

# **Service Guide**

## **Agilent Technologies**

### **8752C**

## **Network Analyzer**



**Agilent Technologies**

**Manufacturing Part Number: 08752-90136**

**Printed in USA**

**Print Date: February 1998**

**Supersedes: December 1997**

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# **Service Guide**

## **HP 8752C Network Analyzer**



**HP Part No. 08752-90136      Supersedes December 1997**  
**Printed in USA      February 1998**

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## **Service Equipment and Analyzer Options**

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### **Table of Service Test Equipment**

The following tables list the tools and test equipment required to perform the analyzer's system verification, troubleshooting, adjustment, and performance tests.

**Table 1-1. Service Test Equipment**

Required Equipment	Critical Specifications	Recommended Model	Use*
Spectrum Analyzer	Freq. Accuracy $\pm 7$ Hz	HP 8563E	A, T
Frequency Counter		HP 5343A	P
Measuring Receiver		HP 8902A	P
Oscilloscope	Bandwidth: 100 MHz Accuracy: 10%	any	T
Digital Voltmeter	Resolution: 10 mV	any	T
Tool Kit	No substitute	HP part number 08753-60023	T
Power Meter (HP-IB)	No substitute	HP 436A Opt. 022, HP 437A or 438A	A, P, T
Power Sensor	Frequency: 300 kHz-3 GHz, 50 $\Omega$	HP 8482A	A, P, T
Power Sensor (for Option 006)	Frequency: 3 GHz-6 GHz	HP 8481A Opt 006	A, P, T
Power Sensor	Frequency: 300 kHz-3 GHz, 75 $\Omega$	HP 8483A Opt. H03	P
Photometer		Tektronix J16	A
Photometer Probe		Tektronix J6503	A
Light Occluder		Tektronix 016-0305-00	A
CRT Demagnetizer or Bulk Tape Eraser			A
Printer		HP ThinkJet, DeskJet, LaserJet	P
Disk Drive	3.5-inch	HP 9122	
Floppy Disk	3.5-inch	HP 92192A	A
Calibration Kit Type-N, 50 $\Omega$	No substitute	HP 85032B	P
Calibration Kit Type-N, 75 $\Omega$	No substitute	HP 85036B	P
Verification Kit 7 mm	No substitute	HP 85029B	P
Low Pass Filter	>50 dB @ 2.96 Hz and passband that includes 800 MHz	HP P/N 9135-0198	A
Step Attenuator	110 dB	HP 8496A	P
Attenuators (fixed):	Return loss: $\geq 32$ dB APC-7 20 dB (2)	HP 8491A Opt. 020	P, T
Power Splitter	2-Way, 50 $\Omega$	HP 11667A	P, T
Minimum Loss Pad	Type-N, 50 $\Omega$ to 75 $\Omega$	HP 11852B	P, T

**1-2 Service Equipment and Analyzer Options**

**Table 1-2. Service Test Equipment (2 of 2)**

<b>Required Equipment</b>	<b>Critical Specifications</b>	<b>Recommended Model</b>	<b>Use *</b>
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	APC-3.5 (f) to type-N (m)	HP P/N 1250-1744	A
Adapter	BNC (m) to type-N (f)	HP P/N 1250-0077	P
Adapter	type-N (m) to type-N (m)	HP P/N 1250-1528	P
RF Cable	24-inch, type-N, 75Ω	HP P/N 8120-2408	A, P
RF Cable	24-inch, type-N, 50Ω	HP P/N 8120-4781	A, P
RF Cable Set	type-N, 50Ω	HP 11851B	P
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), 50Ω	HP 10503A	A
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
* P - Performance Tests A - Adjustment T - Troubleshooting			

**Table 1-2. Required Tools**

T-8, T-10 and T-15 TORX screwdrivers
Flat-blade screwdrivers—small, medium, and large
5/16-inch open-end wrench (for SMA nuts)
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

#### **1-4 Service Equipment and Analyzer Options**



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## **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**

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

**1-6 Service Equipment and Analyzer Options**

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## **Analyzer Options Available**

### **Option 003, 3 GHz Operation**

This option extends the maximum source and receiver frequency of the analyzer to 3 GHz.

### **Option 004, Step Attenuator**

This option provides a source output power range from  $-85$  to  $+10$  dBm.

### **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 such devices as SAW filters, SAW delay lines, RF cables, and RF antennas.

### **Option 075, 75 $\Omega$ Impedance**

This option offers 75 $\Omega$  impedance bridges with type-N test port connectors.

### **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.

### **Option AFN, add 50Ω Test Port Cable**

This option provides a second type-N male to type-N male test port cable and a type-N female to type-N female adapter. Instructions are included for storing a new internal calibration to account for the effects of this cable.

### **Option AFP, add 75Ω Test Port Cable**

This option provides a 75Ω type-N male to type-N female test port cable. Instructions are included for storing a new internal calibration to account for the effects of this cable.

### **Option B02, External Disk Drive**

This option provides an external disk drive and an HP-IB cable.

---

## **Service and Support Options**

Hewlett-Packards offers many repair and calibration options for your analyzer. Contact the nearest Hewlett-Packard sales or service office for information on options available for your analyzer. See the table titled "Hewlett-Packard Sales and Service Offices" in Chapter 15.



## System Verification and Performance Tests

---

### How to Test the Performance of Your Analyzer

To obtain the same quality of performance testing that Hewlett-Packard has administered at the factory, you must perform:

- the system verification procedure

AND

- *all* of the performance test procedures.

This quality of performance testing guarantees that the analyzer is performing within *all* of the published specifications. A Hewlett-Packard Customer Engineer will issue a Certificate of Calibration for your analyzer if two conditions are met:

- Your analyzer passes all the performed tests.
- The equipment and standards that were used to perform the tests are traceable to a national standards institute.

---

**Note**

If you have a particular type of measurement application that does not use all of the analyzer's measurement capabilities, you may ask your local Hewlett-Packard Customer Service Center for a subset of specifications that you want verified. However, this does create the potential for making incorrect measurements when using a different application.

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## Sections in this Chapter

- **HP 8752C System Verification**

- **HP 8752C Performance Tests**

1. Reflection Test Port Output Frequency Range and Accuracy
2. Reflection Test Port Output Power Range and Level Linearity (HP 8752C without Option 004)
3. Reflection Test Port Output Power Range and Level Linearity (HP 8752C with Option 004)
4. Transmission Test Port Input Noise Floor Level (HP 8752C without Option 075)
5. Transmission Test Port Input Noise Floor Level (HP 8752C with Option 075)
6. Test Port Crosstalk
7. System Trace Noise
8. Magnitude Dynamic Accuracy (HP 8752C – All Options)
9. Phase Dynamic Accuracy (HP 8752C – All Options)
10. Compression

- **HP 8752C Performance Test Record**

## 2-2 System Verification and Performance Tests



---

## HP 8752C System Verification

### Equipment

For standard HP 8752C network analyzer:

Calibration kit (50 $\Omega$ , type-N).....HP 85032B  
Cable type-N (50 $\Omega$ ) 24-inch.....HP P/N 8120-4781  
Printer..... HP ThinkJet, DeskJet, LaserJet

For the HP 8752C with Option 075:

Calibration kit (75 $\Omega$ , type-N).....HP 85036B  
Cable type-N (75 $\Omega$ ) 24-inch.....HP P/N 8120-2408  
Printer..... HP ThinkJet, DeskJet, LaserJet

Warm-up time: one hour.

### Description

The HP 8752C system verification consists of performing the verification procedure mentioned in this section. The verification procedure is semi-automated and controlled by the analyzer's firmware.

The verification procedure involves measuring a set of calibration devices (supplied in the HP 85032B 50 $\Omega$  type-N calibration kit or the HP 85036B 75 $\Omega$  type-N calibration kit) and comparing the measured data to the specification limits drawn on the analyzer display. The measured data must fall within the specification limits at all frequencies to pass the test.

System verification is only part of an instrument's calibration procedure. The complete set of instrument specifications can be tested by performing the "HP 8752C System Verification" and all of the analyzer's performance tests. An HP 85032B Option 002 or an HP 85036B Option 1BP calibration kit (including with a Certificate of Calibration with United States National Institute of Standards and Technology (NIST) test numbers) is required for a calibration traceable to NIST.

---

**Note** A Certificate of Calibration is issued if the analyzer's system verification as well as all of the performance tests are performed by a Hewlett-Packard Customer Engineer with all having passed.

---

## **System Verification Cycle and Kit Recertification**

The recommended system verification cycle is every six months. Hewlett-Packard also suggests the calibration kit be recertified annually. For more information about the kit recertification, refer to the *HP 85032B 50Ω Type-N Calibration Kit Operation and Service Manual* or *HP 85036B 75Ω Type-N Calibration Kit Operation and Service Manual*.

## **Measurement Uncertainty**

Associated with any analyzer are measurement errors that add uncertainty to the measured results. This uncertainty limits how accurately a device under test (DUT) can be measured.

The measurement uncertainty is defined to be the sum of the residual systematic (repeatable) and random (non-repeatable) errors in the measurement system. The systematic errors are effective directivity, effective source match, load match, reflection and transmission tracking, and isolation (crosstalk). Random errors include errors due to noise, drift, connector repeatability, and test cable stability.

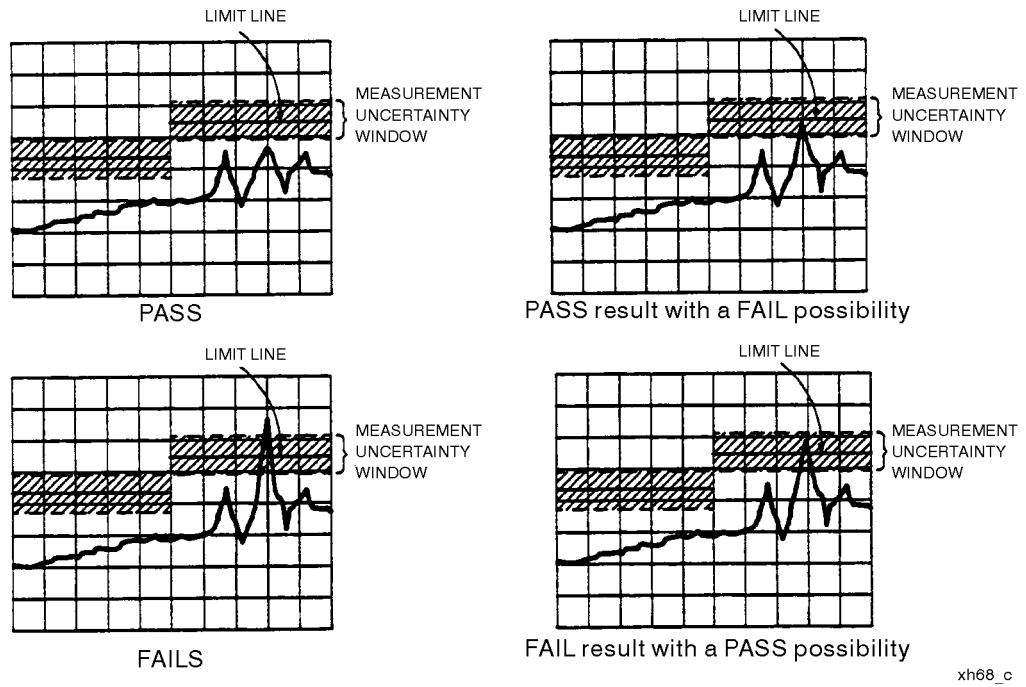
The typical measurement uncertainties for type-N connectors using a 1-port error correction utilize an RSS (Root Sum of Squares) model for the contributions of random errors such as noise, pin depth, pin diameter variation, load return loss, and connector repeatability.

## **Measurement Uncertainty Window**

The PASS/FAIL result of the limit line test generally indicates the status of the verification test. The validity of the limit lines, drawn on the analyzer display during the verification tests, are determined by the measurement uncertainty.

The measurement uncertainty must be taken into account when analyzing the test results. If the analyzer detects the test data outside of the limits, a FAIL will be displayed on the analyzer. This FAIL status may not represent a true failure if at the worst point, the test data is within the measurement uncertainty window (not displayed on the analyzer). Refer to Figure 2-1 for interpretations of test data.

### **2-4 System Verification and Performance Tests**



xh68\_c

**Figure 2-1. Measurement Uncertainty Window**

## HP 8752C Type-N Test Port Characteristics (50Ω System)

### Directivity

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	40 dB <sup>1</sup>	±3.30 dB
1.3 GHz to 3.0 GHz	35 dB	±2.51 dB
3.0 GHz to 6.0 GHz	30 dB	±3.30 dB

<sup>1</sup> 30 dB, 300 kHz to 10 MHz

### Source Match (Reflection)

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	30 dB	±2.51 dB
1.3 GHz to 3.0 GHz	25 dB	±2.88 dB
3.0 GHz to 6.0 GHz	20 dB	±2.88 dB

### Source Match (Transmission)\*

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	23 dB	±2.51 dB
1.3 GHz to 3.0 GHz	20 dB	±2.88 dB
3.0 GHz to 6.0 GHz	16 dB	±2.88 dB

\*Option 004 may degrade transmission source match as much as 2 dB, resulting in up to 0.05 dB additional uncertainty in transmission tracking.

### Reflection Tracking

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	±0.2 dB	±0.009 dB
1.3 GHz to 3.0 GHz	±0.3 dB	±0.019 dB
3.0 GHz to 6.0 GHz	±0.4 dB	±0.070 dB

## 2-6 System Verification and Performance Tests

## Load Match

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	23 dB <sup>1</sup>	± 0.40 dB
1.3 GHz to 3.0 GHz	20 dB	± 0.40 dB
3.0 GHz to 6.0 GHz	18 dB	± 0.92 dB

<sup>1</sup> 14 dB, 300 kHz to 10 MHz for analyzers with option 006

## Transmission Tracking

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	± 0.2 dB	± 0.043 dB
1.3 GHz to 3.0 GHz	± 0.3 dB	± 0.086 dB
3.0 GHz to 6.0 GHz	± 0.5 dB	± 0.172 dB

## HP 8752C Type-N Test Port Characteristics (75Ω System)

### Directivity

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 10 MHz	30 dB	± 4.41 dB
10 MHz to 1.3 GHz	40 dB	± 4.41 dB
1.3 GHz to 3.0 GHz	35 dB	± 4.41 dB

### Source Match (Reflection)

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	30 dB	± 2.88 dB
1.3 GHz to 3.0 GHz	25 dB	± 3.30 dB

### Source Match (Transmission)\*

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	23 dB	$\pm 2.88$ dB
1.3 GHz to 3.0 GHz	20 dB	$\pm 3.30$ dB

\*Option 004 may degrade transmission source match as much as 2 dB, resulting in up to 0.05 dB additional uncertainty in transmission tracking.

### Reflection Tracking

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	$\pm 0.2$ dB	$\pm 0.2$ dB
1.3 GHz to 3.0 GHz	$\pm 0.3$ dB	$\pm 0.3$ dB

### Load Match

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	23 dB	$\pm 0.50$ dB
1.3 GHz to 3.0 GHz	20 dB	$\pm 0.64$ dB

### Transmission Tracking

Frequency Range	Specification	Measurement Uncertainty
300 kHz to 1.3 GHz	$\pm 0.2$ dB	$\pm 0.20$ dB
1.3 GHz to 3.0 GHz	$\pm 0.3$ dB	$\pm 0.30$ dB

## 2-8 System Verification and Performance Tests

---

## System Verification Procedure

1. Switch the analyzer's line power ON. Press **PRESET**.
2. If you want a printout of the verification data, press **LOCAL**  
**SYSTEM CONTROLLER** **SYSTEM** **SERVICE MENU** **TEST OPTIONS** **RECORD ON**.  
Otherwise, go to the next step.

---

**Note** Once you have activated the record function, you *cannot* switch it OFF during the verification procedure. Be sure the paper in the printer is setup so that printing starts at the top of the page.

**In case of printer difficulty:**

If you have an HP-IB compatible printer, verify that the printer address is set to 1.

Refer to the *HP 8752C Network Analyzer User's Guide* for more information on how to perform this task.

---

3. Press **SYSTEM** **SERVICE MENU** **TESTS** **SYS VER TESTS** **EXECUTE TEST**. A brief description of the test procedure is shown on the analyzer display. To begin the test, press **CONTINUE**.
4. Connect a type-N male open to the analyzer's reflection test port. Press **CONTINUE**.
5. When the measurement is done, connect a type-N male short to the reflection test port. Press **CONTINUE**.
6. At the prompt, connect a type-N load to the reflection test port. Press **CONTINUE**. After measuring the load, the system directivity is checked and the test result is displayed on the analyzer.

---

**Note** If you have not activated the **RECORD ON** feature, you need to press **CONTINUE** after EACH of the following tests:

- a. Source Match (Reflection Mode)
  - b. Source Match (Transmission Mode)
  - c. Reflection Tracking
-

7. Connect a type-N RF cable between the analyzer's reflection and transmission test ports. Press **CONTINUE** to test the system load match.
8. If you have activated the record feature, the system will automatically test its transmission tracking. Otherwise, press **CONTINUE** to access this test.
9. Press **CONTINUE** to end the system verification procedure.

### **In case of difficulty**

1. Refer to the "Adjustments and Correction Constants" chapter of this manual. Perform the "Frequency Response Correction Constants Adjustment" procedure. Repeat the "HP 8752C System Verification" procedure.



---

## HP 8752C Performance Tests

This portion of the manual contains performance tests which are part of the instrument calibration process. An instrument calibration includes the system verification, described in the previous section, and the performance tests. To test the complete set of instrument specifications, both portions of the instrument calibration must be performed.

---

**Note** Before performing these performance tests, check that the test equipment is operating to specification. Gage and clean all connectors.

---

The following is a list of performance tests in the order in which they should be performed:

1. Reflection Test Port Output Frequency Range and Accuracy
2. Reflection Test Port Output Power Range and Level Linearity (For HP 8752C Analyzers without Option 004)
3. Reflection Test Port Output Power Range and Level Linearity (For HP 8752C Analyzers with Option 004)
4. Transmission Test Port Input Noise Floor Level (For HP 8752C Analyzers without Option 075)
5. Transmission Test Port Input Noise Floor Level (For HP 8752C Analyzers with Option 075)
6. Test Port Crosstalk
7. System Trace Noise
8. Magnitude Dynamic Accuracy
9. Phase Dynamic Accuracy
10. Compression

---

**Note** Unless otherwise specified, the performance tests are applicable to a standard HP 8752C or an HP 8752C with options.

---

## Equipment Required to Run the Performance Tests

Description	Quantity	HP Model or Part Number
Calibration kit, 50Ω type-N	1	HP 85032B
Calibration kit, 75Ω type-N	1	HP 85036B <sup>1</sup>
Measuring Receiver	1	HP 8902A
Frequency counter	1	HP 5343A
Power meter	1	HP 436A, HP 437A, HP 438A
Power sensor	1	HP 8482A
Power sensor	1	HP 8481A <sup>2</sup>
Power sensor	1	HP 8483A <sup>1</sup>
Power sensor	1	HP 8483A Option H03 <sup>3</sup>
Printer	1	HP ThinkJet, DeskJet, LaserJet
110 dB step attenuator	1	HP 8496A
2-Way power splitter, 50Ω	1	HP 11667A
Cable, 50Ω type-N 24-inch	3	HP P/N 8120-4781
Cable, 75Ω type-N 24-inch	2	HP P/N 8120-2408 <sup>1</sup>
Minimum Loss Pad	2	HP 11852B <sup>1</sup>
Adapter type-N(m) to type-N(m)	1	HP P/M 1250-1528
Adapter BNC(m) to N(f)	1	HP P/N 1250-0077
Adapter APC-3.5mm(f) to N(f)	1	HP P/N 1250-1745

<sup>1</sup> Required only for instruments with Option 075

<sup>2</sup> Required only for instruments with Option 006

<sup>3</sup> Required only for instruments with Option 003 and Option 075

## 2-12 System Verification and Performance Tests

# 1. Reflection Test Port Output Frequency Range and Accuracy

## Specifications

Frequency Range	Frequency Accuracy <sup>1</sup>
300 kHz to 1.3 GHz	±10 ppm
300 kHz to 3 GHz <sup>2</sup>	±10 ppm
300 kHz to 6 GHz <sup>3</sup>	±10 ppm

1 At 25 °C ± 5 °C

2 HP 8752C with Option 003

3 HP 8752C with Option 006

## Equipment

Frequency counter.....HP 5343A  
Adapter BNC(m) to N(f).....HP P/N 1250-0077  
Adapter APC-3.5(f) to N(f).....HP P/N 1250-1745  
Cable (50Ω, type-N) 24-inch.....HP P/N 8120-4781

Additional equipment required for analyzers with Option 075

50Ω to 75Ω minimum loss pad.....HP 11852B

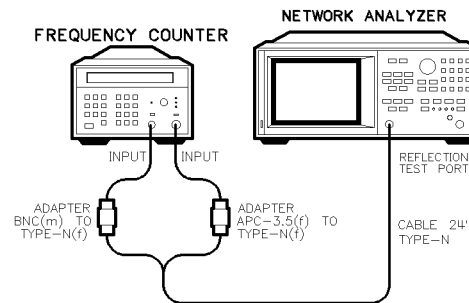
Warm-up time: 30 minutes.

## Description

This test determines the analyzer's reflection test port output frequency range and accuracy over its entire operating frequency range. The frequencies are verified relative to room temperature (25 °C, ±5 °C).

## Procedure

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



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

2. Press **MENU** **CW FREQ** **3** **0** **0** **(k/m)**. Depending on the analyzer's options, record the frequency counter reading in the appropriate table (2 through 6) in the "Performance Test Record."
3. Repeat step 2 for each instrument's CW frequency listed in the appropriate table (2 through 6) in the "Performance Test Record."

## In case of difficulty

1. If any measured frequency barely fails the specification, check the time base accuracy of the frequency counter.
2. If the analyzer fails by a significant margin at *all* frequencies, perform the "Frequency Accuracy" and the "High/Low Band Transition" adjustments. Refer to the chapter titled "Adjustments and Correction Constants" for more information on how to perform these adjustment procedures.
3. Refer to the "Source Troubleshooting" chapter in this manual if the problem still persists.

## 2-14 System Verification and Performance Tests

## 2. Reflection Test Port Output Power Range and Level Linearity (For HP 8752C Analyzers without Option 004)

### Specifications

Power Range	Power Level Linearity Relative to -5 dBm
-20 to -15 dBm	±0.5 dB
-15 to 0 dBm	±0.2 dB
0 to +5 dBm	±0.5 dB

### Equipment

For standard analyzers:

Power meter ..... HP 436A/437B/438A  
 Power sensor ..... HP 8482A

Additional equipment required for analyzers with Option 006

Power sensor ..... HP 8481A

Equipment required for analyzers with Option 075

Power meter ..... HP 436A/437B/438A  
 Power sensor ..... HP 8483A

Warm-up time: 30 minutes.

### Description

This test determines the reflection test port output power range and level linearity for all analyzers without Option 004. The specifications are verified by first setting a reference at -5 dBm for relative power measurements. Next, the analyzer's reflection test port output power is stepped and measured over its operating power range. The power level linearity is found by calculating the difference between the power meter reading and the power offset listed in the appropriate table (7 through 13) of the "Performance Test Record."

## Procedure

### Power Range and Level Linearity for an HP 8752C or an HP 8752C Option 075

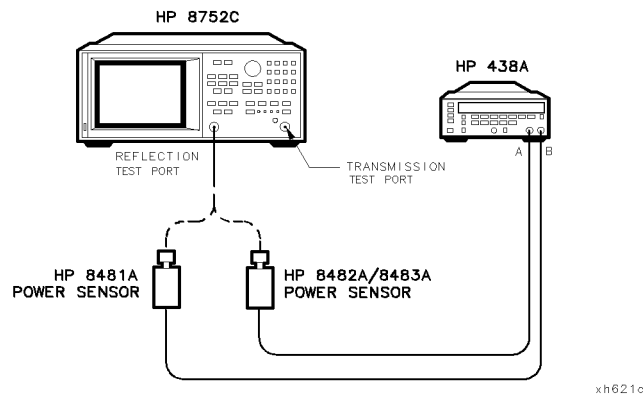
1. Connect the equipment as shown in Figure 2-3.

#### Note

For instruments with Option 075:

- a. use an HP 8483A (75 $\Omega$ ) power sensor
- b. use tables 11 through 13 in the "Performance Test Record."

For instruments with Option 075 *and* Option 003, use an HP 8483A Option H03 (75 $\Omega$ ) power sensor.



**Figure 2-3.**  
**Reflection Test Port Output Power Range and Level Linearity Test Setup**

2. Zero and calibrate the power meter. For more information on how to perform this task, refer to the power meter Operating and Service manual.
3. Press **PRESET** **MENU** **CW FREQ** **3** **0** **0** **k/m**.
4. Press **POWER** **5** **x1**. Set the power meter cal factor for this CW frequency. On the power meter, set the current power level as the reference for relative power (dB) measurements. This can be done by

## 2-16 System Verification and Performance Tests

pressing **(dB REF)** on an HP 436A or **(REL)** on an HP 438A power meter front panel.

5. Press **POWER** **(-)** **(2)** **(0)** **(x1)**. Record the power meter reading in the “Results Measured” column on the “Performance Test Record.”
6. Utilizing the Power Offset value listed in the “Performance Test Record,” calculate the test port output power level linearity using the following formula:  
$$\text{Power Level Linearity} = \text{Measured Value} + \text{Power Offset}$$
7. Record the result of your calculation on the “Performance Test Record.”
8. Repeat steps 5, 6, and 7 for the other power levels listed in the “HP 8752C Performance Test Record (7 of 28).”
9. Press **(MENU)** **CW FREQ** **(1)** **(.)** **(3)** **(G/n)**.
10. Press **POWER** **(-)** **(5)** **(x1)**. Set the power meter cal factor for this CW frequency. Press the appropriate hardkey (**(dB REF)** or **(REL)**) on the HP 436A/438A power meter front panel for relative power measurements.
11. Repeat steps 5, 6, and 7 for the other power levels listed in the “HP 8752C Performance Test Record (8 of 28).”
12. This completes the “Reflection Test Port Output Power Range and Level Linearity” test if you are working with either a standard analyzer or an analyzer with only Option 075. Otherwise, go to the appropriate section below to continue the reflection test port performance tests for other options.

### **Power Range and Level Linearity for an HP 8752C with Option 003**

13. Press **(MENU)** **CW FREQ** **(3)** **(G/n)**.
14. Press **POWER** **(-)** **(5)** **(x1)**. Set the power meter cal factor for this CW frequency. Press the appropriate softkey (**(dB REF)** or **(REL)**) on the power meter front panel for relative power measurements.
15. Press **POWER** **(-)** **(2)** **(0)** **(x1)**. Record the power meter reading in the “Measured Value” column on the “HP 8752C Performance Test Record (9 of 28).”

16. Utilizing the Power Offset value listed in the “Performance Test Record (9 of 28),” calculate the Power Level Linearity using the following formula:

$$\text{Power Level Linearity} = \text{Measured Value} + \text{Power Offset}$$

17. Record the result of your calculation on the “Performance Test Record (9 of 28).”
18. Repeat steps 15, 16, and 17 for the other power levels listed in the “Performance Test Record (9 of 28).”

### **Power Range and Level Linearity for an HP 8752C with Options 003 and 075**

19. Press **(MENU)** **CW FREQ** **(2)** **(G/n)**.
20. Perform steps 14, 15, 16, and 17 for the power levels listed in the “Performance Test Record (12 of 28).”

### **Power Range and Level Linearity for an HP 8752C with Option 006**

21. Press **(MENU)** **CW FREQ** **(6)** **(G/n)**.
22. Perform steps 14, 15, 16, 17, and 18 for the power levels listed in the “Performance Test Record (10 of 28).”

### **In case of difficulty**

1. If you cannot set the test port power at any power level, be sure the analyzer’s source power is activated. To do so, press **(MENU)** **POWER**. Check the **SOURCE PWR** softkey. **ON** should be highlighted.
2. Refer to the “Adjustments and Correction Constants” chapter in this manual. Perform the “RF Output Power Correction Constants Adjustment” procedure.
3. If the problem still exists, refer to the “Source Troubleshooting” chapter in this manual for more troubleshooting information.



### 3. Reflection Test Port Output Power Range and Level Linearity (HP 8752C with Option 004)

#### Specifications

HP 8752C Option	Power Range	Power Level Linearity <sup>1</sup>
Option 004	-85 to +10 dBm	±0.2 dB (-15 to +5 dBm) ±0.5 dB (+5 to +10 dBm)
Options 004 and 075	-85 to +8 dBm	±0.2 dB (-15 to +5 dBm) ±0.5 dB (+5 to +8 dBm)

<sup>1</sup> Relative to -5 dBm

#### Equipment

For standard analyzers:

Power meter ..... HP436A/437B/438A  
 Power sensor ..... HP 8482A  
 Cable (50Ω, type-N) 24-inch ..... HP P/N 1250-1745

Additional equipment required for analyzers with Option 006

Power sensor ..... HP 8481A

Equipment required for analyzers with Option 075

Power meter ..... HP436A/437B/438A  
 Power sensor ..... HP 8483A  
 Cable (75Ω, type-N) 24-inch ..... HP P/N 8120-2408

Warm-up time: 30 minutes.

#### Description

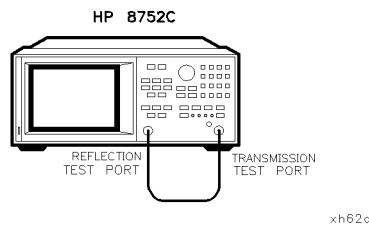
This test determines the reflection test port output power range and level linearity for an analyzer with Option 004. To verify the analyzer power ranges, a power level of -10 dBm is first selected and normalized. Next, various power levels in different power ranges are selected and compared to the specifications listed in the "Performance Test Record." The analyzer power level linearity is confirmed by first setting a reference (at -5 dBm) for relative power measurements. Next, the analyzer's reflection test port output power is stepped

and measured over its specified power range. The power level linearity is found by calculating the difference between the power meter reading and the power offset listed in the “Performance Test Record.”

## Procedure

### Power Range for an HP 8752C with Option 004

1. Connect the equipment as shown in Figure 2-4.



**Figure 2-4.**  
**Reflection Test Port Output Power Range Test Setup**  
**(HP 8752C Option 004)**

2. Press **PRESET** **CH 2** to set the analyzer up for transmission measurements.
3. Press **MENU** **POWER** **PWR RANGE MAN** **POWER RANGES** **RANGE 0** **-15 to +10**. Enter the power level value listed in the the “Performance Test Record (14 of 28).” For this power range, press **1** **0** **x1**.
4. Press **DISPLAY** **DATA→MEMORY** **DATA/MEM** **SCALE REF** **SCALE/DIV** **5** **x1** to normalize and scale down the data trace.
5. To activate the analyzer’s statistic feature, press **MKR FCTN** **MARKER MODE MENU** **STATS ON**.
6. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **x1**.

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7. When the analyzer finishes the sweeps, record the data trace mean value (as shown on the upper right-hand corner of the analyzer display) on the "Performance Test Record (14 of 28)."
8. Press **[MENU] POWER POWER RANGES RANGE 1 -25 to 0**. Enter the power level value listed in the "Performance Test Record." For this power range, press **[2] [0] [x1]**.
9. Repeat steps 6, 7 and 8 for the other power ranges listed in the "Performance Test Record (14 of 28)."

**Power Level Linearity for an HP 8752C with Option 004 or an HP 8752C with Options 004 and 075**

1. Connect the equipment as shown in Figure 2-5.

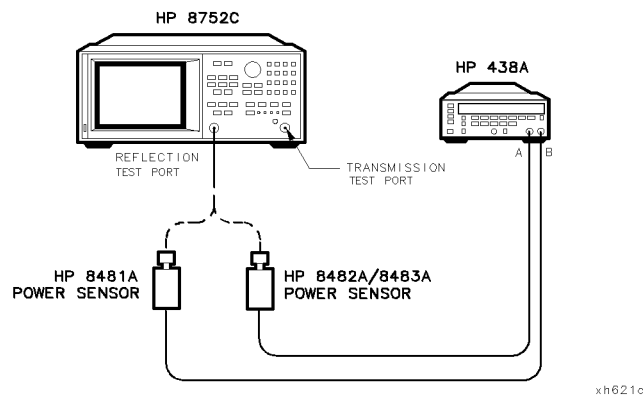
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**Note** For instruments with Option 075:

- a. use an HP 8483A (75Ω) power sensor
- b. use tables 19 through 21 in the "Performance Test Record."

For instruments with Option 075 *and* Option 003, use an HP 8483A Option H03 (75Ω) power sensor.

---



**Figure 2-5.**  
**Reflection Test Port Output Power Level Linearity Test Setup**

2. Zero and calibrate the power meter. For more information on how to perform this task, refer to the power meter's Operating and Service manual.
3. Press **PRESET** **MENU** **CW FREQ** **3** **0** **0** **k/m**.
4. Press **POWER** **5** **x1**. Set the power meter cal factor for this CW frequency. On the power meter, set the current power level as the reference for relative power (dB) measurements by pressing **dB REF** on an HP 436A or **REL** on an HP 438A power meter's front panel.
5. Press **POWER** **1** **5** **x1**. Record the power meter reading in the "Results Measured" column on the "Performance Test Record."
6. Utilizing the Power Offset value listed in the "Performance Test Record," calculate the Power Level Linearity using the following formula:  

$$\text{Power Level Linearity} = \text{Measured Value} + \text{Power Offset}$$
7. Record the result of your calculation on the "Performance Test Record."
8. Repeat steps 5, 6 and 7 for the other power levels listed in the "Performance Test Record."
9. Press **MENU** **CW FREQ** **1** **3** **G/n**.
10. Press **POWER** **5** **x1**. Set the power meter cal factor for this CW frequency. Press the appropriate hardkey (**dB REF** or **REL**) on the HP 436A/438A power meter front panel for relative power measurements.
11. Repeat steps 5, 6, 7 and 8.
12. This completes the "Reflection Test Port Output Power Range and Level Linearity" test if you are working with either an analyzer Option 004 or an analyzer with Options 004 and 075. Otherwise, go to the appropriate following section to ensure the reflection test port meets specifications at the extended frequency range.

#### **Power Level Linearity for an HP 8752C with Options 003 and 004**

13. Press **MENU** **CW FREQ** **3** **G/n**.
14. Press **POWER** **5** **x1**. Set the power meter cal factor for this CW frequency. Press the appropriate hardkey (**dB REF** or **REL**) on the power meter front panel for relative power measurements.

## **2-22 System Verification and Performance Tests**

15. Press **POWER** **(=)** **(1)** **(5)** **(x1)**. Record the power meter reading in the “Results Measured” column on the “Performance Test Record.”
16. Utilizing the Power Offset value listed in the “Performance Test Record,” calculate the Power Level Linearity using the following formula:  

$$\text{Power Level Linearity} = \text{Measured Value} + \text{Power Offset}$$
17. Record the result of your calculation on the “Performance Test Record.”
18. Repeat steps 15, 16 and 17 for the other power levels listed in the “Performance Test Record.”

#### **Power Level Linearity for an HP 8752C with Options 004 and 006**

19. Press **(MENU)** **CW FREQ** **(6)** **(G/n)**.
20. Repeat steps 14, 15, 16, 17 and 18 for the power levels listed in the “Performance Test Record.”

#### **Power Level Linearity for an HP 8752C with Options 003, 004, and 075**

21. Press **(MENU)** **CW FREQ** **(2)** **(G/n)**.
22. Perform steps 14, 15, 16, 17 and 18 for the power levels listed in the “Performance Test Record.”

#### **In case of difficulty**

1. If you cannot set the test port power at any power level, be sure the analyzer’s source power is activated. To do so, press **(MENU)** **POWER**. Check the **SOURCE PWR** softkey. “ON” should be highlighted.
2. Refer to the “Adjustments and Correction Constants” chapter in this manual. Perform the “RF Output Power Correction Constants Adjustment” procedure.
3. If the problem still exists, refer to the “Source Troubleshooting” chapter in this manual for more troubleshooting information.

## 4. Transmission Test Port Input Noise Floor Level (HP 8752C without Option 075)

### Specifications

Frequency Range	IF Bandwidth	Average Noise Floor Level (Transmission)
300 kHz to 1.3 GHz	3 kHz	-90 dBm
300 kHz to 1.3 GHz	10 Hz	-110 dBm
300 kHz to 3 GHz <sup>1</sup>	3 kHz	-90 dBm
300 kHz to 3 GHz <sup>1</sup>	10 Hz	-110 dBm
3 GHz to 6 GHz <sup>2</sup>	3 kHz	-85 dBm
3 GHz to 6 GHz <sup>2</sup>	10 Hz	-105 dBm

1 HP 8752C with Option 003

2 HP 8752C with Option 006

### Equipment

Calibration kit (50 $\Omega$ , type-N).....HP 85032B  
Cable (50 $\Omega$ , type-N) 24-inch.....HP P/N 8120-4781

Warm-up time: one hour.

### Description

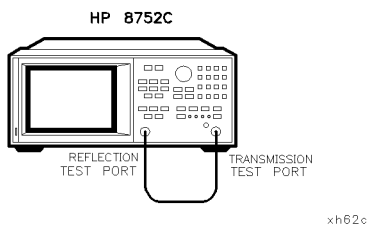
This test determines the analyzer's transmission test port input noise floor level. It is tested at 0 dBm at two different IF bandwidths.

### Procedure

**Noise Floor Level at 300 kHz to 1.3 GHz (Standard Option), 300 kHz to 3 GHz (Option 003), or 300 kHz to 6 GHz (Option 006) with an IF BW of 3 kHz**

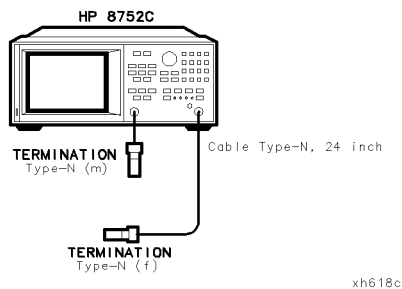
1. Connect the equipment as shown in Figure 2-6.

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**Figure 2-6.**  
**Transmission Test Port Input Noise Floor Level Test Setup 1**

2. Press **PRESET** **MENU** **POWER** **0** **x1**.  
 If your analyzer has Option 003, press **STOP** **3** **G/n**.  
 If your analyzer has Option 006, press **STOP** **6** **G/n**.
3. Press **MEAS** **INPUT PORTS B** **DISPLAY** **DATA—MEMORY** **DATA/MEM**.
4. Connect the equipment as shown in Figure 2-7.



**Figure 2-7.**  
**Transmission Test Port Input Noise Floor Level Test Setup 2**

5. If your analyzer has Option 004, press **(MENU) POWER** **(-)** **(8)** **(5)** **(x1)** **(FORMAT)** **(LIN MAG)** **(SCALE REF)** **(AUTOSCALE)**.

If your analyzer does not have Option 004 installed, press **(MENU) POWER** **(-)** **(2)** **(0)** **(x1)** **(FORMAT)** **(LIN MAG)** **(SCALE REF)** **(AUTOSCALE)**.

6. Press **(MKR FCTN)** **(MARKER MODE MENU)** **(STATS ON)** **(MENU)** **(TRIGGER MENU)** **(SINGLE)**.

7. When the trace is settled, record its mean value as shown on the analyzer display.

8. Use the equation:

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

to convert the linear magnitude mean value (measured in step 7) to log magnitude. Record this calculated value on the "Performance Test Record (22 of 28)."

---

**Note** If your analyzer has Option 003, then record the value calculated during the previous step (step 8) on the "Performance Test Record" under section HP 8752C Option 003 ONLY.

---

### Noise Floor Level at 300 kHz to 1.3 GHz (Standard Option) or 300 kHz to 3 GHz (Option 003) with an IF BW of 10 Hz

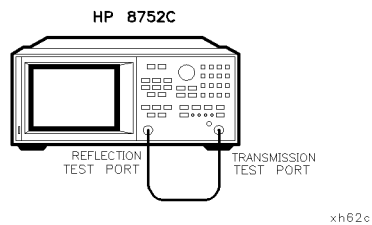
9. Press **(AVG)** **(IF BW)** **(1)** **(0)** **(x1)** to change the IF bandwidth to 10 Hz.
10. Press **(MENU)** **(TRIGGER MENU)** **(SINGLE)**.
11. When the sweep is done, record its mean value. Use the equation:
- $$\text{Power (dBm)} = 20 * \{\log_{10}(\text{linear magnitude mean value})\}$$
- to convert the linear magnitude mean value to log magnitude. Record this calculated value on the "Performance Test Record (22 of 28)."
12. This completes the "Transmission Test Port Input Noise Floor Level" test if you are working with either a standard analyzer or an analyzer with Option 003. Proceed to the next section if your analyzer has Option 006 installed.

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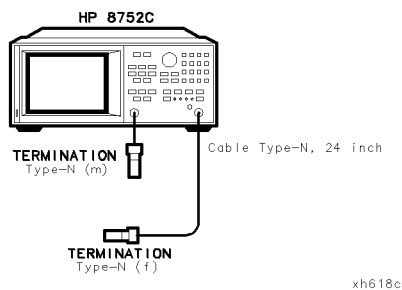
**Noise Floor Level at 3 GHz to 6 GHz (Option 006) with an IF BW of 10 Hz**

13. Press **(START)** **(3)** **(G/n)** **(STOP)** **(6)** **(G/n)**. Connect the equipment as shown in Figure 2-8.



**Figure 2-8.**  
**Transmission Test Port Input Noise Floor Level Test Setup 1**

14. Press **(MENU)** **POWER** **(0)** **(x1)** **(MENU)** **TRIGGER MENU** **SINGLE**.
15. When the sweep is finished, press **(DISPLAY)** **DATA→MEMORY** **(DATA/MEM)**. Connect the equipment as shown in Figure 2-9.



**Figure 2-9.**  
**Transmission Test Port Input Noise Floor Level Test Setup 2**

16. If your analyzer has Option 004, press (MENU) POWER (−) (8) (5) (x1) (MENU) TRIGGER MENU SINGLE.

If your analyzer does not have Option 004 installed, press (MENU) POWER (−) (2) (0) (x1) (MENU) TRIGGER MENU SINGLE.

17. When the measurement is done, record the mean value.

18. Use the equation:

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

to convert the linear magnitude mean value (measured in step 17) to log magnitude. Record this calculated value on the “Performance Test Record (22 of 28).”

### Noise Floor Level at 3 GHz to 6 GHz (Option 006) with IF BW of 3 kHz

19. Press (AVG) IF BW (3) (k/m).

20. Press (MENU) TRIGGER MENU NUMBER of GROUPS (5) (x1).

21. When the sweeps are finished, record the mean value as shown on the analyzer display. Repeat step 18.

### In case of difficulty

1. Refer to the “Adjustments and Correction Constants” chapter. Perform the “ADC Linearity Correction Constants Adjustment” procedure. Rerun the Transmission Test Port Input Noise Floor Level test.
2. If the Noise Floor Level test still fails, suspect the A10 Digital IF board assembly.
3. Refer to the “Receiver Troubleshooting” section in this manual for more troubleshooting information.

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## 5. Transmission Test Port Input Noise Floor Level (HP 8752C with Option 075)

### Specifications

Frequency Range	IF Bandwidth	Average Noise Floor Level (Transmission)
300 kHz to 1.3 GHz	3 kHz	-90 dBm
300 kHz to 1.3 GHz	10 Hz	-110 dBm
300 kHz to 3 GHz <sup>1</sup>	3 kHz	-90 dBm
300 kHz to 3 GHz <sup>1</sup>	10 Hz	-110 dBm

<sup>1</sup> HP 8752C with Option 003

### Equipment

Calibration kit (75Ω, type-N).....HP 85036B  
 Cable (75Ω, type-N) 24-inch.....HP P/N 8120-2408

Warm-up time: one hour.

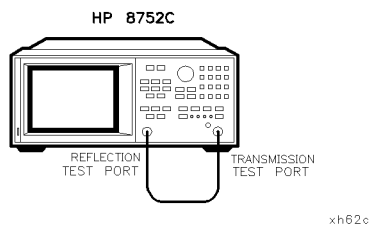
### Description

This test determines the HP 8752C Option 075 or HP 8752C Options 075 and 003 transmission test port input noise floor level. It is tested at 0 dBm at two different IF bandwidths.

### Procedure

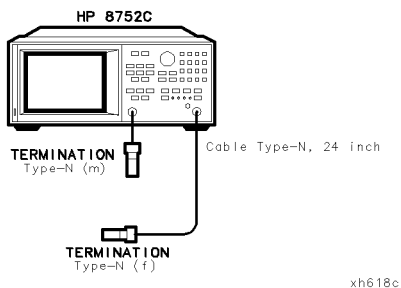
#### Noise Floor Level at 300 kHz to 1.3 GHz (Option 075) or 300 kHz to 3 GHz (Options 075 and 003) with an IF BW of 3 kHz

1. Connect the equipment as shown in Figure 2-10.



**Figure 2-10.**  
**Transmission Test Port Input Noise Floor Level Test Setup 1**

2. Press **PRESET** **MENU** **POWER** **0** **x1** **MEAS** **INPUT PORTS B**.
3. To normalize the data trace, press **DISPLAY** **DATA—MEMORY** **DATA/MEM**.
4. Connect the equipment as shown in Figure 2-11.



**Figure 2-11.**  
**Transmission Test Port Input Noise Floor Level Test Setup 2**

5. If your analyzer has Option 004, press **MENU** **POWER** **—** **8** **5** **x1** **FORMAT** **LIN MAG** **SCALE REF** **AUTOSCALE**.
- If your analyzer does not have Option 004 installed, press **MENU** **POWER** **—** **2** **0** **x1** **FORMAT** **LIN MAG** **SCALE REF** **AUTOSCALE**.
6. Set the power to  $-85$  dBm by pressing **MENU** **POWER** **—** **8** **5** **x1**.

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7. Press **(MKR FCTN) MARKER MODE MENU STATS ON (MENU) TRIGGER MENU NUMBER of GROUPS 5 (x1)**.
8. When the trace is settled, record its mean value (as shown on the analyzer's display).
9. Use the equation:
 
$$Power (dBm) = 20 * \{log_{10}(linear\ magnitude\ mean\ value)\}$$
 to convert the linear magnitude mean value (measured in step 8) to log magnitude. Record this calculated value on the "Performance Test Record (23 of 28)."

---

**Note** If your analyzer has Option 003, then record the value found in step 9 on the "Performance Test Record (23 of 28)" under section HP 8752C Options 075 and 003 ONLY.

---

**Noise Floor Level at 300 kHz to 1.3 GHz (Option 075) or 300 kHz to 3 GHz (Options 075 and 003) with an IF BW of 10 Hz**

10. Press **(AVG) IF BW 1 0 (x1)** to change the IF bandwidth to 10 Hz.
11. Press **(MENU) TRIGGER MENU SINGLE**.
12. When the sweep is done, record its mean value. Use the equation:
 
$$Power (dBm) = 20 * \{log_{10} (linear\ magnitude\ mean\ value)\}$$
 to convert the linear magnitude mean value to log magnitude. Record this calculated value on the "Performance Test Record (23 of 28)."

**In case of difficulty**

1. Refer to the "Adjustments and Correction Constants" chapter. Perform the "ADC Linearity Correction Constants Adjustment" procedure. Rerun the Transmission Test Port Input Noise Floor Level test.
2. If this test still fails, suspect the A10 Digital IF board assembly.
3. Refer to the "Receiver Troubleshooting" section in this manual for more troubleshooting information.

---

## 6. Test Port Crosstalk

### Specifications

Frequency Range	Test Port Impedance	Test Port Crosstalk
300 kHz to 1.3 GHz	50Ω	100 dB
300 kHz to 3 GHz <sup>1</sup>	50Ω	100 dB
3 GHz to 6 GHz <sup>2</sup>	50Ω	90 dB
300 kHz to 1.3 GHz	75Ω	100 dB
1.3 GHz to 3 GHz <sup>3</sup>	75Ω	97 dB

1 HP 8752C with Option 003

2 HP 8752C with Option 006

3 HP 8752C with Option 003 and 075

### Equipment

For analyzers without Option 075:

Calibration kit (50Ω, type-N).....HP 85032B

For analyzers with Option 075

Calibration kit (75Ω, type-N).....HP 85036B

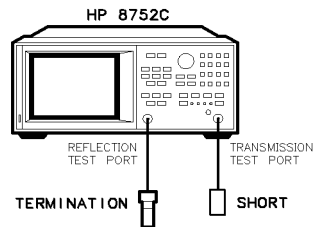
Warm-up time: one hour.

### Description

This test verifies the signal leakage interference between the analyzer reflection and transmission test ports. The system crosstalk is checked by driving the reflection test port and measuring the transmission test port simultaneously.

## Procedure

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



xh617c

**Figure 2-12. Test Port Crosstalk Test Setup**

2. Depending on the options that are currently installed in your analyzer, go to the appropriate following section to test the system crosstalk.

### Test Port Crosstalk for a Standard HP 8752C or an HP 8752C with Option 003

1. Press **PRESET** **MEAS** **TRANSMISSN**. To set the test port power to 0 dBm, press **MENU** **POWER** **0** **(x1)**.
2. Press **SCALE REF** **2** **5** **(x1)** **AVG** **IF BW** **1** **0** **(x1)** **AVERAGING FACTOR** **5** **(x1)** **AVERAGING ON**.
3. Press **MKR FCTN** **MRK SEARCH ON** **TRACKING ON** **SEARCH:MAX**.
4. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **(x1)**.
5. When the analyzer finishes sweeping, record the marker value (as shown in the upper right-hand corner of the analyzer's display) on the appropriate table in the "Performance Test Record."

### Test Port Crosstalk for an HP 8752C with Option 006

1. Press **PRESET** **STOP** **3** **(G/n)** **MEAS** **TRANSMISSN**. To set the test port power to 0 dBm, press **MENU** **POWER** **0** **(x1)**.

2. Press **SCALE REF** **2** **5** **x1** **AVG** **IF BW** **1** **0** **x1** **AVERAGING FACTOR** **5** **x1** **AVERAGING ON**.
3. Press **MKR FCTN** **MRK SEARCH ON** **TRACKING ON** **SEARCH:MAX**.
4. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **x1**.
5. When the analyzer finishes sweeping, record the marker value (as shown in the upper right-hand corner of the analyzer display) on the appropriate table in the "Performance Test Record."
6. To verify the analyzer system crosstalk in the extended frequency range, press **START** **3** **G/n** **STOP** **6** **G/n**.
7. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **x1**.
8. When the analyzer finishes sweeping, record the marker value (as shown in the upper right-hand corner of the analyzer display) on the appropriate table in the "Performance Test Record."

#### **Test Port Crosstalk for an HP 8752C with Option 075**

1. Press **PRESET** **MEAS** **TRANSMISSN**. To set the test port power to 0 dBm, press **MENU** **POWER** **0** **x1**.
2. Press **SCALE REF** **2** **5** **x1** **AVG** **IF BW** **1** **0** **x1** **AVERAGING FACTOR** **5** **x1** **AVERAGING ON**.
3. Press **MKR FCTN** **MRK SEARCH ON** **TRACKING ON** **SEARCH:MAX**.
4. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **x1**.
5. When the analyzer is done sweeping, record the marker value (as shown in the upper right-hand corner of the analyzer display) on the appropriate table in the "Performance Test Record."

#### **Test Port Crosstalk for an HP 8752C with Options 003 and 075**

1. Press **PRESET** **STOP** **1** **.** **3** **G/n** **MEAS** **TRANSMISSN**. To set the test port power to 0 dBm, press **MENU** **POWER** **0** **x1**.

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2. Press **SCALE REF** **2** **5** **x1** **AVG** **IF BW** **1** **0** **x1** **AVERAGING FACTOR** **5** **x1** **AVERAGING ON**.
3. Press **MKR FCTN** **MRK SEARCH ON** **TRACKING ON** **SEARCH:MAX**.
4. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **x1**.
5. When the analyzer is done sweeping, record the marker value (as shown in the upper right-hand corner of the analyzer display) on the appropriate table in the "Performance Test Record."
6. To verify the analyzer system crosstalk in the extended frequency range, press **START** **1** **.** **3** **G/n** **STOP** **3** **G/n**.
7. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **x1**.
8. When the analyzer is done sweeping, record the marker value (as shown in the upper right-hand corner of the analyzer display) on the appropriate table 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* semi-rigid cables connected to the sampler/mixer assemblies and the directional coupler are tight. In addition, tighten any loose screws on the sampler/mixer assemblies (A4/5/6) and the pulse generator assembly (A7). Rerun the test.

## 7. System Trace Noise

### Specifications

Frequency Range	Mode	System Trace Noise (Magnitude) <sup>1</sup>	System Trace Noise (Phase) <sup>1</sup>
300 kHz to 1.3 GHz	Transmission	<0.006 dB rms	<0.038° rms
300 kHz to 1.3 GHz	Reflection	<0.006 dB rms	<0.038° rms
300 kHz to 3 GHz <sup>2</sup>	Transmission	<0.006 dB rms	<0.038° rms
300 kHz to 3 GHz <sup>2</sup>	Reflection	<0.006 dB rms	<0.038° rms
3 GHz to 6 GHz <sup>3</sup>	Transmission	<0.010 dB rms	<0.070° rms
3 GHz to 6 GHz <sup>3</sup>	Reflection	<0.010 dB rms	<0.070° rms

1 At 0 dBm, 3 kHz IF BW

2 HP 8752C with Option 003

3 HP 8752C with Option 006

### Equipment

For analyzers without Option 075:

Calibration kit (50Ω, type-N)..... HP 85032B  
Cable (50Ω, type-N) 24-inch..... HP P/N 8120-4781

For analyzers with Option 075:

Calibration kit (75Ω, type-N)..... HP 85036B  
Cable (75Ω, type-N) 24-inch..... HP P/N 8120-2408

Warm-up time: one hour.

### Description

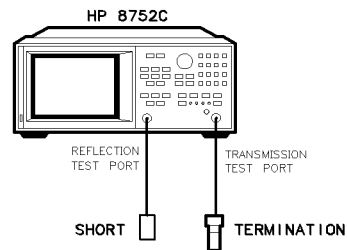
This test measures the system trace noise at a designated CW frequency in both the transmission and reflection modes. It is performed at the instrument's highest CW frequency since this is the worse case for the system trace noise. For an analyzer with Options 003 and 075, a CW frequency of 2 GHz is selected instead of 3 GHz.

#### 2-36 System Verification and Performance Tests

## Procedure

### Reflection Trace Noise (Magnitude)

1. Connect the equipment as shown in Figure 2-13.



xh63c

**Figure 2-13. Reflection Trace Noise Test Setup**

2. Press **PRESET** **MENU** **POWER** **0** **x1** **MENU** **NUMBER of POINTS** **1** **6** **0** **1** **x1**.
3. If you are testing a standard analyzer, press **MENU** **CW FREQ** **1** **3** **G/n**. Otherwise, refer to the following table and choose a CW frequency according to the specified option(s):

Description	CW Frequency
HP 8752C with Option 003	3 GHz
HP 8752C with Option 006	6 GHz
HP 8752C with Option 075	1.3 GHz
HP 8752C with Options 075 and 003	2 GHz

4. To get a better view of the system trace noise, press **SCALE REF** **AUTOSCALE**.
5. Press **MKR FCTN** **MARKER MODE MENU** **STATS ON** to activate the instrument statistics feature.

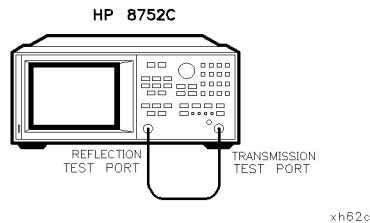
6. Press **(MENU)** **TRIGGER MENU** **NUMBER of GROUPS** **(5)** **(x1)**.
7. When the measurement is done, record the s.dev (standard deviation) value shown in the upper right-hand corner of the analyzer display on the "Performance Test Record."

### Reflection Trace Noise (Phase)

8. Press **(FORMAT)** **PHASE** **(SCALE REF)** **AUTOSCALE**.
9. Press **(MENU)** **TRIGGER MENU** **NUMBER of GROUPS** **(5)** **(x1)**.
10. When the measurement is finished, record the s.dev (standard deviation) value on the "Performance Test Record."

### Transmission Trace Noise (Magnitude)

11. Connect the equipment as shown in Figure 2-14.



**Figure 2-14. Transmission Trace Noise Test Setup**

12. To switch to the transmission mode, press **(MEAS)** **TRANSMISSN**.
13. Press **(MENU)** **TRIGGER MENU** **NUMBER of GROUPS** **(5)** **(x1)** **(SCALE REF)** **AUTOSCALE**.
14. When the measurement is finished, record the s.dev (standard deviation) value on the "Performance Test Record."

### **Transmission Trace Noise (Phase)**

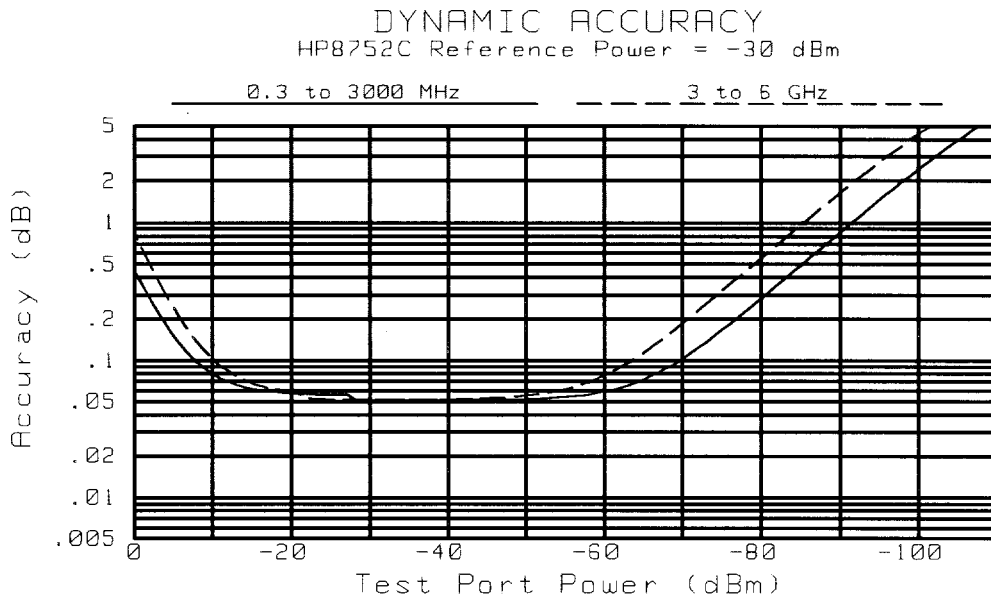
15. Press **FORMAT** **PHASE** **SCALE REF** **AUTOSCALE** .
16. Press **MENU** **TRIGGER MENU** **NUMBER of GROUPS** **5** **x1** .
17. When the measurement is done, record the s. dev (standard deviation) value on the "Performance Test Record."

### **In case of difficulty**

1. Replace the A10 digital IF board assembly. Rerun the test.

## 8. Magnitude Dynamic Accuracy (HP 8752C - All Options)

### Specifications



sh6155c

### Equipment

Measuring receiver.....	HP 8902A
110 dB step attenuator.....	HP 8496A
Adapter N(m) to N(m).....	HP P/N 1250-1528
50Ω 2-way power splitter.....	HP 11667A
Cable (50Ω, type-N) 24-inch (3 required).....	HP P/N 8120-4781

Additional equipment required for analyzers with Option 075:

50Ω to 75Ω minimum loss pad (2 required).....	HP 11852B
-----------------------------------------------	-----------

Warm-up time: 1 hour

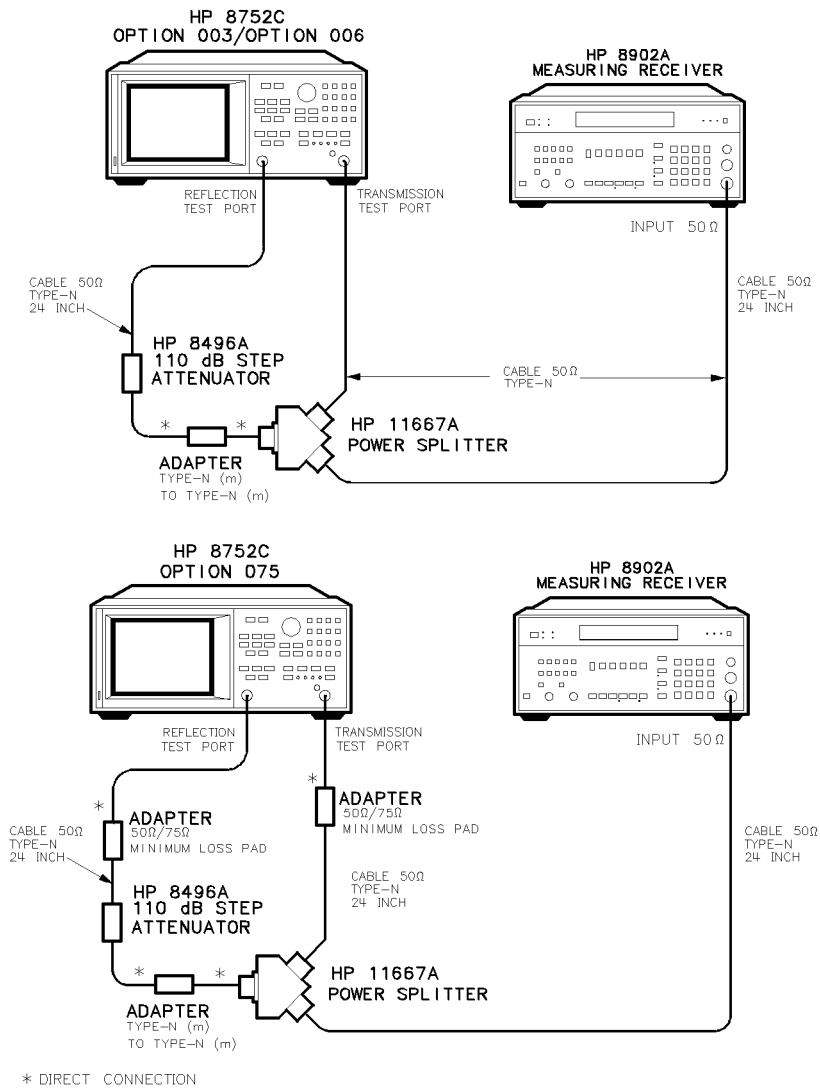
### 2-40 System Verification and Performance Tests

## Description

This test verifies the magnitude dynamic accuracy of the analyzer's transmission test port. The test is performed at a CW frequency of 30 MHz.

