

**HP 83620A/22A Synthesized Sweepers
HP 83623A/24A Synthesized Sweepers
HP 83630A/40A/50A Synthesized Sweepers**

Service Manual

SERIAL NUMBERS

This manual applies to any synthesized sweeper with the following model number and serial number prefix combinations. You may have to modify this manual so that it applies *directly* to your instrument version. Refer to the “Instrument History” chapter.

| HP 83620A/22A/24A | HP 83623A | HP 83630A | HP 83640A | HP 83650A |
|--------------------------|------------------|------------------|------------------|------------------|
| 3420A | 3420A | 3420A | 3420A | 3420A |
| 3250A | 3339A | 3250A | 3339A | 3250A |
| 3245A | 3250A | 3245A | 3250A | 3245A |
| 3213A | 3245A | 3213A | 3245A | 3213A |
| 3145A | 3213A | 3145A | 3213A | 3145A |
| | 3145A | 3143A | 3145A | 3143A |
| | | 3101A | | 3052A |



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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.

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, would 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.

General Safety Considerations

- 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.
 - The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.
 - The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.
 - The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.
 - 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.
 - For continued protection against fire hazard replace line fuse only with same type and rating (F 5A/250V). The use of other fuses or material is prohibited.
-

CAUTION

- Always use the three-prong ac power cord supplied with this instrument. Failure to ensure adequate earth grounding by not using this cord may cause instrument damage.
- Before switching on this product, make sure that the line voltage selector switch is set to the voltage of the power supply and the correct fuse is installed. Assure the supply voltage is in the specified range.
- This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.
- **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 than 800 watts, then forced convection must be used.

Before Applying Power

Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

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).

Preface

This manual provides service information for the HP 8360 Series Synthesized Sweepers.

Manual Conventions

- Front-Panel Key** This represents a key physically located on the instrument.
- Softkey** This indicates a “softkey,” a key whose label is determined by the firmware of the instrument.
- Screen Text** This indicates text displayed on the instrument’s screen.

Instruments Covered By This Manual

This manual applies to instruments having a serial number prefix listed on the title page (behind the “Documentation Map” tab). Some changes may have to be made to this manual so that it applies directly to each instrument; refer to Chapter 12, “Instrument History”, to see what changes may apply to your instrument.

A serial number label (Figure 0-1) is attached to the instrument’s rear panel. A prefix (four digits followed by a letter), and a suffix (five digits unique to each instrument), comprise the instrument serial number.

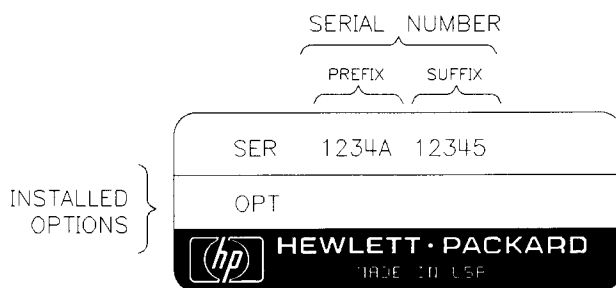


Figure 0-1. Typical Serial Number Label

This manual applies to HP 8360 synthesized sweepers having a model number and serial number prefix listed on the title page (behind the “Documentation Map” tab). Some changes may have to be made to this manual so that it applies directly to each instrument; refer to Chapter 12, “Instrument History” in this manual to see what changes may apply to your instrument.

Compliance

This instrument has been designed and tested in accordance with IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The 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.

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Contents

| | |
|---|------|
| 1. Equipment Required | |
| HP 83620A/22A Required Equipment | 1-2 |
| HP 83623A/24A Required Equipment | 1-9 |
| HP 83630A Required Equipment | 1-16 |
| HP 83640A Required Equipment | 1-23 |
| HP 83650A Required Equipment | 1-30 |
| | |
| 2. Performance Tests | |
| How to Use This Chapter | 2-1 |
| Menus | 2-2 |
| Operator's Check | 2-2 |
| Operation Verification Tests | 2-2 |
| Automated Performance Tests | 2-2 |
| Equipment Required | 2-3 |
| Test Record | 2-3 |
| Test Sequence | 2-3 |
| Calibration Cycle | 2-3 |
| Operation Verification | 2-4 |
| 1. Self-tests | 2-4 |
| 2. Power Accuracy | 2-5 |
| 3. Power Flatness | 2-5 |
| 4. Maximum Leveled Power | 2-5 |
| PERFORMANCE TESTS | 2-7 |
| 1. Internal Timebase: Aging Rate | 2-8 |
| 2. Swept Frequency Accuracy | 2-12 |
| 3. Frequency Switching Time | 2-22 |
| CW Frequency Switching Time (Across Bandswitch Points) | 2-23 |
| Stepped Sweep Frequency Switching Time (Within a Frequency Band) | 2-24 |

| | |
|---|------|
| Frequency List Frequency Switching Time (Across Bandswitch Points) | 2-25 |
| 4. Power Accuracy | 2-28 |
| 5. Power Flatness | 2-31 |
| Low Band Power Flatness | 2-32 |
| High Band Power Flatness | 2-33 |
| Millimeter Band Power Flatness > 20 GHz and \leq 40 GHz | 2-33 |
| Millimeter Band Power Flatness > 40 GHz | 2-33 |
| 6. Maximum Levelled Power | 2-34 |
| 7. External Leveling | 2-37 |
| 8. Spurious Signals (Harmonics & Subharmonics) | 2-40 |
| Harmonic Measurement < 20 GHz | 2-41 |
| Harmonic Measurement 20 to 26.5 GHz | 2-43 |
| Harmonic Measurement 26.5 to 40 GHz | 2-45 |
| Harmonic Measurement 38 to 50 GHz | 2-46 |
| Harmonic/Subharmonic Verification Procedure < 20 GHz | 2-47 |
| Harmonic/Subharmonic Verification Procedure > 20 GHz | 2-48 |
| 9. Spurious Signals (Non-Harmonic) | 2-50 |
| Fixed Spurious Signals | 2-51 |
| Low Band Offset Spurious Signals | 2-53 |
| Low Band Mixer Spurs | 2-54 |
| 10. Spurious Signals (Line-Related) | 2-56 |
| 11. Single Sideband Phase Noise | 2-60 |
| 12. Pulse Modulation On/Off Ratio | 2-65 |
| 13. Pulse Performance | 2-68 |
| Rise and Fall Times | 2-68 |
| Pulse Leveling Accuracy | 2-73 |
| 14. Pulse Performance (Alternate Procedure) | 2-76 |
| Rise and Fall Times < 20 GHz | 2-76 |
| Pulse Leveling Accuracy < 20 GHz | 2-81 |
| Rise and Fall Times > 20 GHz | 2-83 |
| Pulse Leveling Accuracy > 20 GHz | 2-85 |
| 15. Pulse Modulation Video Feedthrough | 2-87 |
| System Calibration | 2-89 |
| Video Gain | 2-90 |
| Low Band Video Feedthrough | 2-91 |
| Video Feedthrough > 2 GHz | 2-95 |
| 16. AM Accuracy | 2-96 |

| | |
|---|-------|
| Low Band < 2 GHz | 2-96 |
| High Band > 2 GHz and < 20 GHz | 2-99 |
| High Band > 20 GHz – Doubler Engaged | 2-101 |
| 17. AM Bandwidth | 2-104 |
| 18. AM Dynamic Range | 2-107 |
| Normal AM Dynamic Range | 2-109 |
| Deep AM Dynamic Range | 2-110 |
| 19. FM Accuracy | 2-114 |
| External FM | 2-114 |
| Internal FM (Option 002 only) | 2-116 |
| 20. FM Bandwidth | 2-118 |
| Find Quadrature | 2-121 |
| DC FM Flatness (Unlocked) | 2-122 |
| 21. Maximum FM Deviation | 2-124 |
| DC FM (≤ 100 Hz) (Using HP 8111A or HP 8116A) | 2-125 |
| AC FM (at 100 kHz) (Using HP 3325A) | 2-126 |
| 22. Internal Pulse Accuracy (Option 002) | 2-131 |
| 23. Modulation Meter (Option 002) | 2-133 |

3. Adjustments

| | |
|---|------|
| How To Use This Chapter | 3-1 |
| Menu Maps | 3-1 |
| Equipment Required | 3-2 |
| Cautions And Warnings | 3-2 |
| List of Adjustments | 3-4 |
| 1. 10 MHz Standard | 3-5 |
| Accuracy Versus Adjustment Interval | 3-9 |
| An Alternate Method | 3-10 |
| 2. Fractional-N VCO | 3-11 |
| 3. Fractional-N Reference and API Spurs | 3-13 |
| 125 kHz Reference Spur Adjustment | 3-14 |
| API 1 Spur Adjustment | 3-16 |
| API 2 Spur Adjustment | 3-16 |
| 4. Sweep Ramp | 3-18 |
| 5. Sampler Assembly | 3-19 |
| 200 MHz Loop VCO Tune Check | 3-20 |
| Sampler Match Adjustment | 3-21 |
| 200 MHz Loop Gain Adjustment | 3-22 |

| | |
|---|------|
| IF Gain Adjustment | 3-22 |
| 6. YO Driver +10V Reference | 3-24 |
| 7. YO Driver Gain and Linearity | 3-26 |
| 8. YO Loop Gain | 3-29 |
| 9. Amplifier/Multiplier Adjustments | 3-31 |
| Adjustment Help | 3-32 |
| Offset and Gain Adjustments | 3-32 |
| Adjusting to the Center of the Passband | 3-32 |
| SRD Bias Adjustment | 3-32 |
| Single Band Delay Compensation Adjustments | 3-32 |
| Setting the Fastest Sweep Time | 3-33 |
| Sweep Speed Related Adjustments | 3-33 |
| YTM Bandcross Delay Terms | 3-33 |
| General Techniques | 3-33 |
| Procedure | 3-34 |
| YTM Gain Adjustment | 3-39 |
| Band 1 Adjustment | 3-39 |
| Band 2 Adjustment | 3-40 |
| Band 3 Adjustment | 3-41 |
| Band 4 Adjustment (HP 83630A/40A/50A only) | 3-43 |
| Band 5 Adjustment (HP 83640A/50A only) | 3-44 |
| Band 6 Adjustment (HP 83640A/50A only) | 3-44 |
| Band 7 Adjustment (HP 83650A only) | 3-45 |
| Multi-band Amplifier/Multiplier Delay Compensation | 3-46 |
| Band 4 Multi-band Amplifier/Multiplier Delay Compensation (HP 83630A/40A/50A only) | 3-47 |
| Verification | 3-48 |
| 10. Amplifier/Filter Adjustments | 3-49 |
| Adjustment Help | 3-50 |
| Offset and Gain Adjustments | 3-50 |
| Squigg Clamp Calibration Constants | 3-50 |
| Adjusting for the Center of the Passband | 3-50 |
| Single Band Delay Compensation Adjustments | 3-51 |
| Setting the Fastest Sweep Time | 3-51 |
| Sweep Speed Related Adjustments | 3-51 |
| YTF Bandcross Delay Terms | 3-51 |
| Procedure | 3-54 |
| Amplifier/Filter Offset and Gain Adjustment | 3-58 |

| | |
|---|-------|
| Band 1 Adjustment | 3-58 |
| Band 2 Adjustment | 3-61 |
| Band 3 Adjustment | 3-63 |
| Band 4 Adjustment (HP 83630A/40A/50A only) | 3-65 |
| Band 5 Adjustment (HP 83640A/50A only) | 3-67 |
| Band 6 Adjustment (HP 83640A/50A only) | 3-68 |
| Band 7 Adjustment (HP 83650A only) | 3-68 |
| Auto Tracking Verification | 3-69 |
| Single-Band Amplifier/Filter Delay | 3-72 |
| Band 1 Adjustment | 3-73 |
| Band 2 Adjustment | 3-74 |
| Band 3 Adjustment | 3-75 |
| Band 4 Adjustment (HP 83630A/40A/50A) | 3-76 |
| Band 5 Adjustment (HP 83640A/50A only) | 3-76 |
| Band 6 Adjustment (HP 83640A/50A only) | 3-77 |
| Band 7 Adjustment (HP 83650A only) | 3-78 |
| Multi-band YTF Delay | 3-79 |
| Band 4 Multi-band YTF Delay (HP 83630A/40A/50A only) | 3-82 |
| Operation Check | 3-83 |
| 11. Low Power SRD Bias | 3-84 |
| 12. Modulator Offset and Gain | 3-86 |
| 13. ALC Power Level Accuracy | 3-91 |
| Low Band ALC Power Accuracy Adjustment | 3-93 |
| High Band Power Accuracy Adjustment | 3-95 |
| 14. Power Flatness | 3-97 |
| Low Band Power Flatness | 3-98 |
| High Band Power Flatness | 3-98 |
| Millimeter Band Power Flatness | 3-99 |
| 15. AM/FM DAC Offset and Gain (Option 002) | 3-100 |
| 16. AM Accuracy | 3-102 |
| AM Offset | 3-103 |
| Log AM Accuracy | 3-103 |
| Linear AM Accuracy | 3-104 |
| 17. AM Delay | 3-106 |
| 18. FM Gain | 3-109 |
| 19. Square Wave Symmetry | 3-112 |
| High Band Adjustment | 3-112 |

| | |
|--|-------|
| Low Band Adjustment | 3-113 |
| 20. AM Input Impedance | 3-114 |
| A. A10 Jumper | 3-115 |
| B. A8 Jumper | 3-116 |
| 21. FM Input Impedance | 3-117 |
| A. A11 Jumper | 3-118 |
| B. A8 Jumper | 3-119 |
| 22. Modulation Generator Flatness (Option 002) | 3-120 |
| 23. External Trigger Edge Selection | 3-123 |
| Triggering on the Leading Edge | 3-124 |
| Triggering on the Trailing Edge | 3-124 |
| 24. Volts/GHz | 3-125 |
| | |
| 4. Calibration Constants | |
| Definition | 4-1 |
| Memory Areas | 4-2 |
| Working Data | 4-2 |
| Protected Data | 4-2 |
| Default Data | 4-2 |
| Checksum Verification | 4-3 |
| Calibration Constant Password | 4-3 |
| Entering a Password | 4-4 |
| Disabling a Password | 4-4 |
| Setting a Password | 4-5 |
| Bypassing the Password | 4-5 |
| Changing Working Data Calibration Constants | 4-6 |
| Saving Working Data Calibration Constants | 4-7 |
| Loading Protected Data Calibration Constants | 4-7 |
| Loading Default Data Calibration Constants | 4-8 |
| Calibration Constant Descriptions | 4-8 |
| | |
| 5. Automated Tests | |
| Introduction | 5-1 |
| Setting Up the System | 5-2 |
| Hardware Requirements | 5-2 |
| Operating System Requirements | 5-2 |
| Installing the Software | 5-3 |
| Disk Files | 5-3 |

| | |
|---|------|
| Make Working Copies | 5-3 |
| Installing the Program onto a Hard Disk | 5-3 |
| Operating from a Floppy Disk | 5-4 |
| Running the Software | 5-4 |
| Configuration Limitations | 5-4 |
| Loading the Software | 5-4 |
| Reporting Software Bugs | 5-6 |
| AUTOMATED PERFORMANCE TESTS | 5-7 |
| 1. Step Attenuator Flatness Test | 5-7 |
| 2. Power Flatness and Accuracy Test | 5-9 |
| AUTOMATED ADJUSTMENTS | 5-12 |
| 1. Step Attenuator Flatness Adjustment | 5-12 |
| 2. YO Delay Adjustment | 5-14 |
| 3. ADC Adjustment | 5-15 |
| 4. Power Flatness Adjustment | 5-16 |
| Utilities | 5-19 |
| 1. Front Panel Emulation | 5-19 |
| 2. Calibration Constants | 5-22 |
| 3. Self-Test | 5-22 |
| 4. Power Sensor Configuration and Calibration Factor File | 5-23 |
| Loading Sensor Calibration Factors | 5-23 |
| To Load Sensor Cal Factors: | 5-23 |
| Menu Overview | 5-27 |
| 6. Menu Maps | |
| ALC Menu | 6-3 |
| Frequency Menu | 6-5 |
| Marker Menu | 6-7 |
| Modulation Menu | 6-9 |
| Power Menu | 6-11 |
| Service Menu | 6-13 |
| Sweep Menu | 6-15 |
| System Menu | 6-17 |
| User Cal Menu | 6-19 |

7. Disassembly and Replacement Procedures

| | |
|--|------|
| Tools Required | 7-3 |
| Front Panel Disassembly and Reassembly | 7-4 |
| Tools Required | 7-4 |
| Description and Procedure | 7-4 |
| 1. Preliminary Steps | 7-6 |
| 2. Front Panel Removal | 7-8 |
| 3. A3 Front Panel Processor Removal | 7-11 |
| 4. A21 Alphanumeric Display Removal | 7-12 |
| 5. A2 Source Module Interface Removal | 7-13 |
| 6. RPG1 Rotary Pulse Generator Removal | 7-14 |
| 7. J1 RF Output Connector Removal | 7-15 |
| 8. Front Panel BNC Connectors Removal | 7-17 |
| 9. A1 Keyboard Removal | 7-18 |
| 10. Display Filter Removal | 7-21 |
| 11. A1 Keyboard Reassembly | 7-22 |
| 12. Front Panel Reassemblies | 7-25 |
| Rear Panel Disassembly and Reassembly | 7-26 |
| Tools Required | 7-26 |
| Description and Procedure | 7-26 |
| 1. Preliminary Steps | 7-28 |
| 2. B1 Fan Removal | 7-29 |
| 3. Rear Panel BNC Connectors Removal and Aux Output Disconnection | 7-31 |
| 4. J1 RF Output Connector Removal (Option 004) | 7-32 |
| 5. Rear Panel Removal | 7-34 |
| 6. A23 10 MHz Reference Standard Removal | 7-36 |
| 7. T1 Transformer Removal | 7-37 |
| 8. A19 Rear Panel Interface Removal | 7-38 |
| 9. Voltage Selector Switch Removal | 7-40 |
| 10. Fuse Housing Removal | 7-42 |
| 11. FL1 Line Filter Removal | 7-43 |
| 12. Option 004 BNC Connectors Removal | 7-44 |
| RF Deck Disassembly and Reassembly | 7-45 |
| Tools Required | 7-45 |
| Description and Procedure | 7-45 |
| 1. Preliminary Steps | 7-47 |
| 2. Lift Up the RF Deck | 7-47 |

| | |
|---|------|
| 3. A20 RF Interface Removal | 7-52 |
| 4. Microcircuit Removal | 7-54 |
| Motherboard Disassembly and Reassembly | 7-70 |
| Tools Required | 7-70 |
| Description and Procedure | 7-70 |
| 1. Preliminary Steps | 7-72 |
| 2. Front Panel Removal | 7-74 |
| 3. J1 RF Output Connector Removal (Front Panel) | 7-76 |
| 4. J1 RF Output Connector Removal (Option 004) | 7-78 |
| 5. Rear Panel Removal | 7-79 |
| 6. Major Assemblies Removal | 7-81 |
| 7. RF Deck Removal | 7-83 |
| 8. Motherboard Removal | 7-85 |
| | |
| 8. Post–Repair | |
| | |
| 9. Replaceable Parts | |
| Module–Exchange Program | 9-1 |
| Replacement Information | 9-2 |
| Ordering Information | 9-2 |
| How to Order Parts ... Fast! | 9-2 |
| | |
| 10. Preventive Maintenance | |
| How to Clean the Fan Filter | 10-2 |
| How to Clean the Display Filter | 10-4 |
| How to Replace the Line Fuse | 10-5 |
| How to Replace the CPU Battery (A15BT1) | 10-7 |
| Removal/Replacement | 10-7 |
| Connector Care | 10-9 |
| | |
| 11. Option Retrofits | |
| Add Attenuator (Add Option 001) | 11-3 |
| Delete Attenuator (Delete Option 001) | 11-4 |
| Add Modulation/Generator (Add Option 002) | 11-5 |
| Delete Keyboard/Display (Add Option 003) | 11-6 |
| Add Keyboard/Display (Delete Option 003) | 11-6 |
| Rear Panel RF Output (Add Option 004) | 11-7 |
| Front Panel RF Output (Delete Option 004) | 11-8 |

| | |
|--|-------|
| 1 Hz Capability (Add Option 008) | 11-9 |
| MATE Compatibility (Add Option 700) | 11-9 |
| Rack Mount Slide Kit (Add Option 806) | 11-10 |
| Rack Flange Kit Without Handles (Add Option 908) | 11-10 |
| Extra Manual Set (Add Option 910) | 11-11 |
| Rack Flange Kit With Handles (Add Option 913) | 11-11 |

12. Instrument History

| | |
|--|-------|
| How to Use Instrument History | 12-1 |
| Change F | 12-3 |
| A10 ALC Assembly | 12-3 |
| Change E | 12-5 |
| Pulse Modulation Video Feedthrough | 12-5 |
| Change D | 12-11 |
| A20 RF Interface Assembly | 12-11 |
| Rear Panel Fan Assembly | 12-11 |
| B1 Fan Assembly Removal | 12-13 |
| Change C | 12-15 |
| Amplifier/Filter Adjustment | 12-15 |
| A30 Directional Coupler | 12-15 |
| Change B | 12-27 |
| Change A | 12-29 |
| 15. Pulse Modulation Video Feedthrough | 12-30 |
| System Calibration | 12-31 |
| Video Gain | 12-33 |
| Low Band Video Feedthrough | 12-33 |
| High Band Video Feedthrough | 12-37 |
| Millimeter Band Video Feedthrough > 20 GHz | 12-37 |

Index

Figures

| | |
|--|-------|
| 0-1. Typical Serial Number Label | x |
| 2-1. Internal Timebase: Aging Rate Test Setup | 2-9 |
| 2-2. Swept Frequency Accuracy Test Setup | 2-12 |
| 2-3. Video Signal on the Oscilloscope | 2-16 |
| 2-4. Frequency Switching Time Test Setup | 2-22 |
| 2-5. Power Accuracy Test Setup | 2-28 |
| 2-6. Power Flatness Test Setup | 2-31 |
| 2-7. Maximum Levelled Power Test Setup | 2-34 |
| 2-8. External Leveling Test Setup | 2-37 |
| 2-9. Spurious Signals (Harmonic) Test Setup < 20 GHz | 2-40 |
| 2-10. Spurious Signals (Harmonics) Test Setup > 20 GHz | 2-43 |
| 2-11. Spurious Signals (Non-Harmonic) Test Setup | 2-50 |
| 2-12. Spurious signals (Line-Related) Test Setup | 2-56 |
| 2-13. Single Sideband Phase Noise Test Setup | 2-61 |
| 2-14. Pulse Modulation On/Off Ratio Test Setup | 2-65 |
| 2-15. Pulse Performance Test Setup | 2-68 |
| 2-16. Pulse Envelope Displayed Over 5 Divisions | 2-72 |
| 2-17. Widened Pulse Envelope | 2-73 |
| 2-18. Pulse Performance Test Setup < 20 GHz | 2-77 |
| 2-19. Signal Level between RF Power Off and On | 2-80 |
| 2-20. Pulse Performance Test Setup >20 GHz | 2-83 |
| 2-21. Video Feedthrough Test Setup | 2-88 |
| 2-22. Measuring Maximum Voltage from the Baseline Video Feedthrough | 2-93 |
| 2-23. AM Accuracy Test Setup Low Band | 2-97 |
| 2-24. AM Accuracy Test Setup < 20 GHz | 2-99 |
| 2-25. AM Accuracy Test Setup > 20 GHz | 2-101 |
| 2-26. AM Bandwidth Test Setup | 2-104 |
| 2-27. AM Dynamic Range Test Setup | 2-108 |
| 2-28. FM Accuracy Test Setup | 2-114 |

| | |
|--|-------|
| 2-29. FM Bandwidth Test Setup | 2-120 |
| 2-30. Maximum FM Deviation Test Setup | 2-124 |
| 2-31. Pulse Accuracy Test Setup | 2-131 |
| 2-32. Modulation Meter Test Setup | 2-133 |
| 3-1. 10 MHz Standard Adjustment Setup | 3-6 |
| 3-2. 10 MHz Standard Adjustment Location | 3-7 |
| 3-3. Accuracy Versus Adjustment Interval | 3-9 |
| 3-4. A4L1 Location | 3-11 |
| 3-5. Fractional-N Reference and API Spur Adjustment Setup | 3-14 |
| 3-6. Fractional-N Reference and API Spurs Adjustment Locations | 3-15 |
| 3-7. FL2 Location | 3-20 |
| 3-8. Sampler Match Adjustment Locations | 3-21 |
| 3-9. IF Gain Adjustment Location | 3-22 |
| 3-10. YO Driver +10V Reference Adjustment Location | 3-24 |
| 3-11. YO Gain and Linearity Break Points | 3-26 |
| 3-12. YO Gain and Linearity Adjustment Locations | 3-27 |
| 3-13. Switch and Adjustment Locations | 3-29 |
| 3-14. Amplifier/Multiplier Adjustments Setup | 3-34 |
| 3-15. A12 Assembly Potentiometer Locations | 3-42 |
| 3-16. Single-Band Delay and Risetime Compensation | 3-52 |
| 3-17. Multi-Band Delay and Risetime Compensation | 3-53 |
| 3-18. Amplifier/Filter Adjustments Setup | 3-54 |
| 3-19. XA10J2 Location | 3-55 |
| 3-20. A12 Assembly Potentiometer Locations | 3-63 |
| 3-21. Low Power SRD Bias Adjustment Setup | 3-84 |
| 3-22. A9R105 Location | 3-85 |
| 3-23. Modulator Offset and Gain Adjustment Setup | 3-86 |
| 3-24. ALC Power Level Accuracy Adjustment Setup | 3-91 |
| 3-25. A10R125 Location | 3-94 |
| 3-26. Power Flatness Adjustment Setup | 3-97 |
| 3-27. A8R111 and A8R105 Adjustment Locations | 3-100 |
| 3-28. AM Accuracy Adjustment Setup | 3-102 |
| 3-29. A10R35 and A10R39 Locations | 3-104 |
| 3-30. AM Delay Adjustment Setup | 3-106 |
| 3-31. AM Delay Adjustment Location | 3-108 |
| 3-32. FM Gain Adjustment Setup | 3-109 |
| 3-33. FM Gain Adjustment Location | 3-111 |
| 3-34. Square Wave Symmetry Adjustment Setup | 3-112 |

| | |
|--|-------|
| 3-35. A10 Jumper Locations | 3-115 |
| 3-36. A8 Jumper Locations | 3-116 |
| 3-37. FM Input Impedance Jumper Locations | 3-118 |
| 3-38. A8 Jumper Locations | 3-119 |
| 3-39. Modulation Generator Flatness Adjustment Setup | 3-120 |
| 3-40. External Trigger Edge Selection Location | 3-123 |
| 3-41. A12S1 Location | 3-126 |
| 5-1. Step Attenuator Flatness Test Setup | 5-8 |
| 5-2. Step Attenuator Flatness Adjustment Setup | 5-13 |
| 7-1. Cable Routing Locations | 7-3 |
| 7-2. Front Panel Disassembly Flowchart | 7-5 |
| 7-3. Front Edge Trim Strip | 7-7 |
| 7-4. Front Panel Screw Locations | 7-9 |
| 7-5. Front Panel Coaxial and Ribbon Cable Locations | 7-10 |
| 7-6. Front Panel Processor Cables | 7-11 |
| 7-7. Display Removal | 7-12 |
| 7-8. Source Module Interface Removal | 7-13 |
| 7-9. RPG Removal | 7-14 |
| 7-10. Removing RF Output Connector (Front Panel) | 7-15 |
| 7-11. Front Panel BNC Locations | 7-17 |
| 7-12. Keyboard Assembly Removal | 7-19 |
| 7-13. Keypad and Anti-rock Sheets | 7-20 |
| 7-14. Display Filter | 7-21 |
| 7-15. Keyboard Reassembly | 7-23 |
| 7-16. Keyboard Assembly Screw Locations | 7-24 |
| 7-17. Rear Panel Disassembly Flowchart | 7-27 |
| 7-18. B1 Rear Panel Fan Assembly | 7-30 |
| 7-19. Rear Panel BNC Connector Locations | 7-31 |
| 7-20. Removing RF Output Connector | 7-32 |
| 7-21. Rear Panel Removal | 7-34 |
| 7-22. Rear Panel Cable Locations | 7-35 |
| 7-23. Reference Standard Mountings | 7-36 |
| 7-24. Transformer Removal | 7-37 |
| 7-25. A19 Rear Panel Interface Removal | 7-39 |
| 7-26. Voltage Selection Switch Removal | 7-40 |
| 7-27. Fuse, Line Filter, and Ground Wires | 7-41 |
| 7-28. Rear Panel Fuse Housing | 7-42 |
| 7-29. Line Filter Removal | 7-43 |

| | |
|--|------|
| 7-30. Option 004 BNC Connectors Removal | 7-44 |
| 7-31. RF Deck Disassembly Flowchart | 7-46 |
| 7-32. Removing RF Output Connector | 7-48 |
| 7-33. W51 RF Cable Location | 7-49 |
| 7-34. RF Deck in the Service Position | 7-51 |
| 7-35. A20 RF Interface | 7-53 |
| 7-36. RF Deck Cable Locations – HP 83640A/50A | 7-55 |
| 7-37. RF Deck Cable Locations – HP 83640A/50A Option 001 | 7-56 |
| 7-38. RF Deck Cable Locations – HP 83640A/50A Option 006 | 7-57 |
| 7-39. RF Deck Cable Locations – HP 83640A/50A Options 001 and 006 | 7-58 |
| 7-40. RF Deck Cable Locations – HP 83620A/22A/30A | 7-59 |
| 7-41. RF Deck Cable Locations – HP 83620A/22A/30A Option 001 | 7-60 |
| 7-42. RF Deck Cable Locations – HP 83620A/22A/30A Option 006 | 7-61 |
| 7-43. RF Deck Cable Locations – HP 83620A/22A/30A Options 001 and 006 | 7-62 |
| 7-44. RF Deck Cable Locations – HP 83623A | 7-63 |
| 7-45. RF Deck Cable Locations – HP 83623A Option 001 | 7-64 |
| 7-46. RF Deck Cable Locations – HP 83624A | 7-65 |
| 7-47. RF Deck Cable Locations – HP 83624A Option 001 | 7-66 |
| 7-48. RF Deck Cable Locations – HP 83623A/24A Option 006 | 7-67 |
| 7-49. RF Deck Cable Locations – HP 83623A/24A Options 001 and 006 | 7-68 |
| 7-50. RF Deck Screw Locations | 7-69 |
| 7-51. Motherboard Disassembly Flowchart | 7-71 |
| 7-52. Front Edge Trim Strip | 7-73 |
| 7-53. Front Panel Screw Locations | 7-74 |
| 7-54. Front Panel Coaxial and Ribbon Cable Locations | 7-75 |
| 7-55. Removing RF Output Connector (Front Panel) | 7-76 |
| 7-56. Removing RF Output Connector (Option 004) | 7-78 |
| 7-57. Rear Panel Removal | 7-79 |
| 7-58. Rear Panel Cable Locations | 7-80 |
| 7-59. Major Assemblies | 7-82 |
| 7-60. W51 Location | 7-83 |
| 7-61. Motherboard Cables | 7-85 |
| 7-62. Motherboard Screws | 7-86 |
| 9-1. Module Exchange Program | 9-4 |
| 9-2. Major Assemblies (1 of 4) | 9-5 |

| | |
|---|-------|
| 9-2. Major Assemblies (2 of 4) | 9-6 |
| 9-2. Major Assemblies (3 of 4) | 9-7 |
| 9-2. Major Assemblies (4 of 4) | 9-8 |
| 9-3. Cables (1 of 17) | 9-14 |
| 9-3. Cables (2 of 17) | 9-15 |
| 9-3. Cables (3 of 17) | 9-16 |
| 9-3. Cables (4 of 17) | 9-17 |
| 9-3. Cables (5 of 17) | 9-18 |
| 9-3. Cables (6 of 17) | 9-19 |
| 9-3. Cables (7 of 17) | 9-20 |
| 9-3. Cables (8 of 17) | 9-21 |
| 9-3. Cables (9 of 17) | 9-22 |
| 9-3. Cables (10 of 17) | 9-23 |
| 9-3. Cables (11 of 17) | 9-24 |
| 9-3. Cables (12 of 17) | 9-25 |
| 9-3. Cables (13 of 17) | 9-26 |
| 9-3. Cables (14 of 17) | 9-27 |
| 9-3. Cables (15 of 17) | 9-28 |
| 9-3. Cables (16 of 17) | 9-29 |
| 9-3. Cables (17 of 17) | 9-30 |
| 9-4. Front Panel Hardware | 9-37 |
| 9-5. Front Panel, Casting and Keypad | 9-39 |
| 9-6. Front Panel, Attaching Hardware (1 of 3) | 9-40 |
| 9-6. Front Panel, Attaching Hardware (2 of 3) | 9-41 |
| 9-6. Front Panel, Attaching Hardware (3 of 3) | 9-42 |
| 9-7. Rear Panel Hardware | 9-43 |
| 9-8. Rear Panel Fan Assembly | 9-46 |
| 9-9. Bottom View, Attaching Hardware | 9-48 |
| 9-10. Top View, Attaching Hardware | 9-49 |
| 9-11. Left Side View, Attaching Hardware | 9-51 |
| 9-12. Right Side View, Attaching Hardware | 9-52 |
| 9-13. RF Deck Right Side View, Attaching Hardware | 9-53 |
| 9-14. RF Connector and Attaching Hardware | 9-55 |
| 9-15. Chassis Parts | 9-56 |
| 10-1. Removing the Fan Filter | 10-3 |
| 10-2. Replacing the Line Fuse | 10-6 |
| 10-3. A15BT1 Battery Location | 10-7 |
| 12-1. Amplifier/Multiplier Adjustments Setup | 12-55 |

Tables

| | |
|--|------|
| 1-1. Required Equipment for HP 83620A/22A | 1-2 |
| 1-2. Required Equipment for HP 83623A/24A | 1-9 |
| 1-3. Required Equipment for HP 83630A | 1-16 |
| 1-4. Required Equipment for HP 83640A | 1-23 |
| 1-5. Required Equipment for HP 83650A | 1-30 |
| 2-1. Operation Verification Form | 2-6 |
| 2-2. Swept Frequency Accuracy Instrument Settings | 2-15 |
| 2-3. Additional Instrument Settings | 2-17 |
| 2-4. Additional Instrument Settings | 2-18 |
| 2-5. Additional Instrument Settings | 2-19 |
| 2-6. Additional Instrument Settings | 2-20 |
| 2-7. CW Frequency Switching Time Settings | 2-24 |
| 2-8. Power Accuracy Frequencies | 2-29 |
| 2-9. Start and Stop Frequencies | 2-41 |
| 2-10. Corresponding YO Frequency Ranges and RF Output Frequencies | 2-42 |
| 2-11. Corresponding YO Frequency Ranges and RF Output Frequencies | 2-45 |
| 2-12. Determining the Actual Spur Frequencies | 2-52 |
| 2-13. Low Band Spurious Signals | 2-54 |
| 2-14. Spectrum Analyzer Frequencies and Line Spur Frequencies and Harmonics | 2-58 |
| 2-15. Phase Noise Measurement System Parameters | 2-63 |
| 2-16. Frequency Setting for Phase Noise Measurements | 2-64 |
| 2-17. Pulse On/Off Center Frequencies | 2-66 |
| 2-18. Synthesizer Frequencies | 2-69 |
| 2-19. Synthesizer and LO Frequencies | 2-78 |
| 2-20. Risetime and Faltime Values | 2-84 |
| 2-21. Low Band Video Feedthrough Frequencies | 2-91 |
| 2-22. Power Level Conversions to Volts Peak | 2-94 |

| | |
|---|-------|
| 2-23. Millimeter Band Video Feedthrough Frequencies | 2-95 |
| 2-24. Synthesizer Frequencies | 2-106 |
| 2-25. Power Meter Readings | 2-110 |
| 2-26. RF Signal Level | 2-112 |
| 2-27. Synthesizer Frequencies | 2-115 |
| 2-28. Synthesizer Frequencies | 2-122 |
| 2-29. DC FM Test Pass-Fail Results | 2-126 |
| 2-30. FM Deviation Frequencies and Settings | 2-129 |
| 2-33. Test Record for HP 83620A and 83622A | 2-135 |
| 2-34. Test Record for HP 83623A and 83624A | 2-143 |
| 2-35. Test Record for HP 83630A | 2-151 |
| 2-36. Test Record for HP 83640A | 2-159 |
| 2-37. Test Record for HP 83650A | 2-167 |
| 3-1. Summary of Fractional-N Reference & API Spurs Adjustment | 3-13 |
| 3-2. Calibration Constant Descriptions | 3-36 |
| 3-3. Start and Stop Frequencies (GHz) | 3-48 |
| 3-4. Amplifier/Filter Calibration Constants and Default Values . . | 3-56 |
| 3-5. Frequency Ranges | 3-71 |
| 3-6. ALC Offset Calibration Constant Default Values | 3-87 |
| 3-7. Center Frequencies and Calibration Constants | 3-90 |
| 3-8. ALC Calibration Constants and Default Values | 3-93 |
| 3-9. Power Level and Calibration Constant Adjustment | 3-94 |
| 3-10. Power Level and Calibration Constant Adjustment | 3-95 |
| 4-9. Calibration Constant Descriptions | 4-10 |
| 4-10. Hardware Configuration Cal Constants #463 and #464 | 4-33 |
| 4-11. Assemblies and Corresponding Cal Constant ID Numbers and Revisions | 4-35 |
| 5-1. Required Binaries | 5-2 |
| 5-2. Test Equipment Required | 5-7 |
| 5-3. Test Equipment Required | 5-13 |
| 5-4. Synthesizer Hardkey Emulation | 5-20 |
| 8-1. Adjustments and Performance Tests Required After Repair or Replacement of an Assembly | 8-1 |
| 9-1. Reference Designations and Abbreviations | 9-3 |
| 9-2. Major Assemblies | 9-9 |
| 9-3. Cables | 9-31 |
| 9-4. Front Panel Hardware | 9-38 |
| 9-5. Front Panel, Casting and Keypad | 9-39 |

| | |
|---|-------|
| 9-6. Front Panel, Attaching Hardware | 9-40 |
| 9-7. Rear Panel (1 of 2) | 9-44 |
| 9-7. Rear Panel (2 of 2) | 9-45 |
| 9-8. Rear Panel Fan Assembly | 9-47 |
| 9-9. Bottom View, Attaching Hardware | 9-48 |
| 9-10. Top View, Attaching Hardware | 9-50 |
| 9-11. Left Side View, Attaching Hardware | 9-51 |
| 9-12. Right Side View, Attaching Hardware | 9-52 |
| 9-13. RF Deck Right Side View, Attaching Hardware | 9-54 |
| 9-14. RF Connector and Attaching Hardware | 9-55 |
| 9-15. Chassis Parts | 9-57 |
| 9-16. Miscellaneous Replaceable Accessories | 9-58 |
| 12-1. Rear Panel Fan Assembly | 12-13 |

Equipment Required

HP 83620A/22A Required Equipment

Table 1-1 Required Equipment for HP 83620A/22A

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---|--|--------------------------------------|--|
| Spectrum Analyzer | Frequency Range: 10 MHz to 20 GHz Frequency Span: 0 Hz, 100 Hz to 20 GHz Amplitude Range: +20 to -100 dBm Resolution Bandwidth: 10 Hz to 3 MHz Video Bandwidth: 10 Hz to 3 MHz Log Fidelity: ± 0.1 dB/dB over 0 to 80 dB display (± 1.0 dB maximum) Video Output: DC voltage proportional to vertical position of trace on display Capable of phase locking to external 10 MHz reference | HP 8566B ² | Swept Frequency Accuracy (P) Spurious Signals (Harmonic) (P) Spurious Signals (Non-harmonic) (P) Spurious Signals (Line Related) (P) Pulse Modulation On/Off Ratio (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Fractional-N Reference and API Spurs (A) FM Gain (A) Square Wave Symmetry (A) |
| Analog Oscilloscope | A vs B Sweep Mode Vertical Sensitivity: 5 mV/Div Bandwidth: 100 MHz | HP 1740A/ HP 54600B | Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) |
| Local Oscillator (Synthesized Sweeper) | | HP 83620/ HP 8340A/B ² | Pulse Performance-Alt (P) AM Accuracy (P) |
| Spectrum Analyzer with Tracking Generator | Frequency Range: 20 Hz to 10 MHz | HP 3585A/B | AM Bandwidth (P) FM Bandwidth (P) |
| Controller | 4 Mbyte RAM BASIC 5.1 HP-IB | HP 9836/HP 9920/ HP 310/HP 320 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-1. Required Equipment for HP 83620A/22A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|-------------------------|---|---|--|
| Software | No Substitute (Shipped with synthesizer) | HP P/N 08360-10001 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |
| DVM | Range: -50 to +50 VDC Accuracy: $\pm 0.01\%$ Input Impedance: $\geq 10\text{ M}\Omega$ | HP 3456A ² / HP 3457A | External Leveling (P) AM Accuracy (P) AM Bandwidth (P) AM Dynamic Range (P) FM Bandwidth (P) Modulation Meter (P) Low Power SRD Bias (A) AM Accuracy (A) AM Delay (A) ADC (AA) |
| Digitizing Oscilloscope | Dual Channel Bandwidth: DC to 300 MHz Input Impedance: 1 M Ω and 50 Ω Vertical Sensitivity: $\leq 5\text{ mV/Div}$ Horizontal Sensitivity: 50 ns/Div Trigger: Event Triggerable | HP 54110A/ HP 54111D ² / HP 54222A | Internal Timebase: Aging Rate (P) Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) FM Bandwidth (P) Internal Pulse Accuracy (P) 10 MHz Standard (A) Modulator Offset and Gain (A) Modulation Generator Flatness (A) |
| Digitizing Oscilloscope | 3 dB Bandwidth: 20 GHz DC Voltage Accuracy: $\pm 0.4\%$ of full scale $\pm 2\text{ mV}$ Trigger Sensitivity DC to 100 MHz: 40 mV p-p Trigger & Timebase Jitter: $\leq 2.5\text{ ps} + 5E^{-5}$ x delay setting Time Interval Accuracy: $\leq 10\text{ ps} \pm 0.1\%$ of reading Channel Input Reflection: $< 5\%$ for 30 ps risetime | HP 54124T | Pulse Performance (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-1. Required Equipment for HP 83620A/22A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---------------------|---|---------------------------------|---|
| Oscilloscope Probes | Division Ratio: 1:1 | HP 10437A | Internal Pulse Accuracy (P) |
| Oscilloscope Probes | Division Ratio: 10:1 | HP 10431A | Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Modulation Video Feedthrough (P) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Modulator Offset and Gain (A) |
| Pulse Generator | Pulse Width: ≤ 5 ns Rise Time: ≤ 10 ns Frequency: 10 Hz to 5 MHz | HP 8112B/HP 8116A ² | Pulse Performance (P) Pulse Modulation Video Feedthrough (P) |
| Function Generator | Frequency Accuracy: $\pm 5 \times 10^{-6}$ Amplitude Accuracy 100 kHz to 1 MHz: ± 0.1 dB 100 kHz to 20 MHz: ± 0.4 dB | HP 3325A/B | AM Accuracy (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Modulation Meter (P) AM Accuracy (A) AM Delay (A) FM Gain (A) |
| Function Generator | Amplitude Range: > 16 V p-p | HP 8111A/HP 8116A/ HP 8175A | Maximum FM Deviation (P) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 436A/ HP 437B/ HP 438A | Power Accuracy (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) AM Accuracy (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 437B | Power Flatness (P) Power Flatness (A) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-1. Required Equipment for HP 83620A/22A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------|---|-----------------------|--|
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 438A | Power Flatness and Accuracy (AP) Power Flatness (AA) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Power Sensor | Frequency Range: 10 MHz to 2.3 GHz Power Range: 1 μ W to 100 mW | HP 8482A | Power Flatness (P) Power Flatness (A) Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) Power Flatness (AA) |
| Power Sensor | Frequency Range: 50 MHz to 20 GHz Power Range: 100 pW to 10 μ W | HP 8485D | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Power Sensor | Frequency Range: 50 MHz to 20 GHz Power Range: 1 μ W to 100 mW | HP 8485A | Power Accuracy (P) Power Flatness (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) Power Flatness (A) AM Accuracy (A) Power Flatness and Accuracy (AP) Power Flatness (AA) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Attenuator | Attenuation: 30 dB ± 0.05 dB at 50 MHz | HP 11708A | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Measuring Receiver | Frequency Range (tuned): 2.5 MHz to 1.3 GHz Range: 0 dBm to -127 dBm Relative Power Accuracy: ± 0.5 dB AM Rates: 20 Hz to 100 kHz Depth: to 99% Accuracy: $\pm 1\%$ of reading ± 1 count | HP 8902A ² | AM Accuracy (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-1. Required Equipment for HP 83620A/22A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|---|-------------------|---|
| Phase Noise Measurement System | Frequency Range (carrier): 0.01 to 18 GHz Sensitivity: < -70 dBc at 100 Hz offset < -78 dBc at 1 kHz offset < -86 dBc at 10 kHz offset < -107 dBc at 100 kHz offset Offset Frequency Range: 100 Hz to 2 MHz Amplitude Accuracy: ±2 dB to 1 MHz offset | HP 3048A | Single Sideband Phase Noise (P) |
| Frequency Standard | Frequency: 10 MHz Stability: > 1 x 10 ⁻¹⁰ /yr | HP 5061A/HP 5071A | Internal Timebase: Aging Rate (P) 10 MHz Standard (A) |
| Microwave Amplifier | Frequency Range: 1.5 to 18 GHz Leveled Output Power: ≥ 16 dBm | HP 8348A | FM Bandwidth (P) |
| Preamplifier/Power Amplifier | Frequency Range: 100 kHz to 1.3 GHz Preamplifier Gain: 25 dB Power Amplifier Gain: 22 dB | HP 8447F | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Delay Line Discriminator | ≥ 1 meter of coax or semirigid cable | | FM Bandwidth (P) |
| Mixer | Frequency Range: 1 GHz to 20 GHz (Norda 4817) | HP P/N 0955-0307 | Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) |
| Power Splitter | Frequency Range: 10 MHz to 20 GHz | HP 11667B | FM Bandwidth (P) |
| Crystal Detector | Frequency Range: DC to 20 GHz Maximum Input: 200 mW Polarity: Negative | HP 33330D | External Leveling (P) AM Bandwidth (P) |
| Attenuator | Frequency Range: 10 MHz to 20 GHz Maximum Input Power: 300 mW Attenuation: 6 dB | HP 8493C Opt 006 | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

Table 1-1. Required Equipment for HP 83620A/22A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|--|--|--|
| Attenuator | Frequency Range: 10 MHz to 20 GHz Maximum Input Power: 300 mW Attenuation: 10 dB | HP 8493C Opt 010 | Power Accuracy (P) Spurious Signals (Harmonic) (P) Pulse Performance (P) Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) (2) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Step Attenuator Flatness (AA) Step Attenuator Flatness (AA) |
| Attenuator | Frequency Range: 10 MHz to 20 GHz Maximum Input Power: 300 mW Attenuation: 20 dB | HP 8493C Option 020 | Maximum Levelled Power (P) Pulse Performance (P) |
| 3.7 GHz Low Pass Filter | | HP P/N 9135-0191 | Pulse Modulation Video Feedthrough (P) |
| 130 MHz Bessel Low Pass Filter | | K & L Microwave 5LL30-130/BT2400/BP | Pulse Modulation Video Feedthrough (P) |
| 500 MHz Low Pass Filter | | Mini-Circuits SLP-550 | Pulse Modulation Video Feedthrough (P) |
| Tool Kit | No Substitute | HP P/N 08360-60060 | |
| Invertron | | California Instruments 501TC | Spurious Signals (Line Related) (P) |
| Capacitor | 1000 pf | HP P/N 0160-4574 | External Leveling (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

The following list of adapters and cables is provided for convenience. They may be used in equipment setups for performance tests or adjustments.

| | |
|-----------------------------------|-------------|
| SMA (m) to SMA (m) adapter | 1250-1159 |
| SMA (f) to SMA (f) adapter | 1250-1158 |
| SMB (m) to SMB (m) adapter | 1250-0669 |
| SMB (f) to SMB (f) adapter | 1250-0672 |
| SMB tee (f) (m) (m) | 1250-1391 |
| | |
| 3.5 mm (f) to 3.5 mm (f) adapter | 5061-5311 |
| 3.5 mm (f) to N-type (m) adapter | 1250-1745 |
| 2.4 mm (f) to 2.92 mm (f) adapter | 1250-2187 |
| 2.4 mm (f) to 2.4 mm (f) adapter | 1250-2188 |
| 2.4 mm (m) to 3.5 mm (f) adapter | 11901C |
| | |
| BNC (f) to BNC (f) adapter | 1250-0080 |
| BNC (m) to BNC (m) adapter | 1250-0216 |
| BNC (f) to SMA (m) adapter | 1250-1200 |
| BNC (f) to SMB (m) adapter | 1250-1237 |
| BNC tee (m) (f) (f) | 1250-0781 |
| | |
| SMB (f) to BNC (m) flexible cable | 85680-60093 |
| SMA semi-rigid cable 2 feet | 08340-20124 |
| BNC cable | 8120-2582 |
| HP-IB cable 2 meters | HP 10833B |

HP 83623A/24A Required Equipment

Table 1-2. Required Equipment for HP 83623A/24A

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---|---|--------------------------------------|--|
| Spectrum Analyzer | Frequency Range: 10 MHz to 20 GHz Frequency Span: 0 Hz, 100 Hz to 20 GHz Amplitude Range: +20 to -100 dBm Resolution Bandwidth: 10 Hz to 3 MHz Video Bandwidth: 10 Hz to 3 MHz Log Fidelity: ±0.1 dB/dB over 0 to 80 dB display (±1.0 dB maximum) Video Output: DC voltage proportional to vertical position of trace on display Capable of phase locking to external 10 MHz reference | HP 8566B ² | Swept Frequency Accuracy (P) Spurious Signals (Harmonic) (P) Spurious Signals (Non-harmonic) (P) Spurious Signals (Line Related) (P) Pulse Modulation On/Off Ratio (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Fractional-N Reference and API Spurs (A) FM Gain (A) Square Wave Symmetry (A) |
| Analog Oscilloscope | A vs B Sweep Mode Vertical Sensitivity: 5 mV/Div Bandwidth: 100 MHz | HP 1740A/ HP 54600B | Amp/Mult Adjustments (A) Amp/Filter Adjustments (A) |
| Local Oscillator (Synthesized Sweeper) | | HP 83620/ HP 8340A/B ² | Pulse Performance-Alt (P) AM Accuracy (P) |
| Spectrum Analyzer with Tracking Generator | Frequency Range: 20 Hz to 10 MHz | HP 3585A/B | AM Bandwidth (P) FM Bandwidth (P) |
| Controller | 4 Mbyte RAM BASIC 5.1 HP-IB | HP 9836/HP 9920/ HP 310/HP 320 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-2. Required Equipment for HP 83623A/24A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|-------------------------|---|---|--|
| Software | No Substitute (Shipped with synthesizer) | HP P/N 08360-10001 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |
| DVM | Range: -50 to +50 VDC Accuracy: $\pm 0.01\%$ Input Impedance: $\geq 10\text{ M}\Omega$ | HP 3456A ² / HP 3457A | External Leveling (P) AM Accuracy (P) AM Bandwidth (P) AM Dynamic Range (P) FM Bandwidth (P) Modulation Meter (P) Low Power SRD Bias (A) AM Accuracy (A) AM Delay (A) ADC (AA) |
| Digitizing Oscilloscope | Dual Channel Bandwidth: DC to 300 MHz Input Impedance: $1\text{ M}\Omega$ and 50Ω Vertical Sensitivity: $\leq 5\text{ mV/Div}$ Horizontal Sensitivity: 50 ns/Div Trigger: Event Triggerable | HP 54110A/ HP 54111D ² / HP 54222A | Internal Timebase: Aging Rate (P) Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) FM Bandwidth (P) Internal Pulse Accuracy (P) 10 MHz Standard (A) Modulator Offset and Gain (A) Modulation Generator Flatness (A) |
| Digitizing Oscilloscope | 3 dB Bandwidth: 20 GHz DC Voltage Accuracy: $\pm 0.4\%$ of full scale $\pm 2\text{ mV}$ Trigger Sensitivity DC to 100 MHz: 40 mV p-p Trigger & Timebase Jitter: $\leq 2.5\text{ ps} + 5E^{-5} \times \text{delay setting}$ Time Interval Accuracy: $\leq 10\text{ ps} \pm 0.1\%$ of reading Channel Input Reflection: $\leq 5\%$ for 30 ps risetime | HP 54124T | Pulse Performance (P) |
| Oscilloscope Probes | Division Ratio: 1:1 | HP 10437A | Internal Pulse Accuracy (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-2. Required Equipment for HP 83623A/24A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---------------------|---|---------------------------------|---|
| Oscilloscope Probes | Division Ratio: 10:1 | HP 10431A | Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Modulation Video Feedthrough (P) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Modulator Offset and Gain (A) |
| Pulse Generator | Pulse Width: ≤ 50 ns Rise Time: ≤ 10 ns Frequency: 10 Hz to 5 MHz | HP 8112B/HP 8116A ² | Pulse Performance (P) Pulse Modulation Video Feedthrough (P) |
| Function Generator | Frequency Accuracy: $\pm 5 \times 10^{-6}$ Amplitude Accuracy 100 kHz to 1 MHz: ± 0.1 dB 100 kHz to 20 MHz: ± 0.4 dB | HP 3325A/B | AM Accuracy (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Modulation Meter (P) AM Accuracy (A) AM Delay (A) FM Gain (A) |
| Function Generator | Amplitude Range: > 16 V p-p | HP 8111A/HP 8116A/ HP 8175A | Maximum FM Deviation (P) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 436A/ HP 437B/ HP 438A | Power Accuracy (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) AM Accuracy (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 437B | Power Flatness (P) Power Flatness (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 438A | Power Flatness and Accuracy (AP) Power Flatness (AA) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-2. Required Equipment for HP 83623A/24A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|--|-----------------------|--|
| Power Sensor | Frequency Range: 10 MHz to 2.3 GHz Power Range: 1 μ W to 100 mW | HP 8482A | Power Flatness (P) Power Flatness (A) Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) Power Flatness (AA) |
| Power Sensor | Frequency Range: 50 MHz to 20 GHz Power Range: 100 pW to 10 μ W | HP 8485D | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Power Sensor | Frequency Range: 50 MHz to 20 GHz Power Range: 1 μ W to 100 mW | HP 8485A | Power Accuracy (P) Power Flatness (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) Power Flatness (A) AM Accuracy (A) Power Flatness and Accuracy (AP) Power Flatness (AA) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Attenuator | Attenuation: 30 dB \pm 0.05 dB at 50 MHz | HP 11708A | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Measuring Receiver | Frequency Range (tuned): 2.5 MHz to 1.3 GHz Range: 0 dBm to -127 dBm Relative Power Accuracy: \pm 0.5 dB AM Rates: 20 Hz to 100 kHz Depth: to 99% Accuracy: \pm 1% of reading \pm 1 count | HP 8902A ² | AM Accuracy (P) |
| Phase Noise Measurement System | Frequency Range (carrier): 0.01 to 18 GHz Sensitivity: < -70 dBc at 100 Hz offset < -78 dBc at 1 kHz offset < -86 dBc at 10 kHz offset < -107 dBc at 100 kHz offset Offset Frequency Range: 100 Hz to 2 MHz Amplitude Accuracy: \pm 2 dB to 1 MHz offset | HP 3048A | Single Sideband Phase Noise (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-2. Required Equipment for HP 83623A/24A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|------------------------------|--|---------------------|--|
| Frequency Standard | Frequency: 10 MHz Stability: $> 1 \times 10^{-10}/\text{yr}$ | HP 5061A/HP 5071A | Internal Timebase: Aging Rate (P) 10 MHz Standard (A) |
| Microwave Amplifier | Frequency Range: 1.5 to 18 GHz Leveled Output Power: ≥ 16 dBm | HP 8348A | FM Bandwidth (P) |
| Preamplifier/Power Amplifier | Frequency Range: 100 kHz to 1.3 GHz Preamplifier Gain: 25 dB Power Amplifier Gain: 22 dB | HP 8447F | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Delay Line Discriminator | ≥ 1 meter of coax or semi-rigid cable | | FM Bandwidth (P) |
| Mixer | Frequency Range: 1 GHz to 20 GHz (Norda 4817) | HP P/N 0955-0307 | Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) |
| Power Splitter | Frequency Range: 10 MHz to 20 GHz | HP 11667B | FM Bandwidth (P) |
| Crystal Detector | Frequency Range: DC to 20 GHz Maximum Input: 200 mW Polarity: Negative | HP 33330D | External Leveling (P) AM Bandwidth (P) |
| Attenuator | Frequency Range: 10 MHz to 20 GHz Maximum Input Power: 300 mW Attenuation: 6 dB | HP 8493C Opt 006 | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Attenuator | Frequency Range: 10 MHz to 20 GHz Maximum Input Power: 300 mW Attenuation: 10 dB | HP 8493C Opt 010 | Power Accuracy (P) Spurious Signals (Harmonic) (P) Pulse Performance (P) Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) (2) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Step Attenuator Flatness (AA) Step Attenuator Flatness (AA) |
| Attenuator | Frequency Range: 10 MHz to 20 GHz Maximum Input Power: 300 mW Attenuation: 20 dB | HP 8493C Option 020 | Maximum Leveled Power (P) Pulse Performance (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

Table 1-2. Required Equipment for HP 83623A/24A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|-------------------------|-------------------------------------|--|
| 3.7 GHz Low Pass Filter | No Substitute | HP P/N 9135-0191 | Pulse Modulation Video Feedthrough (P) |
| 130 MHz Bessel Low Pass Filter | | K & L Microwave 5LL30-130/BT2400/BP | Pulse Modulation Video Feedthrough (P) |
| 500 MHz Low Pass Filter | | Mini-Circuits SLP-550 | Pulse Modulation Video Feedthrough (P) |
| Tool Kit | | HP P/N 08360-60060 | |
| Invertron | | California Instruments 501TC | Spurious Signals (Line Related) (P) |
| Capacitor | 1000 pf | HP P/N 0160-4574 | External Leveling (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

The following list of adapters and cables is provided for convenience. They may be used in equipment setups for performance tests or adjustments.

| | |
|-----------------------------------|-------------|
| SMA (m) to SMA (m) adapter | 1250-1159 |
| SMA (f) to SMA (f) adapter | 1250-1158 |
| SMB (m) to SMB (m) adapter | 1250-0669 |
| SMB (f) to SMB (f) adapter | 1250-0672 |
| SMB tee (f) (m) (m) | 1250-1391 |
| | |
| 3.5 mm (f) to 3.5 mm (f) adapter | 5061-5311 |
| 3.5 mm (f) to N-type (m) adapter | 1250-1745 |
| 2.4 mm (f) to 2.92 mm (f) adapter | 1250-2187 |
| 2.4 mm (f) to 2.4 mm (f) adapter | 1250-2188 |
| 2.4 mm (m) to 3.5 mm (f) adapter | 11901C |
| | |
| BNC (f) to BNC (f) adapter | 1250-0080 |
| BNC (m) to BNC (m) adapter | 1250-0216 |
| BNC (f) to SMA (m) adapter | 1250-1200 |
| BNC (f) to SMB (m) adapter | 1250-1237 |
| BNC tee (m) (f) (f) | 1250-0781 |
| | |
| SMB (f) to BNC (m) flexible cable | 85680-60093 |
| SMA semi-rigid cable 2 feet | 08340-20124 |
| BNC cable | 8120-2582 |
| HP-IB cable 2 meters | HP 10833B |

HP 83630A Required Equipment

Table 1-3. Required Equipment for HP 83630A

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---|---|--------------------------------------|---|
| Spectrum Analyzer | Frequency Range: 10 MHz to 22 GHz (26.5 GHz with external mixers) Frequency Span: 0 Hz, 100 Hz to 22 GHz Amplitude Range: +20 to -100 dBm Resolution Bandwidth: 10 Hz to 3 MHz Video Bandwidth: 10 Hz to 3 MHz Log Fidelity: ±0.1 dB/dB over 0 to 80 dB display (±1.0 dB maximum) Video Output: DC voltage proportional to vertical position of trace on display Capable of phase locking to external 10 MHz reference | HP 8566B ² | Swept Frequency Accuracy (P) Spurious Signals (Harmonic) (P) Spurious Signals (Non-harmonic) (P) Spurious Signals (Line Related) (P) Pulse Modulation On/Off Ratio (P) Pulse Performance-Alt (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Fractional-N Reference and API Spurs (A) FM Gain (A) Square Wave Symmetry (A) |
| Analog Oscilloscope | A vs B Sweep Mode Vertical Sensitivity: 5 mV/Div Bandwidth: 100 MHz | HP 1740A/ HP 54600B | Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) |
| Local Oscillator (Synthesized Sweeper) | | HP 83620/ HP 8340A/B ² | Pulse Performance-Alt (P) AM Accuracy (P) |
| Spectrum Analyzer with Tracking Generator | Frequency Range: 20 Hz to 10 MHz | HP 3585A/B | AM Bandwidth (P) FM Bandwidth (P) |
| Controller | 4 Mbyte RAM BASIC 5.1 HP-IB | HP 9836/HP 9920/ HP 310/HP 320 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-3. Required Equipment for HP 83630A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|-------------------------|--|---|--|
| Software | No Substitute (Shipped with synthesizer) | HP P/N 08360-10001 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |
| DVM | Range: -50 to +50 VDC Accuracy: $\pm 0.01\%$ Input Impedance: $\geq 10\text{ M}\Omega$ | HP 3456A ² / HP 3457A | External Leveling (P) AM Accuracy (P) AM Bandwidth (P) AM Dynamic Range (P) FM Bandwidth (P) Modulation Meter (P) Low Power SRD Bias (A) AM Accuracy (A) AM Delay (A) ADC (AA) |
| Digitizing Oscilloscope | Dual Channel Bandwidth: DC to 300 MHz Input Impedance: 1 M Ω and 50 Ω Vertical Sensitivity: $\leq 5\text{ mV/Div}$ Horizontal Sensitivity: 50 ns/Div Trigger: Event Triggerable | HP 54110A/ HP 54111D ² / HP 54222A | Internal Timebase: Aging Rate (P) Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) FM Bandwidth (P) Internal Pulse Accuracy (P) 10 MHz Standard (A) Modulator Offset and Gain (A) Modulation Generator Flatness (A) |
| Digitizing Oscilloscope | 3 dB Bandwidth: 26.5 GHz DC Voltage Accuracy: $\pm 0.4\%$ of full scale $\pm 2\text{ mV}$ Trigger Sensitivity DC to 100 MHz: 40 mV p-p Trigger & Timebase Jitter: $\leq 2.5\text{ ps} + 5E^{-5}$ x delay setting Time Interval Accuracy: $\leq 10\text{ ps} \pm 0.1\%$ of reading Channel Input Reflection: $\leq 5\%$ for 30 ps risetime | HP 54124T | Pulse Performance (P) |
| Oscilloscope Probes | Division Ratio: 1:1 | HP 10437A | Internal Pulse Accuracy (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-3. Required Equipment for HP 83630A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---------------------|---|---------------------------------|---|
| Oscilloscope Probes | Division Ratio: 10:1 | HP 10431A | Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Modulation Video Feedthrough (P) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Modulator Offset and Gain (A) |
| Pulse Generator | Pulse Width: ≤ 50 ns Rise Time: ≤ 10 ns Frequency: 10 Hz to 5 MHz | HP 8112B/HP 8116A ² | Pulse Performance (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Function Generator | Frequency Accuracy: $\pm 5 \times 10^{-6}$ Amplitude Accuracy 100 kHz to 1 MHz: ± 0.1 dB 100 kHz to 20 MHz: ± 0.4 dB | HP 3325A/B | AM Accuracy (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Modulation Meter (P) AM Accuracy (A) AM Delay (A) FM Gain (A) |
| Function Generator | Amplitude Range: > 16 V p-p | HP 8111A/HP 8116A/ HP 8175A | Maximum FM Deviation (P) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 436A/ HP 437B/ HP 438A | Power Accuracy (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) AM Accuracy (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 437B | Power Flatness (P) Power Flatness (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 438A | Power Flatness and Accuracy (AP) Power Flatness (AA) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-3. Required Equipment for HP 83630A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|---|-----------------------|--|
| Power Sensor | Frequency Range: 10 MHz to 2.3 GHz Power Range: 1 μ W to 100 mW | HP 8482A | Power Flatness (P) Power Flatness (A) Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) Power Flatness (AA) |
| Power Sensor | Frequency Range: 50 MHz to 26.5 GHz Power Range: 100 pW to 10 μ W | HP 8485D | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Power Sensor | Frequency Range: 50 MHz to 26.5 GHz Power Range: 1 μ W to 100 mW | HP 8485A | Power Accuracy (P) Power Flatness (P) AM Dynamic Range (P) Amp/Filter Adjustments (A) ALC Power Level Accuracy (A) Power Flatness (A) AM Accuracy (A) Power Flatness and Accuracy (AP) Power Flatness (AA) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Attenuator | Attenuation: 30 dB \pm 0.05 dB at 50 MHz | HP 11708A | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Measuring Receiver | Frequency Range (tuned): 2.5 MHz to 1.3 GHz Range: 0 dBm to -127 dBm Relative Power Accuracy: \pm 0.5 dB AM Rates: 20 Hz to 100 kHz Depth: to 99% Accuracy: \pm 1% of reading \pm 1 count | HP 8902A ² | AM Accuracy (P) |
| Phase Noise Measurement System | Frequency Range (carrier): 0.01 to 18 GHz Sensitivity: < -70 dBc at 100 Hz offset < -78 dBc at 1 kHz offset < -86 dBc at 10 kHz offset < -107 dBc at 100 kHz offset Offset Frequency Range: 100 Hz to 2 MHz Amplitude Accuracy: \pm 2 dB to 1 MHz offset | HP 3048A | Single Sideband Phase Noise (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-3. Required Equipment for HP 83630A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|----------------------------------|--|-------------------|--|
| Frequency Standard | Frequency: 10 MHz Stability: $> 1 \times 10^{-10}/\text{yr}$ | HP 5061A/HP 5071A | Internal Timebase: Aging Rate (P) 10 MHz Standard (A) |
| Microwave Amplifier | Frequency Range: 1.5 to 26.5 GHz Leveled Output Power: ≥ 16 dBm | HP 8348B | FM Bandwidth (P) |
| Preamplifier/ Power Amplifier | Frequency Range: 100 kHz to 1.3 GHz Preamplifier Gain: 25 dB Power Amplifier Gain: 22 dB | HP 8447F | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Delay Line Discriminator | ≥ 1 meter of coax or semi-rigid cable | | FM Bandwidth (P) |
| Mixer | Frequency Range: 1 GHz to 26.5 GHz (Norda 4817) | HP P/N 0955-0307 | Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) |
| Power Splitter | Frequency Range: 10 MHz to 26.5 GHz | HP 11667B | FM Bandwidth (P) |
| Crystal Detector | Frequency Range: DC to 26.5 GHz Maximum Input: 200 mW Polarity: Negative | HP 33330D | External Leveling (P) AM Bandwidth (P) Amp/Mult Adjustments (A) |
| Attenuator | Frequency Range: 10 MHz to 26.5 GHz Maximum Input Power: 300 mW Attenuation: 6 dB | HP 8493C Opt 006 | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Attenuator | Frequency Range: 10 MHz to 26.5 GHz Maximum Input Power: 300 mW Attenuation: 10 dB | HP 8493C Opt 010 | Power Accuracy (P) Spurious Signals (Harmonic) (P) Pulse Performance (P) Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) (2) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Step Attenuator Flatness (AA) Step Attenuator Flatness (AA) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

Table 1-3. Required Equipment for HP 83630A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|--|--|--|
| Attenuator | Frequency Range: 10 MHz to 26.5 GHz Maximum Input Power: 300 mW Attenuation: 20 dB | HP 8493C Option 020 | Maximum Levelled Power (P) Pulse Performance (P) |
| 3.7 GHz Low Pass Filter | | HP P/N 9135-0191 | Pulse Modulation Video Feedthrough (P) |
| 130 MHz Bessel Low Pass Filter | | K & L Microwave 5LL30-130/BT2400/BP | Pulse Modulation Video Feedthrough (P) |
| 500 MHz Low Pass Filter | | Mini-Circuits SLP-550 | Pulse Modulation Video Feedthrough (P) |
| Tool Kit | No Substitute | HP P/N 08360-60060 | |
| Invertron | | California Instruments 501TC | Spurious Signals (Line Related) (P) |
| Capacitor | 1000 pf | HP P/N 0160-4574 | External Leveling (P) |
| Microwave Amplifier | Frequency Range: 2 to 8 GHz Leveled Output Power: +16 dBm | HP 11975A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| Harmonic Mixer | Frequency Range: 20 to 26.5 GHz | HP 11970K | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| K-Band Coax Adapter | WR42 to APC 3.5 mm (f) | K281C | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

The following list of adapters and cables is provided for convenience. They may be used in equipment setups for performance tests or adjustments.

| | |
|-----------------------------------|-------------|
| SMA (m) to SMA (m) adapter | 1250-1159 |
| SMA (f) to SMA (f) adapter | 1250-1158 |
| SMB (m) to SMB (m) adapter | 1250-0669 |
| SMB (f) to SMB (f) adapter | 1250-0672 |
| SMB tee (f) (m) (m) | 1250-1391 |
| | |
| 3.5 mm (f) to 3.5 mm (f) adapter | 5061-5311 |
| 3.5 mm (f) to N-type (m) adapter | 1250-1745 |
| 2.4 mm (f) to 2.92 mm (f) adapter | 1250-2187 |
| 2.4 mm (f) to 2.4 mm (f) adapter | 1250-2188 |
| 2.4 mm (m) to 3.5 mm (f) adapter | 11901C |
| | |
| BNC (f) to BNC (f) adapter | 1250-0080 |
| BNC (m) to BNC (m) adapter | 1250-0216 |
| BNC (f) to SMA (m) adapter | 1250-1200 |
| BNC (f) to SMB (m) adapter | 1250-1237 |
| BNC tee (m) (f) (f) | 1250-0781 |
| | |
| SMB (f) to BNC (m) flexible cable | 85680-60093 |
| SMA semi-rigid cable 2 feet | 08340-20124 |
| BNC cable | 8120-2582 |
| HP-IB cable 2 meters | HP 10833B |

HP 83640A Required Equipment

Table 1-4. Required Equipment for HP 83640A

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---|--|--------------------------------------|--|
| Spectrum Analyzer | Frequency Range: 10 MHz to 22 GHz (40 GHz with external mixers) Frequency Span: 0 Hz, 100 Hz to 22 GHz Amplitude Range: +20 to -100 dBm Resolution Bandwidth: 10 Hz to 3 MHz Video Bandwidth: 10 Hz to 3 MHz Log Fidelity: ±0.1 dB/dB over 0 to 80 dB display (±1.0 dB maximum) Video Output: DC voltage proportional to vertical position of trace on display Capable of phase locking to external 10 MHz reference | HP 8566B ² | Swept Frequency Accuracy (P) Spurious Signals (Harmonic) (P) Spurious Signals (Non-harmonic) (P) Spurious Signals (Line Related) (P) Pulse Modulation On/Off Ratio (P) Pulse Performance-Alt (P) AM Accuracy (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Fractional-N Reference and API Spurs (A) FM Gain (A) Square Wave Symmetry (A) |
| Analog Oscilloscope | A vs B Sweep Mode Vertical Sensitivity: 5 mV/Div Bandwidth: 100 MHz | HP 1740A/HP 54600B | Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) |
| Local Oscillator (Synthesized Sweeper) | | HP 83620/ HP 8340A/B ² | Pulse Performance-Alt (P) AM Accuracy (P) |
| Spectrum Analyzer with Tracking Generator | Frequency Range: 20 Hz to 10 MHz | HP 3585A/B | AM Bandwidth (P) FM Bandwidth (P) |
| Controller | 4 Mbyte RAM BASIC 5.1 HP-IB | HP 9836/HP 9920/ HP 310/HP 320 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-4. Required Equipment for HP 83640A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|-------------------------|---|---|--|
| Software | No Substitute (Shipped with synthesizer) | HP P/N 08360-10001 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |
| DVM | Range: -50 to +50 VDC Accuracy: $\pm 0.01\%$ Input Impedance: $\geq 10 \text{ M}\Omega$ | HP 3456A ² / HP 3457A | External Leveling (P) AM Accuracy (P) AM Bandwidth (P) AM Dynamic Range (P) FM Bandwidth (P) Modulation Meter (P) Low Power SRD Bias (A) AM Accuracy (A) AM Delay (A) ADC (AA) |
| Digitizing Oscilloscope | Dual Channel Bandwidth: DC to 300 MHz Input Impedance: 1 M Ω and 50 Ω Vertical Sensitivity: $\leq 5 \text{ mV/Div}$ Horizontal Sensitivity: 50 ns/Div Trigger: Event Triggerable | HP 54110A/ HP 54111D ² / HP 54222A | Internal Timebase: Aging Rate (P) Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) FM Bandwidth (P) Internal Pulse Accuracy (P) 10 MHz Standard (A) Modulator Offset and Gain (A) Modulation Generator Flatness (A) |
| Digitizing Oscilloscope | 3 dB Bandwidth: 40 GHz DC Voltage Accuracy: $\pm 0.4\%$ of full scale $\pm 2 \text{ mV}$ Trigger Sensitivity DC to 100 MHz: 40 mV p-p Trigger & Timebase Jitter: $\leq 2.5 \text{ ps} + 5E^{-5} \times \text{delay setting}$ Time Interval Accuracy: $\leq 10 \text{ ps} \pm 0.1\%$ of reading Channel Input Reflection: $\leq 5\%$ for 30 ps risetime | HP 54124T | Pulse Performance (P) |
| Oscilloscope Probes | Division Ratio: 1:1 | HP 10437A | Internal Pulse Accuracy (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-4. Required Equipment for HP 83640A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---------------------|---|---------------------------------|--|
| Oscilloscope Probes | Division Ratio: 10:1 | HP 10431A | Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Modulator Offset and Gain (A) |
| Pulse Generator | Pulse Width: ≤ 50 ns Rise Time: ≤ 10 ns Frequency: 10 Hz to 5 MHz | HP 8112B/HP 8116A ² | Pulse Performance (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Function Generator | Frequency Accuracy: $\pm 5 \times 10^{-6}$ Amplitude Accuracy 100 kHz to 1 MHz: ± 0.1 dB 100 kHz to 20 MHz: ± 0.4 dB | HP 3325A/B | AM Accuracy (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Modulation Meter (P) AM Accuracy (A) AM Delay (A) FM Gain (A) |
| Function Generator | Amplitude Range: > 16 V p-p | HP 8111A/HP 8116A/ HP 8175A | Maximum FM Deviation (P) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 436A/ HP 437B/ HP 438A | Power Accuracy (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) AM Accuracy (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 437B | Power Flatness (P) Power Flatness (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 438A | Power Flatness and Accuracy (AP) Step Attenuator Flatness (AP) Power Flatness (AA) Step Attenuator Flatness (AA) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-4. Required Equipment for HP 83640A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|--|-----------------------|--|
| Power Sensor | Frequency Range: 10 MHz to 2.3 GHz Power Range: 1 μ W to 100 mW | HP 8482A | Power Flatness (P) Power Flatness (A) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) Power Flatness (AA) Step Attenuator Flatness (AP) |
| Power Sensor | Frequency Range: 50 MHz to 40 GHz Power Range: 1 μ W to 100 mW | HP 8487A | Power Accuracy (P) Power Flatness (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) Power Flatness (A) AM Accuracy (A) Square Wave Symmetry (A) Accuracy (AP) Step Attenuator Flatness (AP) Power Flatness (AA) Step Attenuator Flatness (AA) |
| Power Sensor | Frequency Range: 50 MHz to 40 GHz Power Range: 100 pW to 10 μ W | HP 8487D | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Attenuator | Attenuation: 30 dB \pm 0.05 dB at 50 MHz | HP 11708A | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Measuring Receiver | Frequency Range (tuned): 2.5 MHz to 1.3 GHz Range: 0 dBm to -127 dBm Relative Power Accuracy: \pm 0.5 dB AM Rates: 20 Hz to 100 kHz Depth: to 99% Accuracy: \pm 1% of reading \pm 1 count | HP 8902A ² | AM Accuracy (P) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Phase Noise Measurement System | Frequency Range (carrier): 0.01 to 18 GHz Sensitivity: < -70 dBc at 100 Hz offset < -78 dBc at 1 kHz offset < -86 dBc at 10 kHz offset < -107 dBc at 100 kHz offset Offset Frequency Range: 100 Hz to 2 MHz Amplitude Accuracy: \pm 2 dB to 1 MHz offset | HP 3048A | Single Sideband Phase Noise (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-4. Required Equipment for HP 83640A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|----------------------------------|--|---------------------|--|
| Frequency Standard | Frequency: 10 MHz Stability: $> 1 \times 10^{-10}/\text{yr}$ | HP 5061A/HP 5071A | Internal Timebase: Aging Rate (P) 10 MHz Standard (A) |
| Microwave Amplifier | Frequency Range: 1.5 to 26.5 GHz Leveled Output Power: ≥ 16 dBm | HP 8348A | FM Bandwidth (P) |
| Preamplifier/ Power Amplifier | Frequency Range: 100 kHz to 1.3 GHz Preamp Gain: 25 dB Power Amplifier Gain: 22 dB | HP 8447F | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Delay Line Discriminator | ≥ 1 meter of coax or semi-rigid cable | | FM Bandwidth (P) |
| Mixer | Frequency Range: 1 GHz to 20 GHz (Norda 4817) | HP P/N 0955-0307 | Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) |
| Power Splitter | Frequency Range: 10 MHz to 26.5 GHz | HP 11667C | FM Bandwidth (P) |
| Crystal Detector | Frequency Range: DC to 40 GHz Maximum Input: 200 mW Polarity: Negative | HP 33330E | External Leveling (P) AM Bandwidth (P) Amp/Mult Adjustments (A) |
| Attenuator | Frequency Range: 10 MHz to 40 GHz Maximum Input Power: 300 mW Attenuation: 6 dB | HP 8493C Opt 006 | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Attenuator | Frequency Range: 10 MHz to 40 GHz Maximum Input Power: 300 mW Attenuation: 20 dB | HP 8490D Option 020 | Maximum Leveled Power (P) Pulse Performance (P) |
| Attenuator | Frequency Range: 50 MHz to 40 GHz Maximum Input Power: 300 mW Attenuation: 20 dB | HP 8490D Option 010 | Power Accuracy (P) Spurious Signals (Harmonic) (P) Pulse Performance (P) Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) (2) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Step Attenuator Flatness (AA) Step Attenuator Flatness (AA) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

Table 1-4. Required Equipment for HP 83640A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|--|--|---|
| 3.7 GHz Low Pass Filter | | HP P/N 9135-0191 | Pulse Modulation Video Feedthrough (P) |
| 130 MHz Bessel Low Pass Filter | | K & L Microwave 5LL30-130/BT2400/BP | Pulse Modulation Video Feedthrough (P) |
| 500 MHz Low Pass Filter | | Mini-Circuits SLP-550 | Pulse Modulation Video Feedthrough (P) |
| Tool Kit | No Substitute | HP P/N 08360-60060 | |
| Invertron | | California Instruments 501TC | Spurious Signals (Line Related) (P) |
| Capacitor | 1000 pf | HP P/N 0160-4574 | External Leveling (P) |
| Microwave Amplifier | Frequency Range: 2 to 8 GHz Leveled Output Power: +16 dBm | HP 11975A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) AM Accuracy (P) |
| Mixer | Frequency Range: 26.5 to 40 GHz | HP 11970A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| Mixer | Frequency Range: 20 to 26.5 GHz | HP 11970K | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| K-Band Coax Adapter | WR42 to APC 3.5 mm (f) | K281C | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| R-Band Coax Adapter | WR28 to APC 2.4 mm (f) | R281A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

The following list of adapters and cables is provided for convenience. They may be used in equipment setups for performance tests or adjustments.

| | |
|-----------------------------------|-------------|
| SMA (m) to SMA (m) adapter | 1250-1159 |
| SMA (f) to SMA (f) adapter | 1250-1158 |
| SMB (m) to SMB (m) adapter | 1250-0669 |
| SMB (f) to SMB (f) adapter | 1250-0672 |
| SMB tee (f) (m) (m) | 1250-1391 |
| | |
| 3.5 mm (f) to 3.5 mm (f) adapter | 5061-5311 |
| 3.5 mm (f) to N-type (m) adapter | 1250-1745 |
| 2.4 mm (f) to 2.92 mm (f) adapter | 1250-2187 |
| 2.4 mm (f) to 2.4 mm (f) adapter | 1250-2188 |
| 2.4 mm (m) to 3.5 mm (f) adapter | 11901C |
| | |
| BNC (f) to BNC (f) adapter | 1250-0080 |
| BNC (m) to BNC (m) adapter | 1250-0216 |
| BNC (f) to SMA (m) adapter | 1250-1200 |
| BNC (f) to SMB (m) adapter | 1250-1237 |
| BNC tee (m) (f) (f) | 1250-0781 |
| | |
| SMB (f) to BNC (m) flexible cable | 85680-60093 |
| SMA semi-rigid cable 2 feet | 08340-20124 |
| BNC cable | 8120-2582 |
| HP-IB cable 2 meters | HP 10833B |

HP 83650A Required Equipment

Table 1-5. Required Equipment for HP 83650A

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---|--|--------------------------------------|--|
| Spectrum Analyzer | Frequency Range: 10 MHz to 22 GHz (50 GHz with external mixers) Frequency Span: 0 Hz, 100 Hz to 22 GHz Amplitude Range: +20 to -100 dBm Resolution Bandwidth: 10 Hz to 3 MHz Video Bandwidth: 10 Hz to 3 MHz Log Fidelity: ± 0.1 dB/dB over 0 to 80 dB display (± 1.0 dB maximum) Video Output: DC voltage proportional to vertical position of trace on display Capable of phase locking to external 10 MHz reference | HP 8566B ² | Swept Frequency Accuracy (P) Spurious Signals (Harmonic) (P) Spurious Signals (Non-harmonic) (P) Spurious Signals (Line Related) (P) Pulse Modulation On/Off Ratio (P) Pulse Performance-Alt (P) AM Accuracy (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Fractional-N Reference and API Spurs (A) FM Gain (A) Square Wave Symmetry (A) |
| Analog Oscilloscope | A vs B Sweep Mode Vertical Sensitivity: 5 mV/Div Bandwidth: 100 MHz | HP 1740A/ HP 54600B | Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) |
| Local Oscillator (Synthesized Sweeper) | | HP 83620/ HP 8340A/B ² | Pulse Performance-Alt (P) AM Accuracy (P) |
| Spectrum Analyzer with Tracking Generator | Frequency Range: 20 Hz to 10 MHz | HP 3585A/B | AM Bandwidth (P) FM Bandwidth (P) |
| Controller | 4 Mbyte RAM BASIC 5.1 HP-IB | HP 9836/HP 9920/ HP 310/HP 320 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-5. Required Equipment for HP 83650A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|-------------------------|---|---|--|
| Software | No Substitute (Shipped with synthesizer) | HP P/N 08360-10001 | Step Attenuator Flatness (AP) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) YO Delay (AA) ADC (AA) Power Flatness (AA) |
| DVM | Range: -50 to +50 VDC Accuracy: ±0.01% Input Impedance: ≥ 10 MΩ | HP 3456A ² / HP 3457A | External Leveling (P) AM Accuracy (P) AM Bandwidth (P) AM Dynamic Range (P) FM Bandwidth (P) Modulation Meter (P) Low Power SRD Bias (A) AM Accuracy (A) AM Delay (A) ADC (AA) |
| Digitizing Oscilloscope | Dual Channel Bandwidth: DC to 300 MHz Input Impedance: 1 MΩ and 50Ω Vertical Sensitivity: ≤ 5 mV/Div Horizontal Sensitivity: 50 ns/Div Trigger: Event Triggerable | HP 54110A/ HP 54111D ² / HP 54222A | Internal Timebase: Aging Rate (P) Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) FM Bandwidth (P) Internal Pulse Accuracy (P) 10 MHz Standard (A) Modulator Offset and Gain (A) Modulation Generator Flatness (A) |
| Digitizing Oscilloscope | 3 dB Bandwidth: 50 GHz DC Voltage Accuracy: ±0.4% of full scale ±2 mV Trigger Sensitivity DC to 100 MHz: 40 mV p-p Trigger & Timebase Jitter: ≤ 2.5 ps + 5E ⁻⁵ x delay setting Time Interval Accuracy: ≤ 10 ps ±0.1% of reading Channel Input Reflection: ≤ 5% for 30 ps risetime | HP 54124T | Pulse Performance (P) |
| Oscilloscope Probes | Division Ratio: 1:1 | HP 10437A | Internal Pulse Accuracy (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-5. Required Equipment for HP 83650A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---------------------|---|---------------------------------|--|
| Oscilloscope Probes | Division Ratio: 10:1 | HP 10431A | Swept Frequency Accuracy (P) Frequency Switching Time (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Modulator Offset and Gain (A) |
| Pulse Generator | Pulse Width: ≤ 50 ns Rise Time: ≤ 10 ns Frequency: 10 Hz to 5 MHz | HP 8112B/HP 8116A ² | Pulse Performance (P) Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Function Generator | Frequency Accuracy: $\pm 5 \times 10^{-6}$ Amplitude Accuracy 100 kHz to 1 MHz: ± 0.1 dB 100 kHz to 20 MHz: ± 0.4 dB | HP 3325A/B | AM Accuracy (P) AM Dynamic Range (P) FM Accuracy (P) Maximum FM Deviation (P) Modulation Meter (P) AM Accuracy (A) AM Delay (A) FM Gain (A) |
| Function Generator | Amplitude Range: > 16 V p-p | HP 8111A/HP 8116A/ HP 8175A | Maximum FM Deviation (P) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 436A/ HP 437B/ HP 438A | Power Accuracy (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) AM Accuracy (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 437B | Power Flatness (P) Power Flatness (A) |
| Power Meter | Power Range: 1 μ W to 100 mW Accuracy: ± 0.02 dB | HP 438A | Power Flatness and Accuracy (AP) Step Attenuator Flatness (AP) Power Flatness (AA) Step Attenuator Flatness (AA) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-5. Required Equipment for HP 83650A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|--|-----------------------|--|
| Power Sensor | Frequency Range: 10 MHz to 2.3 GHz Power Range: 1 μ W to 100 mW | HP 8482A | Power Flatness (P) Power Flatness (A) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AA) Power Flatness (AA) Step Attenuator Flatness (AP) |
| Power Sensor | Frequency Range: 50 MHz to 50 GHz Power Range: 1 μ W to 100 mW | HP 8487A | Power Accuracy (P) Power Flatness (P) AM Dynamic Range (P) Amp/Filt Adjustments (A) ALC Power Level Accuracy (A) Power Flatness (A) AM Accuracy (A) Power Flatness and Accuracy (AP) Step Attenuator Flatness (AP) Power Flatness (AA) Step Attenuator Flatness (AA) |
| Power Sensor | Frequency Range: 50 MHz to 50 GHz Power Range: 100 pW to 10 μ W | HP 8487D | Step Attenuator Flatness (AP) Step Attenuator Flatness (AA) |
| Attenuator | Attenuation: 30 dB \pm 0.05 dB at 50 MHz | HP 11708A | Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Measuring Receiver | Frequency Range (tuned): 2.5 MHz to 1.3 GHz Range: 0 dBm to -127 dBm Relative Power Accuracy: \pm 0.5 dB AM Rates: 20 Hz to 100 kHz Depth: to 99% Accuracy: \pm 1% of reading \pm 1 count | HP 8902A ² | AM Accuracy (P) Step Attenuator Flatness (AA) Step Attenuator Flatness (AP) |
| Phase Noise Measurement System | Frequency Range (carrier): 0.01 to 18 GHz Sensitivity: < -70 dBc at 100 Hz offset < -78 dBc at 1 kHz offset < -86 dBc at 10 kHz offset < -107 dBc at 100 kHz offset Offset Frequency Range: 100 Hz to 2 MHz Amplitude Accuracy: \pm 2 dB to 1 MHz offset | HP 3048A | Single Sideband Phase Noise (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

2 Recommended model is part of the microwave test station.

Table 1-5. Required Equipment for HP 83650A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|----------------------------------|--|---------------------|--|
| Frequency Standard | Frequency: 10 MHz Stability: $> 1 \times 10^{-10}/\text{yr}$ | HP 5061A/HP 5071A | Internal Timebase: Aging Rate (P) 10 MHz Standard (A) |
| Microwave Amplifier | Frequency Range: 1.5 to 26.5 GHz Leveled Output Power: ≥ 16 dBm | HP 8348A | FM Bandwidth (P) |
| Preamplifier/ Power Amplifier | Frequency Range: 100 kHz to 1.3 GHz Preamplifier Gain: 25 dB Power Amplifier Gain: 22 dB | HP 8447F | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Delay Line Discriminator | ≥ 1 meter of coax or semi-rigid cable | | FM Bandwidth (P) |
| Mixer | Frequency Range: 1 GHz to 26.5 GHz (Norda 4817) | HP P/N 0955-0307 | Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) |
| Power Splitter | Frequency Range: 10 MHz to 50 GHz | HP 11667C | FM Bandwidth (P) |
| Crystal Detector | Frequency Range: DC to 50 GHz Maximum Input: 200 mW Polarity: Negative | HP 33330E | External Leveling (P) AM Bandwidth (P) Amp/Mult Adjustments (A) |
| Attenuator | Frequency Range: 10 MHz to 50 GHz Maximum Input Power: 300 mW Attenuation: 6 dB | HP 8490D Opt 006 | Pulse Performance-Alt (P) Pulse Modulation Video Feedthrough (P) |
| Attenuator | Frequency Range: 10 MHz to 50 GHz Maximum Input Power: 300 mW Attenuation: 20 dB | HP 8490D Option 020 | Maximum Leveled Power (P) Pulse Performance (P) |
| Attenuator | Frequency Range: 50 MHz to 50 GHz Maximum Input Power: 300 mW Attenuation: 20 dB | HP 8490D Option 010 | Power Accuracy (P) Spurious Signals (Harmonic) (P) Pulse Performance (P) Pulse Performance-Alt (P) AM Accuracy (P) FM Bandwidth (P) (2) Amp/Mult Adjustments (A) Amp/Filt Adjustments (A) Step Attenuator Flatness (AA) Step Attenuator Flatness (AA) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

Table 1-5. Required Equipment for HP 83650A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|--------------------------------|--|-------------------------------------|---|
| 3.7 GHz Low Pass Filter | | HP P/N 9135-0191 | Pulse Modulation Video Feedthrough (P) |
| 130 MHz Bessel Low Pass Filter | | K & L Microwave 5LL30-130/BT2400/BP | Pulse Modulation Video Feedthrough (P) |
| 500 MHz Low Pass Filter | | Mini-Circuits SLP-550 | Pulse Modulation Video Feedthrough (P) |
| Tool Kit | No Substitute | HP P/N 08360-60060 | |
| Invertron | | California Instruments 501TC | Spurious Signals (Line Related) (P) |
| Capacitor | 1000 pf | HP P/N 0160-4574 | External Leveling (P) |
| Mixer | Frequency Range: 26.5 to 40 GHz | HP 11970A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| Microwave Amplifier | Frequency Range: 2 to 8 GHz Leveled Output Power: +16 dBm | HP 11975A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) AM Accuracy (P) |
| Mixer | Frequency Range: 20 to 26.5 GHz | HP 11970K | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| Mixer | Frequency Range: 40 to 50 GHz | HP 11970Q | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| K-Band Coax Adapter | WR42 to APC 3.5 mm (f) | K281C | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |

1 A – Manual Adjustment AA – Automated Adjustment AP – Automated Performance Test
P – Manual Performance Test

Table 1-5. Required Equipment for HP 83650A (continued)

| Instrument | Critical Specifications | Recommended Model | Use ¹ |
|---------------------|-------------------------|-------------------|--|
| R-Band Coax Adapter | WR28 to APC 2.4 mm (f) | R281A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |
| Q-Band Coax Adapter | WR22 to APC 2.4 mm (f) | Q281A | Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P) |

1 A - Manual Adjustment AA - Automated Adjustment AP - Automated Performance Test
P - Manual Performance Test

The following list of adapters and cables is provided for convenience. They may be used in equipment setups for performance tests or adjustments.

| | |
|-----------------------------------|-------------|
| SMA (m) to SMA (m) adapter | 1250-1159 |
| SMA (f) to SMA (f) adapter | 1250-1158 |
| SMB (m) to SMB (m) adapter | 1250-0669 |
| SMB (f) to SMB (f) adapter | 1250-0672 |
| SMB tee (f) (m) (m) | 1250-1391 |
| | |
| 3.5 mm (f) to 3.5 mm (f) adapter | 5061-5311 |
| 3.5 mm (f) to N-type (m) adapter | 1250-1745 |
| 2.4 mm (f) to 2.92 mm (f) adapter | 1250-2187 |
| 2.4 mm (f) to 2.4 mm (f) adapter | 1250-2188 |
| 2.4 mm (m) to 3.5 mm (f) adapter | 11901C |
| | |
| BNC (f) to BNC (f) adapter | 1250-0080 |
| BNC (m) to BNC (m) adapter | 1250-0216 |
| BNC (f) to SMA (m) adapter | 1250-1200 |
| BNC (f) to SMB (m) adapter | 1250-1237 |
| BNC tee (m) (f) (f) | 1250-0781 |
| | |
| SMB (f) to BNC (m) flexible cable | 85680-60093 |
| SMA semi-rigid cable 2 feet | 08340-20124 |
| BNC cable | 8120-2582 |
| HP-IB cable 2 meters | HP 10833B |

Performance Tests

How to Use This Chapter

This chapter contains the following procedures:

| | |
|--|-------|
| Operation Verification Tests | 2-4 |
| Performance Tests | 2-7 |
| 1. Internal Timebase: Aging Rate | 2-8 |
| 2. Swept Frequency Accuracy | 2-12 |
| 3. Frequency Switching Time | 2-22 |
| 4. Power Accuracy | 2-28 |
| 5. Power Flatness | 2-31 |
| 6. Maximum Levelled Power | 2-34 |
| 7. External Leveling | 2-37 |
| 8. Spurious Signals (Harmonics & Subharmonics) | 2-40 |
| 9. Spurious Signals (Non-Harmonic) | 2-50 |
| 10. Spurious Signals (Line-Related) | 2-56 |
| 11. Single Sideband Phase Noise | 2-60 |
| 12. Pulse Modulation On/Off Ratio | 2-65 |
| 13. Pulse Performance | 2-68 |
| 14. Pulse Performance (Alternate Procedure) | 2-76 |
| 15. Pulse Modulation Video Feedthrough | 2-87 |
| 16. AM Accuracy | 2-96 |
| 17. AM Bandwidth | 2-104 |
| 18. AM Dynamic Range | 2-107 |
| 19. FM Accuracy | 2-114 |
| 20. FM Bandwidth | 2-118 |
| 21. Maximum FM Deviation | 2-124 |
| 22. Internal Pulse Accuracy (Option 002) | 2-131 |
| 23. Modulation Meter (Option 002) | 2-133 |

Step Attenuator (see Chapter 5).

Use the procedures in this chapter to test the electrical performance of the synthesizer. These tests do not require access to the interior of the instrument.

The synthesizer must warm up for at least one hour before the electrical specifications are valid.

Menus

Fold-out menu maps are located in Chapter 6. Some menus have more than one page of softkeys. Select the **more** softkey to view the next page of softkeys. **more** is not included in the keystrokes given in these procedures.

Note In all cases where you are instructed to preset the synthesizer, use the factory preset mode only.

Operator's Check

For assurance that most of the internal functions of the instrument work (without testing for specifications), see “Operator’s Check,” in the *User’s Handbook*.

Operation Verification Tests

To meet the needs of most incoming inspections (80% verification), and provide reasonable assurance that the instrument works, see the “Operation Verification” section of this chapter.

Automated Performance Tests

The automated performance tests available at time-of-shipment are included in Chapter 5.

Equipment Required

The equipment required to perform the tests in this chapter is listed in Chapter 1. You may use any equipment that meets the critical specifications given.

Test Record

Test records are supplied at the end of this chapter. Use a test record when you perform a full calibration of your synthesizer. This form provides a tabulated index of the performance tests, their acceptable limits, the measurement uncertainty of each test, and a column to record actual measurements.

There is more than one test record. Be sure you use the one designated (at the top) for your synthesizer.

Test Sequence

Perform the tests in the order that they appear.

Calibration Cycle

Perform the tests in this chapter at least once every 24 months.

Operation Verification

The following procedures meet the needs of most incoming inspections (80% verification), and provide a reasonable assurance that the instrument is functioning properly. Do these procedures in the order given.

The operation verification form is supplied at the end of the procedure. Use the form to record the pass/fail results of an operation verification.

1. Self-tests

1. Perform the full self-tests contained in the instrument firmware. No additional test equipment is required. Press **SERVICE** **Selftest (Full)**.

The synthesizer executes a series of self-tests. When completed, the following message is displayed if all the tests passed:

```
ALL SELF-TESTS HAVE PASSED!
```

2. Record *Pass* on the operation verification form and continue to the next test, "Power Accuracy".

If the synthesizer fails one or more self-tests, a different message is displayed listing the most independent test that failed and a reference to the best entry point into the *Troubleshooting* manual. Record *Fail* on the operation verification form and see the *Troubleshooting* manual. After repair, repeat operation verification from the beginning.

2. Power Accuracy

1. Follow the procedure for this performance test given in this chapter.
2. If the synthesizer passes this test, record *Pass* on the operation verification form and continue to the next test, “Power Flatness”.

If the synthesizer fails, record *Fail* on the operation verification form and then follow the “In Case of Difficulty” instructions given for this performance test. After repair, repeat operation verification from the beginning.

3. Power Flatness

1. Follow the procedure for this performance test given in this chapter.
2. If the synthesizer passes this test, record *Pass* on the operation verification form and continue to the next test, “Maximum Levelled Power”.

If the synthesizer fails, record *Fail* on the operation verification form and then follow the “In Case of Difficulty” instructions given for this performance test. After repair, repeat operation verification from the beginning.

4. Maximum Levelled Power

1. Follow the procedure for this performance test given in this chapter.
2. If the synthesizer passes this test, record *Pass* on the operation verification form. Operation verification is completed.

If the synthesizer fails, record *Fail* on the operation verification form and then follow the “In Case of Difficulty” instructions given for this performance test. After repair, repeat operation verification from the beginning.

Table 2-1. Operation Verification Form

| | |
|--------------------------|----------------------------|
| Test Facility _____ | Date _____ |
| Model _____ | Customer _____ |
| Serial Number _____ | Tested By _____ |
| Options _____ | Firmware Revision _____ |
| Test | Results (Pass/Fail) |
| 1. Self-Tests | _____ |
| 2. Power Accuracy | _____ |
| 3. Power Flatness | _____ |
| 4. Maximum Leveled Power | _____ |

PERFORMANCE TESTS

1. Internal Timebase: Aging Rate

Description and Procedure

This procedure checks the accuracy of the internal timebase. The time required for a specific phase change is measured both before and after a specified waiting period. The aging rate is inversely proportional to the absolute value of the difference in the measured times.

The overall accuracy of the internal timebase is a function of:

$TBC \pm AR \pm TE \pm LE$ where:

TBC = timebase calibration

TE = temperature effects

AR = aging rate

LE = line effects

After the timebase is adjusted, the timebase frequency should stay within the aging rate if the following things happen:

- The timebase oven does not cool down.
- The instrument keeps the same orientation with respect to the earth's magnetic field.
- The instrument stays at the same altitude.
- The instrument does not receive any mechanical shock.

If the timebase oven cools (the instrument is disconnected from AC power), you may have to readjust the timebase frequency after a new warmup cycle. Typically, however, the timebase frequency returns to within ± 1 Hz of the original frequency.

Note The internal timebase can be tested after reconnecting AC power for 10 minutes, but for best accuracy, test again after the instrument has been on or in standby condition for 24 hours.

Frequency changes due either to a change in orientation with respect to the earth's magnetic field, or to a change in altitude, usually go away when the instrument is returned to its original position. A frequency change due to mechanical shock usually appears as a fixed frequency error.

1. Connect the equipment as shown in Figure 2-1. Preset all instruments and let them warm up for at least one hour.

Note If the oscilloscope does not have a 50Ω input impedance, connect channel 1 through a 50Ω feedthrough.

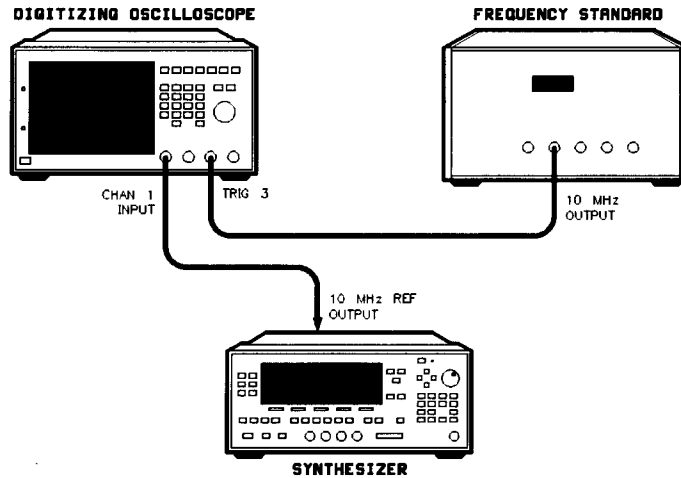


Figure 2-1. Internal Timebase: Aging Rate Test Setup

Equipment

| | |
|-------------------------|-----------|
| Digitizing Oscilloscope | HP 54111D |
| Frequency Standard | HP 5061A |

2. On the oscilloscope, adjust the external triggering for a display of the 10MHz REF OUTPUT signal from the synthesizer:

Channel 1:

| | |
|-----------------|-------------|
| Display | On |
| Volts/Division | 120 mV |
| Input Coupling | dc |
| Input Impedance | 50 Ω |

Channel 2:

| | |
|---------|-----|
| Display | Off |
|---------|-----|

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 5 ns |
| Delay | 0 s |
| Delay Reference | At center |
| Sweep | Trig'd |

Trigger:

| | |
|-----------------|-------------|
| Trigger Mode | Edge |
| Trig 3 Level | 100 mV |
| Trigger Src | Trig 3 |
| Input Impedance | 50 Ω |
| Input Coupling | dc |

Display:

| | |
|--------------|-----------|
| Display Mode | Real time |
|--------------|-----------|

3. Monitor the time and the display. Note the time required for a 360° phase change: T1 = _____ (s)
4. Wait 3 to 24 hours. Note how long you waited: T2 = _____ (h)
5. Repeat step 3. Record the phase change time: T3 = _____ (s)

6. Calculate the aging rate as follows:

$$\text{Aging Rate} = (1 \text{ cycle}/10 \text{ MHz}) (1/T1 - 1/T3) (24 \text{ hours}/T2)$$

Example: T1 = 351 seconds

T2 = 3 hours

T3 = 349 seconds

$$= (1 \text{ cycle}/10 \text{ MHz}) (1/351\text{s} - 1/349\text{s}) (24\text{h}/3\text{h})$$

$$= 1.306 \times 10^{-11} \text{ per day}$$

7. Enter the aging rate on the test record.

Note

If the absolute frequency of the standard and of the timebase oscillator are extremely close, you can reduce the measurement time (T1 and T3) by measuring the time required for a phase change of less than 360°. In step 6, change 1 cycle to 0.5 cycle for 180°, or 0.25 cycle for 90°.

Related Adjustments

10 MHz Standard

In Case of Difficulty

1. Ensure that the instruments have warmed up long enough and that environmental conditions have not changed throughout the test.
2. If the frequency standard and the internal standard are very different in frequency, the time required for a 360° phase shift is too short for an accurate measurement. If the 360° phase shift takes less than two minutes, perform the “10 MHz Standard” adjustment.
3. Refer to the *Troubleshooting* manual.

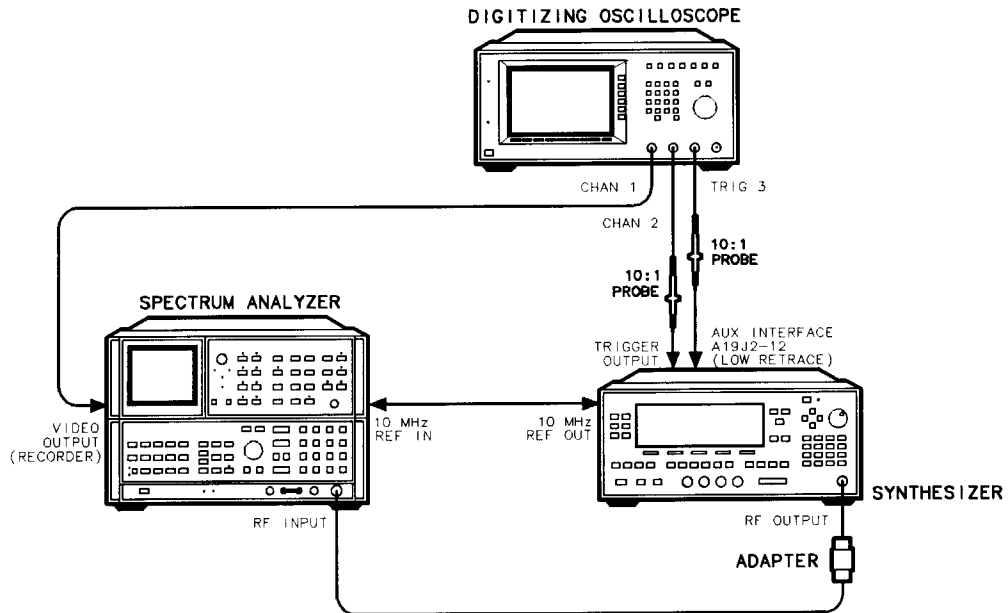
2. Swept Frequency Accuracy

Description and Procedure

With the synthesizer in swept mode, the spectrum analyzer is set to zero span at the measurement frequency. As the synthesizer sweeps through the spectrum analyzer frequency setting, a signal is generated on the spectrum analyzer's video output that is input to the oscilloscope.

The synthesizer's TRIGGER OUTPUT, used to trigger the oscilloscope, is a series of 1601 pulses, evenly spaced during the sweep. The oscilloscope is triggered on the pulse that represents the desired measurement frequency, and the spectrum analyzer is tuned to display the video output on the oscilloscope.

1. Connect the equipment as shown in Figure 2-2. Preset all instruments and let them warm up for at least one hour.



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Figure 2-2. Swept Frequency Accuracy Test Setup

Equipment

| | |
|-------------------------|-----------|
| Spectrum Analyzer | HP 8566B |
| Digitizing Oscilloscope | HP 54111D |
| Oscilloscope Probes | HP 10431A |

2. On the spectrum analyzer, set the center frequency to the first center frequency listed in Table 2-2. Then set:

Span: 0 Hz
Reference Level: 0 dBm
Scale Log: 10 dB/div
Resolution Bandwidth: 100 kHz

3. Set the oscilloscope as follows:

Note Trigger 3 is a trigger enable that ensures that channel 2 (the true trigger) triggers only on a forward sweep after the specified number of events.

Channel 1:

Display On
Volts/Division 300 mV
Input Coupling dc
Input Impedance 1 M Ω
Offset 1V

Channel 2:

Display On
Volts/Division 1V
Offset 2V
Input Coupling dc
Input Impedance 1 M Ω

Timebase:

| | |
|-----------------|------------|
| Time/Division | 25 μ s |
| Delay | 0s |
| Delay Reference | At center |
| Sweep | Triggered |

Trigger:

| | |
|---------------|---------------|
| Trigger Mode | Edge |
| Trigger Src | Chan 2 |
| Trigger Level | 1.6V |
| Trigger Src | Trig 3 |
| Trigger Level | 1.6V |
| Trigger Mode | Events |
| Trigger After | Positive Edge |
| Trigger On | Trig 3 |
| Trigger On | 33 events |
| Trigger Of | Positive edge |
| Trigger On | Channel 2 |

Display:

| | |
|--------------|-----------|
| Display Mode | Real time |
|--------------|-----------|

4. On the synthesizer, press:

USER CAL Freq Cal Menu Swp Span Cal Always (asterisk on)

START First start frequency in Table 2-2

STOP First stop frequency in Table 2-2

Note

Set the frequency range first, or you cannot set the sweep time properly.

CONT **SWEEP TIME** **100** **ms** (For Option 006, set to 150 ms)
POWER LEVEL **0** **dBm**

For the HP 83640A/50A only, also press:

SERVICE Tools Menu Disable Doubler (asterisk on)

Table 2-2. Swept Frequency Accuracy Instrument Settings

| Synthesizer Frequency (GHz) | | Spectrum Analyzer Center Frequency (GHz) | Oscilloscope Trigger Events | Frequency Error | Percent |
|-----------------------------|------|--|-----------------------------|-----------------|---------|
| Start | Stop | | | | |
| 0.01 | 20 | 5.357325 | 429 | _____ | _____ |
| 0.01 | 9.1 | 5.98099375 | 1052 | _____ | _____ |
| 2 | 7 | 2.10 | 33 | _____ | _____ |
| 2 | 7 | 3.20625 | 387 | _____ | _____ |
| 2 | 7 | 3.26875 | 407 | _____ | _____ |
| 2 | 7 | 5.215625 | 1030 | _____ | _____ |
| 2 | 7 | 5.653125 | 1170 | _____ | _____ |
| 2 | 7 | 6.90625 | 1571 | _____ | _____ |
| 7 | 13.5 | 7.1990625 | 50 | _____ | _____ |
| 7 | 13.5 | 13.296875 | 1551 | _____ | _____ |
| 15 | 20 | 15.20 | 65 | _____ | _____ |
| 15 | 20 | 19.696875 | 1504 | _____ | _____ |
| 2 | 13.5 | 2.100625 | 15 | _____ | _____ |
| 2 | 13.5 | 6.8875 | 681 | _____ | _____ |
| 2 | 13.5 | 7.203750 | 725 | _____ | _____ |
| 2 | 13.5 | 13.385 | 1585 | _____ | _____ |
| 7 | 20 | 7.195 | 25 | _____ | _____ |
| 7 | 20 | 13.3375 | 781 | _____ | _____ |
| 7 | 20 | 13.76 | 833 | _____ | _____ |
| 7 | 20 | 19.805 | 1577 | _____ | _____ |

5. Tune the spectrum analyzer center frequency to find and center the video signal on the oscilloscope. (See Figure 2-3.) Align the video input with the trigger output at center screen.

