Analyzer Repair Inc.

Test Equipment Repair & Calibration

HP 8753E-ES

Agilent 8753ES ET Service Guide 08753-90484

Need this instrument repaired or calibrated?

Analyzer Repair services spectrum analyzers, network analyzers, signal generators and other RF/microwave test equipment.

Free estimates - visit our website or email us to get started.

www.analyzerrepair.com **manager@analyzerrepair.com**

This manual is provided free as a reference by Analyzer Repair, Inc. All original content remains the property of its original manufacturer. Not for resale.

If you are the rights holder and object to this document being hosted here, email manager@analyzerrepair.com and it will be removed promptly.

Service Guide

8753ET/ES
Agilent Technologies
Network Analyzers



Agilent Technologies

Part Number 08753-90484

Printed in USA
June 2004

Supersedes Print Date: June 2002

© Agilent Technologies, Inc. 1999–2002, 2004

WARRANTY STATEMENT

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED “AS IS,” AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, AGILENT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. AGILENT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD AGILENT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

DFARS/Restricted Rights Notice

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as “Commercial computer software” as defined in DFAR 252.227-7014 (June 1995), or as a “commercial item” as defined in FAR 2.101(a) or as “Restricted computer software” as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent Technologies’ standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Certification

Agilent Technologies, Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies, Inc. 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.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies, Inc. products. For information about these agreements and for other assistance, contact Agilent. Refer to “Assistance” on page 15-2.

Safety and Regulatory Information

The safety and regulatory information pertaining to this product is located in Chapter 15 , “Safety and Regulatory Information.”

Safety Notes

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument. All pertinent safety notes for using this product are located in Chapter 15 , “Safety and Regulatory Information.”

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

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

Documentation Map



The *Installation and Quick Start Guide* provides procedures for installing, configuring, and verifying the operation of the analyzer. It also will help you familiarize yourself with the basic operation of the analyzer.



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



The *Reference Guide* provides reference information, such as specifications, menu maps, and key definitions.



The *Programmer's Guide* provides general GPIB programming information, a command reference, and example programs. The *Programmer's Guide* contains a CD-ROM with example programs.



The **CD-ROM** provides the *Installation and Quick Start Guide*, the *User's Guide*, the *Reference Guide*, and the *Programmer's Guide* in PDF format for viewing or printing from a PC.



The *Service Guide* provides information on calibrating, troubleshooting, and servicing your analyzer. The *Service Guide* is not part of a standard shipment and is available only as Option 0BW. A CD-ROM with the *Service Guide* in PDF format is included for viewing or printing from a PC.

How to Use This Guide

This guide uses the following conventions:

Front Panel Key	This represents a key physically located on the instrument.
SOFTKEY	This represents a "softkey", a key whose label is determined by the instrument firmware.
`Computer Font`	This represents text displayed on the instrument's screen, text on a computer display, or a programming command.

Contents

1. Service Equipment and Analyzer Options

Required Tools and Equipment 1-2
Principles of Microwave Connector Care 1-7
Analyzer Options Available 1-8
Option 1D5, High Stability Frequency Reference 1-8
Option 002, Harmonic Mode 1-8
Option 004, Step Attenuator (8753ET only) 1-8
Option 006, 6 GHz Operation 1-8
Option 010, Time Domain 1-8
Option 011, Receiver Configuration (8753ES only) 1-8
Option 014, Configurable Test Set (8753ES only) 1-8
Option 075, 75 Ohm System Impedance (8753ES only) 1-9
Option 1CM, Rack Mount Flange Kit without Handles 1-9
Option 1CP, Rack Mount Flange Kit with Handles 1-9
Service and Support Options 1-10
Option W01 1-10
Option W31 1-10
Option W50 1-10
Option W51 1-10
Option W32 1-10
Option W52 1-10
Option W34 1-10
Option W54 1-11

2. System Verification and Performance Tests

Introduction 2-2
System Specifications 2-2
Instrument Specifications 2-2
System Verification Procedure 2-3
Performance Tests 2-3
Certificate of Calibration 2-4
Agilent 8753ES System Verification and Performance Tests 2-5
System Verification Cycle and Kit Recertification 2-5
8753ES System Verification 2-5
8753ES Performance Tests 2-13
1. Test Port Output Frequency Range and Accuracy 2-14
2. External Source Mode Frequency Range 2-17
3. Test Port Output Power Level Accuracy 2-19
4. Test Port Output Power Linearity 2-22
5. Minimum R Channel Level 2-28
6. Test Port Input Noise Floor Level 2-32
7. Test Port Input Frequency Response 2-36
8. Test Port Crosstalk 2-45
9. Uncorrected Port Performance 2-50
10. System Trace Noise 2-56
11. Test Port Receiver Magnitude Dynamic Accuracy 2-59
12. Test Port Receiver Magnitude Compression 2-72
13. Test Port Receiver Phase Compression 2-75
14. Test Port Output/Input Harmonics (Analyzers with Option 002) 2-78

Contents

15. Harmonic Measurement Accuracy (Analyzers with Option 002) 2-83
Agilent 8753ET System Verification and Performance Tests 2-87
System Verification Cycle and Kit Re-certification 2-87
8753ET System Verification 2-87
8753ET Performance Tests 2-95
1. Reflection Test Port Output Frequency Range and Accuracy 2-96
2. External Source Mode Frequency Range 2-98
3. Reflection Test Port Output Power Level Accuracy 2-100
4. Reflection Test Port Output Power Linearity (Analyzers without Option 004). 2-102
5. Reflection Test Port Output Power Linearity (Analyzers with Option 004) 2-108
6. Minimum R Channel Level 2-114
7. Transmission Test Port Input Noise Floor Level 2-119
8. Transmission Test Port Input Frequency Response. 2-122
9. Test Port Crosstalk. 2-127
10. Uncorrected Port Performance 2-131
11. System Trace Noise 2-136
. 2-140
Agilent 8753ES Performance Test Records 2-141
. 2-160
Agilent 8753ET Performance Test Records 2-161

3. Adjustments and Correction Constants
Post-Repair Procedures 3-3
A9 Switch Positions 3-6
Source Default Correction Constants (Test 44) 3-7
Source Pretune Default Correction Constants (Test 45) 3-8
Analog Bus Correction Constants (Test 46) 3-9
Source Pretune Correction Constants (Test 48) 3-10
RF Output Power Correction Constants (Test 47) 3-11
Required Equipment and Tools 3-11
IF Amplifier Correction Constants (Test 51) 3-14
Required Equipment and Tools 3-14
ADC Offset Correction Constants (Test 52) 3-15
Sampler Magnitude and Phase Correction Constants (Test 53) 3-16
Required Equipment and Tools 3-16
Power Sensor Calibration Factor Entry 3-17
Determine the Insertion Loss of the Cable at 1 GHz (8753ES) 3-18
Determine the Insertion Loss of the Cable at 1 GHz (8753ET) 3-19
Sampler Correction Constants Routine 3-20
Cavity Oscillator Frequency Correction Constants (Test 54) 3-26
Required Equipment and Tools 3-26
Spur Search Procedure with a Filter. 3-28
Spurs Search Procedure without a Filter 3-29
Serial Number Correction Constants (Test 55) 3-31

Contents

Option Numbers Correction Constants (Test 56) 3-32
Initialize EEPROMs (Test 58) 3-33
EEPROM Backup Disk Procedure 3-34
Required Equipment and Tools 3-34
Correction Constants Retrieval Procedure 3-35
Required Equipment and Tools 3-35
Loading Firmware 3-36
Loading Firmware into an Existing CPU 3-36
Loading Firmware into a New CPU 3-38
Fractional-N Frequency Range Adjustment 3-40
Required Equipment and Tools 3-40
Frequency Accuracy Adjustment. 3-43
Required Equipment and Tools 3-43
High/Low Band Transition Adjustment 3-47
Fractional-N Spur Avoidance and FM Sideband Adjustment 3-49
Required Equipment and Tools 3-49
Source Spur Avoidance Tracking Adjustment 3-52
Required Equipment and Tools 3-52
Unprotected Hardware Option Numbers Correction Constants 3-54
Sequences for Mechanical Adjustments 3-55
How to Load Sequences from Disk 3-55
How to Set Up the Fractional-N Frequency Range Adjustment 3-55
How to Set Up the High/Low Band Transition Adjustments 3-56
How to Set Up the Fractional-N Spur Avoidance and FM Sideband Adjustment 3-56
Sequence Contents 3-56

4. Start Troubleshooting Here

Assembly Replacement Sequence 4-3
Having Your Analyzer Serviced. 4-4
Step 1. Initial Observations 4-5
Initiate the Analyzer Self-Test 4-5
Step 2. Operator's Check 4-6
Description 4-6
Required Equipment and Tools 4-7
Procedure 4-7
Step 3. GPIB Systems Check 4-8
If Using a Plotter or Printer 4-8
If Using an External Disk Drive 4-9
Troubleshooting Systems with Multiple Peripherals 4-9
Troubleshooting Systems with Controllers 4-9
Step 4. Faulty Group Isolation 4-10
Power Supply 4-11
Check the Rear Panel LEDs 4-11
Check the A8 Post Regulator LEDs 4-11
Digital Control 4-12
Observe the Power Up Sequence 4-12
Verify Internal Tests Passed. 4-13
Source 4-14
Phase Lock Error Messages 4-14

Contents

Check Source Output Power 4-14
No Oscilloscope or Power Meter? Try the ABUS 4-15
Receiver (8753ES) 4-17
Observe the A and B Input Traces 4-17
Receiver Error Messages 4-18
Faulty Data 4-18
Receiver (8753ET) 4-19
Required Equipment 4-19
Observe the A and B Input Traces 4-19
Receiver Error Messages 4-21
Faulty Data 4-21
Accessories 4-22
Accessories Error Messages 4-22
Troubleshooting 8753ES Option 014 4-23
Description 4-23
Setup 4-25
Measurements 4-25
Symptom Example Plots 4-26
Symptoms 4-28

5. Power Supply Troubleshooting
Power Supply Troubleshooting 5-2
Assembly Replacement Sequence 5-3
Simplified Block Diagram 5-4
Start Here 5-5
Check the Green LED and Red LED on A15 5-5
Check the Green LEDs on A8 5-5
Measure the Post Regulator Voltages 5-6
If the Green LED of the A15 Is Not ON Steadily 5-7
Check the Line Voltage, Selector Switch, and Fuse 5-7
If the Red LED of the A15 Is ON 5-8
Check the A8 Post Regulator 5-8
Verify the A15 Preregulator 5-10
Check for a Faulty Assembly 5-11
Check the Operating Temperature 5-12
Inspect the Motherboard 5-12
If the Green LEDs of the A8 Are Not All ON 5-13
Remove A8, Maintain A15W1 Cable Connection 5-13
Check the A8 Fuses and Voltages 5-13
Remove the Assemblies 5-13
Briefly Disable the Shutdown Circuitry 5-14
Inspect the Motherboard 5-16
Error Messages 5-17
Check the Fuses and Isolate A8 5-18
Fan Troubleshooting 5-19
Fan Speeds 5-19
Check the Fan Voltages 5-19
Short A8TP3 to Ground 5-19
Intermittent Problems 5-20

Contents

6. Digital Control Troubleshooting

Digital Control Troubleshooting 6-2
Digital Control Group Block Diagram. 6-3
Assembly Replacement Sequence 6-4
CPU Troubleshooting (A9) 6-5
A9 CC Switch Positions 6-5
Checking A9 CPU Red LED Patterns 6-6
Display Troubleshooting (A2, A18, A19, A27) 6-7
Evaluating Your Display 6-7
Troubleshooting a White Display 6-10
Troubleshooting a Black Display 6-10
Troubleshooting a Display with Color Problems 6-11
Front Panel Troubleshooting (A1, A2) 6-12
Check Front Panel LEDs After Preset 6-12
Identify the Stuck Key 6-13
Inspect Cables 6-15
Test Using a Controller 6-15
Run the Internal Diagnostic Tests 6-16
If the Fault Is Intermittent 6-18
Repeat Test Function 6-18
GPIB Failures 6-19

7. Source Troubleshooting

Source Troubleshooting 7-2
Assembly Replacement Sequence 7-3
Before You Start Troubleshooting 7-4
Power 7-5
1. Source Default Correction Constants (Test 44) 7-5
2. RF Output Power Correction Constants (Test 47) 7-5
3. Sampler Magnitude and Phase Correction Constants (Test 53) 7-5
Phase Lock Error 7-6
Phase Lock Loop Error Message Check 7-6
A4 Sampler/Mixer Check 7-8
A3 Source and A11 Phase Lock Check 7-8
A12 Reference Check 7-12
A13/A14 Fractional-N Check 7-20
A7 Pulse Generator Check 7-25
A11 Phase Lock Check 7-28
Source Group Troubleshooting Appendix 7-30
Troubleshooting Source Problems with the Analog Bus 7-30
Phase Lock Diagnostic Tools 7-30
Broadband Power Problems 7-31

8. Receiver Troubleshooting

Receiver Troubleshooting 8-2
Assembly Replacement Sequence 8-3
Receiver Failure Error Messages 8-4
Troubleshooting When All Inputs Look Bad 8-5

Contents

Run Internal Tests 18 and 17 . . . 8-5
Check 2nd LO . . . 8-5
Check the 4 MHz REF Signal . . . 8-6
Check A10 by Substitution or Signal Examination . . . 8-7
Troubleshooting When One or More Inputs Look Good . . . 8-9
Check the 4 kHz Signal . . . 8-9
Check the Trace with the Sampler Correction Constants Off . . . 8-10
Check 1st LO Signal at Sampler/Mixer . . . 8-10
Check 2nd LO Signal at Sampler/Mixer . . . 8-11

9. Accessories Troubleshooting
Accessories Troubleshooting . . . 9-2
Assembly Replacement Sequence . . . 9-3
Inspect the Accessories . . . 9-4
Inspect the Test Port Connectors and Calibration Devices . . . 9-4
Inspect the Error Terms . . . 9-5
Cable Test . . . 9-6
Verify Shorts and Opens . . . 9-6

10. Service Key Menus and Error Messages
Service Key Menus . . . 10-3
Internal Diagnostics Menus. . . . 10-3
Service Feature Menus . . . 10-16
Firmware Revision Softkey . . . 10-41
GPIB Service Mnemonic Definitions . . . 10-42
Invoking Tests Remotely . . . 10-42
Analog Bus Codes . . . 10-43
Error Messages . . . 10-44

11. Error Terms
Error Terms . . . 11-2
Error Terms Can Also Serve a Diagnostic Purpose . . . 11-3
Error Correction . . . 11-4
Error Term Inspection . . . 11-4
Error Term Descriptions . . . 11-5

12. Theory of Operation
How the Analyzer Works. . . . 12-3
The Built-In Synthesized Source . . . 12-3
The Built-In Test Set . . . 12-4
The Receiver Block . . . 12-4
The Microprocessor . . . 12-4
Required Peripheral Equipment . . . 12-4
A Close Look at the Analyzer's Functional Groups . . . 12-5
Power Supply Theory. . . . 12-6
A15 Preregulator . . . 12-6
A8 Post Regulator . . . 12-7
Digital Control Theory . . . 12-9

Contents

A1 Front Panel 12-11
A2 Front Panel Processor 12-11
A9 CPU/A10 Digital IF 12-11
A18 Display 12-12
A19 GSP 12-12
A27 Inverter 12-13
A16 Rear Panel 12-13
Source Theory Overview 12-14
A14/A13 Fractional-N 12-14
A12 Reference 12-14
A7 Pulse Generator 12-14
A11 Phase Lock 12-14
A3 Source 12-15
Source Super Low Band Operation 12-15
Source Low Band Operation 12-15
Source High Band Operation 12-17
Source Operation in other Modes and Features 12-19
Signal Separation (8753ET) 12-23
The A21 Dual Directional Coupler 12-23
Signal Separation (8753ES) 12-25
The Built-In Test Set 12-25
Receiver Theory 12-27
A4/A5/A6 Sampler/Mixer 12-29
A10 Digital IF 12-30

13. Replaceable Parts

Replacing an Assembly 13-3
Rebuilt-Exchange Assemblies 13-4
Ordering Information 13-5
Replaceable Part Listings 13-7
8753ET: Major Assemblies, Top 13-10
8753ES: Major Assemblies, Top 13-12
8753ET: Major Assemblies, Bottom 13-14
8753ES: Major Assemblies, Bottom 13-15
8753ES Option 014: Major Assemblies and Cables, Bottom 13-16
8753ET: Cables, Top 13-18
8753ES: Cables, Top 13-20
8753ES Option 014: Cables, Top 13-22
8753ET: Cables, Bottom 13-24
8753ES: Cables, Bottom 13-26
8753ET: Cables, Front 13-28
8753ES: Cables, Front 13-30
8753ET/ES: Cables, Rear 13-32
8753ET/ES: Cables and Miscellaneous Parts, Source 13-34
8753ET/ES: Front Panel Assembly, Outside 13-36
8753ET/ES: Front Panel Assembly, Inside 13-38
8753ET: Rear Panel Assembly 13-40
8753ES: Rear Panel Assembly 13-42
8753ET/ES: Rear Panel Assembly, Option 1D5 13-44

Contents

8753ET/ES: Hardware, Top 13-46
8753ET: Hardware, Bottom 13-48
8753ES: Hardware, Bottom 13-49
8753ET/ES: Hardware, Front 13-50
8753ET: Hardware, Test Set Deck 13-51
8753ES: Hardware, Test Set Deck 13-52
8753ET/ES: Hardware, Disk Drive Support 13-53
8753ET/ES: Hardware, Memory Deck 13-54
8753ET/ES: Hardware, Preregulator 13-55
8753ET/ES: Chassis Parts, Outside 13-56
8753ET/ES: Chassis Parts, Inside 13-58
Miscellaneous 13-59

14. Assembly Replacement and Post-Repair Procedures

Replacing an Assembly 14-3
Procedures described in this chapter 14-4
Line Fuse 14-5
Tools Required 14-5
Removal 14-5
Replacement 14-5
Covers 14-6
Tools Required 14-6
Removing the top cover 14-6
Removing the side covers 14-6
Removing the bottom cover 14-6
Front Panel Assembly 14-8
Tools Required 14-8
Removal 14-8
Replacement 14-8
Front Panel Keyboard and Interface Assemblies (A1, A2) 14-10
Tools Required 14-10
Removal 14-10
Replacement 14-10
Display, Display Lamp and Inverter Assemblies (A18, A27) 14-12
Tools Required 14-12
Removal 14-12
Replacement 14-12
Rear Panel Assembly 14-14
Tools Required 14-14
Removal 14-14
Replacement 14-14
Rear Panel Interface Board Assembly (A16) 14-16
Tools Required 14-16
Removal 14-16
Replacement 14-16
A3 Source Assembly 14-18
Tools Required 14-18

Contents

Removal 14-18
Replacement 14-18
A4, A5, A6 Samplers and A7 Pulse Generator 14-20
Tools Required 14-20
Removal 14-20
Replacement 14-20
A8, A10, A11, A12, A13, A14 Card Cage Boards 14-22
Tools Required 14-22
Removal 14-22
Replacement 14-22
A9 CPU Board 14-24
Tools Required 14-24
Removal 14-24
Replacement 14-24
A9BT1 Battery 14-26
Tools Required 14-26
Removal 14-26
Replacement 14-26
A15 Preregulator 14-28
Tools Required 14-28
Removal 14-28
Replacement 14-28
A17 Motherboard Assembly. 14-30
Tools Required 14-30
Removal 14-30
Replacement 14-32
. 14-33
A19 Graphics Processor 14-34
Tools Required 14-34
Removal 14-34
Replacement 14-34
A20 Disk Drive Assembly 14-36
Tools Required 14-36
Removal 14-36
A20 Disk Drive Assembly Replacement. 14-38
Test the disk-eject function, and adjust if required. 14-39
Reinstall the front panel and covers 14-39
A21, A22 Test Port Couplers (8753ES Only) 14-40
Tools Required 14-40
Removal 14-40
Replacement 14-40
A21 Dual Directional Coupler (8753ET Only) 14-42
Tools Required. 14-42
A23 LED Board (8753ES Only) 14-44
Tools Required 14-44
Removal 14-44
Replacement 14-44
A24 Transfer Switch (8753ES Only) 14-46
Tools Required 14-46

Removal 14-46
Replacement 14-46
A25 Test Set Interface (8753ES Only) 14-48
Tools Required 14-48
Removal 14-48
Replacement 14-48
A26 High Stability Frequency Reference (Option 1D5) Assembly 14-50
Tools Required 14-50
Removal 14-50
Replacement 14-50
B1 Fan Assembly 14-52
Tools Required 14-52
Removal 14-52
Replacement 14-52
Post-Repair Procedures 14-53

15. Safety and Regulatory Information
General Information 15-2
Maintenance 15-2
Lithium Battery Disposal 15-2
Assistance 15-2
Shipment for Service 15-2
Contacting Agilent 15-3
Instrument Markings 15-4
Compliance with German FTZ Emissions Requirements 15-4
Compliance with German Noise Requirements 15-4
Safety Symbols 15-5
Safety Considerations 15-5
Safety Earth Ground 15-5
Before Applying Power 15-6
General 15-6
Servicing 15-7

1 Service Equipment and Analyzer Options

Required Tools and Equipment

The following is a list of the tools required to service your analyzer:

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

Table 1-1 Agilent 8753ET Service Test Equipment

Required Equipment	Critical Specifications	HP/Agilent Recommended Model	Use[a]
Frequency Counter	Frequency: 300 kHz–3 GHz (30 kHz–6 GHz for Option 006)	5350B/51B/52B	P
Synthesized Sweeper	Maximum spurious input: <–30 dB Residual FM: <20 kHz	83620A Option 001or 83712B Option 1E1	P
Spectrum Analyzer	Freq. Accuracy ±7 Hz	8563E	A
Oscilloscope	Bandwidth: 100 MHz Accuracy: 10%	any	T
Digital Voltmeter	Resolution: 10 mV	any	T
Tool Kit	No substitute	08753-60023	T
Power Meter (GPIB)		436A/437B/438A or E4418A/E4419A	A, P, T
Power Sensor	Frequency: 300 kHz–3 GHz	8482A	A, P, T
Power Sensor (for Option 006)	Frequency: 3 GHz–6 GHz	8481A	A, P, T
Photometer		Tektronix J16	A
Photometer Probe		Tektronix J6503	A
Light Occluder		Tektronix 016-0305-00	A
Printer		HP ThinkJet, DeskJet, LaserJet	P
Floppy Disk	one 3.5-inch formatted 1.44 MB	any	A
Calibration Kit Type-N, 50Ω	No substitute	85032B	A, P
Calibration Kit 7 mm, 50Ω	No substitute	85031B	P
Verification Kit 7 mm	No substitute	85029B	P
Low Pass Filter	>50 dB @ 2.96 Hz and passband that includes 800 MHz	9135-0198	A
Fixed Attenuator (2)	Type-N 20 dB	8491A Opt. 020	P, T
Adapters (2)	APC-7 to Type-N (m)	11525A	P, A
Adapter	Type-N (m) to Type-N (m)	1250-1475	P
Adapter	BNC to Alligator Clip	8120-1292	A
Adapter	APC-3.5 (m) to Type-N (f)	1250-1750	A, P
Adapter	APC-3.5 (f) to Type-N (f)	1250-1745	A, P

Table 1-1 Agilent 8753ET Service Test Equipment

Required Equipment	Critical Specifications	HP/Agilent Recommended Model	Use[a]
Adapter	BNC (m) to Type-N (f)	1250-0077	P
Adapter	Type-N (f) to Type-N (f)	1250-0777	P
RF Cable Set	APC-7, 50 Ω	11857D	P, A
RF Cable	24-inch, Type-N, 50 Ω	8120-4781	A, P
RF Cable Set	Type-N, 50 Ω	11851B	A
GPIB Cable		10833A	A, P
Coax Cable	BNC (m) to BNC (m), 50Ω	10503A	A
Coax Cable	BNC	8120-1840	A

a. P = Performance Tests, A = Adjustments, T = Troubleshooting

Table 1-2 Agilent 8753ES Service Test Equipment

Required Equipment	Critical Specifications	HP/Agilent Recommended Model	Use[a]
Frequency Counter	Frequency: 300 kHz–3 GHz (6 GHz for Option 006)	5350B/51B/52B	P
Spectrum Analyzer	Freq. Accuracy ±7 Hz	8563E	A
Synthesized Sweeper	Maximum spurious input: <–30 dB Residual FM: <20 kHz	83620A Option 001 or 83712B Option 1E1	P
Oscilloscope	Bandwidth: 100 MHz Accuracy: 10%	any	T
Digital Voltmeter	Resolution: 10 mV	any	T
Tool Kit	No substitute	08753-60023	T
Power Meter (GPIB)		436A/437B/438A or E4418A/E4419A	A, P, T
Power Sensor	Frequency: 300 kHz–3 GHz, 50Ω	8482A	A, P, T
Power Sensor (for Option 006)	Frequency: 3 GHz–6 GHz	8481A	A, P, T
Power Sensor (for Option 075)	Frequency: 300 kHz–3 GHz, 75Ω	8483A Opt. H03	A, P
Photometer		Tektronix J16	A
Photometer Probe		Tektronix J6503	A
Light Occluder		Tektronix 016-0305-00	A
Printer		HP ThinkJet, DeskJet, LaserJet	P
Floppy Disk	one 3.5-inch formatted 1.44 MB	any	A
Calibration Kit 7 mm, 50Ω	No substitute	85031B	P
Calibration Kit Type-N, 75Ω (for Option 075)	No substitute	85036B	P
Verification Kit 7 mm	No substitute	85029B	P
Low Pass Filter	>50 dB @ 2.96 Hz and passband that includes 800 MHz	9135-0198	A
Step Attenuator	No substitute	8496A Opt. 003, H18	P
Fixed Attenuator (2)	Return loss: ≥32 dB APC-7 20 dB	8492A Opt. 020	P, T
Fixed Attenuator (2)	Type-N 20 dB	8491A Opt. 020	P, T
Power Splitter, 2-way	Type-N	11667A, Opt. 001	P
Minimum Loss Pad (2) (for ES Option 075)	Type-N, 50Ω to 75Ω	11852B	A, P, T
Adapter	APC-7 to Type-N (f)	11524A	A, P

Table 1-2 Agilent 8753ES Service Test Equipment

Required Equipment	Critical Specifications	HP/Agilent Recommended Model	Use[a]
Adapters (2)	APC-7 to Type-N (m)	11525A	P
Adapter	APC-7 to 3.5 mm (m)	1250-1746	A, P
Adapter	APC-7 to 3.5 mm (f)	1250-1747	A, P
Adapter	BNC to Alligator Clip	8120-1292	A
Adapter	APC-3.5 (m) to Type-N (f)	1250-1750	A, P
Adapter	APC-3.5 (f) to Type-N (f)	1250-1745	A, P
Adapter	BNC (m) to Type-N (f)	1250-1477	P
Adapter	Type-N (f) to Type-N (f)	1250-0777	P
Adapter	Type-N (f) to Type-N (f), 75Ω	1250-1529	P
RF Cable Set	APC-7, 50 Ω	11857D	A, P
RF Cable (2)	24-inch, APC-7, 50 Ω (2)	8120-4779	A, P
RF Cable (for Option 075)	24-inch, Type-N, 75Ω	8120-2408	A, P
RF Cable	24-inch, Type-N, 50 Ω	8120-4781	A, P
GPIB Cable		10833A	A, P
Coax Cable	BNC (m) to BNC (m), 50Ω	10503A	A
Coax Cable	BNC	8120-1840	A, P

a. P = Performance Tests, A = Adjustments, T = Troubleshooting

Principles of Microwave Connector Care

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

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

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

For additional connector care instruction, contact the nearest Agilent Technologies sales or service office about course numbers HP/Agilent 85050A+24A and 85050A+24D.

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

Table 1-3 Connector Care Quick Reference

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

Analyzer Options Available

Option 1D5, High Stability Frequency Reference

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

Option 002, Harmonic Mode

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

Option 004, Step Attenuator (8753ET only)

This option adds a 70 dB step attenuator into the RF output path.

Option 006, 6 GHz Operation

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

Option 010, Time Domain

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

Option 011, Receiver Configuration (8753ES only)

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

Option 014, Configurable Test Set (8753ES only)

This option provides direct access to the internal components of the analyzer. Front panel access is provided to the A and B sampler ports, the COUPLER/SWITCH ports, the RF IN and RF OUT ports, and the R CHANNEL ports. This option offers improved sensitivity and the ability to add peripheral devices in multiple configurations.

Option 075, 75 Ohm System Impedance (8753ES only)

This option offers 75Ω impedance bridges with type-N 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.

Service and Support Options

The analyzer's standard warranty is a *one-year return to Agilent Technologies* service warranty.

NOTE There are many other repair and calibration options available from the Agilent Technologies support organization. These options cover a range of service agreements with varying response times. Contact Agilent for additional information on available service agreements for this product. Refer to "Contacting Agilent" on page 15-3.

2 System Verification and Performance Tests

Introduction

The performance of the network analyzer is specified in two ways: system specifications, and instrument specifications. Respectively, the analyzer's conformance to these specifications is verified in two ways: system verification, and performance tests.

System Specifications

System specifications specify warranted performance of the measurement system when making error-corrected measurements. The measurement system includes the analyzer, test cables, and calibration kit.

The analyzer's system specifications are described in the *Agilent 8753ET/ES Reference Guide* in the chapters titled "8753ES Specifications and Characteristics" and "8753ET Specifications and Characteristics." System specifications are included in the sections titled "Corrected System Performance." There are specifications for several different network analyzer measurement systems that are designated by the type of device connector used.

System specifications are expressed in two ways:

- residual errors of the measurement system
- graphs of measurement uncertainty versus reflection and transmission coefficients

System specifications are applicable when the measurement system is used to make error-corrected measurements.

System specifications are verified in one of the following ways:

- Complete the system verification procedure in this chapter using a certified verification kit, or
- Complete all of the performance tests and certify (or recertify) the calibration kit that will be used for future measurements. This alternative verifies both the system specifications and the instrument specifications for the analyzer.

Instrument Specifications

Instrument specifications specify the network analyzer's uncorrected measurement port characteristics and its output and input behavior.

The analyzer's instrument specifications are described in the *Agilent 8753ET/ES Reference Guide* in the chapters titled "8753ES Specifications and Characteristics" and "8753ET Specifications and Characteristics." The sections that describe instrument specifications are titled:

- "Uncorrected Port Performance"
- "Test Port Output"
- "Test Port Input"

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

Performance tests are used to confirm that the analyzer meets the instrument specifications.

System Verification Procedure

The system verification procedure tests the network analyzer measurement system, as defined previously, against the system specifications. If confirmation is successful, the measurement system is capable of making measurements to the accuracy specified by the graphs of measurement uncertainty. An outline of the system verification procedure follows:

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

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

Performance Tests

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

Certificate of Calibration

Agilent Technologies will issue a certificate of calibration for the product upon successful completion of system verification or completion of the performance tests. The certificate of calibration will include a “System Attachment” if the system verification procedure is used to confirm the system specifications. If the performance tests are used to confirm instrument specifications, the certificate of calibration will not include a system attachment. The equipment and measurement standards used for the tests must be certified and must be traceable to recognized standards.

NOTE If you have a measurement application that does not use all of the measurement capabilities of the analyzer, you may ask your local Agilent Technologies service office to verify only a subset of the specifications. However, this creates the possibility of making inaccurate measurements if you then use the analyzer in an application requiring additional capabilities.

Agilent 8753ES System Verification and Performance Tests

Use this section of the manual if you are performing system verification or performance tests on an 8753ES analyzer. If your instrument is an 8753ET, turn to "Agilent 8753ET System Verification and Performance Tests" on page 2-87.

System Verification Cycle and Kit Recertification

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

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

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

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

8753ES System Verification

This system verification consists of three separate procedures:

1. "Initialization" on page 2-6
2. "Measurement Calibration" on page 2-8
3. "Device Verification" on page 2-9

Analyzer warm-up time: **30 minutes**

Required Equipment

Description	HP/Agilent Model Number
Calibration Kit: 7-mm	85031B
Verification Kit: 7-mm	85029B
Test Port Extension Cable Set: 7-mm	11857D
Printer	HP ThinkJet/LaserJet
Additional Equipment for Option 075 Analyzers	
Minimum-Loss Pad (2): 50 Ω to 75 Ω	11852B
Adapter (2): APC-7 to Type-N (m)	11525A

Procedure

Initialization

1. Clear all internal memory.

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

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

---

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

b. Select an instrument state and press **RECALL STATE** .

c. Press **SELECT DISK** **INTERNAL DISK** **RETURN** **SAVE STATE** .

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

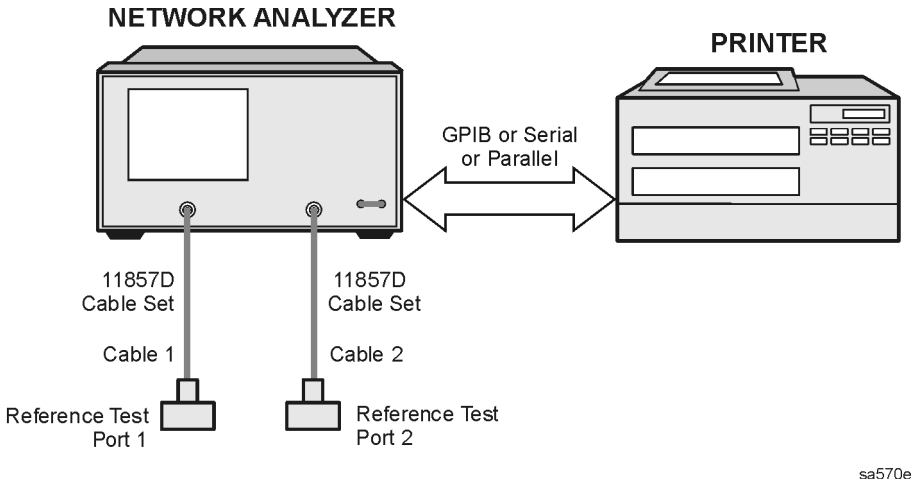
Press **FILE UTILITIES** **RENAME FILE** , enter the desired name, and press **DONE** .

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

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

3. Connect the equipment as shown in Figure 2-1. Let the system warm up for 30 minutes.

Figure 2-1 System Verification Test Setup



4. While the equipment is warming up, review the connector care information in Table 1-3 on page 1-7. Good connections and clean, undamaged connectors are critical for accurate measurement results.
5. Insert the verification kit disk into the analyzer disk drive.
6. Press (Preset) (Save/Recall) **SELECT DISK** **INTERNAL DISK** .
7. If you want a printout of the verification data for all the devices, press (System) **SERVICE MENU** **TEST OPTIONS** **RECORD ON** . If you want a printout of the graph from the display, press **DUMP GRAPH ON** .

NOTE If you switch on the record function, you *cannot* switch it off during the verification procedure.

---

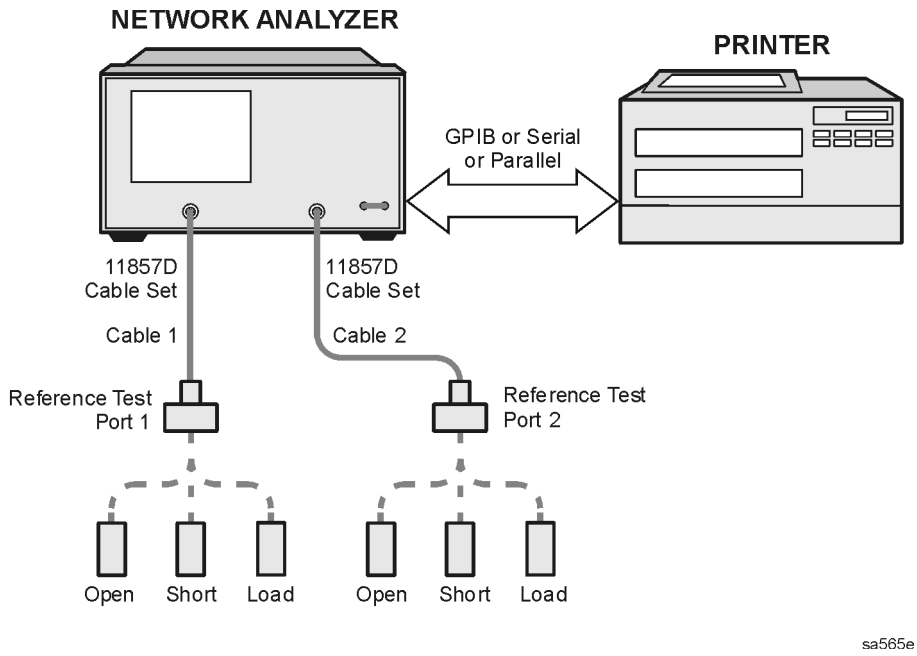
8. Position the paper in the printer so that printing starts at the top of the page.
9. If you have difficulty with the printer:
   - If the interface on your printer is GPIB, verify that the printer address is set to 1 (or change the setting in the analyzer to match the printer).
   - If the interface on your printer is serial or parallel, be sure that you selected the printer port and the printer type correctly. Refer to your *User's Guide* for more information on how to perform these tasks.
10. Press (System) **SERVICE MENU** **TESTS** **SYS VER TESTS** **EXECUTE TEST** .
11. When the analyzer displays `Sys Ver Init DONE`, the initialization procedure is complete.

CAUTION *Do not* press (Preset) or recall another instrument state. You must use the current instrument state.

Measurement Calibration

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

Figure 2-2 Connections for Measurement Calibration Standards



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

25. When the analyzer finishes measuring the standard, connect the 50 ohm termination to reference test port 2.

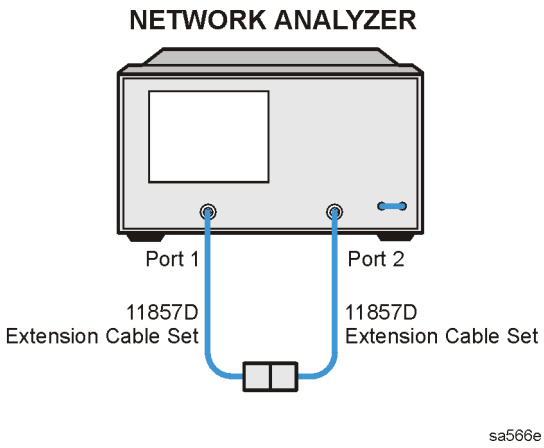
26. Press **REVERSE:LOAD**.

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

    The analyzer briefly displays `COMPUTING CAL COEFFICIENTS`.

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

Figure 2-3 Transmission Calibration Setup



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

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

31. To save the calibration into the analyzer internal memory, press the following:
    (Save/Recall) **SELECT DISK** **INTERNAL MEMORY**

    Rotate the knob to select Register 1 (REG1) on the display. Then press:
    RETURN **SAVE STATE**

IMPORTANT Step 31 is crucial to the correct recall of the calibration during subsequent measurements. The calibration *MUST* be stored in Register 1 (REG1) of **INTERNAL MEMORY** to be properly recalled.

---

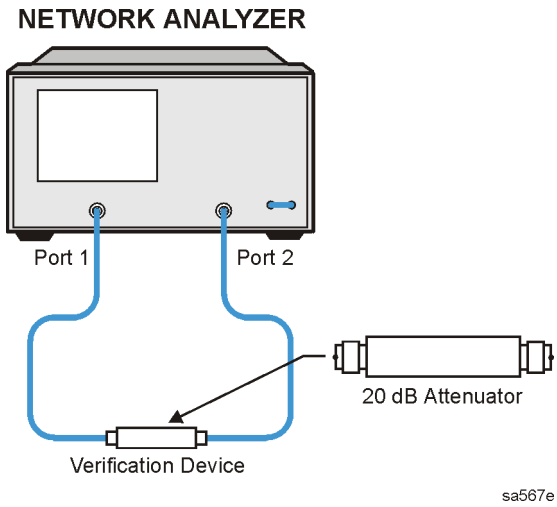
32. When the analyzer finishes saving the instrument state, press **SELECT DISK** **INTERNAL DISK**.

Device Verification

1. Press (System) **SERVICE MENU** **TESTS** (28) (x1) **EXECUTE TEST**.
2. At the prompt, connect the 20 dB attenuator (supplied in the verification kit) as shown in Figure 2-4.

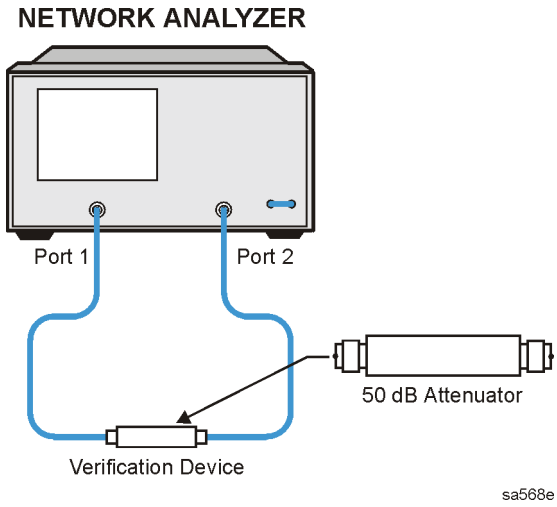
3. Press **CONTINUE** to run the test:
   - If you switched the record function off, the test pauses after each S-parameter measurement. Press **CONTINUE** after each measurement.
   - If you switched the record function on, the analyzer measures all S-parameters (magnitude and phase) without pausing. Also, the analyzer only displays and prints the PASS/FAIL information for the S-parameter measurements that are valid for system verification.

Figure 2-4 Connections for the 20 dB Verification Device



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

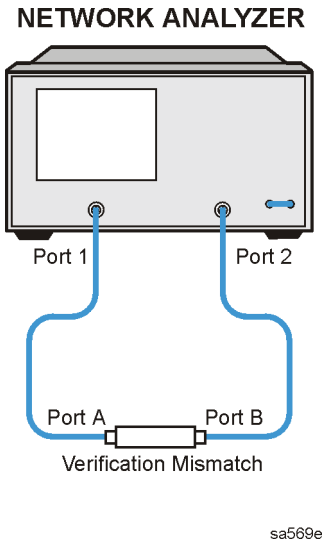
Figure 2-5 Connections for the 50 dB Verification Device



5. Press 29 x1 **EXECUTE TEST** **CONTINUE** .

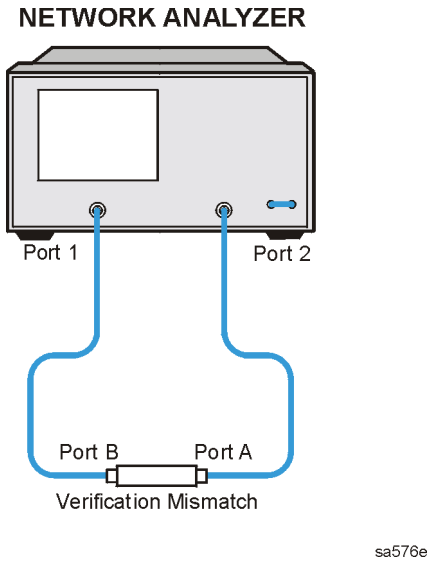
6. When all measurements are complete, replace the verification device with the verification mismatch, as shown in Figure 2-6. Be sure that you connect Port A of the verification mismatch to reference test port 1.

Figure 2-6 Mismatch Device Verification Setup 1



7. Press **RETURN** **TESTS** 30 x1 **EXECUTE TEST** **CONTINUE**.
8. When the analyzer finishes all the measurements, connect the mismatch verification device as shown in Figure 2-7. Notice that Port B is now connected to reference test port 1.

Figure 2-7 Mismatch Device Verification Setup 2



9. Press **RETURN** **TESTS** 31 x1 **EXECUTE TEST** **CONTINUE**.
10. You have completed the system verification procedure when the analyzer displays `Ver Def 4 DONE`.

In Case of Difficulty

1. Inspect all connections.

CAUTION *Do not* disconnect the cables from the analyzer test ports. Doing so *will invalidate* the calibration that you have done earlier.

---

2. Press (Preset) (Save/Recall). Using the front panel knob, highlight the title of the full 2-Port calibration that you performed earlier, then press **RECALL STATE**.
3. Repeat the "Device Verification" procedure.
4. If the analyzer still fails the test, check the measurement calibration as follows:
   a. Press (Preset).
   b. Recall the calibration by pressing (Save/Recall) **SELECT DISK** **INTERNAL MEMORY** **RETURN**.
   c. Use the front panel knob to highlight the calibration you want to recall and press **RECALL STATE**.
   d. Connect the short to reference test port 1.
   e. Press (Meas) **Refl: FWD S11 (A/R)** (Sweep Setup) **TRIGGER MENU** **CONTINUOUS**.
   f. Press (Scale Ref) **SCALE/DIV** (0.05) (x1).
   g. Check that the trace response is 0.00 ±0.05 dB.
   h. Disconnect the short and connect it to reference test port 2.
   i. Press (Meas) **Refl: REV S22(B/R)**.
   j. Check that the trace response is 0.00 ±0.05 dB.
   k. If any of the trace responses are out of the specified limits, repeat the "Measurement Calibration" and "Device Verification" procedures.
5. Refer to Chapter 4 , "Start Troubleshooting Here," for more troubleshooting information.

8753ES Performance Tests

The following tests comprise the performance tests for your analyzer. Make a copy of the "Agilent 8753ES Performance Test Records," starting on page 2-141, to record the results of these tests.

1. Test Port Output Frequency Range and Accuracy, on page 2-14
2. External Source Mode Frequency Range, on page 2-17
3. Test Port Output Power Level Accuracy, on page 2-19
4. Test Port Output Power Linearity, on page 2-22
5. Minimum R Channel Level, on page 2-28
6. Test Port Input Noise Floor Level, on page 2-32
7. Test Port Input Frequency Response, on page 2-36
8. Test Port Crosstalk, on page 2-45
9. Uncorrected Port Performance, on page 2-50
10. System Trace Noise, on page 2-56
11. Test Port Receiver Magnitude Dynamic Accuracy, on page 2-59
12. Test Port Receiver Magnitude Compression, on page 2-72
13. Test Port Receiver Phase Compression, on page 2-75
14. Test Port Output/Input Harmonics (Analyzers with Option 002), on page 2-78
15. Harmonic Measurement Accuracy (Analyzers with Option 002), on page 2-83

1. Test Port Output Frequency Range and Accuracy

Perform this test to verify the frequency accuracy of the 8753ES over its entire operating frequency range. A frequency counter is used to determine the analyzer's output frequency.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Frequency Accuracy[a]
30 kHz to 3 GHz	±10 ppm
3 GHz to 6 GHz[b]	±10 ppm

a. At 25 °C ±5 °C.
b. Only for analyzers with Option 006.

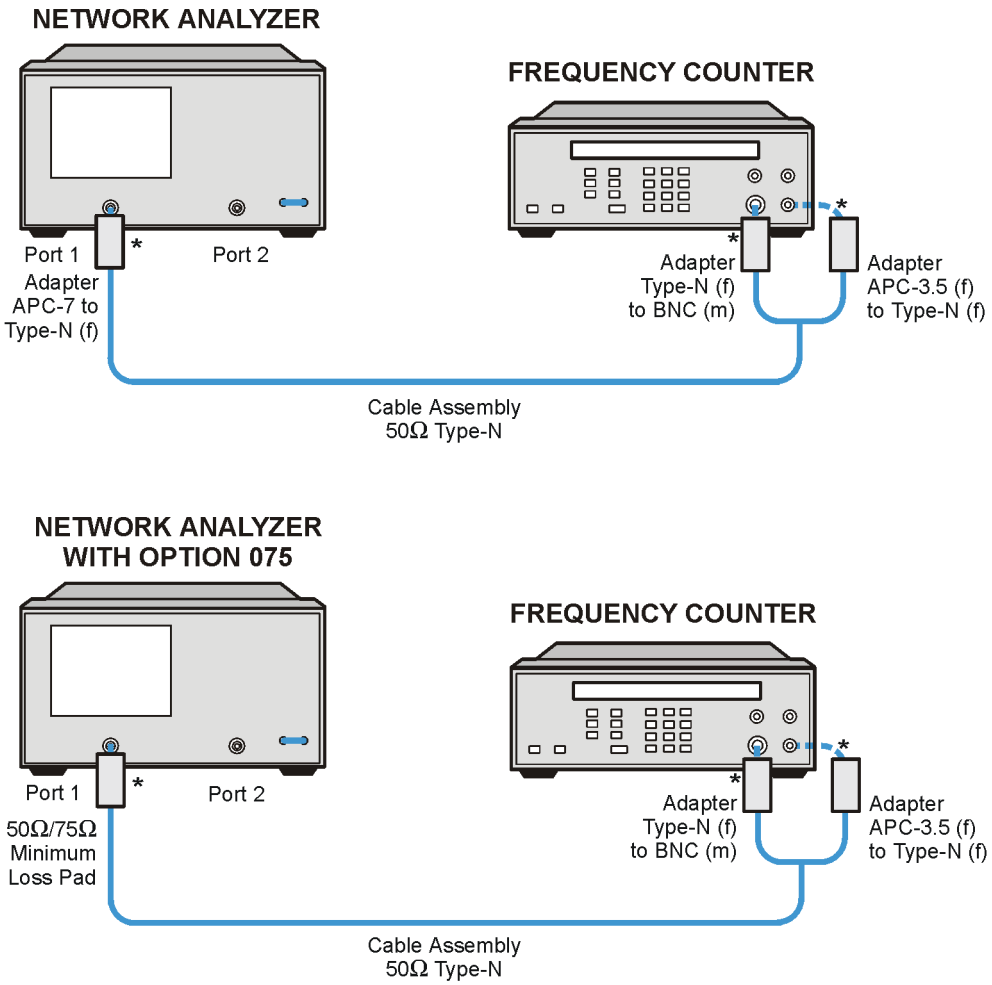
Required Equipment

Description	HP/Agilent Part or Model Number
Frequency Counter	5350B/51B/52B
Cable: 50Ω Type-N, 24-inch	8120-4781
Adapter: APC-3.5 (f) to Type-N (f)	1250-1745
Adapter: APC-7 to Type-N (f)	11524A
Adapter: Type-N (f) to BNC (m)	1250-1477
Additional Equipment needed for an 8753ES with Option 075	
Minimum Loss Pad, 50Ω to 75Ω	11852B

Procedure

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

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



2. Press Preset Sweep Setup **CW FREQ** .
3. Press 30 k/m and write the frequency counter reading on the performance test record.
4. Repeat step 3 for each instrument frequency listed in the performance test record.

In Case of Difficulty

1. If any measured frequency is close to the specification limits, check the time base accuracy of the counter used.
2. If the analyzer fails by a significant margin at *all* frequencies (especially if the deviation increases with frequency), the master time-base probably needs adjustment. In this case, refer to "Frequency Accuracy Adjustment" on page 3-43. The "Fractional-N Frequency Range Adjustment" on page 3-40 also affects frequency accuracy.
3. Refer to Chapter 7 , "Source Troubleshooting," for related troubleshooting information.

2. External Source Mode Frequency Range

Perform this test to verify that the analyzer's reference channel, R Channel In, is capable of phase locking to an external CW signal. CW signals from an external source are fed into the R channel input when the instrument is in external source mode. Proper phase lock conditions are confirmed at a power level of –25 dBm.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range
300 kHz to 3 GHz
300 kHz to 6 GHz[a]

a. Only for analyzers with Option 006.

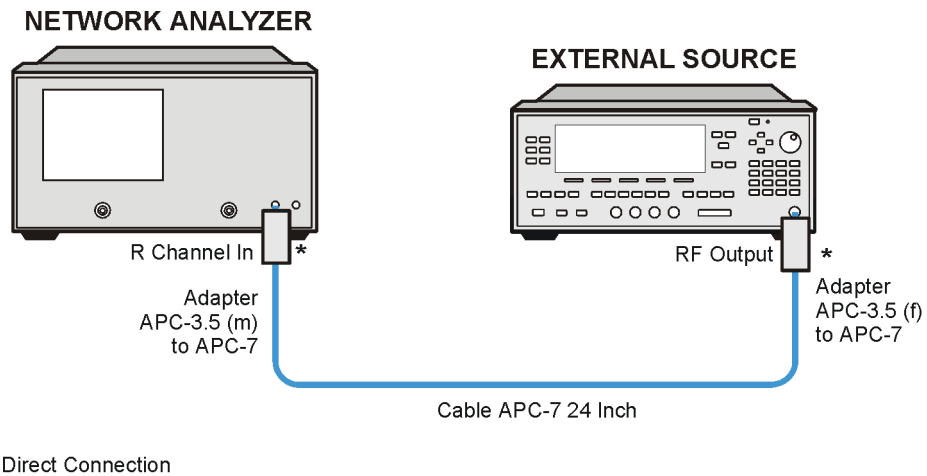
Required Equipment

Description	HP/Agilent Part or Model Number
External Source	83620A Option 001 or 83712B Option 1E1
Cable: APC-7, 24-inch	8120-4779
Adapter: APC-3.5 (f) to APC-7	1250-1747
Adapter: APC-3.5 (m) to APC-7	1250-1746

Procedure

1. Set the external source to a CW frequency of 10 MHz and power level of –25 dBm.
2. Connect the equipment as shown in Figure 2-9.

Figure 2-9 External Source Mode Frequency Range Test Setup



* Direct Connection

sa545e

3. On the network analyzer, press (Preset) (Meas) **INPUT PORTS** **R** .
4. Press (System) **INSTRUMENT MODE** **EXT SOURCE AUTO** (Sweep Setup) **CW FREQ** (10) (M/µ).
5. Check to see if the analyzer is phase locking to the external CW signal:
   - If the analyzer displays any phase lock error messages, write “UNLOCK” in the performance test record for the set CW signal.
   - If the analyzer does not display any phase lock error messages, write “LOCK” in the performance test record for the set CW signal.
6. Set the external source to a CW frequency of 20 MHz.
7. On the analyzer, press (20) (M/µ) or the next external source frequency.
8. Repeat steps 5 through 7 for the other external source CW frequencies listed in the performance test record.

In Case of Difficulty

If the analyzer displayed any phase lock error messages:

1. Be sure the external source power is set to –25 dBm.
2. Make sure the analyzer's “EXT SOURCE AUTO” feature is selected. In addition, verify that the analyzer is set to measure input channel R.
3. Verify that all connections are tight.

3. Test Port Output Power Level Accuracy

Perform this test to confirm the accuracy of the 8753ES test port output power. A power meter is used to determine the output level from Port 1. This measurement is compared to the level set by the network analyzer. The difference must be within the specified tolerance.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Test Port Output Power Accuracy[a]
300 kHz to 3 GHz	±1.0 dB
3 GHz to 6 GHz[b]	±1.0 dB

a. At 0 dBm and 25° C ±5° C
b. Only for analyzers with Option 006

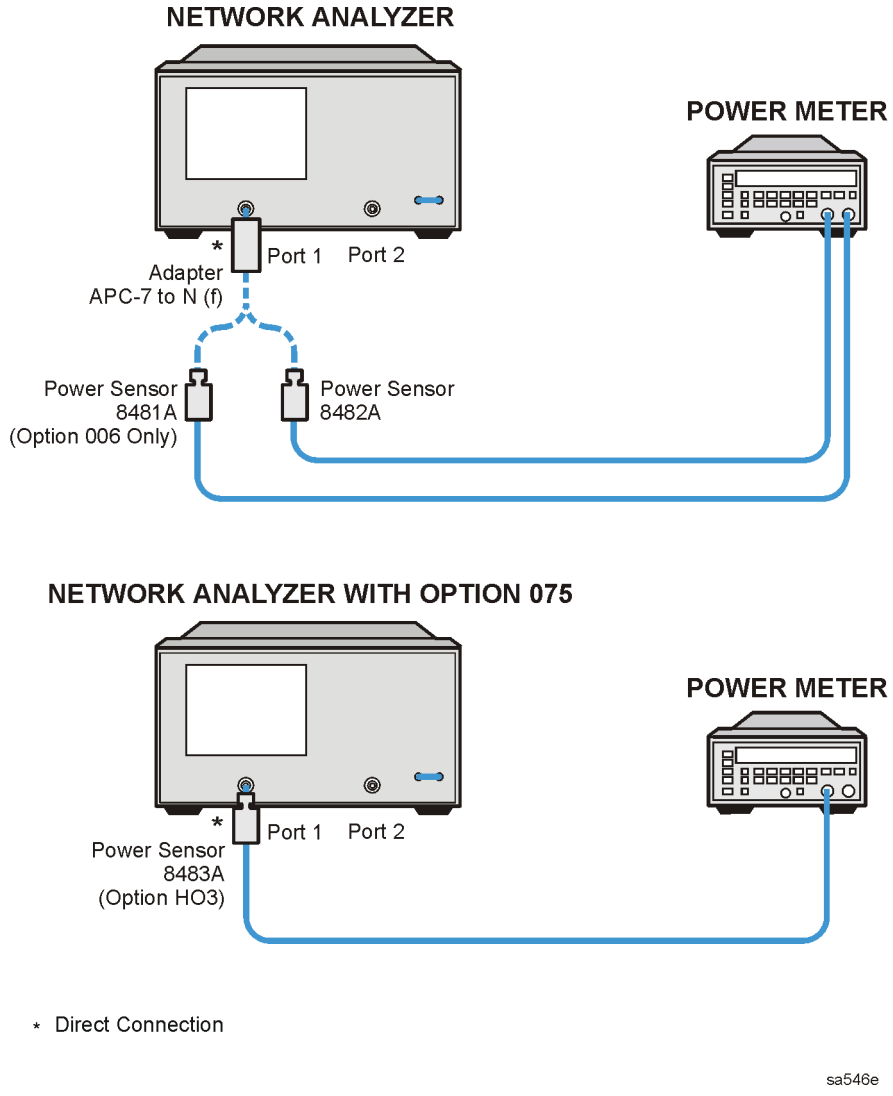
Required Equipment

Description	HP/Agilent Model Number
Power Meter	436A/437B/438A or E4418B/4419B
Power Sensor	8482A
Adapter: APC-7 to Type-N (f)	11524A
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A
Additional Equipment for 75Ω Analyzers	
Power Sensor	8483A Option H03

Procedure

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

Figure 2-10 Test Port Output Power Level Accuracy Test Setup



3. Press Preset.

NOTE The factory preset test port power is 0 dBm.

---

4. Press Sweep Setup **CW FREQ** 300 k/m. Set the calibration factor on the power meter for this CW frequency.
5. Write the power meter reading on the performance test record.
6. Repeat steps 4 and 5 for each CW frequency listed in the performance test record. For analyzers with Option 006, use the HP/Agilent 8481A power sensor for all frequencies above 3 GHz.

In Case of Difficulty

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

4. Test Port Output Power Linearity

This test verifies the analyzer's test port output power linearity throughout the analyzer's frequency range. A power meter calibration is used to set the reference output power across the frequency range of the analyzer. The analyzer's B-channel receiver is used to determine power linearity after each change in output power.

NOTE This test does not verify the functionality of the step attenuator. To verify its function, go to "Step 2. Operator's Check" on page 4-6.

Analyzer warm-up time: **30 minutes**

Specifications

Power Range	Power Level Linearity[a]
–15 to +5 dBm	±0.2 dB
+5 to +10 dBm	±0.5 dB
+5 to +8 dBm[b]	±0.5 dB

a. Relative to 0 dBm from 300 kHz to 3 GHz (2 GHz for Option 075; 6 GHz for Option 006).
b. Options 014 and 075

Required Equipment

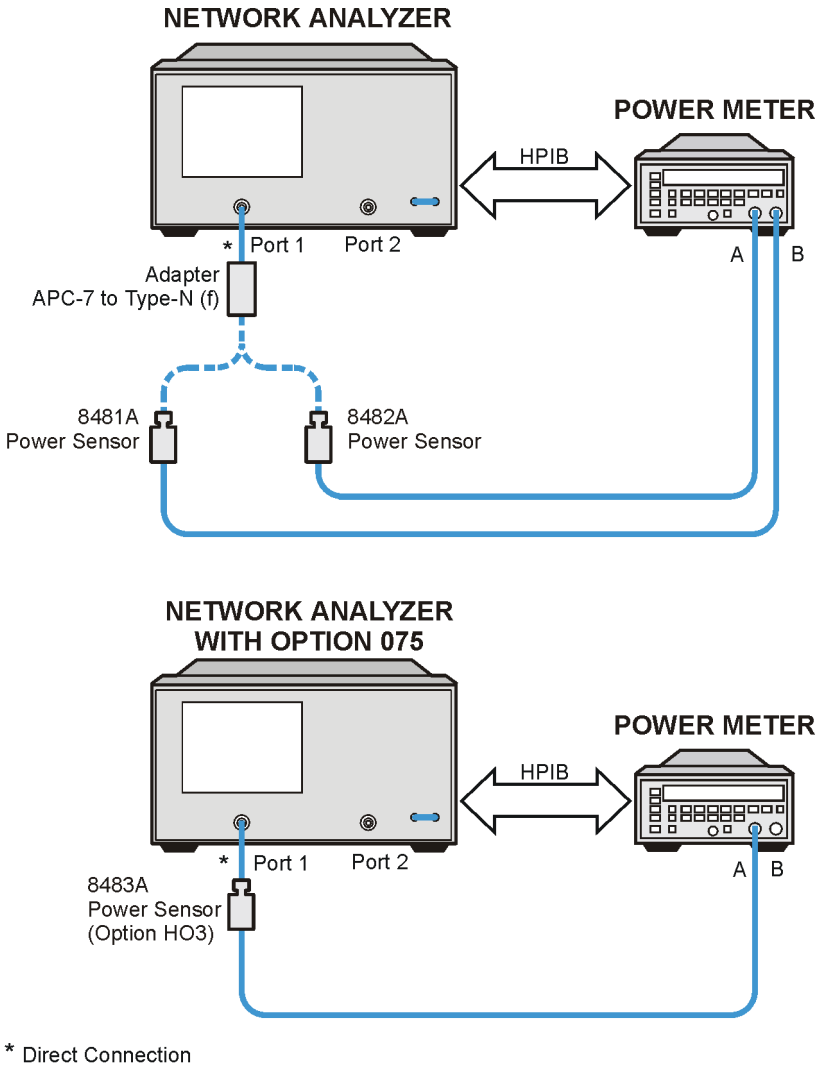
Description	HP/Agilent Part or Model Number
Power Meter	437A/438A or E4418B/4419B
Power Sensor	8482A
Adapter: APC-7 to type-N (f)	11524A
Attenuator: APC-7, 50Ω, 20 dB	8492A Option 020
RF Cable: APC-7, 50Ω	8120-4779
GPIB Cable	10833A/B/C/D
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A
Additional Equipment for Option 075 Analyzers	
Attenuator: 20dB, Type-N	8491A Option 020
Minimum Loss Pads (2): 50Ω to 75Ω	11852B
Cable: 50Ω, Type-N(m) to Type-N (m)	8120-4781
Power Sensor	8483A (Option H03)

Procedure

Power Meter Calibration

1. Zero and calibrate the power meter for the HP/Agilent 8482A power sensor.
2. Connect the equipment as shown in Figure 2-11.

Figure 2-11 Setup for Power Meter Calibration on Test Port 1



3. Press [Preset].
4. Press [Avg] **IF BW** [100] [x1] [Sweep Setup] **NUMBER of POINTS** [51] [x1].
5. Press [Start] [300] [k/m], then;
   - If the analyzer has Option 075, press [Stop] [2] [G/n].
   - If the analyzer has Option 006, press [Stop] [3] [G/n].

6. Press (Local) **SYSTEM CONTROLLER** .
7. Press **SET ADDRESSES** and **POWER MTR** until the analyzer shows the correct power meter model. (Use 438A/437 if the power meter is an E4419B or E4418B.)
8. Press **ADDRESS: P MTR/GPIB** . The default power meter GPIB address is 13. Make sure it is the same as your power meter GPIB address. Otherwise, use the analyzer front panel keypad to enter the correct GPIB address for your power meter.
9. Press (Power) **PWR RANGE AUTO man** to **MAN** to turn auto power range off.

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

---

10. Select **PORT POWER UNCOUPLD** to uncouple the test port output power.
11. Press (Cal) **PWRMTR CAL** .
12. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR A** . Refer to the back of the power sensor to locate the different calibration factor values along with their corresponding frequencies.

NOTE The analyzer's calibration factor sensor table can hold a *maximum* of 55 calibration factor data points.

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

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

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

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

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

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

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

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

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

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

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

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

13. Press the appropriate softkeys to create a power sensor calibration factors table.

14. Press **DONE** to exit the sensor calibration factor entries menu.

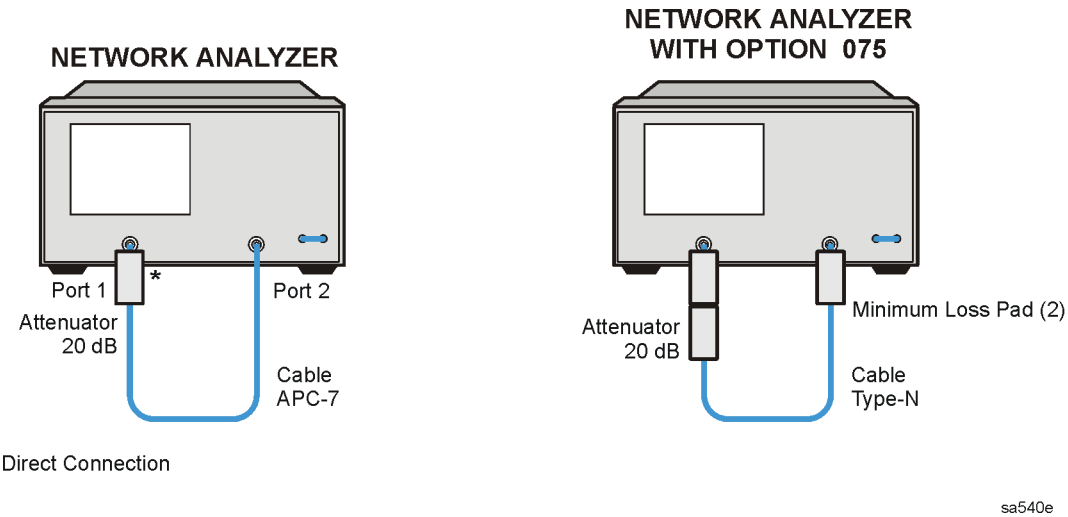
15. Press **RETURN** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.

NOTE The analyzer displays the PC annotation, indicating the power meter calibration is active.

Output Power Linearity Measurement: 300 kHz to 3 GHz

1. Set up the equipment as shown in Figure 2-12.

Figure 2-12 Test Port Output Power level Linearity Test Setup



* Direct Connection

sa540e

2. Press (Meas) **INPUT PORTS** **B** .

3. Press (Sweep Setup) **TRIGGER MENU** **SINGLE** .

4. Press (Display) **DATA → MEMORY** **DATA/MEM** .
5. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** (300) (k/m) **FIXED MKR VALUE** (–15) (x1) **RETURN** **Δ REF = Δ FIXED MKR** .
6. Press (Power) (–15) (x1) (or the next power setting from the performance test record).
7. Press (Sweep Setup) **TRIGGER MENU** **SINGLE** .
8. Press (Marker) **MARKER 1** (Marker Search) **SEARCH: MAX** (Marker) **MARKER 2** (Marker Search) **SEARCH:MIN** .
9. Read the value for marker 1 from the display and enter it in the performance test record in the “Marker 1 Maximum” value column. Enter the value of marker 2 in the “Marker 2 Minimum” value column.
10. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR VALUE** (–13) (x1) (or the next power setting from the performance test record) **RETURN** .
11. Repeat steps 6 through 10 for all power settings listed on the performance test record for the 300 kHz to 3 GHz frequency range.
12. The marker 1 (maximum) and marker 2 (minimum) readings should be within the specified range for each power level with reference to the fixed marker value.
13. If your analyzer does not have Option 006, this completes the test. If you have problems with this test, go to “In Case of Difficulty” on page 2-27.
14. If your analyzer has Option 006, proceed to the next two sections.

Power Meter Calibration from 3 GHz to 6 GHz (Option 006 only)

1. Disconnect the 8482A power sensor from the power meter and connect the 8481A power sensor in its place. Zero and calibrate the power meter for this sensor. Connect the equipment as shown in Figure 2-11 on page 2-23, using the 8481A sensor.
2. Press (Start) (3) (G/n) (Stop) (6) (G/n).
3. Press (Cal) **PWRMTR CAL** (0) (x1).
4. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR B** . Press the appropriate keys to build a sensor calibration factor table for the 8481A power sensor (sensor B).
5. Press **DONE** to exit the sensor calibration factor entries menu.
6. Press **USE SENSOR B** to select the 8481A sensor. Press (Sweep Setup) **TRIGGER MENU** **CONTINUOUS** .
7. Press (Cal) **PWRMTR CAL** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.
8. Proceed to the next section for making the power linearity measurements.

Output Power Linearity Measurement from 3 GHz to 6 GHz (Option 006 only)

1. Set up the equipment as shown in Figure 2-12.
2. Press (Sweep Setup) **TRIGGER MENU** **SINGLE** .
3. Press (Display) **DATA → MEMORY** **DATA/MEM** .
4. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** (3) (G/n) **FIXED MKR VALUE** (–15) (x1) **RETURN** **Δ REF = Δ FIXED MKR** .
5. Press (Power) (–15) (x1) (or the next power setting from the performance test record).
6. Press (Sweep Setup) **TRIGGER MENU** **SINGLE** .
7. Press (Marker) **MARKER 1** (Marker Search) **SEARCH: MAX** (Marker) **MARKER 2** (Marker Search) **SEARCH:MIN** .
8. Read the value for marker 1 from the display and enter it in the performance test record in the “Marker 1 Maximum” value column. Enter the value of marker 2 in the Marker 2 Minimum” value column.
9. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR VALUE** (–13) (x1) (or the next power setting from the performance test record) **RETURN** .
10. Repeat steps 5 through 9 for all power settings listed on the performance test record in the 3 GHz to 6 GHz range.
11. The marker 1 (maximum) and marker 2 (minimum) readings should be within the specified range for each power level with reference to the fixed marker value.
12. This completes the test. If you have problems with this test, go to “In Case of Difficulty,” next.

In Case of Difficulty

1. Ensure that the power meter and power sensors are operating to specifications. Be sure to set the power meter calibration factor for the range of frequencies that you are testing.
2. Verify that there is power coming out of the analyzer's test port 1. Be sure you did not accidentally switch off the analyzer's internal source. If you did, press (Sweep Setup) **POWER** **SOURCE PWR ON** .
3. Repeat this performance test.

5. Minimum R Channel Level

This test confirms that phase lock can be achieved at a specified minimum R channel input power. Power from the analyzer's output port is fed into the R channel receiver using the input found on the front panel. Observations are made for proper phase lock conditions.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Minimum R Channel Level
300 kHz to 3 GHz	< –35 dBm
3 GHz to 6 GHz[a]	< –30 dBm

a. Only for analyzers with Option 006.

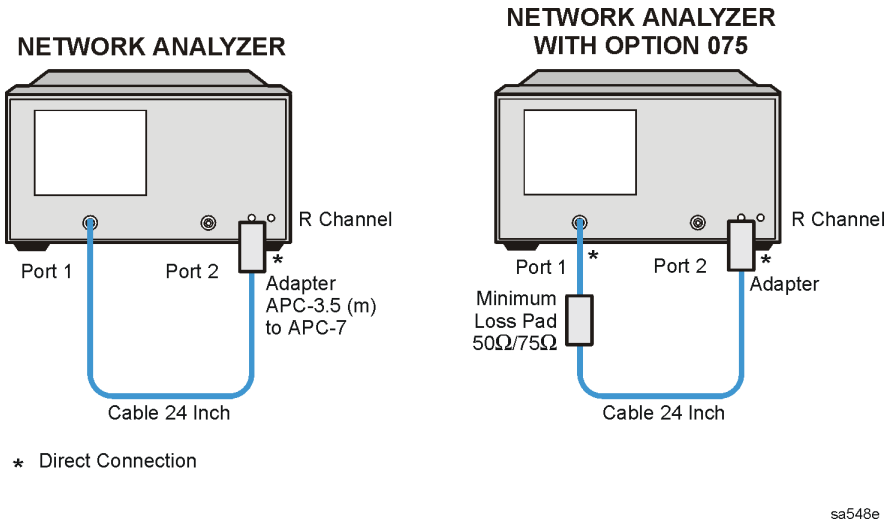
Required Equipment

Description	HP/Agilent Part or Model Number
Adapter: APC-3.5 (m) to APC-7	1250-1746
Cable: APC-7, 24-inch	8120-4779
Required Equipment for 75Ω Analyzers (Option 075)	
Minimum Loss Pad: 50Ω to 75Ω	11852B
Cable: 50Ω Type-N, 24-inch	8120-4781
Adapter: APC-3.5 (m) to Type-N (f)	1250-1750

Procedure

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

Figure 2-13 Minimum R Channel Level Test Setup



2. Press (Preset) (Meas) **INPUT PORTS** **R** .
3. Press (Power) **PWR RANGE MAN** **POWER RANGES** **RANGE 5 –65 to –40**.
4. Press (Scale Ref) **REFERENCE VALUE** (–70) (x1).
5. Press **CW FREQ** (300) (k/m).
6. Press **POWER** (–65) (x1).

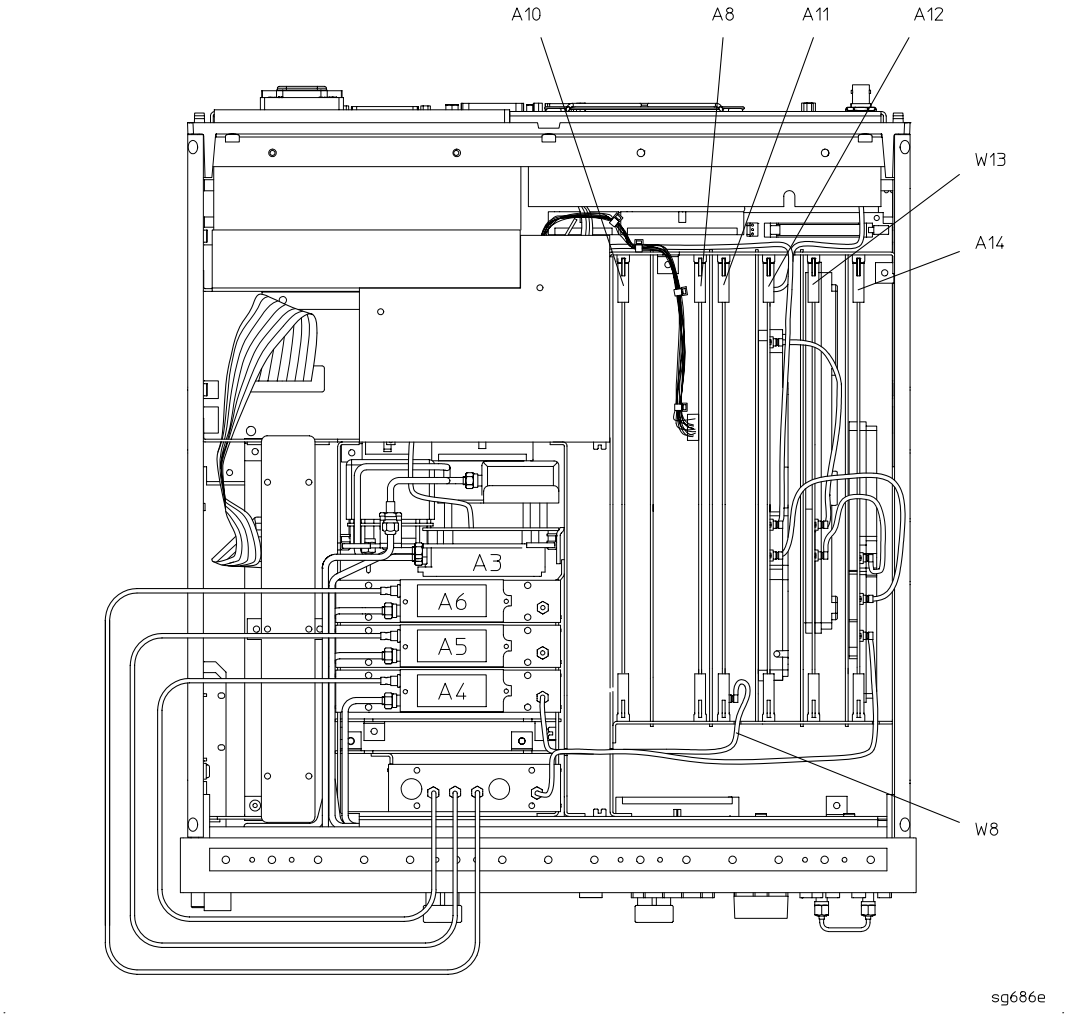
   The analyzer displays the message `CAUTION: NO IF FOUND: CHECK R INPUT LEVEL`.
7. Press (↑) to increase the test port power by 1 dBm.
8. If the analyzer displays a phase lock error message, continue increasing the test port power until phase lock is achieved.
9. Write the test port power that is displayed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

In Case of Difficulty

1. Check the flexible RF cable (W8, as shown in Figure 2-14) between the R sampler assembly (A4) and the phase lock assembly (A11). Make sure it is connected between A11J1 (PL IF IN) and 1st IF Out.

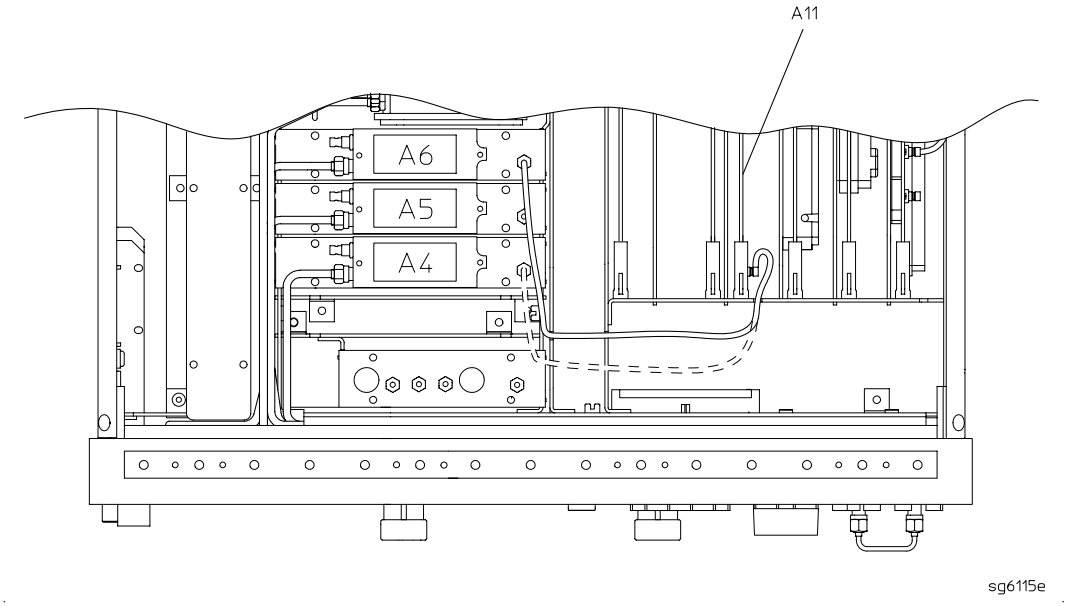
CAUTION *Do not* push cable W8 down next to the A11 phase lock assembly.

Figure 2-14 Flexible RF Cable Location



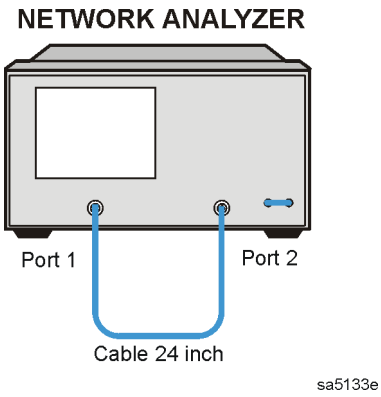
2. Using an ohmmeter, verify that cable W8 is not open. In addition, examine both the cable connectors: measure the resistance between the cable center pin and the cable connector and make sure it is *not* close to zero.
3. Check the R sampler by substituting it with the B sampler (A6). Do this by moving cable W8 to the B sampler (A6), as shown in Figure 2-15.

Figure 2-15 Connections for Substituting the R Sampler (A4)



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

Figure 2-16 Setup for Checking the R Sampler (A4)



5. Repeat the test, but select the B sampler (A6) by pressing Meas **INPUT PORTS** **B** in step 2. Use the following specifications:
   - 300 kHz to 3 GHz: < –27 dBm
   - 3 GHz to 6 GHz: < –22 dBm
6. If the analyzer fails the test, replace the A11 assembly.
7. Verify that the high/low band adjustments are still within specifications. For more information on how to perform this task, refer to "High/Low Band Transition Adjustment" on page 3-47.
8. Refer to Chapter 7 , "Source Troubleshooting," for more troubleshooting information.

6. Test Port Input Noise Floor Level

The analyzer's noise floor level is measured at minimum power with loads connected to the test ports.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Test Port	IF Bandwidth	Average Noise Level (for 50Ω analyzers)	Average Noise Level (for 75Ω analyzers)
300 kHz to 3.0 GHz	Test Port 1	3 kHz	–82 dBm	–80 dBm
300 kHz to 3.0 GHz	Test Port 1	10 Hz	–102 dBm	–100 dBm
300 kHz to 3.0 GHz	Test Port 2	3 kHz	–82 dBm	–80 dBm
300 kHz to 3.0 GHz	Test Port 2	10 Hz	–102 dBm	–100 dBm
3.0 GHz to 6.0 GHz[a]	Test Port 1	3 kHz	–77 dBm	N/A
3.0 GHz to 6.0 GHz[a]	Test Port 1	10 Hz	–97 dBm	N/A
3.0 GHz to 6.0 GHz[a]	Test Port 2	3 kHz	–77 dBm	N/A
3.0 GHz to 6.0 GHz[a]	Test Port 2	10 Hz	–97 dBm	N/A

a. Only for analyzers with Option 006.

Required Equipment

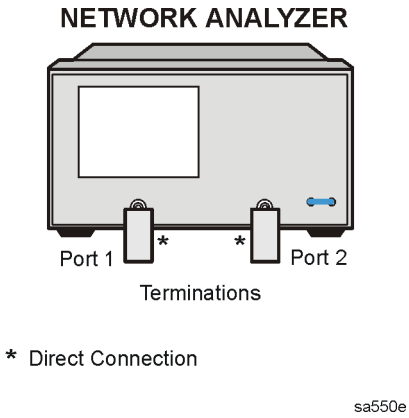
Description	HP/Agilent Part or Model Number
Calibration Kit: 7-mm	85031B
Equipment Required for 75Ω Analyzers	
Calibration Kit: Type-N	85036B

Procedure

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

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

Figure 2-17 Source Input Noise Floor Test Setup



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

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

NOTE Notice that the mean value that is displayed on the analyzer is in µU units. So, for example, if the displayed value is 62 µU, the value that you would put in the equation is (62×10^{-6}).

---

7. Write this calculated value on the performance test record.

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

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

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

12. Write this calculated value on the performance test record.

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

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

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

17. Write this calculated value on the performance test record.

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

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

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

22. Write this calculated value on the performance test record.
23. This completes the test port input noise floor level procedure if your analyzer does not have Option 006. If your analyzer has Option 006, continue with the next section.

Test Port 2 Noise Floor Level from 3 GHz to 6 GHz (IF BW = 3 kHz) (Option 006 only)

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

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

28. Write this calculated value on the performance test record.

Test Port 2 Noise Floor Level from 3 GHz to 6 GHz (IF BW = 10 Hz) (Option 006 only)

29. Press (Avg) **IF BW** (10) (x1) to change the IF bandwidth to 10 Hz.
30. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
31. When the analyzer finishes the sweep, notice the mean value.
32. Convert the measured linear magnitude mean value to log magnitude, using this equation.

    Power (dBm)= 20 × [$\log_{10}$ (linear magnitude mean value)]
33. Write this calculated value on the performance test record.

Test Port 1 Noise Floor Level from 3 GHz to 6 GHz (IF BW = 10 Hz) (Option 006 only)

34. Press (Meas) **INPUT PORTS** **A** **TESTPORT 2**.
35. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
36. When the analyzer finishes the sweep, notice the mean value.
37. Convert the measured linear magnitude mean value to log magnitude, using this equation.

    Power (dBm) = 20 × [$\log_{10}$ (linear magnitude mean value)]
38. Write this calculated value on the performance test record.

Test Port 1 Noise Floor Level from 3 GHz to 6 GHz (IF BW = 3 kHz) (Option 006 only)

39. Press (Avg) **IF BW** (3) (k/m).
40. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
41. When the analyzer finishes the sweep, notice the mean value.
42. Convert the measured linear magnitude mean value to log magnitude, using this equation.

    Power (dBm)= 20 × [$\log_{10}$ (linear magnitude mean value)]
43. Write this calculated value on the performance test record.

In Case of Difficulty

1. Perform the adjustment titled "ADC Offset Correction Constants (Test 52)" on page 3-15.
2. Repeat the entire "6. Test Port Input Noise Floor Level" procedure.
3. Suspect the A10 Digital IF assembly if the analyzer fails both test port input noise floor tests.
4. Refer to Chapter 8 , "Receiver Troubleshooting," for more troubleshooting information.

7. Test Port Input Frequency Response

Power meter calibration is used to control the input to the analyzer's receiver across its frequency range. The network analyzer's input receiver frequency response is measured against this calibrated input.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Input Frequency Response[a]
300 kHz to 3 GHz	± 1 dB
3 GHz to 6 GHz[b]	± 2 dB

a. At 0 dBm.
b. Only for analyzers with Option 006.

Required Equipment

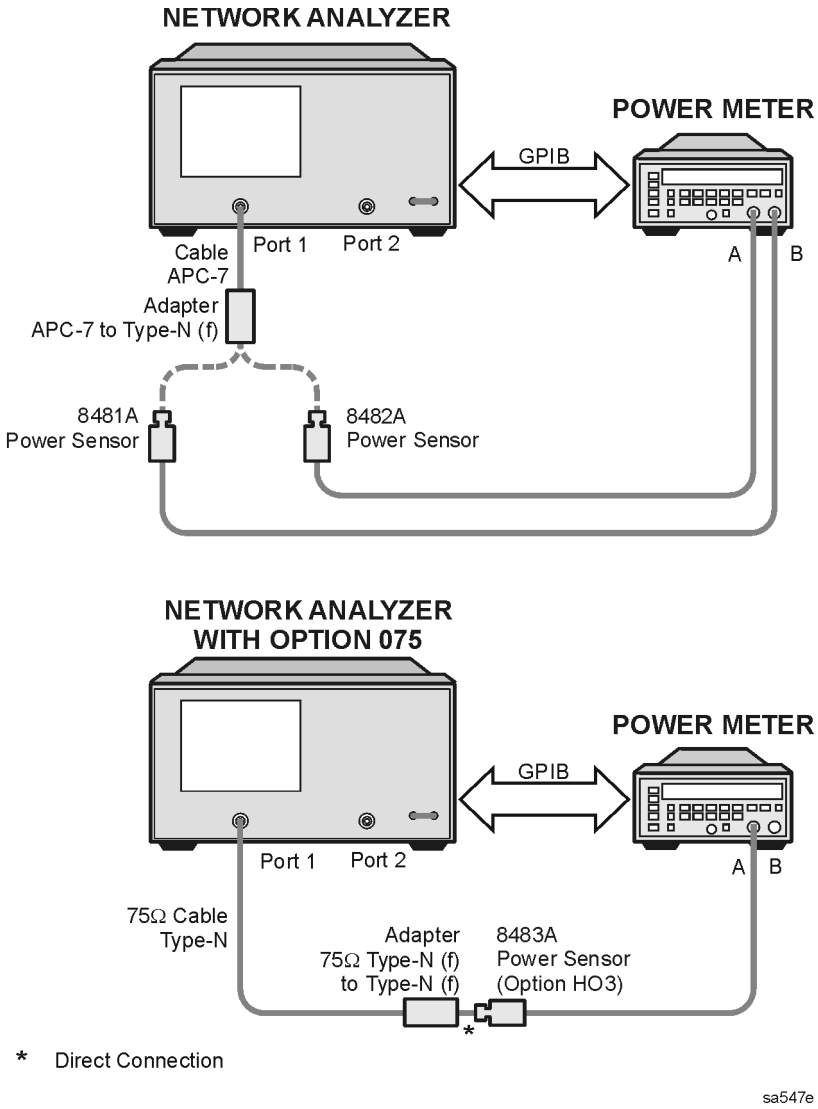
Description	HP/Agilent Part or Model Number
Power Meter	436A/437B/438A or E4418B/4419B
Power Sensor	8482A
Cable: APC-7, 24-inch	8120-4779
Adapter: APC-7 to Type-N (f)	11524A
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A
Additional Equipment for 75Ω Analyzers	
Power Sensor	8483A Option H03
Cable: 75Ω, Type-N	8120-2408
Adapter: 75Ω, type-N (f) to type-N (f)	1250-1529

Procedure

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

1. Zero and calibrate the power meter for the 8482A sensor.
2. Connect the equipment as shown in Figure 2-18.

Figure 2-18 Setup for Power Meter Calibration on Test Port 1



3. Press Preset Avg **IF BW** 3 k/m Start 300 k/m.
4. **Only for Analyzers with Option 006:**
   Press Stop 3 G/n.
5. Press Local **SYSTEM CONTROLLER** .
6. Press **SET ADDRESSES** and **POWER MTR** until the analyzer shows the correct power meter model. (Use the 438A/437 selection if the power meter is an HP/Agilent E4419B or an E4418B.)
7. Press **ADDRESS: P MTR/GPIB** . The default power meter GPIB address is 13. Make sure it is the same as your power meter GPIB address. Otherwise, use the analyzer front panel keypad to enter the correct GPIB address for your power meter.
8. Press Sweep Setup **NUMBER of POINTS** 51 x1.

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

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

---

10. Select **PORT POWER UNCOUPLD** to uncouple the test port output power.
11. Press (Cal) **PWRMTR CAL** .
12. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR A** . Refer to the back of the power sensor to locate the different calibration factor values along with their corresponding frequencies.

NOTE The analyzer's calibration factor sensor table can hold a *maximum* of 55 calibration factor data points.

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

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

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

a. From the sensor calibration factor entries menu, press **ADD** .
b. Press **FREQUENCY** (100) (k/m). If you make an entry error, press (←) and re-enter the correct value again.
c. Press **CAL FACTOR** (96.4) (x1).
d. Press **DONE** to terminate the first calibration factor data point entry.
e. To enter the second cal factor data point, press **ADD** .
f. Press **FREQUENCY** (300) (k/m).
g. Press **CAL FACTOR** (98.4) (x1).
h. To terminate the second calibration factor data point entry, press **DONE** .

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

13. Press the appropriate softkeys to create a power sensor calibration factors table.

14. Press **DONE** to exit the sensor calibration factor entries menu.

15. Press **RETURN** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.

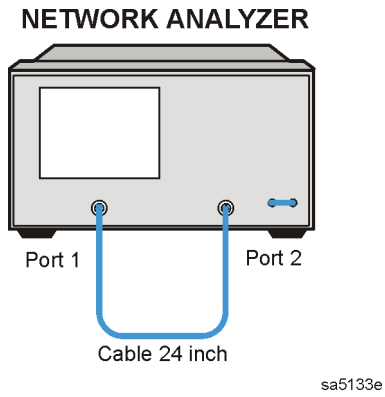
    Wait until the analyzer finishes the sweep, then continue with this procedure.

NOTE The analyzer displays the PC annotation, indicating the power meter calibration is active.

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

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

Figure 2-19 Test Port 2 Input Frequency Response Test Setup



17. Press (Meas) **INPUT PORTS** **B** (Sweep Setup) **TRIGGER MENU** **SINGLE**.

18. Press (Scale Ref) **SCALE/DIV** (1) (x1).

19. Press (Marker) **MARKER 1** (Marker Search) **SEARCH:MIN** to put marker 1 at the minimum magnitude location of the trace.

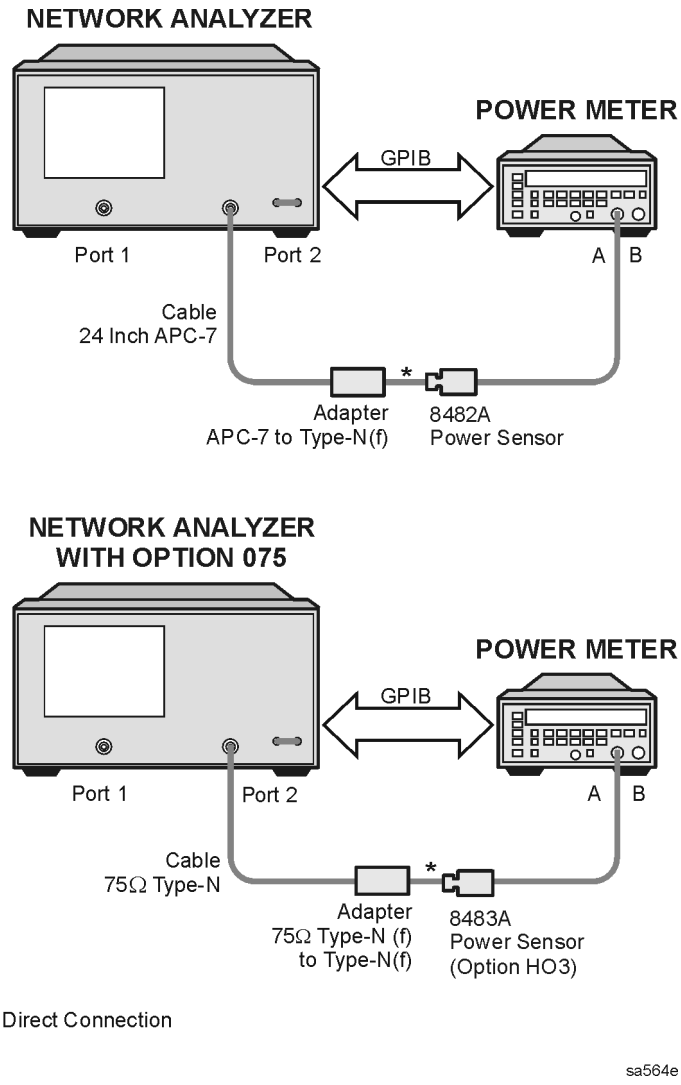
20. Press (Marker) **MARKER 2** (Marker Search) **SEARCH:MAX** to position marker 2 at the maximum magnitude location of the trace.

21. Write the marker 1 or marker 2 value, whichever has the larger absolute magnitude, in the performance test record.

Power Meter Calibration for Test Port 2 from 300 kHz to 3 GHz

22.Connect the equipment as shown Figure 2-20.

Figure 2-20 Setup for Power Meter Calibration on Test Port 2

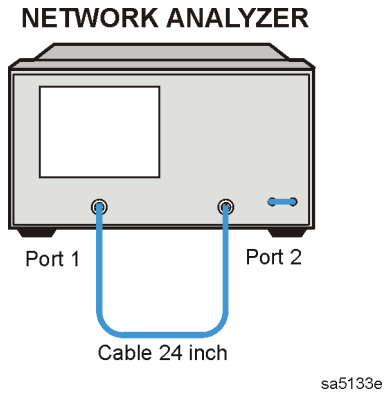


23.Press Sweep Setup **TRIGGER MENU** **CONTINUOUS** Meas **INPUT PORTS** **TESTPORT 2** .

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

25.When the analyzer displays the message `POWER METER CALIBRATION SWEEP DONE`, connect the equipment as shown as in Figure 2-21.

Figure 2-21 Test Port 1 Input Frequency Response Test Setup



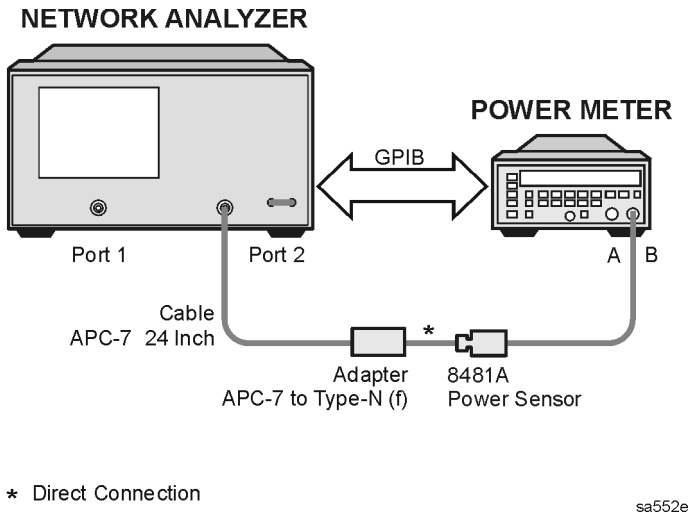
Test Port 1 Input Frequency Response from 300 kHz to 3 GHz

26. Press (Meas) **INPUT PORTS** **A** (Sweep Setup) **TRIGGER MENU** **SINGLE** .
27. Press (Marker) **MARKER 1** (Marker Search) **SEARCH:MIN** .
28. Press (Marker) **MARKER 2** (Marker Search) **SEARCH:MAX** .
29. Write the marker 1 or marker 2 reading, whichever has the larger absolute magnitude, in the performance test record.
30. If your analyzer *does not* have Option 006, this completes the performance test. If your analyzer *has* Option 006, continue with the next sections.

Power Meter Calibration for Test Port 2 from 3 GHz to 6 GHz (Option 006 only)

31. Replace the power sensor with the 8481A, and then set up the power meter:
    a. Cycle the line power for the power meter.
    b. Zero and calibrate the power meter with the new sensor.
32. Connect the equipment as shown in Figure 2-22.

Figure 2-22 Setup for Power Meter Calibration on Test Port 2



33. Press Start 3 G/n Stop 6 G/n.

34. Press Cal **PWRMTR CAL**.

35. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR B**. Press the appropriate keys to build a calibration factor sensor table for the 8481A power sensor.

36. Press **DONE** to exit the sensor calibration factor entries menu.

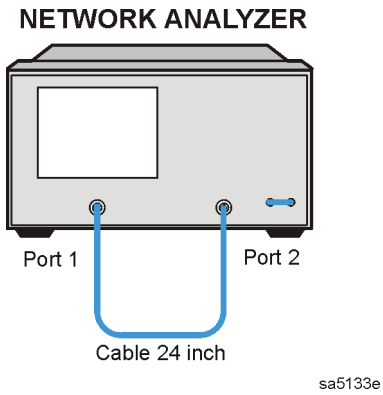
37. To select the 8481A power sensor, press **USE SENSOR B**. Press Sweep Setup **TRIGGER MENU** **CONTINUOUS**.

38. Press Cal **PWRMTR CAL** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.

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

39. When the analyzer finishes the calibration sweep, connect the equipment as shown in Figure 2-23.

Figure 2-23 Setup for Test Port 1 Input Frequency Response



40.Press (Meas) **INPUT PORTS** **A** (Sweep Setup) **TRIGGER MENU** **SINGLE**.

41.Press (Marker) **MARKER 1** (Marker Search) **SEARCH:MIN** to put marker 1 at the minimum magnitude location of the trace.

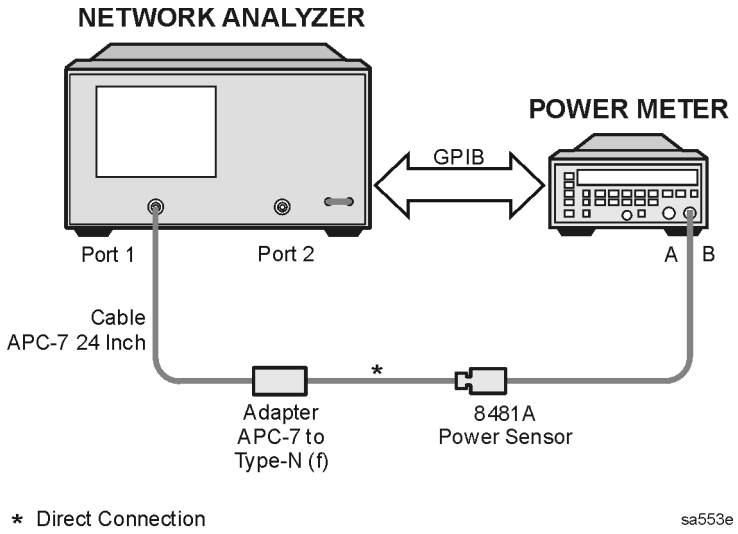
42.Press (Marker) **MARKER 2** (Marker Search) **SEARCH:MAX** to position marker 2 at the maximum magnitude location of the trace.

43.Write the marker 1 or marker 2 reading, whichever has the largest absolute magnitude, in the performance test record.

Power Meter Calibration for Test Port 1 from 3 GHz to 6 GHz (Option 006 only)

44.Connect the equipment as shown in Figure 2-24.

Figure 2-24 Setup for Power Meter Calibration on Test Port 1



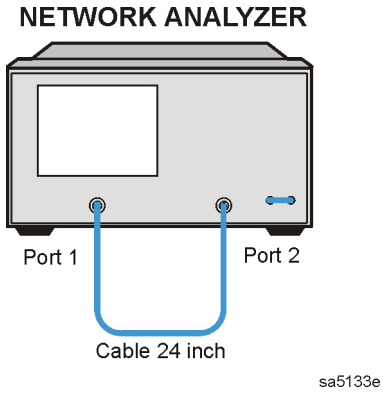
45.Press (Sweep Setup) **TRIGGER MENU** **CONTINUOUS** (Meas) **INPUT PORTS** **TESTPORT 1**.

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

Test Port 2 Input Frequency Response from 3 GHz to 6 GHz (Option 006 only)

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

Figure 2-25 Test Port 2 Input Frequency Response Test Setup



48. Press (Meas) **INPUT PORTS** **B** (Sweep Setup) **TRIGGER MENU** **SINGLE** .
49. Press (Marker) **MARKER 1** (Marker Search) **SEARCH:MIN** to put marker 1 at the minimum magnitude location of the trace.
50. Press (Marker) **MARKER 2** (Marker Search) **SEARCH:MAX** to position marker 2 at the maximum magnitude location of the trace.
51. Write the marker 1 or marker 2 reading, whichever has the largest absolute magnitude, in the performance test record.

In Case of Difficulty

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

8. Test Port Crosstalk

Perform this test to measure the maximum level of signal leakage between the analyzer's test ports. Crosstalk is measured with shorts attached to the test ports after a normalization measurement with a thru.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Crosstalk[a]
300 kHz to 3 GHz	< –100 dB
3 GHz to 6 GHz[b]	< –90 dB

a. Measurement conditions:
25 °C ±5 °C; normalized to a through; measured with two shorts (or shielded open); 10 Hz IF BW; averaging factor 8; alternate mode; source power at +10 dBm (or +8 dBm for Option 014 or Option 075).
b. Only for analyzers with Option 006.

Required Equipment

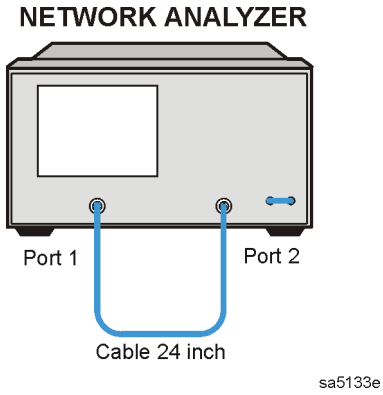
Description	HP/Agilent Part or Model Number
Calibration Kit: 7-mm	85031B
Cable: APC-7, 24-inch	8120-4779
Additional Equipment for 75Ω Analyzers	
Calibration Kit: 75Ω, Type-N	85036B
Cable: 75Ω, Type-N, 24 inch	8120-2408
Adapter: 75Ω, Type-N (m) to Type-N (m)	part of 85036B

Procedure

Normalization from 300 kHz to 3 GHz

1. Connect the 24-inch cable between the analyzer's test ports 1 and 2 as shown in Figure 2-26. Use the appropriate cable for your analyzer (50Ω or 75Ω).

Figure 2-26 8753ES Crosstalk Baseline Measurement

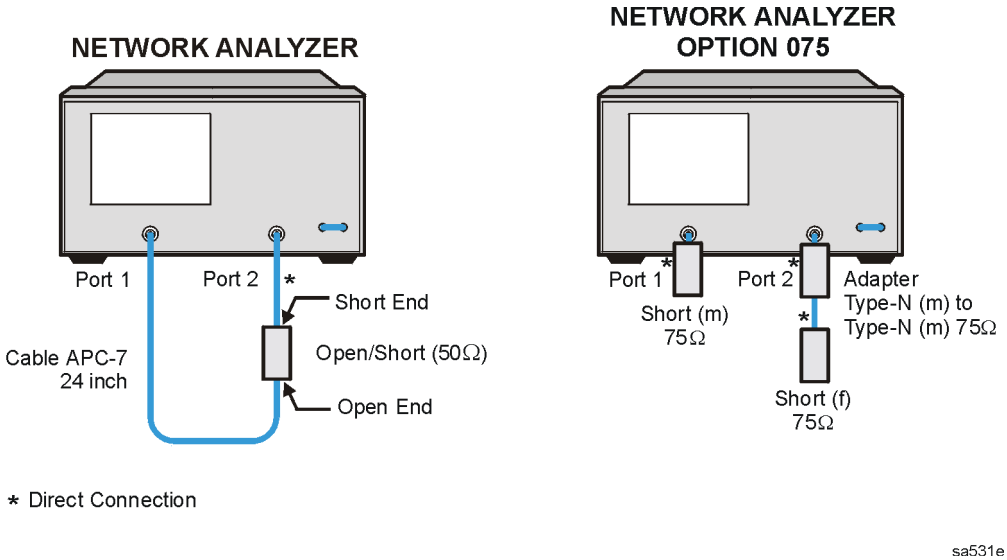


2. Press (Preset) (Cal) **MORE** **ALTERNATE A and B**.
3. Press (Start) (300) (k/m) (Stop) (3) (G/n).
4. Press (Sweep Setup) **NUMBER of POINTS** (101) (x1) (Power) (10) (x1) (or, for analyzers with Option 014 or Option 075, press (8) (x1)).
5. Press (Avg) **IF BW** (10) (x1).
6. Press (Meas) **Trans: FWD S21 (B/R)**.
7. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**. Wait for the sweep to finish, as indicated by the `Hld` notation on the left side of the display.
8. Press (Display) **DATA → MEMORY** **DATA/MEM**.
9. Press (Chan 2) (Meas) **Trans: REV S12 (A/R)**.
10. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**. Wait for the sweep to finish, as indicated by the `Hld` notation on the left side of the display.
11. Press (Display) **DATA → MEMORY** **DATA/MEM**.
12. Press (Scale Ref) **SCALE/DIV** (10) (x1) **REFERENCE VALUE** (–100) (x1).
13. Press (Chan 1) (Scale Ref) **SCALE/DIV** (10) (x1) **REFERENCE VALUE** (–100) (x1).

Crosstalk to Test Port 2 from 300 kHz to 3 GHz

1. Connect the equipment as shown in Figure 2-27. Use the shorts from the calibration kit.

Figure 2-27 8753ES Crosstalk Measurement



2. Press Chan 1 Avg **AVERAGING ON** **AVERAGING FACTOR** 8 x1 Sweep Setup **TRIGGER MENU** **NUMBER of GROUPS** 8 x1. Wait for the sweeps to finish as indicated by the `Hld` indication on the left side of the display.
3. Press Marker Search **SEARCH: MAX** .
4. Write the marker value (which appears on the display) in the performance test record.

Crosstalk to Test Port 1 from 300 kHz to 3 GHz

5. Press Chan 2 Avg **AVERAGING ON** **AVERAGING FACTOR** 8 x1.
6. Press Sweep Setup **TRIGGER MENU** **NUMBER of GROUPS** 8 x1. Wait for the sweeps to finish as indicated by the `Hld` indication on the left side of the display.
7. Press Marker Search **SEARCH: MAX** .
8. Write the marker value (which appears on the analyzer display) in the performance test record. This completes the test. If your analyzer has Option 006, proceed to the next section.

Normalization from 3 GHz to 6 GHz (Option 006 only)

1. Set up the equipment again as shown in Figure 2-26 on page 2-46.
2. Press Start 3 G/n Stop 6 G/n Avg **AVERAGING OFF** .
3. Press Sweep Setup **TRIGGER MENU** **SINGLE** . Wait for the sweep to finish as indicated by the `Hld` indication on the left side of the display.
4. Press Display **DATA → MEMORY** Scale Ref **REFERENCE VALUE** –90 x1.

5. Press Chan 1 Avg **AVERAGING OFF** .
6. Press Sweep Setup **TRIGGER MENU** **SINGLE** . Wait for the sweep to finish as indicated by the `Hld` indication on the left side of the display.
7. Press Display **DATA → MEMORY** Scale Ref **REFERENCE VALUE** –90 x1 .

Crosstalk to Test Port 2 from 3 GHz to 6 GHz (Option 006 only)

8. Connect the equipment as shown in Figure 2-27 on page 2-47. Press Avg **AVERAGING ON** .
9. Press Sweep Setup **TRIGGER MENU** **NUMBER of GROUPS** 8 x1 . Wait for the sweeps to finish as indicated by the `Hld` notation on the left side of the display.
10. Press Marker Search **SEARCH: MAX** .
11. Write the marker value (which appears on the analyzer display) in the performance test record.

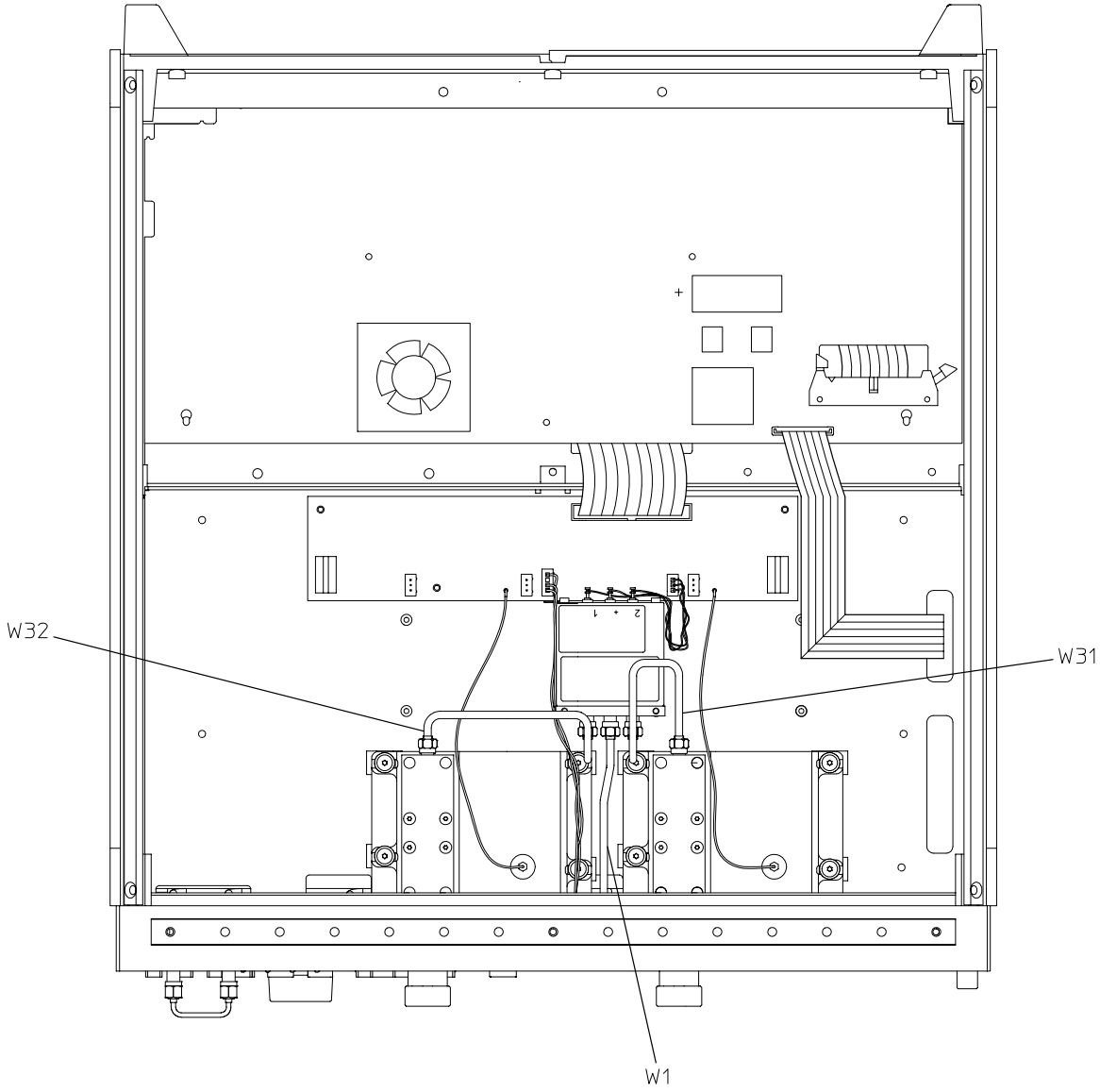
Crosstalk to Test Port 1 from 3 GHz to 6 GHz (Option 006 only)

12. Press Chan 2 Avg **AVERAGING ON** .
13. Press Sweep Setup **TRIGGER MENU** **NUMBER of GROUPS** 8 x1 . Wait for the sweeps to finish as indicated by the `Hld` notation on the left side of the display.
14. Press Marker Search **SEARCH: MAX** .
15. Write the marker value (which appears on the analyzer display) in the performance test record.

In Case of Difficulty

1. Remove the instrument top cover. Using an 8 lb-inch torque wrench, verify that *all* semirigid cables connected to the sampler/mixer assemblies are tight. In addition, tighten any loose screws on the sampler/mixer assemblies (A4/5/6) and the pulse generator assembly (A7).
2. Remove the instrument bottom cover. Refer to Figure 2-28. Verify that cables W1, W31 and W32 are tight.
3. Repeat this test.

Figure 2-28 8753ES Bottom View



9. Uncorrected Port Performance

The analyzer can perform error-correction and store the error coefficients. These error coefficients are, in fact, measurements of the analyzer's uncorrected port performance.

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

Analyzer warm-up time: **30 minutes**

Specifications

Uncorrected[a] Error Terms	Frequency Range		
	300 kHz to 1.3 GHz	1.3 GHz to 3 GHz	3 GHz to 6 GHz[b]
Directivity	35 dB	30 dB	25 dB
Source Match	16 dB	16 dB	14 dB
Load Match	18 dB	16 dB	14 dB
Reflection Tracking	±1.0 dB	±1.0 dB	±1.5 dB
Transmission Tracking	±1.0 dB	±1.0 dB	±1.5 dB

a. At 25 °C ±5 °C, with less than 1 °C deviation from the measurement calibration temperature.
b. Only for analyzers with Option 006.

Required Equipment

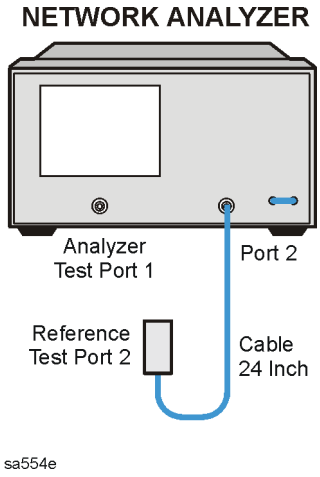
Description	HP/Agilent Part or Model Number
Calibration Kit: 7-mm	85031B
Cable, APC-7: 24-inch	8120-4779
Additional Equipment for 75Ω Analyzers	
Calibration Kit: Type-N	85036B
Cable: 75Ω, Type-N, 24-inch	8120-2408

Procedure

First Full 2-Port Calibration

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

Figure 2-29 First Full 2-Port Calibration Test Setup

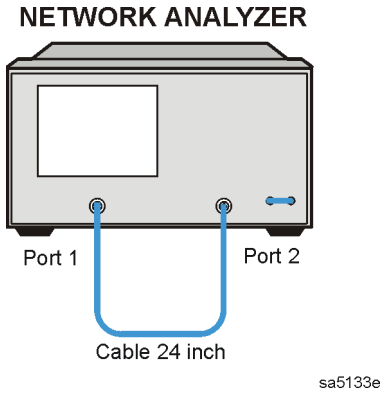


2. Press (Preset) (Avg) **IF BW** (3) (k/m)
   (Start) (300) (k/m).
3. Press (Cal) **CAL KIT** **SELECT CAL KIT** **CAL KIT:7mm** (or **CAL KIT: N 75Ω** if the analyzer has Option 075) **RETURN** **RETURN** **CALIBRATE MENU** **FULL 2-PORT**.
4. Press **ISOLATION** **OMIT ISOLATION**.
5. Connect the OPEN end of the open/short combination (supplied in the calibration kit) to analyzer test port 1.
6. Press **REFLECTION** **FORWARD:OPEN**.
7. Connect the SHORT end of the open/short combination to analyzer test port 1.
8. Press **FORWARD:SHORT**.
9. Replace the open/short combination with the termination (supplied in the calibration kit).
10. Press **FORWARD:LOAD**.
11. Connect the OPEN end of the open/short combination to reference test port 2.
12. Press **REVERSE:OPEN**.
13. Connect the SHORT end of the open/short combination to reference test port 2.
14. Press **REVERSE: SHORT**.
15. Connect the termination to the reference test port 2.
16. Press **REVERSE: LOAD**.
17. When the analyzer displays `PRESS 'DONE' IF FINISHED WITH STD(s)`, press **STANDARDS DONE**.

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

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

Figure 2-30 Transmission Calibration Test Setup



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

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

Directivity (Forward) Calibration Coefficient

21.Press System **SERVICE MENU** **TESTS** 32 x1 **EXECUTE TEST** .

22.When the analyzer finishes the test, press Marker.

23.Using the front panel knob, locate the maximum value of the data trace for the 300 kHz to 1.3 GHz frequency range.

24.Write the maximum value in the performance test record.

25.Repeat the previous two steps for the other frequency range(s) listed on the performance test record.

Source Match (Forward) Calibration Coefficient

26.Press System **SERVICE MENU** **TESTS** 33 x1 **EXECUTE TEST** .

27.When the analyzer finishes the test, repeat steps 22 through 25.

Transmission Tracking (Reverse) Calibration Coefficient

28.Press System **SERVICE MENU** **TESTS** 43 x1 **EXECUTE TEST** .

29.When the analyzer finishes the test, press Marker.

30.Using the front panel knob to move the marker along the data trace, locate the maximum and minimum values for the 300 kHz to 1.3 GHz frequency range.

31.Enter the data trace value that is of greater deviation from zero into the performance test record. (This is the greater absolute value of either the maximum data trace value or the minimum data trace value.)

32.Repeat the previous two steps for the other frequency range(s) listed on the performance test record.

Reflection Tracking (Forward) Calibration Coefficient

33.Press (System) **SERVICE MENU** **TESTS** (34) (x1) **EXECUTE TEST** .

34.When the analyzer finishes the test, repeat steps 29 through 32.

Load Match (Reverse) Calibration Coefficient

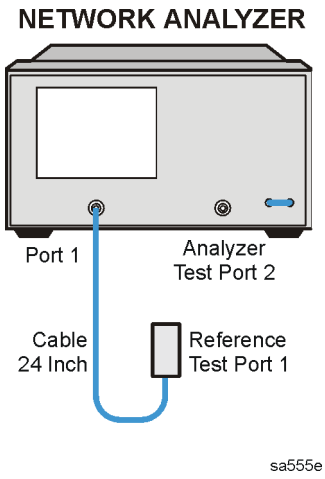
35.Press (System) **SERVICE MENU** **TESTS** (42) (x1) **EXECUTE TEST** .

36.When the analyzer finishes the test, repeat steps 22 through 25.

Second Full 2-Port Calibration

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

Figure 2-31 Second Full 2-Port Calibration Test Setup



38.Press (Preset) (Avg) **IF BW** (3) (k/m) (Start) (300) (k/m).

39.Press (Cal) **CAL KIT** **SELECT CAL KIT** **CAL KIT:7mm** (or **CAL KIT: N 75Ω** if the analyzer has Option 075) **RETURN** **RETURN** **CALIBRATE MENU** **FULL 2-PORT** .

40.Press **ISOLATION** **OMIT ISOLATION** .

41.Connect the OPEN end of the open/short combination (supplied in the calibration kit) to reference test port 1.

42.Press **REFLECTION** **FORWARD:OPEN** .

43.Connect the SHORT end of the open/short combination to reference test port 1.

44.Press **FORWARD:SHORT** .

45.Replace the open/short combination with the termination (supplied in the calibration kit).

46.Press **FORWARD:LOAD** .

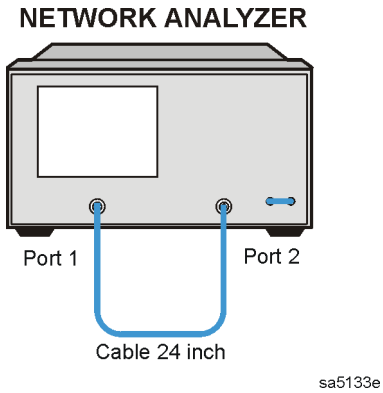
47.Connect the OPEN end of the open/short combination to the analyzer test port 2.

48.Press **REVERSE:OPEN** .

49. Connect the SHORT end of the open/short combination to the analyzer test port 2.
50. Press **REVERSE: SHORT** .
51. Connect the termination to the analyzer test port 2.
52. Press **REVERSE: LOAD** .
53. When the analyzer displays `PRESS 'DONE' IF FINISHED WITH STD(s)`, press **STANDARDS DONE** .

    Wait for the message `COMPUTING CAL COEFFICIENTS` to disappear from the analyzer display before proceeding to the next step.
54. Connect the equipment as shown in Figure 2-32.

Figure 2-32 Transmission Calibration Test Setup



55. Press **TRANSMISSION** **DO BOTH FWD + REV** .
56. Press **DONE 2-PORT CAL** .

Load Match (Forward) Calibration Coefficient

57. Press System **SERVICE MENU** **TESTS** 36 x1 **EXECUTE TEST** .
58. When the test is done, press Marker .
59. Using the front panel knob, locate the maximum value of the data trace for the 300 kHz to 1.3 GHz frequency range.
60. Write the maximum value on the performance test record.
61. Repeat the previous three steps for the other frequency ranges listed on the performance test record.

Directivity (Reverse) Calibration Coefficient

62. Press System **SERVICE MENU** **TESTS** 38 x1 **EXECUTE TEST** .
63. When the analyzer finishes the test, repeat steps 58 through 61.

Source Match (Reverse) Calibration Coefficient

64. Press System **SERVICE MENU** **TESTS** 39 x1. At the prompt, press **EXECUTE TEST**.
65. When the analyzer finishes the test, repeat steps 58 through 61.

Reflection Tracking (Reverse) Calibration Coefficient

66. Press System **SERVICE MENU** **TESTS** 40 x1 **EXECUTE TEST**.
67. When the test is done, press Marker.
68. Using the front panel knob to move the marker along the data trace, locate the maximum and minimum values for the 300 kHz to 1.3 GHz frequency range.
69. Enter the data trace value that is of greater deviation from zero into the performance test record. (This is the greater absolute value of either the maximum data trace value or the minimum data trace value.)
70. Repeat the previous three steps for the other frequency ranges listed on the performance test record.

Transmission Tracking (Forward) Calibration Coefficient

71. Press System **SERVICE MENU** **TESTS** 37 x1 **EXECUTE TEST**.
72. When the analyzer finishes the test, repeat steps 67 through 70.

10. System Trace Noise

Ratio measurements A/R and B/R are made at 3 GHz and 6 GHz to determine the variability of the analyzer's measurement data. IF bandwidths of 3 kHz and 10 Hz are used for the test.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Ratio	System Trace Noise (Magnitude[a])	System Trace Noise (Phase[a])
IF Bandwidth = 10 Hz			
300 kHz to 3 GHz	A/R	<0.001 dB rms	<0.006 °rms
300 kHz to 3 GHz	B/R	<0.001 dB rms	<0.006 °rms
3 GHz to 6 GHz (Option 006)	A/R	<0.002 dB rms	<0.012 °rms
3 GHz to 6 GHz (Option 006)	B/R	<0.002 dB rms	<0.012 °rms
IF Bandwidth = 3 kHz			
300 kHz to 3 GHz	A/R	<0.006 dB rms	<0.038 °rms
300 kHz to 3 GHz	B/R	<0.006 dB rms	<0.038 °rms
3 GHz to 6 GHz (Option 006)	A/R	<0.010 dB rms	<0.070 °rms
3 GHz to 6 GHz (Option 006)	B/R	<0.010 dB rms	<0.070 °rms

a. Trace noise is defined for a transmission measurement in CW mode using a "through" cable having 0 dB loss, with the source set to +5 dBm, and no averaging.

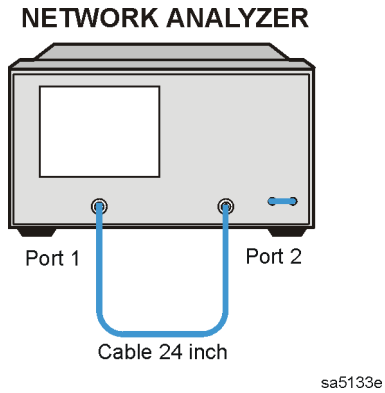
Required Equipment

Description	HP/Agilent Part Number
Cable: APC-7, 24-inch	8120-4779
Additional Equipment for 75Ω Analyzers	
Cable: 75Ω, Type-N, 24-inch	8120-2408

Procedure

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

Figure 2-33 System Trace Noise Test Setup



2. Press (Preset) (Power) (5) (x1) (Sweep Setup) **NUMBER of POINTS** (101) (x1) **CW FREQ** (3) (G/n).
3. Press (Marker Fctn) **MARKER MODE MENU** **MKR STATS ON** to activate the instrument's statistics feature.

A/R Trace Noise Magnitude IF BW = 10 Hz

4. Press (Avg) **IF BW** (10) (x1).
5. Press (Meas) **Trans: REV S12 (A/R)**.
6. Press (Sweep Setup) **TRIGGER MENU** **NUMBER OF GROUPS** (3) (x1). Wait for the sweeps to finish as indicated by the `Hld` notation on the left side of the display.
7. Write the s.dev (standard deviation) value shown, which appears on the analyzer display, on the performance test record.

A/R Trace Noise Phase IF BW = 10 Hz

8. Press (Format) **PHASE**.
9. Write the s.dev value, which appears on the analyzer display, on the performance test record.

A/R Trace Noise Phase IF BW = 3 kHz

10. Press (Avg) **IF BW** (3) (k/m).
11. Press (Sweep Setup) **TRIGGER MENU** **NUMBER OF GROUPS** (3) (x1). Wait for the sweeps to finish as indicated by the `Hld` notation on the left side of the display.
12. Write the s.dev value on the performance test record.

A/R Trace Noise Magnitude IF BW = 3 kHz

13.Press (Format) **LOG MAG** .

14.Write the s.dev value on the performance test record.

B/R Trace Noise Magnitude IF BW = 3 kHz

15.Press (Meas) **Trans: FWD S21 (B/R)** (Sweep Setup) **TRIGGER MENU** **NUMBER OF GROUPS** (3) (x1). Wait for the sweep to finish as indicated by the `Hld` notation on the left side of the display.

16.Write the s.dev value on the performance test record.

B/R Trace Noise Phase IF BW = 3 kHz

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

18.Write the s.dev value on the performance test record.

B/R Trace Noise Phase IF BW = 10 Hz

19.Press (Avg) **IF BW** (10) (x1) (Sweep Setup) **TRIGGER MENU** **NUMBER OF GROUPS** (3) (x1). Wait for the sweep to finish as indicated by the `Hld` notation on the left side of the display.

20.Write the s.dev value on the performance test record.

B/R Trace Noise Magnitude IF BW = 10 Hz

21.Press (Format) **LOG MAG** .

22.Write the s.dev value on the performance test record.

Option 006 only:

1. Press (Sweep Setup) **CW FREQ** (6) (G/n).
2. Go back to "A/R Trace Noise Magnitude IF BW = 10 Hz" on page 2-57, and perform this entire procedure again. Record all values in the performance test record under "Test Frequency 6 GHz."

