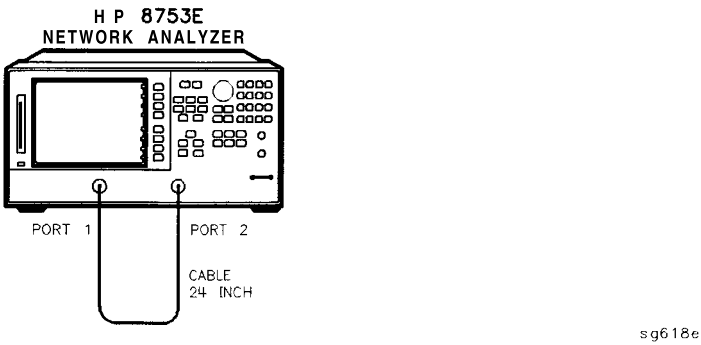



Figure **2-32.** System Trace Noise **Test** Setup

2. **Press** (Preset) (Menu) **POWER** (5) (x1) **RETURN** **NUMBER of POINTS** (1601) (x1).

3. Press (Marker Fctn) MARKER MODE MENU STATS ON to activate the instrument's statistic feature.

## System Trace Noise for A/R Magnitude from 30 kHz to 3 GHz

4. Press (Meas) Trans: REV S12 (A/R).
5. Press (Menu) CW FREQ (3) (G/n) TRIGGER MENU NUMBER of GROUPS (5) (x1).
6. When the analyzer finishes the number of sweeps, press (Scale Ref) AUTO SCALE.
7. Write the sdev (standard deviation) value shown, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for A/R Magnitude from 3 GHz to 6 GHz

8. Press (Menu) CW FREQ (6) (G/n) TRIGGER MENU NUMBER of GROUPS (5) (x1).
9. When the analyzer finishes the number of sweeps, press (Scale Ref) AUTO SCALE.
10. Write the s.dev value, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for A/R Phase from 3 GHz to 6 GHz

11. Press (Format) PHASE.
12. Press (Menu) TRIGGER MENU NUMBER of GROUPS (5) (x1).
13. When the analyzer finishes the number of sweeps, press (Scale Ref) AUTO SCALE
14. Write the s.dev value, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for A/R Phase from 30 kHz to 3 GHz

15. Press (Menu) **CW FREQ** (3) (G/n) **TRIGGER MENU** **NUMBER of GROUPS** (5) (x1).

16. When the analyzer finishes the number of sweeps, press (Scale Ref) **AUTO SCALE**.

17. Write the s.dev value, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for B/R Magnitude from 30 kHz to 3 GHz

18. Press (Meas) **Trans: FWD S21 (B/R)** (Menu) **TRIGGER MENU** **NUMBER of GROUPS** (5) (x1).

19. When the analyzer finishes the number of sweeps, press (Scale Ref) **AUTO SCALE**.

20. Write the s.dev value, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for B/R Magnitude from 3 GHz to 6 GHz

21. Press (Menu) **CW FREQ** (6) (G/n) **TRIGGER MENU** **NUMBER of GROUPS** (5) (x1).

22. When the analyzer finishes the number of sweeps, press (Scale Ref) **AUTO SCALE**

23. Write the s.dev value, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for B/R Phase from 3 GHz to 6 GHz

24. Press (Format) **PHASE** (Menu) **TRIGGER MENU** **NUMBER of GROUPS** (5) (x1).

25. When the analyzer finishes the number of sweeps, press (Scale Ref) **AUTO SCALE**.

26. Write the s.dev value, which appears on the analyzer display, on the "Performance Test Record."

## System Trace Noise for B/R Phase from 30 kHz to 3 GHz

27. Press (Menu) CW FREQ (3) (G/n) TRIGGER MENU NUMBER of GROUPS (5) (x1).

28. When the analyzer finishes the number of sweeps, press (Scale Ref) AUTO SCALE.

29. Write the **s.dev** value, which appears on the analyzer display, on the "Performance Test Record."

## In Case of Difficulty

1. Perform the "ADC Offset Correction Constants" procedure, located in Chapter 3, "Adjustments and Correction Constants."
2. Repeat this performance test.
3. Suspect the **A10** Digital IF board assembly if the analyzer still fails the test.

# 12. Test Port Input Impedance

## Specifications

| Frequency Range | Test Port Input | Return Loss |
|---|---|---|
| 300 kHz to 1.3 GHz | Port 1 | ≥18 dB |
| 1.3 GHz to 3 GHz | Port 1 | ≥16 dB |
| 3 GHz to 6 GHz | Port 1 | ≥14 dB |
| 300 kHz to 1.3 GHz | Port 2 | ≥18 dB |
| 1.3 GHz to 3 GHz | Port 2 | ≥16 dB |
| 3 GHz to 6 GHz | Port 2 | ≥14 dB |

## Required Equipment for 50 ohm Analyzers

Cable, APC-7, 24-inch . . . . . . . . . . . . . . . . . . . . HP P/N 8120-4779
Calibration Kit, 7-mm . . . . . . . . . . . . . . . . . . . . HP 85031B

## Required Equipment for 75 ohm Analyzers

Cable, 75Ω, Type-N, 24-inch . . . . . . . . . . . . . . . . HP P/N 8120-2408
Calibration Kit, 75Ω, Type-N . . . . . . . . . . . . . . . . HP 85036B

*Analyzer warmup time:* 1 hour

Perform this test to measure the return loss of each input test port.

1. Connect the equipment as shown in Figure 2-33.

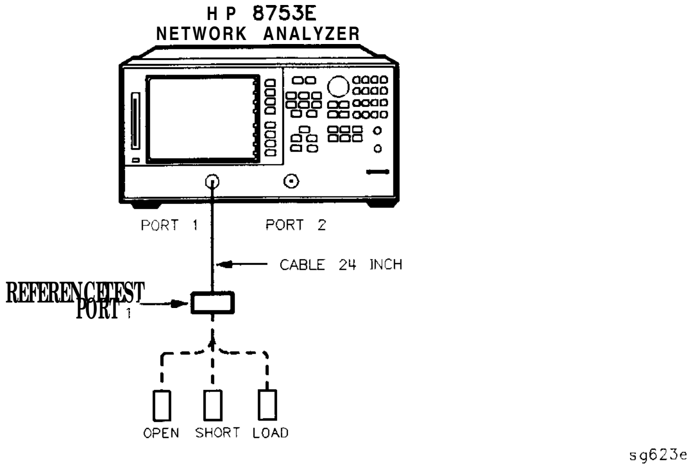



Figure 2-33. S11 1-Port Cal Test Setup

2. Press (Preset) (AVG) IF BW (3000) (x1) (Menu) NUMBER of POINTS (1601) (x1).
3. Press (Start) (300) (k/m).
4. Press (Cal) CAL KIT SELECT CAL KIT and select the appropriate calibration kit:
   - If your analyzer is 50Ω, press CAL KIT: 7mm.
   - If your analyzer is 75Ω, press CAL KIT: N 75Ω.
5. Press RETURN RETURN CALIBRATE MENU S11 1-PORT.
6. Connect an open to reference test port 1, as shown in Figure 2-33.
7. Press FORWARD: OPEN.
8. When the analyzer displays the prompt CONNECT STD THEN PRESS KEY TO MEASURE, connect a short to reference test port 1.
9. Press FORWARD: SHORT.
10. At the prompt, connect a load to reference test port 1.

11. Press **FORWARD: LOAD**.

12. When the analyzer displays 'DONE' IF FINISHED WITH CAL, press **DONE 1-PORT CAL**.

13. Press (Save/Recall) **SAVE STATE**.

14. Connect the equipment as shown in **Figure** 2-34.

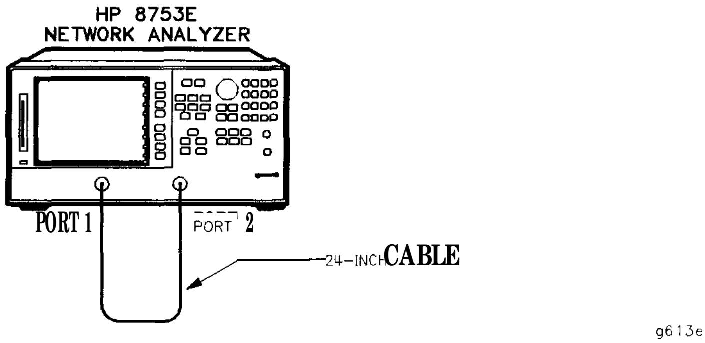



**Figure** 2-34. **Test** Port 2 Input Impedance **Test** Setup

15. Press (Marker) to turn the analyzer's marker 1 on. Use the front panel knob to locate the maximum value of the data trace for each of the frequency ranges listed in the "Performance Test Record."

16. Write these maximum values on the "Performance Test Record."

17. Connect the equipment as shown in Figure 2-35.

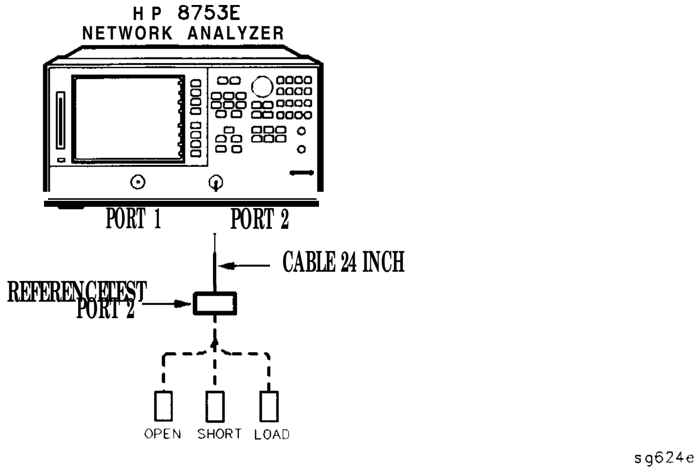



Figure 2-35. **S22** l-Port **Cal Test** Setup

18. Press (Cal) **CALIBRATE MENU** **S22 1-PORT**.
19. At the prompt, connect an open to reference test port 2, as shown in Figure 2-35.
20. Press **REVERSE: OPEN**.
21. When the analyzer displays the prompt CONNECT STD THEN PRESS KEY TO MEASURE, connect a short to reference test port 2.
22. Press **REVERSE: SHORT**.
23. At the prompt, connect a load to reference test port 2.
24. Press **REVERSE: LOAD**.
25. When the analyzer displays 'DONE' IF FINISHED WITH CAL, press **DONE 1-PORT CAL**.
26. Press (Save/Recall) **SAVE STATE** to save the l-Port calibration.
27. Connect the equipment as shown in **Figure** 2-36.

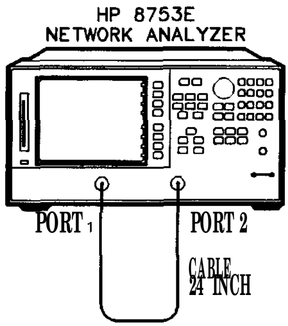



Figure 2-36. Test Port 1 Input Impedance Test Setup

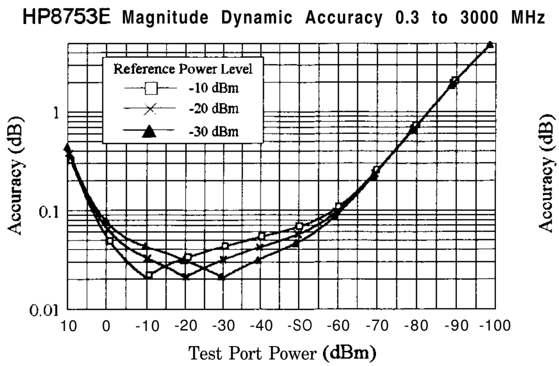
28. Press (Marker) to activate the analyzer's marker 1. Use the front panel knob to locate the maximum value of the data trace for each of the frequency ranges listed in the "Performance Test Record."
29. Write the maximum values on the "Performance Test Record."

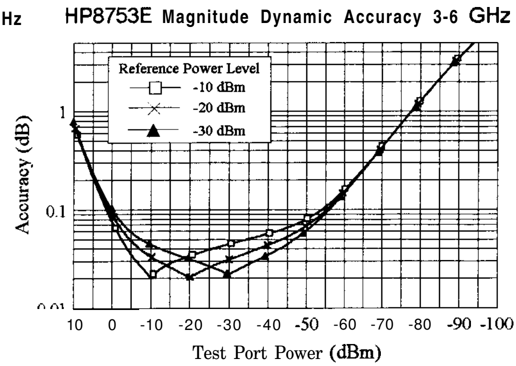
## In Case of Difficulty

1. Suspect the **A10** digital IF board assembly if the analyzer fails ***both*** test port tests.
2. Refer to Chapter 8, "Receiver Troubleshooting," for more troubleshooting information.

# 13. Test Port Receiver Magnitude Dynamic Accuracy

## Specifications




Required Equipment

Power Meter .............................................. HP 436A/437B/438A
Power Sensor ........................................................ HP 8482A
Step Attenuator, 110 dB ........................... HP 8496A Option 001, H18
(See notes on the following page.)
Adapter (2), APC-7 to Type-N (f) ................................. HP 11524A
Adapter, Type-N (f) to Type-N (f) .......................... HP P/N 1250-0777
Cable (3), 50Ω, Type-N, 24-inch ...................................... 8120-4781
Cable, HP-IB ........................................................ HP 10833A
Diskette, 3.5 inch ........................................................... any
Calibration Kit, Type-N, 50 Ω ........................................ HP 85032B

Additional Required Equipment for 75 ohm Analyzers

**Minimum Loss Pad (2), 50Ω to 75Ω** .................................. HP 11852B

***Analyzer warmup time:*** 1 hour

**Note** The HP 8496A step attenuator (Option 001, H18) comes with a special calibration that supports the measurement uncertainties expressed in the test record for this performance test.

The special calibration consists of two measurements The first is a measurement of the attenuation at each step. The data reported for this measurement have the following uncertainties:

- ±0.006 dB from 0 to 40 dB
- ±0.015 dB from >40 to 80 dB
- ±0.025 dB from >80 to 90 dB
- ±0.05 dB >90 dB

The second calibration measurement characterizes match stability between attenuator settings for each attenuator port. The vector difference of $S_{11}$ or ($S_{22}$) between the reference attenuation step and all the other steps is measured. The magnitude of this difference is certified to be ~0.0316 (>30 dB).

---

**Note** The HP 8496A used for this test will have known attenuator errors for attenuations up to 100 dB using a test frequency of 30 MHz. The attenuation used as a reference is 0 dB. If the available calibration data is not expressed as attenuation errors, it can be converted to such a form by the following equation:

(actual attenuation) – (expected attenuation) = attenuator error

Actual attenuation values that are greater than the expected attenuation values will result in positive errors Actual attenuation values that are less than the expected attenuation values will result in negative errors.

## Initial Calculations

1. Fill in the attenuator error values (referenced to 0 dB attenuation) in Table 2-1 by referring to the calibration data for the HP 8496A step-attenuator. Refer to the note on the previous page.
   a. Find the column in the HP 8496A attenuation error table that pertains to the attenuation errors for 30 MHz.
   b. Starting with the "10 dB" step in this column, write down the value in the corresponding space in Table 2-1 for column "B." This value should be placed in the row for the 10 dB HP 8496A setting.
   c. Continue transferring the remaining values of the HP 8496A attenuation errors to column "B" in Table 2-1.
2. In Table 2-1, transfer the 10 dB error value located within the parenthesis in column "B" to each space in column "C."

**Table 2-1.** Magnitude Dynamic Accuracy Calculations

| A | B | C | D (B − C) | E | F (E − D) |
|---|---|---|---|---|---|
| **8496A Attn. (dB)** | Attn. Error (ref 0 **dB**) | 10 **dB** Error **Value** | Attn. **Error** (ref 10 **dB**) | **Expected Measurement (dB)** | Expected **Measurement** (corrected) **(dB)** |
| 0 | **0 dB** | | | 10 | |
| 10 | (______) | | **0 dB** | 0 | |
| 20 | | | | – 10 | |
| 30 | | | | – 20 | |
| 40 | | | | -30 | |
| 50 | | | | – 40 | |
| 60 | | | | – 50 | |
| 70 | | | | -60 | |
| so | | | | – 70 | |
| 90 | | | | – 80 | |

3. The values in column "D" result from changing the reference attenuation of the calibration data of the HP 8496A to 10 dB.

Calculate the attenuation error values for this column by subtracting the **values** in column "C" from the values in column **"B"** (B – C = D).

4. The values in column "F" result from correcting the expected measurement value by the amount of attenuator error.

   Calculate the values in this column by subtracting the values in column "D" from the values in column **"E"** (E – D = **F).**

5. Transfer the values from column "F" in **Table 2-1** to column "F" in the "Performance **Test** Record" for both test ports.

## Power Meter Calibration

6. Zero and calibrate the power meter. (Refer to the power meter manual for details on this procedure.)

7. Connect the equipment as shown in Figure 2-37.

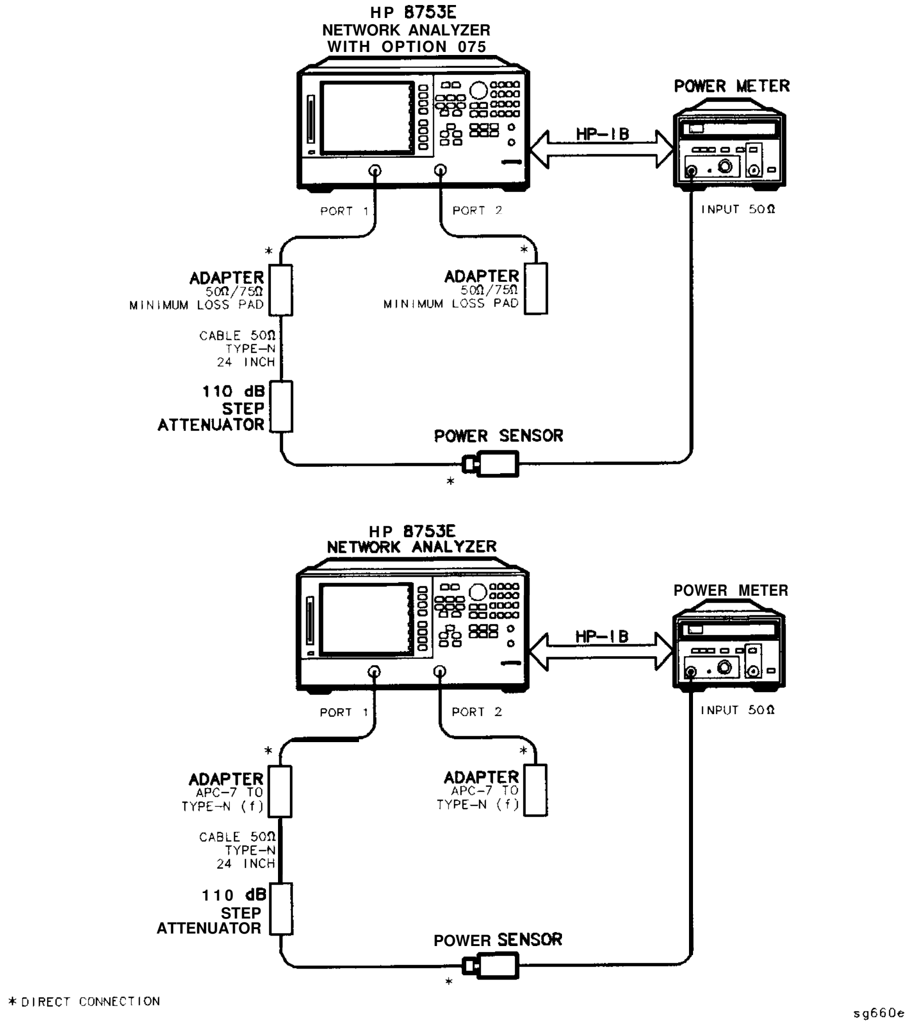



Figure 2-37. Power Meter Calibration for Magnitude Dynamic **Accuracy**

8. Set the HP 8496A to 10 dB.
9. Set the following analyzer parameters:

   (Preset) (Menu) CW FREQ (30) (M/μ)

   NUMBER of POINTS (51) (x1)

   POWER (−10) (x1)

   (Avg) IF BW (10) (x1)

10. Set up the HP 8753E for power meter calibration:
    a. Select the HP 8753E as the system controller:

       (Local..

       SYSTEM CONTROLLER

    b. Set the power meter's address:

       SET ADDRESSES

       ADDRESS: P MTR/HPIB (13) (x1)

    c. Select the appropriate power meter by pressing POWER MTR [ ] until the correct model number is displayed (HP 436A or HP 438A/437).
    d. Select the cal kit and enter the power sensor calibration data.

       (Cal) CAL KIT SELECT CAL KIT N50Ω

       (Cal) PWRMTR CAL LOSS/SENSOR LISTS CAL FACTOR SENSOR A (enter the power sensor calibration data for 30 MHz) DONE

11. Take a power meter calibration sweep.

    (Cal) PWRMTR CAL (−20) (x1)

    ONE SWEEP TAKE CAL SWEEP

12. Verify that the power meter reads approximately -20 dBm.

## Adapter Removal Calibration

13. Connect the equipment as shown in the Figure 2-38:

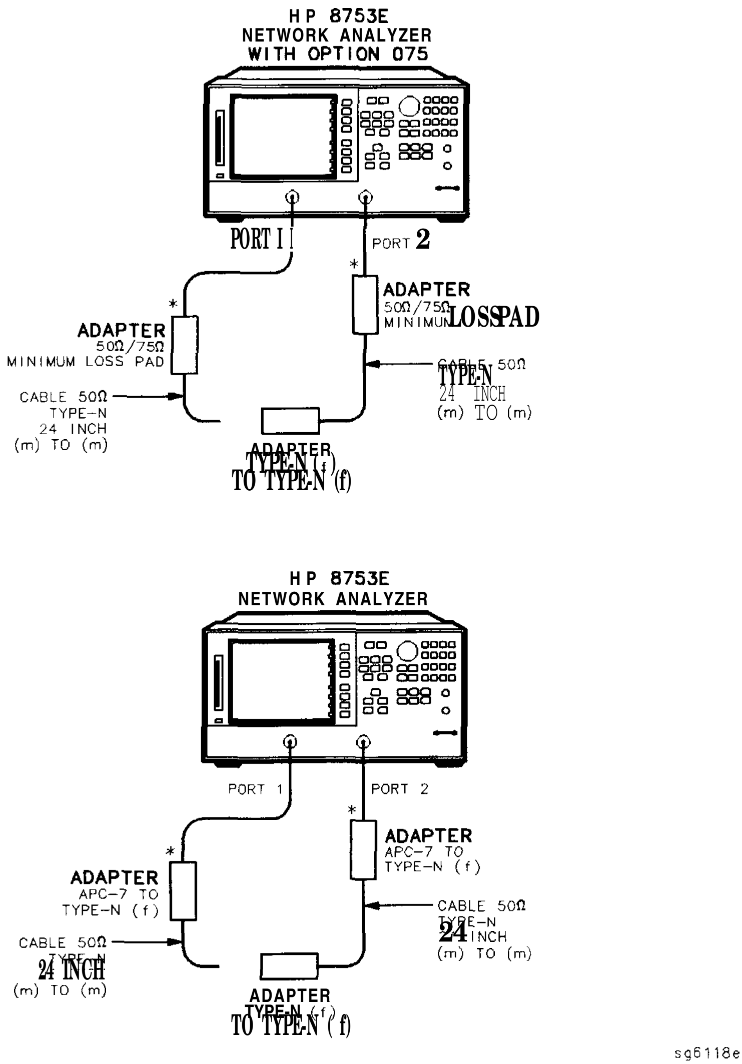



Figure 2-38. Full **2-Port** Calibration with Adapter Removal

14. Perform a full **2-port** error correction with isolation.

| **Note** | When you are performing error-correction for a system that has type-N test port connectors, the **softkey** menus label the sex of the test port connector-not **the calibration** standard connector. **For example, the label SHORT (F) refers to the short that will** be connected to the female *test port.* |
|---|---|

15. Save the results to disk. Name the **file "PORT1."**
16. Move the adapter to reference test port 1 and perform another **full 2-port** error correction.
17. Save the results to disk. Name the file **"PORT2."**
18. **Press** (Cal) **MORE ADAPTER REMOVAL RECALL CAL SETS**.
19. kom the disk directory, choose the **file "PORT1"and** press **RECALL CAL PORT 1**.
20. When this is complete, choose the **file "PORT2"** and press **RECALL CAL PORT 2**.
21. When complete, press **RETURN**.
22. **To enter the adapter delay, press ADAPTER DELAY** (.110) (G/n) **(default for** type-N adapter 1250-1777). The analyzer display will read 110 ps.
23. **Press ADAPTER COAX REMOVE ADAPTER.**
24. Save the results of the new **cal** set.

## Measure Test Port 2 Magnitude Dynamic Accuracy

25. Remove the type-N (f) to (f) adapter and connect the equipment as shown in Figure 2-39. **Confirm** that the step attenuator is set to 10 **dB.**

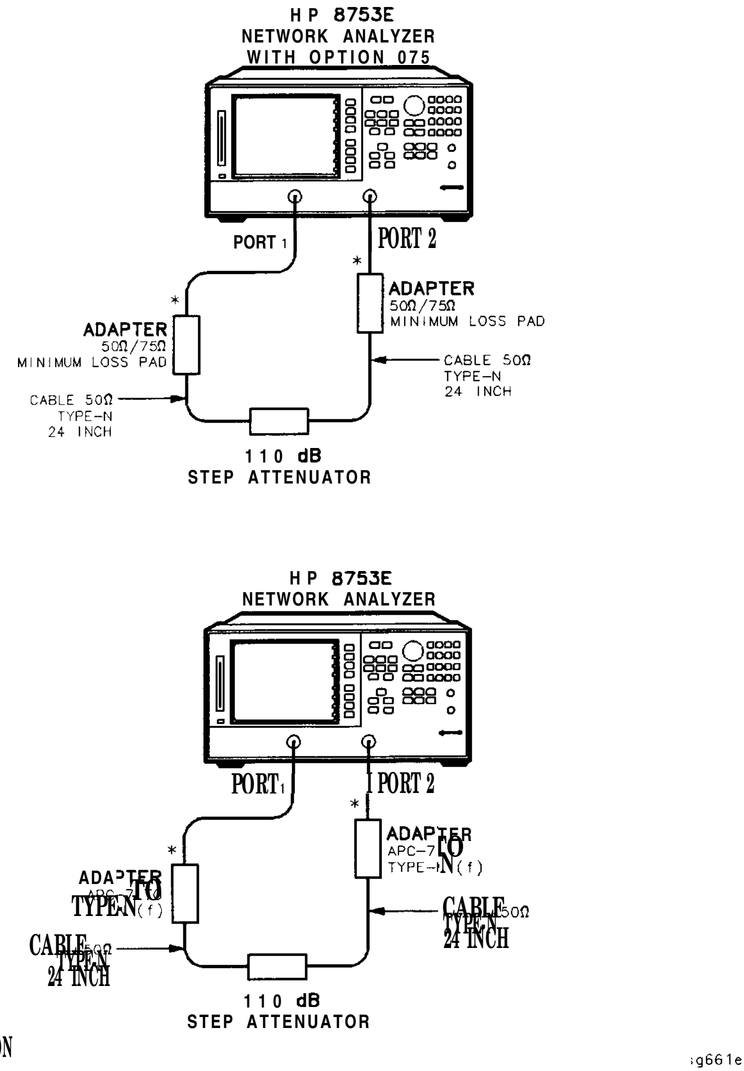



Figure **2-39.** Magnitude Dynamic Accuracy Measurement

26. To set up the dynamic accuracy measurement, press the following:

(Meas) Trans:FWD S21 (B/R)

(Marker Fctn) MKR MODE MENU STATS ON

(Menu) TRIGGER MENU SINGLE

27. Wait for the sweep to finish, then press (Display) DATA → MEM DATA/MEM.

28. Set the step attenuator to 0 dB.

29. Press (Menu) TRIGGER MENU SINGLE.

30. Write the mean value (which appears on the analyzer's display) in the "Test Port Measurement" cohunn of the "Performance Test Record." This column is also labeled "G."

31. Repeat steps 28 through 30 for each setting of the step attenuator.

32. Calculate dynamic accuracy for each step by using the formula |G − F|. Place these values in the appropriate column of the "Performance Test Record."

## Measure Test Port 1 Magnitude Dynamic Accuracy

33. Set the step attenuator to 10 dB.
34. To set up the dynamic accuracy measurement, press the following:

    (Meas) Trans:REV S12 (A/R)

    (Display) DATA

    (Menu) TRIGGER MENU SINGLE

35. Wait for the sweep to finish, then press (Display) DATA → MEM DATA/MEM.
36. Set the step attenuator to 0 dB.
37. Press (Menu) TRIGGER MENU SINGLE.
38. Write the mean value (which appears on the analyzer's display) in the "Test Port Measurement" column of the "Performance Test Record." This column is also labeled "G."
39. Repeat steps 36 through 38 for each setting of the step attenuator.
40. Calculate dynamic accuracy for each step by using the formula |G – F|. Place these values in the appropriate column of the "Performance Test Record."

## In Case of Difficulty

1. If the analyzer fails the test at ALL power levels, be sure you followed the recommended attenuator settings as listed in the "Performance Test Record." Repeat this performance test.
2. If both test port measured values are out of specifications:
   a. Recalibrate the power meter.
   b. Repeat this performance test.

3. If the analyzer fails either test port 2 or test port 1 dynamic accuracy at lower power levels:

   a. Perform the "IF Amplifier Correction Constants" and "ADC Offset Correction Constants" procedures (located in Chapter 3, "Adjustments and Correction Constants").

   b. Repeat this performance test.

   c. If it still fails, replace the A10 Digital IF assembly.

   d. Repeat the two adjustment procedures mentioned in this step and then repeat this performance test.

## 14. Test Port Receiver Magnitude Compression

Specifications

| Frequency Range | Test Port | Magnitude[1] |
|---|---|---|
| 300 kHz to 3 GHz | Port 1 | ≤0.45 dB |
| 3 GHz to 6 GHz[2] | Port 1 | ≤0.80 dB |
| 300 kHz to 3 GHz | Port 2 | ≤0.45 dB |
| 3 GHz to 6 GHz[2] | Port 2 | ≤0.80 dB |

1 With a 10 Hz IF bandwidth.

2 Only for analyzers with Option 006 – 30 kHz to 6 GHz range.

### Required Equipment for 50Ω Analyzers

Cable, APC-7, 24-inch .......................................... HP P/N 8120-4779

### Required Equipment for 75 ohm Analyzers

Cable, 75Ω, Type-N, 24-inch .................................. HP P/N 8120-2408

***Analyzer warmup time:* 1 hour**

Perform this test to verify the compression/expansion magnitude levels of the analyzer's test port receiver samplers.

## Test Port 2 Magnitude Compression

1. Connect the equipment as shown in Figure 2-40.

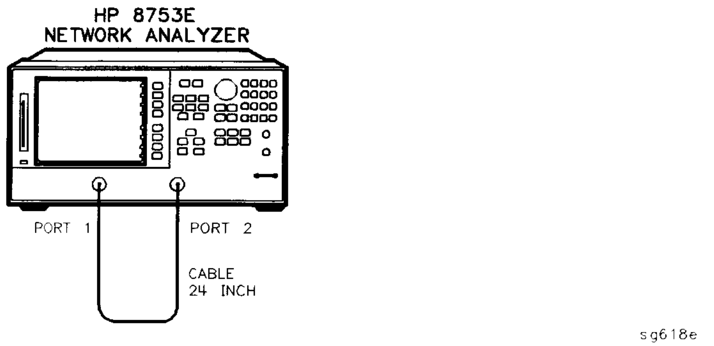



**Figure 2-40. Test Port Magnitude Compression Test Setup**

2. Press (Preset) (Meas) Trans: FWD S21 (B/R).
3. Press (Avg) IF BW (10) (x1).
4. Press (Menu) CW FREQ (50) (M/μ).
5. Press SWEEP TYPE MENU POWER SWEEP START (-10) (x1).
6. Press (Menu) TRIGGER MENU SINGLE.
7. At the end of the sweep, press (Scale Ref) AUTO SCALE.
8. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.
9. Press (Marker) MARKER 2 (Marker Fctn) MKR SEARCH SEARCH: MIN.
10. Press (Marker) ΔMODE MENU ΔREF = 1.
11. Write the absolute value of the marker 2 reading in the "Performance Test Record."
12. Press (Menu) CW FREQ (1) (G/n).
13. Press TRIGGER MENU SINGLE.

14. At the end of the sweep, press (Scale Ref) AUTO SCALE.

15. Press (Marker) MARKER ΔREF=1 (Marker Fctn) MKR SEARCH SEARCH: MAX.

16. Press (Marker) MARKER 2 (Marker Fctn) MKR SEARCH SEARCH: MIN.

17. Write the absolute **value** of marker 2 in the "Performance Test Record."

18. Repeat steps 12 through 17 for the other frequencies listed for Port 2 on the "Performance Test Record."

## Test Port 1 Magnitude Compression

19. Press (Meas) Trans: REV S12 (A/R).

20. Press (Menu) CW FREQ (50) (M/μ).

21. Press TRIGGER MENU SINGLE.

22. At the end of the sweep, press (Scale Ref) AUTO SCALE.

23. Press (Marker) MARKER ΔREF = 1 (Marker Fctn) MKR SEARCH SEARCH: MAX.

24. Press (Marker) MARKER 2 (Marker Fctn) MKR SEARCH SEARCH: MIN.

25. Write the absolute value of the marker 2 reading in the "Measured **Value**" column of the "Performance Test Record."

26. Repeat steps 20 through 25 for the other CW frequencies **listed** for Port 1 in the "Performance Test Record."

## In Case of Difficulty

1. If the analyzer fails "Test Port 2 Magnitude Compression":
   a. Repeat this test.
   b. Replace the **A6** B sampler assembly if the analyzer **still** fails the test.
2. If the analyzer fails **"Test** Port 1 Magnitude Compression":
   a. Repeat this test.
   b. Replace the **A5** A sampler assembly if the **analyzer still fails** the test.

# 15. Test Port Receiver Phase Compression

## Specifications

| CW Frequency | Test Port | Phase[1] |
|---|---|---|
| 300 kHz to 3 GHz | Port 1 | ≤6° |
| 3 GHz to 6 GHz[2] | Port 1 | ≤7.5° |
| 300 kHz to 3 GHz | Port 2 | ≤6° |
| 3 GHz to 6 GHz[2] | Port 2 | ≤7.5° |

1 With 10 Hz IF bandwidth.

2 Only for analyzer with Option 006 – 30 kHz to 6 GHz range.

## Required Equipment for 50Ω Analyzers

Cable, APC-7, 24-inch . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 8120-4779

## Required Equipment for 75 ohm Analyzers

Cable, 75 ohm, Type 24-inch . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 8120-2408

***Analyzer warmup time: 1 hour***

Perform this test to verify the compression/expansion phase relationships of the analyzer's test port receiver samplers.

## Test Port 2 Phase Compression

1. Connect the equipment as shown in Figure 2-41.

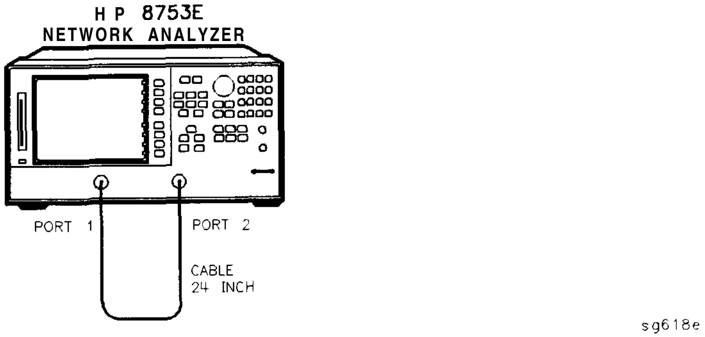



Figure 2-41. **Test** Port Phase Compression **Test Setup**

2. Press (Preset) (Meas) Trans: FWD S21 (B/R) (Format) PHASE.
3. Press (Avg) IF BW (10) (x1).
4. Press (Menu) SWEEP TYPE MENU POWER SWEEP START (-10) (x1).
5. Press (Menu) CW FREQ (50) (M/μ).
6. Press (Menu) TRIGGER MENU SINGLE.
7. At the end of the sweep, press (Scale Ref) AUTO SCALE.
8. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.
9. Press (Marker) MARKER 2 (Marker Fctn) MKR SEARCH SEARCH: MIN.
10. Press (Marker) ΔMODE MENU ΔREF = 1.
11. Write the absolute value of the marker 2 reading in the **"Measured Value" column** of the "Performance Test Record."
12. **Repeat** steps 5 to 11 for the other CW frequencies listed for Port 2 in the "Performance Test Record."

## Test Port 1 Phase Compression

13. Press (Meas) **Trans: REV S12 (A/R)** (Format) **PHASE**.
14. Press (Menu) **CW FREQ** (50) (M/μ).
15. Press (Menu) **TRIGGER MENU** **SINGLE**.
16. At the end of the sweep, press (Scale Ref) **AUTO SCALE**
17. Press (Marker) **MARKER ΔREF = 1** (Marker Fctn) **MKR SEARCH** **SEARCH: MAX**.
18. Press (Marker) **MARKER 2** (Marker Fctn) **MKR SEARCH** **SEARCH: MIN**.
19. Write the absolute value of the marker 2 reading in the "Measured Value" column of the "Performance Test Record."
20. Repeat steps 14 to 19 for the other CW frequencies listed for Port 1 in the "Performance Test Record."

## In Case of Difficulty

1. If the analyzer fails the "Test Port 2 Phase Compression" test:
   a. Repeat this test.
   b. Replace the **A6** B sampler assembly if analyzer still fails the test.
2. If the analyzer fails the "Test Port 1 Phase Compression" test:
   a. Repeat this test.
   b. Replace the **A5** A sampler assembly if analyzer still fails the test.

# 16. Test Port Output/Input Harmonics (Option 002 Analyzers without Option 006 Only)

## Specifications

| Test Port | Harmonic | Limit |
|---|---|---|
| output | **2nd** | **<–25 dBc @** + 10 **dBm** |
| Output | **3rd** | **<–25 dBc @** + 10 **dBm** |
| Input Port 1 | **2nd** | **<–15 dBc @ +8 dBm** |
| **Input** Port 1 | **3rd** | **<–30 dBc @ +8 dBm** |
| **Input** Port 2 | **2nd** | **<–15 dBc @ +8 dBm** |
| **Input** Port 2 | **3rd** | **<–30 dBc @ +8 dBm** |

Equipment Required for **50Ω** Analyzers

Cable, **APC-7, 24-inch** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N **8120-4779**
Attenuator **(2),** 20 **dB, APC-7** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP **8492A** Option 020

Equipment Required for 75 ohm Analyzers

Minimum Loss Pad (2) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP **11852B**
Cable, Type-N . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 8120-2408
Attenuator **(2),** 20 **dB, Type-N** . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP **8491A** Option 020

***Analyzer warmup time: 30*** minutes

Perform this test to determine the spectral purity of the HP 8753E input and output test ports

**Note** The **test** port input **3rd** harmonic specifications are better than the test port output **3rd** harmonic specifications

## Test Port Output Worst Case 2nd Harmonic

1. Press (Preset) (Menu) **POWER** (10) (x1).
2. Press (Start) (16) (M/μ) (Stop) (1.5) (G/n) to set the frequency range.
3. Press (Avg) **IF BW** (10) (x1) to set the IF bandwidth to 10 Hz.
4. Connect the equipment as shown in Figure 2-42.

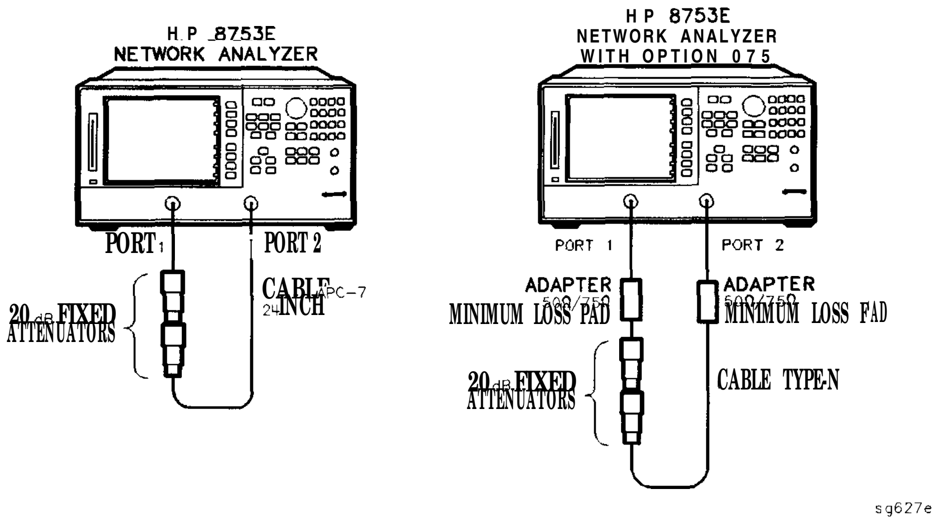



Figure 2-42. Test Port Output Harmonics Test Setup

5. Press (Meas) **Trans:REV S12 (A/R)** **INPUT PORTS** **A**.
6. After one sweep, press (Display) **DATA→MEMORY** **DATA/MEM** to normalize the trace.
7. Press (System) **HARMONIC MEAS** **HARMONIC SECOND**.
8. After one sweep, press (Scale Ref) **AUTO SCALE** to get a better viewing of the trace.
9. Press (Marker Fctn) **MKR SEARCH** **SEARCH MAX**.

10. Write the marker 1 value (which appears on the analyzer display) on the "Performance Test Record." This is the worst case test port output 2nd harmonic

## Test Port Output Worst Case 3rd Harmonic

11. Press (Stop) (1) (G/n) to change the stop frequency to 1 GHz.
12. Press (System) HARMONIC MEAS HARMONIC OFF.
13. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.
14. Press (Scale Ref) AUTO SCALE SCALE/DIV (1) (x1) to get a better viewing of the trace.
15. Press (System) HARMONIC MEAS HARMONIC THIRD.
16. After one sweep, press (Scale Ref) AUTO SCALE.
17. Press (Marker Fctn) MKR SEARCH SEARCH MAX.
18. Write the marker 1 value on the "Performance Test Record."

## Port 1 Input Worst Case 2nd Harmonic

19. Connect the equipment as shown in Figure 2-43.

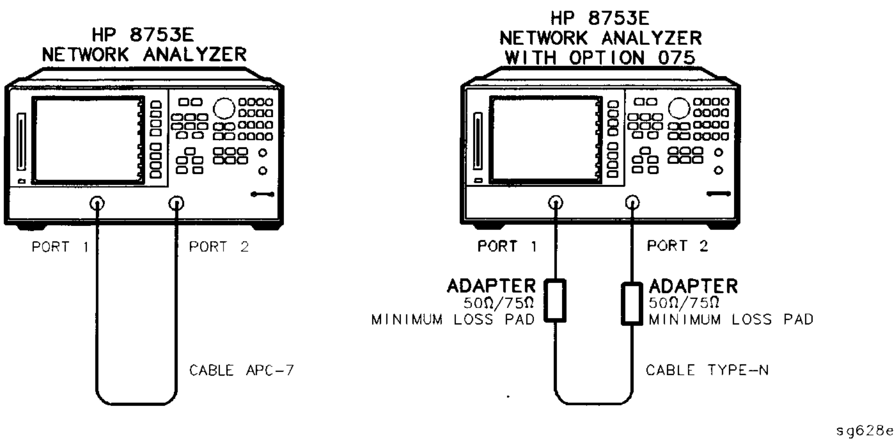



**Figure 2-43. Receiver Harmonics Test Setup**

20. Press (Preset) (Menu) **POWER** (8) (x1).
21. Press (Avg) **IF BW** (1) (0) (x1).
22. Press (Start) (16) (M/μ) (Stop) (1.5) (G/n) to set the frequency range.
23. Press (Meas) **Trans:REV S12 (A/R)** **INPUT PORTS** **A**.
24. After one sweep, press (Display) **DATA→MEMORY** **DATA/MEM** to normalize the trace.
25. Press (System) **HARMONIC MEAS** **HARMONIC SECOND**.
26. After one sweep, press (Scale Ref) **AUTO SCALE** to get a better viewing of the trace.
27. Press (Marker Fctn) **MKR SEARCH** **SEARCH MAX**.
28. Write the marker 1 value (which appears on the analyzer display) on the "Performance Test Record." This is the worst case port 1 input (receiver channel A) 2nd harmonic.

## Port 1 Input Worst Case 3rd Harmonic

29. Press (Stop) (1) (G/n) to change the stop frequency for measuring the receiver 3rd harmonic

30. Press (System) HARMONIC MEAS HARMONIC OFF.

31. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.

32. Press (Scale Ref) AUTO SCALE SCALE/DIV (1) (x1) to get a better viewing of the trace.

33. Press (System) HARMONIC MEAS HARMONIC THIRD.

34. After one sweep, press (Scale Ref) AUTO SCALE.

35. Press (Marker Fctn) MKR SEARCH SEARCH MAX.

36. Write the marker 1 value on the "Performance Test Record."

37. Press (System) HARMONIC MEAS HARMONIC OFF.

## Port 2 Input Worst Case 2nd Harmonic

38. Press (Stop) (1.5) (G/n) to set the stop frequency for measuring the 2nd harmonic

39. Press (Meas) Trans:FWD S21 (B/R) INPUT PORTS B.

40. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.

41. Press (System) HARMONIC MEAS HARMONIC SECOND.

42. After one sweep, press (Scale Ref) AUTO SCALE to get a better viewing of the trace.

43. Press (Marker Fctn) MKR SEARCH SEARCH MAX.

44. Write the marker 1 value (which appears on the analyzer display) on the "Performance Test Record." This is the worst case port 2 input (receiver channel B) 2nd harmonic

## Port 2 Input Worst Case 3rd Harmonic

45. Press (Stop) (1) (G/n) to change the stop frequency for measuring the receiver 3rd harmonic
46. Press (System) HARMONIC MEAS HARMONIC OFF.
47. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.
48. Press (Scale Ref) AUTO SCALE SCALE/DIV (1) (x1) to get a better viewing of the trace.
49. Press (System) HARMONIC MEAS HARMONIC THIRD.
50. After one sweep, press (Scale Ref) AUTO SCALE.
51. Press (Marker Fctn) MKR SEARCH SEARCH MAX.
52. Write the marker 1 value on the "Performance Test Record."

## 17. Test Port Output/Input Harmonics (Option 002 Analyzers with Option 006 Only)

### Specifications

| Test Port | Harmonic | Limit |
|---|---|---|
| Output | 2nd | <–25 dBc @ + 10 dBm |
| Output | 3rd | <–25 dBc @ +10 dBm |
| Input Port 1 | 2nd | <–15 dBc @ +8 dBm |
| Input Port 1 | 3rd | <–30 dBc @ +8 dBm |
| Input Port 2 | 2nd | <–15 dBc @ +8 dBm |
| Input Port 2 | 3rd | <–30 dBc @ +8 dBm |

### Equipment Required

Cable, APC-7, 24-inch . . . . . . . . . . . . . . . . . . . . . . . . . . , . . . . . . . . . . . . HP P/N 8120-4779
Attenuator (2), 20 dB . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 8492A Opt 020

*Analyzer warmup time:* 30 minutes

Perform this test to determine the spectral purity of the HP 8753E input and output test ports

**Note** The test port input 3rd harmonic specifications are *better* than the test port output 3rd harmonic specifications.

## Test Port Output Worst Case 2nd Harmonic

1. Press (Preset) (Menu) **POWER** (10) (x1) to set the test port power to + 10 **dBm.**
2. Press (Start) (16) (M/μ) (Stop) (3) (G/n) to set the frequency range.
3. Press (Avg) **IF BW** (10) (x1) to set the IF bandwidth to 10 Hz.
4. Connect the equipment as shown in Figure 2-44.

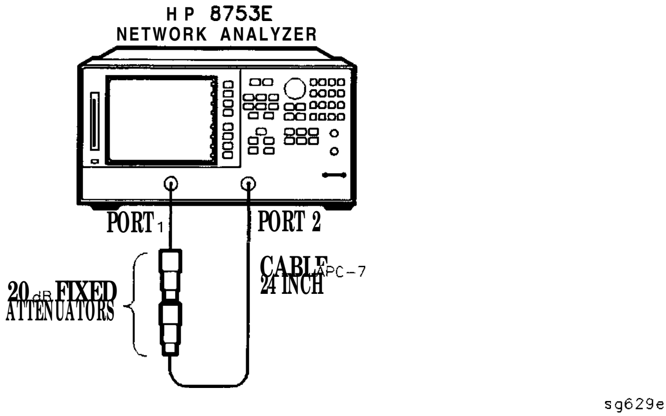



Figure **2-44. Test** Port Output Harmonics **Test** Setup

5. **Press** (Meas) **Trans:REV S12 (A/R)** **INPUT PORTS** **A**.
6. **After one sweep, press** (Display) **DATA→MEMORY** **DATA/MEM** **to normalize the** trace.
7. Press (System) **HARMONIC MEAS** **HARMONIC SECOND**.
8. **After one sweep, press** (Scale Ref) **AUTO SCALE** **to get a better viewing of the** trace.
9. **Press** (Marker Fctn) **MKR SEARCH** **SEARCH MAX**.
10. Write the marker 1 value (which appears on the analyzer display) on the "Performance Test Record." This is the worst case test port output **2nd** harmonic

## Test Port Output Worst Case 3rd Harmonic

11. Press (Stop) (2) (G/n) to change the stop frequency to 2 GHz.
12. Press (System) HARMONIC MEAS HARMONIC OFF.
13. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.
14. Press (Scale Ref) AUTO SCALE SCALE/DIV (1) (x1) to get a better viewing of the trace.
15. Press (System) HARMONIC MEAS HARMONIC THIRD.
16. After one sweep, press (Scale Ref) AUTO SCALE.
17. Press (Marker Fctn) MKR SEARCH SEARCH MAX.
18. Write the marker 1 value on the "Performance Test Record."

## Port 1 Input Worst Case 2nd Harmonic

19. Connect the equipment as shown in Figure 2-45.

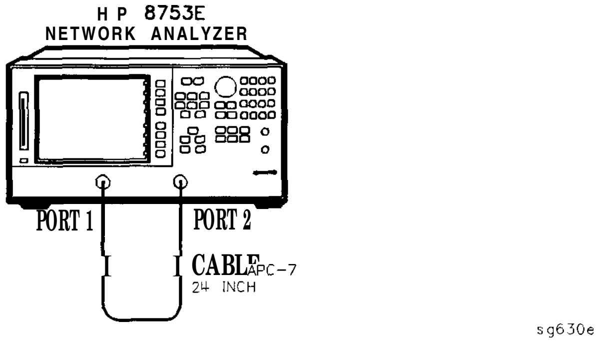



**Figure 2-45. Receiver Harmonics Test Setup**

20. Press (Preset) (Menu) POWER (8) (x1).
21. Press (Avg) IF BW (10) (x1).
22. Press (Start) (16) (M/μ) (Stop) (3) (G/n) to set the frequency range.
23. Press (Meas) Trans:REV S12 (A/R) INPUT PORTS A.
24. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.
25. Press (System) HARMONIC MEAS HARMONIC SECOND.
26. After one sweep, press (Scale Ref) AUTO SCALE to get a better viewing of the trace.
27. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.
28. Write the marker 1 value (which appears on the analyzer display) on the 'Performance Test Record." This is the worst case port 1 input (receiver channel A) 2nd harmonic

## Port 1 Input Worst Case 3rd Harmonic

29. Press (Stop) (2) (G/n) to change the stop frequency for measuring the receiver 3rd harmonic.
30. Press (System) HARMONIC MEAS HARMONIC OFF.
31. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.
32. Press (Scale Ref) AUTO SCALE SCALE/DIV (1) (x1) to get a better viewing of the trace.
33. Press (System) HARMONIC MEAS HARMONIC THIRD.
34. After one sweep, press (Scale Ref) AUTO SCALE.
35. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.
36. Write the marker 1 value on the "Performance Test Record."
37. Press (System) HARMONIC MEAS HARMONIC OFF.

## Port 2 Input Worst Case 2nd Harmonic

38. Press (Stop) (3) (G/n) to set the stop frequency for measuring the 2nd harmonic.
39. Press (Meas) Trans:FWD S21 (B/R) INPUT PORTS B.
40. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.
41. Press (System) HARMONIC MEAS HARMONIC SECOND.
42. After one sweep, press (Scale Ref) AUTO SCALE to get a better viewing of the trace.
43. Press (Marker Fctn) MKR SEARCH SEARCH MAX.
44. Write the marker 1 value (which appears on the analyzer display) on the "Performance Test Record." This is the worst case port 2 input (receiver channel B) 2nd harmonic

## Port 2 Input Worst Case 3rd Harmonic

45. Press (Stop) (2) (G/n) to change the stop frequency for measuring the receiver 3rd harmonic
46. Press (System) HARMONIC MEAS HARMONIC OFF.
47. After one sweep, press (Display) DATA→MEMORY DATA/MEM to normalize the trace.
48. Press (Scale Ref) AUTO SCALE SCALE/DIV (1) (x1) to get a better viewing of the trace.
49. Press (System) HARMONIC MEAS HARMONIC THIRD.
50. After one sweep, press (Scale Ref) AUTO SCALE.
51. Press (Marker Fctn) MKR SEARCH SEARCH: MAX.
52. Write the marker 1 value on the "Performance Test Record."

# 18. Test Port Output Harmonics (Analyzers without Option 002)

## Specifications

| Harmonic | Limit, +10dBm source output[1] |
|---|---|
| 2nd | <−25 dBc |
| 3rd | <−25 dBc |

1 For HP 8753E Option 075: + 8 dBm source output; limits valid for frequencies below 2 GHz

### Equipment Required for 50 ohm Analyzers

Spectrum analyzer . . . . . . . . . . HP 85953
Cable, 50Ω, type-N (m) to type-N (m), 24-inch . . . . . . . . HP P/N 81204781
Adapter, APC-7 to type-N (f) . . . . . . . . HP 11524A
Adapter, type-N (m) to BNC (f) . . . . . . . . HP P/N 1250-1476
Cable, 503, BNC (m) . . . . . . . . HP P/N 8120-1840

### Additional Equipment Required for 75 ohm Analyzers

Minimum-loss pad . . . . . . . . HP 11852B

*Equipment warmup time:* 30 minutes (network analyzer and spectrum analyzer)

Perform this test to determine the spectral purity of the network analyzer RF source. Use this procedure with HP 8753E network analyzers without Option 002 (harmonic measurement capability).

## Procedure

1. Calibrate the *spectrum analyzer*:

   a. Connect the BNC cable between the spectrum analyzer CAL OUT connector and the 508 input. Use the type-N (m) to BNC (f) adapter at the 50Ω input.

   b. Press (CAL).

   c. Press **CAL YTF** and wait for calibration to complete.

   d. Press **CAL FREQ & AMPTD** and wait for calibration to complete.

   e. Press **STORE CAL**.

   f. Remove the BNC cable and adapter.

2. Connect the equipment as shown in Figure 2-46.

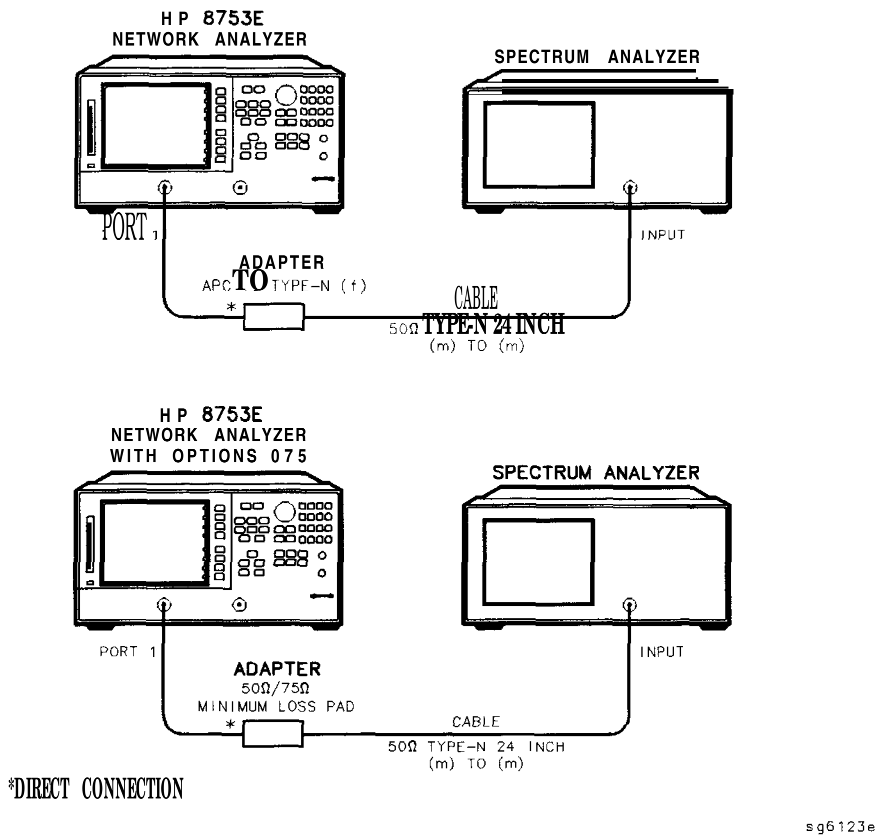



Figure 2-46. Test Port Output Harmonics Test Setup

3. Set the *network analyzer source* power to + 10 dBm:

   a. Press (PRESET).

   b. Press (MENU).

   c. Press **Power**.

   d. Press (10) (x1). (For 75Ω analyzers, press (8) (x1).)

   e. Press **RETURN**.

4. Set up the *spectrum analyzer* display:
   a. Press (SPAN).
   b. Press (20) (MHz).
   c. Press (BW).
   d. Press (300) (kHz).
   e. Press **VBW/RBW RATIO**.
   f. Press (.03) (ENTER).
   g. Press (AMPLITUDE).
   h. Press **REF LVL**.
   i. Press (10) (+dBm).
5. Set the *network analyzer* and *spectrum analyzer* to the harmonic frequency. Use the appropriate test record to choose the proper harmonic frequency. Refer to the test record in Section 2a for 3 GHz network analyzers, or the test record in Section 2b for 6 GHz network analyzers.
   - *Network Analyzer*

   a. Press **CW FREQ**.
   b. Enter the harmonic frequency from the test record. For example, press (100) (M/μ) to set the network analyzer to the second harmonic of the first fundamental frequency in the 3 GHz test record.
      - *Spectrum Analyzer*

   c. *Press* (FREQUENCY).
   d. Enter the harmonic frequency from the test record. For example, press (100) (MHz) to set the spectrum analyzer to the second harmonic of the first fundamental frequency in the 3 GHz or 6 GHz test record.
   e. Press (MKR →).
   f. Press **MKR → CF**.
   g. Press (SGL SWP).
   h. Press (MKR).
   i. Press **MKR Δ**

6. Set up the *network analyzer* to output the fundamental frequency:

   a. Press **CW FREQ**.

   b. Enter the fundamental frequency. For example, press (50) (M/μ) to enter the first fundamental frequency in the 3 GHz test record.

7. Measure and record the power in the second or third harmonic by taking a single sweep with the *spectrum analyzer*:

   a. Press (SGL SWEEP).

   b. Read the MARKER A measurement, and record it in the appropriate row of the test record under Measurement Value (dBc).

8. Reset the *spectrum analyzer* marker:

   a. Press (MKR).

   b. Press **MARKER NORMAL**.

9. Repeat steps 5 through 8 for the remaining second and third harmonic frequencies, and the fundamental frequencies listed in the test record.

# 2a

# Performance Test Record

For Analyzers with a Frequency Range of
30 **kHz** to 3 **GHz**

**Note** See the next "Performance Test Record" section if your analyzer frequency range is from 30 **kHz** to 6 **GHz** (Option 006).

## HP 8753E Performance **Test Record** (1 of 13)

Calibration Lab Address: ______________________

______________________

______________________

Report Number ______________________

Date ______________________

Last Calibration Date ______________________

Customer's Name ______________________

Performed by ______________________

Model **HP** 8753E

Serial No. ______________________ Option(s) ______________________

**Firmware** Revision ______________________

Ambient Temperature ____________ ° C Relative Humidity ____________ %

**Test** Equipment **Used:**

| Description | Model Number | Trace Number | **Cal** Due Date |
|---|---|---|---|
| Frequency Counter | | | |
| Power Meter | | | |
| Power Sensor | | | |
| Calibration Kit | | | |
| Verification Kit | | | |

Notes/Comments: ______________________

______________________

# HP 8753E Performance Test Record (2 of 13)
# For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard** Company<br>**Model** HP 8753E<br>**Serial Number** ________________ | Report Number ________________<br>**Date** ________________ |

▶▶ 1. Test Port **Output Frequency** Range and Accuracy

| CW **Frequencies (MHz)** | **Min. (MHz)** | Results Measured **(MHz)** | **Max. (MHz)** | **Measurement** Uncertainty **(MHz)** |
|---|---|---|---|---|
| 0.03 | 0.029999 7 | | 0.030 000 3 | f0.OOO 000 050 |
| 0.3 | 0.299 997 | | 0.300003 | ± 0.000 000 520 |
| 5.0 | 4.999 950 | | 5.000 050 | ± 0.000 009 |
| 16.0 | 15.999 840 | | 16.000 160 | 1 0.000 028 |
| 31.0 | 30.999 690 | | 31.000310 | ± 0.000 054 |
| 60.999999 | 60.999 390 | | 61.000 610 | ± 0.000 106 |
| 121.0 | 120.998 790 | | 121.001210 | ± 0.000 207 |
| 180.0 | 179.998 200 | | 180.001800 | ± 0.000 307 |
| 310.0 | 309.995 900 | | 310.003106 | ± 0.000528 |
| 700.0 | 699.930 000 | | 700.007000 | ± 0.001 192 |
| 1300.0 | 1299.987 | | 1300.013 | ± 0.002 212 |
| 2 000.0 | 1 999.980 | | 2000.020 | ± 0.003 403 |
| 3 000.0 | 2 999.970 | | 3 000.030 | ± 0.005 104 |

▶▶ 2. External Source Mode **Frequency** Range

| **Test Frequencies (GHz)** | **Results** |
|---|---|
| 0.010 | |
| 0.020 | |
| 0.100 | |
| 1.000 | |
| 2.000 | |
| 3.000 | |

# HP 8753E Performance Test Record (3 of 13)
# For 30 kHz—3 GHz Analyzers

| Hewlett-Packard Company<br>Model HP 8753E<br>Serial Number ______ | Report Number ______<br>Date ______ |
|---|---|

**▶▶ 3. Test Port Output Power Accuracy**

| Test Frequencies | Test Port Output Power (dBm) | Specification (dB) | Measured Value (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| Center Frequency | | | | |
| 300 kHz | 0 | ± 1 | ______ | ± 0.465 |
| 20 MHz | 0 | ± 1 | ______ | ± 0.10 |
| 50 MHz | 0 | ± 1 | ______ | ± 0.10 |
| 100 MHz | 0 | ± 1 | ______ | ± 0.10 |
| 200 MHz | 0 | ± 1 | ______ | ± 0.10 |
| 500 MHz | 0 | • 1 | ______ | ± 0.10 |
| 1 GHz | 0 | ± 1 | ______ | ± 0.13 |
| 2 GHz | 0 | ± 1 | ______ | ± 0.13 |
| 3 GHz | 0 | ± 1 | ______ | ± 0.27 |

**▶▶ 4. Test Port Output Power Range and Linearity**

| Test settings | Results Measured (dB) | Power Level Linearity (dB) | Specification (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| CW Frequency = 300 kHz | | | | |
| – 15 | ______ | ______ | ± 0.2 | ± 0.03 |
| – 13 | ______ | ______ | ± 0.2 | ± 0.03 |
| – 11 | ______ | ______ | ± 0.2 | ● 0.03 |
| - 9 | ______ | ______ | ± 0.2 | ± 0.02 |
| - 7 | ______ | ______ | ± 0.2 | ± 0.02 |
| – 5 | ______ | ______ | ± 0.2 | ± 0.02 |
| - 3 | ______ | ______ | ± 0.2 | ● [illegible] |
| - 1 | ______ | ______ | ± 0.2 | ± 0.02 |
| + 1 | ______ | ______ | ± 0.2 | ± 0.03 |
| + 3 | ______ | ______ | ± 0.2 | ± 0.03 |
| + 5 | ______ | ______ | ± 0.5 | ± 0.03 |

| Hewlett-Packard Company<br>Model HP 8753E<br>Serial Number ______ | Report Number ______<br>Date ______ |
|---|---|

▶▶4. Test Port Output Power Range and Linearity (continued)

| Test settings | Results Measured (dB) | Power Level Linearity (dB) | Specification (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| + 7 | | | ± 0.5 | ± 0.03 |
| + 8 | | | ± 0.5 | ± 0.03 |
| +Q | | | ± 0.5 | ± 0.03 |
| + 10 | | | ± 0.5 | ± 0.03 |
| CW Frequency = 3 GHz | | | | |
| – 15 | | | ± 0.2 | ● 0.03 |
| – 13 | | | ± 0.2 | ± 0.03 |
| – 11 | | | ± 0.2 | ± 0.03 |
| - 9 | | | ± 0.2 | ± 0.02 |
| - 7 | | | ± 0.2 | ± 0.02 |
| – 5 | | | ± 0.2 | ± 0.02 |
| - 3 | | | ± 0.2 | ± 0.02 |
| - 1 | | | ± 0.2 | ± 0.02 |
| + 1 | | | ± 0.2 | ± 0.03 |
| + 3 | | | ± 0.2 | ± 0.03 |
| + 5 | | | ± 0.6 | ± 0.03 |
| + 7 | | | ± 0.5 | ± 0.03 |
| + 8 | | | ± 0.5 | ± 0.03 |
| +Q | | | ± 0.6 | ± 0.03 |
| + 10 | | | ± 0.5 | ± 0.03 |

# HP 8753E Performance Test Record (5 of 13)
## For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard** Company<br>Model HP **8753E**<br>**Serial Number** ________________ | **Report** Number ________________<br>**Date** ________________ |

**5. Minimum R Channel Level**

| CW **Frequency** | **Specification (dB)** | **Test** Port Power | Measurement Uncertainty **(dB)** |
|---|---|---|---|
| 300 **kHz** | < -35 | ________ | ± 1.0 |
| 3.29 MHz | < -35 | ________ | ± 1.0 |
| 3.31 **MHz** | < -35 | ________ | ± 1.0 |
| **15.90** MHz | < -35 | ________ | ± 1.0 |
| 16.10 MHz | < -35 | ________ | ± 1.0 |
| 30.90 MHz | < -35 | ________ | ± 1.0 |
| 31.10 MHz | < -35 | ________ | ± 1.0 |
| 1.6069 **GHz** | < -35 | ________ | ± 1.0 |
| 1.6071 **GHz** | < -35 | ________ | ± 1.0 |
| 3.000 **GHz** | < -35 | ________ | ± 1.0 |

6. Test Port Input Noise **Floor** Level

| Frequency **Range** | Test Port | **IF** Bandwidth | Specification **(dBm)** | Calculated **Value** | **Measurement** Uncertainty |
|---|---|---|---|---|---|
| **300 kHz - 3 GHz** | Port 1 | **3 kHz** | – 82 | ________ | **N/A** |
| **300 kHz - 3 GHz** | Port 1 | 10 Hz | – 102 | ________ | **N/A** |
| **300 kHz - 3 GHz** | Port 2 | 10 **Hz** | – 102 | ________ | **N/A** |
| **300 kHz - 3 GHz** | Port 2 | **3 kHz** | - 8 2 | ________ | **N/A** |

# HP 8753E Performance Test Record (6 of 13)
## For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| Hewlett-Packard **Company**<br>Model HP **8753E**<br>**Serial Number** ______ | **Report** Number ______<br>**Date** ______ |

▶▶ 7. Test Port Input Frequency Response

| Frequency Range | Test Port | Specification (dB) | Measured Value (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| 300 kHz—3GHz | Port 2 | ± 1 | | 0.47 |
| 300 kHz—3GHz | Port 1 | ± 1 | | 0.47 |

▶▶ 8. Test Port Crosstalk

| Test settings | Specification (dB) | Measured Value (dB) | Measurement Uncertainty |
|---|---|---|---|
| **Crosstalk to Test Port 2**<br>300 kHz—3GHz | < -100 | | N/A |
| **Crosstalk to Test** Port 1<br>300 kHz—3GHz | < -100 | | N/A |

# HP 8753E Performance Test Record (7 of 13)
## For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| Hewlett-Packard Company<br>Model HP 8753E<br>Serial Number ______ | Report Number ______<br>Date ______ |

**9. Calibration Coefficients**

| Test Description | Frequency Range | Spec. (dB) | Measured Value (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| Forward Direction | | | | |
| Directivity | 300 kHz - 1.3 GHz | ≥ 35 | | ± 0.9 |
| Directivity | 1.3 GHz - 3 GHz | ≥ 30 | | ± 0.8 |
| Forward Direction | | | | |
| Source Match | 300 kHz - 1.3 GHz | ≥ 16 | | ± 0.2 |
| Source Match | 1.3 GHz - 3 GHz | ≥ 16 | | ± 0.2 |
| Forward Direction | | | | |
| Trans. Tracking | 300 kHz - 1.3 GHz | ± 1.5 | | ± 0.006 |
| Trans. Tracking | 1.3 GHz - 3 GHz | ± 1.5 | | ± 0.009 |
| Forward Direction | | | | |
| Refl. Tracking | 300 kHz - 1.3 GHz | ● 1.5 | | ± 0.001 |
| Refl. Tracking | 1.3 GHz - 3 GHz | ± 1.5 | | ± 0.005 |
| F&verse Direction | | | | |
| Load Match | 300 kHz - 1.3 GHz | ≥ 18 | | ± 0.1 |
| Load Match | 1.3 GHz - 3 GHz | ≥ 16 | | ± 0.2 |

| Hewlett-Packard Company<br>Model HP 8753E<br>Serial Number ______ | Report Number ______<br>Date ______ |
|---|---|

▶▶ 9. Calibration Coefficients (continued)

| Test Description | Frequency Range | Spec. (dB) | Measured Value (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| Reverse Direction | | | | |
| Trans. Tracking | 300 kHz - 1.3 GHz | ± 1.5 | | ± 0.006 |
| Trans. Tracking | 1.3 GHz - 3 GHz | ± 1.5 | | ± 0.009 |
| Forward Direction | | | | |
| Load Match | 300 kHz - 1.3 GHz | ≥ 18 | | ± 0.1 |
| Load Match | 1.3 GHz - 3 GHz | ≥ 16 | | ± 0.2 |
| Reverse Direction | | | | |
| Directivity | 300 kHz - 1.3 GHz | ≥ 35 | | ± 0.9 |
| Directivity | 1.3 GHz - 3 GHz | ≥ 30 | | ± 0.8 |
| Reverse Direction | | | | |
| Source Match | 300 kHz - 1.3 GHz | ≥ 16 | | ± 0.2 |
| Source Match | 1.3 GHz - 3 GHz | ≥ 16 | | ± 0.2 |
| Reverse Direction | | | | |
| Refl. Tracking | 300 kHz - 1.3 GHz | ± 1.5 | | ± 0.001 |
| Refl. Tracking | 1.3 GHz - 3 GHz | ± 1.5 | | ± 0.005 |

# HP 8753E Performance Test Record (9 of 13)
# For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard** Company<br>Model HP **8753E**<br><br>**Serial** Number ______ | <br>**Report** Number ______<br><br>Date ______ |

▶▶ 10. System **Trace** Noise

| CW Frequency **(GHz)** | **Ratio** | **Specification** | Measured **Value** | **Measurement** Uncertainty |
|---|---|---|---|---|
| 3 | A/R | < 0.006 dB rms | ______ | ±0.001 dB |
| 3 | A/R | < 0.038° rms | ______ | ±0.01° |
| 3 | B/R | < 0.006 dB rms | ______ | ±0.001 dB |
| 3 | B/R | < 0.038° rms | ______ | ±0.01° |

▶▶ 12. **Test** Port Input Impedance

| **Frequency Range** | Test Port | **Return** Loss **(dB)** | **Specification (dB)** | **Measurement Uncertainty (dB)** |
|---|---|---|---|---|
| 300 kHz—1.3 GHz | Port 2 | ______ | ≥ 18 | ± 1.5 |
| 1.3 GHz—3 GHz | Port 2 | ______ | ≥ 16 | ± 1.5 |
| 300 kHz—1.3 GHz | Port 1 | ______ | ≥ 18 | ± 1.5 |
| 1.3 GHz—3 GHz | Port 1 | ______ | ≥ 16 | ± 1.5 |

# **HP** 8753E Performance **Test** Record (10 of 13)
# For 30 **kHz—3 GHz** Analyzers

| **lewlett-Packard** Company<br>**Iodel HP 8753E**<br>**ierial** Number ______________ | Report Number ______________<br>**Date** ______________ |
|---|---|

▶▶ 13. Test Port Receiver Magnitude Dynamic Accuracy

| | | G | F | **\|G – F\|** | | |
|---|---|---|---|---|---|---|
| Test Port Input Power **(dBm)** | **8496A** Attn. **(dB)** | **Test** Port Measurement **(dB)** | Expected **Measur**ement (corrected) **(dB)** | **Dynamic Accuracy (Calculated)** | **Spec. (dB)** | **Meas. Uncer. (dB)** |
| **Test** Port 2 | | | | | | |
| – 10 | 0 | | | | ≤ 0.033 | ± 0.008 |
| – 20 (Ref) | 10 | | 0.000 | | ≤0.020 | ± 0.008 |
| –30 | 20 | | | | ≤ 0.031 | ± 0.008 |
| –40 | 30 | | | | ≤ 0.042 | ± 0.008 |
| –50 | 40 | | | | ≤ 0.057 | ± 0.008 |
| – 60 | 50 | | | | ≤ 0.098 | ± 0.017 |
| – 70 | 60 | | | | ≤ 0.247 | ● 0.017 |
| -80 | 70 | | | | ≤ 0.725 | ± 0.017 |
| – 90 | 80 | | | | ≤ 2.097 | ± 0.017 |
| – loo | 90 | | | | ≤ 5.399 | ± 0.027 |
| **Test Port 1** | | | | | | |
| – 10 | 0 | | | | ≤ 0.033 | ± 0.008 |
| – 20 (Ref) | 10 | | 0.000 | | ~0.020 | ± 0.008 |
| – 30 | 20 | | | | ≤ 0.031 | ± 0.008 |
| –40 | 30 | | | | ≤ 0.042 | ± 0.008 |
| –50 | 40 | | | | ≤ 0.057 | ± 0.008 |
| – 60 | 50 | | | | ≤ 0.098 | ± 0.017 |
| – 70 | **60** | | | | ≤ 0.247 | ± 0.017 |
| -80 | 70 | | | | ≤ 0.725 | ± 0.017 |
| -90 | 80 | | | | ≤ 2.097 | ± 0.017 |
| – 100 | 90 | | | | ≤ **5.399** | ± 0.027 |

# HP 8753E Performance Test Record (11 of 13)
## For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard Company**<br>Model HP **8753E**<br>**Serial** Number ______ | **Report** Number ______<br>Date ______ |

▶▶ 14. **Test** Port Receiver **Magnitude** Compression

| CW Frequency | Test Port | **Measured Value (dB)** | **Specification (dB)** | **Measurement** Uncertainty |
|---|---|---|---|---|
| *50 MHZ* | Port 2 | ______ | ≤ 0.45 | **N/A** |
| **1 GHz** | Port 2 | ______ | ≤ 0.45 | N/A |
| **2 GHz** | Port 2 | ______ | ≤ 0.45 | **N/A** |
| **3 GHz** | Port 2 | ______ | ≤ 0.45 | **N/A** |
| **50 MHz** | Port 1 | ______ | ≤ 0.45 | **N/A** |
| **1 GHz** | Port 1 | ______ | ≤ 0.45 | *NIA* |
| **2 GHz** | Port 1 | ______ | ≤ 0.45 | **N/A** |
| **3 GHz** | Port 1 | ______ | ≤ 0.45 | *NIA* |

▶▶ 16. **Test** Port Receiver Phase Compression

| CW Frequency | **Test** Port | **Measured Value (degrees)** | Specification **(degrees)** | **Measurement** Uncertainty |
|---|---|---|---|---|
| **50 MHz** | Port 2 | ______ | ≤ 6° | **N/A** |
| **1 GHz** | Port 2 | ______ | ≤ 6° | **N/A** |
| **2 GHz** | Port 2 | ______ | ≤ 6° | *NIA* |
| **3 GHz** | Port 2 | ______ | ≤ 6° | **N/A** |
| *50* MHz | Port 1 | ______ | ≤ 6° | *NIA* |
| **1 GHz** | Port 1 | ______ | ≤ 6° | **N/A** |
| **2 GHz** | Port 1 | ______ | ≤ 6° | N/A |
| **3 GHz** | Port 1 | ______ | ≤ 6° | *NIA* |

# HP 8753E Performance Test Record (12 of 13)
## For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard** Company<br>Model **HP** 8753E<br><br>**Serial Number** ________ | **Report** Number ________<br><br>Date ________ |

▶▶ 16. Test Port **Output/Input** Harmonics (Option 002 without Option 006)

| **Test** Description | **Specification (dBc)** | **Measurement** Value **(dBc)** | Measurement Uncertainty **(dB)** |
|---|---|---|---|
| **Test** Port output **Harmonics** | | | |
| **2nd** | ≤ 25 | ________ | ± 1.5 |
| **3rd** | ≤ 25 | ________ | ± 1.5 |
| Port 1 Input Harmouics | | | |
| **2nd** | ≤ 15 | ________ | ± 1.5 |
| **3rd** | ≤ 30 | ________ | ± 1.5 |
| Port 2 Input **Harmonics** | | | |
| **2nd** | ≤ 15 | ________ | ± 1.5 |
| **3rd** | ≤ 30 | ________ | ± 1.5 |

# HP 8753E Option 011 Performance Test Record (13 of 13)
## For 30 kHz—3 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard Company** | |
| **Model** HP **8753E** | **Report** Number ______________ |
| **Serial** Number ______________ | Date ______________ |

**18. Test Port Output Harmonics (Analyzers without Option 002)**

| Second Harmonic Frequency | Fundamental Frequency | Specification (dBc) | Measurement Value (dBc) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| 100 MHz | 50 MHz | ≤ 25 | ______ | ± 1.6 |
| 1.0 GHz | 500 MHz | ≤ 25 | ______ | ± 1.6 |
| 2.4 GHz | 1.2 GHz | ≤ 25 | ______ | ± 1.6 |
| 3.0 GHz | 1.5 GHz | ≤ 25 | ______ | ± 1.6 |
| Third Harmonic Frequency | | | | |
| 300 MHz | 100 MHz | ≤ 25 | ______ | ± 1.6 |
| 1.2 GHz | 400 MHz | ≤ 25 | ______ | ± 1.6 |
| 2.7 GHz | 900 MHz | ≤ 25 | ______ | ± 1.6 |
| 3.0 GHz | 1 GHz | ≤ 25 | ______ | ± 1.6 |

2b

# Performance Test Record

For Analyzers with a Frequency Range of
30 kHz to 6 GHz

**Note** See the previous "Performance Test Record" section if your analyzer frequency range is from 30 kHz to 3 GHz.

## HP 8753E Performance Test Record (1 of 15)

Calibration Lab Address: Report Number ______

Date ______

______ Last Calibration Date ______

______ Customer's Name______

______ Performed by ______

Model HP 87533 Option 006

Serial No. ______ Option(s) ______

Firmware Revision ______

Ambient Temperature ______ ° C Relative Humidity ______ %

Test Equipment Used:

| Description | Model Number | Trace Number | Cal Due Date |
|---|---|---|---|
| kequency Counter | | | |
| Power Meter | | | |
| Power Sensor | | | |
| Calibration Kit | | | |
| Verification Kit | | | |

Notes/Comments: ______

______

# HP 8753E Performance Test Record (2 of 15)
# For 30 kHz—6 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard** Company<br>Model **HP 8753E** Option 006<br><br>**Serial Number** ____________ | **Report** Number ____________<br><br>Date ____________ |

**▶▶ 1. Test Port Output Frequency Range and Accuracy**

| **Test** Frequencies (MHz) | Min. (MHz) | Results Measured (MHz) | Max. (MHz) | Measurement Uncertainty (MHz) |
|---|---|---|---|---|
| 0.03 | 0.029999 7 | | 0.0300003 | ± 0.000000050 |
| 0.3 | 0.299 997 | | 0.300 003 | ± 0.000 000 520 |
| 5.0 | 4.999 950 | | 5.000 050 | ± 0.000 009 |
| 16.0 | 15.999 840 | | 16.000160 | ± 0.000 028 |
| 31.0 | 30.999 690 | | 31.000 310 | ± 0.000 054 |
| 80.999 999 | 60.999 390 | | 61.000610 | ± 0.000 105 |
| 121.0 | 120.998 790 | | 121.001210 | ± 0.000 207 |
| 180.0 | 179.998 200 | | 180.001800 | ± 0.000307 |
| 310.0 | 309.995 900 | | 310.003100 | ± 0.000 528 |
| 700.0 | 699.930 000 | | 700.007000 | ± 0.001 192 |
| 1300.0 | 1299.987 | | 1300.013 | ± 0.002 212 |
| 2 000.0 | 1999.980 | | 2000.020 | ± 0.003 403 |
| 3 000.0 | 2 999.970 | | 3000.030 | ± 0.005 104 |
| 4.0 | 3.999 960 | | 4.000 040 | ± 0.008 805 |
| 5.0 | 4.999 950 | | 5.000050 | ± 0.008 506 |
| 6.0 | 5.999 940 | | 6.000 060 | ± 0.010207 |

# HP 8753E Performance **Test** I&cord (3 of 15)
## For 30 **kHz—6 GHz** Analyzers

| Elewlett-Packard Company<br>Model **HP 8753E** Option 006<br><br>**Serial** Number ______________ | Report **Number** ______________<br><br>**Date** ______________ |
|---|---|

**2. External** Source Mode **Frequency** Range

| Test **Frequencies (GHz)** | Result |
|---|---|
| 0.010 | ______ |
| 0.020 | ______ |
| 0.100 | ______ |
| 1.000 | ______ |
| 2.000 | ______ |
| 3.000 | ______ |
| 4.000 | ______ |
| 5.000 | ______ |
| **6.000** | ______ |

3. Test Port **Output** Power **Accuracy**

| **Test Frequency** | **Test** Port **Output** Power **(dBm)** | **Specification (dB)** | Measured **Value (dB)** | Measurement **Uncertainty (dB)** |
|---|---|---|---|---|
| 300 **kHz** | 0 | i l | | ± 0.47 |
| 20 MHz | 0 | i l | | ± 0.25 |
| 50 MHz | 0 | i l | | ± 0.12 |
| 100 MHz | 0 | i l | | ± 0.12 |
| 200 MHz | 0 | i l | | ± 0.12 |
| 500 MHz | 0 | **± 1** | | ± 0.12 |
| **1 GHz** | 0 | i l | | ± 0.12 |
| **2 GHz** | 0 | i l | | ± 0.15 |
| **3 GHz** | 0 | i l | | ± 0.15 |
| **4 GHz** | 0 | i l | | ± 0.17 |
| **5 GHz** | 0 | i l | | ± 0.17 |
| **6 GHz** | 0 | i l | | ± 0.17 |

# HP 8753E Performance Test Record (4 of 15)
## For 30 kHz—6 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard** Company<br>**Model** HP **8753E** Option 006<br><br>**Serial Number** ________ | Report **Number** ________<br><br>**Date** ________ |

**4. Test** Port Output Power Range **and** Linearity

| Test settings | **Results** Measured **(dB)** | Power Level **Linearity (dB)** | **Specification (dB)** | Mess. Uncert. **(dB)** |
|---|---|---|---|---|
| CW Frequency = 300 **kHz** | | | | |
| – 15 | | | ± 0.2 | ± 0.03 |
| – 13 | | | ± 0.2 | ± 0.03 |
| – 11 | | | ± 0.2 | ± 0.03 |
| - 9 | | | ± 0.2 | ± 0.02 |
| - 7 | | | ± 0.2 | ± 0.02 |
| - 5 | | | ± 0.2 | ± 0.02 |
| - 3 | | | ± 0.2 | ± 0.02 |
| - 1 | | | ± 0.2 | ± 0.02 |
| + 1 | | | ± 0.2 | ± 0.03 |
| + 3 | | | ± 0.2 | ± 0.03 |
| + 5 | | | ± 0.5 | ± 0.03 |
| + 7 | | | ± 0.5 | ± 0.03 |
| + 8 | | | ± 0.5 | ± 0.03 |
| +Q | | | ± 0.5 | ± 0.03 |
| + 10 | | | ± 0.5 | ± 0.03 |
| CW **Frequency** = 3 **GHz** | | | | |
| – 15 | | | ± 0.2 | ± 0.03 |
| – 13 | | | ± 0.2 | ± 0.03 |
| – 11 | | | ± 0.2 | ± 0.03 |
| - 9 | | | ± 0.2 | ± 0.02 |
| - 7 | | | ± 0.2 | ± 0.02 |
| - 5 | | | ± 0.2 | ± 0.02 |
| - 3 | | | ± 0.2 | ± 0.02 |
| - 1 | | | ± 0.2 | ± 0.02 |
| + 1 | | | ± 0.2 | ± 0.03 |
| + 3 | | | ± 0.2 | ± 0.03 |
| + 5 | | | ± 0.5 | ± 0.03 |

| **Hewlett-Packard Company** **Model HP 8753E** Option 006 | Report Number ______________ |
|---|---|
| **Serial Number** ______________ | Date ______________ |

▶▶ 4. Test Port **Output** Power **Range** and Linearity **(Continued)**

| Test settings | Results Measured **(dB)** | Power Level **Linearity (dB)** | **Specification (dB)** | **Meas. Uncert. (dB)** |
|---|---|---|---|---|
| + 7 | | | ± 0.5 | ± 0.03 |
| + 8 | | | ± 0.5 | ± 0.03 |
| +Q | | | ± 0.5 | ± 0.03 |
| + 10 | | | ± 0.5 | ± 0.03 |
| CW Frequency = 6 GHz | | | | |
| – 15 | | | ± 0.2 | ± 0.03 |
| – 13 | | | ± 0.2 | ± 0.03 |
| – 11 | | | ± 0.2 | ± 0.03 |
| - 9 | | | ± 0.2 | ± 0.03 |
| - 7 | | | ± 0.2 | ± 0.02 |
| - 5 | | | ± 0.2 | ± 0.02 |
| - 3 | | | ± 0.2 | ± 0.02 |
| - 1 | | | ± 0.2 | ± 0.02 |
| + 1 | | | ± 0.2 | ± 0.02 |
| + 3 | | | ± 0.2 | ± 0.03 |
| + 5 | | | ± 0.5 | ± 0.03 |
| + 7 | | | ± 0.5 | ± 0.03 |
| + 8 | | | ± 0.5 | ± 0.03 |
| + 9 | | | ± 0.5 | ± 0.03 |
| + 10 | | | ± 0.5 | ± 0.03 |

| | |
|---|---|
| **Hewlett-Packard** Company<br>Model **HP 8753E** Option 006<br>**Serial Number** ______ | **Report** Number ______<br>Date ______ |

**▶▶ 6. Minimum R Channel Level**

| CW Frequency | Specification (dB) | Test Port Power | Measurement Uncertainty (dB) |
|---|---|---|---|
| 300 kHz | < -35 | ______ | ± 1.0 |
| 3.29 MHz | < -35 | ______ | ± 1.0 |
| 3.31 MHz | < -35 | ______ | ± 1.0 |
| 15.90 MHz | < -35 | ______ | ± 1.0 |
| 16.10 MHz | < -35 | ______ | ± 1.0 |
| 30.90 MHz | < -35 | ______ | ± 1.0 |
| 31.10 MHz | < -35 | ______ | ± 1.0 |
| 1.6069 GHz | < -35 | ______ | ± 1.0 |
| 1.6071 GHz | < -35 | ______ | ± 1.0 |
| 3.000 GHz | < -35 | ______ | ± 2.0 |
| 4.000 GHz | < -30 | ______ | ± 2.0 |
| 5.000 GHz | < -30 | ______ | ± 2.0 |
| 6.000 GHz | < -30 | ______ | ± 2.0 |

**▶▶ 6. Test Port Input Noise Floor Level**

| Frequency Range | Test Port | IF Bandwidth | Specification (dBm) | Calculated Value | Measurement Uncertainty |
|---|---|---|---|---|---|
| 300 kHz—3 GHz | Port 1 | 3 kHz | – 82 | ______ | N/A |
| 300 kHz—3GHz | Port 1 | 10 Hz | – 102 | ______ | N/A |
| 300 kHz—3 GHz | Port 2 | 10 Hz | – 102 | ______ | N/A |
| 300 kHz—3 GHz | Port 2 | 3 kHz | – 82 | ______ | N/A |
| 3 GHz—6 GHz | Port 2 | 3 kHz | – 77 | ______ | N/A |
| 3 GHz—6 GHz | Port 2 | 10 Hz | – 97 | ______ | N/A |
| 3 GHz—6 GHz | Port 1 | 10 Hz | - 9 7 | ______ | N/A |
| 3 GHz—6 GHz | Port 1 | 3 kHz | – 77 | ______ | N/A |

# **HP** 8753E Performance **Test** Record (7 of 15)
## For 30 **kHz—6 GHz** Analyzers

| | |
|---|---|
| Hewlett-Packard **Company**<br>Model HP **8753E** Option 006<br><br>Serial Number ______ | Report Number ______<br><br>**Date** ______ |

**7. Test** Port Input Frequency Response

| Frequency Range | **Test** Port | **Specification (dB)** | **Measured** Value **(dB)** | **Measurement** Uncertainty **(dB)** |
|---|---|---|---|---|
| **300 kHz—3 GHz** | **Port 2** | ± 1 | ______ | 0.47 |
| **300 kHz—3 GHz** | **Port 1** | ± 1 | ______ | 0.47 |
| **3 GHz—6 GHz** | **Port 1** | ± 2 | ______ | 0.17 |
| **3 GHz—6 GHz** | **Port 2** | ± 2 | ______ | 0.17 |

**8. Test Port crosstalk**

| Test settings | **Specification (dB)** | **Measured Value (dB)** | Measurement Uncertainty |
|---|---|---|---|
| **Crosstalk to Test Port 2**<br>**300 kHz—3 GHz** | < -100 | ______ | **N/A** |
| **Crosstalk to Test Port 1**<br>**300 kHz—3 GHz** | < -100 | ______ | **N/A** |
| **Crosstalk to Test Port 1**<br>**3 GHz—6 GHz** | < −90 | ______ | **N/A** |
| **Crosstalk to Test Port 2**<br>**3 GHz—6 GHz** | < -90 | ______ | **N/A** |

# HP 8753E Performance Test Record (8 of 15)
## For 30 kHz—6 GHz Analyzers

| **Hewlett-Packard Company** | |
|---|---|
| Model HP **8753E** Option **006** | Report Number ____________ |
| **Serial Number** ____________ | Date ____________ |

**▶▶ 9. Calibration Coefficients**

| Test Description | Frequency Range | Spec. (dB) | Measured Value (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| Forward Direction | | | | |
| Directivity | 300 kHz—1.3 GHz | ≥ 35 | | ± 0.9 |
| Directivity | 1.3 GHz—3 GHz | ≥ 30 | | ± 0.8 |
| Directivity | 3 GHz—6 GHz | ≥ 25 | | ± 0.8 |
| Forward Direction | | | | |
| Source Match | 300 kHz—1.3 GHz | ≥ 16 | | ± 0.2 |
| Source Match | 1.3 GHz—3 GHz | ≥ 16 | | ± 0.2 |
| Source Match | 3 GHz—6 GHz | ≥ 14 | | ± 0.3 |
| Forward Direction | | | | |
| Trans. Tracking | 300 kHz—1.3 GHz | ± 1.5 | | ± 0.006 |
| Trans. Tracking | 1.3 GHz—3 GHz | ± 1.5 | | ± 0.009 |
| Trans. Tracking | 3 GHz—6 GHz | ± 2.5 | | ± 0.021 |
| Forward Direction | | | | |
| Refl. Tracking | 300 kHz—1.3 GHz | ± 1.5 | | ± 0.001 |
| Refl. Tracking | 1.3 GHz—3 GHz | ± 1.5 | | ± 0.005 |
| Refl. Tracking | 3 GHz—6 GHz | ± 2.5 | | ± 0.020 |
| Reverse Direction | | | | |
| Load Match | 300 kHz—1.3 GHz | ≥ 18 | | ± 0.1 |
| Load Match | 1.3 GHz—3 GHz | ≥ 16 | | ± 0.2 |
| bad Match | 3 GHz—6 GHz | ≥ 14 | | ± 0.2 |