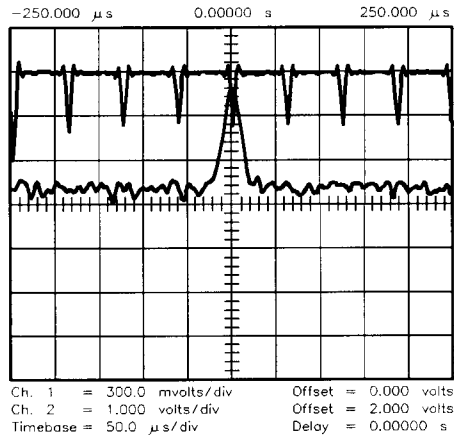


Figure 2-3. Video Signal on the Oscilloscope

6. Note the final center frequency setting required to center the video signal.
7. Record the difference between the initial center frequency setting and the value noted in step 6 in Table 2-2 as frequency error.
8. Repeat steps 5 through 7 for the remaining instrument settings in Table 2-2 and Table 2-3 through Table 2-6 as appropriate for each instrument model.
9. Calculate the frequency error as a percent of the sweep width as follows for each of the results in Table 2-2 and Table 2-3 through Table 2-6:

$$\frac{\text{frequency error}}{\text{stop frequency} - \text{start frequency}} \times 100 = \text{percent}$$

10. Record the worst case value on the test record.

For HP 83620/22A/23A/24A only:

Table 2-3. Additional Instrument Settings

| Synthesizer Frequency (GHz) | | Spectrum Analyzer Center Frequency (GHz) | Oscilloscope Trigger Events | Frequency Error | Percent |
|--------------------------------|------|--|--------------------------------|--------------------|---------|
| Start | Stop | | | | |
| 2 | 20 | 2.10125 | 10 | _____ | _____ |
| 2 | 20 | 6.8825 | 435 | _____ | _____ |
| 2 | 20 | 7.1525 | 459 | _____ | _____ |
| 2 | 20 | 13.25 | 1001 | _____ | _____ |
| 2 | 20 | 13.79 | 1049 | _____ | _____ |
| 2 | 20 | 19.775 | 1581 | _____ | _____ |

For HP 83630A only:

Table 2-4. Additional Instrument Settings

| Synthesizer Frequency (GHz) | | Spectrum Analyzer Center Frequency (GHz) | Oscilloscope Trigger Events | Frequency Error | Percent |
|-----------------------------|------|--|-----------------------------|-----------------|---------|
| Start | Stop | | | | |
| 0.01 | 26.5 | 5.45700625 | 330 | | |
| 2 | 26.5 | 2.18375 | 13 | | |
| 2 | 26.5 | 6.7775 | 313 | | |
| 2 | 26.5 | 7.145 | 337 | | |
| 2 | 26.5 | 13.3925 | 745 | | |
| 2 | 26.5 | 13.6375 | 761 | | |
| 2 | 26.5 | 19.7625 | 1161 | | |
| 2 | 26.5 | 20.13 | 1185 | | |
| 2 | 26.5 | 26.49875 | 1405 | | |

For HP 83640A only:

Table 2-5. Additional Instrument Settings

| Synthesizer Frequency (GHz) | | Spectrum Analyzer Center Frequency (GHz) | Oscilloscope Trigger Events | Frequency Error | Percent |
|-----------------------------|------|--|-----------------------------|-----------------|---------|
| Start | Stop | | | | |
| 0.01 | 26.5 | 5.45700625 | 330 | | |
| 2 | 40 | 2.19 | 9 | | |
| 2 | 40 | 6.8925 | 207 | | |
| 2 | 40 | 7.13 | 217 | | |
| 2 | 40 | 13.305 | 477 | | |
| 2 | 40 | 13.590 | 489 | | |
| 2 | 40 | 19.7175 | 747 | | |
| 2 | 40 | 20.145 | 765 | | |
| 2 | 40 | 23.850 | 921 | | |
| 2 | 40 | 13.3025 | 1037 | | |
| 2 | 40 | 16.6275 | 1317 | | |
| 2 | 40 | 16.8175 | 1333 | | |
| 2 | 40 | 19.715 | 1577 | | |

For HP 83650A only:

Table 2-6. Additional Instrument Settings

| Synthesizer Frequency (GHz) | | Spectrum Analyzer Center Frequency (GHz) | Oscilloscope Trigger Events | Frequency Error | Percent |
|-----------------------------|------|--|-----------------------------|-----------------|---------|
| Start | Stop | | | | |
| 0.01 | 26.5 | 5.45700625 | 330 | _____ | _____ |
| 2 | 50 | 2.15 | 6 | _____ | _____ |
| 2 | 50 | 6.86 | 163 | _____ | _____ |
| 2 | 50 | 7.1 | 171 | _____ | _____ |
| 2 | 50 | 13.4 | 381 | _____ | _____ |
| 2 | 50 | 13.61 | 388 | _____ | _____ |
| 2 | 50 | 19.85 | 596 | _____ | _____ |
| 2 | 50 | 20.12 | 605 | _____ | _____ |
| 2 | 50 | 23.75 | 726 | _____ | _____ |
| 2 | 50 | 13.3 | 821 | _____ | _____ |
| 2 | 50 | 16.66 | 1045 | _____ | _____ |
| 2 | 50 | 16.75 | 1051 | _____ | _____ |
| 2 | 50 | 18.94 | 1197 | _____ | _____ |
| 2 | 50 | 19.06 | 1205 | _____ | _____ |
| 2 | 50 | 23.875 | 1526 | _____ | _____ |

Related Adjustments

YO Driver +10V Reference
YO Driver Gain and Linearity
YO Delay Compensation
Sweep Ramp Calibration

In Case of Difficulty

1. Verify that the spectrum analyzer frequency is accurate. If necessary, calibrate the frequency with the synthesizer's 10 MHz reference connected to the spectrum analyzer's external reference.
2. Refer to the *Troubleshooting* manual.

3. Frequency Switching Time

Description and Procedure

The synthesizer's Z-AXIS BLANK/MARKER output goes active high when a change in frequency is initiated, and returns low when the synthesizer settles at the new frequency. Using an oscilloscope to monitor this output, the frequency switching time is measured in CW, step sweep, and frequency list modes.

1. Connect the equipment as shown in Figure 2-4. Preset both instruments and let them warm up for at least one hour.

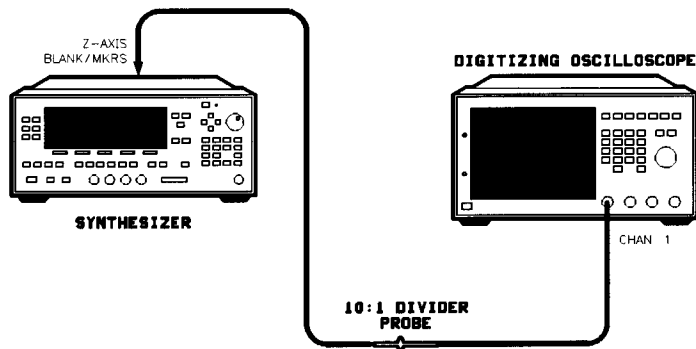


Figure 2-4. Frequency Switching Time Test Setup

Equipment

| | |
|-------------------------|-----------|
| Digitizing Oscilloscope | HP 54111D |
| Oscilloscope Probes | HP 10431A |

CW Frequency Switching Time (Across Bandswitch Points)

2. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|--------------|
| Display | On |
| Preset | TTL |
| Input Coupling | dc |
| Input Impedance | 1 M Ω |

Channel 2:

| | |
|---------|-----|
| Display | Off |
|---------|-----|

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 10 ms |
| Delay Reference | At left |
| Delay | -10 ms |
| Sweep | Triggered |

Trigger:

| | |
|---------------|--------|
| Trigger Mode | Edge |
| Trigger Src | Chan 1 |
| Trigger Level | 1.6V |
| Trigger Slope | Pos |

Display:

| | |
|--------------|------------|
| Display Mode | Repetitive |
| Averaging | Off |

3. On the synthesizer, set the first *Initial CW Frequency* in Table 2-7.
4. On the oscilloscope, clear the display. The oscilloscope should display *Awaiting Trigger*.
5. On the synthesizer, set the first *Second CW Frequency* in Table 2-7.

Table 2-7. CW Frequency Switching Time Settings

| Initial CW Frequency (GHz) | Second CW Frequency (GHz) | Pulse Width |
|----------------------------|---------------------------|-------------|
| 0.01 ¹ | 50 ² | |
| 13.5 | 50 ² | |

1 Set to 2 GHz (lowest start frequency) for synthesizers not capable of 0.01 GHz.

2 Set to the highest stop frequency for synthesizers not capable of 50 GHz.

6. On the oscilloscope, note the pulse width of the Z-axis blank/markers signal. Record this value as pulse width in Table 2-7.
7. Clear the oscilloscope display and repeat steps 3 through 6 for the remaining frequencies in Table 2-7.
8. On the test record, record the maximum pulse width from Table 2-7.

Stepped Sweep Frequency Switching Time (Within a Frequency Band)

9. On the synthesizer, press:

FREQUENCY **(MENU)** Step Swp Menu Step Size **(100)** **(MHz)**

Step Dwell **(10)** **(ms)**

(START) **(2.4)** **(GHz)**

(STOP) **(6.9)** **(GHz)**

(SINGLE)

SWEEP **(MENU)** Sweep Mode Step

(SINGLE)

10. On the oscilloscope, set:

Channel 1:

Display On
Preset TTL
Input Coupling dc

Timebase:

Time/Division 2 ms
Delay Reference At left
Delay -2 ms
Sweep Triggered

Trigger:

| | |
|---------------|---------------|
| Trigger Mode | Events |
| Trigger After | Negative edge |
| Trigger Src | Chan 1 |
| Trigger On | 1 events |
| Trigger Of | Positive edge |
| Trigger On | Channel 1 |

Display:

| | |
|--------------|------------|
| Display Mode | Repetitive |
|--------------|------------|

11. Set the oscilloscope for a single sweep at the next trigger. Press **Stop/Single**. The oscilloscope should display **Awaiting Trigger**.
12. On the synthesizer, initiate a stepped sweep. Press **SINGLE**.
13. On the oscilloscope, measure the positive pulse width and note the value _____.
14. Increment the trigger to 20 events and repeat steps 11 through 13. Pulse width value _____.
15. Increment the trigger to 45 events and repeat steps 11 through 13. Pulse width value _____.
16. Record the worst case value from steps 13 through 15 on the test record.

Frequency List Frequency Switching Time (Across Bandswitch Points)

17. On the synthesizer, delete any entries in the frequency list menu. Press: **FREQUENCY** **MENU** **List Menu** **Delete Menu** **All**
18. On the synthesizer, press **Enter List Freq** and enter the following frequencies in the frequency list menu:

Frequency List for Synthesizers with 0.01 GHz Capability

Frequency (GHz):

6.9
2.1
1.9
13.5
20.0
26.5¹
40.0¹

¹ Disregard if beyond your synthesizer's capability.

Frequency List for Synthesizers without 0.01 GHz Capability

Frequency (GHz):

7.1
6.9
2.0
13.5
20.0
26.5¹
40.0¹

¹ Disregard if beyond your synthesizer's capability.

19. On the oscilloscope, set:

Channel 1:

| | |
|----------------|-----|
| Display | On |
| Preset | TTL |
| Input Coupling | dc |

Channel 2:

| | |
|---------|-----|
| Display | Off |
|---------|-----|

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 5 ms |
| Delay Reference | At left |
| Delay | -2 ms |
| Sweep | Triggered |

Trigger:

| | |
|---------------|---------------|
| Trigger Mode | Events |
| Trigger After | Negative edge |
| Trigger Src | Channel 1 |
| Trigger On | 1 events |
| Trigger Of | Positive edge |
| Trigger On | Channel 1 |

Display:

| | |
|--------------|------------|
| Display Mode | Repetitive |
|--------------|------------|

20. On the synthesizer, press:

SINGLE

SWEEP **MENU** Sweep Mode List

SINGLE

21. On the oscilloscope, set a single sweep at the next trigger. Press

Stop/Single. The oscilloscope should display **Awaiting Trigger**.

22. On the synthesizer, initiate a frequency list sweep. Press **SINGLE**.

23. On the oscilloscope, measure the positive pulse width and note the value:

| Pulse Width Value | |
|-----------------------|-------|
| 1 event | _____ |
| 2 events | _____ |
| 3 events | _____ |
| 4 events | _____ |
| 5 events ¹ | _____ |
| 6 events ¹ | _____ |

¹ Not applicable for all models. (Each event corresponds to a change in frequency in the frequency list.)

24. Increment the trigger on events and repeat steps 21 and 22 for a trigger on events up to and including 6.

25. Record the worst case value from step 23 on the test record.

Related Adjustments

Fractional-N VCO

Sampler Assembly

YO Loop Gain

In Case of Difficulty

1. Verify that the oscilloscope triggers when stepping between two frequencies.

If necessary, adjust the trigger level on the oscilloscope.

2. Refer to the *Troubleshooting* manual.

4. Power Accuracy

Description and Procedure

Using a power meter, check the power accuracy of the synthesizer at several CW frequencies. At each frequency, verify that the actual output power is within specification over the full dynamic range of the ALC loop.

1. Turn on the equipment shown in Figure 2-5 and let them warm up for at least one hour. Press **PRESET** on the synthesizer.
2. On the power meter:
 - a. Zero and calibrate the power meter/sensor.
 - b. Set to dBm mode.
3. Connect the equipment as shown in Figure 2-5.
4. To achieve peak power, turn on RF peaking. Press:

USER CAL Tracking Menu Peak RF Always (asterisk on).

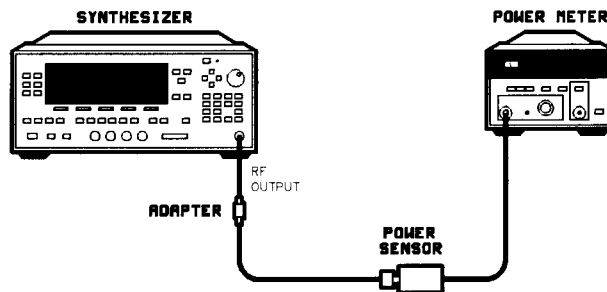


Figure 2-5. Power Accuracy Test Setup

Equipment

| | |
|------------------|---|
| Power Meter | HP 436A/7A/8A |
| Power Sensor | HP 8487A (HP 83640A/50A) |
| Power Sensor | HP 8485A (HP 83620A/22A/23A/24A/30A) |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |

5. On the synthesizer, press:
CW Enter the first CW value in Table 2-8.
POWER **MENU** **Up/Dn Power** **1** **dB**
Uncoupl Atten (Option 001 only)
POWER LEVEL **-10** **dBm**
RF ON/OFF Off (amber light off)
6. Zero the power meter.
7. On the synthesizer, turn the RF on (amber light on).

Table 2-8. Power Accuracy Frequencies


| Frequency (GHz) | Measured Difference at ≤ 10 dBm | Measured Difference at > 10 dBm |
|--------------------|--|---|
| 0.1 ¹ | | |
| 1.0 ¹ | | |
| 6.0 | | |
| 10.0 | | |
| 18.0 | | |
| 23.0 ¹ | | |
| 28.0 ¹ | | |
| 36.0 ¹ | | |
| 45.0 ¹ | | |

1 Disregard if beyond your synthesizer's capability.

8. On the power meter, set the power sensor calibration factor for the frequency to be measured.
9. Note the difference between the power meter reading and the power value set on the synthesizer. Write this value down on a separate piece of paper.

Note

For power levels of 10 dBm and above, measure the power at 10 dBm, then set the attenuator to the 10 dB position (use a 10 dB attenuator for synthesizers without a step attenuator.) Record the difference between the measurements: _____ (approximately 10 dB). Then, with the attenuator still set to 10 dB, complete the remaining measurements. Each of these measurements should be offset by the difference in dB that you measured.

10. On the synthesizer, use the up  key to increment the power level 1 dB.
11. Repeat steps 8 through 10, to the maximum specified power level of your synthesizer. Record the worst case measured difference (greatest duration) for this frequency in Table 2-8 for power levels ≤ 10 dBm and, if your synthesizer is capable, for power levels > 10 dBm.
12. On the synthesizer, set the power level to -10 dBm.
13. Repeat steps 8 through 11 for the remaining frequencies in Table 2-8 *not to exceed* the maximum specified frequency of your synthesizer. Remember to delete the 10 dB of attenuation for power levels below 0 dBm.
14. Record the worst case measured values for each frequency range and power range on the test record.

Related Adjustments

Modulator Offset and Gain
ALC Power Level Accuracy
ALC Power Flatness

In Case of Difficulty

Refer to the *Troubleshooting* manual.

5. Power Flatness

Description and Procedure

This procedure uses the user flatness correction array to automatically measure power flatness. The power meter is connected directly to the synthesizer's RF output. The synthesizer controls the power meter via HP-IB while the power meter measures the RF output. (There cannot be another controller on the HP-IB during this test.) If the synthesizer has a step attenuator, it is set to 0 dB so that any input into the flatness array indicates the RF output power flatness.

Note This performance test requires an HP 437B power meter. The correct power sensor calibration factors must be loaded and selected.

This procedure deletes any existing user flatness correction array.

1. Turn on the equipment shown in Figure 2-6. Connect the power sensor for the frequency range being calibrated. Do not connect the power sensor to the synthesizer yet. Preset all instruments and let them warm up for at least one hour.

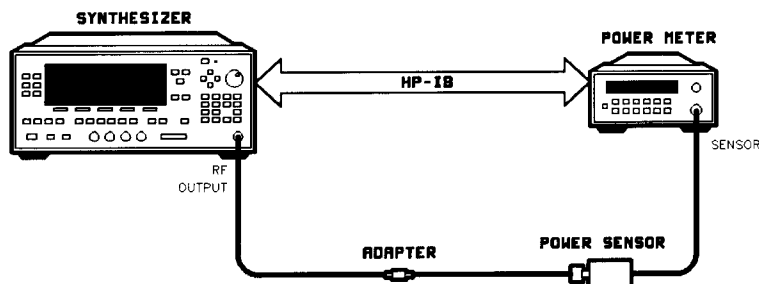


Figure 2-6. Power Flatness Test Setup

Equipment

| | |
|--------------|--------------------------------------|
| Power Meter | HP 437A |
| Power Sensor | HP 8482A |
| Power Sensor | HP 8487A (HP 83640A/50A) |
| Power Sensor | HP 8485A (HP 83620A/22A/23A/24A/30A) |

Low Band Power Flatness

Disregard if beyond your synthesizer's capability.

2. In the synthesizer's flatness menu:
 - a. Delete all entries in the user flatness correction array. Press:
POWER **(MENU)** **Fitness Menu** **Delete Menu** **Delete All**
 - b. Set the auto fill stop frequency to 2 GHz:
Auto Fill Stop **(2)** **(GHz)**
 - c. Set the auto fill start frequency to 15 MHz:
(PRIOR) **Auto Fill Start** **(15)** **(MHz)**
 - d. Set the auto fill increment to 10 MHz:
Auto Fill Incr **(10)** **(MHz)**
3. On the power meter, load the calibration factors for the power sensor.
 - a. Zero and calibrate the power meter/sensor.
 - b. Connect the power sensor to the synthesizer's RF OUTPUT as shown in Figure 2-6.
4. Set the synthesizer to measure the power correction values and generate a new user flatness array for the frequency range entered. Press:
Mtr Meas Menu **Measure Corr All**

When the flatness correction array is completed, the menu is returned.
5. Scroll through the user flatness correction values using the up/down arrow keys. Note the maximum and minimum correction values. The difference between them is the power flatness measurement. Record the value on the test record and compare the value to the specification.
6. Delete the flatness correction array. Press:
POWER **(MENU)** **Fitness Menu** **Delete Menu** **Delete All**

High Band Power Flatness

7. With the appropriate power sensor for this frequency range, repeat steps 2 through 6 for:
 - A 20 GHz stop frequency.
 - A 2.05 GHz start frequency.
 - A 100 MHz increment.

Millimeter Band Power Flatness > 20 GHz and ≤ 40 GHz

Disregard if beyond your synthesizer's capability.

8. With the appropriate power sensor for this frequency range, repeat steps 2 through 6 for:
 - A 40 GHz stop frequency (for HP 83630A only, set to 26.5 GHz).
 - A 20.05 GHz start frequency.
 - A 100 MHz increment.

Millimeter Band Power Flatness > 40 GHz

Disregard if beyond your synthesizer's capability.

9. With the appropriate power sensor for this frequency range, repeat steps 2 through 6 for:
 - A 50 GHz stop frequency.
 - A 40.05 GHz start frequency.
 - A 100 MHz increment.

Related Adjustments

Power Flatness

In Case of Difficulty

1. The power meter must be an HP 437B.
2. The correct calibration factors for the power sensor must be loaded.
3. Refer to the *Troubleshooting* manual.

6. Maximum Levelled Power

Note This performance test is not valid unless the synthesizer meets both its power accuracy and power flatness specifications. Perform those tests first.

Description and Procedure

The unlevelled status indicator is displayed when the instrument is unlevelled as the synthesizer sweeps over specific frequency ranges in fast continuous sweep, and fast and slow single sweep operation. Because of the synthesizer's power accuracy and flatness performance, a power meter is not required for this measurement. The following procedure tests the most likely worst case situations for maximum levelled power.

1. Set up and turn on the equipment shown in Figure 2-7. Preset the synthesizer and let it warm up for at least one hour.

Note The 20 dB attenuator provides a good match on the RF output. If the synthesizer has a step attenuator, you can simulate a good match by decoupling the step attenuator from the ALC and setting the attenuator to 20 dB.

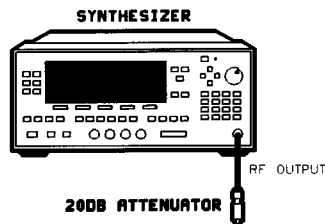


Figure 2-7. Maximum Levelled Power Test Setup

Equipment

| | |
|------------------|---|
| Attenuator 20 dB | HP 8490D Option 020 (HP 83640A/50A) |
| Attenuator 20 dB | HP 8493C Option 020 (HP 83620A/22A/23A/24A/30A) |

2. To achieve peak power, initiate auto tracking on the synthesizer as follows. Terminate the RF OUTPUT with a good 50 ohm impedance match such as a 20 dB attenuator or a power sensor (not necessary for synthesizers with a step attenuator.) Press:

POWER **MENU** Tracking Menu Auto Track

Wait for the synthesizer to complete auto tracking before continuing to the next step.

3. On the synthesizer, press:

POWER LEVEL Set the power to 1 dB below the specified maximum leveled power for the synthesizer's full frequency range.

RF ON/OFF On (amber light is on)

CONT **SWEEP TIME** **0** **ms** (minimum)

4. Increase the power level until the unleveled status indicator comes on, then reduce the power level until the indicator just goes off. (Power is leveled).
5. Set the sweep to **SINGLE** and initiate several sweeps. If necessary, reduce the power level until the unleveled status indicator does not turn on while sweeping.
6. On the synthesizer, press:

SWEEP TIME **0.5** **sec**

Initiate several sweeps. If necessary, reduce the power level until the unleveled status indicator does not turn on while sweeping.

Record the power level on the test record.

7. On the synthesizer, press:

CONT **SWEEP TIME** **0** **msec** (minimum)

8. For the following synthesizer models, change the stop frequency to each of the frequencies listed. Repeat steps 3 through 7 for each of these new frequency ranges.

HP 83630A: 20.0 GHz

HP 83640A: 26.5 GHz
20.0 GHz (Option 001 only)

HP 83650A: 40.0 GHz
26.5 GHz
20.0 GHz (Option 001 only)

Related Adjustments

Amplifier/Multiplier Adjustments
Amplifier/Filter Adjustments
Modulator Offset and Gain

In Case of Difficulty

Refer to the *Troubleshooting* manual.

7. External Leveling

Description and Procedure

The synthesizer is set up to externally level using a negative crystal detector. A DVM measures the crystal detector DC output. A 1000 pf capacitor across the DVM input limits the effect of any small signals generated by the DVM. The synthesizer power level is set to the minimum allowable limit and then is increased until the power output is leveled. The external leveling voltage is then measured and compared to the minimum specification. Next, the output power is increased until the maximum leveled power is reached. The leveling voltage is measured and compared to the specification.

Note The synthesizer must meet the power flatness specification before proceeding with this test.

1. Preset all instruments shown in Figure 2-8 and let them warm up for at least one hour.

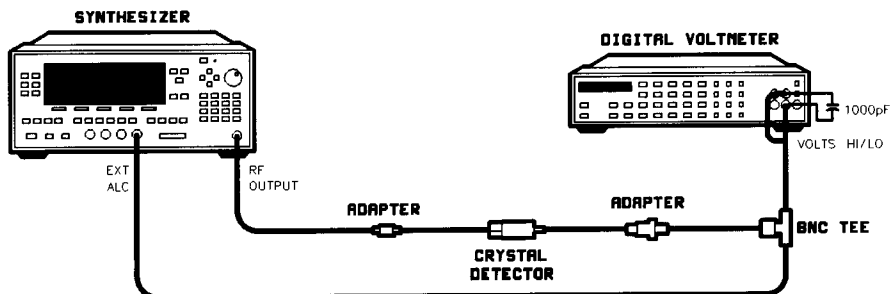


Figure 2-8. External Leveling Test Setup

Equipment

| | |
|-------------------|---------------------------------------|
| Digital Voltmeter | HP 3456A |
| Crystal Detector | HP 33330E (HP 83640A/50A) |
| Crystal Detector | HP 33330D (HP 83620A/22A/23A/24A/30A) |
| Capacitor 1000 pf | HP P/N 0160-4574 |

2. To achieve peak power, initiate auto tracking on the synthesizer as follows: terminate the RF output with a good 50Ω impedance match such as a 10 dB attenuator or a power sensor (not necessary for synthesizers with a step attenuator). Press:

USER CAL Tracking Menu Auto Track (asterisk on)

Wait for the synthesizer to complete auto tracking before continuing to the next step.

3. Connect the equipment as shown in Figure 2-8.
4. On the synthesizer, press:

ALC Leveling Point ExtDet Coupling Factor **0** **dB**

POWER LEVEL **-36** **dBm**

5. Maximum accuracy for the HP 3456A is obtained by increasing the DVM display resolution and the number of integration cycles. On the HP 3456A, set:

100 **STORE** **N CYC INT**

6 **STORE** **N DIG DISP**

Set the DVM to measure DC volts.

6. Increase the synthesizer power level until the **LOW UNLEVEL** message turns off. (If it is already out, leave the power level at -36 dBm.)
7. On the synthesizer, press:

CW **10** **GHz**

Record the DVM reading on the test record and compare the reading to the specification.

Note If the **UNLEVEL** message turns on before reaching +4 dBm, set the stop frequency to a low enough frequency where the specified output power is ≥ 4 dBm. If you don't get an unlevelled message, disconnect the BNC tee temporarily to make sure that the unlevelled message turns on. Then reconnect the equipment and continue with the test.

8. Press **POWER LEVEL**. Increase the synthesizer power level until the **UNLEVEL** message turns on. Decrease power just until the message goes out.
9. Record the DVM reading on the test record and compare the reading to the specification.

Related Adjustments

Amplifier/Multiplier Adjustments
Amplifier/Filter Adjustments
Power Flatness

In Case of Difficulty

1. Be sure you are externally leveling with a negative crystal detector.
2. If the DVM readings are not within the specifications, perform an external detector calibration (under the **USER CAL** key.)
3. Refer to the *Troubleshooting* manual.

8. Spurious Signals (Harmonics & Subharmonics)

Description and Procedure

Use this procedure to measure the synthesizer's harmonics and subharmonics over its entire frequency range. Harmonics are integer multiples of the synthesizer RF output frequency and subharmonics are fractional multiples of the YO frequency. Subharmonics do not exist at all frequencies. In low band, mixer spurs and fundamental feedthrough are the most significant harmonically-related signals. The mixer spur/YO frequency relationship is as follows:

$$X (5.4 \text{ GHz fixed oscillator}) - Y (\text{YO frequency}) = \text{Mixer Spur Frequency}$$

where X and Y are integers.

Other harmonics are typically direct multiples of the YO frequency.

In this procedure, the synthesizer is manually swept over its frequency range while the spectrum analyzer measures the harmonics and subharmonics in each frequency band. Any harmonics or subharmonics that are within 5 dB of the specification are subsequently verified with a more accurate procedure.

1. Turn on the equipment shown in Figure 2-9 and Figure 2-10. Preset the instruments and let them warm up for at least one hour.

On the HP 8566B, connect the CAL OUTPUT to the RF INPUT. Press **SHIFT** **W** to calibrate the spectrum analyzer.

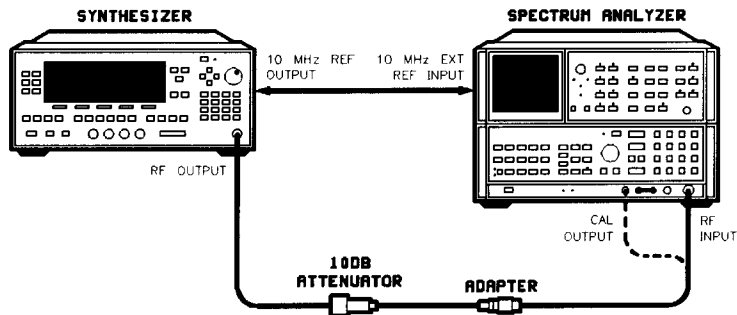


Figure 2-9. Spurious Signals (Harmonic) Test Setup < 20 GHz

Equipment

| | |
|-------------------|---|
| Spectrum Analyzer | HP 8566B |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |

2. To achieve peak power, turn on RF peaking. Set:
 Tracking Menu Peak RF Always (asterisk on).

Harmonic Measurement < 20 GHz

3. Connect the equipment as shown in Figure 2-9.
4. On the synthesizer, press:
 Set the maximum specified leveled power.
 SWEEP Manual Sweep
5. On the spectrum analyzer, set the first set of start and stop frequencies from Table 2-9. Then set:

Reference Level: -20 dBm
 Scale Log: 5 dB/Division
 Bandwidth Resolution: 3 MHz
 Video Bandwidth 3 MHz

Table 2-9. Start and Stop Frequencies

| Start Frequency (GHz) | Stop Frequency (GHz) |
|--------------------------|-------------------------|
| 0.01 ¹ | 2.2 |
| 2.2 | 7.0 |
| 7.0 | 13.5 |
| 13.5 | 20.0 |

1 Set to 2 GHz for HP 83622A/24A.

6. Manually sweep the synthesizer across the frequency range while checking the spectrum analyzer display for harmonics and subharmonics.

See Table 2-10 for the YO frequency ranges that correspond to the RF output frequencies.

**Table 2-10.
Corresponding YO Frequency Ranges and RF Output
Frequencies**

| YO Frequencies (GHz) | Harmonic | RF Output Frequencies (GHz) |
|-------------------------|----------|-----------------------------------|
| 5.41 to 7.4 | N/A | 0.01 to 2.0 |
| 2.0 to 7.0 | 1 | 2.0 to 7.0 |
| 3.5 to 6.75 | 2 | 7.0 to 13.5 |
| 4.5 to 6.67 | 3 | 13.5 to 20.0 |

7. Compare the amplitude of the harmonics to the specifications listed in the test record. If any harmonic is within 5 dB of specification, make a more accurate measurement using the “Harmonic/Subharmonic Verification Procedure < 20 GHz” that follows.
8. For the HP 83620A/30A: Record, on the test record, the value of the worst case harmonic for RF output frequencies of 0.01 to 2.2 GHz.

For the HP 83622A/24A: Record, on the test record, the value of the worst case harmonic for RF output frequencies of 2 to 2.2 GHz.

For the HP 83623A/40A/50A and all for instruments with Option 006: Record, on the test record, the value of the worst case harmonic for RF output frequencies of 10 to < 50 MHz and 50 MHz to 2.2 GHz.

9. Reset your synthesizer to the parameters given in step 5.
10. For each set of start and stop frequencies given in Table 2-9 manually sweep the synthesizer across the frequency range and check the spectrum analyzer display for harmonics *and* subharmonics.
11. Compare the harmonics/subharmonics to the specifications listed in the test record and verify any that are within 5 dB of specification with the “Harmonic/Subharmonic Verification Procedure < 20 GHz”.
12. For the HP 83620A/22A/23A/24A: Record, on the test record, the worst case harmonic for RF output frequencies of ≥ 2.2 and ≤ 20 GHz and

the value of the worst case subharmonic for RF output frequencies of ≥ 7 to ≤ 20 GHz.

For the HP 83630A/40A/50A: Record, on the test record, the worst case subharmonic for RF output frequencies of ≥ 7 and ≤ 20 GHz. Note, for future use, the worst case harmonic for RF output frequencies of ≥ 2.2 to ≤ 20 GHz _____.

Harmonic Measurement 20 to 26.5 GHz

Disregard if beyond your synthesizer's capability.

13. Connect the equipment as shown in Figure 2-10 using the HP 11970K Mixer (20 to 26.5 GHz).

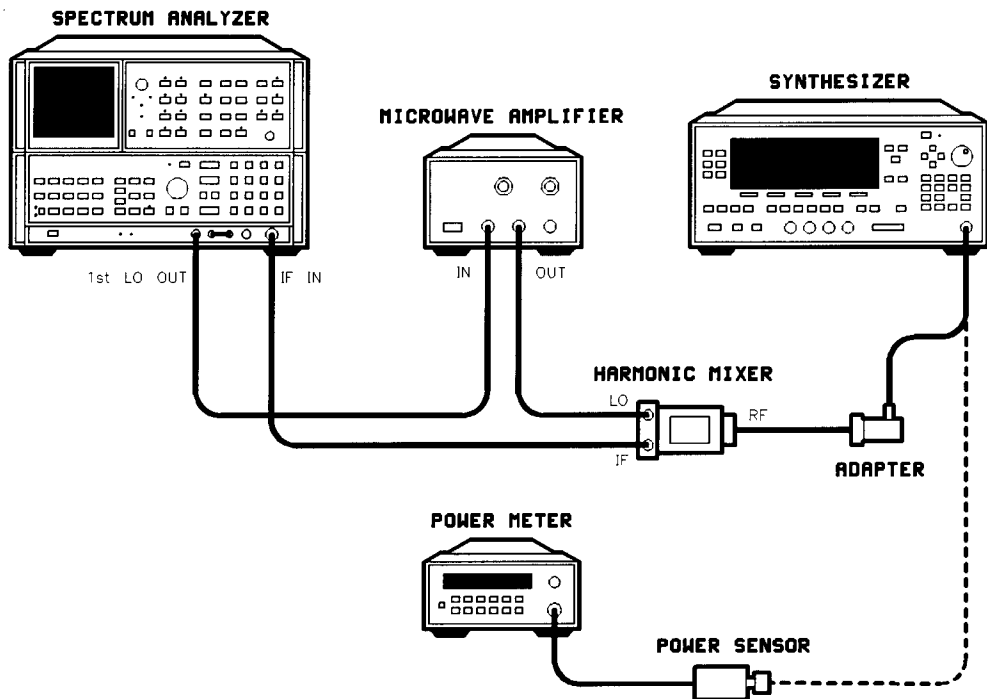


Figure 2-10. Spurious Signals (Harmonics) Test Setup > 20 GHz

Equipment

| | |
|---------------------------------|-----------------------|
| Spectrum Analyzer | HP 8566B ¹ |
| Microwave Amplifier | HP 11975A |
| Harmonic Mixer (20 to 26.5 GHz) | HP 11970K |
| Harmonic Mixer (26.5 to 40 GHz) | HP 11970A |
| Harmonic Mixer (40 to 50 GHz) | HP 11970Q |

¹ Firmware revision 13.8.86 or later.

- On the spectrum analyzer, select the external mixer for the 20 to 26.5 GHz frequency range and set the reference level offset to compensate for the mixer's conversion loss at 23 GHz.
- On the synthesizer, press:
CW **23** **GHz**
- Set the microwave amplifier output power level to +16 dBm.
- On the spectrum analyzer, set:

Center Frequency: 23 GHz
Frequency Span: 1 MHz

Adjust the reference level to position the signal peak at the top reference graticule. Use this reference level for all harmonic measurements.

- On the spectrum analyzer, set:
Start Frequency: 20 GHz
Stop Frequency: 26.5 GHz
- Manually sweep the synthesizer across the frequency range while checking the spectrum analyzer display for harmonics and subharmonics. See Table 2-11 for the YO frequency ranges that correspond to the RF output frequencies.

Since an external mixer is used, use the spectrum analyzer signal identify feature to verify that suspected signals are in the 20 to 26.5 GHz frequency range. The signals most likely to appear are the fifth and sixth YO harmonics.

- Compare the amplitude of the harmonics and subharmonics to the specifications listed in the test record. If any harmonics or subharmonics are within 5 dB of the specification, make a more accurate measurement using the "Harmonic/Subharmonic Verification Procedure > 20 GHz" that

follows. Note the worst case harmonic _____ and the worst case subharmonic _____ from 20 to 26.5 GHz.

21. For the HP 83630A only: Record, on the test record, the worst case subharmonic from > 20 to ≤ 26.5 GHz.

For the HP 83630A/40A/50A only: From steps 12 and 20, determine the worst case harmonic from ≥ 2.2 to ≤ 26.5 GHz and record this value on the test record.

Table 2-11.
Corresponding YO Frequency Ranges and RF Output Frequencies

| Model | YO Frequencies (GHz) | YO Harmonic From Amp/Mult | YO Harmonic at RF Output | RF Output Frequencies (GHz) |
|---------------|----------------------|---------------------------|--------------------------|-----------------------------|
| HP 83630A/50A | 5.0 to 6.625 | 4 | 4 | 20 to 26.5 |
| HP 83650A | 4.41667 to 5.5667 | 3 | 6 | 26.5 to 33.4 |
| HP 83650A | 5.5667 to 6.333 | 3 | 6 | 33.4 to 38 |
| HP 83650A | 4.75 to 6.25 | 4 | 8 | 38 to 50 |
| HP 83640A | 5.0 to 6.375 | 2 | 4 | 20 to 25.5 |
| HP 83640A | 4.25 to 5.0 | 3 | 6 | 25.5 to 30 |
| HP 83640A | 5.0 to 6.667 | 3 | 6 | 30 to 40 |

Harmonic Measurement 26.5 to 40 GHz

Disregard if beyond your synthesizer's capability.

22. Replace the HP 11970K mixer with the HP 11970A Mixer (26.5 to 40 GHz).
23. On the spectrum analyzer, select the external mixer for the 26.5 to 40 GHz frequency range and set the reference level offset to compensate for the mixer's conversion loss at 33 GHz.
24. On the synthesizer, press:
25. On the spectrum analyzer, set:

Center Frequency: 33 GHz
Frequency Span: 1 MHz

Adjust the reference level to position the signal peak at the top reference graticule. Use this reference level for all harmonic measurements.

26. On the spectrum analyzer, set:

Start Frequency: 26.5 GHz
Stop Frequency: 40 GHz (HP 83640A)
38 GHz (HP 83650A)

27. Manually sweep the synthesizer across the frequency range while checking the spectrum analyzer display for harmonics and subharmonics. See Table 2-11 for the YO frequency ranges that correspond to the RF output frequencies.

Since an external mixer is used, use the spectrum analyzer signal identify feature to verify that suspected signals are in the 26.5 to 40 GHz frequency range. The signals most likely to appear are the fifth and sixth YO harmonics.

28. Compare the amplitude of the harmonics and subharmonics to the specifications listed in the test record. If any harmonics or subharmonics are within 5 dB of the specification, make a more accurate measurement using the “Harmonic/Subharmonic Verification Procedure > 20 GHz” that follows. Note the worst case harmonic _____ and the worst case subharmonic _____ from 26.5 to 40 GHz.
29. For the HP 83640A only: From step 28, determine the worst case harmonic from ≥ 26.5 to ≤ 40 GHz and record this value on the test record.

For the HP 83640A/50A only: From steps 20 and 28, determine the worst case subharmonic from > 20 and ≤ 40 GHz and record this value on the test record.

Harmonic Measurement 38 to 50 GHz

Disregard if beyond your synthesizer's capability.

30. Replace the HP 11970A mixer with the HP 11970Q Mixer (33 to 50 GHz).
31. On the spectrum analyzer, select external mixer for the 33 to 50 GHz frequency range and set the reference level offset to compensate for the conversion loss at 40 GHz.
32. On the synthesizer, press:

CW **40** **GHz**

33. On the spectrum analyzer, set:

Center Frequency: 40 GHz
Frequency Span: 1 MHz

Adjust the reference level to position the signal peak at the top reference graticule. Use this reference level for all harmonic measurements.

34. On the spectrum analyzer, set:

Start Frequency: 38 GHz
Stop Frequency: 50 GHz

35. Manually sweep the synthesizer across the frequency range while checking the spectrum analyzer display for harmonics and subharmonics. See Table 2-11 for the YO frequency ranges that correspond to the RF output frequencies.

Since an external mixer is used, use the spectrum analyzer signal identify feature to verify that suspected signals are in the 38 to 50 GHz frequency range. The signals most likely to appear are the fifth and sixth YO harmonics.

36. Compare the amplitude of the harmonics and subharmonics to the specifications listed in the test record. If any harmonics or subharmonics are within 5 dB of the specification, make a more accurate measurement using the “Harmonic/Subharmonic Verification Procedure > 20 GHz” that follows. Note the worst case harmonic _____ and the worst case subharmonic _____ from 38 to 50 GHz.
37. For the HP 83650A only: From steps 28 and 36, determine the worst case harmonic from ≥ 26.5 to ≤ 50 GHz and record this value on the test record. From step 36, determine the worst case subharmonic from > 40 and ≤ 50 GHz and record this value on the test record.

Harmonic/Subharmonic Verification Procedure < 20 GHz

1. Set the synthesizer to the RF output frequency that corresponds to the harmonic or subharmonic to be measured.

2. On the spectrum analyzer, set:

Frequency: Same frequency as the synthesizer
Span: 1 MHz
Reference Level: 15 dBm
Scale Log: 5 dB/Division
Bandwidth Resolution: 10 kHz
Video Bandwidth: 30 kHz

3. Measure the synthesizer RF output amplitude with the spectrum analyzer marker.
4. Set the spectrum analyzer to the harmonic or subharmonic frequency to be measured. Measure the signal level with the spectrum analyzer marker. Change the reference level as necessary.
5. Calculate the harmonic/subharmonic level, where the harmonic/subharmonic is less than the carrier, as follows:

Harmonic/Subharmonic amplitude (dBc) = $-[\text{Synthesizer RF output amplitude (dBm)} - (\text{Harmonic/Subharmonic amplitude (dBm)})]$

For example:

RF Output = +10 dBm
Harmonic = -60 dBm
Harmonic (dBc) = [RF Out - (Harmonic)]
= $-[10 - (-60 \text{ dBm})]$
= $-[10 + 60 \text{ dBm}]$
= -70 dBc

Harmonic/Subharmonic Verification Procedure > 20 GHz

Note For accurate measurements, the synthesizer must meet its power flatness specification.

1. Note the synthesizer CW frequency that produces the suspect harmonic/subharmonic.
2. Set the synthesizer to the same RF output frequency as the harmonic/subharmonic to be measured.

3. On the spectrum analyzer, set:

| | |
|-----------------------|-----------------------------------|
| Frequency: | Same frequency as the synthesizer |
| Span: | 1 MHz |
| Reference Level: | 15 dBm |
| Scale Log: | 5 dB/Division |
| Bandwidth Resolution: | 10 kHz |
| Video Bandwidth: | 30 kHz |

4. Measure the synthesizer RF output amplitude with the spectrum analyzer marker.
5. Set the synthesizer to the CW frequency noted in step 1.
6. Measure the signal level with the spectrum analyzer marker. Change the reference level as necessary.
7. Calculate the harmonic/subharmonic level where the harmonic/subharmonic is less than the carrier, as follows:

Harmonic/Subharmonic Amplitude (dBc) = [Synthesizer RF output amplitude (dBm) – Harmonic/Subharmonic amplitude (dBm)]

For example:

| | |
|----------------|-------------------------|
| RF Output | = +10 dBm |
| Harmonic | = –60 dBm |
| Harmonic (dBc) | = [RF Out – (Harmonic)] |
| | = –[10 – (–60 dBm)] |
| | = –[10 + 60 dBm] |
| | = –70 dBc |

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

9. Spurious Signals (Non-Harmonic)

Description and Procedure

Use this procedure to measure known, fixed, offset spurs that are generated in the frequency synthesis section of the synthesizer. The synthesizer is set to various CW frequencies where these spurious signals will most likely occur. Then the spectrum analyzer is tuned to the spur frequencies to measure their levels.

1. Preset the instruments shown in Figure 2-11 and let them warm up for at least one hour.

On the HP 8566B, connect the CAL OUTPUT to the RF INPUT. Press **SHIFT** **W** to calibrate the spectrum analyzer.

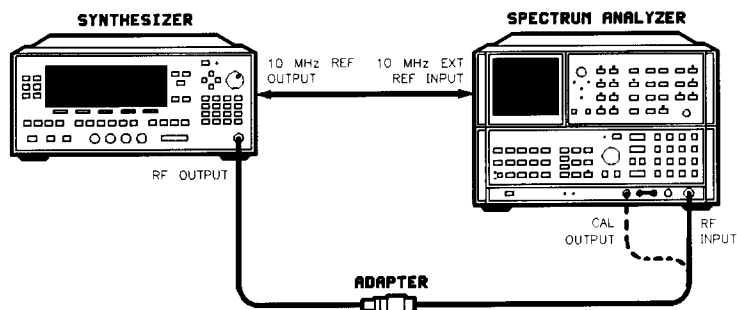


Figure 2-11. Spurious Signals (Non-Harmonic) Test Setup

Equipment

| | |
|-------------------|----------|
| Spectrum Analyzer | HP 8566B |
|-------------------|----------|

2. To achieve peak power, turn on RF peaking. Set: **USER CAL** Tracking Menu Peak RF Always (asterisk on)
3. Connect the equipment as shown in Figure 2-11.

Fixed Spurious Signals

4. On the synthesizer, press:

CW **19.765** **GHz**

POWER LEVEL Set the maximum specified leveled power.

5. On the spectrum analyzer, set:

Center Frequency: 19.765 GHz
Frequency Span: 500 kHz
Reference Level: 10 dBm
Scale Log: 5 dB/Division
Resolution Bandwidth: Auto
Sweep Time: Auto
Marker: Set to 19.765 GHz

6. On the spectrum analyzer, set the marker to the highest peak and then set the marker to center frequency. Decrease the frequency span to 100 Hz keeping the signal centered on the display and then repeat the marker peak search and set the marker to center frequency.
7. Note the signal amplitude on the spectrum analyzer. This is the carrier amplitude to which the spurs are referenced.

_____ dBm Carrier Amplitude

8. Use the following procedure to determine the actual frequency of the spurs in Table 2-12:
 - a. On the synthesizer, press: **SERVICE** **Adjust Menu** **Calib Menu**
Select Cal .
 - b. Use the RPG knob to select the first calibration constant in Table 2-12 (#18).
 - c. To the value of the spectrum analyzer center frequency (19.765 GHz), add the value of the calibration constant (or twice the value, as indicated in Table 2-12) and the value from the second column of Table 2-12 (20 kHz). Record this value (in Hz) in the last column of Table 2-12.

For example:

19.765 GHz (Spectrum analyzer center frequency)
 + 338 kHz (Possible value of calibration constant #18)
 + 20 kHz (Value from second column of the table)

 = 19,765,358,000 Hz (Record this result in the last column of the table.)

Repeat this procedure for the remaining calibration constants in Table 2-12. The last two actual spur frequencies have already been calculated and are not related to calibration constants.

Table 2-12. Determining the Actual Spur Frequencies

| Calibration Constant (Hz) | Additional Value (kHz) | Actual Spur Frequency (Hz) |
|-----------------------------|------------------------|----------------------------|
| Calibration Constant #18 | 20 | _____ |
| 2(Calibration Constant #18) | 40 | _____ |
| Calibration Constant #19 | 60 | _____ |
| 2(Calibration Constant #19) | 120 | _____ |
| N/A | 125 | 19,765,125,000 |
| N/A | 500 | 19,765,500,000 |

- On the spectrum analyzer, set the center frequency to the first “Actual Spur Frequency” from Table 2-12. Then set:

Reference Level: -50 dBm
 Video Averaging: On 100 samples
 Marker: Same as spectrum analyzer frequency

- Locate the spur corresponding to the spectrum analyzer frequency (see Table 2-12) and use the marker to measure its amplitude. If the spur is in the noise level, use the noise level amplitude (this gives a worst case value).

_____ dBm Spur Absolute Amplitude

11. Calculate the spur level in dBc as follows:

$$\text{Carrier Amplitude (dBm)} - \text{Spur Absolute Amplitude (dBm)} = \text{Spur Level (dBc)}$$

Record the result on the test record. Compare the result to the specification.

12. Repeat steps 9 through 11 for each of the spurs and spectrum analyzer frequencies in Table 2-12.

Low Band Offset Spurious Signals

Disregard if beyond your synthesizer's capability.

13. On the synthesizer, press:

CW **1** **GHz**

POWER LEVEL **0** **dBm**

14. On the spectrum analyzer, set:

Center Frequency: 1 GHz
Frequency Span: 500 Hz
Reference Level: 0 dBm
Resolution Bandwidth: Auto
Video Bandwidth: Auto
Marker: 1 GHz
Video Averaging: Off

15. Use the marker to measure the synthesizer's RF output amplitude at 1 GHz. This is the carrier amplitude to which the spurs are referenced.

_____ dBm RF output at 1 GHz

16. Set the spectrum analyzer center frequency to each of the frequencies in Table 2-13. Use the marker to measure the spurs (change the reference level as necessary).

Calculate the spur level in dBc for each of the spurs as follows:

$$\text{Spur Level (dBc)} = -[\text{RF Output at 1 GHz (dBm)} - (\text{Spur Level})]$$

Record the spur level in dBc on the test record. Compare the spur level to the specification.

Table 2-13. Low Band Spurious Signals

| Spectrum Analyzer Frequency | Spur |
|-----------------------------|---------------------|
| 100 MHz | 100 MHz Fixed Spur |
| 900 MHz | 100 MHz Offset Spur |
| 6.4 GHz | LO Feedthrough Spur |

Low Band Mixer Spurs

17. On the synthesizer, press:

CW **1.6** **GHz**

18. On the spectrum analyzer, set:

Start Frequency: 1.4 GHz
 Stop Frequency: 1.8 GHz
 Reference Level: 0 dBm
 Resolution Bandwidth: 300 kHz
 Video Bandwidth: 100 kHz
 Sweep Time: Auto
 Scale Log: 10 dB/Division
 Marker: Normal Peak Search MKR-->REF LVL

19. Set the synthesizer to CW 1.9999 GHz and tune from 1.9999 GHz to 1.8 GHz. This results in the most dominant mixing spur moving from 1.4 to 1.8 GHz. The spur should be at the left-hand edge of the display (1.4 GHz). It should then travel to the right as you tune down. If you can't see it, increase power until you can identify the spur. Then reset the power level to 0 dBm (the performance specification is valid for 0 dBm). You are finished tuning when the spur merges with the 2 GHz carrier.
20. Identify the worst point (where the spur has the greatest power level), or if the spur is lost in the noise floor use that value, and record the difference between the reference level and spurious signal amplitude on the test record.

Related Adjustments

Fractional-N Reference and API Spurs

In Case of Difficulty

Refer to the *Troubleshooting* manual.

10. Spurious Signals (Line-Related)

Description and Procedure

Use this procedure to measure line-related spurs. The synthesizer is placed at a CW frequency where the synthesizer is most sensitive to line-related spurs. The spectrum analyzer measures the RF output offset by the harmonics of the line power frequency (60 Hz or 50 Hz). To eliminate measuring the spectrum analyzer line-related spurs, an Invertron is used to operate the spectrum analyzer at a different line frequency so that its own spurs will not affect the measurement.

The spectrum analyzer must have the capability of a 10 Hz resolution bandwidth. A wider resolution bandwidth results in the synthesizer's phase noise masking the spur.

1. Set the invertron for a line frequency of 55 Hz and for normal operating voltage.
2. Connect the equipment as shown in Figure 2-12. Preset the instruments and let them warm up for at least one hour.

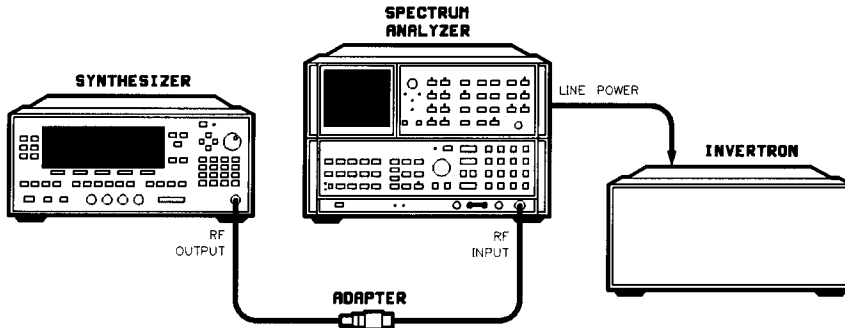


Figure 2-12. Spurious signals (Line-Related) Test Setup

Equipment

| | |
|-------------------|------------------------------|
| Spectrum Analyzer | HP 8566B |
| Invertron | California Instruments 501TC |

3. To achieve peak power, turn on RF peaking. Set:
USER CAL **Tracking Menu** **Peak RF Always** (asterisk on)
4. On the synthesizer, press:
CW **6.99** **GHz**
POWER LEVEL **0** **dBm**
5. On the spectrum analyzer, set:

| | |
|-----------------------|-----------------|
| Center Frequency: | 6.99 GHz |
| Frequency Span: | 2 kHz |
| Reference Level: | 10 dBm |
| Scale Log: | 5 dB/Division |
| Resolution Bandwidth: | 300 Hz |
| Sweep Time: | Auto |
| Marker: | Set to 6.99 GHz |

6. On the spectrum analyzer, set the marker to the highest peak and note the frequency difference of the marker from the center frequency. Calibrate the spectrum analyzer frequency offset so that the signal peak is in the center of the display.
7. Note the signal amplitude on the spectrum analyzer. This is the carrier amplitude to which the spurs are referenced.

_____ dBm Carrier Amplitude

Note This procedure is written for a line frequency of 60 Hz. For a 50 Hz line frequency, look for spurs at frequencies of 50 Hz times the harmonics in Table 2-14, and set the spectrum analyzer frequencies accordingly.

8. On the spectrum analyzer, set the center frequency to the first spur frequency from Table 2-14. Then set:

| | |
|-----------------------|-------------------------------------|
| Reference Level: | -50 dBm |
| Frequency Span: | 100 Hz |
| Resolution Bandwidth: | 10 Hz |
| Marker: | Same as spectrum analyzer frequency |
| Video Averaging: | On 100 samples |

9. Locate the spur corresponding to the spectrum analyzer frequency (see Table 2-14) and use the marker to measure its amplitude. If the spur is in the noise level, use the noise level amplitude (this gives a worst case value).

_____ dBm Spur Absolute Amplitude

10. Calculate the spur level in dBc as follows:

$$\text{Spur Level (dBc)} = -[\text{Carrier Amplitude (dBm)} - (\text{Spur Level})]$$

Record the result on the test record. Compare the result to the specification.

Note The odd harmonics will normally be higher than the even harmonics.

11. Repeat steps 8 through 10 for each of the spurs and spectrum analyzer frequencies in Table 2-14. Change the spectrum analyzer reference level as indicated in the table.

Table 2-14.
Spectrum Analyzer Frequencies and Line Spur Frequencies and Harmonics

| Line Spur Harmonic | Line Spur Frequency (Hz) | Spectrum Analyzer Frequency (Hz) | Reference Level (dBm) |
|--------------------|--------------------------|----------------------------------|-----------------------|
| 2 | 120 | 6,990,000,120 | -50 |
| 3 | 180 | 6,990,000,180 | -50 |
| 4 | 240 | 6,990,000,240 | -50 |

12. For synthesizers capable of frequencies down to 10 MHz, set the synthesizer and spectrum analyzer to 1.9 GHz and repeat steps 6 through 11 for this frequency.

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

11. Single Sideband Phase Noise

Description and Procedure

This procedure uses a phase noise measurement system. It is the fastest and most accurate method for measuring phase noise.

1. Connect the equipment as shown in Figure 2-13. Preset the equipment and let them warm up for at least one hour.

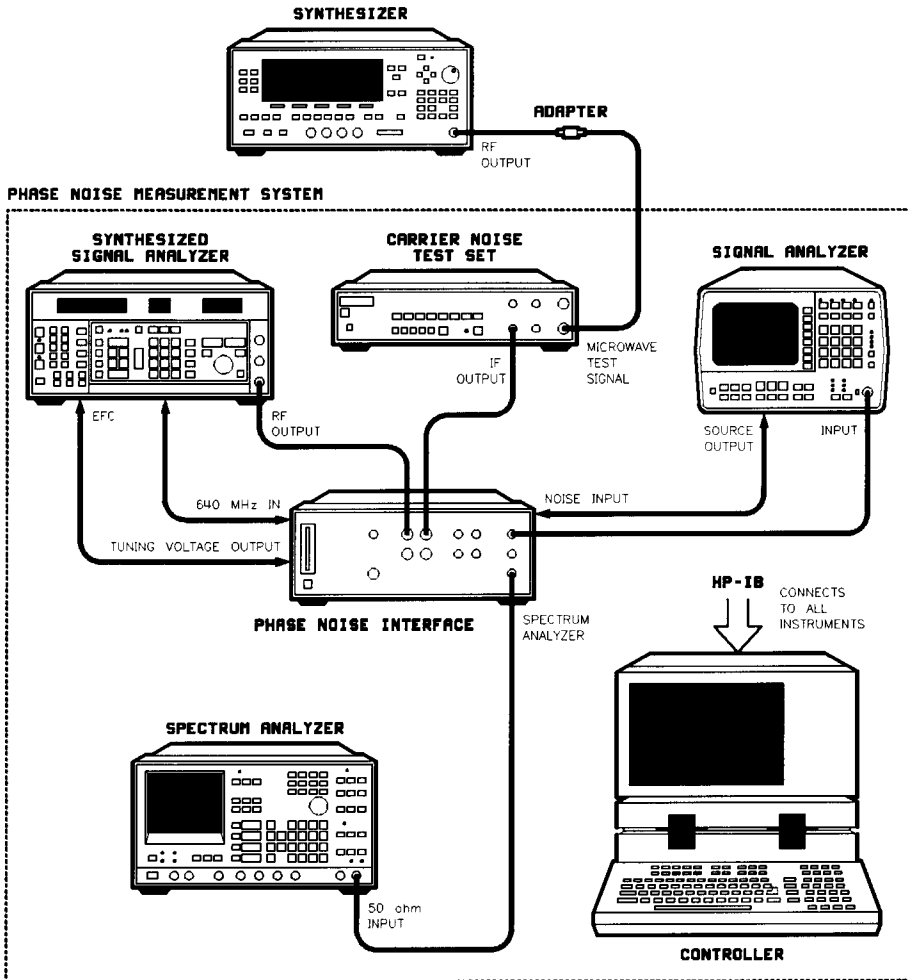


Figure 2-13. Single Sideband Phase Noise Test Setup

Equipment

Phase Noise Measurement System

HP 3048A

2. Load the measurement software for the phase noise measurement system.
3. On the synthesizer, press:

CW **6.99** **GHz**

POWER LEVEL **0** **dBm**

4. On the phase noise measurement system, set:

Measurement Type: phase locked
Start Offset Freq: 100 Hz
Stop Freq: 2 MHz
Minimum Averages: 40
Carrier Frequency: 6.99 GHz
Det Input Freq: 50 MHz
DUT: user's srce, man
Ref Source: 8662A, SYS, VCO, EFC
Ext Timebase: not in use
Down Converter: 1179C, SYS
HP 11848A LNA: out

Note To avoid entering these parameters each time you perform this test, create a file on the phase noise measurement system containing these parameters.

With these parameters entered, the software automatically sets the remaining parameters. Table 2-15 shows the complete set of parameters.

Table 2-15. Phase Noise Measurement System Parameters

| | |
|---------------------------------|----------------------------------|
| Measurement Type: phase locked | K_VCO Method: measured |
| Start Offset Freq: 100 Hz | VCO Tune Constant: 82.33 Hz/V |
| Stop Freq: 2 MHz | |
| Minimum Averages: 40 | |
| | Loop Suppression: Verified |
| | Closed PLL BW: 150.5 Hz |
| Carrier Frequency: 6.99 GHz | Peak Tuning Range: 725.1 Hz |
| Det Input Freq: 50 MHz | Assumed Pole: 37.9 kHz |
| Entered K_VCO: 28 Hz/V | DUT: user's srce, man |
| Center Voltage: 0V | Ref Source: 8662A, SYS, VCO, EFC |
| Tune-voltage Range: ± 10 V | Ext Timebase: not in use |
| Phase Detector: 5 to 1600 MHz | Down Converter: 11792C, SYS |
| K_Detector Method: measured | HP 11848A LNA: Out |
| Detector Constant: 458.8 mV/Rad | |

5. Follow the instructions on the controller to make the phase noise measurement.
6. The dynamic signal analyzer has two traces. The sine wave shows the beatnote frequency in time domain (like an oscilloscope). The other trace is in the frequency domain (like a spectrum analyzer).

At the message VERIFY BEATNOTE <1 MHz, tune the signal generator for minimum sine wave frequency with the frequency domain signal near the left edge (0 Hz).

7. When the measurement is complete record the results on the test record and compare them to the specification.
8. Repeat steps 3 through 6 for the frequencies in Table 2-16.

Table 2-16. Frequency Setting for Phase Noise Measurements

| Synthesizer Frequency (GHz) | Phase Noise Measurement System | |
|-----------------------------|--------------------------------|----------------------|
| | Carrier Frequency (GHz) | Detector Input (MHz) |
| 1.97 ¹ | 1.97 | 310 |
| 18.0 | 18.0 | 720 |

¹ Disregard if beyond your synthesizer's capability.

Related Adjustments

Sampler Assembly

In Case of Difficulty

1. Line spurs may be present in the trace which exceed the phase noise specification. They should be ignored.
2. Be sure that the signal generator frequency (detector input) is tuned close enough that a zero beat can be found.
3. Note where the problem occurs (carrier frequency and offset frequency from the carrier) and refer to the *Troubleshooting* manual.

12. Pulse Modulation On/Off Ratio

Description and Procedure

Using a spectrum analyzer, the synthesizer's CW RF output power is measured both with pulse on and with pulse off. The difference in power is the pulse on/off ratio.

1. Connect the equipment as shown in Figure 2-14. Preset all instruments and let them warm up for at least one hour.

On the HP 8556B, connect the CAL OUTPUT to the RF INPUT. Press **SHIFT** **W** to calibrate the spectrum analyzer.

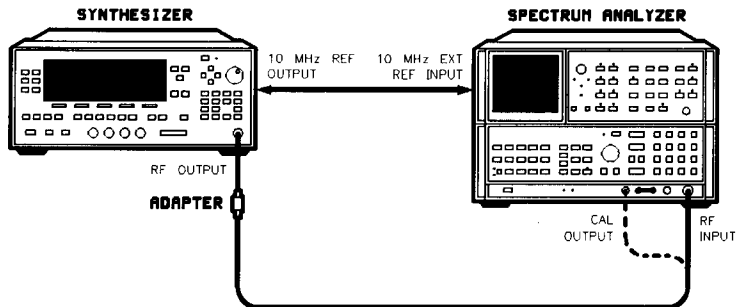


Figure 2-14. Pulse Modulation On/Off Ratio Test Setup

Equipment

| | |
|-------------------|----------|
| Spectrum Analyzer | HP 8566B |
|-------------------|----------|

2. On the synthesizer, press:
 - CW** The first center frequency in Table 2-17.
 - For the HP 83623A/24A only:** Set the power level to 0 dBm by pressing:
 - POWER LEVEL** **0** **dBm**
 - For all other synthesizers:** Set the power level to -9.9 dBm by pressing:
 - POWER LEVEL** **-9.9** **dBm**
 - Then, for all synthesizers:** Press: **FREQUENCY** **MENU** **Up/Dn** **Size** **CW** **50** **MHz**
3. On the spectrum analyzer, set:

| | |
|-----------------------------|----------------------------------|
| Center Frequency: | The same frequency set in step 2 |
| Frequency Span: | 100 Hz |
| Reference Level: | 0 dBm |
| Marker: | On |
| Center Frequency Step Size: | 50 MHz |

Table 2-17. Pulse On/Off Center Frequencies

| Center Frequency (GHz) | Pulse On/Off Ratio |
|------------------------|--------------------|
| 1.0 ¹ | _____ |
| 6.0 | _____ |
| 9.0 | _____ |
| 20.0 | _____ |
| 22.0 ¹ | _____ |

1 Disregard if beyond your synthesizer's capability.

4. On the spectrum analyzer:
 - a. Tune center frequency to center the signal on the display.
 - b. Set the marker to highest peak.
 - c. Note the marker amplitude.
5. On the synthesizer, turn on the external pulse. Press:
 - MOD** **Pulse On/Off Extrnl** (asterisk on)

or, for synthesizers with Option 002, press:

MOD Pulse Menu Pulse On/Off Ext (asterisk on)

6. On the spectrum analyzer set the reference level to -70 dBm.
7. Set the marker to the highest peak and note the maximum marker amplitude.
8. The difference between the marker value in step 4 and the marker value in step 7 is the pulse on/off ratio. Record this value in Table 2-17.
9. On the spectrum analyzer, set the reference level to 0 dBm.
10. On the synthesizer, turn off external pulse:

MOD Pulse On/Off Extrnl (asterisk off)

or, for synthesizers with Option 002, press:

MOD Pulse Menu Pulse On/Off Ext (asterisk off)

11. Repeat steps 2 through 10 for the remaining synthesizer and spectrum analyzer frequencies in Table 2-17 with the following changes to step 7 when testing 6.0 GHz:

For a CW Frequency of 6.0 GHz:

- a. Step the synthesizer and spectrum analyzer in 50 MHz steps from 6.0 to 7.0 GHz.
 - b. Note the frequency of the highest amplitude signal. Set the synthesizer and spectrum analyzer to this frequency.
 - c. Set the marker to the highest peak and note the maximum marker amplitude.
12. Record the worst case value from Table 2-17 on the test record.

Related Adjustments

None

In Case of Difficulty

1. A failure can be caused by a spur. Move the center frequency of both the spectrum analyzer and the synthesizer by 1 kHz, and retest at that point. If the on/off ratio is bad, it will be bad over greater than a 100 kHz region.
2. Refer to the *Troubleshooting* manual.

13. Pulse Performance

Description and Procedure

In this procedure, the synthesizer's RF output is displayed directly on a high-bandwidth digitizing oscilloscope where the rise and fall times are measured and a comparison of pulsed and CW power level accuracy is made. Power level accuracy is checked at a 10 Hz pulse repetition rate to verify its operation at the slowest specified rate.

Rise and Fall Times

1. Connect the equipment as shown in Figure 2-15. Preset the instruments and let them warm up for at least one hour.

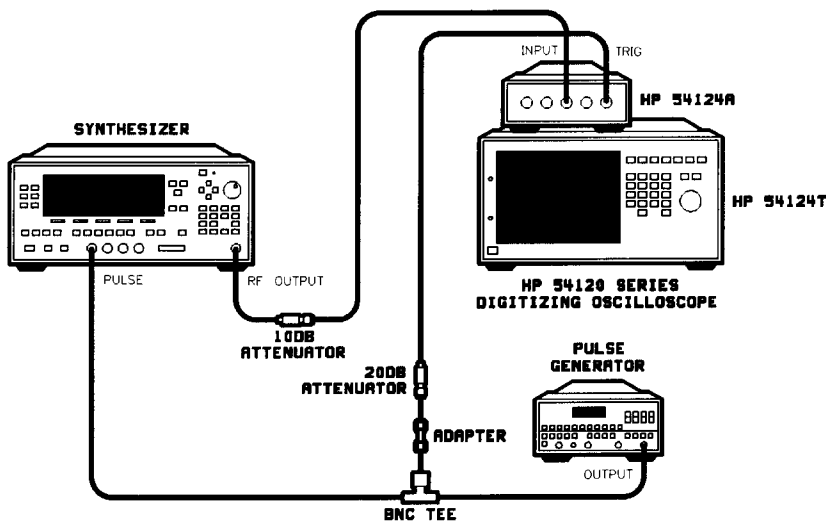


Figure 2-15. Pulse Performance Test Setup

Equipment

| | |
|-------------------------|---|
| Digitizing Oscilloscope | HP 54124T |
| Pulse Generator | HP 8112A |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |
| Attenuator 20 dB | HP 8490D Option 020 (HP 83640A/50A) |
| Attenuator 20 dB | HP 8493C Option 020 (HP 83620A/22A/23A/24A/30A) |

2. On the synthesizer, press:

CW First synthesizer frequency in Table 2-18.

POWER LEVEL **0** **dBm**

ALC **Leveling Point Internal** (asterisk on)

Leveling Mode Search (asterisk on)

USER CAL **Tracking Menu Peak RF Always** (asterisk on)

Table 2-18. Synthesizer Frequencies

| Synthesizer Frequencies (GHz) | Risetime | Falltime | Level Accuracy |
|----------------------------------|----------|----------|-------------------|
| 1.9 ¹ | | | |
| 5.0 | | | |
| 9.0 | | | |
| 15.0 | | | |
| 23.0 ¹ | | | |
| 28.0 ¹ | | | |
| 35.0 ¹ | | | |
| 45.0 ¹ | | | |

¹ Disregard if beyond your synthesizer's capability.

Note The CW frequencies checked provide a minimum verification of pulse performance. If pulse performance at a different frequency is important, repeat the test at that CW frequency.

3. On the pulse generator, set:

Pulse Width: 50 ns
Pulse Period: 10 us (100 kHz)
Pulse Level: 5V
Disable: LED off (enables pulse generator)

4. On the oscilloscope, set:

Channel 3:
 Ext Probe 10
 Display 0n
 Volts/Division 15 mV (Readjust as required)
 Offset 0V

Timebase:
 Time/Division 5 ns
 Delay 100 ns
 Delay Reference At center

Trigger:
 Trigger Slope Positive
 Probe Atten 20
 Trigger Level 1.2V

Display:
 Display Mode Persistence
 Display Time 1 sec
 Screen Single

Note On the oscilloscope, turn the waveform math function on. Then use the waveform math maximum function to determine the pulse envelope when making the following measurements.

5. On the synthesizer, press:

MOD **Pulse On/Off Extrnl** (asterisk on)

or, for synthesizers with Option 002, press:

MOD **Pulse Menu Pulse On/Off Ext** (asterisk on)

6. On the oscilloscope:

- a. Adjust the timebase delay to position the rising edge of the pulsed RF near the center of the display.
- b. Adjust the channel 3 volts/division and offset to obtain a 5 division signal level between the RF power off and the RF power on. (See Figure 2-16.)
- c. Adjust the channel 3 offset to move the RF power off line one-half division below the nearest horizontal graticule (making the horizontal graticule cross the waveform at the 10% point.)
- d. Adjust the oscilloscope timebase to widen the pulse envelope so that the measurement can be made with greater accuracy. (See Figure 2-17.)
- e. Use the oscilloscope's delta t function to measure the time difference between the 10% and 90% risetime points on the envelope. (The 10% point of the risetime is where the pulse envelope crosses the graticule. The 90% point is 4 divisions up.) Record this value in Table 2-18.

13. On the oscilloscope, set:

Channel 3:
Volts/Division 30 mV
Timebase:
Time/Division 100 ns
Delay Reference At left
Trigger:
Trigger Level 50 mV

Increase the oscilloscope sensitivity to 5 mV/division. Adjust the delay and timebase so that the pulse waveform takes up the entire display. Adjust the oscilloscope channel 3 offset to position the top of the pulse envelope near the center graticule.

14. On the synthesizer, turn off external pulse and set the power level to -0.3 dBm. Press:

Pulse On/Off Ext (asterisk off)

POWER LEVEL **-3** **dBm**

15. Use the oscilloscope's waveform math maximum function to determine the peak power level (if the waveform math function was previously on, clear the display before executing this step.) Use the oscilloscope's delta V feature and position marker 1 at the center of the peak power as displayed by the math waveform (the width of the waveform is caused by noise in the system.) Leave the marker at that position.
16. Set the synthesizer's power level to $+0.3$ dBm. Press:

POWER LEVEL **3** **dBm**

17. Clear the oscilloscope display and use the oscilloscope's waveform math maximum feature to determine the peak power level. Use the oscilloscope's delta V feature and position marker 2 at the center of the peak power as displayed by the math waveform.

If the difference between marker 1 and marker 2 is less than 1 division, repeat steps 13 through 17 with channel 3 volts/division set to a more sensitive scale.

18. On the synthesizer, press:

POWER LEVEL **0** **dBm**

MOD Pulse On/Off Extrnl (asterisk on)

19. Observe the peak pulse power. It should stay within the two delta V markers set in steps 16 and 18. Record the “Pass” or “Fail” in the Level Accuracy column in Table 2-18.
20. Repeat steps 12 through 19 at each synthesizer frequency in Table 2-18.
21. If all results in Table 2-18 are “Pass”, record “Pass” on the test record. If any results are “Fail”, record “Fail” on the test record.

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

14. Pulse Performance (Alternate Procedure)

Description and Procedure

In this procedure, the synthesizer's RF output is downconverted in frequency so that an oscilloscope can measure the rise and fall times and make a comparison of pulsed and CW power level accuracy. For measurements above 20 GHz RF output frequency, a spectrum analyzer with external mixer is used to downconvert to a 321.4 MHz RF. Power level accuracy is checked at a 10 Hz pulse repetition rate to verify its operation at the slowest specified rate. The power amplifier ensures a sufficient signal level into the oscilloscope to make the measurement.

1. Turn on the equipment shown in Figure 2-18 and Figure 2-20. Preset the instruments and let them warm up for at least one hour.

Rise and Fall Times < 20 GHz

Note This procedure is not valid for fast pulse option (Option 006).

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

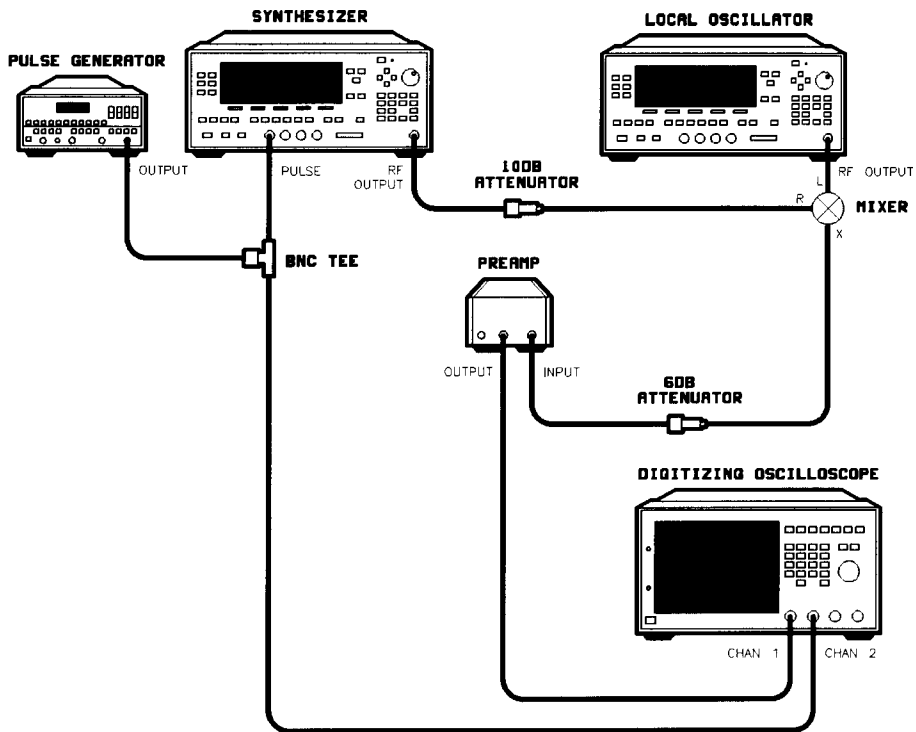


Figure 2-18. Pulse Performance Test Setup < 20 GHz

Equipment

| | |
|-------------------------|---|
| Local Oscillator | |
| (Synthesized Sweeper) | HP 83620A |
| Digitizing Oscilloscope | HP 54111D |
| Preamplifier | HP 8447F |
| Mixer | HP P/N 0955-0307 |
| Attenuator 6 dB | HP 8493C Option 006 |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |

3. On the synthesizer, press:
 - CW** First synthesizer frequency in Table 2-19.
 - POWER LEVEL** **-5** **dBm**
 - ALC** **Leveling Point Internal** (asterisk on)
 - Leveling Mode Search** (asterisk on)
4. On the local oscillator (HP 83620A), set the center frequency to the first LO frequency in Table 2-19. Then set:

Power Level: 10 dBm
 RF Power: 0n

Table 2-19. Synthesizer and LO Frequencies

| Synthesizer Frequencies (GHz) | LO Frequencies (GHz) | Risetime | Falltime | Level Accuracy |
|-------------------------------|----------------------|----------|----------|----------------|
| 1.9 ¹ | 2.4 | | | |
| 5.0 | 4.5 | | | |
| 9.0 | 8.5 | | | |
| 15.0 | 14.5 | | | |

¹ Disregard if beyond your synthesizer's capability.

Note The CW frequencies checked provide a minimum verification of pulse performance. If pulse performance at a different frequency is important, repeat the test at that CW frequency.

5. On the pulse generator, set:
 - Pulse Width: 50 ns
 - Pulse Period: 10 us (100 kHz)
 - Pulse Level: 5V
 - Disable: LED off (enables pulse generator)

6. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|---------|
| Display | On |
| Volts/Division | 100 mV |
| Offset | 0V |
| Input Coupling | dc |
| Input Impedance | 50 ohms |

Channel 2:

| | |
|---------|-----|
| Display | Off |
|---------|-----|

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 10 ns |
| Delay | 100 ns |
| Delay Reference | At center |

Trigger:

| | |
|----------------|--------|
| Trigger Mode | Edge |
| Trigger Source | Chan 2 |
| Trigger Level | 2V |

Display:

| | |
|--------------------|------------|
| Display Mode | Repetitive |
| Averaging | On |
| Number of Averages | 1 |
| Screen | Single |

Note

On the oscilloscope, turn the waveform math function on. Then use the waveform math maximum function to determine the pulse envelope when making the following measurements.

7. On the synthesizer, press:

MOD Pulse On/Off Extrnl (asterisk on)

11. Repeat steps 7 through 10 at each synthesizer and LO frequency in Table 2-19.
12. For the HP 83620A/22A and for the HP 83623A/24A, record each worst case risetime and falltime value from Table 2-19 on the appropriate test record.

Pulse Leveling Accuracy < 20 GHz

13. On the pulse generator, set:

Pulse Width: 1 us
 Pulse Period: 1 ms
 Pulse Level: 5V

14. On the synthesizer, press:

CW First synthesizer frequency in Table 2-19

POWER LEVEL **-0** **dBm**

ALC Leveling Mode Normal

MOD Pulse On/Off Extrnl (asterisk on)

15. On the spectrum analyzer, set the center frequency to the first frequency in Table 2-19.

16. On the oscilloscope, set:

Channel 1:

Volts/Division 30 mV

Timebase:

Time/Division 100 ns

Delay Reference At left

Adjust the delay and timebase so that the pulse waveform takes up the entire display. Adjust the oscilloscope channel 1 offset to position the top of the pulse envelope near the center graticule.

17. On the synthesizer, turn off external pulse and set the power level to -0.3 dBm. Press:

Pulse On/Off Extrnl (asterisk off)

POWER LEVEL **-0.3** **dBm**

18. Use the oscilloscope's waveform math maximum function to determine the peak power level (if the waveform math function was previously on, clear the display before executing this step.) Use the oscilloscope's delta V feature and position marker 1 at the center of the peak power as displayed by the math waveform (the width of the waveform is caused by noise in the system.) Leave the marker at that position.
19. Set the synthesizer's power level to -0.3 dBm. Press:

POWER LEVEL **-0.3** **dBm**

20. Clear the oscilloscope display and use the oscilloscope's waveform math maximum feature to determine the peak power level. Use the oscilloscope's delta V feature and position marker 2 at the center of the peak power as displayed by the math waveform.

If the difference between marker 1 and marker 2 is less than 1 division, change channel 1 volts/division to a more sensitive scale and repeat steps 16 through 20.

21. On the synthesizer, press:

POWER LEVEL **-0** **dBm**

MOD **Pulse On/Off Extrnl** (asterisk on)

22. Reset the oscilloscope waveform math feature to maximum and observe the peak pulse power. It should stay within the two delta V markers set in steps 17 and 19. Record the value in Table 2-19.
23. Repeat steps 12 through 21 at each synthesizer and LO frequency in Table 2-19.
24. For the HP 83620A/22A and for the HP 83623A/24A, record the worst case level accuracy from Table 2-19 on the appropriate test record.

Rise and Fall Times > 20 GHz

Disregard if beyond your synthesizer's capability.

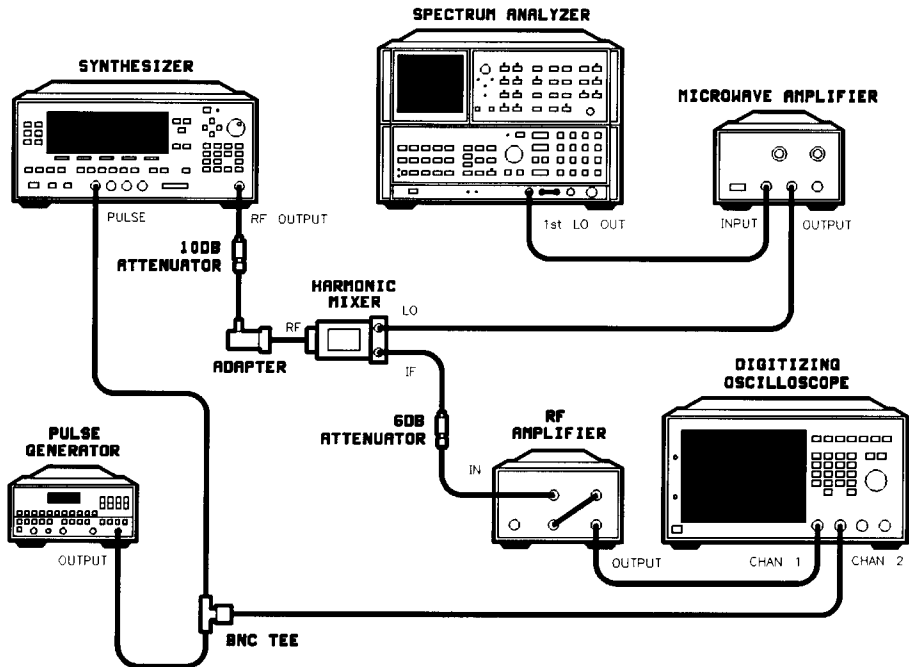


Figure 2-20. Pulse Performance Test Setup >20 GHz

Equipment

| | |
|-------------------------|---------------------------|
| Spectrum Analyzer | HP 8566B |
| Digitizing Oscilloscope | HP 54111D |
| Microwave Amplifier | HP 11975A |
| RF Amplifier | HP 8447F |
| Pulse Generator | HP 8116A |
| Harmonic Mixer | HP 11970K |
| Harmonic Mixer | HP 11970A (HP 83640A/50A) |
| Harmonic Mixer | HP 11970Q (HP 83650A) |
| Attenuator 6 dB | HP 8493C Option 006 |
| Attenuator 10 dB | HP 8490D Option 010 |

Table 2-20. Risetime and Falltime Values

| CW Frequency | Risetime | Falltime | Level Accuracy |
|--------------|----------|----------|----------------|
| 23 GHz | | | |
| 28 GHz | | | |
| 35 GHz | | | |
| 45 GHz | | | |

Procedure > 20 to ≤ 26.5 GHz.

25. Connect the equipment as shown in Figure 2-20 using the HP 11970K Mixer.

26. On the synthesizer, press:

CW **23** **GHz**

POWER LEVEL **0** **dBm**

ALC **Leveling Point Intrnl** (asterisk on)

Leveling Mode Search (asterisk on)

27. Set the microwave amplifier output power level to +16 dBm.

28. On the spectrum analyzer, select external mixer and set the frequency range for the mixer. Then set:

Center Frequency: 23 GHz

Frequency Span: 0 Hz

29. Repeat steps 5 through 10 recording the risetime and falltime values in Table 2-20. For HP 83630A only, record the worst case risetime and worst case falltime values from Table 2-19 and Table 2-20 on the test record.

Procedure > 26.5 to ≤ 40 GHz.

30. Replace the HP 11970K Mixer with the HP 11970A Mixer.

31. Repeat steps 5 through 10 at synthesizer and spectrum analyzer CW frequencies of 30 and 35 GHz recording the risetime and falltime values in Table 2-20. For HP 83640A only, record the worst case risetime and worst case falltime values from Table 2-19 and Table 2-20 on the test record.

Procedure > 40 GHz to ≤ 50 GHz.

32. Replace the HP 11970A Mixer with the HP 11970Q Mixer (33 to 50 GHz).
33. Repeat steps 5 through 10 at synthesizer and spectrum analyzer CW frequencies of 45 GHz and record the risetime and falltime values in Table 2-20. For the HP 83650A only, record the worst case risetime and worst case falltime values from Table 2-19 and Table 2-20 on the test record.

Pulse Leveling Accuracy > 20 GHz

Disregard if beyond your synthesizer's capability.

Procedure > 20 to ≤ 26.5 GHz.

34. Replace the HP 11970Q Mixer with the HP 11970K Mixer.
35. On the synthesizer, press:
CW **23** **GHz**
36. Repeat steps 13 through 22 and record the level accuracy in Table 2-20.
37. For HP 83630A only, record the worst case level accuracy from Table 2-19 and Table 2-20 on the test record.

Procedure > 26.5 to ≤ 40 GHz.

38. Replace the HP 11970K Mixer with the HP 11970A Mixer.
39. Repeat steps 13 through 22 for CW frequencies of 30 and 35 GHz and record the level accuracy in Table 2-20.
40. For HP 83640A only, record the worst case level accuracy from Table 2-19 and Table 2-20 on the test record.

Procedure > 40 to ≤ 50 GHz.

41. Replace the HP 11970A Mixer with the HP 11970Q Mixer.
42. Repeat steps 13 through 22 for a CW frequency of 45 GHz and record the level accuracy in Table 2-20.
43. For HP 83650A only, record the worst case level accuracy from Table 2-19 and Table 2-20 on the test record.

Related Adjustments

None

In Case of Difficulty

1. A noisy amplifier can cause a noisy trace that is too wide to measure. Substitute amplifiers to verify a problem with the amplifier.
2. If there is no change in amplification, the amplifier may be saturated (operating in compression). The 0.3 dB variation should be approximately equal on both sides. Try a lower synthesizer power level to get the amplifier out of saturation.
3. Refer to the *Troubleshooting* manual.

15. Pulse Modulation Video Feedthrough

Description and Procedure

In CW, at specified maximum leveled power, the synthesizer is pulse modulated using a pulse generator. The synthesizer's RF output is filtered (only the video feedthrough passes), amplified, and displayed on an oscilloscope. Because of the low amplitude of the video feedthrough, a preamplifier is used in the test setup; system gain must be considered when making this measurement.

When video feedthrough is expressed as a percentage, the following equation is used:

$$\text{Video feedthrough (\%)} = [(\text{video } V_p / \text{carrier } V_p) \times 100] / \text{video gain}$$

1. Preset all the instruments shown in Figure 2-21 and let them warm up for at least one hour.
2. To achieve peak power, turn on RF peaking:
USER CAL Tracking Menu Peak RF Always (asterisk on)
3. Connect the equipment as shown in Figure 2-21 with the pulse generator connected directly to channel 1 of the oscilloscope (A).

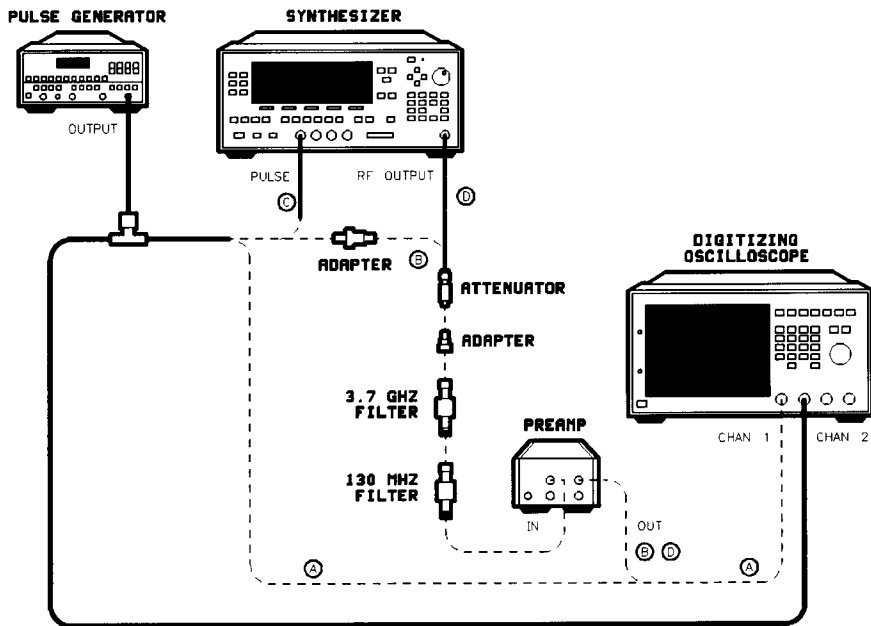


Figure 2-21. Video Feedthrough Test Setup

Equipment

| | |
|-------------------------|---|
| Pulse Generator | HP 8116A |
| Digitizing Oscilloscope | HP 54111D |
| Preamplifier | HP 8447F |
| 130 MHz Filter | K & L Microwave 5LL30-130/BT2400/BP |
| 500 MHz Low Pass Filter | Mini-Circuits SLP-550 |
| 3.7 GHz Filter | HP P/N 9135-0191 |
| Attenuator 6 dB | HP 8493C Option 006 (HP 83620A/22A/ 30A/40A/50A) |
| Attenuator 20 dB | HP 8493C Option 020 (HP 83623A/24A) |

System Calibration

Note The pulse generator output level can be affected by loading. Leave the pulse generator connected to the oscilloscope's channel 2 (through the BNC tee) as you set the output level.

4. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|-------------|
| Display | On |
| Volts/Division | 50 mV |
| Offset | 0V |
| Input Coupling | dc |
| Input Impedance | 50 Ω |

Channel 2:

| | |
|-----------------|-------------|
| Display | Off |
| Input Impedance | 50 Ω |

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 20 ns |
| Delay | 0s |
| Delay Reference | At center |

Trigger:

| | |
|----------------|-----------|
| Trigger Mode | Edge |
| Trigger Source | Channel 1 |
| Trigger Level | 0.05V |
| Trigger Slope | Positive |

Display:

| | |
|--------------------|------------|
| Display Mode | Repetitive |
| Averaging | On |
| Number of Averages | 16 |

5. On the pulse generator, set:
 - Pulse: Selected
 - Pulse width: 10 ns
 - Frequency: 2 MHz (500 ns)
 - Offset: 0V
6. On the pulse generator, set the pulse amplitude for a reading of 0.1V on the oscilloscope.

Video Gain

7. Connect the pulse generator to the oscilloscope's channel 1 through the attenuator, filters, and amplifier (B).
8. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|-------|
| Volts/Division | 0.2V |
| Offset | -0.3V |
| Input Coupling | dc |
| Input Impedance | 50Ω |

Trigger:

| | |
|----------------|-----------|
| Trigger Mode | Edge |
| Trigger Source | Channel 1 |
| Trigger Level | -0.4V |
| Trigger Slope | Negative |

9. On the oscilloscope, note the pulse amplitude: _____Vp
10. Calculate the video gain:

$$\begin{aligned} \text{Video gain} &= \frac{\text{system } V_p \text{ (from step 9)}}{\text{pulse generator } V_p} \\ &= \frac{\text{system } V_p}{0.1 V_p} \end{aligned}$$

Video Gain = _____

Low Band Video Feedthrough

Disregard if beyond your synthesizer's capability.

11. Connect the pulse generator output to the synthesizer's pulse input (C).
12. Connect the synthesizer to the oscilloscope's channel 1 through the attenuator, filters, and amplifier (D).

13. On the synthesizer, press:

CW First CW frequency in Table 2-21

ALC Leveling Mode Search .

POWER LEVEL **10** **dBm**

MOD Pulse On/Off Extrnl (asterisk on)

or, for synthesizers with Option 002, instead press:

MOD Pulse Menu Pulse On/Off Ext

Table 2-21. Low Band Video Feedthrough Frequencies

| Synthesizer CW Frequency (GHz) | Video Feedthrough (%) ≤ 10 dBm | Video Feedthrough (%) > 10 dBm |
|--------------------------------------|--------------------------------------|--------------------------------------|
| 0.4 | _____ | _____ |
| 0.7 | _____ | _____ |
| 1.0 | _____ | _____ |
| 1.3 | _____ | _____ |
| 1.6 | _____ | _____ |
| 1.9 | _____ | _____ |

14. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|-------------|
| Display | On |
| Volts/Division | 0.01 V |
| Offset | 0V |
| Input Coupling | dc |
| Input Impedance | 50 Ω |

Channel 2:

| | |
|----------------|-----|
| Display | Off |
| Volts/Division | 1V |
| Offset | 2V |

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 200 ns |
| Delay | 400 ns |
| Delay Reference | At center |

Trigger:

| | |
|----------------|-----------|
| Trigger Mode | Edge |
| Trigger Source | Channel 2 |
| Trigger Level | 1V |
| Trigger Slope | Positive |

Display:

| | |
|--------------------|------------|
| Display Mode | Repetitive |
| Averaging | On |
| Number of averages | 64 |

15. On the pulse generator, set:

| | |
|--------------|---------------------|
| Pulse width: | 500 ns |
| Frequency: | 200 kHz (5 μ s) |
| Offset: | 0V |
| Amplitude: | 5V |

16. On the oscilloscope, note the maximum voltage from the baseline.
(See Figure 2-22.) Video feedthrough (V_p) = _____ V_p

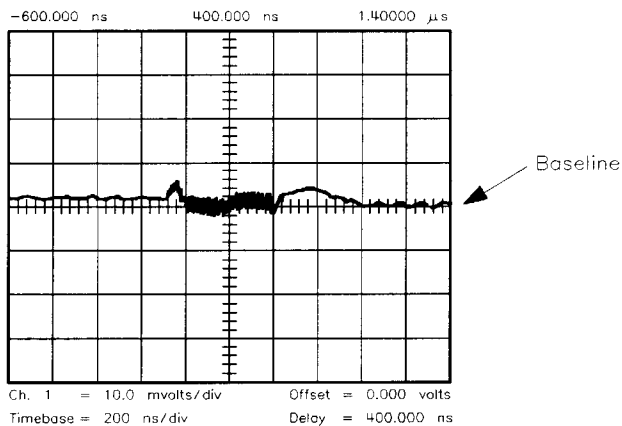


Figure 2-22. Measuring Maximum Voltage from the Baseline Video Feedthrough

17. Using the video gain from step 10, the video feedthrough (V_p) from step 16, and the carrier voltage from Table 2-22 calculate the video feedthrough as a percent of carrier power:

$$\text{Video feedthrough (\%)} = [(\text{video } V_p / \text{carrier } V_p) \times 100] / \text{video gain}$$

Table 2-22. Power Level Conversions to Volts Peak

| Synthesizer Maximum Specified Power (dBm) Into 50Ω | Peak Carrier Voltage ¹ (V) | Synthesizer Maximum Specified Power (dBm) Into 50Ω | Peak Carrier Voltage ¹ (V) |
|--|---------------------------------------|--|---------------------------------------|
| 0 | 0.316 | 10.5 | 1.059 |
| 0.5 | 0.335 | 11.0 | 1.122 |
| 1.0 | 0.355 | 11.5 | 1.189 |
| 1.5 | 0.376 | 12.0 | 1.259 |
| 2.0 | 0.398 | 12.5 | 1.334 |
| 2.5 | 0.422 | 13.0 | 1.413 |
| 3.0 | 0.447 | 13.5 | 1.496 |
| 3.5 | 0.473 | 14.0 | 1.585 |
| 4.0 | 0.501 | 14.5 | 1.679 |
| 4.5 | 0.531 | 15.0 | 1.778 |
| 5.0 | 0.562 | 15.5 | 1.884 |
| 5.5 | 0.596 | 16.0 | 1.995 |
| 6.0 | 0.631 | 16.5 | 2.113 |
| 6.5 | 0.668 | 17.0 | 2.239 |
| 7.0 | 0.708 | 17.5 | 2.371 |
| 7.5 | 0.750 | 18.0 | 2.512 |
| 8.0 | 0.794 | 18.5 | 2.661 |
| 8.5 | 0.841 | 19.0 | 2.819 |
| 9.0 | 0.891 | 19.5 | 2.985 |
| 9.5 | 0.944 | 20.0 | 2.985 |
| 10.0 | 1.000 | | |

$$^1 \text{ Peak Carrier Voltage} = 10 \left(\frac{P_{\text{dBm}} - 10}{20} \right)$$

18. Record the video feedthrough (in Table 2-21).
19. Repeat steps 16 through 18 for the remaining CW frequencies in Table 2-21.
20. For synthesizers capable of > 10 dBm, set the maximum specified leveled power and repeat steps 16 through 18 for all of the CW frequencies in Table 2-21.
21. Record the worst case value from Table 2-21 for each power range on the test record.

Video Feedthrough > 2 GHz

22. Replace the 130 MHz low pass filter with a 500 MHz low pass filter.
23. Repeat steps 7 through 10 to check video gain once more.
24. On the oscilloscope, reset channel 1 to 0.01 volts/division.
25. Set the synthesizer to its maximum specified leveled power and repeat steps 13 and 16 through 17 (the oscilloscope and pulse generator are already set up) for the CW frequencies in Table 2-23. Do *not* exceed the maximum frequency of your synthesizer. Record the video feedthrough in Table 2-23.

Table 2-23. Millimeter Band Video Feedthrough Frequencies

| Frequency (GHz) | Video Feedthrough (%) |
|-----------------|-----------------------|
| 5.0 | _____ |
| 10.0 | _____ |
| 15.0 | _____ |
| 20.0 | _____ |
| 23.0 | _____ |
| 28.0 | _____ |
| 35.0 | _____ |
| 45.0 | _____ |

26. Record the worst case value in Table 2-23 on the test record.

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

16. AM Accuracy

Description and Procedure

This procedure measures the AM accuracy of the synthesizer. The local oscillator and mixer are used to downconvert the synthesizer frequency to the frequency range of the measuring receiver (an HP 11793A Microwave Converter can be substituted for the mixer). For measurements above 20 GHz RF output frequency, a spectrum analyzer with external mixer are used to downconvert to a 321.4 MHz RF. The function generator provides AM modulation. The function generator signal level is adjusted for 30% AM as measured by the measuring receiver. The function generator signal level is checked for accuracy. A DVM may be necessary to measure the function generator output.

1. Turn on the equipment shown in Figure 2-23. Preset the instruments and let them warm up for at least one hour.
2. On the measuring receiver, calibrate and store the AM calibration factor.

Low Band < 2 GHz

Disregard if beyond your synthesizer's capability.

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

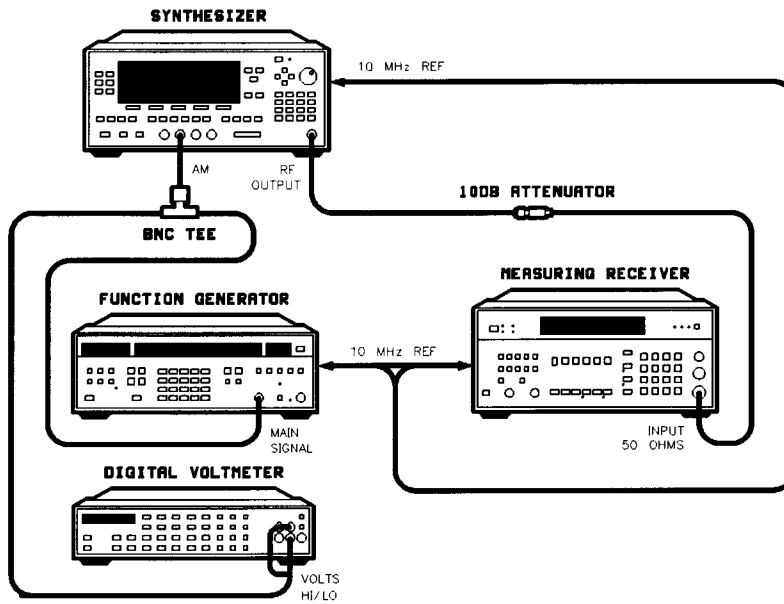


Figure 2-23. AM Accuracy Test Setup Low Band

Equipment

| | |
|--------------------|---|
| Function Generator | HP 3325A |
| Digital Voltmeter | HP 3456A |
| Measuring Receiver | HP 8902A |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/23A/30A) |

4. On the synthesizer, press:

CW **500** **MHz**

POWER LEVEL **0** **dBm**

USER CAL **AM Cal Menu** **AM BW Cal Always** (asterisk on)

5. On the function generator, set:

Function: Sine wave
Frequency: 1 kHz
DC Offset: 0 mV

Set the amplitude to $600 \text{ mV}_{\text{p-p}}$ (or $212 \text{ mV}_{\text{rms}}$) and verify this amplitude with the DVM. Note that the DVM measures in V rms ($V_{\text{rms}} \times 1.414 \times 2 = V_{\text{p-p}}$).

6. On the measuring receiver, set:

HP Filter: 300 Hz
LP Filter: 3 kHz
Measurement: AM
Detector: Peak $\pm/2$ (both on)
Automatic Operation

7. On the synthesizer, turn on AM modulation. Press:

MOD AM On/Off 100%/V (asterisk on)

For instruments with Option 002, instead press:

MOD AM Menu AM On/Off Ext (asterisk on)

AM Type 100%/V (asterisk on)

8. On the test record, record the modulation depth as indicated by the measuring receiver.

For Instruments with Option 002 only.

9. On the synthesizer, turn on internal AM. Press:

MOD AM Menu AM On/Off Int (asterisk on)

10. On the synthesizer, press:

Internal AM Rate **1** kHz

Internal AM Depth **30** enter

11. On the test record, record the modulation depth as indicated by the measuring receiver.

High Band > 2 GHz and < 20 GHz

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

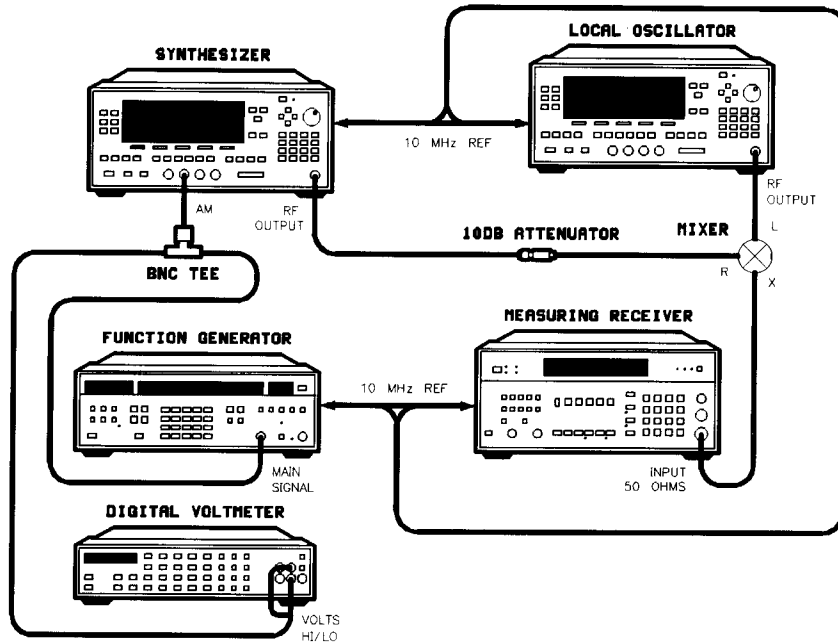


Figure 2-24. AM Accuracy Test Setup < 20 GHz

Equipment

| | |
|-----------------------|---|
| Function Generator | HP 3325A |
| Digital Voltmeter | HP 3456A |
| Local Oscillator | |
| (Synthesized Sweeper) | HP 83620A |
| Measuring Receiver | HP 8902A |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |
| Mixer | HP P/N 0955-0307 |

13. On the synthesizer, press:

CW **5** **GHz**

POWER LEVEL **0** **dBm**

USER CAL **AM Cal Menu AM BW Cal Always** (asterisk on)

14. On the local oscillator, set:

CW Frequency: 5.1 GHz

RF: On

Power Level: 10 dBm

15. On the function generator, set:

Function: Sine wave

Frequency: 1 kHz

DC Offset: 0 mV

Set the amplitude to 600 mV p-p and verify this amplitude with the DVM.

Note that the DVM measures in V rms ($V_{rms} \times 1.414 \times 2 = V_{p-p}$).

16. On the measuring receiver, set:

HP Filter: 300 Hz

LP Filter: 3 kHz

Measurement: AM

Detector: Peak $\pm/2$ (both on)

Automatic Operation

17. On the synthesizer, turn on AM modulation. Press:

MOD **AM On/Off 100%/V** (asterisk on)

For instruments with Option 002, instead press:

MOD **AM Menu AM On/Off Ext** (asterisk on)

AM Type 100%/V (asterisk on)

18. On the test record, record the modulation depth as indicated by the measuring receiver.

For Instruments with Option 002 only.

19. On the synthesizer, turn external AM off and internal AM on. Press:

MOD **AM Menu AM On/Off Ext** (asterisk off)

AM On/Off Int (asterisk on)

20. On the synthesizer, press:
 Internal AM Rate **1** kHz
 Internal AM Depth **30** enter
21. On the test record, record the modulation depth as indicated by the measuring receiver.

High Band > 20 GHz - Doubler Engaged

Disregard if beyond your synthesizer's capability.

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

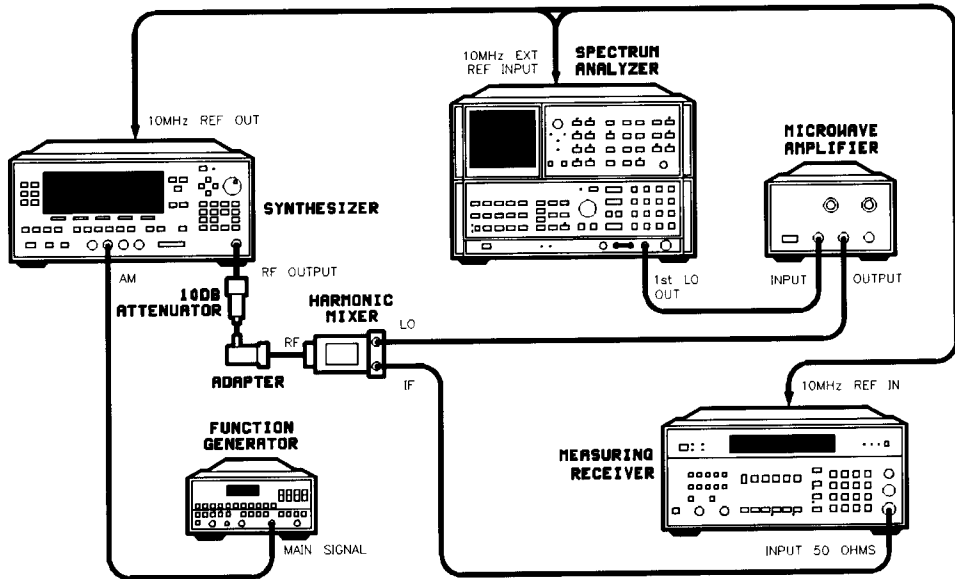


Figure 2-25. AM Accuracy Test Setup > 20 GHz

Equipment

| | |
|---------------------|---------------------|
| Spectrum Analyzer | HP 8566B |
| Microwave Amplifier | HP 11975A |
| Measuring Receiver | HP 8902A |
| Harmonic Mixer | HP P/N 0955-0307 |
| Function Generator | HP 3325A |
| Attenuator 10 dB | HP 8490D Option 010 |

23. On the synthesizer, press:

CW **28** **GHz**

POWER LEVEL **-3** **dBm**

MOD **AM On/Off 100%/V** (asterisk off)

For instruments with Option 002, instead press:

MOD **AM Menu AM On/Off Ext** (asterisk on)

AM Type 100%/V (asterisk on)

24. Set the microwave amplifier output power level to +16 dBm.
25. On the spectrum analyzer, set:

Center Frequency: 28 GHz

Frequency Span: 0 Hz

26. Set up the function generator as in step 6.
27. Set up the measuring receiver as in step 7 and select automatic operation.
28. On the synthesizer, press:

MOD **AM On/Off 100%/V** (asterisk on)

For instruments with Option 002, instead press:

MOD **AM Menu AM On/Off Ext** (asterisk on)

AM Type 100%/V (asterisk on)

29. On the test record, record the modulation depth as indicated by the measuring receiver.

For Instruments with Option 002 only:

30. On the synthesizer, turn external AM off and internal AM on. Press:

MOD **AM Menu AM On/Off Ext** (asterisk off)

AM On/Off Int (asterisk on)

31. On the synthesizer, press:
Internal AM Rate
Internal AM Depth
32. On the test record, record the modulation depth as indicated by the measuring receiver.

Related Adjustments

Modulator Offset and Gain

In Case of Difficulty

1. The AM input impedance is internally selectable to either 50Ω or $2\text{ k}\Omega$ (the factory-set value is 50Ω). If the AM input is set for $2\text{ k}\Omega$, and the function generator requires a 50Ω system, use a DVM to measure the AM input signal level while it is connected to the synthesizer.
2. Refer to the *Troubleshooting* manual.

17. AM Bandwidth

Description and Procedure

This test verifies that the peak RF output power does not vary more than a specified amount over the specified amplitude modulation rate frequency range. The spectrum analyzer with the tracking generator operates as a network analyzer to measure the flatness. Flatness errors associated with the tracking generator and spectrum analyzer are calibrated out of the measurement.

1. Connect the equipment as shown in Figure 2-26 with the tracking generator output connected to the 50 ohm input of the spectrum analyzer and to the DVM. Press **PRESET** and let the equipment warm up for at least one hour.