In Case of Difficulty

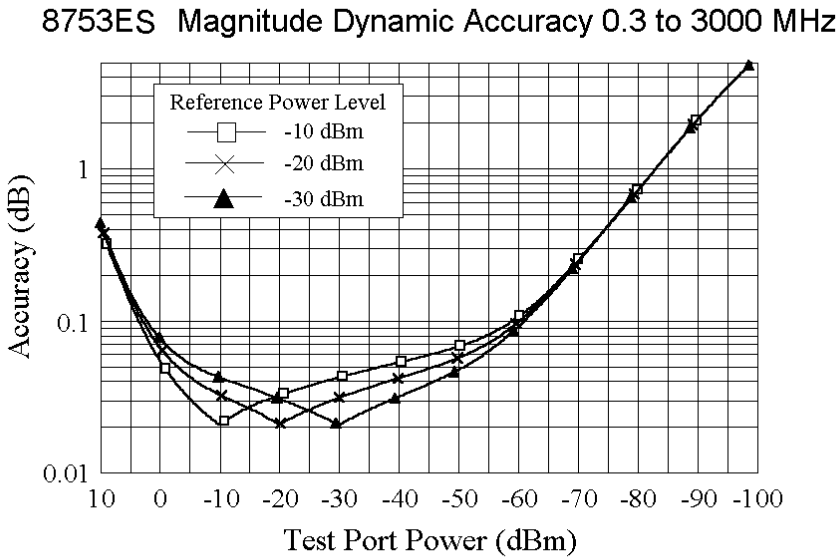
1. Perform the ADC Offset Correction Constants procedure, located in Chapter 3 , "Adjustments and Correction Constants."
2. Repeat this performance test.
3. Suspect the A10 Digital IF board assembly if the analyzer still fails the test.

11. Test Port Receiver Magnitude Dynamic Accuracy

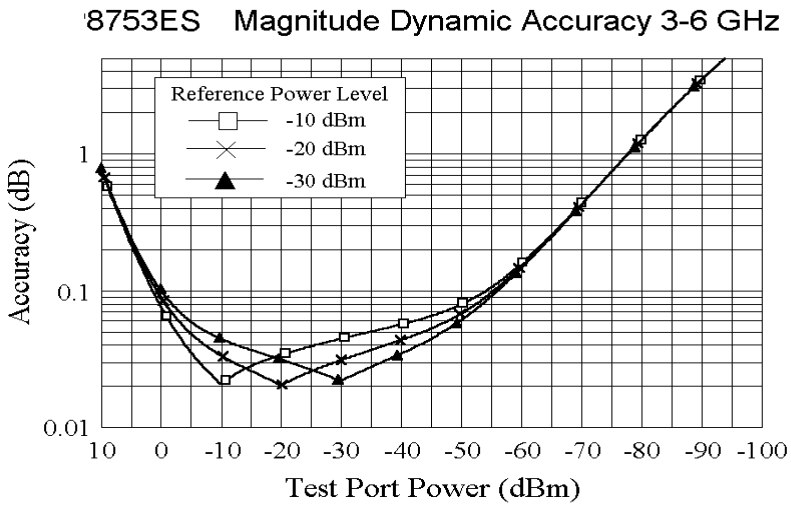
The analyzer's receiver linearity versus input power is measured with a calibrated step attenuator. Measurement uncertainty is minimized by using the analyzer's capability to perform error correction.

Analyzer warm-up time: **30 minutes**

Specifications



sa594e



sa595e

Required Equipment

Description	HP/Agilent Part or Model Number
Power Meter	436A/437B/438A or E4418B/4419B
Power Sensor	8482A
Step Attenuator: 110 dB	8496A Option H19 (See note below.)
Adapter: APC-7 to Type-N (f)	11524A
Cable: GPIB	10833A
Calibration Kit: 7-mm, 50Ω	85031B
Cables (2): APC-7, 50Ω	8120-4779
Additional Equipment for 75Ω Analyzers	
Minimum Loss Pads (2): 50Ω to 75Ω	11852B
Adapters (2): APC-7 to Type-N (m)	11525A

NOTE The HP/Agilent 8496A step attenuator (Option H19) comes with a special calibration that supports the measurement uncertainties expressed in the test record for this performance test.

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

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

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

Procedure

Initial Calculations

1. Fill in the attenuator error values (referenced to 0 dB attenuation) by referring to the calibration data for the 8496A step-attenuator. Refer to the note below if the calibration data are not expressed as attenuation errors.
   a. Find the column in the 8496A attenuation error table that pertains to the attenuation errors for 30 MHz.
   b. Starting with the 10 dB step in this column, write down the value in the corresponding space in Table 2-1 for column B. This value should be placed in the row for the 10 dB 8496A setting.
   c. Continue transferring the remaining values of the 8496A attenuation errors to column B in Table 2-1.
2. In Table 2-1, transfer the 10 dB error value located within the parenthesis in column B to each space in column C.

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

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

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

Table 2-1 Magnitude Dynamic Accuracy Calculations

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

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

   Calculate the attenuation error values for this column by subtracting the values in column C from the values in column B. The result is B – C = D.

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

   Calculate the values in this column by subtracting the values in column D from the values in column E. The result is E – D = F.

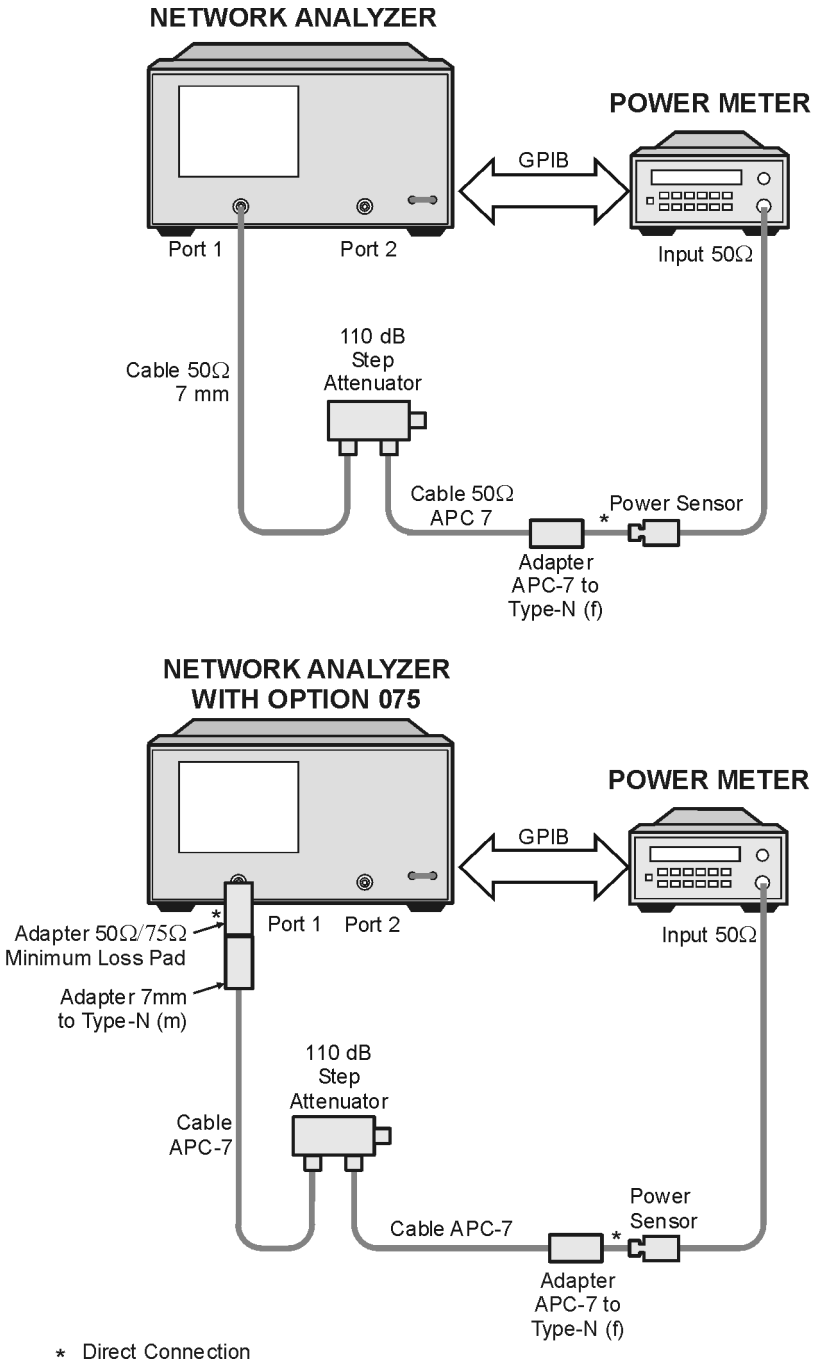
5. Transfer the values from column F in Table 2-1 to column F in the performance test record for both test ports.

Power Meter Calibration

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

7. Connect the equipment as shown in Figure 2-34.

Figure 2-34 Power Meter Calibration for Magnitude Dynamic Accuracy

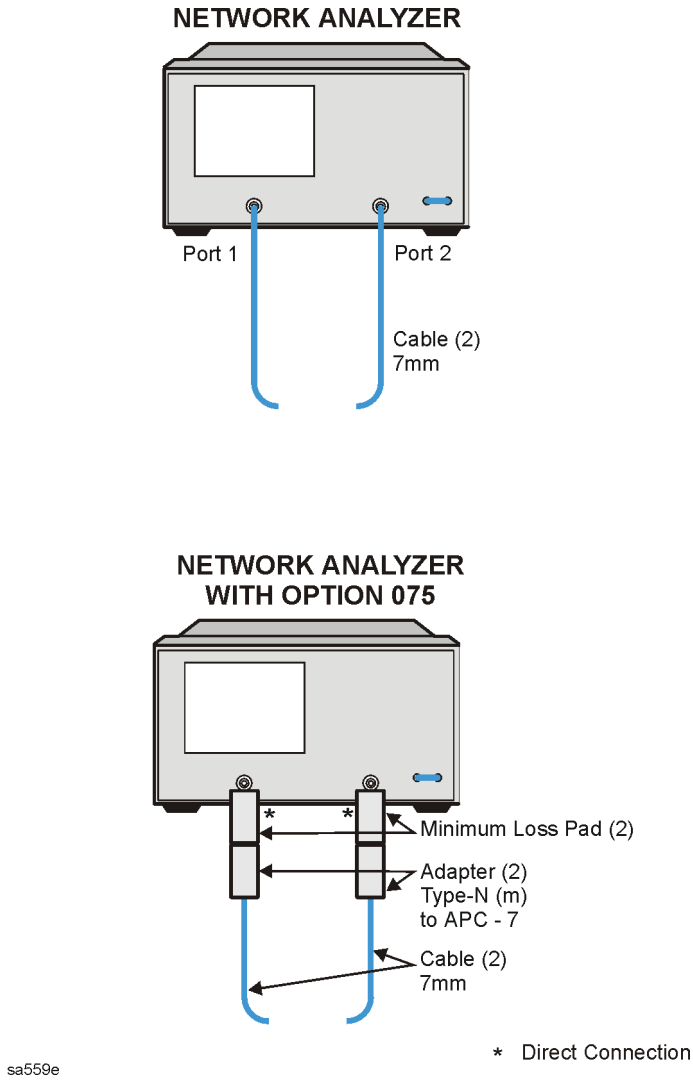


8. Set the step attenuator to 10 dB.
9. Set the following analyzer parameters:
   - Preset Sweep Setup **CW FREQ** 30 M/µ
   - **NUMBER of POINTS** 51 x1
   - Power –10 x1
   - Avg **IF BW** 10 x1
10. Set up the 8753ES for power meter calibration:
    a. Select the 8753ES as the system controller:
       - Local
       - **SYSTEM CONTROLLER**
    b. Set the power meter's address:
       - **SET ADDRESSES**
       - **ADDRESS: P MTR/GPIB** 13 x1
    c. Select the appropriate power meter by pressing **POWER MTR** until the correct model number is displayed. (Use the 438A/437 selection if the power meter is an E4419B or E4418B.)
    d. Select the calibration kit and enter the power sensor calibration data.
       - Cal **CAL KIT** **SELECT CAL KIT** **7mm 85031**
       - Cal **PWRMTR CAL** **LOSS/SENSOR LISTS** **CAL FACTOR SENSOR A** (enter the power sensor calibration data for 30 MHz) **DONE**
11. Take a power meter calibration sweep.
    - Cal **PWRMTR CAL** –20 x1
    - **ONE SWEEP** **TAKE CAL SWEEP**
12. Verify that the power meter reads approximately –20 dBm.

Full 2-Port Calibration

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

Figure 2-35 Full 2-Port Calibration

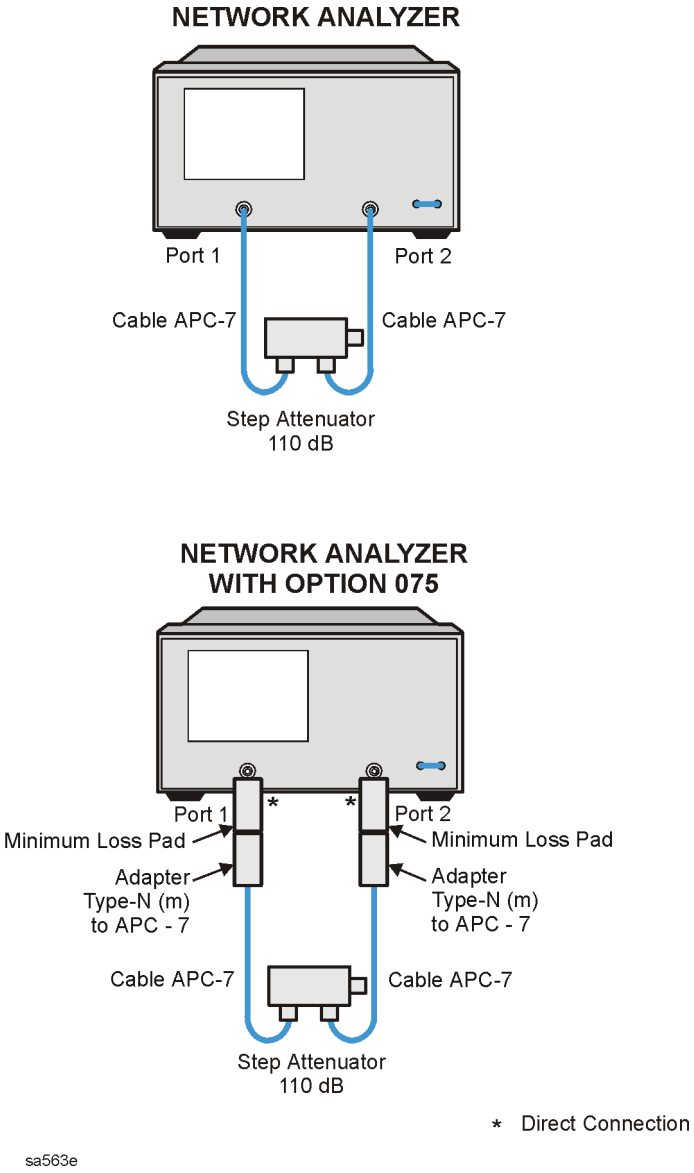


14. Perform a full 2-port error correction with isolation using the HP/Agilent 85031B cal kit.

Measure Test Port 2 Magnitude Dynamic Accuracy

15. Connect the equipment as shown in Figure 2-36. Confirm that the step attenuator is set to 10 dB.

Figure 2-36 Magnitude Dynamic Accuracy Measurement



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

- Meas **Trans: FWD S21 (B/R)**
- Marker Fctn **MKR MODE MENU** **STATS ON**
- Sweep Setup **TRIGGER MENU** **SINGLE**

17. Wait for the sweep to finish, then press Display **DATA → MEMORY** **DATA/MEM** .

18.Set the step attenuator to 0 dB.

19.Press Sweep Setup **TRIGGER MENU** **SINGLE** .

20.Press Format **MORE** **REAL** . Write the mean value (which appears on the analyzer's display) in the column marked "Real Part" in the performance test record. Note that the analyzer will display units as mU, µU, or nU, which are abbreviations for 10^{-3} units, 10^{-6} units, and 10^{-9} units, respectively.

21.Press **IMAGINARY** . Write the mean value (which appears on the analyzer's display) in the column marked "Imaginary Part" in the performance test record. Note that the analyzer will display units as mU, µU, or nU, which are abbreviations for 10^{-3} units, 10^{-6} units, and 10^{-9} units, respectively.

22.Repeat steps 19 through 21 for each setting of the step attenuator as written in the performance test record.

23.For each pair of real and imaginary parts calculate the value given by the formula: $10 \log_{10} [(\text{Real Part})^2 + (\text{Imaginary Part})^2]$. Write the result in the performance test record in the "Test Port Measurement" column (column "G").

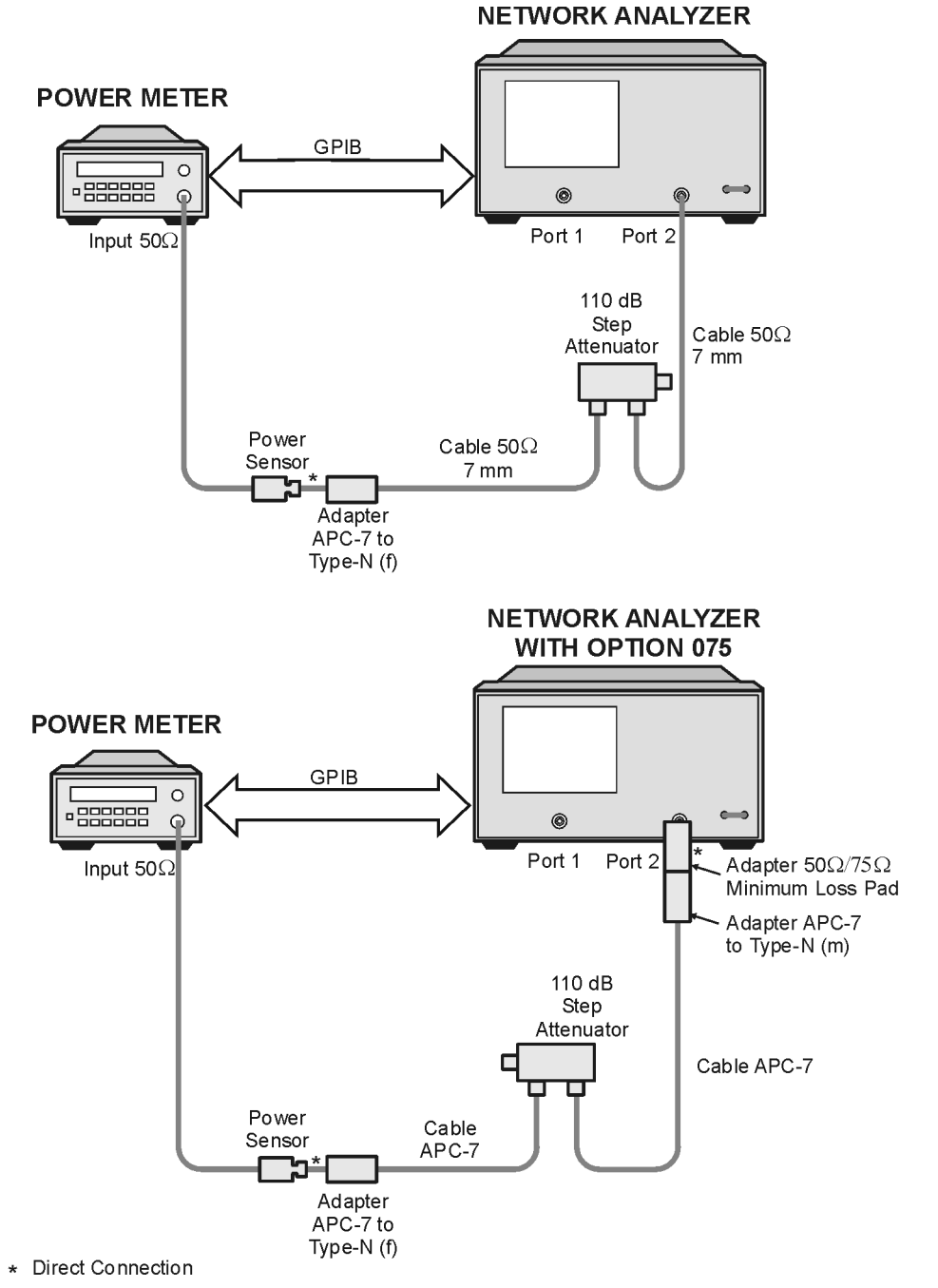
24.Calculate the dynamic accuracy for each attenuator setting by using the formula: $|G - F|$ (the absolute value of the difference between the values in column "G" and column "F").

Power Meter Calibration for Test Port 1

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

26.Connect the equipment as shown in Figure 2-34.

Figure 2-37 Power Meter Calibration for Magnitude Dynamic Accuracy



27.Set the step attenuator to 10 dB.

28.Set the following analyzer parameters:

- (Sweep Setup) **TRIGGER MENU** **CONTINUOUS**
- (Meas) **Trans: REV S12 (A/R)**

29.Take a power meter calibration sweep.

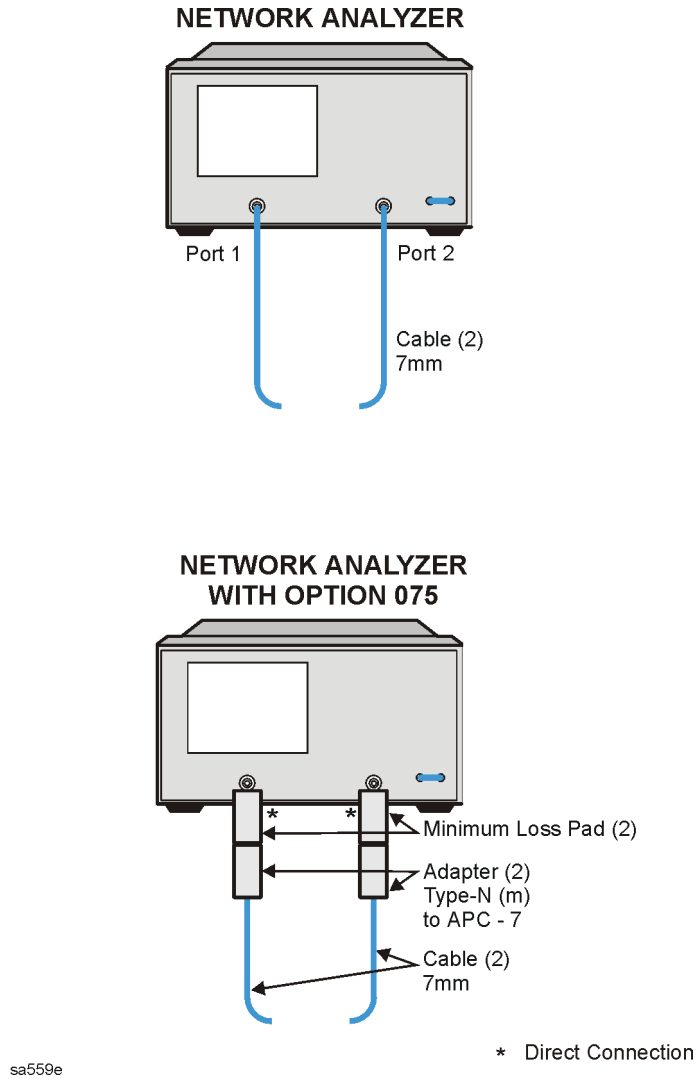
- Cal **PWRMTR CAL** –20 x1
- **ONE SWEEP** **TAKE CAL SWEEP**

30.Verify that the power meter reads approximately –20 dBm.

Full 2-Port Calibration

31.Connect the equipment as shown in Figure 2-38.

Figure 2-38 Full 2-Port Calibration

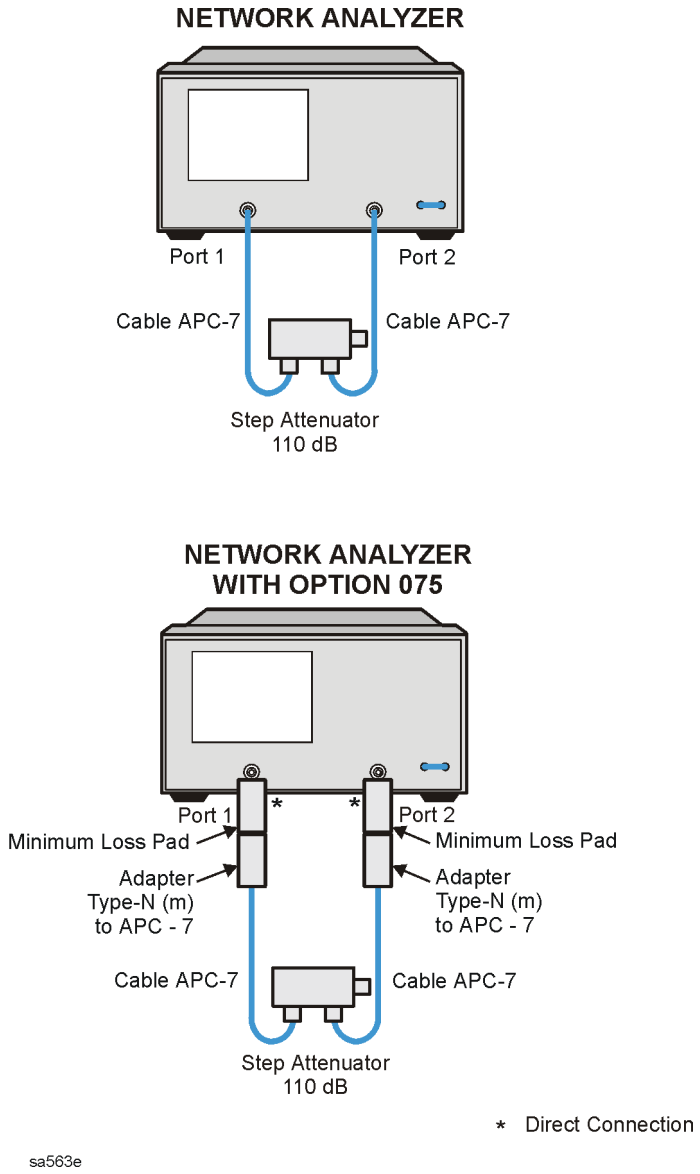


32.Perform a full 2-port error correction with isolation using the 85031B cal kit. If, necessary, refer to your analyzer's user's guide for detailed information on performing calibrations.

Measure Test Port 1 Magnitude Dynamic Accuracy

33.Connect the equipment as shown in Figure 2-39.

Figure 2-39 Magnitude Dynamic Accuracy Measurement



34.Set the step attenuator to 10 dB.

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

- Display **DATA**
- Sweep Setup **TRIGGER MENU** **SINGLE**

36.Wait for the sweep to finish, then press Display **DATA → MEMORY** **DATA/MEM**.

37.Set the step attenuator to 0 dB.

38. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
39. Press (Format) **MORE** **REAL**. Write the mean value (which appears on the analyzer's display) in the column marked "Real Part" in the performance test record. Note that the analyzer will display units as mU μU or nU, which are abbreviations for 10^{-3} units, 10^{-6} units, and 10^{-9} units, respectively.
40. Press **IMAGINARY**. Write the mean value (which appears on the analyzer's display) in the column marked "Imaginary Part" in the performance test record. Note that the analyzer will display units as mU μU or nU, which are abbreviations for 10^{-3} units, 10^{-6} units, and 10^{-9} units, respectively.
41. Repeat steps 38 through 40 for each setting of the step attenuator as written in the performance test record.
42. For each pair of real and imaginary parts calculate the value given by the formula: $10 \log_{10} [(\text{Real Part})^2 + (\text{Imaginary Part})^2]$. Write the result in the performance test record in the "Test Port Measurement" column (column "G").
43. Calculate the dynamic accuracy for each attenuator setting by using the formula: $|G - F|$ (the absolute value of the difference between the values in column "G" and column "F").

In Case of Difficulty

1. If the analyzer fails the test at *all* power levels, be sure you followed the recommended attenuator settings as listed in the performance test record. Repeat this performance test.
2. If both test port measured values are out of specifications:
   a. Recalibrate the power meter.
   b. Repeat this performance test.
3. If the analyzer fails either test port 2 or test port 1 dynamic accuracy at lower power levels:
   a. Perform the following adjustments: "IF Amplifier Correction Constants (Test 51)" on page 3-14 and "ADC Offset Correction Constants (Test 52)" on page 3-15.
   b. Repeat this performance test.
   c. If it still fails, replace the A10 Digital IF assembly.
   d. Repeat the two adjustment procedures mentioned in this step and then repeat this performance test.

12. Test Port Receiver Magnitude Compression

Perform this test to verify the magnitude compression/expansion of the analyzer's test port receivers. Power sweeps from low to high power are made at designated CW frequencies. A reference measurement is made while the signal to the receiver is attenuated to avoid compression. The attenuation is removed and compression is observed and measured.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Magnitude[a]
300 kHz to 3 GHz	≤0.42 dB
3 GHz to 6 GHz	≤0.76 dB

a. With a 10 Hz IF bandwidth.

Required Equipment

Description	HP/Agilent Part or Model Number
Cable (2): 50Ω, APC-7	8120-4779
Step Attenuator	8496A Option 003 and Option H18
Additional Equipment for 75Ω Analyzers	
Minimum Loss Pad (2)	11852B
Adapters (2): APC-7 to Type-N (f)	11524A
Cables (2): 50Ω, Type-N 24 inch	8120-4781

Procedure

1. Connect the equipment as shown in Figure 2-40 (Figure 2-41 for 75Ω analyzers).

Figure 2-40 Test Port Receiver Magnitude Compression Test Setup

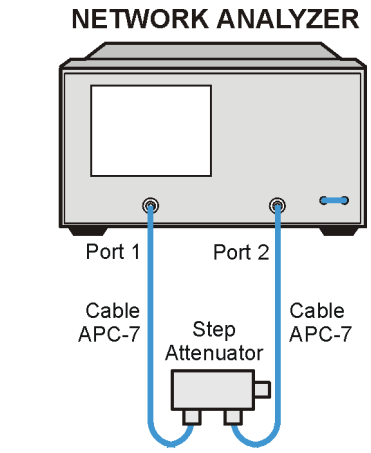
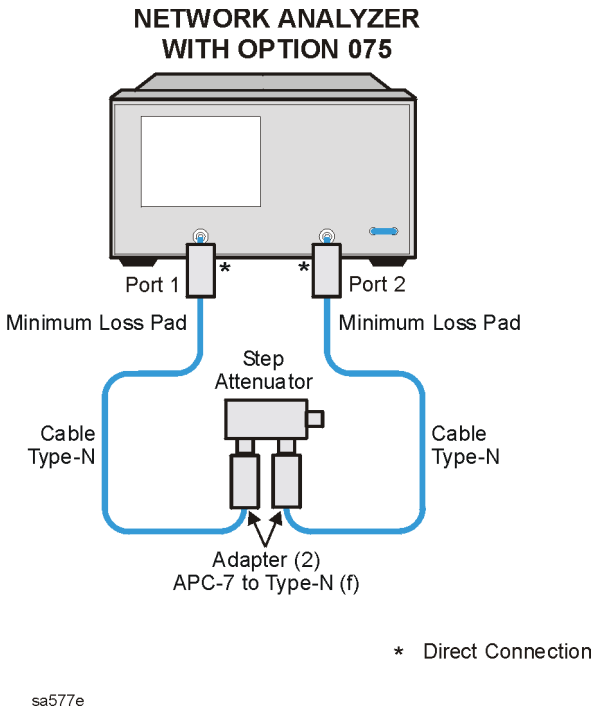


Figure 2-41 Test Port Receiver Magnitude Compression for 75Ω Analyzers



2. On the analyzer, press (Preset) (Avg) **IF BW** (10) (x1).
3. Press (Meas) **INPUT PORTS** **B** .
4. Press (Sweep Setup) **SWEEP TYPE MENU** **POWER SWEEP** (Start) (–10) (x1) (Marker) (–10) (x1) **Δ MODE MENU** **Δ REF = 1** .
5. Press (Sweep Setup) **CW FREQ** (300) (k/m) (or next CW frequency).
6. Set the step attenuator to 20 dB attenuation.

7. Press **TRIGGER MENU** **SINGLE**.
8. Press (Display) **DATA → MEMORY** **DATA/MEM**.
9. Set the step attenuator to 0 dB attenuation.
10. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
11. Press (Scale Ref) **AUTO SCALE**.
12. Press (Marker) **MARKER 2** (Marker Search) **SEARCH: MAX**.
13. Press (Marker) **MARKER 3** (Marker Search) **SEARCH: MIN**.
14. Read the value of both markers and enter the largest absolute value in the performance test record under “Measured Value Test Port 2.”
15. Repeat steps 5 through 14 for each CW frequency listed in the performance test record.
16. Press (Meas) **INPUT PORTS** **A** **TESTPORT 2**.
17. Repeat steps 5 through 14 for each CW frequency listed in the performance test record. For step 14, record the values in the performance test record under “Measured Value, Test Port 1.”

In Case of Difficulty

1. If the analyzer fails test port 2 magnitude compression:
   a. Repeat this test.
   b. Replace the A6 B sampler assembly if the analyzer still fails the test.
2. If the analyzer fails test port 1 magnitude compression:
   a. Repeat this test.
   b. Replace the A5 A sampler assembly if the analyzer still fails the test.

13. Test Port Receiver Phase Compression

Perform this test to verify the phase compression/expansion of the analyzer's test port receivers. Power sweeps from low to high power are made at designated CW frequencies. A reference measurement is made while the signal to the receiver is attenuated to avoid compression. The attenuation is removed and compression is observed and measured.

Analyzer warm-up time: **30 minutes**

Specifications

CW Frequency	Test Port	Phase[a]
300 kHz to 3 GHz	Test Port 1	≤ 6°
3 GHz to 6 GHz[b]	Test Port 1	≤ 7.2°

a. With 10 Hz IF bandwidth.
b. Only for analyzers with Option 006.

Required Equipment for 50Ω Analyzers

Description	HP/Agilent Part or Model Number
Cables (2): 50Ω, APC-7	8120-4779
Step Attenuator	8496A Option 003, H18
Additional Equipment for 75Ω Analyzers	
Minimum Loss Pad (2)	11852B
Adapters (2): APC-7 to Type-N (f)	11524A
Cables (2): 50Ω, Type-N, 24-inch	8120-4781

Procedure

1. Connect the equipment as shown in Figure 2-42 (Figure 2-43 for 75Ω analyzers).

Figure 2-42 Test Port Phase Compression Test Setup

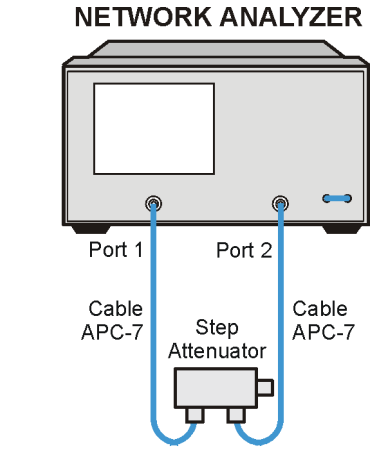
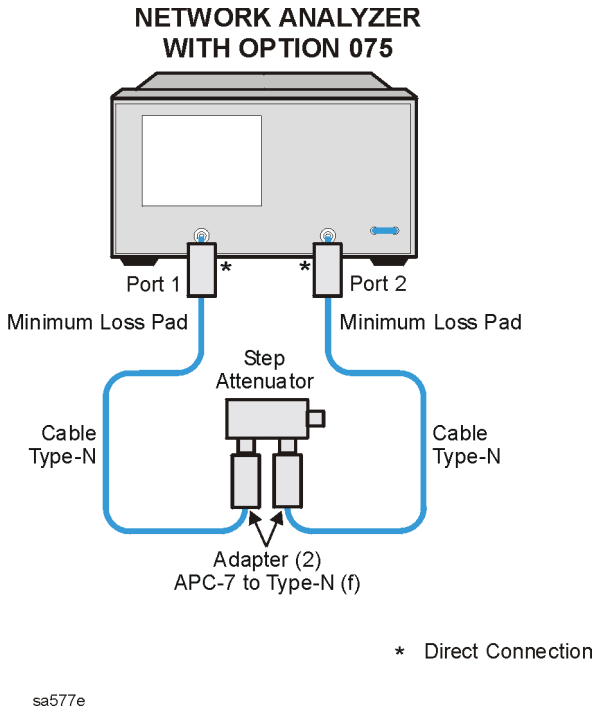


Figure 2-43 Test Port Phase Compression Test Setup for 75Ω Analyzers



2. Press (Preset) **IF BW** (10) (x1).
3. Press (Meas) **INPUT PORTS** **B/R** (Format) **PHASE**.
4. Press (Sweep Setup) **SWEEP TYPE MENU** **POWER SWEEP** (Start) (–10) (x1) (Marker) (–10) (x1) **Δ MODE MENU** **Δ REF = 1**.
5. Press (Sweep Setup) **CW FREQ** (300) (k/m) (or next CW frequency).

6. Set the step attenuator to 20 dB attenuation.
7. Press **TRIGGER MENU** **SINGLE** .
8. Press (Display) **DATA → MEMORY** **DATA/MEM** .
9. Set the step attenuator to 0 dB attenuation.
10. Press (Sweep Setup) **TRIGGER MENU** **SINGLE** .
11. Press (Scale Ref) **AUTO SCALE** .
12. Press (Marker) **MARKER 2** (Marker Search) **SEARCH: MAX** .
13. Press (Marker) **MARKER 3** (Marker Search) **SEARCH: MIN.** .
14. Read the value of both markers and enter the largest absolute value in the performance test record under “Measured Value Test Port 2.”
15. Repeat steps 5 through 14 for each CW frequency listed in the performance test record.
16. Press (Meas) **INPUT PORTS** **A/R** **TESTPORT 2** (Format) **PHASE** .
17. Repeat steps 5 through 14 for each CW frequency listed in the performance test record. Record the entries under “Measured Value, Test Port 1.”

In Case of Difficulty

1. If the analyzer fails the test port 2 phase compression test:
   a. Repeat this test.
   b. Replace the A6 B sampler assembly if analyzer still fails the test.
2. If the analyzer fails the test port 1 phase compression test:
   a. Repeat this test.
   b. Replace the A5 A sampler assembly if analyzer still fails the test.

14. Test Port Output/Input Harmonics (Analyzers with Option 002)

Perform this test to determine the spectral purity of the analyzer's input and output test ports. Output and input harmonic levels are measured using the analyzer's harmonic mode which sets the receiver's frequency at the second or third harmonic of the source frequency.

Analyzer warm-up time: **30 minutes**

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

Specifications

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

a. +8 dBm for analyzers with Option 014 or 075.

Required Equipment

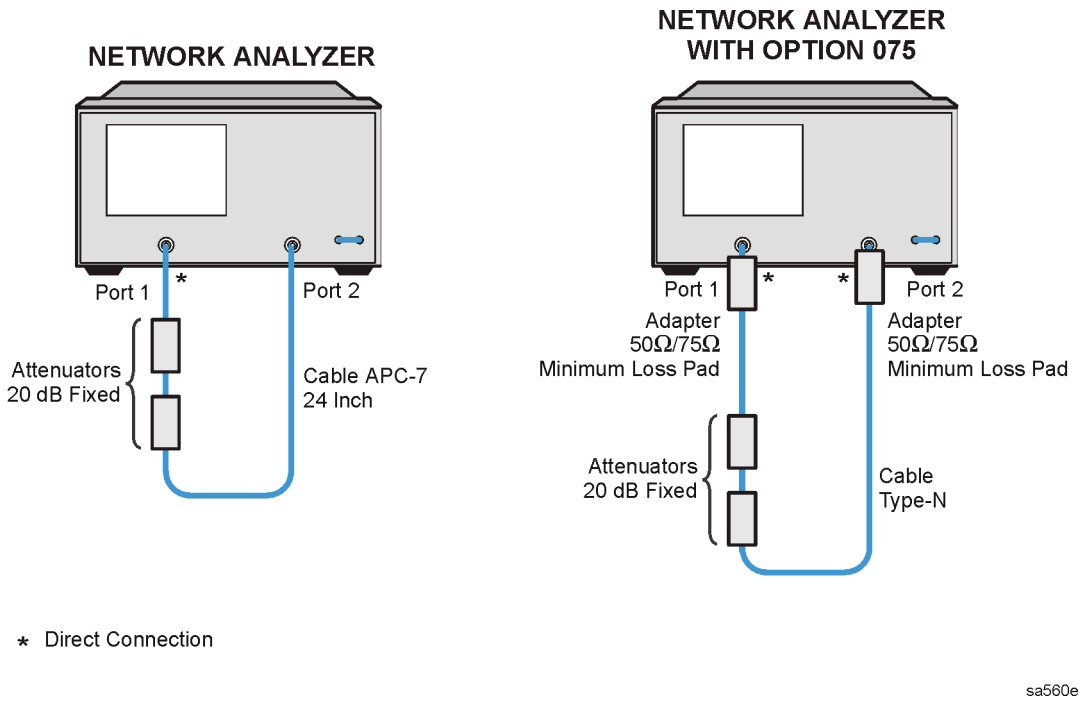
Description	HP/Agilent Part or Model Number
Cable: APC-7, 24-inch	8120-4779
Attenuators (2): 20 dB, APC-7	8492A Option 020
Additional Equipment for 75Ω Analyzers	
Minimum Loss Pad (2)	11852B
Cable: Type-N, 50Ω	8120-4781
Attenuators (2): 20 dB, Type-N	8491A Option 020

Procedure

Test Port Output Worst-Case 2nd Harmonic

1. Press [Preset] [Power] [10] [x1] to set the test port power to +10 dBm. (Set the power to +8 dBm for analyzers with Option 014 or 075.)
2. Press [Start] [16] [M/µ]. To set the frequency range:
   If you do not have Option 006, press [Stop] [1.5] [G/n].
   If you have Option 006, press [Stop] [3] [G/n].
3. Press [Avg] **IF BW** [10] [x1] to set the IF bandwidth to 10 Hz.
4. Connect the equipment as shown in Figure 2-44.

Figure 2-44 Test Port Output Harmonics Test Setup



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

Test Port Output Worst-Case 3rd Harmonic

11.To change the stop frequency:
If you *do not* have Option 006, press (Stop) (1) (G/n).
If you *have* Option 006, press (Stop) (2) (G/n).

12.Press (System) **HARMONIC MEAS** **HARMONIC OFF**.

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

14.Press (Scale Ref) **AUTO SCALE** to get a better viewing of the trace.

15.Press (System) **HARMONIC MEAS** **HARMONIC THIRD**.

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

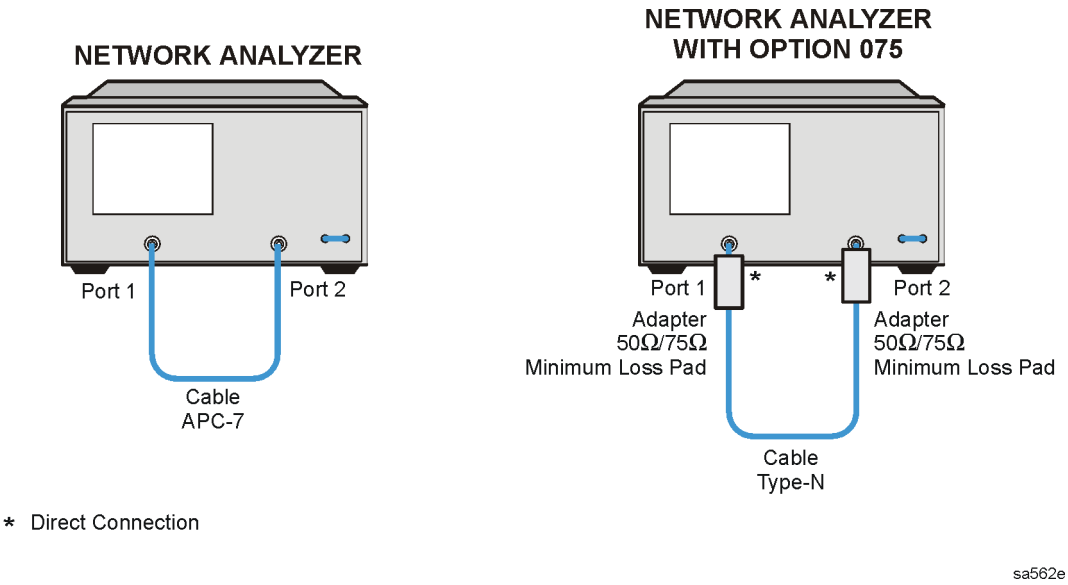
17.Press (Marker Search) **SEARCH:MAX**.

18.Write the marker 1 value on the performance test record.

Test Port 1 Input Worst-Case 2nd Harmonic

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

Figure 2-45 Receiver Harmonics Test Setup



20.Press (Preset) (Power) (8) (x1).

21.Press (Avg) **IF BW** (10) (x1).

22.To set the frequency range, press (Start) (16) (M/µ).
If you *do not* have Option 006, press (Stop) (1.5) (G/n).
If you *have* Option 006, press (Stop) (3) (G/n).

23.Press (Meas) **Trans:REV S12 (A/R)** **INPUT PORTS** **A** .

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

25.Press (System) **HARMONIC MEAS** **HARMONIC SECOND** .

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

27.Press (Marker Search) **SEARCH:MAX** .

28.Write the marker 1 value (which appears on the analyzer display) on the performance test record. This is the worst-case Test Port 1 input (receiver channel A) 2nd harmonic.

Test Port 1 Input Worst-Case 3rd Harmonic

29.To change the stop frequency for measuring the receiver 3rd harmonic:
If you *do not* have Option 006, press (Stop) (1) (G/n).
If you *have* Option 006, press (Stop) (2) (G/n).

30.Press (System) **HARMONIC MEAS** **HARMONIC OFF** .

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

32.Press (Scale Ref) **AUTO SCALE** to get a better viewing of the trace.

33.Press (System) **HARMONIC MEAS** **HARMONIC THIRD** .

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

35.Press (Marker Search) **SEARCH:MAX** .

36.Write the marker 1 value on the performance test record.

37.Press (System) **HARMONIC MEAS** **HARMONIC OFF** .

Test Port 2 Input Worst-Case 2nd Harmonic

38.To set the stop frequency for measuring the 2nd harmonic:
If you *do not* have Option 006, press (Stop) (1.5) (G/n).
If you *have* Option 006, press (Stop) (3) (G/n).

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

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

41.Press (System) **HARMONIC MEAS** **HARMONIC SECOND** .

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

43.Press (Marker Search) **SEARCH:MAX** .

44.Write the marker 1 value (which appears on the analyzer display) on the performance test record. This is the worst-case port 2 input (receiver channel B) 2nd harmonic.

Test Port 2 Input Worst-Case 3rd Harmonic

45. To change the stop frequency for measuring the receiver 3rd harmonic:
    If you *do not* have Option 006, press (Stop) (1) (G/n).
    If you *have* Option 006, press (Stop) (2) (G/n).

46. Press (System) **HARMONIC MEAS** **HARMONIC OFF**.

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

48. Press (Scale Ref) **AUTO SCALE** to get a better viewing of the trace.

49. Press (System) **HARMONIC MEAS** **HARMONIC THIRD**.

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

51. Press (Marker Search) **SEARCH:MAX**.

52. Write the marker 1 value on the performance test record.

15. Harmonic Measurement Accuracy (Analyzers with Option 002)

This test verifies the network analyzer's accuracy when operating in the harmonic measurement mode (Option 002). Using a power splitter, an external source injects the harmonic signal into both the analyzer's receiver and the power meter. The analyzer's reading is compared to that of the power meter. The allowable difference is shown in the "Specifications" table, below.

Equipment warm-up time: **30 minutes**

Specifications

Frequency Range	Accuracy
16 MHz to 3 GHz	±1.5 dB
3 GHz to 6 GHz[a]	±3.0 dB

a. Only for analyzers with Option 006.

Required Equipment

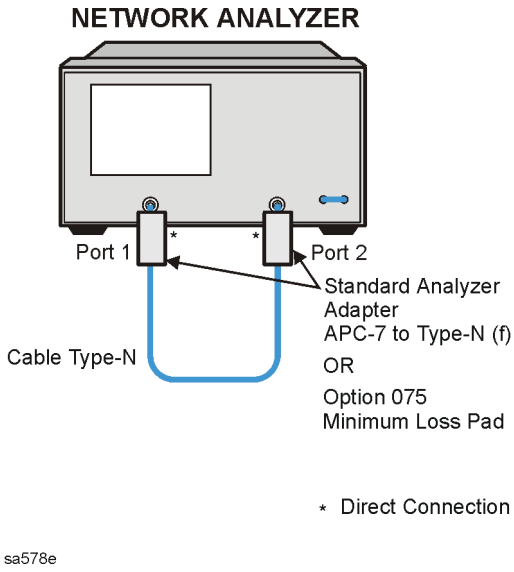
Description	HP/Agilent Part or Model Number
External Source	83712B
Power Meter	436A/437B/438A or 4418B/4419B
Power Splitter	11667A Option 001
Power Sensor	8482A
Adapter: Type-N (f) to Type-N (f)	1250-0777
Adapters (2): APC-7 to Type-N (f)	11524A
Cables (2): 50Ω, Type-N, 24 inch	8120-4781
Cable: BNC, 48 inch	8120-1840
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A
Additional Equipment for Option 075 Analyzers	
Minimum Loss Pad (2)	11852B

Procedure

Determine the Cable Loss at Specified Frequencies

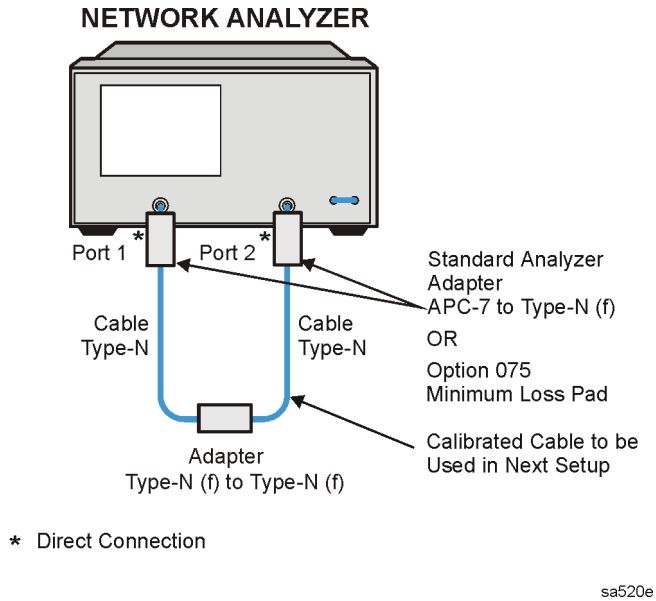
1. Connect the equipment as shown in Figure 2-46. Observe the differences between the standard 8753ES and the Option 075 (75Ω) 8753ES.

Figure 2-46 Harmonic Measurement Accuracy, Cable Loss Setup 1



2. Press (Preset) (Start) (40) (M/µ).
3. Press (Meas) **Trans: S21 (B/R)** (Cal) **CALIBRATE MENU** **RESPONSE** **THRU**.
4. Disconnect the cable from Test Port 2. Connect the type-N (f) to type-N (f) adapter to the end of the cable and attach the second type-N cable as shown in Figure 2-47.

Figure 2-47 Harmonic Measurement Accuracy, Cable Loss Setup 2



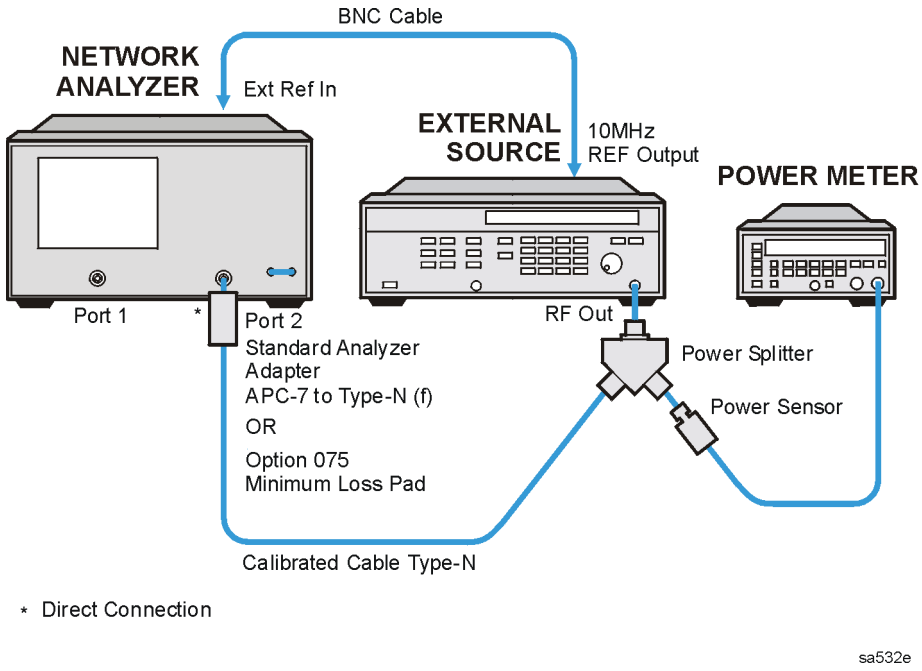
5. Press (Scale Ref) **SCALE/DIV** (1) (x1).
6. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.

7. Press (Marker). Enter the first external source frequency (40 MHz) by pressing (40) (M/µ). Read the value of the marker (in dB, in the upper right of the display), and enter this value in the performance test record under "Cable Loss." Repeat this step for all external source frequencies listed in the performance test record.

Instrument Setup

8. Zero and calibrate the power meter for the 8482A power sensor.
9. Set up the equipment as shown in Figure 2-48. For the type-N cable, use the one that was added in step 4.
10. On the analyzer, press:
    (Preset) (Avg) **IF BW** (1) (k/m) (Meas) **INPUT PORTS** **B**
    (Scale Ref) **SCALE/DIV** (1) (x1)
    (Marker Fctn) **MARKER MODE MENU** **STATS ON**
11. On the external source, set the power level for 6 dBm.

Figure 2-48 Harmonic Measurement Accuracy Test Setup



Harmonic Measurement Accuracy

12. On the analyzer, press:
    (System) **HARMONIC MEAS** **SECOND** . Then press (Sweep Setup) **CW FREQ** (20) (M/µ) (or the next fundamental frequency for the network analyzer).
13. Set the external source for CW operation at 40 MHz (or the next second harmonic frequency).

14. On the analyzer, press **TRIGGER MENU** **SINGLE** . Record the “mean” reading of the marker in the performance test record under “Network Analyzer Reading” (column B) for the second harmonic (40 MHz, or the next second harmonic frequency).
15. On the power meter, set the cal factor appropriate for the frequency of the external source. Record the power meter reading in the performance test record under “Power Meter Meas” for 40 MHz, or the next second harmonic frequency.
16. Set the external source for CW operation at 60 MHz, or the next third harmonic frequency.
17. On the analyzer, press System **HARMONIC MEAS** **THIRD** .

    Then press Sweep Setup **TRIGGER MENU** **SINGLE** .
    Record the “mean” reading of the marker in the performance test record under “Network Analyzer Reading” for the third harmonic (60 MHz or the next third harmonic frequency).
18. On the power meter, set the cal factor appropriate for the frequency of the external source. Record the power meter reading in the performance test record under “Power Meter Meas” for 60 MHz, or the next third harmonic frequency.
19. Repeat steps 12 through 18 for the fundamental, second and third harmonic frequencies. Before measuring harmonics above 3 GHz, zero and calibrate the power meter using the 8481A power sensor. Be sure to use the correct cal factor.
20. Use the entries in the performance test record and the following calculation to determine the measurement accuracy for each harmonic frequency.

    a. Add the cable loss to the power meter reading and record the result in column A.

    b. Subtract the network analyzer readings (column B) from the entries in column A. Record the results in the column for Harmonic Measurement Accuracy.

In Case of Difficulty

1. Check all connections.
2. Ensure that correct power meter cal factors were used.
3. Refer to Chapter 8 , “Receiver Troubleshooting.”

Agilent 8753ET System Verification and Performance Tests

Use this section of the manual if you are performing system verification and/or performance tests on an 8753ET analyzer. If your instrument is an 8753ES, turn to "Agilent 8753ES System Verification and Performance Tests" on page 2-5.

System Verification Cycle and Kit Re-certification

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

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

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

8753ET System Verification

This system verification consists of three separate procedures:

1. "Initialization" on page 2-88
2. "Enhanced Response Calibration" on page 2-89
3. "Device Verification" on page 2-91

Analyzer warm-up time: **30 minutes**

Required Equipment

Description	HP/Agilent Model Number
Calibration Kit: 7-mm	85031B
Verification Kit: 7-mm	85029B
Test Port Extension Cable Set: 7-mm	11857D
Adapters (2): Type-N (m) to APC-7 (from cal kit)	85032B or 11525A
Printer:	HP ThinkJet/DeskJet/LaserJet

Initialization

1. Clear all internal memory.

CAUTION This will erase all instrument states that may be stored in internal memory. Perform the following steps to save any instrument states that are stored in internal memory to a floppy disk.

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

b. Select an instrument state and press **RECALL STATE** .

c. Press **SELECT DISK** **INTERNAL DISK** **RETURN** **SAVE STATE** .

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

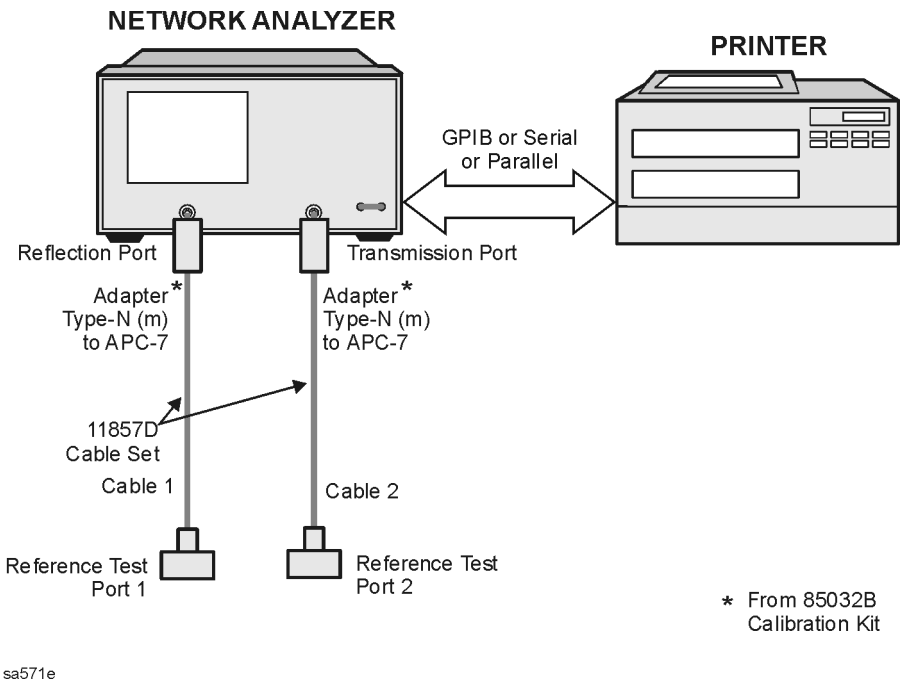
Press **FILE UTILITIES** **RENAME FILE** , enter the desired name, and press **DONE** .

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

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

2. Connect the equipment as shown in Figure 2-49. Let the system warm up for 30 minutes.

Figure 2-49 System Verification Test Setup



3. While the equipment is warming up, review the connector care information in Table 1-3 on page 1-7. Good connections and clean, undamaged connectors are critical for accurate measurement results.
4. Insert the verification kit disk into the analyzer disk drive.
5. Press (Preset) (Save/Recall) **SELECT DISK** **INTERNAL DISK** .
6. If you want a printout of the verification data for all the devices, press (System) **SERVICE MENU** **TEST OPTIONS** **RECORD ON** . If you want a printout of the graph from the display, press **DUMP GRAPH ON** .

NOTE If you switch on the record function, you *cannot* switch it off during the verification procedure.

---

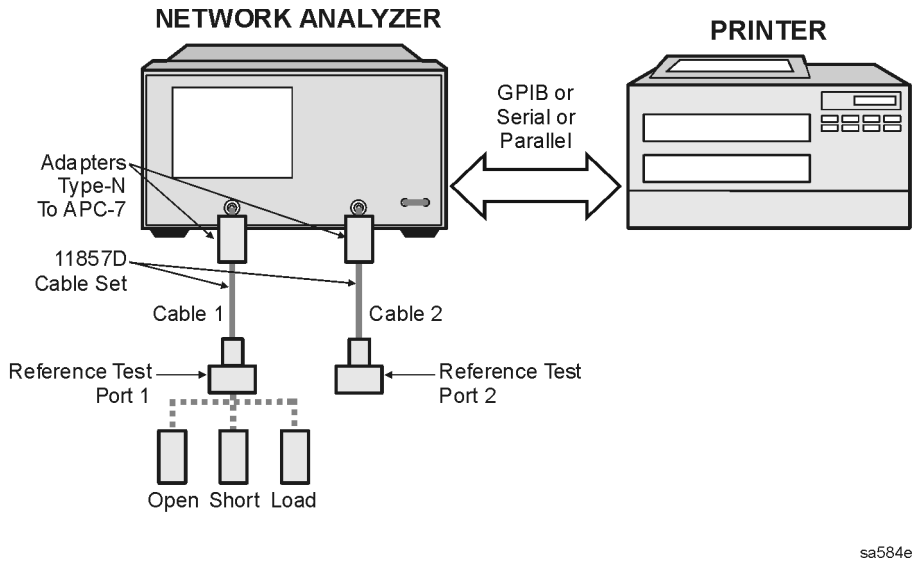
7. Position the paper in the printer so that printing starts at the top of the page.
8. If you have difficulty with the printer:
   - If the interface on your printer is GPIB, verify that the printer address is set to 1 (or change the setting in the analyzer to match the printer).
   - If the interface on your printer is serial or parallel, be sure that you selected the printer port and the printer type correctly. Refer to the analyzer's user's guide for more information on how to perform these tasks.
9. Press (System) **SERVICE MENU** **TESTS** **SYS VER TESTS** **EXECUTE TEST** .
10. When the analyzer displays `Sys Ver Init DONE`, the initialization procedure is complete.

CAUTION *Do not* press (Preset) or recall another instrument state. You must use the instrument state that you loaded during the initialization procedure.

Enhanced Response Calibration

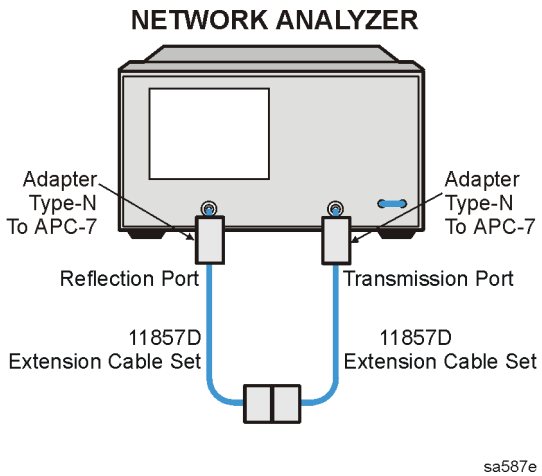
11. Press (Cal) **CAL KIT** **SELECT CAL KIT** **CAL KIT:7mm 85031** **RETURN** **RETURN** .
12. Press **CALIBRATE MENU** **ENHANCED RESPONSE** **TRANS/REFL ENH.** .
13. Press **ISOLATION** **OMIT ISOLATION** .
14. Press **REFLECTION** .
15. Connect the "open" end of the open/short combination (supplied in the HP/Agilent 85031B calibration kit) to reference test port 1, as shown in Figure 2-50.

Figure 2-50 Connections for Measurement Calibration Standards



16. Press **FORWARD:OPEN** .
17. When the analyzer finishes measuring the standard, connect the “short” end of the open/short combination to reference test port 1.
18. Press **FORWARD:SHORT** .
19. When the analyzer finishes measuring the standard, connect the 50 ohm termination (supplied in the calibration kit) to reference test port 1.
20. Press **FORWARD:LOAD** .
21. When the analyzer finishes measuring the standard, press **STANDARDS DONE** .
22. Remove the 50 ohm termination from reference test port 1 and connect both reference test ports together as shown in Figure 2-51.

Figure 2-51 Transmission Calibration Setup



23.Press **TRANSMISSION** **DO BOTH FWD THRUS** .

24.Press **DONE FWD ENH RESP** .

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

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

Device Verification

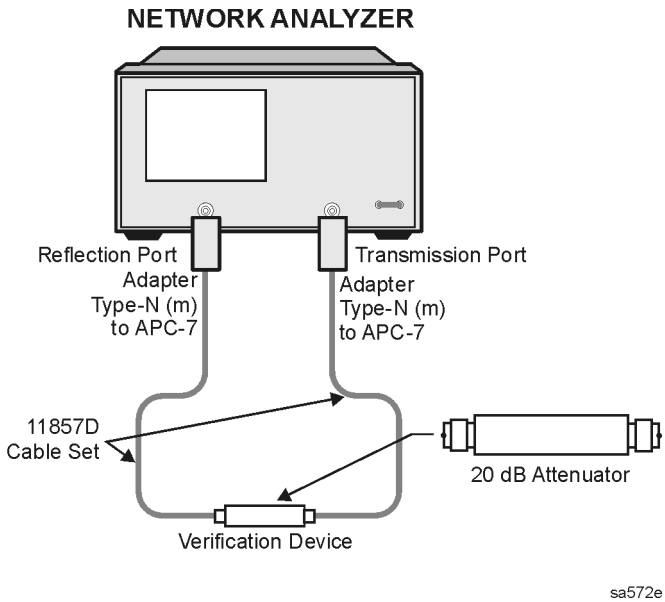
27.Press (System) **SERVICE MENU** **TESTS** (28) (x1) **EXECUTE TEST** .

28.At the prompt, connect the 20 dB attenuator (supplied in the verification kit) as shown in Figure 2-52.

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

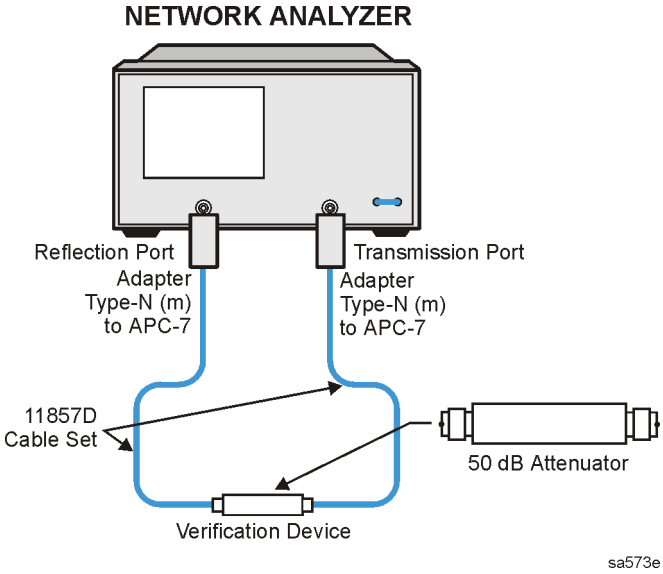
- If you switched the record function off, the test pauses after each measurement.Press **CONTINUE** after each measurement.
- If you switched the record function on, the analyzer takes all the required measurements for the test without pausing. Also, the analyzer only displays and prints the PASS/FAIL information for the measurements that are valid for system verification.

Figure 2-52 Connections for the 20 dB Verification Device



30.When the analyzer finishes all the measurements, connect the 50 dB attenuator (supplied in the verification kit), as shown in Figure 2-53.

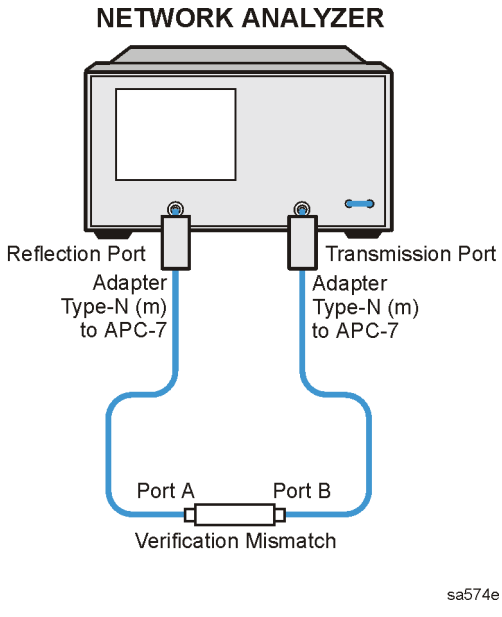
Figure 2-53 Connections for the 50 dB Verification Device



31. Press (29) (x1) **EXECUTE TEST** **CONTINUE** .

32. When all measurements are complete, replace the verification device with the verification mismatch, as shown in Figure 2-54. Be sure that you connect Port A of the verification mismatch to reference test port 1.

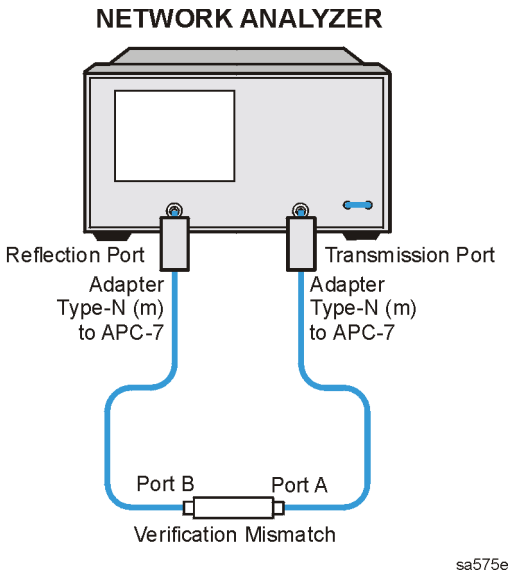
Figure 2-54 Mismatch Device Verification Setup 1



33. Press **RETURN** **TESTS** (30) (x1) **EXECUTE TEST** **CONTINUE** .

34. When the analyzer finishes all the measurements, connect the mismatch verification device as shown in Figure 2-55. Notice that Port B is now connected to reference test port 1.

Figure 2-55 Mismatch Device Verification Setup 2



35. Press **RETURN** **TESTS** (31) (x1) **EXECUTE TEST** **CONTINUE** .
36. You have completed the system verification procedure when the analyzer displays `Ver Def 4 DONE`.

In Case of Difficulty

1. Inspect all connections.

CAUTION *Do not* disconnect the cables from the analyzer test ports. Doing so *will invalidate* the calibration that you have done earlier.

---

2. Press (Preset) (Save/Recall). Using the front panel knob, highlight the title of the enhanced response calibration that you did earlier, then press **RECALL STATE** .
3. Repeat the "Device Verification" procedure.
4. If the analyzer still fails the test, check the measurement calibration as follows:
   a. Press (Preset).
   b. Recall the calibration by pressing (Save/Recall) **SELECT DISK** **INTERNAL MEMORY** **RETURN** .
   c. Use the front panel knob to highlight the calibration you want to recall and press **RECALL STATE** .
   d. Connect the short to reference test port 1.
   e. Press (Meas) **REFLECTION** (Sweep Setup) **TRIGGER MENU** **CONTINUOUS** .
   f. Press (Scale Ref) **SCALE/DIV** (0.05) (x1).

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

h. If the trace response is out of the specified limits, repeat the "Enhanced Response Calibration" and "Device Verification" procedures.

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

8753ET Performance Tests

The following tests comprise the performance tests for your analyzer. Make a copy of the "Agilent 8753ET Performance Test Records," starting on page 2-161, to record the results of these tests.

1. Reflection Test Port Output Frequency Range and Accuracy, on page 2-96
2. External Source Mode Frequency Range, on page 2-98
3. Reflection Test Port Output Power Level Accuracy, on page 2-100
4. Reflection Test Port Output Power Linearity (Analyzers without Option 004), on page 2-102
5. Reflection Test Port Output Power Linearity (Analyzers with Option 004), on page 2-108
6. Minimum R Channel Level, on page 2-114
7. Transmission Test Port Input Noise Floor Level, on page 2-119
8. Transmission Test Port Input Frequency Response, on page 2-122
9. Test Port Crosstalk, on page 2-127
10. Uncorrected Port Performance, on page 2-131
11. System Trace Noise, on page 2-136

1. Reflection Test Port Output Frequency Range and Accuracy

This test determines the analyzer's reflection test port output frequency range and accuracy over its entire operating frequency range. A frequency counter is used to determine the analyzer's output frequency.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Frequency Accuracy[a]
300 kHz to 3 GHz	±10 ppm
3 GHz to 6 GHz[b]	±10 ppm

a. At 25 °C ±5 °C.
b. Only for analyzers with Option 006.

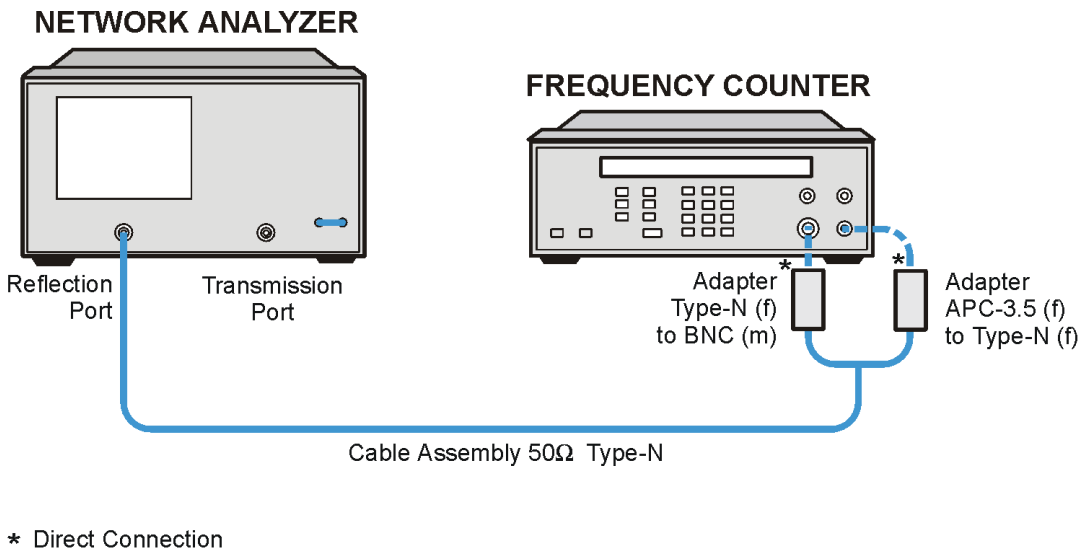
Required Equipment

Description	HP/Agilent Part or Model Number
Frequency Counter	5350B/51B/52B
Cable: 50Ω, Type-N, 24 inch	8120-4781
Adapter: APC-3.5 (f) to Type-N (f)	1250-1745
Adapter: Type-N (f) to BNC (m)	1250-0077

Procedure

1. Connect the equipment as shown in Figure 2-56.

Figure 2-56 Reflection Test Port Output Frequency Range and Accuracy



* Direct Connection

sa541e

2. Press Preset Sweep Setup **CW FREQ** .
3. Press 300 k/m and write the frequency counter reading on the performance test record.
4. Repeat step 3 for each instrument frequency listed in the performance test record.

In Case of Difficulty

1. If any measured frequency is close to the specification limits, check the time base accuracy of the frequency counter used.
2. If the analyzer fails by a significant margin at *all* frequencies (especially if the deviation increases with frequency), the master time base probably needs adjustment. In this case, refer to the "Frequency Accuracy Adjustment" on page 3-43. The "Fractional-N Frequency Range Adjustment" on page 3-40 also affects frequency accuracy.
3. Refer to the Chapter 7 , "Source Troubleshooting," if the problem persists.

2. External Source Mode Frequency Range

CW signals from an external source are fed into the R channel input when the instrument is in external source mode. Proper phase lock conditions are confirmed at a power level of –25 dBm.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range
300 kHz to 3 GHz
300 kHz to 6 GHz[a]

a. Only for analyzers with Option 006.

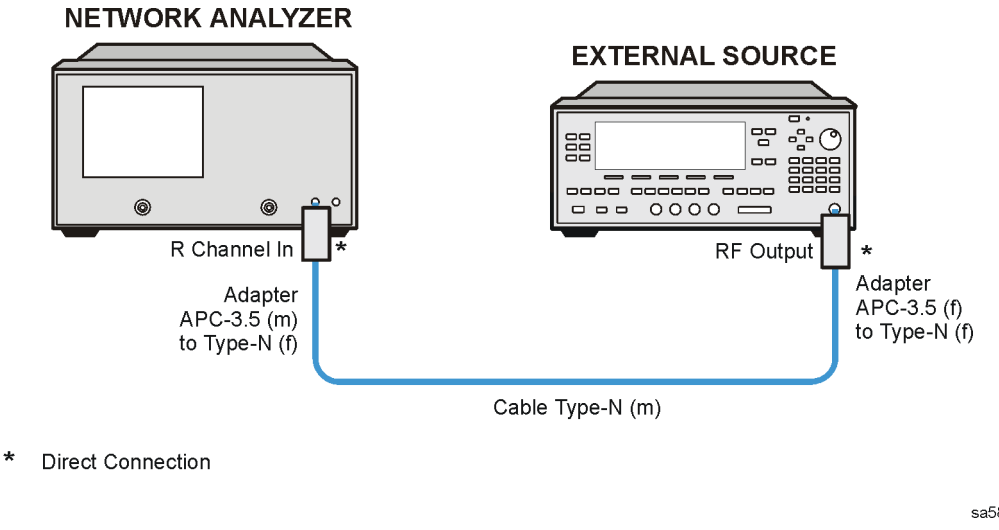
Required Equipment

Description	HP/Agilent Part or Model Number
External Source	83620A Option 001 or 83712B Option 1E1
Cable: Type-N (m)	8120-4781
Adapter: APC-3.5 (f) to Type-N (f)	1250-1745
Adapter: APC-3.5 (m) to Type-N (f)	1250-1750

Procedure

1. Set the external source for a CW frequency of 10 MHz and power level of –25 dBm.
2. Connect the equipment as shown in Figure 2-57.

Figure 2-57 External Source Mode Frequency Range Test Setup



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

4. Press (System) **INSTRUMENT MODE** **EXT SOURCE AUTO** (Sweep Setup) **CW FREQ** (10) (M/µ).
5. Check to see if the analyzer is phase locking to the external CW signal:
   - If the analyzer displays any phase lock error messages, write “UNLOCK” in the performance test record for the set CW signal.
   - If the analyzer does not display any phase lock error messages, write “LOCK” in the performance test record for the set CW signal.
6. Set the external source to a CW frequency of 20 MHz.
7. On the analyzer, press (20) (M/µ).
8. Repeat steps 5 through 7 for the other external source CW frequencies listed in the performance test record.

In Case of Difficulty

If the analyzer displayed any phase lock error messages:

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

3. Reflection Test Port Output Power Level Accuracy

Perform this test to confirm the accuracy of the 8753ET test port output power. A power meter is used to determine the output power level from the reflection port for selected CW frequencies. This measurement is compared to the level set by the network analyzer. The difference must be within the specified tolerance.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Reflection Test Port Output Power Level Accuracy[a]
300 kHz to 3 GHz	±1.0 dB
3 GHz to 6 GHz[b]	±1.0 dB

a. At –5 dBm (analyzers without Option 004); –10 dBm (Option 004). Holds at 25 °C ±5 °C
b. Only for analyzers with Option 006

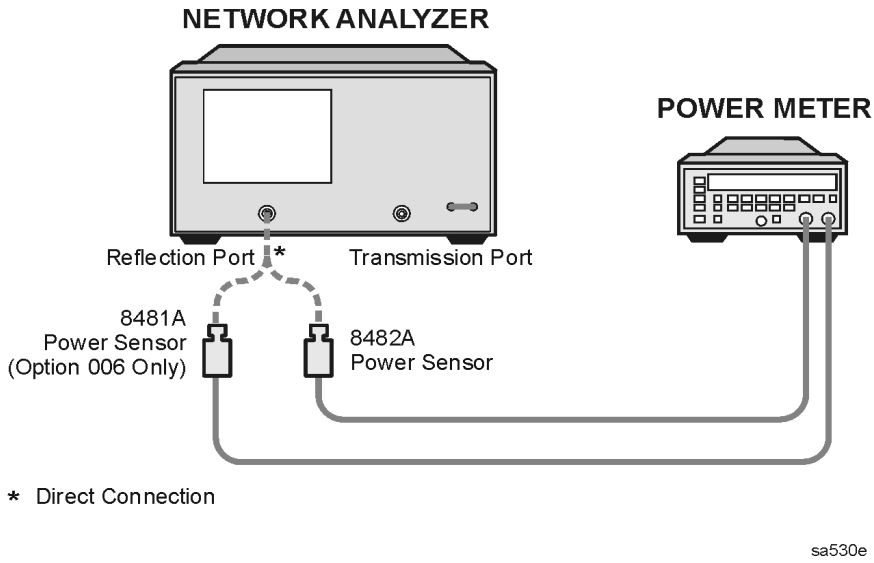
Required Equipment

Description	HP/Agilent Part or Model Number
Power Meter	436A/437B/438A or E4418B/4419B
Power Sensor	8482A
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A

Procedure

1. Zero and calibrate the power meter. For more information on how to perform this task, refer to the power meter operating manual.
2. Connect the equipment as shown in Figure 2-58.

Figure 2-58 Reflection Test Port Output Power Level Accuracy Test Setup



3. Press Preset Power. For analyzers *with* Option 004, press –10 x1. For analyzers *without* Option 004, press –5 x1.
4. Press Sweep Setup **CW FREQ** 300 k/m. Set the calibration factor on the power meter for this CW frequency.
5. Write the power meter reading on the performance test record.
6. Repeat steps 4 and 5 for each CW frequency listed in the performance test record. For analyzers with Option 006, use the 8481A power sensor for all frequencies above 3 GHz. Be sure to recalibrate the power meter after changing sensors.

In Case of Difficulty

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

4. Reflection Test Port Output Power Linearity (Analyzers *without* Option 004)

This test verifies the analyzer's test port output power linearity throughout the analyzer's frequency range. A power meter calibration sets the reference output power across the analyzer's frequency range. The network analyzer's B-channel receiver is used to determine power linearity after each change in output power.

Analyzer warm-up time: **30 minutes**

Specifications

Power Range	Power Level Linearity[a]
–20 to –15 dBm	± 0.5 dB
–15 to 0 dBm	± 0.2 dB
0 to + 5 dBm	± 0.5 dB

a. Relative to –5 dBm from 300 kHz to 3 GHz (6 GHz for Option 006).

Required Equipment

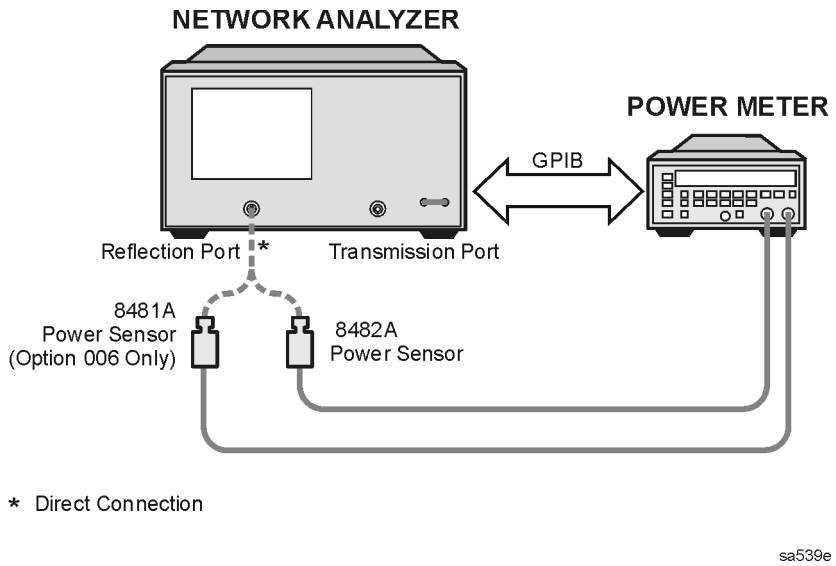
Description	HP/Agilent Part or Model Number
Power Meter	437A/438A or E4418B/4419B
Power Sensor	8482A
Attenuator: 20 dB, Type-N	8491A Option 020
RF Cable: 50Ω, Type-N, 24 inch	8120-4781
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A

Procedure

Power Meter Calibration

1. Zero and calibrate the power meter for one or both sensors.
2. Connect the equipment as shown in Figure 2-59.

Figure 2-59 Setup for Power Meter Calibration



3. Press Preset.
4. Press Avg **IF BW** 100 x1 Sweep Setup **NUMBER of POINTS** 51 x1 **POWER** –5 x1.
5. Press Start 300 k/m.
   a. If your analyzer has Option 006, press Stop 3 G/n.
6. Press Local **SYSTEM CONTROLLER**.
7. Press **SET ADDRESSES** and **POWER MTR** until the analyzer shows the correct power meter model. (Use the 438A/437 selection if the power meter is an HP/Agilent E4419B or E4418B.)
8. Press **ADDRESS: P MTR/GPIB**. The default power meter GPIB address is 13. Make sure it is the same as your power meter GPIB address. Otherwise, use the analyzer front panel keypad to enter the correct GPIB address for your power meter.
9. Press Cal **PWRMTR CAL**.
10. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR A**. Refer to the back of the power sensor to locate the different calibration factor values along with their corresponding frequencies.

NOTE The analyzer's calibration factor sensor table can hold a *maximum* of 55 calibration factor data points.

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

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

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

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

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

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

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

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

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

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

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

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

11. Press the appropriate softkeys to create a power sensor calibration factors table.

12. Press **DONE** to exit the sensor calibration factor entries menu.

13. Press **RETURN** (–5) (x1) to set the calibration power to –5 dBm.

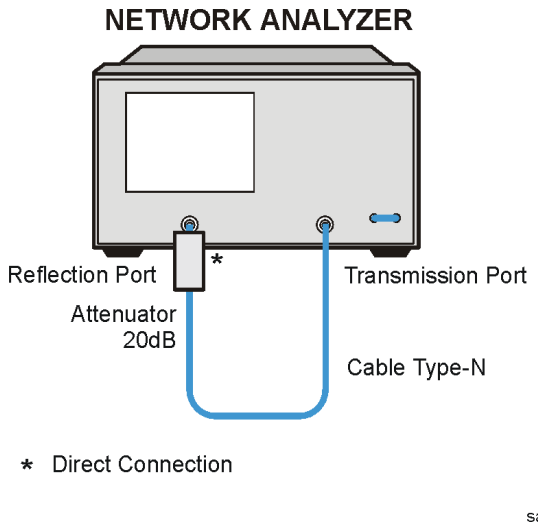
14. Press **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.

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

Output Power Linearity Measurement from 300 kHz to 3 GHz

1. Set up the equipment as shown in Figure 2-60.

Figure 2-60 Output Power Linearity Test Setup



2. Press (Meas) **INPUT PORTS** **B**.
3. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
4. Press (Display) **DATA → MEMORY** **DATA/MEM**.
5. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** (300) (k/m) **FIXED MKR VALUE** (–15) (x1) **RETURN** **Δ REF = Δ FIXED MKR**.
6. Press (Power) (–20) (x1) (or the next power setting from the performance test record).
7. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
8. Press (Marker) **MARKER 1** (Marker Search) **SEARCH: MAX** (Marker) **MARKER 2** (Marker Search) **SEARCH:MIN**.
9. Read the value for marker 1 from the display and enter it in the performance test record in the “Marker 1 (Maximum)” column. Enter the value of marker 2 in the “Marker 2 (Minimum) column.
10. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR VALUE** (–13) (x1) (or the next power offset value from the performance test record) **RETURN**.
11. Repeat steps 6 through 10 for all power settings and associated power offsets listed on the performance test record in the 300 kHz to 3 GHz range.
12. The marker 1 (maximum) and marker 2 (minimum) readings should be within the specified range for each power level with reference to the fixed marker value.

13. If your analyzer does not have Option 006, this completes the test.
    If your analyzer *has* Option 006: go on to "Power Meter Calibration from 3 GHz to 6 GHz," next.

Power Meter Calibration from 3 GHz to 6 GHz

1. Connect the equipment as shown in Figure 2-59, using the 8481A power sensor. Zero and calibrate the power meter for this new sensor.
2. Press (Start) (3) (G/n) (Stop) (6) (G/n).
3. Press (Cal) **PWRMTR CAL** (–5) (x1).
4. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR B**. Press the appropriate softkeys to build a sensor calibration factor table for the 8481A power sensor (sensor B).
5. Press **DONE** to exit the sensor calibration factor entries menu.
6. Press **USE SENSOR B** to select the 8481A sensor. Press (Sweep Setup) **TRIGGER MENU** **CONTINUOUS**.
7. Press (Cal) **PWRMTR CAL** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration. The calibrated port power should remain at –5 dBm.

Output Power Linearity Measurement from 3 GHz to 6 GHz

1. Set up the equipment as shown in Figure 2-60.
2. Press (Meas) **INPUT PORTS** **B**.
3. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
4. Press (Display) **DATA → MEMORY** **DATA/MEM**.
5. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** (3) (G/n) **FIXED MKR VALUE** (–15) (x1) **RETURN** **Δ REF = Δ FIXED MKR**.
6. Press (Power) (–20) (x1) (or the next power setting from the performance test record).
7. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
8. Press (Marker) **MARKER 1** (Marker Search) **SEARCH: MAX** (Marker) **MARKER 2** (Marker Search) **SEARCH:MIN**.
9. Read the value for marker 1 from the display and enter it in the performance test record in the "Marker 1 (Maximum)" column. Enter the value of marker 2 in the "Marker 2 (Minimum)" column.
10. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR VALUE** (–13) (x1) (or the next power offset value from the performance test record) **RETURN**.
11. Repeat steps 6 through 10 for all power settings and associated power offsets listed on the performance test record in the 3 GHz to 6 GHz range.

12.The marker 1 (maximum) and marker 2 (minimum) readings should be within the specified range for each power level with reference to the fixed marker value.

In Case of Difficulty

1. Ensure that the power meter and power sensor(s) are operating to specifications. Be sure you set the power meter calibration factor for the range of frequencies that you are testing.
2. Verify that there is power coming out of the analyzer's reflection test port. Be sure you did not accidentally switch off the analyzer's internal source. If you did so, press (Sweep Setup) **POWER** **SOURCE PWR ON** .
3. Repeat this performance test.

5. Reflection Test Port Output Power Linearity (Analyzers with Option 004)

This test verifies the analyzer's test port output power linearity throughout the analyzer's frequency range. A power meter calibration sets the reference output power across the analyzer's frequency range. The network analyzer's B-channel receiver is used to determine power linearity after each change in output power.

NOTE This test does not verify the functionality of the step attenuator. To verify its function, perform "Step 2. Operator's Check" on page 4-6.

Analyzer warm-up time: **30 minutes**

Specifications

Power Range	Power Level Linearity[a]
–15 dBm to +5 dBm	± 0.2 dB
+5 to +10 dBm	± 0.5 dB

a. Relative to 0 dBm from 300 kHz to 3 GHz (6 GHz for Option 006).

Required Equipment

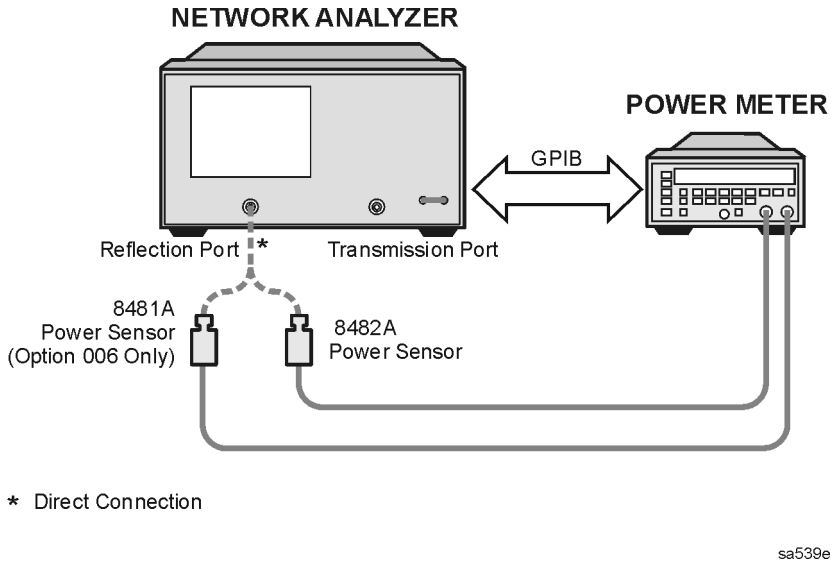
Description	HP/Agilent Part or Model Number
Power Meter	437A/438A or E4418B/4419B
Power Sensor	8482A
Attenuator: 20 dB, Type-N	8491A Option 020
RF Cable: 50Ω, Type-N, 24 inch	8120-4781
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A

Procedure

Power Meter Calibration

1. Zero and calibrate the power meter for one or both sensors.
2. Connect the equipment as shown in Figure 2-61, using the 8482A power sensor.

Figure 2-61 Setup for Power Meter Calibration



3. Press Preset.
4. Press Avg **IF BW** 100 x1 Sweep Setup **NUMBER of POINTS** 51 x1.
5. Press Start 300 k/m.
   If your analyzer has Option 006:
   Press Stop 3 G/n.
6. Press Power **POWER RANGE MAN** **POWER RANGES** **RANGE 0** 0 x1.
7. Press Local **SYSTEM CONTROLLER**.
8. Press **SET ADDRESSES** and **POWER MTR** until the analyzer shows the correct power meter model. (Use the 438A/437 selection if the power meter is an E4419B or E4418B.)
9. Press **ADDRESS: P MTR/GPIB**. The default power meter GPIB address is 13. Make sure it is the same as your power meter GPIB address. Otherwise, use the analyzer front panel keypad to enter the correct GPIB address for your power meter.

NOTE The analyzer displays the `PRm` annotation, indicating that the analyzer power range is set to MANUAL.

---

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

NOTE The analyzer's calibration factor sensor table can hold a *maximum* of 55 calibration factor data points.

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

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

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

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

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

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

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

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

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

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

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

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

12. Press the appropriate softkeys to create a power sensor calibration factors table.

13. Press **DONE** to exit the sensor calibration factor entries menu.

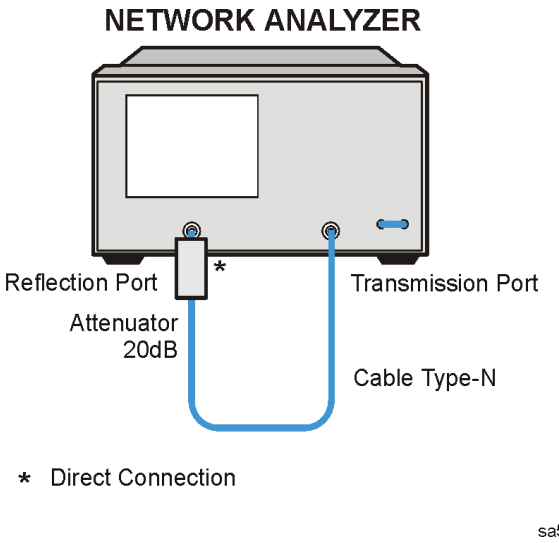
14. Press **RETURN** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration. (The Port 1 Cal Power is 0 dBm, the reference power level for power linearity measurements.)

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

Output Power Linearity Measurement

1. Set up the equipment as shown in Figure 2-62.

Figure 2-62 Output Power Linearity Test



2. Press (Meas) **INPUT PORTS** **B**.
3. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
4. Press (Display) **DATA → MEMORY** **DATA/MEM**.
5. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** (300) (k/m) **FIXED MKR VALUE** (–15) (x1) **RETURN** **Δ REF = Δ FIXED MKR**.
6. Press (Power) (–15) (x1) (or the next power setting from the performance test record).
7. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
8. Press (Marker) **MARKER 1** (Marker Search) **SEARCH: MAX** (Marker) **MARKER 2** (Marker Search) **SEARCH:MIN**.
9. Read the value for marker 1 from the display and enter it in the performance test record in the "Marker 1 (Maximum)" column. Enter the value of marker 2 in the "Marker 2 (Minimum)" column.
10. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR VALUE** (–13) (x1) (or the next power setting from the performance test record) **RETURN**.
11. Repeat steps 6 through 10 for all power settings listed on the performance test record in the 300 kHz to 3 GHz range.

12. The marker 1 (maximum) and marker 2 (minimum) readings should be within the specified range for each power level with reference to the fixed marker value.
13. If your analyzer does *not* have Option 006: this completes the test.
    If your analyzer *has* Option 006: go to "Power Meter Calibration from 3 GHz to 6 GHz," next.

Power Meter Calibration from 3 GHz to 6 GHz

1. Connect the equipment as shown in Figure 2-61 using the 8481A power sensor.
2. Press (Start) (3) (G/n) (Stop) (6) (G/n).
3. Press (Cal) **PWRMTR CAL**.
4. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR B**. Press the appropriate softkeys to build a sensor calibration factor table for the 8481A power sensor (sensor B).
5. Press **DONE** to exit the sensor calibration factor entries menu.
6. Press **USE SENSOR B** to select the 8481A sensor. Press (Sweep Setup) **TRIGGER MENU** **CONTINUOUS**.
7. Press (Cal) **PWRMTR CAL** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.

Output Power Linearity Measurement from 3 GHz to 6 GHz

1. Set up the equipment as shown in Figure 2-62.
2. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
3. Press (Display) **DATA → MEMORY** **DATA/MEM**.
4. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** (3) (G/n) **FIXED MKR VALUE** (–15) (x1) **RETURN** **Δ REF = Δ FIXED MKR**.
5. Press (Power) (–15) (x1) (or the next power setting from the performance test record).
6. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
7. Press (Marker) **MARKER 1** (Marker Search) **SEARCH: MAX** (Marker) **MARKER 2** (Marker Search) **SEARCH:MIN**.
8. Read the value for marker 1 from the display and enter it in the performance test record in the "Marker 1 (Maximum)" column. Enter the value of marker 2 in the "Marker 2 (Minimum)" column.
9. Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR VALUE** (–13) (x1) (or the next power setting from the performance test record) **RETURN**.

10.Repeat steps 5 through 9 for all power settings listed on the performance test record in the 3 GHz to 6 GHz range.

11.The marker 1 (maximum) and marker 2 (minimum) readings should be within the specified range for each power level with reference to the fixed marker value.

12.This completes the test.

In Case of Difficulty

1. Ensure that the power meter and power sensor(s) are operating to specifications. Be sure you set the power meter calibration factor for the range of frequencies that you are testing.
2. Verify that there is power coming out of the analyzer's reflection test port. Be sure you did not accidentally switch off the analyzer's internal source. If you did so, press (Sweep Setup) **POWER** **SOURCE PWR ON** .
3. Repeat this performance test.

6. Minimum R Channel Level

This test confirms that phase lock can be achieved at a specified minimum R channel input power. Power from the analyzer's output port is fed into the R channel receiver using the input found on the front panel. Observations are made for proper phase lock conditions.

Analyzer warm-up time: **30 minutes.**

Specifications

Frequency Range	Minimum R Channel Level
300 kHz–3.0 GHz	< –35 dBm
3 GHz–6.0 GHz[a]	< –30 dBm

a. Only for analyzers with Option 006.

Required Equipment

Description	HP/Agilent Part or Model Number
Adapter: 3.5-mm (m) to Type-N (f)	1250-1750
Cable: 50 W, Type-N, 24 inch	8120-4781
Attenuators (2): 20 dB, Type-N	8491A Option 020

Procedure

1. If you *do not* have Option 004, connect the equipment as shown in Figure 2-63.
   If you *have* Option 004, connect the equipment as shown in Figure 2-64.

Figure 2-63 8753ET (Standard) Minimum R-Channel Level Test Setup

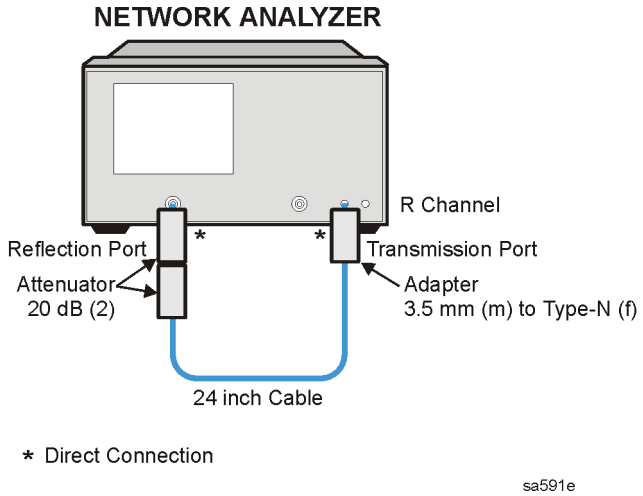
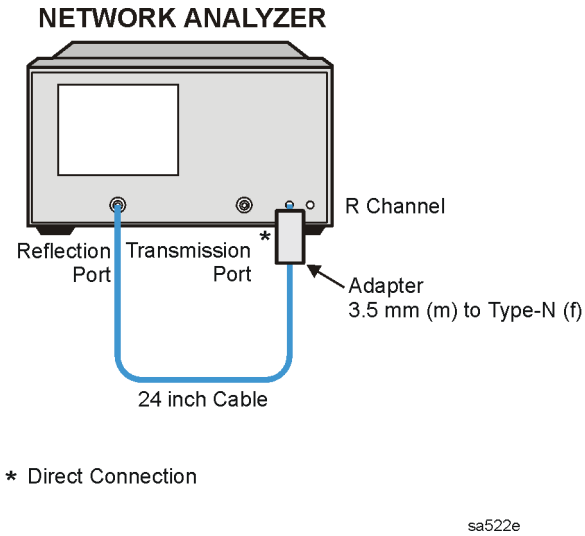


Figure 2-64 8753ET (Option 004) Minimum R Channel Level Test Setup



2. Press (Preset) (Meas) **INPUT PORTS R** .
3. If you *do not* have Option 004, go to step 4.
   If you *have* Option 004, press (Power) **PWR RANGE MAN** **POWER RANGES** **RANGE 5 –65 to –40** .
4. Press (Scale Ref) **REFERENCE VALUE** (–70) (x1).
5. Press (Sweep Setup) **CW FREQ** (300) (k/m).
6. If you *do not* have Option 004, press (Power) (–20) (x1).
   If you *have* Option 004, press (Power) (–65) (x1).

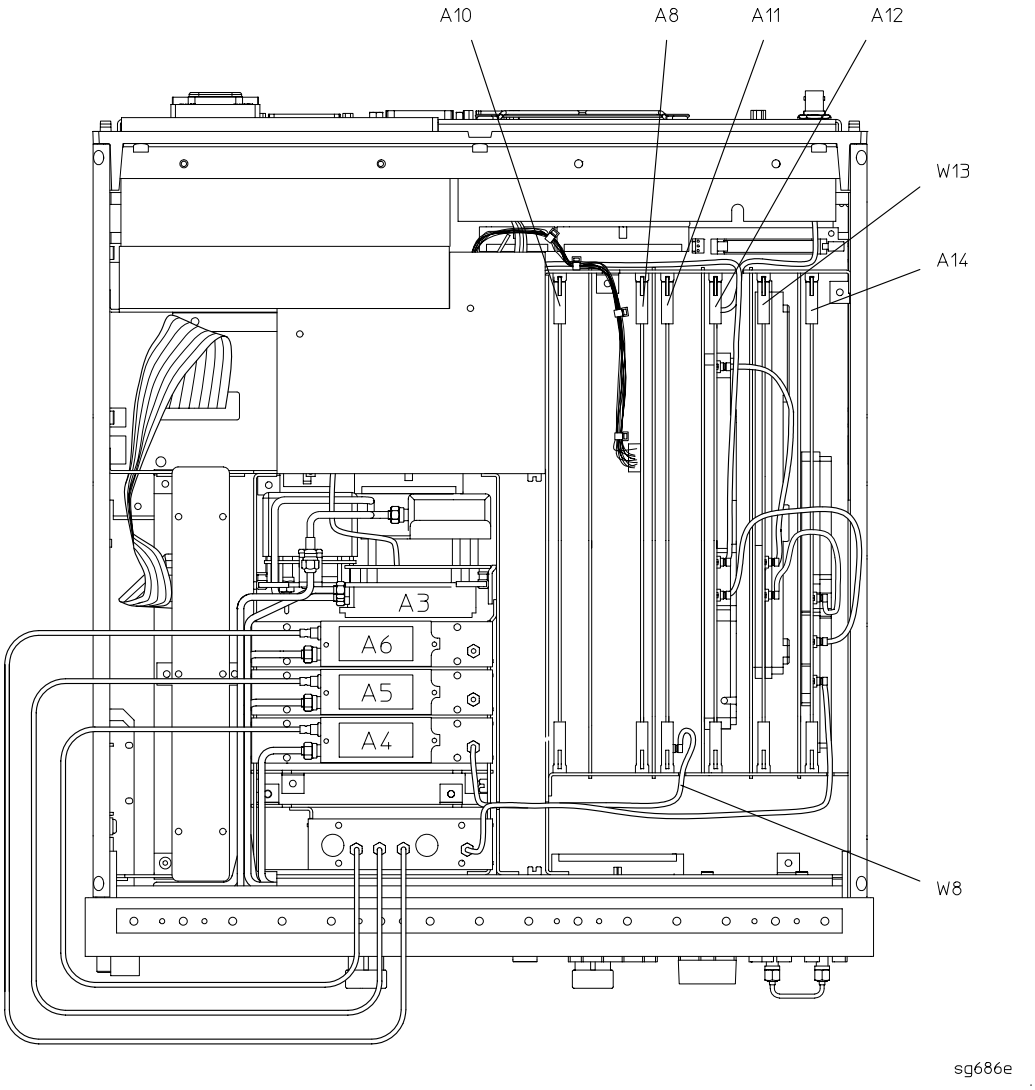
   The analyzer displays the message `CAUTION: NO IF FOUND: CHECK R INPUT LEVEL`.
7. Press (↑) to increase the port power by 1 dBm.
8. If the analyzer displays a phase lock error message, continue increasing the test port power until phase lock is achieved.
9. If you *do not* have Option 004, subtract 40 dBm from the displayed test port power and record the result on the performance test record in the column for R-channel power.
   If you *have* Option 004, write the displayed test port power on the performance test record in the column for R-channel power.
10. Repeat steps 5 through 9 for the other CW frequencies listed in the performance test record.

In Case of Difficulty

1. Check the flexible RF cable (W8, as shown in Figure 2-65) between the R sampler assembly (A4) and the phase lock assembly. Make sure it is connected between A11J1 (PL IF IN) and 1st IF Out.

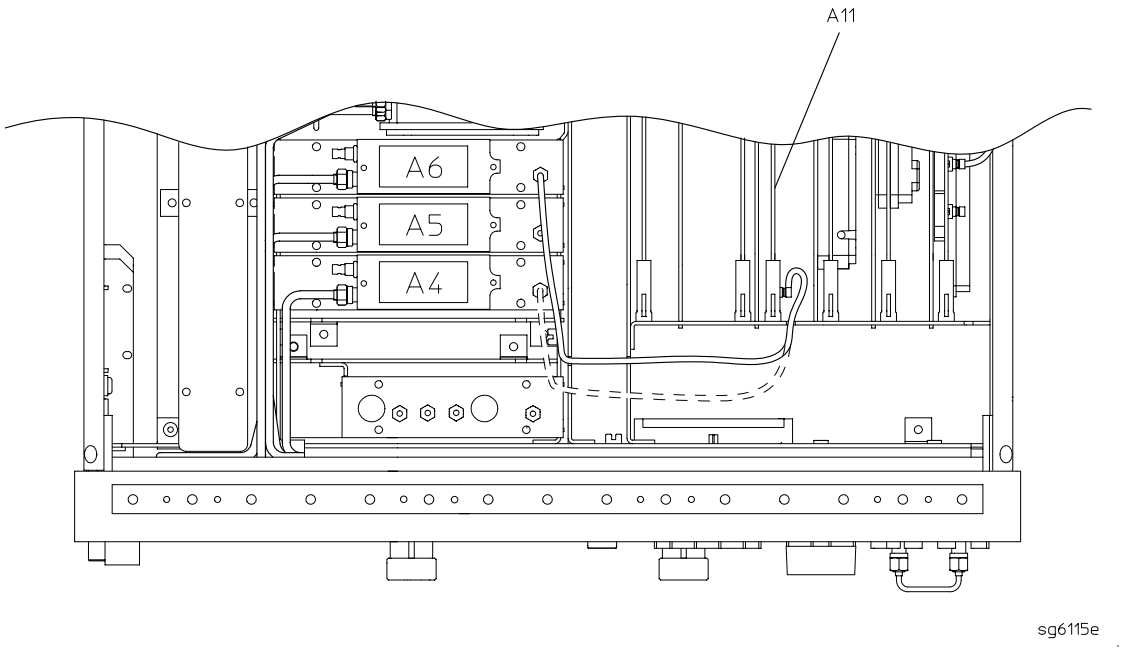
CAUTION Do not push cable W8 down next to the A11 phase lock assembly.

Figure 2-65 Flexible RF Cable Location



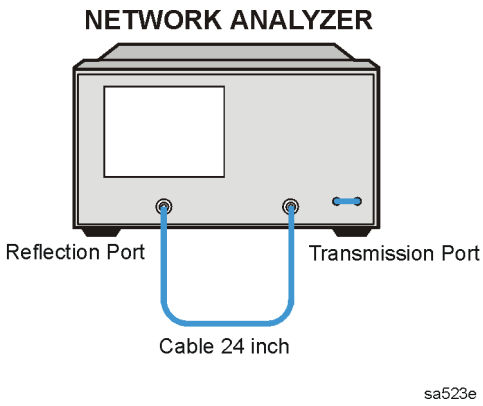
2. Using an ohmmeter, verify that the RF cable is not open. In addition, examine both the cable connectors: measure the resistance between the center pin and the cable connector and make sure it is not close to zero.
3. Check the R sampler by substituting it with the B sampler (A6).
   a. Move cable W8 to the B sampler (A6), as shown in Figure 2-66.

Figure 2-66 Connection for Substituting the R sampler (A4)



4. Connect the equipment as shown in Figure 2-67.

Figure 2-67 Setup for Checking the R sampler (A4).



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

   300 kHz to 3 GHz: < –27 dBm
   3 GHz to 6 GHz: < –22 dBm

6. If the analyzer fails the test, replace the A11 assembly.

7. Verify that the high/low band adjustments are still within specifications. For more information on how to perform this task, refer to “High/Low Band Transition Adjustment” on page 3-47.
8. Refer to Chapter 7 , “Source Troubleshooting,” for more troubleshooting information.

7. Transmission Test Port Input Noise Floor Level

The analyzer's noise floor is measured at minimum power with loads connected to the test ports.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	IF Bandwidth	Average Noise Floor Level
300 kHz–3 GHz	3 kHz	–90 dBm
300 kHz–3 GHz	10 Hz	–110 dBm
3 GHz–6 GHz[a]	3 kHz	–85 dBm
3 GHz–6 GHz[a]	10 Hz	–105 dBm

a. Only for analyzers with Option 006.

Required Equipment

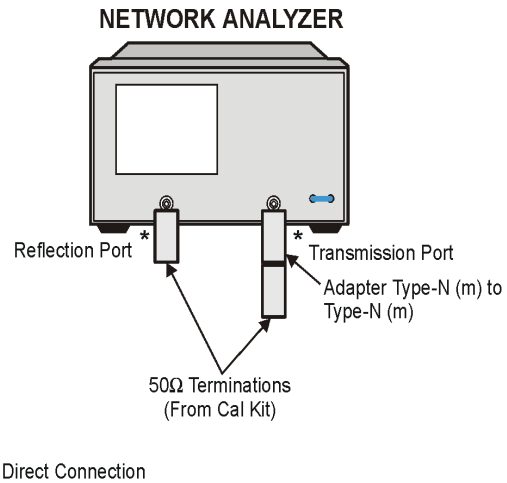
Description	HP/Agilent Part or Model Number
Calibration kit: Type-N	85032B
Adapter: Type-N (m) to Type-N (m)	1250-1475

Procedure

Transmission Test Port Input Noise Floor Level from 300 kHz to 3 GHz (IF BW = 3 kHz)

1. Connect the equipment as shown in Figure 2-68.

Figure 2-68 Transmission Test Port Input Noise Floor Level Test Setup



2. Press (Preset) (Avg) **IF BW** (3000) (x1).
3. If your analyzer *does not* have Option 004:
   press (Power) (–20) (x1) (Start) (300) (k/m) (Stop) (3) (G/n).

   If your analyzer *has* Option 004:
   press (Power) (–85) (x1) (Start) (300) (k/m) (Stop) (3) (G/n).
4. Press (Meas) **INPUT PORTS** **B** (Format) **LIN MAG** (Scale Ref) **AUTO SCALE**.
5. Press (Marker Fctn) **MARKER MODE MENU** **MKR STATS ON** (Sweep Setup) **TRIGGER MENU** **SINGLE**.
6. When the analyzer finishes the sweep, read the mean value (which appears on the right side of the analyzer display).
7. Convert the measured linear magnitude mean value to log magnitude, using this equation.

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

NOTE Notice that the mean value that is displayed on the analyzer is in µUnits. So, for example, if the displayed value is 62 µU, the value that you would put in the equation is (62×10^{-6}).

---

8. Write this calculated value on the performance test record.

Transmission Test Port Input Noise Floor Level from 300 kHz to 3 GHz (IF BW = 10 Hz)

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

    Power(dBm)= 20 × [$\log_{10}$(linear magnitude mean value)]
13. Write this calculated value on the performance test record.

Transmission Test Port Input Noise Floor Level from 3 GHz to 6 GHz (IF BW = 10 Hz) Option 006 Only

14. Press (Start) (3) (G/n) (Stop) (6) (G/n).
15. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
16. When the analyzer finishes the sweep, read the mean value.

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

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

18. Write this calculated value on the performance test record.

Transmission Test Port Input Noise Floor Level from 3 GHz to 6 GHz (IF BW = 3 kHz) Option 006 Only

19. Press (Avg) **IF BW** (3) (k/m).

20. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.

21. When the analyzer finishes the sweep, read the mean value.

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

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

23. Write this calculated value on the performance test record.

In Case of Difficulty

1. Perform "ADC Offset Correction Constants (Test 52)" on page 3-15.
2. Repeat this performance test.
3. Refer to Chapter 8 , "Receiver Troubleshooting," for more troubleshooting information.

8. Transmission Test Port Input Frequency Response

Perform this test to examine the frequency response of the transmission test port. Power meter calibration is used to control the input to the analyzer's receiver across its frequency range. The network analyzer's input receiver frequency response is measured against this calibrated input.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Input Frequency Response[a]
300 kHz to 3 GHz	± 1 dB
3 GHz to 6 GHz[b]	± 2 dB

a. At –10 dBm.
b. Only for analyzers with Option 006.

Required Equipment

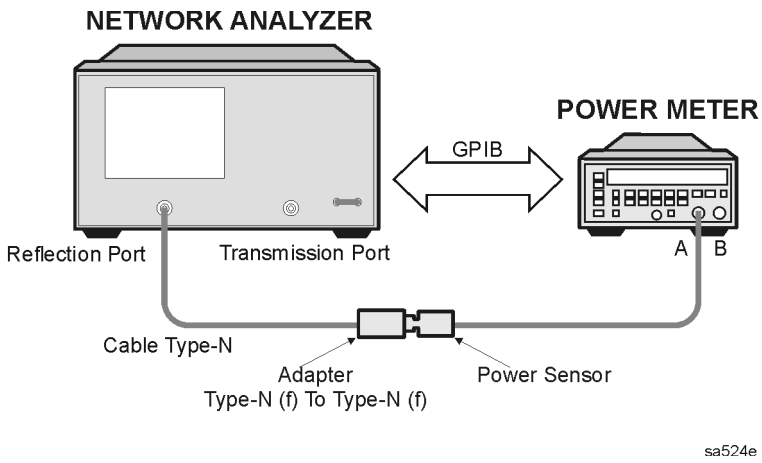
Description	HP/Agilent Part or Model Number
Power Meter	436A/437B/438A or E4418B/4419B
Power Sensor	8482A
Cable: Type-N (m) to Type-N (m), 24-inch	8120-4781
Adapter: Type-N (f) to Type-N (f)	1250-0777
Cable: GPIB	10833A
Additional Equipment for Option 006 Analyzers	
Power Sensor	8481A

Procedure

Power Meter Calibration on the Reflection Test Port from 300 kHz to 3 GHz

1. Zero and calibrate the power meter using the 8482A power sensor.
2. Connect the equipment as shown in Figure 2-69.

Figure 2-69 Power Meter Calibration Setup



3. Press (Preset) (Avg) **IF BW** (3) (k/m) (Start) (300) (k/m).
4. If your analyzer has Option 006, press (Stop) (3) (G/n).
5. Press (Local) **SYSTEM CONTROLLER**.
6. Press **SET ADDRESSES** and **POWER MTR** until the analyzer shows the correct power meter model. (Use the 438A/437 selection if the power meter is an E4419B or E4418B.)
7. Press **ADDRESS: P MTR/GPIB**. The default power meter GPIB address is 13. Make sure it is the same as your power meter GPIB address. Otherwise, use the analyzer front panel keypad to enter the correct GPIB address for your power meter.
8. Press (Sweep Setup) **NUMBER of POINTS** (51) (x1).
9. For analyzers with Option 004, press **POWER** **PWR RANGE MAN** to turn the auto power range off.

NOTE The analyzer displays the `PRm` annotation, indicating that the analyzer power range is set to MANUAL.

---

10. Press (Cal) **PWRMTR CAL** (–10) (x1).
11. Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR A**. Refer to the back of the power sensor to locate the different calibration factor values along with their corresponding frequencies.

NOTE The analyzer's calibration factor sensor table can hold a *maximum* of 55 calibration factor data points.

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

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

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

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

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

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

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

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

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

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

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

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

12. Press the appropriate softkeys to create a power sensor calibration factors table.

13. Press **DONE** to exit the sensor calibration factor entries menu.

14. Press **RETURN** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.

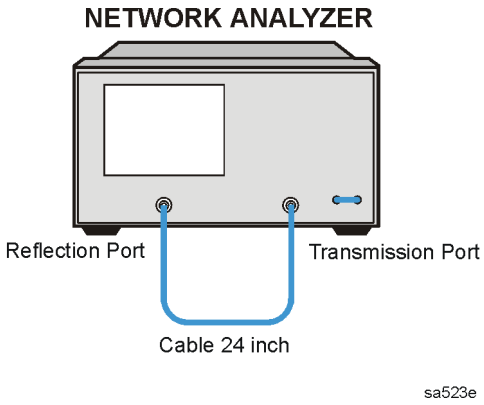
    Wait until the analyzer finishes the sweep, then continue with this procedure.

NOTE The analyzer displays the PC annotation, indicating the power meter calibration is active.

Transmission Test Port Input Frequency Response from 300 kHz to 3 GHz

15.Connect the equipment as shown in Figure 2-70.

Figure 2-70 Transmission Test Port Input Frequency Response



16.Press (Meas) **INPUT PORTS** **B** .

17.Press (Sweep Setup) **TRIGGER MENU** **SINGLE** .

18.Press (Marker) **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** (300) (k/m) **FIXED MKR VALUE** (–10) (x1) **RETURN** **Δ REF = Δ FIXED MKR** .

19.Press (Marker) **MARKER 1** (Marker Search) **SEARCH: MAX** (Marker) **MARKER 2** (Marker Search) **SEARCH:MIN** .

20.Write the marker 1 or marker 2 value—whichever has the larger absolute magnitude—in the performance test record.

21.If your analyzer does *not* have Option 006, this completes the test.
If your analyzer *does* have Option 006, continue with the following steps.

Power Meter Calibration for the Reflection Test Port for 3 GHz to 6 GHz (Analyzers with Option 006)

22.Set up the analyzer as shown in Figure 2-69, using the 8481A power sensor. Cycle the line power on the power meter. Zero and calibrate the power meter for this sensor.

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

24.Press (Cal) **PWRMTR CAL** (–10) (x1).

25.Press **LOSS/SENSR LISTS** **CAL FACTOR SENSOR B** . Press the appropriate softkeys to build a calibration factor sensor table for the 8481A power sensor.

26.Press **DONE** to exit the sensor calibration factor entries menu.

27.To select the 8481A power sensor, press **USE SENSOR B** . Press (Sweep Setup) **TRIGGER MENU** **CONTINUOUS** .

28. Press Cal **PWRMTR CAL** **ONE SWEEP** **TAKE CAL SWEEP** to start the power meter calibration.

Transmission Test Port Input Frequency Response from 3 GHz to 6 GHz (Analyzers with Option 006)

29. When the analyzer displays the message `POWER METER CALIBRATION SWEEP DONE`, connect the equipment as shown as in Figure 2-70.

30. Press Sweep Setup **TRIGGER MENU** **SINGLE** .

31. Press Marker **Δ MODE MENU** **FIXED MKR POSITION** **FIXED MKR STIMULUS** 3 G/n **RETURN** .

32. Press Marker **MARKER 1** Marker Search **SEARCH: MAX** Marker **MARKER 2** Marker Search **SEARCH:MIN** .

33. Write the marker 1 or marker 2 reading—whichever has the largest magnitude—in the performance test record.

In Case of Difficulty

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

9. Test Port Crosstalk

Perform this test to determine the maximum level of signal leakage between the analyzer's test ports. Crosstalk is measured with shorts attached to the test ports after a normalization measurement with a through cable.

Analyzer warm-up time: **30 minutes**

Specifications

Frequency Range	Test Port Crosstalk[a]
300 kHz to 3.0 GHz	–100 dBm
3 GHz to 6.0 GHz[b]	–90 dBm

a. Measurement conditions: normalized to a through; measured with two shorts; 10 Hz IF BW, averaging factor of 8 in alternate mode; source power set to the lesser of the maximum power out or the maximum receiver power.
b. Applies to analyzers with Option 006.

Required Equipment

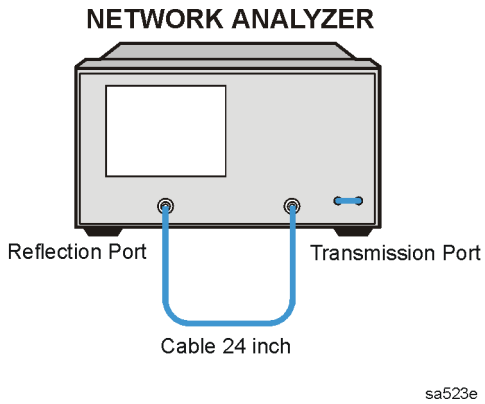
Description	HP/Agilent Part or Model Number
Adapter: 50Ω, Type-N(m) to Type-N(m)	1250-1475
Cable: Type-N, 24-inch	8120-4781
Calibration Kit	85032B

Procedure

Normalization from 300 kHz to 3 GHz

1. Connect the equipment as shown in Figure 2-71.

Figure 2-71 8753ET Crosstalk Normalization Measurement

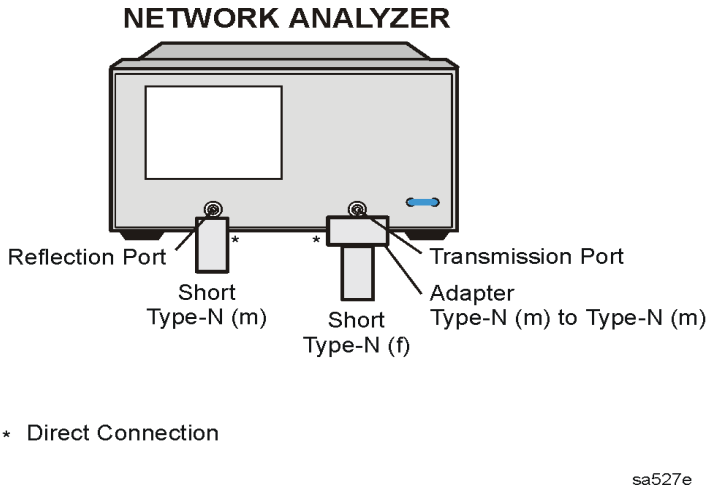


1. Press [Preset] [Power] [0] [x1] [Start] [300] [k/m].
2. If your analyzer has Option 006, press [Stop] [3] [G/n].
3. Press [Avg] **IF BW** [10] [x1].
4. Press [Cal] **MORE** **ALTERNATE RFL/TRN**.
5. Press [Meas] **TRANSMISSN** [Sweep Setup] **TRIGGER MENU** **SINGLE**.
6. When the sweep is completed, press [Display] **DATA → MEMORY** **DATA/MEM**.

Crosstalk from 300 kHz to 3 GHz

7. Connect the equipment as shown in Figure 2-72. Connect the shorts to both test ports.

Figure 2-72 8753ET Crosstalk Measurement



8. Press [Scale Ref] **REFERENCE VALUE** [–100] [x1].
9. Press [Avg] **AVERAGING FACTOR** [8] [x1] **AVERAGING: ON** [Sweep Setup] **TRIGGER MENU** **NUMBER of GROUPS** [8] [x1].
10. Wait for the sweeps to finish as indicated by the `Hld` notation on the left side of the display.
11. Press [Marker Search] **SEARCH: MAX**.
12. Write the marker value (which appears on the analyzer display) in the performance test record.
13. If your analyzer does *not* have Option 006, this completes the test. If you have any problems, go to "In Case of Difficulty" on page 2-129.
    If your analyzer has Option 006, continue with "Normalization from 3 GHz to 6 GHz," next.

Normalization from 3 GHz to 6 GHz

14. Set up the equipment again as shown in Figure 2-71.

15. Press Start 3 G/n Stop 6 G/n Avg **AVERAGING: OFF**.

16. Press Sweep Setup **TRIGGER MENU** **SINGLE**. When the sweep has completed, press Display **DATA → MEMORY** **DATA/MEM**.

Crosstalk from 3 GHz to 6 GHz

17. Connect the equipment as shown in Figure 2-72.

18. Press Avg **AVERAGING: ON** Sweep Setup **TRIGGER MENU** **NUMBER of GROUPS** 8 x1. Wait for the sweeps to finish.

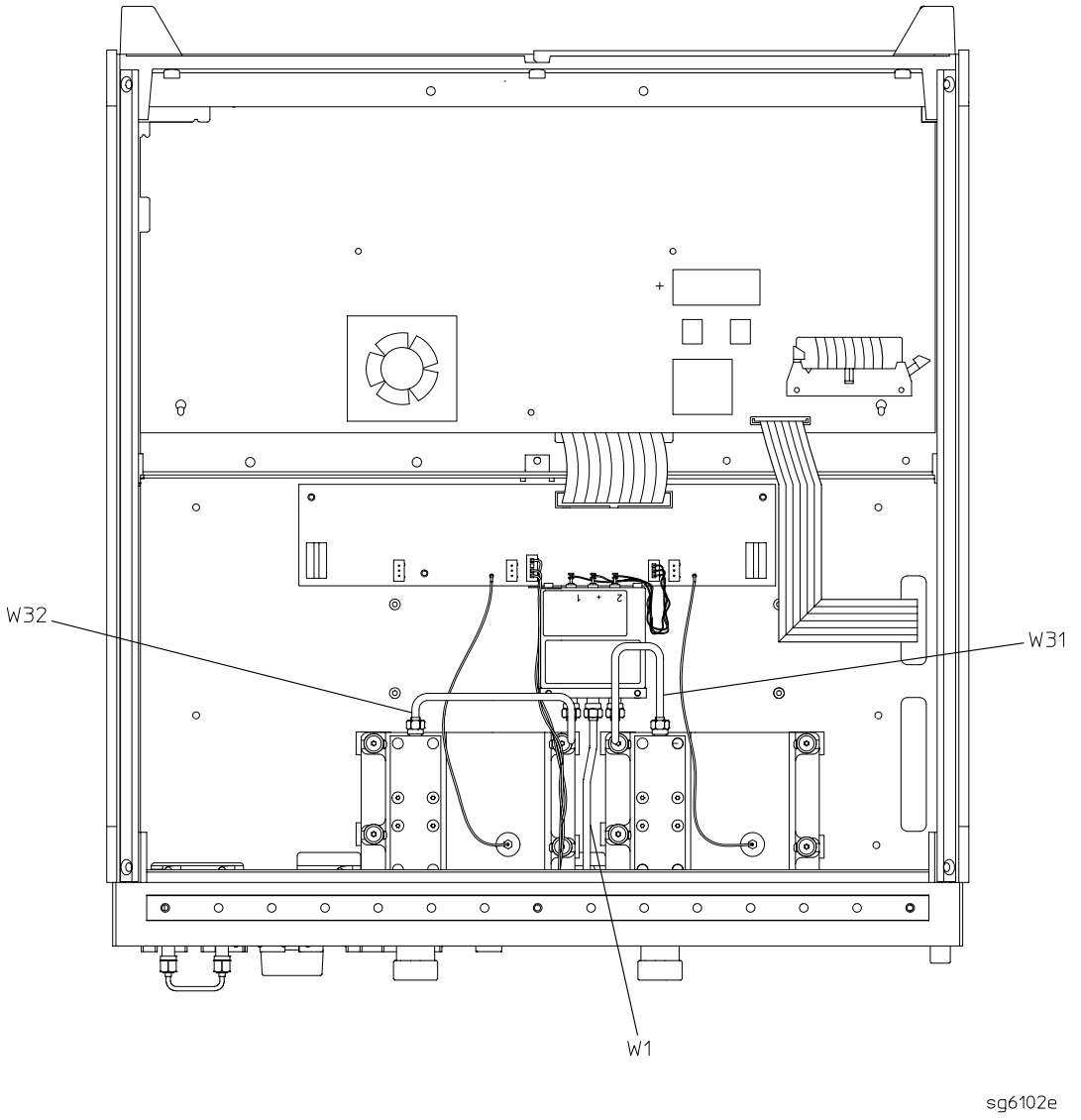
19. Press Marker Search **SEARCH: MAX**.