# HP 8753E Performance Test Record (9 of 15)
## For 30 kHz—6 GHz Analyzers

| | |
|---|---|
| Hewlett-Packard Company<br>Model HP **8753E** Option **006**<br>Serial Number ______ | Report Number ______<br>Date ______ |

**9. Calibration Coefficients (continued)**

| **Test** Description | **Frequency Range** | **Spec. (dB)** | Measured **Value (dB)** | Measurement Uncertainty **(dB)** |
|---|---|---|---|---|
| Reverse Direction | | | | |
| Trans. Tracking | 300 kHz—1.3 GHz | ± 1.5 | | ± 0.006 |
| Trans. Tracking | 1.3 GHz—3 GHz | ± 1.5 | | ± 0.009 |
| Trans. Tracking | 3 GHz—6 GHz | ± 2.5 | | ± 0.021 |
| Forward Direction | | | | |
| Load Match | 300 kHz—1.3 GHz | ≥ 18 | | ± 0.1 |
| Load Match | 1.3 GHz—3 GHz | ≥ 16 | | ± 0.2 |
| Load Match | 3 GHz—6 GHz | ≥ 14 | | ± 0.2 |
| F&verse Direction | | | | |
| Directivity | 300 kHz—1.3 GHz | ≥ 35 | | ± 0.9 |
| Directivity | 1.3 GHz—3 GHz | ≥ 30 | | ± 0.8 |
| Directivity | 3 GHz—6 GHz | ≥ 25 | | ± 0.8 |
| Reverse Direction | | | | |
| Source Match | 300 kHz - 1.3 GHz | ≥ 16 | | ± 0.2 |
| Source Match | 1.3 GHz - 3 GHz | ≥ 16 | | ± 0.2 |
| Source Match | 3 GHz - 6 GHz | ≥ 14 | | ± 0.3 |
| Reverse Direction | | | | |
| Refl. Tracking | 300 kHz - 1.3 GHz | ± 1.5 | | ± 0.001 |
| Refl. Tracking | 1.3 GHz - 3 GHz | ± 1.5 | | ± 0.005 |
| Refl. Tracking | 3 GHz - 6 GHz | ± 2.5 | | ± 0.020 |

# HP 8753E Performance Test Record (10 of 15)
## For 30 kHz—6 GHz Analyzers

| | |
|---|---|
| Hewlett-Packard Company<br>Model HP 8753E Option 006<br><br>Serial Number ____________ | Report Number ____________<br><br>Date ____________ |

▶▶ 11. System Trace Noise

| Frequency (GHz) | Ratio | Measured Value | Specification | Measurement Uncertainty |
|---|---|---|---|---|
| 3 | A/R (Magnitude) | ______ | ≤ 0.006 dB rms | ± 0.001 dB |
| 6 | A/R (Magnitude) | ______ | ≤ 0.010 dB mls | ± 0.001 dB |
| 6 | AIR (Phase) | ______ | ≤ 0.0700 rms | ± 0.01 ° |
| 3 | A/R (Phase) | ______ | ≤ 0.038° mls | ± 0.01 ° |
| 3 | B/R (Magnitude) | ______ | ≤ 0.006 dB rms | ± 0.001 dB |
| 6 | B/R (Magnitude) | ______ | ≤ 0.010 dB rms | ± 0.001 dB |
| 6 | B/R (Phase) | ______ | ≤ 0.070° rms | ± 0.01 ° |
| 3 | B/R (Phase) | ______ | ≤ 0.038° rms | ± 0.01 ° |

▶▶ 12. Test Port Input Impedance

| Test Description | Test Port | Return Loss (dB) | Specification (dB) | Measurement Uncertainty (dB) |
|---|---|---|---|---|
| 300 kHz—1.3 GHz | Port 2 | ______ | ≥ 18 | ± 1.5 |
| 1.3 GHz—3 GHz | Port 2 | ______ | ≥ 16 | ± 1.5 |
| 3 GHz—6 GHz | Port 2 | ______ | ≥ 14 | ± 1.0 |
| 300 kHz—1.3 GHz | Port 1 | ______ | ≥ 18 | ± 1.6 |
| 1.3 GHz—3 GHz | Port 1 | ______ | ≥ 16 | ± 1.5 |
| 3 GHz—6 GHz | Port 1 | ______ | ≥ 14 | ± 1.0 |

| **Hewlett-Packard** Company<br>Model **HP 8753E** Option **006**<br>**Serial Number** ______________ | Report Number ______________<br>Date ______________ |
|---|---|

**13. Test** Port Receiver Magnitude Dynamic Accuracy

| **Test** Port Input Power **(dBm)** | **8496A** Attn. **(dB)** | G<br>**Test** Port Measurement **(dB)** | F<br>Expected **Measurement (corrected) (dB)** | **\|G – F\|**<br>**Dynamic Accuracy (Calculated)** | **Spec. (dB)** | **Meas. Uncer. (dB)** |
|---|---|---|---|---|---|---|
| **Test Port 2** | | | | | | |
| – 10 | 0 | | | | ≤ 0.033 | ± 0.008 |
| **– 20 (Ref)** | 10 | | 0.000 | | **≤0.020** | ± 0.008 |
| – 30 | 20 | | | | ≤ 0.031 | ± 0.008 |
| - 4 0 | 30 | | | | ≤ 0.042 | ± 0.008 |
| - 5 0 | 40 | | | | ≤0.057 | ± 0.008 |
| – 60 | 50 | | | | ≤ 0.098 | ± 0.017 |
| – 70 | 60 | | | | ≤ 0.247 | ± 0.017 |
| - 8 0 | 70 | | | | ≤0.725 | ± 0.017 |
| – 90 | **80** | | | | ≤ 2.097 | ± 0.017 |
| – 100 | 90 | | | | ≤ 6.399 | ± 0.027 |
| **Test** Port 1 | | | | | | |
| – 10 | 0 | | | | ≤0.033 | ± 0.008 |
| **– 20 (Ref)** | 10 | | 0.000 | | ~0.020 | ± 0.008 |
| – 30 | 20 | | | | ≤ 0.031 | ± 0.008 |
| - 4 0 | 30 | | | | ≤ 0.042 | ± 0.008 |
| - 5 0 | 40 | | | | ≤0.057 | ± 0.008 |
| - 6 0 | 50 | | | | ≤0.098 | ± 0.017 |
| – 70 | **60** | | | | ≤ 0.247 | ± 0.017 |
| – 80 | 70 | | | | ≤ 0.726 | ± 0.017 |
| – 90 | **80** | | | | ≤ 2.097 | ± 0.017 |
| – 100 | 90 | | | | ≤5.399 | ± 0.027 |

# HP 8753E Performance Test Record (12 of 15)
## For 30 kHz—6 GHz Analyzers

| | |
|---|---|
| Hewlett-Packard Company<br>**Model HP 8753E** Option 006<br><br>**Serial Number** ______ | **Report** Number ______<br><br>Date ______ |

▶▶ 14. Test Port Receiver Magnitude Compression

| CW Frequency | Test Port | Measured Value (dB) | Specification (dB) | Measurement Uncertainty |
|---|---|---|---|---|
| 50 MHz | Port 2 | | ≤ 0.45 | N/A |
| 1 GHz | Port 2 | | ≤ 0.45 | N/A |
| 2 GHz | Port 2 | | ≤ 0.45 | N/A |
| 3 GHz | Port 2 | | ≤ 0.45 | NIA |
| 4 GHz | Port 2 | | ≤ 0.80 | NIA |
| 5 GHz | Port 2 | | ≤ 0.80 | N/A |
| 6 GHz | Port 2 | | ≤ 0.80 | NIA |
| 50 MHz | Port 1 | | ≤ 0.45 | NIA |
| 1 GHz | Port 1 | | ≤ 0.45 | NIA |
| 2 GHz | Port 1 | | ≤ 0.45 | N/A |
| 3 GHz | Port 1 | | ≤ 0.45 | NIA |
| 4 GHz | Port 1 | | ≤ 0.80 | N/A |
| 5 GHz | Port 1 | | ≤ 0.80 | NIA |
| 6 GHz | Port 1 | | ≤ 0.80 | NIA |

## HP 8753E Performance Test Record (13 of 15)
## For 30 kHz—6 GHz Analyzers

| | |
|---|---|
| Hewlett-Packard Company<br>Model HP 8753E Option 006<br><br>Serial Number ______ | Report Number ______<br><br>Date ______ |

▶▶ 15. Test Port Receiver Phase Compression

| CW Frequency | Test Port | Measured Value (degrees) | Specification (degrees) | Measurement Uncertainty |
|---|---|---|---|---|
| 50 MHz | Port 2 | ______ | ≤ 6° | N/A |
| 1 GHz | Port 2 | ______ | ≤ 6° | N/A |
| 2 GHz | Port 2 | ______ | ≤ 6° | N/A |
| 3 GHz | Port 2 | ______ | ≤ 6° | N/A |
| 4 GHz | Port 2 | ______ | ≤ 7.5° | N/A |
| 5 GHz | Port 2 | ______ | ≤ 7.5° | N/A |
| 6 GHz | Port 2 | ______ | ≤ 7.5° | N/A |
| 50 MHz | Port 1 | ______ | ≤ 6° | N/A |
| 1 GHz | Port 1 | ______ | ≤ 6° | N/A |
| 2 GHz | Port 1 | ______ | ≤ 6° | N/A |
| 3 GHz | Port 1 | ______ | ≤ 6° | N/A |
| 4 GHz | Port 1 | ______ | ≤ 7.5° | N/A |
| 5 GHz | Port 1 | ______ | ≤ 7.5° | N/A |
| 6 GHz | Port 1 | ______ | ≤ 7.5° | N/A |

## HP 8753E Performance Test Record (14 of 15)
## For 30 kHz—6 GHz Analyzers

| | |
|---|---|
| **Hewlett-Packard** Company<br>Model HP **8753E** Option **006**<br><br>**Serial Number** ____________________ | Report Number ____________________<br><br>Date ____________________ |

▶▶ 17. **Output/Input** Test Port **Harmonics** (Option **002** only)

| Test Description | **Specification (dBc)** | Measurement Value **(dBc)** | **Measurement** Uncertainty **(dB)** |
|---|---|---|---|
| **Test** Port output **Harmonics** | | | |
| **2nd** | ≤ 25 | ____________ | ± 1.5 |
| **3rd** | ≤ 25 | ____________ | ± 1.5 |
| Port 1 Input Harmonics | | | |
| **2nd** | ≤ 15 | ____________ | ± 1.5 |
| **3rd** | ≤ 30 | ____________ | ± 1.5 |
| Port 2 Input Harmonics | | | |
| **2nd** | ≤ 15 | ____________ | ± 1.5 |
| **3rd** | ≤ 30 | ____________ | ± 1.5 |

# HP 8753E Performance Test Record (15 of 15)
# For 30 kHz—6 GHz Analyzers

| **Hewlett-Packard** Company<br>Model **HP 8753E** Option **006**<br>**Serial** Number ______ | Report Number ______<br>Date ______ |
|---|---|

▶▶ 18. **Test** Port Output Harmonics (Analyzers without Option **002)**

| Second Harmonic Frequency | **Fundamental** Frequency | Specification **(dBc)** | Measurement **Value** **(dBc)** | Measurement **Uncertainty** **(dB)** |
|---|---|---|---|---|
| 100 MHz | 50 **MHz** | ≤ 25 | ______ | ± 1.6 |
| 1.0 **GHz** | 500 MHz | ≤ 25 | ______ | ± 1.6 |
| 2.4 **GHz** | 1.2 **GHz** | ≤ 25 | ______ | ± 1.6 |
| 3.2 **GHz** | 1.6 **GHz** | ≤ 25 | ______ | ± 1.6 |
| 4.0 **GHz** | 2.0 **GHz** | ≤ 25 | ______ | ± 1.6 |
| 5.0 **GHz** | 2.5 **GHz** | ≤ 25 | ______ | ± 1.6 |
| 6.0 **GHz** | 3.0 **GHz** | ≤ 25 | ______ | ± 1.6 |
| Third Harmonic **Frequency** | | | | |
| 300 **MHz** | 100 MHz | ≤ 25 | ______ | ± 1.6 |
| 1.2 **GHz** | 400 MHz | ≤ 25 | ______ | ± 1.6 |
| 2.7 **GHz** | 900 MHz | ≤ 25 | ______ | ± 1.6 |
| 3.3 **GHz** | 1.1 **GHz** | ≤ 25 | ______ | ± 1.6 |
| 4.8 **GHz** | 1.6 **GHz** | ≤ 25 | ______ | ± 1.6 |
| 6.0 **GHz** | 2.0 **GHz** | ≤ 25 | ______ | ± 1.6 |

# 3

# Adjustments and Correction Constants

This chapter has the following adjustment procedures:

- A9 Switch Positions
- Source Default Correction Constants (Test 44)
- Source Pretune Default Correction Constants (Test 45)
- Analog Bus Correction Constants (Test 46)
- Source Pretune Correction Constants (lest 48)
- RF Output Power Correction Constants (Test 47)
- IF Amplifier Correction Constants (Test 51)
- ADC Offset Correction Constants (Test 52)
- Sampler Magnitude and Phase Correction Constants (Test 53)
- Cavity Oscillator Frequency Correction Constants (Test 54)
- Serial Number Correction Constants (Test 55)
- Option Numbers Correction Constants (Test 56)
- Initialize EEPROMs (Test 58)
- EEPROM Backup Disk Procedure
- Correction Constants Retrieval Procedure
- Loading Firmware
- Fractional-N Frequency Range Adjustment
- Frequency Accuracy Adjustment
- High/Low Band Transition Adjustment
- Fractional-N Spur Avoidance and FM Sideband Adjustment
- Source Spur Avoidance Tracking Adjustment
- Unprotected Hardware Option Numbers Correction Constants

## Post-Repair Procedures for HP 8753E

**Table 3-1** lists the additional service procedures which you must perform to ensure that the instrument is working correctly, following the replacement of an assembly. These procedures can be located in either Chapter 2 or Chapter 3.

***Perform the procedures in the order that they are listed in the table.***

**Table 3-1.** Related Service Procedures

| Replaced Assembly | **Adjustments/** Correction Constants (Ch. **3)** | **Verification (Ch. 2)** |
|---|---|---|
| Al Front Panel Keyboard | None | **Service Test 0**<br>Service **Test** 23 |
| **A2** Front Panel **Interface** | None | Service **Test** 0<br>Service **Test** 23<br>service **Test** 12<br>**Tests** 66 - 80 |
| **A3** Source | **A9** Switch Positions<br>Source Def CC (**Test** 44)<br>Pretune Default CC (**Test** 45)<br>**Analog Bus CC (Test 46)**<br>Source Pretune CC (**Test** 48)<br>RF Output Power CC (**Test** 47)<br>Sampler **Magnitude** and Phase **CC** (**Test** 53)<br>Cavity **Oscillator** Frequency CC (**Test** 54)<br>Source Spur Avoidance Tracking<br>EEPROM Backup Disk | **Test** Port Output Frequency Range and Accuracy<br>Test Port Output Power Accuracy<br>**Test** Port Output Power Range and Linearity<br>**Test** Port output/Input **Harmonics** (Option **002 only)** |
| **A4/A5/A6** Samplers | **A9** Switch Positions<br>Sampler Maguitude and Phase CC (**Test** 53)<br>IF Amplifier CC (**Test** 51)<br>EEPROM Backup Disk | **Minimum** R Channel Level (if R sampler replaced)<br>**Test Port Crosstalk**<br>**Test** Port Input Frequency Response |
| **A7** Pulse Generator | **A9** Switch Positions<br>Sampler **Magnitude** and Phase CC (**Test** 53)<br>EEPROM **Backup** Disk | **Test** Port Input Frequency Response<br>Test Port Frequency Range and **Accuracy** |
| **A8** Post Regulator | **A9** Switch Positions<br>Cavity **Oscillator** Frequency CC (**Test** 54)<br>Source Spur Avoidance Tracking<br>EEPROM Backup Disk | Service **Test** 0<br>Check **A8** test point voltages |

## Table 3-1. Related Service Procedures (2 of 3)

| Replaced Assembly | Adjustments/ Correction Constants (ch. 3) | Verification (Ch. 2) |
|---|---|---|
| A9 CPU (EEPROM Backup Disk Available) | A9 Switch Positions<br>Load Firmware<br>CC Retrieval<br>Serial Number CC (Test 65)<br>Option Number CC (Test 56) | Operator's Check<br>Service Test 21<br>Service Test 22 |
| A9 CPU (EEPROM Backup Disk Not Available) | A9 Switch Positions<br>Load Firmware<br>Serial Number CC (Test 56)<br>Option Number CC (Test 66)<br>Source Def CC (Test 44)<br>Pretune Default CC (Test 45)<br>Analog Bus CC (Test 46)<br>Cal Kit Default (Test 57)<br>Source Pretune CC (Test 48)<br>RF Output Power CC (Test 47)<br>Sampler Magnitude and Phase CC (Test 63)<br>ADC Linearity CC (Test 62)<br>IF Amplifier CC (Test 51)<br>Cavity Oscillator Frequency CC (Test 54)<br>EEPROM Backup Disk | Test Port Output Frequency Range and Accuracy<br>Test Port Output Power Accuracy<br>Test Port Output Power Range and Linearity<br>Test Port Receiver Dynamic Accuracy<br>Test Port Input Frequency Response |
| A10 Digital IF | A9 Switch Positions<br>Analog Bus CC (Test 46)<br>Sampler Magnitude and Phase CC (Test 53)<br>ADC Linearity CC (Test 52)<br>IF Amplifler CC (Test 61)<br>EEPROM Backup Disk | Test Port Input Noise Floor Level<br>Test Port Crosstalk<br>System Trace Noise |
| All Phase Lock | A9 Switch Positions<br>Analog Bus CC (Test 46)<br>Pretune Default CC (Test 45)<br>Source Pretune CC (Test 48)<br>EEPROM Backup Disk | Minimum R Channel Level<br>Test Port Output Frequency Range and Accuracy |
| A12 Reference | A9 Switch Positions<br>High/Low Band Transition<br>Frequency Accuracy<br>EEPROM Backup Disk | Test Port Output Frequency Range and Accuracy |

## Table 3-1. Related Service Procedures (3 of 3)

| l&placed **Assembly** | **Adjustments/** Correction **Constants** (ch. 3) | **Verification (Ch. 2)** |
|---|---|---|
| **A13** Fractional-N **(Analog)** | **A9 Switch** Positions<br>Fractional-N Spur and FM Sideband<br>EEPROM **Backup** Disk | **Test** Port Output Frequency Range and Accuracy |
| **A14** Fractional-N **(Digital)** | **A9** Switch Positions<br>Fractional-N Frequency Range<br>Fractional-N Spur Avoidance and FM sideband<br>EEPROM **Backup** Disk | **Test** Port Output Frequency Range and Accuracy |
| **A15 Preregulator** | None | **Self-Test** |
| **A16** Rear Panel Interface | None | **Internal Test** 13, Rear Panel |
| **A17** Motherboard | None | Observation of Display<br>**Tests 66 - 80** |
| **A18** Display | None | Observation of Display<br>**Tests 66** - 80 |
| **A19** Graphics System Processor | None | Observation of Display<br>**Tests** 59 - 80 |
| **A20** Disk Drive | none | none |
| **A21 Test** Port Coupler | RF Output Power **CC (Test** 47)<br>Sampler Magnitude and Phase **CC (Test** 53) | **Test** Port **Crosstalk**<br>**Test** Port Frequency Response |
| **A22 Test** Port Coupler | Sampler Magnitude and Phase CC **(Test** 53)<br>• | **Test** Port **Crosstalk**<br>**Test** Port Frequency Response |
| **A23 Bd Assy LED** | none | Self-Test (Chapter 4) |
| **A24** Transfer Switch | none | **Test** Port **Crosstalk** |
| **A25 Test** Set Interface | none | **Self-Test** (Chapter 4) |
| **A26** H&h Stability Frequency Reference | Frequency **Accuracy** Adjustment (Option **1D5)** | **Test** Port Frequency Range **and Accuracy** |

* Hewlett-Packard **verifies** source output performance on port 1 only. Port 2 source output performance is typical.

## A9 Switch Positions

1. Remove the power line cord from the analyzer.
2. Set the analyzer on its side.
3. Remove the two lower-rear comer bumpers from the bottom of the instrument with the T-10 TORX screwdriver.
4. Loosen the captive screw on the bottom cover's back edge, using a T-15 TORX screwdriver.
5. Slide the cover toward the rear of the instrument.
6. Move the switch as shown in **Figure 3-1:**
   - Move the A9 switch to the Alter position before you run any of the correction constant adjustment routines. This is the position for altering the analyzer's correction constants.
   - Move the A9 switch to the Normal position, after you have run correction constant adjustment routines. This is the position for normal operating conditions.
7. **Reinstall** the bottom cover, but not the rear bumpers

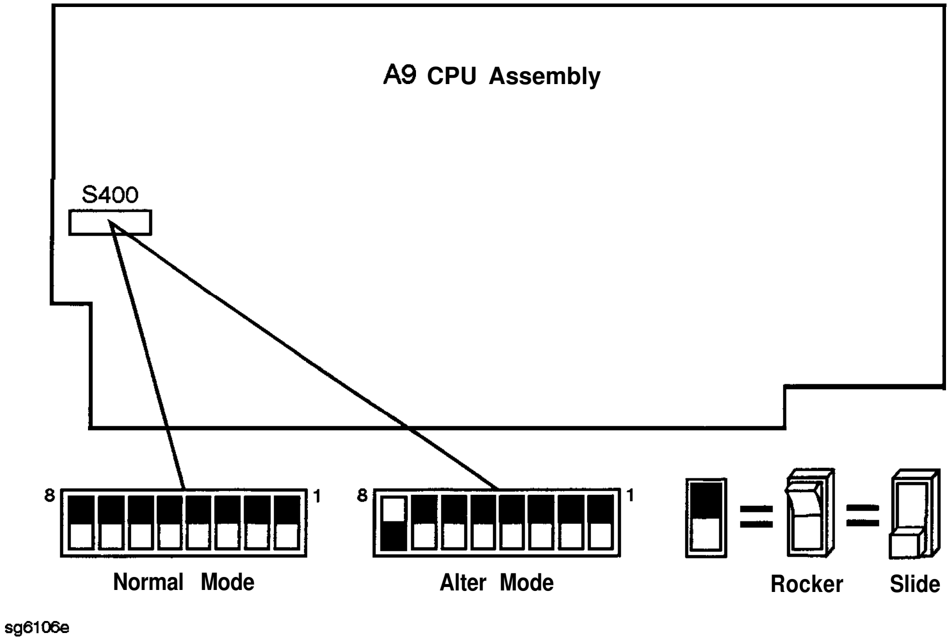



**Figure 3-1. A9 Correction Constants Switch**

8. Reconnect the power line cord and switch on the instrument.

## Source Default Correction Constants (Test 44)

*Analyzer warmup time:* **30** minutes.

This internal adjustment routine writes default correction constants for the source power accuracy.

1. Press (Preset) (System) **SERVICE MENU** **TESTS** (44) (x1) **EXECUTE TEST** **YES**.

2. Observe the analyzer for the results of the adjustment routine:

   - If the analyzer displays *Source Def DONE, you have completed this procedure.
   - If the analyzer displays *Source Def FAIL, refer to Chapter 7, "Source Troubleshooting."

## Source Pretune Default Correction Constants (Test 45)

*Analyzer warmup time: 30* **minutes.**

This adjustment writes default correction constants for rudimentary phase lock pretuning accuracy.

1. Press (Preset) (System) SERVICE MENU TESTS (45) (x1) EXECUTE TEST YES.
2. Observe the analyzer for the results of this adjustment routine:
   - If the analyzer displays Pretune Def DONE, you have completed this procedure.
   - If the analyzer displays FAIL, refer to Chapter 7, "Source Troubleshooting."

## Analog Bus Correction Constants (Test 46)

***Analyzer warmup time: 30* minutes.**

This procedure calibrates the analog bus by using three reference voltages (ground, + 0.37 and +2.5 volts), then stores the calibration data as correction constants in EEPROMs.

1. Press (Preset) (System) SERVICE MENU TESTS (46) (x1) EXECUTE TEST YES.

2. Observe the analyzer for the results of the adjustment routine:

- If the analyzer displays ABUS Cor DONE, you have completed this procedure.
- If the analyzer displays ABUS Cor FAIL, refer to Chapter 6, "Digital Control Troubleshooting."

# Source Pretune Correction Constants (Test 48)

*Analyzer warmup time: 30* **minutes.**

This procedure generates pretune values for correct phase-locked loop operation.

1. Press (Preset) (System) **SERVICE MENU** **TESTS** (48) (x1) **EXECUTE TEST** **YES**.
2. Observe the analyzer for the results of this adjustment routine:
   - If the analyzer displays **Pretune** Cor DONE, you have completed this procedure.
   - If the analyzer displays FAIL, refer to Chapter 7, "Source Troubleshooting."

# RF Output Power Correction Constants (Test 47)

### Required Equipment and Tools

Power Meter . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP 437B or HP 438A
HP-IB Cable . . . . . , . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 10833A
Antistatic Wrist Strap . . . . . . . . . . . . . . . . . . , . . . . . . . . . . . . . . . . . . . HP P/N 9300-1367
Antistatic Wrist Strap Cord . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire . . . . . . . . . . . . . HP P/N 9300-0797

### Additional Required Equipment for 50Ω Analyzers

Power Sensor . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 8482A
Power Sensor (for Option 006 analyzers) . . . . . . . . . . . . . . . . . . . . . . . . . . .HP 8481A
Adapter APC-7 to Type-N (f) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 11524A

### Additional Required Equipment for 75Ω Analyzers

Power Sensor . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 8483A Option H03

***Analyzer warmup* Time: 30 minutes.**

This procedure adjusts several correction constants that can improve the output power level accuracy of the internal source. They are related to the power level, power slope, power slope offset, and the ALC roll-off factors among others.

1. If you just completed "Sampler Magnitude and Phase Correction Constants (Test 53)," continue this procedure with step 8.
2. Press (Preset) (Local) SYSTEM CONTROLLER.
3. Press (Local) SET ADDRESSES ADDRESS: P MTR/HPIB. The default power meter address is 13. Refer to the power meter manual as required to observe or change its HP-IB address
4. Press POWER MTR:438A/437 to toggle between the 438A/437 and 436A power meters. Choose the appropriate model number.

**Note** If you are using the HP 438A power meter, connect the HP 8482A power sensor to channel A, and the HP 8481A power sensor to channel B.

## Power Sensor Calibration Factor Entry

5. Press **System** **SERVICE MENU** **TEST OPTIONS** **LOSS/SENSR LISTS** **CAL FACTOR SENSOR A** to access the calibration factor menu for power sensor A (HP 8482A for a 50Ω analyzer, or HP 8483A Option H03 for a 75Ω analyzer).
6. Zero and calibrate the power meter and power sensor.
7. Build a table of up to 55 points (55 frequencies with their calibration factors). To enter each point, follow these steps:
   a. Press **ADD** **FREQUENCY**.
   b. Input a frequency value and then press the appropriate key (**G/n**, **M/μ**, or **k/m**).
   c. Press **CAL FACTOR** and enter the calibration factor percentage that corresponds to the frequency you entered.

      The cal factor and frequency values are found on the back of the sensor. If you make a mistake, press **←** and re-enter the correct value.
   d. Press **DONE** to complete the data entry for each point.

---

**Note** The following terms are part of the sensor calibration menu:

| | |
|---|---|
| **SEGMENT** | allows you to select a frequency point. |
| **EDIT** | allows you to edit or change a previously entered value. |
| **DELETE** | allows you to delete a point from the sensor cal factor table. |
| **ADD** | allows you to add a point into the sensor cal factor table. |
| **CLEAR LIST** | allows you to erase the entire sensor cal factor table. |
| **DONE** | allows you to complete the points entry of the sensor cal factor table. |

---

8. **For Option 006 Instruments Only: Press** CAL FACTOR SENSOR B to create a power sensor calibration table for power sensor B (HP **8481A),** using the **softkeys** mentioned above.

9. Connect the equipment as shown in Figure 3-2.

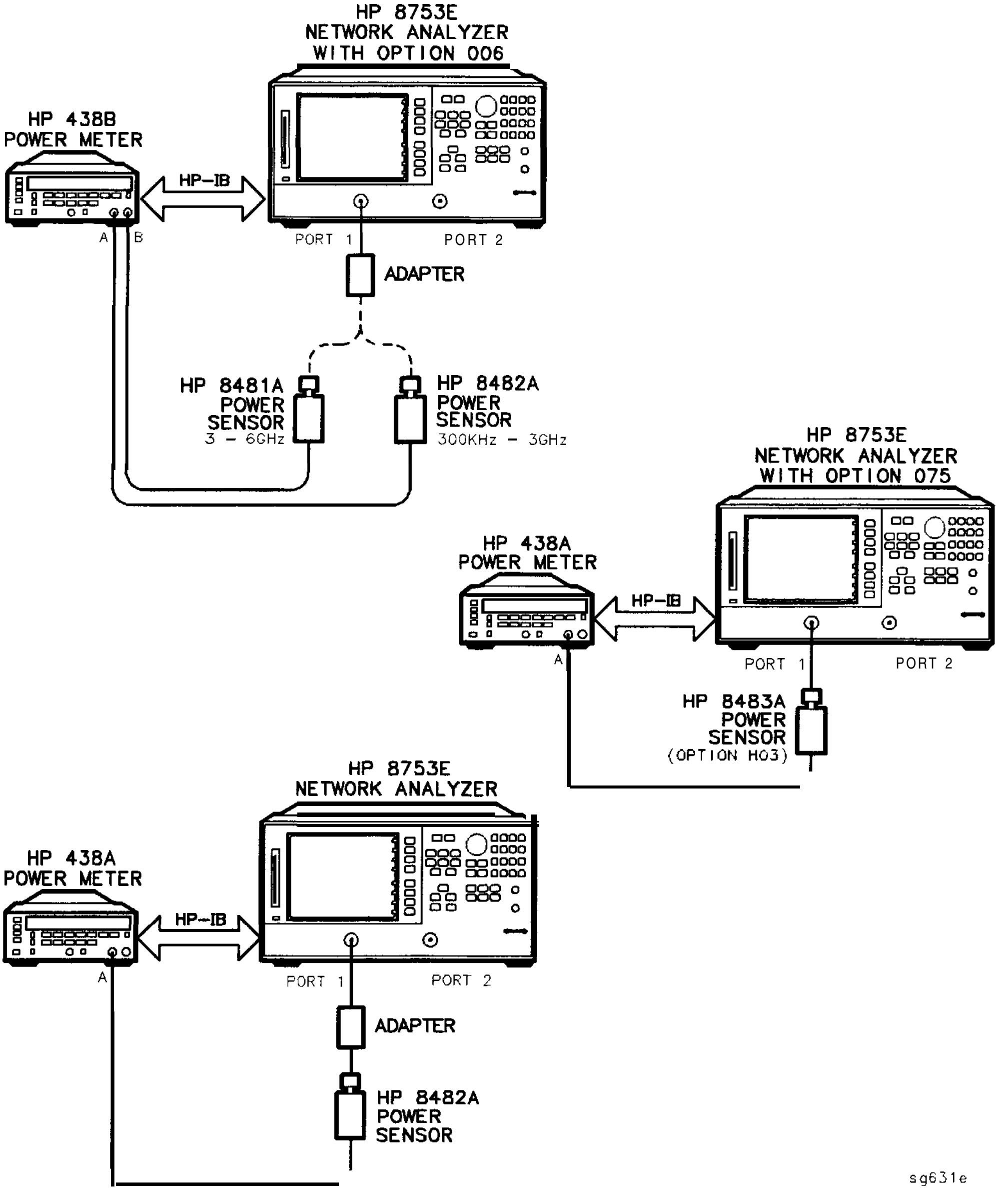



**Figure 3-2. RF Output Correction Constants Test Setup for the HP 8753E**

10. Press (System) SERVICE MENU TESTS (47) (x1).

11. Press EXECUTE TEST and YES at the prompt to alter the correction constants.

12. Follow the instructions at the prompts and press CONTINUE

13. When the analyzer completes the test, observe the display for the results:

- If you see DONE, press (Preset) and you have completed this procedure.
- If you see FAIL, re-run this routine in the following order:

a. Press-(Preset).

b. Repeat the "Source Default Correction Constants (Test 44)" procedure.

c. Repeat the "RF' Output Power Correction Constants (Test 47)" procedure.

## IF Amplifier Correction Constants (Test 61)

**Required Equipment and Tools**

Antistatic Wrist Strap .......................................... HP P/N 9300-1367
Antistatic Wrist Strap Cord .................................. HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire ............. HP P/N 9300-0797

**Additional Required Equipment for 50 ohm Analyzers**

RF Cable - (50Ω) 24-inch, APC-7 ............................. HP P/N 8120-4779

**Additional Required Equipment for 75Ω Analyzers**

RF Cable - (750) 24-inch, Type-N ............................ HP P/N 8120-2408

***Analyzer warmup Time: 30* minutes.**

These correction constants compensate for possible discontinuities of signal greater than -30 dBm.

1. Connect the RF cable from Port 1 to Port 2 of the analyzer.
2. Press (Preset) (System) SERVICE MENU TESTS (51) (x1) EXECUTE TEST YES CONTINUE.
3. Observe the analyzer for the results of the adjustment routine:
   - If DONE is displayed, you have completed this procedure.
   - If FAIL is displayed, check that the RF cable is connected from Port 1 to Port 2. Then repeat this adjustment routine.
   - If the analyzer continues to fail the adjustment routine, refer to the "Digital Control Troubleshooting" chapter.

## ADC Offset Correction Constants (Test 52)

*Analyzer warmup time: 30* **minutes.**

These correction constants improve the dynamic accuracy by shifting small signals to the most linear part of the ADC quantizing curve.

1. Press (Preset) (System) SERVICE MENU TESTS (52) (x1) EXECUTE TEST YES.

**Note** This routine takes about three minutes.

2. Observe the analyzer for the results of the adjustment routine:
   - If the analyzer displays ADC Ofs Cor DONE, you have completed this procedure.
   - If the analyzer displays ADC Ofs Cor FAIL, refer to the "Digital Control Troubleshooting" chapter.

## Sampler Magnitude and Phase Correction Constants (Test 53)

### Required Equipment and Tools

Power Meter . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP **437B** or HP **438A**
HP-IB Cable . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP **10833A**
Antistatic Wrist Strap . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-1367
Antistatic Wrist Strap Cord . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-0980
Static-control Mat and Earth Ground Wire . , . . . . . . . . . . . . . . . . . . .HP P/N 9300-0797

### Additional Required Equipment for 50Ω Analyzers

Power Sensor . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP **8482A**
Power Sensor (for Option 006 analyzers) . . . . . . . . . . . . . . . . . . . . . . . . . HP **8481A**
Cable, (509) **24-inch, APC-7** (2) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP P/N 81204779
Adapter **APC-7** to Type-N(f) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP **11524A**

### Additional Required Equipment for 75Ω Analyzers

Power Sensor . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP **8483A** Option **H03**
Cable, (75ohm) **24-inch,** Type-N (2) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP 8120-2408

***Analyzer warmup time: 30* minutes.**

This adjustment procedure corrects the overall flatness of the microwave components that make up the analyzer receiver and test separation sections. This is necessary for the HP 8753E to meet the published test port flatness.

1. If you just completed "Source Correction Constants **(Test 47),"** continue this procedure with step 8.
2. **Press** (Preset) (Local) SYSTEM CONTROLLER.
3. **Press** (Local) SET ADDRESSES ADDRESS: P MTR/HPIB. **The default power** meter address is 13. Refer to the power meter manual as required to observe or change its HP-IB address.
4. **Press** POWER MTR:438A/437 **to toggle between the 438A/437 and 436A** power meters. Choose the appropriate **model number.**

**Note** If you are using the HP **438A** power meter, connect the HP **8482A** power sensor to channel A, and the HP **8481A** power sensor to channel B.

## Power Sensor Calibration Factor Entry

5. Press (System) **SERVICE MENU** **TEST OPTIONS** **LOSS/SENSR LISTS** **CAL FACTOR SENSOR A** to access the calibration factor menu for power sensor A (HP 8482A for 50Ω analyzers, or HP 8483A Option H03 for 75 ohm analyzers).
6. Build a table of up to 55 points (55 frequencies with their calibration factors). To enter each point, follow these steps:
   a. Press **ADD** **FREQUENCY**.
   b. Input a frequency value and then press the appropriate key ((G/n), (M/μ), or (k/m)).
   c. Press **DONE** and enter the calibration factor percentage that corresponds to the frequency you entered.

      The cal factor and frequency values are found on the back of the sensor. If you make a mistake, press (⟵) and re-enter the correct value.
   d. Press **DONE** to complete the data entry for each point.

---

**Note** The following terms are part of the sensor calibration menu:

**SEGMENT** allows you to select a frequency point.

**EDIT** allows you to edit or change a previously entered value.

**DELETE** allows you to delete a point from the sensor cal factor table.

**ADD** allows you to add a point into the sensor cal factor table.

**CLEAR LIST** allows you to erase the entire sensor cal factor table.

**DONE** allows you to complete the points entry of the sensor cal factor table.

---

7. **For Option 006 Instruments Only:** Zero and calibrate the power meter and HP 8481A power sensor. Then press CAL FACTOR SENSOR B to create a power sensor calibration table for power sensor B (HP 8481A), using the softkeys mentioned above.

## Determine the Insertion Loss of the Cable at 1 GHz

8. Press (Preset) (Meas) Trans : FWD S21(B/R) .
9. Press (Center) (1) (G/n) (Span) (50) (M/μ).
10. Press (Cal) CAL KIT CAL KIT : 7mm RETURN CALIBRATE MENU RESPONSE .
11. Connect the 24 inch cable from Port 1 to Port 2, as shown in Figure 3-3.

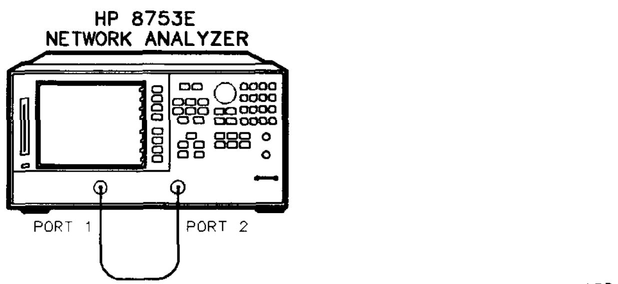



**Figure 3-3. First Connections for Insertion Loss Measurement**

12. Press THRU and then DONE : RESPONSE when the analyzer is done measuring the through.
13. Press (Save/Recall) SAVE STATE to save the calibration that you just made.
14. Make the connections as shown in Figure 3-4.

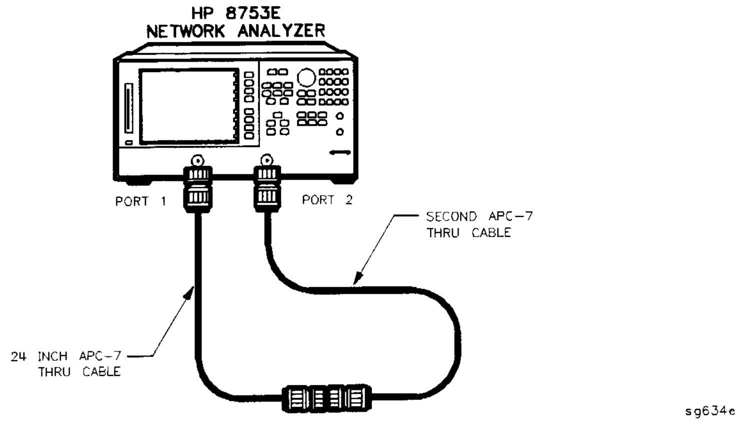



**Figure 3-4. Second Connections for Insertion Loss Measurement**

15. Press (Scale Ref) SCALE/DIV (.1) (x1) (Marker) MARKER 1 (1) (G/n). Record the insertion loss of the second through cable as shown in the upper-right corner of the analyzer display.

## Sampler Correction Constants Routine

16. Press (Preset) (System) SERVICE MENU TESTS (53) (x1) EXECUTE TEST and answer YES at the prompt.

17. When the analyzer displays CONNECT <3 GHz SENSOR A TO PORT 1, make the connections as shown in Figure 3-5.

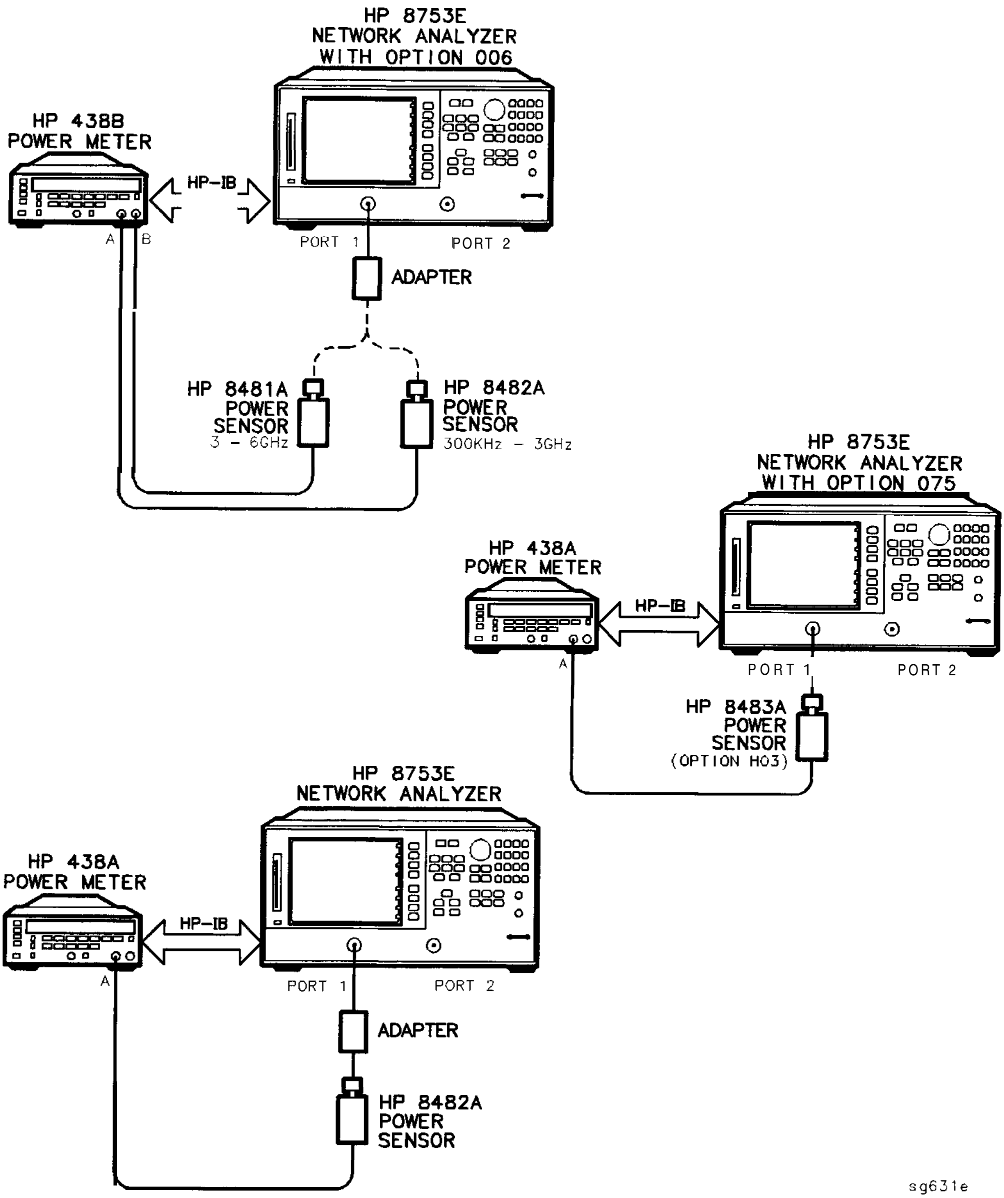



**Figure 3-5. Connections for Sampler Correction Routine**

18. Press **CONTINUE** to start the test. This part of the test will take about seven minutes.

- If the analyzer displays Sampler Cor - FAIL, check the following:

   a. The HP-IB address of your power meter is set at 13. Then rerun this routine ("Sampler Correction Constants Routine").

   b. The HP 8482A power sensor is connected to Port 1. Rerun this routine ('Sampler Correction Constants Routine ").

19. **For Option 006 Instruments Only:** When the analyzer displays CONNECT 6 GHz SENSOR B TO PORT 1, make the connections as shown in Figure 3-6. Then press **CONTINUE**. This part of the test will take about 20 seconds.

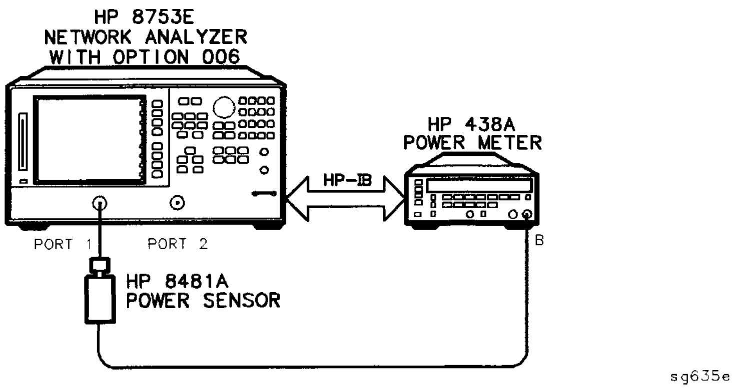



**Figure 3-6. Connections for Sampler Correction at 6 GHz**

20. When the analyzer displays CONNECT <3 GHz SENSOR A TO PORT 2, make the connections as shown in Figure 3-7.

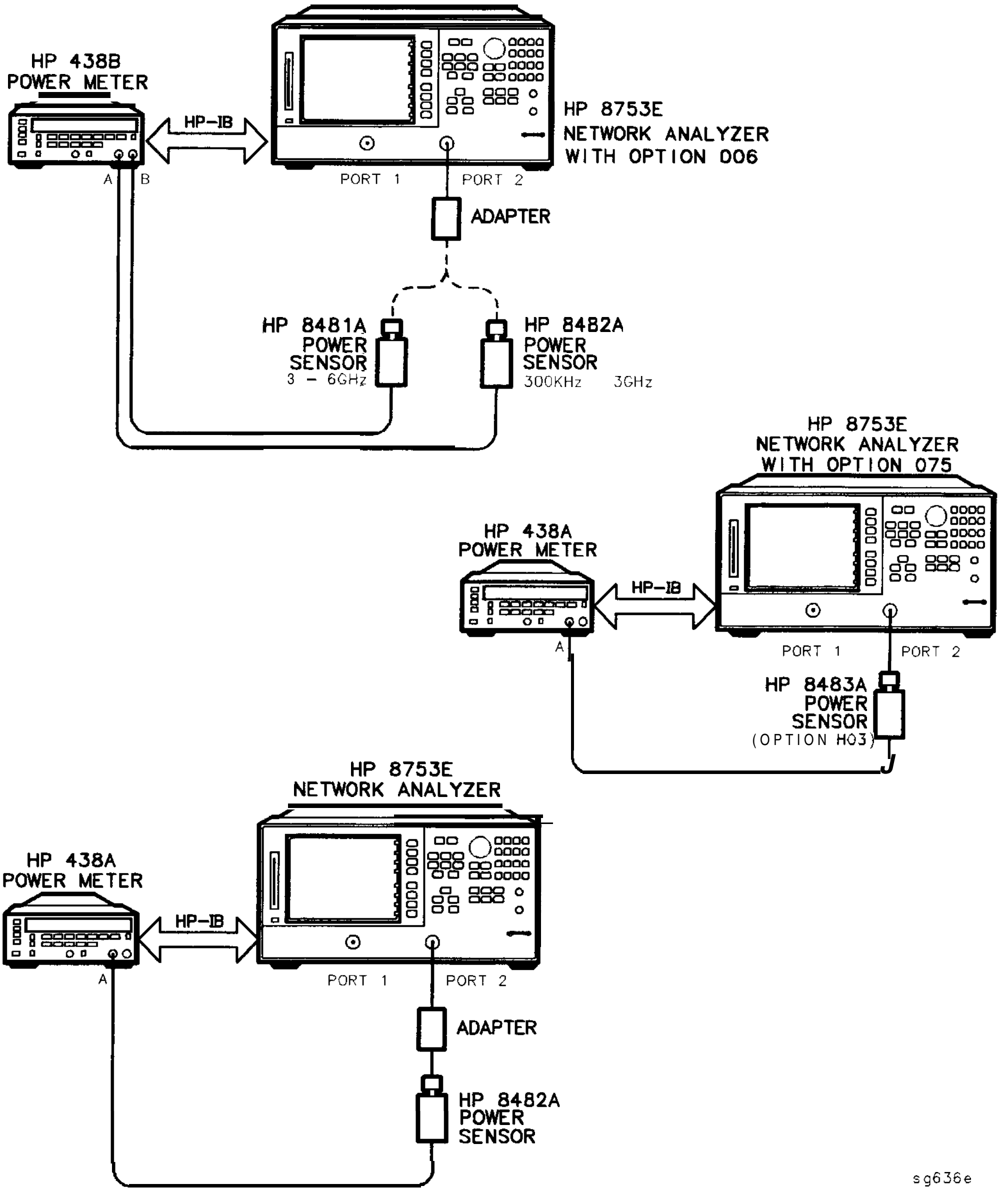



**Figure 3-7. Connections for Sampler Correction at Port 2**

21. Press **CONTINUE**. **This part of the test will take about 10 minutes.**

22. **For Option 006 Instruments Only:** When the analyzer displays CONNECT 6 GHz SENSOR TO PORT 2, make the connections as shown in Figure 3-8. Then press **CONTINUE**. **This part of the test will take about 20 seconds.**

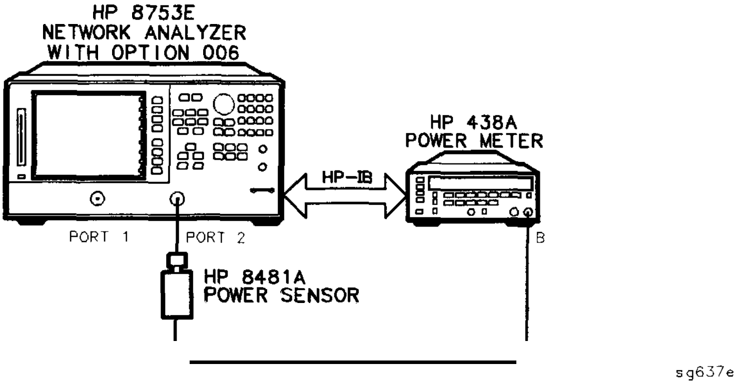



**Figure 3-8. Connections for Sampler Correction at Port 2 for 6 GHz**

23. When the analyzer displays CONNECT PORT 1 TO PORT 2, make the connections of the second through cable (of which you have determined its insertion loss) as shown in Figure 3-9.

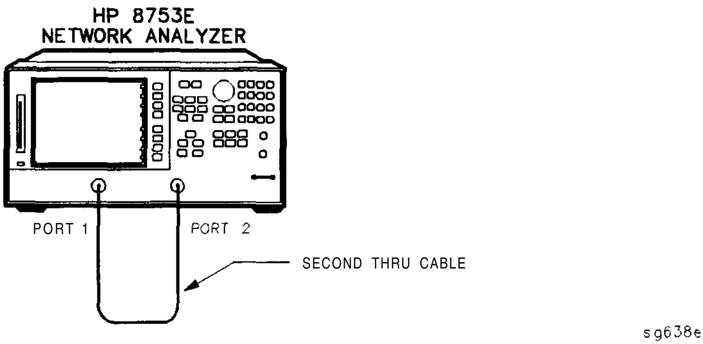



**Figure 3-9. Connections for the Second Through Cable**

24. Press **CONTINUE**.

25. Enter the insertion loss of the through cable (determined in step 15) and press **CONTINUE**. For example, if the insertion loss of the through cable at 1 GHz is found to be 0.25 dB, then press 1.25) (x1).

26. When the analyzer completes the test, observe the display for the results:
    - If you see Sampler Cor - DONE, you have completed this procedure.
    - If you see `Sampler Cor` - FAIL, it is necessary to adjust the sampler gain offset values, which are stored in EEPROM.

      **A Channel Sampler**

      a. Access the first address by pressing (System) **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** (1619001372) (x1).

      b. Enter the new value at the accessed address by pressing **POKE** (46) (x1).

      c. Access the second address by pressing **PEEK/POKE ADDRESS** (1619001373) (x1).

      d. Enter the new value at the accessed address by pressing **POKE** (248) (x1).

      e. Press (Preset) for the analyzer to use the new values.

      f. Repeat the "Sampler Correction Constants Routine" starting at step 16.
    - If the analyzer continues to fail this adjustment routine, refer to Chapter 7, "Source Troubleshooting."

      **B Channel Sampler**

      a. Access the first address by pressing (System) **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** (1619001374) (x1).

      b. Enter the new value at the accessed address by pressing **POKE** (46) (x1).

      c. Access the second address by pressing **PEEK/POKE ADDRESS** (1619001375) (x1).

      d. Enter the new value at the accessed address by pressing **POKE** (248) (x1).

      e. Press (Preset) for the analyzer to use the new values

f. Repeat the "Sampler Correction Constants Routine" starting at step 16.

- If the analyzer continues to **fail** this adjustment routine, refer to Chapter 7, "Source Troubleshooting."

**R Channel Sampler**

a. Access the first address by pressing (System) SERVICE MENU PEEK/POKE PEEK/POKE ADDRESS (1619001376) (x1).

b. Enter the new value at the accessed address by pressing POKE (66) (x1).

c. Access the second address by pressing PEEK/POKE ADDRESS (1619001377) (x1).

d. Enter the new value at the accessed address by pressing POKE (128) (x1).

e. Press (Preset) for the analyzer to use the new values.

f. Repeat the "Sampler Correction Constants Routine" starting at step 16.

- If the analyzer continues to **fail** this adjustment routine, refer to Chapter 7, "Source Troubleshooting."

## Cavity Oscillator Frequency Correction Constants (Test 54)

### Required Equipment and Tools

Low-pass Filter . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 91350198
Antistatic Wrist Strap . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-1367
Antistatic Wrist Strap Cord . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire . . . . . . . . . . . . . HP PM 9300-0797

### Additional Required Equipment for 50 ohm Analyzers

Adapter APC-7 to 3.5 mm (m) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP P/N 1250-1746
Adapter APC-7 to 3.5 mm (f) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP P/N 1250-1747
RF Cable Set APC-7. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP 118571)

### Additional Required Equipment for 75Ω Analyzers

Adapter APC-3.5 (f) to Type-N (f) . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP P/N 1250-1745
Adapter APC-3.5 (m) to Type-N (f) . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP P/N 1250-1750
RF Cable Set 503, Type-N . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP11851B
Minimum Loss Pad 50ohm75Ω (2) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .HP11852B

*Analyzer warmup Time: 30* **minutes.**

The nominal frequency of the cavity oscillator is 2.982 GHz, but it varies with temperature. This procedure determines the precise frequency of the cavity oscillator at a particular temperature by identifying a known spur

**Note** You should perform this procedure with the recommended filter, or a filter with at least 50 dB of rejection at 2.9 GHz, and a passband which includes 800 MHz. The filter makes spur identification substantially faster and more reliable.

With the filter, you need to distinguish between only two spurs, each of which should be 10 dB to 20 dB (3 to 4 divisions) above the trace noise.

Without the filter, you need to distinguish the target spur between four or five spurs, each of which may be 0.002 to 0.010 dB (invisible to 2 divisions) above or below the trace noise.

Perform the first five steps of the procedure at least once for familiarization before trying to select the target spur (especially if you are not using a filter).

1. Connect the equipment shown in Figure 3-10.

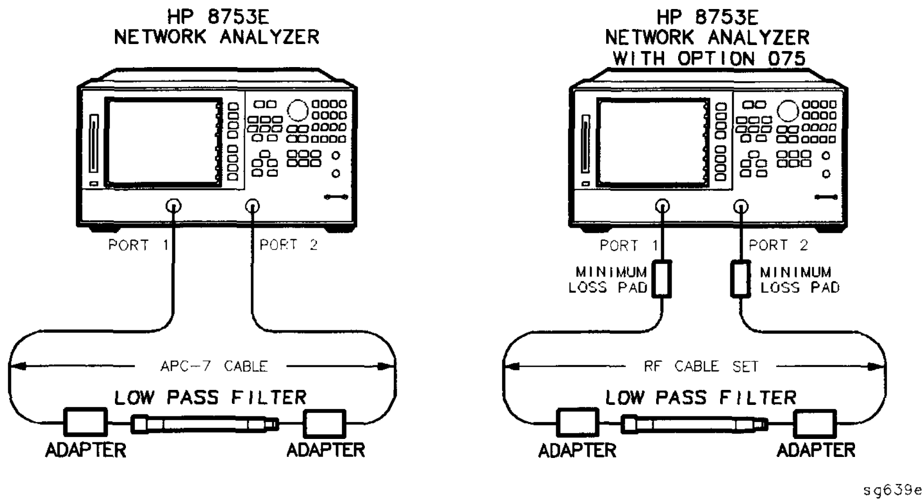



**Figure 3-10.**
**Setup for Cavity Oscillator Frequency Correction Constant Routine**

2. Press (Preset) (Avg) **IF BW** (3000) (x1) (System) **SERVICE MENU** **TESTS** (54) (x1) **EXECUTE TEST** **YES**.

   During this adjustment routine, you will see several softkeys:

| | |
|---|---|
| **CONTINUE** | sweeps the current frequency span; you may press it repeatedly for additional sweeps of the current frequency span. |
| **NEXT** | sweeps the next frequency span (2 MHz higher). |
| **SELECT** | enters the **value** of the marker (which you have placed on the spur) and exits the routine. |
| **ABORT** | exits the routine. |

3. **Press CONTINUE to sweep the first frequency span three times. Each new** span overlaps the previous span by 3 MHz (the center frequency increases by 2 MHz; the span is 5 MHz). Therefore, anything visible on the right half of the screen of one set of sweeps will appear on the left half or center of the screen when you press NEXT.

4. Press NEXT repeatedly. Watch the trace on each sweep and try to spot the target spur With the **filter,** the target spur **will** be one of two obvious spurs (see Figure 3-11). Without the **filter** (not recommended), the target spur will be one of four or five less distinct spurs as shown in Figure 3-12 and Figure 3-13. When the center frequency increases to 2994.999 MHz, and you have not "selected" the target spur, Cav Osc Cor FAIL **will** appear on the display.

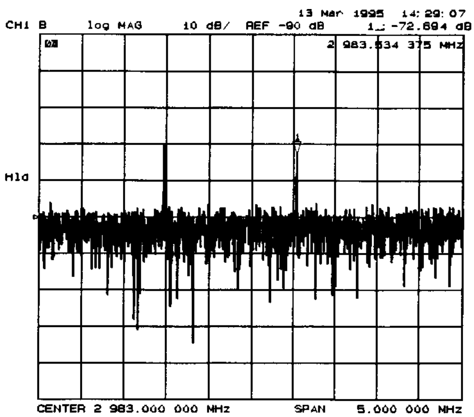



**Figure 3-11. Typical Display of Spurs with a Filter**

## Spur Search Procedure with a Filter

5. **Press EXECUTE TEST YES CONTINUE and the other softkeys as required to** observe and mark the target spur The target spur will appear to the right of a second spur, similar to **Figure 3-1** 1.

6. Rotate the front panel knob to position the marker on the spur and then **press SELECT.**

7. Observe the analyzer for the results of this adjustment routine:
   - If the analyzer displays Cav Osc Cor DONE, you have completed this procedure.
   - If the analyzer does not display DONE, repeat this procedure.
   - If the analyzer continues not to display DONE, refer to Chapter 7, "Source Troubleshooting."

## Spurs Search Procedure without a Filter

8. **Press EXECUTE TEST YES CONTINUE and the other softkeys as required to** observe and mark the target spur
9. The target spur will appear in many variations Often it will be difficult to identify positively; occasionally it will be nearly impossible to identify. Do not hesitate to press CONTINUE as many times as necessary to thoroughly inspect the current span.

   The target spur **usually** appears as one of a group of four evenly spaced spurs as in Figure 3-12. The target spur is on the right most spur (fourth from the left). On any particular sweep, one, any, or all of the spurs may be large, **small,** visible, invisible, above or below the reference line.

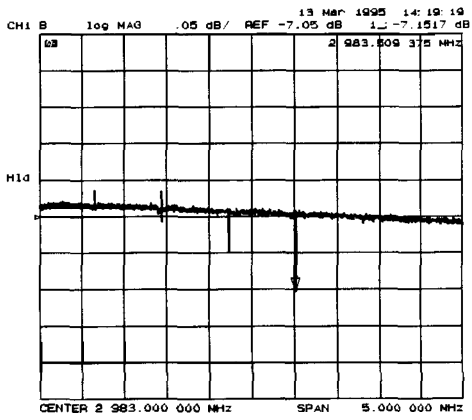



**Figure 3-12. Typical Display of Four Spurs without a Filter**

On occasion the largest spur appears as one of a group of five evenly spaced spurs as shown in **Figure** 3-13. The target spur is again the fourth from the left (not the fifth, right-most spur).

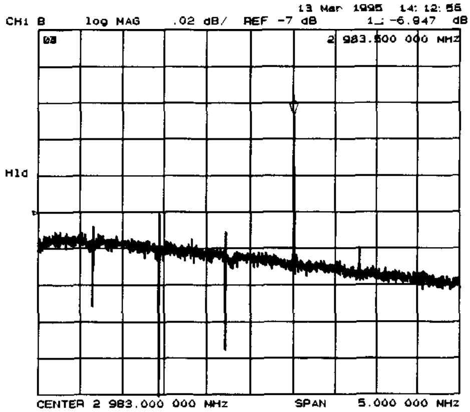



**Figure 3-13. Target Spur Is Fourth in Display of Five spurs**

Figure 3-14 shows another variation of the basic four spur pattern: some up, some down, and the target spur itself almost indistinguishable.

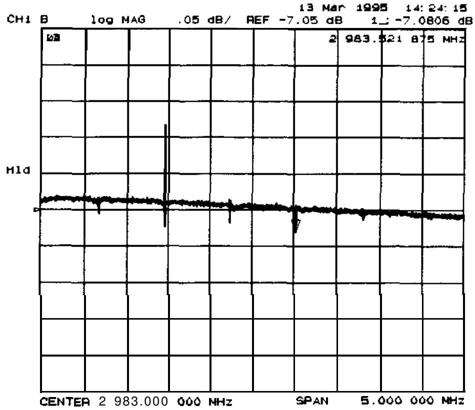



**Figure 3-14. Target Spur Is Almost Invisible**

10. Rotate the front panel knob to position the marker on the target spur. Then press SELECT and observe the analyzer for the results of the adjustment routine:

- If the analyzer displays Cav Osc Cor DONE, you have completed this procedure.
- If the analyzer displays FAIL, refer to Chapter 7, "Source Troubleshooting."

## Serial Number Correction Constants (Test 55)

*Analyzer warmup time: 5* **minutes.**

This procedure stores the analyzer serial number in the A9 CPU assembly EEPROMs.

**Caution** Perform this procedure *ONLY* if the A9 CPU assembly has been replaced.

1. Record the ten character serial number that is on the HP 8753E rear panel identification label.
2. **Press (Preset) DISPLAY MORE TITLE ERASE TITLE to erase the HP logo.**
3. Enter the serial number with an external keyboard or by rotating the front panel knob to position the arrow below each character of the instrument **serial number, and then pressing SELECT LETTER to enter each letter. Enter** a total of ten characters: four digits, one letter, and five **final** digits.

   **Press BACKSPACE if you made a mistake.**
4. **Press DONE when you have finished entering the title.**

**Caution** You *CANNOT* correct mistakes after you perform step 5, unless you contact the factory for a clear serial number keyword. Then you must perform the "Options Correction Constants" procedure and repeat this procedure.

5. Press (System) **SERVICE MENU** **TESTS** (55) (x1) **EXECUTE TEST** **YES**.

6. Observe the analyzer for the results of the routine:

- If the analyzer displays the message `Serial Cor` DONE, you have completed this procedure.
- If the analyzer does not display DONE, then either the serial number that you entered in steps 3 and 4 did not match the required format or a serial number was already stored. Check the serial number recognized by the analyzer:

  a. Press (Preset) (System) **SERVICE MENU** **FIRMWARE REVISION**.

  b. Look for the serial number displayed on the analyzer screen.

  c. Rerun this adjustment test.

- If the analyzer continues to fail this adjustment routine, contact your nearest HP sales or service office.

## Option Numbers Correction Constants (Test 56)

This procedure stores instrument option(s) information in **A9** CPU assembly **EEPROMs.** You can also use this procedure to remove a serial number, with the **unique** keyword, as referred to in "Serial Number Correction Constant."

1. Remove the instrument top cover and record the keyword label(s) that are on the display assembly. Note that *each* **keyword** is for each option installed in the instrument.
   - If the instrument does not have a label, then contact your nearest Hewlett-Packard sales or service office. Be sure to include the full serial number of the instrument.
2. **Press** (Preset) (Display) **MORE** **TITLE** **ERASE TITLE**.
3. Enter the keyword with an external keyboard or by rotating the front panel knob to position the arrow below each character of the keyword, and then pressing **SELECT LETTER** to enter each letter.

   Press **BACKSPACE** if you made a mistake.
4. **Press DONE when you have finished entering the title.**

**Caution** Do not confuse "I" with "1" or "0" with "0" (zero).

5. **Press** (System) **SERVICE MENU** **TESTS** (56) (x1) **EXECUTE TEST** **YES**.
6. Observe the analyzer for the results of the adjustment routine:
   - If the analyzer displays `Option Cor DONE,` you have completed this procedure.
   - If the analyzer has more than one option, repeat steps 2 through 5 to install the remaining options.
   - If the analyzer displays `Option Cor FAIL,` check the keyword used in step 3 and make sure it is correct. Pay special attention to the letters "I" or "O", the numbers "1" or "0" (zero). Repeat this entire adjustment test.
   - If the analyzer continues to fail the adjustment routine, contact your nearest HP sales or service office.

## Initialize EEPROMs (Test 58)

This service internal test performs the following functions:

- *Destroys* **all** correction constants and all unprotected options
- Initializes certain EEPROM address locations to zeroes.

**Note** This routine ***will not*** alter the serial number or Options 002, 006 and 010 correction constants.

1. Make sure the **A9** switch is in the alter position.
2. **Press** (Preset) (System) SERVICE MENU TESTS (58) (x1) (EXECUTE TEST) (YES).
3. Restore the analyzer correction constants in the EEPROMs:
   - If you have the correction constants backed up on a disk, perform these steps:

     a. **Place the disk in the analyzer disk drive and press** (Save/Recall) SELECT DISK INTERNAL DISK.

     b. Use the front panel knob to **highlight** the filename that represents your serial number.

     c. **Press** RETURN RECALL STATE (Preset).
   - If you don't have the correction constants backed up on a disk, run all the internal service routines in the following order:

     □ Source Default Correction Constants (Test 44)
     □ Source Pretune Correction Constants (Test 45)
     □ Analog Bus Correction Constants (Test 46)
     □ Source Pretune Correction Constants (Test 48)
     □ Calibration Kit Default Correction Constants (Test 57)
     □ ADC Offset Correction Constants (Test 52)
     □ RF Output Power Correction Constants (Test 47)
     □ Sampler Magnitude and Phase Correction Constants (Test 53)
     □ IF Amplifier Correction Constants (Test 51)
     □ Cavity Oscillator Frequency Correction Constants (Test 54)

## EEPROM Backup Disk Procedure

### Required Equipment and Tools

3.5-inch Floppy Disk .................................... HP 92192A (box of 10)
Antistatic Wrist Strap ........................................ HP P/N 9300-1367
Antistatic Wrist Strap Cord ................................. HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire ............ HP P/N 9300-0797

The correction constants, that are unique to your instrument, are stored in EEPROM on the A9 controller assembly. By creating an EEPROM backup disk, you will have a copy of all the correction constant data should you need to replace or repair the A9 assembly.

1. Insert a 3.5-inch disk into the analyzer disk drive.
2. If the disk is not formatted, follow these steps:
   a. Press (Save/Recall) FILE UTILITIES FORMAT DISK.
   b. Select the format type:
      - To format a LIF disk, select FORMAT:LIF
      - To format a DOS disk, select FORMAT:DOS.
   c. Press FORMAT INT DISK and answer YES at the query.
3. Press (System) SERVICE MENU SERVICE MODES MORE STORE EEPR ON (Save/Recall) SELECT DISK INTERNAL DISK RETURN SAVE STATE.

**Note** The analyzer creates a default file "FILE0". The filename appears in the upper-left comer of the display. The file type "ISTATE(E)" indicates that the file is an instrument-state with EEPROM backup.

4. Press FILE UTILITIES RENAME FILE ERASE TITLE. Use the front panel knob and the SELECT LETTER softkey (or an external keyboard) to rename the file "FILE0" TO "N*12345*" where *12345* represents the last 5 digits of the instrument's serial number. (The first character in the filename must be a letter.) When you are finished renaming the file, press DONE.

5. Write the following information on the disk label:
   - analyzer serial number
   - today's date
   - "EEPROM Backup Disk"

# Correction Constants Retrieval Procedure

### Required Equipment and Tools

EEPROM Backup Disk
Antistatic Wrist Strap . . . . , . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-1367
Antistatic Wrist Strap Cord . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire . . . . . . . . . . . . HP P/N 9300-0797

By using the current EEPROM backup disk, you can download the correction constants data into the instrument EEPROMs.

1. Insert the "EEPROM Backup Disk" into the HP 8753E disk drive.
2. Make sure the **A9** switch is in the **Alter** position.
3. Press (Save/Recall) SELECT DISK INTERNAL DISK. Use the front panel knob to **highlight** the **file "N12345"** where **N12345** represents the file name of the EEPROM data for the **analyzer.** On the factory shipped EEPROM backup disk, the filename is **FILE1.**
4. **Press** RETURN RECALL STATE **to download the correction constants data into** the instrument **EEPROMs.**
5. Perform "Option Numbers Correction Constant (Test 56)."
6. Press (Preset) and verify that good data was transferred to EEPROM by performing a simple measurement.
7. Move the **A9** switch back to its Normal position when you are done working with the instrument.

# Loading Firmware

### Required Equipment and Tools

- Firmware disk for the HP 8753E

***Analyzer warmup Time: None*** **required.**

The following procedures will load **firmware** for new or existing CPU boards in an HP 8753E network analyzer.

## Loading Firmware into an Existing CPU

Use this procedure for upgrading **firmware** in an operational instrument whose CPU board has not been changed.

**Caution** Loading **firmware** will clear all internal memory.

Perform the following steps to save any instrument states that are stored in internal memory to a floppy disk.

1. Press (Save/Recall) SELECT DISK INTERNAL MEMORY RETURN.
2. Select an instrument state and press RECALL STATE.
3. Press SELECT DISK INTERNAL DISK RETURN SAVE STATE.
4. If the instrument state file was not saved to disk with the same name that it had while in internal memory, you may wish to rename the **file.**

   Press FILE UTILITIES RENAME FILE, enter the desired name, and press DONE.
5. Repeat steps 1 through 4 for each instrument state that you wish to save.

1. Turn off the network analyzer.
2. Insert the **firmware** disk into the instrument's disk drive.
3. Turn the instrument on. The **firmware** will be loaded automatically during power-on. The front panel **LEDs** should step through a sequence as firmware is loaded. The display will be blank **during** this time.

At the end of a successful loading, the **LEDs** for Channel 1 and **Testport** 1 will remain on and the display **will** turn on indicating the version of **firmware** that was loaded.

## In Case of Difficulty

If the firmware did not load successfully, LED patterns on the front panel can help you isolate the problem.

- If the following LED pattern is present, the firmware disk is not for use with your instrument model. Check that the **firmware** disk used was for the HP 8753E.

| LED Pattern | | | | | |
|---|---|---|---|---|---|
| **CH1** | **CH2** | **R** | **L** | **T** | **S** |
| • | • | | | | |

- If any of the following LED patterns are present, the firmware disk may be defective.

| LED Pattern | | | | | |
|---|---|---|---|---|---|
| **CH1** | **CH2** | B | **L** | T | S |
| | | • | | | |
| | • | • | | | |
| • | | • | | | |
| • | • | • | | | |
| | | | • | | |
| | • | | • | | |
| • | | | • | | |
| • | • | | • | | |
| | | • | • | | |
| | • | • | • | | |
| • | | • | • | | |
| | | • | | | • |
| | • | • | | | • |

- If any other LED pattern is present, the CPU board is defective.

## Loading Firmware into a New CPU

Use this procedure to load firmware for an instrument whose CPU board has been replaced.

1. Turn off the network analyzer.
2. Insert the firmware disk into the instrument's disk drive.
3. Turn the instrument on. The firmware will be loaded automatically during power-on. The front panel LEDs should step through a sequence as firmware is loaded. The display will be blank during this time.

   At the end of a successful loading, the LEDs for Channel 1 and Testport 1 will remain on and the display will turn on indicating the version of firmware that was loaded.

---

**Note** After the firmware has been loaded, the correction constants must be restored. Refer to Table 3-1 (2 of 3) to identify the service procedures required to restore (retrieve) or recreate the correction constants.

---

### In Case of Difficulty

- If the firmware did not load successfully, LED patterns on the front panel can help you isolate the problem.
  - If the following LED pattern is present, an acceptable firmware filename was not found on the disk. (The desired format for firmware filenames is 8753E_07._02.) Check that the firmware disk used was for the HP 87533.

| LED Pattern | | | | | |
|---|---|---|---|---|---|
| CH1 | CH2 | R | L | T | S |
| | • | | | | |

- ❑ If any of the following LED patterns are present, the **firmware** disk may be defective.

| LED Pattern | | | | | |
|---|---|---|---|---|---|
| **CH1** | **CH2** | B | L | T | **S** |
| | | ● | | | |
| | ● | ● | | | |
| ● | | ● | | | |
| ● | ● | ● | | | |
| | | | ● | | |
| | ● | | ● | | |
| ● | | | ● | | |
| ● | ● | | ● | | |
| | | ● | ● | | |
| | ● | ● | ● | | |
| ● | | ● | ● | | |
| | | ● | | | ● |
| | ● | ● | | | ● |

- ❑ If any other LED pattern is present, the CPU board is defective.

---

**Note** If **firmware** did not load, a red LED on the CPU board will be flashing.

---

- ■ If the following LED pattern is present on the CPU board, suspect the disk drive or associated cabling:

● ● ● □ ● ● □ □

(front of instrument ⇓)

# Fractional-N Frequency Range Adjustment

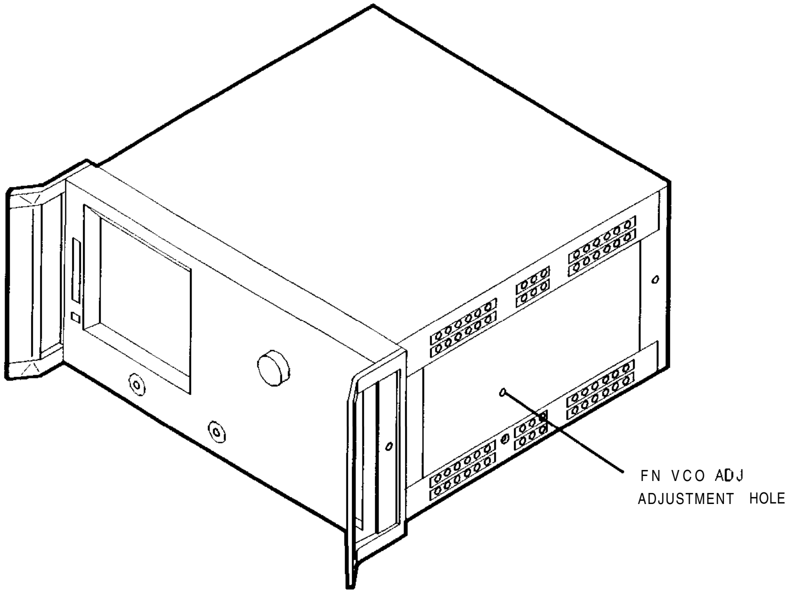
## Required Equipment and Tools

Non-metallic Adjustment Tool ............................... HP P/N 8830-0024
Antistatic Wrist Strap ........................................ HP P/N 9300-1367
Antistatic Wrist Strap Cord ................................ HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire ............ HP P/N 9300-0797

*Analyzer warmup time:* **30 minutes**

This procedure centers the fractional-N VCO (voltage controlled oscillator) in its tuning range to insure reliable operation of the instrument.

1. Remove the right-rear bumpers and right side cover.
2. Press (Preset) (Display) DUAL CHAN ON (System) SERVICE MENU ANALOG BUS ON (Menu) NUMBER of POINTS (11) (x1) COUPLED CH OFF.
3. Press (Start) (36) (M/μ) (Stop) (60.75) (M/μ) (Menu) SWEEP TIME (12.5) (k/m) (Meas) ANALOG IN Aux Input (29) (x1) to observe the "FN VCO Tun" voltage.
4. Press (Format) MORE REAL (Scale Ref) (.6) (x1) REFERENCE VALUE (-7) (x1) to set and scale channel 1. Press (Marker) to set the marker to the far right of the graticule.
5. Press (CH2) (Menu) CW FREQ (31.0001) (M/μ) SWEEP TIME (12.375) (k/m) (Meas) ANALOG IN Aux Input (29) (x1) to observe the "FN VCO Tun" voltage.
6. Press (Format) MORE REAL (Scale Ref) (.2) (x1) REFERENCE VALUE (6.77) (x1) (Marker) (6) (k/m) to set channel 2 and its marker.
7. Adjust the "FN VCO TUNE" (see Figure 3-15) with a non-metallic tool so that the channel 1 marker is as many divisions above the reference line as the channel 2 marker is below it. (See Figure 3-16.)




sg640e

**Figure 3-15. Location of the FN VCO TUNE Adjustment**

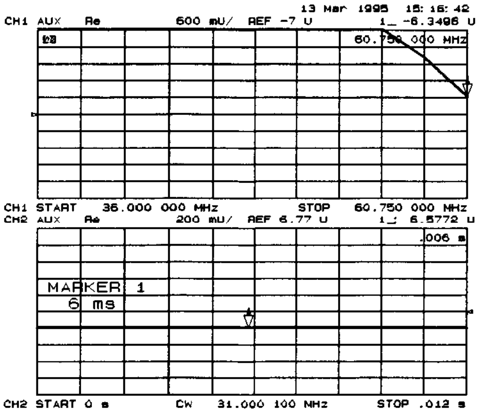



**Figure 3-16. Fractional-N Frequency Range Adjustment Display**

8. To fine-tune this adjustment, press (Preset) (Menu) CW FREQ (System) SERVICE MENU ANALOG BUS ON SERVICE MODES FRACN TUNE ON to set "FRAC N TUNE" to 29.2 MHz.

9. Press (Meas) ANALOG IN Aux Input (29) (x1) (Marker) (Format) MORE REAL (Scale Ref) REFERENCE VALUE (7) (x1).

10. Observe the analyzer for the results of this adjustment:

- If the marker value is less than 7, you have completed this procedure.
- If the marker value is greater than 7, readjust "FN VCO ADJ" to 7. Then perform steps 2 to 10 to confirm that the channel 1 and channel 2 markers are still above and below the reference line respectively.
- If you cannot adjust the analyzer correctly, replace the A14 board assembly.

# Frequency Accuracy Adjustment

## Required Equipment and Tools

Spectrum Analyzer .............................................. HP 8563E
RF Cable, 50Ω Type-N, 24-inch ............................HP P/N 8120-4781
Non-metallic Adjustment Tool .............................. HP P/N 8830-0024
Antistatic Wrist Strap . , ..................................... HP P/N 9300-1367
Antistatic Wrist Strap Cord ................................. HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire ............ HP P/N 9300-0797

## Additional Required Equipment for 50Ω Analyzers

Adapter APC-7 to Type-N (f) ....................................... HP 11525A

## Additional Required Equipment for 75Ω Analyzers

Minimum Loss Pad ................................................ HP 11852B

***Analyzer warmup time:* 30 minutes.**

This adjustment sets the VCXO (voltage controlled crystal oscillator) frequency to maintain the instrument's frequency accuracy.

1. Remove the upper-rear bumpers and analyzer top cover
2. Connect the equipment as shown in Figure 3-17.

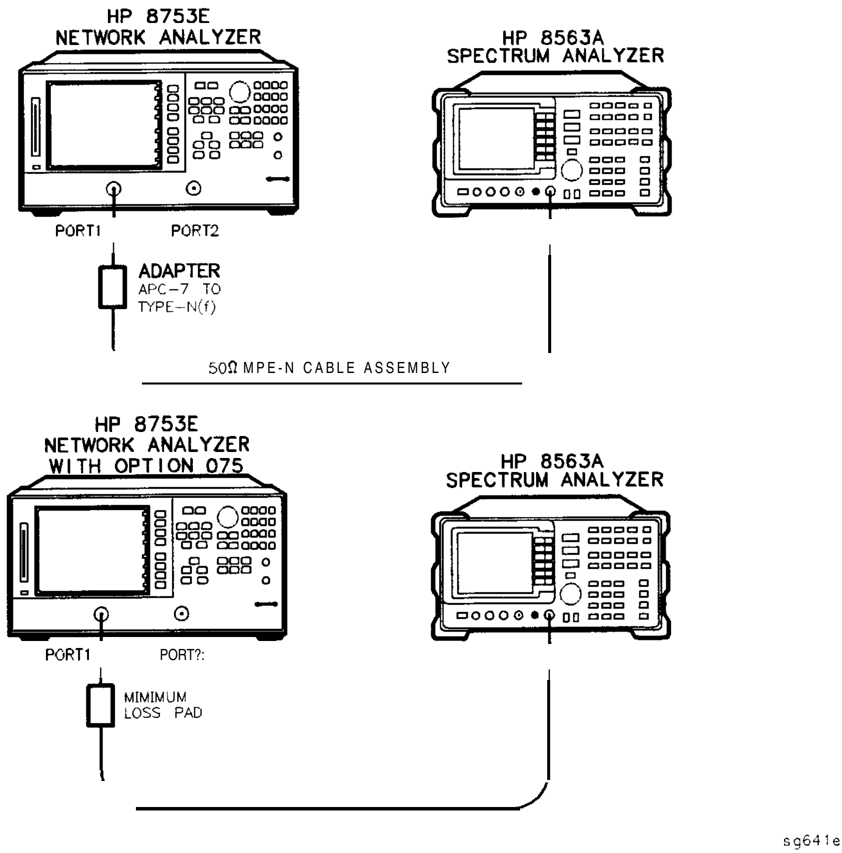



**Figure 3-17. Frequency Accuracy Adjustment Setup**

**Note** Make sure that the spectrum analyzer and network analyzer references are *not* connected.

3. **For Option 1D5 Instruments** Only: Remove the BNC-to-BNC jumper that is connected between the "EXT REF" and the "10 MHz Precision Reference," as shown in Figure 3-19.
4. Set the spectrum analyzer measurement parameters as follows:

   (FREQUENCY) (3) (G/n) (or (6) (G/n) for Option 006)
   (Span) (60) (kHz) (or (120) (kHz) for Option 006)
   (AMPLITUDE) **REF LVL** (10) (+dBm)

5. On the HP 8753E, press (Preset) (Menu) **CW FREQ** (3) (G/n) (or (6) (G/n) for Option 006).

6. No adjustment is required if the spectrum analyzer measurement is within the following specifications:

   - **±30 kHz** for the HP 8753E
   - **±60 kHz** for the HP 8753e, Option 006

   Otherwise, locate the **A12** assembly (red extractors) and adjust the VCXO ADJ (see **Figure** 3-18) for a spectrum analyzer center frequency measurement within specifications.

7. Replace the **A12** assembly if you are unable to adjust the frequency as specified. Repeat this adjustment test.

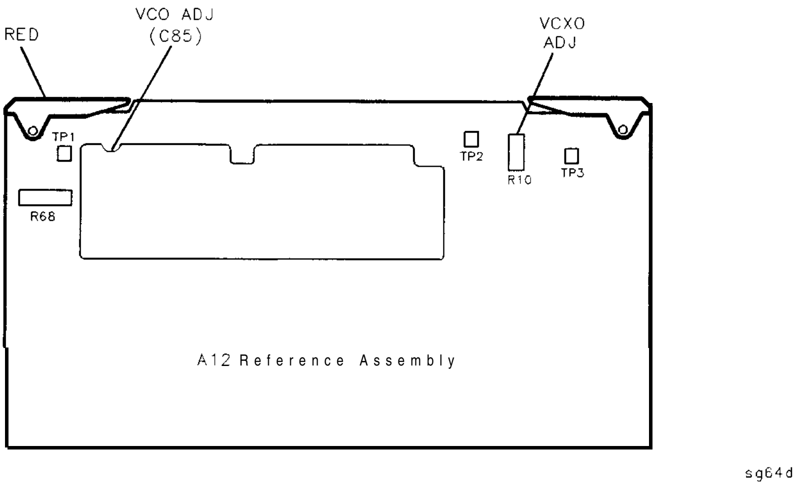



**Figure 3-18. Location of the VCXO ADJ Adjustment**

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**Note** To increase the accuracy of this adjustment, the following steps are recommended.

---

8. Replace the instrument covers and wait 10 to 15 minutes in order to allow the analyzer to reach its precise operating temperature.

9. Recheck the CW frequency and adjust if necessary.

## Instruments with Option 1D5 Only

10. Reconnect the BNC-to-BNC jumper between the "EXT REF" and the "10 MHz Precision Reference" as shown in Figure 3-19.

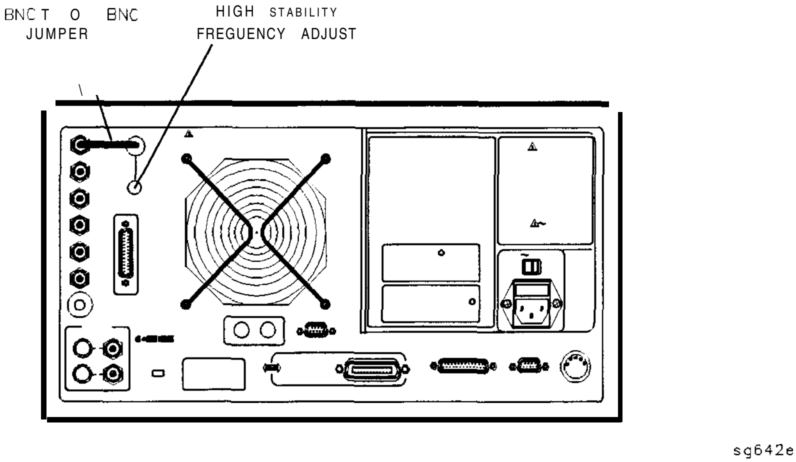



**Figure 3-19. High Stability Frequency Adjustment Location**

11. Insert a narrow screwdriver and adjust the high-stability frequency reference potentiometer for a **CW** frequency measurement within specification.

## In Case of Difficulty

Replace the **A26** assembly if you cannot adjust the **CW** frequency within specification.

# High/Low Band Transition Adjustment

## Required Equipment and Tools

Non-metallic Adjustment Tool . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 8830-0024

***Analyzer warmup time: 30* minutes.**

This adjustment centers the VCO (voltage controlled oscillator) of the A12 reference assembly for high and low band operations.

1. **Press (Preset) (System) SERVICE MENU ANALOG BUS ON (Start) (11) (M/μ) (Stop) (21) (M/μ) to observe part of both the low and high bands on the analog bus.**
2. **Press (Meas) ANALOG IN Aux Input (22) (x1) (Format) MORE REAL (Display) DATA→MEM DATA-MEMORY to subtract the ground voltage from the next measurement.**
3. **Press (Meas) ANALOG IN Aux Input (23) (x1) (Marker) (11) (M/μ).**
4. Press (Scale (.1) (x1) and observe the VCO tuning trace:
   - If the left half of trace = 0 ±1000 mV and right half of trace = 100 to 200 mV higher (one to two divisions, see Figure 3-20): no adjustment is necessary.
   - If the adjustment is necessary, follow these steps:

     a. Adjust the VCO tune (see Figure 3-21) to position the left half of the trace to 0 ±125 mV. The variable capacitor, C85, has a half-turn tuning range if the A12 Reference Board is part number 08753-60209, and seven turns if the part number is 08753-60357. Be careful not to overtighten and damage the seven-turn capacitor.

     b. Adjust the HBLB (see Figure 3-21) to position the right half of the trace 125 to 175 mV (about 1 to 1.5 divisions) higher than the left half.
   - Refer to Chapter 7, "Source Troubleshooting," if you cannot perform the adjustment.

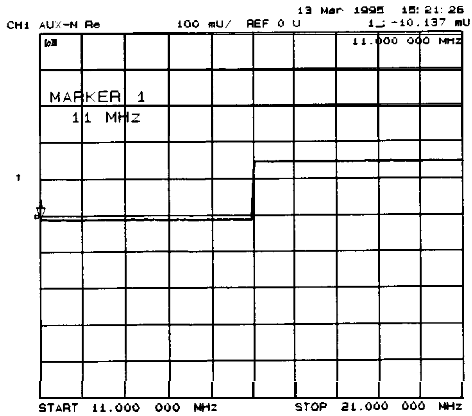



**Figure 3-20. High/Low Band Transition Adjustment Trace**

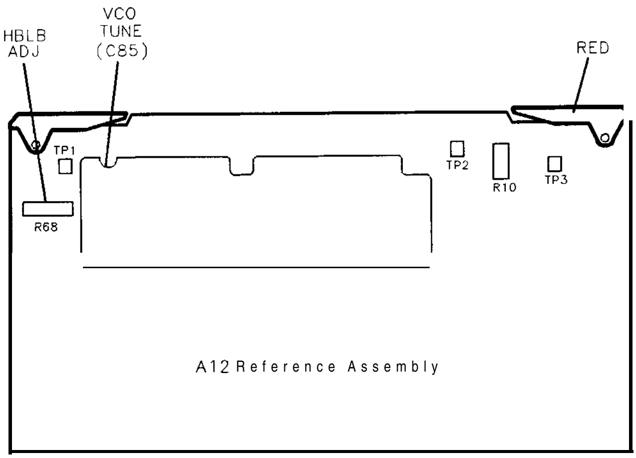



**Figure 3-21. High/Low Band Adjustment Locations**

## Fractional-N Spur Avoidance and FM Sideband Adjustment

### Required Equipment and Tools

Spectrum Analyzer .................................................. HP 8563E
HP-IB Cable .................................................. HP 10833A/B/C/D
RF Cable 50 ohm, Type 24-inch .............................. HP P/N 81204781
Cable, 50Ω Coax, BNC (m) to BNC (m) ............................ .HP 10503A
Non-metallic Adjustment Tool .............................. HP P/N 8830-0024
Antistatic Wrist Strap ...................................... HP P/N 9300-1367
Antistatic Wrist Strap Cord ................................ HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire ........... HP P/N 9300-0797

### Additional Required Equipment for 50Ω Analyzers

Adapter APC-7 to Type-N (f) ........................................ HP 11525A

### Additional Required Equipment for 75 ohm Analyzers

Minimum Loss Pad ........................................................ HP 11852B

***Analyzer warmup time: 30* minutes.**

This adjustment minimizes the spurs caused by the API (analog phase interpolator, on the fractional-N assembly) circuits. It also improves the sideband characteristics.

1. Connect the equipment as shown in Figure 3-22.
2. Make sure the instruments are set to their default HP-IB addresses: HP 8753E = 16, Spectrum Analyzer = 18.