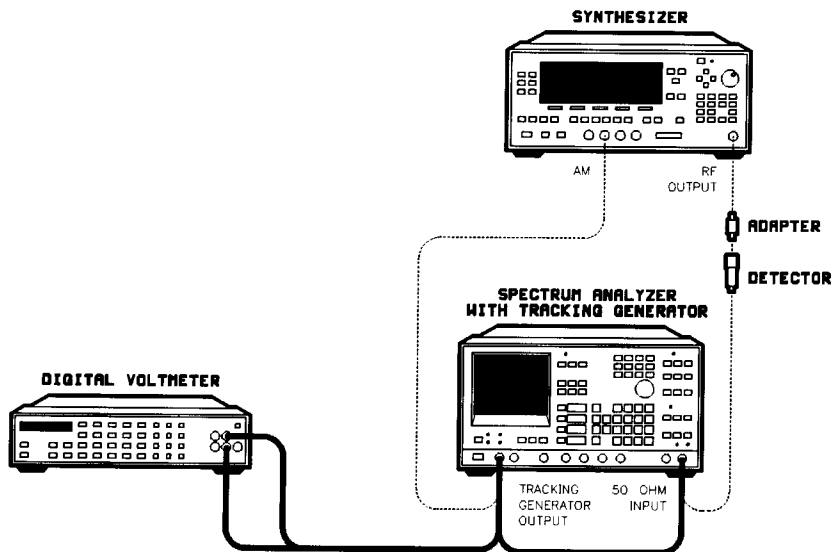


Figure 2-26. AM Bandwidth Test Setup

Equipment

| | |
|-------------------------|---------------------------------------|
| Spectrum Analyzer | |
| With Tracking Generator | HP 3585A/B |
| Crystal Detector | HP 33330E (HP 83640A/50A) |
| Crystal Detector | HP 33330D (HP 83620A/22A/23A/24A/30A) |
| Digital Voltmeter | HP 3456A |

2. On the spectrum analyzer, set:

Start Frequency: 5 kHz

Stop Frequency: 200 kHz

Sweep Manual: 5 kHz

dB/Div: 1 dB

Range: 5 dBm

Tracking Generator

Amplitude: Maximum 600 mV p-p (212 mV rms on the DVM)

- On the spectrum analyzer, clear trace A memory. Change the **REF LEV**, using the RPG knob, to position the trace (dot) on the center horizontal graticule.
- Set the spectrum analyzer to continuous sweep. When a full sweep is completed, store trace A into trace B memory. Then display A minus B (turning off trace B). A straight line should be displayed.

The spectrum analyzer is now calibrated.

- Connect the tracking generator output to the synthesizer's AM input and connect the synthesizer's RF output through the crystal detector to the spectrum analyzer's 50 ohm input.
- On the synthesizer, press:

USER CAL **AM CAL MENU** **AM BW CAL** Always (asterisk on)

CW First synthesizer frequency in Table 2-24

POWER LEVEL Set to 5 dB below specified maximum leveled power

MOD **AM On/Off 100%/V** (asterisk on)

or for synthesizers with Option 002, press:

MOD **AM On/Off Ext AM Type 100%/V**

Table 2-24. Synthesizer Frequencies

| Synthesizer Frequencies (GHz) | 3 dB Bandwidth |
|-------------------------------|----------------|
| 1.5 ¹ | |
| 5.0 | |
| 9.0 | |
| 18.0 | |
| 23.0 ¹ | |
| 28.0 ¹ | |
| 36.0 ¹ | |
| 44.0 ¹ | |

¹ Disregard if beyond your synthesizer's capability.

7. On the spectrum analyzer, clear and view trace A (light on). Change the reference level to set the peak of the trace on the center graticule. If an over range occurs, turn the RPG knob in the opposite direction.

The display now shows the synthesizer AM flatness from 5 kHz to 200 kHz.

8. Use the spectrum analyzer markers to determine the 3 dB bandwidth. Record the frequency of the 3 dB bandwidth in Table 2-24. If the 3 dB bandwidth point is off the display, record "> 200 kHz" in Table 2-24.
9. Set the spectrum analyzer to **CONT** and repeat steps 7 and 8 for the remaining synthesizer frequencies in Table 2-24.
10. Record the smallest bandwidth from Table 2-24 on the test record.

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

18. AM Dynamic Range

Description and Procedure

In this procedure, a function generator is used to provide a DC voltage to the synthesizer's AM input. The synthesizer is set to 0 dBm output power. AM is enabled and a DC voltage is applied. The DC voltage is set for maximum AM without an overmodulation indication to drive the synthesizer's modulator to the edge of distortion. The output power is measured with a power meter. A measurement is made in 1 GHz steps across the synthesizer's frequency range. This equipment lets you measure down to -30 dBm. If you reach this level before the synthesizer overmodulates, the power meter will indicate an under range measurement.

This procedure is repeated using the deep AM function in the search ALC mode. A spectrum analyzer is used in place of the power meter to make the deep AM measurement. This equipment allows you to measure down to approximately -65 dBm. If your synthesizer does not overmodulate by this point, and you wish to measure the power level just before overmodulation, use a power supply to increase the DC voltage supply to the AM input.

CAUTION Do not exceed -15 V DC to the AM input or damage will occur.

1. Preset the instruments shown in Figure 2-27 and let them warm up for at least one hour.

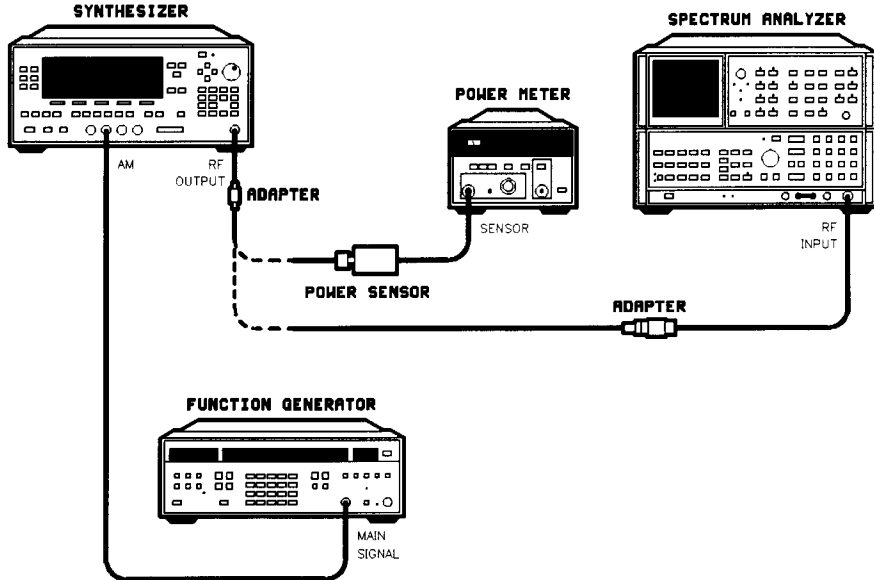


Figure 2-27. AM Dynamic Range Test Setup

Equipment

| | |
|--------------------|--------------------------------------|
| Spectrum Analyzer | HP 8566B |
| Digital Voltmeter | HP 3456A |
| Function Generator | HP 3325A |
| Power Meter | HP 436A/7A/8A |
| Power Sensor | HP 8487A (HP 83640A/50A) |
| Power Sensor | HP 8485A (HP 83620A/22A/23A/24A/30A) |

- On the synthesizer, turn on RF peaking and AM bandwidth calibration.
Press:
 Tracking Menu Peak RF Always (asterisk on)
 AM Cal Menu AM BW Cal Always (asterisk on)
- Zero and calibrate the power meter/sensor.
- Connect the equipment as shown in Figure 2-27 with the power sensor connected to the synthesizer's RF OUTPUT.

5. On the synthesizer, press:
 - CW** **1** **GHz** (Set to 2 GHz for synthesizers with lowest start frequency of 2 GHz)
 - FREQUENCY** **MENU** **Up/Dn** **Size** **CW** **1** **GHz**
 - POWER** **MENU** **Uncoupl** **Atten** (Option 001 only)
 - POWER LEVEL** **-10** **dBm**
 - MOD** Verify that all modulation is off. (No asterisks next to key labels.)

For synthesizers with Option 002, if modulation is on, an “AM,” “FM,” or “PLS” message will be displayed.
6. On the power meter, set:
 - Mode:** **dBm**
 - Cal Factor %:** Cal factor corresponding to the synthesizer’s CW frequency
7. On the function generator, turn off all waveforms and set:
 - DC Offset:** **-1.5 V DC**

Normal AM Dynamic Range

8. On the synthesizer, turn on AM modulation to 10 dB/V:
 - MOD** **AM On/Off** **10dB/V** (asterisk on)

or, for synthesizers with Option 002, press:

 - MOD** **AM Menu** **AM On/Off** **Ext** (asterisk on)
 - AM Type** **10 dB/V** (asterisk on)
9. Decrease the function generator output just until the OVERMOD message turns on. Then increase the signal until the OVERMOD message turns off. (The more negative the signal applied to the modulator is, the more the RF output level decreases.)
10. Wait for the power meter to settle then note the power meter reading in Table 2-25. If the power meter reads under range, record < -30 dB.

Table 2-25. Power Meter Readings

| | |
|--------------|---------------------------|
| 1 GHz _____ | 12 GHz _____ |
| 2 GHz _____ | 13 GHz _____ |
| 3 GHz _____ | 14 GHz _____ |
| 4 GHz _____ | 15 GHz _____ |
| 5 GHz _____ | 16 GHz _____ |
| 6 GHz _____ | 17 GHz _____ |
| 7 GHz _____ | 18 GHz _____ |
| 8 GHz _____ | 19 GHz _____ |
| 9 GHz _____ | 20 GHz _____ |
| 10 GHz _____ | 21 GHz ¹ _____ |
| 11 GHz _____ | 22 GHz ¹ _____ |

¹ HP 83630A/40A/50A only.

11. Repeat steps 9 and 10 from 2 to 22 GHz, in 1 GHz steps. Change the power meter cal factor % as required.
12. Record the worst case value from Table 2-25 on the test record.

Deep AM Dynamic Range

13. Disconnect the power sensor from the synthesizer and connect the spectrum analyzer as shown in Figure 2-27.
14. On the synthesizer, press:
 - CW** **1** **GHz** (Set to 2 GHz for synthesizers with lowest start frequency of 2 GHz)
 - POWER LEVEL** **-15** **dBm**
 - AM On/Off** **10 dB/V** (asterisk off)
 or for synthesizers with Option 002, press:
 - MOD** **AM Menu** **AM On/Off** **Int** (asterisk off)

15. On the spectrum analyzer, set:
 - Center Frequency: 1 GHz
 - Frequency Span: 1 MHz
 - CF Step Size: 1 GHz
 - Reference Level: 5 dBm
 - Scale Log: 5 dB/Division
16. Center the signal on the spectrum analyzer with the center frequency control.
17. On the synthesizer, press:
 - AM On/Off 100%/V (asterisk on)
 - Deep AM (asterisk on)or for synthesizers with Option 002, press:
 - AM On/Off Ext AM Type 100%/V (asterisk off)
 - Deep AM (asterisk on)
18. Change the spectrum analyzer reference level to -40 dBm.

Note Make the following measurements as quickly as possible since the signal amplitude is subject to drift when you use deep AM at low levels. If necessary, turning AM off and on again will reset the power level.

19. With a 10 mV resolution, adjust the function generator until you get an OVERMOD message on the synthesizer or until the signal drops into the noise level on the spectrum analyzer. Decrease the function generator output just until the OVERMOD message disappears.
20. Record the RF signal level (or the noise level if the signal is in the noise).

Table 2-26. RF Signal Level

| | |
|--------------|---------------------------|
| 1 GHz _____ | 12 GHz _____ |
| 2 GHz _____ | 13 GHz _____ |
| 3 GHz _____ | 14 GHz _____ |
| 4 GHz _____ | 15 GHz _____ |
| 5 GHz _____ | 16 GHz _____ |
| 6 GHz _____ | 17 GHz _____ |
| 7 GHz _____ | 18 GHz _____ |
| 8 GHz _____ | 19 GHz _____ |
| 9 GHz _____ | 20 GHz _____ |
| 10 GHz _____ | 21 GHz ¹ _____ |
| 11 GHz _____ | 22 GHz ¹ _____ |

¹ HP 83630A/40A/50A only.

21. On the synthesizer, turn off modulation. Set:
AM On/Off 10dB/V (asterisk off)
or for synthesizers with Option 002, press:
AM Type 10 dB/V (asterisk off)
22. Step the synthesizer and spectrum analyzer CW and center frequencies in 1 GHz steps. Turn modulation back on and repeat steps 19 through 21 to the highest frequency from Table 2-26 that applies to your synthesizer.
23. Record the worst case values from step 20 on the test record:
 - a. For the HP 83630A, record worst case values for frequencies < 20 GHz and for frequencies ≥ 20 GHz.
 - b. For the HP 83640A/50A, record worst case values for frequencies ≤ 20 GHz and for frequencies > 20 GHz.
 - c. For all other instruments, record the worst case value for all frequencies tested.

Related Adjustments

Modulator Offset and Gain

Modulation Generator Adjustment (Option 002)

In Case of Difficulty

1. Make sure that the most negative voltage without an OVERMOD message is applied.
2. Refer to the *Troubleshooting* manual.

19. FM Accuracy

Description and Procedure

Use this procedure to measure the FM accuracy of the synthesizer. With the synthesizer set to an FM sensitivity of 10 MHz/V, and the function generator providing an FM modulation index of 2.404, the RF output should be a null. The function generator amplitude is adjusted for the Bessel null and the difference between signals is recorded.

Note Since the modulation frequency for external FM is 1 MHz, this procedure relies on the voltage-setting accuracy of the function generator (the frequency is too high for a DVM, and an oscilloscope is not accurate enough.)

External FM

1. Connect the equipment as shown in Figure 2-28. Preset all instruments and let them warm up for at least one hour.

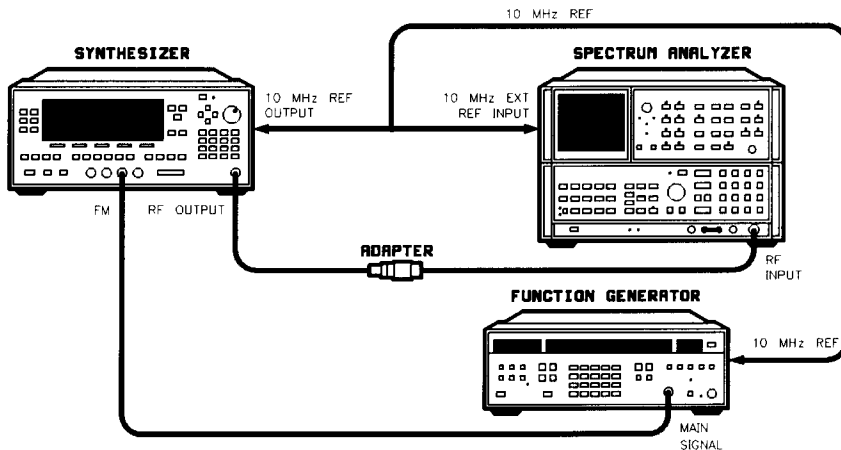


Figure 2-28. FM Accuracy Test Setup

Equipment

| | |
|--------------------|----------|
| Spectrum Analyzer | HP 8566B |
| Function Generator | HP 3325A |

2. To achieve peak power on the synthesizer, turn on RF peaking. Press: **USER CAL** **Tracking Menu** **Peak RF Always** (asterisk on)
3. On the synthesizer, press:
 - CW** First synthesizer frequency in Table 2-27
 - POWER LEVEL** Set the specified maximum leveled power

Table 2-27. Synthesizer Frequencies

| Synthesizer Frequencies (GHz) | External FM Error (%) | Internal FM Error (%) |
|----------------------------------|--------------------------|--------------------------|
| 1.0 ¹ | _____ | _____ |
| 5.0 | _____ | _____ |
| 10.0 | _____ | _____ |
| 16.0 | _____ | _____ |
| 22.0 ¹ | _____ | _____ |

1 Disregard if beyond your synthesizer's capability.

4. On the function generator, set:

Function: Sine wave
 Frequency: 1 MHz
 Amplitude: 480.8 mV p-p (169.96 mV rms)
 DC Offset: 0 V

5. On the spectrum analyzer, set:

Reference Level: 0 dBm
 Attenuator: Auto
 Center Frequency: Same frequency as in step 3
 Frequency Span: 50 kHz

Resolution Bandwidth: 3 kHz
Video Bandwidth: 1 kHz
Sweep Time: Auto
Sweep: Continuous

6. Center the signal on the spectrum analyzer display using the center frequency function.
7. Turn on the synthesizer modulation. Press:
MOD **FM On/Off 100 kHz** (asterisk on)
or for synthesizers with Option 002, press:
MOD **FM Menu FM On/Off Ext** (asterisk on)
8. Adjust the function generator amplitude to minimize the amplitude of the signal on the spectrum analyzer.
9. Calculate the percentage of error as follows:
$$\text{Error (\%)} = [(480.8 \text{ mV p-p} - \text{New Amplitude})/480.8 \text{ mV p-p}] \times 100.$$
10. Record the error in Table 2-27.
11. Turn off the synthesizer FM modulation. Press:
FM On/Off 100 kHz (asterisk off)
or for synthesizers with Option 002, press:
FM On/Off Ext (asterisk off)
12. Repeat steps 6 through 11 at the synthesizer (and spectrum analyzer) frequencies in Table 2-27.
13. Record the worst case value from Table 2-27 on the test record.

Internal FM (Option 002 only)

14. On the synthesizer, press:
CW First synthesizer frequency in Table 2-27
MOD **FM Menu FM On/Off Ext** (asterisk off)
15. Set the spectrum analyzer center frequency to the same frequency as the synthesizer.
16. Center the signal on the spectrum analyzer display using the center frequency function.

17. On the synthesizer, press:

MOD **FM Menu** **FM On/Off Int** (asterisk on)

Internal FM Rate **1** **MHz**

Internal FM Dev **2.404** **MHz**

18. Adjust the internal FM deviation on the synthesizer to minimize the amplitude of the carrier on the spectrum analyzer.

19. Calculate the percentage of error as follows:

$$\text{Error (\%)} = [(2.404 \text{ MHz} - \text{New FM Deviation}) / 2.404 \text{ MHz}] \times 100.$$

20. Record the error in Table 2-27.

21. Turn off the internal FM modulation. Select:

FM On/Off Int (asterisk off)

22. Repeat steps 15 through 21 at the synthesizer (and spectrum analyzer) frequencies in Table 2-27.

23. Record the worst case "Internal FM Error" (from Table 2-27) on the test record.

Related Adjustments

FM Gain

Modulation Generator (Option 002)

Modulation Generator Flatness (Option 002)

In case of Difficulty

Refer to the *Troubleshooting* manual.

20. FM Bandwidth

Description and Procedure

Use this procedure to verify that the RF output power does not vary more than a specified amount over the specified frequency modulation rate frequency range. A low frequency spectrum analyzer with a tracking generator operates as a network analyzer to measure the FM flatness. Flatness errors associated with the tracking generator and spectrum analyzer are calibrated out of the measurement. Flatness errors due to the power splitter and microwave amplifier are minimized by external leveling at the amplifier. The delay line discriminator is used to demodulate the FM from the RF carrier. It also provides an input to the spectrum analyzer that is equivalent to the tracking generator frequency and proportional in power to the synthesizer RF output.

The delay line discriminator is formed by driving a mixer with a modulated carrier into the LO port, and a delayed carrier into the RF port. The delay is produced with a cable of approximately 3 feet in length. With this setup, the mixer responds to phase differences between the two inputs. The cable has a constant time delay and, as the carrier frequency is frequency-modulated, a linear phase shift occurs between the mixer inputs. Since the mixer inputs are in quadrature, the mixer operates as a phase detector that amplitude tracks the RF input (synthesizer power) and has an output frequency corresponding to the FM rate (tracking generator frequency).

1. Connect the equipment as shown in Figure 2-29 with the tracking generator output connected to the channel 1 input of the oscilloscope and to the FM input of the synthesizer (A). A DVM can be used in place of the oscilloscope for rms measurements. Preset all the equipment and let them warm up at least one hour.
2. To achieve peak power on the synthesizer, turn on RF peaking. Press: **USER CAL** **Tracking Menu Peak RF Always** (asterisk on)
3. On the spectrum analyzer, set:

Center frequency: 100 kHz
Frequency Span: 0 Hz

Set the spectrum analyzer tracking generator to 100 mV p-p (35 mV rms). Choose the alternate detector if your tracking generator has an alternate detector that improves the low-end flatness.

4. Connect the tracking generator output to the 50 ohm input of the spectrum analyzer through the 10 dB attenuator (B). On the spectrum analyzer, set:

Start Frequency: 100 kHz
Stop Frequency: 10 MHz
Resolution Bandwidth: 10 kHz
Video Bandwidth: 1 kHz
Sweep: Continuous
dB/Div: 1 dB
Range: -10 dBm

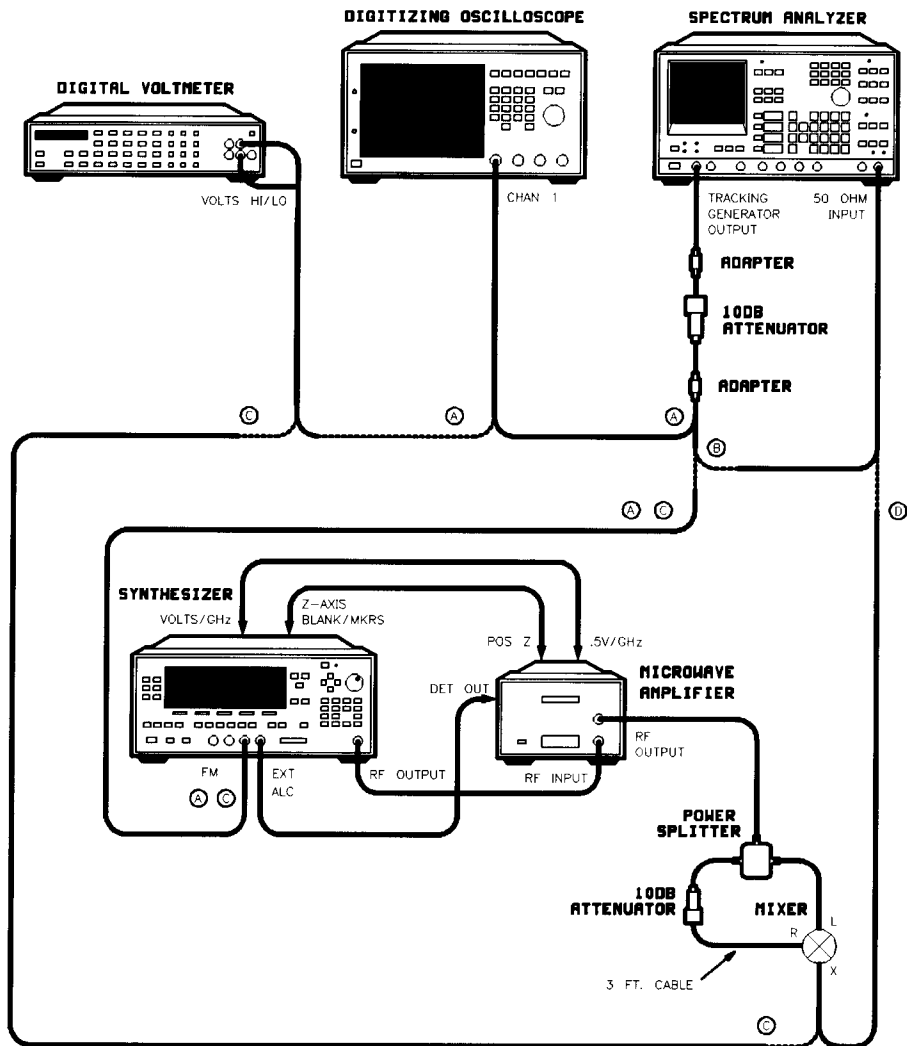


Figure 2-29. FM Bandwidth Test Setup

Equipment

| | |
|---|---|
| Spectrum Analyzer with Tracking Generator | HP 3585A/B |
| Digitizing Oscilloscope | HP 54111D |
| Digital Voltmeter | HP 3456A |
| Microwave Amplifier | HP 8348A (HP 83620A/22A/23A/24A/30A) |
| Power Splitter | HP 11667C (HP 83640A/50A) |
| Power Splitter | HP 11667B (HP 83620A/22A/23A/24A/30A) |
| Mixer | HP P/N 0955-0307 |
| Attenuator 10 dB (2) | HP 8490D Option 010 (HP 83640A/50A) |
| Attenuator 10 dB (2) | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |
| Delay Line | HP P/N 08503-20038 |
| Discriminator (cable 3 ft.) | |

5. On the spectrum analyzer, clear trace A memory. Change the reference level, using the RPG knob, to position the trace on the center horizontal graticule.
6. When a full sweep is completed, store trace A into trace B memory. Then display A minus B (turning off trace B). A straight line should be displayed.

Find Quadrature

7. Connect the tracking generator output to the synthesizer's FM input and connect the mixer's IF output to the DVM's VOLTS HI/LO input (C).

Set the DVM to measure DC volts.

8. On the synthesizer, press:

CW First synthesizer frequency in Table 2-28

ALC Leveling Point ExtDet Coupling Factor **16** **dB**

POWER LEVEL Set the power so that the microwave amplifier displays an output of 16 dBm.

Table 2-28. Synthesizer Frequencies

| Synthesizer Frequencies (GHz) | Maximum Difference |
|----------------------------------|-----------------------|
| 1.5 ¹ | _____ |
| 5.0 | _____ |
| 9.0 | _____ |
| 18.0 | _____ |
| 23.0 ² | _____ |

1 Disregard if beyond your synthesizer's capability.

2 HP 83630A/40A/50A only.

9. On the spectrum analyzer, set:

Center Frequency: 100 kHz

Frequency Span: 0 Hz

10. On the synthesizer, press **CW** and use the left arrow key to position the cursor in the 1 MHz position (one digit left of the decimal point). Use the rotary knob or step keys to adjust the CW frequency for 0 V DC on the DVM.

DC FM Flatness (Unlocked)

11. Move the mixer's IF output from the DVM to the spectrum analyzer's 50Ω input (D).

12. On the synthesizer, turn on FM DC. Press:

MOD FM On/Off DC (asterisk on)

13. On the spectrum analyzer, set:

Start Frequency: 100 kHz

Stop Frequency: 10 MHz

dB/Div: 1 dB

Change the reference level to set the start of the trace or the highest peak on the center graticule.

14. The display now shows the synthesizer FM flatness from 100 kHz to 10 MHz. Use the spectrum analyzer markers to find the 3 dB bandwidth. Record this frequency in Table 2-28. If the total variation is less than 3 dB then record "> 10 MHz" in Table 2-28.
15. Repeat steps 7 through 14 at the synthesizer frequencies in Table 2-28.
16. Record the smallest bandwidth from Table 2-28 on the test record.

Related Adjustments

FM Gain

In Case of Difficulty

Refer to the *Troubleshooting* manual.

21. Maximum FM Deviation

Description and Procedure

In this procedure, the synthesizer's RF output is monitored directly on a spectrum analyzer for low FM rates. The FM amplitude is increased until the maximum deviation exceeds the specification.

For higher FM rates, the FM rate is set so that a Bessel null occurs when the RF peak deviation equals the specification. The modulation amplitude is increased in order to pass through the correct Bessel null for the FM rate used and the peak deviation specified.

1. Connect the equipment as shown in Figure 2-30. Preset all the instruments and let them warm up for at least one hour.

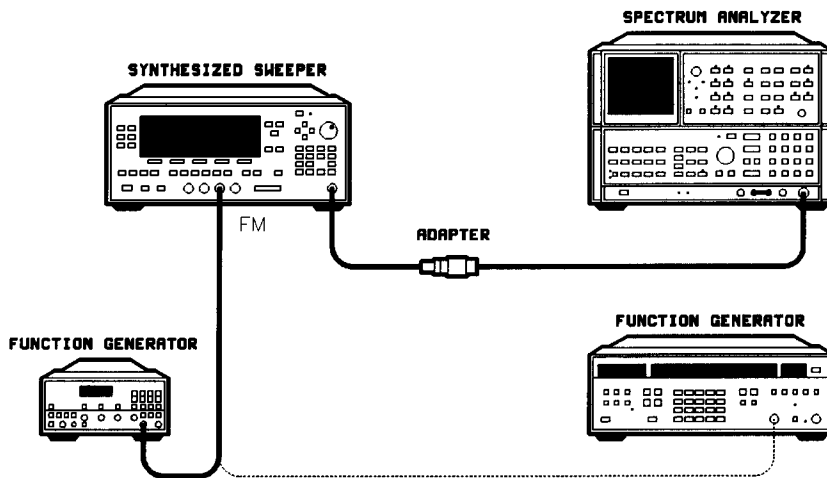


Figure 2-30. Maximum FM Deviation Test Setup

Equipment

| | |
|--------------------|----------------------|
| Spectrum Analyzer | HP 8566B |
| Function Generator | HP 3325A |
| Function Generator | HP 8111A or HP 8116A |

DC FM (≤ 100 Hz) (Using HP 8111A or HP 8116A)

Note Synthesizer models without 1 GHz capability should use 5 GHz settings instead of 1 GHz, as indicated in parenthesis.

2. On the synthesizer, press:

CW **1** **GHz** (5 GHz)

FREQUENCY **MENU** **Up/Dn** **Size** **CW** **1** **GHz**

USER CAL **Tracking Menu** **Peak RF Always** (asterisk on)

3. On the spectrum analyzer, set:

Center Frequency: 1 GHz (5 GHz)

Frequency Span: 187.5 MHz

Reference Level: 10 dBm

4. Connect the high voltage output (16 V p-p) function generator and set it as follows:

Function: Sine wave

Frequency: 100 Hz

Amplitude: Minimum

5. Center the signal on the spectrum analyzer display by adjusting the center frequency. Set the spectrum analyzer to maximum hold.

6. On the synthesizer, press:

MOD **FM On/Off DC** (asterisk on)

or for synthesizers with Option 002, press:

MOD **FM Menu** **FM On/Off Ext** (asterisk on)

FM Coupling DC (asterisk on)

Note The function generator must be capable of supplying > 16 Vp-p into 50Ω to obtain sufficient FM deviation for this step.

7. Increase the function generator amplitude until the width of the signal displayed exceeds eight divisions on the spectrum analyzer. In Table 2-29 record PASS if the signal exceeds eight divisions with no unlock or overmod message on the synthesizer. Record FAIL if not.

Table 2-29. DC FM Test Pass-Fail Results

| | |
|---------------------|-------|
| 1 GHz ¹ | _____ |
| 5 GHz | _____ |
| 9 GHz | _____ |
| 18 GHz | _____ |
| 22 GHz ¹ | _____ |

1 Disregard if beyond your synthesizer's capability.

8. On the synthesizer, press:
FM On/Off DC (asterisk off)

or for synthesizers with Option 002, press:
FM On/Off Ext (asterisk off)
9. On the spectrum analyzer, clear and write to trace A.
10. Decrease the function generator amplitude to minimum.
11. Repeat steps 5 through 10 for the remaining synthesizer and spectrum analyzer frequencies in Table 2-29.
12. Circle PASS on the test record if all the results in Table 2-29 are PASS. If not, circle FAIL on the test record.

AC FM (at 100 kHz) (Using HP 3325A)

Note

Maximum FM deviation for a 100 kHz rate is limited to a modulation index of 5 times n, where n = frequency band. The modulation index is equivalent to deviation/rate.

Synthesizer models without 1 GHz capability should use 5 GHz settings, as indicated in parenthesis, instead of 1 GHz.

13. On the synthesizer, press:
CW **1** **GHz** (5 GHz)
14. On the spectrum analyzer, set:

Center frequency: Same as synthesizer frequency
Frequency Span: 1 MHz

Reference Level: 10 dBm

Clear all data from the display.

15. Center the signal on the analyzer display.
16. Connect the synthesized function generator and set it as follows:

Function: Sine wave
Frequency (FM Rate): 100 kHz
Amplitude: 1 mV

17. On the synthesizer, press:

MOD FM On/Off 100 kHz (asterisk on)

or, for synthesizers with Option 002, press:

MOD FM Menu FM On/Off Ext (asterisk on)

This activates FM sensitivity. Use the down arrow key to set FM sensitivity to 1.00 MHz/V.

18. On the function generator, set:

Amplitude (Calculated Null Voltage): 271 mV rms

Use the **AMPTD CAL** key to do an amplitude calibration. Use the arrow keys to adjust the amplitude to achieve a null of the 1st sideband (Sideband Nulled).

Note

The sidebands may not respond to increases and decreases of the FM input voltage symmetrically. In this case, take the average of the voltages that cause the lower sideband and upper sideband to null. If the sidebands null at more than one voltage level, use the lower voltage value as the null voltage.

19. Record the "Actual Null Voltage" in the space provided in Table 2-30.
20. Calculate the actual FM sensitivity using the formula:

$$\text{Actual FM Sensitivity} = \left(\frac{\text{Calculated Null Voltage}}{\text{Actual Null Voltage}} \right) (\text{Set FM Sensitivity})$$

Record this value in the space provided in Table 2-30.

21. On the function generator, increase the amplitude (FM input voltage) until the synthesizer displays an UNLOCK or OVERMOD message. Decrease the FM Input Voltage just until the UNLOCK or OVERMOD message turns off.

22. Record the FM input voltage in the Maximum FM Voltage column of Table 2-30.
23. Calculate the maximum FM deviation using the formula:
$$\text{Max FM Deviation} = (\text{Actual FM Sensitivity})[(1.414)(\text{Max FM Voltage})]$$
24. Record the maximum FM deviation in the appropriate column of the test record.
25. Repeat steps 13 through 24 for all the synthesizer settings indicated in Table 2-30.

Note Remember to use the set FM sensitivity as a multiplier when calculating the actual FM sensitivity.

Table 2-30. FM Deviation Frequencies and Settings

| Synthesizer Settings | | Spectrum Analyzer Settings | | Sideband Nulled | Function Generator Settings | | Readings and Calculations | | |
|----------------------|------------------|----------------------------|------------------|-----------------|-----------------------------|----------------------------|--|-------------------------|------------------------------------|
| CW Freq. (GHz) | FM Sens. (MHz/V) | Center Freq. (GHz) | Freq. Span (MHz) | | Freq. FM Rate (MHz) | Ampl. (mV _{rms}) | Actual Null Volts (mV _{rms}) | Actual FM Sens. (MHz/V) | Max. FM Volts (mV _{rms}) |
| 1 ¹ | 1 | 1 | 1 | 1 | 0.1 | 271 | | | |
| 5 | 1 | 5 | 1 | 1 | 0.1 | 271 | | | |
| 9 | 1 | 9 | 1.2 | 5 | 0.1 | 621 | | | |
| 17 | 1 | 17 | 1.3 | 6 | 0.1 | 706 | | | |
| 22 ¹ | 1 | 22 | 1.3 | 6 | 0.1 | 706 | | | |
| 1 ¹ | 10 | 1 | 5 | 1 | 1 | 271 | | | |
| 5 | 10 | 5 | 5 | 1 | 1 | 271 | | | |
| 1 ¹ | 10 | 1 | 1 | carrier | 3 | 510 | | | |
| 5 | 10 | 5 | 1 | carrier | 3 | 510 | | | |

1 Disregard if beyond your synthesizer's capability.

Related Adjustments

FM Gain
Modulation Generator
Modulation Generator Flatness

In Case of Difficulty

1. If the synthesizer remains unlocked, turn AC FM off and begin the procedure from step 13 for the CW frequency in question.
2. Refer to the *Troubleshooting Manual*.

22. Internal Pulse Accuracy (Option 002)

Description and Procedure

This performance test uses an oscilloscope to measure the pulse width of the output of the modulation generator (not the pulse width of the RF output).

1. Connect the equipment as shown in Figure 2-31. Preset all instruments and let them warm up for at least one hour.

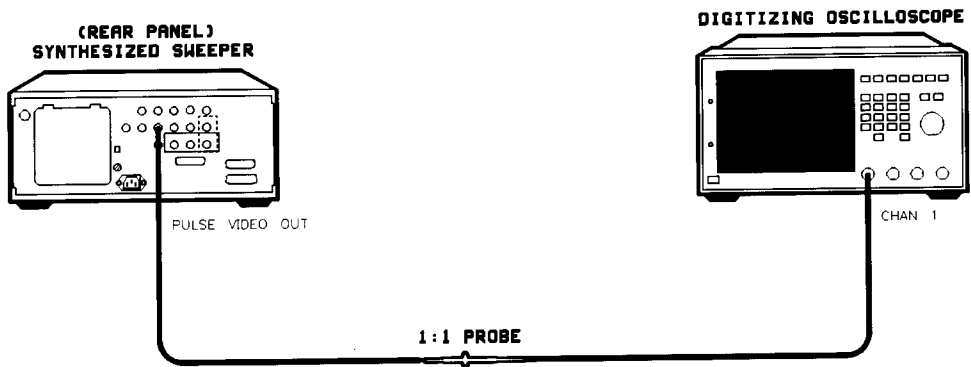


Figure 2-31. Pulse Accuracy Test Setup

Equipment

| | |
|-------------------------|-----------|
| Digitizing Oscilloscope | HP 54111D |
| Oscilloscope Probes | HP 10437A |

2. On the synthesizer, press:

MOD Pulse Menu Pulse On/Off Int (asterisk on)

Internal Menu Internal Pulse Width **25** **ns**

Internal Pulse Period **300** **ns**

3. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|-------------|
| Display | On |
| Volts/Division | 500 mV |
| Input Coupling | dc |
| Input Impedance | 50 Ω |

Timebase:

| | |
|-----------------|--------|
| Time/Division | 10 ns |
| Delay Reference | center |
| Sweep | auto |

Trigger:

| | |
|---------------|--------|
| Trigger Mode | Edge |
| Trig Src | Chan 1 |
| Trigger Level | 1.2V |
| Slope | Pos |

Display:

| | |
|--------------|------------|
| Display Mode | Repetitive |
| Averaging | Off |
| Display Time | 0.2 s |

4. Adjust the oscilloscope offset to fully display the signal.
5. Use the oscilloscope to measure the width of the pulse. Record the value measured on the test record.
6. On the synthesizer, change the pulse width to 50 ns. Press:
Internal Pulse Width
7. Use the oscilloscope to measure the width of the pulse. Record the value measured on the test record.

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

23. Modulation Meter (Option 002)

Description and Procedure

The modulation meter measures and displays the value of the externally generated amplitude or frequency modulation. This procedure determines the accuracy of the modulation meter.

1. Connect the equipment as shown in Figure 2-32. Preset the instruments and let them warm up for at least one hour.

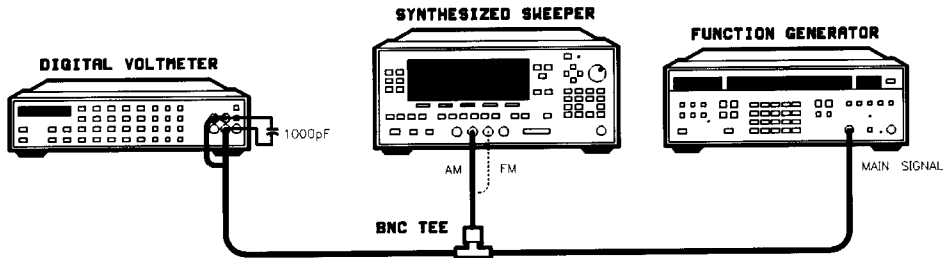


Figure 2-32. Modulation Meter Test Setup

Equipment

| | |
|--------------------|----------|
| Function Generator | HP 3325A |
| Digital Voltmeter | HP 3456A |

2. Set the DVM to measure AC. Press:
10 **STORE** **N CYC INT**
6 **STORE** **N DIG DISP**
3. On the synthesizer, press **CW** **10** **GHz**.
4. Set the function generator for a 100 kHz, 600 mV p-p, sine wave output signal.
5. On the synthesizer, turn on external AM modulation and turn on the AM meter function. Press:
MOD **AM Menu** **AM On/Off Ext** (asterisk on).
PRIOR **Monitor Menu** **Meter On/Off AM** (asterisk on).

6. Record the AM METER value on the test record.
7. Set the function generator for a 1 kHz, 1.800 V p-p, sine wave output signal. If necessary, adjust the function generator for a DVM reading of 0.6363 AC V rms.
8. Record the AM METER value on the test record.
9. Disconnect the BNC tee from the AM input and connect it to the FM input.
10. On the synthesizer, turn off external AM, turn on external FM, set the FM sensitivity to 1 MHz/V, and turn on the FM meter function. Press:
 - MOD** AM Menu AM On/Off Ext (asterisk off)
 - PRIOR** FM Menu FM On/Off Ext (asterisk on)
 - 1** **MHz**
 - PRIOR** Monitor Menu Meter On/Off FM (asterisk on)
11. Set the function generator for a 1 kHz, 10 V p-p, sine wave output signal. If necessary, adjust the function generator amplitude for a DVM reading of 3.535 AC V rms.
12. Record the FM METER value on the test record.
13. Set the function generator for a 100 kHz, 2 V p-p, sine wave output signal.
14. Record the FM METER value on the test record.

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

Table 2-33. Test Record for HP 83620A and 83622A (1 of 8)

| | |
|-------------------------|-----------------------------------|
| Test Facility: _____ | Report Number _____ |
| _____ | Date _____ |
| _____ | Customer _____ |
| _____ | Tested by _____ |
| Model _____ | Ambient temperature _____ °C |
| Serial Number _____ | Relative humidity _____ % |
| Options _____ | Line frequency _____ Hz (nominal) |
| Firmware Revision _____ | |
| Special Notes: | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

Table 2-33. Test Record for HP 83620A and 83622A (2 of 8)

| | | | |
|--------------------------------|---------------------|---------------------|---------------------|
| Model _____ | Report Number _____ | Date _____ | |
| Test Equipment Used | Model Number | Trace Number | Cal Due Date |
| 1. Digital Oscilloscope | _____ | _____ | _____ |
| 2. Measuring Receiver | _____ | _____ | _____ |
| 3. Power Sensor | _____ | _____ | _____ |
| 4. Power Meter | _____ | _____ | _____ |
| 5. Microwave Spectrum Analyzer | _____ | _____ | _____ |
| 6. Function Generator | _____ | _____ | _____ |
| 7. _____ | _____ | _____ | _____ |
| 8. _____ | _____ | _____ | _____ |
| 9. _____ | _____ | _____ | _____ |
| 10. _____ | _____ | _____ | _____ |
| 11. _____ | _____ | _____ | _____ |
| 12. _____ | _____ | _____ | _____ |
| 13. _____ | _____ | _____ | _____ |
| 14. _____ | _____ | _____ | _____ |
| 15. _____ | _____ | _____ | _____ |
| 16. _____ | _____ | _____ | _____ |
| 17. _____ | _____ | _____ | _____ |

Table 2-33. Test Record for HP 83620A and 83622A (3 of 8)

| Model | | Report No. | | | Date |
|----------|--|----------------------|----------------|--------------------------|--------------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 1. | Internal Timebase: Aging Rate 7. Calculated Rate | | _____ | 5×10^{-10} /day | $\pm 5.6 \times 10^{-11}$ |
| 2. | Swept Frequency Accuracy Worst Case Value: 10. Start Freq _____ Stop Freq _____ | | _____ | 0.1% of sweep | $\pm 0.005\%$ of sweep |
| 3. | Frequency Switching Time 8. CW Step 16. Stepped Sweep 25. Frequency List | | _____ | 50 ms | $\pm 10 \mu\text{s}$ |
| | | | _____ | 5 ms | $\pm 1 \mu\text{s}$ |
| | | | _____ | 50 ms | $\pm 10 \mu\text{s}$ |
| 4. | Power Accuracy 14. > -10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz > +10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz | -0.6 dB -0.7 dB | _____ _____ | +0.6 dB +0.7 dB | ± 0.19 dB ± 0.35 dB |
| | | -1.2 dB -1.3 dB | _____ _____ | +1.2 dB +1.3 dB | ± 0.21 dB ± 0.46 dB |
| 5. | Power Flatness 5. < 2 GHz ≥ 2 and ≤ 20 GHz | | _____ _____ | 1.0 dB 1.2 dB | 0.13 dB 0.25 dB |
| 6. | Maximum Leveled Power Standard or Opt. 006: 6. ≤ 20 GHz Opt. 001 or Opts. 001 and 006: 6. ≤ 20 GHz | +13 dBm +11.5 dBm | _____ _____ | | ± 1.8 dB ± 1.8 dB |

Table 2-33. Test Record for HP 83620A and 83622A (4 of 8)

| Model | | Report No. | | | Date |
|----------|--|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 7. | External Leveling | | | | |
| | 7. Minimum Power | -0.2 mV | _____ | | $\pm 3 \mu\text{V}$ |
| | 10. Maximum Power | | _____ | -0.5 V | $\pm 20 \mu\text{V}$ |
| 8. | Spurious Signals: Harmonic Harmonics (Standard): | | | | |
| | 8. 0.01 to < 2.2 GHz | -30 dBc | _____ | | $\pm 1.75 \text{ dB}$ |
| | 8. 2 to < 2.2 GHz | -30 dBc | _____ | | $\pm 1.75 \text{ dB}$ |
| | 12. ≥ 2.2 and ≤ 20 GHz | -50 dBc | _____ | | $\pm 1.75 \text{ dB}$ |
| | Harmonics (Opt. 006): | | | | |
| | 8. < 50 MHz | -20 dBc | _____ | | $\pm 1.75 \text{ dB}$ |
| | 8. ≥ 50 MHz to < 2.2 GHz | -30 dBc | _____ | | $\pm 1.75 \text{ dB}$ |
| | 12. ≥ 2.2 and ≤ 20 GHz | -60 dBc | _____ | | $\pm 1.75 \text{ dB}$ |
| | Subharmonics: | | | | |
| | 12. ≥ 7 and ≤ 20 GHz | -50 dBc | _____ | | $\pm 1.75 \text{ dB}$ |
| 9. | Spurious Signals: Non-harmonic | | | | |
| | 11. Spur Frequency: | | | | |
| | _____ | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | _____ | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | _____ | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | _____ | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | 125 kHz | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | 500 kHz | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | 16. Spur Frequency: | | | | |
| | 100 MHz Fixed | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | 100 MHz Offset | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | LO Feedthrough | -60 dBc | _____ | | $\pm 1 \text{ dB}$ |
| | 20. Low Band Mixer Spur | -60 dBc | _____ | | $\pm 1.85 \text{ dB}$ |

Table 2-33. Test Record for HP 83620A and 83622A (5 of 8)

| Model | | Report No. | | | Date |
|-------------------------|--------------------------------|-----------------------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 10. | Spurious Signals: Line Related | | | | |
| | 10. At 6.99 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 10. At 1.9 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 11. | Single Sideband Phase Noise | | | |
| 7. Offsets at 6.99 GHz: | | | | | |
| 100 Hz to < 1 kHz | | -70 dBc | _____ | | ±2 dB |
| 1 kHz to < 10 kHz | | -78 dBc | _____ | | ±2 dB |
| 10 kHz to < 100 kHz | | -86 dBc | _____ | | ±2 dB |
| ≥ 100 kHz | | -107 dBc | _____ | | ±2 dB |
| 7. Offsets at 1.97 GHz: | | | | | |
| 100 Hz to < 1 kHz | | -70 dBc | _____ | | ±2 dB |
| 1 kHz to < 10 kHz | | -78 dBc | _____ | | ±2 dB |
| 10 kHz to < 100 kHz | | -86 dBc | _____ | | ±2 dB |
| ≥ 100 kHz | | -107 dBc | _____ | | ±2 dB |
| 7. Offsets at 18.0 GHz: | | | | | |
| 100 Hz to < 1 kHz | | -60 dBc | _____ | | ±2 dB |
| 1 kHz to < 10 kHz | -68 dBc | _____ | | ±2 dB | |
| 10 kHz to < 100 kHz | -76 dBc | _____ | | ±2 dB | |
| ≥ 100 kHz | -97 dBc | _____ | | ±2 dB | |

1 ±3 dB if the Invertron is not used.

Table 2-33. Test Record for HP 83620A and 83622A (6 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | ±1 dB |
| 13. | Pulse Performance Standard: | | | | |
| | 10. Risetime | | _____ | 25 ns | ±0.9 ns |
| | 10. Falltime | | _____ | 25 ns | ±0.9 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| | Option 006: | | | | |
| | 10. Risetime | | _____ | 10 ns | ±0.4 ns |
| | 10. Falltime | | _____ | 10 ns | ±0.4 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| 14. | Pulse Performance (Alternate) | | | | |
| | 12. Risetime | | _____ | 25 ns | |
| | 12. Falltime | | _____ | 25 ns | |
| | 24. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video Feedthrough | | | | |
| | 21. < 2 GHz | | | | |
| | ≤ 10 dBm | | _____ | 2% | ±0.22% |
| | > 10 dBm | | _____ | 5% | ±0.4% |
| | 26. ≥ 2 and ≤ 20.0 GHz | | | | |
| | Standard: | | _____ | 0.2% | ±0.03% |
| | Option 006: | | _____ | 1% | ±0.07% |

Table 2-33. Test Record for HP 83620A and 83622A (7 of 8)

| Model | | Report No. | | | Date |
|----------|-------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 16. | AM Accuracy | | | | |
| | < 2 GHz: | | | | |
| | 8. AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| | 11. AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | > 2 and < 20 GHz: | | | | |
| | 18. AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| | 21. AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| 17. | AM Bandwidth | | | | |
| | 10. 3 dB Bandwidth | 100 kHz | _____ | | ±10.31 kHz |
| 18. | AM Dynamic Range | | | | |
| | 12. Normal | | _____ | -20 dBm | ±0.4 dB |
| | 23. Deep | | _____ | -37 dBm | ±1.66 dB |
| 19. | FM Accuracy | | | | |
| | 13. Maximum FM Error | -10% | _____ | +10% | ±3.7% |
| | 23. Maximum FM Error Opt. 002 | -10% | _____ | +10% | ±3.7% |
| 20. | FM Bandwidth | | | | |
| | 16. 3 dB Bandwidth | 8 MHz | _____ | | ±320 kHz |

Table 2-33. Test Record for HP 83620A and 83622A (8 of 8)

| Model | | Report No. | | | Date |
|----------|---|---------------|-----------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 21. | Maximum FM Deviation | | | | |
| | 12. DC FM Unlocked ≤ 100 Hz: $> \pm 75$ MHz Deviation | | Pass/Fail | | ± 2.3 MHz |
| | 24. AC FM Locked 100 kHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 5 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 9 GHz | 1 MHz | _____ | | ± 42.4 kHz |
| | 17 GHz | 1.5 MHz | _____ | | ± 63.6 kHz |
| | 24. AC FM Locked 1 MHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 5 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 24. AC FM Locked 3 MHz: $> \pm 8$ MHz deviation | | | | |
| | 1 GHz | 8 MHz | _____ | | ± 340 kHz |
| | 5 GHz | 8 MHz | _____ | | ± 340 kHz |
| 22. | Internal Pulse Accuracy (Opt. 002) | | | | |
| | 5. Pulse Width | 20 ns | _____ | 30 ns | ± 110 ps |
| | 7. Pulse Width | 45 ns | _____ | 55 ns | ± 117 ps |
| 23. | Modulation Meter (Opt. 002) | | | | |
| | 5. AM Meter | 25% | _____ | 35% | $\pm 0.6\%$ |
| | 7. AM Meter | 85% | _____ | 95% | $\pm 0.6\%$ |
| | 11. FM Meter | 4.95 MHz | _____ | 5.05 MHz | ± 15 kHz |
| | 13. FM Meter | 950 kHz | _____ | 1.05 MHz | ± 10 kHz |

Table 2-34. Test Record for HP 83623A and 83624A (1 of 8)

| | |
|-------------------------|-----------------------------------|
| Test Facility: _____ | Report Number _____ |
| _____ | Date _____ |
| _____ | Customer _____ |
| _____ | Tested by _____ |
| Model _____ | Ambient temperature _____ °C |
| Serial Number _____ | Relative humidity _____ % |
| Options _____ | Line frequency _____ Hz (nominal) |
| Firmware Revision _____ | |
| Special Notes: | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

Table 2-34. Test Record for HP 83623A and 83624A (2 of 8)

| | | | |
|--------------------------------|---------------------|---------------------|---------------------|
| Model _____ | Report Number _____ | Date _____ | |
| Test Equipment Used | Model Number | Trace Number | Cal Due Date |
| 1. Digital Oscilloscope | _____ | _____ | _____ |
| 2. Measuring Receiver | _____ | _____ | _____ |
| 3. Power Sensor | _____ | _____ | _____ |
| 4. Power Meter | _____ | _____ | _____ |
| 5. Microwave Spectrum Analyzer | _____ | _____ | _____ |
| 6. Function Generator | _____ | _____ | _____ |
| 7. _____ | _____ | _____ | _____ |
| 8. _____ | _____ | _____ | _____ |
| 9. _____ | _____ | _____ | _____ |
| 10. _____ | _____ | _____ | _____ |
| 11. _____ | _____ | _____ | _____ |
| 12. _____ | _____ | _____ | _____ |
| 13. _____ | _____ | _____ | _____ |
| 14. _____ | _____ | _____ | _____ |
| 15. _____ | _____ | _____ | _____ |
| 16. _____ | _____ | _____ | _____ |
| 17. _____ | _____ | _____ | _____ |

Table 2-34. Test Record for HP 83623A and 83624A (3 of 8)

| Model | | Report No. | | | Date |
|----------|--|--|----------------------------------|--------------------------|--|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 1. | Internal Timebase: Aging Rate 7. Calculated Rate | | _____ | 5x10 ⁻¹⁰ /day | ±5.6x10 ⁻¹¹ |
| 2. | Swept Frequency Accuracy Worst Case Value: 10. Start Freq _____ Stop Freq _____ | | _____ | 0.1% of sweep | ±0.005% of sweep |
| 3. | Frequency Switching Time 8. CW Step 16. Stepped Sweep 25. Frequency List | | _____ | 50 ms | ±10 μs |
| | | | _____ | 5 ms | ±1 μs |
| | | | _____ | 50 ms | ±10 μs |
| 4. | Power Accuracy 14. > -10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz > +10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz | -0.6 dB -0.7 dB | _____ _____ | +0.6 dB +0.7 | ±0.19 dB ±0.35 dB |
| | | -1.2 dB -1.3 dB | _____ _____ | +1.2 dB +1.3 dB | ±0.21 dB ±0.46 dB |
| 5. | Power Flatness 5. < 2 GHz ≥ 2 and ≤ 20 GHz | | _____ | 1.0 dB 1.2 dB | 0.13 dB 0.25 dB |
| 6. | Maximum Leveled Power 6. HP 83623A: Standard or Opt. 006 Opt. 001 or Opts. 001 and 006 6. HP 83624A: Standard Option 006 | +17 dBm +15.5 dBm +20 dBm +17 dBm | _____ _____ _____ _____ | | ±1.8 dB ±1.8 dB ±1.8 dB ±1.8 dB |

Table 2-34. Test Record for HP 83623A and 83624A (4 of 8)

| Model | | Report No. | | | Date |
|----------|--|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | Option 001 | +18.5 dBm | _____ | | ±1.8 dB |
| | Opts. 001 and 006 | +15.5 dBm | _____ | | ±1.8 dB |
| 7. | External Leveling | | | | |
| | 7. Minimum Power | -0.2 mV | _____ | | ±3 μV |
| | 10. Maximum Power | | _____ | -0.5 V | ±20 μV |
| 8. | Spurious Signals: Harmonic Harmonics (Standard): | | | | |
| | 8. < 50 MHz | -20 dBc | _____ | | ±1.75 dB |
| | 8. ≥50 MHz to < 2.2 GHz | -25 dBc | _____ | | ±1.75 dB |
| | 8. 2 to < 2.2 GHz | -25 dBc | _____ | | ±1.75 dB |
| | 12. ≥ 2.2 to ≤ 20 GHz | -25 dBc | _____ | | ±1.75 dB |
| | Harmonics (Opt. 006): | | | | |
| | 8. < 50 MHz | -20 dBc | _____ | | ±1.75 dB |
| | 8. ≥ 50 MHz to < 2.2 GHz | -25 dBc | _____ | | ±1.75 dB |
| | 12. ≥ 2.2 and ≤ 20 GHz | -60 dBc | _____ | | ±1.75 dB |
| | Subharmonics | | | | |
| | 12. ≥ 7 to ≤ 20 GHz | -50 dBc | _____ | | ±1.75 dB |
| 9. | Spurious Signals: Non-harmonic | | | | |
| | 11. Spur Frequency: | | | | |
| | _____ | -60 dBc | _____ | | ±1 dB |
| | _____ | -60 dBc | _____ | | ±1 dB |
| | _____ | -60 dBc | _____ | | ±1 dB |
| | _____ | -60 dBc | _____ | | ±1 dB |
| | 125 kHz | -60 dBc | _____ | | ±1 dB |
| | 500 kHz | -60 dBc | _____ | | ±1 dB |

Table 2-34. Test Record for HP 83623A and 83624A (5 of 8)

| Model | | Report No. | | | Date |
|-------------|--------------------------------|---------------|---------|--------------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 16. Spur Frequency: | | | | |
| | 100 MHz Fixed | -60 dBc | _____ | | ±1 dB |
| | 100 MHz Offset | -60 dBc | _____ | | ±1 dB |
| | LO Feedthrough | -60 dBc | _____ | | ±1 dB |
| | 20. Low Band Mixer Spur | -60 dBc | _____ | | ±1.85 dB |
| 10. | Spurious Signals: Line Related | | | | |
| | 10. At 6.99 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 10. At 1.9 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ | |
| 11. | Single Sideband Phase Noise | | | | |
| | 7. Offsets at 6.99 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -107 dBc | _____ | | ±2 dB |
| | 7. Offsets at 1.97 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB |
| ≥ 100 kHz | -107 dBc | _____ | | ±2 dB | |

1 ±3 dB if the Invertron is not used.

Table 2-34. Test Record for HP 83623A and 83624A (6 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 7. Offsets at 18.0 GHz: | | | | |
| | 100 Hz to < 1 kHz | -60 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -68 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -76 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -97 dBc | _____ | | ±2 dB |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | ±1 dB |
| 13. | Pulse Performance Standard: | | | | |
| | 10. Risetime | | _____ | 25 ns | ±0.9 ns |
| | 10. Falltime | | _____ | 25 ns | ±0.9 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| | Option 006: | | | | |
| | 10. Risetime | | _____ | 10 ns | ±0.4 ns |
| | 10. Falltime | | _____ | 10 ns | ±0.4 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| 14. | Pulse Performance (Alternate) | | | | |
| | 12. Risetime | | _____ | 25 ns | |
| | 12. Falltime | | _____ | 25 ns | |
| | 24. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video Feedthrough | | | | |
| | 21. < 2 GHz | | | | |
| | ≤ 10 dBm | | _____ | 2% | ±0.22% |
| | > 10 dBm | | _____ | 5% | ±0.35% |
| | 26. ≥ 2 and ≤ 20.0 GHz | | _____ | 1% | ±0.06% |

Table 2-34. Test Record for HP 83623A and 83624A (7 of 8)

| Model | | Report No. | | | Date |
|-----------|-------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 16. | AM Accuracy | | | | |
| | < 2 GHz: | | | | |
| | 8. AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| | 11. AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | > 2 and < 20 GHz: | | | | |
| | 18. AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 17. | AM Bandwidth | | | | |
| | 10. 3 dB Bandwidth | 100 kHz | _____ | | ±10.31 kHz |
| 18. | AM Dynamic Range | | | | |
| | 12. Normal | | _____ | -20 dBm | ±0.4 dB |
| | 23. Deep | | _____ | | |
| | HP 83623A | | _____ | -33 dBm | ±1.65 dB |
| HP 83624A | | _____ | -30 dBm | ±1.65 dB | |
| 19. | FM Accuracy | | | | |
| | 13. Maximum FM Error | -10% | _____ | +10% | ±3.7% |
| | 23. Maximum FM Error Opt. 002 | -10% | _____ | +10% | ±3.7% |
| 20. | FM Bandwidth | | | | |
| | 16. 3 dB Bandwidth | 8 MHz | _____ | | ±320 kHz |

Table 2-34. Test Record for HP 83623A and 83624A (8 of 8)

| Model | | Report No. | | | Date |
|----------|---|---------------|-----------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 21. | Maximum FM Deviation | | | | |
| | 12. DC FM Unlocked ≤ 100 Hz: $> \pm 75$ MHz Deviation | | Pass/Fail | | ± 2.3 MHz |
| | 24. AC FM Locked 100 kHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 5 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 9 GHz | 1 MHz | _____ | | ± 42.2 kHz |
| | 17 GHz | 1.5 MHz | _____ | | ± 63.6 kHz |
| | 24. AC FM Locked 1 MHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 5 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 24. AC FM Locked 3 MHz: $> \pm 8$ MHz deviation | | | | |
| | 1 GHz | 8 MHz | _____ | | ± 340 kHz |
| | 5 GHz | 8 MHz | _____ | | ± 340 kHz |
| 22. | Internal Pulse Accuracy (Opt. 002) | | | | |
| | 5. Pulse Width | 20 ns | _____ | 30 ns | ± 110 ps |
| | 7. Pulse Width | 45 ns | _____ | 55 ns | ± 117 ps |
| 23. | Modulation Meter (Opt. 002) | | | | |
| | 5. AM Meter | 25% | _____ | 35% | $\pm 0.6\%$ |
| | 7. AM Meter | 85% | _____ | 95% | $\pm 0.6\%$ |
| | 11. FM Meter | 4.95 MHz | _____ | 5.05 MHz | ± 15 kHz |
| | 13. FM Meter | 950 kHz | _____ | 1.05 MHz | ± 10 kHz |

Table 2-35. Test Record for HP 83630A (1 of 8)

| | |
|-------------------------|-----------------------------------|
| Test Facility: _____ | Report Number _____ |
| _____ | Date _____ |
| _____ | Customer _____ |
| _____ | Tested by _____ |
| Model _____ | Ambient temperature _____ °C |
| Serial Number _____ | Relative humidity _____ % |
| Options _____ | Line frequency _____ Hz (nominal) |
| Firmware Revision _____ | |
| Special Notes: | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

Table 2-35. Test Record for HP 83630A (2 of 8)

| | | | |
|--------------------------------|---------------------|---------------------|---------------------|
| Model _____ | Report Number _____ | Date _____ | |
| Test Equipment Used | Model Number | Trace Number | Cal Due Date |
| 1. Digital Oscilloscope | _____ | _____ | _____ |
| 2. Measuring Receiver | _____ | _____ | _____ |
| 3. Power Sensor | _____ | _____ | _____ |
| 4. Power Meter | _____ | _____ | _____ |
| 5. Microwave Spectrum Analyzer | _____ | _____ | _____ |
| 6. Function Generator | _____ | _____ | _____ |
| 7. _____ | _____ | _____ | _____ |
| 8. _____ | _____ | _____ | _____ |
| 9. _____ | _____ | _____ | _____ |
| 10. _____ | _____ | _____ | _____ |
| 11. _____ | _____ | _____ | _____ |
| 12. _____ | _____ | _____ | _____ |
| 13. _____ | _____ | _____ | _____ |
| 14. _____ | _____ | _____ | _____ |
| 15. _____ | _____ | _____ | _____ |
| 16. _____ | _____ | _____ | _____ |
| 17. _____ | _____ | _____ | _____ |

Table 2-35. Test Record for HP 83630A (3 of 8)

| Model | | Report No. | | | Date |
|----------|--|---|---|---|---|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 1. | Internal Timebase: Aging Rate 7. Calculated Rate | | _____ | $5 \times 10^{-10} / \text{day}$ | $\pm 5.6 \times 10^{-11}$ |
| 2. | Swept Frequency Accuracy Worst Case Value: 10. Start Freq _____ Stop Freq _____ | | _____ | 0.1% of sweep | $\pm 0.005\%$ of sweep |
| 3. | Frequency Switching Time 8. CW Step 16. Stepped Sweep 25. Frequency List | | _____ | 50 ms | $\pm 10 \mu\text{s}$ |
| | | | _____ | 5 ms | $\pm 1 \mu\text{s}$ |
| | | | _____ | 50 ms | $\pm 10 \mu\text{s}$ |
| 4. | Power Accuracy 14. > -10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 26.5 GHz > +10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz | -0.6 dB -0.7 dB -0.9 dB -1.2 dB -1.3 dB | _____ _____ _____ _____ _____ | +0.6 dB +0.7 dB +0.9 dB +1.2 dB +1.3 dB | ± 0.19 dB ± 0.35 dB ± 0.38 dB ± 0.21 dB ± 0.46 dB |
| 5. | Power Flatness 5. < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 26.5 GHz | | _____ _____ _____ | 1.0 dB 1.2 dB 1.6 dB | 0.13 dB 0.25 dB 0.27 dB |
| 6. | Maximum Leveled Power Standard or Opt. 006: 0.01 to ≤ 26.5 GHz 0.01 to ≤ 20 GHz | +10.0 dBm +13.0 dBm | _____ _____ | | ± 1.7 dB ± 1.7 dB |

Table 2-35. Test Record for HP 83630A (4 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | Opt. 001 or Opts. 001 and 006: | | | | |
| | 0.01 to \leq 26.5 GHz | +8.0 dBm | _____ | | ± 1.7 dB |
| | 0.01 to \leq 20 GHz | +11.5 dBm | _____ | | ± 1.7 dB |
| 7. | External Leveling | | | | |
| | 7. Minimum Power | -0.2 mV | _____ | | ± 3 μ V |
| | 10. Maximum Power | | _____ | -0.5 V | ± 20 μ V |
| 8. | Spurious Signals: Harmonic | | | | |
| | Harmonics (Standard): | | | | |
| | 8. 0.01 to $<$ 2.2 GHz | -30 dBc | _____ | | ± 1.75 dB |
| | 21. \geq 2.2 and \leq 26.5 GHz | - 50 dBc | _____ | | ± 1.75 dB |
| | Harmonics (Opt. 006): | | | | |
| | 8. $<$ 50 MHz | -20 dBc | _____ | | ± 1.75 dB |
| | 8. \geq 50 MHz to $<$ 2.2 GHz | -30 dBc | _____ | | ± 1.75 dB |
| | 12. \geq 2.2 and \leq 26.5 GHz | -60 dBc | _____ | | ± 1.75 dB |
| | Subharmonics | | | | |
| | 12. \geq 7 and \leq 20 GHz | -50 dBc | _____ | | ± 1.75 dB |
| | 21. $>$ 20 and \leq 26.5 GHz | -50 dBc | _____ | | ± 1.75 dB |
| 9. | Spurious Signals: | | | | |
| | Non-harmonic | | | | |
| | 11. Spur Frequency: | | | | |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | 125 kHz | -60 dBc | _____ | | ± 1 dB |
| | 500 kHz | -60 dBc | _____ | | ± 1 dB |

Table 2-35. Test Record for HP 83630A (5 of 8)

| Model | | Report No. | | | Date |
|----------|--------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 16. Spur Frequency: | | | | |
| | 100 MHz Fixed | -60 dBc | _____ | | ±1 dB |
| | 100 MHz Offset | -60 dBc | _____ | | ±1 dB |
| | LO Feedthrough | -60 dBc | _____ | | ±1 dB |
| | 20. Low Band Mixer Spur | -60 dBc | _____ | | ±1.85 dB |
| 10. | Spurious Signals: Line Related | | | | |
| | 10. At 6.99 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 10. At 1.9 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| 11. | Single Sideband Phase Noise | | | | |
| | 7. Offsets at 6.99 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB |
| | ≥100 kHz | -107 dBc | _____ | | ±2 dB |
| | 7. Offsets at 1.97 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -107 dBc | _____ | | ±2 dB |

1 ±3 dB if the Invertron is not used.

Table 2-35. Test Record for HP 83630A (6 of 8)

| Model | | Report No. | | | Date |
|----------|-------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 7. | Offsets at 18.0 GHz: | | | | |
| | 100 Hz to < 1 kHz | -60 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -68 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -76 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -97 dBc | _____ | | ±2 dB |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | ±1 dB |
| 13. | Pulse Performance | | | | |
| | Standard: | | | | |
| | 10. Risetime | | _____ | 25 ns | ±0.9 ns |
| | 10. Falltime | | _____ | 25 ns | ±0.9 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| | Option 006: | | | | |
| | 10. Risetime | | _____ | 10 ns | ±0.4 ns |
| | 10. Falltime | | _____ | 10 ns | ±0.4 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.3 dB |
| 14. | Pulse Performance (Alternate) | | | | |
| | 29. Risetime | | _____ | 25 ns | |
| | 29. Falltime | | _____ | 25 ns | |
| | 37. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video | | | | |
| | Feedthrough | | | | |
| | 21. < 2 GHz | | | | |
| | ≤ 10 dBm | | _____ | 2% | ±0.22% |
| | > 10 dBm | | _____ | 5% | ±0.4% |
| | 26. ≥ 2 and ≤ 26.5 GHz | | | | |
| | Standard: | | _____ | 0.2% | ±0.03% |
| | Option 006: | | _____ | 1% | ±0.07% |

Table 2-35. Test Record for HP 83630A (7 of 8)

| Model | | Report No. | | | Date |
|----------|---------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 16. | AM Accuracy < 2 GHz: | | | | |
| 8. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 11. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | > 2 and < 20 GHz: | | | | |
| 18. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 21. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| 17. | AM Bandwidth | | | | |
| 10. | 3 dB Bandwidth | 100 kHz | _____ | | ±10.31 kHz |
| 18. | AM Dynamic Range | | | | |
| 12. | Normal | | _____ | -20 dBm | ±0.45 dB |
| 23. | Deep < 20 GHz | | _____ | -37 dBm | ±1.65 dB |
| 23. | Deep ≥ 20 GHz | | _____ | -40 dBm | ±1.35 dB |
| 19. | FM Accuracy | | | | |
| 13. | Maximum FM Error | -10% | _____ | +10% | ±3.7% |
| 23. | Maximum FM Error Opt. 002 | -10% | _____ | +10% | ±3.7% |
| 20. | FM Bandwidth | | | | |
| 16. | 3 dB Bandwidth | 8 MHz | _____ | | ±320 kHz |

Table 2-35. Test Record for HP 83630A (8 of 8)

| Model | | Report No. | | | Date |
|----------|---|---------------|-----------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 21. | Maximum FM Deviation | | | | |
| | 12. DC FM Unlocked ≤ 100 Hz: $> \pm 75$ MHz Deviation | | Pass/Fail | | ± 2.3 MHz |
| | 24. AC FM Locked 100 kHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 5 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 9 GHz | 1 MHz | _____ | | ± 42.4 kHz |
| | 17 GHz | 1.5 MHz | _____ | | ± 63.6 kHz |
| | 22 GHz | 2 MHz | _____ | | ± 84.8 kHz |
| | 24. AC FM Locked 1 MHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 5 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 24. AC FM Locked 3 MHz: $> \pm 8$ MHz deviation | | | | |
| | 1 GHz | 8 MHz | _____ | | ± 340 kHz |
| | 5 GHz | 8 MHz | _____ | | ± 340 kHz |
| 22. | Internal Pulse Accuracy (Opt. 002) | | | | |
| | 5. Pulse Width | 20 ns | _____ | 30 ns | ± 110 ps |
| | 7. Pulse Width | 45 ns | _____ | 55 ns | ± 117 ps |
| 23. | Modulation Meter (Opt. 002) | | | | |
| | 5. AM Meter | 25% | _____ | 35% | $\pm 0.6\%$ |
| | 7. AM Meter | 85% | _____ | 95% | $\pm 0.6\%$ |
| | 11. FM Meter | 4.95 MHz | _____ | 5.05 MHz | ± 15 kHz |
| | 13. FM Meter | 950 kHz | _____ | 1.05 MHz | ± 10 kHz |

Table 2-36. Test Record for HP 83640A (1 of 8)

| | |
|-------------------------|-----------------------------------|
| Test Facility: _____ | Report Number _____ |
| _____ | Date _____ |
| _____ | Customer _____ |
| _____ | Tested by _____ |
| Model _____ | Ambient temperature _____ °C |
| Serial Number _____ | Relative humidity _____ % |
| Options _____ | Line frequency _____ Hz (nominal) |
| Firmware Revision _____ | |
| Special Notes: | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

Table 2-36. Test Record for HP 83640A (2 of 8)

| | | | |
|--------------------------------|---------------------|---------------------|---------------------|
| Model _____ | Report Number _____ | Date _____ | |
| Test Equipment Used | Model Number | Trace Number | Cal Due Date |
| 1. Digital Oscilloscope | _____ | _____ | _____ |
| 2. Measuring Receiver | _____ | _____ | _____ |
| 3. Power Sensor | _____ | _____ | _____ |
| 4. Power Meter | _____ | _____ | _____ |
| 5. Microwave Spectrum Analyzer | _____ | _____ | _____ |
| 6. Function Generator | _____ | _____ | _____ |
| 7. _____ | _____ | _____ | _____ |
| 8. _____ | _____ | _____ | _____ |
| 9. _____ | _____ | _____ | _____ |
| 10. _____ | _____ | _____ | _____ |
| 11. _____ | _____ | _____ | _____ |
| 12. _____ | _____ | _____ | _____ |
| 13. _____ | _____ | _____ | _____ |
| 14. _____ | _____ | _____ | _____ |
| 15. _____ | _____ | _____ | _____ |
| 16. _____ | _____ | _____ | _____ |
| 17. _____ | _____ | _____ | _____ |

Table 2-36. Test Record for HP 83640A (3 of 8)

| Model | | Report No. | | | Date |
|----------|---|------------------------------------|-------------------------|----------------------------------|---|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 1. | Internal Timebase: Aging Rate 7. Calculated Rate | | _____ | $5 \times 10^{-10} / \text{day}$ | $\pm 5.6 \times 10^{-11}$ |
| 2. | Swept Frequency Accuracy Worst Case Value: 10. Start Freq _____ Stop Freq _____ | | _____ | 0.1% of sweep | $\pm 0.005\%$ of sweep |
| 3. | Frequency Switching Time 8. CW Step 16. Stepped Sweep 25. Frequency List | | _____ | 50 ms | $\pm 10 \mu\text{s}$ |
| | | | _____ | 5 ms | $\pm 1 \mu\text{s}$ |
| | | | _____ | 50 ms | $\pm 10 \mu\text{s}$ |
| 4. | Power Accuracy 14. > -10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 40 GHz | -0.6 dB -0.7 dB -0.9 dB | _____ _____ _____ | 0.6 dB 0.7 dB 0.9 dB | ± 0.22 dB ± 0.35 dB ± 0.38 dB |
| 5. | Power Flatness 5. < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 40 GHz | | _____ _____ _____ | 1.0 dB 1.2 dB 1.8 dB | 0.15 dB 0.25 dB 0.27 dB |
| 6. | Maximum Leveled Power Standard or Opt. 006: 0.01 to ≤ 40 GHz 0.01 to < 26.5 GHz 0.01 to < 20 GHz | +6.0 dBm +10.0 dBm +10.0 dBm | _____ _____ _____ | | ± 1.4 dB ± 1.8 dB ± 1.8 dB |

Table 2-36. Test Record for the HP 83640A (4 of 8)

| Model | | Report No. | | | Date |
|----------|--|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | Opt. 001 or Opts. 001 and 006: | | | | |
| | 0.01 to \leq 40 GHz | +4 dBm | _____ | | ± 1.4 dB |
| | 0.01 to $<$ 26.5 GHz | +8 dBm | _____ | | ± 1.8 dB |
| | 0.01 to $<$ 20 GHz | +8.5 dBm | _____ | | ± 1.8 dB |
| 7. | External Leveling | | | | |
| | 7. Minimum Power | -0.2 mV | _____ | | ± 3 μ V |
| | 10. Maximum Power | | _____ | -0.5 V | ± 20 μ V |
| 8. | Spurious Signals: Harmonic Harmonics (Standard): | | | | |
| | 8. $<$ 50 MHz | -20 dBc | _____ | | ± 1.75 dB |
| | 8. \geq 50 MHz and $<$ 2.2 GHz | -30 dBc | _____ | | ± 1.75 dB |
| | 21. \geq 2.2 and $<$ 26.5 GHz | -50 dBc | _____ | | ± 1.75 dB |
| | 29. \geq 26.5 to 40 GHz | -40 dBc | _____ | | ± 1.75 dB |
| | Subharmonics: | | | | |
| | 12. \geq 7 and \leq 20 GHz | -50 dBc | _____ | | ± 1.75 dB |
| | 29. $>$ 20 and \leq 40 GHz | -40 dBc | _____ | | ± 1.55 dB |
| 9. | Spurious Signals: Non-harmonic | | | | |
| | 11. Spur Frequency: | | | | |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | 125 kHz | -60 dBc | _____ | | ± 1 dB |
| | 500 kHz | -60 dBc | _____ | | ± 1 dB |
| | 16. Spur Frequency: | | | | |
| | 100 MHz Fixed | -60 dBc | _____ | | ± 1 dB |
| | 100 MHz Offset | -60 dBc | _____ | | ± 1 dB |
| | LO Feedthrough | -60 dBc | _____ | | ± 1 dB |

Table 2-36. Test Record for the HP 83640A (5 of 8)

| Model | | Report No. | | | Date |
|---------------------|--------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 10. | 20. Low Band Mixer Spur | -60 dBc | _____ | | ±1.85 dB |
| | Spurious Signals: Line Related | | | | |
| | 10. At 6.99 GHz: | | | | |
| | 120 Hz | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz | -55 dBc | _____ | | ±1 dB ¹ |
| | At 1.9 GHz: | | | | |
| | 120 Hz | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz | -55 dBc | _____ | | ±1 dB ¹ |
| 11. | Single Sideband Phase Noise | | | | |
| | 7. Offsets at 6.99 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -107 dBc | _____ | | ±2 dB |
| | Offsets at 2.23 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -107 dBc | _____ | | ±2 dB |
| | Offsets at 18.0 GHz: | | | | |
| | 100 Hz to < 1 kHz | -60 dBc | _____ | | ±2 dB |
| 1 kHz to < 10 kHz | -68 dBc | _____ | | ±2 dB | |
| 10 kHz to < 100 kHz | -76 dBc | _____ | | ±2 dB | |
| ≥ 100 kHz | -97 dBc | _____ | | ±2 dB | |

1 ±3 dB if the Invertron is not used.

Table 2-36. Test Record for the HP 83640A (6 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | ±1 dB |
| 13. | Pulse Performance Standard: | | | | |
| | 10. Risetime | | _____ | 25 ns | ±0.9 ns |
| | 10. Falltime | | _____ | 25 ns | ±0.9 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| | Option 006: | | | | |
| | 10. Risetime | | _____ | 10 ns | ±0.4 ns |
| | 10. Falltime | | _____ | 10 ns | ±0.4 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| 14. | Pulse Performance (Alternate) | | | | |
| | 31. Risetime | | _____ | 25 ns | |
| | 31. Falltime | | _____ | 25 ns | |
| | 40. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video Feedthrough | | | | |
| | 21. < 2 GHz | | | | |
| | ≤ 10 dBm | | _____ | 2% | ±0.22% |
| | 26. ≥ 2 and ≤ 40.0 GHz | | _____ | 1% | ±0.06% |

Table 2-36. Test Record for the HP 83640A (7 of 8)

| Model | | Report No. | | | Date |
|----------|-----------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 16. | AM Accuracy | | | | |
| | Low Band < 2 GHz: | | | | |
| 8. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 11. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | High Band > 2 and < 20 GHz: | | | | |
| 18. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 21. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | Doubled High Band > 20 GHz: | | | | |
| 29. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 32. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| 17. | AM Bandwidth | | | | |
| 10. | 3 dB Bandwidth | 100 kHz | _____ | | ±10.31 kHz |
| 18. | AM Dynamic Range | | | | |
| 12. | Normal | | _____ | -20 dBm | ±0.45 dB |
| 23. | Deep ≤ 20 GHz | | _____ | -40 dBm | ±1.65 dB |
| 23. | Deep > 20 GHz | | _____ | -30 dBm | ±1.35 dB |
| 19. | FM Accuracy | | | | |
| 13. | Maximum FM Error | -10% | _____ | 10% | ±3.7% |
| 23. | Maximum FM Error Opt. 002 | -10% | _____ | 10% | ±3.7% |
| 20. | FM Bandwidth | | | | |
| 16. | 3 dB Bandwidth | 8 MHz | _____ | | ±320 kHz |

Table 2-36. Test Record for the HP 83640A (8 of 8)

| Model | | Report No. | | | Date |
|----------|---|---------------|-----------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 21. | Maximum FM Deviation | | | | |
| | 12. DC FM Unlocked ≤ 100 Hz: $> \pm 75$ MHz Deviation | | Pass/Fail | | ± 2.3 MHz |
| | 24. AC FM Locked 100 kHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 5 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 9 GHz | 1 MHz | _____ | | ± 42.4 kHz |
| | 17 GHz | 1.5 MHz | _____ | | ± 63.6 kHz |
| | 22 GHz | 2 MHz | _____ | | ± 84.8 kHz |
| | 24. AC FM Locked 1 MHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 5 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 24. AC FM Locked 3 MHz: $> \pm 8$ MHz deviation | | | | |
| | 1 GHz | 8 MHz | _____ | | ± 340 kHz |
| | 5 GHz | 8 MHz | _____ | | ± 340 kHz |
| 22. | Internal Pulse Accuracy (Opt. 002) | | | | |
| | 5. Pulse Width | 20 ns | _____ | 30 ns | ± 110 ps |
| | 7. Pulse Width | 45 ns | _____ | 55 ns | ± 117 ps |
| 23. | Modulation Meter (Opt. 002) | | | | |
| | 5. AM Meter | 25% | _____ | 35% | $\pm 0.6\%$ |
| | 7. AM Meter | 85% | _____ | 95% | $\pm 0.6\%$ |
| | 11. FM Meter | 4.95 MHz | _____ | 5.05 MHz | ± 15 kHz |
| | 13. FM Meter | 950 kHz | _____ | 1.05 MHz | ± 10 kHz |

Table 2-37. Test Record for HP 83650A (1 of 8)

| | |
|-------------------------|-----------------------------------|
| Test Facility: _____ | Report Number _____ |
| _____ | Date _____ |
| _____ | Customer _____ |
| _____ | Tested by _____ |
| Model _____ | Ambient temperature _____ °C |
| Serial Number _____ | Relative humidity _____ % |
| Options _____ | Line frequency _____ Hz (nominal) |
| Firmware Revision _____ | |
| Special Notes: | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

Table 2-37. Test Record for HP 83650A (2 of 8)

| | | | |
|--------------------------------|---------------------|---------------------|---------------------|
| Model _____ | Report Number _____ | Date _____ | |
| Test Equipment Used | Model Number | Trace Number | Cal Due Date |
| 1. Digital Oscilloscope | _____ | _____ | _____ |
| 2. Measuring Receiver | _____ | _____ | _____ |
| 3. Power Sensor | _____ | _____ | _____ |
| 4. Power Meter | _____ | _____ | _____ |
| 5. Microwave Spectrum Analyzer | _____ | _____ | _____ |
| 6. Function Generator | _____ | _____ | _____ |
| 7. _____ | _____ | _____ | _____ |
| 8. _____ | _____ | _____ | _____ |
| 9. _____ | _____ | _____ | _____ |
| 10. _____ | _____ | _____ | _____ |
| 11. _____ | _____ | _____ | _____ |
| 12. _____ | _____ | _____ | _____ |
| 13. _____ | _____ | _____ | _____ |
| 14. _____ | _____ | _____ | _____ |
| 15. _____ | _____ | _____ | _____ |
| 16. _____ | _____ | _____ | _____ |
| 17. _____ | _____ | _____ | _____ |

Table 2-37. Test Record for HP 83650A (3 of 8)

| Model | | Report No. | | | Date |
|----------|---|--|----------------------------------|--------------------------------------|--|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 1. | Internal Timebase: Aging Rate 7. Calculated Rate | | _____ | 5×10^{-10} /day | $\pm 5.6 \times 10^{-11}$ |
| 2. | Swept Frequency Accuracy Worst Case Value: 10. Start Freq _____ Stop Freq _____ | | _____ | 0.1% of sweep | $\pm 0.005\%$ of sweep |
| 3. | Frequency Switching Time 8. CW Step: 16. Stepped Sweep 25. Frequency List | | _____ | 50 ms | $\pm 10 \mu s$ |
| | | | _____ | 5 ms | $\pm 1 \mu s$ |
| | | | _____ | 50 ms | $\pm 10 \mu s$ |
| 4. | Power Accuracy 14. > -10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 40 GHz > 40 GHz | -0.6 dB -0.7 dB -0.9 dB -1.7 dB | _____ _____ _____ _____ | 0.6 dB 0.7 dB 0.9 dB 1.7 dB | ± 0.22 dB ± 0.35 dB ± 0.38 dB ± 0.79 dB |
| 5. | Power Flatness 5. < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 40 GHz > 40 GHz | | _____ _____ _____ _____ | 1.0 dB 1.2 dB 1.6 dB 3.0 dB | 0.15 dB 0.25 dB 0.38 dB 0.57 dB |
| 6. | Maximum Leveled Power Standard or Opt. 006: 0.01 to ≤ 50 GHz 0.01 to < 40 GHz 0.01 to < 26.5 GHz 0.01 to < 20 GHz | +2.5 dBm +5.0 dBm +10.0 dBm +10.0 dBm | _____ _____ _____ _____ | | ± 2.3 dB ± 1.3 dB ± 1.7 dB ± 1.7 dB |

Table 2-37. Test Record for HP 83650A (4 of 8)

| Model | | Report No. | | | Date |
|----------|-----------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | Opt. 001 or Opts. 001 and 006: | | | | |
| | 0.01 to \leq 50 GHz | 0 dBm | _____ | | ± 2.3 dB |
| | 0.01 to $<$ 40 GHz | +3.0 dBm | _____ | | ± 1.3 dB |
| | 0.01 to $<$ 26.5 GHz | +8.0 dBm | _____ | | ± 1.7 dB |
| | 0.01 to $<$ 20 GHz | +8.5 dBm | _____ | | ± 1.7 dB |
| 7. | External Leveling | | | | |
| | 7. Minimum Power | -0.2 mV | _____ | | ± 3 μ V |
| | 10. Maximum Power | | _____ | -0.5 V | ± 20 μ V |
| 8. | Spurious Signals: Harmonic | | | | |
| | Harmonics: | | | | |
| | 8. $<$ 50 MHz | -20 dBc | _____ | | ± 1.75 dB |
| | 8. \geq 50 MHz to $<$ 2.2 GHz | -30 dBc | _____ | | ± 1.75 dB |
| | 21. \geq 2.2 to \leq 26.5 GHz | -50 dBc | _____ | | ± 1.75 dB |
| | 37. 26.5 to 50 GHz | -40 dBc | _____ | | ± 2.22 dB |
| | Subharmonics: | | | | |
| | 12. \geq 7 to \leq 20 GHz | -50 dBc | _____ | | ± 1.75 dB |
| | 29. $>$ 20 to \leq 40 GHz | -40 dBc | _____ | | ± 1.55 dB |
| | 37. $>$ 40 to \leq 50 GHz | -35 dBc | _____ | | ± 2.22 dB |
| 9. | Spurious Signals: Non-harmonic | | | | |
| | 11. Spur Frequency: | | | | |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | _____ | -60 dBc | _____ | | ± 1 dB |
| | 125 kHz | -60 dBc | _____ | | ± 1 dB |
| | 500 kHz | -60 dBc | _____ | | ± 1 dB |

Table 2-37. Test Record for HP 83650A (5 of 8)

| Model | | Report No. | | | Date |
|-------------------------|---------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 10. | 16. Spur Frequency: | | | | |
| | 100 MHz Fixed | -60 dBc | _____ | | ±1 dB |
| | 100 MHz Offset | -60 dBc | _____ | | ±1 dB |
| | LO Feedthrough | -60 dBc | _____ | | ±1 dB |
| | 20. Low Band Mixer Spur | -60 dBc | _____ | | ±1.85 dB |
| | Spurious Signals: Line Related | | | | |
| | 10. At 6.99 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| 11. | At 1.9 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 180 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 240 Hz Spur | -55 dBc | _____ | | ±1 dB ¹ |
| | 11. Single Sideband Phase Noise | | | | |
| | 7. Offsets at 6.99 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -107 dBc | _____ | | ±2 dB |
| 7. Offsets at 1.97 GHz: | | | | | |
| 100 Hz to < 1 kHz | -70 dBc | _____ | | ±2 dB | |
| 1 kHz to < 10 kHz | -78 dBc | _____ | | ±2 dB | |
| 10 kHz to < 100 kHz | -86 dBc | _____ | | ±2 dB | |
| ≥ 100 kHz | -107 dBc | _____ | | ±2 dB | |

1 ±3 dB if the Invertron is not used.

Table 2-37. Test Record for HP 83650A (6 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 7. Offsets at 18.0 GHz: | | | | |
| | 100 Hz to < 1 kHz | -60 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -68 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -76 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -97 dBc | _____ | | ±2 dB |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | ±1 dB |
| 13. | Pulse Performance Standard: | | | | |
| | 10. Risetime | | _____ | 25 ns | ±0.9 ns |
| | 10. Falltime | | _____ | 25 ns | ±0.9 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| | Option 006: | | | | |
| | 10. Risetime | | _____ | 10 ns | ±0.4 ns |
| | 10. Falltime | | _____ | 10 ns | ±0.4 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| 14. | Pulse Performance (Alternate) | | | | |
| | 33. Risetime | | _____ | 25 ns | |
| | 33. Falltime | | _____ | 25 ns | |
| | 43. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video Feedthrough | | | | |
| | 21. < 2 GHz | | | | |
| | ≤ 10 dBm | | _____ | 2% | ±0.22% |
| | 26. ≥ 2 and ≤ 50.0 GHz | | _____ | 1% | ±0.06% |

Table 2-37. Test Record for HP 83650A (7 of 8)

| Model | | Report No. | | | Date |
|----------|-----------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 16. | AM Accuracy | | | | |
| | Low Band < 2 GHz: | | | | |
| 8. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 11. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | High Band > 2 and < 20 GHz: | | | | |
| 18. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 21. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | Doubled High Band > 20 GHz: | | | | |
| 29. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 32. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| 17. | AM Bandwidth | | | | |
| 10. | 3 dB Bandwidth | 100 kHz | _____ | | ±10.31 kHz |
| 18. | AM Dynamic Range | | | | |
| 12. | Normal | | _____ | -20 dBm | ±0.4 dB |
| 23. | Deep ≤ 20 GHz | | _____ | -40 dBm | ±1.65 dB |
| 23. | Deep > 20 GHz | | _____ | -30 dBm | ±1.35 dB |
| 19. | FM Accuracy | | | | |
| 13. | Maximum FM Error | -10% | _____ | +10% | ±3.7% |
| 23. | Maximum FM Error Opt. 002 | -10% | _____ | +10% | ±3.7% |
| 20. | FM Bandwidth | | | | |
| 16. | 3 dB Bandwidth | 8 MHz | _____ | | ±320 kHz |

Table 2-37. Test Record for HP 83650A (8 of 8)

| Model | | Report No. | | | Date |
|----------|---|---------------|-----------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 21. | Maximum FM Deviation | | | | |
| | 12. DC FM Unlocked ≤ 100 Hz: $> \pm 75$ MHz Deviation | | Pass/Fail | | ± 2.3 MHz |
| | 24. AC FM Locked 100 kHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 5 GHz | 500 kHz | _____ | | ± 21.2 kHz |
| | 9 GHz | 1 MHz | _____ | | ± 42.4 kHz |
| | 17 GHz | 1.5 MHz | _____ | | ± 63.6 kHz |
| | 22 GHz | 2 MHz | _____ | | ± 84.8 kHz |
| | 24. AC FM Locked 1 MHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 5 GHz | 5 MHz | _____ | | ± 212 kHz |
| | 24. AC FM Locked 3 MHz: $> \pm 8$ MHz deviation | | | | |
| | 1 GHz | 8 MHz | _____ | | ± 340 kHz |
| | 5 GHz | 8 MHz | _____ | | ± 340 kHz |
| 22. | Internal Pulse Accuracy (Opt. 002) | | | | |
| | 5. Pulse Width | 20 ns | _____ | 30 ns | ± 110 ps |
| | 7. Pulse Width | 45 ns | _____ | 55 ns | ± 117 ps |
| 23. | Modulation Meter (Opt. 002) | | | | |
| | 5. AM Meter | 25% | _____ | 35% | $\pm 0.6\%$ |
| | 7. AM Meter | 85% | _____ | 95% | $\pm 0.6\%$ |
| | 11. FM Meter | 4.95 MHz | _____ | 5.05 MHz | ± 15 kHz |
| | 13. FM Meter | 950 kHz | _____ | 1.05 MHz | ± 10 kHz |

Adjustments

How To Use This Chapter

Perform these adjustments only if directed by the *Troubleshooting* manual or if a performance test fails.

Menu Maps

Fold-out menu maps are located in Chapter 6.

Some menus have more than one page of softkeys. Select the **More** softkey to view the next page of softkeys. **More** is *not* included in the keystrokes given in these procedures.

Note In all cases where you are instructed to preset the synthesizer, use the factory preset mode only.

If a password is set, it will have to be disabled before the adjustment menu can be accessed. See Chapter 4 for instructions.

Equipment Required

The equipment required to perform the adjustments in this chapter is listed in Chapter 1. You may use any equipment that satisfies the critical specifications given. Use a *non-metallic* adjustment tool.

Cautions And Warnings

This instrument has been designed in accordance with international safety standards. However, for safe operation follow the cautions and warnings in this manual.

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.
- The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.
- The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.
- The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.
- 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.
- For continued protection against fire hazard replace line fuse only with same type and rating (F 5A/250V). The use of other fuses or material is prohibited.

CAUTION

- Always use the three-prong ac power cord supplied with this instrument. Failure to ensure adequate earth grounding by not using this cord may cause instrument damage.
 - Before switching on this product, make sure that the line voltage selector switch is set to the voltage of the power supply and the correct fuse is installed. Assure the supply voltage is in the specified range.
-

List of Adjustments

The following is a list of this chapter's adjustments and the page number that each adjustment is located on:

| | |
|---|-------|
| "1. 10 MHz Standard" | 3-5 |
| "2. Fractional-N VCO" | 3-11 |
| "3. Fractional-N Reference and API Spurs" | 3-13 |
| "4. Sweep Ramp" | 3-18 |
| "5. Sampler Assembly" | 3-19 |
| "6. YO Driver +10V Reference" | 3-24 |
| "7. YO Driver Gain and Linearity" | 3-26 |
| "8. YO Loop Gain" | 3-29 |
| "9. Amplifier/Multiplier Adjustments" | 3-31 |
| "10. Amplifier/Filter Adjustments" | 3-49 |
| "11. Low Power SRD Bias" | 3-84 |
| "12. Modulator Offset and Gain" | 3-86 |
| "13. ALC Power Level Accuracy" | 3-91 |
| "14. Power Flatness" | 3-97 |
| (this adjustment may be replaced with the automated power flatness adjustment in Chapter 5.) | |
| "15. AM/FM DAC Offset and Gain (Option 002)" | 3-100 |
| "16. AM Accuracy" | 3-102 |
| "17. AM Delay" | 3-106 |
| "18. FM Gain" | 3-109 |
| "19. Square Wave Symmetry" | 3-112 |
| "20. AM Input Impedance" | 3-114 |
| "21. FM Input Impedance" | 3-117 |
| "22. Modulation Generator Flatness (Option 002)" | 3-120 |
| "23. External Trigger Edge Selection" | 3-123 |
| "24. Volts/GHz" | 3-125 |

For the following automated adjustments, refer to Chapter 5, "Automated Tests":

- YO Delay Adjustment
- ADC Adjustment
- Power Flatness

1. 10 MHz Standard

Description and Procedure

This procedure adjusts the frequency accuracy of the internal 10 MHz time base. This adjustment should be done on a regular basis if absolute frequency accuracy is important (see Figure 3-3.)

For best accuracy, readjust the 10 MHz timebase oscillator after the synthesizer has been on or in standby for 24 hours. See “Accuracy Versus Adjustment Interval,” following this adjustment, for information on how to determine a periodic adjustment schedule.

After the timebase is adjusted, the timebase frequency should stay within the aging rate if the following things happen:

- The time base oven does not cool down.
- The instrument keeps the same orientation with respect to the earth’s magnetic field.
- The instrument stays at the same altitude.
- The instrument does not receive any mechanical shock.

If the time base oven cools (the instrument is disconnected from AC power), you may have to readjust the time base frequency after a new warm-up cycle. Typically, however, the time base frequency returns to within ± 1 Hz of the original frequency.

Note You can adjust the internal timebase after reconnecting AC power for 10 minutes, but for best accuracy, test again after the instrument has been on or in standby for 24 hours.

Frequency changes, due either to a change in orientation with respect to the earth’s magnetic field or to a change in altitude, are usually eliminated when the instrument is returned to its original position. A frequency change due to mechanical shock usually appears as a fixed frequency error.

1. Connect the equipment as shown in Figure 3-1. Preset all instruments and let them warm up for one hour.

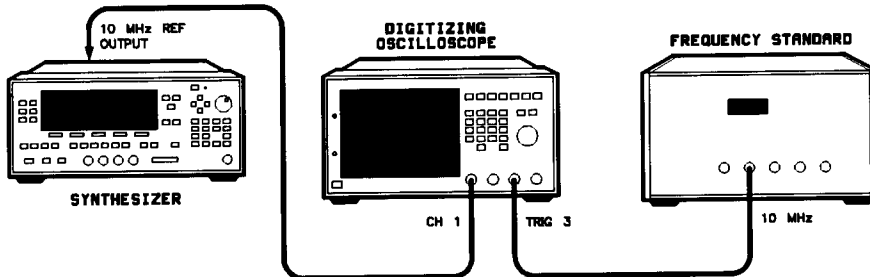


Figure 3-1. 10 MHz Standard Adjustment Setup

Equipment

| | |
|-------------------------|-----------|
| Digitizing Oscilloscope | HP 54111D |
| Frequency Standard | HP 5061A |

Note

If the oscilloscope does not have a 50 Ω input impedance, connect channel 1 through a 50 Ω feedthrough.

2. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|-------------|
| Display | On |
| Volts/Division | 200 mV |
| Input Coupling | dc |
| Input Impedance | 50 Ω |

Channel 2:

| | |
|---------|-----|
| Display | Off |
|---------|-----|

Timebase:

| | |
|---------------|----------|
| Time/Division | 10 ns |
| Trigger | External |

Trigger:
Trigger Mode Edge
Trigger Source Trig 3
Input Coupling ac

Display:
Display Mode Real Time

3. On the oscilloscope, adjust the trigger level so that the sweep is synchronized to the synthesizer's internal standard. The waveform will appear to drift.
4. Using a non-metallic tool, adjust the A23 10 MHz standard (see Figure 3-2) for minimum horizontal movement of the oscilloscope waveform.

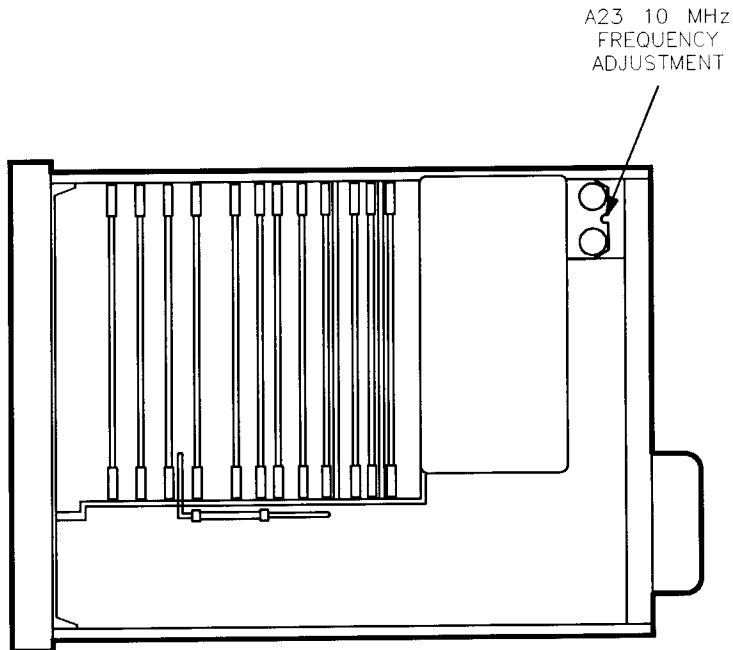


Figure 3-2. 10 MHz Standard Adjustment Location

Related Performance Tests

Internal Timebase: Aging Rate

In Case of Difficulty

1. Ensure that an external standard is not connected. (At instrument preset the synthesizer automatically chooses the external standard as the reference if one is connected to the 10 MHz REF INPUT.)
2. Refer to the *Troubleshooting* manual.

Accuracy Versus Adjustment Interval

Figure 3-3 shows the required adjustment interval to maintain a given accuracy. If you know the aging rate, you can determine a more precise adjustment interval.

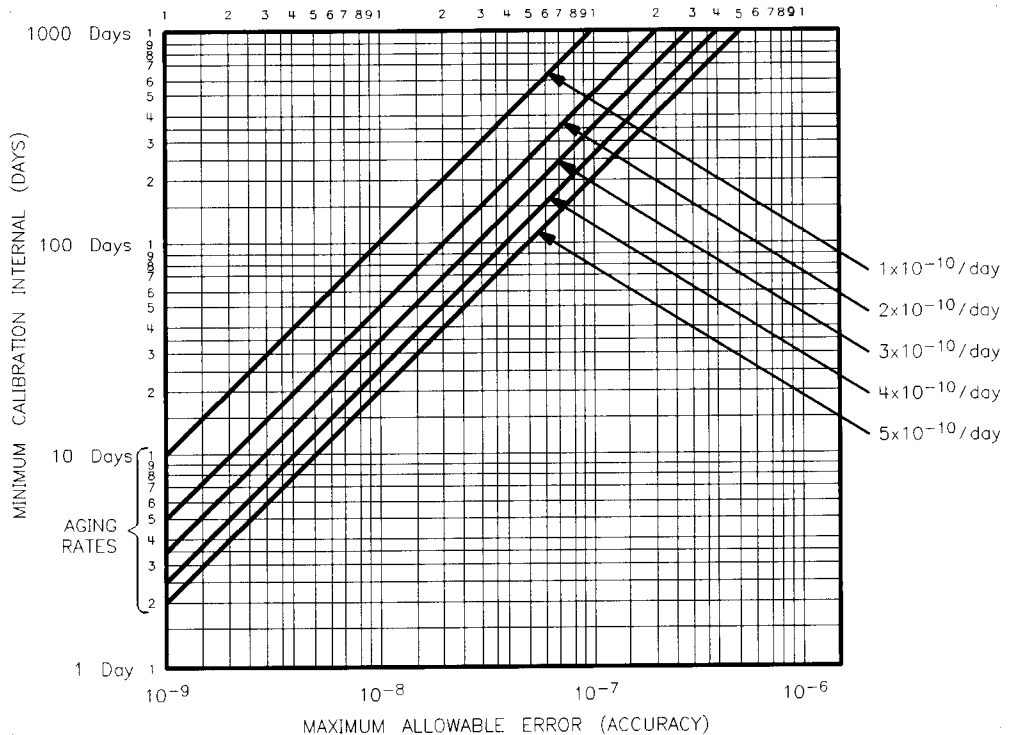


Figure 3-3. Accuracy Versus Adjustment Interval

1. Find the line on Figure 3-3 that corresponds to the 10 MHz timebase oscillator aging rate. (To determine the aging rate, see "Performance Tests".)
2. On the horizontal axis, find the maximum allowable error (accuracy) that you want.
3. Follow the maximum allowable error vertically until it intersects the known aging rate.

4. From the point of intersection, move horizontally to the left and read the minimum calibration interval measured in days.

An Alternate Method

You can also determine the minimum calibration interval using the following formula:

$$\frac{\text{maximum allowable error}}{\text{known aging rate (per day)}} = \text{calibration interval in days}$$

2. Fractional-N VCO

Description and Procedure

No test equipment is required for this procedure.

This adjustment sets the VCO tuning voltage to -6.0 V for a VCO output of 60 MHz.

1. Leaving all cables connected, place the A4 fractional-N assembly on an analog extender board.
2. Turn the synthesizer on and press **PRESET**. Let the instrument warm up for at least one hour.
3. Select the A4 VCO tune adjustment. On the synthesizer, press:
SERVICE Adjust Menu AssyAdj Menu A4 VCO Tune
4. Using a non-metallic tool, adjust A4L1 (see Figure 3-4) to center the needle on the display.

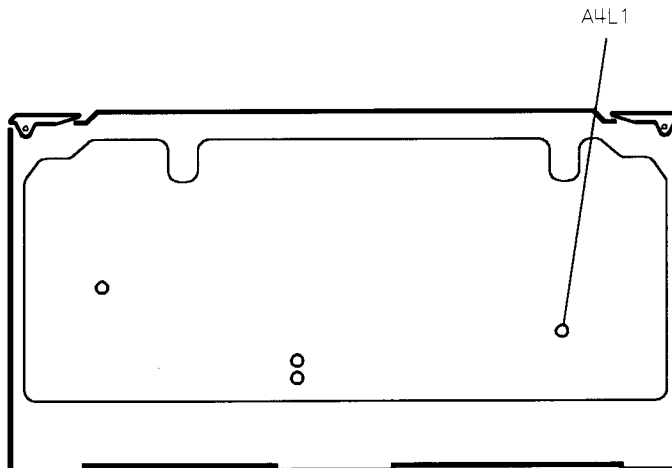


Figure 3-4. A4L1 Location

5. Turn the synthesizer to standby, and reinstall the A4 assembly.

Related Performance Tests

Self-tests

In Case of Difficulty

1. Verify that an analog extender board is used.
2. Make sure the 125 kHz reference cable, W11, is connected to A4J1.
3. Refer to the *Troubleshooting* manual.

3. Fractional-N Reference and API Spurs

Note Do *not* perform this adjustment on a new or rebuilt replacement assembly. The A4 assembly is factory-adjusted, and is *not* instrument dependent.

Description and Procedure

This adjustment minimizes three known spurs (125 kHz reference, API1, and API2). At each spur frequency, the spectrum analyzer is phase locked to the synthesizer, connected directly to the A4 fractional-N assembly output, and operated in zero span. A4R70, R31, and R30 are adjusted for minimum spur level. Table 3-1 summarizes this adjustment.

Table 3-1.
Summary of Fractional-N Reference & API Spurs Adjustment

| Spur | Fractional-N CW Frequency (MHz) | Analyzer Frequency (MHz) | Potentiometer | Minimum dBc |
|-------------------|---------------------------------------|--------------------------------|---------------|----------------|
| 125 kHz Reference | 44.125 | 44.0 | A4R70 | -75 |
| API 1 | 44.005 | 44.0 | A4R31 | -70 |
| API 2 | 44.0005 | 44.0055 | A4R30 | -80 |

1. With the A4 assembly on an analog extender board, connect the equipment as shown in Figure 3-5. Preset the instruments, and let them warm up for at least one hour.

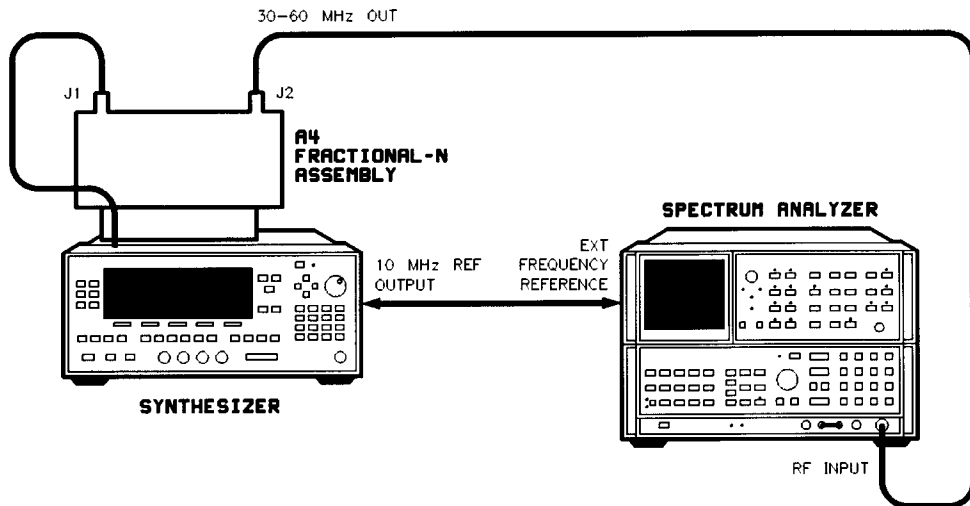


Figure 3-5. Fractional-N Reference and API Spur Adjustment Setup

Equipment

| | |
|-------------------|----------|
| Spectrum Analyzer | HP 8566B |
|-------------------|----------|

2. On the spectrum analyzer, set:

Frequency Span: 0 Hz
 Resolution Bandwidth: 10 Hz
 Sweep Time: 10 s
 Reference Level: -10 dBm
 Scale Log: 10 dB/Division
 Video Averaging: Off
 Clear Write A: Selected

125 kHz Reference Spur Adjustment

3. On the synthesizer, press:

CW

SERVICE Tools Menu CntIPLL Menu Frac N Menu

CW **44.125** **MHz**

4. On the spectrum analyzer, set:

Center Frequency: 44.125 MHz

Frequency Span: 500 Hz

Adjust the frequency offset to center the signal on the display.

Frequency Span: 0 Hz

Peak the signal on the display.

Note the signal level: _____ dBm

Center Frequency: 44.0 MHz

Reference Level: -40 dBm

5. On the synthesizer, adjust A4R70 (see Figure 3-6) for minimum signal on the spectrum analyzer.

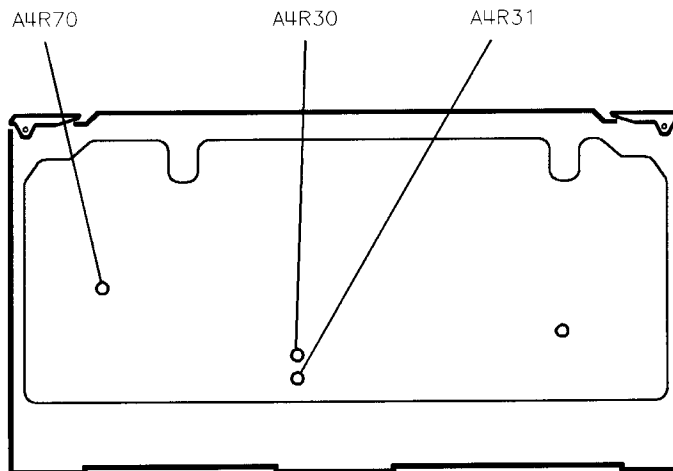


Figure 3-6. Fractional-N Reference and API Spurs Adjustment Locations

The difference in level between the signal noted in step 4 and the signal in this step should be at least -75 dBc.