20. Write the marker value (which appears on the analyzer display) in the performance test record.

In Case of Difficulty

1. Remove the instrument top cover. Using an 8 lb-inch torque wrench, verify that all semirigid cables connected to the sampler/mixer assemblies are tight. In addition, tighten any loose screws on the sampler/mixer assemblies (A4/A5/A6) and the pulse generator assembly (A7).
2. Remove the instrument bottom cover. Refer to Figure 2-73. Verify that cables W1, W31, and W32 are tight.
3. Repeat this test.

Figure 2-73 8753ET Bottom View



10. Uncorrected Port Performance

The analyzer can perform error-correction and store the error coefficients. These error coefficients are, in fact, measurements of the analyzer's uncorrected port performance.

NOTE The crosstalk error terms are omitted in this procedure. They are covered in the "Test Port Crosstalk" performance test.

Analyzer warm-up time: **30 minutes**

Specifications

Uncorrected [a] Error Terms	**Frequency Range**		
	300 kHz to 1.3 GHz	**1.3 GHz to 3 GHz**	**3 GHz to 6 GHz[b]**
Directivity	30 dB	24 dB	19 dB
Source Match (Standard)	25 dB	20 dB	14 dB
Source Match (Option 004)	23 dB	18 dB	14 dB
Load Match (raw)	24 dB	19 dB	16 dB
Reflection Tracking	±1.0 dB	±1.0 dB	±2.0 dB
Transmission Tracking	±1.5 dB	±1.5 dB	±2.5 dB

a. At 25 °C ±5 °C, with less than 1°C deviation from the measurement calibration temperature.
b. Only for analyzers with Option 006.

Required Equipment

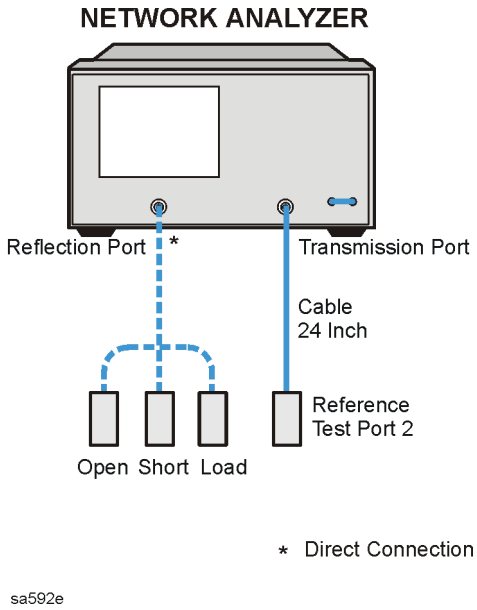
Description	**HP/Agilent Part or Model Number**
Calibration Kit: 50Ω, Type-N	85032B
Cable: Type-N, 24-inch	8120-4781

Procedure

First Enhanced Response Calibration

1. Refer to Figure 2-74 when performing steps 2 through 10.

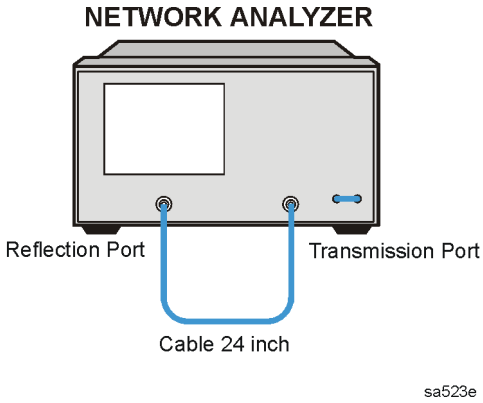
Figure 2-74 First Enhanced Response Calibration



2. Press (Preset) (Avg) **IF BW** (3) (k/m) (Start) (300) (k/m).
3. Press (Cal) **CAL KIT** **SELECT CAL KIT** **N 50Ω 85032** **RETURN** **RETURN** **CALIBRATE MENU** **ENHANCED RESPONSE** **TRAN/REFL ENH. RESP.**.
4. Press **ISOLATION** **OMIT ISOLATION**.
5. Connect the OPEN (supplied in the calibration kit) to the analyzer's reflection test port.
6. Press **REFLECTION** **FORWARD:OPENS** **OPEN(F)** **DONE: OPENS**.
7. Connect the SHORT to the reflection test port.
8. Press **FORWARD:SHORTS** **SHORT(F)** **DONE: SHORTS**.
9. Connect the 50 ohm termination (supplied in the calibration kit) to the reflection test port.
10. Press **FORWARD:LOAD** **STANDARDS DONE**.

11.Connect the equipment as shown in Figure 2-75.

Figure 2-75 Transmission Calibration Test Setup



12.Press **TRANSMISSION** **DO BOTH FWD THRUS**.

13.Press **STANDARDS DONE** **DONE FWD ENH RESP**.

Directivity (Forward) Calibration Coefficient

14.Press System **SERVICE MENU** **TESTS** 32 x1 **EXECUTE TEST**.

15.When the analyzer finishes the test, press Marker.

16.Using the front panel knob, locate the maximum value of the data trace for the 300 kHz to 1.3 GHz frequency range.

17.Write the maximum value in the performance test record.

18.Repeat the previous two steps for the other frequency ranges listed on the performance test record.

Source Match (Forward) Calibration Coefficient

19.Press System **SERVICE MENU** **TESTS** 33 x1 **EXECUTE TEST**.

20.When the analyzer finishes the test, repeat steps 15 through 18. *Enter the results only in that part of the performance test record that applies to your analyzer* (Standard or Option 004).

Reflection Tracking (Forward) Calibration Coefficient

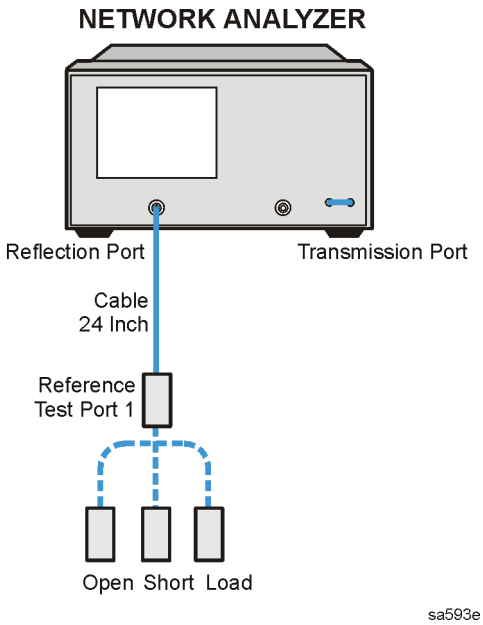
21.Press System **SERVICE MENU** **TESTS** 34 x1 **EXECUTE TEST**.

22.When the analyzer finishes the test, repeat steps 15 through 18.

Second Enhanced Response Calibration

23.Connect the equipment as shown in Figure 2-76.

Figure 2-76 Second Enhanced Response Calibration



24.Press Preset Start 300 k/m.

25.Press Cal **CAL KIT** **SELECT CAL KIT** **N 50Ω 85032** **RETURN** **RETURN** **CALIBRATE MENU** **ENHANCED RESPONSE** **TRAN/REFL ENH. RESP.**.

26.Press **ISOLATION** **OMIT ISOLATION** .

27.Connect the OPEN (supplied in the calibration kit) to reference test port 1. Use the pin extension provided in the calibration kit.

28.Press **REFLECTION** **FORWARD:OPENS** **OPEN(M)** **DONE: OPENS** .

29.Connect the SHORT to reference test port 1.

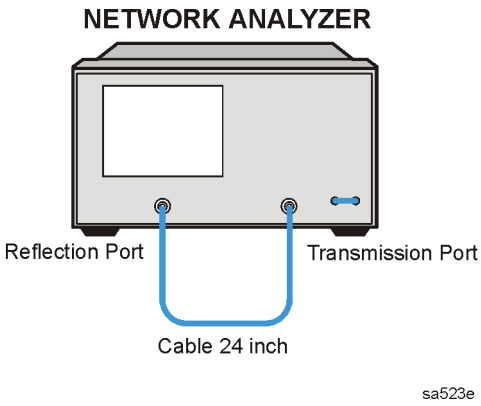
30.Press **FORWARD:SHORTS** **SHORT(M)** **DONE: SHORTS** .

31.Connect the 50 ohm termination (supplied in the calibration kit) to reference test port 1.

32.Press **FORWARD:LOAD** **STANDARDS DONE** .

33.Connect the equipment as shown in Figure 2-77.

Figure 2-77 Transmission Calibration Test Setup



34.Press **TRANSMISSION** **DO BOTH FWD THRUS** **STANDARDS DONE** **DONE FWD ENH RESP** .

Load Match (Forward) Calibration Coefficient

35.Press System **SERVICE MENU** **TESTS** 36 x1 **EXECUTE TEST** .

36.When the test is done, press Marker **MARKER 1** .

37.Using the front panel knob, locate the maximum value of the data trace for the 300 kHz to 1.3 GHz frequency range.

38.Write the maximum value on the performance test record.

39.Repeat the previous two steps for the other frequency ranges listed on the performance test record.

Transmission Tracking (Forward) Calibration Coefficient

40.Press System **SERVICE MENU** **TESTS** 37 x1 **EXECUTE TEST** .

41.When the analyzer finishes the test, repeat steps 37 through 39.

In Case of Difficulty

1. Check the condition of the connectors and cables.

11. System Trace Noise

Perform this test to determine the system trace noise at designated CW frequencies in both transmission and reflection modes. Ratio measurements are made at 3 GHz and 6 GHz to determine the variability of the analyzer's measurement data. IF bandwidths of 3 kHz and 10 Hz are used for the test.

NOTE Trace noise is defined for a ratio measurement. For the transmission measurement (B/R), the connection is a 0 dB-loss thru with 0 dBm into the receiver. For a reflection measurement (A/R), an open is used on the reflection port with +5 dBm reflected power.

Analyzer warm-up time: **30 minutes.**

Specifications

Frequency Range	System Trace Noise (Magnitude)	System Trace Noise (Phase)
IF Bandwidth = 3 kHz		
300 kHz to 3.0 GHz	< 0.006 dB rms	< 0.038 °rms
3 GHz to 6.0 GHz	< 0.010 dB rms	< 0.070 °rms
IF Bandwidth = 10 Hz		
300 kHz to 3.0 GHz	< 0.001 dB rms	< 0.006 °rms
3 GHz to 6.0 GHz	< 0.002 dB rms	< 0.012 °rms

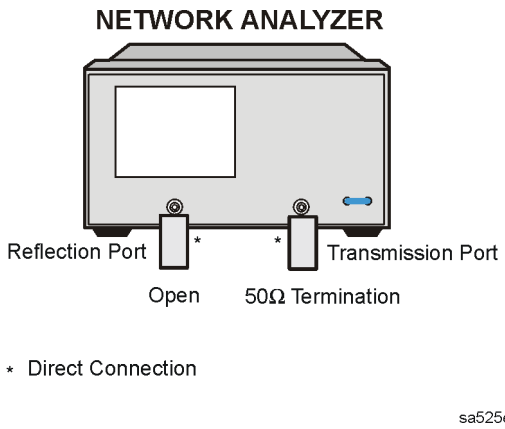
Required Equipment

Description	HP/Agilent Part or Model Number
Calibration Kit: 50 Ω, Type-N	85032B
Cable: 50 Ω, Type-N, 24-inch	8120-4781

Procedure

1. Connect the equipment as shown in Figure 2-78.

Figure 2-78 Reflection Trace Noise Test Setup



Reflection Trace Noise Magnitude, IF BW = 3 kHz

2. Press (Preset) (Power) (5) (x1) (Avg) **IF BW** (3) (k/m) (Sweep Setup) **NUMBER of POINTS** (201) (x1) **CW FREQ** (3) (G/n).
3. Press (Marker Fctn) **MARKER MODE MENU** **MKR STATS ON**.
4. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
5. When the measurement is done (indicated by the `Hld` notation on the left side of the display), record the standard deviation (shown on the right side of the display) in the performance test record.

Reflection Trace Noise Phase, IF BW = 3 kHz

6. Press (Format) **PHASE**.
7. Record the standard deviation in the performance test record.

Reflection Trace Noise Phase, IF BW = 10 Hz

8. Press (Avg) **IF BW** (10) (x1).
9. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
10. When the measurement is done, record the standard deviation in the performance test record.

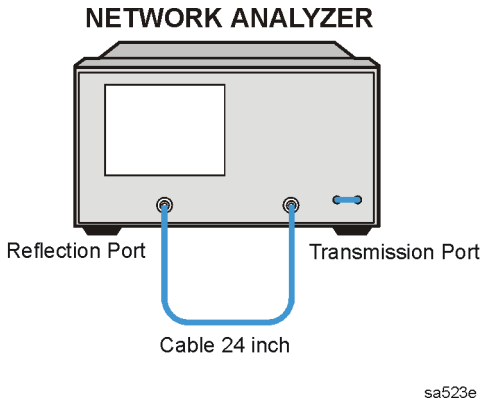
Reflection Trace Noise Magnitude, IF BW = 10 Hz

11. Press (Format) **LOG MAG**.
12. Record the standard deviation in the performance test record.

Transmission Trace Noise Magnitude, IF BW = 10 Hz

13.Connect the equipment as shown in Figure 2-79.

Figure 2-79 Transmission Test Port Trace Noise



14.Press Power 0 x1.

15.Press Meas **TRANSMISSN** .

16.Press Sweep Setup **TRIGGER MENU** **SINGLE** .

17.When the measurement is done, record the standard deviation in the performance test record.

Transmission Trace Noise Phase, IF BW = 10 Hz

18.Press Format **PHASE** .

19.Record the standard deviation in the performance test record.

Transmission Trace Noise Phase, IF BW = 3 kHz

20.Press Avg **IF BW** 3 k/m.

21.Press Sweep Setup **TRIGGER MENU** **SINGLE** .

22.When the measurement is done, record the standard deviation in the performance test record.

Transmission Trace Noise Magnitude, IF BW = 3 kHz

23.Press Format **LOG MAG** .

24.Record the standard deviation in the performance test record.

25.If you *do not* have Option 006, this completes the test.
If you *have* Option 006, go to "Reflection and Transmission Trace Noise (Option 006 Only)," next.

Reflection and Transmission Trace Noise (Option 006 Only)

26. Connect the equipment as shown in Figure 2-78.

27. Press Meas **REFLECTION** Power 5 x1 Avg **IF BW** 3 k/m Sweep Setup **CW FREQ** 6 G/n.

28. Go back to step 4 on page 2-137 and repeat the rest of the procedure from this step.

In Case of Difficulty

1. Perform "ADC Offset Correction Constants (Test 52)" on page 3-15.
2. Suspect the A10 digital IF assembly if *both* receiver channels fail.
3. Refer to Chapter 8 , "Receiver Troubleshooting," for troubleshooting information.

This page intentionally left blank.

Agilent 8753ES Performance Test Records

The performance test records in this chapter include entries up to 6 GHz for analyzers that have Option 006 (6 GHz operation). If your analyzer does not have Option 006, write “N/A” for entries above 3 GHz.

Calibration Lab Address:		**Report Number**	
		Date	
		Last Calibration Date	
		Customer’s Name	
		Performed by	
Model 8753ES Serial No.		 Options	
Firmware Revision			
Ambient Temperature	°C	Relative Humidity	%
Test Equipment Used Description	Model Number	Trace Number	Cal Due Date
Frequency Counter			
Power Meter			
Power Sensor			
Calibration Kit			
Verification Kit			
Step Attenuator			
Notes/Comments			

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number**
Option(s)	**Date**

1. Test Port Output Frequency Range and Accuracy

Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.

CW Frequency (MHz)	Min. (MHz)	Results Measured (MHz)	Max. (MHz)	Measurement Uncertainty (MHz)
0.03	0.029 999 7		0.030 000 3	± 0.000 000 050
0.3	0.299 997		0.300 003	± 0.000 000 520
5.0	4.999 950		5.000 050	± 0.000 007
16.0	15.999 840		16.000 160	± 0.000 028
31.0	30.999 690		31.000 310	± 0.000 054
60.999 999	60.999 389		61.000 609	± 0.000 105
121.0	120.998 790		121.001 210	± 0.000 207
180.0	179.998 200		180.001 800	± 0.000 307
310.0	309.996 900		310.003 100	± 0.000 528
700.0	699.993 000		700.007 000	± 0.001 192
1 300.0	1 299.987		1 300.013	± 0.002 212
2 000.0	1 999.980		2 000.020	± 0.003 403 000
3 000.0	2 999.970		3 000.030	± 0.005 104
4 000.0	3 999.960		4 000.040	± 0.006 805
5 000.0	4 999.950		5 000.050	± 0.008 506
6 000.0	5 999.940		6 000.060	± 0.010 207

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number**
Option(s)	**Date**

2. External Source Mode Frequency Range

Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.

Test Frequencies (GHz)	Results
0.010	
0.020	
0.100	
1.000	
2.000	
3.000	
4.000	
5.000	
6.000	

Agilent Technologies Company **Model 8753ES** **Serial Number**			**Report Number**	
Option(s)			**Date**	
3. Test Port Output Power Level Accuracy				
Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.				
Test Frequency	Test Port Output Power (dBm)	Specification (dB)	Measured Value (dBm)	Measurement uncertainty (dB)
300 kHz	0	±1		±0.47
20 MHz	0	±1		±0.14
50 MHz	0	±1		±0.14
100 MHz	0	±1		±0.14
200 MHz	0	±1		±0.14
500 MHz	0	±1		±0.14
1 GHz	0	±1		±0.13
2 GHz	0	±1		±0.13
3 GHz	0	±1		±0.27
4 GHz	0	±1		±0.17
5 GHz	0	±1		±0.17
6 GHz	0	±1		±0.17

Agilent Technologies Company **Model 8753ES** **Serial Number**		**Report Number**		
Option(s)		**Date**		
4. Test Port Output Power Linearity				
Frequency Range: 300 kHz to 3 GHz				
Power Setting dBm	Marker 1 Maximum (dB)	Marker 2 Minimum (dB)	Specification (dB)	Meas. Uncert. (dB)
–15			± 0.2	± 0.04
–13			± 0.2	± 0.03
–11			± 0.2	± 0.03
–9			± 0.2	± 0.03
–7			± 0.2	± 0.03
–5			± 0.2	± 0.03
–3			± 0.2	± 0.02
–1			± 0.2	± 0.02
+1			± 0.2	± 0.02
+3			± 0.2	± 0.02
+5			± 0.2	± 0.03
+7			± 0.5	± 0.03
+8			± 0.5	± 0.03
+9			± 0.5	± 0.03
+10			± 0.5	± 0.03

4. Test Port Output Power Linearity (continued)				
Frequency Range: 3 GHz to 6 GHz				
Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.				
Power Setting dBm	Marker 1 Maximum (dB)	Marker 2 Minimum (dB)	Specification (dB)	Meas. Uncert. (dB)
–15			± 0.2	± 0.04
–13			± 0.2	± 0.03
–11			± 0.2	± 0.03
–9			± 0.2	± 0.03
–7			± 0.2	± 0.03
–5			± 0.2	± 0.03
–3			± 0.2	± 0.02
–1			± 0.2	± 0.02
+1			± 0.2	± 0.02
+3			± 0.2	± 0.02
+5			± 0.2	± 0.03
+7			± 0.5	± 0.03
+8			± 0.5	± 0.03
+9			± 0.5	± 0.03
+10			± 0.5	± 0.03

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number**
Option(s)	**Date**

5. Minimum R Channel Level

Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.

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

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number**
Option(s)	**Date**

6. Test Port Input Noise Floor Level

Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.

Frequency Range	Test Port	IF Bandwidth	Specification (dBm)[a]	Calculated Value	Meas. Uncert. (dB)
300 kHz–3 GHz	Port 1	3 kHz	≤ –82 (–80)		±2.0
300 kHz–3 GHz	Port 1	10 Hz	≤ –102 (–100)		±2.0
300 kHz–3 GHz	Port 2	10 Hz	≤ –102 (–100)		±2.0
300 kHz–3 GHz	Port 2	3 kHz	≤ –82 (–80)		±2.0
3 GHz–6 GHz	Port 2	3 kHz	≤ –77		±2.0
3 GHz–6 GHz	Port 2	10 Hz	≤ –97		±2.0
3 GHz–6 GHz	Port 1	10 Hz	≤ –97		±2.0
3 GHz–6 GHz	Port 1	3 kHz	≤ –77		±2.0

a. Specifications in parentheses are valid for analyzers with Option 075.

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number**
Option(s)	**Date**

7. Test Port Input Frequency Response

Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.

Frequency Range	Test Port	Specification (dB)	Measured Value (dB)	Meas. Uncert. (dB)
300 kHz–3 GHz	Port 2	± 1		0.47
300 kHz–3 GHz	Port 1	± 1		0.47
3 GHz–6 GHz	Port 1	± 2		0.17
3 GHz–6 GHz	Port 2	± 2		0.17

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number**		
Option(s)	**Date**		
8. Test Port Crosstalk			
Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.			
Test Settings	Specification (dB)	Measured Value (dB)	Measurement Uncertainty (dB)
Crosstalk to Test Port 2 300 kHz–3 GHz	< –100		±1.0
Crosstalk to Test Port 1 300 kHz–3 GHz	< –100		±1.0
Crosstalk to Test Port 1 3 GHz–6 GHz	< –90		±2.0
Crosstalk to Test Port 2 3 GHz–6 GHz	< –90		±2.0

Agilent Technologies Company **Model 8753ES** **Serial Number**			**Report Number** **Date**	
9. Uncorrected Port Performance				
Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.				
Test Description	Frequency Range	Spec. (dB)	Measured Value (dB)	Meas. Uncert. (dB)
Forward Directivity				
Directivity	300 kHz–1.3 GHz	≤ –35		±0.9
Directivity	1.3 GHz–3 GHz	≤ –30		±0.8
Directivity	3 GHz–6 GHz	≤ –25		±0.8
Forward Source Match				
Source Match	300 kHz–1.3 GHz	≤ –16		±0.2
Source Match	1.3 GHz–3 GHz	≤ –16		±0.2
Source Match	3 GHz–6 GHz	≤ –14		±0.3
Reverse Trans. Tracking				
Trans. Tracking	300 kHz–1.3 GHz	±1.0		±0.006
Trans. Tracking	1.3 GHz–3 GHz	±1.0		±0.009
Trans. Tracking	3 GHz–6 GHz	±1.5		±0.021
Forward Refl. Tracking				
Refl. Tracking	300 kHz–1.3 GHz	±1.0		±0.001
Refl. Tracking	1.3 GHz–3 GHz	±1.0		±0.005
Refl. Tracking	3 GHz–6 GHz	±1.5		±0.020
Reverse Load Match				
Load Match	300 kHz–1.3 GHz	≤ –18		±0.1
Load Match	1.3 GHz–3 GHz	≤ –16		±0.2
Load Match	3 GHz–6 GHz	≤ –14		±0.2
Forward Load Match				
Load Match	300 kHz–1.3 GHz	≤ –18		±0.1
Load Match	1.3 GHz–3 GHz	≤ –16		±0.2
Load Match	3 GHz–6 GHz	≤ –14		±0.2

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number** **Date**

9. Uncorrected Port Performance (continued)

Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.

Test Description	Frequency Range	Spec. (dB)	Measured Value (dB)	Meas. Uncert. (dB)
Reverse Direction				
Directivity	300 kHz–1.3 GHz	≤ –35		±0.9
Directivity	1.3 GHz–3 GHz	≤ –30		±0.8
Directivity	3 GHz–6 GHz	≤ –25		±0.8
Reverse Direction				
Source Match	300 kHz–1.3 GHz	≤ –16		±0.2
Source Match	1.3 GHz–3 GHz	≤ –16		±0.2
Source Match	3 GHz–6 GHz	≤ –14		±0.3
Reverse Direction				
Refl. Tracking	300 kHz–1.3 GHz	±1.0		±0.001
Refl. Tracking	1.3 GHz–3 GHz	±1.0		±0.005
Refl. Tracking	3 GHz–6 GHz	±1.5		±0.020
Forward Direction				
Trans. Tracking	300 kHz–1.3 GHz	±1.0		±0.006
Trans. Tracking	1.3 GHz–3 GHz	±1.0		±0.009
Trans. Tracking	3 GHz–6 GHz	±1.5		±0.021

Agilent Technologies Company **Model 8753ES** **Serial Number**			**Report Number**	
10. System Trace Noise				
Ratio	IF BW	Phase/Magnitude	Measured Value	Specification
Test Frequency: 3 GHz				
A/R	10 Hz	Magnitude		< 0.001 dB rms
A/R	10 Hz	Phase		< 0.006 °rms
A/R	3 kHz	Phase		< 0.038 °rms
A/R	3 kHz	Magnitude		< 0.006 dB rms
B/R	3 kHz	Magnitude		< 0.006 dB rms
B/R	3 kHz	Phase		< 0.038 °rms
B/R	10 Hz	Phase		< 0.006 °rms
B/R	10 Hz	Magnitude		< 0.001 dB rms
Test Frequency: 6 GHz				
Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.				
A/R	10 Hz	Magnitude		< 0.002 dB rms
A/R	10 kHz	Phase		< 0.012 °rms
A/R	3 kHz	Phase		<0.070 °rms
A/R	3 Hz	Magnitude		< 0.010 dB rms
B/R	3 kHz	Magnitude		< 0.010 dB rms
B/R	3 kHz	Phase		< 0.070 °rms
B/R	10 Hz	Phase		< 0.012 °rms
B/R	10 Hz	Magnitude		< 0.002 dB rms

Agilent Technologies Company **Model 8753ES** **Serial Number**					**Report Number**			
Option(s)					**Date**			
11. Test Port Receiver Magnitude Dynamic Accuracy (Test Port 2)								
				G	**F**	**|G – F|**		
Test Port Input Power (dBm)	8496A Attn. (dB)	Real Part	Imag. Part	Test Port Measurement (dB)	Expected Measurement (Corrected) (dB)	Dynamic Accuracy (Calculated)	Spec. (dB)	Meas. Uncer. (dB)
–10	0						≤ 0.033	± 0.008
–20 (ref)	10				0.000		≤ 0.021	± 0.008
–30	20						≤ 0.031	± 0.008
–40	30						≤ 0.041	± 0.008
–50	40						≤ 0.054	± 0.008
–60	50						≤ 0.069	± 0.017
–70	60						≤ 0.111	± 0.017
–80	70						≤ 0.257	± 0.017
–90	80						≤ 0.741	± 0.017
–100	90						≤ 2.121	± 0.027

Agilent Technologies Company **Model 8753ES** **Serial Number**					**Report Number**			
Option(s)					**Date**			
11. Test Port Receiver Magnitude Dynamic Accuracy (Test Port 1)								
				G	**F**	**|G – F|**		
Test Port Input Power (dBm)	8496A Attn. (dB)	Real Part	Imaginary Part	Test Port Measurement (dB)	Expected Measurement (Corrected) (dB)	Dynamic Accuracy (Calculated)	Spec. (dB)	Meas. Uncer. (dB)
–10	0						≤ 0.033	± 0.008
–20 (ref)	10				0.000		≤ 0.021	± 0.008
–30	20						≤ 0.031	± 0.008
–40	30						≤ 0.041	± 0.008
–50	40						≤ 0.054	± 0.008
–60	50						≤ 0.069	± 0.017
–70	60						≤ 0.111	± 0.017
–80	70						≤ 0.257	± 0.017
–90	80						≤ 0.741	± 0.017
–100	90						≤ 2.121	± 0.027

Agilent Technologies Company
Model 8753ES

Serial Number

Option(s)

12. Test Port Receiver Magnitude Compression

Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.

	Measured Value			
CW Frequency	Test Port 2	Test Port 1	Specification (dB)	Measurement Uncertainty (dB)
300 kHz			≤ 0.42	±0.04
50 MHz			≤ 0.42	±0.04
1 GHz			≤ 0.42	±0.04
1.65 GHz			≤ 0.42	±0.04
2 GHz			≤ 0.42	±0.04
3 GHz			≤ 0.42	±0.04
4 GHz			≤ 0.76	±0.05
5 GHz			≤ 0.76	±0.05
6 GHz			≤ 0.76	±0.05

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number**
Option(s)	**Date**

13. Test Port Receiver Phase Compression

Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.

	Measured Value			
CW Frequency	Test Port 2	Test Port 1	Specification	Measurement Uncertainty
300 kHz			≤ 6°	±0.3°
50 MHz			≤ 6°	±0.3°
1 GHz			≤ 6°	±0.3°
1.65 GHz			≤ 6°	±0.3°
2 GHz			≤ 6°	±0.3°
3 GHz			≤ 6°	±0.3°
4 GHz			≤ 7.2°	±0.4°
5 GHz			≤ 7.2°	±0.4°
6 GHz			≤ 7.2°	±0.4°

Agilent Technologies Company **Model 8753ES** **Serial Number**		**Report Number**	
Option(s)		**Date**	
14. Test Port Output/Input Harmonics (Analyzers with Option 002)			
Test Description	Specification (dBc)	Measurement Value (dBc)	Measurement Uncertainty (dB)
Test Port Output Harmonics			
2nd	≤ –25		± 1.5
3rd	≤ –25		± 1.5
Port 1 Input Harmonics			
2nd	≤ –15		± 1.5
3rd	≤ –30		± 1.5
Port 2 Input Harmonics			
2nd	≤ –15		± 1.5
3rd	≤ –30		± 1.5

Agilent Technologies Company **Model 8753ES** **Serial Number**	**Report Number** **Date**

15. Harmonic Measurement Accuracy (Option 002 only)

Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.

Analyzer Freq. (Fund.)	Ext. Source Freq. (Harm.)	Power Meter Meas.	Cable Loss	(A) Power Meter + Cable Loss	(B) Network Analyzer Reading	(A – B) Harm. Meas. Accy.	Spec. (dB)	Meas. Uncert. (dB)
20 MHz	40 MHz						± 1.5	± 0.17
20 MHz	60 MHz						± 1.5	± 0.17
100 MHz	200 MHz						± 1.5	± 0.17
100 MHz	300 MHz						± 1.5	± 0.17
300 MHz	600 MHz						± 1.5	± 0.17
300 MHz	900 MHz						± 1.5	± 0.17
500 MHz	1 GHz						± 1.5	± 0.17
500 MHz	1.5 GHz						± 1.5	± 0.17
1 GHz	2 GHz						± 1.5	± 0.17
1 GHz	3 GHz						± 1.5	± 0.17
2 GHz	4 GHz						± 3	± 0.17
2 GHz	6 GHz						± 3	± 0.17
3 GHz	6 GHz						± 3	± 0.17

This page intentionally left blank.

Agilent 8753ET Performance Test Records

The performance test records in this chapter include entries up to 6 GHz for analyzers that have Option 006 (6 GHz operation). If your analyzer does not have Option 006, write “N/A” for entries above 3 GHz.

Calibration Lab Address:		**Report Number**	
		Date	
		Last Calibration Date	
		Customer’s Name	
		Performed by	
Model 8753ET Serial No.		Options	
Firmware Revision			
Ambient Temperature	°C	Relative Humidity	%
Test Equipment Used			
Description Frequency Counter	Model Number	Trace Number	Cal Due Date
Power Meter			
Power Sensor			
Calibration Kit			
Verification Kit			
Notes/Comments			

Agilent Technologies Company **Model 8753ET** **Serial Number**			**Report Number**	
Option(s)		**Date**		
1. Reflection Test Port Output Frequency Range and Accuracy				
Note: If your analyzer does not have Option 006, write “N/A” for entries above 3 GHz.				
CW Frequency (MHz)	Min. (MHz)	Measured Value (MHz)	Max. (MHz)	Measurement Uncertainty (MHz)
0.3	0.299 997		0.300 003	± 0.000 000 520
5.0	4.999 950		5.000 050	± 0.000 008 610
16.0	15.999 840		16.000 160	± 0.000 028 220
31.0	30.999 690		31.000 310	± 0.000 053 730
60.999 999	60.999 389		61.000 609	± 0.000 104 800
121.0	120.998 790		121.001 210	± 0.000 206 800
180.0	179.998 200		180.001 800	± 0.000 307 200
310.0	309.996 900		310.003 100	± 0.000 528 300
700.0	699.993 000		700.007 000	± 0.001 191 700
1 300.0	1 299.987		1 300.013	± 0.002 212 300
2 000.0	1 999.980		2 000.020	± 0.003 403 000
3 000.0	2 999.970		3 000.030	± 0.005 104 000
4 000.0	3 999.960		4 000.040	± 0.006 805 000
5 000.0	4 999.950		5 000.050	± 0.008 506 000
6 000.0	5 999.940		6 000.060	± 0.010 207 000

Agilent Technologies Company **Model 8753ET** **Serial Number**	**Report Number**
Option(s)	**Date**

2. External Source Mode Frequency Range

Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.

Test Frequencies (GHz)	Results
0.010	
0.020	
0.100	
1.000	
2.000	
3.000	
4.000	
5.000	
6.000	

Agilent Technologies Company **Model 8753ET** **Serial Number**	**Report Number**
Option(s)	**Date**

3. Reflection Test Port Output Power Level Accuracy

Note: If your analyzer does not have Option 006, write "N/A" for entries above 3 GHz.

Test Frequency	Minimum Value[a] (dBm)	Measured Value	Maximum Value[a] (dBm)	Measurement Uncertainty (dB)
300 kHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.47
20 MHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.25
50 MHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.12
100 MHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.12
200 MHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.12
500 MHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.12
1 GHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.12
2 GHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.15
3 GHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.15
4 GHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.17
5 GHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.17
6 GHz	–6.0 (–11.0)		–4.0 (–9.0)	±0.17

a. Values in parentheses pertain to analyzers with Option 004.

Agilent Technologies Company **Model 8753ET** **Serial Number**	**Report Number**
Option(s)	**Date**

4. Reflection Test Port Output Power Linearity (for analyzers *without* Option 004)

Frequency Range: 300 kHz to 3 GHz

Power Setting (dBm)	Power Offset (dBm)	Marker 1 (Maximum)	Marker 2 (Minimum)	Spec. (dB)	Meas. Uncert. (dB)
–20	–15			±0.5	±0.04
–18	–13			±0.5	±0.03
–16	–11			±0.5	±0.03
–14	–9			±0.2	±0.03
–12	–7			±0.2	±0.03
–10	–5			±0.2	±0.03
–8	–3			±0.2	±0.02
–6	–1			±0.2	±0.02
–4	+1			±0.2	±0.02
–2	+3			±0.2	±0.02
0	+5			±0.5	±0.03
+3	+8			±0.5	±0.03
+5	+10			±0.5	±0.03

4. Reflection Test Port Output Power Linearity (for analyzers *without* Option 004) (continued)					
Frequency Range: 3 GHz to 6 GHz					
Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.					
Power Setting (dBm)	Power Offset (dBm)	Marker 1 (Maximum)	Marker 2 (Minimum)	Spec. (dB)	Meas. Uncert. (dB)
–20	–15			±0.5	±0.04
–18	–13			±0.5	±0.03
–16	–11			±0.5	±0.03
–14	–9			±0.2	±0.03
–12	–7			±0.2	±0.03
–10	–5			±0.2	±0.03
–8	–3			±0.2	±0.02
–6	–1			±0.2	±0.02
–4	+1			±0.2	±0.02
–2	+3			±0.2	±0.02
0	+5			±0.5	±0.03
+3	+8			±0.5	±0.03
+5	+10			±0.5	±0.03

Agilent Technologies Company **Model 8753ET** **Serial Number**	**Report Number**			
Option(s)	**Date**			
5. Reflection Test Port Output Power Linearity (for analyzers *with* Option 004)				
Frequency Range: 300 kHz to 3 GHz				
Power Setting (dBm)	Marker 1 (Maximum)	Marker 2 (Minimum)	Spec. (dB)	Meas. Uncert. (dB)
–15			±0.2	±0.04
–13			±0.2	±0.03
–11			±0.2	±0.03
–9			±0.2	±0.03
–7			±0.2	±0.03
–5			±0.2	±0.03
–3			±0.2	±0.02
–1			±0.2	±0.02
+1			±0.2	±0.02
+3			±0.2	±0.02
+5			±0.5	±0.03
+7			±0.5	±0.03
+9			±0.5	±0.03
+10			±0.5	±0.03

5. Reflection Test Port Output Power Linearity (for analyzers *with* Option 004) (continued)				
Frequency Range: 3 GHz to 6 GHz				
Note: If your analyzer does not have Option 006, write “N/A” for entries above 3 GHz.				
Power Setting (dBm)	Marker 1 (Maximum)	Marker 2 (Minimum)	Spec. (dB)	Meas. Uncert. (dB)
–15			±0.2	±0.04
–13			±0.2	±0.03
–11			±0.2	±0.03
–9			±0.2	±0.03
–7			±0.2	±0.03
– 5			±0.2	±0.03
– 3			±0.2	±0.02
– 1			±0.2	±0.02
+1			±0.2	±0.02
+3			±0.2	±0.02
+5			±0.5	±0.03
+7			±0.5	±0.03
+9			±0.5	±0.03
+10			±0.5	±0.03

Agilent Technologies Company **Model 8753ET** **Serial Number**	**Report Number**
Option(s)	**Date**

6. Minimum R Channel Level

Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.

CW Frequency	R Channel Power	Specification (dBm)	Measurement Uncertainty (dB)
300 kHz		< –35	±1.5
3.29 MHz		< –35	±1.5
3.31 MHz		< –35	±1.5
15.90 MHz		< –35	±1.5
16.10 MHz		< –35	±1.5
30.90 MHz		< –35	±1.5
31.10 MHz		< –35	±1.5
1.6069 GHz		< –35	±1.5
1.6071 GHz		< –35	±1.5
3.000 GHz		< –30	±1.5
4.000 GHz		< –30	±1.5
5.000 GHz		< –30	±1.5
6.000 GHz		< –30	±1.5

Agilent Technologies Company **Model 8753ET** **Serial Number**	**Report Number**

7. Transmission Test Port Input Noise Floor Level

Note: If your analyzer does not have Option 006, write "N/A" for entries above 3 GHz.

Frequency Range	IF Bandwidth	Calculated Value	Specification (dBm)	Measurement Uncertainty (dBm)
300 kHz to 3.0 GHz	3 kHz		≤ –90	± 1.0
300 kHz to 3.0 GHz	10 Hz		≤ –110	± 1.0
3 GHz to 6.0 GHz	10 Hz		≤ –105	± 2.0
3 GHz to 6.0 GHz	3 kHz		≤ –85	± 2.0

Agilent Technologies Company **Model 8753ET** **Serial Number**		**Report Number**	
Option(s)		**Date**	
8. Transmission Test Port Input Frequency Response			
Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.			
Frequency Range	Measured Value (dB)	Specification (dB)	Measurement Uncertainty (dB)
300 kHz to 3 GHz		±1	±0.47
3 GHz to 6 GHz		±2	±0.17

Agilent Technologies Company **Model 8753ET** **Serial Number**	**Report Number**	
Option(s)	**Date**	

9. Test Port Crosstalk

Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.

Frequency Range	Measured Value (dB)	Specification (dB)	Measurement Uncertainty (dB)
300 kHz to 3 GHz		< –100	±1.0
3 GHz to 6 GHz		< –90	±2.0

Agilent Technologies Company **Model 8753ET** **Serial Number**			**Report Number**	
10. Uncorrected Port Performance				
Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.				
Test Description	Frequency Range	Spec. (dB)	Measured Value (dB)	Meas. Uncert. (dB)
Forward Direction				
Directivity	300 kHz to 1.3 GHz	≤ –30		± 0.9
Directivity	1.3 GHz to 3 GHz	≤ –24		± 0.6
Directivity	3 GHz to 6 GHz	≤ –19		± 0.8
Forward Direction (Standard)				
Source Match	300 kHz to 1.3 GHz	≤ –25		± 1.3
Source Match	1.3 GHz to 3 GHz	≤ –20		± 1.5
Source Match	3 GHz to 6 GHz	≤ –14		± 1.3
Forward Direction (Option 004)				
Source Match	300 kHz to 1.3 GHz	≤ –23		± 1.0
Source Match	1.3 GHz to 3 GHz	≤ –18		± 1.2
Source Match	3 GHz to 6 GHz	≤ –14		± 1.3

Agilent Technologies Company **Model 8753ET** **Serial Number**			**Report Number**	
Option(s)		**Date**		
10. Uncorrected Port Performance (continued)				
Note: If your analyzer does not have Option 006, write "N/A" in all entries above 3 GHz.				
Test Description	Frequency Range	Spec. (dB)	Measured Value (dB)	Meas. Uncert. (dB)
Forward Direction				
Refl. Tracking	300 kHz to 1.3 GHz	± 1.0		± 0.009
Refl. Tracking	1.3 GHz to 3 GHz	± 1.0		± 0.019
Refl. Tracking	3 GHz to 6 GHz	± 2.0		± 0.030
Forward Direction				
Load Match	300 kHz to 1.3 GHz	≤ –24		± 0.2
Load Match	1.3 GHz to 3 GHz	≤ –19		± 0.2
Load Match	3 GHz to 6 GHz	≤ –16		± 0.2
Forward Direction				
Trans. Tracking	300 kHz to 1.3 GHz	± 1.5		± 0.006
Trans. Tracking	1.3 GHz to 3 GHz	± 1.5		± 0.055
Trans. Tracking	3 GHz to 6 GHz	± 2.5		± 0.054

Agilent Technologies Company **Model 8753ET** **Serial Number**			**Report Number**	
11. System Trace Noise				
Test Port	IF BW	Phase/Magnitude	Measured Value	Specification
Test Frequency: 3 GHz				
Reflection	3 kHz	Magnitude		<0.006 dB rms
Reflection	3 kHz	Phase		<0.038 °rms
Reflection	10 Hz	Phase		<0.006 °rms
Reflection	10 Hz	Magnitude		<0.001 dB rms
Transmission	10 Hz	Magnitude		<0.001 dB rms
Transmission	10 Hz	Phase		<0.006 °rms
Transmission	3 kHz	Phase		<0.038 °rms
Transmission	3 kHz	Magnitude		<0.006 dB rms
Test Frequency: 6 GHz				
Note: If your analyzer does not have Option 006, write “N/A” in all entries above 3 GHz.				
Reflection	3 kHz	Magnitude		<0.010 dB rms
Reflection	3 kHz	Phase		<0.070 °rms
Reflection	10 Hz	Phase		<0.012 °rms
Reflection	10 Hz	Magnitude		<0.002 dB rms
Transmission	10 Hz	Magnitude		<0.002 dB rms
Transmission	10 Hz	Phase		<0.012 °rms
Transmission	3 kHz	Phase		<0.070 °rms
Transmission	3 kHz	Magnitude		<0.010 dB rms

3 Adjustments and Correction Constants

This chapter contains the following adjustment procedures:

- A9 Switch Positions on page 3-6
- Source Default Correction Constants (Test 44) on page 3-7
- Source Pretune Default Correction Constants (Test 45) on page 3-8
- Analog Bus Correction Constants (Test 46) on page 3-9
- Source Pretune Correction Constants (Test 48) on page 3-10
- RF Output Power Correction Constants (Test 47) on page 3-11
- IF Amplifier Correction Constants (Test 51) on page 3-14
- ADC Offset Correction Constants (Test 52) on page 3-15
- Sampler Magnitude and Phase Correction Constants (Test 53) on page 3-16
- Cavity Oscillator Frequency Correction Constants (Test 54) on page 3-26
- Serial Number Correction Constants (Test 55) on page 3-31
- Option Numbers Correction Constants (Test 56) on page 3-32
- Initialize EEPROMs (Test 58) on page 3-33
- EEPROM Backup Disk Procedure on page 3-34
- Correction Constants Retrieval Procedure on page 3-35
- Loading Firmware on page 3-36
- Fractional-N Frequency Range Adjustment on page 3-40
- Frequency Accuracy Adjustment on page 3-43
- High/Low Band Transition Adjustment on page 3-47
- Fractional-N Spur Avoidance and FM Sideband Adjustment on page 3-49
- Source Spur Avoidance Tracking Adjustment on page 3-52
- Unprotected Hardware Option Numbers Correction Constants on page 3-54

Post-Repair Procedures

Table 3-1 lists the additional service procedures which you must perform to ensure that the instrument is working correctly, following the replacement of an assembly. Unless otherwise noted, these procedures can be located in either Chapter 2 , "System Verification and Performance Tests," or in this chapter, "Adjustments and Correction Constants."

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

Table 3-1 Related Service Procedures

Replaced Assembly	Adjustments/ Correction Constants (Chapter 3)	Verification (Chapter 2)
A1 Front Panel Keyboard	None	— Service Test 0 (Chapter 10) — Service Test 23 (Chapter 10)
A2 Front Panel Interface	None	— Service Test 0 (Chapter 10) — Service Test 23 (Chapter 10) — Service Test 12 (Chapter 10) — Tests 66–80
A3 Source	— A9 Switch Positions — Source Def CC (Test 44) — Pretune Default CC (Test 45) — Analog Bus CC (Test 46) — Source Pretune CC (Test 48) — RF Output Power CC (Test 47) — Sampler Magnitude and Phase CC (Test 53) — Cavity Oscillator Frequency CC (Test 54) — Source Spur Avoidance Tracking — EEPROM Backup Disk	— Test Port Output Frequency Range and Accuracy — Test Port Output Power Level Accuracy — Test Port Output Power Linearity — Test Port Output/Input Harmonics (Option 002 only)
A4/A5/A6 Samplers	— A9 Switch Positions — Sampler Magnitude and Phase CC (Test 53) — IF Amplifier CC (Test 51) — EEPROM Backup Disk	— Minimum R Channel Level (if R sampler replaced) — Test Port Crosstalk — Test Port Input Frequency Response
A7 Pulse Generator	— A9 Switch Positions — Sampler Magnitude and Phase CC (Test 53) — EEPROM Backup Disk	— Test Port Input Frequency Response — Test Port Frequency Range and Accuracy
A8 Post Regulator	— A9 Switch Positions — Cavity Oscillator Frequency CC (Test 54) — Source Spur Avoidance Tracking — EEPROM Backup Disk	— Service Test 0 (Chapter 10) — Check A8 test point voltages
A9 CPU (EEPROM Backup Disk Available)	— A9 Switch Positions — Load Firmware — Serial Number CC (Test 55) — Option Number CC (Test 56) — Correction Constants Retrieval	— Operator's Check — Service Test 21 (Chapter 4) — Service Test 22 (Chapter 4)

Table 3-1 Related Service Procedures

Replaced Assembly	Adjustments/ Correction Constants (Chapter 3)	Verification (Chapter 2)
A9 CPU (EEPROM Backup Disk Not Available)	— A9 Switch Positions — Load Firmware — Serial Number CC (Test 55) — Option Number CC (Test 56) — Source Def CC (Test 44) — Pretune Default CC (Test 45) — Analog Bus CC (Test 46) — ADC Linearity CC (Test 52) — Source Pretune CC (Test 48) — RF Output Power CC (Test 47) — Sampler Magnitude and Phase CC (Test 53) — IF Amplifier CC (Test 51) — Cavity Oscillator Frequency CC (Test 54) — Unprotected Hardware Option Numbers CC — EEPROM Backup Disk	— Test Port Output Frequency Range and Accuracy — Test Port Output Power Level Accuracy — Test Port Output Power Linearity — Test Port Receiver Magnitude Dynamic Accuracy — Test Port Input Frequency Response
A10 Digital IF	— A9 Switch Positions — Analog Bus CC (Test 46) — ADC Linearity CC (Test 52) — Sampler Magnitude and Phase CC (Test 53) — IF Amplifier CC (Test 51) — EEPROM Backup Disk	— Test Port Input Noise Floor Level — Test Port Crosstalk — System Trace Noise
A11 Phase Lock	— A9 Switch Positions — Analog Bus CC (Test 46) — Pretune Default CC (Test 45) — Source Pretune CC (Test 48) — EEPROM Backup Disk	— Minimum R Channel Level — Test Port Output Frequency Range and Accuracy
A12 Reference	— A9 Switch Positions — High/Low Band Transition — Frequency Accuracy — EEPROM Backup Disk	— Source Frequency Range and Accuracy
A13 Fractional-N (Analog)	— A9 Switch Positions — Fractional-N Spur Avoidance and FM Sideband — EEPROM Backup Disk	— Test Port Output Frequency Range and Accuracy
A14 Fractional-N (Digital)	— A9 Switch Positions — Fractional-N Frequency Range — Fractional-N Spur Avoidance and FM Sideband — EEPROM Backup Disk	— Test Port Output Frequency Range and Accuracy
A15 Preregulator	None	— Self-Test (Chapter 4)
A16 Rear Panel Interface	None	— Internal Test 13, Rear Panel

Table 3-1 Related Service Procedures

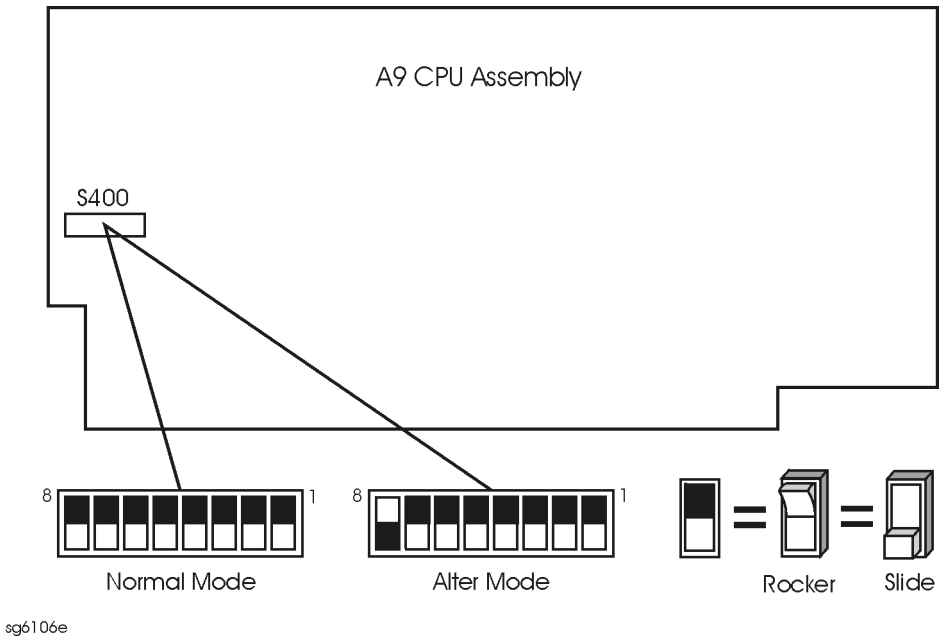
Replaced Assembly	Adjustments/ Correction Constants (Chapter 3)	Verification (Chapter 2)
A17 Motherboard	None	— Observation of Display — Tests 66–80 (Chapter 10)
A18 Display	None	— Observation of Display — Tests 66–80 (Chapter 10)
A19 Graphics System Processor	None	— Observation of Display — Tests 66–80 (Chapter 10)
A20 Disk Drive	None	None
8753ET: A21 Dual Directional Coupler	— A9 Switch Positions — RF Output Power CC (Test 47) — Sampler Magnitude and Phase CC (Test 53) — IF Amplifier CC (Test 51) — EEPROM Backup Disk	— Reflection Test Port Output Power Level Accuracy — Reflection Test Port Output Power Linearity — Transmission Test Port Input Frequency Response — Uncorrected Port Performance
8753ES: A21 Test Port Coupler	— A9 Switch Positions — RF Output Power CC (Test 47) — Sampler Magnitude and Phase CC (Test 53) — IF Amplifier CC (Test 51) — EEPROM Backup Disk	— Test Port Output Power Level Accuracy — Test Port Output Power Linearity — Test Port Input Frequency Response — Test Port Crosstalk — Test Port Receiver Magnitude Compression — Test Port Receiver Phase Compression — Harmonic Measurement Accuracy (Option 002)
8753ES: A22 Test Port Coupler[a]	— A9 Switch Positions — Sampler Magnitude and Phase CC (Test 53) — IF Amplifier CC (Test 51) — EEPROM Backup Disk*	— Test Port Input Frequency Response — Test Port Crosstalk — Test Port Receiver Magnitude Compression — Test Port Receiver Phase Compression — Harmonic Measurement Accuracy (Option 002)
A23 Bd Assy LED	None	— Self-Test (Chapter 4)
8753ES: A24 Transfer Switch	None	— Operator's Check — Service Test 21 (Chapter 4) — Service Test 22 (Chapter 4) — Test Port Crosstalk
A25 Test Set Interface	None	— Self-Test (Chapter 4)
A26 High Stability Freq Ref	— Frequency Accuracy Adjustment (Option 1D5)	— Test Port Frequency Range and Accuracy

a. Agilent Technologies verifies source output performance on Port 1 only. Port 2 source output performance is typical.

A9 Switch Positions

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

Figure 3-1 A9 Correction Constants Switch



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

Source Default Correction Constants (Test 44)

Analyzer warm-up time: **30 minutes.**

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

1. Press (Preset) (System) **SERVICE MENU** **TESTS** (44) (x1) **EXECUTE TEST** **YES** .
2. Observe the analyzer for the results of the adjustment routine:
   - If the analyzer displays `*Source Def DONE`, you have completed this procedure.
   - If the analyzer displays `*Source Def FAIL`, refer to Chapter 7 , “Source Troubleshooting.”

Source Pretune Default Correction Constants (Test 45)

Analyzer warm-up time: **30 minutes.**

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

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

Analog Bus Correction Constants (Test 46)

Analyzer warm-up time: **30 minutes.**

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

1. Press (Preset) (System) **SERVICE MENU** **TESTS** (46) (x1) **EXECUTE TEST** **YES** .
2. Observe the analyzer for the results of the adjustment routine:
   - If the analyzer displays `ABUS Cor DONE`, you have completed this procedure.
   - If the analyzer displays `ABUS Cor FAIL`, refer to Chapter 6 , “Digital Control Troubleshooting.”

Source Pretune Correction Constants (Test 48)

Analyzer warm-up time: **30 minutes.**

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

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

RF Output Power Correction Constants (Test 47)

Required Equipment and Tools

Description	HP/Agilent Part or Model Number
Power Meter	436A/437B/438A or E4418B/4419B
GPIB Cable	10833A
Antistatic Wrist Strap	9300-1367
Antistatic Wrist Strap Cord	9300-0980
Static-control Table Mat and Ground Wire	9300-0797
Additional Equipment for 50Ω Analyzers	
Power Sensor	8482A
Power Sensor (for Option 006 analyzers)	8481A
Adapter APC-7 to Type-N (f) (for 8753ES only)	11524A
Additional Equipment for 75Ω Analyzers	
Power Sensor	8483A Option H03

Analyzer warm-up time: **30 minutes.**

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

1. If you just completed "Sampler Magnitude and Phase Correction Constants (Test 53)," start at step 8 in this procedure.
2. Press Preset Local **SYSTEM CONTROLLER** .
3. Press Local **SET ADDRESSES** **ADDRESS: P MTR/GPIB** . The default power meter address is 13. Refer to the power meter manual as required to observe or change its GPIB address.
4. Press **POWER MTR:438A/437** to toggle between the 438A/437 and 436A power meters. Choose the appropriate model number. (Use the 438A/437 selection if the power meter is an E4419B or E4418B.)

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

Power Sensor Calibration Factor Entry

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

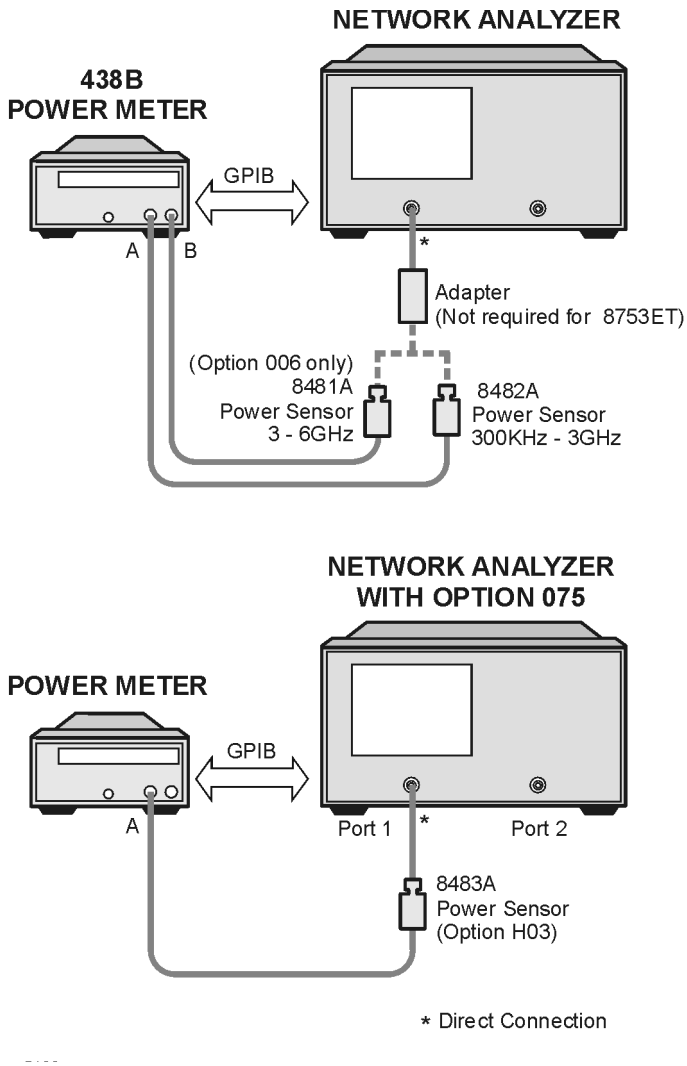
      The cal factor and frequency values are found on the back of the sensor. If you make a mistake, press (←) and re-enter the correct value.
   d. Press **DONE** to complete the data entry for each point.

NOTE The following terms are part of the sensor calibration menu.

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

8. **For Option 006 Instruments Only:** Press **CAL FACTOR SENSOR B** to create a power sensor calibration table for power sensor B (8481A), using the softkeys mentioned above.
9. Connect the equipment as shown in Figure 3-2.

Figure 3-2 RF Output Correction Constants Test Setup



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

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

12.Follow the instructions at the prompts and press **CONTINUE** .

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

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

  a. Press (Preset).

  b. Repeat "Source Default Correction Constants (Test 44)" on page 3-7.

  c. Repeat "RF Output Power Correction Constants (Test 47)" on page 3-11.

IF Amplifier Correction Constants (Test 51)

Required Equipment and Tools

Description	HP/Agilent Part Number
Antistatic Wrist Strap	9300-1367
Antistatic Wrist Strap Cord	9300-0980
Static-control Table Mat and Ground Wire	9300-0797
Additional Equipment for 50Ω Analyzers	
RF Cable: (50Ω) 24-inch, APC-7 (8753ES only)	8120-4779
RF Cable: (50Ω) 24-inch, Type-N	8120-4781
Additional Equipment for 75Ω Analyzers	
RF Cable: (75Ω) 24-inch, Type-N	8120-2408

Analyzer warm-up time: **30 minutes.**

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

1. Connect the appropriate RF cable between Port 1 and Port 2 of the analyzer (or between the Transmission and Reflection Ports on an 8753ET analyzer).
2. Press Preset System **SERVICE MENU** **TESTS** 51 x1 **EXECUTE TEST** **YES** **CONTINUE** .
3. Observe the analyzer for the results of the adjustment routine:
   - If DONE is displayed, you have completed this procedure.
   - If FAIL is displayed, check that the RF cable is connected between Port 1 and Port 2. Then, repeat this adjustment routine.
   - If the analyzer continues to fail the adjustment routine, refer to Chapter 6 , “Digital Control Troubleshooting.”

ADC Offset Correction Constants (Test 52)

Analyzer warm-up time: **30 minutes.**

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

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

NOTE This routine takes about three minutes.

2. Observe the analyzer for the results of the adjustment routine:
   - If the analyzer displays `ADC Ofs Cor DONE`, you have completed this procedure.
   - If the analyzer displays `ADC Ofs Cor FAIL`, refer to Chapter 6 , “Digital Control Troubleshooting.”

Sampler Magnitude and Phase Correction Constants (Test 53)

Required Equipment and Tools

Description	HP/Agilent Part or Model Number
Power Meter	436A437B/438A or E4418B/4419B
GPIB Cable	10833A
Antistatic Wrist Strap	9300-1367
Antistatic Wrist Strap Cord	9300-0980
Static-control Mat and Ground Wire	9300-0797
Additional Equipment for 50Ω Analyzers	
Power Sensor	8482A
Power Sensor (for Option 006 analyzers)	8481A
Cable: (50Ω) 24-inch, APC-7 (2)	8120-4779
Adapter: APC-7 to Type-N(f) (for 8753ES only)	11524A
Additional Equipment for 75Ω Analyzers	
Power Sensor	8483A Option H03
Cable: (75Ω) 24-inch, Type-N (2)	8120-2408
Additional Equipment for 8753ET Analyzers	
Calibration Kit (Type-N)	85032B
Cable: (50Ω), 24 inch, Type-N	8120-4781

Analyzer warm-up time: **30 minutes.**

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

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

NOTE If you are using the 438A or E4419B power meter, connect the 8482A power sensor to channel A, and the 8481A power sensor to channel B.

Power Sensor Calibration Factor Entry

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

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

NOTE The following terms are part of the sensor calibration menu.

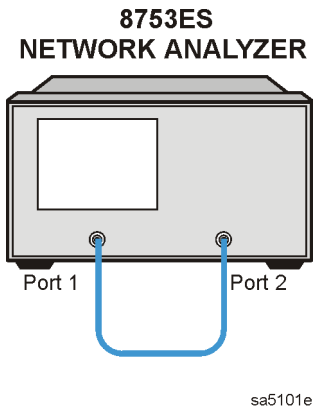
SEGMENT	allows you to select a frequency point.
EDIT	allows you to edit or change a previously entered value.
DELETE	allows you to delete a point from the sensor cal factor table.
ADD	allows you to add a point into the sensor cal factor table.
CLEAR LIST	allows you to erase the entire sensor cal factor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

7. **For Option 006 Instruments Only:** Zero and calibrate the power meter and HP 8481A power sensor. Then press **CAL FACTOR SENSOR B** to create a power sensor calibration table for power sensor B (8481A), using the softkeys mentioned above.
8. If you have an 8753ES, go to "Determine the Insertion Loss of the Cable at 1 GHz (8753ES)," next.
   If you have an 8753ET, go to "Determine the Insertion Loss of the Cable at 1 GHz (8753ET)" on page 3-19.

Determine the Insertion Loss of the Cable at 1 GHz (8753ES)

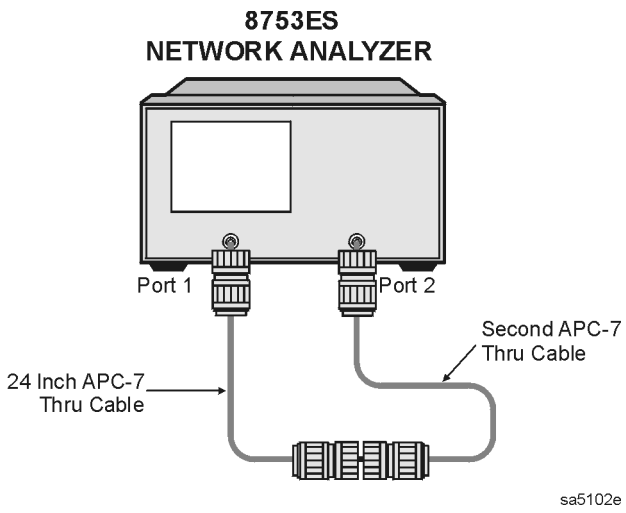
1. Press Preset Meas **Trans: FWD S21(B/R)** .
2. Press Center 1 G/n Span 50 M/µ.
3. Press Cal **CAL KIT** **CAL KIT: 7mm** **RETURN** **CALIBRATE MENU** **RESPONSE** .
4. Connect the 24 inch cable from Port 1 to Port 2, as shown in Figure 3-3.

Figure 3-3 First Connections for Insertion Loss Measurement (8753ES)



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

Figure 3-4 Second Connection for Insertion Loss Measurement

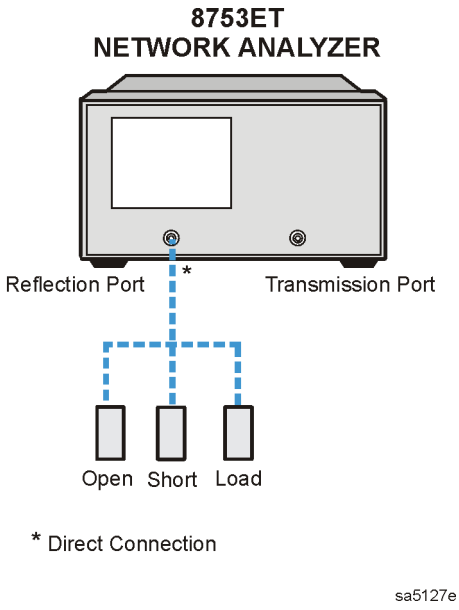


8. Press (Scale Ref) **SCALE/DIV** (.1) (x1) (Marker) **MARKER 1** (1) (G/n). Make a note of the insertion loss (found in the upper-right corner of the analyzer display). Proceed to "Sampler Correction Constants Routine" on page 3-20.

Determine the Insertion Loss of the Cable at 1 GHz (8753ET)

1. Press (Preset) (Meas) **REFLECTION**.
2. Press (Center) (1) (G/n) (Span) (50) (M/µ).
3. Refer to Figure 3-5.

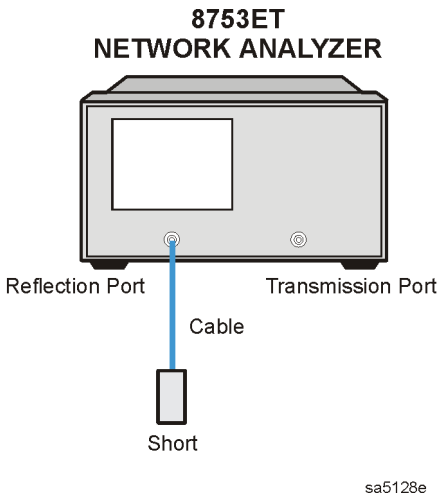
Figure 3-5 First Connection for Insertion Loss Measurement (8753ET)



4. Perform a 1-port calibration by performing the following steps.
   a. Press (Cal) **CALIBRATE MENU** **REFLECTION 1-PORT**.
   b. Press **FORWARD: OPENS**.
   c. Connect the open (from the calibration kit) to the Reflection port as shown in Figure 3-5.
   d. Press **OPEN (F)** **DONE: OPENS**.
   e. Press **FORWARD: SHORTS**.
   f. Connect the short to the Reflection port as shown in Figure 3-5.
   g. Press **SHORT (F)** **DONE: SHORTS**.
   h. Remove the short from the Reflection port, then connect the load to the Reflection port as shown in Figure 3-5. Press **LOAD**, then **DONE 1-PORT CAL**.

5. Attach a type-N cable and a short to the Reflection port as shown in Figure 3-6.

Figure 3-6 Second Connection for Insertion Loss Measurement (8753ET)

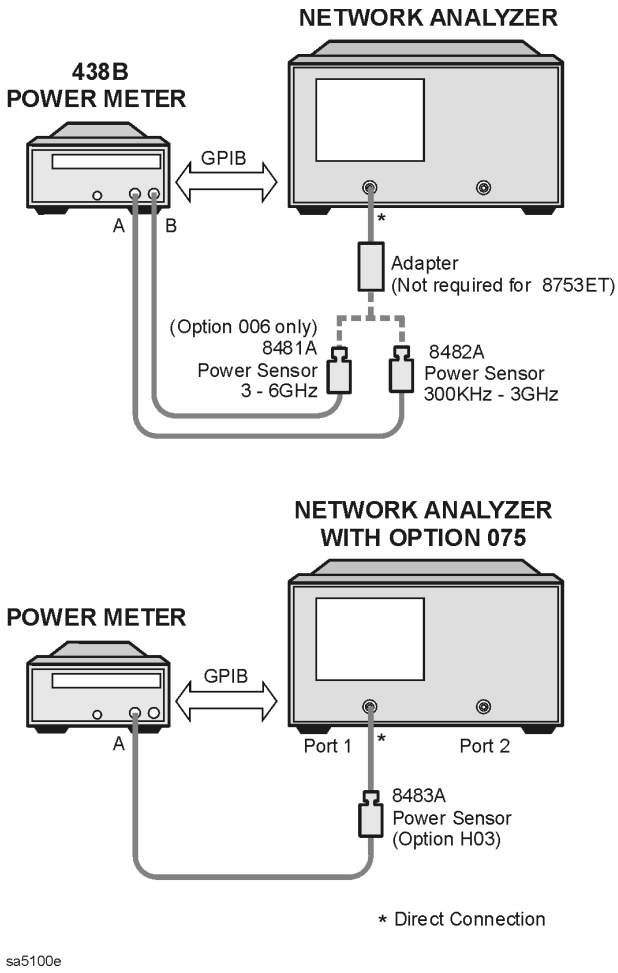


6. Press (Marker) **MARKER 1** (1) (G/n).
7. Press (Sweep Setup) **TRIGGER MENU** **SINGLE**.
8. Note the marker reading and divide it by 2. Record this calculated value as the insertion loss of the cable. It will be used later in this procedure. Proceed to "Sampler Correction Constants Routine," next.

Sampler Correction Constants Routine

1. Press (Preset) (System) **SERVICE MENU** **TESTS** (53) (x1) **EXECUTE TEST** and answer **YES** at the prompt.
2. The analyzer displays:
   `CONNECT <3 GHz SENSOR A TO PORT 1` (8753ES)
   or
   `CONNECT <3 GHz SENSOR A TO REFL PORT` (8753ET)
   Make the connections as shown in Figure 3-7, using the 8482A power sensor.

Figure 3-7 Connections for Sampler Correction Routine



3. Press **CONTINUE** to start the test. This part of the test will take about three minutes.

   If the analyzer displays `Sampler Cor - FAIL`, check the following:

   a. The GPIB address of your power meter is set at 13. Then repeat the "Sampler Correction Constants Routine" on page 3-20.

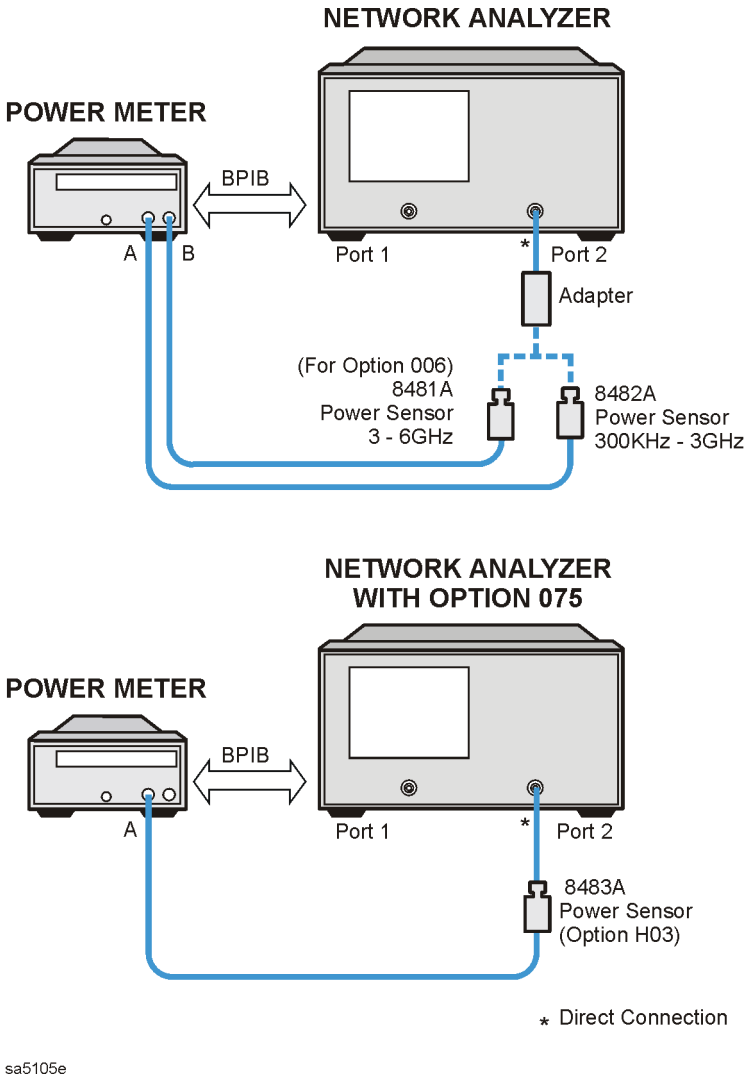
   b. The 8482A power sensor is connected to Port 1. Then repeat the "Sampler Correction Constants Routine" on page 3-20.

4. For Option 006 Instruments Only:
   When the analyzer displays:
   `CONNECT 6 GHz SENSOR B TO PORT 1`, (8753ES)
   or
   `CONNECT 6 GHz SENSOR B TO REFL PORT`, (8753ET)
   make the connections as shown in Figure 3-7, using the 8481A power sensor. Then press **CONTINUE**. This part of the test will take about 20 seconds.

   If you have an 8753ES, continue with the next step.
   If you have an 8753ET, proceed to step 8.

5. 8753ES only:
   When the analyzer displays `CONNECT <3 GHz SENSOR A TO PORT 2`, make the connections as shown in Figure 3-8, using the 8482A power sensor.

Figure 3-8 Connections for Sampler Correction at Port 2



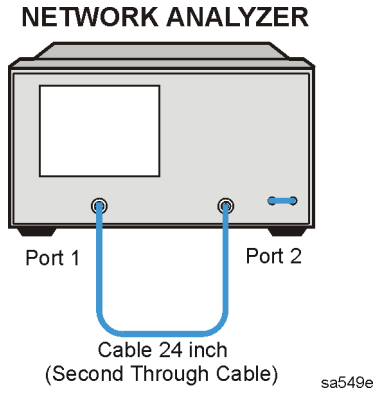
6. For 8753ES only:

   a. Press **CONTINUE**. This part of the test will take about 10 minutes.

   b. **For Option 006 Instruments Only:** When the analyzer displays `CONNECT 6 GHz SENSOR TO PORT 2`, make the connections as shown in Figure 3-8, using the HP/Agilent 8481A power sensor. Then press **CONTINUE**. This part of the test will take about 20 seconds.

7. When the analyzer displays `CONNECT PORT 1 TO PORT 2`, connect the second through cable (for which you have previously determined the insertion loss) as shown in Figure 3-9. Proceed to step 9.

Figure 3-9 Connections for the Second Through Cable



8. For 8753ET only:
   The analyzer will prompt you for the following connections in this order:
   - `CONNECT OPEN TO REFL PORT.`
   - `CONNECT CABLE FROM REFL TO TRANS PORT.`

   Make the appropriate connections and press **CONTINUE**.
9. Press **CONTINUE**.
10. Enter the insertion loss of the through cable (determined previously) and press **CONTINUE**. For example, if the insertion loss of the through cable at 1 GHz was found to be 0.25 dB, then press (.25) (x1).
11. When the analyzer completes the test, observe the display for the results:
    - If you see `Sampler Cor - DONE`, you have completed this procedure.
    - If you see `Sampler Cor - FAIL`, it is necessary to adjust the sampler gain offset values, which are stored in EEPROM. Each sampler will require its own offset which is determined by performing "8753ES: Sampler Offset," or "8753ET: Sampler Offset," next.

8753ES: Sampler Offset

1. Press Preset Start 100 k/m.
2. Connect an APC-7 RF cable between Port 1 and Port 2.
3. Press Power 0 x1.
4. Press Meas **INPUT PORTS** and then select the sampler to be tested: **A**, **B**, or **R**.
   - If Sampler A will be tested: select **TESTPORT 2**.
   - If Sampler B will be tested: select **TESTPORT 1**.
   - If Sampler R will be tested: press **TESTPORT 1**.
5. Go to step 1 in "Sampler Offset (continued)."

8753ET: Sampler Offset

1. Press Preset Start 100 k/m.
   - If Sampler A will be tested: Connect an open to the Reflection port.
   - If Sampler B or Sampler R will be tested: Connect a type-N RF cable between the Reflection and Transmission ports.
2. Press Power 0 x1.
3. Press Meas **INPUT PORTS** and then select the sampler to be tested: **A**, **B**, or **R**.
4. Go to step 1 in "Sampler Offset (continued)," next.

Sampler Offset (continued)

1. Press System **CONFIGURE MENU** **RAW OFFSET OFF**.
2. Press Sweep Setup **TRIGGER MENU** **SINGLE**.
3. Press Marker **MARKER 1** Marker Search **SEARCH: MAX**.
4. Read the marker's power value from the top of the display. Be sure to retain the sign (+ or –) of the value.
5. Perform the following calculation using the following instructions:

   Sampler Offset = ROUND [4.0 (4.0 – (marker value))]

   - Subtract the marker value from 4.0.
   - Multiply the result by 4.0.
   - Round the result to the nearest integer.
6. Record this number for each sampler.
7. Continue with one of the following three procedures, depending on which sampler needs adjustment.

A Channel Sampler

1. Access the first address by pressing System **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** 1619001372 x1.
2. Enter the new value for the A sampler offset at the accessed address by pressing **POKE** [new value for A] x1.
3. Access the second address by pressing **PEEK/POKE ADDRESS** 1619001373 x1.
4. Enter the new value at the accessed address by pressing **POKE** 248 x1.
5. Press Preset for the analyzer to use the new values.
6. Go to "Finish," or to the next sampler to be adjusted.

B Channel Sampler

1. Access the first address by pressing System **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** 1619001374 x1.
2. Enter the new value for the B sampler offset at the accessed address by pressing **POKE** [new value for B] x1.
3. Access the second address by pressing **PEEK/POKE ADDRESS** 1619001375 x1.
4. Enter the new value at the accessed address by pressing **POKE** 248 x1.
5. Press Preset for the analyzer to use the new values.
6. Go to "Finish," or to the next sampler to be adjusted.

R Channel Sampler

1. Access the first address by pressing System **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** 1619001376 x1.
2. Enter the new value for the R sampler offset at the accessed address by pressing **POKE** [new value for R] x1.
3. Access the second address by pressing **PEEK/POKE ADDRESS** 1619001377 x1.
4. Enter the new value at the accessed address by pressing **POKE** 128 x1.
5. Press Preset for the analyzer to use the new values.
6. Go to "Finish," or to the next sampler to be adjusted.

Finish

1. Repeat the "Sampler Correction Constants Routine" on page 3-20.
2. If the analyzer continues to fail this adjustment routine, refer to Chapter 7 , "Source Troubleshooting."

Cavity Oscillator Frequency Correction Constants (Test 54)

Required Equipment and Tools

Description	HP/Agilent Part or Model Number
Low-pass filter	9135-0198
Antistatic wrist strap	9300-1367
Antistatic wrist strap cord	9300-0980
Static-control table mat and ground wire	9300-0797
Additional Equipment for 50Ω Analyzers	
Adapter: (2) Type-N (m) to APC-7 (8753ET)	11525A
Adapter: APC-7 to 3.5 mm (m)	1250-1746
Adapter: APC-7 to 3.5 mm (f)	1250-1747
RF cable set: APC-7	11857D
Additional Equipment for 75Ω Analyzers	
Adapter: APC-3.5 (f) to Type-N (f)	1250-1745
Adapter: APC-3.5 (m) to Type-N (f)	1250-1750
RF Cable Set: 50Ω, Type-N	11851B
Minimum Loss Pad: 50Ω to 75Ω (2) (75Ω analyzer)	11852B

Analyzer warm-up time: **30 minutes.**

The nominal frequency of the cavity oscillator is 2.982 GHz, but it varies with temperature. This procedure determines the precise frequency of the cavity oscillator at a particular temperature by identifying a known spur.

NOTE You should perform this procedure with the recommended filter, or a filter with at least 50 dB of rejection at 2.9 GHz, and a passband which includes 800 MHz. The filter makes spur identification substantially faster and more reliable.

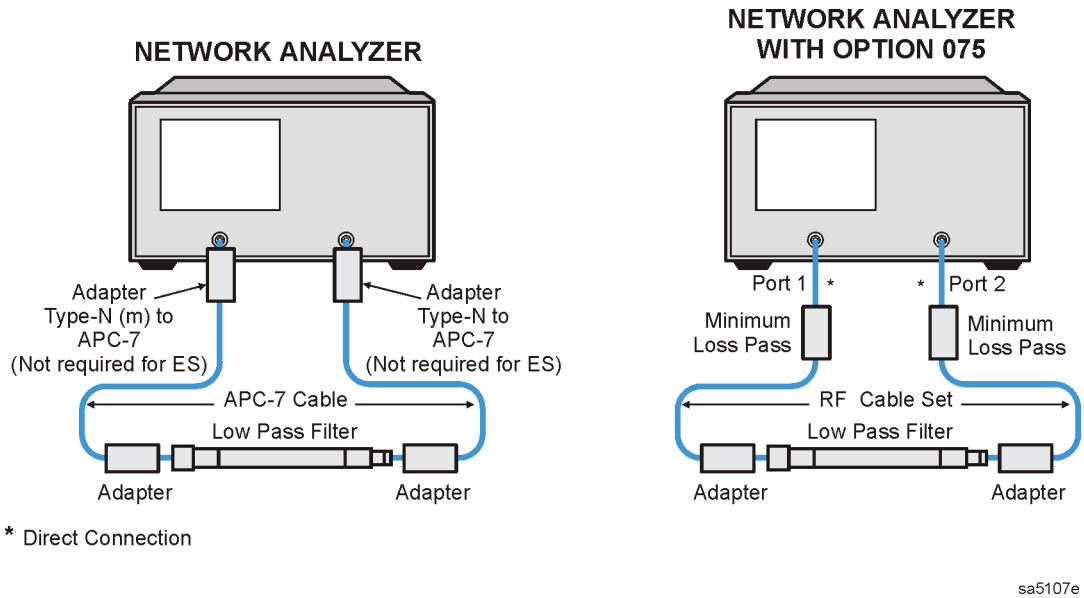
With the filter, you need to distinguish between only two spurs, each of which should be 10 dB to 20 dB (3 to 4 divisions) above the trace noise.

Without the filter, you need to distinguish the target spur between four or five spurs, each of which may be 0.002 to 0.010 dB (invisible to 2 divisions) above or below the trace noise.

Perform the first five steps of the procedure at least once for familiarization before trying to select the target spur (especially if you are not using a filter).

1. Connect the equipment shown in Figure 3-10.

Figure 3-10 Setup for Cavity Oscillator Frequency Correction Constant Routine



2. Press (Preset) (Avg) **IF BW** (3000) (x1) (System) **SERVICE MENU** **TESTS** (54) (x1) **EXECUTE TEST** **YES** .

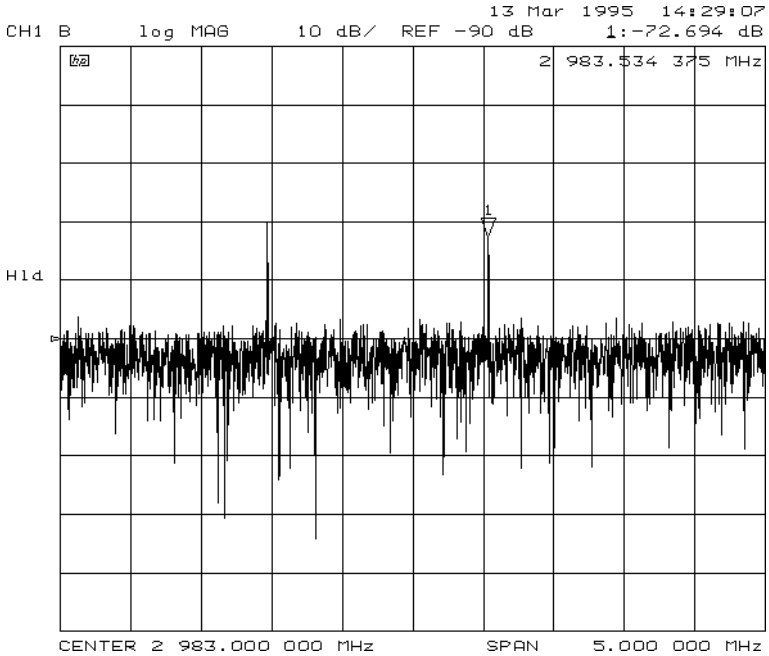
   During this adjustment routine, you will see several softkeys:

CONTINUE	sweeps the current frequency span; you may press it repeatedly for additional sweeps of the current frequency span.
NEXT	sweeps the next frequency span (2 MHz higher).
SELECT	enters the value of the marker (which you have placed on the spur) and exits the routine.
ABORT	exits the routine.

3. Press **CONTINUE** to sweep the first frequency span three times. Each new span overlaps the previous span by 3 MHz (the center frequency increases by 2 MHz; the span is 5 MHz). Therefore, anything visible on the right half of the screen of one set of sweeps will appear on the left half or center of the screen when you press **NEXT** .

4. Press **NEXT** repeatedly. Watch the trace on each sweep and try to spot the target spur. With the filter, the target spur will be one of two obvious spurs (see Figure 3-11). Without the filter (not recommended), the target spur will be one of four or five less distinct spurs as shown in Figure 3-12 and Figure 3-13. When the center frequency increases to 2994.999 MHz, and you have not “selected” the target spur, the message `Cav Osc Cor FAIL` will appear on the display.

Figure 3-11 Typical Display of Spurs with a Filter



Spur Search Procedure with a Filter

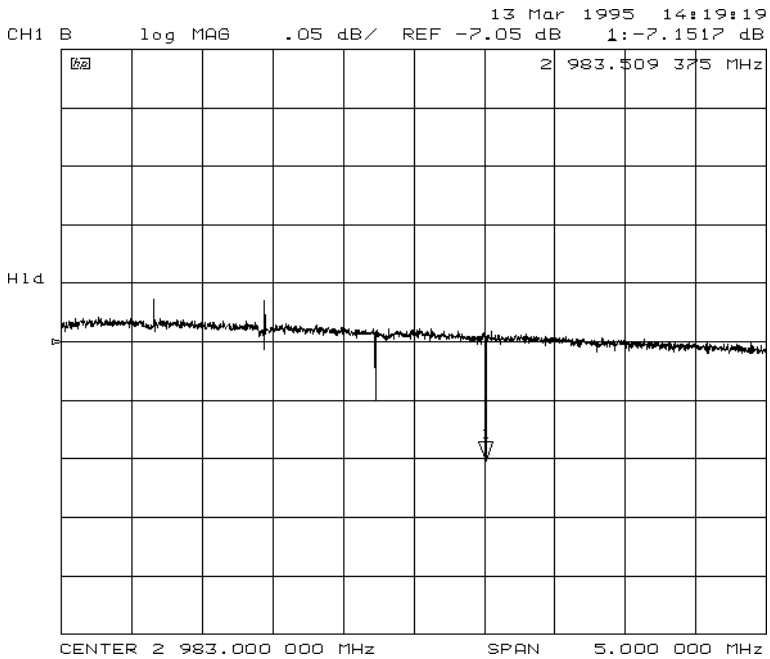
5. Press **EXECUTE TEST** **YES** **CONTINUE** and the other softkeys as required to observe and mark the target spur. The target spur will appear to the right of a second spur, similar to Figure 3-11.
6. Rotate the front panel knob to position the marker on the spur and then press **SELECT** .
7. Observe the analyzer for the results of this adjustment routine:
   - If the analyzer displays `Cav Osc Cor DONE`, you have completed this procedure.
   - If the analyzer does not display `DONE`, repeat this procedure.
   - If the analyzer continues not to display `DONE`, refer to Chapter 7 , “Source Troubleshooting.”

Spurs Search Procedure without a Filter

8. Press **EXECUTE TEST** **YES** **CONTINUE** and the other softkeys as required to observe and mark the target spur.
9. The target spur will appear in many variations. Often it will be difficult to identify positively; occasionally it will be nearly impossible to identify. Do not hesitate to press **CONTINUE** as many times as necessary to thoroughly inspect the current span.

   The target spur usually appears as one of a group of four evenly spaced spurs as in Figure 3-12. The target spur is the right most spur (fourth from the left). On any particular sweep, one, any, or all of the spurs may be large, small, visible, invisible, above or below the reference line.

Figure 3-12 Typical Display of Four Spurs without a Filter



On occasion the largest spur appears as one of a group of five evenly spaced spurs as shown in Figure 3-13. The target spur is again the fourth from the left (not the fifth, right-most spur).

Figure 3-13 Target Spur Is Fourth in Display of Five Spurs

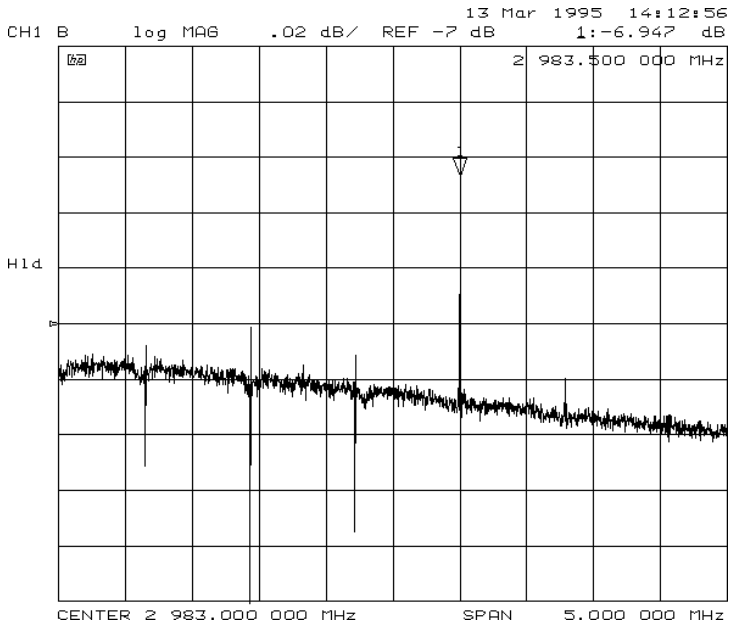
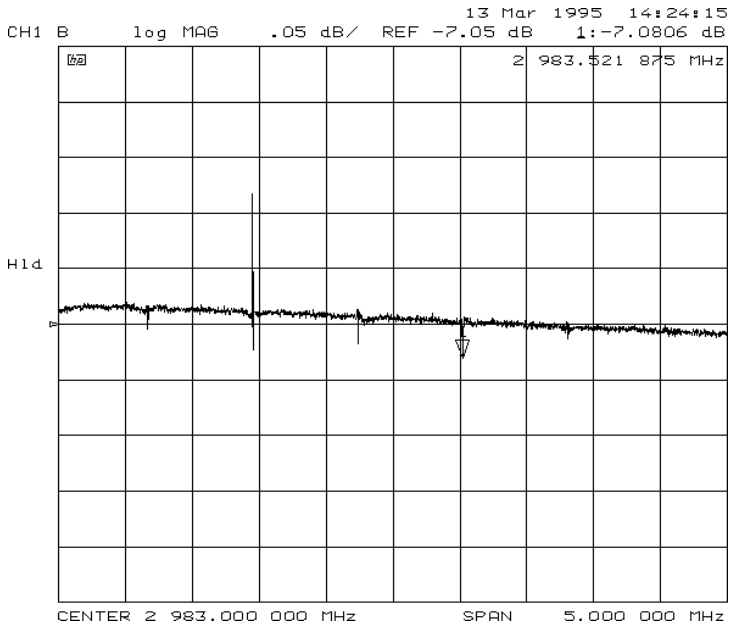


Figure 3-14 shows another variation of the basic four-spur pattern: some up, some down, and the target spur itself almost indistinguishable.

Figure 3-14 Target Spur Is Almost Invisible



10. Rotate the front panel knob to position the marker on the target spur. Then press **SELECT** and observe the analyzer for the results of the adjustment routine:
    - If the analyzer displays `Cav Osc Cor DONE`, you have completed this procedure.
    - If the analyzer displays `FAIL`, refer to Chapter 7 , “Source Troubleshooting.”

Serial Number Correction Constants (Test 55)

Analyzer warm-up time: **5 minutes.**

This procedure stores the analyzer serial number in the A9 CPU assembly EEPROMs.

CAUTION Perform this procedure *only* if the A9 CPU assembly has been replaced.

1. Record the ten character serial number that is on the analyzer's rear panel identification label.
2. Press (Preset) **DISPLAY** **MORE** **TITLE** **ERASE TITLE** to erase the HP/Agilent logo.
3. Enter the serial number with an external keyboard or by rotating the front panel knob to position the arrow below each character of the instrument serial number, and then pressing **SELECT LETTER** to enter each letter.

   Press (←) if you made a mistake.
4. Press **DONE** when you have finished entering the title.

CAUTION You *cannot* correct mistakes after you perform step 5, unless you contact the factory for a clear-serial-number keyword. Then you must perform the "Option Numbers Correction Constants (Test 56)" on page 3-32 and repeat this procedure.

5. Press (System) **SERVICE MENU** **TESTS** (55) (x1) **EXECUTE TEST** **YES** .
6. Observe the analyzer for the results of the routine:
   - If the analyzer displays the message `Serial Cor DONE`, you have completed this procedure.
   - If the analyzer does not display `DONE`, then either the serial number that you entered in steps 3 and 4 did not match the required format or a serial number was already stored. Check the serial number recognized by the analyzer:
     a. Press (Preset) (System) **SERVICE MENU** **FIRMWARE REVISION** .
     b. Look for the serial number displayed on the analyzer screen.
     c. Repeat this adjustment test.
   - If the analyzer continues to fail this adjustment routine, contact the nearest Agilent Technologies sales or service office.

Option Numbers Correction Constants (Test 56)

This procedure stores instrument option(s) information in A9 CPU assembly EEPROMs. You can also use this procedure to remove a serial number, with the unique keyword, as referred to in "Option Numbers Correction Constants (Test 56)," previously.

1. Remove the instrument top cover and record the keyword label(s) that are on the display assembly. Note that *each* keyword is for each option installed in the instrument.
   - If the instrument does not have a label, then contact your nearest Agilent Technologies sales or service office. Be sure to include the full serial number of the instrument.
2. Press (Preset) (Display) **MORE** **TITLE** **ERASE TITLE** .
3. Enter the keyword with an external keyboard or by rotating the front panel knob to position the arrow below each character of the keyword, and then pressing **SELECT LETTER** to enter each letter.

   Press (←) if you made a mistake.
4. Press **DONE** when you have finished entering the title.

CAUTION Do not confuse "I" with "1" (one) or "O" with "0" (zero).

5. Press (System) **SERVICE MENU** **TESTS** (56) (x1) **EXECUTE TEST** **YES** .
6. Observe the analyzer for the results of the adjustment routine:
   - If the analyzer displays `Option Cor DONE`, you have completed this procedure.
   - If the analyzer has more than one option, repeat steps 2 through 5 to install the remaining options.
   - If the analyzer displays `Option Cor FAIL`, check the keyword used in step 3 and make sure it is correct. Pay special attention to the letters "I" or "0", the numbers "1" or "0" (zero). Repeat this entire adjustment test.
   - If the analyzer continues to fail the adjustment routine, contact the nearest Agilent Technologies sales or service office.

Initialize EEPROMs (Test 58)

This service internal test performs the following functions:

- *Destroys* all correction constants and all unprotected options.
- Initializes certain EEPROM address locations to zeroes.

NOTE This routine *will not* alter the serial number or Options 002, 006 and 010 correction constants.

1. Make sure the A9 switch is in the alter position.
2. Press (Preset) (System) **SERVICE MENU** **TESTS** (58) (x1) **EXECUTE TEST** **YES** .
3. Restore the analyzer correction constants in the EEPROMs:
   - If you have the correction constants backed up on a disk, perform these steps:
     a. Place the disk in the analyzer disk drive and press (Save/Recall) **SELECT DISK** **INTERNAL DISK** .
     b. Use the front panel knob to highlight the filename that represents your serial number.
     c. Press **RETURN** **RECALL STATE** (Preset).
   - If you don't have the correction constants backed up on a disk, run all the internal service routines in the following order:
     — Source Default Correction Constants (Test 44)
     — Source Pretune Correction Constants (Test 45)
     — Analog Bus Correction Constants (Test 46)
     — ADC Offset Correction Constants (Test 52)
     — Source Pretune Correction Constants (Test 48)
     — RF Output Power Correction Constants (Test 47)
     — Sampler Magnitude and Phase Correction Constants (Test 53)
     — IF Amplifier Correction Constants (Test 51)
     — Cavity Oscillator Frequency Correction Constants (Test 54)
     — EEPROM Backup Disk Procedure

EEPROM Backup Disk Procedure

Required Equipment and Tools

Description	HP/Agilent Part or Model Number
3.5-inch Floppy Disk	92192A (box of 10)
Antistatic Wrist Strap	9300-1367
Antistatic Wrist Strap Cord	9300-0980
Static-control Table Mat and Ground Wire	9300-0797

The correction constants, which are unique to your instrument, are stored in EEPROM on the A9 controller assembly. By creating an EEPROM backup disk, you will have a copy of all the correction constant data should you need to replace or repair the A9 assembly.

1. Insert a 3.5-inch disk into the analyzer disk drive.
2. If the disk is not formatted, follow these steps:
   a. Press (Save/Recall) **FILE UTILITIES** **FORMAT DISK**.
   b. Select the format type:
      - To format a LIF disk, select **FORMAT:LIF**.
      - To format a DOS disk, select **FORMAT:DOS**.
   c. Press **FORMAT INT DISK** and answer **YES** at the query.
3. Press (System) **SERVICE MENU** **SERVICE MODES** **MORE** **STORE EEPR ON** (Save/Recall) **SELECT DISK** **INTERNAL DISK** **RETURN** **SAVE STATE**.

NOTE The analyzer creates a default file “FILE0”. The filename appears in the upper-left corner of the display. The file type “ISTATE(E)” indicates that the file is an instrument-state with EEPROM backup.

4. Press **FILE UTILITIES** **RENAME FILE** **ERASE TITLE**. Use the front panel knob and the **SELECT LETTER** softkey (or an external keyboard) to rename the file “FILE0” TO “N*12345*” where *12345* represents the last 5 digits of the instrument's serial number. (The first character in the filename must be a letter.) When you are finished renaming the file, press **DONE**.
5. Write the following information on the disk label:
   - analyzer serial number
   - today's date
   - “EEPROM Backup Disk”

Correction Constants Retrieval Procedure

Required Equipment and Tools

Description	HP/Agilent Part Number
EEPROM backup disk	
Antistatic wrist strap	9300-1367
Antistatic wrist strap cord	9300-0980
Static-control table mat and earth ground wire	9300-0797

By using the current EEPROM backup disk, you can download the correction constants data into the instrument EEPROMs.

1. Insert the “EEPROM Backup Disk” into the analyzer’s disk drive.
2. Make sure the A9 switch is in the Alter position.
3. Press (Save/Recall) **SELECT DISK** **INTERNAL DISK** . Use the front panel knob to highlight the file “*N12345*” where *N12345* represents the file name of the EEPROM data for the analyzer. On the factory shipped EEPROM backup disk, the filename is “FILE1”.
4. Press **RETURN** **RECALL STATE** to download the correction constants data into the instrument EEPROMs.
5. Press (Preset) and verify that good data was transferred to EEPROM by performing a simple measurement.
6. Move the A9 switch back to the Normal position when you are done working with the instrument.

Loading Firmware

Required Equipment and Tools

Firmware disk for the 8753ES or 8753ET

Analyzer warm-up time: **None required.**

The following procedures will load firmware for new or existing CPU boards in your network analyzer.

Loading Firmware into an Existing CPU

Use this procedure for upgrading firmware in an operational instrument whose CPU board has not been changed.

CAUTION Loading firmware will clear all internal memory. Perform steps 1 through 5, next, to save any instrument states that are stored in internal memory to a floppy disk. If saving states is not necessary, proceed to step 6.

1. Press (Save/Recall) **SELECT DISK** **INTERNAL MEMORY** **RETURN** .
2. Select an instrument state and press **RECALL STATE** .
3. Press **SELECT DISK** **INTERNAL DISK** **RETURN** **SAVE STATE** .
4. If the instrument state file was not saved to disk with the same name that it had while in internal memory, you may wish to rename the file:
   Press **FILE UTILITIES** **RENAME FILE** , enter the desired name, and press **DONE** .
5. Repeat steps 1 through 4 for each instrument state that you wish to save.
6. Turn off the network analyzer.
7. Insert the firmware disk into the instrument's disk drive.
8. Turn the instrument on. The firmware will be loaded automatically during power-on. The front panel LEDs should step through a sequence as firmware is loaded. The display will be blank during this time.

   At the end of a successful loading, the LEDs for Channel 1 (and Port 1 on an 8753ES) will remain on and the display will turn on indicating the version of firmware that was loaded.

In Case of Difficulty

If the firmware did not load successfully, LED patterns on the front panel can help you isolate the problem.

- If the following LED pattern is present, an acceptable firmware filename was not found on the disk. (The desired format for firmware filenames is `8753Ex_7._yz`, where `x` = either `S` or `T`, and where `yz` = the latest firmware revision number.) Check that the firmware disk used was for the 8753ET/ES.

LED Pattern					
CH1	**CH2**	**R**	**L**	**T**	**S**
✲	✲				

- If any of the following LED patterns are present, the firmware disk may be defective.

LED Pattern					
CH1	**CH2**	**R**	**L**	**T**	**S**
		✲			
	✲	✲			
✲		✲			
✲	✲	✲			
			✲		
	✲		✲		
✲			✲		
✲	✲		✲		
		✲	✲		
	✲	✲	✲		
✲		✲	✲		
		✲			✲
	✲	✲			✲

- If any other LED pattern is present, the CPU board is defective.

Loading Firmware into a New CPU

Use this procedure to load firmware for an instrument whose CPU board has been replaced.

1. Turn off the network analyzer.
2. Insert the firmware disk into the instrument's disk drive.
3. Turn the instrument on. The firmware will be loaded automatically during power-on. The front panel LEDs should step through a sequence as firmware is loaded. The display will be blank during this time.

   At the end of a successful loading, the LEDs for Channel 1 (and Port 1 on an 8753ES) will remain on and the display will turn on indicating the version of firmware that was loaded.

In Case of Difficulty

- If the firmware did not load successfully, LED patterns on the front panel can help you isolate the problem.

  — If the following LED pattern is present, an acceptable firmware filename was not found on the disk. (The desired format for firmware filenames is `8753Ex_7._yz`, where `x` = either `S` or `T`, and where `yz` = the latest firmware revision number.) Check that the firmware disk used was for the 8753ES or 8753ET.

LED Pattern					
CH1	**CH2**	**R**	**L**	**T**	**S**
	✲				

— If any of the following LED patterns are present, the firmware disk may be defective.

LED Pattern					
CH1	CH2	R	L	T	S
		✲			
	✲	✲			
✲		✲			
✲	✲	✲			
			✲		
	✲		✲		
✲			✲		
✲	✲		✲		
		✲	✲		
	✲	✲	✲		
✲		✲	✲		
		✲			✲
	✲	✲			✲

— If any other LED pattern is present, the CPU board is defective.

NOTE If firmware did not load, a red LED on the CPU board will be flashing.

- If the following LED pattern is present on the CPU board, suspect the disk drive or associated cabling:

✲ ✲ ✲ O ✲ ✲ O O

(front of instrument ⇩)

Fractional-N Frequency Range Adjustment

Required Equipment and Tools

Description	HP/Agilent Part Number
Non-metallic adjustment tool	8830-0024
Antistatic wrist strap	9300-1367
Antistatic wrist strap cord	9300-0980
Static-control table mat and ground wire	9300-0797

Analyzer warm-up time: **30 minutes**

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

1. Remove the right-rear bumpers and right side cover.
2. Press (Preset) (Display) **DUAL|QUAD SETUP** **DUAL CHAN ON** (System) **SERVICE MENU** **ANALOG BUS ON** (Sweep Setup) **NUMBER OF POINTS** (11) (x1) **COUPLED CH OFF**.
3. Press (Start) (36) (M/µ) (Stop) (60.75) (M/µ) (Sweep Setup) **SWEEP TIME** (12.5) (k/m) (Meas) **ANALOG IN Aux Input** (29) (x1) to observe the “FN VCO Tun” voltage.
4. Press (Format) **MORE** **REAL** (Scale Ref) (.6) (x1) **REFERENCE VALUE** (–7) (x1) to set and scale channel 1. Press (Marker) to set the marker to the far right of the graticule.
5. Press (Chan 2) (Sweep Setup) **CW FREQ** (31.0001) (M/µ) **SWEEP TIME** (12.375) (k/m) (Meas) **ANALOG IN Aux Input** (29) (x1) to observe the “FN VCO Tun” voltage.
6. Press (Format) **MORE** **REAL** (Scale Ref) (.2) (x1) **REFERENCE VALUE** (6.77) (x1) (Marker) (6) (k/m) to set channel 2 and its marker.
7. Adjust the “FN VCO TUNE” (see Figure 3-15) with a non-metallic tool so that the channel 1 marker is as many divisions above the reference line as the channel 2 marker is below it. (See Figure 3-16.)
8. To fine-tune this adjustment, press (Preset) (Sweep Setup) **CW FREQ** (System) **SERVICE MENU** **ANALOG BUS ON** **SERVICE MODES** **FRACN TUNE ON** to set “FRAC N TUNE” to 29.2 MHz.

Figure 3-15 Location of the FN VCO TUNE Adjustment

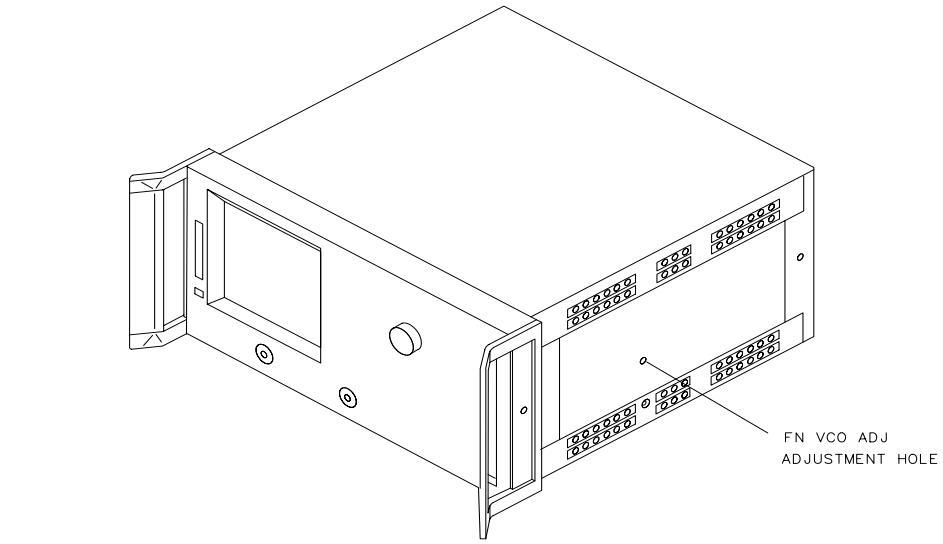
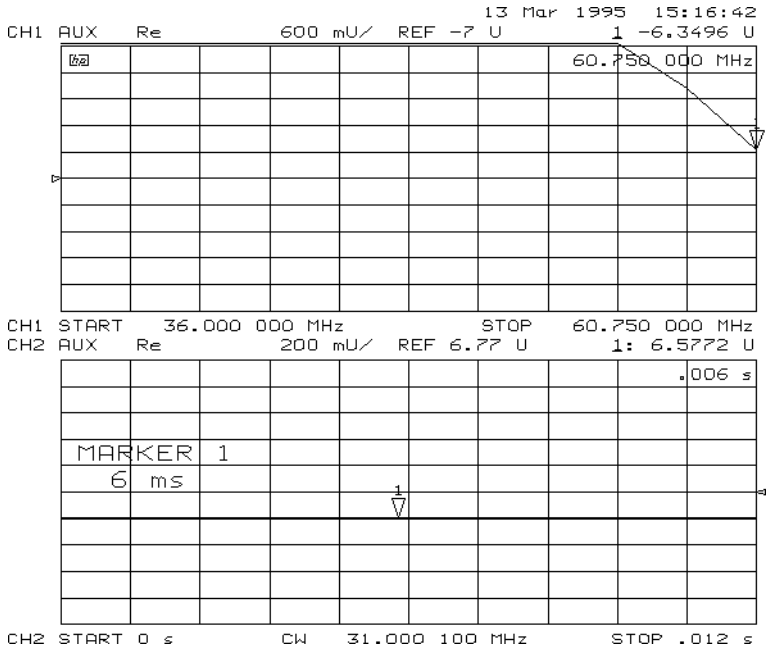


Figure 3-16 Fractional-N Frequency Range Adjustment Display



9. Press (Meas) **ANALOG IN Aux Input** (29) (x1) (Marker) (Format) **MORE** **REAL** (Scale Ref) **REFERENCE VALUE** (7) (x1).

10.Observe the analyzer for the results of this adjustment:

- If the marker value is less than 7, you have completed this procedure.
- If the marker value is greater than 7, readjust “FN VCO ADJ” to 7. Then perform steps 2 to 10 to confirm that the channel 1 and channel 2 markers are still above and below the reference line respectively.
- If you cannot adjust the analyzer correctly, replace the A14 board assembly.

Frequency Accuracy Adjustment

Required Equipment and Tools

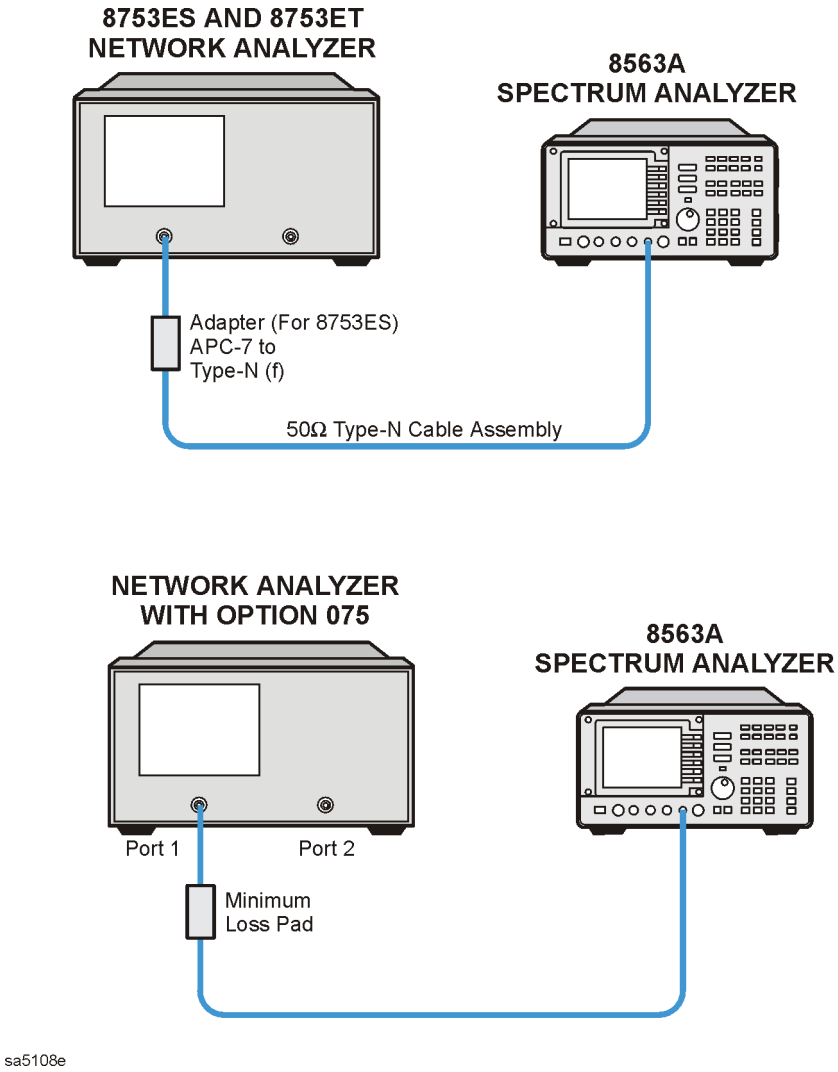
Description	HP/Agilent Part or Model Number
Spectrum analyzer	8563E
RF Cable: 50Ω Type-N, 24-inch	8120-4781
Non-metallic adjustment tool	8830-0024
Antistatic wrist strap	9300-1367
Antistatic wrist strap cord	9300-0980
Static-control table mat and ground wire	9300-0797
Additional Equipment for 50Ω Analyzers	
Adapter APC-7 to Type-N (f) (8753ES only)	11524A
Additional Equipment for 75Ω Analyzers	
Minimum loss pad	11852B

Analyzer warm-up time: **30 minutes.**

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

1. Remove the upper-rear bumpers and analyzer top cover.
2. Connect the equipment as shown in Figure 3-17.

Figure 3-17 Frequency Accuracy Adjustment Setup



NOTE Make sure that the spectrum analyzer and network analyzer references are *not* connected.

3. **For Option 1D5 Instruments Only:** Remove the BNC-to-BNC jumper that is connected between the "EXT REF" and the "10 MHz Precision Reference," as shown in Figure 3-19.
4. Set the spectrum analyzer measurement parameters as follows:

   FREQUENCY 3 G/n (or 6 G/n for Option 006) Span 60 kHz (or 120 kHz for Option 006) **AMPLITUDE** **REF LEVEL** 10 +dBm
5. On the network analyzer, press Preset Sweep Setup **CW FREQ** 3 G/n (or 6 G/n for Option 006).

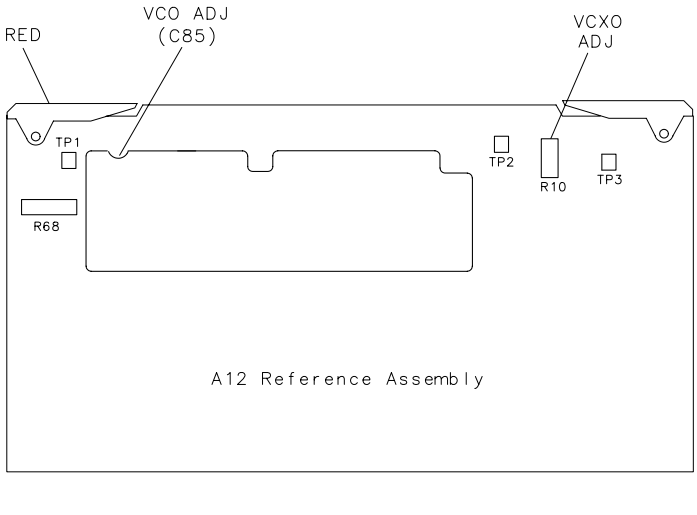
6. No adjustment is required if the spectrum analyzer measurement is within the following specifications:

   - ± 30 kHz for analyzers without Option 006
   - ± 60 kHz for analyzers with Option 006

   Otherwise, locate the A12 assembly (red extractors) and adjust the VCXO ADJ (see Figure 3-18) for a spectrum analyzer center frequency measurement within specifications.

7. Replace the A12 assembly if you are unable to adjust the frequency as specified. Repeat this adjustment test.

Figure 3-18 Location of the VCXO ADJ Adjustment



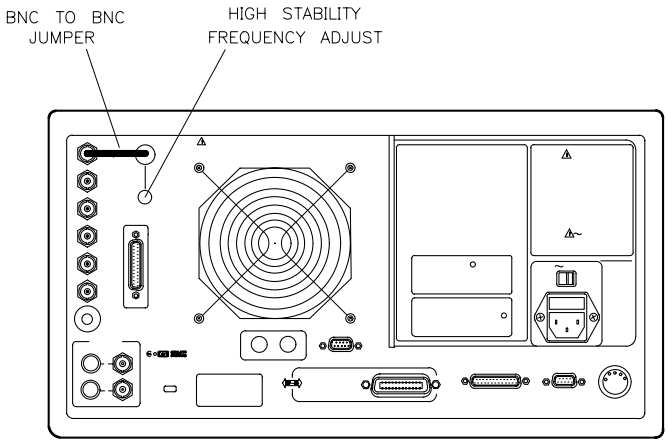
NOTE To increase the accuracy of this adjustment, the following steps are recommended.

8. Replace the instrument covers and wait 15 minutes in order to allow the analyzer to reach its precise operating temperature.
9. Recheck the CW frequency and adjust if necessary.

Instruments with Option 1D5 Only

10. Reconnect the BNC-to-BNC jumper between the “EXT REF” and the “10 MHz Precision Reference” as shown in Figure 3-19.

Figure 3-19 High Stability Frequency Adjustment Location



11. Insert a narrow screwdriver and adjust the high-stability frequency reference potentiometer for a CW frequency measurement within specification.

In Case of Difficulty

Replace the A26 assembly if you cannot adjust the CW frequency within specification.

High/Low Band Transition Adjustment

Required Equipment and Tools

Description	HP/Agilent Part or Model Number
Non-metallic adjustment tool	8830-0024

Analyzer warm-up time: **30 minutes.**

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

1. Press (Preset) (System) **SERVICE MENU** **ANALOG BUS ON** (Start) (11) (M/µ) (Stop) (21) (M/µ) to observe part of both the low and high bands on the analog bus.
2. Press (Meas) **ANALOG IN Aux Input** (22) (x1) (Format) **MORE** **REAL** (Display) **DATA→MEM** **DATA–MEMORY** to subtract the ground voltage from the next measurement.
3. Press (Meas) **ANALOG IN Aux Input** (23) (x1) (Marker) (11) (M/µ).
4. Press (Scale Ref) (.1) (x1) and observe the VCO tuning trace:
   - If the left half of trace = 0 ± 1000 mV and right half of trace = 100 to 200 mV higher (one to two divisions, see Figure 3-20): no adjustment is necessary.
   - If adjustment is necessary, follow these steps:
     a. Adjust the VCO tune (see Figure 3-21) to position the left half of the trace to 0 ±125 mV. The variable capacitor, C85, has a half-turn tuning range if the A12 Reference Board is part number 08753-60209, and seven turns if the part number is 08753-60357. Be careful not to overtighten and damage the seven-turn capacitor.
     b. Adjust the HBLB (see Figure 3-21) to position the right half of the trace 125 to 175 mV (about 1 to 1.5 divisions) higher than the left half.
   - Refer to Chapter 7 , “Source Troubleshooting,” if you cannot perform the adjustment.

Figure 3-20 High/Low Band Transition Adjustment Trace

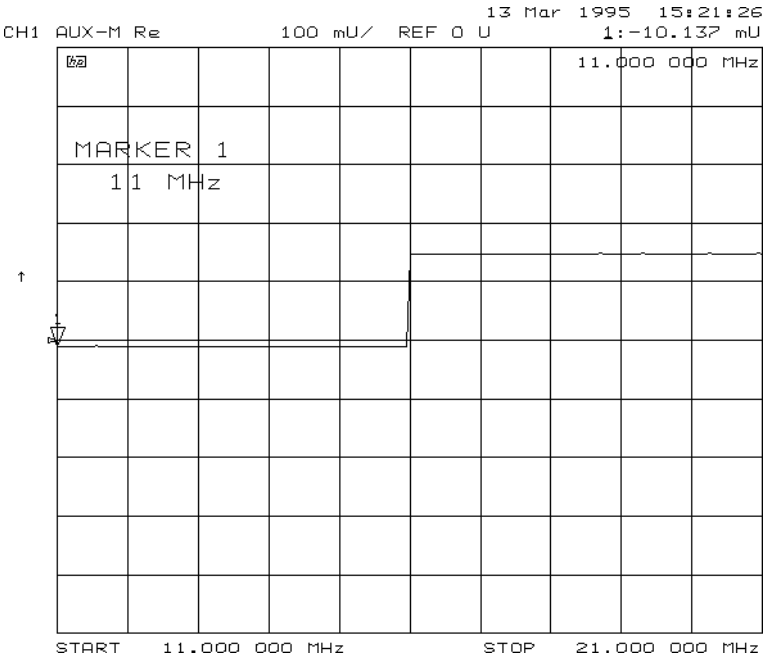
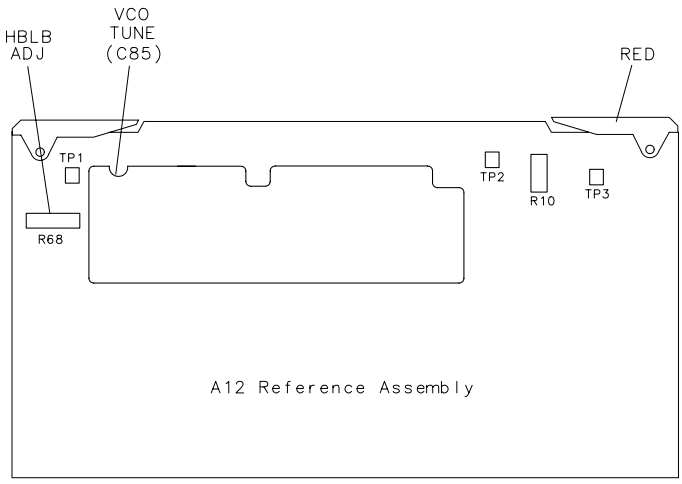


Figure 3-21 High/Low Band Adjustment Locations



Fractional-N Spur Avoidance and FM Sideband Adjustment

Required Equipment and Tools

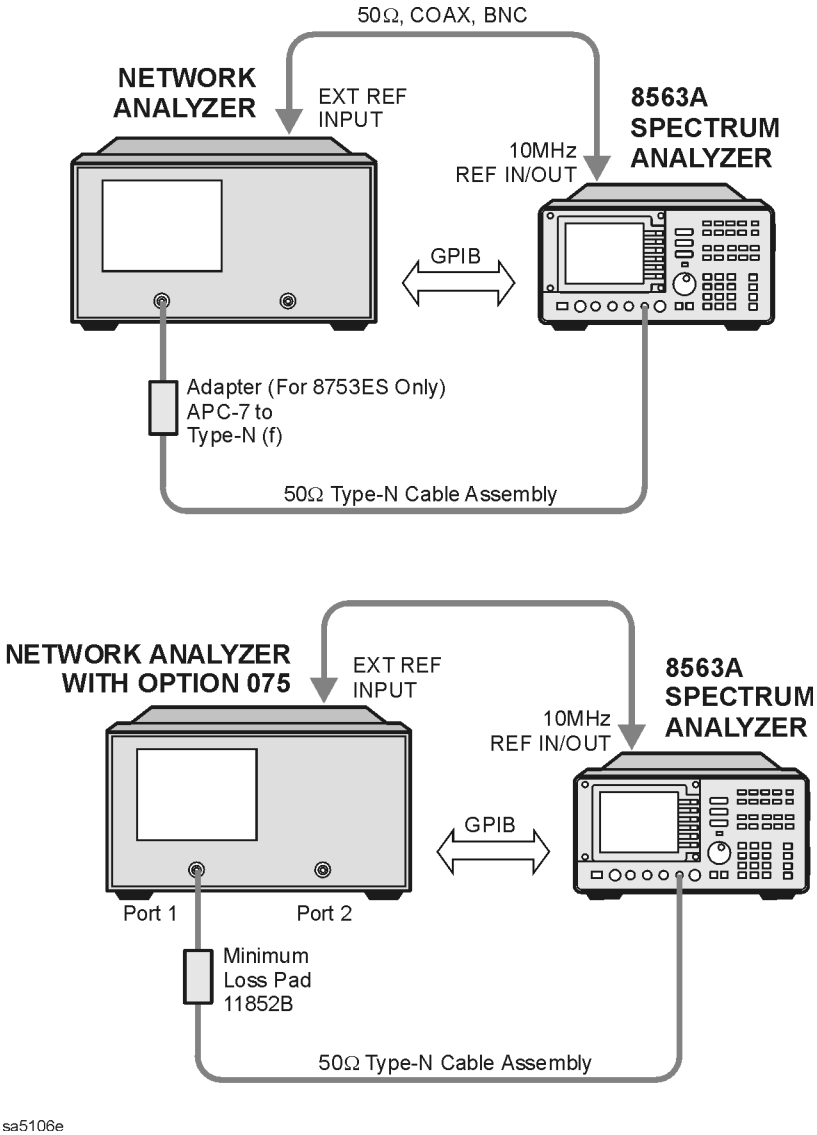
Description	HP/Agilent Part or Model Number
Spectrum analyzer	8563E
GPIB Cable	10833A/B/C/D
RF Cable: 50Ω, Type-N, 24-inch	8120-4781
Cable: 50Ω Coax, BNC (m) to BNC (m)	10503A
Non-metallic adjustment tool	8830-0024
Antistatic wrist strap	9300-1367
Antistatic wrist strap cord	9300-0980
Static-control table mat and ground wire	9300-0797
Additional Equipment for 50Ω Analyzers	
Adapter APC-7 to Type-N (f) (8753ES only)	11524A
Additional Equipment for 75Ω Analyzers	
Minimum loss pad	11852B

Analyzer warm-up time: **30 minutes.**

This adjustment minimizes the spurs caused by the API (analog phase interpolator, on the fractional-N assembly) circuits. It also improves the sideband characteristics.

1. Connect the equipment as shown in Figure 3-22.
2. Make sure the instruments are set to their default GPIB addresses: 8753ES/ET= 16, spectrum analyzer = 18.

Figure 3-22 Fractional-N Spur Avoidance and FM Sideband Adjustment Setup



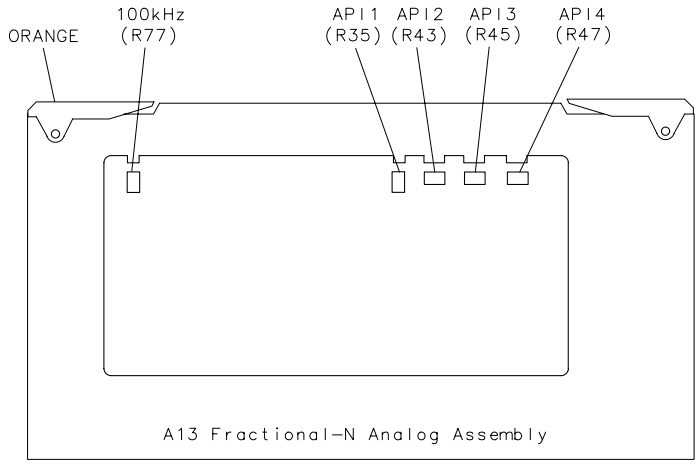
3. Set the spectrum analyzer measurement parameters as follows:

Reference Level	0 dBm
Resolution Bandwidth	100 Hz
Center Frequency	676.145105 MHz
Span	2.5 kHz

4. On the analyzer, press (Preset) (Avg) **IF BW** (3000) (x1) (Sweep Setup) **CW FREQ** (676.045105) (M/μ).

5. Adjust the 100 kHz (R77) for a null (minimum amplitude) on the spectrum analyzer. The minimum signal may, or may not, drop down into the noise floor.

Figure 3-23 Location of API and 100 kHz Adjustments



6. On the spectrum analyzer, set the center frequency for 676.051105 MHz.
7. On the analyzer, press Sweep Setup **CW FREQ** 676.048105 M/µ.
8. Adjust the API1 (R35) for a null (minimum amplitude) on the spectrum analyzer.
9. On the spectrum analyzer, set the center frequency for 676.007515 MHz.
10. On the analyzer, press Sweep Setup **CW FREQ** 676.004515 M/µ.
11. Adjust the API2 (R43) for a null (minimum amplitude) on the spectrum analyzer.
12. On the spectrum analyzer, set the center frequency for 676.003450 MHz.
13. On the analyzer, press Sweep Setup **CW FREQ** 676.00045 M/µ.
14. Adjust the API3 (R45) for a null (minimum amplitude) on the spectrum analyzer.
15. On the spectrum analyzer, set the center frequency for 676.003045 MHz.
16. On the analyzer, press Sweep Setup **CW FREQ** 676.000045 M/µ.
17. Adjust the API4 (R47) for a null (minimum amplitude) on the spectrum analyzer.