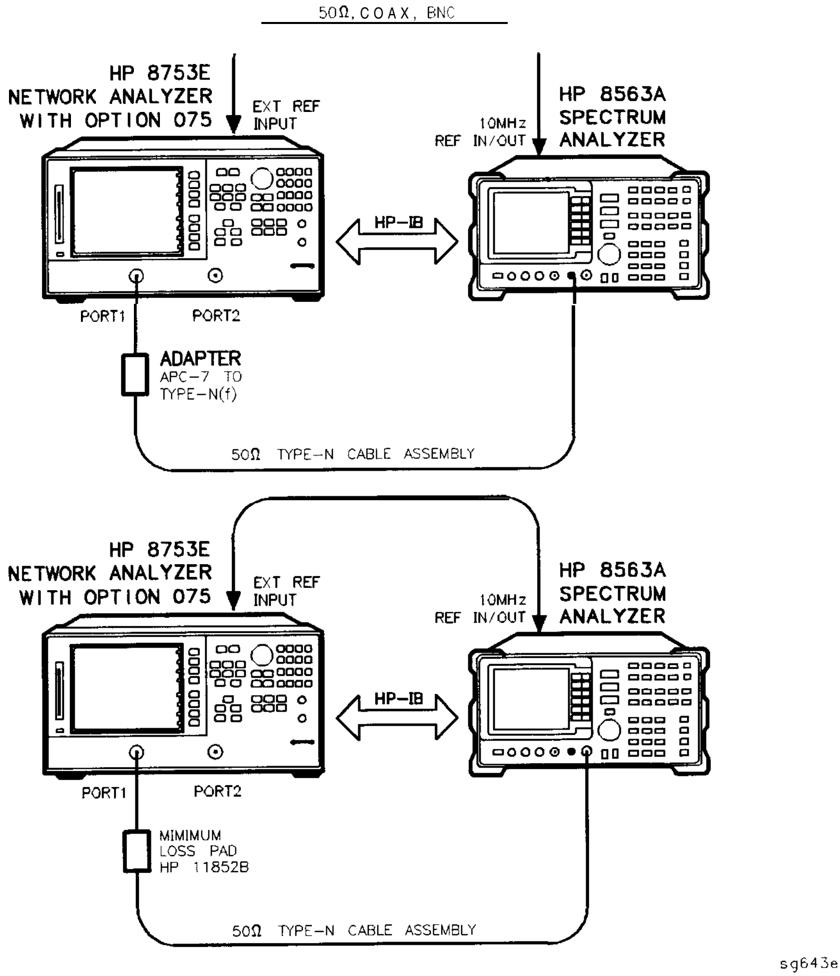



**Figure 3-22.**
**Fractional-N Spur Avoidance and FM Sideband Adjustment Setup**

3. Set the spectrum analyzer measurement parameters as follows:

| | |
|---|---|
| Reference Level | 0 dBm |
| Resolution Bandwidth | 100 Hz |
| Center Frequency | 676.145105 MHz |
| Span | 2.5 kHz |

4. On the HP 8753E, press (Preset) (Avg) **IF BW** (3000) (x1) (Menu) **CW FREQ** (676.045105) (M/μ).

5. Adjust the 100 **kHz (R77)** for a **null** (minimum amplitude) on the spectrum analyzer. The minimum **signal** may, or may not, drop down into the noise floor.

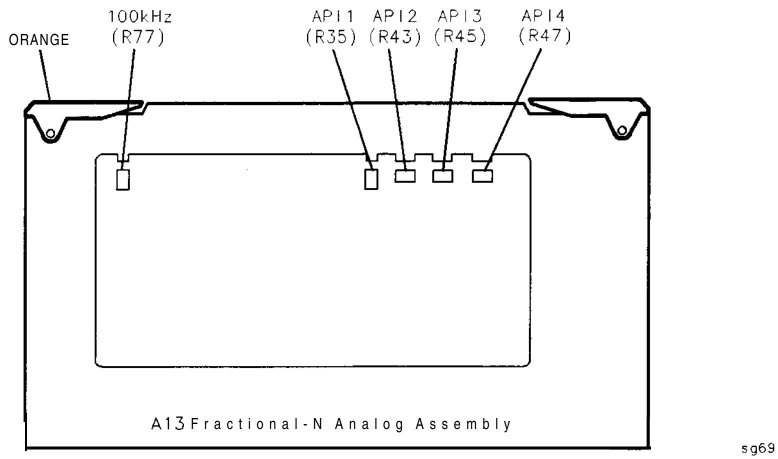



**Figure 3-23. Location of API and 100 kHz Adjustments**

6. On the spectrum analyzer, set the center frequency for 676.051105 MHz.

7. On the HP 8753e, press (Menu) **CW FREQ** (676.048105) (M/μ).

8. Adjust the **API1 (R35)** for a **null** (minimum amplitude) on the spectrum analyzer.

9. On the spectrum analyzer, set the center frequency for 676.007515 MHz.

10. **On the HP 8753E, press** (Menu) **CW FREQ** (676.004515) (M/μ).

11. **Adjust** the **API2 (R43)** for a **null** (minimum amplitude) on the spectrum analyzer.

12. On the spectrum analyzer, set the center frequency for 676.003450 MHz.

13. **On the HP 8753E, press** (Menu) **CW FREQ** (676.00045) (M/μ).

14. Adjust the **API3 (R45)** for a **null** (minimum amplitude) on the spectrum analyzer.

15. On the spectrum analyzer, set the center frequency for 676.003045 MHz.

16. On the HP 8753E, press (Menu) **CW FREQ** (676.000045) (M/μ).

17. Adjust the **API4 (R47)** for a null (minimum amplitude) on the spectrum analyzer.

**In Case of Difficulty**

18. If this adjustment cannot be performed satisfactorily, repeat the entire procedure. Or else replace the **A13** board assembly.

# Source Spur Avoidance Tracking Adjustment

## Required Equipment and Tools

BNC Alligator Clip Adapter .................................. HP P/N 8120-1292
BNC-to-BNC Cable ............................................ .HP P/N 8120-1840
Antistatic Wrist Strap ........................................ HP P/N 9300-1367
Antistatic Wrist Strap Cord ................................. HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire ........... HP P/N 9300-0797

***Analyzer warmup time: 30* minutes.**

This adjustment optimizes tracking between the YO (YIG **oscillator)** and the cavity **oscillator** when they are frequency offset to avoid spurs. Optimizing YO-cavity **oscillator** tracking reduces potential phase-locked loop problems.

1. Mate the adapter to the BNC cable and connect the BNC connector end to AUX INPUT on the HP 8753E rear panel. Connect the BNC center conductor **alligator-clip** to All **TP10** (labeled $\phi$ ERR); the shield **clip** to All **TP1** (GND) as shown in **Figure** 3-24.

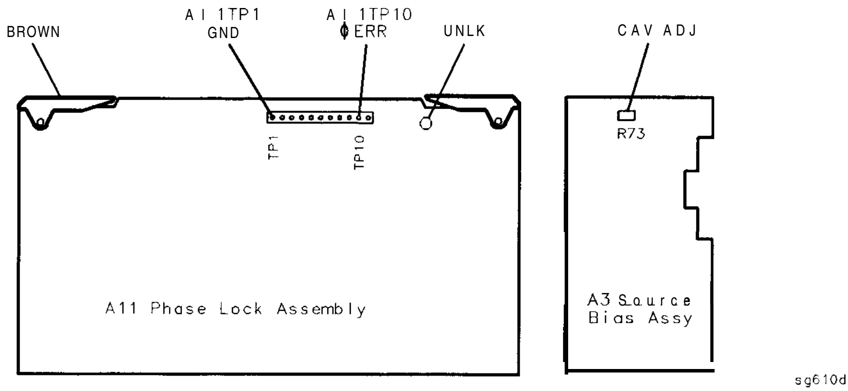



**Figure 3-24. Location of All Test Points and A3 CAV ADJ Adjustments**

2. Press (Preset) (Center) (400) (M/$\mu$) (Span) (50) (M/$\mu$).

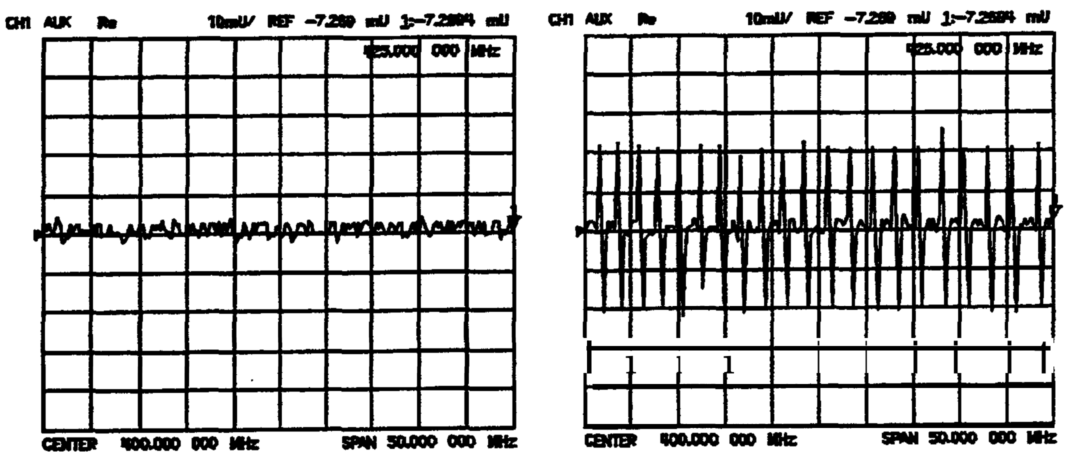
3. Press (System) SERVICE MENU ANALOG BUS ON (Meas) ANALOG IN Aux Input (11) (x1).

4. Press (Format) MORE REAL (Scale Ref) (10) (k/m) MARKER→REFERENCE.

5. To make sure that you have connected the test points properly, adjust the CAV ADJ potentiometer while observing the analyzer display. You should notice a change in voltage.

6. Observe the phase locked loop error voltage:

   - If "spikes" are not visible on the analyzer display (see **Figure** 3-25): no adjustment is necessary.
   - If "spikes" are excessive (see Figure 3-25): adjust the CAV ADJ potentiometer (see **Figure** 3-24) on the **A3** source bias assembly to eliminate the spikes.
   - If the "spikes" persist, refer to Chapter 7, "Source Troubleshooting."




a) Acceptable b) Excessive

sg637s

**Figure 3-25. Display of Acceptable versus Excessive Spikes**

## Unprotected Hardware Option Numbers Correction Constants

*Analyzer warmup Time: None.*

This procedure stores the instrument's unprotected option(s) information in **A9** CPU assembly **EEPROMs.**

1. Make sure the **A9** switch is in the Alter position.
2. Record the installed options that are printed on the rear panel of the analyzer.
3. Press (System) SERVICE MENU PEEK/POKE PEEK/POKE ADDRESS.
4. Refer to **Table** 3-2 for the address of each unprotected hardware option. Enter the address for the **specific** installed hardware option that needs to be **enabled or disabled. Follow the address entry by** POKE (1) (x1).

   . Press POKE (−1) (xl, then (Preset) to enable the option;

   . or, press POKE (0) (x1), then (Preset) to disable the option.

**Table** 3-2. PEEK/POKE Addresses

| **Hardware** Options | PEEK/POKE Address |
|---|---|
| 1D5 | 1619001529 |
| 011 | 1619001532 |

5. Repeat steps 3 and 4 for **all** of the unprotected options that you want to enable.

6. After you have entered all of the instrument's hardware options, press the following keys:

   (System) **SERVICE MENU** **FIRMWARE REVISION**

7. View the analyzer display for the listed options
8. When you have entered all of the hardware options, return the **A9** switch to the Normal position.
9. Perform the "EEPROM Backup Disk Procedure" located on page 3-42.

### In Case of Difficulty

If any of the installed options are missing from the list, return to step 2 and reenter the missing option(s).

## Sequences for Mechanical Adjustments

The network analyzer has the capability of automating tasks through a sequencing function. The following adjustment sequences are available via Access *HP* on the World Wide Web.

- **Fractional-N Frequency** Range Adjustment (F'NADJ and **FNCHK)**
- High/Low Band Transition Adjustment (HBLBADJ)
- Fractional-N Spur Avoidance and **FM** Sideband Adjustment (APIADJ)

You can download these adjustment sequences from the following URL:

**http://www.tmo.hp.com/tmo/pia/component_test/PIATop/English/comptest_support.html**

## How to Load Sequences from Disk

1. Place the sequence disk in the analyzer disk drive.
2. **Press** (Local) **SYSTEM CONTROLLER** (SEQUENCE) **MORE** **LOAD SEQUENCE FROM DISK** **READ SEQUENCE FILE TITLES**.
3. Select any or all of the following sequence **files** by pressing:
   - **Select LOAD SEQ APIADJ if you want to load the file for the "Fractional-N** Spur Avoidance and **FM** Sideband Adjustment."
   - **Select LOAD SEQ HBLBADJ if you want to load the file for the "High/Low** Band Transition Adjustment."
   - **Select LOAD SEQ FNADJ and LOAD SEQ FNCHK if you want to load the files for the "Fractional-N Frequency Range Adjustment."**

## How to Set Up the Fractional-N Frequency Range Adjustment

1. Remove the right-rear bumpers and right side cover. This exposes the adjustment location in the sheet metal.
2. Press (Preset) **SEQUENCE X FNADJ** (where X is the sequence number).
3. Adjust the "FN VCO TUNE" with a non-metallic tool so that the channel 1 marker is as many divisions above the reference line as the channel 2 marker is below it.
4. Press (Preset) **SEQUENCE X FNCHK** (where X is the sequence number).
   - If the marker value is <7, you have completed this procedure.
   - If the marker value is >7, readjust "FN VCO TUNE" to 7. Then repeat steps 2,3, and 4 to confirm that the channel 1 and channel 2 markers are still above and below the reference line respectively.

## How to Set Up the High/Low Band Transition Adjustments

1. Press (Preset) **SEQ X HBLBADJ** (where X is the sequence number).
2. Observe the VCO tuning trace:
   - If the left half of trace = 0±1000 mV and right half of trace = 100 to 200 mV higher (one to two divisions): no adjustment is necessary.
   - If the adjustment is necessary, follow these steps:
     a. Remove the upper-rear bumpers and top cover, using a TORX screwdriver.
     b. Adjust the VCO tune (A12 C85) to position the left half of the trace to 0±125 mV. This is a very sensitive adjustment where the trace could easily go off of the screen.
     c. Adjust the HBLB (A12 R68) to position the right half of the trace 125 to 175 mV (about 1 to 1.5 divisions) higher than the left half.

- Refer to Chapter 7, "Source Troubleshooting," if you cannot perform the adjustment.

## How to Set Up the Fractional-N Spur Avoidance and FM Sideband Adjustment

1. Press (Preset) SEQUENCE X APIADJ (where **X** is the **sequence number**).
2. Remove the upper-rear comer bumpers and the top cover, using a TORX screwdriver.
3. **Follow** the directions on the analyzer display and make **all** of the API adjustments.

## Sequence Contents

### Sequence for the High/Low Band Transition Adjustment

*—Sequence HBLBADJ sets the hi-band to low-band switch point.—*

PRESET
SYSTEM
  SERVICE MENU
    **ANALOG** BUS ON
**START 11 M/u**
STOP 21 **M/u**
**MEAS**
  ANALOG IN 22 xl **(A12** GND)
DISPLAY
  **DATA > MEM**
  DATA-MEM
**MEAS**
  *ANALOG IN 23* xl (VCO TUNE)
**MKR 11 M/u**
**SCALE/REF .1** xl

## Sequences for the Fractional-N Frequency Range Adjustment

*—Sequence FNADJ sets up A14 (FRAC N Digital) VCO.—*

DISPLAY
  DUAL CHAN ON
SYSTEM
  SERVICE MENU
    ANALOG BUS ON
MENU
  NUMBER OF POINTS 11 xl
  COUPLED CHAN OFF
START 36 **M/u**
STOP 60.75 **M/u**
MENU
  SWEEP TIME 12.5 k/m
**MEAS**
  ANALOG IN 29 xl (FN VCO TUN)
**SCALE/REF** 0.6 xl
  REF VALUE -7 xl
**MKR**
CH 2
MENU
  CW FREQ 31.0001 **M/u**
  SWEEP TIME 12.375 k/m
**MEAS**
  ANALOG IN 29 xl (FN VCO TUN)
**SCALE/REF .2** xl
  REF VALUE 6.77 xl
**MKR 6 k/m**

*—Sequence FNCHK check the VCO adjustment.—*

MENU
  CW FREQ 1 G/n
SYSTEM
  SERVICE MENU
    ANALOG BUS ON
    SERVICE MODES
      FRACNTUNEON
**MEAS**
  ANALOG IN 29 xl
**MKR**

**SCALE/REF**
REF VALUE 7 xl

## Sequences for the Fractional-N Avoidance and FM Sideband Adjustment

*—Sequence APIADJ sets up the fractional-N API spur adjustments.—*

TITLE
SP **2.5K**
PERIPHERAL HPIB ADDR
18 xl
TITLE TO PERIPHERAL
WAIT x
0 xl
TITLE
AT ODB
TITLE TO PERIPHERAL
WAIT x
0 xl
TITLE
RM **100HZ**
TITLE TO PERIPHERAL
WAIT x
0 xl
TITLE
CF **676.145105MZ**
TITLE TO PERIPHERAL
WAIT x
0 xl
CW FREQ
**676.045105M/u**
TITLE
ADJ **A13 100KHZ**
SEQUENCE
PAUSE
TITLE
CF **676.048105MZ**
TITLE TO PERIPHERAL
WAIT x
0 xl

```
TITLE
   ADJ A13 API1
SEQUENCE
PAUSE
TITLE
   CF 676.007515MZ
TITLE TO PERIPHERAL
WATT x
   0 xl
CW FREQ
   676.004515M/u
TITLE
   ADJ A13 API2
SEQUENCE
PAUSE
TITLE
   CF 676.003450MZ
TITLE TO PERIPHERAL
WAIT x
   0 xl
CW FREQ
   676.000450M/u
TITLE
   ADJ A13 API3
SEQUENCE
PAUSE
TITLE
   CF 676.003045MZ
TITLE TO PERIPHERAL
WAIT x
0 xl
CW FREQ
   676.000045M/u
TITLE
ADJ A13 API4
```

# 4

# Start Troubleshooting Here

The information in this chapter helps you:

- Identify the portion of the analyzer that is at fault.
- Locate the specific troubleshooting procedures to identify the assembly or peripheral at fault.

To identify the portion of the analyzer at fault, follow these procedures:

Step 1. Initial Observations

Step 2. Operator's Check

Step 3. HP-IB Systems Check

Step 4. Faulty Group Isolation

## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8753E network analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts."
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures."
4. Perform the necessary adjustments. Refer to Chapter 3, "Adjustments and Correction Constants."
5. Perform the necessary performance tests. Refer to Chapter 2, "System Verification and Performance Tests."

## Having Your Analyzer Serviced

The HP 8753E has a one year on-site warranty, where available. If the analyzer should fail any of the following checks, call your local HP sales or service office. A customer engineer will be dispatched to service your analyzer on-site. If a customer engineer is not available in your area, follow the steps below to send your analyzer back to HP for repair

1. Choose the nearest HP service center. (A table listing of Hewlett-Packard sales or service offices is provided at the end of this guide.)
2. Include a detailed description of any failed test and any error message.
3. Ship the analyzer, using the original or comparable antistatic packaging materials.

# Step 1. Initial Observations

## Initiate the Analyzer Self-Test

1. Disconnect all devices and peripherals from the analyzer.
2. Switch on the analyzer and press (Preset).
3. Watch for the indications shown in Figure **4-1** to determine if the analyzer is operating correctly.

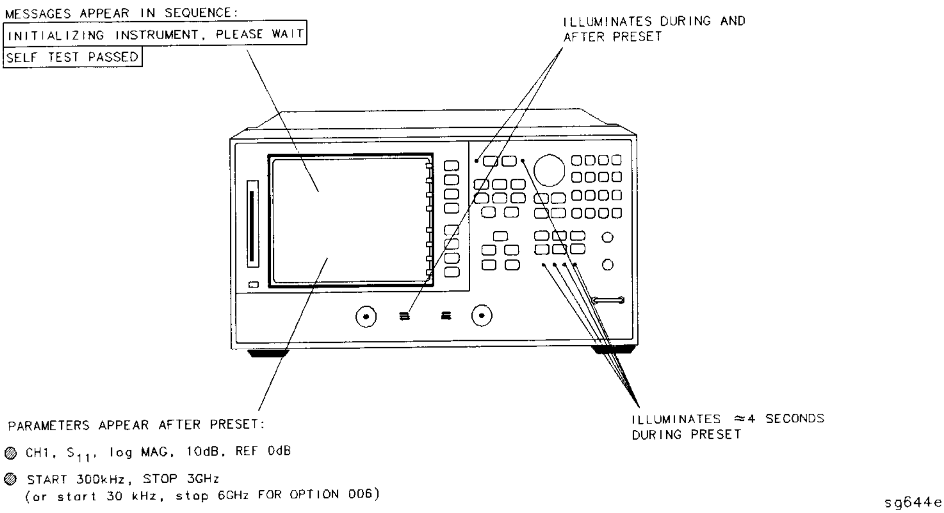



**Figure 4-1. Preset Sequence**

■ If the self-test failed, refer to "Step 4. Faulty Group Isolation".

## Step 2. Operator's Check

### Description

The operator's check consists of two **softkey** initiated tests: Port 1 Op **Chk** and Port 2 Op **Chk.**

A short is connected to port 1 (port *2)* to reflect **all** the source energy back into the analyzer for an $S_{11}$ ($S_{22}$) measurement.

The **first** part of Port 1 Op **Chk** checks the repeatability of the transfer switch. An $S_{11}$ measurement is stored in memory and the switch is toggled to port 2 and then back to port 1 where another $S_{11}$ measurement is made. The difference between the memory trace and the second trace is switch repeatability.

The remaining parts of both tests exercise the internal attenuator in 5 **dB** steps over a 55 **dB** range.

The resulting measurements must fall within a limit testing window to pass the test. The window size is based on both source and receiver specifications.

The operator's check determines that:

- The source is phase locked across the entire frequency range.
- All three samplers are functioning properly.
- The transfer switch is operational.
- The attenuator steps 5 **dB** at a time.

**Required Equipment and lbols**

Short .................................... part of the HP **85031B** calibration kit

***Analyzer warm-up time:* 30 minutes.**

### Procedure

1. Disconnect all devices, peripherals, and accessories (including adapters and limiters) from the analyzer.
2. **To run the test for port 1, press (Preset) PRESET: FACTORY (System) SERVICE MENU TESTS EXTERNAL TESTS.**
3. The display should show TEST 21 Port 1 Op **Chk** in the active entry area.

4. Press **EXECUTE TEST** to begin the test.
5. At the prompt, connect the short to the port indicated. Make sure the connection is tight.
6. Press **CONTINUE**.
7. The test is a sequence of subtests. At the end of the subtests, the test title and result will be displayed. If all tests pass successfully, the overall test status will be `PASS`. If any test fails, the overall test status `will` be `FAIL`.
8. To run the test for port 2, press the step ⇧ key. The display should show `TEST 22` **`Port 2`** `Op Chkin` the active entry area.
9. Repeat steps 4 through 7.
10. If both tests pass, the analyzer is about 80% verified. If either test fails, refer to "Step 4. Faulty Group Isolation" in this section, or:
    a. Make sure that the connection is tight. Repeat the test.
    b. Visually inspect the connector interfaces and clean if necessary (refer to "Principles of Microwave Connector Care" located in Chapter 1).
    c. Verify that the short meets published specifications.
    d. Substitute another short, and repeat the test.
    e. Finally, refer to the detailed tests located in this section, or fault isolation procedures located in the troubleshooting sections

## Step 3. HP-IB Systems Check

Check the analyzer's HP-IB functions with a ***known working*** passive peripheral (such as a plotter, printer, or disk drive).

1. Connect the peripheral to the analyzer using a ***good*** HP-IB cable..
2. Press (Local) SYSTEM CONTROLLER to enable the analyzer to control the peripheral.
3. Then press SET ADDRESSES and the appropriate softkeys to verify that the device addresses will be recognized by the analyzer. The factory default addresses are:

| Device | HP-IB Address |
|---|---|
| HP 8753E | 16 |
| Plotter port - BP-IB | 5 |
| Printer port - BP-IB | 1 |
| Disk (external) | 0 |
| Controller | 21 |
| Power meter - HP-IB | 13 |

**Note**

You may use other addresses with two provisions:

- Each device must have its own address.
- The address set on each device must match the one recognized by the analyzer (and displayed).

Peripheral addresses are often set with a rear panel switch. Refer to the manual of the peripheral to read or change its address.

## If Using a Plotter or Printer

1. Ensure that the plotter or printer is set up correctly:
   - Power is on.
   - Pens and paper loaded.
   - Pinch wheels are down.
   - Some plotters need to have **P1** and **P2** positions set.
2. Press (Copy) and then PLOT or PRINT MONOCHROME.
   - ❑ If the result is a copy of the analyzer display, the printing/plotting features are functional in the analyzer. Continue with "Troubleshooting Systems with Multiple Peripherals", "Troubleshooting Systems with Controllers", or the "Step 4. **Faulty** Group Isolation" section in this chapter.
   - ❑ If the result is not a copy of the analyzer display, suspect the HP-IB function of the analyzer. Refer to Chapter 6, "Digital Control Troubleshooting."

## If Using an External Disk Drive

1. **Select the external disk drive. Press** (Save/Recall) SELECT DISK EXTERNAL DISK.
2. Verify that the address is set correctly. Press (Local) SET ADDRESSES ADDRESS:DISK.
3. Ensure that the disk drive is set up correctly:
   - Power is on.
   - An initialized disk in the correct drive.
   - Correct disk unit number and volume number (press (Local) to access the **softkeys** that display the numbers; default is 0 for both).
   - With hard disk (Winchester) drives, make sure the configuration switch is properly set (see drive manual).

4. Press (Start) (1) (M/µ) (Save/Recall) **SAVE STATE**. Then press (Preset) (Save/Recall) **RECALL STATE**.

- ❑ If the resultant trace starts at 1 MHz, HP-IB is functional in the analyzer. Continue with "Troubleshooting Systems with Multiple Peripherals", "Troubleshooting Systems with Controllers", or the "Step 4. Faulty Group Isolation" section in this chapter.
- ❑ If the resultant trace does not start at 1 MHz, suspect the HP-IB function of the analyzer: refer to Chapter 6, "Digital Control Troubleshooting."

## Troubleshooting Systems with Multiple Peripherals

Connect any other system peripherals (but not a controller) to the analyzer one at a time and check their functionality. Any problems observed are in the peripherals, cables, or are address problems (see above).

## Troubleshooting Systems with Controllers

Passing the preceding checks indicates that the analyzer's peripheral functions are normal. Therefore, if the analyzer has not been operating properly with an external controller, check the following:

- The HP-IB interface hardware is incorrectly installed or not operational. (See "HP-IB Requirements" in the *HP 8753E Network Analyzer User's Guide.)*
- The programming syntax is incorrect. (Refer to the *HP 8753E Network Analyzer* Programmer's *Guide*.)

If the analyzer appears to be operating unexpectedly but has not completely failed, go to "Step 4. Faulty Group Isolation."

## Step 4. Faulty Group Isolation

Use the following procedures only if you have read the previous sections in this chapter and you think the problem is in the analyzer. These are simple procedures to verify the four functional groups in sequence, and determine which group is faulty.

The four functional groups are:

- power supplies
- digital control
- source
- receiver

Descriptions of these groups are provided in Chapter 12, "Theory of Operation."

The checks in the following pages must be performed in the order presented. If one of the procedures fails, it is an indication that the problem is in the functional group checked. Go to the troubleshooting information for the indicated group, to isolate the problem to the defective assembly.

Figure 4-2 **illustrates** the troubleshooting organization.

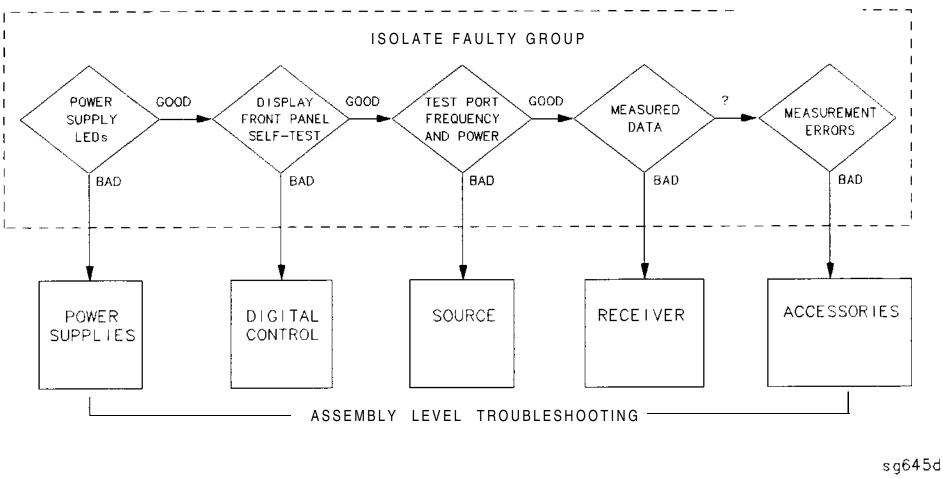



**Figure 4-2. Troubleshooting Organization**

# Power Supply

## Check the Rear Panel LEDs

Switch on the analyzer. Notice the condition of the two **LEDs** on the **A15** preregulator at rear of the analyzer. (See Figure 4-3.)

- ❑ The upper (red) LED should be off.
- ❑ The lower (green) LED should be on.

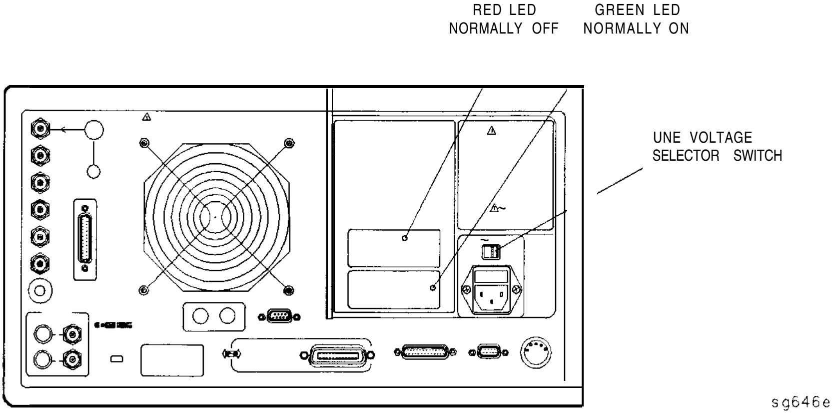



**Figure 43. A15 Preregulator LEDs**

## Check the A8 Post Regulator LEDs

Remove the analyzer's top cover. Switch on the power. Inspect the green **LEDs** along the top edge of the **A8** post-regulator assembly.

•I **All** green **LEDs** should be on.

- ❑ The fan should be audible.

In case of difficulty, refer to Chapter 5, "Power Supply Troubleshooting."

# Digital Control

## Observe the Power Up Sequence

Switch the analyzer power off, then on. The following should take place within a few seconds:

- On the front panel, observe the following:
  1. All six amber **LEDs** illuminate.
  2. The port 2 LED **illuminates.**
  3. The amber **LEDs** go off after a few seconds, except the CH 1 LED. At the same moment, the port 2 LED goes off and the port 1 LED **illuminates.** **(See Figure 4-4.)**
- The display should come up bright with no irregularity in colors.
- After an initial pattern, five red **LEDs** on the **A9** CPU board should remain off. They can be observed through a small opening in the rear panel.

If the power up sequence does not occur as described, or if there are problems using the front panel keyboard, refer to Chapter 6, "Digital Control Troubleshooting."

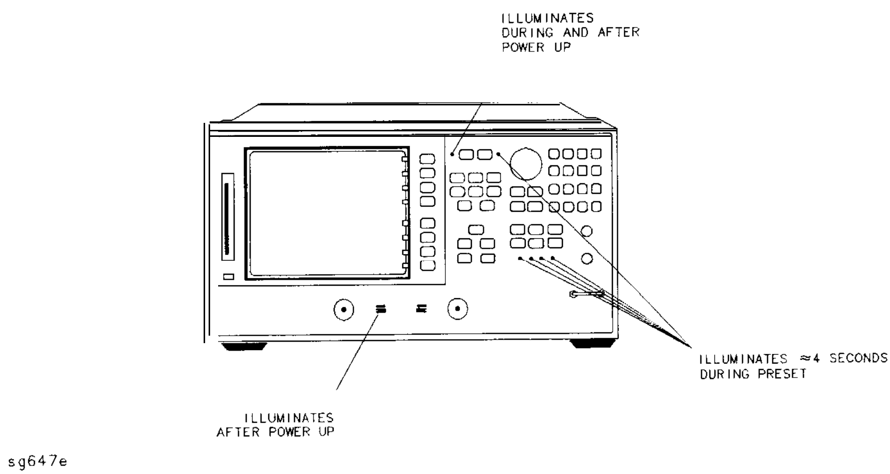



**Figure 4-4. Front Panel Power Up Sequence**

## Verify Internal Tests Passed

1. Press (Preset) (System) **SERVICE MENU** **TESTS** **INTERNAL TESTS** **EXECUTE TEST**. The display should indicate:

   TEST

   0 ALL INT PASS

   - If your display shows the above message, go to step 2. Otherwise, continue with this step.
   - If phase lock error messages are present, this test may stop without passing or failing. In this case, continue with the next procedure to check the source.
   - If you have unexpected results, or if the analyzer indicates a specific test **failure,** that internal test (and possibly others) have failed; the analyzer reports the **first** failure detected. Refer to Chapter 6, "Digital Control Troubleshooting."
   - If the analyzer indicates **failure** but does not identify the test, press (⇧) to search for the failed test. Then refer to Chapter 6, "Digital Control Troubleshooting." Likewise, if the response to front panel or HP-IB commands is unexpected, troubleshoot the digital control group.

2. Perform the Analog Bus test. Press **RETURN** (19) (x1) **EXECUTE TEST**.
   - If this test fails, refer to Chapter 6, "Digital Control Troubleshooting."
   - If this test passes, continue with the next procedure to check the source.

# Source

## Phase Lock Error Messages

The error messages listed below are usually indicative of a source failure or improper instrument configuration. (Ensure that the R channel input is receiving at least −35 dBm power). Continue with this procedure.

- `NO IF FOUND: CHECK R INPUT LEVEL`

  The first IF was not detected during the pretune stage of phase lock.

- `NO PHASE LOCK: CHECK R INPUT LEVEL`

  The first IF was detected at the pretune stage but phase lock could not be acquired thereafter.

- `PHASE LOCK LOST`

  Phase lock was acquired but then lost.

- `PHASE LOCK CAL FAILED`

  An internal phase lock calibration routine is automatically executed at power-on, when pretune values drift, or when phase lock problems are detected. A problem spoiled a calibration attempt.

- `POSSIBLE FALSE LOCK`

  The analyzer is achieving phase lock but possibly on the wrong harmonic comb tooth.

- `SWEEP TIME TOO FAST`

  The fractional-N and the digital IF circuits have lost synchronization.

## Check Source Output Power

1. Connect the equipment as shown in Figure 4-5. Be sure that any special accessories, such as limiters, have been disconnected.

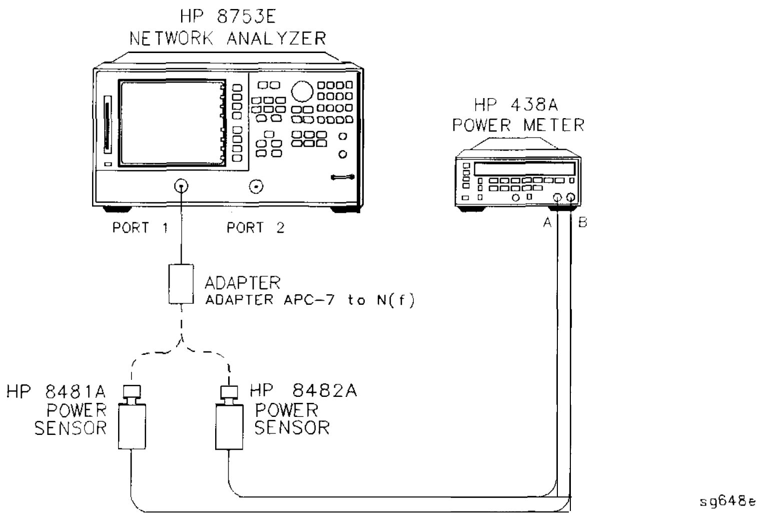



**Figure 4-5. Equipment Setup for Source Power Check**

2. Zero and calibrate the power meter. Press (Preset) on the analyzer to initialize the instrument.

3. On the analyzer, press (Menu) CW FREQ (300) (k/m) to output a CW 300 kHz signal. The power meter should read approximately 0 dBm.

4. Press (16) (M/µ) to change the CW frequency to 16 MHz. The output power should remain approximately 0 dBm throughout the analyzer frequency range. Repeat this step at 1 and 3 GHz. (For Option 006 include an additional check at 6 GHz.)

If any incorrect power levels are measured, refer to Chapter 7, "Source Troubleshooting."

## No Oscilloscope or Power Meter? Try the ABUS

Monitor ABUS node 16.

1. Press (Preset) (Start) (300) (k/m) (Stop) (3) (G/n) (System) SERVICE MENU ANALOG BUS ON.
2. (Meas) ANALOG IN Aux Input (16) (x1).
3. (Format) MORE REAL (Scale Ref) AUTOSCALE.

The display should resemble Figure 4-6.

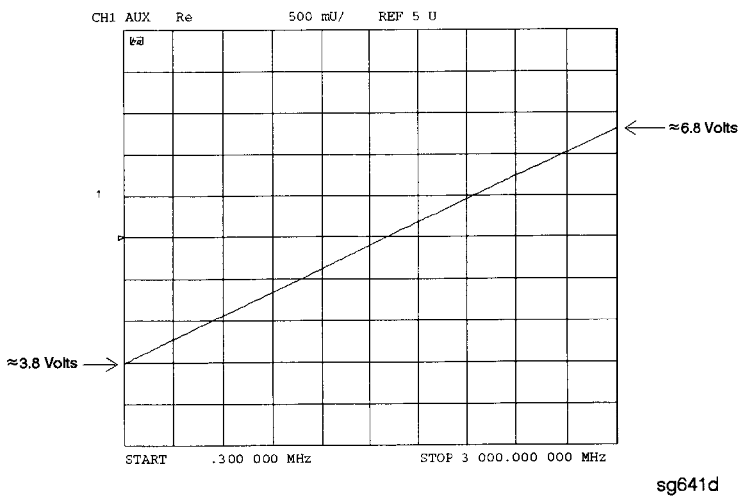



**Figure 4-6. ABUS Node 16: 1 V/GHz**

If any of the above procedures provide unexpected results, or if error messages are present, refer to Chapter 7, "Source Troubleshooting."

# Receiver

## Observe the A and B Input Traces

1. Connect the equipment as shown in **Figure** 47 below. Be sure that any special accessories, such as limiters, have been disconnected. (The through cable is HP part number 8120-4779.)

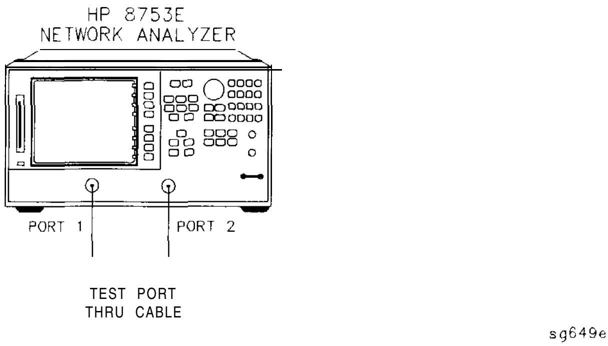



**Figure 4-7. Equipment Setup**

2. Press (Preset) (Meas) **INPUT PORTS** **A** **TEST PORT 2** (Scale Ref) **AUTO SCALE**.
3. Observe the measurement trace displayed by the A input. The trace should have about the same flatness as the trace in Figure 4-8.
4. Press (Meas) **INPUT PORTS** **TEST PORT 1** **B**.
5. Observe the measurement trace displayed by the B input. The trace should have about the same flatness as the trace in **Figure** 4-8.

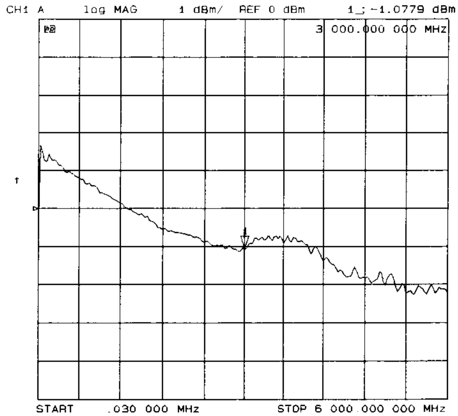



**Figure 4-8. Typical Measurement Trace**

If the source is working, but the A or B input traces appear to be in error, refer to Chapter 8, "Receiver Troubleshooting."

The following symptoms may also indicate receiver failure.

## Receiver Error Messages

- CAUTION: OVERLOAD ON INPUT A; POWER REDUCED
- CAUTION: OVERLOAD ON INPUT B; POWER REDUCED
- CAUTION: OVERLOAD ON INPUT R; POWER REDUCED

The error messages above indicate that you have exceeded approximately +14 dBm at one of the test ports. The RF output power is automatically reduced to −85 dBm. The annotation P↓ appears in the left margin of the display to indicate that the power trip function has been activated. When this occurs, press (Menu) POWER and enter a lower power level. Press SOURCE PWR ON to switch on the power again.

## Faulty Data

Any trace data that appears to be below the noise floor of the analyzer (−100 dBm) is indicative of a receiver failure.

# Accessories

If the analyzer has passed all of the previous checks but is still making incorrect measurements, suspect the system accessories Accessories such as RF or interconnect cables, calibration or verification kit devices, limiters, and adapters can **all** induce system problems

Reconfigure the system as it is normally used and **reconfirm** the problem. Continue **with** Chapter 9, "Accessories Troubleshooting."

## Accessories Error Messages

- **POWER PROBE SHUT DOWN!**

  The biasing supplies to a front panel powered device (**like** a probe or millimeter module) are shut down due to excessive current draw. Troubleshoot the device.


Figure 4-10. HP 8753E OVERALL BLOCK DIAGRAM

5

# Power Supply Troubleshooting

Use this procedure only if you have read Chapter 4, “Start Troubleshooting Here.” Follow the procedures in the order given, unless:

- an error message appears on the display, refer to “Error Messages” near the end of this chapter.
- the fan is not working; refer to “Fan Troubleshooting” in this chapter.

The power supply group assemblies consist of the following:

- **A8** post regulator
- **A15** preregulator

All assemblies, however, are related to the power supply group because power is supplied to each assembly.

## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8753E network analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts."
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures."
4. Perform the necessary adjustments. Refer to Chapter 3, "Adjustments and Correction Constants."
5. Perform the necessary performance tests Refer to Chapter 2, "System Verification and Performance Tests"

## Simplified Block Diagram

Figure 5-1 shows the power supply group in simplified block diagram form. Refer to the detailed block diagram of the power supply (Figure 5-8) located at the end of this chapter to see voltage lines and specific connector pin numbers.

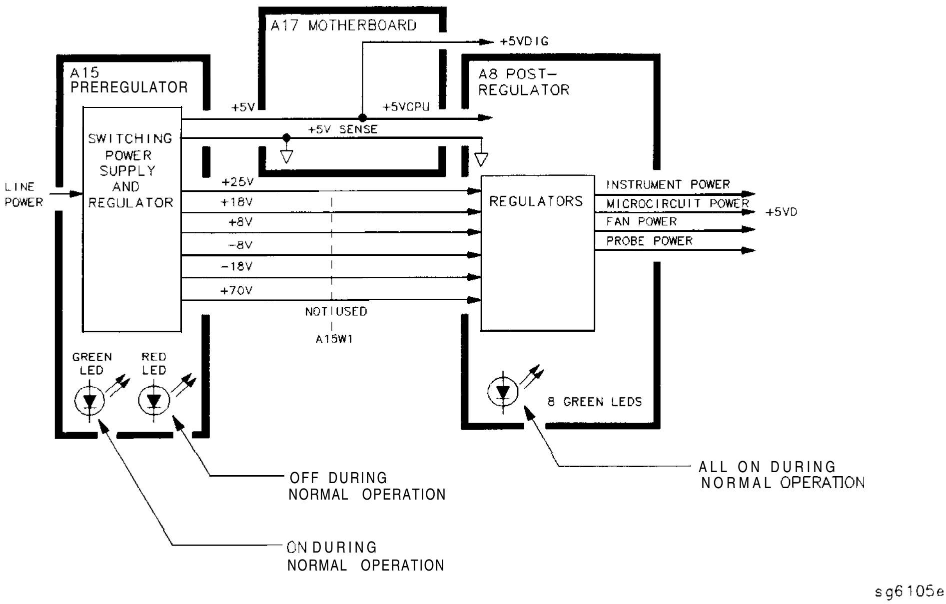



**Figure 5-1. Power Supply Group Simplified Block Diagram**

## Start Here

### Check the Green LED and Red LED on A15

Switch on the analyzer and look at the rear panel of the analyzer. Check the two power supply diagnostic LEDs on the A15 preregulator casting by looking through the holes located to the left of the line voltage selector switch. (See Figure 5-2.)

During normal operation, the bottom (green) LED is on and the top (red) LED is off. If these LEDs are normal, then A15 is 95% verified. Continue to "Check the Green LEDs on A8".

- ❑ If the green LED is not on steadily, refer to "If the Green LED of the A15 Is not ON Steadily" in this procedure.
- ❑ If the red LED is on or flashing, refer to "If the Red LED of the A15 Is ON" in this procedure.

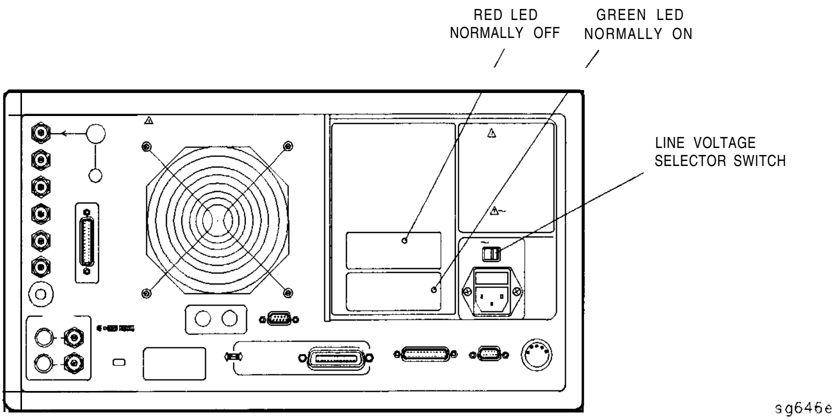



**Figure 5-2. Location of A15 Diagnostic LEDs**

## Check the Green LEDs on A8

Remove the top cover of the analyzer and locate the A8 post regulator; use the location diagram under the top cover if necessary. Check to see if the green LEDs on the top edge of A8 are all on. There are eight green LEDs (one is not visible without removing the PC board stabilizer).

- ❑ If all of the green LEDs on the top edge of A8 are on, there is a 95% confidence level that the power supply is verified. lb confirm the last 5% uncertainty of the power supply, refer to "Measure the Post Regulator Voltages" (next).
- ❑ If any LED on the A8 post regulator is off or Eashing, refer to "If the Green LEDs of the A8 are not all ON" in this procedure.

## Measure the Post Regulator Voltages

Measure the DC voltages on the test points of A8 with a voltmeter. Refer to Figure 5-3 for test point locations and Table 5-1 for supply voltages and limits.

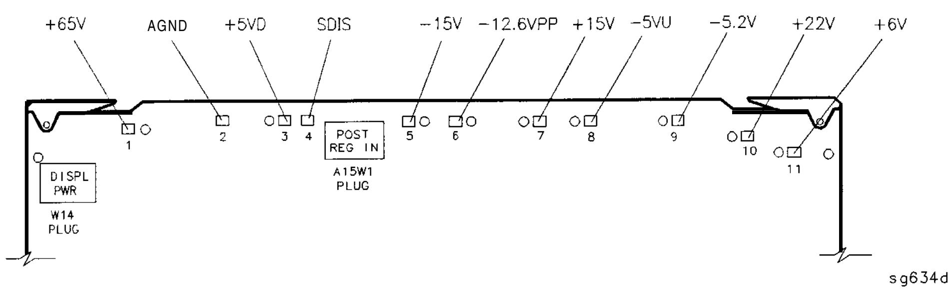



**Figure 5-3. A8 Post Regulator Test Point Locations**

## Table 5-1. A8 Post Regulator Test Point Voltages

| TP | Supply | Range |
|---|---|---|
| 1 | + 65 V (not used) | + 64.6 to + 65.4 |
| 2 | AGND | n/a |
| 3 | +5 VD | +4.9 to +5.3 |
| 4 | SDIS | n/a |
| 6 | −15 V | -14.4 to -15.6 |
| 6 | −12.6 VPP (probe power) | -12.1 to -12.8 |
| 7 | +15 V | + 14.5 to + 15.5 |
| 8 | +5 VU | + 5.05 to + 5.35 |
| 0 | -5.2 V | -5.0 to -5.4 |
| 10 | +22 V | +21.3 to +22.7 |
| 11 | +6 V | +5.8 to +6.2 |

## If the Green LED of the A15 Is not ON Steadily

If the green LED is not on steadily, the line voltage is not enough to power the analyzer.

### Check the Line Voltage, Selector Switch, and Fuse

Check the main power line cord, line fuse, line selector switch setting, and actual line voltage to see that they are all correct. Figure 5-4 shows how to remove the line fuse, using a small flat-blade screwdriver to pry out the fuse holder. Figure 5-2 shows the location of the line voltage selector switch. Use a small flat-blade screwdriver to select the correct switch position.

If the **A15** green LED is still not on steadily, replace **A15.**

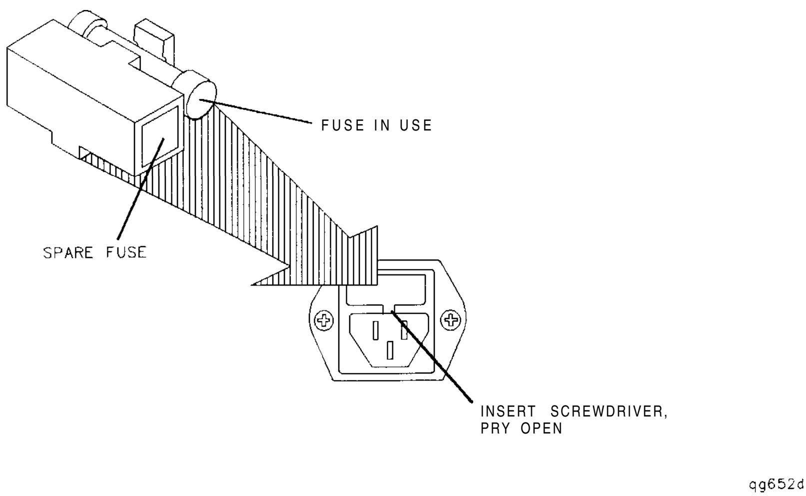



**Figure 5-4. Removing the Line Fuse**

## If the Red LED of the A15 Is ON

If the red LED is on or flashing, the power supply is shutting down. Use the following procedures to determine which assembly is causing the problem.

### Check the A8 Post Regulator

1. Switch off the analyzer.
2. Disconnect the cable **A15W1** from the **A8** post regulator. (See Figure 5-5.)
3. Switch on the analyzer and observe the red LED on **A15.**
   - ❑ If the red LED goes out, the problem is probably the **A8** post regulator. Continue to "Verify the **A15** Preregulator" to **first** verify that the inputs to **A8** are correct.
   - ❑ If the red LED is still on, the problem is probably the **A15** preregulator, or one of the assemblies obtaining power from it. Continue with "Check for a **Faulty** Assembly".

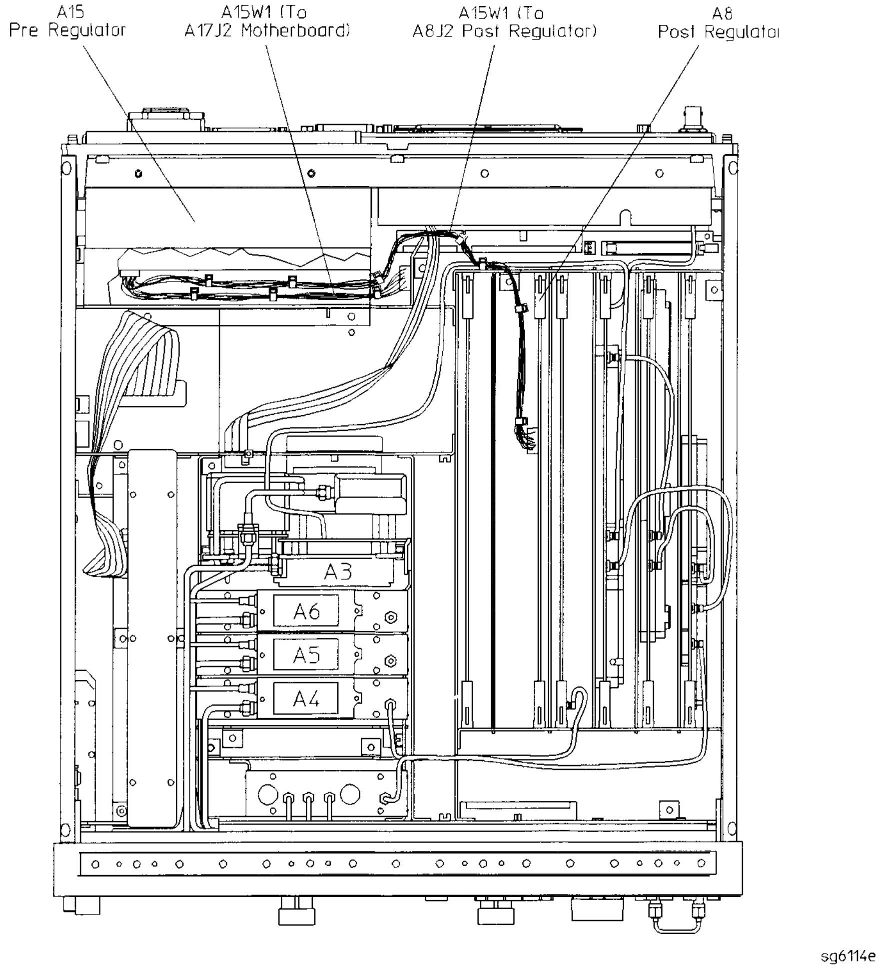



Figure 5-5. Power Supply Cable Locations

## Verify the **A15** Preregulator

Verify that the **A15** preregulator is supplying the correct voltages to the **A8** post regulator. Use a voltmeter with a small probe to measure the output voltages of **A15W1's** plug. Refer to **Table** 5-2 and **Figure** 5-6.

- ☐ If the voltages are not within tolerance, replace **A15.**

- ❑ If the voltages are within tolerance, **A15** is verified. Continue to "Check for a Faulty Assembly".

**Table** 5-2. Output Voltages

| Pin | A15W1P1 (Disconnected) Voltages | A8J2 (Connected) Voltages | A15 Preregulator Label |
|---|---|---|---|
| 1 | N/C | +68 to +72 | N/C |
| 2 | +125 to +100 | +68 to +72 | +70 V |
| 3,4 | +22.4 to +33.6 | +17.0 to +18.4 | +18 V |
| 5,6 | −22.4 to −33.6 | -17.0 to -18.4 | −18 V |
| 7 | N/C | +7.4 to +8.0 | N/C |
| 8 | +9.4 to +14 | +7.4 to +8.0 | +8 V |
| 9,10 | -0.4 to -14 | −6.7 to -7.3 | −8 V |
| 11 | N/C | +24.6 to +28.6 | N/C |
| 12 | +32 to +48 | +24.6 to +28.6 | +25 V |

**NOTE:** The + 5 VD supply must be loaded by one or more assemblies at **all times**, or the other voltages will **not** be correct. It connects to the motherboard connector **A17J3** Pin 4.

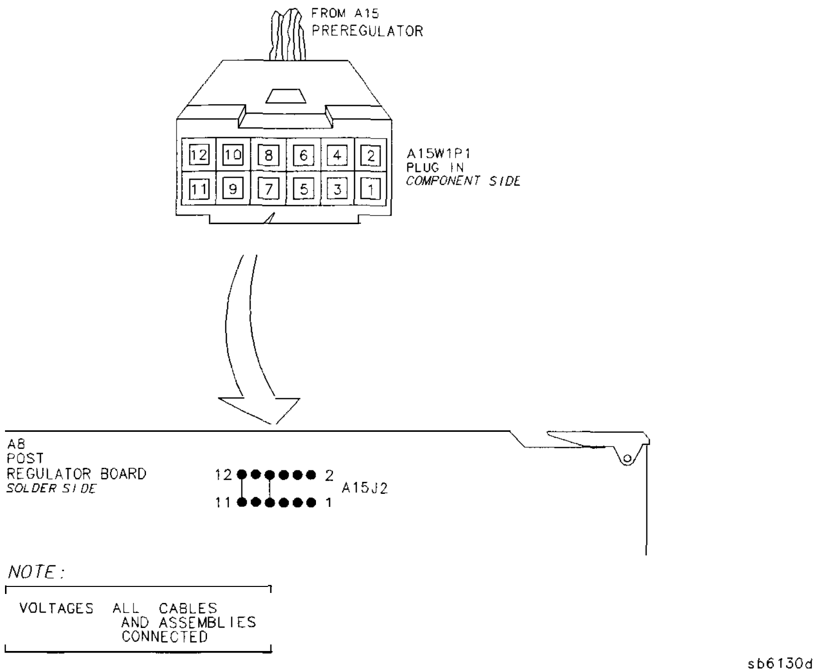



Figure 5-6. **A15W1** Plug Detail

## Check for a Faulty Assembly

This procedure checks for a faulty assembly that might be shutting down the **A15** preregulator via one of the following lines (also refer to **Figure 5-1**):

- **A15W1** connecting to the **A8** post regulator
- the + 5 VCPU line through the motherboard
- the +5 VDIG line through the motherboard

Do the following:

1. Switch off the analyzer.
2. Ensure that **A15W1** is reconnected to **A8.** (Refer to **Figure** 5-5.)
3. Remove or disconnect the assemblies listed in **Table** 5-3 one at a time and in the order shown. The assemblies are sorted from most to least accessible. **Table** 5-3 also lists any associated assemblies that are supplied

by the assembly that is being removed. After each assembly is removed or disconnected switch on the analyzer and observe the red LED on A15.

Note

- ***Always switch off the analyzer before removing or disconnecting assemblies.***
- When extensive disassembly is required, refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures."
- Refer to Chapter 13, "Replaceable Parts," to identify specific cables and assemblies that are not shown in this chapter.

- ❑ If the red LED goes out, the particular assembly (or one receiving power from it) that allows it to go out is faulty.
- ❑ If the red LED is still on after you have checked all of the assemblies listed in Table 5-3, continue to "Check the Operating Temperature".

**Table 5-3. Recommended Order for Removal/Disconnection**

| Assembly To Remove | Removal or Disconnection Method | Other Assemblies that Receive Power from the Removed Assembly |
|---|---|---|
| 1. A19 Graphics Processor | Remove from Card Cage | None |
| 2. A14 Frac N Digital | Remove from Card Cage | None |
| 3. A9 CPU | Disconnect W36 (see "Cables, Rear" in Chapter 13) | A20 Disk Drive |
| 4. A16 Rear Panel Interface | Disconnect W27 (see "Cables, Rear" in Chapter 13) | A25 Test Set Interface<br>A24 Transfer Switch<br>A23 LED Front Panel |
| 5. A2 Front Panel Interface | Disconnect W17 (see "Cables, Front" in Chapter 13) | A1 Front Panel Keyboard<br>A18 Display |

## Check the Operating Temperature

The temperature sensing circuitry inside the **A15** preregulator may be shutting down the supply. Make sure the temperature of the open air operating environment does not exceed 55 **°C** (131 **°F),** and that the analyzer fan is operating.

- ❑ If the fan does not seem to be operating correctly, refer to "Pan Troubleshooting" at the end of this procedure.
- ❑ If there does not appear to be a temperature problem, it is likely that **A15** is faulty.

## Inspect the Motherboard

If the red LED is still on after replacement or repair of **A15,** switch off the analyzer and inspect the motherboard for solder bridges and other noticeable defects. Use an ohmmeter to check for shorts The +5 VD, +5 VCPU, or +5 VDSENSE lines may be bad. Refer to the block diagram **(Figure** 5-8) at the end of this chapter and troubleshoot these suspected power supply lines on the **A17** motherboard.

## If the Green **LEDs** of the **A8** are not all ON

The green **LEDs** along the top edge of the **A8** post regulator are normally on.

Flashing **LEDs** on **A8** indicate that the shutdown circuitry on the **A8** post regulator is protecting power supplies from overcurrent conditions by repeatedly shutting them down. This may be caused by supply loading on **A8** or on any other assembly in the analyzer.

### Remove **A8,** Maintain **A15W1** Cable Connection

1. Switch off the analyzer.
2. Remove **A8** from its motherboard connector, but keep the **A15W1** cable connected to **A8.**
3. Short **A8TP2** (AGND) (see **Figure** 5-3) to chassis ground with a clip lead.
4. Switch on the analyzer and observe the green **LEDs** on **A8.**
   - ❑ If any green **LEDs** other than **+5** VD are still off or flashing, continue to "Check the **A8 Fuses** and Voltages".
   - ❑ If all **LEDs** are now on **steadily** except for the +**5** VD LED, the **A15** preregulator and **A8** post regulator are working properly and the trouble is excessive loading somewhere after the motherboard connections at **A8.** Continue to "Remove the Assemblies".

### Check the **A8** Fuses and Voltages

Check the fuses along the top edge of **A8.** If any **A8** fuse has burned out, replace it. If it burns out again when power is applied to the analyzer, **A8** or **A15** is faulty. Determine which assembly has failed as follows.

1. Remove the **A15W1** cable at **A8.** (See Figure 5-5.)
2. Measure the voltages at **A15W1P1** (see F'igure 5-6) with a voltmeter having a small probe.
3. Compare the measured voltages with those in **Table** 5-2.
   - ❑ If the voltages are within tolerance, replace **A8.**
   - ❑ If the voltages are not within tolerance, replace **A15.**

If the green **LEDs** are now on, the **A15** preregulator and **A8** post regulator are working properly and the trouble is excessive loading somewhere after the motherboard connections at **A8.** Continue to "Remove the Assemblies".

## Remove the Assemblies

1. Switch off the ***analyzer.***
2. Install **A8.** Remove the jumper from **A8TP2** (AGND) to chassis ground.
3. Remove or disconnect **all** the assemblies listed below. (See Figure 5-5.) ***Always switch off the analyzer before removing or disconnecting an assembly.***

   **A10** digital IF
   All phase lock
   **A12** reference
   **A13** fractional-N analog
   **A14** fractional-N **digital**
   **A19** graphics processor

4. Switch on the analyzer and observe the green **LEDs** on **A8.**
   - ❑ If any of the green **LEDs** are off or flashing, it is not likely that any of the assemblies listed above is causing the problem. Continue to "Briefly Disable the Shutdown Circuitry".
   - ❑ If **all** green **LEDs** are now on, one or more of the above assemblies may be faulty. Continue to next step.
5. Switch off the analyzer.
6. Reinstall each assembly one at a time. Switch on the analyzer after each assembly is **installed.** The assembly that causes the green **LEDs** to go off or flash could be faulty.

---

**Note** It is possible, however, that this condition is caused by the **A8** post regulator not supplying enough current. To check this, reinstall the assemblies in a different order to change the loading. If the same assembly appears to be faulty, replace that assembly. If a different assembly appears faulty, **A8** is most likely faulty (unless both of the other assemblies are faulty).

---

## Briefly Disable the Shutdown Circuitry

In this step, you shutdown the protective circuitry for a short time, and the supplies are forced on (including shorted supplies) with a 100% duty cycle.

---

Caution — Damage to components or to circuit traces may occur if **A8TP4** (SDIS) is shorted to chassis ground for more than a few seconds **while** supplies are shorted.

---

1. Connect **A8TP4** (SDIS) to chassis ground with a jumper **wire.**
2. Switch on the analyzer and note the **signal** mnemonics and test points of any **LEDs** that are ***off. Immediately remove the jumper wire.***
3. Refer to the block diagram **(Figure** 5-8) at the end of this chapter and do the **following:**
   - Note the mnemonics of any additional signals that may connect to any **A8** test point that showed a **fault** in the previous step.
   - Cross reference **all** assemblies that use the power supplies whose **A8 LEDs** went out when **A8TP4** (SDIS) was connected to chassis ground.

- Make a list of these assemblies.
- Delete the following assemblies from your list as they have already been verified earlier in this section.

  **A10** digital IF
  All phase lock
  **A12** reference
  **A13** fractional-N analog
  **A14** fractional-N digital
  **A19** graphics processor

4. Switch off the analyzer.
5. **Of** those assemblies that are left on the list, remove or disconnect them from the analyzer one at a time. **Table** 5-4 shows the best order in which to remove them, sorting them from most to least accessible. **Table** 5-4 also lists any associated assemblies that are supplied by the assembly that is being removed. After each assembly is removed or disconnected, switch on the **analyzer** and observe the **LEDs.**

---

Note

- ***Always switch off the analyzer before removing or disconnecting assemblies.***
- When extensive disassembly is required, refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures. "
- Refer to Chapter 13, "Replaceable Parts", to identify specific cables and assemblies that are not shown in this chapter.

---

- ❑ If all the **LEDs** light, the assembly (or one receiving power from it) that allows them to light is faulty.
- ❑ If the **LEDs** are still not on steadily, continue to "Inspect the Motherboard".

**Table** 5-4. Recommended Order for Removal/Disconnection

| **Assembly** To Remove | **Removal or** Disconnection Method | **Other Assemblies that** Receive Power from the Removed Assembly |
|---|---|---|
| 1. **A3** Source | **Remove from Card Cage** | **None** |
| 2. **A7** Pulse **Generator** | **Remove from Card Cage** | **None** |
| **3. A4 R Sampler** | **Remove from Card Cage** | **None** |
| 4. **A5** A Sampler | **Remove from Card Cage** | **None** |
| 6. **A6** B Sampler | **F&move from Card Cage** | **None** |
| **6. A9 CPU** | **Disconnect W35 and W36** | **A20 Disk Drive** |
| 7. **A2 Front Panel Interface** | **Disconnect W17** | **Al Front Panel Keyboard** |
| **8. A16 Rear Panel Interface** | **Disconnect W27** | **A25 Test Set Interface**<br>**A24 Transfer Switch**<br>**A23 LED Front Panel** |

## Inspect the Motherboard

Inspect the **A17** motherboard for solder bridges and shorted traces. In **particular,** inspect the traces that **carry** the supplies whose **LEDs** faulted when **A8TP4** (SDIS) was grounded earlier.

## Error Messages

Three error messages are associated with the power supplies functional group. They are shown here.

- POWER SUPPLY **SHUT** DOWN!

  **One** or more supplies on the **A8** post regulator assembly is shut down due to one of the following conditions: overcurrent, overvoltage, or undervoltage. Refer to "If the Red LED of the **A15** Is ON" earlier in this procedure.

- POWER **SUPPLY** HOT

  The temperature sensors on the **A8** post regulator assembly detect an overtemperature condition. The regulated power supplies on **A8** have been shut down.

  Check the temperature of the operating environment; it should not be greater than + 55 **°C** (131 **°F).** The fan should be operating and there should be at least 15 cm (6 in) spacing behind and all around the analyzer to allow for proper ventilation.

- PROBE **POWER SHUT** DOWN!

  The front panel RF probe biasing supplies are shut down due to excessive current draw. These supplies are + 15 VPP and -12.6 VPP, both supplied by the **A8** post regulator. + 15 VPP is derived from the + 15 V supply. -12.6 VPP is derived from the -12.6 V supply.

  Refer to Figure 5-7 and carefully measure the power supply voltages at the front panel RF probe connectors.

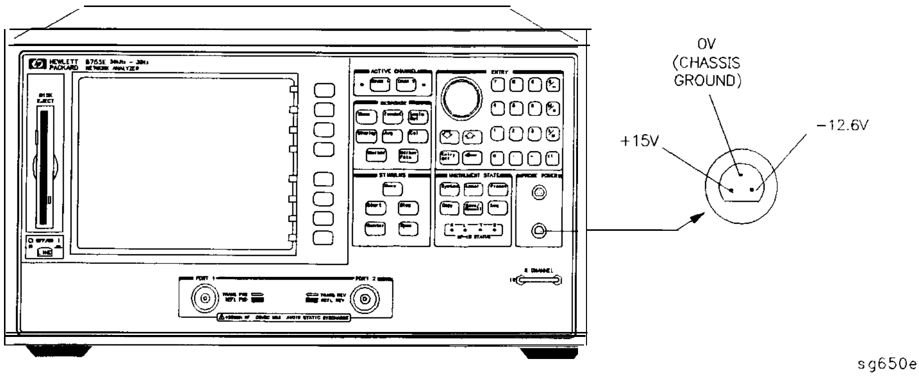



Figure 5-7. Front **Panel** Probe Power Connector Voltages

- ❑ If the correct voltages are present, troubleshoot the probe.
- ❑ If the voltages are not present, check the + 15 V and -12.6 V green **LEDs** on **A8.**
  - If the **LEDs** are on, there is an open between the **A8** assembly and the front panel probe power connectors, Put **A8** onto an extender board and measure the voltages at the following pins:

| | |
|---|---|
| **A8P2** pins 6 and 36 | -12.6 volts |
| **A8P2** pins 4 and 34 | + 15 volts |

  - If the **LEDs** are off, continue with "Check the **Fuses** and Isolate **A8".**

## Check the Fuses and Isolate **A8**

Check the fuses associated with each of these supplies near the **A8** test points. If these fuses keep burning out, a short exists. Try isolating **A8** by removing it from the motherboard connector, but keeping the cable **A15W1** connected to **A8J2.** Connect a jumper wire from **A8TP2** to chassis ground. If either the + 15 V or -12.6 V fuse blows, or the associated green **LEDs** do not light, replace **A8.**

If the + 15 V and -12.6 V green **LEDs** light, troubleshoot for a short between the motherboard connector pins **XA8P2** pins 6 and 36 (-12.6 **V**) and the front panel probe power connectors. Also check between motherboard connector pins **XA8P2** pins 4 and 34 (+ 15 **V**) and the front panel probe power connectors.

## Fan Troubleshooting

### **Fan** Speeds

The fan speed varies depending upon temperature. It is normal for the fan to be at high speed when the analyzer is just switched on, and then change to low speed when the analyzer is cooled.

### Check the **Fan** Voltages

If the fan is dead, refer to the **A8** post regulator block diagram **(Figure** 5-8) at the end of this chapter. The fan is driven by the + 18 V and -18 V supplies coming from the **A15 preregulator.** Neither of these supplies is fused.

The -18 V supply is regulated on **A8** in the fan drive block, and remains constant at approximately -14 volts It connects to the **A17** motherboard via pin 32 of the **A8P1** connector.

The + 18 V supply is regulated on **A8** but changes the voltage to the fan, depending on **airflow** and temperature information. Its voltage ranges from approximately – 1.0 volts to + 14.7 volts, and connects to the **A17** motherboard via pin 31 of the **A8P1** connector.

Measure the voltages of these supplies **while** using an extender board to allow access to the PC board connector, **A8P1.**

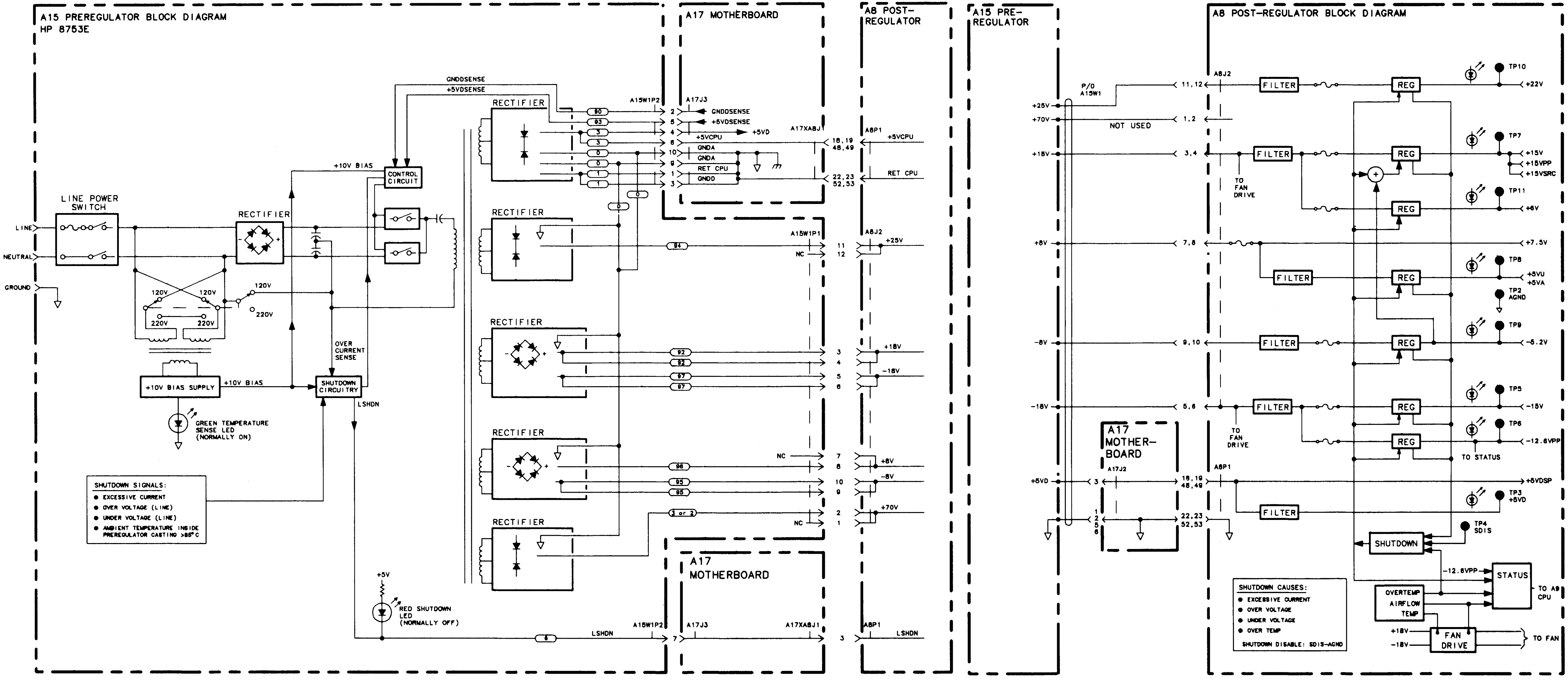
### Short **A8TP3** to Ground

If there is no voltage at **A8P1** pins 31 and 32, switch off the analyzer. Remove **A8** from its motherboard connector (or extender board) but keep the cable **A15W1** connected to **A8.** (See **Figure** 5-5.) Connect a jumper wire between **A8TP3** and chassis ground. Switch on the analyzer.

- ❑ If **all** the green **LEDs** on the top edge of **A8** Iight (except **+5** VD), replace the fan.
- ❑ If other green **LEDs** on **A8** do not Iight, refer to "If the Green **LEDs** of the **A8** are not all ON" **earlier** in this procedure.

## Intermittent Problems

PRESET states that appear spontaneously (without pressing (Preset)) typically signal a power supply or **A9** CPU problem. Since the **A9** CPU assembly is the easiest to substitute, do so. If the problem ceases, replace the **A9.** If the problem continues, replace the **A15** preregulator assembly.




eg6125e

Figure 5-8. Power Supply Block Diagram

# 6

# Digital Control Troubleshooting

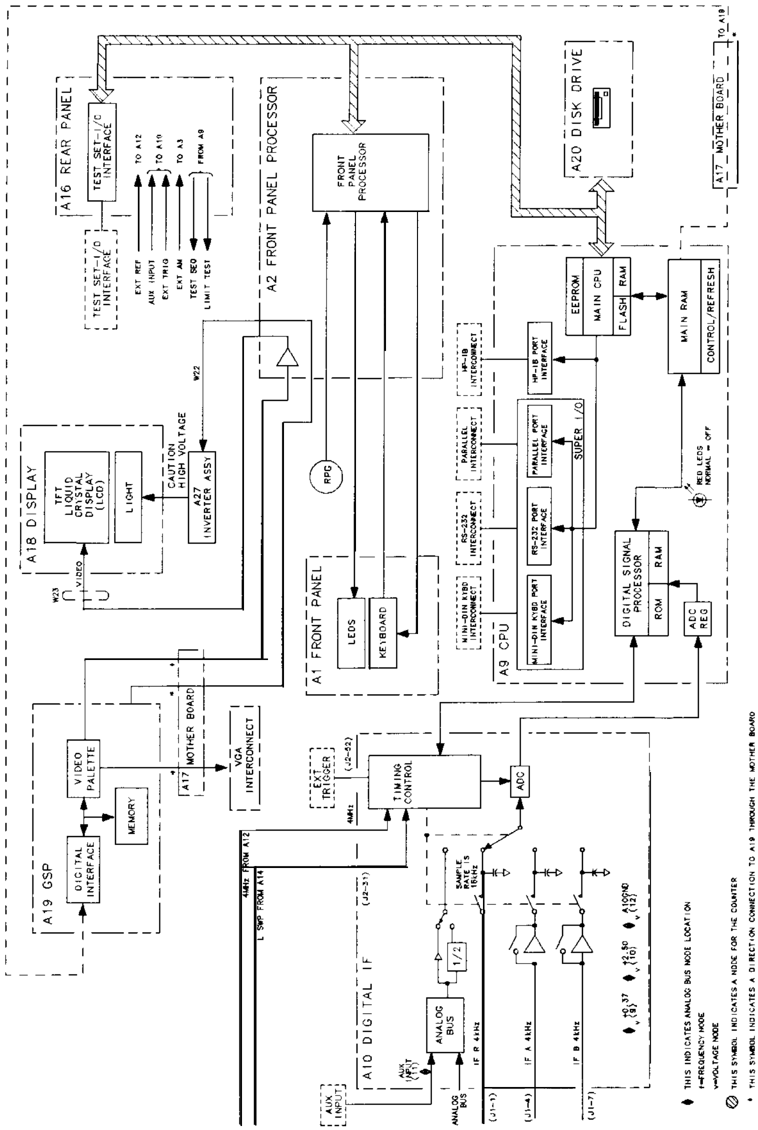
Use this procedure only if you have read Chapter 4, "Start Troubleshooting Here."

The digital control group assemblies consist of the following:

- CPU
  - **A9**
- Display
  - **A2, A18, A19, A27**
- Front Panel
  - Al, **A2**
- Digital IF
  - **A10**
- Rear Panel Interface
  - **A16**

Begin with "CPU Troubleshooting," then proceed to the assembly that you suspect has a problem. If you suspect an HP-IB interface problem, refer to "HP-IB Failures," at the end of this chapter.

# Digital Control Group Block Diagram




sg6107e

Figure 6-1. Digital Control Group Block Diagram

## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8753E network analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts."
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures."
4. Perform the necessary adjustments. Refer to Chapter 3, "Adjustments and Correction Constants"
5. Perform the necessary performance tests. Refer to Chapter 2, "System Verification and Performance Tests."

## CPU Troubleshooting (A9)

### A9 CC Switch Positions

The A9 CC switch must be in the NORMAL position for these procedures. This is the position for normal operating conditions. To move the switch to the NORMAL position, do the following:

1. Remove the power line cord from the analyzer.
2. Set the analyzer on its side.
3. Remove the two comer bumpers from the bottom of the instrument with a **T-15** TORX screwdriver.
4. Loosen the captive screw on the bottom cover's back edge.
5. Slide the cover toward the rear of the instrument.
6. Move the switch to the NORMAL position as shown in Figure 6-2.
7. Replace the bottom cover and power cord.

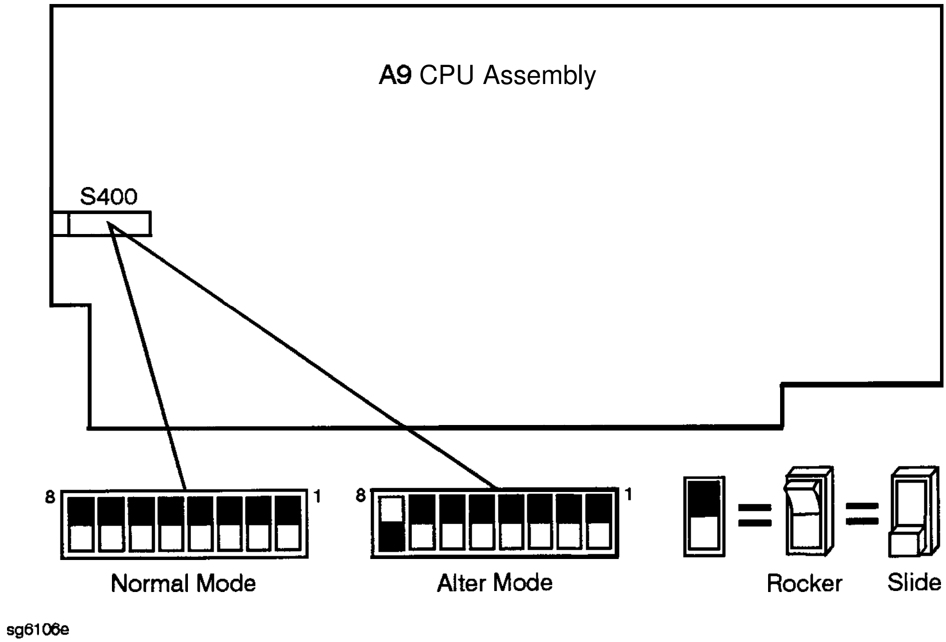



Figure 6-2. Switch Positions on the A9 CPU

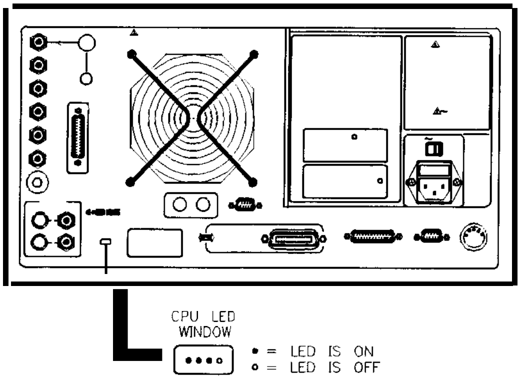
## Checking A9 CPU Red LED Patterns

The A9 CPU has five red LEDs that can be viewed through a small opening in the rear panel of the analyzer. (See Figure 6-3.) Four LEDs are easily viewable. The fifth LED must be viewed by looking to the left at an angle.

1. Cycle the power while observing five red **LEDs**

   Cycle the power on the analyzer and observe the five red LEDs. After an initial pattern, the five red LEDs on the A9 CPU board should remain off.

   - If the LEDs remained off, then proceed to the assembly that you suspect has a problem.
   - If the LEDs did not remain off, switch off the power and remove the bottom cover for further troubleshooting.




sg651e

Figure 6-3. CPU LED Window on Rear Panel

2. Cycle the power while observing **all** eight red **LEDs**

   With the analyzer positioned bottom up, cycle the power and observe the eight red **LEDs** while looking from the front of the instrument.

---

Note — If **firmware** did not load, a red LED on the CPU board will be flashing. Refer to "Loading Firmware" in Chapter 3.

---

3. Evaluate results

   - ❑ If either of the following LED patterns remain, go to "Display Troubleshooting."

     ● ● ● 0 ● ● ● 0

     ● ● ● ▯ ● ● ▯ ●

     (front of instrument ⇓)

   - ❑ If any other LED patterns remain, replace the **A9** CPU after verifying the power supply.

## Display Troubleshooting **(A2, A18, A19, A27)**

This section contains the following information:

- Evaluating your Display
- Troubleshooting a White Display
- Troubleshooting a Black Display
- Troubleshooting a Display with Color Problems

### Evaluating your Display

Switch the analyzer off, and then on. The display should be bright with the annotation legible and intelligible. There are four criteria against which your display is measured:

- Background Lamp Intensity
- Green, Red or Blue Stuck Pixels
- Dark Stuck Pixels
- Newtons **Rings**

Evaluate the display as follows:

- If either the **A18** LCD, **A19** GSP, **A9** CPU or **A27** backlight inverter assemblies are replaced, perform a visual inspection of the display.
- If it appears that there is a problem with the display, refer to the troubleshooting information that follows
- If the new display appears dim or doesn't light, see "Backlight Intensity Check," next.

## Backlight Intensity Check

### Required Equipment and Tools

Photometer. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Tektronix J16
Probe . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Tektronix J6503
Light Occluder . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Tektronix 016-0305-00
Antistatic Wrist Strap . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-1367
Antistatic Wrist Strap Cord . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . HP P/N 9300-0980
Static-control Table Mat and Earth Ground Wire . . . . . . . . . . . . HP P/N 9300-0797

***Analyzer warmup time:*** 30 minutes. ***Photometer warm-up time:*** 30 minutes.

---

**Note** This procedure should be performed with a photometer and only by qualified personnel.

---

1. **Press (Display) MORE ADJUST DISPLAY INTENSITY (100) (x1), to set the display** intensity at 100%.
2. **Press (System) SERVICE MENU TESTS (62) (x1) EXECUTE TEST CONTINUE** set a white screen test pattern on the display.
3. Set the photometer probe to NORMAL. Press (POWER) on the photometer to switch it on and allow 30 minutes of warm-up time. Zero the photometer according to the manufacturer's instructions
4. Center the photometer on the analyzer display as shown in **Figure** 6-4.

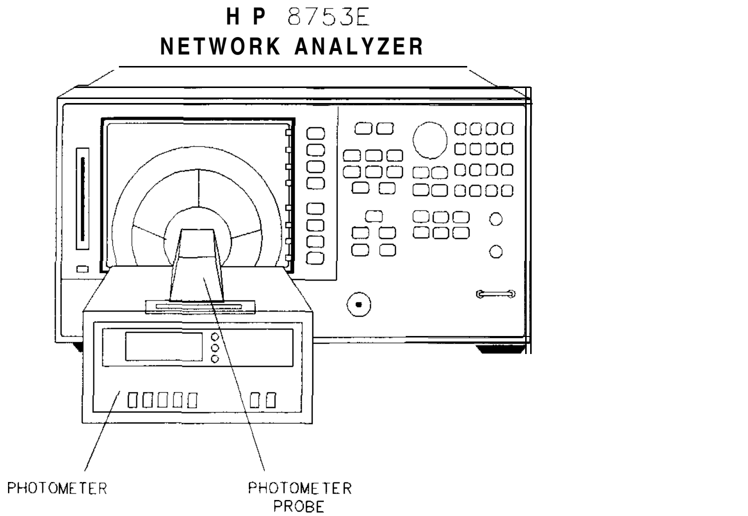



Figure 6-4. Backlight Intensity Check Setup

**Note** The intensity levels are read with a display bezel installed.

5. If the photometer registers less than 50 Nits, the display backlight lamp is bad. Refer to the "Replacement Procedures" chapter in the service manual for information on display lamp replacement.

## Red, Green, or Blue Pixels Specifications

Red, green, or blue "stuck on" pixels may appear against a black background. To test for these dots, press (System) SERVICE MENU TESTS (70) (x1) EXECUTE TEST CONTINUE

In a properly working display, the following will not occur:

- complete rows or columns of stuck pixels
- more than 5 stuck pixels (not to exceed a maximum of 2 red or blue, and 3 green)
- 2 or more consecutive stuck pixels
- stuck pixels less than 6.5 mm apart

### Dark Pixels **Specifications**

Dark "stuck on" pixels may appear against a **white** background. To test for **these dots, press** (System) SERVICE MENU TESTS (66) (x1) EXECUTE TEST CONTINUE.

In a properly working display, the following **will** not occur:

- more than 12 stuck pixels (not to exceed a maximum of 7 red, green, or blue)
- more than one occurrence of 2 consecutive stuck pixels
- stuck pixels less than 6.5 mm apart

### Newton's Rings

To check for the patterns known as Newton's Rings, change the display to white by pressing the following keys:

(System) SERVICE MENU TESTS (66) (x1) EXECUTE TEST CONTINUE

Figure 6-5 **illustrates** acceptable and non-acceptable examples of Newtons Rings

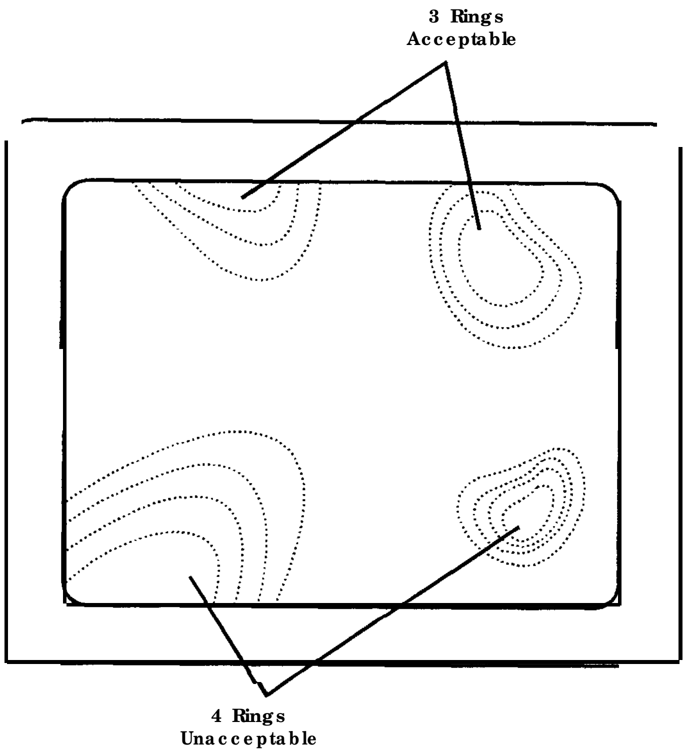



**Figure** 6-5. Newtons Rings

## Troubleshooting a White Display

If the display is white, the **A27** back light inverter is functioning properly. Connect a VGA monitor to the analyzer.

- If the image on the external monitor is normal, then suspect **A2, A18,** or the front panel cabling.
- If the image on the external monitor is bad, suspect the **A19** GSP or cable **W20** (CPU to motherboard).

## Troubleshooting a Black Display

1. Remove the front panel with the exception of leaving cable **W17 (A2** to motherboard) connected.
2. Press (Preset) while checking to see if there is a flash of light.
   - If the light does not flash, suspect the front panel cabling, the display lamp, or the **A27** inverter.