API 1 Spur Adjustment

6. On the synthesizer, change the fractional-N to CW 44.005 MHz. Press:

7. On the spectrum analyzer, set:

Center Frequency: 44.005 MHz

Reference Level: +10 dBm

Note the signal level: _____ dBm

Center Frequency: 44.0 MHz

Reference Level: -40 dBm

8. On the synthesizer, adjust A4R31 (see Figure 3-6) for minimum signal on the spectrum analyzer.

The difference in level between the signal noted in step 7 and the signal in this step should be at least -70 dBc.

API 2 Spur Adjustment

9. On the synthesizer, change the fractional-N to CW 44.0005 MHz. Press

10. On the spectrum analyzer, set:

Center Frequency: 44.0005 MHz

Reference Level: +10 dBm

Note the signal level: _____ dBm

Center Frequency: 44.0055 MHz

Reference Level: -40 dBm

11. On the synthesizer, adjust A4R30 (see Figure 3-6) for minimum signal on the spectrum analyzer.

The difference in level between the signal noted in step 10 and the signal in this step should be at least -80 dBc.

12. Turn the synthesizer to standby and reinstall the A4 assembly.

Related Performance Tests

Spurious Signals (Non-Harmonic)

In Case of Difficulty

1. Ensure that the spectrum analyzer is locked to the external reference.
2. You may need to use video averaging on the spectrum analyzer if the spur level is low enough to be hidden by phase noise.
3. If you cannot adjust spurs below the recommended levels, the problem is probably with the A4 fractional-N assembly. Refer to the *Troubleshooting* manual.

4. Sweep Ramp

Description and Procedure

No test equipment is required for this adjustment.

This is an automatic adjustment. The synthesizer's internal DVM measures the sweep ramp voltage at the end of the sweep. The synthesizer then sets the sweep time calibration constants to calibrate the sweep ramp.

1. Turn the synthesizer on and press **PRESET**. Let the synthesizer warm up for at least one hour.
2. Select the A14 sweep ramp adjustment. On the synthesizer, press:

SERVICE Adjust Menu AssyAdj Menu A14 SwpRmp

The synthesizer will measure, calculate, and store the sweep time calibration constants. When the adjustment is complete, the following message appears on the display:

```
Sweep Ramp Cal Completed  
Calibration constants were modified.
```

3. If this is the last calibration constant you will be adjusting, see "Calibration Constants" to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

Self-Tests
Swept Frequency Accuracy

In Case of Difficulty

Refer to the *Troubleshooting* manual.

5. Sampler Assembly

Description and Procedure

No test equipment is required for this procedure.

There are three sampler assembly adjustments:

- In the sampler match adjustment, as the internal DVM monitors the loop input to the sampler, trim capacitors are adjusted to optimize the sampler match over the full frequency range of the loop.
 - The 200 MHz loop gain adjustment is automatic. When this adjustment is selected in the A6 adjustment menu, the synthesizer selects internal calibration constants for optimum loop gain over the full frequency range of the loop.
 - In the IF gain adjustment, the IF amplifier gain is adjusted as the internal DVM monitors the IF output level to the YO loop.
1. Turn the synthesizer to standby. At FL2 (see Figure 3-7), disconnect the semi-rigid cable between FL2 and the A6 assembly.

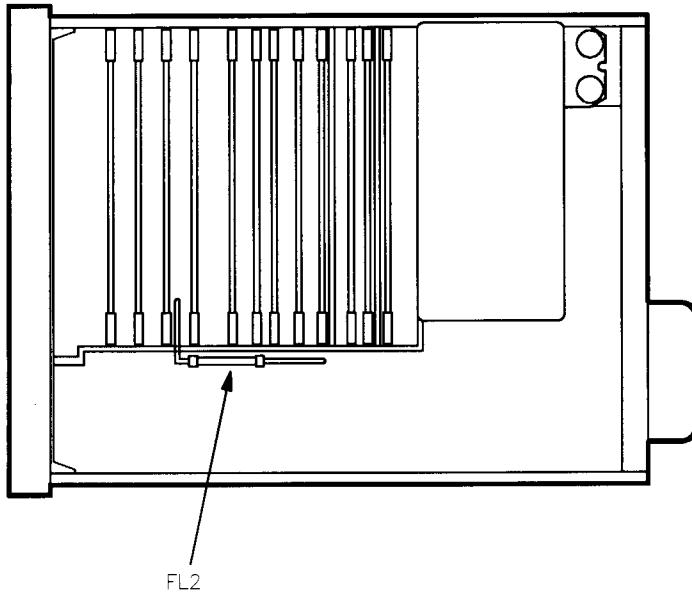


Figure 3-7. FL2 Location

2. Leaving the flexible cable connected to A6J1 (40 MHz reference), place the A6 assembly on the analog extender board.
3. Turn the synthesizer on and press **PRESET**. Let it warm up for at least one hour.
4. Select the A6 adjustment menu. Press:
SERVICE Adjust Menu AssyAdj Menu A6 Adj Menu

200 MHz Loop VCO Tune Check

5. In the A6 adjustment menu, select the A6 VCO tune check **A6 VCO Tune**.
6. The following message should be displayed:
Ctrim and C60 are OK.
If this message is not displayed, refer to troubleshooting.

Note If the three tuning voltages at the bottom of the display (V200, Vavg, and V220) are all equal, the 200 MHz phase-locked loop is unlocked.

7. Select **Done**.

Sampler Match Adjustment

8. In the A6 adjustment menu, select the A6 sampler match adjustment, **A6 Smplr Match**.

Note The sampler match display is a graphic representation of the sampler match over the full frequency range of the 200 MHz loop. The more asterisks displayed at a frequency, the more output signal (and the better the match) at that frequency. Make the adjustment for best match over the full frequency range of the loop.

9. Adjust A6C82 and A6C83 (Figure 3-8) for best overall sampler match.

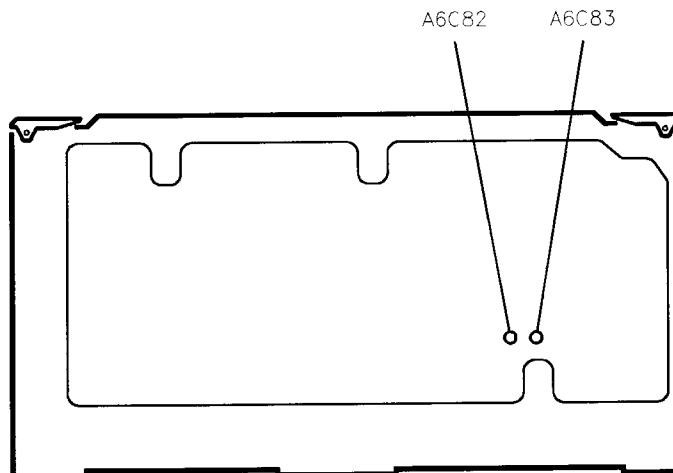


Figure 3-8. Sampler Match Adjustment Locations

10. Select Done .

200 MHz Loop Gain Adjustment

11. In the A6 adjustment menu, select the A6 loop gain adjustment, **A6 Loop Gain** . The synthesizer automatically performs the adjustment. When the message Calibration Constants should be SAVED is displayed, the adjustment is complete. Continue with the next step.
12. Set the synthesizer to standby. Reinstall the A6 assembly in the instrument, and connect all cables.

IF Gain Adjustment

13. Turn the synthesizer on. Select **A6 IF Gain** .
14. Adjust A6R73 (see Figure 3-9) to center the “needle” on the display.

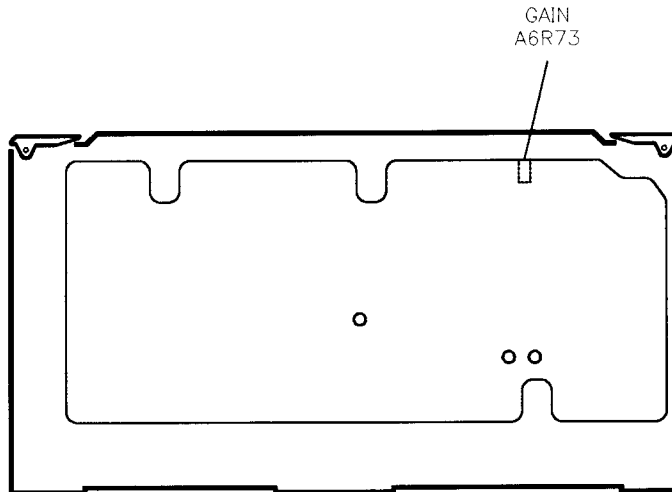


Figure 3-9. IF Gain Adjustment Location

15. Select Done .

16. If this is the last calibration constant you will be adjusting, see “Calibration Constants” to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

Self-tests

In Case of Difficulty

1. Make sure the 40 MHz reference input cable is connected while the A6 assembly is on the analog extender board.
2. For the IF gain adjustment, if the needle registers on the far left or right, ensure that all coax cables (including semi-rigid) are connected and that no unlocked message is displayed.
3. There is some interaction between the adjustments in this procedure. Try an alternate order of adjustments.
4. Refer to the *Troubleshooting* manual.

6. YO Driver +10V Reference

Description and Procedure

No test equipment is required for this procedure.

As the internal DVM monitors the +10V reference, you make the adjustment.

1. Turn the synthesizer on and press **PRESET**. Let the instrument warm up for at least one hour.
2. Select the A13 adjustment menu. On the synthesizer, press:
SERVICE Adjust Menu AssyAdj Menu A13 Adj Menu
3. Select the A13 +10V reference adjustment, **A13+10V Ref**.
4. Adjust A13R11 (see Figure 3-10) to center the “needle” on the display.

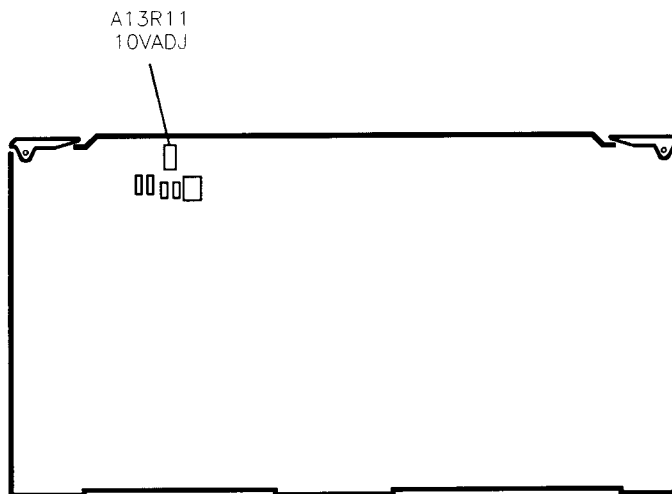


Figure 3-10. YO Driver +10V Reference Adjustment Location

5. Select Done.

Related Performance Tests

Self-tests

In Case of Difficulty

Refer to the *Troubleshooting* manual.

7. YO Driver Gain and Linearity

Description and Procedure

No test equipment is required for these adjustments.

For the gain adjustment, the synthesizer's internal DVM monitors the YO loop error voltage at two frequencies (points B and C in Figure 3-11). When you select the gain potentiometer adjustment, the synthesizer displays the difference in voltage between points B and C as a "needle" with arrows on either side. By adjusting A13R54 to center the "needle", you equalize the voltage between the two frequency points.

The linearity adjustment has two parts (each of which is selected and adjusted similarly to the gain adjustment). The low break point adjustment equalizes the voltage between points A and B in Figure 3-11. The high break point adjustment equalizes the voltage between points C and D.

Note You must adjust the gain first; then adjust the break points.

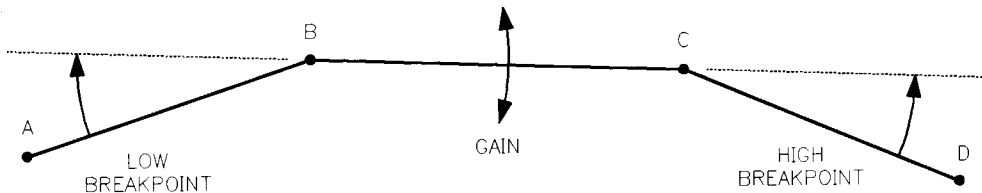


Figure 3-11. YO Gain and Linearity Break Points

1. Turn the synthesizer on and press **PRESET**. Let it warm up for at least one hour.
2. Select the A13 gain menu. Press:

SERVICE Adjust Menu AssyAdj Menu A13 Adj Menu A13 Gain Menu

Note

If the following message is displayed: Adjust A13 pot until "locked"., adjust the potentiometer until the locked indication is displayed. Continue with step 3.

3. Select the gain potentiometer adjustment, **Gain Pot**.
4. Adjust A13R54 (see Figure 3-12) to center the "needle" on the display.

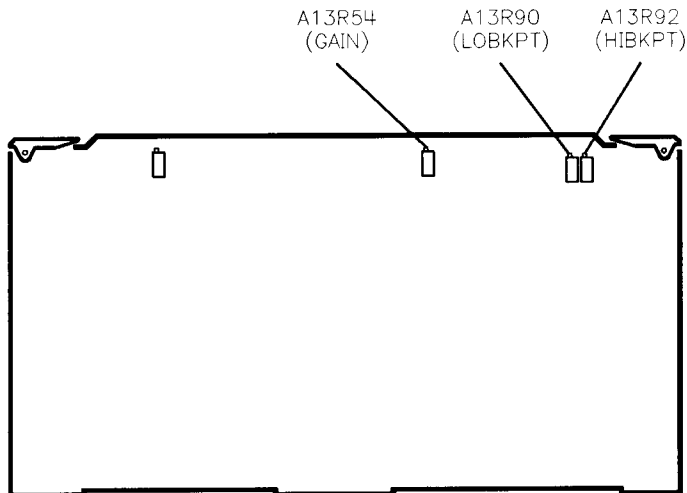


Figure 3-12. YO Gain and Linearity Adjustment Locations

5. Select the low break point potentiometer adjustment, **Lo Bk Pot**.
6. Adjust A13R90 (see Figure 3-12) to center the "needle" on the display.
7. Select the high break point potentiometer adjustment, **Hi Bk Pot**.
8. Adjust A13R92 (see Figure 3-12) to center the "needle" on the display.
9. Select **Done**.
10. If this is the last calibration constant you will be adjusting, see "Calibration Constants" to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

Self-tests

In Case of Difficulty

Refer to the *Troubleshooting* manual.

8. YO Loop Gain

Description and Procedure

No test equipment is required for this procedure.

1. Turn the synthesizer on and press **PRESET**. Let the instrument warm up for at least one hour.
2. Select the assembly adjustment menu. Press:
SERVICE **Adjust Menu** **AssyAdj Menu**
3. Select the A5 loop gain adjustment, **A5 Loop Gain**.
4. On the A5 assembly, set all five switches on A5S1 to the closed position.
(See Figure 3-13.)

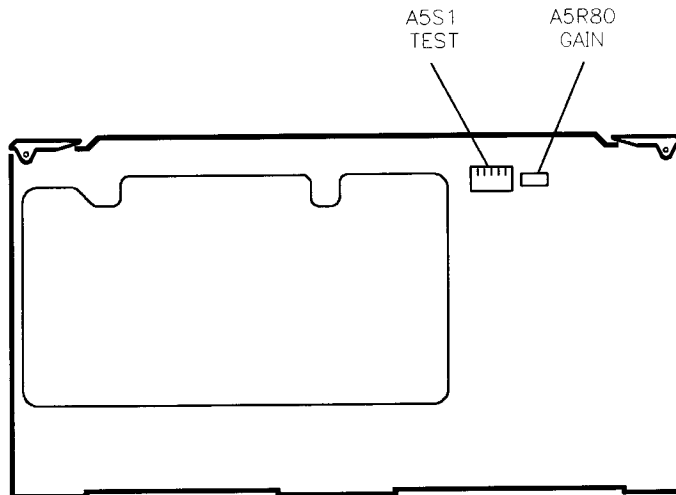


Figure 3-13. Switch and Adjustment Locations

5. Adjust A5R80 (see Figure 3-13) to center the “needle” on the display.
6. Select **Done**.
7. Set all A5 switches to open and select **Done**.

Related Performance Tests

None

In Case of Difficulty

1. Be sure to close the A5S1 switches before making the adjustment and open the switches when the adjustment is complete.
2. Refer to the *Troubleshooting* manual.

9. Amplifier/Multiplier Adjustments

Description

This procedure maximizes RF power by tracking the tuned filter in the amplifier/multiplier to the RF output frequency. The amplifier/filter output is also monitored. Initial tracking is done in single band sweeps at slow sweep speeds to eliminate the effects of bandcross and hysteresis in the tuning coil. (Those will be corrected with delay and risetime calibration constants.) A squegging clamp adjustment limits the power into the amplifier/multiplier and is adjusted in the amplifier/filter adjustments for maximum output power without squegging. A “squegg” is a distortion in the RF output caused by too much power to the amplifier/multiplier and characterized by a power dropout in a portion of the trace, or a power dropout over a broad frequency range. The SRD bias adjustments are made to optimize the efficiency of the frequency multiplication. The YTM delay compensation adjustments maximize power for fast single- and multi-band sweeps.

Note

If you have replaced either the YO, the YO driver, or the multiplier/filter driver, first initiate an auto tracking (press **USER CAL** **Tracking Menu** **Auto Track**.) If auto tracking passes and the instrument passes the “Maximum Leveled Power” performance test, *do not* continue with this procedure. If auto tracking fails, (an error message is displayed), continue with this procedure.

Adjustment Help

The following explanations are provided for a better understanding of the amplifier/multiplier adjustments. Refer to these explanations as often as necessary. They will help make these adjustments easier. (The adjustment procedure follows.)

Offset and Gain Adjustments.

- For all offset and gain adjustments, adjust *through* the bandpass. Keep adjusting until the power peaks and then drops off. Then reset the adjustment to the peaked point.
- For all offset and gain adjustments, if power stays peaked over several calibration constant values, set the calibration constant to the middle value of the peaked range.

Adjusting to the Center of the Passband.

- The amplifier/multiplier has a tracking filter on its output. Its purpose is to pass the selected RF output frequency and reject harmonics. The objective of this procedure is to track the bandpass filter with the RF output frequency over a variety of sweep conditions and frequency ranges. Effects of the auxiliary output may mask the true center of the bandpass. Always tune to the lower peak (lower calibration constant value).

SRD Bias Adjustment.

- Adjust these calibration constants *into squegging* and then back off until peak power is achieved.
- After reaching peak power, decrease the calibration constant value by 15 counts when adjusting the A term and decrease power by 1/2 dB (approximately 1/3 division) when adjusting the B term.

Single Band Delay Compensation Adjustments.

- If a drop in power greater than 1 division occurs when in single sweep, increase the A delay term to put the A term at the high end of the peak. For example, for the following calibration constant values:

Start of the peak = 1800

Middle of the peak = 1950

End of the peak = 2100

Set the A term to 2050

Setting the Fastest Sweep Time.

- Setting the sweep time to 0 milliseconds sets the synthesizer to the fastest sweep time for the frequency range being swept. Each time the frequency range is changed, the sweep time must be reset to 0 ms in order to maintain the fastest sweep time.

Sweep Speed Related Adjustments.

- Delay compensation adjustments are affected by sweep speed. The adjustments are performed at fast sweep speeds which are the worst case. All other adjustments are performed at slow sweep speeds; they are not affected by sweep speed.

If you have a power problem that occurs only for fast sweep rates, it is probably affected by delay compensation or risetime adjustments.

YTM Bandcross Delay Terms.

- The YTM Bx Dly terms are either offset or gain terms used only during multi-band sweeps. A1 denotes the offset term for band 1. B1 denotes the gain term for band 1. The offset (A) should be adjusted to maximize power at the beginning of the band. The gain (B) is adjusted to maximize power toward the end of the band.

General Techniques.

- In some adjustments power may peak twice. This is caused by the auxiliary output masking the true peak. Always adjust to the first peak (lowest value of the calibration constant).
- If the adjustment has a wide range without any apparent improvement. Leave it set to the default value.

Procedure

Note

In this procedure, some calibration constants and potentiometers may be set to default conditions and left. This is normal. These boards contain adjustments for different vintages of the HP 8360 family. Not all adjustments are used each time.

1. Connect the equipment as shown in Figure 3-14 using an analog oscilloscope with A versus B sweep capability. Power on all the instruments and let them warm up for at least one hour.
2. On the synthesizer, press **PRESET**.

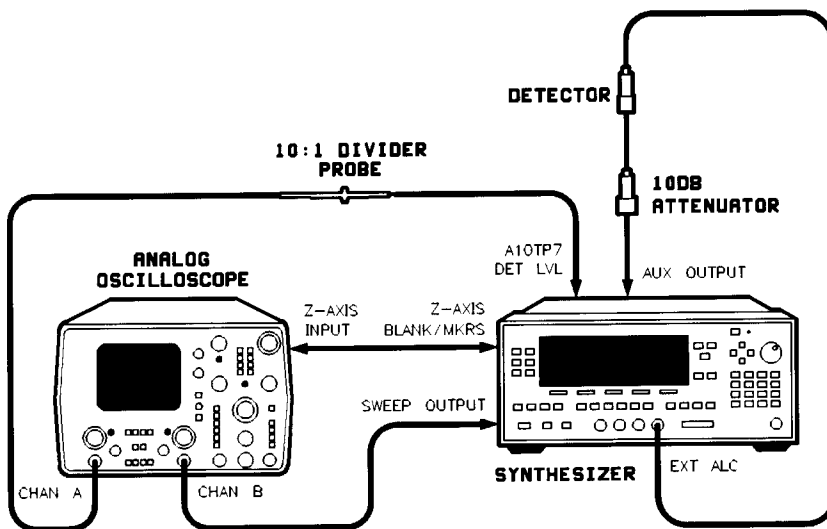


Figure 3-14. Amplifier/Multiplier Adjustments Setup

Equipment

| | |
|---------------------|---|
| Analog Oscilloscope | HP 1740A |
| Oscilloscope Probes | HP 10431A |
| Detector | HP 33330D (HP 83620A/22A/23A/24A/30A) |
| Detector | HP 33330E (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |

3. Set the default values given in Table 3-2 into the corresponding YTM calibration constants. On the synthesizer, press:

SERVICE Adjust Menu Calib Menu

Select Cal Enter the number of the first calibration constant from Table 3-2 and terminate the entry with **ENTER**. When using the front panel emulator software, pressing the arrow keys will allow you to vary the calibration constants. The calibration constant shown at the *top* of the “display” window is the active constant.

Modify Cal Enter the default value from Table 3-2 and terminate the entry with **ENTER**.

Using the up/down arrow keys, select each of the rest of the calibration constants in Table 3-2 and set their default values by entering the value on the numeric keypad. Terminate your entry with the **ENTER** key.

Table 3-2. Calibration Constant Descriptions

| Number | Description | Default Value | Adjustment Description |
|--------|------------------------|---------------|---|
| 105 | SRD Bias A; Band 1 | 255 | Maximize power over lower 30% of band. Sweep speed is not a factor. Adjust for 0.5 dB below maximum power. |
| 106 | SRD Bias A; Band 2 | 130 | |
| 107 | SRD Bias A; Band 3 | 130 | |
| 108 | SRD Bias A; Band 4 | 130 | |
| 109 | SRD Bias A; Band 5 | 130 | |
| 110 | SRD Bias A; Band 6 | 120 | |
| 111 | SRD Bias A; Band 7 | 120 | |
| 118 | SRD Bias B; Band 1 | 255 | Maximize power over higher 30% of band. Sweep speed is not a factor. Adjust for 0.5 dB below maximum power. |
| 119 | SRD Bias B; Band 2 | 150 | |
| 120 | SRD Bias B; Band 3 | 150 | |
| 121 | SRD Bias B; Band 4 | 150 | |
| 122 | SRD Bias B; Band 5 | 160 | |
| 123 | SRD Bias B; Band 6 | 160 | |
| 124 | SRD Bias B; Band 7 | 160 | |
| 131 | Squegg Clamp 1A | 255 | Default values are not altered. Numbers should remain unchanged (#131 is adjusted in another procedure). |
| 132 | Squegg Clamp 2A | 255 | |
| 133 | Squegg Clamp 3A | 255 | |
| 134 | Squegg Clamp 4A | 255 | |
| 135 | Squegg Clamp 5A | 255 | |
| 136 | Squegg Clamp 6A | 255 | |
| 137 | Squegg Clamp 7A | 255 | |
| 144 | YTM Delay Term A Hrm 1 | 1000 | Default values are not altered. Numbers should remain unchanged. Maximize power over first 20% of band. Affects fast sweeps only. Single sweep mode is also critical. |
| 145 | YTM Delay Term A Hrm 2 | 1000 | |
| 146 | YTM Delay Term A Hrm 3 | 1000 | |
| 147 | YTM Delay Term A Hrm 4 | 1000 | |
| 148 | YTM Delay Term A Hrm 5 | 1000 | |
| 149 | YTM Delay Term A Hrm 6 | 1000 | |
| 150 | YTM Delay Term A Hrm 7 | 1000 | |

Table 3-2. Calibration Constant Descriptions (continued)

| Number | Description | Default Value | Adjustment Description |
|--------|------------------------|---------------|--|
| 157 | YTM Delay Term B Hrm 1 | 300 | Default values are not altered. Numbers should remain unchanged. Maximize power over higher 30% of band. Affects fast sweeps only. |
| 158 | YTM Delay Term B Hrm 2 | 300 | |
| 159 | YTM Delay Term B Hrm 3 | 300 | |
| 160 | YTM Delay Term B Hrm 4 | 300 | |
| 161 | YTM Delay Term B Hrm 5 | 300 | |
| 162 | YTM Delay Term B Hrm 6 | 300 | |
| 163 | YTM Delay Term B Hrm 7 | 300 | |
| 170 | YTM Bx Dly Term A1 | 1000 | Default values for all terms except A3 and A4. Delay compensation for multi-band sweeps only. Adjust for maximum power at lower 50% of band. Affects fast sweep speeds only. |
| 171 | YTM Bx Dly Term A2 | 1000 | |
| 172 | YTM Bx Dly Term A3 | 1000 | |
| 173 | YTM Bx Dly Term A4 | 1000 | |
| 174 | YTM Bx Dly Term A5 | 1000 | |
| 175 | YTM Bx Dly Term A6 | 1000 | |
| 176 | YTM Bx Dly Term A7 | 1000 | |
| 183 | YTM Bx Dly Term B1 | 300 | Default values for all terms except B3 and B4. Delay compensation for multi-band sweeps only. Adjust for maximum power at lower 50% of band. Affects fast sweep speeds only. |
| 184 | YTM Bx Dly Term B2 | 300 | |
| 185 | YTM Bx Dly Term B3 | 300 | |
| 186 | YTM Bx Dly Term B4 | 300 | |
| 187 | YTM Bx Dly Term B5 | 300 | |
| 188 | YTM Bx Dly Term B6 | 300 | |
| 189 | YTM Bx Dly Term B7 | 300 | |
| 195 | YTM Kick Threshold | 110 | Default values are not altered. Numbers should remain unchanged. |
| 196 | YTM CW Kick Max | 600 | |
| 197 | YTM Mono Band Kick | 2000 | |
| 198 | YTM Stereo Band Kick | 2000 | |
| 199 | YTM Slew Rate | 400 | |
| 200 | YTM Slew Max | 50 | |
| 201 | YTM Slew Min | 0 | |
| 202 | YTM Neg Kick Wait | 2 | |
| 203 | YTM Fwd Kick Pct | 50 | |
| 204 | YTM Fwd Kick Wait | 30 | |

Table 3-2. Calibration Constant Descriptions (continued)

| Number | Description | Default Value | Adjustment Description |
|--------|----------------------|---------------|--|
| 205 | YTM Rise; Band 1 | 15 | Minimize power dropouts at the start of band. Adjustment is only effective at fast sweep speeds. Adjusted in the Amplifier/Filter Adjustments. |
| 206 | YTM Rise; Band 2 A1 | 20 | |
| 207 | YTM Rise; Band 2 B1 | 2 | |
| 208 | YTM Rise; Band 2 A2 | 15 | |
| 209 | YTM Rise; Band 3 A1 | 70 | |
| 210 | YTM Rise; Band 3 B1 | 7 | |
| 211 | YTM Rise; Band 3 A2 | 15 | |
| 212 | YTM Rise; Band 3 B2 | 15 | |
| 213 | YTM Rise; Band 3 A3 | 15 | |
| 214 | YTM Rise; Band 4 | 15 | |
| 215 | YTM Rise; Band 5 | 15 | |
| 216 | YTM Rise; Band 6 | 10 | Maximize power over higher 10% of band. Adjust at slow sweep speeds. |
| 217 | YTM Rise; Band 7 | 10 | |
| 225 | *YTM Gain Band 1 | 2048 | |
| 226 | *YTM Gain Band 2 | 2048 | |
| 227 | *YTM Gain Band 3 | 2048 | |
| 228 | *YTM Gain Band 4 | 2048 | |
| 229 | *YTM Gain Band 5 | 2048 | Maximize power over lower 10% of band. Adjust at slow sweep speeds. |
| 230 | *YTM Gain Band 6 | 2048 | |
| 231 | *YTM Gain Band 7 | 2048 | |
| 238 | *YTM Offset Band 1 | 2048 | |
| 239 | *YTM Offset Band 2 | 2048 | |
| 240 | *YTM Offset Band 3 | 2048 | |
| 241 | *YTM Offset Band 4 | 2048 | |
| 242 | *YTM Offset Band 5 | 2048 | |
| 243 | *YTM Offset Band 6 | 2048 | Default values are not altered. Numbers should remain unchanged. |
| 244 | *YTM Offset Band 7 | 2048 | |
| 248 | YTM B2 Offset Offset | 0 | |

Table 3-2. Calibration Constant Descriptions (continued)

| Number | Description | Default Value | Adjustment Description |
|--------|----------------------|---------------|--|
| 373 | YTM Dly Term C Hrm 1 | 0 | Default values are not altered. Numbers should remain unchanged. |
| 374 | YTM Dly Term C Hrm 2 | 0 | |
| 375 | YTM Dly Term C Hrm 3 | 0 | |
| 376 | YTM Dly Term C Hrm 4 | 0 | |
| 377 | YTM Dly Term C Hrm 5 | 0 | |
| 378 | YTM Dly Term C Hrm 6 | 0 | |
| 379 | YTM Dly Term C Hrm 7 | 0 | |
| 382 | YTM Bx Dly Term C1 | 0 | Default values are not altered. Numbers should remain unchanged. |
| 383 | YTM Bx Dly Term C2 | 0 | |
| 384 | YTM Bx Dly Term C3 | 0 | |
| 385 | YTM Bx Dly Term C4 | 0 | |
| 386 | YTM Bx Dly Term C5 | 0 | |
| 387 | YTM Bx Dly Term C6 | 0 | |
| 525 | Hibernation Time | 90 | Default values are not altered. Numbers should remain unchanged. |
| 526 | Bandcross 1 | 42 | |
| 527 | Bandcross 2 | 32 | |
| 528 | Bandcross 3 | 28 | |
| 529 | Bandcross 4 | 26 | |
| 530 | Bandcross 5 | 28 | |
| 531 | Bandcross 6 | 20 | |
| 532 | Bandcross 7 | 20 | |

YTM Gain Adjustment

Band 1 Adjustment.

- On the synthesizer, press:

START **2.0** **GHz**

STOP **7** **GHz**

SWEEP TIME **200** **msec**

ALC **Leveling Point Ext Det** (asterisk on)

POWER LEVEL **25** **dBm**

Note that the synthesizer has unlevelled output power.

5. On the oscilloscope, set:

Channel A:

Volts/Division: 5 mV/Division
Offset: As required
Input Coupling: DC
Input Impedance: 1 M Ω

Channel B

Volts/Division: 1 V/Division
Offset: As required
Input Coupling: DC
Input Impedance: 1 M Ω
Sweep Mode: A versus B

Adjust Channel B offset, volts/division, and horizontal position controls for a trace that fills the full horizontal display. Adjust the vertical position with the A vertical position control.

6. Make certain that calibration constant #131, Squegg Clamp 1A, is set to 255. Then adjust A12R69, YTMG, to maximize high end power (last two horizontal display divisions).
7. Modify calibration constant #238, YTM Offset; Band 1, to maximize low end power.
8. Repeat steps 6 and 7 until the entire band is peaked.
9. Record the value of calibration constant #238, YTM Offset; Band 1

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 6 through 8 again. Change calibration constant #238 back to its original value.

Band 2 Adjustment.

10. On the synthesizer, press:

START 7 GHz
STOP 13.5 GHz

11. Set the oscilloscope vertical position as necessary to display the trace.
12. Modify calibration constant #226, YTM Gain; Band 2, to maximize high end power. The high end power may peak twice. If it does, adjust the

- calibration constant to the lower peak (where the value of the calibration constant is the lower number).
13. Modify calibration constant #239, YTM Offset; Band 2, to maximize low end power. Power may peak twice. Adjust to the lower peak.
 14. Adjust band 2 SRD bias calibration constants as follows:
 - a. Increment calibration constant #106, SRD Bias A; Band 2, to maximize low end power. Then decrease the calibration constant value by 15 counts.
 - b. Increment calibration constant #119, SRD Bias B; Band 2, to maximize high end power. Then decrease the power by one third division ($\approx 1/2$ dB).
 15. Repeat steps 12 through 14 until the entire band is peaked.
 16. Record the value of calibration constant #239, YTM Offset; Band 2
-

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 12 through 15. Change calibration constant #239 back to its original value.

Band 3 Adjustment.

17. On the synthesizer, press:

| | | |
|-------|------|-----|
| START | 13.5 | GHz |
|-------|------|-----|

| | | |
|------|----|-----|
| STOP | 20 | GHz |
|------|----|-----|
18. Set A12R25 B3S1 fully clockwise (see Figure 3-15).

Note

There are two sets of potentiometers on the A12 assembly with identical names. Make *certain* you are adjusting the correct ones.

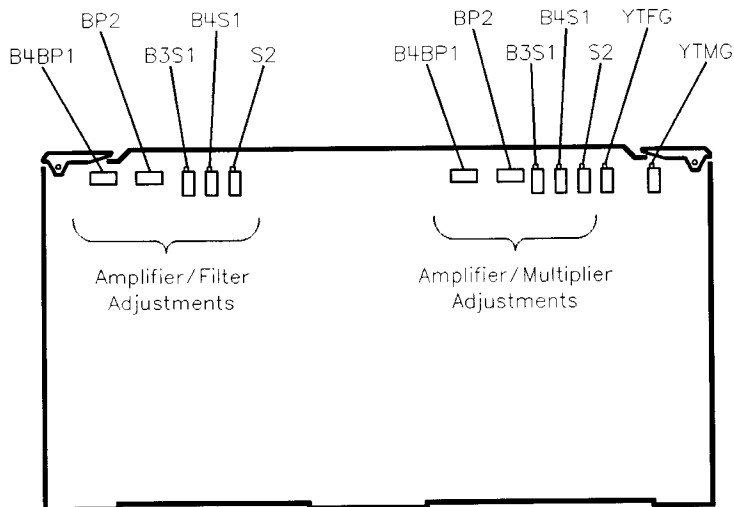


Figure 3-15. A12 Assembly Potentiometer Locations

19. Set calibration constant #227, YTM Gain; Band 3, to 2048.
20. Modify calibration constant #240, YTM Offset; Band 3, to maximize low end power. Power may peak twice. Adjust to the lower peak.
21. Adjust A12R25 B3S1 (see Figure 3-15) for maximum power at the high end. The high end power may peak twice. If it does, adjust the potentiometer to the lower peak (where the adjustment is furthest counterclockwise).
22. Set the band 3 SRD bias calibration constants as follows:
 - a. Increment calibration constant #107, SRD Bias A; Band 3, to maximize low end power. Then decrease the calibration constant value by 15 counts.
 - b. Increment calibration constant #120, SRD Bias B; Band 3, to maximize high end power. Then decrease the power by one third division ($\approx 1/2$ dB).
23. Repeat steps 20 through 22 until power is optimized over the full band.
24. Record the value of calibration constant #240, YTM Offset; Band 3

_____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat

steps 18 through 23. Change calibration constant #240 back to its original value.

Band 4 Adjustment (HP 83630A/40A/50A only).

25. On the synthesizer, press:

START **20** **GHz**
STOP **26.5** **GHz**

26. See Figure 3-15 and set:

A12R23 B4BP1 fully clockwise.

A12R24 BP2 fully clockwise.

A12R26 B4S1 fully clockwise.

A12R27 S2 fully clockwise.

27. Set the oscilloscope vertical position as necessary to display the trace.

28. Modify calibration constant #241, YTM Offset; Band 4, to maximize power at the very low end. Power may peak twice. Adjust to the lower peak.

29. Modify calibration constant #228, YTM Gain; Band 4, to maximize power at the first division on the display. Power may peak twice. Adjust to the lower peak.

Note

If there is no noticeable increase in power in the next two adjustments, leave the potentiometers at their preset position (fully clockwise).

30. Adjust A12R26 B4S1 for maximum high-end power. Power may peak twice. Adjust to the lower peak.

31. Adjust A12R23 B4BP1 for maximum power to optimize the 3rd through the 7th divisions. Stop when the power begins to decrease. Power may peak twice. Adjust to the lower peak.

32. Repeat step 30.

33. Adjust band 4 SRD bias calibration constants as follows:

a. Increment calibration constant #108, SRD Bias A; Band 4, to maximize low end power. Then decrease the calibration constant value by 15 counts.

b. Increment calibration constant #121, SRD Bias B; Band 4, to maximize high end power. Then decrease the power by one third division ($\approx 1/2$ dB).

34. Repeat steps 28 through 33 until the entire band is peaked.

35. Record the value of calibration constant #241, YTM Offset; Band 4
- _____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 26 through 34. Change calibration constant #241 back to its original value.

Band 5 Adjustment (HP 83640A/50A only).

36. On the synthesizer, press:

START **26.5** **GHz**
STOP **33.4** **GHz**

37. Adjust calibration constant #229, YTM Gain; Band 5, for maximum power at the high end of band 5. The high end power may peak twice. If it does, adjust the calibration constant to the lower peak (where the value of the calibration constant is the lower number).
38. Modify calibration constant #242, YTM Offset; Band 5, to maximize low end power. Power may peak twice. Adjust to the lower peak.
39. Set the band 5 SRD bias calibration constants as follows:
- Increment calibration constant #109, SRD Bias A; Band 5, to maximize low end power. Then decrease the calibration constant value by 15 counts.
 - Increment calibration constant #122, SRD Bias B; Band 5, to maximize high end power. Then decrease the power by one third division ($\approx 1/2$ dB).
40. Repeat steps 37 through 39 until power is optimized over the full band.
41. Record the value of calibration constant #242, YTM Offset; Band 5
- _____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 37 through 40. Change calibration constant #242 back to its original value.

Band 6 Adjustment (HP 83640A/50A only).

42. On the synthesizer, press:

START **33.4** **GHz**
STOP **38** **GHz** (HP 83650A)
STOP **40** **GHz** (HP 83640A)

43. Adjust calibration constant #230, YTM Gain; Band 6, for maximum power at the high end of band 6. The high end power may peak twice. If it does, adjust the calibration constant to the lower peak (where the value of the calibration constant is the lower number).
44. Modify calibration constant #243, YTM Offset; Band 6, to maximize low end power. Power may peak twice. Adjust to the lower peak.
45. Set the band 6 SRD bias calibration constants as follows:
 - a. Increment calibration constant #110, SRD Bias A; Band 6, to maximize low end power. Then decrease the calibration constant value by 15 counts.

Increment calibration constant #123, SRD Bias B; Band 6, to maximize high end power. Then decrease the power by one third division ($\approx 1/2$ dB).
46. Repeat steps 43 through 45 until power is optimized over the full band.
47. Record the value of calibration constant #243, YTM Offset; Band 6

_____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 43 through 46. Change calibration constant #243 back to its original value.

Band 7 Adjustment (HP 83650A only).

48. On the synthesizer, press:

START

38

GHz

STOP

50

GHz
49. Adjust calibration constant #231, YTM Gain; Band 7, for maximum power at the high end of band 7. The high end power may peak twice. If it does, adjust the calibration constant to the lower peak (where the value of the calibration constant is the lower number).
50. Modify calibration constant #244, YTM Offset; Band 7, to maximize low end power. Power may peak twice. Adjust to the lower peak.
51. Set the band 7 SRD bias calibration constants as follows:
 - a. Increment calibration constant #111, SRD Bias A; Band 7, to maximize low end power. Then decrease the calibration constant value by 15 counts.

- b. Increment calibration constant #124, SRD Bias B; Band 7, to maximize high end power. Then decrease the power by one third division ($\approx 1/2$ dB).
52. Repeat steps 49 through 51 until power is optimized over the full band.
53. Record the value of calibration constant #244, YTM Offset; Band 7

_____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 49 through 52. Change calibration constant #244 back to its original value.

Multi-band Amplifier/Multiplier Delay Compensation.

Note Power dropouts at the start of each band are typically removed with the YTM Risettime calibration constants. These will be adjusted later.

54. On the synthesizer, press:

START **2.0** **GHz**
STOP **20** **GHz**
SWEEP TIME **0** **msec**

Note The synthesizer intensity marker is set to identify the bandcross frequency (13.5 GHz). Reduce oscilloscope trace intensity to identify the marker. You can also identify bandcrosses by temporarily removing the cable from the Z-AXIS BLANK/MKRS connector on the synthesizer rear panel. Make sure this cable is connected when making adjustments.

55. On the synthesizer, press:
MARKER **Marker M1** **13.5** **GHz** (start of band 3)
56. Adjust calibration constant #172, YTM Bx Dly Term A3, to maximize power at the low end of band 3 (adjust the lowest amplitude portion of the band).
57. Adjust calibration constant #185, YTM Bx DLY Term B3 to maximize power at the high end of band 3.

58. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB). If the change in power is greater than 2/3 division, readjust the A term of the delay adjustment #172 for low end problems, or the B term of the delay adjustment #185 for high end problems.
59. On the synthesizer, press:
60. Press several times to initiate several sweeps. If a drop in power greater than 1 division occurs when in single sweep, increase the A term of the delay adjustment #172 to put the A term at the high end of the peak. (See "Adjustment Help".)

**Band 4 Multi-band Amplifier/Multiplier Delay Compensation
(HP 83630A/40A/50A only).**

61. On the synthesizer, press:

 (start of band 4)
62. Adjust calibration constant #173, YTM Bx Dly Term A4, to maximize power at the start of band 4.
63. Adjust calibration constant #186, YTM Bx Dly Term B4, to maximize power at the high end of band 4.
64. Switch between the fastest sweep time (0 ms) and 500 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB) across both bands. If the change is greater than 2/3 division, readjust the appropriate delay term.
65. On the synthesizer, press:
66. Press several times to initiate several sweeps. If a drop in power greater than 1 division occurs when in single sweep, readjust the appropriate delay term for the location of the problem.
67. On the synthesizer, press:
68. Press several times to initiate several sweeps. If a drop in power greater than 1/3 division occurs when in single sweep, readjust the appropriate delay term for the location of the problem.

Verification.

69. Try the following start and stop frequencies:

Table 3-3. Start and Stop Frequencies (GHz)

| HP 83620A/22A/23A/24A | HP 83630A | HP 83640A/50A |
|-------------------------|--------------|---------------|
| 0.01 to 20 ¹ | 0.01 to 26.5 | 0.01 to 50 |
| 4.5 to 18 | 4 to 23 | 4.5 to 33 |
| 10 to 20 | 10 to 20 | 10 to 45 |
| 2 to 14.5 | 2 to 14.5 | 2 to 23 |

¹ For HP 83622A/24A only, set from 2 GHz to 20 GHz

Compare sweeps of 0 ms and 1s and also single sweeps at fast speed. If a power drop of 0.5 division or greater is noted, readjust the appropriate calibration constant. If problems occur in other bands, adjust the appropriate YTM Bx Dly Terms for that band.

70. Perform “Amplifier/Filter Adjustments” next.

Related Performance Tests

Maximum Leveled Power

In Case Of Difficulty

1. See “Adjustment Help” in this procedure.
2. Verify the oscilloscope ALC board calibration. When calibrated, the voltage on the oscilloscope is scaled to ≈ 33 mV/dB.
3. Refer to the *Troubleshooting* manual.

10. Amplifier/Filter Adjustments

Description

This procedure maximizes RF power by tracking the YIG tuned filter to the RF output frequency. Initial tracking is done in single band sweeps at slow sweep speeds to eliminate the effects of bandcross and hysteresis in the tuning coil. (Those will be corrected with delay calibration constants.) Auto tracking is initiated to optimize the slow sweep tracking.

The YTF delay compensation adjustments maximize power for fast single- and multi-band sweeps. The YTM risetime adjustments are done in multi-band fast sweeps to optimize power at the start of each frequency band.

A squegging clamp adjustment limits the power and is adjusted for maximum output power without squegging. A “squegg” is a distortion in the RF output caused by too much power to the amplifier/multiplier and characterized by a power dropout in a portion of the trace, or a power dropout over a broad frequency range.

Note

If you have replaced either the YO or the YO driver, first initiate an auto tracking (press **USER CAL** **Tracking Menu** **Auto Track**.) If auto tracking passes and the instrument passes the “Maximum Leveled Power” performance test, *do not* continue with this procedure. If auto tracking fails, (an error message is displayed), continue with this procedure.

Adjustment Help

The following explanations are provided for a better understanding of the amplifier/filter adjustments. Refer to these explanations as often as necessary. They will help make these adjustments easier. (The adjustment procedure follows.)

Offset and Gain Adjustments.

- For all offset and gain adjustments, adjust *through* the bandpass. Keep adjusting until the power peaks and then drops off. Then reset the adjustment to the peaked point.
- For all offset and gain adjustments, if power stays peaked over several calibration constant values, set the calibration constant to the middle value of the peaked range.

Squegg Clamp Calibration Constants.

Squegg clamp calibration constants are available to limit the power into the amplifier/multiplier. The band 1 adjustment is set for a specific output power at the start of band 1. All other squegg clamp adjustments are set to a default value to allow maximum output power.

- When increasing any squegg clamp calibration constant, power is increased too far when any of the following occurs:
 - Any portion of the trace is distorted or power drops out in a portion of the trace (sphere squegging).
 - Power drops over a broad frequency range.
 - Power stops increasing on any portion of the trace.

Adjusting for the Center of the Passband.

- The passband and tuning linearity of the amplifier/filter varies with frequency. The amplifier/filter adjustments track the amplifier/filter passband with the amplifier/multiplier output frequency over the full frequency range of the synthesizer.

Single Band Delay Compensation Adjustments.

- If a drop in power greater than 1.5 dB occurs when in single sweep, increase the A delay term to put the A term at the high end of the peak.

For example, for the following calibration constant values:

Start of the peak = 1800

Middle of the peak = 1950

End of the peak = 2100

Set the A term to 2050

See Figure 3-16 for a graphic representation of the frequencies affected by the calibration constants.

Setting the Fastest Sweep Time.

- Setting the sweep time to 0 milliseconds sets the synthesizer to the fastest sweep time for the frequency range being swept. Each time the frequency range is changed, the sweep time must be reset to 0 ms in order to maintain the fastest sweep time.

Sweep Speed Related Adjustments.

- Delay compensation and risetime adjustments are affected by sweep speed. The adjustments are performed at fast sweep speeds which are the worst case. All other adjustments are performed at slow sweep speeds; they are not affected by sweep speed.

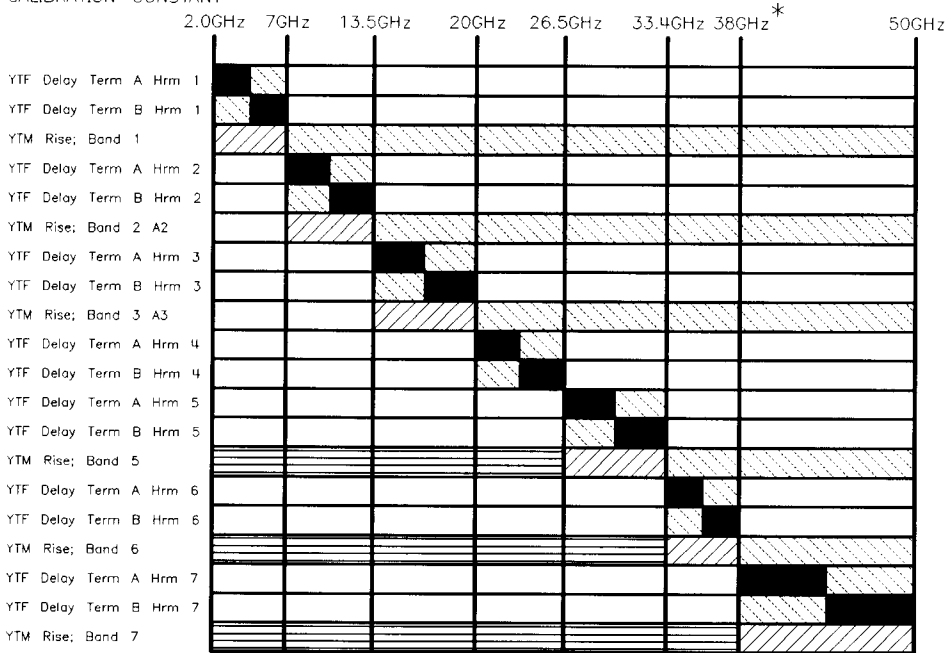
If you have a sweep speed problem, it is probably affected by delay compensation or risetime adjustments.

YTF Bandcross Delay Terms.






The YTF Bx Dly terms are either offset or gain terms. A1 denotes the offset term for band 1. B1 denotes the gain term for band 1. The offset (A) should be adjusted to maximize power at the beginning of the band. The gain (B) is adjusted to maximize power toward the end of the band.

See Figure 3-16 and Figure 3-17 for a graphic representation of the frequencies affected by the calibration constants.

CALIBRATION CONSTANT



* 40GHz for the HP 83640A.

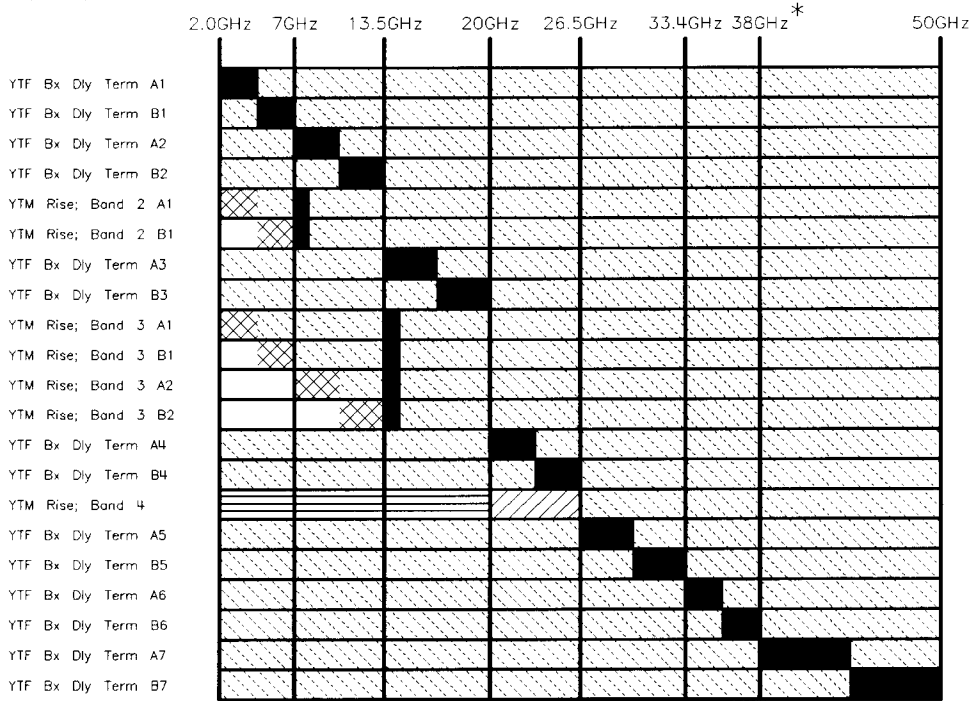
-  Frequencies affected by calibration constant.
-  Start of sweep frequencies that enable calibration constants.
-  Risetime affects start of sweep when sweep starts in this frequency range.
-  Range of possible sweep.
-  Start of sweep frequencies that enable calibration constants for the start of the affected band.

Example 1: YTM Rise; Band 3 B1 affects the beginning of Band 3 when the sweep starts in the second half of Band 1 and ends in Bands 3 through 7.






Example 2: YTM Rise; Band 4 affects the beginning of Band 4 when the sweep starts in Bands 1 through 3 or it affects the frequency of the start of sweep when the start of sweep is anywhere in Band 4.

Figure 3-16. Single-Band Delay and Risetime Compensation

CALIBRATION CONSTANT



* 40GHz for the HP 83640A.

-  Frequencies affected by calibration constant.
-  Start of sweep frequencies that enable calibration constants.
-  Risetime affects start of sweep when sweep starts in this frequency range.
-  Range of possible sweep.
-  Start of sweep frequencies that enable calibration constants for the start of the affected band.

Example 1: YTM Rise; Band 3 B1 affects the beginning of Band 3 when the sweep starts in the second half of Band 1 and ends in Bands 3 through 7.

Example 2: YTM Rise; Band 4 affects the beginning of Band 4 when the sweep starts in Bands 1 through 3 or it affects the frequency of the start of sweep when the start of sweep is anywhere in Band 4.

Figure 3-17. Multi-Band Delay and Risetime Compensation

Procedure

1. Connect the equipment as shown in Figure 3-18 using an analog oscilloscope with A versus B sweep capability. Do not connect the power meter yet. (See Figure 3-19 for location detail of XA10J2 pin 55 on the motherboard.) Power on all the instruments and let them warm up for at least one hour.
2. Press **PRESET** on the synthesizer and, for the HP 83640A/50A press: **SERVICE Tools Menu Disable Doubler** (asterisk on)
3. On the power meter:
Zero and calibrate the power meter/sensor.
Set the power meter to dBm mode.

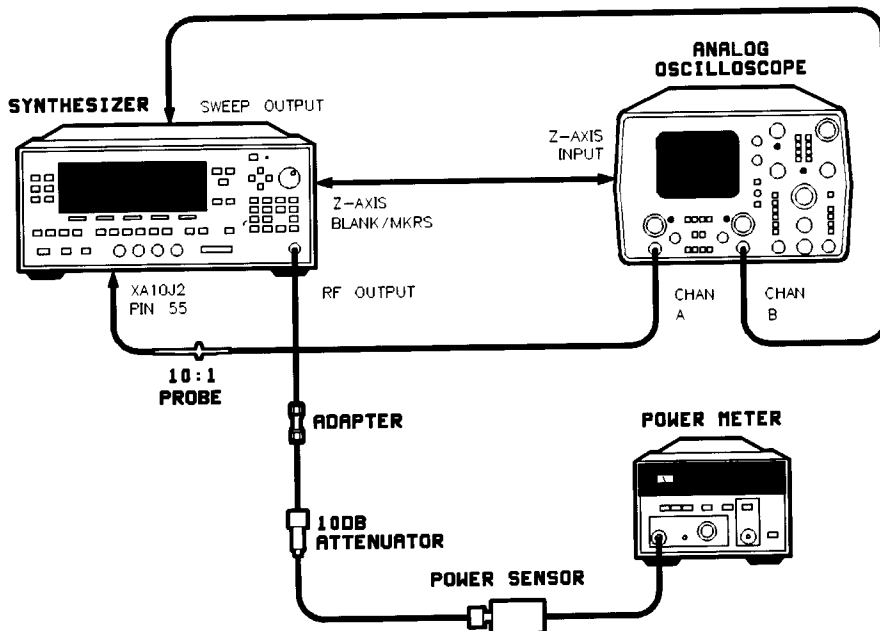


Figure 3-18. Amplifier/Filter Adjustments Setup

Equipment

| | |
|---------------------|---|
| Analog Oscilloscope | HP 1740A |
| Oscilloscope Probes | HP 10431A |
| Power Meter | HP 436A/7A/8A |
| Power Sensor | HP 8485A (HP 83620A/22A/23A/24A/30A) |
| Power Sensor | HP 8487A (HP 83640A/50A) |
| Attenuator 10 dB | HP 8493C Option 010 (HP 83620A/22A/23A/24A/30A) |
| Attenuator 10 dB | HP 8490D Option 010 (HP 83640A/50A) |

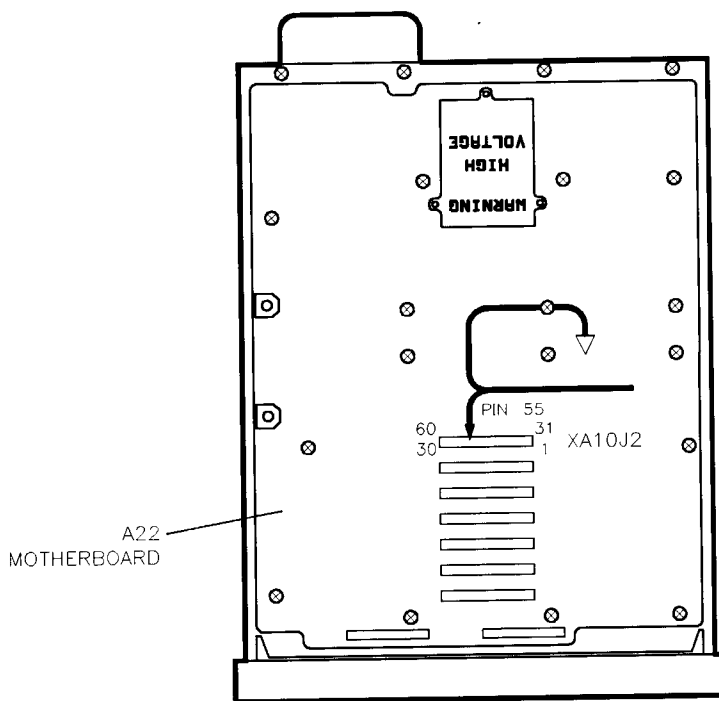


Figure 3-19. XA10J2 Location

- Set the default values given in Table 3-4 into the corresponding amplifier/filter calibration constants. On the synthesizer, set:

SERVICE Adjust Menu Calib Menu

Select Cal Enter the number of the first calibration constant from Table 3-4 and terminate the entry with **ENTER**. When using the front panel emulator software, pressing the arrow keys will allow you to vary the calibration constants. The calibration constant shown at the *top* of the “display” window is the active constant.

Modify Cal Enter the default value from Table 3-4 and terminate the entry with **ENTER**.

Using the up/down arrow keys, select each of the rest of the calibration constants in Table 3-4 and set their default values by entering the value on the numeric keypad. Terminate your entry with the **ENTER** key.

**Table 3-4.
Amplifier/Filter Calibration Constants and Default Values**

| Number | Description | Default Value | Adjustment Description |
|--------|---------------------|---------------|---|
| 131 | Squegg Clamp 1A | 255 | Maximize power across the band without squegging. Adjusted at slow sweep speeds and single sweep mode where the SYTM sphere is most likely to squegg. |
| 132 | Squegg Clamp 2A | 255 | |
| 133 | Squegg Clamp 3A | 255 | |
| 134 | Squegg Clamp 4A | 255 | |
| 135 | Squegg Clamp 5A | 255 | |
| 136 | Squegg Clamp 6A | 255 | |
| 137 | Squegg Clamp 7A | 255 | |
| 205 | YTM Rise; Band 1 | 15 | Minimize power dropouts at the start of band. Adjustment is only effective at fast sweep speeds. |
| 206 | YTM Rise; Band 2 A1 | 20 | |
| 207 | YTM Rise; Band 2 B1 | 2 | |
| 208 | YTM Rise; Band 2 A2 | 15 | |
| 209 | YTM Rise; Band 3 A1 | 70 | |
| 210 | YTM Rise; Band 3 B1 | 7 | |
| 211 | YTM Rise; Band 3 A2 | 15 | |
| 212 | YTM Rise; Band 3 B2 | 15 | |
| 213 | YTM Rise; Band 3 A3 | 15 | |
| 214 | YTM Rise; Band 4 | 15 | |
| 215 | YTM Rise; Band 5 | 15 | |
| 216 | YTM Rise; Band 6 | 10 | |
| 217 | YTM Rise; Band 7 | 10 | |

Table 3-4.
Amplifier/Filter Calibration Constants and Default Values
(continued)

| Number | Description | Default Value | Adjustment Description |
|--------|------------------------|---------------|---|
| 449 | DAmp Clamp 1 | 255 | Protect the bridge detector from excessive power when doubler amp mode is selected. |
| 450 | DAmp Clamp 2 | 255 | |
| 451 | DAmp Clamp 3 | 255 | |
| 452 | DAmp Clamp 4 | 255 | |
| 453 | DAmp Clamp 5 | 255 | |
| 454 | DAmp Clamp 6 | 255 | |
| 455 | DAmp Clamp 7 | 255 | |
| 566 | YTF Delay Term A Hrm 1 | 1000 | Maximize power over first 20% of band. Affects fast sweeps only. Single sweep mode is also critical. |
| 562 | YTF Delay Term A Hrm 2 | 1000 | |
| 563 | YTF Delay Term A Hrm 3 | 1000 | |
| 564 | YTF Delay Term A Hrm 4 | 1000 | |
| 565 | YTF Delay Term A Hrm 5 | 1000 | |
| 566 | YTF Delay Term A Hrm 6 | 1000 | |
| 567 | YTF Delay Term A Hrm 7 | 1000 | |
| 571 | YTF Delay Term B Hrm 1 | 300 | Maximize power over higher 30% of band. Affects fast sweeps only. |
| 572 | YTF Delay Term B Hrm 2 | 300 | |
| 573 | YTF Delay Term B Hrm 3 | 300 | |
| 574 | YTF Delay Term B Hrm 4 | 300 | |
| 575 | YTF Delay Term B Hrm 5 | 300 | |
| 576 | YTF Delay Term B Hrm 6 | 300 | |
| 577 | YTF Delay Term B Hrm 7 | 300 | |
| 591 | YTF Bx Dly Term A1 | 1000 | Delay compensation for multi-band sweeps only. Adjust for maximum power at lower 50% of band. Affects fast sweep speeds only. |
| 592 | YTF Bx Dly Term A2 | 1000 | |
| 593 | YTF Bx Dly Term A3 | 1000 | |
| 594 | YTF Bx Dly Term A4 | 1000 | |
| 595 | YTF Bx Dly Term A5 | 1000 | |
| 596 | YTF Bx Dly Term A6 | 1000 | |
| 597 | YTF Bx Dly Term A7 | 1000 | |

Table 3-4.
Amplifier/Filter Calibration Constants and Default Values
(continued)

| Number | Description | Default Value | Adjustment Description |
|--------|--------------------|---------------|--|
| 601 | YTF Bx Dly Term B1 | 300 | Delay compensation for multi-band sweeps only. Adjust for maximum power at higher 30% of band. Affects fast sweep speeds only. |
| 602 | YTF Bx Dly Term B2 | 300 | |
| 603 | YTF Bx Dly Term B3 | 300 | |
| 604 | YTF Bx Dly Term B4 | 300 | |
| 605 | YTF Bx Dly Term B5 | 300 | |
| 606 | YTF Bx Dly Term B6 | 300 | |
| 607 | YTF Bx Dly Term B7 | 300 | |
| 621 | *YTF Gain Band 1 | 2048 | Maximize power over higher 10% of band. Adjust at slow sweep speeds. |
| 622 | *YTF Gain Band 2 | 2048 | |
| 623 | *YTF Gain Band 3 | 2048 | |
| 624 | *YTF Gain Band 4 | 2048 | |
| 625 | *YTF Gain Band 5 | 2048 | |
| 626 | *YTF Gain Band 6 | 2048 | |
| 627 | *YTF Gain Band 7 | 2048 | |
| 631 | *YTF Offset Band 1 | 2048 | Maximize power over lower 10% of band. Adjust at slow sweep speeds. |
| 632 | *YTF Offset Band 2 | 2048 | |
| 633 | *YTF Offset Band 3 | 2048 | |
| 634 | *YTF Offset Band 4 | 2048 | |
| 635 | *YTF Offset Band 5 | 2048 | |
| 636 | *YTF Offset Band 6 | 2048 | |
| 637 | *YTF Offset Band 7 | 2048 | |

Amplifier/Filter Offset and Gain Adjustment

Band 1 Adjustment.

5. On the synthesizer, set:

START 2.0 GHz

STOP 7 GHz

SWEEP TIME 200 msec

ALC Leveling Mode ALCOff (asterisk off)

POWER LEVEL 25 dBm

Note that the synthesizer has unlevelled output power.
6. On the oscilloscope, set:

Channel A:

Volts/Division: 5 mV/Division
Volts/Division: 10 mV/Division (HP 83623A/24A only)
Offset: As required
Input Coupling: DC
Input Impedance: 1 M Ω

Channel B

Volts/Division: 1 V/Division
Offset: As required
Input Coupling: DC
Input Impedance: 1 M Ω
Sweep Mode: A versus B

Adjust Channel A offset, volts/division, and horizontal position controls for a trace that fills the full horizontal display. Adjust the vertical position with the A vertical position control.

Note In the following adjustment power dropouts may occur due to squegging. Ignore the squegging (the squegg clamp will be adjusted later) and peak the adjustment for maximum power.

7. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
8. Adjust A12R126 YTFG to maximize high end power (last two horizontal display divisions).
9. Modify calibration constant #631, YTF Offset; Band 1, to maximize low end power.
10. Repeat steps 8 and 9 until the entire band is peaked.
11. Record the value of calibration constant #631, YTF Offset; Band 1

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 7 through 10 until it is. Then change calibration constant #631 back to the recorded value.

12. On the synthesizer, set:
POWER LEVEL **0** **dBm**
13. Adjust calibration constant #131, Squegg Clamp 1A, to maximize RF output power across the band. The clamp is adjusted correctly when the following is true:
 - a. An increase in the calibration constant value decreases the output power.
 - b. A small decrease in the calibration constant value results in no change in output power.
14. If you have an HP 83623A/24A, continue with “Band 2 Adjustment”. Otherwise, adjust calibration constant #131, Squegg Clamp 1A as described here, to protect the bridge detector from excessive power:
 - a. Set the oscilloscope vertical position as necessary to display the trace.
 - b. On the synthesizer, set:
SWEEP **MENU** **Manual Sweep** (asterisk on)
 - c. Using the rotary knob, find the peak of the sweep as displayed by the oscilloscope.
 - d. If the power level of the peak point is greater than 21.5 dBm for HP 83620A/22A/30A or 23.5 dBm for HP 83640A/50A, as displayed on the power meter, decrease Squegg Clamp 1A until the power level is less than these values.

If the power level of the peak point is already less than these values, return the synthesizer to continuous sweep and decrease Squegg Clamp 1A just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

15. If you have any instrument *except* an HP 83640A/50A, continue with “Band 2 Adjustment”. Otherwise, adjust calibration constant #449, DAmP Clamp 1 as described here, to protect the bridge detector from excessive power while in doubler amp mode:
 - a. On the synthesizer, set:
SERVICE **Tools Menu Disable Doubler** (asterisk off)
POWER **MENU** **Dblr Amp Menu Doubler Amp Mode On** (asterisk on)
 - b. Set the oscilloscope vertical position as necessary to display the trace.
 - c. On the synthesizer, set:
SWEEP **MENU** **Manual Sweep** (asterisk on)

- d. Using the synthesizer rotary knob, find the peak of the sweep as displayed by the oscilloscope.
- e. If the power level of the peak point is greater than 23.5 dBm, as displayed on the power meter, decrease Damp Clamp 1 until the power level is less than this level.

If the power level of the peak point is already less than this level, set the synthesizer back to continuous sweep and decrease Damp Clamp 1 just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

16. Disable the doubler, turn doubler amp mode off, and return the synthesizer to continuous sweep if you are still in manual sweep.

Band 2 Adjustment.

17. On the synthesizer, set:

18. Set the oscilloscope vertical position as necessary to display the trace.
19. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
20. Modify calibration constant #622, YTF Gain; Band 2, to maximize high end power.
21. Modify calibration constant #632, YTF Offset; Band 2, to maximize low end power.
22. Repeat steps 20 and 21 until the entire band is peaked.
23. Record the value of calibration constant #632, YTF Offset; Band 2

_____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 19 through 22 until it is. Then change calibration constant #632 back to the recorded value.

24. On the synthesizer, set:

25. Adjust calibration constant #132, Squegg Clamp 2A, to maximize RF output power across the band.

26. If you have an HP 83623A/24A, continue with “Band 3 Adjustment”. Otherwise, adjust calibration constant #132, Squegg Clamp 2A as described here, to protect the bridge detector from excessive power:
- Set the oscilloscope vertical position as necessary to display the trace.
 - On the synthesizer, set:
SWEEP **(MENU) Manual Sweep** (asterisk on)
 - Using the rotary knob, find the peak of the sweep as displayed by the oscilloscope.
 - If the power level of the peak point is greater than 20 dBm for HP 83620A/22A/30A or 22.7 dBm for HP 83640A/50A, as displayed on the power meter, decrease Squegg Clamp 2A until the power level is less than these values.

If the power level of the peak point is already less than these values, return the synthesizer to continuous sweep and decrease Squegg Clamp 2A just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

27. If you have any instrument *except* an HP 83640A/50A, continue with “Band 3 Adjustment”. Otherwise, adjust calibration constant #450, DAmP Clamp 2 as described here, to protect the bridge detector from excessive power while in doubler amp mode:
- On the synthesizer, set:
(SERVICE) Tools Menu Disable Doubler (asterisk off)
POWER (MENU) Dblr Amp Menu Doubler Amp Mode On (asterisk on)
 - Set the oscilloscope vertical position as necessary to display the trace.
 - On the synthesizer, set:
SWEEP **(MENU) Manual Sweep** (asterisk on)
 - Using the synthesizer rotary knob, find the peak of the sweep as displayed by the oscilloscope.
 - If the power level of the peak point is greater than 22.7 dBm, as displayed on the power meter, decrease DAmP Clamp 2 until the power level is less than these values.

If the power level of the peak point is already less than these values, set the synthesizer back to continuous sweep and decrease DAmP Clamp 2 just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

28. Disable the doubler, turn doubler amp mode off, and return the synthesizer to continuous sweep if you are still in manual sweep.

Band 3 Adjustment.

29. On the synthesizer, set:

START 13.5 GHz

STOP 20 GHz

POWER LEVEL 25 dBm

30. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
31. Set A12R108 B3S1 fully clockwise (see Figure 3-20).

Note

There are two sets of potentiometers on the A12 assembly with identical names. Make *certain* you are adjusting the correct ones.

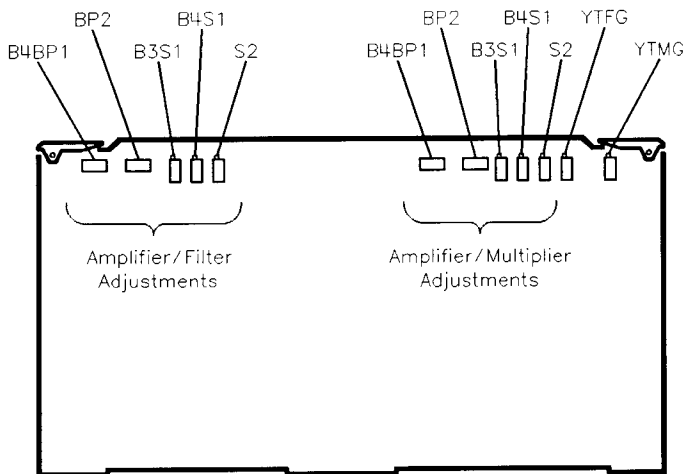


Figure 3-20. A12 Assembly Potentiometer Locations

32. Set calibration constant #623, YTF Gain; Band 3, to 2084.
33. Modify calibration constant #633, YTF Offset; Band 3, to maximize low end power.
34. Adjust A12R108 B3S1 (see Figure 3-20) for maximum power over the rest of the sweep (3 to 10 divisions).

35. Repeat steps 33 and 34 until power is optimized over the full band.
36. Record the value of calibration constant #633, YTF Offset; Band 3

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 31 through 35 until it is. Then change calibration constant #633 back to the recorded value.

37. On the synthesizer, set:

POWER LEVEL **0** **dBm**

38. Adjust calibration constant #133, Squegg Clamp 3A, to maximize RF output power across the band.
39. If you have an HP 83623A/24A, continue with “Band 4 Adjustment”. Otherwise, adjust calibration constant #133, Squegg Clamp 3A as described here, to protect the bridge detector from excessive power:
 - a. Set the oscilloscope vertical position as necessary to display the trace.
 - b. On the synthesizer, set:
SWEEP **MENU** **Manual Sweep** (asterisk on)
 - c. Using the rotary knob, find the peak of the sweep as displayed by the oscilloscope.
 - d. If the power level of the peak point is greater than 21.5 dBm for HP 83620A/22A/30A or 22.3 dBm for HP 83640A/50A, as displayed on the power meter, decrease Squegg Clamp 3A until the power level is less than these values.

If the power level of the peak point is already less than these values, return the synthesizer to continuous sweep and decrease Squegg Clamp 3A just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

40. If you have any instrument *except* an HP 83640A/50A, continue with “Band 4 Adjustment”. Otherwise, adjust calibration constant #451, DAmP Clamp 3 as described here, to protect the bridge detector from excessive power while in doubler amp mode:
 - a. On the synthesizer, set:
SERVICE **Tools Menu Disable Doubler** (asterisk off)
POWER **MENU** **Dblr Amp Menu Doubler Amp Mode On** (asterisk on)
 - b. Set the oscilloscope vertical position as necessary to display the trace.

- c. On the synthesizer, set:
SWEEP (MENU) Manual Sweep (asterisk on)
- d. Using the synthesizer rotary knob, find the peak of the sweep as displayed by the oscilloscope.
- e. If the power level of the peak point is greater than 22.3 dBm, as displayed on the power meter, decrease Damp Clamp 3 until the power level is less than these values.

If the power level of the peak point is already less than these values, set the synthesizer back to continuous sweep and decrease Damp Clamp 3 just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

- 41. Disable the doubler, turn doubler amp mode off, and return the synthesizer to continuous sweep if you are still in manual sweep.

Band 4 Adjustment (HP 83630A/40A/50A only).

- 42. On the synthesizer, set:

(START) (20) (GHz)
(STOP) (26.5) (GHz)
(POWER LEVEL) (25) (dBm)

- 43. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
- 44. Set the following potentiometers, located on the left side of the board, fully clockwise:
A12R109 B4S1
A12R110 S2
A12R105 B4BP1
A12R106 BP2
- 45. Set the oscilloscope vertical position as necessary to display the trace.
- 46. Modify calibration constant #634, YTF Offset; Band 4, to maximize low end power.
- 47. Modify calibration constant #624, YTF Gain; Band 4, to maximize power at the first division on the display.

Note

If there is no noticeable increase in power in the next two adjustments, leave the potentiometers at their preset position (fully clockwise).

48. Adjust A12R109 B4S1 for maximum high-end power.
49. Adjust A12R105 B4BP1 for maximum power to optimize the 3rd through the 7th divisions. Stop when the power begins to decrease.
50. Repeat step 47.
51. Repeat steps 41 through 48 until the entire band is peaked.
52. Record the value of calibration constant #634, YTM Offset; Band 4

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 46 through 51 until it is. Then change calibration constant #634 back to the recorded value.

53. On the synthesizer, set:
POWER LEVEL **0** **dBm**
54. Adjust calibration constant #134, Squegg Clamp 4A, to maximize RF output power across the band.
55. For the HP 83630A only, adjust calibration constant #134, Squegg Clamp 4A as described here, to protect the bridge detector from excessive power:
 - a. Set the oscilloscope vertical position as necessary to display the trace.
 - b. On the synthesizer, set:
SWEEP **MENU** **Manual Sweep** (asterisk on)
 - c. Using the rotary knob, find the peak of the sweep as displayed by the oscilloscope.
 - d. If the power level of the peak point is greater than 18.9 dBm, as displayed on the power meter, decrease Squegg Clamp 4A until the power level is less than these values.

If the power level of the peak point is already less than these values, return the synthesizer to continuous sweep and decrease Squegg Clamp 4A just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

56. For the HP 83640A/50A only, adjust calibration constant #452, DAmpl Clamp 4 as described here, to protect the bridge detector from excessive power while in doubler amp mode:
 - a. On the synthesizer, set:
SERVICE **Tools Menu** **Disable Doubler** (asterisk off)
POWER **MENU** **Dblr Amp Menu** **Doubler Amp Mode On** (asterisk on)

- b. Set the oscilloscope vertical position as necessary to display the trace.
- c. On the synthesizer, set:
SWEEP **MENU** **Manual Sweep** (asterisk on)
- d. Using the synthesizer rotary knob, find the peak of the sweep as displayed by the oscilloscope.
- e. If the power level of the peak point is greater than 23.5 dBm, as displayed on the power meter, decrease Damp Clamp 4 until the power level is less than these values.

If the power level of the peak point is already less than these values, set the synthesizer back to continuous sweep and decrease Damp Clamp 4 just until the peak point begins to drop (this indicates that power to the bridge detector is clamped).

57. Disable the doubler, turn doubler amp mode off, and return the synthesizer to continuous sweep if you are still in manual sweep.

Band 5 Adjustment (HP 83640A/50A only).

58. On the synthesizer set:

START **26.5** **GHz**
STOP **33.4** **GHz**
POWER LEVEL **25** **dBm**

59. Set the oscilloscope vertical position as necessary to display the trace.
60. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
61. Modify calibration constant #625, YTF Gain; Band 5, to maximize high end power.
62. Modify calibration constant #635, YTF Offset; Band 5, to maximize low end power.
63. Repeat steps 61 and 62 until the entire band is peaked.
64. Note the value of calibration constant #635, YTF Offset; Band 5

_____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 61 through 63 until it is. Then change calibration constant #635 back to the recorded value.

65. On the synthesizer, set:

POWER LEVEL **0** **dBm**

66. Adjust calibration constant #135, Squegg Clamp 5A, to maximize RF output power across the band.

Band 6 Adjustment (HP 83640A/50A only).

67. On the synthesizer set:
START **33.4** **GHz**
STOP **38** **GHz** (40 GHz for HP 83640A only)
POWER LEVEL **25** **dBm**
68. Set the oscilloscope vertical position as necessary to display the trace.
69. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
70. Modify calibration constant #626, YTF Gain; Band 6, to maximize high end power.
71. Modify calibration constant #636, YTF Offset; Band 6, to maximize low end power.
72. Repeat steps 70 and 71 until the entire band is peaked.
73. Note the value of calibration constant #636, YTF Offset; Band 6

_____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 70 through 72 until it is. Then change calibration constant #636 back to the recorded value.

74. On the synthesizer, set:
POWER LEVEL **0** **dBm**
75. Adjust calibration constant #136, Squegg Clamp 3A, to maximize RF output power across the band.

Band 7 Adjustment (HP 83650A only).

76. On the synthesizer set:
START **38** **GHz**
STOP **50** **GHz**
POWER LEVEL **25** **dBm**
77. Set the oscilloscope vertical position as necessary to display the trace.
78. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
79. Modify calibration constant #627, YTF Gain; Band 7, to maximize high end power.

80. Modify calibration constant #637, YTF Offset; Band 7, to maximize low end power.
81. Repeat steps 79 and 80 until the entire band is peaked.
82. Note the value of calibration constant #637, YTF Offset; Band 7

_____.

Step down the calibration constant in 100 count steps and verify that the entire trace shifts down evenly. If the power change is not uniform, repeat steps 79 through 81 until it is. Then change calibration constant #637 back to the recorded value.

83. On the synthesizer, set:
84. Adjust calibration constant #137, Squegg Clamp 7A, to maximize RF output power across the band.

Auto Tracking Verification.

85. Record the value of the following calibration constants:

#621 YTF Gain; Band 1 _____
 #622 YTF Gain; Band 2 _____
 #623 YTF Gain; Band 3 _____
 #624 YTF Gain; Band 4 _____
 #625 YTF Gain; Band 5 _____
 #626 YTF Gain; Band 6 _____
 #627 YTF Gain; Band 7 _____

#631 YTF Offset; Band 1 _____
 #632 YTF Offset; Band 2 _____
 #633 YTF Offset; Band 3 _____
 #634 YTF Offset; Band 4 _____
 #635 YTF Offset; Band 5 _____
 #636 YTF Offset; Band 6 _____
 #637 YTF Offset; Band 7 _____

#225 YTM Gain; Band 1 _____
 #226 YTM Gain; Band 2 _____
 #227 YTM Gain; Band 3 _____
 #228 YTM Gain; Band 4 _____
 #229 YTM Gain; Band 5 _____
 #230 YTM Gain; Band 6 _____

#231 YTM Gain; Band 7 _____

#238 YTM Offset; Band 1 _____

#239 YTM Offset; Band 2 _____

#240 YTM Offset; Band 3 _____

#241 YTM Offset; Band 4 _____

#242 YTM Offset; Band 5 _____

#243 YTM Offset; Band 6 _____

#244 YTM Offset; Band 7 _____

86. Initiate auto tracking on the synthesizer as follows. Terminate the RF OUTPUT with a good 50Ω impedance match such as a 10 dB attenuator or a power sensor (not required for synthesizers with a step attenuator). Press:

USER CAL Tracking Menu Auto Track

Wait for the synthesizer to complete auto tracking. If auto tracking fails (an error message is displayed) repeat the gain and offset adjustments for the failed frequency.

87. On the synthesizer, set:

START 2.0 GHz

STOP 20 GHz

CONT SWEEP TIME 1.5 sec

ALC Leveling Point Intrnl (asterisk on)

POWER LEVEL 25 dBm

For the HP 83640A/50A only, also press:

SERVICE Tools Menu Disable Doubler (asterisk off)

Connect the power meter to the synthesizer RF OUTPUT through the power sensor and 10 dB attenuator (see Figure 3-18). Adjust the oscilloscope horizontal control to place the low power point on a vertical graticule and note the position.

Select manual sweep. Press SWEEP **MENU** Manual Sweep (asterisk on). Use the arrow keys to adjust the CW frequency to the minimum power point on the oscilloscope.

On the power meter, check that the power at this point is not less than the specified maximum leveled power (note that power is attenuated by 10 dB). If it is, note the level and frequency, and check the following:

- a. Compare the manually adjusted YTF and YTM gain and offset calibration constants (step 85) to the auto tracked calibration constants. A large difference in values (several hundred counts) indicates a possible misadjustment. The auto tracking values are correct.
 - b. If the band 3 values are within 500 counts of the limits of their ranges, repeat the B3S1, B4S1, and B4BP1 adjustments with the doubler disabled.
 - c. If the band 4 values are within 500 counts of the limits of the range, repeat the B4S1 and B4BP1 adjustments with the doubler disabled (unless you have just readjusted these adjustments in step b).
 - d. If the problem continues, it is most likely hardware-related. Refer to the *Troubleshooting* manual.
88. For the HP 83630A/40A/50A, repeat step 87 for each frequency range listed in Table 3-5 and a sweep time of 1.5 seconds.

Table 3-5. Frequency Ranges

| HP 83630A | HP 83640A | HP 83650A |
|----------------|----------------|----------------|
| 20 to 26.5 GHz | 20 to 26.5 GHz | 20 to 26.5 GHz |
| | 26.5 to 40 GHz | 26.5 to 40 GHz |
| | | 40 to 50 GHz |

89. On the synthesizer, set:

START 2.0 GHz

STOP 20 GHz

CONT SWEEP TIME 1.5 sec

90. Set the synthesizer power level to the specified maximum leveled power. Check for ALC oscillations or level squegging.
- a. The SRD bias A or B calibration constants for the affected band might eliminate oscillation. The problem is with the A term if the oscillations are near the beginning of the band. It is with the B term if the oscillations are near the end of the band. SRD bias has a range. It can be overbiased which causes level squegging. If so, decrease the value of the SRD bias calibration constants and repeat the adjustment.

- b. If the SRD bias calibration constants have no effect, check the ALC Mod Gain calibration constant for the appropriate band.
91. For the HP 83630A/40A/50A, repeat step 90 for each frequency range listed in Table 3-5 and a sweep time of 1.5 seconds.
 92. Set the synthesizer power level to 25 dBm and then set various frequency ranges such as 5 GHz to 50 GHz or 10 GHz to 45 GHz.

Set the sweep times to greater than 200 ms for single-band sweeps and less than 1.5 seconds for multi-band sweeps since delay compensation has not yet been adjusted.

For each frequency range set, compare the signal levels of single sweep to continuous sweep. Band frequency ranges are as follows:

| Band | Frequency Range (GHz) |
|------|-----------------------------|
| 0 | 0.01 to < 2.0 |
| 1 | 2.0 to 7.0 |
| 2 | 7.0 to < 13.5 |
| 3 | 13.5 to 20.0 |
| 4 | > 20.0 to 26.5 |
| 5 | ≥ 26.5 to < 33.4 |
| 6 | ≥ 33.4 to < 38 ¹ |
| 7 | > 38 to 50 |

¹ 40 GHz for the HP 83640A.

Problems here are typically associated with sphere heating while awaiting the start of sweep trigger. If necessary adjust the squegging clamp calibration constant for the appropriate band.

Single-Band Amplifier/Filter Delay.

93. On the synthesizer, set:

START 2.0 GHz
 STOP 7 GHz
 CONT SWEEP TIME 0 msec
 POWER LEVEL 25 dBm
 ALC Leveling Mode ALCOff (asterisk on)

For the HP 83640A/50A only, also set:

SERVICE **Tools Menu Disable Doubler** (asterisk on)

94. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.

Note

The oscilloscope vertical sensitivity is initially set to 50 mV/division (5 mV/division with a 10:1 probe) providing a logarithmic scale of ≈ 1.5 dB/division. If necessary, decrease the vertical sensitivity for some frequency bands to 100 mV/division in order to display the entire trace on the CRT (the oscilloscope is already set to 10 mV/division for the HP 83623A/24A). If you do change the vertical sensitivity by half, remember that the logarithmic scale must change by half also.

Band 1 Adjustment.

95. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB.) If not, adjust the appropriate rise or delay term (steps 98 through 100) and repeat this step.

Note

If fast sweep has more power than slow sweep do not readjust. Continue with the next step.

96. On the synthesizer, set:

SWEEP TIME **0** **msec**

97. Press **SINGLE** several times to initiate several sweeps and check that a drop in power ≤ 1 division occurs when in single sweep. If it is less than 1 division, skip the remainder of "Band 1 Adjustment" and continue with "Band 2 Adjustment".

If the drop in power is > 1 division, increase the A term of the delay adjustment #561 to put the A term at the high end of the peak. Then repeat from step 95.

98. Adjust calibration constant #561, YTF Dly Term A Hrm 1, to maximize power for the low end of band 1. Set the calibration constant for the middle of the peaked range.

99. Adjust calibration constant #571, YTF Dly Term B Hrm 1, to maximize power for the high end of band 1. Set the calibration constant for the middle of the peaked range.
100. Adjust calibration constant #205, YTM Rise; Band 1, to minimize power dropout at the start of band 1.

Band 2 Adjustment.

Note If the oscilloscope is not already set to 5 mV/division (or 10 mV/division for the HP 83623A/24A), do so now. The logarithmic scale is calculated with the 5 mV/division value so for models using 10 mV/division the logarithmic scale must change by half.

101. On the synthesizer, set:

102. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
103. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than $\approx 2/3$ division. If not, adjust the appropriate rise or delay term (steps 106 through 108) and then repeat this step.
104. On the synthesizer, set:
105.
 - a. Press several times to initiate several sweeps. Note any drop in power.
 - b. Press . Then press again (LED on) and note any drop in power.
 - c. The power loss noted in step a can be no smaller than the power loss noted in step b. If the step a power loss is greater than the step b power loss by 1 division (≈ 1.5 dB), increase the A term of the delay adjustment #562 to put the A term at the high end of the peak. Then repeat from step 103.

If the power loss in step a is *not* smaller than that in step b, skip the rest of "Band 2 Adjustment" and continue with "Band 3 Adjustment".

106. Adjust calibration constant #562, YTF Dly Term A Hrm 2, to maximize power for the low end of band 2.
107. Adjust calibration constant #572, YTF Dly Term B Hrm 2, to maximize power for the high end of band 2.
108. Adjust calibration constant #208, YTM Rise; Band 2 A2, to minimize power dropout at the start of band 2.

Band 3 Adjustment.

109. On the synthesizer, set:

110. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
111. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB). If not, adjust the appropriate rise or delay terms (steps 114 through 116) and then repeat this step.
112. On the synthesizer, set:
113. a. Press several times to initiate several sweeps. Note any drop in power.
 b. Press . Then press again (LED on) and note any drop in power.
 c. The power loss noted in step a can be no smaller than the power loss noted in step b. If the step a power loss is greater than the step b power loss by 1 division (≈ 1.5 dB), increase the A term of the delay adjustment #573 to put the A term at the high end of the peak. Then repeat from step 111.

If the power loss in step a is *not* smaller than that in step b, skip the rest of “Band 3 Adjustment” and continue with “Band 4 Adjustment”.

114. Adjust calibration constant #563, YTF Dly Term A Hrm 3, to maximize power for the low end of band 3.
115. Adjust calibration constant #573, YTF Dly Term B Hrm 3, to maximize power for the high end of band 3.
116. Adjust calibration constant #213, YTM Rise; Band 3 A3, to minimize power dropout at the start of band 3.

Band 4 Adjustment (HP 83630A/40A/50A).

117. On the synthesizer, set:

START 20 GHz
STOP 26.5 GHz
CONT SWEEP TIME 0 msec
POWER LEVEL 25 dBm

118. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.

119. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than $\approx 2/3$ division. If not, adjust the appropriate rise term (steps 122 and 123) and then repeat this step.

120. On the synthesizer, set:

SWEEP TIME 0 msec

121. a. Press SINGLE several times to initiate several sweeps. Note any drop in power.

b. Press SINGLE RF ON/OFF. Then press RF ON/OFF again (LED on) and note any drop in power.

c. The power loss noted in step a can be no smaller than the power loss noted in step b. If the step a power loss is greater than the step b power loss by 1 division (≈ 1.5 dB), increase the A term of the delay adjustment #564 to put the A term at the high end of the peak. Then repeat from step 119.

If the power loss in step a is *not* smaller than that in step b, skip the rest of “Band 4 Adjustment” and continue with “Band 5 Adjustment”.

122. Adjust calibration constant #564, YTF Dly Term A Hrm 4, to maximize power for the low end of band 4.

123. Adjust calibration constant #574, YTF Dly Term B Hrm 4, to maximize power for the high end of band 4.

Band 5 Adjustment (HP 83640A/50A only).

124. On the synthesizer, set:

START 26.5 GHz
STOP 33.4 GHz
CONT SWEEP TIME 0 msec
POWER LEVEL 25 dBm

125. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.

126. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB). If not, adjust the appropriate rise or delay term (steps 129 through 131) and then repeat this step.
127. On the synthesizer, set:
SWEEP TIME 0 msec
128. a. Press SINGLE several times to initiate several sweeps. Note any drop in power.
 b. Press SINGLE RF ON/OFF. Then press RF ON/OFF again (LED on) and note any drop in power.
 c. The power loss noted in step a can be no smaller than the power loss noted in step b. If the step a power loss is greater than the step b power loss by 1 division (≈ 1.5 dB), increase the A term of the delay adjustment #565 to put the A term at the high end of the peak. Then repeat from step 126.

If the power loss in step a is *not* smaller than that in step b, skip the rest of "Band 5 Adjustment" and continue with "Band 6 Adjustment".

129. Adjust calibration constant #565, YTF Dly Term A Hrm 5, to maximize power for the low end of band 5.
130. Adjust calibration constant #575, YTF Dly Term B Hrm 5, to maximize power for the high end of band 5.
131. Adjust calibration constant #215, YTM Rise; Band 5, to minimize power dropout at the start of band 5.

Band 6 Adjustment (HP 83640A/50A only).

132. On the synthesizer, set:
START 33.4 GHz
STOP 38 GHz (40 GHz for HP 83640A)
CONT SWEEP TIME 0 msec
POWER LEVEL 25 dBm
133. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
134. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB). If not, adjust the appropriate rise or delay term (steps 137 through 139) and then repeat this step.
135. On the synthesizer, set:
SWEEP TIME 0 msec

136. a. Press **SINGLE** several times to initiate several sweeps. Note any drop in power.
- b. Press **SINGLE** **RF ON/OFF**. Then press **RF ON/OFF** again (LED on) and note any drop in power.
- c. The power loss noted in step a can be no smaller than the power loss noted in step b. If the step a power loss is greater than the step b power loss by 1 division (≈ 1.5 dB), increase the A term of the delay adjustment #566 to put the A term at the high end of the peak. Then repeat from step 134.

If the power loss in step a is *not* smaller than that in step b, skip the rest of “Band 6 Adjustment” and continue with “Band 7 Adjustment”.

137. Adjust calibration constant #566, YTF Dly Term A Hrm 6, to maximize power for the low end of band 6.
138. Adjust calibration constant #576, YTF Dly Term B Hrm 6, to maximize power for the high end of band 6.
139. Adjust calibration constant #216, YTM Rise; Band 6, to minimize power dropout at the start of band 6.

Band 7 Adjustment (HP 83650A only).

140. On the synthesizer, set:

START **38** **GHz**
STOP **50** **GHz**
CONT **SWEEP TIME** **0** **msec**
POWER LEVEL **25** **dBm**

141. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
142. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB). If not, adjust the appropriate rise or delay term (steps 145 through 147) and then repeat this step.
143. On the synthesizer, set:

SWEEP TIME **0** **msec**

144. a. Press **SINGLE** several times to initiate several sweeps. Note any drop in power.
- b. Press **SINGLE** **RF ON/OFF**. Then press **RF ON/OFF** again (LED on) and note any drop in power.
- c. The power loss noted in step a can be no smaller than the power loss noted in step b. If the step a power loss is greater than the step b power loss by 1 division (≈ 1.5 dB), increase the A term of the delay adjustment #567 to put the A term at the high end of the peak. Then repeat from step 142.

If the power loss in step a is *not* smaller than that in step b, skip the rest of “Band 7 Adjustment” and continue with “Multi-band YTF Delay”.

145. Adjust calibration constant #567, YTF Dly Term A Hrm 7, to maximize power for the low end of band 7.
146. Adjust calibration constant #577, YTF Dly Term B Hrm 7, to maximize power for the high end of band 7.
147. Adjust calibration constant #217, YTM Rise; Band 7, to minimize power dropout at the start of band 7.

Multi-band YTF Delay.

148. On the synthesizer, set:

START **13** **GHz**
STOP **20** **GHz**
CONT **SWEEP TIME** **0** **msec**
POWER LEVEL **25** **dBm**

149. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.

Note

Synthesizer intensity markers are set to identify the bandcross frequencies (7.0, 13.5 GHz, and 20.0 GHz). Reduce oscilloscope trace intensity to identify these markers. You can also identify bandcrosses by temporarily removing the cable from the Z-AXIS BLANK/MKRS connector on the synthesizer rear panel. Make sure this cable is connected when making adjustments.

150. On the synthesizer, set:
 (MARKER) Marker M1 (13.5) (GHz) (asterisk on)
151. Adjust calibration constant #593, YTF Bx Dly Term A3, to maximize power at the low end of band 3.
152. Adjust calibration constant #603, YTF Bx DLY Term B3 to maximize power at the high end of band 3.
153. Adjust calibration constant #212, YTM Rise; Band 3 B2, to minimize power dropout at the end of band 3.
154. Switch between the fastest sweep time (0 ms) and 200 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB). If the change in power is greater than 2/3 division, readjust the A term of the delay adjustment #593 for low end problems, or the B term of the delay adjustment #603 for high end problems.
155. On the synthesizer, set:
 (CONT) (SWEEP TIME) (0) (msec)
156. Press (SINGLE) several times to initiate several sweeps. If a drop in power greater than 1 division occurs when in single sweep, increase the A term of the delay adjustment #593 to put the A term at the high end of the peak.
157. On the synthesizer, set:
 (START) (7) (GHz)
 (CONT) (SWEEP TIME) (0) (msec)
 (POWER LEVEL) (25) (dBm)
158. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
159. Switch between the fastest sweep time (0 ms) and 500 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB) across both bands. If the change is greater than 2/3 division, readjust the appropriate delay term.
160. Adjust calibration constant #592, YTF Bx Dly Term A2, to maximize power at the start of band 2 (start of sweep).
161. Adjust calibration constant #602, YTF Bx Dly Term B2, to maximize power at the end of band 2.
162. Adjust calibration constant #211, YTM Rise; Band 3 A2, to minimize power dropout at the start of band 3.
163. On the synthesizer, set:
 (START) (10) (GHz)
 (POWER LEVEL) (25) (dBm)

164. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
165. Adjust calibration constant #212, YTM Rise; Band 3 B2, to minimize power dropout at the start of band 3.
166. On the synthesizer, set:
SWEEP TIME 0 msec
167. Press SINGLE several times to initiate several sweeps. If a drop in power greater than 1 division occurs when in single sweep, readjust the appropriate delay term for the location of the problem.
168. On the synthesizer, set:
START 2.0 GHz
CONT SWEEP TIME 0 msec
MARKER Marker M2 7 GHz (asterisk on)
POWER LEVEL 25 dBm
169. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
170. Adjust calibration constant #591, YTF Bx Dly Term A1, to maximize power at the start of band 1.
171. Adjust calibration constant #601, YTF Bx Dly Term B1, to maximize power at the high end of band 1.
172. Adjust calibration constant #206, YTM Rise; Band 2 A1, to minimize power dropout at the start of band 2.
173. Adjust calibration constant #209, YTM Rise; Band 3 A1, to minimize power dropout at the start of band 3.
174. Switch between the fastest sweep time (0 ms) and 1s sweep time and check that power changes less than 2/3 division (≈ 1 dB) across all bands. If the change is greater than 2/3 division, readjust the appropriate delay term.
175. On the synthesizer, set:
SWEEP TIME 0 msec
176. Press SINGLE several times to initiate several sweeps. If a drop in power greater than 1 division occurs when in single sweep, readjust the appropriate delay or risetime term for the location of the problem.
177. On the synthesizer, set:
START 5 GHz
POWER LEVEL 25 dBm
178. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.

179. Adjust calibration constant #210, YTM Rise; Band 3 B1, to minimize power dropout at the end of band 3.
180. Adjust calibration constant #207, YTM Rise; Band 2 B1, to minimize power dropout at the end of band 2.

Band 4 Multi-band YTF Delay (HP 83630A/40A/50A only).

181. On the synthesizer, set:
 - START** **2.0** **GHz**
 - STOP** **26.5** **GHz**
 - CONT** **SWEEP TIME** **0** **msec**
 - MARKER** **Marker M3** **20** **GHz** (asterisk on)
 - POWER LEVEL** **25** **dBm**
182. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
183. Adjust calibration constant #594, YTF Bx Dly Term A4, to maximize power at the start of band 4.
184. Adjust calibration constant #604, YTF Bx Dly Term B4, to maximize power at the end of band 4.
185. Adjust calibration constant #214, YTM Rise; Band 4, to minimize power dropout at the start of band 4.
186. Switch between the fastest sweep time (0 ms) and 500 ms sweep time and check that power changes less than 2/3 division (≈ 1 dB) across both bands. If the change is greater than 2/3 division, readjust the appropriate delay term.
187. On the synthesizer, set:
 - SWEEP TIME** **0** **msec**
188. Press **SINGLE** several times to initiate several sweeps. If a drop in power greater than 1 division occurs when in single sweep, readjust the appropriate delay term for the location of the problem.
189. On the synthesizer, set:
 - START** **15** **GHz**
 - CONT** **SWEEP TIME** **0** **msec**
 - POWER LEVEL** **25** **dBm**
190. Decrease the synthesizer power level until the level of the entire trace on the oscilloscope begins to drop.
191. Press **SINGLE** several times to initiate several sweeps. If a drop in power greater than 1/3 division occurs when in single sweep, readjust the appropriate delay or risetime term for the location of the problem.

Operation Check.

192. Try the following start and stop frequencies:

Start and Stop Frequencies (GHz)

| HP 83620A/23A | HP 83622A/24A | HP 83630A | HP 83640A | HP 83650A |
|---------------|---------------|---------------|-------------|-------------|
| 0.045 to 20 | 2 to 20 | 0.045 to 26.5 | 0.045 to 40 | 0.045 to 50 |
| 4.5 to 18 | 4.5 to 18 | 4.5 to 18 | 4.5 to 33 | 4.5 to 33 |
| 10 to 20 | 10 to 20 | 10 to 20 | 10 to 23 | 10 to 45 |
| 2 to 14.5 | 2 to 14.5 | 2 to 14.5 | 2 to 14.5 | 2 to 23 |

Compare sweeps of 0 ms and 1 s and also single sweeps at fast speed. If a power drop of 0.5 division or greater is noted, readjust the appropriate calibration constant.

193. If this is the last calibration constant you will be adjusting, see “Calibration Constants” to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

Maximum Leveled Power

In Case Of Difficulty

1. See “Adjustment Help” in this procedure.
2. Verify the oscilloscope ALC board calibration. When calibrated, the voltage on the oscilloscope is scaled to ≈ 33 mV/dB.
3. Refer to the *Troubleshooting* manual.

11. Low Power SRD Bias

Description and Procedure

The synthesizer is set to 10 GHz. Then the A9 pulse board MIN adjustment sets the source voltage of the FET for the proper SRD bias level.

1. Connect the equipment as shown in Figure 3-21. Preset all instruments and let them warm up for at least one hour.

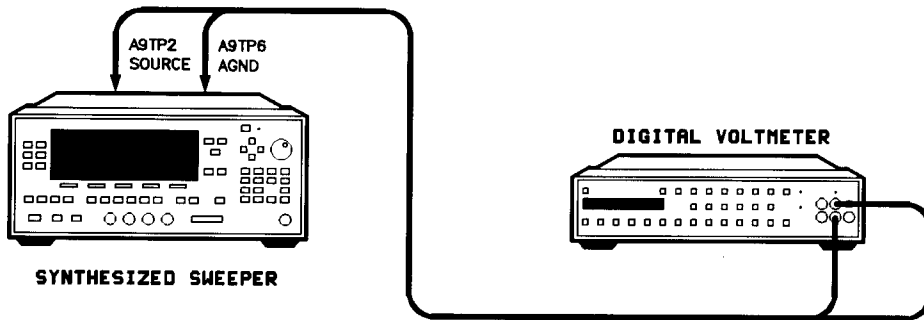


Figure 3-21. Low Power SRD Bias Adjustment Setup

Equipment

| | |
|-----|----------|
| DVM | HP 3456A |
|-----|----------|

2. On the synthesizer set:
 CW 10 GHz.
3. Set the DVM to measure DC volts.
4. Adjust A9R105 MIN (see Figure 3-22) for -0.54 V DC.

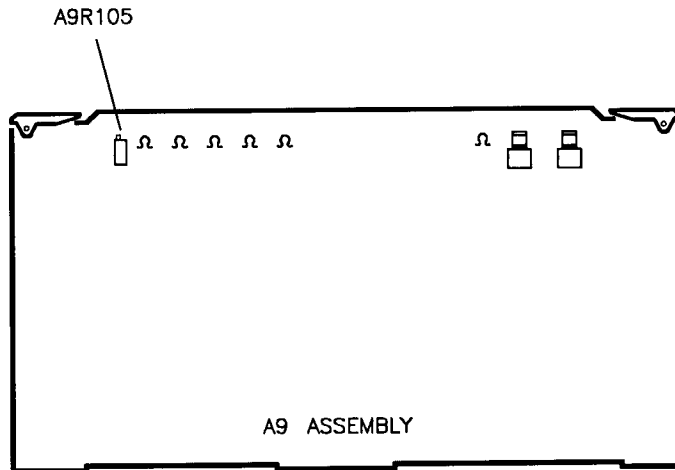


Figure 3-22. A9R105 Location

Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

12. Modulator Offset and Gain

Description and Procedure

In this procedure, the ALC modulation offset and gain calibration constants are adjusted to linearize the ALC modulator response to the ALC power level reference voltage. Default values are entered for the modulator offset calibration constants and internal firmware is activated to set the modulator gain calibration constants. The synthesizer is then set for a power sweep across the entire leveled ALC range (-20 to the maximum leveled power). The integrator level signal on the ALC board is monitored to verify linearity. If necessary, the modulator offset values are modified.

1. Connect the equipment as shown in Figure 3-23. Preset the instruments and let them warm up for at least one hour.

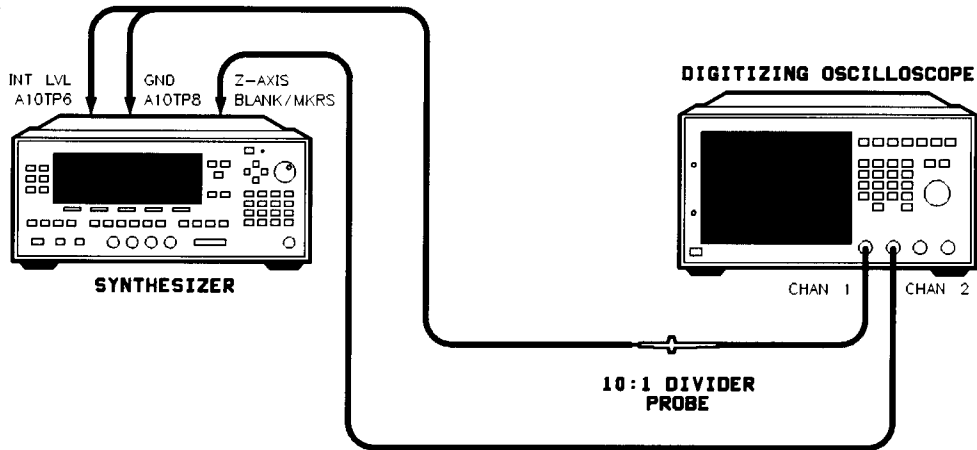


Figure 3-23. Modulator Offset and Gain Adjustment Setup

Equipment

| | |
|-------------------------|-----------|
| Digitizing Oscilloscope | HP 54111D |
| Oscilloscope Probes | HP 10431A |

2. On the synthesizer, set:

SERVICE **Adjust Menu** **Calib Menu**

3. If you have replaced the low band assembly (A24) or the dual modulator assembly (A38), set the ALC offset calibration constants to the default values given in Table 3-6. Otherwise, skip to step 7.

Select **Select Cal**. Using the numeric keypad, enter the number of the first calibration constant in Table 3-6. Terminate your entry with the **ENTER** key.

Select **Modify Cal**. Use the numeric keypad to enter the corresponding default value in Figure 3-23. Terminate your entry with the **ENTER** key.

4. Using the up/down arrow keys, select each of rest of the calibration constants in Figure 3-23 and set their default values by entering the value on the numeric keypad. Terminate your entry with the **ENTER** key.

Table 3-6. ALC Offset Calibration Constant Default Values

| Calibration Constant | Description | Default Value |
|----------------------|---------------------|---------------|
| 315 | ALC Mod Ofs; Band 0 | 100 |
| 316 | ALC Mod Ofs; Band 1 | 100 |
| 317 | ALC Mod Ofs; Band 2 | 100 |
| 318 | ALC Mod Ofs; Band 3 | 100 |
| 319 | ALC Mod Ofs; Band 4 | 100 |
| 320 | ALC Mod Ofs; Band 5 | 150 |
| 321 | ALC Mod Ofs; Band 6 | 150 |
| 322 | ALC Mod Ofs; Band 7 | 150 |

5. On the synthesizer, set:

SERVICE Adjust Menu AssyAdj Menu A10 Adj Menu A10 Mod Gain

The synthesizer will measure, calculate, and store the modulator gain calibration constants.

When the adjustment is completed the following message appears on the display:

```
Modulator Gain Cal Completed
Calibration constants were modified.
```

6. If this is the last calibration constant you will be adjusting, see "Calibration Constants" to store the calibration constants as protected data (in EEPROM).
7. Connect the oscilloscope as shown in Figure 3-23.
8. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|--------------|
| Display | 0n |
| Volts/Division | 50 mV |
| Offset | As necessary |
| Input Coupling | dc |
| Input Impedance | 1 M Ω |

Channel 2:

| | |
|-----------------|--------------|
| Display | 0n |
| Volts/Division | 2V |
| Input Coupling | dc |
| Input Impedance | 1 M Ω |

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 10 ms |
| Delay | 5 ms |
| Delay Reference | At left |
| Sweep | Triggered |

Trigger:

| | |
|--------------|------|
| Trigger Mode | Edge |
|--------------|------|

Trigger Source Channel 2
Trigger Level 2V
Trigger Slope Negative

Display:

Display Mode Repetitive
Averaging On
Number of Averages 2
Screen Single

9. On the synthesizer, set:

CENTER **1** **GHz**
SPAN **0** **GHz**

10. For synthesizers with Option 001, set:

POWER **MENU** **Uncoupl Atten**

11. Set the synthesizer power level to -20 dBm. Press:

POWER LEVEL **-** **20** **dBm**

Now set the synthesizer for a power sweep of its full ALC range. For example, if your synthesizer's specified maximum leveled power *at this frequency* is +10 dBm then set the power sweep to 30 dB/sweep (-20 dBm to +10 dBm = 30 dB). Press:

POWER **MENU** **POWER SWEEP** **30** **dB**

12. Continue to set up the synthesizer as follows:

SWEEP TIME **100** **msec**

USER CAL **Tracking Menu Peak RF Always** (asterisk on)

13. Adjust the oscilloscope timebase so the Z-axis input goes high at the right edge of the display. This signal is low during the power sweep.

14. Change the value of the band 0 calibration constant #315 to adjust the signal variation during the power sweep (while Z-axis is low) as follows:

Adjust the calibration constant so that the trace in the last three (farthest right) graticules is as flat as possible. Initiate an AM bandwidth calibration, press: **USER CAL** **AM Cal Menu AM BW Cal Once**.

Repeat the adjustment and calibration until the last three graticules are as flat as possible.

15. Set the synthesizer to each of the center frequencies in Table 3-7. Change the power sweep as appropriate to sweep the full ALC range. Perform an AM bandwidth calibration and then repeat step 14 for each corresponding calibration constant.