In Case of Difficulty

18. If this adjustment cannot be performed satisfactorily, repeat the entire procedure, or replace the A13 board assembly.

Source Spur Avoidance Tracking Adjustment

Required Equipment and Tools

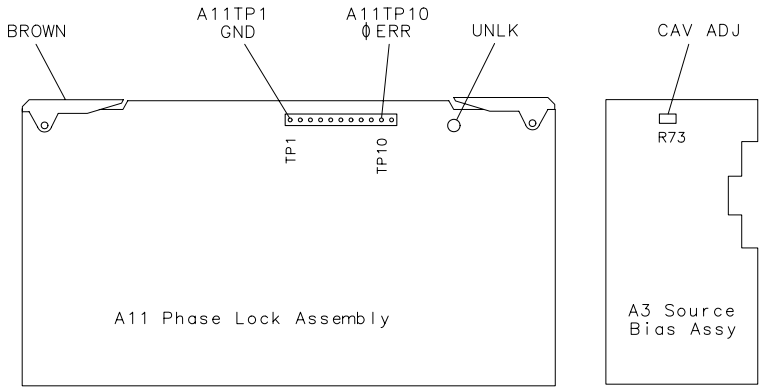
Description	HP/Agilent Part Number
BNC alligator clip adapter	8120-1292
BNC-to-BNC cable	8120-1840
Antistatic wrist strap	9300-1367
Antistatic wrist strap cord	9300-0980
Static-control table mat and ground wire	9300-0797

Analyzer warm-up time: **30 minutes.**

This adjustment optimizes tracking between the YO (YIG oscillator) and the cavity oscillator when they are frequency offset to avoid spurs. Optimizing YO-cavity oscillator tracking reduces potential phase-locked loop problems.

1. Mate the adapter to the BNC cable and connect the BNC connector end to AUX INPUT on the analyzer's rear panel. Connect the BNC center conductor alligator-clip to A11 TP10 (labeled ϕ ERR); the shield clip to A11 TP1 (GND) as shown in Figure 3-24.

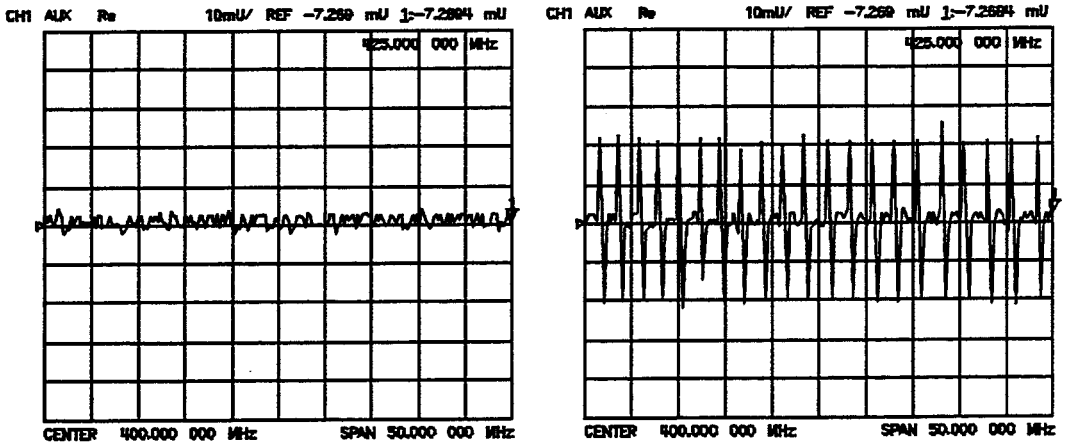
Figure 3-24 Location of A11 Test Points and A3 CAV ADJ Adjustments



2. Press Preset Center 400 M/µ Span 50 M/µ.
3. Press System **SERVICE MENU** **ANALOG BUS ON** Meas **ANALOG IN Aux Input** 11 x1.
4. Press Format **MORE** **REAL** Scale Ref 10 k/m **MARKER→REFERENCE**.
5. To make sure that you have connected the test points properly, adjust the CAV ADJ potentiometer while observing the analyzer display. You should notice a change in voltage.

6. Observe the phase locked loop error voltage:
   - If “spikes” are not visible on the analyzer display (see Figure 3-25): no adjustment is necessary.
   - If “spikes” are excessive (see Figure 3-25): adjust the CAV ADJ potentiometer (see Figure 3-24) on the A3 source bias assembly to eliminate the spikes.
   - If the “spikes” persist, refer to Chapter 7 , “Source Troubleshooting.”

Figure 3-25 Display of Acceptable versus Excessive Spikes



Unprotected Hardware Option Numbers Correction Constants

Analyzer warm-up time: **None.**

This procedure stores the instrument's unprotected option(s) information in A9 CPU assembly EEPROMs.

1. Make sure the A9 switch is in the Alter position.
2. Record the installed options that are printed on the rear panel of the analyzer.
3. Press (System) **SERVICE MENU** **PEEK/POKE** **PEEK/POKE ADDRESS** .
4. Refer to Table 3-2 for the address of each unprotected hardware option. Enter the address for the specific installed hardware option that needs to be enabled or disabled. Follow the address entry by **POKE** (–1) (x1).
   - Pressing **POKE** (–1) (x1) after an entry enables the option.
   - Pressing **POKE** (0) (x1) after an entry disables the option.

Table 3-2 PEEK/POKE Addresses

Hardware Options	PEEK/POKE Address
1D5	1619001529
011	1619001532
004	1619001531
014	1619001543
075	1619001528

5. Repeat steps 3 and 4 for all of the unprotected options that you want to enable.
6. After you have entered all of the instrument's hardware options, press the following keys:

   (System) **SERVICE MENU** **FIRMWARE REVISION**
7. View the analyzer display for the listed options.
8. When you have entered all of the hardware options, return the A9 switch to the Normal position.
9. Perform the "EEPROM Backup Disk Procedure" on page 3-34.

In Case of Difficulty

If any of the installed options are missing from the list, return to step 2 and re-enter the missing option(s).

Sequences for Mechanical Adjustments

The network analyzer has the capability of automating tasks through a sequencing function. The following adjustment sequences are available from the Agilent Technologies web site on the World Wide Web.

- Fractional-N Frequency Range Adjustment (FNADJ and FNCHK)
- High/Low Band Transition Adjustment (HBLBADJ)
- Fractional-N Spur Avoidance and FM Sideband Adjustment (APIADJ)

To download these adjustment sequences from the Internet:

Go the Agilent Technologies Website at the following URL:	`http://www.agilent.com/`
Using the search function, search on the following phrase:	8753 adjustment sequence

How to Load Sequences from Disk

1. Place the sequence disk in the analyzer disk drive.
2. Press (Local) **SYSTEM CONTROLLER** (Seq) **MORE** **LOAD SEQ FROM DISK** **READ SEQ FILE TITLES** .
3. Select any or all of the following sequence files by pressing:
   - Select **LOAD SEQ APIADJ** if you want to load the file for the “Fractional-N Spur Avoidance and FM Sideband Adjustment.”
   - Select **LOAD SEQ HBLBADJ** if you want to load the file for the “High/Low Band Transition Adjustment.”
   - Select **LOAD SEQ FNADJ** and **LOAD SEQ FNCHK** if you want to load the files for the “Fractional-N Frequency Range Adjustment.”

How to Set Up the Fractional-N Frequency Range Adjustment

1. Remove the right-rear bumpers and right side cover. This exposes the adjustment location in the sheet metal.
2. Press (Preset) **SEQUENCE X FNADJ** (where X is the sequence number).
3. Adjust the “FN VCO TUNE” with a non-metallic tool so that the channel 1 marker is as many divisions above the reference line as the channel 2 marker is below it.
4. Press (Preset) **SEQUENCE X FNCHK** (where X is the sequence number).
   - If the marker value is <7, you have completed this procedure.
   - If the marker value is >7, readjust “FN VCO TUNE” to 7. Then repeat steps 2, 3, and 4 to confirm that the channel 1 and channel 2 markers are still above and below the reference line respectively.

How to Set Up the High/Low Band Transition Adjustments

1. Press (Preset) **SEQ X HBLBADJ** (where X is the sequence number).
2. Observe the VCO tuning trace:
   - If the left half of trace = 0 ± 1000 mV and right half of trace = 100 to 200 mV higher (one to two divisions): no adjustment is necessary.
   - If the adjustment is necessary, follow these steps:
     a. Remove the upper-rear bumpers and top cover, using a TORX screwdriver.
     b. Adjust the VCO tune (A12 C85) to position the left half of the trace to 0 ± 125 mV. This is a very sensitive adjustment where the trace could easily go off of the screen.
     c. Adjust the HBLB (A12 R68) to position the right half of the trace 125 to 175 mV (about 1 to 1.5 divisions) higher than the left half.
   - Refer to Chapter 7 , “Source Troubleshooting,” if you cannot perform the adjustment.

How to Set Up the Fractional-N Spur Avoidance and FM Sideband Adjustment

1. Press (Preset) **SEQUENCE X APIADJ** (where X is the sequence number).
2. Remove the upper-rear corner bumpers and the top cover, using a TORX screwdriver.
3. Follow the directions on the analyzer display and make all of the API adjustments.

Sequence Contents

Sequence for the High/Low Band Transition Adjustment

— Sequence HBLBADJ sets the hi-band to low-band switch point. —

PRESET
SYSTEM
    SERVICE MENU
        ANALOG BUS ON
START 11 M/u
STOP 21 M/u
MEAS
    ANALOG IN 22 x1 (A12 GND)
DISPLAY
    DATA > MEM
    DATA – MEM
MEAS
    ANALOG IN 23 x1 (VCO TUNE)
MKR 11 M/u
SCALE/REF .1 x1

Sequences for the Fractional-N Frequency Range Adjustment

— Sequence FNADJ sets up A14 (FRAC N Digital) VCO. —

DISPLAY
    DUAL CHAN ON
SYSTEM
    SERVICE MENU
        ANALOG BUS ON
SWEEP SETUP
    NUMBER OF POINTS 11 x1
    COUPLED CHAN OFF
START 36 M/u
STOP 60.75 M/u
SWEEP SETUP
    SWEEP TIME 12.5 k/m
MEAS
    ANALOG IN 29 x1 (FN VCO TUN)
SCALE/REF 0.6 x1
    REF VALUE –7 x1
MKR
CH 2
SWEEP SETUP
    CW FREQ 31.0001 M/u
    SWEEP TIME 12.375 k/m
MEAS
    ANALOG IN 29 x1 (FN VCO TUN)
SCALE/REF .2 x1
    REF VALUE 6.77 x1
MKR 6 k/m

— Sequence FNCHK checks the VCO adjustment. —

SWEEP SETUP
    CW FREQ 1 G/n
SYSTEM
    SERVICE MENU
        ANALOG BUS ON
        SERVICE MODES
            FRAC N TUNE ON
MEAS
    ANALOG IN 29 x1
MKR
SCALE/REF
    REF VALUE 7 x1

Sequences for the Fractional-N Avoidance and FM Sideband Adjustment

— Sequence APIADJ sets up the fractional-N API spur adjustments. —

```
TITLE
    SP 2.5K
PERIPHERAL HPIB ADDR
    18 x1
TITLE TO PERIPHERAL
WAIT x
    0 x1
TITLE
    AT 0DB
TITLE TO PERIPHERAL
WAIT x
    0 x1
TITLE
    RB 100HZ
TITLE TO PERIPHERAL
WAIT x
    0 x1
TITLE
    CF 676.145105MZ
TITLE TO PERIPHERAL
WAIT x
    0 x1
CW FREQ
    676.045105M/u
TITLE
    ADJ A13 100KHZ
SEQUENCE
PAUSE
TITLE
    CF 676.051105MZ
TITLE TO PERIPHERAL
WAIT x
    0 x1
CW FREQ
    676.048105M/u
TITLE
    ADJ A13 API1
SEQUENCE
PAUSE
```

TITLE

CF 676.007515MZ

TITLE TO PERIPHERAL

WAIT x

0 x1

CW FREQ

676.004515M/u

TITLE

ADJ A13 API2

SEQUENCE

PAUSE

TITLE

CF 676.003450MZ

TITLE TO PERIPHERAL

WAIT x

0 x1

CW FREQ

676.000450M/u

TITLE

ADJ A13 API3

SEQUENCE

PAUSE

TITLE

CF 676.003045MZ

TITLE TO PERIPHERAL

WAIT x

0 x1

CW FREQ

676.000045M/u

TITLE

ADJ A13 API4

4 Start Troubleshooting Here

The information in this chapter helps you:

- Identify the portion of the analyzer that is at fault.
- Locate the specific troubleshooting procedures to identify the assembly or peripheral at fault.

To identify the portion of the analyzer at fault, follow these procedures:

Step 1. Initial Observations on page 4-5

Step 2. Operator's Check on page 4-6

Step 3. GPIB Systems Check on page 4-8

Step 4. Faulty Group Isolation on page 4-10

Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an Agilent 8753ET/ES network analyzer.

1. Identify the faulty group. Refer to the information in this chapter. Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13 , “Replaceable Parts.”
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

Having Your Analyzer Serviced

If the analyzer should fail any of the following checks, call the nearest Agilent Technologies sales or service office to determine the warranty on your instrument, and whether repair will be on-site, or return to Agilent Technologies.

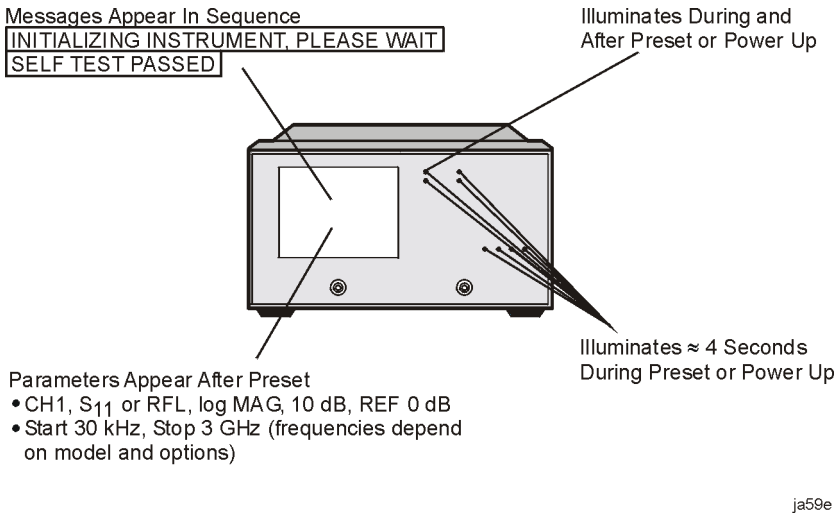
1. Choose the nearest Agilent Technologies service center. (Refer to "Contacting Agilent" on page 15-3.)
2. Include a detailed description of any failed test and any error message.
3. Ship the analyzer, using the original or comparable antistatic packaging materials.

Step 1. Initial Observations

Initiate the Analyzer Self-Test

1. Disconnect all devices and peripherals from the analyzer.
2. Switch on the analyzer and press Preset.
3. Watch for the indications shown in Figure 4-1 to determine if the analyzer is operating correctly.

Figure 4-1 Preset Sequence



- If the self-test failed, refer to "Step 4. Faulty Group Isolation" on page 4-10.

Step 2. Operator's Check

Description

The operator's check consists of two tests to check Port 1 and Port 2 on the 8753ES, or the Reflection and Transmission port on the 8753ET. These tests are initiated via the front panel of the analyzer and are called “Port 1 Op Chk” and “Port 2 Op Chk.”

The operator's check determines that:

- The source is phase-locked across the entire frequency range.
- All three samplers are functioning properly.
- The transfer switch is operational (8753ES only).
- The attenuator steps 10 dB at a time. (8753ES and 8753ET Option 004 only)

Port 1 (8753ES) or Reflection Port (8753ET)

A short is connected to Port 1 to reflect all the source energy back into the analyzer for an A/R measurement.

For the 8753ES, the first part of “Port 1 Op Chk” checks the repeatability of the transfer switch. An S_{11} measurement is stored in memory and the switch is toggled to Port 2 and then back to Port 1 where another S_{11} measurement is made. The difference between the memory trace and the second trace is switch repeatability. This procedure is absent from the routine for the 8753ET, since it lacks a transfer switch.

The remaining part of the test exercises the internal attenuator in 10 dB steps over a 70 dB range.

The resulting measurements must fall within a limit testing window to pass the test. The window size is based on both source and receiver specifications.

Port 2 (8753ES) or Transmission Port (8753ET)

“Port 2 Op Chk” is essentially the same as “Port 1 Op Chk” for the 8753ES. The short is placed on Port 2 for the procedure.

For the 8753ET, the procedure calls for connecting a through cable between the Reflection and Transmission ports. RF power is obtained from the Reflection port. Again, the test exercises the internal attenuator (if the analyzer has Option 004) and checks that the B/R measurement falls within acceptable limits.

Required Equipment and Tools

Description	HP/Agilent Part or Model Number
Short (for 8753ES)	Part of 85031B Calibration Kit
Short (for 8753ET)	Part of 85032B Calibration Kit
Cable: 50Ω, Type-N	8120-4781

Analyzer warm-up time: **30 minutes.**

Procedure

1. Disconnect all devices, peripherals, and accessories (including adapters and limiters) from the analyzer.
2. To run the test for port 1, press (Preset) **PRESET: FACTORY** (Preset) (System) **SERVICE MENU** **TESTS** **EXTERNAL TESTS** .
3. The display should show "`TEST 21 Port 1 Op Chk`" in the active entry area.
4. Press **EXECUTE TEST** to begin the test.
5. At the prompt, connect the short to the port indicated. Make sure the connection is tight.
6. Press **CONTINUE** .
7. The test is a sequence of subtests. At the end of the subtests, the test title and result will be displayed. If all tests pass successfully, the overall test status will be `PASS`. If any test fails, the overall test status will be `FAIL`.
8. To run the test for port 2, press the step (⇦) key. The display should show "`TEST 22 Port 2 Op Chk`" in the active entry area.
9. Repeat steps 4 through 7.
   For an 8753ET:
   You will be prompted to connect a cable between the Reflection and Transmission ports.
10. If both tests pass, the analyzer is about 80% verified. If either test fails, refer to "Step 4. Faulty Group Isolation" on page 4-10, or:
    a. Make sure that the connection is tight. Repeat the test.
    b. Visually inspect the connector interfaces and clean if necessary (refer to "Principles of Microwave Connector Care" on page 1-7).
    c. Verify that the short meets published specifications.
    d. Substitute another short, and repeat the test.
    e. Finally, refer to the detailed tests located in this section, or fault-isolation procedures located in the troubleshooting sections.

Step 3. GPIB Systems Check

Check the analyzer's GPIB 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* GPIB 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	GPIB Address
8753ET/ES	16
Plotter port – GPIB	5
Printer port – GPIB	1
Disk (external)	0
Controller	21
Power meter – GPIB	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. Proceed to "Troubleshooting Systems with Multiple

Peripherals" on page 4-9, "Troubleshooting Systems with Controllers" on page 4-9, or "Step 4. Faulty Group Isolation" on page 4-10.

- If the result is not a copy of the analyzer display, suspect the GPIB function of the analyzer. Refer to Chapter 6 , "Digital Control Troubleshooting."

If Using an External Disk Drive

1. Select the external disk drive. Press (Save/Recall) **SELECT DISK** **EXTERNAL DISK** .
2. Verify that the address is set correctly. Press (Local) **SET ADDRESSES** **ADDRESS:DISK** .
3. Ensure that the disk drive is set up correctly:
   - Power is on.
   - An initialized disk in the correct drive.
   - Correct disk unit number and volume number (press (Local) to access the softkeys that display the numbers; default is 0 for both).
   - With hard disk (Winchester) drives, make sure the configuration switch is properly set (see drive manual).
4. Press (Start) (1) (M/μ) (Save/Recall) **SAVE STATE** . Then press (Preset) (Save/Recall) **RECALL STATE** .
   - If the resultant trace starts at 1 MHz, GPIB is functional in the analyzer. Proceed to "Troubleshooting Systems with Multiple Peripherals" on page 4-9, "Troubleshooting Systems with Controllers" on page 4-9, or "Step 4. Faulty Group Isolation" on page 4-10.
   - If the resultant trace does not start at 1 MHz, suspect the GPIB function of the analyzer: refer to Chapter 6 , "Digital Control Troubleshooting."

Troubleshooting Systems with Multiple Peripherals

Connect any other system peripherals (but not a controller) to the analyzer one at a time and check their functionality. Any problems observed are in the peripherals, cables, or are address problems (see above).

Troubleshooting Systems with Controllers

Passing the preceding checks indicates that the analyzer's peripheral functions are normal. Therefore, if the analyzer has not been operating properly with an external controller, check the following:

- The GPIB interface hardware is incorrectly installed or not operational.
- The programming syntax is incorrect. (Refer to your analyzer's programmer's guide.)

If the analyzer appears to be operating unexpectedly but has not completely failed, go to "Step 4. Faulty Group Isolation" on page 4-10.

Step 4. Faulty Group Isolation

Use the following procedures only if you have read the previous sections in this chapter and you think the problem is in the analyzer. These are simple procedures to verify the four functional groups in sequence, and determine which group is faulty.

The four functional groups are:

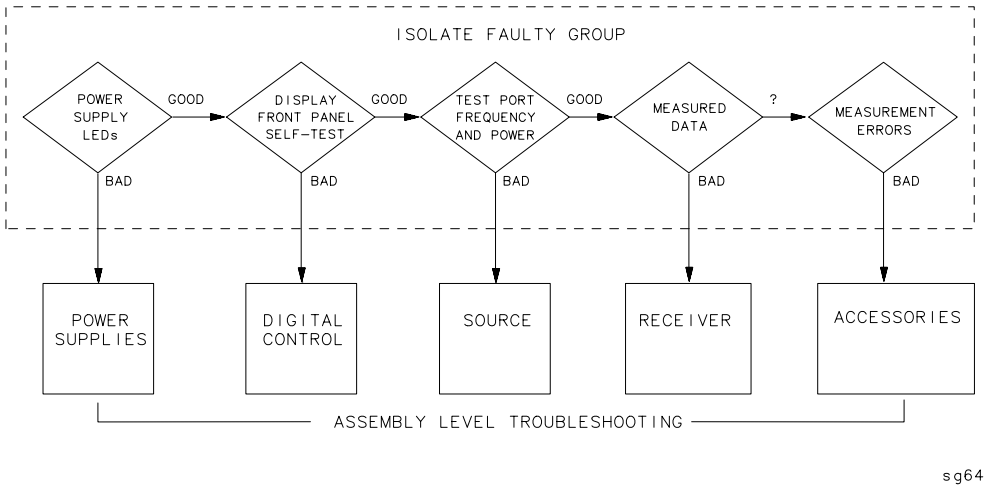
- power supplies
- digital control
- source
- receiver

Descriptions of these groups are provided in Chapter 12 , “Theory of Operation.”

The checks in the following pages must be performed in the order presented. If one of the procedures fails, it is an indication that the problem is in the functional group checked. Go to the troubleshooting information for the indicated group, to isolate the problem to the defective assembly.

Figure 4-2 illustrates the troubleshooting organization.

Figure 4-2 Troubleshooting Organization



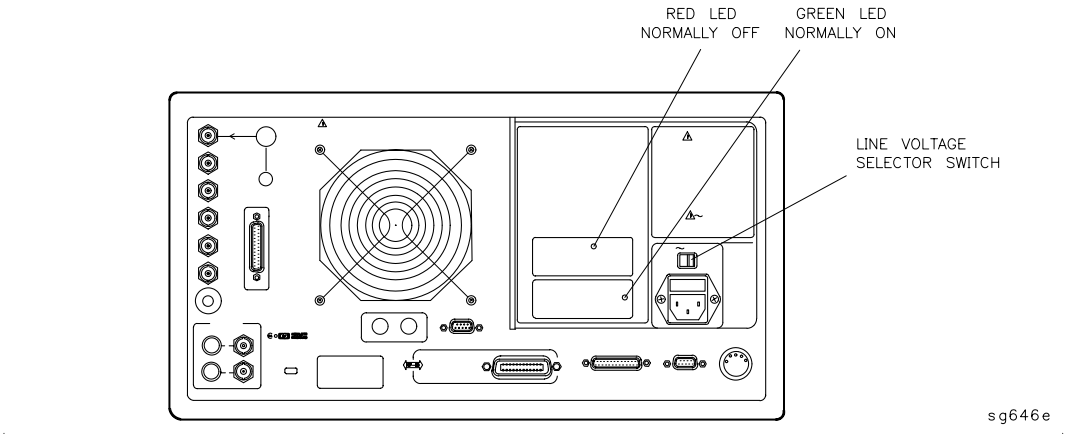
Power Supply

Check the Rear Panel LEDs

Switch on the analyzer. Notice the condition of the two LEDs on the A15 preregulator at rear of the analyzer. (See Figure 4-3.)

- The upper (red) LED should be off.
- The lower (green) LED should be on.

Figure 4-3 A15 Preregulator LEDs



Check the A8 Post Regulator LEDs

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

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

In case of difficulty, refer to Chapter 5 , “Power Supply Troubleshooting.”

Digital Control

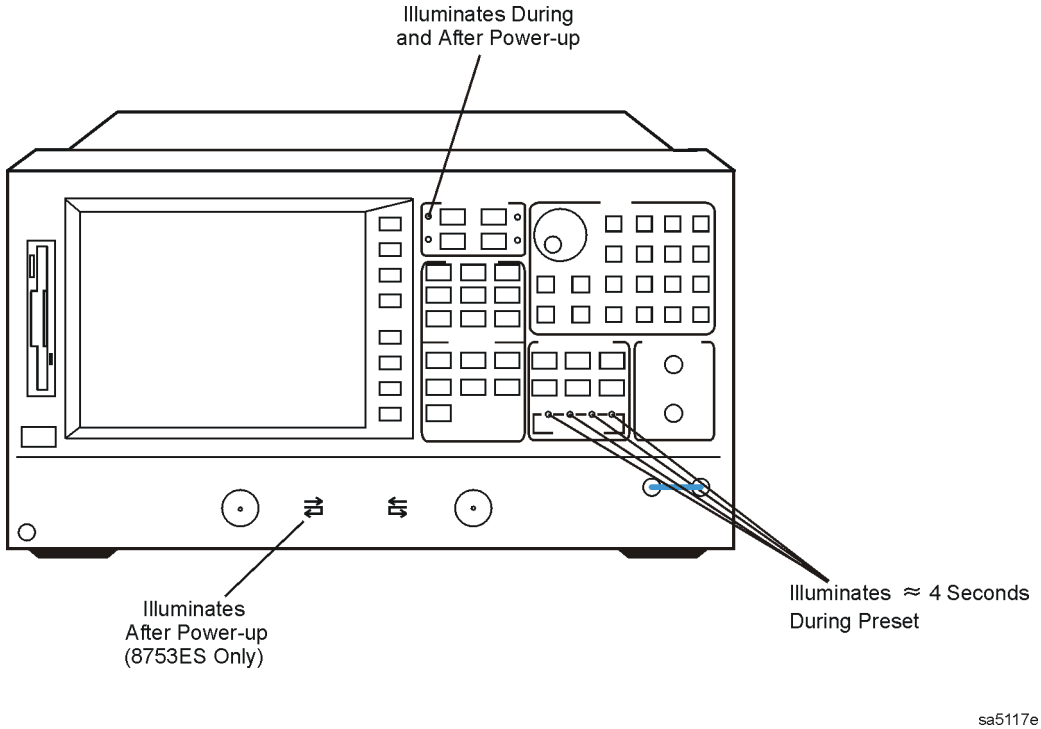
Observe the Power Up Sequence

Switch the analyzer power off, then on. The following should take place within a few seconds:

- On the front panel, observe the following:
  1. All eight amber LEDs illuminate.
  2. 8753ES Only: the Port 2 LED illuminates.
  3. The amber LEDs go off after a few seconds, except the Chan 1 LED.
     8753ES Only: the Port 2 LED goes off and the Port 1 LED illuminates. (See Figure 4-4.)
- The display should come up bright with no irregularity in colors.
- After an initial pattern, five red LEDs on the A9 CPU board should remain off. They can be observed through a small opening in the rear panel.

If the power up sequence does not occur as described, or if there are problems using the front panel keys, refer to Chapter 6 , “Digital Control Troubleshooting.”

Figure 4-4 Front Panel Power Up Sequence



Verify Internal Tests Passed

1. Press (Preset) (System) **SERVICE MENU** **TESTS** **INTERNAL TESTS** **EXECUTE TEST**. The display should indicate:

   ```
   TEST

   0 ALL INT       PASS
   ```

   - If your display shows the above message, go to step 2. Otherwise, continue with this step.
   - If phase lock error messages are present, this test may stop without passing or failing. In this case, continue with the next procedure to check the source.
   - If you have unexpected results, or if the analyzer indicates a specific test failure, that internal test (and possibly others) have failed; the analyzer reports the first failure detected. Refer to Chapter 6 , "Digital Control Troubleshooting."
   - If the analyzer indicates failure but does not identify the test, press (⇨) to search for the failed test. Then refer to Chapter 6 , "Digital Control Troubleshooting." Likewise, if the response to front panel or GPIB commands is unexpected, troubleshoot the digital control group.

2. Perform the analog bus test by pressing **RETURN** (19) (x1) **EXECUTE TEST**.
   - If this test fails, refer to Chapter 6 , "Digital Control Troubleshooting."
   - If this test passes, continue with the next procedure to check the source.

Source

Phase Lock Error Messages

The error messages listed below are usually indicative of a source failure or improper instrument configuration. (Ensure that the R channel input is receiving at least –35 dBm power). Continue with this procedure.

- `NO IF FOUND: CHECK R INPUT LEVEL`

  The first IF was not detected during the pretune stage of phase lock.

- `NO PHASE LOCK: CHECK R INPUT LEVEL`

  The first IF was detected at the pretune stage but phase lock could not be acquired thereafter.

- `PHASE LOCK LOST`

  Phase lock was acquired but then lost.

- `PHASE LOCK CAL FAILED`

  An internal phase lock calibration routine is automatically executed at power-on, when pretune values drift, or when phase lock problems are detected. A problem spoiled a calibration attempt.

- `POSSIBLE FALSE LOCK`

  The analyzer is achieving phase lock but possibly on the wrong harmonic comb tooth.

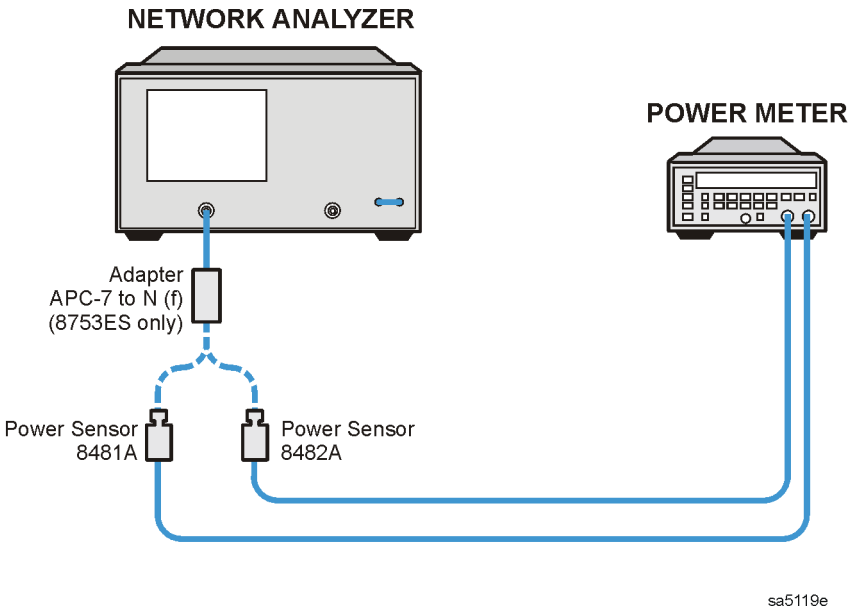
- `SWEEP TIME TOO FAST`

  The fractional-N and the digital IF circuits have lost synchronization.

Check Source Output Power

1. Connect the equipment as shown in Figure 4-5. Be sure that any special accessories, such as limiters, have been disconnected.

Figure 4-5 Equipment Setup for Source Power Check



2. Zero and calibrate the power meter. Press (Preset) on the analyzer to initialize the instrument.
3. On the analyzer, press (Sweep Setup) **CW FREQ** (300) (k/m) to output a CW 300 kHz signal. The power meter should read approximately 0 dBm.
4. Press (16) (M/μ) to change the CW frequency to 16 MHz. The output power should remain approximately 0 dBm throughout the analyzer frequency range. Repeat this step at 1 and 3 GHz. (For Option 006 include an additional check at 6 GHz.)

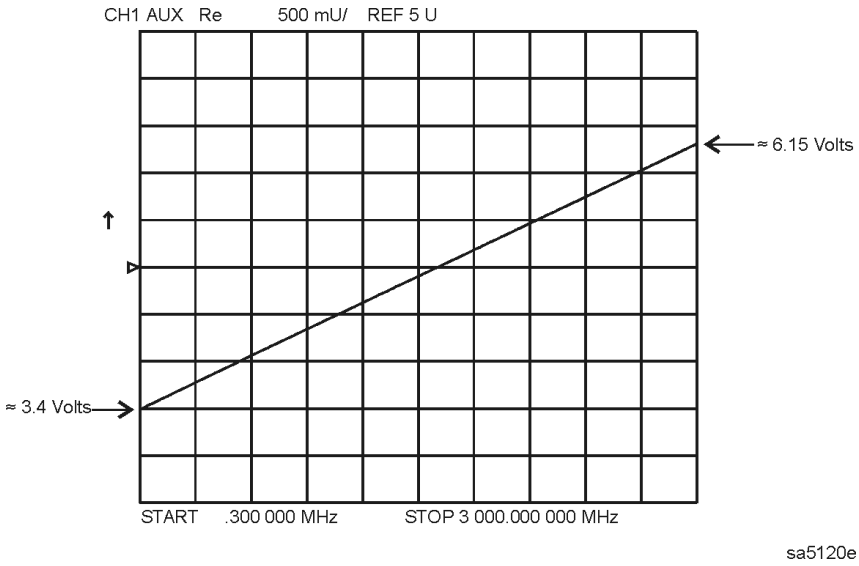
If any incorrect power levels are measured, refer to Chapter 7 , "Source Troubleshooting."

No Oscilloscope or Power Meter? Try the ABUS

1. Monitor ABUS node 16 by pressing (Preset) (Start) (300) (k/m) (Stop) (3) (G/n) (System) **SERVICE MENU** **ANALOG BUS ON** .
2. Press (Meas) **ANALOG IN Aux Input** (16) (x1).
3. (Format) **MORE** **REAL** (Scale Ref) **AUTOSCALE** .

The display should resemble Figure 4-6.

Figure 4-6 ABUS Node 16: 1 V/GHz



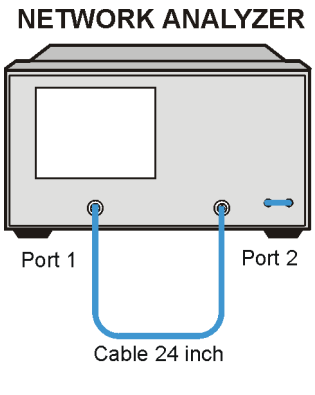
If any of the above procedures provide unexpected results, or if error messages are present, refer to Chapter 7 , “Source Troubleshooting.”

Receiver (8753ES)

Observe the A and B Input Traces

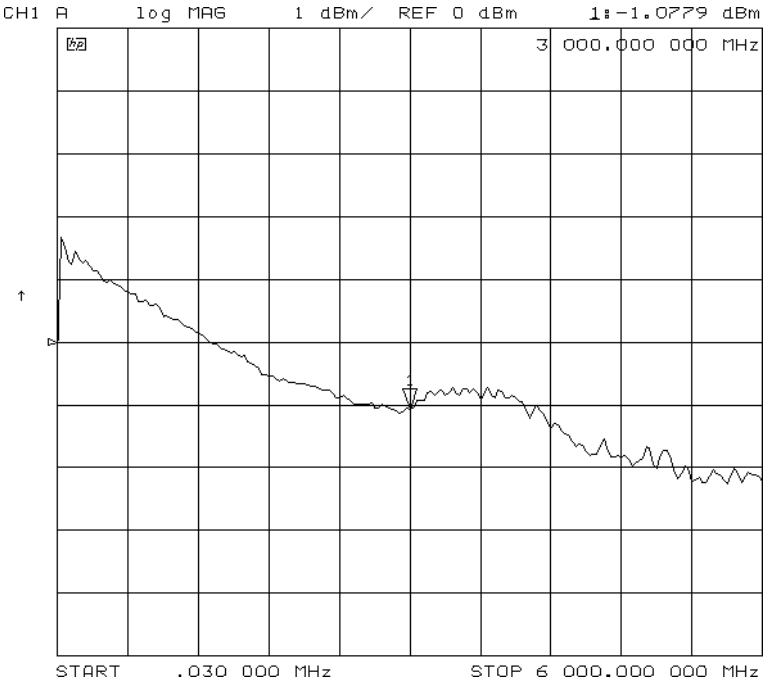
1. Connect the equipment as shown in Figure 4-7. Be sure that any special accessories, such as limiters, have been disconnected. (The through cable is part number 8120-4779 for 50Ω analyzers and 8120-2408 for 75Ω analyzers.)

Figure 4-7 Equipment Setup



2. Press (Preset) (Meas) **INPUT PORTS** **A** **TEST PORT 2** (Scale Ref) **AUTO SCALE**.
3. Observe the measurement trace displayed by the A input. The trace should have about the same flatness as the trace in Figure 4-8.
4. Press (Meas) **INPUT PORTS** **B** **TEST PORT 1**.
5. Observe the measurement trace displayed by the B input. The trace should have about the same flatness as the trace in Figure 4-8.

Figure 4-8 Typical Measurement Trace



If the source is working, but the A or B input traces appear to be in error, refer to Chapter 8 , "Receiver Troubleshooting."

The following symptoms may also indicate receiver failure.

Receiver Error Messages

- CAUTION: OVERLOAD ON INPUT A; POWER REDUCED
- CAUTION: OVERLOAD ON INPUT B; POWER REDUCED
- CAUTION: OVERLOAD ON INPUT R; POWER REDUCED

The error messages above indicate that you have exceeded approximately +14 dBm at one of the test ports. The RF output power is automatically reduced to –85 dBm. The annotation P↓ appears in the left margin of the display to indicate that the power trip function has been activated. When this occurs, press (Power) and enter a lower power level. Press **SOURCE PWR ON** to switch on the power again.

Faulty Data

Any trace data that appears to be below the noise floor of the analyzer (–100 dBm) is indicative of a receiver failure.

Receiver (8753ET)

Required Equipment

Description	HP/Agilent Part or Model Number
Short	Part of 85032B Calibration Kit
Cable: 50Ω, Type-N	8120-4781

Observe the A and B Input Traces

A Input

1. Connect the short to the Reflection port.
2. Press Preset Meas **INPUT PORTS** **A** Scale Ref **AUTO SCALE** **SCALE/DIV** 1 x1.
3. Observe the measurement trace displayed by the A input. The trace should have about the same flatness as the trace in Figure 4-9.

B Input

1. Disconnect the short from the Reflection port and connect the through cable between the Reflection and Transmission ports.
2. Press Meas **INPUT PORTS** **B** .
3. Observe the measurement trace displayed by the B input. The trace should have about the same flatness as the trace in Figure 4-10.

Figure 4-9 A Input: Typical Measurement Trace

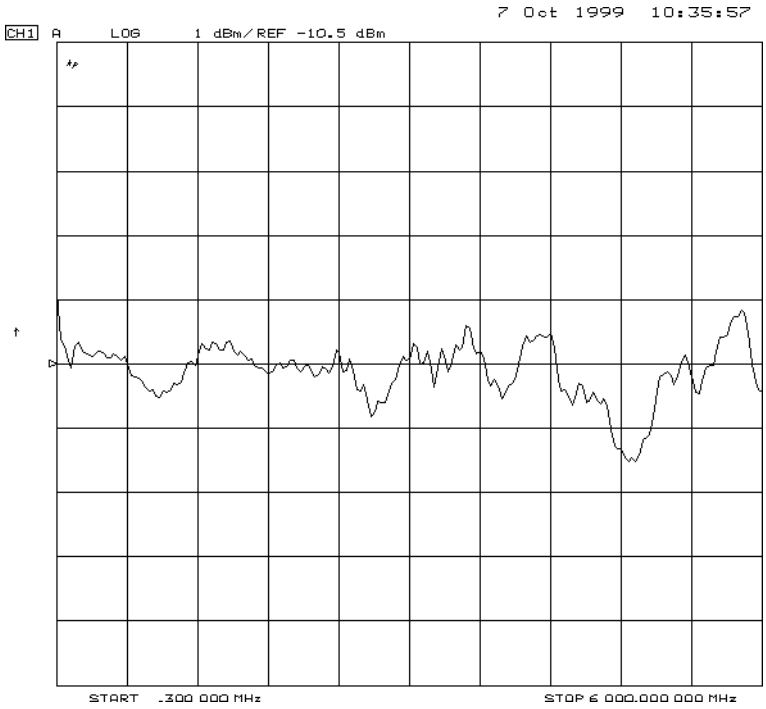
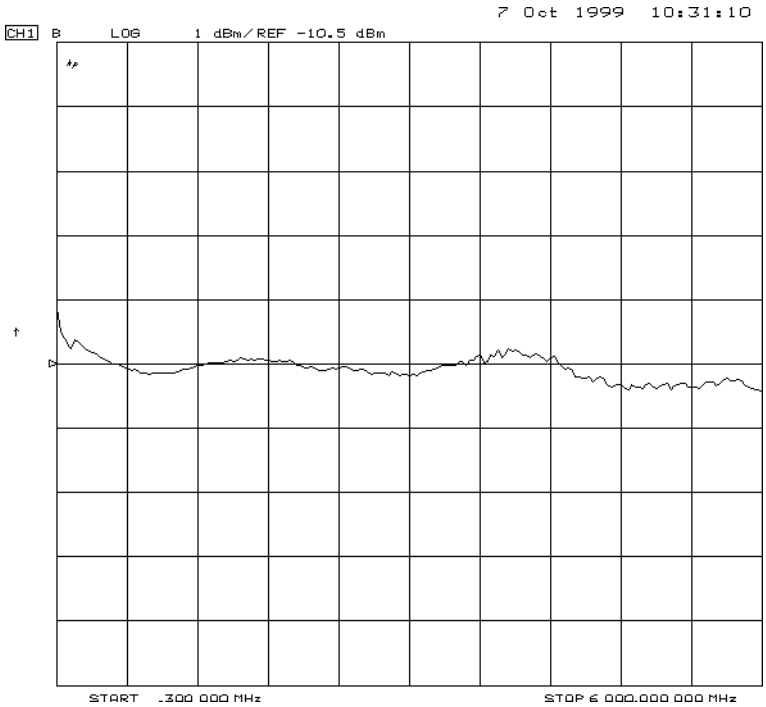


Figure 4-10 B Input: Typical Measurement Trace



If the source is working, but the A or B input traces appear to be in error, refer to Chapter 8 , "Receiver Troubleshooting."

The following symptoms may also indicate receiver failure.

Receiver Error Messages

- `CAUTION: OVERLOAD ON INPUT A; POWER REDUCED`
- `CAUTION: OVERLOAD ON INPUT B; POWER REDUCED`
- `CAUTION: OVERLOAD ON INPUT R; POWER REDUCED`

The error messages above indicate that you have exceeded approximately +14 dBm at one of the test ports. The RF output power is automatically reduced to –20 dBm (or –85 dBm for Option 004). The annotation P↓ appears in the left margin of the display to indicate that the power trip function has been activated. When this occurs, press (Power) and enter a lower power level. Press **SOURCE PWR ON** to switch on the power again.

Faulty Data

Any trace data that appears to be below the noise floor of the analyzer (–100 dBm) is indicative of a receiver failure.

Accessories

If the analyzer has passed all of the previous checks but is still making incorrect measurements, suspect the system accessories. Accessories such as RF or interconnect cables, calibration or verification kit devices, limiters, and adapters can all induce system problems.

Reconfigure the system as it is normally used and reconfirm the problem. Continue with Chapter 9 , “Accessories Troubleshooting.”

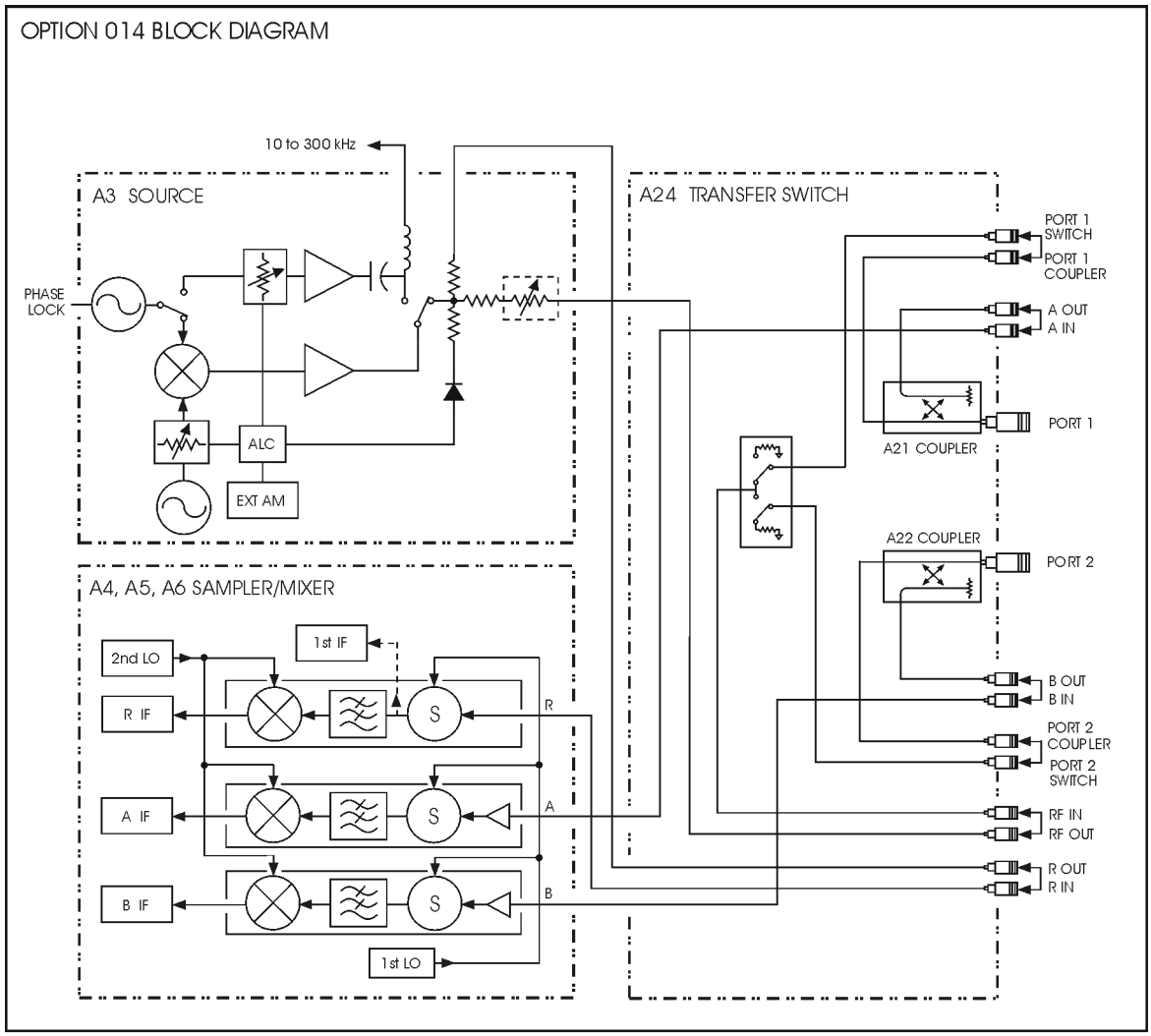
Accessories Error Messages

- `POWER PROBE SHUT DOWN!`

  The biasing supplies to a front panel powered device (like a probe or millimeter module) are shut down due to excessive current draw. Troubleshoot the device.

Troubleshooting 8753ES Option 014

Figure 4-11 8753ES Option 014



Description

This section provides the service procedure for troubleshooting the 8753ES Option 014, and is intended to be used as a guide in finding and fixing problems with the 8753ES Option 014 only. For information on troubleshooting the standard instrument, refer to the appropriate sections of this service guide.

The Option 014 troubleshooting guide is divided into sections called “Symptoms.” Each symptom corresponds to a possible problem experienced during the operation of the analyzer in the standard mode of operation.

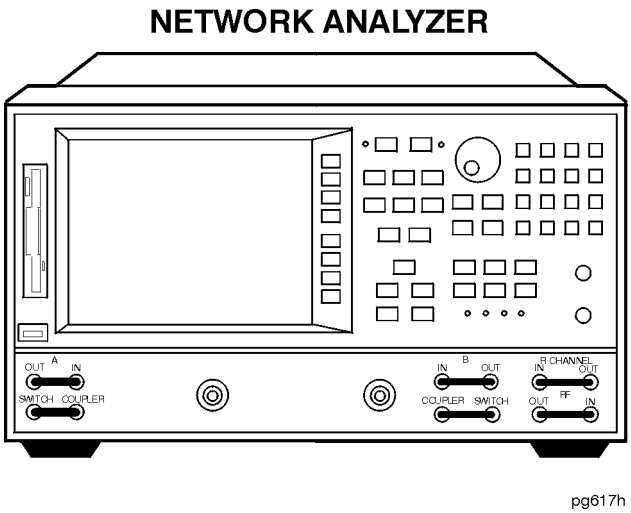
NOTE When servicing the 8573ES Option 014, configure the instrument in the standard mode. Refer to Figure 4-12, "Standard Mode Jumper Configuration." In this configuration all of the standard self-tests and performance tests are the same as the standard 8753ES.

Required Equipment and Tools

Description	HP/Agilent Part or Model Number
TORX T-10 Screwdriver	
Torque Wrench 5/16 inch[a]	8710-1765
Calibration Kit: 7mm	85031B
RF Cable: APC-7, 24-inch (610mm)	8120-4779

a. The torque is 8 inch pounds.

Figure 4-12 Standard Mode Jumper Configuration



Setup

1. Press (Preset).
2. Connect the RF cable between PORT 1 and PORT 2.

Measurements

Perform the following measurements. Observe the response and make note of any irregularities or degraded response in the frequency response. Refer to Figure 4-13, Figure 4-14, and Figure 4-15 for examples of different responses. Complete all of the steps listed. If a problem occurs, match the measurement (S11, S21, S12, S22) where the problem was displayed, to the symptom that closest describes the problem. For information on how to make measurements, refer to your analyzer's user's guide.

1. Measure the S21 response by pressing (Meas) **Trans: FWD S21 (B/R)** .
2. Measure the S12 response by pressing **Trans: REV S12 (A/R)** .
3. Disconnect the cable from PORT 2.
4. Connect a short to the end of the test port cable.
5. Measure the S11 response by pressing **Refl: FWD S11 (A/R)** .
6. Disconnect the cable from PORT 1.
7. Connect the cable to PORT 2.
8. Measure the S22 response by pressing **Refl: REV S22 (B/R)** .

Symptom Example Plots

The following are examples of S21, S12, S11 and S22 measurements. Figure 4-13, "Example of a Good Measurement," shows what good S21 and S11 measurements would look like. (These are only examples. The signal that you see may vary with your instrument.) Figure 4-14, "Example of a Power Hole," and Figure 4-15, "Example of Frequency Roll Off," are examples of what an irregular or a degraded signal might look like. These plots are intended to be used only as examples for troubleshooting. Symptoms one through four include sample plots of what irregular or degraded signals may look like for the different S-parameter measurements described in the symptom.

CAUTION If problems are experienced and replacement parts are required, refer to Chapter 13 , "Replaceable Parts." It is recommended that all service be done by qualified Agilent Technologies service personnel.

Figure 4-13 Example of a Good Measurement

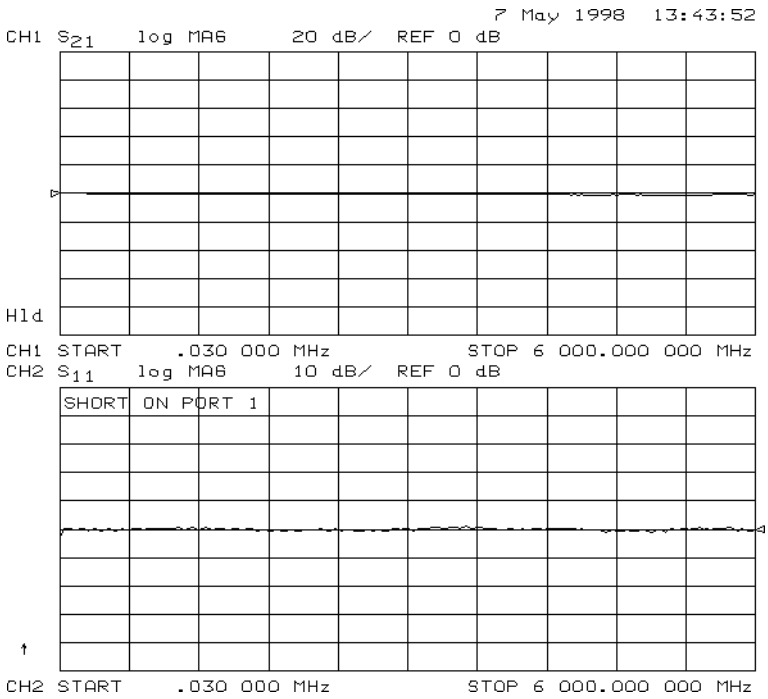


Figure 4-14 Example of a Power Hole

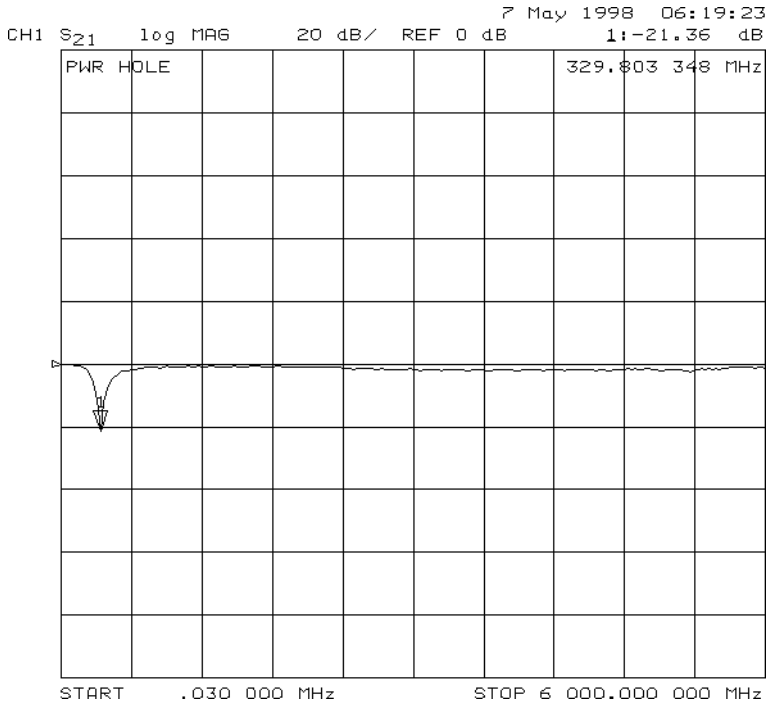
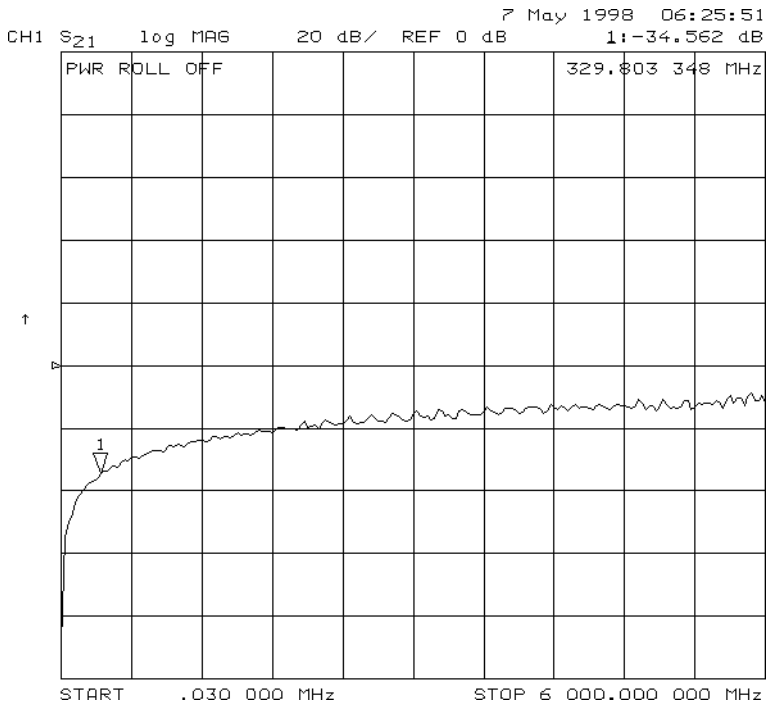


Figure 4-15 Example of Frequency Roll Off



Symptoms

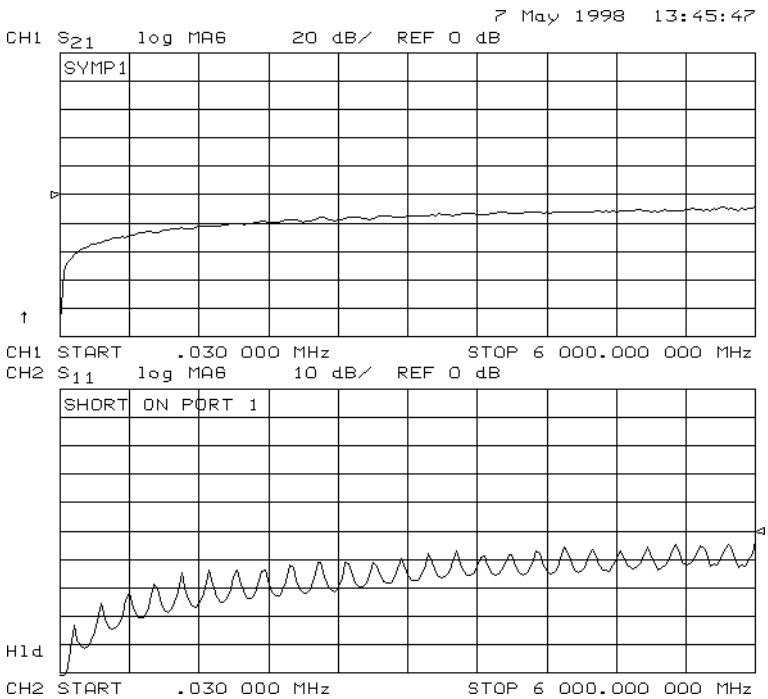
The following symptoms use the S22, S21, S12 and S11 test response as a guide for troubleshooting the 8753ES Option 014.

Symptom 1

Degraded or irregular response in the S11 and S21 measurement. No problems in the S22 or S12 response mode. Refer to Figure 4-16.

1. Check the jumper cable between PORT 1 SWITCH and PORT 1 COUPLER ports. If the jumper is damaged, replace it. If no damage can be found on the jumper, take a look at the SWITCH and COUPLER ports on the front panel. Inspect for damage to the ports. Look for damage to the center conductor (bent pin) or damaged threads on either port. Replace any damaged ports.
2. If no problems are found during inspection of the ports, reconnect the jumper from PORT 1 SWITCH port to the PORT 1 COUPLER port. Make sure that the jumper is connected correctly. Improper connections will cause power holes in the frequency response.
3. If the problem still persists, check the internal cables located in the RF test deck area. Refer to Figure 13-6 on page 13-17 for cable locations.

Figure 4-16 Example Symptom One

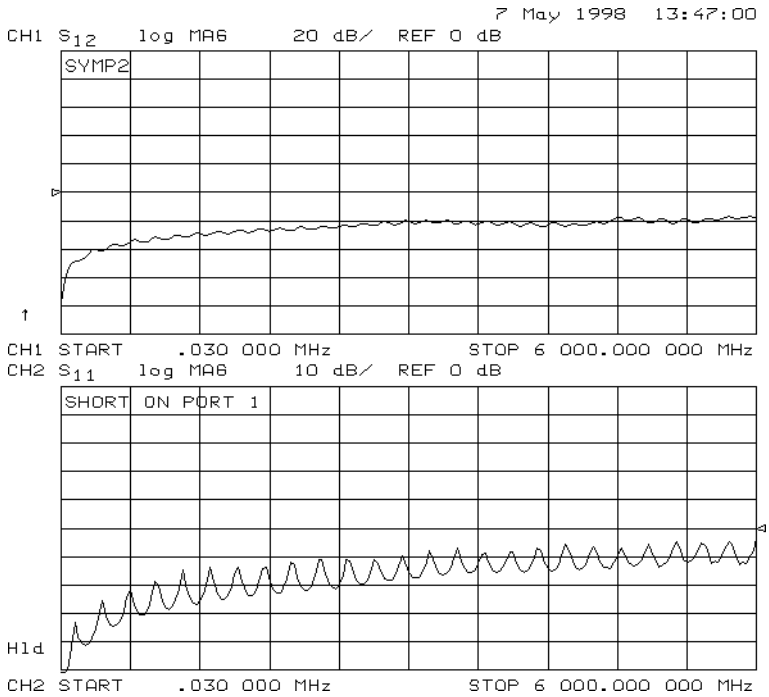


Symptom 2

Degraded or irregular response in the S11 and S12 measurement. No problems in the S22 or S21 response mode. Refer to Figure 4-17.

1. Check the jumper cable between the PORT 1 A IN and the PORT 1 A OUT ports. If the jumper is damaged, replace it. If no damage can be found on the jumper, take a look at the SWITCH and COUPLER ports on the front panel. Inspect for damage to the ports. Look for damage to the center conductor (bent pin) or damaged threads on either port. Replace any damaged ports.
2. If no problems are found during inspection of the ports, reconnect the jumper between the PORT 1 A IN and the PORT 1 A OUT port. Make sure that the jumper is connected correctly. Improper connections will cause power holes in the frequency response.
3. If the problem still persists, check the internal cables located in the RF test deck area. Refer to Figure 13-6 on page 13-17 for cable locations.

Figure 4-17 Example Symptom Two

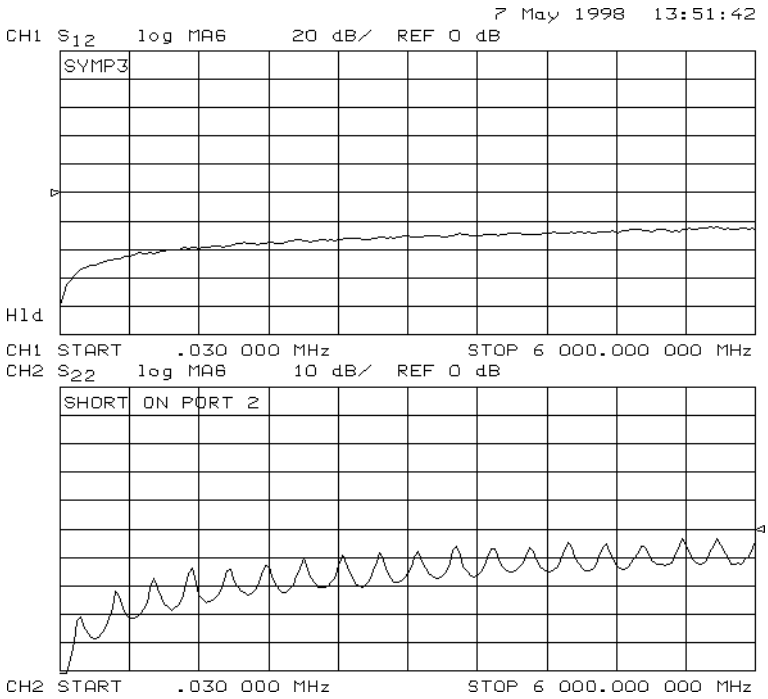


Symptom 3

Degraded or irregular response in the S22 and S12 measurement. No problems in the S11 or S21 response mode. Refer to Figure 4-18.

1. Check the jumper cable between the PORT 2 SWITCH and the PORT 2 COUPLER ports. If the jumper is damaged, replace it. If no damage can be found on the jumper, take a look at the SWITCH and COUPLER ports on the front panel. Inspect for damage to the ports. Look for damage to the center conductor (bent pin) or damaged threads on either port. Replace any damaged ports.
2. If no problems are found during inspection of the ports, reconnect the jumper between the PORT 2 SWITCH and the PORT 2 COUPLER port. Make sure that the jumper is connected correctly. Improper connections will cause power holes in the frequency response.
3. If the problem still persists, check the internal cables located in the RF test deck area. Refer to Figure 13-6 on page 13-17 for cable locations.

Figure 4-18 Example Symptom Three

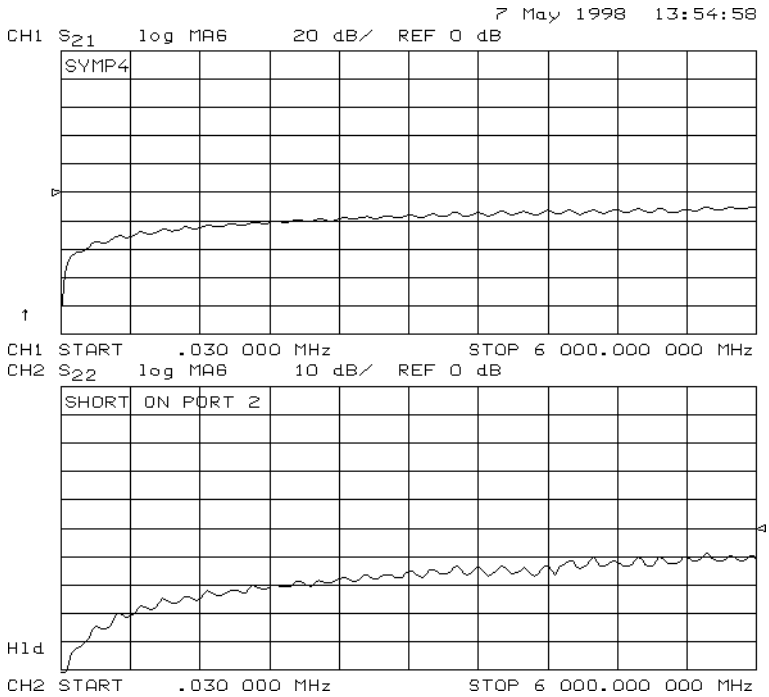


Symptom 4

Degraded or irregular response in the S22 and S21 measurement. No problems in the S11 or S12 response mode. Refer to Figure 4-19.

1. Check the jumper cable between the PORT 2 B IN and the PORT 2 B OUT ports. If the jumper is damaged, replace it. If no damage can be found on the jumper, take a look at the SWITCH and COUPLER ports on the front panel. Inspect for damage to the ports. Look for damage to the center conductor (bent pin) or damaged threads on either port. Replace any damaged ports.
2. If no problems are found during inspection of the ports, reconnect the jumper between the PORT 2 B IN and the PORT 2 B OUT port. Make sure that the jumper is connected correctly. Improper connections will cause power holes in the frequency response.
3. If the problem still persists, check the internal cables located in the RF test deck area. Refer to Figure 13-1 on page 13-6 for cable locations.

Figure 4-19 Example Symptom Four

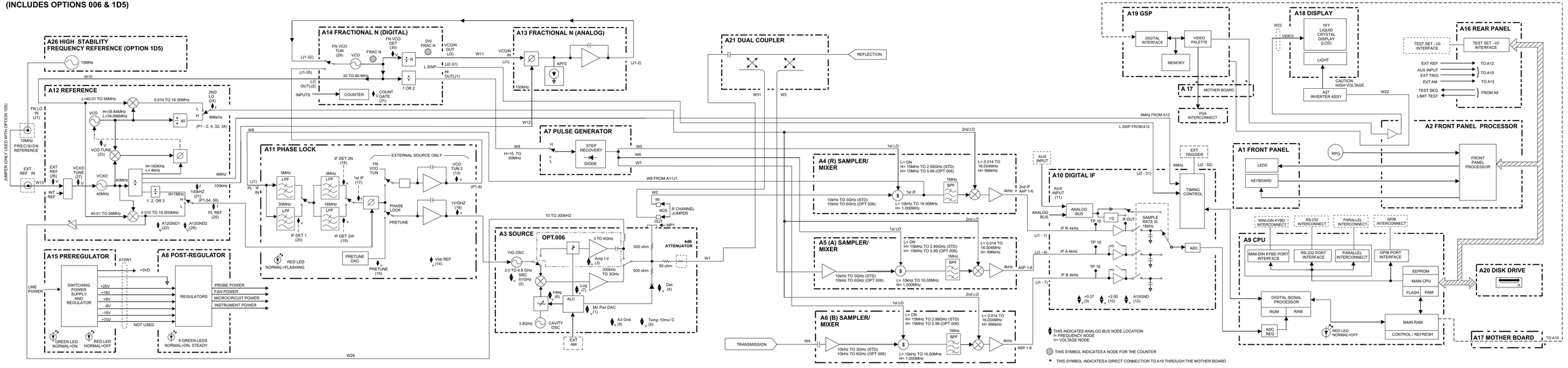


Symptom 5

Degraded or irregular response in all parameters.

1. Check the jumper cable between the RF IN and the RF OUT ports. If the jumper is damaged, replace it. If no damage can be found on the jumper, take a look at the SWITCH and COUPLER ports on the front panel. Inspect for damage to the ports. Look for damage to the center conductor (bent pin) or damaged threads on either port. Replace any damaged ports.
2. If no problems are found during inspection of the ports, reconnect the jumper between the RF IN and the RF OUT port. Make sure that the jumper is connected correctly. Improper connections will cause power holes in the frequency response.
3. If the problem still persists, check the internal cables located in the RF test deck area. Refer to Figure 13-6 on page 13-17 for cable locations.

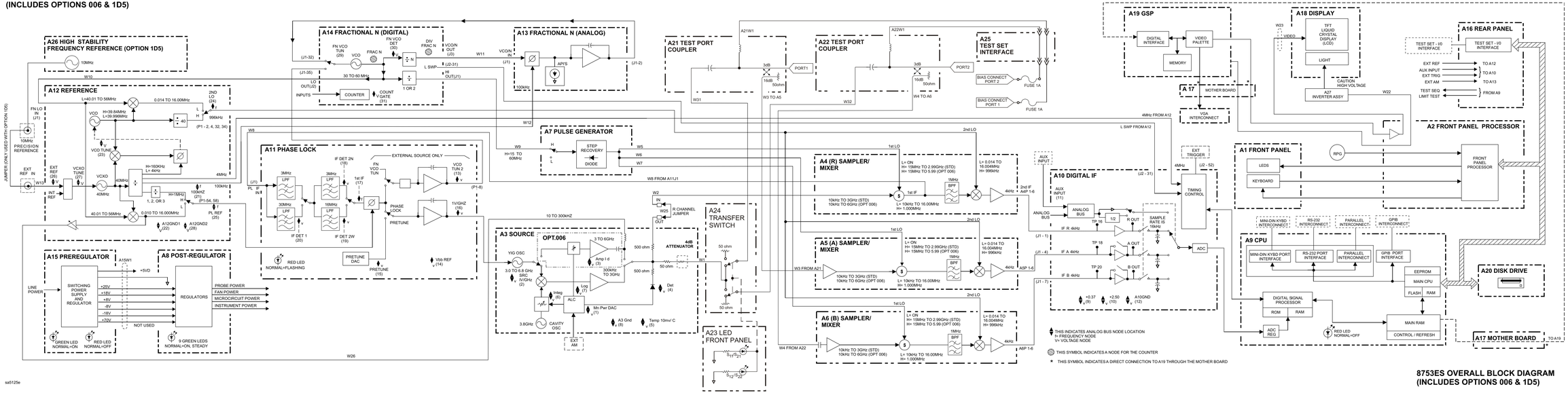
8753ET OVERALL BLOCK DIAGRAM
(INCLUDES OPTIONS 006 & 1D5)



sa51e

8753ET OVERALL BLOCK DIAGRAM
(INCLUDES OPTIONS 006 & 1D5)

8753ES OVERALL BLOCK DIAGRAM
(INCLUDES OPTIONS 006 & 1D5)



sa5125e

8753ES OVERALL BLOCK DIAGRAM
(INCLUDES OPTIONS 006 & 1D5)

5 Power Supply Troubleshooting

Power Supply Troubleshooting

Use this procedure only if you have read Chapter 4 , “Start Troubleshooting Here.” Follow the procedures in the order given, unless:

- an error message appears on the display; refer to “Error Messages” on page 5-17.
- the fan is not working; refer to “Fan Troubleshooting” on page 5-19.

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

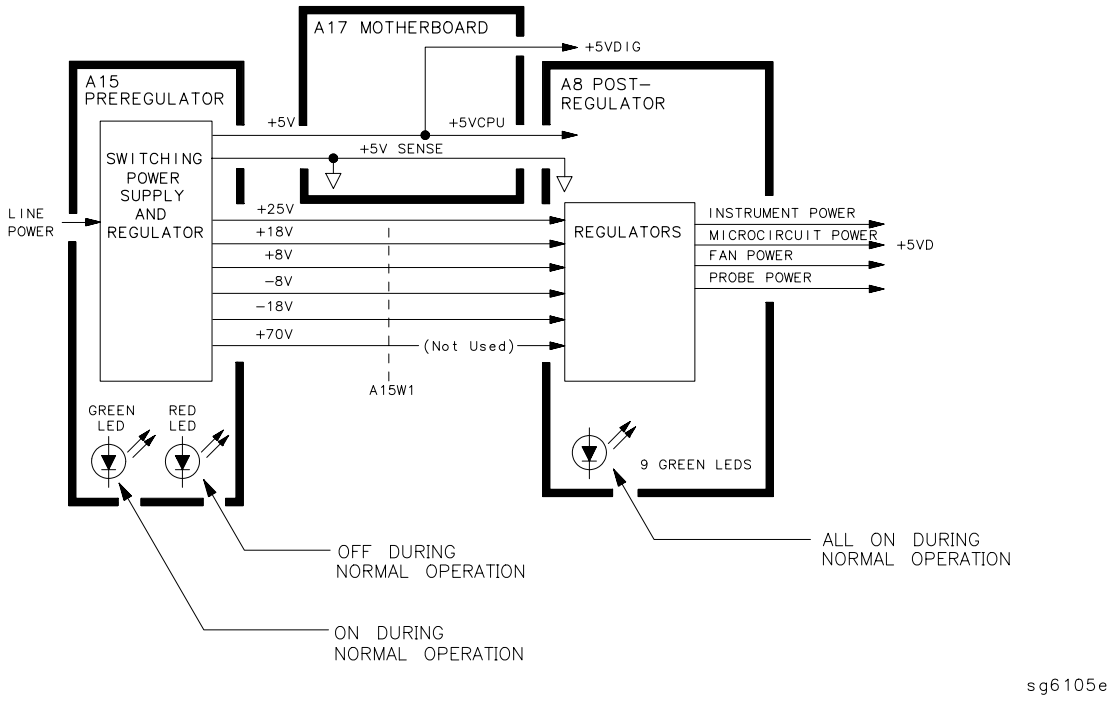
The following steps show the sequence to replace an assembly in an Agilent 8753ET/ES network analyzer.

1. Identify the faulty group. Refer to Chapter 4 , “Start Troubleshooting Here.” Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13 , “Replaceable Parts.”
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

Simplified Block Diagram

Figure 5-1 shows the power supply group in simplified block diagram form. Refer to the detailed block diagram of the power supply located at the end of this chapter to see voltage lines and specific connector pin numbers.

Figure 5-1 Power Supply Group Simplified Block Diagram



Start Here

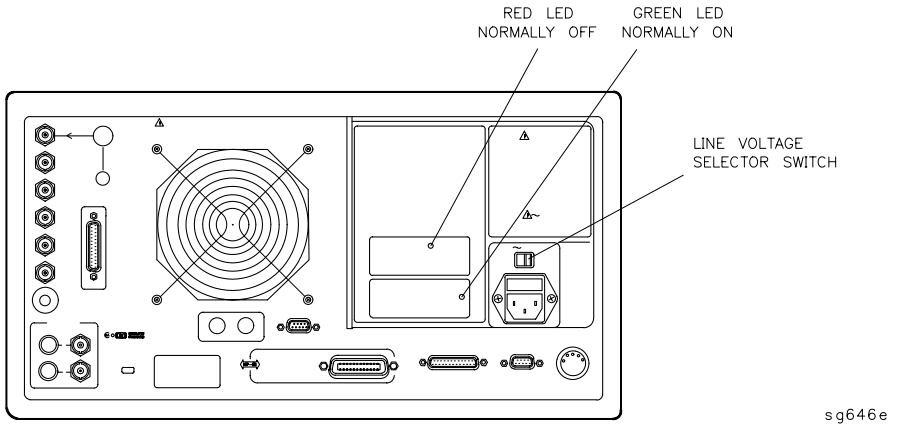
Check the Green LED and Red LED on A15

Switch on the analyzer and look at the rear panel of the analyzer. Check the two power supply diagnostic LEDs on the A15 preregulator casting by looking through the holes located to the left of the line voltage selector switch. (See Figure 5-2.)

During normal operation, the bottom (green) LED is on and the top (red) LED is off. If these LEDs are normal, then A15 is 95% verified. Continue to "Check the Green LEDs on A8".

- If the green LED is not on steadily, refer to "If the Green LED of the A15 Is Not ON Steadily" on page 5-7.
- If the red LED is on or flashing, refer to "If the Red LED of the A15 Is ON" on page 5-8.

Figure 5-2 Location of A15 Diagnostic LEDs



Check the Green LEDs on A8

Remove the top cover of the analyzer and locate the A8 post regulator; use the location diagram under the top cover if necessary. Check to see if the green LEDs on the top edge of A8 are all on. There are 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 of the A8 Are Not All ON" on page 5-13.

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 5-3 for supply voltages and limits.

Figure 5-3 A8 Post Regulator Test Point Locations

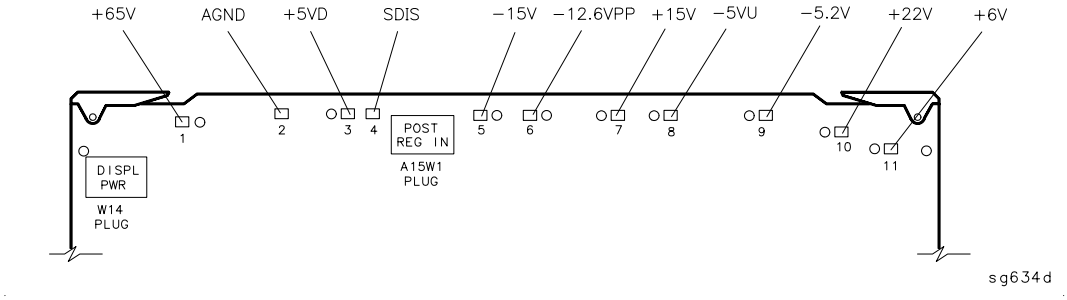


Table 5-1 A8 Post Regulator Test Point Voltages

TP	Supply	Range
1	+65 V (not used)	+64.6 to +65.4
2	AGND	n/a
3	+5 VD	+4.9 to +5.3
4	SDIS	n/a
5	–15 V	–14.4 to –15.6
6	–12.6 VPP (probe power)	–12.1 to –12.91
7	+15 V	+14.5 to +15.5
8	+5 VU	+5.05 to +5.35
9	–5.2 V	–5.0 to –5.4
10	+22 V	+21.3 to +22.7
11	+6 V	+5.8 to +6.2

If the Green LED of the A15 Is Not ON Steadily

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

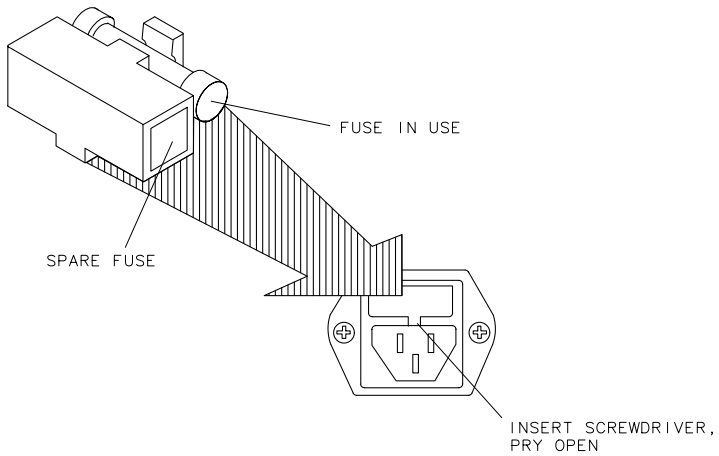
Check the Line Voltage, Selector Switch, and Fuse

Check the main power line cord, line fuse, line selector switch setting, and actual line voltage to see that they are all correct. Figure 5-4 shows how to remove the line fuse, using a small flat-blade screwdriver to pry out the fuse holder. Figure 5-2 shows the location of the line voltage selector switch. Use a small flat-blade screwdriver to select the correct switch position.

NOTE Refer to "8753ET/ES: Hardware, Preregulator" on page 13-55 for the correct line fuse description and part number.

If the A15 green LED is still not on steadily, replace A15.

Figure 5-4 Removing the Line Fuse



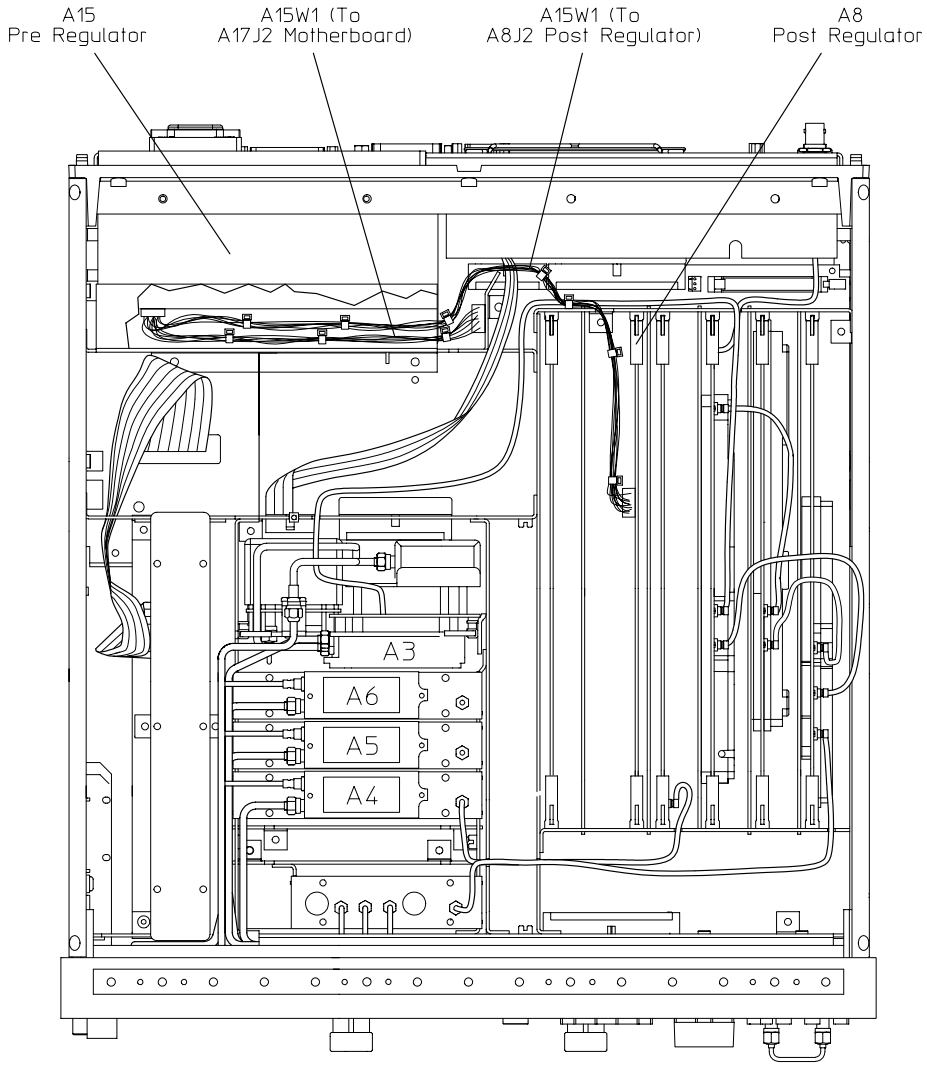
If the Red LED of the A15 Is ON

If the red LED is on or flashing, the power supply is shutting down. Use the following procedures to determine which assembly is causing the problem.

Check the A8 Post Regulator

1. Switch off the analyzer.
2. Disconnect the cable A15W1 from the A8 post regulator. (See Figure 5-5.)
3. Switch on the analyzer and observe the red LED on A15.
   - If the red LED goes out, the problem is probably the A8 post regulator. Continue to "Verify the A15 Preregulator" on page 5-10 to first verify that the inputs to A8 are correct.
   - If the red LED is still on, fuse F4 in the preregulator A15 may need to be replaced if the line voltage selector switch was set to 120 V, and the instrument was connected to a 220 V supply.
   - 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" on page 5-11.

Figure 5-5 Power Supply Cable Locations



Verify the A15 Preregulator

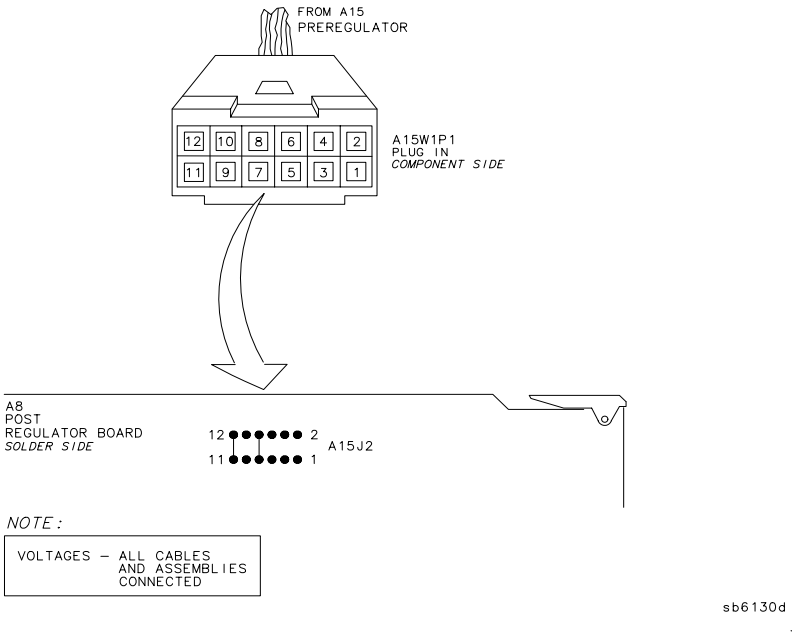
Verify that the A15 preregulator is supplying the correct voltages to the A8 post regulator. Use a voltmeter with a small probe to measure the output voltages of A15W1's plug. Refer to Table 5-2 and Figure 5-6.

- If the voltages are not within tolerance, replace A15.
- If the voltages are within tolerance, A15 is verified. Continue to "Check for a Faulty Assembly" on page 5-11.

Table 5-2 Output Voltages

Pin	A15W1P1 (Disconnected) Voltages	A8J2 (Connected) Voltages	A15 Preregulator Label
1	N/C	+68 to +76.2	N/C
2	+125 to +100	+68 to +76.2	+70 V
3,4	+22.4 to +33.6	+17.0 to +18.4	+18 V
5,6	–22.4 to –33.6	–17.0 to –18.4	–18 V
7	N/C	+7.4 to +8.0	N/C
8	+9.4 to +14	+7.4 to +8.0	+8 V
9,10	–9.4 to –14	–6.7 to –7.4	–8 V
11	N/C	+24.6 to +28.6	N/C
12	+32 to +48	+24.6 to +28.6	+25 V
NOTE: The +5 VD supply must be loaded by one or more assemblies at all times, or the other voltages will not be correct. It connects to the motherboard connector A17J3 Pin 4.			

Figure 5-6 A15W1 Plug Detail



Check for a Faulty Assembly

This procedure checks for a faulty assembly that might be shutting down the A15 preregulator via one of the following lines (also refer to Figure 5-1):

- A15W1 connecting to the A8 post regulator
- the +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 are supplied by the assembly that is being removed. After each assembly is removed or disconnected switch on the analyzer and observe the red LED on A15.

CAUTION

- *Always switch off the analyzer before removing or disconnecting assemblies.*
- When extensive disassembly is required, refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
- Refer to Chapter 13 , “Replaceable Parts,” to identify specific cables and assemblies that are not shown in this chapter.

- If the red LED goes out, the particular assembly (or one receiving power from it) that allows it to go out is faulty.
- If the red LED is still on after you have checked all of the assemblies listed in Table 5-3, continue to "Check the Operating Temperature" on page 5-12.

Table 5-3 Recommended Order for Removal/Disconnection

Assembly To Remove	Removal or Disconnection Method	Other Assemblies that Receive Power from the Removed Assembly
1. A19 Graphics Processor	Remove from Card Cage Disconnect from W14	None A18 Display
2. A14 Frac N Digital	Remove from Card Cage	None
3. A9 CPU	Disconnect W36 Remove from cardcage	A20 Disk Drive None
4. A16 Rear Panel Interface	Disconnect W27 Disconnect A16W1	A25 Test Set Interface A24 Transfer Switch A23 LED Front Panel None
5. A2 Front Panel Interface	Disconnect W17	A1 Front Panel Keyboard A18 Display

Check the Operating Temperature

The temperature sensing circuitry inside the A15 preregulator may be shutting down the supply. Make sure the temperature of the open air operating environment does not exceed 55 °C (131 °F), and that the analyzer fan is operating.

- If the fan does not seem to be operating correctly, refer to "Fan Troubleshooting" on page 5-19.
- If there does not appear to be a temperature problem, it is likely that A15 is faulty.

Inspect the Motherboard

If the red LED is still on after replacement or repair of A15, switch off the analyzer and inspect the motherboard for solder bridges and other noticeable defects. Use an ohmmeter to check for shorts. The +5 VD, +5 VCPU, or +5 VDSENSE lines may be bad. Refer to the block diagram at the end of this chapter and troubleshoot these suspected power supply lines on the A17 motherboard.

If the Green LEDs of the A8 Are Not All ON

The green LEDs along the top edge of the A8 post regulator are normally on.

Flashing LEDs on A8 indicate that the shutdown circuitry on the A8 post regulator is protecting power supplies from overcurrent conditions by repeatedly shutting them down. This may be caused by supply loading on A8 or on any other assembly in the analyzer.

Remove A8, Maintain A15W1 Cable Connection

1. Switch off the analyzer.
2. Remove A8 from its motherboard connector, but keep the A15W1 cable connected to A8.
3. Remove the display power cable.
4. Short A8TP2 (AGND) (see Figure 5-3 on page 5-6) 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 +5 VD are still off or flashing, continue to "Check the A8 Fuses and Voltages" on page 5-13.
   - If all LEDs are now on steadily except for the +5 VD LED, the A15 preregulator and A8 post regulator are working properly and the trouble is excessive loading somewhere after the motherboard connections at A8. Continue to "Remove the Assemblies" on page 5-13.

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 on page 5-9.)
2. Measure the voltages at A15W1P1 (see Figure 5-6 on page 5-11) with a voltmeter having a small probe.
3. Compare the measured voltages with those in Table 5-2 on page 5-10.
   - If the voltages are within tolerance, replace A8.
   - If the voltages are not within tolerance, replace A15.

If the green LEDs are now on, the A15 preregulator and A8 post regulator are working properly and the trouble is excessive loading somewhere after the motherboard connections at A8. Continue to "Remove the Assemblies," next.

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 on page 5-9.) *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

4. Switch on the analyzer and observe the green LEDs on A8.
   - If any of the green LEDs are off or flashing, it is not likely that any of the assemblies listed above is causing the problem. Continue to "Briefly Disable the Shutdown Circuitry" on page 5-14.
   - If all green LEDs are now on, one or more of the above assemblies may be faulty. Continue to the next step.
5. Switch off the analyzer.
6. Reconnect W14 and W20 to A19.
7. Reinstall each assembly one at a time. Switch on the analyzer after each assembly is installed. The assembly that causes the green LEDs to go off or flash could be faulty.

NOTE It is possible, however, that this condition is caused by the A8 post regulator not supplying enough current. To check this, reinstall the assemblies in a different order to change the loading. If the same assembly appears to be faulty, replace that assembly. If a different assembly appears faulty, A8 is most likely faulty (unless both of the other assemblies are faulty).

Briefly Disable the Shutdown Circuitry

In this step, you shutdown the protective circuitry for a short time, and the supplies are forced on (including shorted supplies) with a 100% duty cycle.

CAUTION Damage to components or to circuit traces may occur if A8TP4 (SDIS) is shorted to chassis ground for more than a few seconds while supplies are shorted.

1. Switch off the analyzer.
2. Connect A8TP4 (SDIS) to chassis ground with a jumper wire.
3. Switch on the analyzer and note the signal mnemonics and test points of any LEDs that are off. *Immediately remove the jumper wire*.

4. Refer to the block diagram at the end of this chapter and do the following:
   - Note the mnemonics of any additional signals that may connect to any A8 test point that showed a fault in the previous step.
   - Cross-reference all assemblies that use the power supplies whose A8 LEDs went out when A8TP4 (SDIS) was connected to chassis ground.
   - Make a list of these assemblies.
   - Delete the following assemblies from your list as they have already been verified earlier in this section.

     A10 digital IF

     A11 phase lock

     A12 reference

     A13 fractional-N analog

     A14 fractional-N digital

     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, sorting them from most to least accessible. Table 5-4 also lists any associated assemblies that are supplied by the assembly that is being removed. After each assembly is removed or disconnected, switch on the analyzer and observe the LEDs.

CAUTION

- *Always switch off the analyzer before removing or disconnecting assemblies.*
- When extensive disassembly is required, refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
- Refer to Chapter 13 , “Replaceable Parts,” to identify specific cables and assemblies that are not shown in this chapter.

- If all the LEDs light, the assembly (or one receiving power from it) that allows them to light is faulty.
- If the LEDs are still not on steadily, continue to “Inspect the Motherboard” on page 5-16.

Table 5-4 Recommended Order for Removal/Disconnection

Assembly to Remove	Removal or Disconnection Method	Other Assemblies that Receive Power from the Removed Assembly
1. A3 Source	Remove from Card Cage	None
2. A7 Pulse Generator	Remove from Card Cage	None
3. A4 R Sampler	Remove from Card Cage	None
4. A5 A Sampler	Remove from Card Cage	None
5. A6 B Sampler	Remove from Card Cage	None
6. A9 CPU	Disconnect W35 and W36	A20 Disk Drive
7. A2 Front Panel Interface	Disconnect W17	A1 Front Panel Keyboard
8. A16 Rear Panel Interface	Disconnect W27	A25 Test Set Interface A24 Transfer Switch (8753ES only) A23 LED Front Panel

Inspect the Motherboard

Inspect the A17 motherboard for solder bridges and shorted traces. In particular, inspect the traces that carry the supplies whose LEDs faulted when A8TP4 (SDIS) was grounded earlier.

Error Messages

Three error messages are associated with the power supplies functional group. They are shown here.

- `POWER SUPPLY SHUT DOWN!`

  One or more supplies on the A8 post regulator assembly is shut down due to one of the following conditions: overcurrent, overvoltage, or undervoltage. Refer to "If the Red LED of the A15 Is ON" on page 5-8.

- `POWER SUPPLY HOT`

  The temperature sensors on the A8 post regulator assembly detect an overtemperature condition. The regulated power supplies on A8 have been shut down.

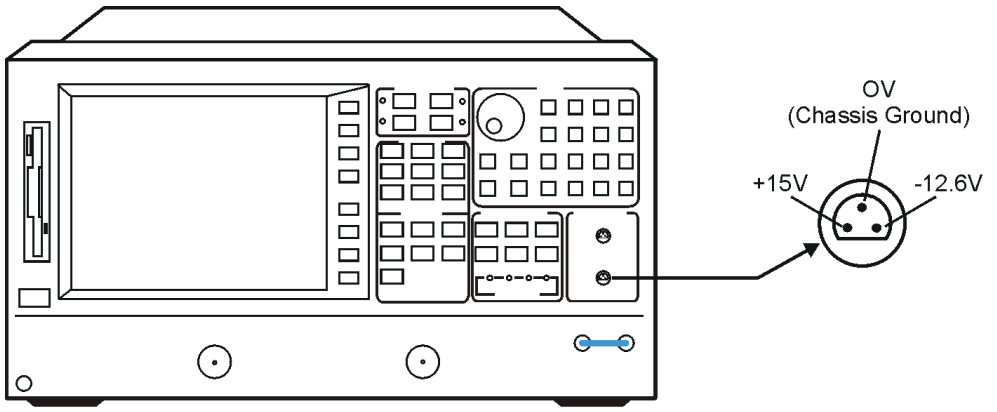
  Check the temperature of the operating environment; it should not be greater than +55 °C (131 °F). The fan should be operating and there should be at least 15 cm (6 in) spacing behind and all around the analyzer to allow for proper ventilation.

- `PROBE POWER SHUT DOWN!`

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

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

Figure 5-7 Front Panel Probe Power Connector Voltages



- If the correct voltages are present, troubleshoot the probe.
- If the voltages are not present, check the +15 V and –12.6 V green LEDs on A8.

  — If the LEDs are on, there is an open between the A8 assembly and the front panel probe power connectors. Put A8 onto an extender board and measure the voltages at the following pins:

A8P2 pins 6 and 36	–12.6 volts
A8P2 pins 4 and 34	+15 volts

  — If the LEDs are off, continue with "Check the Fuses and Isolate A8."

Check the Fuses and Isolate A8

Check the fuses associated with each of these supplies near the A8 test points. If these fuses keep burning out, a short exists. Try isolating A8 by removing it from the motherboard connector, but keeping the cable A15W1 connected to A8J2. Connect a jumper wire from A8TP2 to chassis ground. If either the +15 V or –12.6 V fuse blows, or the associated green LEDs do not light, replace A8.

If the +15 V and –12.6 V green LEDs light, troubleshoot for a short between the motherboard connector pins XA8P2 pins 6 and 36 (–12.6 V) and the front panel probe power connectors. Also check between motherboard connector pins XA8P2 pins 4 and 34 (+15 V) and the front panel probe power connectors.

Fan Troubleshooting

Fan Speeds

The fan speed varies depending upon temperature. It is normal for the fan to be at high speed when the analyzer is just switched on, and then change to low speed when the analyzer is cooled.

Check the Fan Voltages

If the fan is dead, refer to the A8 post regulator block diagram at the end of this chapter. The fan is driven by the +18 V and –18 V supplies coming from the A15 preregulator. Neither of these supplies is fused.

The –18 V supply is regulated on A8 in the fan drive block, and remains constant at approximately –14 volts. It connects to the A17 motherboard via pin 32 of the A8P1 connector.

The +18 V supply is regulated on A8 but changes the voltage to the fan, depending on airflow and temperature information. Its voltage ranges from approximately –1.0 volts to +14.7 volts, and connects to the A17 motherboard via pin 31 of the A8P1 connector.

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

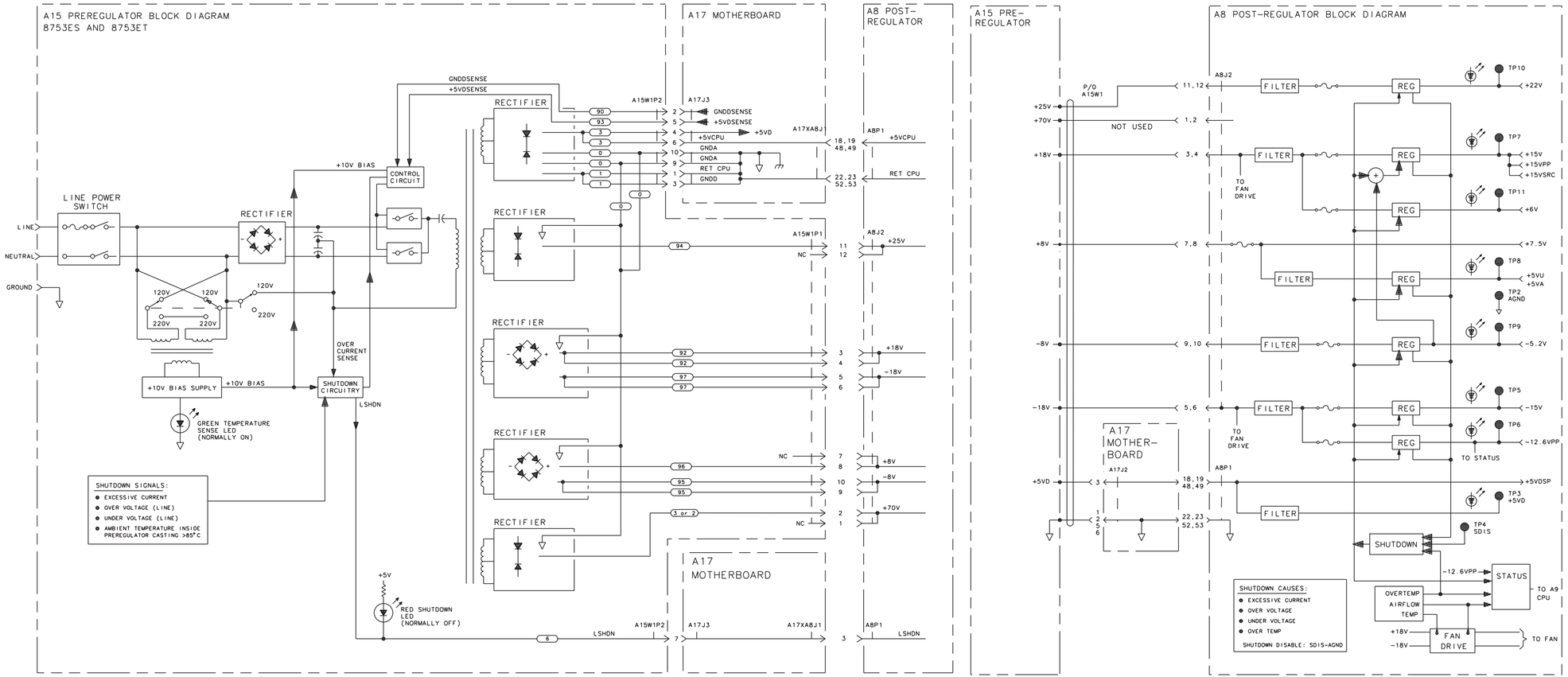
Short A8TP3 to Ground

If there is no voltage at A8P1 pins 31 and 32, switch off the analyzer. Remove A8 from its motherboard connector (or extender board) but keep the cable A15W1 connected to A8. (See Figure 5-5 on page 5-9.) Connect a jumper wire between A8TP3 and chassis ground. Switch on the analyzer.

- If all the green LEDs on the top edge of A8 light (except +5 VD), replace the fan.
- If other green LEDs on A8 do not light, refer to “If the Green LEDs of the A8 Are Not All ON” on page 5-13.

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.



so5124e

Power Supply Block Diagram

6 Digital Control Troubleshooting

Digital Control Troubleshooting

Use this procedure only if you have read Chapter 4 , “Start Troubleshooting Here.”

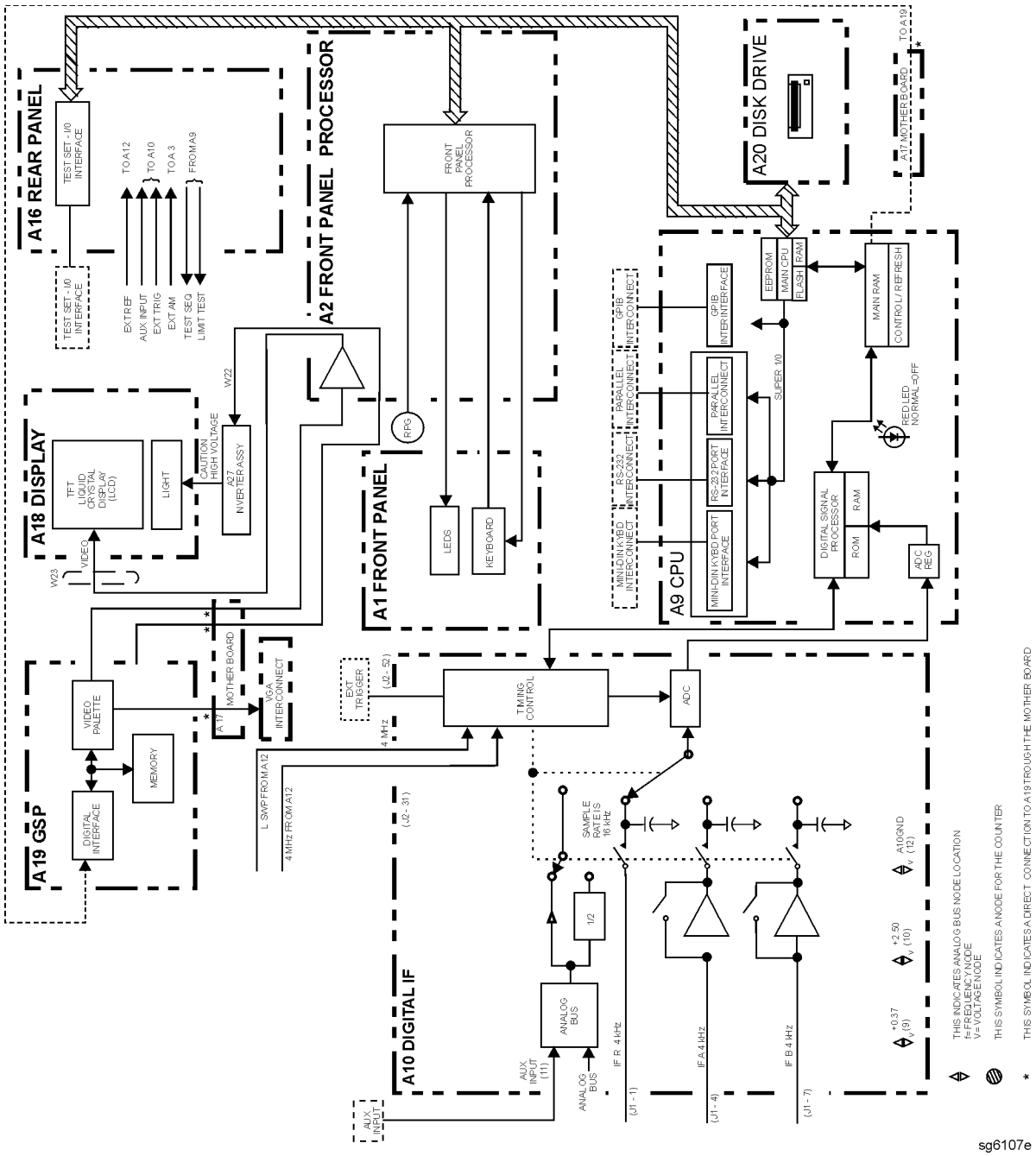
The digital control group assemblies consist of the following:

- CPU
  - — A9
- Display
  - — A2, A18, A19, A27
- Front Panel
  - — A1, A2
- Digital IF
  - — A10
- Rear Panel Interface
  - — A16

Begin with “CPU Troubleshooting (A9)” on page 6-5, then proceed to the assembly that you suspect has a problem. If you suspect an GPIB interface problem, refer to “GPIB Failures” on page 6-19.

Digital Control Group Block Diagram

Figure 6-1 Digital Control Group Block Diagram



Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an Agilent 8753ET/ES network analyzer.

1. Identify the faulty group. Refer to Chapter 4 , “Start Troubleshooting Here.” Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13 , “Replaceable Parts.”
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

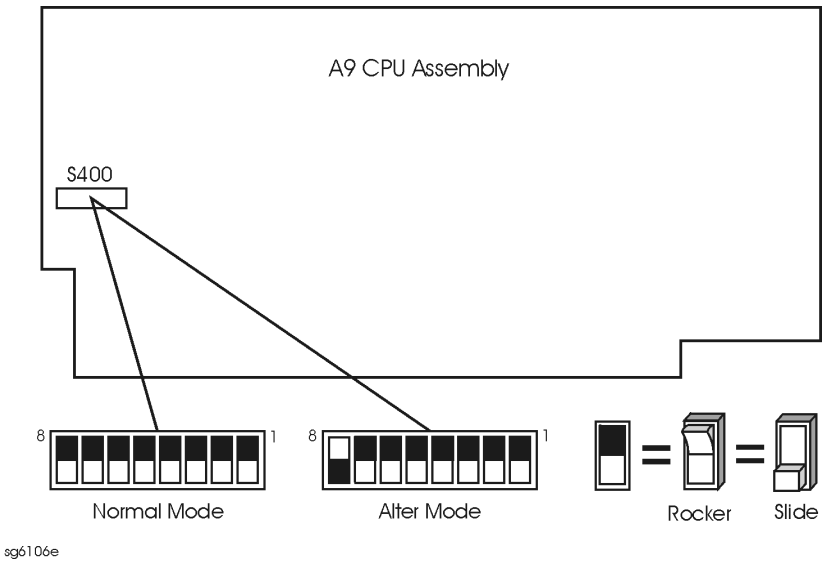
CPU Troubleshooting (A9)

A9 CC Switch Positions

The A9 CC switch must be in the NORMAL position for these procedures. This is the position for normal operating conditions. To move the switch to the NORMAL position, do the following:

1. Remove the power line cord from the analyzer.
2. Set the analyzer on its side.
3. Remove the two corner bumpers from the bottom of the instrument with a T-15 TORX screwdriver.
4. Loosen the captive screw on the bottom cover's back edge.
5. Slide the cover toward the rear of the instrument.
6. Move the switch to the NORMAL position as shown in Figure 6-2.
7. Replace the bottom cover and power cord.

Figure 6-2 Switch Positions on the A9 CPU



Checking A9 CPU Red LED Patterns

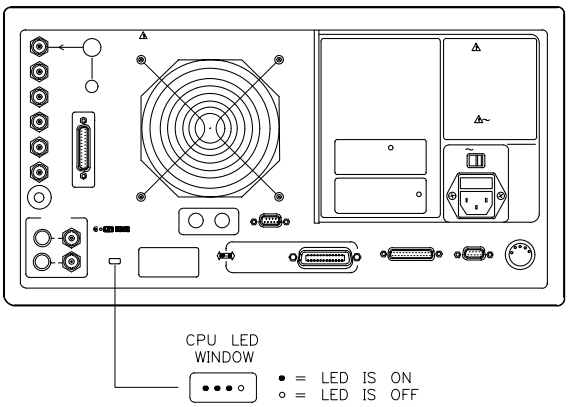
The A9 CPU has five red LEDs that can be viewed through a small opening in the rear panel of the analyzer. (See Figure 6-3.) Four LEDs are easily viewable. The fifth LED must be viewed by looking to the left at an angle.

1. **Cycle the power while observing five red LEDs**

   Cycle the power on the analyzer and observe the five red LEDs. After an initial pattern, the five red LEDs on the A9 CPU board should remain off.

   - If the LEDs remained off, then proceed to the assembly that you suspect has a problem.
   - If the LEDs did not remain off, switch off the power and remove the bottom cover for further troubleshooting.

Figure 6-3 CPU LED Window on Rear Panel



2. **Cycle the power while observing all eight red LEDs**

   With the analyzer positioned bottom up, cycle the power and observe the eight red LEDs while looking from the front of the instrument.

NOTE If firmware did not load, a red LED on the CPU board will be flashing. Refer to "Loading Firmware" on page 3-36.

---

3. **Evaluate results**

   - If either of the following LED patterns remain, go to "Display Troubleshooting (A2, A18, A19, A27)" on page 6-7. (✷ = LED is on.)

     ✷ ✷ ✷ 0 ✷ ✷ ✷ 0

     ✷ ✷ ✷ 0 ✷ ✷ 0 ✷

     (front of instrument ⇓)

   - If any other LED patterns remain, replace the A9 CPU after verifying the power supply.

Display Troubleshooting (A2, A18, A19, A27)

This section contains the following information:

- Evaluating your Display
- Troubleshooting a White Display
- Troubleshooting a Black Display
- Troubleshooting a Display with Color Problems

Evaluating Your Display

Switch the analyzer off, and then on. The display should be bright with the annotation legible and intelligible. There are four criteria against which your display is measured:

- Background Lamp Intensity
- Green, Red or Blue Stuck Pixels
- Dark Stuck Pixels
- Newtons Rings

Evaluate the display as follows:

- If either the A18 LCD, A19 GSP, A9 CPU or A27 backlight inverter assemblies are replaced, perform a visual inspection of the display.
- If it appears that there is a problem with the display, refer to the troubleshooting information that follows.
- If the new display appears dim or doesn't light, see “Backlight Intensity Check,” next.

Backlight Intensity Check

Required Equipment and Tools

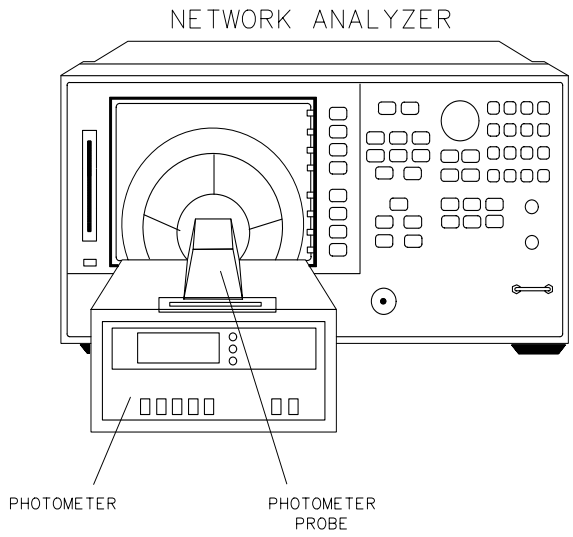
Description	HP/Agilent Part or Model Number
Photometer	Tektronix J16
Probe	Tektronix J6503
Light Occluder	Tektronix 016-0305-00
Antistatic Wrist Strap Cord	9300-0980
Antistatic Wrist Strap	9300-1367
Static-control Table Mat and Ground Wire	9300-0797

Analyzer warm-up time: **30 minutes.** *Photometer warm-up time:* **30 minutes.**

NOTE This procedure should be performed with a photometer and only by qualified personnel.

1. Press (Display) **MORE** **ADJUST DISPLAY** **INTENSITY** (100) (x1) to set the display intensity at 100%.
2. Press (System) **SERVICE MENU** **TESTS** (62) (x1) **EXECUTE TEST** **CONTINUE** to set a white screen test pattern on the display.
3. Set the photometer probe to NORMAL. Turn on power to the photometer and allow 30 minutes of warmup time. Zero the photometer according to the manufacturer's instructions.
4. Center the photometer on the analyzer display as shown in Figure 6-4.

Figure 6-4 Backlight Intensity Check Setup



NOTE The intensity levels are read with a display bezel installed.

5. If the photometer registers less than 50 Nits, the display backlight lamp is bad. Refer to the Chapter 14 , "Assembly Replacement and Post-Repair Procedures," for information on display lamp replacement.

Red, Green, or Blue Pixels Specifications

Red, green, or blue “stuck on” pixels may appear against a black background. To test for these dots, press System **SERVICE MENU** **TESTS** 70 x1 **EXECUTE TEST** **CONTINUE** .

In a properly working display, the following will not occur:

— complete rows or columns of stuck pixels

— more than 5 stuck pixels (not to exceed a maximum of 2 red or blue, and 3 green)

— 2 or more consecutive stuck pixels

— stuck pixels less than 6.5 mm apart

Dark Pixels Specifications

Dark “stuck on” pixels may appear against a white background. To test for these dots, press System **SERVICE MENU** **TESTS** 66 x1 **EXECUTE TEST** **CONTINUE** .

In a properly working display, the following will not occur:

— more than 12 stuck pixels (not to exceed a maximum of 7 red, green, or blue)

— more than one occurrence of 2 consecutive stuck pixels

— stuck pixels less than 6.5 mm apart

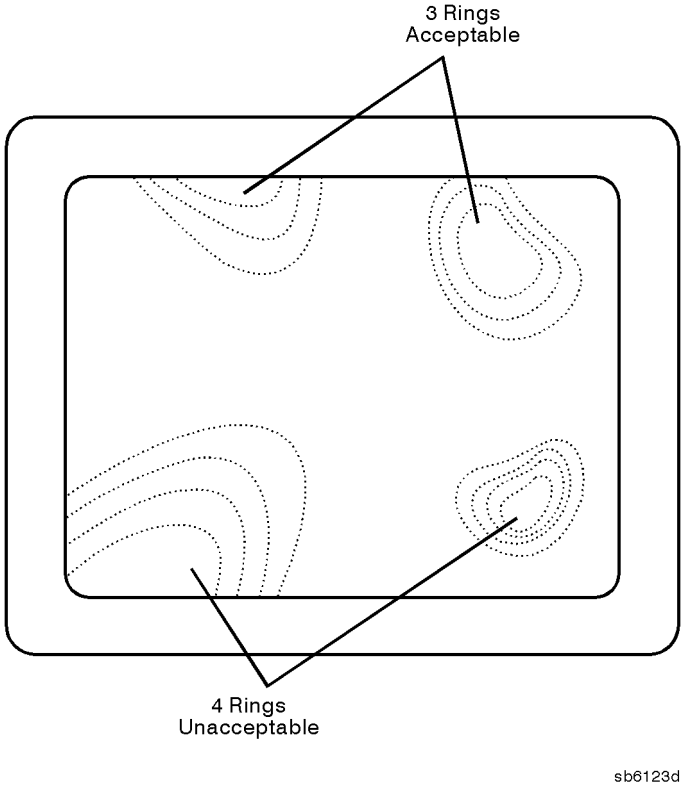
Newton's Rings

To check for the patterns known as Newton's Rings, change the display to white by pressing the following keys:

Press System **SERVICE MENU** **TESTS** 66 x1 **EXECUTE TEST** **CONTINUE** .

Figure 6-5 illustrates acceptable and non-acceptable examples of Newtons Rings.

Figure 6-5 Newtons Rings



Troubleshooting a White Display

If the display is white, the A27 back light inverter is functioning properly. Connect a VGA monitor to the analyzer.

- If the image on the external monitor is normal, then suspect A2, A18, or the front panel cabling.
- If the image on the external monitor is bad, suspect the A19 GSP or cable W20 (CPU to motherboard).

Troubleshooting a Black Display

1. Remove the front panel with the exception of leaving cable W17 (A2 to motherboard) connected.
2. Press Preset while checking to see if there is a flash of light.
   - If the light does not flash, suspect the front panel cabling, the display lamp, or the A27 inverter.

Troubleshooting a Display with Color Problems

1. Press Display **ADJUST DISPLAY** **DEFAULT COLORS**. If this does not correct the color problems, continue with the next step.
2. Run display service test 74 as described in "Test Patterns" on page 10-14. Confirm that there are four intensities for each color.
   - If the test passes, then continue.
   - If the test fails, then suspect the front panel cabling, A2, A19, or A18.
3. Connect a VGA monitor to the analyzer.
   - If the image on the external monitor has the same color problems, then replace the A19 GSP.
   - If the image on the external monitor is acceptable, then there must be a missing color bit. Suspect the front panel cabling, A2, A19, or A18.

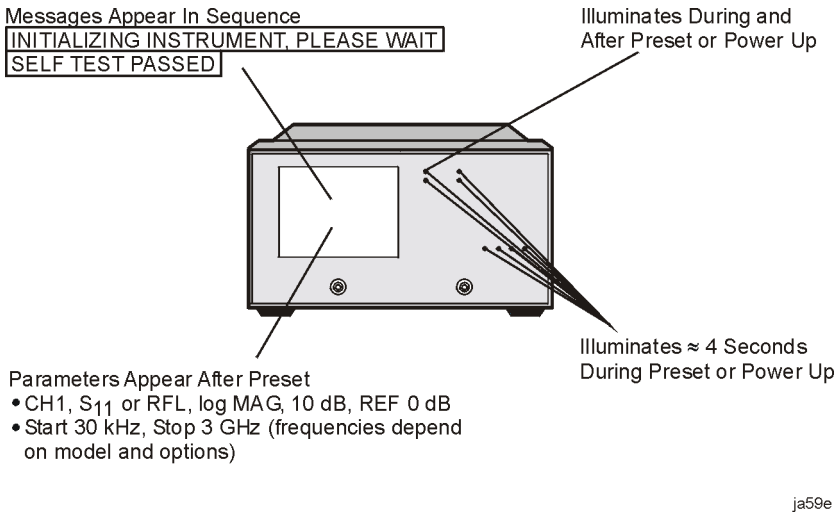
Front Panel Troubleshooting (A1, A2)

Check Front Panel LEDs After Preset

1. Press Preset on the analyzer.
2. Observe that all front panel LEDs turn on and, within five seconds after releasing Preset, all but the Chan1 and Port 1 LED turns off. Refer to Figure 6-6.
   - If all the front panel LEDs either stay on or off, there is a control problem between A9 and A1/A2. See "Inspect Cables" on page 6-15.
   - If, at the end of the turn on sequence, the Chan 1 LED is not on and all GPIB status LEDs are not off, continue with "Identify the Stuck Key" on page 6-13.
   - If you suspect that one or more LEDs have burned out, replace the A1 keypad assembly.

NOTE Port 1 and Port 2 LED problems may be caused by the malfunction of the A23 LED board or the A24 transfer switch.

Figure 6-6 Preset Sequence



Identify the Stuck Key

Match the front panel LED pattern with the patterns in Table 6-1. The LED pattern identifies the stuck key. Free the stuck key or replace the front panel part causing the problem. (The Chan 3 and Chan 4 LEDs are not used. ✷ = LED is on. The footswitch is an accessory that can be set up through a rear panel port.)

Table 6-1 Front Panel Key Codes

Decimal Number	LED Pattern						Key
	Chan 1	Chan 2	R	L	T	S	
0							G/n
1						✷	9
2					✷		M/µ
3					✷	✷	6
4				✷			k/m
5				✷		✷	3
6				✷	✷		x1
7				✷	✷	✷	–
8			✷				8
9			✷			✷	7
10			✷		✷		5
11			✷		✷	✷	4
12			✷	✷			2
13			✷	✷		✷	1
14			✷	✷	✷		.
15			✷	✷	✷	✷	0
16		✷					Footswitch
17		✷				✷	⇧
18		✷			✷		←
19		✷			✷	✷	Local
20		✷		✷			System
21		✷		✷		✷	Seq

Table 6-1 Front Panel Key Codes

Decimal Number	LED Pattern						Key
	Chan 1	Chan 2	R	L	T	S	
22		✷		✷	✷		Save/Recall
23		✷		✷	✷	✷	Copy
24		✷	✷				⇩
25		✷	✷			✷	Entry Off
26		✷	✷		✷		Scale Ref
27		✷	✷		✷	✷	Cal
28		✷	✷	✷			Marker Fctn
29		✷	✷	✷		✷	Power
30		✷	✷	✷	✷		Sweep Setup
31	Not Used						
32	✷						Chan 2
33	✷					✷	Chan 4
34	✷				✷		Format
35	✷				✷	✷	Avg
36	✷			✷			Marker Search
37	✷			✷		✷	Stop
38	✷			✷	✷		Span
39	Not Used						
40	✷		✷				Chan 1
41	✷		✷			✷	Chan 3
42	✷		✷		✷		Meas
43	✷		✷		✷	✷	Display
44	✷		✷	✷			Marker
45	✷		✷	✷		✷	Start
46	✷		✷	✷	✷		Center
47	✷		✷	✷	✷	✷	Return

Table 6-1 Front Panel Key Codes

Decimal Number	LED Pattern						Key
	Chan 1	Chan 2	R	L	T	S	
48	✷	✷					softkey 1
49	✷	✷				✷	softkey 2
50	✷	✷			✷		softkey 3
51	✷	✷			✷	✷	softkey 4
52	✷	✷		✷			softkey 5
53	✷	✷		✷		✷	softkey 6
54	✷	✷		✷	✷		softkey 7
55	✷	✷		✷	✷	✷	softkey 8

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.

Test Using a Controller

If a controller is available, write a simple command to the analyzer. If the analyzer successfully executes the command, the problem is either the A2 front panel interface or W17 (A2 to motherboard ribbon cable) is faulty.

Run the Internal Diagnostic Tests

The analyzer incorporates 20 internal diagnostic tests. Most tests can be run as part of one or both major test sequences: all internal (test 0) and preset (test 1).

1. Press System **SERVICE MENU** **TESTS** 0 x1 **EXECUTE TEST** to perform all INT tests.
2. Then press 1 x1 to see the results of the preset test. If either sequence fails, press the ⇧ ⇩ keys to find the first occurrence of a FAIL message for tests 2 through 20. See Table 6-2 for further troubleshooting information.

Table 6-2 Internal Diagnostic Test with Commentary

Test	Sequence[a]	Probable Failed Assemblies[b]: Comments and Troubleshooting Hints
0 All Int	— -	— : Executes tests 3-11, 13-16, 20.
1 Preset	— -	— : Executes tests 2-11, 14-16. Runs at power-on or preset.
2 ROM	P,AI	A9: Repeats on fail; refer to "CPU Troubleshooting (A9)" on page 6-5 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: See Chapter 5 , "Power Supply Troubleshooting."
15 Frac-N Cont	P,AI	A14: Replace A14.
16 Sweep Trig	P,AI	A14,A10: Most likely A14.
17 ADC Lin	— -	A10: Replace A10.
18 ADC Ofs	— -	A10: Replace A10.
19 ABUS Test	— -	A10: Replace A10.
20 FN Count	AI	A14/A13/A10: Most likely A14 or A13, as previous tests check A10. See Chapter 7 , "Source Troubleshooting."

a. P = Part of "Preset" sequence; AI = part of "All Internal" sequence
b. In decreasing order of probability.

If the Fault Is Intermittent

Repeat Test Function

If the failure is intermittent, do the following:

1. Press (System) **SERVICE MENU** **TEST OPTIONS** **REPEAT ON** to turn on the repeat function.
2. Then press **RETURN** **TESTS** .
3. Select the test desired and press **EXECUTE TEST** .
4. Press any key to stop the function. The test repeat function is explained in Chapter 10 , “Service Key Menus and Error Messages.”

GPIB Failures

If you have performed "Step 3. GPIB Systems Check" on page 4-8, and you suspect there is an GPIB 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 GPIB paths external to the instrument.

Press (System) **SERVICE MENU** **TESTS** (13) (x1) **EXECUTE TEST** .

- If the analyzer fails the test, the problem is likely to be the A16 rear panel.
- If the analyzer passes the test, it indicates that the A9 CPU can communicate with the A16 rear panel with a 50% confidence level. There is a good chance that the A16 rear panel is working. This is because internal bus lines have been tested between the A9 CPU and A16, and GPIB signal paths are not checked external to the analyzer.

7 Source Troubleshooting

Source Troubleshooting

Use this procedure only if you have read Chapter 4 , "Start Troubleshooting Here." This chapter is divided into two troubleshooting procedures for the following problems:

- Incorrect power levels: Perform the "Power" troubleshooting checks on page 7-5.
- Phase lock error: Perform the "Phase Lock Error" troubleshooting checks on page 7-6.

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 Agilent 8753ET/ES network analyzer.

1. Identify the faulty group. Refer to Chapter 4 , “Start Troubleshooting Here.” Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13 , “Replaceable Parts.”
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

Before You Start Troubleshooting

Make sure all of the assemblies are firmly seated. Also make sure that input R has a signal of at least –35 dBm (about 0.01 Vp-p into 50 ohms) at all times to maintain phase lock.

Power

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

For the following checks, make sure that the A9 switch is in the Alter position.

1. Source Default Correction Constants (Test 44)

To run this test, press Preset System **SERVICE MENU** **TESTS** 44 x1 **EXECUTE TEST**. When complete, DONE should appear on the analyzer display. Use a power meter to verify that source power can be controlled and that the power level is approximately correct. If the source passes these checks, proceed with step 2. However, if FAIL appears on the analyzer display, or if the analyzer fails the checks, replace the source.