## Procedure

1. On the HP 8902A, press the blue shift key and **(INST PRESET)** **(CLEAR)**. Press the yellow shift key and **(TUNED RF LEVEL)**. Press **(LOG/LIN)** to have the HP 8902A display linear readings (dBm). Press **(3)** **(2)** **(.)** **(1)** **(SPCL)**.
2. Set the HP 8496A to 20 dB.
3. On the analyzer, press **(PRESET)** **(MENU)** **CW FREQ** **(3)** **(0)** **(M/μ)**. Press **NUMBER of POINTS** **(5)** **(1)** **(x1)**. Press **(AVG)** **IF BW** **(1)** **(0)** **(x1)**.
4. Connect the equipment as shown in Figure 2-15.



**Figure 2-15. Magnitude Dynamic Accuracy Test Setup**

**2-42 System Verification and Performance Tests**



5. On the analyzer, press **MEAS** **TRANSMISSN** **MENU** **POWER** **0** **[x1]**. Using the analyzer's front panel knob, adjust the test port power for a reading of -30.000 dBm on the HP 8902A. Wait for the reading to stabilize.

---

**Note** Ignore the UNCAL annunciation on the HP 8902A.

---

6. On the HP 8902A, press the blue shift key and **SET REF**.
7. On the analyzer, press **CAL** **CALIBRATE MENU** **RESPONSE THRU**. After the beep, press **DONE: RESPONSE**.
8. On the analyzer, press **SAVE/RECALL** **SAVE STATE**. Press **MKR FCTN** **MARKER MODE MENU** **STATS ON**.
9. Set the HP 8496A to 10 dB.
10. On the analyzer, press **MENU** **TRIGGER MENU** **SINGLE**.
11. Record the mean value (as shown on the analyzer's display) in the "Trans. Port" column of the "Performance Test Record."
12. Record the HP 8902A readout in the "HP 8902A" column of the "Performance Test Record."
13. Calculate the difference between the "Trans. Port" and the "HP 8902A." Take the absolute value of this difference and enter the result in the "Calculated Value" column of the "Performance Test Record."
14. Set the HP 8496A to the next attenuation setting listed in the "Performance Test Record." On the analyzer, press **SINGLE**. Repeat steps 11 to 14 for the remaining attenuation settings listed in the "Performance Test Record."

---

**Note** When the HP 8902A displays the RECAL annunciation, press **CALIBRATE**.

---

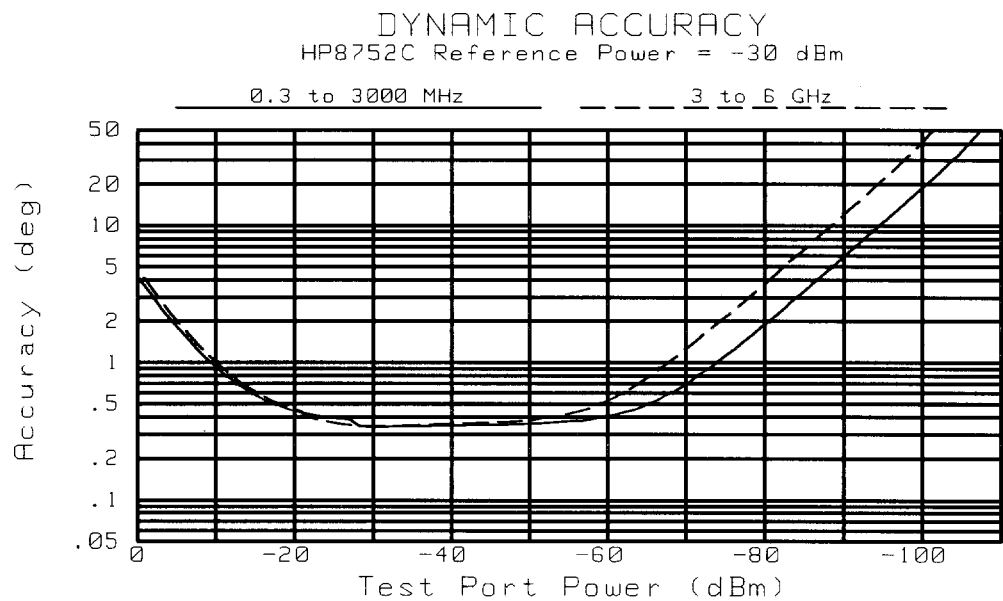
### **In case of difficulty**

1. If the test fails 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 the measured values are out of specifications, the HP 8902A needs to be recalibrated. On the HP 8902A, press **CLEAR**. Repeat this performance test. Be sure to press **CALIBRATE** when RECAL is shown on the measuring receiver display.
3. If this test fails at lower power levels:
  - a. refer to the “Correction Constants and Adjustments” chapter
    - i. perform the “IF Amplifier Correction Constants” test
    - ii. perform the “ADC Offset Correction Constants” test
    - iii. repeat this performance test
  - b. If it still fails:
    - i. replace the A10 digital IF assembly
    - ii. perform the “IF Amplifier Correction Constants” test
    - iii. perform the “ADC Offset Correction Constants” test
    - iv. perform the “Magnitude Dynamic Accuracy” test
    - v. repeat this performance test

## **2-44 System Verification and Performance Tests**

## 9. Phase Dynamic Accuracy (HP 8752C - All Options)

### Specifications



sh6156c

### Equipment

There are no external equipment requirements to perform this test.

### Description

This test verifies the phase dynamic accuracy of the analyzer's transmission port. The test is performed at a CW frequency of 30 MHz.

## Procedure

1. Refer to the "Magnitude Dynamic Accuracy" section of the "Performance Test Record." For every Trans. Input Power, copy the result from the "Calculated Value" column and enter it in the "Magnitude Dynamic Accuracy Value" column of the Phase Dynamic Accuracy section of the "Performance Test Record."
2. For every Trans. Input Power, calculate "A" using the following formula:  
$$A = 10(\text{Magnitude Dynamic Accuracy Value}/20)$$
3. Write the result in the "A" column of the "Performance Test Record."
4. For every Trans. Input Power, calculate "B" using the following formula:  
$$B = 1 - A$$
5. Write the result in the "B" column of the "Performance Test Record."
6. For every Trans. Input Power, calculate the phase dynamic accuracy, using the following formula:  
$$\text{Phase Dynamic Accuracy} = \text{SIN}^{-1} (B)$$
7. Write the result in the Calculated Value column of the "Performance Test Record."

---

## 10. Compression

### Specifications

Frequency Range	Magnitude <sup>1</sup>	Phase <sup>1</sup>
300 kHz to 1.3 GHz	$\leq 0.45$ dB	$\leq 4.2^\circ$
1.3 GHz to 3 GHz <sup>2</sup>	$\leq 0.45$ dB	$\leq 4.2^\circ$
3 GHz to 6 GHz <sup>3</sup>	$\leq 0.82$ dB	$\leq 5.0^\circ$

1 10 Hz IF BW

2 HP 8752C with Option 003

3 HP 8752C with Option 006

### Equipment

HP 8752C or HP 8752C Option 003 or HP 8752C Option 006:

Cable (50 $\Omega$ , type-N) 24-inch ..... HP P/N 8120-4781

HP 8752C Option 075:

Cable (75 $\Omega$ , type-N) 24-inch ..... HP P/N 8120-2408

Warm-up time: 1 hour.

### Description

This test verifies the compression/expansion levels of the analyzer's transmission test port sampler. Due to their frequency dependent characteristics, the compression test is performed at selected CW frequencies.

## Procedure

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

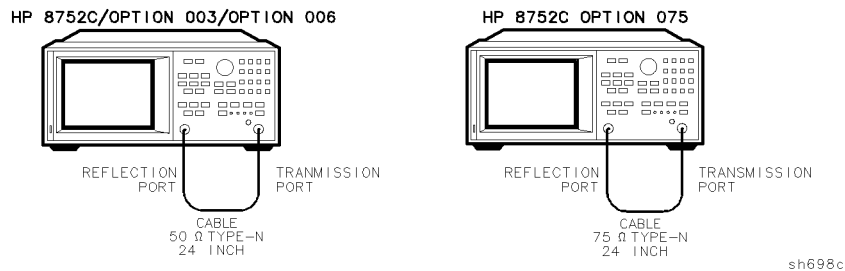


Figure 2-16. Compression Test Setup

2. Press **PRESET** **MEAS** **TRANSMISSN**.
3. Press **AVG** **IF BW** **1** **0** **x1**.
4. Press **MENU** **CW FREQ** **5** **0** **M/μ**.
5. Press **SWEEP TYPE MENU** **POWER SWEEP** **START** **-** **2** **0** **x1** **STOP** **0** **x1**.
6. Press **MENU** **TRIGGER MENU** **SINGLE**.
7. At the end of the sweep, press **SCALE REF** **AUTOSCALE**.
8. Press **MKR FCTN** **MKR SEARCH** **SEARCH: MAX**.
9. Press **MKR** **MARKER 2** **MKR FCTN** **MKR SEARCH** **SEARCH: MIN**.
10. Press **MKR** **Δ** **MODE MENU** **Δ** **REF=1**.
11. Record the absolute delta value of the (marker 2 – marker 1) reading from the upper right top-most value in the “Magnitude Value” column of the “Performance Test Record.”
12. Press **FORMAT** **PHASE**.

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13. Press **(MENU)** TRIGGER MENU SINGLE . At the end of the sweep, press **(SCALE REF)** AUTOSCALE .
14. Press **(MKR)** MARKER Δ REF=1 **(MKR FCTN)** MKR SEARCH SEARCH: MAX .
15. Press **(MKR)** MARKER 2 **(MKR FCTN)** MKR SEARCH SEARCH: MIN .
16. Record the absolute delta value of the (marker 2 – marker 1) reading from the upper-right top most value in the “Phase Value” column of the “Performance Test Record.”

---

**Note** Marker 2 has unit reading of m° which means milli-degrees.

---

17. Press **(FORMAT)** LOG MAG **(MENU)** CW FREQ (1) **(G/n)**.
18. Press TRIGGER MENU SINGLE . At the end of the sweep, press **(SCALE REF)** AUTOSCALE .
19. Press **(MKR)** MARKER Δ REF=1 **(MKR FCTN)** MKR SEARCH SEARCH: MAX .
20. Press **(MKR)** MARKER 2 **(MKR FCTN)** MKR SEARCH SEARCH: MIN .
21. Record the absolute delta value of the marker 2 reading in the “Magnitude Value” column of the “Performance Test Record.”
22. Repeat steps 12 to 21 for the other CW frequencies listed in the “Performance Test Record.”

**In case of difficulty**

1. If this test fails, suspect the A6 B sampler assembly. Repeat this test. Replace the sampler assembly if the problem still exists.

---

## Performance Test Record

### HP 8752C Performance Test Record (1 of 28)

Calibration Lab Address: _____	Report Number _____		
_____	Date _____		
_____	Last Calibration Date _____		
_____	Customer's Name _____		
_____	Performed by _____		
<b>Model HP 8752C</b>			
Serial No. _____	Option(s) _____		
Firmware Revision _____			
Ambient Temperature _____ ° C	Relative Humidity _____ %		
<b>Test Equipment Used:</b>			
<b>Description</b>	<b>Model Number</b>	<b>Trace Number</b>	<b>Cal Due Date</b>
Frequency Counter	_____	_____	_____
Power Meter	_____	_____	_____
Power Sensor	_____	_____	_____
Calibration Kit	_____	_____	_____
Notes/Comments:	_____		
_____	_____		
_____	_____		



### HP 8752C Performance Test Record (2 of 28)

<b>Hewlett-Packard Company</b> Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 1. Reflection Test Port Output Frequency Range and Accuracy (Standard HP 8752C)</b>				
CW Frequencies (MHz)	Min. (MHz)	Results Measured (MHz)	Max. (MHz)	Measurement Uncertainty (MHz)
0.3	0.299 997	_____	0.300 003	± 0.000 000 360
5.0	4.999 950	_____	5.000 050	± 0.000 006
16.0	15.999 840	_____	16.000 160	± 0.000 019
31.0	30.999 690	_____	31.000 310	± 0.000 037
60.999 999	60.999 390	_____	61.000 610	± 0.000 073
121.0	120.998 790	_____	121.001 210	± 0.000 145
180.0	179.998 200	_____	180.001 800	± 0.000 216
310.0	309.995 900	_____	310.003 100	± 0.000 372
700.0	699.930 000	_____	700.007 000	± 0.000 840
1 300.0	1 299.987 000	_____	1 300.013	± 0.001 560

### HP 8752C Performance Test Record (3 of 28)

<b>Hewlett-Packard Company</b> Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 1. Reflection Test Port Output Frequency Range and Accuracy                  (HP 8752C Option 003)</b>				
CW Frequencies (MHz)	Min. (MHz)	Results Measured (MHz)	Max. (MHz)	Measurement Uncertainty (MHz)
0.3	0.299 997	_____	0.300 003	± 0.000 000 360
5.0	4.999 950	_____	5.000 050	± 0.000 006
16.0	15.999 840	_____	16.000 160	± 0.000 019
31.0	30.999 690	_____	31.000 310	± 0.000 037
60.999 999	60.999 390	_____	61.000 610	± 0.000 073
121.0	120.998 790	_____	121.001 210	± 0.000 145
180.0	179.998 200	_____	180.001 800	± 0.000 216
310.0	309.995 900	_____	310.003 100	± 0.000 372
700.0	699.930 000	_____	700.007 000	± 0.000 840
1 300.0	1 299.987 000	_____	1 300.013	± 0.001 560
2 000.0	1 999.980 000	_____	2 000.020 000	± 0.002 400
3 000.0	2 999.970 000	_____	3 000.030 000	± 0.003 600

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### HP 8752C Performance Test Record (4 of 28)

<b>Hewlett-Packard Company</b> Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 1. Reflection Test Port Output Frequency Range and Accuracy                  (HP 8752C Option 006)</b>				
CW Frequencies (MHz)	Min. (MHz)	Results Measured (MHz)	Max. (MHz)	Measurement Uncertainty (MHz)
0.3	0.299 997	_____	0.300 003	± 0.000 000 360
5.0	4.999 950	_____	5.000 050	± 0.000 006
16.0	15.999 840	_____	16.000 160	± 0.000 019
31.0	30.999 690	_____	31.000 310	± 0.000 037
60.999 999	60.999 390	_____	61.000 610	± 0.000 073
121.0	120.998 790	_____	121.001 210	± 0.000 145
180.0	179.998 200	_____	180.001 800	± 0.000 216
310.0	309.995 900	_____	310.003 100	± 0.000 372
700.0	699.930 000	_____	700.007 000	± 0.000 840
1 300.0	1 299.987 000	_____	1 300.013	± 0.001 560
2 000.0	1 999.980 000	_____	2 000.020 000	± 0.002 400
3 000.0	2 999.970 000	_____	3 000.030 000	± 0.003 600
4 000.0	3 999.960	_____	4 000.040	± 0.004 800
5 000.0	4 999.950	_____	5 000.050	± 0.006 000
6 000.0	5 999.940	_____	6 000.060	± 0.007 200

### HP 8752C Performance Test Record (5 of 28)

<b>Hewlett-Packard Company</b> Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 1. Reflection Test Port Output Frequency Range and Accuracy                  (HP 8752C Option 075)</b>				
CW Frequencies (MHz)	Min. (MHz)	Results Measured (MHz)	Max. (MHz)	Measurement Uncertainty (MHz)
0.3	0.299 997	_____	0.300 003	± 0.000 000 360
5.0	4.999 950	_____	5.000 050	± 0.000 006
16.0	15.999 840	_____	16.000 160	± 0.000 019
31.0	30.999 690	_____	31.000 310	± 0.000 037
60.999 999	60.999 390	_____	61.000 610	± 0.000 073
121.0	120.998 790	_____	121.001 210	± 0.000 145
180.0	179.998 200	_____	180.001 800	± 0.000 216
310.0	309.995 900	_____	310.003 100	± 0.000 372
700.0	699.930 000	_____	700.007 000	± 0.000 840
1 300.0	1 299.987 000	_____	1 300.013	± 0.001 560

#### 2-54 System Verification and Performance Tests

**HP 8752C Performance Test Record (6 of 28)**

Hewlett-Packard Company Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 1. Reflection Test Port Output Frequency Range and Accuracy                  (HP 8752C Options 003 and 075)</b>				
CW Frequencies (MHz)	Min. (MHz)	Results Measured (MHz)	Max. (MHz)	Measurement Uncertainty (MHz)
0.3	0.299 997	_____	0.300 003	± 0.000 000 360
5.0	4.999 950	_____	5.000 050	± 0.000 006
16.0	15.999 840	_____	16.000 160	± 0.000 019
31.0	30.999 690	_____	31.000 310	± 0.000 037
60.999 999	60.999 390	_____	61.000 610	± 0.000 073
121.0	120.998 790	_____	121.001 210	± 0.000 145
180.0	179.998 200	_____	180.001 800	± 0.000 216
310.0	309.995 900	_____	310.003 100	± 0.000 372
700.0	699.930 000	_____	700.007 000	± 0.000 840
1 300.0	1 299.987 000	_____	1 300.013	± 0.001 560
2 000.0	1 999.980 000	_____	2 000.020 000	± 0.002 400
3 000.0	2 999.970 000	_____	3 000.030 000	± 0.003 600



### HP 8752C Performance Test Record (8 of 28)

Hewlett-Packard Company Model HP 8752C			Report Number _____		
Serial Number _____			Date _____		
<b>▶▶ 2. Reflection Test Port Output Power Range and Level Linearity (HP 8752C without Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 1.3 GHz</b>					
-20.0	_____	+ 15	_____	±0.5	±0.23
-18.0	_____	+ 13	_____	±0.5	±0.15
-16.0	_____	+ 11	_____	±0.5	±0.01
-14.0	_____	+ 9	_____	±0.2	±0.06
-12.0	_____	+ 7	_____	±0.2	±0.07
-10.0	_____	+ 5	_____	±0.2	±0.09
-8.0	_____	+ 3	_____	±0.2	±0.06
-6.0	_____	+ 1	_____	±0.2	±0.03
-4.0	_____	- 1	_____	±0.2	±0.02
-2.0	_____	- 3	_____	±0.2	±0.01
0.0	_____	- 5	_____	±0.5	±0.09
+ 2.0	_____	- 7	_____	±0.5	±0.06
+ 4.0	_____	- 9	_____	±0.5	±0.03
+ 5.0	_____	-10	_____	±0.5	±0.03

### HP 8752C Performance Test Record (9 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____			Report Number _____ Date _____		
<b>▶▶ 2. Reflection Test Port Output Power Range and Level Linearity                  (HP 8752C with Option 003, without Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 3.0 GHz</b>					
-20.0	_____	+15	_____	±0.5	±0.23
-18.0	_____	+13	_____	±0.5	±0.15
-16.0	_____	+11	_____	±0.5	±0.01
-14.0	_____	+9	_____	±0.2	±0.06
-12.0	_____	+7	_____	±0.2	±0.07
-10.0	_____	+5	_____	±0.2	±0.09
-8.0	_____	+3	_____	±0.2	±0.06
-6.0	_____	+1	_____	±0.2	±0.03
-4.0	_____	-1	_____	±0.2	±0.02
-2.0	_____	-3	_____	±0.2	±0.01
0.0	_____	-5	_____	±0.5	±0.09
+2.0	_____	-7	_____	±0.5	±0.06
+4.0	_____	-9	_____	±0.5	±0.03
+5.0	_____	-10	_____	±0.5	±0.03



### HP 8752C Performance Test Record (10 of 28)

Hewlett-Packard Company Model HP 8752C			Report Number _____		
Serial Number _____			Date _____		
<b>▶▶ 2. Reflection Test Port Output Power Range and Level Linearity (HP 8752C with Option 006, without Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 6.0 GHz</b>					
-20.0	_____	+ 15	_____	±0.5	±0.23
-18.0	_____	+ 13	_____	±0.5	±0.15
-16.0	_____	+ 11	_____	±0.5	±0.01
-14.0	_____	+ 9	_____	±0.2	±0.06
-12.0	_____	+ 7	_____	±0.2	±0.07
-10.0	_____	+ 5	_____	±0.2	±0.09
-8.0	_____	+ 3	_____	±0.2	±0.06
-6.0	_____	+ 1	_____	±0.2	±0.03
-4.0	_____	- 1	_____	±0.2	±0.02
-2.0	_____	- 3	_____	±0.2	±0.01
0.0	_____	- 5	_____	±0.5	±0.09
+ 2.0	_____	- 7	_____	±0.5	±0.06
+ 4.0	_____	- 9	_____	±0.5	±0.03
+ 5.0	_____	-10	_____	±0.5	±0.03



### HP 8752C Performance Test Record (12 of 28)

Hewlett-Packard Company Model HP 8752C			Report Number _____		
Serial Number _____			Date _____		
<b>▶▶ 2. Reflection Test Port Output Power Range and Level Linearity (HP 8752C with Option 075, without Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 1.3 GHz</b>					
-20.0	_____	+ 15	_____	±0.5	±0.13
-18.0	_____	+ 13	_____	±0.5	±0.20
-16.0	_____	+ 11	_____	±0.5	±0.16
-14.0	_____	+ 9	_____	±0.2	±0.14
-12.0	_____	+ 7	_____	±0.2	±0.13
-10.0	_____	+ 5	_____	±0.2	±0.13
-8.0	_____	+ 3	_____	±0.2	±0.20
-6.0	_____	+ 1	_____	±0.2	±0.16
-4.0	_____	- 1	_____	±0.2	±0.14
-2.0	_____	- 3	_____	±0.2	±0.13
0.0	_____	- 5	_____	±0.5	±0.13
+ 2.0	_____	- 7	_____	± 0.5	±0.20
+ 4.0	_____	- 9	_____	± 0.5	±0.16
+ 5.0	_____	-10	_____	± 0.5	±0.15

### HP 8752C Performance Test Record (13 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____			Report Number _____ Date _____		
<b>▶▶ 2. Reflection Test Port Output Power Range and Level Linearity                  (HP 8752C with Options 003 and 075, without Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 2 GHz</b>					
-20.0	_____	+15	_____	±0.5	±0.13
-18.0	_____	+13	_____	±0.5	±0.20
-16.0	_____	+11	_____	±0.5	±0.16
-14.0	_____	+9	_____	±0.2	±0.14
-12.0	_____	+7	_____	±0.2	±0.13
-10.0	_____	+5	_____	±0.2	±0.13
-8.0	_____	+3	_____	±0.2	±0.20
-6.0	_____	+1	_____	±0.2	±0.16
-4.0	_____	-1	_____	±0.2	±0.14
-2.0	_____	-3	_____	±0.2	±0.13
0.0	_____	-5	_____	±0.5	±0.13
+2.0	_____	-7	_____	±0.5	±0.20
+4.0	_____	-9	_____	±0.5	±0.16
+5.0	_____	-10	_____	±0.5	±0.15

### HP 8752C Performance Test Record (14 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 3. Reflection Test Port Output Power Range (HP 8752C with Option 004)</b>				
Power Range (dBm)	Power Level Value (dB)	Specification (dB)	Mean Value (dB)	Measurement Uncertainty (dB)
-15 to +10	-10	$0 \pm 1.0$	_____	$\pm 0.100$
-25 to 0	-20	$0 \pm 1.5$	_____	$\pm 0.060$
-35 to -10	-30	$0 \pm 1.7$	_____	$\pm 0.050$
-45 to -20	-40	$0 \pm 1.9$	_____	$\pm 0.050$
-55 to -30	-50	$0 \pm 2.2$	_____	$\pm 0.055$
-65 to -40	-60	$0 \pm 2.5$	_____	$\pm 0.080$
-75 to -50	-70	$0 \pm 2.8$	_____	$\pm 0.200$
-85 to -60	-80	$0 \pm 3.1$	_____	$\pm 0.565$

### HP 8752C Performance Test Record (15 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____		Report Number _____ Date _____			
<b>▶▶ 3. Reflection Test Port Output Power Level Linearity (HP 8752C with Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 300 kHz</b>					
- 15.0	_____	+10	_____	± 0.2	± 0.06
- 12.0	_____	+7	_____	± 0.2	± 0.07
- 10.0	_____	+5	_____	± 0.2	± 0.09
- 8.0	_____	+3	_____	± 0.2	± 0.06
- 6.0	_____	+1	_____	± 0.2	± 0.03
- 4.0	_____	-1	_____	± 0.2	± 0.02
- 2.0	_____	-3	_____	± 0.2	± 0.01
0.0	_____	-5	_____	± 0.5	± 0.09
+2.0	_____	-7	_____	± 0.5	± 0.06
+4.0	_____	-9	_____	± 0.5	± 0.03
+5.0	_____	-10	_____	± 0.5	± 0.03
+10.0	_____	-15	_____	± 0.5	± 0.03

### HP 8752C Performance Test Record (16 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____			Report Number _____ Date _____		
<b>▶▶ 3. Reflection Test Port Output Power Level Linearity (HP 8752C with Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 1.3 GHz</b>					
- 15.0	_____	+ 10	_____	± 0.2	± 0.06
- 12.0	_____	+ 7	_____	± 0.2	± 0.07
- 10.0	_____	+ 5	_____	± 0.2	± 0.09
- 8.0	_____	+ 3	_____	± 0.2	± 0.06
- 6.0	_____	+ 1	_____	± 0.2	± 0.03
- 4.0	_____	- 1	_____	± 0.2	± 0.02
- 2.0	_____	- 3	_____	± 0.2	± 0.01
0.0	_____	- 5	_____	± 0.5	± 0.09
+ 2.0	_____	- 7	_____	± 0.5	± 0.06
+ 4.0	_____	- 9	_____	± 0.5	± 0.03
+ 5.0	_____	- 10	_____	± 0.5	± 0.03
+ 10.0	_____	- 15	_____	± 0.5	± 0.03

### HP 8752C Performance Test Record (17 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____		Report Number _____ Date _____			
<b>▶▶ 3. Reflection Test Port Output Power Level Linearity (HP 8752C with Option 004)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 3 GHz</b>					
- 15.0	_____	+10	_____	± 0.2	± 0.06
- 12.0	_____	+7	_____	± 0.2	± 0.07
- 10.0	_____	+5	_____	± 0.2	± 0.09
- 8.0	_____	+3	_____	± 0.2	± 0.06
- 6.0	_____	+1	_____	± 0.2	± 0.03
- 4.0	_____	-1	_____	± 0.2	± 0.02
- 2.0	_____	-3	_____	± 0.2	± 0.01
0.0	_____	-5	_____	± 0.5	± 0.09
+2.0	_____	-7	_____	± 0.5	± 0.06
+4.0	_____	-9	_____	± 0.5	± 0.03
+5.0	_____	-10	_____	± 0.5	± 0.03
+10.0	_____	-15	_____	± 0.5	± 0.03



### HP 8752C Performance Test Record (18 of 28)

Hewlett-Packard Company Model HP 8752C			Report Number _____		
Serial Number _____			Date _____		
<b>▶▶ 3. Reflection Test Port Output Power Level Linearity (HP 8752C with Options 004 and 006)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 6 GHz</b>					
- 15.0	_____	+ 10	_____	± 0.2	± 0.06
- 12.0	_____	+ 7	_____	± 0.2	± 0.07
- 10.0	_____	+ 5	_____	± 0.2	± 0.09
- 8.0	_____	+ 3	_____	± 0.2	± 0.06
- 6.0	_____	+ 1	_____	± 0.2	± 0.03
- 4.0	_____	- 1	_____	± 0.2	± 0.02
- 2.0	_____	- 3	_____	± 0.2	± 0.01
0.0	_____	- 5	_____	± 0.5	± 0.09
+ 2.0	_____	- 7	_____	± 0.5	± 0.06
+ 4.0	_____	- 9	_____	± 0.5	± 0.03
+ 5.0	_____	- 10	_____	± 0.5	± 0.03
+ 10.0	_____	- 15	_____	± 0.5	± 0.03

### HP 8752C Performance Test Record (19 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____			Report Number _____ Date _____		
<b>▶▶ 3. Reflection Test Port Output Power Level Linearity                  (HP 8752C with Options 004 and 075)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 300 kHz</b> - 15.0 - 12.0 - 10.0 - 8.0 - 6.0 - 4.0 - 2.0 0.0 + 2.0 + 4.0 + 5.0 + 8.0	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	+ 10 + 7 + 5 + 3 + 1 - 1 - 3 - 5 - 7 - 9 - 10 - 13	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	± 0.2 ± 0.2 ± 0.2 ± 0.2 ± 0.2 ± 0.2 ± 0.2 ± 0.5 ± 0.5 ± 0.5 ± 0.5 ± 0.5 ± 0.5	± 0.14 ± 0.13 ± 0.13 ± 0.20 ± 0.16 ± 0.14 ± 0.13 ± 0.13 ± 0.20 ± 0.16 ± 0.15 ± 0.15

### HP 8752C Performance Test Record (20 of 28)

Hewlett-Packard Company Model HP 8752C			Report Number _____		
Serial Number _____			Date _____		
<b>▶▶ 3. Reflection Test Port Output Power Level Linearity (HP 8752C with Options 004 and 075)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 1.3 GHz</b>					
- 15.0	_____	+ 10	_____	± 0.2	± 0.14
- 12.0	_____	+ 7	_____	± 0.2	± 0.13
- 10.0	_____	+ 5	_____	± 0.2	± 0.13
- 8.0	_____	+ 3	_____	± 0.2	± 0.20
- 6.0	_____	+ 1	_____	± 0.2	± 0.16
- 4.0	_____	- 1	_____	± 0.2	± 0.14
- 2.0	_____	- 3	_____	± 0.2	± 0.13
0.0	_____	- 5	_____	± 0.5	± 0.13
+ 2.0	_____	- 7	_____	± 0.5	± 0.20
+ 4.0	_____	- 9	_____	± 0.5	± 0.16
+ 5.0	_____	- 10	_____	± 0.5	± 0.15
+ 8.0	_____	- 13	_____	± 0.5	± 0.15

### HP 8752C Performance Test Record (21 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____			Report Number _____ Date _____		
<b>▶▶ 3. Reflection Test Port Output Power Level Linearity                  (HP 8752C with Options 003, 004, and 075)</b>					
Test Settings (dBm)	Results Measured (dB)	Power Offset (dB)	Power Level Linearity (dB)	Specification (dB)	Measurement Uncertainty (dB)
<b>CW Frequency = 2 GHz</b>					
- 15.0	_____	+10	_____	± 0.2	± 0.14
- 12.0	_____	+7	_____	± 0.2	± 0.13
- 10.0	_____	+5	_____	± 0.2	± 0.13
- 8.0	_____	+3	_____	± 0.2	± 0.20
- 6.0	_____	+1	_____	± 0.2	± 0.16
- 4.0	_____	-1	_____	± 0.2	± 0.14
- 2.0	_____	-3	_____	± 0.2	± 0.13
0.0	_____	-5	_____	± 0.5	± 0.13
+2.0	_____	-7	_____	± 0.5	± 0.20
+4.0	_____	-9	_____	± 0.5	± 0.16
+5.0	_____	-10	_____	± 0.5	± 0.15
+8.0	_____	-13	_____	± 0.5	± 0.15

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### HP 8752C Performance Test Record (22 of 28)

<b>Hewlett-Packard Company</b> Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 4. Transmission Test Port Input Noise Floor Level (HP 8752C without Option 075)</b>				
Frequency Range	IF BW	Specification (dBm)	Calculated Value	Measurement Uncertainty (dB)
<b>HP 8752C Standard ONLY</b>				
300 kHz to 1.3 GHz	3 kHz	- 90	_____	N/A
300 kHz to 1.3 GHz	10 Hz	- 110	_____	N/A
<b>HP 8752C Option 003 ONLY</b>				
300 kHz to 3 GHz	3 kHz	- 90	_____	N/A
300 kHz to 3 GHz	10 Hz	- 110	_____	N/A
<b>HP 8752C Option 006 ONLY</b>				
3 GHz to 6 GHz	3 kHz	-85	_____	N/A
3 GHz to 6 GHz	10 Hz	- 105	_____	N/A

### HP 8752C Performance Test Record (23 of 28)

<b>Hewlett-Packard Company</b> Model HP 8752C Serial Number _____		Report Number _____ Date _____		
<b>▶▶ 5. Transmission Test Port Input Noise Floor Level (HP 8752C with Option 075)</b>				
Frequency Range	IF BW	Spec. (dBm)	Calculated Value	Measurement Uncertainty (dB)
300 kHz to 1.3 GHz	3 kHz	- 90	_____	N/A
300 kHz to 1.3 GHz	10 Hz	- 110	_____	N/A
<b>HP 8752C Options 075 and 003 ONLY</b>				
300 kHz to 3 GHz	3 kHz	- 90	_____	N/A
300 kHz to 3 GHz	10 Hz	- 110	_____	N/A

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### HP 8752C Performance Test Record (24 of 28)

<b>Hewlett-Packard Company</b> Model HP 8752C Serial Number _____		Report Number _____ Date _____	
<b>▶▶ 6. Test Port Crosstalk (HP 8752C All Options)</b>			
Frequency Range	Specification (dBm)	Measured Value	Measurement Uncertainty (dB)
<b>Standard HP 8752C</b> 300 kHz to 1.3 GHz	$\leq -100$ dB	_____	N/A
<b>HP 8752C Option 003 ONLY</b> 300 kHz to 3.0 GHz	$\leq -100$ dB	_____	N/A
<b>HP 8752C Option 006 ONLY</b> 300 kHz to 3.0 GHz	$\leq -100$ dB	_____	N/A
3.0 GHz to 6.0 GHz	$\leq -100$ dB	_____	N/A
<b>HP 8752C Option 075 ONLY</b> 300 kHz to 1.3 GHz	$\leq -100$ dB	_____	N/A
<b>HP 8752C Options 003 and 075 ONLY</b> 300 kHz to 1.3 GHz	$\leq -100$ dB	_____	N/A
1.3 GHz to 3.0 GHz	$\leq -97$ dB	_____	N/A

### HP 8752C Performance Test Record (25 of 28)

<b>Hewlett-Packard Company</b> <b>Model HP 8752C</b>		<b>Report Number</b> _____		
<b>Serial Number</b> _____		<b>Date</b> _____		
<b>▶▶ 7. System Trace Noise (HP 8752C All Options)</b>				
Mode	IF BW	Specification (dBm)	Measured Value (dB)	Measurement Uncertainty (dB)
<b>Standard HP 8752C</b>				
Reflection Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Reflection Phase	3 kHz	<0.038° rms	_____	N/A
Transmission Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Transmission Phase	3 kHz	<0.038° rms	_____	N/A
<b>HP 8752C Option 003 ONLY</b>				
Reflection Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Reflection Phase	3 kHz	<0.038° rms	_____	N/A
Transmission Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Transmission Phase	3 kHz	<0.038° rms	_____	N/A
<b>HP 8752C Option 006 ONLY</b>				
Reflection Magnitude	3 kHz	<0.010 dB rms	_____	N/A
Reflection Phase	3 kHz	<0.070° rms	_____	N/A
Transmission Magnitude	3 kHz	<0.010 dB rms	_____	N/A
Transmission Phase	3 kHz	<0.070° rms	_____	N/A
<b>HP 8752C Option 075 ONLY</b>				
Reflection Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Reflection Phase	3 kHz	<0.038° rms	_____	N/A
Transmission Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Transmission Phase	3 kHz	<0.038° rms	_____	N/A
<b>HP 8752C Options 003 and 075 ONLY</b>				
Reflection Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Reflection Phase	3 kHz	<0.038° rms	_____	N/A
Transmission Magnitude	3 kHz	<0.006 dB rms	_____	N/A
Transmission Phase	3 kHz	<0.038° rms	_____	N/A

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### HP 8752C Performance Test Record (26 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____			Report Number _____ Date _____			
<b>▶▶ 8. Magnitude Dynamic Accuracy</b>						
Trans. Port Input Power (dB)	HP 8496A Setting (dB)	Trans. Port (dB)	HP 8902A (dB)	Measured Value (dB)	Spec. (dB)	Meas. Uncer. (dB)
-20	10	_____	_____	_____	≤0.058	±0.02
-30	20	_____	_____	_____	≤0.050	±0.02
-40	30	_____	_____	_____	≤0.050	±0.04
-50	40	_____	_____	_____	≤0.053	±0.06
-60	50	_____	_____	_____	≤0.060	±0.08
-70	60	_____	_____	_____	≤0.115	±0.14
-80	70	_____	_____	_____	≤0.285	±0.16
-90	80	_____	_____	_____	≤0.860	±0.18
-100	90	_____	_____	_____	≤2.500	±0.20
-110	100	_____	_____	_____	≤5.400	±0.20

### HP 8752C Performance Test Record (27 of 28))

Hewlett-Packard Company Model HP 8752C			Report Number _____			
Serial Number _____			Date _____			
▶▶ 9. Phase Dynamic Accuracy						
Trans. Port Input Power (dB)	Magnitude Dynamic Accuracy Value	A	B	Calculated Value (degrees)	Spec. (degrees)	Meas. Uncert.
-20	_____	_____	_____	_____	≤0.46	N/A
-30	_____	_____	_____	_____	≤0.35	N/A
-40	_____	_____	_____	_____	≤0.36	N/A
-50	_____	_____	_____	_____	≤0.38	N/A
-60	_____	_____	_____	_____	≤0.40	N/A
-70	_____	_____	_____	_____	≤0.70	N/A
-80	_____	_____	_____	_____	≤1.90	N/A
-90	_____	_____	_____	_____	≤6.00	N/A
-100	_____	_____	_____	_____	≤18.00	N/A
-110	_____	_____	_____	_____	≤55.00	N/A

### HP 8752C Performance Test Record (28 of 28)

Hewlett-Packard Company Model HP 8752C Serial Number _____			Report Number _____ Date _____			
<b>▶▶ 10. Compression</b>						
CW Freq.(GHz)	Magnitude Value (dB)	Spec. (dB)	Meas. Uncert.	Phase Value (degrees)	Spec. (degrees)	Meas. Uncer. (dB)
0.05	_____	≤0.45	N/A	_____	≤4.2	N/A
1.00	_____	≤0.45	N/A	_____	≤4.2	N/A
1.30	_____	≤0.45	N/A	_____	≤4.2	N/A



## Adjustments and Correction Constants

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The accuracy of the analyzer is achieved and maintained through mechanical adjustments and correction constants. The correction constants are empirically derived data that is stored in memory. Correction constants refine the analyzer's measurements and define its operation.

---

### When to Perform the Adjustment Procedures

Perform the following adjustment procedures in these two instances:

- if one of the analyzer's assemblies has been replaced
- or
- if one or more of the analyzer's performance tests failed.

### Keep Correction Constants Current to Save Time

Keep the correction constants current by performing "15. EEPROM Backup Disk Procedure" any time you perform one or more of the correction constant adjustment procedures. Then, if you need to replace the A9 assembly, you can quickly retrieve the data from the back up disk, rather than regenerating it by performing all of the correction constant adjustment procedures.

### Adjustment Procedure Error Messages

- POW MET INVALID
- POW MET NOT SETTLED
- POW MET NOT FOUND

The messages listed above indicate power meter problems.

If the analyzer displays one of these messages, check:

- the test setup
- the line power
- the HP-IB connections and addresses
- the model number

After the problem has been identified and corrected, repeat the test.

- TROUBLE! CHECK SET-UP AND START OVER

Check your setup against the illustrated test setup and repeat the test.

---

## Perform Adjustments in This Order

When performing more than one adjustment, perform them in this order:

1. A9 CC Jumper Position Procedure
2. EEPROM Backup Disk Procedure
3. Initialize EEPROMs (Test #58)
4. Source Default Correction Constants (Test #44)
5. Source Pretune Default Correction Constants (Test #45)
6. Analog Bus Correction Constants (Test #46)
7. RF Output Power Correction Constants (Test #47)
8. Source Pretune Correction Constants (Test #48)
9. Display Intensity Adjustments (Test #49)
10. IF Amplifier Correction Constants (Test #51)
11. ADC Offset Correction Constants (Test #52)
12. Frequency Response Correction Constants (Tests #57 then #53)
13. Cavity Oscillator Correction Constants (Test #54)
14. Serial Number Correction Constant (Test #55)
15. Option Number Correction Constant (Test #56)
16. Model Number Correction Constant
17. Vertical Position and Focus Adjustments
18. Display Degaussing (Demagnetizing)
19. Fractional-N Frequency Range Adjustment
20. Frequency Accuracy Adjustment
21. High/Low Band Transition Adjustment
22. Fractional-N Spur and FM Sideband Adjustment
23. Source Spur Avoidance Tracking Adjustment
24. EEPROM Backup Disk Procedure

### 3-2 Adjustments and Correction Constants

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**Note**

If you have replaced the CPU board, or if the analyzer has lost all of its correction constants perform the adjustments in the order listed below (from top to bottom):

1. A9 CC Jumper Position Procedure
  12. Serial Number Correction Constant (Test #55)
  13. Option Number Correction Constant (Test #56)
  16. Model Number Correction Constant
  14. Initialize EEPROMs (Test #58)
  16. Model Number Correction Constant
  7. Display Intensity Adjustments (Test #49)
  17. Vertical Position and Focus Adjustments
  18. Display Degaussing (Demagnetizing)
  2. Source Default Correction Constants (Test #44)
  3. Source Pretune Default Correction Constants (Test #45)
  4. Analog Bus Correction Constants (Test #46)
  9. ADC Offset Correction Constants (Test #52)
  19. Fractional-N Frequency Range Adjustment
  6. Source Pretune Correction Constants (Test #48)
  20. Frequency Accuracy Adjustment
  21. High/Low Band Transition Adjustment
  22. Fractional-N Spur and FM Sideband Adjustment
  23. Source Spur Avoidance Tracking Adjustment
  5. RF Output Power Correction Constants (Test #47)
  8. IF Amplifier Correction Constants (Test #51)
  11. Cavity Oscillator Correction Constants (Test #54)
  10. Frequency Response Correction Constants (Tests #57 then #53)
  15. EEPROM Backup Disk Procedure
- 

### Test Equipment Specifications

Each of the following procedures lists the equipment required to perform the adjustment procedure. Typically, common hand tools (screwdrivers, etc.) are not listed.

If you do not have the required equipment, refer to the critical specifications in Table 1-1 to identify appropriate substitutes.

## **Analyzer Cover Removal**

Typically, when performing the analyzer's adjustment procedures, only the top cover needs to be removed (to adjust the A9CC jumper position).

To remove the top cover:

1. Remove the upper rear standoffs.
2. Loosen the top cover retaining screw.
3. Slide back the cover.

### **3-4 Adjustments and Correction Constants**



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## 1. A9 CC Jumper Position Procedure

### A9 CC (Correction Constant) Jumper Position

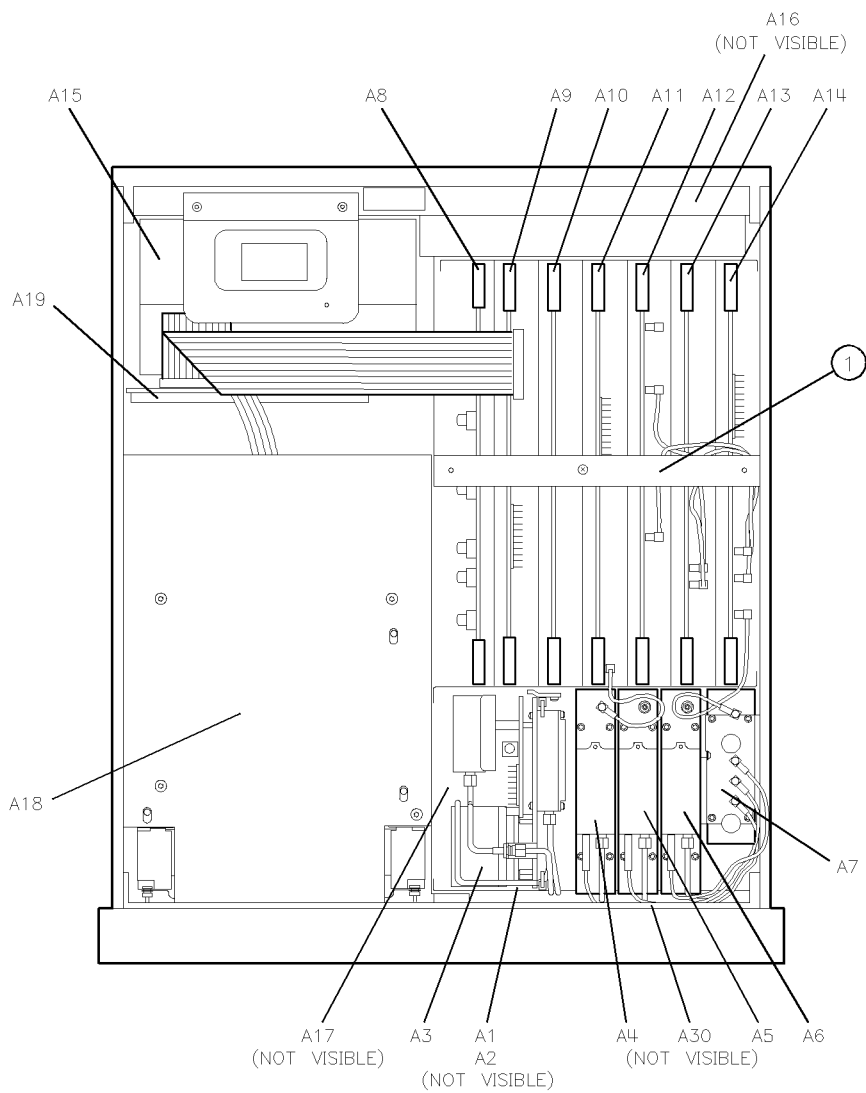
To change the correction constants, you must move the A9 CC jumper to the ALT (alter) position. The analyzer is shipped (and should be operated) with the A9 CC jumper in the NRM (normal) position.

### Procedure

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**Caution**      Switch off the analyzer's line power before removing or installing assemblies.

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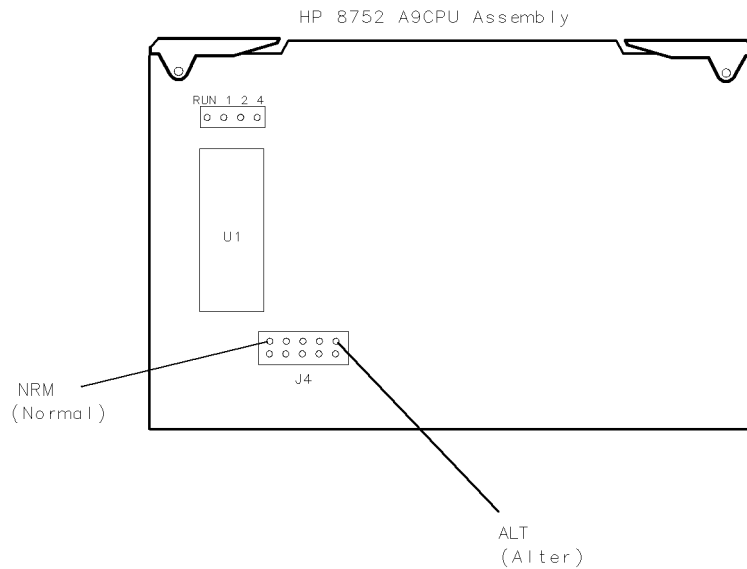


sh65c

**Figure 3-1. Location of Major Assemblies**

### 3-6 Adjustments and Correction Constants

1. Remove the analyzer top cover (see the section titled “Analyzer Cover Removal,” located earlier in this chapter).
2. Remove the PC board stabilizer (item 1, Figure 3-1).
3. Remove the A9 CPU assembly by pulling on the white lifters.



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**Figure 3-2. NRM (Normal) and ALT (Alter) Positions of A9 CC Jumper**

4. Move the A9 CC jumper to the ALT position. Refer to Figure 3-2.
5. Reinstall the A9 assembly and run the correction constant routine(s).
6. Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).

---

**Note** Update the EEPROM backup disk by performing “15. EEPROM Backup Disk Procedure” at the end of this chapter.

---

---

## 2. Source Default Correction Constants (Test #44)

### Equipment

No equipment is required to perform this adjustment.

### Warm-up time

5 minutes

### Description and Procedure

This internal adjustment test writes default correction constants for rudimentary source power accuracy. This adjustment must be performed before the "Source Pretune Correction Constants (Test #45)" procedure.

1. Put the A9 CC jumper in the ALT position (see "1. A9 CC Jumper Position Procedure").
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU TESTS** **44** **x1**. When the display shows  
\*Source Def -ND-  
press **EXECUTE TEST**.
4. Press **YES** at the query to alter the correction constants.
5. When complete, **DONE** should appear on the display.
6. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants.
7. Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").

### 3-8 Adjustments and Correction Constants

---

### 3. Source Pretune Default Correction Constants (Test #45)

#### Equipment

No equipment is required to perform this adjustment.

#### Warm-up time

30 minutes

#### Description and Procedure

This adjustment generates two default correction constants which pretune the YIG oscillators to insure proper phase lock.

1. Put the A9 CC jumper in the ALT position (see “1. A9 CC Jumper Position Procedure”).
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU** **TESTS** **45** **x1**.
4. When the analyzer displays  
\*Pretune Def  
press **EXECUTE TEST**.
5. Press **YES** at the query to alter the correction constants and observe the display:
  - If \*Pretune Def DONE is displayed, the adjustment is complete.
  - Refer to “15. EEPROM Backup Disk Procedure” to store the new correction constants. Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).

---

## 4. Analog Bus Correction Constants (Test #46)

### Equipment

No equipment is required for this adjustment.

### Warm-up time

30 minutes

### Description and Procedure

This procedure calibrates the analog bus using three reference voltages: ground, +0.37V and +2.5V. It then stores the calibration data as correction constants in EEPROM.

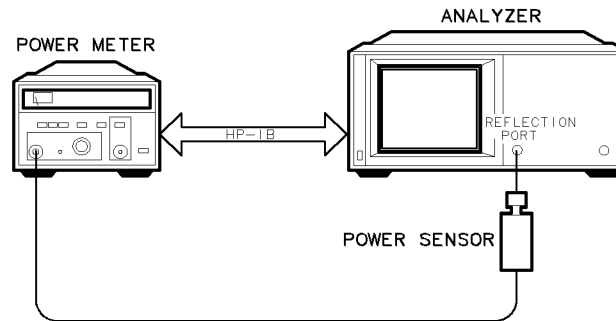
1. Put the A9 CC jumper in the ALT position (see "1. A9 CC Jumper Position Procedure").
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU TESTS** **46** **x1**. When the display shows:

ABUS Cor

press **EXECUTE TEST** and then press **YES** at the query to alter the correction constants and observe the display:

- **ABUS COR DONE** displayed: the adjustment is complete. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants. Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").
- **ABUS COR FAIL** displayed: rerun the procedure; in case of continued improper operation, refer to the chapter titled "Digital Control Troubleshooting."

## 5. RF Output Power Correction Constants (Test #47)



sh653c

Figure 3-3. Source Adjustment Setup

### Equipment Required

Item	For 50Ω Analyzers	For 75Ω Analyzers
HP-IB cable (2)	HP 10833A/B/C/D	HP 10833A/B/C/D
Power meter	HP 436A Option 022 or HP 438A	HP 436A Option 022 or HP 438A
Power sensor	HP 8482A*	HP 8483A Option HO3

\*Use HP 8481A Option 006 above 4.2 GHz

### Warm-up time

30 minutes

### Description and Procedure

Several correction constants improve the output power level accuracy of the internal source. They relate to power level, power slope, power slope offset, and ALC roll-off factors.

1. Put the A9 CC jumper in the ALT position (see "1. A9 CC Jumper Position Procedure").
2. Press **PRESET**.

3. Press (SYSTEM) SERVICE MENU TESTS (44) (x1) EXECUTE TEST YES to write default correction constants for rudimentary source power accuracy.
4. Press (PRESET) (MEAS) INPUT PORTS R to measure input R.
5. Press (LOCAL) SYSTEM CONTROLLER SET ADDRESSES  
ADDRESS: P MTR/HPIB to see the address at which the analyzer expects to find the power meter (the default address is 13). Refer to the power meter manual as required to observe or change its address to 13.
6. Press POWER MTR: 438A/437 to toggle between 438A/437 and 436A to match your power meter model number. When using the HP 438A, use channel A.

---

**Note** If you are using an 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

7. Press (SYSTEM) SERVICE MENU TEST OPTIONS LOSS/SENSR LISTS  
CAL FACTOR SENSOR A to access the calibration factor menu.

---

**Note** In this menu, you can build a table of up to twelve points (twelve frequencies with their cal factors). Cal factor and frequency values are listed on the back of the power sensor.

---

- Input the cal factor frequency as GHz or MHz by pressing the appropriate entry key.
- Input cal factor percentages as whole numbers (for example, enter CAL FACTOR 98% as 98).

The following terms are part of the sensor calibration menu:

**SEGMENT**: press the softkey and use RPG or entry keys to select a point,

**EDIT**: press the softkey to change a previously entered value,

**DELETE**: press the softkey to delete a point from the table,

**ADD**: press the softkey to add a point to the table,

### 3-12 Adjustments and Correction Constants



**CLEAR LIST**: press the softkey to erase the entire table,

**DONE**: press the softkey when a table is complete and correct.

8. Press the appropriate softkeys to build a sensor calibration table.

---

**Note**            The Sensor's reference calibration factor is the calibration factor for 50 MHz.

---

9. Carefully zero and calibrate the power meter/sensor (refer to the power meter/sensor manual as required).

### Source Correction Routine

10. Press **(SYSTEM) SERVICE MENU TESTS (47) (x1)** to display Source Cor.
11. Press **EXECUTE TEST** and **YES** at the prompt to alter the correction constants.
12. When prompted, connect the equipment as shown in Figure 3-3.
13. Follow the instructions on the screen and press **CONTINUE**. You can reposition the marker as many times as required to achieve the flattest line.

If there is no appreciable rolloff, position the marker at the highest frequency. Press **SELECT** to select the marker position which most effectively flattens the trace.

- **DONE** signals the successful conclusion of this routine. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants.
- Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").
- **FAIL** is best handled by performing this procedure again.
- In case of continued failure, refer to the chapter titled "Source Troubleshooting."

---

## 6. Source Pretune Correction Constants (Test #48)

### Equipment Required

No equipment is required to perform this adjustment.

### Warm-up time

30 minutes

### Description and Procedure

This adjustment generates two correction constants which pretune the YIG oscillators to insure proper phase lock.

1. Put the A9 CC jumper in the ALT position (see "1. A9 CC Jumper Position Procedure").
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU TESTS** **48** **X1**.
4. When the analyzer displays:

Pretune Cor

press **EXECUTE TEST**. Press **YES** at the query to alter the correction constants and observe the display:

- Pretune Cor DONE displayed: the adjustment is complete and can be tested by pressing **PRESET** and again observing the display:
  - Normal operation observed: the adjustment is complete. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants. Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").
  - Error messages observed: refer to the chapter titled "Source Troubleshooting."
  - Continued improper operation: refer to the chapter titled "Source Troubleshooting."

---

## 7. Display Intensity Adjustments (Test #49)

### Equipment Required

Item	Model Number
Photometer	Tektronix J16
Photometer probe	Tektronix J6503
Light occluder	Tektronix 016-0305-00

### Warm-up time

30 minutes

### Description and Procedure

There are three display intensity adjustments:

1. background
2. maximum
3. operating default

Perform these adjustments when either the A19 GSP, A9 CPU, or A18 display assemblies are replaced (as indicated in “Assembly Replacement and Post-Repair Procedures”).

---

**Note** This procedure should be performed with a photometer and only by qualified service personnel.

---

### Background Adjustment

1. Put the A9 CC jumper in the ALT position (see “1. A9 CC Jumper Position Procedure”).
2. In a dimly lit room (or with the analyzer’s display shaded from bright lights), press **PRESET**.

3. Press **(SYSTEM) SERVICE MENU TESTS (49) (x1)**.

4. The analyzer should display:

Intensity Cor -MD-

---

**Note** The display could be so far out of adjustment that the annotation will be very difficult to read.

---

5. Press **EXECUTE TEST** (top softkey) and **YES** (second from top softkey) at the prompt to alter the correction constants. Alternating vertical bars of three different intensities will be drawn on the display. Each bar has a number written below it (either 0, 1, or 2).
6. Adjust the analyzer's RPG knob until the vertical bar labeled "1" is just barely visible against the black border. Vertical bar "0" must not be visible.

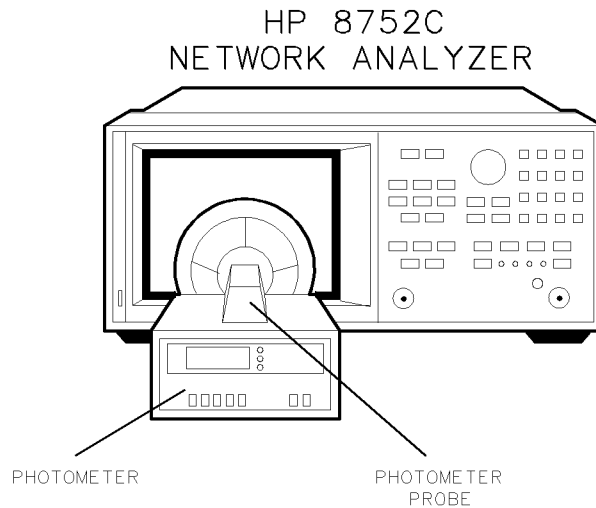
### Maximum Intensity Adjustment

This adjustment ensures that the light output at the 100% intensity level is equal to, or less than, 150 NITs. The level is set using a photometer to measure the display's light output level.

---

**Caution** Operating the display at intensities higher than 150 NITs may reduce the life of the display.

---



sh642c

**Figure 3-4. Maximum Intensity Adjustment Set-up**

7. Press the top softkey.
8. Set the photometer probe to NORMAL. Press **POWER** on the photometer to switch it on and allow 30 minutes warm-up. Zero the photometer according to the manufacturer's instructions. The analyzer display should have an all white screen.
9. Center the photometer on the analyzer's display as shown in Figure 3-4. Adjust the analyzer's RPG knob to the maximum (clockwise) position. If the photometer registers greater than 150 NITs, turn the RPG knob until a reading of no more than 150 NITs registers on the photometer without the bezel (90 NITs with the bezel). If the photometer registers a reading of less than 150 NITs and greater than 100 NITs, proceed to the next step. If the photometer registers a reading of less than 100 NITs, the display is faulty.

---

**Note**

The above intensity levels are read without a display bezel installed. The glass filter transmits 60% of the display light, therefore 150 NITs would be 90 NITs with the bezel installed.

---

## Operating Default Intensity Adjustment

This adjustment sets the display's default intensity level. The analyzer normally presets to the same intensity level that was last used. This level is stored in volatile memory. If the memory is lost, the analyzer will use the default display intensity to ensure that the display is visible and to eliminate concern that the display may not be functioning.

10. Press the top softkey on the analyzer to bring up the next display adjustment mode.
11. Center the photometer on the analyzer's display as shown in Figure 3-4. Adjust the analyzer's RPG knob until the photometer registers 100 NITs of output light if the glass bezel assembly is not installed.

Adjust for 60 NITs if the glass bezel is installed.

12. Press the top softkey on the analyzer and observe the display:
  - If DONE is displayed: the adjustment is complete. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants. This completes the series of three display intensity adjustments. Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").
  - If the analyzer continues to operate improperly: refer to "Start Troubleshooting Here" to isolate the problem.