Table 3-7. Center Frequencies and Calibration Constants

| Center Frequencies (GHz) | Calibration Constants |
|-----------------------------|-----------------------|
| 5.0 | #316 Band 1 |
| 9.0 | #317 Band 2 |
| 19.0 | #318 Band 3 |
| 25.0 ¹ | #319 Band 4 |
| 30.0 ¹ | #320 Band 5 |
| 35.0 ¹ | #321 Band 6 |
| 45.0 ¹ | #322 Band 7 |

¹ Disregard if beyond your synthesizer's capability.

Related Performance Tests

Maximum Leveled Power AM Bandwidth

In Case of Difficulty

Refer to the *Troubleshooting* manual.

13. ALC Power Level Accuracy

Description and Procedure

This adjustment sets the absolute power accuracy in each frequency band at a CW frequency. The digital ALC calibration array is loaded with zeros for the 0 dB attenuator setting to eliminate any power offset from this source. Calibration constants set the power accuracy at four power levels. A potentiometer sets the power accuracy at an 18 dBm level in the low band (not applicable for all models).

Note This adjustment procedure zeros the digital ALC calibration array at the 0 dB attenuator setting. The “Power Flatness” adjustment must be performed after this procedure.

1. Preset the equipment shown in Figure 3-24 and let them warm up for at least one hour. Do *not* connect the power sensor to the synthesizer RF OUTPUT yet.

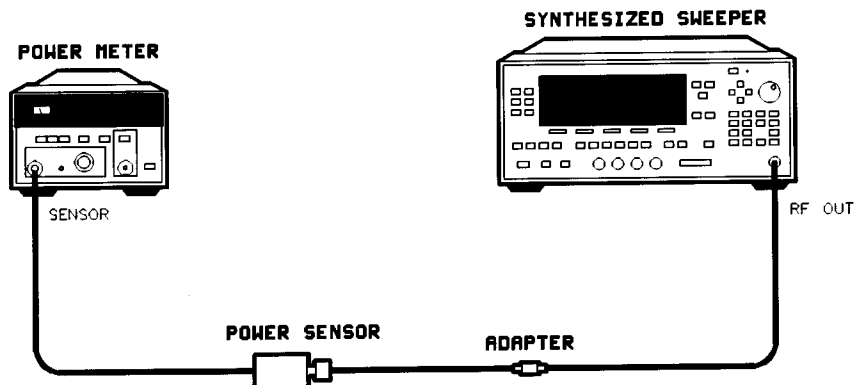


Figure 3-24. ALC Power Level Accuracy Adjustment Setup

Equipment

| | |
|--------------|--------------------------------------|
| Power Meter | HP 436A/7A/8A |
| Power Sensor | HP 8485A (HP 83620A/22A/23A/24A/30A) |
| Power Sensor | HP 8487A (HP 83640A/50A) |

2. Zero and calibrate the power meter/sensor and set the power meter to dBm mode. Connect the power sensor to the synthesizer's RF OUTPUT.

Set the CAL FACTOR % for the power sensor 1 GHz calibration factor.

3. On the synthesizer, set:

USER CAL Tracking Menu RF Peak Always (asterisk on)

POWER **MENU** Uncoupl Atten (Option 001 only)

4. On the synthesizer, zero the digital ALC calibration for the 0 dB attenuator setting for all frequency ranges:

SERVICE Adjust Menu DigALC Menu

AtnStep To Cal **0** **dB**

Cal Freq Range Lo Band ALC Cal Array (Atn, Freq) Zero

Cal Freq Range Hi Band ALC Cal Array (Atn, Freq) Zero

Note

The default values given in the next step are a general starting point. If the current ALC power accuracy is within 1 dB, fewer repetitions are required if you start with the existing calibration constants unchanged.

5. Set the default values given in Table 3-8 into the corresponding ALC calibration constants. On the synthesizer, set:

SERVICE Adjust Menu Calib Menu

Select Cal Enter the number of the calibration constant from Table 3-8 and terminate the entry with **ENTER**.

Modify Cal Enter the default value from Table 3-8 and terminate the entry with **ENTER**.

Table 3-8. ALC Calibration Constants and Default Values

| ALC Calibration Constant | Default Value |
|---|---------------|
| Low Band 0.01 to 2.0 GHz¹ | |
| #265 LVL DAC Ofs Lo Bnd | 120 |
| #252 LVL DAC Gain Lo Bnd | 20 |
| #284 ALC Det Ofs; Lo | 142 |
| #293 ALC Log Brkpt; Lo | 140 |
| High Band 2.0 to 20 GHz | |
| #264 LVL DAC Ofs Hi Bnd | 0 |
| #251 LVL DAC Gain Hi Bnd | 20 |
| #283 ALC Det Ofs; Hi | 134 |
| #292 ALC Log Brkpt; Hi | 131 |

¹ Disregard if beyond your synthesizer's capability.

Low Band ALC Power Accuracy Adjustment

6. On the synthesizer, set:
 - CW** **1** **GHz**
 - SERVICE** **Adjust Menu** **Calib Menu**
7. On the synthesizer, set:
 - POWER LEVEL** First power level in Table 3-9
8. Select the first calibration constant in Table 3-9:
 - Select Cal** **265** **ENTER**
9. On the synthesizer, select **Modify Cal** and, using the rotary knob, modify the calibration constant so that the power meter and the power level setting are the same.
10. Repeat steps 8 through 10 for each power level and calibration constant given in Table 3-9.

Table 3-9. Power Level and Calibration Constant Adjustment

| Power Level (dBm) | Calibration Constant Adjustment |
|-------------------|---------------------------------|
| 0.0 | #265 LVL DAC Ofs Lo Bnd |
| -10.0 | #252 LVL DAC Gain Lo Bnd |
| -20.0 | #284 ALC Det Ofs; Lo |
| +10.0 | #293 ALC Det Log Brkpt; Lo |

11. On the synthesizer, set:

POWER LEVEL 18 dBm

Adjust A10R125, +20 dBm, until the power meter and the power level setting are the same. Figure 3-25 shows the location of A10R125.

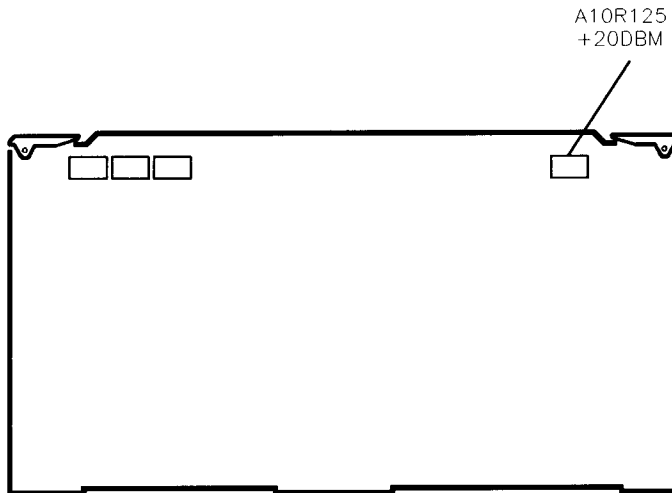


Figure 3-25. A10R125 Location

12. Repeat steps 8 through 12 until the power accuracy for each calibration constant is within ± 0.01 dBm.

High Band Power Accuracy Adjustment

13. On the synthesizer, set:

CW **10** **GHz**

SERVICE **Adjust Menu** **Calib Menu**

14. On the power meter, set the CAL FACTOR % for the power sensor 10 GHz calibration factor.

15. On the synthesizer, set:

POWER LEVEL First power level in Table 3-10

16. Select the first calibration constant in Table 3-10:

Select Cal **264** **ENTER**

17. On the synthesizer, select **Modify Cal** and, using the rotary knob, modify the calibration constant so that the power meter and the power level setting are the same.
18. Repeat steps 16 through 18 for each power level and calibration constant given in Table 3-10.
19. Repeat steps 16 through 19 until the power accuracy for each calibration constant is within ± 0.01 dBm.

Table 3-10. Power Level and Calibration Constant Adjustment

| Power Level (dBm) | Calibration Constant Adjustment |
|-------------------|---------------------------------|
| 0.0 | #264 LVL DAC Ofs Hi Bnd |
| -10.0 | #251 LVL DAC Gain Hi Bnd |
| -20.0 | #283 ALC Det Ofs; Hi |
| +10.0 | #292 ALC Det Log Brkpt; Hi |

20. If this is the last calibration constant you will be adjusting, see “Calibration Constants” in this manual to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

14. Power Flatness

(The automated power flatness adjustment in Chapter 5 may be used in place of this procedure.)

Description and Procedure

In this procedure, the synthesizer measures and corrects power flatness. The synthesizer controls the power meter via HP-IB while the power meter is measuring the RF output. For each synthesizer frequency band and a 0 dB attenuator setting, control is given to the synthesizer to measure and correct power flatness.

Note This adjustment requires an HP 437B Power Meter. The correct power sensor calibration factors must be loaded and selected. This procedure cannot be run with a controller on the HP-IB, nor can it be run from a front panel emulator. For Option 003 instrument, see Chapter 5.

1. Preset the instruments shown in Figure 3-26. Do *not* connect the power sensor to the synthesizer RF output yet. Let both instruments warm up for at least one hour.

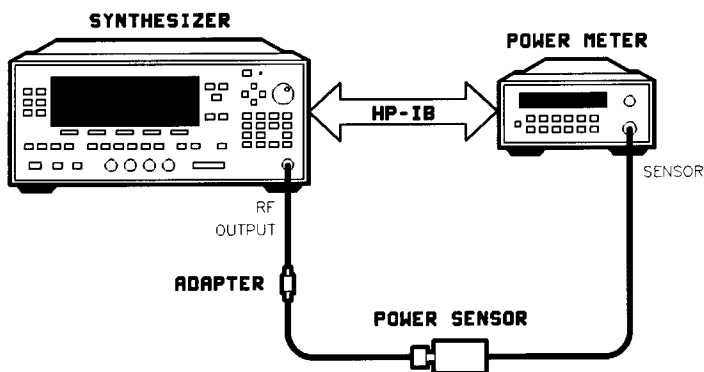


Figure 3-26. Power Flatness Adjustment Setup

Equipment

| | |
|--------------|--------------------------------------|
| Power Meter | HP 437A |
| Power Sensor | HP 8482A |
| Power Sensor | HP 8485A (HP 83620A/22A/23A/24A/30A) |
| Power Sensor | HP 8487A (HP 83640A/50A) |

Low Band Power Flatness

Disregard if beyond your synthesizer's capability.

2. On the synthesizer, press:

SERVICE Adjust Menu DigALC Menu

Cal Freq Range Lo Bnd (asterisk on)

AtnStep to Cal **0** **dB**

3. Load and select the calibration factors for the correct power sensor for this frequency band into the power meter. Refer to the power meter manual for instructions.

Zero and calibrate the power meter then connect the power sensor to the synthesizer RF output.

4. On the synthesizer, press **Pwr Mtr ALC Cal**.

The synthesizer measures power flatness and calculates a new flatness array for the frequency band and attenuator setting.

5. On the synthesizer, press **SAVE** and continue to the next step.

High Band Power Flatness

6. Load and select the calibration factors for the correct power sensor for this frequency band into the power meter. Refer to the power meter manual for instructions.

Zero and calibrate the power meter then connect the power sensor to the synthesizer RF output.

7. On the synthesizer, press:

Cal Freq Range Hi Band (asterisk on)

8. Repeat steps 3 through 5.

Millimeter Band Power Flatness

Disregard if beyond your synthesizer's capability.

9. Load and select the calibration factors for the correct power sensor for this frequency band into the power meter. Refer to the power meter manual for instructions.

Zero and calibrate the power meter then connect the power sensor to the synthesizer RF output.

10. On the synthesizer, press:
Cal Freq Range mm Band (asterisk on)
11. Repeat steps 3 through 5.

Related Performance Tests

Power Flatness

In Case of Difficulty

1. The HP 437B Power Meter must be used. Correct calibration factors must be loaded and selected.
2. Make sure that the only HP-IB connection is between the synthesizer and the power meter. No controller is allowed on the bus.
3. Refer to the *Troubleshooting* manual.

15. AM/FM DAC Offset and Gain (Option 002)

Description and Procedure

No test equipment is required for this procedure. This procedure calibrates the modulation generator assembly by adjusting the AM and FM DACs. The internal DVM measures the DAC output voltages. The DAC offset is then zeroed with this adjustment procedure and the DAC gain is automatically calibrated with calibration constants.

1. Turn the synthesizer on and press **PRESET**. Let the synthesizer warm up for at least one hour.
2. Select the A8 adjustment menu. On the synthesizer, press:
SERVICE Adjust Menu AssyAdj Menu A8 Adj Menu
3. The **AM DAC** adjustment is automatically selected (asterisk on).
4. Adjust A8R111 (see Figure 3-27) to center the “needle” on the display.

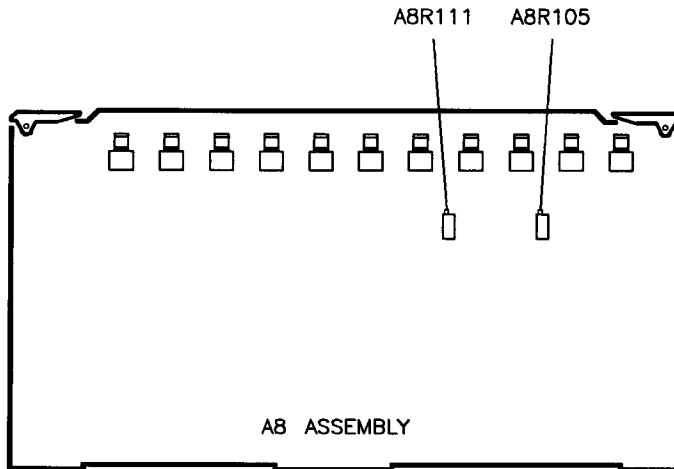


Figure 3-27. A8R111 and A8R105 Adjustment Locations

5. Select **FM DAC** (asterisk on).
6. Adjust A9R105 (see Figure 3-27) to center the “needle” on the display.

7. Select **Done**.

The synthesizer will display the following message:

Updating Cal Constants

8. If this is the last calibration constant you will be adjusting, see “Calibration Constants” to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

AM Accuracy

FM Accuracy

In Case of Difficulty

Refer to the *Troubleshooting* manual.

16. AM Accuracy

Description and Procedure

This procedure consists of three adjustments. Calibration constant #277, AM Offset, is adjusted for no change in RF output power when AM is enabled but no voltage is applied. EXP AM CAL is adjusted for a -10 dB change in power when -1.00 V is applied and AM 10 dB/V is selected. LIN AM CAL is adjusted so that a -0.80 V AM input (100%/V AM selected) causes the RF output to decrease to 4.00% of its initial value.

1. Turn on the instruments shown in Figure 3-28 and let them warm up for at least one hour.
2. Zero and calibrate the power meter/sensor.
3. Connect the equipment as shown in Figure 3-28.

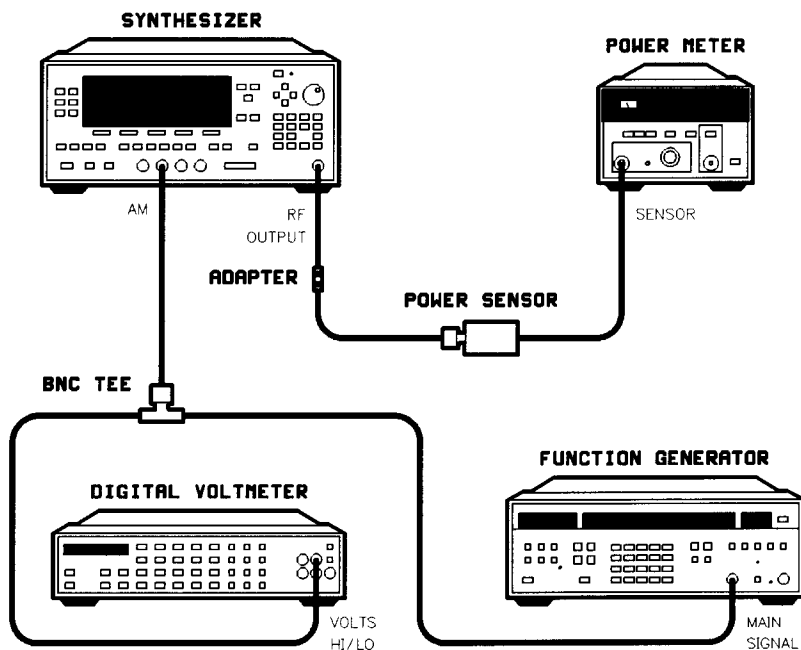


Figure 3-28. AM Accuracy Adjustment Setup

Equipment

| | |
|--------------------|--------------------------------------|
| Digital Voltmeter | HP 3456A |
| Function Generator | HP 3325A |
| Power Meter | HP 436A/7A/8A |
| Power Sensor | HP 8485A (HP 83620A/22A/23A/24A/30A) |
| Power Sensor | HP 8487A (HP 83640A/50A) |

- Set the function generator for a 0V DC rear panel output (the instrument front panel output is connected to the synthesizer's AM input.)
- On the synthesizer, press:

CW **5** **GHz**
POWER LEVEL **-15** **dBm**

AM Offset

- Set the power meter to read relative power (dB).
- On the synthesizer, press:
MOD **AM On/Off 100%/V** (asterisk on)
or, for synthesizers with Option 002, instead press:
MOD **AM Menu AM On/Off Ext AM Type 100%/V**
- Adjust calibration constant #277, AM Offset, for a 0 dB reading on the power meter. Press:
SERVICE **Adjust Menu Calib Menu Select Cal** **277** **ENTER**
Modify Cal Use the rotary knob to adjust the calibration constant for a 0 dB reading on the power meter.

Log AM Accuracy

- Set the power meter to measure absolute log power (dBm).
- On the synthesizer, press:
POWER LEVEL **0** **dBm**
MOD **AM On/Off 100%/V** (asterisk off)
or, for synthesizers with Option 002, instead press:
MOD **AM Menu AM On/Off Ext** (asterisk off)
- Set the function generator to the front panel output.
- Set the power meter to read relative power (dB).

13. Set the function generator to -1.0 V DC offset. Verify the correct voltage on the DVM.
14. On the synthesizer, press:
AM On/Off 10dB/V (asterisk on)
or, for synthesizers with Option 002, instead press:
AM On/Off Ext (asterisk on)
AM Type 10dB/V (asterisk on)
15. Adjust A10R35, EXP AM CAL, for a -10 dB power meter reading. See Figure 3-29 for the location of A10R35.

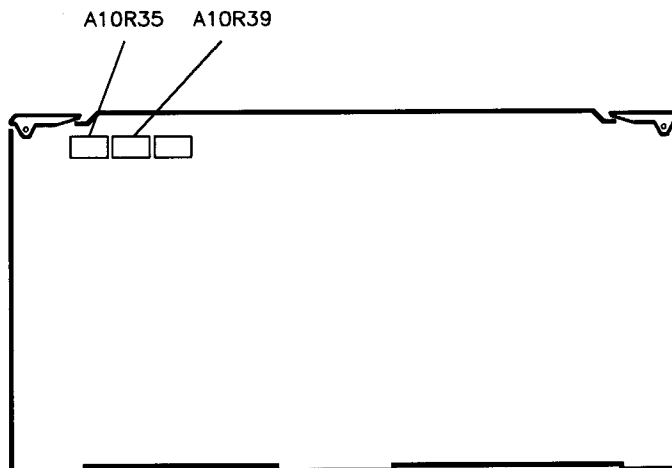


Figure 3-29. A10R35 and A10R39 Locations

Linear AM Accuracy

16. On the synthesizer, press:
AM On/Off 10dB/V (asterisk off)
or, for synthesizers with Option 002, instead press:
AM On/Off Ext (asterisk off)
17. On the synthesizer, press:
POWER LEVEL **5** **dBm**

18. Set the power meter to measure linear mode (watts).

For power meters without a relative linear mode, adjust the synthesizer power level for a 3.16 mW power meter reading.

For power meters with relative linear mode (%), set the power meter to relative.

19. Set the function generator for a -0.8 V DC offset. Verify the correct voltage on the DVM.

20. On the synthesizer, press:

MOD **AM On/Off 100%/V** (asterisk on)

or, for synthesizers with Option 002, instead press:

MOD **AM On/Off Ext** (asterisk on)

AM Type 100%/V (asterisk on)

21. Adjust A10R39, LIN AM CAL, for a 0.126 mW (4.00% relative) reading. See Figure 3-29 for the location of A10R39.

Related Performance Tests

AM Accuracy

In Case of Difficulty

Refer to the *Troubleshooting* manual.

17. AM Delay

Description and Procedure

In the ALC loop, the integrator input from the ALC detector is delayed (phase shifted from the reference input) through the ALC modulator, RF path, and ALC detector. Because of this, amplitude modulation can peak the AM frequency response. In this adjustment, you set the delay in the reference input equal to the delay in the input from the ALC detector.

The synthesizer is set to maximum leveled power at a CW frequency, with amplitude modulation at the maximum rate. Monitoring the INT LVL signal (the integrator output), adjust the AM DELAY to minimize any AC voltage present.

1. Preset the instruments shown in Figure 3-30 and let them warm up for at least one hour.

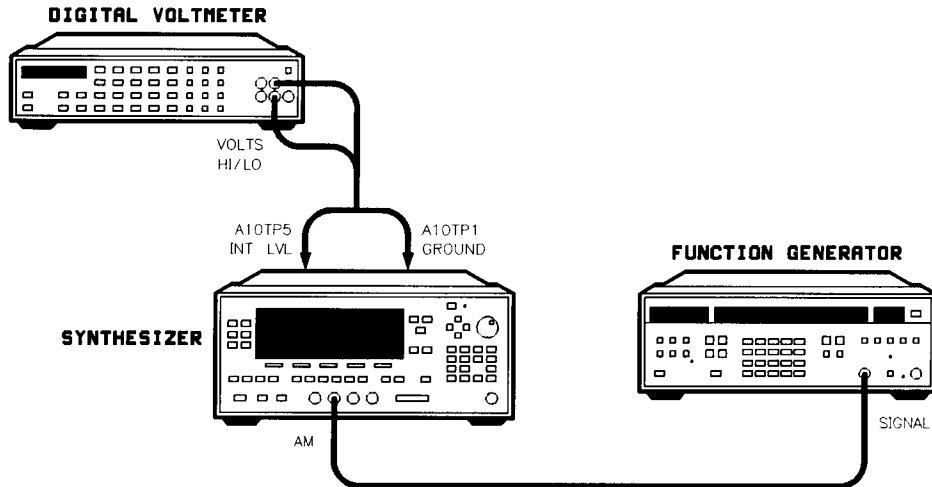


Figure 3-30. AM Delay Adjustment Setup

Equipment

| | |
|--------------------|----------|
| Digital Voltmeter | HP 3456A |
| Function Generator | HP 3325A |

- To achieve peak power, turn on RF peaking. Press:
USER CAL **Tracking Menu** **Peak RF Always** (asterisk on)
 - Connect the equipment as shown in Figure 3-30.
 - On the synthesizer, press:
CW **10** **GHz**
POWER LEVEL Set to 3 dB below maximum specified leveled power.
MOD **AM On/Off 100%/V** (asterisk on)
- or, for synthesizers with Option 002, instead press:
MOD **AM Menu** **AM On/Off Ext** (asterisk on)
AM Type 100%/V (asterisk on)

Note The function generator should have a 50 Ω output for an accurate output. If necessary, use a BNC tee and monitor the output level while the function generator is connected to the AM input.

- On the function generator, press:

| | |
|------------|-------------|
| Function: | Sinewave |
| Frequency: | 100 kHz |
| DC Offset: | 0V |
| Output: | Front Panel |
| Amplitude: | 600 mV p-p |

6. Adjust A10R55 (see Figure 3-31) for a minimum AC voltage reading on the DVM.

Note You should expect to see very small changes in voltage.

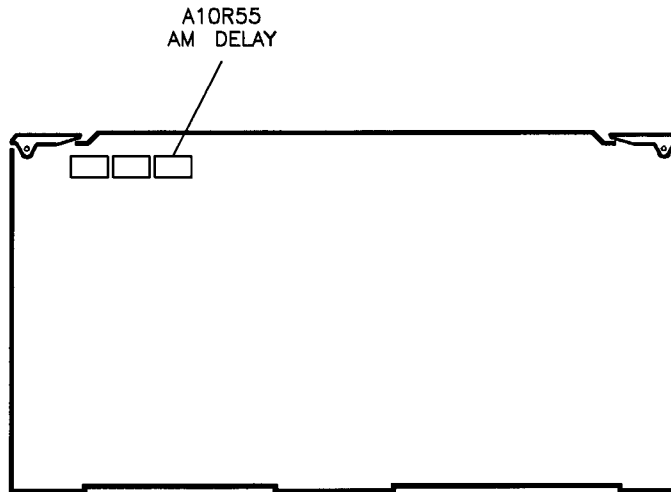


Figure 3-31. AM Delay Adjustment Location

Related Performance Tests

AM Bandwidth

In Case of Difficulty

Refer to the *Troubleshooting* manual.

18. FM Gain

Description and Procedure

This adjustment sets the gain on the FM driver assembly to match the YO FM coil sensitivity, and to provide a 10 MHz/V FM input sensitivity. The function generator is set to provide FM at a 1 MHz rate and a 2.404 MHz deviation. This corresponds to a modulation index of 2.404, which should result in no power in the carrier. FM gain is adjusted to minimize the RF output power.

1. Connect the equipment as shown in Figure 3-32. Preset all instruments and let them warm up for at least one hour.

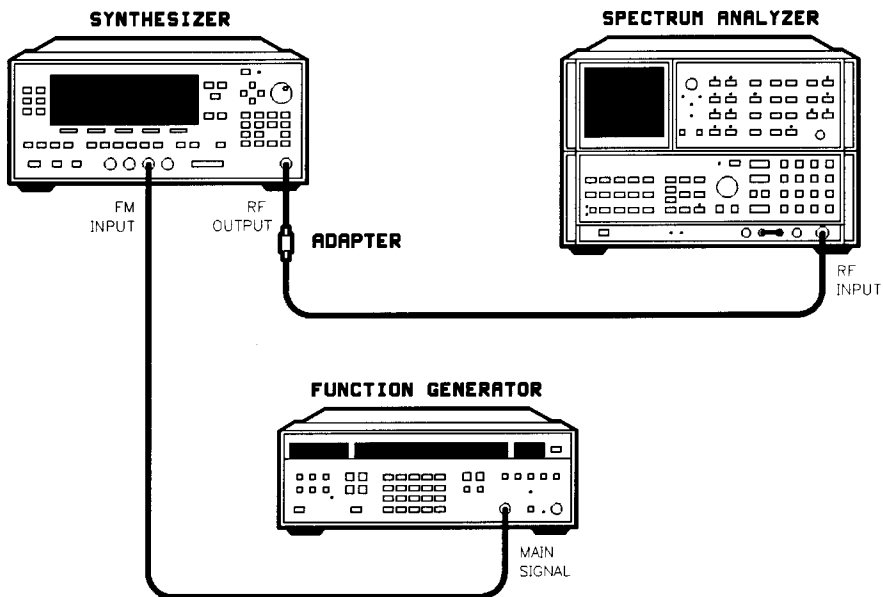


Figure 3-32. FM Gain Adjustment Setup

Equipment

| | |
|--------------------|----------|
| Function Generator | HP 3325A |
| Spectrum Analyzer | HP 8566B |

Note

The function generator specified is accurate enough to set the amplitude without using a DVM. If you use a different function generator, use a wide bandwidth DVM, such as an HP 3458A, to accurately set the voltage.

2. On the function generator, press:

Function: Sinewave
Frequency: 1 MHz
DC Offset: 0V
Amplitude: 480.8 mV p-p (169.96 mV rms)

3. On the spectrum analyzer, press:

Reference Level: 0 dBm
Attenuator: Auto
Center Frequency: 5 GHz
Frequency Span: 50 kHz
Resolution BW: 3 kHz
Video BW: 1 kHz
Sweep Time: Auto
Sweep: Continuous

4. On the synthesizer, press:

CW **5** **GHz**

MOD **FM On/Off 100kHz** (asterisk on)

or, for synthesizers with Option 002, instead press:

MOD **FM Menu FM On/Off Ext** (asterisk on)

FM Coupling 100kHz (asterisk on)

5. Adjust A11R55 (see Figure 3-33) for a minimum signal on the spectrum analyzer.

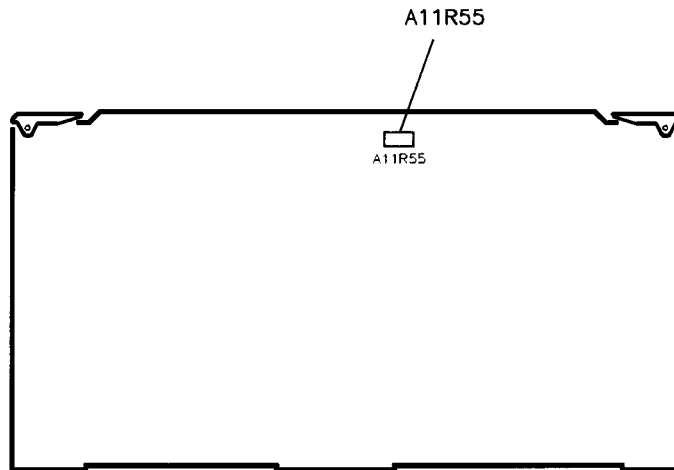


Figure 3-33. FM Gain Adjustment Location

Related Performance Tests

Self-tests
FM Accuracy

In Case of Difficulty

1. Verify the function generator output (amplitude and frequency) with an oscilloscope. Use a BNC tee with the function generator connected to the FM input.
2. Refer to the *Troubleshooting* manual.

19. Square Wave Symmetry

Description and Procedure

Use this adjustment to set the synthesizer modulation (27.78 square wave) for equal RF on/off periods. This is accomplished by minimizing the even harmonics of the 27.78 square wave.

High Band Adjustment

1. Connect the equipment as shown in Figure 3-34. Preset both instruments and let them warm up for at least one hour.

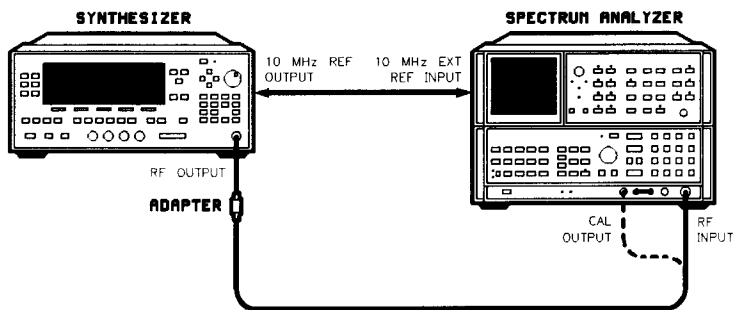


Figure 3-34. Square Wave Symmetry Adjustment Setup

Equipment

| | |
|-------------------|----------|
| Spectrum Analyzer | HP 8566B |
|-------------------|----------|

2. On the synthesizer, press:
CW **5** **GHz**
POWER LEVEL **5** **dBm**
3. On the spectrum analyzer, press:
Center Frequency: 5 GHz
Frequency Span: 200 kHz

Make sure the signal is centered on the display.

4. On the synthesizer, press:
MOD **Pulse On/Off Scalar** (asterisk on)
or, for synthesizers with Option 002, instead press:
MOD **Pulse Menu Pulse On/Off Scalar** (asterisk on)
5. Set the spectrum analyzer marker to the peak of either 2nd sideband (56 kHz away).
6. Press the marker to center frequency key (adjusts the 2nd sideband to the center of the display).
7. On the spectrum analyzer, press:
Frequency Span: 0 Hz
8. Adjust calibration constant #330, Slow Sym High Band, for a minimum reading on the spectrum analyzer. Press:
SERVICE **Adjust Menu Calib Menu Select Cal**
Use the rotary knob or arrow keys to select calibration constant #330. Press **Modify Cal** and use the rotary knob to adjust the calibration constant.

Low Band Adjustment

Disregard if beyond your synthesizer's capability.

9. Reset the spectrum analyzer frequency span to 200 kHz.
10. Repeat this adjustment procedure at a frequency of 1 GHz and adjust calibration constant #329 (Slow Sym Low Band) for a minimum reading on the spectrum analyzer.
11. If this is the last calibration constant you will be adjusting, see "Calibration Constants" to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting Manual*.

20. AM Input Impedance

Description and Procedure

No test equipment is required for this procedure.

This procedure sets the AM input impedance to either 50Ω or $2\text{ k}\Omega$. The AM input impedance on A10 must be set to $2\text{ k}\Omega$ for proper operation of the internal modulation generator (Option 002).

Instruments without Option 002 should perform step A, "A10 Jumper".

Instruments with Option 002 should set the A10 jumper to the $2\text{ k}\Omega$ position using step A, "A10 Jumper" and should perform step B, "A8 Jumper".

A. A10 Jumper

1. On the synthesizer, set the line power switch to standby.
2. Lift up the A10 ALC assembly far enough to access the jumper shown in Figure 3-35.
3. The AM input impedance is factory-set to the 50 ohm position. To change it to 2 k Ω , move the jumper to the position marked "2K". The jumper can be returned to the "50 OHM" position to change the AM input impedance to 50 ohms.
4. Reinstall the A10 assembly.

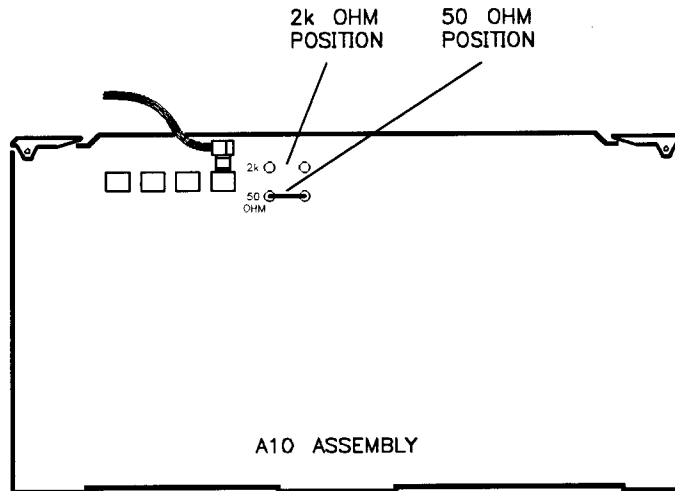


Figure 3-35. A10 Jumper Locations

B. A8 Jumper

1. On the synthesizer, make sure the line power switch is set to standby.
2. Lift up the A8 modulation generator assembly far enough to access the jumper shown in Figure 3-36.
3. The AM input impedance is factory-set to the 50 ohm position. To change it to 2 k Ω , move the jumper to the position marked "2K". The jumper can be returned to the position marked "50" to change the AM input impedance to 50 ohms.
4. Reinstall the A8 assembly.

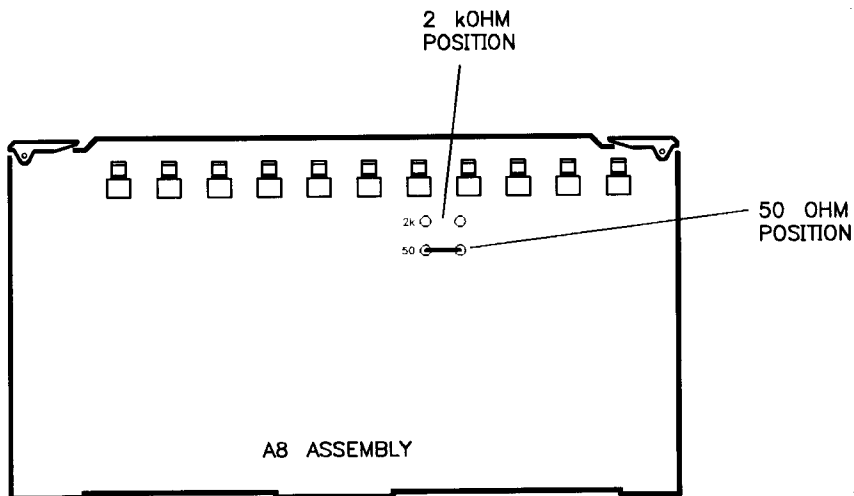


Figure 3-36. A8 Jumper Locations

Related Performance Tests

AM Accuracy
AM Bandwidth
AM Dynamic Range

In Case of Difficulty

If the jumper is missing, see "Replaceable Parts".

21. FM Input Impedance

Description and Procedure

A soldering iron is required for this procedure.

This procedure sets the FM input impedance to either 50Ω or 600Ω . The FM input impedance on A11 must be set to 600Ω for proper operation of the internal modulation generator (Option 002).

Instruments without Option 002 should perform step A, "A11 Jumper".

Instruments with Option 002 should set the A11 jumper to the 600Ω position using step A, "A11 Jumper" and should perform step B, "A8 Jumper".

A. A11 Jumper

1. On the synthesizer, set the line power switch to standby.
2. Disconnect the coaxial cables from the A11 FM driver assembly.
3. Remove the A11 assembly from the synthesizer.
4. Locate the zero ohm resistor shown in Figure 3-37. The FM input impedance is factory-set to the 50 ohm position. To change it to 600 ohms, remove the resistor from the A11 assembly by unsoldering it. The FM input impedance can be reset to 50 ohms by soldering the resistor back into the A11 assembly.

Note If you will never use the 50 ohm setting, the resistor can be clipped out.

5. Reinstall the A11 assembly and reconnect the coaxial cables.

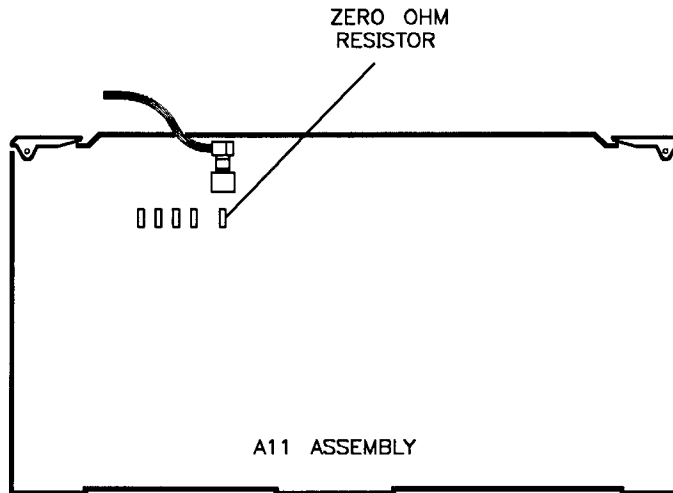


Figure 3-37. FM Input Impedance Jumper Locations

B. A8 Jumper

1. On the synthesizer, make sure the line power switch is set to standby.
2. Lift up the A8 modulation generator assembly far enough to access the jumper shown in Figure 3-38.
3. The FM input impedance is factory-set to the 50 ohm position. To change it to 600 ohms, move the jumper to the position marked "600". The jumper can be returned to the position marked "50" to change the FM input impedance to 50 ohms.
4. Reinstall the A8 assembly.

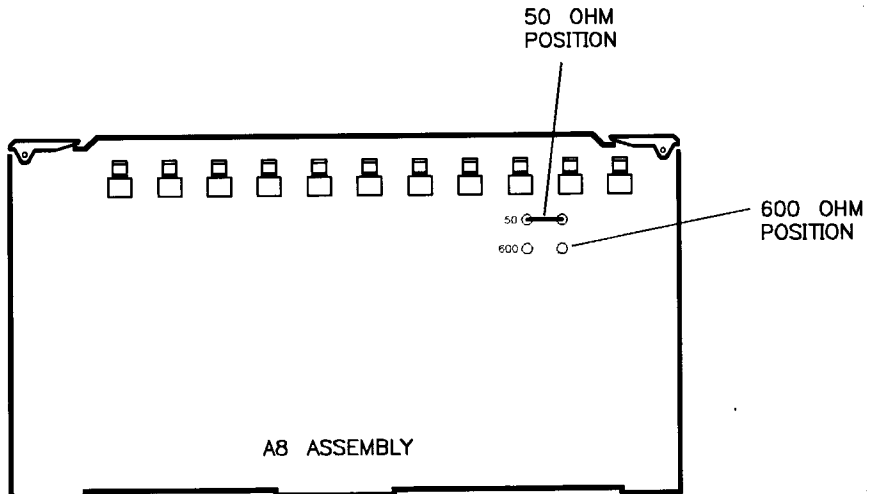


Figure 3-38. A8 Jumper Locations

Related Performance Tests

FM Accuracy
FM Bandwidth
Maximum FM Deviation

In Case of Difficulty

If the jumper is missing, see "Replaceable Parts".

22. Modulation Generator Flatness (Option 002)

Description and Procedure

The internal modulation generator is set up for FM operation. A 100 kHz rate, measured at the AM/FM OUTPUT connector, is used as the reference amplitude. A calibration constant is adjusted so the AM/FM output signal is the same amplitude as for a 1 MHz FM rate.

1. Connect the equipment as shown in Figure 3-39. Preset all instruments and let them warm up for at least one hour.

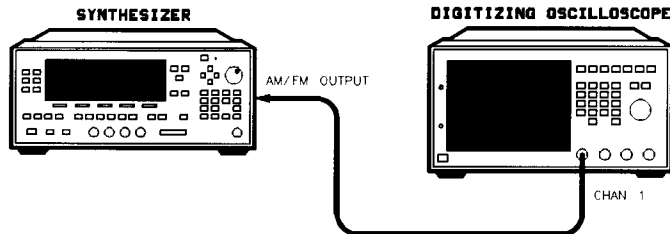


Figure 3-39. Modulation Generator Flatness Adjustment Setup

Equipment

| | |
|-------------------------|-----------|
| Digitizing Oscilloscope | HP 54111D |
|-------------------------|-----------|

2. On the synthesizer, press:

MOD FM Menu FM On/Off Int (asterisk on)

Internal FM Rate **100** **kHz** Internal FM Dev **8** **MHz**

PRIOR Monitor Menu ModOut On/Off FM

3. On the oscilloscope, set:

Channel 1

| | |
|-----------------|-------------|
| Display | On |
| Volts/Division | 210 mV |
| Input Coupling | dc |
| Input Impedance | 50 Ω |

Timebase
 Time/Division 2 μ s
 Delay Reference Center
 Sweep Auto

Trigger
 Trigger Mode Edge
 Trig Src Chan 1
 Slope Pos

Display
 Display Mode Repetitive
 Averaging Off
 Display Time 0.2 s

4. Adjust the oscilloscope vertical sensitivity controls to almost fill the graticule display with the sine wave. Do not let the sinewave be clipped. (Use the front panel keypad because the RPG changes the sensitivity in steps too large for this purpose.)
5. Use the measure feature of the oscilloscope to measure the amplitude of the sinewave. (If a SIGNAL CLIPPED message is displayed, repeat the vertical sensitivity adjustment until the message is no longer displayed when the signal is measured.)
 Record the amplitude of the sinewave _____ V p-p.
6. On the oscilloscope, change the timebase to 200 ns/div.
7. On the synthesizer, press:
 (FM Menu) Internal FM Rate (1) (MHz)
 (SERVICE) Adjust Menu Calib Menu Select Cal (274) (ENTER)
8. Press **Modify Cal** and, using the rotary knob, change the calibration constant until the sinewave displayed on the oscilloscope is the same amplitude (V p-p) as the recorded value. (The oscilloscope does not automatically update the measurement; continue to press the measure function as you change the calibration constant.)
9. If this is the last calibration constant you will be adjusting, see "Calibration Constants" to store the calibration constants as protected data (in EEPROM).

Related Performance Tests

FM Accuracy

In Case of Difficulty

Refer to the *Troubleshooting* manual.

23. External Trigger Edge Selection

Description and Procedure

No test equipment is required for this procedure.

This procedure sets the external trigger to trigger on either the leading or the trailing edge of a TTL signal. When the jumper (shown in Figure 3-40) is in the POS position a sweep is triggered on the leading edge of the pulse (when the signal changes from 0 to 5 volts). When the jumper is in the NEG position a sweep is triggered on the trailing edge of the pulse (when the signal changes from 5 to 0 volts).

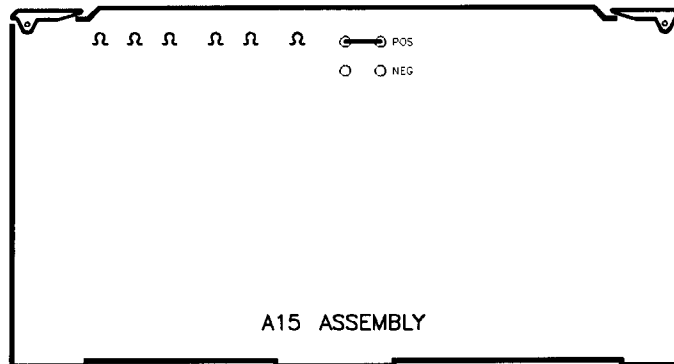


Figure 3-40. External Trigger Edge Selection Location

Triggering on the Leading Edge

1. Turn the synthesizer power off and lift up the A15 assembly far enough to access the jumper shown in Figure 3-40. In some instruments the jumper positions will be rotated to the left 90°. In these instruments the jumper vertically connects the two left points in the POS position and the two right points in the NEG position. (POS and NEG positions are labeled on all assemblies.)
2. The jumper is factory-set to the POS position (triggers on the leading edge). If the jumper has been moved to the NEG position move back it to the POS position. The synthesizer now triggers a sweep on the leading edge (a 0 to 5 volt change).
3. Reinstall the A15 assembly and turn synthesizer power on.

Triggering on the Trailing Edge

1. Turn the synthesizer power off and lift up the A15 assembly far enough to access the jumper shown in Figure 3-40. In some instruments the jumper positions will be rotated to the left 90°. In these instruments the jumper vertically connects the two left points in the POS position and the two right points in the NEG position. (POS and NEG positions are labeled on all assemblies.)
2. The jumper is factory-set to the POS position (triggers on the leading edge). To change it move the jumper to the NEG position. The synthesizer now triggers a sweep on the trailing edge (a 5 to 0 volt change).
3. Reinstall the A15 assembly and turn synthesizer power on.

24. Volts/GHz

Description and Procedure

No test equipment is required for this procedure.

A five-section switch on the A12 multiplier/filter driver assembly sets the volts/GHz scale for the rear panel V/GHz output connector. At the factory, synthesizers with a maximum frequency of ≤ 30 GHz are set to 0.5 V/GHz and higher frequency instruments are set to 0.25 V/GHz. The following procedure describes how to set the switch to scale the output.

1. Set A12S1 (shown in Figure 3-41) for the required volts/GHz scale according to the following table:

Note No damage results from setting the volts/GHz to a scale that is beyond the frequency limits given in the table however the volts/GHz will be inaccurate beyond the frequency limits.

| Volts/GHz Scale | Maximum Frequency | Switch Settings | | | | |
|-----------------|-------------------|-----------------|--------|--------|--------|-----|
| | | SW1 | SW2 | SW3 | SW4 | SW5 |
| 1 V/GHz | 20 GHz | closed | closed | closed | closed | X |
| 0.5 V/GHz | 40 GHz | open | open | closed | closed | X |
| 0.25 V/GHz | 50 GHz | open | open | open | open | X |

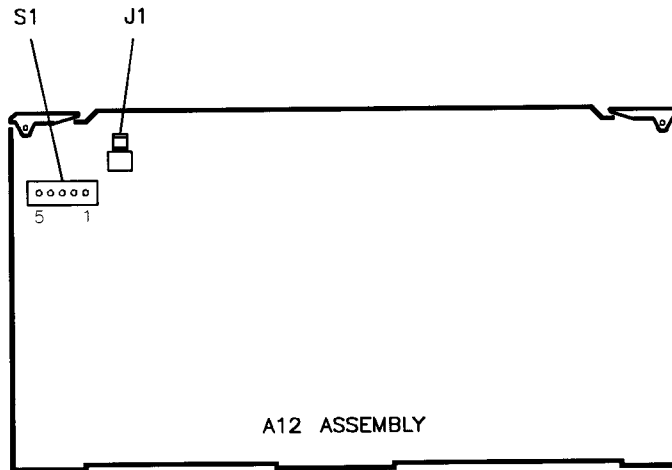


Figure 3-41. A12S1 Location

Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

Calibration Constants

Introduction

This section contains the following information on calibration constants and how to use them:

- Definition
- Memory Areas
- Checksum Verification
- Calibration Constant Password
- Changing Working Data Calibration Constants
- Saving Working Data Calibration Constants
- Loading Protected Data Calibration Constants
- Loading Default Data Calibration Constants
- Calibration Constant Descriptions

Definition

Calibration constants are data which describe your individual instrument. Calibration constants contain serial number prefix, hardware configuration, and board revision information. Calibration constants also contain calibration information specific to the operation of each instrument that is used to make sure that the instrument meets specifications.

Note Changing calibration constants can cause your instrument to *not* meet specifications.

Memory Areas

The synthesizer has three memory areas reserved for calibration constants:

Working Data

Working data is the set of calibration constants accessed during normal operation and contains the calibration information required for optimum instrument performance. Working data is stored in RAM, and is maintained by a 1 farad capacitor.

Protected Data

Protected data resides in EEPROM. This calibration data is essentially the same as working data, but is not dependent on the capacitor. If the synthesizer's checksum test fails, or if the capacitor becomes discharged and working data is lost, the synthesizer copies protected data values into working data RAM.

Note

If the synthesizer is unplugged for a period greater than five days, the capacitor will be completely discharged. After reconnecting the synthesizer to line power, the capacitor will be completely recharged after 24 hours.

Default Data

Default data resides in UVEPROM. This data differs from working and protected data in that it cannot be changed. This data represents a typical synthesizer, and is not optimized for your instrument. The default calibration constants are a starting point for calibration. The synthesizer will probably *not* meet specifications. The synthesizer uses default data if a problem exists in both working and protected data or if you select **Default Cal** in the calibration utility menu.

Checksum Verification

At instrument power on, the calibration constants stored in RAM are added and compared with the checksum value. If the two values match, the current calibration constants are maintained in RAM.

If the RAM checksum does not verify, the calibration constants are loaded into RAM from EEPROM. These calibration constants are added and compared with their checksum value. If the two values match, these calibration constants (from EEPROM) are maintained in RAM.

If the RAM checksum still does not verify, the default calibration constants are loaded into RAM from UVEPROM. A message is displayed on the synthesizer indicating that the default calibration constants are in use. The synthesizer will probably *not* meet performance specifications. All the performance tests should be run.

Calibration Constant Password

The synthesizer is shipped with a factory-set password. A password disables access to the adjustment menu unless the password is entered (see “Entering a Password”). Calibration constants *cannot* be manually altered without accessing the adjustment menu.

The following is the factory-set password: 8360 You can set a new password. See “Setting a Password”.

You can eliminate the password. See “Disabling a Password”.

If you have forgotten the password, or if you require access to the calibration constant adjustments for calibration purposes and do not know the password, see “Bypassing the Password”.

Entering a Password

An asterisk on the **Disable Adjust** softkey in the service menu indicates that a password is set. In order to access the adjustment menu you must enter that password:

1. On the synthesizer, set:

SERVICE Adjust Menu .

The following message is displayed: ENTER PASSWORD: 0

2. Enter the correct password using the numeric keypad and press **ENTER**.

The asterisk on the **Disable Adjust** softkey turns off.

3. Select **Adjust Menu** again to access the adjustment menu.

Entering the password allows permanent access to the adjustment menu, even if line power is cycled. To disable access again, set another password.

Disabling a Password

If you wish to eliminate a password (either the factory-set password or one you set yourself), perform the following:

1. On the synthesizer, set:

SERVICE Disable Adjust .

The following message is displayed: ENTER PASSWORD: 0

2. Enter the current password using the numeric keypad and press **ENTER**.

The asterisk on the **Disable Adjust** softkey turns off.

Disabling the password allows permanent access to the adjustment menu, even if line power is cycled.

Setting a Password

If a password is already set on the synthesizer and you wish to change it, first follow the “Disabling a Password” procedure. This eliminates the current password. Then continue with this procedure.

If no password is set on the synthesizer (there is no asterisk on the **Disable Adjust** softkey), and you wish to set a password, perform the following:

1. On the synthesizer, set:

SERVICE **Disable Adjust** .

The following message is displayed: SET PASSWORD: 0

2. Enter the desired password using the numeric keypad. Up to 14 numeric digits are allowed. Terminate the entry by pressing: **ENTER**.
3. A warning message is displayed informing you that the adjustment menus will no longer be accessible. To verify that you do wish to set the password, select **Yes, Confirm** .

The asterisk on the **Disable Adjust** softkey turns on, indicating the password is set.

Bypassing the Password

If you require access to the adjustment menu for calibration purposes, a password is set, and you do not know the password, perform the following:

1. Turn off line power to the synthesizer.
2. Open A15S1 switch 5 (set the switch to the "1" position).
3. Turn on line power to the synthesizer and press **SERVICE**.

The asterisk on the **Disable Adjust** softkey turns off enabling access to the adjustment menu.

When access to the adjustment menu is no longer desired, enable the previously set password. Perform the following:

4. Turn off line power to the synthesizer.

5. Close A15S1 switch 5 (set the switch to the "0" position).
6. Turn on line power to the synthesizer and press **SERVICE**.

The asterisk on the **Disable Adjust** softkey turns on indicating that you cannot access the adjustment menu.

If you have forgotten the password and wish to set a new one, perform steps 1 through 3 and then steps 7 through 10.

7. On the synthesizer, select **Disable Adjust**.

The following message is displayed: SET PASSWORD: 0

8. Enter the desired password using the numeric keypad. Up to 14 numeric digits are allowed. Terminate the entry by pressing: **ENTER**.
9. A warning message is displayed informing you that the adjustment menus will no longer be accessible. To verify that you do wish to set the password, select **Yes, Confirm**.
10. Another warning message is displayed informing you that the A15S1 switch 5 is set open. Complete steps 4 through 6 to close the switch and enable the password.

Changing Working Data Calibration Constants

If you need to modify the working data calibration constants, the following procedure accesses the calibration constants and lets you change them.

1. On the synthesizer, set:
SERVICE **Adjust Menu** **Calib Menu**.
2. Select **Select Cal**.

Enter the number of the calibration constant you wish to change using the up/down arrow keys, the rotary knob, or the numeric keypad. Terminate numeric keypad entries by pressing **ENTER**.
3. Select **Modify Cal**.

Change the value of the calibration constant using the right/left arrow keys, the rotary knob, or the numeric keypad. Terminate numeric keypad entries by pressing **ENTER**.

4. Exit the calibration menu using the **PRIOR** key or by pressing **PRESET**.

Saving Working Data Calibration Constants

In some adjustment procedures you will change working data calibration constants. The following procedure stores the calibration constants as protected data (in EEPROM).

1. On the synthesizer, set: **SERVICE Adjust Menu Calib Menu Cal Util Menu**.
2. Select **Save Cal**. A warning is displayed informing you that changing the calibration constants may drastically affect instrument performance. To verify that you do wish to save the new calibration constants, select **yes**.

The working data calibration constants are now stored as protected data (in EEPROM).
3. Exit the calibration utility menu using the **PRIOR** key or pressing **PRESET**.

Loading Protected Data Calibration Constants

If your working data calibration constants have been altered or deleted, the following procedure loads the protected calibration constants from EEPROM into working data memory.

1. On the synthesizer, set: **SERVICE Adjust Menu Calib Menu Cal Util Menu**.
2. Select **Recall Cal**.

A warning is displayed informing you that changing the calibration constants may drastically affect instrument performance. To verify that you do wish to recall the protected data calibration constants, select **yes**.

The protected data calibration constants are now loaded into working data.

3. Exit the calibration utility menu using the **PRIOR** key or pressing **PRESET**.

Loading Default Data Calibration Constants

If you want to use the generic synthesizer calibration constants as working data, the following procedure loads the default calibration constants from UVEPROM into working data memory.

1. On the synthesizer, set:
SERVICE Adjust Menu Calib Menu Cal Util Menu.
2. Select **Default Cal**.

A warning is displayed informing you that changing the calibration constants may drastically affect instrument performance. To verify that you do wish to recall the default calibration constants, select **yes**.

The default data calibration constants are now loaded into working data.

3. Exit the calibration utility menu using the **PRIOR** key or pressing **PRESET**.

Calibration Constant Descriptions

Table 4-9 provides the following information for each calibration constant:

- The calibration constant number in ascending order.
- The calibration constant name. An asterisk indicates that this calibration constant is adjusted by an automated adjustment.
- The range of realistic adjustment (adjustment outside of the range may be possible but will probably cause the synthesizer to be severely misadjusted)

or the default value (some calibration constants are set to a default value and are not adjustable).

- The related adjustment procedure, manual, automated, or front panel, that adjusts that calibration constant.

Note Blank calibration constants are reserved for future use.

Table 4-9. Calibration Constant Descriptions

| Number | Description | Range or Default | Related Adjustment |
|--------|---------------------|---|--------------------|
| 1 | Identifier Response | 0 — HP 83620A 1 — HP 83621A 2 — HP 83622A 3 — HP 83623A 4 — HP 83624A 5 — HP 83640A 6 — HP 83642A 7 — HP 8340B 8 — HP 83631A 9 — HP 8341B 10 — HP 83650A 11 — HP 83651A 12 — Not Used 13 — HP 83630A | |
| 2 | Dwell After RF On | 2 | |
| 3 | User Configuration | 0 | |
| 4 | Lockout Features | 0 | |
| 5 | Display Field Lock | 0 | |
| 6 | Retrace Dwell Time | 0 | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | Production Info 1 | 0 | |
| 17 | Production Info 2 | 0 | |
| 18 | Production Info 3 | Instrument specific | |
| 19 | Production Info 4 | Instrument specific | |
| 20 | Production Info 5 | Instrument specific | |
| 21 | Lock Dwell Time | 2 | |
| 22 | Max Ph Lk Wait | 100 | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|---------------------|------------------|---------------------|
| 23 | YO Slew Rate | 500 | |
| 24 | YO Kick Max | 6000 | |
| 25 | YO Settle Rate | 20 | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |
| 32 | | | |
| 33 | | | |
| 34 | | | |
| 35 | | | |
| 36 | YO Dly Term A Bnd 0 | 400 to 800 | YO Delay Adjustment |
| 37 | YO Dly Term A Bnd 1 | 400 to 800 | YO Delay Adjustment |
| 38 | YO Dly Term A Bnd 2 | 400 to 800 | YO Delay Adjustment |
| 39 | YO Dly Term A Bnd 3 | 400 to 800 | YO Delay Adjustment |
| 40 | YO Dly Term A Bnd 4 | 400 to 800 | YO Delay Adjustment |
| 41 | YO Dly Term A Bnd 5 | 400 to 800 | YO Delay Adjustment |
| 42 | YO Dly Term A Bnd 6 | 400 to 800 | YO Delay Adjustment |
| 43 | YO Dly Term A Bnd 7 | 400 to 800 | YO Delay Adjustment |
| 44 | | | |
| 45 | | | |
| 46 | | | |
| 47 | | | |
| 48 | | | |
| 49 | | | |
| 50 | YO Dly Term B Bnd 0 | 300 to 700 | YO Delay Adjustment |
| 51 | YO Dly Term B Bnd 1 | 300 to 700 | YO Delay Adjustment |
| 52 | YO Dly Term B Bnd 2 | 300 to 700 | YO Delay Adjustment |
| 53 | YO Dly Term B Bnd 3 | 300 to 700 | YO Delay Adjustment |
| 54 | YO Dly Term B Bnd 4 | 300 to 700 | YO Delay Adjustment |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|---------------------|------------------|------------------------------|
| 55 | YO Dly Term B Bnd 5 | 300 to 700 | YO Delay Adjustment |
| 56 | YO Dly Term B Bnd 6 | 300 to 700 | YO Delay Adjustment |
| 57 | YO Dly Term B Bnd 7 | 300 to 700 | YO Delay Adjustment |
| 58 | | | |
| 59 | | | |
| 60 | | | |
| 61 | | | |
| 62 | | | |
| 63 | | | |
| 64 | | | |
| 65 | | | |
| 66 | | | |
| 67 | | | |
| 68 | | | |
| 69 | | | |
| 70 | | | |
| 71 | | | |
| 72 | *CW Offset | -500 to +500 | YO Driver Gain And Linearity |
| 73 | YO Off Ver; Band 0 | 0 | |
| 74 | YO Off Ver; Band 1 | 0 | |
| 75 | YO Off Ver; Band 2 | 0 | |
| 76 | YO Off Ver; Band 3 | 0 | |
| 77 | YO Off Ver; Band 4 | 0 | |
| 78 | YO Off Ver; Band 5 | 0 | |
| 79 | YO Off Ver; Band 6 | 0 | |
| 80 | YO Off Ver; Band 7 | 0 | |
| 81 | | | |
| 82 | | | |
| 83 | | | |
| 84 | | | |
| 85 | | | |
| 86 | | | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|------------------|----------------------------|
| 87 | YO Swp Ver; Band 0 | 0 | |
| 88 | YO Swp Ver; Band 1 | 0 | |
| 89 | YO Swp Ver; Band 2 | 0 | |
| 90 | YO Swp Ver; Band 3 | 0 | |
| 91 | YO Swp Ver; Band 4 | 0 | |
| 92 | YO Swp Ver; Band 5 | 0 | |
| 93 | YO Swp Ver; Band 6 | 0 | |
| 94 | YO Swp Ver; Band 7 | 0 | |
| 95 | | | |
| 96 | | | |
| 97 | | | |
| 98 | | | |
| 99 | | | |
| 100 | | | |
| 101 | YTM Temp Coefficient | 0 | |
| 102 | | | |
| 103 | | | |
| 104 | | | |
| 105 | SRD Bias A; Band 1 | 255 | Amp/Multiplier Adjustments |
| 106 | SRD Bias A; Band 2 | 30 to 230 | Amp/Multiplier Adjustments |
| 107 | SRD Bias A; Band 3 | 30 to 230 | Amp/Multiplier Adjustments |
| 108 | SRD Bias A; Band 4 | 30 to 230 | Amp/Multiplier Adjustments |
| 109 | SRD Bias A; Band 5 | 30 to 230 | Amp/Multiplier Adjustments |
| 110 | SRD Bias A; Band 6 | 30 to 230 | Amp/Multiplier Adjustments |
| 111 | SRD Bias A; Band 7 | 30 to 230 | Amp/Multiplier Adjustments |
| 112 | | | |
| 113 | | | |
| 114 | | | |
| 115 | | | |
| 116 | | | |
| 117 | | | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|------------------|------------------------------|
| 118 | SRD Bias B; Band 1 | 255 | Amp/Multiplier Adjustments |
| 119 | SRD Bias B; Band 2 | 30 to 230 | Amp/Multiplier Adjustments |
| 120 | SRD Bias B; Band 3 | 30 to 230 | Amp/Multiplier Adjustments |
| 121 | SRD Bias B; Band 4 | 30 to 230 | Amp/Multiplier Adjustments |
| 122 | SRD Bias B; Band 5 | 30 to 230 | Amp/Multiplier Adjustments |
| 123 | SRD Bias B; Band 6 | 30 to 230 | Amp/Multiplier Adjustments |
| 124 | SRD Bias B; Band 7 | 30 to 230 | Amp/Multiplier Adjustments |
| 125 | | | |
| 126 | | | |
| 127 | | | |
| 128 | | | |
| 129 | | | |
| 130 | | | |
| 131 | Squegg Clamp 1A | 15 to 200 | Amplifier/Filter Adjustments |
| 132 | Squegg Clamp 2A | 255 | Amplifier/Filter Adjustments |
| 133 | Squegg Clamp 3A | 255 | Amplifier/Filter Adjustments |
| 134 | Squegg Clamp 4A | 255 | Amplifier/Filter Adjustments |
| 135 | Squegg Clamp 5A | 255 | Amplifier/Filter Adjustments |
| 136 | Squegg Clamp 6A | 255 | Amplifier/Filter Adjustments |
| 137 | Squegg Clamp 7A | 255 | Amplifier/Filter Adjustments |
| 138 | | | |
| 139 | | | |
| 140 | | | |
| 141 | | | |
| 142 | | | |
| 143 | | | |
| 144 | YTM Dly Term A Hrm 1 | 600 to 2000 | Amplifier/Filter Adjustments |
| 145 | YTM Dly Term A Hrm 2 | 600 to 2500 | Amplifier/Filter Adjustments |
| 146 | YTM Dly Term A Hrm 3 | 600 to 3000 | Amplifier/Filter Adjustments |
| 147 | YTM Dly Term A Hrm 4 | 600 to 2500 | Amplifier/Filter Adjustments |
| 148 | YTM Dly Term A Hrm 5 | 600 to 3000 | Amplifier/Filter Adjustments |
| 149 | YTM Dly Term A Hrm 6 | 600 to 3000 | Amplifier/Filter Adjustments |
| 150 | YTM Dly Term A Hrm 7 | 600 to 3000 | Amplifier/Filter Adjustments |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|------------------|------------------------------|
| 151 | | | |
| 152 | | | |
| 153 | | | |
| 154 | | | |
| 155 | | | |
| 156 | | | |
| 157 | YTM Dly Term B Hrm 1 | 200 to 500 | Amplifier/Filter Adjustments |
| 158 | YTM Dly Term B Hrm 2 | 200 to 500 | Amplifier/Filter Adjustments |
| 159 | YTM Dly Term B Hrm 3 | 200 to 500 | Amplifier/Filter Adjustments |
| 160 | YTM Dly Term B Hrm 4 | 200 to 500 | Amplifier/Filter Adjustments |
| 161 | YTM Dly Term B Hrm 5 | 200 to 500 | Amplifier/Filter Adjustments |
| 162 | YTM Dly Term B Hrm 6 | 200 to 500 | Amplifier/Filter Adjustments |
| 163 | YTM Dly Term B Hrm 7 | 200 to 500 | Amplifier/Filter Adjustments |
| 164 | | | |
| 165 | | | |
| 166 | | | |
| 167 | | | |
| 168 | | | |
| 169 | | | |
| 170 | YTM Bx Dly Term A 1 | 600 to 2000 | Amp/Multiplier Adjustments |
| 171 | YTM Bx Dly Term A 2 | 600 to 2500 | Amp/Multiplier Adjustments |
| 172 | YTM Bx Dly Term A 3 | 600 to 3000 | Amp/Multiplier Adjustments |
| 173 | YTM Bx Dly Term A 4 | 600 to 2500 | Amp/Multiplier Adjustments |
| 174 | YTM Bx Dly Term A 5 | 600 to 3000 | Amp/Multiplier Adjustments |
| 175 | YTM Bx Dly Term A 6 | 600 to 3000 | Amp/Multiplier Adjustments |
| 176 | YTM Bx Dly Term A 7 | 600 to 3000 | Amp/Multiplier Adjustments |
| 177 | | | |
| 178 | | | |
| 179 | | | |
| 180 | | | |
| 181 | | | |
| 182 | | | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|------------------|------------------------------|
| 183 | YTM Bx Dly Term B 1 | 200 to 500 | Amp/Multiplier Adjustments |
| 184 | YTM Bx Dly Term B 2 | 200 to 500 | Amp/Multiplier Adjustments |
| 185 | YTM Bx Dly Term B 3 | 200 to 500 | Amp/Multiplier Adjustments |
| 186 | YTM Bx Dly Term B 4 | 200 to 500 | Amp/Multiplier Adjustments |
| 187 | YTM Bx Dly Term B 5 | 200 to 500 | Amp/Multiplier Adjustments |
| 188 | YTM Bx Dly Term B 6 | 200 to 500 | Amp/Multiplier Adjustments |
| 189 | YTM Bx Dly Term B 7 | 200 to 500 | Amp/Multiplier Adjustments |
| 190 | | | |
| 191 | | | |
| 192 | | | |
| 193 | | | |
| 194 | | | |
| 195 | YTM Kick Threshold | 110 | Amp/Multiplier Adjustments |
| 196 | YTM CW Kick Max | 600 | Amp/Multiplier Adjustments |
| 197 | YTM Mono Band Kick | 2000 | Amp/Multiplier Adjustments |
| 198 | YTM Stereo Band Kick | 2000 | Amp/Multiplier Adjustments |
| 199 | YTM Slew Rate | 400 | Amp/Multiplier Adjustments |
| 200 | YTM Slew Max | 50 | |
| 201 | YTM Slew Min | 0 | |
| 202 | YTM Neg Kick Wait | 2 | |
| 203 | YTM Fwd Kick Pct | 50 | |
| 204 | YTM Fwd Kick Wait | 30 | |
| 205 | YTM Rise; Band 1 | 1 to 20 | Amplifier/Filter Adjustments |
| 206 | YTM Rise; Band 2 A1 | 20 to 25 | Amplifier/Filter Adjustments |
| 207 | YTM Rise; Band 2 B1 | 1 to 4 | Amplifier/Filter Adjustments |
| 208 | YTM Rise; Band 2 A2 | 10 to 20 | Amplifier/Filter Adjustments |
| 209 | YTM Rise; Band 3 A1 | 5 to 255 | Amplifier/Filter Adjustments |
| 210 | YTM Rise; Band 3 B1 | 0 to 50 | Amplifier/Filter Adjustments |
| 211 | YTM Rise; Band 3 A2 | 5 to 255 | Amplifier/Filter Adjustments |
| 212 | YTM Rise; Band 3 B2 | 0 to 50 | Amplifier/Filter Adjustments |
| 213 | YTM Rise; Band 3 A3 | 1 to 20 | Amplifier/Filter Adjustments |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|---------------------|------------------|---|
| 214 | YTM Rise; Band 4 | 1 to 50 | Amplifier/Filter Adjustments |
| 215 | YTM Rise; Band 5 | 1 to 50 | Amplifier/Filter Adjustments |
| 216 | YTM Rise; Band 6 | 1 to 50 | Amplifier/Filter Adjustments |
| 217 | YTM Rise; Band 7 | 1 to 50 | Amplifier/Filter Adjustments |
| 218 | | | |
| 219 | | | |
| 220 | | | |
| 221 | | | |
| 222 | | | |
| 223 | | | |
| 224 | | | |
| 225 | *YTM Gain; Band 1 | 1500 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 226 | *YTM Gain; Band 2 | 1000 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 227 | *YTM Gain; Band 3 | 500 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 228 | *YTM Gain; Band 4 | 500 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 229 | *YTM Gain; Band 5 | 500 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 230 | *YTM Gain; Band 6 | 500 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 231 | *YTM Gain; Band 7 | 500 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 232 | | | |
| 233 | | | |
| 234 | | | |
| 235 | | | |
| 236 | | | |
| 237 | | | |
| 238 | *YTM Offset; Band 1 | 1500 to 2500 | Amp/Multiplier Adjustments; Auto Track |
| 239 | *YTM Offset; Band 2 | 1500 to 3000 | Amp/Multiplier Adjustments; Auto Track |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|-----------------------|------------------|---|
| 240 | *YTM Offset; Band 3 | 1500 to 3000 | Amp/Multiplier Adjustments; Auto Track |
| 241 | *YTM Offset; Band 4 | 1500 to 3000 | Amp/Multiplier Adjustments; Auto Track |
| 242 | *YTM Offset; Band 5 | 1500 to 3000 | Amp/Multiplier Adjustments; Auto Track |
| 243 | *YTM Offset; Band 6 | 1500 to 3000 | Amp/Multiplier Adjustments; Auto Track |
| 244 | *YTM Offset; Band 7 | 1500 to 3000 | Amp/Multiplier Adjustments; Auto Track |
| 245 | | | |
| 246 | | | |
| 247 | | | |
| 248 | YTM B2 Offset Offset | -50 to +50 | Amp/Multiplier Adjustments |
| 249 | | | |
| 250 | | | |
| 251 | *LVL DAC Gain Hi Bnd | -100 to +100 | ALC Power Level Accuracy; Detector Cal |
| 252 | *LVL DAC Gain Lo Bnd | -100 to +100 | ALC Power Level Accuracy; Detector Cal |
| 253 | *LVL DAC Gain Xtal | -100 to +100 | Detector Cal |
| 254 | *LVL DAC Gain 2ndOut | 0 | |
| 255 | *LVL DAC Gain PwrMtr | -100 to +100 | |
| 256 | *LVL DAC Gain Module | -100 to +100 | |
| 257 | *LVL DAC Gain ALC Off | 0 | |
| 258 | | | |
| 259 | | | |
| 260 | | | |
| 261 | | | |
| 262 | | | |
| 263 | | | |
| 264 | *LVL DAC Ofs Hi Bnd | -50 to +300 | ALC Power Level Accuracy; Detector Cal |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|-----------------------|--------------------|--|
| 265 | *LVL DAC Ofc Lo Bnd | 100 to 250 | ALC Power Level Accuracy; Detector Cal |
| 266 | *LVL DAC Ofc Xtal | -1000 to +1000 | Detector Cal |
| 267 | *LVL DAC Ofc 2ndOut | 0 | |
| 268 | *LVL DAC Ofc PwrMtr | -100 to +100 | |
| 269 | *LVL DAC Ofc Module | -100 to +100 | |
| 270 | *LVL DAC Ofc ALC Off | 0 | |
| 271 | | | |
| 272 | | | |
| 273 | | | |
| 274 | Internal FM Flat | -10,000 to +10,000 | Modulation Generator Flatness |
| 275 | FM DAC Gain Trim | -1000 to +1000 | |
| 276 | AM DAC Gain Trim | -1000 to +1000 | |
| 277 | AM Offset | -20 to +20 | |
| 278 | | | |
| 279 | | | |
| 280 | | | |
| 281 | | | |
| 282 | | | |
| 283 | *ALC Det Ofc; Hi | 100 to 160 | ALC Power Level Accuracy; Detector Cal |
| 284 | *ALC Det Ofc; Lo | 100 to 160 | ALC Power Level Accuracy; Detector Cal |
| 285 | *ALC Det Ofc; Xtal | 100 to 160 | |
| 286 | *ALC Det Ofc; 2nd Out | 100 to 160 | |
| 287 | | | |
| 288 | | | |
| 289 | | | |
| 290 | | | |
| 291 | | | |
| 292 | *ALC Log Brkpt; Hi | 0 to 255 | ALC Power Level Accuracy; Detector Cal |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment | |
|--------|-----------------------|------------------|--|---------------------------|
| 293 | *ALC Log Brkpt; Lo | 0 to 255 | ALC Power Level Accuracy; Detector Cal | |
| 294 | *ALC Log Brkpt; Xtal | 0 to 255 | | |
| 295 | *ALC Log Brkpt; 2nd | 0 to 255 | | |
| 296 | | | | |
| 297 | | | | |
| 298 | | | | |
| 299 | | | | |
| 300 | | | | |
| 301 | *ALC Mod Gain; Band 0 | 100 to 200 | | Modulator Offset And Gain |
| 302 | *ALC Mod Gain; Band 1 | 100 to 200 | | Modulator Offset And Gain |
| 303 | *ALC Mod Gain; Band 2 | 70 to 200 | Modulator Offset And Gain | |
| 304 | *ALC Mod Gain; Band 3 | 70 to 200 | Modulator Offset And Gain | |
| 305 | *ALC Mod Gain; Band 4 | 100 to 200 | Modulator Offset And Gain | |
| 306 | *ALC Mod Gain; Band 5 | 50 to 150 | Modulator Offset And Gain | |
| 307 | *ALC Mod Gain; Band 6 | 50 to 150 | Modulator Offset And Gain | |
| 308 | *ALC Mod Gain; Band 7 | 50 to 150 | Modulator Offset And Gain | |
| 309 | | | | |
| 310 | | | | |
| 311 | | | | |
| 312 | | | | |
| 313 | | | | |
| 314 | | | | |
| 315 | ALC Mod Ofs; Band 0 | 50 to 150 | Modulator Offset And Gain | |
| 316 | ALC Mod Ofs; Band 1 | 50 to 150 | Modulator Offset And Gain | |
| 317 | ALC Mod Ofs; Band 2 | 150 to 220 | Modulator Offset And Gain | |
| 318 | ALC Mod Ofs; Band 3 | 150 to 220 | Modulator Offset And Gain | |
| 319 | ALC Mod Ofs; Band 4 | 100 to 200 | Modulator Offset And Gain | |
| 320 | ALC Mod Ofs; Band 5 | 100 to 200 | | |
| 321 | ALC Mod Ofs; Band 6 | 100 to 200 | | |
| 322 | ALC Mod Ofs; Band 7 | 100 to 200 | | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|---------------------|------------------|--------------------|
| 323 | | | |
| 324 | | | |
| 325 | | | |
| 326 | | | |
| 327 | | | |
| 328 | | | |
| 329 | Slow Sym Low Band | 100 to 160 | |
| 330 | Slow Sym High Band | 100 to 160 | |
| 331 | Attenuator Sw Point | -1000 | |
| 332 | | | |
| 333 | | | |
| 334 | | | |
| 335 | Squegg Clamp 1B | 100 | |
| 336 | Squegg Clamp 2B | 100 | |
| 337 | Squegg Clamp 3B | 100 | |
| 338 | Squegg Clamp 4B | 100 | |
| 339 | Squegg Clamp 5B | 100 | |
| 340 | Squegg Clamp 6B | 100 | |
| 341 | Squegg Clamp 7B | 100 | |
| 342 | | | |
| 343 | | | |
| 344 | | | |
| 345 | | | |
| 346 | | | |
| 347 | | | |
| 348 | | | |
| 349 | | | |
| 350 | | | |
| 351 | ADC 5V Range +OFF | -5000 to +5000 | ADC Adjustment |
| 352 | ADC 15V Range +OFF | -5000 to +5000 | ADC Adjustment |
| 353 | ADC 5V Range +GAIN | -1950 to +1950 | ADC Adjustment |
| 354 | ADC 15V Range +GAIN | -750 to +750 | ADC Adjustment |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|------------------|--------------------|
| 355 | ADC 5V Range -OFF | -5000 to +5000 | ADC Adjustment |
| 356 | ADC 15V Range -OFF | -5000 to +5000 | ADC Adjustment |
| 357 | ADC 5V Range -GAIN | -750 to +750 | ADC Adjustment |
| 358 | ADC 15V Range -GAIN | -1750 to +1950 | ADC Adjustment |
| 359 | | | |
| 360 | | | |
| 361 | | | |
| 362 | | | |
| 363 | | | |
| 364 | | | |
| 365 | | | |
| 366 | | | |
| 367 | PwrMtr Gain; Lo Band | 0 | |
| 368 | PwrMtr Gain; Hi Band | 0 | |
| 369 | Pwr Mtr Offset | 0 | |
| 370 | | | |
| 371 | | | |
| 372 | | | |
| 373 | YTM Dly Term C Hrm 1 | 0 | |
| 374 | YTM Dly Term C Hrm 2 | 0 | |
| 375 | YTM Dly Term C Hrm 3 | 0 | |
| 376 | YTM Dly Term C Hrm 4 | 0 | |
| 377 | YTM Dly Term C Hrm 5 | 0 | |
| 378 | YTM Dly Term C Hrm 6 | 0 | |
| 379 | YTM Dly Term C Hrm 7 | 0 | |
| 380 | | | |
| 381 | | | |
| 382 | YTM Bx Dly Term C 1 | 0 | |
| 383 | YTM Bx Dly Term C 2 | 0 | |
| 384 | YTM Bx Dly Term C 3 | 0 | |
| 385 | YTM Bx Dly Term C 4 | 0 | |
| 386 | YTM Bx Dly Term C 5 | 0 | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|-----------------------|------------------|--------------------|
| 387 | YTM Bx Dly Term C 6 | 0 | |
| 388 | YTM Bx Dly Term C 7 | 0 | |
| 389 | | | |
| 390 | | | |
| 391 | | | |
| 392 | | | |
| 393 | *Loop Gain: 200.0 MHz | 10 to 20 | Sampler Assembly |
| 394 | *Loop Gain: 200.5 MHz | 10 to 20 | Sampler Assembly |
| 395 | *Loop Gain: 201.0 MHz | 10 to 20 | Sampler Assembly |
| 396 | *Loop Gain: 201.5 MHz | 10 to 20 | Sampler Assembly |
| 397 | *Loop Gain: 202.0 MHz | 10 to 20 | Sampler Assembly |
| 398 | *Loop Gain: 202.5 MHz | 10 to 20 | Sampler Assembly |
| 399 | *Loop Gain: 203.0 MHz | 10 to 20 | Sampler Assembly |
| 400 | *Loop Gain: 203.5 MHz | 10 to 20 | Sampler Assembly |
| 401 | *Loop Gain: 204.0 MHz | 10 to 20 | Sampler Assembly |
| 402 | *Loop Gain: 204.5 MHz | 10 to 20 | Sampler Assembly |
| 403 | *Loop Gain: 205.0 MHz | 10 to 20 | Sampler Assembly |
| 404 | *Loop Gain: 205.5 MHz | 10 to 20 | Sampler Assembly |
| 405 | *Loop Gain: 206.0 MHz | 10 to 20 | Sampler Assembly |
| 406 | *Loop Gain: 206.5 MHz | 10 to 20 | Sampler Assembly |
| 407 | *Loop Gain: 207.0 MHz | 10 to 20 | Sampler Assembly |
| 408 | *Loop Gain: 207.5 MHz | 10 to 20 | Sampler Assembly |
| 409 | *Loop Gain: 208.0 MHz | 10 to 20 | Sampler Assembly |
| 410 | *Loop Gain: 208.5 MHz | 10 to 20 | Sampler Assembly |
| 411 | *Loop Gain: 209.0 MHz | 10 to 20 | Sampler Assembly |
| 412 | *Loop Gain: 209.5 MHz | 10 to 20 | Sampler Assembly |
| 413 | *Loop Gain: 210.0 MHz | 10 to 20 | Sampler Assembly |
| 414 | *Loop Gain: 210.5 MHz | 10 to 20 | Sampler Assembly |
| 415 | *Loop Gain: 211.0 MHz | 10 to 20 | Sampler Assembly |
| 416 | *Loop Gain: 211.5 MHz | 12 to 24 | Sampler Assembly |
| 417 | *Loop Gain: 212.0 MHz | 13 to 26 | Sampler Assembly |
| 418 | *Loop Gain: 212.5 MHz | 14 to 28 | Sampler Assembly |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|-----------------------|------------------|------------------------------|
| 419 | *Loop Gain: 213.0 MHz | 14 to 28 | Sampler Assembly |
| 420 | *Loop Gain: 213.5 MHz | 15 to 30 | Sampler Assembly |
| 421 | *Loop Gain: 214.0 MHz | 16 to 32 | Sampler Assembly |
| 422 | *Loop Gain: 214.5 MHz | 17 to 34 | Sampler Assembly |
| 423 | *Loop Gain: 215.0 MHz | 18 to 36 | Sampler Assembly |
| 424 | *Loop Gain: 215.5 MHz | 18 to 36 | Sampler Assembly |
| 425 | *Loop Gain: 216.0 MHz | 19 to 38 | Sampler Assembly |
| 426 | *Loop Gain: 216.5 MHz | 20 to 40 | Sampler Assembly |
| 427 | *Loop Gain: 217.0 MHz | 22 to 44 | Sampler Assembly |
| 428 | *Loop Gain: 217.5 MHz | 23 to 46 | Sampler Assembly |
| 429 | *Loop Gain: 218.0 MHz | 24 to 48 | Sampler Assembly |
| 430 | *Loop Gain: 218.5 MHz | 28 to 56 | Sampler Assembly |
| 431 | *Loop Gain: 219.0 MHz | 30 to 60 | Sampler Assembly |
| 432 | *Loop Gain: 219.5 MHz | 32 to 64 | Sampler Assembly |
| 433 | *Loop Gain: 220.0 Mhz | 32 to 64 | Sampler Assembly |
| 434 | | | |
| 435 | | | |
| 436 | | | |
| 437 | | | |
| 438 | | | |
| 439 | | | |
| 440 | Doubler Amp Mode | 0 | |
| 441 | Phuoc Magic Enable | 0 | |
| 442 | *Sweeptime Range 0 | 3750 to 6250 | Sweep Ramp |
| 443 | *Sweeptime Range 1 | 19655 to 32755 | Sweep Ramp |
| 444 | *Sweeptime Range 2 | 9360 to 15600 | Sweep Ramp |
| 445 | | | |
| 446 | | | |
| 447 | | | |
| 448 | | | |
| 449 | Damp Clamp 1 | 75 to 250 | Amplifier/Filter Adjustments |
| 450 | Damp Clamp 2 | 75 to 250 | Amplifier/Filter Adjustments |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|--------------------|------------------|------------------------------|
| 451 | DAMP Clamp 3 | 75 to 250 | Amplifier/Filter Adjustments |
| 452 | DAMP Clamp 4 | 75 to 250 | Amplifier/Filter Adjustments |
| 453 | DAMP Clamp 5 | 75 to 255 | |
| 454 | DAMP Clamp 6 | 75 to 255 | |
| 455 | DAMP Clamp 7 | 75 to 255 | |
| 456 | | | |
| 457 | | | |
| 458 | | | |
| 459 | | | |
| 460 | Debugs | 0 | |
| 461 | Serial Numb Prefix | See footnote 1 | |
| 462 | | | |
| 463 | Hardware Config 1 | See footnote 1 | |
| 464 | Hardware Config 2 | See footnote 1 | |
| 465 | | | |
| 466 | | | |
| 467 | | | |
| 468 | | | |
| 469 | | | |
| 470 | | | |
| 471 | | | |
| 472 | | | |
| 473 | Power Spec Band 0 | See footnote 2 | |
| 474 | Power Spec Band 1 | See footnote 2 | |
| 475 | Power Spec Band 2 | See footnote 2 | |
| 476 | Power Spec Band 3 | See footnote 2 | |
| 477 | Power Spec Band 4 | See footnote 2 | |
| 478 | Power Spec Band 5 | See footnote 2 | |
| 479 | Power Spec Band 6 | See footnote 2 | |
| 480 | Power Spec Band 7 | See footnote 2 | |
| 481 | | | |
| 482 | | | |
| 483 | | | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|---------------------|------------------|--------------------|
| 484 | | | |
| 485 | | | |
| 486 | | | |
| 487 | Max Sweep Rate | 300 | |
| 488 | Max Sweep Rate 8516 | 100 | |
| 489 | | | |
| 490 | | | |
| 491 | | | |
| 492 | | | |
| 493 | A1 Revision | See footnote 3 | |
| 494 | A2 Revision | See footnote 3 | |
| 495 | A3 Revision | See footnote 3 | |
| 496 | A4 Revision | See footnote 3 | |
| 497 | A5 Revision | See footnote 3 | |
| 498 | A6 Revision | See footnote 3 | |
| 499 | A7 Revision | See footnote 3 | |
| 500 | A8 Revision | See footnote 3 | |
| 501 | A9 Revision | See footnote 3 | |
| 502 | A10 Revision | See footnote 3 | |
| 503 | A11 Revision | See footnote 3 | |
| 504 | A12 Revision | See footnote 3 | |
| 505 | A13 Revision | See footnote 3 | |
| 506 | A14 Revision | See footnote 3 | |
| 507 | A15 Revision | See footnote 3 | |
| 508 | A16 Revision | See footnote 3 | |
| 509 | A17 Revision | See footnote 3 | |
| 510 | A18 Revision | See footnote 3 | |
| 511 | A19 Revision | See footnote 3 | |
| 512 | A20 Revision | See footnote 3 | |
| 513 | A21 Revision | See footnote 3 | |
| 514 | A22 Revision | See footnote 3 | |
| 515 | A23 Revision | See footnote 3 | |
| 516 | | | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|-------------------|------------------|--------------------|
| 517 | | | |
| 518 | | | |
| 519 | | | |
| 520 | | | |
| 521 | | | |
| 522 | | | |
| 523 | | | |
| 524 | | | |
| 525 | Hibernation Time | 90 | |
| 526 | Bandcross Time 1 | 42 | |
| 527 | Bandcross Time 2 | 32 | |
| 528 | Bandcross Time 3 | 28 | |
| 529 | Bandcross Time 4 | 26 | |
| 530 | Bandcross Time 5 | 28 | |
| 531 | Bandcross Time 6 | 20 | |
| 532 | Bandcross Time 7 | 20 | |
| 533 | | | |
| 534 | | | |
| 535 | | | |
| 536 | Special Option 1 | 0 | |
| 537 | Special Option 2 | 0 | |
| 538 | Special Option 3 | 0 | |
| 539 | Special Option 4 | 0 | |
| 540 | Special Option 5 | 0 | |
| 541 | Special Option 6 | 0 | |
| 542 | Special Option 7 | 0 | |
| 543 | Special Option 8 | 0 | |
| 544 | Special Option 9 | 0 | |
| 545 | Special Option 10 | 0 | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|------------------|--------------------|
| 546 | | | |
| 547 | | | |
| 548 | | | |
| 549 | | | |
| 550 | | | |
| 551 | | | |
| 552 | | | |
| 553 | | | |
| 554 | Display FIFO Time | 245 | |
| 555 | Display FSCC Time | 1 | |
| 556 | | | |
| 557 | | | |
| 558 | | | |
| 559 | | | |
| 560 | | | |
| 561 | YTF Dly Term A Hrm 1 | 1000 | |
| 562 | YTF Dly Term A Hrm 2 | 1000 | |
| 563 | YTF Dly Term A Hrm 3 | 1000 | |
| 564 | YTF Dly Term A Hrm 4 | 1000 | |
| 565 | YTF Dly Term A Hrm 5 | 1000 | |
| 566 | YTF Dly Term A Hrm 6 | 1000 | |
| 567 | YTF Dly Term A Hrm 7 | 1000 | |
| 568 | | | |
| 569 | | | |
| 570 | | | |
| 571 | YTF Dly Term B Hrm 1 | 300 | |
| 572 | YTF Dly Term B Hrm 2 | 300 | |
| 573 | YTF Dly Term B Hrm 3 | 300 | |
| 574 | YTF Dly Term B Hrm 4 | 300 | |
| 575 | YTF Dly Term B Hrm 5 | 300 | |
| 576 | YTF Dly Term B Hrm 6 | 300 | |
| 577 | YTF Dly Term B Hrm 7 | 300 | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|------------------|------------------------------|
| 578 | | | |
| 579 | | | |
| 580 | | | |
| 581 | YTF Dly Term C Hrm 1 | 0 | |
| 582 | YTF Dly Term C Hrm 2 | 0 | |
| 583 | YTF Dly Term C Hrm 3 | 0 | |
| 584 | YTF Dly Term C Hrm 4 | 0 | |
| 585 | YTF Dly Term C Hrm 5 | 0 | |
| 586 | YTF Dly Term C Hrm 6 | 0 | |
| 587 | YTF Dly Term C Hrm 7 | 0 | |
| 588 | | | |
| 589 | | | |
| 590 | | | |
| 591 | YTF Bx Dly Term A 1 | 1000 | |
| 592 | YTF Bx Dly Term A 2 | 1000 | |
| 593 | YTF Bx Dly Term A 3 | 600 to 2500 | |
| 594 | YTF Bx Dly Term A 4 | 600 to 2500 | |
| 595 | YTF Bx Dly Term A 5 | 1000 | |
| 596 | YTF Bx Dly Term A 6 | 1000 | |
| 597 | YTF Bx Dly Term A 7 | 1000 | |
| 598 | | | |
| 599 | | | |
| 600 | | | |
| 601 | YTF Bx Dly Term B 1 | 300 | Amplifier/Filter Adjustments |
| 602 | YTF Bx Dly Term B 2 | 300 | Amplifier/Filter Adjustments |
| 603 | YTF Bx Dly Term B 3 | 200 to 450 | Amplifier/Filter Adjustments |
| 604 | YTF Bx Dly Term B 4 | 200 to 450 | Amplifier/Filter Adjustments |
| 605 | YTF Bx Dly Term B 5 | 300 | Amplifier/Filter Adjustments |
| 606 | YTF Bx Dly Term B 6 | 300 | Amplifier/Filter Adjustments |
| 607 | YTF Bx Dly Term B 7 | 300 | Amplifier/Filter Adjustments |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|---------------------|------------------|------------------------------|
| 608 | | | |
| 609 | | | |
| 610 | | | |
| 611 | YTF Bx Dly Term C 1 | 0 | |
| 612 | YTF Bx Dly Term C 2 | 0 | |
| 613 | YTF Bx Dly Term C 3 | 0 | |
| 614 | YTF Bx Dly Term C 4 | 0 | |
| 615 | YTF Bx Dly Term C 5 | 0 | |
| 616 | YTF Bx Dly Term C 6 | 0 | |
| 617 | YTF Bx Dly Term C 7 | 0 | |
| 618 | | | |
| 619 | | | |
| 620 | | | |
| 621 | *YTF Gain; Band 1 | 1500 to 2500 | Amplifier/Filter Adjustments |
| 622 | *YTF Gain; Band 2 | 1000 to 2500 | Amplifier/Filter Adjustments |
| 623 | *YTF Gain; Band 3 | 500 to 2500 | Amplifier/Filter Adjustments |
| 624 | *YTF Gain; Band 4 | 500 to 2500 | Amplifier/Filter Adjustments |
| 625 | *YTF Gain; Band 5 | 500 to 2500 | Amplifier/Filter Adjustments |
| 626 | *YTF Gain; Band 6 | 500 to 2500 | Amplifier/Filter Adjustments |
| 627 | *YTF Gain; Band 7 | 500 to 2500 | Amplifier/Filter Adjustments |
| 628 | | | |
| 629 | | | |
| 630 | | | |
| 631 | *YTF Offset; Band 1 | 1500 to 2500 | Amplifier/Filter Adjustments |
| 632 | *YTF Offset; Band 2 | 1500 to 3000 | Amplifier/Filter Adjustments |
| 633 | *YTF Offset; Band 3 | 1500 to 3000 | Amplifier/Filter Adjustments |
| 634 | *YTF Offset; Band 4 | 1500 to 3000 | Amplifier/Filter Adjustments |
| 635 | *YTF Offset; Band 5 | 1500 to 3000 | Amplifier/Filter Adjustments |
| 636 | *YTF Offset; Band 6 | 1500 to 3000 | Amplifier/Filter Adjustments |
| 637 | *YTF Offset; Band 7 | 1500 to 3000 | Amplifier/Filter Adjustments |
| 638 | | | |
| 639 | | | |
| 640 | | | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|----------------------|--|--------------------|
| 641 | A24 Rev;Low Band | See footnote 3 | |
| 642 | A25 Rev;Mod Splitter | See footnote 3 | |
| 643 | A26 Rev;YIG Osc | See footnote 3 | |
| 644 | A27 Rev;Isolator | See footnote 3 | |
| 645 | A28 Rev;SYTM | See footnote 3 | |
| 646 | A29 Rev;Amp/Detector | See footnote 3 | |
| 647 | A30 Rev;Coupler | See footnote 3 | |
| 648 | A31 Rev;Attenuator | See footnote 3 | |
| 649 | A32 Rev;Doublers | See footnote 3 | |
| 650 | A33 Rev;Amplifier | See footnote 3 | |
| 651 | A34 Rev;RP Assembly | See footnote 3 | |
| 652 | A35 Rev;Isolator | See footnote 3 | |
| 653 | A36 PM/A42 PMSF Rev | See footnote 3 | |
| 654 | | | |
| 655 | A38 Rev;Dual Mod | See footnote 3 | |
| 656 | | | |
| 657 | | | |
| 658 | | | |
| 659 | | | |
| 660 | Quick Step Slew 0 | 120 — A13 Revision=4 5 — All others | |
| 661 | Quick Step Slew 1 | 120 — A13 Revision=4 5 — All others | |
| 662 | Quick Step Slew 2 | 60 — A13 Revision=4 10 — All others | |
| 663 | Quick Step Slew 3 | 40 — A13 Revision=4 15 — All others | |
| 664 | Quick Step Slew 4 | 30 — A13 Revision=4 17 — All others | |
| 665 | Quick Step Slew 5 | 20 — A13 Revision=4 26 — All others | |
| 666 | Quick Step Slew 6 | 20 — A13 Revision=4 26 — All others | |
| 667 | Quick Step Slew 7 | 15 — A13 Revision=4 35 — All others | |

Table 4-9. Calibration Constant Descriptions (continued)

| Number | Description | Range or Default | Related Adjustment |
|--------|--------------------|------------------|--------------------|
| 668 | | | |
| 669 | | | |
| 670 | RF Interface ID | 0 | |
| 671 | A9 Pulse Board ID | See footnote 3 | |
| 672 | A12 YTM Driver ID | See footnote 3 | |
| 673 | A28 Amp/Mult ID | See footnote 3 | |
| 674 | A29 Amp/Filt ID | See footnote 3 | |
| 675 | A38 Dual Mod ID | See footnote 3 | |
| 676 | A36 PM/A42 PMSF ID | See footnote 3 | |
| 677 | A32 Doubler ID | See footnote 3 | |
| 678 | A10 ALC Board ID | See footnote 3 | |
| 679 | | | |
| 680 | | | |
| 681 | | | |
| 682 | | | |
| 683 | | | |
| 684 | | | |
| 685 | | | |
| 686 | | | |
| 687 | | | |
| 688 | | | |
| 689 | | | |
| 690 | | | |

¹ Specific to the synthesizer's hardware configuration. The calibration constant value is set at the factory. See Table 4-10.

² Specified maximum leveled power for the band (for example, 7 dBm equals 700, 10 dBm equals 1000).

³ Specific to the synthesizer's hardware configuration. The calibration constant ID number and revision vary depending on the assembly version. See Table 4-11.

Table 4-10.
Hardware Configuration Cal Constants #463 and #464

| Synthesizer Model Number | #463 Hardware Config 1 | | | | | | #464 Hardware Config 2 | |
|--------------------------|------------------------|------------|------------|------------|------------|------------|------------------------|------------|
| | Starting Cal Constant | Option 001 | Option 002 | Option 004 | Option 006 | Option H10 | Starting Value | Option 006 |
| HP83620A | +19,600 | -128 | +4 | +4096 | +2 | -127 | +1 | +2 |
| HP83622A | +19,584 | -128 | +4 | +4096 | +2 | -127 | +1 | +2 |
| HP83623A | +19,608 | -128 | +4 | +4096 | +2 | -127 | +1 | +2 |
| HP83624A | +19,592 | -128 | +4 | +4096 | +2 | -127 | +1 | +2 |
| HP83630A | +19,600 | -128 | +4 | +4096 | +2 | -127 | +1 | +2 |
| HP83640A | +19,632 | -128 | +4 | +4096 | +2 | -127 | +1 | +2 |
| HP83642A | +160 | -128 | +4 | +4096 | - | -127 | - | - |
| HP83650A | +19,888 | -128 | +4 | +4096 | +2 | -127 | +1 | +2 |
| HP83621A | +30,864 | - | - | - | - | - | - | - |
| HP83631A | +30,864 | - | - | - | - | - | - | - |
| HP83651A | +32,176 | - | - | - | - | - | - | - |

Note

This table applies only to instruments with the following serial prefixes:

- HP 83620A/22A: 3145A and greater
- HP 83623A/24A: 3145A and greater
- HP 83630A: 3103A and greater
- HP 83640A: 3145A and greater
- HP 83650A: 3052A and greater
- HP 83621A/31A: 3103A and greater
- HP 83651A: 3044A and greater

Option H10 and all other options are *mutually exclusive*.

Example: Calibration constant #463

$$\begin{array}{r} \text{HP 83620A} + 001 + 004 = ? \\ 19,600 \quad - 128 + 4096 = 23,568 \end{array}$$

Example: Calibration constant #464

$$\begin{array}{r} \text{HP 83623A} + 006 = ? \\ 1 \quad + \quad 2 = 3 \end{array}$$

**Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and
Revisions**

| Assembly | ID Number | Revision | Part Number | Description |
|----------|------------------------------------|------------------------------------|---|--|
| A1 | None | #493 0 | 08360-60001 | Keyboard |
| A2 | None | #493 0 | 08360-60002 | Source Module Interface |
| A3 | None | #495 0 | 08360-60003 | Front Panel Processor |
| A4 | None | #496 0 | 08360-60010 | Fractional-N |
| A5 | None | #497 0 1 | 08360-60009 08360-60209 | YO Phase Detector YO Phase Detector |
| A6 | None | #498 0 1 1 | 08360-60007 08360-60007 08360-60214 | Sampler (With VCO Adj.) Sampler (No VCO Adj.) Sampler (No VCO Adj.) |
| A7 | None | #499 0 1 | 08360-60008 | Reference Future Use |
| A8 | None | #500 0 | 08360-60166 | Modulation Generator |
| A9 | #671 0 0 0 1 1 2 | #501 0 1 2 0 0 0 | 08360-60005 08360-60152 08360-60205 08360-60188 08360-60232 | Pulse Pulse (Opt. 006 Compatible) Pulse (Dual Slope Squegg Clamp) Pulse (Self Bias SRD) Pulse (Self Bias SRD) Pulse (HP 83630A H35) |

**Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and
Revisions (continued)**

| Assembly | ID Number | Revision | Part Number | Description |
|----------|-----------|-------------|---------------------------------------|-------------------------------|
| A10 | #678 | #502 | | |
| | 0 | 0 | 08360-60006 | ALC |
| | 1 | 0 | 08360-60206 | ID # begins FW rev 23Oct92 |
| | 0 | 0 | 08360-60222 | |
| A11 | None | #503 | | |
| | | 0 | 08360-60011 | FM Driver |
| A12 | #672 | #504 | | |
| | 0 | 0 | 08360-60012 | SYTM Driver |
| | 1 | 0 | 08360-60212 | Multiplier/Filter Driver |
| A13 | None | #505 | | |
| | | 0 | 08360-60013 | Never Used |
| | | 1 | 08360-60013 | YO Driver |
| | | 2 | | Never Used |
| | | 3 | 08360-60213 | YO Driver (HP 83621A/31A/51A) |
| | 4 | 08360-60207 | YO Driver (Quick Step) | |
| A14 | None | #506 | | |
| | | 0 | 08360-60014 | Sweep Generator |
| A15 | None | #507 | | |
| | | 1 | 08360-60264 | CPU (Battery) 2 ROM Chip Set |
| | | 0 | 08360-60015 | CPU (Battery) 4 ROM Chip Set |
| | 1 | 08360-60215 | CPU (Supercap/Battery) 2 ROM Chip Set | |
| A16 | None | #508 | | |
| | | 0 | 08360-60016 | Post Regulator |
| A17 | None | #509 | | |
| | | 0 | 08360-60017 | Rectifier/Filter |
| A18 | None | #510 | | |
| | | 0 | 08360-60018 | Switching Regulator |
| | 0 | 08360-60198 | Switching Regulator | |

**Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and
Revisions (continued)**

| Assembly | ID Number | Revision | Part Number | Description |
|----------|--------------------------|--------------------------|--|--|
| A19 | None | #511 0 | 08360-60019 | Rear Panel Interface |
| A20 | #670 0 0 0 0 | #512 1 1 1 2 | 08360-60004 08360-60187 08360-60223 08360-60241 | RF Interface RF Interface RF Interface RF Interface |
| A21 | None | #513 0 | 1990-1295 | Alphanumeric Display |
| A22 | None | #514 0 0 | 08360-60196 08360-60022 | Motherboard Motherboard |
| A23 | None | #515 0 | HP 10811E | 10 MHz Reference Standard |
| A24 | None | #641 0 | 5086-7463 | Low Band |
| A25 | None | #642 0 1 | 5086-7464 | Mod Splitter Directional Coupler |
| A26 | None | #643 0 0 | 5086-7505 5086-7515 | YO YO |
| A27 | None | #644 0 | 0955-0475 | Isolator |

**Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and
Revisions (continued)**

| Assembly | ID Number | Revision | Part Number | Description |
|----------|-----------|----------|-------------|---|
| A28 | #673 | #645 | | |
| | 0 | 0 | 5086-7503 | SYTM |
| | 0 | 0 | 5086-7545 | SYTM |
| | 1 | 0 | 5086-7596 | Switched Amp/Mult (HP 83621A/31A) |
| | 1 | 1 | 5086-7596 | Switched Amp/Mult (HP 83630A H35) |
| | 2 | 0 | 5086-7585 | Amp/Mult (HP 83651A) |
| | 2 | 1 | 5086-7622 | Amp/Mult (HP 83630A/50A) |
| | 2 | 2 | 5086-7622 | Amp/Mult with Aux Out |
| A29 | #674 | #646 | | |
| | 0 | 0 | 5086-7562 | Amp/Detector (HP 83620A/22A, HP 83623A/24A, HP 83640A/42A) |
| | 1 | 0 | 5086-7586 | Amp/Filter (HP 83651A) |
| | 1 | 1 | 5086-7623 | Amp/Filter (HP 83630A/40A/50A) |
| | 2 | 0 | | Dassault Amp/Filter #73 |
| | 2 | 1 | 5086-7636 | Amp/Filter (HP 83630A/40A/50A Option 006) |
| | 4 | 0 | | Future Use |
| A30 | None | #647 | | |
| | | 0 | 0955-0148 | Directional Coupler (HP 83620A/22A, HP 83623A/24A) |
| | | 0 | 0955-0125 | Directional Coupler (HP 83630A/31A) |
| | | 0 | 0955-0472 | Directional Coupler (HP 83640A/42A) |
| | | 0 | 0955-0523 | Directional Coupler (HP 83650A/51A) |
| A31 | None | #648 | | |
| | | 0 | 33326-60003 | Step Attenuator |
| | | 0 | 33326-60002 | Step Attenuator |
| A32 | #677 | #649 | | |
| | 0 | 0 | 5086-7507 | Frequency Doubler (40 GHz) |
| | 0 | 1 | 5086-7607 | Frequency Doubler (40 GHz) |
| | 1 | 1 | 5086-7513 | Frequency Doubler (50 GHz) |
| A33 | None | #650 | | |
| | | 0 | 5086-7465 | Amplifier (High Power) |

**Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and
Revisions (continued)**

| Assembly | ID Number | Revision | Part Number | Description |
|----------|--------------------------|--------------------------|--|--|
| A34 | None | #651 0 | 08360-60061 | RP Floating BNC |
| A35 | None | #652 0 | 0955-0475 | Isolator |
| A36 | #676 0 0 0 | #653 0 1 1 | 5086-7565 5086-7582 5086-7588 | Pulse Modulator (Option 006) Pulse Modulator (Option H06) Pulse Modulator (Option H07) |
| A37 | | | | |
| A38 | #675 0 1 2 | #655 0 0 0 | 5086-7602 5086-7634 | Dual Modulator (HP 83630A H35) Dual Modulator (HP 83630A/50A) AM Modulator (Option 006) |
| A42 | #676 0 0 1 1 | #653 1 1 1 1 | 5086-7628 5086-7629 5086-7630 5086-7631 | Pulse Mod Switched Filter (HP 83620A/22A Opt. 006) Pulse Mod Switched Filter (HP 83623A/24A Opt. 006) Pulse Mod Switched Filter (HP 83630A Opt. 006) Pulse Mod Switched Filter (HP 83640A/50A Opt. 006) |

Automated Tests

Introduction

This chapter explains how to load and run the “HP 8360 Service Support Software” revision A.01.31. Revisions lower than A.01.31 are not compatible with instruments with Option 006. These tests require operator interaction.

This software requires that the synthesizer is set to the SCPI programming language. This is set by the rear panel switch or by the front panel. Refer to the “Installation” chapter of the *User’s Handbook* for further information. After using the software, return the synthesizer to its original setting.

This chapter contains the following information on using the software:

- Setting Up the System
- Installing the Software
- Running the Software
- Reporting Software Bugs
- Automated Performance Tests
 - Step Attenuator Flatness Test
 - Power Flatness and Accuracy Test
- Automated Adjustments
 - Step Attenuator Flatness Adjustment
 - YO Delay Adjustment
 - ADC Adjustment
 - Power Flatness Adjustment
- Utilities
 - Front Panel Emulation
 - Calibration Constants
 - Self-Test
 - Power Sensor Configuration and Calibration Factor File

Setting Up the System

Hardware Requirements

The automated tests require an HP 9000 series 200/300 desktop computer with at least 2.25 megabytes of RAM, a disk drive, and an HP-IB interface. This program will not run with high resolution color monitors (> 512 x 390 pixels). Software is provided on two 3.5 inch disks, formatted double-sided, and are usable in double-sided disk drives only. Any required measurement instruments are listed in each test procedure.

Operating System Requirements

The test software requires BASIC version 5.1 and the following binaries.

Table 5-1. Required Binaries

| Language Extensions | Drivers |
|---------------------|--------------------------------|
| CLOCK | CRTA or CRTB (depends on CRT) |
| COMPLEX | CS80 or DISC (depends on disk) |
| CRTX | HFS |
| EDIT | HPIB |
| ERR | SRM |
| GRAPH | |
| GRAPHX | |
| IO | |
| KBD | |
| MAT | |
| MS | |
| PDEV | |
| TRANS | |
| XREF | |

Refer to the BASIC user's documentation for instructions on loading the operating system and binaries.

Installing the Software

Disk Files

The automated tests are provided on two double-sided disk. Previous revisions may be different.

Make Working Copies

Before doing anything else, make a working copy of the master disks!

Type: INITIALIZE "Address of drive containing blank floppy"

The master disk is shipped from the factory write-protected and cannot be written to or initialized in this mode. We recommend you maintain this master disk in write-protect mode. During execution of some tests, the program reads from and writes to the disk, use a working copy that is not write-protected when you run the software.

Installing the Program onto a Hard Disk

We recommend that you run the software from a hard disk. It is possible to operate it from a single or dual floppy disk drive, however speed will be sacrificed.

To install the program onto your hard disk, create a directory that will contain the program and its associated files. (Refer to the BASIC user's documentation for instructions on creating directories.) After you create the directory, run the install program below to load all of the files onto your hard disk.

1. Insert master disk #1 into the floppy disk drive.
2. Type: COPY "OPV_8360:,700,0" TO "/TEST/OPV_8360:,1400,0"
3. Remove master disk #1 and insert master disk #2 into the disk drive.

4. Type LOAD "COPY_DISK:,700,0"
5. Press RUN and follow the prompts to copy all files from the second master disk to the hard disk. In this example, the source location is :,700,0 and the destination location is :,1400,0

Your hard disk is now set up to run the automated tests.

Operating from a Floppy Disk

When you run the software from a floppy disk drive, be sure to leave the second master disk in the disk drive while the program runs. If this is not done, the program will not run.

Running the Software

CAUTION This software uses RAM memory volumes for fast access of data files. These volumes may also be used by other programs and could contain data that will be erased by this program. Make sure that the computer you are using does not have important data in any memory volumes before running this software.

Configuration Limitations

The computer containing the software must be the *only* controller on the bus. If more than one controller is present, the software will not run properly.

Loading the Software

1. Make sure the software has been copied into a directory (if running from a hard disk) or copied to a work disk (if running from a floppy disk).
2. Set the default mass storage to the directory or floppy disk that contains the test software. Use the BASIC MSI command. See the *BASIC Language Reference* for more information on setting the default mass storage.

Note

CAPS LOCK ON or OFF cannot be changed while the program is running. Set the keyboard before you load the software.