2. RF Output Power Correction Constants (Test 47)

Follow the instructions for this procedure given in "RF Output Power Correction Constants (Test 47)" on page 3-11. The procedure is complete when DONE appears on the analyzer display. Use a power meter to verify that power levels are now correct. If power levels are not correct, or if the analyzer fails the routine, proceed with step 3, next.

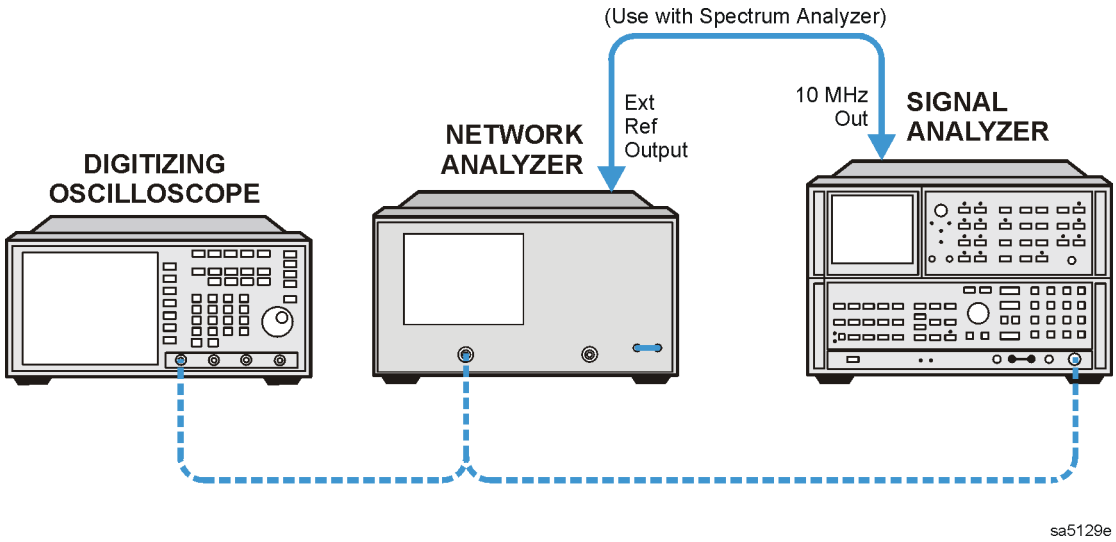
3. Sampler Magnitude and Phase Correction Constants (Test 53)

Follow the instructions for this procedure given in "Sampler Magnitude and Phase Correction Constants (Test 53)" on page 3-16. The procedure is complete when DONE appears on the analyzer display. Next, repeat step 2, above. If the analyzer fails the routine in step 2, replace the source.

If the analyzer fails the routine in step 3, replace the source.

Phase Lock Error

Figure 7-1 Basic Phase Lock Error Troubleshooting Equipment Setup



Troubleshooting tools include the assembly location diagram and phase lock diagnostic tools. The assembly location diagram is on the underside of the instrument top cover. The diagram shows major assembly locations and RF cable connections. The phase lock diagnostic tools are explained in the "Source Group Troubleshooting Appendix" on page 7-30 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

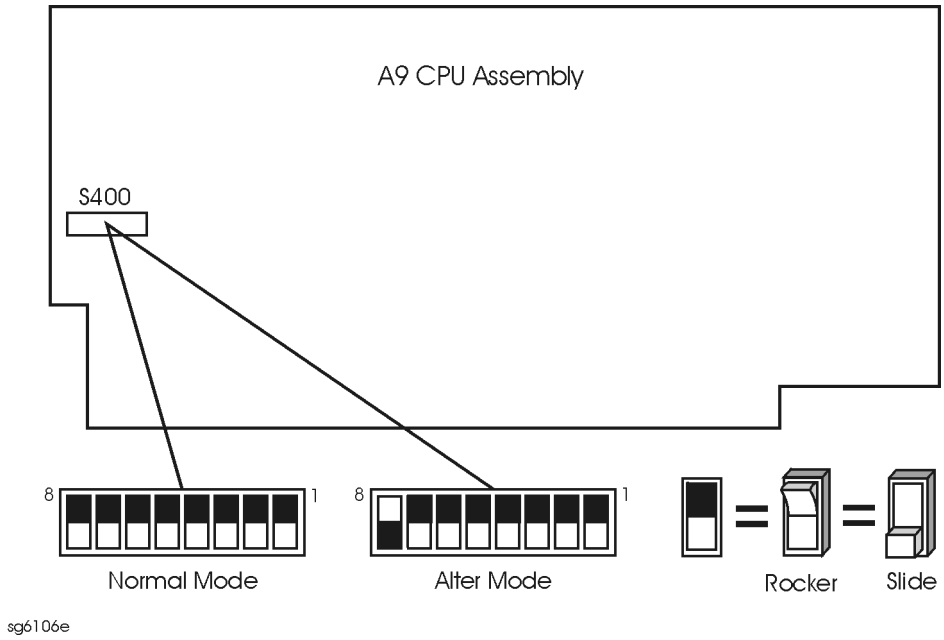
Phase lock error messages may appear as a result of incorrect pretune correction constants. To check this possibility, perform the pretune correction constants routine.

The four phase lock error messages, listed below, are described in the "Source Group Troubleshooting Appendix" on page 7-30.

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

1. Make sure the A9 CC switch is in the ALTER position:
   a. Remove the power line cord from the analyzer.
   b. Set the analyzer on its side.
   c. Remove the two corner bumpers from the bottom of the instrument with a T-15 TORX screwdriver.
   d. Loosen the captive screw on the bottom cover's back edge.
   e. Slide the cover toward the rear of the instrument.
   f. Set the switch to the ALTER position as shown in Figure 7-2.
   g. Replace the bottom cover, corner bumpers, and power cord.

Figure 7-2 Switch Positions on the A9 CPU



2. Switch on the analyzer and press System **SERVICE MENU** **TESTS** 46 x1 **EXECUTE TEST** to generate new analog bus correction constants. Then press System **SERVICE MENU** **TESTS** 45 x1 **EXECUTE TEST** to generate default pretune correction constants.

   Press System **SERVICE MENU** **TESTS** 48 x1 **EXECUTE TEST** **YES** to generate new pretune correction constants.

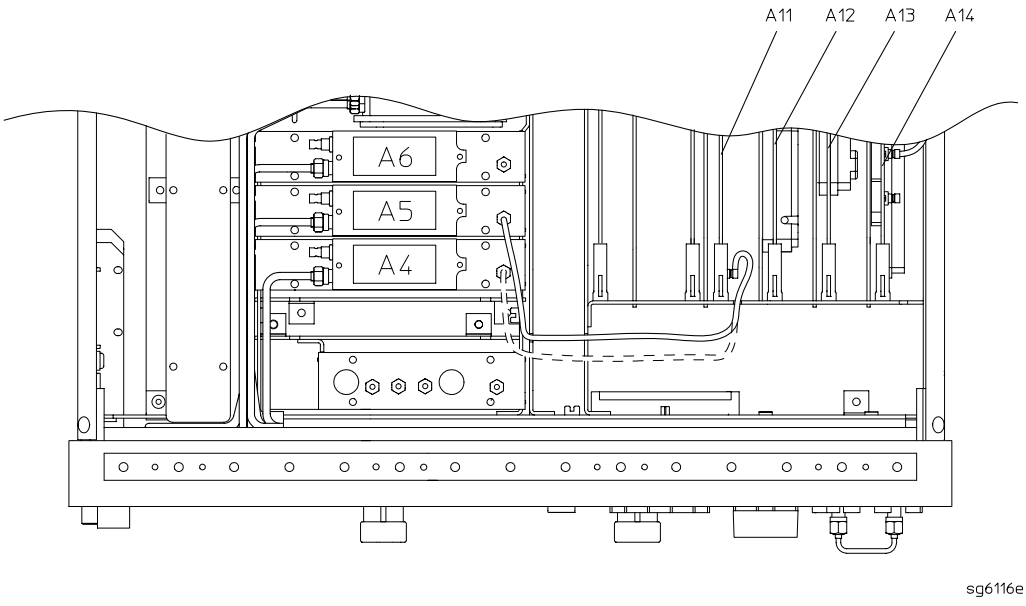
3. Press Preset and observe the analyzer display:
   - No error message: set the A9 CC switch to the NORMAL position. Then refer to "Post-Repair Procedures" on page 14-53 to verify operation.
   - Error message visible: continue with "A4 Sampler/Mixer Check".

A4 Sampler/Mixer Check

The A4, A5, and A6 (R, A and B) sampler/mixers are similar in operation. Any sampler can be used to phase lock the source. To eliminate the possibility of a faulty R sampler, follow this procedure.

4. 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.

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



5. If the analyzer is an 8753ES, and you connected W8 to:
   - **A5**, press Meas **Refl FWD: S11 (A/R)**
   - **A6**, press Meas **Refl REV: S22 (B/R)**
6. If the analyzer is an 8753ET, and you connected W8 to:
   - **A5**, press Meas **REFLECTION**
   - **A6**, connect a cable between the Reflection and Transmission test ports and press Meas **TRANSMISSN**.
7. Ignore the displayed trace, but check for phase lock error messages. If the phase lock problem persists, the R-channel sampler is *not* the problem.

A3 Source and A11 Phase Lock Check

This procedure checks the source and part of the phase lock assembly. It opens the phase-locked loop and exercises the source by varying the source output frequency with the A11 pretune DAC.

NOTE If the analyzer failed internal test 48, default pretune correction constants were stored which may result in a constant offset of several MHz. Regardless, continue with this procedure.

NOTE Use a spectrum analyzer for problems above 100 MHz.

1. Connect the oscilloscope or spectrum analyzer as shown in Figure 7-1. (Set the oscilloscope input impedance to 50 ohms.)
2. Press (Preset) (System) **SERVICE MENU** **SERVICE MODES** **SRC ADJUST MENU** **SRC TUNE ON** **SRC TUNE FREQ** to activate the source tune (SRC TUNE) service mode.
3. Use the front panel knob or front panel keys to set the pretune frequency to 300 kHz, 30 MHz, and 40 MHz. Verify the signal frequency on the oscilloscope.

NOTE In SRC TUNE mode, the source output frequency changes in 1 to 2 MHz increments and should be 1 to 6 MHz above the indicated output frequency.

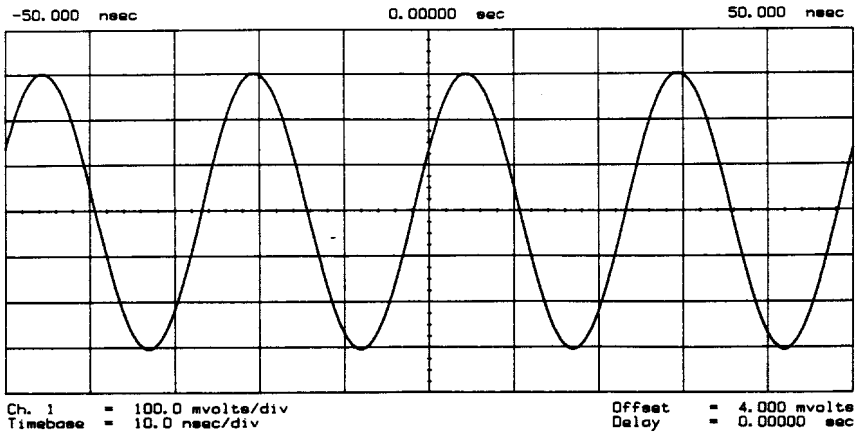
4. Check for the frequencies indicated by Table 7-1.

Table 7-1 Output Frequency in SRC Tune Mode

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

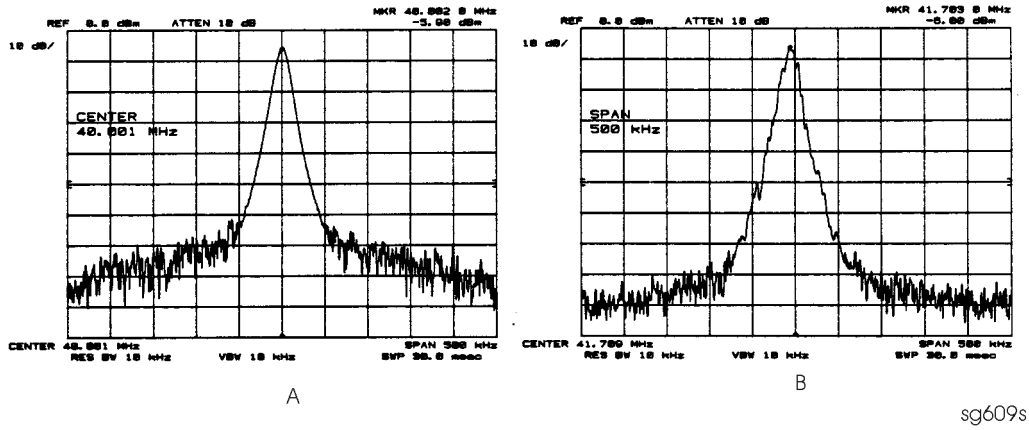
5. The signal observed on an oscilloscope should be as solid as the signal in Figure 7-4.

Figure 7-4 Waveform Integrity in SRC Tune Mode



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

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



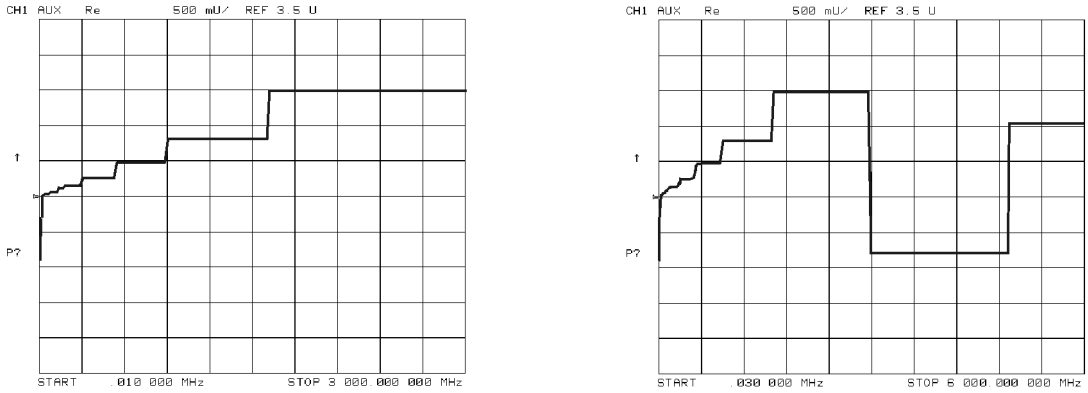
7. Press Power to vary the power and check for corresponding level changes on the test instrument. (A power change of 20 dB will change the voltage observed on the oscilloscope by a factor of ten.)
8. Note the results of the frequency and power changes:
   - If the frequency and power output changes are correct, skip ahead to "A12 Reference Check" on page 7-12.
   - If the frequency changes are not correct, continue with "YO Coil Drive Check with Analog Bus" on page 7-11.
   - If the power output changes are not correct, check analog bus node 3 by performing the following steps:
     a. Press System **SERVICE MENU** **ANALOG BUS ON** Meas **S PARAMETERS** **ANALOG IN Aux Input** Format **MORE** **REAL** 3 x1.
     b. Press Marker 2 G/n. The marker should read approximately 434 mU.
     c. Press Marker 4 G/n. The marker should read approximately 646 mU.

YO Coil Drive Check with Analog Bus

NOTE If the analog bus is not functional, perform the "YO Coil Drive Check with Oscilloscope" on page 7-11.

1. Press (Preset) (System) **SERVICE MENU** **ANALOG BUS ON** **SERVICE MODES** **SOURCE PLL OFF** (Meas) **ANALOG IN Aux Input** **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 1 V/GHz signal at analog bus node 16.
3. Compare the waveform to Figure 7-6. If the waveform is incorrect, the A11 phase lock assembly is faulty.

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



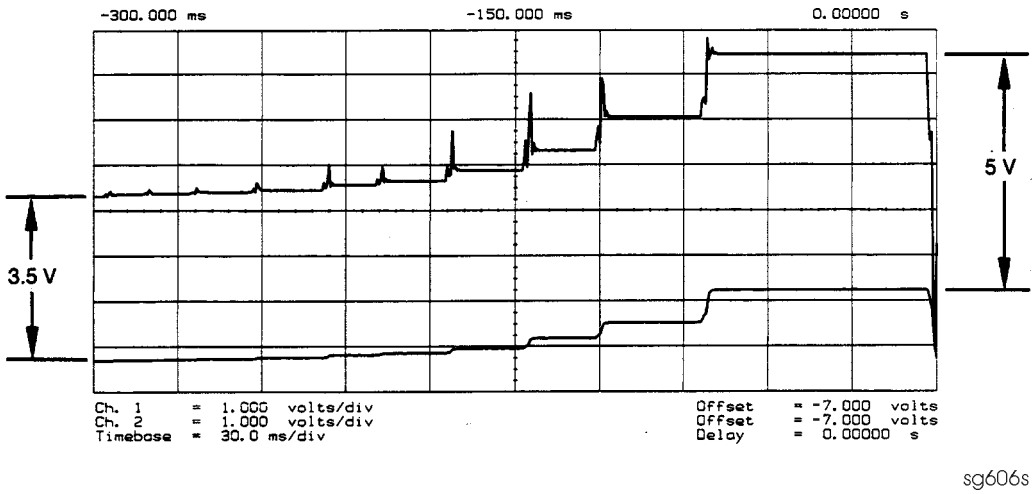
YO Coil Drive Check with Oscilloscope

NOTE Use the large extender board for easy access to the voltage points. The extender board is included with the 8753 Tool Kit. See Chapter 13 , "Replaceable Parts," for part numbers and ordering information.

1. Connect oscilloscope probes to A11P1-1 and A11P1-2. The YO coil drive signal is actually two signals whose voltage difference drives the coil.
2. Press (Preset) (System) **SERVICE MENU** **SERVICE MODES** **SOURCE PLL OFF** to operate the analyzer in a swept open loop mode.

3. Monitor the two YO coil drive lines. In source tune mode, the voltage difference should vary from approximately 3.5 to 5.0 volts as shown in Figure 7-7.
   - If the voltages are not correct, replace the faulty A11 assembly.
   - If the output signals from the A11 assembly are correct, replace the faulty A3 source assembly.
   - If neither the A11, nor the A3 assembly is faulty, continue with the next check.

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



A12 Reference Check

The signals are evaluated with pass/fail checks. The most efficient way to check the A12 frequency reference signals is to use the analog bus while referring to Table 7-2.

Alternatively, you can use an oscilloscope, while referring to Table 7-3 and Figure 7-8 through Figure 7-14. If any of the observed signals differs from the figures, there is a 90% probability that the A12 assembly is faulty. Either consider the A12 assembly defective or perform the "A12 Digital Control Signals Check" on page 7-18.

Both of these procedures are described ahead.

Analog Bus Method

1. Press (Preset) (System) **SERVICE MENU** **ANALOG BUS ON** (Meas) **ANALOG IN Aux Input** **ANALOG BUS** to switch on the analog bus and its counter.
2. Press (21) (x1) to count the frequency of the 100 kHz signal.
3. Press (Menu) **CW FREQ** (500) (k/m). Verify that the counter reading (displayed on the analyzer next to `cnt:`) matches the corresponding 100 kHz value for the CW frequency. (Refer to Table 7-2.)

4. Verify the remaining CW frequencies, comparing the counter reading with the value in Table 7-2:
   - Press (2) (M/µ).
   - Press (50) (M/µ).

Table 7-2 Analog Bus Check of Reference Frequencies

CW Frequency	Analog Bus Node 21 100 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 ±0.1%. Accuracy may vary with gate time and signal strength.			

5. Press (24) (x1) to count the frequency of the 2nd LO signal.
6. Press (Menu) **CW FREQ** (500) (k/m). Verify that the counter reading matches the corresponding 2nd LO value for the CW frequency. (Refer to Table 7-2.)
7. Verify the remaining CW frequencies, comparing the counter reading with the value in Table 7-2:
   - Press (2) (M/µ).
   - Press (50) (M/µ).
8. Press (25) (x1) to count the frequency of the PLREF signal.
9. Press (Menu) **CW FREQ** (500) (k/m). Verify that the counter reading matches the corresponding PLREF value for the CW frequency. (Refer to Table 7-2.)
10. Verify the remaining CW frequencies, comparing the counter reading with the value in Table 7-2:
    - Press (2) (M/µ).
    - Press (50) (M/µ).
11. Check the results.
    - If all the counter readings match the frequencies listed in Table 7-2, skip ahead to "A13/A14 Fractional-N Check" on page 7-20.
    - If the counter readings are incorrect at the 500 kHz and 2 MHz settings only, go to "FN LO at A12 Check" on page 7-16.
    - 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 next. (If the signals are good, either the A10 or A14 assemblies could be faulty.)

Oscilloscope Method

You need not use the oscilloscope method unless the analog bus is non-functional or any of the signals fail the specifications listed in Table 7-2.

If the analog bus is non-functional or the previous check has revealed questionable signals, observe the signals with an oscilloscope. Table 7-3 identifies a convenient test point and a plot for the five signals listed.

Table 7-3 A12 Reference Frequencies

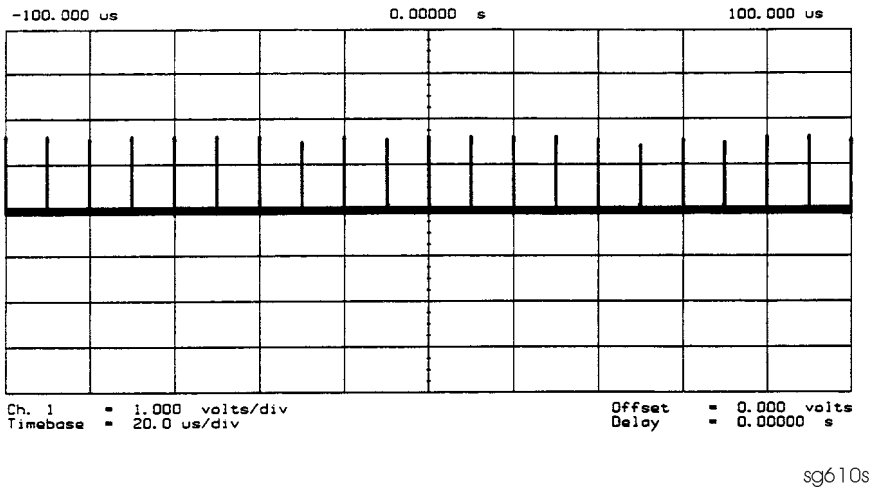
Mnemonic	Signal Description	Location	See Figure	Analyzer Setting
FN100kHzREF	100 kHz Reference	A13TP5	Figure 7-8	any
REF	Phase Lock Reference	A11TP9	Figure 7-9	≥16 MHz CW
REF	Phase Lock Reference	A11TP9	Figure 7-10	5 MHz CW
FN LO[a]*	Fractional-N LO	A14J2	Figure 7-11	10 MHz CW
4MHz REF	4 MHz Reference	A12TP9	Figure 7-12	any
2ND LO+/–	Second LO	A12P1-2,4	Figure 7-13	≥16 MHz CW
2ND LO+/–	Second LO	A12P1-2,4	Figure 7-14	14 MHz CW

a. Not an A12 signal, but required for A12 low band operation.

100 kHz Pulses

The 100 kHz pulses are very narrow and typically 1.5 V in amplitude. You may have to increase the oscilloscope intensity to see these pulses. (See Figure 7-8.)

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

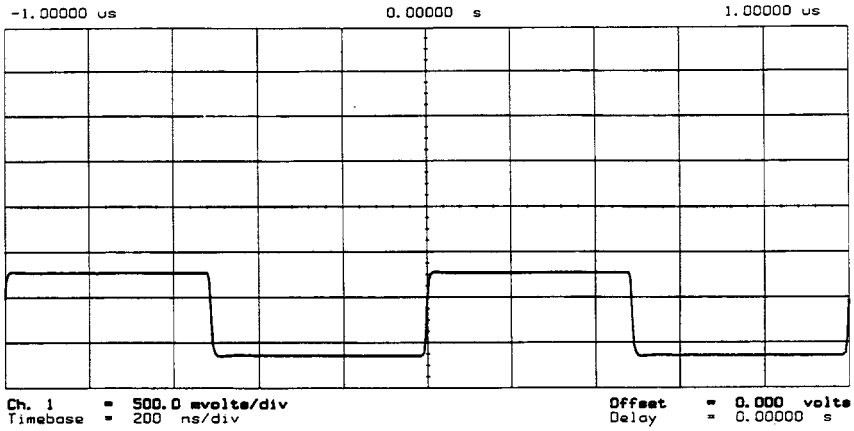


PLREF Waveforms

REF Signal At A11TP9 REF is the buffered PLREF+ signal. The 1st IF is phase locked to this signal. Use an oscilloscope to observe the signal at the frequencies noted in Figure 7-9 and Figure 7-10.

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

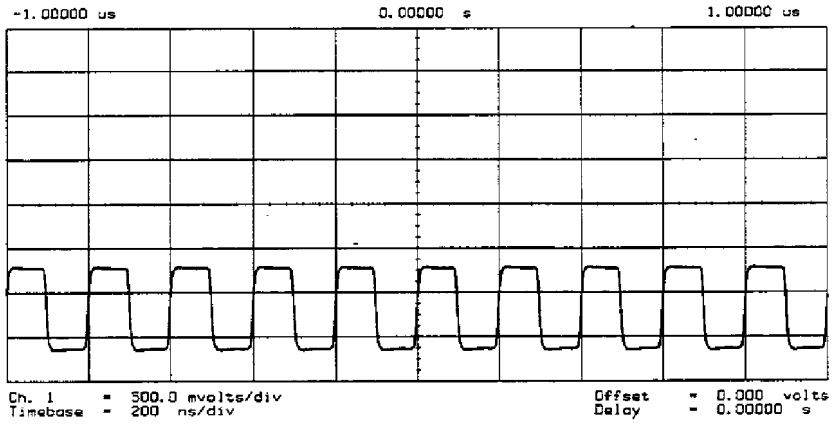
Figure 7-9 High Band REF Signal (≥16 MHz CW)



sg611s

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)



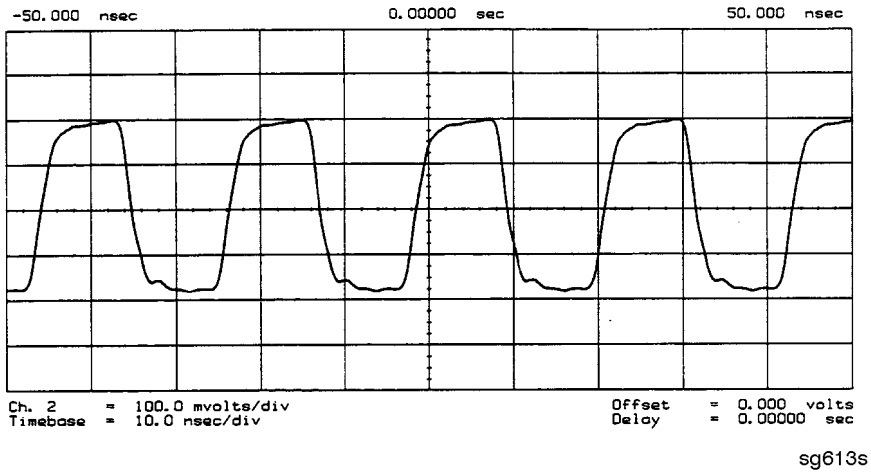
sg612s

- If REF looks good, skip ahead to "4 MHz Reference Signal" on page 7-16.
- If REF is bad in low band, continue with "FN LO at A12 Check," next.

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 good, the A12 assembly is faulty.
   - If the FN LO signal is not good, skip ahead to "A13/A14 Fractional-N Check" on page 7-20.

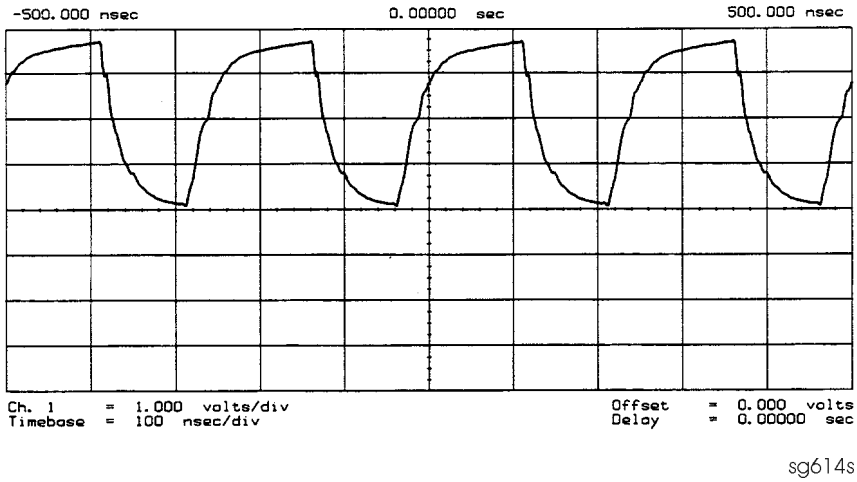
Figure 7-11 Typical FN LO Waveform at A12J1



4 MHz Reference Signal

This reference signal is used to control the receiver. If faulty, this signal can cause apparent source problems because the CPU uses receiver data to control the source. At A12TP9 it should appear similar to Figure 7-12.

Figure 7-12 4 MHz Reference Signal at A12TP9 (Preset)

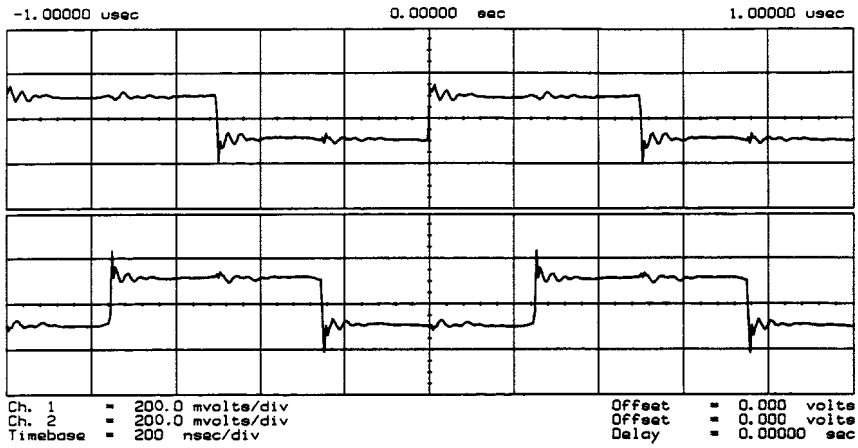


2ND LO Waveforms

The 2nd LO signals appear different in phase and shape at different frequencies.

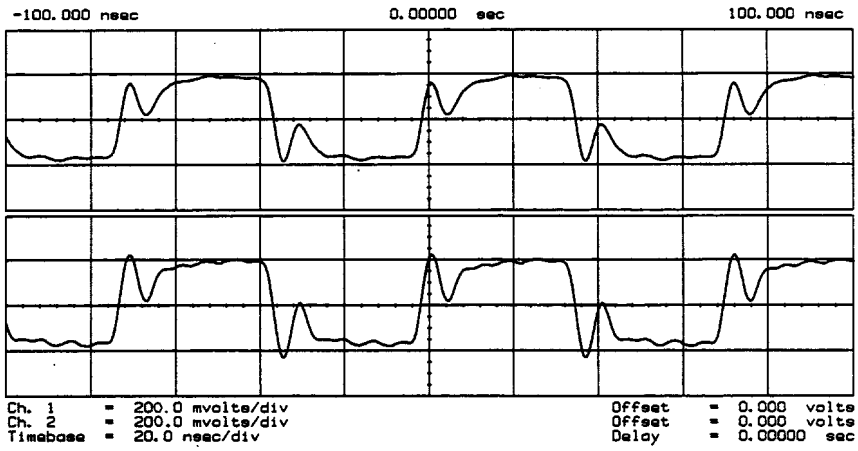
90 Degree Phase Offset of 2nd LO Signals in High Band In high band, the 2nd LO is 996 kHz. As indicated by Figure 7-13, the 2nd LO actually consists of two signals 90 degrees out of phase.

Figure 7-13 90 Degree Phase Offset of High Band 2nd LO Signals (≥16 MHz CW)



In-Phase 2nd LO Signals in Low Band The 2nd LO signals in low band, as shown in Figure 7-14, are not phase shifted. In low band these signals track the RF output with a 4 kHz offset.

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.

A12 Digital Control Signals Check

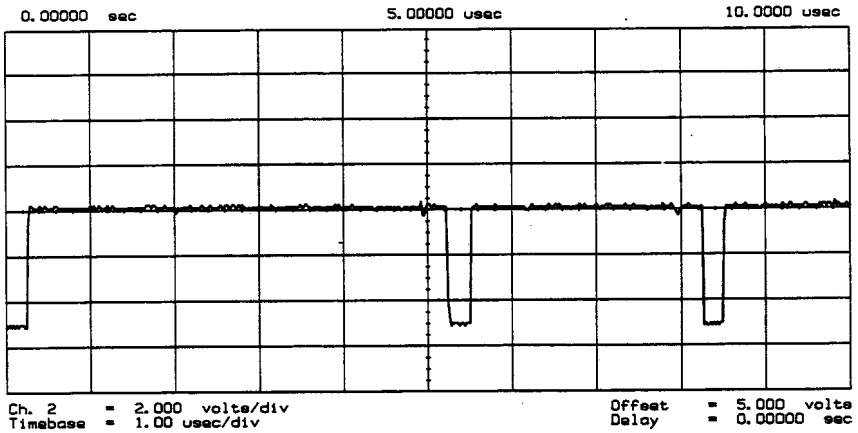
Several digital control signals must be functional for the A12 assembly to operate properly. Check the control lines listed in Table 7-1 with the oscilloscope in the high input impedance setting.

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

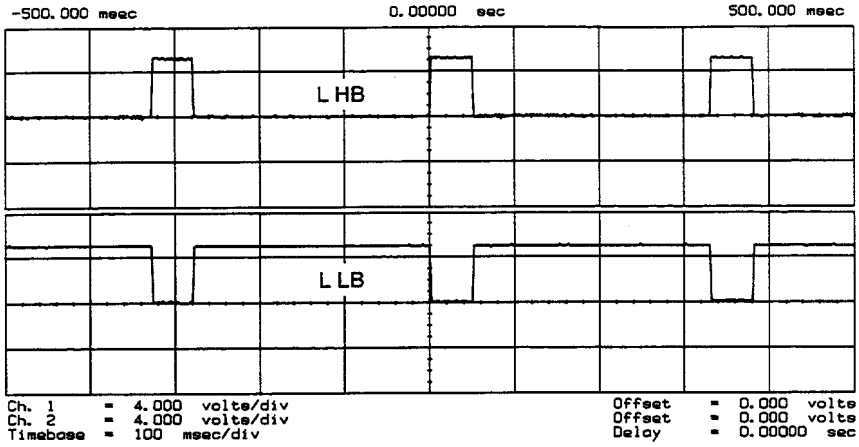
L ENREF Line This is a TTL signal. To observe it, trigger on the negative edge. In preset state, the signal should show activity similar to Figure 7-15.

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.

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



sg618s

If all of the digital signals appear good, the A12 assembly is faulty.

A13/A14 Fractional-N Check

Use the analog bus or an oscilloscope to check the A14 VCO's ability to sweep from 30 MHz to 60 MHz. The faster analog bus method should suffice unless problems are detected.

Fractional-N Check with Analog Bus

1. Press (Preset) (System) **SERVICE MENU** **ANALOG BUS ON** (Meas) **ANALOG IN Aux Input** **FRAC N** to switch on the analog bus and the fractional-N counter.
2. Press (Menu) **CW FREQ** to set the analyzer to CW mode.
3. Set the instrument as indicated in Table 7-5 and see whether the VCO generates the frequencies listed.

Table 7-5 VCO Range Check Frequencies

Instrument Setting	Counter Reading
31 MHz	30 ±0.030 MHz
60.999999 MHz	60 ±0.060 MHz

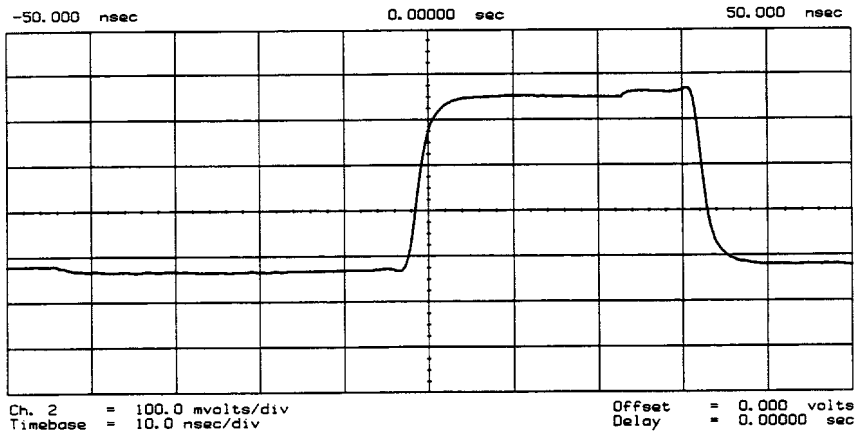
4. Check the counter reading at the frequencies indicated.
   - If the readings are within the limits specified, the probability is greater than 90% that the fractional-N assemblies are functional. Either skip ahead to the "A7 Pulse Generator Check" on page 7-25, or perform the more conclusive "A14 VCO Range Check with Oscilloscope" described next.
   - If the readings fail the specified limits, perform the "A14 VCO Exercise" on page 7-22.

A14 VCO Range Check with Oscilloscope

1. Remove the W9 HI OUT cable (A14J1 to A7) from the A7 assembly and connect it to an oscilloscope set for 50 ohm input impedance. Switch on the analyzer.
2. Press (Preset) (System) **SERVICE MENU** **SERVICE MODES** **FRACN TUNE ON** to activate the FRACN TUNE service mode. See Chapter 10 , "Service Key Menus and Error Messages," for more information on the 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.

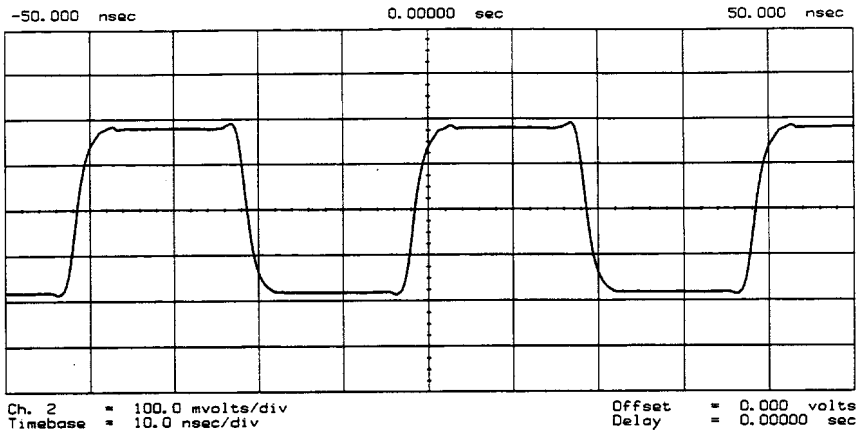
   If the fractional-N output signals are correct, continue source troubleshooting by skipping ahead to "A7 Pulse Generator Check" on page 7-25.

Figure 7-17 10 MHz HI OUT Waveform from A14J1



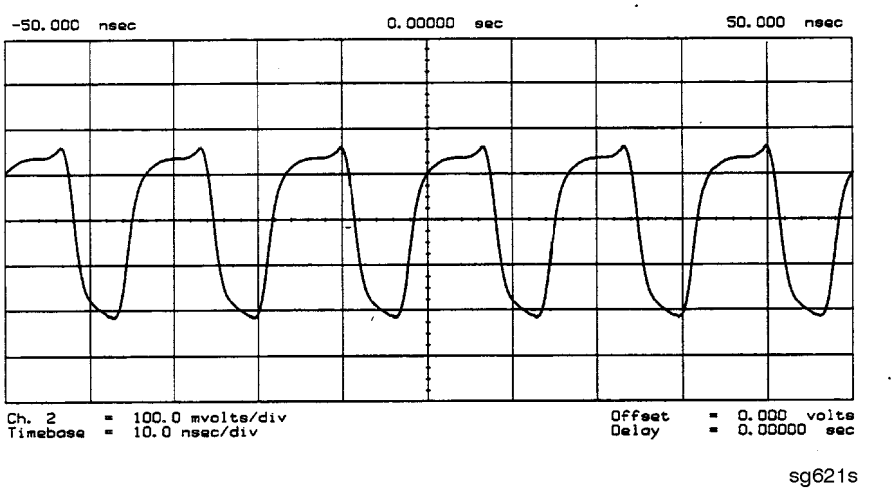
sg619s

Figure 7-18 25 MHz HI OUT Waveform from A14J1



sg620s

Figure 7-19 60 MHz HI OUT Waveform from A14J1

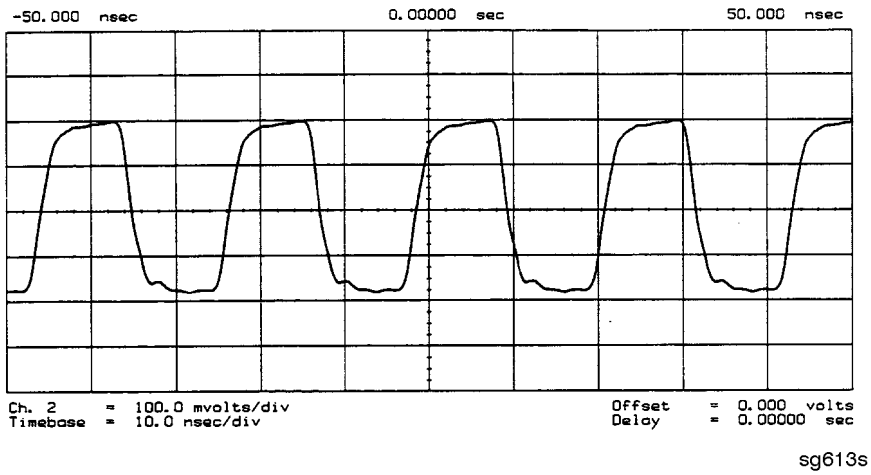


A14 VCO Exercise

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.

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 +15 V internal power supply from A8TP8 to A14TP14 and then jumping the –5.2 V supply from A8TP10 to A14TP14.
5. Confirm that the VCO frequency changes from approximately 30 MHz or less to 60 MHz or more.
6. If this procedure produces unexpected results, the A14 assembly is faulty.
7. If this procedure produces the expected results, continue with the "A14 Divide-by-N Circuit Check" on page 7-23.

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 µs to 11 µs.
   - 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," next.
6. Remember to replace the A13 assembly.

A14-to-A13 Digital Control Signals Check

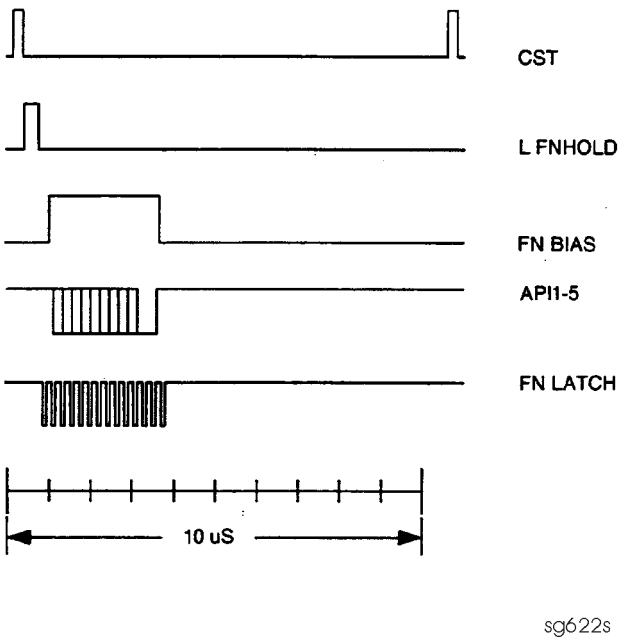
The A14 assembly generates a TTL cycle start (CST) signal every 10 microseconds. If the VCO is oscillating and the CST signal is not detectable at A14TP3, the A14 assembly is non-functional.

Use the CST signal as an external trigger for the oscilloscope and monitor the signals in Table 7-6. Since these TTL signals are generated by A14 to control A13, check them at A13 first. Place A13 on the large extender board. The signals should look similar to Figure 7-21. If these signals are good, the A13 assembly is defective.

Table 7-6 A14-to-A13 Digital Control Signal Locations

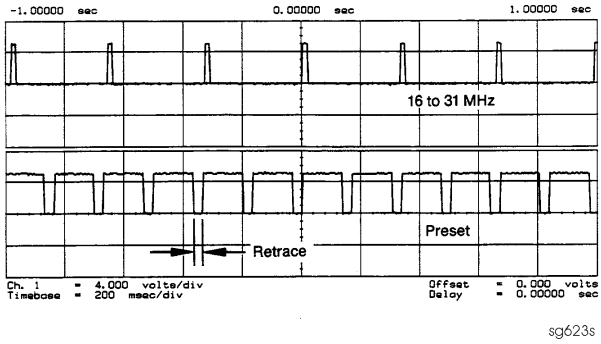
Mnemonic	A13 Location	A14 Location
CST	none	TP3
L FNHOLD	P2-2	P2-2
FNBIAS	P2-5	P2-5
API1	P2-32	P2-32
API2	P2-3	P2-3
API3	P2-34	P2-34
API4	P2-4	P2-4
API5	P2-35	P2-35
FN LATCH	P1-28	P1-58

Figure 7-21 A14 Generated Digital Control Signals



H MB Line This signal is active during the 16 MHz to 31 MHz sweep. The upper trace of 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.

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



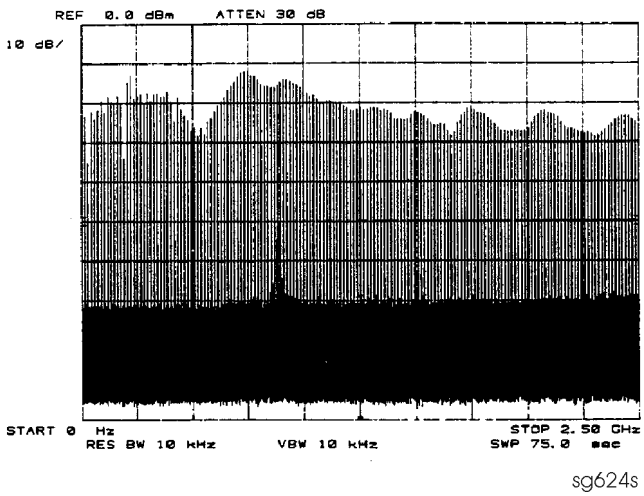
A7 Pulse Generator Check

The pulse generator affects phase lock in high band only. It can be checked with either a spectrum analyzer or an oscilloscope.

A7 Pulse Generator Check with Spectrum Analyzer

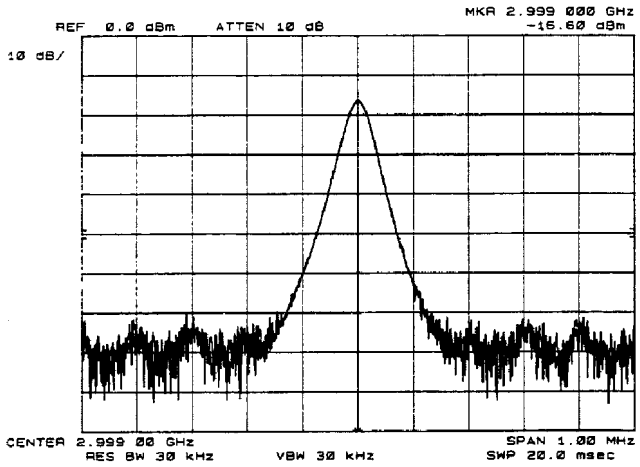
1. Remove the A7-to-A6 SMB cable (W7) from the A7 pulse generator assembly. Set the analyzer to generate a 16 MHz CW signal. Connect the spectrum analyzer to the A7 output connector and observe the signal. The A7 comb should resemble the spectral display in Figure 7-23.

Figure 7-23 Pulse Generator Output



2. If the analyzer malfunction relates to a particular frequency or range, look more closely at the comb tooth there. Adjust the spectrum analyzer span and bandwidth as required. Even at 3 GHz, the comb should look as clean as Figure 7-24. For Option 006 instruments at 6 GHz, the comb tooth level should be approximately –46 dBm.

Figure 7-24 High Quality Comb Tooth at 3 GHz



sg625s

3. If the signal at the A7 output is good, check the A7-to-A4 cable.
4. If the signal is not as clean as Figure 7-24, observe the HI OUT input signal to the A7 assembly.
   a. On the network analyzer, press System **SERVICE MENU** **SERVICE MODES** **PLL AUTO OFF** . Otherwise do not readjust the instrument. Remove the A14-to-A7 SMB cable (W9) from the A7 pulse generator assembly (CW ≈ 16 MHz).
   b. Set the spectrum analyzer to a center frequency of 45 MHz and a span of 30 MHz. Connect it to the A14-to-A7 cable still attached to the A14 assembly. Narrow the span and bandwidth to observe the signal closely.
5. If the HI OUT signal is as clean as Figure 7-25, the A7 assembly is faulty.

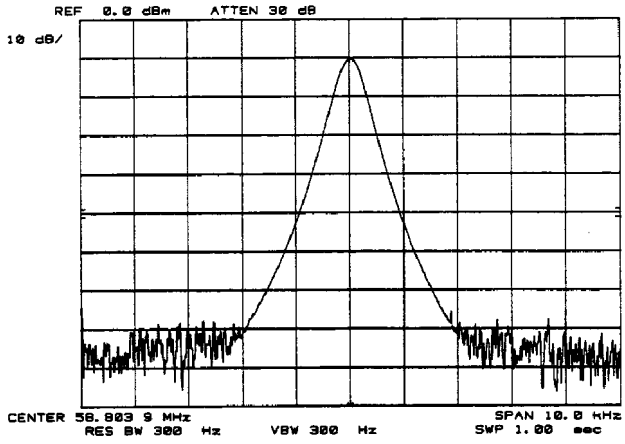
   Otherwise, check the A14-to-A7 cable or recheck the A13/A14 fractional-N as described ahead.

Rechecking the A13/A14 Fractional-N

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

Figure 7-25 Stable HI OUT Signal in FRACN TUNE Mode



A7 Pulse Generator Check with Oscilloscope

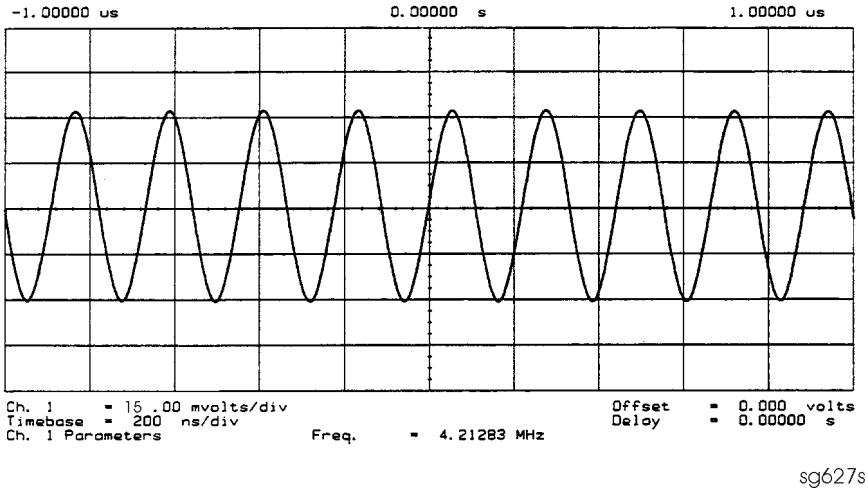
Perform this check if a spectrum analyzer is not available.

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 service mode of the analyzer and tune the source to 50 MHz. Press **SRC ADJUST MENU** **SRC TUNE ON** **SRC TUNE FREQ** (50) (M/µ).
4. Set the SRC TUNE frequency to those listed in Table 7-7 and observe the 1st IF waveforms. They should appear similar to Figure 7-26.
   - If the signals observed are proper, continue with "A11 Phase Lock Check" on page 7-28.
   - If the signals observed are questionable, use a spectrum analyzer to perform the "A7 Pulse Generator Check with Spectrum Analyzer" on page 7-25.

Table 7-7 1st IF Waveform Settings

SRC TUNE	FRACN	Harmonic	1st IF
50 MHz	50 MHz	1	1 to 6 MHz
250 MHz	50 MHz	5	1 to 6 MHz
2550 MHz	50 MHz	51	1 to 6 MHz

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



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" on page 7-30 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 "Source Pretune Correction Constants (Test 48)" on page 3-10.
- 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

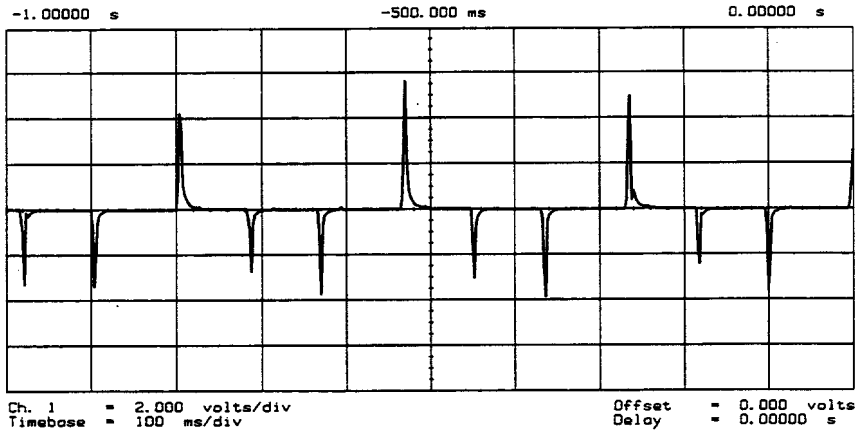
To confirm that the A11 assembly is receiving the signals required for its proper operation, perform the following steps.

1. Place the A11 assembly on the large extender board.
2. Switch on the analyzer and press (Preset).
3. Check for the signals listed in Table 7-8.

Table 7-8 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 (Preset) (Menu) **NUMBER OF POINTS** (3) (x1) to observe this signal.
REF	I	A11TP9	Figure 7-9, Figure 7-10	Observe both low band and high band CW frequencies.
YO COIL +	O	A11P1-2,32	Figure 7-7	Use **SOURCE PLL OFF**.
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. Use A7 pulse generator check setup.

Figure 7-27 FM Coil – Plot with 3 Point Sweep



sg628s

4. If any of the input signal is not proper, refer to the overall block diagram in Chapter 4 as an aid to troubleshooting the problem to its source.
5. If any of the output signals is not proper, the A11 assembly is faulty.

Source Group Troubleshooting Appendix

Troubleshooting Source Problems with the Analog Bus

The analog bus can perform a variety of fast checks. However, it too is subject to failure and thus should be tested prior to use. You should have done this in Chapter 4 .

To use the analog bus to check any one of the nodes, press (Preset) (System) **SERVICE MENU** **ANALOG BUS IN** . Then press (Meas) **ANALOG IN Aux Input** and enter the analog bus node number followed by (x1). Refer to "Analog Bus" on page 10-20 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" on page 7-8.

`NO PHASE LOCK: CHECK R INPUT LEVEL` means the IF was not acquired after pretune: a source problem. Perform the "A4 Sampler/Mixer Check" on page 7-8.

`PHASE LOCK CAL FAILED` means that a calculation of pretune values was not successful: a source or receiver failure. Perform "Source Pretune Correction Constants (Test 48)" on page 3-10. If the analyzer fails that routine, perform the "A4 Sampler/Mixer Check" on page 7-8.

`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" on page 10-16 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 Overview" on page 12-14 for additional information regarding band related problems. Then use the procedures in this chapter to check source functions at specific frequencies.

Broadband Power Problems

This section assumes that a power problem exists across the full frequency range, but that no error message is displayed on the analyzer. The problem may affect Port 1, Port 2, or both. Assemblies in question include:

- A3 source
- A21 directional coupler
- A22 directional coupler (8753ES only)
- A24 solid-state transfer switch (8753ES only)
- any cables from the A3 source to the outputs of port 1 or port 2

8 Receiver Troubleshooting

Receiver Troubleshooting

Use this procedure only if you have read Chapter 4 , “Start Troubleshooting Here.” Follow the procedures in the order given, unless instructed otherwise.

The receiver group assemblies consist of the following:

- A4/A5/A6 sampler/mixer assemblies
- A10 digital IF assembly

Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an Agilent 8753ET/ES network analyzer.

1. Identify the faulty group. Refer to Chapter 4 , “Start Troubleshooting Here.” Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13 , “Replaceable Parts.”
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

Receiver Failure Error Messages

The error messages which indicate receiver group problems may be caused by the instrument itself or by external devices or connections. The following three error messages share the same description.

- `CAUTION: OVERLOAD ON INPUT A, POWER REDUCED`
- `CAUTION: OVERLOAD ON INPUT B, POWER REDUCED`
- `CAUTION: OVERLOAD ON INPUT R, POWER REDUCED`

If any of the above error messages appear, the analyzer has exceeded approximately +14 dBm at one of the test ports. The RF output power is automatically reduced to –85 dBm. The annotation P↓ appears in the left margin of the display to indicate that the power trip function has been activated. To reset the analyzer's power and regain control of the power level, do the following:

1. Remove any devices under test which may have contributed excess power to the input.
2. Press (Power) (0) (x1) **SOURCE PWR ON** to return the power level to the preset state.
   - If the power trip indicator (P↓) does not reappear, reconfigure the test setup to keep input power levels at 0 dBm or below.
   - If P↓ reappears, go to "Observe the A and B Input Traces" on page 4-17.

Troubleshooting When All Inputs Look Bad

Run Internal Tests 18 and 17

1. Press (Preset) (System) **SERVICE MENU** **TESTS** (18) (x1) **EXECUTE TEST** to run the ADC offset.
2. Then, when the analyzer finishes test 18, press (17) (x1) **EXECUTE TEST** to run the ADC linearity test.

If either of these tests FAIL, the A10 assembly is probably faulty. This can be confirmed by checking the 4 MHz signal and substituting the A10 assembly or checking the signals listed in Table 8-1 on page 8-7.

Check 2nd LO

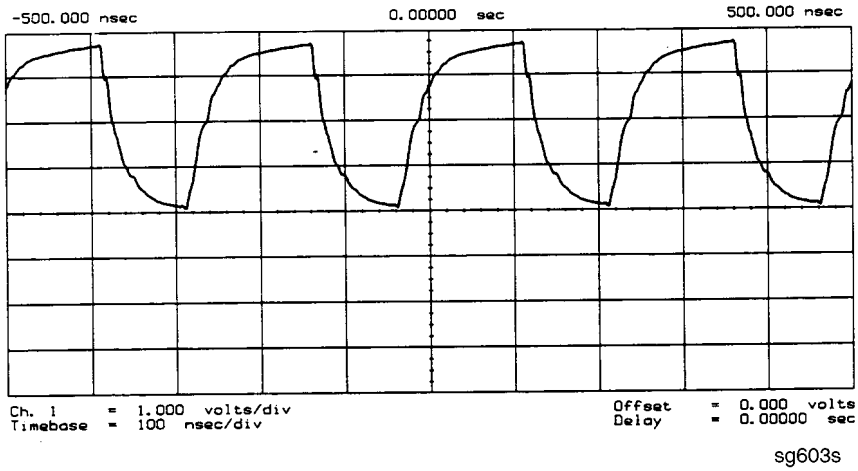
Check the 2nd LO signal. Refer to "A12 Reference Check" on page 7-12 for analog bus and oscilloscope checks of the 2nd LO and waveform illustrations.

- If the analyzer passes the checks, continue to "Check the 4 MHz REF Signal," next.
- If the analyzer fails the checks, perform the "High/Low Band Transition Adjustment" on page 3-47. If the adjustment fails, or brings no improvement, replace A12.

Check the 4 MHz REF Signal

1. Press (Preset).
2. Use an oscilloscope to observe the 4 MHz reference signal at A10P2-6.
   - If the signal does not resemble Figure 8-1, troubleshoot the signal source (A12P2-36) and path.
   - If the signal is good, the probability is greater than 90% that the A10 assembly is faulty. For confirmation, perform "Check A10 by Substitution or Signal Examination," next.

Figure 8-1 4 MHz REF Waveform



Check A10 by Substitution or Signal Examination

If the 4 MHz REF signal is good at the A10 digital IF assembly, check the A10 assembly by one of the following methods:

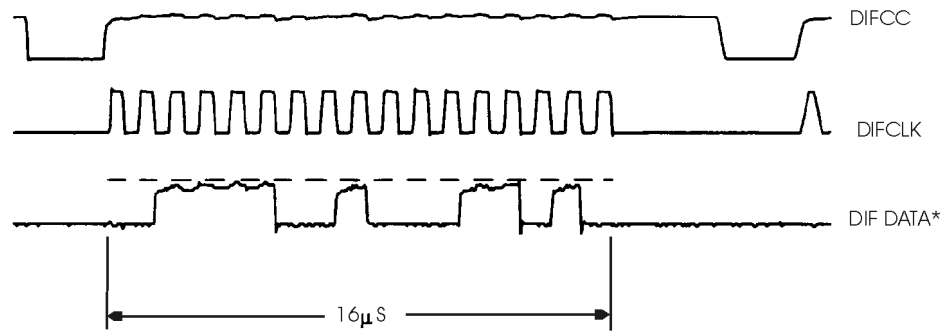
- Substitute another A10 assembly or
- Check the signal/control lines required for its operation. The pins and signal sources of those lines are identified in Table 8-1. It is possible that the A9 assembly may not be providing the necessary signals. These signal checks allow you to determine which assembly is faulty. Some of the waveforms are illustrated by Figure 8-2 and Figure 8-3.

If the substitute assembly shows no improvement or if all of the input signals are valid, continue with "Check the 4 kHz Signal" on page 8-9. Otherwise, troubleshoot the suspect signals 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 8-2
DIFCLK	Digital IF serial clock	P2-4	A10P2-4	Figure 8-2
DIF DATA	Digital IF serial data out	P2-3	A10P2-3	Figure 8-2
L ENDIF	L=enable digital IF	P2-17	A9P2-17	Figure 8-3
L INTCOP	L=interrupt, DSP	P2-2	A10P2-2	Figure 8-3
*Check for TTL activity.				

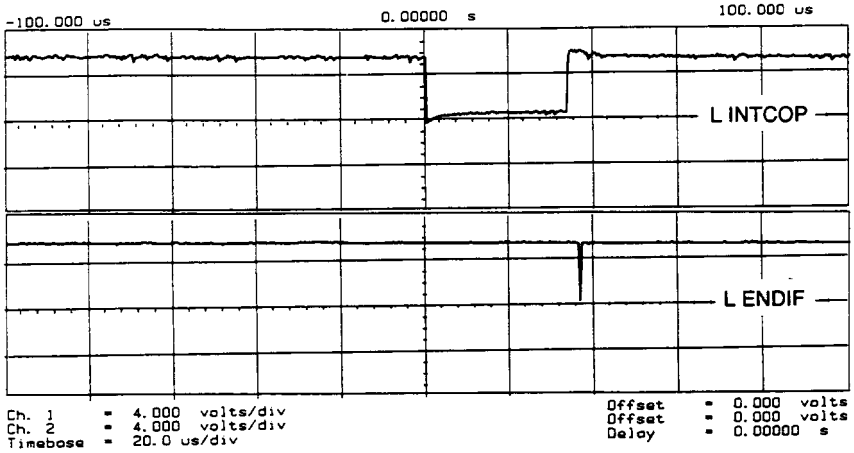
Figure 8-2 Digital Data Lines Observed Using L INTCOP as Trigger



* DIF DATA consists of 16 serial bits per input conversion. the LSB is on the right side and is the most volatile.

sg602s

Figure 8-3 Digital Control Lines Observed Using L INTCOP as Trigger



sg604s

Troubleshooting When One or More Inputs Look Good

Since at least one input is good, all of the common receiver circuitry beyond the multiplexer is functional. Only the status of the individual sampler/mixers and their individual signal paths is undetermined.

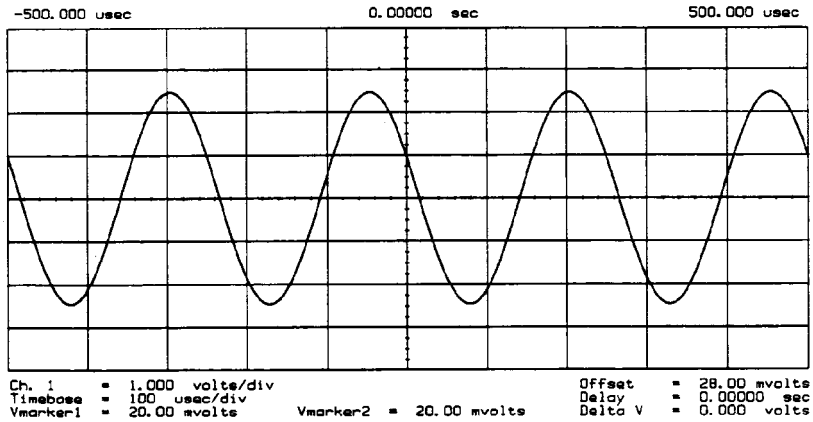
Check the 4 kHz Signal

1. Press (Preset) (Menu) **CW FREQ** .
2. Use an oscilloscope to check the 4 kHz output of the sampler/mixer in question at the A10 assembly. The input and output access pins are listed in Table 8-2. The signal should resemble the waveform of Figure 8-4.
   - If the signal is good, continue with "Check the Trace with the Sampler Correction Constants Off" on page 8-10.
   - If the signal is bad, skip ahead to "Check 1st LO Signal at Sampler/Mixer" on page 8-10.

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

Figure 8-4 2nd IF (4 kHz) Waveform



sg605s

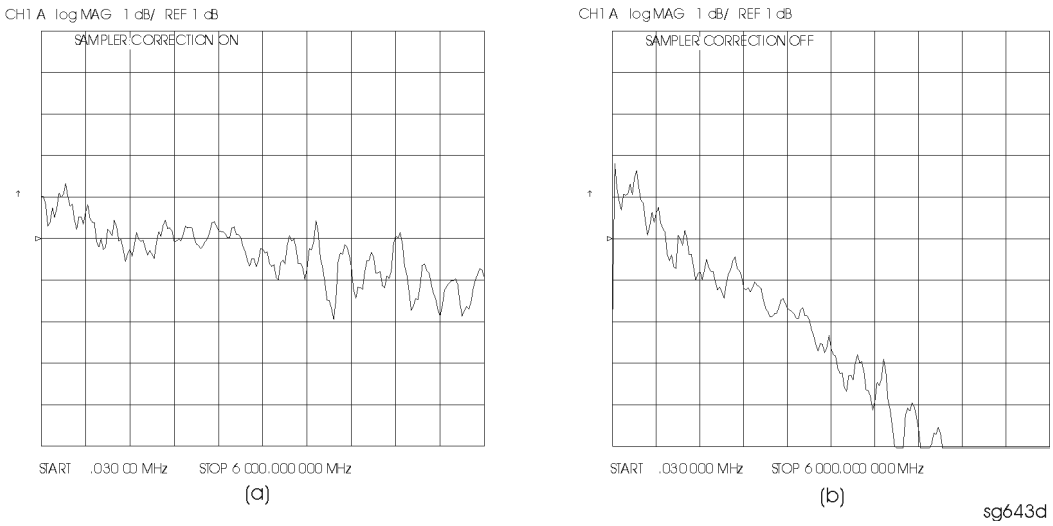
Check the Trace with the Sampler Correction Constants Off

1. Press (Preset) (Meas) **INPUT PORTS** **A** (Scale Ref) **AUTO SCALE** .
2. The trace is currently being displayed with the sampler correction constants on and should resemble Figure 8-5a.
3. Press (System) **SERVICE MENU** **SERVICE MODES** **MORE** **SAMPLER COR OFF** .
4. The trace is now being displayed with sampler correction constants off and should have worsened to resemble Figure 8-5b.
5. Press **SAMPLER COR ON** . The trace should improve and resemble Figure 8-5a again.

NOTE When the correction constants are switched off, an absolute offset and bandswitch points may be evident.

If the trace shows no improvement when the sampler correction constants are toggled from off to on, perform "Sampler Magnitude and Phase Correction Constants (Test 53)" on page 3-16. If the trace remains bad after this adjustment, the A10 assembly is defective.

Figure 8-5 Typical Trace with Sampler Correction On and Off



Check 1st LO Signal at Sampler/Mixer

If the 4 kHz signal is bad at the sampler/mixer assembly, check the 1st LO signal where it enters the sampler/mixer assembly in question.

- If the 1st LO is faulty, check the 1st LO signal at its output connector on the A7 assembly to determine if the failure is in the cable or the assembly.
- If the 1st LO is good, continue with "Check 2nd LO Signal at Sampler/Mixer," next.

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" on page 7-12 for analog bus and oscilloscope checks of the 2nd LO and waveform illustrations. Table 8-3 identifies the signal location at the samplers and the A12 assembly.

Table 8-3 2nd LO Locations

Mnemonic	Description	Sampler Location	Signal Source
2nd LO 1	2nd LO (0 degrees)	A4/5/6 P1-11	A12P1-2, 32
2nd LO 2	2nd LO (–90 degrees)	A4/5/6 P1-4	A12P1-4, 34

If the 2nd LO is good at the sampler/mixer, the sampler/mixer assembly is faulty. Otherwise, troubleshoot the A12 assembly and associated signal path.

9 Accessories Troubleshooting

Accessories Troubleshooting

Use this procedure only if you have read Chapter 4 , “Start Troubleshooting Here.” Follow the procedures in the order given, unless instructed otherwise.

Measurement failures can be divided into two categories:

- Failures which don't affect the normal functioning of the analyzer but render incorrect measurement data.
- Failures which impede the normal functioning of the analyzer or prohibit the use of a feature.

This chapter addresses the first category of failures which are usually caused by the following:

- operator errors
- faulty calibration devices or connectors
- bad cables or adapters
- improper calibration techniques

These failures are checked using the following procedures:

- “Inspect the Accessories” on page 9-4
- “Inspect the Error Terms” on page 9-5

Assembly Replacement Sequence

The following steps show the sequence to replace an assembly in an Agilent 8753ET/ES network analyzer.

1. Identify the faulty group. Refer to Chapter 4 , “Start Troubleshooting Here.” Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13 , “Replaceable Parts.”
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

Inspect the Accessories

Inspect the Test Port Connectors and Calibration Devices

1. Check for damage to the mating contacts of the test port center conductors and loose connector bulkheads.
2. Inspect the calibration kit devices for bent or broken center conductors and other physical damage. Refer to the calibration kit operating and service manual for information on gaging and inspecting the device connectors.

   If any calibration device is obviously damaged or out of mechanical tolerance, replace the device.

Inspect the Error Terms

Error terms are a measure of a “system”: a network analyzer, calibration kit, and any cables used. As required, refer to Chapter 11 , “Error Terms,” for the following:

- The specific measurement calibration procedure used to generate the error terms.
- The routines required to extract error terms from the instrument.
- Typical error term data.

Use Table 9-1 to cross-reference error term data to system faults.

Table 9-1 Components Related to Specific Error Terms

Component	Directivity	Source Match	Reflection Tracking	Isolation	Load Match	Transmission Tracking
Calibration Kit						
load	X					
open/short	X	X				
Analyzer						
sampler			X	X		X
A10 digital IF				X		
test port connectors	X	X	X	X	X	X
External cables					X	X

If you detect problems using error term analysis, use the following approach to isolate the fault:

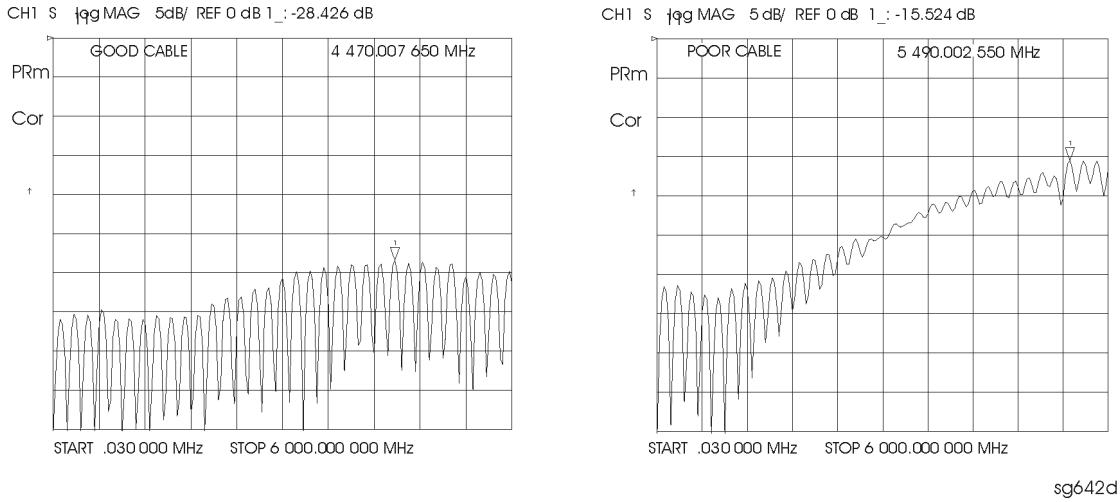
1. Check the cable by examining the load match and transmission tracking terms. If those terms are incorrect, go to “Cable Test” on page 9-6.
2. Verify the calibration kit devices:
   - Loads (for 8753ES): If the directivity error term looks good, the load and the test port are good. If directivity looks bad, connect the same load on the other test port and measure its directivity. If the second port looks bad, as if the problem had shifted with the load, replace the load. If the second port looks good, as if the load had not been the problem, troubleshoot the first port.
   - Loads (for 8753ET): If the directivity error term looks good, the load and the test port are good. If directivity looks bad, connect a known good load to the Reflection port and measure its directivity. If the directivity now looks good, replace the original load. If the directivity still looks bad, troubleshoot the Reflection port.
   - Shorts and opens: If the source match and reflection tracking terms look good, the shorts and the opens are good. If these terms look bad while the rest of the terms look good, proceed to “Verify Shorts and Opens” on page 9-6.

Cable Test

The load match error term is a good indicator of cable problems. You can further verify a faulty cable by measuring the reflection of the cable. Perform an S11 1-port calibration directly at port 1 (no cables). Then connect the suspect cable to port 1 and terminate the open end in 50 ohms.

Figure 9-1 shows the return loss trace of a good (left side) and faulty (right side) cable. Note that the important characteristic of a cable trace is its level (the good cable trace is much lower) not its regularity. Refer to the cable manual for return loss specifications.

Figure 9-1 Typical Return Loss Traces of Good and Poor Cables



Verify Shorts and Opens

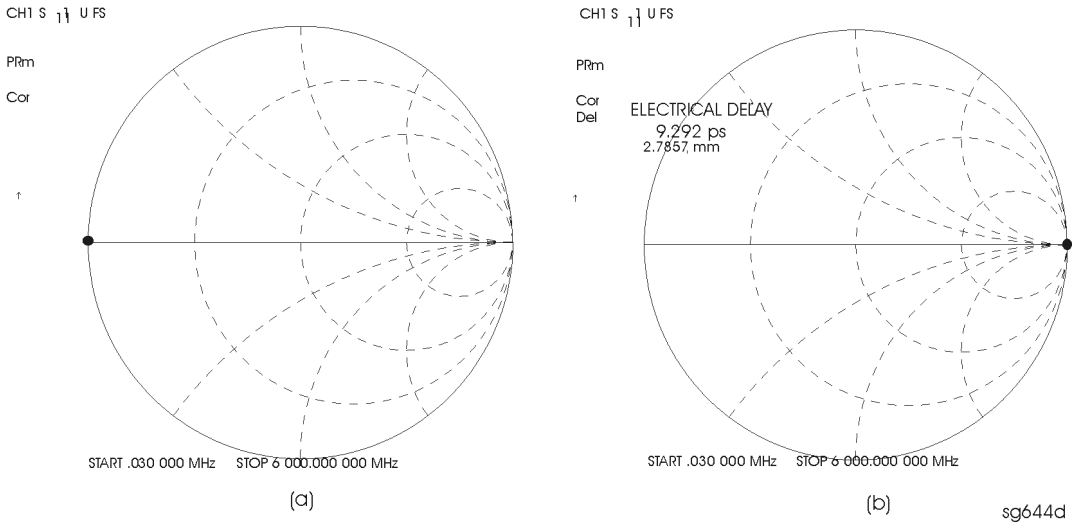
Substitute a known good short and open of the same connector type and sex as the short and open in question. If the devices are not from one of the standard calibration kits, refer to your analyzer's user's guide for information on how to use the **MODIFY CAL KIT** function. Set aside the short and open that are causing the problem.

1. Perform an S11 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 port 1. Press Scale Ref **ELECTRICAL DELAY** and turn the front panel knob to enter enough electrical delay so that the trace appears as a dot at the left side of the circle. (See Figure 9-2a, left.)

   Replace the good short with the questionable short at port 1. The trace of the questionable short should appear very similar to the known good short.
3. Connect the good open to port 1. Press Scale Ref **ELECTRICAL DELAY** and turn the front panel knob to enter enough electrical delay so that the trace appears as a dot at the right side of the circle. (See Figure 9-2b, right.)

Replace the good open with the questionable open at port 1. The trace of the questionable open should appear very similar to the known good open.

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



10 Service Key Menus and Error Messages

The functions available in the service key menus allow you to perform the following service functions:

- test
- verify
- adjust
- control
- troubleshoot

The main section of this chapter, "Service Key Menus," divides the menus into three groups:

- "Internal Diagnostics Menus" on page 10-3
- "Service Feature Menus" on page 10-16
- "Firmware Revision Softkey" on page 10-41

Additionally, there are sections providing information on the following:

- "GPIB Service Mnemonic Definitions" on page 10-42
- "Error Messages" on page 10-44

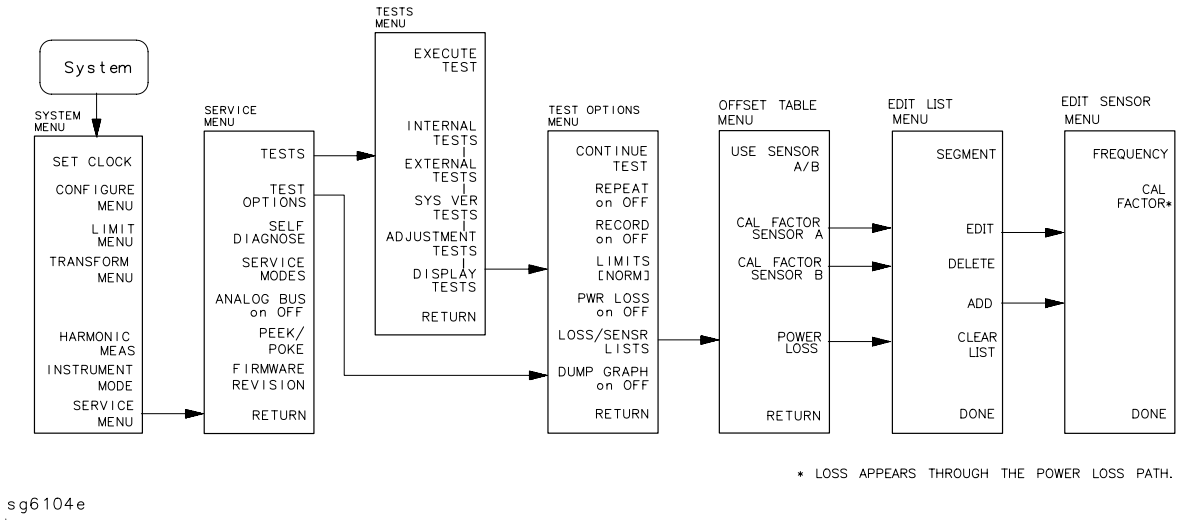
Service Key Menus

Internal Diagnostics Menus

The internal diagnostics menus are shown in Figure 10-1 and described in the following tables. The following keys access the internal diagnostics menus:

- **TESTS**
- **TEST OPTIONS**
- **SELF DIAGNOSE**

Figure 10-1 Internal Diagnostics Menus



NOTE Throughout this service guide, these conventions are observed:

- (Hardkeys) are labeled front panel keys.
- **SOFTKEYS** are display-defined keys (in the menus).
- `GPIB COMMANDS` (when applicable)

Tests Menu

To access this menu, press System **SERVICE MENU** **TESTS** .

The Tests menu allows you to select or execute the service tests. The default is set to internal test 1. To select a test via GPIB command, use the `TEST[D]` command.

NOTE Descriptions of tests in each of the categories are given in "Test Descriptions" on page 10-8.

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 GPIB code. The GPIB command to output the test status of the most recently executed test is `OUTPTESS`. For more information, refer to "GPIB Service Mnemonic Definitions" on page 10-42.

Table 10-1 Test Status Terms

Display Abbreviation	Definition	GPIB Code
PASS	PASS	0
FAIL	FAIL	1
-IP-	IN PROGRESS	2
(NA)	NOT AVAILABLE	3
-ND-	NOT DONE	4
DONE	DONE	5

Table 10-2 Tests Menu Keys

Key	GPIB Mnemonic	Description
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	N/A	Evaluates the analyzer's internal operation. These tests are completely internal and do not require external connections or user interaction.
EXTERNAL TESTS	N/A	Evaluate the analyzer's external operation. These additional tests require some user interaction (such as keystrokes).
SYS VER TESTS	N/A	Verifies the analyzer system operation by examining the contents of the measurement calibration arrays. Refer to Chapter 2 , "System Verification and Performance Tests." Information about the calibration arrays is provided in Chapter 11 , "Error Terms."
ADJUSTMENT TESTS	N/A	Generates and stores the correction constants. For more information, refer to Chapter 3 , "Adjustments and Correction Constants."
DISPLAY TESTS	N/A	Checks for correct operation of the display and GSP board.

Test Options Menu

To access this menu, press System **SERVICE MENU** **TEST OPTIONS** .

Table 10-3 Test Options Menu Keys

Key	GPIB Mnemonic	Description
TEST OPTIONS	N/A	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 GPIB. This is especially useful for correction constants. The instrument must be in system controller mode or pass control mode to print (refer to your analyzer's user's guide for more information on printing).
LIMITS [NORM/SPCL]	N/A	Selects either NORMal or SPeCiaL (tighter) limits for the operator's check. The SPCL limits are useful for a guard band.
PWR LOSS on OFF	PWRLOSS	Selects whether or not to use the power loss table for a power meter calibration.
LOSS/SENSR LISTS	N/A	Accesses the power loss/sensor lists menu that contains the following softkeys: **USE SENSOR A/B** (USESENS<A|B>) selects the A or B power sensor calibration factor list for use in power meter calibration measurements. **CAL FACTOR SENSOR A** (CALFSENA) accesses the Edit List menu to allow modification of the calibration data table for power sensor A. **CAL FACTOR SENSOR B** (CALFSENB) accesses the Edit List menu to allow modification of the calibration data table for power sensor B. **POWER LOSS** (POWLLIST) accesses the Edit List menu to allow modification of the external power loss data table that corrects coupled-arm power loss when a directional coupler samples the RF output.
DUMP GRAPH	N/A	Generates printed graphs of verification results when activated during a system verification.

Edit List Menu

To access this menu, press System **SERVICE MENU** **TEST OPTIONS** **LOSS/SENSR LISTS** and then press one of the following: **CAL FACTOR SENSOR A** or **CAL FACTOR SENSOR B** or **POWER LOSS** .

Table 10-4 Edit List Menu Keys

Key	GPIB Mnemonic	Description
SEGMENT	N/A	Selects a segment (frequency point) to be edited, deleted from, or added to the current data table. Works with the entry controls.
EDIT	SEDI[D]	Allows modification of frequency, cal factor and loss values previously entered in the current data table.
DELETE	SDEL	Deletes frequency, cal factor and loss values previously entered in the current data table.
ADD	SADD	Adds new frequency, cal factor and loss values to the current data table up to a maximum of 12 segments (frequency points, PTS).
CLEAR LIST	CLEL	Deletes the entire current data table (or list) when **YES** is pressed. Press **NO** to avoid deletion.
DONE	EDITDONE	Selects whether or not to use the power loss table for a power meter calibration.

Self Diagnose Softkey

You can access the self diagnosis function by pressing System **SERVICE MENU** **SELF DIAGNOSE** . This function examines, in order, the pass/fail status of all internal tests and displays NO FAILURE FOUND if no tests have failed.

If a failure is detected, the routine displays the assembly or assemblies most probably faulty and assigns a failure probability factor to each assembly.

Test Descriptions

The analyzer has up to 80 routines that test, verify, and adjust the instrument. This section describes those tests.

Internal Tests This group of tests runs without external connections or operator interaction. All return a `PASS` or `FAIL` condition. All of these tests run on power-up and **PRESET** except as noted.

Table 10-5 Internal Tests

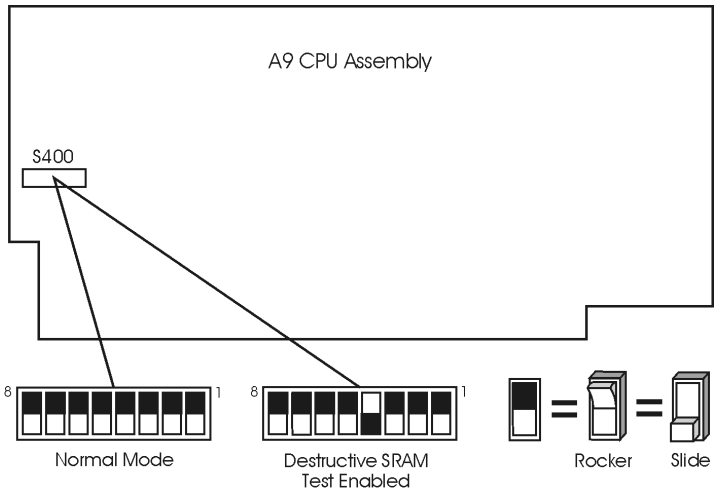
Test Number	Test Name	Description
0	ALL INT	Runs only when selected. It consists of internal tests 3–11, 13–16, and 20. Use the front panel knob to scroll through the tests and see which failed. If all pass, the test displays a PASS status. Each test in the subset retains its own test status.
1	PRESET	Runs the following subset of internal tests: first, the ROM/RAM tests 2, 3, and 4; then tests 5–11, 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 GPIB as "TST?". It is not performed upon remote preset.
2	ROM	Part of the ROM/RAM tests and cannot be run separately. Refer to Chapter 6 , "Digital Control Troubleshooting," for more information.
3	SRAM RAM	Verifies the A9 CPU SRAM (long-term) memory with a non-destructive write/read pattern. A destructive version that writes over stored data at power-on can be enabled by changing the 4th switch position of the A9 CPU switch as shown below. 
4	Main DRAM	Verifies the A9 CPU main memory (DRAM) with a non-destructive write/read test pattern. A destructive version of this test is run during power-on. For additional information, see Chapter 6 , "Digital Control Troubleshooting."

Table 10-5 Internal Tests

Test Number	Test Name	Description
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 processors A9 CPU data buffering and address decoding. (See also tests 23 and 24.) This runs only when selected.
13	GPIB	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 GPIB interface; for that, see the analyzer's programmer's guide.) This runs only when selected or with ALL INTERNAL.
14	Post Reg	Polls the status register of the A8 post-regulator, and flags these conditions: heat sink too hot, inadequate air flow, or post-regulated supply shutdown.
15	Frac N Cont	Tests the ability of the A9 CPU main processor to write/read to the control element on the A14 fractional-N (digital) assembly. The control element must be functioning, and the fractional-N VCO must be oscillating (although not necessarily phase-locked) to pass.
16	Sweep Trig	Tests the sweep trigger (L SWP) 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.
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.

Table 10-5 Internal Tests

Test Number	Test Name	Description
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 30 and 60 are comprehensive front panel checks, more complete than test 12, that checks the front panel keys and knob entry.

Table 10-6 External Tests

Test Number	Test Name	Description
21	Port 1 Op Chk	Part of "Step 2. Operator's Check" on page 4-6. The procedure requires the external connection of a short to PORT 1.
22	Port 2 Op Chk	Same as 21, but tests PORT 2 (for 8753ES). A through cable is required for the 8753ET.
23	Fr Pan Seq	Tests the front panel knob entry and all A1 front panel keys, as well as the front panel microprocessor on the A2 assembly. It prompts the user to rotate the front panel knob, then press each key in an ordered sequence. It continues to the next prompt only if the current prompt is correctly satisfied.
24	Fr Pan Diag	Similar to 23 above, but the user rotates the front panel knob or presses the keys in any order. This test displays the command the instrument received.
25	ADC Hist	Factory use only.
26	Source Ex	Factory use only.

System Verification Tests These tests apply mainly to system-level, error-corrected verification and troubleshooting. Tests 27 to 31 are associated with the system verification procedure, documented in Chapter 2 , "System Verification and Performance Tests." Tests 32 to 43 facilitate examining the calibration coefficient arrays (error terms) resulting from a measurement calibration; refer to Chapter 11 , "Error Terms," for details.

Table 10-7 System Verification Tests

Test Number	Test Name	Description
27	Sys Ver Init	Recalls the initialization state for system verification from an 8753ET/ES verification disk, in preparation for a measurement calibration. It must be done before service internal tests 28, 29, 30, or 31 are performed.
28	Ver Dev 1	Recalls verification limits from disk for verification device #1 in all applicable measurements. It performs pass/fail limit testing of the current measurement.
29	Ver Dev 2	Same as 28 above for device #2.
30	Ver Dev 3	Same as 28 above for device #3.
31	Ver Dev 4	Same as 28 above for device #4.
32–43	Cal Coef 1–12	Copies error term data from a measurement calibration array to display memory. A measurement calibration must be complete and active. The definition of calibration arrays depends on the current calibration type. After execution, the memory is automatically displayed. Refer to Chapter 11 , "Error Terms," for details.

Adjustment Tests These tests (except as noted) are used in the procedures located in Chapter 3 , "Adjustments and Correction Constants."

Table 10-8 Adjustment Tests

Test Number	Test Name	Description
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 GPIB to generate new correction constants. Run tests 44, 45, 46, and 48 first.
48	Pretune Cor	Generates source pretune values for proper phase-locked loop operation. Run tests 44, 45, and 46 first.
50	Disp 2 Ex[a]	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 GPIB, then compares A and B, (magnitude and phase), against R. It improves the R input accuracy and A/B/R tracking.
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		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.

a. Not used in the adjustment procedures.

Display Tests These tests return a PASS/FAIL condition. All six amber front panel LEDs will turn off if the test passes. Press Preset to exit the test. If any of the six LEDs remain on, the test has failed.

Table 10-9 Display Tests

Test Number	Test Name	Description
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 increment to the next pattern, press softkey 1; to go back to a previous pattern, press softkey 2. To exit the test pattern and return the softkey labels, press softkey 8 (bottom softkey). The following is a description of the test patterns.

Table 10-10 Test-Patterns

Test Number	Test Name	Description
66	Test Pat 1	Displays an all white screen for verifying the light output of the A18 display and checks for color purity.
67–69	Test Pat 2–4	Displays a red, green, and blue pattern for verifying the color purity of the display and also the ability to independently control each color.
70	Test Pat 5	Displays an all black screen. This is used to check for stuck pixels.
71	Test Pat 6	Displays a 16-step gray scale for verifying that the A19 GSP board can produce 16 different amplitudes of color (in this case, white). The output comes from the RAM on the GSP board, it is then split. The signal goes through a video DAC and then to an external monitor or through some buffer amplifiers and then to the internal LCD display. If the external display looks good but the internal display is bad, then the problem may be with the display or the cable connecting it to the GSP board. This pattern is also very useful when using an oscilloscope for troubleshooting. The staircase pattern it produces will quickly show missing or stuck data bits.
72	Test Pat 7	Displays the following seven colors: Red, Yellow, Green, Cyan, Blue, Magenta and White.
73	Test Pat 8	This pattern is intended for use with an external display. The pattern displays a color rainbow pattern for showing the ability of the A19 GSP board to display 15 colors plus white. The numbers written below each bar indicate the tint number used to produce that bar (0 &100=pure red, 33=pure green, 67=pure blue).
74	Test Pat 9	Displays the three primary colors Red, Green, and Blue at four different intensity levels. You should see 16 color bands across the screen. Starting at the left side of the display the pattern is; Black four bands of Red (each band increasing in intensity) Black four bands of Green (each band increasing in intensity) Black four bands of Blue (each band increasing in intensity) Black If any one of the four bits for each color is missing the display will not look as described.
75	Test Pat 10	Displays a character set for showing the user all the different types and sizes of characters available. Three sets of characters are drawn in each of the three character sizes. 125 characters of each size are displayed. Characters 0 and 3 cannot be drawn and several others are really control characters (such as carriage return and line feed).
76	Test Pat 11	Displays a bandwidth pattern for verifying the bandwidth of the EXTERNAL display. It consists of multiple alternating white and black vertical stripes. Each stripe should be clearly visible. A limited bandwidth would smear these lines together. This is used to test the quality of the external monitor.

Table 10-10 Test-Patterns

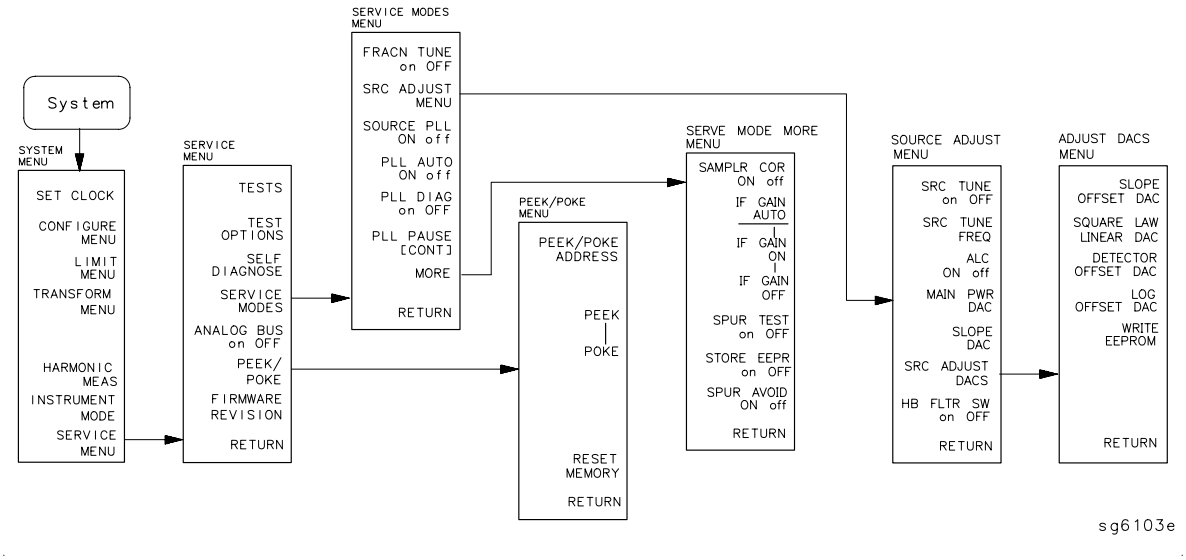
Test Number	Test Name	Description
77	Test Pat 12	Displays a repeating gray scale for troubleshooting, using an oscilloscope. It is similar to the 16 step gray scale but is repeated 32 times across the screen. Each of the 3 outputs of the video palette will then show 32 ramps (instead of one staircase) between each horizontal sync pulse. This pattern is used to troubleshoot the pixel processing circuit of the A19 GSP board.
78	Test Pat 13	Displays a convergence pattern for measuring the accuracy of the color convergence of the external monitor.
79–80	Test Pat 14–15	Displays crosshatch and inverse crosshatch patterns for testing color convergence, linearization alignment. This is useful when aligning the LCD display in the bezel.

Service Feature Menus

The service feature menus are shown in Figure 10-2 and described in the following tables. The following keys access the service feature menus:

- **SERVICE MODES**
- **ANALOG BUS on OFF**
- **PEEK/POKE**
- **FIRMWARE REVISION**

Figure 10-2 Service Feature Menus



Service Modes Menu

The service modes menu allows you to control and monitor various circuits for troubleshooting. To access this menu, press System **SERVICE MENU**.

SERVICE MODES .

Table 10-11 Service Modes Menu Keys

Key	GPIB Mnemonic	Description
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 Chapter 7 , "Source Troubleshooting."
SRC ADJUST MENU	N/A	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** allows you to change the source tune frequency. **ALC ON off** toggles the automatic leveling control (ALC) on and off. **MAIN PWR DAC** **SLOPE DAC** **SRC ADJUST DACS** **HB FLTR SW on OFF**
SOURCE PLL ON off	SM3	With this mode switched OFF, the source stays in the pretune mode and does not attempt to complete the phase lock sequence. Also, all phase lock error messages are disabled. The fractional-N circuits and the receiver operate normally. Therefore, the instrument sweeps, but the source is being driven by the pretune DAC in a stair-stepped fashion.

Table 10-11 Service Modes Menu Keys

Key	GPIB Mnemonic	Description
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	N/A	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	N/A	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	N/A	Provides access to the rest of the service modes keys.
SAMPLER COR ON off	SM5	Toggles the sampler correction routine ON, for normal operation, or OFF, for diagnosis or adjustment purposes.
IF GAIN AUTO	N/A	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	N/A	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.

Table 10-11 Service Modes Menu Keys

Key	GPIB Mnemonic	Description
IF GAIN OFF	N/A	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	N/A	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 Chapter 3 , "Adjustments and Correction Constants"). 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

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 GPIB, 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" on page 10-22 for a description of each individual node. Refer to the "Overall Block Diagram" in Chapter 4 , "Start Troubleshooting Here" 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" on page 10-22
- 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 "Analog In Menu" on page 10-21 for more information.

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 GPIB, 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** key toggles between low and high resolution.

Resolution	Maximum Signal	Minimum Signal
LOW	+0.5 V	–0.5 V
HIGH	+10 V	–10 V

Table 10-12 Analog In Menu Keys

Key	GPIB Mnemonic	Description
AUX OUT on OFF	N/A	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	N/A	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 GPIB command to output the counter's frequency data.
ANALOG BUS	N/A	Switches the counter to monitor the analog bus.

Table 10-12 Analog In Menu Keys

Key	GPIB Mnemonic	Description
FRAC N	N/A	Switches the counter to monitor the A14 fractional-N VCO frequency at the node shown on the "Overall Block Diagram," in Chapter 4 , "Start Troubleshooting Here."
DIV FRAC N	N/A	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" in Chapter 4 , "Start Troubleshooting Here" for node locations.

A3 Source To observe six of the eight A3 analog bus nodes (not node 5 or 8), perform step A3 to set up a power sweep on the analog bus. Then follow the node specific instructions.

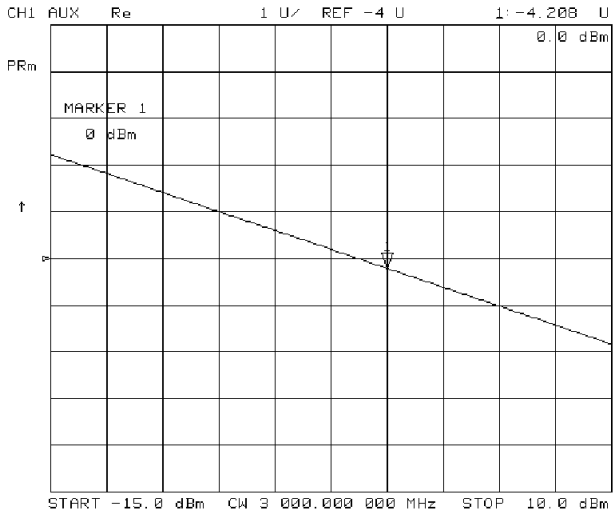
Step A3: Press (Preset) (System) **SERVICE MENU** **ANALOG BUS ON** (Meas) **ANALOG IN** (Format) **MORE** **REAL** (Sweep Setup) **CW FREQ** (3) (G/n) **SWEEP TYPE MENU** **POWER SWEEP** (Start) (–15) (x1) (Stop) (10) (x1).

Node 1 Mn Pwr DAC (main power DAC)

Perform step A3 to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (1) (x1) (Scale Ref) **AUTO SCALE** .

Node 1 is the output of the main power DAC. It sets the reference voltage to the ALC loop. At normal operation, this node should read approximately –4 volts at 0 dBm with a slope of about –150 mV/dB. This corresponds to approximately 4 volts from –15 to +10 dBm.

Figure 10-3 Analog Bus Node 1



sg6262d

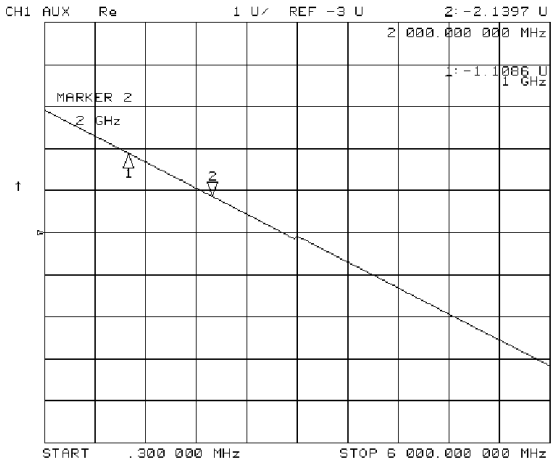
Node 2 Src 1V/GHz (source 1 volt per GHz)

Press the following to view analog bus node 2:

(Preset) (Start) (30) (k/m) (System) **SERVICE MENU** **ANALOG BUS ON** (Meas) **ANALOG IN** (2) (x1) (Format) **MORE** **REAL** (Scale Ref) **AUTO SCALE** .

Node 2 measures the voltage on the internal voltage controlled oscillator. Or, in normal operation, it should read –1 V/GHz.

Figure 10-4 Analog Bus Node 2



sg6263d

Node 3 Amp Id (amplifier current)

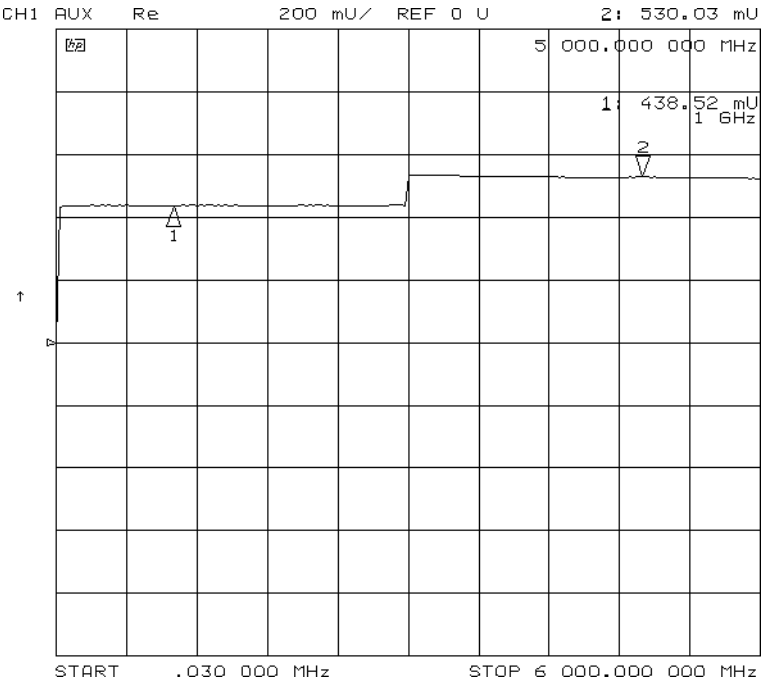
Press the following keys to view analog node 3:

(Preset) (System) **SERVICE MENU** **ANALOG BUS ON** (Meas) **ANALOG IN** (3) (x1)
(Format) **MORE** **REAL** (Scale Ref) **AUTO SCALE** .

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

- 15 mA from 30 kHz to 299 kHz
- 130 mA from 300 kHz to 3 GHz
- 500 mA from 3 GHz to 6 GHz

Figure 10-5 Analog Bus Node 3

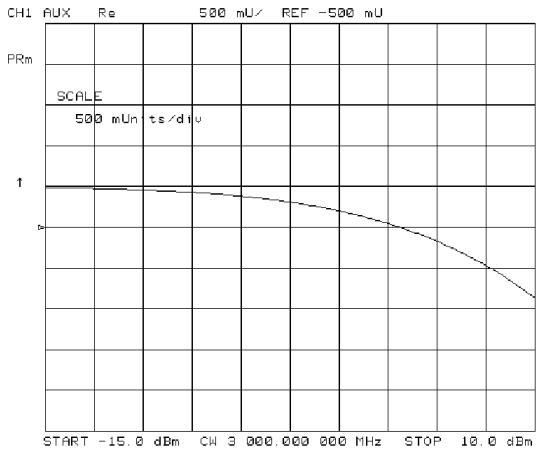


Node 4 Det (detects RF OUT power level)

Perform step A3, described previously, to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (4) (x1) (Scale Ref) **AUTO SCALE**.

Node 4 detects power that is coupled and detected from the RF OUT arm to the ALC loop. Note that the voltage exponentially follows the power level inversely. Flat segments indicate ALC saturation and should not occur between –85 dBm and +10 dBm.

Figure 10-6 Analog Bus Node 4



sg6265d

Node 5 Temp (temperature sensor)

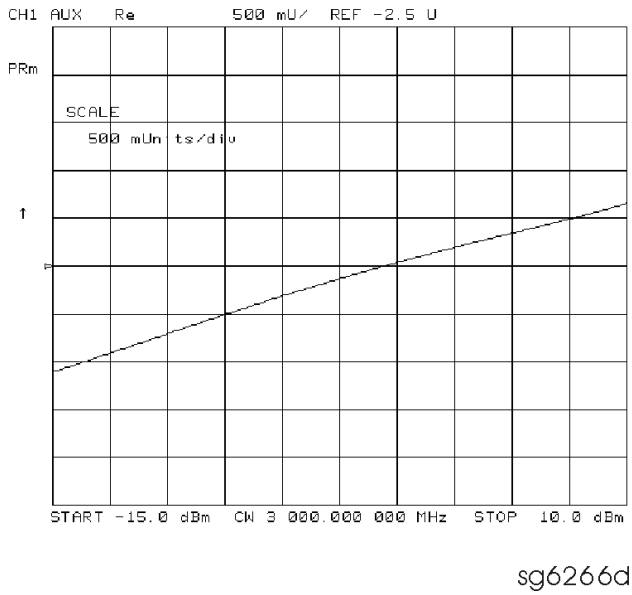
This node registers the temperature of the cavity oscillator which must be known for effective spur avoidance. The sensitivity is 10 mV/°C. The oscillator changes frequency slightly as its temperature changes. This sensor indicates the temperature so that the frequency can be predicted.

Node 6 Integ (ALC leveling integrator output)

Perform step A3 to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (6) (x1) (Scale Ref) **AUTO SCALE** .

Node 6 displays the output of the summing circuit in the ALC loop. Absolute voltage level variations are normal. When node 6 goes above 0 volts, the ALC saturation is indicated.

Figure 10-7 Analog Bus Node 6



sg6266d

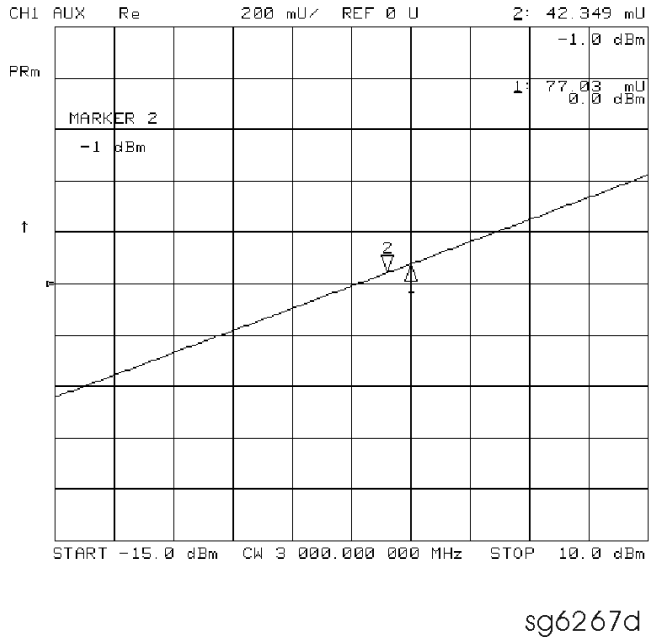
Node 7 Log (log amplifier output detector)

Perform step A3 to set up a power sweep on the analog bus. Then press (Meas) **ANALOG IN** (7) (x1) (Scale Ref) **AUTO SCALE** .

Node 7 displays the output of a logger circuit in the ALC loop. The trace should be a linear ramp with a slope of 33 mv/dB with approximately 0 volts at –3 dBm. Absolute voltage level variations are normal. Flat segments indicate ALC saturation and should not occur between –15 dBm and +10 dBm.

The proper waveform at node 7 indicates that the circuits in the A3 source ALC loop are normal and the source is leveled.

Figure 10-8 Analog Bus Node 7



Node 8 A3 Gnd (ground)

A10 Digital IF To observe the A10 analog bus nodes, perform step A10, below. Then follow the node-specific instructions.

Step A10: Press: (Preset) (Meas) **ANALOG IN** (Marker) (System) **SERVICE MENU** **ANALOG BUS ON** (Format) **MORE** **REAL** .

Node 9 +0.37 V (+0.37 V reference)

Perform step A10, above, and then press (Meas) **ANALOG IN** **RESOLUTION [HIGH]** (9) (x1).

Check for a flat line at approximately +0.37 V. This is used as the voltage reference in "Analog Bus Correction Constants (Test 46)" on page 3-9. The voltage level should be the same in high and low resolution; the absolute level is not critical.

Node 10 +2.50 V (+2.50 V reference)

Perform step A10, above, and then press (Meas) **ANALOG IN** **RESOLUTION [LOW]** (10) (x1) (Scale Ref) (1) (x1).

Check for a flat line at approximately +2.5 V. This voltage is used in "Analog Bus Correction Constants (Test 46)" on page 3-9 as a reference for calibrating the analog bus low resolution circuitry.

Node 11 Aux Input (rear panel input)

Perform step A10 and then press (Meas) **ANALOG IN** (11) (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** in Table 10-12 on page 10-21). For GPIB considerations, see "GPIB Service Mnemonic Definitions" on page 10-42.

Node 12 A10 Gnd (ground reference)

This node is used in "Analog Bus Correction Constants (Test 46)" on page 3-9 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** (Marker) (System) **SERVICE MENU** **ANALOG BUS ON** (Format) **MORE** **REAL** .

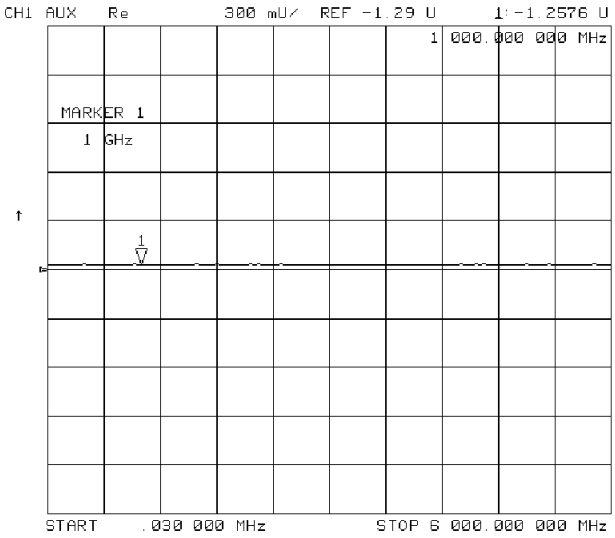
Node 13 VCO Tune 2 (not used)

Node 14 Vbb Ref (ECL reference voltage level)

Perform step A11 and then press (Meas) **ANALOG IN** (14) (x1) (Scale Ref) (0.3) (x1) **REFERENCE VALUE** (–1.29) (x1).

The trace should be a flat line across the entire operation frequency range within 0.3 V (one division) of the reference value. Vbb Ref is used to compensate for ECL voltage drift.

Figure 10-9 Analog Bus Node 14



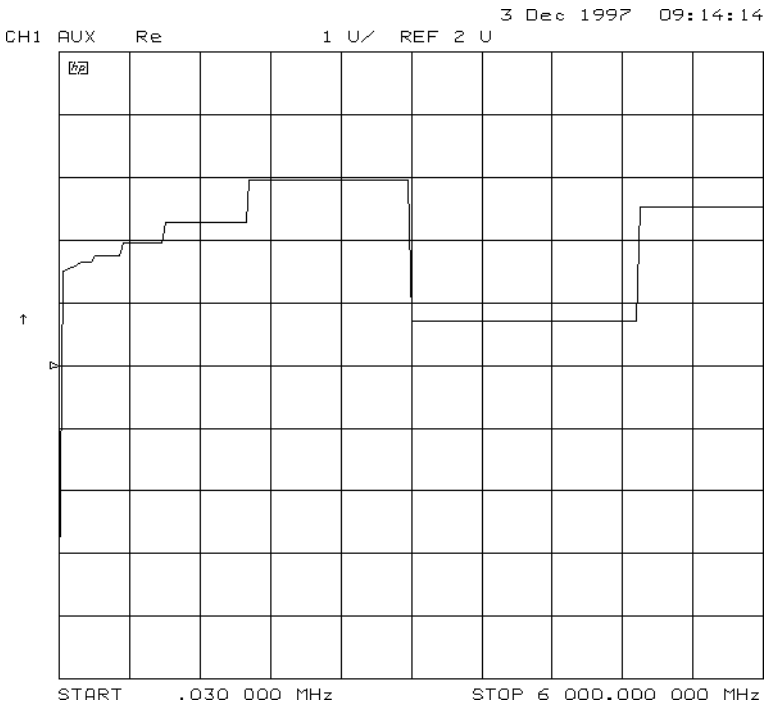
sg6268d

Node 15 Pretune (open-loop source pretune voltage)

Perform step A11 and then press (Meas) **ANALOG IN** (15) (x1) (Scale Ref) **AUTO SCALE** .

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 10-10 Analog Bus Node 15

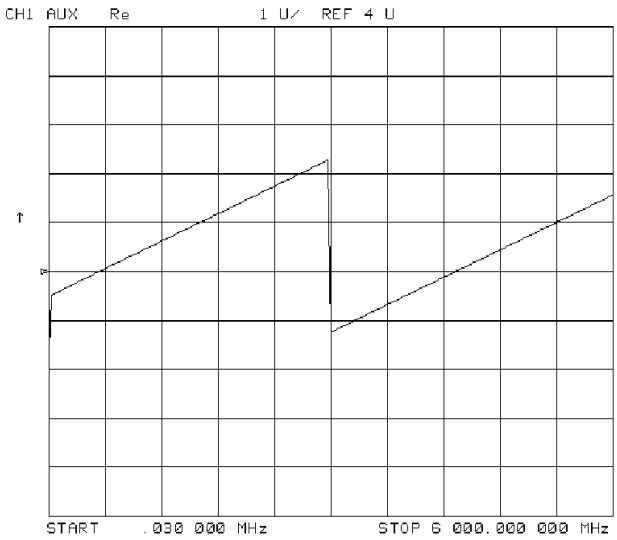


Node 16 1V/GHz (source oscillator tuning voltage)

Perform step A11 and then press (Meas) **ANALOG IN** (16) (x1) (Scale Ref) **AUTO SCALE** .

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 10-11. 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 Chapter 7 , "Source Troubleshooting."

Figure 10-11 Analog Bus Node 16



Node 17 1st IF (IF used for phase lock)

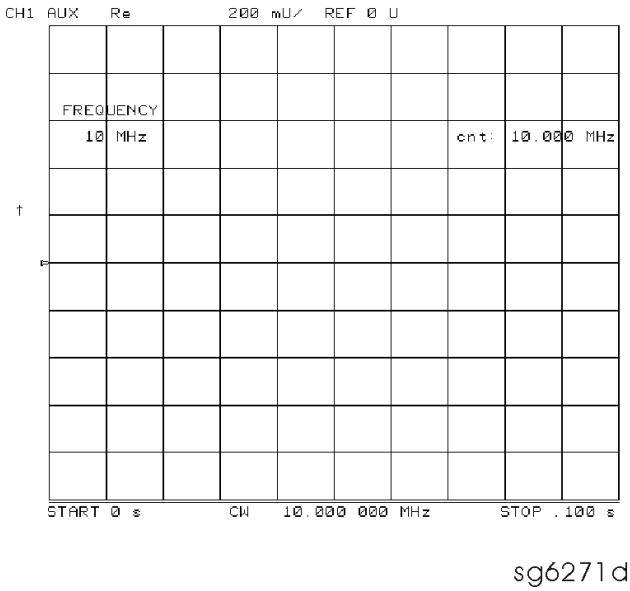
Perform step A11 and then press (Meas) **ANALOG IN** (17) (x1) **COUNTER: ANALOG BUS** (Sweep Setup) **CW FREQ** .

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 Figure 10-12) 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.

Figure 10-12 Counter Readout Location



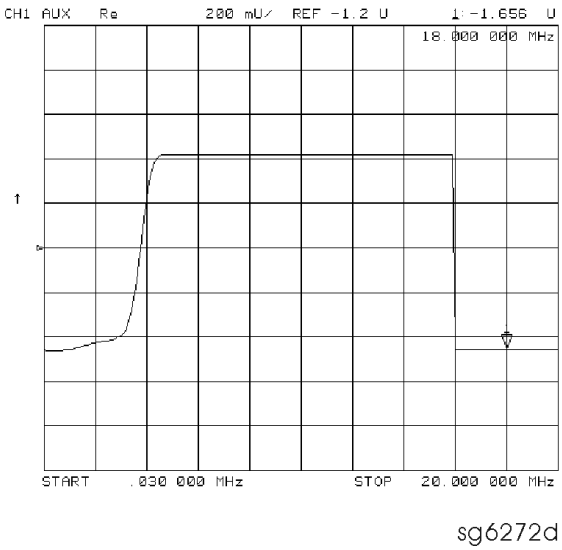
sg6271d

Node 18 IF Det 2N (IF on A11 phase lock after 3 MHz filter)

Perform step A11 and then press (Meas) **ANALOG IN** (18) (x1) (Stop) (20) (M/µ) (Scale Ref) **AUTOSCALE** .

This node detects the IF within the low pass filter/limiter. The filter is used during the track and sweep sequences but never in band 1 (3.3 to 16 MHz). The low level (about –1.7 V) means IF is in the passband of the filter. This node can be used with the FRAC N TUNE and SRC TUNE service modes.

Figure 10-13 Analog Bus Node 18



Node 19 IF Det 2W (IF after 16 MHz filter)

Perform step A11 and then press (Meas) **ANALOG IN** (19) (x1) (Stop) (20) (x1) (Scale Ref) (0.2) (x1) **REFERENCE VALUE** (–1.2) (x1).

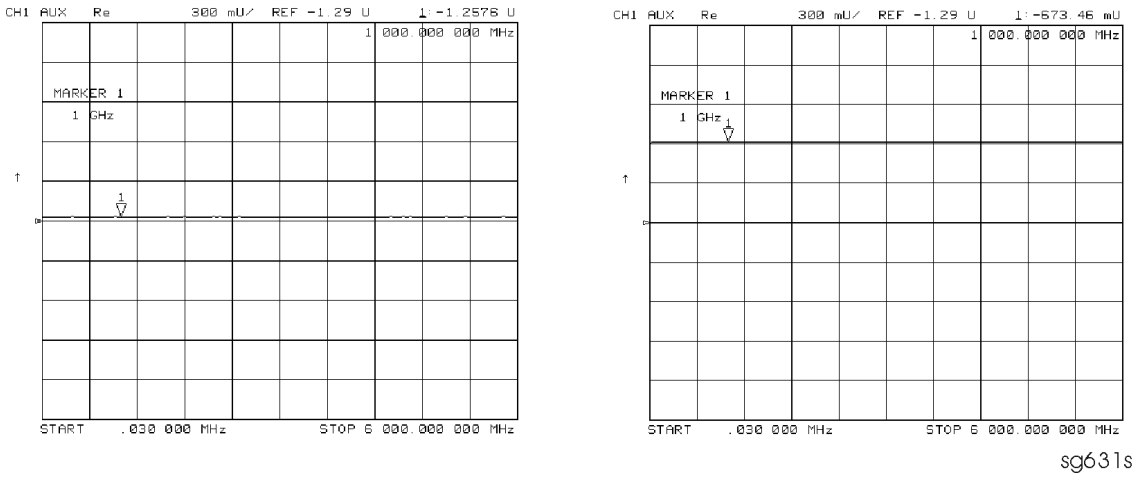
This node detects IF after the 16 MHz filter/limiter. The filter is used during pretune and acquire, but not in band 1. Normal state is a flat line at about –1.7 V.

Node 20 IF Det 1 (IF after 30 MHz filter)

Perform step A11 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.

Figure 10-14 Analog Bus Node 20



A12 Reference To observe the A12 analog bus nodes perform step A12, below. Then follow the node-specific instructions.

Step A12: Press (Preset) (Meas) **ANALOG IN** (Marker) (System) **SERVICE MENU** **ANALOG BUS ON** (Format) **MORE** **REAL**.

Node 21 100 kHz (100 kHz reference frequency)

Perform step A12 and then press (Meas) **ANALOG IN** (21) (x1) **COUNTER: ANALOG BUS**. This node counts the A12 100 kHz reference signal that is used on A13 (the fractional-N analog assembly) as a reference frequency for the phase detector.

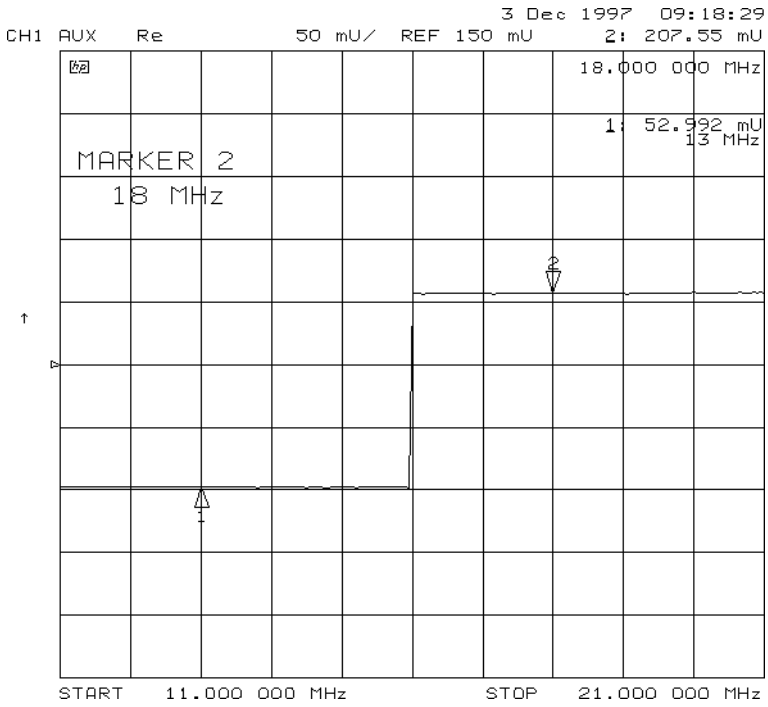
Node 22 A12 Gnd 1 (ground)

Node 23 VCO Tune (A12 VCO tuning voltage)

Perform Step A12 and then press Start 11 M/µ Stop 21 M/µ Meas **ANALOG IN** 23 x1 Marker Scale Ref **AUTO SCALE** .

The trace should show a voltage step as shown in Figure 10-15. At normal operation, the left half trace should be 0 ±1000 mV and the right half trace should be 100 to 200 mV higher (that is, one to two divisions). If the trace does not appear as shown in Figure 10-15, refer to "High/Low Band Transition Adjustment" on page 3-47.

Figure 10-15 Analog Bus Node 23



Node 24 2nd LO

Perform step A12 and then press (Meas) **ANALOG IN** (24) (x1) **COUNTER: ANALOG BUS** (Sweep Setup) **CW FREQ** .

This node counts the 2nd LO used by the sampler/mixer assemblies to produce the 2nd IF of 4 kHz. As you vary the frequency, the counter reading should change to values very close to those indicated below:

Frequency Entered	Counter Reading
0.03 to 1 MHz	(frequency-entered) +4 kHz
1 to 16 MHz	not accurate
16 to 3,000 MHz	996 kHz

Node 25 PL Ref (phase lock reference)

Perform step A12 and then press (Meas) **ANALOG IN** (25) (x1) **COUNTER: ANALOG BUS** (Sweep Setup) **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 to 3,000 MHz	1 MHz

Node 26 Ext Ref (rear panel external reference input)

Perform step A12 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 –0.9 V
- With external reference: about –0.6 V

Node 27 VCXO Tune (40 MHz VCXO tuning voltage)

Perform step A12 and then press (Meas) **ANALOG IN** (27) (x1) (Marker Fctn) **MARKER →REFERENCE**.

This node displays the voltage used to fine tune the A12 reference VCXO to 40 MHz. You should see a flat line at some voltage level (the actual voltage level varies from instrument to instrument). Anything other than a flat line indicates that the VCXO is tuning to different frequencies. Refer to "Frequency Accuracy Adjustment" on page 3-43.

Node 28 A12 Gnd 2 (Ground reference)

A14 Fractional-N (Digital) To observe the A14 analog bus nodes perform step A14, below. Then follow the node-specific instructions.

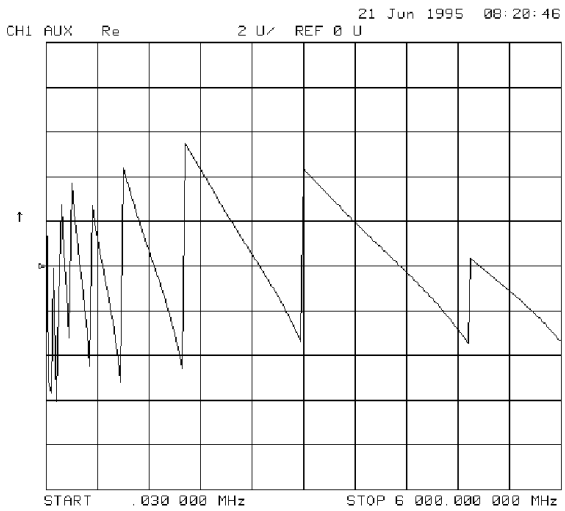
Step A14: Press (Preset) (Meas) **ANALOG IN** (System) **SERVICE MENU** **ANALOG BUS ON** (Format) **MORE** **REAL**.

Node 29 FN VCO Tun (A14 FN VCO tuning voltage)

Perform step A14 and then press (Meas) **ANALOG IN** (29) (x1) (Scale Ref) **AUTOSCALE**.

Observe the A14 FN VCO tuning voltage. If the A13 and A14 assemblies are functioning correctly and the VCO is phase locked, the trace should look like Figure 10-16. 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 10-16 Analog Bus Node 29



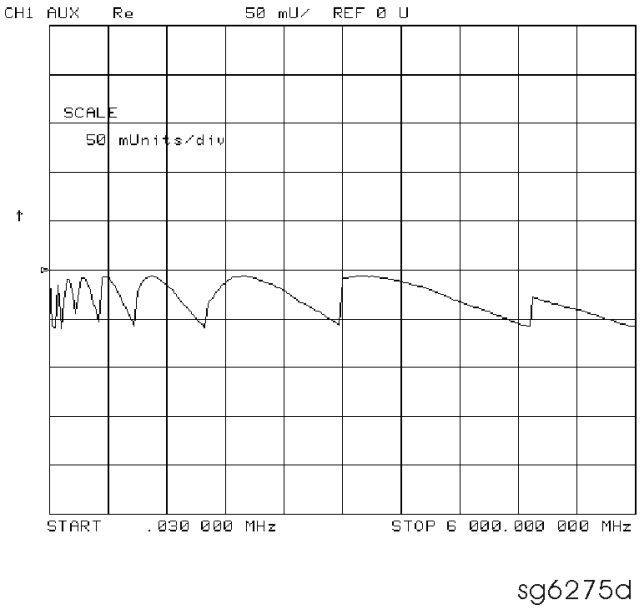
sg6274d

Node 30 FN VCO Det (A14 VCO detector)

Perform step A14 and then press (Meas) **ANALOG IN** (30) (x1) **RESOLUTION [HIGH]** (Scale Ref) (50) (k/m).

See whether the FN VCO is oscillating. The trace should resemble Figure 10-17.