## 8. IF Amplifier Correction Constants (Test #51)

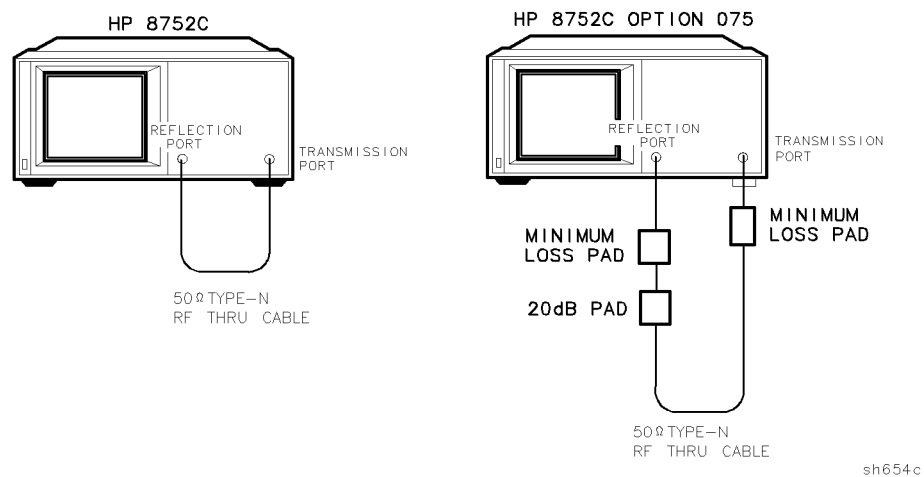
### Equipment Required

Item	50Ω Analyzers	75Ω Analyzers
RF cable	HP PN 8120-4781	HP PN 8120-4781
Pad attenuator	N/A	HP 8491A Option 020
50/75Ω min loss pad (2)	N/A	HP 11852B

### Warm-up time

30 minutes

### Description and Procedure



**Figure 3-5. IF Amplifier Correction Constant Setup**

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

1. Put the A9 CC jumper in the ALT position (see "1. A9 CC Jumper Position Procedure").
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU TESTS** **51** **x1**.
4. Press **EXECUTE TEST**.
5. When  
     **IF Step Cor**  
     appears on the display, press **YES** at the query to alter the correction constants.
6. At the prompt, remove any cable or device from the reflection port. Press **CONTINUE**.
7. At the prompt, connect the attenuator and RF cable as shown in Figure 3-5. Press **CONTINUE**.
8. If **DONE** is displayed: the adjustment is complete. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants. Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").
9. If the procedure does not end with **DONE**, check the A9 CC jumper and the setup and repeat. In case of difficulty, refer to the chapter titled "Digital Control Troubleshooting."

### 3-20 Adjustments and Correction Constants



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## 9. ADC Offset Correction Constants (Test #52)

### Equipment

No equipment is required to perform this adjustment.

### Warm-up time

30 minutes

### Description and Procedure

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

1. Put the A9 CC jumper in the ALT position (see “1. A9 CC Jumper Position Procedure”).
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU** **TESTS** **52** **x1**. When the analyzer displays:  
ADC 0fs Cor  
press **EXECUTE TEST**.
4. Press **YES** at the query to alter the correction constants. Observe the display:
  - ADC 0fs Cor DONE displayed: the adjustment is complete. Refer to “15. EEPROM Backup Disk Procedure” to store the new correction constants. Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).
  - ADC 0fs Cor FAIL displayed: rerun the routine; in case of continued improper operation, refer to the chapter titled “Digital Control Troubleshooting.”

---

## 10. Frequency Response Correction Constants (Tests #53 and #57)

### Equipment Required

Item	50Ω Analyzers	75Ω Analyzers
RF cable	HP PN 8120-4781	HP PN 8120-2408
type-N calibration kit	HP 85032B	HP 85036B

### Warm-up time

30 minutes

### Description and Procedure

Perform “5. RF Output Power Correction Constants (Test #47)” before continuing if you have replaced one or more of these assemblies:

- A3 source
- A9 CPU
- A30 directional coupler
- AT1 attenuator

---

**Note** This procedure must be performed with the RF cable that will be used with the analyzer. When the RF cable is replaced, this procedure should be performed again to keep the correction constants current.

---

1. Put the A9 CC jumper in the ALT position (see “1. A9 CC Jumper Position Procedure”).
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU** **TESTS** **57** **x1** **EXECUTE TEST** **YES**.
4. Press **SYSTEM** **SERVICE MENU** **TESTS** **53** **x1**.
5. When Freq Resp Cor -ND- appears, press **EXECUTE TEST** **YES**. This allows the correction constants to be altered.
6. Connect a standard, as prompted on the display, then press the corresponding softkey.

### 3-22 Adjustments and Correction Constants

---

**Note** For open and short standards, you must select an additional softkey that indicates whether the test port is male or female. In this case, it is female (f).

---

7. Press **DONE** after the standard is measured.
8. Measure all three standard types (short, open, load).
9. Press **DONE 1-PORT CAL** to allow the analyzer to compute the calibration coefficients. This takes about 20 seconds.
10. Connect the RF cable between the reflection and transmission test ports.
11. Press **THRU**.
12. After the analyzer underlines **THRU** on the display, press **DONE: RESPONSE**.
13. When the procedure is finished, look at the display:
  - If **DONE** is displayed, this procedure is complete. Store the new correction constants to disk. Refer to “15. EEPROM Backup Disk Procedure.” Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).
  - If **FAIL** is displayed, refer to the chapter titled “Receiver Troubleshooting.”

## 11. Cavity Oscillator Frequency Correction Constants (Test #54)

### Equipment Required

Item	50Ω Analyzers	75Ω Analyzers
Low-pass filter	HP PN 9135-0198	HP PN 9135-0198
RF cable	HP PN 8120-4781	HP PN 8120-4781
50Ω to 75Ω minimum loss pad (2)	N/A	HP 11852B
APC-3.5(f) to type-N(m) adapter	1250-1744	1250-1744
APC-3.5(m) to type-N(f) adapter	1250-1750	1250-1750

### Warm-up time

30 minutes

### Description and Procedure

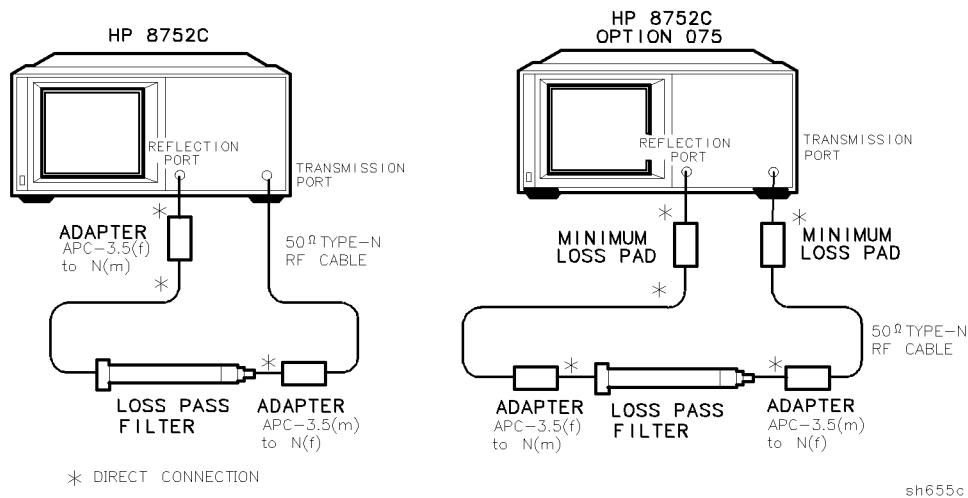


Figure 3-6. Cavity Oscillator Frequency Correction Constant Setup

### 3-24 Adjustments and Correction Constants

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** With the filter, the operator needs 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, the target spur is one of 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.

---

1. Put the A9 CC jumper in the ALT position (see “1. A9 CC Jumper Position Procedure”).
2. Connect the equipment as shown in Figure 3-6 and switch the analyzer’s line power on.
3. Press **PRESET**.
4. Press **SYSTEM SERVICE MENU TESTS 54 x1**.
5. When the analyzer displays:

Cav Osc Cor

press **EXECUTE TEST**. Then press **YES** at the query to alter the correction constants.

---

**Note** During this adjustment routine, you will see several softkeys:

**CONTINUE** sweeps the current frequency span (may be pressed repeatedly for additional looks at the current frequency span).

**NEXT** sweeps the next frequency span (2 MHz higher).

**SELECT** enters the value of the marker (which should be on the spur) and exits the routine.

**ABORT** exits the routine.

---

6. Press **CONTINUE** to sweep the first frequency span three times. If there are no spurs displayed, press **NEXT**.

---

**Note** Each new span overlaps the previous span by 3 MHz (the center frequency increases by 2 MHz; the span is 5 MHz). Thus anything visible on the right half of the display on one set of sweeps will appear on the left half or center of the display.

---

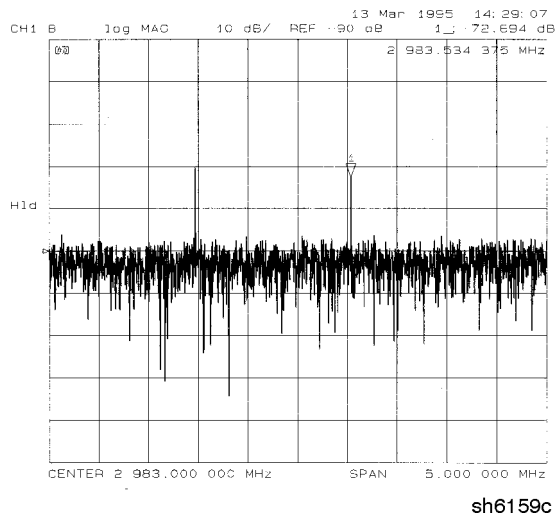
7. Press **NEXT** repeatedly while watching the trace on each sweep and trying to spot the target spur. With the filter, the target spur will be one of two obvious spurs (see Figure 3-7). Without the filter (not recommended), it will be one of four or five less distinct spurs as shown in Figure 3-9, Figure 3-10, and Figure 3-11.

When the center frequency increases to 2994.999 MHz and you have not targeted the selected spur, Cav Osc Cor FAIL appears on the display.

8. If you are confident that you found the target spur, continue with step 9 (filter procedure) or step 11 (filterless procedure). Otherwise repeat steps 5 through 8.

### **Spur Search Procedure with Filter**

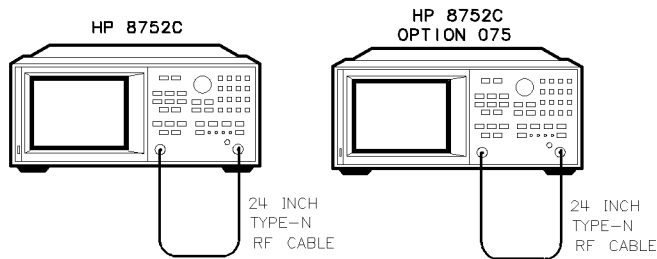
9. With the filter, the target spur will appear to the right of a second spur, similar to Figure 3-7. Rotate the RPG knob to position the marker on the spur.



**Figure 3-7. Typical Target Spur Using Filter**

10. Press **SELECT** and observe the display:
  - **DONE** appears: the procedure has been performed successfully. Refer to “15. EEPROM Backup Disk Procedure” to store the new correction constants.
  - If **ND** (not done) is displayed, repeat this procedure. Refer to “Source Troubleshooting” if **ND** is still displayed.

## Spur Search Procedure without Filter

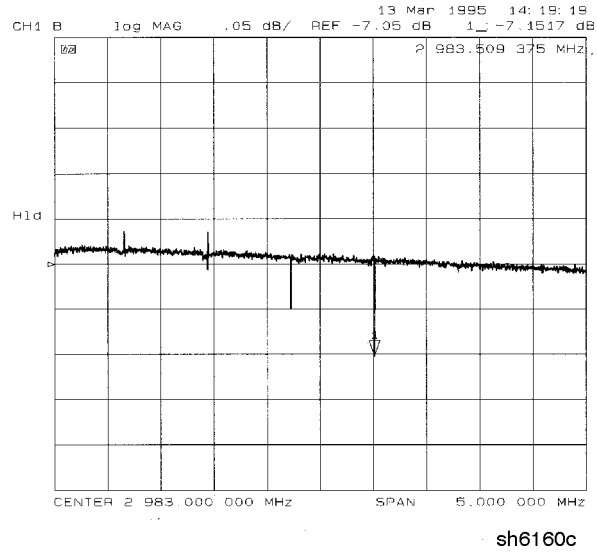


sh6114c

**Figure 3-8. Cavity Oscillator Frequency Correction Alternative Setup**

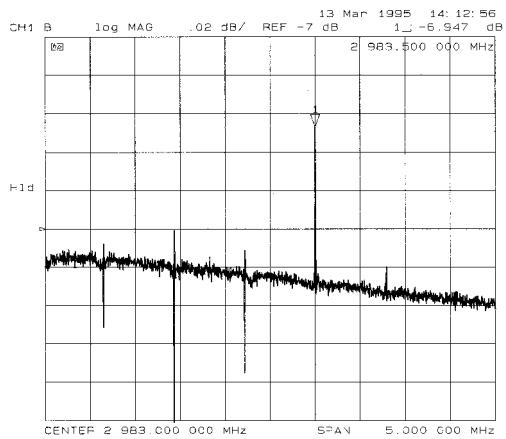
11. Connect the test equipment as shown in Figure 3-8.
12. Without the filter, the target spur will appear in a variety of disguises. Often it will be difficult to identify positively; occasionally it will be nearly impossible to identify. Press **CONTINUE** as many times as necessary to thoroughly inspect the current span. Without the filter, the target spur usually appears as one of a group of four evenly spaced spurs, as in Figure 3-9. The target spur is the right-most spur (fourth from the left). On any particular sweep, any or all of the spurs may be large, small, visible, invisible, above or below the reference line.





**Figure 3-9. Typical Display of Four Spurs without Filter**

On occasion the target spur appears as one of a group of five evenly spaced spurs, as in Figure 3-10. The target spur is again the fourth from the left (not the fifth, right-most spur).

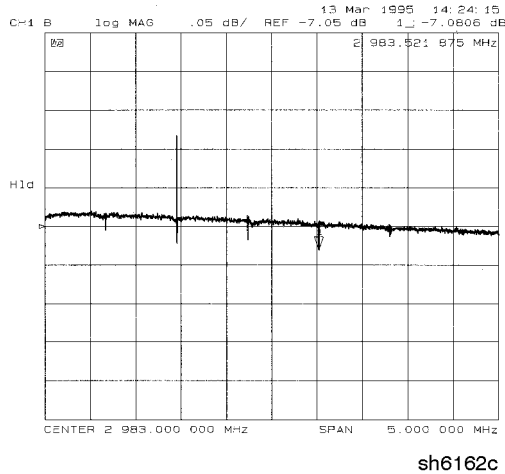


sh6161c

**Figure 3-10. Typical Display of Five Spurs without Filter**

Figure 3-11 shows another variation of the basic four spur pattern: some up, some down and the target spur itself almost indistinguishable.

### 3-30 Adjustments and Correction Constants



**Figure 3-11. Variation of Display of Four Spurs without Filter**

13. Rotate the RPG knob to position the marker on the target spur. Then press **SELECT** and observe the display:
  - **DONE** appears: the procedure has been performed successfully. Refer to “15. EEPROM Backup Disk Procedure” to store the new correction constants. Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).
  - If **ND** (not done) is displayed, repeat this procedure. Refer to “Source Troubleshooting” if **ND** is still displayed.

---

## 12. Serial Number Correction Constant (Test #55)

### Equipment

No equipment is required for this adjustment.

### Warm-up time

5 minutes

### Description and Procedure

This procedure customizes the replacement A9 CPU assembly by storing the analyzer's unique serial number as a correction constant in EEPROM.

---

**Caution** Perform this procedure **ONLY** if the A9 CPU assembly has been replaced.

---

1. Put the A9 CC jumper in the ALT position (see "1. A9 CC Jumper Position Procedure").
2. Note the ten-character serial number on the analyzer's rear panel identification label.
3. Press **PRESET**.

---

**Caution** Mistakes *cannot* be corrected after step 5 is performed.

---

4. Press **DISPLAY** **MORE** **TITLE** **ERASE TITLE** to erase the HP logo. Rotate the RPG knob to position the arrow below each character of the analyzer serial number and press **SELECT LETTER** to enter each in turn. Enter a total of ten characters: four digits, one letter, and five final digits.

Press **BACKSPACE** if you made a mistake. Press **DONE** when the title is complete and correct.

5. Press **SYSTEM** **SERVICE MENU** **TESTS** **55** **x1**. When the display shows:

Serial Cor

press **EXECUTE TEST**. Press **YES** at the query to alter the correction constant.

### 3-32 Adjustments and Correction Constants

6. If this procedure did not end with DONE:
  - The serial number entered did not conform to the required format, or
  - a valid serial number was already stored.

In any case:

- Confirm that the serial number is correct, and
- repeat this procedure.

Contact HP if the procedure still does not end with DONE.

7. To check the serial number recognized by the analyzer, press **PRESET** **SYSTEM** **SERVICE MENU** **FIRMWARE REVISION**. The analyzer displays the new serial number (SER. NO.). If not, repeat steps 3 through 6.
8. Refer to “15. EEPROM Backup Disk Procedure” to store the new correction constants. Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).

---

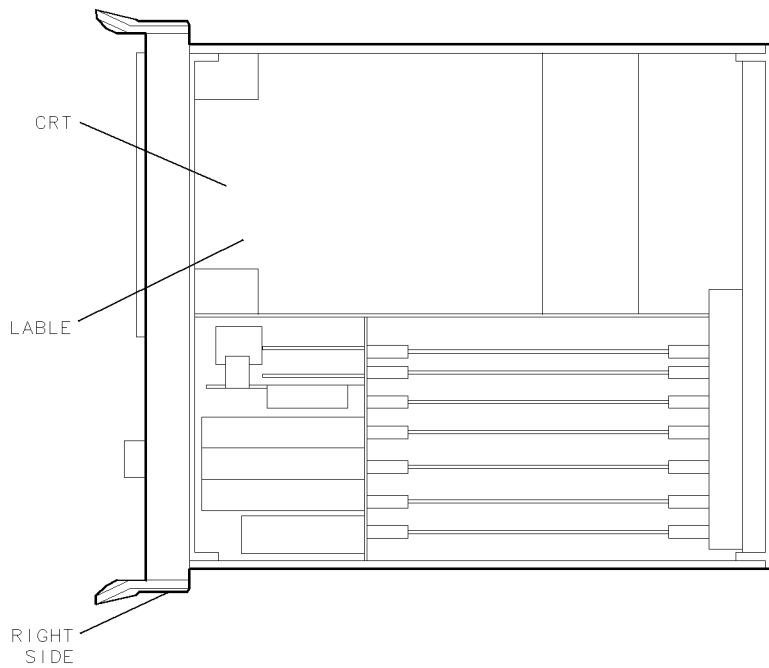
## 13. Option Numbers Correction Constant (Test #56)

### Equipment

No equipment is required for this adjustment.

### Warm-up time

5 minutes



sh643c

**Figure 3-12. Location of Keyword Label**

### 3-34 Adjustments and Correction Constants

## Description and Procedure

Special information is stored in the A9 CPU assembly if an analyzer has any of (or any combination of) these options:

- 003 (3 GHz operation)
- 004 (attenuator)
- 006 (6 GHz operation)
- 010 (time domain)

This procedure restores that information after an A9 CPU assembly has been replaced.

Perform this procedure only if:

- the analyzer has one or more of the above options, *and*
  - the A9 CPU assembly has been replaced, *and*
  - the serial number correction constant procedure has been performed.
1. Put the A9 CC jumper in the ALT position (see “1. A9 CC Jumper Position Procedure”).
  2. Note the keyword label on the display (see Figure 3-12). The label has one keyword for each option installed in the analyzer. If the analyzer lacks a label, call your local HP Sales and Service office to obtain the keyword(s). Be prepared to tell the service engineer the analyzer’s full serial number and the options about to be installed on the analyzer.
  3. Press **PRESET**.
  4. Press **DISPLAY** **MORE** **TITLE** **ERASE TITLE**. Rotate the RPG knob to position the arrow below each character of the first keyword, and press **SELECT LETTER** to enter each in turn.

Press **BACKSPACE** if you made a mistake. When you have finished entering the keyword, press **DONE**.

5. Press **(SYSTEM)** **SERVICE MENU** **TESTS** **(56)** **(x1)**. When the display shows:

Option Cor

press **EXECUTE TEST**. Press **YES** at the query to alter the correction constant and observe the analyzer's display:

- If **DONE** is displayed: the adjustment is complete. Continue with step 6.
  - **FAIL** is displayed: check the keyword again to make sure it is correct, particularly if it contains the letters "I" or "O" or the numbers "1" or "0". Repeat the procedure beginning with step 2. If the procedure continues to fail, contact HP.
6. If the analyzer has more than one option, repeat steps 3, 4, and 5 to install the remaining options. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants.
  7. Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").

### Option 004 Installation

1. Press **(SYSTEM)** **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** **(2621814)** **(x1)** **POKE** **(-1)** **(x1)**.
2. Press **(PRESET)** **(SYSTEM)** **SERVICE MENU** **FIRMWARE REVISION**.
3. Verify that Option 004 is shown on the analyzer's display.
4. Refer to "15. EEPROM Backup Disk Procedure" to store the new correction constants.
5. Return the A9 CC jumper to the NRM position (see "1. A9 CC Jumper Position Procedure").

## 3-36 Adjustments and Correction Constants



---

## 14. Initialize EEPROMs (Test #58)

This service internal test performs the following functions:

- *destroys* all correction constants and all un-protected options
- initializes certain EEPROM address locations to zeros
- replaces the display intensity correction constants with default values

---

**Note** This routine *will not* alter the serial number or Options 003, 006 and 010 correction constants.

---

1. Press (PRESET) (SYSTEM) SERVICE MENU TESTS (58) (x1) EXECUTE TEST YES.

2. To restore the analyzer's error correction constants:

- If you have the correction constants backed up on a disk, refer to the "EEPROM Backup Disk Procedure."
- 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)
  - RF Output Power Correction Constants (Test #47)
  - Source Pretune Correction Constants (Test #48)
  - Display Intensity (Test #49)
  - IF Amplifier Correction Constants (Test #51)
  - ADC Offset Correction Constants (Test #52)
  - Frequency Response Correction Constants (Test #57 then #53)
  - Calibration Kit Default Correction Constants (Test #57)
  - Cavity Oscillator Frequency Correction Constants (Test #54)

---

## 15. EEPROM Backup Disk Procedure

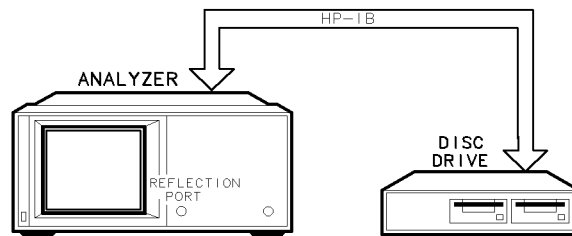
### Equipment Required

Item	HP Model
CS80 disk drive	HP 9122
HP-IB cable	HP 10833 A/B/C/D
3.5-inch disk	blank disk or supplied EEPROM Calibration Data Disk

### Warm-up time

None

### Description and Procedure



sh656c

**Figure 3-13. EEPROM Backup Procedure Setup**

A unique EEPROM Calibration Data Disk is shipped from the factory with each analyzer. This disk is a record of the calibration constants (CCs) stored in EEPROM on the A9 CPU assembly. It allows you to replace the A9 CPU board assembly without having to rerun all of the correction constant adjustment procedures.

- Take care of the supplied EEPROM Calibration Data Disk:
  - If you don't have the original, make a backup disk and keep it current.
- Store the correction constant data to the EEPROM Calibration Data Disk each time you perform one or more correction constant routines.

### 3-38 Adjustments and Correction Constants

- Retrieve correction constant data from the EEPROM Calibration Data Disk if you need to replace the A9 CPU board assembly.

## How to Make an EEPROM Backup Disk and Store CCs and Data to It

1. Set the disk drive to HP-IB address 00. Insert a disk in drive 0.
2. Connect the instruments as shown in Figure 3-13. Switch on the analyzer first, followed by the disk drive.
3. Press **(LOCAL) SYSTEM CONTROLLER**.
4. Press **(SAVE/RECALL) SELECT DISK CONFIGURE EXT DISK**. Set the disk address, disk unit number, and volume number to 0.
5. Press **RETURN EXTERNAL DISK**:
  - If the NA does not toggle from **INTERNAL MEMORY** to **EXTERNAL DISK**:
    - Make sure the drive is powered up, its address correct, and that the HP-IB cable is OK.
    - Make sure the supplied disk or an initialized, non-write protected disk is in place:
      - If the disk is not initialized, press **(SAVE/RECALL) FILE UTILITIES FORMAT DISK FORMAT EXT DISK YES**.
6. Press **(SYSTEM) SERVICE MENU SERVICE MODES MORE STORE EEPR ON (SAVE/RECALL) SAVE STATE** to store the EEPROM data with the instrument state. This step stores the correction constants in a default file named "ISTATE0" on the floppy disk.
7. Press **(SAVE/RECALL) FILE UTILITIES** and use the RPG to highlight the file "ISTATE0."
8. Press **RENAME FILE ERASE TITLE**.  
 Then use the RPG and softkeys to title the file *N12345* (the first character must be a letter; *12345* represent the last five digits of the analyzer's serial number).
9. When finished, press **DONE**.
10. Label the disk with this information:
  - the serial number of the analyzer
  - the words "EEPROM Backup Disk"
  - today's date

## How to Recall CC Data from the EEPROM Disk into the Analyzer

1. Set the disk drive to HP-IB address 00 and insert the EEPROM Disk.
2. Connect the instruments as shown in Figure 3-13.
3. Put the A9 CC jumper in the ALT position (see "1. A9 CC Jumper Position Procedure").
4. Install the new A9 assembly.
5. Switch on the disk drive and then the analyzer:
  - If the display is dark:
    - Press **DISPLAY MORE** (bottom softkey)
    - **ADJUST DISPLAY** (fourth softkey from top)
    - **INTENSITY** (top softkey) and then turn the RPG knob.
  - If the display is unfocused: see "17. Vertical Position and Focus Adjustments" for more information.

---

**Note** Disregard noisy trace data or error messages that appear on the display at this time.

---

6. Press **LOCAL SYSTEM CONTROLLER**.
7. Press **SAVE/RECALL SELECT DISK CONFIGURE EXT DISK**. Set the disk address, disk unit number, and volume number to 0.
8. Press **SAVE/RECALL SELECT DISK EXTERNAL DISK**.

---

**Note** If the analyzer does not toggle to **EXTERNAL DISK**, switch off the instruments, turn on the disk drive and then the analyzer, check its HP-IB address and cable.

---

9. Press **SAVE/RECALL** and use the RPG to highlight the file (FILE1 on the original EEPROM Calibration Data Disk or file *N12345* where *N12345* represents the filename of the EEPROM Backup Disk).
10. Press **RETURN RECALL STATE**.
11. Perform the serial number (service internal test #55) and the option number correction constant routines (service internal test #56), if applicable.
12. Press **PRESET** and verify that good data was transferred to EEPROM by performing a simple measurement.

### 3-40 Adjustments and Correction Constants

13. Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).
  - In case of difficulty, refer to the chapter titled “Start Troubleshooting Here.”

---

## 16. Model Number Correction Constant (Option 075 Only)

### Equipment

No equipment is required for this adjustment.

### Warmup time

5 minutes

### Description and Procedure

This procedure sets an EEPROM bit for HP 8752C analyzers with Option 075 so that certain system default values will be correct after the A9 CPU assembly firmware is replaced.

Firmware and A9 CPU assemblies are shipped with the bit set correctly for HP 8752C analyzers *without* Option 075.

---

**Caution** After installing new A9 CPU or new firmware, but *before* performing this procedure, perform “15. EEPROM Backup Disk Procedure” found at the end of this chapter.

---

1. Put the A9 CC jumper in the ALT position (see “1. A9 CC Jumper Position Procedure”).
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** **2621808** **x1**  
**POKE** **1** **x1** **RESET MEMORY** **PRESET**.
4. To verify that the procedure was successful, press **SYSTEM** **SERVICE MENU** **FIRMWARE REVISION**. Opt 075 should appear on the display. If Opt 075 is *not* displayed, repeat the procedure. Contact the nearest HP sales and service office if the procedure was not successful.
5. Return the A9 CC jumper to the NRM position (see “1. A9 CC Jumper Position Procedure”).

---

## 17. Vertical Position and Focus Adjustments

### Equipment

Narrow, non-conductive, flathead screwdriver, 2-inches long

### Warmup time

30 minutes

### Description and Procedure

Only vertical position and focus, can be adjusted in the field (this includes both customers and service centers). These adjustments are optional and should rarely be required.

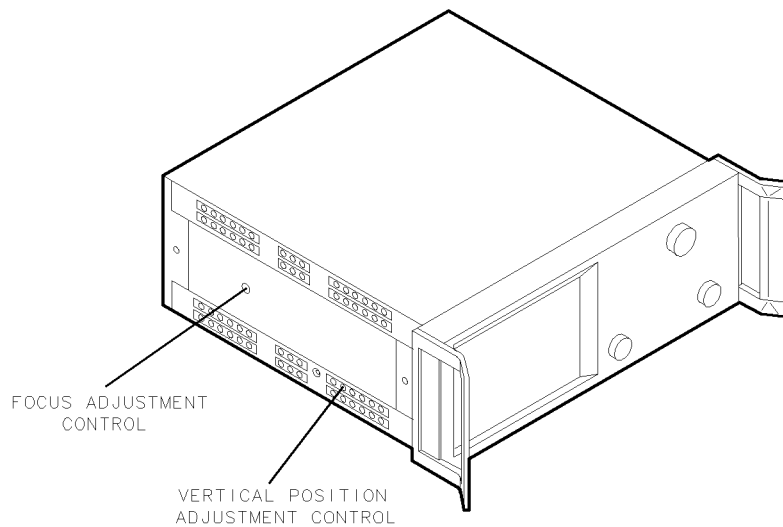
---

**Caution** Any other adjustments to the display will void the warranty.

---

### Vertical Position Adjustment

1. To access vertical and focus adjustments controls, remove the side panel nearest to the display.



sh641c

**Figure 3-14. Vertical Position and Focus Adjustment Controls**

2. Insert a narrow, non-conductive, flat head screw driver (at least 2-inches long) into the vertical position hole. See Figure 3-14.
3. Adjust the control until the softkey labels are aligned with the softkeys.

### **Focus Adjustment**

4. Use the same screwdriver to adjust the focus until the display is the most readable.



---

## 18. Display Degaussing (Demagnetizing)

### Equipment

Any CRT demagnetizer or bulk tape eraser

### Warm-up time

5 minutes

### Description and Procedure

All color monitors are susceptible to external magnetic fields. The usual symptom is a discoloration or slight dimming, usually occurring near the top left corner of the analyzer's display. In extreme cases, a total color shift may be observed; for example, a trace that was red may shift to green.

Like most displays, the CRT can be sensitive to large magnetic fields generated from unshielded motors. In countries that use a 50 Hz line voltage frequency, some 10 Hz jitter may be observed. If this problem is observed, remove the device causing the magnetic field.

Should the display become magnetized or if color purity is a problem, cycle the power several times. Leave the analyzer off for at least 30 seconds before switching it on. This will activate the automatic degaussing circuitry in the display. If this is insufficient to achieve color purity, use a commercially available demagnetizer (either a CRT demagnetizer or a bulk tape eraser). Follow the manufacturer's instructions keeping in mind the following:

- Initially use the demagnetizer no closer than 4 inches (10 cm) from the face of the CRT.
- If needed, try again at a slightly closer distance until the CRT is demagnetized.

---

**Caution**      Applying a strong magnetic field to the CRT face can permanently destroy it.

---

---

## 19. Fractional-N Frequency Range Adjustment

### Equipment Required

No equipment is required to perform this adjustment procedure.

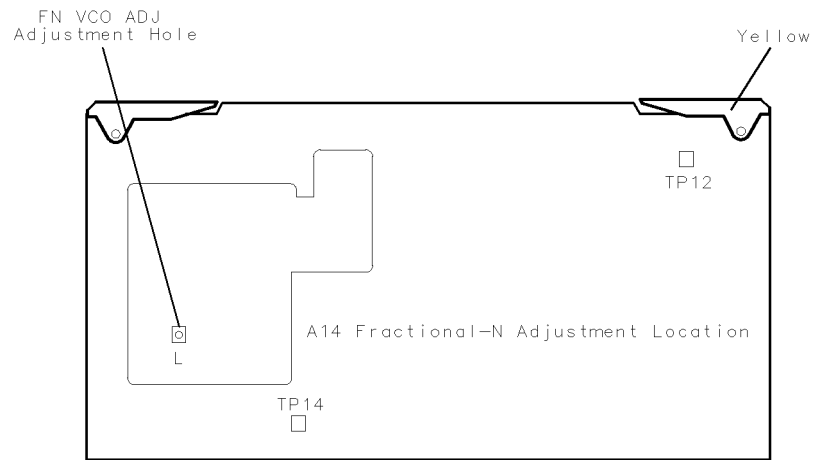
### Warm-up time

30 minutes

### Description and Procedure

This adjustment centers the fractional-N VCO (voltage controlled oscillator) in its tuning range to insure reliable operation of the analyzer.

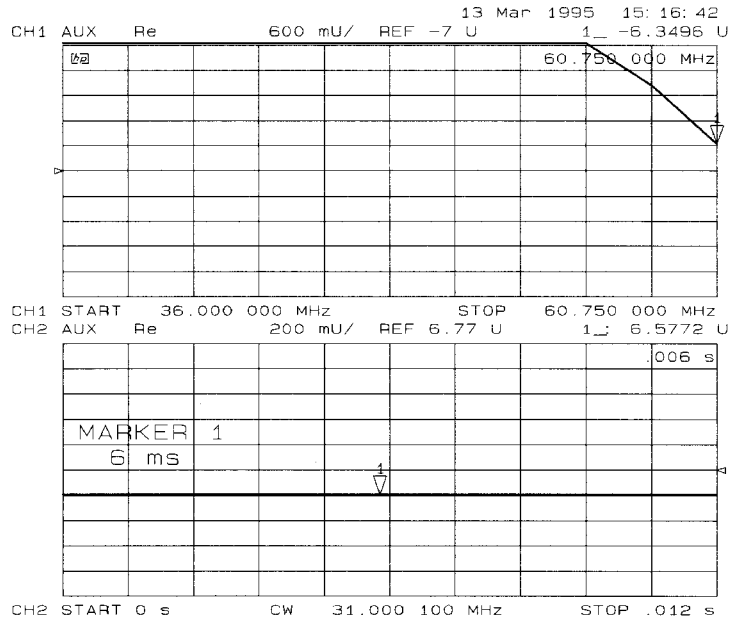
1. Remove the analyzer right side panel.
2. Press **PRESET**.
3. Press **DISPLAY** **DUAL CHAN ON** **MENU** **NUMBER of POINTS** **11** **x1**  
**COUPLED CH OFF**.
4. Press **START** **36** **M/u** **STOP** **60.75** **M/u** **MENU** **SWEEP TIME** **12.5** **k/m**  
**SYSTEM** **SERVICE MENU** **ANALOG BUS ON** **MEAS** **ANALOG IN** **Aux Input** **29**  
**x1** to observe the "FN VCO Tune" voltage.  
  
Press **SCALE REF** **.6** **x1** **REFERENCE VALUE** **-7** **x1** to set and scale channel 1.
5. Press **MKR** to set the marker to the far right of the graticule.
6. Press **CH 2** **MENU** **CW FREQ** **31.0001** **M/u** **SWEEP TIME** **12.375** **k/m** **MEAS**  
**ANALOG IN** **Aux Input** **29** **x1** to observe the "FN VCO Tune" voltage. Press  
**SCALE REF** **.2** **x1** **REFERENCE VALUE** **6.77** **x1** **MKR** **6** **k/m** to set channel 2 and its marker.



sh644c

**Figure 3-15. FN VCO TUNE Adjustment Location**

7. Observe the analyzer display for the results of the adjustment.
  - a. Refer to Figure 3-15. If the marker value is less than 7, the adjustment procedure is complete.



sh6157c

**Figure 3-16. Fractional-N Frequency Range Adjustment Display**

- b. If the marker value is greater than 7, readjust FN VCO ADJ to 7 (refer to Figure 3-14). Perform steps 2 through 7 to confirm that the channel 1 and channel 2 markers respectively are still above and below the reference line.
- c. If the adjustment cannot be performed correctly, replace the A14 board assembly.

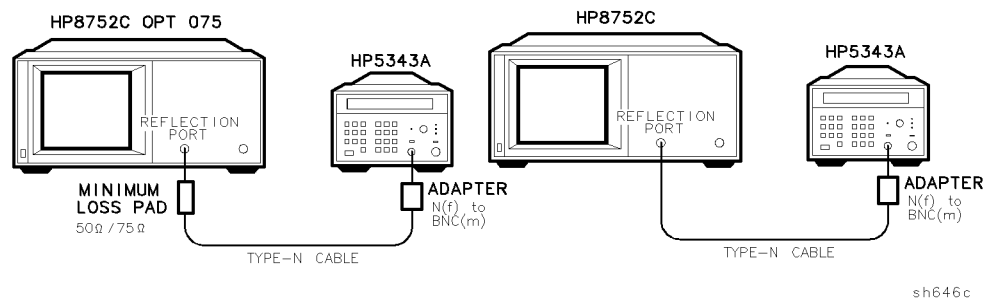
## 20. Frequency Accuracy Adjustment

### Equipment Required

Item	HP Model Number
50Ω to 75Ω minimum loss pad*	HP 11852B
type-N cable	HP PN 8120-4781
type-N(f) to BNC(m) adapter	HP PN 1250-0077
Frequency counter	HP 5343A
* Option 075 analyzers only.	

### Warm-up time

30 minutes



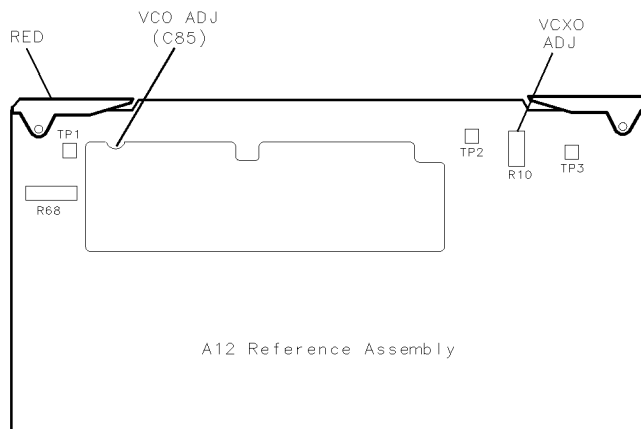
**Figure 3-17.**  
**Reflection Test Port Output Frequency Accuracy Adjustment Setup**

**Note** For 75Ω analyzers, insert an HP 11852B 50Ω to 75Ω minimum loss pad and adapters between frequency counter port and type-N cable.

## Description and Procedure

This adjustment sets the VCXO (voltage controlled crystal oscillator) frequency to maintain the analyzer's frequency accuracy.

1. Remove the analyzer's top cover and connect the equipment as shown in Figure 3-17.
2. Press **PRESET**.
3. Press **MENU** **CW FREQ** **50** **M/u** and note the frequency:
  - Frequency = 50 MHz  $\pm$ 500 Hz: no adjustment is required.
  - To adjust the frequency, locate the A12 assembly (red extractors) and adjust VCXO ADJ (see Figure 3-18) for a frequency counter reading of 50 MHz  $\pm$ 500 Hz.
4. If you are unable to adjust the frequency as specified, replace the A12 assembly.



sg64d

**Figure 3-18. VCXO ADJ Adjustment Location**

### 3-50 Adjustments and Correction Constants

---

## 21. High/Low Band Transition Adjustment

### Equipment Required

No equipment is required for this adjustment procedure.

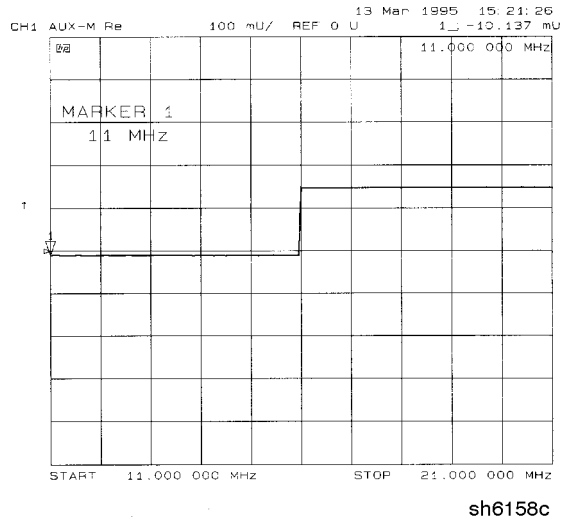
### Warm-up time

30 minutes

### Description and Procedure

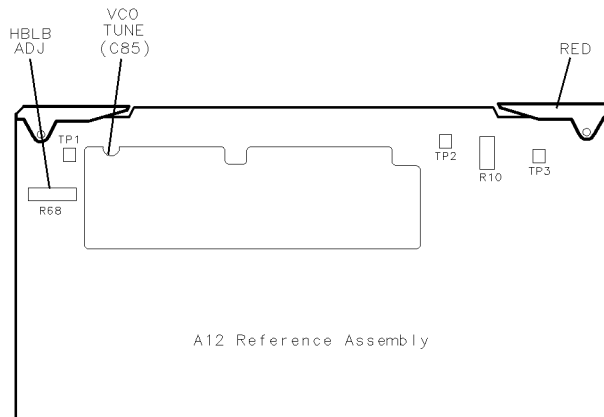
This adjustment centers the VCO (voltage controlled oscillator) of the A12 reference assembly for reliable high band and low band operation.

1. Remove the top cover (see "1. A9CC Jumper Position Procedure"). Remove the PC board stabilizer and place the A12 assembly on an extender board. Use extension SMB cables as needed.
2. Press **PRESET**.
3. Press **SYSTEM** **SERVICE MENU** **ANALOG BUS ON** **START** **11** **(M/u)** **STOP** **21** **(M/u)** to observe part of both the low and high bands on the analog bus.
4. Press **MEAS** **ANALOG IN** **Aux Input** **22** **(x1)** **DISPLAY** **DATA->MEM** **DATA-MEM** to subtract the ground voltage from the next measurement.
5. Press **MEAS** **ANALOG IN** **A12 Gnd 1** **23** **(x1)** **MKR** **11** **(M/u)**.
6. Press **MKR FCTN** **MARKER->REFERENCE** **SCALE REF** **1** **(x1)** and observe the VCO tune voltage trace:
  - Left half of trace =  $0 \pm 1000$  mV and right half of trace = 100 to 200 mV higher (one to two divisions, see Figure 3-19): no adjustment necessary.



**Figure 3-19. High/Low Band Transition Adjustment Trace**

- To adjust: turn VCO TUNE (see Figure 3-20) to position the left half of the trace to  $0 \pm 125$  mV. Then adjust HBLB to position the right half of the trace 125 to 175 mV (about 1 1/2 divisions) higher than the left half.



**Figure 3-20. High/Low Band Adjustments Locations**

### 3-52 Adjustments and Correction Constants



7. In some cases, the VCO TUNE adjustment may need to be performed first. If you are having trouble with the high low band adjustment, perform the following procedure:

a. Press:

(SYSTEM) SERVICE MENU ANALOG BUS ON

(START) (10) (M/μ) (STOP) (10) (M/μ)

b. Press:

(MEAS) ANALOG IN Aux INPUT (22) (x1)

(DISPLAY) DATA->MEMORY DATA-MEM

c. Press:

(MEAS) ANALOG IN Aux INPUT (23) (x1)

(FORMAT) MORE REAL

d. Adjust C85 (VCO TUNE) to 0 units  $\pm$  100 mU.

e. Press (SYSTEM) SERVICE MENU ANALOG BUS ON (START) (11) (M/u) (STOP) (21) (M/u) to observe part of both the low and high bands on the analog bus.

f. Press (MEAS) ANALOG IN Aux Input (22) (x1) (DISPLAY) DATA->MEM DATA-MEM to subtract the ground voltage from the next measurement.

g. Press (MEAS) ANALOG IN A12 Gnd 1 (23) (x1) (MKR) (11) (M/u).

h. Press (MKR FCTN) MARKER->REFERENCE (SCALE REF) (.1) (x1) and observe the VCO tune voltage trace:

- Left half of trace =  $0 \pm 1000$  mV and right half of trace = 100 to 200 mV higher (one to two divisions, see Figure 3-19): no adjustment necessary.

If you still cannot perform the high/low band adjustment, refer to the chapter titled "Source Troubleshooting."

---

## 22. Fractional-N Spur Avoidance and FM Sideband Adjustment

### Equipment Required

Item	HP Model Number
Spectrum Analyzer	HP 8563E
RF Cable 50 $\Omega$ , type-N, 24-inch	HP P/N 8120-4781
Cable, 50 $\Omega$ 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
50 $\Omega$ to 75 $\Omega$ Minimum Loss Pad*	HP 11852B
* Option 075 analyzers only.	

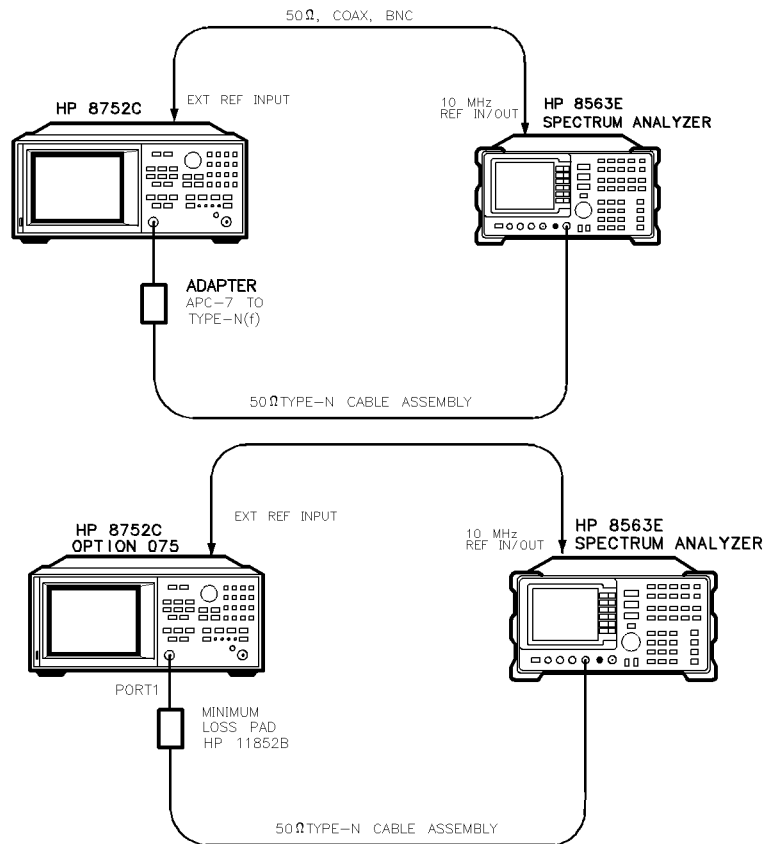
### Warmup time

30 minutes

### Description and Procedure

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 3-21.
2. Make sure the instruments are set to their default HP-IB addresses:  
HP 8752C = 16, Spectrum Analyzer = 18.



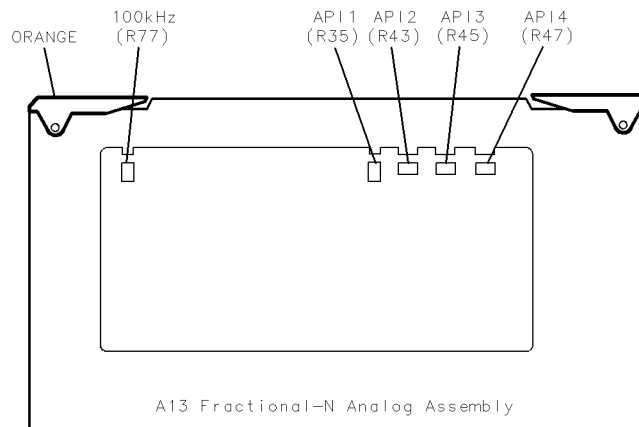
sg6115c

**Figure 3-21.**  
**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

4. On the HP 8752C, press **PRESET** **CENTER** **676.045105** **(M/μ)**.
5. Refer to Figure 3-22. 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.



sg69d

**Figure 3-22. Location of API and 100 kHz Adjustments**

6. On the spectrum analyzer, set the center frequency for 676.048105 MHz.
7. On the HP 8752C, press **CENTER** **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 8752C, press **CENTER** **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 8752C, press **CENTER** **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.

### 3-56 Adjustments and Correction Constants

16. On the HP 8752C, press **CENTER** **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. If the adjustment is still unattainable, replace the A13 board assembly.

## 23. Source Spur Avoidance Tracking Adjustment

### Equipment Required

Item	HP Part Number
BNC-alligator clip adapter	8120-1292
BNC cable	8120-1840

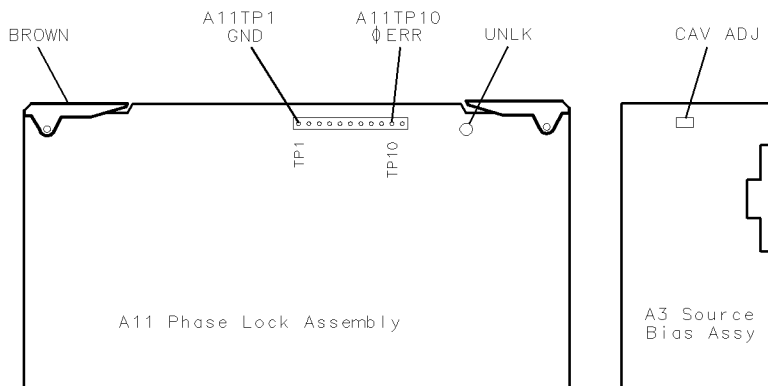
### Warm-up time

30 minutes

### Description and Procedure

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 minimizes fluctuations in the phase-locked loop.

1. Mate a BNC-alligator clip to the BNC cable and connect the BNC end to AUX INPUT on the rear panel. Connect the alligator-clip to A11TP10 (labeled  $\phi$  ERR). Connect the shield clip to A11TP1 (GND), shown in Figure 3-23.



sh652c

Figure 3-23. A11 Test Point and A3 CAV ADJ Locations

### 3-58 Adjustments and Correction Constants

2. Press **PRESET**.
3. Press **CENTER** **400** **M/u** **SPAN** **50** **M/u** to generate a sweep from 375 MHz to 425 MHz.
4. Press **SYSTEM** **SERVICE MENU** **ANALOG BUS ON** **MEAS**  
**ANALOG IN** Aux Input **11** **x1** **SCALE REF** **10** **k/m** **MKR FCTN**  
**MARKER->REFERENCE** to observe the phase-locked loop error voltage:
  - If spikes are not visible on the display (see Figure 3-24): no adjustment is necessary.
  - If spikes are excessive (see Figure 3-24): adjust the CAV ADJ potentiometer (see Figure 3-23) on the A3 source bias assembly to eliminate the spikes.
5. Refer to "Start Troubleshooting Here" if visible spikes persist.

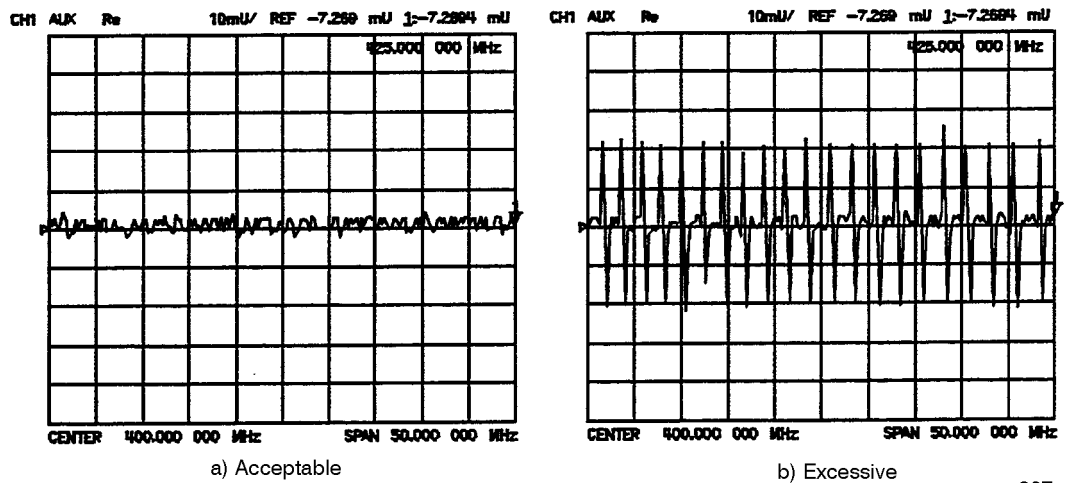


Figure 3-24. Display of Acceptable Versus Excessive Spikes





# 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. Confidence Test
- Step 3. HP-IB System Check
- Step 4. Faulty Group Isolation

---

## **Assembly Replacement Sequence**

The following steps show the sequence to replace an assembly in an HP 8752C Network Analyzer.

1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.

---

## **Having Your Analyzer Serviced**

If your analyzer should fail any of the following checks, call the nearest HP sales or service office for assistance. See the table titled “Hewlett-Packard Sales and Service Offices” in Chapter 15. If your analyzer needs to be returned to HP, follow the steps below.

1. Choose the nearest HP service center. (Hewlett-Packard sales and service offices are listed in the “Safety and Licensing” chapter.)
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.

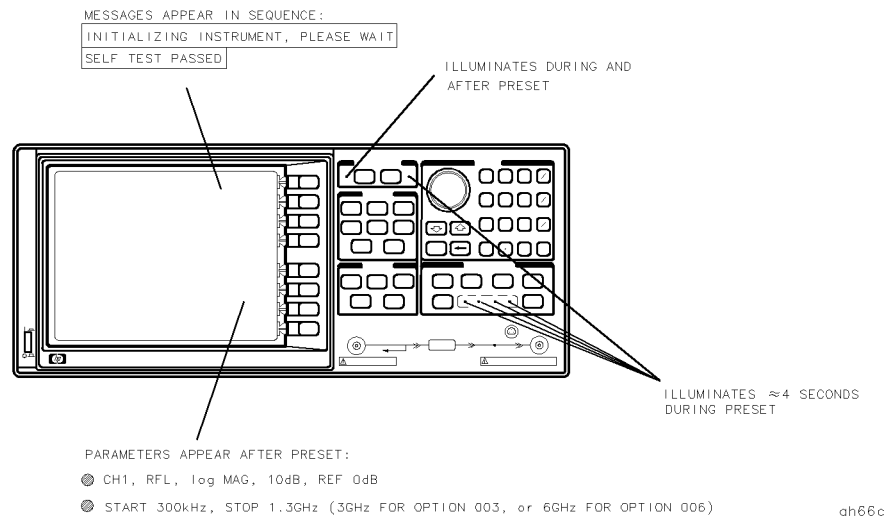
### **4-2 Start Troubleshooting Here**

---

## 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 in the order shown in Figure 4-1 to determine if the analyzer is operating correctly.



**Figure 4-1. LED Power-up Sequence**

### If the Self-Test Failed

1. Check the AC line power to the analyzer.
2. Check the fuse (rating listed on rear panel, spare inside holder).
3. Check the line voltage setting (use small screwdriver to change).
4. If the problem persists, refer to “Step 4. Faulty Group Isolation”.

---

## Step 2. Confidence Test

The confidence test verifies that the circuits in the analyzer are functioning properly. However, it does not verify the accessories or the analyzer specifications.

The resulting measurement must fall within a limit testing window to pass the test. The window size is based on both source and receiver specifications. The characteristics tested are combinations of: source match, reflection tracking, directivity, transmission tracking, noise floor, and crosstalk.

The confidence test adds all the applicable error terms together. To separate them out or to keep a record of them for maintenance, refer to the “Error Terms” chapter.

If you want to test the individual analyzer specifications then refer to the “Verification and Performance Tests” chapter.

### Procedure

1. Select the test data printing status.
  - If you *do not* want the test data to automatically print, continue with step 2.
  - If you want to have the test data automatically print, press **PRESET** **SYSTEM** **SERVICE MENU** **TEST OPTIONS** **RECORD ON**.

---

**Note** When using an InkJet printer, the analyzer must be set to the standard print mode through the **COPY** menu.

---

2. Press **SYSTEM** **SERVICE MENU** **TESTS** **EXTERNAL TESTS** **EXECUTE TEST**. The analyzer should display a short description of the test and a reminder of the RECORD function.
3. Press **CONTINUE** to begin the test.
4. Disconnect all devices from the reflection test port, as prompted on the analyzer display.
5. Press **CONTINUE** to run the “source match, tracking” test. There should be a PASS/FAIL result displayed on the analyzer.

#### 4.4 Start Troubleshooting Here

6. Press **CONTINUE** to run the “transmission crosstalk, noise floor” test. (With the record function on, this test will automatically run). There should be a PASS/FAIL result displayed on the analyzer.
7. Press **CONTINUE** and then connect the RF cable supplied with the analyzer between the reflection and transmission test ports.
8. Press **CONTINUE** to run the “transmission tracking, source/load match” test. There should be a PASS/FAIL result displayed on the analyzer.
9. Press **CONTINUE** to run the “load match, directivity” test. (With the record function on, this test will automatically run.) There should be a PASS/FAIL result displayed on the analyzer.
10. Press **CONTINUE** again.

The analyzer now displays the result of the confidence test. If the test failed:

- It could be due to loose connections. Tighten all connections and repeat the Confidence Test.
- It could be due to a bad frequency response correction. Run service test 53.
- It could be due to a faulty RF cable. Run the cable confidence test (service test 22) or replace the cable. Run the verification procedure (test 27) to identify which error term is causing the failure.

### **Cable Confidence Test**

This test provides an easy check of the RF performance of the transmission cable supplied with the HP 8752C.

The test limits used are the sum of the HP 8752C specifications that apply, plus the uncertainties in the measurement.

### **Procedure**

1. Press **(PRESET) (SYSTEM) SERVICE MENU TESTS EXTERNAL TESTS (22) (x1)**. The analyzer should display:

```
TEST
  22  CABLE CONFID  -ND-
```

2. Press **EXECUTE TEST**. The analyzer now displays a brief description of the test and the test limits.
3. Press **CONTINUE** to begin the test. Connect an RF cable between the reflection and the transmission test ports, as prompted on the analyzer.
4. Press **CONTINUE** and notice the PASS/FAIL result.
  - If the cable passes the test: press **CONTINUE** again and move the cable gently in all possible directions to see if it stays within the limits.
  - If the cable fails the test: replace the cable.

Refer to “Step 4. Faulty Group Isolation” in this chapter if the problem persists and the analyzer does not use HP-IB.

#### **4-6 Start Troubleshooting Here**

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### 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 8752C	16
Plotter port - HP-IB	5
Printer port - HP-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 the “Digital Control Troubleshooting” chapter.

## 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)

### 4-8 Start Troubleshooting Here



4. Press **START** **I** **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 the “Digital Control Troubleshooting” chapter.

### **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, suspect the controller. Check the following:

- Compatibility of controller, must be HP 9000 series 200/300. (Refer to the “Service Equipment and Analyzer Options” chapter.)
- HP-IB interface hardware is installed. (Refer to the manual, *Installing and Maintaining HP Basic/WS 6.2*, that comes with your HP Basic software.)
- Select code is correct. (Refer to the manual, *Installing and Maintaining HP Basic/WS 6.2*, that comes with your HP Basic software.)
- I/O and HP-IB binaries are loaded. (Refer to the manual, *Installing and Maintaining HP Basic/WS 6.2*, that comes with your HP Basic software.)
- HP-IB cables. (See “HP-IB Requirements” in the *HP 8752C Network Analyzer User’s Guide*.)
- Programming syntax is correct. (Refer to the *HP 8752C 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:

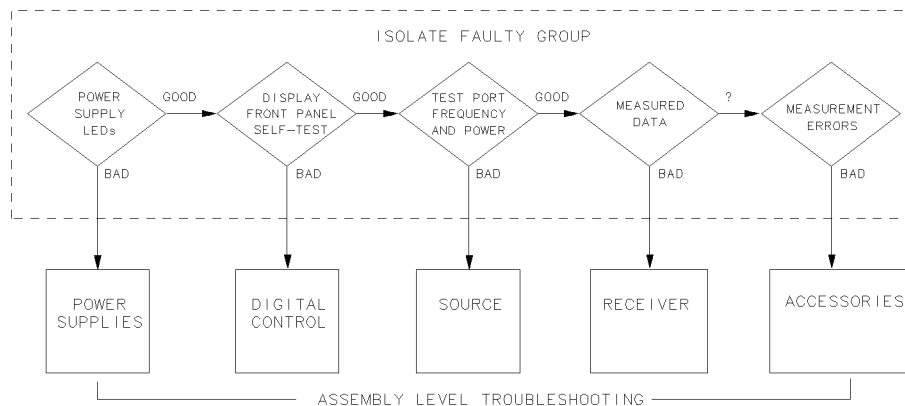
- power supplies
- digital control
- source
- receiver

Descriptions of these groups are provided in the “Theory of Operation” chapter.

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.



sg645d

**Figure 4-2. Troubleshooting Organization**

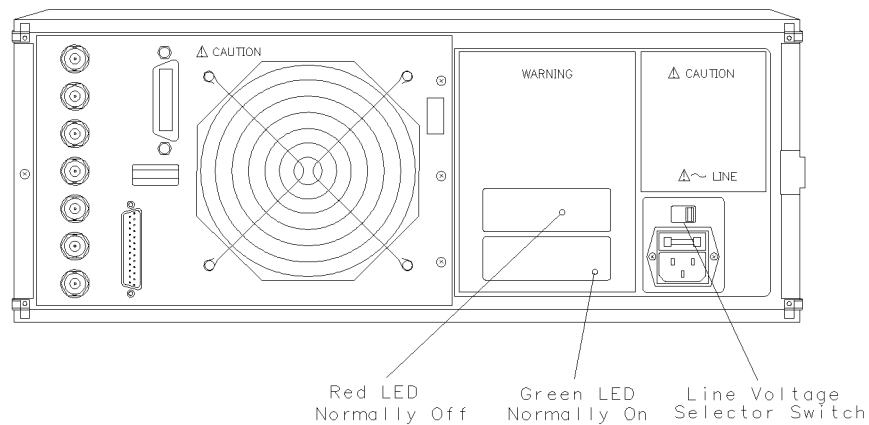
### 4-10 Start Troubleshooting Here

## Power Supply Check

### 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.



sh663c

**Figure 4-3. A15 Preregulator LEDs**

### Check the A8 Post Regulator LEDs

Remove the analyzer's top cover. Inspect the green LEDs along the top edge of the A8 post regulator assembly.