3. Load the test software.

Insert master disk #1 in your default drive, or from your hard-drive directory, perform the following: Type:

LOAD "OPV_8360"

Press **RETURN**.

4. Press **RUN** to start the test program. If you are using floppy disks, the program will prompt you to install the second disk.
5. Some important messages are displayed, then the program displays a menu with the available model numbers. Using the arrow keys, select the correct model to be tested. Press **SELECT**.
6. The program asks for the installed options and the serial number of the unit under test. Enter the appropriate information.
7. A menu of the available tests is displayed. Using the arrow keys, select the appropriate test. Press **SELECT**.

Note

Refer to the following pages for a detailed description and specific operating information (if any) for a specific test.

8. Follow the prompts in the individual tests for connection instructions and other relevant test information. When the test finishes, you are returned to the test menu.
9. Either select another test to run or select the **DONE** softkey to exit the program.

Reporting Software Bugs

If a test does not run correctly, re-run the test. If the test fails to run properly again, fill out the “Software Support Request” at the end of this chapter and return it to your local HP sales office.

AUTOMATED PERFORMANCE TESTS

1. Step Attenuator Flatness Test

Performance verification test for Option 001

Description

A power meter is used to make relative power measurements to determine the actual attenuation of each attenuator card. Mismatch error is minimized by including a fixed attenuation in front of the card being measured for both parts of the relative measurement (with/without the card). The software uses the value of each attenuator card to calculate what the actual attenuation is when set to a specific value. For example, the attenuator value for the 30 dB setting is the sum of the 10 dB and the 20 dB cards. The effect of digital ALC correction is accounted for by the software.

The following test equipment is required for this performance test. No substitutions are allowed.

Table 5-2. Test Equipment Required

| Instrument | HP Model Number |
|-----------------------------------|--------------------|
| 10 dB Attenuator | 8493C |
| 30 dB Attenuator | 11708A |
| Power Meter | 438A |
| Power Sensor (50 MHz to 26.5 GHz) | 8485A ¹ |
| Power Sensor (50 MHz to 26.5 GHz) | 8485D ¹ |
| Power Sensor (100 kHz to 4.2 GHz) | 8482A |

¹ Substitute HP 8487A/D for 40 GHz synthesizers.

Procedure

Connect the equipment as shown in Figure 5-1. Preset all instruments and let them warm up for at least one hour.

Note This program requires that power sensor calibration factors be stored in a file. If the calibration factors have not been entered previously, refer to the utility, “4. Power Sensor Configuration and Calibration Factor File”.

Select the step attenuator flatness test and follow the prompts on the display.

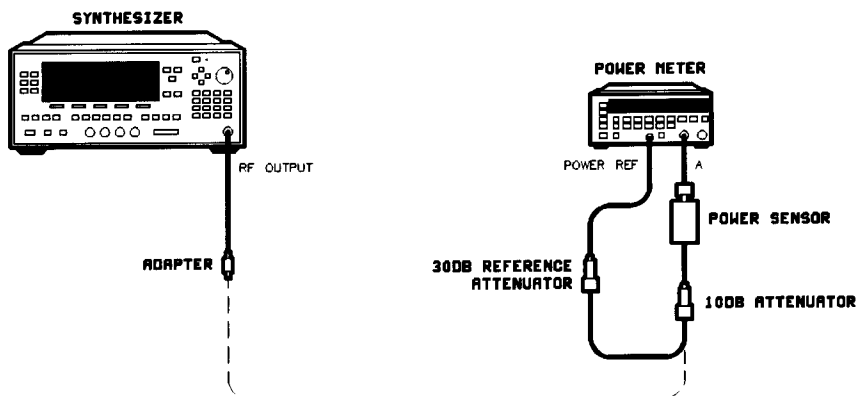


Figure 5-1. Step Attenuator Flatness Test Setup

2. Power Flatness and Accuracy Test

Performance verification test for standard instrument

Description

Note If Option 001 is installed in your instrument, perform the “Step Attenuator Flatness” test.

This test uses the user flatness correction array to measure power flatness at the RF output. The power is measured every 10 MHz in low band and every 100 MHz in high and millimeter bands.

The calibration factors for the power sensor must be added to the program before the test is run. Refer to the utility, “4. Power Sensor Configuration and Calibration Factor File”, if necessary.

The following test equipment is required for this test. No substitutions are allowed. (The test setup is given in the software.)

Test Equipment Required

| Instrument | HP Model Number |
|--|-----------------|
| Power Meter | 438A |
| Power Sensor (100 kHz to 4.2 GHz) | 8482A |
| Power Sensor (50 MHz to 26.5 GHz) | 8485A |
| Power Sensor (50 MHz to 50 GHz) ¹ | 8487A |
| 10 dB Attenuator (DC to 26.5 GHz) ² | 8493C |

1 For 40 GHz synthesizers only.

2 For high power synthesizers only.

Procedure

Select the power flatness and accuracy test and enter your power sensor data by performing the following steps.

Note If the power sensor data was added previously, and is still current, skip the following steps and run the test.

1. Select the **HELP** softkey to access the power sensor configuration and calibration menus.
2. Select power meter configuration.
3. Select the sensor to edit.
4. Enter the power sensor configuration data (follow the prompts on the display).

Note Do *not* edit the “Sensor ID”. The names set at the factory must remain unchanged for the program to run properly. The factory recommended “Zero Hr” is 1.00 and the “Cal Hr” is 24.00. Use the left and right arrows to move the cursor within a field. Use the up and down arrows to increment or decrement the value. **RETURN** selects the field.

5. When all changes have been made, select save power meter configuration.
6. Next select power meter calibration factors to add the power sensor calibration factors to the program.
7. Select current to change the active power sensor to the one for which you would like to enter the data.
8. Select edit header, and enter the serial number of the power sensor.
9. Select edit calibration factors.
10. Enter the calibration factors from your power sensor (follow the prompts on the display).
11. When all of the calibration factors have been added, select store calibration factors to store the calibration factors for future use.

12. Exit the power meter calibration.
13. Run the power flatness and accuracy test.

AUTOMATED ADJUSTMENTS

1. Step Attenuator Flatness Adjustment

Calibration for Option 001

Before doing any adjustment, enter the password for access to the adjustment calibration constants. Use the front panel or the front panel emulation program provided with this software.

See Chapter 4 for information on enabling the calibration constants with the password.

Description

A power meter is used to make relative power measurements to determine the actual attenuation of each attenuator card. Mismatch error is minimized by including a fixed attenuation in front of the card being measured for both parts of the relative measurement (with/without the card). The software uses the value of each attenuator card to calculate what the actual attenuation is when set to a specific value. For example, the attenuator value for the 30 dB setting is the sum of the 10 dB and the 20 dB cards. The effect of digital ALC correction is accounted for by the software.

The following test equipment is required for this adjustment. No substitutions are allowed.

Table 5-3. Test Equipment Required

| Instrument | HP Model Number |
|-----------------------------------|--------------------|
| 10 dB Attenuator | 8493C |
| 30 dB Attenuator | 11708A |
| Power Meter | 438A |
| Power Sensor (50 MHz to 26.5 GHz) | 8485A ¹ |
| Power Sensor (50 MHz to 26.5 GHz) | 8485D ¹ |
| Power Sensor (100 kHz to 4.2 GHz) | 8482A |

¹ Substitute HP 8487A/D for 40 GHz synthesizers.

Procedure

Connect the equipment as shown in Figure 5-2. Preset all instruments and let them warm up for at least one hour.

Select the step attenuator flatness adjustment and follow the prompts on the display.

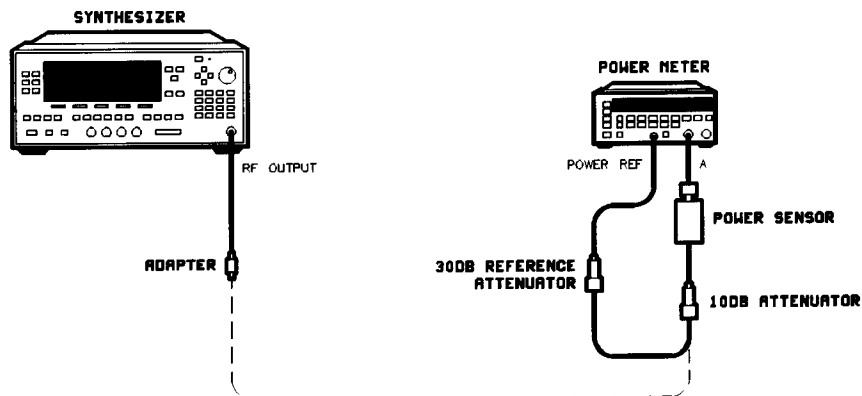


Figure 5-2. Step Attenuator Flatness Adjustment Setup

2. YO Delay Adjustment

Description

This adjustment uses the internal counter to measure swept frequency accuracy. YO delay affects the swept frequency accuracy at fast sweep times (less than 100 ms). This procedure adjusts the calibration constants for the YIG oscillator to achieve consistent swept frequency accuracy over the entire operating range of the instrument.

CAUTION If your instrument has Option 006, be certain that you identified your option configuration when the software was initially loaded or else this procedure will not run properly.

Select the YO delay adjustment and follow the prompts on the display.

No test equipment is required.

3. ADC Adjustment

Description

This adjustment uses an external digital voltmeter (DVM) to measure VCOMP on the YO driver assembly and compares the reading to the ADC measurement. The ADC calibration constants are adjusted so that the DVM and ADC measurements are the same. The procedure is repeated for each voltage range (both plus and minus supplies).

Select the ADC adjustment and follow the prompts on the display.

The following test equipment is required for this adjustment. (The test setup is given in the software.)

Test Equipment Required

| Instrument | HP Model Number |
|-------------------|------------------------|
| Digital Voltmeter | 3456A, 3457A, or 3458A |

4. Power Flatness Adjustment

Calibration for standard instrument

Description

Note If Option 001 is installed in your instrument, perform the “Step Attenuator Flatness” adjustment.

This adjustment zeros the digital ALC array and measures the power from the RF output. The power is measured every 10 MHz in low band and every 100 MHz in high and millimeter bands. The calibration constants are adjusted to achieve a flat output.

The calibration factors for the power sensor must be added to the program. Refer to the utility, “4. Power Sensor Configuration and Calibration Factor File”, if necessary.

The following test equipment is required for this adjustment. No substitutions are allowed. (The test setup is given in the software.)

Test Equipment Required

| Instrument | HP Model Number |
|--|-----------------|
| Power Meter | 438A |
| Power Sensor (100 kHz to 4.2 GHz) | 8482A |
| Power Sensor (50 MHz to 26.5 GHz) | 8485A |
| Power Sensor (50 MHz to 50 GHz) ¹ | 8487A |
| 10 dB Attenuator (DC to 26.5 GHz) ² | 8493C |

1 For 40 GHz synthesizers only.

2 For high power synthesizers only.

Procedure

Select the power flatness adjustment and enter your power sensor data by performing the following steps.

Note If the power sensor data was added previously, and is still current, skip the following steps and run the test.

1. Select the **HELP** softkey to access the power sensor configuration and calibration menus.
2. Select power meter configuration.
3. Select the sensor to edit.
4. Enter the power sensor configuration data (follow the prompts on the display).

Note Do *not* edit the “Sensor ID”. The names set at the factory must remain unchanged for the program to run properly. The factory recommended “Zero Hr” is 1.00 and the “Cal Hr” is 24.00. Use the left and right arrows to move the cursor within a field and the up and down arrows to increment or decrement the value. **RETURN** selects the field.

5. When all changes have been made, select save power meter configuration.
6. Next select power meter calibration factors to add the power sensor calibration factors to the program.
7. Select current to change the active power sensor to the one for which you would like to enter the data.
8. Select edit header and enter the serial numbers of the power sensor.
9. Select edit calibration factors.
10. Enter the calibration factors from your power sensor (follow the prompts on the display).
11. When all of the calibration factors have been added, select store calibration factors to store the calibration factors for future use.

12. Exit the power meter calibration.
13. Run the power flatness adjustment.

Utilities

1. Front Panel Emulation

Description

This utility simulates an 8360 series instrument front panel keyboard in an instrument with a delete front panel option installed.

Procedure

To access the front panel emulation utility, select the front panel emulation program in the test menu.

The front panel emulation program cannot run front panel functions that use a power meter or printer. These functions cause the 8360 series instrument to act as a controller, which conflicts with the computer as the controller on the bus. Use a substitute front panel to run these functions, or use the tests provided with this software.

When using the front panel emulation program, enter the letter directly above the caret (^) to activate the function or key. Note that the keys are case sensitive (“L” means “ALC” and “l” means “LOCAL”). See Table 5-4 for a detailed listing of hardkey designations.

For numeric entry, two different terminator keys are combined on one hardkey. The actual terminator depends on the active mode of the synthesizer.

For example: When pulse width is the active entry, **10** **k** enters 10 ms. When frequency span is the active entry, **10** **k** enters 10 kHz.

Softkeys are designated by **menukey X**, where X is 1 through 5 and corresponds to the five softkey positions below the display. To activate the softkey, press the function key on the keyboard that corresponds to the number X indicated by menukey.

Table 5-4. Synthesizer Hardkey Emulation

| Hardkey | Program Display | To Activate Select |
|---------------------|-----------------|--------------------|
| MENU SELECT | | |
| MOD | mod | m |
| ALC | aLc | L |
| MARKER | mrK | K |
| USER CAL | cal | c |
| SERVICE | Srv | S |
| PRIOR | Prior | P |
| SYSTEM | | |
| SAVE | saVe | V |
| RECALL | Rcl | R |
| MENU | meNu | N |
| USER DEFINED | | |
| MENU | menU | U |
| ASSIGN | asgn | a |
| ENTRY | | |
| ENTRY ON/OFF | entry off | f |
| GHz/dB(m) | GHz/dBm | G |
| MHz/usec | MHz/uS | M |
| kHz/msec | kHz/mS | k |
| Hz,sec/ENTER | Hz/ENT | H |

Table 5-4. Synthesizer Hardkey Emulation (continued)

| Hardkey | Program Display | To Activate Select |
|-------------------------|-----------------|--------------------|
| SWEEP | | |
| SWEEP TIME | Time | T |
| SINGLE | sIng | I |
| CONT | cOnt | O |
| MENU | mEnu | E |
| FREQUENCY | | |
| CW | cW | W |
| START | stArt | A |
| STOP | stop | o |
| CENTER | Cent | C |
| SPAN | span | n |
| MENU | menu | u |
| POWER | | |
| POWER LEVEL | level | v |
| FLTNES ON/OFF | flat | t |
| RF ON/OFF | on/oFf | F |
| MENU | menu | e |
| INSTRUMENT STATE | | |
| PRESET | preset | r |
| LOCAL | local | l |

2. Calibration Constants

Description

The calibration constants utility provides a variety of ways to manipulate the calibration constants stored in the instrument.

Use this utility to print out a list of the calibration constants stored in the instrument, to make a back-up of the calibration constants, and to restore calibration constants from a backed-up file.

Procedure

Enter the password to allow access to the calibration constants by running the front panel emulation program provided with this software. See Chapter 4 for information on accessing the calibration constants with the password.

You may need to perform several steps to reach your final goal. For example, to move the calibration constants from the instrument's working memory to a disk for back-up, you must first move them to the computer memory, and then from computer memory to disk. To store the calibration constants, you may use the hard disk drive, Disk 2 of your working disks, or a separate data disk. When storing data on a new disk, be sure to format the disk before you begin the utility.

Select the calibration constants entry in the test menu and follow the prompts.

3. Self-Test

Description

This utility is executed using the front panel emulation program. A full self-test of the synthesizer will be executed and the results displayed on the computer.

4. Power Sensor Configuration and Calibration Factor File

Description

This utility is used for creating and editing the files that store power sensor calibration factors. The power sensor calibration factors are used in the “Power Flatness” and “Step Attenuator” performance tests and adjustment procedures. This data can be stored to the directory or disk for future use. The power meter/power sensor configuration utility is used to define which power sensors, by serial number, are actually used when the automated test is run. Although you may enter and store calibration factors for several power sensors, the program will use only the power sensors that you have identified by serial number in the configuration utility.

Loading Sensor Calibration Factors

The service software program for loading sensor calibration factors is unfriendly. Following the steps outlined should result in a successful entry. Do not hurry or skip steps.

To Load Sensor Cal Factors:

1. Load the HP 8360 Service Software and run.
2. At the “Test Menu” selected one of the following: “Power Flatness and Accuracy Test”, “Step Attenuator Flatness Test”, “Power Flatness Adjust”, or “Step Attenuator Flatness Adjust”.
3. Press the “Help” key (F2) when it appears on the function keys to get to the “Help Menu” where the “Pmtr Config” (Power Meter Configuration) and “Pmtr Cal Factors” selections are located.
4. Scroll down to and select [2] “Pmtr Config”. The power meter configuration routine is only used to select sensor serial numbers (model numbers are fixed). After selecting “Pmtr Config” the screen will display a list of model and serial numbers the program will use during the test.

Important Notes for Editing the Selections:

- No new model numbers can be added. The program only recognizes the model numbers listed and will stop if other model numbers are entered.

- Model numbers can not be changed. Only the serial numbers can be changed in this menu. Use serial numbers to track different sensor model numbers.
- Only edit sensor serial numbers in this menu.
- Always exit the program by selecting [17] “Save Configuration” and, then, pressing “Done”. A bug in the program may erase model numbers if this is not done. If a model number is missing create a new working disk number 2 using the master disk or purge “PMTRCONF” file from the working disk and copy the “PMTRCONF” file back to the working disk from the master disk.
- The frequency range of the instrument determined which sensor model numbers listed will be used during the test. The serial number determines which cal factors will be used. The following list explains which model numbers are used when.
- For instruments with a maximum frequency of 26.5 GHz, the following sensors are used:
 - 8485D + 10 dB pad
 - 8485D
 - 8485A
 - 8482A
- For instrument with a maximum frequency above 26.5 GHz, the following sensors are used:
 - 8487D + 10 dB pad
 - 8487D
 - 8487A
 - 8482A

After Selection, Continue with Cal Sensor Procedures:

5. If the sensor serial numbers are correct, scroll down to [17] “Save Power Meter Configuration”, and press “Select”.
6. If a different sensor serial number needs to be entered or a new sensor serial number added, scroll to the model number to be edited and press “Select” to get to the “Edit Sensor #1” screen.

7. To change the serial number in the “Edit Sensor” screen, scroll to the Serial Number selection [4] and press “Select”. Once “Select” has been pressed, a number must be entered.
8. After “Edit Sensor” is selected, “Enter Text” should be displayed. Enter the serial number and press “Return”, then “Done”. The model and new serial number should be listed in the table.
9. Repeat steps 6 through 8 until all the correct serial numbers are displayed.
10. Now save the new serial numbers in the Power Meter Configuration file by scrolling to [17] “Save Power Meter Configuration” and pressing “Select” then “Done” to exit the routine.
11. If the cal factors need to be loaded for new serial numbers or changed for existing serial numbers, scroll to “Pmtr Cal Factor” selection [3], and press “Select”. A list of serial numbers and sensor model numbers should be displayed.
12. Scroll down to the serial number to be edited and press “Select”. If the correct serial number is not displayed, return to the “Pmtr Config” program and repeat entering the correct serial number.

When entering cal factors for a new serial number, the message “Failed attempt to access file ... ” will appear. Press “Abort”. Read the message displayed and then press “OK”.

13. The “Cal Factor Edit Menu” should now be displayed. This menu has 6 options. Here is an explanation of each selection.
 - [1] Edit Cal Factors: Select “Edit Cal Factors” to edit the cal-factors for the serial number selected. After “Select” is pressed the cal factors are displayed. Scroll to the line to be edited and press “Select”. There are four choices for editing the cal factors.
 - Value - Value is used to edit a cal factor. Enter the new value by typing over the old data. Do not use the delete key.
 - Frequency - Frequency is used to edit the frequency. Enter the new value by typing over the old data. Do not use the delete key.
 - Insert - Inserts a line in the table at the location of the pointer.
 - Delete - Deletes the line in the table at the location of the pointer.

[2] Edit Sensor Information: Not used.

[3] Load Cal Factors: This selection loads the calibration factor data file for the selected sensor from disk or the directory specified in the MSI command.

[4] Store Cal Factors: This stores the cal factors for the selected power sensor to disk or the directory specified by the MSI command.

[5] Current: Displays the current sensor serial and model number.

[6] Serial Entry: This selection is used to create a new cal factor data table for the selected power sensor.

- To enter frequency and correction factors for the sensor, enter the frequency, a comma, and then the correction factor (Frequency, Correction). The frequency must be entered in GHz (.01 = 10 MHz). Correction factors must be entered in % (97.0 = 97.0%). Enter frequencies in ascending order (lowest to highest).

- The first frequency point must be below the start frequency the sensor is used at: For first frequency points enter:

8485A/D <0.05 GHz

8482A, 8485A/D <0.01 GHz

- There must be a calibration factor at 50 MHz. The test software requires this 50 MHz calibration factor for the power sensor.

- The last frequency point must be greater than the highest frequency the sensor is used at. The last frequency points entered:

8487A/D 50.0 GHz

8482A >4.2 GHz

8485A/D, 8487A/D >26.5 GHz

- To end serial entry enter "0,0".

- Select "Store Cal Factors".

14. To exit the "Cal Factor Edit Menu" press "Done".

15. If all entries are complete, press "Done". If additional editing is required scroll to the desired choice and select

After all data is entered and “Done” has been selected the program should continue running. If a “Time Out” error occurs, check the setup and press “Retry”. If “Retry” fails to start the program press “Abort” and start the program over.

Menu Overview

The following menu choices are displayed:

Calco Utility

This is the instrument calibration factors utility. Use it to store and retrieve instrument calibration factors. The following menu choices will allow you to enter and store calibration factors:

- [1] Review CALS in Disk File
- [2] Review CALS from UUT Working CALS
- [3] Store UUT Working CALS to Disk File
- [4] Load CALS From a Disk File to UUT Working CALS
- [5] Copy UUT Working CALS to UUT Protected CALS
- [6] Copy UUT Protected CALS to UUT Working CALS

Pmtr Config

This is the power meter configuration utility. Use it to enter serial numbers for the power sensors which are listed in the “Sensor ID” column. For example, when the program requires an HP 8487D power sensor, it will use the calibration factor data that is stored for whichever power sensor has been listed in the “Serial” column. If HP 8487A/D power sensors are used to test synthesizers with maximum stop frequencies of ≤ 26.5 GHz, enter their serial numbers for the HP 8485A/D choices. The “Sensor ID” and “Name” columns identify the frequency range and power level over which the power sensor is used. The HP 8487A/D can substitute for an HP 8485D; however, the reverse is not true.

After you select a power sensor, move the arrow to “Serial Number” and enter the new serial number. Then select **DONE**.

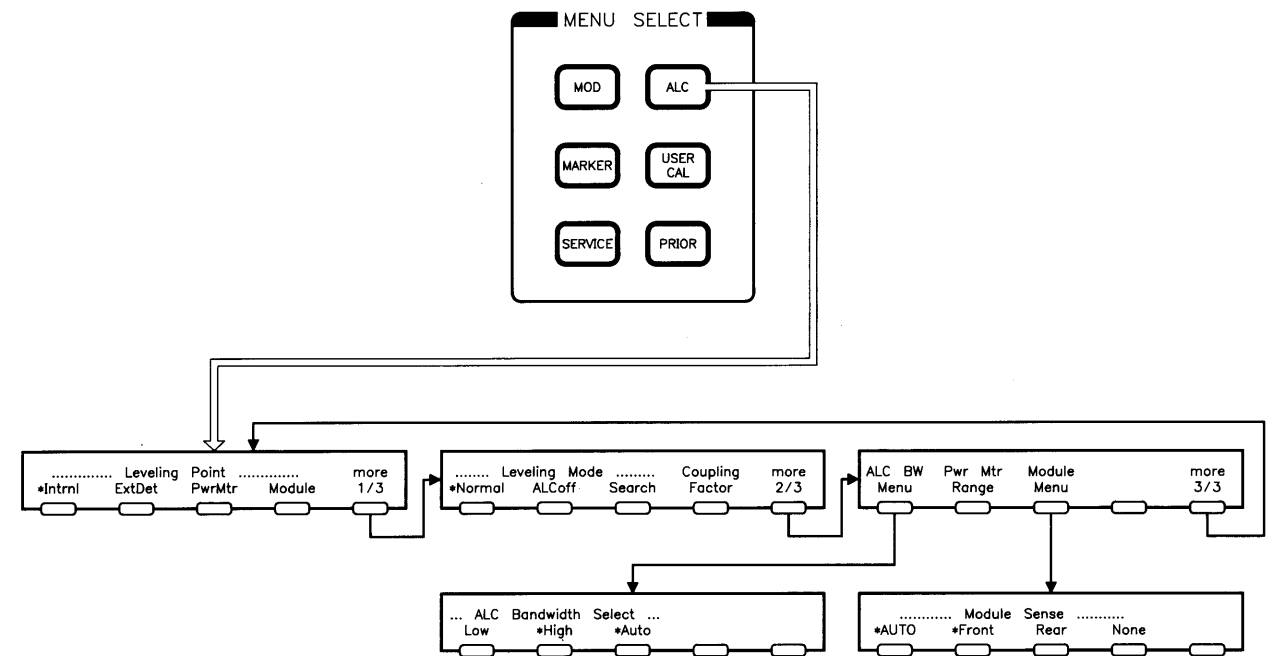
When the power meter configuration is correct, scroll down to selection 17 and save the configuration data.

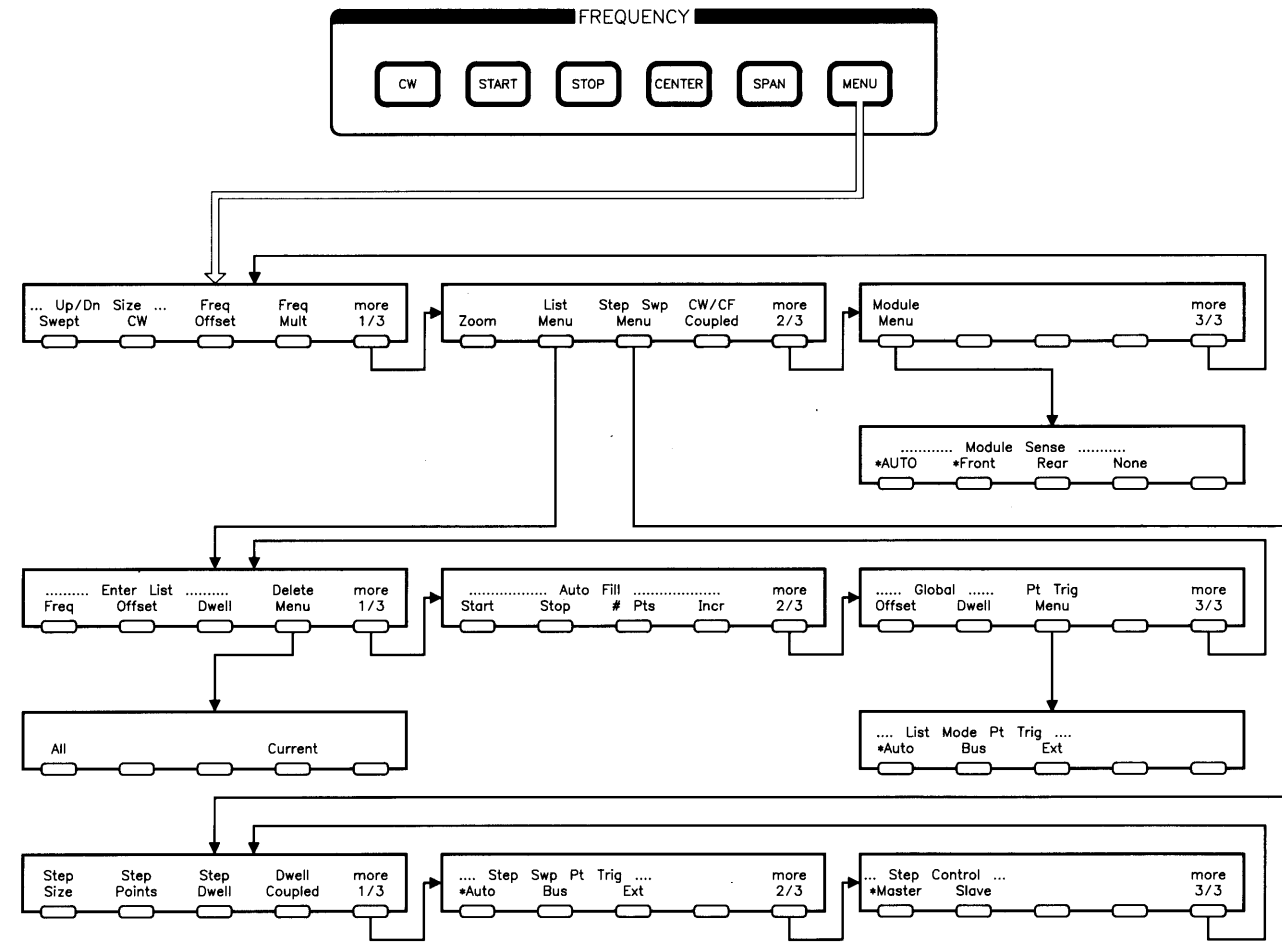
Pmtr Cal Factors

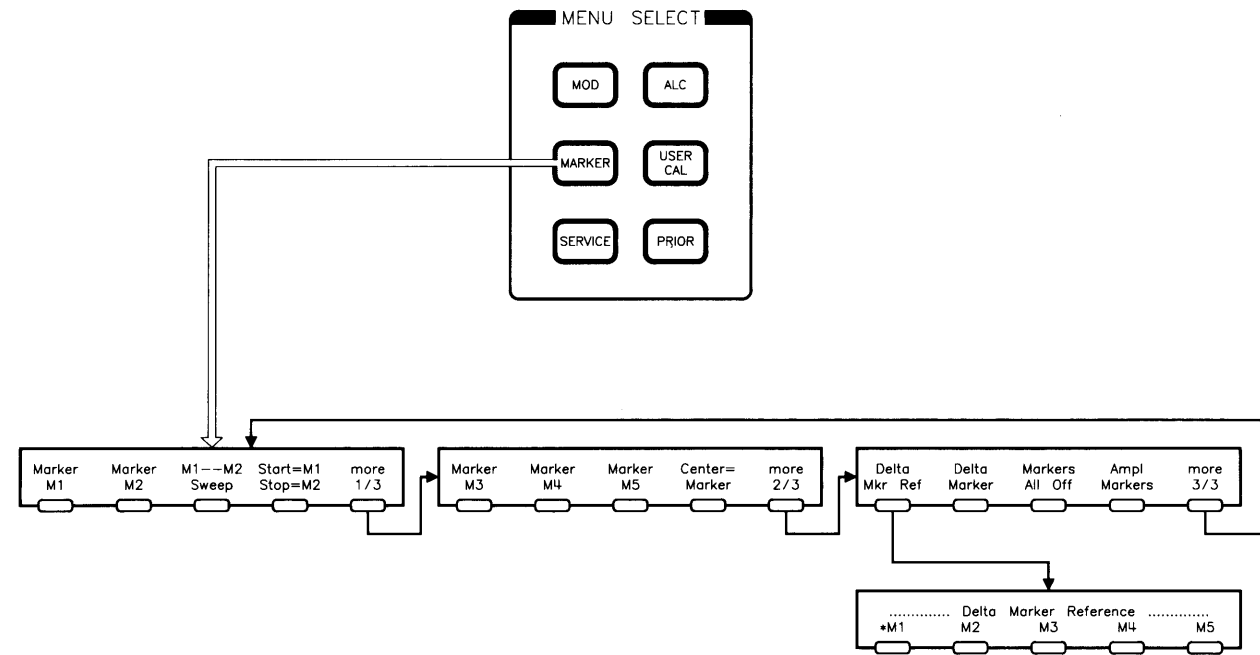
This is the power meter calibration factor utility. Use it to enter and store calibration factors for each power sensor. Notice that the test software requires calibration factors at 50 MHz and at one frequency higher than the specified stop frequency of the synthesizer under test.

To edit or enter new calibration factors, select the serial number for the power sensor from the displayed list. (This list is derived from the power meter configuration utility and the power sensor must already be entered in the configuration.) The calibration factors which were previously stored will be loaded and the editing menu will be displayed.

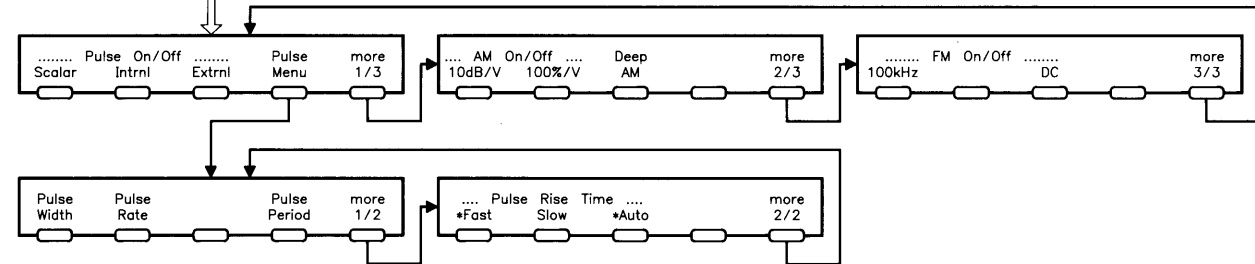
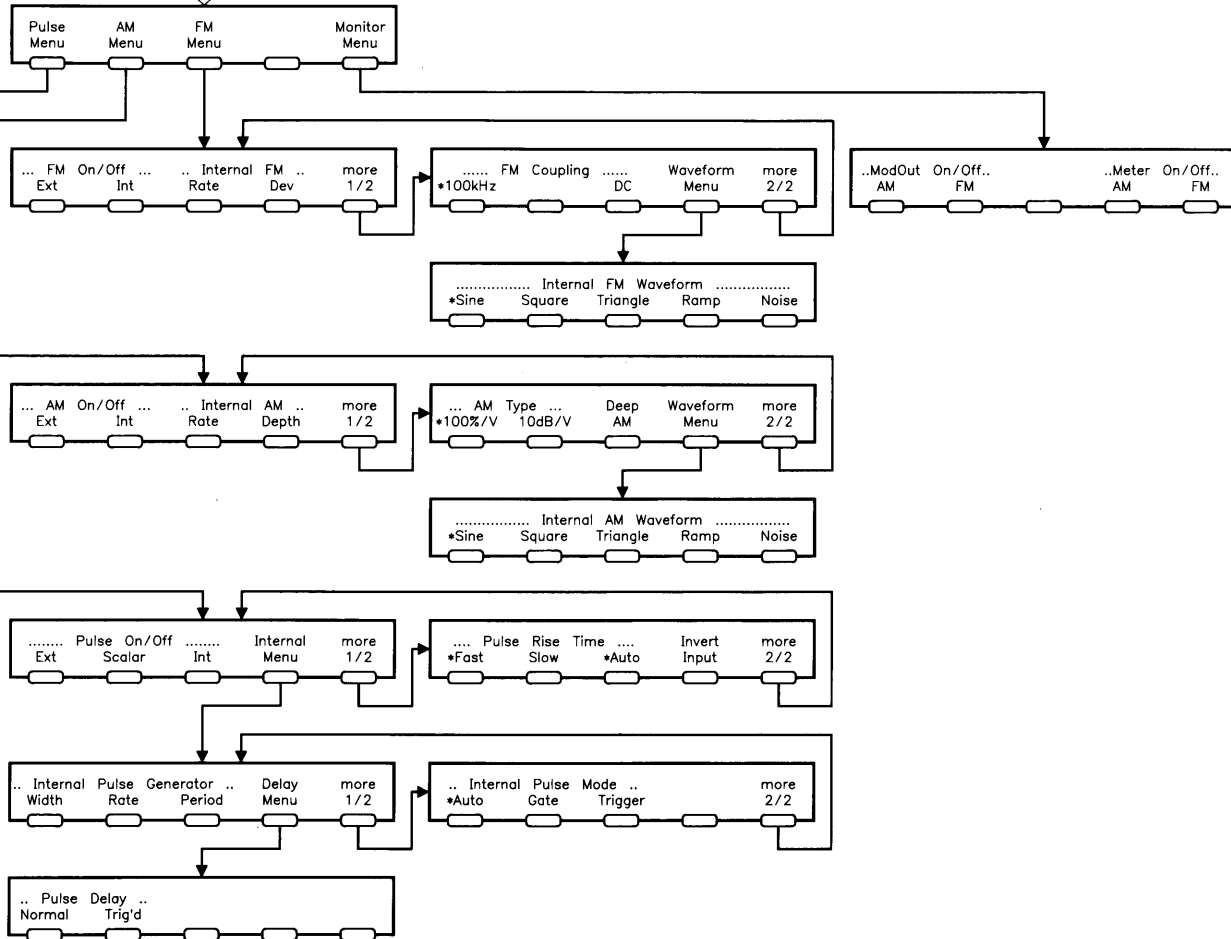
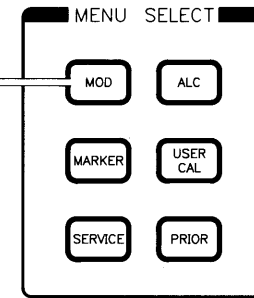
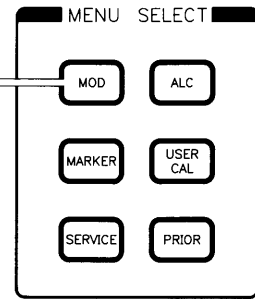
Menu Maps

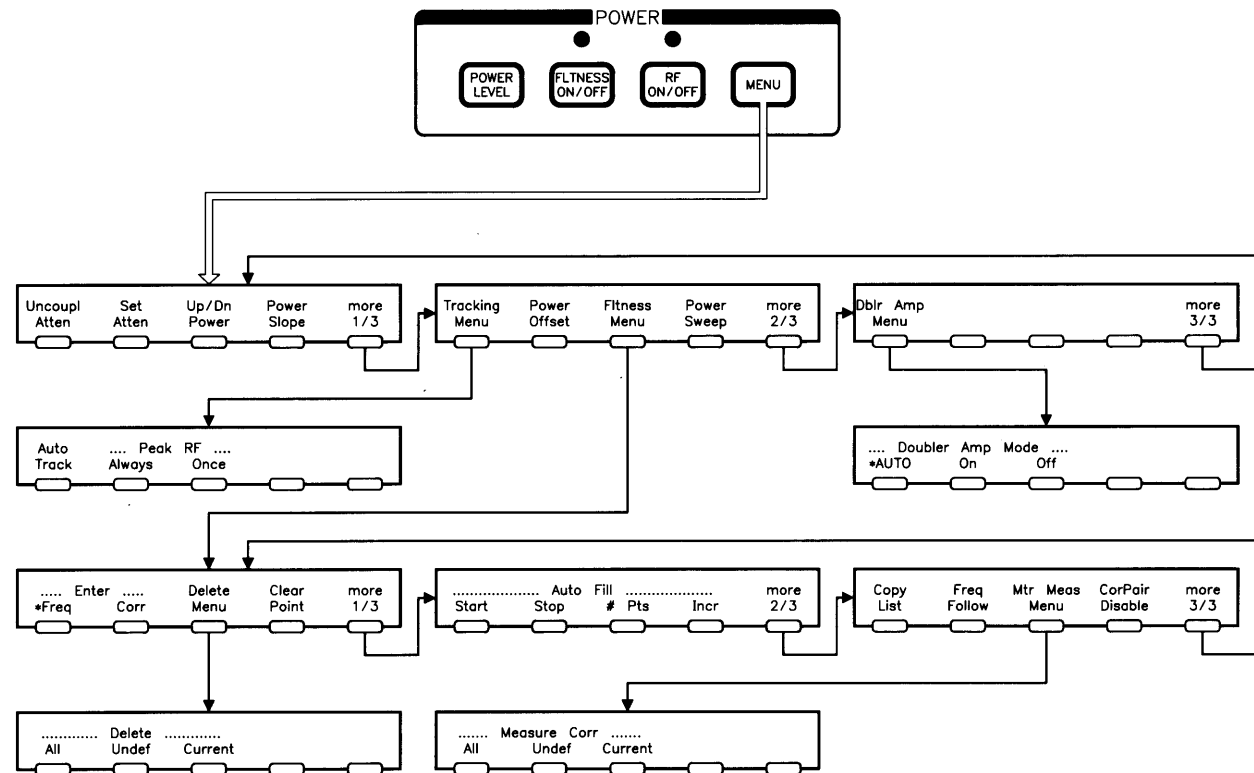


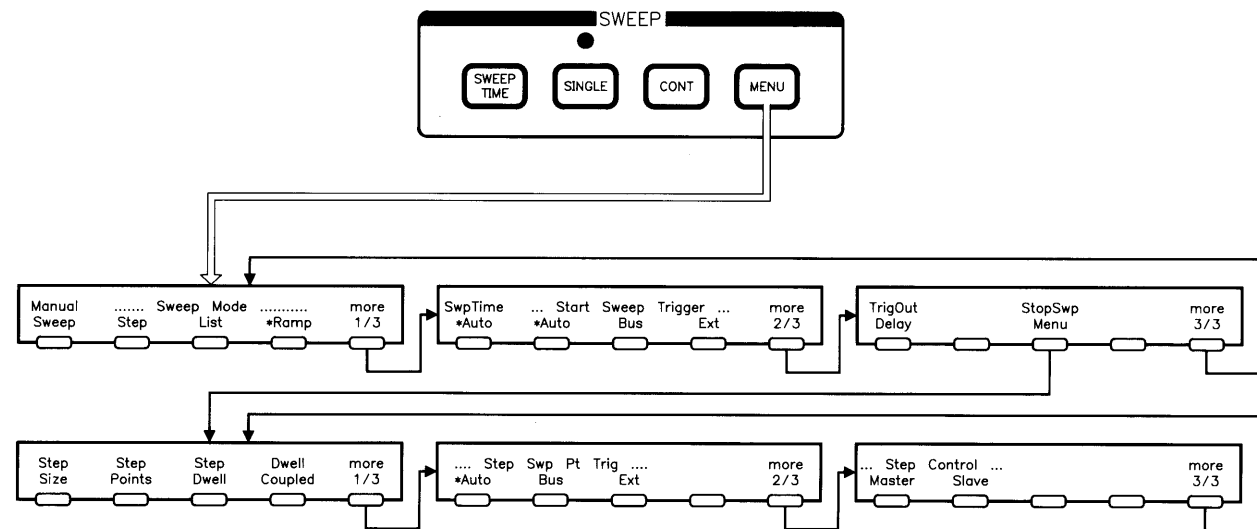


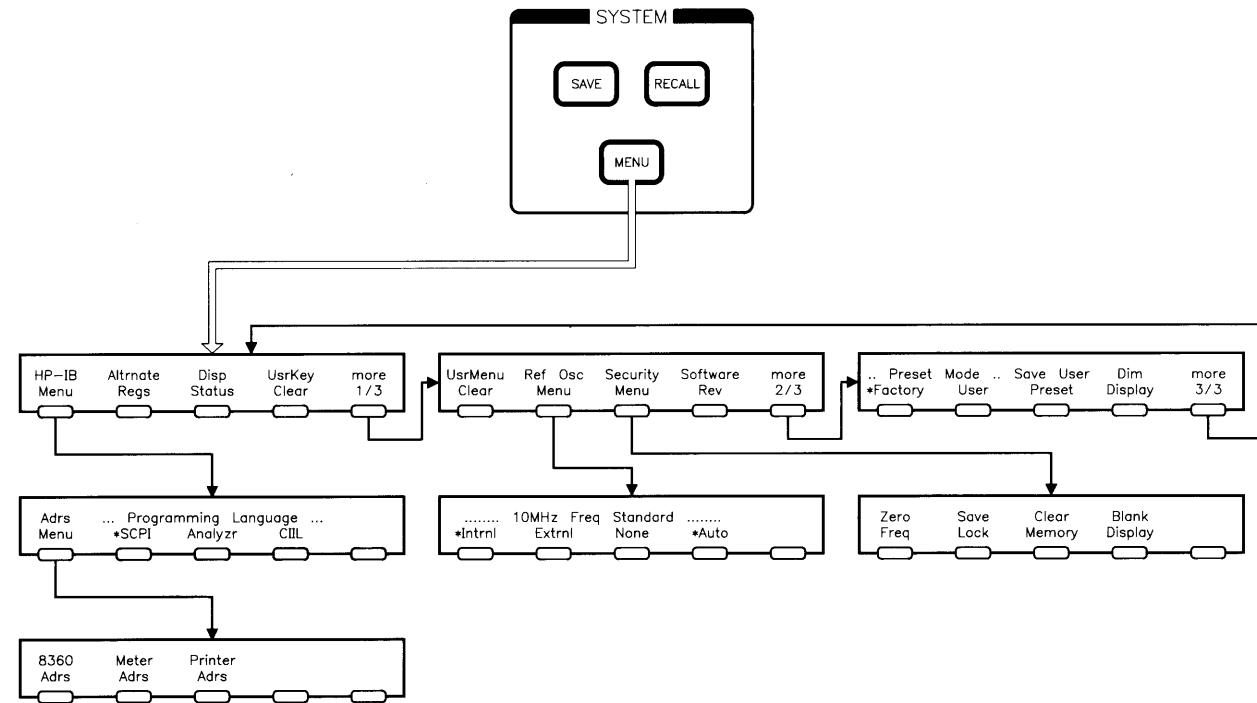


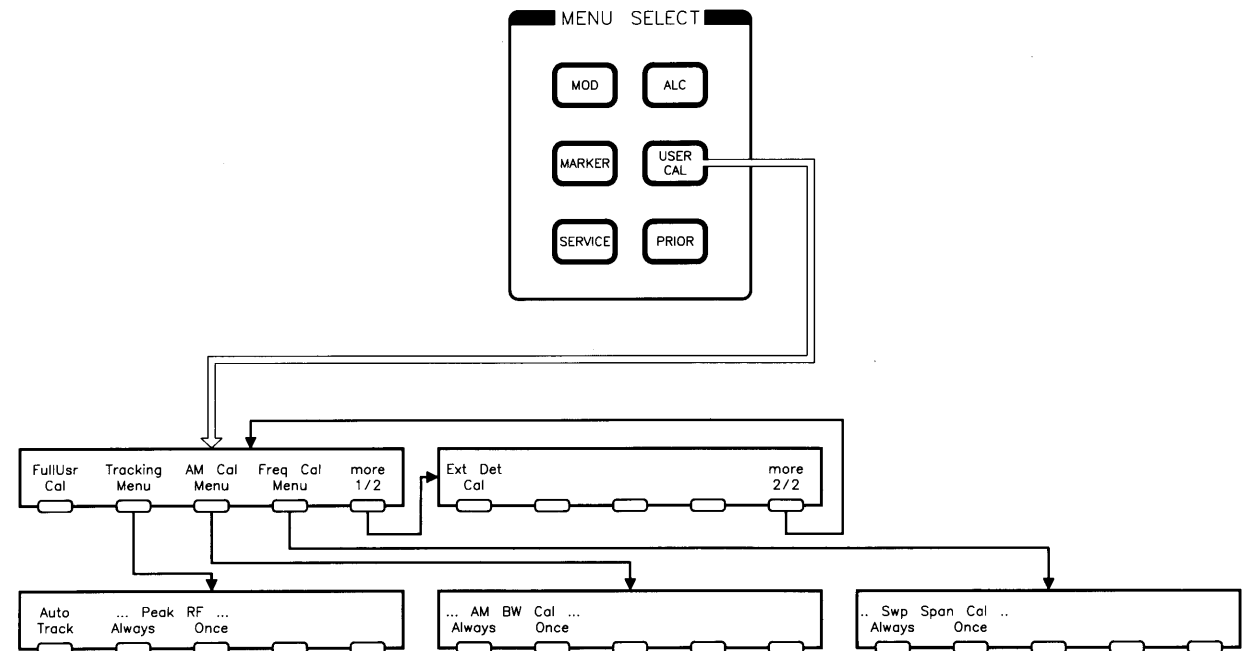
OPTION 002 MENU











Disassembly and Replacement Procedures

Introduction

This chapter provides the following disassembly and reassembly procedures. Use these procedures while repairing or replacing an assembly.

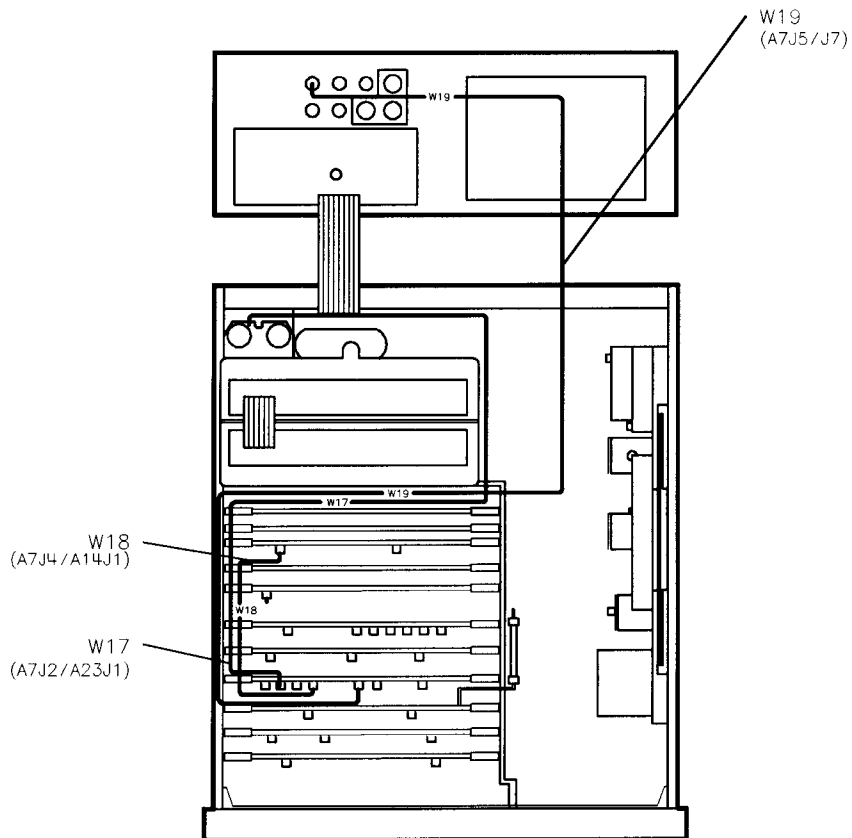
- “Front Panel Disassembly and Reassembly”
- “Rear Panel Disassembly and Reassembly”
- “RF Deck Disassembly and Reassembly”
- “Motherboard Disassembly and Reassembly”

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.
- The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.
- The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.
- The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.
- 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.
- For continued protection against fire hazard replace line fuse only with same type and rating (F 5A/250V). The use of other fuses or material is prohibited.

CAUTION

- Perform the following procedures only at a static safe work station. The attenuators and printed circuit assemblies in this instrument are very sensitive to static electricity damage. Wear an anti-static wrist strap that is connected to earth ground.
 - When reassembling the instrument, the cables shown in Figure 7-1 must be routed through the instrument *as shown* or instrument performance may be affected.
-



IMPORTANT !

W17, W18, W19 MUST BE ROUTED AS SHOWN

Figure 7-1. Cable Routing Locations

Tools Required

Each procedure lists the required tools at the beginning of that section. See Chapter 9 for the associated part numbers.

Front Panel Disassembly and Reassembly

Tools Required

- T-10 Torx Screwdriver (torque 10 in-lb)
- 0.050 Hex Driver
- 9/16 in. Nut Driver
- 5/16 in. Open End Wrench
- Coax Extractor Tool-Submin D Connector

Description and Procedure

Some steps in this procedure may not apply to all option configurations. If a particular step does not apply, continue with the next appropriate step.

To disassemble the front panel, follow this procedure in the order given.

To reassemble the front panel, follow this procedure in the reverse order.

Refer to the flowchart in Figure 7-2 to determine the necessary disassembly steps for a given assembly.

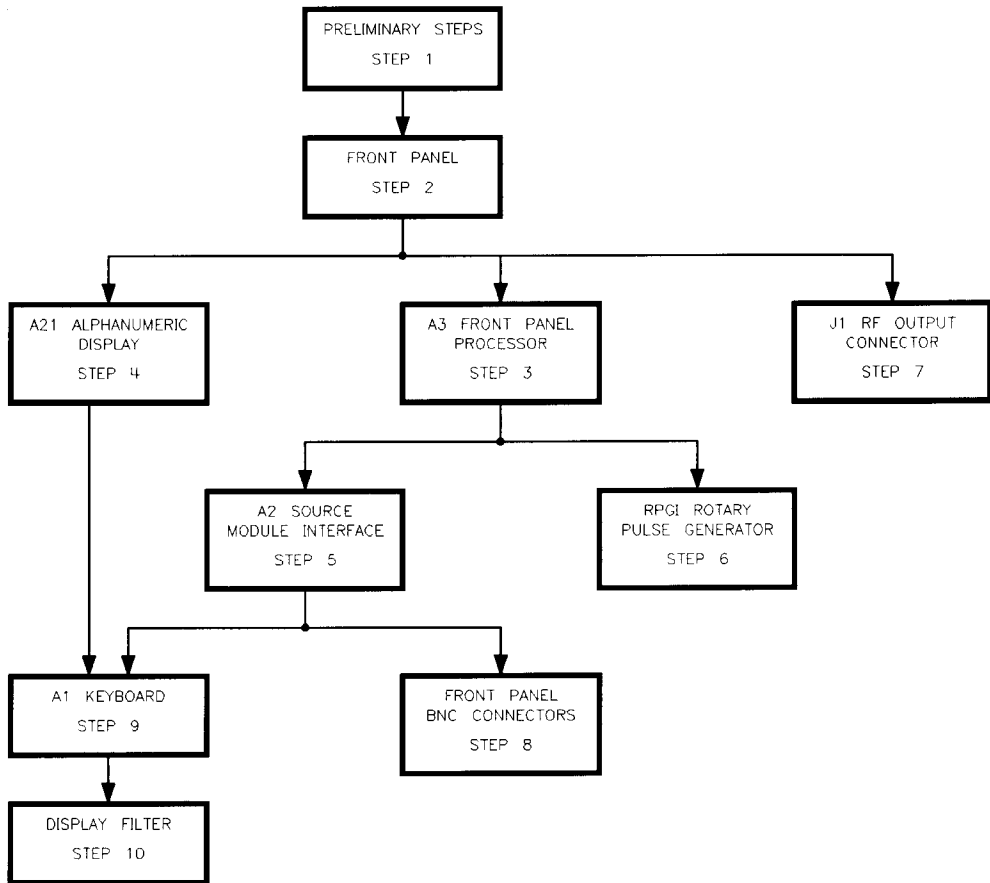


Figure 7-2. Front Panel Disassembly Flowchart

1. Preliminary Steps

CAUTION You can easily blow the fuse for the 13.5V supply on the preregulator assembly if you do not disconnect the AC power cord. Also, the danger of shock is increased if the power cord is connected.

1. Disconnect the AC power line cord.
 2. Remove the screw from each of the top two feet on the rear panel.
 3. Remove the top two feet.
 4. Remove the instrument top cover.
-

Note An RF braid is in each of the side channels on the top of the instrument. When you reassemble the instrument, be sure this braid remains in the channel.

5. Remove the vinyl trim strip from the top front edge of the instrument. (Place a flat screwdriver in either slot in the trim strip and lift to remove, see Figure 7-3.)

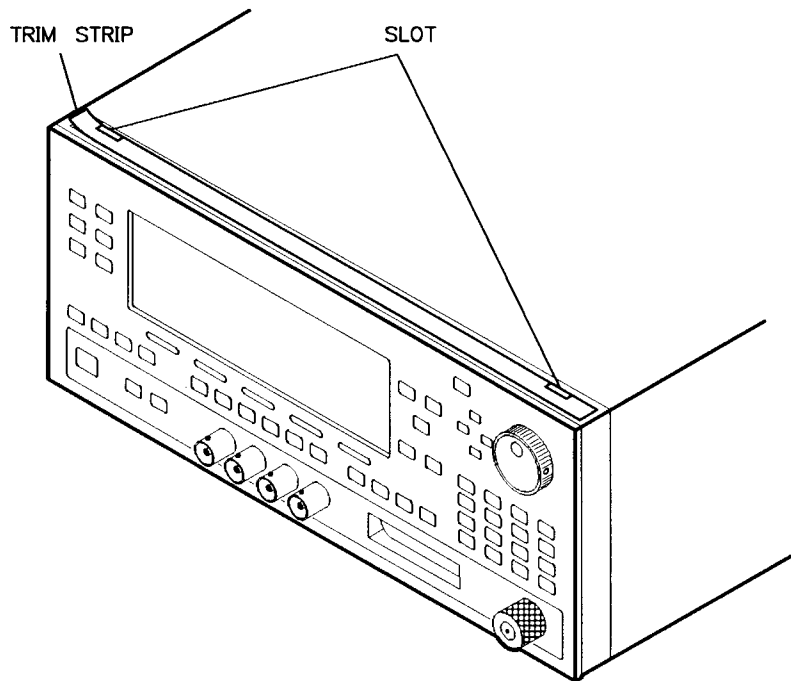


Figure 7-3. Front Edge Trim Strip

2. Front Panel Removal

Refer to Figure 7-4.

1. Complete “1. Preliminary Steps” before continuing.
2. Remove *three* of the four screws under the trim strip.
3. Remove *two* of the three screws on the lower front frame edge.
4. Gently pry the front panel and display from the frame.

Note

If you are removing the front panel only so that you can lift up the RF deck and if you have a flat surface in front of the synthesizer on which to lay the front panel, let the front panel lie in front of the synthesizer with all the cables connected and continue with step 1 of “2. Lift Up the RF Deck”. If you do not have a flat surface for the front panel, disconnect ribbon cables W2 and W3 from the motherboard and lay the front panel on top of the synthesizer.

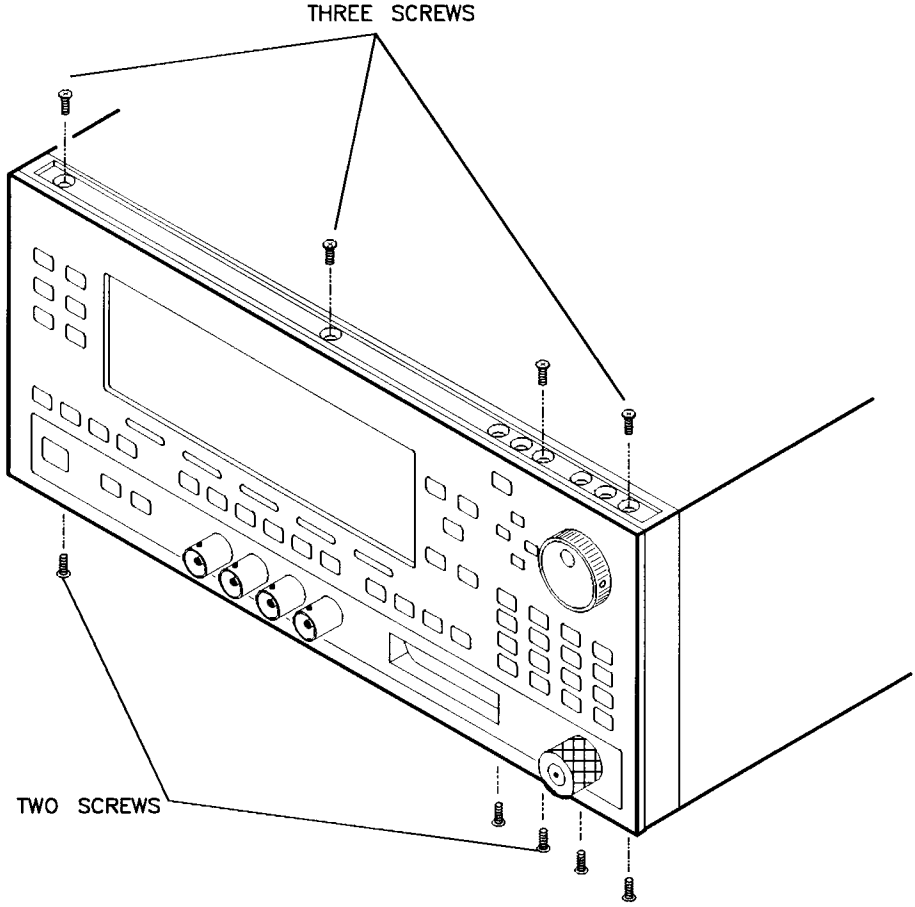


Figure 7-4. Front Panel Screw Locations

Refer to Figure 7-5.

Note Instruments with Option 004 do not have all the cables shown.

5. Cut the tie wraps holding the cables.
6. From the A9, A10, and A11 assemblies (or the A8 assembly for instruments with Option 002), disconnect the four coaxial cables (W6, W7, W8, and W9) attached to the BNC connectors.
7. Disconnect the source module interface cable, W10.
8. Disconnect ribbon cables W2 and W3 from the motherboard.

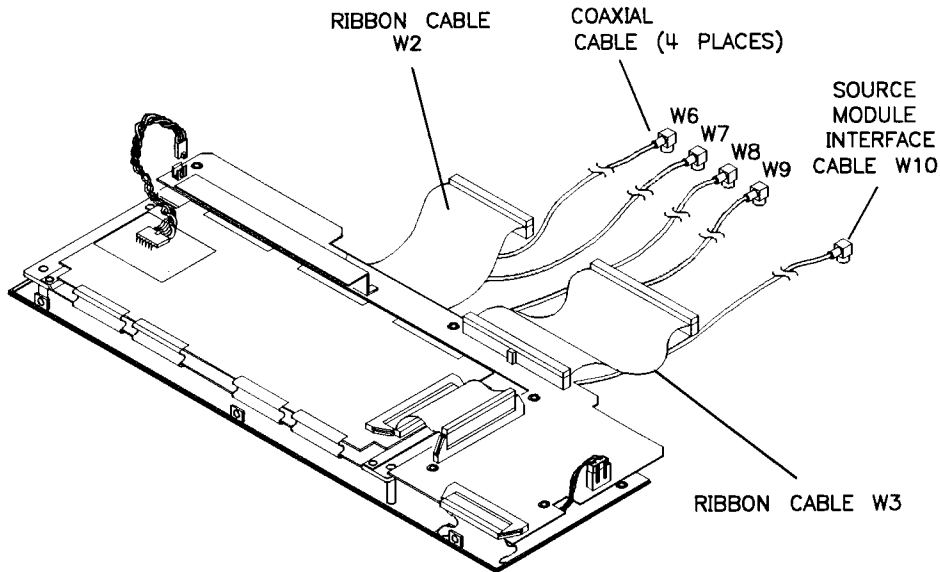


Figure 7-5. Front Panel Coaxial and Ribbon Cable Locations

3. A3 Front Panel Processor Removal

Refer to Figure 7-6.

1. Complete “1. Preliminary Steps” and “2. Front Panel Removal” before continuing.
2. Disconnect the three ribbon cables (W3, W4, and W5), the rotary pulse generator (RPG) cable, and the six-wire display cable W1.
3. Remove the eight screws from the PC assembly.
4. Lift off the front panel processor assembly.

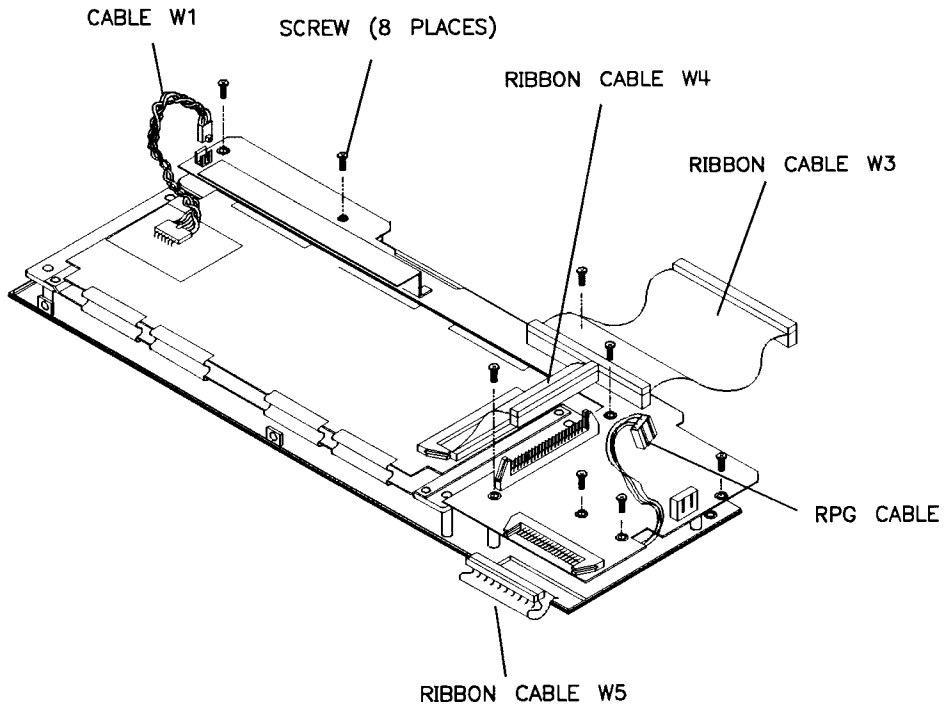


Figure 7-6. Front Panel Processor Cables

4. A21 Alphanumeric Display Removal

Refer to Figure 7-7.

1. Complete “1. Preliminary Steps” and “2. Front Panel Removal” before continuing.
2. Disconnect the six-wire display cable W1 and ribbon cable W4.
3. Remove the four outer-most screws around the edge of the bracket.
4. Lift off the display.

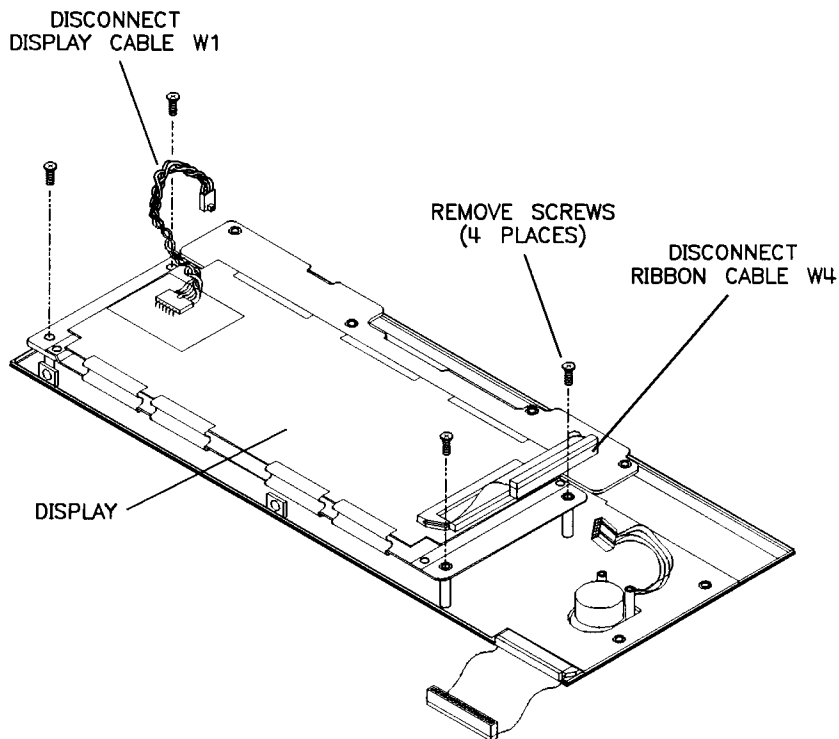


Figure 7-7. Display Removal

5. A2 Source Module Interface Removal

Refer to Figure 7-8.

1. Complete “1. Preliminary Steps”, “2. Front Panel Removal”, and “3. A3 Front Panel Processor Removal” before continuing.
2. Remove the source module interface cable (W10).
3. Remove the four screws.
4. Remove the source module interface assembly.
5. Disconnect ribbon cable W2 from the source module interface assembly.
6. Remove the A2 source module interface assembly.

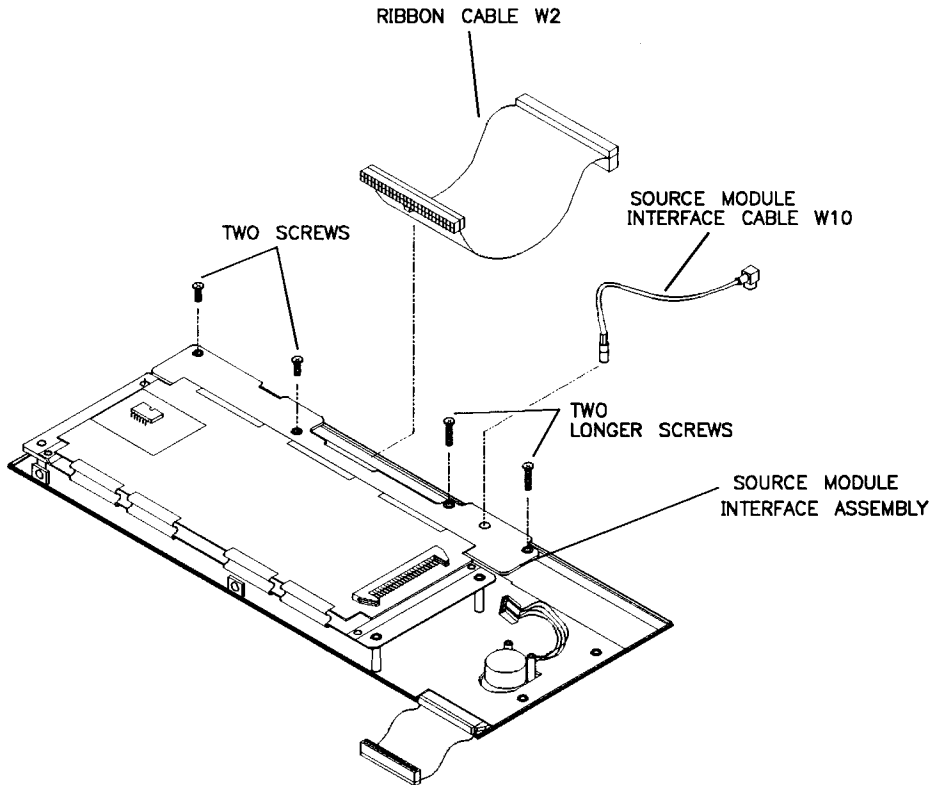


Figure 7-8. Source Module Interface Removal

6. RPG1 Rotary Pulse Generator Removal

Refer to Figure 7-9.

1. Complete “1. Preliminary Steps”, “2. Front Panel Removal”, and “3. A3 Front Panel Processor Removal” before continuing.
2. Loosen the two hex screws and remove the rotary knob.

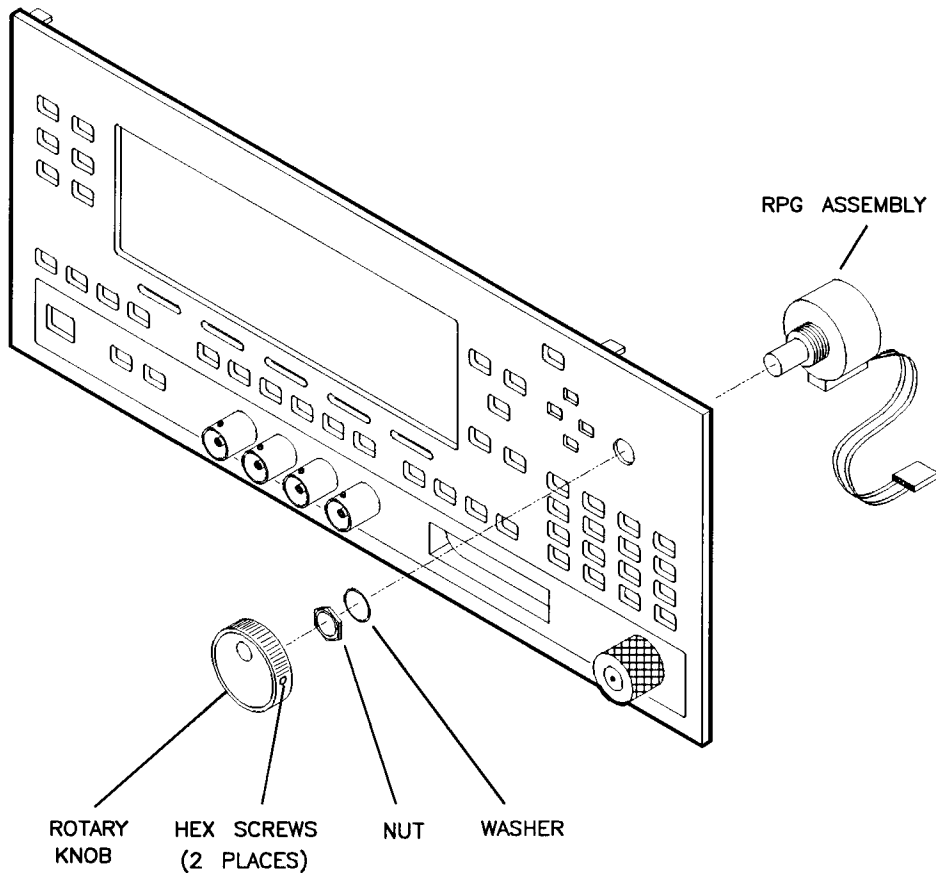


Figure 7-9. RPG Removal

7. J1 RF Output Connector Removal

Refer to Figure 7-10 for front panel output.

CAUTION To avoid damaging the connector, do not disassemble the RF output connector assembly. Only unscrew the connector on the end of the cable.

1. Complete “1. Preliminary Steps” and “2. Front Panel Removal” before continuing.
2. On the lower front frame edge, remove the two RF output screws that hold the RF output assembly.
3. Remove the RF connector with cable W43.

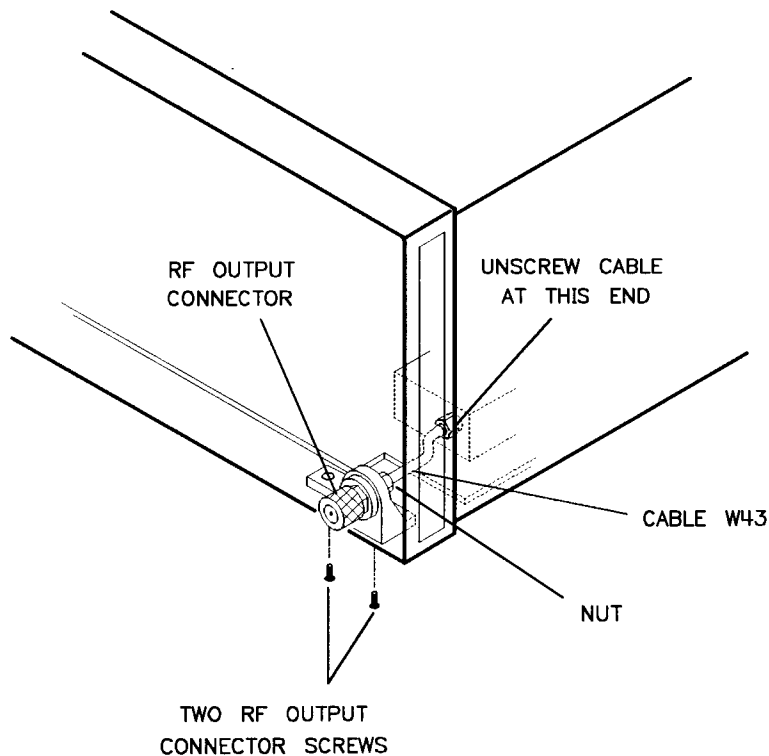


Figure 7-10. Removing RF Output Connector (Front Panel)

Note

When you re-attach the connector and cable to the synthesizer, first, loosen the nut between cable W43 and the connector. Then reverse steps 1 and 2. Finally, tighten the nut between cable W43 and the connector to 10 in-lb.

8. Front Panel BNC Connectors Removal

Refer to Figure 7-11.

1. Complete “1. Preliminary Steps”, “2. Front Panel Removal”, “3. A3 Front Panel Processor Removal” and “5. A2 Source Module Interface Removal” before continuing.
2. Remove the two screws on each of the four PC assemblies attached to the back of the front panel.
3. Slide out the connectors.

Note If the washer on the front of the connector is not centered properly, loosen the nut to slide the connector out.

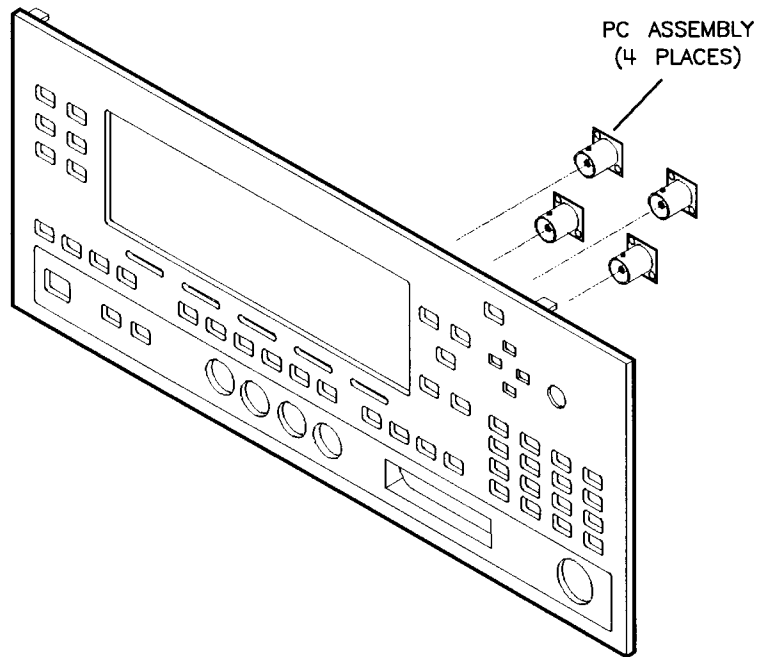


Figure 7-11. Front Panel BNC Locations

9. A1 Keyboard Removal

Refer to Figure 7-12.

1. Complete “1. Preliminary Steps”, “2. Front Panel Removal”, “3. A3 Front Panel Processor Removal”, “4. A21 Alphanumeric Display Removal” and “5. A2 Source Module Interface Removal” before continuing.
2. Remove the nine screws from the keyboard assembly.
3. Lift off the keyboard assembly.

Note It is important that the top of the keyboard be kept clean. Dirt on the contacts will affect the performance of the keypad.

4. Disconnect ribbon cable W5 from the keyboard.

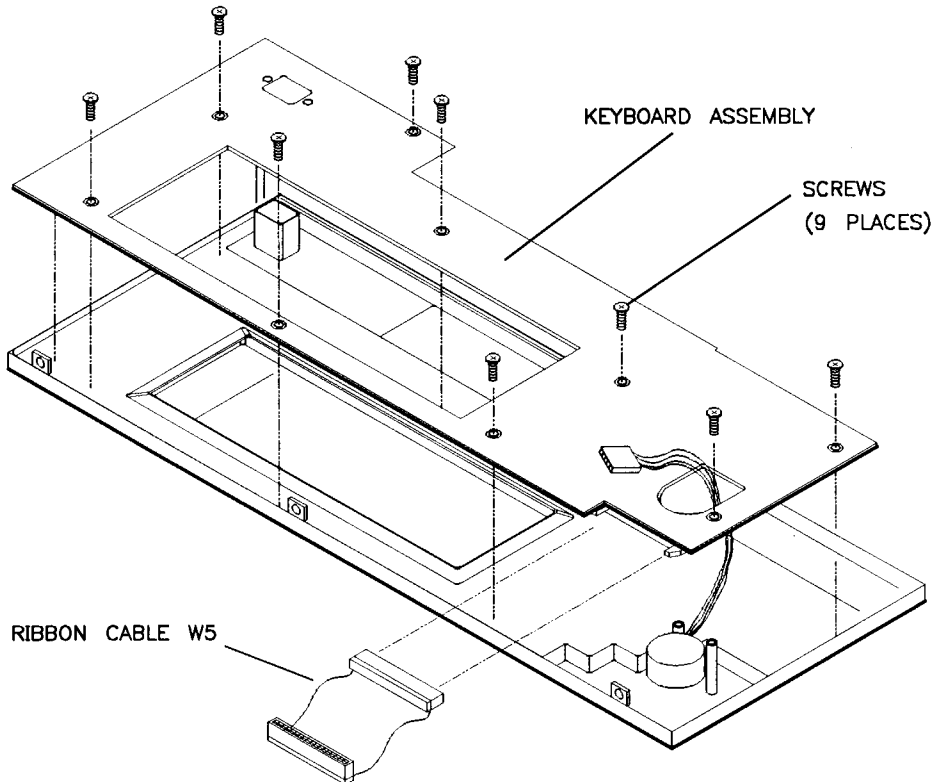


Figure 7-12. Keyboard Assembly Removal

Refer to Figure 7-13.

CAUTION The following steps can degrade keypad performance. If you separate the anti-rock sheets from the keypad, you must replace both the anti-rock sheets and the keypad.

5. Remove the keypad.
6. Remove the anti-rock sheets.

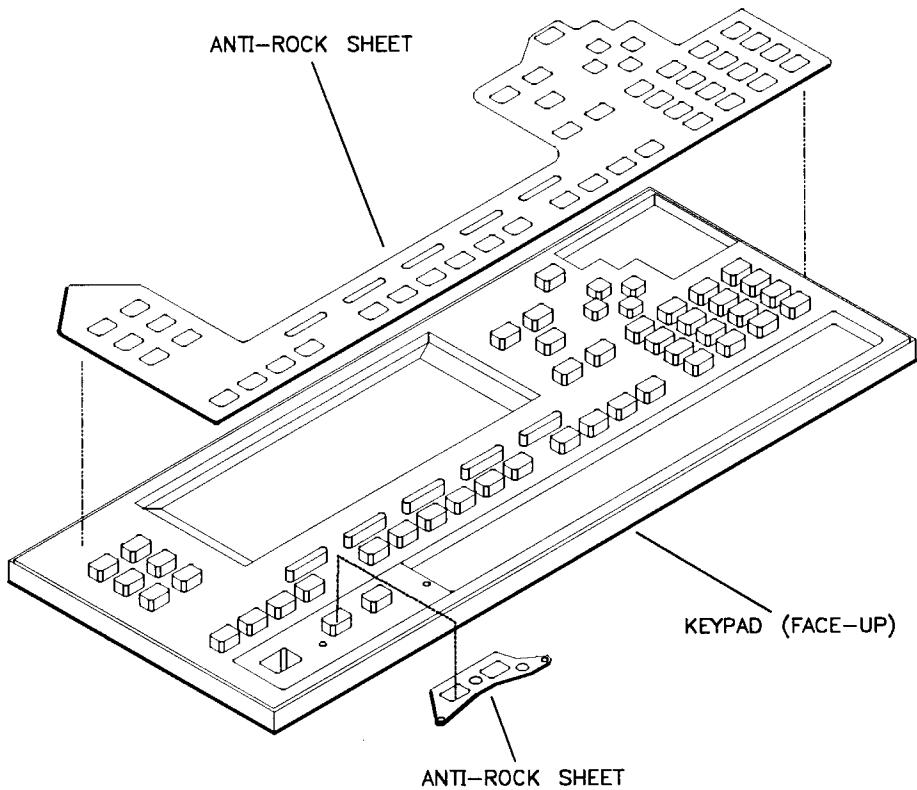


Figure 7-13. Keypad and Anti-rock Sheets

10. Display Filter Removal

Refer to Figure 7-14.

1. Complete “1. Preliminary Steps”, “2. Front Panel Removal”, “3. A3 Front Panel Processor Removal”, “4. A21 Alphanumeric Display Removal”, “5. A2 Source Module Interface Removal” and “9. A1 Keyboard Removal” before continuing.
2. With all other assemblies removed, lift out the display filter.

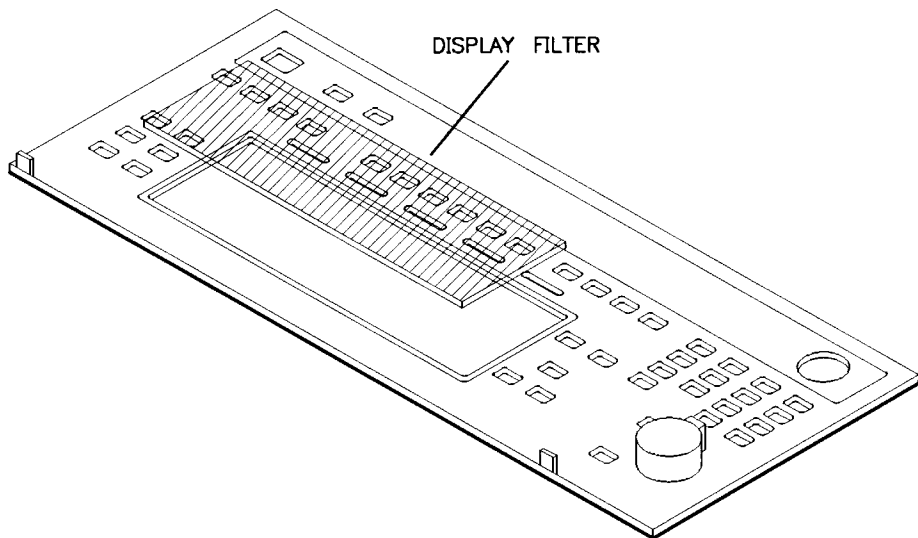


Figure 7-14. Display Filter

11. A1 Keyboard Reassembly

Refer to Figure 7-15.

1. With the front panel frame supported on the edges so it is elevated off the table by at least one inch, place the frame face down.
2. Clean the display filter and place it on the frame.
3. Carefully lining up the press-fit holes, place the anti-rock sheets over the keypad. Press into place.
4. Place the keypad face down and press each key into place.
5. Inspect the front panel to be sure all keys protrude through the front panel, and are all the same height.

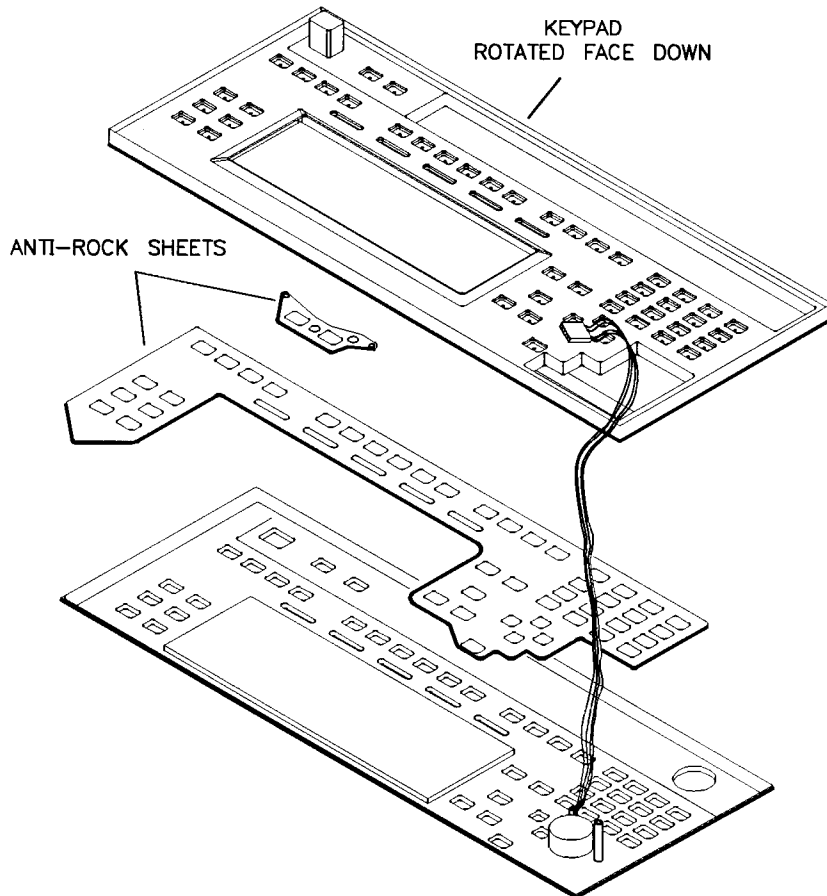


Figure 7-15. Keyboard Reassembly

Refer to Figure 7-16

6. Connect ribbon cable W5 to the A1 keyboard assembly.
7. Replace the A1 keyboard assembly.
8. Replace the nine screws that hold in the assembly.

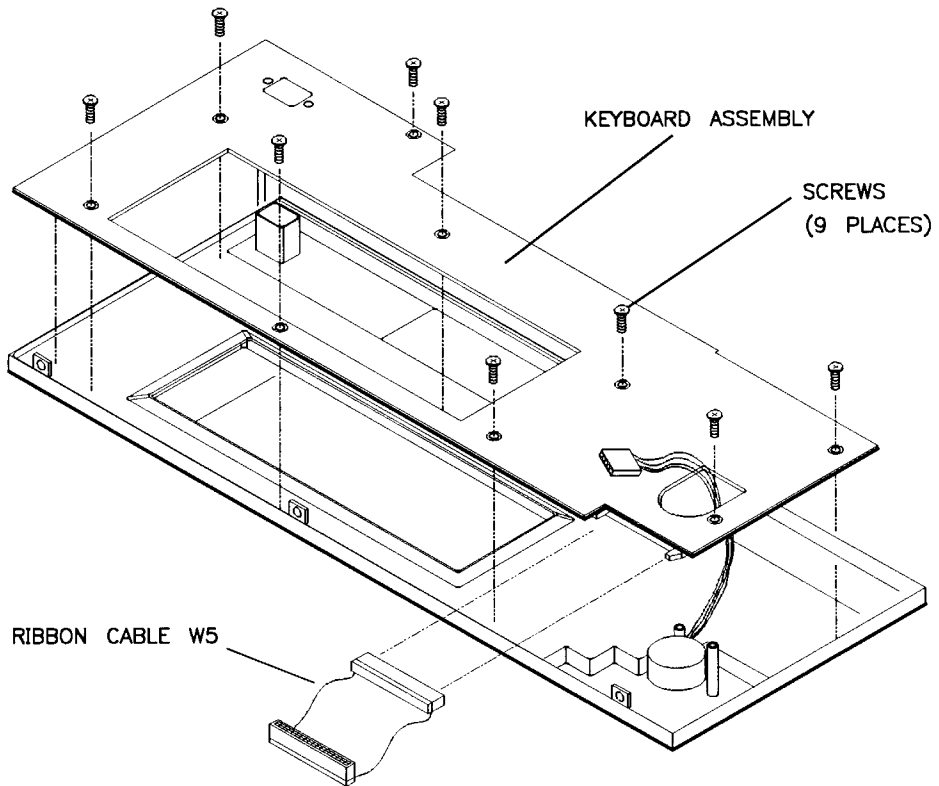


Figure 7-16. Keyboard Assembly Screw Locations

12. Front Panel Reassemblies

Follow the flowchart, Figure 7-2, in reverse order to perform the reassembly of the following assemblies:

- J1 RF Output Connector
- A3 Front Panel Processor
- A21 Alphanumeric Display
- A2 Source Module Interface Assembly
- RPG1 Rotary Pulse Generator (RPG)
- BNC Connectors
- Display Filter

Rear Panel Disassembly and Reassembly

Tools Required

- 9/16 in. Socket
- T-10 Torx Screwdriver
- T-15 Torx Screwdriver
- 5.5 mm Nut Driver
- 5/16 in. Open End Wrench
- 14 mm Open End Wrench
- 7 mm Nut Driver
- #1 x 3 1/8 in. Pozidriv Screwdriver
- #2 x 4 in. Pozidriv Screwdriver
- Coax Extractor Tool–Submin D Connector

Description and Procedure

Some steps in this procedure may not apply to all option configurations. If a particular step does not apply, continue with the next appropriate step.

To disassemble the rear panel and associated assemblies, follow this procedure in the order given.

To reassemble the rear panel and associated assemblies, follow this procedure in the reverse order.

CAUTION Cable routing may affect instrument performance. Refer to Figure 7-1 for a diagram of the instrument cable routing.

Refer to the flowchart in Figure 7-17 to determine the necessary disassembly steps for a given assembly.

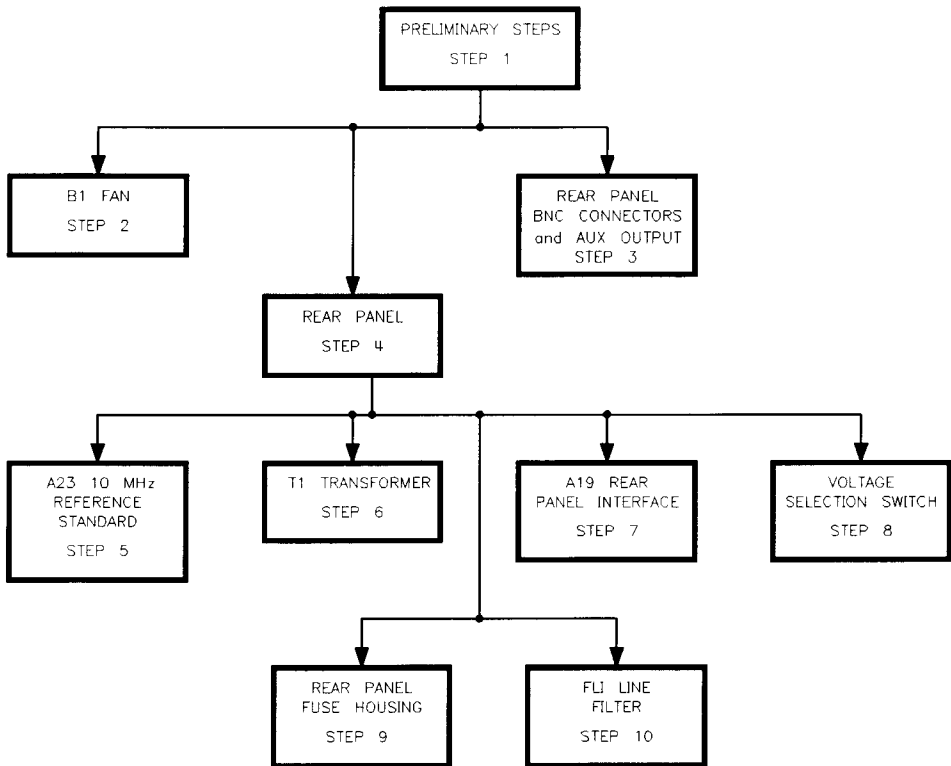


Figure 7-17. Rear Panel Disassembly Flowchart

1. Preliminary Steps

CAUTION You can easily blow the fuse for the 13.5V supply on the preregulator assembly if you do not disconnect the AC power cord. Also, the danger of shock is increased if the power cord is connected.

1. Disconnect the AC power line cord.
 2. Remove the screw from each of the four feet on the rear panel.
 3. Remove the four feet.
 4. To remove the side straps, remove the two screws on each side panel.
 5. Remove the instrument top, bottom, and side covers.
-

Note An RF braid is in each of the side channels on the top and bottom of the instrument. When you reassemble the instrument, be sure the braids remain in the side cover channels.

2. B1 Fan Removal

Refer to Figure 7-18.

1. Complete “1. Preliminary Steps” before continuing.
2. Remove both screws (item 1) from the fan shroud.
3. Remove items 2 through 5.
4. Remove the four screws (item 7) from the rear panel/fan brackets.
5. Unplug the fan harness.
6. Tip the fan and angle it out through the opening in the rear panel.
7. Remove the four screws (item 7) attaching the two brackets to the fan and remove the brackets (item 10).

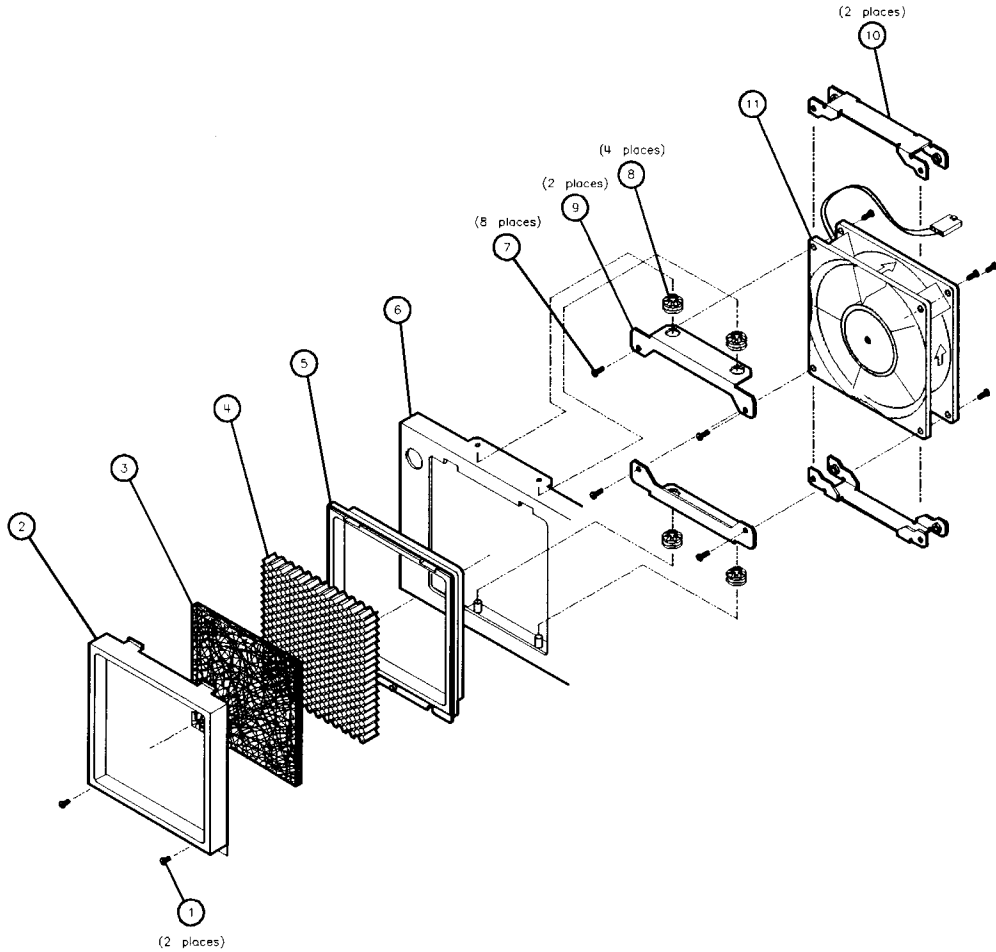


Figure 7-18. B1 Rear Panel Fan Assembly

3. Rear Panel BNC Connectors Removal and Aux Output Disconnection

Refer to Figure 7-19.

1. Complete “1. Preliminary Steps” before continuing.
2. Remove the nuts and washers on the four BNC connectors, 10 MHz REF INPUT, 10 MHz REF OUTPUT, VOLTS/GHz, and TRIGGER OUTPUT.
3. Slide out the four connectors.
4. If you have Option 002, repeat steps 1 and 2 for the following connectors: AM/FM OUTPUT, PULSE SYNC OUT, and PULSE VIDEO OUT.
5. Disconnect W48 at rear panel SMA connector J14 AUX OUTPUT.

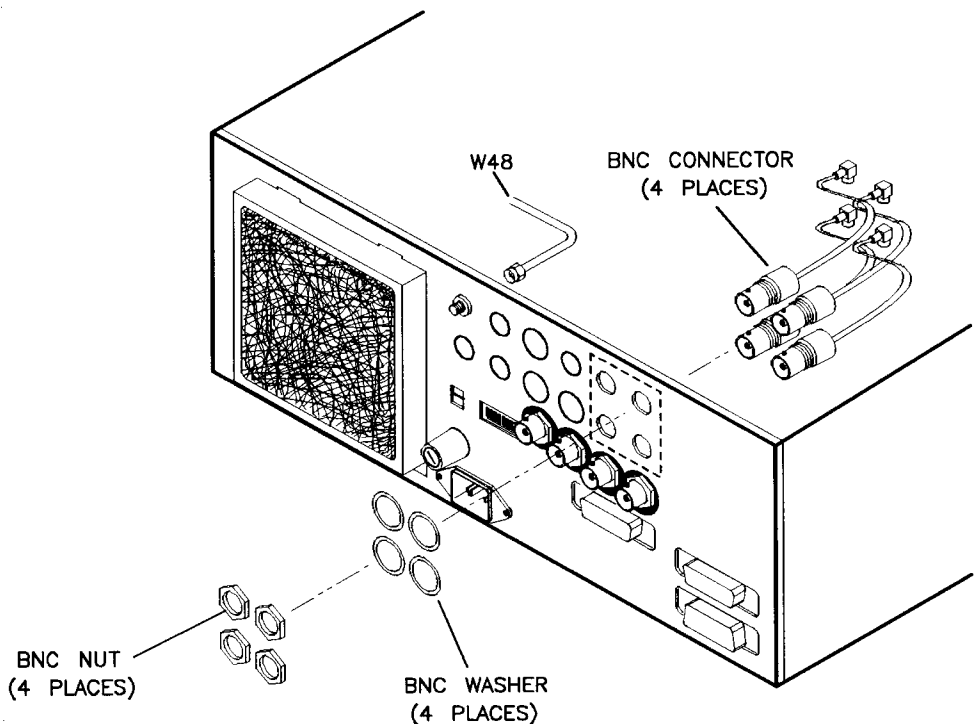


Figure 7-19. Rear Panel BNC Connector Locations

4. J1 RF Output Connector Removal (Option 004)

Refer to Figure 7-20.

CAUTION To avoid damaging the connector, do not disassemble the RF output connector assembly. Only unscrew the connector on the end of the cable.

1. Complete “1. Preliminary Steps” before continuing.
2. Disconnect cable W43 at the directional coupler A30 (or at the step attenuator A31 for instruments with Option 001).
3. Remove the two screws from the RF output connector plate on the rear panel.
4. Remove the RF connector with cable W43 attached.

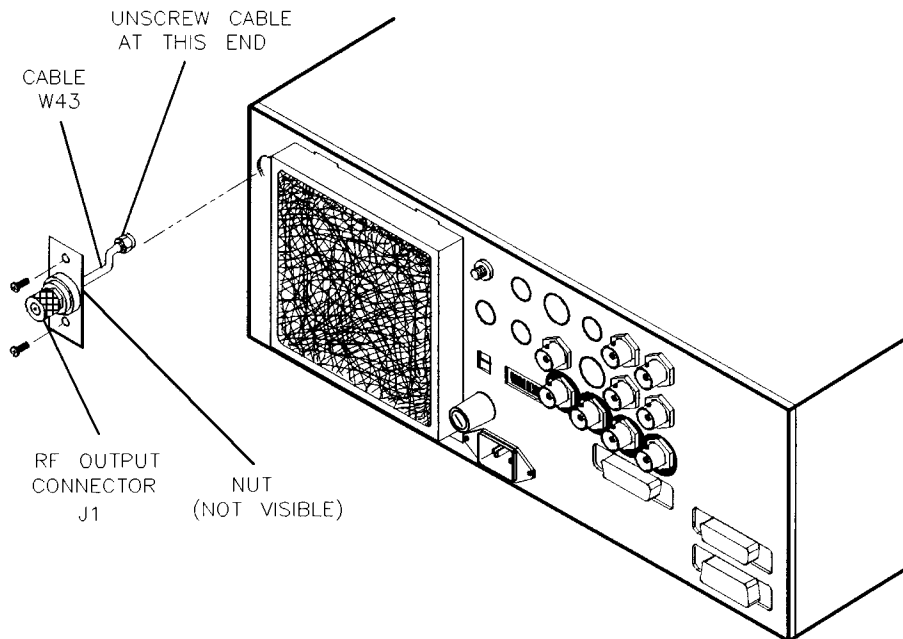


Figure 7-20. Removing RF Output Connector

Note

When you re-attach the connector and cable to the synthesizer, first, loosen the nut between cable W43 and the connector. Then perform the disassembly steps in reverse order. Finally, torque the nut between cable W43 and the connector J1 to 10 in-lb (112 N-cm).

5. Rear Panel Removal

Refer to Figure 7-21.

1. Complete “1. Preliminary Steps” and “7. J1 RF Output Connector Removal” before continuing.
2. Remove the four screws on the top back edge.
3. Remove the four screws on the bottom back edge.
4. Slide the rear panel out of the casting.

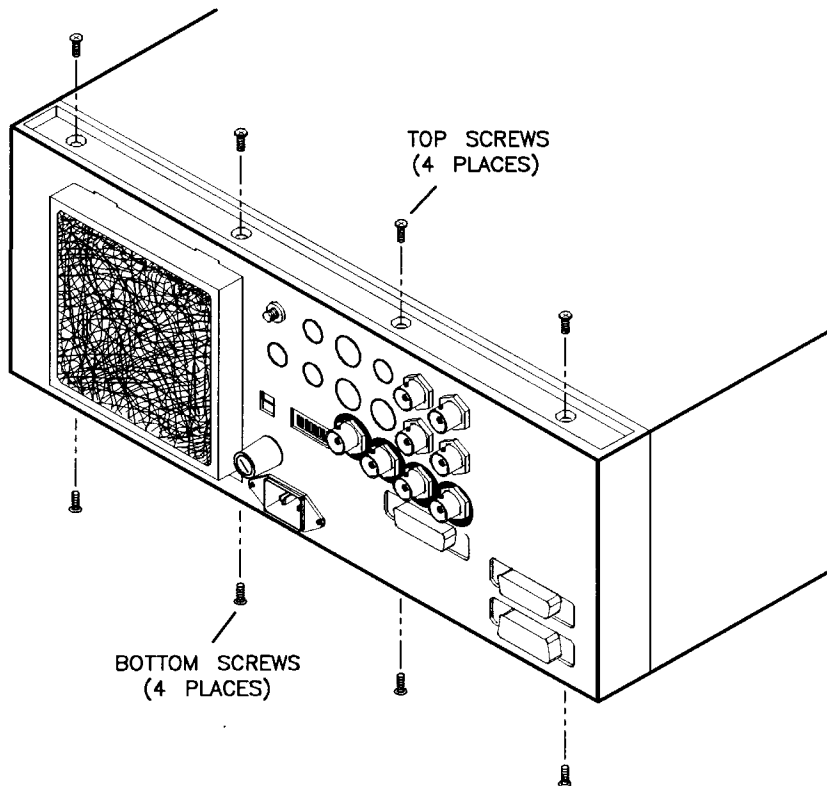


Figure 7-21. Rear Panel Removal

Refer to Figure 7-22.

5. Disconnect ribbon cable W31 from the motherboard.
6. Disconnect the 8-pin line switch connector.
7. Disconnect the fan harness.
8. Cut the tie wraps holding the coaxial cables to the four BNC connectors and the source module interface.
9. Disconnect the coaxial cables from the A7, A12, and A14 assemblies and disconnect the source module interface cable from the A19 assembly.

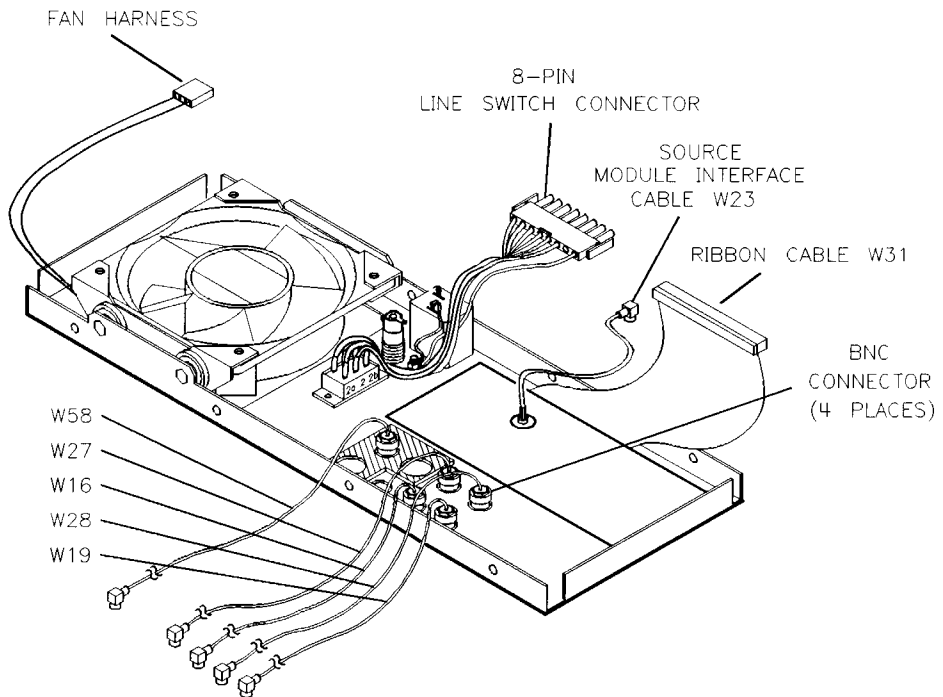


Figure 7-22. Rear Panel Cable Locations

6. A23 10 MHz Reference Standard Removal

Refer to Figure 7-23.

1. Complete “1. Preliminary Steps”, “7. J1 RF Output Connector Removal”, and “5. Rear Panel Removal” before continuing.
2. Disconnect cable W17 and the pin-locking tab, W30.
3. Without removing the screws, press the shock-mount pads through the sheet metal holes.
4. Slide the reference standard out.

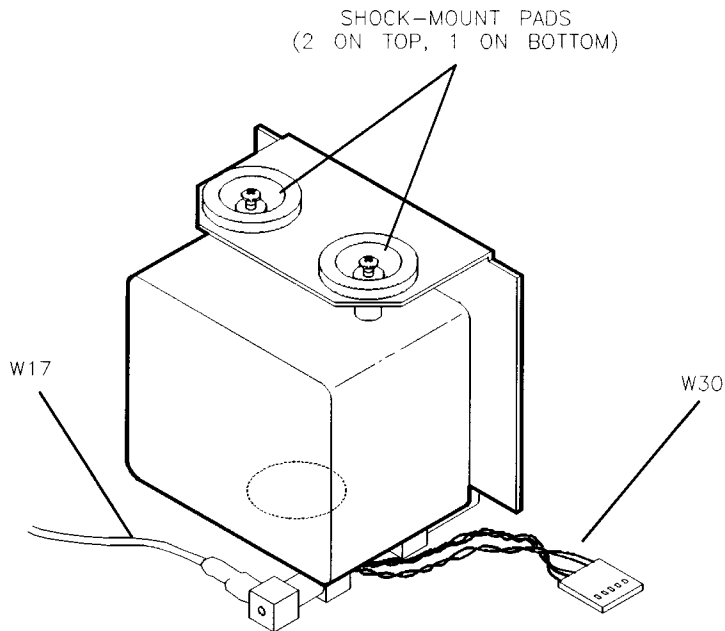


Figure 7-23. Reference Standard Mountings

7. T1 Transformer Removal

Refer to Figure 7-24.