Figure 10-17 Analog Bus Node 30



Node 31 Count Gate (analog bus counter gate)

Perform step A14 and then press (Meas) **ANALOG IN** (31) (x1) (Scale Ref) (2) (x1).

You should see a flat line at +5 V across the operating frequency range. The counter gate activity occurs during bandswitches, and therefore is not visible on the analog bus. To view the bandswitch activity, look at this node on an oscilloscope, using **AUX OUT ON**. Refer to **AUX OUT on OFF** in Table 10-12 on page 10-21.

PEEK/POKE Menu

To access this menu, press System **SERVICE MENU** **PEEK/POKE** .

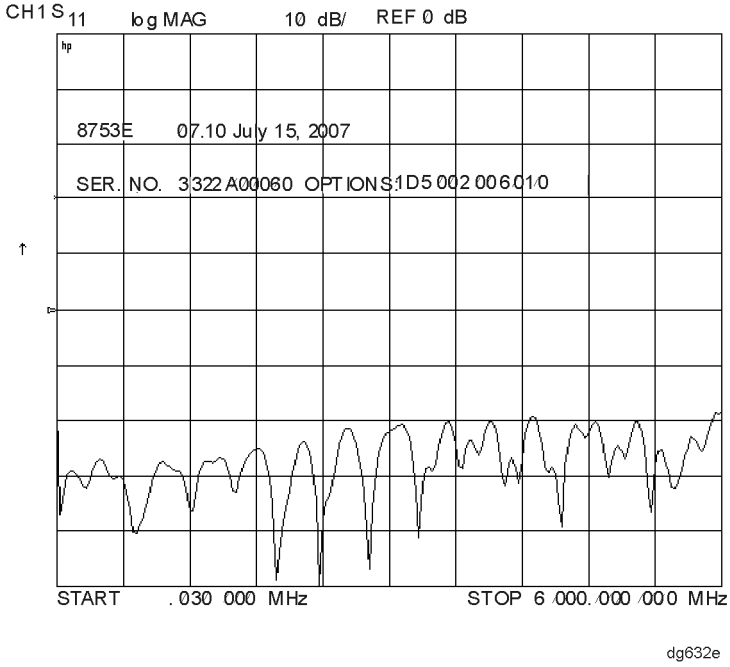
Table 10-13 PEEK/POKE Menu Keys

Key	GPIB Mnemonic	Description
PEEK/POKE	N/A	Allows you to edit the content of one or more memory addresses. The keys are described below. **CAUTION** The PEEK/POKE capability is intended for service use only.
PEEK/POKE ADDRESS	PEEL[D]	Accesses any memory address and shows it in the active entry area of the display. Use the front panel knob, entry keys, or step keys to enter the memory address of interest.
PEEK	PEEK	Displays the data at the accessed memory address.
POKE	POKE[D]	allows you to change the data at the memory address accessed by the **PEEK/POKE ADDRESS** softkey. Use the front panel knob, entry keys, or step keys to change the data. The A9CC switch must be in the “ALTER” position in order to poke.
RESET MEMORY	N/A	Resets or clears the memory where instrument states are stored. To do this, press **RESET MEMORY** Preset.

Firmware Revision Softkey

Press System **SERVICE MENU** **FIRMWARE REVISION** to display the current firmware revision information. The number and implementation date appear in the active entry area of the display as shown in Figure 10-18. The analyzer's serial number and installed options are also displayed. Another way to display the firmware revision information is to cycle the line power.

Figure 10-18 Location of Firmware Revision Information on Display



GPIB Service Mnemonic Definitions

All service routine keystrokes can be made through GPIB in one of the following approaches:

- sending equivalent remote GPIB 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.)

GPIB programming information is provided in the analyzer’s programmer’s 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 analyzer’s programmer’s guide.
- Respond to the prompt with a `TESRn` command (see “Tests Menu” on page 10-4).

Symbol Conventions

[ ]	An optional operand
D	A numerical operand
< >	A necessary appendage
|	An either/or choice in appendages

Analog Bus Codes

ANAI[D]	Measures and displays the analog input. The preset state input to the analog bus is the rear panel AUX IN. The other 30 nodes may be selected with D only if the ABUS is enabled (ANABon).
OUTPCNTR	Outputs the counter's frequency data.
OUTPERRO	Reads any prompt message sent to the error queue by a service routine.
OUTPTESS	Outputs the integer status of the test most recently executed. Status codes are those listed under “TST?”.
TST?	Executes the power-on self test (internal test 1) and outputs an integer test status. Status codes are as follows: 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 your analyzer's reference guide.

BATTERY FAILED. STATE MEMORY CLEARED	
Error Number 183	The battery protection of the non-volatile SRAM memory has failed. The SRAM memory has been cleared. Refer to Chapter 14 , "Assembly Replacement and Post-Repair Procedures," for battery replacement instructions. See the chapter titled "Preset State and Memory Allocation" in the analyzer's reference guide for more information about the SRAM memory.

BATTERY LOW! STORE SAVE REGS TO DISK	
Error Number 184	The battery protection of the non-volatile SRAM memory is in danger of failing. If this occurs, all of the instrument state registers stored in SRAM memory will be lost. Save these states to a disk and refer to Chapter 14 , "Assembly Replacement and Post-Repair Procedures," for battery replacement instructions. See the chapter titled "Preset State and Memory Allocation" in the analyzer's reference guide for more information about the SRAM memory.

CALIBRATION ABORTED	
Error Number 74	You have changed the active channel during a calibration so the calibration in progress was terminated. Make sure the appropriate channel is active and restart the calibration.

CALIBRATION REQUIRED	
Error Number 63	A calibration set could not be found that matched the current stimulus state or measurement parameter. You will have to perform a new calibration.

CORRECTION CONSTANTS NOT STORED	
Error Number 3	A store operation to the EEPROM was not successful. You must change the position of the switch on the A9 CPU assembly. Refer to "A9 Switch Positions" on page 3-6.

CORRECTION TURNED OFF	
Error Number 66	Critical parameters in your current instrument state do not match the parameters for the calibration set, therefore correction has been turned off. The critical instrument state parameters are sweep type, start frequency, frequency span, and number of points.

CURRENT PARAMETER NOT IN CAL SET	
Error Number 64	Correction is not valid for your selected measurement parameter. Either change the measurement parameters or perform a new calibration.

DEADLOCK	
Error Number 111	A fatal firmware error occurred before instrument preset completed.

DEVICE: not on, not connect, wrong addrs	
Error Number 119	The device at the selected address cannot be accessed by the analyzer. Verify that the device is switched on, and check the GPIB connection between the analyzer and the device. Ensure that the device address recognized by the analyzer matches the GPIB 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 GPIB connection and then try substituting another disk drive to isolate the problem instrument.

DISK: not on, not connected, wrong addrs	
Error Number 38	The disk cannot be accessed by the analyzer. Verify power to the disk drive, and check the GPIB connection between the analyzer and the disk drive. Ensure that the disk drive address recognized by the analyzer matches the GPIB address set on the disk drive itself.

DISK READ/WRITE ERROR	
Error Number 189	There may be a problem with your disk. Try a new floppy disk. If a new floppy disk does not eliminate the error, suspect hardware problems.

INITIALIZATION FAILED	
Error Number 47	The disk initialization failed, probably because the disk is damaged.

INSUFFICIENT MEMORY, PWR MTR CAL OFF	
Error Number 154	There is not enough memory space for the power meter calibration array. Increase the available memory by clearing one or more save/recall registers, or by reducing the number of points.

NO CALIBRATION CURRENTLY IN PROGRESS	
Error Number 69	The **RESUME CAL SEQUENCE** softkey is not valid unless a calibration is already in progress. Start a new calibration.

NOT ENOUGH SPACE ON DISK FOR STORE	
Error Number 44	The store operation will overflow the available disk space. Insert a new disk or purge files to create free disk space.

NO FILE(S) FOUND ON DISK	
Error Number 45	No files of the type created by an analyzer store operation were found on the disk. If you requested a specific file title, that file was not found on the disk.

NO IF FOUND: CHECK R INPUT LEVEL	
Error Number 5	The first IF signal was not detected during pretune. Check the front panel R channel jumper. If there is no visible problem with the jumper, refer to Chapter 7 , "Source Troubleshooting."

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 Chapter 7 , "Source Troubleshooting."

NO SPACE FOR NEW CAL. CLEAR REGISTERS	
Error Number 70	You cannot store a calibration set due to insufficient memory. You can free more memory by clearing a saved instrument state from an internal register (which may also delete an associated calibration set, if all the instrument states using the calibration kit have been deleted). You can store the saved instrument state and calibration set to a disk before clearing them. After deleting the instrument states, press Preset to run the memory packer.

NOT ALLOWED DURING POWER METER CAL	
Error Number 198	When the analyzer is performing a power meter calibration, the GPIB bus is unavailable for other functions such as printing or plotting.

OVERLOAD ON INPUT A, POWER REDUCED (ES only)	
Error Number 58	See OVERLOAD ON INPUT R POWER REDUCED (error number 57).

OVERLOAD ON INPUT B, POWER REDUCED (ES only)	
Error Number 59	See OVERLOAD ON INPUT R POWER REDUCED (error number 57).

OVERLOAD ON INPUT R, POWER REDUCED	
Error Number 57	You have exceeded approximately +14 dBm at one of the test ports. The RF output power is automatically reduced to –85 dBm. The annotation P⇓ appears in the left margin of the display to indicate that the power trip function has been activated. When this occurs, reset the power to a lower level, then toggle the **SOURCE PWR on OFF** softkey to switch on the power again.

OVERLOAD ON REFL PORT, POWER REDUCED (ET only)	
Error Number 58	See OVERLOAD ON INPUT R POWER REDUCED (error number 57).

OVERLOAD ON TRANS PORT, POWER REDUCED (ET only)	
Error Number 59	See OVERLOAD ON INPUT R POWER REDUCED (error number 57).

PARALLEL PORT NOT AVAILABLE FOR GPIO	
Error Number 165	You have defined the parallel port as COPY for sequencing in the GPIB menu. To access the parallel port for general purpose I/O (GPIO), set the selection to [GPIO].

PARALLEL PORT NOT AVAILABLE FOR COPY	
Error Number 167	You have defined the parallel port as general purpose I/O (GPIO) for sequencing. The definition was made under the (Local) key menus. To access the parallel port for copy, set the selection to **PARALLEL [COPY]**.

PHASE LOCK CAL FAILED	
Error Number 4	An internal phase lock calibration routine is automatically executed at power-on, preset, and any time a loss of phase lock is detected. This message indicates that phase lock calibration was initiated and the first IF detected, but a problem prevented the calibration from completing successfully. Refer to Chapter 3 , "Adjustments and Correction Constants," and execute pretune correction (test 48). This message may appear if you connect a mixer between the RF output and R input before turning on frequency offset mode. Ignore it: it will go away when you turn on frequency offset. This message may also appear if you turn on frequency offset mode before you define the offset.

PHASE LOCK LOST	
Error Number 8	Phase lock was acquired but then lost. Refer to Chapter 7 , "Source Troubleshooting."

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 "Source Pretune Correction Constants (Test 48)" on page 3-10.

POWER METER INVALID	
Error Number 116	The power meter indicates an out-of-range condition. Check the test setup.

POWER METER NOT SETTLED	
Error Number 118	Sequential power meter readings are not consistent. Verify that the equipment is set up correctly. If so, preset the instrument and restart the operation.

POWER SUPPLY HOT!	
Error Number 21	The temperature sensors on the A8 post-regulator assembly have detected an over-temperature condition. The power supplies regulated on the post-regulator have been shut down. Refer to Chapter 5 , "Power Supply Troubleshooting."

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 Chapter 5 , "Power Supply Troubleshooting."

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 Chapter 7 , "Source Troubleshooting." You will only receive this message over the GPIB. On the analyzer, P? is displayed.

PRINTER: error	
Error Number 175	The parallel port printer is malfunctioning. The analyzer cannot complete the copy function.

PRINTER: not handshaking	
Error Number 177	The printer at the parallel port is not responding.

PRINTER: not on, not connected, wrong addrs	
Error Number 24	The printer does not respond to control. Verify power to the printer, and check the GPIB connection between the analyzer and the printer. Ensure that the printer address recognized by the analyzer matches the GPIB address set on the printer itself.

PROBE POWER SHUT DOWN!	
Error Number 23	The analyzer biasing supplies to the HP/Agilent 85024A external probe are shut down due to excessive current. Troubleshoot the probe, and refer to Chapter 5 , "Power Supply Troubleshooting."

PWR MTR: NOT ON/CONNECTED OR WRONG ADDRS	
Error Number 117	The power meter cannot be accessed by the analyzer. Verify that the power meter address and model number set in the analyzer match the address and model number of the actual power meter.

SAVE FAILED.INSUFFICIENT MEMORY	
Error Number 151	You cannot store an instrument state in an internal register due to insufficient memory. Increase the available memory by clearing one or more save/recall registers and pressing (Preset), or by storing files to a disk.

SELF TEST #n FAILED	
Service Error Number 112	Internal test #n has failed. Several internal test routines are executed at instrument preset. The analyzer reports the first failure detected. Refer to the internal tests and the self-diagnose feature descriptions earlier in this chapter.

SOURCE POWER TURNED OFF, RESET UNDER POWER MENU	
Information Message	You have exceeded the maximum power level at one of the inputs and power has been automatically reduced. The annotation P⇓ indicates that power trip has been activated. When this occurs, reset the power and then press (Power) **SOURCE PWR on OFF**, to switch on the power. This message follows error numbers 57, 58, and 59.

SWEEP MODE CHANGED TO CW TIME SWEEP	
Error Number 187	If you select external source auto or manual instrument mode and you do not also select CW mode, the analyzer is automatically switched to CW.

TEST ABORTED	
Error Number 113	You have prematurely stopped a service test.

TROUBLE!CHECK SETUP AND START OVER	
Service Error Number 115	Your equipment setup for the adjustment procedure in progress is not correct. Check the setup diagram and instructions in "Source Pretune Correction Constants (Test 48)" on page 3-10. Start the procedure again.

WRONG DISK FORMAT, INITIALIZE DISK	
Error Number 77	You have attempted to store, load, or read file titles, but your disk format does not conform to the Logical Interchange Format (LIF). You must initialize the disk before reading or writing to it.

11 Error Terms

Error Terms

The analyzer generates and stores factors in internal arrays when measurement error-correction (measurement calibration) is performed. These factors are known by the following terms:

- error terms
- E-terms
- measurement calibration coefficients

The analyzer determines 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 your analyzer’s user’s guide. For details on the theory of error-correction, refer to the “Operating Concepts” chapter of your analyzer’s user’s guide.

Error Terms Can Also Serve a Diagnostic Purpose

Specific parts of the analyzer and its accessories directly contribute to the magnitude and shape of the error terms. Since we know this correlation and we know what typical error terms look like, we can examine error terms to monitor system performance (preventive maintenance) or to identify faulty components in the system (troubleshooting).

- **Preventive Maintenance:** A stable, repeatable system should generate repeatable error terms over long time 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 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 “9. Uncorrected Port Performance” on page 2-50 and “10. Uncorrected Port Performance” on page 2-131, and shown graphically on the plots in this chapter. If the magnitude exceeds its limit, inspect the corresponding system component. If the condition causes system verification to fail, replace the component.

  Consider the following while troubleshooting:

  — All parts of the system, including cables and calibration devices, can contribute to systematic errors and affect 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 Table 1-3 on page 1-7 for information on connection techniques and on cleaning and gaging connectors.

  — Use error term analysis to troubleshoot minor, subtle performance problems. Refer to Chapter 4 , “Start Troubleshooting Here,” 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.

Error Correction

Use one of the following error-correction procedures depending on which analyzer you have:

- 8753ES: "9. Uncorrected Port Performance" on page 2-50
- 8753ET: "10. Uncorrected Port Performance" on page 2-131

Error Term Inspection

Make a hardcopy of the measurement results:

1. Connect a printing or plotting peripheral to the analyzer.
2. Press (Local) **SYSTEM CONTROLLER** **SET ADDRESSES** and select the appropriate peripheral to verify that the GPIB address is set correctly on the analyzer.
3. Press (Save/Recall) and then choose either **PRINT** or **PLOT**.
4. 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 your analyzer's user's guide.

If Error Terms Seem Worse than Typical Values

1. Perform a system verification to verify that the system still conforms to specifications.
2. If system verification fails, refer to Chapter 4 , "Start Troubleshooting Here."

Error Term Descriptions

The error term descriptions in this section include the following information:

- significance of each error term
- typical results following a full 2-port error-correction
- guidelines to interpret each error term

Table 11-1 Error Coefficient Arrays and Tests

Array	Enhanced Response	2-port	Test Number
01	E_D	E_{DF}	32
02	E_S	E_{SF}	33
03	E_R	E_{RF}	34
04	E_X	E_{XF}	35
05	E_L[a]	E_{LF}	36
06	E_T	E_{TF}	37
07		E_{DR}	38
08		E_{SR}	39
09		E_{RR}	40
10		E_{XR}	41
11		E_{LR}	42
12		E_{TR}	43

a. This term is used to generate the calibration coefficients, but is not used during measurement error correction.

Meaning of first subscript:
D: directivity
S: source match
R: reflection tracking
X: crosstalk or isolation
L: load match
T: transmission tracking

Meaning of second subscript:
F: forward
R: reverse

The same description applies to both the forward (F) and reverse (R) terms. Reverse terms do not apply to the 8753ET.

Directivity (E_{DF} and E_{DR})

Description Directivity is a measure of any detected power that is reflected when a load is attached to the test port. These are the uncorrected forward and reverse directivity error terms of the system. The directivity error of the test port is determined by measuring the reflection (S11, S22) of the load during the error-correction procedure.

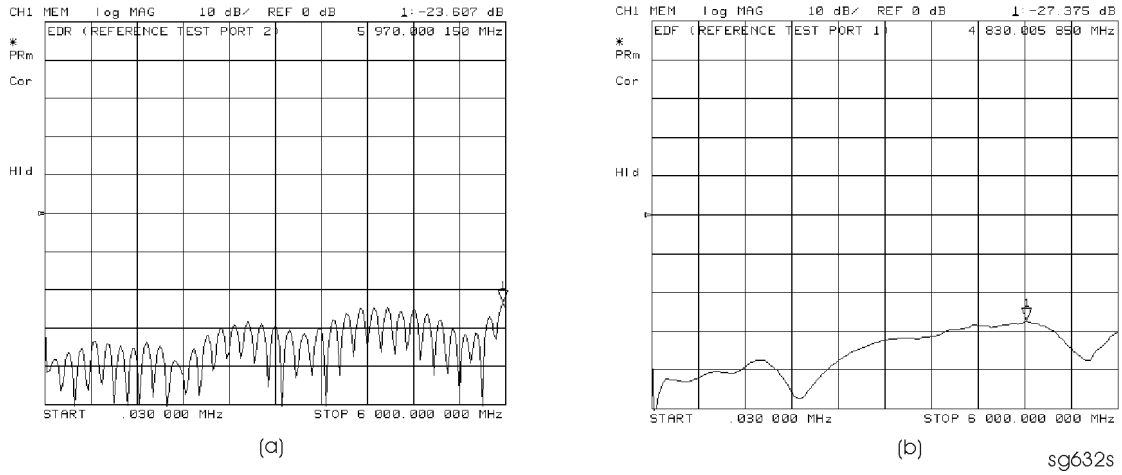
Significant System Components

- load used in the error-correction (calibration)
- test port connectors
- test port cables

Affected Measurements

Low reflection device measurements are most affected by directivity errors.

Figure 11-1 Typical E_{DF}/E_{DR} without and with Cables



Source Match (E_{SF} and E_{SR})

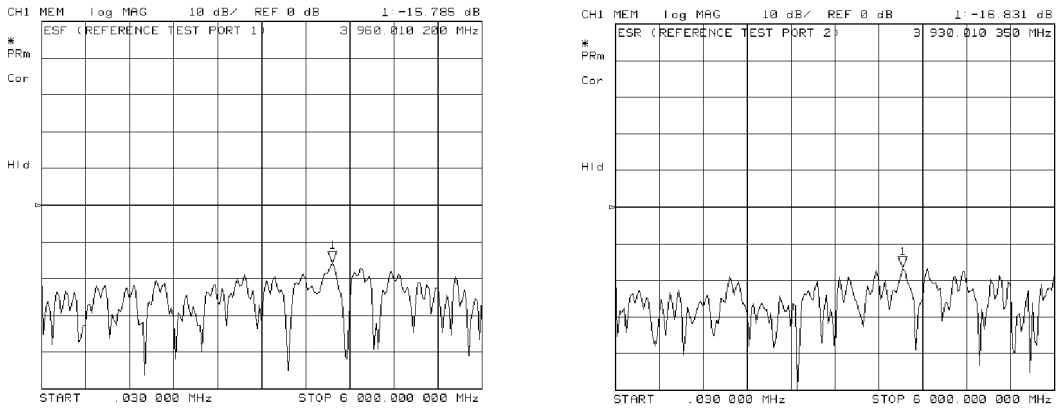
Description Source match is a measure of test port connector match, as well as the match between all components from the source to the test port. These are the forward and reverse uncorrected source match terms of the driven port.

Significant System Components

- load calibration kit device
- open calibration kit device
- short calibration kit device
- bridge
- test port connectors
- bias tees
- step attenuator
- transfer switch
- test port cables

Affected Measurements Reflection and transmission measurements of highly reflective devices are most affected by source match errors.

Figure 11-2 Typical E_{SF}/E_{SR} without and with Cables



sg633s

Reflection Tracking (E_{RF} and E_{RR})

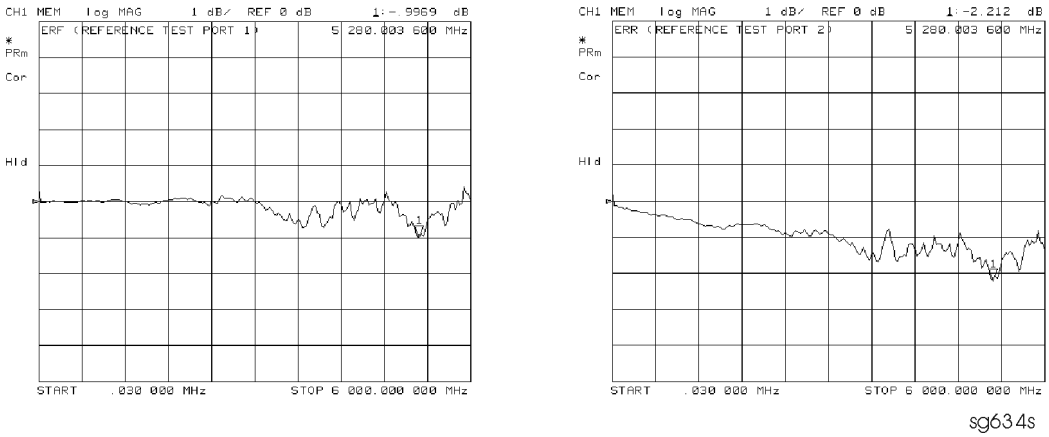
Description Reflection tracking is the difference between the frequency response of the reference path (R path) and the frequency response of the reflection test path (A or B input path).

Significant System Components

- open calibration kit device
- short calibration kit device
- R signal path if large variation in both E_{RF} and E_{RR}
- A or B input paths if only one term is affected

Affected Measurements All reflection measurements (high or low return loss) are affected by the reflection tracking errors.

Figure 11-3 Typical E_{RF}/E_{RR} without and with Cables



sg634s

Isolation (Crosstalk, E_{XF} and E_{XR})

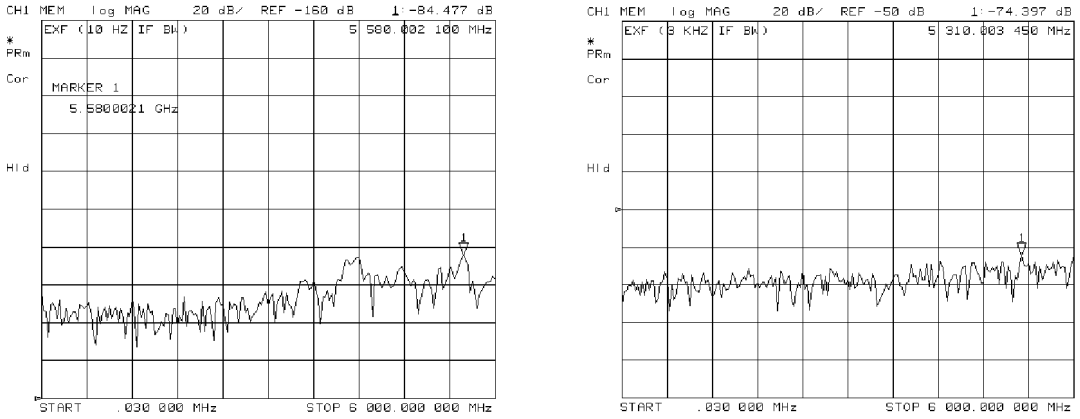
Description Isolation is a measure of the leakage between the test ports and the signal paths. The isolation error terms are characterized by measuring transmission (S21, S12) with loads attached to both ports during the error-correction procedure. Since these terms are low in magnitude, they are usually noisy (not very repeatable). The error term magnitude changes dramatically with IF bandwidth: a 10 Hz IF bandwidth must be used in order to lower the noise floor beyond the crosstalk specification. Using averaging will also reduce the peak-to-peak noise in this error term.

Significant System Components

- sampler crosstalk

Affected Measurements Transmission measurements, (primarily where the measured signal level is very low), are affected by isolation errors. For example, transmission measurements where the insertion loss of the device under test is large.

Figure 11-4 Typical E_{XF}/E_{XR} with 10 Hz Bandwidth and with 3 kHz Bandwidth



sg638s

Load Match (E_{LF} and E_{LR})

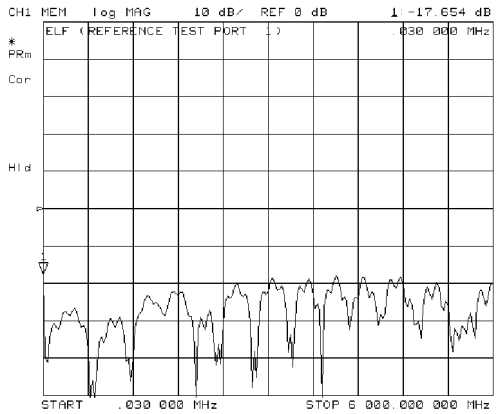
Description Load match is a measure of the impedance match of the test port that terminates the output of a 2-port device. Load match error terms are characterized by measuring the reflection (S11, S22) responses of a “through” configuration during the calibration procedure.

Significant System Components

- “through” cable
- cable connectors
- test port connectors

Affected Measurements All transmission and reflection measurements of a low insertion loss two-port devices are most affected by load match errors. Transmission measurements of lossy devices are also affected.

Figure 11-5 Typical E_{LF}/E_{LR}



sg6277d

Transmission Tracking (E_{TF} and E_{TR})

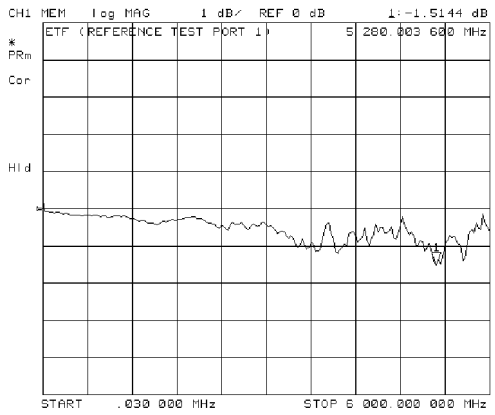
Description Transmission tracking is the difference between the frequency response of the reference path (including R input) and the transmission test path (including A or B input) while measuring transmission. The response of the test port cables is included. These terms are characterized by measuring the transmission (S21, S12) of the “through” configuration during the error-correction procedure.

Significant System Components

- R signal path (if both E_{TF} and E_{TR} are bad)
- A or B input paths
- “through” cable

Affected Measurements All transmission measurements are affected by transmission tracking errors.

Figure 11-6 Typical E_{TF}/E_{TR}



sg6278d

12 Theory of Operation

This chapter is divided into two major sections:

- "How the Analyzer Works" gives a general description of the analyzers' operation.
- "A Close Look at the Analyzer's Functional Groups" provides more detailed operating theory for each of the analyzer's functional groups.

How the Analyzer Works

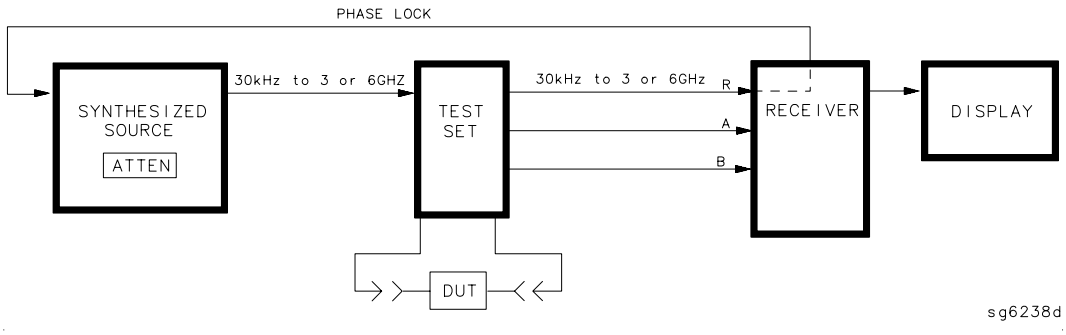
Network analyzers measure the reflection and transmission characteristics of devices and networks. A network analyzer test system consists of the following:

- source
- signal-separation devices
- receiver
- display

The analyzer applies a signal that is either transmitted through the device under test, or reflected from its input, and then compares it with the incident signal generated by the swept RF source. The signals are then applied to a receiver for measurement, signal processing, and display.

The analyzer consists of a high resolution synthesized RF source, test set, and a dual channel three-input receiver to measure and display magnitude, phase, and group delay of transmitted and reflected power. Analyzers with Option 010 provide the additional capability of transforming measured data from the frequency domain to the time domain. Figure 12-1 is a simplified block diagram of the network analyzer system. A detailed block diagram of the analyzer is located at the end of Chapter 4 , “Start Troubleshooting Here.”

Figure 12-1 Simplified Block Diagram of the Network Analyzer System



The Built-In Synthesized Source

The analyzer's built-in synthesized source produces a swept RF signal in the range of 30 kHz to 3.0 GHz. The Agilent 8753ET/ES Option 006 is able to generate signals up to 6 GHz. The source output power is leveled by an internal ALC (automatic leveling control) circuit. To achieve frequency accuracy and phase measuring capability, the analyzer is phase locked to a highly stable crystal oscillator.

For this purpose, a portion of the transmitted signal is routed to the R channel input of the receiver, where it is sampled by the phase detection loop and fed back to the source.

The Source Step Attenuator

The step attenuator is standard in 8753ES analyzers and available with Option 004 on 8753ET analyzers. The 70 dB, electro-mechanical, step attenuator contained in the source has very low loss. It is used to adjust the power level to the device under test (DUT) without changing the level of the incident power in the reference path. Attenuation levels are set via the front panel softkeys.

The Built-In Test Set

Both the 8753ET and the 8753ES have built-in test sets that provide signal separation capability. The test sets differ between the two types of network analyzers.

- The 8753ET has a “transmission/reflection” test set. With this configuration, measurements can be made only in the “forward” direction. Signals incident to and reflected from the DUT are separated by the dual directional coupler that is connected to the reflection port of the network analyzer. Incident signals are routed to the R-sampler, and reflected signals are routed to the A-sampler. Signals transmitted through the DUT are measured by the B-sampler which is connected directly to the transmission port. No “reverse” measurements can be made unless the DUT is turned around so that the RF power is now applied to its former “output port.”
- The 8753ES has an “S-parameter” test set. The test set consists of two directional couplers and a solid-state transfer switch. The couplers, which separate incident, reflected, and transmitted signals from the DUT are connected to the analyzer’s test ports, Port 1 and Port 2. The transfer switch directs RF power from the source to either test port. This allows both “forward” and “reverse” measurements to be made without changing the connections to the DUT. All incident signals—whether applied to Port 1 or Port 2—are routed to the R-sampler. Reflected and transmitted signals are routed to either the A-sampler or the B-sampler after signal separation by the directional couplers.

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 GPIB. The formatted data is then displayed.

Required Peripheral Equipment

In addition to the analyzer, the network analyzer measurement system requires calibration standards for vector accuracy enhancement, and cables for interconnections.

A Close Look at the Analyzer's Functional Groups

The operation of the analyzer is most logically described in five functional groups. Each group consists of several major assemblies, and performs a distinct function in the instrument. Some assemblies are related to more than one group, and in fact all the groups are to some extent interrelated and affect each other's performance.

- **Power Supply:** The power supply functional group consists of the A8 post regulator and the A15 preregulator. It supplies power to the other assemblies in the instrument.
- **Digital Control:** The digital control group consists of the 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). 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 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:**

  8753ET
  Reflected power is separated from incident power by the A21 dual directional coupler and sent to the A sampler. Power transmitted through the device under test is routed through the transmission port to the B sampler.

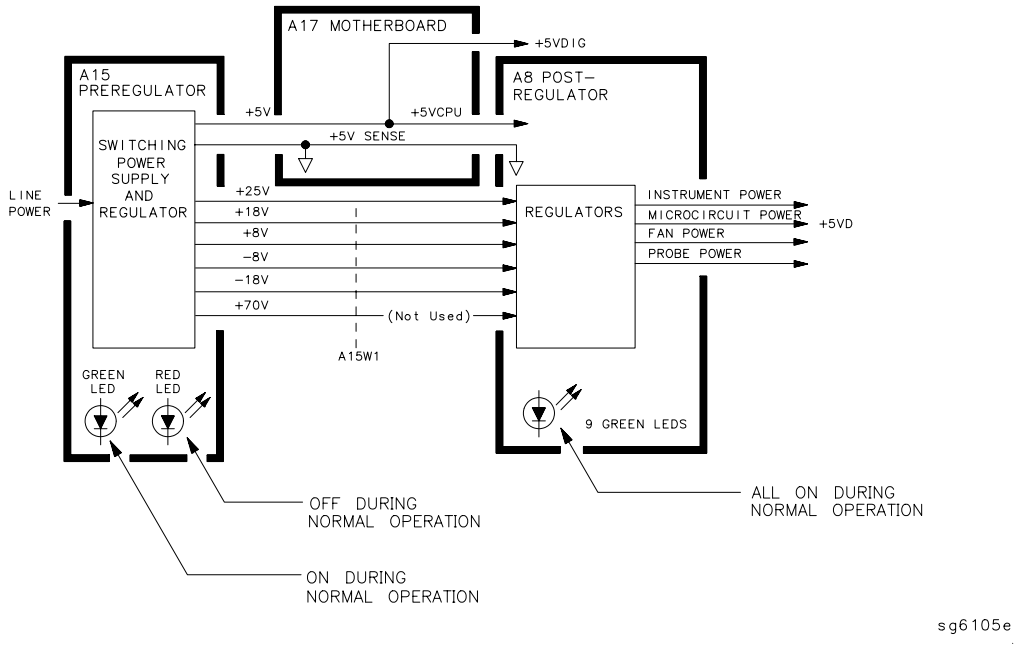
  8753ES
  The signal separation group performs the function of an S-parameter test set, dividing the source signal into a reference path and a test path, and providing connections to the device under test. It consists of the A24 transfer switch, the A21 test port 1 coupler, and the A22 test port 2 coupler.
- **Receiver:** The receiver group consists of the A4/A5/A6 sampler/mixers and the A10 digital IF. The A12 reference assembly and the A9 CPU are also related. The receiver measures and processes input signals for display.

The following pages describe the operation of each of the functional groups.

Power Supply Theory

The power supply functional group consists of the A15 preregulator and the A8 post regulator. These two assemblies comprise a switching power supply that provides regulated DC voltages to power all assemblies in the analyzer. The A15 preregulator is enclosed in a casting at the rear of the instrument. It is connected to the A8 post regulator by a wire bus A15W1. Figure 12-2 is a simplified block diagram of the power supply group.

Figure 12-2 Power Supply Functional Group, Simplified Block Diagram



A15 Preregulator

The A15 preregulator steps down and rectifies the line voltage. It provides a fully regulated +5 V digital supply, and several preregulated voltages that go to the A8 post regulator assembly for additional regulation.

The A15 preregulator assembly includes the line power module, a 60 kHz switching preregulator, and overvoltage protection for the +5 V digital supply. It provides LEDs, visible from the rear of the instrument, to indicate either normal or shutdown status.

Line Power Module

The line power module includes the line power switch, voltage selector switch, and main fuse. The line power switch is activated from the front panel. The voltage selector switch, accessible at the rear panel, adapts the analyzer to local line voltages of approximately 115 V or 230 V (with 350 VA maximum). The main fuse, which protects the input side of the preregulator against drawing too much line current, is also accessible at the rear panel. Refer to your analyzer's installation and quick start guide for line voltage tolerances and other power considerations. Refer to "8753ET/ES: Hardware, Preregulator" on page 13-55 for the recommended fuse part number and values.

Preregulated Voltages

The switching preregulator converts the line voltage to several DC voltages. The regulated +5 V digital supply goes directly to the motherboard. The following partially regulated voltages are routed through A15W1 to the A8 post regulator for final regulation:

+70 V (not used) +25 V +18 V –18 V +8 V –8 V

Regulated +5 V Digital Supply

The +5 VD supply is regulated by the control circuitry in the A15 preregulator. It goes directly to the motherboard, and from there to all assemblies requiring a low noise digital supply. A +5 V sense line returns from the motherboard to the A15 preregulator. The +5 V CPU is derived from the +5 VD in the A8 post regulator and goes directly to the A19 graphics system processor.

In order for the preregulator to function, the +5 V digital supply must be loaded by one or more assemblies, and the +5 V sense line must be working. If not, the other preregulated voltages will not be correct.

Shutdown Indications: the Green LED and Red LED

The green LED is on in normal operation. It is off when line power is not connected, not switched on, or set too low, or if the line fuse has blown.

The red LED, which is off in normal operation, turns on to indicate a fault in the +5 V supply. This may be an over/under line voltage, over line current, or overtemperature condition. Refer to the troubleshooting chapters for more information.

A8 Post Regulator

The A8 post regulator filters and regulates the DC voltages received from the A15 preregulator. It provides fusing and shutdown circuitry for individual voltage supplies. It distributes regulated constant voltages to individual assemblies throughout the instrument. It includes the overtemperature shutdown circuit, the variable fan speed circuit, and the air flow detector. Nine green LEDs provide status indications for the individual voltage supplies.

Refer to the power supply block diagram located at the end of Chapter 5 , “Power Supply Troubleshooting,” to see the voltages provided by the A8 post regulator.

Voltage Indications: the Green LEDs

The nine green LEDs along the top edge of the A8 assembly are on during normal operation, to indicate the correct voltage is present in each supply. If they are off or flashing, a problem is indicated. The troubleshooting procedures (later in this chapter) detail the steps to trace the cause of the problem.

Shutdown Circuit

The shutdown circuit is triggered by overcurrent, overvoltage, undervoltage, or overtemperature. It protects the instrument by causing the regulated voltage supplies to be shut down. It also sends status messages to the A9 CPU to trigger warning messages on the analyzer display. The voltages that are not shut down are the +5 VD and +5 VCPU digital supplies from the preregulator, the fan supplies, the probe power supplies, and the display supplies. The shutdown circuit can be disabled momentarily for troubleshooting purposes by using a jumper to connect the SDIS line (A8TP4) to ground.

Variable Fan Circuit and Air Flow Detector

The fan power is derived directly from the +18 V and –18 V supplies from the A15 preregulator. The fan is not fused, so that it will continue to provide airflow and cooling when the instrument is otherwise disabled. If overheating occurs, the main instrument supplies are shut down and the fan runs at full speed. An overtemperature status message is sent to the A9 CPU to initiate a warning message on the analyzer display. The fan also runs at full speed if the air flow detector senses a low output of air from the fan. (Full speed is normal at initial power on.)

Display Power

The A8 assembly supplies +5 VCPU to the A19 GSP through the motherboard. The GSP converts a portion of the +5 VCPU to 3.3 V to drive the display and LVDS (low voltage differential signaling) logic. The A19 GSP also controls and supplies power to the A27 backlight inverter. The voltages generated by the inverter are then routed to the display. Display power is not connected to the protective shutdown circuitry so that the A18 display assemblies can operate during troubleshooting when other supplies do not work.

NOTE **If blanking pulses from the A19 GSP are not present, then +3.3 V will not be sent to the display.**

Probe Power

The +18 V and –18 V supplies are post regulated to +15 V and –12.6 V to provide a power source at the front panel for an external RF probe or millimeter modules.

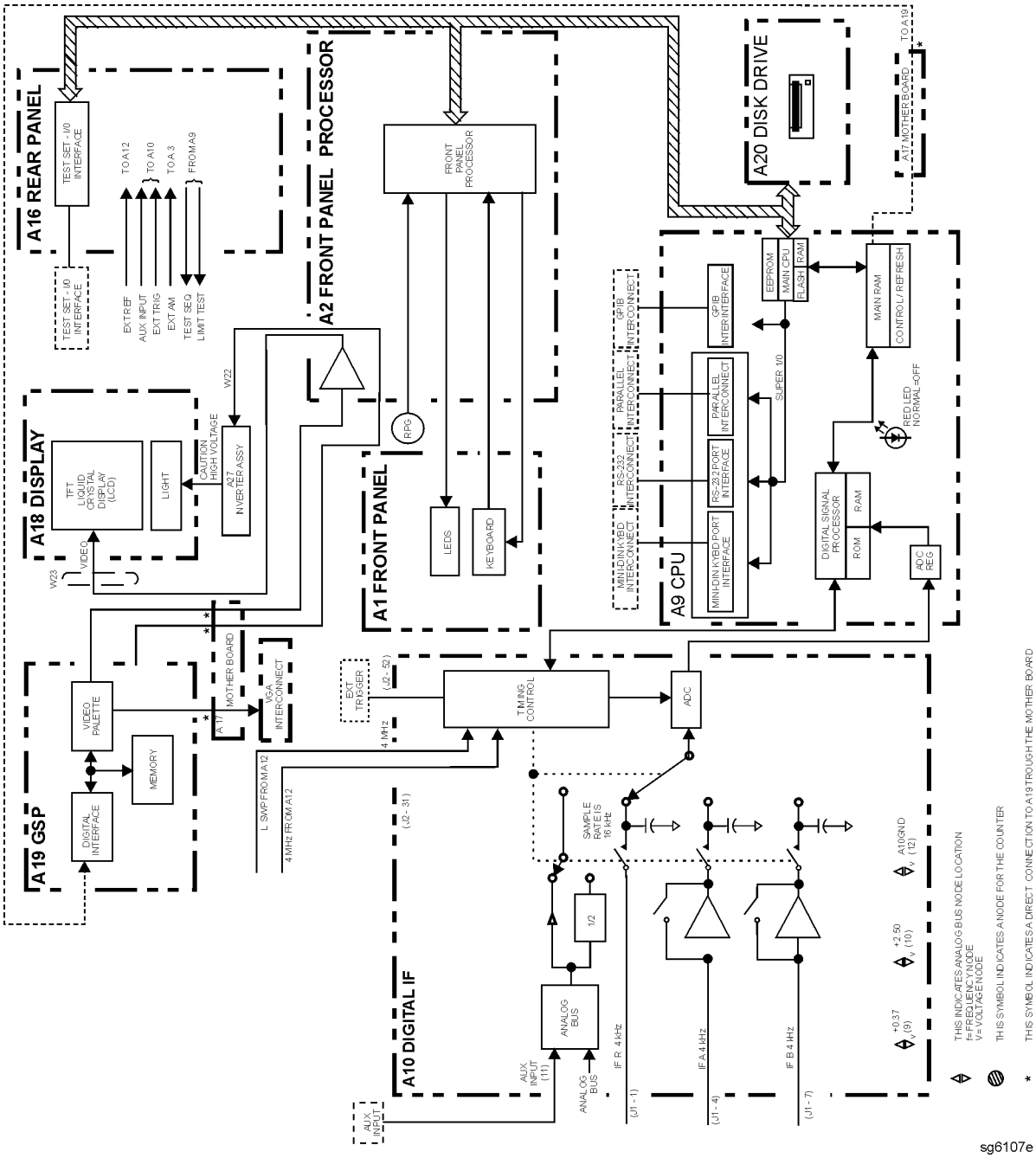
Digital Control Theory

The digital control functional group consists of the following assemblies:

- A1 front panel
- A2 front panel processor
- A9 CPU
- A10 digital IF
- A16 rear panel
- A18 display
- A19 GSP
- A27 Inverter

These assemblies combine to provide digital control for the entire analyzer. They provide math processing functions, as well as communications between the analyzer and an external controller and/or peripherals. Figure 12-3 is a simplified block diagram of the digital control functional group.

Figure 12-3 Digital Control Group, Simplified Block Diagram



A1 Front Panel

The A1 front panel assembly provides user interface with the analyzer. It includes the keyboard for local user inputs, and the front panel LEDs that indicate instrument status. The RPG (rotary pulse generator) is not electrically connected to the front panel, but provides user inputs directly to the front panel processor.

A2 Front Panel Processor

The A2 front panel processor detects and decodes user inputs from the front panel and the RPG, and transmits them to the CPU. It has the capability to interrupt the CPU to provide information updates. It controls the front panel LEDs that provide status information to the user.

The A2 also contains the LVDS (low voltage differential signaling) receivers which connect to the graphics processor. The received video signals are routed to the A18 display.

A9 CPU/A10 Digital IF

The A9 CPU assembly contains the main CPU (central processing unit), the digital signal processor, memory storage, and interconnect port interfaces. The main CPU is the master controller for the analyzer, including the other dedicated microprocessors. The memory includes EEPROM, DRAM, flash ROM, SRAM and boot ROM.

Data from the receiver is serially clocked into the A9 CPU assembly from the A10 digital IF. The data taking sequence is triggered either from the A14 fractional-N assembly, externally from the rear panel, or by software on the A9 assembly.

Main CPU

The main CPU is a 32-bit microprocessor that maintains digital control over the entire instrument through the instrument bus. The main CPU receives external control information from the front panel or GPIB, and performs processing and formatting operations on the raw data in the main RAM. It controls the digital signal processor, the front panel processor, the display processor, and the interconnect port interfaces. In addition, when the analyzer is in the system controller mode, the main CPU controls peripheral devices through the peripheral port interfaces.

The main CPU has a dedicated flash ROM that contains the operating system for instrument control. Front panel settings are stored in SRAM, with a battery providing at least 5 years of backup storage when external power is off.

Main RAM

The main RAM (random access memory) is shared memory for the CPU and the digital signal processor. It stores the raw data received from the digital signal processor, while additional calculations are performed on it by the CPU. The CPU reads the resulting formatted data from the main RAM and converts it to GSP commands. It writes these commands to the GSP for output to the analyzer display.

EEPROM

EEPROM (electrically-erasable programmable read only memory) contains factory set correction constants unique to each instrument. These constants correct for hardware variations to maintain the highest measurement accuracy. The correction constants can be updated by executing the routines in Chapter 3 , "Adjustments and Correction Constants."

Digital Signal Processor

The digital signal processor receives the digitized data from the A10 digital IF. It computes discrete Fourier transforms to extract the complex phase and magnitude data from the 4 kHz IF signal. The resulting raw data is written into the main RAM.

A18 Display

The A18 display is an 8.4-inch liquid crystal display (LCD) with associated drive circuitry. It receives a +3.3 V power supply from the A19 GSP, along with the voltage generated from the A27 backlight inverter. It receives the following signals from the A19 GSP:

- digital TTL horizontal sync
- digital TTL vertical sync
- blanking
- data clock
- digital TTL red video
- digital TTL green video
- digital TTL blue video

A19 GSP

The A19 graphics system processor is the main interface between the A9 CPU and the 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, which are then used for the following purposes:

- The video signals are used to produce VGA compatible RGB output signals, which are routed to the A16 rear panel.
- The video signals are converted by an LVDS (low voltage differential signaling) driver which translates the signals to low level differential signals to help eliminate radiated emissions. The converted video signals are then routed to the A2 assembly, where they are received and sent to the A18 display.

The A19 assembly receives the +5 VCPU which is used for processing and supplying power to the A27 backlight inverter (+5 VCPU) and the A18 display (3.3 V).

A27 Inverter

The A27 backlight inverter assembly supplies the ac voltage for the backlight tube in the A18 display assembly. This assembly takes the +5 VCPU and converts it to approximately 680 Vac steady state. At start-up the voltage can reach up to 1.5 kVac. There are two control lines:

- Digital ON/OFF
- Analog Brightness

  — 100% intensity is 0 V

  — 50% intensity is 4.5 V

A16 Rear Panel

The A16 rear panel includes the following interfaces:

TEST SET I/O INTERCONNECT. This provides control signals and power to operate duplexer test adapters.

EXT REF. This allows for a frequency reference signal input that can phase lock the analyzer to an external frequency standard for increased frequency accuracy.

The analyzer automatically enables the external frequency reference feature when a signal is connected to this input. When the signal is removed, the analyzer automatically switches back to its internal frequency reference.

10 MHZ PRECISION REFERENCE. (Option 1D5) This output is connected to the EXT REF (described above) to improve the frequency accuracy of the analyzer.

AUX INPUT. This allows for a dc or ac voltage input from an external signal source, such as a detector or function generator, which you can then measure using the Measure menu.(You can also use this connector as an analog output in service routines.)

EXT AM. This allows for an external analog signal input that is applied to the ALC circuitry of the analyzer's source. This input analog signal amplitude modulates the RF output signal.

EXT TRIG. This allows connection of an external negative TTL-compatible signal that will trigger a measurement sweep. The trigger can be set to external through softkey functions.

TEST SEQ. This outputs a TTL signal that can be programmed in a test sequence to be high or low, or pulse (10 µs) high or low at the end of a sweep for a robotic part handler interface.

LIMIT TEST. This outputs a TTL signal of the limit test results as follows:

— Pass: TTL high

— Fail: TTL low

VGA OUTPUT. This provides a video output of the analyzer display that is capable of running a PC VGA monitor.

Source Theory Overview

The source produces a highly stable and accurate RF output signal by phase locking a YIG oscillator to a harmonic of the synthesized VCO (voltage controlled oscillator). The source output produces a CW or swept signal between 300 kHz and 3 GHz (or 300 kHz and 6 GHz for Option 006) with a maximum leveled power of +10 dBm. The source's built-in 70 dB step attenuator allows the power to go as low as –85 dBm. (The step attenuator is standard on 8753ES analyzers, and available as Option 004 on 8753ET analyzers.)

The full frequency range of the source is produced in 14 subsweeps, one in super low band, two in low band, and eleven in high band. The high band frequencies (16 MHz to 3 GHz) or (16 MHz to 6 GHz for Option 006) are achieved by harmonic mixing, with a different harmonic number for each subsweep. The low band frequencies (300 kHz to 16 MHz) are down-converted by fundamental mixing. The super low band frequencies (10 kHz to 300 kHz) are sent directly from the A12 reference board to the output of the A3 source assembly. This band is not phased locked nor does it use the ALC. It is the basic amplified output of the fractional-N synthesizer.

The source functional group consists of the individual assemblies described below.

A14/A13 Fractional-N

These two assemblies comprise the synthesizer. The 30 to 60 MHz VCO in the 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” on page 12-27.) The A12 is also the origin of the super low band portion of the analyzer’s source.

A7 Pulse Generator

A step recovery diode in the pulse generator produces a comb of harmonic multiples of the VCO output. These harmonics provide the high band LO (local oscillator) input to the samplers. In low band and super low band, the operation the pulse generator is turned off.

A11 Phase Lock

This assembly compares the first IF (derived from the source output in the A4 sampler) to a stable reference, and generates an error voltage that is integrated into the drive for the A3 source assembly.

A3 Source

This assembly includes a 3.0 to 6.8 GHz YIG oscillator and a 3.8 GHz cavity oscillator. The outputs of these oscillators are mixed to produce the RF output signal. In Option 006 (30 kHz to 6 GHz) the frequencies 3.0 to 6.0 GHz are no longer a mixed product, but are the direct output of the YIG oscillator. The signal tracks the stable output of the synthesizer. The ALC (automatic leveling control) circuitry is also in the A3 assembly.

Source Super Low Band Operation

The Super Low Band Frequency Range is 10 kHz to 300 kHz. These frequencies are generated by the A12 Reference Board. They are the amplified output of the fractional-N synthesizer. This output is not phase locked and is not subject to ALC control. Refer to Table 12-1.

Table 12-1 Super Low Band Subsweep Frequencies

Fractional-N	1st IF	RF Output
40.0 to 43.3 MHz	0.010 to 0.300 MHz	0.010 to 0.300 MHz

Source Low Band Operation

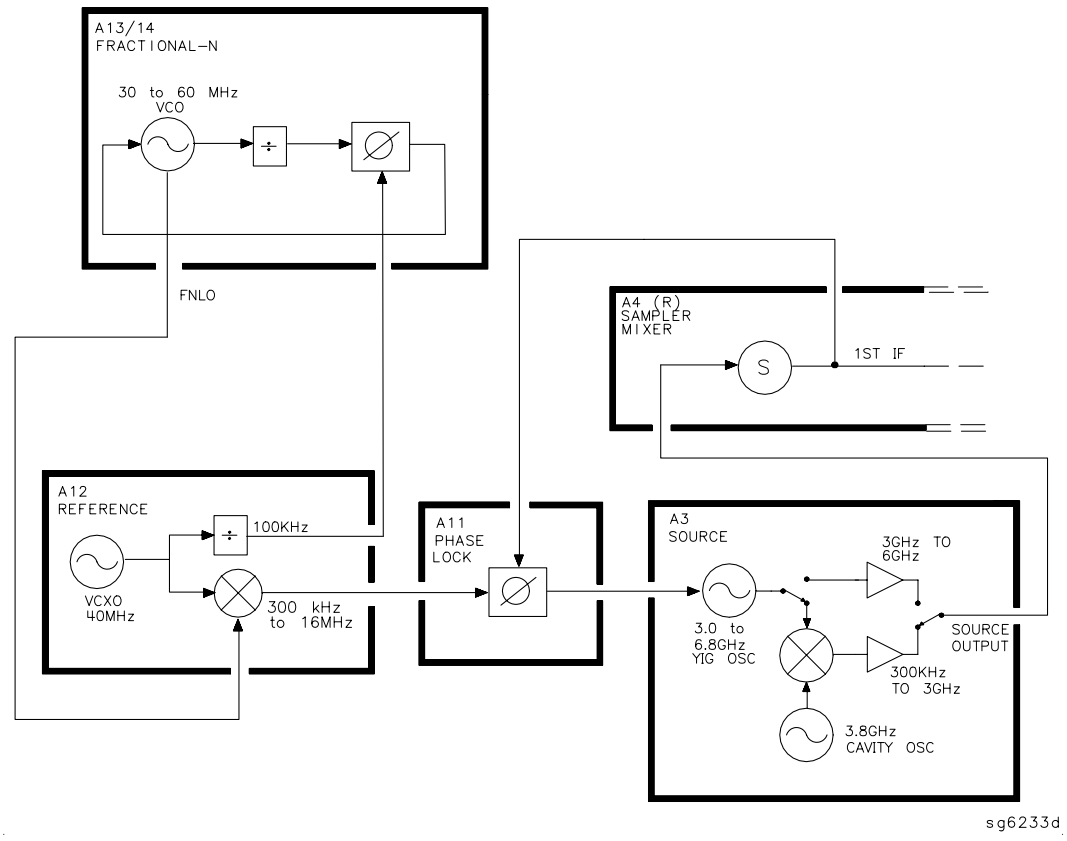
The low band frequency range is 300 kHz to 16 MHz. These frequencies are generated by locking the A3 source to a reference signal. The reference signal is synthesized by mixing down the fundamental output of the fractional-N VCO with a 40 MHz crystal reference signal. Low band operation differs from 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 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 sampler.** The pretuned DAC in the A11 phase lock assembly sets the A3 source to a frequency 1 MHz to 6 MHz above the start frequency. This signal (source output) goes to the A4 R input sampler/mixer assembly.

4. **The signal from the source is fed back (1st IF) to the phase comparator.** The source output signal passes directly through the sampler in the A4 assembly, because the sampler is biased on. The signal (1st IF) is fed back unaltered to the phase comparator in the 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.
6. **A synthesized sub sweep is generated. The source tracks the synthesizer.** When lock is achieved at the start frequency, the synthesizer starts to sweep. This changes the phase lock reference frequency, and causes the source to track at a difference frequency 40 MHz below the synthesizer.

Figure 12-4 Low Band Operation of the Source



The full low band is produced in two subsweeps, to allow addition IF filtering below 3 MHz. At the transition between subsweeps, the source is pretuned and then relocks. Table 12-2 lists the low band subsweep frequencies at the fractional-N VCO and the RF output.

Table 12-2 Low Band Subsweep Frequencies

Fractional-N	1st IF	Source Output
40.3 to 43.3 MHz	0.3 to 3.3 MHz	0.3 to 3.3 MHz
43.3 to 56.0 MHz	3.3 to 16.0 MHz	3.3 to 16.0 MHz

Source High Band Operation

The high band frequency range is 16 MHz to 3.0 GHz (or 16 MHz to 6.0 GHz with Option 006). These frequencies are generated in subsweeps by phase-locking the A3 source signal to harmonic multiples of the fractional-N VCO. The high band subsweep sequence, illustrated in Figure 12-5, follows these steps:

1. **A signal (HI OUT) is generated by the fractional-N 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 sampler.** 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 input sampler/mixer assembly.
4. **The synthesizer signal and the source signal are combined by the sampler. A difference frequency is generated.** In the A4 sampler, the 1st LO signal from the pulse generator is combined with the source output signal. The IF (intermediate frequency) produced is a first approximation of 1 MHz. This signal (1st IF) is routed back to the A11 phase lock assembly.
5. **The difference frequency (1st IF) from the A4 sampler is compared to a reference.** The 1st IF feedback signal from the A4 is filtered and applied to a phase comparator circuit in the A11 phase lock assembly. The other input to the phase comparator is a crystal controlled 1 MHz signal from the A12 reference assembly. Any frequency difference between these two signals produces a proportional error voltage.

6. **A tuning signal (YO DRIVE) tunes the source and phase lock is achieved.** The error voltage is used to drive the A3 source YIG oscillator, in order to bring it closer to the required frequency. The loop process continues until the 1st IF feedback signal to the phase comparator is equal to the 1 MHz reference signal, and phase lock is achieved.
7. **A synthesized subsweep is generated by A13/A14. The A3 source tracks the synthesizer.** When the source is phase locked to the synthesizer at the start frequency, the synthesizer starts to sweep. The phase locked loop forces the source to track the synthesizer, maintaining a constant 1 MHz 1st IF signal.

   The full high band sweep is generated in a series of subsweeps, by phase locking the A3 source signal to harmonic multiples of the fractional-N VCO. The 16 to 31 MHz subsweep is produced by a one half harmonic, using the divide-by-2 circuit on the A14 assembly. At the transitions between subsweeps, the source is pretuned and then relocks. Table 12-3 lists the high band subsweep frequencies from the fractional-N VCO and the source output.

Figure 12-5 High Band Operation of the Source

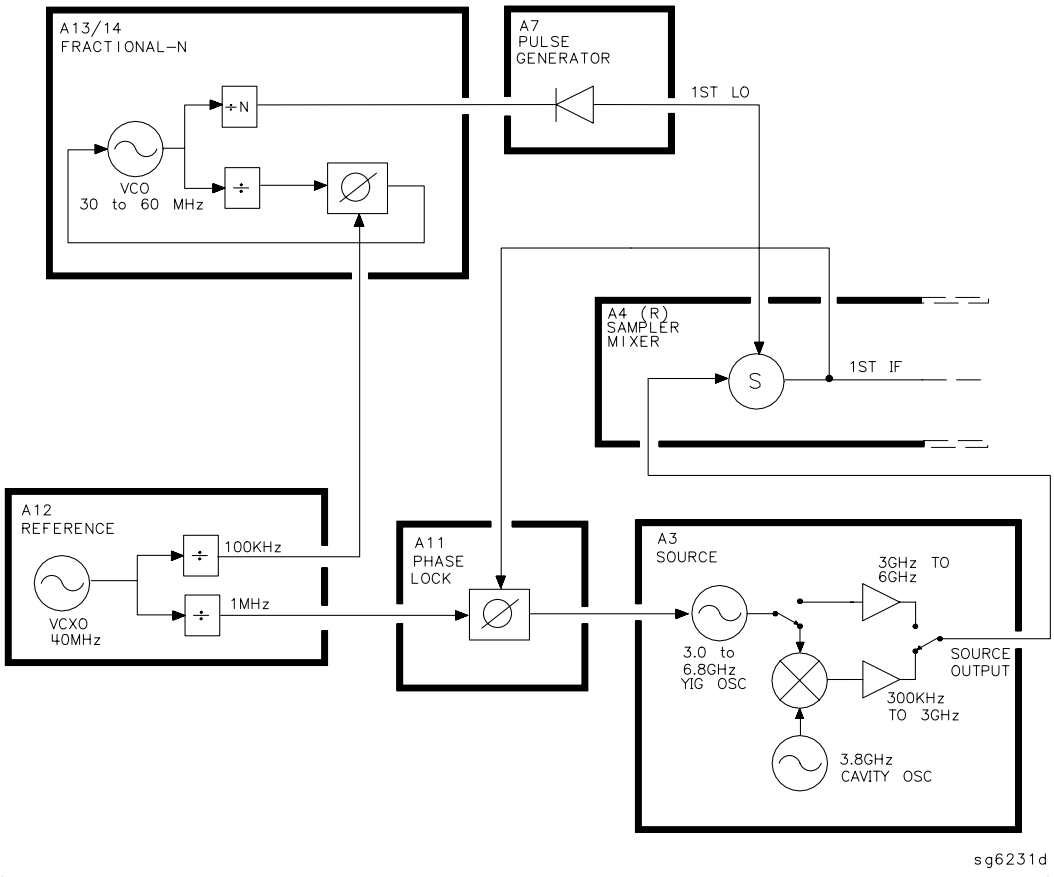


Table 12-3 High Band Subsweep Frequencies

Fractional-N (MHz)	Harmonic	Source Output (MHz)
30 to 60	1/2	16 to 31
30 to 60	1	31 to 61
30 to 60	2	61 to 121
40 to 59	3	121 to 178
35.4 to 59.2	5	178 to 296
32.8 to 59.4	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
Option 006		
37.0 to 59.6	83	3000 to 4950
49.0 to 59.4	101	4950 to 6000

Source Operation in other Modes and Features

Besides the normal network analyzer mode, the analyzer has extra modes and features to make additional types of measurements. The following describes the key differences in how the analyzer operates to achieve these new measurements.

Frequency Offset

The analyzer can measure frequency-translating devices with the frequency offset feature.

The receiver operates normally. However, the source is pretuned to a different frequency by an offset entered by the user. The device under test will translate this frequency back to the frequency the receiver expects. Otherwise, phase locking and source operation occur as usual.

Harmonic Analysis (Option 002)

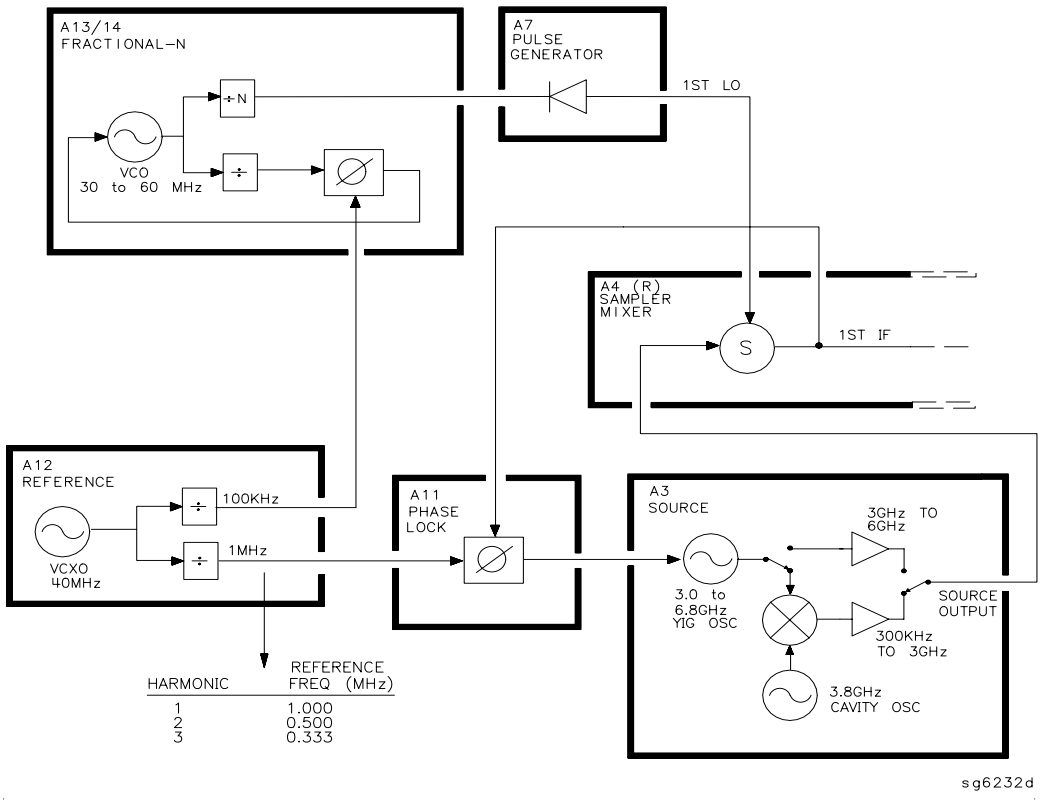
The analyzer can measure the 2nd or 3rd harmonic of the fundamental source frequency, on a swept or CW basis, with the harmonic analysis feature (optional).

To make this measurement, the reference frequency (normally 1 MHz) from the A12 reference assembly to the A11 phase lock assembly is divided by 1, 2, or 3. See Figure 12-6.

The fractional-N assemblies are also tuned so that the correct harmonic (comb tooth) of the 1st LO is 0.500 or 0.333 MHz below the source frequency instead of the usual 1.000 MHz. The analyzer pretunes the A3 source normally, then phase locks the 1st IF to the new reference frequency to sweep the fundamental source frequency in the usual way. The key difference is that the 1st IF (output from the R sampler) due to the fundamental and used for phase locking is now 0.500 or 0.333 MHz instead of 1.000 MHz.

Since the chosen VCO harmonic and the source differ by 0.500 or 0.333 MHz, then another VCO harmonic, 2 or 3 times higher in frequency, will be exactly 1.000 MHz away from the 2nd or 3rd harmonic of the source frequency. The samplers, then, will also down-convert these harmonics to yield the desired components in the 1st IF at 1.000 MHz. Narrow bandpass filters in the receiver eliminate all but the 1.000 MHz signals; these pass through to be processed and displayed.

Figure 12-6 Harmonic Analysis



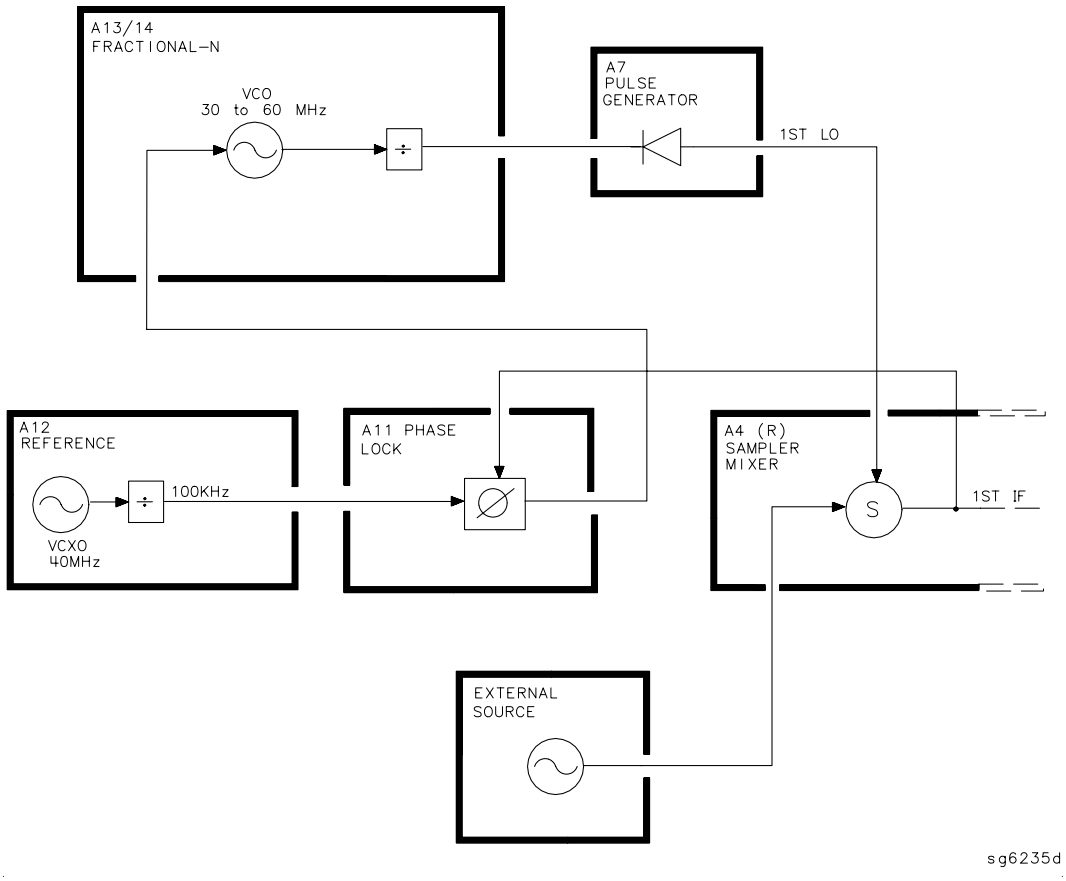
External Source Mode

In external source mode, the analyzer phase locks its receiver to an external signal source. This source must be CW (not swept), but it does not need to be synthesized. The user must enter the source frequency into the analyzer. (The analyzer's internal source output is not used.)

To accomplish this, the phase lock loop is reconnected so that the tuning voltage from the A11 phase lock assembly controls the VCO of the A14 fractional-N assembly and not the A3 source. See Figure 12-7. The VCO's output still drives the 1st LO of the samplers and down-converts the RF signal supplied by the external source. The resulting 1st IF is fed back to the A11 phase lock assembly, compared to the 1.000 MHz reference, and used to generate a tuning voltage as usual. However, the tuning voltage controls the VCO to lock on to the external source, keeping the 1st IF at exactly 1.000 MHz.

The analyzer normally goes through a pretune-acquire-track sequence to achieve phase lock. In external source mode, the fractional-N VCO pretunes as a closed-loop synthesizer referenced to the 100 kHz signal from the A12 reference assembly. Then, to acquire or track, a switch causes the VCO to be tuned by the A11 phase lock assembly instead. (Refer to the Overall Block Diagram at the end of Chapter 4 , “Start Troubleshooting Here.”)

Figure 12-7 External Source Mode



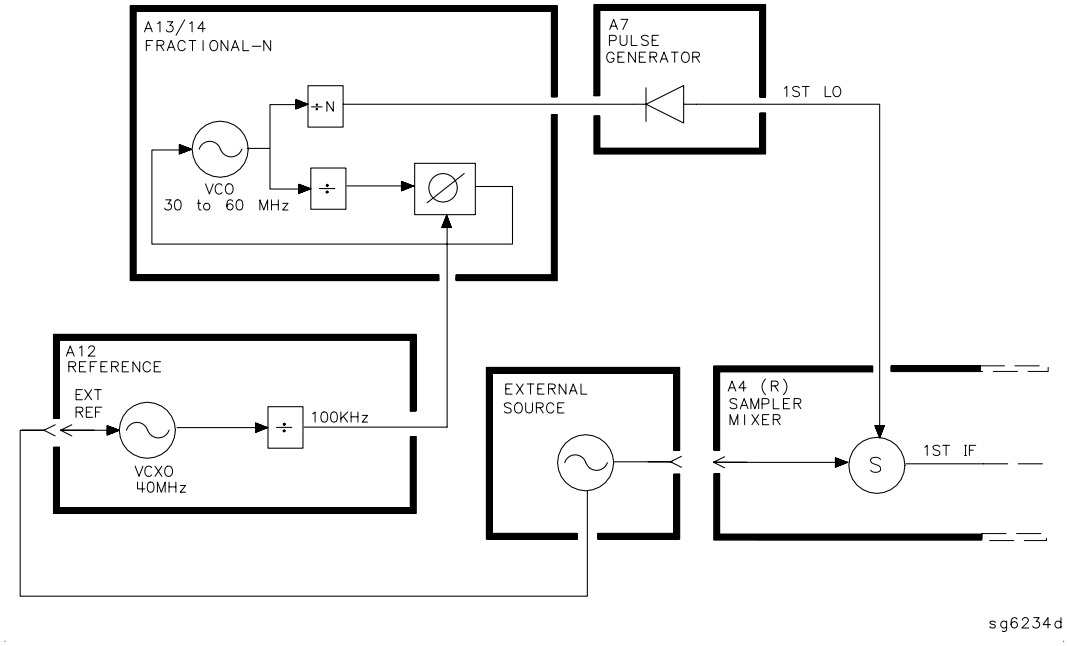
Tuned Receiver Mode

In tuned receiver mode, the analyzer is a synthesized, swept, narrow-band receiver only. The external signal source must be synthesized and reference-locked to the analyzer.

To achieve this, the analyzer's source and phase lock circuits are completely unused. See Figure 12-8. The fractional-N synthesizer is tuned so that one of its harmonics (1st LO) down-converts the RF input to the samplers. (In contrast to external source mode, the analyzer does not phase lock at all. However, the 1st LO is synthesized.)

The analyzer can function as a swept tuned receiver, similar to a spectrum analyzer, but the samplers create spurious signals at certain frequencies, which limit the accuracy of such measurements.

Figure 12-8 Tuned Receiver Mode



Signal Separation (8753ET)

The A21 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 signals coming from the device under test. A portion of the incident signal is applied to the R sampler/mixer via one of the coupled arms of the dual directional coupler. Meanwhile, the reflected signal is routed from the reflection test port via the other coupled arm to the input of the A sampler/mixer in the receiver.

If the 8753ET network analyzer is equipped with a step attenuator in the source assembly (Option 004), one of the coupled arms of the dual directional coupler is not used for transmitting part of the incident signal to the R sampler/mixer. Instead, the R sampler signal is taken directly from the source prior to the step attenuator.

Signals applied to the transmission test port are fed directly to the B sampler/mixer.

Figure 12-9 8753ET Dual Directional Coupler without Option 004

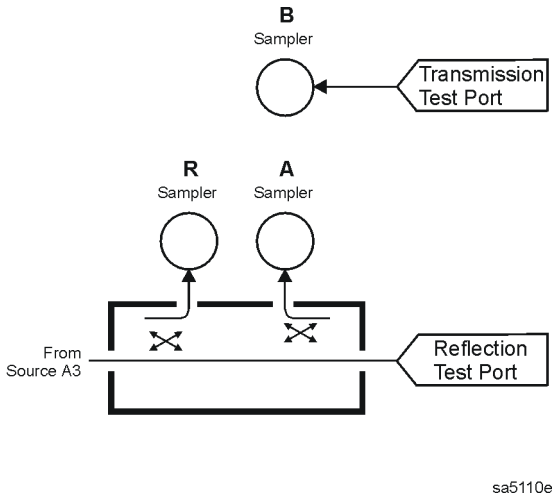
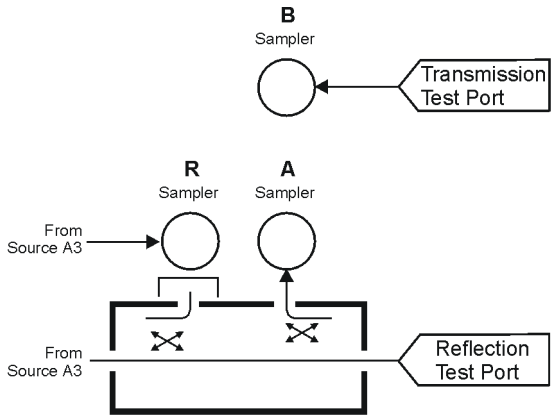


Figure 12-10 8753ET Dual Directional Coupler with Option 004



Signal Separation (8753ES)

The Built-In Test Set

Figure 12-11 shows a simplified block diagram of the analyzer's built-in test set.

A21 and A22 Test Port Couplers

The analyzer's test port couplers are used to separate signals incident to, reflected from, and transmitted from the device under test. Each test port coupler has a coupling coefficient factor of 16 dB.

A23 LED Front Panel

The LED front panel board indicates whether the source power is incident on the analyzer's test port 1 or test port 2. The analyzer's source power is directed to test port 1 when making a forward transmission/reflection measurement. Similarly, source power is incident at test port 2 when making a reverse transmission/reflection measurement.

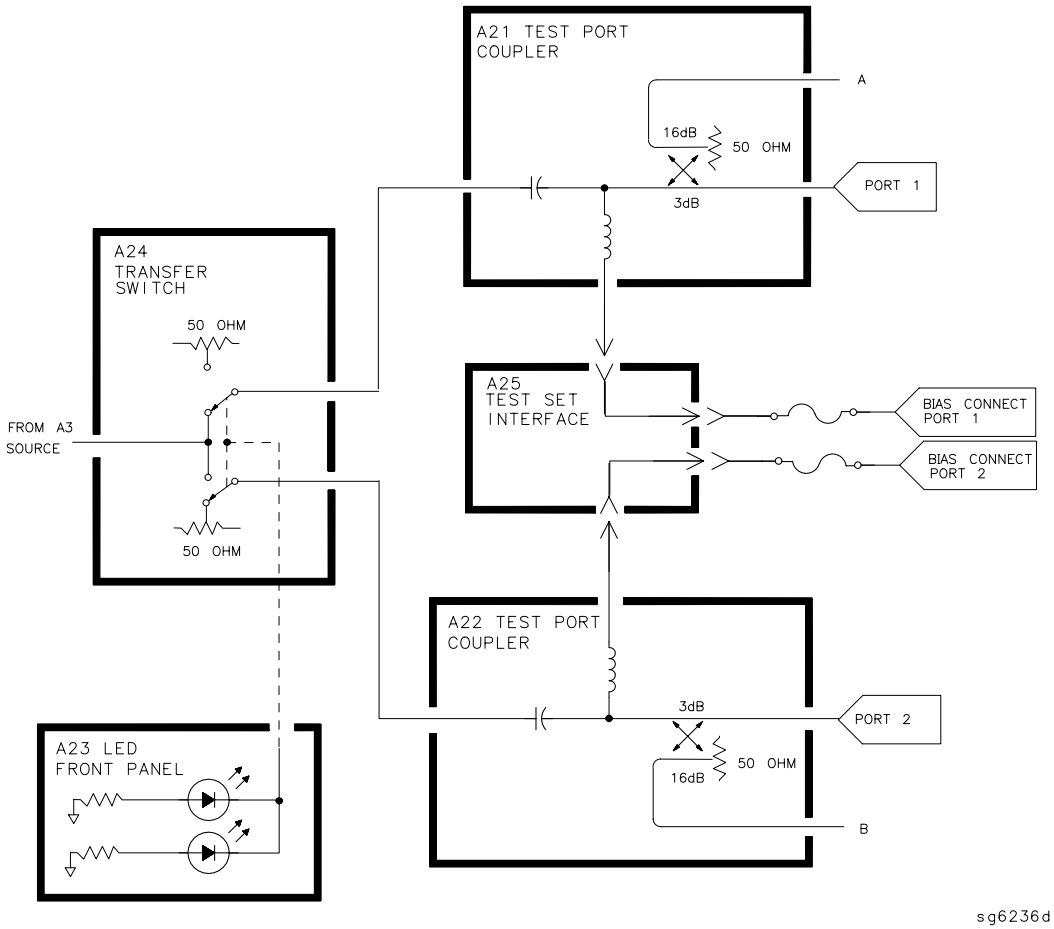
A24 Transfer Switch

The A3 source output power is directed to either the analyzer's test port 1 or test port 2 via a low loss solid state transfer switch. With this switch, all four S-parameters can be updated continuously (for example, the data obtained from a full 2-port calibration). In addition, the transfer switch provides termination for the inactive test port in order to minimize the crosstalk between the source and receiver sampler.

A25 Test Set Interface

The test set interface board provides biasing for active devices under test with an external dc voltage. This dc voltage is applied directly to the test port center pin. In addition, the test set interface board provides the drive signal for the A24 forward/reverse transfer switch.

Figure 12-11 Simplified Block Diagram of the 8753ES Built-In Test Set



Receiver Theory

The receiver functional group consists of the following assemblies:

- A4 sampler/mixer
- A5 sampler/mixer
- A6 sampler/mixer
- A10 digital IF

These assemblies combine with the A9 CPU (described in "Digital Control Theory" on page 12-9) to measure and process input signals into digital information for display on the analyzer. Figure 12-12 through Figure 12-14 are simplified block diagrams of the receiver functional group. The A12 reference assembly is also included in the illustration to show how the 2nd LO signal is derived.

Figure 12-12 Receiver Functional Group, 8753ET without Option 004

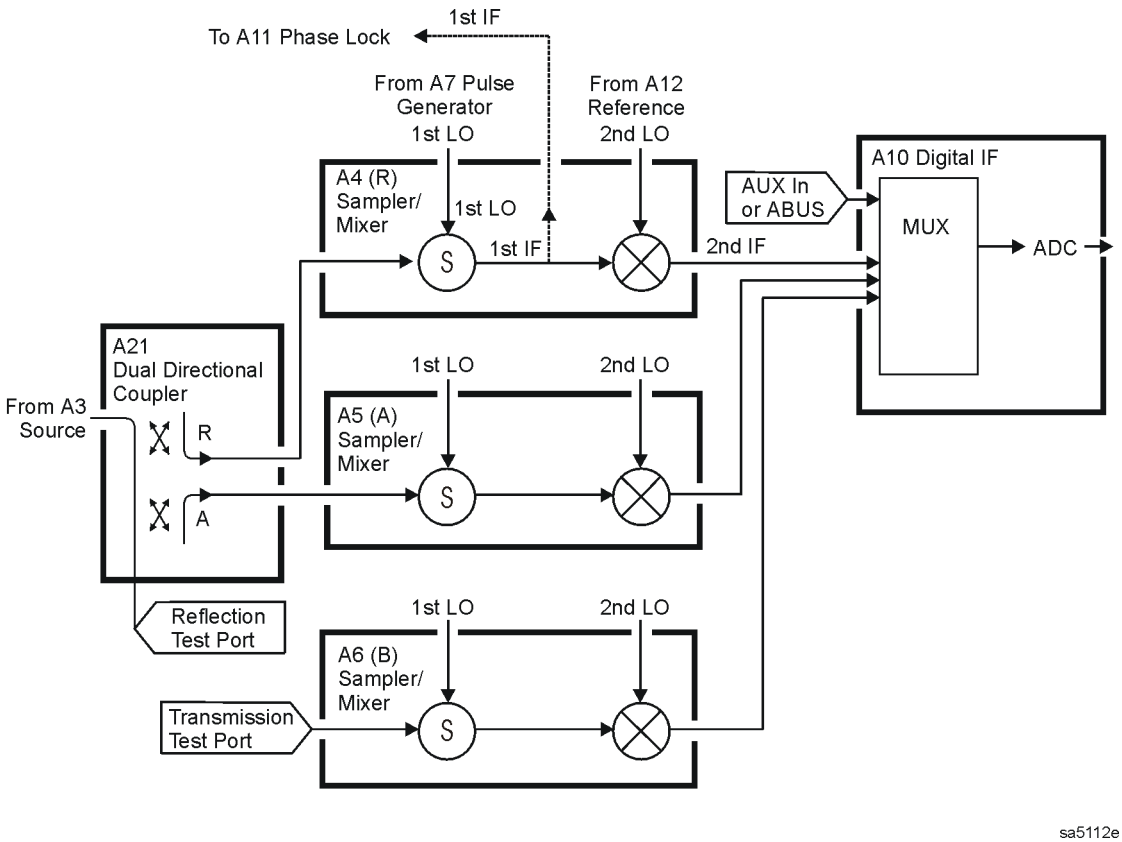


Figure 12-13 Receiver Functional Group, 8753ET with Option 004

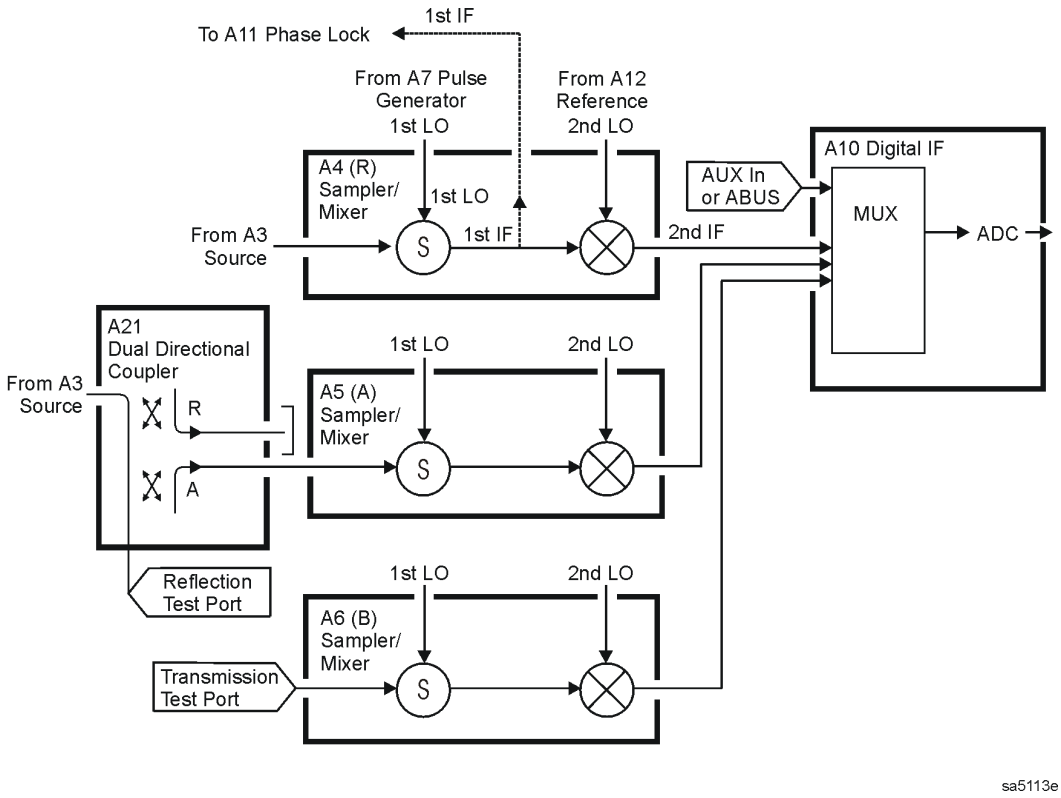
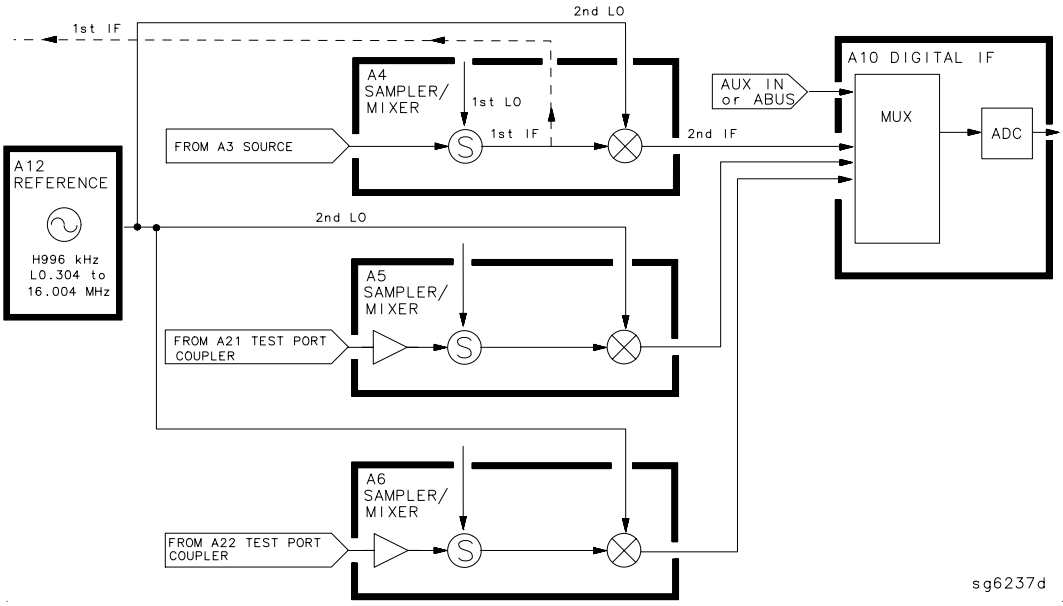


Figure 12-14 Receiver Functional Group, 8753ES



A4/A5/A6 Sampler/Mixer

The A4, A5, and A6 sampler/mixers all down-convert the RF input signals to fixed 4 kHz 2nd IF signals with amplitude and phase corresponding to the RF input.

The Sampler Circuit in High Band

In high band operation, the sampling rate of the samplers is controlled by the 1st LO from the A7 pulse generator assembly. The 1st LO is a comb of harmonics produced by a step recovery diode driven by the fractional-N VCO fundamental signal. One of the harmonic signals is 1 MHz below the start frequency set at the front panel. The 1st LO is combined in the samplers with the RF input signal from the source. In the Option 006, samplers are additionally capable of recognizing RF input signals from 3 to 6 GHz. The mixing products are filtered, so that the only remaining response is the difference between the source frequency and the harmonic 1 MHz below it. This fixed 1 MHz signal is the 1st IF. Part of the 1st IF signal from the R sampler is fed back to the A11 phase lock assembly.

The Sampler Circuit in Low Band or Super Low Band

In low band or super low band, the sampler diodes are biased continuously on, so that the RF input signal passes through them unchanged. Thus the 1st IF is identical to the RF output signal from the source (300 kHz to 16 MHz for lowband; 10 to 300 kHz for super lowband), and sweeps with it. Part of the 1st IF signal from the R sampler is fed back to the A11 phase lock assembly.

(Refer to "Source Theory Overview" on page 12-14 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.

The Mixer Circuit

The 1st IF and the 2nd LO are combined in the mixer circuit. The resulting difference frequency (the 2nd IF) is a constant 4 kHz in both bands, as Table 12-4 shows.

Table 12-4 High Band Subsweep Frequencies

Band	1st IF	2nd LO	2nd IF
Super Low	0.010 to 0.300 MHz	0.014 to 0.304 MHz	4.0 kHz
Low	0.300 to 16.0 MHz	0.304 to 16.004 MHz	4.0 kHz
High	1.000 MHz	0.996 MHz	4.0 kHz

A10 Digital IF

The three 4 kHz 2nd IF signals from the sampler/mixer assemblies are input to the A10 digital IF assembly. These signals are sampled at a 16 kHz rate. A fourth input is the analog bus, which can monitor either an external input at the rear panel AUX IN connector, or one of 31 internal nodes. A multiplexer sequentially directs each of the signals to the ADC (analog-to-digital converter). Here they are converted to digital form and sent to the A9 CPU assembly for processing. Refer to "Digital Control Theory" on page 12-9 for more information on signal processing.

13 Replaceable Parts

This chapter contains information for ordering replacement parts for the Agilent 8753ES and 8753ET network analyzers. Replaceable parts include the following:

- major assemblies
- cables
- chassis hardware

In general, parts of major assemblies are not listed. Refer to Table 13-1 on page 13-62 to help interpret part descriptions in the replaceable parts lists that follow.

Replacing an Assembly

The following steps show the sequence to replace an assembly (ASSY) in the analyzer.

1. Identify the faulty group. Refer to Chapter 4 , “Start Troubleshooting Here.” Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to the information in this chapter.
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to Chapter 14 , “Assembly Replacement and Post-Repair Procedures.”
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

Rebuilt-Exchange Assemblies

Under the rebuilt-exchange assembly program, certain factory-repaired and tested modules (assemblies) are available on a trade-in basis. These assemblies are offered for lower cost than a new assembly, but meet all factory specifications required of a new assembly.

The defective assembly must be returned for credit under the terms of the rebuilt-exchange assembly program. Any spare assembly stock desired should be ordered using the new assembly part number. Figure 13-1 illustrates the module exchange procedure. “Major Assemblies, Top” and “Major Assemblies, Bottom” list all major assemblies, including those that can be replaced on an exchange basis.

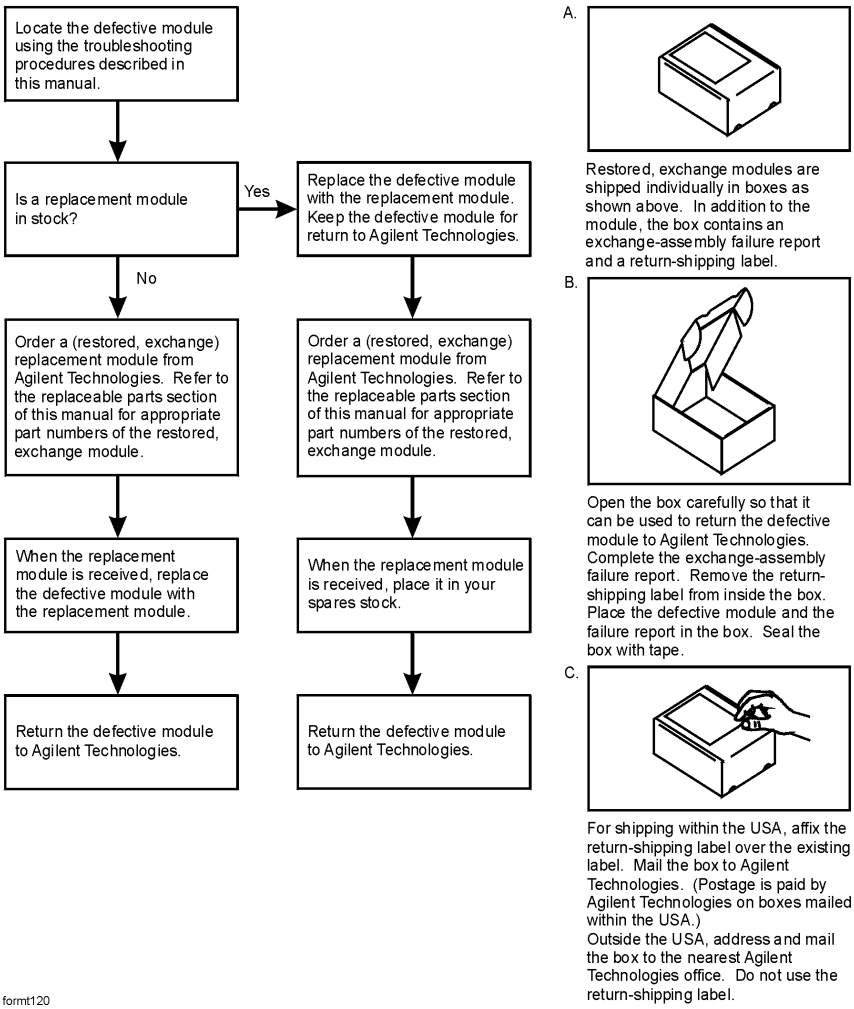
Ordering Information

To order a part listed in the replaceable parts lists, quote the Agilent Technologies part number, indicate the quantity required, and address the order to the nearest Agilent Technologies office.

To order a part that is not listed in the replaceable parts lists, include the instrument model number, complete instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Agilent Technologies office.

Figure 13-1 Module Exchange Procedure

The module exchange program described here is a fast, efficient, economical method of keeping your instrument in service.



Replaceable Part Listings

The following pages list the replacement part numbers and descriptions for 8753ET and 8753ES network analyzers. Illustrations with reference designators are provided to help identify and locate the part needed. The parts lists are organized into the following categories:

- 8753ET: Major Assemblies, Top on page 13-10
- 8753ES: Major Assemblies, Top on page 13-12
- 8753ET: Major Assemblies, Bottom on page 13-14
- 8753ES: Major Assemblies, Bottom on page 13-15
- 8753ES Option 014: Major Assemblies and Cables, Bottom on page 13-16
- 8753ET: Cables, Top on page 13-18
- 8753ES: Cables, Top on page 13-20
- 8753ES Option 014: Cables, Top on page 13-22
- 8753ET: Cables, Bottom on page 13-24
- 8753ES: Cables, Bottom on page 13-26
- 8753ET: Cables, Front on page 13-28
- 8753ES: Cables, Front on page 13-30
- 8753ET/ES: Cables, Rear on page 13-32
- 8753ET/ES: Cables and Miscellaneous Parts, Source on page 13-34
- 8753ET/ES: Front Panel Assembly, Outside on page 13-36
- 8753ET/ES: Front Panel Assembly, Inside on page 13-38
- 8753ET: Rear Panel Assembly on page 13-40
- 8753ES: Rear Panel Assembly on page 13-42
- 8753ET/ES: Rear Panel Assembly, Option 1D5 on page 13-44
- 8753ET/ES: Hardware, Top on page 13-46
- 8753ET: Hardware, Bottom on page 13-48
- 8753ES: Hardware, Bottom on page 13-49
- 8753ET/ES: Hardware, Front on page 13-50
- 8753ET: Hardware, Test Set Deck on page 13-51
- 8753ES: Hardware, Test Set Deck on page 13-52
- 8753ET/ES: Hardware, Disk Drive Support on page 13-53
- 8753ET/ES: Hardware, Memory Deck on page 13-54
- 8753ET/ES: Hardware, Preregulator on page 13-55

- 8753ET/ES: Chassis Parts, Outside on page 13-56
- 8753ET/ES: Chassis Parts, Inside on page 13-58
- Miscellaneous on page 13-59

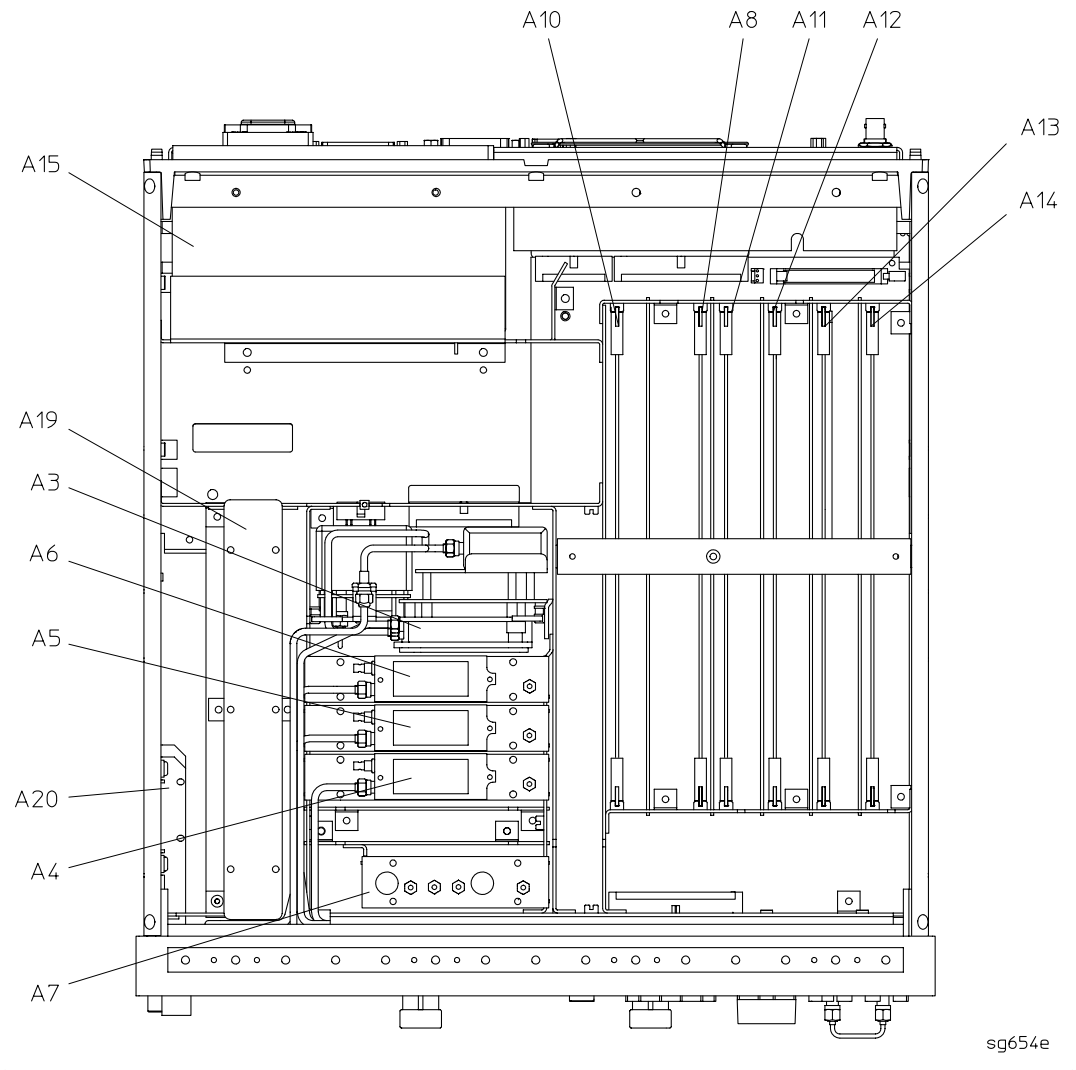
This page intentionally left blank.

8753ET: Major Assemblies, Top

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
A1, A2				NOT SHOWN[a]
A3		08753-60234	1	ASSY-SOURCE 3 GHz (EXCHANGE: 08753-69234)
A3	004	08753-60231	1	ASSY-SOURCE 3 GHz (EXCHANGE: 08753-69231)
A3	006	08753-60233	1	ASSY-SOURCE 6 GHz (EXCHANGE: 08753-69233)
A3	004, 006	08753-60146	1	ASSY-SOURCE 6 GHz (EXCHANGE: 08753-69146)
A4		08753-60907	1	ASSY-SAMPLER R
A5		08753-60908	1	ASSY-SAMPLER A
A6		08753-60951	1	ASSY-SAMPLER B
A7		08753-60164	1	BD ASSY-PULSE GENERATOR
A8[b]		08753-60949	1	BD ASSY-POST REGULATOR
A9				NOT SHOWN[c]
A10		08753-60958	1	BD ASSY-DIGITAL IF
A11		08753-60162	1	BD ASSY-PHASE LOCK
A12		08753-60957	1	BD ASSY-REFERENCE
A13		08753-60013	1	BD ASSY-FRAC N ANALOG
A14		08753-60068	1	BD ASSY-FRAC N DIGITAL
A15		0950-3488	1	ASSY-PREREGULATOR
A16				NOT SHOWN[d]
A17				NOT SHOWN[e]
A18				NOT SHOWN[a]
A19		08753-60359	1	BD ASSY-GRAPHICS PROCESSOR (GSP) (under sheet metal cover)
A20		0950-2782	1	ASSY-DISK DRIVE
A26	1D5			NOT SHOWN[f]
A27				NOT SHOWN[a]
B1				NOT SHOWN[d]
RPG				NOT SHOWN[a]

a. See "8753ET/ES: Front Panel Assembly, Inside" on page 13-38.
b. For fuse part numbers on the A8 Post Regulator, refer to "Miscellaneous" on page 13-59.
c. See "8753ET: Major Assemblies, Bottom" on page 13-14.
d. See "8753ET: Rear Panel Assembly" on page 13-40.
e. See "8753ET/ES: Chassis Parts, Inside" on page 13-58.
f. See "8753ET/ES: Rear Panel Assembly, Option 1D5" on page 13-44.

Figure 13-2 8753ET: Major Assemblies, Top

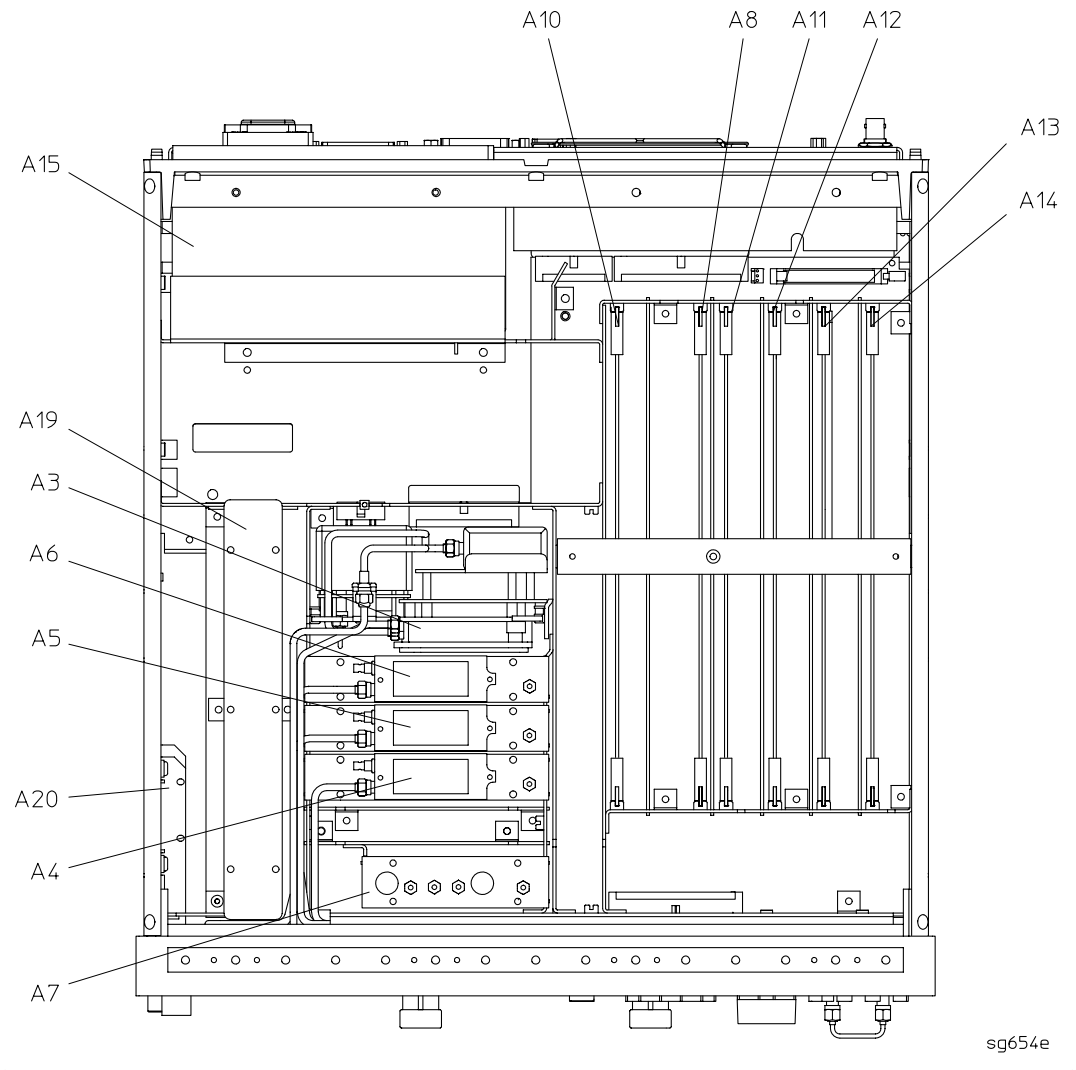


8753ES: Major Assemblies, Top

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
A1, A2				NOT SHOWN[a]
A3		08753-60231	1	ASSY-SOURCE 3 GHz (EXCHANGE: 08753-69231)
A3	006	08753-60146	1	ASSY-SOURCE 6 GHz (EXCHANGE: 08753-69146)
A4		08753-60907	1	ASSY-SAMPLER R
A5		08753-60908	1	ASSY-SAMPLER A
A6		08753-60908	1	ASSY-SAMPLER B
A7		08753-60164	1	BD ASSY-PULSE GENERATOR
A8[b]		08753-60949	1	BD ASSY-POST REGULATOR
A9				NOT SHOWN[c]
A10		08753-60958	1	BD ASSY-DIGITAL IF
A11		08753-60162	1	BD ASSY-PHASE LOCK
A12		08753-60957	1	BD ASSY-REFERENCE
A13		08753-60013	1	BD ASSY-FRAC N ANALOG
A14		08753-60068	1	BD ASSY-FRAC N DIGITAL
A15		0950-3488	1	ASSY-PREREGULATOR
A16				NOT SHOWN[d]
A17				NOT SHOWN[e]
A18				NOT SHOWN[a]
A19		08753-60359	1	BD ASSY-GRAPHICS PROCESSOR (GSP) (under sheet metal cover)
A20		0950-2782	1	ASSY-DISK DRIVE
A26	1D5			NOT SHOWN[f]
A27				NOT SHOWN[a]
B1				NOT SHOWN[d]
RPG				NOT SHOWN[a]

a. See “8753ET/ES: Front Panel Assembly, Inside” on page 13-38.
b. For fuse part numbers on the A8 Post Regulator, refer to “Miscellaneous” on page 13-59.
c. See “8753ES: Major Assemblies, Bottom” on page 13-15.
d. See “8753ES: Rear Panel Assembly” on page 13-42.
e. See “8753ET/ES: Chassis Parts, Inside” on page 13-58.
f. See “8753ET/ES: Rear Panel Assembly, Option 1D5” on page 13-44.

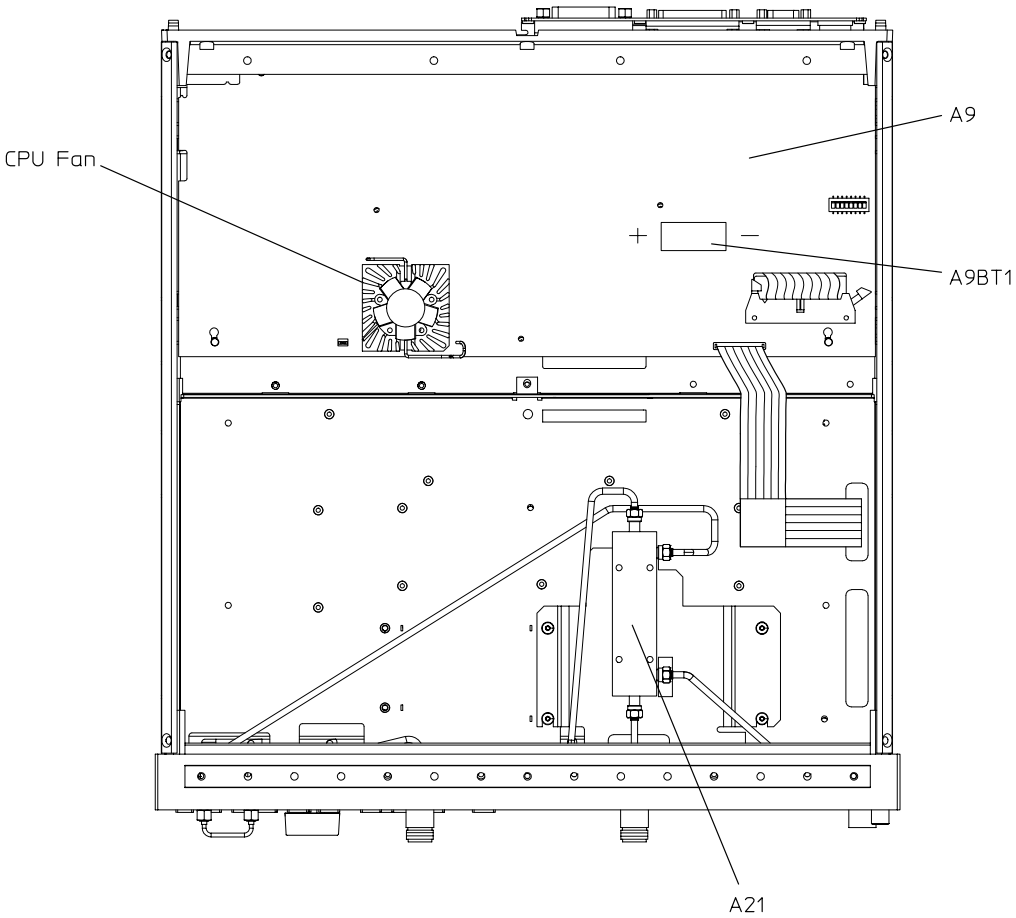
Figure 13-3 8753ES: Major Assemblies, Top



8753ET: Major Assemblies, Bottom

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
A9		08753-60315	1	CPU REPAIR KIT (EXCHANGE: 08753-69315)
CPU FAN		5060-8776	1	A9 CPU FAN
A9BT1		1420-0338	1	BATTERY-LITHIUM 3V 1.2AH
A21		5087-7069	1	ASSY-DUAL COUPLER (EXCHANGE: 5087-6069)

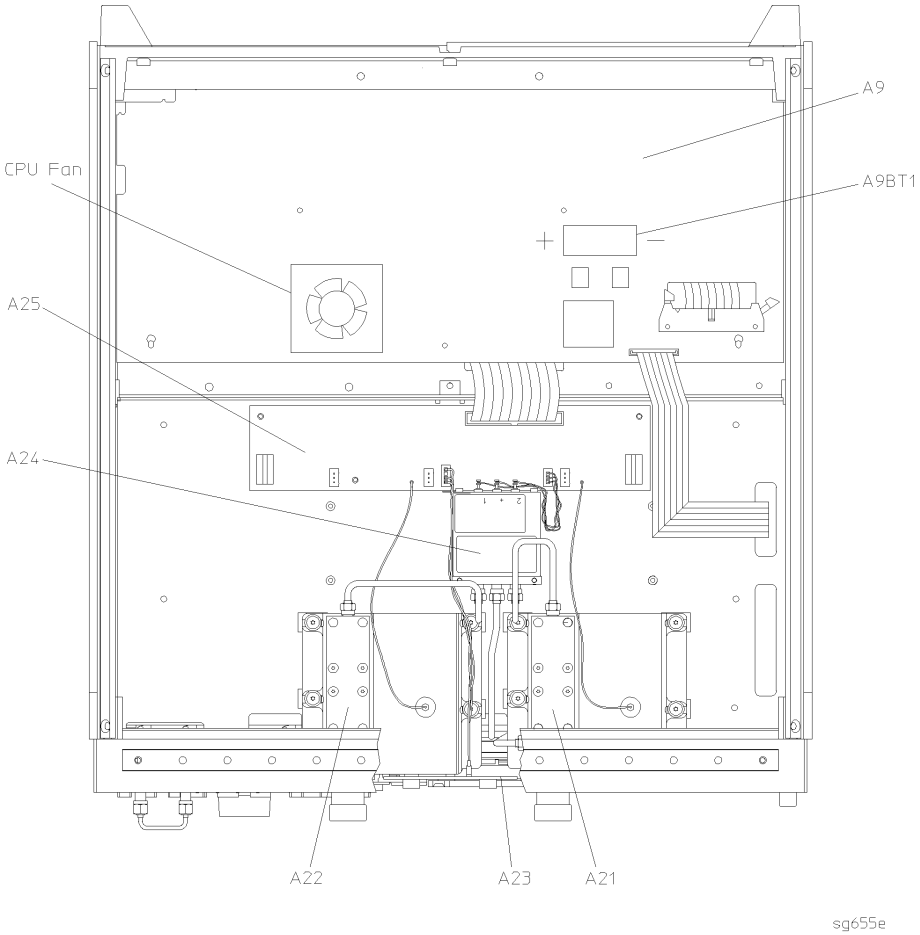
Figure 13-4 8753ET: Major Assemblies, Bottom



8753ES: Major Assemblies, Bottom

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
A9		08753-60315	1	CPU REPAIR KIT (EXCHANGE: 08753-69315)
CPU FAN		5060-8776	1	A9 CPU FAN
A9BT1		1420-0338	1	BATTERY-LITHIUM 3V 1.2AH
A21		5087-7007	1	ASSY-TEST PORT COUPLER (EXCHANGE: 5087-6007)
A21	075	5087-7008	1	ASSY-TEST PORT COUPLER (EXCHANGE: 5087-6008)
A22		5087-7007	1	ASSY-TEST PORT COUPLER (EXCHANGE: 5087-6007)
A22	075	5087-7008	1	ASSY-TEST PORT COUPLER (EXCHANGE: 5087-6008)
A23		08753-60145	1	BD ASSY-LED FRONT PANEL
A24		5087-7067	1	ASSY-TRANSFER SWITCH, SOLID STATE (EXCHANGE: 5087-6067)
A25		08753-60280	1	BD ASSY-TEST SET INTERFACE

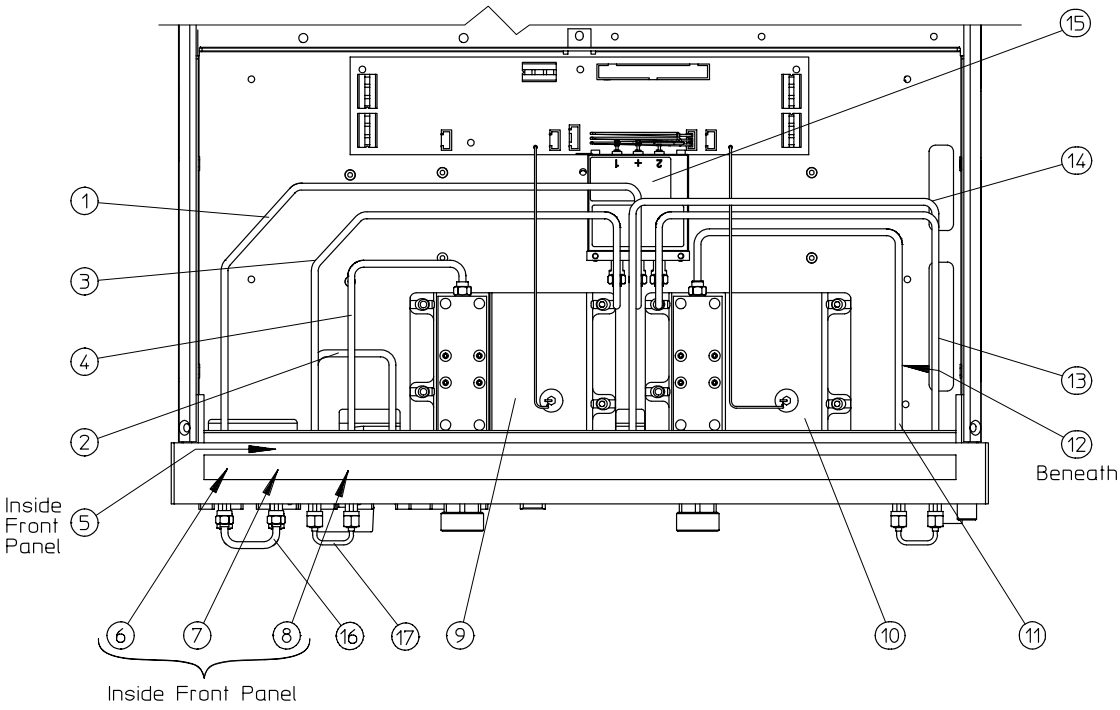
Figure 13-5 8753ES: Major Assemblies, Bottom



8753ES Option 014: Major Assemblies and Cables, Bottom

Item	Option	HP/Agilent Part Number	Qty	Description
1	014	08753-20184	1	SWITCH RF IN to A24 PORT C
2	014	08753-20181	1	A22 COUPLER ARM to B SAMPLER OUT
3	014	08753-20176	1	SWITCH A24 to PORT 2 SWITCH
4	014	08753-20180	1	PORT 2 COUPLER to A22 COUPLER MAIN
5	014	08753-20951	1	SOURCE A3 to RF OUT
6	014	08753-20291	1	SOURCE A3 to R CHANNEL OUT
7		08753-20290	1	R CHANNEL IN to R SAMPLER
8		08753-20954	1	B SAMPLER IN to B SAMPLER
9		5087-7007	1	A22 COUPLER, TEST PORT 2
10		5087-7007	1	A21 COUPLER, TEST PORT 1
11	014	08753-20177	1	PORT 1 COUPLER to A21 COUPLER MAIN
12	014	08753-20179	1	A SAMPLER IN to A SAMPLER
13	014	08753-20175	1	SWITCH A24 to PORT 1 SWITCH
14	014	08753-20178	1	A21 COUPLER ARM to A SAMPLER OUT
15		5087-7067	1	A24 SWITCH
16	014	08720-20075	2	Front panel jumper
17	014	08753-20183	4	Front panel jumper

Figure 13-6 8753ES Option 014, Major Assemblies and Cables, Bottom

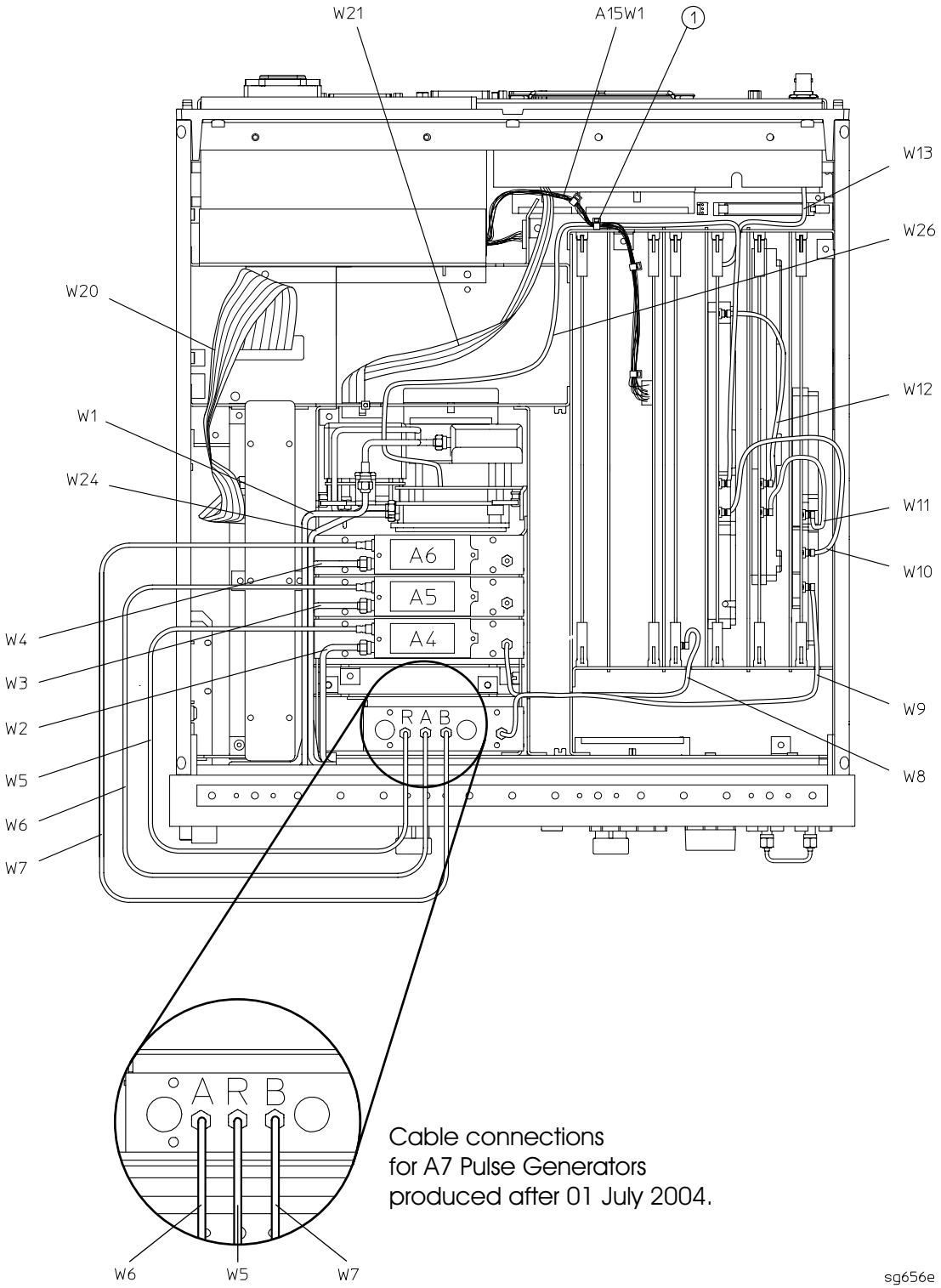


8753ET: Cables, Top

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
1			1400-0249	1	CABLE TIE (15W1 to CHASSIS)
A15W1		18W	(part of A15)	1	PREREGULATOR (A15) to POST REGULATOR (A8J2) and MOTHERBOARD (A17J3)
W1		SR	08753-20363	1	SOURCE ASSY (A3W7) to DUAL DIRECTIONAL COUPLER (A21)
W2		SR	08753-20290	1	FP (R CHANNEL IN) to SAMPLER-R (A4)
W3		SR	08753-20361	1	DUAL DIRECTIONAL COUPLER (A21) to SAMPLER-A (A5)
W4		SR	08753-20364	1	TRANSMISSION PORT to SAMPLER-B (A6)
W5		F	08753-60027	1	SAMPLER-R (A4) to PULSE GENERATOR (A7)
W6		F	08753-60027	1	SAMPLER-A (A5) to PULSE GENERATOR (A7)
W7		F	08753-60027	1	SAMPLER-B (A6) to PULSE GENERATOR (A7)
W8		F	08753-60029	1	PHASE LOCK (A11J1) to SAMPLER-R (A4)
W9		F	8120-5021	1	FRAC-N DIGITAL (A14J1) to PULSE GENERATOR (A7)
W10		F	08753-60029	1	FRAC-N DIGITAL (A14J2) to REFERENCE (A12J1)
W11		F	08753-60029	1	FRAC-N DIGITAL (A14J3) to FRAC-N ANALOG (A13J1)
W12		F	08753-60029	1	FRAC-N ANALOG (A13J2) to REFERENCE (A12J2)
W13		F	08753-60026	1	REFERENCE (A12J3) to RP (EXT REF)
W20		34R	8120-6890	1	MOTHERBOARD (A17J11) to CPU (A9J5)
W21		14R	8120-6876	1	MOTHERBOARD (A17J12) to REAR PANEL VGA OUT
W24	004	SR	08753-20291	1	SOURCE ASSY (A3) to FP (R CHANNEL OUT)
W26		F	8120-5026	1	SOURCE ASSY (A3) to REFERENCE (A12J4)

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
F = Flexible Coax Cable
SR = Semi-Rigid Coax Cable

Figure 13-7 8753ET: Cables, Top

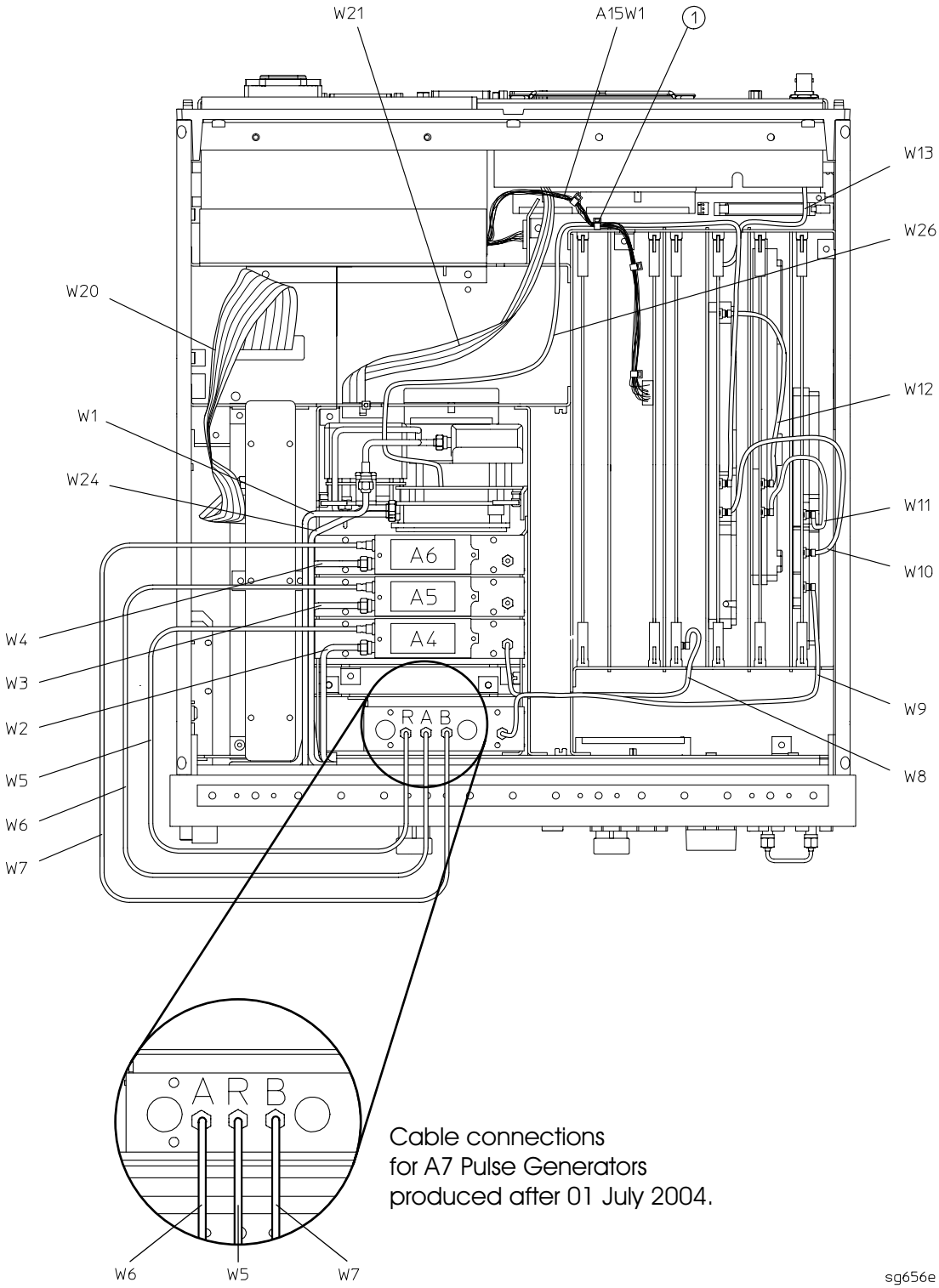


8753ES: Cables, Top

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
1			1400-0249	1	CABLE TIE (15W1 to CHASSIS)
A15W1		18W	(part of A15)	1	PREREGULATOR (A15) to POST REGULATOR (A8J2) and MOTHERBOARD (A17J3)
W1		SR	08753-20952	1	SOURCE ASSY (A3W4) to TRANSFER SWITCH (A24)
W2		SR	08753-20290	1	FP (R CHANNEL IN) to SAMPLER-R (A4)
W3		SR	08753-20286	1	TEST PORT 1 COUPLER (A21) to SAMPLER-A (A5)
W4		SR	08753-20953	1	TEST PORT 2 COUPLER (A22) to SAMPLER-B (A6)
W5		F	08753-60027	1	SAMPLER-R (A4) to PULSE GENERATOR (A7)
W6		F	08753-60027	1	SAMPLER-A (A5) to PULSE GENERATOR (A7)
W7		F	08753-60027	1	SAMPLER-B (A6) to PULSE GENERATOR (A7)
W8		F	08753-60029	1	PHASE LOCK (A11J1) to SAMPLER-R (A4)
W9		F	8120-5021	1	FRAC-N DIGITAL (A14J1) to PULSE GENERATOR (A7)
W10		F	08753-60029	1	FRAC-N DIGITAL (A14J2) to REFERENCE (A12J1)
W11		F	08753-60029	1	FRAC-N DIGITAL (A14J3) to FRAC-N ANALOG (A13J1)
W12		F	08753-60029	1	FRAC-N ANALOG (A13J2) to REFERENCE (A12J2)
W13		F	08753-60026	1	REFERENCE (A12J3) to RP (EXT REF)
W20		34R	8120-6890	1	MOTHERBOARD (A17J11) to CPU (A9J5)
W21		14R	8120-6876	1	MOTHERBOARD (A17J12) to REAR PANEL VGA OUT
W24		SR	08753-20291	1	SOURCE ASSY (A3) to FP (R CHANNEL OUT)
W26		F	8120-5026	1	SOURCE ASSY (A3) to REFERENCE (A12J4)

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
F = Flexible Coax Cable
SR = Semi-Rigid Coax Cable

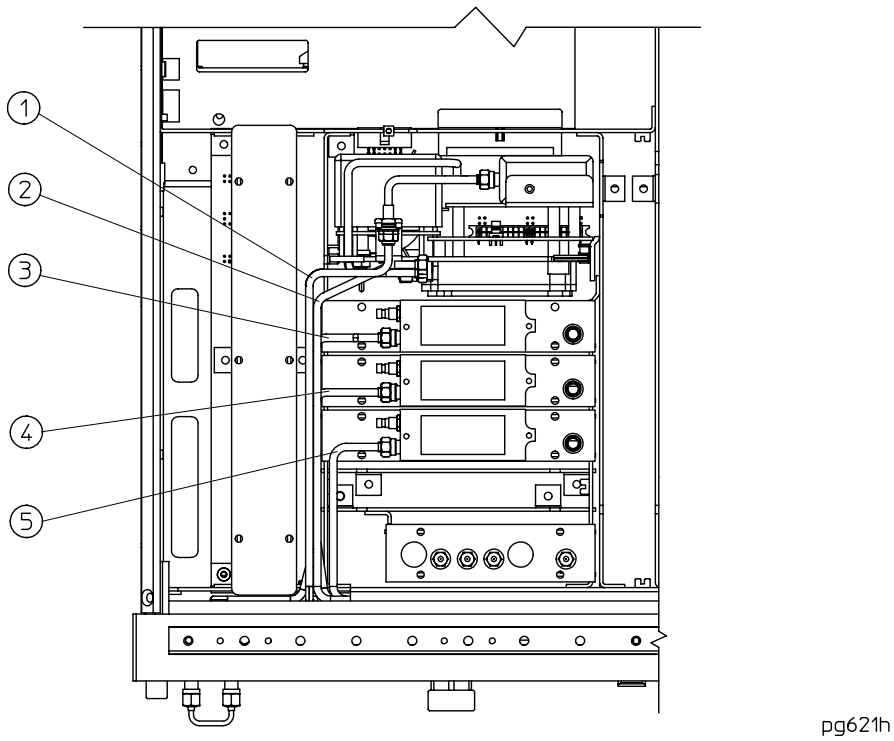
Figure 13-8 8753ES: Cables, Top



8753ES Option 014: Cables, Top

Item	Option	HP/Agilent Part Number	Qty	Description
1	014	08753-20951	1	CABLE, SOURCE to RF OUT
2		08753-20291	1	CABLE, R CHANNEL OUT to A3 SOURCE
3	014	08753-20954	1	CABLE, B SAMPLER IN to B SAMPLER
4	014	08753-20179	1	CABLE, A SAMPLER IN to A SAMPLER
5		08753-20290	1	CABLE, R CHANNEL IN to R SAMPLER

Figure 13-9 8753ES Option 014: Cables, Top



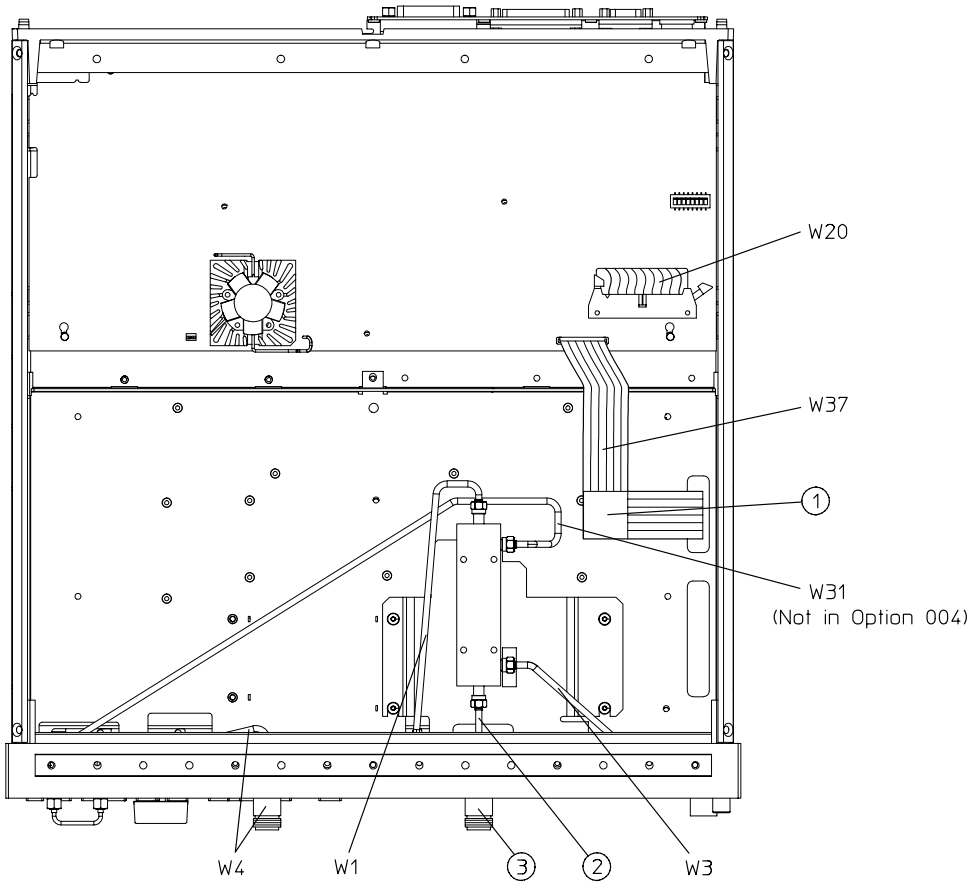
This page intentionally left blank.