- All green LEDs should be on.
- The fan should be audible.

In case of difficulty, refer to the "Power Supply Troubleshooting" chapter.

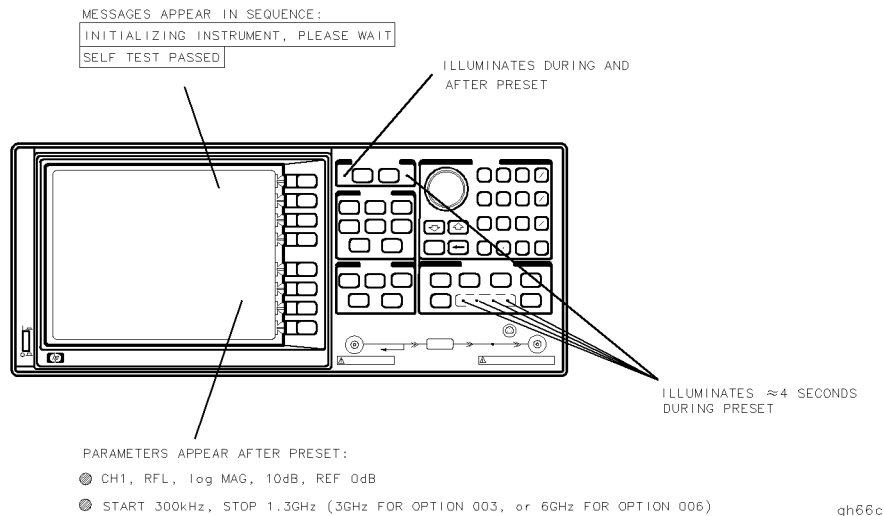
**Start Troubleshooting Here 4-11**

## Digital Control Check

### 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 amber LEDs go off after a few seconds, except the CH 1 LED. (See Figure 4-4).
- The display should come up bright and focused.



**Figure 4-4. Front Panel Power-up Sequence**

## 4-12 Start Troubleshooting Here

## 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 the “Service Key Menus and Error Messages” chapter for internal test information; then refer to the “Digital Control Troubleshooting” chapter.
  - If the analyzer indicates failure but does not identify the test, press **↑** to search for the failed test. (For a description of the failed test refer to the “Service Key Menus” chapter.) Then refer to the “Digital Control Troubleshooting” chapter. Likewise, if the response to front panel or HP-IB commands is unexpected, troubleshoot the digital control group.
2. To perform the Analog Bus test, press **RETURN** **19** **X1** **EXECUTE TEST**.
    - If this test fails, refer to the “Digital Control Troubleshooting” chapter.
    - If this test passes, continue with the next procedure to check the source.

## Source Check

1. Check the display for any of the following phase lock error messages:

- NO IF FOUND: CHECK R INPUT LEVEL
- NO PHASE LOCK: CHECK R INPUT LEVEL
- PHASE LOCK LOST
- PHASE LOCK CAL FAILED

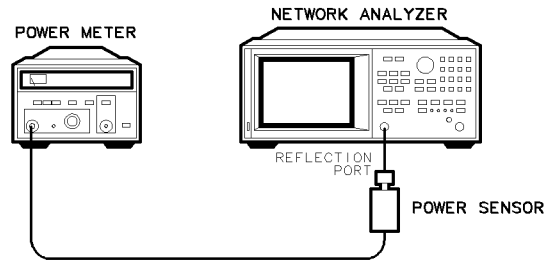
If any of these error messages appear, refer to the “Source Troubleshooting” chapter. Otherwise, continue with the next step.

**Start Troubleshooting Here 4-13**

2. Connect the equipment as shown in Figure 4-5.

Item	50 Ohm NAs	75 Ohm NAs
Power meter	HP 436A, 437B, or 438A	
Power sensor	HP 8482A	HP 8483A Option H03*

\* special option power sensor



sh634c

**Figure 4-5. Equipment Setup for Source Power Check**

3. Switch on the instruments. Zero and calibrate the power meter.
4. On the analyzer, press **PRESET** Stimulus **MENU** **POWER** **-20** **x1** **MENU** **CW FREQ** **300** **(K/m)**. The power meter should read approximately  $-20$  dBm ( $-85$  dBm for Option 004).
5. Press **16** **(M/μ)** to change the CW frequency to 16 MHz. The power meter should read approximately  $-20$  dBm throughout the analyzer's frequency range. Repeat checking the frequency at 1 GHz intervals up to the maximum frequency of the analyzer.
6. Press **POWER** **5** **x1** to increase the output power to 5 dBm (+10 dBm for Option 004).
7. Step through the frequencies as above: the power meter should read approximately 5 dBm at all frequencies (+10 dBm with Option 004).

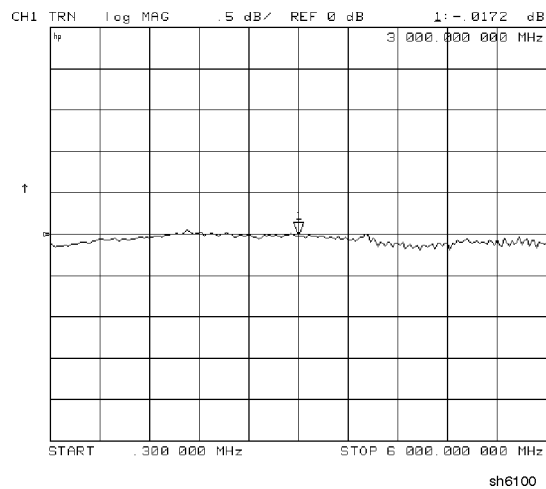
If any incorrect power levels are measured, refer to the "Source Troubleshooting" chapter. Otherwise, continue with "Receiver Check."

#### 4-14 Start Troubleshooting Here

## Receiver Check

1. Connect an RF cable directly between the reflection and transmission ports.
2. On the analyzer, press **PRESET** **MEAS** **TRANSMISSION** **SCALE REF** **.5** **x1**.
3. Notice the condition of the trace: it should resemble Figure 4-6

If the trace shows unexpected results, refer to the “Receiver Troubleshooting” chapter.



**Figure 4-6. Typical Measurement Trace**

## Accessories Check

If the analyzer has passed all of the above checks but is still making incorrect measurements, an accessory could be faulty: RF cables, interconnect cables, and calibration kit devices can all induce system problems.

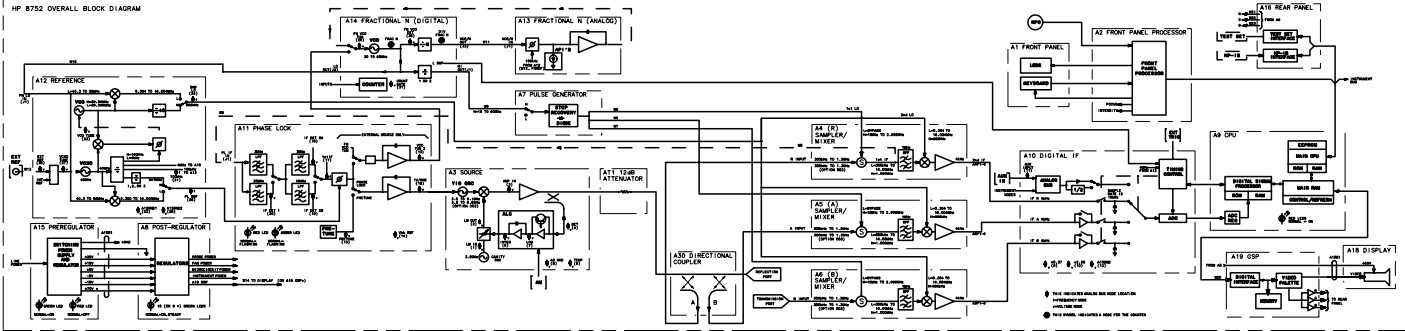
Reconfigure the system to its normal state and reconfirm the problem. If the problem persists, refer to the “Accessories Troubleshooting” chapter.

**Start Troubleshooting Here 4-15**

#### **4-16 Start Troubleshooting Here**



HP 8752 OVERALL BLOCK DIAGRAM



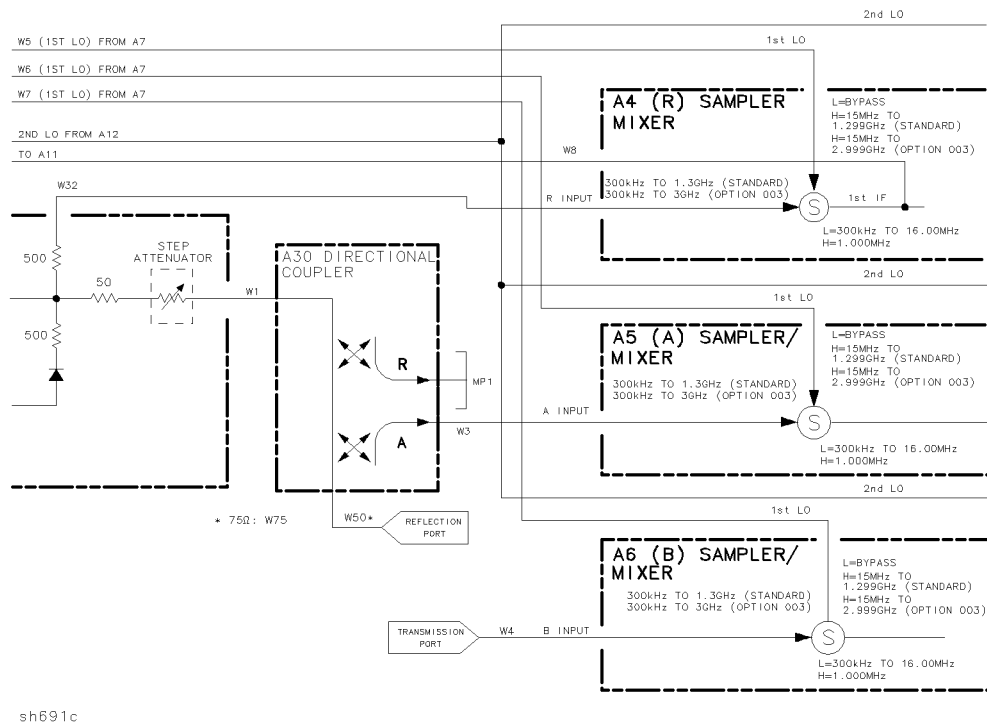
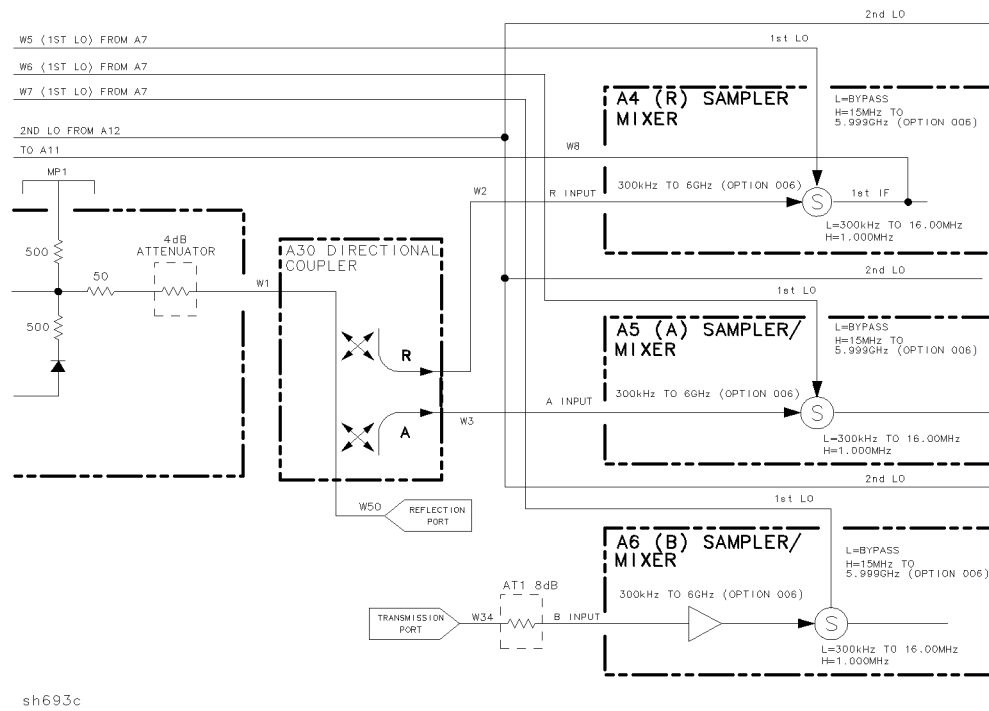


Figure 4-7. HP 8752C Overall Block Diagram (2 of 4) Option 003 and 004

Start Troubleshooting Here 4-19



**Figure 4-7. HP 8752C Overall Block Diagram (3 of 4) Option 006**

**4-20 Start Troubleshooting Here**

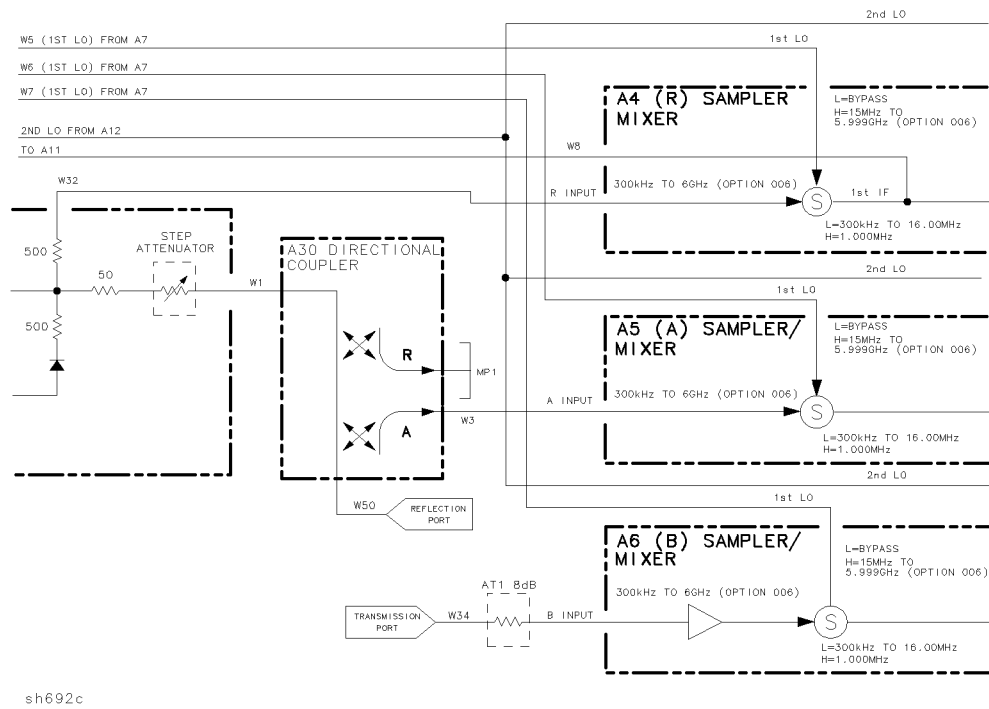


Figure 4-7. HP 8752C Overall Block Diagram (4 of 4) Option 004 and 006

Start Troubleshooting Here 4-21



## Power Supply Troubleshooting

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Use this procedure only if you have read the “Start Troubleshooting Here” chapter. 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**

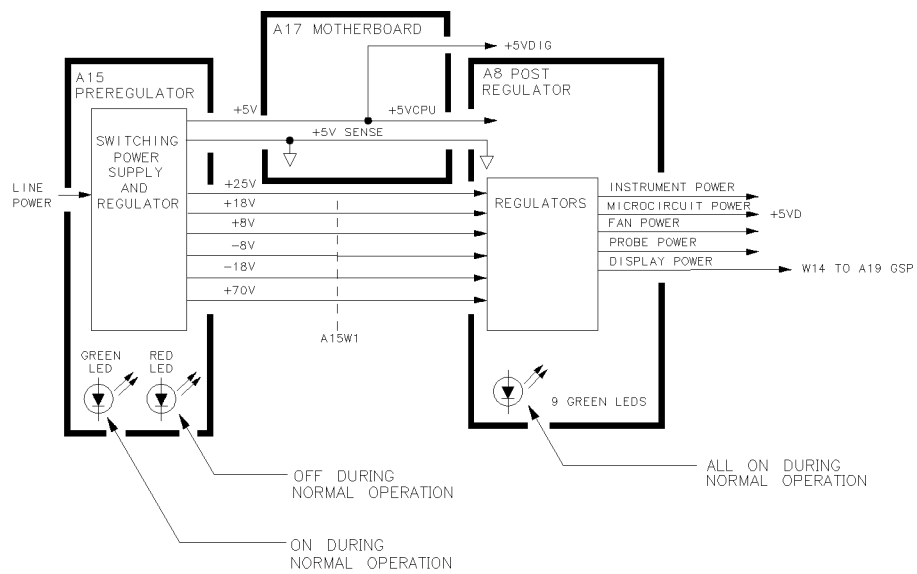
The following steps show the sequence to replace an assembly in an HP 8752C Network Analyzer.

1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.

### **5-2 Power Supply Troubleshooting**

## 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.



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**Figure 5-1. Power Supply Group Simplified Block Diagram**



---

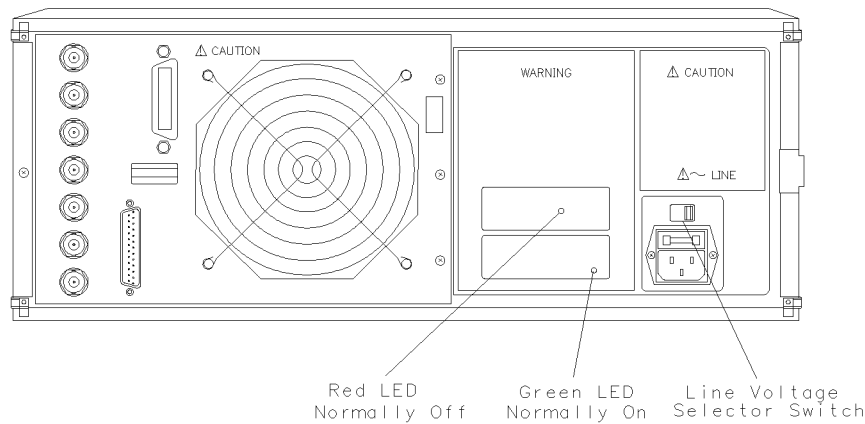
## Start Here

### 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 with “Check the Green LEDs on A8”.

- If the green LED is not on steadily, refer to “If the Green LED on A15 is not On Steadily” in this procedure.
- If the red LED is on or flashing, refer to “If the Red LED On A15 is On” in this procedure.



sh663c

**Figure 5-2. Location of A15 Diagnostic LEDs**

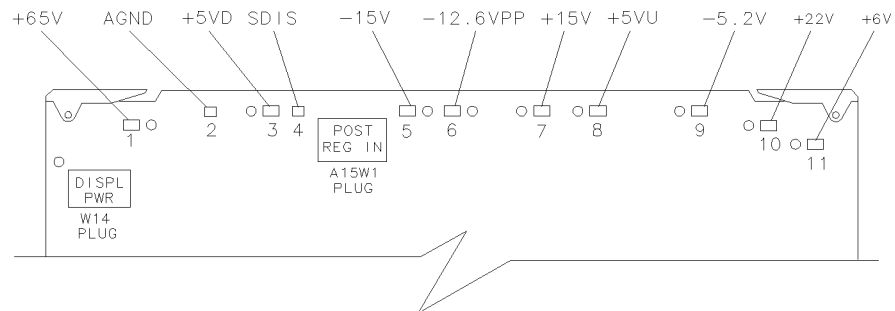
## 5-4 Power Supply Troubleshooting

## Check the Green LEDs on A8

1. Remove the top cover of the analyzer and locate the A8 post regulator. Use the location diagram under the top cover if necessary.
2. Check to see if the green LEDs on the top edge of A8 are all on. There are nine 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. To 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 flashing, refer to “If the Green LEDs On A8 are not All On” in this chapter.

## 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.



sh664c

**Figure 5-3. A8 Post Regulator Test Point Locations**

**Table 5-1. A8 Post Regulator Test Point Voltages**

<b>TP</b>	<b>Supply</b>	<b>Range</b>
1	+ 65V	+ 64.6 to + 65.4
2	AGND	n/a
3	+ 5 VD	+ 4.9 to + 5.3
4	SDIS	n/a
5	- 15V	- 14.4 to - 15.6
6	- 12.6 VPP (probe power)	- 12.1 to - 12.8
7	+ 15V	+ 14.5 to + 15.5
8	+ 5 VU	+ 5.05 to + 5.35
9	- 5.2 V	- 5.0 to - 5.4
10	+ 22V	+ 21.3 to + 22.7
11	+ 6V	+ 5.8 to + 6.2

## 5-6 Power Supply Troubleshooting

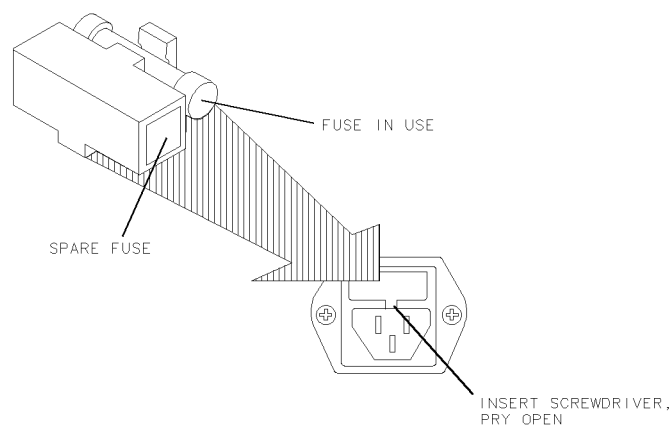
---

## If the Green LED on A15 is not On Steadily

If the green LED is not on steadily, the line voltage is missing or is not enough to power the analyzer.

### Check the Line Voltage, Selector Switch, and Fuse

1. 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-bladed screwdriver to pry out the fuse holder. Figure 5-2 shows the location of the line voltage selector switch.
2. Use a small flat-bladed screwdriver to select the correct switch position.
  - If the A15 green LED is still not on steadily, replace A15.



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**Figure 5-4. Removing the Line Fuse**

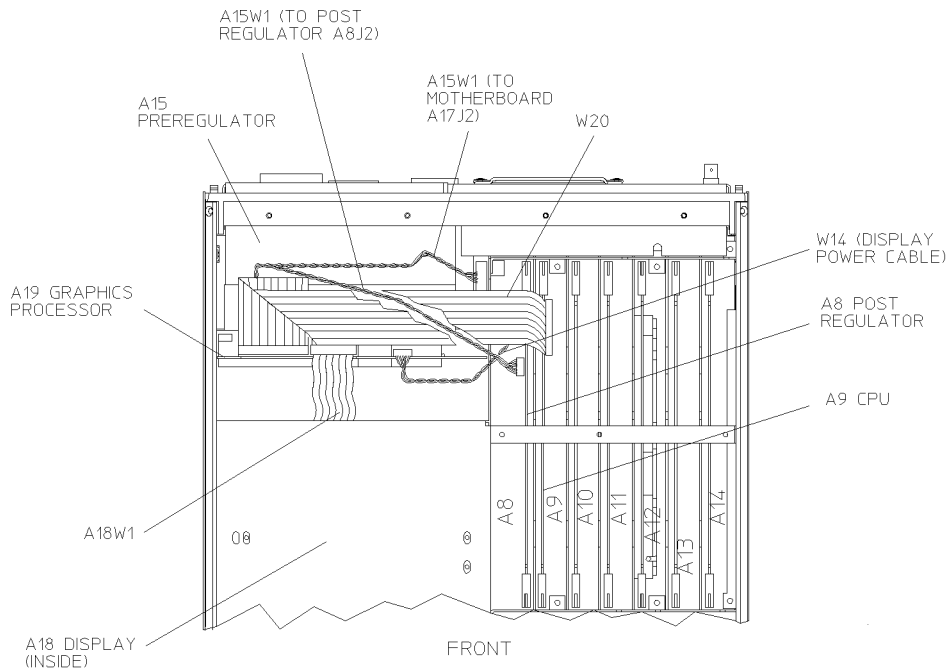
---

## **If the Red LED On 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 with “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.”



sh6200d

**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.

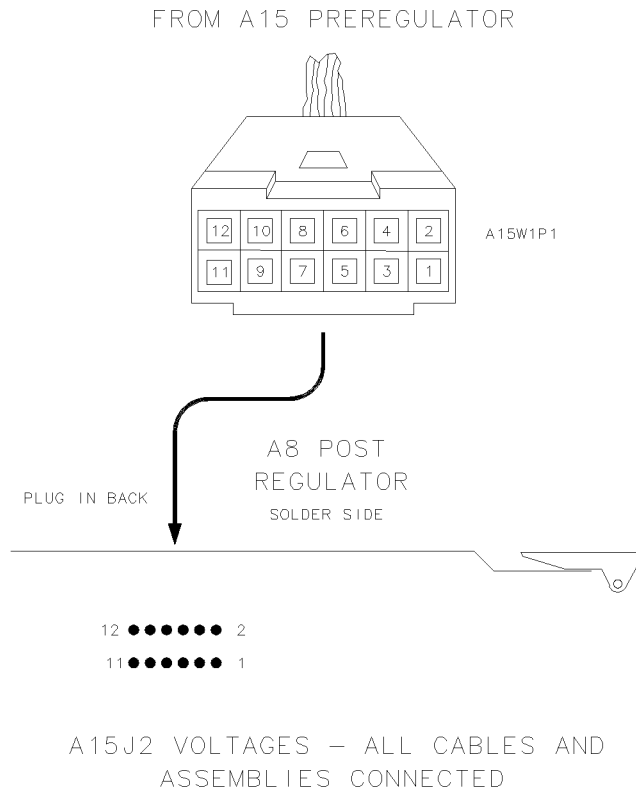
- If the voltages are not within tolerance, replace A15.
- If the voltages are within tolerance, A15 is verified. Continue with "Check for a Faulty Assembly."

**Table 5-2. Output Voltages**

Pin	A15W1P1 (Disconnected) Voltages	A8J2 (Connected) Voltages	A15 Preregulator Mnemonic
1,2	+125 to +100	+68 to +72	+70V
3,4	+22.4 to +33.6	+17.0 to +18.4	+18V
5,6	-22.4 to -33.6	-17.0 to -18.4	-18V
7	N/C	N/C	N/C
8	+9.4 to +14	+7.4 to +8.0	+8 V
9,10	-9.4 to -14	-6.7 to -7.3	-8 V
11	+32 to +48	+24.6 to +26.6	+25V
12	N/C	N/C	N/C

NOTE: The +5VD supply must be loaded by one or more assemblies at all times, or the other voltages will not be correct. It connects to motherboard connector A17J3 Pin 4.

**5-10 Power Supply Troubleshooting**



sh667c

**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):

- the A15W1 cable connected to the A8 post regulator
- the +5VCPU line through the motherboard
- the +5VDIG 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 receive power from 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 the “Assembly Replacement and Post-Repair Procedures” chapter.
  - Refer to the “Replaceable Parts” chapter to identify specific cables and assemblies that are not shown in this chapter.
- 

- If the red LED goes out, the particular assembly removed (or one receiving power from it) is faulty.
- If the red LED is still on after you have checked all of the assemblies listed in Table 5-3, continue with “Check the Operating Temperature.”

**Table 5-3. Recommended Order for Removal/Disconnection**

<b>Assembly To Remove</b>	<b>Removal or Disconnection Method</b>	<b>Other Assemblies that Receive Power from the Removed Assembly</b>
1. A19 Graphics Processor	Disconnect W14	A18 Display
2. A14 Frac N Digital	Remove from Card Cage	None
3. A9 CPU	Remove from Card Cage	None
4. A16 Rear Panel Interface	Disconnect A16W1	None
5. A2 Front Panel Interface	Disconnect W17	A1 Front Panel Keyboard

## 5-12 Power Supply Troubleshooting

## **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 “Fan 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 +5VD, +5VCPU, or +5VDSense 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 On 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. Remove the display power cable W14 (see Figure 5-5).
4. Short A8TP2 (AGND) (see Figure 5-3) to chassis ground with a clip lead.
5. Switch on the analyzer and observe the green LEDs on A8.
  - If any green LEDs other than +5VD are still off or flashing, continue with "Check the A8 Fuses and Voltages."
  - If all LEDs are now on steadily except for the +5VD 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 with "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 Figure 5-6) with a voltmeter that has 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.

#### 5-14 Power Supply Troubleshooting

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 with “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.*
  - A9 CPU
  - A10 digital IF
  - A11 phase lock
  - A12 reference
  - A13 fractional-N analog
  - A14 fractional-N digital
  - A19 graphics processor (disconnect W14, A18W1, and W20)
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 with, “Briefly Disable the Shutdown Circuitry.”
  - If all green LEDs are now on, one or more of the above assemblies may be faulty. Continue with next step.
5. Switch off the analyzer.
6. Reconnect W14 and W20 to A19.
7. Switch on the analyzer and observe the LEDs.
  - If the LEDs are off or blinking, replace the A19 assembly.
  - If the LEDs are still on, continue with next step.
8. Switch off the analyzer.
9. Reconnect A18W1 to the A19 assembly.
10. Switch on the analyzer and observe the LEDs.
  - If the LEDs are off, replace the A18 display.
  - If the LEDs are still on, continue with the next step.

11. Switch off the analyzer.
12. 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.

---

1. Switch off the analyzer.
2. Connect A8TP4 (SDIS) to chassis ground with a jumper wire.
3. Switch on the analyzer and notice the LEDs that are off. *Immediately remove the jumper wire.*
4. Refer to the block diagram (Figure 5-8) at the end of this chapter and do the following:
  - a. Notice any additional signals that may connect to any A8 test point that showed a fault in the previous step.
  - b. Cross reference all assemblies that use the power supplies whose A8 LEDs went out when A8TP4 (SDIS) was connected to chassis ground.

- c. Make a list of these assemblies.
- d. Delete the following assemblies from your list as they have already been verified earlier in this section.

- A9 CPU
- A10 digital IF
- A11 phase lock
- A12 reference
- A13 fractional-N analog
- A14 fractional-N digital
- A18 display
- A19 graphics processor

5. Switch off the analyzer.
6. 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. Table 5-4 also lists any associated assemblies that receive power 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 the “Assembly Replacement and Post-Repair Procedures” chapter.
- Refer to the “Replaceable Parts” chapter to identify specific cables and assemblies that are not shown in this chapter.

- 
- If all the LEDs light, the assembly removed (or one receiving power from it) is faulty.
  - If the LEDs are still not on steadily, continue with “Inspect the Motherboard.”

**Table 5-4. Recommended Order for Removal/Disconnection**

<b>Assembly To Remove</b>	<b>Removal or Disconnection Method</b>	<b>Other Assemblies that Receive Power from the Removed Assembly</b>
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
5. A6 B Sampler	Remove from Card Cage	None
6. A2 Front Panel Interface	Disconnect W17	A1 Front Panel Keyboard
7. A16 Rear Panel Interface	Disconnect A16W1	None

### **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 On 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.

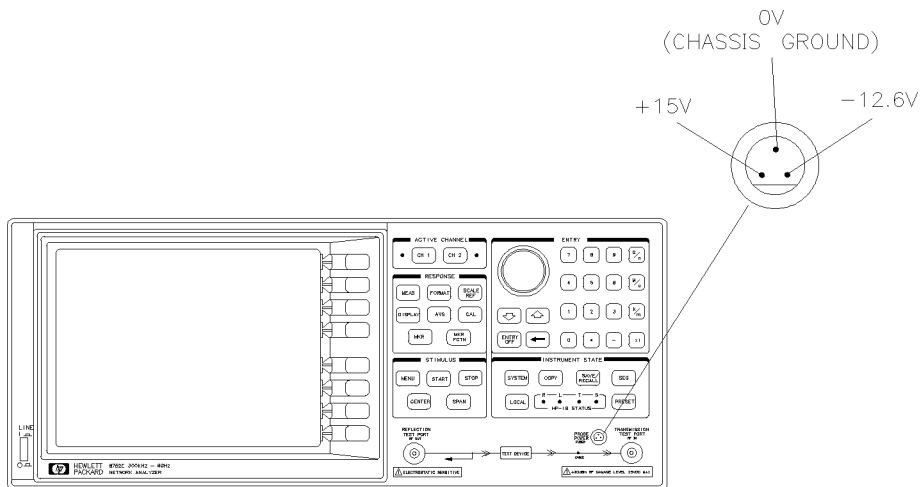
Check the temperature of the operating environment; it should not be greater than +55 °C (131 °F). The fan should be operating and there should be at least 15 cm (6 in) spacing behind and all around the analyzer to allow for proper ventilation.

- **PROBE POWER SHUT DOWN!**

The front panel RF probe biasing supplies are shut down due to excessively drawn current. These supplies are +15VPP and –12.6VPP, both supplied by the A8 post regulator. +15VPP is derived from the +15V supply. –12.6VPP is derived from the –12.6V supply.

Refer to Figure 5-7 and carefully measure the power supply voltages at the front panel RF probe connectors.





sh668c

**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 +15V and -12.6V 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.”

## 5-20 Power Supply Troubleshooting

### **Check the Fuses and Isolate A8**

1. Check the fuses associated with each of these supplies near the A8 test points. If these fuses keep burning out, a short exists.
2. Try isolating A8 by removing it from the motherboard connector, but keeping the cable A15W1 connected to A8J2.
3. Connect a jumper wire from A8TP2 to chassis ground.
  - If either the +15V or –12.6V fuse blows, or the associated green LEDs do not light, replace A8.
  - If the +15V and –12.6V green LEDs light, troubleshoot for a short between the motherboard connector pins XA8P2 pins 6 and 36 (–12.6V) and the front panel probe power connectors. Also check between motherboard connector pins XA8P2 pins 4 and 34 (+15V) 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

1. 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 +18V and –18V supplies coming from the A15 preregulator. Neither of these supplies is fused.

**The –18V 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 +18V 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.

2. Measure the voltages of these supplies while using an extender board to allow access to the PC board connector, A8P1.

### Short A8TP3 to Ground

1. 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).
2. Connect a jumper wire between A8TP3 and chassis ground.
3. Switch on the analyzer and observe the green LEDs.
  - If all the green LEDs on the top edge of A8 light (except +5VD), replace the fan.
  - If other green LEDs on A8 do not light, refer to “If the Green LEDs On A8 are not All On” earlier in this procedure.

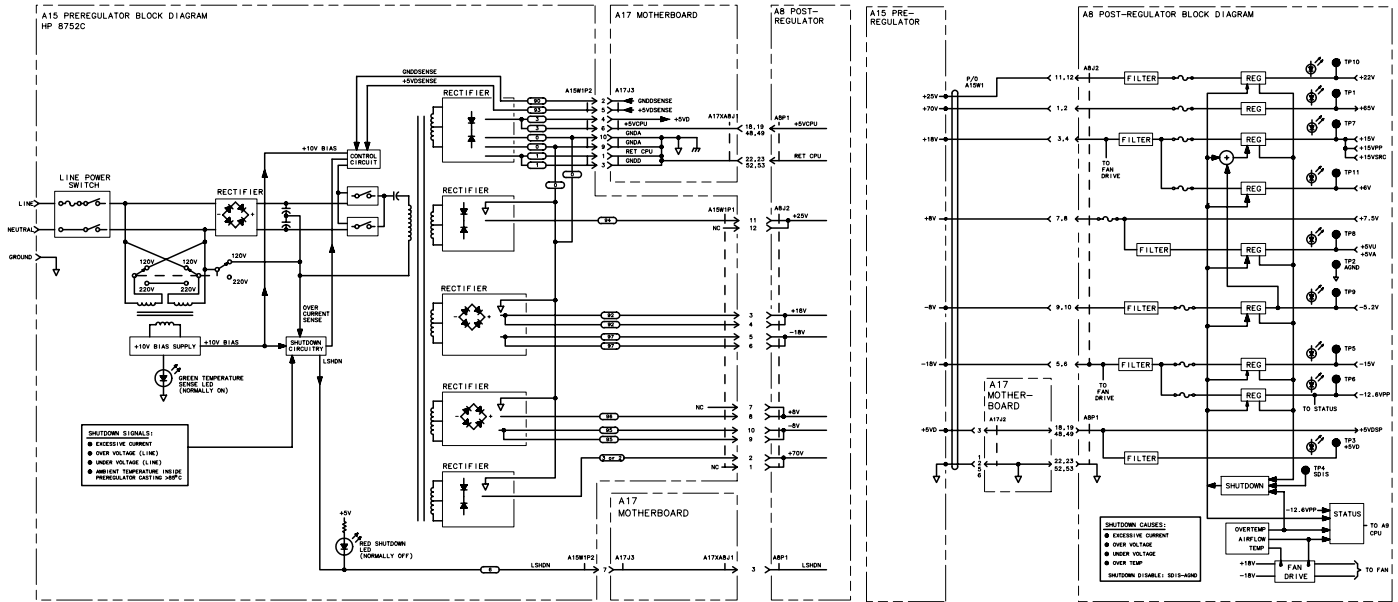
## 5-22 Power Supply Troubleshooting

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## 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.

## 5-24 Power Supply Troubleshooting



an6112c

POWER SUPPLY BLOCK DIAGRAM

# 6

## Digital Control Troubleshooting

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Use this procedure only if you have read the “Start Troubleshooting Here” chapter. Follow the procedures in the order given, unless instructed otherwise. If you suspect an HP-IB interface problem, refer to “HP-IB Failures” at the end of this chapter.

The digital control group assemblies consist of the following:

- A1 front panel keyboard
- A2 front panel interface
- A9 CPU
- A10 digital IF
- A16 rear panel
- A18 display
- A19 GSP

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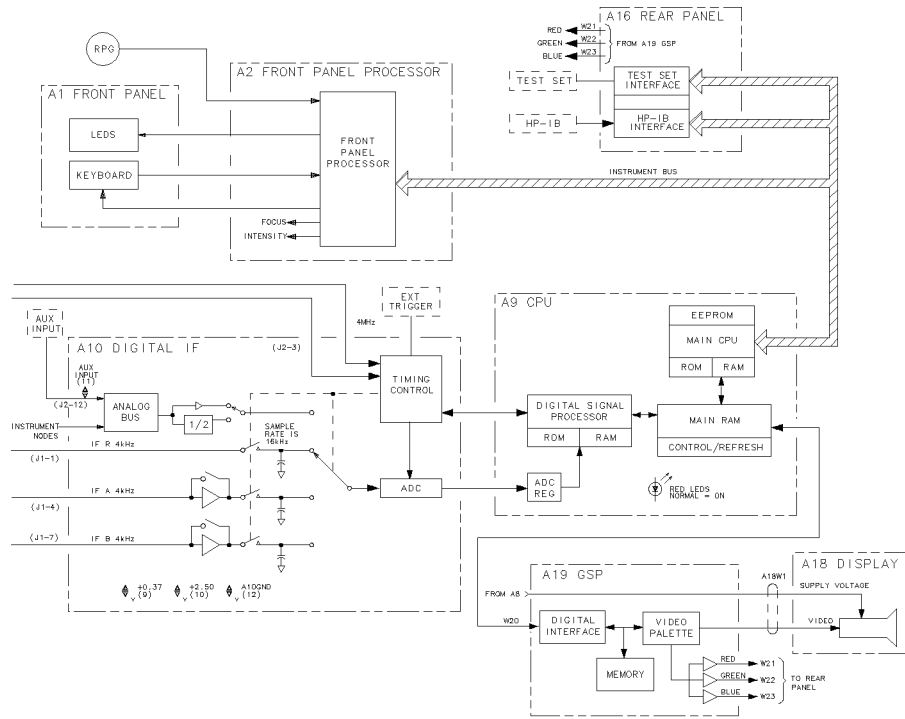
## **Assembly Replacement Sequence**

The following steps show the sequence to replace an assembly in an HP 8752C Network Analyzer.

1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.



## Digital Control Group Block Diagram



sh6101c

Figure 6-1. Digital Control Group Block Diagram

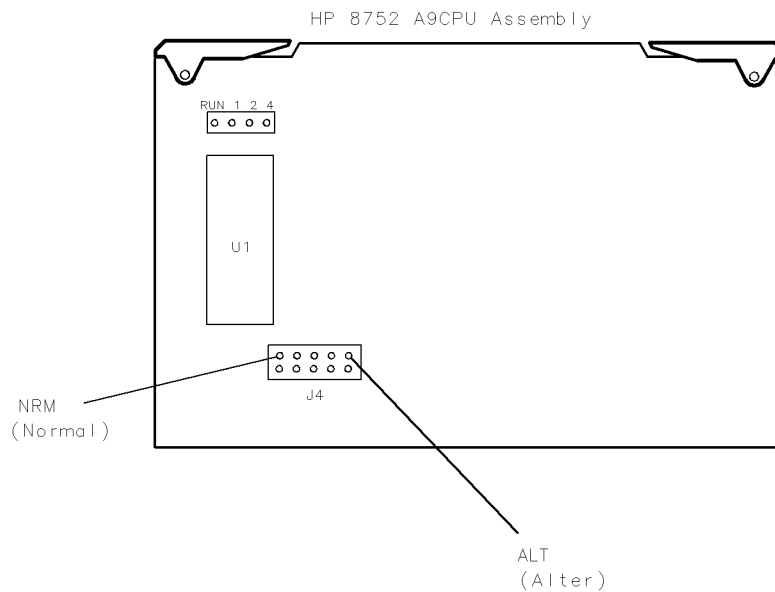
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## Check A9 CPU Operation

### A9 CC Jumper Positions

The A9 CC jumper must be in the “NRM” (normal) position for these procedures. This is the position for normal operating conditions. To move the jumper to the “NRM” position, do the following:

1. Unplug the analyzer.
2. Remove the top cover.
3. Remove the A9 CPU board.
4. Move the jumper to the NRM position. (Refer to Figure 6-2.)
5. Replace the A9 CPU board, top cover, and power cord.



sh640c

**Figure 6-2. Jumper Positions on the A9 CPU**

### 6-4 Digital Control Troubleshooting

## Checking A9 CPU Red LED Patterns

The A9 CPU has four red LEDs that can be viewed by removing the top cover. (Refer to “Major Assemblies” in Chapter 13 to locate the A9 CPU and Figure 6-3 to identify the LEDs.)

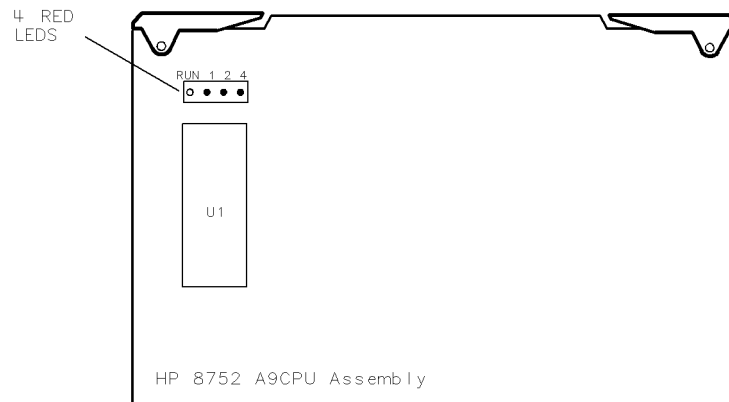
### 1. Cycle the power

Cycle the power on the analyzer and observe the four red LEDs. All four LEDs should be on after power up.

If the four LEDs did not illuminate, replace the A9 CPU after verifying the power supply.

### 2. Hold in the preset key

Press and hold down the **PRESET** key while observing the four LEDs on A9. The far left LED should be off. (See Figure 6-3.)



sh6102c

**Figure 6-3. Location of Four LEDs on A9 CPU**

### 3. Release the preset key

Release the **PRESET** key and watch for the *rapid* sequence shown below. Notice that the far left LED always remains on. (The filled circles represent illuminated LEDs.)

- ● ● ● **PRESET** still held down
- ● ● ● **PRESET** released – Pattern 1
- ○ ● ● Pattern 2
- ● ● ● Pattern 3
- ○ ● ○ Pattern 4
- ● ● ● Pattern 5 – two left LEDs flicker
- ● ● ○ Pattern 6
- ● ● ● Pattern 7 – two left LEDs flicker

### 4. Observe and evaluate results

- If the above sequence is observed, and the far right LED remained on, go to “Check A19 GSP and A18 Display Operation.”
- If the right LED does not remain on, replace the A9 CPU assembly and repeat the three LED pattern checks.
- If the LEDs are held in any one of the patterns shown in Table 6-1, and have the corresponding error message, replace the A9 firmware ICs. (Firmware ICs are not separately replaceable. Replacement kits are listed in the “Replaceable Parts” chapter.)

**Table 6-1. LED Code and Pattern Versus Test Failed**

LED Code Sum	Message Displayed	Faulty Component
RUN 1 2 4		
○ ● ● ●	ROM 1L FAIL	U24
● ● ● ○	ROM 2L FAIL	U25
● ● ● ●	ROM 1M FAIL	U4
● ● ● ○	ROM 2M FAIL	U5

## 6-6 Digital Control Troubleshooting

---

## Check A19 GSP and A18 Display Operation

### Cycle Power and Look at the Display

Switch the analyzer off, and then on. The display should be bright and focused with the annotation legible and intelligible.

- If the display is acceptable, go to “A1/A2 Front Panel Troubleshooting.”
- If the display is unacceptable, continue with the next step.

### Perform Display Intensity and Focus Adjustments

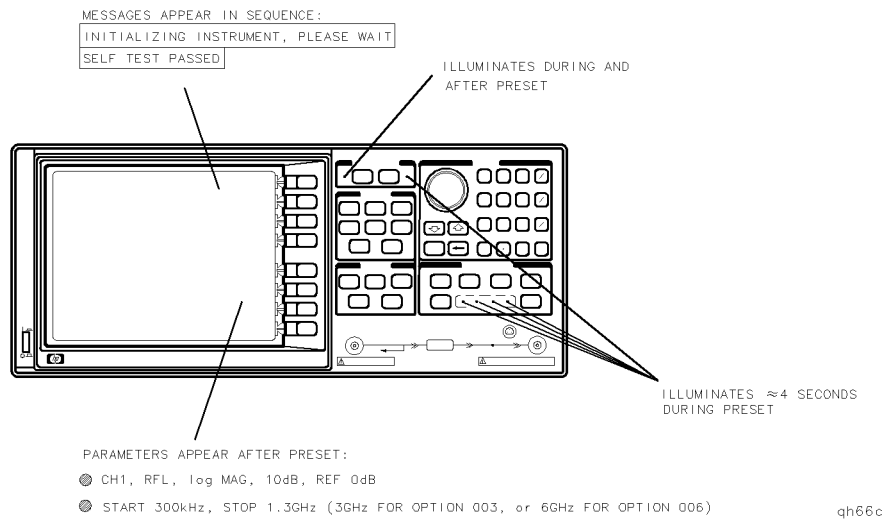
Refer to the “Adjustments and Correction Constants” chapter, and perform the “Display Intensity Adjustments.” If this does not resolve the problem, refer to “A19 GSP and A18 Display Troubleshooting,” located later in this chapter.

---

## A1/A2 Front Panel Troubleshooting

### 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 LED turns off. Refer to Figure 6-4.
  - 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.”



**Figure 6-4. Preset Sequence**

### Identify the Stuck Key
















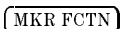


Match the LED pattern with the patterns in Table 6-2. The LED pattern identifies the stuck key. Free the stuck key or replace the front panel part causing the problem.

### 6-8 Digital Control Troubleshooting

**Table 6-2. 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			•		•	•	CH 1	Active Channel
12			•	•			CH 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 6-2. Front Panel Key Codes (continued)**

Decimal Number	LED Pattern						Key	Front Panel Block	
	CH1	CH2	R	L	T	S			
26		•	•		•			Entry	
27		•	•		•	•		Response	
28		•	•	•				Response	
29		•	•	•		•		Entry	
30		•	•	•	•			Entry	
31		•	•	•	•	•	softkey 2	Softkey	
32	•							Stimulus	
33	•					•		Entry	
34	•				•			Entry	
35	•				•	•		Stimulus	
36	•			•			softkey 8	Softkey	
37	•			•		•		Entry	
38	•			•	•			Instrument State	
39	•			•	•	•	softkey 7	Softkey	
40-47	Not used								
48	•	•						Entry	
49	•	•				•		Entry	
50	•	•			•			Entry	
51	•	•			•	•		Response	
52	•	•		•				Response	
53	•	•		•		•		Entry	
54	•	•		•	•			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 A1 and A2. Make sure the cables are properly connected. Replace any bad cables.

## 6-10 Digital Control Troubleshooting



## 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 6-3 for further troubleshooting information.

**Table 6-3. 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 "Check A9 CPU Operation" 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 pass, replace A10.
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: Refer to the "Power Supply Troubleshooting" chapter.
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. Refer to the "Source Troubleshooting" chapter.
* P = part of PRESET sequence; AI = part of ALL INTERNAL sequence.		
† in decreasing order of probability.		

**6-12 Digital Control Troubleshooting**

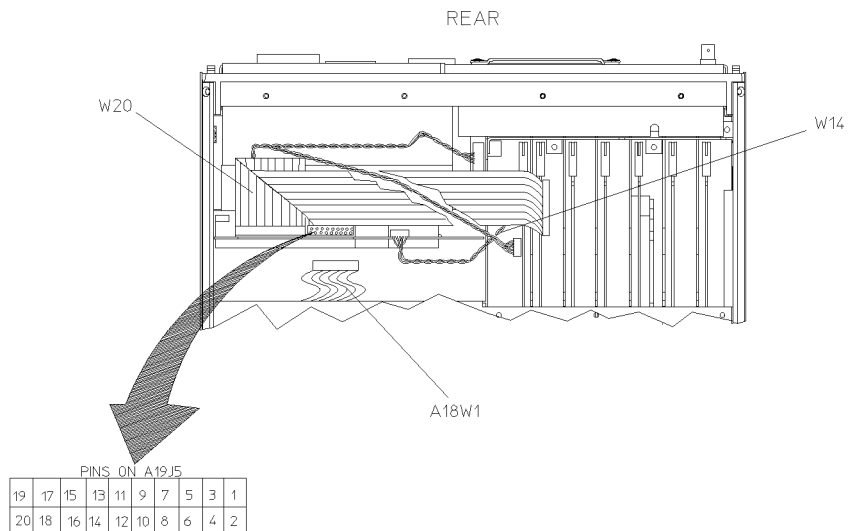
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## A19 GSP and A18 Display Troubleshooting

### Measure Display Power Supply Voltages on A19

Measure the display power supply voltages on the A19 GSP assembly. Check pins 2, 4, and 6 on A19J5 for  $+65 \pm 0.4$  V (see Figure 6-5).

- If the voltages are incorrect, continue with the next check.
- If the voltages are correct, go to “Run Display Test 59” later in this chapter.



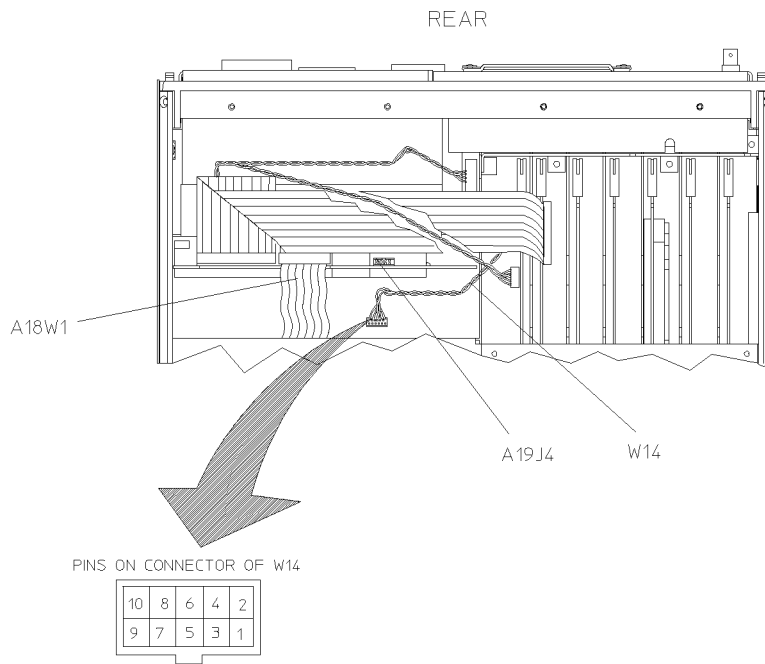
sh6201c

**Figure 6-5. Pin Locations on A19J5**

## Measure Display Power Supply Voltages Entering A19

Measure the power supply voltages entering the A19 assembly coming from the A8 assembly. Check pins 1 and 2 on the connector of W14 for  $+65 \pm 0.4$  V, and pin 6 for  $+5.16 \pm 0.1$  V (see Figure 6-6).

- If the voltages are incorrect, refer to the “Power Supply Troubleshooting” chapter.
- If the voltages are correct entering, but incorrect leaving the GSP assembly, replace the A19 GSP assembly.



sh6202c

**Figure 6-6. Pin Locations on Connector of W14**

## Run Display Test 59

1. On the analyzer, press **PRESET** **SYSTEM** **SERVICE MENU** (softkey 8) **TESTS** (softkey 1) **DISPLAY TESTS** (softkey 7). The analyzer will display:

```
TEST
  59  Disp/cpu com  -ND-
```

2. Press **EXECUTE TEST** (softkey 8). The display will blank and the front panel LEDs will flash once.
  - If all of the LEDs go off and the display remains blank the analyzer passed the test. If the analyzer passes the test, press **PRESET** and go to “Run display Tests 60-65”.
  - If any of the front panel LEDs remain on (except for the port LEDs), the analyzer failed the test. Continue with the next check.

## Inspect Ribbon Cable Repeat Display Test 59

1. Inspect the W20 (A9-A19) ribbon cable for a loose connection.
2. Repeat “Run Display test 59.” If the test fails, a walking one pattern will be continuously transferred from the CPU, through the cable, to the GSP.
3. Immediately go to the next check.

## Perform Walking One Pattern

1. Disconnect the W20 (A9-A19) ribbon cable from A19J6.
2. Use an oscilloscope to verify a walking one pattern is transferring from the A9 CPU through the cable. The walking one pattern (see Figure 6-7) is found on pins 3 through 10, and 13 through 20 on the connector of W20 (see Figure 6-8).
  - If the signal is not present at the end of the cable, check for it at the A9 connector of the ribbon cable.
  - If the signal is still not present, replace the A9 assembly.

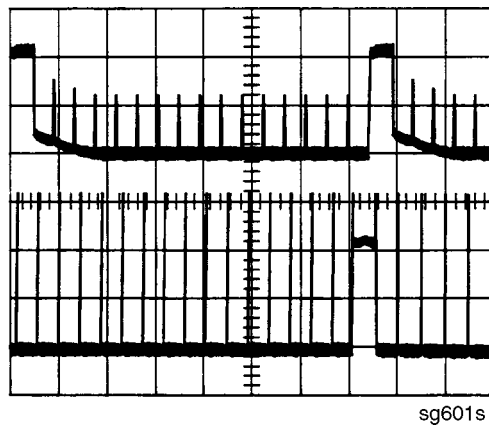
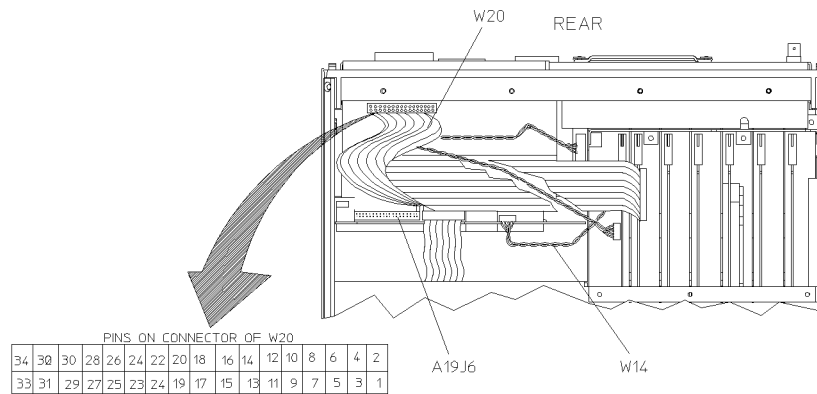


Figure 6-7. A9 CPU Walking One Pattern



sh6206c

**Figure 6-8. Pin Locations on Connector of W20**

### Run display Tests 60-65

1. Press **PRESET** **SYSTEM** **SERVICE MENU** (softkey 8) **TESTS** (softkey 1) **DISPLAY TESTS** (softkey 7) **60** **X1**.
2. Press **EXECUTE TEST** (softkey 8). If the analyzer passes the test, the display will blank and the front panel LEDs will flash once.
3. Press **PRESET** and perform display tests 61 through 65 (substitute the next test number where **60** was used). Watch for the LEDs to go off and the display to blank except for test 65. Test 65 causes the display to dim rather than blank.
  - If any of the display tests fail, replace the A19 assembly.
  - If all of the following is true, replace the A18 display assembly.
    - CPU test passes the LED test.
    - GSP passes all of the internal display tests (59 through 65).
    - Power supply checks out.
    - Intensity, focus, and vertical adjustments fail to produce an acceptable image.

---

## 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 activate the repeat function.
2. Then press **RETURN** **TESTS**.
3. Select the desired test and press **EXECUTE TEST**.
4. Press **(PRESET)** to stop the function. The test repeat function is explained in the “Service Key Menus and Error Messages” chapter.

---

## HP-IB Failures

If you have performed “Step 3. Troubleshooting HP-IB Systems” in the “Start Troubleshooting Here” chapter, 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 analyzer.

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.



## Source Troubleshooting

---

Use this procedure only if you have read the “Start Troubleshooting Here” chapter. 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 8752C Network Analyzer.

1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.

---

## 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.

### 7.2 Source Troubleshooting

---

## Power

If the analyzer output power levels are incorrect but no phase lock error is present, perform the following checks in the order given:

### 1. Source Default Correction Constants (Test 44)

1. Press **PRESET** **SYSTEM** **SERVICE MENU** **TESTS** **44** **X1** **EXECUTE TEST**.  
When complete, "DONE" should appear on the analyzer display.
2. 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.
  - If "FAIL" appears on the analyzer display, or if the analyzer fails the checks, replace the source.

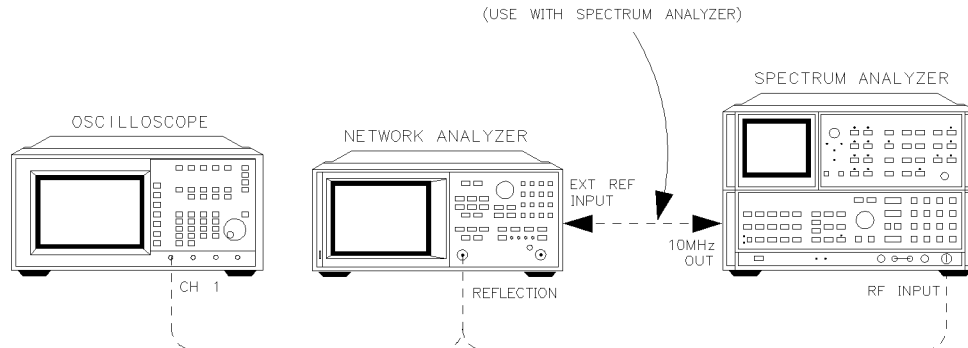
### 2. RF Output Power Correction Constants (Test 47)

1. Follow the instructions for this procedure given in the "Adjustments and Correction Constants" chapter. The procedure is complete when "DONE" appears on the analyzer display.
2. Use a power meter to verify that power levels are now correct.
  - If power levels are incorrect, or if the analyzer fails the routine, proceed with step 3.

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

1. Follow the instructions for this procedure given in the "Adjustments and Correction Constants" chapter. The procedure is complete when "DONE" appears on the analyzer display.
2. 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



sh673c

**Figure 7-1. 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

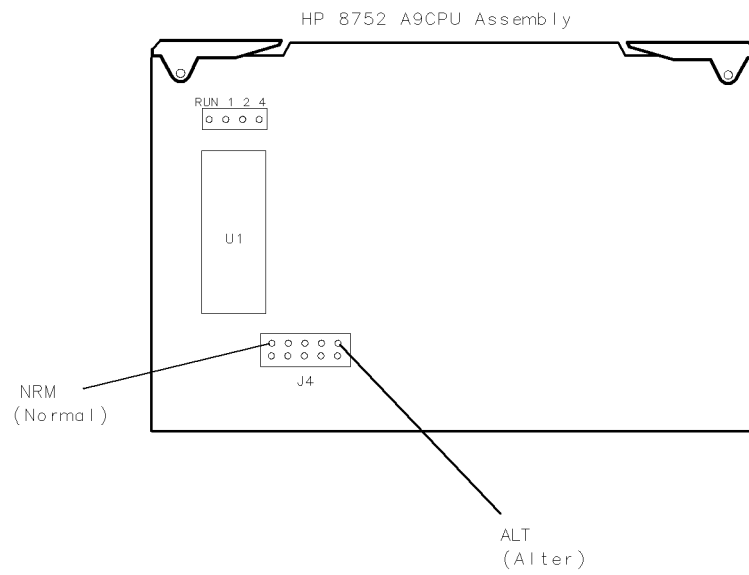
Phase lock error messages may appear as a result of incorrect pretune correction constants. To check this possibility, perform the pretune correction constants routine.