## Troubleshooting a Display with Color Problems

1. **Press (Display) ADJUST DISPLAY DEFAULT COLORS. If this does not correct the color problems, continue with the next step.**
2. **Run** display service test 74 as described in Chapter 10. Confirm that there are four intensities for each color.
   - If the test passes, then continue.
   - If the test fails, then suspect the front panel cabling, **A2, A19,** or **A18.**
3. Connect a VGA monitor to the analyzer.
   - If the image on the external monitor has the same color problems, then replace the **A19 GSP.**
   - If the image on the external monitor is acceptable, then there must be a missing color bit. Suspect the front panel cabling, **A2, A19,** or **A18.**

# Front Panel Troubleshooting (Al, A2)

## Check Front Panel LEDs After Preset

1. Press (Preset) on the analyzer.
2. Observe that all front panel **LEDs** turn on and, within five seconds after releasing (Preset), all but the **CH1** and Port 1 LED turns off. Refer to Figure 6-6.
   - ❑ If all the front panel **LEDs** either stay on or off, there is a control problem between **A9** and **A1/A2.** See "Inspect Cables, " located later in this chapter.
   - ❑ If, at the end of the turn on sequence, the channel 1 LED is not on and all HP-IB status **LEDs** are not off, continue with "Identify the Stuck Key".
   - ❑ If you suspect that one or more **LEDs** have burned out, replace the Al keypad assembly.

| Note | Port 1 and port 2 LED problems may be caused by the malfunction of the **A23** LED board or the **A24** transfer switch. |
|---|---|

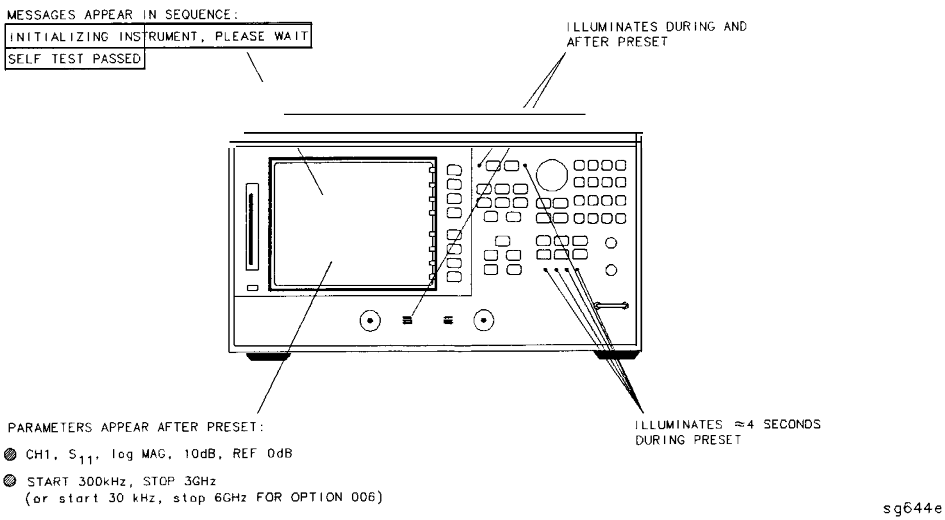



Figure 6-6. Preset Sequence

## Identify the Stuck Key

Match the LED pattern with the patterns in **Table 6-1.** The LED pattern identifies the stuck key. **Free** the stuck key or replace the front panel part causing the problem.

**Table 6-1.** Front **Panel** Key Codes

| Decimal Number | LED Pattern | | | | | | Key | Front Panel Block |
|---|---|---|---|---|---|---|---|---|
| | CH1 | CH2 | R | L | T | S | | |
| 0 | | | | | | | Cal | Response |
| 1 | | | | | | . | 3 | Entry |
| 2 | | | | | . | | k/m | Entry |
| 3 | | | | | . | . | Display | Response |
| 4 | | | | . | | | Avg | Response |
| 5 | | | | . | | . | 2 | Entry |
| 6 | | | | . | . | | 1 | Entry |
| 7 | | | | . | . | . | softkey 3 | Softkey |
| 8 | | | . | | | | softkey 5 | Softkey |
| 9 | | | . | | | . | 9 | Entry |
| 10 | | | . | | . | | G/n | Entry |
| 11 | | | . | | . | . | Chan 1 | Active Channel |
| 12 | | | . | . | | | Chan 2 | Active Channel |
| 13 | | | . | . | | . | 8 | Entry |
| 14 | | | . | . | . | | 7 | Entry |
| 15 | | | . | . | . | . | softkey 1 | Softkey |
| 16 | | . | | | | | Stop | Stimulus |
| 17 | | . | | | | . | Save/Recall | Instrument State |
| 18 | | . | | | . | | Seq | Instrument State |
| 19 | | . | | | . | . | Menu | Stimulus |
| 20 | | . | | . | | | Start | Stimulus |
| 21 | | . | | . | | . | Copy | Instrument State |
| 22 | | . | | . | . | | System | Instrument State |
| 23 | | . | | . | . | . | softkey 6 | Softkey |
| 24 | | . | . | | | | Scale Ref | Response |
| 25 | | . | . | | | . | 6 | Entry |

## Table 6-1. Front Panel Key Codes (continued)

| Decimal Number | LED Pattern CH1 | CH2 | R | L | T | S | Key | Front Panel Block |
|---|---|---|---|---|---|---|---|---|
| 26 | | • | . | | • | | M/μ | Entry |
| 27 | | . | . | | • | • | Meas | Response |
| 28 | | . | . | . | | | Format | Response |
| 29 | | . | . | . | | • | 5 | Entry |
| 30 | | . | . | . | • | | 4 | Entry |
| 31 | | . | . | • | • | • | softkey 2 | Softkey |
| 32 | • | | | | | | Span | Stimulus |
| 33 | • | | | | | • | ⇓ | Entry |
| 34 | • | | | | • | | ENTRY OFF | Entry |
| 35 | • | | | | • | • | Center | Stimulus |
| 36 | • | | | • | | | softkey 8 | Softkey |
| 37 | • | | | • | | • | ⇑ | Entry |
| 38 | • | | | • | • | | Local | Instrument State |
| 39 | • | | | • | • | • | softkey 7 | Softkey |
| **40-47** | lot **used** | | | | | | | |
| 48 | . | • | | | | | ← | Entry |
| 49 | . | • | | | | • | − | Entry |
| 50 | . | • | | | • | | x1 | Entry |
| 51 | . | • | | | • | • | Marker | Response |
| **52** | . | • | | • | | | Marker Fctn | Response |
| **53** | . | • | | • | | • | . | Entry |
| **54** | . | • | | • | • | | 0 | Entry |
| **55** | . | • | | • | • | • | softkey 4 | Softkey |

## Inspect Cables

Remove the front panel assembly and visually inspect the ribbon cable that connects the front panel to the motherboard. Also, inspect the interconnecting ribbon cable between Al and **A2.** Make sure the cables are properly connected. Replace any bad cables.

## Test Using a Controller

If a controller is available, write a simple command to the analyzer. If the analyzer successfully executes the command, the problem is either the **A2** front panel interface or **W17 (A2** to motherboard ribbon cable) is faulty.

## Run the Internal Diagnostic Tests

The analyzer incorporates 20 internal diagnostic tests. Most tests can be run as part of one or both major test sequences: **all** internal (test 0) and preset (test 1).

1. Press (System) SERVICE MENU TESTS (0) (x1) EXECUTE TEST to perform all INT tests.
2. Then press (1) (x1) to see the results of the preset test. If either sequence fails, press the (⇧) (⇩) keys to find the first occurrence of a FAIL message for tests 2 through 20. See Table 6-2 for further troubleshooting information.

## Table 6-2. Internal Diagnostic Test with Commentary

| Test | Sequence* | Probable Failed Assemblies†, Comments and Troubleshooting Hints |
|---|---|---|
| 0 All Int | — | —: Executes tests 3-11, 13-16, 20. |
| 1 Preset | — | —: Executes tests 2-11, 14-16. Runs at power-on or preset. |
| 2 ROM | P,AI | A9: Repeats on fail; refer to "CPU Troubleshooting (A9)" in this chapter to replace ROM or A9. |
| 3 CMOS RAM | P,AI | A9: Replace A9. |
| 4 Main DRAM | P,AI | A9: Repeats on fail; replace A9. |
| 5 DSP Wr/Rd | P,AI | A9: Replace A9. |
| 6 DSP RAM | P,AI | A9: Replace A9. |
| 7 DSP ALU | P,AI | A9: Replace A9. |
| 8 DSP Intrpt | P,AI | A9/A10: Remove A10, rerun test. If fail, replace A9. If paw, replace A1( |
| 9 DIF Control | P,AI | A9/A10: Most likely A9 assembly. |
| 10 DIF Counter | P,AI | A10/A9/A12: Check analog bus node 17 for 1 MHz. If correct, A12 is verified; suspect A10. |
| 11 DSP Control | P,AI | A10/A9: Most likely A10. |
| 12 Fr Pan Wr/Rd | — | A2/A1/A9: Run test 23. If fail, replace A2. If pass, problem is on bus between A9 and A2 or on A9 assembly. |
| 13 Rear Panel | AI | A16/A9: Disconnect A16, and check A9J2 pin 48 for 4 MHz clock signal. If OK, replace A16. If not, replace A9. |
| 14 Post-reg | P,AI | A15/A8/Destination assembly: See Chapter 5, 'Power Supply Troubleshooting." |
| 15 Frac-N Cont | P,AI | A14: Replace A14. |
| 16 Sweep Trig | P,AI | A14,A10: Most likely A14. |
| 17 ADC Lin | — | A10: Replace A10. |
| 18 ADC Ofs | — | A10: Replace A10. |
| 19 ABUS Test | — | A10: Replace A10. |
| 20 FN count | AI | A14/A13/A10: Most likely A14 or A13, as previous tests check A10. See Chapter 7, "Source Troubleshooting." |

* P - part of PRESET sequence; AI -part of ALL INTERNAL sequence.
† in decreasing order of probability.

## If the Fault Is Intermittent

### Repeat Test Function

If the failure is intermittent, do the following:

1. Press (System) SERVICE MENU TEST OPTIONS REPEAT ON to turn on the repeat function.
2. Then press RETURN TESTS.
3. Select the test desired and press EXECUTE TEST.
4. Press any key to stop the function. The test repeat function is explained in Chapter 10, "Service Key Menus and Error Messages"

## HP-IB Failures

If you have performed "Step 3. Troubleshooting HP-IB Systems" in Chapter 4, "Start Troubleshooting Here," and you suspect there is an HP-IB problem in the analyzer, perform the following test. It checks the internal communication path between the A9 CPU and the A16 rear panel. It does not check the HP-IB paths external to the instrument.

Press (System) SERVICE MENU TESTS (13) (x1) EXECUTE TEST.

- If the analyzer fails the test, the problem is likely to be the A16 rear panel.
- If the analyzer passes the test, it indicates that the A9 CPU can communicate with the A16 rear panel with a 50% confidence level. There is a good chance that the A16 rear panel is working. This is because internal bus lines have been tested between the A9 CPU and A16, and HP-IB signal paths are not checked external to the analyzer.

# 7

# Source Troubleshooting

Use this procedure only if you have read Chapter 4, "Start Troubleshooting Here." This chapter is divided into two troubleshooting procedures for the following problems:

- Incorrect power levels: Perform the "Power" troubleshooting checks.
- Phase lock error: Perform the "Phase Lock Error" troubleshooting checks.

The source group assemblies consist of the following:

- **A3** source
- **A4** sampler/mixer
- **A7** pulse generator
- A11 phase lock
- **A12** reference
- **A13** fractional-N (analog)
- **A14** fractional-N (digital)

## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8753E network analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts."
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures."
4. Perform the necessary adjustments. Refer to Chapter 3, "Adjustments and Correction Constants."
5. Perform the necessary performance tests Refer to Chapter 2, "System Verification and Performance Tests."

## Before You Start Troubleshooting

Make sure all of the assemblies are firmly seated. Also make sure that input R has a signal of at least -35 dBm (about 0.01 Vp-p into 50 ohms) at all times to maintain phase lock.

## Power

If the analyzer output power levels are incorrect but no phase lock error is present, perform the following checks in the order given:

For the following checks, make sure that the A9 switch is in the Alter position.

### 1. Source Default Correction Constants (Test 44)

To run this test, press (Preset) (System) SERVICE MENU TESTS (44) (x1) EXECUTE TEST. When complete, DONE should appear on the analyzer display. Use a power meter to verify that source power can be controlled and that the power level is approximately correct. If the source passes these checks, proceed with step 2. However, if FAIL appears on the analyzer display, or if the analyzer fails the checks, replace the source.

### 2. RF Output Power Correction Constants (Test 47)

Follow the instructions for this procedure given in Chapter 3, "Adjustments and Correction Constants." The procedure is complete when DONE appears on the analyzer display. Use a power meter to verify that power levels are now correct. If power levels are not correct, or if the analyzer fails the routine, proceed with step 3.

### 3. Sampler Magnitude and Phase Correction Constants (Test 53)

Follow the instructions for this procedure given in Chapter 3, "Adjustments and Correction Constants." The procedure is complete when DONE appears on the analyzer display. Next, repeat step 2. If the analyzer fails the routine in step 2, replace the source.

If the analyzer fails the routine in step 3, replace the source.

# Phase Lock Error

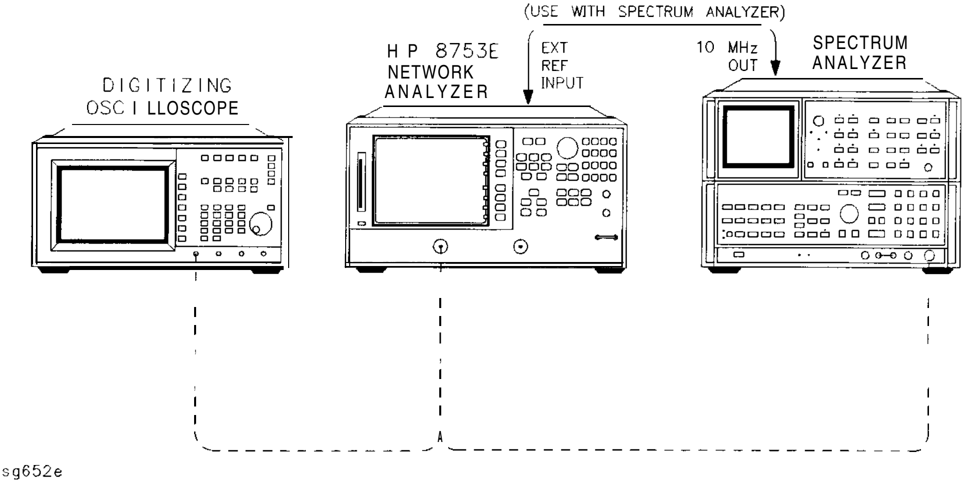



Figure 7-1. Basic Phase Lock Error Troubleshooting Equipment Setup

Troubleshooting tools include the assembly location diagram and phase lock diagnostic tools. The assembly location diagram is on the underside of the instrument top cover. The diagram shows major assembly locations and RF cable connections. The phase lock diagnostic tools are explained in the “Source Group Troubleshooting Appendix” and should be used to troubleshoot phase lock problems The equipment setup shown in Figure **7-1** can be used throughout this chapter.

## Phase Lock Loop Error Message Check

Phase lock error messages may appear as a result of incorrect pretune correction constants. To check this possibility, perform the **pretune** correction constants routine.

The four phase lock error messages, listed below, are described in the “Source Group Troubleshooting Appendix” at the end of this chapter.

- NO **IF FOUND:** CHECK R INPUT LEVEL
- NO PHASE LOCK: CHECK R INPUT LEVEL
- PHASE LOCK CAL FAILED

■ PHASE LOCK LOST

1. Make sure the **A9** CC switch is in the **ALTER** position:
   a. Remove the power line cord from the analyzer.
   b. Set the analyzer on its side.
   c. Remove the two corner bumpers from the bottom of the instrument with a **T-15** TORX screwdriver.
   d. Loosen the captive screw on the bottom cover's back edge.
   e. Slide the cover toward the rear of the instrument.
   f. Move the jumper to the **ALT** position as shown in Figure 7-2.
   g. Replace the bottom cover, comer bumpers, and power cord.

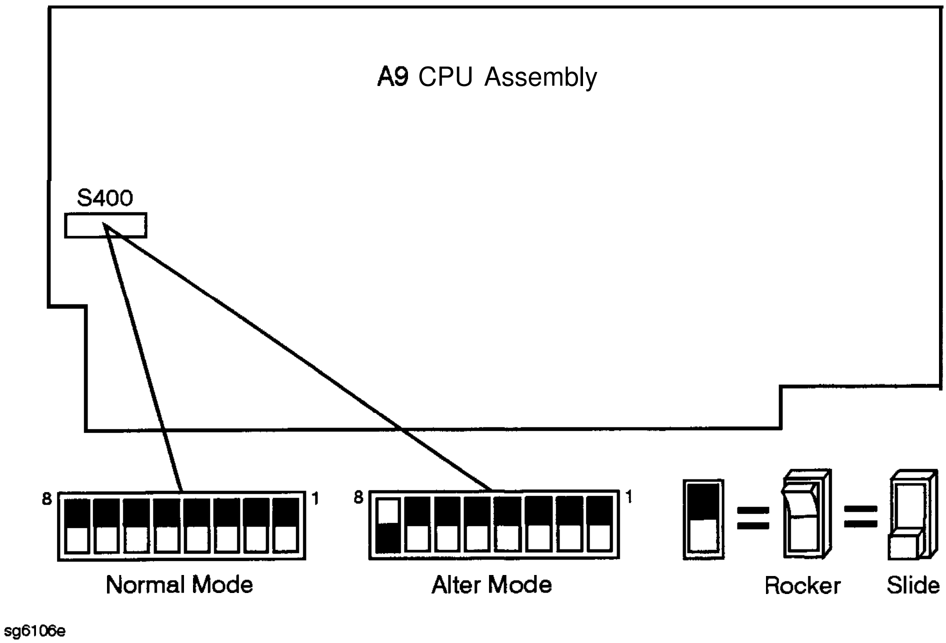



Figure 7-2. Jumper Positions on the **A9** CPU

2. Switch on the analyzer and press (System) **SERVICE MENU** **TESTS** (46) (x1) **EXECUTE TEST** to generate new analog bus correction constants. Then press (System) **SERVICE MENU** **TESTS** (45) (x1) **EXECUTE TEST** to generate default pretune correction constants

   Press (System) **SERVICE MENU** **TESTS** (48) (x1) **EXECUTE TEST** **YES** to generate new pretune correction constants.

3. Press (Preset) and observe the analyzer display:

   a. No error message: restore the A9 CC jumper to the NRM position. Then refer to "Post-Repair Procedures" in Chapter 14 to verify operation.

   b. Error message visible: continue with "A4 Sampler/Mixer Check".

## A4 Sampler/Mixer Check

The A4, A5, and A6 (R, A and B) sampler/mixers are similar in operation. Any sampler can be used to phase lock the source. lb eliminate the possibility of a faulty R sampler, follow this procedure.

1. Remove the W8 cable (Al 1J1 to A4) from the R-channel sampler (A4) and connect it to either the A-channel sampler (A5) or the B-channel sampler (A6). Refer to Figure 7-3.

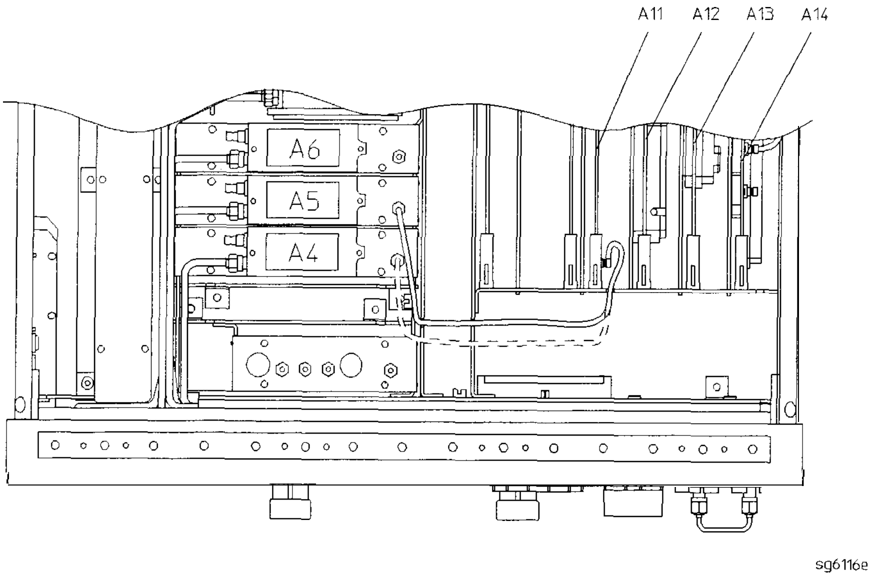



Figure 7-3. **Sampler/Mixer** to Phase Lock Cable Connection Diagram

2. If you connected **W8** to:

- ☐ **A5**, press (Meas) **Refl FWD: S11 (A/R)**
- ☐ **A6**, press (Meas) **Refl REV: S22 (B/R)**

3. Ignore the displayed trace, but check for phase lock error messages. If the phase lock problem persists, the R-channel sampler is ***not*** the problem.

## A3 Source and A11 Phase Lock Check

This procedure checks the source and part of the phase lock assembly. It opens the phase-locked loop and exercises the source by varying the source output frequency with the A11 pretune DAC.

Note: If the analyzer **failed** internal test 48, default pretune correction constants were stored which may result in a constant offset of several MHz. Regardless, continue with this procedure.

Note: Use a spectrum analyzer for problems above 100 MHz.

1. Connect the **oscilloscope** or spectrum analyzer as shown in Figure **7-1.** (Set the oscilloscope input impedance to 50 ohms)
2. **Press (Preset) (System) SERVICE MENU SERVICE MODES SRC ADJUST MENU SRC TUNE ON SRC TUNE FREQ to activate the source tune (SRC TUNE)** service mode.
3. Use the front panel knob or front panel keys to set the pretune frequency to 300 **kHz,** 30 MHz, and 40 MHz. Verify the signal frequency on the **oscilloscope.**

Note: In SRC TUNE mode, the source output frequency changes in 1 to 2 MHz increments and **should** be 1 to 6 MHz above the indicated output frequency.

4. Check for the frequencies indicated by **Table 7-1.**

**Table** 7-1. Output Frequency in **SRC** Tune Mode

| Setting | Observed Frequency |
|---|---|
| 300 kHz | 1.3 to 6.3 MHz |
| 30 MHz | 31 to 36 MHz |
| 40 MHz | 41 to 46 MHz |

5. The signal observed on an **oscilloscope** should be as **solid** as the **signal** in **Figure** 7-4.

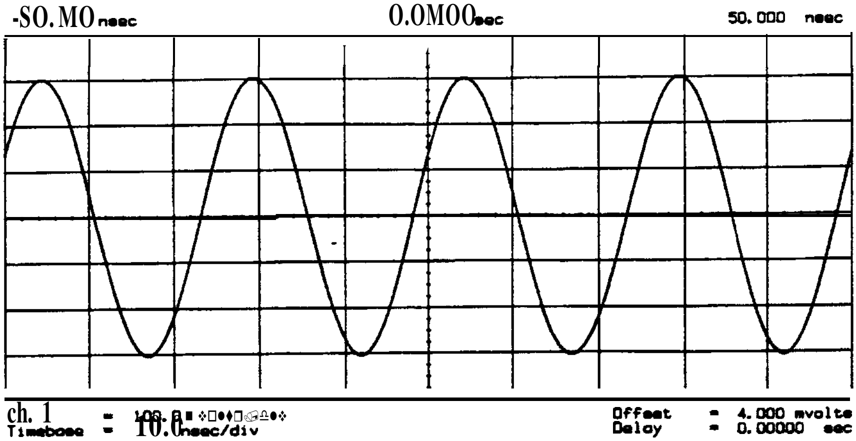



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Figure 7-4. Waveform Integrity in **SRC** Tune Mode

6. The signal observed on the spectrum analyzer will appear jittery as in Figure 7-5 (B), not solid as in **Figure** 7-5 (A). This is because in SRC TUNE mode the output is not phase locked.

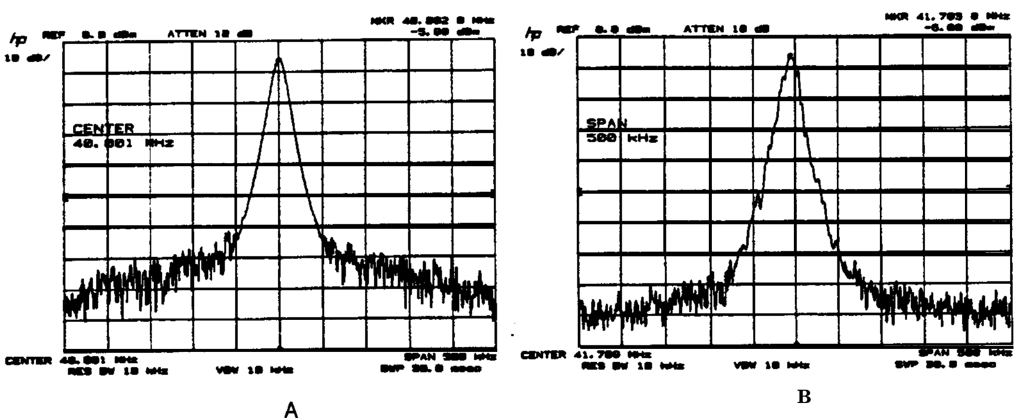


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Figure 7-5.
Phase Locked Output Compared to Open Loop Output in **SRC** Tune Mode

7. Press (Menu) **POWER** to vary the power and check for corresponding level changes on the test instrument. (A power change of 20 dB will change the voltage observed on the oscilloscope by a factor of ten.)

8. Note the results of the frequency and power changes:

   - ☐ If the frequency and power output changes are correct, skip ahead to "A12 Reference Check" located in this chapter.
   - ☐ If the frequency changes are not correct, continue with "YO Coil Drive Check with Analog Bus".
   - ☐ If the power output changes are not correct, check analog bus node 3.

     a. Press (System) **SERVICE MENU** **ANALOG BUS ON** (Meas) **ANALOG IN Aux Input** (Format) **MORE** **REAL** (3) (x1).

     b. Press (Marker) (2) (G/n). The marker should read approximately 434 mU.

     c. Press (Marker) (4) (G/n). The marker should read approximately 646 mU.

## YO Coil Drive Check with Analog Bus

**Note** If the analog bus is not functional, perform the "YO Drive Coil Check with Oscilloscope" test.

1. Press (Preset) (System) SERVICE MENU ANALOG BUS ON SERVICE MODES SOURCE PLL OFF (Meas) ANALOG IN Aux Input.
2. Then press (16) (x1) (Format) MORE REAL (Scale Ref) AUTOSCALE. This keystroke sequence lets you check the pretune DAC and the A11 output to the YO coil drive by monitoring the 1 V/GHz signal at analog bus node 16.
3. Compare the waveform to Figure 7-6. If the waveform is incorrect, the A11 phase lock assembly is faulty.

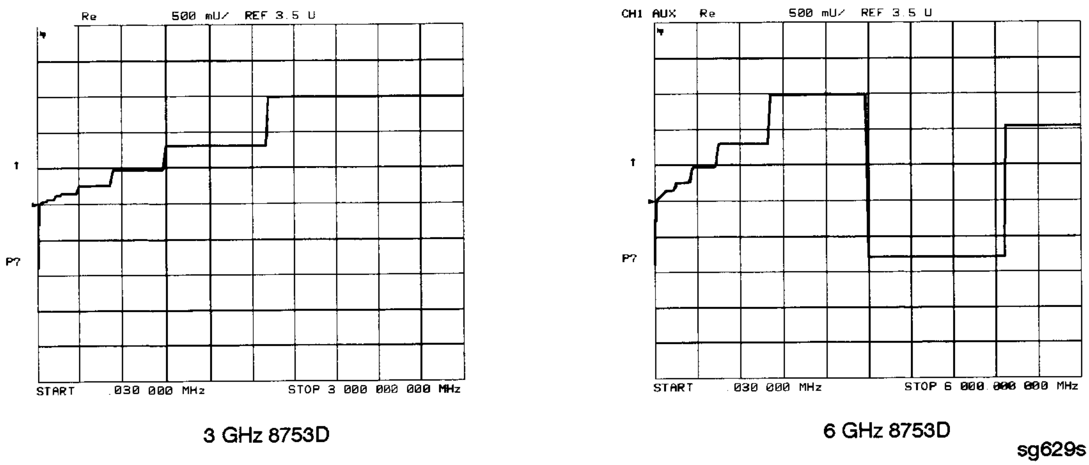


**Figure 7-6. 1 V/GHz at Analog Bus Node 16 with Source PLL Off.**

## YO Coil Drive Check with Oscilloscope

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| | |
|---|---|
| Note | Use the large extender board for easy access to the voltage points. The extender board is included with the HP 8753 **Tool** Kit. See Chapter 13, "Replaceable **Parts",** for part numbers and ordering information. |

---

1. Connect **oscilloscope** probes to **A11P1-1** and **A11P1-2.** The YO **coil** drive signal is actually two signals whose voltage difference drives the coil.
2. **Press (Preset) (System) SERVICE MENU SERVICE MODES SOURCE PLL OFF to operate the analyzer in a swept open loop mode.**
3. Monitor the two YO coil drive lines In source tune mode the voltage difference should vary from approximately 3.5 to 5.0 volts as shown in Figure 7-7.
   - ❑ If the voltages are not correct, replace the faulty All assembly.
   - ❑ If the output **signals** from the All assembly are correct, replace the faulty **A3** source assembly.
   - ❑ If neither the A11, nor the**A3** assembly is faulty, continue with the next check.

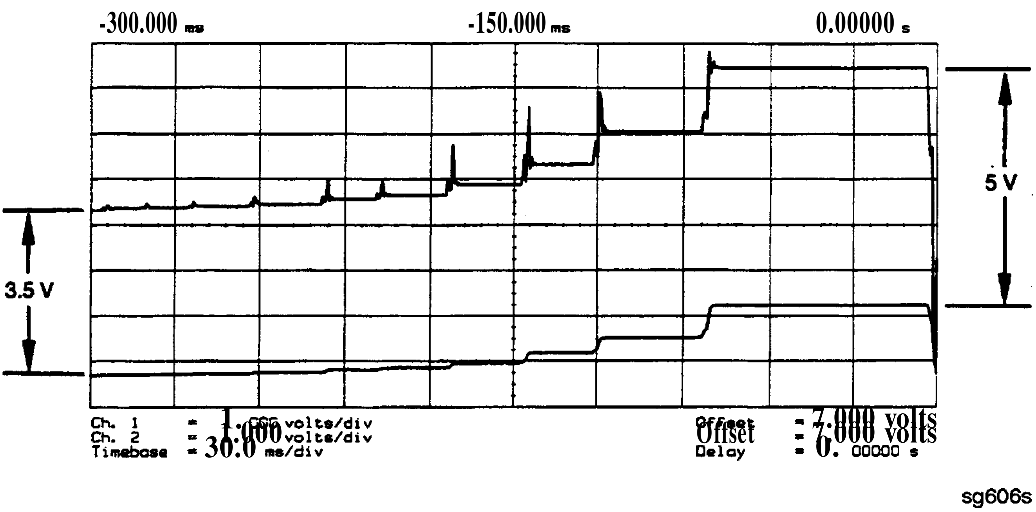


Figure 7-7.
YO- and YO + Coil Drive Voltage Differences with SOURCE **PLL** OFF

## A12 Reference Check

The signals are evaluated with pass/fail checks. The most efficient way to check the A12 frequency reference signals is to use the analog bus while referring to Table 7-2.

Alternatively, you can use an oscilloscope, while referring to Table 7-3 and Figure 7-8 through Figure 7-14. If any of the observed signals differs from the figures, there is a 90% probability that the A12 assembly is faulty. Either consider the A12 assembly defective or perform the "A12 Digital Control Signals Check".

Both of these procedures are described ahead.

### Analog Bus Method

1. Press (Preset) (System) SERVICE MENU ANALOG BUS ON (Meas) ANALOG IN Aux Input ANALOG BUS to switch on the analog bus and its counter.
2. Press (21) (x1) to count the frequency of the 100 kHz signal.
3. Press (Menu) CW FREQ (500) (k/m). Verify that the counter reading (displayed on the analyzer next to cnt:) matches the corresponding 100 kHz value for the CW frequency. (Refer to Table 7-2.)
4. Verify the remaining CW frequencies, comparing the counter reading with the value in Table 7-2:
   - Press (2) (M/μ).
   - Press (50) (M/μ).

**Table 7-2. Analog Bus Check of Reference Frequencies**

| CW Frequency | Analog Bus Node 21<br>100 kHz | Analog Bus Node 24<br>2nd LO | Analog Bus Node 25<br>PLREF |
|---|---|---|---|
| 500 kHz | 0.100 MHz | 0.504 MHz | 0.500 MHz |
| 2 MHz | 0.100 MHz | 2.007 MHz | 2.000 MHz |
| 50 MHz | 0.100 MHz | 0.996 MHz | 1.000 MHz |

NOTE: The counter should indicate the frequencies listed in this table to within ±0.1%. Accuracy may vary with gate time and signal strength.

5. Press (24) (x1) to count the frequency of the **2nd LO** signal.
6. Press (Menu) **CW FREQ** (500) (k/m). Verify that the counter reading matches the corresponding **2nd LO** value for the CW frequency. (Refer to **Table** 7-2.)
7. Verify the remaining CW frequencies, comparing the counter reading with the value in **Table** 7-2:
   - Press (2) (M/μ).
   - Press (50) (M/μ).
8. Press (25) (x1) to count the frequency of the PLREF **signal.**
9. **Press** (Menu) **CW FREQ** (500) (k/m). **Verify that the counter reading matches** the corresponding PLREF value for the CW frequency. (Refer to **Table** 7-2.)
10. Verify the remaining CW frequencies, comparing the counter reading with the value in **Table** 7-2:
    - **Press** (2) (M/μ).
    - **Press** (50) (M/μ).
11. Check the results.
    - ❑ If **all** the counter readings match the frequencies **listed** in **Table** 7-2, skip ahead to "**A13/A14** Fractional-N Check".
    - ❑ If the counter readings are incorrect at the 500 **kHz** and 2 MHz settings only, go to "**FN** LO at **A12** Check".
    - ❑ If **all** the counter readings are incorrect at **all** three CW frequencies, the counter may be faulty. Perform the "**Oscilloscope** Method" check of the signals described below. (If the **signals** are good, either the **A10** or **A14** assemblies could be faulty.)

### Oscilloscope Method

You need not use the oscilloscope method unless the analog bus is non-functional or any of the signals fail the specifications listed in Table 7-2.

If the analog bus is non-functional or the previous check has revealed questionable signals, observe the signal(s) with an oscilloscope. Table 7-3 identifies a convenient test point and a plot for the five signals listed.

**Table 7-3. A12 Reference Frequencies**

| Mnemonic | Signal Description | Location | See Figure | Analyzer Setting |
|---|---|---|---|---|
| FN100kHzREF | 100 kHz Reference | A13TP5 | Figure 7-8 | any |
| REF | Phase Lock Reference | A11TP9 | Figure 7-9 | ≥16 MHz CW |
| REF | Phase Lock Reference | A11TP9 | Figure 7-10 | 5 MHz CW |
| FN LO* | Fractional-N LO | A14J2 | Figure 7-11 | 10 MHz CW |
| 4MHz REF | 4 MHz Reference | A12TP9 | Figure 7-12 | any |
| 2ND LO+/− | Second LO | A12P1-2,4 | Figure 7-13 | ≥16 MHz CW |
| 2ND Lo+/- | Second LO | A12P1-2,4 | Figure 7-14 | 14 MHz CW |

Not an A12 signal, but required for A12 lowband operation.

## 100 kHz Pulses

The 100 kHz pulses are very narrow and typically 1.5 V in amplitude. You may have to increase the oscilloscope intensity to see these pulses. (See Figure 7-8.)

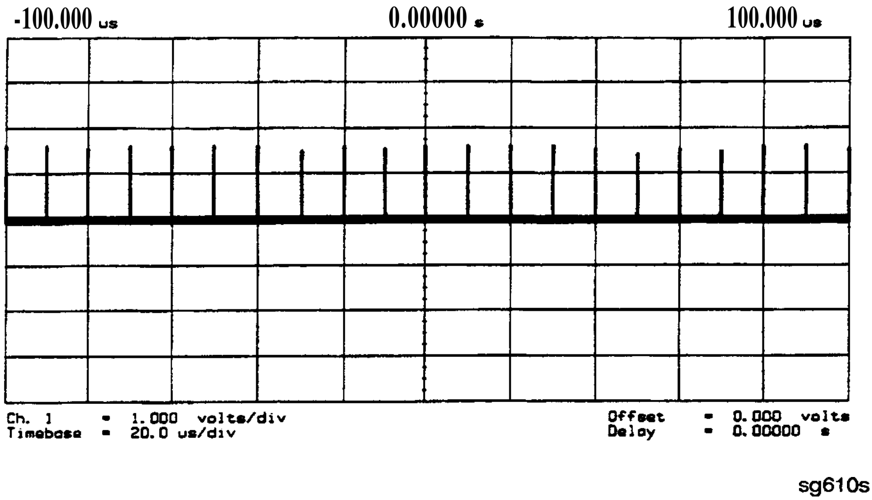


Figure 7-8. Sharp 100 **kHz** Pulses at **A13TP5** (any frequency)

## **PLREF** Waveforms

**REF** Signal At **A11TP9.** REF is the buffered PLREF+ signal. The 1st IF is phase locked to this signal. Use an oscilloscope to observe the signal at the frequencies noted in Figure 7-9 and Figure 7-10.

High Band **REF** Signal. In high band the REF signal is a constant 1 MHz square wave as indicated by Figure 7-9.

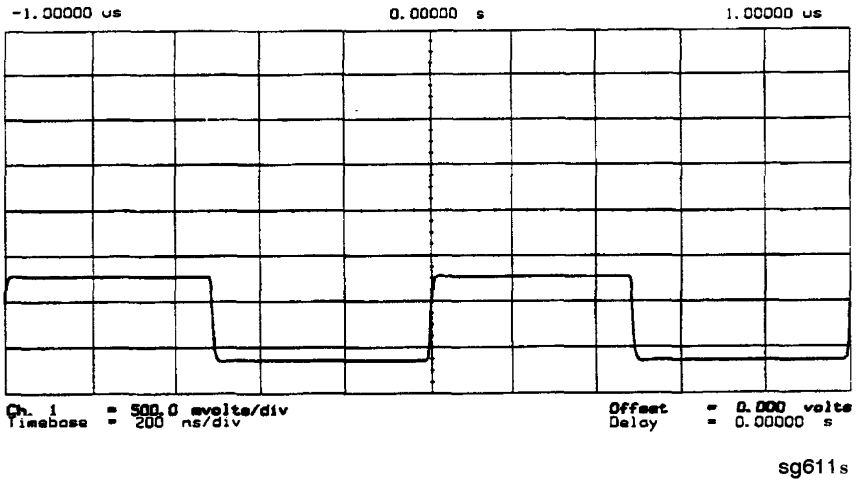


Figure 7-9. High Band **REF** Signal (**≥16** MHz **CW)**

Low Band REF **Signal.** In low band this signal follows the frequency of the RF output signal. Figure 7-10 illustrates a 5 MHz CW signal.

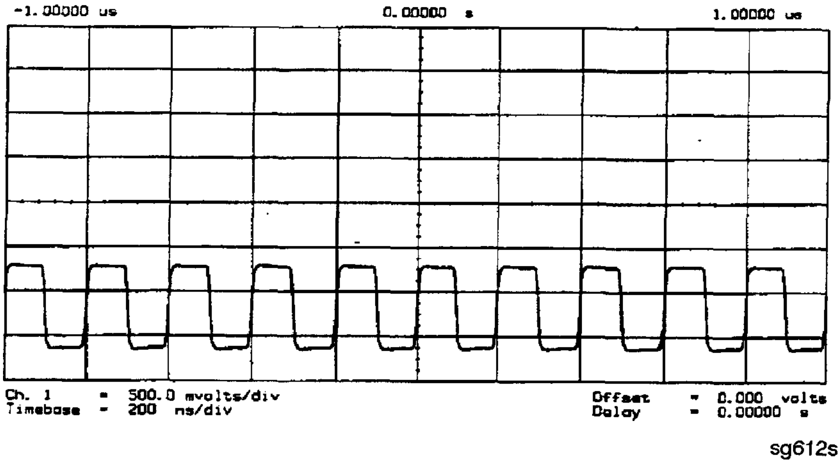


Figure **7-10. REF** Signal at **A11TP9** (5 **MHz CW)**

- ❑ If REF looks good, skip ahead to "4 MHz Reference Signal".
- ❑ If REF is bad in low band, continue with **"FN LO** at **A12** Check".

## FN LO at A12 Check

1. Use an oscilloscope to observe the FN LO from A14 at the cable end of A14J2. Press (Preset) (System) SERVICE MENU SERVICE MODES FRACN TUNE ON to switch on the fractional-N service mode.
2. Use the front panel knob to vary the frequency from 30 to 60 MHz. The signal should appear similar to Figure 7-1 1. The display will indicate 10 to 60.8 MHz.
   - ❑ If the FN LO signal is good, the A12 assembly is faulty.
   - ❑ If the FN LO signal is not good, skip ahead to "A13/A14 Fractional-N Check".

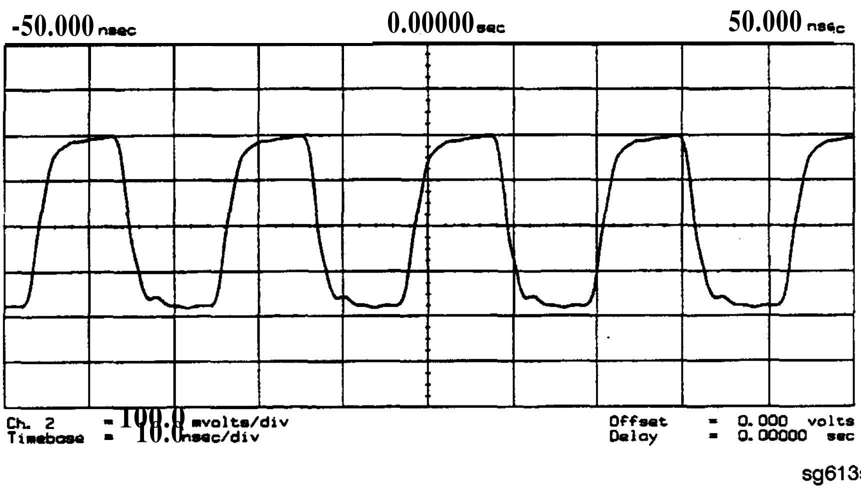


Figure 7-11. Typical FN LO Waveform at A12J1

## 4 MHz Reference Signal

This reference signal is used to control the receiver. If faulty, this signal can cause apparent source problems because the CPU uses receiver data to control the source. At **A12TP9** it should appear similar to **Figure** 7-12.

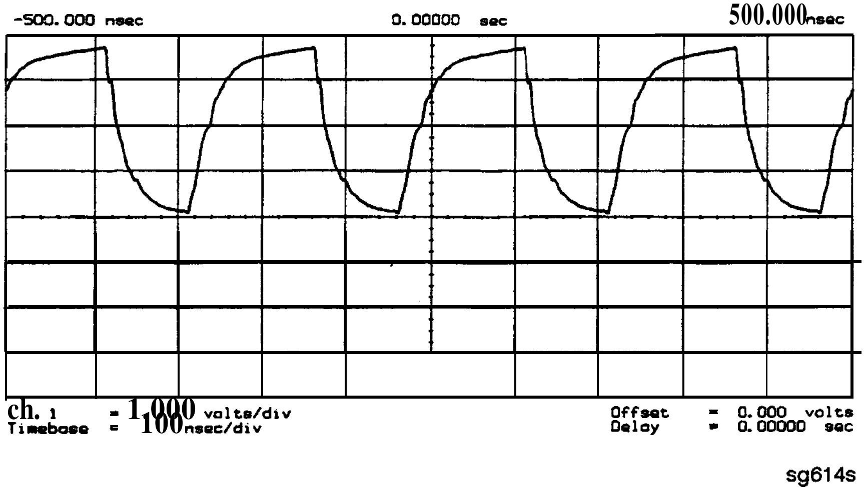


Figure 7-12. 4 **MHz** Reference **Signal** at **A12TP9** (Preset)

### 2ND LO Waveforms

The 2nd LO signals appear different in phase and shape at different frequencies.

90 Degree Phase Offset of 2nd LO Signals in High Band. In high band, the 2nd LO is 996 kHz. As indicated by Figure 7-13, the 2nd LO actually consists of two signals 90 degrees out of phase.

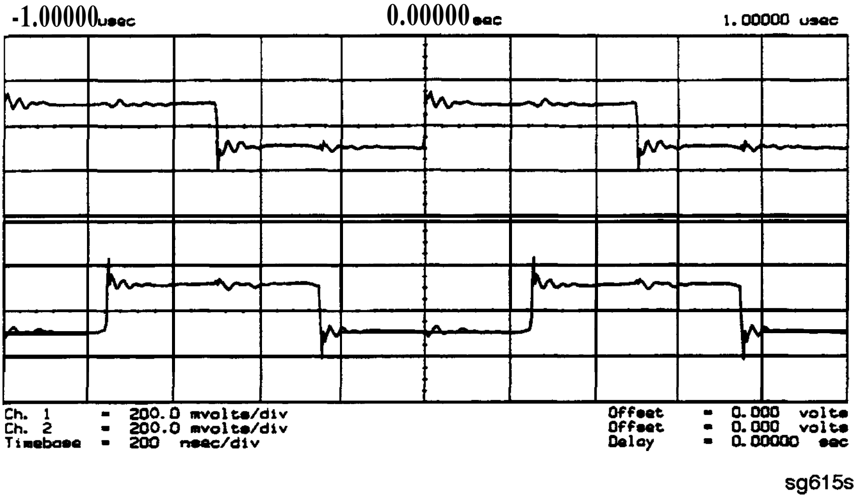


Figure 7-13.
90 Degree Phase Offset of High Band 2nd LO Signals (≥16 MHz CW)

In-Phase 2nd LO Signals in Low Band. The 2nd LO signals in low band, as shown in Figure 7-14, are not phase shifted. In low band these signals track the RF output with a 4 kHz offset.

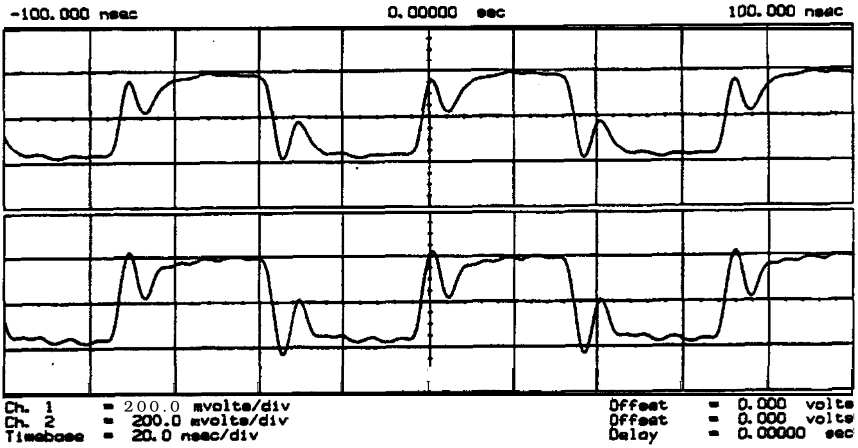

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Figure 7-14. In-Phase Low Band 2nd LO Signals (14 MHz CW)

If any of the signals of Table 7-2 are incorrect, the probability is 90% that the **A12** assembly is faulty. Either consider the **A12** assembly faulty or perform the "**A12** Digital Control Signals Check" described ahead.

## A12 Digital Control Signals Check

Several digital control signals must be functional for the A12 assembly to operate properly. Check the control lines listed in Table 7-4 with the oscilloscope in the high input impedance setting.

**Table 7-4. A12-Related Digital Control Signals**

| Mnemonic | Signal Description | Location | See Figure | Analyzer Setting |
|---|---|---|---|---|
| L ENREF | L-Reference Enable | A12P2-6 | Figure 7-15 | Preset |
| L HB | L-High Band | A12P2-32 | Figure 7-16 | Preset |
| LLB | L-Low Band | A12P1-23 | Figure 7-16 | Preset |

L ENREF Line. This is a TTL signal. To observe it, trigger on the negative edge. In preset state, the signal should show activity similar to Figure 7-15.

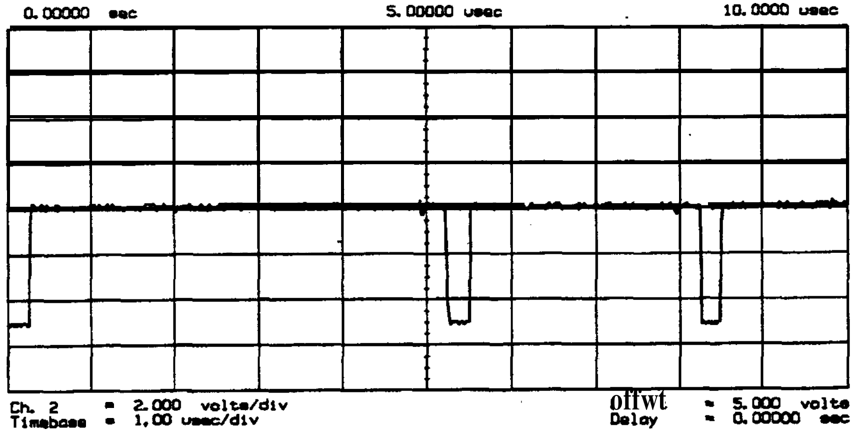


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Figure 7-15. L ENREF Line at A12P2-16 (Preset)

L HB and L LB Lines. These complementary signals toggle when the instrument switches from low band to high band as illustrated by Figure 7-16.

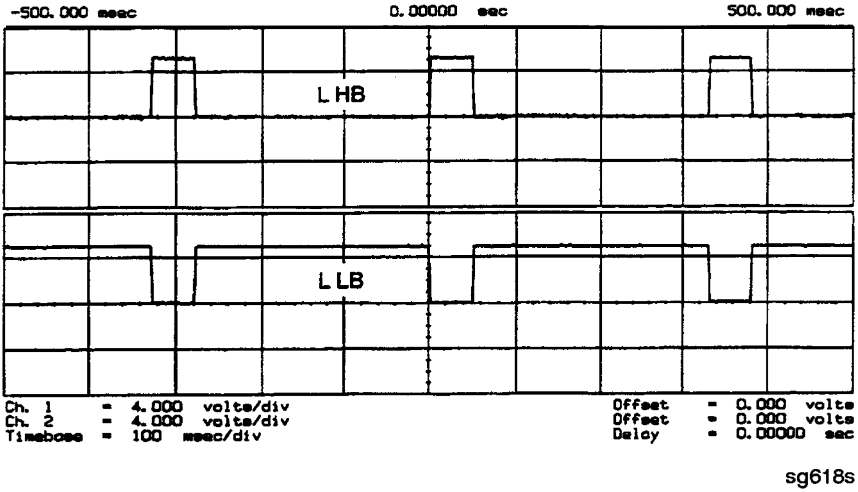



Figure 7-16. Complementary L **HB** and L LB Signals (Preset)

If all of the digital signals appeared good, the **A12** assembly is faulty

## **A13/A14** Fractional-N Check

Use the analog bus or an oscilloscope to check the **A14 VCO's** ability to sweep from 30 MHz to 60 MHz. The faster analog bus method should suffice unless problems are detected.

### Fractional-N Check with Analog Bus

1. **Press (Preset) (System) SERVICE MENU ANALOG BUS ON (Meas) ANALOG IN Aux Input FRAC N to switch on the analog bus and the** fractional-N counter.
2. Then press (Menu) CW FREQ to set the analyzer to CW mode.
3. Set the instrument as indicated in **Table** 7-5 and see whether the VCO generates the frequencies listed.

**Table** 7-5. **VCO** Range Check Frequencies

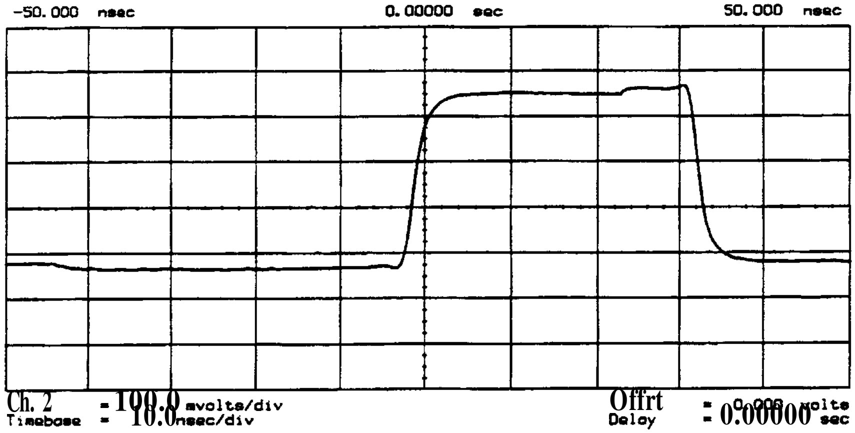
| **Instrument** Setting | **Counter Reading** |
|---|---|
| 31 MHz | 30±0.030 MHz |
| 60.999999 MHz | 60±0.060 MHz |

4. Check the counter reading at the frequencies indicated.
   - ❑ If the readings are within the limits specified, the probability is greater than 90% that the **fractional-N** assemblies are functional. Either skip ahead to the "**A7 Pulse** Generator Check" or perform the more conclusive "**A14** VCO Range Check with Oscilloscope" described below.
   - ❑ If the readings **fail** the specified limits, perform the "**A14** VCO Exercise".

## A14 VCO Range Check with Oscilloscope

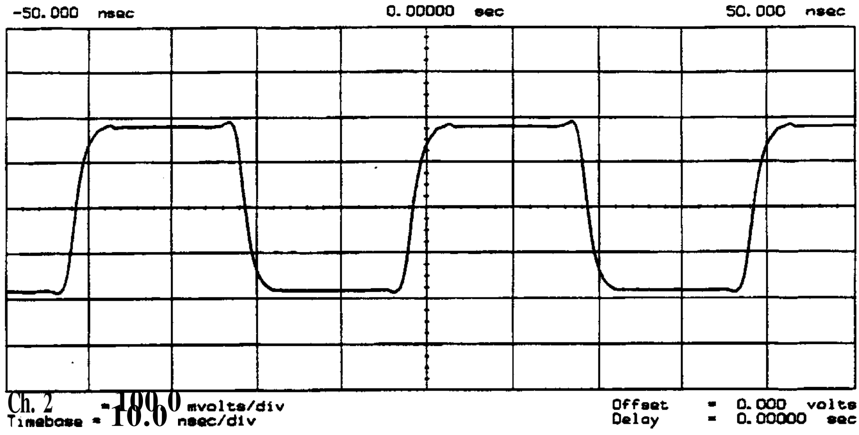
1. Remove the **W9** HI OUT cable **(A14J1** to **A7)** from the **A7** assembly and connect it to an oscilloscope set for 50 ohm input impedance. Switch on the analyzer.
2. **Press (Preset) (System) SERVICE MENU SERVICE MODES FRACN TUNE ON to activate the FRACN TUNE service mode. See Chapter 10, "Service Key** Menus and Error Messages", for more information-on the F'RACN TUNE mode.
3. Vary the fractional-N VCO frequency with the front panel knob and check the signal with the oscilloscope. The waveform should resemble **Figure** 7-17, Figure 7-18, and **Figure** 7-19.

   If the fractional-N output signals are correct, continue source troubleshooting by skipping ahead to "**A7** Pulse Generator Check".



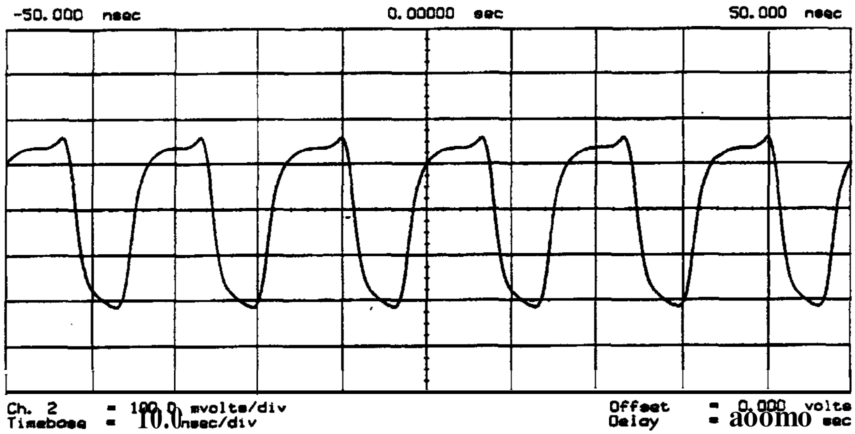

sg619s

Figure 7-17. 10 **MHz HI** OUT **Waveform** from **A14J1**




sg620s

Figure 7-18. 25 **MHz HI** OUT **Waveform** from **A14J1**




sg621s

Figure 7-19. 60 **MHz HI** OUT **Waveform** from **A14J1**

## **A14** VCO Exercise

The nominal tuning voltage range of the VCO is + 10 to -5 volts When the analyzer is in operation, this voltage is supplied by the **A13** assembly. This procedure substitutes a power supply for the **A13** assembly to check the frequency range of the **A14** VCO.

1. Switch off the analyzer and remove the **A13** assembly.
2. Put the **A14** assembly on an extender board and switch on the instrument.
3. Prepare to monitor the VCO frequency, either by:
   a. Activating the analog bus and setting the internal counter to the FRACN node, or
   b. Connecting an oscilloscope to **A14J2** (labeled LO OUT) and looking for waveforms similar to Figure 7-20.

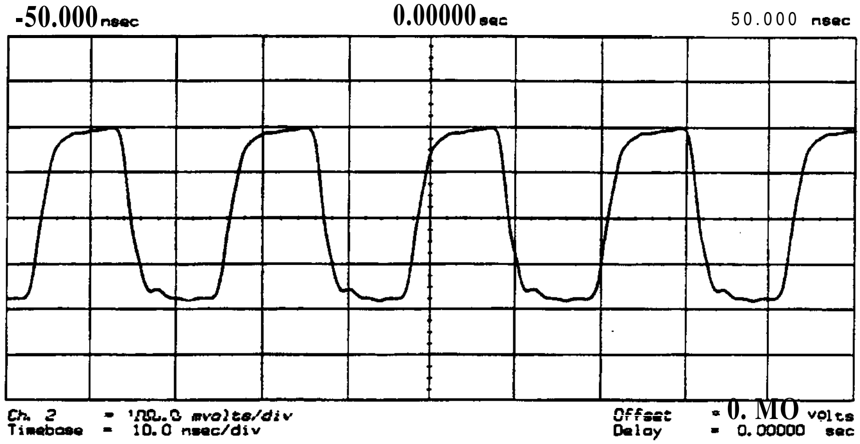



Figure 7-20. LO OUT **Waveform** at **A14J2**

4. Vary the voltage at **A14TP14** from + 10 to -5 volts either by:
   a. Connecting an appropriate external power supply to **A14TP14,** or
   b. First jumping the + 15 V internal power supply from **A8TP8** to **A14TP14** and then jumping the -5.2 V supply from **A8TP10** to **A14TP14.**
5. **Confirm** that the VCO frequency changes from approximately 30 MHz or less to 60 MHz or more.
6. If this procedure produces unexpected results, the **A14** assembly is faulty.
7. If this procedure produces the expected results, continue with the "**A14** Divide-by-N Circuit Check".

## A14 Divide-by-N Circuit Check

| Note | The **A13** assembly should still be out of the instrument and the **A14** assembly on an extender board. |
| --- | --- |

1. Ground **A14TP14** and confirm (as in the **A14** VCO Exercise) that the VCO oscillates at approximately 50 to 55 MHz.
2. Put the analyzer in CW mode (to avoid **relock** transitions) and activate the F'RACN TUNE service mode.
3. Connect an oscilloscope to **A14J3** and observe the output.
4. With the F'RACN TUNE service feature, vary the frequency from 30 MHz to 60.8 MHz.
5. The period of the observed signal should vary from 5.5 $\mu s$ to 11 $\mu s$.
   - ❑ If this procedure produces unexpected results, the **A14** assembly is faulty.
   - ❑ If this procedure produces the expected results, perform the **"A14-to-A13** Digital Control **Signals** Check.**".**
6. Remember to replace the **A13** assembly.

## A14-to-A13 Digital Control Signals Check.

The **A14** assembly generates a **TTL cycle** start **(CST)** signal every 10 microseconds. If the VCO is **oscillating** and the CST **signal** is not detectable at **A14TP3,** the **A14** assembly is non-functional.

Use the CST signal as an external trigger for the oscilloscope and monitor the signals in **Table** 7-6. Since these **TTL** signals are generated by **A14** to control **A13,** check them at **A13 first.** Place **A13** on the large extender board. The signals should look similar to **Figure** 7-21. If these signals are good, the **A13** assembly is defective.

**Table 7-6. A14-to-A13 Digital Control Signal Locations**

| Mnemonic | A13 Location | A14 Location |
|---|---|---|
| CST | none | TP3 |
| L FNHOLD | P2-2 | P2-2 |
| FNBIAS | P2-5 | P2-5 |
| | | |
| API1 | P2-32 | P2-32 |
| API2 | P2-3 | P2-3 |
| API3 | P2-34 | P2-34 |
| API4 | P2-4 | P2-4 |
| API5 | P2-35 | P2-35 |
| | | |
| NLATCH | P1-28 | P1-58 |

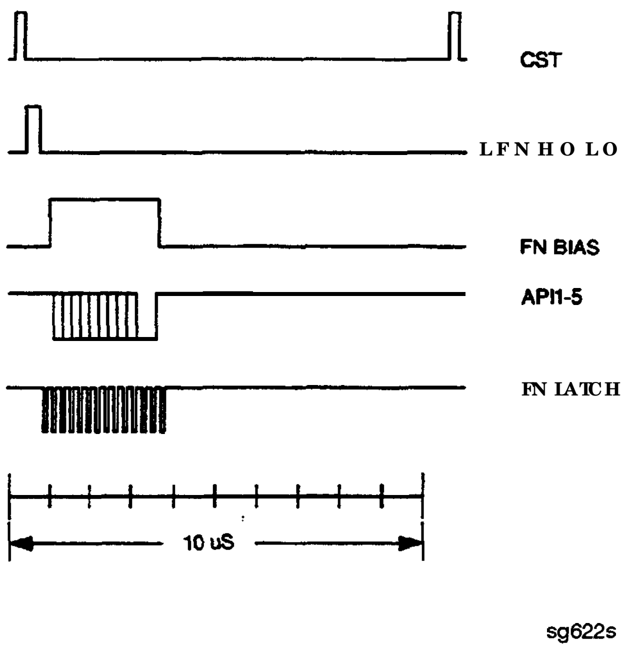



Figure 7-21. **A14** Generated Digital Control Signals

H MB Line. This signal is active during the 16 MHz to 31 MHz sweep. The upper trace of F'igure 7-22 shows relative inactivity of this signal during preset condition. The lower trace shows its status during a 16 MHz to 31 MHz sweep with inactivity during retrace only.

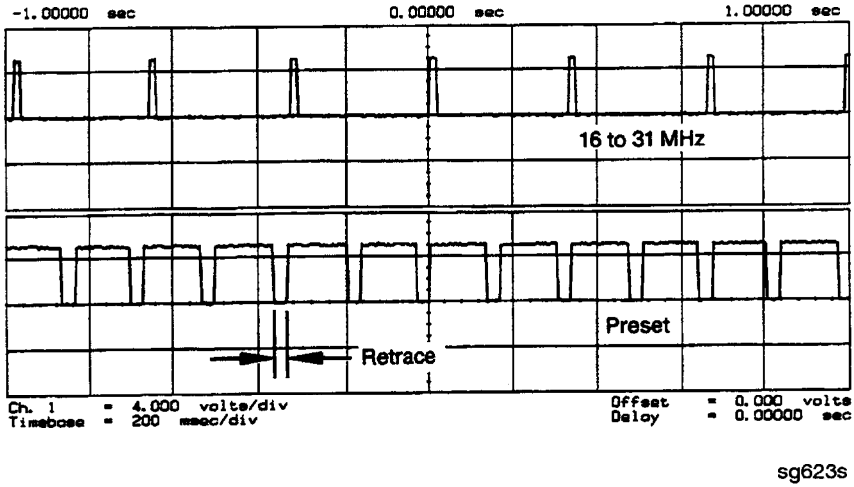



Figure 7-22.
H **MB Signal** at **A14P1-5** (Preset and 16 **MHz** to 31 MHz Sweep)

## A7 Pulse Generator Check

The pulse generator affects phase lock in high band only. It can be checked with either a spectrum analyzer or an oscilloscope.

### A7 Pulse Generator Check with Spectrum Analyzer

1. Remove the **A7-to-A6** SMB cable **(W7)** from the **A7** pulse generator assembly. Set the analyzer to generate a 16 MHz CW signal. Connect the spectrum analyzer to the **A7** output connector and observe the signal. The **A7** comb should resemble the spectral display in Figure 7-23.

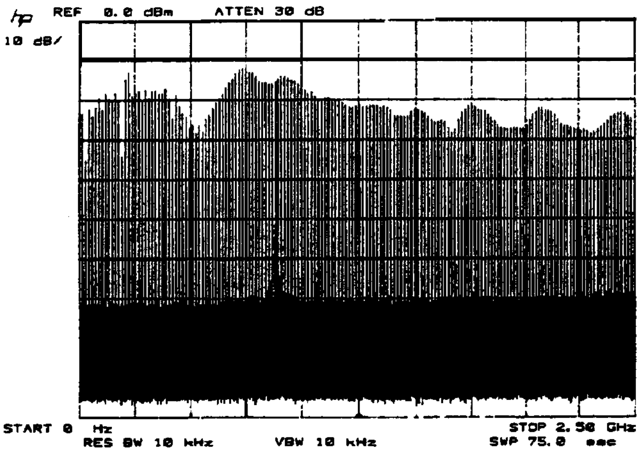



Figure 7-23. Pulse Generator Output

2. If the analyzer malfunction relates to a particular frequency or range, look more closely at the comb tooth there. Adjust the spectrum analyzer span and bandwidth as required. Even at 3 **GHz,** the comb should look as clean as Figure 7-24. For Option 006 instruments at 6 **GHz,** the comb tooth level should be approximately -46 **dBm.**

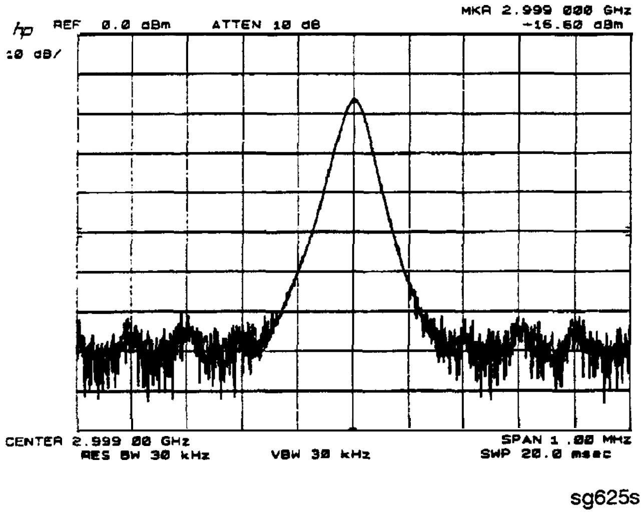



Figure 7-24. High Quality Comb **Tooth** at 3 **GHz**

3. If the **signal** at the **A7** output is good, check the **A7-to-A4** cable.
4. If the signal is not as clean as **Figure** 7-24, observe the HI OUT input signal to the **A7** assembly.
   a. On the network analyzer, press (System) SERVICE MENU SERVICE MODES PLL AUTO OFF. **Otherwise do not readjust the instrument. Remove the A14-to-A7** SMB cable **(W9)** from the **A7** pulse generator assembly (CW ≈ 16 MHz).
   b. Set the spectrum analyzer to a center frequency of 45 MHz and a span of 30 MHz. Connect it to the **A14-to-A7** cable still attached to the **A14** assembly. Narrow the span and bandwidth to observe the signal closely.
5. If the HI OUT signal is as clean as Figure 7-25, the **A7** assembly is faulty.

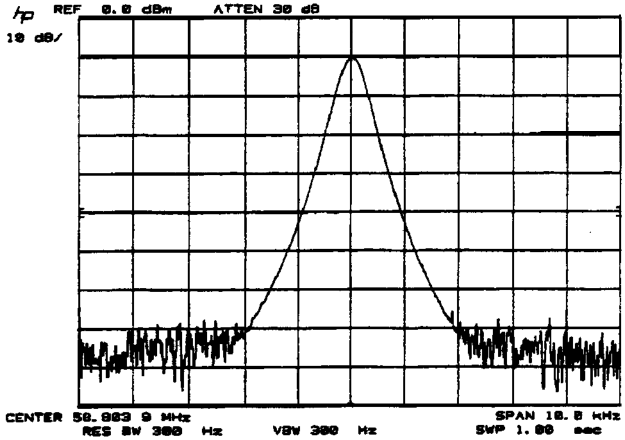
   Otherwise, check the **A14-to-A7** cable or recheck the **A13/A14** fractional-N as described ahead.

## Rechecking the **A13/A14** Fractional-N

Some phase lock problems may result from phase noise problems in the fractional-N loop. lb troubleshoot this unusual **failure** mode, do the following:

1. Set the network analyzer at 60 MHz in the FRACN TUNE mode.

2. Use a spectrum analyzer, to **examin**e the HI OUT signal from the **A14** assembly. The signal should appear as clean as Figure 7-25. The comb shape may vary from pulse generator to pulse generator.




sg626s

Figure 7-25. Stable HI OUT **Signal** in **FRACN** TUNE Mode

## **A7** Pulse Generator Check with Oscilloscope

Perform this check if a spectrum analyzer is not available.

1. Remove the **A4-to-A11** SMB cable from the **A4** (R) sampler/mixer output. Connect the oscilloscope to the **A4** output **(1st** IF).
2. Activate the **FRACN** TUNE service mode and **tune the fractional-N to 50 MHz. Press** (System) SERVICE MENU SERVICE MODES FRACN TUNE ON (50) (M/μ).
3. Activate the SRC TUNE service mode of the analyzer and **tune** the source to **50 MHz. Press** SRC TUNE ON SRC TUNE FREQ (50) (M/μ).
4. Set the SRC TUNE frequency to those listed in Table 7-7 and observe the **1st IF** waveforms. They should appear similar to **Figure** 7-26.
   - ❑ If the signals observed are proper, continue with “All Phase Lock Check”.
   - ❑ If the signals observed are questionable, use a spectrum analyzer to perform the preceding **“A7 Pulse** Generator Check with Spectrum Analyzer”.

Table 7-7. 1st IF Waveform Settings

| SRC TUNE | FRACN | Harmonic | 1st IF |
|---|---|---|---|
| 50 MHz | 50 MHz | 1 | 1 to 6 MHz |
| 250 MHz | 50 MHz | 5 | 1 to 6 MHz |
| 2550 MHz | 50 MHz | 51 | 1 to 6 MHz |

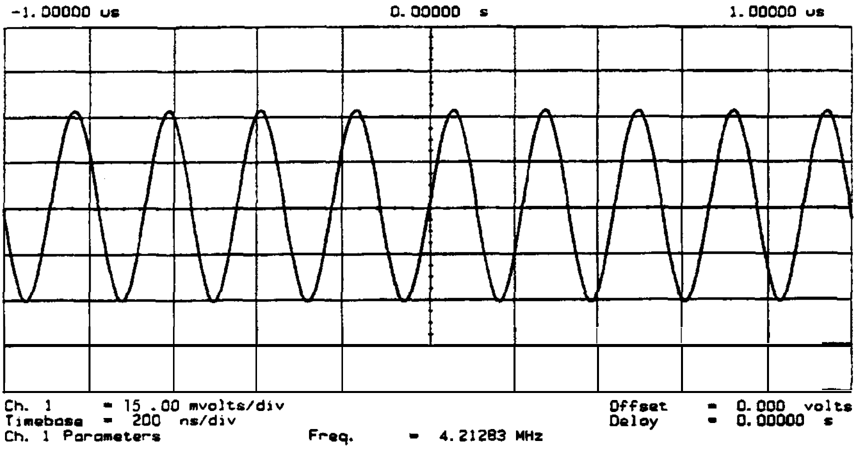



Figure 7-26. Typical 1st IF Waveform in FRACN TUNE/SRC TUNE Mode

## All Phase Lock Check

At this point, the All phase lock assembly appears to be faulty (its inputs should have been verified already). Nevertheless, you may elect to use the phase lock diagnostic routines or check the relevant signals at the assembly itself for confirmation.

**Note** If external source mode is the only operating mode with phase lock problems, replace the A11 phase lock assembly.

## Phase Lock Check with PLL **DIAG**

Refer to "Phase Lock Diagnostic Tools" in "Source Group Troubleshooting Appendix" at the end of this chapter for an explanation of the error messages and the diagnostic routines. Follow the steps there to determine in which state the phase lock is lost.

- ❑ If NO IF FOUND is displayed, confirm that the analog bus is functional and perform the "Source Pretune Correction Constants (Test 48)" as outlined in Chapter 3, "Adjustments and Correction Constants."
- ❑ If phase lock is lost in the ACQUIRE state, the A11 assembly is faulty
- ❑ If phase lock is lost in the TRACK state, troubleshoot source phase lock loop components other than the A11 assembly.

## Phase Lock Check by Signal [redacted] **Examination**

To confirm that the A11 assembly is receiving the signals required for its proper operation, perform the following steps.

1. Place the A11 assembly on the large extender board.
2. Switch on the analyzer and press (Preset).
3. Check for the signals listed in Table 7-8.

**Table 7-8. All Input Signals**

| Mnemonic | I/O | Access | See Figure | Notes |
|---|---|---|---|---|
| **FM COIL –** | 0 | **A11P1-3,33** | **Figure 7-27** | **Aids YO COIL in setting YIG. Press (Preset) (Menu) NUMBER OF POINTS (3) (x1) to observe this signal.** |
| **REF** | I | **A11TP9** | **Figure 7-9, Figure** 7-10 | Observe both low band and high band CW frequencies. |
| **YO COIL +** | 0 | **A11P1-2,32** | **Figure 7-7** | **Use SOURCE PLL OFF.** |
| **YO COIL –** | 0 | **A11P1-1,31** | **Figure** 7-7 | |
| **1ST IF** | I | **A11 PL IF IN** | **Figure 7-26** | Check for 1 **MHz** with tee a All jack (not at cable end) **ir** high band. |

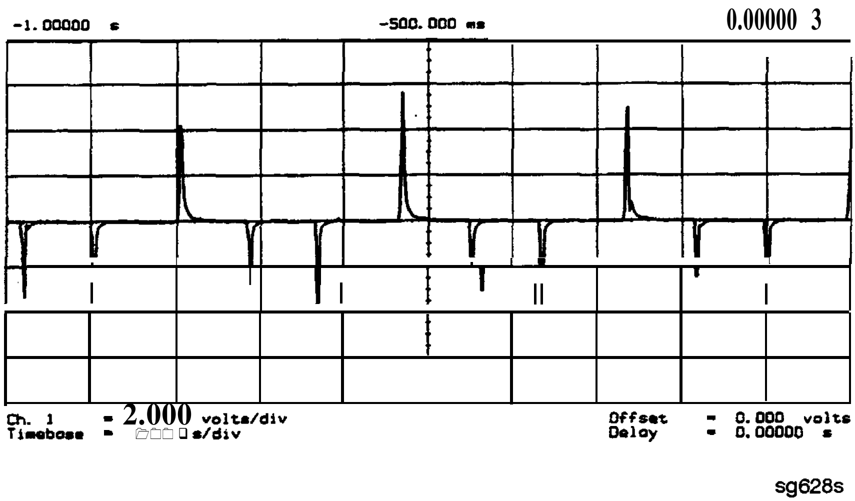



Figure 7-27. FM Coil – Plot with 3 Point Sweep

4. If any of the input signal is not proper, refer to the overall block diagram in Chapter 4, "Start Troubleshooting Here," as an aid to trouble shooting the problem to its source.
5. If any of the output signals is not proper, the A11 assembly is faulty.

# Source Group Troubleshooting Appendix

## Troubleshooting Source Problems with the Analog Bus

The analog bus can perform a variety of fast checks, However, it too is subject to failure and thus should be tested prior to use. You should have done this in Chapter 4, "Start Troubleshooting Here. "

lb use the analog bus to check **any** one of the nodes, **press** (Preset) (System) SERVICE MENU ANALOG BUS_IN. **Then press** (Meas) ANALOG IN Aux Input and enter the analog bus node number followed by (x1). Refer to "Analog Bus" in Chapter 10, "Service Key Menus and Error Messages", for additional information.

## Phase Lock Diagnostic Tools

- error messages
- diagnostic routines

### Phase Lock Error Messages

All phase lock error messages can result from improper front panel connections.

NO IF FOUND : CHECK R INPUT LEVEL means no IF was detected during pretune: a source problem. Perform the "**A4** Sampler/Mixer Check".

NO PHASE LOCK : CHECK R INPUT LEVEL means the IF was not acquired after pretune: a source problem. Perform the "**A4** Sampler/Mixer Check", earlier in this chapter.

PHASE LOCK CAL FAILED means that a calculation of **pretune** values was not successful: a source or receiver failure. Perform the "Source **Pretune** Correction Constants" routine as outlined in Chapter 3, "Adjustments and Correction Constants" If the analyzer fails that routine, perform the "**A4** Sampler/Mixer Check".

PHASE LOCK LOST means that phase lock was lost or interrupted before the band sweep ended: a source problem. Refer to "Phase Lock Diagnostic Routines" next to access the phase lock loop diagnostic service routine. Then troubleshoot the problem by following the procedures in this chapter.

## Phase Lock Diagnostic Routines

Perform the following steps to determine at what frequencies and bands the phase lock problem occurs

1. Press (Preset) (System) **SERVICE MENU** **SERVICE MODES** **PLL AUTO OFF** to switch off the automatic phase-locked loop. Normally, when the phase-locked loop detects lock problems, it automatically aborts the sweep and attempts to recalibrate the pretune cycle. Switching off PLL AUTO defeats this routine.

2. Press **PLL DIAG ON** to switch on the phase-locked loop diagnostic service mode. In this mode, the phase lock cycle and subsweep number are displayed on the analyzer display. (See "Service modes menu" in Chapter 10, "Service Key Menus and Error Messages", for more information.)

3. Press **PLL PAUSE** to pause the phase lock sequence and determine where the source is trying to tune when lock is lost.

Refer to "Source theory" in Chapter 12, "Theory of Operation", for additional information regarding band related problems. Then use the procedures in this chapter to check source functions at specific frequencies.

## Broadband Power Problems

This section assumes that a power problem exists across the full frequency range, but that no error message is displayed on the analyzer. The problem may affect port 1, port 2, or both. Assemblies in question include:

- **A3** source
- **A21, A22** directional couplers
- **A24** solid-state transfer switch
- any cables from the **A3** source to the outputs of port 1 or port 2

8

# Receiver Troubleshooting

Use this procedure only if you have read Chapter 4, “Start Troubleshooting Here.” Follow the procedures in the order given, unless instructed otherwise.

The receiver group assemblies consist of the following:

- **A4/5/6** sampler/mixer assemblies
- **A10** digital IF assembly

## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8753E network analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts."
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures."
4. Perform the necessary adjustments. Refer to Chapter 3, "Adjustments and Correction Constants."
5. Perform the necessary performance tests. Refer to Chapter 2, "System Verification and Performance Tests"

## Receiver Failure Error Messages

The error messages which indicate receiver group problems may be caused by the instrument itself or by external devices or connections. The following three error messages share the same description.

- CAUTION: OVERLOAD ON INPUT A, POWER REDUCED
- CAUTION: OVERLOAD ON INPUT B, POWER REDUCED
- CAUTION: OVERLOAD ON INPUT R, POWER REDUCED

If any of the above error messages appear, the analyzer has exceeded approximately + 14 dBm at one of the test ports. The RF output power is automatically reduced to -85 dBm. The annotation **P↓** appears in the left margin of the display to indicate that the power trip function has been activated. To reset the analyzer's power and regain control of the power level, do the following:

1. Remove any devices under test which may have contributed excess power to the input.
2. Press (Menu) POWER (0) (x1) SOURCE POWER ON to return the power level to the preset state.
   - If the power trip indicator (**P↓**) does not reappear, reconfigure the test setup to keep input power levels at 0 dBm or below.
   - If **P↓** reappears, continue with "Check the A and B Inputs".

# Check the A and B Inputs

Good inputs produce traces similar to Figure 8-2 in terms of flatness. To examine both input traces, do the following:

1. Connect the equipment as shown in Figure 8-1. (The through cable is HP part number **8120-4779.)**

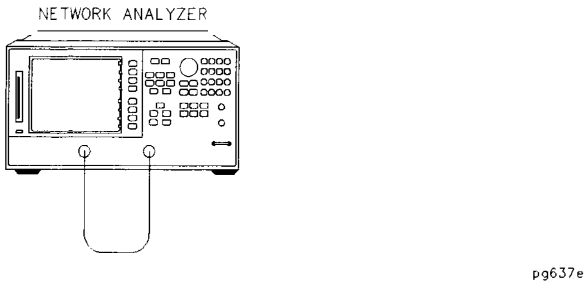



Figure S-l. Equipment Setup

2. Check the flatness of the input A trace by comparing it with the trace in Figure 8-2.

   **Press** (Preset) (Meas) **INPUT PORTS** **A** **TEST PORT 2** (Scale Ref) **AUTO SCALE**

3. Check the flatness of the input B trace by comparing it with the trace in Figure 8-2.

   **Press** (Meas) **INPUT PORTS** **TEST PORT 1** **B**.

   - ❑ If neither of the input traces resembles Figure 8-2, continue with "Troubleshooting When All Inputs Look Bad".
   - ❑ If at least one input trace resembles **Figure** 8-2, continue with "Troubleshooting When One or More Inputs Look Good".

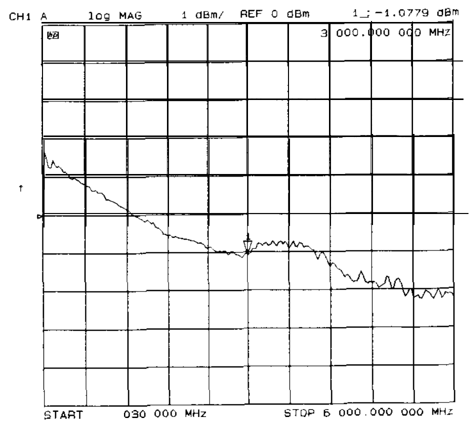


Figure 8-2. Typical Good Trace

# Troubleshooting When All Inputs Look Bad

## Run Internal Tests 18 and 17

1. Press (Preset) (System) SERVICE MENU TESTS (18) (x1) EXECUTE TEST to run the ADC offset.
2. Then, when the analyzer finishes test 18, press (17) (x1) EXECUTE TEST to run the ADC linearity test.

If either of these tests FAIL, the A10 assembly is probably faulty. This can be confirmed by checking the 4 MHz signal and substituting the A10 assembly or checking the signals listed in Table 8-1.

## Check 2nd LO

Check the 2nd LO signal. Refer to the "A12 Reference Check" section of Chapter 7, "Source Troubleshooting" for analog bus and oscilloscope checks of the 2nd LO and waveform illustrations.

- ❑ If the analyzer passes the checks, continue to "Check the 4 MHz REF Signal".
- ❑ If the analyzer fails the checks, perform the high/low band transition adjustment. If the adjustment fails, or brings no improvement, replace A12.

## Check the 4 MHz REF Signal

1. Press (Preset).
2. Use an **oscilloscope** to observe the 4 MHz reference **signal** at **A10P2-6.**
   - ❑ If the **signal** does not resemble Figure 8-3, troubleshoot the signal source **(A12P2-36)** and path.
   - ❑ If the signal is good, the probability is greater than 90% that the **A10** assembly is faulty. For confirmation, perform "Check **A10** by Substitution or Signal Examination".

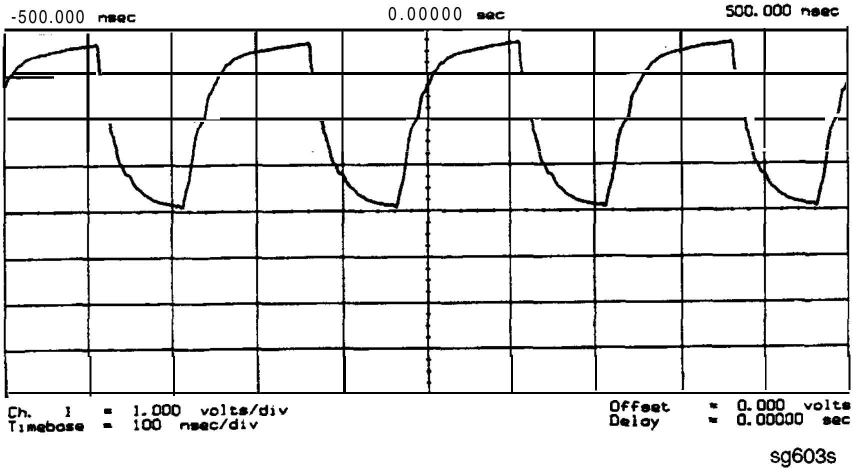



Figure 8-3. 4 **MHz REF Waveform**

## Check A10 by Substitution or Signal Examination

If the 4 MHz REF signal is good at the A10 digital IF assembly, check the A10 assembly by one of the following methods:

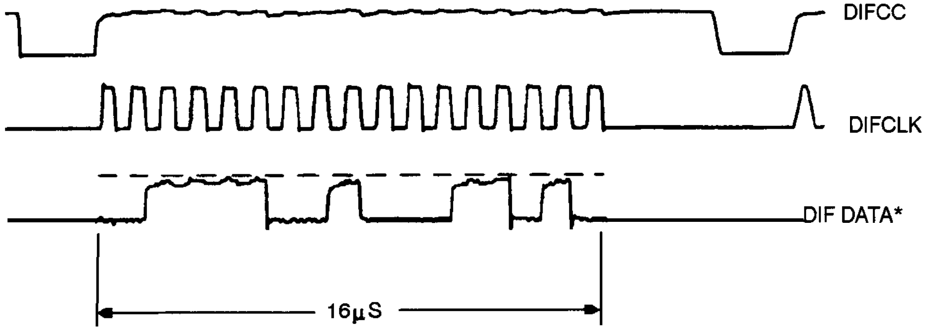
- Substitute another A10 assembly or
- Check the signal/control lines required for its operation. The pins and signal sources of those lines are identified in Table 8-1. It is possible that the A9 assembly may not be providing the necessary signals. These signal checks allow you to determine which assembly is faulty. Some of the waveforms are illustrated by Figure 8-4 and Figure 8-5.

If the substitute assembly shows no improvement or if all of the input signals are valid, continue with "Check the 4 kHz Signal". Otherwise troubleshoot the suspect signal(s) or consider the A10 assembly faulty.

## Table S-l. Signals Required for A10 Assembly Operation

| Mnemonic | Description | A10 Location | Signal Source | See Figure |
|---|---|---|---|---|
| DIFD0 | Digital IF data 0 (LSB) | P2-27 | A9P2-27 | * |
| DIFD1 | Digital IF data 1 | P2-57 | A9P2-57 | * |
| DIFD2 | Digital IF data 2 | P2-28 | A9P2-28 | * |
| DIFD3 | Digital IF data 3 | P2-58 | A9P2-58 | * |
| DIFD4 | Digital IF data 4 | P2-29 | A9P2-29 | * |
| DIFD5 | Digital IF data 5 | P2-59 | A9P2-59 | * |
| DIFD6 | Digital IF data 6 | P2-30 | A9P2-30 | * |
| DIFD7 | Digital IF data 7 (MSB) | P2-60 | A9P2-60 | * |
| L DIFEN0 | Digital IF enable 0 | P2-34 | A9P2-34 | * |
| L DIFEN1 | Digital IF enable 1 | P2-5 | A9P2-5 | * |
| L DIFEN2 | Digital IF enable 2 | P2-35 | A9P2-35 | * |
| DIFCC | Digital IF conversion comp. | P2-33 | A10P2-33 | Figure 8-4 |
| DIFCLK | Digital IF aerial clock | P2-4 | A10P2-4 | Figure 8-4 |
| DIF DATA | Digital IF serial data out | P2-3 | A10P2-3 | Figure 8-4 |
| L ENDIF | L-enable digital IF | P2-17 | A9P2-17 | Figure 8-5 |
| L INTCOP | L-interrupt, DSP | P2-2 | A10P2-2 | Figure 8-5 |

'Check for TTL activity.




* DIF DATA consists of 16 serial bits per input conversion.
the LSB is on the right side and is the most volatile.

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Figure 8-4. Digital Data Lines Observed Using L INTCOP as Trigger

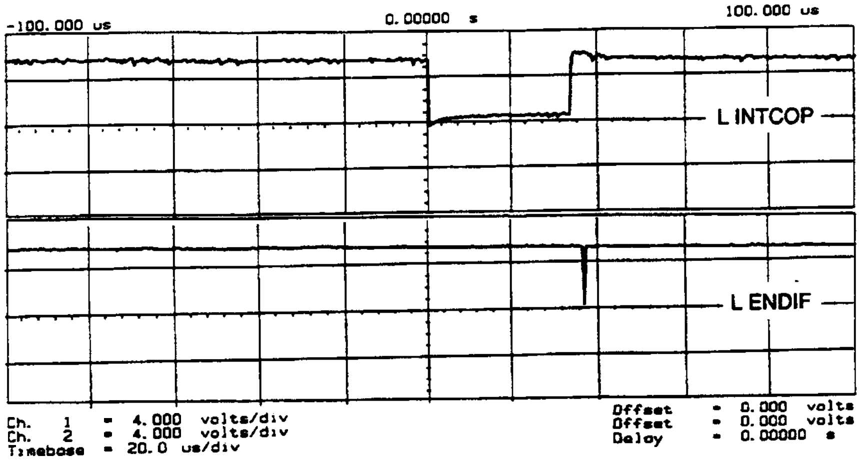


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Figure 8-5. Digital Control Lines Observed Using L INTCOP as Trigger

# Troubleshooting When One or More Inputs Look Good

Since at least one input is good, all of the common receiver circuitry beyond the multiplexer is functional. Only the status of the individual sampler/mixers and their individual signal paths is undetermined.

## Check the 4 kHz Signal

1. Press (Preset) (Menu) **CW FREQ**.
2. Use an oscilloscope to check the 4 **kHz** output of the sampler/mixer in question at the **A10** assembly. The input and output access pins are listed in **Table** 8-2. The signal should resemble the waveform of Figure 8-6.
   - ❑ If the signal is good, continue with "Check the Trace with the Sampler Correction Constants Off".
   - ❑ If the signal is bad, skip ahead to "Check **1st LO Signal** at **Sampler/Mixer**".

**Table** 8-2. **2nd** IF (4 **kHz) Signal** Locations

| Mnemonic | Description | A10 Location | Signal Source |
|---|---|---|---|
| IFR | 4 kHz | A10P1-1, 31 | A4P1-6 |
| IFA | 4 kHz | A10P1-4, 34 | A5P1-6 |
| IFB | 4 kHz | A10P1-7, 37 | A6P1-6 |

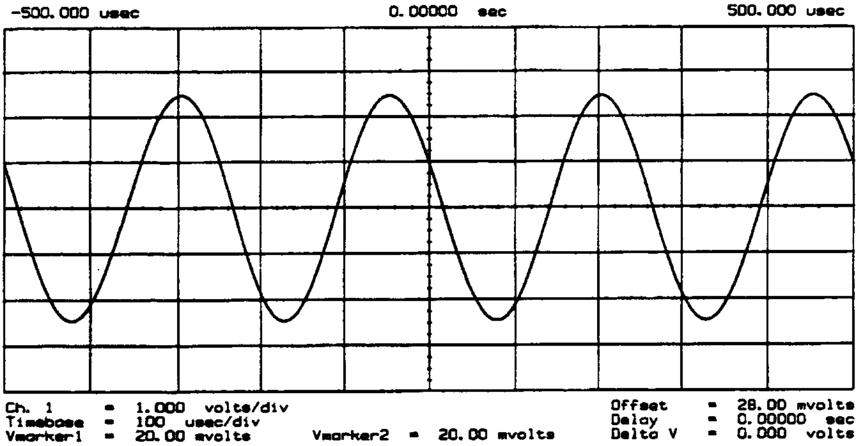


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**Figure 8-6. 2nd IF (4 kHz) Waveform**

## Check the Trace with the Sampler Correction Constants Off

1. Press (Preset) (Meas) INPUT PORTS A (Scale Ref) AUTO SCALE.
2. The trace is currently being displayed with the sampler correction constants on and should resemble Figure 8-7a.
3. Press (System) SERVICE MENU SERVICE MODES MORE SAMPLER COR OFF.
4. The trace is now being displayed with sampler correction constants off and should have worsened to resemble Figure 8-7b.
5. Press SAMPLER COR ON. The trace should improve and resemble Figure 8-7a again.

---

**Note** When the correction constants are switched off, an absolute offset and bandswitch points may be evident.

---

If the trace shows no improvement when the sampler correction constants are toggled from off to on, perform the "Sampler Magnitude and Phase Correction Constants (Test 53)" adjustment described in Chapter 3, "Adjustments and Correction Constants" If the trace remains bad after this adjustment, the **A10** assembly is defective.