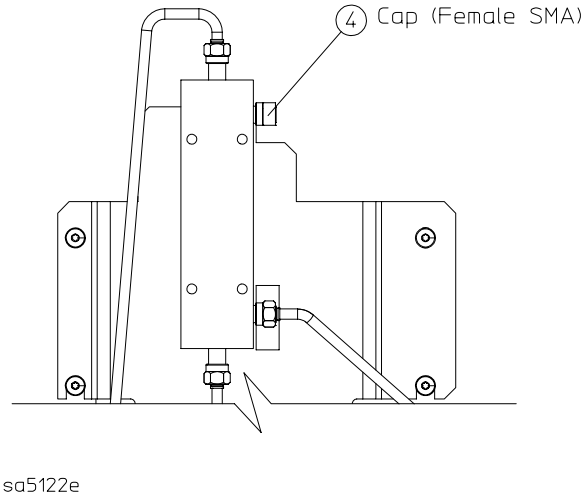
8753ET: Cables, Bottom

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
1			1400-0611	1	CABLE CLAMP
2		SR	08753-20907	1	CABLE, A21 TO PORT 1 CONNECTOR (PART OF A21)
3		SR	86290-60005	1	PORT 1 CONNECTOR, TYPE-N TO SMA
4	004		1250-0590	1	CAP (FEMALE SMA)
W1		SR	08753-20363	1	SOURCE ASSY (A3W7) to DUAL-DIRECTIONAL COUPLER (A21)
W3		SR	08753-20361	1	DUAL-DIRECTIONAL COUPLER (A21) to SAMPLER-A (A5)
W4		SR	08753-20364	1	TRANSMISSION PORT to SAMPLER-B (A6) (INCLUDES PORT 2 CONNECTOR)
W20		34R	8120-6890	1	CPU (A9J7) to MOTHERBOARD (A17J11)
W31	Std., 006	SR	08753-20365	1	DUAL-DIRECTIONAL COUPLER (A21) TO FP (R CHANNEL OUT)
W37		26R	8120-8670	1	DISK DRIVE (A20) TO CPU (A9J8)

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
SR = Semi-Rigid Coax Cable

Figure 13-10 8753ET: Cables, Bottom



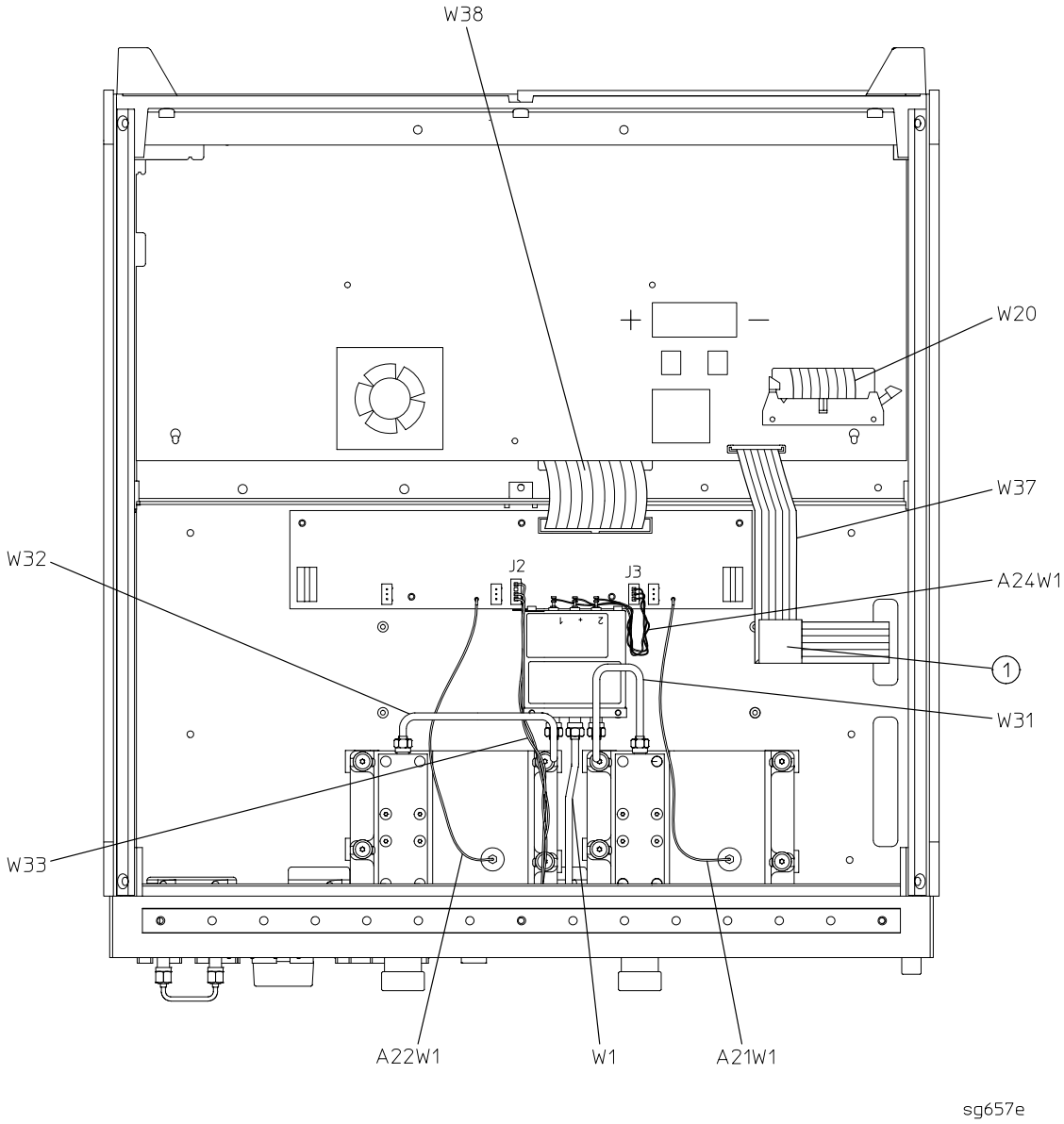


8753ES: Cables, Bottom

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
1			1400-0611	1	CABLE CLAMP
A21W1		1W	8120-6483	1	GRAY WIRE-TEST PORT 1 COUPLER (A21) to TEST SET INTERFACE (A25TP1)
A22W1		1W	8120-6483	1	GRAY WIRE-TEST PORT 2 COUPLER (A22) to TEST SET INTERFACE (A25TP2)
A24W1		3W	85047-60004	1	TRANSFER SWITCH (A24) to TEST SET INTERFACE (A25J3)
W1		SR	08753-20952	1	SOURCE ASSY (A3W4) to TRANSFER SWITCH (A24)
W20		34R	8120-6890	1	CPU (A9J7) to MOTHERBOARD (A17J11)
W31		SR	08753-20288	1	TEST PORT 1 COUPLER (A21) to TRANSFER SWITCH (A24)
W32		SR	08753-20289	1	TEST PORT 2 COUPLER (A22) to TRANSFER SWITCH (A24)
W33		4W	08753-60221	1	LED (A23J1) to TEST SET INTERFACE (A25J2)
W37		26R	8120-8670	1	DISK DRIVE (A20) to CPU (A9J8)
W38		40R	8120-6882	1	TEST SET INTERFACE (A25J1) to MOTHERBOARD (A17J2)

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
SR = Semi-Rigid Coax Cable

Figure 13-11 8753ES: Cables, Bottom

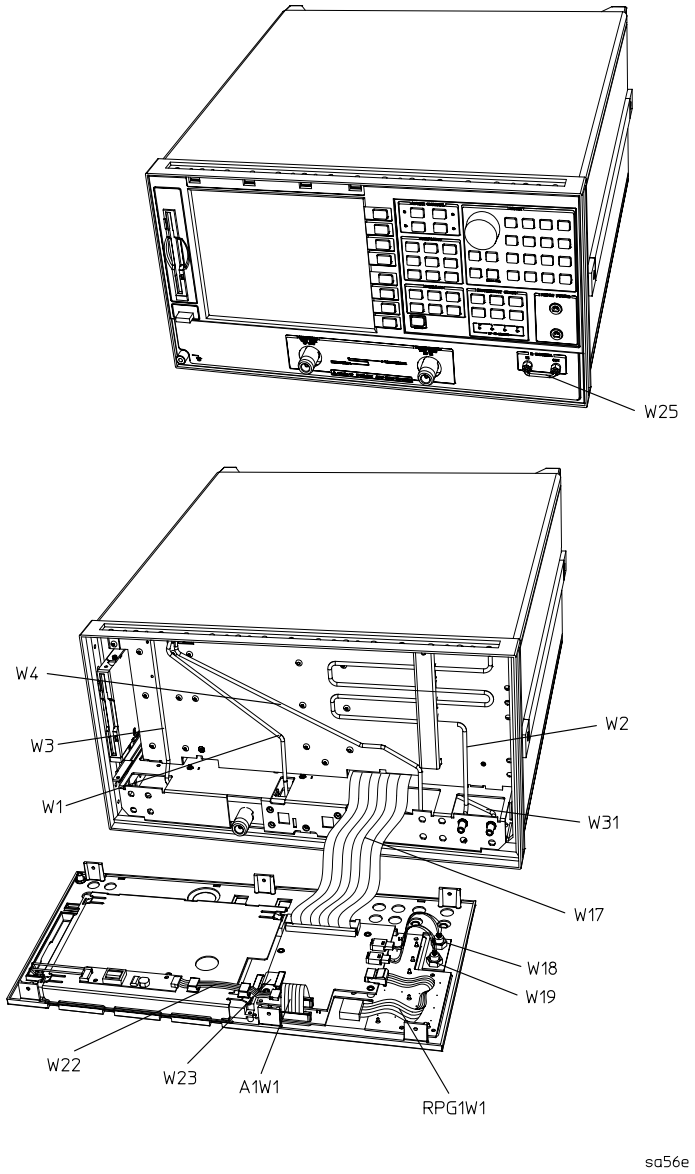


8753ET: Cables, Front

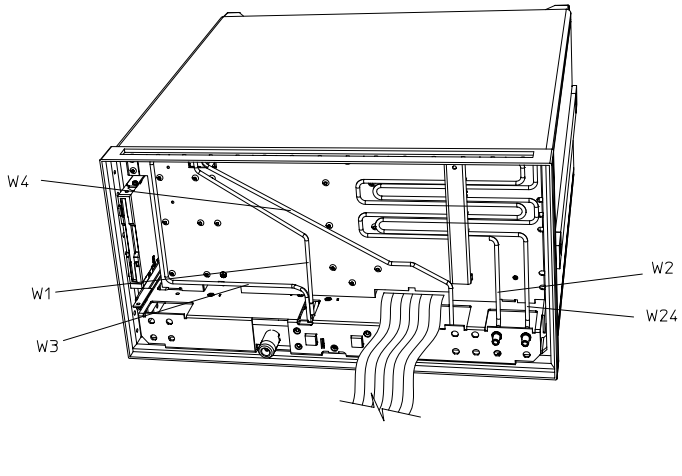
Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
A1W1		30R	8120-8439	1	FP KEYBOARD (A1J1) to FP INTERFACE (A2J2)
RPG1W1		5R	(part of RPG1)	1	RPG to FP INTERFACE (A2J5)
W1		SR	08753-20363	1	SOURCE ASSY (A3W7) to DUAL DIRECTIONAL COUPLER (A21)
W2		SR	08753-20290	1	FP (R CHANNEL IN) to SAMPLER-R (A4)
W3		SR	08753-20361	1	DUAL DIRECTIONAL COUPLER (A21) to SAMPLER-A (A5)
W4		SR	08753-20364	1	TRANSMISSION PORT to SAMPLER-B (A6)
W17		50R	8120-8431	1	FP INTERFACE (A2J1) to MOTHERBOARD (A17J1)
W18		3W	08753-60364	1	FP INTERFACE (A2J4) to FP (PROBE POWER)
W19		3W	08753-60364	1	FP INTERFACE (A2J3) to FP (PROBE POWER)
W22		5R	8120-8842	1	FP INTERFACE (A2J7) to INVERTER (A27)
W23		31R	8120-8409	1	FP INTERFACE (A2J6) to DISPLAY (A18)
W24	004	SR	08753-20291	1	SOURCE ASSY (A3) TO FP (R CHANNEL OUT)
W25		SR	08720-20075	1	FP (R CHANNEL OUT) to FP (R CHANNEL IN)
W31		SR	08753-20365		DUAL COUPLER (A21) to R CHANNEL OUT

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
SR = Semi-Rigid Coax Cable

Figure 13-12 8753ET: Cables, Front



8753ET Option 004

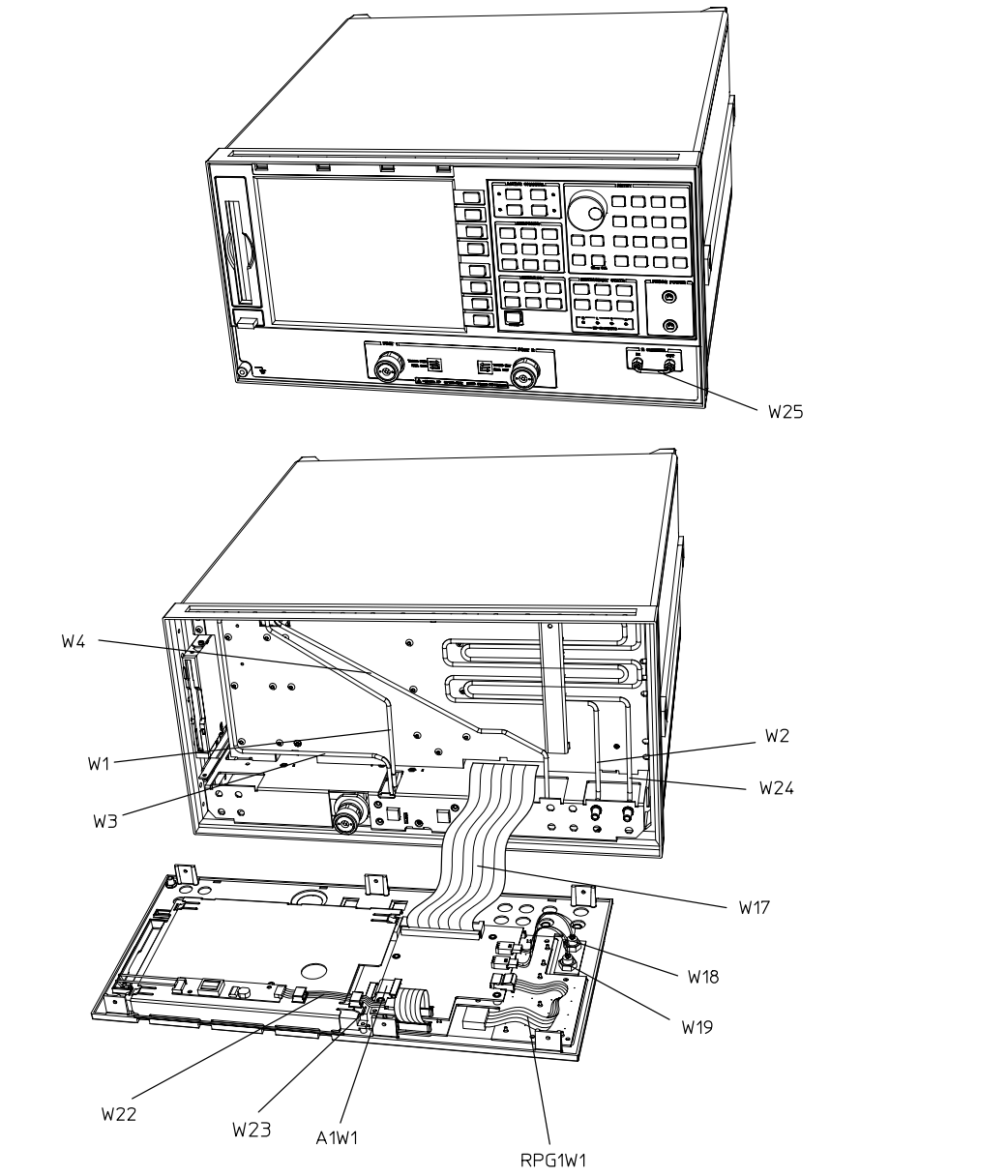


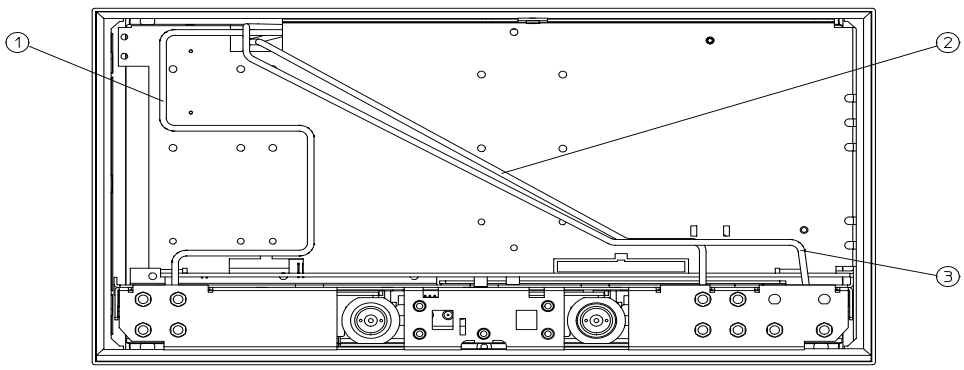
8753ES: Cables, Front

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
A1W1		30R	8120-8439	1	FP KEYBOARD (A1J1) to FP INTERFACE (A2J2)
RPG1W1		5R	(part of RPG1)	1	RPG to FP INTERFACE (A2J5)
W1		SR	08753-20952	1	SOURCE ASSY (A3W4) to TRANSFER SWITCH (A24)
W2		SR	08753-20290	1	FP (R CHANNEL IN) to SAMPLER-R (A4)
W3		SR	08753-20286	1	TEST PORT 1 COUPLER (A21) to SAMPLER-A (A5)
W4		SR	08753-20953	1	TEST PORT 2 COUPLER (A22) to SAMPLER-B (A6)
W17		50R	8120-8431	1	FP INTERFACE (A2J1) to MOTHERBOARD (A17J1)
W18		3W	08753-60364	1	FP INTERFACE (A2J4) to FP (PROBE POWER)
W19		3W	08753-60364	1	FP INTERFACE (A2J3) to FP (PROBE POWER)
W22		5R	8120-8842	1	FP INTERFACE (A2J7) to INVERTER (A27)
W23		31R	8120-8409	1	FP INTERFACE (A2J6) to DISPLAY (A18)
W24		SR	08753-20291	1	SOURCE ASSY (A3) to FP (R CHANNEL OUT)
W25		SR	08720-20075	1	FP (R CHANNEL OUT) to FP (R CHANNEL IN)
1	014	SR	08753-20179	1	CABLE, A SAMPLER IN to A SAMPLER
2	014	SR	08753-20954	1	CABLE, B SAMPLER IN to B SAMPLER
3	014	SR	08753-20951	1	CABLE, SOURCE to RF OUT

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
SR = Semi-Rigid Coax Cable

Figure 13-13 8753ES: Cables, Front



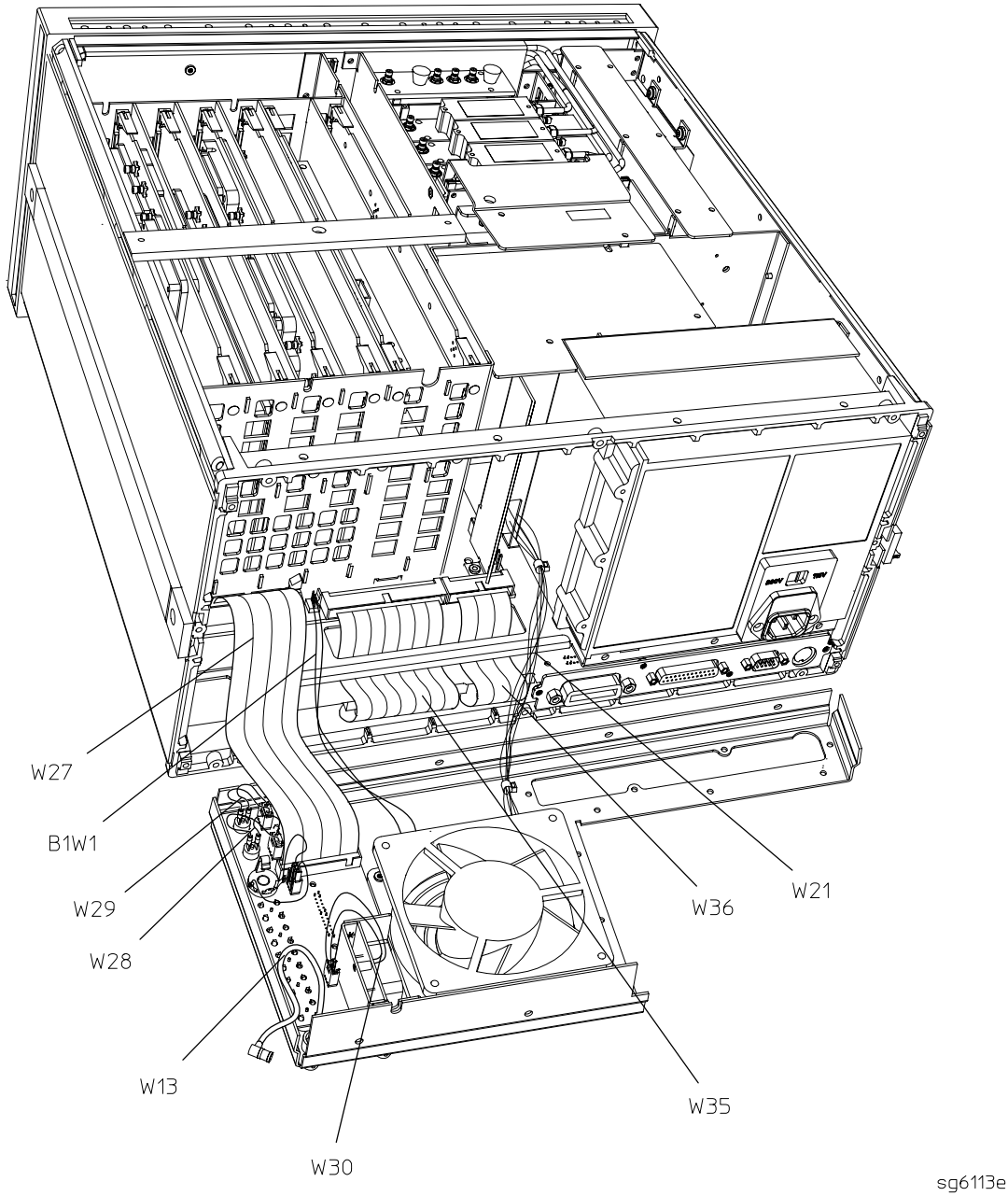


8753ET/ES: Cables, Rear

Ref. Desig.	ET/ES	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
B1W1	ET/ES		2W	(part of B1)	1	FAN (B1) to MOTHERBOARD (A17J5)
W13	ET/ES		F	08753-60026	1	REFERENCE (A12J3) to RP (EXT REF)
W21	ET/ES		14R	8120-6876	1	MOTHERBOARD (A17J12) to RP (VGA OUT)
W27	ET/ES		34R	8120-6407	1	RP INTERFACE (A16J4) to MOTHERBOARD (A17J6)
W28	ES		2W	85047-60005	1	RP INTERFACE (A16J10) to RP (PORT 1 FUSE)
W29	ES		2W	85047-60005	1	RP INTERFACE (A16J11) to RP (PORT 2 FUSE)
W30	ET/ES	1D5	3W	8120-6458	1	RP INTERFACE (A16J3) to HIGH-STABILITY FREQ REF (A26J1)
W35	ET/ES		50R	8120-6379	1	CPU (A9J1) to MOTHERBOARD (A17J7)
W36	ET/ES		26R	8120-6382	1	CPU (A9J2) to MOTHERBOARD (A17J8)

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
F = Flexible Coax Cable

Figure 13-14 8753ET/ES: Cables, Rear



8753ET/ES: Cables and Miscellaneous Parts, Source

Ref. Desig.	ET/ES	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
A3A2W1	ET/ES		10R	08753-60034	1	EYO (A3A3) to ALC (A3A2J3)
A3A4W1	ET/ES		4W	08753-60035	1	CAVITY OSC (A3A4) to ALC (A3A2J2)
A3A5	ET	004	NA	33321Q		70 dB STEP ATTENUATOR
	ES					
A3AT1	ET		NA	0955-0208		4 dB FIXED ATTENUATOR
A3MP1	ET		NA	1250-0590	1	CAP (FEMALE SMA)
A3W1	ET/ES		SR	08753-20107	1	EYO (A3A3) to SOURCE ASSY (A3)
A3W2	ET/ES		SR	08753-20032	1	CAVITY OSC (A3A4) to SOURCE ASSY (A3)
A3W3	ET	004	SR	08753-20106	1	SOURCE ASSY (A3) to ATTENUATOR (A3A5)
A3W3	ES		SR	08753-20106	1	SOURCE ASSY (A3) to ATTENUATOR (A3A5)
A3W4	ET	004	SR	08753-20111	1	ATTENUATOR (A3A5) to W1
A3W4	ES		SR	08753-20111	1	ATTENUATOR (A3A5) to W1
A3W5	ES		10R	5062-0701	1	ALC (A3A2J1) to ATTENUATOR (A3A5)
A3W5	ET	004	10R	5062-0701	1	ALC (A3A2J1) to ATTENUATOR (A3A5)
A3W7	ET		SR	08752-20024		4 dB ATTENUATOR (A3AT1) to BULKHEAD (A3 OUTPUT)

a. *n*W = Wire Bundle (*n* is the number of wires in the bundle)
*n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
SR = Semi-Rigid Coax Cable

Figure 13-15 8753ES and 8753ET Option 004: Cables and Misc. Parts, Source

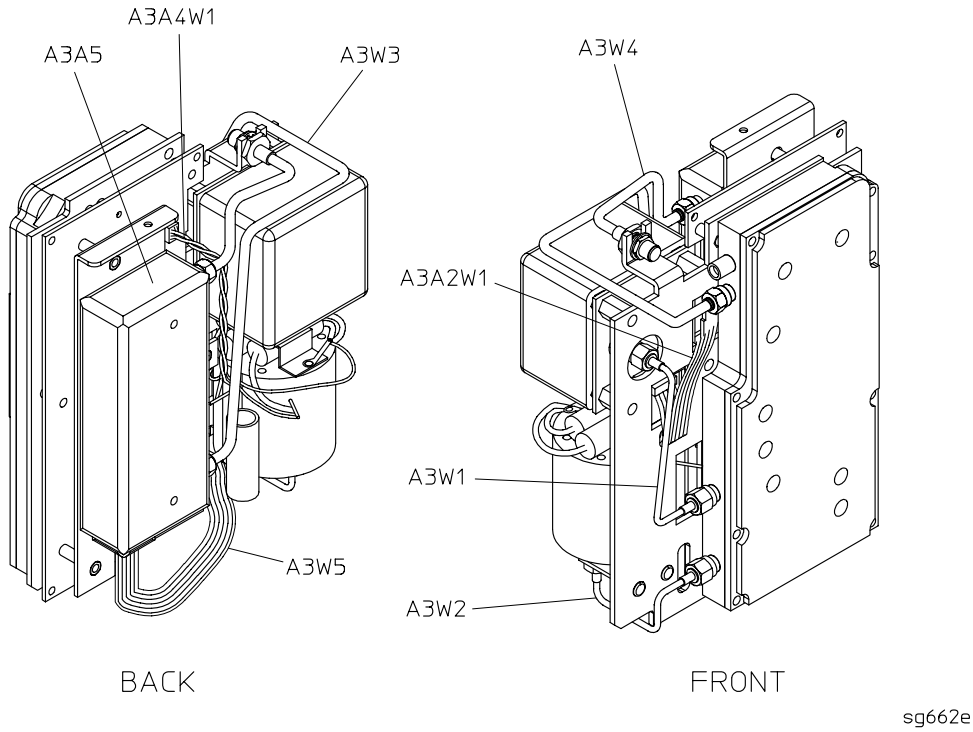
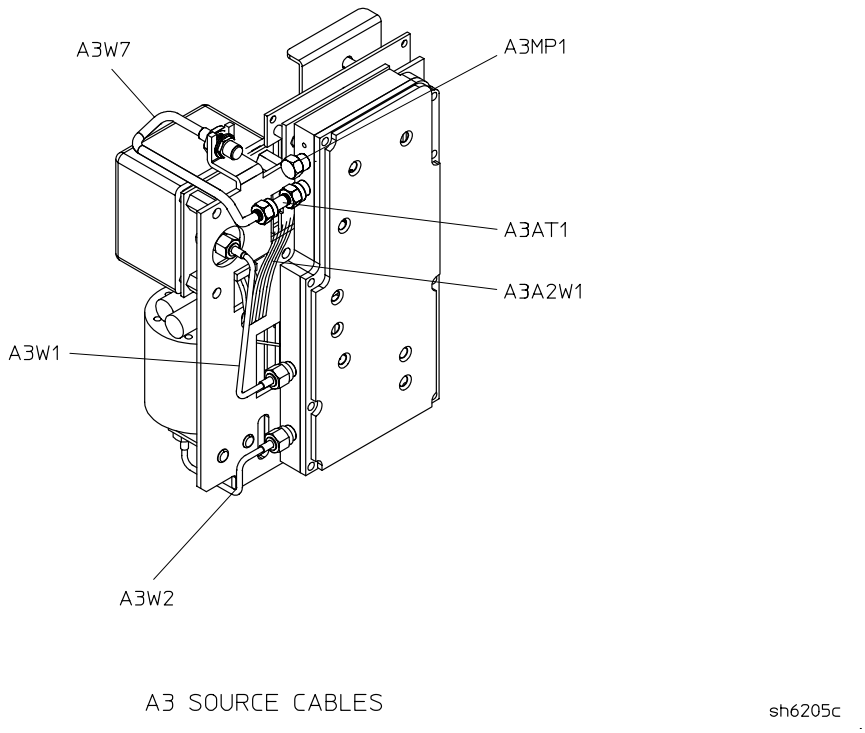


Figure 13-16 8753ET: Cables and Miscellaneous Parts, Source

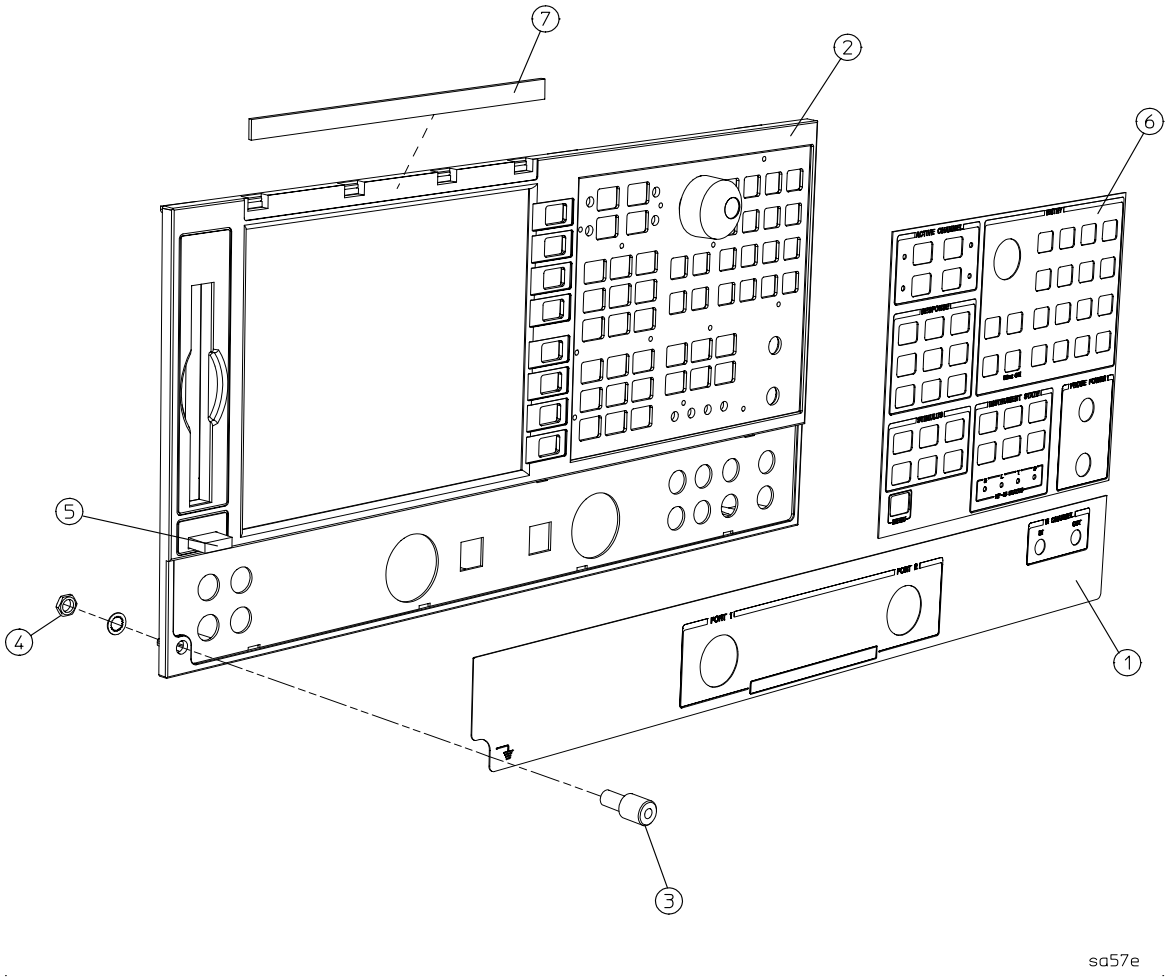


8753ET/ES: Front Panel Assembly, Outside

Ref. Desig.	ET/ES	Option	HP/Agilent Part Number	Qty	Description
1	ES		08753-80168	1	OVERLAY, LOWER FRONT PANEL
1	ES	075	08753-80170	1	OVERLAY, LOWER FRONT PANEL
1	ES	014	08753-80198	1	OVERLAY, LOWER FRONT PANEL
1	ET		08753-80218	1	OVERLAY, LOWER FRONT PANEL
2	ES		08753-60938	1	FP REPAIR KIT[a]
2	ES	075	08753-60940	1	FP REPAIR KIT[a]
2	ES	014	08753-60942	1	FP REPAIR KIT[a]
2	ET		08753-60941	1	FP REPAIR KIT[a]
3	ET/ES		1510-0038	1	GROUND POST
4	ET/ES		2950-0006	1	NUT HEX 1/4-32
4	ET/ES		2190-0067	1	WASHER LK .256 ID
5	ET/ES		08753-40015	1	LINE BUTTON
6	ET/ES		08753-80216	1	OVERLAY, UPPER FRONT PANEL
7	ES		08753-80208	1	NAMEPLATE, 8753ES, 30 kHz – 3 GHz
		006	08753-80205		NAMEPLATE, 8753ES, 30 kHz – 6 GHz
	ET		08753-80207		NAMEPLATE, 8753ET, 300 kHz – 3 GHz
		006	08753-80204		NAMEPLATE, 8753ET, 300 kHz – 6 GHz

a. Comes with casting, gasket, upper and lower overlays.

Figure 13-17 8753ET/ES: Front Panel Assembly, Outside

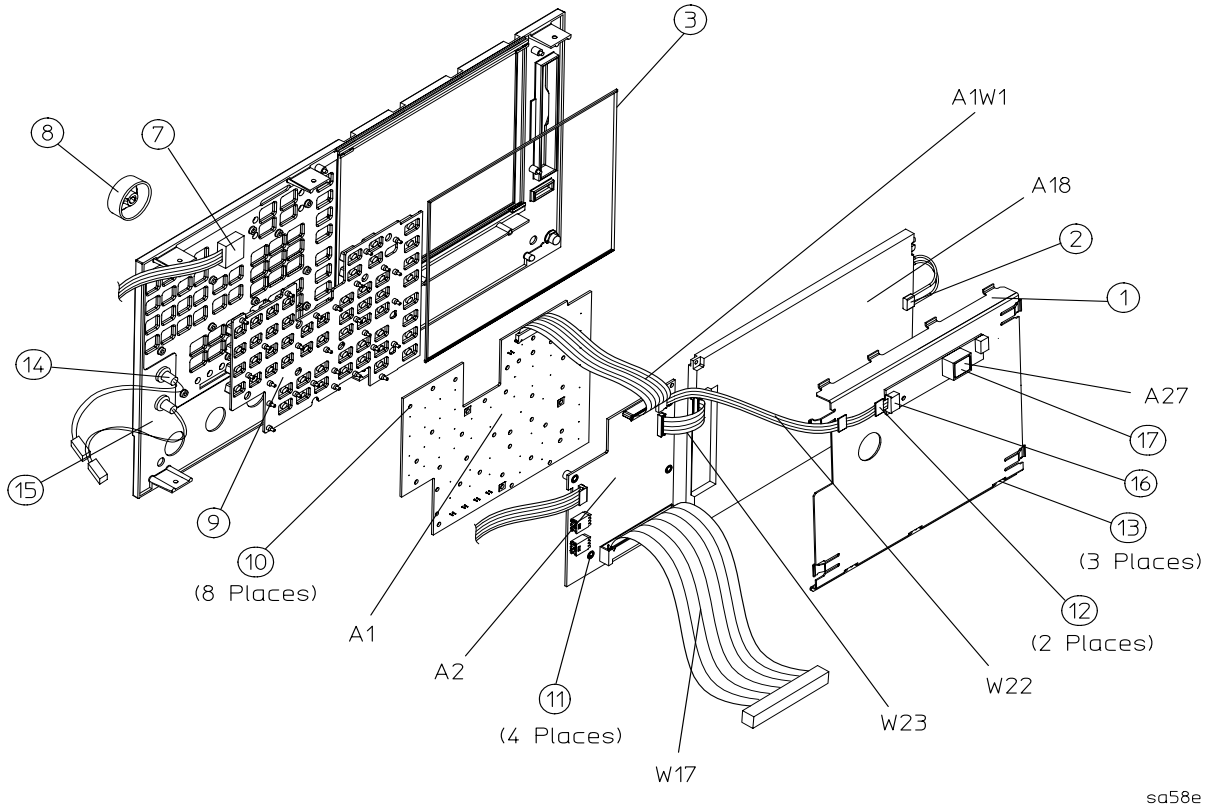


8753ET/ES: Front Panel Assembly, Inside

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
1			08753-00150	1	DISPLAY HOLD DOWN
2			2090-0386	1	DISPLAY LAMP
3			1000-0995	1	DISPLAY GLASS
7			1990-1864	1	RPG (INCLUDES CABLE AND HARDWARE)
8			E4400-40003	1	RPG KNOB
9			08720-40016	1	FLUBBER KEYPAD
10			0515-0430	8	SCREW SM 3.0 6CWPNTX
11			0515-0665	4	SCREW SMM 3.0 14CWPNTX
12			1400-1439	2	CABLE CLIP
13			0515-0372	3	SCREW SMM 3.0 8CWPNTX
14			08753-60364	2	CABLE ASSY, PROBE POWER
14			2950-0144	2	NUT, HEX 3/8-32
15			08753-00112	1	PLATE, PROBE POWER
16			0515-0430	2	SCREW SMM 3.0 6CWPNTX
17			08753-20948	1	COVER, INVERTER
A1			08720-60267	1	BD ASSY-FRONT PANEL
A2			08753-60358	1	BD ASSY-FRONT PANEL INTERFACE
A18			08753-60937	1	LCD REPLACEMENT ASSY
A27			0950-3379	1	ASSY-INVERTER
A1W1		26R	8120-8439	1	A1 TO A2
W17		50R	8120-8431	1	A2 TO A17
W22		5R	8120-8842	1	CABLE-FP INTF (A2J7) to INVERTER (A27)
W23		31R	8120-8409	1	CABLE-FP INTF (A2J6) to DISPLAY (A18)

a. *n*R = Ribbon Cable (*n* is the number of wires in the ribbon)

Figure 13-18 8753ET/ES: Front Panel Assembly, Inside

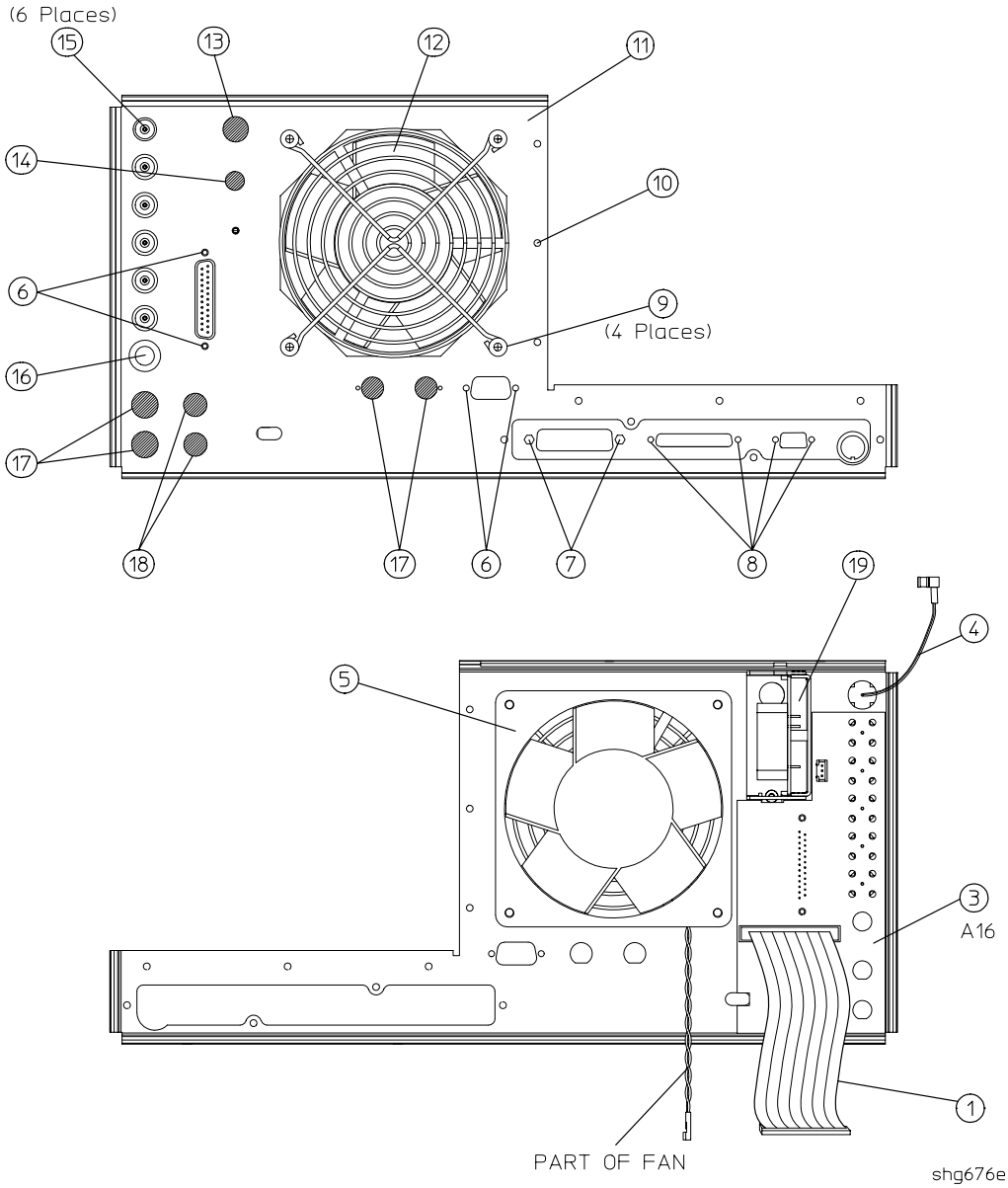


8753ET: Rear Panel Assembly

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
1		34R	8120-6407	1	RP INTERFACE (A16J4) TO MB (A17J6) (W27)
3 (A16)			08720-60138	1	BD ASSY-REAR PANEL INTERFACE (A16)
4			08753-60026	1	ASSY-EXTERNAL REFERENCE CABLE (W13)
5			08415-60036	1	ASSY-FAN
6			1251-2942	4	FASTENER CONN RP LOCK
7			2190-0034	2	WASHER LK .194ID10
7			0380-0644	2	NUT STDF .327L 6-32
8			1251-7812	4	FASTENER CONN RP LOCK
9			0515-0379	4	SCREW SMM3.5X16 CWPNTX
9			3050-1192	4	FLAT WASHER
10			0515-0372	10	SCREW SMM3.0X8 CWPNTX
11			08720-00071	1	REAR PANEL SHEET METAL
12			3160-0281	1	FAN GUARD
13			6960-0419	1	HOLE PLUG
14			6960-0086	1	HOLE PLUG
15			2190-0102	8	WASHER LK .472ID
15			2950-0035	8	NUT HEX 15/32-32
16			0400-0271	1	GROMMET SN.5-515ID
17			6960-0027	4	HOLE PLUG
18			6960-0149	2	HOLE PLUG
19	1D5				HIGH STABILITY FREQUENCY REFERENCE[b]

a. *n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
b. See "8753ET/ES: Rear Panel Assembly, Option 1D5" on page 13-44.

Figure 13-19 8753ET: Rear Panel Assembly

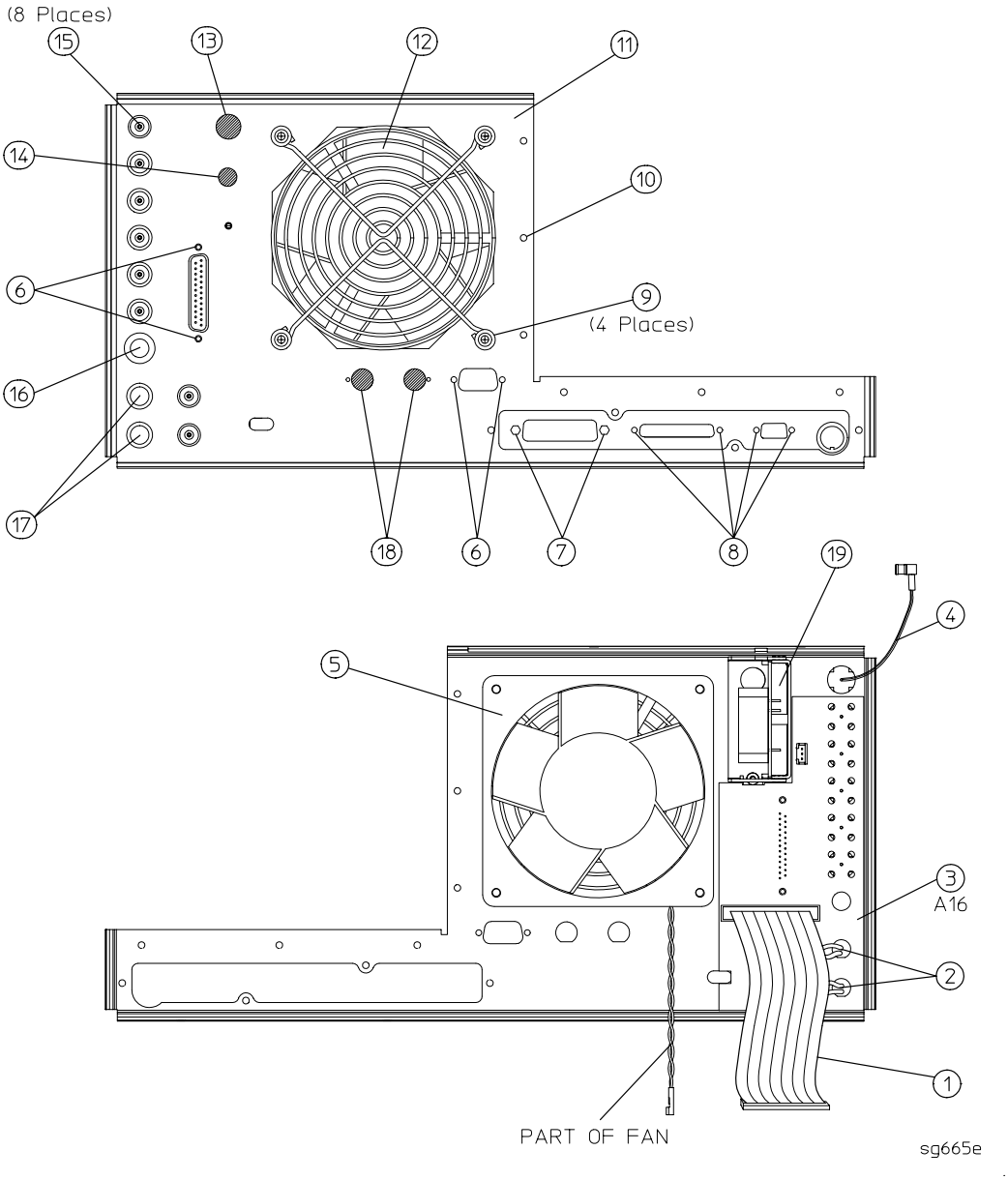


8753ES: Rear Panel Assembly

Ref. Desig.	Opt	Type[a]	HP/Agilent Part Number	Qty	Description
1		34R	8120-6407	1	RP INTERFACE (A16J4) TO MB (A17J6) (W27)
2			85047-60005	2	FUSE HARNESS ASSEMBLY
3 (A16)			08720-60138	1	BD ASSY-REAR PANEL INTERFACE (A16)
4			08753-60026	1	ASSY-EXTERNAL REFERENCE CABLE (W13)
5			08415-60036	1	ASSY-FAN
6			1251-2942	4	FASTENER CONN RP LOCK
7			2190-0034	2	WASHER LK .194ID10
7			0380-0644	2	NUT STDF .327L 6-32
8			1251-7812	4	FASTENER CONN RP LOCK
9			0515-0379	4	SCREW SMM3.5X16 CWPNTX
9			3050-1192	4	FLAT WASHER
10			0515-0372	10	SCREW SMM3.0X8 CWPNTX
11			08720-00071	1	REAR PANEL SHEET METAL
12			3160-0281	1	FAN GUARD
13			6960-0419	1	HOLE PLUG
14			6960-0086	1	HOLE PLUG
15			2190-0102	8	WASHER LK .472ID
15			2950-0035	8	NUT HEX 15/32-32
16			0400-0271	1	GROMMET SN.5-515ID
17			2110-0047	2	FUSE
17			1400-0112	2	FUSE CAP
18			6960-0027	2	HOLE PLUG
19	1D5				HIGH STABILITY FREQUENCY REFERENCE[b]

a. *n*R = Ribbon Cable (*n* is the number of wires in the ribbon)
b. See "8753ET/ES: Rear Panel Assembly, Option 1D5" on page 13-44.

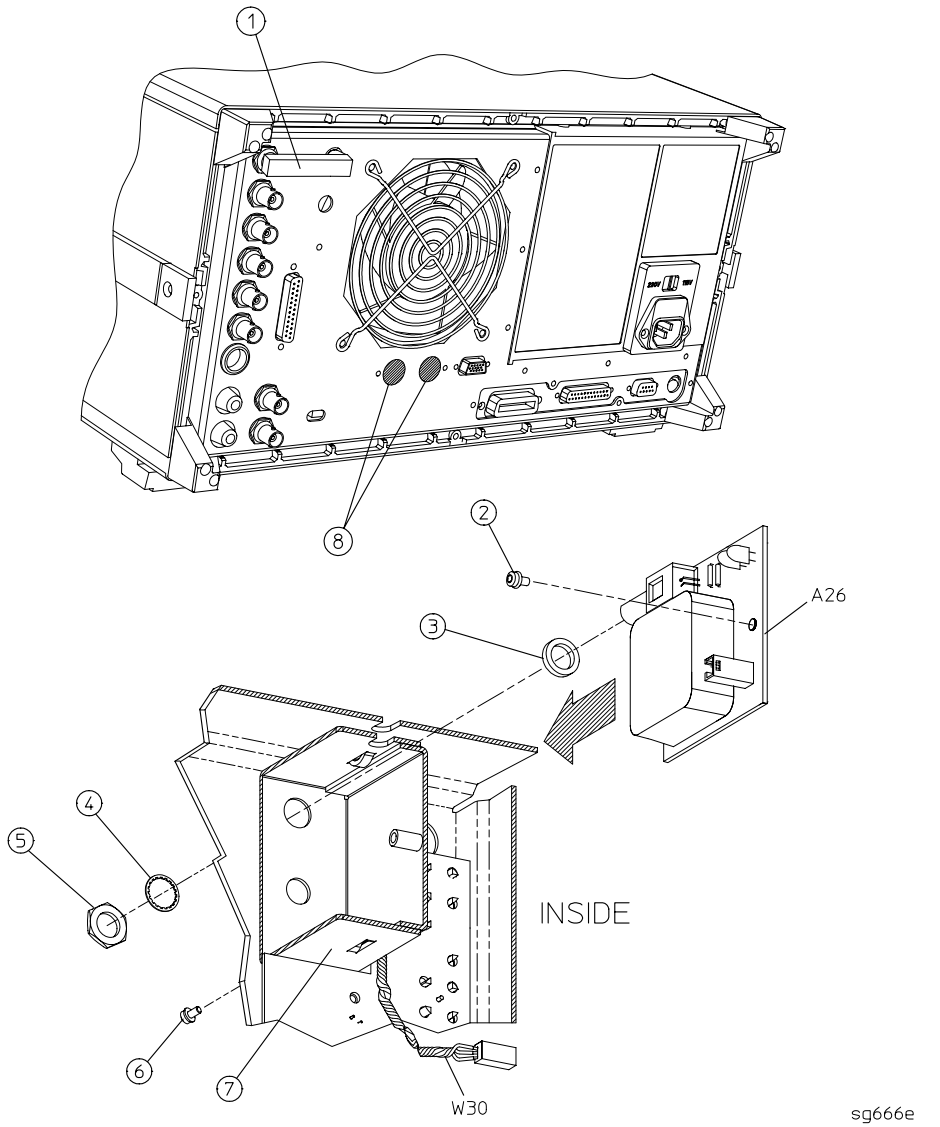
Figure 13-20 8753ES: Rear Panel Assembly



8753ET/ES: Rear Panel Assembly, Option 1D5

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
1	1D5	1250-1859	1	ADAPTER-COAX
2	1D5	0515-0374	1	SCREW-MACHINE M3.0×10 CW-PN-TX
3	1D5	3050-1546	1	WASHER-FLAT .505ID NY
4	1D5	2190-0068	1	WASHER-LOCK .505ID
5	1D5	0590-1310	1	NUT-SPECIALTY 1/2-28
6	1D5	0515-0430	1	SCREW-MACHINE M3.0×6 CW-PN-TX
7	1D5	08753-00078	1	BRACKET-OSC BD
8		6960-0027	2	HOLE PLUGS
A26	1D5	08753-60158	1	BD ASSY-HIGH STABILITY FREQ REF
W30	1D5	8120-6458	1	RP INTERFACE (A16J3) to HIGH-STABILITY FREQ REF (A26J1)

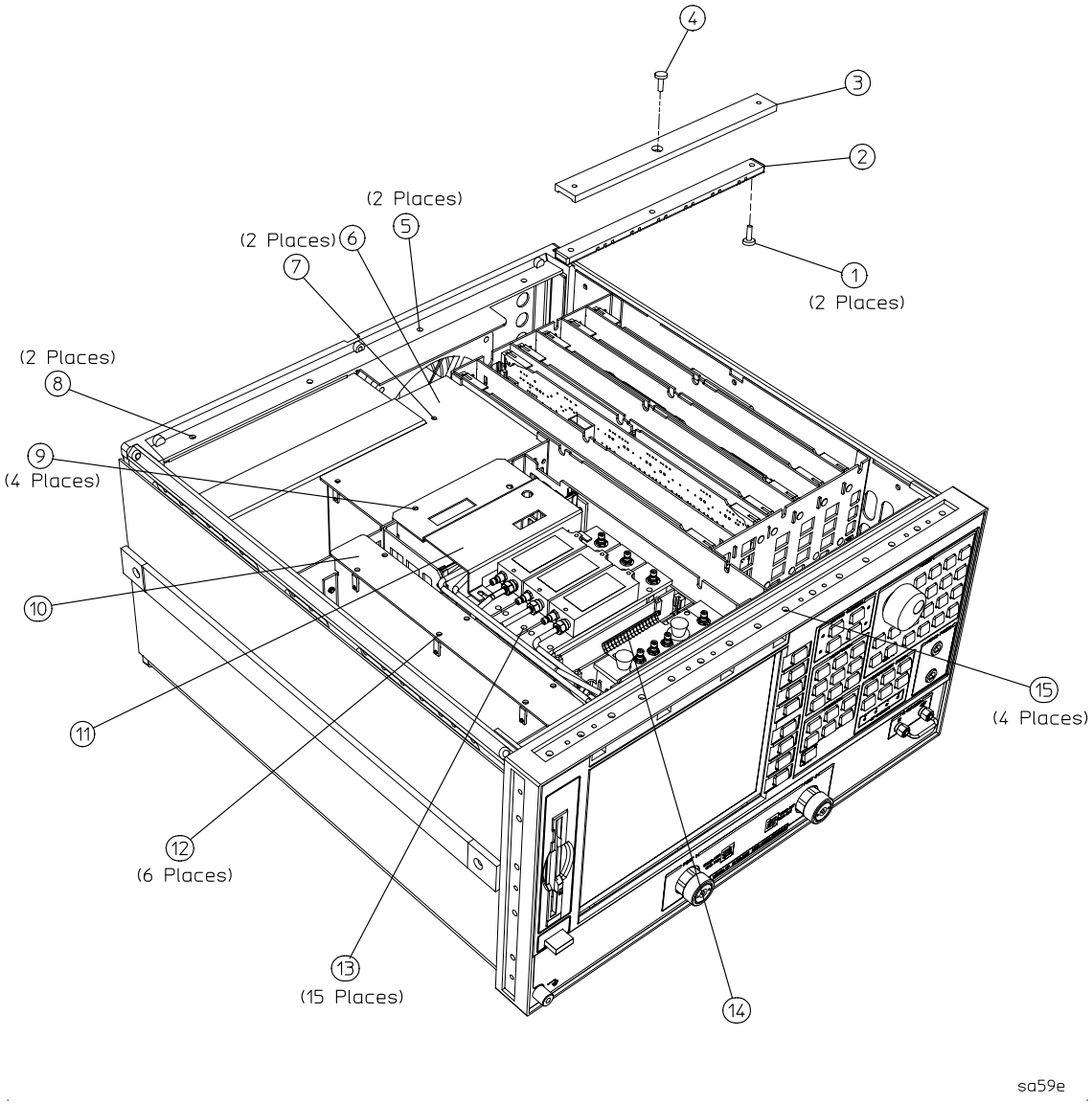
Figure 13-21 8753ET/ES: Rear Panel Assembly, Option 1D5



8753ET/ES: Hardware, Top

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
1		0515-2799	2	SCREW-MACHINE M3.0×10 CW-FL-TX
2		08753-40014	1	STABILIZER-PC BOARD
3		08753-20062	1	STABILIZER CAP
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		08753-00107	1	AIR FLOW COVER
7		0515-0374	2	SCREW-MACHINE M3.0 X 10 CW-PN-TX
8		0515-0377	2	SCREW-MACHINE M3.5×10 CW-PN-TX
9		0515-0374	2	SCREW-MACHINE M3.0×12 CW-PN-TX
10		08753-00129	1	GSP COVER
11		08753-00145	1	BRACKET-SOURCE (SOURCE STRAP)
12		0515-0374	6	SCREW-MACHINE M3.0 X 10 CW-PN-TX
13		0515-0374	15	SCREW-MACHINE M3.0×10 CW-PN-TX
14		08753-00040	1	CLIP-PULSER GROUND
15		0515-1400	2	SCREW-MACHINE M3.5×8 PC-FL-TX

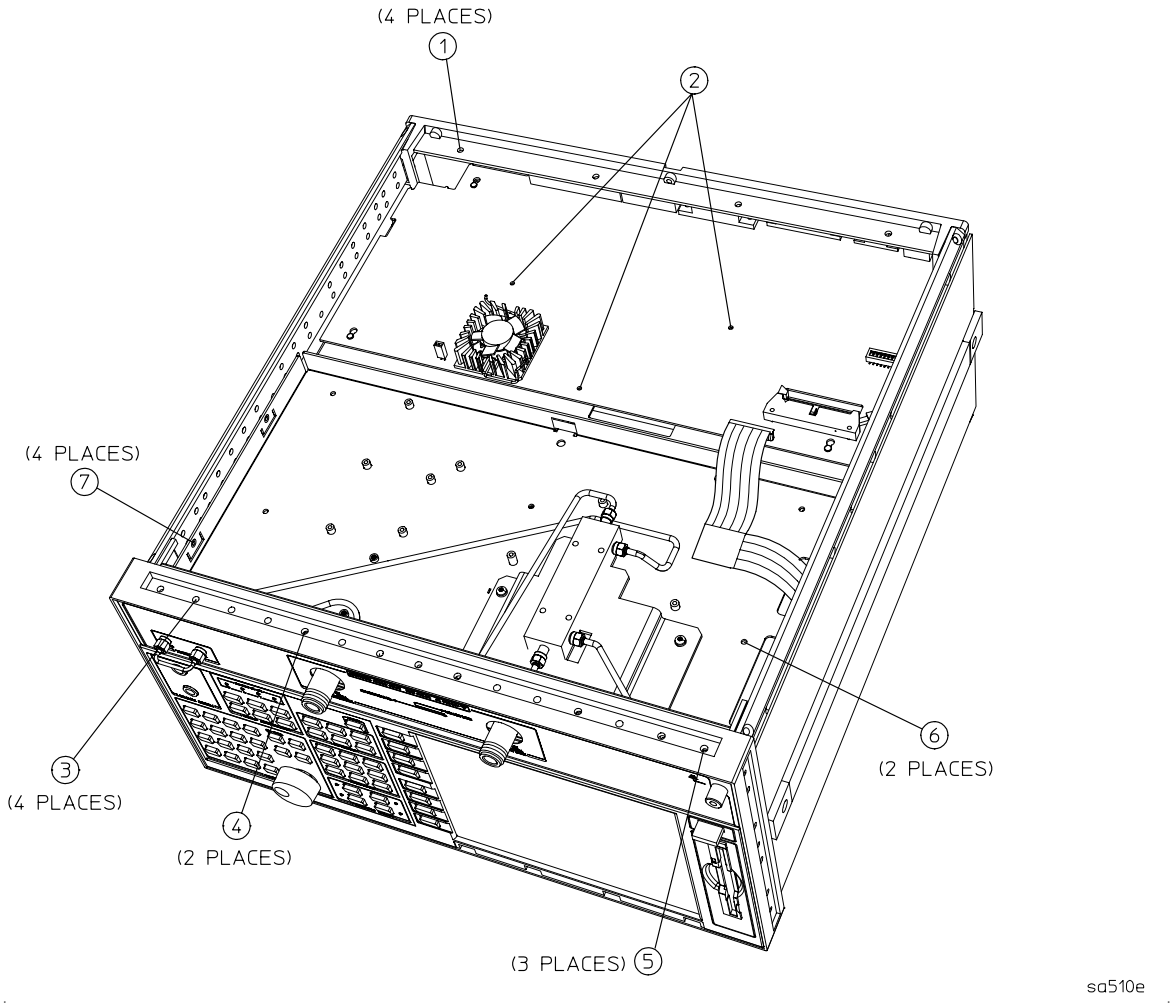
Figure 13-22 8753ET/ES: Hardware, Top



8753ET: Hardware, Bottom

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
1		0515-0458	4	SCREW-MACHINE M3.5×8 CW-PN-TX
2		0515-0430	3	SCREW-MACHINE M3.0×6 CW-PN-TX
3		0515-2086	4	SCREW-MACHINE M4.0×7 PC-FL-TX
4		0515-2038	2	SCREW-MACHINE M3.5×10 PC-FL-TX
5		0515-1400	3	SCREW-MACHINE M3.5×8 PC-FL-TX
6		0515-0375	2	SCREW-MACHINE M3.0×16 CW-PN-TX
7		0515-0458	4	SCREW-MACHINE M3.0×16 CW-PN-TX

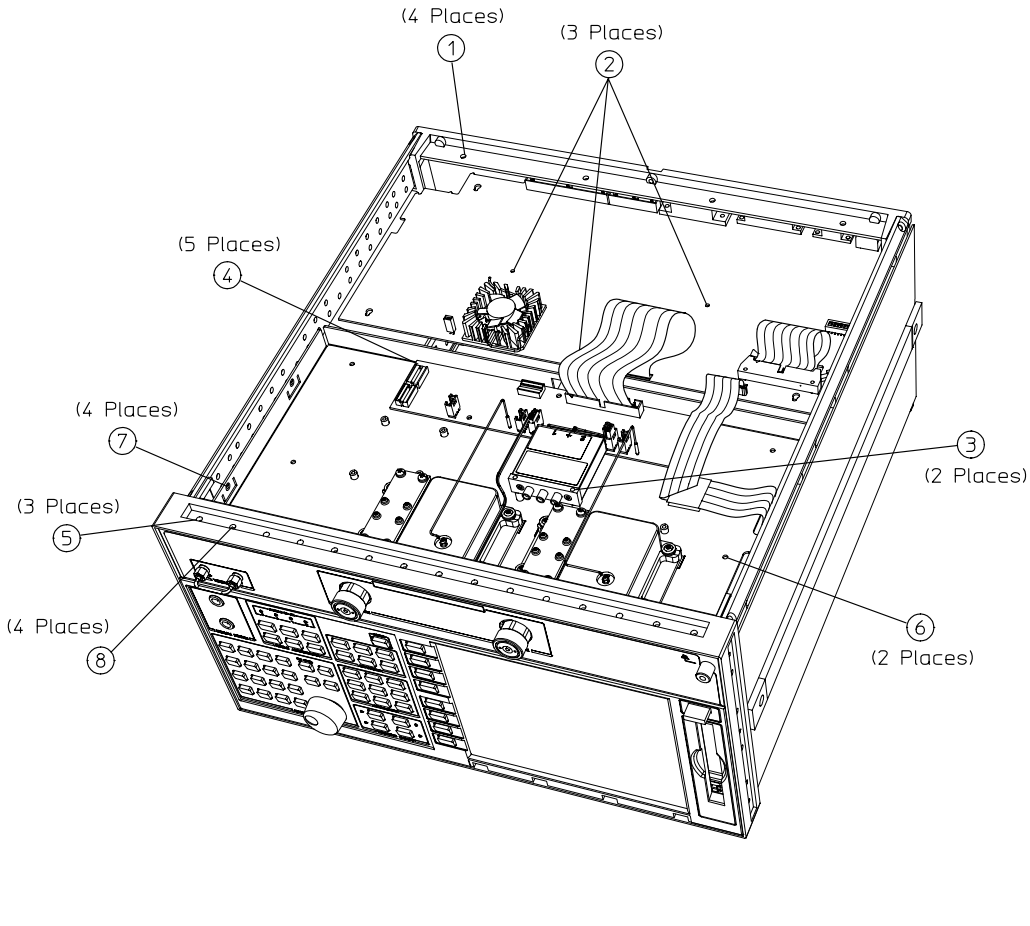
Figure 13-23 8753ET: Hardware, Bottom



8753ES: Hardware, Bottom

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
1		0515-0458	4	SCREW-MACHINE M3.5×8 CW-PN-TX
2		0515-0430	3	SCREW-MACHINE M3.0×6 CW-PN-TX
3		0515-0667	2	SCREW-MACHINE M3.0×25 CW-PN-TX
4		0515-0430	5	SCREW-MACHINE M3.0×6 CW-PN-TX
5		0515-1400	3	SCREW-MACHINE M3.5×8 PC-FL-TX
6		0515-0375	2	SCREW-MACHINE M3.0×16 CW-PN-TX
7		0515-0458	4	SCREW-MACHINE M3.0×16 CW-PN-TX
8		0515-2086	4	SCREW-MACHINE M4.0×7 PC-FL-TX

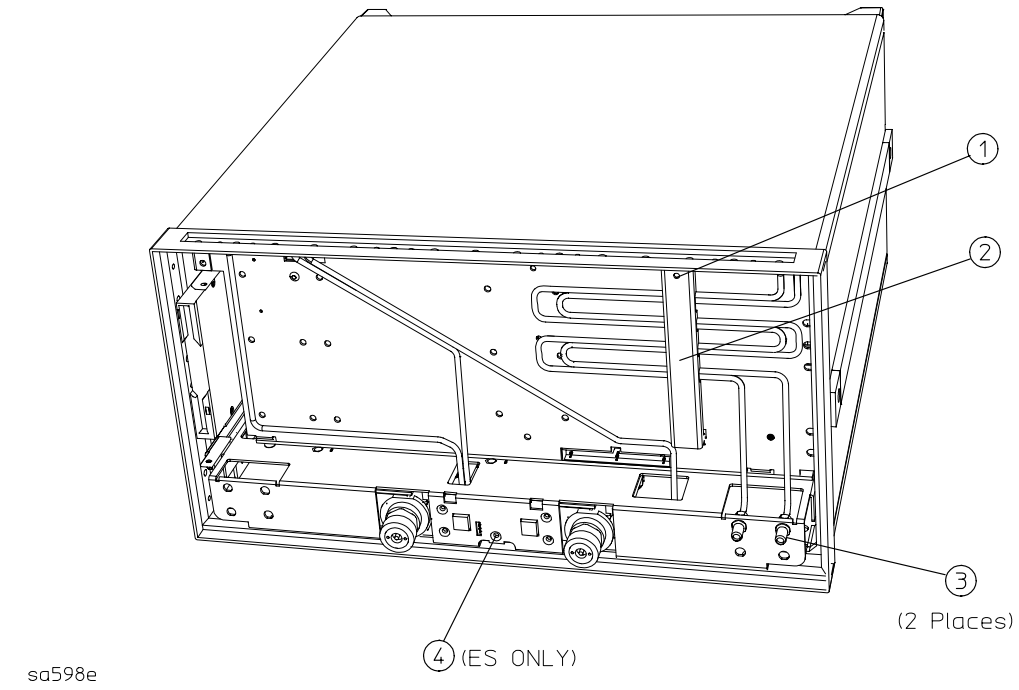
Figure 13-24 8753ES: Hardware, Bottom



8753ET/ES: Hardware, Front

Ref. Desig.	ET/ES	Option	HP/Agilent Part Number	Qty	Description
1	ET/ES		0515-0665	1	SMM 3.0×14 CWPNTX
2	ET/ES		08753-00137	1	BRACKET - CABLE SUPPORT
3	ET/ES		1250-1251	2	ADAPTER FEMALE SMA/FEMALE SMA
4	ES		0515-1946	1	SCREW-MACHINE M3.0×6 PC-FL-TX

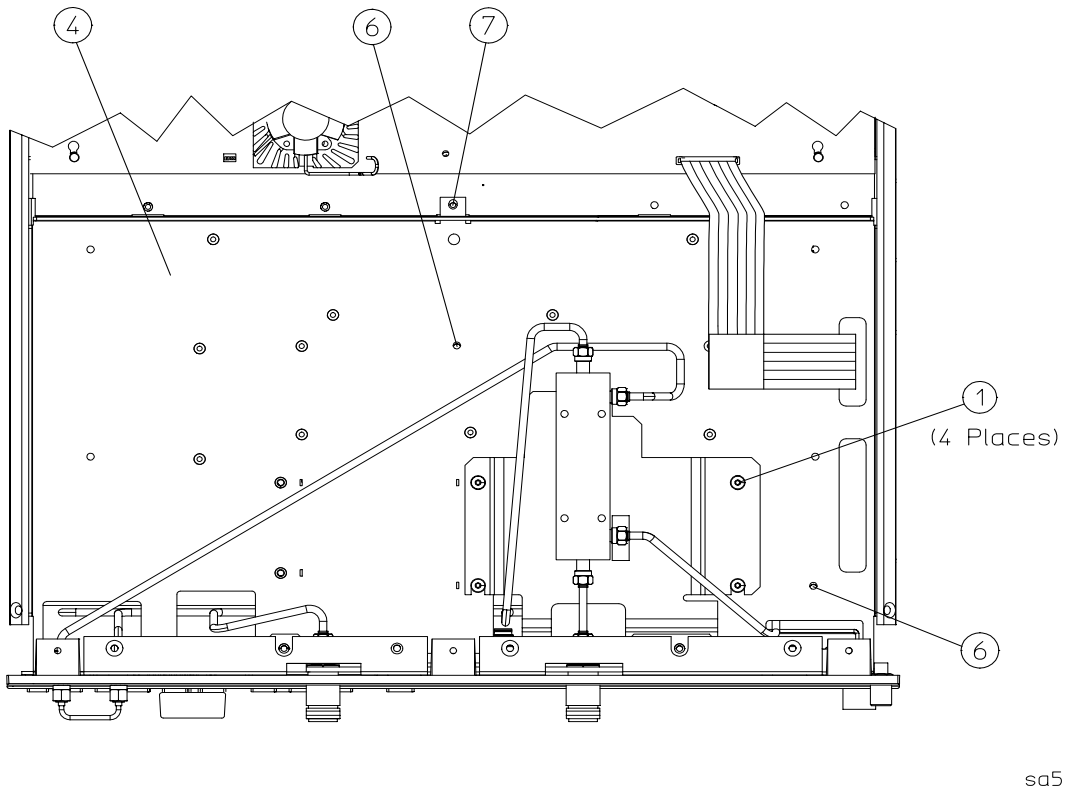
Figure 13-25 8753ET/ES: Hardware, Front



8753ET: Hardware, Test Set Deck

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
1		0515-0458	4	SCREW-MACHINE M 3.0 X 16 CW-PN-TK
4		08753-00127	1	CHASSIS-TEST SET
6		0515-0375	2	SCREW-MACHINE M3.0×16 CW-PN-TX
7		0515-0430	1	SCREW-MACHINE M3.0×6 CW-PN-TX

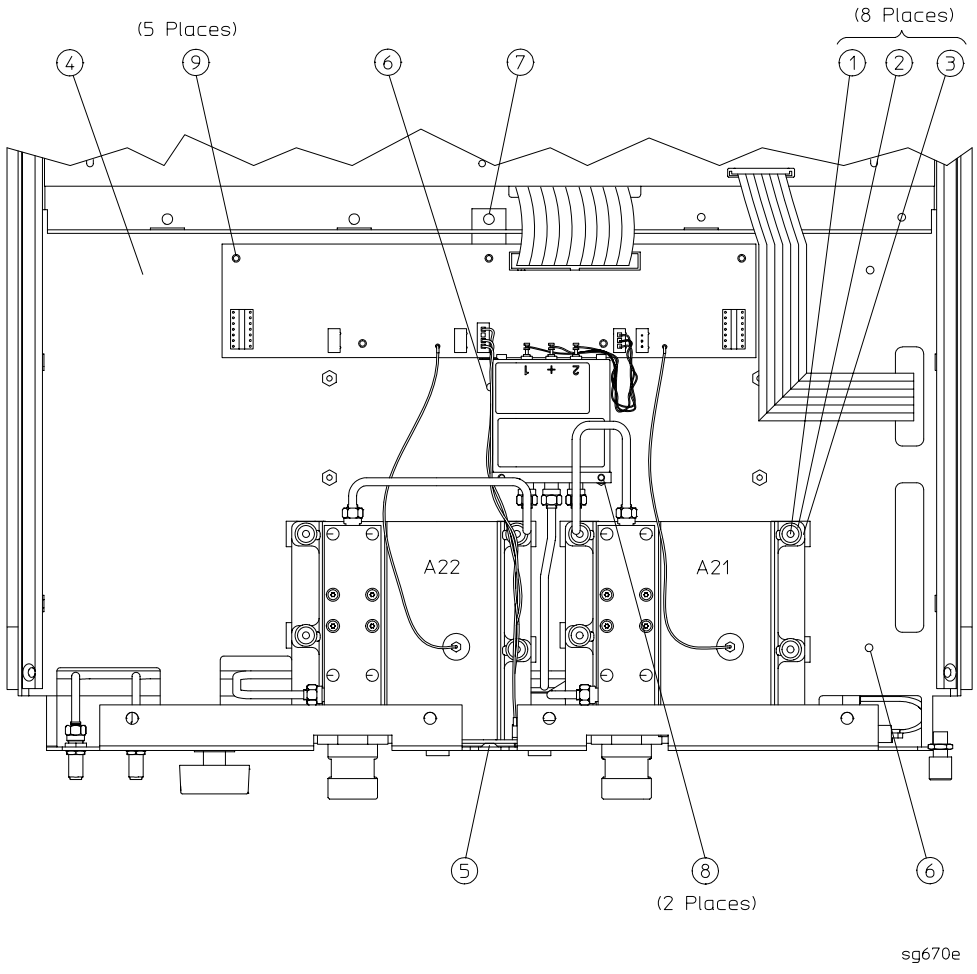
Figure 13-26 8753ET: Hardware, Test Set Deck



8753ES: Hardware, Test Set Deck

Ref. Desig.	Option	HP/Agilent Part Number	Qty	Description
1		08753-20296	8	SHOULDER SCREW
2		08753-40013	8	GUIDE WASHER
3		08753-20293	8	PRESSURE SPRING
4		08753-00127	1	CHASSIS-TEST SET
5		0515-1946	1	SCREW-MACHINE M3.0×6 PC-FL-TX
6		0515-0375	2	SCREW-MACHINE M3.0×16 CW-PN-TX
7		0515-0430	1	SCREW-MACHINE M3.0×6 CW-PN-TX
8		0515-0667	2	SCREW-MACHINE M3.0×25 CW-PN-TX
9		0515-0430	5	SCREW-MACHINE M3.0×6 CW-PN-TX

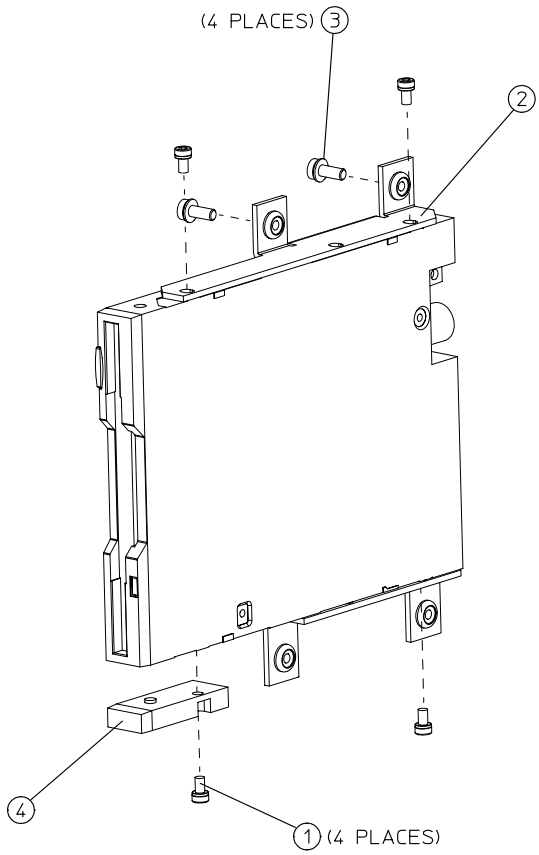
Figure 13-27 8753ES: Hardware, Test Set Deck



8753ET/ES: Hardware, Disk Drive Support

Ref. Desig.	ET/ES	Option	HP/Agilent Part Number	Qty	Description
1	ET/ES		0515-1048	4	SCREW-M 2.5X4 SOCKET HEAD, HEX.
2	ET/ES		08753-00152	1	DISK DRIVE BRACKET
3	ET/ES		0515-0374	4	SCREWS -MACHINE M 3.0X10 CWPNTX
4	ET/ES		08753-40016	1	PLUG, DISK DRIVE

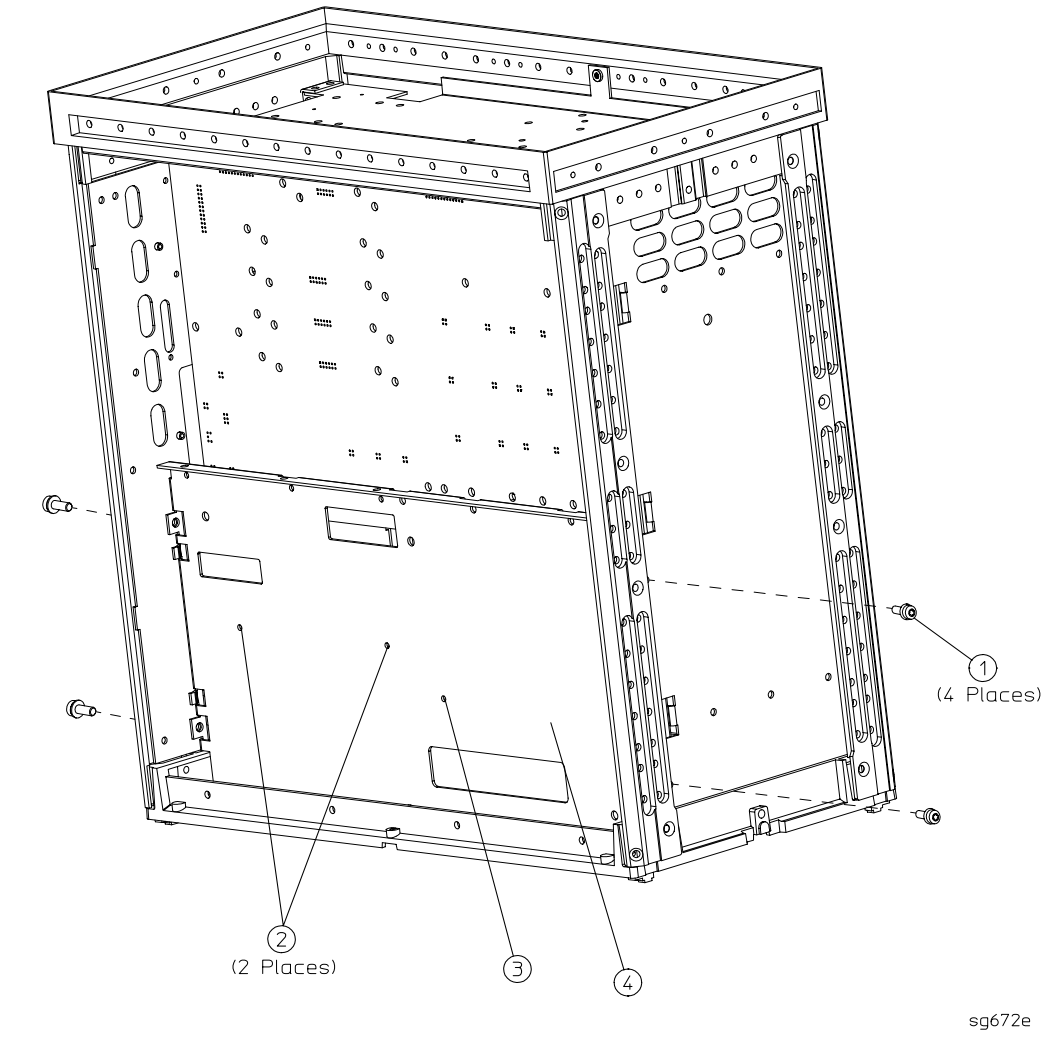
Figure 13-28 8753ET/ES: Hardware, Disk Drive Support



8753ET/ES: Hardware, Memory Deck

Ref. Desig.	ET/ES	Option	HP/Agilent Part Number	Qty	Description
1	ET/ES		0515-0458	4	SCREW-MACHINE M3.5×8 CW-PN-TX
2	ET/ES		0515-0430	2	SCREW-MACHINE M3.0×6 CW-PN-TX
3	ET/ES		0515-0375	1	SCREW-MACHINE M3.0×14 CW-PN-TX
4	ET/ES		08753-00128	1	DECK-MEMORY

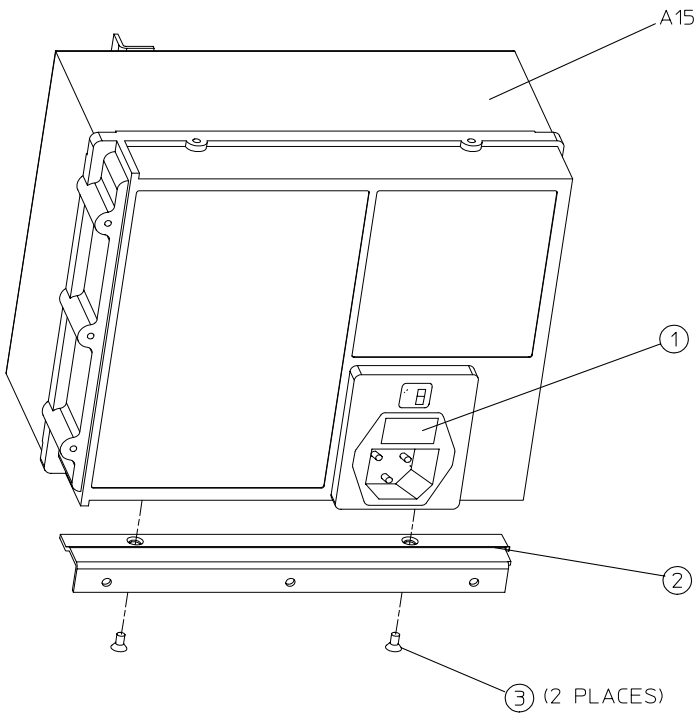
Figure 13-29 8753ET/ES: Hardware, Memory Deck



8753ET/ES: Hardware, Preregulator

Ref. Desig.	ET/ES	Option	HP/Agilent Part Number	Qty	Description
1	ET/ES		2110-1059	1	FUSE, T 5A 125V, UL LISTED/CSA CERTIFIED TO 248 STANDARD (for 115V operations)
1	ET/ES		2110-1036	1	FUSE, T 4A H 250V, BUILT TO IEC127-2/5 STANDARD (for 230V operations)
2	ET/ES		08753-00065	1	BRACKET-PREREGULATOR
3	ET/ES		0515-1400	2	SCREW-MACHINE M3.5×8 CW-FL-TX
A15	ET/ES		0950-3488	1	PREREGULATOR-ASSY

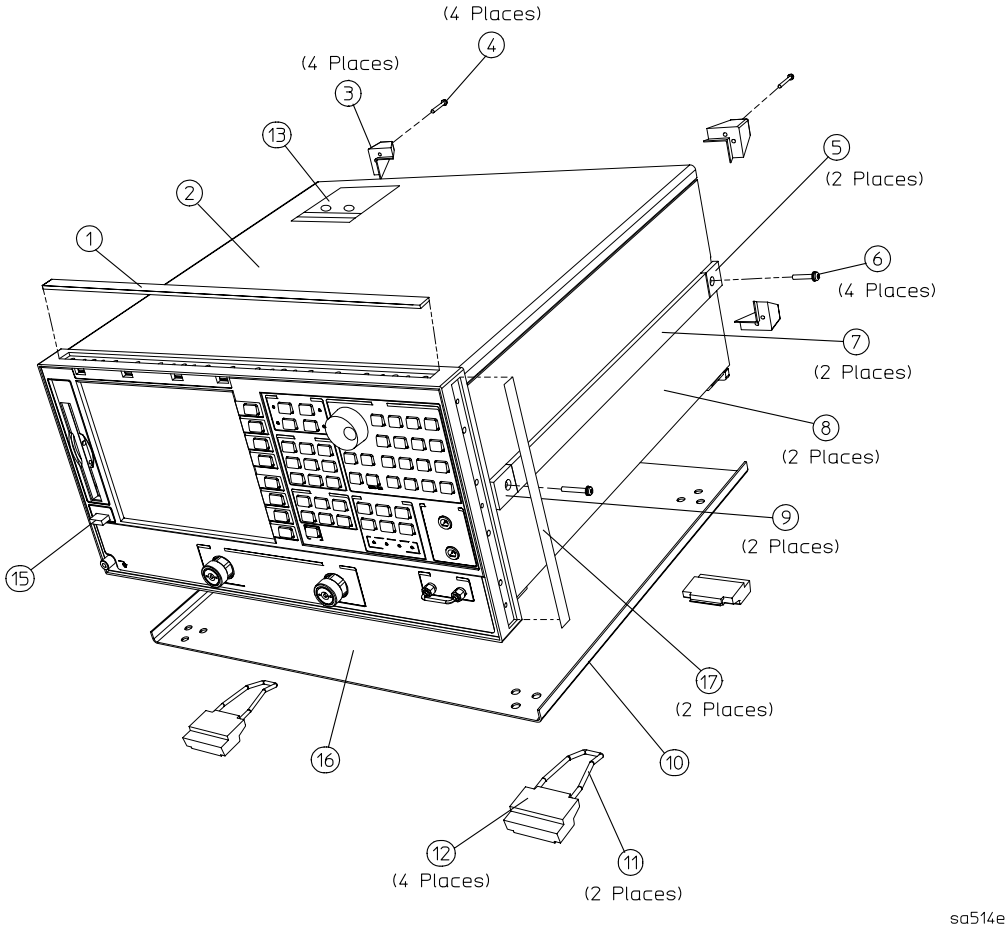
Figure 13-30 8753ET/ES: Hardware, Preregulator



8753ET/ES: Chassis Parts, Outside

Ref. Desig.	ET/ES	Option	HP/Agilent Part Number	Qty	Description
1	ET/ES		5041-9176	1	TRIM STRIP
2	ET/ES		08720-00078	1	COVER-TOP
3	ET/ES		5041-9188	4	REAR STANDOFF
4	ET/ES		0515-1402	4	SCREW SMM 3.5 8 PCPNTX
5	ET/ES		5041-9187	2	REAR CAP-SIDE STRAP
6	ET/ES		0515-1384	4	SCREW SMM 5.0 10 PCFLTX
7	ET/ES		08720-00081	2	SIDE STRAP
8	ET/ES		08720-00080	2	COVER-SIDE
9	ET/ES		5041-9186	2	FRONT CAP-SIDE STRAP
10	ET/ES		08720-00079	2	COVER-BOTTOM
11	ET/ES		1460-1345	2	FOOT ELEVATOR
12	ET/ES		5041-9167	4	FOOT
13	ET/ES		08753-80066	1	LABEL: CAUTION WARNING
15	ET/ES		08753-40015	1	LINE BUTTON
16	ET/ES		5180-8500	1	MYLAR INSULATOR
17	ET/ES		5041-9173	2	SIDE TRIM STRIP

Figure 13-31 8753ET/ES: Chassis Parts, Outside

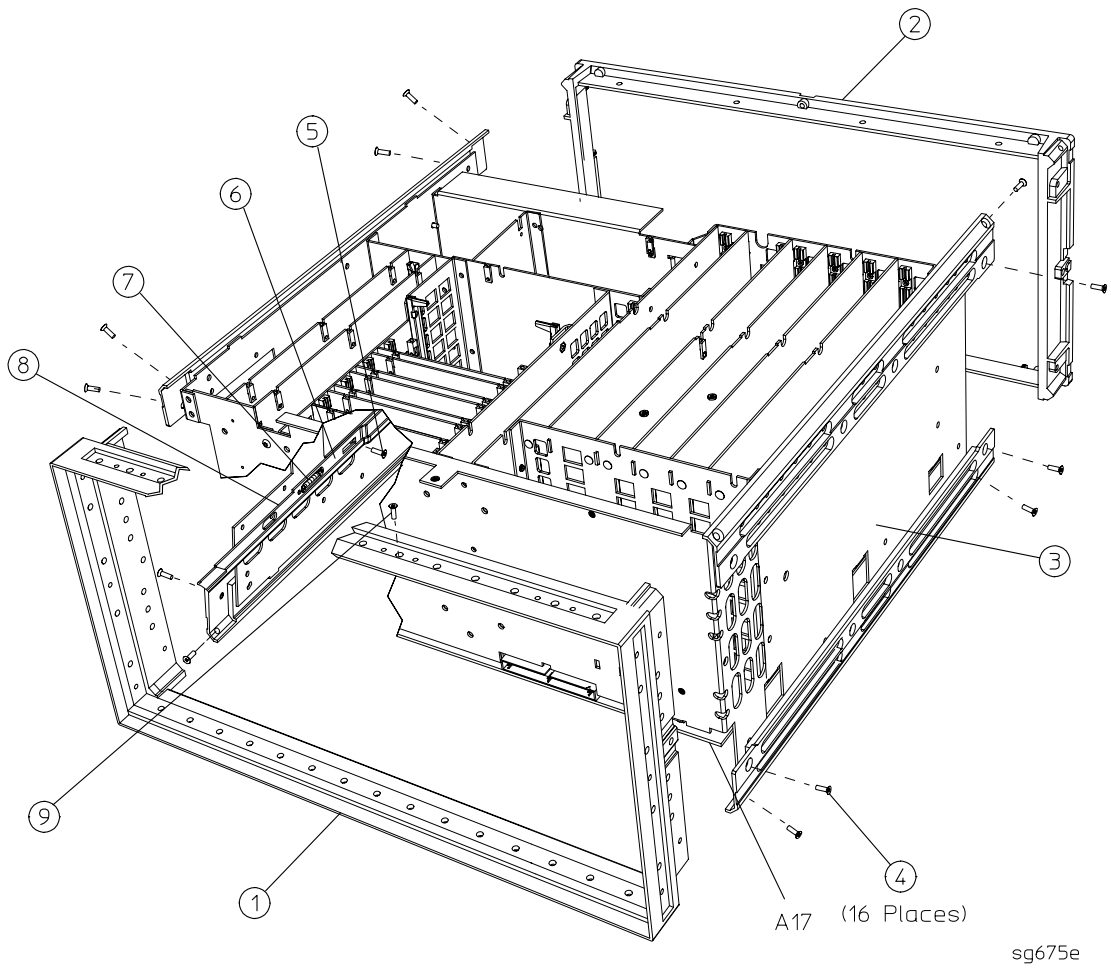


8753ET/ES: Chassis Parts, Inside

Ref. Desig.	ET/ES	Option	HP/Agilent Part Number	Qty	Description
1	ET/ES		5022-1190	1	FRONT PANEL FRAME
2	ET/ES		5021-5808	1	REAR FRAME
3	ET/ES		08753-60936	1	ASSY-CARDCAGE/MOTHER
4	ET/ES		0515-2086	16	SCREW SMM4.0×7 PCFLTX
5	ET/ES		0515-0430	1	SCREW M3.0×6 CWPNTX[a]
6	ET/ES		08720-00083	1	INSULATOR SWITCH[a]
7	ET/ES		1460-1573	1	SPRING EXTENSION 0.138 OD
8	ET/ES		08720-00077	1	SWITCH ROD[a]
9	ET/ES		0515-1400	1	SMM 3.5×8 PCFLTX
A17	ET/ES		08753-60360	1	BD ASSY-MOTHERBOARD

a. Part of CARDCAGE/MOTHER assembly (item 3).

Figure 13-32 8753ET/ES: Chassis Parts, Inside



Miscellaneous

Description	HP/Agilent Part Number
Service Tools	
8753 TOOL KIT *includes the following:*	08753-60023
RF CABLE-INPUT R	08753-20028
EXTENDER BOARD ASSEMBLY-RECEIVER	08753-60019
EXTENDER BOARD ASSEMBLY-SOURCE	08753-60020
EXTENDER BOARD ASSEMBLY-CARD CAGE	08753-60155
EXTENDER BOARD ASSEMBLY-GSP	08753-60309
ADAPTER-MALE SMB TO MALE SMB	1250-0669
ADAPTER-MALE TYPE N TO FEMALE SMA	1250-1250
CABLE ASSEMBLY	5061-1022
BAG-ANTISTATIC 13×15	9222-1132
Documentation	
Agilent Technologies 8753ET/ES and 8753ES Option 011 Manual Sets CD-ROM - includes 8753ET/ES Manual Set (08753-90470) and 8753ES Option 011 Manual Set (08753-90477)	08753-90469
Agilent Technologies 8753ET/ES MANUAL SET *includes the following:*	08753-90470
8753ET/ES INSTALLATION/QUICK START GUIDE	08753-90471
8753ET/ES USER'S GUIDE	08753-90472
8753ET/ES REFERENCE GUIDE	08753-90473
8753ET/ES PROGRAMMER'S GUIDE (includes example programs on CD-ROM)	08753-90475
Agilent Technologies 8753ES Option 011 Manual Set *includes the following:*	08753-90477
8753ES OPTION 011 INSTALLATION/QUICK START GUIDE	08753-90478
8753ES OPTION 011 USER'S GUIDE	08753-90479
8753ES OPTION 011 REFERENCE GUIDE	08753-90480
8753ES OPTION 011 PROGRAMMER'S GUIDE	08753-90475
Agilent Technologies 8753ET/ES and 8753ES Option 011 Service Documentation:	
8753ET/ES SERVICE GUIDE[a]	08753-90484
8753ES OPTION 011 SERVICE GUIDE[a]	08753-90485

a. Includes the service guide CD-ROM (part number 08753-90504).

Description	HP/Agilent Part or Model Number
Agilent 8753ET Upgrade Kits	
HARMONIC MEASUREMENT UPGRADE KIT	8753ETU OPT 002
STEP ATTENUATOR UPGRADE KIT	8753ETU OPT 004
6 GHz UPGRADE KIT	8753ETU OPT 006
TIME DOMAIN UPGRADE KIT	8753ETU OPT 010
FIRMWARE UPGRADE KIT	8753ETU OPT 099
HIGH-STABILITY FREQUENCY REFERENCE RETROFIT KIT	8753ETU OPT 1D5
Agilent 8753ES Upgrade Kits	
HARMONIC MEASUREMENT UPGRADE KIT	8753ESU OPT 002
6 GHz UPGRADE KIT	8753ESU OPT 006
6 GHz UPGRADE KIT (for 8753ES Option 011)	8753ESU OPT 611
TIME DOMAIN UPGRADE KIT	8753ESU OPT 010
FIRMWARE UPGRADE KIT	8753ESU OPT 099
HIGH-STABILITY FREQUENCY REFERENCE RETROFIT KIT	8753ESU OPT 1D5
Protective Caps for Connectors	
FEMALE GPIB CONNECTOR	1252-5007
FEMALE TEST SET I/O	1252-4690
FEMALE PARALLEL PORT	1252-4690
RS-232 CONNECTOR	1252-4697
7-mm TEST PORTS	1401-0249
FEMALE TYPE-N TEST PORTS (OPTIONS 011 AND 075)	1401-0247

Description	HP/Agilent Part or Model Number
Fuses used on the A8 Post Regulator	
FUSE 0.5A 125V NON-TIME DELAY 0.25×0.27	2110-0046
FUSE 0.75A 125V NON-TIME DELAY 0.25×0.27	2110-0424
FUSE 1A 125V NON-TIME DELAY 0.25×0.27	2110-0047
FUSE 2A 125V NON-TIME DELAY 0.25×0.27	2110-0425
FUSE 4A 125V NON-TIME DELAY 0.25×0.27	2110-0476
For Line Fuse part numbers, refer to "8753ET/ES: Hardware, Preregulator" on page 13-55**.**	
GPIB Cables	
GPIB CABLE, 1M (3.3 FT)	10833A
GPIB CABLE, 2M (6.6 FT)	10833B
GPIB CABLE, 4M (13.2 FT)	10833C
GPIB CABLE, 0.5M (1.6 FT)	10833D
ESD Supplies	
ADJUSTABLE ANTISTATIC WRIST STRAP	9300-1367
5 FT GROUNDING CORD *for wrist strap*	9300-0980
2 × 4 FT ANTISTATIC TABLE MAT WITH 15 FT GROUND WIRE	9300-0797
ANTISTATIC HEEL STRAP *for use on conductive floors*	9300-1126
Other	
8753E KEYBOARD OVERLAY *for external keyboard*	08753-80131
RACK MOUNT KIT WITHOUT HANDLES	5063-9216
RACK MOUNT KIT WITH HANDLES	5063-9236
FRONT HANDLE	5063-9229
FLOPPY DISKS, 3.5 INCH DOUBLE-SIDED (box of 10)	92192A

Table 13-1 Abbreviation Definitions

REFERENCE DESIGNATIONS
A.....Assembly
B.....fan; motor
J.....electrical connector (stationary portion); jack
RPG.....rotary pulse generator
W.....cable; transmission path; wire

ABBREVIATIONS
A.....ampere
ALC.....automatic level control
ASSY.....assembly
AUX.....auxiliary
BD.....board
COAX.....coaxial
CPU.....central processing unit
CW.....conical washer (screws)
D.....diameter
ESD.....electrostatic discharge
EXT.....external
EYO.....YIG oscillator
FL.....flathead (screws)
FP.....front panel
FRAC-N.....fractional N
FREQ.....frequency
GHz.....gigahertz
GPIB.....general purpose interface bus
HEX.....hexagonal
HP.....Hewlett-Packard
HX.....hex recess (screws)
ID.....inside diameter
IF.....intermediate frequency
I/O.....input/output
kHz.....kilahertz
LCD.....liquid crystal display
LED.....light-emitting diode
M.....meters
M.....meteric hardware
MB.....motherboard
MHz.....megahertz
mm.....millimeters
MON.....monitor
NOM.....nominal
NY.....nylon
OD.....outside diameter
Opt.....option
OSC.....oscillator
PC.....patch lock
PC.....printed circuit
PN.....panhead (screws)
REF.....reference
REPL.....replacement
RP.....rear panel
SH.....socket head cap (screws)
TX.....TORX recess (screws)
Qty.....quantity
V.....volt
WFR.....wire formed
W/O.....without
YIG.....yttrium-iron garnet

OPTIONS
002.....harmonics measurement
004.....55dB step attenuator (ET only)
006.....6 GHz operation
010.....time domain
011.....w/o test set (ES only)
075.....75 ohm test set (ES only)
1D5.....10 MHz precision ref

14 Assembly Replacement and Post-Repair Procedures

This chapter contains procedures for removing and replacing the major assemblies of the network analyzer. A table showing the corresponding post-repair procedures for each replaced assembly is located at the end of this chapter.

Replacing an Assembly

The following steps show the sequence to replace an assembly in the network analyzer.

1. Identify the faulty group. Refer to Chapter 4 , “Start Troubleshooting Here.” Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
2. Order a replacement assembly. Refer to Chapter 13 , “Replaceable Parts.”
3. Replace the faulty assembly and determine what adjustments are necessary. Refer to the information provided in this chapter for assembly replacement instructions.
4. Perform the necessary adjustments. Refer to Chapter 3 , “Adjustments and Correction Constants.”
5. Perform the necessary performance tests. Refer to Chapter 2 , “System Verification and Performance Tests.”

WARNING **These servicing instructions are for use by qualified personnel only. 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 **The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.**

CAUTION Many of the assemblies in this instrument are very susceptible to damage from ESD (electrostatic discharge). Perform the following procedures only at a static-safe workstation and wear a grounding strap.

Procedures described in this chapter

The following pages describe assembly replacement procedures for the analyzer assemblies listed below:

- Line Fuse on page 14-5
- Covers on page 14-6
- Front Panel Assembly on page 14-8
- Front Panel Keyboard and Interface Assemblies (A1, A2) on page 14-10
- Display, Display Lamp and Inverter Assemblies (A18, A27) on page 14-12
- Rear Panel Assembly on page 14-14
- Rear Panel Interface Board Assembly (A16) on page 14-16
- A3 Source Assembly on page 14-18
- A4, A5, A6 Samplers and A7 Pulse Generator on page 14-20
- A8, A10, A11, A12, A13, A14 Card Cage Boards on page 14-22
- A9 CPU Board on page 14-24
- A9BT1 Battery on page 14-26
- A15 Preregulator on page 14-28
- A17 Motherboard Assembly on page 14-30
- A19 Graphics Processor on page 14-34
- A20 Disk Drive Assembly on page 14-36
- A21, A22 Test Port Couplers (8753ES Only) on page 14-40
- A21 Dual Directional Coupler (8753ET Only) on page 14-42
- A23 LED Board (8753ES Only) on page 14-44
- A24 Transfer Switch (8753ES Only) on page 14-46
- A25 Test Set Interface (8753ES Only) on page 14-48
- A26 High Stability Frequency Reference (Option 1D5) Assembly on page 14-50
- B1 Fan Assembly on page 14-52

IMPORTANT Unless noted otherwise, all replacement procedures apply to both the 8753ES and the 8753ET.

Line Fuse

Tools Required

- small slot screwdriver

Removal

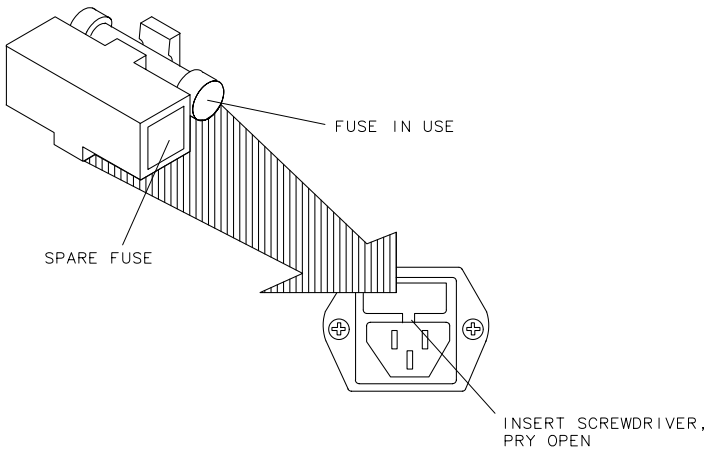
WARNING **For continued protection against fire hazard, replace line fuse only with same type and rating (115 V operation: T 5A 125V UL/CSA; 230V operation: T 4A H 250V IEC). The use of other fuses or materials is prohibited.**

1. Refer to Figure 14-1.
2. Disconnect the power cord.
3. Use a small slot screwdriver to pry open the fuse holder.
4. Replace the failed fuse with one of the correct rating for the line voltage. See "8753ET/ES: Hardware, Preregulator" on page 13-55 to find the part number.

Replacement

1. Simply replace the fuse holder.

Figure 14-1 Line Fuse



Covers

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- T-20 TORX screwdriver
- T-25 TORX screwdriver

Refer to Figure 14-2 when performing the following procedures.

Removing the top cover

1. Remove both upper rear feet (item 1) by loosening the attaching screws (item 2).
2. Loosen the top cover screw (item 3).
3. Slide cover back and off.

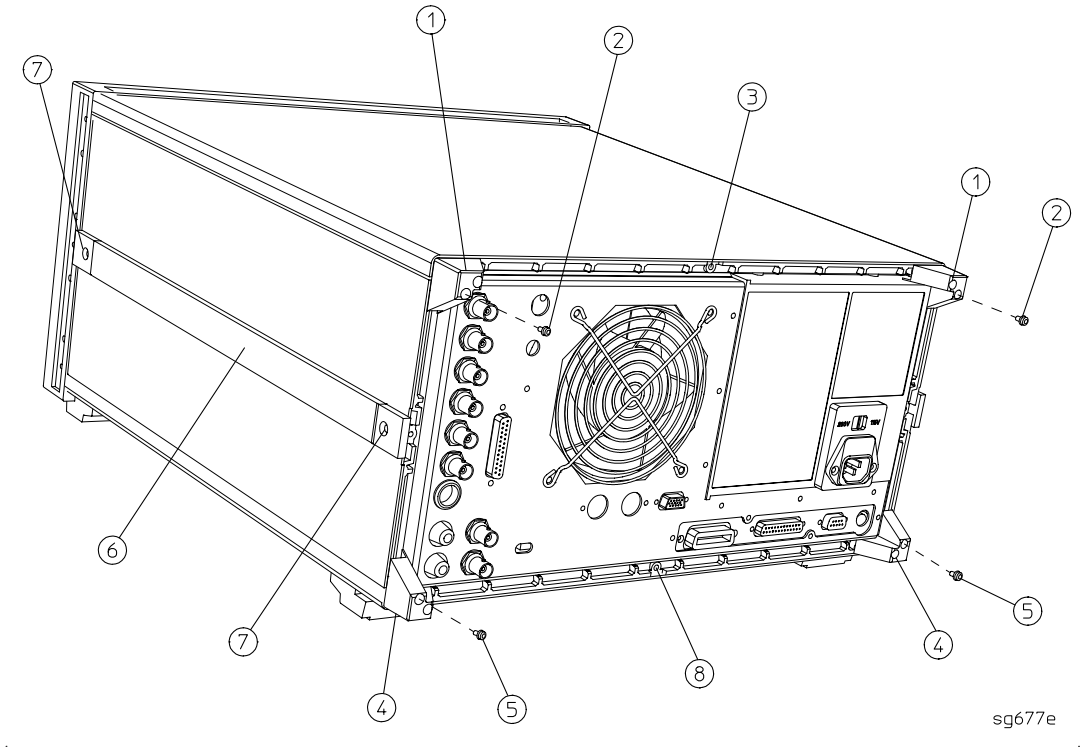
Removing the side covers

1. Remove the top cover.
2. Remove the lower rear foot (item 4) that corresponds to the side cover you want to remove by loosening the attaching screw (item 5).
3. Remove the handle assembly (item 6) by loosening the attaching screws (item 7).
4. Slide the cover back and off.

Removing the bottom cover

1. Remove both lower rear feet (item 4) by loosening the attaching screws (item 5).
2. Loosen the bottom cover screw (item 8).
3. Slide the cover back and off.

Figure 14-2 Covers



Front Panel Assembly

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- 5/16-inch open-end torque wrench (set to 10 in-lb)

Refer to Figure 14-3 when using the following instructions.

Removal

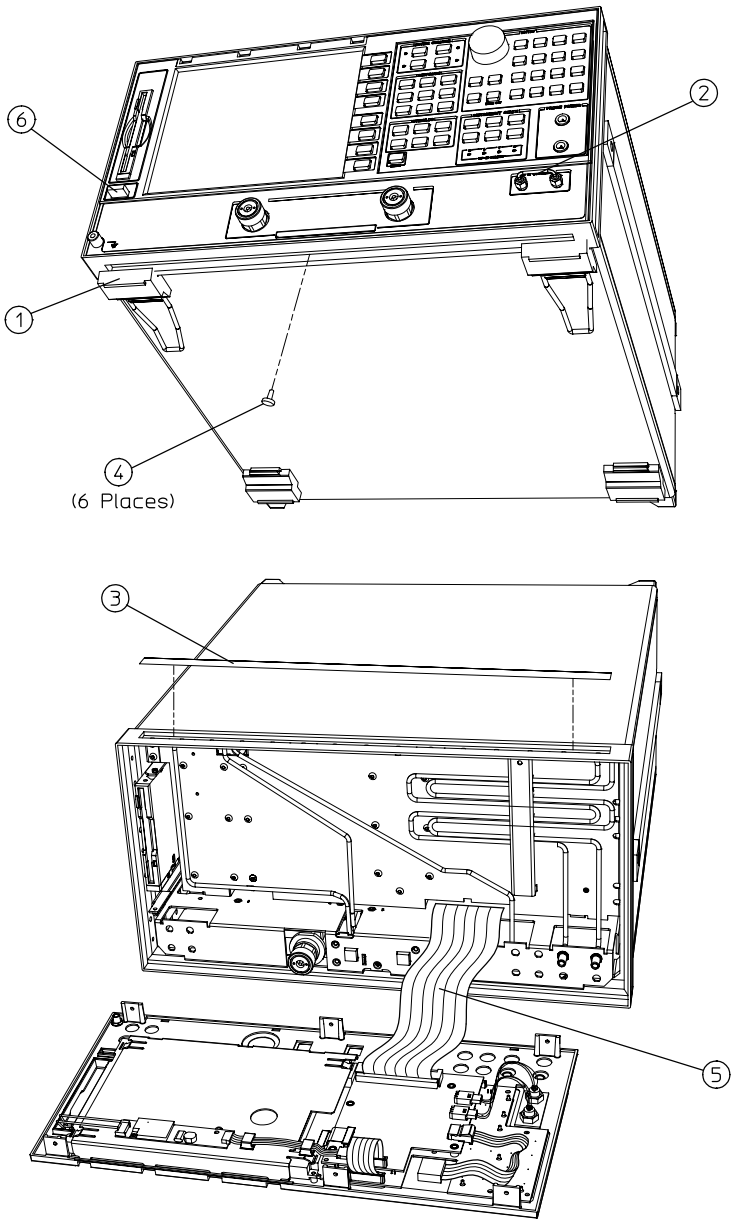
1. Disconnect the power cord.
2. Remove the front bottom feet (item 1).
3. Remove all of the RF cables that are attached to the front panel (item 2).
4. Remove the line button (item 6) by pulling it out.
5. Remove the trim strip (item 3) from the top edge of the front frame by prying under the strip with a small slot screwdriver.
6. Remove the six screws (item 4) from the top and bottom edges of the frame.
7. Slide the front panel over the test port connectors.
8. Disconnect the ribbon cable (item 5). The front panel is now free from the instrument.

Replacement

1. Reverse the order of the removal procedure.

NOTE When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.

Figure 14-3 Front Panel Assembly



Front Panel Keyboard and Interface Assemblies (A1, A2)

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- 5/16-inch open-end torque wrench (set to 10 in-lb)

Removal

1. Remove the front panel assembly from the analyzer (refer to "Front Panel Assembly" on page 14-8).
2. Refer to Figure 14-4. Disconnect cables (items 4 and 7) by pulling up on the corners of the connector base. This will release the cable for easy removal. *Damage may occur to the connector if this step is not followed.*
3. Disconnect all other cables from the front panel interface board (items 1, 2, 3, and 6).
4. Remove the four screws (item 5) that secure the A2 interface board.
5. Remove the eight screws from the A1 front panel board to access and remove the rubber keypad.

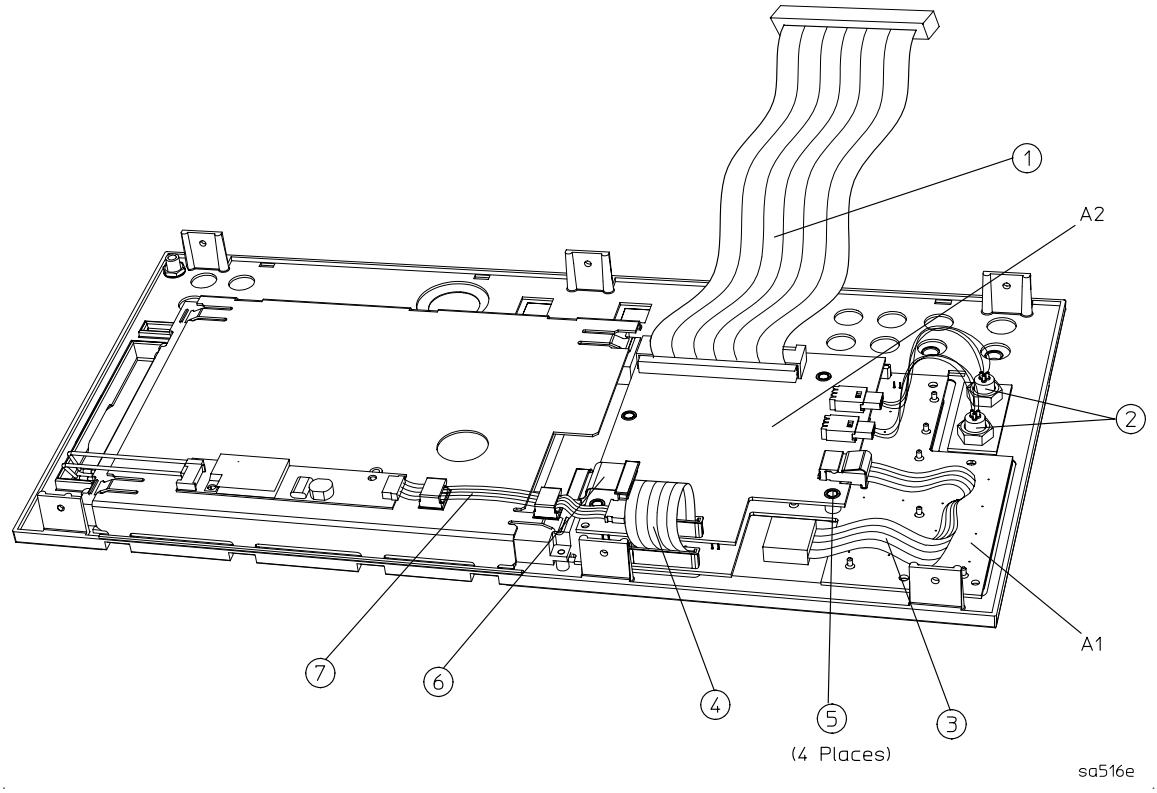
Replacement

1. Reverse the order of the removal procedure.

CAUTION Damage may result if the following step is not followed.

2. To reconnect item 7, ensure that the ribbon cable is placed squarely into both of its cable clamps.

Figure 14-4 Front Panel Keyboard and Interface Assemblies



Display, Display Lamp and Inverter Assemblies (A18, A27)

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- #0 Phillips Screwdriver

Removal

1. Remove the front panel assembly (refer to "Front Panel Assembly" on page 14-8).
2. Refer to Figure 14-5. Disconnect the cables (items 2, 3 and 4) by performing the following steps:
   a. Disconnect cable (item 2) from the inverter (A27). Slip item 2 out of both of its cable clamps.
   b. Disconnect item 4 from the inverter (A27).
   c. Disconnect item 3 from the keyboard interface board (A2).
3. Remove the two screws (item 8) that attach the inverter (A27) and inverter cover (A28) to the mounting plate (item 7). Note that this also allows the inverter cover to be separated from the inverter.
4. Remove the three screws (item 1) along the bottom edge of the mounting plate.
5. Swing the bottom edge of the mounting plate up as shown, then pull it away from the display. The display can now be removed from the front panel.

NOTE The bottom half of Figure 14-5 depicts the rear view of the A18 assembly with the mounting plate removed. Use the location of the display lamp cable (item 4) to aid in orientation.

6. Remove the two screws (item 5) that attach the lamp to the display. Detach the lamp from the display by pulling it down, then up, as shown.

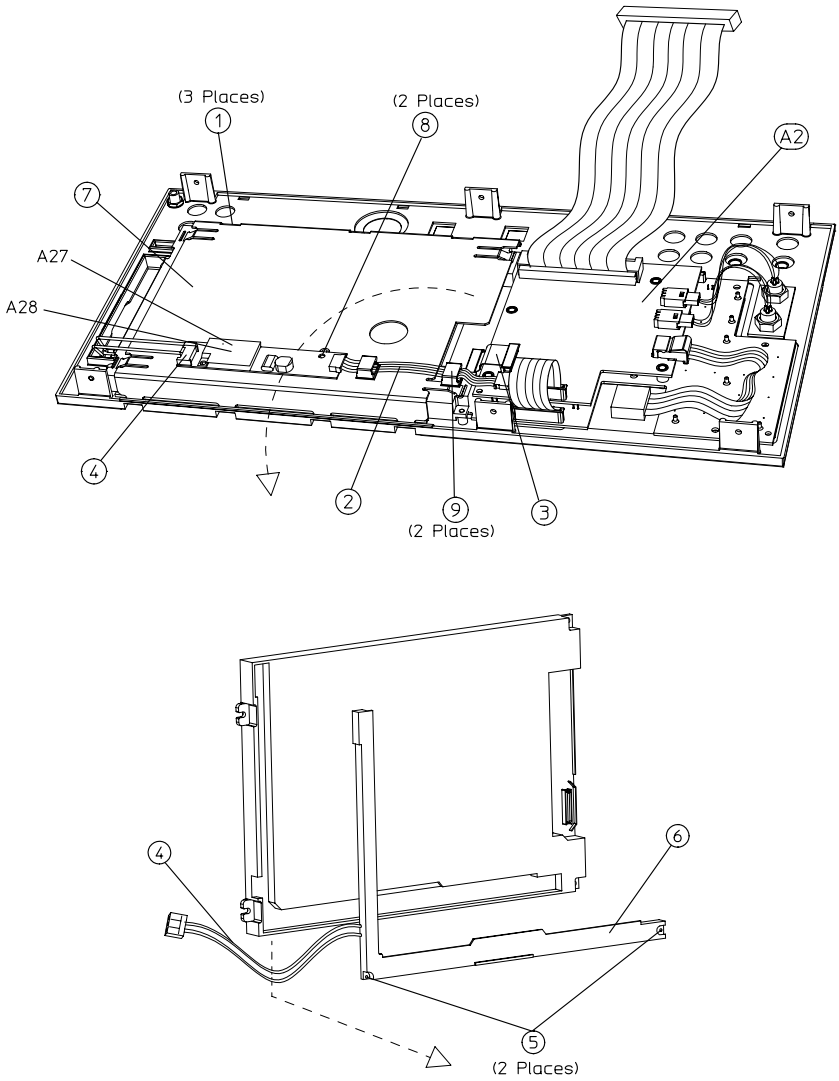
Replacement

1. Reverse the order of the removal procedure.
2. Be sure to route ribbon cable 2 through both cable clamps.

CAUTION Be sure that cables are plugged in square and correct. Failure to do so will result in serious component damage.