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

#### 7.4 Source Troubleshooting

1. Make sure the A9 CC Jumper is in the ALTER position:
  - a. Unplug the analyzer.
  - b. Remove the top cover.
  - c. Remove the A9 CPU board.
  - d. Move the jumper to the ALT position. (Refer to Figure 7-2.)
  - e. Replace the A9 CPU board, top cover, and power cord.



sh640c

**Figure 7-2. Jumper Positions on the A9 CPU**

2. Switch on the analyzer and press (PRESET) (SYSTEM) SERVICE MENU TESTS (46) (X1) EXECUTE TEST YES to generate new analog bus correction constants.
3. Then press (PRESET) (SYSTEM) SERVICE MENU TESTS (45) (X1) EXECUTE TEST YES to generate new pretune correction constants.
4. Press (PRESET) (SYSTEM) SERVICE MENU TESTS (48) (X1) EXECUTE TEST YES to generate new pretune correction constants.

---

**Note** Always press (PRESET) before and after performing an adjustment test.

---

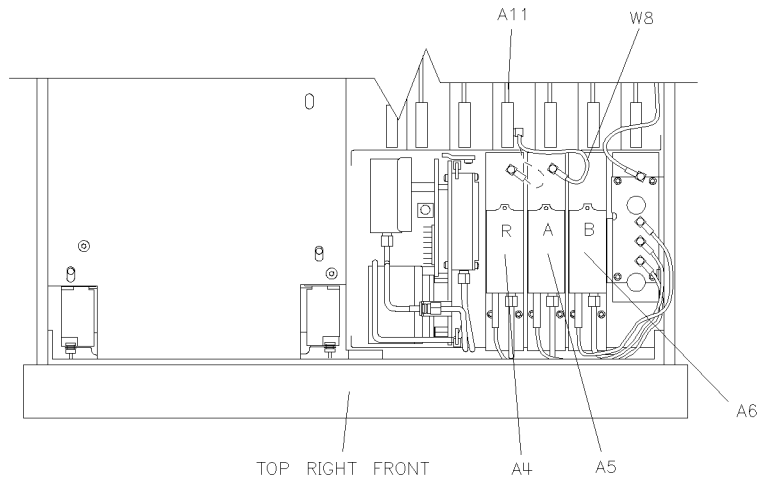
5. Press (PRESET) and observe the analyzer display:
  - If no error message is displayed: restore the A9 CC jumper to the NRM position. Then refer to “Post-Repair Procedures” in the “Assembly Replacement and Post-Repair Procedures” chapter to verify operation.
  - If an error message is displayed: continue 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. To eliminate the possibility of a faulty R sampler, follow this procedure.

1. Remove the W8 cable (A11J1 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.

## **7-6 Source Troubleshooting**



sh672c

**Figure 7-3. Sampler/Mixer to Phase Lock Cable Connection Diagram**

2. If you connected W8 to:
  - **A5**, press **(MEAS) REFLECTION**
  - **A6**, connect a cable between the reflection and transmission test ports and press **(MEAS) TRANSMISSN**
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.

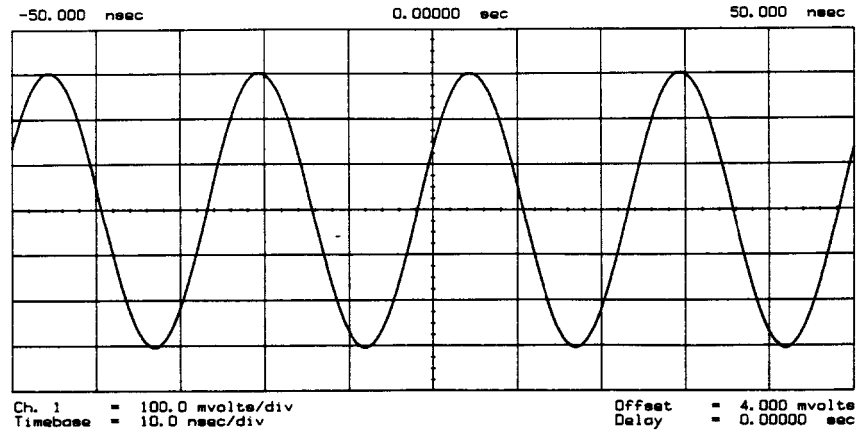
**Table 7-1. Output Frequency in SRC Tune Mode**

Setting	Observed Frequency
300 kHz	1.3 to 6.3 MHz
30 MHz	31 to 36 MHz
40 MHz	41 to 46 MHz

### 7-8 Source Troubleshooting



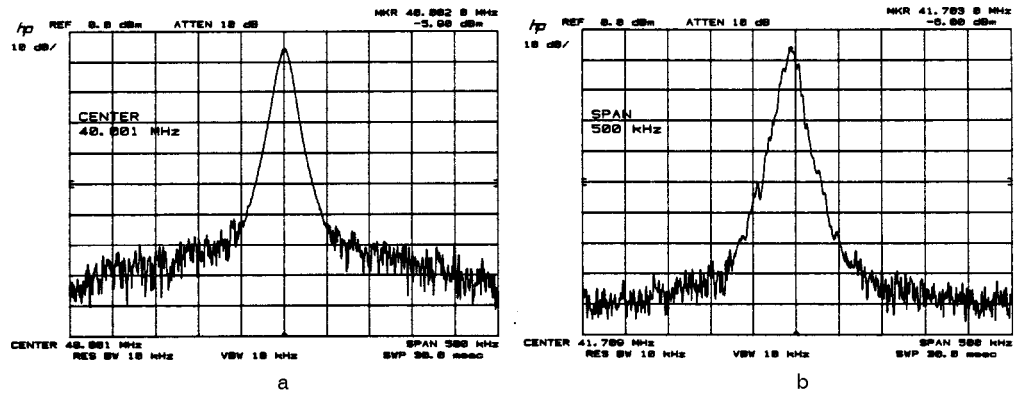
5. The signal observed on an oscilloscope should be as solid as the signal in Figure 7-4.



sg607s

**Figure 7-4. Waveform Integrity in SRC Tune Mode**

6. The signal observed on the spectrum analyzer will appear jittery as in Figure 7-5b, not solid as in Figure 7-5a. This is because in SRC TUNE mode the output is not phase locked.



sg609s

**Figure 7-5. Phase Locked Output Compared to Open Loop Output in SRC Tune Mode**

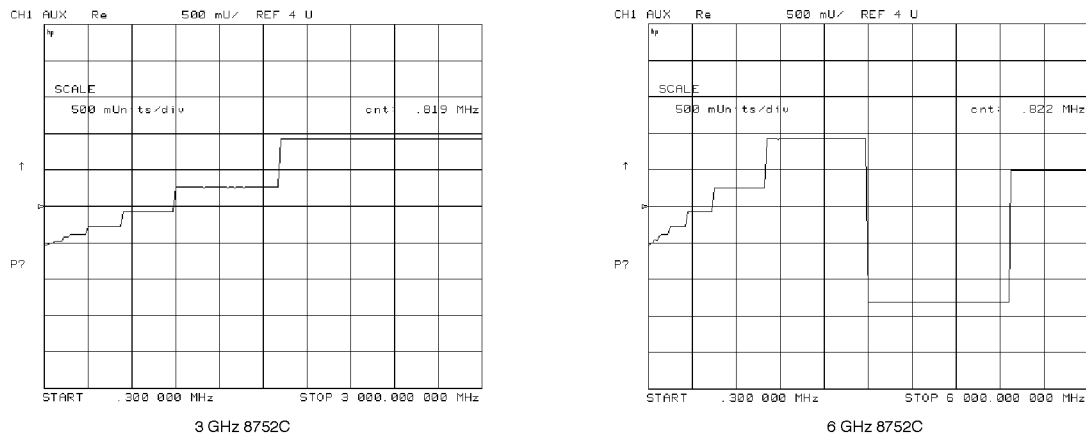
7. Press **(MENU) POWER** to vary the power and check for corresponding level changes on the test instrument. (A power change of 20 dB will change the voltage observed on the oscilloscope by a factor of ten.)
8. Note the results of the frequency and power changes:
  - If the frequency and power output changes are correct, continue with “A12 Reference Check” located in this chapter.
  - If the frequency changes are incorrect, continue with “YO Coil Drive Check with Analog Bus.”
  - If the power output changes are incorrect, 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.

## 7-10 Source Troubleshooting

## YO Coil Drive Check with Analog Bus

**Note** If the analog bus is not functional, perform the “YO Drive Coil Check with Oscilloscope” procedure.

1. Press (PRESET) (SYSTEM) SERVICE MENU ANALOG BUS ON SERVICE MODES SOURCE PLL OFF (MEAS) ANALOG IN Aux Input COUNTER: ANALOG BUS.
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 1V/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.



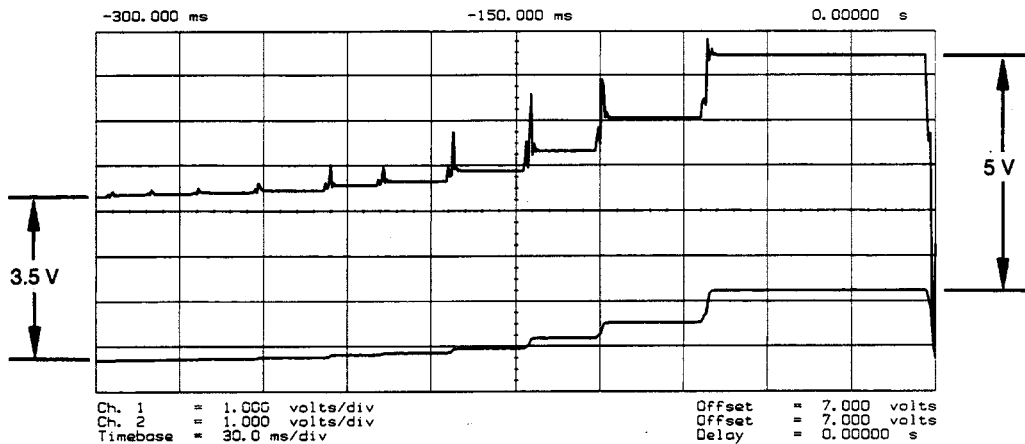
sh6116c

**Figure 7-6. 1V/GHz at Analog Bus Node 16 with Source PLL Off.**

## YO Coil Drive Check with Oscilloscope

**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 the "Replaceable Parts" chapter 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 incorrect, replace the faulty A11 assembly.
  - If the voltages are correct, replace the faulty A3 source assembly.
  - If neither the A11, nor the A3 assembly is faulty, continue with the next check.



sg606s

**Figure 7-7.**  
**YO- and YO+ Coil Drive Voltage Differences with SOURCE PLL OFF**

### 7-12 Source Troubleshooting

## 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 next.

### 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:
  - a. Press (2) (M/μ).
  - b. Press (50) (M/μ).

**Table 7-2. Analog Bus Check of Reference Frequencies**

CW Frequency	Analog Bus Node 21 100 kHz	Analog Bus Node 24 2nd LO	Analog Bus Node 25 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  $\pm 0.1\%$ . 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:
  - a. Press (2) (M/μ).
  - b. 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:
  - a. Press (2) (M/μ).
  - b. Press (50) (M/μ).
11. Check the results.
  - If all the counter readings match the frequencies listed in Table 7-2, continue with “A13/A14 Fractional-N Check.”
  - If the counter readings are incorrect at the 500 kHz and 2 MHz settings only, continue with “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 correct, either the A10 or A14 assemblies could be faulty.)

#### 7-14 Source Troubleshooting

## 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 convenient test points and figures showing the five signals listed.

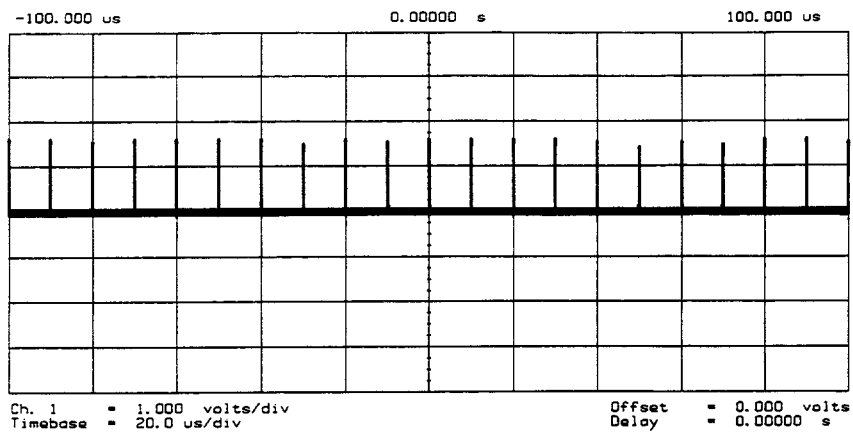
**Table 7-3. A12 Reference Frequencies**

Mnemonic	Signal Description	Test Point Location	See Figure	Analyzer Setting
FN100kHzREF	100 kHz Reference	A13TP5	Figure 7-8	any
REF	Phase Lock Reference	A11TP1 PIN 9	Figure 7-9	$\geq 16$ MHz CW
REF	Phase Lock Reference	A11TP1 PIN 9	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	$\geq 16$ 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 1.5V in amplitude. You may have to increase the oscilloscope intensity to see these pulses. (See Figure 7-8.)



sg610s

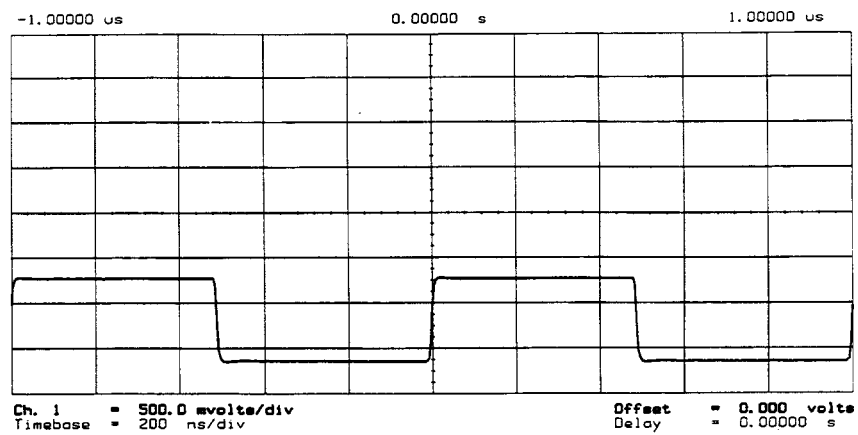
Figure 7-8. Sharp 100 kHz Pulses at A13TP5 (any frequency)



## PLREF Waveforms

**REF Signal At A11TP1 PIN 9.** 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.

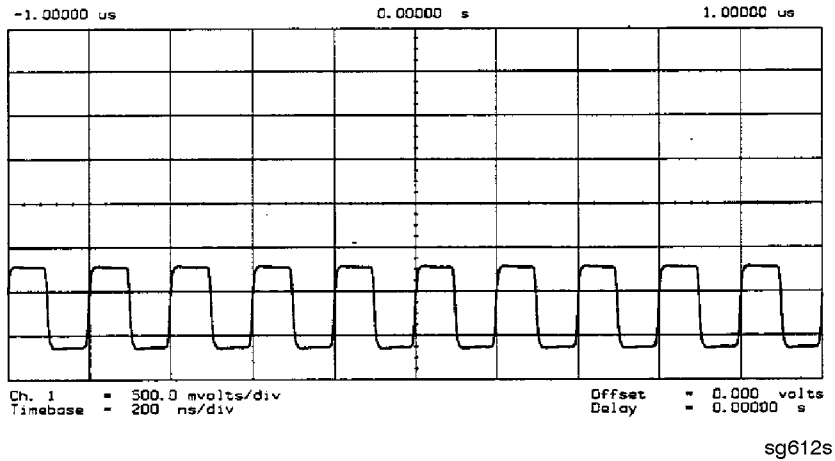
**High Band REF Signal.** In high band the REF signal is a constant 1 MHz square wave as indicated by Figure 7-9.



sg611s

Figure 7-9. High Band REF Signal ( $\geq 16$  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.



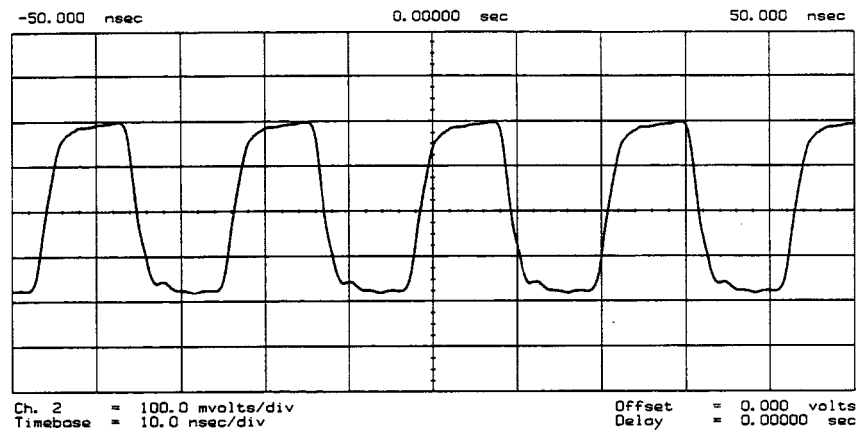
**Figure 7-10. REF Signal at A11TP9 (5 MHz CW)**

- If REF looks correct, continue with “4 MHz Reference Signal.”
- If REF is incorrect in low band, continue with “FN LO at A12 Check.”

## 7-18 Source Troubleshooting

### 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 7-11. The display will indicate 10 to 60.8 MHz.
  - If the FN LO signal is correct, the A12 assembly is faulty.
  - If the FN LO signal is incorrect, continue with "A13/A14 Fractional-N Check."

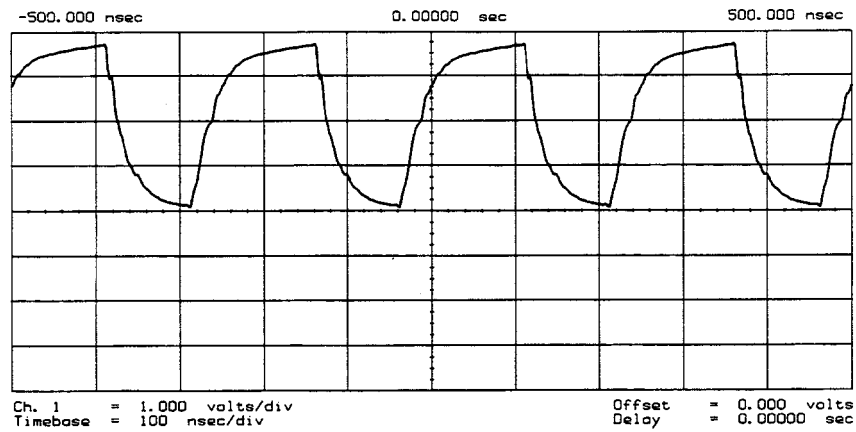


sg613s

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.



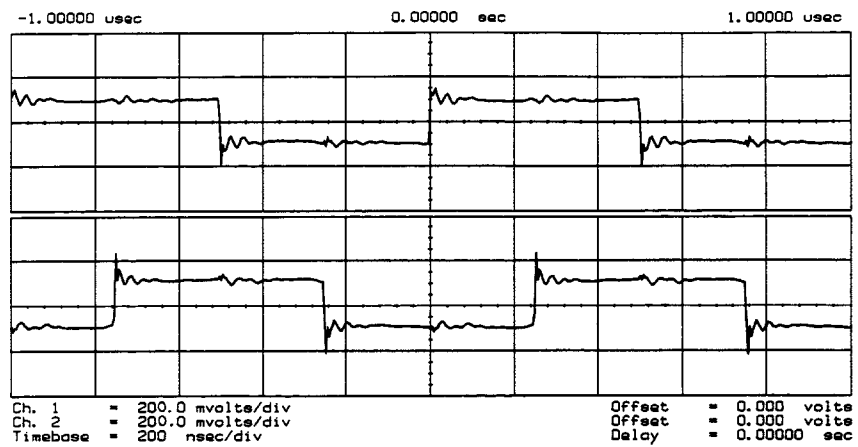
sg614s

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. Refer to Table 7-3 for convenient test points.

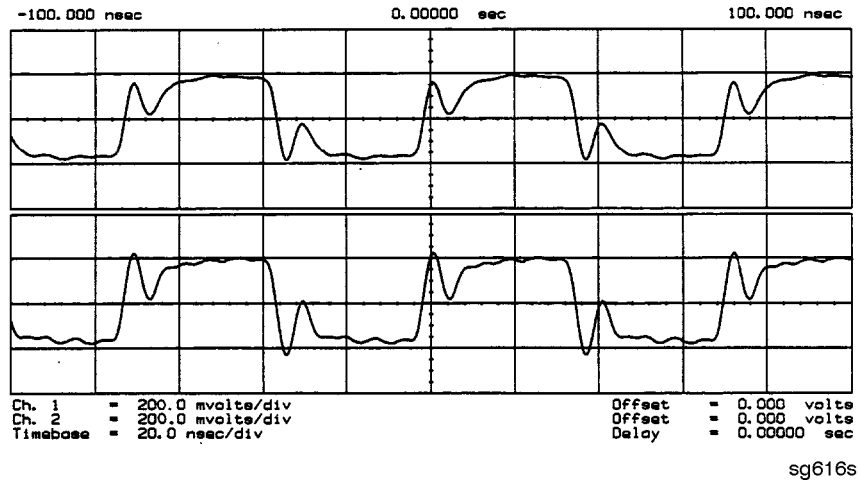
**90 Degree Phase Offset of 2nd LO Signals in High Band.** In high band, the 2nd LO is 996 kHz. As indicated by Figure 7-13, the 2nd LO actually consists of two signals 90 degrees out of phase.



sg615s

**Figure 7-13.**  
**90 Degree Phase Offset of High Band 2nd LO Signals ( $\geq 16$  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.



**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 next.

**7-22 Source Troubleshooting**

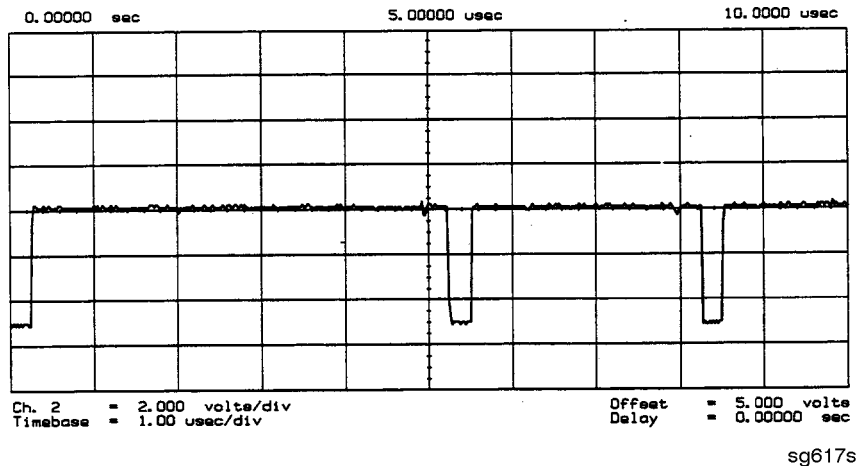
## A12 Digital Control Signals Check

Several digital control signals must be functional for the A12 assembly to operate correctly. 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**

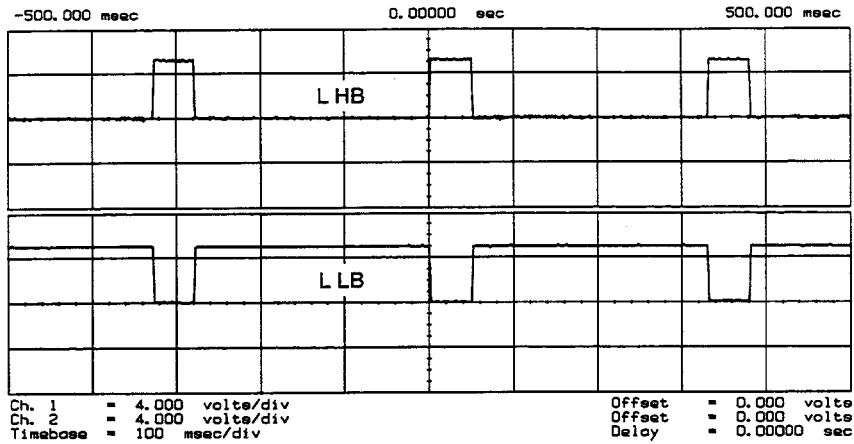
Mnemonic	Signal Description	Location	See Figure	Analyzer Setting
L ENREF	L=Reference Enable	A12P2-16	Figure 7-15	Preset
L HB	L=High Band	A12P2-32	Figure 7-16	Preset
L LB	L=Low Band	A12P1-23	Figure 7-16	Preset

**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.



**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.



sg618s

**Figure 7-16. Complementary L HB and L LB Signals (Preset)**

If all of the digital signals appeared correct, 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.

## 7-24 Source Troubleshooting



**Table 7-5. VCO Range Check Frequencies**

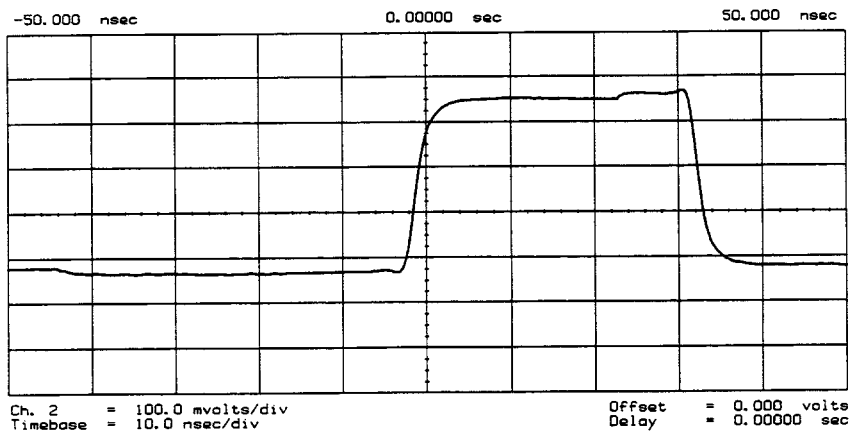
<b>Instrument Setting</b>	<b>Counter Reading</b>
31 MHz	$30 \pm 0.030$ MHz
60.999999 MHz	$60 \pm 0.060$ MHz

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 continue with 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

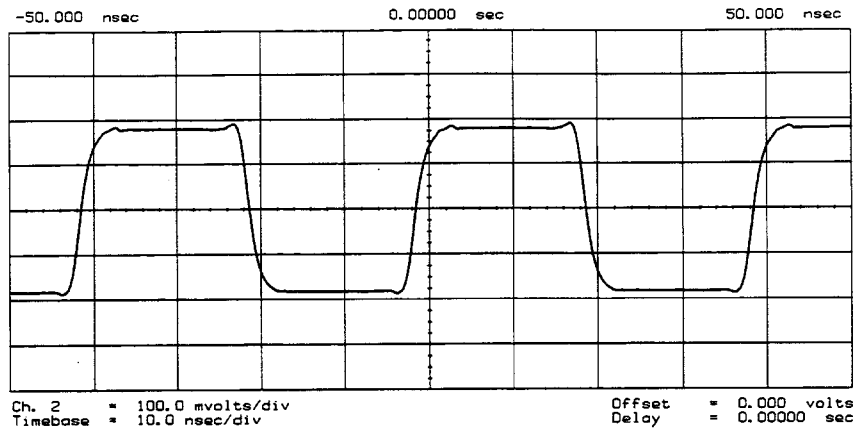
1. Remove the W9 HI OUT cable (A14J1 to A7) from the A7 assembly and connect it to an oscilloscope set for 50 ohm input impedance. Switch on the analyzer.
2. Press **PRESET** **SYSTEM** **SERVICE MENU** **SERVICE MODES** **FRACN TUNE ON** to activate the FRACN TUNE service mode. See the “Service Key Menus and Error Messages” chapter for more information on the FRACN 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 continuing with “A7 Pulse Generator Check.”



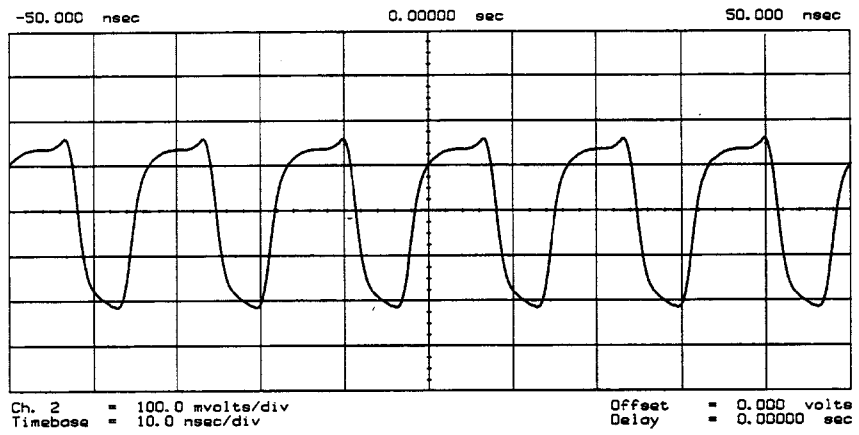
sg619s

**Figure 7-17. 10 MHz HI OUT Waveform from A14J1**



sg620s

**Figure 7-18. 25 MHz HI OUT Waveform from A14J1**



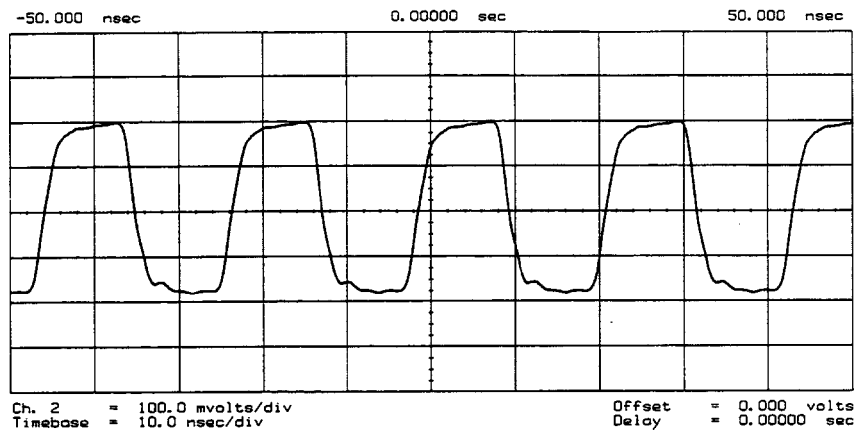
sg621s

**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:
  - Activating the analog bus and setting the internal counter to the FRACN node, or
  - Connecting an oscilloscope to A14J2 (labeled LO OUT) and looking for waveforms similar to Figure 7-20.



sg613s

**Figure 7-20. LO OUT Waveform at A14J2**

4. Vary the voltage at A14TP14 from +10 to -5 volts either by:
  - Connecting an appropriate external power supply to A14TP14, or
  - First jumping the +15V internal power supply from A8TP8 to A14TP14 and then jumping the -5.2V supply from A8TP10 to A14TP14.

## 7-28 Source Troubleshooting

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 FRACN TUNE service mode.
3. Connect an oscilloscope to A14J3 and observe the output.
4. With the FRACN 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.

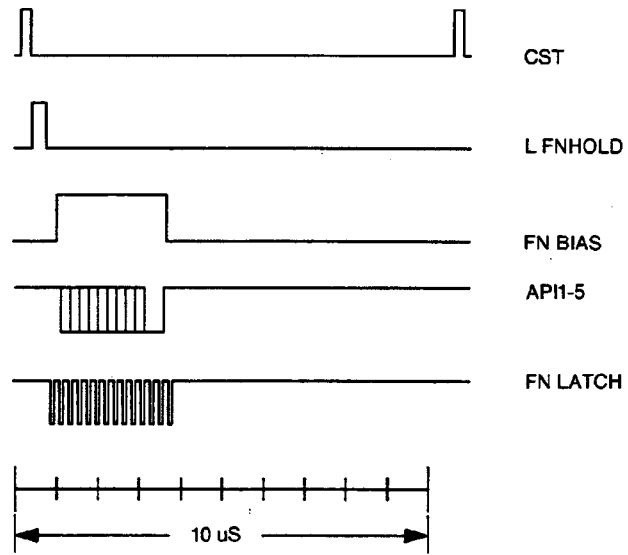
The A14 assembly generates a TTL cycle start (CST) signal every 10 microseconds. If the VCO is oscillating and the CST signal is not detectable at A14TP3, the A14 assembly is non-functional.

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 correct, 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

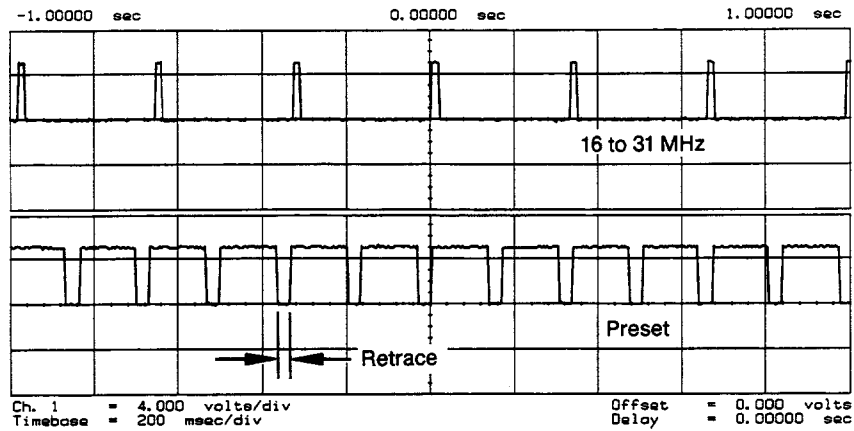
### 7-30 Source Troubleshooting



sg622s

**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 Figure 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.



sg623s

**Figure 7-22.**  
**H MB Signal at A14P1-5 (Preset and 16 MHz to 31 MHz Sweep)**

## 7-32 Source Troubleshooting



## 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.

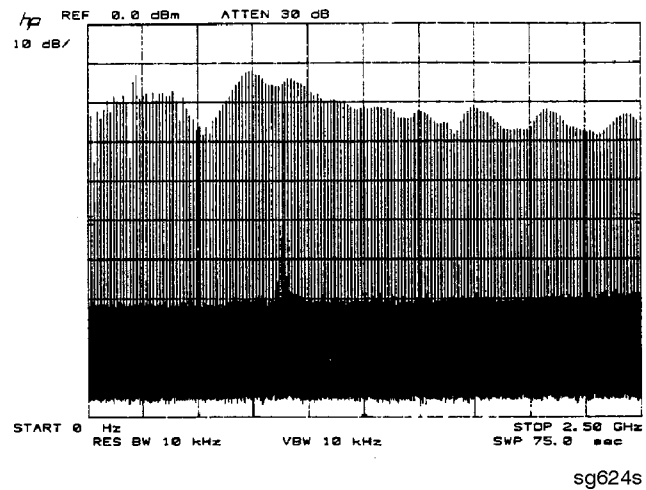
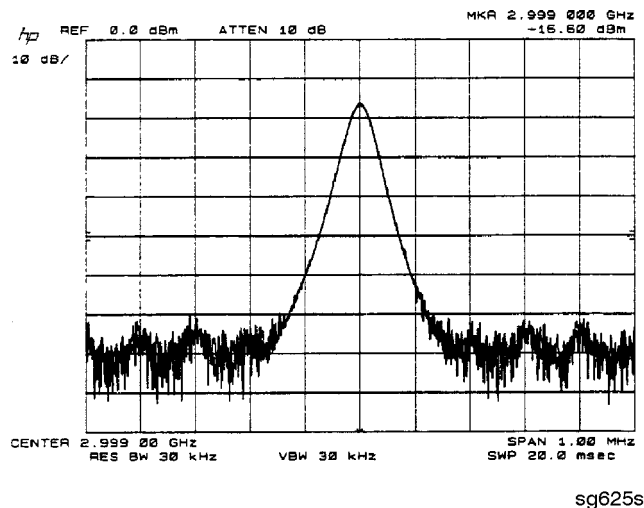


Figure 7-23. Pulse Generator Output

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**

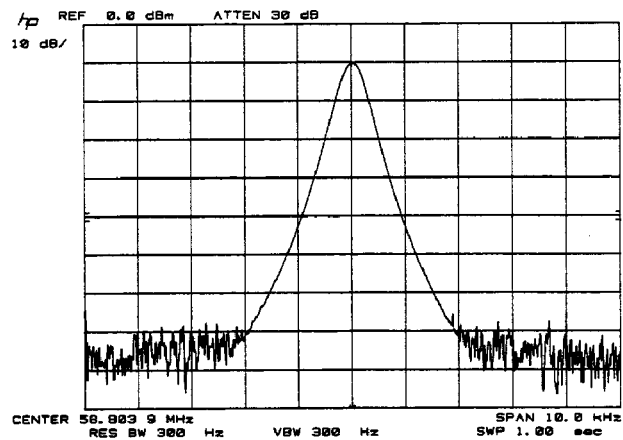
3. If the signal at the A7 output is correct, check the A7-to-A4 cable.
4. If the signal is not as clean as Figure 7-24, observe the HI OUT input signal to the A7 assembly.
  - a. On the network analyzer, press **(SYSTEM) SERVICE MENU SERVICE MODES PLL AUTO OFF**. Otherwise do not readjust the instrument. Remove the A14-to-A7 SMB cable (W9) from the A7 pulse generator assembly. (CW  $\approx 16$  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.

### 7-34 Source Troubleshooting

## Rechecking the A13/A14 Fractional-N

Some phase lock problems may result from phase noise problems in the fractional-N loop. To 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 examine 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

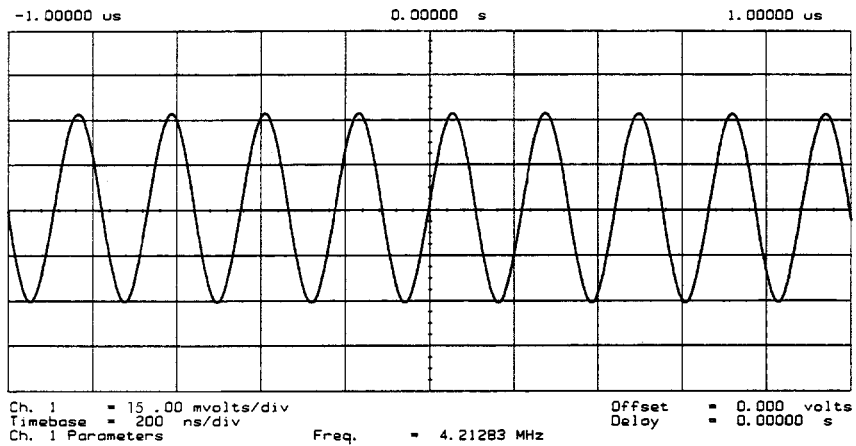
Perform this check if a spectrum analyzer is not available.

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 correct, continue with “A11 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



sg627s

**Figure 7-26. Typical 1st IF Waveform in FRACN TUNE/SRC TUNE Mode**

## 7-36 Source Troubleshooting

## A11 Phase Lock Check

At this point, the A11 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 the “Adjustments and Correction Constants” chapter.
- 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.

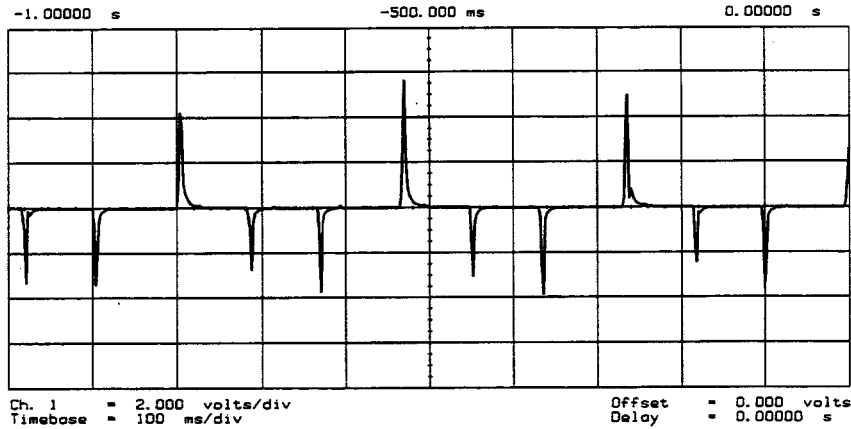
### Phase Lock Check by Signal Examination

To confirm that the A11 assembly is receiving the signals required for its 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. A11 Input Signals**

Mnemonic	I/O	Access	See Figure	Notes
FM COIL -	O	A11P1-3,33	Figure 7-27	Aids YO COIL in setting YIG. Press <b>PRESET</b> <b>MENU</b> <b>NUMBER OF POINTS</b> <b>3</b> <b>X1</b> to observe this signal.
REF	I	A11TP9	Figure 7-9, Figure 7-10	Observe both low band and high band CW frequencies.
YO COIL +	O	A11P1-2,32	Figure 7-7	Use <b>SOURCE PLL OFF</b> .
YO COIL -	O	A11P1-1,31	Figure 7-7	
1ST IF	I	A11 PL IF IN	Figure 7-26	Check for 1 MHz with tee a A11 jack (not at cable end) in high band.



sg628s

**Figure 7-27. FM Coil - Plot with 3 Point Sweep**

4. If any of the input signal is not correct, refer to the overall block diagram in the "Start Troubleshooting Here" chapter as an aid to trouble shooting the problem to its source.
5. If any of the output signals are incorrect, the A11 assembly is faulty.

**7-38 Source Troubleshooting**

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## 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 should be tested prior to use. You should have done this in the “Start Troubleshooting Here” chapter.

To use the analog bus to check any one of the nodes, press **PRESET** **SYSTEM** **SERVICE MENU** **ANALOG BUS ON**. Then press **MEAS** **ANALOG IN Aux Input** and enter the analog bus node number followed by **x1**. Refer to “Analog Bus” in the “Service Key Menus and Error Messages” chapter 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 the “Adjustments and Correction Constants” chapter. 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 the “Service Key Menus and Error Messages” chapter 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 the “Theory of Operation” chapter 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 will only effect the reflection test port. Assemblies in question include:

- A3 source
- A30 dual directional coupler
- any cables from the A3 source to the output of the reflection test port



## Receiver Troubleshooting

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Use this procedure only if you have read the “Start Troubleshooting Here” chapter. 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
- A30 dual directional coupler

---

## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8752C Network Analyzer.

1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.

---

## Receiver Failure Error Messages

There are two error messages that indicate receiver group problems. These messages may be caused by the analyzer itself or by external devices or connections. An explanation of each error message follows.

### CAUTION: OVERLOAD ON REFL PORT, POWER REDUCED

You have exceeded approximately +20 dBm at the reflection port. The RF output power is automatically reduced to – 20 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 analyzer’s reflection port.
2. Press **(MENU)** **POWER** **(0)** **(X1)** **SOURCE POWER ON** to turn the analyzer’s internal source back on.

## 8-2 Receiver Troubleshooting

- 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 R, A, and B Inputs.”

### CAUTION: OVERLOAD ON TRANSPORT, POWER REDUCED

You have exceeded approximately +4 dBm at the transmission port. The RF output power is automatically reduced to –20 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 analyzer's transmission port.
2. Connect a cable from the reflection port to the transmission port.
3. Press **(MENU) POWER (0) (X1) SOURCE POWER ON** to turn the analyzer's internal source back on.
  - 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 R, A, and B Inputs.”

---

## Check the R, A, and B Inputs

Use the following procedure to check the flatness of the R, A, and B input traces by comparing them with the sample traces shown in Figure 8-1 through Figure 8-3.

### 1. Check the R trace

- Press **(MEAS)** **INPUT PORTS** **R** **(SCALE REF)** **AUTO SCALE**.
- Check the flatness of the R trace by comparing it with the trace in Figure 8-1.

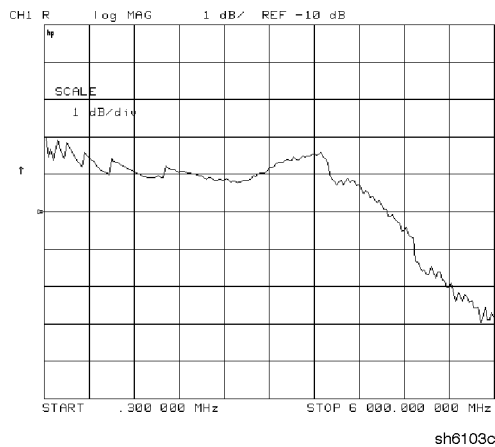
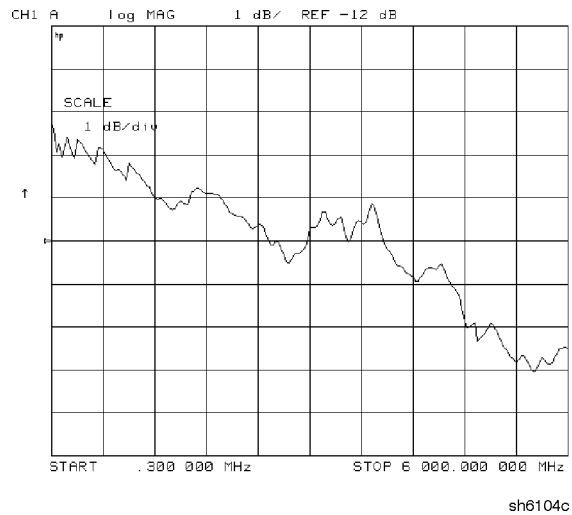


Figure 8-1. Sample R Input Trace

### 2. Check the A trace.

- Connect a short to the reflection test port of the analyzer.
- Press **(MEAS)** **INPUT PORTS** **A** **(SCALE REF)** **AUTO SCALE**.
- Check the flatness of the input A trace by comparing it with the trace in Figure 8-2.

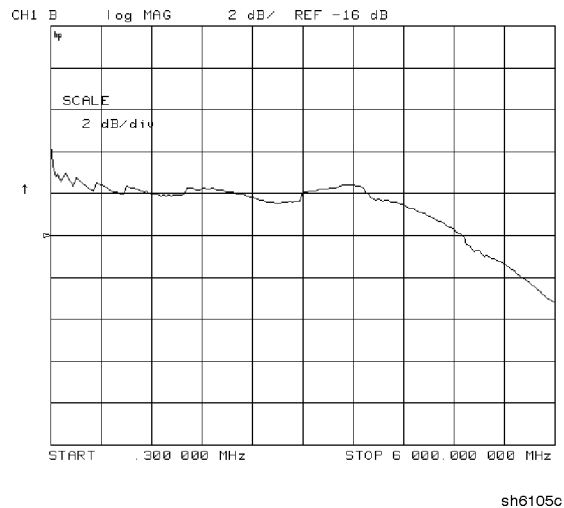
## 8-4 Receiver Troubleshooting



**Figure 8-2. Sample A Input Trace**

**3. Check the B trace.**

- a. Connect a thru cable from the reflection test port to the transmission test port of the analyzer.
- b. Press **MEAS** **INPUT PORTS B** **SCALE REF** **AUTO SCALE**.
- c. Check the flatness of the input B trace by comparing it with the trace in Figure 8-3.



**Figure 8-3. Sample B Input Trace**

**4. Review the results.**

- If none of the input traces resemble the corresponding sample trace, continue with “Troubleshooting When All Inputs Look Bad.”
- If at least one input trace resembles its corresponding sample trace, continue with “Troubleshooting When One or More Inputs Look Good.”

**8-6 Receiver Troubleshooting**

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## Troubleshooting When All Inputs Look Bad

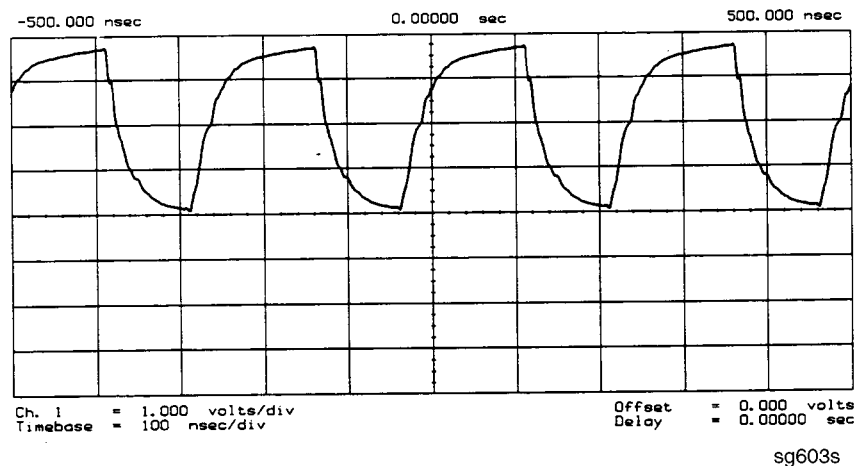
### Run Internal Tests 18 and 17

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.
3. If either of these tests FAIL, continue with “Check the 4 MHz REF Signal.”

---

## 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 8-4, 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 "Vhrvk S10 by Substitution or Signal Examination.."



**Figure 8-4. 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 and rerun internal tests 18 and 17.
- 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 8-5 and Figure 8-6.

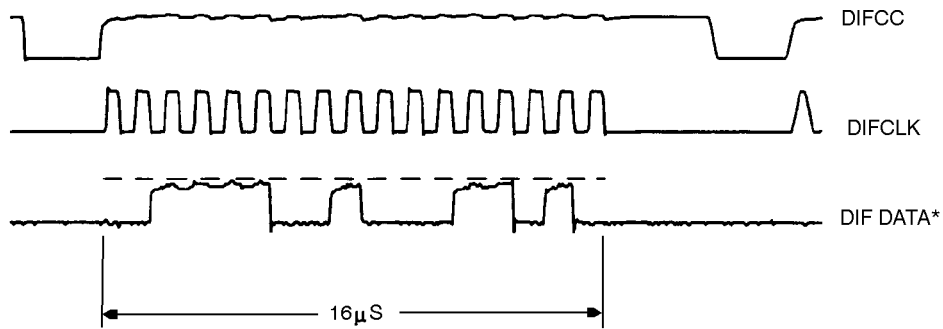
### 8-8 Receiver Troubleshooting



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 8-1. Signals Required for A10 Assembly Operation**

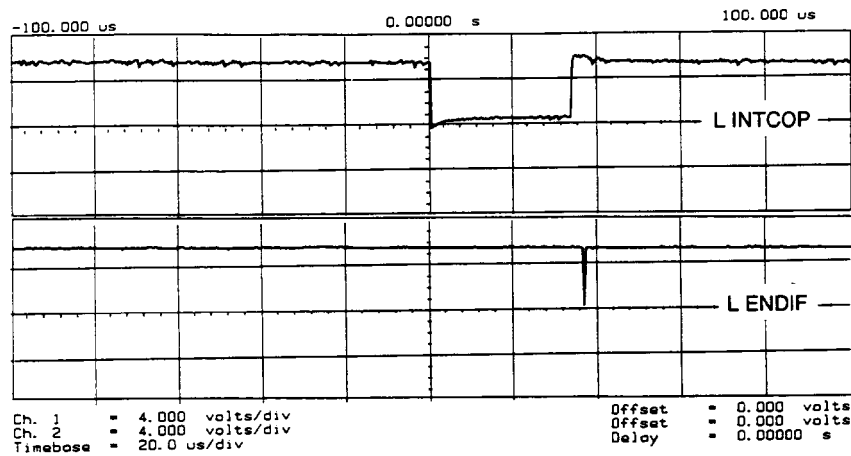
Mnemonic	Description	A10 Location	Signal Source	See Figure
DIFD0	Digital IF data 0 (LSB)	P2-27	A9P2-27	*
DIFD1	Digital IF data 1	P2-57	A9P2-57	*
DIFD2	Digital IF data 2	P2-28	A9P2-28	*
DIFD3	Digital IF data 3	P2-58	A9P2-58	*
DIFD4	Digital IF data 4	P2-29	A9P2-29	*
DIFD5	Digital IF data 5	P2-59	A9P2-59	*
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 8-5
DIFCLK	Digital IF serial clock	P2-4	A10P2-4	Figure 8-5
DIF DATA	Digital IF serial data out	P2-3	A10P2-3	Figure 8-5
L ENDIF	L= enable digital IF	P2-17	A9P2-17	Figure 8-6
L INTCOP	L= interrupt, DSP	P2-2	A10P2-2	Figure 8-6
*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.

sg602s

**Figure 8-5. Digital Data Lines Observed Using L INTCOP as Trigger**



sg604s

**Figure 8-6. Digital Control Lines Observed Using L INTCOP as Trigger**

## 8-10 Receiver Troubleshooting

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## 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.

- If all inputs look good but the average power level is incorrect, continue with “Check the Frequency Response Correction.”
- If one or two inputs look bad, continue with “Check the 4 kHz Signal.”

### Check the Frequency Response Correction

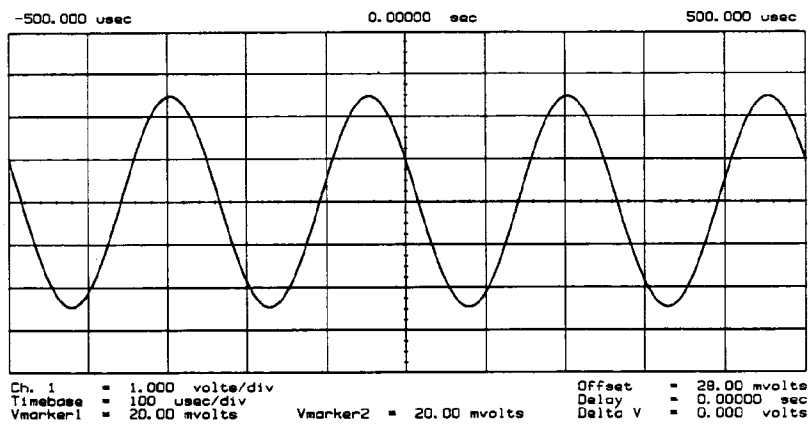
1. Remove all connections to the reflection and transmission ports and press **PRESET**. You should observe a straight line at 0 dB with a scale of 5 dB/DIV.
2. Connect a thru between the reflection and transmission ports. Press **CH 2**. The trace observed should be the same as the previous one.
  - If the traces are not as described, perform the Frequency Response Correction adjustment in the “Adjustments and Correction Constants” chapter.
  - If the traces are still not as described after performing the adjustment, replace the A10 assembly.

### 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 8-7.
  - If the signal is good, replace the A10 assembly.
  - If the signal is bad, continue with “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



sg605s

**Figure 8-7. 2nd IF (4 kHz) Waveform**

### 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.”

## 8-12 Receiver Troubleshooting

## 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 the “Source Troubleshooting” chapter 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 bad, troubleshoot the A12 reference assembly and signal path.
- If the 2nd LO is good and the B sampler is suspected faulty, replace the A6 (B) sampler/mixer.
- If the 2nd LO is good but the R or A sampler is suspected faulty, continue with “Check Input Trace.”

## Check Input Trace

All inputs to the sampler have been verified except for the signal coming from the coupler. The problem is most likely a faulty coupler or sampler. However, the A10 assembly may also be at fault.

Press **PRESET** **MEAS** **INPUT PORTS** and select the input with the bad trace.

The trace normally has a number of jumps in it due to band switches, as shown in Figure 8-1 through Figure 8-3. Each jump should be less than 2 dB.

- If there are other peaks or holes in the trace, the sampler is probably faulty. Remove the suspected sampler and exchange it with the known good sampler. If the problem disappears, replace the suspected sampler.
- If there is a broadband problem, it is probably caused by the coupler.
  - If the level (average value) of the trace is wrong but the trace is otherwise correct, the problem is most likely in the coupler or the A10 assembly. Either measure the output of the coupler with a power meter, or swap the A10 assembly with another known working A10 assembly.
  - Check directivity, source match, and crosstalk by performing the system verification procedure described in the “System Verification and Performance Tests” chapter. If any of these fail, check the coupler and sampler connections.

To verify the coupler is faulty, remove the sampler that has the bad input and exchange it with the known good sampler. If there is no improvement, replace the coupler. If the problem disappears, replace the original sampler.

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.

## Accessories Troubleshooting

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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 8752C Network Analyzer.

1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.

### **9-2 Accessories Troubleshooting**



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## **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
<b>Calibration Kit</b>						
load	X					
open/short	X	X				
<b>Analyzer</b>						
sampler			X	X		X
A10 digital IF				X		
dual directional coupler	X	X	X	X	X	X
test port connectors	X	X	X	X	X	X
<b>External cables</b>					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 port are good. If directivity looks bad, check directivity again with a known good load. If the problem is still present, replace the dual directional coupler assembly.

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.”

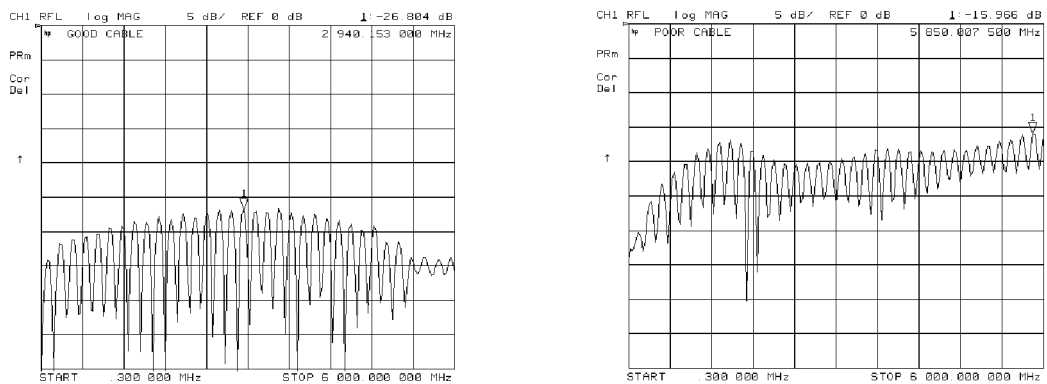
#### 9-4 Accessories Troubleshooting

## 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. Connect the suspect cable between the reflection port and the transmission port.

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.

Another way to verify the operation of the cable is to run the Cable Confidence Test (test number 22). Press **(SYSTEM) SERVICE MENU TESTS (22) (x1) EXECUTE**.



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**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 8752C 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.

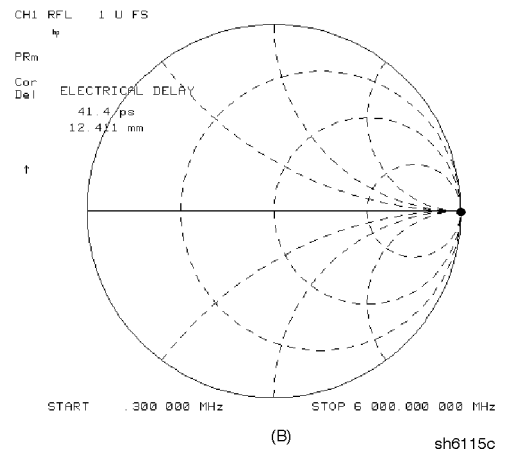
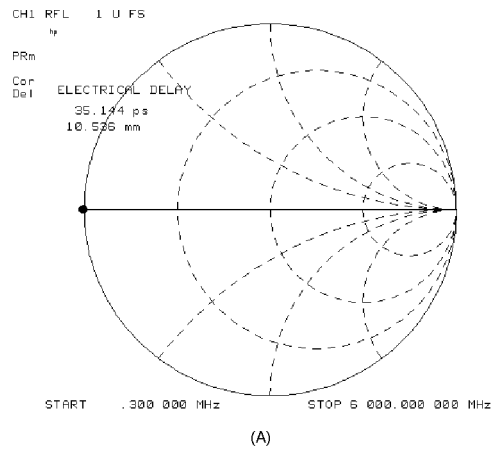
1. Perform a reflection 1-port calibration using the good short and open. Then press **FORMAT SMITH CHART** to view the devices in Smith chart format.
2. Connect the good short to the reflection port. Press **SCALE REF** **ELECTRICAL DELAY**. Turn the front panel knob to enter enough electrical delay so that the trace appears as a dot at the left side of the smith chart (see Figure 9-2a).

Replace the good short with the questionable short at the reflection port. The trace of the questionable short should appear very similar to the known good short.

3. Connect the good open to the reflection port. 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).

Replace the good open with the questionable open at the reflection port. The trace of the questionable open should appear very similar to the known good open.