1. Complete “1. Preliminary Steps”, “7. J1 RF Output Connector Removal”, and “5. Rear Panel Removal” before continuing.
2. Remove the six-wire pin-locking tab.
3. Remove the center screw, plastic washer, two insulators, and plate.
4. Remove the toroidal transformer.

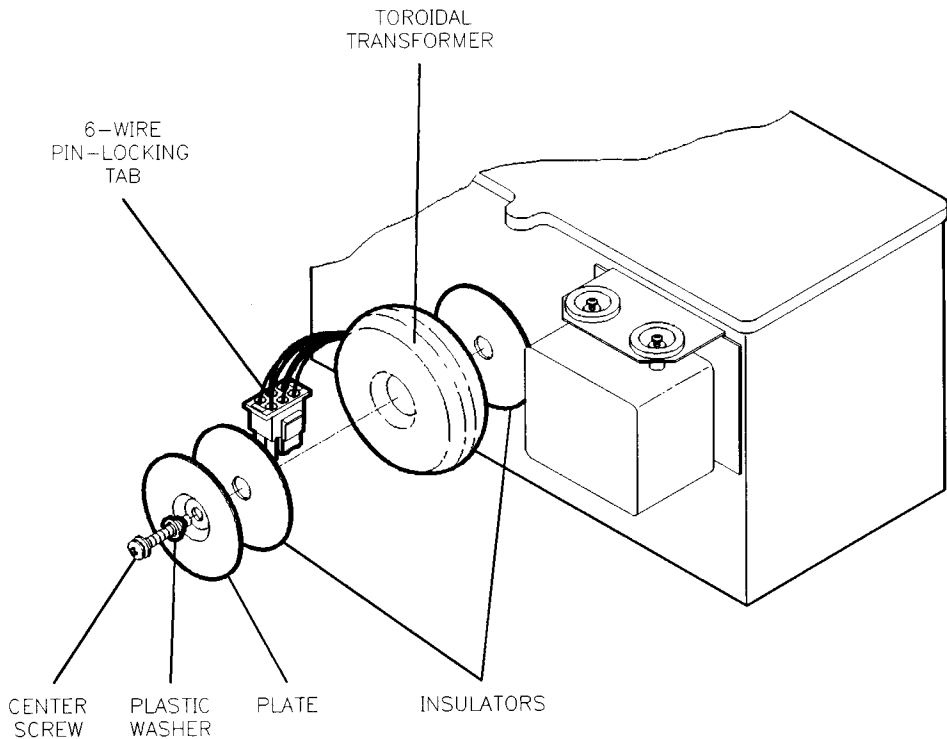


Figure 7-24. Transformer Removal

8. A19 Rear Panel Interface Removal

Refer to Figure 7-25.

1. Complete “1. Preliminary Steps”, “7. J1 RF Output Connector Removal”, and “5. Rear Panel Removal” before continuing.
2. Disconnect the source module interface cable W23 from SMB connector A10J3 on the A10 ALC assembly. (W23 is not included with replacement A19 assemblies.)
3. Remove the five screws.
4. Remove A19 from the rear panel.
5. To remove the shield from the rear panel interface, first remove W23 using the coax extractor tool and then remove the two screws holding the shield to the rear panel interface.

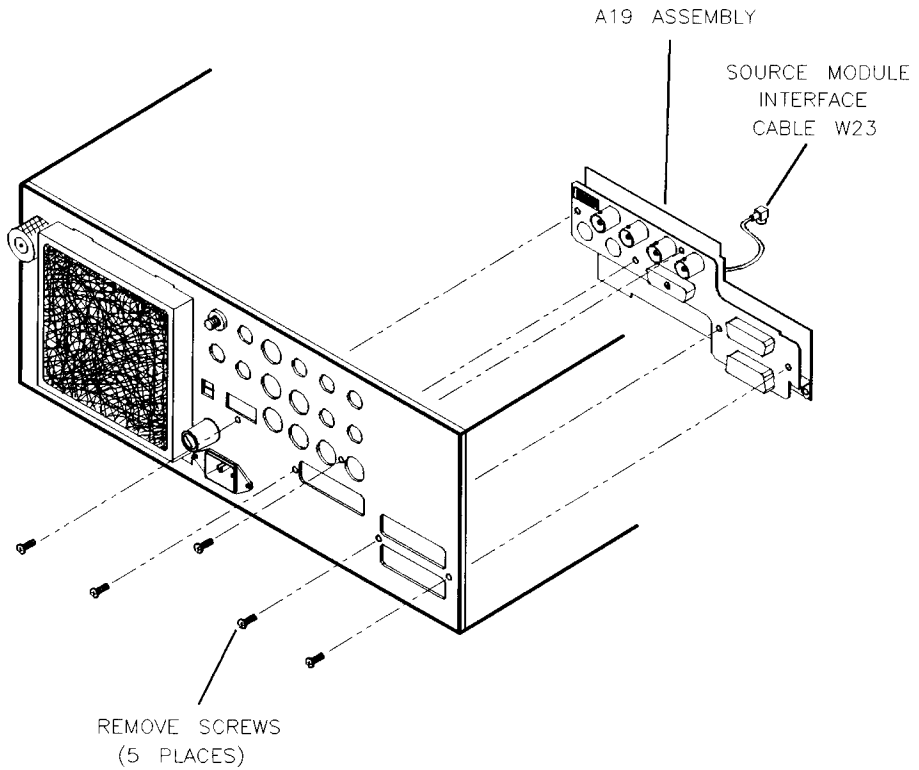


Figure 7-25. A19 Rear Panel Interface Removal

9. Voltage Selector Switch Removal

Refer to Figure 7-26.

1. Complete “1. Preliminary Steps”, “7. J1 RF Output Connector Removal”, and “5. Rear Panel Removal” before continuing.
2. Cut the tie wraps holding the wires.
3. Disconnect the 8-pin connector from the motherboard.
4. Remove the two nuts, bolts, and washers holding in the voltage selector switch.

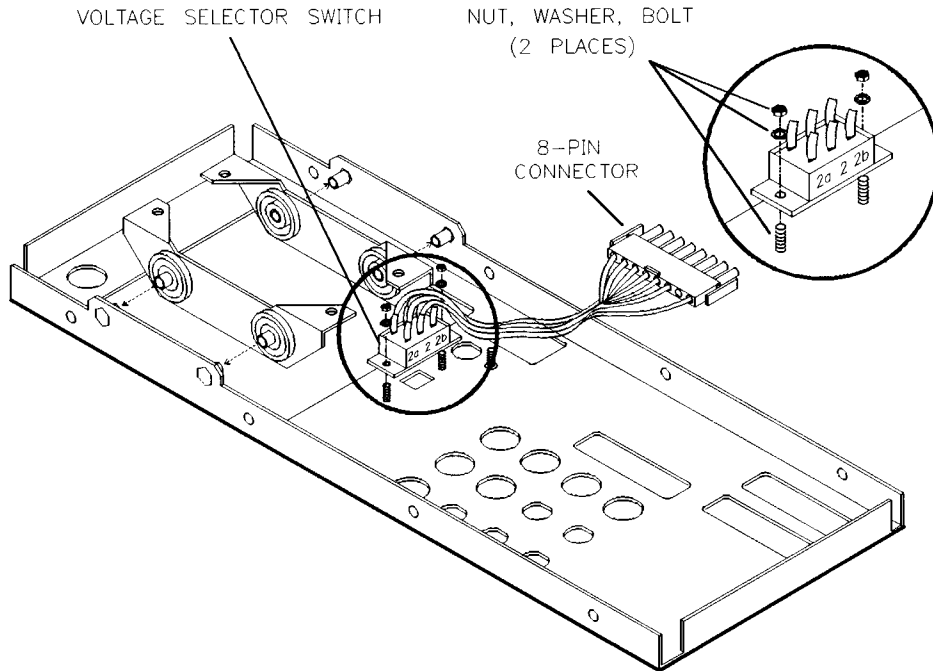


Figure 7-26. Voltage Selection Switch Removal

Refer to Figure 7-27.

5. Unsolder the white/brown/grey wire from the fuse.
6. Unsolder the white/grey wire from the line filter.
7. Unscrew the green/white ground wire from the back panel.

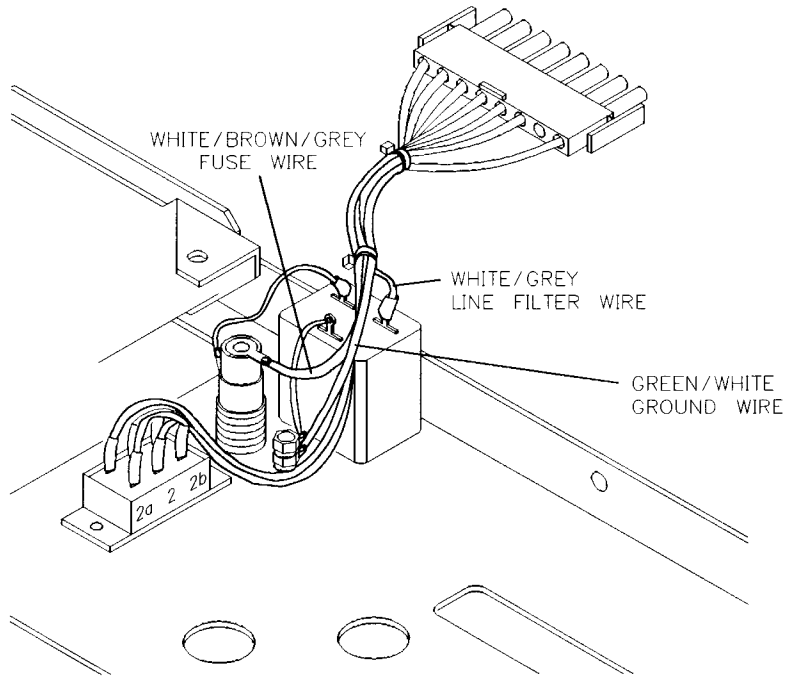


Figure 7-27. Fuse, Line Filter, and Ground Wires

Note

To reassemble, add 3/8 in. shrink tubing to each wire before soldering. Then perform the above steps in reverse order.

10. Fuse Housing Removal

Refer to Figure 7-28.

1. Complete “1. Preliminary Steps”, “7. J1 RF Output Connector Removal”, and “5. Rear Panel Removal” before continuing.
2. Remove the two nuts, bolts, and washers holding the voltage selector switch, and remove the switch (this provides clearance for the wrench to remove the fuse holder).
3. Unsolder the two fuse holder wires.
4. Unscrew the nut holding the fuse housing.
5. Slide the fuse housing out of the back panel.

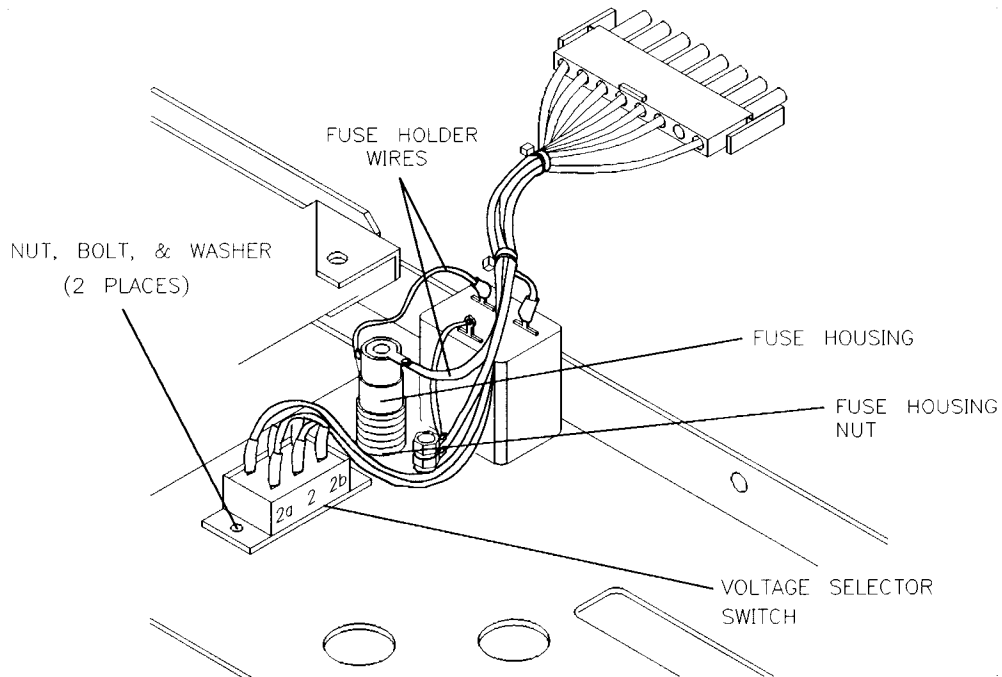


Figure 7-28. Rear Panel Fuse Housing

Note To reassemble, add 3/8 in. shrink tubing to each wire before soldering. Then perform the above steps in reverse order.

11. FL1 Line Filter Removal

Refer to Figure 7-29.

1. Complete “1. Preliminary Steps”, “7. J1 RF Output Connector Removal”, and “5. Rear Panel Removal” before continuing.
2. Unsolder the three wires attached to the line filter.
3. Remove the two screws on the rear panel.
4. Slide out the line filter from the rear panel.

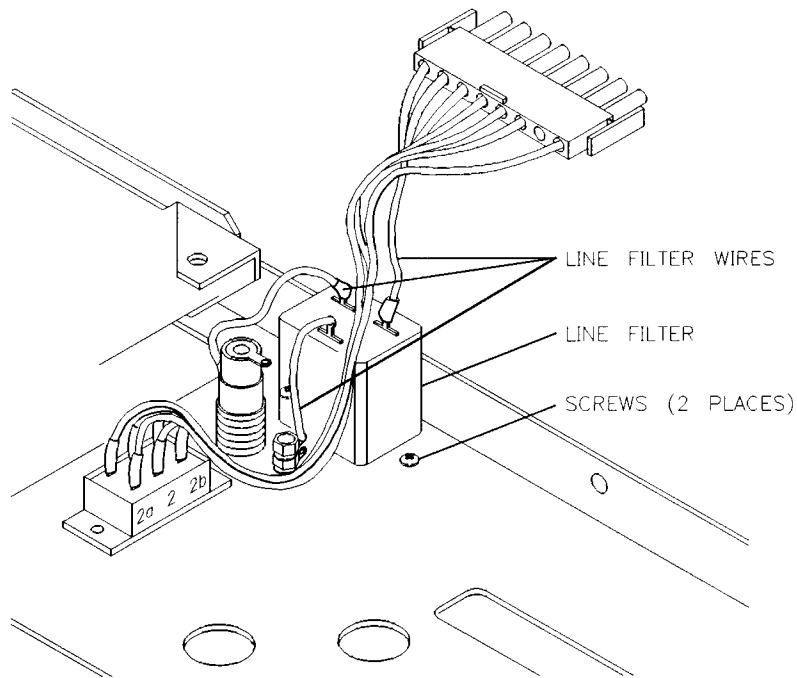


Figure 7-29. Line Filter Removal

Note

To reassemble, add 3/8 in. shrink tubing to each wire before soldering. Then perform the above steps in reverse order.

12. Option 004 BNC Connectors Removal

Refer to Figure 7-30.

1. Complete "1. Preliminary Steps" before continuing.
2. Remove the five screws holding the A34 RP floating BNC board assembly to the rear panel.
3. Slide out the board with the connectors.
4. Remove the nut and washer attaching the pulse input BNC connector to the rear panel.
5. Slide out the pulse input BNC connector.

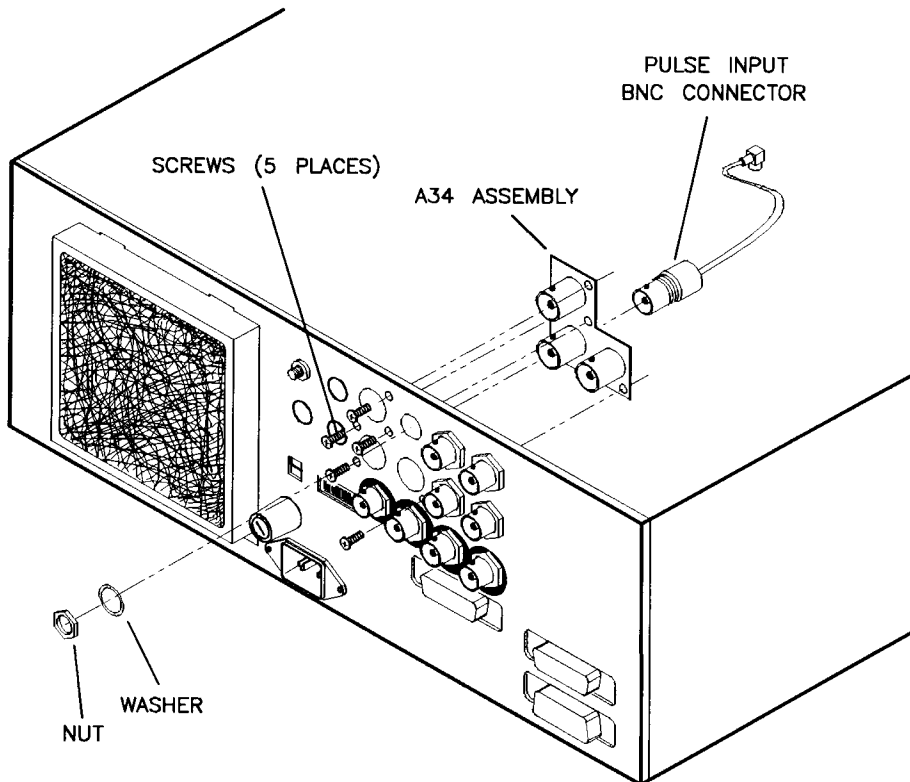


Figure 7-30. Option 004 BNC Connectors Removal

RF Deck Disassembly and Reassembly

Tools Required

#1 x 3 1/8 in. Pozidriv Screwdriver
T-10 Torx Screwdriver
5/16 in. Torque Wrench
5 mm Ball and Socket Driver

Note On the RF deck, all Pozidriv screws have English threads and all Torx screws have metric threads.

Description and Procedure

To disassemble the RF deck and associated assemblies, follow this procedure in the order given.

To reassemble the RF deck and associated assemblies, follow this procedure in the reverse order.

Refer to the flowchart in Figure 7-31 to determine the necessary disassembly steps for a given assembly.

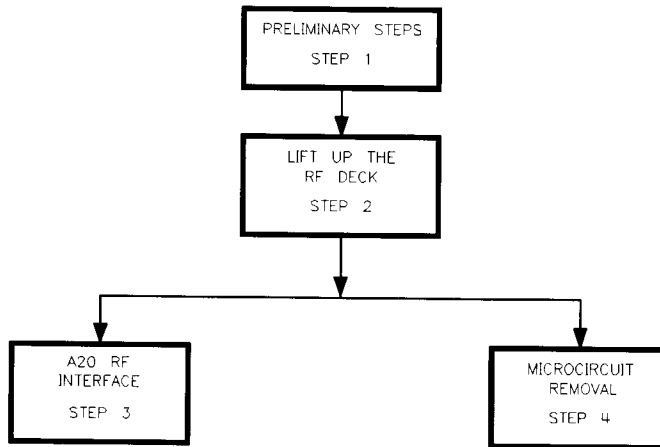


Figure 7-31. RF Deck Disassembly Flowchart

1. Preliminary Steps

CAUTION You can easily blow the fuse for the 13.5V supply on the preregulator assembly if you do not disconnect the AC power cord. Also, the danger of shock is increased if the power cord is connected.

1. Disconnect the AC power line cord.
 2. Remove the screw from each of the top two feet on the rear panel.
 3. Remove the top two feet.
 4. Remove the instrument top cover.
-

Note An RF braid is in each of the side channels on the top of the instrument. When you reassemble the instrument, be sure this braid remains in the channel.

2. Lift Up the RF Deck

If your instrument has front panel RF output, remove the front panel. (See “Front Panel Disassembly and Reassembly”, step 2.)

If your instrument has rear panel RF output (Option 004), see step 4 of “Rear Panel Disassembly and Reassembly” then continue with step 4 of this procedure.

CAUTION To avoid damaging the connector, do not disassemble the RF output connector assembly. Only unscrew the connector on the end of the cable.

1. Complete “1. Preliminary Steps” before continuing.
2. On the lower front frame edge, remove the two screws that hold the RF output assembly.
3. Remove the RF connector with cable W43 still connected.

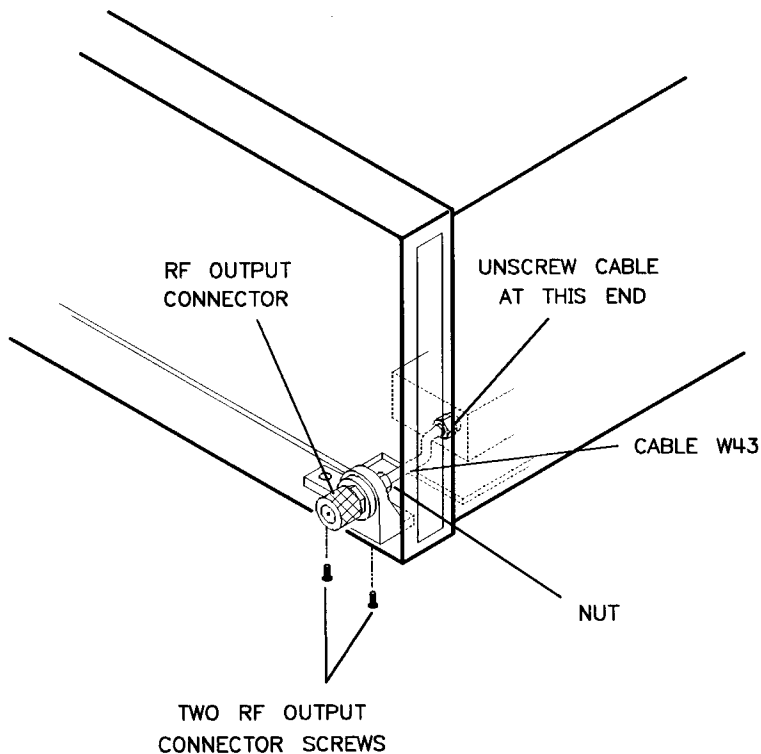


Figure 7-32. Removing RF Output Connector

Note

When you re-attach the connector and cable to the synthesizer, first loosen the nut between cable W43 and the connector. Then reverse steps 1 through 3. Finally, torque the nut between cable W43 and connector J1 to 10 in-lb (112 N-cm).

4. Reinstall the front panel.
5. Carefully disconnect cable W48 from the rear panel SMA connector W14 (it's a close fit – watch out that you do not damage the cable center conductor).
6. Disconnect cable W51 (see Figure 7-33) from the low pass filter FL2 (you may need to loosen the other end of W51 also).
7. Remove the two hex screws from the RF deck.

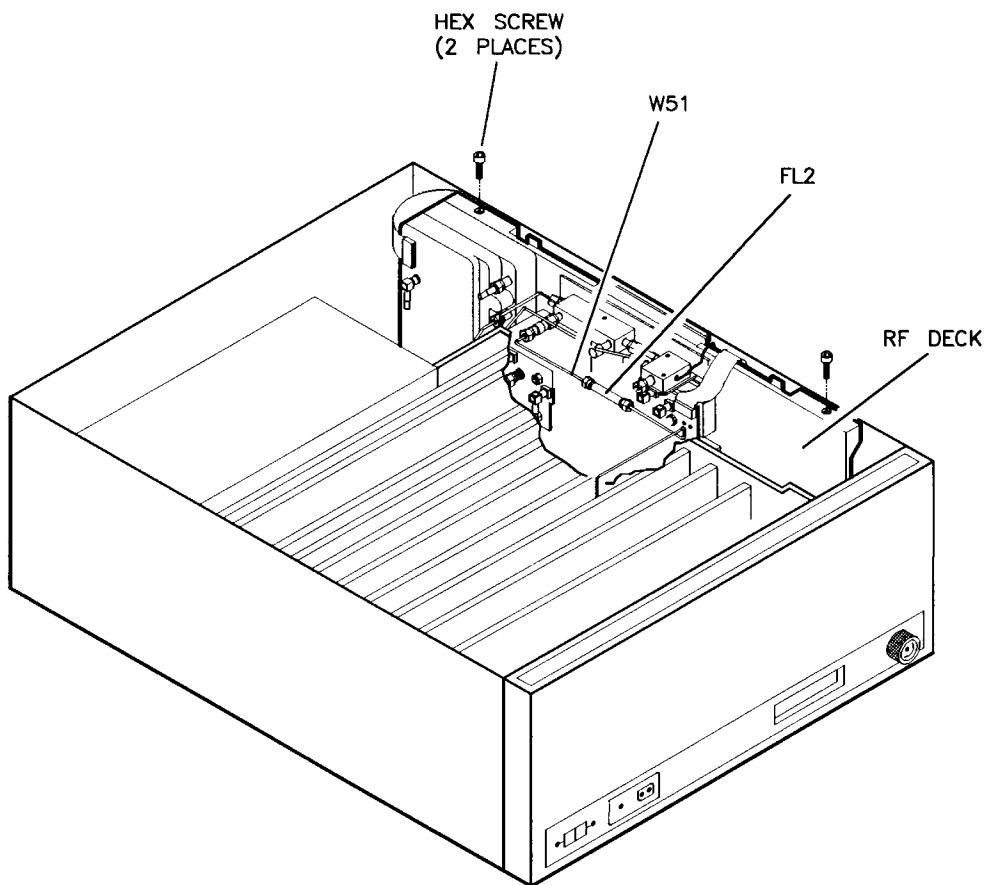


Figure 7-33. W51 RF Cable Location

CAUTION

Avoid damage to the various ribbon cables and their connectors attached to the RF deck assembly when removing that assembly in the next step. Move all flexible coaxial cables out of the way of the RF deck assembly components.

8. Carefully pull out the RF deck and rest it on the side of the instrument.

Note Some flexible cables will still be attached preventing the RF deck from being completely removed from the instrument.

Refer to Figure 7-34.

Note The analog extender board and coax extender cable mentioned in the following steps are part of the service tool kit. Refer to Chapter 9 for the part number of this kit.

9. For troubleshooting insert an analog extender board into the motherboard connector for the RF deck. Place the RF deck on the extender board and use the two hex screws to attach the deck to the synthesizer frame (service position). If you are not troubleshooting and are lifting up the RF deck for disassembly purposes, attach the deck to the synthesizer frame without using the extender board.
10. For troubleshooting:
 - a. Attach a coax extender cable between W51 and the low pass filter FL2.
 - b. Reconnect the RF connector and W43.
 - i. Loosen the nut between cable W43 and the connector.
 - ii. Reconnect cable W43 at directional coupler A30 (or the attenuator A31 for instruments with Option 001).
 - iii. Torque the nut between cable W43 and connector J1 to 10 in-lb (112 N-cm).

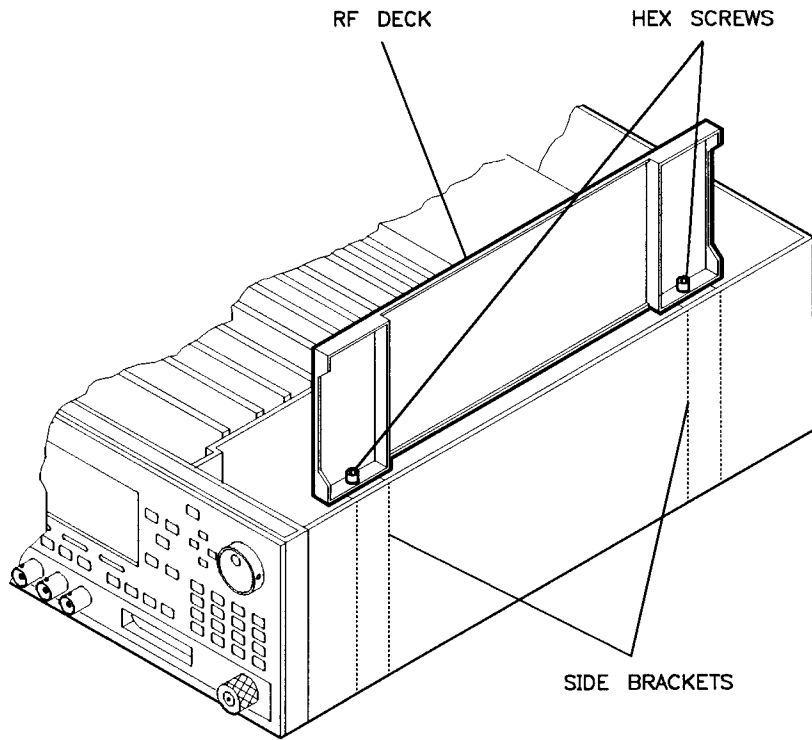


Figure 7-34. RF Deck in the Service Position

3. A20 RF Interface Removal

Refer to Figure 7-35.

1. Complete “1. Preliminary Steps” and “2. Lift Up the RF Deck” before continuing.
2. Disconnect the following ribbon cables. (You may need to loosen the two hex screws attaching the deck to the synthesizer frame in order to remove the cables on the lower edge of the RF deck.)
 - W36 (HP 83640A/50A only)
 - W37
 - W38
 - W39
 - W40 (Option 001 only)
 - W41
 - W42
 - W69 (All models except HP 83624A)
 - W73 (All models except HP 83623A/24A)
3. Remove the 3-wire pin-locking tab (HP 83623A/24A).
4. Remove the four corner screws that attach the board to the casting.
5. Remove the A20 RF interface assembly.

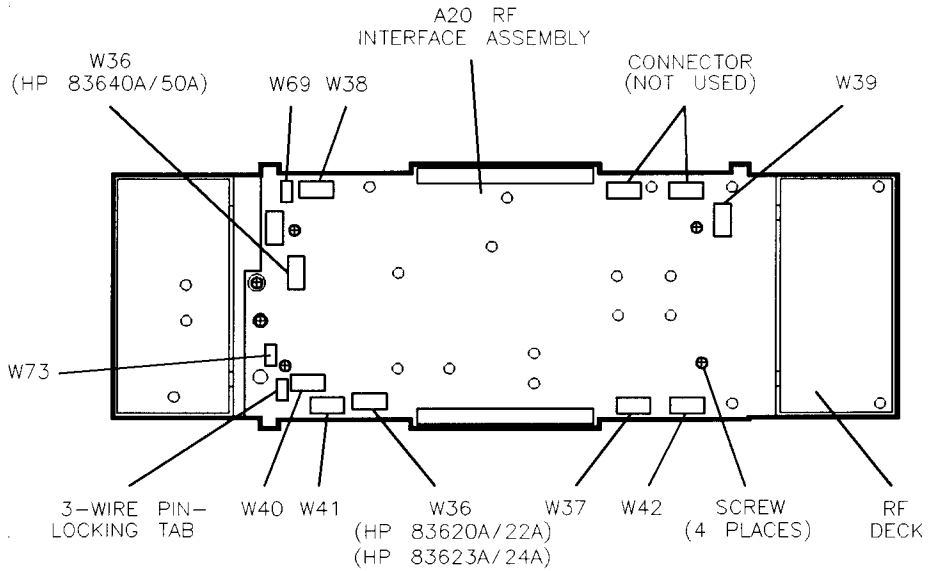


Figure 7-35. A20 RF Interface

4. Microcircuit Removal

Note For the following procedures, refer to Figure 7-36 through Figure 7-50 for cable locations and for screw locations.

1. Complete “1. Preliminary Steps” and “2. Lift Up the RF Deck” before continuing.
2. With the RF deck up in the service position, any microcircuit can be removed:
 - a. Most microcircuits have a cable connecting them to the A20 RF interface assembly. Disconnect the cable from the A20 assembly (if you have already removed the A20 assembly, this step is not necessary).
 - b. Disconnect all semi-rigid and flexible cables from the microcircuit. Be sure to loosen all semi-rigid cables at their other connections also. If you do not, the cables may be damaged.
 - c. Remove the microcircuits by removing the screws that hold them to the RF deck.

RF Deck Cables
HP 83640A/50A
No Options

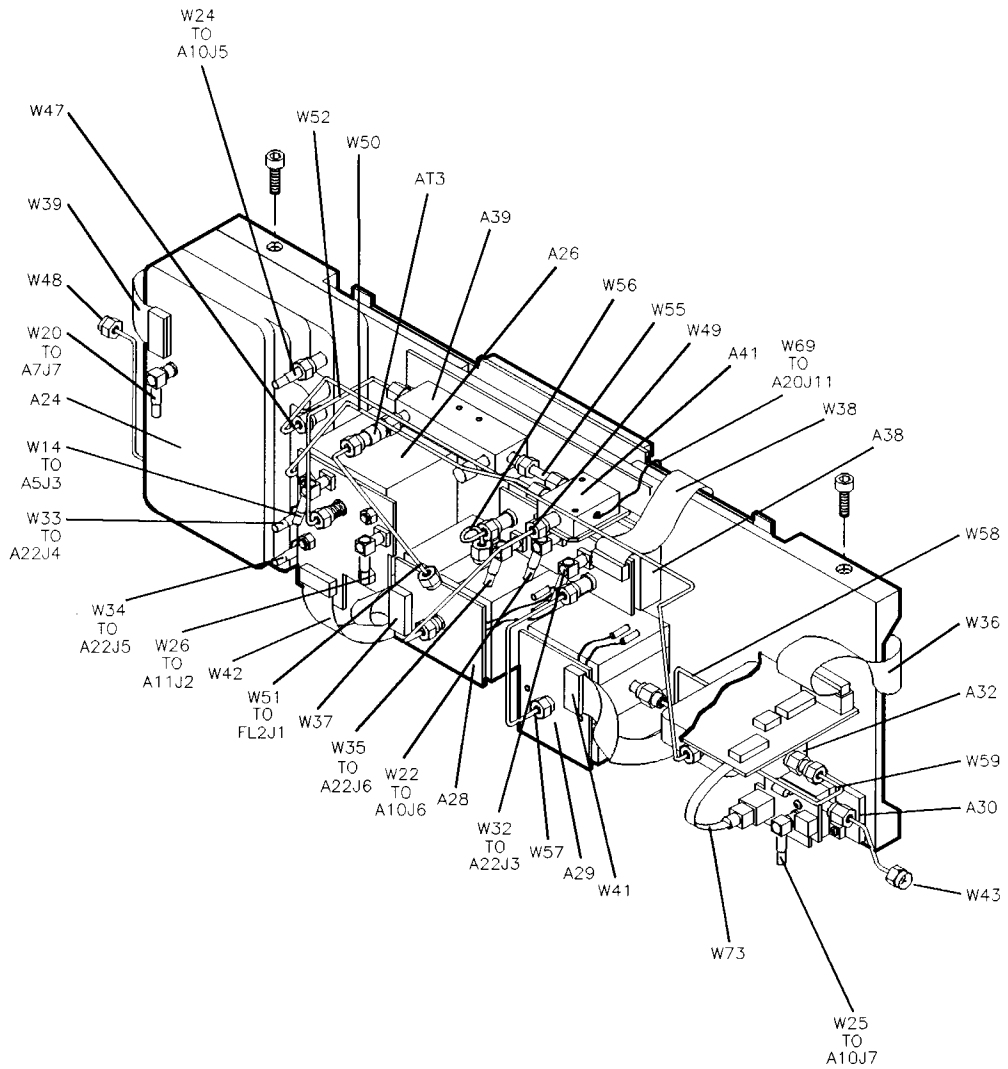


Figure 7-36. RF Deck Cable Locations – HP 83640A/50A

RF Deck Cables
HP 83640A/50A
Option 001

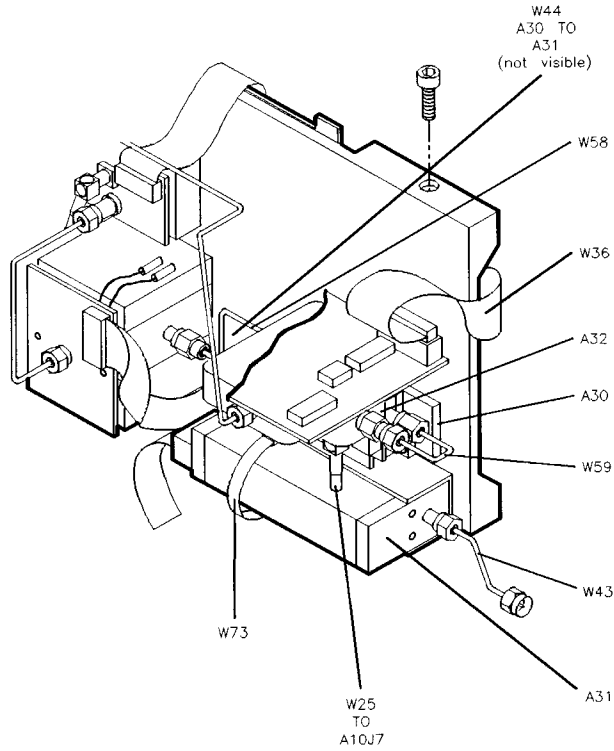


Figure 7-37. RF Deck Cable Locations - HP 83640A/50A Option 001

RF Deck Cables
HP 83640A/50A
Option 006

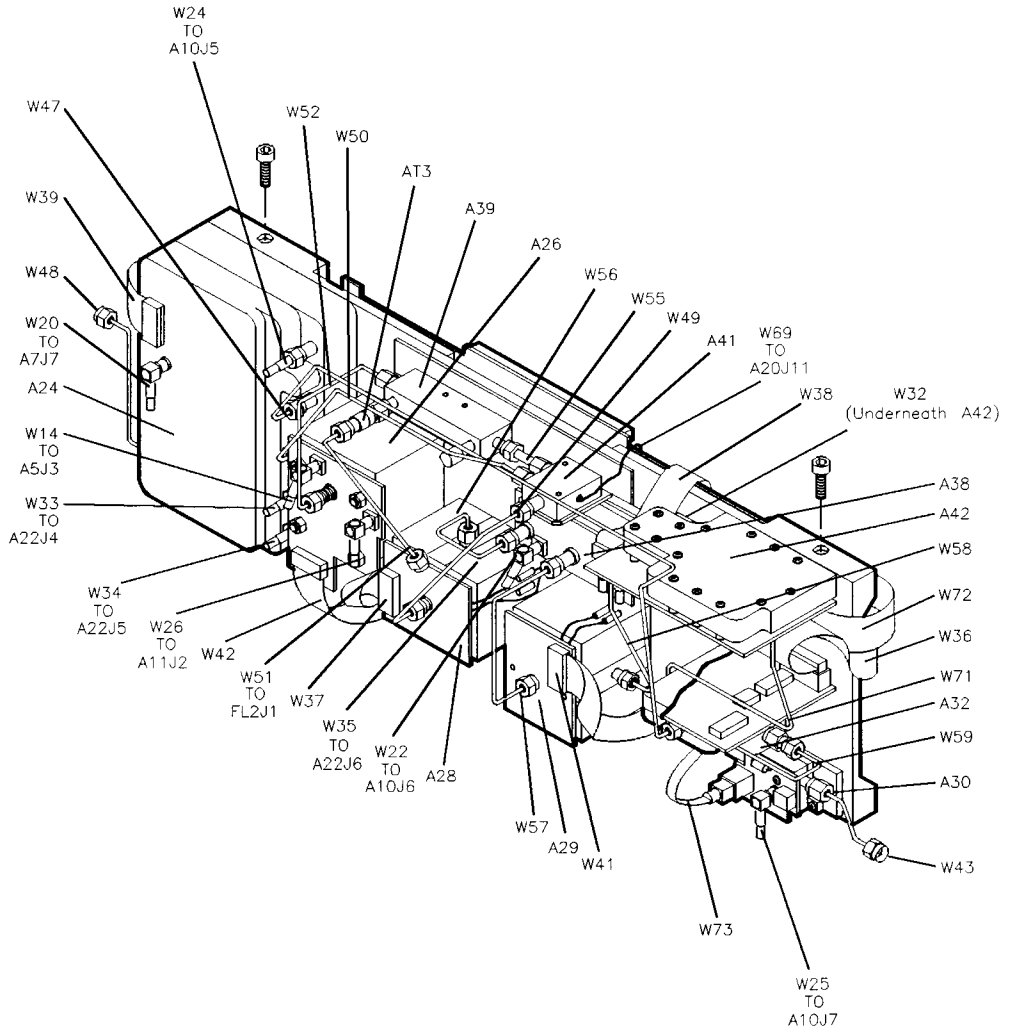


Figure 7-38. RF Deck Cable Locations - HP 83640A/50A Option 006

RF Deck Cables
HP 83640A/50A
Options 001 and 006

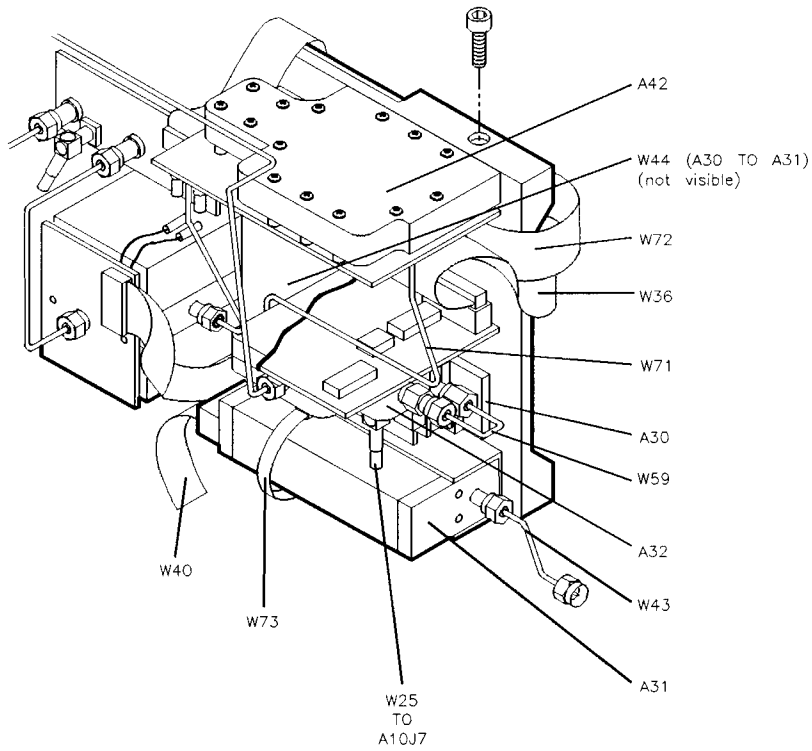


Figure 7-39. RF Deck Cable Locations – HP 83640A/50A Options 001 and 006

RF Deck Cables
HP 83620A/22A/30A
No Options

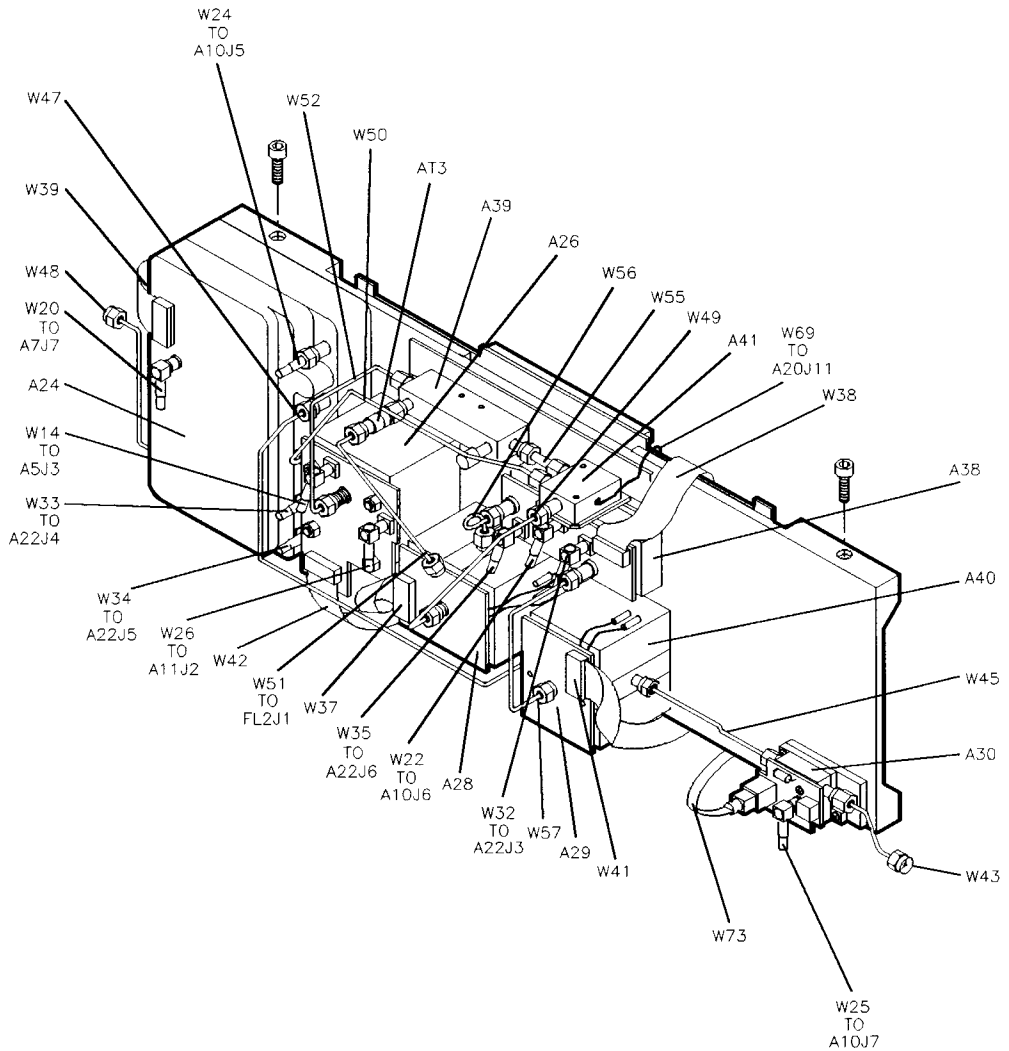


Figure 7-40. RF Deck Cable Locations - HP 83620A/22A/30A

RF Deck Cables
HP 83620A/22A/30A
Option 001

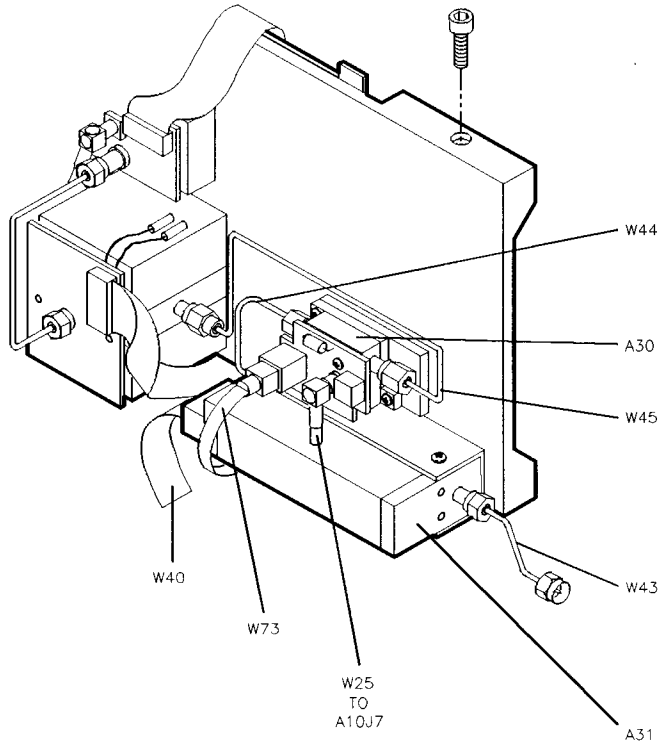


Figure 7-41. RF Deck Cable Locations - HP 83620A/22A/30A Option 001

RF Deck Cables
HP 83620A/22A/30A
Option 006

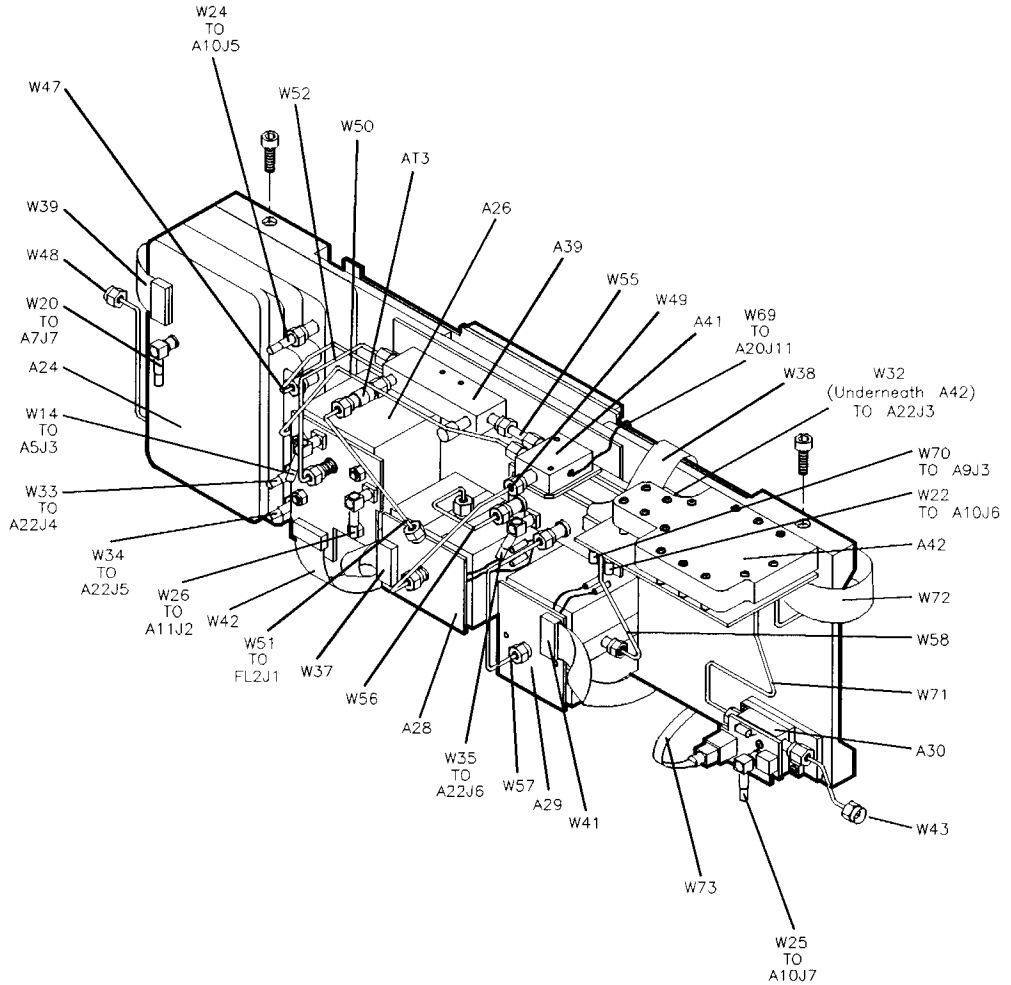


Figure 7-42. RF Deck Cable Locations - HP 83620A/22A/30A Option 006

RF Deck Cables
HP 83620A/22A/30A
Options 001 and 006

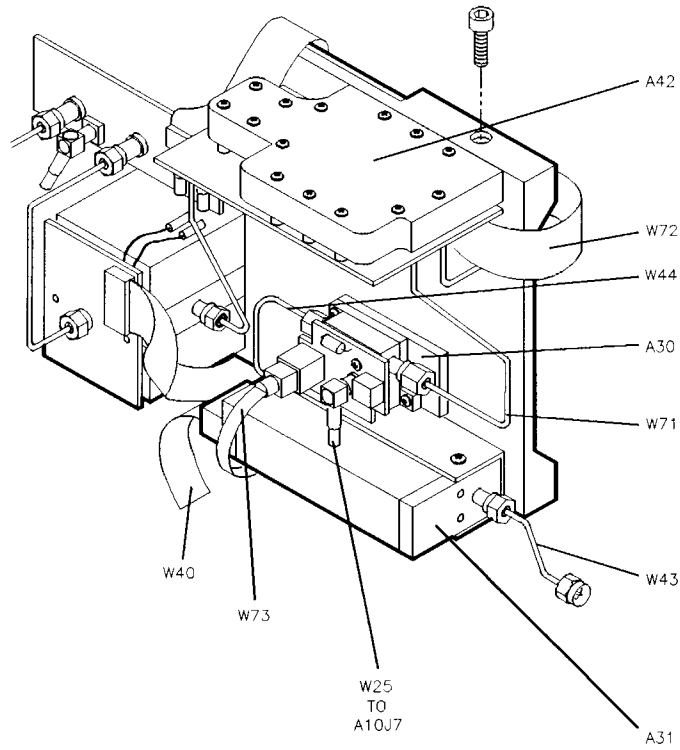


Figure 7-43.
RF Deck Cable Locations – HP 83620A/22A/30A Options 001 and 006

RF Deck Cables
HP 83623A
Option 001

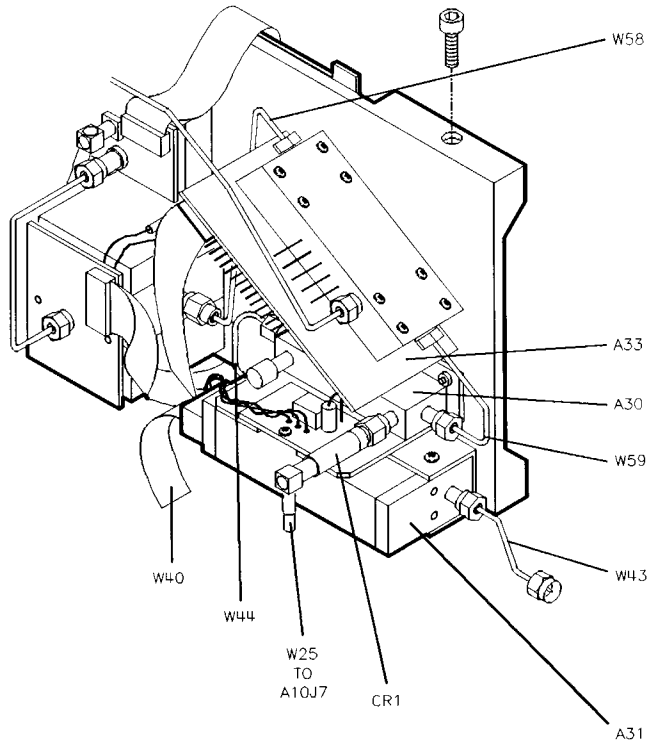


Figure 7-45. RF Deck Cable Locations - HP 83623A Option 001

RF Deck Cables
HP 83624A
No Options

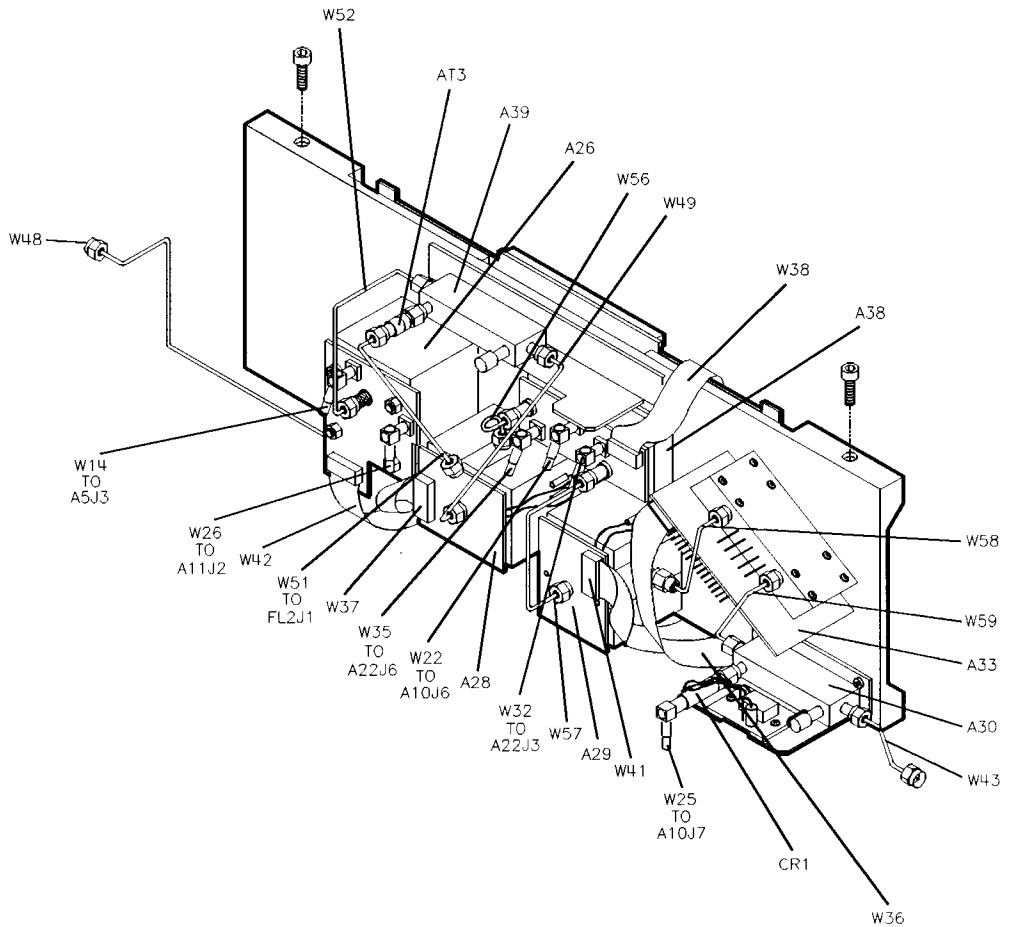


Figure 7-46. RF Deck Cable Locations - HP 83624A

RF Deck Cables
HP 83624A
Option 001

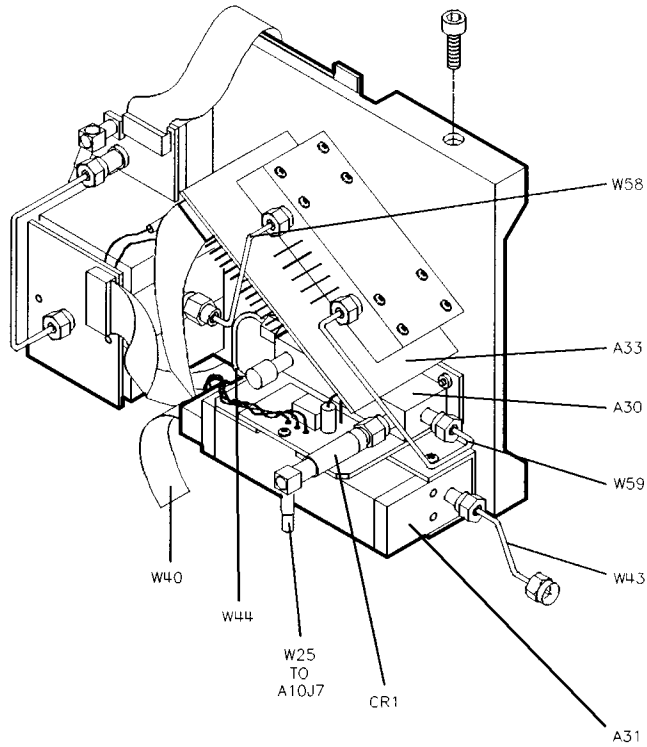


Figure 7-47. RF Deck Cable Locations - HP 83624A Option 001

RF Deck Cables
HP 83623A/24A
Option 006

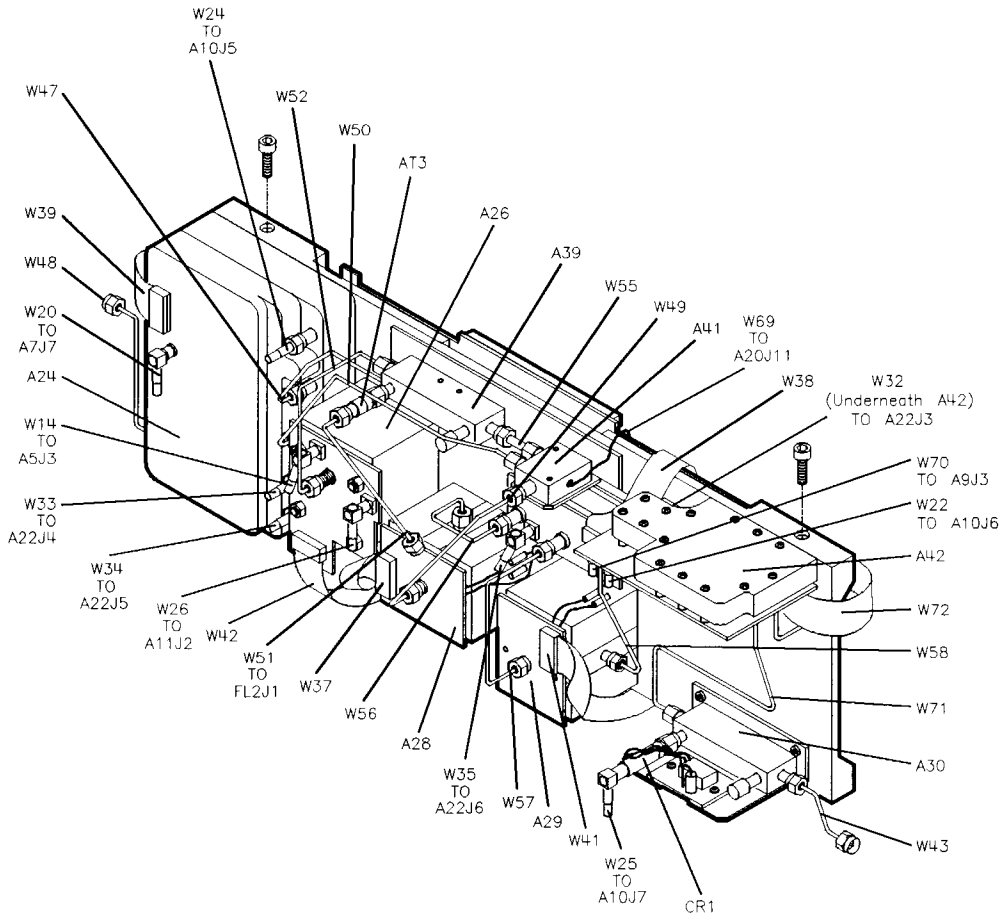


Figure 7-48. RF Deck Cable Locations - HP 83623A/24A Option 006

RF Deck Cables
HP 83623A/24A
Options 001 and 006

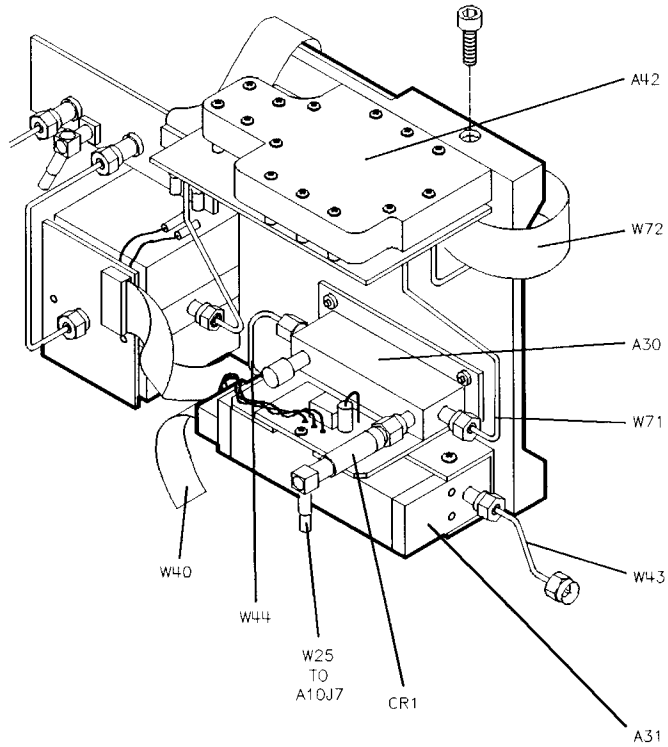


Figure 7-49. RF Deck Cable Locations - HP 83623A/24A Options 001 and 006

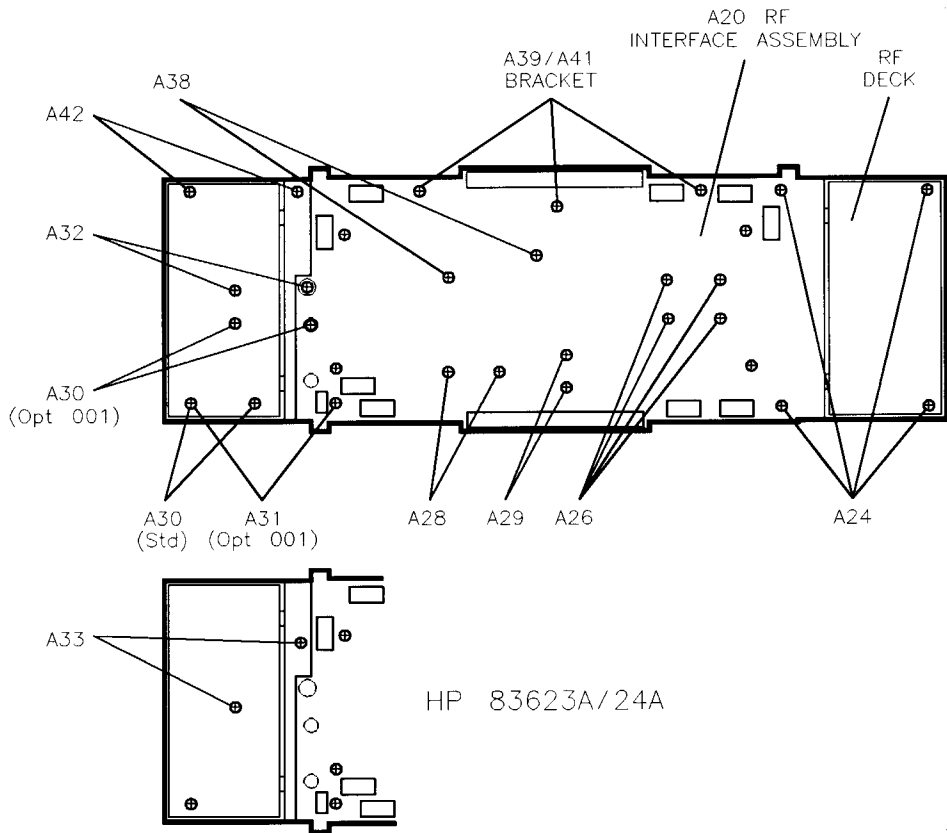


Figure 7-50. RF Deck Screw Locations

Motherboard Disassembly and Reassembly

Tools Required

T-15 Torx Screwdriver
#2 x 4 Pozidriv Screwdriver
5/16 in. Open End Wrench
5mm Ball and Socket Driver

Description and Procedure

To disassemble the motherboard, follow this procedure in the order given.

To reassemble the motherboard, follow this procedure in the reverse order.

CAUTION Cable routing may affect instrument performance. Refer to Figure 7-1 for a diagram of the instrument cable routing.

Refer to the flowchart in Figure 7-51 to determine the necessary disassembly steps for a given assembly.

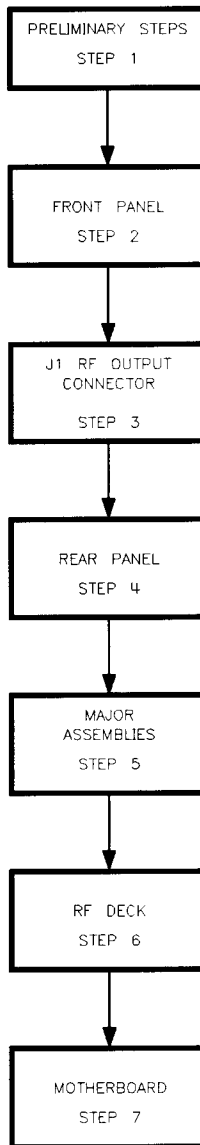


Figure 7-51. Motherboard Disassembly Flowchart

1. Preliminary Steps

CAUTION You can easily blow the fuse for the 13.5V supply on the preregulator assembly if you do not disconnect the AC power cord. Also, the danger of shock is increased if the power cord is connected.

1. Disconnect the AC power line cord.
 2. Remove the screw from each of the four feet on the rear panel.
 3. Remove the four rear feet.
 4. Remove the four bottom feet.
 5. To remove the side straps, remove the two screws on each side panel.
 6. Remove the vinyl trim strip from the top, front edge of the instrument.
(Place a flat screwdriver in either slot in the trim strip and lift to remove, see Figure 7-52).
 7. Remove the instrument top, bottom, and side covers.
-

Note An RF braid is in each of the side channels on the top and bottom of the instrument. When you reassemble the instrument, be sure the braids remain in the side cover channels.

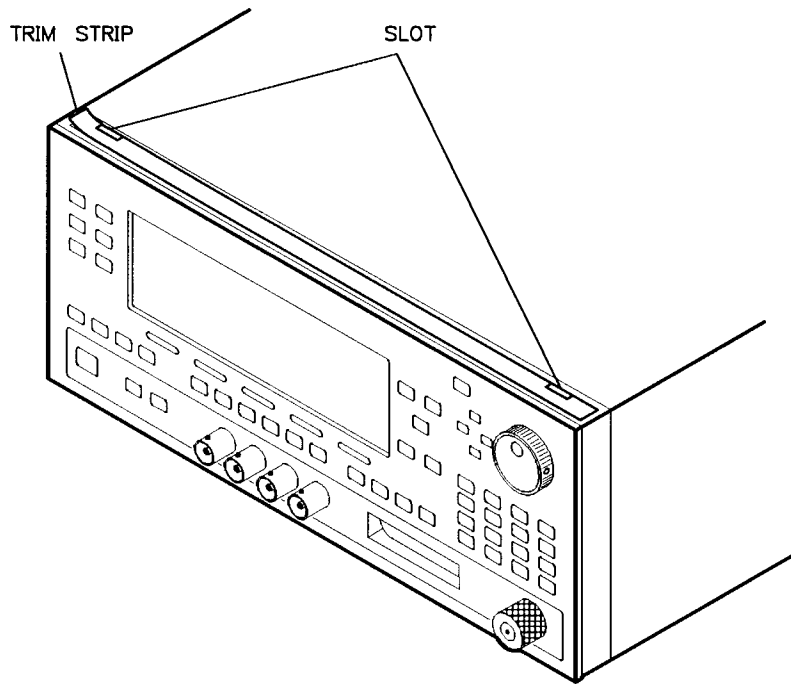


Figure 7-52. Front Edge Trim Strip

2. Front Panel Removal

Refer to Figure 7-53.

1. Complete “1. Preliminary Steps” before continuing.
2. Remove *three* of the four screws under the trim strip.
3. Remove *two* of the three screws on the lower, front frame edge.
4. Gently pry the front panel and display from the frame.

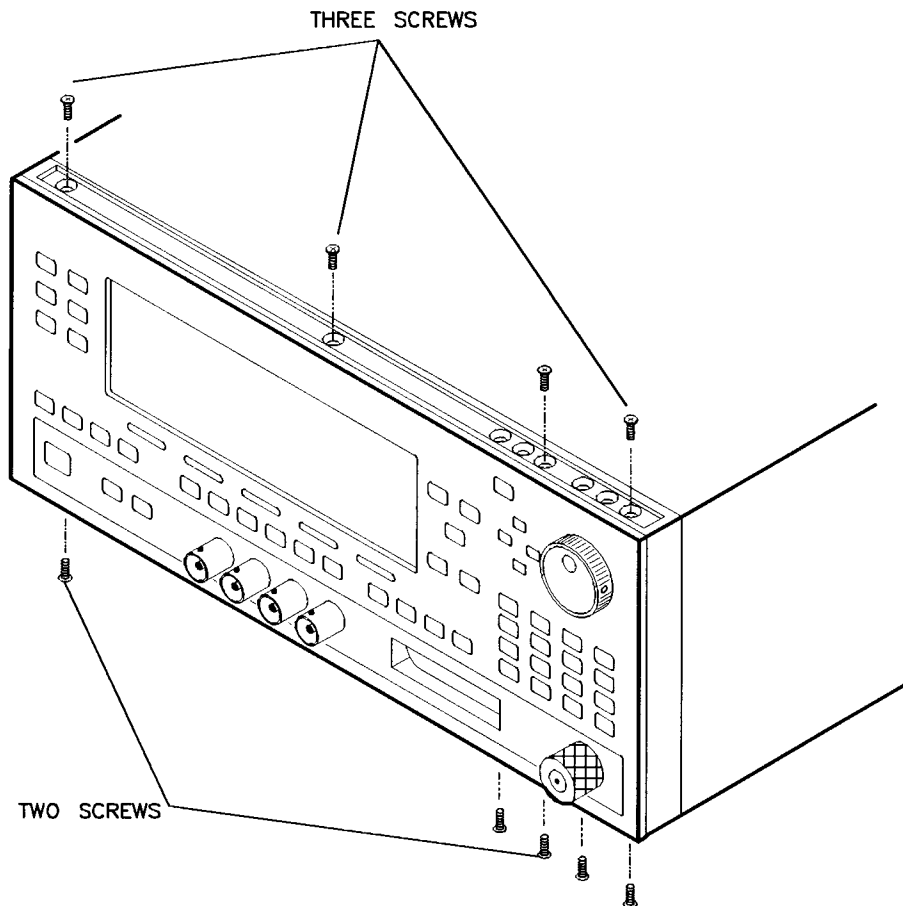


Figure 7-53. Front Panel Screw Locations

Refer to Figure 7-54.

Note Instruments with Option 004 do not have all the cables shown.

5. Cut the tie wraps holding the cables.
6. From the A9, A10, and A11 assemblies (or the A8 assembly for instruments with Option 002), disconnect the four coaxial cables (W6, W7, W8, and W9) attached to the BNC connectors, and the source module interface cable (W10).
7. Disconnect ribbon cables W2 and W3 from the motherboard.

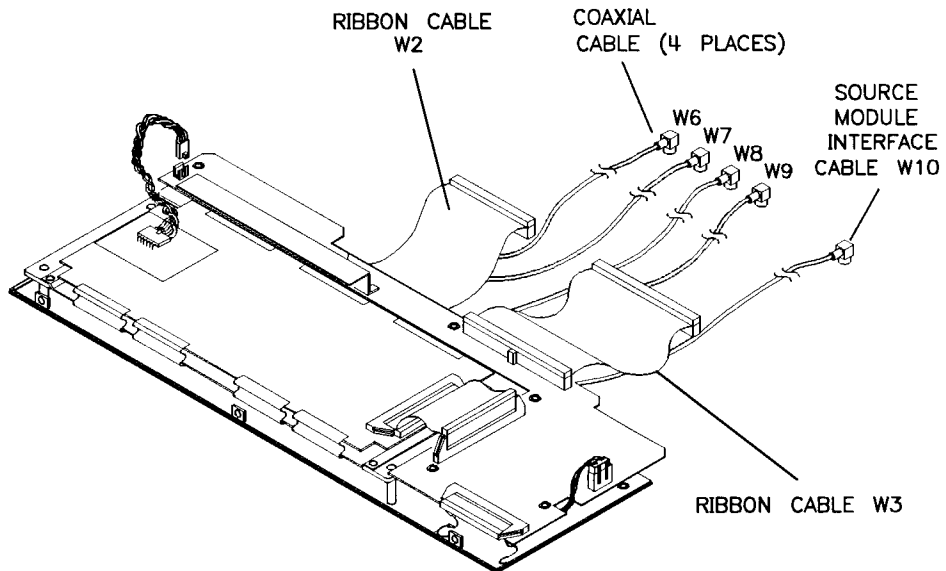


Figure 7-54. Front Panel Coaxial and Ribbon Cable Locations

3. J1 RF Output Connector Removal (Front Panel)

Refer to Figure 7-55.

CAUTION To avoid damaging the connector, do not disassemble the RF output connector assembly. Only unscrew the connector on the end of the cable.

1. Complete “1. Preliminary Steps” and “2. Front Panel Removal” before continuing.
2. On the lower front frame edge, remove the two RF output screws that hold the RF output assembly.
3. Remove the RF connector with cable W43.

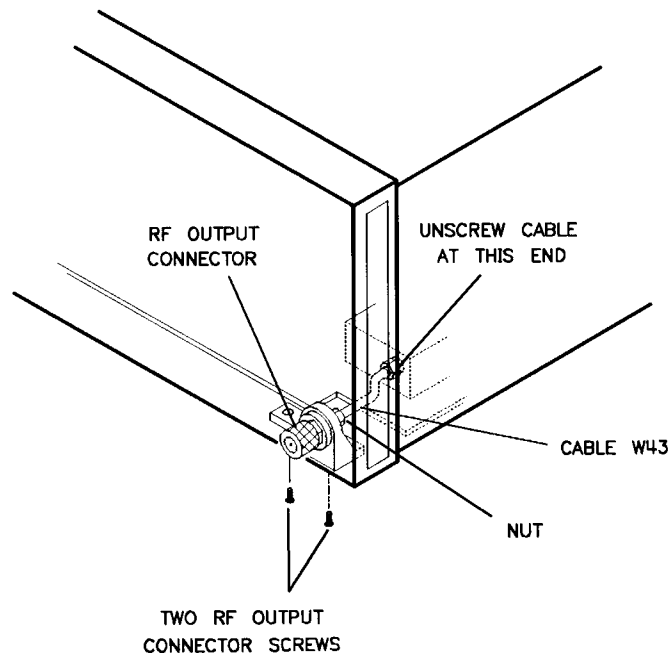


Figure 7-55. Removing RF Output Connector (Front Panel)

Note

When you re-attach the connector and cable to the synthesizer, first, loosen the nut between cable W43 and the connector. Then reverse the steps above. Finally, torque the nut between cable W43 and the connector J1 to 10 in-lb (112 N-cm).

4. J1 RF Output Connector Removal (Option 004)

Refer to Figure 7-56.

CAUTION To avoid damaging the connector, do not disassemble the RF output connector assembly. Only unscrew the connector on the end of the cable.

1. Complete “1. Preliminary Steps” and “2. Front Panel Removal” before continuing.
2. Unscrew the RF output connector plate from the rear panel.
3. Remove the RF connector with cable W43.

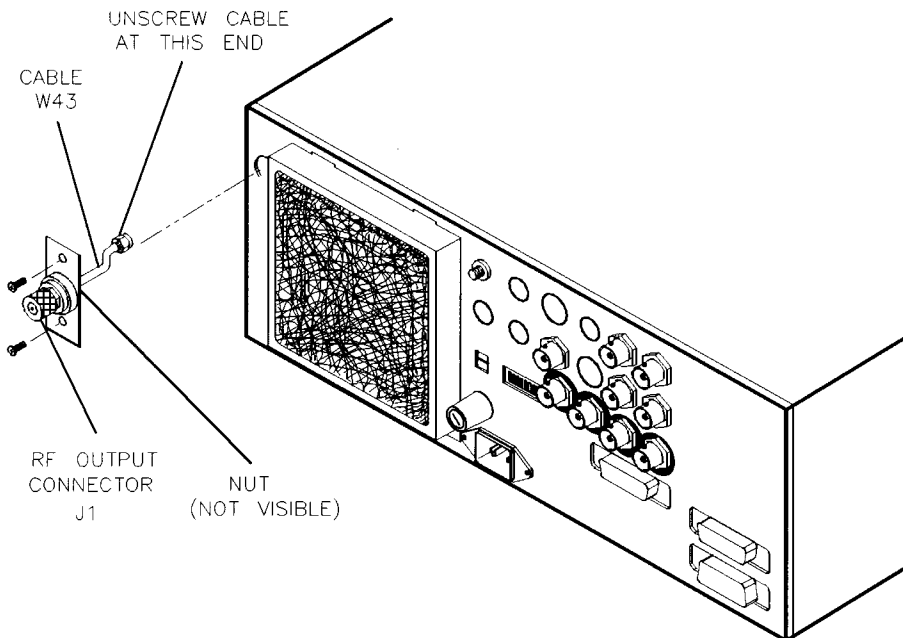


Figure 7-56. Removing RF Output Connector (Option 004)

5. Rear Panel Removal

Refer to Figure 7-57.

1. Complete “1. Preliminary Steps” and “7. J1 RF Output Connector Removal” before continuing.
2. Remove the four screws on the top back edge.
3. Remove the four screws on the bottom back edge.
4. Slide the rear panel out of the casting.

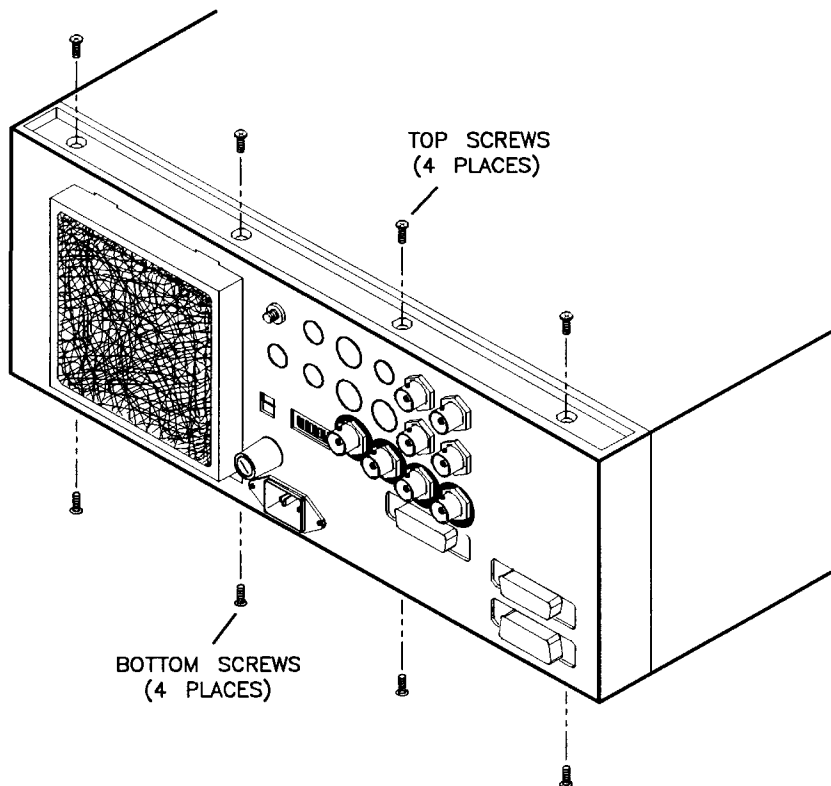


Figure 7-57. Rear Panel Removal

Refer to Figure 7-58.

5. Disconnect ribbon cable W31 from the motherboard.
6. Disconnect the 8-pin line switch connector.
7. Disconnect the fan harness.
8. Cut the tie wraps holding the coaxial cables to the four BNC connectors and the source module interface.
9. Disconnect the coaxial cables from the A7, A10, A12, and A14 assemblies and disconnect the source module interface cable from the A19 assembly.

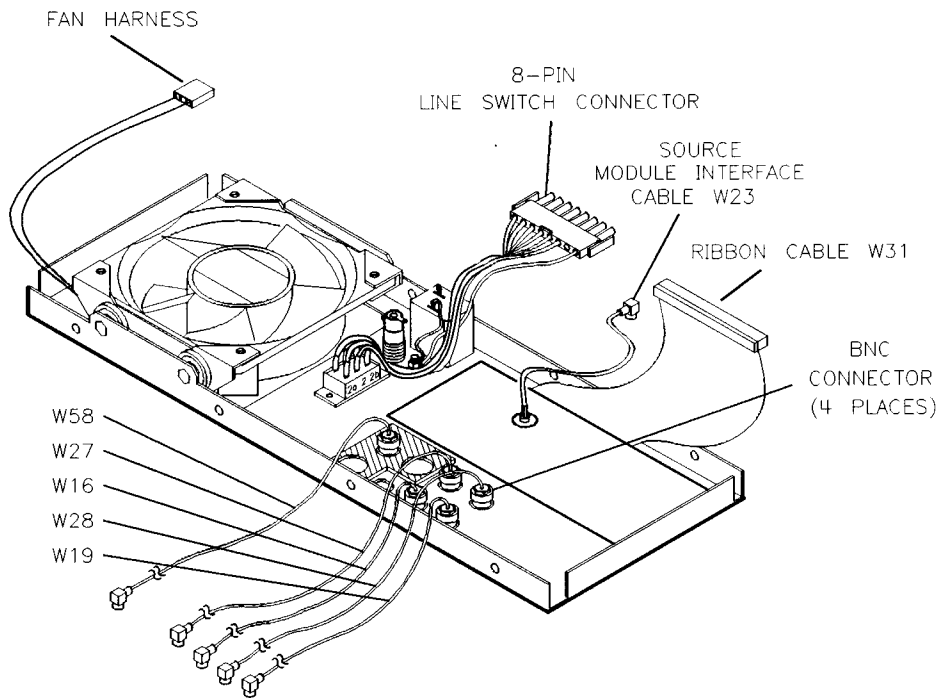


Figure 7-58. Rear Panel Cable Locations

6. Major Assemblies Removal

Refer to Figure 7-59.

1. Complete “1. Preliminary Steps”, “2. Front Panel Removal”, “7. J1 RF Output Connector Removal”, and “5. Rear Panel Removal” before continuing.
2. Remove the six screws from the regulator shield.
3. Remove the shield.
4. Cut the tie wraps holding the cables attached to the PC assemblies.
5. Disconnect all cables attached to the PC assemblies.
6. Disconnect semi-rigid cable W54 from the A6 assembly.

Note All cables are labeled for easy reassembly. For identification purposes, the extractors on the PC assemblies are color-coded to indicate their assembly number.

7. Pull out all PC assemblies.

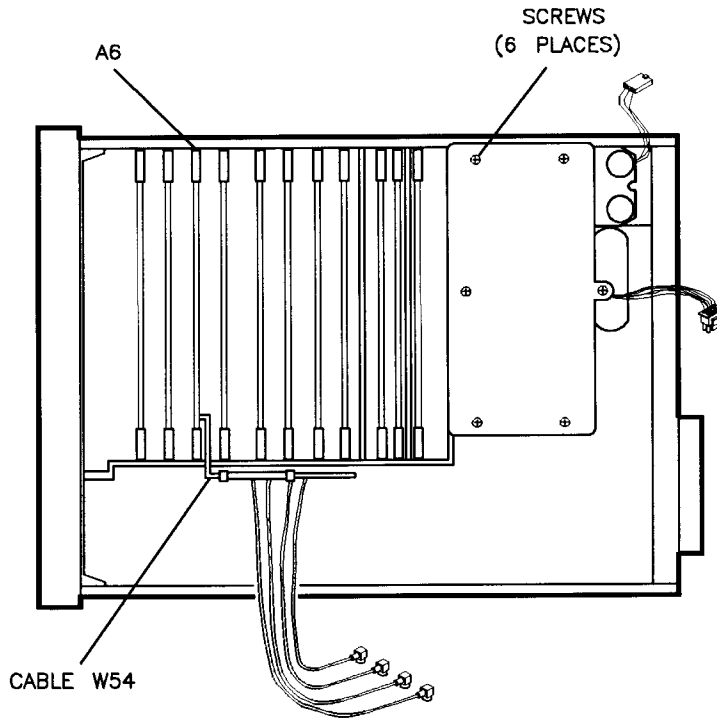


Figure 7-59. Major Assemblies

7. RF Deck Removal

Refer to Figure 7-60.

1. Complete “1. Preliminary Steps” and “7. J1 RF Output Connector Removal” before continuing.
2. Disconnect cable W51 from the attenuator.
3. Remove the two hex screws from the RF deck.

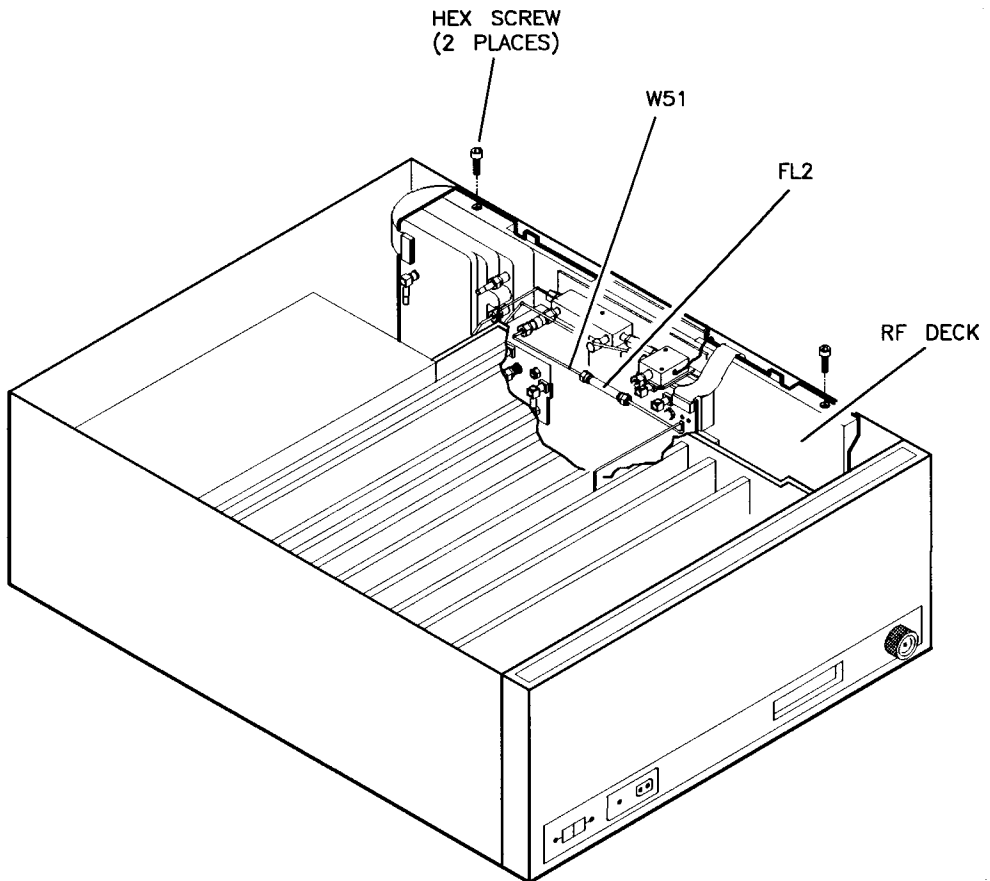


Figure 7-60. W51 Location

CAUTION Avoid damage to the various ribbon cables and their connectors attached to the RF deck assembly when removing that assembly in the next step. Move all flexible coaxial cables out of the way of the RF deck assembly components.

4. Carefully pull out the RF deck and rest it on the side of the instrument.
5. Remove flexible cables W32, W33, W34, and W35 from the motherboard.
6. Remove the hex screws from the RF deck and set the RF deck aside.

8. Motherboard Removal

Refer to Figure 7-61.

1. Complete “1. Preliminary Steps”, “2. Front Panel Removal”, “7. J1 RF Output Connector Removal”, “5. Rear Panel Removal”, “6. Major Assemblies Removal”, and “7. RF Deck Removal” before continuing.
2. Disconnect the transformer pin-locking tab and the reference oscillator pin-locking tab.

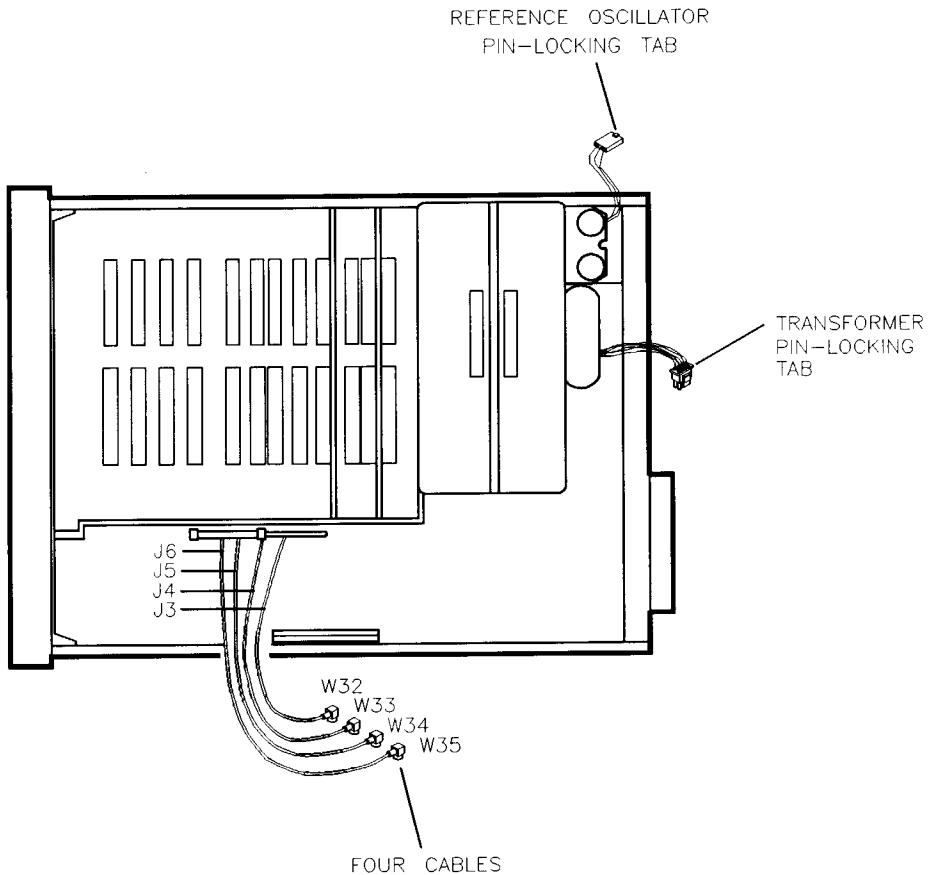


Figure 7-61. Motherboard Cables

3. Remove the 16 screws from the bottom side of the motherboard bottom side Figure 7-62.
4. Lift off the motherboard.

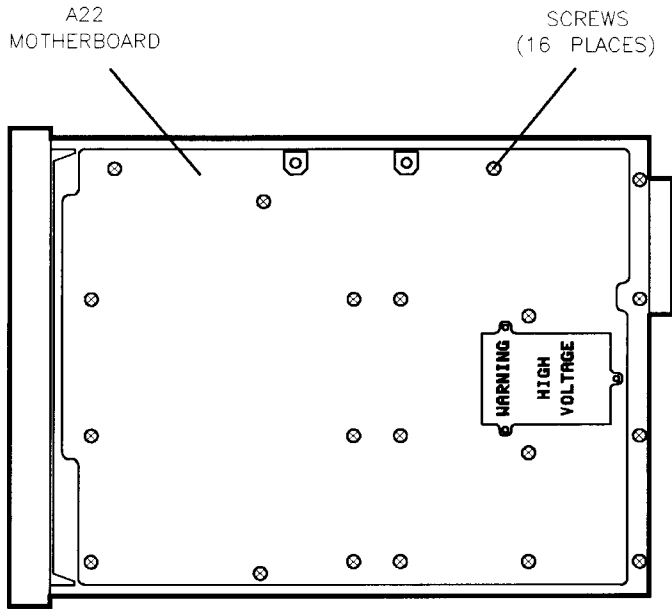


Figure 7-62. Motherboard Screws

Post-Repair

Table 8-1.
Adjustments and Performance Tests Required After Repair or
Replacement of an Assembly

| Assembly | Adjustment | Performance Test |
|------------------------------|---|--|
| A1 Front Panel Keyboard | None | Full Self-Test Front Panel Self-Test |
| A2 Source Module Interface | None | Full Self-Test |
| A3 Front Panel Processor | None | Full Self-Test Front Panel Self-Test |
| A4 Fractional-N ¹ | Fractional-N VCO Fractional-N Reference and API Spurs | Full Self-Test Frequency Switching Time Spurious Signals (Non-Harmonics) |
| A5 YO Phase Detector | YO Loop Gain | Full Self-Test Frequency Switching Time Spurious Signals (Non-Harmonics) Single Sideband Phase Noise |
| A6 Sampler | Sampler Assembly | Full Self-Test Frequency Switching Time Spurious Signals (Non-Harmonics) Single Sideband Phase Noise |

¹ The adjustments listed are required only after *repair* of the assembly. The *replacement* assembly is adjusted at the factory and is not instrument-dependent.

**Table 8-1.
Adjustments and Performance Tests Required After Repair or
Replacement of an Assembly (continued)**

| Assembly | Adjustment | Performance Test |
|------------------------------|--|--|
| A7 Reference | None | Full Self-Test Frequency Switching Time Spurious Signals (Non-Harmonics) Spurious Signals (Line-Related) Single Sideband Phase Noise |
| A8 Modulation Generator | AM/FM DAC Offset and Gain Modulation Generator Flatness | Full Self-Test Pulse Performance AM Accuracy FM Accuracy Internal Pulse Accuracy Modulation Meter |
| A9 Pulse | Amp/Mult Adjustments Amp/Filt Adjustments Low Power SRD Bias AM Delay | Full Self-Test Maximum Leveled Power Pulse Performance |
| A10 ALC | Modulator Offset and Gain ALC Power Level Accuracy Power Flatness AM Accuracy | Full Self-Test Power Accuracy Maximum Leveled Power External Leveling AM Accuracy AM Bandwidth AM Dynamic Range |
| A11 FM Driver | FM Gain | Full Self-Test FM Accuracy FM Bandwidth Maximum FM Deviation |
| A12 Multiplier/Filter Driver | Amp/Mult Adjustments Amp/Filt Adjustments | Full Self-Test Maximum Leveled Power |

Table 8-1.
Adjustments and Performance Tests Required After Repair or
Replacement of an Assembly (continued)

| Assembly | Adjustment | Performance Test |
|-----------------------------------|--|---|
| A13 YO Driver | YO Driver +10V Reference YO Driver Gain and Linearity YO Delay (automated) | Full Self-Test Swept Frequency Accuracy Frequency Switching Time Single Sideband Phase Noise Maximum FM Deviation |
| A14 Sweep Generator | Sweep Ramp | Full Self-Test Swept Frequency Accuracy |
| A15 CPU | ADC (automated) | Full Self-Test HP-IB Self-Test |
| A16 Postregulator | None | Full Self-Test |
| A17 Rectifier/Filter | None | Full Self-Test |
| A18 Switching Regulator | None | Full Self-Test |
| A19 Rear Panel Interface | None | Full Self-Test HP-IB Self-Test |
| A20 RF Interface | None | Full Self-Test Operation Verification |
| A21 Alphanumeric Display | None | Full Self-Test HP-IB Self-Test |
| A22 Motherboard | None | Full Self-Test Operation Verification |
| A23 10 MHz Reference ¹ | 10 MHz Standard | Full Self-Test Internal Timebase: Aging Rate Single Sideband Phase Noise |

¹ The adjustments listed are required only after *repair* of the assembly. The *replacement* assembly is adjusted at the factory and is not instrument-dependent.

**Table 8-1.
Adjustments and Performance Tests Required After Repair or
Replacement of an Assembly (continued)**

| Assembly | Adjustment | Performance Test |
|-------------------------|---|--|
| A24 Low Band | Modulator Offset and Gain ALC Power Level Accuracy Power Flatness | Full Self-Test Power Accuracy Power Flatness Maximum Leveled Power Spurious Signals (Harmonics) Spurious Signals (Non-Harmonics) Single Sideband Phase Noise Pulse Modulation On/Off Ratio Pulse Performance Pulse Modulation Video Feedthrough AM Accuracy AM Bandwidth AM Dynamic Range |
| A26 YIG Oscillator | YO Driver Gain and Linearity YO Delay (Automated) FM Gain | Full Self-Test Swept Frequency Accuracy Frequency Switching Time Maximum Leveled Power Spurious Signals (Harmonics) Single Sideband Phase Noise FM Accuracy FM Bandwidth Maximum FM Deviation |
| A28 Amp/Mult | Amp/Mult Adjustments Amp/Filter Adjustments | Full Self-Test Maximum Leveled Power Spurious Signals (Harmonics) FM Bandwidth |
| A29 Amp/Filter | Amp/Filter Adjustments | Full Self-Test Maximum Leveled Power Spurious Signals (Harmonics) Pulse Performance FM Bandwidth |
| A30 Directional Coupler | ALC Power Level Accuracy Power Flatness | Full Self-Test Power Accuracy Maximum Leveled Power |

**Table 8-1.
Adjustments and Performance Tests Required After Repair or
Replacement of an Assembly (continued)**

| Assembly | Adjustment | Performance Test |
|----------------------|---|--|
| A30 Bridge Detector | ALC Power Level Accuracy Power Flatness | Full Self-Test Power Accuracy Maximum Leveled Power |
| A31 Step Attenuator | ALC Power Level Accuracy Step Attenuator Flatness (automated) | Full Self-Test Maximum Leveled Power Attenuator Verification (only if data is required) |
| A32 Doubler | Power Flatness | Full Self-Test Power Accuracy Power Flatness Maximum Leveled Power Spurious Signals (Harmonics) |
| A33 Amplifier/Switch | Power Flatness | Full Self-Test Maximum Leveled Power Spurious Signals (Harmonics) Pulse Modulation On/Off Ratio |
| A33 Amplifier | Power Flatness | Full Self-Test Maximum Leveled Power Spurious Signals (Harmonics) Pulse Modulation On/Off Ratio |
| A34 Rear Panel BNC | None | Full Self-Test |
| A38 Dual Modulator | Amp/Filter Adjustments ¹ Modulator Offset and Gain ALC Power Level Accuracy Power Flatness AM Accuracy | Maximum leveled Power Spurious Signals (Harmonics) Pulse Modulation On/Off Ratio Pulse Performance Pulse Modulation Video Feedthrough AM Accuracy AM Bandwidth AM Dynamic Range |

¹ The entire amplifier/filter adjustment procedure does not need to be performed. Perform only the squegging clamp portions of this adjustment.

Table 8-1.
Adjustments and Performance Tests Required After Repair or
Replacement of an Assembly (continued)

| Assembly | Adjustment | Performance Test |
|-------------------------------|---|---|
| A39 Directional Coupler | None | Full Self-Test Maximum Leveled Power |
| A41 Diode Switch | None | Full Self-Test Maximum Leveled Power |
| A42 Pulse Mod Switched Filter | Modulator Offset and Gain | Maximum Leveled Power Spurious Signals (Harmonics) Pulse Modulation On/Off Ratio Pulse Performance Pulse Modulation Video Feedthrough AM Bandwidth AM Dynamic Range |
| B1 Fan | None | Spurious Signals (Non-Harmonics) |
| CR1 Detector | ALC Power Level Accuracy Power Flatness | Full Self-Test Power Accuracy Maximum Leveled Power |
| FL1 Line Module | None | Spurious Signals (Line-Related) |
| FL2 8 GHz LPF | Sampler Assembly | Full Self-Test |
| J1 RF Output Connector | Power Flatness (automated) Step Attenuator (automated) | Full Self-Test Maximum Leveled Power |
| RPG1 Rotary Pulse Generator | None | Full Self-Test Front Panel Self-Test |
| T1 Toroid Power Transformer | None | Full Self-Test |

Replaceable Parts

Introduction

Replaceable parts include major assemblies and all chassis hardware. Table 9-1 lists reference designations and abbreviations used in this chapter.

For information on removing and replacing assemblies, see Chapter 7, “Disassembly and Replacement Procedures”.

Module-Exchange Program

Many major assemblies are covered by the module-exchange program. Under the terms of the program, factory-repaired and tested assemblies are available on a trade-in basis (a defective assembly *must* be returned for credit). Exchange assemblies meet all new assembly specifications, but are less expensive. Figure 9-1 illustrates the module exchange procedure.

In order to prevent damage when returning products to Hewlett-Packard, use original or comparable packaging.

Order spare assembly stock using the *new* assembly part number.

If you have any questions, contact your Hewlett-Packard customer engineer for the latest information about this program.

Replacement Information

The following information is given in the tables in this chapter:

- Hewlett–Packard part number.
- Part quantity for that figure. There may be more of that part in other figures.
- Part description (see Table 9-1 for abbreviations).

Ordering Information

For any listed part, request the Hewlett–Packard part number and quantity required from the nearest Hewlett–Packard office.

How to Order Parts . . . Fast!

Hewlett–Packard parts specialists have direct on–line access to the replaceable parts listed in this manual. Four–day delivery is standard; there is a charge for hotline (one–day) delivery.

In the United States, call the following toll–free number: **(800) 227–8164**

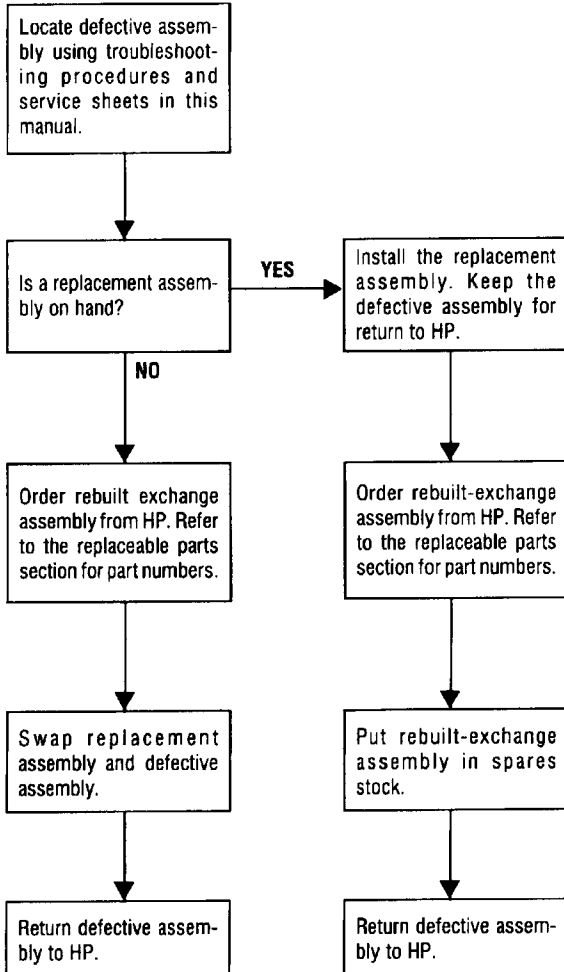
Monday through Friday, 6 am to 5 pm (Pacific Standard Time)

Outside the United States, contact your nearest Hewlett–Packard office.

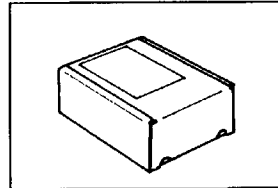
Table 9-1. Reference Designations and Abbreviations

| | | | |
|-------|---|--------|--|
| A | Amperage; Assembly | LG | Long; Length |
| AT | Termination | LK | Lock |
| AX | Axial Lead | LPF | Low Pass Filter |
| AY | Assembly | M | Male; Maximum; Meter; Mil; Milli |
| B | Fan; Motor | MTG | Mounting |
| BI | Bipin | NTD | Non-Time Delay |
| BT | Battery | NYL | Nylon |
| CHAM | Chamfer | PAN-HD | Pan Head |
| CMPNT | Component | RF | Rear Panel |
| CONN | Connector | RPG | Rotary Pulse Generator |
| CR | Detector | SKT | Socket |
| CU | Copper | SN-PL | Tin Plated |
| D | Diameter | SRD | Step Recovery Diode |
| DEG | Degree | STD | Standard |
| F | Fuse | STL | Steel |
| FE | Ferrule | SW | Switch |
| FL | Filter | T | Transformer Thickness; Taper; Tooth |
| FLH | Flat Head | TD | Time Delay |
| FLTG | Floating | THD | Thread; Threaded |
| FP | Front Panel | THK | Thick |
| FR | Front | TPG | Tapping |
| HD | Hand; Hard; Heavy Duty; Head | TR-HD | Truss Head |
| HEX | Hexadecimal; Hexagon; Hexagonal | UL | Underwriters Laboratories |
| ID | Inside Diameter | W | Cable; Wire |
| IN | Inch | WD | Width |
| INTL | Internal; International | YIG | Yttrium Iron Garnate |
| J | Electrical Connector (Stationary Position); Jack | YO | YIG Oscillator |
| LBL | Label | | |

Use this fast, efficient, economical method to keep your Hewlett-Packard instrument in service.

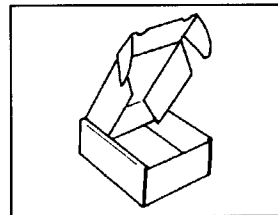


A.



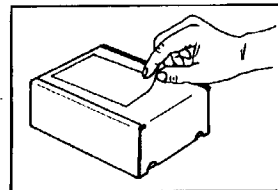
Rebuilt-exchange assemblies are shipped individually in boxes like this. In addition to the circuit assembly, the box contains:
Exchange assembly failure report
Return address label

B.



Open box carefully - it will be used to return defective assembly to HP. Complete failure report. Place it and defective assembly in box. Be sure to remove enclosed return address label.

C.

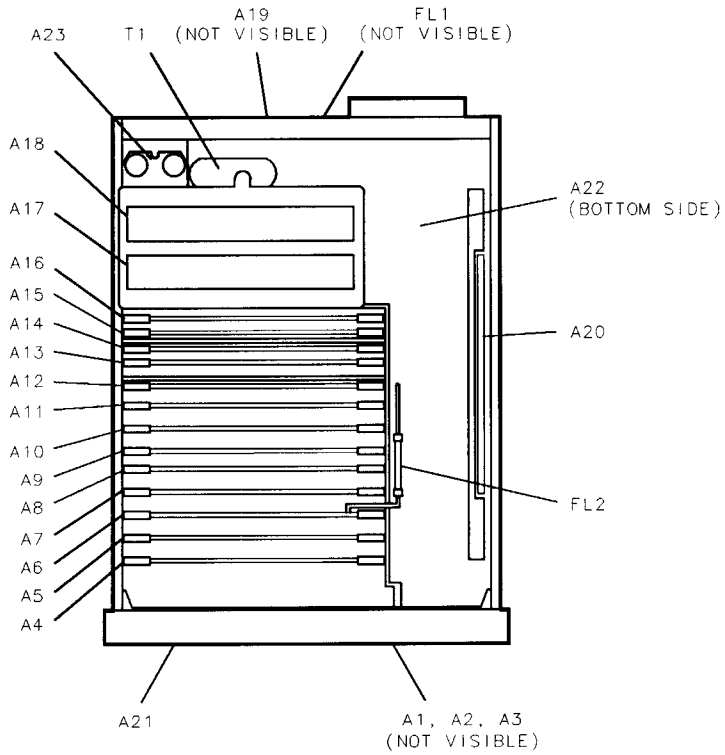


Seal box with tape. Inside U.S.A.*, stick preprinted return address label over label already on box, and return box to HP. Outside U.S.A., do not use address label; instead address box to the nearest HP office.