CAUTION Do not exceed 10 in-lb when replacing the display hold-down plate screws.

Figure 14-5 Display, Display Lamp and Inverter Assemblies



Rear Panel Assembly

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

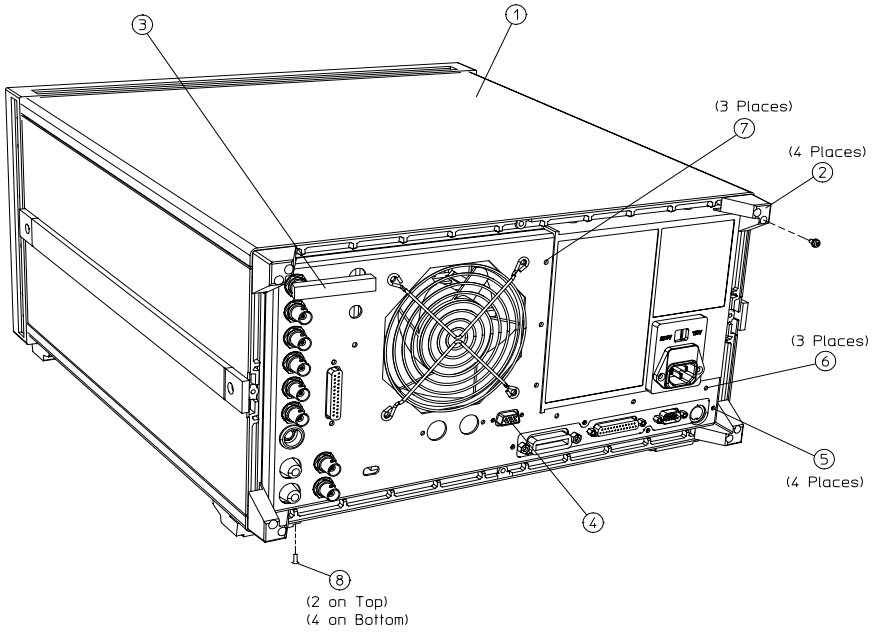
Removal

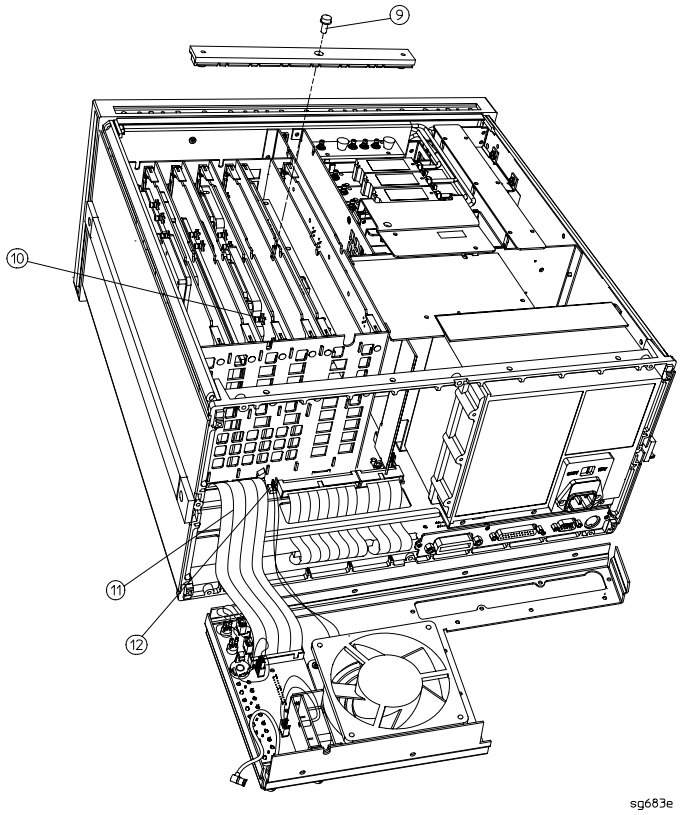
1. Disconnect the power cord and remove the top (item 1) and bottom covers (refer to "Covers" on page 14-6).
2. Refer to Figure 14-6. Remove the four rear standoffs (item 2).
3. If the analyzer has option 1D5, remove the BNC jumper from the high stability frequency reference (item 3).
4. Remove the four screws (item 5) that attach the interface bracket to the rear panel.
5. Remove the six screws (items 6 and 7) that attach the preregulator to the rear panel.
6. Remove the six screws (item 8) from the rear frame: two from the top edge, and four from the bottom edge.
7. Remove the screw from the pc board stabilizer (item 9) and remove the stabilizer.
8. Lift the reference board (A12) from its motherboard connector and disconnect the flexible RF cable from its connector on A12 (item 10).
9. Identify the wiring harness leading to the VGA connector (item 4). Follow this harness back to its connection on the motherboard. The air flow cover, attached by two screws, will have to be removed to get to this connection. Disconnect the VGA wire harness at this point.
10. Pull the rear panel away from the frame. Disconnect the ribbon cable (item 11) from the motherboard connector, pressing down and out on the connector locks. Disconnect the wiring harness (item 12) from the motherboard.

Replacement

1. Reverse the order of the removal procedure.

Figure 14-6 Rear Panel Assembly





Rear Panel Interface Board Assembly (A16)

Tools Required

- 9/16 hex nut driver
- 3/16 hex nut driver
- T-10 TORX screwdriver
- T-15 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

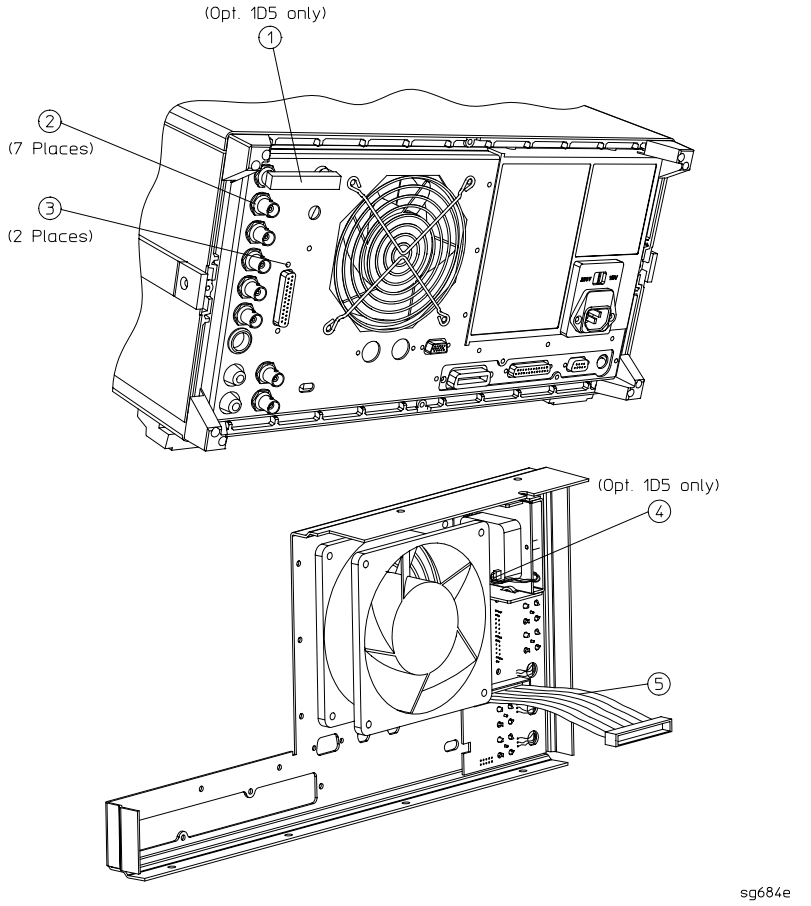
Removal

1. Disconnect the power cord and remove the top and bottom covers (refer to "Covers" on page 14-6).
2. Refer to Figure 14-7. If the analyzer has option 1D5, remove the high-stability frequency reference jumper (item 1).
3. Remove the hardware that attaches the seven (five for the 8753ET) BNC connectors to the rear panel (item 2).
4. Remove the hardware that attaches the interface connector to the rear panel (item 3).
5. Remove the rear panel from the analyzer (refer to "Rear Panel Assembly" on page 14-14).
6. If the analyzer has option 1D5, disconnect the cable (item 4) from the rear panel interface board.
7. Disconnect the ribbon cable (item 5) from the rear panel interface board.

Replacement

1. Reverse the order of the removal procedure.

Figure 14-7 Rear Panel Interface Board Assembly



A3 Source Assembly

Tools Required

- T-15 TORX screwdriver
- 5/16-inch open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap
- small slot screwdriver
- needle nose pliers

Removal

1. Disconnect the power cord and remove the top cover (refer to "Covers" on page 14-6).
2. Refer to Figure 14-8. Remove the source bracket (item 1) by removing four screws. (It might be necessary to disconnect a flexible cable from the B sampler.)
3. Disconnect the flexible cable W26.
4. Disconnect the semirigid cable W1.
5. Lift the two retention clips (item 2) at the front and rear of the source assembly to an upright position.
6. Move W1 to the side while lifting the source high enough to provide wrench clearance for W24. To lift the A3 source assembly, use the source bracket handle (item 3).
7. Disconnect the semirigid cable W24.
8. Remove the source assembly from the instrument.

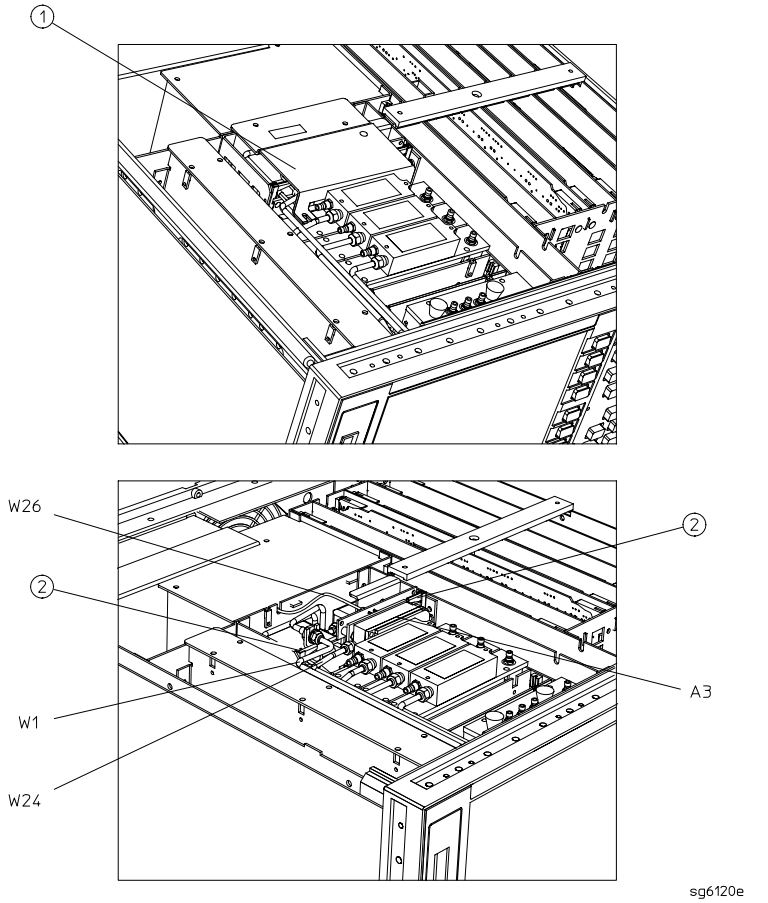
Replacement

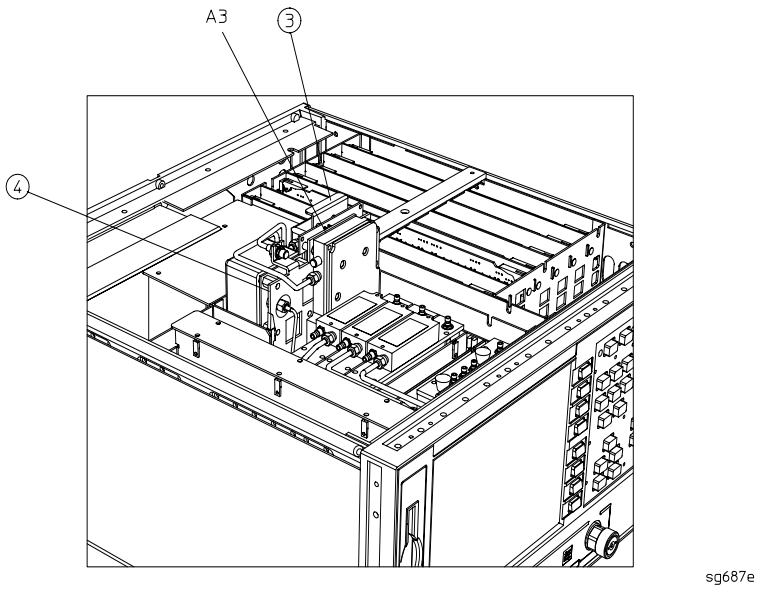
1. Check the connector pins on the motherboard before reinstallation.
2. Slide the edges of the sheet metal partition (item 4) into the guides at the sides of the source compartment. Press down on the module to ensure that it is well seated in the motherboard connector.
3. Push down the retention clips (item 2). Reconnect the two semirigid cables (W1 and W24) and one flexible cable (W26) to the source assembly.

NOTE When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.

4. Reinstall the source bracket (item 1).
5. Reconnect the flexible cable to the B sampler.

Figure 14-8 A3 Source Assembly





A4, A5, A6 Samplers and A7 Pulse Generator

Tools Required

- Needle-nose pliers
- T-10 TORX screwdriver
- 5/16-inch open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

Removal

1. Disconnect the power cord and remove the top cover (refer to "Covers" on page 14-6).
2. Refer to Figure 14-9. To remove the B sampler (A6), you must remove the source bracket (item 1).
3. Disconnect all cables from the top of the sampler (A4/A5/A6) or pulse generator (A7).
4. Remove the screws from the top of each sampler assembly. Extract the assembly from the slot.

NOTE To remove the A (A5) or R (A4) sampler, first remove the cable on the B (A6) sampler.

NOTE If you are removing the pulse generator (A7), the grounding clip, which rests on top of the assembly, will become loose once the four screws are removed. Be sure to replace the grounding clip when reinstalling the pulse generator assembly.

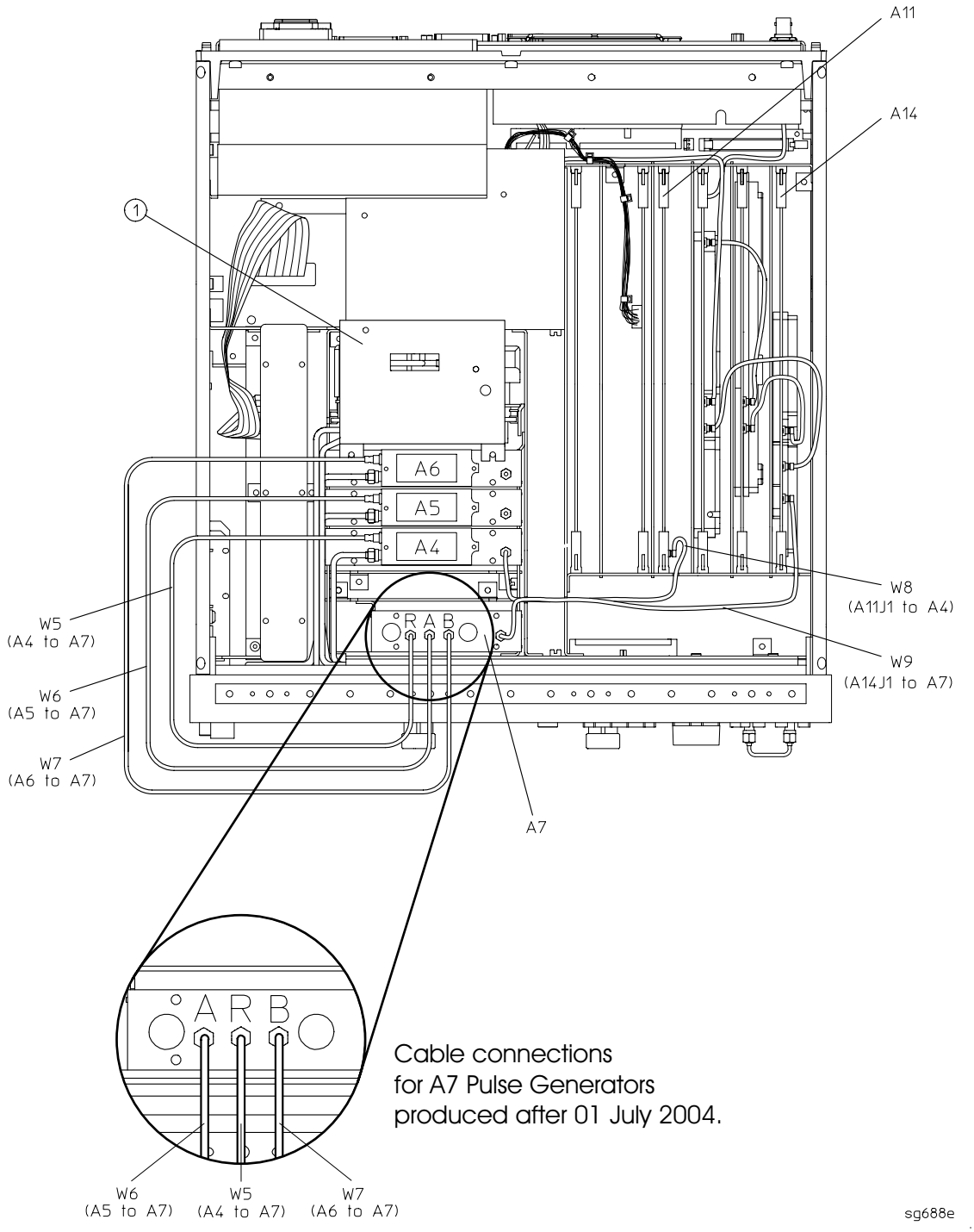
Replacement

1. Check the connector pins on the motherboard before reinstallation.
2. Reverse the order of the removal procedure.

NOTE

- When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.
- Be sure to route W8 and W9 as shown. No excess wire should be hanging in the A11 and A14 board slots. Routing the wires in this manner will reduce noise and crosstalk.

Figure 14-9 A4, A5, A6 Samplers and A7 Pulse Generator



A8, A10, A11, A12, A13, A14 Card Cage Boards

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

Removal

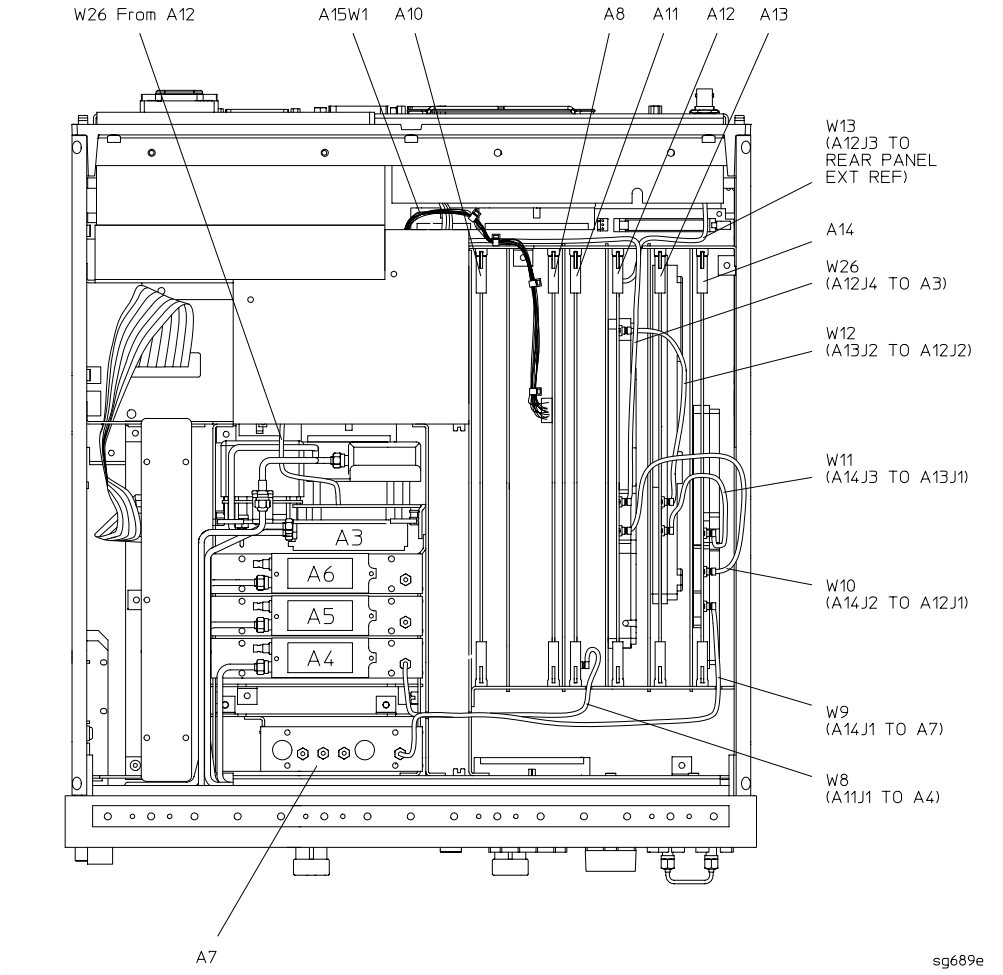
1. Disconnect the power cord and remove the top cover (refer to "Covers" on page 14-6).
2. Refer to Figure 14-10. Remove the screw from the pc board stabilizer and remove the stabilizer.
3. Lift the two extractors located at each end of the board. Lift the board from the card cage slot, just enough to disconnect any flexible cables that may be connected to it.
4. Remove the board from the card cage slot.

Replacement

1. Check the connector pins on the motherboard before reinstallation.
2. Reverse the order of the removal procedure.

NOTE Be sure to route W8 and W9 as shown. No excess wire should be hanging in the A11 and A14 board slots. Routing the wires in this manner will reduce noise and crosstalk in the instrument.

Figure 14-10 Card Cage Boards: A8, A10, A11, A12, A13, A14



A9 CPU Board

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

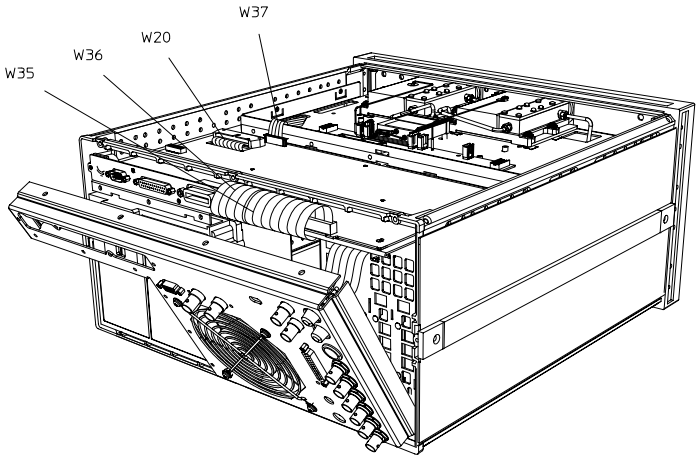
Removal

1. Disconnect the power cord.
2. Remove the top and bottom covers (refer to "Covers" on page 14-6).
3. Remove the rear panel assembly, following steps 2 through 6 of "Rear Panel Assembly" on page 14-14.
4. Turn the analyzer upside down.
5. Pull the rear panel away from the frame as shown in Figure 14-11.
6. Disconnect the four ribbon cables (W20, W35, W36, and W37) from the CPU board (A9).
7. Remove the three screws (item 2) that secure the CPU board (A9) to the deck. Slide the board towards the front of the instrument so that it disengages from the three standoffs (item 3).
8. Lift the board off of the standoffs.

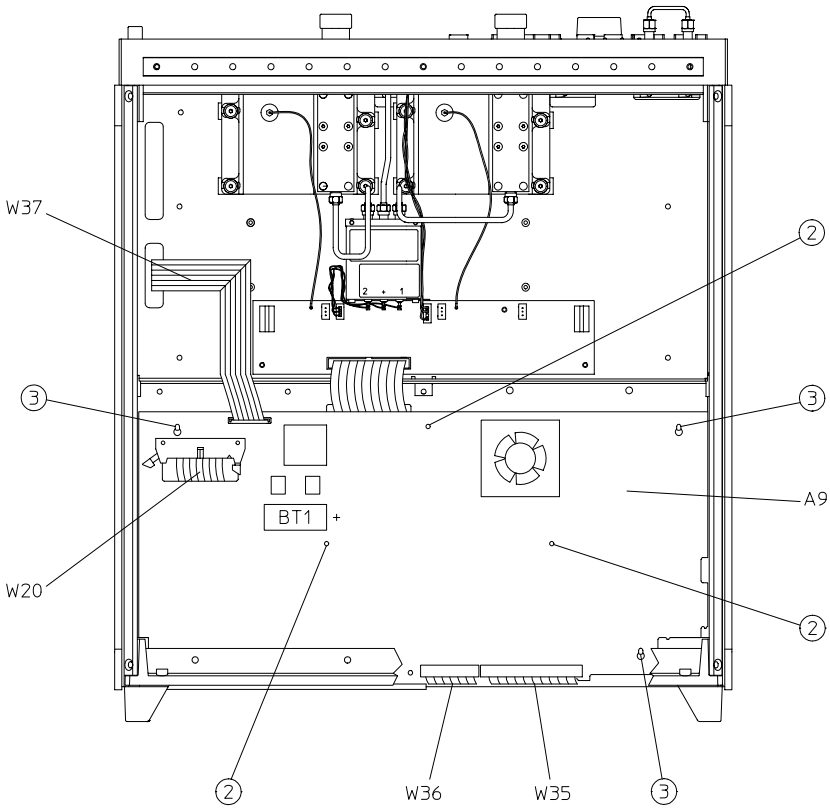
Replacement

1. Reverse the order of the removal procedure.
2. Leave the bottom cover off in order to perform the post repair procedures located at the end of this chapter.

Figure 14-11 A9 CPU Board



sg6112e



sg690e

A9BT1 Battery

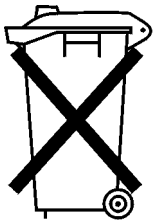
Tools Required

- T-10 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- soldering iron with associated soldering tools

Removal

1. Remove the A9 CPU board (refer to "A9 CPU Board" on page 14-24).
2. Refer to Figure 14-12. Unsolder and remove A9BT1 from the A9 CPU board.

WARNING **Battery A9BT1 contains lithium. Do not incinerate or puncture this battery. Discard used batteries according to manufacturer's instructions.**



DO NOT THROW BATTERIES AWAY BUT
COLLECT AS SMALL CHEMICAL WASTE.

sk780a

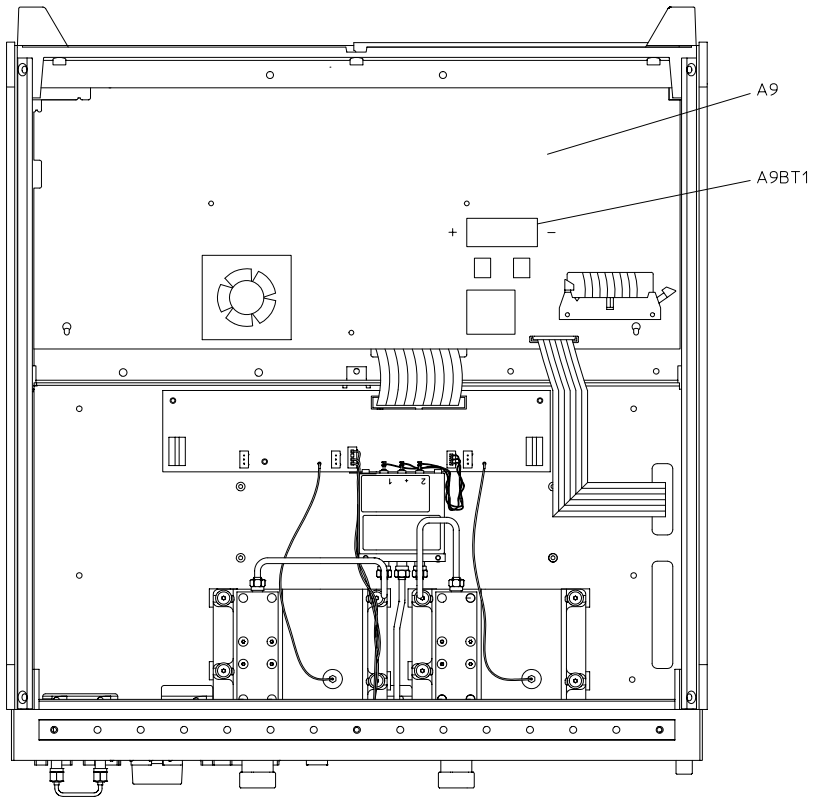
Replacement

1. Make sure the new battery is inserted into the A9 board with the correct polarity.

WARNING **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended.**

2. Solder the battery into place.
3. Replace the A9 CPU board (refer to "A9 CPU Board" on page 14-24).

Figure 14-12 A9BT1 Battery



A15 Preregulator

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

Removal

1. Remove the rear panel (refer to "Rear Panel Assembly" on page 14-14).
2. Remove the two remaining screws from the top of the rear frame.
3. Refer to Figure 14-13. Disconnect the wire bundle (A15W1) from A8J2 and A17J3.
4. Remove the preregulator (A15) from the frame.

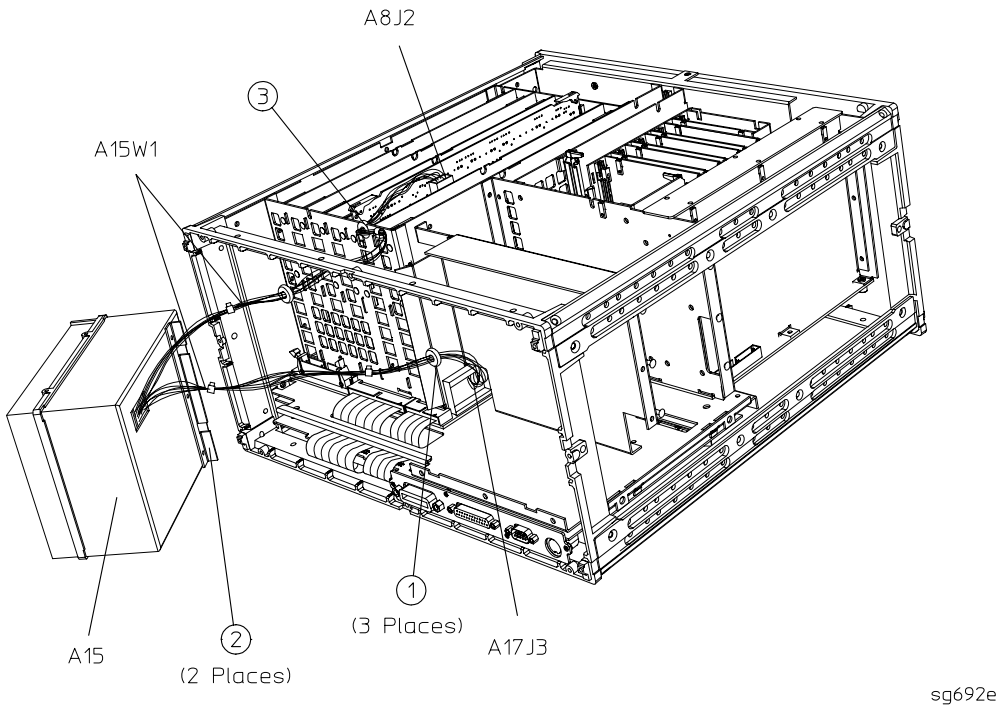
Replacement

1. Reverse the order of the removal procedure.

NOTE

- When reinstalling the preregulator (A15), make sure the three grommets (item 1) on A15W1 are seated in the two slots (item 2) on the back side of the preregulator and the slot (item 3) in the card cage wall.
- After reinstalling the preregulator (A15), be sure to set the line voltage selector to the appropriate setting, 115 V or 230 V.

Figure 14-13 A15 Preregulator



A17 Motherboard Assembly

Tools Required

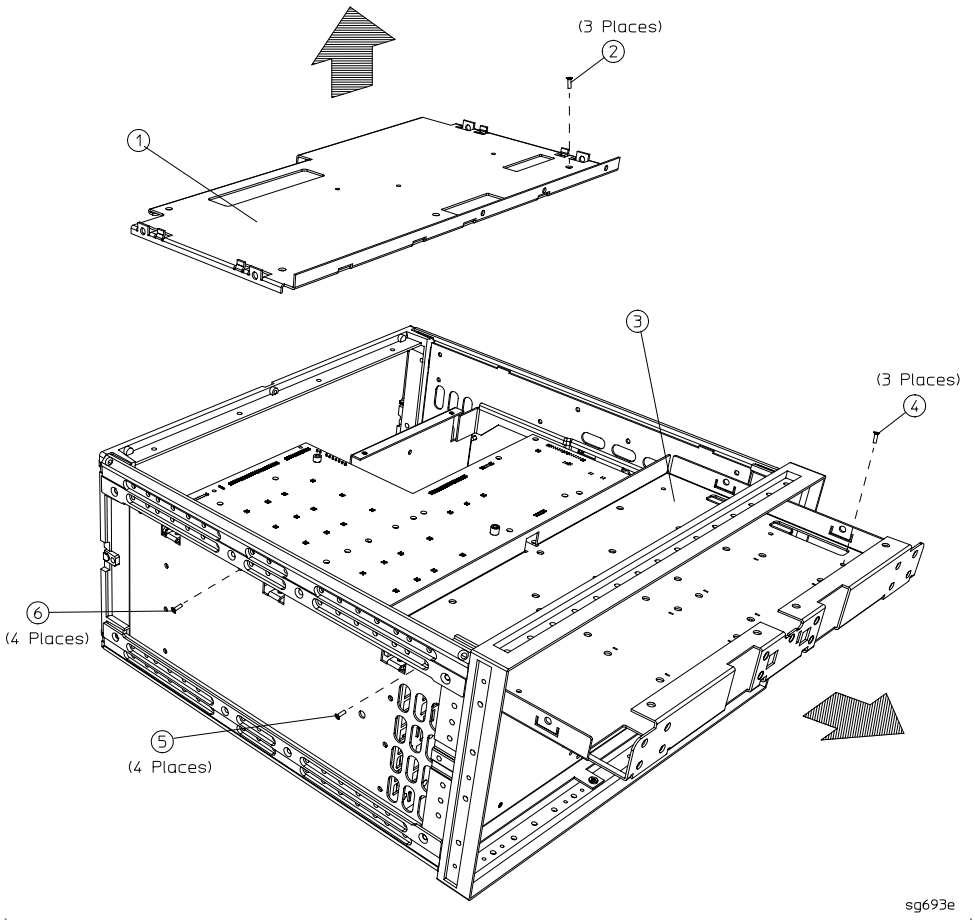
- T-10 TORX screwdriver
- T-15 TORX screwdriver
- T-20 TORX screwdriver
- small slot screwdriver
- 2.5-mm hex-key driver
- 5/16-inch open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

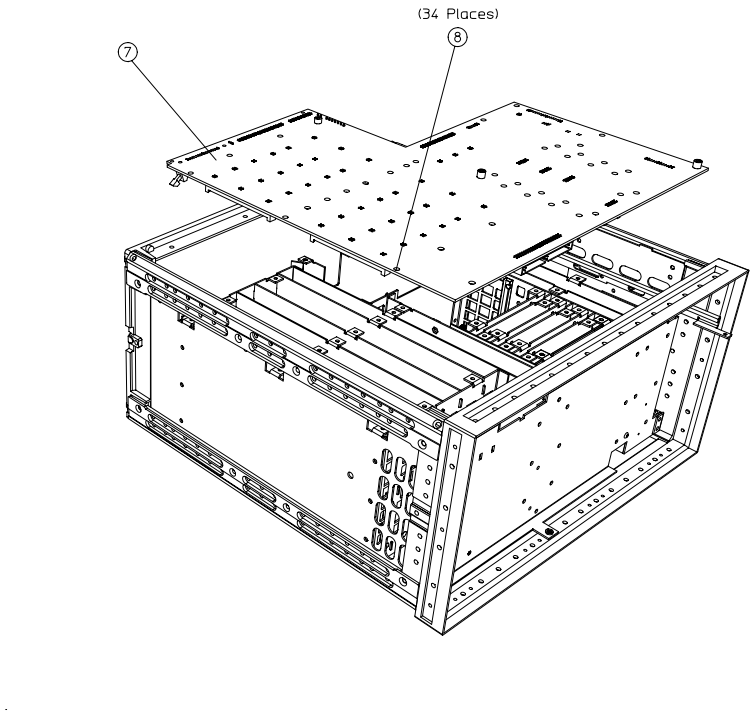
Removal

To remove the A17 motherboard assembly only, perform the following steps to remove all assemblies and cables that connect to the motherboard.

1. Disconnect the power cord and remove the top, bottom, and side covers (refer to "Covers" on page 14-6).
2. Remove the front panel assembly (refer to "Front Panel Assembly" on page 14-8).
3. Remove the rear panel assembly (refer to "Rear Panel Assembly" on page 14-14).
4. Remove the preregulator (refer to "A15 Preregulator" on page 14-28).
5. Remove the graphics processor (refer to "A19 Graphics Processor" on page 14-34).
6. Remove the test set deck (item 3) by removing the three screws (item 4) from the bottom and four screws (item 5) from the side frames. For clarity, the figure on the next page does not show the assemblies attached to the test set deck.
7. Remove the CPU board (refer to "A9 CPU Board" on page 14-24).
8. Refer to Figure 14-14. Remove the memory deck (item 1) by removing three screws (item 2) from the bottom and four screws (item 6) from the side frames.
9. Remove the source assembly (refer to "A3 Source Assembly" on page 14-18).
10. Remove the samplers and pulse generator (refer to "A4, A5, A6 Samplers and A7 Pulse Generator" on page 14-20).
11. Remove the card cage boards (refer to "A8, A10, A11, A12, A13, A14 Card Cage Boards" on page 14-22). Continue with step 12 to remove the motherboard only, or to step 13 to remove the motherboard/card cage assembly.
12. To disconnect the motherboard (item 7), remove the 34 riv screws (item 8). *Important: Do not misplace any of these screws.*

Figure 14-14 A17 Motherboard Assembly

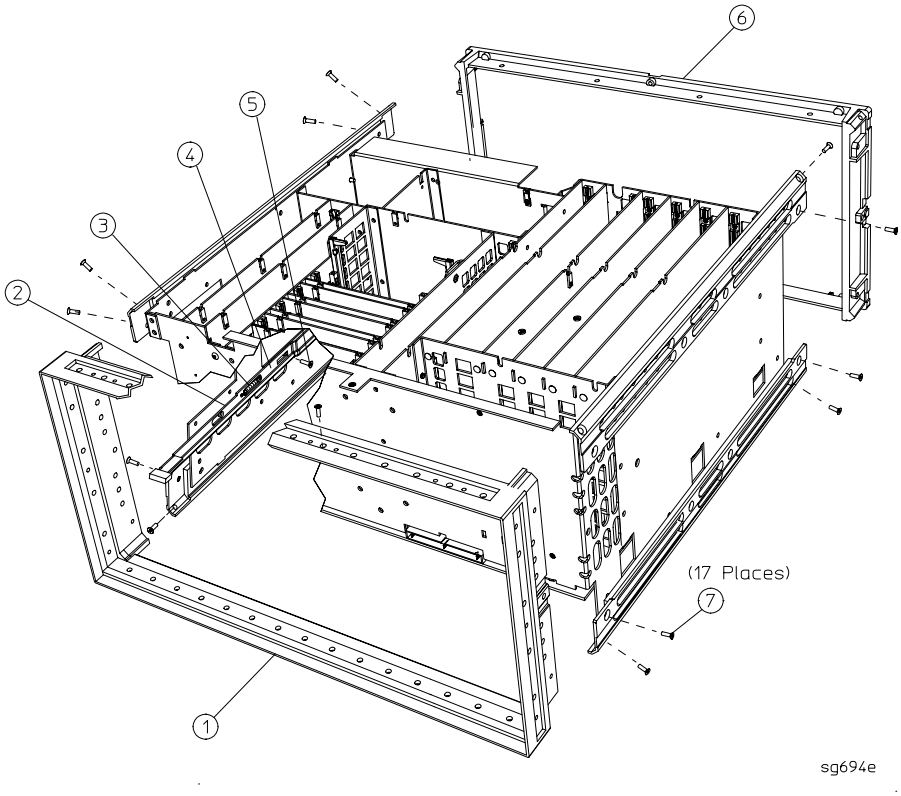




To remove the A17 motherboard assembly along with the card cage, continue with the following step:

13. Refer to Figure 14-15. Remove the front frame (item 1) and rear frame (item 6) by removing the attaching screws (item 7). At this point, only the motherboard/card cage assembly should remain. This whole assembly is replaceable (see "8753ET/ES: Chassis Parts, Inside" on page 13-58).

Figure 14-15 A17 Motherboard and Card Cage Assembly



Replacement

1. Reverse the order of the removal procedure.

This page intentionally left blank.

A19 Graphics Processor

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

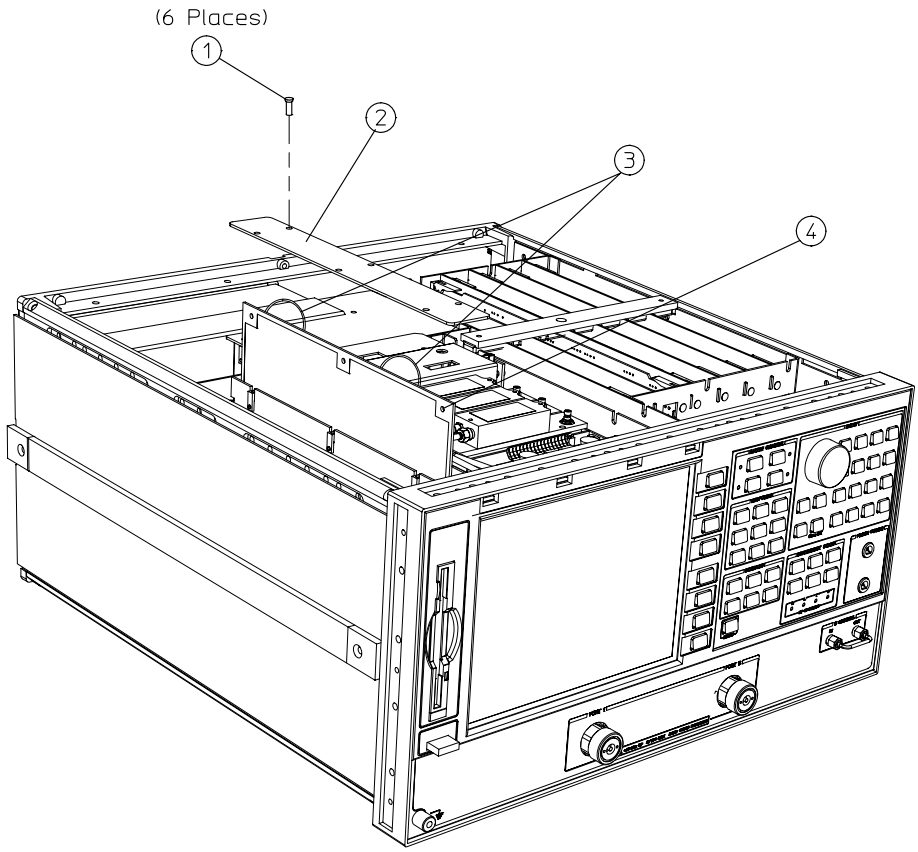
Removal

1. Disconnect the power cord.
2. Remove the top cover (refer to "Covers" on page 14-6) and front panel (refer to "Front Panel Assembly" on page 14-8).
3. Refer to Figure 14-16. Remove the six screws (item 1) from the GSP cover (item 2) and lift off.
4. Swing out the handles (item 3) and pull the GSP board (item 4) out of the analyzer.

Replacement

1. Check the connector pins on the motherboard before reinstallation.
2. Reverse the order of the removal procedure.

Figure 14-16 A19 Graphics Processor



A20 Disk Drive Assembly

Tools Required

- T-8 TORX screwdriver
- T-10 TORX screwdriver
- T-15 TORX screwdriver
- T-25 TORX screwdriver
- #2 ball-end hex driver with long shaft
- ESD (electrostatic discharge) grounding wrist strap
- 3.5” diskette

Removal

1. Disconnect the power cord and remove the top, bottom, and left side covers (“Covers” on page 14-6).

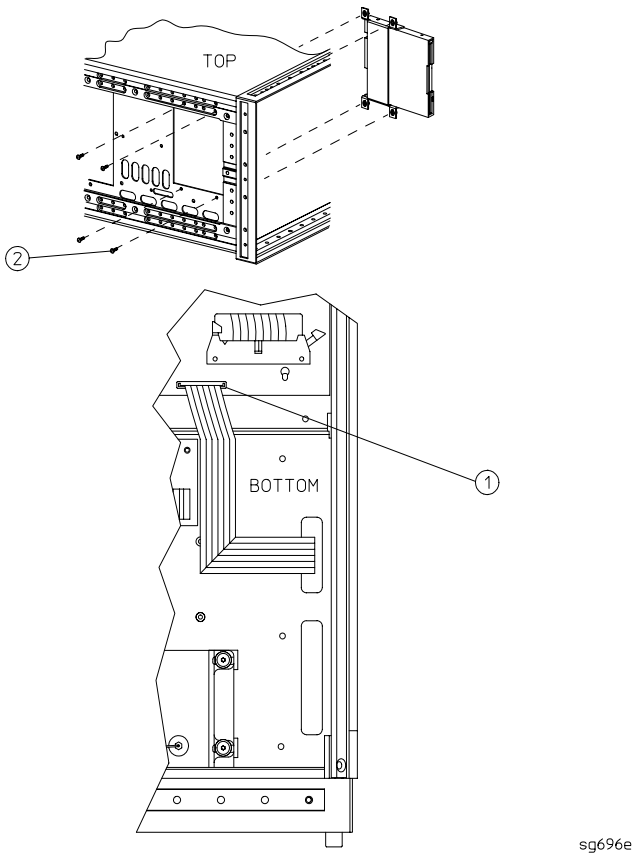
NOTE The next step instructs you to disconnect a ribbon cable from its connector on the CPU board. Figure 14-17 depicts the location of the connector (item 1).

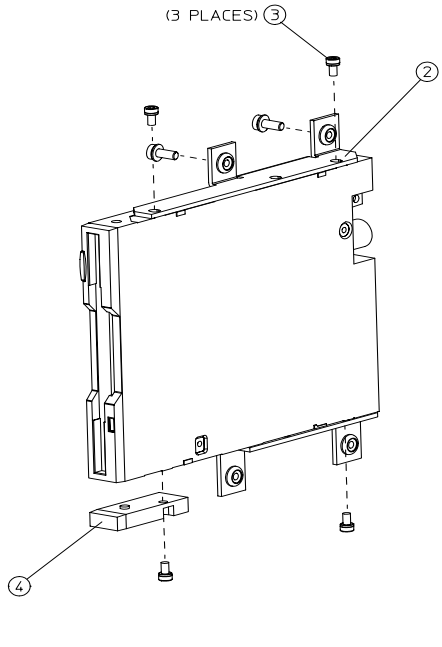
2. Turn the analyzer onto its right side and gently pull up on each end of the connector body to release the disk drive ribbon cable (item 1 of Figure 14-17) from the CPU board.
3. Remove the four screws (item 2) that secure the disk drive bracket to the analyzer chassis.

NOTE Save the screws removed in this step for installing the replacement disk drive.

4. Slide the disk drive—with the attached cable—out of the top of the instrument.
5. Disconnect the ribbon cable from the disk drive by gently pulling up on each end of the connector body to release the ribbon cable.
6. Remove the three screws (item 3) that secure the bracket to the disk drive.
7. Remove the plug (item 4) from the disk drive.

Figure 14-17 A20 Disk Drive Assembly





A20 Disk Drive Assembly Replacement

1. Attach the plug (item 4) to the replacement disk drive.
2. Attach the disk drive bracket to the replacement disk drive as shown. Leave the three screws loose in case the disk drive's position needs to be adjusted.

NOTE Place the disk drive on a horizontal and flat surface when attaching the bracket. This minimizes distortion of the disk drive.

---

3. Connect the disk drive ribbon cable to the replacement disk drive.

NOTE In steps 3 and 5, make sure that the connector-contacts on both the disk drive and the CPU touch the ribbon cable contact areas (the ribbon-cable contact areas must face the contacts in the disk drive and CPU connectors). Also assure that the connector is properly locked by gently pushing down on the ends of the connector body.

---

4. Slide the disk drive assembly into the analyzer. Align the disk drive door with the opening in the front panel. Attach it to the analyzer frame using the four screws from step 3 of the "Removal" procedure.
5. Route the ribbon cable through the side access hole. Avoid twisting the cable: duplicate the original folds made to the cable. Connect the disk drive cable to the CPU board. Refer to item 1 in Figure 14-17. Secure the ribbon cable to its clamp on the test set deck.
6. Remove the trim strip from the top of the front panel.
7. Remove the top left screw located under the trim strip.
8. Tighten the three screws (item 3) that fasten the disk drive to the bracket. The top front-most screw is accessed through the exposed screw-hole under the trim strip.

Test the disk-eject function, and adjust if required.

1. Insert a diskette into the disk drive and then eject the disk.
2. If the diskette does not eject properly, loosen and then retighten the three screws that hold the disk drive to the disk drive bracket:
   a. Loosen the three screws that are readily accessible.
   b. Loosen the upper-most front screw through the screw hole left empty in step 7 on page 14-38.
   c. Center the disk drive in the opening.
   d. Retighten all three screws.

Reinstall the front panel and covers

1. Reinstall the top left screw under the trim strip.
2. Reinstall the trim strip.
3. Reinstall the covers. If necessary, refer to "Front Panel Assembly" on page 14-8 for help with this task.

A21, A22 Test Port Couplers (8753ES Only)

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- 5/16-inch open-end torque wrench (set to 10 in-lb)
- soldering iron and solder

Removal

1. Disconnect the power cord and remove the bottom cover (refer to "Covers" on page 14-6).
2. Refer to Figure 14-18. Disconnect the small bias wires from the test set interface board:
   - For coupler A21, disconnect the gray wire (A21W1).
   - For coupler A22, disconnect the gray wire (A22W1).
3. Disconnect the two semirigid cables from the coupler assembly:
   - For coupler A21 disconnect W3 and W31.
   - For coupler A22 disconnect W4 and W32.
4. Remove the four screws, washers, and pressure springs that secure the coupler to the test set deck. Remove the coupler.
5. Remove the pressure springs.

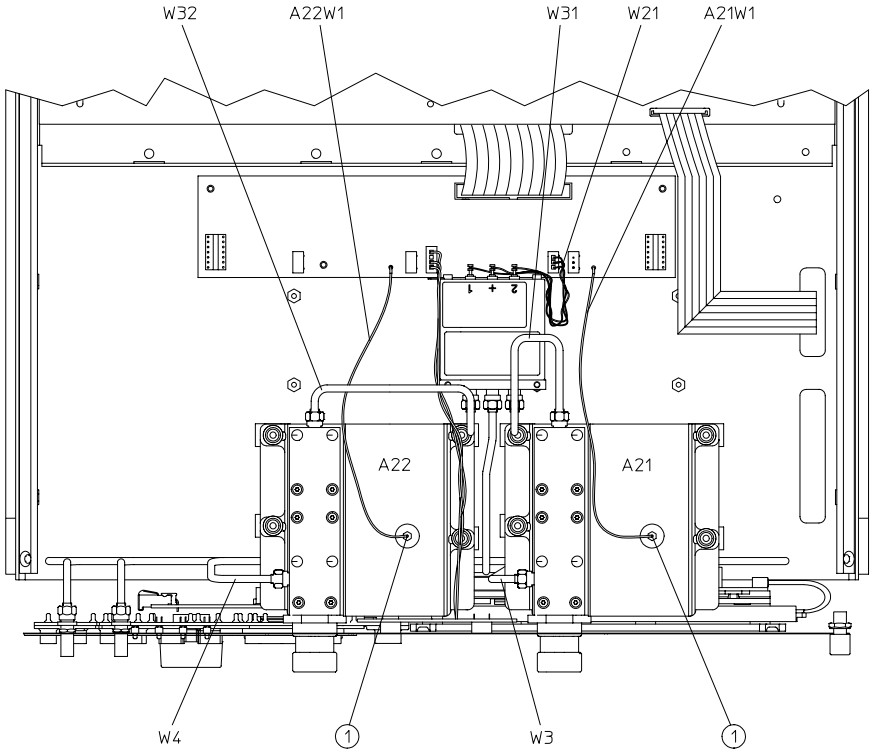
Replacement

1. Reverse the order of the removal procedure.

NOTE

- If you're installing a new coupler, the gold lead on the feedthru capacitor (item 1) must be *carefully* bent at 90 degrees to prevent it from shorting to the bottom cover.
- When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.

Figure 14-18 A21, A22 Test Port Couplers



A21 Dual Directional Coupler (8753ET Only)

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- 5/16-inch open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap
- Small slot screwdriver

Removal

The dual directional coupler is replaced as a unit together with its mounting bracket and port connectors.

1. Turn the analyzer over onto its top and remove the bottom cover (refer to "Covers" on page 14-6).

NOTE In the following step you will be disconnecting some semi-rigid cables from the coupler. Note that there are three semi-rigid cables to remove on analyzers without Option 004, and only two cables to remove on analyzers with Option 004. Be sure to refer to the appropriate illustration on the next page.

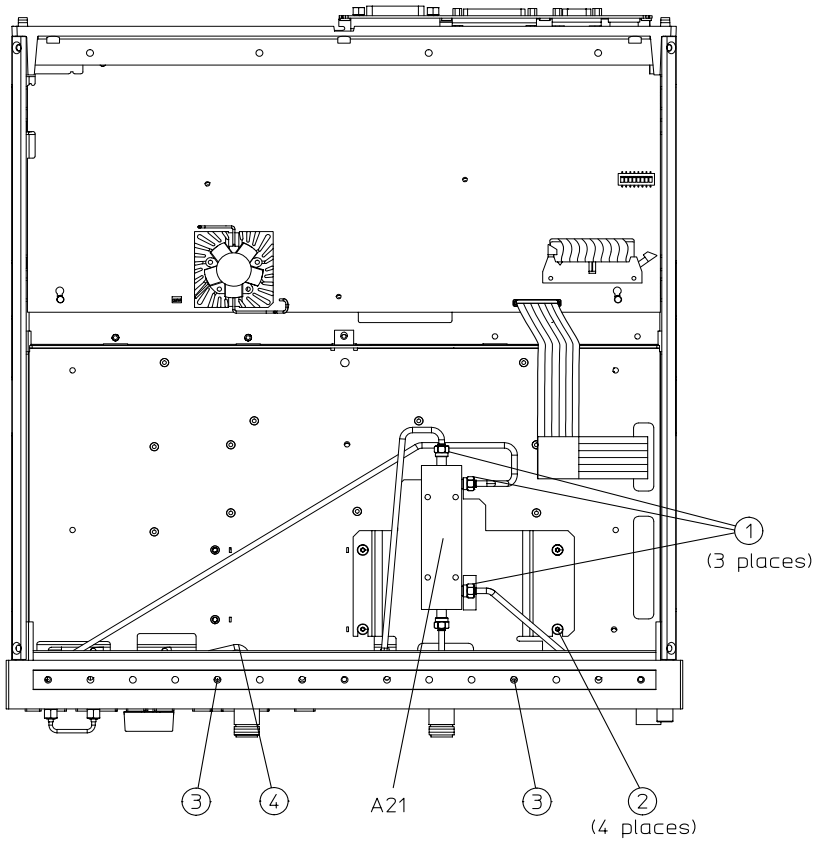
2. Refer to Figure 14-19. Use the 5/16-inch open-end wrench to disconnect the semi-rigid cables (item 1) from the dual directional coupler and from the rear of the transmission port connector.
3. Remove the four screws (item 2) that attach the coupler bracket to the test set deck.
4. Remove the two screws (item 3) that secure the coupler bracket to the lower lip of the front frame.
5. Slide the coupler/bracket assembly towards the rear of the instrument. This will allow room for the open-end wrench to remove the semi-rigid cable from the rear of the transmission port connector (item 4).
6. Lift the coupler bracket over the four studs in the test set deck, then slide the bracket down and back to remove the coupler assembly from the analyzer.

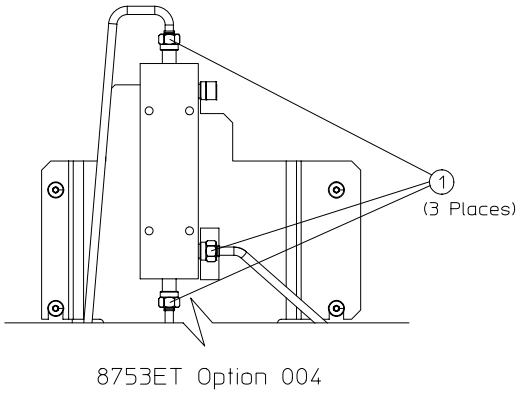
Replacement

1. Reverse the order of the removal procedure.

NOTE When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.

Figure 14-19 A21 Dual Directional Coupler





A23 LED Board (8753ES Only)

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- small slot screwdriver
- ESD (electrostatic discharge) grounding wrist strap
- 5/16-inch open-end torque wrench (set to 10 in-lb)

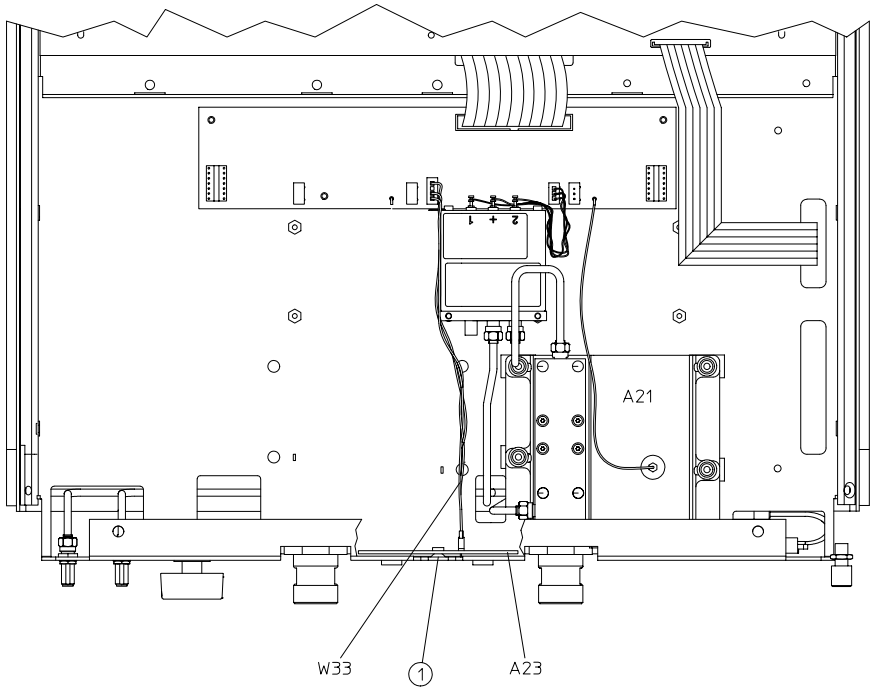
Removal

1. Disconnect the power cord and remove the bottom cover (refer to "Covers" on page 14-6).
2. Remove the front panel (refer to "Front Panel Assembly" on page 14-8).
3. Remove the A22 test port coupler (refer to "A21, A22 Test Port Couplers (8753ES Only)" on page 14-40).
4. Refer to Figure 14-20. Disconnect W33 from the LED board (A23).
5. Remove the screw (item 1) from the front of the test set deck.
6. Remove the LED board (A23).

Replacement

1. Reverse the order of the removal procedure.

Figure 14-20 A23 LED Board



A24 Transfer Switch (8753ES Only)

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- 5/16-inch open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

Removal

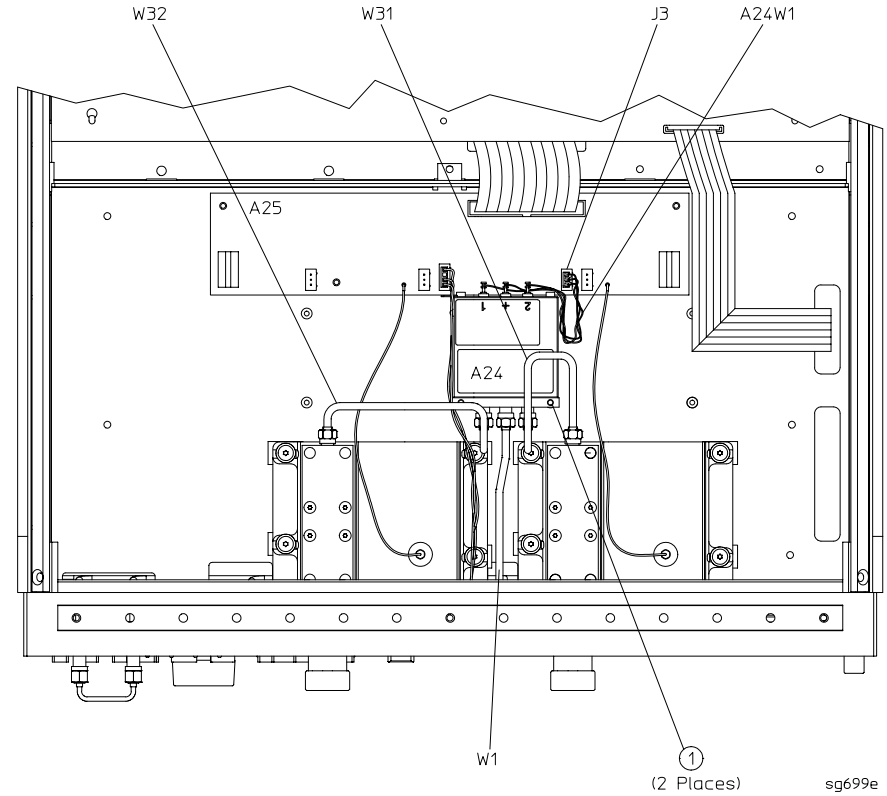
1. Disconnect the power cord and remove the bottom cover (refer to "Covers" on page 14-6).
2. Refer to Figure 14-21. Disconnect A24W1 from J3 on the test set interface board (A25).
3. Disconnect the three semirigid cables (W1, W31, and W32) from the transfer switch (A24).
4. Remove the two screws (item 1) that secure the transfer switch to the test set deck.

Replacement

1. Reverse the order of the removal procedure.

NOTE When reconnecting semirigid cables, it is recommended that the connections be torqued to 10 in-lb.

Figure 14-21 A24 Transfer Switch



A25 Test Set Interface (8753ES Only)

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- 5/16-inch open-end torque wrench (set to 10 in-lb)
- ESD (electrostatic discharge) grounding wrist strap

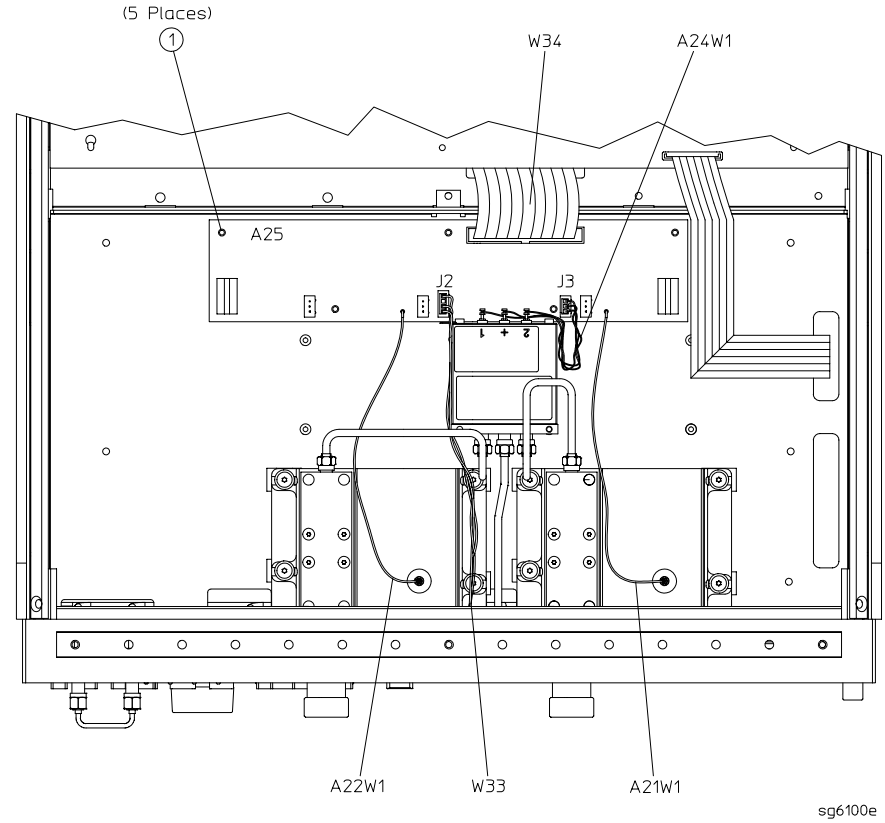
Removal

1. Disconnect the power cord and remove the bottom cover (refer to "Covers" on page 14-6).
2. Refer to Figure 14-22. Disconnect all cables and wires (A21W1, A22W1, W33, and W34) from the test set interface board (A25).
3. Remove the five screws (item 1) that secure the test set interface board.

Replacement

1. Reverse the order of the removal procedure.

Figure 14-22 A25 Test Set Interface



A26 High Stability Frequency Reference (Option 1D5) Assembly

Tools Required

- T-10 TORX screwdriver
- T-15 TORX screwdriver
- 9/16-inch hex-nut driver
- ESD (electrostatic discharge) grounding wrist strap

Removal

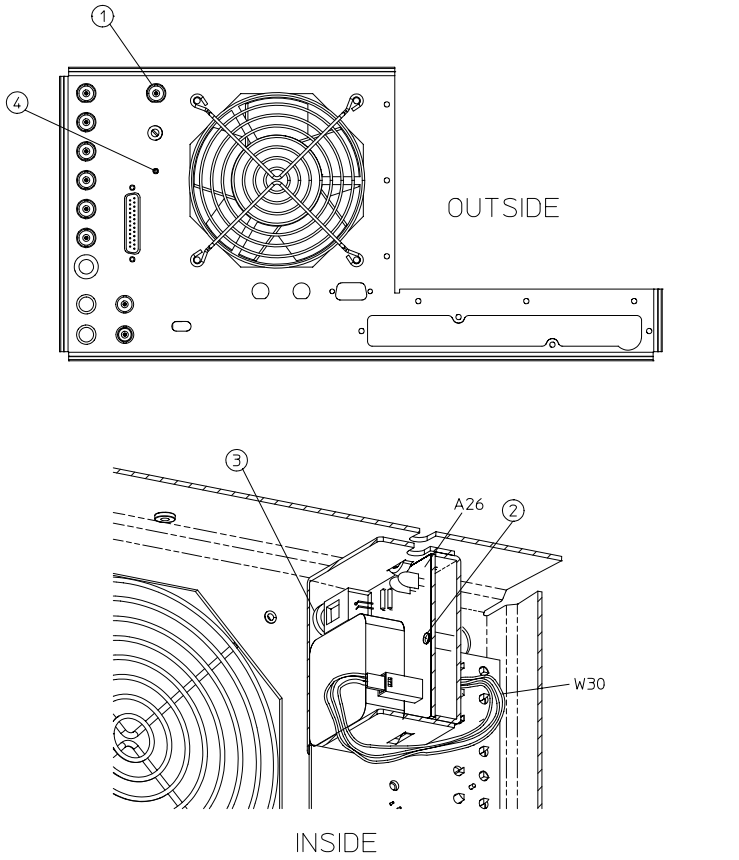
1. Remove the rear panel (refer to "Rear Panel Assembly" on page 14-14).
2. Refer to Figure 14-23. Disconnect W30 from the high stability frequency reference board (A26).
3. Remove the BNC connector nut and washer from the 10 MHz PRECISION REFERENCE connector (item 1) on the rear panel.
4. Remove the screw (item 4) that attaches the 1D5 assembly to the rear panel.
5. Remove the screw (item 2) that secures the high stability frequency reference board (A26) to the bracket.
6. Slide the board out of the bracket. Be careful not to lose the plastic spacer washer (item 3) that is on the BNC connector as the board is being removed.

Replacement

1. Reverse the order of the removal procedure.

NOTE Before reinserting the high stability frequency reference board (A26) into the bracket, be sure the plastic spacer washer (item 3) is on the BNC connector.

Figure 14-23 A26 High Stability Frequency Reference (Option 1D5) Assembly



B1 Fan Assembly

Tools Required

- 2.5-mm hex-key driver
- T-10 TORX screwdriver
- T-15 TORX screwdriver
- ESD (electrostatic discharge) grounding wrist strap

Removal

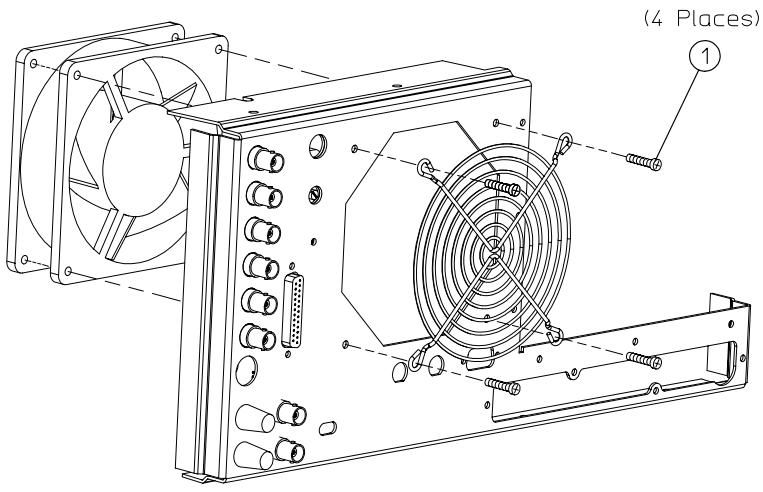
1. Remove the rear panel (refer to "Rear Panel Assembly" on page 14-14).
2. Refer to Figure 14-24. Remove the four screws (item 1) that secure the fan and fan cover to the rear panel.

Replacement

1. Reverse the order of the removal procedure.

NOTE The fan should be installed so that the direction of the air flow is away from the instrument. There is an arrow on the fan chassis indicating the air flow direction.

Figure 14-24 B1 Fan Assembly



Post-Repair Procedures

Table 3-1 on page 3-3 lists the additional service procedures which you must perform to ensure that the analyzer is working correctly, following the replacement of an assembly.

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

15 Safety and Regulatory Information

General Information

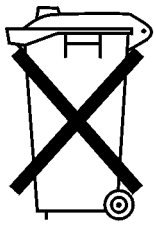
Maintenance

Clean the cabinet, using a dry or damp cloth only.

WARNING **To prevent electrical shock, disconnect the analyzer from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

Lithium Battery Disposal

If the battery on the CPU board (A9) needs to be disposed of, dispose of it in accordance with your country's requirements. If required, you may return the battery to Agilent Technologies for disposal. Refer to "Contacting Agilent" on page 15-3 for assistance.



DO NOT THROW BATTERIES AWAY BUT
COLLECT AS SMALL CHEMICAL WASTE.

sk780a

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For any assistance, contact your nearest Agilent Technologies Sales and Service Office. Refer to "Contacting Agilent" on page 15-3.

Shipment for Service

If you are sending the instrument to Agilent Technologies for service, ship the analyzer to the nearest Agilent service center for repair. (Refer to "Contacting Agilent" on page 15-3.) Include a description of any failed test and any error message. Ship the analyzer using the original or comparable antistatic packaging materials.

Contacting Agilent

Online assistance: www.agilent.com/find/assist

Americas			
Brazil *(tel)* (+55) 11 4197 3700 *(fax)* (+55) 11 4197 3800	**Canada** *(tel)* 888 447 7378	**Mexico** *(tel)* 1 800 734 7703 *(fax)* 1 800 734 7704	**United States** *(tel)* 800 829 4444 *(alt)* (+1) 303 662 3998 *(fax)* 800 829 4433
Asia Pacific and Japan			
Australia (*tel*) 1 800 225 574 (*alt*) 1 800 893 449 (*fax*) 1 800 681 776 (*fax*) 1 800 225 539	**China** (*tel*) 800 810 0508 (*alt*) 800 810 0510 (*fax*) 800 810 0507 (*fax*) 800 810 0362	**Hong Kong** (*tel*) 800 933 229 (*fax*) 800 900 701	**India** (*tel*) 1600 112 929 (*alt*) 1600 112 626 (*fax*) 1600 112 727 (*fax*) 1600 113 040
Japan (Bench) (*tel*) 0120 32 0119 (*alt*) (+81) 426 56 7799 (*fax*) 0120 01 2144	**Japan (On-Site)** (*tel*) 0120 802 363 (*alt*) (+81) 426 56 7498 (*fax*) (+81) 426 60 8953	**Singapore** (*tel*) 1 800 275 0880 (*fax*) (+65) 6836 0240 (*fax*) (+65) 6755 1235 (*fax*) (+65) 6755 1214	**South Korea** (*tel*) 080 770 7774 (*tel*) 080 778 0011 (*tel*) 080 778 0012 (*alt*) +65 270 1207 (*fax*) 080 778 0013 (*fax*) +82 080 778-0014 (*fax*) 080 770 7778
Taiwan (*tel*) 0800 047 661 (*tel*) 0800 047 669 (*fax*) 0800 047 667	**Thailand** (*tel*) 1 800 2758 5822 (*alt*) (+66) 259 3442 (*fax*) 1 800 656 336	**Malaysia** (*tel*) 1800 880 399 (*fax*) 1800 801 054	
Europe			
Austria (*tel*) 0820 87 44 11* (*fax*) 0820 87 44 22	**Belgium** (*tel*) (+32) (0)2 404 9340 (*alt*) (+32) (0)2 404 9000 (*fax*) (+32) (0)2 404 9395	**Denmark** (*tel*) (+45) 7013 1515 (*alt*) (+45) 7013 7313 (*fax*) (+45) 7013 1555	**Finland** (*tel*) (+358) 10 855 2100 (*fax*) (+358) 10 855 2923
France (*tel*) 0825 010 700* (*alt*) (+33) (0)1 6453 5623 (*fax*) 0825 010 701*	**Germany** (*tel*) 01805 24 6333* (*alt*) 01805 24 6330* (*fax*) 01805 24 6336*	**Ireland** (*tel*) (+353) (0)1 890 924 204 (*alt*) (+353) (0)1 890 924 206 (*fax*)(+353) (0)1 890 924 024	**Israel** (*tel*) (+972) 3 9288 500 (*fax*) (+972) 3 9288 501
Italy (*tel*) (+39) (0)2 9260 8484 (*fax*) (+39) (0)2 9544 1175	**Luxemburg** (*tel*) (+32) (0)2 404 9340 (*alt*) (+32) (0)2 404 9000 (*fax*) (+32) (0)2 404 9395	**Netherlands** (*tel*) (+31) (0)20 547 2111 (*alt*) (+31) (0)20 547 2000 (*fax*) (+31) (0)20 547 2190	**Russia** (*tel*) (+7) 095 797 3963 (*alt*) (+7) 095 797 3900 (*fax*) (+7) 095 797 3901
Spain (*tel*) (+34) 91 631 3300 (*alt*) (+34) 91 631 3000 (*fax*) (+34) 91 631 3301	**Sweden** (*tel*) 0200 88 22 55* (*alt*) (+46) (0)8 5064 8686 (*fax*) 020 120 2266*	**Switzerland (French)** (*tel*) 0800 80 5353 opt. 2* (*alt*) (+33) (0)1 6453 5623 (*fax*) (+41) (0)22 567 5313	**Switzerland (German)** (*tel*) 0800 80 5353 opt. 1* (*alt*) (+49) (0)7031 464 6333 (*fax*) (+41) (0)1 272 7373
Switzerland (Italian) (*tel*) 0800 80 5353 opt. 3* (*alt*) (+39) (0)2 9260 8484 (*fax*) (+41) (0)22 567 5314	**United Kingdom** (*tel*) (+44) (0)7004 666666 (*alt*) (+44) (0)7004 123123 (*fax*) (+44) (0)7004 444555		
(tel) = primary telephone number; *(alt)* = alternate telephone number; *(fax)* = FAX number; * = in country number 5/04			

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.
	The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)
	The CSA mark is a registered trademark of the Canadian Standards Association.
ISM1-A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.
ICES / NMB-001	This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).
	The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.

Compliance with German FTZ Emissions Requirements

This network analyzer complies with German FTZ 526/527 Radiated Emissions and Conducted Emission requirements.

Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrerordnung–3. GSGV Deutschland).

Acoustic Noise Emission/Geraeuschemission	
LpA <70 dB	Lpa <70 dB
Operator Position	am Arbeitsplatz
Normal Operation	normaler Betrieb
per ISO 7779	nach DIN 45635 t. 19

Safety Symbols

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

CAUTION	Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, would result in damage to or destruction of the instrument. Do not proceed beyond a caution note until the indicated conditions are fully understood and met.

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

Safety Considerations

NOTE	This instrument has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronics Measuring Apparatus, and has been supplied in a safe condition. This instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

Safety Earth Ground

WARNING	**This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.**

WARNING	**Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.**

Before Applying Power

CAUTION The front panel LINE switch disconnects the mains circuits from the mains supply after the EMC filters and before other parts of the instrument.

CAUTION Before switching on this instrument, make sure that the analyzer line voltage selector switch is set to the voltage of the power supply and the correct fuse is installed.

CAUTION If this product is to be energized via an autotransformer make sure the common terminal is connected to the neutral (grounded side of the mains supply).

General

WARNING **To prevent electrical shock, disconnect the analyzer from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

WARNING **If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

CAUTION VENTILATION REQUIREMENTS: When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4° C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater that 800 watts, then forced convection must be used.

WARNING **Install the instrument according to the enclosure protection provided. This instrument does not protect against the ingress of water. This instrument protects against finger access to hazardous parts within the enclosure.**

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 **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended. Discard used batteries according to manufacturer's instructions.**

WARNING **The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.**

WARNING **For continued protection against fire hazard, replace line fuse only with same type and rating (115 V operation: T 5A 125V UL/CSA; 230V operation: T 4A H 250V IEC). The use of other fuses or materials is prohibited.**

Index

Symbols

+5 V digital supply
theory of operation, 12-7

Numerics

10 MHz HI OUT Waveform from A14J1, 7-21
10 MHz precision reference assembly replacement, 14-50
100 kHz pulses, 7-14
1st LO signal at sampler/mixer, 8-10
25 MHz HI OUT Waveform from A14J1, 7-21
2nd IF (4 kHz) signal locations, 8-9
2nd LO locations, 8-11
2ND LO waveforms, 7-17
4 kHz signal check, 8-9
4 MHz REF signal check, 8-6
4 MHz reference signal, 7-16
60 MHz HI OUT Waveform from A14J1, 7-22
75 ohm impedance option, 1-9
8753E adjustments, 3-1
8753ES block diagram, 4-23

A

A and B input traces check, 4-17
A1/A2 front panel troubleshooting, 6-12
A2 front panel processor digital control, 12-11
A3 source
and A11 phase lock check, 7-8
external source mode, 12-20
frequency offset, 12-19
harmonic analysis, 12-19
high band theory, 12-17
low band theory, 12-15
operation in other modes, 12-19
source, 12-15
super low band theory, 12-15
theory of operation, 12-3
tuned receiver mode, 12-22
A4 sampler/mixer, 12-27
A4 sampler/mixer check, 7-8
A5 sampler/mixer, 12-27
A6 sampler/mixer, 12-27
A7 pulse generator check, 7-25
A7 pulse generator source, 12-14
A8 post regulator
air flow detector, 12-7
display power, 12-8
fuses and voltages, 5-13
green LEDs, 12-7
probe power, 12-8
shutdown circuit, 12-8
test points, 5-6
theory of operation, 12-7
variable fan circuit, 12-8
A9 CPU
digital control, 12-11
operation check, 6-5
A10 assembly signals required, 8-7
A10 check by substitution or signal examination, 8-7
A10 digital IF, 10-28, 12-27
digital control, 12-11
A11 input signals, 7-29
A11 phase lock, 10-29
source, 12-14
A11 phase lock and A3 source check, 7-8
A11 phase lock check, 7-28
A12 digital control signals check, 7-18
A12 reference, 10-35
source, 12-14
A12 reference check, 7-12
A13 frac-N analog
source, 12-14
A13/A14 Fractional-N Check, 7-20
A14 Divide-by-N Circuit Check, 7-23
A14 Frac-N digital source, 12-14
A14 fractional-N (digital), 10-38
A14 generated digital control signals, 7-24
A14 VCO exercise, 7-22
A14-to-A13 digital control signals check, 7-23
A15 preregulator
check, 5-10
theory of operation, 12-5
A15W1 plug detail, 5-11
A16 rear panel
digital control, 12-13
A18 display
digital control, 12-12
power, 12-8
A19 GSP digital control, 12-12
A21 test port coupler, 12-25
A22 test port coupler, 12-25
A23 LED front panel, 12-25
A24 transfer switch, 12-25
A25 test set interface, 12-25
A27 inverter digital control, 12-13
abbreviation definitions, 13-62
ABUS Cor., 10-12
ABUS node 16 for power check, 4-15
ABUS test, 10-10
accessories
error message check, 4-22
inspection, 9-4
troubleshooting, 4-22
troubleshooting chapter, 9-1
accuracy of frequency adjustment, 3-43
adapters, 1-3
ADC Hist., 10-10
ADC Lin., 10-9
ADC main, 10-20
ADC offset correction constants adjustment, 3-15
ADC Ofs., 10-9
ADC Ofs. Cor., 10-12
ADD, 10-7
addresses for GPIB systems, 4-8
adjustment
A9 switch positions, 3-6
ADC offset correction constants (test 52), 3-15
analog bus correction constants (test 46), 3-9
cavity oscillator frequency correction constants (test 54), 3-26
fractional-N frequency range, 3-40
fractional-N spur avoidance and FM sideband, 3-49
frequency accuracy, 3-43
high/low band transition, 3-47
IF amplifier correction constants (test 51), 3-14
initialize EEPROM's (test 58), 3-33
option numbers correction constants (test 56), 3-32
RF output power correction constants (test 47), 3-11
sampler magnitude and phase correction constants (test 53), 3-16
sequences for mechanical adjustments, 3-55
serial number correction constants (test 55), 3-31
source default correction constants (test 44), 3-7
source pretune correction constants (test 48), 3-10
source pretune default correction constants (test 45), 3-8

Index

source spur avoidance tracking, 3-52
tests, 10-4
ADJUSTMENT TESTS, 10-6
adjustments, 3-1
air flow detector, 12-8
ALC ON OFF, 10-17
ALL INT, 10-8
Alter and Normal switch position adjustment, 3-6
amplifier (IF) adjustment, 3-14
ANALOG BUS, 10-21
analog bus, 10-20
codes, 10-43
correction constants adjustment, 3-9
reference frequencies check, 7-13
YO coil drive check, 7-11
analog bus node 1, 10-23
analog bus node 10, 10-29
analog bus node 11, 10-29
analog bus node 12, 10-29
analog bus node 13, 14, 10-30
analog bus node 15, 10-31
analog bus node 16, 10-32
analog bus node 17, 10-33
analog bus node 18, 10-34
analog bus node 19, 10-34
analog bus node 2, 10-24
analog bus node 20, 10-35
analog bus node 21, 10-35
analog bus node 22, 10-35
analog bus node 23, 10-36
analog bus node 24, 10-37
analog bus node 25, 10-37
analog bus node 26, 10-37
analog bus node 27, 10-38
analog bus node 28, 10-38
analog bus node 29, 10-38
analog bus node 3, 10-25
analog bus node 30, 10-39
analog bus node 4, 10-26
analog bus node 5, 10-26
analog bus node 6, 10-27
analog bus node 7, 10-28
analog bus node 8, 10-28
analog bus node 9, 10-29
analog bus nodes, 10-22
A3, 10-22
analog in menu, 10-21
analyzer
adjustments, 3-1
block diagram, 4-23
GPIB addresses, 4-8
options available, 1-8
spectrum, 1-3
theory of operation, 12-1
and, 3-1
antistatic wrist strap, 1-2
antistatic wrist strap cord, 1-2
appendix for source group troubleshooting, 7-30
assembly replacement, 14-1
A10 digital IF, 14-22
A11 phase lock, 14-22
A12 reference, 14-22
A13 frac-N analog, 14-22
A14 frac-N digital, 14-22
A15 preregulator, 14-28
A17 motherboard, 14-30
A19 graphics processor, 14-34
A20 disk drive, 14-36
A21 dual directional coupler, 14-42
A21 test port couplers, 14-40
A22 test port couplers, 14-40
A23 LED board, 14-44
A24 transfer switch, 14-46
A25 test set interface, 14-48
A26 high stability frequency reference, 14-50
A3 source, 14-18
A4 R-sampler, 14-20
A5 A-sampler, 14-20
A6 B-sampler, 14-20
A7 pulse generator, 14-20
A8 post regulator, 14-22
A9 CPU, 14-24
A9BT1 battery, 14-26
B1 fan, 14-52
covers, 14-6
display, 14-12
display lamp, 14-12
front panel, 14-8
front panel interface, 14-10
keypad, 14-10
line fuse, 14-5
rear panel, 14-14
rear panel interface, 14-16
attenuator
fixed, 1-3
theory of operation, 12-4
available options, 1-8

B

B and A inputs check, 8-4
background intensity check for display, 6-7
backup EEPROM disk, 3-34
bad cables, 9-2
band (high/low) transition adjustment, 3-47
BATTERY FAILED. STATE MEMORY CLEARED, 10-44
BATTERY LOW. STORE SAVE REGS TO DISK, 10-44
block diagram, 4-23
digital control group, 6-3
power supply, 5-4
broadband power problems, 7-31
built-in test set, 12-25
LED front panel, 12-25
test port couplers, 12-25
test set interface, 12-25
transfer switch, 12-25
bus nodes, 10-22
bus, analog, 10-20

C

cable inspection, 6-15
cable test, 9-6
cables, 1-4
CAL FACTOR SENSOR A, 10-6
CAL FACTOR SENSOR B, 10-6
CALIBRATION ABORTED, 10-44
calibration coefficients, 11-1
calibration device inspection, 9-4
calibration kit, 2-3
7 mm, 50 W, 1-3
device verification, 9-5
Type-N, 50 ohm, 1-3
CALIBRATION REQUIRED, 10-44
calibration, certificate, 2-4
care of connectors, 1-7
CAUTION
OVERLOAD ON INPUT A, POWER REDUCED, 8-4
OVERLOAD ON INPUT B, POWER REDUCED, 8-4
OVERLOAD ON INPUT R, POWER REDUCED, 8-4
Cav osc Cor., 10-12
cavity oscillator frequency adjustment, 3-26
cavity oscillator frequency correction constants adjustment, 3-26
CC procedures
ADC offset (test 52), 3-15
analog bus (test 46), 3-9
cavity oscillator frequency (test 54), 3-26
IF amplifier (test 51), 3-14
initialize EEPROM's (test 58), 3-33
option numbers (test 56), 3-32

Index

retrieve correction constant data from EEPROM backup disk, 3-35
RF output power (test 47), 3-11
sampler magnitude (test 53), 3-16
source default (test 44), 3-7
source pretune (test 48), 3-10
source pretune default (test 45), 3-8
unprotected hardware option numbers, 3-54
center conductor damage, 9-4
certificate of calibration, 2-4
check
1st LO signal at sampler/mixer, 8-10
4 MHz REF signal, 8-6
A and B input traces, 4-17
A and B inputs, 8-4
A1/A2 front panel, 6-12
A3 source and A11 phase lock, 7-8
A4 sampler/mixer, 7-8
A7 pulse generator, 7-25
A8 fuses and voltages, 5-13
A9 CPU control, 6-5
A10 by substitution or signal examination, 8-7
A11 phase lock, 7-28
A12 digital control signals, 7-18
A13/A14 Fractional-N, 7-20
A13/A14 fractional-N, 7-20
A14 Divide-by-N Circuit Check, 7-23
A14-to-A13 digital control signals, 7-23
A15 Preregulator, 5-10
accessories error messages, 4-22
CPU control, 6-5
digital control, 4-12
disk drive, 4-9
fan voltages, 5-19
FN LO at A12, 7-16
for a faulty assembly, 5-11
GPIB systems, 4-8
line voltage, selector switch, fuse, 5-7
motherboard, 5-12
operating temperature, 5-12
operation of A9 CPU control, 6-5
phase lock error message, 7-6
phase lock error messages, 4-14
plotter or printer, 4-8
post regulator voltages, 5-6
power supply, 4-11
power up sequence, 4-12
preregulator LEDs, 4-11
rear panel LEDs, 4-11
receiver, 4-17
receiver error messages, 4-18
source, 4-14
the 4 kHz signal, 8-9
trace with sampler correction off, 8-10
YO coil drive with analog bus, 7-11
check front panel cables, 6-15
cleaning of connectors, 1-7
CLEAR LIST, 10-7
coax cable, 1-4
codes for analog bus, 10-43
coefficients, 11-1
comb tooth at 3 GHz, 7-26
components related to specific error terms, 9-5
compression test, 2-72, 2-75
configurable test set option, 1-8
connection techniques, 1-7
connector, care of, 1-7
CONTINUE TEST, 10-6
controller GPIB address, 4-8
controller troubleshooting, 4-9
conventions for symbols, 10-42
conventions, formatting, 1-iv
correction constants
ADC offset (test 52), 3-15
analog bus (test 46), 3-9
cavity oscillator frequency (test 54), 3-26
display intensity (test 45), 6-7
IF amplifier (test 51), 3-14
initialize EEPROMs (test 58), 3-33
option numbers (test 56), 3-32
retrieval from EEPROM backup disk, 3-35
RF output power (test 47), 3-11
sampler magnitude (test 53), 3-16
serial number (test 55), 3-31
source default (test 44), 3-7
source pretune (test 48), 3-10
source pretune default (test 45), 3-8
unprotected hardware option numbers, 3-54
CORRECTION CONSTANTS NOT STORED, 10-44
CORRECTION TURNED OFF, 10-44
counter, 10-20
COUNTER OFF, 10-21
counter readout location, 10-33
counter, frequency, 1-3
CPU
digital control, 12-11
operation check, 6-5
crosstalk test, 2-45, 2-127
CURRENT PARAMETER NOT IN CAL SET, 10-45

D

damage to center conductors, 9-4
data that is faulty, 4-18
DEADLOCK, 10-45
default correction constants adjustment for
source, 3-7
source pretune, 3-8
DELETE, 10-7
description of tests, 10-8
DEVICE
not on, not connect, wrong addrs, 10-45
diagnose softkey, 10-7
diagnostic
error terms, 11-1
LEDs for A15, 5-5
of analyzer, 4-5
routines for phase lock, 7-30
tests, 6-16
diagnostics, internal, 10-3
diagram
8753E, 4-23
A4 sampler/mixer to phase lock cable, 7-8
digital control group, 6-3
power supply, 5-4
DIF Control, 10-9
DIF Counter, 10-9
digital control
A1 front panel, 12-11
A2 front panel processor, 12-11
A9 CPU, 12-11
A10 digital IF, 12-11
A16 rear panel, 12-13
A18 display, 12-12
A19 GSP, 12-12
A27 inverter, 12-13
check, 4-12
digital signal processor, 12-12
EEPROM, 12-12
group block diagram, 6-3
lines observed using L INTCOP as trigger, 8-8
main CPU, 12-11
main RAM, 12-11
signals A14-to-A13 check, 7-23
signals check, 7-18

signals generated from A14, 7-24
theory of operation, 12-9
troubleshooting chapter, 6-1
digital data lines observed using L INTCOP as trigger, 8-8
digital IF, 10-28, 12-30
digital control, 12-11
digital voltmeter, 1-3
directivity (EDF and EDR), 11-6
disable shutdown circuit, 5-14
DISK
not on, not connected, wrong addrs, 10-45
disk drive
check, 4-9
external, GPIB address, 4-8
replacement, 14-38
DISK HARDWARE PROBLEM, 10-45
DISK MESSAGE LENGTH ERROR, 10-45
DISK READ/WRITE ERROR, 10-45
disk, floppy, 1-3
disk, verification, 2-5, 2-87
Disp 2 Ex., 10-12
Disp/cpu com., 10-13
display
digital control, 12-12
intensity, 6-7
power, 12-8
tests, 10-4, 10-13
DISPLAY TESTS, 10-5
displayed spurs with a filter, 3-28
DIV FRAC N, 10-22
Divide-by-N Circuit Check, 7-23
documentation map, 1-iv
DONE, 10-7
DRAM cell, 10-13
DSP ALU, 10-9
DSP Control, 10-9
DSP Intrpt, 10-9
DSP RAM, 10-9
DSP Wr/Rd, 10-9
dynamic accuracy test, 2-59

E

earth ground wire and static-control table mat, 1-2
edit list menu, 10-7
equipment
cavity oscillator frequency adjustment, 3-26
display intensity correction constants adjustment, 6-7
EEPROM backup disk procedure, 3-34
fractional-N frequency range adjustment, 3-40
fractional-N spur avoidance and FM sideband adjustment, 3-49
frequency accuracy adjustment, 3-43
high/low band transition adjustment, 3-47
IF amplifier correction constants adjustment, 3-14
required service, 1-1
RF output power correction constants adjustment, 3-11
sampler magnitude adjustment, 3-16
source spur avoidance tracking adjustment, 3-52
error
BATTERY FAILED. STATE MEMORY CLEARED, 10-44
BATTERY LOW. STORE SAVE REGS TO DISK, 10-44
CALIBRATION ABORTED, 10-44
CALIBRATION REQUIRED, 10-44
CORRECTION CONSTANTS NOT STORED, 10-44
CORRECTION TURNED OFF, 10-44
CURRENT PARAMETER NOT IN CAL SET, 10-45
DEADLOCK, 10-45
DEVICE
not on, not connected, wrong addrs, 10-45
DISK
not on, not connected, wrong addrs, 10-45
DISK HARDWARE PROBLEM, 10-45
DISK MESSAGE LENGTH ERROR, 10-45
DISK READ/WRITE ERROR, 10-45
INSTALLATION FAILED, 10-45
INSUFFICIENT MEMORY, PWR MTR CAL OFF, 10-45
NO CALIBRATION CURRENTLY IN PROGRESS, 10-46
NO FILE(S) FOUND ON DISK, 10-46
NO IF FOUND CHECK R INPUT LEVEL, 10-46
NO PHASE LOCK CHECK R INPUT LEVEL, 10-46
NO SPACE FOR NEW CAL. CLEAR REGISTERS, 10-46
NOT ALLOWED DURING POWER METER CAL, 10-46
NOT ENOUGH SPACE ON DISK FOR STORE, 10-46
OVERLOAD ON INPUT A, POWER REDUCED, 10-46, 10-47
OVERLOAD ON INPUT B, POWER REDUCED, 10-46
OVERLOAD ON INPUT R, POWER REDUCED, 10-47
PARALLEL PORT NOT AVAILABLE FOR COPY, 10-47
PARALLEL PORT NOT AVAILABLE FOR GPIO, 10-47
PHASE LOCK CAL FAILED, 10-47
PHASE LOCK LOST, 10-47
POSSIBLE FALSE LOCK, 10-47
POWER METER INVALID, 10-48
POWER METER NOT SETTLED, 10-48
POWER SUPPLY HOT!, 10-48
POWER SUPPLY SHUT DOWN!, 10-48
POWER UNLEVELED, 10-48
PRINTER
error, 10-48
not handshaking, 10-48
not on, not connected, wrong addrs, 10-48
PROBE POWER SHUT DOWN!, 10-48
PWR MTR
NOT ON/CONNECTED OR WRONG ADDRS, 10-49
SAVE FAILED.INSUFFICIENT MEMORY, 10-49
SELF TEST #n FAILED, 10-49
SOURCE POWER TURNED OFF, RESET UNDER POWER MENU, 10-49

SWEEP MODE CHANGED TO CW TIME SWEEP, 10-49
TROUBLE!CHECK SETUP AND START OVER, 10-49
WRONG DISK FORMAT, INITIALIZE DISK, 10-49
error correction procedure, 11-4
error messages, 10-1, 10-44
phase lock, 7-6
receiver failure, 8-4
error term inspection, 9-5
error terms, 11-1
directivity (EDF and EDR), 11-6
isolation (crosstalk EXF and EXR), 11-9
load match (ELF and ELR), 11-10
reflection tracking (ERF and ERR), 11-8
source match (ESF and ESR), 11-7
transmission tracking (ETF and ETR), 11-11
e-terms, 11-1
external source, 1-3
external source mode frequency range test, 2-17, 2-98
EXTERNAL TESTS, 10-5
external tests, 10-4, 10-10

F

failure
A1/A2 front panel, 6-12
A11 phase lock and A3 source check, 7-8
GPIB, 6-19
key stuck, 6-13
phase lock error, 7-6
receiver, 8-4
RF power from source, 7-5
fan
air flow detector, 12-8
speeds, 5-19
troubleshooting, 5-19
variable fan circuit, 12-8
voltages, 5-19
faulty analyzer repair, 4-3
faulty cables, 9-2
faulty calibration devices or connectors, 9-2
faulty data, 4-18
faulty group isolation, 4-10
filter, low pass, 1-3
firmware revision softkey, 10-41
floppy disk, 1-3
FM Coil plot with 3 point sweep, 7-29
FN Count, 10-10
FN LO at A12 check, 7-16
FN LO waveform at A12J1, 7-16
formatting conventions, 1-iv
Fr Pan Diag., 10-10
Fr Pan Wr/Rd, 10-9
FRAC N, 10-22
Frac N Cont., 10-9
frac-N analog source, 12-14
frac-N digital source, 12-14
FRACN TUNE mode HI OUT signal, 7-27
FRACN TUNE ON OFF, 10-17
fractional-N (digital), 10-38
Fractional-N Check, 7-20
fractional-N frequency range adjustment, 3-40
fractional-N frequency range adjustment sequence, 3-55
fractional-N spur avoidance and FM sideband adjustment, 3-49
fractional-N spur avoidance and FM sideband adjustment sequence, 3-55
frequency
accuracy adjustment, 3-43
counter, 1-3, 10-20
output in SRC tune mode, 7-9
range and accuracy test, 2-14, 2-96
range of fractional-N adjustment, 3-40
range, external source mode test, 2-17, 2-98
response test, 2-36, 2-122
front panel
digital control, 12-11
probe power voltages, 5-17
processor, digital control of, 12-11
troubleshooting, 6-12
front panel key codes, 6-13
functional group
fault isolation, 4-10
theory of operation, 12-5
fuse check, 5-7

G

GPIB
addresses, 4-8
cable, 1-4
failures, 6-19
mnemonic for service, 10-1
service mnemonic definitions, 10-42
system check, 4-8
green LEDs
A15 preregulator (power supply shutdown), 12-7
A8 post regulator, 12-7
GSP digital control, 12-12

H

H MB line, 7-24
hardkeys, 10-3
harmonic measurement accuracy test, 2-83
harmonics test, 2-78
HB FLTR SW ON OFF, 10-17
HI OUT signal in FRACN TUNE mode, 7-27
high band REF signal, 7-15
high quality comb tooth at 3 GHz, 7-26
high stability frequency reference assembly replacement, 14-50
high/low band transition
adjustment, 3-47
adjustment sequence, 3-55
how to
adjust
ADC offset correction constants, 3-15
analog bus correction constants, 3-9
cavity oscillator frequency correction constants, 3-26
fractional-N frequency range, 3-40
fractional-N spur avoidance and FM sideband, 3-49
frequency accuracy, 3-43
high/low band transition, 3-47
IF amplifier correction constants, 3-14
option numbers correction constants, 3-32
RF output power correction constants, 3-11
sampler magnitude correction constants, 3-16
serial number correction constants, 3-31
source default correction constants, 3-7
source pretune correction constants, 3-10
source pretune default correction constants, 3-8
source spur avoidance tracking, 3-52
the analyzer, 3-1

the analyzer using sequences, 3-55
backup the EEPROM disk, 3-34
check display intensity, 6-7
clean connectors, 1-7
identify the faulty functional group, 4-10
initialize EEPROMs, 3-33
load sequences from disk, 3-55
position the A9 switch, 3-6
repair the analyzer, 4-2
retrieve correction constant data from EEPROM backup disk, 3-35
set up high/low band transition adjustments, 3-56
set up the fractional-N frequency range adjustment, 3-55
set up the fractional-N spur avoidance and FM sideband adjustment, 3-56
troubleshoot, 4-2
broadband power problems, 7-31
the digital control group, 6-1
the receiver, 8-1
the source, 7-1

I

IF amplifier correction constants adjustment, 3-14
IF GAIN AUTO, 10-18
IF GAIN OFF, 10-19
IF GAIN ON, 10-18
IF Step Cor., 10-12
improper calibration technique, 9-2
Init EEPROM, 10-12
initial observations, 4-5
INITIALIZATION FAILED, 10-45
initialize EEPROMs, 3-33
input frequency response test, 2-36, 2-122
input noise floor level test, 2-32, 2-119
input traces check, 4-17
inputs (A and B) check, 8-4
inspect cables, 6-15
inspect error terms, 9-4
inspect the accessories, 9-4
inspection of test port connectors and calibration devices, 9-4
instrument markings, 15-4
instrument specifications, 2-2
INSUFFICIENT MEMORY, PWR MTR CAL OFF, 10-45
Inten DAC., 10-13
internal diagnostic tests, 6-16
internal diagnostics, 10-3
INTERNAL TESTS, 10-5
internal tests, 10-3
inverter digital control, 12-13
invoking tests remotely, 10-42
isolation (crosstalk, EXF and EXR), 11-9

K

key codes, 6-13
key conventions, 1-iv
keys
identifying stuck, 6-13
in service menu, 10-1
kit
calibration kit 7 mm, 50 W, 1-3
tool, 1-3
verification kit 7 mm, 1-3
kits
calibration and verification, 2-3

L

L ENREF line, 7-18
L HB and L LB Lines, 7-18
L INTCOP as trigger to observe control lines, 8-8
L INTCOP as trigger to observe data lines, 8-8
L LB and L HB Lines, 7-18
L LB and L HB lines, 7-19
LED front panel, 12-25
light occluder, 1-3
LIMITS NORM/SPCL, 10-6
line fuse check, 5-7
line voltage check, 5-7
LO (2ND) waveforms, 7-17
LO OUT waveform at A14J2, 7-22
load match (ELF and ELR), 11-10
location
diagnostic LEDs for A15, 5-5
post regulator test points, 5-6
power supply cable, 5-9
lock error, 7-6
LOSS/SNSR LISTS, 10-6
low band REF signal, 7-15
low pass filter, 1-3

M

magnitude
compression test, 2-72
dynamic accuracy test, 2-59
sampler mag. adjustment, 3-16
main ADC, 10-20
Main DRAM, 10-8
MAIN PWR DAC, 10-17
Main VRAM, 10-13
maintenance, 15-2
measurement calibration coefficients, 11-1
mechanical adjustment sequences, 3-55
memory
INSUFFICIENT MEMORY PWR MTR CAL OFF, 10-45
menu
analog in, 10-21
edit list, 10-7
peek/poke, 10-40
service keys, 10-3
service modes, 10-16
test options, 10-6
tests, 10-4
menus for service, 10-1
message
BATTERY FAILED. STATE MEMORY CLEARED, 10-44
BATTERY LOW! STORE SAVE REGS TO DISK, 10-44
CALIBRATION ABORTED, 10-44
CALIBRATION REQUIRED, 10-44
CORRECTION CONSTANTS NOT STORED, 10-44
CORRECTION TURNED OFF, 10-44
CURRENT PARAMETER NOT IN CAL SET, 10-45
DEADLOCK, 10-45
DEVICE
not on, not connected, wrong addrs, 10-45
DISK
not on, not connected, wrong addrs, 10-45
DISK HARDWARE PROBLEM, 10-45
DISK MESSAGE LENGTH ERROR, 10-45
DISK READ/WRITE ERROR, 10-45
INITIALIZATION FAILED, 10-45
INSUFFICIENT MEMORY, PWR MTR CAL OFF, 10-45
NO CALIBRATION IN PROGRESS, 10-46

NO FILE(S) FOUND ON DISK, 10-46
NO IF FOUND
CHECK R INPUT LEVEL, 10-46
NO PHASE LOCK
CHECK R INPUT LECEL, 10-46
NO SPACE FOR NEW CAL.
CLEAR REGISTERS, 10-46
NOT ALLOWED DURING
POWER METER CAL, 10-46
NOT ENOUGH SPACE ON
DISK FOR STORE, 10-46
OVERLOAD ON INPUT A,
POWER REDUCED, 10-46, 10-47
OVERLOAD ON INPUT B,
POWER REDUCED, 10-46
OVERLOAD ON INPUT R,
POWER REDUCED, 10-47
PARALLEL PORT NOT
AVAILABLE FOR COPY, 10-47
PARALLEL PORT NOT
AVAILABLE FOR GPIO, 10-47
PHASE LOCK CAL FAILED, 10-47
PHASE LOCK LOST, 10-47
POSSIBLE FALSE LOCK, 10-47
POWER METER INVALID, 10-48
POWER METER NOT
SETTLED, 10-48
POWER SUPPLY HOT!, 10-48
POWER SUPPLY SHUT
DOWN!, 10-48
POWER UNLEVELED, 10-48
PRINTER
error, 10-48
not handshaking, 10-48
not on, not connected, wrong addrs, 10-48
PROBE POWER SHUT
DOWN!, 10-48
PWR MTR
NOT ON/CONNECTED OR
WRONG ADDRS, 10-49
SAVE FAILED.
INSUFFICIENT
MEMORY, 10-49
SELF TEST #n FAILED, 10-49
SOURCE POWER TURNED
OFF, RESET UNDER
POWER MENU, 10-49
SWEEP MODE CHANGED TO
CW TIME SWEEP, 10-49
TROUBLE!CHECK SETUP
AND START OVER, 10-49
WRONG DISK FORMAT,
INITIALIZE DISK, 10-49
message for phase lock error, 7-6
messages, error, 10-1
meter, power, 1-3
microprocessor
theory of operation, 12-4
microwave connector care, 1-7
minimum R channel level test, 2-28, 2-114
mnemonic definitions, 10-42
mnemonics for service keys, 10-1
monitor ABUS node 16 for power, 4-15
motherboard check, 5-12

N

NO CALIBRATION
CURRENTLY IN
PROGRESS, 10-46
NO FILE(S) FOUND ON DISK, 10-46
NO IF FOUND
CHECK R INPUT LEVEL, 7-30, 10-46
NO PHASE LOCK
CHECK R INPUT LEVEL, 7-30, 10-46
NO SPACE FOR NEW CAL.
CLEAR REGISTERS, 10-46
nodes for analog bus, 10-22
noise floor level test, 2-32, 2-119
Normal and Alter switch position adjustment, 3-6
NOT ALLOWED DURING
POWER METER CAL, 10-46
number (option) adjustment, 3-32
number (serial) adjustment, 3-31

O

offset (ADC) adjustment, 3-15
open loop compared to phase locked output in SRC mode, 7-10
operating temperature check, 5-12
operation check of A9 CPU, 6-5
operation verification
post-repair, 3-3, 14-53
operator's check, 4-6
option numbers correction constants adjustment, 3-32
options
002 harmonic mode, 1-8
004 step attenuator, 1-8
006 6 GHz operation, 1-8
010 time domain, 1-8
011 receiver configuration, 1-8
014 configurable test set, 1-8
075 75 ohm impedance, 1-9
1CM rack mount flange kit without handles, 1-9
1CP rack mount flange kit with handles, 1-9
1D5 high stability frequency reference, 1-8
1D5, assembly replacement, 14-50
service and support, 1-10
oscilloscope, 1-3
oscilloscope check for reference frequencies, 7-14
output frequency
in SRC tune mode, 7-9
range and accuracy test, 2-14, 2-96
output power
level accuracy test, 2-19, 2-100
linearity test, 2-22, 2-102, 2-108
output/input harmonics test, 2-78
overall block diagram, 4-23
OVERLOAD ON INPUT A,
POWER REDUCED, 10-46, 10-47
OVERLOAD ON INPUT B,
POWER REDUCED, 10-46
OVERLOAD ON INPUT R,
POWER REDUCED, 10-47

P

P?, 10-48
PARRALLEL PORT NOT
AVAILABLE FOR COPY, 10-47
PARRALLEL PORT NOT
AVAILABLE FOR GPIO, 10-47
parts list
cables, 13-32, 13-34
cables (8753ES), 13-20, 13-22, 13-26, 13-30
cables (8753ET), 13-18, 13-24, 13-28
chassis, 13-56, 13-58
documentation, 13-59
front panel assembly, 13-36, 13-38

hardware, 13-46, 13-48, 13-49, 13-50, 13-51, 13-52, 13-53, 13-54, 13-55
major assemblies (8753ES), 13-12, 13-15
major assemblies (8753ET), 13-10, 13-14
major assemblies and cables (8753ES), 13-16
miscellaneous, 13-59
rear panel assembly, 13-40, 13-42, 13-44
tools, 13-59
upgrade kits, 13-59
patterns, test, 10-14
PEEK, 10-40
PEEK/POKE, 10-40
PEEK/POKE ADDRESS, 10-40
peek/poke menu, 10-40
performance test records
8753ES, 2-141
8753ET, 2-161
performance tests, 2-3
8753ES, 2-13
8753ET, 2-95
external source mode frequency range, 2-17, 2-98
harmonic measurement accuracy, 2-83
minimum R channel level, 2-28, 2-114
post-repair, 3-3
reflection test port output frequency range and accuracy, 2-96
reflection test port output power level accuracy, 2-100
system trace noise test, 2-56, 2-136
test port crosstalk, 2-45, 2-127
test port input frequency response, 2-36
test port input noise floor level, 2-32
test port output frequency range and accuracy, 2-14
test port output power level accuracy, 2-19
test port output power linearity test, 2-22, 2-102, 2-108
test port output/input harmonics, 2-78
test port receiver magnitude compression, 2-72
test port receiver magnitude dynamic accuracy, 2-59
test port receiver phase compression, 2-75
transmission test port input frequency response, 2-122
transmission test port input noise floor level, 2-119
uncorrected port performance, 2-50, 2-131
peripheral equipment
theory of operation, 12-4
peripheral GPIB addresses, 4-8
peripheral troubleshooting, 4-9
phase compression test, 2-75
phase lock, 10-29
A11 check, 7-28
and A3 source check, 7-8
source, 12-14
PHASE LOCK CAL FAILED, 7-30, 10-47
phase lock error, 7-6
message check, 4-14
messages, 7-30
PHASE LOCK LOST, 7-30, 10-47
phase locked output compared to open loop in SRC tune mode, 7-10
photometer probe, 1-3
PLL AUTO ON OFF, 10-18
PLL DIAG ON OFF, 10-18
PLL PAUSE, 10-18
plotter and printer check, 4-8
plotter GPIB address, 4-8
PLREF waveforms, 7-15
POKE, 10-40
Port 1 Op Chk., 10-10
Port 2 Op Chk., 10-10
port performance test, 2-50, 2-131
POSSIBLE FALSE LOCK, 10-47
Post Reg., 10-9
post regulator
air flow detector, 12-8
display power, 12-8
green LEDs, 12-7
probe power, 12-8
shutdown circuit, 12-8
test point locations, 5-6
theory of operation, 12-7
variable fan circuit, 12-8
post-repair procedures, 3-3
power from source, 7-5
power level accuracy test, 2-19, 2-100
power linearity test, 2-22, 2-102, 2-108
POWER LOSS, 10-6
power meter (GPIB), 1-3
power meter GPIB address, 4-8
POWER METER INVALID, 10-48
POWER METER NOT SETTLED, 10-48
power output check, 4-14
power problems (broadband), 7-31
power sensor, 1-3
power supply
block diagram, 5-4
cable location, 5-9
check, 4-11
functional group block diagram, 5-4
theory of operation, 12-6
troubleshooting, 5-1
POWER SUPPLY HOT!, 10-48
POWER SUPPLY SHUT DOWN!, 10-48
power supply shutdown
A15 green LED, 12-7
A15 red LED, 12-7
theory of operation, 12-7
POWER UNLEVELED, 10-48
power up sequence check, 4-12
precision frequency reference assembly replacement, 14-50
preregulated voltages
theory of operation, 12-7
preregulator
LED check, 4-11
theory of operation, 12-6
voltages, 5-10
PRESET, 10-8
preset sequence, 4-5, 6-13
Pretune Cor., 10-12
Pretune Def., 10-12
preventive maintenance, 11-1
principles of microwave connector care, 1-7
PRINTER
error, 10-48
not handshaking, 10-48
not on, no connected, wrong addrs, 10-48
printer, 1-3
printer GPIB address, 4-8
probe power, 12-8
PROBE POWER SHUT DOWN!, 10-48
probe power voltages, 5-17
probe, photometer, 1-3
procedure
A9 switch positions, 3-6
ADC offset correction constants (test 52), 3-15
analog bus correction constant (test 46), 3-9

Index

cavity oscillator correction constants (test 54), 3-26
EEPROM backup disk, 3-34
fractional-N frequency range adjustment, 3-40
fractional-N frequency spur avoidance FM sideband adjustment, 3-49
frequency accuracy adjustment, 3-43
high/low band transition adjustment, 3-47
IF amplifier correction constants (test 51), 3-14
initialize EEPROMs (test 58), 3-33
option numbers correction constant (test 56), 3-32
retrieve correction constant data from EEPROM backup disk, 3-35
RF output power correction constants (test 47), 3-11
sampler magnitude and phase correction constant (test 53), 3-16
sequences for mechanical adjustments, 3-55
serial number correction constant (test 55), 3-31
source default correction constant (test 44), 3-7
source pretune correction constant (test 48), 3-8
source pretune default correction constant (test 45), 3-8
source spur avoidance tracking adjustment, 3-52
spur search with a filter, 3-28
spur search without a filter, 3-29
unprotected hardware option numbers correction constants, 3-54
pulse generator (A7) check, 7-25
pulse generator source, 12-14
pulses, 100 kHz, 7-14
PWR LOSS, 10-6
PWR MTR
NOT ON/CONNECTED OR WRONG ADDRS, 10-49

R

R channel level test, 2-28, 2-114
rear panel
assembly replacement, 14-14
digital control, 12-13
LED check, 4-11
rear panel interface
assembly replacement, 14-16
receiver
check, 4-17
digital IF, 12-30
error messages, 4-18
failure error messages, 8-4
magnitude compression test, 2-72
magnitude dynamic accuracy test, 2-59
phase compression test, 2-75
sampler/mixer, 12-29
theory of operation, 12-4, 12-27
troubleshooting, 8-1
recertification, 2-5
RECORD ON OFF, 10-6
red LED on A15
power supply shutdown, 12-7
REF (4MHz) signal check, 8-6
REF signal At A11TP9, 7-15
reference (A12) check, 7-12
reference frequencies check using analog bus, 7-13
reference frequencies check using oscilloscope, 7-14
reference signal (4 MHz), 7-16
reference source, 12-14
reference, A12, 10-35
reflection test port output frequency range and accuracy test, 2-96
reflection test port output power level accuracy test, 2-100
reflection test port output power linearity test, 2-102, 2-108
removing the line fuse, 5-7
repair procedure, 4-2
REPEAT ON OFF, 10-6
replaceable parts
cables, 13-32, 13-34
cables (8753ES), 13-20, 13-22, 13-26, 13-30
cables (8753ET), 13-18, 13-24, 13-28
chassis, 13-56, 13-58
documentation, 13-59
front panel assembly, 13-36, 13-38
hardware, 13-46, 13-48, 13-49, 13-50, 13-51, 13-52, 13-53, 13-54, 13-55
major assemblies (8753ES), 13-12, 13-15
major assemblies (8753ET), 13-10, 13-14
major assemblies and cables (8753ES), 13-16
miscellaneous, 13-59
rear panel assembly, 13-40, 13-42, 13-44
tools, 13-59
upgrade kits, 13-59
required tools, 1-1
RESET MEMORY, 10-40
return analyzer for repair, 4-4
revision (firmware) softkey, 10-41
RF cable set, 1-4
RF output power correction constants adjustment, 3-11
RF power from source, 7-5
RGB outputs, 10-13
ROM, 10-8

S

SAMPLER COR ON OFF, 10-18
Sampler Cor., 10-12
sampler magnitude correction constants adjustment, 3-16
sampler/mixer, 12-29
2nd LO signal, 12-29
high band, 12-29
low band, 12-29
mixer circuit, 12-29
super low band, 12-29
SAVE FAILED. INSUFFICIENT MEMORY, 10-49
search for spurs with a filter, 3-28
search for spurs without a filter, 3-29
SEGMENT, 10-7
selector switch check, 5-7
Self diagnose softkey, 10-7
SELF TEST #n FAILED, 10-49
self-test, 4-5
sensor, power, 1-3
sequence
fractional-N spur avoidance and FM sideband adjustment, 3-56
sequence check for power up, 4-12
sequence contents, 3-56
fractional-N avoidance and FM sideband adjustment, 3-58
fractional-N frequency range adjustment, 3-57
high/low band transition adjustment, 3-56
VCO adjustment, 3-57

sequences
  fractional-N frequency range adjustment, 3-55
  high/low band transition adjustment, 3-56
Serial Cor., 10-12
serial number correction constants adjustment, 3-31
service and support options, 1-10
service center procedure, 4-4
service features, 10-16
service key menus, 10-1
  service features, 10-16
service key mnemonics, 10-1
service mnemonics definitions, 10-42
SERVICE MODES, 10-17
service test equipment, 1-3
service tools list, 1-2
servicing the analyzer, 4-4
setup
  cavity oscillator frequency correction constant routine, 3-27
  fractional-N spur avoidance and FM sideband adjustment, 3-49
  frequency accuracy adjustment, 3-44
  insertion loss measurement, 3-18
  intensity check, 6-8
  phase lock error troubleshooting, 7-6
  RF output correction constants, 3-13
  sampler correction routine, 3-21
  source power check, 4-15
setup check for disk drive, 4-9
setup check for plotter or printer, 4-8
shipment for service, 15-2
short and open device verification, 9-6
shutdown circuit
  A8 post regulator, 12-8
shutdown circuitry disable, 5-14
signal examination for phase lock, 7-29
signal separation
  built-in test set, 12-25
  theory of operation, 12-25
signals required for A10 assembly operation, 8-7
SLOPE DAC, 10-17
softkeys, 10-3
source
  A3 source, 12-15
  A7 pulse generator, 12-14
  and A11 phase lock check, 7-8
  A11 phase lock, 12-14
  A12 reference, 12-14
  A13 frac-N analog, 12-14
  A14 frac-N digital, 12-14
  attenuator, theory of operation, 12-4
  check, 4-14
  default correction constant adjustment, 3-7
  external source mode, 12-20
  frequency offset, 12-19
  group assemblies, 7-1
  group troubleshooting appendix, 7-30
  harmonic analysis, 12-19
  high band theory, 12-17
  low band theory, 12-15
  match (ESF and ESR), 11-7
  operation in other modes, 12-19
  power, 7-5
  pretune correction constants adjustment, 3-10
  pretune default correction constants adjustment, 3-8
  spur avoidance tracking adjustment, 3-52
  super low band theory, 12-15
  theory of operation, 12-3, 12-14
  troubleshooting, 7-1
  tuned receiver mode, 12-22
Source Cor. (source correction test), 10-12
Source Def. (source default test), 10-12
SOURCE PLL ON OFF, 10-17
SOURCE POWER TURNED OFF, RESET UNDER POWER MENU, 10-49
source, external, 1-3
specifications
  instrument, 2-2
  system, 2-2
spectrum analyzer, 1-3
speed, fan, 5-19
spikes display (acceptable versus excessive), 3-53
SPUR AVOID ON OFF, 10-19
spur avoidance and FM sideband adjustment, 3-49
spur avoidance tracking adjustment, 3-52
spur search with a filter, 3-28
spur search without a filter, 3-29
SPUR TEST ON OFF, 10-19
spurs displayed with a filter, 3-28
SRAM RAM, 10-8
SRC ADJUST DACS, 10-17
SRC ADJUST MENU, 10-17
SRC TUNE FREQ, 10-17
SRC tune mode frequency output, 7-9
SRC tune mode phase locked output compared to open loop, 7-10
SRC tune mode waveform integrity, 7-9
SRC TUNE ON OFF, 10-17
stable HI OUT signal in FRACN TUNE mode, 7-27
Start Troubleshooting chapter, 4-2
static-control table mat and earth ground wire, 1-2
status terms for test, 10-4
step attenuator option, 1-8
STORE EEPR ON OFF, 10-19
stuck keys, identifying using LED patterns, 6-13
support and service options, 1-10
SWEEP MODE CHANGED TO CW TIME SWEEP, 10-49
Sweep Trig., 10-9
switch position adjustment, 3-6
symbol conventions, 10-42
Sys Ver Init., 10-11
SYS VER TESTS, 10-5
system specifications, 2-2
system trace noise test, 2-56, 2-136
system verification, 2-3, 2-5
  8753ES, 2-5
  8753ET, 2-87
  post-repair, 3-3, 14-53
  tests, 10-4, 10-11

T

temperature check, 5-12
terms for test status, 10-4
test 44, 3-7, 10-12
test 45, 3-8, 10-12
test 46, 3-9, 10-12
test 47, 3-11, 10-12
test 48, 3-10, 10-12
test 50, 10-12
test 51, 3-14, 10-12
test 52, 3-15, 10-12
test 53, 3-16, 10-12
test 54, 3-26, 10-12
test 55, 3-31, 10-12
test 56, 3-32, 10-12

test 57, 10-12
test 58, 3-33, 10-12
test 59, 10-13
test 60, 10-13
test 61, 10-13
test 62, 10-13
test 63, 10-13
test 64, 10-13
test 65, 10-13
test 66, 10-14
test 67–69, 10-14
test 70, 10-14
test 71, 10-14
test 72, 10-14
test 73, 10-14
test 74, 10-14
test 75, 10-14
test 76, 10-14
test 77, 10-15
test 78, 10-15
test 79–80, 10-15
TEST ABORTED, 10-49
test descriptions, 10-8
test equipment for service, 1-3
TEST OPTIONS, 10-3
test options menu, 10-6
test patterns, 10-4, 10-14
  Pattern 1., 10-14
  Pattern 10., 10-14
  Pattern 11., 10-14
  Pattern 12., 10-15
  Pattern 13., 10-15
  Pattern 14–15., 10-15
  Pattern 2–4., 10-14
  Pattern 5., 10-14
  Pattern 6., 10-14
  Pattern 7., 10-14
  Pattern 8., 10-14
  Pattern 9., 10-14
test port
  connector inspection, 9-4
  couplers, 12-25
  crosstalk test, 2-45, 2-127
  input frequency response test, 2-36, 2-122
  input noise floor level test, 2-32, 2-119
  output frequency range and accuracy test, 2-96
  output power level accuracy test, 2-19, 2-100
  output power linearity test, 2-22, 2-102, 2-108
  output/input harmonics test, 2-78
  receiver magnitude compression test, 2-72
  receiver magnitude dynamic accuracy test, 2-59
  receiver phase compression test, 2-75
test records (8753ES), 2-141
test records (8753ET), 2-161
test set, 12-25
  interface, 12-25
  LED front panel, 12-25
  test port couplers, 12-25
  theory of operation, 12-3
  transfer switch, 12-25
test status terms, 10-4
tests
  adjustments, 10-12
  diagnostics, 6-16
  display, 10-13
  external, 10-10
  internal, 10-8
  menu, 10-4
  performance, 2-3
  performance (8753ES), 2-13
  performance (8753ET), 2-95
  system verification, 10-11
theory of operation, 12-1
  +5 V digital supply, 12-6
  A15 green LED, 12-7
  A15 preregulator, 12-6
  A15 red LED, 12-7
  A3 source, 12-4, 12-15
  A8 green LEDs, 12-7
  A8 post regulator, 12-7
  A8 shutdown circuit, 12-8
  air flow detector, 12-8
  digital control, 12-9
  display power, 12-8
  functional groups, 12-5
  line power module, 12-6
  microprocessor, 12-4
  peripheral equipment, 12-4
  power supply, 12-6
  power supply shutdown, 12-7
  preregulator voltages, 12-7
  probe power, 12-8
  receiver, 12-4, 12-27
  signal separation, 12-25
  source attenuator, 12-4
  test set, 12-4
  variable fan circuit, 12-8
tool kit, 1-3
tools for service, 1-2
trace noise test, 2-56, 2-136
trace with sampler correction on and off, 8-10
tracking for source spur avoidance adjustment, 3-52
transfer switch, 12-25
transmission test port input frequency response test, 2-122
transmission tracking (ETF and ETR), 11-11
TROUBLE!CHECK SETUP AND START OVER, 10-49
troubleshooting
  1st LO signal at sampler/mixer, 8-10
  A1/A2 front panel, 6-12
  A10 by substitution or signal examination, 8-7
  A11 phase lock, 7-28
  A11 phase lock and A3 source check, 7-8
  A12 reference, 7-12
  A13/A14 Fractional-N, 7-20
  A14 Divide-by-N Circuit Check, 7-23
  A15 preregulator, 5-10
  A7 pulse generator, 7-25
  accessories, 4-22, 9-1
  broadband power, 7-31
  diagnostics, 4-5
  digital control, 6-1
  disk drive, 4-9
  fan, 5-19
  faulty data, 4-21
  faulty group identification, 4-10
  first step, 4-2
  front panel, 6-12
  GPIB systems, 4-8
  phase lock error, 7-6
  plotters or printers, 4-8
  power supply, 5-1
  receiver, 8-1
  receiver error messages, 4-18
  self-test, 4-5
  source, 7-1
  source group appendix, 7-30
  start, 4-2
  systems with controllers, 4-9
  systems with multiple peripherals, 4-9
  when all inputs look bad, 8-5
  when one or more input looks good, 8-9
  YO coil drive check with analog bus, 7-11

U

uncorrected port performance test, 2-50, 2-131
unprotected hardware option numbers correction constants, 3-54

USE SENSOR A/B, 10-6

V

VCO (A14) exercise, 7-22
VCO range check frequencies, 7-20
Ver Dev 1., 10-11
Ver Dev 2., 10-11
Ver Dev 3., 10-11
Ver Dev 4., 10-11
verification disk, 2-5, 2-87
verification kit 7 mm, 1-3
verification kits, 2-3
verification procedures
  post-repair, 3-3, 14-53
verification, system, 2-3, 2-5
voltage indications
  post regulator, 12-7
voltages
  A15 preregulator check, 5-10
  A8, 5-13
  fan, 5-19
  front panel probe power, 5-17
  YO- and YO+ coil drive voltage differences with & SOURCE PLL OFF, 7-12
voltages for post regulator, 5-6
voltmeter, 1-3
VRAM bank, 10-13
VRAM/video, 10-13

W

warranty explanation, 4-4
waveform integrity in SRC tune mode, 7-9
wrist strap and cord (antistatic), 1-2
WRONG DISK FORMAT, INITIALIZE DISK, 10-49

Y

YO- and YO+ coil drive voltage differences with & SOURCE PLL OFF, 7-12
YO coil drive check with analog bus, 7-11