## 9-6 Accessories Troubleshooting



**Figure 9-2. Typical Smith Chart Traces of Good Short (a) and Open (b)**



## 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:

- Internal Diagnostics
- 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:

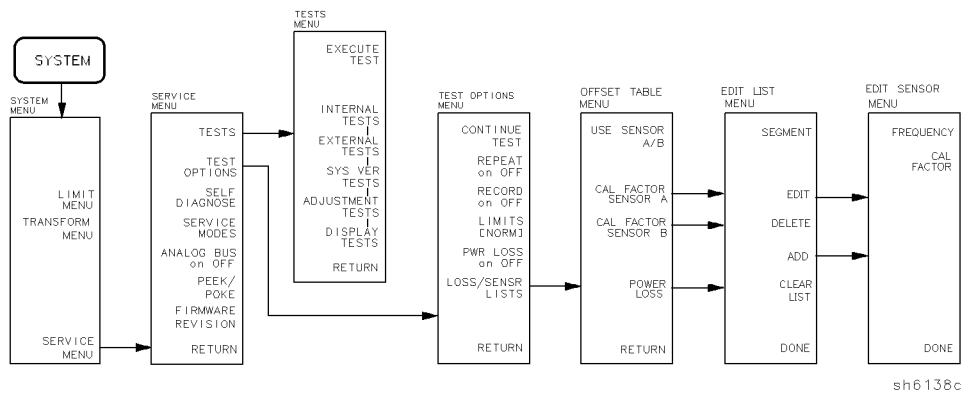
- Understand the message.
- Solve the problem.

---

## 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



**Figure 10-1. Internal Diagnostics Menu**

---

### 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

---

## 10-2 Service Key Menus and Error Messages



## 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).

**10-4 Service Key Menus and Error Messages**

#### 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 8752C 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.

#### POWER 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.

**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 or loss values previously entered in the current data table.

### DELETE (SDEL)

deletes frequency, cal factor or loss values previously entered in the current data table.

### ADD (SADD)

adds new frequency, cal factor or loss values to the current data table up to a maximum of 12 segments (frequency points).

### 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.

## 10-6 Service Key Menus and Error Messages

## 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 FAIL 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.

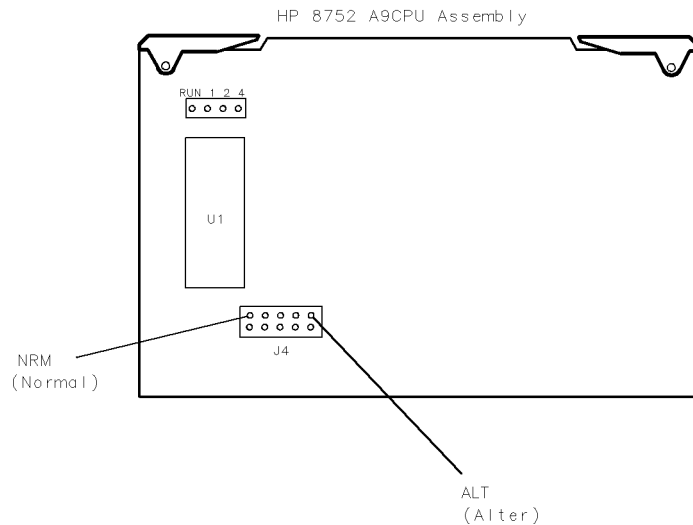
- 0 **ALL INT.** Runs only when selected. It consists of internal tests 3-11, 13-16, and 20. Use the front panel knob to scroll through the tests and see which failed. If all pass, the test displays a PASS status. Each test in the subset retains its own test status.
- 1 **PRESET.** Runs the following 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?". Refer to HP-IB service mnemonics definitions. 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 **CMOS RAM.** Verifies the A9 CPU CMOS (long-term) memory with a non-destructive write/read pattern. A destructive version that writes over stored data is shown in Table 10-2.

- 4 **Main DRAM.** Verifies the A9 CPU main memory (DRAM) with a non-destructive write/read test pattern. A destructive version is shown in Table 10-2. These tests, internal tests 2 through 4, are normally run at preset and power-on. However, a jumper on the A9 CPU assembly, illustrated in Figure 10-2, can be set in one of five positions with the following results:

**Table 10-2. Descriptions of Jumper Positions**

<b>Jumper Position</b>	<b>Position No</b>	<b>Result</b>
ALTER	1	With the jumper in this right position, correction constants can be altered, (updated) during adjustment procedures. The altered correction constants are stored in EEPROM, replacing previously stored correction constants.
CMOS	2	This destructive version of the CMOS RAM test (internal test 3) continuously writes over information stored there.
DRAM	3	This destructive version of the main DRAM test (internal test 4) continuously writes over information stored there.
SKIP	4	For factory use only.
NORMAL	5	The left position is the normal operation position.

## 10-8 Service Key Menus and Error Messages



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**Figure 10-2. Jumper Positions on the A9 CPU**

For additional information, see Internal Tests 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 Counter.** 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 below.) 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 8752C Network Analyzer Programmer's Guide*.) This runs only when selected or with ALL INTERNAL (internal test #10).
- 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) line 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-linearities.

## 10-10 Service Key Menus and Error Messages



- 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 digital 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 23 and 24 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. Test 27 is associated with the system verification procedure, documented in the “System Verification and Performance Tests” chapter. Tests 32 to 34 facilitate examining the calibration coefficient arrays (error terms) resulting from a measurement calibration; refer to the “Error Terms” chapter for details.

- 27      **Sys Ver Init.** Runs a series of measurements on devices contained in the HP 85032B 50 $\Omega$  Type-N Calibration Kit (for the HP 8752C) or the HP 85036B 75 $\Omega$  Type-N Calibration Kit (for the HP 8752C Option 075).
- 28 - 31    Not used.
- 32-34    **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 the “Error Term” chapter 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 Cor.** 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.
- 49      **Intensity Cor.** Stores the current values of the intensity adjustments under **DISPLAY** for recall of display intensity values at power-on.
- 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.

## 10-14 Service Key Menus and Error Messages

- 54     **Cav Osc Cor.** 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     **\*Cal Kit Def.** 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 do not return a PASS/FAIL condition. All six amber front panel LEDs will turn off if the test passes. The display will be blank; press **PRESET** to exit the test. If any of the six LEDs remain on, the test has failed.

- 59     **Disp/cpu com.** 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 writing 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 80), then pressing **EXECUTE TEST CONTINUE**. The test pattern will be displayed and the softkey labels blanked. 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. In this, and other solid test patterns, an extremely thin full-screen horizontal line will be seen about 1/4 screen height from the bottom. This condition is characteristic of the display and does not indicate any problem.
- 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 gun color. If the purity of the displayed test pattern is a problem, it usually indicates that the face of the display needs to be de-gaussed (de-magnetized). If the purity is bad, cycling the power a few times may cure the problem. If this does not work, a commercially available de-magnetizer must be used.
- 70      **Test Pat 5.** Displays a 16-step gray scale for verifying that the palette chip on the A19 GSP board can produce 16 different amplitudes of color (in this case, white.) 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.
- 71      **Test Pat 6.** Displays a 3-step gray scale pattern for adjusting the background level (or 0 step) so that the first bar is not visible, and the second bar is just barely visible. This pattern consists of the first three gray scale bars of the 16-step gray scale.
- 72      **Test Pat 7.** Displays a convergence pattern for measuring the accuracy of the color convergence. It is mainly for use by the factory, since convergence cannot be adjusted in the field.
- 73-74   **Test Pat 8-9.** Displays crosshatch and inverse crosshatch patterns for testing color convergence, linearity, alignment, and high voltage regulation, in the factory only. No field adjustments are possible.

- 75 **Test Pat 10.** Displays an H pattern for checking the focus of the display. Under normal conditions, this should never need to be adjusted. However, it is possible to adjust it by accessing the focus control adjustment at the left rear of the display. See the “Adjustments” chapter.
- 76 **Test Pat 11.** Verifies the functionality of the pixel stretching circuit of the A19 GSP board. Under normal conditions, this pattern should appear all white. If a failure occurs in the pixel stretching circuit, the pattern will consist of 16 alternating white and gray vertical stripes. Suspect problems with the STRETCH line and LFIRSTPIX.
- 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 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).
- 79 **Test Pat 14.** 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).
- 80 **Test Pat 15.** Displays a bandwidth pattern for verifying the bandwidth of the 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 adjustment can be performed in the factory only.

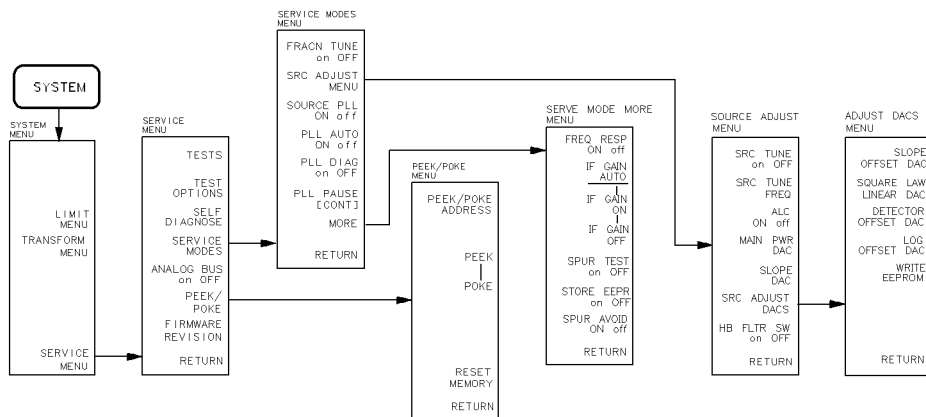
## 10-18 Service Key Menus and Error Messages



## 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



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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 FRACN 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 allow 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** with the ALC switched on, the main power dac controls the reference level of the ALC loop. With the ALC switched off, it controls the drive to the ALC modulator. The main power DAC gets overwritten at every internal phase locking.

**SLOPE DAC** for manufacturing use only.

**SRC ADJUST DACS** for manufacturing use only.

**HB FLTR SW on OFF** for manufacturing use only.

**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 (C1 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,” below, 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 (FRAC N)
- A14 fractional-N VCO divided down to 100 kHz (DIV FRAC 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.
- Fast-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.

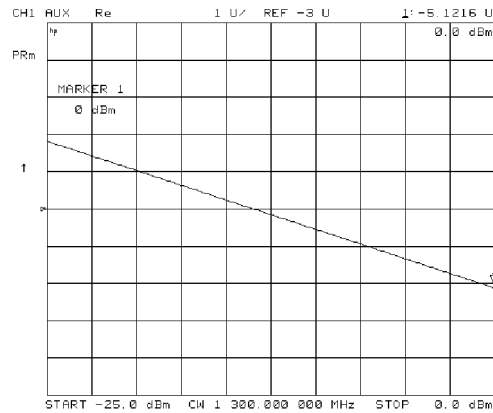
Press:

**PRESET**  
**SYSTEM** SERVICE MENU ANALOG BUS ON  
**MEAS** ANALOG IN  
**MENU** CW FREQ **1** **.** **3** **G/n** SWEEP TYPE MENU POWER SWEEP

### Node 1 Mn Pwr DAC (main power DAC)

Perform step A3, above, to set up a power sweep on the analog bus. Then press **MEAS** **ANALOG IN** **1** **x1** **SCALE REF** **AUTO SCALE** **MKR**.

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.



sh6117c

**Figure 10-4. Analog Bus Node 1**

## 10-30 Service Key Menus and Error Messages

**Node 2            Src 1V/GHz (source 1 volt per GHz)**

Press the following to view analog bus node 2:

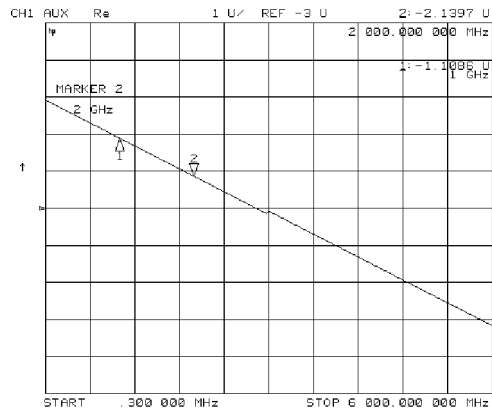
**PRESET**

**SYSTEM SERVICE MENU ANALOG BUS ON**

**MEAS ANALOG IN 2 x1**

**SCALE REF AUTO SCALE**

**MKR MARKER 2 2 G/n** Node 2 measures the voltage on the internal voltage controlled oscillator. During normal operation, it should read  $-1\text{V/GHz}$ .



sg6263d

**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**

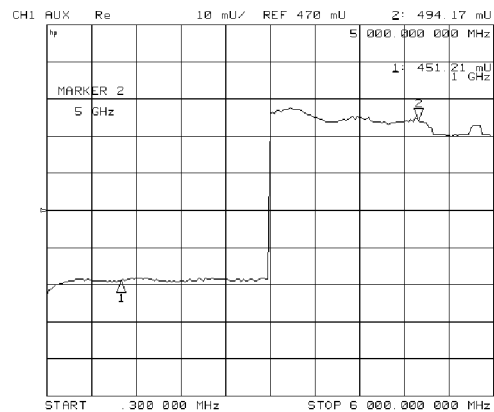
**SCALE REF** **AUTO SCALE**

**MKR** **MARKER 2** **5** **G/n**

Node 3 measures the current that goes to the main IF amplifier. At normal operation this node should read about:

430 mA from 300 kHz to 3 GHz

500 mA from 3 GHz to 6 GHz



sh6118c

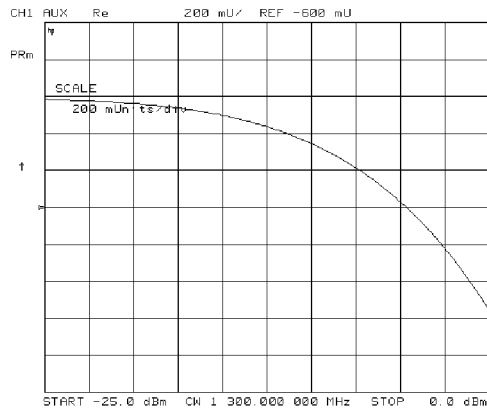
**Figure 10-6. Analog Bus Node 3**

## 10-32 Service Key Menus and Error Messages

**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  $-85$  dBm and  $+10$  dBm.



sh6119c

**Figure 10-7. Analog Bus Node 4**

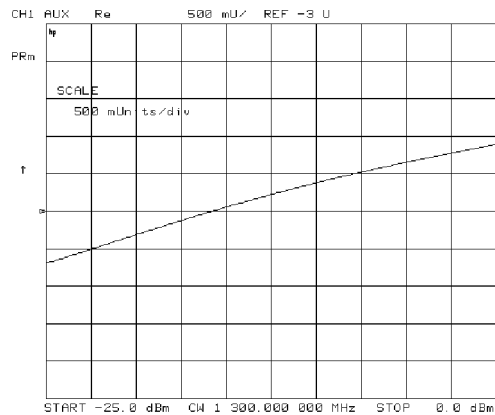
### Node 5 Temp (temperature sensor)

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, above, 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.



sh6120c

**Figure 10-8. Analog Bus Node 6**



### Node 7 Log (log amplifier output detector)

Perform step A3, above, to set up a power sweep on the analog bus. Then press

**MEAS** **ANALOG IN** **7** **x1**

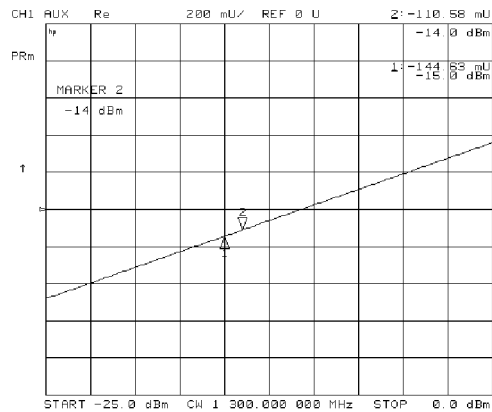
**SCALE REF** **AUTO SCALE**

**MKR** **-** **15** **x1**

**MARKER 2** **-** **14** **x1**

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. Absolute voltage level variations are normal. Flat segments indicate ALC saturation and should not occur between -25 dBm and 0 dBm.

The proper waveform at node 7 indicates that the circuits in the A3 source ALC loop are normal and the source is leveled.



sh6121c

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

**MKR**

**SYSTEM** SERVICE MENU ANALOG BUS ON

### 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 +0.37V. 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.

---

**Note** The marker reading shows units of “mV” (millivolts).

---

### 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 +2.5V. 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, above, 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.

### **A11 Phase Lock**

To observe the A11 analog bus nodes perform step A11, below. Then follow the node-specific instructions.

#### **Step A11.**

Press:

**PRESET**

**MEAS** **ANALOG IN**

**MKR**

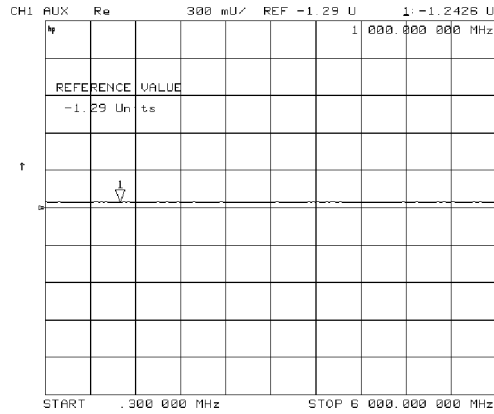
**SYSTEM** **SERVICE MENU** **ANALOG BUS ON**

### **Node 13            VCO Tune 2 (not used)**

### Node 14 Vbb Ref (ECL reference voltage level)

Perform step A11, above, 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.



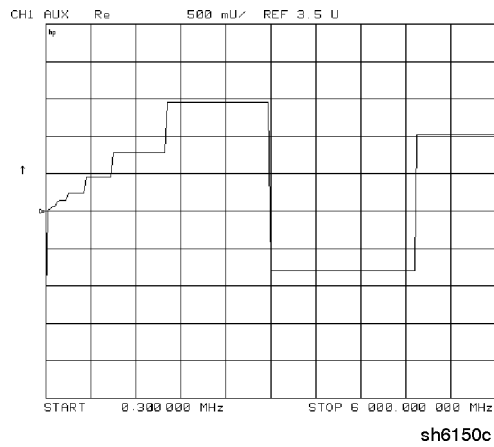
sh6122c

**Figure 10-10. Analog Bus Node 14**

### Node 15 Pretune (open-loop source pretune voltage)

Perform step A11, above, 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.

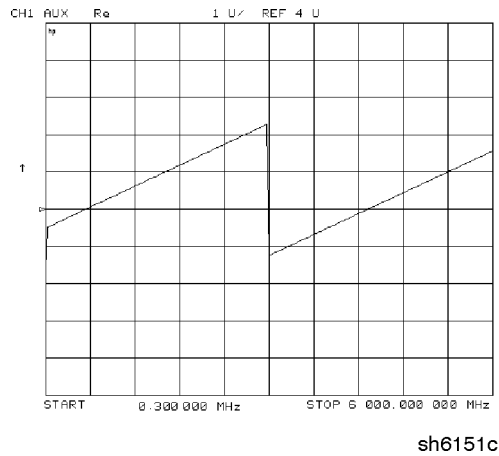


**Figure 10-11. Analog Bus Node 15**

**Node 16 1V/GHz (source oscillator tuning voltage)**

Perform step A11, above, 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 A11 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**

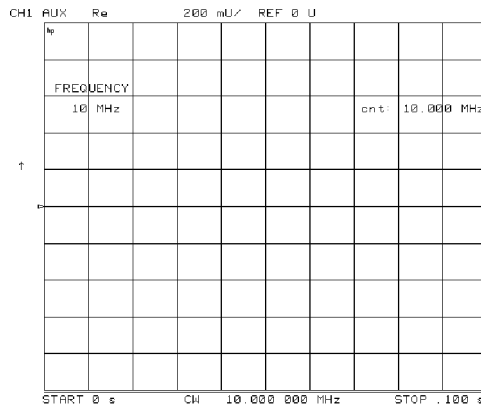
**Node 17 1st IF (IF used for phase lock)**

Perform step A11, above, 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 3 GHz	1 MHz

This node displays the IF frequency (see node17) as it enters the A11 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.



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**Figure 10-13. Counter Readout Location**

### Node 18 IF Det 2N (IF on A11 phase lock after 3 MHz filter)

Perform step A11, above, and then press **MEAS** **ANALOG IN** **18** **X1**

**STOP** **20** **M/μ**

**SCALE REF** **AUTOSCALE**

**MRK** **18** **M/μ**

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  $-1.7V$ ) means IF is in the passband of the filter. This node can be used with the FRAC N TUNE and SRC TUNE service modes.

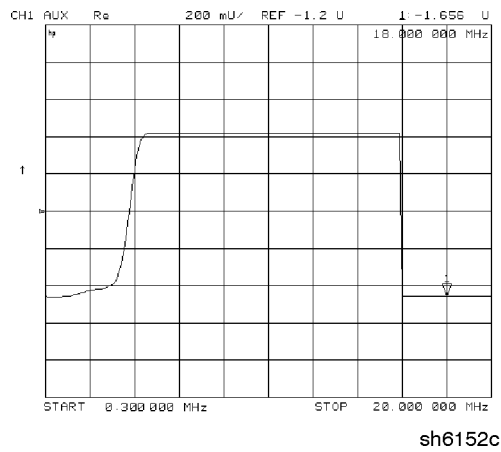


Figure 10-14. Analog Bus Node 18



**Node 19 IF Det 2W (IF after 16 MHz filter)**

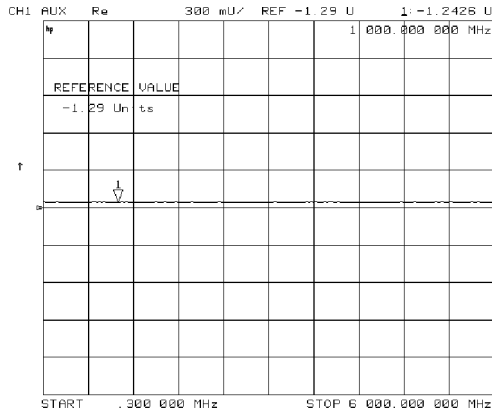
Perform step A11, above, and then press **MEAS** **ANALOG IN** **19** **x1** **STOP** **20** **x1** **SCALE REF** **2** **x1** **REFERENCE VALUE** **-1.2** **x1**.

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 line at about -1.7 V.

**Node 20 IF Det 1 (IF after 30 MHz filter)**

Perform step A11, above and then press **MEAS** **ANALOG IN** **20** **x1** **SCALE REF** **0.3** **x1** **REFERENCE VALUE** **-1.29** **x1**.

The trace should be a flat line 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.



sh6122c

**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

**MKR**

**SYSTEM** SERVICE MENU ANALOG BUS ON

### Node 21      100 kHz (100 kHz reference frequency)

Perform step A12, above, 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.

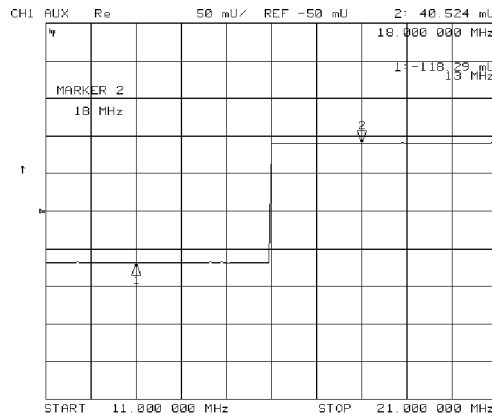
### Node 22      A12 Gnd 1 (ground)

### Node 23 VCO Tune (A12 VCO tuning voltage)

Perform Step A12, above, and then press:

START 11 M/μ  
STOP 21 M/μ  
MEAS ANALOG IN 23 x1  
SCALE REF AUTO SCALE  
MRK 13 M/μ  
MARKER 2 18 M/μ.

The trace should show a voltage step as shown in Figure 10-16. At normal operation, the left half trace should be  $0 \pm 1000$  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.



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Figure 10-16. Analog Bus Node 23

### Node 24      2nd LO

Perform step A12, above, 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 MHz to 6 GHz	1 MHz

### Node 25      PL Ref (phase lock reference)

Perform step A12, above, 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 A11 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 MHz to 6 GHz	1 MHz

### **Node 26            Ext Ref (rear panel external reference input)**

Perform step A12, above, and then press **MEAS** **ANALOG IN** **26** **x1**.

The voltage level of this node indicates whether an external reference timebase is being used:

- No external reference: about  $-0.9V$
- With external reference: about  $-0.6V$ .

### **Node 27            VCXO Tune (40 MHz VCXO tuning voltage)**

Perform step A12, above, and then press **MEAS** **ANALOG IN** **27** **x1** **MKR 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**

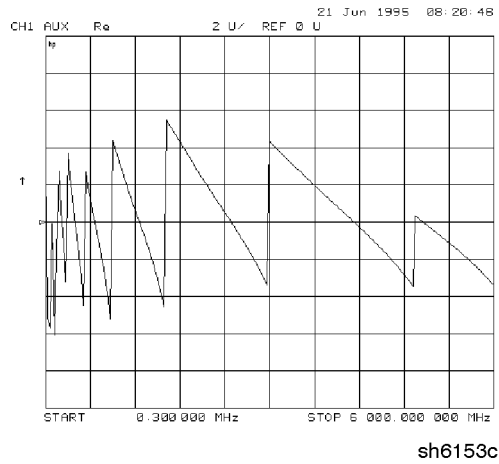
**MEAS** **ANALOG IN**

**SYSTEM** **SERVICE MENU** **ANALOG BUS ON**

**Node 29 FN VCO Tun (A14 FN VCO tuning voltage)**

Perform step A14, above, 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**

**10-48 Service Key Menus and Error Messages**

### Node 30 FN VCO Det (A14 VCO detector)

Perform step A14, above, 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.

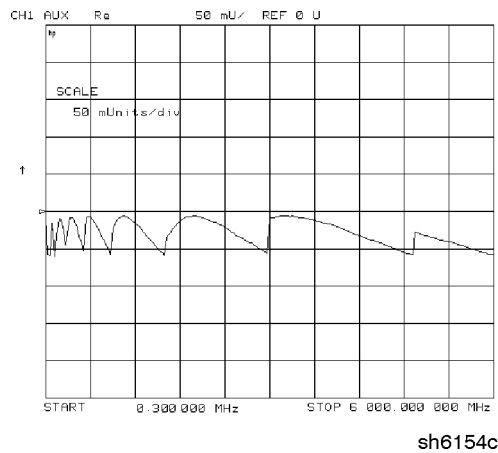


Figure 10-18. Analog Bus Node 30

### Node 31 Count Gate (analog bus counter gate)

Perform step A14, above, and then press **MEAS** **ANALOG IN** **31** **x1** **SCALE REF** **2** **x1** **MKR**.

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** (PEEK[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 jumper 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**.





---

## 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 <b>D</b> 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: 0 = pass 1 = fail 2 = in progress 3 = not available 4 = not done 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 8752C Network Analyzer User's Guide*.

---

---

### BATTERY FAILED . STATE MEMORY CLEARED

Error Number 183 The battery protection of the non-volatile CMOS memory has failed. The CMOS memory has been cleared. The battery should be replaced. See the "Preset State and Memory Allocation," chapter in the *HP 8752C Network Analyzer User's Guide* for more information about the CMOS memory.

---

### BATTERY LOW! STORE SAVE REGS TO DISK

Error Number 184 The battery protection of the non-volatile CMOS memory is in danger of failing. If this occurs, all of the instrument state registers stored in CMOS 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 8752C Network Analyzer User's Guide* for more information about the CMOS 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 addr

Error Number 119 The device at the selected address cannot be accessed by the 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 addr

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.

---

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.

---

OVERLOAD ON REFL PORT, POWER REDUCED

Error Number 58 You have exceeded approximately +20 dBm at the reflection port. The RF output power is automatically reduced to -20 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 the power back on.



---

OVERLOAD ON TRANS PORT, POWER REDUCED

Error Number 59 You have exceeded approximately +4 dBm at the reflection port. The RF output power is automatically reduced to -20 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 the power back on.

---

OVERLOAD ON INPUT R, POWER REDUCED

Error Number 57 You have exceeded approximately +17 dBm at the reflection port. The RF output power is automatically reduced to -20 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 the power back on.

---

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).

---

#### 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 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.

---

#### POW MET INVALID

Error Number 116 The power meter indicates an out-of-range condition. Check the test setup.

---

#### POW MET 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.

### 10-60 Service Key Menus and Error Messages

---

POW MET: not on, not connected, wrong addr

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.

---

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.

---

PRINTER: not on, not connected, wrong addr

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.

---

**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 TRIPPED , 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.

---

SYSTEM IS NOT IN REMOTE

Error Number 52 The analyzer is in local mode. In this mode, the analyzer will not respond to HP-IB commands with front panel key equivalents. It will, however, respond to commands that have no such equivalents, such as status requests.

---

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.



## 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 8752C Network Analyzer User’s Guide*. For details on the theory of error-correction, refer to the “Application and Operation Concepts” chapter of the *HP 8752C 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 characteristics 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 intervals, 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 the values of the 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, which may ultimately need replacing.

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.

### 11-2 Error Terms

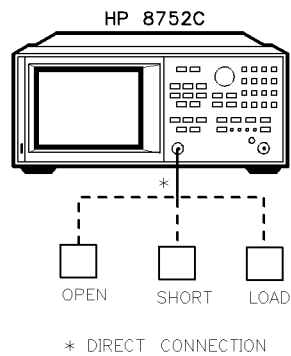


- Use error term analysis to troubleshoot minor, subtle performance problems. Refer to the “Start Troubleshooting Here” chapter if a blatant failure or gross measurement error is evident.
- It is often worthwhile to perform the procedure twice (using two distinct measurement calibrations) to establish the degree of repeatability. If the results do not seem repeatable, check all connectors and cables.

---

## Reflection 1-Port Error-Correction Procedure

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. Assuming that your calibration kit is the N 50 $\Omega$  default, press:  
**CAL KIT N 50 $\Omega$  RETURN**
4. To select the correction type, press:  
**CALIBRATE MENU REFLECTION 1-PORT**
5. Connect a shielded open circuit to the REFLECTION port. See Figure 11-1.



sh6134c

**Figure 11-1. Standard Connections for One-Port Error-Correction**

### 11.4 Error Terms

6. To measure the standard, press:

**FORWARD: OPENS OPEN (f)**

When the analyzer is done measuring the standard, press:

**DONE: OPENS**

7. Disconnect the open, and connect a short circuit to the REFLECTION port.

8. To measure the device, press:

**FORWARD: SHORTS SHORT (f)**

After the beep, press:

**DONE: SHORTS**

9. Disconnect the short, and connect an impedance-matched load to the REFLECTION port.

10. To measure the standard, press:

**FORWARD: LOAD**

The analyzer underlines the **LOAD** softkey after it measures the standard.

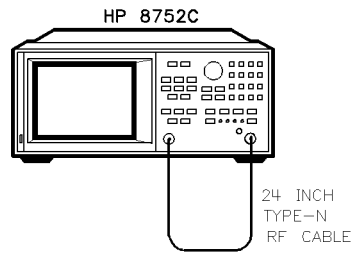
11. To compute the reflection correction coefficients, press:

**DONE: 1-PORT CAL**

---

## Response and Isolation Calibration Procedures

1. Press **MEAS** **TRANSMISSN** .
2. Press **CAL** **CAL KIT N 50Ω** **RETURN** .
3. Press **CALIBRATE MENU** **RESPONSE & ISOL'N** .
4. Press **RESPONSE** .
5. Connect equipment as shown in Figure 11-2.

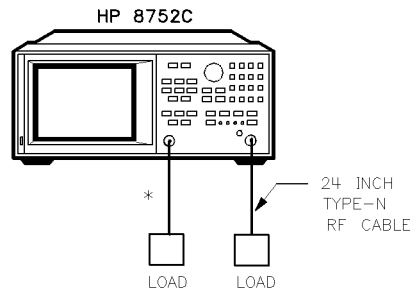


sh6132c

**Figure 11-2. Standard Connections for Response Calibration**

6. Press **THRU** .
7. After the beep, press **DONE: RESPONSE** .
8. Connect the equipment as shown in Figure 11-3.

### 11-6 Error Terms



\* DIRECT CONNECTION

sh6133c

**Figure 11-3. Standard Connections for Isolation Calibration**

9. Press **ISOL'N STD**.
10. After the beep, press **DONE: RESP ISOL'N CAL**.
11. 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 <sup>1</sup>	1-port	
1	$E_R$ or $E_T$	$E_X$ ( $E_D$ )	$E_D$	32
2		$E_T$ ( $E_R$ )	$E_S$	33
3			$E_R$	34

**NOTES:**  
 Meaning of first subscript: D=directivity; S=source match; R=reflection tracking; X=crosstalk;  
 L=load match; T=transmission tracking.

<sup>1</sup> Response and Isolation cal yields:  $E_X$  or  $E_T$  if a transmission measurement or  $E_D$  or  $E_R$  if a reflection measurement.

---

## Error Term Inspection

---

**Note** If the correction is not active, press **CAL** **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 11-2 lists the test numbers.

2. Press **SCALE REF** and adjust the scale and reference to study the error term trace.
3. Press **MKR 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 8752C Network Analyzer User’s Guide*.

### 11-8 Error Terms

## 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 1.3	1.3 to 3.0	3.0 to 6.0
Directivity	40 dB <sup>1</sup>	35 dB	32 dB
Source Match	30 dB	25 dB	20 dB
Reflection Tracking	±0.2 dB	±0.3 dB	±0.4 dB
Transmission Tracking	±0.2 dB	±0.3 dB	±0.4 dB
Crosstalk	100 dB	100 dB	90 dB

<sup>1</sup> 30 dB, 300 kHz to 10 MHz

---

## **Error Term Descriptions**

The error term descriptions in this section include the following information:

- significance of each error term
- typical results following either a reflection 1-port or a response and isolation calibration
- guidelines to interpret each error term



## Directivity ( $E_D$ ) - After a Reflection 1-Port Calibration

### Description

Directivity is a measure of any detected power that is reflected when a load is attached to the test port. The directivity error of the test port is determined by measuring the reflection of the load during the error-correction procedure.

### Significant System Components

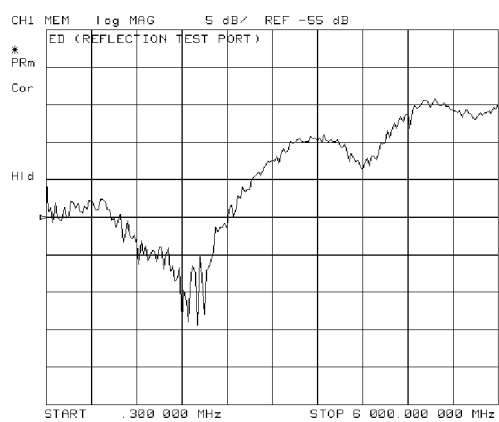
- load used in the error-correction (calibration)
- test port connectors
- analyzer's directional coupler

### Affected Measurements

Low reflection device measurements are most affected by directivity errors. Highly reflective device measurements will look normal.

### Procedure

To view the analyzer's directivity parameters, perform a 1-port calibration, then press: **SYSTEM** **SERVICE MENU** **TEST** **32** **x1**.



sh6124c

**Figure 11-4. Typical  $E_D$  (Reflection Test Port)**

## 11.12 Error Terms

## Source Match ( $E_S$ ) - After a Reflection 1-Port Calibration

### 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. It is obtained by measuring the reflection of an open and a short connected directly to the test port.

### Significant System Components

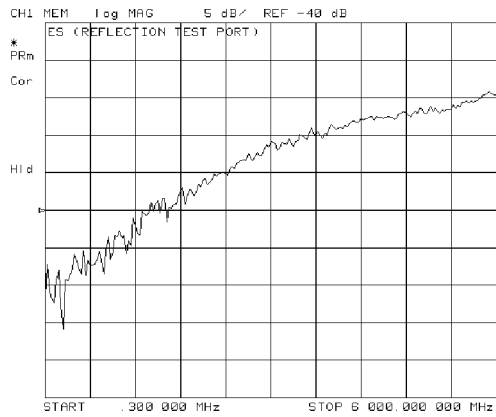
- open calibration kit device
- short calibration kit device
- analyzer's directional coupler
- test port connectors

### Affected Measurements

Reflection and transmission measurements of highly reflective devices are most affected by source match errors.

### Procedure

To view the analyzer's source match parameters, perform a 1-port calibration, then press: **SYSTEM** **SERVICE MENU** **TEST** **33** **x1**.



sh6125c

**Figure 11-5. Typical  $E_S$  (Reflection Test Port)**

#### 11.14 Error Terms

## Reflection Tracking ( $E_R$ ) - After a Reflection 1-Port Calibration

### 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 input path). The error term is obtained by measuring the reflections of an open and a short during calibration.

### Significant System Components

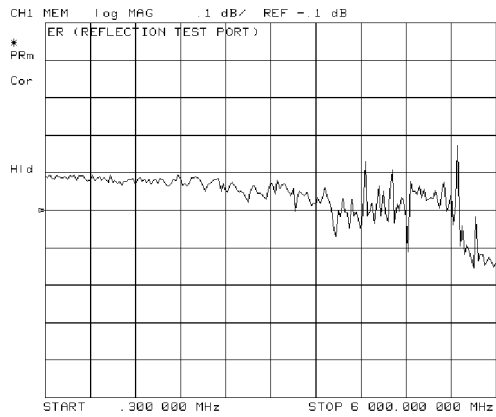
- open calibration kit device
- short calibration kit device
- R or A signal path for large variation in  $E_R$

### Affected Measurements

All reflection measurements (high or low return loss) are affected by the reflection tracking errors.

### Procedure

To view the analyzer's reflection tracking parameters, perform a 1- port calibration, then press: **SYSTEM** **SERVICE MENU** **TEST** **34** **x1**.



sh6126c

**Figure 11-6. Typical  $E_R$  (Reflection Test Port)**

## 11.16 Error Terms

## **Isolation (Crosstalk, $E_X$ ) - After a Response and Isolation (Transmission) Calibration**

### **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 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**

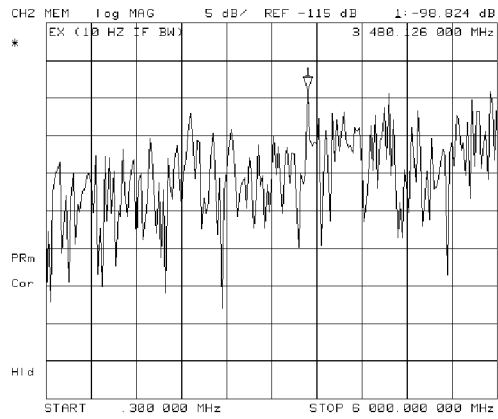
- sampler crosstalks

### **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.

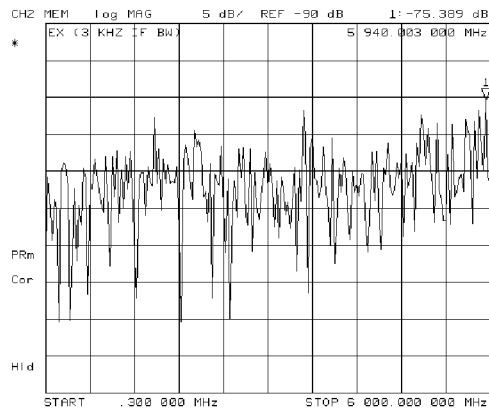
### **Procedure**

To view the analyzer's isolation parameters, perform a response and isolation calibration, then press: **SYSTEM** **SERVICE MENU** **TEST** **34** **x1**.



sh6127c

Figure 11-7. Typical  $E_X$  with 10 Hz Bandwidth



sh6128c

Figure 11-8. Typical  $E_X$  with 3 kHz Bandwidth

## 11-18 Error Terms



## Transmission Tracking ( $E_T$ )

### Description

Transmission tracking is the difference between the frequency response of the reference path (including R input) and the transmission test path (including A input) while measuring transmission. The response of the test port cables is included. These terms are characterized by measuring the transmission of the “thru” configuration during the error-correction procedure.

### Significant System Components

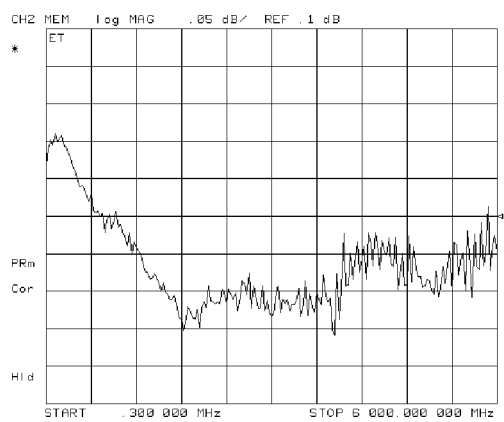
- R signal path
- A input paths
- “thru” cable

### Affected Measurements

All transmission measurements are affected by transmission tracking errors.

### Procedure

To view the analyzer’s transmission tracking parameters, perform a 1-port calibration, then press: **SYSTEM** **SERVICE MENU** **TEST** **34** **x1**.



sh6129c

**Figure 11-9. Typical  $E_T$**

## 11-20 Error Terms

## Theory of Operation

---

This chapter is divided into two major sections:

- “How the HP 8752C Works” gives a general description of the HP 8752C network analyzer’s operation.
- “A Close Look at the Analyzer’s Functional Groups” provides more detailed operating theory for each of the analyzer’s functional groups.

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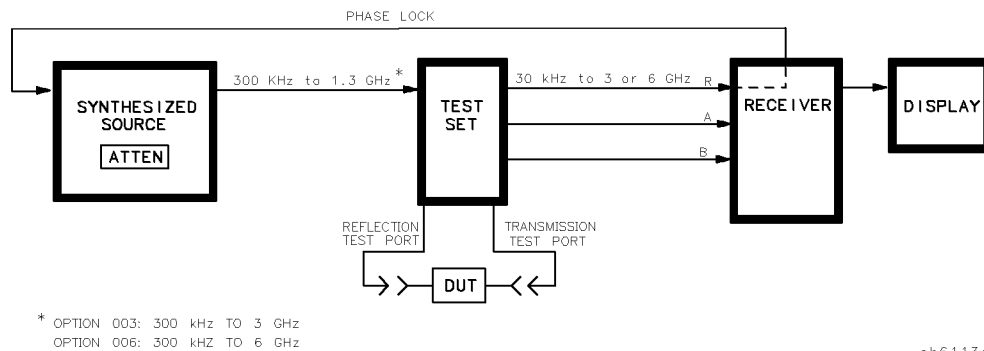
## How the HP 8752C Works

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. These signals are then applied to a receiver for measurement, signal processing, and display.

The HP 8752C vector network analyzer integrates a high resolution synthesized RF source, transmission/reflection 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 8752C Option 010 has the additional capability of transforming measured data from frequency domain to 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 the “Start Troubleshooting Here” chapter.



**Figure 12-1. Simplified Block Diagram of the Network Analyzer System**

### 12-2 Theory of Operation

### **The Built-In Synthesized Source**

The analyzer's built-in synthesized source produces a swept RF signal in the range of 300 kHz to 1.3 GHz. The HP 8752C Option 003 is able to generate signals up to 3 GHz and the Option 006 generates 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 sampler/mixer of the receiver, where it is sampled by the phase detection loop and fed back to the source.

### **The Source Step Attenuator (Option 004)**

The HP 8752C Option 004 includes a 70 dB, electro-mechanical step attenuator. This very low-loss attenuator is contained in the source assembly. 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 Transmission/Reflection Test Set**

The HP 8752C features a built-in test set that provides the signal separation capability for the device under test. The test uses a dual directional coupler to separate the incident signal from the transmitted and reflected signals. The incident signal is applied to the R sampler/mixer via one of coupled arms of the dual directional coupler. Meanwhile, the reflected signal is routed from the reflection test port via the other coupled arm of the dual directional coupler to the input of the A sampler/mixer in the receiver. The transmitted signal is fed directly from the transmission test port to the B sampler/mixer. (Analyzers having Option 006 have an 8 dB pad between the transmission test port and the B sampler/mixer.)

## **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.

## **12-4 Theory of Operation**

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## A Close Look at the Analyzer's Functional Groups

The operation of the analyzer can be divided into five functional groups. Each group consists of several major assemblies and performs a distinct function. 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 A1 front panel and A2 front panel processor, the A9 CPU, the A16 rear panel, the A18 display, and the A19 graphics system processor (GSP) assemblies. 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, A11 phase lock, A12 reference, A13 fractional-N (analog), and A14 fractional-N (digital) assemblies. The A4 R 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.

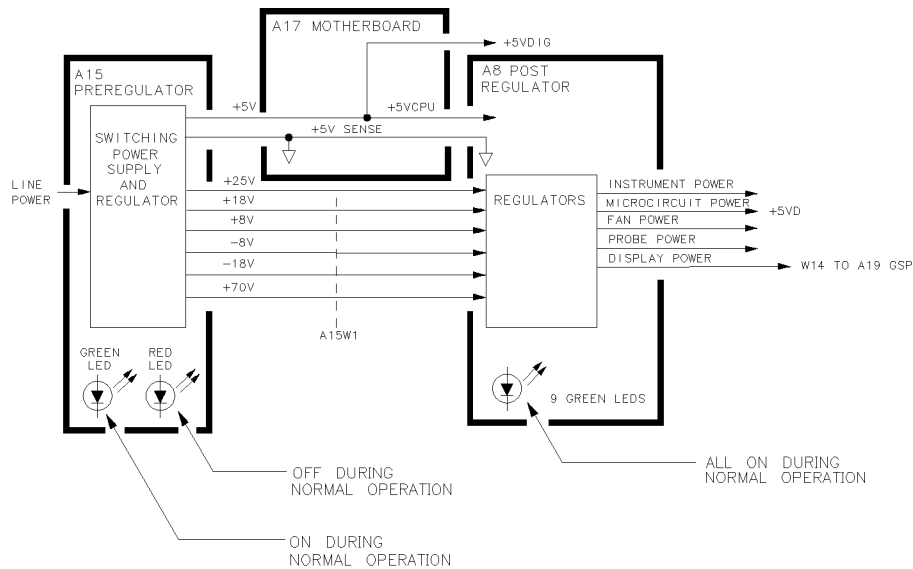
**Signal Separation.** The signal separation group consists of the A30 dual directional coupler assembly. This assembly performs the function of a reflection/transmission test set. It divides the source signal into a reference path and a test path, and provides connections to the device under test.

**Receiver.** The receiver group consists of the A4/A5/A6 sampler/mixers and the A10 digital IF assemblies. The A12 reference assembly and the A9 CPU assembly 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.



sg636d

**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 +5V 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 +5V digital supply. It provides LEDs (visible from the rear of the instrument) to indicate either normal operating or shutdown status.

#### 12-6 Theory of Operation



## **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 115V or 230V (with 350 VA maximum). The main fuse, which protects the input side of the preregulator against drawing excessive line current, is also accessible at the rear panel. Refer to the *HP 8752C 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 +5V digital supply is routed directly to the motherboard. The following partially regulated voltages are routed through A15W1 to the A8 post regulator for final regulation:

+70V +25V +18V -18V +8V -8V

## **Regulated +5V Digital Supply**

The +5VD supply is regulated by the control circuitry in the A15 preregulator. It is routed directly to the motherboard, and from there to all assemblies requiring a low noise digital supply. A +5V sense line returns from the motherboard to the A15 preregulator. The +5V CPU is derived from the +5 VD in the A8 post regulator and goes directly to the A19 GSP.

In order for the preregulator to function, the +5V digital supply must be loaded by one or more assemblies, and the +5V 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, 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 +5V 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 the 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 the “Power Supply Troubleshooting” chapter 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’s display. The voltages that are not shut down are the +5VD and +5VCPU 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 jumpering the SDIS line (A8TP4) to ground.

### **Variable Fan Circuit and Air Flow Detector**

The fan power is derived directly from the +18V and –18V supplies from the A15 preregulator. Because the fan is not fused, 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’s display. The fan also runs at full speed if the air flow detector senses a low output of air from the fan. (Full speed is normal at initial power on.)

## **12-8 Theory of Operation**

### **Display Power**

The A8 assembly supplies voltages to the display through a wire cable. The A8 supplies +5V CPU and +65V to the A19 GSP, then the +65V is routed to the display. Because they are not connected to the protective shutdown circuitry, the A18 display assemblies can operate during troubleshooting when other supplies do not work.

### **Probe Power**

The +18V and -18V supplies are post regulated to +15V and -12.6V to provide a power source at the front panel for an external RF probe or milli-meter modules.

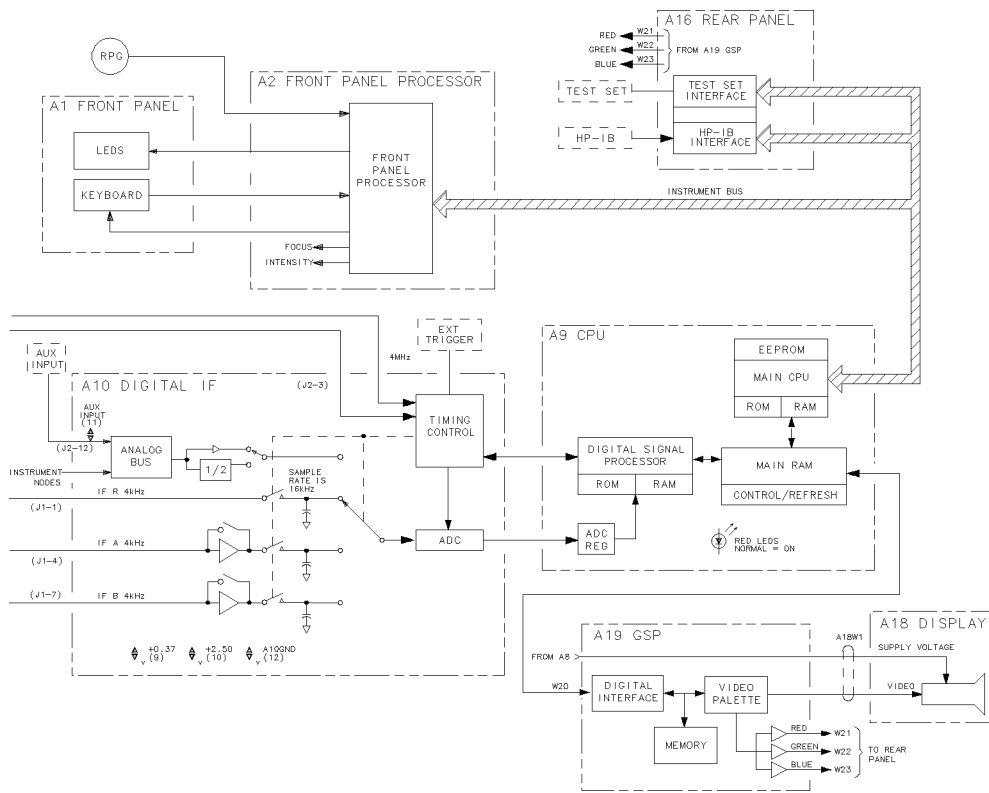
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## **Digital Control Theory**

The digital control functional group consists of the following assemblies:

- A1 front panel
- A2 front panel processor
- A9 CPU
- A10 digital IF
- A16 rear panel
- A18 display
- A19 GSP

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 block diagram of the digital control functional group.



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**Figure 12-3. Digital Control Group, Block Diagram**

### A1 Front Panel Keyboard

The A1 front panel keyboard 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 A1 front panel keyboard, but provides user inputs directly to the front panel processor.

### 12-10 Theory of Operation

## **A2 Front Panel Processor**

The A2 front panel processor detects and decodes user inputs from the front panel keys and RPG knob, and transmits them to the CPU. It has the capability to interrupt the CPU to provide information updates. It also controls the front panel LEDs that provide status information to the user.

## **A9 CPU/A10 Digital IF**

The A9 CPU assembly contains the main CPU (central processing unit), the digital signal processor, memory storage. The main CPU is the master controller for the analyzer, including the other dedicated microprocessors. The memory includes EEPROM, RAM, EPROM, and 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 firmware on the A9 assembly.

## **Main CPU**

The main CPU is a 16-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 EPROM that contains the operating system for instrument control. Front panel settings are stored in CMOS RAM, with a battery providing at least 5 years of backup storage when external power is switched 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's display.

Detailed information on the data processing sequence is provided in *HP 8752C Network Analyzer User's Guide*.

### **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 the "Adjustments and Correction Constants" chapter.

### **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.

### **A18 Display**

The A18 display is a 7.5-inch raster scan CRT with associated drive circuitry. It receives a +65V power supply from the A19 GSP, along with digital TTL horizontal and vertical sync signals, as well as red, green, and blue (RGB) video signals. Automatic degaussing is performed whenever the instrument is switched on to minimize the magnetization of the display.

### **A19 GSP**

The A19 graphics system processor (GSP) provides an interface between the A9 CPU and the A18 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 and sends the signals to the A18 display. It also produces RGB output signals which are sent to the rear panel. The assembly receives two power supply voltages: +5V<sub>CPU</sub>, which is used for processing, and +65V, which is passed on to A18 display but not used on A19 GSP.

## **12.12 Theory of Operation**

## A16 Rear Panel

The A16 rear panel includes the following interfaces:

**TEST SET I/O INTERCONNECT.** The HP 8752C cannot be used with external test sets. However, with an adapter, you can use signal levels for sequencing. Refer to the “Application and Operation Concepts” chapter of the *HP 8752C Network Analyzer User’s Guide* for information on applying the test set interconnect.

**EXT REF IN.** 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.

**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. (You can also use this connector as an analog output in service routines.)

**EXT AM.** This allows an external analog signal input to be applied to the ALC circuitry of the analyzer’s source. This input analog signal amplitude modulates the RF output signal.

**EXT TRIGGER.** 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.

**EXT MON: RED, GREEN, BLUE.** Although these interfaces are not electrically connected to the A16 rear panel interface board, they are connected to the rear panel assembly. Three video output connectors provide analog blue, green, and red video signals which you can use to drive an analog multi-sync monitor. The monitor must be compatible with the analyzer’s 25.5 kHz scan rate and video levels: 1 Vp-p, 0.7 V = white, 0 V = black, -0.3 V sync, sync on green.

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## 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 1.3 GHz (3 GHz for Option 003 and 6 GHz for Option 006). The maximum leveled power is +5 dBm. Option 004 analyzers have a 70 dB step attenuator built into the source that allows the power to be decreased to -85 dBm and increased to a maximum leveled power of +10 dBm.

The full frequency range of the source is produced in 13 subsweeps, two in low band and eleven in high band. The high band frequencies start at 16 MHz and go up to 1.3 GHz (3 GHz for Option 003 and 6 GHz for Option 006). The high band frequencies 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 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 A14 assembly generates the stable LO frequencies for fundamental and harmonic mixing.

### A12 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 A12 reference assembly. (The 2nd LO signal from the A12 assembly is explained in "Receiver Theory".)

### 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 operation the pulse generator is turned off.

## 12.14 Theory of Operation



### **A11 Phase Lock**

This assembly compares the first IF (derived from the source output in the A4 R 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 (300 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.

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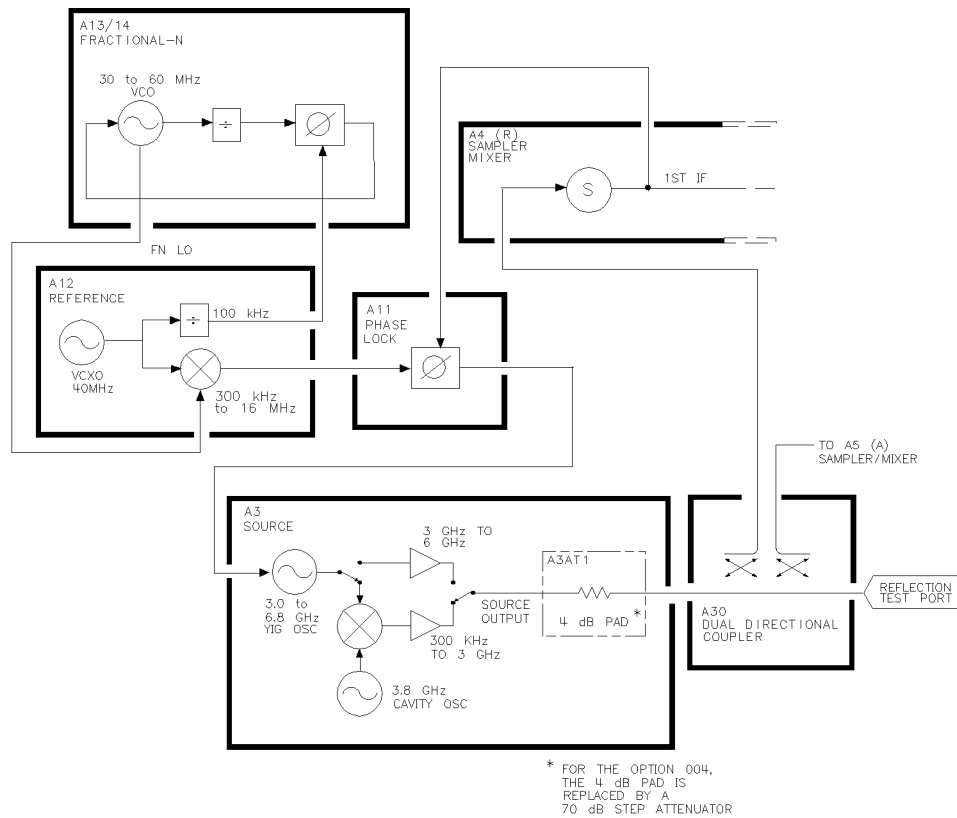
## Source Low Band Operation

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 A11 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 R 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 A11 assembly.
3. **The A3 source is pretuned. The source output is fed to the A4 R sampler/mixer.** The pretuned DAC in the A11 phase lock assembly sets the A3 source to a frequency 1 to 6 MHz above the start frequency. This signal (source output) is applied to the A4 R sampler/mixer assembly via the coupled arm of the A30 dual directional coupler.
4. **The signal from the source is fed back (1st IF) to the phase comparator.** The source output signal passes directly through the R 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 A11 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.

### 12.16 Theory of Operation

6. **A synthesized sub sweep is generated. The source tracks the synthesizer.** When phase 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.



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**Figure 12-4. Low Band Operation of the Source**

The full low band is produced in two subsweeps, to allow additional IF filtering below 3 MHz. At the transition between subsweeps, the source is retuned and then relocks. Table 12-1 lists the low band subsweep frequencies at the fractional-N VCO and the source output.

**Table 12-1. Low Band Subsweep Frequencies**

<b>Fractional-N (MHz)</b>	<b>1st IF (MHz)</b>	<b>Source Output (MHz)</b>
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 1.3 GHz (3.0 GHz for Option 003 and 6.0 GHz for 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:

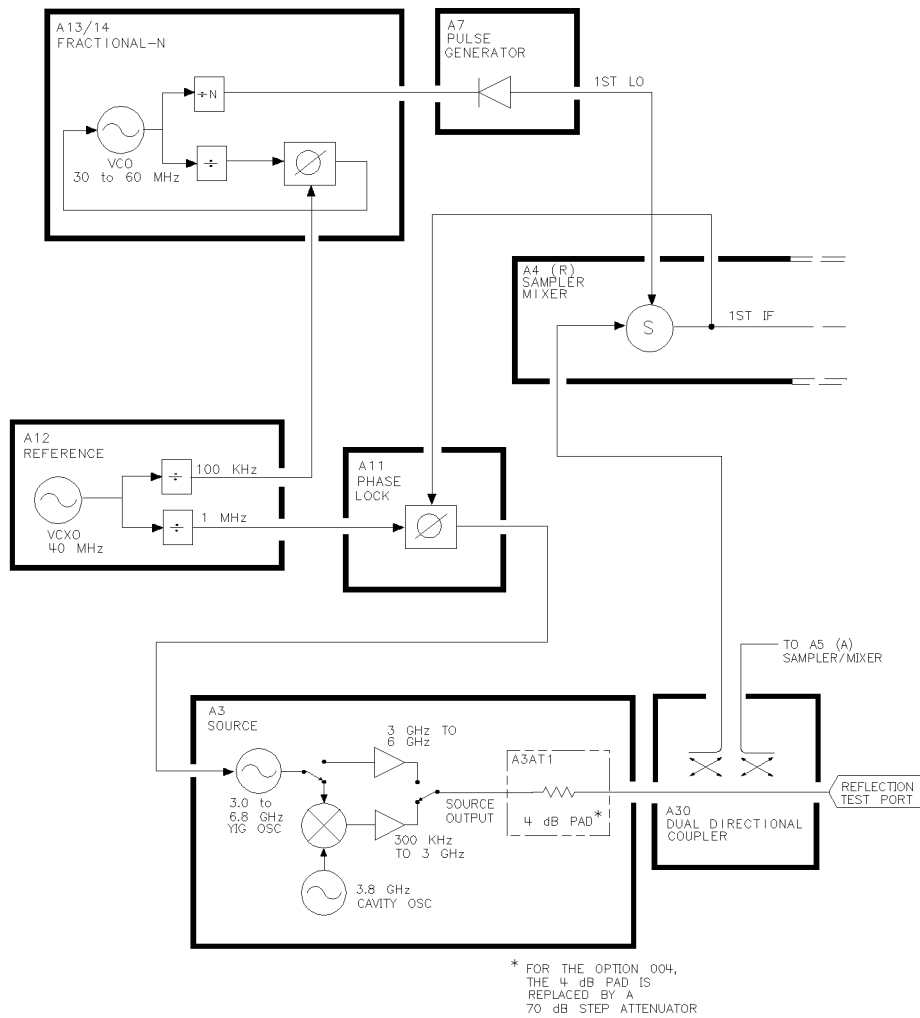
1. **A signal (HI OUT) is generated by the fractional-N VCO.** The VCO in the A14 fractional-N assembly generates a CW or swept signal in the range of 30 to 60 MHz. This signal is synthesized and phase locked to a 100 kHz reference signal from the A12 reference assembly. The signal from the fractional-N 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 pretuned. The source output is fed to the A4 R sample/mixer.** The pretune DAC in the A11 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 sampler/mixer assembly via the coupled arm of the dual directional coupler.
4. **The synthesizer signal and the source signal are combined by the sampler. A difference frequency is generated.** In the A4 R 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. The 1st IF is routed back to the A11 phase lock assembly.
5. **The difference frequency (1st IF) from the A4 R 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 12-2 lists the high band subsweep frequencies from the fractional-N VCO and the source output.