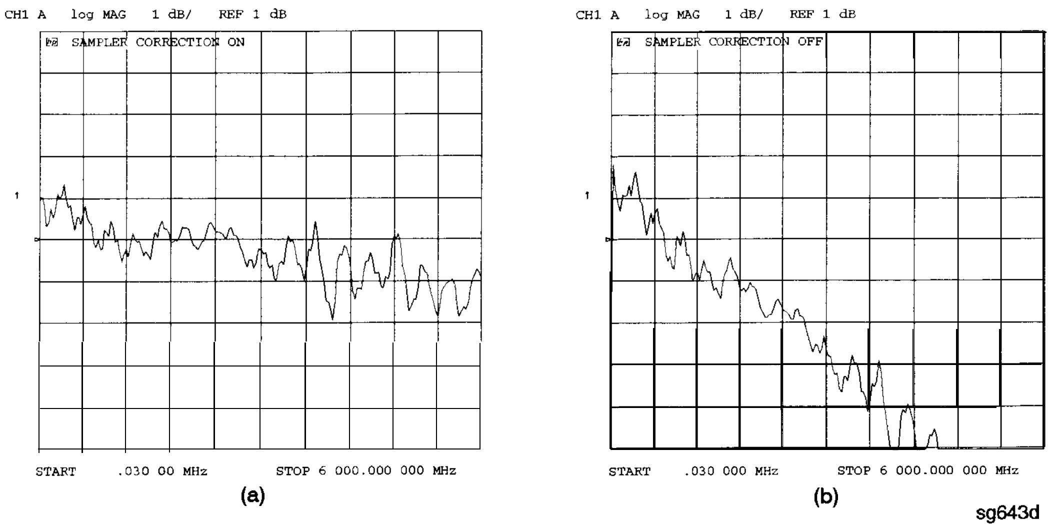



Figure 8-7. Typical Trace with Sampler Correction On and **Off**

## Check 1st LO Signal at Sampler/Mixer

If the 4 kHz signal is bad at the sampler/mixer assembly, check the 1st LO signal where it enters the sampler/mixer assembly in question.

- If the 1st LO is faulty, check the 1st LO signal at its output connector on the A7 assembly to determine if the failure is in the cable or the assembly.
- If the 1st LO is good, continue with "Check 2nd LO Signal at Sampler/Mixer".

## Check 2nd LO Signal at Sampler/Mixer

Check the 2nd LO signal at the pins identified in Table 8-3. Refer to the "A12 Reference Check" in Chapter 7, "Source Troubleshooting", for analog bus and oscilloscope checks of the 2nd LO and waveform illustrations Table 8-3 identifies the signal location at the samplers and the A12 assembly.

**Table 8-3. 2nd LO Locations**

| Mnemonic | Description | Sampler Location | Signal Source |
|---|---|---|---|
| 2nd LO 1 | 2nd LO (0 degrees) | A4/5/6 P1-11 | A12P1-2, 32 |
| 2nd LO 2 | 2nd LO (−90 degrees) | A4/5/6 P1-4 | A12P1-4, 34 |

If the 2nd LO is good at the sampler/mixer, the sampler/mixer assembly is faulty. Otherwise, troubleshoot the A12 assembly and associated signal path.

9

# Accessories Troubleshooting

Use this procedure only if you have read Chapter 4, “Start Troubleshooting Here.” Follow the procedures in the order given, unless instructed otherwise.

Measurement **failures** can be divided into two categories:

- **Failures** which don’t affect the normal functioning of the analyzer but render incorrect measurement data.
- **Failures** which impede the normal functioning of the analyzer or prohibit the use of a feature.

This chapter addresses the **first** category of **failures** which are usually caused by the following:

- operator errors
- faulty calibration devices or connectors
- bad cables or adapters
- improper calibration techniques

These **failures** are checked using the following procedures:

- “Inspect the Accessories”
- “Inspect the Error Terms”

## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8753E network analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts."
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures."
4. Perform the necessary adjustments. Refer to Chapter 3, "Adjustments and Correction Constants."
5. Perform the necessary performance tests. Refer to Chapter 2, "System Verification and Performance Tests"

# Inspect the Accessories

## Inspect the Test Port Connectors and Calibration Devices

1. Check for damage to the mating contacts of the test port center conductors and loose connector bulkheads.
2. Inspect the calibration kit devices for bent or broken center conductors and other physical damage. Refer to the calibration kit operating and service manual for information on gaging and inspecting the device connectors.

   If any calibration device is obviously damaged or out of mechanical tolerance, replace the device.

# Inspect the Error Terms

Error terms are a measure of a "system": a network analyzer, calibration kit, and any cables used. As required, refer to Chapter 11, "Error Terms," for the following:

- The specific measurement calibration procedure used to generate the error terms.
- The routines required to extract error terms from the **instrument.**
- Typical error term data.

Use **Table 9-1** to cross-reference error term data to system faults

**Table 9-1.** Components Related to Specific Error **Terms**

| Component | Directivity | Source Match | Reflection Tracking | Isolation | Load Match | Transmission Tracking |
|---|---|---|---|---|---|---|
| **Calibration Kit** | | | | | | |
| load | X | | | | | |
| open/short | X | X | | | | |
| **Analyzer** | | | | | | |
| sampler | | | X | X | | X |
| A10 digital IF | | | | X | | |
| test port connectors | X | X | X | X | X | X |
| **External cables** | | | | | X | X |

If you detect problems using error term analysis, use the following approach to isolate the fault:

1. Check the cable by examining the load match and transmission tracking terms. If those terms are incorrect, go to "Cable Test."
2. Verify the calibration kit devices:

   Loads: If the directivity error term looks good, the load and the test port are good. If directivity looks bad, connect the same load on the other test port and measure its directivity. If the second port looks bad, as if the problem had shifted with the load, replace the load. If the second port looks good, as if the load had not been the problem, troubleshoot the first port.

   Shorts and opens: If the source match and reflection tracking terms look good, the shorts and the opens are good. If these terms look bad while the rest of the terms look good, proceed to "Verify Shorts and Opens."

## Cable **Test**

The load match error term is a good indicator of cable problems. You can further verify a faulty cable by measuring the reflection of the cable. Perform an **S11** l-port calibration directly at port 1 (no cables). Then connect the suspect cable to port 1 and terminate the open end in 50 ohms.

Figure **9-1** shows the return loss trace of a good (left side) and faulty cable. Note that the important characteristic of a cable trace is its level (the good cable trace is much lower) not its regularity. Refer to the cable manual for return loss specifications.

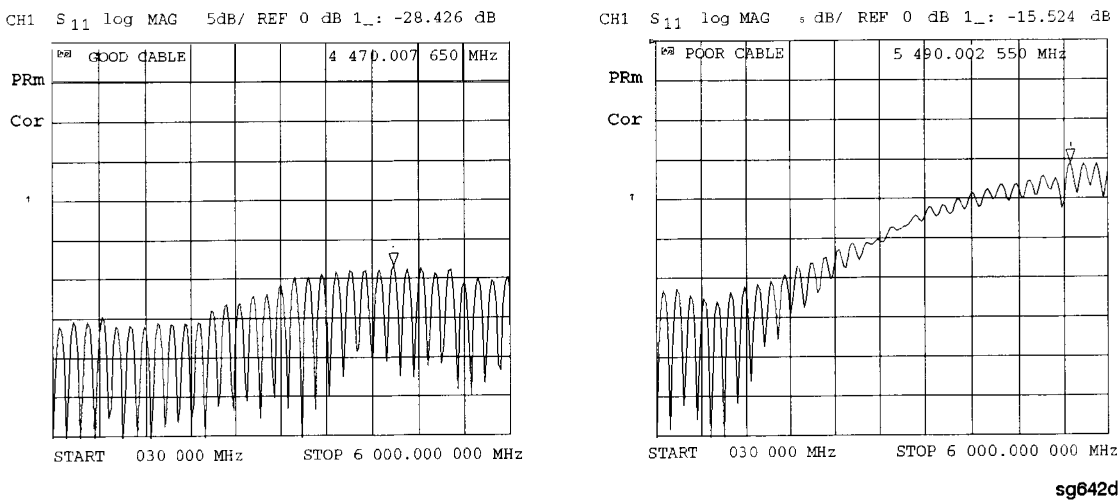



Figure 9-1. **Typical** Return Loss Traces of Good and Poor Cables

## Verify Shorts and Opens

Substitute a known good short and open of the same connector type and sex as the short and open in question. If the devices are not from one of the standard calibration kits, refer to the ***HP 8753E Network Analyzer User's Guide*** for information on how to use the MODIFY CAL KIT function. Set aside the short and open that are causing the problem.

1. Perform an **S11** l-port calibration using the good short and open. Then press FORMAT SMITH CHART to view the devices in Smith chart format.
2. Connect the good short to port 1. Press (Scale Ref) ELECTRICAL DELAY and turn the front panel knob to enter enough electrical delay so that the trace appears as a dot at the left side of the circle. (See **Figure 9-2a,** left.)

   Replace the good short with the questionable short at port 1. The trace of the questionable short should appear very similar to the known good short.
3. Connect the good open to port 1. Press (Scale Ref) ELECTRICAL DELAY and turn the front panel knob to enter enough electrical delay so that the trace appears as a dot at the right side of the circle. (See Figure **9-2b,** right.)

   Replace the good open with the questionable open at port 1. The trace of the questionable open should appear very similar to the known good open.

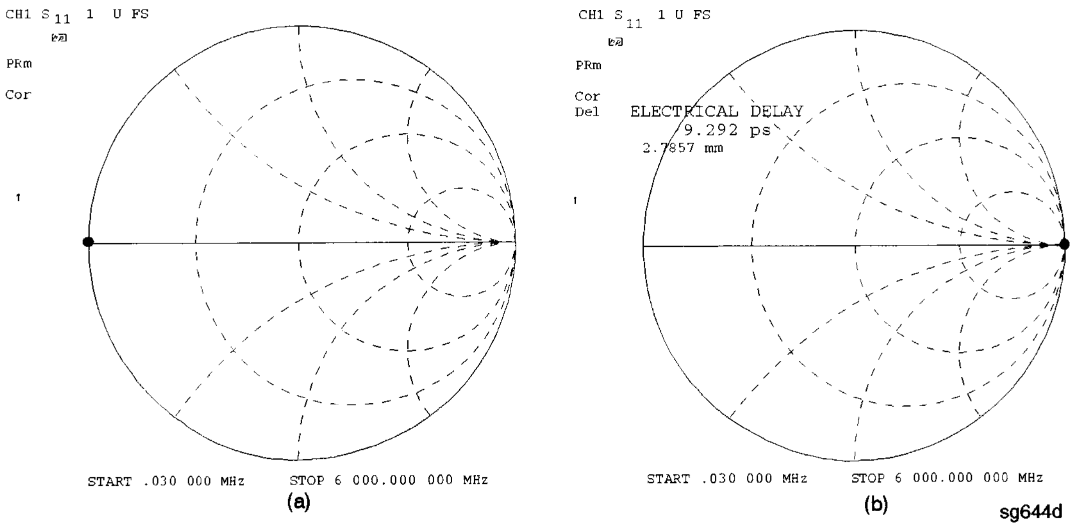



Figure 9-2. Typical Smith Chart Traces of Good Short (a) and Open **(b)**

# 10

# Service Key Menus and Error Messages

## Service Key Menus

These menus allow you to perform the following service functions:

- test
- verify
- adjust
- control
- troubleshoot

The menus are divided into two groups:

1. Internal Diagnostics
2. Service Features

When applicable, the HP-IB mnemonic is written in parentheses following the key. See HP-IB Service Mnemonic Definitions at the end of this section.

## Error Messages

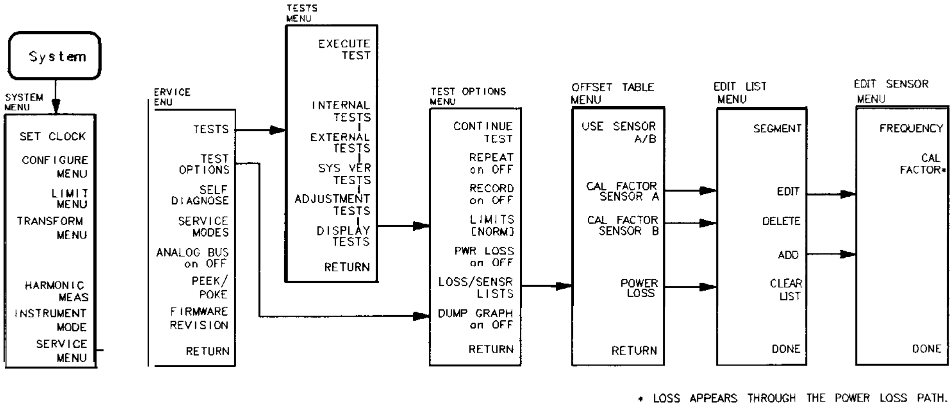
The displayed messages that pertain to service functions are also listed in this chapter to help you:

- Understand the message.
- Solve the problem.

# Service Key Menus - Internal Diagnostics

The internal diagnostics menus are shown in **Figure 10-1** and described in the following paragraphs. The following keys access the internal diagnostics menus:

- TESTS
- TEST OPTIONS
- SELF-DIAGNOSE




sg6104e

Figure **10-1.** Internal Diagnostics Menus

Note

Throughout this service guide, these conventions are observed:

- ☐ **(HARDKEYS) are labeled front panel keys.**
- ☐ **SOFTKEYS are display defined keys (in the menus).**
- ☐ (HP-IB COMMANDS) when applicable, follow the keystrokes in parentheses.

## **Tests** Menu

To access this menu, press (System) **SERVICE MENU** **TESTS**.

**TESTS** **(TEST [D])** accesses a menu that allows you to select or execute the service tests The default is set to internal test 1.

---

Note Descriptions of tests in each of the categories are given under the heading *Test Descriptions* in the following pages.

---

The tests are divided by function into the following categories:

- Internal Tests (0–20)
- External Tests (21-26)
- System Verification Tests (27-43)
- Adjustment Tests (44-58)
- Display Tests (59-65)
- Test Patterns (66–80)

To access the **first** test in each category, press the category **softkey.** To access the other tests, use the numeric keypad, step keys, or front panel knob. The test number, name, and status abbreviation will be displayed in the active entry area of the display.

**Table 10-1** shows the test status abbreviation that appears on the display, its **definition,** and the equivalent HP-IB code. The HP-IB command to output the test status of the most recently executed test is OUTPTESS. For more information, refer to "HP-IB Service Mnemonic Definitions" located at the end of this chapter.

**Table 10-1. Test Status Terms**

| Display Abbreviation | Definition | HP-IB Code |
|---|---|---|
| PASS | PASS | 0 |
| FAIL | FAIL | 1 |
| -IP- | IN PROGRESS | 2 |
| (NA) | NOT AVAILABLE | 3 |
| -ND- | NOT DONE | 4 |
| DONE | DONE | 5 |

**EXECUTE TEST** (EXET) runs the selected test and may display these softkeys:

**CONTINUE** (TESR1) continues the selected test.

**YES** (TESR2) alters correction constants during adjustment tests.

**NEXT** (TESR4) displays the next choice.

**SELECT** (TESR6) chooses the option indicated.

**ABORT** (TESR8) terminates the test and returns to the tests menu.

**INTERNAL TESTS** evaluates the analyzer's internal operation. These tests are completely internal and do not require external connections or user interaction.

**EXTERNAL TESTS** evaluate the analyzer's external operation. These additional tests require some user interaction (such as keystrokes).

**SYS VER TESTS** verifies the analyzer system operation by examining the contents of the measurement calibration arrays. The procedure is in the "System Verification and Performance Tests" chapter. Information about the calibration arrays is provided in the "Error Terms" chapter.

**ADJUSTMENT TESTS** generates and stores the correction constants. For more information, refer to the "Adjustments" chapter.

**DISPLAY TESTS** checks for correct operation of the display and GSP board.

## Test Options Menu

**To access this menu, press (System) SERVICE MENU TEST OPTIONS.**

**TEST OPTIONS** accesses softkeys that affect the way tests (routines) run, or supply necessary additional data.

**CONTINUE TEST (TESR1)** resumes the test from where it was stopped.

**REPEAT on OFF (TO2)** toggles the repeat function on and off. When the function is ON, the selected test will run 10,000 times unless you press any key to stop it. The analyzer shows the current number of passes and fails.

**RECORD on OFF (TO1)** toggles the record function on and off. When the function is ON, certain test results are sent to a printer via HP-IB. This is especially useful for correction constants. The instrument must be in system controller mode or pass control mode to print (refer to the "Printing, Plotting, and Saving Measurement Results" chapter in the *HP* 87533 User's *Guide*.

**LIMITS[NORM/SPCL]** selects either NORMal or SPeCiaL (tighter) limits for the Operator's Check. The SPCL limits are useful for a guard band.

**PWR LOSS (POWLLIST)** accesses the following Edit List menu to allow modification of the external power loss data table.

**LOSS/SENSR LISTS** accesses the power loss/sensor lists menu:

- **USE SENSOR A/B** selects the A or B power sensor calibration factor list for use in power meter calibration measurements.
- **CAL FACTOR SENSOR A** (CALFSENA) accesses the Edit List menu to allow modification of the calibration data table for power sensor A.
- **CAL FACTOR SENSOR B** (CALFSENB) accesses the Edit List menu to allow modification of the calibration data table for power sensor B.
- **POWER LOSS** (POWLLIST) accesses the Edit List menu to allow modification of the external power loss data table that corrects coupled-arm power loss when a directional coupler samples the RF output.

**DUMP GRAPH** generates printed graphs of verification results when activated during a system verification.

**Edit List Menu** To access this menu, press (System) **SERVICE MENU** **TEST OPTIONS** **LOSS/SENSR LISTS** and then press one of the following: **CAL FACTOR SENSOR A** or **CAL FACTOR SENSOR B** or **POWER LOSS**.

**SEGMENT** selects a segment (frequency point) to be edited, deleted from, or added to the current data table. Works with the entry controls

**EDIT** (SEDI[D]) allows modification of frequency, cal factor and loss values previously entered in the current data table.

**DELETE** (SDEL) deletes frequency, cal factor and loss values previously entered in the current data table.

**ADD** (SADD) adds new frequency, cal factor and loss values to the current data table up to a maximum of 12 segments (frequency points, PTS).

**CLEAR LIST** (CLEL) deletes the entire current data table (or list) when **YES** is pressed. Press **NO** to avoid deletion.

**DONE** (EDITDONE) returns to the previous menu.

## Self Diagnose Softkey

**You can access the self diagnosis function by pressing** (System) SERVICE MENU SELF DIAGNOSE. This **function** examines, in order, the pass/fail status of **all** internal tests and displays NO FAILURE FOUND if no tests have failed.

If a failure is detected, the routine displays the assembly or assemblies most probably faulty and assigns a **failure** probability factor to each assembly.

## Test Descriptions

The analyzer has up to 80 routines that test, verify, and adjust the instrument. This section describes those tests.

### Internal Tests

This group of tests runs without external connections or operator interaction. All return a PASS or FAIL condition. All of these tests run on power-up and PRESET except as noted.

0 ALL **INT. Runs** only when selected. It consists of internal tests 3-11, 13-16, and 20. Use the front panel knob to scroll through the tests and see which failed. If **all** pass, the test displays a PASS status. Each test in the subset retains its own test status.

1 PRESET. Runs the following subset of internal tests: first, the **ROM/RAM** tests 2, 3, and 4; then tests 5 through 11, 14, 15, and 16. If any of these tests fail, this test returns a FAIL status. Use the front panel knob to scroll through the tests and see which failed. If all pass, this test displays a PASS status. Each test in the subset retains its own test status. This same subset is available over HP-IB as "TST?". It is not performed upon remote preset.

2 ROM. Part of the **ROM/RAM** tests and **cannot** be **run** separately. Refer to the "Digital Control Troubleshooting" chapter for more information.

3 **SRAM** RAM. Verifies the **A9** CPU SRAM (long-term) memory with a non-destructive write/read pattern. A destructive version that writes over stored data at power-on can be enabled by changing the **4th** switch position of the **A9** CPU switch as shown in Figure 10-2.

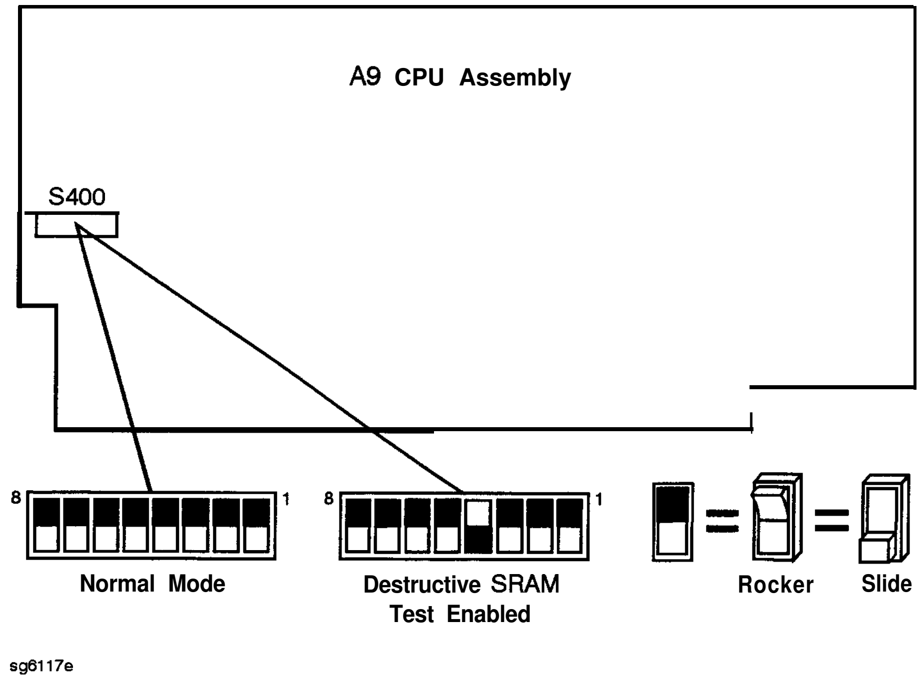



Figure **10-2. A9** CPU Switch Positions

4 Main DRAM. Verifies the **A9** CPU main memory (DRAM) with a non-destructive write/read test pattern. A destructive version of this test is run during power-on.

For additional information, see Internal Tests (near the front of this section) and the "Digital Control Troubleshooting" chapter.

5 DSP **Wr/Rd.** Verifies the ability of the main processor and the DSP (digital signal processor), both on the **A9** CPU assembly, to communicate with each other through DRAM. This **also** verifies that programs can be loaded to the **DSP,** and that most of the main RAM access circuits operate correctly.

6 DSP RAM. Verifies the **A9** CPU RAM associated with the digital signal processor by using a write/read pattern.

7 DSP ALU. Verifies the **A9** CPU high-speed math processing portions of the digital signal processor.

8 DSP **Intrpt.** Tests the ability of the **A9** CPU **digital** signal processor to respond to interrupts from the **A10** digital IF **ADC.**

9 DIF Control. Tests the ability of the **A9** CPU main processor to write/read to the control latches on the **A10 digital** IF

10 DIF Canter. Tests the ability of the **A9** CPU main processor to write/read to the triple divider on the **A10** CPU. It tests the **A9** CPU data buffers and **A10** digital IF, the 4 MHz clock from the **A12** reference.

11 DSP Control. Tests the ability of the **A9** CPU digital signal processor to write to the control latches on the **A10** digital IF. Feedback is **verified** by the main processor. It primarily tests the **A10** digital IF, but failures may be caused by the **A9** CPU.

12 **Fr Pan Wr/Rd.** Tests the ability of the **A9** CPU main processor to write/read to the front panel processor. It tests the **A2** front panel interface and **processor,and A9** CPU data buffering and address decoding. (See **also** tests 23 and 24.) This runs **only** when selected.

13 Rear **Panel.** Tests the ability of the **A9** CPU main processor to write/read to the rear panel control elements. It tests the **A16** rear panel, and **A9** CPU data buffering and address decoding. (It does not test the HP-IB interface; for that, see the HP-IB Programming Guide.) This **runs only** when selected or with ALL INTERNAL.

14 Post **Reg. Polls** the status register of the **A8** post-regulator, and flags these conditions: heat sink too hot, inadequate air flow, or post-regulated supply shutdown.

15 **Frac N Cont.** Tests the ability of the A9 CPU main processor to write/read to the control element on the A14 fractional-N (digital) assembly. The control element must be functioning, and the fractional-N VCO must be oscillating (although not necessarily phase-locked) to pass.

16 Sweep Trig. Tests the sweep trigger (L SWP) Iine from the A14 fractional-N to the A10 digital IF. The receiver with the sweep synchronizes L SWP.

17 ADC Lin. It tests the linearity of the A10 digital IF ADC using the built-in ramp generator. The test generates a histogram of the ADC linearity, where each data point represents the relative "width" of a particular ADC code. Ideally, all codes have the same width; different widths correspond to non-Iinearities

18 ADC Ofs. This runs only when selected. It tests the ability of the offset DAC, on the A10 digital IF', to apply a bias offset to the IF signals before the ADC input. This runs only when selected.

19 **ABUS Test.** Tests analog bus accuracy, by measuring several analog bus reference voltages (all nodes from the A10 digitai IF). This runs only when selected.

20 **FN Count.** Uses the internal counter to count the A14 fractional-N VCO frequency (120 to 240 MHz) and the divided fractional-N frequency (100 kHz). It requires the 100 kHz signal from A12 and the counter gate signal from A10 to pass

## External Tests

These tests require either external equipment and connections or operator interaction of some kind to run. Tests 30 and 60 are comprehensive front panel checks, more complete than test 12, that checks the front panel keys and knob entry.

21 Port 1 Op **Chk.** Part of the "Operator's Check" procedure, located in the "Start Troubleshooting" chapter. The procedure requires the external connection of a short to PORT 1.

22 Port 2 Op **Chk.** Same as 21, but tests PORT 2.

23 **Fr Pan** Seq. Tests the front panel knob entry and all A1 front panel keys, as well as the front panel microprocessor on the **A2** assembly. It prompts the user to rotate the front panel knob, then press each key in an ordered sequence. It continues to the next prompt only if the current prompt is correctly satisfied.

24 **Fr Pan** Diag. Similar to 23 above, but the user rotates the front panel knob or presses the keys in any order. This test displays the command the instrument received.

25 **ADC** Hist. Factory use only.

26 Source Ex. **Factory** use only.

## System Verification Tests

These tests apply **mainly** to system-level, error-corrected verification and troubleshooting. Tests 27 to 31 are associated with the system verification procedure, documented in the "System Verification and Performance Tests" chapter. Tests 32 to 43 **facilitate** examining the calibration coefficient arrays (error terms) **resulting** from a measurement calibration; refer to Chapter 11, "Error Terms," for **details.**

27 Sys Ver Init. **Recalls** the **initialization** state for system verification from an HP 8753E verification disk, in preparation for a measurement calibration. It must be done before service internal tests 28, 29, 30, or 31 are performed.

28 Ver Dev 1. **Recalls** verification Iimits from disk for verification device #1 in **all** applicable S-parameter measurements. It performs **pass/fail** Iimit testing of the current measurement.

29 Ver Dev 2. **Same** as 28 above for device **#2.**

30 Ver Dev 3. Same as 28 above for device **#3.**

31 Ver Dev 4. Same as 28 above for device **#4.**

32-43 **Cal Coef** 1-12. Copies error term data from a measurement calibration array to display memory. A measurement calibration must be complete and active. The **definition** of calibration arrays depends on the current calibration type. After execution, the memory is automatically displayed. Refer to Chapter 11, "Error Terms," for details.

## Adjustment Tests

The tests without asterisks are used in the procedures located in the "Adjustments" chapter of this manual, except as noted.

44 *Source Def. Writes default correction constants for rudimentary source power accuracy. Use this test before running test 47, below.

45 ***Pretune** Def. Writes default correction constants for rudimentary phase lock pretuning accuracy. Use this test before running test 48, below.

46 **ABUS Cor.** Measures three **fixed** voltages on the **ABUS,** and generates new correction constants for **ABUS** amplitude accuracy in both high resolution and low resolution modes. Use this test before **running** test 48, below.

47 Source Cm. Measures source output power accuracy, flatness, and linearity against an external power meter via HP-IB to generate new correction constants Run tests 44, **45, 46,** and 48 first.

48 **Pretune Cor.** Generates source pretune values for proper phase-locked loop operation. Run tests 44, 45, and 46 first.

50 Disp 2 Ex. Not used in "Adjustments." Writes the "secondary test pattern" to the display for adjustments. Press (Preset to exit this routine.

51 **IF** Step **Cor.** Measures the gain of the IF **amplifiers** (A and B only) located on the **A10** digital IF, to determine the correction constants for absolute amplitude accuracy. It provides smooth dynamic accuracy and absolute amplitude accuracy in the -30 **dBm** input power region.

52 ADC Ofs **Cor.** Measures the **A10** Digital IF ADC linearity characteristics, using an internal ramp generator, and stores values for the optimal operating region. During measurement, IF signals are centered in the optimal region to improve low-level dynamic accuracy.

53 Sampler **Cor.** Measures the absolute amplitude response of the R sampler against an external power meter via HP-IB, then compares A and B, (magnitude and phase), against R. It improves the R input accuracy and **A/B/R** tracking.

54 **Cav** Osc Cm. Calculates the frequency of the cavity oscillator and the instrument temperature for effective spur avoidance.

55 Serial Cor. Stores the serial number (input by the user in the Display Title menu) in EEPROM. This routine will not overwrite an existing serial number.

56 Option **Cor.** Stores the option keyword (required for Option 002, 006, 010 or any combination).

57 Not used.

58 **Init EEPROM.** This test initializes certain EEPROM addresses to zeros and resets the display intensity correction constants to the default values. Also, the test will not alter the serial number and correction constants for Option 002, 006, and 010.

### Display Tests

These tests return a **PASS/FAIL** condition. All six amber front panel **LEDs** will turn off if the test passes. Press (Preset) to exit the test. If any of the six **LEDs** remain on, the test has failed.

59 **Disp/cpu** corn. Checks to **confirm** that the CPU can communicate with the **A19** GSP board. The CPU writes all zeros, all ones, and then a walking one pattern to the GSP and reads them back. If the test fails, the CPU repeats the walking 1 pattern until (Preset) is pressed.

60 DRAM cell. Tests the DRAM on **A19** by writing a test pattern to the DRAM and then verifying that it can be read back.

61 Main **VRAM.** Tests the VRAM by writing all zeros to one location in each bank and then writii all ones to one location in each bank. **Finally** a walking one pattern is written to one location in each bank.

62 **VRAM** bank. Tests all the cells in each of the 4 VRAM banks

63 **VRAM/video. Verifies** that the GSP is able to successfully perform both write and read shift register transfers. It also checks the video signals **LHSYNC,** LVSYNC, and LBLANK to verify that they are active and toggling.

64 **RGB** outputs. **Confirms** that the analog video signals are correct and it verifies their functionality.

65 **Inten** DAC. Verifies that the intensity DAC can be set both low and high.

## Test Patterns

Test patterns are used in the factory for display adjustments, diagnostics, and troubleshooting, but they are not used for field service. Test patterns are executed by entering the test number (66 through SO), then pressing EXECUTE TEST CONTINUE. **The test pattern will be displayed and the softkey** labels blanked. **To** increment to the next pattern, press **softkey** 1; to go back to a previous pattern, press **softkey** 2. To exit the test pattern and return the **softkey** labels, press **softkey** 8 (bottom softkey). The following is a description of the test patterns.

66 **Test** Pat 1. Displays an all white screen for verifying the light output of the **A18** display and checks for color purity.

67-69 **Test** Pat 2-4. Displays a red, green, and blue pattern for verifying the color purity of the display and also the ability to independently control each color.

70 **Test** Pat 5. Displays an all black screen. This is used to check for stuck pixels.

71 **Test Pat** 6. Displays a **16-step** gray **scale** for verifying that the **A19** GSP board can produce 16 different amplitudes of color (in this case, white). The output comes from the RAM on the GSP board, it is then split. The signal goes through a video DAC and then to an external monitor or through some buffer amplifiers and then to the internal LCD display. If the external display looks good but the internal display is bad, then the problem may be with the display or the cable connecting it to the GSP board. This pattern is also very useful when using an oscilloscope for troubleshooting. The staircase pattern it produces will quickly show missing or stuck data bits

72 Test Pat 7. Displays the following seven colors: Red, Yellow, Green, Cyan, Blue, Magenta and White.

73 **Test Pat** 8. This pattern is intended for use with an external display. The pattern displays a color rainbow pattern for showing the ability of the **A19** GSP board to display 15 colors plus white. The numbers written below each bar indicate the tint number used to produce that bar (0 **& 100=pure** red, **33=pure** green, **67=pure** blue).

74 **Test Pat** 9. Displays the three primary colors Red, Green, and Blue at four different intensity levels. You should see 16 color bands across the screen. Starting at the left side of the display the pattern is; Black four bands of Red (each band increasing in intensity) Black four bands

of Green (each band increasing in intensity) Black four bands of Blue (each band increasing in intensity) Black If any one of the four bits for each color is missing the display will not look as described.

75 **Test Pat** 10. Displays a character set for showing the user **all** the different types and sizes of characters available. Three sets of characters are drawn in each of the three character sizes. 125 characters of each size are displayed. Characters 0 and 3 cannot be drawn and several others are really control characters (such as carriage return and line feed).

76 **Test** Pat 11. Displays a bandwidth pattern for verifying the bandwidth of the EXTERNAL display. It consists of multiple alternating white and black vertical stripes. Each stripe should be clearly visible. A limited bandwidth would smear these lines together. This is used to test the quality of the external monitor.

77 **Test Pat** 12. Displays a repeating gray scale for troubleshooting, using an oscilloscope. It is similar to the 16 step gray scale but is repeated 32 times across the screen. Each of the 3 outputs of the video palette will then show 32 ramps (instead of one staircase) between each horizontal sync pulse. This pattern is used to troubleshoot the pixel processing circuit of the **A19** GSP board.

78 **Test Pat** 13. Displays a convergence pattern for measuring the accuracy of the color convergence of the external monitor.

79-80 **Test** Pat 14-15. Displays crosshatch and inverse crosshatch patterns for testing color convergence, **linearity,and** alignment. This is useful when aligning the LCD display in the bezel.

# Service Key Menus - Service Features

The service feature menus are shown in **Figure 10-3** and described in the following paragraphs. The following keys access the service feature menus:

- SERVICE MODES
- ANALOG BUS on OFF
- PEEK/POKE
- FIRMWARE REVISION

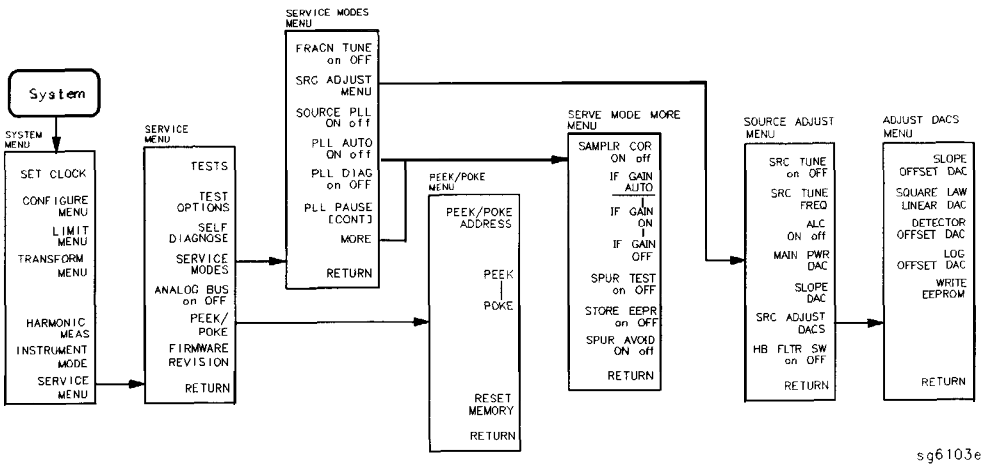



Figure 10-3. Service Feature Menus

## Service Modes Menu

**To access this menu, press:** (System) SERVICE MENU SERVICE MODES.

SERVICE MODES — allows you to control and monitor various circuits for troubleshooting.

FRACN TUNE on OFF **(SM1)** — tests the **A13** and **A14** fractional-N circuits. It **allows you** to directly control and monitor the output frequency of the fractional-N synthesizer **(10** MHz to 60 **MHz).** Set the instrument to CW sweep mode **and** then set F'RACN TUNE ON.

Change frequencies with the front panel keys or knob. The output of the **A14** assembly can be checked at **A14J1** HI OUT (in high band) or **A14J2** LO OUT (in low band) with an oscilloscope, a frequency counter, or a spectrum analyzer. **Signal** jumps and changes in shape at 20 MHz and 30 MHz when tuning up in frequency, and at 29.2 MHz and 15 MHz when tuning down, are due to switching of the digital divider. This mode can be used with the SRC TUNE mode as described in "Source Troubleshooting" chapter.

**SRC ADJUST MENU** accesses the functions that ailow you to adjust the source:

**SRC TUNE on OFF** tests the pretune functions of the phase lock and source assemblies Use the entry controls to set test port output to any frequency from 300 KHz to 6 **GHz.** When in this mode:

- Set analyzer to CW frequency before pressing **SRC TUNE ON**.
- Test port output is 1 to 6 MHz above indicated (entered) frequency.
- Instrument does not attempt to phase lock.
- Residual **FM** increases.

**SRC TUNE FREQ** allow you to change the source tune frequency.

**ALC ON off** toggles the automatic leveling control (ALC) on and off.

**MAIN PWR DAC**

**SLOPE DAC**

**SRC ADJUST DACS**

**HB FLTR SW on OFF**

**SOURCE PLL ON off** (SM3)

With this mode switched OFF, the source stays in the pretune mode and does not attempt to complete the phase lock sequence. Also, all phase lock error messages are disabled. The fractional-N circuits and the receiver operate normally. Therefore, the instrument sweeps, but the source is being driven by the pretune DAC in a stair-stepped fashion.

**PLL AUTO ON off** (SM4)

Automatically attempts to determine new pretune values when the **instrument** encounters phase lock problems (for example, "harmonic skip"). With **PLL AUTO OFF** **the frequencies and voltages do** not change, like when they are attempting to determine new **pretune** values, so troubleshooting the phase-locked loop circuits is more convenient. This function may also be turned off to avoid pretune calibration errors in applications where there is a limited frequency response in the R (reference) channel. For example, in a high power test application, using band limited **filters** for R channel phase locking.

**PLL DIAG on OFF** (SM5)

displays a phase lock sequence at the beginning of each band. This sequence normally occurs very rapidly, making it difficult to troubleshoot phase lock problems Switching this mode ON slows the process down, allowing you to inspect the steps of the phase lock sequence **(pretune,** acquire, and track) by pausing at each step. The steps are indicated on the display, along with the channel (Cl or **C2)** and band number **(B1** through **B13).**

This mode can be used with PLL PAUSE to **halt** the process at any step. It can also be used with the analog bus counter.

**PLL PAUSE**

used only with **PLL** DIAG mode. **CONT** indicates that it will continuously cycle through all steps of the phase lock sequence. **PAUSE** holds it at any step of interest. This mode is useful for troubleshooting phase-locked loop problems

**MORE**

Accesses the service modes more menu listed below.

## Service Modes More Menu

**To access this menu, press (System) SERVICE MENU SERVICE MODES MORE.**

SAMPLER COR ON off (SM6)
: Toggles the sampler correction routine ON, for normal operation, or OFF, for diagnosis or adjustment purposes

IF GAIN AUTO
: Normal operating condition and works in conjunction with IF GAIN ON and OFF. The **A10** assembly includes a switchable attenuator section and an amplifier that **amplifies** low-level 4 **kHz** IF signals (for A and B inputs only). This mode allows the **A10** IF section to automatically determine if the attenuator should be switched in or out. The switch occurs when the A or B input signal is approximately -30 **dBm.**

IF GAIN ON
: Locks out the **A10** IF attenuator sections for checking the **A10** IF gain amplifier circuits, regardless of the amplitude of the A or B IF signal. Switches out **both** the A and B attenuation circuits; they cannot be switched independently. Be aware that input signal levels above -30 **dBm** at the sampler input will saturate the ADC and cause measurement errors.

IF GAIN OFF
: Switches in both of the **A10** IF attenuators for checking the **A10** IF gain amplifier circuits Small input signals will appear noisy, and raise the apparent noise floor of the instrument.

SPUR TEST on OFF (SM7)
: For factory use only.

STORE EEPR on OFF
: Allows you to store the correction constants that reside in non-volatile memory **(EEPROM)** onto a disk. Correction constants improve instrument performance by compensating for specific operating variations due to hardware limitations (refer to the "Adjustments" chapter). Having this information on disk is useful as a backup, in case the constants are lost (due to a CPU board failure). Without a disk backup the correction constants can be regenerated

manually, although the procedures are more time consuming.

**SPUR AVOID ON off** (SM8)
offsets the frequency of both the **A3** YIG oscillator and the **A3** cavity oscillator to avoid spurs which **cannot otherwise be filtered out.** **SPUR AVOID OFF** allows examination of these spurs for service.

**ANALOG BUS on OFF** (ANAB)
enables and disables the analog bus, described below. Use it with the analog in menu, (a description of this menu follows).

## Analog Bus

**To access the analog bus, press (System) SERVICE MENU ANALOG BUS ON.**

### Description of the **Analog** Bus

The analog bus is a single multiplexed line that networks 31 nodes within the **instrument.** It can be controlled from the front panel, or through HP-IB, to make voltage and frequency measurements just like a voltmeter, oscilloscope, or frequency counter. The next few paragraphs provide general information about the structure and operation of the analog bus See "Analog Bus Nodes, " for a description of each individual node. Refer to the "Overall Block Diagram," in the "Start Troubleshooting" chapter, to see where the nodes are located in the instrument.

The analog bus consists of a source section and a receiver section. The source can be the following:

- any one of the 31 nodes described in "Analog Bus Nodes"
- the **A14** fractional-N VCO
- the **A14** fractional-N VCO divided down to 100 **kHz**

The receiver portion can be the following:

- the main ADC
- the frequency counter

When analog bus traces are displayed, frequency is the x-axis. For a linear x-axis in time, switch to CW time mode (or sweep a single band).

## The Main ADC

The main ADC is located on the **A10 digital IF** assembly and makes voltage measurements in two ranges. See "**RESOLUTION**", under "Analog In Menu".

## The Frequency Counter

The frequency counter is located on the **A14** assembly and can count one of three sources:

- selected analog bus node
- **A14** fractional-N VCO (F'RAC N)
- **A14** fractional-N VCO divided down to 100 **kHz** (DIV F'RAC N) (frequency range is 100 **kHz** to 16 MHz)

The counts are triggered by the phase lock cycle; one at each **pretune,** acquire, and track for each bandswitch. (The service mode, **SOURCE** PLL, must be ON for the counter to be updated at each bandswitch). The counter works in swept modes or in CW mode. It can be used in conjunction with **SERVICE MODES** for troubleshooting phase lock and source problems.

To read the counter over **HP-IB,** use the command OUTPCNTR.

### Notes

- The display and marker units **(U)** correspond to volts
- Nodes 17 **(1st** IF) and 24 **(2nd** LO) are unreliable above 1 MHz.
- About 0.750 MHz is a typical counter reading with no AC signal present.
- Anything occurring during bandswitches is not visible.
- Past-moving waveforms may be sensitive to sweep time.
- The analog bus input impedance is about **50K** ohms
- Waveforms up to approximately 200 Hz can be reproduced.

## Analog In Menu

Select this menu to monitor voltage and frequency nodes, using the analog bus and internal counter, as explained below.

To switch on the analog bus and access the analog in menu, press:

(System) **SERVICE MENU** **ANALOG BUS ON** (Meas) **ANALOG IN**

The **RESOLUTION [LOW]** key toggles between low and high resolution.

| Resolution | Maximum Signal | Minimum Signal |
|---|---|---|
| LOW | +0.5 V | -0.5 V |
| HIGH | +10 V | -10 V |

**AUX OUT on OFF** allows you to monitor the analog bus nodes (except nodes 1, 2, 3, 4, 9, 10, 12) with external equipment (oscilloscope, voltmeter, etc). To do this, connect the equipment to the AUX INPUT BNC connector on the rear panel, and press **AUX OUT** until **ON** is highlighted.

Caution — To prevent damage to the analyzer, first connect the signal to the rear panel AUX INPUT, and then switch the function ON.

**COUNTER: OFF** switches the internal counter off and removes the counter display from the display. The counter can be switched on with one of the next three keys. (Note: Using the counter slows the sweep.) The counter bandwidth is 16 MHz unless otherwise noted for a specific node.

Note — OUTPCNTR is the HP-IB command to output the counter's frequency data.

**ANALOG BUS** switches the counter to monitor the analog bus.

**FRAC N** switches the counter to monitor the **A14** fractional-N VCO frequency at the node shown on the "Overall Block Diagram, " in the "Start Troubleshooting" chapter.

**DIV FRAC N** switches the counter to monitor the **A14** fractional-N VCO frequency after it has been divided down to **100 kHz** for phase locking the VCO.

## Analog Bus Nodes

The following paragraphs describe the 31 analog bus nodes. The nodes are listed in numerical order and are grouped by assembly. Refer to the "Overall Block Diagram" for node locations.

### A3 Source

To observe six of the eight A3 analog bus nodes (not node 5 or 8), perform step A3 to set up a power sweep on the analog bus. Then follow the node specific instructions.

**Step A3.**
**Press:**
(Preset)
(System) SERVICE MENU ANALOG BUS ON
(Meas) ANALOG IN
(Format) MORE REAL
(Menu) CW FREQ (3) (G/n) SWEEP TYPE MENU POWER SWEEP
(Start) (-15) (x1)
(Stop) (10) (x1)

Node 1 **Mn Pwr** DAC (main power **DAC)**

Perform step **A3** to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (1) (x1) (Scale Ref) **AUTO SCALE**.

Node 1 is the output of the main power DAC. It sets the reference voltage to the ALC loop. At normal operation, this node should read approximately -4 volts at 0 **dBm** with a slope of about -150 **mV/dB.** This corresponds to approximately 4 volts from -15 to + 10 **dBm.**

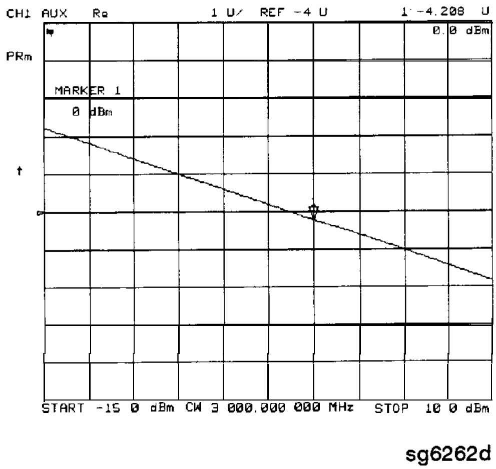



Figure 10-4. Analog Bus Node 1

Node 2 Src **1V/GHz** (source 1 volt per **GHz)**

Press the following to view analog bus node 2:

(Preset) (Start) (3) (0) (k/m)

(System) **SERVICE MENU** **ANALOG BUS ON**

(Meas) **ANALOG IN** (2) (x1)

(Format) **MORE** **REAL**

(Scale Ref) **AUTO SCALE**

Node 2 measures the voltage on the internal voltage controlled oscillator. Or, in normal operation, it should read **−1V/GHz.**

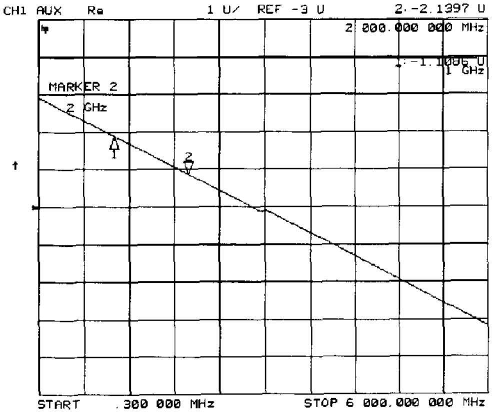



Figure 10-5. Analog Bus Node 2

Node 3 Amp Id **(amplifier** current)

Press the following keys to view analog node 3:

(Preset) (System) **SERVICE MENU** **ANALOG BUS ON**

(Meas) **ANALOG IN** (3) (x1)

(Format) **MORE** **REAL**

(Scale Ref) **AUTO SCALE**

Node 3 measures the current that goes to the main IF amplifier. At normal operation this node should read about:

15 **mA** from 30 **kHz** to 299 **kHz**

130 **mA** from 300 **kHz** to 3 **GHz**

500 **mA** from 3 **GHz** to 6 **GHz**

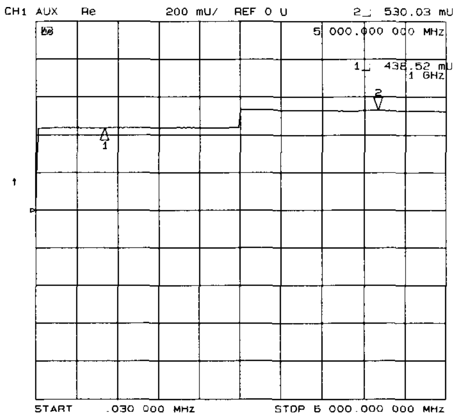
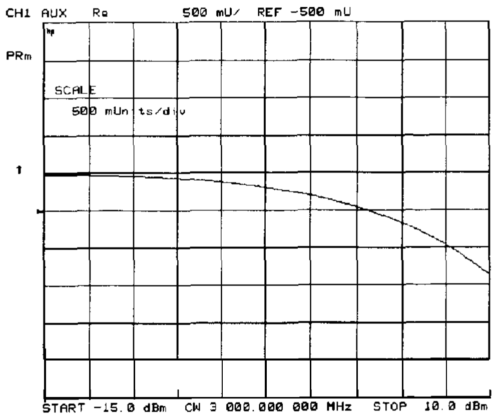



**Figure 10-6. Analog Bus Node 3**

Node 4 Det (detects RF OUT power level)

Perform step **A3,** described previously, to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (4) (x1) (Scale Ref) **AUTO SCALE**.

Node 4 detects power that is coupled and detected from the RF OUT arm to the ALC loop. Note that the voltage exponentially follows the power level inversely. Flat segments indicate ALC saturation and should not occur between -15 **dBm** and + 10 **dBm.**




sg6265d

**Figure 10-7. Analog Bus Node 4**

Node 5 **Temp** (temperature sensor)

This node registers the temperature of the cavity oscillator which must be known for effective spur avoidance. The sensitivity is 10 **mV/°** C. The oscillator changes frequency slightly as its temperature changes. This sensor indicates the temperature so that the frequency can be predicted.

Node 6 Integ (ALC leveling integrator output)

Perform step **A3** to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (6) (x1) (Scale Ref) **AUTO SCALE**.

Node 6 displays the output of the summing circuit in the ALC loop. Absolute voltage level variations are normal. When node 6 goes above 0 volts, the ALC saturation is indicated.

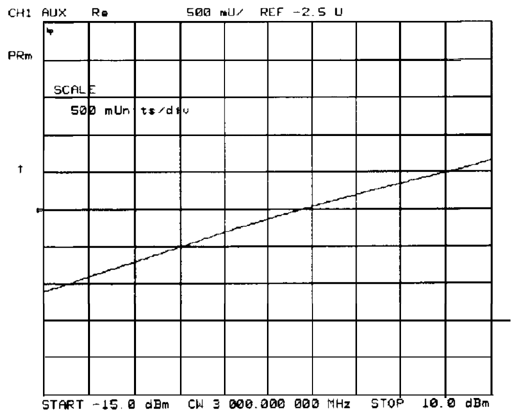



Figure **10-8.** Analog Bus Node 6

Node 7 Log (log **amplifier** output detector)

Perform step **A3** to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (7) (x1) (Scale Ref) **AUTO SCALE**.

Node 7 displays the output of a logger circuit in the ALC loop. The trace should be a linear ramp with a slope of 33 **mv/dB** with approximately 0 volts at -3 **dBm.** Absolute voltage level variations are normal. Flat segments indicate ALC saturation and should not occur between -15 **dBm** and + 10 **dBm.**

The proper waveform at node 7 indicates that the circuits in the **A3** source ALC loop are normal and the source is leveled.

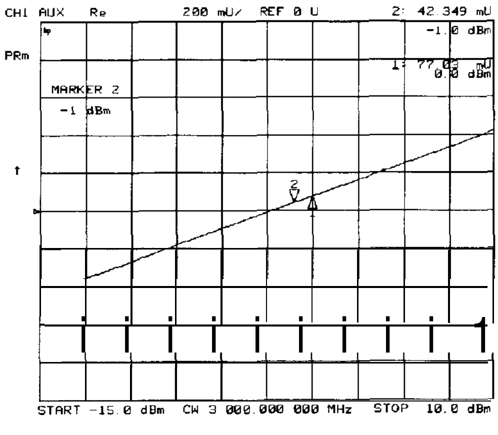



Figure **10-9.** Analog Bus Node 7

Node 8 **A3** Gnd (ground)

## A10 Digital IF

To observe the **A10** analog bus nodes, perform step **A10,** below. Then follow the node-specific instructions

Step **A10.**
Press:
(Preset)
(Meas) **ANALOG IN**
(Marker)
(System) **SERVICE MENU** **ANALOG BUS ON**
(Format) **MORE** **REAL**

**Node 9** **+0.37 V (+0.37** V reference)

Perform step **A10,** above, and then press (Meas) **ANALOG IN** **RESOLUTION [HIGH]** (9) (x1).

Check for a flat line at approximately + 0.37 V. This is used as the voltage reference in the "Analog Bus Correction Constants" adjustment procedure. The voltage level should be the same in high and low resolution; the absolute level is not critical.

**Node 10** **+2.50 V (+2.50** V reference)

Perform step A10, above, and then press (Meas) **ANALOG IN** **RESOLUTION [LOW]** (10) (x1) (Scale Ref) (1) (x1).

Check for a flat line at approximately +2.5 V. This voltage is used in the "Analog Bus Correction Constants" adjustment as a reference for calibrating the analog bus low resolution circuitry.

Node 11 Aux Input (rear panel input)

Perform step A10 and then press (Meas) ANALOG IN (1) (1) (x1).

This selects the rear panel AUX INPUT to drive the analog bus for voltage and frequency measurements It can be used to look at test points within the instrument, using the analyzer's display as an oscilloscope. Connect the test point of interest to the rear panel AUX INPUT BNC connector.

This feature can be useful if an oscilloscope is not available. Also, it can be used for testing voltage-controlled devices by connecting the driving voltage of the device under test to the AUX IN connector. Look at the driving voltage on one display channel, while displaying the S-parameter response of the test device on the other display channel.

With AUX OUT switched ON, you can examine the analyzer's analog bus nodes with external equipment (see AUX OUT on OFF under the "Analog Bus Menu" heading). For HP-IB considerations, see "HP-IB Service Mnemonic Definitions," located later in this chapter.

Node 12 A10 Gnd (ground reference)

This node is used in the "Analog Bus Correction Constants" adjustment as a reference for calibrating the analog bus low and high resolution circuitry.

## All Phase Lock

To observe the All analog bus nodes, perform step All, below. Then follow the node-specific instructions.

Step All.
Press:
(Preset)
(Meas) ANALOG IN
(Marker)
(System) SERVICE MENU ANALOG BUS ON
(Format) MORE REAL

Node 13 VCO Tune 2 (not used)

Node 14 **Vbb Ref (ECL** reference voltage level)

Perform step Al 1 and then press (Meas) **ANALOG IN** (14) (x1) (Scale Ref) (.3) (x1) **REFERENCE VALUE** (-1.29) (x1).

The trace should be a flat line across the entire operation frequency range within 0.3 V (one division) of the reference value. Vbb Ref is used to compensate for ECL voltage drift.

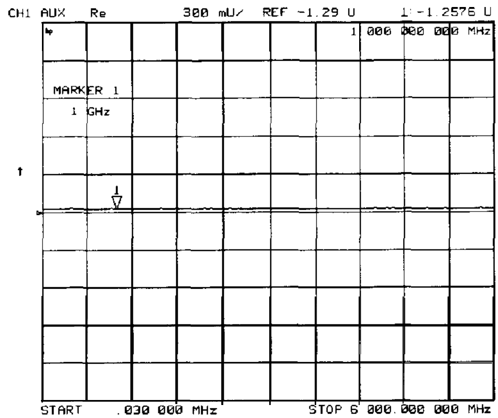



Figure 10-10. Analog Bus Node 14

Node 15 **Pretune** (open-loop source pretune voltage)

**Perform step A11 and then press (Meas) ANALOG IN (15) (x1) (Scale Ref) AUTOSCALE.**

This node displays the source pretune signal and should look like a stair-stepped ramp. Each step corresponds to the start of a band.

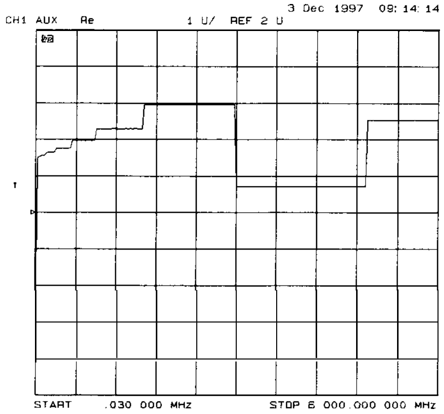



Figure 10-11. **Analog** Bus Node 15

Node 16 **1V/GHz** (source oscillator tuning voltage)

Perform step A11 and then press (Meas) **ANALOG IN** (16) (x1) (Scale Ref) **AUTOSCALE**.

This node displays the tuning voltage ramp used to tune the source oscillator. You should see a voltage ramp like the one shown in **Figure 10-12.** If this waveform is correct, you can be confident that the All phase lock assembly, the **A3** source assembly, the **A13/A14** fractional-N assemblies, and the **A7** pulse generator are working correctly and the instrument is phase locked. If you see anything else, refer to the "Source Troubleshooting" chapter.

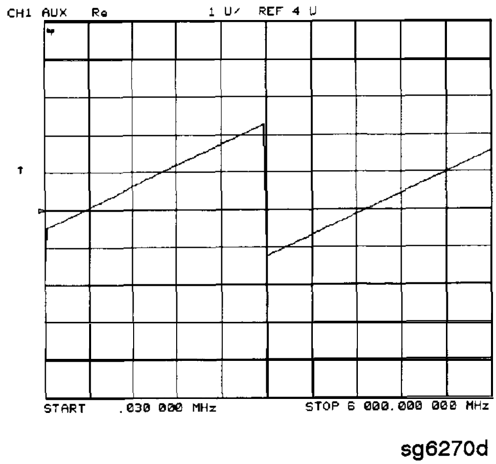



Figure **10-12.** Analog Bus Node 16

Node 17 **1st** IF (IF used for phase lock)

**Perform step A11 and then press (Meas) ANALOG IN (17) (x1) COUNTER: ANALOG BUS (Menu) CW FREQ.**

Vary the frequency and compare the results to the table below.

| Entered Frequency | Counter Reading |
|---|---|
| 0.2 to 15.999 MHz | same as entered |
| 16 MHz to 6 GHz | 1 MHz |

This node displays the IF frequency (see node17) as it enters the All phase lock assembly via the A4 R sampler assembly. This signal comes from the R sampler output and is used to phase lock the source.

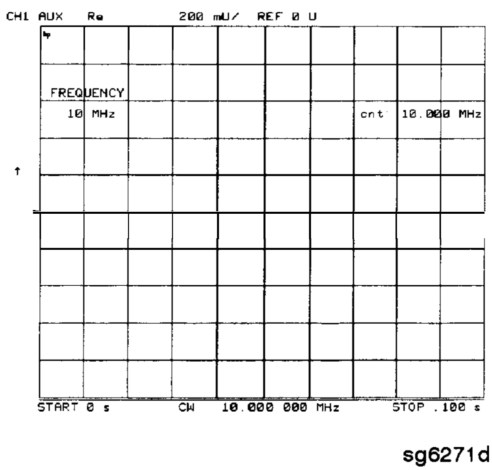



Figure 10-13. Counter Readout Location

Node 18 IF Det **2N (IF** on All phase lock after 3 MHz filter)

Perform step A11 and then press (Meas) **ANALOG IN** (18) (xl) (Stop) (20) (M/μ) (Scale Ref) **AUTOSCALE**.

This node detects the IF within the low pass **filter/limiter.** The **filter** is used during the track and sweep sequences but never in band 1 (3.3 to 16 MHz). The low level (about -1.7 V) means IF is in the **passband** of the **filter.** This node can be used with the FRAC N TUNE and SRC TUNE service modes.

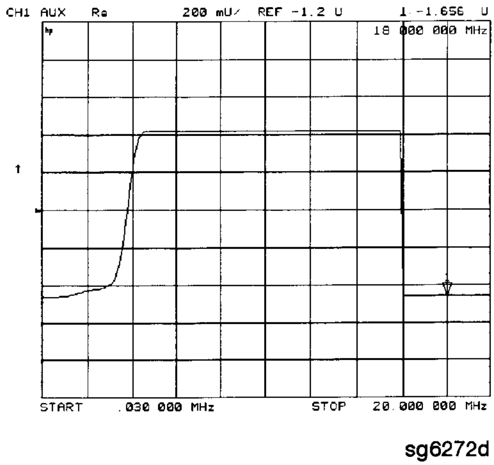



Figure **10-14.** Analog Bus Node 18

Node 19 **IF** Det **2W (IF** after 16 **MHz filter)**

**Perform step A11 and then press** (Meas) **ANALOG IN** (19) (x1) (Menu) (Stop) (20) (M/μ) (Scale Ref) (.2) (x1) **REFERENCE VALUE** (-1.2) (x1).

This node detects IF after the 16 MHz **filter/limiter.** The **filter** is used during pretune and acquire, but not in band 1. Normal state is a flat Iine at about -1.7 v.

Node 20 IF Det 1 (IF after 30 **MHz** filter)

**Perform** step A11 and then press (Meas) **ANALOG IN** (20) (x1) (Scale Ref) (0.3) (x1) **REFERENCE VALUE** (-1.29) (x1).

The trace should be a flat Iine across the entire frequency band at least 0.5 V greater than Vbb (node 14). The correct trace indicates the presence of IF after the **first** 30 MHz **filter/limiter.**

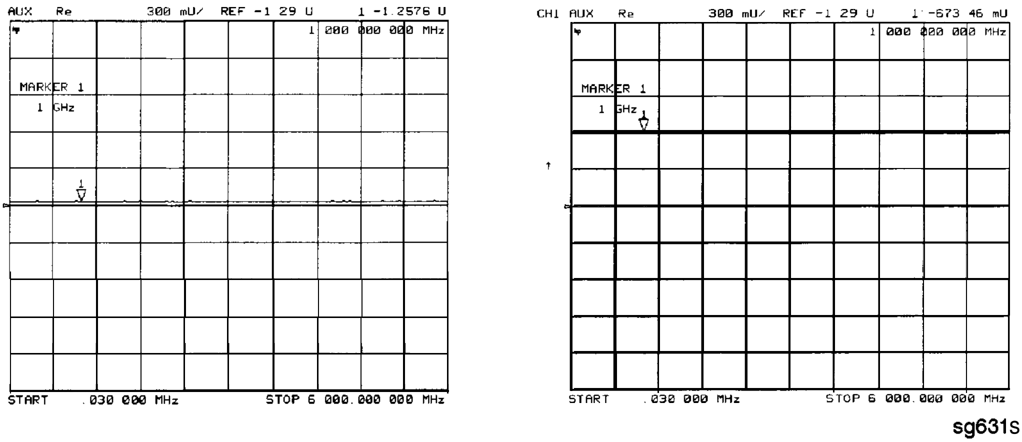



Figure 10-15. Analog Bus Node 20

## **A12** Reference

**To** observe the **A12 analog** bus nodes perform step **A12,** below. Then **follow** the node-specific instructions.

Step **A12.**

Press:

(Preset)

(Meas) **ANALOG IN**

(Marker)

(System) **SERVICE MENU** **ANALOG BUS ON**

(Format) **MORE** **REAL**

Node 21 100 **kHz** (100 **kHz** reference frequency)

Perform step A12 and then press (Meas) **ANALOG IN** (21) (x1) **COUNTER: ANALOG BUS**. This node counts the A12 100 kHz reference signal that is used on A13 (the fractional-N analog assembly) as a reference frequency for the phase detector.

Node 22 **A12** Gnd 1 (ground)

Node 23 VCO Tune **(A12 VCO** tuning voltage)

**Perform Step A12 and then press** (Start) (11) (M/$\mu$) (Stop) (21) (M/$\mu$) (Meas) **ANALOG IN** (23) (x1) (Marker) (Scale Ref) **AUTO SCALE**.

The trace should show a voltage step as shown in **Figure** 10-16. At normal operation, the left **half** trace should be 0 ±**1000 mV** and the right **half** trace should be 100 to 200 **mV** higher (that is, one to two divisions). If the trace does not appear as shown in Figure 10-16, refer to the "High/Low Band Transition Adjustment" in the "Adjustments and Correction Constants" chapter.

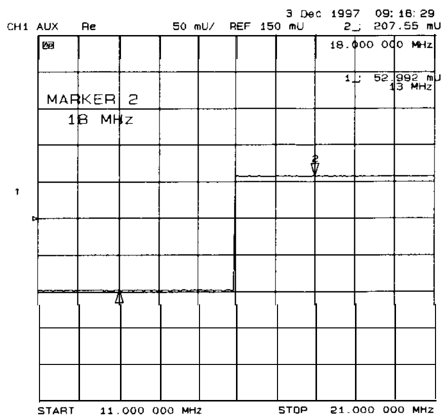



**Figure 10-16. Analog Bus Node 23**

Node 24 **2nd** LO

**Perform step A12 and then press** (Meas) **ANALOG IN** (24) (x1) **COUNTER: ANALOG BUS** (Menu) **CW FREQ**.

This node counts the **2nd** LO used by the sampler/mixer assemblies to produce the **2nd** IF of 4 **kHz.** As you vary the frequency, the counter reading should change to values very close to those indicated below:

| Frequency Entered | Counter Reading |
|---|---|
| 0.03 to 1 MHz | frequency entered +4 kHz |
| 1 to 16 MHz | not accurate |
| 16 to 3,000 MHz | 996 kHz |

Node 25 PL **Ref (phase** lock reference)

**Perform step A12 and then press** (Meas) **ANALOG IN** (25) (x1) **COUNTER: ANALOG BUS** (Menu) **CW FREQ**.

This node counts the reference signal used by the phase comparator circuit on the All phase lock assembly. As you vary the frequency, the counter reading should change as indicated below:

| Frequency Entered | Counter Reading |
|---|---|
| 0.3 to 1 MHz | frequency entered |
| 1 to 16 MHz | not accurate |
| 16 to 3,000 MHz | 1 MHz |

Node 26 Ext **Ref** (rear panel external reference input)

Perform step **A12** and then press (Meas) **ANALOG IN** 126) (x1).

The voltage level of this node indicates whether an external reference **timebase** is being used:

- No external reference: about -0.9 V
- With external reference: about -0.6 V.

Node 27 VCXO Tune (40 **MHz** VCXO **tuning** voltage)

Perform step **A12** and then press (Meas) **ANALOG IN** (27) (x1) (Marker Fctn) **MARKER →REFERENCE**

This node displays the voltage used to **fine** tune the **A12** reference VCXO to 40 MHz. You should see a flat line at some voltage level (the actual voltage level varies from instrument to instrument). Anything other than a flat line indicates that the VCXO is tuning to different frequencies. Refer to the "Frequency Accuracy" adjustment procedure.

Node 28 **A12** Gnd 2 (Ground reference)

### **A14** Fractional-N **(Digital)**

To observe the **A14** analog bus nodes perform step **A14,** below. Then follow the node-specific instructions.

Step **A14.**
Press:
(Preset)
(Meas) **ANALOG IN**
(System) **SERVICE MENU** **ANALOG BUS ON**
(Format) **MORE** **REAL**

Node 29 FN **VCO** Tun **(A14** FN VCO tuning voltage)

Perform step **A14** and then press (Meas) **ANALOG IN** (29) (x1) (Scale Ref) **AUTOSCALE**

Observe the **A14 FN** VCO tuning voltage. If the **A13** and **A14** assemblies are functioning correctly and the VCO is phase locked, the trace should look **like** Figure 10-17. Any other waveform indicates that the FN VCO is not phase locked. The vertical **lines** in the trace indicate the band crossings. (The counter can **also** be enabled to count the VCO frequency in CW mode.)

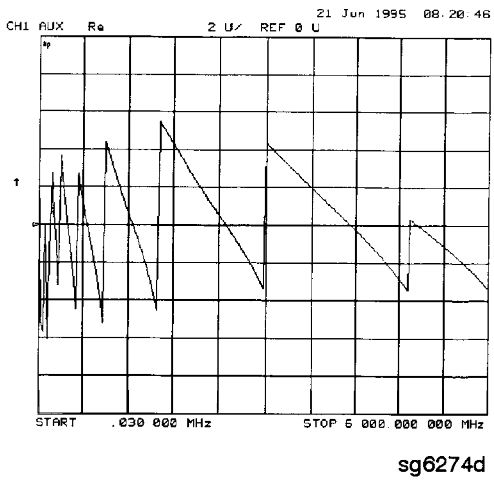



Figure 10-17. Analog Bus Node 29

Node 30 FN **VCO** Det **(A14 VCO** detector)

**Perform step A14 and then press** (Meas) ANALOG IN (30) (x1) RESOLUTION [HIGH] (Scale Ref) (50) (k/m).

See whether the **FN** VCO is oscillating. The trace should resemble **Figure** 10-18.

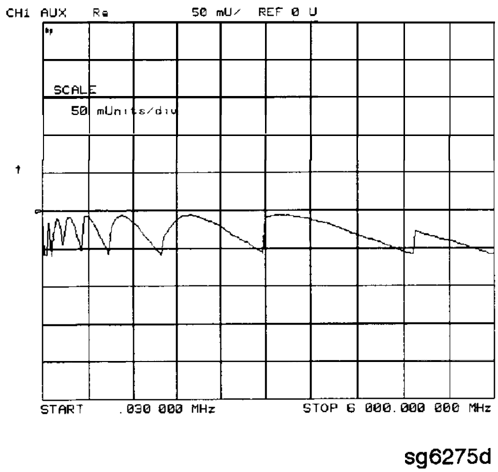



Figure 10-18. Analog Bus Node 30

Node 31 **Count** Gate (analog bus counter gate)

**Perform step A14 and then press** (Meas) ANALOG IN (31) (x1) (Scale Ref) (2) (x1).

You should see a flat line at + 5 V across the operating frequency range. The counter gate activity occurs during bandswitches, and therefore is not visible on the analog bus. To view the bandswitch activity, **look at this** node on an **oscilloscope, using** AUX OUT ON**. Refer to** AUX OUT on OFF **under the Analog** Bus Menu heading.

## PEEK/POKE Menu

**To access this menu, press (System) SERVICE MENU PEEK/POKE.**

| | |
|---|---|
| PEEK/POKE | allows you to edit the content of one or more memory addresses The keys are described below. |

---

**Caution** The PEEK/POKE capability is intended for service use only.

---

| | |
|---|---|
| PEEK/POKE ADDRESS (PEEL[D]) | accesses any memory address and shows it in the active entry area of the display. Use the front panel knob, entry keys, or step keys to enter the memory address of interest. |
| PEEK (PEEK) | displays the data at the accessed memory address. |
| POKE (POKE[D]) | allows you to change the data at the memory address accessed by the PEEK/POKE ADDRESS softkey. Use the front panel knob, entry keys, or step keys to change the data. The A9CC switch must be in the "ALTER" position in order to poke. |
| RESET MEMORY | resets or clears the memory where instrument states are stored. To do this, press RESET MEMORY (Preset. |

## Firmware Revision Softkey

**Press (System) SERVICE MENU FIRMWARE REVISION to display the current firmware** revision information. The number and implementation date appear in the active entry area of the display as shown in **Figure 10-19** below. The analyzer's serial number and installed options are **also** displayed. Another way to display the **firmware** revision information is to cycle the line power.

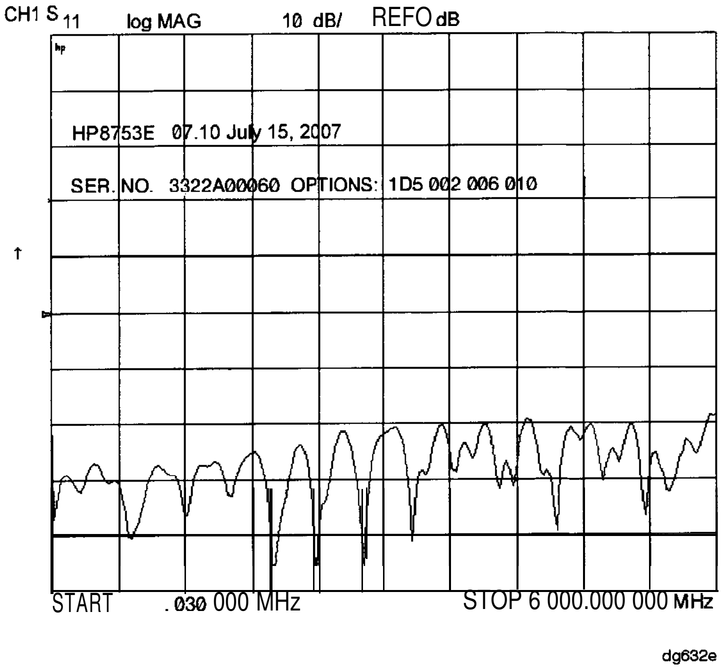



Figure 10-19. Location of Firmware Revision Information on Display

# HP-IB Service Mnemonic Definitions

All service routine keystrokes can be made through HP-IB in one of the following approaches:

- sending equivalent remote HP-IB commands. (Mnemonics have been documented previously with the corresponding keystroke.)
- invoking the System Menu (MENUSYST) and using the analyzer mnemonic **(SOFTn)**, where **"n"** represents the **softkey** number. (Softkeys are numbered 1 to 8 from top to bottom.)

An HP-IB overview is provided in the "Compatible Peripherals" chapter in the User's *Guide.* HP-IB programming information is also provided in the Programming Guide.

## Invoking Tests Remotely

Many tests require a response to the displayed prompts. Since bit 1 of the Event Status Register B is set (bit 1 = service routine waiting) any time a service routine prompts the user for an expected response, you can send an appropriate response using one of the following techniques:

- Read event status register B to reset the bit.
- Enable bit 1 to interrupt (ESNB[D]). See "Status Reporting" in the ***Programming Guide.***
- Respond to the prompt with a **TESRn** command (see Tests Menu, at the beginning of this chapter).

Symbol Conventions

| | |
|---|---|
| [ ] | An optional operand |
| D | A **numerical** operand |
| < > | A necessary appendage |
| \| | An either/or choice in appendages |

## Analog Bus Codes

| | |
|---|---|
| **ANAI[D]** | Measures and displays the analog input. The preset state input to the analog bus is the rear panel AUX IN. The other 30 nodes may be selected with D only if the **ABUS** is enabled **(ANABon).** |
| OUTPCNTR | Outputs the counter's frequency data. |
| **OUTPERRO** | Reads any prompt message sent to the error queue by a service routine. |
| OUTPTESS | Outputs the integer status of the test most recently executed. Status codes are those listed under "TST?". |
| TST? | Executes the power-on self test (internal test 1) and outputs an integer test status. Status codes are as follows:<br>0 = pass<br>1 = fail<br>2 = in progress<br>3 = not available<br>4 = not done<br>5 = done |

## Error Messages

This section contains an alphabetical list of the error messages that pertain to servicing the analyzer. The information in the list includes explanations of the displayed messages and suggestion to help solve the problem.

Note — The error messages that pertain to measurement applications are included in the ***HP 8753E Network Analyzer User's Guide.***

BATTERY FAILED. STATE MEMORY CLEARED

Error Number 183 — The battery protection of the non-volatile SRAM memory has failed. The SRAM memory has been cleared. Refer to the "Assembly Replacement and Post-Repair Procedures" chapter for battery replacement instructions See the "Preset State and Memory Allocation," chapter in the ***HP 87533 Network Analyzer*** User's ***Guide*** for more information about the SRAM memory.

BATTERY LOW! STORE SAVE REGS TO DISK

Error Number 184 — The battery protection of the non-volatile SRAM memory is in danger of failing. If this occurs, all of the instrument state registers stored in SRAM memory will be lost. Save these states to a disk and refer to the "Assembly Replacement and Post-Repair Procedures" chapter for battery replacement instructions. See the "Preset State and Memory Allocation," chapter in the HP ***8753E Network Analyzer User's Guide*** for more information about the SRAM memory.

CALIBRATION ABORTED

Error Number 74 — You have changed the active channel during a calibration so the calibration in progress was terminated. Make sure the appropriate channel is active and restart the calibration.

CALIBRATION REQUIRED

Error Number 63 — A calibration set could not be found that matched the current stimulus state or measurement parameter. You will have to perform a new calibration.

CORRECTION CONSTANTS NOT STORED

Error Number 3 — A store operation to the EEPROM was not successful. You must change the position of the jumper on the **A9** CPU assembly. Refer to the "**A9** CC Jumper Position Procedure" in the "Adjustments and Correction Constants" chapter.

CORRECTION TURNED OFF

Error Number 66 — Critical parameters in your current instrument state do not match the parameters for the calibration set, therefore correction has been turned off. The critical instrument state parameters are sweep type, start frequency, frequency span, and number of points

CURRENT PARAMETER NOT IN CAL SET

Error Number 64 — Correction is not valid for your selected measurement parameter. Either change the measurement parameters or perform a new calibration.

DEADLOCK

Error Number 111 — A fatal firmware error occurred before instrument preset completed.

**DEVICE: not on, not connect,** wrong addrs

Error Number 119: The device at the selected address cannot be accessedbythe analyzer. Verify that the device is switched on, and check the HP-IB connection between the analyzer and the device. Ensure that the device address recognized by the analyzer matches the HP-IB address set on the device itself.

DISK HARDWARE PROBLEM

Error Number 39: The disk drive is not responding correctly. Refer to the disk drive operating manual.

DISK MESSAGE LENGTH ERROR

Error Number 190: The analyzer and the external disk drive aren't communicating properly. Check the **HP-IB** connection and then try substituting another disk drive to isolate the problem instrument.

**DISK: not on, not** connected, wrong addrs

Error Number 38: The disk cannot be accessed by the analyzer. Verify power to the disk drive, and check the **HP-IB** connection between the analyzer and the disk drive. Ensure that the disk drive address recognized by the analyzer matches the HP-IB address set on the disk drive itself.

DISK READ/WRITE ERROR

Error Number 189 There may be a problem with your disk. Try a new floppy disk. If a new floppy disk does not eliminate the error, suspect hardware problems.

INITIALIZATION FAILED

Error Number 47 The disk initialization failed, probably because the disk is damaged.

INSUFFICIENT MEMORY, PWR MTR CAL OFF

Error Number 154 There is not enough memory space for the power meter calibration array. Increase the available memory by clearing one or more save/recall registers, or by reducing the number of points

NO CALIBRATION CURRENTLY IN PROGRESS

Error Number 69 The RESUME CAL SEQUENCE softkey is not valid unless a calibration is already in progress. Start a new calibration.

NOT ENOUGH SPACE ON DISK FOR STORE

Error Number 44 The store operation will overflow the available disk space. Insert a new disk or purge files to create free disk space.

NO FILE(S) FOUND ON DISK

Error Number 45 — No files of the type created by an analyzer store operation were found on the disk. If you requested a specific file title, that file was not found on the disk.

NO IF FOUND: CHECK R INPUT LEVEL

Error Number 5 — The first IF signal was not detected during pretune. Check the front panel R channel jumper. If there is no visible problem with the jumper, refer to the "Source Troubleshooting" chapter.

NO PHASE LOCK: CHECK R INPUT LEVEL

Error Number 7 — The first IF signal was detected at pretune, but phase lock could not be acquired. Refer to the "Source Troubleshooting" chapter.

NO SPACE FOR NEW CAL. CLEAR REGISTERS

Error Number 70 — You cannot store a calibration set due to insufficient memory. You can free more memory by clearing a saved instrument state from an internal register (which may also delete an associated calibration set, if all the instrument states using the calibration kit have been deleted.) You can store the saved instrument state and calibration set to a disk before clearing them. After deleting the instrument states, press (Preset) to run the memory packer.

NOT ALLOWED DURING POWER METER CAL

Error Number 198 When the analyzer is performing a power meter calibration, the HP-IB bus is unavailable for other functions such as printing or plotting.

OVER LOAD ON INPUT A, POWER REDUCED

Error Number 58 See error number 57.

OVER LOAD ON INPUT B, POWER REDUCED

Error Number 59 See error number 57.

OVER LOAD ON INPUT R, POWER REDUCED

Error Number 57 You have exceeded approximately + 14 **dBm** at one of the test ports, The RF output power is automatically reduced to -85 **dBm.** The annotation **P⇓** appears in the left margin of the display to indicate that the power trip function has been activated. When this occurs, reset the power to a lower level, **then toggle the SOURCE PWR on OFF softkey to switch on the** power again.

PARALLEL PORT NOT AVAILABLE FOR GPIO

Error Number 165 You have **defined** the parallel port as COPY for sequencing in the HP-IB menu. **To** access the parallel port for general purpose I/O (GPIO), set the selection to [GPIO].

PARALLEL PORT NOT AVAILABLE FOR COPY

Error Number 167 — You have **defined** the parallel port as general purpose I/O (GPIO) for sequencing. The definition was made under the (Local key menus. To access the **parallel** port for copy, set the selection to **PARALLEL [COPY]**.

PHASE LOCK CAL FAILED

Error Number 4 — An internal phase lock calibration routine is automatically executed at power-on, preset, and any time a loss of phase lock is detected. This message indicates that phase lock calibration was initiated and the **first** IF detected, but a problem prevented the calibration from completing successfully. Refer to Chapter 3, "Adjustments and Correction Constants" and execute pretune correction (test 48).

This message may appear if you connect a mixer between the RF' output and R input before turning on frequency offset mode. Ignore it: it will go away when you turn on frequency offset. This message may also appear if you turn on frequency offset mode before you **define** the offset.

PHASE LOCK LOST

Error Number 8 — Phase lock was acquired but then lost. Refer to the "Source Troubleshooting" chapter.

POSSIBLE FALSE LOCK

Error Number 6 — Phase lock has been achieved, but the source may be phase locked to the wrong harmonic of the synthesizer. Perform the source pretune correction routine documented in the "Adjustments and Correction Constants" chapter.

POWER METER INVALID

Error Number 116 — The power meter indicates an out-of-range condition. Check the test setup.

POWER METER NOT SETTLED

Error Number 118 — Sequential power meter readings are not consistent. Verify that the equipment is set up correctly. If so, preset the instrument and restart the operation.

POWER SUPPLY HOT!

Error Number 21 — The temperature sensors on the **A8** post-regulator assembly have detected an over-temperature condition. The power supplies regulated on the post-regulator have been shut down. Refer to the "Power Supply Troubleshooting" chapter.

POWER SUPPLY SHUT DOWN!

Error Number 22 — One or more supplies on the **A8** post-regulator assembly have been shut down due to an over-current, over-voltage, or under-voltage condition. Refer to the "Power Supply Troubleshooting" chapter.

POWER UNLEVELED

Error Number 179: There is either a hardware failure in the source or you have attempted to set the power level too high. Check to see if the power level you set is within specifications. If it is, refer to the "Source Troubleshooting" chapter. You will only receive this message over the HP-IB. On the analyzer, P? is displayed.

---

PRINTER: error

Error Number 175: The parallel port printer is malfunctioning. The analyzer cannot complete the copy function.

---

PRINTER: not handshaking

Error Number 177: The printer at the parallel port is not responding.

---

PRINTER: **not on,** not connected, wrongaddrs

Error Number 24: The printer does not respond to control. Verify power to the printer, and check the HP-IB connection between the analyzer and the printer. Ensure that the printer address recognized by the analyzer matches the HP-IB address set on the printer itself.

---

PROBE POWER SHUT DOWN!

Error Number 23: The analyzer biasing supplies to the HP 85024A external probe are shut down due to excessive current. Troubleshoot the probe, and refer to the "Power Supply Troubleshooting" chapter.

PWR MTR: NOT ON/CONNECTED OR WRONG ADDRS

Error Number 117: The power meter cannot be accessed by the analyzer. Verify that the power meter address and model number set in the analyzer match the address and model number of the actual power meter.

SAVE FAILED. INSUFFICIENT MEMORY

Error Number 151: You cannot store an instrument state in an internal register due to insufficient memory. Increase the available memory by clearing one or more save/recall registers and pressing (Preset), or by storing **files** to a disk.

**SELF TEST #n** FAILED

Service Error Number 112: Internal test #n has failed. Several internal test routines are executed at instrument preset. The analyzer reports the first **failure** detected. Refer to the internal tests and the self-diagnose feature descriptions earlier in this chapter.

**SOURCE POWER TURNED OFF,** RESET UNDER POWER MENU

Information Message: You have exceeded the maximum power level at one of the inputs and power has been automatically reduced. The annotation **P⇓** indicates that power trip has been activated. When this occurs, reset the power and then press (Menu) **POWER SOURCE PWR on OFF**, **to switch on the power. This message** follows error numbers 57, 58, and 59.

SWEEP MODE CHANGED TO CW TIME SWEEP

Error Number 187 — If you select external source auto or manual instrument mode and you do not also select CW mode, the analyzer is automatically switched to CW.

TEST ABORTED

Error Number 113 — You have prematurely stopped a service test.

TROUBLE! CHECK SETUP AND START OVER

Service Error Number 115 — Your equipment setup for the adjustment procedure in progress is not correct. Check the setup diagram and instructions in the "Adjustments and Correction Constants" chapter. Start the procedure again.

WRONG DISK FORMAT, INITIALIZE DISK

Error Number 77 — You have attempted to store, load, or read file titles, but your disk format does not conform to the Logical Interchange Format (LIF). You must initialize the disk before reading or writing to it.

11

# Error Terms

The analyzer generates and stores factors in internal arrays when a measurement error-correction (measurement calibration) is performed. These factors are known by the following terms:

- error terms
- E-terms
- measurement calibration coefficients

The analyzer creates error terms by measuring **well-defined** calibration devices over the frequency range of interest and comparing the measured data with the ideal model for the devices The differences represent systematic (repeatable) errors of the analyzer system. The resulting calibration coefficients are good representations of the systematic error sources. For details on the various levels of error-correction, refer to the "Optimizing Measurement Results" chapter of *the HP 8753E Network Analyzer User's Guide.* For details on the theory of error-correction, refer to the "Application and Operation Concepts" chapter of *the HP 8753E Network Analyzer User's Guide.*

## Error Terms Can Also Serve a Diagnostic Purpose

Specific parts of the analyzer and its accessories directly contribute to the magnitude and shape of the error terms Since we know this correlation and we know what typical error terms look like, we can examine error terms to monitor system performance (preventive maintenance) or to identify faulty components in the system (troubleshooting).

- Preventive Maintenance: A stable, repeatable system should generate repeatable error terms over long time interval% for example, six months If you make a hardcopy record (print or plot) of the error terms, you can periodically compare current error terms with the record. A sudden shift in error terms reflects a sudden shift in systematic errors, and may indicate the need for further troubleshooting. A long-term trend often reflects drift, connector and cable wear, or gradual degradation, indicating the need for further investigation and preventive maintenance. Yet, the system may still conform to specifications. The cure is often as simple as cleaning and gaging connectors or inspecting cables.

- Troubleshooting: If a subtle failure or mild performance problem is suspected, the magnitude of the error terms should be compared against values generated previously with the same instrument and calibration kit. This comparison will produce the most precise view of the problem.

  However, if previously generated values are not available, compare the current values to the typical values listed in Table 11-2, and shown graphically on the plots in this chapter. If the magnitude exceeds its limit, inspect the corresponding system component. If the condition causes system verification to fail, replace the component.

  Consider the following while troubleshooting:

  - All parts of the system, including cables and calibration devices, can contribute to systematic errors and impact the error terms.
  - Connectors must be clean, gaged, and within specification for error term analysis to be meaningful.
  - Avoid unnecessary bending and flexing of the cables following measurement calibration, minimizing cable instability errors.
  - Use good connection techniques during the measurement calibration. The connector interface must be repeatable. Refer to the "Principles of Microwave Connector Care" section in the "Service Equipment and Analyzer Options" chapter for information on connection techniques and on cleaning and gaging connectors.
  - Use error term analysis to troubleshoot minor, subtle performance problems. Refer to the "Start Troubleshooting Here" chapter if a blatant failure or gross measurement error is evident.
  - It is often worthwhile to perform the procedure twice (using two distinct measurement calibrations) to establish the degree of repeatability. If the results do not seem repeatable, check all connectors and cables.

# Full Two-Port Error-Correction Procedure

| Note | This is the most accurate error-correction procedure. Since the analyzer takes both forward and reverse sweeps, this procedure takes more time than the other correction procedures. |
|---|---|

1. Set any measurement parameters that you want for the device measurement: power, format, number of points, IF bandwidth.
2. To access the measurement correction menus, press:

   (Cal)
3. If your calibration kit is different than the kit specified under the CAL KIT [ ] **softkey, press:**

   CAL KIT SELECT CAL KIT **(select your** type **of kit)**
   RETURN
4. To select the correction type, press:

   CALIBRATE MENU FULL 2-PORT REFLECTION
5. Connect a shielded open circuit to PORT 1.

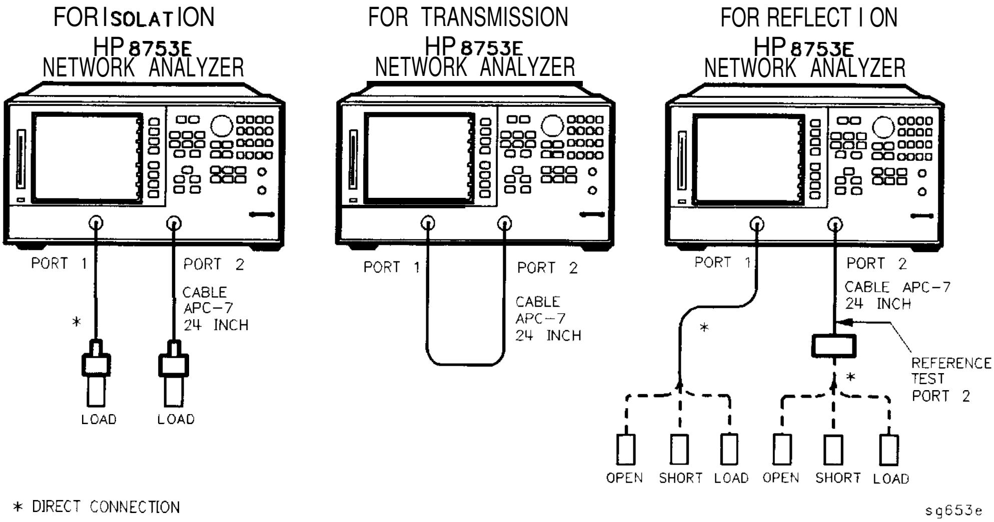



Figure **11-1.** Standard Connections for Full Two-Port Error-Correction

6. To measure the standard, when the displayed trace has settled, press:

   **FORWARD: OPEN**

   The analyzer underlines the **OPEN** softkey after it measures the standard.

7. Disconnect the open, and connect a short circuit to PORT 1.
8. To measure the device, when the displayed trace has settled, press:

   **FORWARD: SHORT**

   The analyzer underlines the **SHORT** softkey after it measures the standard.

9. Disconnect the short, and connect an impedance-matched load to PORT 1.
10. To measure the standard, when the displayed trace has settled, press:

    **FORWARD: LOAD**

    The analyzer underlines the **LOAD** softkey after it measures the standard.