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**Figure 12-5. High Band Operation of the Source**

**Table 12-2. High Band Sub sweep Frequencies**

<b>Fractional-N (MHz)</b>	<b>Harmonic</b>	<b>Source Output (MHz)</b>
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	9	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
37.0 to 59.6	83	3000 to 4950
49.0 to 59.4	101	4950 to 6000



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## Signal Separation

### The A30 Dual Directional Coupler

Signal separation in the analyzer is accomplished with a dual directional coupler which, by itself, comprises the analyzer's built-in test set. The dual directional coupler is connected to the reflection test port. It is used to separate the incident signal going to the device under test from reflected signal coming from the device under test. The incident signal is applied to the R sampler/mixer via one of coupled arms of the dual directional coupler. Meanwhile, the reflected signal is routed from the reflection test port via the other coupled arm of the dual directional coupler to the input of the A sampler/mixer in the receiver.

The transmitted signal is fed directly from the transmission test port to the B sampler/mixer. (Analyzers having Option 006 have an 8 dB pad between the transmission test port and the B sampler/mixer.)

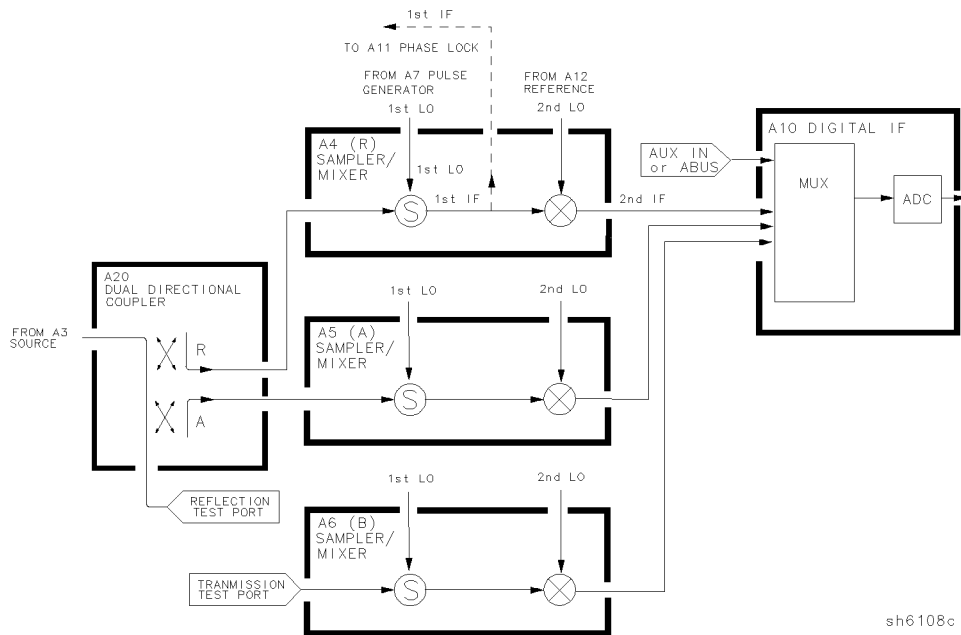
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## Receiver Theory

The receiver functional group consists of the following assemblies:

- A4 R sampler/mixer
- A5 A sampler/mixer
- A6 B sampler/mixer
- A10 digital IF

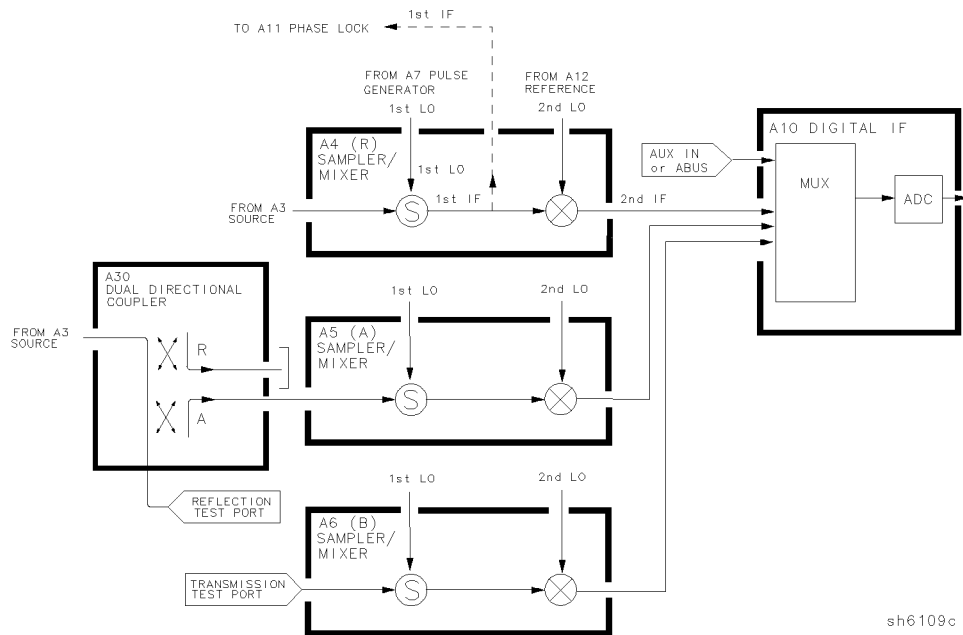
These assemblies combine with the A9 CPU (described in "Digital Control Theory") to measure and process input signals into digital information for display on the analyzer. Figure 12-6 through Figure 12-9 are simplified block diagrams of the different receiver functional groups for the various analyzer options.



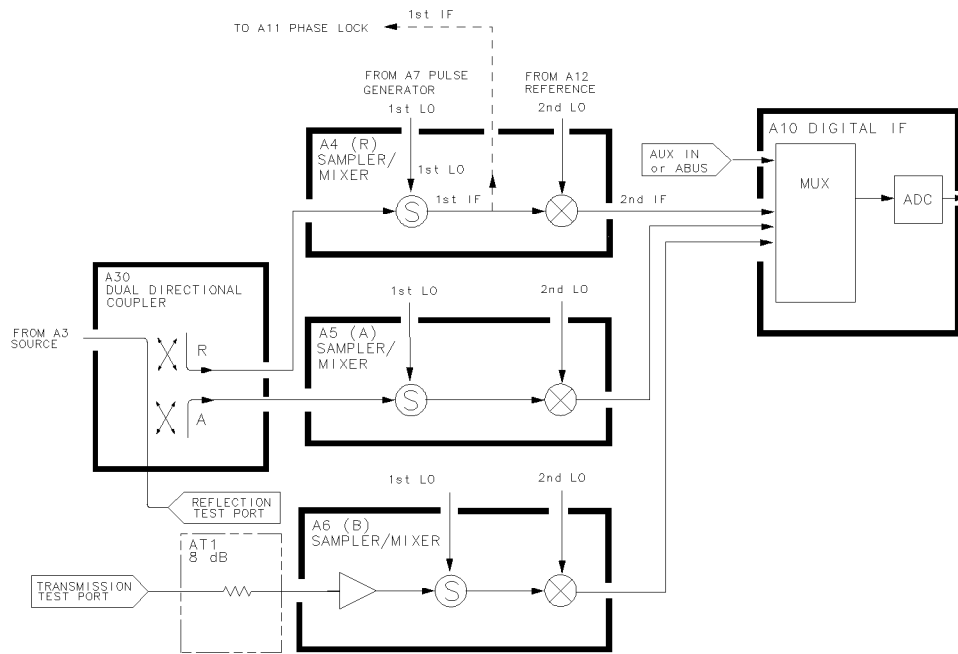
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**Figure 12-6. Receiver Functional Group (standard and Option 003)**

**12-24 Theory of Operation**



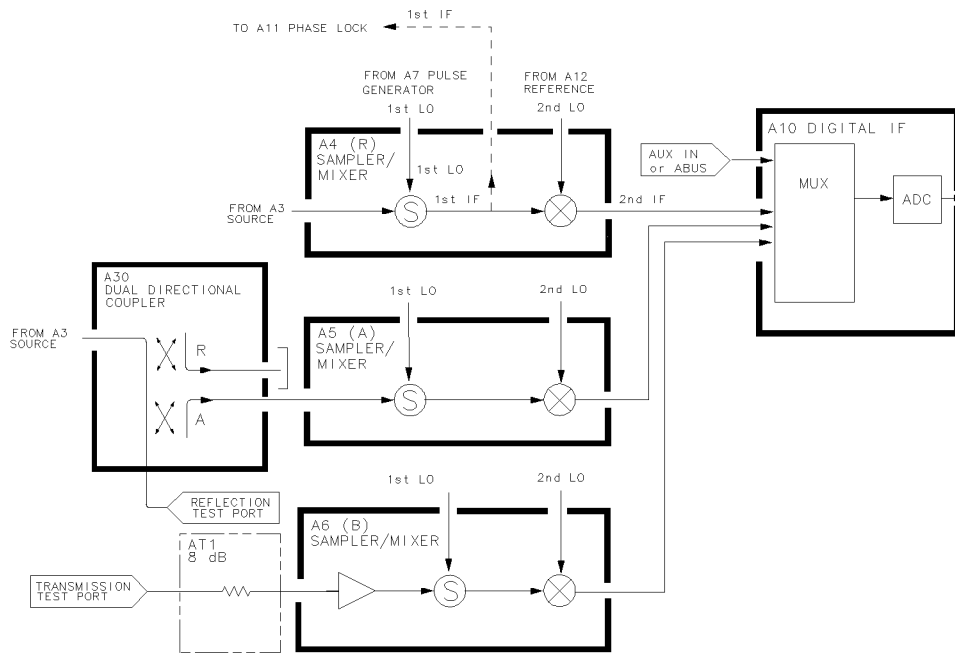
**Figure 12-7. Receiver Functional Group (Option 003 and 004)**



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**Figure 12-8. Receiver Functional Group (Option 006)**

**12-26 Theory of Operation**



sh6110c

**Figure 12-9. Receiver Functional Group (Option 004 and 006)**

## **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. For the analyzer with with Option 006, the A6 B sampler/mixer assembly includes an 8 dB gain preamplifier in front of the sampler. This improves the noise figure performance of the analyzer's receiver channel 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 source output signal. In options 003 and 006, samplers are additionally capable of receiving RF input signals up to 3 and 6 GHz respectively. 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 A4 R sampler is fed back to the A11 phase lock assembly.

### **The Sampler Circuit in Low Band**

In 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), and sweeps with it. Part of the 1st IF signal from the A4 R sampler is fed back to the A11 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 39.84 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.

## **12-28 Theory of Operation**

### 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 12-3 shows.

**Table 12-3. Mixer Frequencies**

<b>Band</b>	<b>1st IF</b>	<b>2nd LO</b>	<b>2nd IF</b>
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.





## Replaceable Parts

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This chapter contains information for ordering replacement parts for the HP 8752C network analyzer. Replaceable parts include the following:

- major assemblies
- cables
- chassis hardware

In general, parts of major assemblies are not listed. Refer to “Abbreviations” at the back of this chapter to help interpret part descriptions in the replaceable parts lists that follow.

---

## **Assembly Replacement Sequence**

The following steps show the sequence to replace an assembly in an HP 8752C Network Analyzer.

1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.

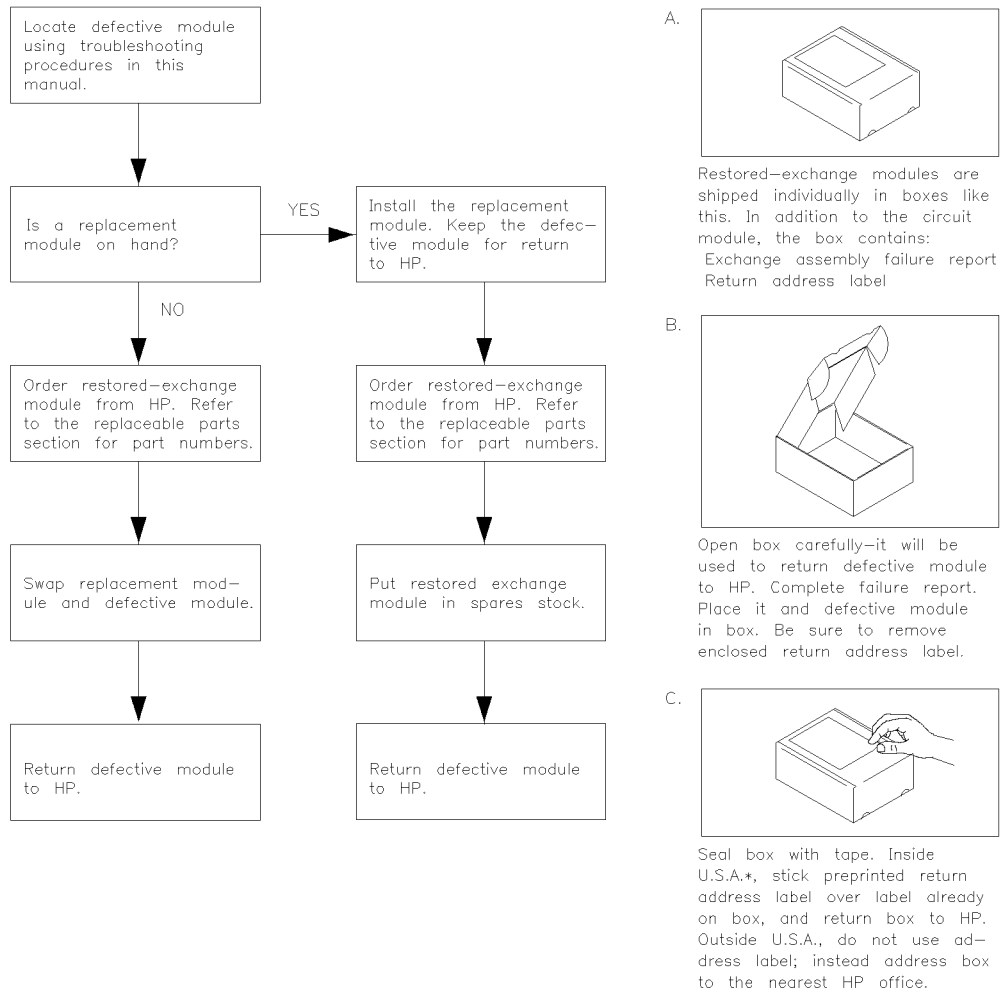
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## **Save Money with Rebuilt-Exchange Assemblies**

Under the rebuilt-exchange assembly program, certain factory-repaired and tested modules (assemblies) are available on a trade-in basis. These assemblies cost less than a new assembly, and 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. Figure 13-1 illustrates the module exchange procedure. “Major Assemblies” shows all major assemblies, including those that can be replaced on an exchange basis.

The module exchange program described here is a fast, efficient, economical method of keeping your Hewlett-Packard instrument in service.



\*HP pays postage on boxes mailed in U.S.A.

sg613d

**Figure 13-1. Module Exchange Procedure**

---

## **Gather This Information Before Ordering**

To order a part listed in the replaceable parts lists:

1. Determine the part number.
2. Determine the quantity required.
3. Mail this information to the nearest Hewlett-Packard office or, in the U.S., call the hotline number listed in the following section.

To order a part not listed in the replaceable parts lists:

1. Note the instrument model number (HP 8752C).
2. Note the serial number and options, if any (see rear panel).
3. Describe the part.
4. Describe the function of the part.
5. Determine the quantity required.
6. Mail this information to the nearest Hewlett-Packard office or, in the U.S., call the hotline number listed in the following section.

### **Call (800) 227-8164 to Order Parts Fast (U.S. only)**

When you have gathered the information required to place an order, contact Hewlett-Packard's direct ordering team by calling the following toll-free hotline number:

(800) 227-8164

Monday through Friday, 6 AM to 5 PM (Pacific Standard Time)

The parts specialists have direct online access to replacement parts inventory corresponding to the replaceable parts lists in this manual. Four day delivery time is standard; there is a charge for hotline one-day delivery.

This information applies to the United States only. Outside the United States, contact your nearest HP office.

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## Replaceable Part Listings

The following pages list the replacement part numbers and descriptions for the HP 8753C 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
- Front Panel Assemblies
- Rear Panel Assemblies
- Cables, Top View
- Front Panel, Cables and Attaching Hardware
- Rear Panel, Cables and Attaching Hardware
- Source and Sampler Parts: Standard and Option 003
- Source and Sampler Parts: Option 004/006
- Source and Sampler Parts: Options 004 and 003/004
- Source and Sampler Parts: Option 006
- Display Bezel Assembly
- Chassis Parts
- Top View of Attaching Hardware and Post Regulator Fuses
- Bottom View of Attaching Hardware
- Right View of Attaching Hardware
- Left View of Attaching Hardware
- Rear Panel Attaching Hardware
- Replaceable Labels
- Miscellaneous Parts and Accessories

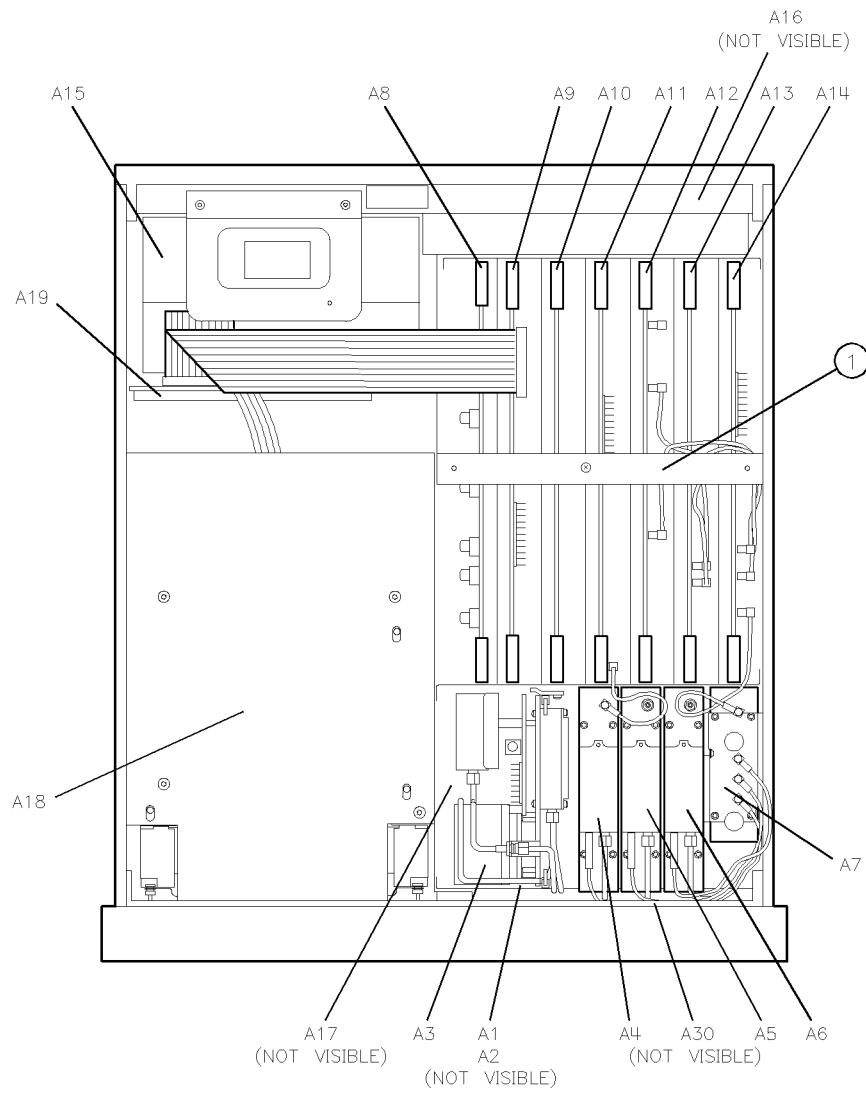
## Major Assemblies

Item	Opt.	HP Part Number	Qty	Description
A1				FRONT PANEL KEYBOARD ASSY (see "Front Panel Assemblies")
A2				FRONT PANEL INTERFACE ASSY (see "Front Panel Assemblies")
A3				SOURCE ASSY (see "Source and Sampler Parts")
A4				R SAMPLER ASSY (see "Source and Sampler Parts")
A5				A SAMPLER ASSY (see "Source and Sampler Parts")
A6				B SAMPLER ASSY (see "Source and Sampler Parts")
A7		08753-60007	1	PULSE GENERATOR BD ASSY
		08753-69007		PULSE GENERATOR BD ASSY (Rebuilt-Exchange) (includes board cover)
A8		08753-60208	1	POST REGULATOR BD ASSY
		08753-69208		POST REGULATOR BD ASSY (Rebuilt-Exchange)
A9		08752-60016	1	CPU BD ASSY
A9BT1		1420-0394	1	BATTERY-LITHIUM 3V 1A (not shown)
A10		08753-60095	1	DIGITAL IF BD ASSY
		08753-69095		DIGITAL IF BD ASSY (Rebuilt-Exchange)
A11		08753-60162	1	PHASE LOCK BD ASSY
A12		08752-60023	1	REFERENCE BD ASSY
A13		08753-60013	1	FRACTIONAL-N ANALOG BD ASSY
		08753-69013		FRACTIONAL-N ANALOG BD ASSY (Rebuilt-Exchange)
A14		08753-60068	1	FRACTIONAL-N DIGITAL BD ASSY
A15		08753-60098	1	PREREGULATOR ASSY
		08753-69098		PREREGULATOR ASSY (Rebuilt-Exchange)
A16				REAR PANEL BD ASSY (see "Rear Panel Assemblies")
A17		08753-60130	1	MOTHERBOARD ASSY REPLACEMENT KIT (includes motherboard, card cage, and corner struts)
A18		2090-0210	1	DISPLAY ASSY
		5180-8484		DISPLAY ASSY (Rebuilt-Exchange)
A19		08753-60170	1	GRAPHICS SYSTEM PROCESSOR (GSP) ASSY
A30		5086-7955	1	50Ω DUAL DIRECTIONAL COUPLER*
		5086-6955		50Ω COUPLER* (Rebuilt-Exchange)
	075	5086-7557	1	75Ω DUAL DIRECTIONAL COUPLER*
	075	5086-6557		75Ω COUPLER* (Rebuilt-Exchange)
AT1	006			8 dB ATTENUATOR (see "Source and Sampler Parts")
B1		08753-60047	1	FAN ASSEMBLY

\*includes bracket and front panel connectors

### 13-6 Replaceable Parts

## Major Assemblies



sh65c

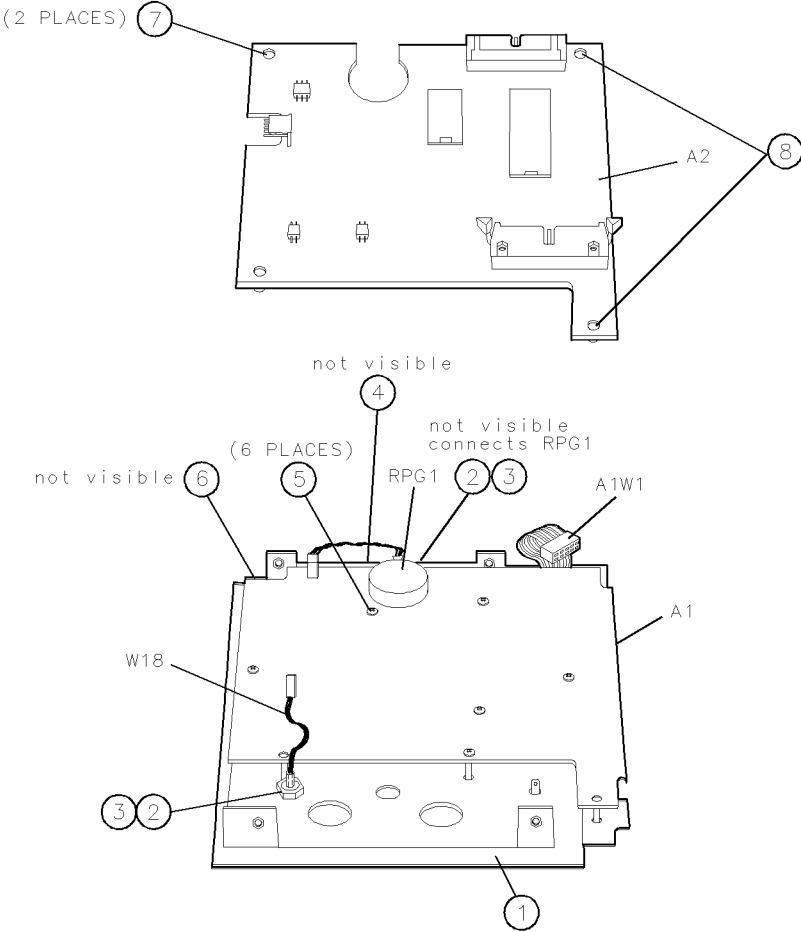
## Front Panel Assemblies

Item	Opt.	HP Part Number	Qty	Description
1		08752-60029	1	50Ω FRONT DRESS PANEL
1	075	08752-60030	1	75Ω FRONT DRESS PANEL
2		2190-0016	3	WASHER-LOCK INTERNAL T 3/8 INCH 0.377-INCH-ID
3		2950-0043	3	NUT-HEX-DOUBLE CHAMFER 3/8-32-THREAD
4		01650-47401	1	RPG KNOB
5*		0515-0374	6	SCREW-MACHINE M3.0×10 CW-PN-TX
6		08752-40003	1	KEYPAD, RUBBER
7*		0515-1410	2	SCREW-MACHINE M3.0 × 20 CW-PN-TX
8*		0515-0375	2	SCREW-MACHINE M3.0 × 16 CW-PN-TX
A1		08753-60140	1	FRONT PANEL KEYBOARD ASSY
A1W1				RIBBON CA ASSY, A1 to A2 (p/o A1) (see "Cables, Top View")
A2		08753-60091	1	FRONT PANEL INTERFACE BD ASSY
RPG1		08757-60053	1	ROTARY PULSE GENERATOR (RPG)
W18		08711-60037	1	PROBE POWER CA ASSY, A2 to FRONT PANEL
*Metric hardware: other thread types will damage threaded holes.				

## 13-8 Replaceable Parts



**Front Panel Assemblies**



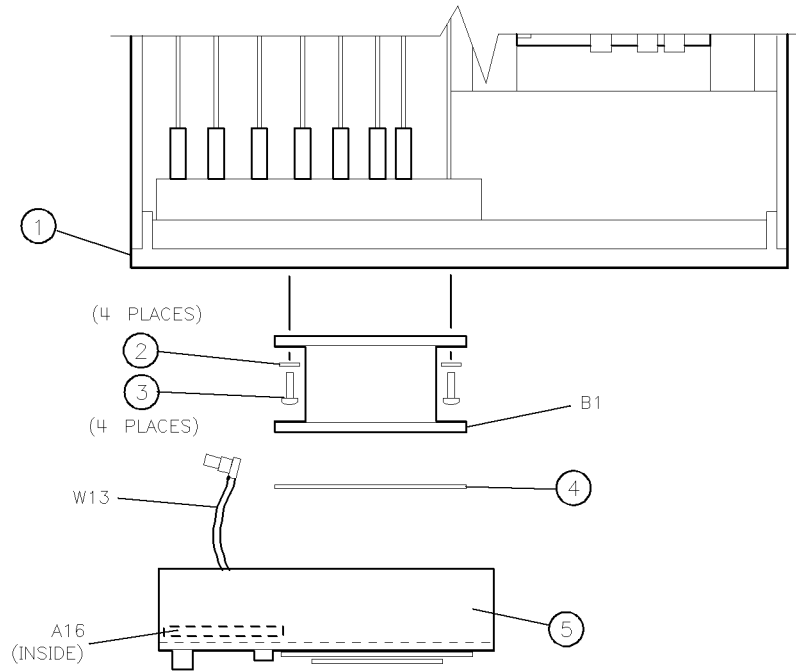
sh610c

## Rear Panel Assemblies

Item	Opt.	HP Part Number	Qty	Description
1				REAR FRAME (see "Chassis Parts")
2		2190-0584	4	WASHER-LOCK HELICAL 3.0 MM 3.1-MM-ID
3*		0515-0965	4	SCREW-SOCKET-HEAD-CAP M3 × 0.5 14MM-LONG
4		08753-20040	1	FAN GASKET
5		08753-00047	1	REAR PANEL
A16		08752-60013	1	REAR PANEL BD ASSY (includes A16W1)
B1		08753-60047	1	FAN (includes cable assembly)
W13				CA ASSY, REAR PANEL to A12 (see "Cables, Top View")
*Metric hardware: other thread types will damage threaded holes.				

## 13-10 Replaceable Parts

## Rear Panel Assemblies



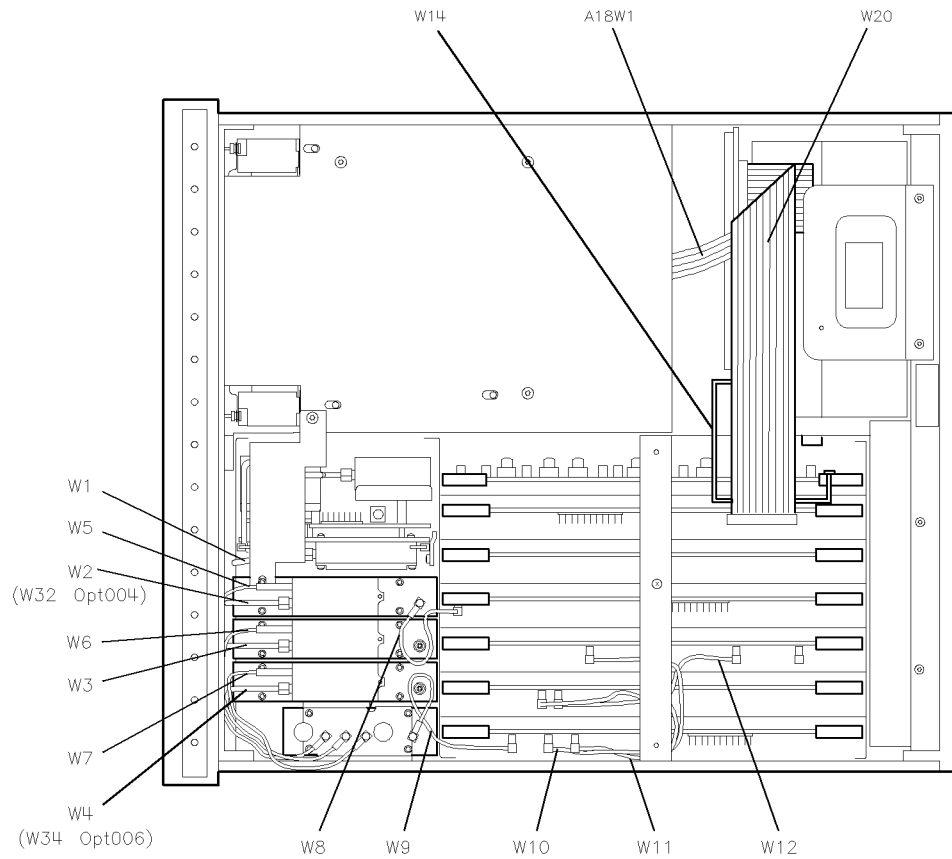
sh612c

## Cables, Top View

Item	Opt.	HP Part Number	Qty	Description
A18W1		p/o A18	1	CA ASSY, A18 to A19
W1		08752-20021	1	SEMI-RIGID CA ASSY, A3 to A30 (see "Front Panel, Cables and Attaching Hardware")
W2		5021-8770	1	SEMI-RIGID CA ASSY, A30 to A4
W3		5021-8771	1	SEMI-RIGID CA ASSY, A30 to A5
W4		08753-20030	1	SEMI-RIGID CA ASSY, RF IN to A6
W5		08753-60027	1	FLX RF CA ASSY, A7 to A4
W6		08753-60027	1	FLX RF CA ASSY, A7 to A5
W7		08753-60027	1	FLX RF CA ASSY, A7 to A6
W8		08753-60061	1	FLX RF CA ASSY, A4 to A11
W9		08753-60061	1	FLX RF CA ASSY, A14 to A7
W10		08753-60029	1	FLX RF CA ASSY, A14 to A12
W11		08753-60029	1	FLX RF CA ASSY, A14 to A13
W12		08753-60029	1	FLX RF CA ASSY, A12 to A13
W13		08753-60026	1	FLX RF CA ASSY, A16 to A12
W14		08753-60113	1	DISPLAY POWER CA ASSY, A8 to A19
W20		08513-60036	1	CA ASSY, A9 to A19

## 13.12 Replaceable Parts

## Cables, Top View



sh68c

## Front Panel, Cables and Attaching Hardware

Item	Opt.	HP Part Number	Qty	Description
1*		0515-0458	3	SCREW-MACHINE M3.5×8 CW-PN-TX
W1		5021-8769	1	SEMI-RIGID CA ASSY, A3 to A30
W3		5021-8771	1	SEMI-RIGID CA ASSY, A30 to A5
W17		08753-60033	1	RIBBON CA ASSY, A2 to A17
W50		1250-2189	1	CA ASSY, A30 to REFLECTION PORT
W75	075	1250-2311	1	CA ASSY, A30 to REFLECTION PORT

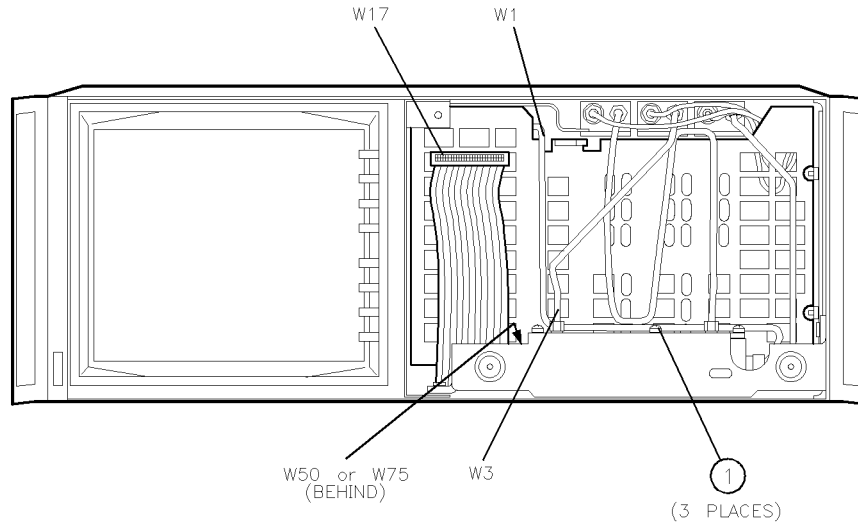
\*Metric hardware: other thread types will damage threaded holes.

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**Note**            The cables described on this page are common to all instrument options. For *option specific* cables refer to the “Source and Sampler Parts” section for your option.

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## Front Panel Cables and Attaching Hardware



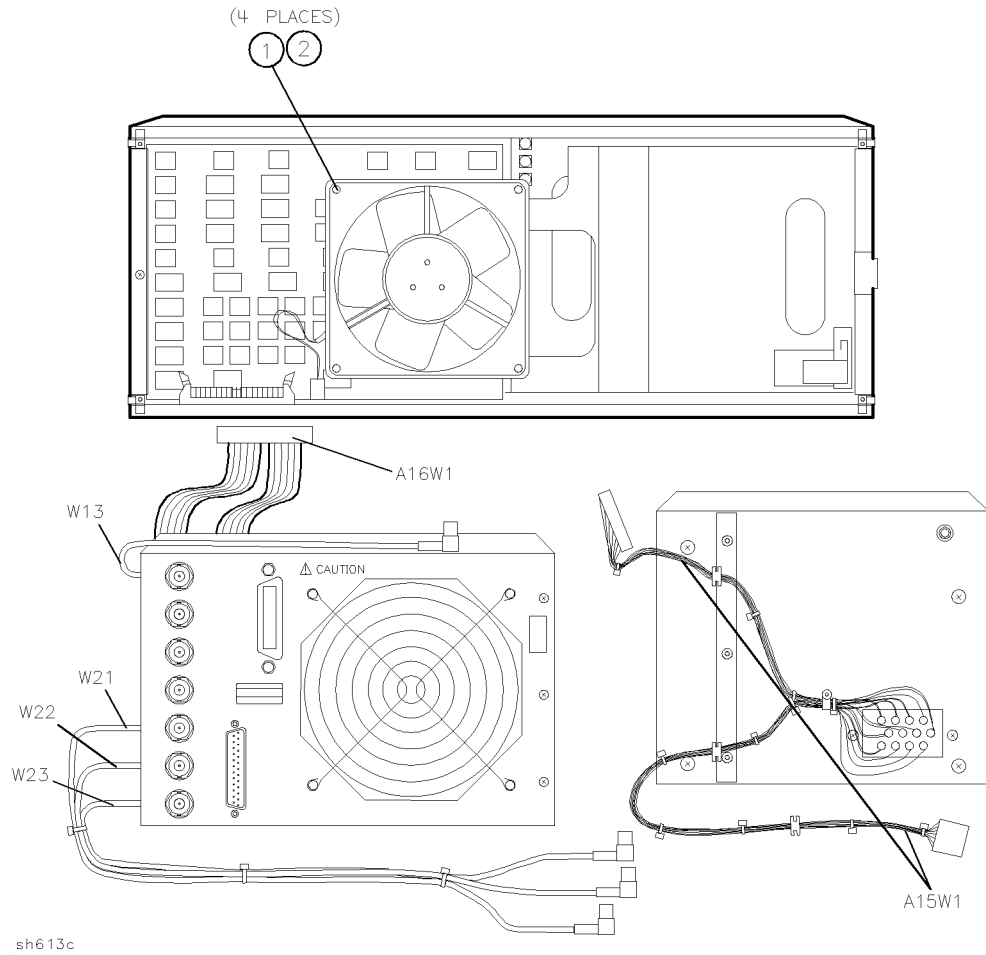
## Rear Panel, Cables and Attaching Hardware

Item	Opt.	HP Part Number	Qty	Description
1*		0515-0965	4	SCREW-MACHINE M3.0×14 SH-HX
2		2190-0584	4	WASHER-LOCK M3.0 NOM
A15W1		p/o A15	1	CA ASSY, A15 to A8 and A17
A16W1		08753-60033	1	RIBBON CA ASSY, A16 to A17 (p/o A16)
W13		08753-60026	1	FLX RF CA ASSY, REAR PANEL to A12
W21		08753-60117	1	FLX RF CA ASSY, RED (p/o A16)
W22		08753-60118	1	FLX RF CA ASSY, GREEN (p/o A16)
W23		08753-60119	1	FLX RF CA ASSY, BLUE (p/o A16)
*Metric hardware: other thread types will damage threaded holes.				

### 13-16 Replaceable Parts



## Rear Panel Cables and Attaching Hardware

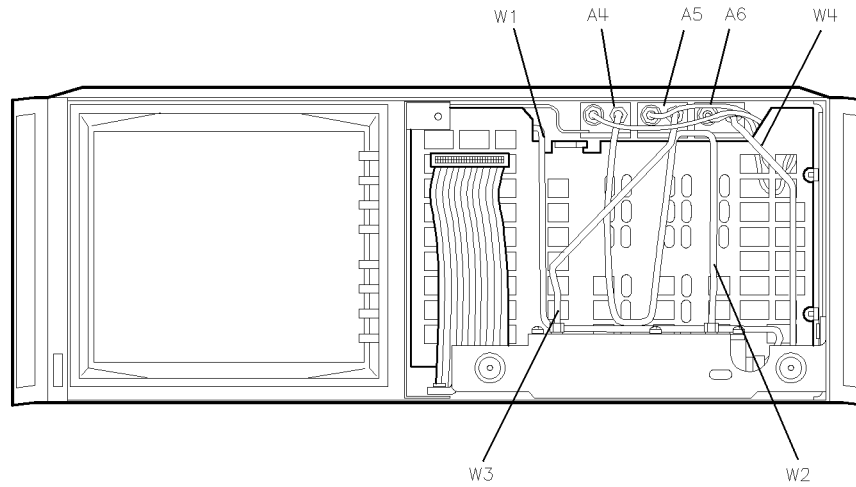


## Source and Sampler Parts: Standard and Option 003

Item	HP Part Number	Qty	Description
A3	08753-60234	1	SOURCE ASSY
A3	08753-69234		SOURCE ASSY (Rebuilt-Exchange)
A3MP1	1250-0590	1	SMB CAP
A3W1	08753-20107	1	RF CA, SEMI-RIGID, EYO (A3A3) to SOURCE (A3)
A3W2	08753-20032	1	RF CA, SEMI-RIGID, CAV OSC (A3A4) to SOURCE (A3)
A3A2W1	08753-60034	1	RIBBON CA ASSY, EYO (A3A3) to ALC (A3A2)
A3W7	08752-20024	1	RF CA, 4 dB ATTENUATOR (A3AT1) to BULKHEAD (A3 OUTPUT)
A4	08753-60004	1	R SAMPLER ASSY
A5	08753-60004	1	A SAMPLER ASSY
A6	08753-60004	1	B SAMPLER ASSY
W1	08752-20021	1	RF CA, SOURCE (A3) to COUPLER (A30)
W2	5021-8770	1	RF CA, COUPLER (A30) to R SAMPLER (A4)
W3	5021-8771	1	RF CA, COUPLER (A30) to A SAMPLER (A5)
W4	08753-20030	1	RF CA, TRANSMISSION PORT to B SAMPLER (A6)

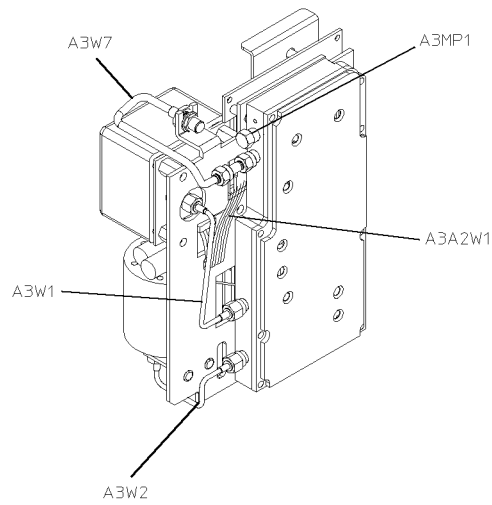
### 13-18 Replaceable Parts

## Source and Sampler Parts: Standard and Option 003



SAMPLERS AND FRONT PANEL CABLES

sh6130c



A3 SOURCE CABLES

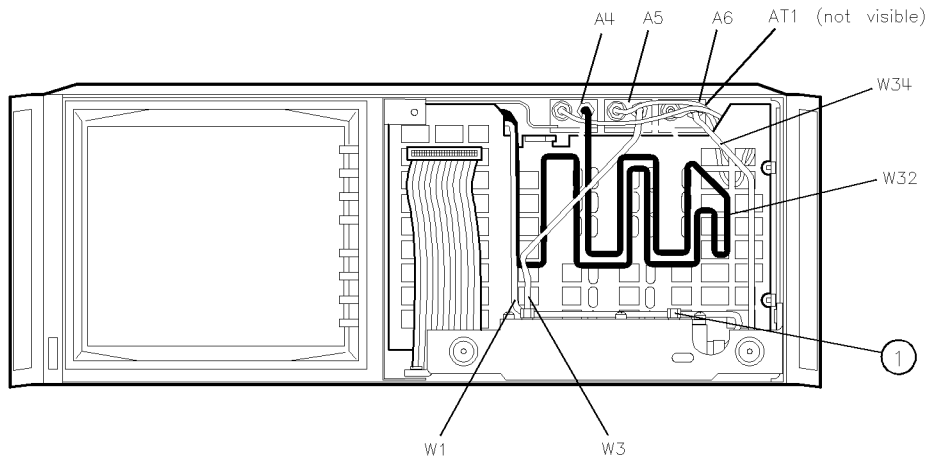
sh6205c

## Source and Sampler Parts: Option 004/006

Item	HP Part Number	Qty	Description
1	1250-0590	1	SMB CAP (used on coupler)
A3	08753-60146	1	SOURCE ASSY
A3	08753-69146		SOURCE ASSY (Rebuilt-Exchange)
A3W1	08753-20107	1	RF CA, SEMI-RIGID, EYO (A3A3) to SOURCE (A3)
A3W2	08753-20032	1	RF CA, SEMI-RIGID, CAV OSC (A3A4) to SOURCE (A3)
A3A2W1	08753-60034	1	RIBBON CA ASSY, EYO (A3A3) to ALC (A3A2)
A3W3	08753-20106	1	RF CA, SOURCE (A3) to 70 dB STEP ATTENUATOR (A3A5)
A3W4	08753-20111	1	RF CA, 70 dB STEP ATTENUATOR (A3A5) to BULKHEAD (A3 OUTPUT)
AT1	0955-0206	1	8 dB ATTENUATOR (connects to B sampler)
A4	08753-60004	1	R SAMPLER ASSY
A5	08753-60004	1	A SAMPLER ASSY
A6	08753-60169	1	B SAMPLER ASSY
W1	08752-20021	1	RF CA, SOURCE (A3) to COUPLER (A30)
W3	5021-8771	1	RF CA, COUPLER (A30) to A SAMPLER (A5)
W32	08752-20022	1	RF CA, SOURCE (A3) to R SAMPLER (A4)
W34	08752-20023	1	RF CA, TRANSMISSION PORT to 8 dB ATTENUATOR (AT1)

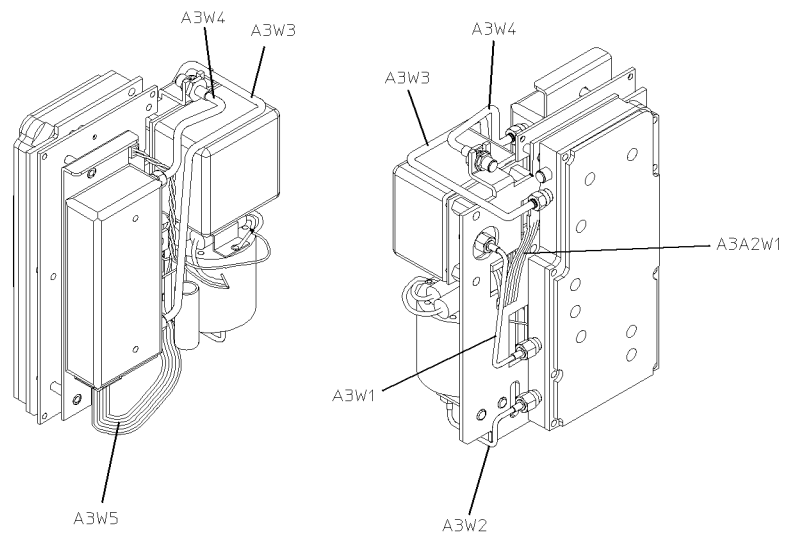
### 13-20 Replaceable Parts

## Source and Sampler Parts: Option 004/006



SAMPLERS AND FRONT PANEL CABLES

sh6131c



A3 SOURCE CABLES

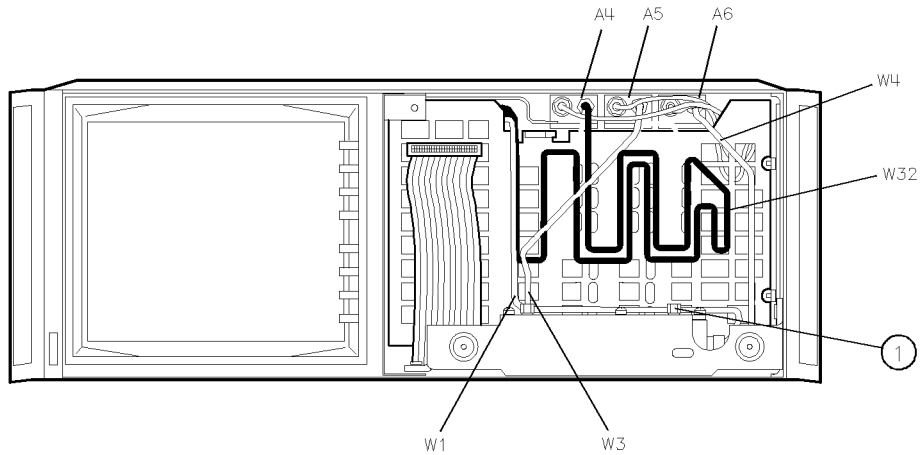
sh6204c

## Source and Sampler Parts: Options 004 and 003/004

Item	HP Part Number	Qty	Description
1	1250-0590	1	SMB CAP
A3	08753-60231	1	SOURCE ASSY
A3	08753-69231		SOURCE ASSY (Rebuilt-Exchange)
A3W1	08753-20107	1	RF CA, SEMI-RIGID, EYO (A3A3) to SOURCE (A3)
A3W2	08753-20032	1	RF CA, SEMI-RIGID, CAV OSC (A3A4) to SOURCE (A3)
A3A2W1	08753-60034	1	RIBBON CA ASSY, EYO (A3A3) to ALC (A3A2)
A3W3	08753-20106	1	RF CA, SOURCE (A3) to 70 dB STEP ATTENUATOR (A3A5)
A3W4	08753-20111	1	RF CA, 70 dB STEP ATTENUATOR (A3A5) to BULKHEAD (A3 OUTPUT)
A4	08753-60004	1	R SAMPLER ASSY
A5	08753-60004	1	A SAMPLER ASSY
A6	08753-60004	1	B SAMPLER ASSY
W1	08752-20021	1	RF CA, SOURCE (A3) to COUPLER (A30)
W3	5021-8771	1	RF CA, COUPLER (A30) to A SAMPLER (A5)
W4	08753-20030	1	RF CA, TRANSMISSION PORT to B SAMPLER (A)
W32	08752-20022	1	RF CA, SOURCE (A3) to R SAMPLER (A4)

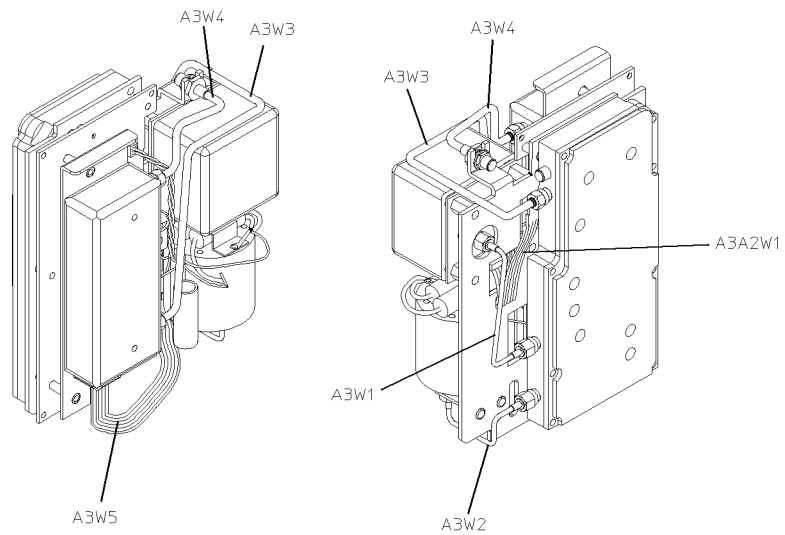
### 13-22 Replaceable Parts

**Source and Sampler Parts: Options 004 and 003/004**



SAMPLERS AND FRONT PANEL CABLES

sh6136c



A3 SOURCE CABLES

sh6204c

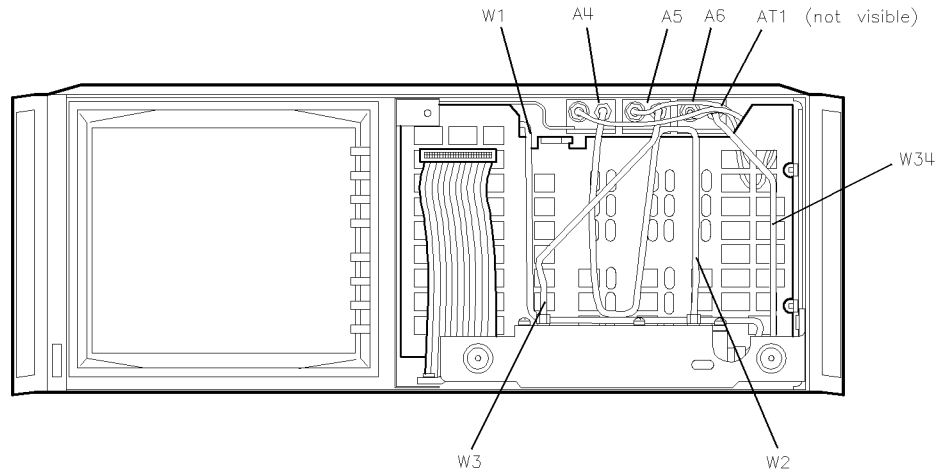
## Source and Sampler Parts: Option 006

Item	HP Part Number	Qty	Description
A3	08753-60233	1	SOURCE ASSY
A3	08753-69233		SOURCE ASSY (Rebuilt-Exchange)
A3MP1	1250-0590	1	SMB CAP
A3W1	08753-20107	1	RF CA, SEMI-RIGID, EYO (A3A3) to SOURCE (A3)
A3W2	08753-20032	1	RF CA, SEMI-RIGID, CAV OSC (A3A4) to SOURCE (A3)
A3A2W1	08753-60034	1	RIBBON CA ASSY, EYO (A3A3) to ALC (A3A2)
A3W7	08752-20024	1	RF CA, 4 dB ATTENUATOR (A3AT1) to BULKHEAD (A3 OUTPUT)
A4	08753-60004	1	R SAMPLER ASSY
A5	08753-60004	1	A SAMPLER ASSY
A6	08753-60169	1	B SAMPLER ASSY
W1	08752-20021	1	RF CA, SOURCE (A3) to COUPLER (A30)
W2	5021-8770	1	RF CA, COUPLER (A30) to R SAMPLER (A4)
W3	5021-8771	1	RF CA, COUPLER (A30) to A SAMPLER (A5)
W34	08752-20023	1	RF CA, TRANSMISSION PORT to 8 dB ATTENUATOR (AT1)

### 13-24 Replaceable Parts

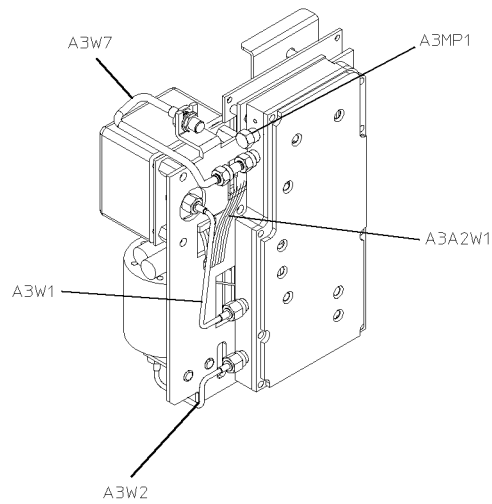


## Source and Sampler Parts: Option 006



SAMPLERS AND FRONT PANEL CABLES

sh6135c



A3 SOURCE CABLES

sh6205c

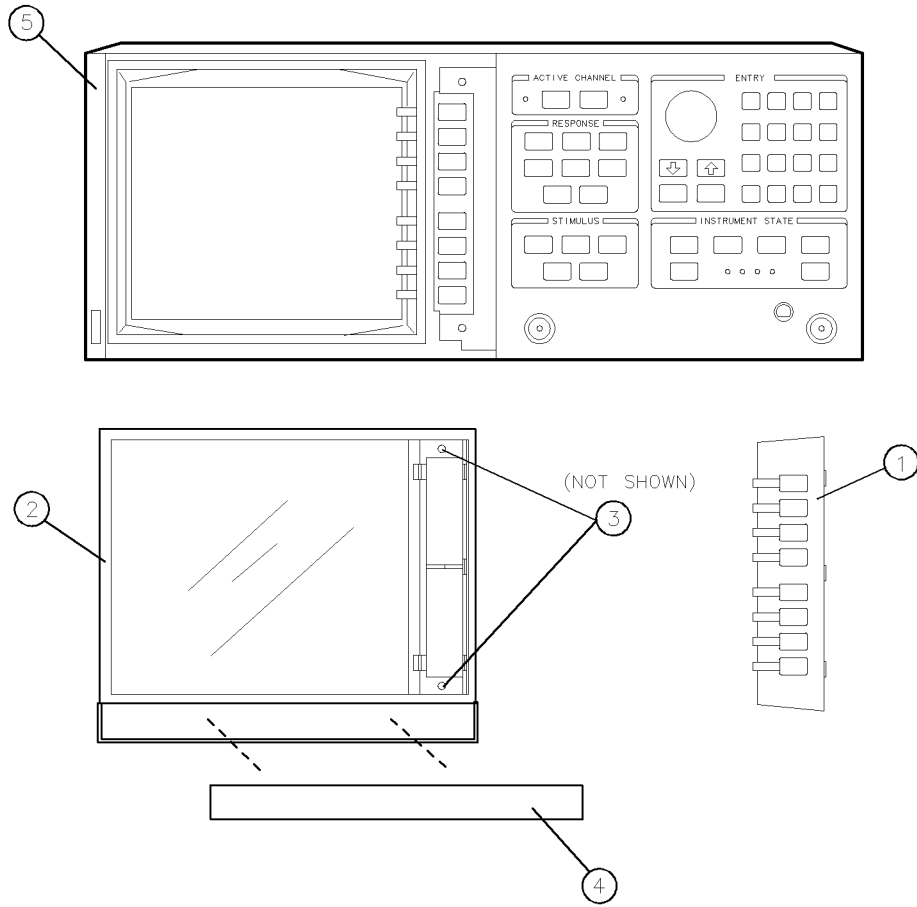
## Display Bezel Assembly

Item	Opt.	HP Part Number	Qty	Description
1		08757-40012	1	SOFTKEYS COVER
2		5062-7208	1	BEZEL ASSY (nameplate must be ordered separately)
3*		0515-2113	2	SCREW-MACHINE M4.0×8 PC-PN-TX
4		08752-80032	1	NAMEPLATE 8752C
4	003	08752-80034	1	NAMEPLATE 8752C OPTION 003
4	006	08752-80035	1	NAMEPLATE 8752C OPTION 006
5		08757-40003	1	BEZEL SUPPORT

\*Metric hardware: other thread types will damage threaded holes.

### 13-26 Replaceable Parts

## Display Bezel Assembly



sh64c

Replaceable Parts 13-27

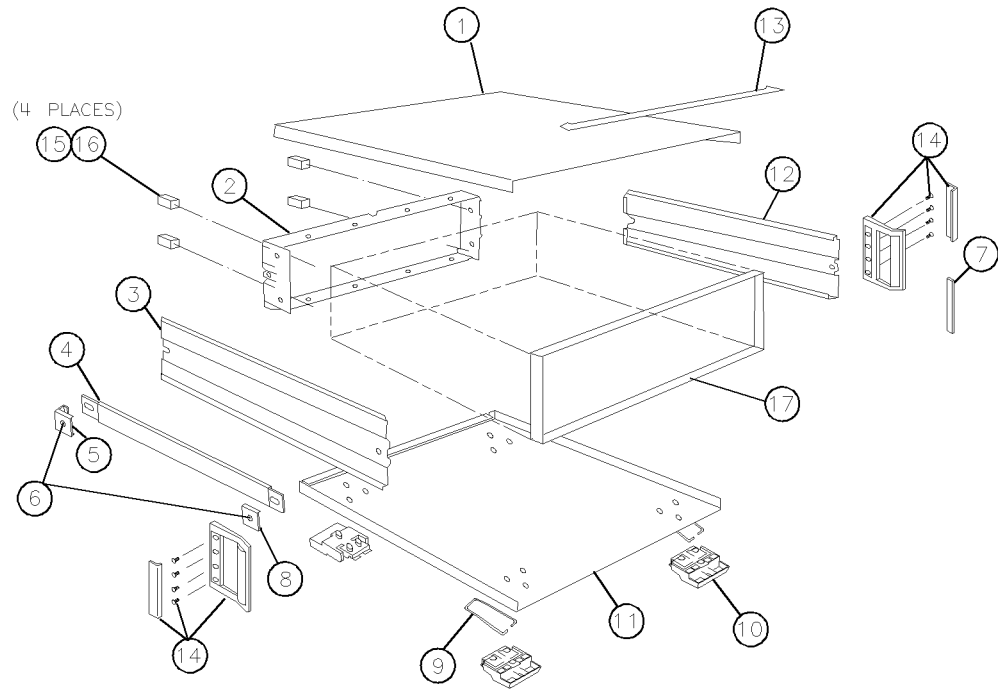
## Chassis Parts

Item	HP Part Number	Qty	Description
1	5062-3735	1	COVER, TOP ASSY
2	5021-5806	1	REAR FRAME
3	5062-3842	1	COVER-SIDE (for use with strap handle)
4	5062-3704	1	STRAP HANDLE 18 INCH
5	5041-8820	1	STRAP, HANDLE, CAP-REAR
6*	0515-1384	2	SCREW-MACHINE M5.0×10 PC-FL-TX
7	5001-0540	2	TRIM, SIDE (used when front handles are removed)
8	5041-8819	1	STRAP, HANDLE, CAP-FRONT
9	1460-1345	2	TILT STAND
10	5041-8801	4	FOOT (STANDARD)
11	5062-3747	1	COVER, BOTTOM ASSY (order item 11A also)
11A	08753-20039	1	BOTTOM COVER MYLAR INSULATOR (not shown)
12	5062-3817	1	COVER-SIDE-PERF
13	5041-8802	1	TRIM, TOP
14	5062-3990	1	FRONT HANDLE KIT (for rack mount options)
15	5041-8821	4	REAR STANDOFF
16*	0515-1402	4	SCREW-MACHINE M3.5×8 PC-PN-TX
17	5021-8405	1	FRONT FRAME

\*Metric hardware: other thread types will damage threaded holes.  
**NOTE:** See "Miscellaneous Parts and Accessories" for touch-up paint.