11. Repeat the open-short-load measurements descried above, but connect the devices in turn to PORT 2, and use the **REVERSE: OPEN**, **REVERSE: SHORT**, and **REVERSE: LOAD** softkeys.
12. To compute the reflection correction coefficients, press:

    **STANDARDS DONE**

13. To start the transmission portion of the correction, press: **TRANSMISSION**.
14. Make a "through" connection between the points where you will connect your device under test as shown in F'igure 11-1.

| Note | Include any adapters or cables that you will have in the device measurement. That is, connect the standard device where you will connect your device under test. |
|---|---|

**Note** The through in most calibration kits is defined with zero length. The correction will *not* work properly if a non-zero length through is used, unless the calibration kit is modified to change the defined through to the length used. This is important for measurements of non-insertable devices (devices having ports that are both male or both female). The modified calibration kit must be saved as the user calibration kit, and the USER KIT must be selected before the calibration is started.

15. To measure the standard, when the trace has settled, press:

    DO BOTH FWD+REV

    The analyzer underlines the softkey label after it makes each measurement.

16. Press ISOLATION and select from the following two options:

    - If you will be measuring devices with a dynamic range less than 90 dB, press:

      OMIT ISOLATION ISOLATION DONE

    - If you will be measuring devices with a dynamic range greater than 90 dB, follow these steps:

      a. Connect impedance-matched loads to PORT 1 and PORT 2.

**Note** If you will be measuring highly reflective devices, such as filters, use the test device, connected to the reference plane and terminated with a load, for the isolation standard.

      b. Activate at least four times more averages than desired during the device measurement.

      c. Press (Cal) RESUME CAL SEQUENCE FWD ISOL'N ISOL'N STD REV ISOL'N ISOL'N STD ISOLATION DONE.

      d. Return the averaging to the original state of the measurement, and press (Cal) RESUME CAL SEQUENCE.

17. To compute the error coefficients, press:

    DONE 2-PORT CAL

The analyzer displays the corrected measurement trace. The analyzer also shows the notation Cor at the left of the screen, indicating that error-correction is on.

---

**Note** You can save or store the measurement correction to use for later measurements Use the menus under (Save/Recall), or refer to "Printing, Plotting, and Saving Measurement Results" located in the ***HP 8753E Network Analyzer*** User's ***Guide*** for procedures.

---

18. This completes the full two-port correction procedure. You can connect and measure your device under test.

**Table 11-1.** Calibration **Coefficient Terms** and **Tests**

| Calibration Coefficient | Calibration Type | | | | Test Number |
|---|---|---|---|---|---|
| | Response | Response and Isolation* | 1-port | 2-port† | |
| 1 | $E_R$ or $E_T$ | $E_X$ ($E_D$) | $E_D$ | $E_{DF}$ | 32 |
| 2 | | $E_T$ ($E_R$) | $E_S$ | $E_{SF}$ | 33 |
| 3 | | | $E_R$ | $E_{RF}$ | 34 |
| 4 | | | | $E_{XF}$ | 35 |
| 5 | | | | $E_{LF}$ | 36 |
| 6 | | | | $E_{TF}$ | 37 |
| 7 | | | | $E_{DR}$ | 38 |
| 8 | | | | $E_{SR}$ | 39 |
| 9 | | | | $E_{RR}$ | 40 |
| 10 | | | | $E_{XR}$ | 41 |
| 11 | | | | $E_{LR}$ | 42 |
| 12 | | | | $E_{TR}$ | 43 |

**NOTES:**

**Meaning of first subscript: D–directivity; S–source match; R–reflection tracking; X–crosstalk; L–load match; T–transmission tracking.**

**Meaning of second subscript: F–forward; R–reverse.**

*** Response and Isolation cal yields: $E_X$ or $E_T$ if a transmission parameter ($S_{21}$, $S_{12}$) or $E_D$ or $E_R$ if a reflection parameter ($S_{11}$, $S_{22}$).**

**† One-path, 2-port cal duplicates arrays 1 to 6 in arrays 7 to 12.**

# Error Term Inspection

Note If the correction is not active, press [call CORRECTION ON .

1. **Press** (System) SERVICE MENU TESTS (32) (x1) EXECUTE TEST.

   The analyzer copies the first calibration measurement trace for the selected error term into memory and then displays it. **Table 11-1** lists the test numbers

2. Press (Scale Ref) and adjust the scale and reference to study the error term trace.
3. Press (Marker Fctn) and use the marker functions to determine the error term magnitude.
4. Compare the displayed measurement trace to the trace shown in the following "Error Term descriptions" section, and to previously measured data. If data is not available from previous measurements, refer to the typical uncorrected performance specifications listed in **Table** 11-2.
5. Make a hardcopy of the measurement results:
   a. Connect a printing or plotting peripheral to the analyzer.
   b. **Press** (Local) SYSTEM CONTROLLER SET ADDRESSES **and select the** appropriate peripheral to verify that the **HP-IB** address is set correctly on the analyzer.
   c. **Press** (Save/Recall) **and then choose either** PRINT **or** PLOT.
   d. Press (Display) MORE TITLE and title each data trace so that you can identify it later.

   For detailed information on creating hardcopies, refer to "Printing, Plotting, and Saving Measurement Results" in the ***HP 8753E Network Analyzer User's Guide.***

## If Error Terms Seem Worse than Typical Values

1. Perform a system verification to verify that the system still conforms to specifications.
2. If system verification fails, refer to "Start Troubleshooting Here."

## Uncorrected Performance

The following table shows typical performance without error-correction. RF cables are not used except as noted. Related error terms should be within these values.

**Table 11-2. Uncorrected System Performance**

| | Frequency Range (GHz) | |
|---|---|---|
| | **0.0003 to 3.0** | **3.0 to 6.0** |
| **Directivity** | 30 dB | 25 dB |
| **Source Match** | 16 dB | 14 dB |
| **Load Match** | 16 dB | 14 dB |
| **Reflection Tracking*** | ±1.5 dB | +0.5 dB, −2.5 dB |
| **Transmission Tracking*** | ±1.5 dB | +0.5 dB, −2.5 dB |
| **Crosstalk** | 90 dB | 80 dB |

*Deviation from nominal trace across the frequency range.

## Error Term Descriptions

The error term descriptions in this section include the following information:

- significance of each error term
- typical results following a full **2-port** error-correction
- guidelines to interpret each error term

The same description applies to both the forward **(F)** and reverse (R) terms.

## Directivity (**EDF** and **EDR**)

### Description

Directivity is a measure of any detected power that is reflected when a load is attached to the test port. These are the uncorrected forward and reverse directivity error terms of the system. The directivity error of the test port is determined by measuring the reflection (**S11, S22**) of the load during the error-correction procedure.

### **Significant** System Components

- load used in the error-correction (calibration)
- test port connectors
- test port cables

## Affected Measurements

Low reflection device measurements are most affected by directivity errors.

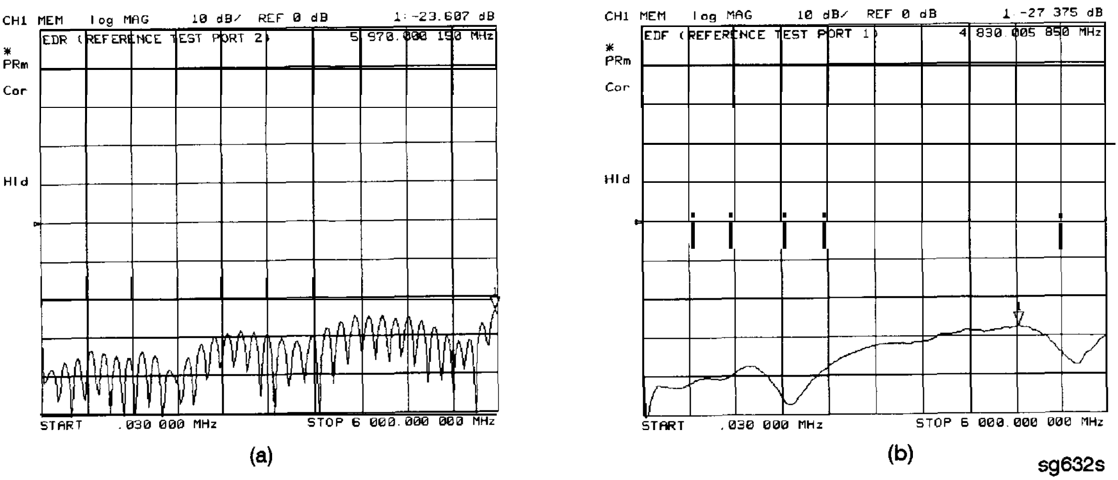



Figure 11-2. Typical **EDF/EDR** without **and** with Cables

## Source Match (**ESF** and ESR)

### Description

Source match is a measure of test port connector match, as well as the match between all components from the source to the test port. These are the forward and reverse uncorrected source match terms of the driven port.

### **Significant** System Components

- load calibration kit device
- open calibration kit device
- short calibration kit device
- bridge
- test port connectors
- bias tees
- step attenuator
- transfer switch
- test port cables

### Affected Measurements

Reflection and transmission measurements of highly reflective devices are most affected by source match errors.

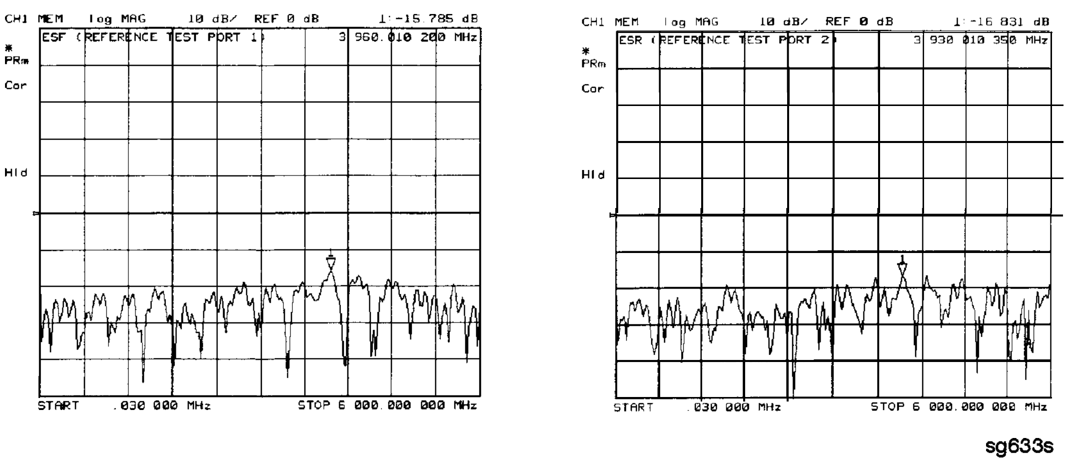



Figure 11-3. Typical **ESF/ESR** without and with Cables

## Reflection Tracking (**ERF** and **ERR**)

### Description

Reflection tracking is the difference between the frequency response of the reference path (R path) and the frequency response of the reflection test path (A or B input path).

### Significant System Components

- open calibration kit device
- short calibration kit device
- R signal path if large variation in both **ERF** and **ERR**
- A or B input paths if only one term is affected

### Affected Measurements

All reflection measurements (high or low return loss) are affected by the reflection tracking errors.

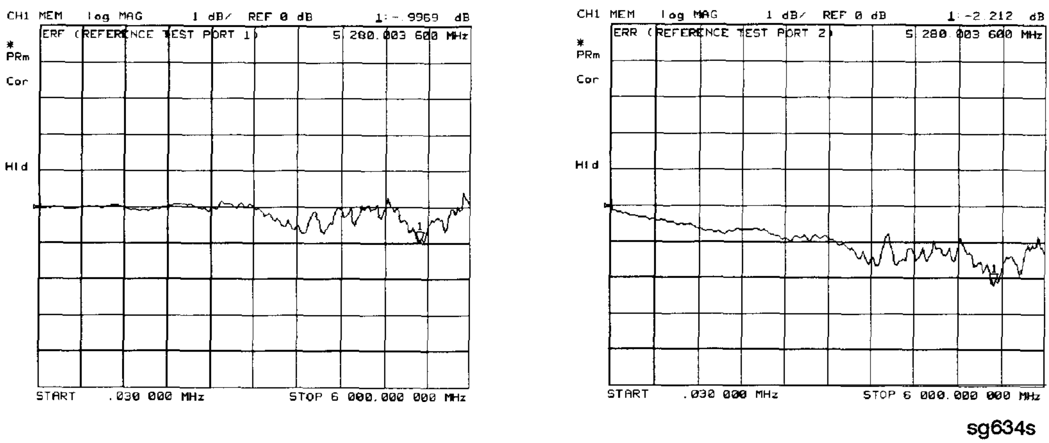



Figure 11-4. Typical **ERF/ERR** without and with Cables

# Isolation (Crosstalk, **EXF** and EXE)

## Description

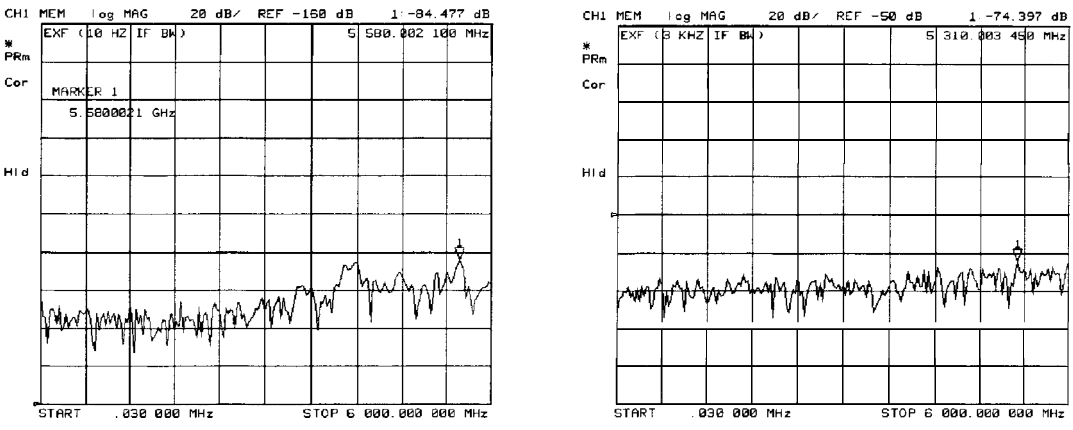
Isolation is a measure of the leakage between the test ports and the signal paths The isolation error terms are characterized by measuring transmission **(S21, S12)** with loads attached to both ports during the error-correction procedure. Since these terms are low in magnitude, they are usually noisy (not very repeatable). The error term magnitude changes dramatically with IF bandwidth: a 10 Hz IF bandwidth must be used in order to lower the noise floor beyond the crosstalk specification. Using averaging will also reduce the peak-to-peak noise in this error term.

## Significant System Components

- sampler crosstalk

## Affected Measurements

Transmission measurements, (primarily where the measured signal level is very low), are affected by isolation errors. For example, transmission measurements where the insertion loss of the device under test is large.




sg638s

Figure 11-5.
Typical **EXF/EXR** with 10 Hz Bandwidth and with 3 **kHz** Bandwidth

## Load Match (ELF and ELR)

### Description

Load match is a measure of the impedance match of the test port that terminates the output of a 2-port device. Load match error terms are characterized by measuring the reflection (S11, S22) responses of a "through" configuration during the calibration procedure.

### Significant System Components

- "through" cable
- cable connectors
- test port connectors

### Affected Measurements

All transmission and reflection measurements of a low insertion loss two-port devices are most affected by load match errors. Transmission measurements of lossy devices are also affected.

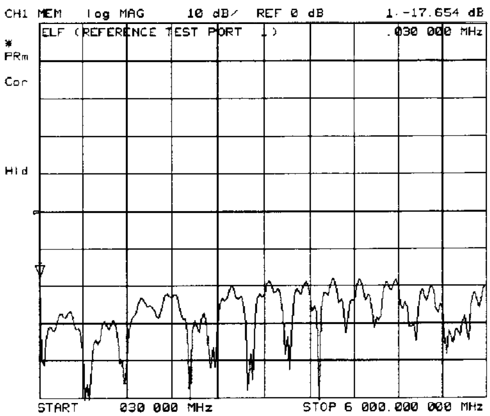



Figure 11-6. Typical ELF/ELR

## Transmission Tracking (ETF and ETR)

### Description

Transmission tracking is the difference between the frequency response of the reference path (including R input) and the transmission test path (including A or B input) while measuring transmission. The response of the test port cables is included. These terms are characterized by measuring the transmission **(S21, S12)** of the "through" configuration during the error-correction procedure.

### Significant System Components

- R signal path (if both ETF and ETR are bad)
- A or B input paths
- "through" cable

### Affected Measurements

All transmission measurements are affected by transmission tracking errors.

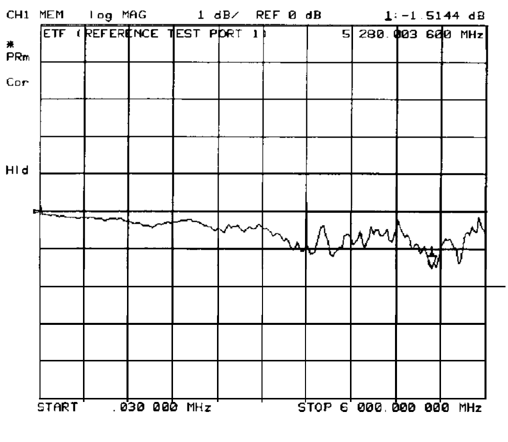



Figure 11-7. **Typical ETF/ETR**

# 12

# Theory of Operation

This chapter is divided into two major sections:

- "How the HP 8753E Works" gives a general description of the HP 8753E network analyzer operation.
- "A Close Look at the Analyzer's Functional Groups" provides more detailed operating theory for each of the analyzer's functional groups.

## How the HP 8753E Works

Network analyzers measure the reflection and transmission characteristics of devices and networks. A network analyzer test system consists of the following:

- source
- signal-separation devices
- receiver
- display

The analyzer applies a signal that is either transmitted through the device under test, or reflected from its input, and then compares it with the incident signal generated by the swept RF source. The signals are then applied to a receiver for measurement, signal processing, and display.

The HP 8753E vector network analyzer integrates a high resolution synthesized RF source, test set, and a dual channel three-input receiver to measure and display magnitude, phase, and group delay of transmitted and reflected power. The HP 8753E Option 010 has the additional capability of transforming measured data from the frequency domain to the time domain. Figure 12-1 is a simplified block diagram of the network analyzer system. A detailed block diagram of the analyzer is located at the end of Chapter 4, "Start Troubleshooting Here."

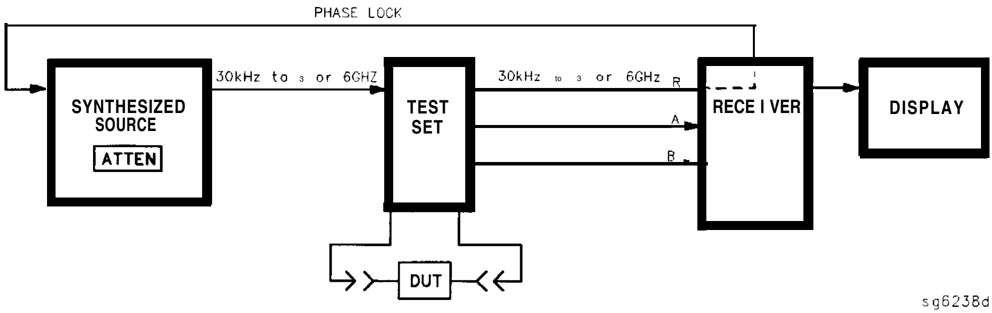



Figure 12-1. **Simplified** Block Diagram of the Network Analyzer System

## The Built-In Synthesized Source

The analyzer's built-in synthesized source produces a swept RF signal in the range of 30 **kHz** to 3.0 **GHz.** The HP 8753E Option 006 is able to generate signals up to 6 **GHz.** The source output power is leveled by an internal ALC (automatic leveling control) circuit. To achieve frequency accuracy and phase measuring capability, the analyzer is phase locked to a highly stable crystal oscillator.

For this purpose, a portion of the transmitted signal is routed to the R channel input of the receiver, where it is sampled by the phase detection loop and fed back to the source.

### The Source Step Attenuator

The 70 **dB**, electro-mechanical, step attenuator contained in the source has very low loss. It is used to adjust the power level to the device under test without changing the level of the incident power in the reference path. The user sets the attenuation levels via the front panel softkeys.

## The Built-In Test Set

The HP 8753E features a built-in test set that provides the signal separation capability for the device under test, as well as to the signal-separation devices. The signal separation devices are needed to separate the incident signal from the transmitted and reflected signals. The incident signal is applied to the R channel input via an external jumper cable on the front panel. Meanwhile, the transmitted and reflected signals are internally routed from the test port couplers to the inputs of the A and B sampler/mixers in the receiver. Port 1 is connected to the A input and port 2 is connected to the B input.

The test set contains the hardware required to make simultaneous transmission and reflection measurements in both the forward and reverse directions. A solid-state transfer switch in the built-in test set allows reverse measurements to be made without changing the connections to the device under test.

## The Receiver Block

The receiver block contains three sampler/mixers for the R, A and B inputs. The signals are sampled, and down-converted to produce a 4 kHz IF' (intermediate frequency). A multiplexer sequentially directs each of the three IF signals to the ADC (analog to digital converter) where it is converted from an analog to a digital signal to be measured and processed for viewing on the display. Both amplitude and phase information are measured simultaneously, regardless of what is displayed on the analyzer.

## The Microprocessor

A microprocessor takes the raw data and performs all the required error correction, trace math, formatting, scaling, averaging, and marker operations, according to the instructions from the front panel or over HP-IB. The formatted data is then displayed.

## Required Peripheral Equipment

In addition to the analyzer, a system requires calibration standards for vector accuracy enhancement, and cables for interconnections.

# A Close Look at the Analyzer's Functional Groups

The operation of the analyzer is most logically described in five functional groups. Each group consists of several major assemblies, and performs a distinct function in the instrument. Some assemblies are related to more than one group, and in fact all the groups are to some extent interrelated and affect each other's performance.

Power Supply. The power supply functional group consists of the **A8** post regulator and the **A15** preregulator. It supplies power to the other assemblies in the instrument.

Digital Control. The digital control group consists of the Al front panel and **A2** front panel processor, the **A9** CPU, the **A16** rear panel, the **A18** display and the **A19** graphics system processor (GSP). The **A10** digital IF assembly is also related to this group. These assemblies combine to provide digital control for the analyzer.

Source. The source group consists of the **A3** source, **A7** pulse generator, All phase lock, **A12** reference, **A13** fractional-N (analog), and **A14** fractional-N (digital) assemblies. The **A4** sampler is also related since it is part of the source phase lock loop. The source supplies a phase-locked RF signal to the device under test.

Signal Separation. The signal separation group performs the function of an S-parameter test set, dividing the source signal into a reference path and a test path, and providing connections to the device under test. It consists of the **A24** transfer switch, the **A21** test port 1 coupler, and the **A22** test port 2 coupler.

Receiver. The receiver group consists of the **A4/A5/A6** sampler/mixers and the **A10** digital IF. The **A12** reference assembly and the **A9** CPU are also related. The receiver measures and processes input signals for display.

The following pages describe the operation of each of the functional groups.

## Power Supply Theory

The power supply functional group consists of the **A15** preregulator and the **A8** post regulator. These two assemblies comprise a switching power supply that provides regulated DC voltages to power all assemblies in the analyzer. The **A15** preregulator is enclosed in a casting at the rear of the instrument behind the display. It is connected to the **A8** post regulator by a wire bus **A15W1. Figure** 12-2 is a simplified block diagram of the power supply group.

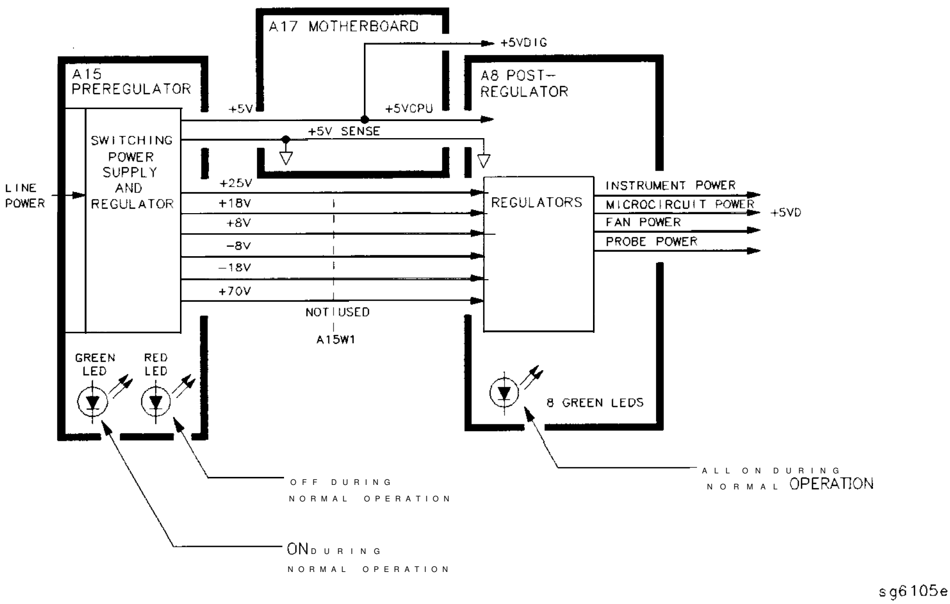



Figure 12-2. Power Supply Functional Group, Simplified Block Diagram

### A15 Preregulator

The **A15** preregulator steps down and **rectifies** the line voltage. It provides a fully regulated **+5** V digital supply, and several preregulated voltages that go to the **A8** post regulator assembly for additional regulation.

The **A15** preregulator assembly includes the line power module, a 60 **kHz** switching preregulator, and overvoltage protection for the **+5** V digital supply. It provides **LEDs,** visible from the rear of the instrument, to indicate either normal or shutdown status.

### Line Power Module

The line power module includes the line power switch, voltage selector switch, and main fuse. The line power switch is activated from the front panel. The voltage selector switch, accessible at the rear panel, adapts the analyzer to local line voltages of approximately 115 V or 230 V (with 350 VA maximum). The main fuse, which protects the input side of the preregulator against drawing too much line current, is also accessible at the rear panel. Refer to the ***HP 8753E Network Analyzer Installation and Quick Start Guide*** for line voltage tolerances and other power considerations.

### Preregulated Voltages

The switching preregulator converts the line voltage to several DC voltages. The regulated +5 V digital supply goes directly to the motherboard. The following partially regulated voltages are routed through **A15W1** to the **A8** post regulator for final regulation:

**+70 V   +25 V   +18 V   −18 V   +8 V   −8 V**

### Regulated + 5 V Digital Supply

The + 5 VD supply is regulated by the control circuitry in the **A15** preregulator. It goes directly to the motherboard, and from there to all assemblies requiring a low noise digital supply. A + 5 V sense line returns from the motherboard to the **A15** preregulator. The +5 V CPU is derived from the +5 VD in the **A8** post regulator and goes directly to the **A19** graphics system processor.

In order for the preregulator to function, the +5 V digital supply must be loaded by one or more assemblies, and the + 5 V sense line must be working. If not, the other preregulated voltages will not be correct.

### Shutdown Indications: the Green LED and Red LED

The green LED is on in normal operation. It is off when line power is not connected, not switched on, or set too low, or if the line fuse has blown.

The red LED, which is off in normal operation, lights to indicate a fault in the +5 V supply. This may be an over/under line voltage, over line current, or overtemperature condition. Refer to the troubleshooting chapters for more information.

## A8 Post Regulator

The A8 post regulator filters and regulates the DC voltages received from the A15 preregulator. It provides fusing and shutdown circuitry for individual voltage supplies. It distributes regulated constant voltages to individual assemblies throughout the instrument. It includes the overtemperature shutdown circuit, the variable fan speed circuit, and the air flow detector. Nine green LEDs provide status indications for the individual voltage supplies

Refer to the Power Supply Block Diagram located at the end of Chapter 5, "Power Supply Troubleshooting", to see the voltages provided by the A8 post regulator.

### Voltage Indications: the Green LEDs

The nine green LEDs along the top edge of the A8 assembly are on in normal operation, to indicate the correct voltage is present in each supply. If they are off or flashing, a problem is indicated. The troubleshooting procedures later in this chapter detail the steps to trace the cause of the problem.

### Shutdown Circuit

The shutdown circuit is triggered by overcurrent, overvoltage, undervoltage, or overtemperature. It protects the instrument by causing the regulated voltage supplies to be shut down. It also sends status messages to the A9 CPU to trigger warning messages on the analyzer display. The voltages that are not shut down are the +5 VD and +5 VCPU digital supplies from the preregulator, the fan supplies, the probe power supplies, and the display supplies. The shutdown circuit can be disabled momentarily for troubleshooting purposes by using a jumper to connect the SDIS line (A8TP4) to ground.

### Variable Fan Circuit and Air Flow Detector

The fan power is derived directly from the + 18 V and -18 V supplies from the A15 preregulator. The fan is not fused, so that it will continue to provide airflow and cooling when the instrument is otherwise disabled. If overheating occurs, the main instrument supplies are shut down and the fan runs at full speed. An overtemperature status message is sent to the A9 CPU to initiate a warning message on the analyzer display. The fan also runs at full speed if the air flow detector senses a low output of air from the fan. (Pull speed is normal at initial power on.)

### Display Power

The **A8** assembly supplies **+5** VCPU to the **A19** GSP through the motherboard. The GSP converts a portion of the **+5** VCPU to 3.3 V to drive the display and LVDS (low voltage differential signaling) logic The **A19** GSP **also** controls and supplies power to the **A27** backlight inverter. The voltages generated by the inverter are then routed to the display. Display power is not connected to the protective shutdown circuitry so that the **A18** display assemblies can operate during troubleshooting when other supplies do not work.

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Note  If blanking pulses from the **A19** GSP are not present, then **+3.3** V will not be sent to the display.

---

### Probe Power

The + 18 V and -18 V supplies are post regulated to + 15 V and -12.6 V to provide a power source at the front panel for an external RF probe or millimeter modules.

## Digital Control Theory

The digital control functional group consists of the following assemblies:

- Al front panel
- **A2** front panel processor
- **A9** CPU
- **A10** digital IF
- **A16** rear panel
- **A18** display
- **A19** GSP
- **A27** Inverter

These assemblies combine to provide digital control for the entire analyzer. They provide math processing functions, as well as communications between the analyzer and an external controller and/or peripherals Figure 12-3 is a simplified block diagram of the digital control functional group.

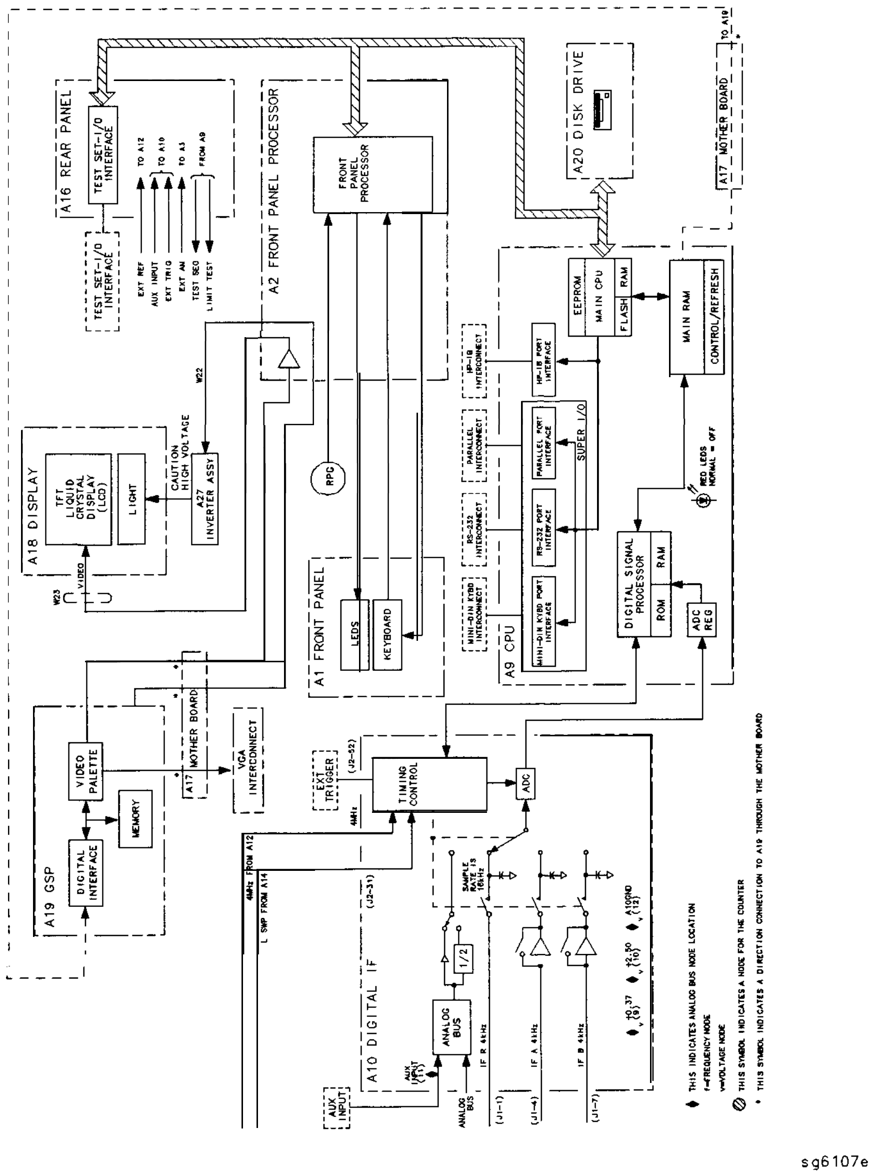



**Figure** 12-3. Digital Control Group, Simplified Block Diagram

## A1 Front Panel

The A1 front panel assembly provides user interface with the analyzer. It includes the keyboard for local user inputs, and the front panel **LEDs** that indicate instrument status The RPG (rotary pulse generator) is not electrically connected to the front panel, but provides user inputs directly to the front panel processor.

## A2 Front Panel Processor

The **A2** front panel processor detects and decodes user inputs from the front panel and the RPG, and transmits them to the CPU. It has the capability to interrupt the CPU to provide information updates. It controls the front panel **LEDs** that provide status information to the user.

The **A2** also contains the LVDS (low voltage differential signaling) receivers which connect to the graphics processor. The received video signals are routed to the **A18** display.

## A9 CPU/A10 Digital IF

The **A9** CPU assembly contains the main CPU (central processing unit), the **digital** signal processor, memory storage, and interconnect port interfaces The main CPU is the master controller for the analyzer, including the other dedicated microprocessors The memory includes EEPROM, DRAM, flash ROM, SRAM and boot ROM.

Data from the receiver is serially clocked into the **A9** CPU assembly from the **A10** digital IF'. The data taking sequence is triggered either from the **A14 fractional-N** assembly, externally from the rear panel, or by software on the **A9** assembly.

### Main CPU

The main CPU is a **32-bit** microprocessor that maintains **digital** control over the entire instrument through the instrument **bus.** The main CPU receives external control information from the front panel or HP-IB, and performs processing and formatting operations on the raw data in the main RAM. It controls the digital **signal** processor, the front panel processor, the display processor, and the interconnect port interfaces. In addition, when the analyzer is in the system controller mode, the main CPU controls peripheral devices through the peripheral port interfaces

The main CPU has a dedicated flash ROM that contains the operating system for instrument control. Front panel settings are stored in **SRAM,** with a battery providing at least 5 years of backup storage when external power is off.

### Main RAM

The main RAM (random access memory) is shared memory for the CPU and the digital signal processor. It stores the raw data received from the digital signal processor, while additional calculations are performed on it by the CPU. The CPU reads the resulting formatted data from the main RAM and converts it to GSP commands. It writes these commands to the GSP for output to the analyzer display.

### EEPROM

EEPROM (electrically-erasable programmable read only memory) contains factory set correction constants **unique** to each instrument. These constants correct for hardware variations to maintain the highest measurement accuracy. The correction constants can be updated by executing the routines in Chapter 3, "Adjustments and Correction Constants."

### Digital Signal Processor

The digital signal processor receives the digitized data from the A10 digital IF. It computes discrete Fourier transforms to extract the complex phase and magnitude data from the 4 **kHz** IF signal. The resulting raw data is written into the main RAM.

## Al8 Display

The Al8 display is an 8.4 inch LCD with associated drive circuitry. It receives a **+3.3** V power supply from the A19 GSP, along with the voltage generated from the A27 backlight inverter. It receives the following signals from the A19 GSP:

- digital **TTL** horizontal sync
- digital **TTL** vertical sync
- blanking
- data clock
- digital **TTL** red video
- **digital TTL green** video
- digital **TTL** blue video

## A19 GSP

The A19 graphics system processor is the main interface between the A9 CPU and the Al8 display. The CPU **(A9)** converts the formatted data to GSP commands and writes it to the GSP. The GSP processes the data to obtain the necessary video signals, which are then used for the following purposes:

- The video signals are used to produce VGA compatible RGB output signals, which are routed to the Al6 rear panel.
- The video signals are converted by an LVDS (low voltage differential signaling) driver which translates the signals to low level differential signals to help **eliminate** radiated emissions The converted video signals are then routed to the A2 assembly, where they are received and sent to the Al8 display.

The A19 assembly receives the **+5** VCPU which is used for processing and supplying power to the A27 backlight inverter (+ 5 **VCPU)** and the Al8 display **(3.3 V).**

## A27 Inverter

The **A27** backlight inverter assembly supplies the ac voltage for the backlight tube in the Al8 display assembly. This assembly takes the + 5 VCPU and converts it to approximately 380 **Vac** with 5 ma of current at 40 **kHz.** There are two control lines:

- Digital ON/OFF
- Analog Brightness
  - 100% intensity is 0 V
  - **50%** intensity is 4.5 V

## Al6 Bear Panel

The Al6 rear panel includes the following interfaces:

TEST **SET I/O** INTERCONNECT. This provides control signals and power to operate duplexer test adapters

EXT **REF.** This allows for a frequency reference signal input that can phase lock the analyzer to an external frequency standard for increased frequency accuracy.

The analyzer automatically enables the external frequency reference feature when a signal is connected to this input. When the signal is removed, the analyzer automatically switches back to its internal frequency reference.

**10 MHZ PRECISION REFERENCE. (Option 1D5)** This output is connected to the EXT REF (described above) to improve the frequency accuracy of the analyzer.

**AUX** INPUT. This allows for a dc or ac voltage input from an external signal source, such as a detector or function generator, which you can then measure, using the S-parameter menu. (You can also use this connector as an analog output in service routines.)

**EXT AM.** This allows for an external analog signal input that is applied to the ALC circuitry of the analyzer's source. This input analog signal amplitude modulates the RF output signal.

**EXT** TRIG. This allows connection of an external negative **TTL-compatible** signal that will trigger a measurement sweep. The trigger can be set to external through **softkey** functions.

**TEST SEQ.** This outputs a **TTL** signal that can be programmed in a test sequence to be high or low, or pulse (10 **μseconds)** high or low at the end of a sweep for a robotic part handler interface.

**LIMIT TEST.** This outputs a **TTL** signal of the limit test results as follows:

Pass: **TTL high**

Fail: **TTL low**

**VGA** OUTPUT. This provides a video output of the analyzer display that is capable of running a PC VGA monitor.

## Source Theory Overview

The source produces a highly stable and accurate RF output signal by phase locking a YIG oscillator to a harmonic of the synthesized **VCO** (voltage controlled oscillator). The source output produces a CW or swept signal between 300 **kHz** and 3 **GHz** (or 300 **kHz** and 6 **GHz** for Option 006) with a maximum leveled power of + 10 **dBm.** The source's built-in 70 **dB** step attenuator allows the power to go as low as -85 **dBm.**

The full frequency range of the source is produced in 14 subsweeps, one in super low band, two in low band, and eleven in high band. The high band frequencies (16 MHz to 3 **GHz)** or (16 MHz to 6 **GHz** for Option 006) are achieved by harmonic mixing, with a different harmonic number for each subsweep. The low band frequencies (300 **kHz** to 16 MHz) are down-converted by fundamental mixing. The super low band frequencies (10 **kHz** to 300 **kHz)** are sent directly from the Al2 reference board to the output of the A3 source assembly. This band is not phased locked nor does it use the ALC. It is the basic amplified output of the fractional-N synthesizer.

The source functional group consists of the individual assemblies described below.

### **A14/A13** Fractional-N

These two assemblies comprise the synthesizer. The 30 to 60 MHz VCO in the Al4 assembly generates the stable LO frequencies for fundamental and harmonic mixing.

### Al2 Reference

This assembly provides stable reference frequencies to the rest of the instrument by dividing down the output of a 40 MHz crystal oscillator. In low band operation, the output of the fractional-N synthesizer is mixed down in the Al2 reference assembly. (The 2nd **LO** signal from the Al2 assembly is explained in Receiver Theory.) The Al2 is **also** the origin of the super low band portion of the 87533 source.

## A7 Pulse Generator

A step recovery diode in the pulse generator produces a comb of harmonic multiples of the VCO output. These harmonics provide the high band LO (local oscillator) input to the samplers. In low band and super low band the operation the pulse generator is turned off.

## All Phase Lock

This assembly compares the **first** IF (derived from the source output in the **A4** sampler) to a stable reference, and generates an error voltage that is integrated into the drive for the **A3** source assembly.

## A3 Source

This assembly includes a 3.0 to 6.8 **GHz** YIG oscillator and a 3.8 **GHz** cavity oscillator. The outputs of these oscillators are mixed to produce the RF output signal. In Option 006 (30 **kHz** to 6 **GHz)** the frequencies 3.0 to 6.0 **GHz** are no longer a mixed product, but are the direct output of the YIG Oscillator. The signal tracks the stable output of the synthesizer. The ALC (automatic leveling control) circuitry is also in the **A3** assembly.

# Source Super Low Band Operation

The Super Low Band Frequency Range is 10 **kHz** to 300 **kHz.** These frequencies are generated by the **A12** Reference Board. They are the **amplified** output of the fractional-N synthesizer. This output is not phase locked and is not subject to ALC control. Refer to **Table** 12-1.

**Table** 12-1. Super Low Band **Subsweep** Frequencies

| Fractional-N (MHz) | 1st IF (MHz) | RF Output (MHz) |
|---|---|---|
| 40.0 to 43.3 | 0.010 to 0.300 | 0.010 to 0.300 |

## Source Low Band Operation

The low band frequency range is 300 **kHz** to 16 MHz. These frequencies are generated by locking the **A3** source to a reference signal. The reference signal is synthesized by mixing down the fundamental output of the fractional-N **VCO** with a 40 MHz crystal reference signal. Low band operation differs from high band in these respects: The reference frequency for the All phase lock is not a **fixed** 1 MHz signal, but varies with the frequency of the fractional-N **VCO** signal. The sampler diodes are biased on to pass the signal through to the mixer. The **1st** IF signal from the **A4** sampler is not fixed but is identical to the source output signal and sweeps with it. The following steps outline the low band sweep sequence, illustrated in Figure 12-4.

1. A **signal (FN** LO) is generated by the fractional-N VCO. The VCO in the **A14 Fractional-N** assembly generates a CW or swept signal that is 40 MHz greater than the start frequency. The signal is divided down to 100 **kHz** and phase locked in the **A13** assembly, as in high band operation.
2. The fractional-N VCO **signal** is mixed with 40 **MHz** to produce a reference signal. The signal **(FN** LO) from the Fractional-N VCO goes to the **A12** reference assembly, where it is mixed with the 40 MHz VCXO (voltage controlled crystal oscillator). The resulting signal is the reference to the phase comparator in the All assembly.
3. The **A3** source is pretuned. The source output is fed to the **A4** sampler. The pretuned DAC in the All phase lock assembly sets the **A3** source to a frequency 1 to 6 MHz above the start frequency. This signal (source output) goes to the **A4** R input sampler/mixer assembly.
4. The **signal** from the source is fed back **(1st** IF') to the phase comparator. The source output signal passes directly through the sampler in the **A4** assembly, because the sampler is biased on. The signal **(1st IF)** is fed back unaltered to the phase comparator in the All phase lock assembly. The other input to the phase comparator is the heterodyned reference signal from the **A12** assembly. Any frequency difference between these two signals produces a proportional error voltage.
5. A tuning signal **(YO** DRIVE) **tunes** the source and **phase** lock is achieved. The error voltage is used to drive the **A3** source YIG oscillator to bring the YIG closer to the reference frequency. The loop process continues until the source frequency and the reference frequency are the same, and phase lock is achieved.

6. A synthesized sub sweep is generated. The source tracks the synthesizer. When lock is achieved at the start frequency, the synthesizer starts to sweep. This changes the phase lock reference frequency, and causes the source to track at a difference frequency 40 MHz below the synthesizer.

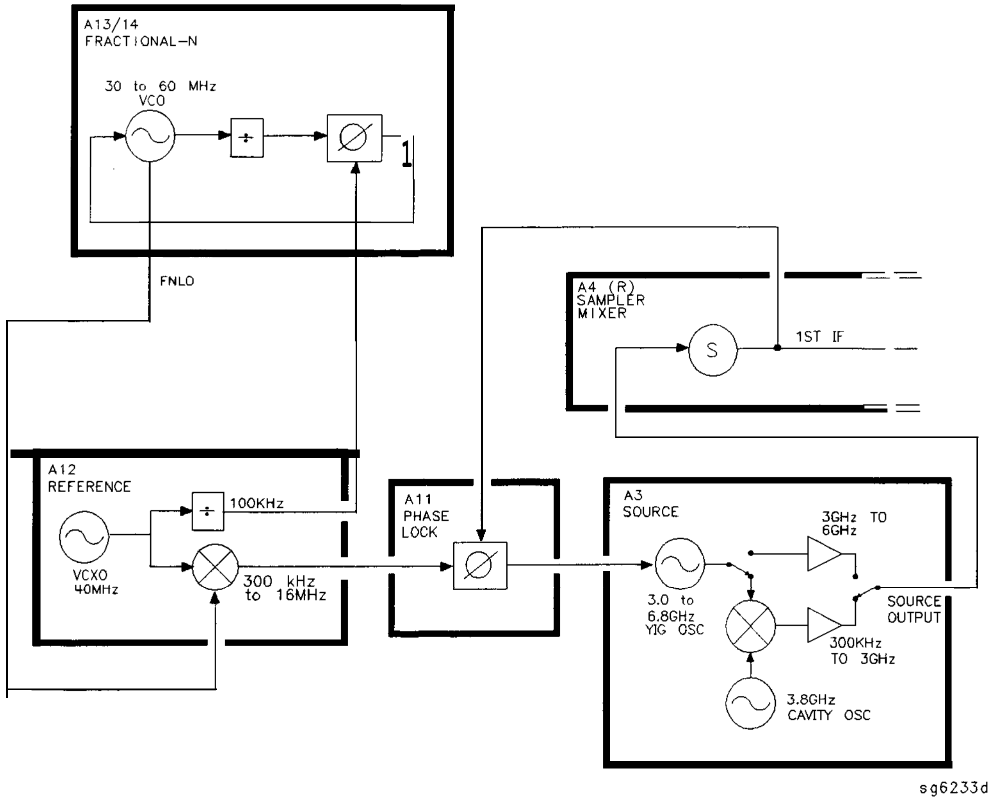



**Figure** 12-4. Low Band Operation of the Source

The full low band is produced in two sub sweeps, to allow addition IF **filtering** below 3 MHz. At the transition between subsweeps, the source is pretuned and then relocks. **Table** 12-2 lists the low band **subsweep** frequencies at the fractional-N VCO and the RF output.

**Table 12-2.** Low Band **Subsweep** Frequencies

| Fractional-N (MHz) | 1st IF (MHz) | Source Output (MHz) |
|---|---|---|
| 40.3 to 43.3 | 0.3 to 3.3 | 0.3 to 3.3 |
| 43.3 to 56.0 | 3.3 to 16.0 | 3.3 to 16.0 |

## Source High Band Operation

The high band frequency range is 16 MHz to 3.0 **GHz** or 16 MHz to 6.0 **GHz** with Option 006. These frequencies are generated in subsweeps by phase-locking the **A3** source signal to harmonic multiples of the fractional-N VCO. The high band **subsweep** sequence, **illustrated** in **Figure** 12-5, follows these steps:

1. A **signal (HI** OUT) is generated by the fractional-N VCQ. The VCO in the **A14** fractional-N assembly generates a CW or swept signal in the range of 30 to **6O** MHz. This signal is synthesized and phase locked to a 100 **kHz** reference signal from the **A12** reference assembly. The signal from the fractional-N VCO is divided by 1 or 2, and goes to the pulse generator.
2. A comb of harmonics **(1st** LO) is produced **in** the **A7** pulse generator. The divided down signal from the fractional-N VCO drives a step recovery diode (SRD) in the **A7** pulse generator assembly. The SRD multiplies the fundamental signal from the fractional-N into a comb of harmonic frequencies The harmonics are used as the **1st** LO (local oscillator) signal to the samplers One of the harmonic signals is 1 MHz below the start signal set from the front panel.
3. The **A3** source is pretuued. The source output is fed to the **A4** sampler. The **pretune** DAC in the All phase lock assembly sets the **A3** source to a **first** approximation frequency (1 to 6 MHz higher than the start frequency). This signal (RF OUT) goes to the **A4** R input sampler/mixer assembly.
4. The synthesizer **signal** and the source signal are combined by the sampler. A difference frequency is generated. In the **A4** sampler, the **1st** LO signal from the pulse generator is combined with the source output signal. The **IF** (intermediate frequency) produced is a **first** approximation of 1 MHz. This signal **(1st** IF') is routed back to the A11 phase lock assembly.
5. The difference frequency **(1st** IF') from the **A4** sampler is compared to a reference. The **1st** IF feedback signal from the **A4** is filtered and applied to a phase comparator circuit in the A11 phase lock assembly. The other input to the phase comparator is a crystal controlled 1 MHz signal from the **A12** reference assembly. Any frequency difference between these two signals produces a proportional error voltage.
6. A **tuning signal (YO DRIVE)** tunes the source and phase lock is achieved. The error voltage is used to drive the **A3** source YIG oscillator, in order to bring it closer to the required frequency. The loop process continues until the **1st** IF feedback signal to the phase comparator is equal to the 1 MHz reference signal, and phase lock is achieved.

7. A synthesized **subsweep** is generated by **A13/A14.** The **A3** source tracks the synthesizer. When the source is phase locked to the synthesizer at the start frequency, the synthesizer starts to sweep. The phase locked loop forces the source to track the synthesizer, **maintaining** a constant 1 **MHz 1st** IF signal.

   The full high band sweep is generated in a series of subsweeps, by phase locking the **A3** source signal to harmonic multiples of the fractional-N VCO. The 16 to 31 MHz **subsweep** is produced by a one half harmonic, using the **divide-by-2** circuit on the **A14** assembly. At the transitions between subsweeps, the source is **pretuned** and then **relocks. Table** 12-3 lists the high band **subsweep** frequencies from the fractional-N VCO and the source output.

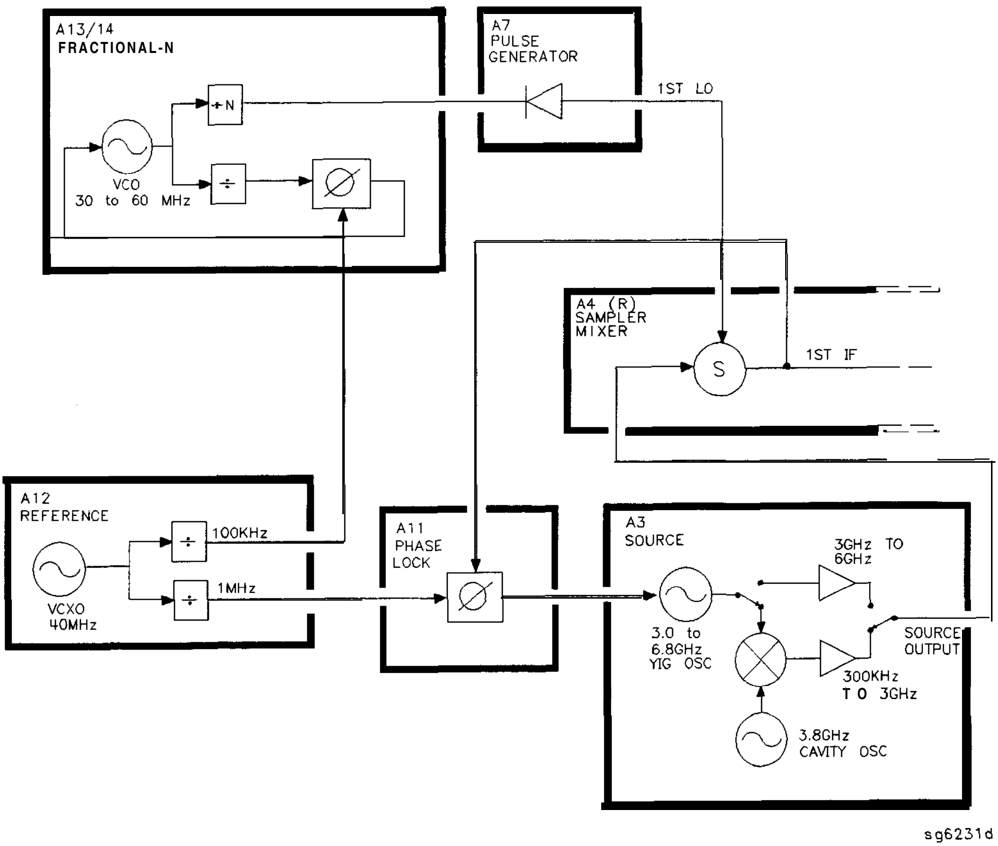



Figure 12-5. High Band Operation of the Source

## Table 12-3. High Band Subsweep Frequencies

| Fractional-N (MHz) | Harmonic | source output (MHz) |
|---|---|---|
| 30 to 60 | 1/2 | 16 to 31 |
| 30 to 60 | 1 | 31 to 61 |
| 30 to 60 | 2 | 61 to 121 |
| 40 to 59 | 3 | 121 to 178 |
| 35.4 to 59.2 | 5 | 178 to 296 |
| 32.8 to 59.4 | 0 | 296 to 536 |
| 35.7 to 59.5 | 15 | 536 to 893 |
| 33.0 to 59.5 | 27 | 893 to 1607 |
| 31.5 to 58.8 | 51 | 1607 to 3000 |
| option 006 | | |
| 37.0 to 59.5 | 83 | 3000 to 4950 |
| 49.0 to 59.4 | 101 | 4950 to 6000 |

## Source Operation in other Modes/Features

Resides the normal network analyzer mode, the HP **8753E** has extra modes and features to make additional types of measurements The following describes the key differences in how the analyzer operates to achieve these new measurements

### Frequency Offset

The analyzer can measure frequency-translating devices with the frequency offset feature.

The receiver operates normally. However, the source is pretuned to a different frequency by an offset entered by the user. The device under test **will** translate this frequency back to the frequency the receiver expects. Otherwise, phase locking and source operation occur as usual.

### Harmonic Analysis (Option 002)

The **analyzer** can measure the **2nd** or **3rd** harmonic of the fundamental source frequency, on a swept or CW basis, with the harmonic analysis feature (optional).

**To** make this measurement, the reference frequency (normally 1 MHz) from the **A12** reference assembly to the All phase lock assembly is divided by 1, 2, or 3. See **Figure** 12-6.

The fractional-N assemblies are also tuned so that the correct harmonic (comb tooth) of the **1st** LO is 0.500 or 0.333 MHz below the source frequency instead of the usual 1.000 MHz. **The** analyzer pretunes the **A3** source normally, then phase locks the **1st IF** to the new reference frequency to sweep the fundamental source frequency in the usual way. The key difference is that the **1st** IF (output from the R sampler) due to the fundamental and used for phase locking is now 0.500 or 0.333 MHz instead of 1.000 MHz.

Since the chosen VCO harmonic and the source differ by 0.500 or 0.333 MHz, then another VCO harmonic, 2 or 3 times higher in frequency, will be exactly 1.000 MHz away from the **2nd** or **3rd** harmonic of the source frequency. The samplers, then, will also down-convert these harmonics to yield the desired components in the **1st** IF at 1.000 MHz. Narrow **bandpass filters** in the receiver eliminate all but the 1.000 MHz signals; these pass through to be processed and displayed.

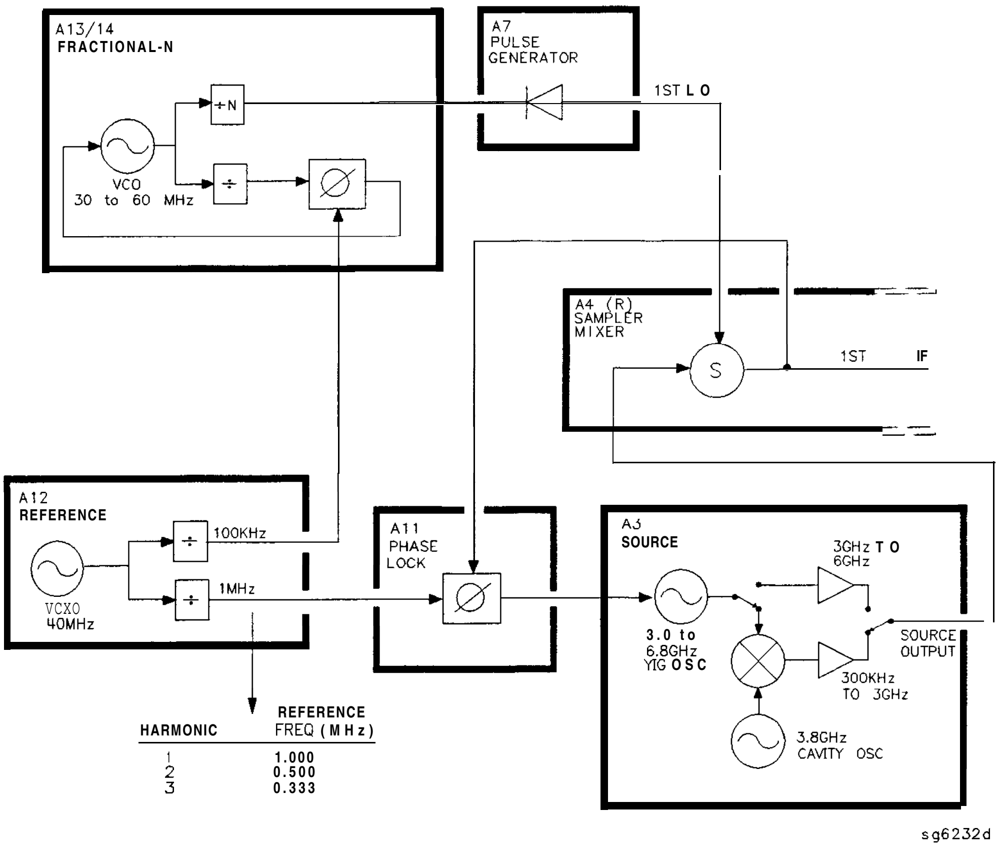



Figure 12-6. Harmonic Analysis

## External Source Mode

In external source mode, the analyzer phase locks its receiver to an external signal source. This source must be CW (not swept), but it does not need to be synthesized. The user must enter the source frequency into the analyzer. (The analyzer's internal source output is not used.)

To accomplish this, the phase lock loop is reconnected so that the tuning voltage from the A11 phase lock assembly controls the VCO of the **A14** fractional-N assembly and not the **A3** source. See Figure 12-7. The **VCO's** output still drives the **1st** LO of the samplers and down-converts the RF signal supplied by the external source. The resulting **1st** IF is fed back to the A11 phase lock assembly, compared to the 1.000 MHz reference, and used to generate a **tuning** voltage as usual. However, the tuning voltage controls the VCO to lock on to the external source, keeping the **1st** IF at exactly 1.000 MHz.

The analyzer normally goes through a pretune-acquire-track sequence to achieve phase lock. In external source mode, the fractional-N **VCO pretunes** as a closed-loop synthesizer referenced to the 100 **kHz** signal from the **A12** reference assembly. Then, to acquire or track, a switch causes the VCO to be tuned by the All phase lock assembly instead. (Refer to the Overall Block Diagram at the end of Chapter 4, “Start Troubleshooting Here.“)

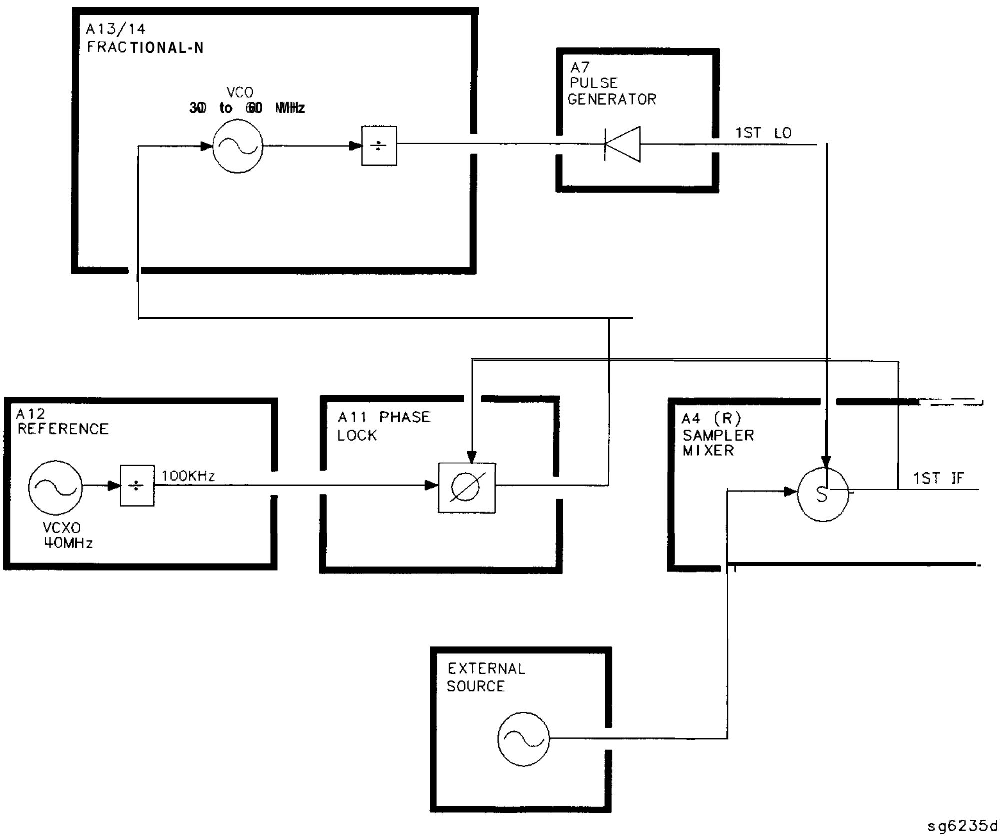



Figure 12-7. **External** Source Mode

## Tuned Receiver Mode

In tuned receiver mode, the analyzer is a synthesized, swept, narrow-band receiver only. The external signal source must be synthesized and reference-locked to the analyzer.

To achieve this, the analyzer's source and phase lock circuits are completely unused. See Figure 12-8. The fractional-N synthesizer is tuned so that one of its harmonics (1st LO) down-converts the RF input to the samplers (In contrast to external source mode, the analyzer does not phase lock at all. However, the 1st LO is synthesized.)

The analyzer can function as a swept tuned receiver, similar to a spectrum analyzer, but the samplers create spurious signals at certain frequencies, which limit the accuracy of such measurements

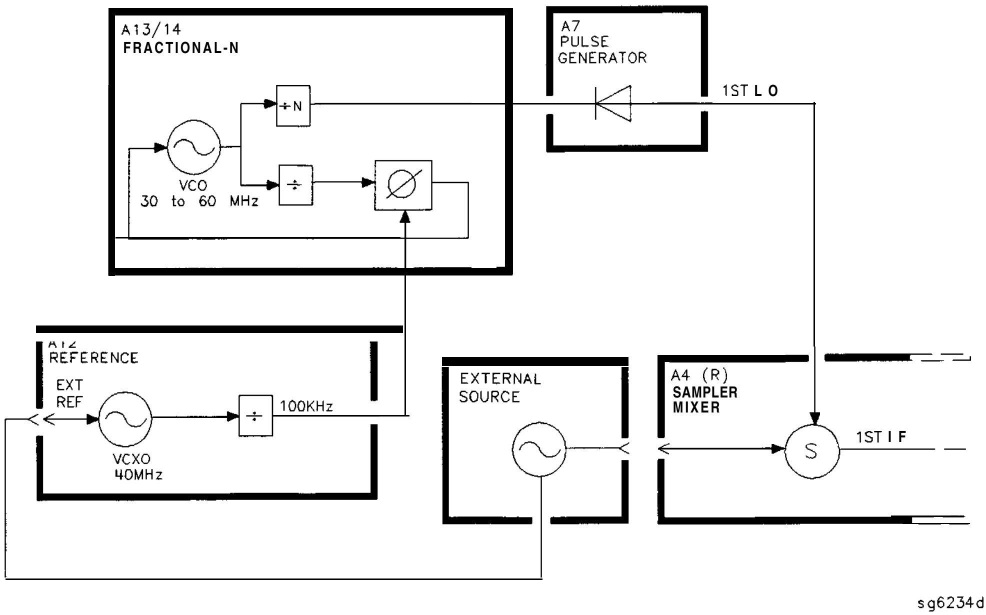



Figure 12-8. Tuned Receiver Mode

## Signal Separation

### The Built-In Test Set

**Figure** 12-9 shows a **simplified** block diagram of the analyzer's built-in test set.

#### A21 and A22 Test Port Couplers

The analyzer's test port couplers are used to separate signals incident to, reflected from, and transmitted from the device under test. Each test port coupler has a coupling coefficient factor of 16 **dB.**

#### A23 LED Front Panel

The LED front panel board indicates whether the source power is incident on the analyzer's test port 1 or test port **2.** The analyzer's source power is directed to test port 1 when making a forward transmission/reflection measurement. Similarly, source power is incident at test port 2 when making a reverse transmission/reflection measurement.

#### A24 Transfer Switch

The **A3** source output power is directed to either the analyzer's test port 1 or test port 2 via a low loss solid state transfer switch. With this switch, all four S-parameters can be updated continuously (for example: the data obtained from a full **2-port** calibration). In addition, the transfer switch provides termination for the inactive test port in order to minimize the crosstalk between the source and receiver sampler.

#### A25 Test Set Interface

The test set interface board provides biasing for active devices under test with an external dc voltage. This dc voltage is applied directly to the test port center pm. In addition, the test set interface board provides the drive signal for the **A24** forward/reverse transfer switch.

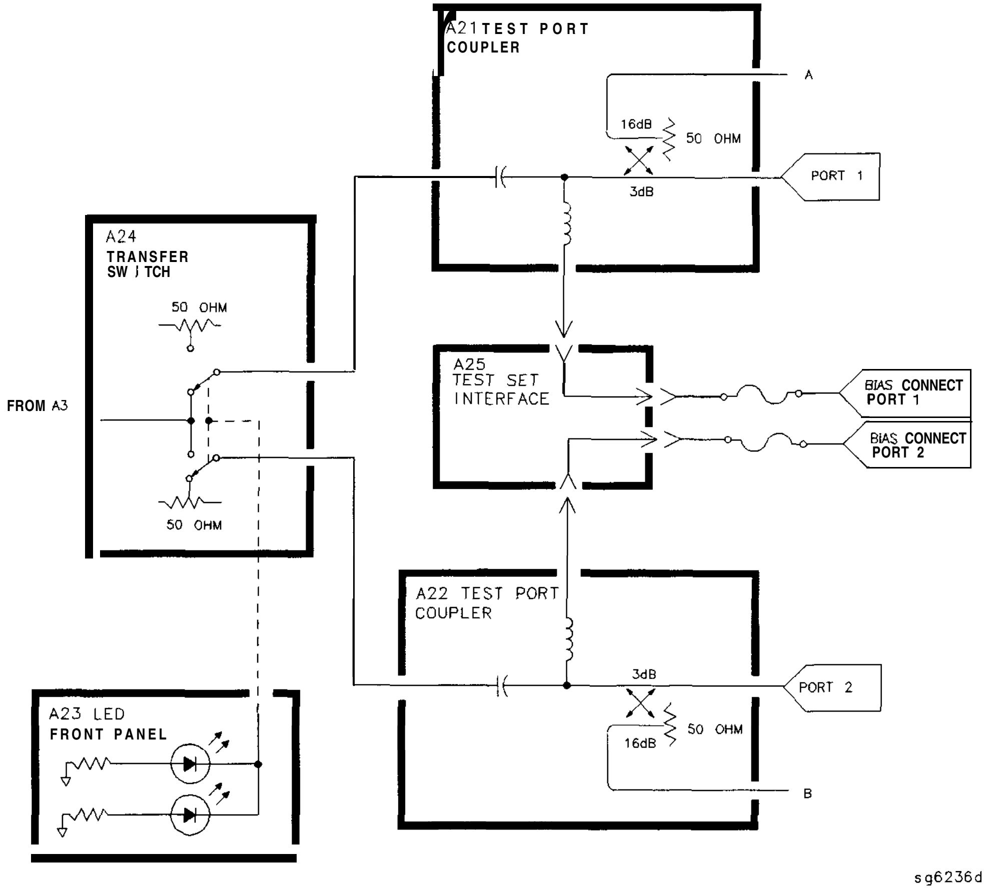



Figure 12-9. **Simplified** Block Diagram of the Built-in **Test** Set

## Receiver Theory

The receiver functional group consists of the following assemblies:

**A4** sampler/mixer

**A5** sampler/mixer

**A6** sampler/mixer

**A10** digital IF

These assemblies combine with the **A9** CPU (described in Digital Control Theory) to measure and process input signals into digital information for display on the analyzer. Figure 12-10 is a **simplified** block diagram of the receiver functional group. The **A12** reference assembly is **also** included in the illustration to show how the **2nd** LO signal is derived.

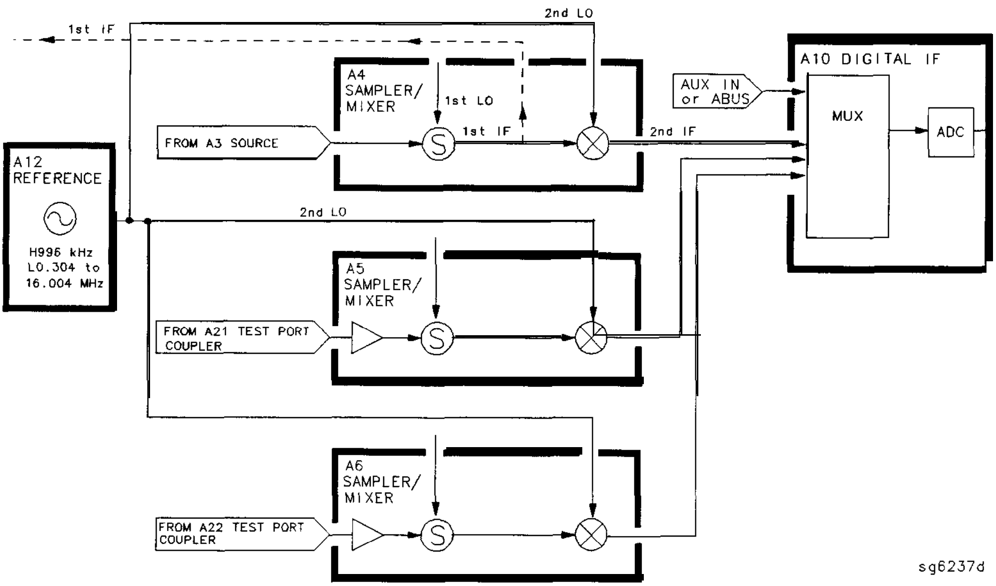



**Figure** 12-10. Receiver Functional Group, **Simplified** Block Diagram

## A4/A5/A6 Sampler/Mixer

The **A4, A5,** and **A6** sampler/mixers all down-convert the RF input signals to **fixed** 4 **kHz 2nd** IF signals with amplitude and phase corresponding to the RF' input. The **A5** and **A6** sampler/mixer assemblies both include an 8 **dB** gain preamplifier in front of the sampler. This improves the noise figure performance of the analyzer's receiver channels A and B.

### The Sampler Circuit in High Band

In high band operation, the sampling rate of the samplers is controlled by the **1st** LO from the **A7** pulse generator assembly. The **1st** LO is a comb of harmonics produced by a step recovery diode driven by the fractional-N VCO fundamental signal. One of the harmonic signals is 1 MHz below the start frequency set at the front panel. The **1st** LO is combined in the samplers with the RF input signal from the source. In the Option 006, samplers are additionally capable of recognizing RF input signals from 3 to 6 **GHz.** The mixing products are **filtered,** so that the only remaining response is the difference between the source frequency and the harmonic 1 MHz below it. This **fixed 1 MHz signal is the 1st IF. Part of the 1st IF signal from the R sampler is fed** back to the All phase lock assembly.

### The Sampler Circuit in Low Band or Super Low Band

In low band or super low band the sampler diodes are biased continuously on, so that the RF input signal passes through them unchanged. Thus the **1st** IF is identical to the RF output signal from the source (300 **kHz** to 16 MHz for **lowband;** 10 to 300 **kHz** for super lowband), and sweeps with it. Part of the **1st** IF signal from the R sampler is fed back to the All phase lock assembly.

(Refer to "Source Theory Overview" for information on high band and low band operation of the source.)

### The 2nd LO Signal

The **2nd** LO is obtained from the **A12** reference assembly. In high band, the **2nd** LO is **fixed** at 996 **kHz.** This is produced by feeding the 39.34 MHz output of a phase-locked oscillator in the **A12** assembly through a **divide-by-40** circuit.

In low band, the **2nd LO** is a variable frequency produced by mixing the output of the fractional-N **VCO** with a **fixed** 39.996 MHz signal in the **A12** assembly. The **2nd LO** covers the range of 0.014 to 16.004 MHz in two subsweeps that correspond with the source subsweeps These subsweeps are 0.304 to 3.304 MHz and 3.304 to 16.004 MHz.

### The Mixer Circuit

The **1st** IF and the **2nd LO** are combined in the mixer circuit. The resulting difference frequency (the **2nd** IF) is a constant 4 **kHz** in both bands, as **Table** 12-4 shows

**Table** 12-4. Mixer Frequencies

| **Band** | **1st** IF | **2nd LO** | **2nd** IF |
|---|---|---|---|
| Super Low | 0.010 **to** 0.300 **MHz** | 0.014 **to** 0.304 **MHz** | 4.0 **kHz** |
| **Low** | **0.300 to** 16.0 **MHz** | 0.304 to 16.004 **MHz** | 4.0 **kHz** |
| **High** | **1.000 MHz** | 0.996 MHz | 4.0 **kHz** |

## **A10** Digital IF

The three 4 **kHz 2nd** IF **signals** from the sampler/mixer assemblies are input to the **A10** digital IF assembly. These signals are sampled at a 16 **kHz** rate. A fourth input is the analog bus, which can monitor either an external input at the rear panel AUX IN connector, or one of 31 internal nodes. A multiplexer sequentially directs each of the signals to the ADC (analog-to-digital converter). Here they are converted to digital form and sent to the **A9** CPU assembly for processing. Refer to “Digital Control Theory” for more information on signal processing.

# 13

# Replaceable Parts

This chapter contains information for ordering replacement parts for the HP 8753E network analyzer. Replaceable parts include the following:

- major assemblies
- cables
- chassis hardware

In general, parts of major assemblies are not listed. Refer to Table 13-1 at the back of this chapter to help interpret part descriptions in the replaceable parts lists that follow.

## Replacing an Assembly

The following steps show the sequence to replace an assembly in an HP 8753E network analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts"
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures"
4. Perform the necessary adjustments. Refer to Chapter 3, "Adjustments and Correction Constants "
5. Perform the necessary performance tests Refer to Chapter 2, "System **Verification** and Performance Tests. "

## Rebuilt-Exchange Assemblies

Under the rebuilt-exchange assembly program, certain factory-repaired and tested modules (assemblies) are available on a trade-in basis These assemblies are offered for lower cost than a new assembly, but meet all factory specifications required of a new assembly.

The defective assembly must be returned for credit under the terms of the rebuilt-exchange assembly program. Any spare assembly stock desired should be ordered using the new assembly part number. **Figure** 13-1 illustrates the module exchange procedure. "Major Assemblies, **Top"** and "Major Assemblies, Bottom" list all major assemblies, including those that can be replaced on an exchange basis

## Ordering Information

**To** order a part listed in the replaceable parts lists, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

To order a part that is not listed **in** the replaceable parts lists, include the instrument model number, complete instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

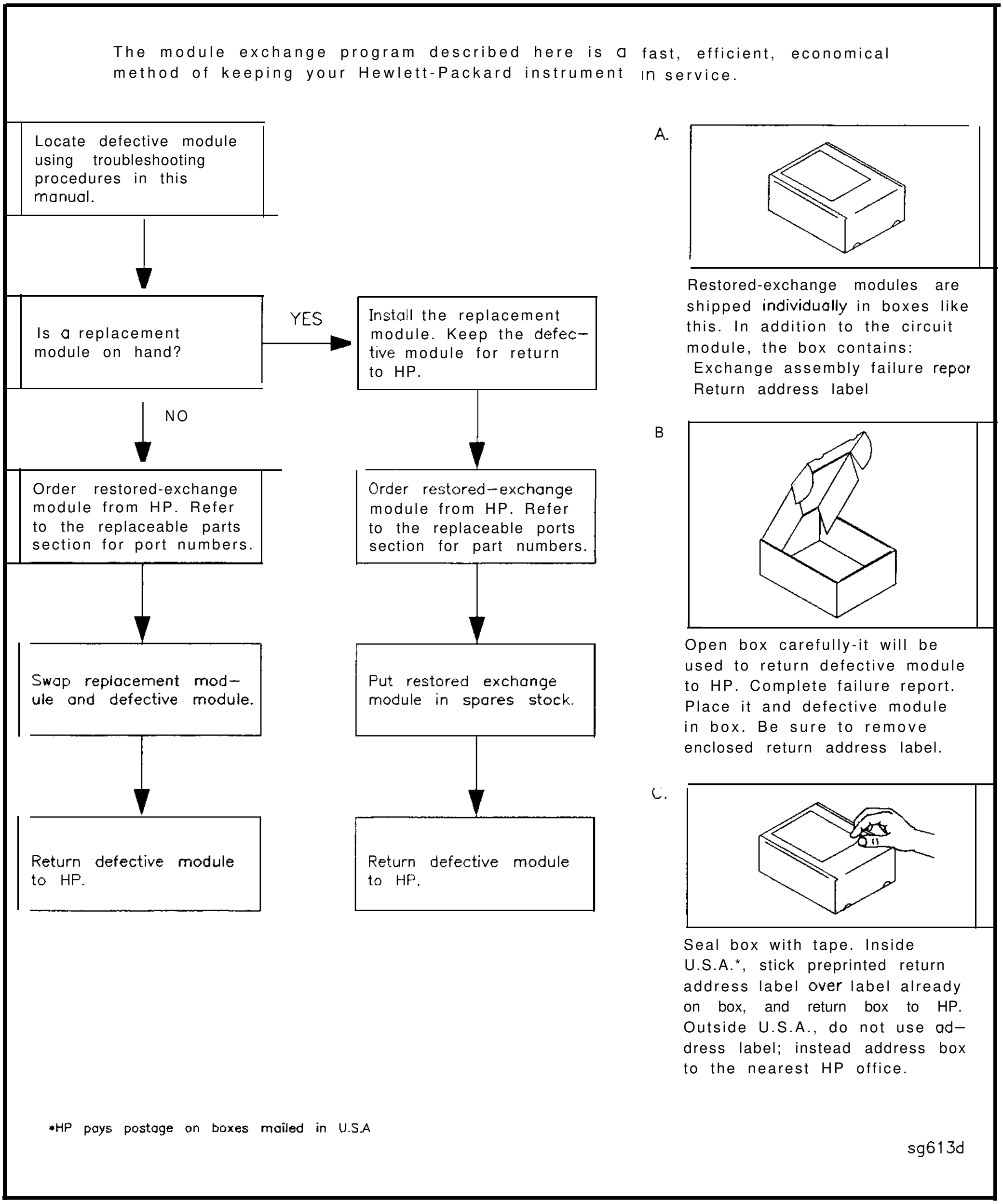



Figure 13-1. Module Exchange Procedure

## Replaceable Part Listings

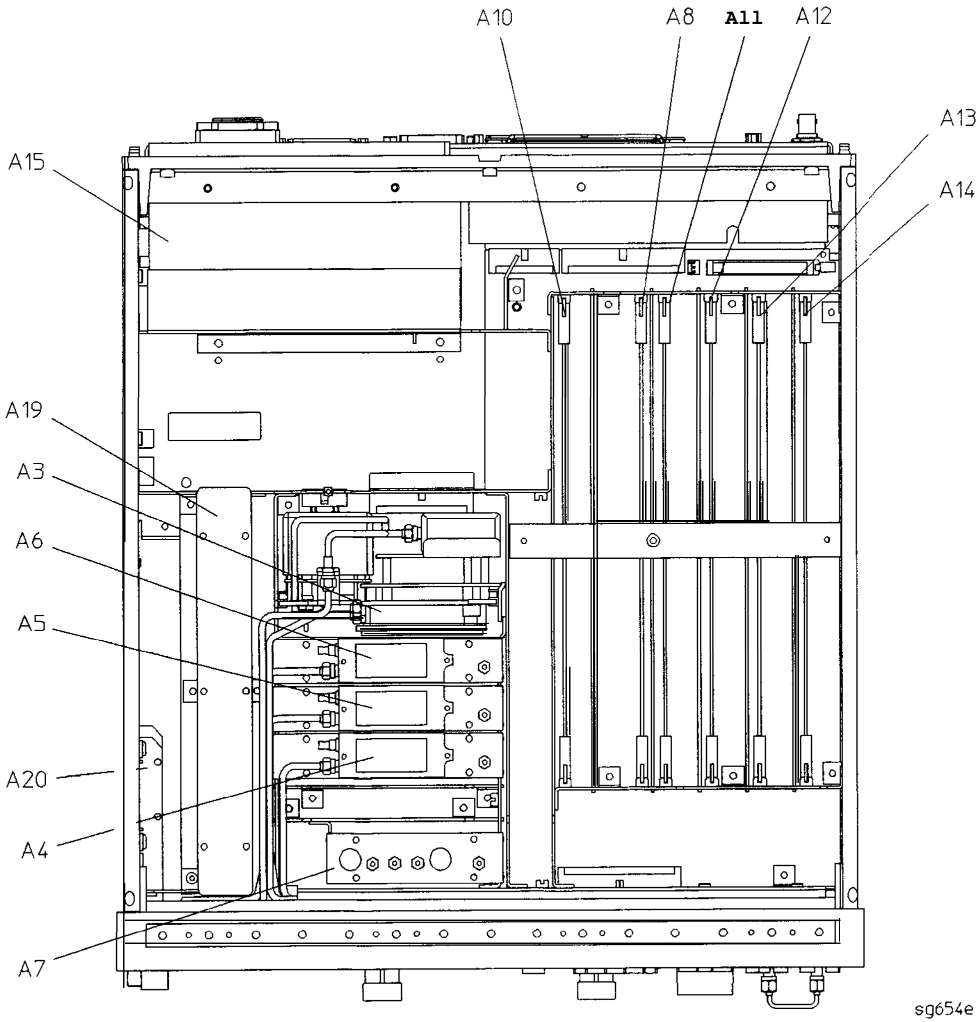
The following pages list the replacement part numbers and descriptions for the HP 8753E Network Analyzer. Illustrations with reference designators are provided to help identify and locate the part needed. The parts lists are organized into the following categories:

- Major Assemblies, Top
- Major Assemblies, Bottom
- Cables, Top
- Cables, Bottom
- Cables, Front
- Cables, Rear
- Cables, Source
- Front Panel, Outside
- Front Panel, Inside
- Rear Panel
- Rear Panel, Option 1D5
- Hardware, Top
- Hardware, Bottom
- Hardware, kont
- Hardware, Test Set Deck
- Hardware, Disk Drive Support
- Hardware, Memory Deck
- Hardware, Preregulator
- Chassis Parts, Outside
- Chassis Parts, Inside
- Miscellaneous

## **Major** Assemblies, Top

| Ref. **Desig.** | option | **HP Part Number** | **Qty** | **Description** |
|---|---|---|---|---|
| A1 | | | | NOT SHOWN (see **"Front Panel** Assembly, **Inside")** |
| **A2** | | | | NOT SHOWN (see 'Front Panel **Assembly,** Inside") |
| **A3** | | **08753-60231** | 1 | **ASSY-SOURCE** 3 **GHz** |
| **A3** | | **08753-69231** | 1 | **ASSY-SOURCE** 3 **GHz (REBUILT-EXCHANGE)** |
| **A3** | 006 | **08753-60146** | 1 | **ASSY-SOURCE** 6 **GHz** |
| **A3** | 006 | **08753-69146** | 1 | ASSY-SOURCE 6 **GHz (REBUILT-EXCHANGE)** |
| The following **parts** apply to **instruments** with **serial numbers greater** than **US3739xxxx** or **JP3802xxxx,** and to instruments having **all** three samplers replaced. | | | | |
| **A4** | | **08753-60907** | 1 | ASSY-SAMPLER R **(REBUILT-EXCHANGE: 08753-69907)** |
| **A5** | | **08753-60908** | 1 | **ASSY-SAMPLER** A **(REBUILT-EXCHANGE: 08753-69908)** |
| **A6** | | **08753-60908** | 1 | **ASSY-SAMPLER** B **(REBUILT-EXCHANGE: 08753-69908)** |
| The following **parts** apply **to** instruments with serial numbers in the form of **US3739xxxx** or **JP3802xxxx. If** all three **samplers** are being replaced, we the part **numbers** listed above. | | | | |
| **A4** | | **08753-60004** | 1 | ASSY-SAMPLER R **(REBUILT-EXCHANGE: 08753-69004)** |
| **A5** | | **08753-60169** | 1 | **ASSY-SAMPLER** A **(REBUILT-EXCHANGE: 08753-69169)** |
| **A6** | | **08753-60169** | 1 | **ASSY-SAMPLER** B **(REBUILT-EXCHANGE: 08753-69169)** |
| **A7** | | **08753-60164** | 1 | **BD ASSY-PULSE GENERATOR** |
| **A7** | | **08753-69164** | 1 | **BD ASSY-PULSE GENERATOR (REBUILT-EXCHANGE)** |
| **A8*** | | **08753-60366** | 1 | BD **ASSY-POST REGULATOR** |
| **A10** | | **08753-60095** | 1 | BD **ASSY-DIGITAL IF** |
| A11 | | **08753-60162** | 1 | **BD ASSY-PHASE LOCK** |
| **A12** | | **08753-60357** | 1 | **BD ASSY-REFERENCE** |
| **A13** | | **08753-60013** | 1 | BD **ASSY-FRAC** N **ANALOG** |
| **A14** | | **08753-60068** | 1 | BD **ASSY-FRAC** N **DIGITAL** |
| **A15** | | **08753-60098** | 1 | **ASSY-PREREGULATOR** |
| **A15** | | **08753-69098** | 1 | **ASSY-PREREGULATOR (REBUILT-EXCHANGE)** |
| **A16** | | | | **NOT** SHOWN **(see** "Bear Panel Awembly") |
| **A17** | | | | NOT SHOWN (see **"Chassis Parts, Inside")** |
| **A18** | | | 1 | NOT **SHOWN** (see **"Front Panel** Assembly, Inside") |
| **A19** | | **08753-60271** | 1 | **BD ASSY-GRAPHICS PROCESSOR** (under **sheet** metal cover) |
| **A20** | | **08720-60190** | 1 | **ASSY-DISK DRIVE** |
| **A27** | | | 1 | NOT **SHOWN** (see "Front **Panel Assembly, Inside")** |
| **A26** | **1D5** | | | **NOT** SHOWN **(see** 'Rear Panel Assembly, Option **1D5")** |
| **B1** | | | | **NOT** SHOWN (see "Rear Panel Assembly") |
| **RPG** | | | | **NOT** SHOWN **(see** "Front Panel Assembly, **Inside")** |

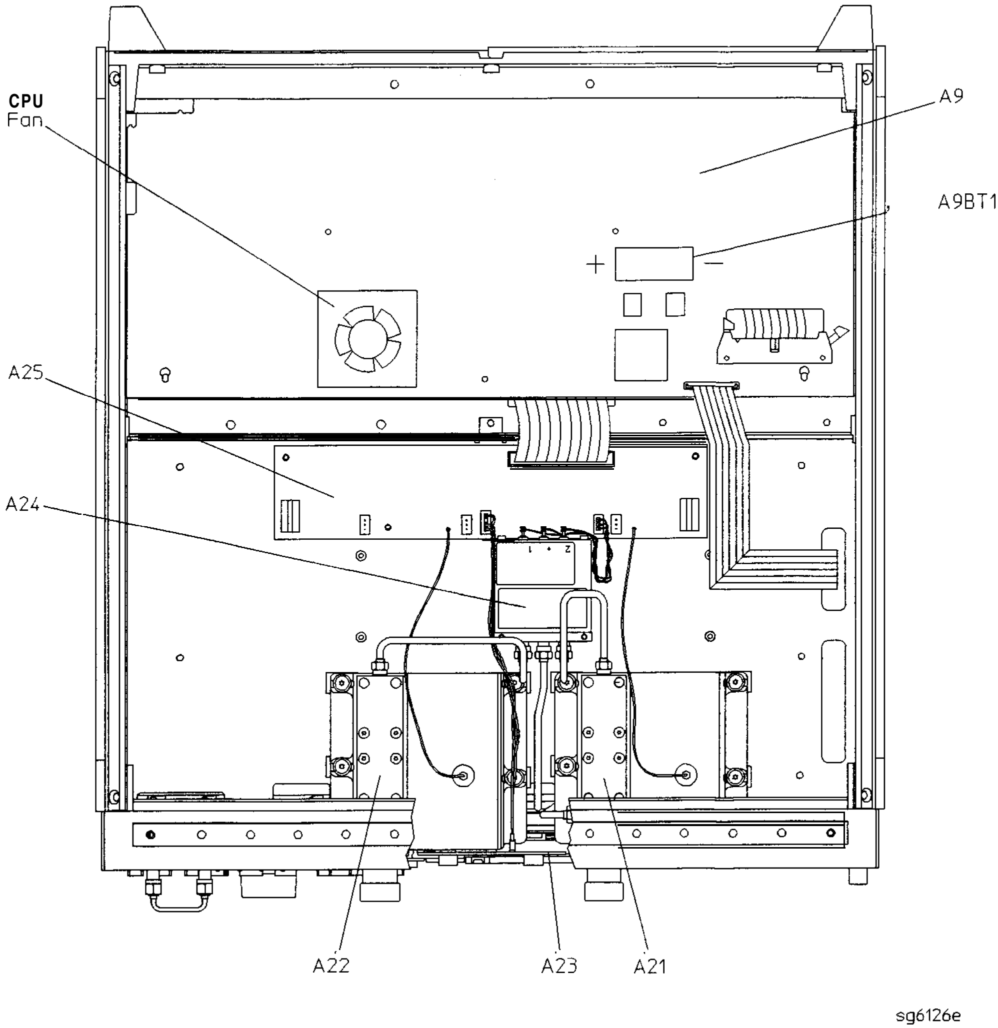
• **For** fuse part **numbers** on the AS **Post** Regulator, refer to **"Miscellaneous"** in **this** chapter.


A10
A8
A11
A12
A13
A14
A15
A19
A3
A6
A5
A20
A4
A7
sg654e

# Major Assemblies, Bottom

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| A9 | | 08753-60315 | 1 | CPU REPAIR KIT |
| A9 | | 08753-69315 | 1 | CPU REPAIR KIT (REBUILT-EXCHANGE) |
| CPU FAN | | 5060-8776 | 1 | A9 CPU FAN[1] |
| A9BT1 | | 1420-0338 | 1 | BATTERY-LITHIUM 3V 1.2AH |
| A21 | | 5087-7007 | 1 | ASSY-TEST PORT COUPLER |
| A21 | | 5087-6007 | 1 | ASSY-TEST PORT COUPLER (REBUILT-EXCHANGE) |
| A21 | 075 | 5087-7008 | 1 | ASSY-TEST PORT COUPLER |
| A21 | 075 | 60874008 | 1 | ASSY-TEST PORT COUPLER (REBUILT-EXCHANGE) |
| A22 | | 6087-7007 | 1 | ASSY-TEST PORT COUPLER |
| A22 | | 60874007 | 1 | ASSY-TEST PORT COUPLER (REBUILT-EXCHANGE) |
| A22 | 075 | 6087-7008 | 1 | ASSY-TEST PORT COUPLER |
| A22 | 075 | 60874008 | 1 | ASSY-TEST PORT COUPLER (REBUILT-EXCHANGE) |
| A23 | | 08753-60145 | 1 | BD ASSY-LED FRONTPANEL |
| A24 | | 5086-7539 | 1 | ASSY-TRANSFER SWITCH |
| A24 | | 5086-6539 | 1 | ASSY-TRANSFER SWITCH (REBUILT-EXCHANGE) |
| A25 | | 08753-60280 | 1 | BD ASSY-TEST SET INTERFACE |

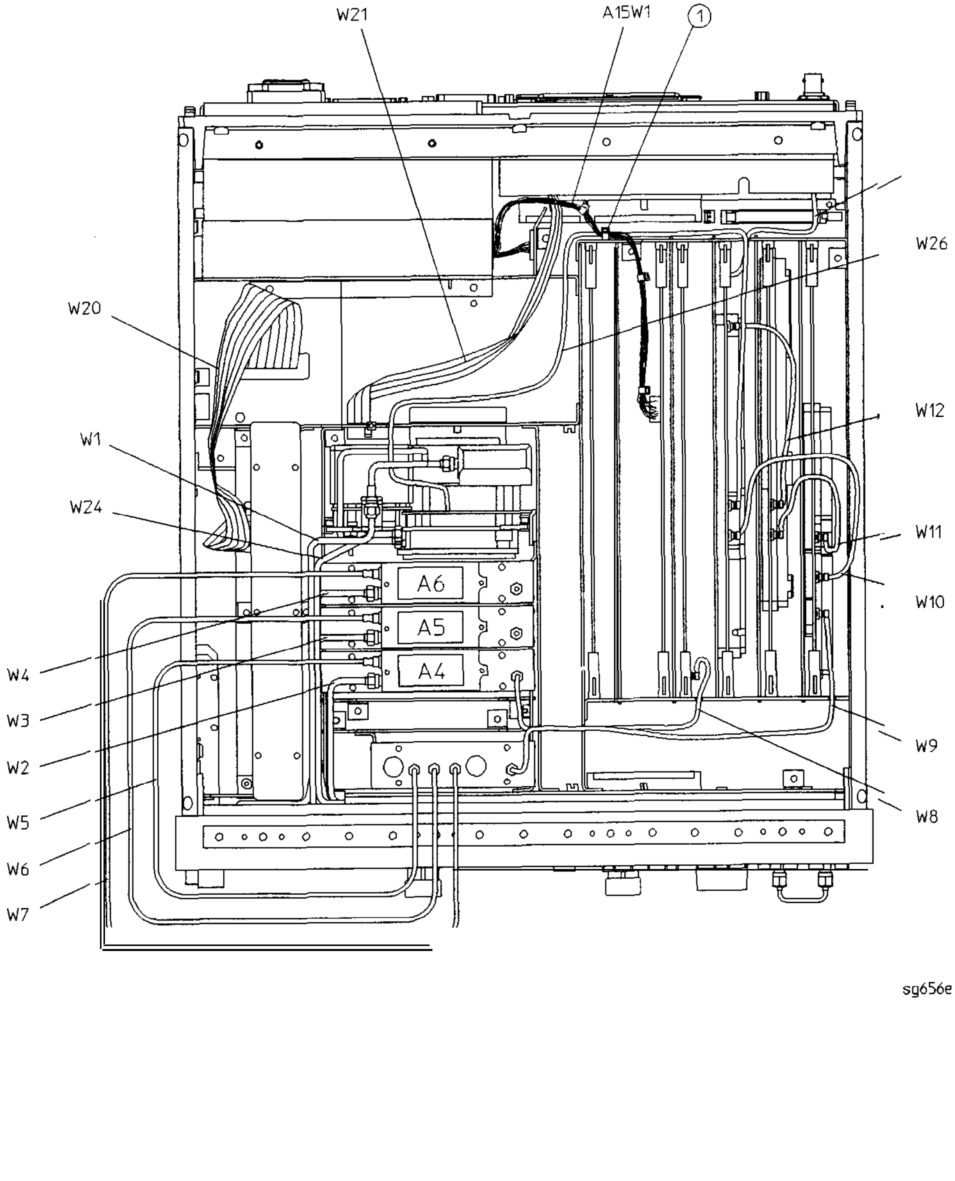
1 Remove the backing from the heat transfer area before re-assembly.


CPU
Fan
A9
A9BT1
A25
A24
A22
A23
A21
sg6126e

# Cables, Top

| Ref. Desig. | Type* | Opt | HP Part Number | Qty | Description |
|---|---|---|---|---|---|
| 1 | | | 1400-0249 | 1 | CABLE TIE (15W1 to CHASSIS) |
| A15W1 | 18W | | (part of A15) | 1 | PREREGULATOR (A15) to POST REGULATOR (A8J2) and MOTHERBOARD (A17J3) |
| W1 | SR | | 08753-20285 | 1 | SOURCE ASSY (A3W4) to TRANSFER SWITCH (A24) |
| W2 | SR | | 08753-20291 | 1 | FP (R CHANNEL IN) to SAMPLER-R (A4) |
| ws | SR | | 08753-20286 | 1 | TEST FORT 1 COUPLER (A21) to SAMPLER-A (AS) |
| W4 | SR | | 08753-20366 | 1 | TEST PORT 2 COUPLER (A22) to SAMPLER-B (A6) |
| W5 | F | | 08753-60027 | 1 | SAMPLER-R (A4) to PULSE GENERATOR (A7) |
| W6 | F | | 08753-60027 | 1 | SAMPLE%A (A5) to PULSE GENERATOR (A7) |
| W7 | F | | 08753-60027 | 1 | SAMPLER-B (A6) to PULSE GENERATOR (A7) |
| W8 | F | | 08753-60029 | 1 | PHASE LOCK (A11J1) to SAMPLER-R (A4) |
| W9 | F | | 8120-5021 | 1 | FRAC-N DIGITAL (A14J1) to PULSE GENERATOR (A7) |
| W10 | F | | 08753-60029 | 1 | FRAC-N DIGITAL (A14J2) to REFERENCE(A12J1) |
| W11 | F | | 08753-60029 | 1 | FRAC-N DIGITAL (A14J3) to FRAC-N ANALOG (A13J1) |
| W12 | F | | 08753-60029 | 1 | FRAC-N ANALOG (A13J2) to REFERENCE(A12J2) |
| W13 | F | | 08753-60026 | 1 | REFERENCE (A12J3) to RP (EXT REF) |
| W24 | SR | | 08753-20291 | 1 | SOURCE ASSY (A3) to FP (R CHANNEL OUT) |
| W26 | F | | 8120-5026 | 1 | SOURCE ASSY (A3) to REFERENCE (A12J4) |
| W21 | 14R | | 8120-6876 | 1 | MOTHERBOARD (A17J12) to REAR PANEL VGA OUT |
| W20 | 34R | | 8120-6890 | 1 | MOTHERBOARD (A17J11) to CPU (A9J5) |

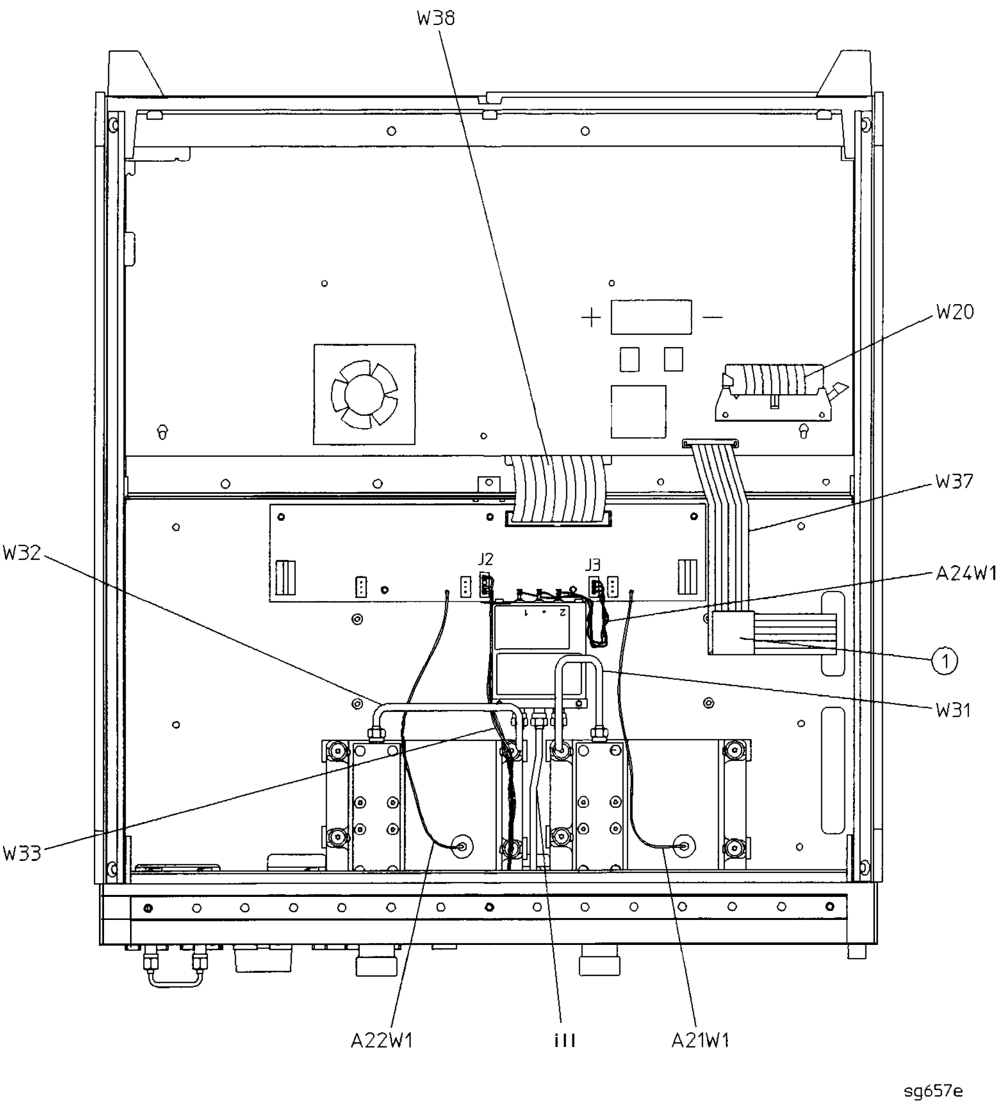
* *n*W Wire Bundle (*n* is the number of wires in the bundle)
*n*R Ribbon Cable (*n* is the number of wires in the ribbon)
F Flexible Coax Cable
SR Semi-Rigid Coax Cable


W21
A15W1
1
W26
W20
W12
W1
W24
W11
W10
A6
A5
A4
W4
W3
W2
W9
W5
W8
W6
W7
sg656e

## Cables, Bottom

| Ref. Desig. | Type* | Opt | HP Part Number | Qty | Description |
|---|---|---|---|---|---|
| 1 | | | 1400-0611 | 1 | CABLE CLAMP |
| A21W1 | 1W | | 8120-6483 | 1 | GRAY WIRE-TEST PORT 1 COUPLER (A21) to TEST SET INTERFACE (A25TP1) |
| A22W1 | 1W | | 8120-6483 | 1 | GRAY WIRE-TEST PORT 2 COUPLER (A22) to TEST SET INTERFACE (A25TP2) |
| A24W1 | SW | | 85047-60004 | 1 | TRANSFER SWITCH (A24) to TEST SET INTERFACE (A25J3) |
| W1 | SR | | 08753-20285 | 1 | SOURCE ASSY (A3W4) to TRANSFER SWITCH (A24) |
| W20 | 34R | | 8120-6890 | 1 | CPU/PIG (A9J7) to MOTHERBOARD (A17J11) |
| W31 | SR | | 08753-20102 | 1 | TEST PORT 1 COUPLER (A21) to TRANSFER SWITCH (A24) |
| W32 | SR | | 08753-20101 | 1 | TEST PORT 2 COUPLER (A22) to TRANSFER SWITCH (A24) |
| W33 | 4W | | 08753-60221 | 1 | LED (A23J1) to TEST SET INTERFACE (A25J2) |
| W37 | 26R | | 8120-8670 | 1 | DISK DRIVE (A20) to CPU/PIG (A9J8) |
| W38 | 40R | | 8120-6882 | 1 | TEST SET INTERFACE (A25J1) to MOTHERBOARD (A17J2) |

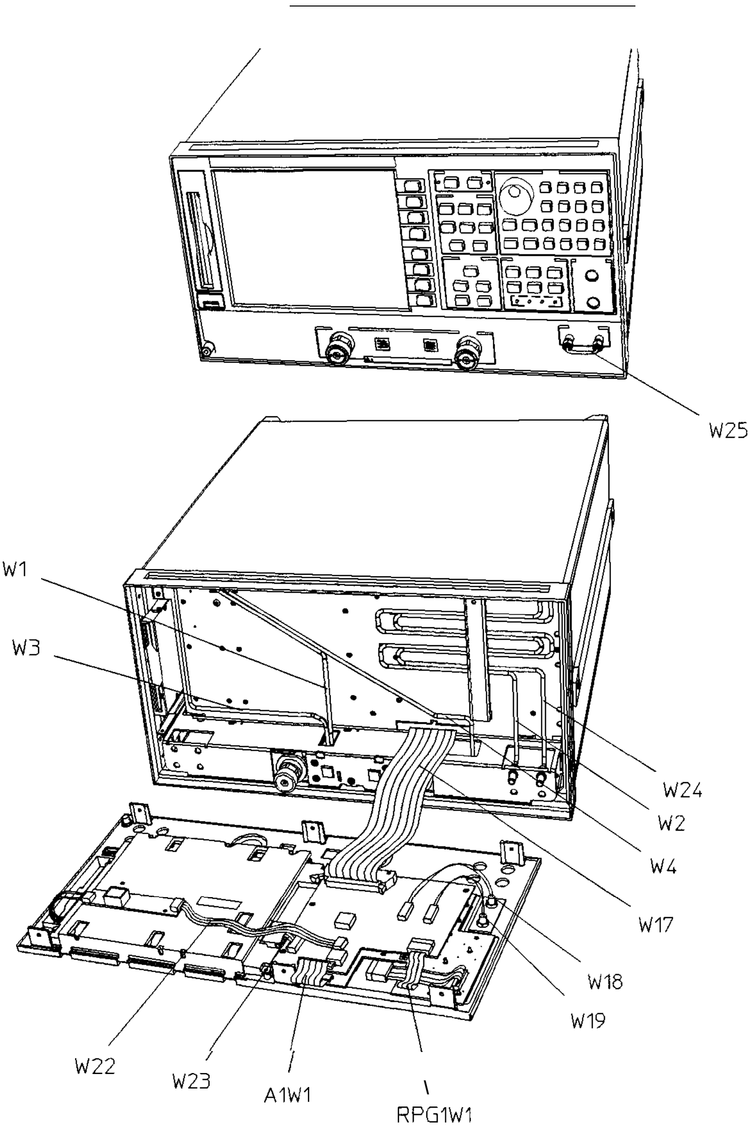
* *n*W Wire Bundle (*n* is the number of wires in the bundle)
*n*R Ribbon Cable (*n* is the number of wires in the ribbon)
SR Semi-Rigid Coax Cable


W38
W20
W37
W32
J2
J3
A24W1
1
W31
W33
A22W1
ill
A21W1
sg657e

## Cables, Front

| Ref. Desig. | Type* | opt | HP Part Number | Qty | Description |
|---|---|---|---|---|---|
| A1W1 | SOB | | 8120-8439 | 1 | FP KEYBOARD (A1J1) to FP INTERFACE (A2J2) |
| RPG1W1 | 5R | | (part. of RPG1) | 1 | RPG to FP INTERFACE (A2J5) |
| W1 | SR | | 08753-20285 | 1 | SOURCE ASSY (A3W4) to TRANSFER SWITCH (A24) |
| W2 | SR | | 08753-20291 | 1 | FP (B CHANNEL IN) to SAMPLER-R (A4) |
| ws | SR | | 08753-20286 | 1 | TEST PORT 1 COUPLER (A21) to SAMPLER-A (AS) |
| W4 | SR | | 08753-20287 | 1 | TEST PORT 2 COUPLER (A22) to SAMPLER-B (A6) |
| W17 | 50R | | 8120-8431 | 1 | FP INTEBFACE (A2J1) to MOTHERBOABD (A17J1) |
| W18 | SW | | 08711-60037 | 1 | FP INTERFACE (A2J4) to FP (PROBE POWER) |
| W19 | SW | | 08711-60037 | 1 | FP INTERFACE (A2J3) to FP (PROBE POWER) |
| W22 | 5R | | 8120-8408 | 1 | FP INTERFACE (A2J7) to INVERTER (A27) |
| W23 | 31R | | 8120-8409 | 1 | FP INTERFACE (A2J6) to DISPLAY (A18) |
| W24 | SR | | 08753-20220 | 1 | SOURCE ASSY (A3) to FP (R CHANNEL OUT) |
| W25 | SR | | 08720-20098 | 1 | FP (R CHANNEL OUT) to FP (R CHANNEL IN) |

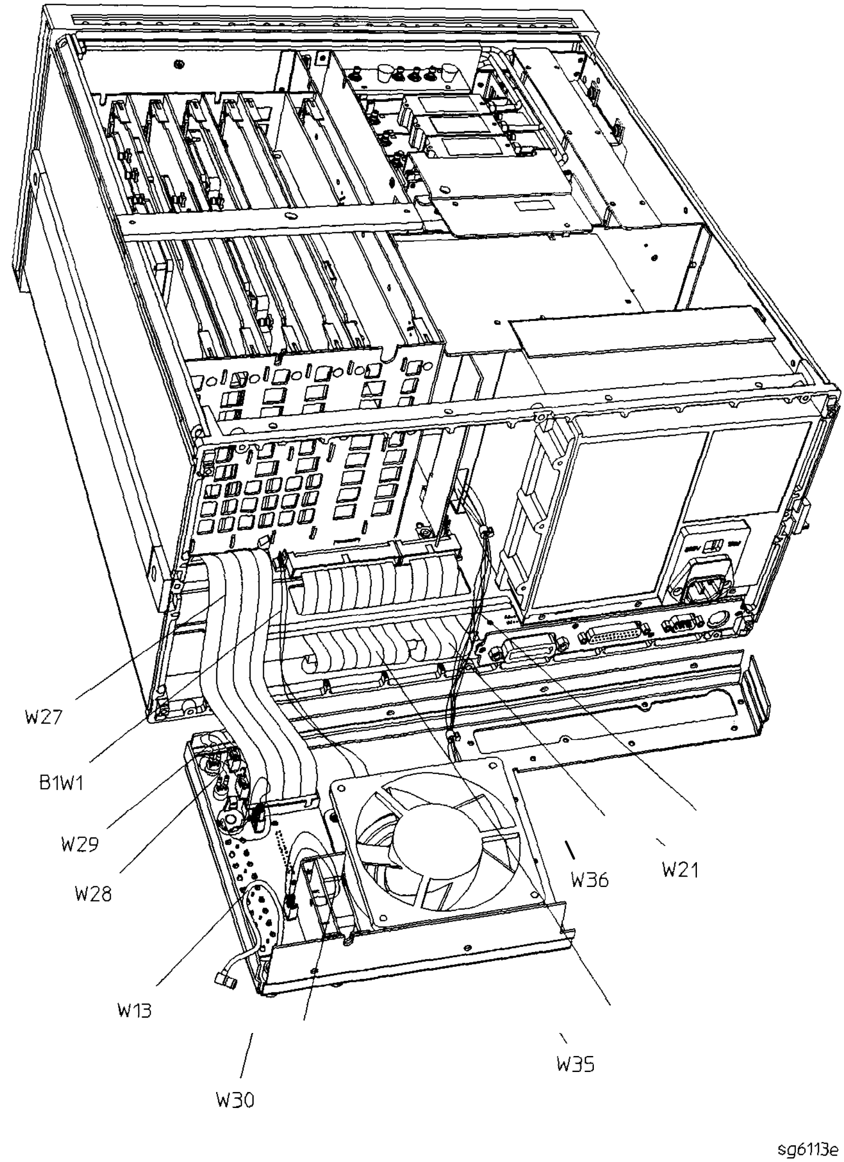
* *n*W Wire Bundle (n is the number of wires in the bundle)
*n*R Bibbon Cable (n is the number of wires in the ribbon)
SR Semi-Bigid Coax Cable


W25
W1
W3
W24
W2
W4
W17
W18
W19
W22
W23
A1W1
RPG1W1
sg658e

# Cables, Rear

| Ref. Desig. | Type* | Opt | HP Part Number | Qty | Description |
|---|---|---|---|---|---|
| B1W1 | 2W | | (part of B1) | 1 | FAN (B1) to MOTHERBOARD (A17J5) |
| W13 | F | | 08753-60026 | 1 | REFERENCE (A12J3) to BP (EXT REF) |
| W21 | 14R | | 8120-6876 | 1 | MOTHERBOARD (A17J12) to RP (VGA OUT) |
| W27 | 34R | | 8120-6407 | 1 | RP INTERFACE (A16J4) to MOTHERBOARD (A17J6) |
| W28 | 2W | | 85047-60005 | 1 | RP INTERFACE (A16J10) to RP (PORT 1 FUSE) |
| W29 | 2W | | 85047-60005 | 1 | RP INTERFACE (A16J11) to RP (PORT 2 FUSE) |
| W30 | 3W | 1D5 | 8120-6458 | 1 | RP INTERFACE (A16J3) to HIGH-STABILITY FREQ REF (A26J1) |
| W35 | 50R | | 8120-6379 | 1 | CPU/PIG (A9J1) to MOTHERBOARD (A17J7) |
| W36 | 26R | | 8120-6382 | 1 | CPU/PIG (A9J2) to MOTHERBOARD (A17J8) |

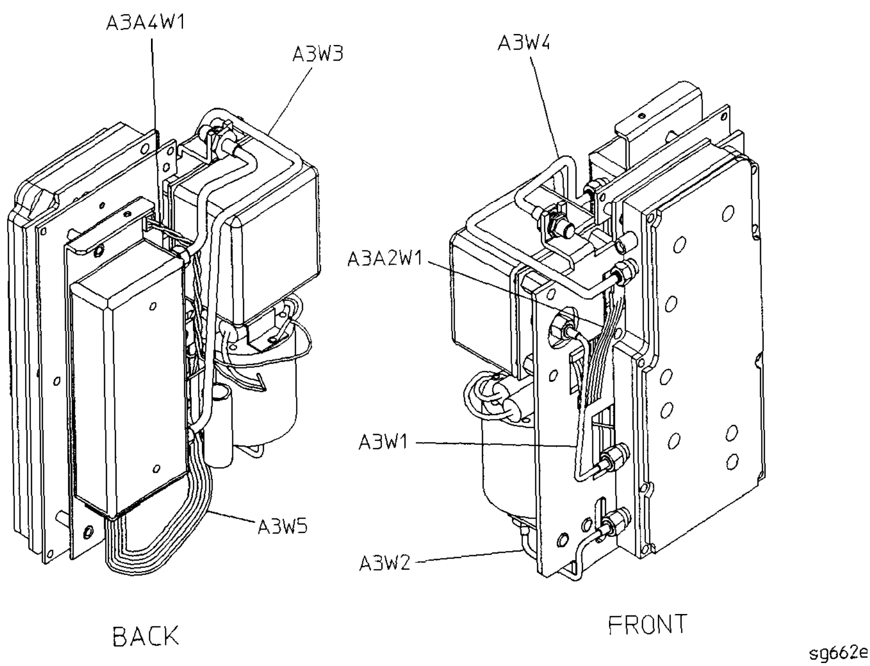
* *n*W Wire Bundle (n is the number of wires in the bundle)
*n*R Ribbon Cable (n is the number of wires in the ribbon)
F Flexible Coax Cable


W27
B1W1
W29
W28
W13
W30
W36
W21
W35
sg6113e

# Cables, Source

| Ref. Desig. | Type* | opt | HP Part Number | Qty | Description |
|---|---|---|---|---|---|
| A3A2W1 | 10R | | 08753-60034 | 1 | EYO (A3A3) to ALC (A3A2J3) |
| A3A4W1 | 4W | | 08753-60035 | 1 | CAVITY OSC (A3A4) to ALC (A3A2J2) |
| A3W1 | SR | | 08753-20107 | 1 | EYO (A3A3) to SCURCE ASSY (A3) |
| A3W2 | SR | | 08753-20032 | 1 | CAVITY OSC (A3A4) to SCURCE ASSY (A3) |
| A3W3 | SR | | 08753-20106 | 1 | SCURCE ASSY (A3) to ATTENUATOR (A3A5) |
| A3W4 | SR | | 08753-20111 | 1 | ATTENUATOR (A3A5) to W1 |
| A3W5 | 10R | | 5062-0701 | 1 | ALC (A3A2J1) to ATTENUATOR (A3A5) |

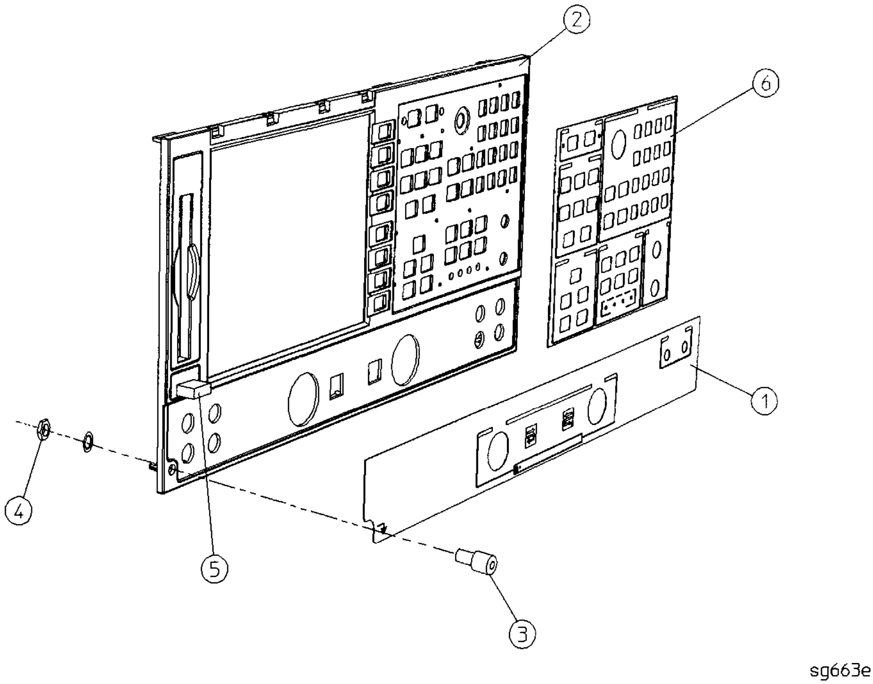
* *n*W Wire Bundle (*n* is the number of wires in the bundle)
*n*R Ribbon Cable (n is the number of wires in the ribbon)
SR Semi-Rigid Coax Cable


A3A4W1
A3W3
A3W4
A3A2W1
A3W1
A3W5
A3W2
BACK
FRONT
sg662e

# Front Panel Assembly, Outside

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | STD | 08753-80168 | 1 | OVERLAY, LOWER FRONT PANEL |
| 1 | 075 | 08753-80170 | 1 | OVERLAY, LOWER FRONT PANEL |
| 2 | STD | 08753-60924 | 1 | FP REPAIR KIT STD[1] |
| 2 | 075 | 08753-60926 | 1 | FP REPAIR KIT #075[1] |
| 3 | | 1510-0038 | 1 | GROUND POST |
| 4 | | 2950-0006 | 1 | NUT HEX 1/4-32 |
| 4 | | 2190-0067 | 1 | WASHER LK .256 ID |
| 5 | | 08753-40015 | 1 | LINE BUTTON |
| | | 08753-80211 | 1 | OVERLAY, UPPER FRONT PANEL |

1 Comes with gasket, upper and lower overlays.

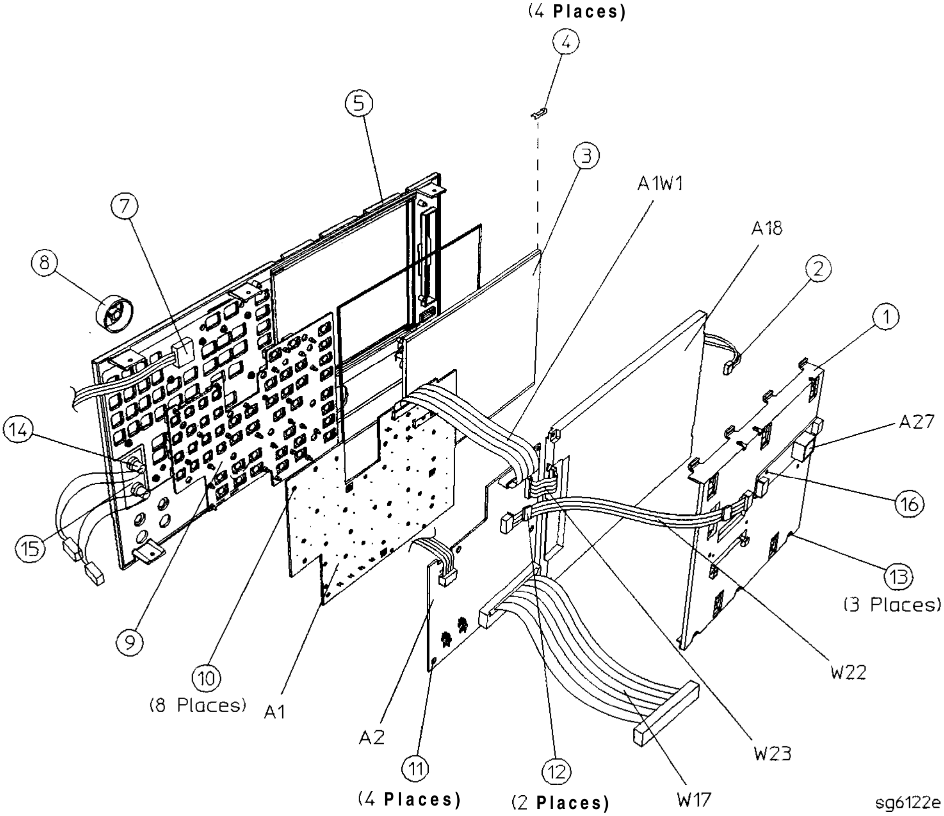

2
6
1
4
5
3
sg663e

# Front Panel Assembly, Inside

| Ref. Desig. | Type | Opt | HP Part Number | Qty | Description |
|---|---|---|---|---|---|
| 1 | | | 08720-40012 | 1 | DISPLAY HOLD DOWN |
| 2 | | | 2090-0566 | 1 | DISPLAY LAMP |
| A18 | | | 08753-60325 | 1 | LCD REPLACEMENT ASSY |
| 3 | | | 1000-0995 | 1 | DISPLAY GLASS |
| 4 | | | 08720-00094 | 4 | GROUNDING CLIPS |
| | | 1DT | 08753-00135 | 1 | FILLER PLATE[1] |
| 5 | | | 08753-20300 | 1 | FRONT PANEL |
| 7 | | | 1990-1864 | 1 | RPG (INCLUDES CABLE AND HARDWARE) |
| 8 | | | E4400-40003 | 1 | RPG KNOB |
| 9 | | | 08720-40010 | 1 | FLUBBER KEYPAD |
| 10 | | | 0515-0430 | 8 | SCREW SM 3.0 6CWPNTX |
| 11 | | | 0515-0306 | 4 | SCREW SMM 3.0 14CWPNTX |
| 12 | | | 1400-1439 | 2 | CABLE CLIP[2] |
| 13 | | | 0515-0372 | 3 | SCREW SMM 3.0 8CWPNTX |
| 14 | | | 08712-60035 | 2 | CABLE ASSY, PROBE POWER |
| 14 | | | 2950-0144 | 2 | NUT, HEX 3/8-32 |
| 15 | | | 08753-00112 | 1 | PLATE, PBOBE POWER |
| 16 | | | 0624-0828 | 2 | SCREW, TAPPING |
| A1 | | | 08720-60127 | 1 | BD ASSY-FRONT PANEL |
| A2 | | | 08753-60311 | 1 | BD ASSY-FRONT PANEL INTERFACE |
| A1W1 | 26R | | 8120-8439 | 1 | A1 TO A2 |
| A27 | | | 0950-3068 | 1 | ASSY-INVERTER |
| W17 | 50R | | 8120-8431 | 1 | A2 TO A17 |
| W22 | 5R | | 8120-8408 | 1 | CABLE-FP INTF (A2J7) to INVERTER (A27) |
| W23 | 31R | | 8120-8409 | 1 | CABLE-FP INTF (A2J6) to DISPLAY (A18) |

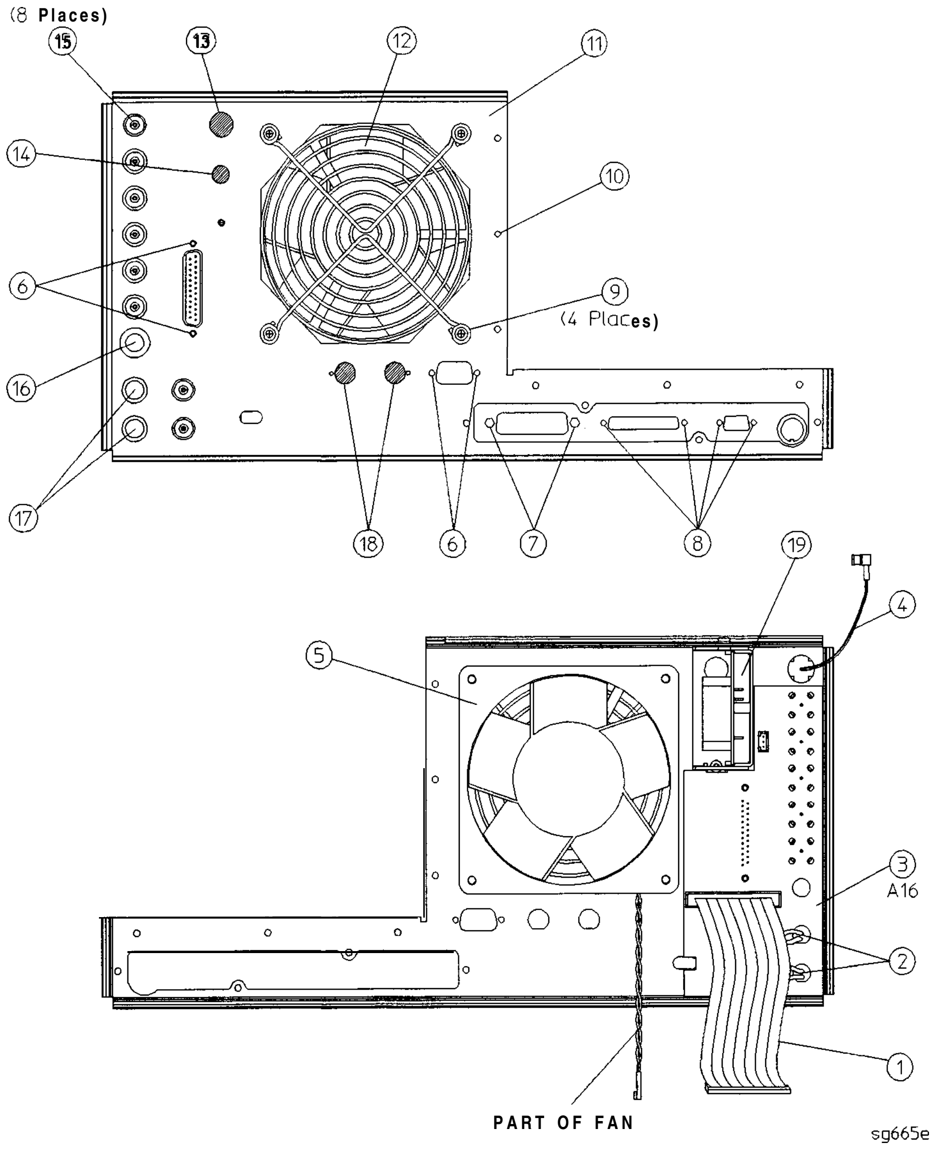
1 Not shown. F&places A18 and display glass for Option 1DT. Order new grounding clips when replacing filler plate.

2 Order with A2 and LCD hold down.


(4 Places)
4
5
3
A1W1
7
A18
8
2
1
A27
14
16
15
13
(3 Places)
W22
9
10
(8 Places)
A1
A2
W23
11
(4 Places)
12
(2 Places)
W17
sg6122e

# Rear Panel Assembly

| Ref. Desig. | Type | Opt | HP Part Number | Qty | Description |
|---|---|---|---|---|---|
| 1 | 34R | | 8120-6407 | 1 | RP INTERFACE (A16J4) TO MB (A17J6) (W27) |
| 2 | | | 85047-60005 | 2 | FUSE HARNESS ASSEMBLY |
| 3 (A16) | | | 08720-60138 | 1 | BD ASSY-REAR PANEL INTERFACE (A16) |
| 4 | | | 08753-60026 | 1 | ASSY-EXTERNAL REFERENCE CABLE (W13) |
| 5 | | | 08415-60036 | 1 | ASSY-FAN |
| 6 | | | 1251-2942 | 4 | FASTENER CONN RP LOCK |
| 7 | | | 2190-0034 | 2 | WASHER LK .194ID10 |
| 7 | | | 0380-0644 | 2 | NUT STDF .327L 632 |
| 8 | | | 1251-7812 | 4 | FASTENER CONN RP LOCK |
| 9 | | | 0515-0379 | 4 | SCREW SMM3.5X16 CWPNTX |
| 9 | | | 3050-1192 | 4 | FLAT WASHER |
| 10 | | | 0515-0372 | 10 | SCREW SMM3.0X8 CWPNTX |
| 11 | | | 08720-00071 | 1 | REAR PANEL SHEET METAL |
| 12 | | | 3160-0281 | 1 | FAN GUARD |
| 13 | | | 6960-0419 | 1 | HOLE PLUG |
| 14 | | | 6960-0086 | 1 | HOLE PLUG |
| 15 | | | 2190-0102 | 8 | WASHER LK .472ID |
| 15 | | | 2950-0035 | 8 | NUT HEX 15/32-32 |
| 16 | | | 0400-0271 | 1 | GROMMET SN.5-515ID |
| 17 | | | 2110-0047 | 2 | FUSE |
| 17 | | | 1400-0112 | 2 | FUSE CAP |
| 18 | | | 6960-0027 | 2 | HOLE PLUGS |
| 19 | | 1D5 | | | (see "Rear Panel Assembly, Option 1D5") |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(4 Places)
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A16
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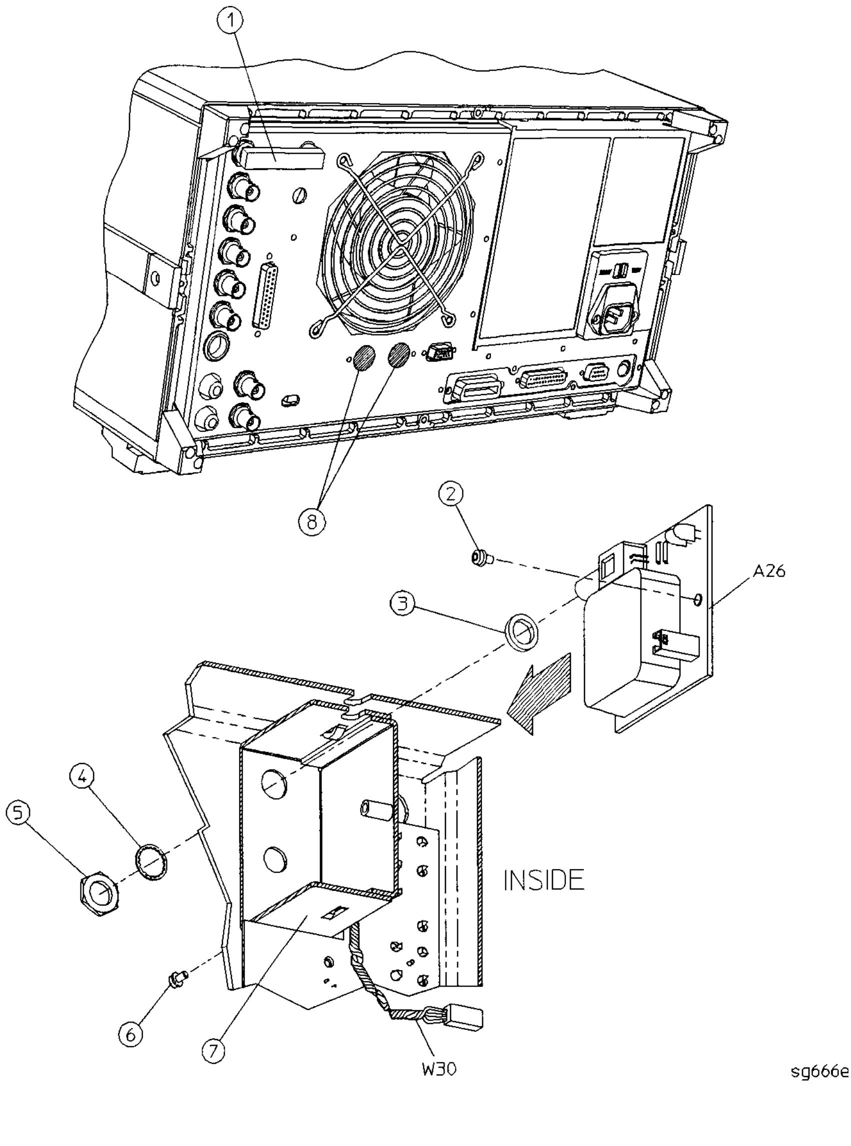
PART OF FAN
sg665e

# Rear Panel Assembly, Option 1D5

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | 1D5 | 1250-1859 | 1 | ADAPTER-COAX |
| 2 | 1D5 | 0515-0374 | 1 | SCREW-MACHINE M3.0×10 CW-PN-TX |
| 3 | 1D5 | 3050-1546 | 1 | WASHER-FLAT .505ID NY |
| 4 | 1D5 | 2190-0068 | 1 | WASHER-LOCK .505ID |
| 6 | 1D5 | 2950-0054 | 1 | NUT-SPECIALTY 1/2-28 |
| 6 | 1D5 | 0515-0430 | 1 | SCREW-MACHINE M3.0×6 CW-PN-TX |
| 7 | 1D5 | 08753-00078 | 1 | BRACKET-OSC BD |
| 8 | | 6960-0027 | 2 | HOLE PLUGS |
| A26 | 1D5 | 08753-60158 | 1 | BD ASSY-HIGH STABILITY FREQ REF |
| W30 | 1D5 | 8120-6458 | 1 | RP INTERFACE (A16J3) to HIGH-STABILITY FREQ REF (A26J1) |


1
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A26
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INSIDE
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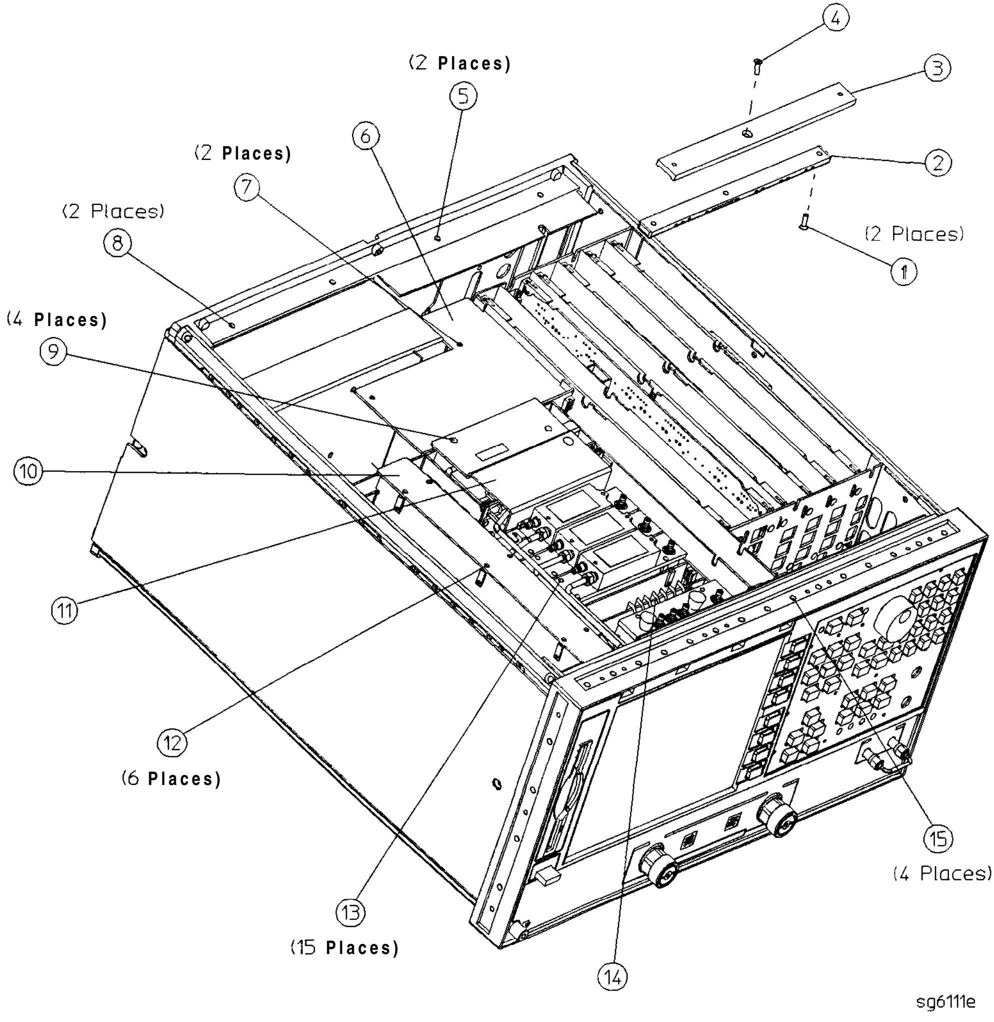
W30
sg666e

# Hardware, Top

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | | 0515-2799 | 2 | SCREW-MACHINE M3.0x10 CW-FL-TX |
| 2 | | 08753-40014 | 1 | STABILIZER-PC BOARD |
| 3 | | 08753-20062 | 1 | STABILIZER CAP |
| 4 | | 0515-2035 | 1 | SCREW-MACHINE M3.0x16 PC-FL-TX |
| 5 | | 0515-0458 | 2 | SCREW-MACHINE M3.5x8 CW-PN-TX |
| 6 | | 08753-00107 | 1 | AIR FLOW COVER |
| 7 | | 0515-0374 | 2 | SCREW-MACHINE M3.0 X 10 CW-PN-TX |
| 8 | | 0515-0377 | 2 | SCREW-MACHINE M3.5x10 CW-PN-TX |
| 0 | | 0515-0374 | 2 | SCREW-MACHINE M3.0x12 CW-PN-TX |
| 10 | | 08753-00129 | 1 | GSP COVER |
| 11 | | 08753-00113 | 1 | BRACKET-SOURCE (SOURCE STRAP) |
| 12 | | 0515-0374 | 6 | SCREW-MACHINE M3.0 X 10 CW-PN-TX |
| 13 | | 0515-0374 | 15 | SCREW-MACHINE M3.0x10 CW-PN-TX |
| 14 | | 08753-00040 | 1 | CLIP-PULSER GROUND |
| 15 | | 0515-1400 | 3 | SCREW-MACHINE M3.5x8 PC-FL-TX |


(2 Places)
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(2 Places)
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(4 Places)
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(6 Places)
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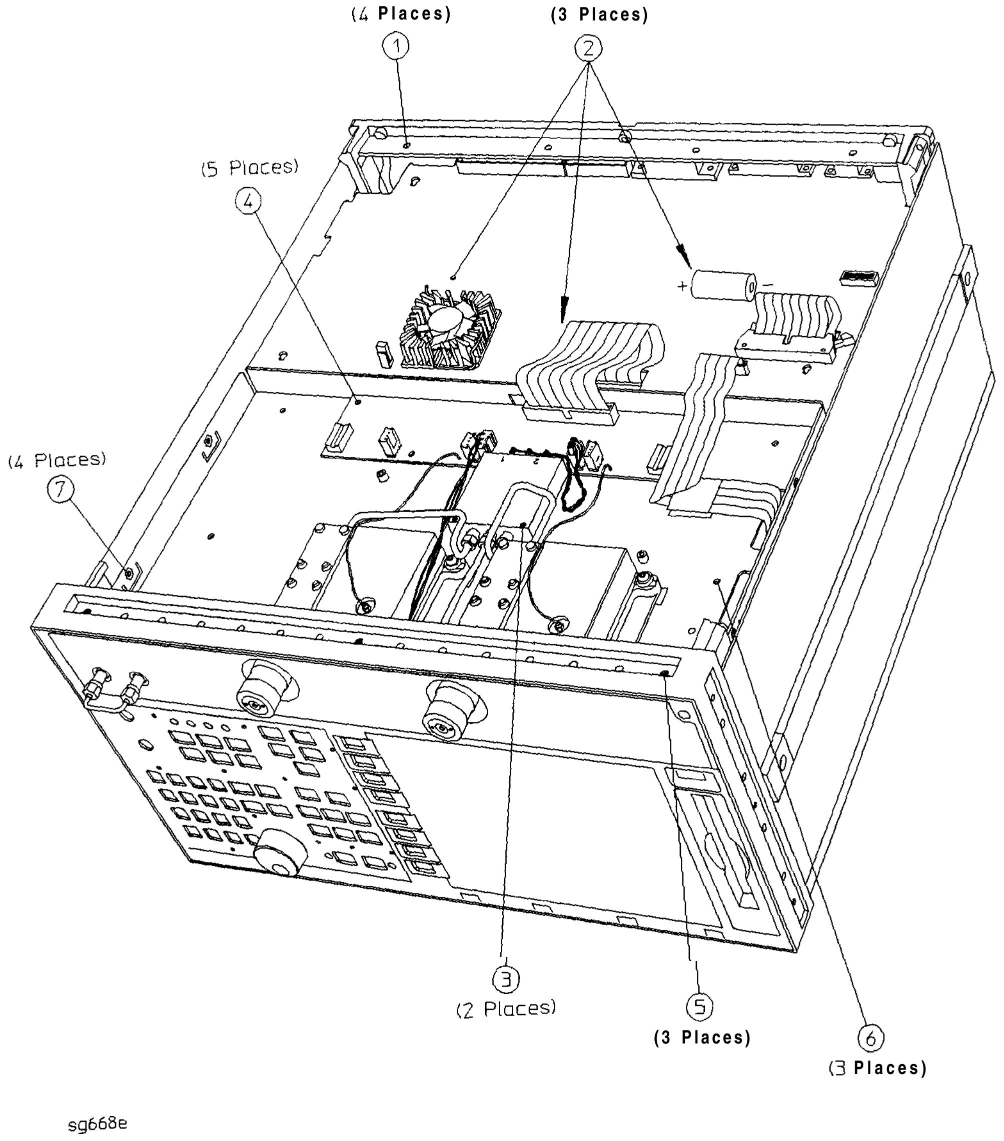
sg6111e

## Hardware, Bottom

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | | 0515-0458 | 4 | SCREW-MACHINE M3.5×8 CW-PN-TX |
| 2 | | 0515-0430 | 8 | SCREW-MACHINE M3.0×6 CW-PN-TX |
| 3 | | 0515-0667 | 2 | SCREW-MACHINE M3.0×25 CW-PN-TX |
| 4 | | 0515-0430 | 5 | SCREW-MACHINE M3.0×6 CW-PN-TX |
| 5 | | 0515-1400 | 3 | SCREW-MACHINE ~ M3.5×8 PC-FL-TX |
| 6 | | 0515-0375 | 8 | SCREW-MACHINE M3.0×16 CW-PN-TX |
| 7 | | 0515-0458 | 4 | SCREW-MACHINE M3.0×16 CW-PN-TX |



(4 Places)
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(3 Places)
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(5 Places)
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(4 Places)
7
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(2 Places)
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(3 Places)
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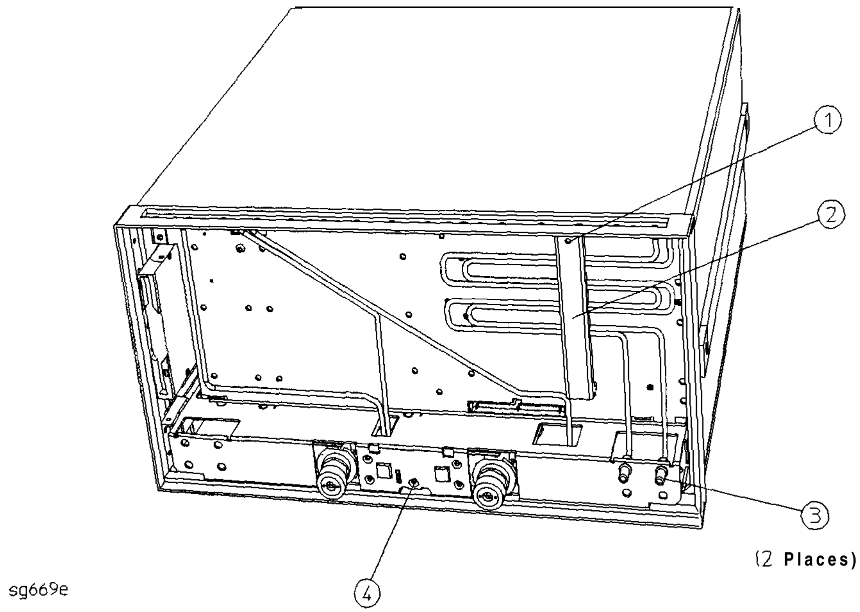
(3 Places)
sg668e

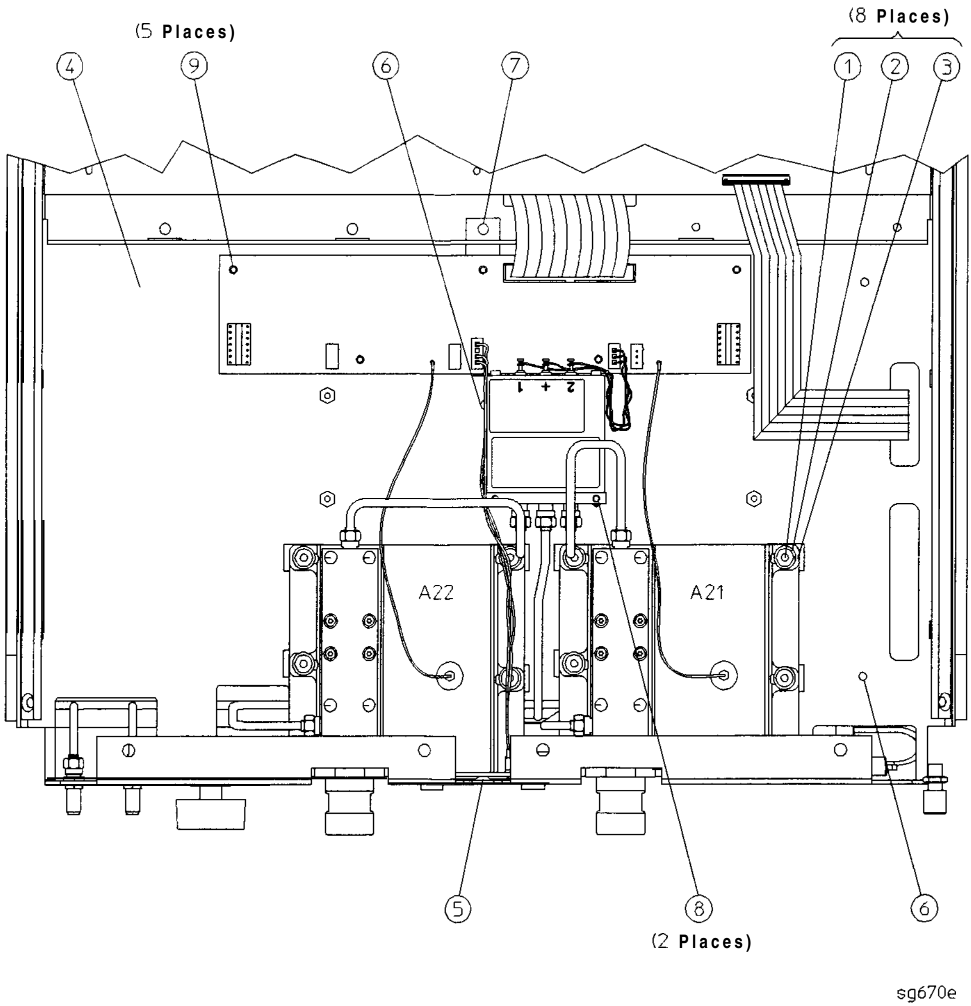
## Hardware, **Front**

| Ref. **Desig.** | **Option** | **HP Part Number** | **Qty** | **Description** |
|---|---|---|---|---|
| 1 | | **0515-0665** | 1 | **SMM 3.0×14 CWPNTX** |
| 2 | | **08753-00137** | 1 | **BRACKET - CABLE SUPPORT** |
| 3 | | **1250-1251** | 2 | **ADAPTER FEMALE SMA/FEMALE SMA** |
| 4 | | **0515-1946** | 1 | **SCREW-MACHINE M3.0×6 PC-FL-TX** |


1
2
3
(2 Places)
4
sg669e

# Hardware, Test Set Deck

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | | 08753-20296 | 8 | SHOULDER SCREW |
| 2 | | 08753-40013 | 8 | GUIDE WASHER |
| 3 | | 08753-20293 | 8 | PRESSURE SPRING |
| 4 | | 08753-00127 | 1 | CHASSIS-TEST SET |
| 5 | | 0515-1946 | 1 | SCREW-~ M3.0x 6 PC-FL-TX |
| 6 | | 0515-0375 | 2 | SCREW-MACHINE M3.0x 16 CW-PN-TX |
| 7 | | 0515-0430 | 1 | SCREW-- M3.0x 6 CW-FN-TX |
| 8 | | 0515-0667 | 2 | SCREW-MACHINE M3.0x25 CW-PN-TX |
| 9 | | 0515-0430 | 5 | SCREW-MACHINE M3.0x6 CW-FN-TX |


(5 Places)
(8 Places)
4
9
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7
1
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3
A22
A21
2 + 1
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8
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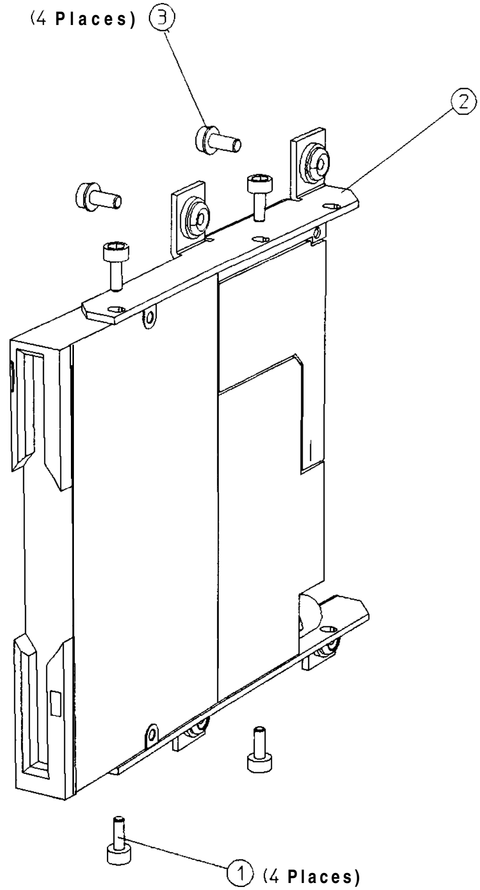
(2 Places)
sg670e

# Hardware, Disk Drive Support

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | | 0515-1048 | 4 | SCREW-M 2.5X4 SOCKET BEAD, HEX. |
| 2 | | 08720-00021 | 1 | DISK DRIVE BRACKET[1] |
| 2 | | 08753-00152 | 1 | DISK DRIVE BRACKET[1] |
| 3 | | 0515-0374 | 4 | SCREWS -- M 3.0X10CWPNTX |

1 Your analyzer may use either p/n 08720-00021 or p/n 08753-00152. Analyzers manufactured prior to February 1999 use p/n 0872040021. Analyzers manufactured after February 1900, or that have been repaired or upgraded with Service Kit p/n 08720-40190, use p/n 08753-40152. Contact Hewlett-Packard if you need help identifying replacement parts for your analyzer.


(4 Places) 3
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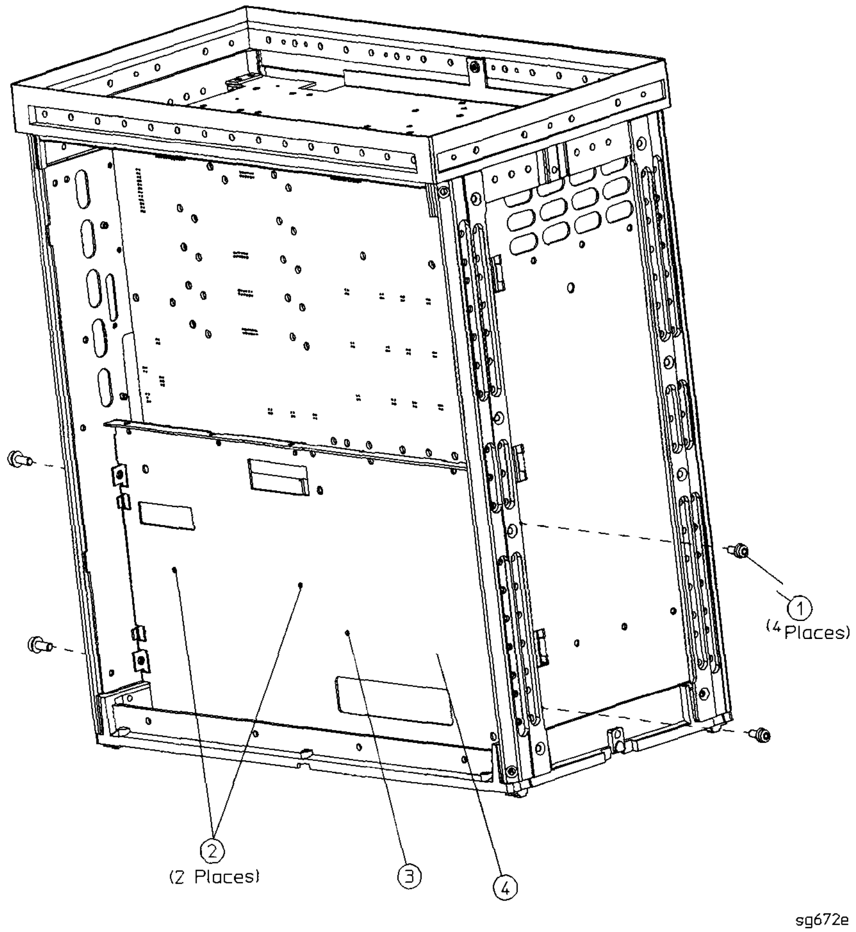
1 (4 Places)
sg671e

# Hardware, Memory Deck

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | | 0515-0468 | 4 | SCREW-MACHINE M3.5×8 CW-PN-TX |
| 2 | | 0515-0430 | 2 | SCREW-MACHINE M3.0×6 CW-PN-TX |
| 3 | | 0515-0375 | 1 | SCREW-MACHINE M3.0×14 CW-PN-TX |
| 4 | | 08753-00128 | 1 | DECK-MEMORY |



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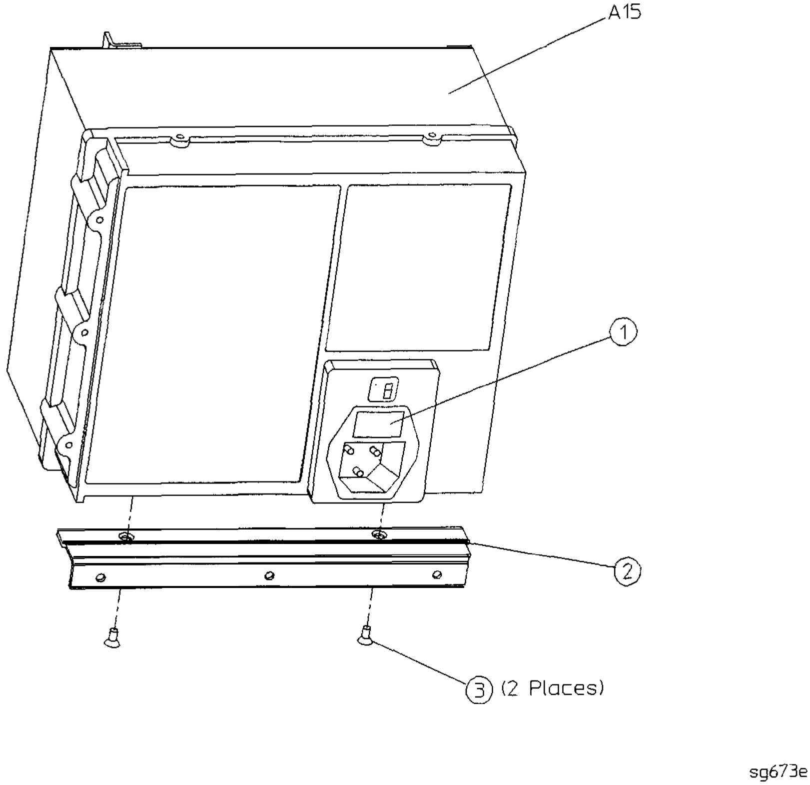
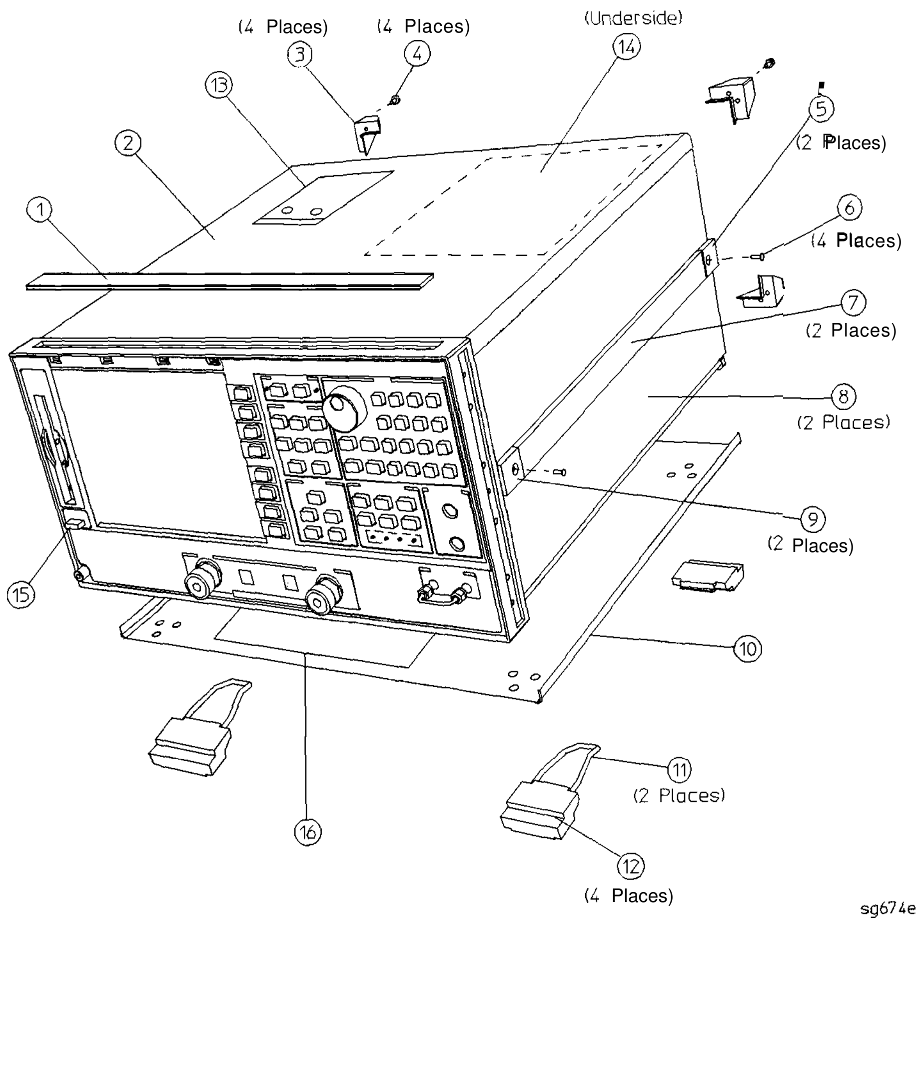
## Hardware, Preregulator

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | | 2110-0780 | 1 | FUSE 3A 250V NON-TIME DELAY (CSA/UL) |
| 1 | | 2110-0655 | 1 | FUSE 3.15A 250V NON-TIME DELAY (IEC) |
| 2 | | 08753-00065 | 1 | BRACKET-PREREGULATOR |
| 3 | | 0515-1400 | 2 | SCREW-MACHINE M3.5×8CW-FL-TX |
| A15 | | 08753-60098 | 1 | PREREGULATOR-ASSY |
| A15 | | 08753-69098 | 1 | PREREGULATOR-ASSY (REBUILT-EXCHANGE) |


A15
1
2
3 (2 Places)
sg673e

# Chassis **Parts,** Outside

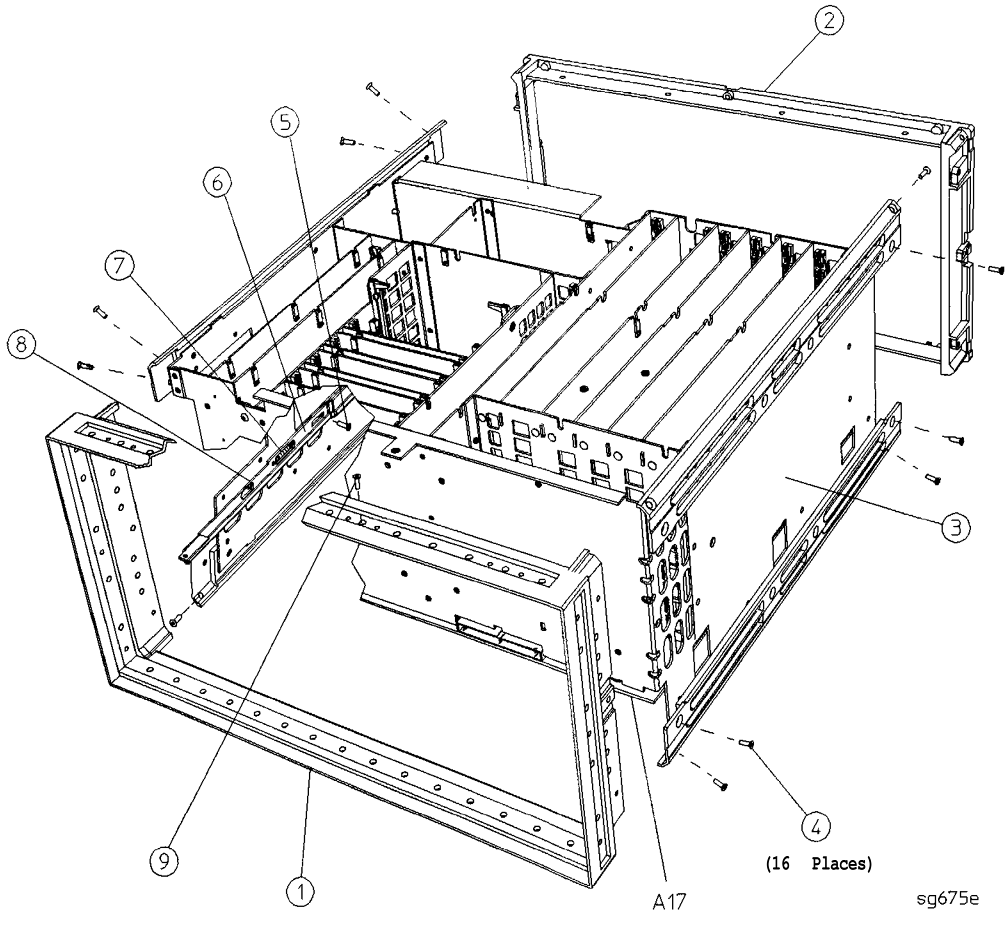
| Ref. **Desig.** | **Option** | **HP Part Number** | **Qty** | Description |
|---|---|---|---|---|
| 1 | | 5041-9176 | 1 | TRIM STRIP |
| 2 | | 08720-00078 | 1 | COVER-TOP |
| 3 | | 5041-9188 | 4 | REAR STANDOFF |
| 4 | | 0515-1402 | 4 | SCREW SMM 3.5 8 PCPNTX |
| 6 | | 5041-9187 | 2 | REAR CAP-SIDE STRAP |
| 6 | | 0515-1384 | 4 | SCREW SMM 5.0 10 PCFLTX |
| 7 | | 08720-00081 | 2 | SIDE STRAP |
| 8 | | 08720-00080 | 2 | COVER-SIDE |
| 0 | | 6041-0186 | 2 | FRONT CAP-SIDE STRAP |
| 10 | | 08720-00079 | 2 | COVER-BOTTOM |
| 11 | | 1460-1345 | 2 | FOOT ELEVATOR |
| 12 | | 5041-9167 | 4 | FOOT |
| 13 | | 08753-80066 | 1 | LABEL: CAUTION WARNING |
| 14 | | 08753-80174 | 1 | LABEL: LOCATION DIAGRAM |
| 16 | | 08753-40015 | 1 | LINE BUTTON |
| 16 | | 6180-8600 | 1 | MYLAR INSULATOR |


(4 Places)
(4 Places)
(Underside)
3
4
14
13
2
1
5
(2 Places)
6
(4 Places)
7
(2 Places)
8
(2 Places)
9
(2 Places)
15
10
11
(2 Places)
16
12
(4 Places)
sg674e

## Chassis Parts, Inside

| Ref. Desig. | Option | HP Part Number | Qty | Description |
|---|---|---|---|---|
| 1 | | 5022-1190 | 1 | FRONTPANELFRAME |
| 2 | | 5021-5808 | 1 | REARFRAME |
| 3 | | 08753-60314 | 1 | ASSY-CARDCAGE/MOTHER |
| 4 | | 0515-2086 | 16 | SCREW SMM4.0x7 PCFLTX |
| 5 | | 0515-0430 | 1 | SCREW M3.0x6 CWPNTX* |
| 6 | | 08720-00083 | 1 | INSULATOR SWITCH* |
| 7 | | 1460-1573 | 1 | SPRING EXTENSION .138 OD |
| 8 | | 08720-00077 | 1 | SWITCH ROD* |
| 9 | | 0515-1400 | 1 | SMM 3.5x8 PCFLTX |
| A17 | | 08753-60270 | 1 | BD ASSY-MOTHERBOARD |

* Part of CARDCAGE/MOTHER assembly (item 3).


2
5
6
7
8
3
4
(16 Places)
9
1
A17
sg675e

## Miscellaneous

| Description | HP Part Number |
|---|---|
| **Service Tools** | |
| HP 8753 TOOL KIT *includes the following:* | 08753-60023 |
| RF CABLE-INPUT R | 08753-20028 |
| EXTENDER BOARD ASSEMBLY-RECEIVER | 08753-60019 |
| EXTENDER BOARD ASSEMBLY-SOURCE | 08753-60020 |
| EXTENDER BOARD ASSEMBLY-CARD CAGE | 08753-60155 |
| ADAPTER-MALE SMB TO MALE SMB | 1250-0669 |
| ADAPTER-MALE TYPE N TO FEMALE SMA | 1250-1250 |
| CABLE ASSEMBLY | 5061-1022 |
| BAG-ANTISTATIC 13×15 | 9222-1132 |
| Documentation | |
| HP 8753E EXAMPLE PROGRAM DISK #1 | 08753-10028 |
| HP 8753E EXAMPLE PROGRAM DISK #2 | 08753-10029 |
| HP 8753E SERVICE GUIDE | 08753-90374 |
| HP 8753E OPTION 011 SERVICE GUIDE | 08753-90404 |
| HP 8753E MANUAL SET *includes the following:* | 08753-90365 |
| HP 8753E HP-IB PROGRAMMING AND COMMAND REFERENCE GUIDE | 08753-90366 |
| HP 8753E HP BASIC PROGRAMMING EXAMPLES GUIDE | 08753-90413 |
| HP 8753E USER'S GUIDE (*includes Quick Reference, 08753-90368*) | 08753-90367 |
| HP 8753E INSTALLATION/QUICK START GUIDE | 08753-90369 |
| HP 8753E SYSTEM VERIFICATION AND PERFORMANCE TESTS | 08753-90394 |
| HP 8753E OPTION 011 MANUAL SET *includes the following:* | 08753-90370 |
| HP 8753E HP-IB PROGRAMMING AND COMMAND REFERENCE GUIDE | 08753-90366 |
| HP 8753E HP BASIC PROGRAMMING EXAMPLES GUIDE | 08753-90413 |
| HP 8753E OPTION 011 USER'S GUIDE (*includes Quick Reference, 08753-90373*) | 08753-90371 |
| HP 8753E OPTION 011 INSTALLATION/QUICK START GUIDE | 08753-90372 |
| HP 8753E OPTION 011 SYSTEM VERIFICATION AND PERFORMANCE TESTS | 08753-90395 |
| **Upgrade Kits** | |
| HARMONIC MEASUREMENT UPGRADE KIT | 8753EU OPT 002 |
| 6 GHz UPGRADE KIT FOR HP 8753E | 8753EU OPT 006 |
| 6 GHz UPGRADE KIT FOR HP 8753E OPTION 011 | 8753EU OPT 611 |
| TIME DOMAIN UPGRADE KIT | 8753EU OPT 010 |
| FIRMWARE UPGRADE KIT | 8753EU OPT 099 |
| HIGH-STABILITY FREQUENCY REFERENCE RETROFIT KIT | 8753EU OPT 1D5 |

| Description | HP Part Number |
|---|---|
| **Protective Cape for Connectors** | |
| FEMALE HP-IB CONNECTOR | 1252-5007 |
| FEMALE TEST SET I/O | 1252-4690 |
| FEMALE PARALLEL PORT | 1252-4690 |
| RS-232 CONNECTOR | 1252-4697 |
| 7-mm TEST PORTS | 1401-0249 |
| FEMALE TYPE-N TEST PORTS (OPTIONS 011 AND 075) | 1401-0247 |
| **Fuses used on the A8 Post Regulator** | |
| FUSE 0.5A 125V NON-TIME DELAY 0.25×0.27 | 2110-0046 |
| FUSE 0.75A 125V NON-TIME DELAY 0.25×0.27 | 2110-0424 |
| FUSE 1A 125V NON-TIME DELAY 0.25×0.27 | 2110-0047 |
| FUSE 2A 125V NON-TIME DELAY 0.25×0.27 | 2110-0425 |
| FUSE 4A 125V NON-TIME DELAY 0.25×0.27 | 2110-0476 |
| **HP-IB Cables** | |
| HP-IB CABLE, 1M (3.3 FT) | HP 10833A |
| HP-IB CABLE, 2M (6.6 FT) | HP 10833B |
| HP-IB CABLE, 4M (13.2 FT) | HP 10833C |
| HP-IB CABLE, 0.5M (1.6 FT) | HP 10833D |
| **ESD Supplies** | |
| ADJUSTABLE ANTISTATIC WRIST STRAP | 9300-1367 |
| 5 FT GROUNDING CORD *for wrist strap* | 9300-0980 |
| 2 × 4 FT ANTISTATIC TABLE MAT WITH 15 FT GROUND WIRE | 9300-0797 |
| ANTISTATIC HEEL STRAP *for use on conductive floors* | 9300-1126 |
| **Other** | |
| HP 8753E KEYBOARD OVERLAY *for external keyboard* | 08753-80131 |
| RACK MOUNT KIT WITHOUT HANDLES | 5062-3978 |
| RACK MOUNT KIT WITH HANDLES | 5062-4073 |
| FRONT HANDLE | 5063-9229 |
| FLOPPY DISKS, 3.5 INCH DOUBLE-SIDED (box of 10) | HP 92192A |

## Table 13-1. Reference Designations, Abbreviations, and Options

| REFERENCE DESIGNATIONS | |
|---|---|
| A | assembly |
| B | fan;motor |
| J | electrical connector (stationary portion); jack |
| RPG | rotary pulse generator |
| W | cable; transmission path; wire |

| ABBREVIATIONS | |
|---|---|
| A | ampere |
| ALC | automatic level control |
| ASSY | assembly |
| AUX | auxiliary |
| BD | board |
| COAX | coaxial |
| CPU | central processing unit |
| CW | conical washer (screws) |
| D | diameter |
| ESD | electrostatic discharge |
| EXT | external |
| EYO | YIG oscillator |
| FL | flathead (screws) |
| FP | front panel |
| FRAC-N | fractional N |
| FREQ | frequency |
| GHz | gigahertz |
| HEX | hexagonal |
| HP | Hewlett-Packard |
| HP-IB | Hewlett-Packard interface bun |
| HX | hex recess (screws) |
| ID | inside diameter |
| IF | intermediate frequency |
| I/O | input/output |
| LED | light-emitting diode |
| M | meters |
| M | metric hardware |
| MHz | megahertz |
| mm | millimeters |
| MON | monitor |
| NOM | nominal |
| NY | nylon |
| OD | outside diameter |
| Opt | option |
| OSC | oscillator |
| PN | panhead |
| PC | patch lock (screws) |
| PC | printed circuit |
| PIG | peripheral interface group |
| PN | panhead (screws) |
| REF | reference |
| REPL | replacement |
| RP | rear panel |
| SH | socket head cap (screws) |
| TX | TORX recess (screws) |
| Qty | quantity |
| V | volt |
| WFR | wire formed |
| W/O | without |
| YIG | yttrium-iron garnet |

| OPTIONS | |
|---|---|
| 002 | harmonica measurement |
| 006 | 6 GHz performance |
| 010 | time domain |
| 011 | w/o test set |
| 076 | 75 ohm test set |
| 1D5 | 10 MHz precision ref |

# 14

# Assembly Replacement and Post-Repair Procedures

This chapter contains procedures for removing and replacing the major assemblies of the HP 8753E network analyzer. A table showing the corresponding post-repair procedures for each replaced assembly is located at the end of this chapter.

## Replacing an Assembly

The following steps show the sequence to replace an assembly in an HP 8753E Network Analyzer.

1. Identify the faulty group. Refer to Chapter 4, "Start Troubleshooting Here." Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13, "Replaceable Parts."
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14, "Assembly Replacement and Post-Repair Procedures"
4. Perform the necessary adjustments Refer to Chapter 3, "Adjustments and Correction Constants "
5. Perform the necessary performance tests. Refer to Chapter 2, "System Verification and Performance **Tests.** "

**Warning** These servicing instructions are for use by **qualified** personnel only. lb avoid electrical shock, do not perform any servicing unless you are qualified to do so.

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

**Warning** The power cord is **connected** to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.

**Caution** Many of the assemblies in this instrument are very susceptible to damage from ESD (electrostatic discharge). Perform the following procedures only at a static-safe workstation and wear a grounding strap.

## Procedures described in this chapter

The following pages describe assembly replacement procedures for the HP 8753E assemblies listed below:

- **Line Fuse**
- Covers
- **Front** Panel Assembly
- **Front** Panel Interface and Keypad Assemblies (Al, **A2)**
- Display, Display Lamp, and Inverter Assemblies **(A18, A27)**
- Rear Panel Assembly
- Rear Panel Interface Board Assembly **(A16 )**
- **A3** Source Assembly
- **A4, A5, A6** Samplers and **A7** Pulse Generator
- AS, **A10,** All, **A12, A13, A14** Card Cage Boards
- **A9** CPU/PIG Board
- **A9BT1** Battery
- **A15** Preregulator
- **A17** Motherboard Assembly
- **A19** Graphics Processor
- **A20** Disk Drive
- **A21, A22 Test** Port Couplers
- **A23** LED Board
- **A24** Transfer Switch
- **A25 Test** Set Interface
- **A26** High Stability Frequency Reference (Option **1D5)**
- **B1 Fan**

# Line Fuse

## Tools Required

- small slot screwdriver

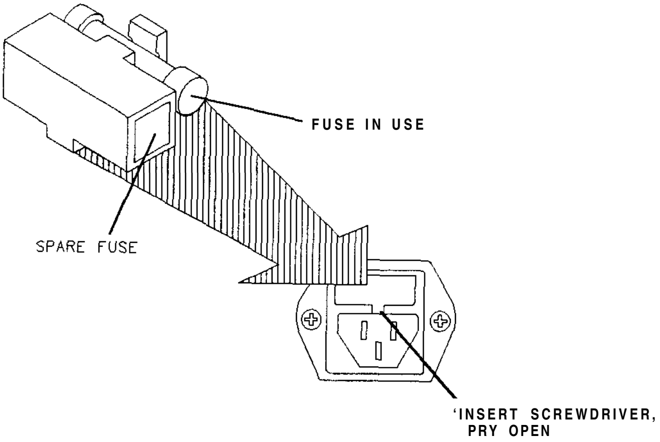
## Removal

**Warning** For continued protection against fire **hazard,** replace fuse only **with** same type **and** rating (3 A 250 **VAC).** The use of **other** fuses or materials is prohibited.

1. Disconnect the power cord.
2. Use a small slot screwdriver to pry open the fuse holder.
3. Replace the failed fuse with a 3 AF 250 V F fuse. See "Hardware, Preregulator" in Chapter 13 to find the part number.

## Replacement

1. Simply replace the fuse holder.


FUSE IN USE
SPARE FUSE
'INSERT SCREWDRIVER,
PRY OPEN
qg652d

# Covers

## Tools Required

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- **T-20** TORX screwdriver
- **T-25** TORX screwdriver

## Removing the top cover

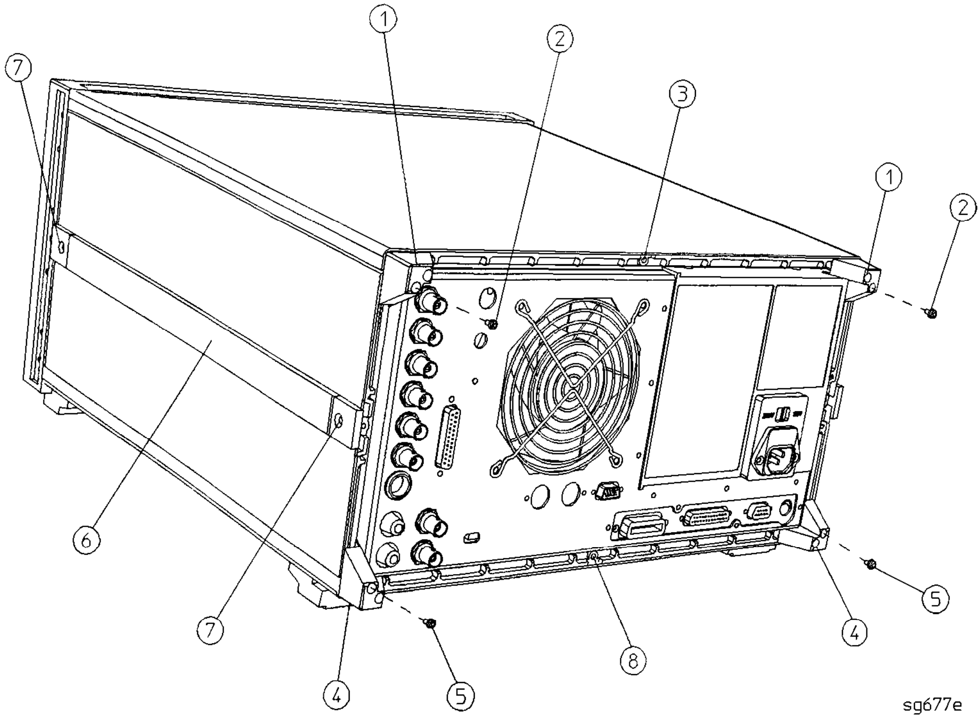
1. Remove both upper rear feet (item 1) by loosening the attaching screws (item 2).
2. Loosen the top cover screw (item 3).
3. Slide cover off.

## Removing the side covers

1. Remove the top cover.
2. Remove the lower rear foot (item 4) that corresponds to the side cover you want to remove by loosening the attaching screw (item 5).
3. Remove the handle assembly (item 6) by loosening the attaching screws (item 7).
4. Slide cover off.

## Removing the bottom cover

1. Remove both lower rear feet (item 4) by loosening the attaching screws (item 5).
2. Loosen the bottom cover screw (item 8).
3. Slide cover off.


1
2
3
1
2
7
6
7
4
5
8
4
5
sg677e

# Front Panel Assembly

## **Tools** Required

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- **5/16-inch** open-end torque wrench (set to 10 in-lb)

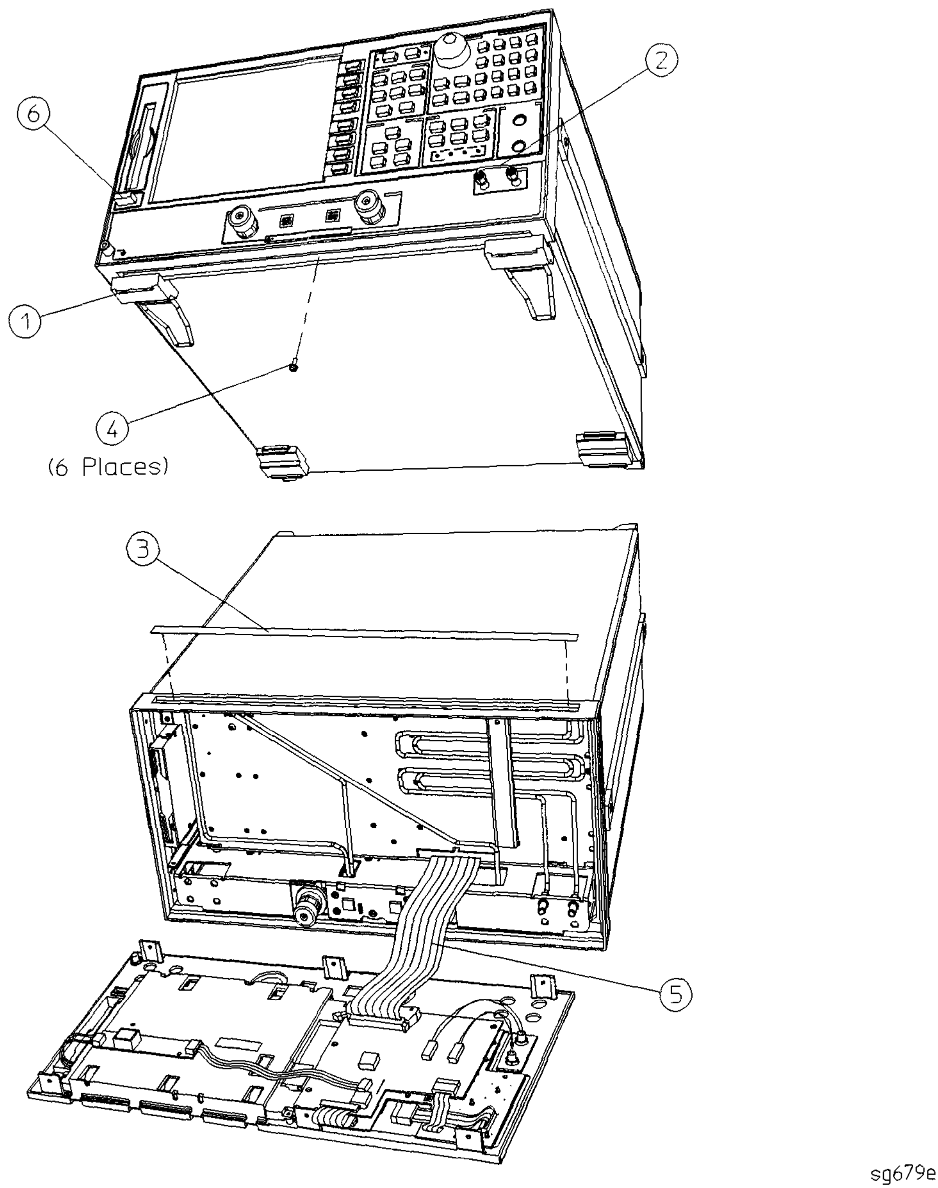
## Removal

1. **Disconnect** the power cord.
2. Remove the front bottom feet (item 1).
3. Remove **all** of the RF cables that are attached to the front panel (item 2).
4. Remove the line button (item 6).
5. Remove the trim strip (item 3) from the top edge of the front frame by prying under the strip with a small slot screwdriver.
6. Remove the six screws (item 4) from the top and bottom edges of the frame.
7. Slide the front panel over the test port connectors
8. Disconnect the ribbon cable (item 5). The front panel is now free from the **instrument.**

## Replacement

1. Reverse the order of the removal procedure.

| Note | When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb. |
|---|---|


6
2
1
4
(6 Places)
3
5
sg679e

# Front Panel Keyboard and Interface Assemblies **(A1, A2)**

## **Tools** Required

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- **5/16-inch** open-end torque wrench (set to 10 in-lb)

## Removal

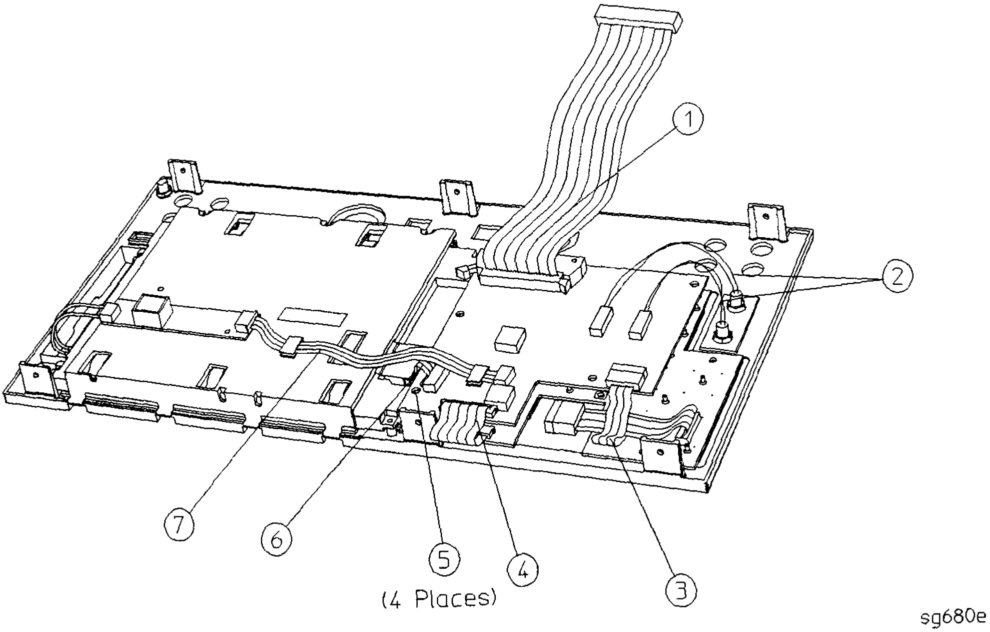
1. Remove the front panel assembly from the analyzer (refer to **"Front** Panel Assembly" in this chapter).
2. **Disconnect** all cables from the front panel interface board (items 1, 2, 3, 4, 6, and 7).
   - Disconnect item 4 by pulling up on the comers of the connector base. This will release the cable for easy removal. Damage ***may occur to the connector if this step is not followed.***
   - Disconnect item 7 by sliding the ribbon cable away from its cable clamp.
3. Remove the four screws (item **5),** attaching the interface board **(A2).**
4. Remove the nine screws from the Al front panel board to access and remove the rubber keypad.