## 13-28 Replaceable Parts

## Chassis Parts



sh627c

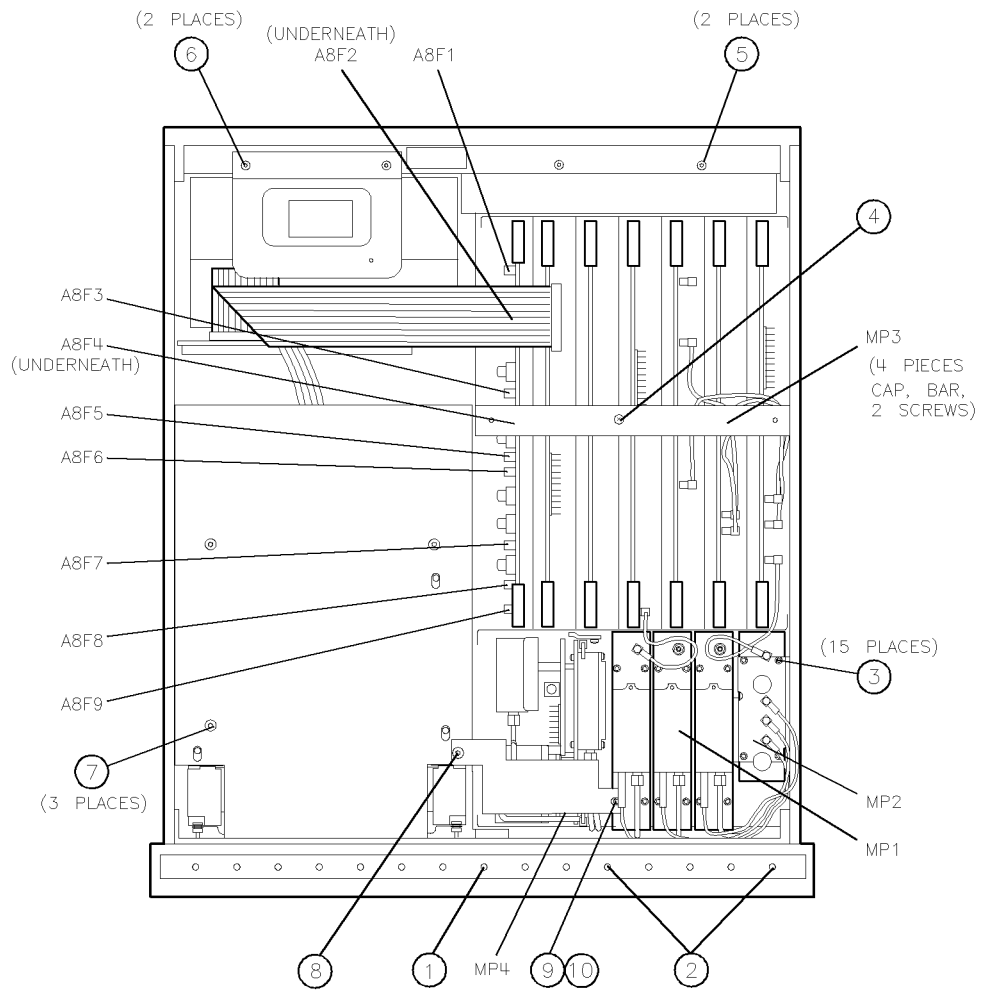
## Top View of Attaching Hardware and Post Regulator Fuses

Ref. Desig.	HP Part Number	Qty	Description
1*	0515-2086	1	SCREW-MACHINE M4.0×7 PC-FL-TX
2*	0515-1400	2	SCREW-MACHINE M3.5×8 PC-FL-TX
3*	0515-0374	15	SCREW-MACHINE M3.0×10 CW-PN-TX
4*	0515-2035	1	SCREW-MACHINE M3.0×16 PC-FL-TX
5*	0515-0458	2	SCREW-MACHINE M3.5×8 CW-PN-TX
6*	0515-0377	2	SCREW-MACHINE M3.5×10 CW-PN-TX
7*	0515-0390	3	SCREW-MACHINE M4.0×6 CW-FL-TX
8*	0515-0433	1	SCREW-MACHINE M4.0×8 CW-FL-TX
9*	0515-0664	1	SCREW-MACHINE M3.0×12 CW-PN-TX
10	3050-0891	1	WASHER-FLAT M3.0 NOM
A8F1	2110-0425	1	FUSE 2A 125V NTD 0.25×0.27
A8F2	2110-0424	1	FUSE 0.75A 125V NTD 0.25×0.27
A8F3	2110-0425	1	FUSE 2A 125V NTD 0.25×0.27
A8F4	2110-0424	1	FUSE 0.75A 125V NTD 0.25×0.27
A8F5	2110-0476	1	FUSE 4A 125V NTD 0.25×0.27
A8F6	2110-0425	1	FUSE 2A 125V NTD 0.25×0.27
A8F7	2110-0476	1	FUSE 4A 125V NTD 0.25×0.27
A8F8	2110-0047	1	FUSE 1A 125V NTD 0.25×0.27
A8F9	2110-0046	1	FUSE 0.5A 125V NTD 0.25×0.27
MP1	08753-00039	1	A5 ISOLATION GROUNDING CLIP
MP2	08753-00040	1	A7 ISOLATION GROUNDING SHIELD
MP3	08753-40006	1	PC BOARD STABILIZER-BAR
	08753-20062	1	PC BOARD STABILIZER-CAP
*	0515-0374	2	SCREW-MACHINE M3.0×10 CW-PN-TX (attaches cap to bar)
MP4	08753-00044	1	SOURCE RETAINER BRACKET

\*Metric hardware; other thread types will damage threaded holes.

### 13-30 Replaceable Parts

## Top View of Attaching Hardware and Post Regulator Fuses



sh66c

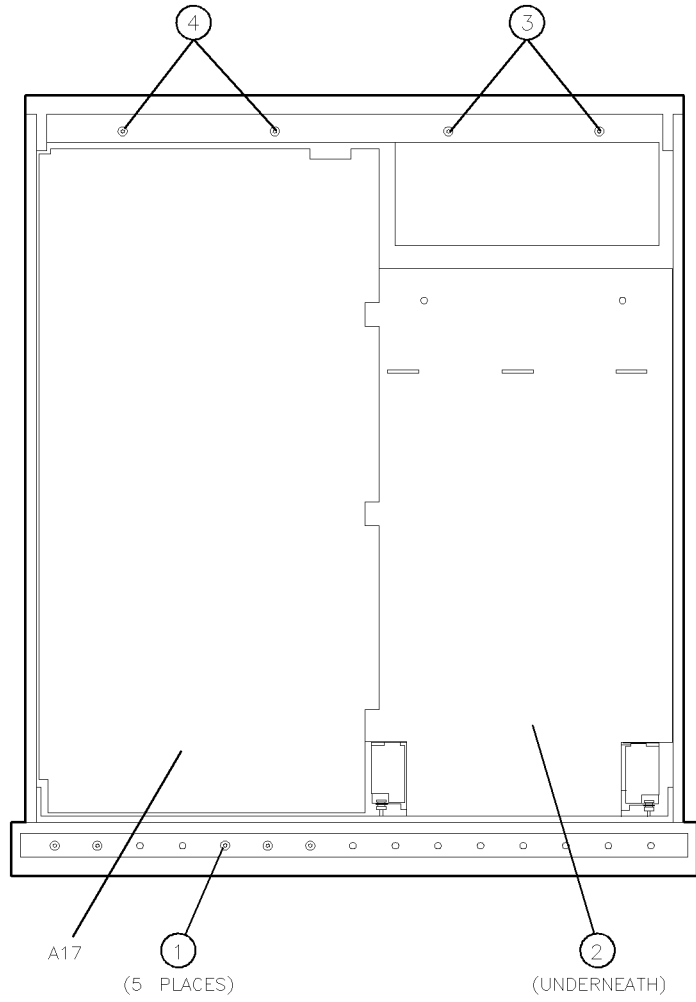
## Bottom View of Attaching Hardware

Item	HP Part Number	Qty	Description
1*	0515-1400	5	SCREW-MACHINE M3.5×8 PC-FL-TX
2	5180-8500	1	INSULATOR
3*	0515-0377	2	SCREW-MACHINE M3.5×10 CW-PN-TX
4*	0515-0458	2	SCREW-MACHINE M3.5×8 CW-PN-TX
A17			MOTHERBOARD ASSY (see "Major Assemblies")

\*Metric hardware: other thread types will damage threaded holes.



### Bottom View of Attaching Hardware

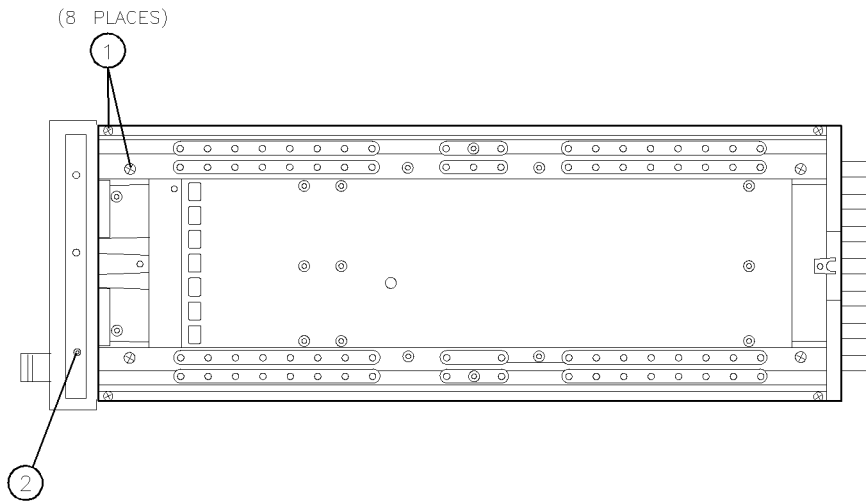


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## Right View of Attaching Hardware

Item	HP Part Number	Qty	Description
1*	0515-2086	8	SCREW-MACHINE M4.0×7 PC-FL-TX
2*	0515-1400	1	SCREW-MACHINE M3.5×8 PC-FL-TX

\*Metric hardware: other thread types will damage threaded holes.



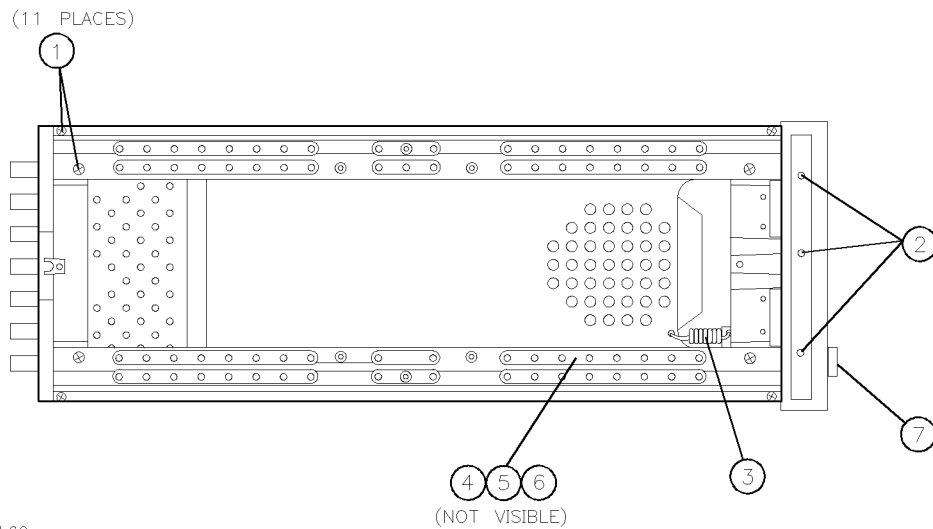
sh61c

## 13-34 Replaceable Parts

## Left View of Attaching Hardware

Item	HP Part Number	Qty	Description
1*	0515-2086	8	SCREW-MACHINE M4.0×7 PC-FL-TX
2*	0515-2086	3	SCREW-MACHINE M4.0×7 PC-FL-TX
3	1460-1573	1	SPRING-EXTENSION .138 OD
4*	0515-0430	1	SCREW-MACHINE M3.0×6 CW-PN-TX
5	08753-00036	1	INSULATOR-SWITCH
6	08753-00048	1	ACTUATOR-LINE SWITCH
7	08757-40005	1	LINE BUTTON

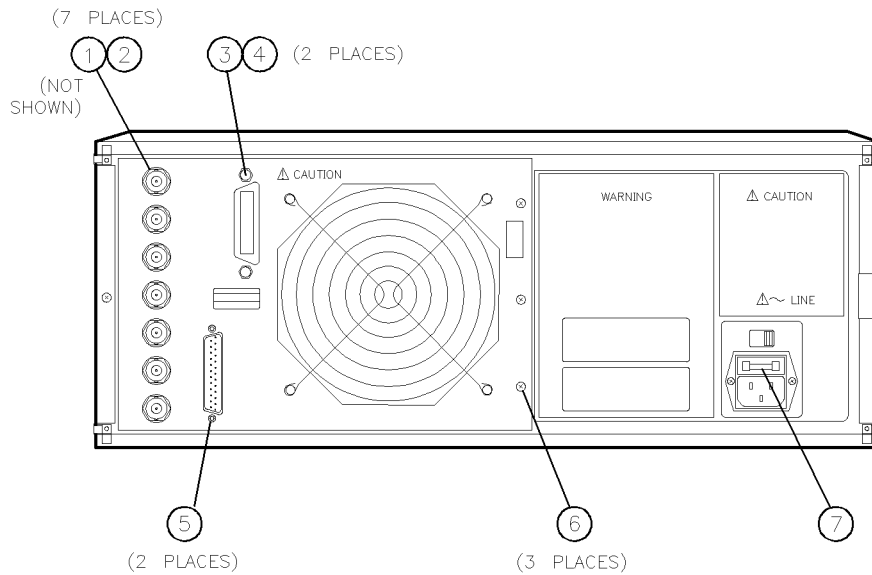
\*Metric hardware: other thread types will damage threaded holes.



## Rear Panel Attaching Hardware

Item	HP Part Number	Qty	Description
1	2190-0102	4	WASHER-LOCK INTERNAL TEETH 15/32 INCH 0.472-INCH-ID
2	2950-0035	7	NUT-HEX-DOUBLE CHAMFER 15/32-32-THREAD
3	2190-0586	2	WASHER-LOCK HELICAL 4.0 MM 4.1-MM-ID
4	0380-0643	2	STANDOFF-HEX 0.255-INCH-LONG 6-32 THREAD
5	1251-2942	2	LOCK-SUBMIN D CONN (includes lockwashers)
6*	0515-0372	3	SCREW-MACHINE M3.0×8 CW-PN-TX
7	2110-0780	1	FUSE 3A 250V NON-TIME DELAY

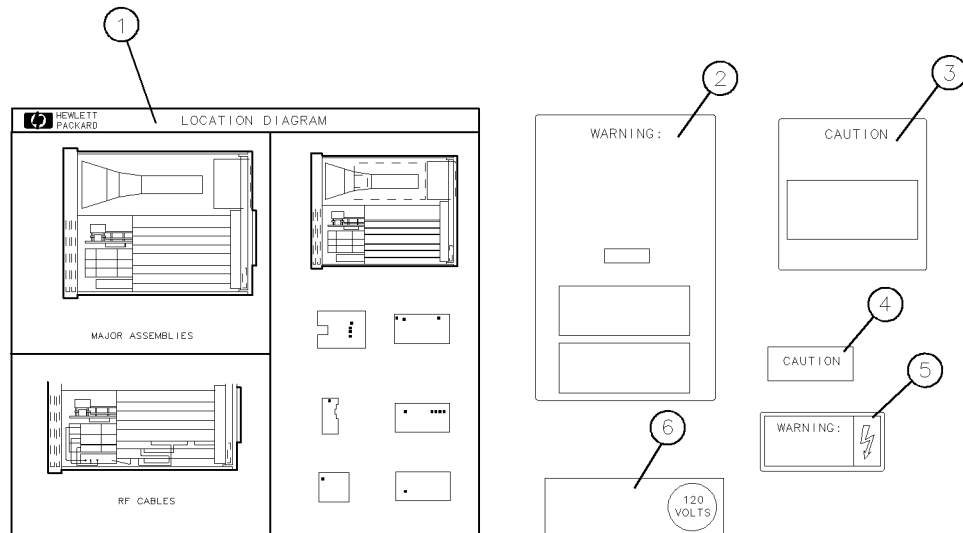
\*Metric hardware: other thread types will damage threaded holes.



## 13-36 Replaceable Parts

## Replaceable Labels

Item	HP Part Number	Qty	Description
1	08752-80003	1	LABEL, LOCATION DIAGRAM
2	7120-4295	1	LABEL, HAZARDOUS VOLTAGE WARNING
3	7120-6999	1	LABEL, LINE VOLTAGE SELECTOR SWITCH
4	7121-2527	1	LABEL, METRIC HARDWARE CAUTION
5	08753-80066	1	LABEL, WARNING CAUTION
6	7121-5125	1	TAG, WARNING ESD SENSITIVE



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## Miscellaneous Parts and Accessories

HP Part Number	Description
<b>ACCESSORIES</b>	
5062-4072	OPT 1CP, RACK MOUNT KIT FOR INSTRUMENTS EQUIPPED WITH HANDLES
0515-1106	REPLACEMENT SCREWS FOR OPT 913
5062-3978	OPT 1CM, RACK MOUNT KIT FOR INSTRUMENTS WITHOUT HANDLES
0515-1114	REPLACEMENT SCREWS, OPT 908
HP 85032B	50 OHM-TYPE N CALIBRATION KIT (OPT 001)
HP 85033C	50 OHM-3.5 MM CALIBRATION KIT (OPT 001)
HP 11852B	50-75Ω MINIMUM LOSS ATTENUATOR
HP 11853A	50Ω TYPE-N ADAPTER KIT
HP 11878A	50Ω 3.5 MM ADAPTER KIT
HP 11854A	50Ω BNC ADAPTER KIT
HP 11855A	75Ω TYPE-N ADAPTER KIT
HP 11856A	75Ω BNC ADAPTER KIT
8120-4781	50Ω TYPE-N TEST PORT RETURN CA
8120-2408	75Ω TYPE-N TEST PORT RETURN CA
9300-0969	ESD WRIST STRAP (SMALL)
9300-1117	ESD WRIST STRAP (MEDIUM)
9300-0970	ESD WRIST STRAP (LARGE)
HP 92175T	ESD TABLE MAT
HP 10833A	HP-IB CA (1 M, 3.3 FEET)
HP 10833B	HP-IB CA (2 M, 6.6 FEET)
HP 10833C	HP-IB CA (4 M, 13.2 FEET)
HP 10833D	HP-IB CA (0.5 M, 1.7 FEET)
HP 92192A	FLOPPY DISKS (box of 10 double-sided 3.5 inch disks)
HP 85043B	SYSTEM RACK MOUNT

### 13-38 Replaceable Parts

## Miscellaneous Parts and Accessories

HP Part Number	Description
<b>SOFTWARE</b>	
08753-10004	HP 8752C EXAMPLE MEASUREMENT PROGRAM DISK
08753-10005	HP 8752C EXAMPLE MEASUREMENT PROGRAM DISK
<b>SERVICE TOOLS</b>	
08753-60023	HP 8752C TOOL KIT
<b>DOCUMENTATION</b>	
08752-90134	HP 8752C MANUAL SET <i>includes the following:</i>
08752-90135	HP 8752C USER'S GUIDE ( <i>includes Quick Reference, 08752-90138</i> )
08752-90137	HP 8752C PROGRAMMING GUIDE
08752-90139	HP 8752C INSTALLATION & QUICK START GUIDE
08752-90157	HP 8752C SYSTEM VERIFICATION AND PERFORMANCE TESTS
08752-90136	HP 8752C SERVICE GUIDE (this manual)
08752-90158	HP 8752C COMPONENT-LEVEL INFORMATION
<b>UPGRADE KITS</b>	
HP 11884D	6 GHz UPGRADE KIT (conversion to Opt 006)
HP 11885A	3 GHz RECEIVER UPGRADE KIT (conversion to Opt 003)
HP 85019C	TIME DOMAIN UPGRADE KIT (conversion to Opt 010)
08752-60019	ATTENUATOR UPGRADE KIT (conversion to Opt 004)
<b>SERVICE NOTES*</b>	
8753A-1	9 EEPROM BACKUP
8753A-5	IMPROVING RELIABILITY OF THE A3 SOURCE ASSEMBLY
<b>TOUCH-UP PAINT</b>	
6010-1146	DOVE GRAY PAINT (front panel frame, portions of front handles)
6010-1147	FRENCH GRAY (side, top, bottom covers)
6010-1148	PARCHMENT WHITE (rack mount flanges, rack support shelves, front panel)
*To obtain a service note, contact your local HP Service Center.	

## Abbreviations

### 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
CA	cable
COAX	coaxial
CPU	central processing unit
CW	conical washer (screws)
D	diameter
ESD	electrostatic discharge
EXT	external
EYO	YIG oscillator
FL	flathead (screws)
FLX	flexible
FP	front panel
FRAC-N	fractional N
FREQ	frequency
GHz	gigahertz
HEX	hexagonal
HP	Hewlett-Packard
HP-IB	Hewlett-Packard interface bus
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
MNL	manual
MON	monitor
NOM	nominal
NTD	non-time delay
NY	nylon
OD	outside diameter
Opt	option
OSC	oscillator
PC	patch lock (screws)
PC	printed circuit
PN	panhead (screws)
p/o	part of
REF	reference
REPL	replacement
RF	radio frequency
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	
003	3 GHz performance
004	70 dB step attenuator
006	6 GHz performance
010	time domain
075	.75 ohm test set



## Assembly Replacement and Post-Repair Procedures

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This chapter contains procedures for removing and replacing the major assemblies of the HP 8752C network analyzer. A table showing the corresponding post-repair procedures for each replaced assembly is located at the end of this chapter.

Procedures described in this chapter consist of the following:

- Cover Removal
- Initial Front Panel Procedure
- Initial Rear Panel Procedure
- A1, A2 (keyboard, front panel interface)
- A3 (source)
- A15, A16 (preregulator, rear panel board)
- A18 (display)
- A30 (directional coupler)
- B1 (fan)
- A9BT1 (battery)

---

**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.

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## Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an HP 8752C Network Analyzer.

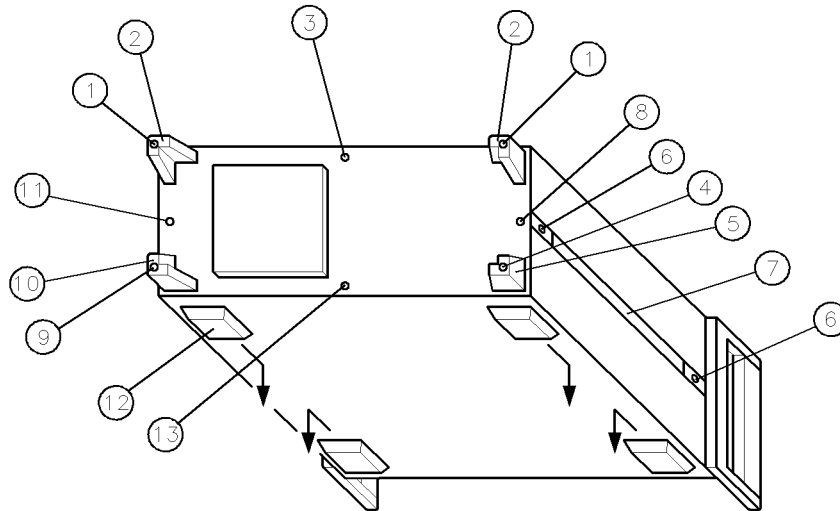
1. Identify the faulty group. Refer to the “Start Troubleshooting Here” chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the “Replaceable Parts” chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the “Assembly Replacement and Post-Repair Procedures” chapter.
4. Perform the necessary adjustments. Refer to the “Adjustments and Correction Constants” chapter.
5. Perform the necessary performance tests. Refer to the “System Verification and Performance Tests” chapter.

---

## Tools Required

- ESD wrist strap and grounding cord
- Small flat edge screwdriver
- TORX driver
  - Number 10
  - Number 15
  - Number 25
- Wrenches, open end:
  - 3/16-inch
  - 9/32-inch
  - 5/16-inch
  - 9/16-inch

## Cover Removal Procedure



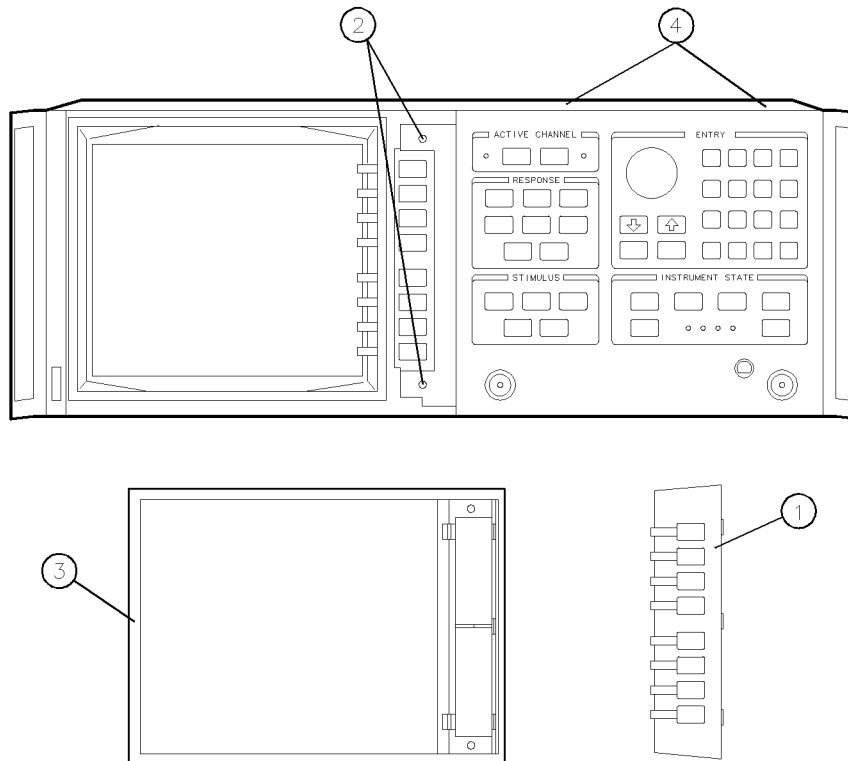
sh682c

**Figure 14-1. Cover Removal Procedure**

To remove top cover:	To remove right side cover:
remove screws (1) & upper standoffs (2)	remove top cover
loosen screw (3)	remove screw (9) & lower standoff (10)
slide cover off	loosen screw (11)
	slide cover back
To remove left side cover:	To remove bottom cover:
remove top cover	remove bottom feet (12)
remove screw (4) & lower standoff (5)	remove screws (4,9) & lower standoffs (5,10)
remove screws (6) & handle (7)	loosen screw (13)
loosen screw (8)	slide cover off
slide cover back	

---

## Initial Front Panel Procedure

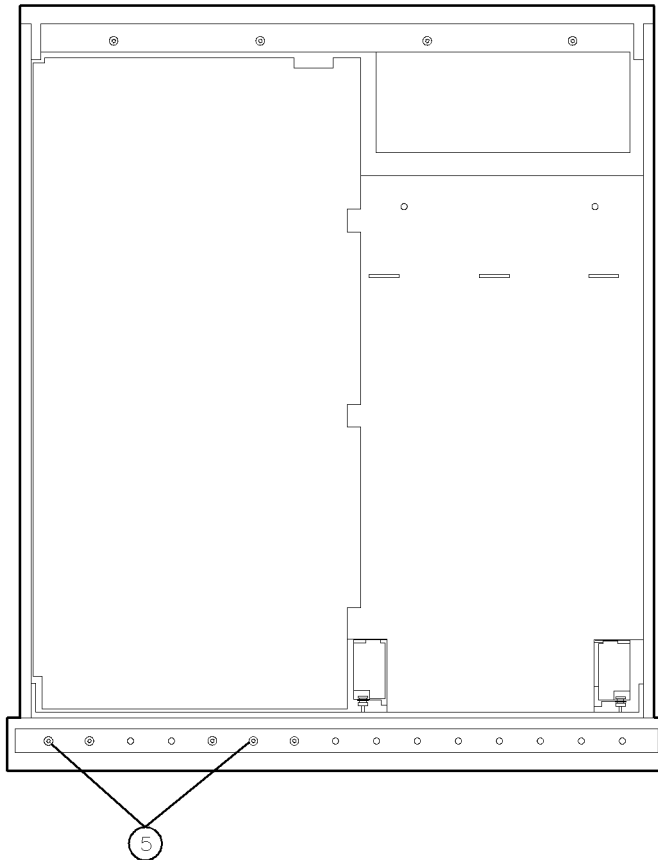


sh617c

**Figure 14-2. Initial Front Panel Procedure**

1. Remove the bezel's softkey cover (item 1, Figure 14-2) by sliding your fingernail under the left edge, near the top or bottom of the cover.
2. Pry the cover away from the bezel. Do not scratch the glass.
3. Remove the two screws (item 2) exposed by the previous step.
4. Remove the bezel (item 3) from the frame.
5. Remove the trim strip from the top edge of the front frame by prying it with a flat screwdriver.
6. Remove the two right-most screws from the top edge of the frame (item 4).

### 14-4 Assembly Replacement and Post-Repair Procedures



sh618c

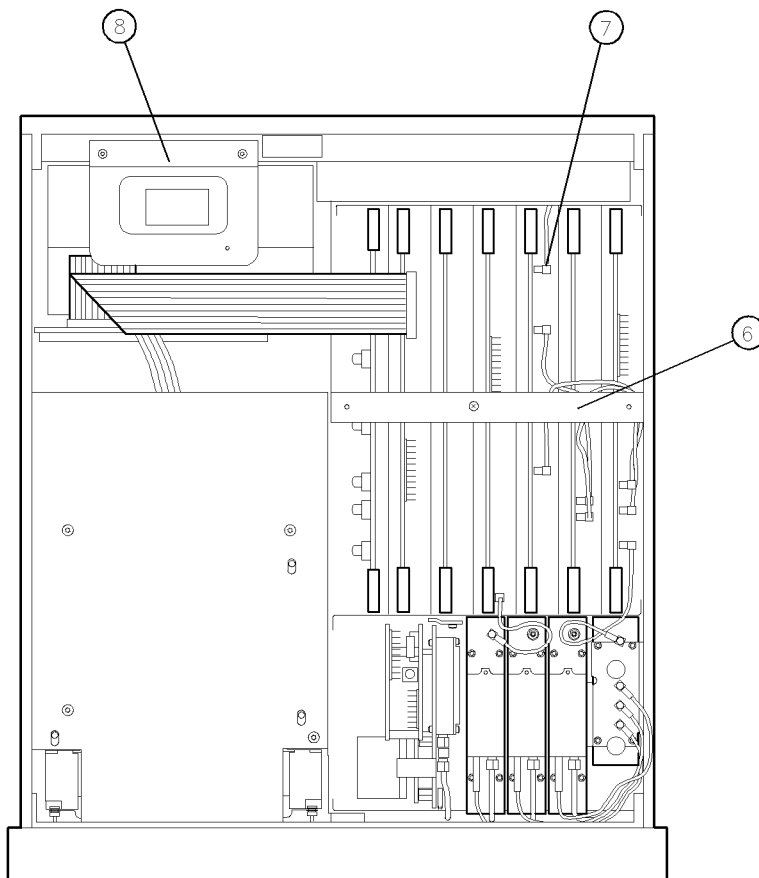
**Figure 14-3. Location of Screws on Bottom Edge of Frame**

7. Turn the instrument over and remove the right front foot.
8. Remove the two screws from the bottom edge of the frame (item 5).
9. Continue with the procedure which referred to this one.

---

## Initial Rear Panel Procedure

1. Remove the top and bottom covers (see “Cover Removal Procedure”).
2. Remove the PC board stabilizer (item 6, Figure 14-4).

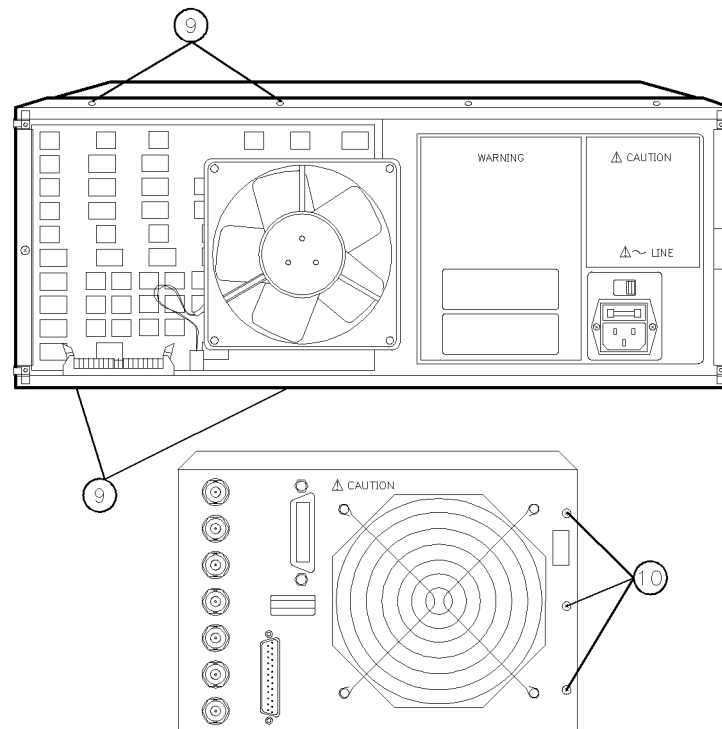


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**Figure 14-4. Location of EXT REF cable and GSP Assembly**

### 14-6 Assembly Replacement and Post-Repair Procedures

3. Lift the A12 reference assembly from its motherboard connector and disconnect the EXT REF coax cable (item 7) from A12J3.
4. Remove the A19 GSP assembly clamp (item 8).
5. Disconnect the RED, GREEN, and BLUE coax cables from the GSP board (you may need to move the large ribbon cable to access them).



sh684c

**Figure 14-5. Location of Rear Panel Fasteners**

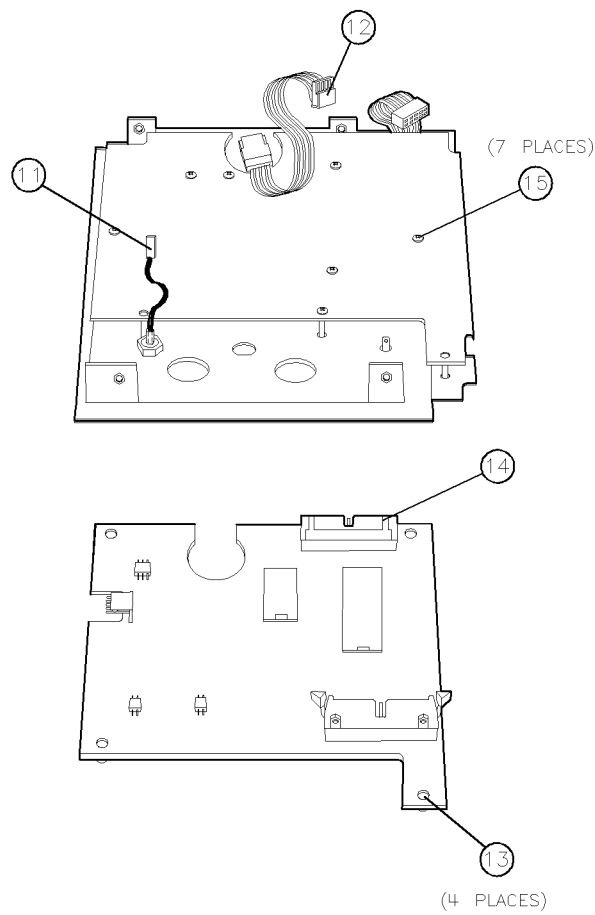
6. Remove seven screws from the rear panel assembly: two from the top and bottom frames (item 9), and three from the back (item 10, Figure 14-5).
7. Pull the rear panel away from the frame. Disconnect the ribbon cable from its motherboard connector by pressing down and out on the connector locks.
8. Continue with the procedure which referred you to this one.

---

## A1, A2 Front Panel Keyboard, Interface

### How to Remove the Front Panel Keyboard or Interface

1. Perform the "Initial Front Panel Procedure."
2. Slide the front panel over the type-N connectors.



sh620c

**Figure 14-6. Location of A1 and A2 components**

### 14-8 Assembly Replacement and Post-Repair Procedures



3. Disconnect the ribbon cable from the front panel by pressing down and out on the connector locks.
4. Remove the probe power cable (item 11) and the RPG cable (item 12).
5. Remove the four screws in the corners of the A2 assembly (item 13).
6. Insert the blade of a small flat screwdriver into the slots on the sides of the ribbon cable connector (item 14). Gently pry upwards on either side of the connector until it is loose.
7. Remove the remaining seven screws from the A1 assembly (item 15).

### **Reverse Removal Procedure to Reinstall**

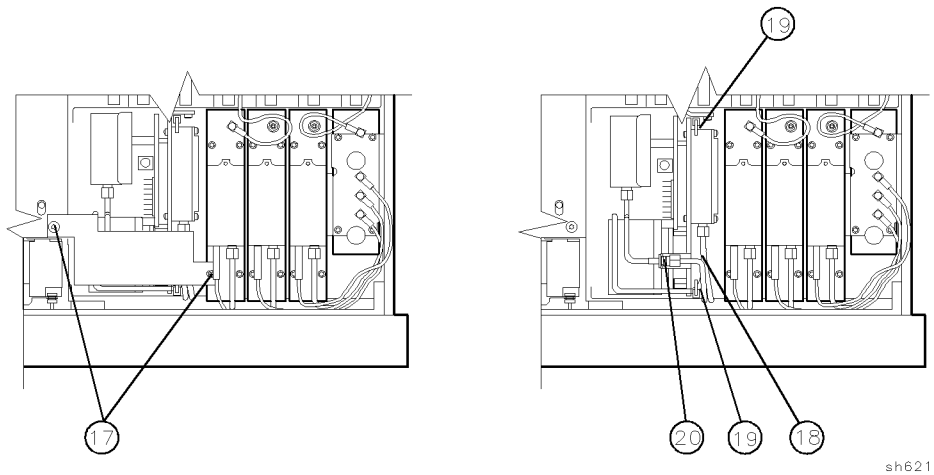
After reinstallation, refer to “Post-Repair Procedures” at the end of this chapter to ensure that the analyzer operates properly.

---

## A3 Source

### How to Remove the Source

1. Remove the power cord and the top cover (see “Cover Removal Procedure”).
2. Remove the two screws with washers (item 17, Figure 14-7) from the source retainer bracket. Remove the bracket.



**Figure 14-7. Location of Source Parts**

3. Disconnect the semi-rigid cables (item 18) at the bulkhead connector and source.
4. Pull the two retention clips (item 19) at the front and rear of the source module to an upright position.
5. Push the disconnected cables toward the right side of the analyzer.
6. Pull up on the source bracket handle (item 20) and remove the source.

### 14.10 Assembly Replacement and Post-Repair Procedures

## **Reverse Removal Procedure to Reinstall**

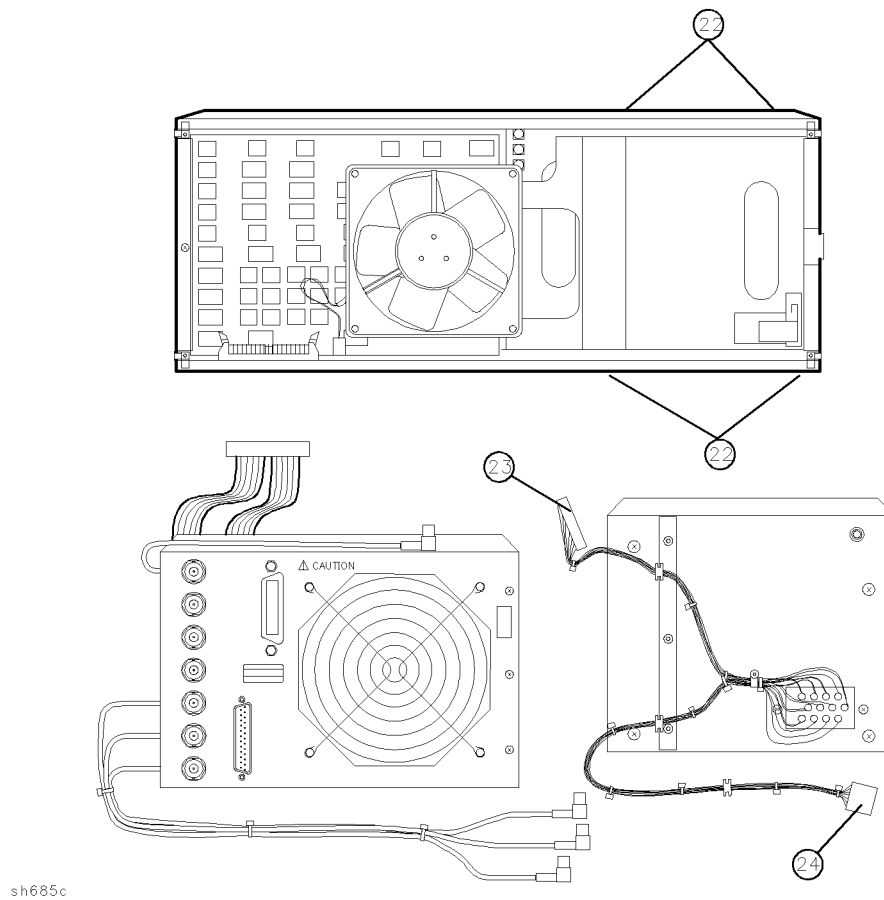
- Keep the semi-rigid cables out of the way as you reinstall the source.
- Make sure the edges of the sheet metal partition slide into the guides at the front and back of the source compartment.
- Make sure the source is well seated in the motherboard connector.
- Remember to push down the retention clips.
- After reinstallation, refer to “Post-Repair Procedures” at the end of this chapter to ensure that the analyzer operates properly.

---

## A15 Preregulator

### How to Remove the Preregulator

1. Perform the "Initial Rear Panel Procedure."



**Figure 14-8. Location of Preregulator Fasteners and Wires**

### 14.12 Assembly Replacement and Post-Repair Procedures

2. Remove the remaining four screws (item 22, Figure 14-8) in the rear frame: two on the top and two on the bottom.
3. Disconnect the A15 wire bundle (item 23) from the A8 post-regulator board assembly.
4. Disconnect the A15 wires (item 24) from the motherboard.
5. Pull the preregulator assembly free from the frame.

### **Reverse Removal Procedure to Reinstall**

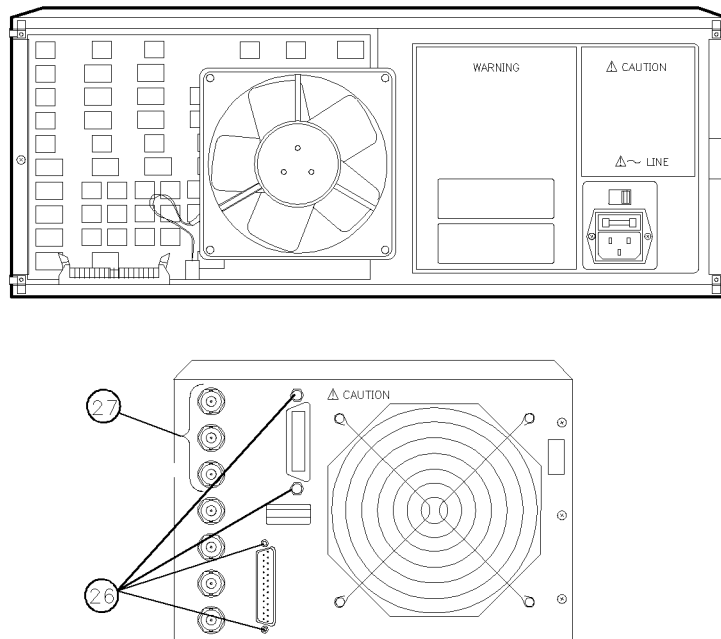
After reinstallation, refer to “Post-Repair Procedures” at the end of this chapter to ensure that the analyzer operates properly.

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## A16 Rear Panel Board Assembly

### How to Remove the Rear Panel

1. Perform the "Initial Rear Panel Procedure."



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**Figure 14-9. Location of Rear Panel Fasteners**

2. Remove the hex screws (item 26, Figure 14-9) from the HP-IB connector and the test set interconnect connector.
3. Remove the hex nuts and lock washers (item 27) from the AUX INPUT, EXT AM, and EXT TRIGGER BNC connectors.
4. Remove the rear panel board assembly.

### 14.14 Assembly Replacement and Post-Repair Procedures

## **Reverse Removal Procedure to Reinstall**

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**Note** Torque the hex screws to 4 in-lb maximum.

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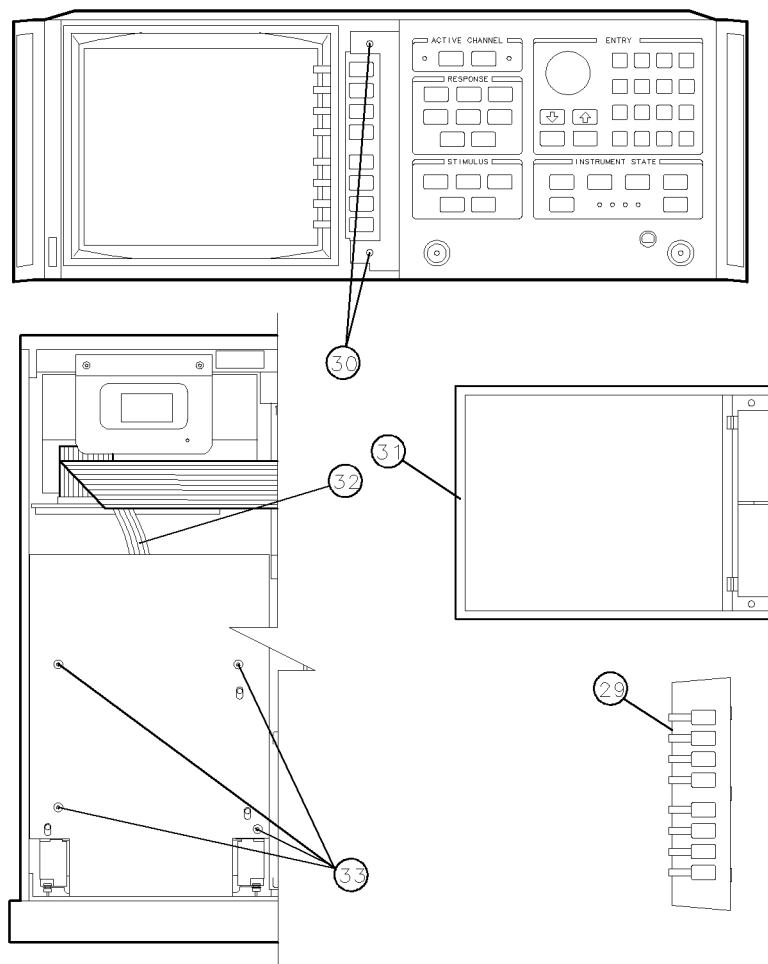
After reinstallation, refer to “Post-Repair Procedures” at the end of this chapter to ensure that the analyzer operates properly.

---

## A18 Display

### How to Remove the Display

1. Remove the power cord and the top cover (see "Cover Removal Procedure").



sh687c

**Figure 14-10. Location of Display Fasteners and Parts**

#### 14.16 Assembly Replacement and Post-Repair Procedures



2. Remove the bezel's softkey cover (item 29, Figure 14-10) by sliding your fingernail under the left edge, near the top or bottom of the cover.
3. Pry the softkey cover away from the bezel. Take care to not scratch the glass.
4. Remove the two screws (item 30) exposed by the previous step.
5. Remove the bezel (item 31) carefully; it is heavy for its size.
6. Remove the gasket from the front of the CRT.
7. At the A19 GSP assembly, disconnect the grey ribbon cable (item 32) from the CRT.
8. Remove the four screws on the top of the display shield (item 33).
9. Start to slide the display out of the instrument by pushing on the back of the display assembly. There is a hole at the rear of the display shielding where you can reach in to push the display.

### **How to Reinstall the Display**

1. Remove and set aside the bottom shield attached to the replacement display. Install the bottom shield on the old display assembly before it is returned for repair.
2. Leave the ribbon cable (A18W1) in the fastened position for easy retrieval through the rear display shielding.
3. Reverse the first six steps.

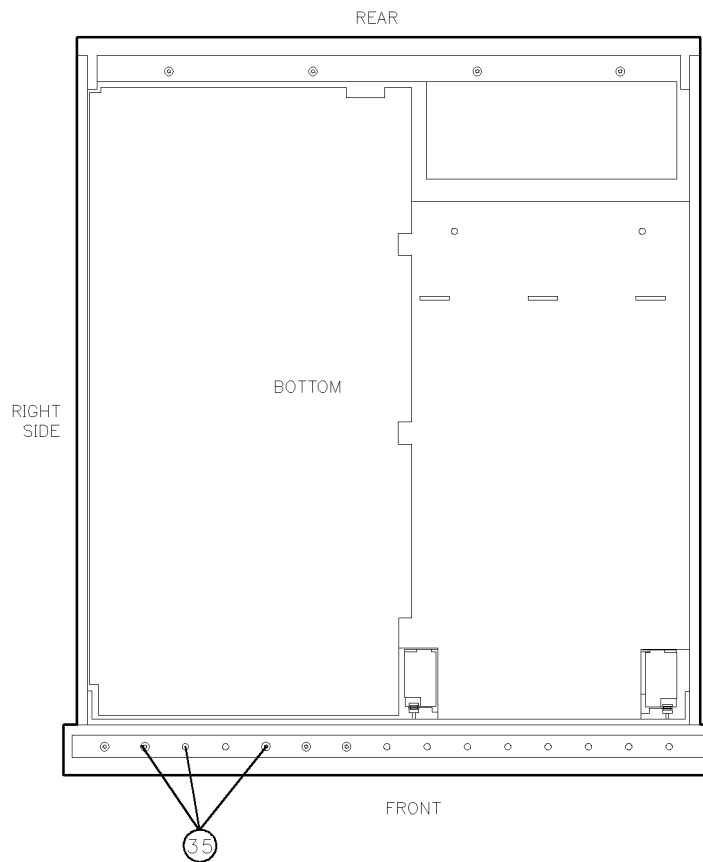
After reinstallation, refer to "Post-Repair Procedures" at the end of this chapter to ensure that the analyzer operates properly.

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## A30 Directional Coupler

### How to Remove the Directional Coupler

1. Perform the "Initial Front Panel Procedure."

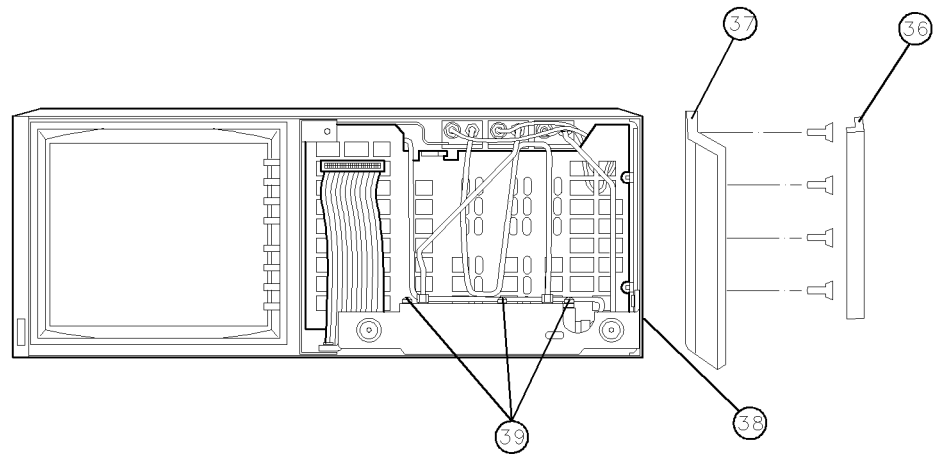


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**Figure 14-11. Location of Coupler Screws on Bottom Front Frame**

### 14.18 Assembly Replacement and Post-Repair Procedures

2. Remove the three screws which fasten the coupler to the bottom front frame (item 35, Figure 14-11).
3. Remove the front panel by sliding it out and over the type-N connectors.
4. Disconnect the ribbon cable from the front panel by pressing down and out on the connector locks.
5. Remove the trim strip (item 36, Figure 14-12) on the right side of the front panel by prying under the strip with a flat screwdriver.
6. Remove the right side front handle (item 37).



sh690c

**Figure 14-12. Location of Directional Coupler Hardware**

7. Remove the screw on the side edge of the frame (item 38).
8. Disconnect the semi-rigid cables from the coupler.
9. Remove the coupler and bracket from the analyzer.
10. Remove the screws (item 39) that fasten the bracket to the coupler.
11. Disconnect any remaining cables from the coupler.

### **Reverse Removal Procedure to Reinstall**

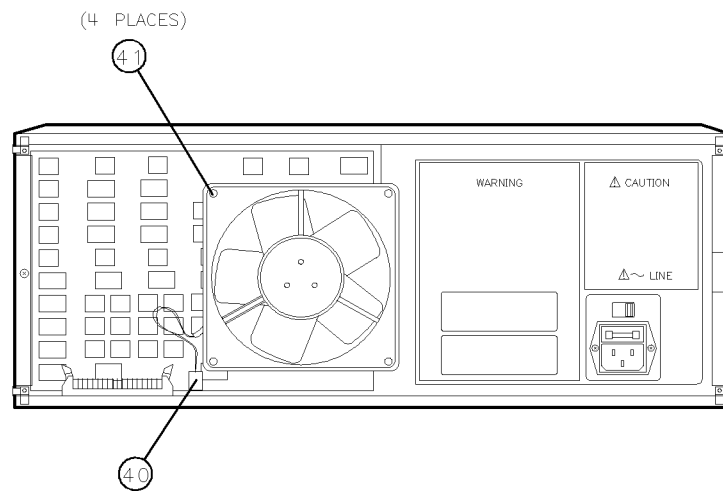
After reinstallation, refer to “Post-Repair Procedures” at the end of this chapter to ensure that the analyzer operates properly.

---

## B1 Fan

### How to Remove the Fan

1. Perform the “Initial Rear Panel Procedure.”



sh689c

**Figure 14-13. Location of Fan Wire Bundle and Screws**

2. Disconnect the fan's wire bundle from its motherboard connector (item 40, Figure 14-13).
3. Remove the Torx screws (item 41) from the four corners of the fan.

### Reverse Removal Procedure to Reinstall

After reinstallation, refer to “Post-Repair Procedures” at the end of this chapter to ensure that the analyzer operates properly.

## 14-20 Assembly Replacement and Post-Repair Procedures

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## A9BT1 Battery

### How to Remove the Battery

1. Remove the A9 CPU board from its card cage slot.
2. Unsolder and remove the battery from the A9 CPU board.

---

**Warning**      **Battery A9BT1 contains lithium. Do not incinerate or puncture this battery. Dispose of the discharged battery in a safe manner.**

---

### Replacing the Battery

1. Make sure the new battery is inserted into the A9 board with the correct polarity.
2. Solder the battery into place.
3. Replace the A9 CPU board.

## Post-Repair Procedures

After you repair or replace an assembly, check the following table. It lists any additional service procedures that must be performed to ensure the instrument is working properly.

**Table 14-1. Post-Repair Procedures**

Replaced or Repaired Assembly	Adjustments Correction Constants (CC)	Verification
A1 Front Panel Keyboard	None	Internal Test 0 Internal Test 23
A2 Front Panel Interface	None	Internal Test 0 Internal Test 23 Internal Test 12
A3 Source	A9 CC Jumper Position Source Default CC (test 44) Source Pretune Default CC (Test 45) Analog Bus CC (Test 46) RF Output Power (Test 47) Source Pretune (Test 48) Frequency Response CC (Tests 53 and 57) Cavity Oscillator CC (Test 54) Source Spur Avoidance Tracking EEPROM Backup Disk	Reflection Test Port Output Power Range and Level Linearity
A4/A5/A6 Samplers	A9 CC Jumper Position Frequency Response CC (Tests 53 and 57) IF Amplifier CC (Test 51) EEPROM Backup Disk	Test Port Crosstalk
A7 Pulse Generator	A9 CC Jumper Position Frequency Response CC (Tests 53 and 57) EEPROM Backup Disk	Reflection Test Port Output Power Range and Level Linearity
A8 Post Regulator	A9 CC Jumper Position Source Spur Avoidance Tracking Cavity Oscillator CC (Test 54) EEPROM Backup Disk	Internal Test 0 Check A8 Test Point Voltages

### 14-22 Assembly Replacement and Post-Repair Procedures

**Table 14-1. Post-Repair Procedures (continued)**

Replaced or Repaired Assembly	Adjustments Correction Constants (CC)	Verification
A9 CPU	A9 CC Jumper Position Model Number CC (75Ω only) Display Intensity CC (Test 49) Serial Number CC (Test 55) Option Number CC (Test 56) Source Default CC (Test 44) Source Pretune Default CC (Test 45) Analog Bus CC (Test 46) RF Output Power CC (Test 47) Source Pretune CC (Test 48) Frequency response CC (Tests 53 and 57) ADC Offset CC (Test 52) IF Amplifier CC (Test 51) Cavity Oscillator CC (Test 54) EEPROM Backup Disk	Reflection Test Port Output Power Range and Level Linearity Magnitude Dynamic Accuracy Phase Dynamic Accuracy
A10 Digital IF	A9 CC Jumper Position Analog Bus CC (Test 46) Frequency Response CC (Tests 53 and 57) IF Amplifier CC (Test 51) EEPROM Backup Disk	Transmission Test Port Input Noise Floor Test Port Crosstalk System Trace Noise
A11 Phase Lock	A9 CC Jumper Position Analog Bus CC (Test 46) Pretune Default CC (Test 45) Source Pretune CC (Test 45) EEPROM Backup Disk	Reflection Test Port Output Frequency Range and Accuracy
A12 Reference	High/Low Band Transition Frequency Accuracy	Reflection Test Port Output Frequency Range and Accuracy
A13 Frac-N (Analog)	Frac-N Spur Avoidance and FM Sideband	Reflection Test Port Output Frequency Range and Accuracy
A14 Frac-N (Digital)	Frac-N Frequency Range Frac-N Spur Avoidance and FM Sideband	Reflection Test Port Output Frequency Range and Accuracy
A15 Preregulator	None	Self Test
A16 Rear Panel Board	None	Internal Test 13
A17 Motherboard	None	Self Test
A18 Display	Vertical Position and Focus Display Intensity CC (Test 49) <i>only if needed</i>	Internal Tests 66 - 80

**Table 14-1. Post-Repair Procedures (continued)**

<b>Replaced or Repaired Assembly</b>	<b>Adjustments Correction Constants (CC)</b>	<b>Verification</b>
A19 Graphic System Processor	None	Internal Tests 59 - 80
A30 Dual Directional Coupler	A9 CC Jumper Position Frequency Response CC (Tests 53 and 57) RF Output Power CC (Test 47) EEPROM Backup Disk	Verification
A3A5 Step Attenuator	A9 CC Jumper Position RF Output Power CC (Test 47) EEPROM Backup Disk	Reflection Test Port Output Power Range and Level Linearity
A3AT1 4 dB Attenuator	A9 CC Jumper Position RF Output Power CC (Test 47) EEPROM Backup Disk	Reflection Test Port Output Power Range and Level Linearity
8 dB Attenuator	A9 CC Jumper Position RF Output Power CC (Test 47) EEPROM Backup Disk	Reflection Test Port Output Power Range and Level Linearity



## Safety and Licensing

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### Notice

The information contained in this document is subject to change without notice.

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### Certification

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

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

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### 15-2 Safety and Licensing

## Hewlett-Packard Sales and Service Offices (continued)

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### 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 anti-static packaging materials*. A listing of Hewlett-Packard sales and service offices is provided in this chapter.

---

## 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.

---

<b>Caution</b>	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.
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<b>Warning</b>	<b>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.</b>
----------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

---

---

## 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.

---

## General Safety Considerations

### 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.

---

### Before Applying Power

---

**Caution** 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 detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the main supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.

---

**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**      The analyzer's internal battery contains lithium. Do not incinerate or puncture this battery. Dispose of the discharged battery in a safe manner.

---

**Warning**      For continued protection against fire hazard replace line fuse only with same type and rating (F 5A/250V). The use of other fuses or material is prohibited.

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