## Replacement

1. Reverse the order of the removal procedure.

**Caution** Damage may result if the following step is not followed.

2. To reconnect item 7, ensure that the ribbon cable is placed squarely into both of its cable clamps


1
2
7
6
5
(4 Places)
4
3
sg680e

# Display Lamp and Inverter Assemblies **(A18, A27)**

## **Tools** Required

- **T-8** TORX screwdriver
- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- **5/16-inch** open-end torque wrench (set to 10 in-lb)

## Removal

1. Remove the front panel assembly (refer to **"Front** Panel Assembly" in this chapter).
2. Disconnect the cables (items 2, 3 and 4) from the Al assembly.
3. Remove two screws (item 8) from the mounting plate (7) to remove the **inverter (A27).**
4. Remove the three screws (item 1) that attach the **mounting** plate and display to the front panel.
5. Remove the mounting plate and the display **(A18)** from the front panel.

| Note | The bottom half of the following **figure** depicts the rear view of the **A18** assembly with the mounting plate removed. Use the location of the display lamp cable (item 4) to aid in orientation. |
|---|---|

6. Remove the three screws (item 5) from the outside of the display.
7. Pull the lamp (item 6) out with a curving side motion, as shown.

## Replacement

1. Reverse the order of the removal procedure.
2. Be sure to route ribbon cable 2 through the cable clamp on the **A2** assembly and the LCD mounting plate (item 7).

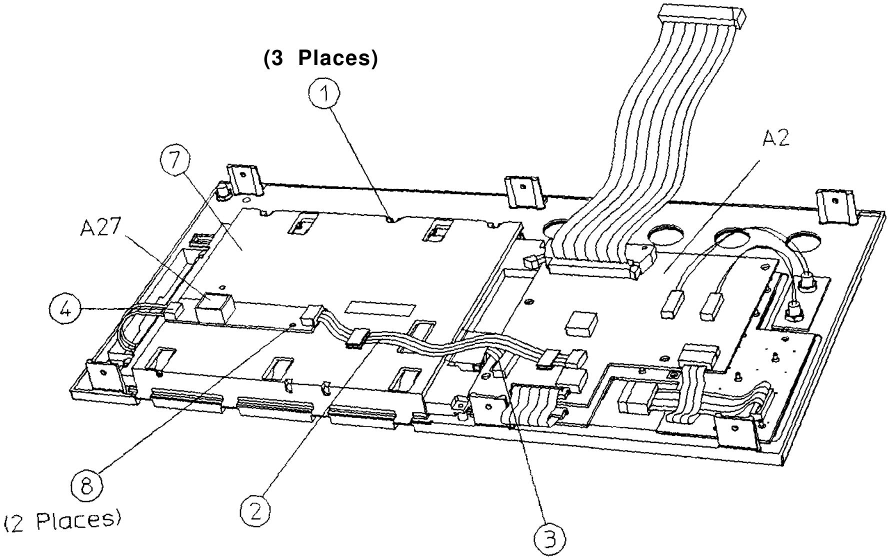
---

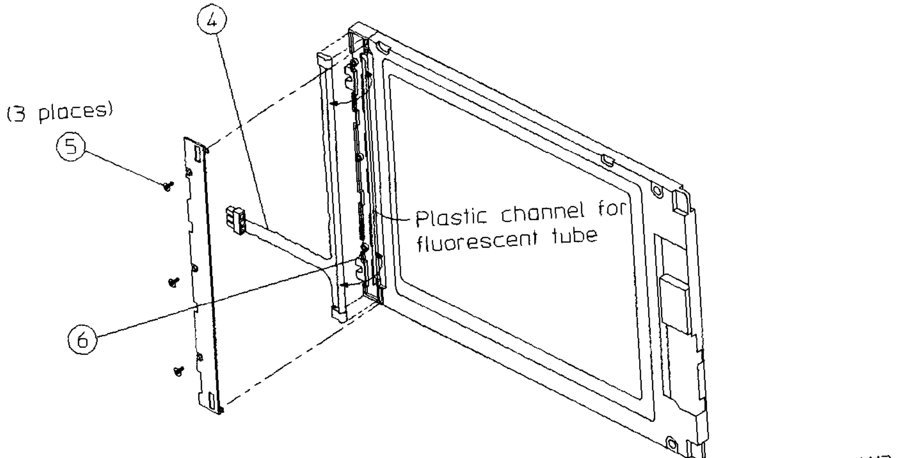
**Caution** Be sure that cables are plugged in square and correct. **Failure** to do so will result in serious component damage.

---

**Caution** Do not exceed 3 in-lb when replacing the self-tapping screws (item 8).

---


(3 Places)
1
7
A2
A27
4
8
(2 Places)
2
3


4
(3 places)
5
Plastic channel for
fluorescent tube
6
shg6113e

## Rear Panel Assembly

### **Tools** Required

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

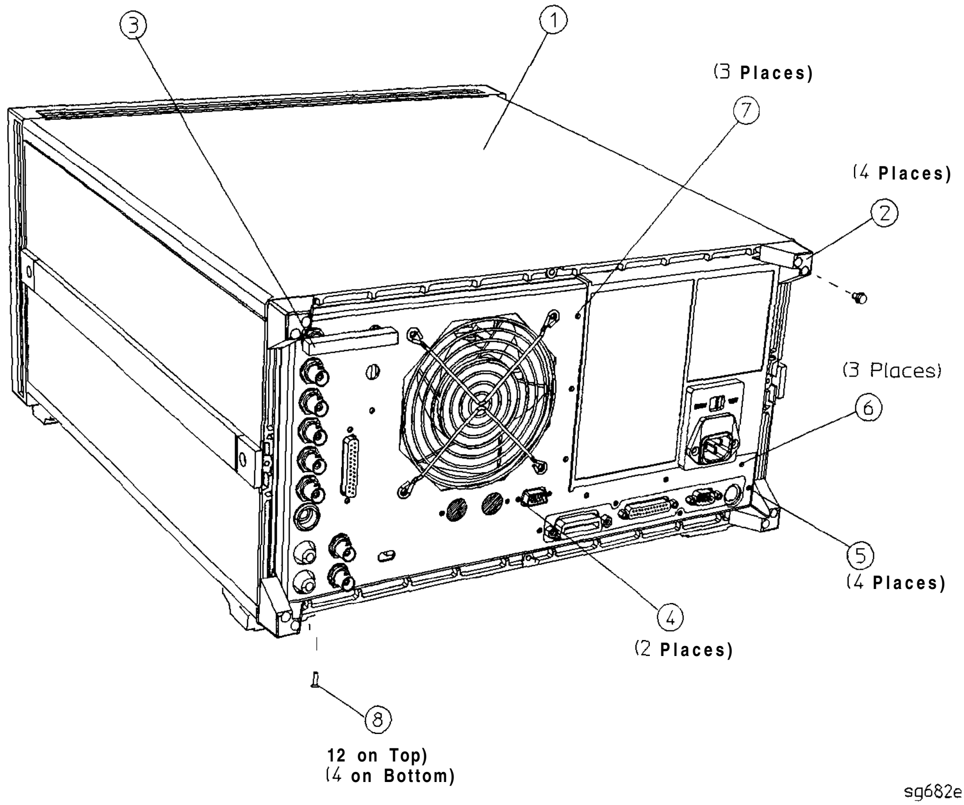
### Removal

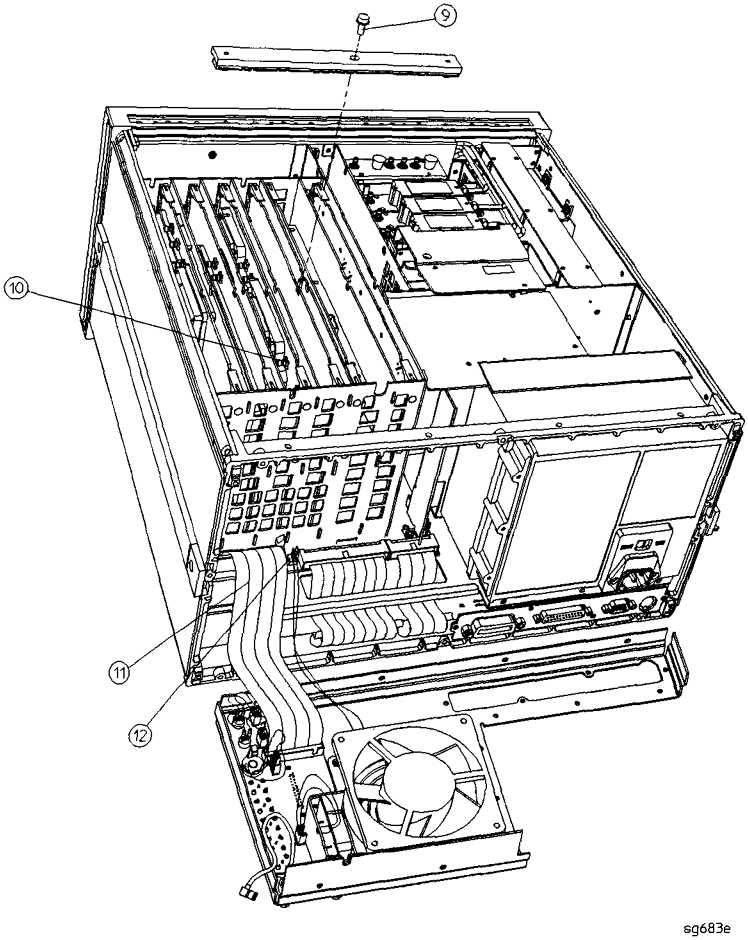
1. Disconnect the power cord and remove the top (item 1) and bottom covers (refer to “Covers” in this chapter).
2. Remove the four rear standoffs (item 2).
3. If the **analyzer** has option **1D5,** remove the BNC jumper from the high stability frequency reference (item 3).
4. Remove the four screws (item 5) that attach the interface bracket to the rear panel.
5. Remove the six screws (item 6) and (item **7),** that attach the **preregulator** to the rear panel.
6. Remove the six screws (item 8) from the rear frame: two from the top edge and four from the bottom edge.
7. Remove the screw from the pc (item 9) board **stabilizer** and remove the stabilizer.
8. Lift the reference board **(A12)** from its motherboard connector and disconnect the flexible RF cable from its connector on **A12** (item 10)
9. Identify the wiring harness leading to the VGA connector (item 4). **Follow** this harness back to its connection on the motherboard. The air flow cover, attached by two screws, **will** have to be removed to get to this connection. Disconnect the VGA wire harness at this point.

10. Pull the rear panel away from the frame. Disconnect the ribbon cable (item 11) from the motherboard connector, pressing down and out on the connector locks. Disconnect the wiring harness (item 12) from the motherboard.

## Replacement

1. Reverse the order of the removal procedure.




9
10
11
12
sg683e

## **Rear** Panel Interface Board Assembly **(A16)**

### **Tools** Required

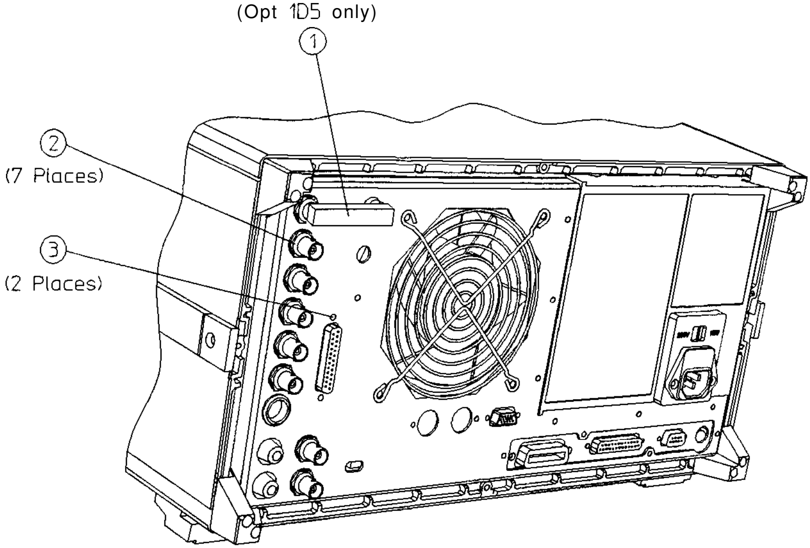
- **9/16** hex nut driver
- **3/16** hex nut driver
- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

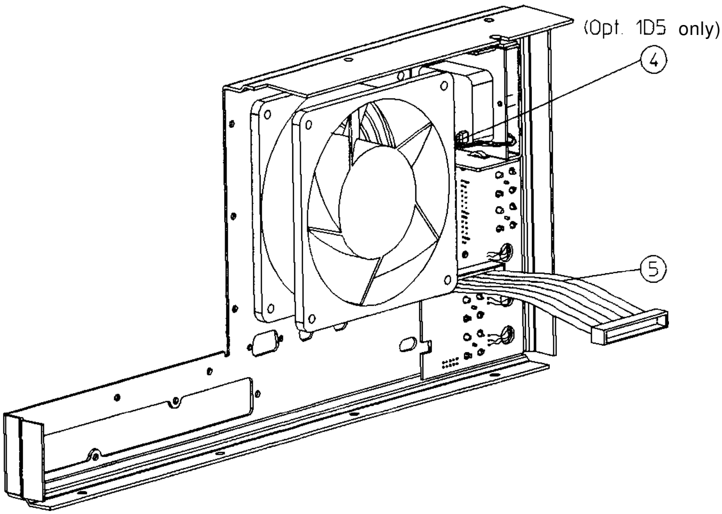
### Removal

1. Disconnect the power cord and remove the top and bottom covers (refer to "Covers" in this chapter).
2. If the **analyzer** has option **1D5,** remove the **high-stability** frequency reference jumper (item 1).
3. Remove the hardware that attaches the seven BNC connectors to the rear panel (item 2).
4. Remove the hardware that attaches the interface connector to the rear panel (item 3).
5. Remove the rear panel from the analyzer (refer to "Rear Panel Assembly" in this chapter).
6. If the analyzer has option **1D5,** disconnect the cable (item 4) from the rear panel interface board.
7. Disconnect the ribbon cable (item 5) from the rear panel interface board.

### Replacement

1. Reverse the order of the removal procedure.




sg684e

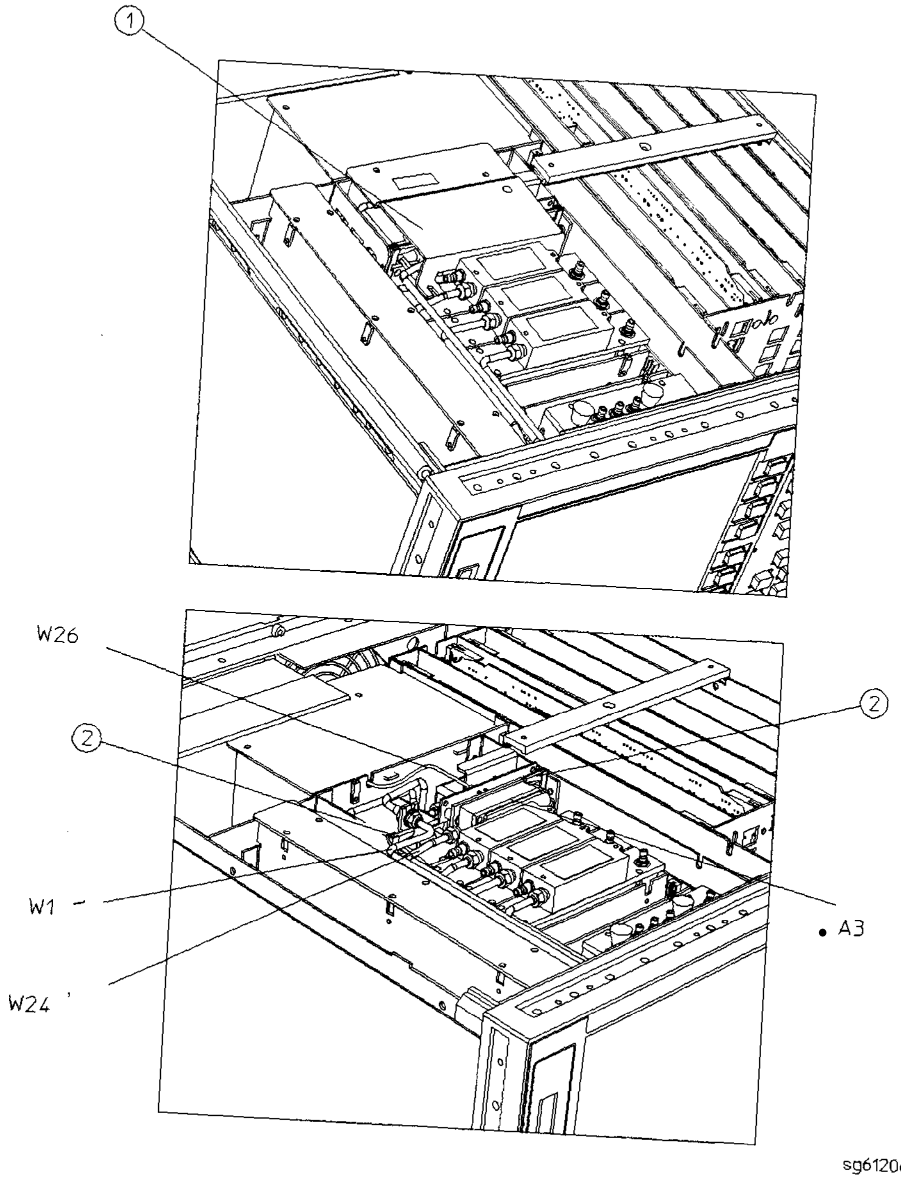
# A3 Source Assembly

## Tools Required

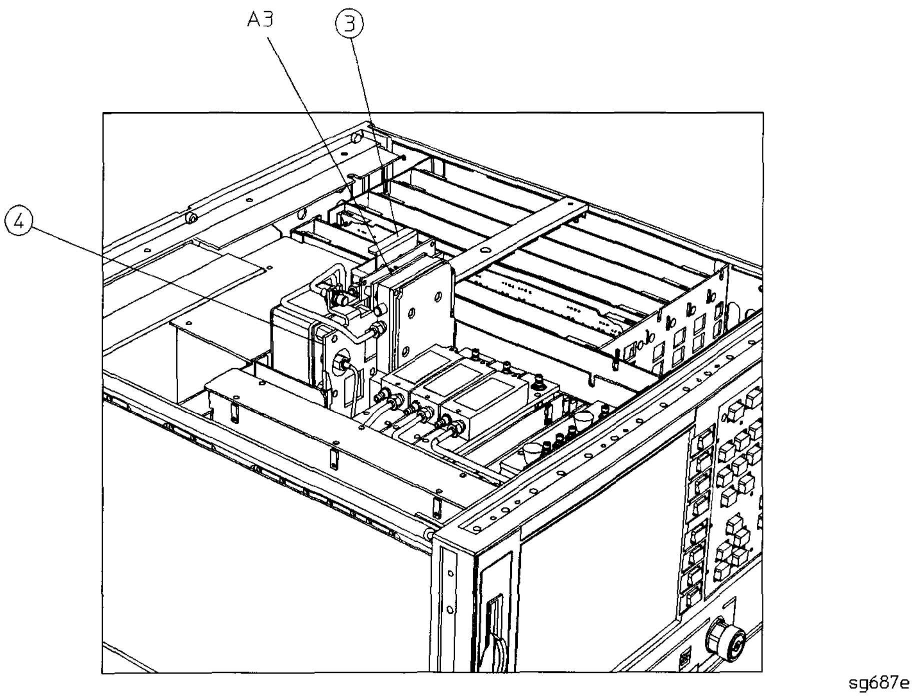
- **T-15** TORX screwdriver
- **5/16-inch** open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

## Removal

1. Disconnect the power cord and remove the top cover (refer to "Covers" in this chapter).
2. Remove the source bracket (item 1) by removing four screws (It might be necessary to disconnect a flexible cable from the B sampler.)
3. Disconnect the flexible cable **W26.**
4. Disconnect the semirigid cable **W1.**
5. Lift the two retention clips (item 2) at the front and rear of the source assembly to an upright position.
6. Move **W1** to the side **while** lifting the source high enough to provide wrench clearance for **W24. To** lift the **A3** source assembly, use the source bracket handle (item 3).
7. Disconnect the semirigid cable **W24.**
8. Remove the source assembly from the instrument.


1
W26
2
2
W1
A3
W24
sg6120e

# A3 Source Assembly




## Replacement

1. Check the connector pins on the motherboard before reinstallation.
2. Slide the edges of the sheet metal partition (item 4) into the guides at the sides of the source compartment. Press down on the module to ensure that it is well seated in the motherboard connector.
3. Push down the retention clips Reconnect the two semirigid cables (**W1** and **W24**) and one flexible cable (**W26**) to the source assembly.

**Note** When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.

4. Reinstall the source bracket.
5. Reconnect the flexible cable to the B sampler.

# A4, AS, A6 Samplers and A7 Pulse Generator

## ToolsRequired

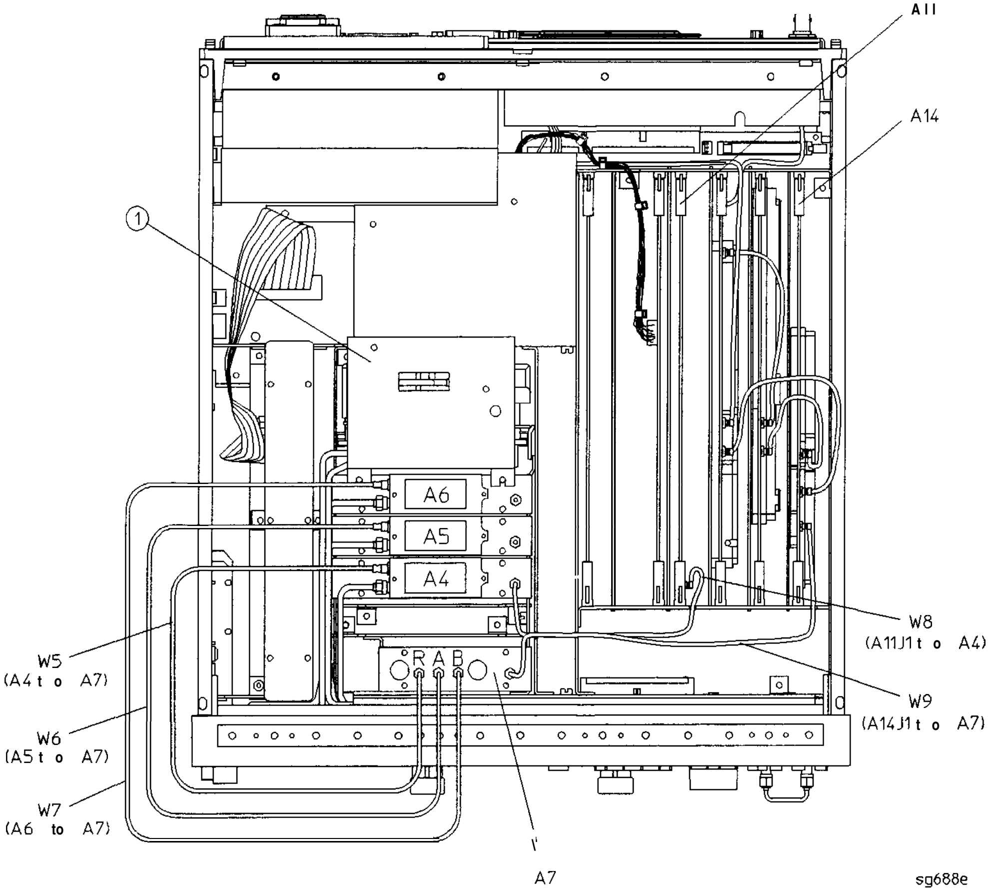
- Needle-nose pliers
- **T-10** TORX screwdriver
- **5/16-inch** open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

## Removal

1. Disconnect the power cord and remove the top cover (refer to "Covers" in this chapter).
2. To remove the B sampler**(A6),** you must remove the source bracket (item 1).
3. Disconnect all cables from the top of the sampler **(A4/A5/A6)** or pulse generator **(A7).**
4. Remove the screws from the top of each sampler assembly. Extract the assembly from the slot.

**Note** — **To** remove the A **(A5)** or R **(A4)** sampler, **first** remove the cable on the B **(A6)** sampler.

**Note** — If you are removing the pulse generator **(A7),** the grounding clip, which rests on top of the assembly, will become loose once the four screws are removed. Be sure to replace the grounding clip when **reinstalling** the pulse generator assembly.


A11
A14
1
A6
A5
A4
R A B
W8
(A11J1 to A4)
W9
(A14J1 to A7)
W5
(A4 to A7)
W6
(A5 to A7)
W7
(A6 to A7)
A7
sg688e

## Replacement

1. Check the connector pins on the motherboard before reinstallation.
2. Reverse the order of the removal procedure.

---

**Note**

- When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.
- Be sure to route **W8** and **W9** as shown. No excess wire should be hanging in the All and **A14** board slots. Routing the wires in this manner will reduce noise and crosstalk.

---

# A8, A10, A11,A12, A13, A14 Card Cage Boards

## Tools Required

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

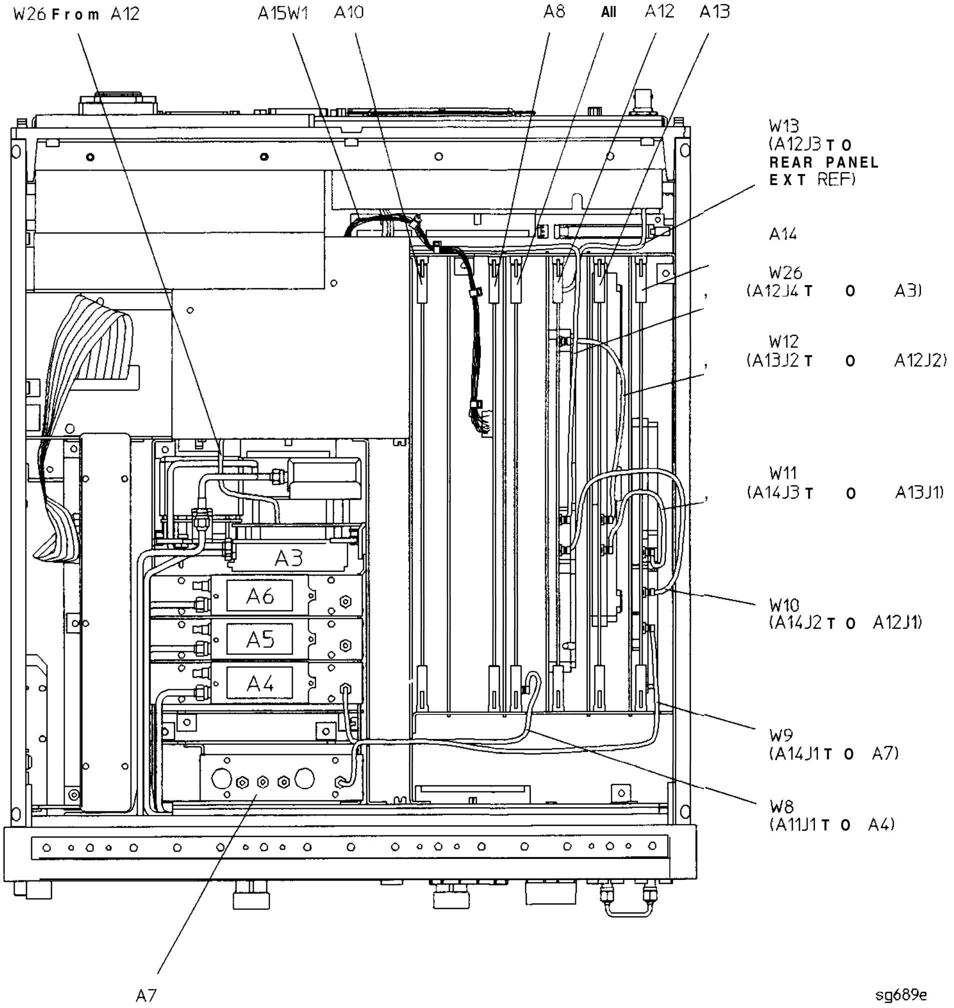
## Removal

1. **Disconnect** the power cord and remove the top cover (refer to "Covers" in this chapter).
2. Remove the screw from the pc board stabilizer and remove the stabilizer.
3. Lift the two extractors located at each end of the board. Lift the board from the card cage slot, just enough to disconnect any flexible cables that may be connected to it.
4. Remove the board from the card cage slot.

## Replacement

1. Check the connector pins on the motherboard before reinstallation.
2. Reverse the order of the removal procedure.

**Note** De sure to route **W8** and **W9** as shown. No excess wire should be hanging in the All and **A14** board **slots.** Routing the wires in this manner will reduce noise and crosstalk in the instrument.



W26 From A12
A15W1
A10
A8
All
A12
A13
W13
(A12J3 TO
REAR PANEL
EXT REF)
A14
W26
(A12J4 TO A3)
W12
(A13J2 TO A12J2)
W11
(A14J3 TO A13J1)
W10
(A14J2 TO A12J1)
W9
(A14J1 TO A7)
W8
(A11J1 TO A4)
A3
A6
A5
A4
A7
sg689e

# A9 CPU Board

## Tools Required

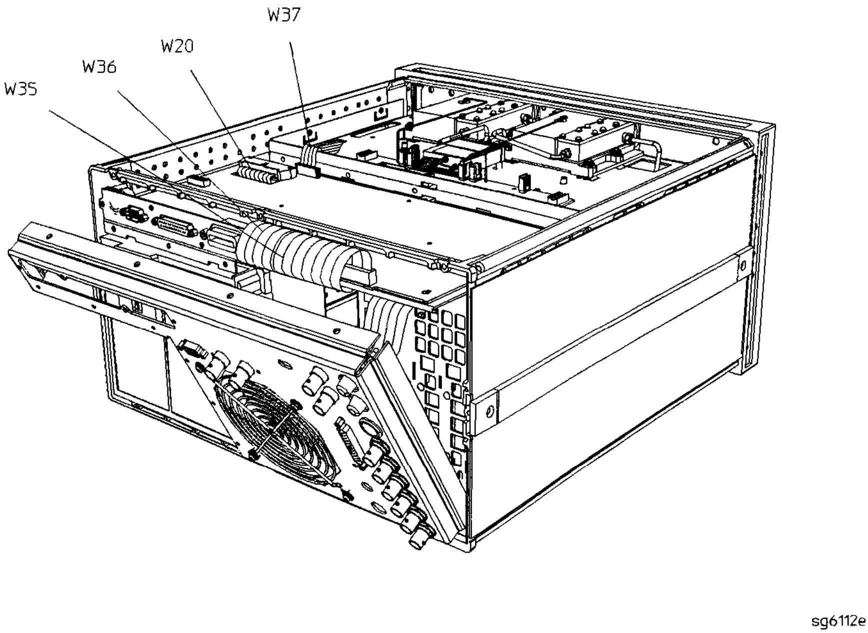
- **T-10** TORX screwdriver
- **T-15 TORX** screwdriver
- ESD (electrostatic discharge) grounding wrist strap

## Removal

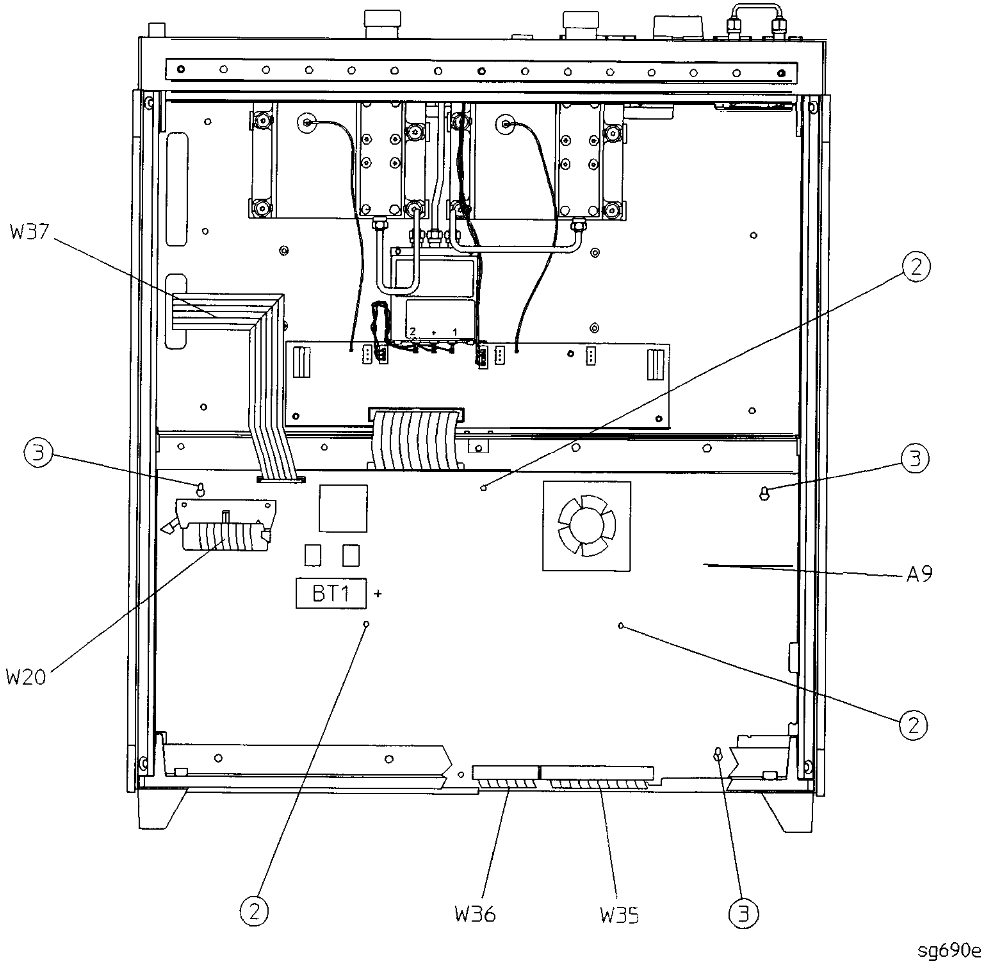
1. Disconnect the power cord.
2. Remove the top and bottom covers (refer to "Covers" in this chapter).
3. Remove the rear panel assembly, following steps 4 through 6 of "Rear Panel Assembly. "
4. Turn the analyzer upside down.
5. Pull the rear panel away from the frame as shown in the following **figure.**
6. Disconnect the four ribbon cables **(W20, W35, W36,** and **W37)** from the CPU board (AS).
7. Remove the three screws (item 2) that secure the CPU board **(A9)** to the deck. Slide the board towards the front of the instrument so that it disconnects from the three standoffs (item 3).
8. Lift the board off of the standoffs

## Replacement

1. Reverse the order of the removal procedure.
2. Leave the bottom cover off in order to perform the post repair procedures located at the end of this chapter.


W37
W20
W36
W35
sg6112e

# A9 CPU Board



# A9BT1 Battery

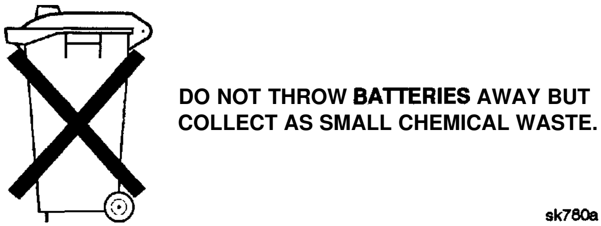
## Tools Required

- **T-10** TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- soldering iron with associated soldering tools

## Removal

1. Remove the **A9** CPU/PIG board (refer to "**A9** CPU Board" in this chapter).
2. Unsolder and remove **A9BT1** from the **A9** CPU/PIG board.

**Warning** **Battery A9BT1 contains lithium. Do not incinerate or puncture this battery. Dispose of the discharged battery in a safe manner.**

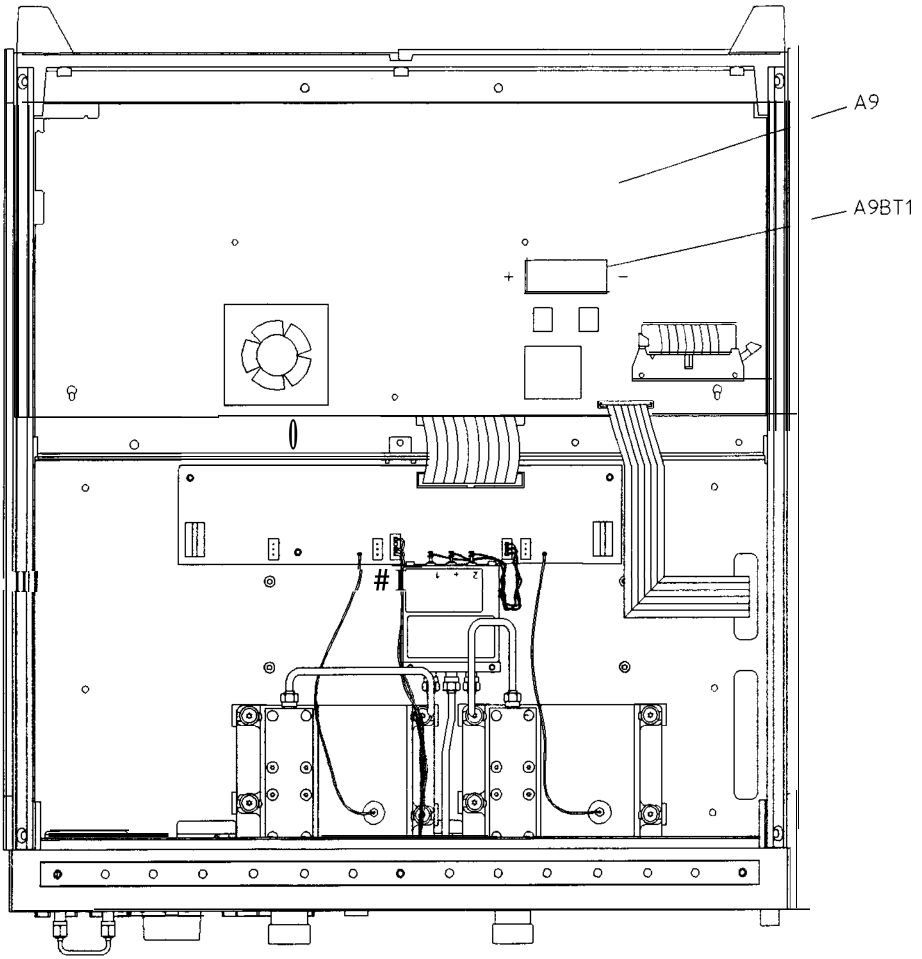



## Replacement

1. Make sure the new battery is inserted into the **A9** board with the correct polarity.

**Warning** **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended.**

2. Solder the battery into place.
3. Replace the **A9** CPU/PIG board (refer to "**A9** CPU Board" in this chapter).




sg691e

# A15 Preregulator

## Tools Required

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

## Removal

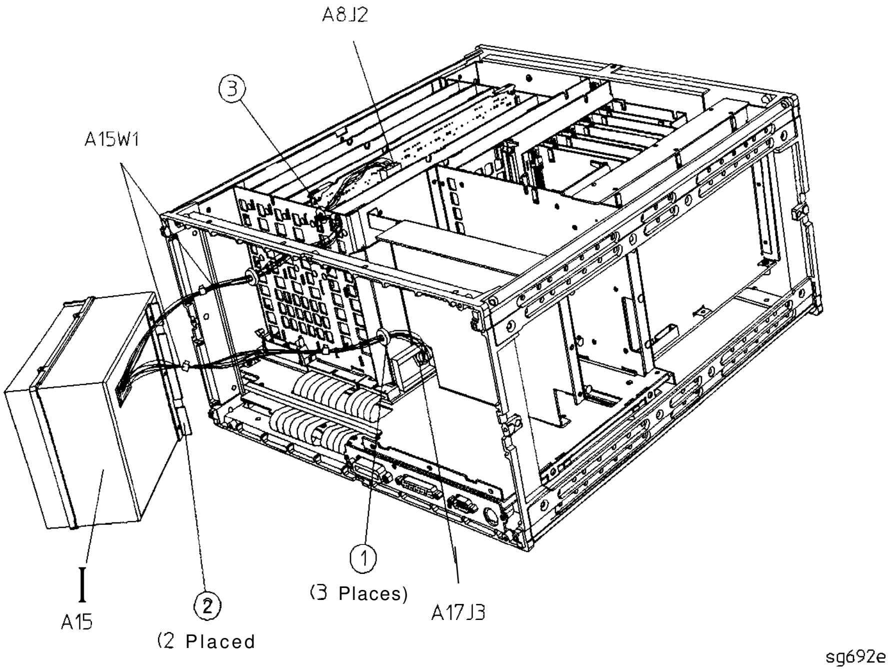
1. Remove the rear panel (refer to "Rear **Panel** Assembly" in this chapter).
2. Remove the two remaining screws from the top of the rear frame.
3. Disconnect the wire bundle **(A15W1)** from **A8J2** and **A17J3.**
4. Remove the preregulator **(A15)** from the frame.

## Replacement

1. Reverse the order of the removal procedure.

**Note**

- When **reinstalling** the preregulator **(A15),** make sure the three grommets (item 1) on **A15W1** are seated in the two slots (item 2) on the back side of the preregulator and the slot (item 3) in the card cage wall.
- After **reinstalling** the preregulator **(A15),** be sure to set the line voltage selector to the appropriate setting, 115 V or 230 V.


A8J2
3
A15W1
A15
2
(2 Placed
1
(3 Places)
A17J3
sg692e

# A17 Motherboard Assembly

## Tools Required

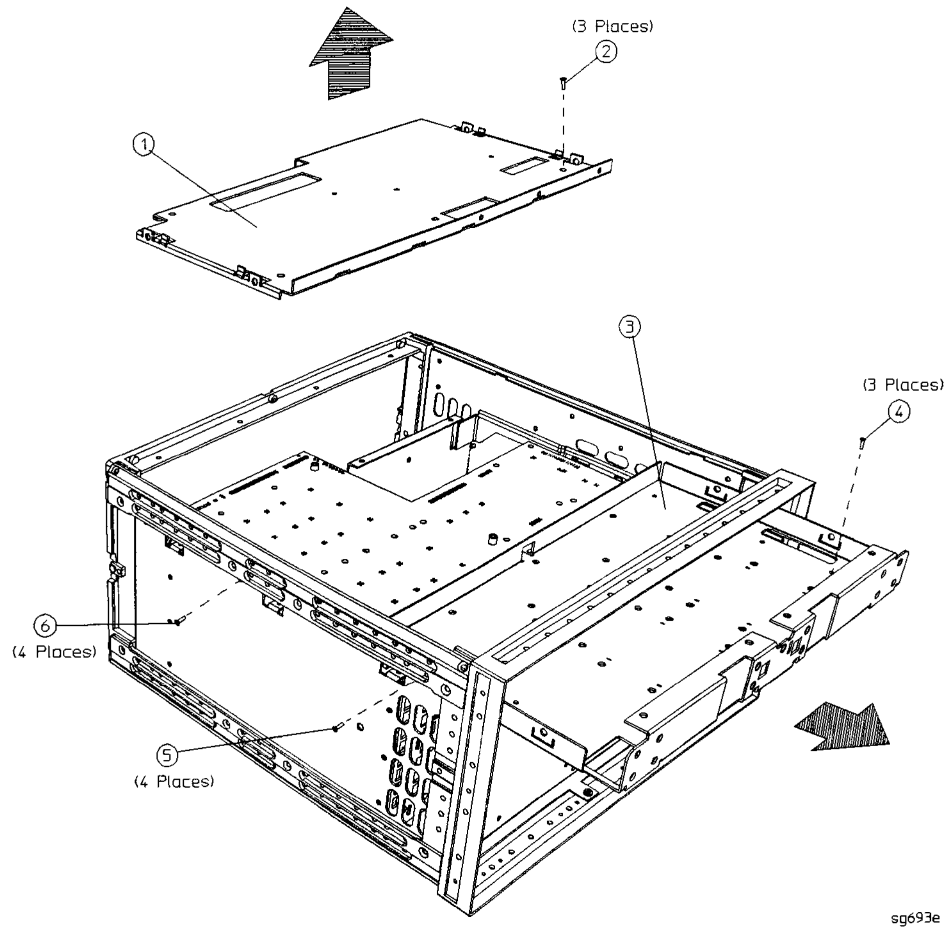
- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- **T-20** TORX screwdriver
- **small** slot screwdriver
- **2.5-mm** hex-key driver
- **5/16-inch** open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

## Removal

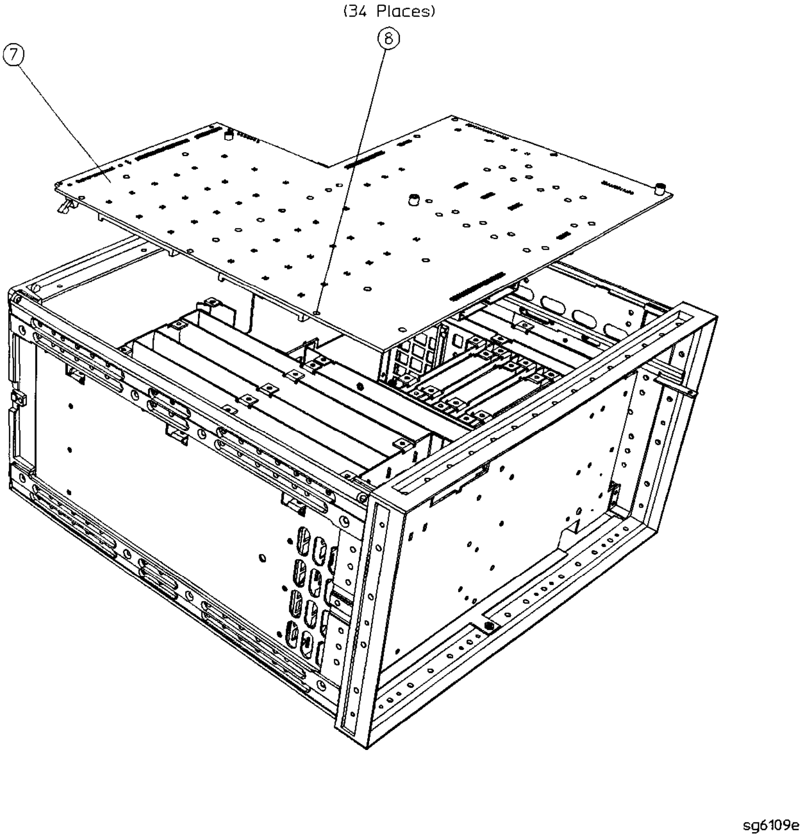
lb remove the **A17** motherboard assembly only, perform the following steps to remove all assemblies and cables that connect to the motherboard.

1. Disconnect the power cord and remove the top, bottom, and side covers (refer to “Covers” in this chapter).
2. Remove the front panel assembly (refer to “Front Panel Assembly” in this chapter).
3. Remove the rear panel assembly (refer to “Rear **Panel** Assembly” in this chapter).
4. Remove the preregulator (refer to **“A15** Preregulator” in this chapter).
5. Remove the graphics processor (refer to **“A19** Graphics Processor” in this chapter).
6. Remove the test set deck (item 3) by removing the three screws (item 4) from the bottom and four screws (item 5) from the side frames. For clarity, the **figure** on the next page does not show the assemblies attached to the test set deck.
7. Remove the CPU board (refer to **“A9** CPU Board” in this chapter).
8. Remove the memory deck (item 1) by removing three screws (item 2) from the bottom and four screws (item 6) from the side frames

9. Remove the source assembly (refer to "**A3** Source Assembly" in this chapter).
10. Remove the samplers and pulse generator (refer to "**A4, A5, A6** Samplers and **A7** Pulse Generator" in this chapter).
11. Remove the card cage boards (refer to "**A8, A10,** All, **A12, A13, A14** Card Cage Boards" in this chapter). Continue with step 12 to remove the motherboard, or step 13 to remove the motherboard/card cage assembly.
12. To disconnect the motherboard (item**7**), remove the 34 riv screws (item **8**). ***Important: Do not misplace any of these screws.***

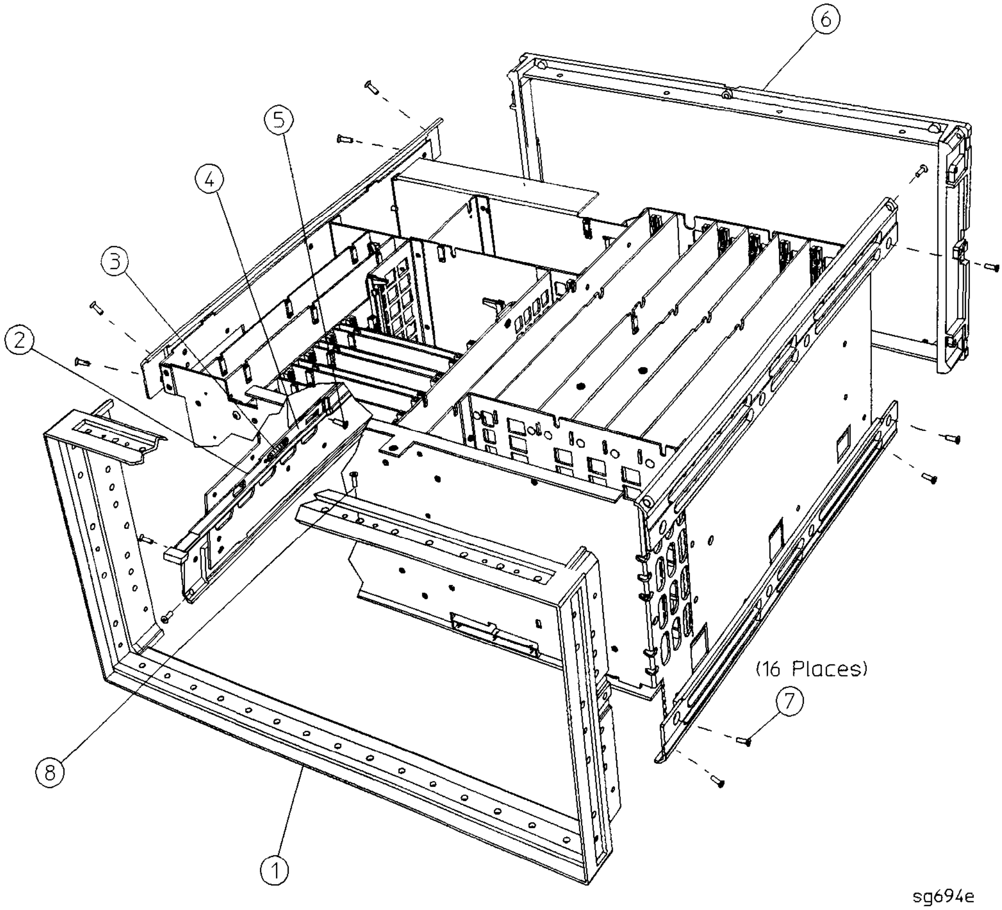


## A 17 Motherboard Assembly




To remove the **A17** motherboard assembly along with the card cage, continue with the following step:

13. Referring to the **figure** on the following page, remove the front frame (item 1) and rear frame (item 6) by removing the attaching screws (item 7). At this point, only the motherboard/card cage assembly should remain. This whole assembly is replaceable.




## Replacement

1. Reverse the order of the removal procedure.

# A19 Graphics Processor

## Tools Required

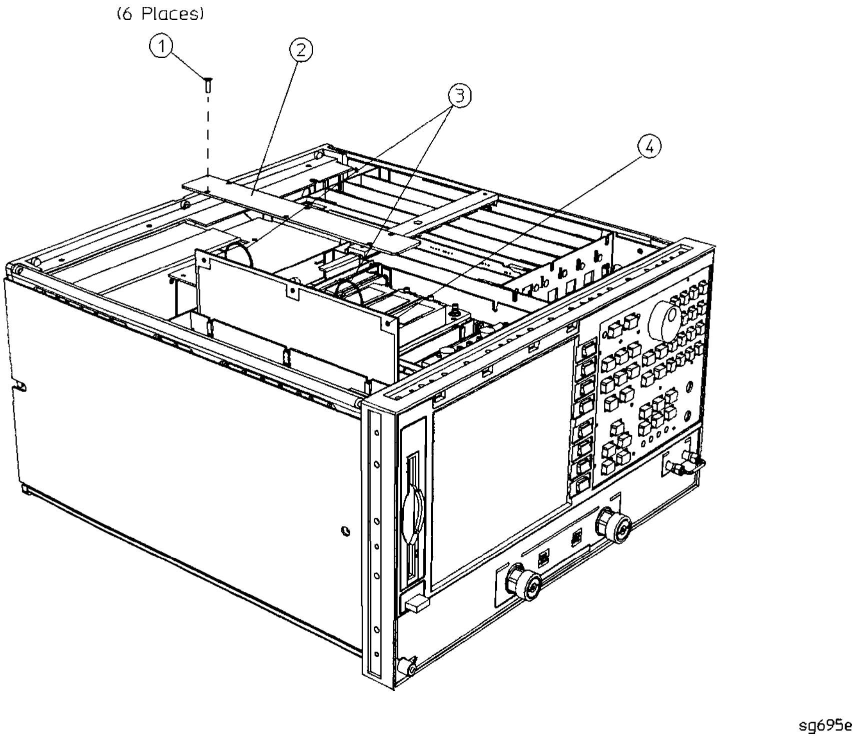
- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

## Removal

1. Disconnect the power cord.
2. Remove the top cover (refer to “Covers” in this chapter) and front panel (refer to “Front Panel Assembly” in this chapter.)
3. Remove the six screws (item 1) from the GSP cover (item 2) and lift off.
4. Swing out the handles (item 3) and pull the GSP board (item 4) out of the analyzer.

## Replacement

1. Check the connector pins on the motherboard before reinstallation.
2. Reverse the order of the removal procedure.


(6 Places)
1
2
3
4
sg695e

# A20 Disk Drive Assembly

## Tools Required

- #2 ball-end hexdriver with long shaft
- T-8 TORX screwdriver
- T-10 TORX screwdriver
- T-15 TORX screwdriver
- T-20 TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap

## Required Diskette

- 3.5" diskette, 1.44 MB, formatted (DOS)

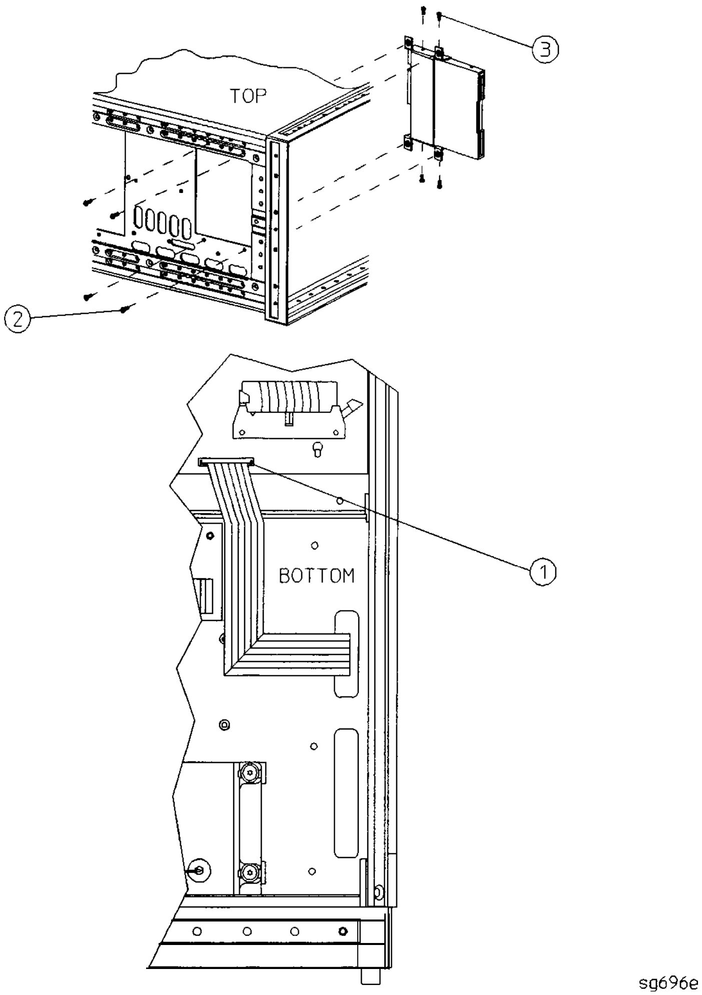
## Preliminary Instructions

Prepare the new disk drive assembly for installation in the analyzer. The Installation Note included in the service kit provides details for this procedure.

1. Disconnect the power cord and remove the top, bottom, and left side-covers (refer to "Covers" in this chapter).
2. Turn the analyzer over, so that the bottom faces up.
3. Disconnect the ribbon cable (item 1) that connects to the disk drive from its connector on the CPU board.
4. Remove the four screws (item 2) that secure the disk-drive bracket to the side of the analyzer, and remove the complete disk drive assembly.

**Note** Save the screws removed in this step for use later when installing the new disk drive bracket.

5. Disconnect the ribbon cable from its connection on the disk drive.


3
TOP
2
BOTTOM
1
sg696e

## Install the replacement disk drive.

1. Connect the existing ribbon cable to the replacement disk drive.

**Note** Make sure that the disk drive connector-contacts touch the ribbon cable contact areas (the ribbon-cable contact areas must face the contacts in the disk drive connector). Also assure that the connector is properly locked.

2. Slide the disk drive and bracket assembly into the analyzer.
3. Route the ribbon cable through the side access hole. Avoid twisting the cable-duplicate the original folds made to the cable.
4. **Fasten** the disk-drive bracket to the side of the analyzer frame, using the four screws saved in step 4 (immediately above).
5. Remove the trim strip from the top of the front panel.
6. Remove the screw from the top left comer of the front panel. This will allow access to one of the **#2** hex screws of the disk-drive assembly.
7. **Align** the disk drive with the front panel, and tighten the three screws that fasten the disk drive to the disk-drive bracket. Do not over-tighten.
8. **Reconnect** the ribbon cable to the CPU board.

**Note** Make sure that the CPU connector-contacts touch the ribbon cable contact areas (the ribbon-cable contact areas must face the contacts in the CPU connector). Also assure that the connector is properly locked.

## Test the disk-eject function, and adjust if required.

1. Insert a diskette into the drive.
2. Eject the diskette from the drive.
3. If the diskette does not eject properly, loosen and re-tighten the three screws that hold the disk drive to the disk-drive bracket:
   a. Loosen the two screws that are readily accessible.
   b. Loosen the upper-most front screw through the access hole in the top-left area of the front frame.

c. Center the disk drive in the opening.

d. Re-tighten all three screws.

## Reinstall the covers.

1. Reinstall the remaining top front-panel screw in the left corner.
2. Reinstall the trim strip.
3. Reinstall the covers. If needed, refer to "Covers" in this chapter for help in performing this task.

# A21, A22 Test Port Couplers

## Tools Required

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- **5/16-inch** open-end torque wrench (set to 10 in-lb)

## Removal

1. **Disconnect** the power cord and remove the bottom cover (refer to "Covers" in this chapter).
2. Disconnect the small bias wire from the test set interface board **(A25).**

   For coupler **A2** 1 disconnect the gray wire **(A2** 1 W 1).
   For coupler **A22** disconnect the gray wire **(A22W1).**
3. Disconnect the two semirigid cables from the coupler assembly.

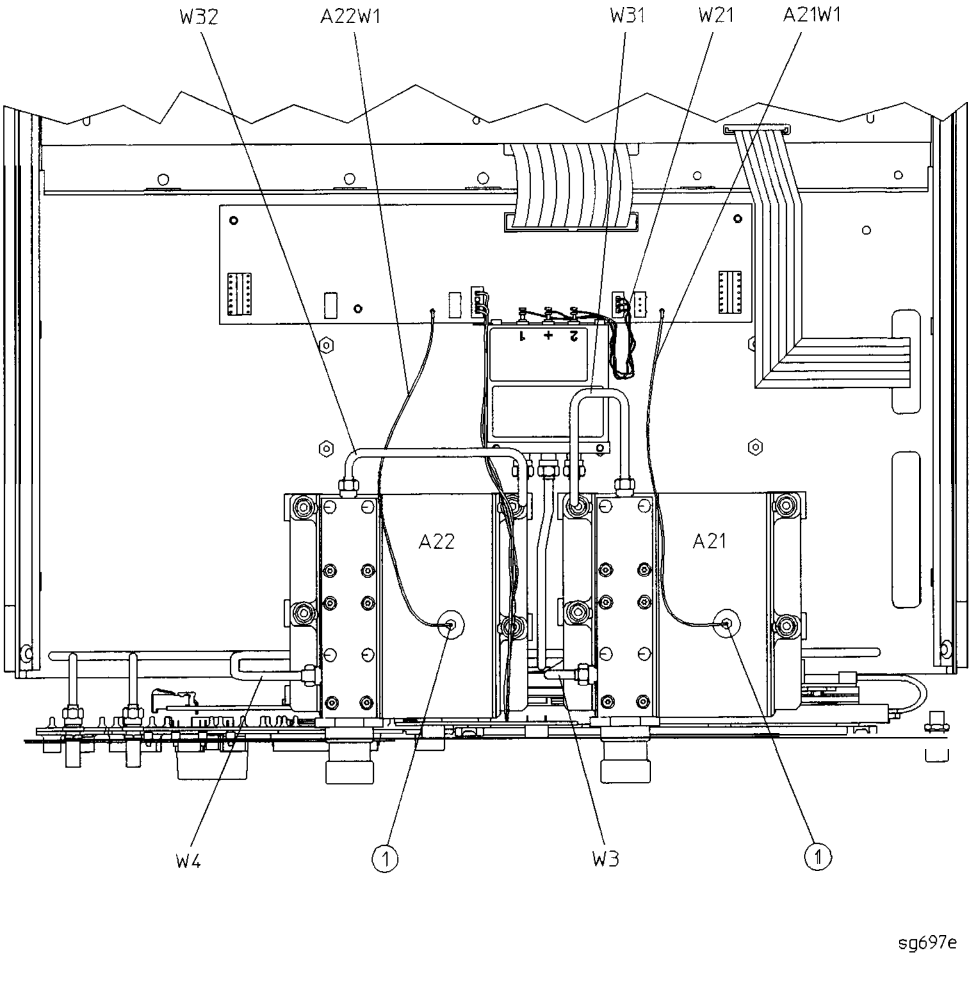
   For coupler **A21** disconnect **W3** and **W31.**
   For coupler **A22** disconnect **W4** and **W32.**
4. Remove the four screws, washers, and pressure springs that secure the coupler to the test set deck. Remove the coupler.
5. Remove the pressure springs

## Replacement

1. Reverse the order of the removal procedure.

**Note**

- If you're **installing** a new coupler, the gold lead on the feedthru capacitor (item 1) must be ***carefully*** bent at 90 degrees to prevent it from shorting to the bottom cover.
- When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.


W32
A22W1
W31
W21
A21W1
1
+
2
A22
A21
W4
1
W3
1
sg697e

# A23 LED Board

## Tools Required

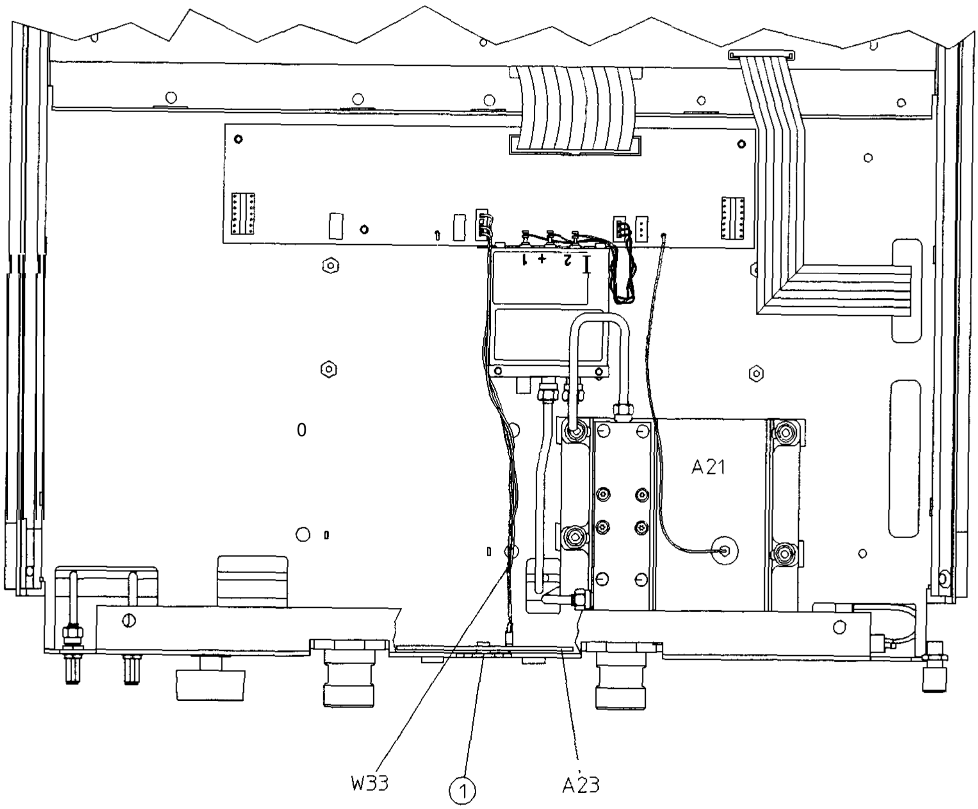
- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- **5/16-inch** open-end torque wrench (set to 10 in-lb)

## Removal

1. Disconnect the power cord and remove the bottom cover (refer to "Covers" in this chapter).
2. Remove the front panel (refer to **"Front** Panel Assembly" in this chapter).
3. Remove the **A22** test port coupler (refer to **"A21, A22 Test Port** Couplers" in this chapter).
4. Disconnect **W33** from the LED board **(A23).**
5. Remove the screw (item 1) from the front of the test set deck.
6. Remove the LED board **(A23).**

## Replacement

1. Reverse the order of the removal procedure.




sg698e

# A24 Transfer Switch

## Tools Required

- **T-10** TORX screwdriver
- **T-15 TORX** screwdriver
- **5/16-inch** open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

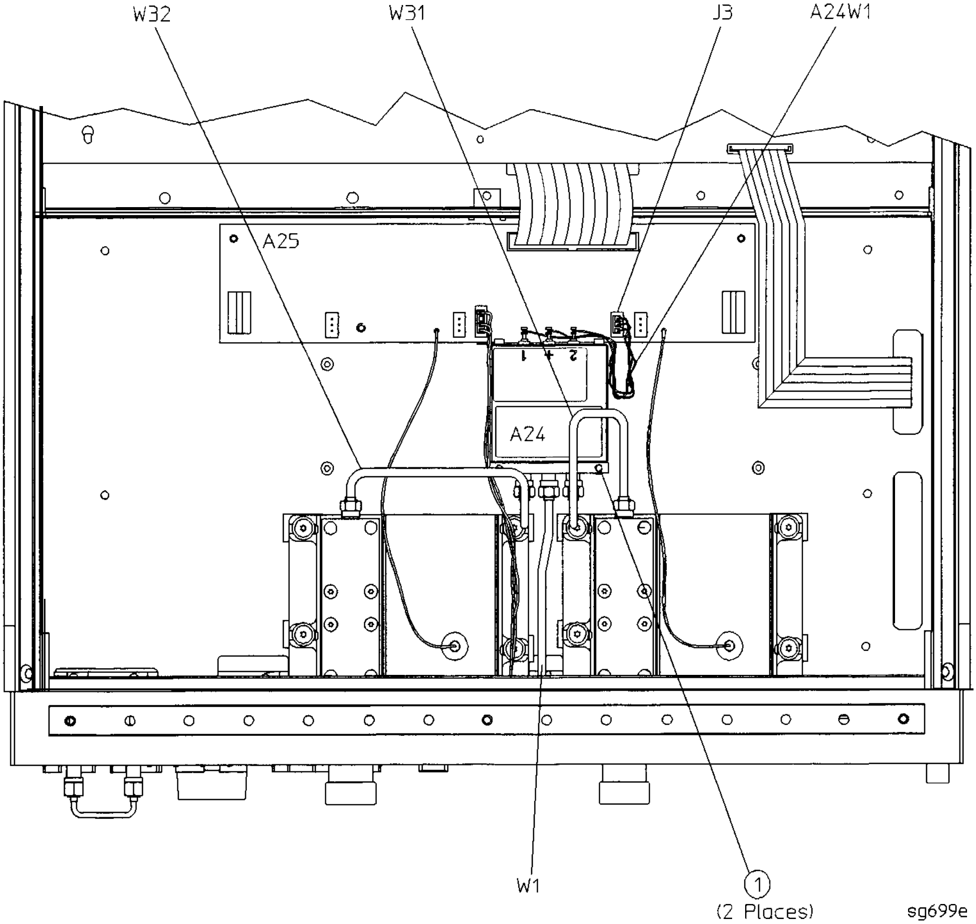
## Removal

1. Disconnect the power cord and remove the bottom cover (refer to "Covers" in this chapter).
2. Disconnect **A24W1** from **J3** on the test set interface board **(A25).**
3. Disconnect the three semirigid cables **(W1, W31,** and **W32)** from the transfer **switch (A24).**
4. Remove the two screws (item 1) that secure the transfer switch.

## Replacement

1. Reverse the order of the removal procedure.

**Note** When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.


W32
W31
J3
A24W1
A25
A24
W1
1
(2 Places)
sg699e

# A25 Test Set Interface

## Tools Required

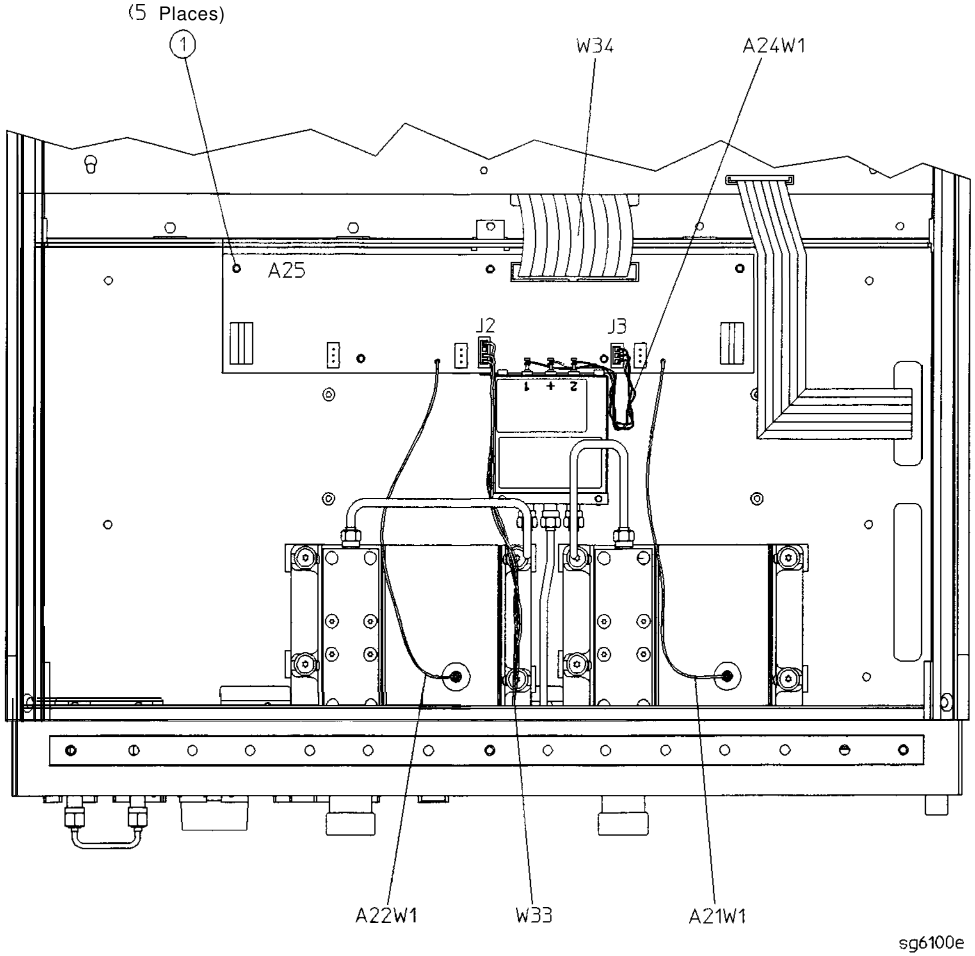
- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- **5/16-inch** open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

## Removal

1. **Disconnect** the power cord and remove the bottom cover (refer to "Covers" in this chapter).
2. Disconnect all cables and wires **(A21W1, A22W1, W33,** and **W34)** from the test set interface board **(A25).**
3. Remove the five screws (item 1) that secure the test set interface board.

## Replacement

1. Reverse the order of the removal procedure.


(5 Places)
1
W34
A24W1
A25
J2
J3
A22W1
W33
A21W1
sg6100e

# A26 High Stability Frequency Reference (Option 1D5) Assembly

## ToolsRequired

- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- **9/16-inch** hex-nut driver
- ESD (electrostatic discharge) grounding wrist strap

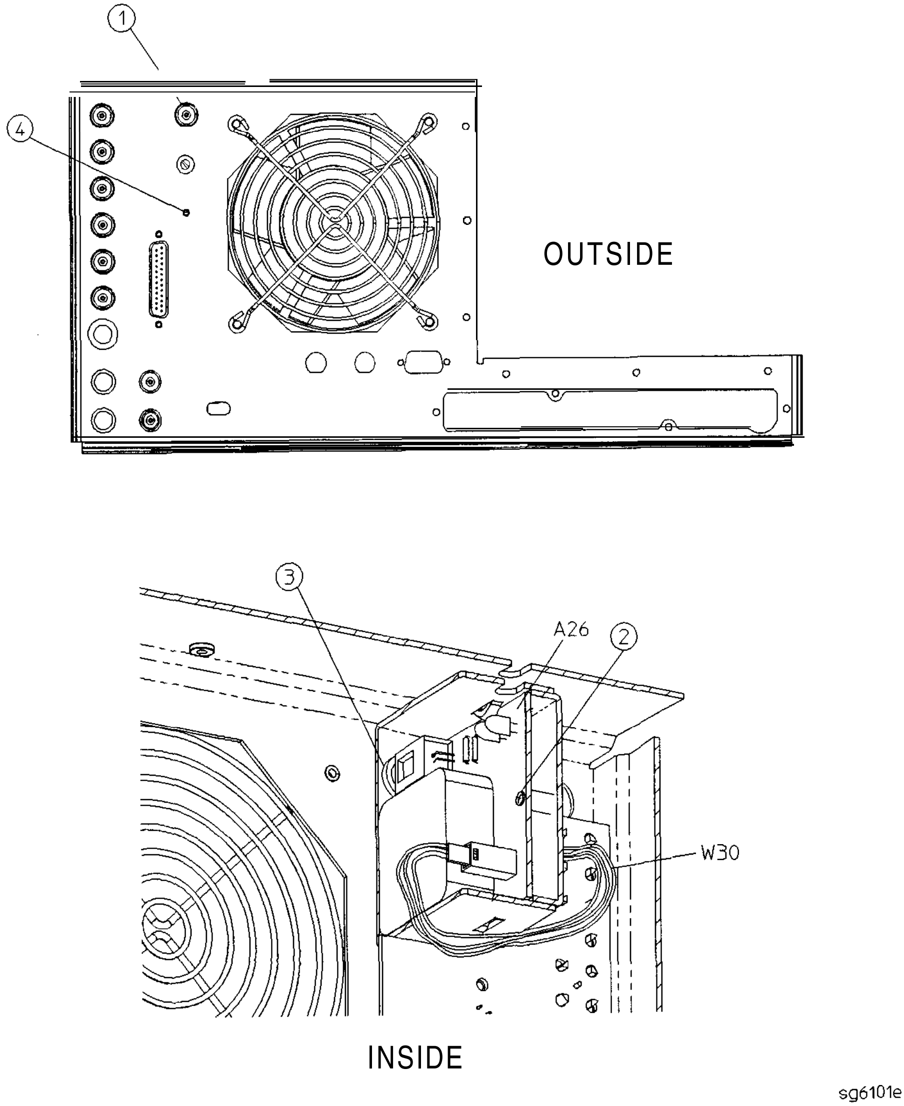
## Removal

1. Remove the rear panel (refer to "Rear Panel Assembly" in this chapter).
2. Disconnect **W30** from the high stability frequency reference board **(A26).**
3. Remove the BNC connector nut and washer from the " 10 **MHz** PRECISION REFERENCE" connector (item 1) on the rear panel.
4. Remove the screw (item 4) that attaches the **1D5** assembly to the rear **panel.**
5. Remove the screw (item 2) that secures the high stability frequency reference board **(A26)** to the bracket.
6. Slide the board out of the bracket. Be careful not to lose the plastic spacer washer (item 3) that is on the BNC connector as the board is being removed.

## Replacement

1. Reverse the order of the removal procedure.

| **Note** | Before reinserting the high stability frequency reference board **(A26)** into the bracket, be sure the plastic spacer washer (item 3) is on the BNC connector. |
|---|---|


1
4
OUTSIDE
3
A26
2
W30
INSIDE
sg6101e

# B1 Fan Assembly

## Tools Required

- **2.5-mm** hex-key driver
- **T-10** TORX screwdriver
- **T-15** TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

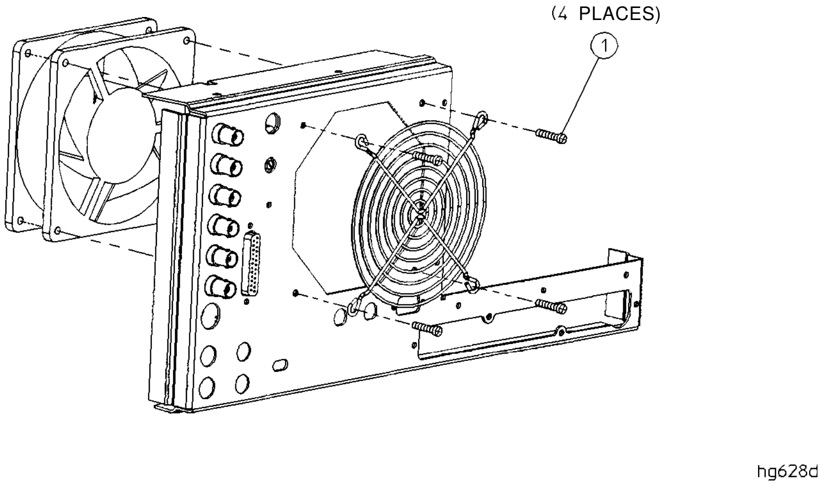
## Removal

1. Remove the rear panel (refer to "Rear Panel Assembly" in this chapter).
2. Remove the four screws (item 1) that secure the fan and fan cover to the rear panel.

## Replacement

1. Reverse the order of the removal procedure.

**Note** The fan should be installed so that the direction of the air Bow is away from the instrument. There is an arrow on the fan chassis indicating the air flow direction.


(4 PLACES)
1
hg628d

## Post-Repair Procedures for HP 8753E

The following table lists the additional service procedures which you must perform to ensure that the instrument is working correctly, following the replacement of an assembly. These procedures can be located in either Chapter 2 or Chapter 3.

***Perform the procedures in the order that they are listed in the table***

**Table 14- 1. Belated Service Procedures**

| Replaced **Assembly** | **Adjustments/ Correction** constants (ch.3) | **Verification (Ch. 2)** |
|---|---|---|
| Al **Front** Panel Keyboard | None | Service Test 0<br>serviceTest 23 |
| A2 **Front** Panel **Interface** | None | Service Test 0<br>service Test 23<br>service Test 12<br>Tests 66 - 80 |
| A3 source | A9 Switch Positions<br>Source Def CC (Test 44)<br>Pretune Default CC (Test 46)<br>Analog Bus CC (Test 46)<br>Source Pretune CC (Test 48)<br>RF Output Power CC (Test 47)<br>Sampler Magnitude and Phase CC (Test 53)<br>Cavity Oscillator Frequency CC (Test 54)<br>Source Spur Avoidance Tracking<br>EEPROM Backup Disk | Test Port Output Frequency Range and Accuracy<br>Test Port Output Power Accuracy<br>Test Port Output Power Range aud Linearity<br>Test Port Output/Input Harmonics (Option 002 only) |
| A4/A5/A6 Samplers | A9 Switch Positions<br>Sampler Magnitude and Phase CC (Test 53)<br>IF Amplifier CC (Test 51)<br>EEPROM Backup Disk | Minimum R Channel Level (if R sampler replaced)<br>Test Port Crosstalk<br>Test Port Input Frequency Response |
| A7 Pulse Generator | A9 Switch Positions<br>Sampler Magnitude and Phase CC (Test 53)<br>EEPROM Backup Disk | Test Port Input Frequency Response<br>Test Port Frequency Range and Accuracy |
| A8 Post Regulator | A9 Switch Positions<br>Cavity Oscillator Frequency CC (Test 54)<br>Source Spur Avoidance Tracking<br>EEPROM Backup Disk | Service Test 0<br>Check A8 test point voltages |

## Table 14-1. Related Service Procedures (2 of 3)

| Replaced Assembly | Adjustments/ Correction Constants (Ch. 3) | Verification (Ch. 2) |
| --- | --- | --- |
| A9 CPU (EEPROM Backup Disk Available) | A9 Switch Positions<br>Load Firmware<br>CC Retrieval<br>Serial Number CC (Test 55)<br>Option Number CC (Test 56) | Operator's Check<br>service Test 21<br>Service Test 22 |
| A9 CPU (EEPROM Backup Disk Not Available) | A9 Switch Positions<br>Load Firmware<br>Serial Number CC (Test 55)<br>Option Number CC (Test 56)<br>Source Def CC (Test 44)<br>Pretune Default CC (Test 46)<br>Analog Bus CC (Test 46)<br>Cal Kit Default (Test 57)<br>Source Pretune CC (Test 48)<br>RF Output Power CC (Test 47)<br>Sampler Magnitude and Phase CC (Test 53)<br>ADC Linearity CC (Test 52)<br>IF Amplifier CC (Test 51)<br>Cavity Oscillator Frequency CC (Test 54)<br>EEPROM Backup Disk | Test Port Output Frequency Range and Accuracy<br>Test Port Output Power Accuracy<br>Test Port Output Power Range and Linearity<br>Test Port Receiver Dynamic Accuracy<br>Test Port Input Frequency Response |
| A10 Digital IF | A9 Switch Positions<br>Analog Bus CC (Test 46)<br>Sampler Magnitude and Phase CC (Test 53)<br>ADC Linearity CC (Test 52)<br>IF Amplifier CC (Test 51)<br>EEPROM Backup Disk | Test Port Input Noise Floor Level<br>Test Port Crosstalk<br>System Trace Noise |
| A11 Phase Lock | A9 Switch Positions<br>Analog Bus CC (Test 46)<br>Pretune Default CC (Test 45)<br>Source Pretune CC (Test 48)<br>EEPROM Backup Disk | Minimum R Channel Level<br>Test Port Output Frequency Range and Accuracy |
| A12 Reference | A9 Switch Positions<br>High/Low Band Transition<br>Frequency Accuracy<br>EEPROM Backup Disk | Test Port Output Frequency Range and Accuracy |

## Table 14-1. Related Service Procedures (3 of 3)

| Replaced Assembly | Adjustments/ Correction Constants (ch. 2) | Verification (Ch. 2) |
|---|---|---|
| A13 Fractional-N (Analog) | A9 Switch Positions<br>Fractional-N Spur and FM Sideband<br>EEPROM Backup Disk | Test Port Output Frequency Range and Accuracy |
| A14 Fractional-N (Digital) | A9 Switch Positions<br>Fractional-N Frequency Range<br>Fractional-N Spur Avoidance and FM Sideband<br>EEPROM Backup Disk | Test Port Output Frequency Range and Accuracy |
| A15 Preregulator | None | Self-Test |
| A16 Rear Panel Interface | None | Internal Test 13, Rear Panel |
| A17 Motherboard | None | Observation of Display<br>Tests 66 - 80 |
| A18 Display | None | Observation of Display<br>Tests 66 - 80 |
| A19 Graphics System Processor | None | Observation of Display<br>Tests 59 - 80 |
| A20 Disk Drive | none | none |
| A21 Test Port Coupler | RF Output Power CC (Test 47)<br>Sampler Magnitude and Phase CC (Test 53) | Test Port Crosstalk<br>Test Port Frequency Response |
| A22 Test Port Coupler | Sampler Magnitude and Phase CC (Test 53)<br>• | Test Port Crosstalk<br>Test Port Frequency Response |
| A23 Bd Assy LED | none | Self-Test (Chapter 4) |
| A24 Transfer Switch | none | Test Port Crosstalk |
| A25 Test Set Interface | none | Self-Test (Chapter 4) |
| A26 High Stability Frequency Reference | Frequency Accuracy Adjustment (Option 1D5) | Test Port Frequency Range and Accuracy |

* Hewlett-Packard verifies source output performance on port 1 only. Port 2 source output performance is typical.

# 15

# Safety and Licensing

## Notice

The information contained in this document is subject to change without notice.

Hewlett-Packard makes no warranty of any kind with regard to this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

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

## Warranty

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of three years 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.

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## 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.***

# Hewlett-Packard Sales and Service Offices

## UNITED STATES

Instrument Support Center
**Hewlett-Packard Company**
**(800) 403-0801**

## EUROPEAN FIELD OPERATIONS

**Headquarters**
**Hewlett-Packard** S.A.
160, **Route** du **Nant-d'Avril**
**1217 Meyrin 2/Geneva**
**Switzerland**
(4122) **780.8111**

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

**Germany**
Hewlett-Packard **GmbH**
Hewlett-Packard **Strasse**
61362 **Bad Homburg v.d.H**
**Germany**
(49 6172) **16-0**

Great Britain
Hewlett-Packard Ltd.
E&dale **Road, Winnersh** Triangle
**Wokingham, Berkshire RG41 5DZ**
**England**
**(44 734) 696622**

## INTERCON FIELD OPERATIONS

**Headquarters**
**Hewlett-Packard** Company
**3495 Deer Creek Road**
**Palo** Alto, **California,** USA
**94304-1316**
(416) **857-5027**

**Australia**
Hewlett-Packard **Australia** Ltd.
31-41 Joseph Street
Blackbum, Victoria 3130
(613) **895-2895**

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

**Japan**
**Hewlett-Packard** Japan, Ltd.
91 **Takakura-Cho, Hachioji**
**Tokyo** 192, Japan
(81426) **60-2111**

**Singapore**
**Hewlett-Packard** Singapore (Pte.) Ltd.
169 Beach **Road**
**#29-00** Gateway **West**
**Singapore** 0718
**(65) 291-9088**

**Taiwan**
Hewlett-Packard **Taiwan**
**8th** Floor, H-P **Building**
**337 Fu Hsing North Road**
**Taipei, Taiwan**
(336 2) **712-0404**

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

## Shipment for Service

If you are sending the instrument to Hewlett-Packard for service, ship the analyzer to the nearest HP service center for repair, including a description of any failed test and any error message. Ship the analyzer using the original or comparable antistatic packaging materials.

## Safety Symbols

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

**Caution** Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, would result in damage to or destruction of the instrument. Do not proceed beyond a caution note until the indicated conditions are fully understood and met.

**Warning** **Warning 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 note until the indicated conditions are fully understood and met.**

## Instrument Markings

⚠ The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.

"CE" The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)

**"ISM1-A"** This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.

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

## Safety Considerations

**Note** This instrument has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronics Measuring Apparatus, and has been supplied in a safe condition. This instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

### Safety Earth Ground

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

**Warning** **Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.**

### Before Applying Power

**Caution** Before switching on this instrument, make sure that the **analyzer** line voltage selector switch is set to the voltage of the power supply and the correct fuse is installed.

**Caution** If this product is to be energized via an autotransformer make sure the common terminal is connected to the neutral (grounded side of the mains supply).

## Servicing

**Warning** No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

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

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

**Warning** Adjustments described in this document may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

**Warning** The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.

**Warning** For continued protection against fire hazard replace line fuse only with same type and rating (F 3A/250V). The use of other fuses or material is prohibited.

## General

**Warning** **To prevent electrical shock, disconnect the HP 8753E from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

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

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

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

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**Warning** **Install the instrument according to the enclosure protection provided. This instrument does not protect against the ingress of water. This instrument protects agains finger access to hazardous parts within the enclosure.**

## Compliance with German FTZ Emissions Requirements

This network analyzer complies with German **FTZ 526/527** Radiated Emissions and Conducted Emission requirements.

## Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe **nach** der Maschinenlaernuerordung -3. GSGV Deutschland).

| Acoustic Noise | **Emission/Geraeuschemission** |
|---|---|
| **LpA<70 dB** | **Lpa<70 dB** |
| Operator Position | am Arbeitsplatz |
| Normal Operation | **normaler** Betrieb |
| **per ISO 7779** | **nach** DIN 45635 t. 19 |

# Index

## B

N

## R

## T

## U



## V



## W



## Y