*HP pays postage on boxes mailed in U.S.A.

Figure 9-1. Module Exchange Program

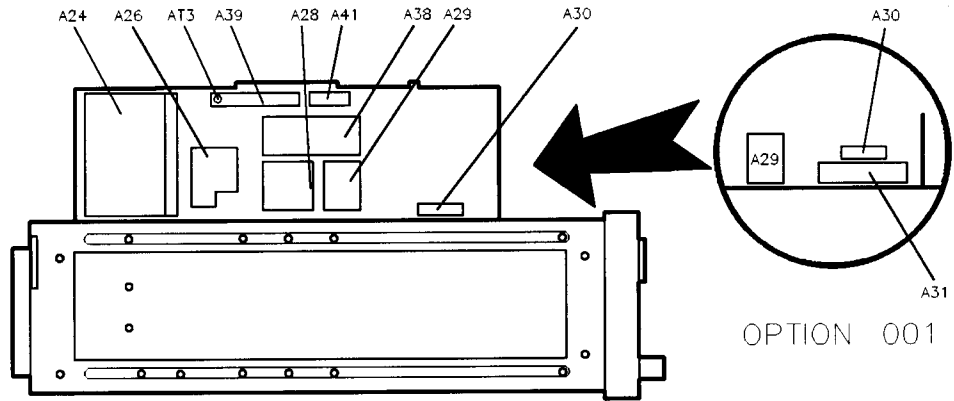
Major Assemblies-Top View



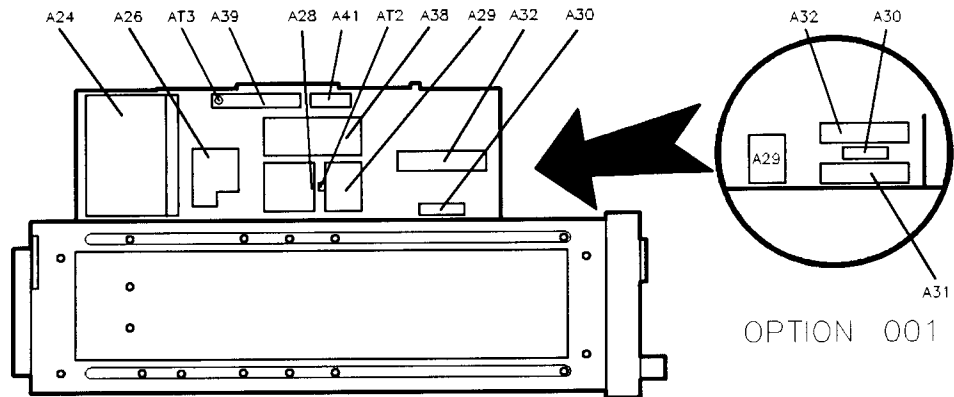
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Figure 9-2. Major Assemblies (1 of 4)

Major Assemblies—RF Deck



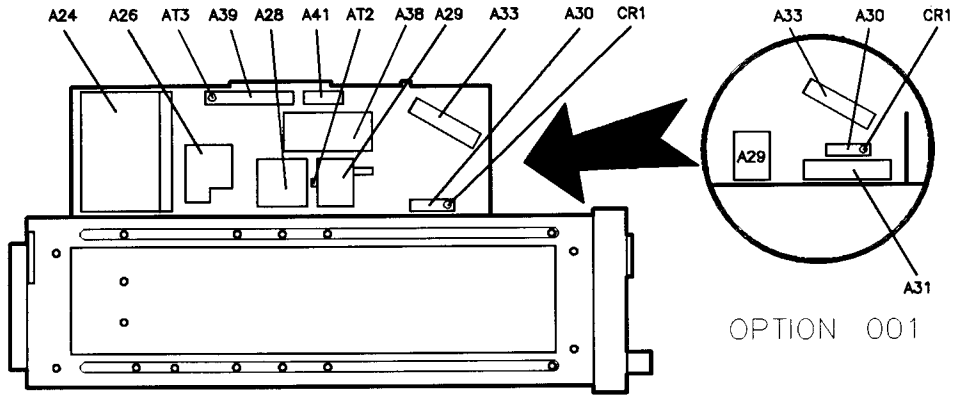
HP 83620A/22A/30A



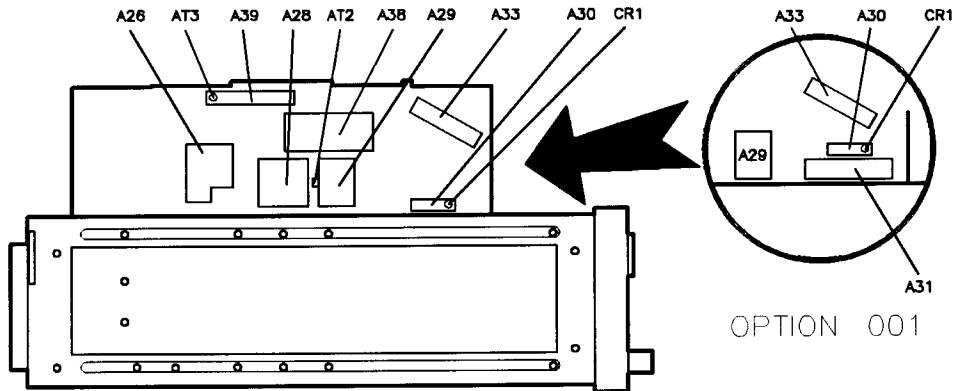
HP 83640A/50A

Figure 9-2. Major Assemblies (2 of 4)

Major Assemblies-RF Deck



HP 83623A



HP 83624A

Figure 9-2. Major Assemblies (3 of 4)

Major Assemblies—RF Deck

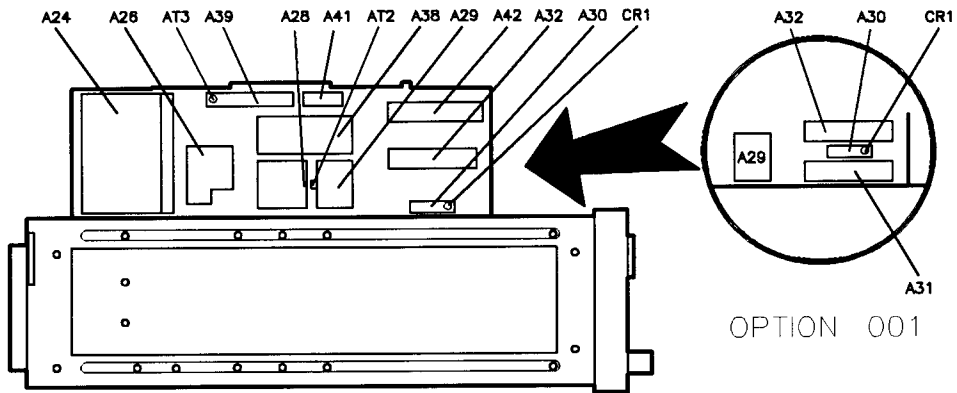
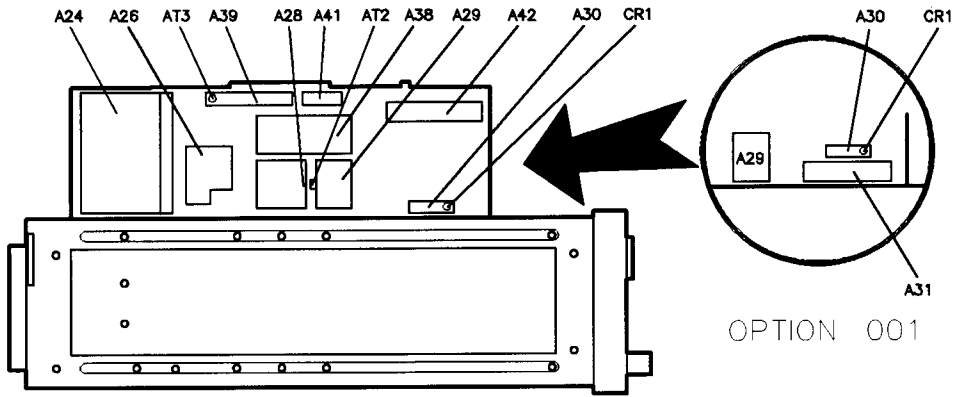


Figure 9-2. Major Assemblies (4 of 4)

Table 9-2. Major Assemblies

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| A1 | 08360-60001 | 1 | FRONT PANEL KEYBOARD ASSEMBLY |
| A2 | 08360-60002 | 1 | SOURCE MODULE INTERFACE ASSEMBLY |
| A3 | 06360-60003 | 1 | FRONT PANEL PROCESSOR ASSEMBLY |
| A4 | 08360-60010 | 1 | FRACTIONAL-N ASSEMBLY |
| A4 | 08360-69010 | | FRACTIONAL-N ASSEMBLY (\) |
| A5 | 08360-60209 | 1 | YO LOOP ASSEMBLY |
| A5 | 08360-69209 | | YO LOOP ASSEMBLY (Rebuilt-Exchange) |
| A6 | 08360-60214 | 1 | SAMPLER ASSEMBLY |
| A6 | 08360-69214 | | SAMPLER ASSEMBLY (Rebuilt-Exchange) |
| A7 | 08360-60008 | 1 | REFERENCE ASSEMBLY |
| A7 | 08360-69008 | | REFERENCE ASSEMBLY (Rebuilt-Exchange) |
| A8 | 08360-60166 | 1 | MODULATION GENERATION ASSEMBLY (Option 002) |
| A8 | 08360-69166 | | MODULATION GENERATION ASSEMBLY (Rebuilt-Exchange) |
| A8W1 | 1258-0124 | 1 | JUMPER-AM INPUT IMPEDANCE |
| A8W2 | 1258-0124 | 1 | JUMPER-FM INPUT IMPEDANCE |
| A9 | 08360-60232 | 1 | PULSE ASSEMBLY |
| A10 | 08360-60222 | 1 | ALC ASSEMBLY (HP 83620A/22A/23A/24A/30A) |
| A10 | 08360-69222 | | ALC ASSEMBLY (Rebuilt-Exchange) |
| A10 | 08360-60206 | 1 | ALC ASSEMBLY (HP 83640A/50A) |
| A10 | 08360-69206 | | ALC ASSEMBLY (Rebuilt-Exchange) |
| A10W1 | 1258-0124 | 1 | JUMPER-AM INPUT IMPEDANCE |
| A11 | 08360-60011 | 1 | FM DRIVER ASSEMBLY |
| A11W1 | 8159-0005 | 1 | ZERO OHM RESISTOR-FM INPUT IMPEDANCE |
| A12 | 08360-60212 | 1 | MULTIPLIER/FILTER DRIVER ASSEMBLY |
| A12 | 08360-69212 | | MULTIPLIER/FILTER DRIVER ASSEMBLY (Rebuilt-Exchange) |

Table 9-2. Major Assemblies (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| A13 | 08360-60207 | 1 | YO DRIVER ASSEMBLY |
| A13 | 08360-69207 | | YO DRIVER ASSEMBLY (Rebuilt-Exchange) |
| A14 | 08360-60014 | 1 | SWEEP GENERATOR ASSEMBLY |
| A14 | 08360-69014 | | SWEEP GENERATOR ASSEMBLY (Rebuilt-Exchange) |
| A15 | 08360-60264 | 1 | CPU ASSEMBLY |
| A15 | 08360-69264 | | CPU ASSEMBLY (Rebuilt-Exchange) |
| | 08360-60201 | 1 | FIRMWARE UPGRADE KIT |
| A15BT1 | 1420-0516 | 1 | BATTERY (Used with CPU Assembly 08360-60015) |
| A15BT1 | 1420-0275 | 1 | BATTERY (Used with CPU Assembly 08360-60215) |
| A15BT1 | 1420-0394 | 1 | BATTERY (Used with CPU Assembly 08360-60264) |
| A16 | 08360-60016 | 1 | POSTREGULATOR ASSEMBLY |
| A16 | 08360-69016 | | POSTREGULATOR ASSEMBLY (Rebuilt-Exchange) |
| | 0400-0018 | 1 | GROMMET-CHAN .052 TH (Part of A16) |
| A16F1 | 2110-0047 | 1 | FUSE (INCH) 1A 125V NTD BI |
| A16F2 | 2110-0618 | 3 | FUSE (INCH) 5A 125V NTD BI |
| A16F3 | 2110-0713 | 2 | FUSE-SUBMINIATURE 10A 125V NTD AX |
| A16F4 | 2110-0713 | | FUSE-SUBMINIATURE 10A 125V NTD AX |
| A16F5 | 2110-0618 | | FUSE (INCH) 5A 125V NTD BI |
| A16F6 | 2110-0618 | | FUSE (INCH) 5A 125V NTD BI |
| A16F7 | 2110-0425 | 2 | FUSE (INCH) 2A 125V NTD BI |
| A16F8 | 2110-0425 | | FUSE (INCH) 2A 125V NTD BI |
| A17 | 08360-60017 | 1 | RECTIFIER/FILTER ASSEMBLY |
| A17 | 08360-69017 | | RECTIFIER/FILTER ASSEMBLY (Rebuilt-Exchange) |
| A17F1 | 2110-0303 | 1 | FUSE (INCH) 2A 250V TD FE UL |
| A18 | 08360-60198 | 1 | SWITCHING REGULATOR ASSEMBLY |
| A18 | 08360-69198 | | SWITCHING REGULATOR ASSEMBLY (Rebuilt-Exchange) |
| A18F1 | 2110-0201 | 1 | FUSE (INCH) 0.25A 250V TD FE UL |
| A19 | 08360-60019 | 1 | REAR PANEL INTERFACE ASSEMBLY |

Table 9-2. Major Assemblies (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| A20 | 08360-60266 | 1 | RF INTERFACE ASSEMBLY |
| A20F1 | 2110-0425 | 1 | FUSE (INCH) 2A 125V NTD BI |
| A21 | 1990-1295 | 1 | ALPHANUMERIC DISPLAY ASSEMBLY |
| A22 | 08360-60196 | 1 | MOTHERBOARD ASSEMBLY |
| A23 | 10811E | 1 | 10 MHZ REFERENCE STANDARD (Includes W30) |
| A24 | 5086-7463 | 1 | LOWBAND ASSEMBLY (All models except HP 83624A) |
| A24 | 5086-6463 | | LOWBAND ASSEMBLY (Rebuilt-Exchange) |
| A25 | | | NOT USED |
| A26 | 5086-7515 | 1 | YIG OSCILLATOR (2.0-7.5 GHz) |
| A26 | 5086-6515 | | YIG OSCILLATOR (2.0-7.5 GHz) (Rebuilt-Exchange) |
| A27 | | | NOT USED |
| A28 | 5086-7622 | 1 | AMPLIFIER/MULTIPLIER |
| A28 | 5086-6622 | | AMPLIFIER/MULTIPLIER (Rebuilt-Exchange) |
| A29 | 5086-7616 | 1 | FILTER (HP 83620A/22A/23A/24A) |
| A29 | 5086-6616 | | FILTER (Rebuilt-Exchange) |
| A29 | 5086-7623 | 1 | AMPLIFIER/FILTER (HP 83630A/40A/50A) |
| A29 | 5086-6623 | | AMPLIFIER/FILTER (Rebuilt-Exchange) |
| A29 | 5086-7636 | 1 | AMPLIFIER/FILTER (HP 83630A/40A/50A Option 006) |
| A29 | 5086-6636 | | AMPLIFIER/FILTER (Rebuilt-Exchange) |
| A30 | 5086-7645 | 1 | BRIDGE DETECTOR (HP 83620A/22A/30A) |
| A30 | 0955-0148 | 1 | μ WAVE DIRECTIONAL COUPLER 20 GHZ MAX (HP 3623A/24A) |
| A30 | 5086-7644 | 1 | BRIDGE DETECTOR (HP 83640A/50A) |
| A30 | 5086-7656 | 1 | BRIDGE DETECTION (HP 83620A/22A/30A Option 006) |
| A31 | 33326-60003 | | STEP ATTENUATOR (HP 83620A/22A/23A/24A/30A) |
| A31 | 33326-60002 | 1 | STEP ATTENUATOR (HP 83640A) |
| A31 | 33326-60005 | 1 | STEP ATTENUATOR (HP 83650A) |

Table 9-2. Major Assemblies (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| A32 | 5086-7607 | 1 | DOUBLER (HP 83640A) |
| A32 | 5086-6607 | | DOUBLER (Rebuilt-Exchange) |
| A32 | 5086-7604 | 1 | DOUBLER (HP 83650A) |
| A32 | 5086-6604 | | DOUBLER (Rebuilt-Exchange) |
| A33 | 5086-7465 | 1 | AMPLIFIER/SWITCH (HP 83623A) |
| A33 | 5086-7665 | 1 | AMPLIFIER/SWITCH (Rebuilt-Exchange) |
| A33 | 5086-7510 | 1 | AMPLIFIER (2-20 GHz) (HP 83624A) |
| A33 | 5086-7610 | 1 | AMPLIFIER (2-20 GHz) (Rebuilt-Exchange) |
| A34 | 08360-60061 | 1 | RF FLOATING BNC ASSEMBLY (Option 004) |
| A34W1 | 08360-60099 | 1 | EXTERNAL LEVELING A34J3/A10J4 (Option 004) |
| A34W2 | 08360-60100 | 1 | AM INPUT A34J1/A10J8 (Option 004) |
| A34W3 | 08360-60101 | 1 | FM INPUT A34J2/A11J1 (Option 004) |
| A34 | 08360-60186 | 1 | RF FLOATING BNC ASSEMBLY (Option 002 and 004) |
| A34W1 | 08360-60099 | 1 | EXTERNAL LEVELING A34J3/A10J4 (Option 002 and 004) |
| A34W2 | 08360-60178 | 1 | AM INPUT A34J1/A8J7 (Option 002 and 004) |
| A34W3 | 08360-60179 | 1 | FM INPUT A34J2/A8J10 (Option 002 and 004) |
| A35 | | | NOT USED |
| A36 | | | NOT USED |
| A38 | 5086-7602 | 1 | DUAL MODULATOR |
| A38 | 5086-7634 | 1 | AM MODULATOR (Option 006) |
| A39 | 0955-0098 | 1 | COUPLER (2.0 - 8.4 GHZ) |
| A41 | 5086-7327 | 1 | DIODE SWITCH (All models except HP 83624A) |
| A42 | 5086-7628 | 1 | PULSE MODULATION SWITCHED FILTER (HP 83620A/22A Option 006) |
| A42 | 5086-7629 | 1 | PULSE MODULATION SWITCHED FILTER (HP 83623A/24A Option 006) |
| A42 | 5086-7630 | 1 | PULSE MODULATION SWITCHED FILTER (HP 83630A Option 006) |
| A42 | 5086-7631 | 1 | PULSE MODULATION SWITCHED FILTER (HP 83640A/50A Option 006) |
| AT2 | 1810-0118 | 1 | TERMINATION SMA MALE 50Ω (HP 83623A/24A/40A/50A and Option 006) |
| AT3 | 0955-0216 | 1 | ATTENUATOR 20 DB |

Table 9-2. Major Assemblies (continued)

| Ref. Design. | HP Part Number | Qty | Description |
|--------------|----------------|-----|---|
| B1 | 08360-80026 | 1 | FAN |
| CR1 | 08360-60147 | 1 | DETECTOR REPLACEMENT KIT (HP 83623A/24A) |
| F1 | 2110-0227 | 1 | FUSE (INCH) 5A 250V NTD FE UL (See Table 9-7) |
| F1 | 2110-0003 | 1 | FUSE (INCH) 3A 230V NTD FE UL (See Table 9-7) |
| FL1 | 9135-0242 | 1 | LINE MODULE - FILTERED |
| FL2 | 0955-0485 | 1 | 8 GHZ LOW PASS FILTER |
| J1 | 08673-60040 | 1 | RF OUTPUT CONNECTOR (HP 83620A/22A/23A/24A/30A) |
| J1 | 5062-6610 | 1 | RF OUTPUT CONNECTOR (HP 83640A/50A) |
| T1 | 9100-4781 | 1 | TOROID POWER TRANSFORMER |

Cables-Front Panel

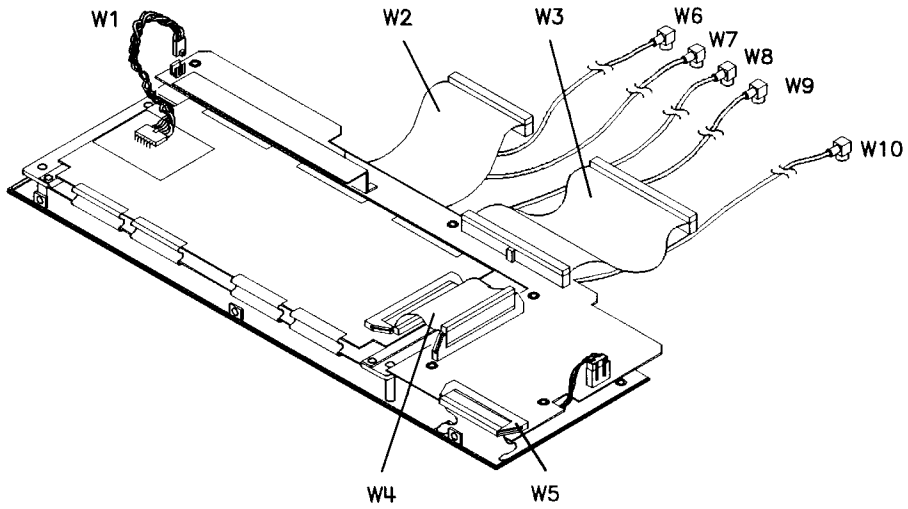


Figure 9-3. Cables (1 of 17)

Cables-Top View

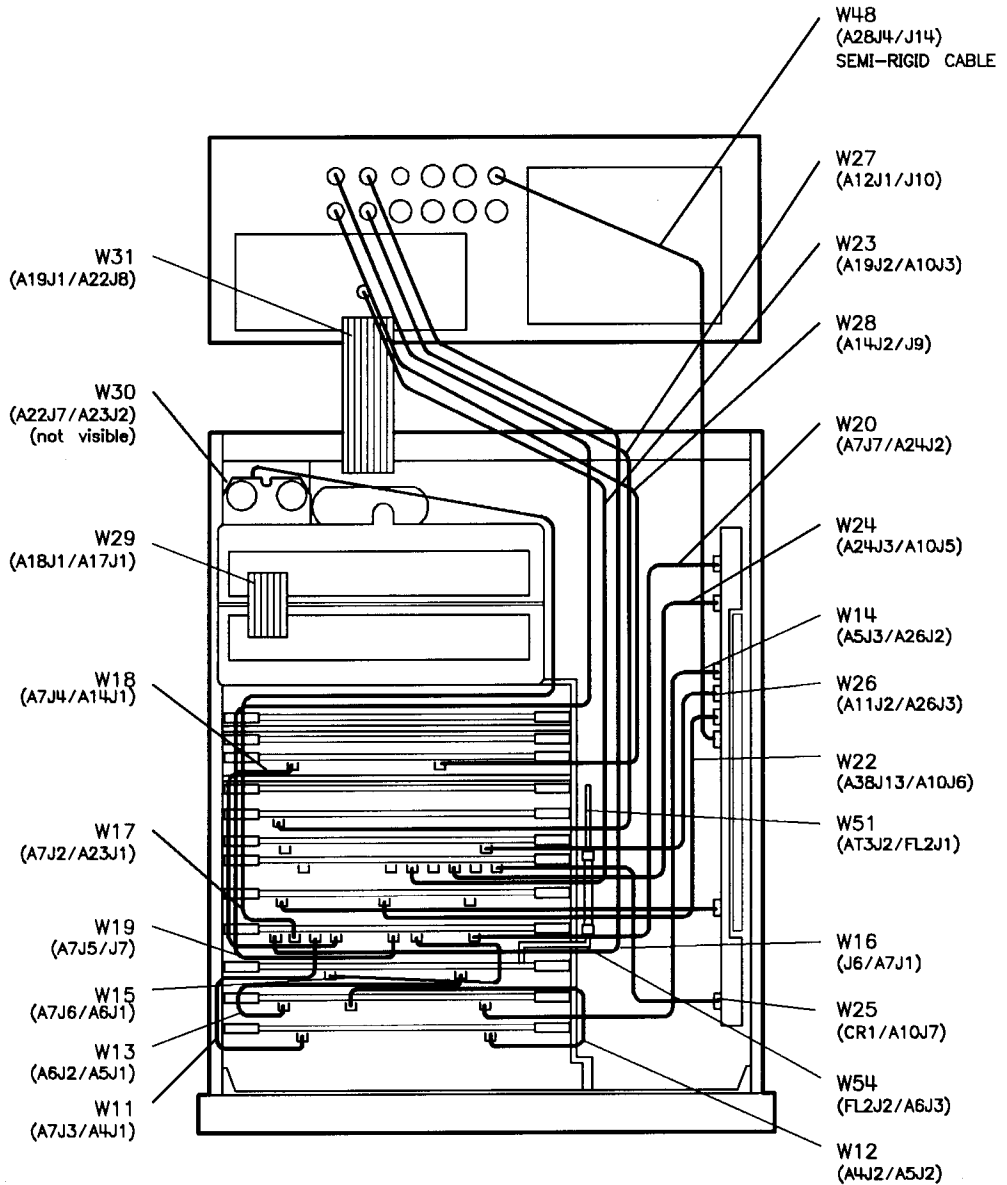


Figure 9-3. Cables (2 of 17)

Cables-Top View

Option 002

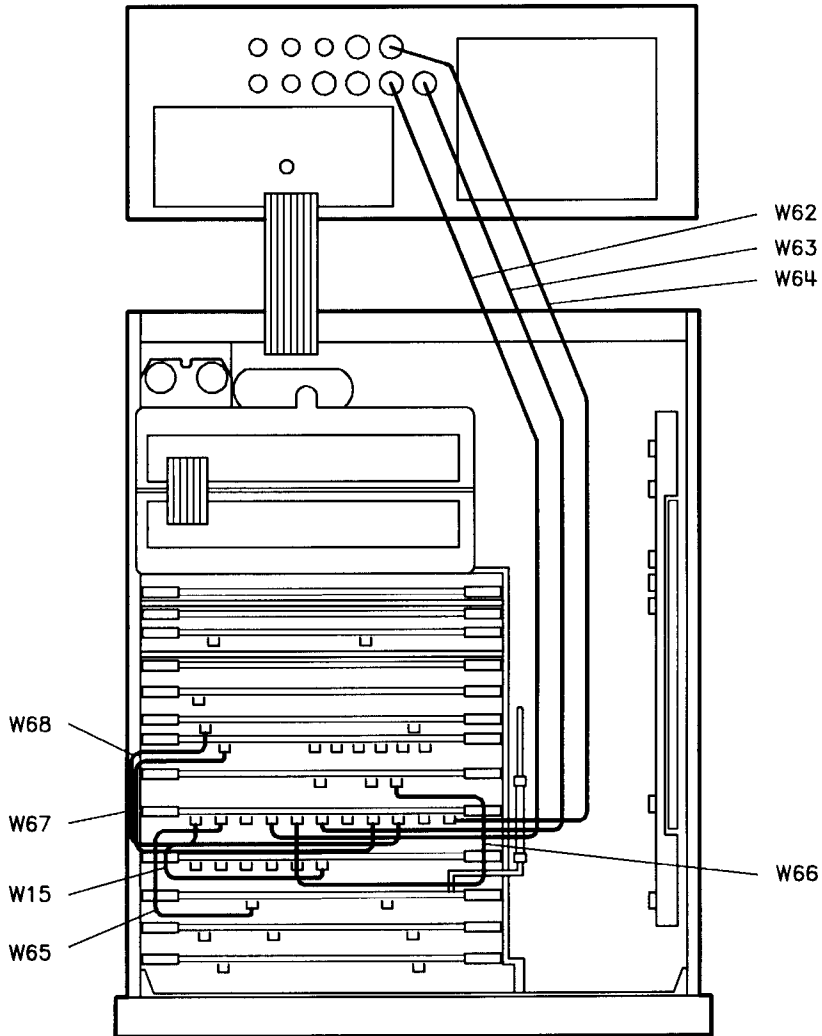


Figure 9-3. Cables (3 of 17)

Cables-HP 83640A/50A RF Deck

No Options

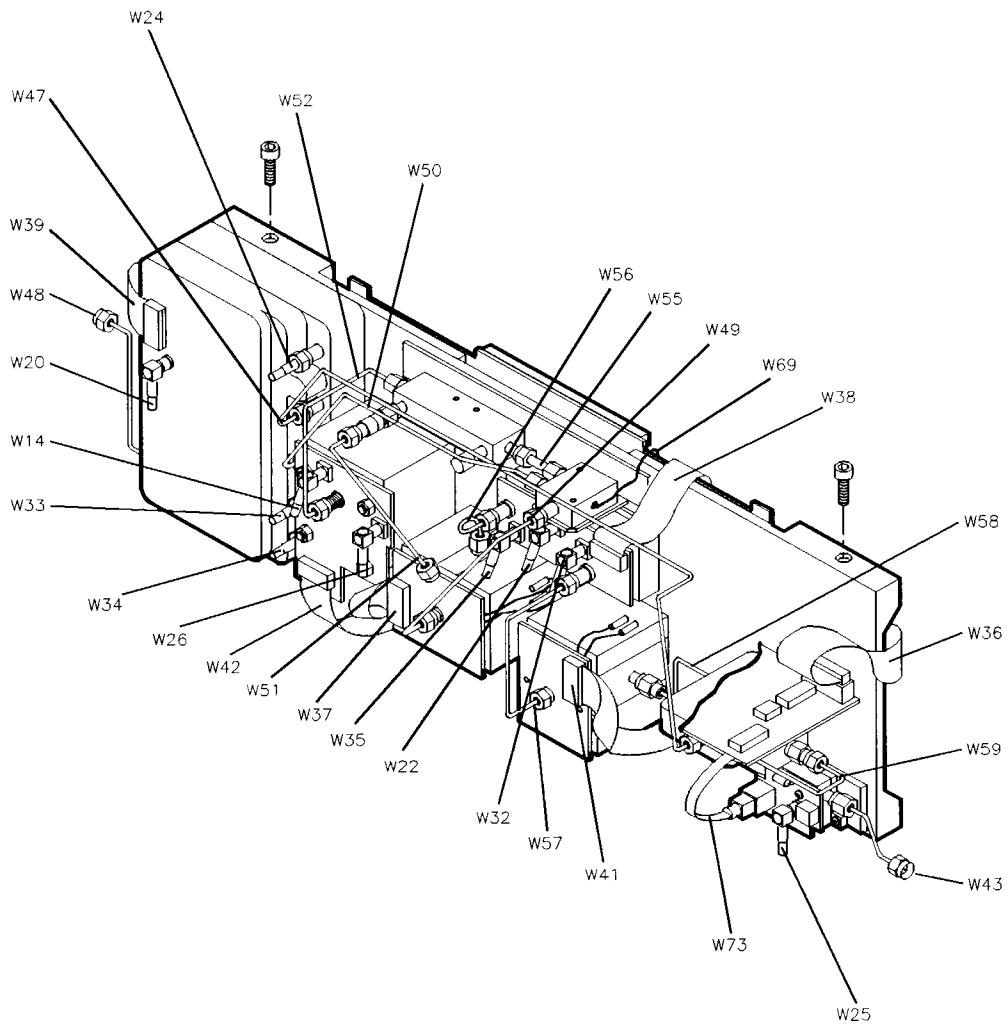


Figure 9-3. Cables (4 of 17)

Cables-HP 83640A/50A RF Deck
Option 001

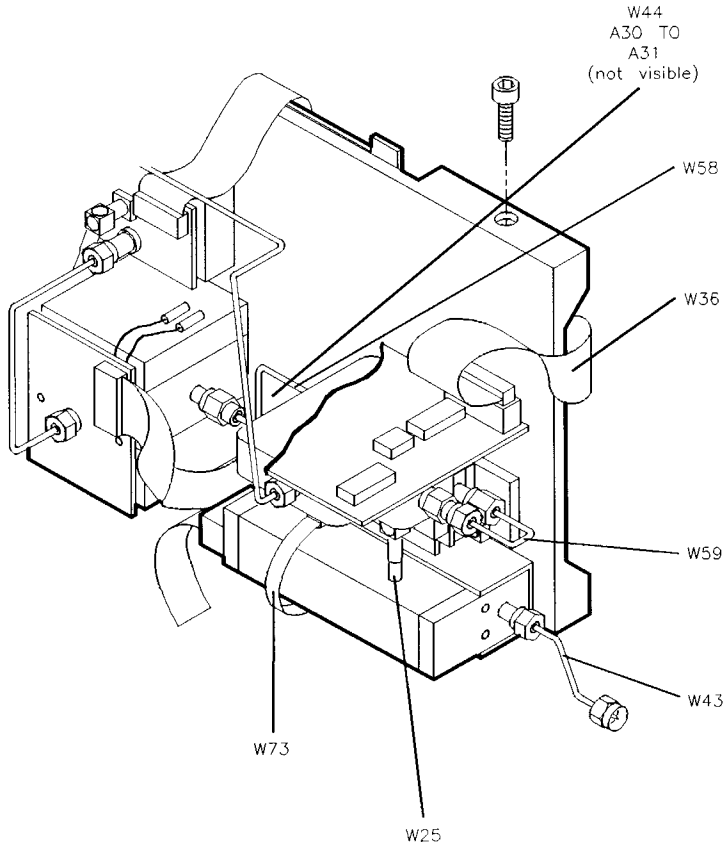


Figure 9-3. Cables (5 of 17)

Cables-HP 83640A/50A RF Deck
Option 006

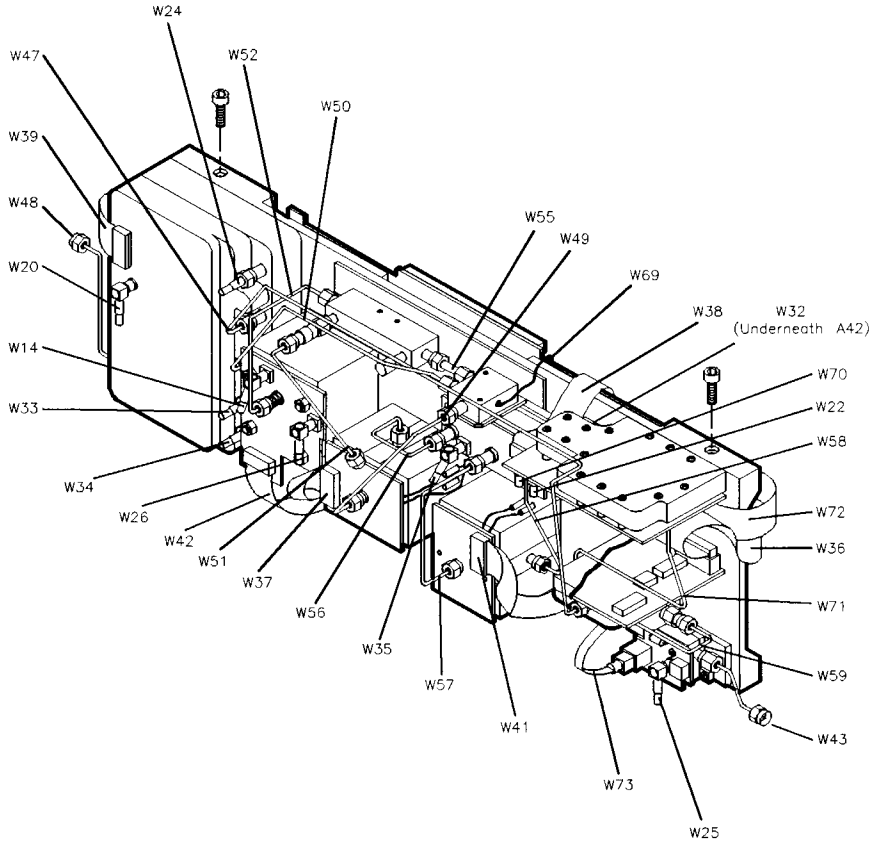


Figure 9-3. Cables (6 of 17)

Cables-HP 83640A/50A RF Deck
Options 001 and 006

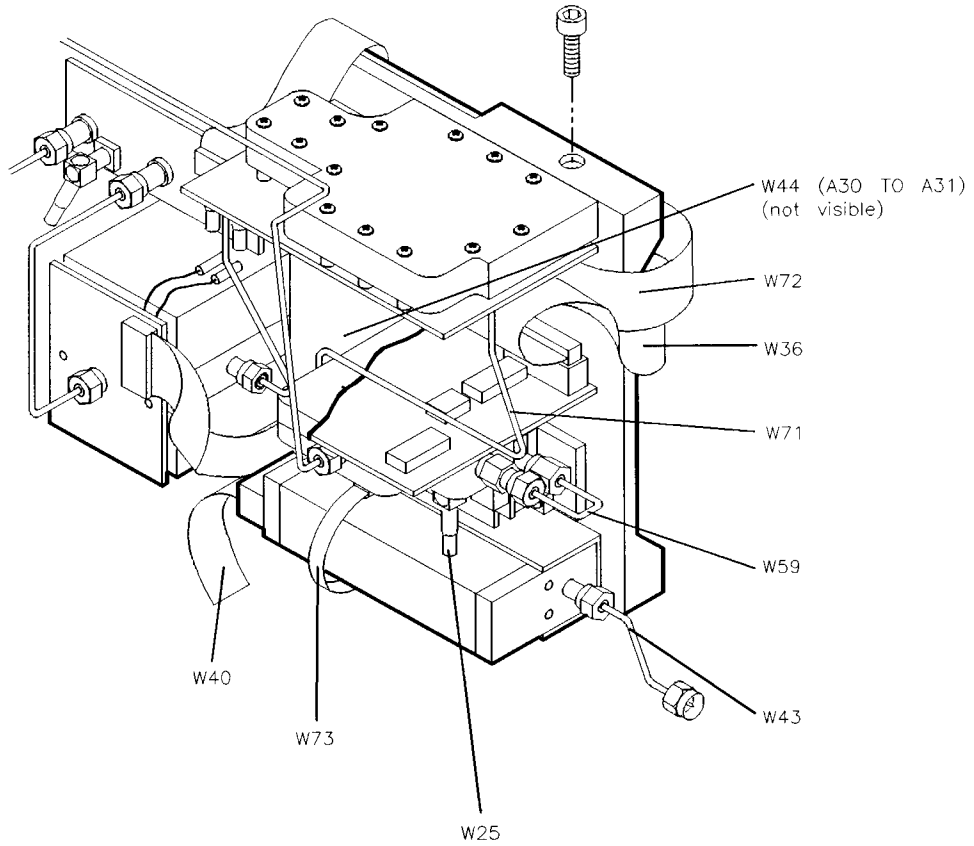


Figure 9-3. Cables (7 of 17)

Cables-HP 83620A/22A/30A RF Deck

No Options

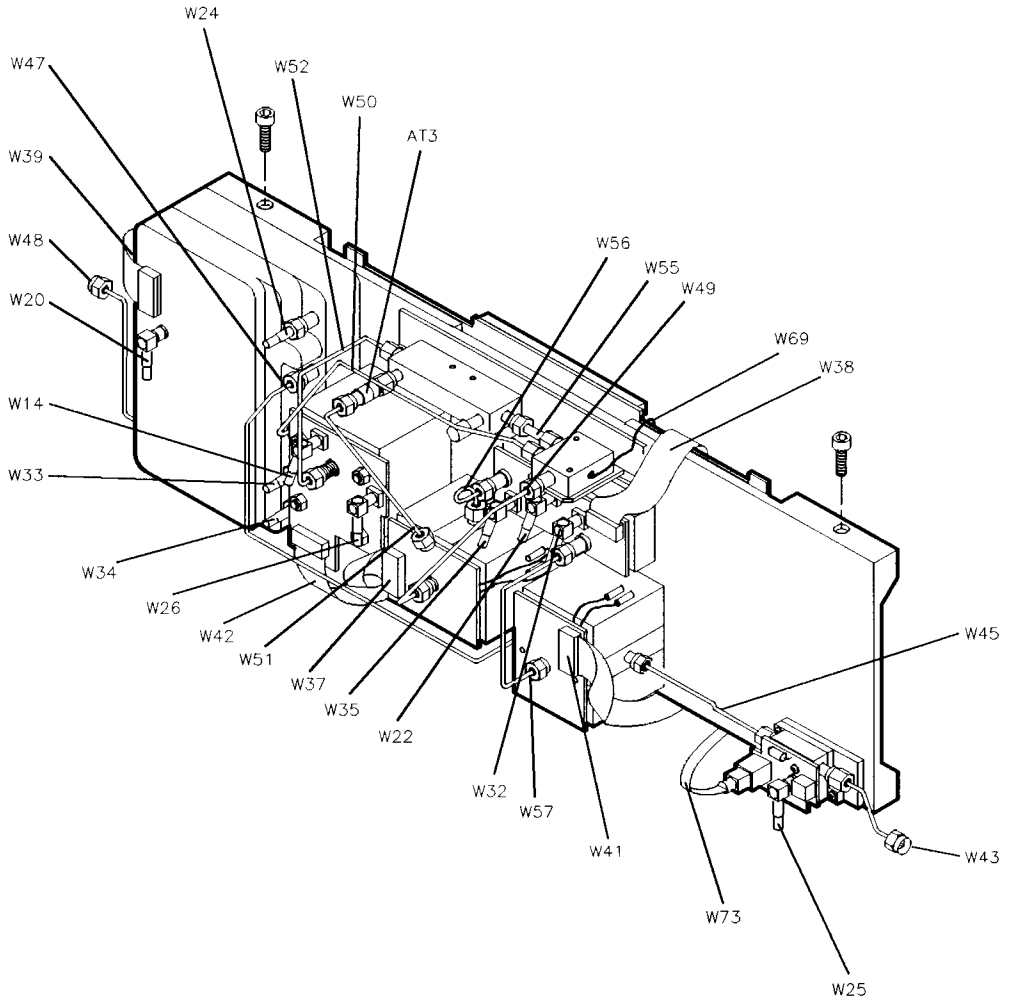


Figure 9-3. Cables (8 of 17)

Cables-HP 83620A/22A/30A RF Deck
Option 001

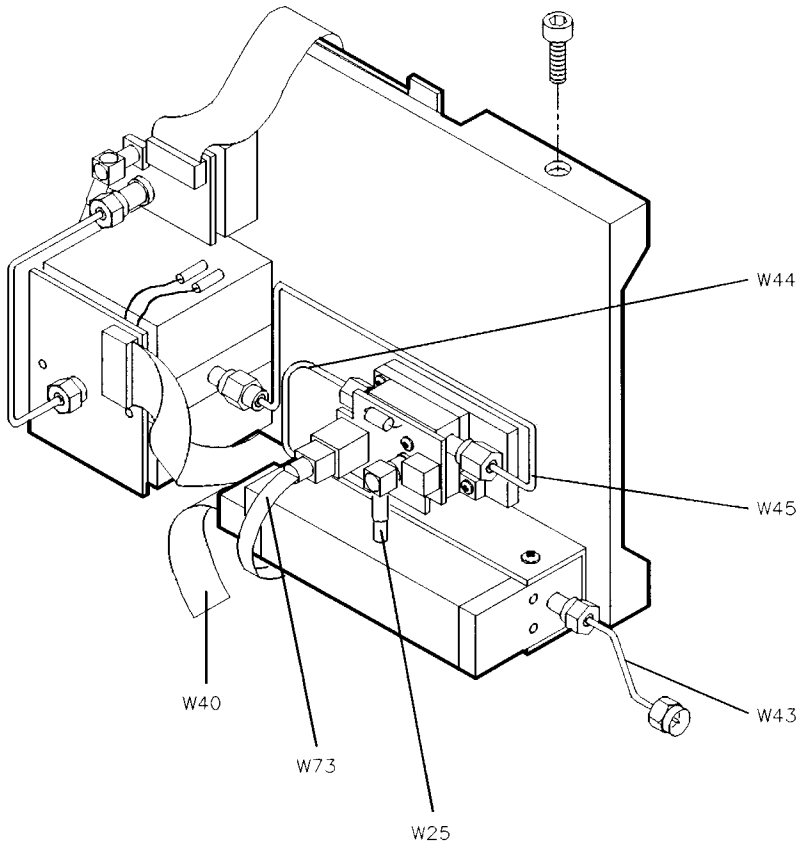


Figure 9-3. Cables (9 of 17)

Cables-HP 83620/22A/30A RF Deck
Option 006

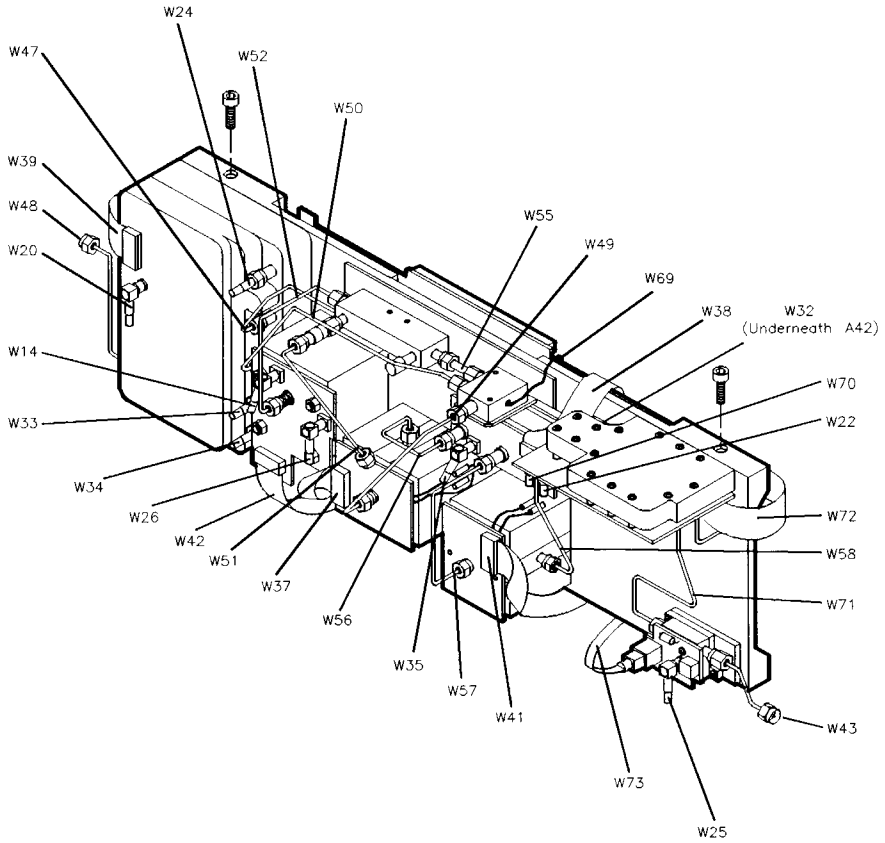


Figure 9-3. Cables (10 of 17)

Cables-HP 83620A/22A/30A RF Deck
Options 001 and 006

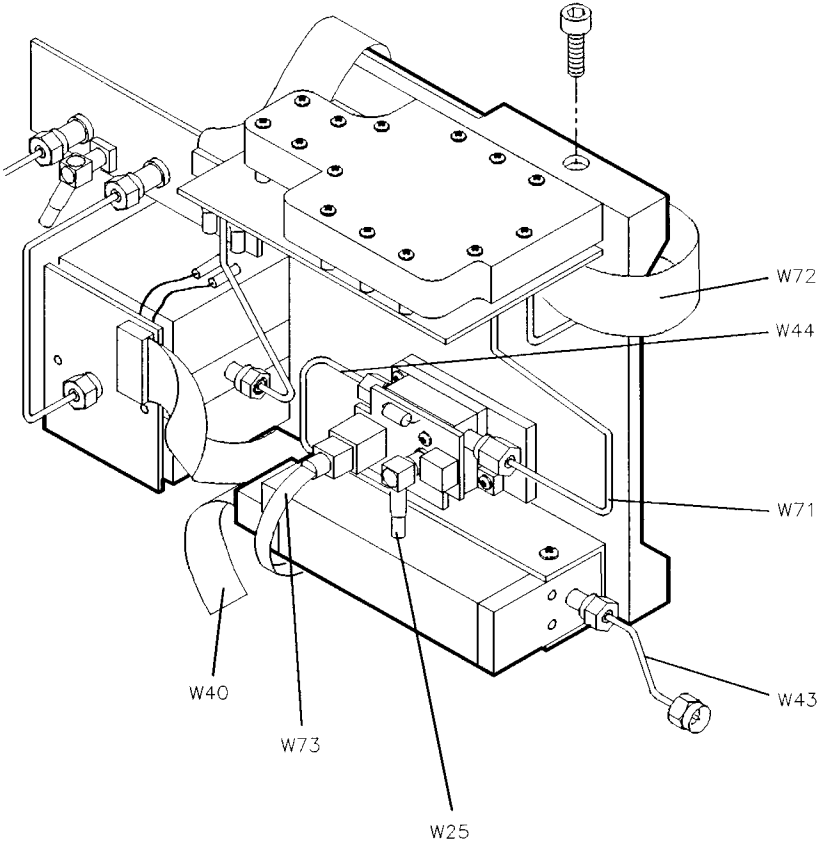


Figure 9-3. Cables (11 of 17)

Cables-HP 83623A RF Deck

No Options

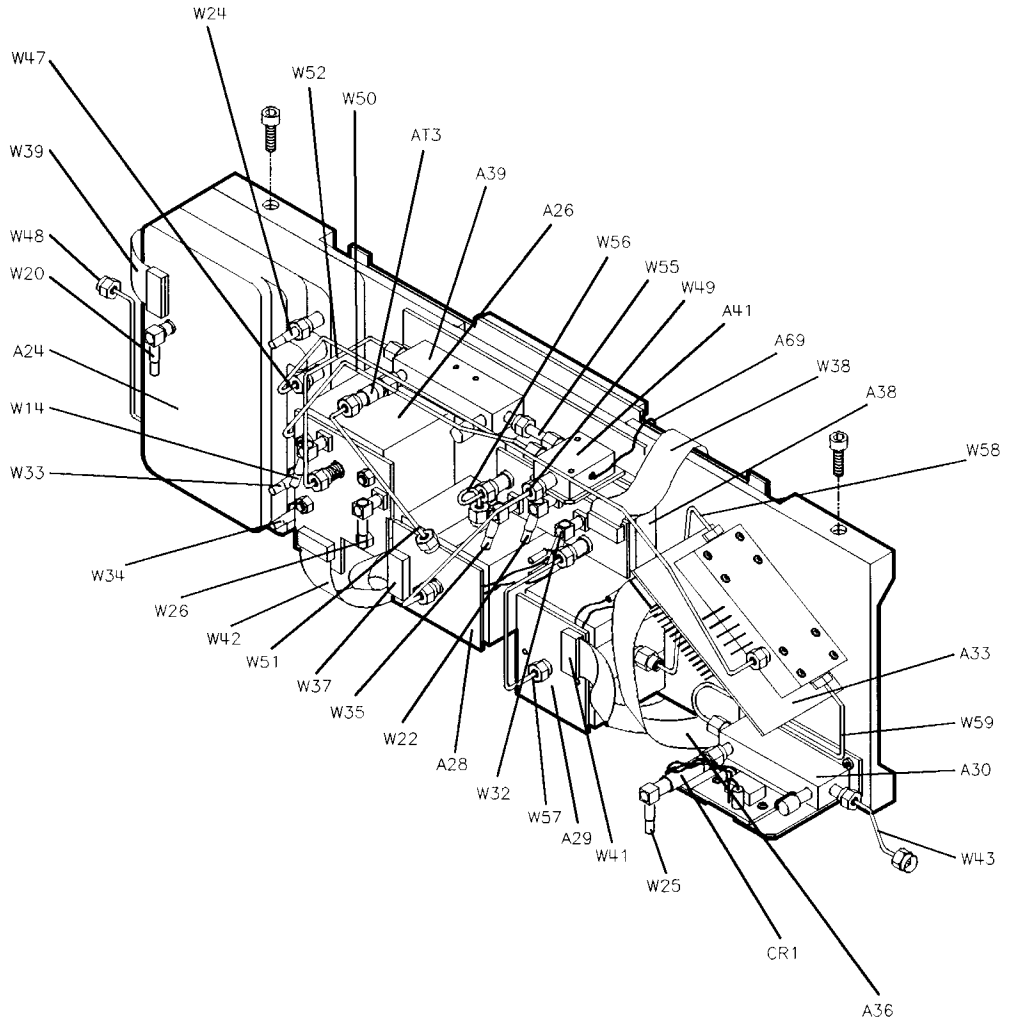


Figure 9-3. Cables (12 of 17)

Cables-HP 83623A RF Deck

Option 001

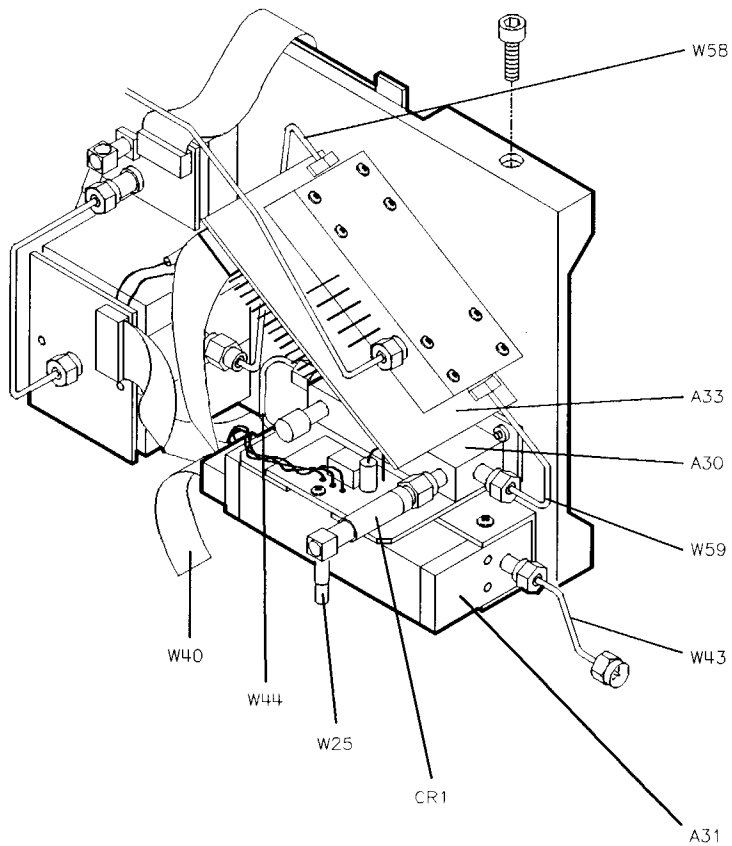


Figure 9-3. Cables (13 of 17)

Cables-HP 83624A RF Deck
No Options

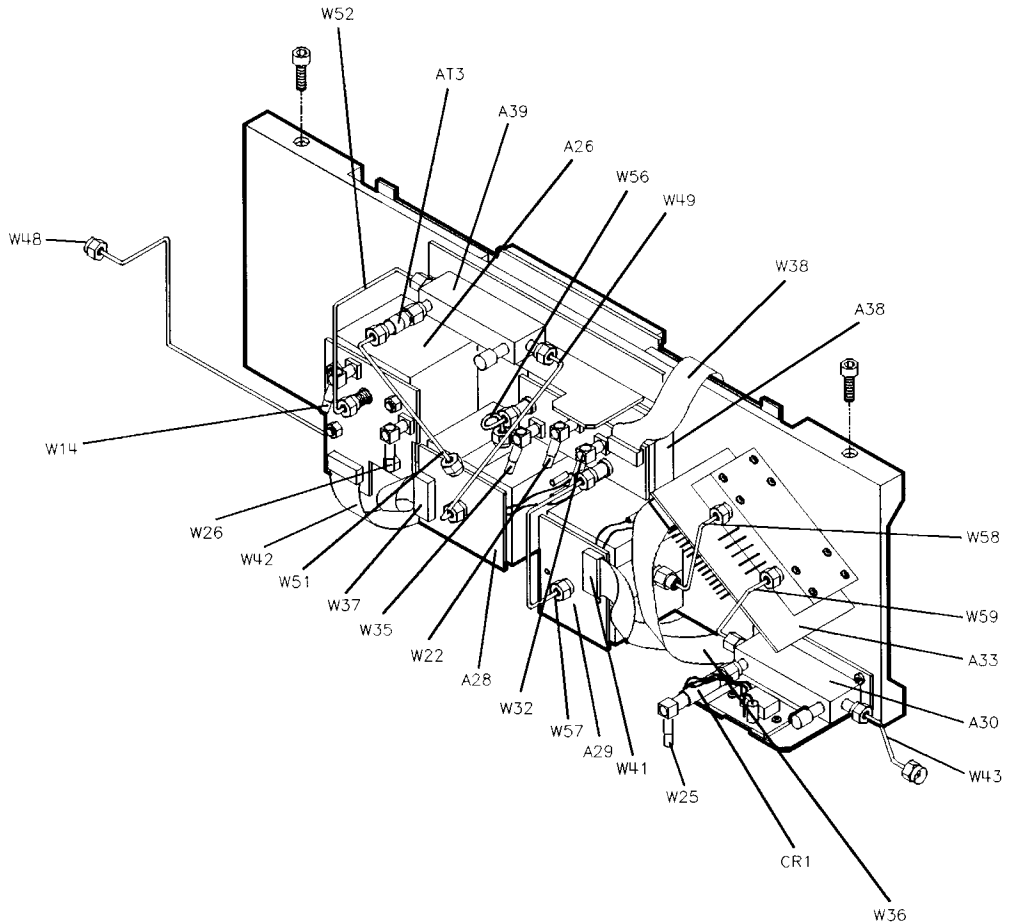


Figure 9-3. Cables (14 of 17)

Cables-HP 83624A RF Deck
Option 001

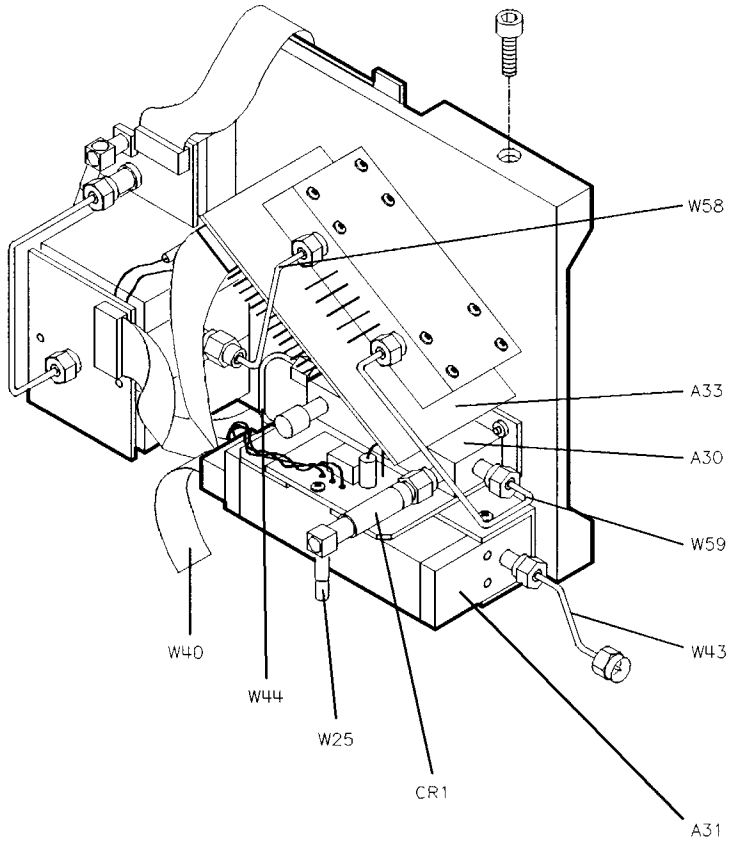


Figure 9-3. Cables (15 of 17)

Cables-HP 83623A/24A RF Deck
Option 006

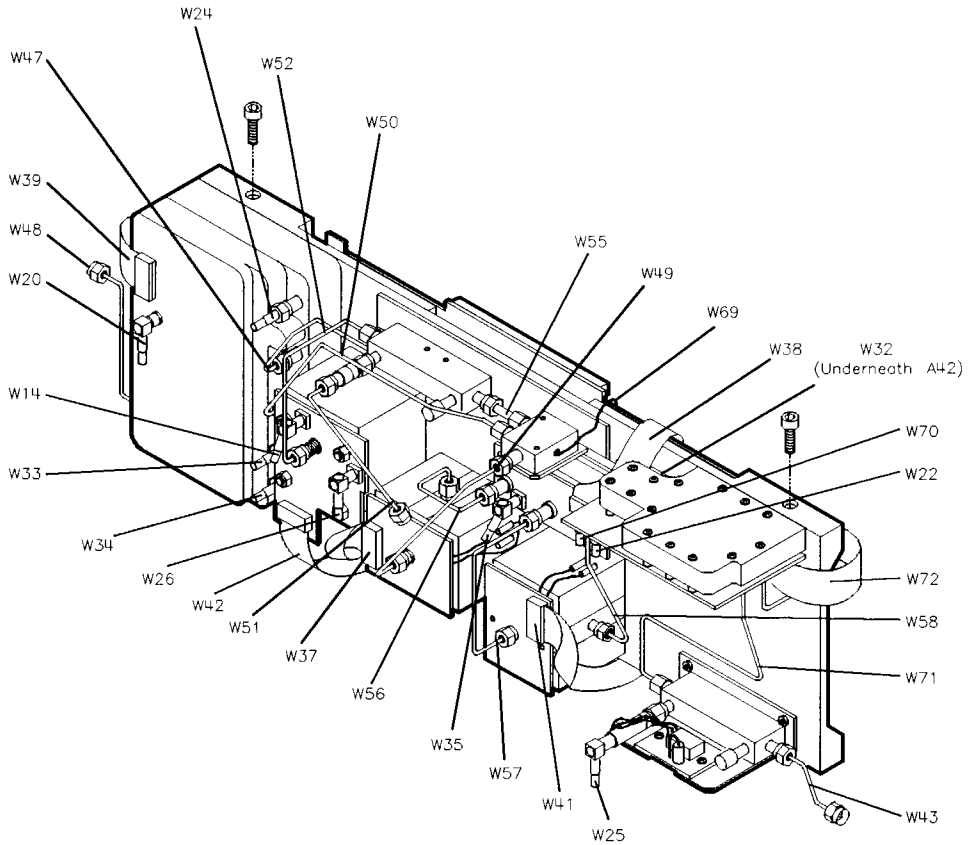


Figure 9-3. Cables (16 of 17)

Cables-HP 83623A/24A RF Deck
Options 001 and 006

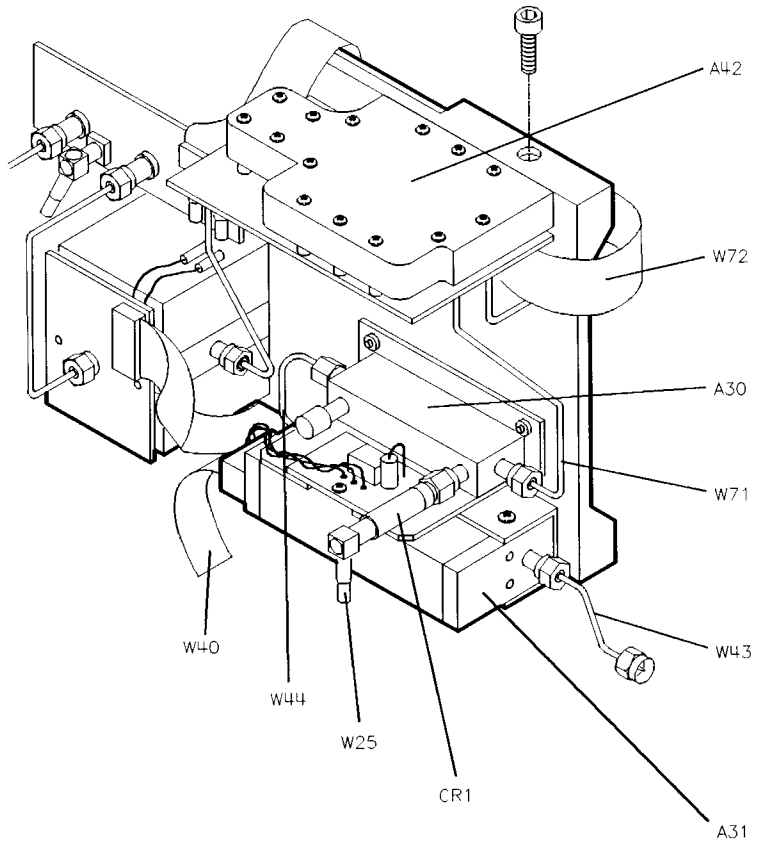


Figure 9-3. Cables (17 of 17)

Table 9-3. Cables

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| W1 | 08360-60062 | 1 | DISPLAY POWER A3J1/A21J1 |
| W2 | 08360-60056 | 1 | SMI/MOTHERBOARD-A2J1/A22J1 |
| W3 | 08360-60057 | 1 | F.P. PROCESSOR/MOTHERBOARD A3J2/A22J2 |
| W4 | 08360-60055 | 1 | F.P. PROCESSOR/DISPLAY A3J3/A21J2 |
| W5 | 08360-60054 | 1 | KEYBOARD/F.P. PROCESSOR A1J1/A3J4 |
| W6 | 08360-60070 | 1 | EXTERNAL PULSE J2/A9J4 |
| W6 | 08360-60094 | 1 | EXTERNAL PULSE J8/A9J4 (Option 004) |
| W6 | 08360-60172 | 1 | EXTERNAL PULSE J2/A8J3 (Option 002) |
| W6 | 08360-60175 | 1 | EXTERNAL PULSE J8/A8J3 (Option 002 and 004) |
| W7 | 08360-60068 | 1 | AM INPUT J3/A10J8 |
| W7 | 08360-60173 | 1 | AM INPUT J3/A8J7 (Option 002) |
| W8 | 08360-60069 | 1 | FM INPUT J4/A11J1 |
| W8 | 08360-60174 | 1 | FM INPUT J4/A8J10 (Option 002) |
| W9 | 08360-60051 | 1 | EXTERNAL LEVELING J5/A10J4 |
| W10 | 08360-60092 | 1 | FP SMI LEVELING-A2J2/A10J2 |
| W11 | 08360-60074 | 1 | 125 KHZ REF-A7J3/A4J1 |
| W12 | 08360-60075 | 1 | 30-60 MHZ-A4J2/A5J2 |
| W13 | 08360-60076 | 1 | SAMPLER IF-A6J2/A5J1 |
| W14 | 08360-60083 | 1 | HIGH FREQ PLL-A5J3/A26J2 |
| W15 | 08360-60072 | 1 | 40 MHZ REF-A7J6/A6J1 |
| W15 | 08360-60182 | 1 | 40 MHz REF-A7J6/A8J1 (Option 002) |
| W16 | 08360-60095 | 1 | EXTERNAL STD-J6/A7J1 |
| W17 | 08360-60071 | 1 | OVEN STD-A23J1/A7J2 |
| W18 | 08360-60073 | 1 | 1 MHZ-A7J4/A14J1 |
| W19 | 08360-60096 | 1 | 10 MHZ REAR PANEL -A7J5/J7 |
| W20 | 08360-60082 | 1 | 100 MHZ REF-A7J7/A24J2 |

Table 9-3. Cables (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| W21 | | | NOT USED |
| W22 | 08360-60228 | 1 | PRE-PULSE LEVELING DET-A38J13/A10J6 |
| W22 | 08360-60245 | 1 | PRE-PULSE LEVELING DET-A42J4/A10J6 (Option 006) |
| W23 | 08360-60093 | 1 | RF SMI LEVELING-A19J2/A10J3 |
| W24 | 08360-60107 | 1 | LOWBAND DETECTOR-A24J3/A10J5 |
| W25 | 08360-60106 | 1 | HI BAND DETECTOR-CR1/A10J7 |
| W26 | 08360-60079 | 1 | YO FM SIGNAL A11J2/A26J3 |
| W27 | 08360-60097 | 1 | V/GHZ-A12J1/J10 |
| W28 | 08360-60098 | 1 | TRIGGER OUTPUT-A14J2/J9 |
| W29 | 08360-60031 | 1 | PREREG IN/PREREG OUT-A18J1/A17J1 |
| W30 | 08360-60063 | 1 | MOTHERBOARD/10MHZ STD-A22J7/A23J2 |
| W31 | 08360-60037 | 1 | REAR PANEL/MOTHERBOARD-A19J1/A22J8 |
| W32 | 08360-60226 | 1 | PULSE MOD HI-A22J3/A38J3 |
| W32 | 08360-60247 | 1 | SLOW PULSE-A22J3/A42J3 (Option 006) |
| W33 | 08360-60088 | 1 | PULSE MOD LO-A22J4/A24J6 |
| W34 | 08360-60087 | 1 | ALC MOD LOW-A22J5/A24J7 |
| W35 | 08360-60225 | 1 | ALC MOD HI-A22J6/A38J2 |
| W36 | 08360-60230 | 1 | RF INTERFACE/AMP SWITCH-A20J14/A33J1 (HP 83623A) |
| W36 | 08360-60230 | 1 | RF INTERFACE/AMPLIFIER-A20J14/A33J1 (HP 83624A) |
| W36 | 08360-60191 | 1 | RF INTERFACE/DOUBLER-A20J5/A32J1 (HP 83640A/50A) |
| W37 | 08360-60189 | 1 | RF INTERFACE/AMP MULT-A20J9/A28J1 |
| W38 | 08360-60227 | 1 | RF INTERFACE/DUAL MOD-A20J1/A38J1 |
| W38 | 08360-60227 | 1 | RF INTERFACE/AM MOD-A20J1/A38J1 (Option 006) |
| W39 | 08360-60046 | 1 | RF INTERFACE/LOWBAND-A20J4/A24J1 |
| W40 | 08360-60045 | 1 | RF INTERFACE/ATTEN A20J6/A31J1 (Option 001) |

Table 9-3. Cables (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| W41 | 08360-60190 | 1 | RF INTERFACE/AMP FILTER-A20J8/A29J1 |
| W42 | 08360-60040 | 1 | RF INTERFACE/YO-A20J10/A26J1 |
| W43 | 08360-20072 | 1 | DIR COUPLER/RF OUT-A30J2/J1 (HP 83620A/22A/23A/24A/30A) |
| W43 | 08360-20072 | 1 | ATTEN/RF OUT-A31J2/J1 (HP 83620A/22A/23A/24A/30A Option 001) |
| W43 | 08360-20073 | 1 | DIR COUPLER/RF OUT-A30J2/J1 (HP 83620A/22A/23A/24A/30A Option 004) |
| W43 | 08360-20073 | 1 | ATTEN/RF OUT-A31J2/J1 (HP 83620A/22A/23A/24A/30A Option 014) |
| W43 | 08360-20082 | 1 | DIR COUPLER/RF OUT-A30J2/J1 (HP 83640A/50A) |
| W43 | 08360-20082 | 1 | ATTEN/RF OUT-A31J2/J1 (HP 83640A/50A Option 001) |
| W43 | 08360-20083 | 1 | DIR COUPLER/RF OUT-A30J2/J1 (HP 83640A/50A Option 004) |
| W43 | 08360-20083 | 1 | ATTEN/RF OUT-A31J2/J1 (HP 83640A/50A Option 014) |
| W44 | 08360-20191 | 1 | BRIDGE DET/ATTEN A30J5/A31J1 (HP 83620A/22A/30A Options 001 and 006) |
| W44 | 08360-20071 | 1 | DIR COUPLER/ATTEN A30J2/A31J1 (HP 83623A/24A Options 001 and 006) |
| W44 | 08360-20193 | 1 | BRIDGE DET/ATTEN A30J5/A31J1 (HP 83640A/50A Option 001) |
| W45 | 08360-20185 | 1 | AMP FILTER/BRIDGE DET-A29J3/A30J4 (HP 83620A/22A/30A) |
| W45 | 08360-20190 | 1 | AMP FILTER/BRIDGE DET-A29J3/A30J4 (HP 83620A/22A/30A Option 001) |

Table 9-3. Cables (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| W46 | | | NOT USED |
| W47 | 08360-20075 | 1 | LOWBAND/AMP SWITCH-A24J4/A33J3 (HP 83623A) |
| W47 | 08360-20163 | 1 | LOWBAND/AMP FILTER-A24J4/A29J2 (HP 83620A/22A/30A) |
| W47 | 08360-20139 | 1 | LOWBAND/DOUBLER-A24J4/A32J3 (HP 83640A/50A) |
| W47 | 08360-20246 | 1 | LOWBAND/PLS MOD SW FILT-A24J4/A42J7 (HP 83620A/23A/30A Option 006) |
| W48 | 08360-20235 | 1 | AMP MULT/AUX OUTPUT-A28J4/J14 |
| W48 | 08360-20236 | 1 | AMP MULT/AUX OUTPUT-A28J4/J14 (Option 004) |
| W49 | 08360-20171 | 1 | DIODE SWITCH/AMP MULT-A41J3/A28J5 (All models except HP 83624A) |
| W49 | 08360-20230 | 1 | COUPLER/AMP MULT-A39J2/A28J5 (HP 83624A) |
| W50 | 08360-20169 | 1 | DIODE SWITCH/LOWBAND-A41J2/A24J5 (All models except HP 83624A) |
| W51 | 08360-20173 | 1 | ATTENUATOR/LPF-AT3J2/FL2J1 |
| W51 | 08360-20172 | 1 | ATTENUATOR/LPF-AT3J2/FL2J1 (Option 004) |
| W52 | 08360-20147 | 1 | YO/DIR COUPLER-A26J4/A39J1 |
| W53 | | | NOT USED |
| W54 | 08360-20087 | 1 | LPF/SAMPLER-FL2J2/A6J3 |
| W55 | 1250-1159 | 1 | DIR COUPLER/DIODE SWITCH-A39J2/A41J1 (All models except HP 83624A) |

Table 9-3. Cables (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| W56 | 08360-20208 | 1 | AMP MULT/DUAL MOD-A28J3/A38J15 |
| W56 | 08360-20258 | 1 | AMP MULT/AM MOD-A28J3/A38J8 (Option 006) |
| W57 | 08360-20203 | 1 | DUAL MOD/AMP FILTER-A38J16/A29J2 |
| W57 | 08360-20203 | 1 | AM MOD/AMP FILTER-A38J9/A29J2 (Option 006) |
| W58 | 08360-20218 | 1 | FILTER/AMP SWITCH-A29J3/A33J2 (HP 83623A) |
| W58 | 08360-20221 | 1 | FILTER/AMPLIFIER-A29J3/A33J2 (HP 83624A) |
| W58 | 08360-20137 | 1 | AMP FILTER/DOUBLER-A29J3/A32J2 (HP 83640A/50A) |
| W58 | 08360-20250 | 1 | AMP FILTER/PLS MOD SW FILT-A29J3/A42J5 (Option 006) |
| W59 | 08360-20078 | 1 | AMP SWITCH/DIR COUPLER-A33J4/A30J1 (HP 83623A) |
| W59 | 08360-20070 | 1 | AMP SWITCH/DIR COUPLER-A33J4/A30J1 (HP 83623A Option 001) |
| W59 | 08360-20107 | 1 | AMPLIFIER/DIR COUPLER-A33J3/A30J1 (HP 83624A Option 001) |
| W59 | 08360-20108 | 1 | AMPLIFIER/DIR COUPLER-A33J3/A30J1 (HP 83624A) |
| W59 | 08360-20194 | 1 | DOUBLER/BRIDGE DET-A32J4/A30J4 (HP 83640A/50A) |
| W59 | 08360-20192 | 1 | DOUBLER/BRIDGE DET-A32J4/A30J4 (HP 83640A/50A Option 001) |
| W60 | | | NOT USED |
| W61 | | | NOT USED |
| W62 | 08360-60176 | 1 | PULSE VIDEO OUT-A8J4/J13 (Option 002) |
| W63 | 08360-60177 | 1 | PULSE SYNC OUT-A8J6/J12 (Option 002) |
| W64 | 08360-60180 | 1 | AM/FM OUTPUT-A8J11/J11 (Option 002) |
| W65 | 08360-60181 | 1 | 40 MHZ OUT-A8J21/A6J1 (Option 002) |

Table 9-3. Cables (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| W66 | 08360-60183 | 1 | PULSE OUT-A8J5/A9J4 (Option 002) |
| W67 | 08360-60184 | 1 | AM OUT-A8J8/A10J1 (Option 002) |
| W68 | 08360-60185 | 1 | FM OUT-A8J9/A11J1 (Option 002) |
| W69 | 08360-60224 | 1 | RF INTERFACE/DIODE SWITCH-A20J12/A41J1 (All models except HP 83624A) |
| W70 | 08360-60248 | 1 | FAST PULSE HI-A9J3/A42J1 (Option 006) |
| W71 | 08360-20247 | 1 | PLS MOD SW FILT/DOUBLER-A42J6/A32J2 (HP 83640A/50A Option 006) |
| W71 | 08360-20252 | 1 | PLS MOD SW FILT/BRIDGE DET-A42J6/A30J4 (HP 83620A/22A/30A Option 006) |
| W71 | 08360-20249 | 1 | PLS MOD SW FILT/COUPLER-A42J6/A30J1 (HP 83623A/24A Options 001 and 006) |
| W71 | 08360-20251 | 1 | PLS MOD SW FILT/BRIDGE DET-A42J6/A30J4 (HP 83620A/22A/30A Options 001 and 006) |
| W71 | 08360-20248 | 1 | PLS MOD SW FILT/COUPLER-A42J6/A30J1 (HP 83623A/24A Option 006) |
| W72 | 08360-60191 | 1 | RF INTERFACE/PLS MOD SW FILT-A20J11/A42J8 (Option 006) |
| W73 | 08360-60250 | 1 | RF INTERFACE/BRIDGE DETECTOR-A20J13/A30J3 |

Front Panel Hardware

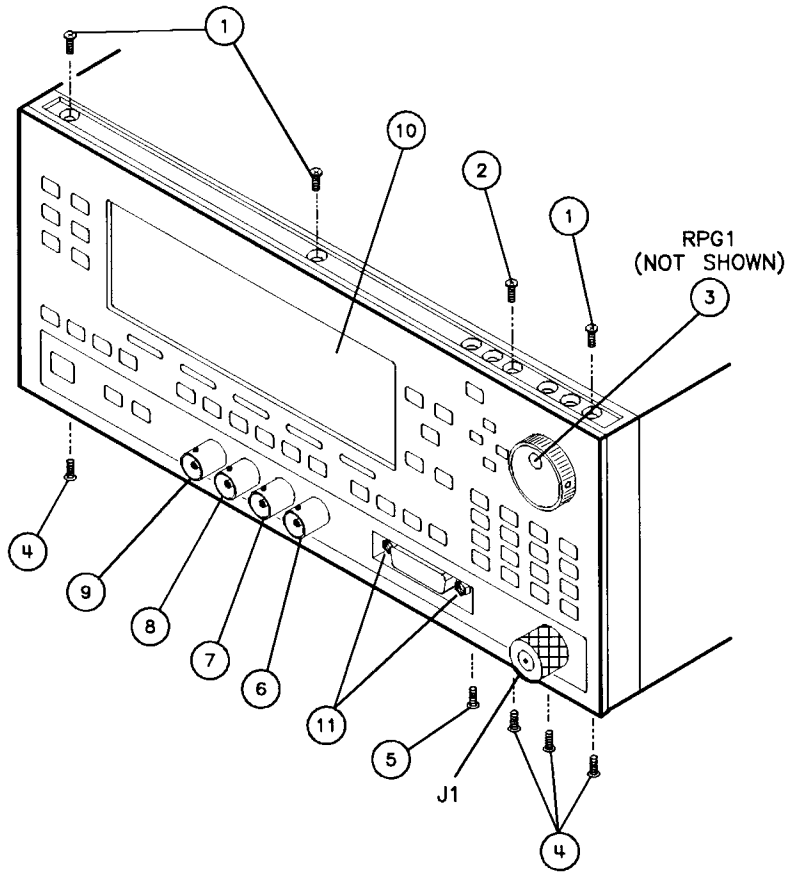
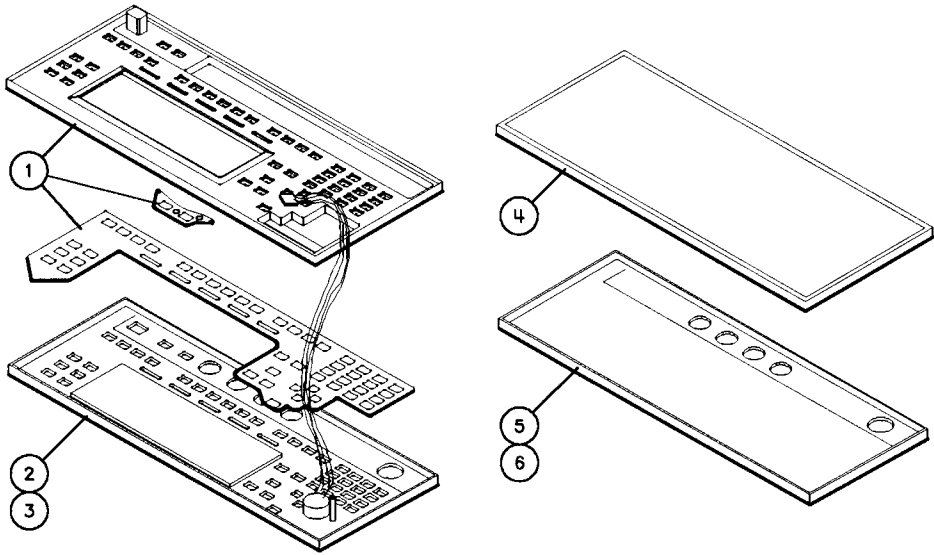


Figure 9-4. Front Panel Hardware

Table 9-4. Front Panel Hardware

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| 1 | 0515-2043 | 7 | SCREW-MACH. M4 x 0.7 8MM-LG 90-DEG-FLH-HD |
| 2 | 0515-0943 | 2 | SCREW-MACH. M4 x 0.7 12MM-LG |
| | 0535-0082 | 2 | NUT-SPECIALTY M3.5 x 1.27 THD; 8.44MM |
| 3 | 0370-3033 | 1 | ROTARY KNOB |
| 4 | 0515-2043 | | SCREW-MACH. M4 x 0.7 8MM-LG 90-DEG-FLH-HD |
| 5 | 0515-0943 | | SCREW-MACH. M4 x 0.7 12MM-LG |
| | 0535-0082 | 2 | NUT-SPECIALTY M3.5 x 1.27 THD; 8.44MM |
| 6 | | 4 | J2 FLTG BNC PLS GRD |
| | | 4 | (Includes the following) |
| | 2190-0102 | | WASHER-LK INTL T 15/32 IN .472-IN-ID |
| | 0590-1251 | | NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD |
| 7 | | | J3 FLTG BNC AY-FM |
| | | | (Includes the following) |
| | 2190-0102 | | WASHER-LK INTL T 15/32 IN .472-IN-ID |
| | 0590-1251 | | NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD |
| 8 | | | J4 FLTG BNC AY-AM |
| | | | (Includes the following) |
| | 2190-0102 | | WASHER-LK INTL T 15/32 IN .472-IN-ID |
| | 0590-1251 | | NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD |
| 9 | | | J5 FLTG BNC AY-EXT |
| | | | (Includes the following) |
| | 2190-0102 | | WASHER-LK INTL T 15/32 IN .472-IN-ID |
| | 0590-1251 | | NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD |
| 10 | 08360-40007 | 1 | DISPLAY FILTER |
| 11 | 1251-5436 | 4 | SCREW LOCK KIT-AMP HD CONN |
| J1 | | | RF OUTPUT CONNECTOR - See Table 9-2 |
| RPG1 | | | ROTARY PULSE GENERATOR (RPG) |
| | | | (Includes the following) |
| | 2190-0016 | 1 | WASHER-LK INTL T 3/8 IN .377-IN-ID |
| | 2950-0043 | 1 | NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK |

Front Panel, Casting and Keypad



(STANDARD)

(OPTION 003)

Figure 9-5. Front Panel, Casting and Keypad

Table 9-5. Front Panel, Casting and Keypad

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| 1 | 08360-60146 | 1 | KEYPAD REPLACEMENT KIT |
| 2 | 08360-20051 | 1 | FRONT PANEL CASTING - FEEDS |
| 3 | 06360-20050 | 1 | FRONT PANEL CASTING - NO FEEDS (Option 004) |
| 4 | 08360-40004 | 1 | RFI SEAL (BLACK RUBBER GASKET) |
| 5 | 06360-20052 | 1 | FRONT PANEL CASTING - SHEET MTL/NO FEEDS (Options 003 and 004) |
| 6 | 06360-20053 | 1 | FRONT PANEL CASTING - SHEET MTL/FEEDS (Option 003) Also order front panel nameplate in "Miscellaneous Replaceable Accessories" |

Front Panel, Attaching Hardware

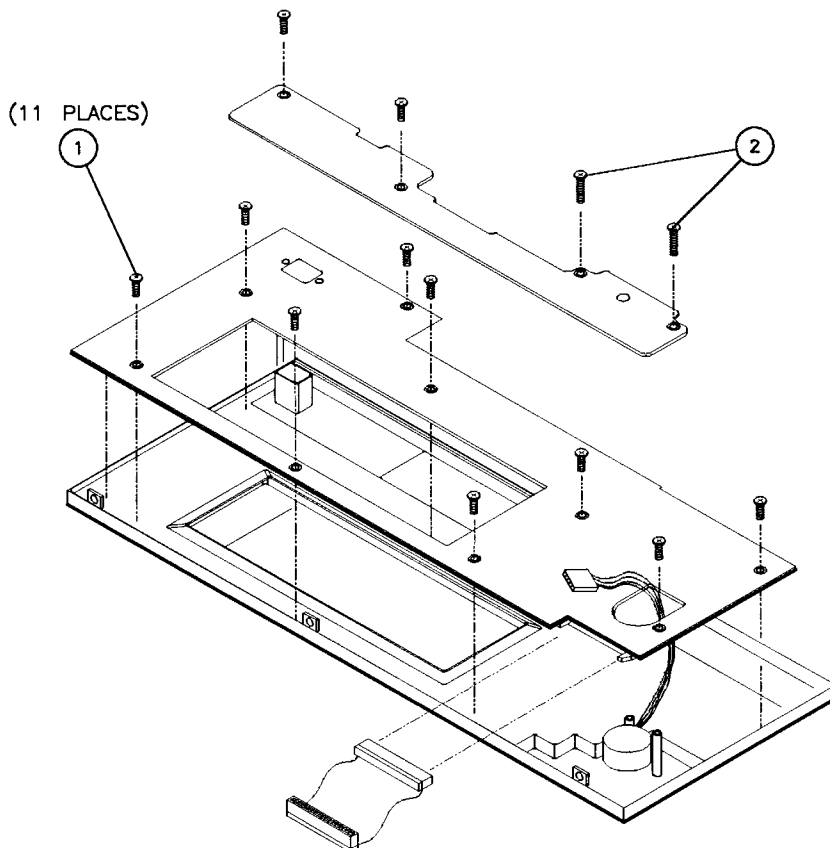


Figure 9-6. Front Panel, Attaching Hardware (1 of 3)

Table 9-6. Front Panel, Attaching Hardware

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| 1 | 0515-0372 | 27 | SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG |
| 2 | 0515-0664 | 2 | SCREW-MACHINE ASSEMBLY M3 x 0.5 12MM-LG |
| 3 | 08360-00034 | 2 | MOUNTING BRACKET - DISPLAY |
| 4 | 0515-0372 | | SCREW-MACHINE ASSEMBLY M3 X 0.5 8MM-LG |
| 5 | 0515-0372 | | SCREW-MACHINE ASSEMBLY M3 X 0.5 8MM-LG |

Front Panel, Attaching Hardware

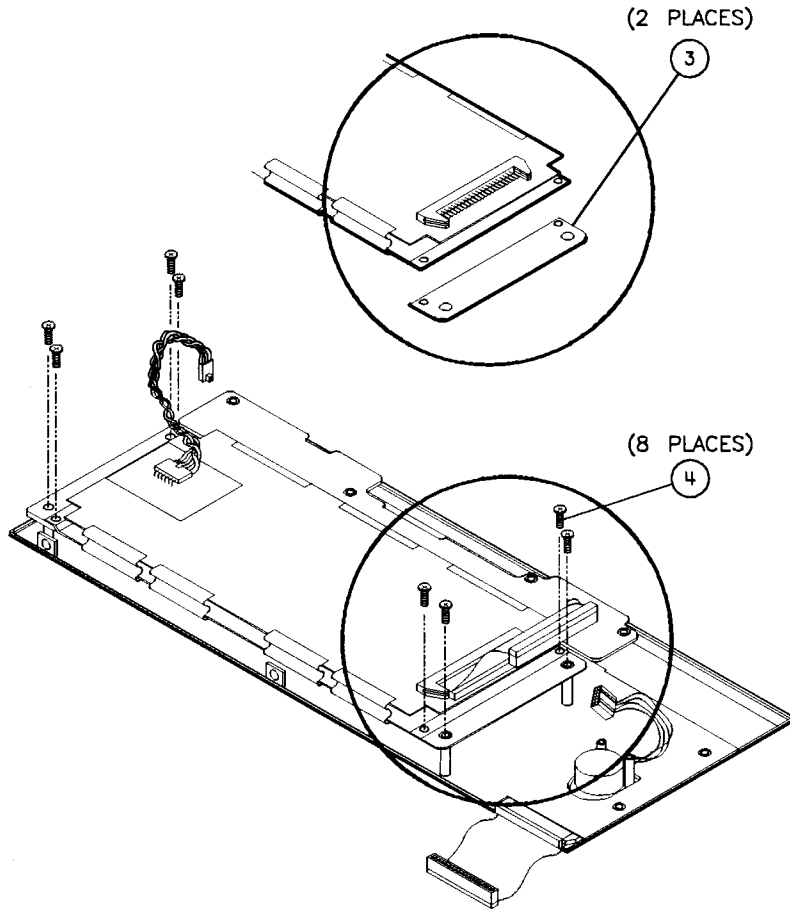


Figure 9-6. Front Panel, Attaching Hardware (2 of 3)

Front Panel, Attaching Hardware

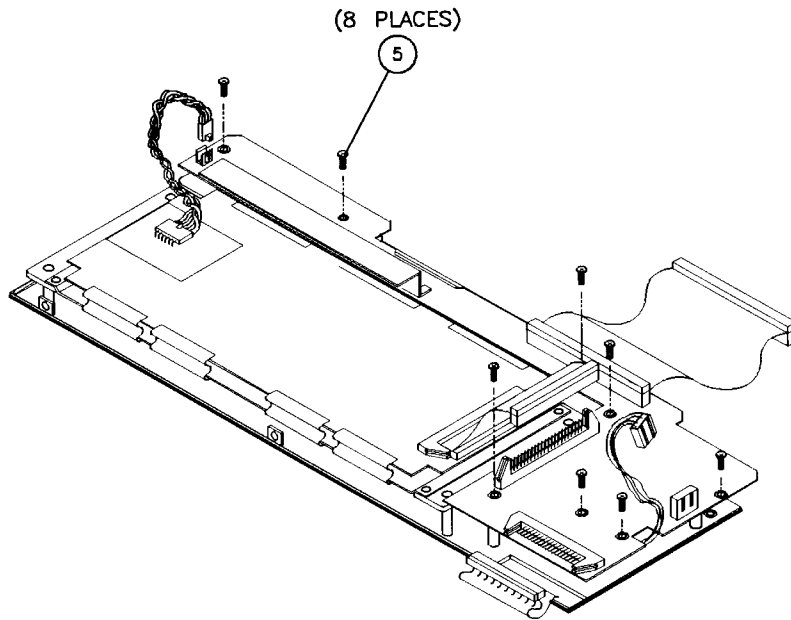


Figure 9-6. Front Panel, Attaching Hardware (3 of 3)

Rear Panel Hardware

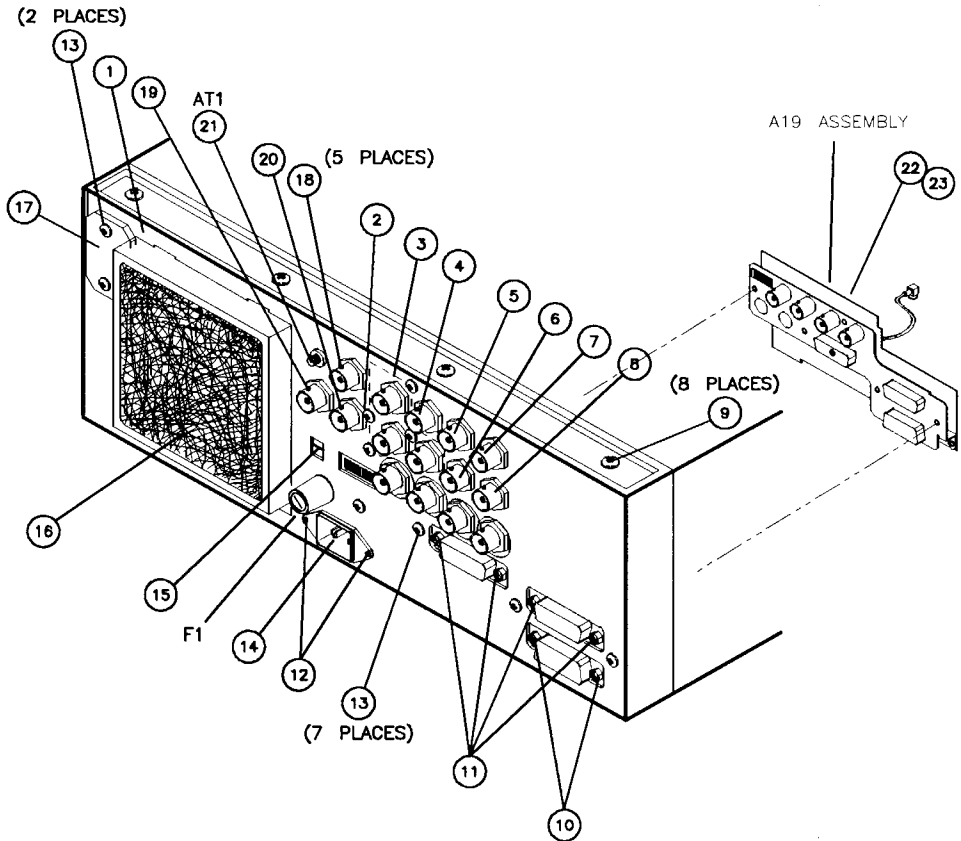


Figure 9-7. Rear Panel Hardware

Rear Panel Hardware

Table 9-7. Rear Panel (1 of 2)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| 1 | 08360-00001 | 1 | REAR PANEL |
| 2 | 0515-1372 | 5 | SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG |
| 3 | | | BNC CONNECTORS (Order A34 of Table 9-2) |
| | 6960-0027 | 4 | PLUG-HOLE TR-HD FOR .625-D-HOLE NYL |
| 4 | 08360-60094 | 1 | J8 - CA AY-PLS INPUT (Option 004) |
| | 6960-0041 | 1 | PLUG-HOLE TR-HD FOR .5-D-HOLE NYL (Standard) |
| 5 | | | J6 - CA AY-10MHZ IN-See Table 9-3 (Includes the following) |
| | 2950-0035 | 4 | NUT-HEX DBL-CHAM 15/32-32-THD |
| | 2190-0102 | 4 | WASHER LK INTL T 15/32 IN .472-IN-ID |
| 6 | | | J10 - CA AY-VOLTS/GHZ-See Table 9-3 (Includes the following) |
| | 2950-0035 | | NUT-HEX DBL-CHAM 15/32-32-THD |
| | 2190-0102 | | WASHER LK INTL T 15/32 IN .472-IN-ID |
| 7 | | | J7 - CA AY-10MHZ OUT-See Table 9-3 (Includes the following) |
| | 2950-0035 | | NUT-HEX DBL-CHAM 15/32-32-THD |
| | 2190-0102 | | WASHER LK INTL T 15/32 IN .472-IN-ID |
| 8 | | | J9 - CA AY-ANAL INTFC-See Table 9-3 (Includes the following) |
| | 2950-0035 | | NUT-HEX DBL-CHAM 15/32-32-THD |
| | 2190-0102 | | WASHER LK INTL T 15/32 IN .472-IN-ID |
| 9 | 0515-0380 | 8 | SCREW-MACHINE ASSEMBLY M4 x 0.7 10MM-LG |
| 10 | 0380-0643 | 2 | STANDOFF HEX .255-IN-LG 6/32-THD |
| 11 | 1251-5436 | 4 | SCREW LOCK KIT-AMP HD CONN |
| 12 | 0515-1037 | 2 | SCREW-MACHINE ASSEMBLY M3 x 0.5 45MM-LG |
| 13 | 0515-0372 | 9 | SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG |
| 14 | | | LINE MODULE - FILTERED (See Table 9-2) |
| 15 | 08360-60032 | 1 | AC VOLTAGE SELECTION SWITCH/HARNESS |

Table 9-7. Rear Panel (2 of 2)

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| 16 | | | FAN (see Table 9-2) |
| 17 | 08360-00025 | 1 | PLATE - REAR BLANK |
| | 6960-0027 | 4 | PLUG-HOLE TR-HD FOR .625-D-HOLE NYL |
| 18 | | 1 | J11-CA AY-AM/FM OUTPUT (Option 002) (Includes the following) |
| | 2950-0035 | | NUT-HEX DBL-CHAM 15/32-32-THD |
| | 2190-0102 | | WASHER LK INTL T 15/32 IN .472-IN-ID |
| | 6960-0041 | 1 | PLUG-HOLE TR-HD FOR .5-D-HOLE NYL (Standard) |
| 19 | | 1 | J12-CA AY-PULSE SYNC OUT (Option 002) (Includes the following) |
| | 2950-0035 | | NUT-HEX DBL-CHAM 15/32-32-THD |
| | 2190-0102 | | WASHER LK INTL T 15/32 IN .472-IN-ID |
| | 6960-0041 | 1 | PLUG-HOLE TR-HD FOR .5-D-HOLE NYL (Standard) |
| 20 | | 1 | J13-CA AY-PULSE VIDEO OUT (Option 002) (Includes the following) |
| | 2950-0035 | | NUT-HEX DBL-CHAM 15/32-32-THD |
| | 2190-0102 | | WASHER LK INTL T 15/32 IN .472-IN-ID |
| | 6960-0041 | 1 | PLUG-HOLE TR-HD FOR .5-D-HOLE NYL (Standard) |
| 21 | 1250-1753 | 1 | J14-CONNECTOR-AUX OUTPUT |
| 22 | 08360-20245 | 1 | REAR PANEL INTERFACE SHIELD |
| 23 | 0515-2032 | 2 | SCREW-MACH M3 x 0.5 8MM-LG 90-DEG-FLH-HD |
| AT1 | 1810-0118 | 1 | TERMINATION SMA MALE 50Ω |
| F1 | 2110-0227 | 1 | FUSE (INCH) 5A 250V NTD FE UL |
| | 2110-0003 | 1 | FUSE (INCH) 3A 230V NTD FE UL |
| | 2110-0564 | 1 | FUSEHOLDER BODY |
| | 2110-0565 | 1 | FUSEHOLDER CAP |
| | 2110-0569 | 1 | FUSEHOLDER NUT |

Rear Panel Fan Assembly

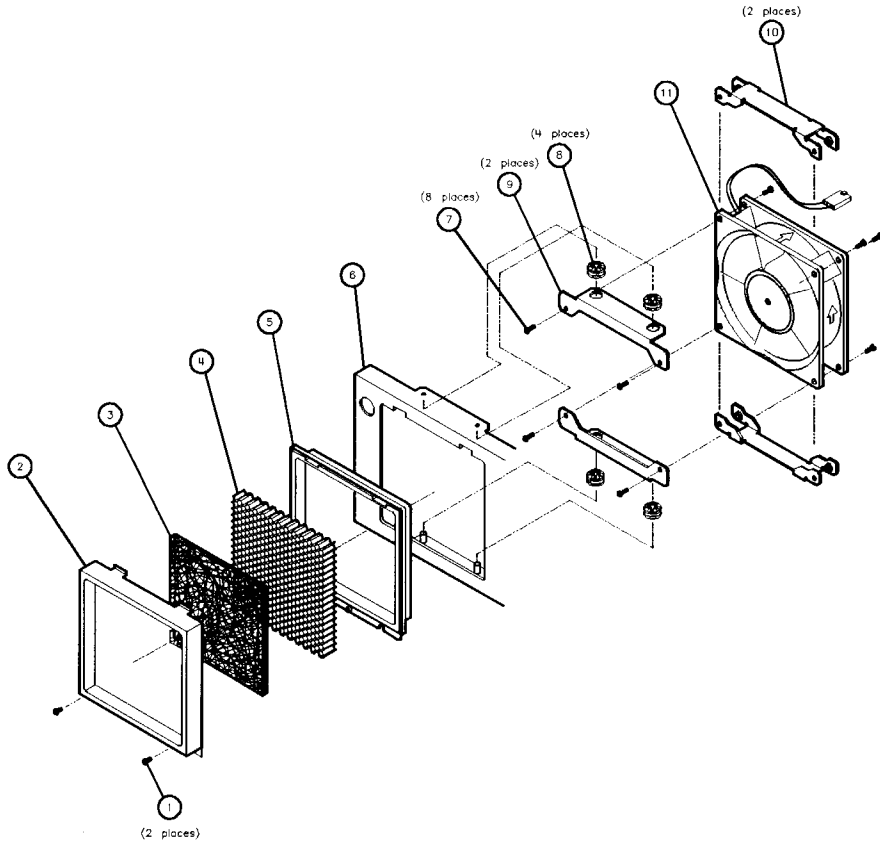


Figure 9-8. Rear Panel Fan Assembly

Rear Panel Fan Assembly

Table 9-8. Rear Panel Fan Assembly

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|-------------------------------|
| 1 | 0515-0430 | 2 | SMM 3.0 6 PM TX |
| 2 | 08360-00059 | 1 | FAN SHROUD |
| 3 | 08360-20254 | 1 | FOAM |
| 4 | 08360-00058 | 1 | HEXCELL HONEYCOMB |
| 5 | 08360-40011 | 1 | GROUND HEX SHROUD |
| 6 | 08360-00060 | 1 | REAR PANEL |
| 7 | 0515-2011 | 8 | SCREW-MACHINE ASSY M3.5 x 0.6 |
| 8 | 0400-0356 | 4 | GROMMET |
| 9 | 08360-00057 | 2 | BRACKET FAN/REAR PANEL |
| 10 | 08360-00061 | 2 | BRACKET FAN |
| 11 | 08360-80026 | 1 | FAN |

Bottom View, Attaching Hardware

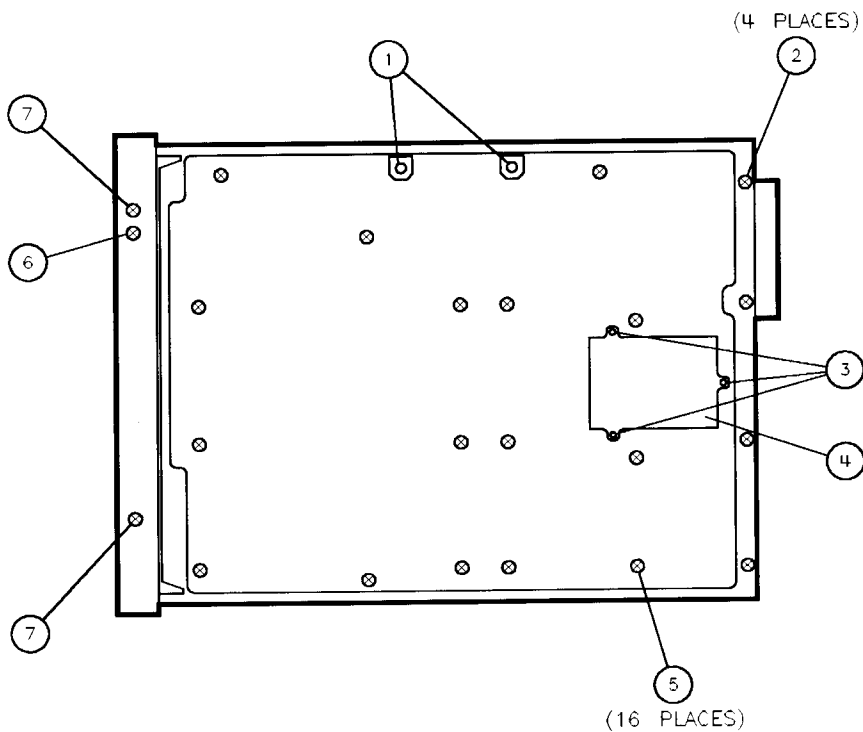


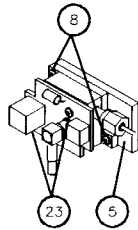
Figure 9-9. Bottom View, Attaching Hardware

Table 9-9. Bottom View, Attaching Hardware

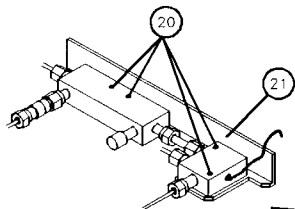
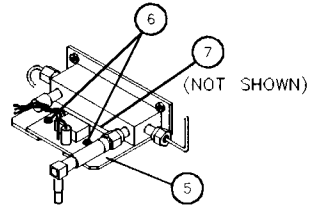
| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| 1 | 6960-0016 | 2 | PLUG-HOLE TR-HD FOR .125-D HOLE NYL |
| 2 | | | SCREW-MACHINE (See Table 9-7) |
| 3 | 0624-0518 | 3 | SCREW-TPG 6-19 .25-IN-LG PAN-HD-TORX T15 |
| 4 | 08360-40002 | 1 | HIGH VOLTAGE COVER |
| 5 | 0515-0382 | 16 | SCREW-MACHINE ASSEMBLY M4 x 0.7 12MM-LG |
| 6 | | | SCREW-MACHINE (See Table 9-4) |
| 7 | | | SCREW-MACHINE (See Table 9-4) |

Top View, Attaching Hardware

(HP 83620A/22A/30A/40A/50A)



(HP 83623A/24A)



(OPTION 001)

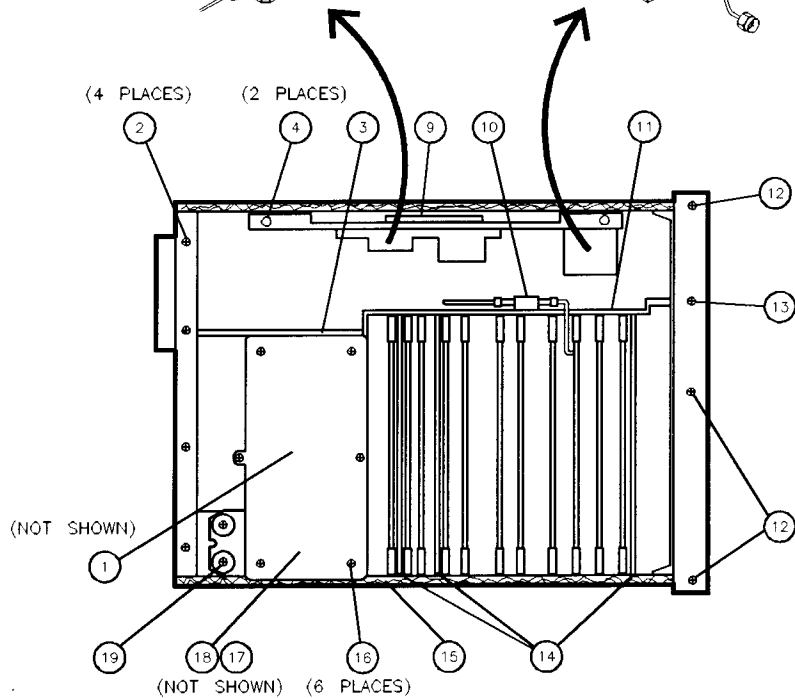
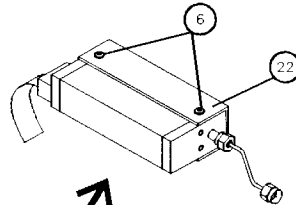


Figure 9-10. Top View, Attaching Hardware

Table 9-10. Top View, Attaching Hardware

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| 1 | 08360-00015 | 1 | POWER SUPPLY HOUSING |
| 2 | | | SCREW-MACHINE (See Table 9-8) |
| 3 | 08360-20044 | 1 | END SUPPORT |
| 4 | 0515-0501 | 2 | SCREW-SKT-HD-CAP M6 x 1.0 12MM-LG |
| 5 | 5021-7872 | 1 | MOUNTING BRACKET BRIDGE DETECTOR (HP 83620A/22A/30A/40A/50A) |
| 5 | 08360-00008 | 1 | MOUNTING BRACKET COUPLER/DETECTOR (HP 83623A/24A) |
| 6 | 0515-0372 | 2 | SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG (Quantity is 4 in instruments with Option 001) |
| 7 | 0520-0173 | 2 | SCREW-MACH 256 .188 PNPD |
| 8 | 0515-0430 | 2 | SMM 3.0 6 PN TX |
| 9 | 08360-00035 | 1 | SUPPORT CONNECTORS |
| 10 | 08360-20237 | 1 | EXTRUSION-FILTER MOUNT |
| | 0515-0383 | 1 | SCREW-MACHINE ASSEMBLY M4 x 0.7 16MM-LG |
| 11 | 08360-20042 | 1 | CARD CAGE SUPPORT |
| 12 | | | SCREW-MACHINE (See Table 9-4) |
| 13 | | | SCREW-MACHINE (See Table 9-4) |
| 14 | 08360-20043 | 3 | DIVIDERS |
| 15 | 8160-0539 | | RFI ROUND STRIP CU-CLD-STL SN-PL (2.56 FT) |
| 16 | 0515-0382 | 6 | SCREW-MACHINE ASSEMBLY M4 x 0.7 12MM-LG |
| 17 | 08360-40004 | | RFI SEAL (3 FT) |
| 18 | 08360-20045 | 1 | POWER SUPPLY COVER |
| 19 | 2200-0103 | 2 | SCREW-MACH. 4-40 .25-IN-LG PAN-HD-POZI |
| | 2190-0105 | 2 | WASHER-LK HLCL NO. 6 .141-IN-ID |
| | 1520-0205 | 3 | SHOCK MOUNT .31-EFF-HGT |
| 20 | 0515-1539 | 4 | SCREW-MACHINE M3 x0.5 16MM-LG |
| 21 | 08360-00052 | 1 | MOUNTING BRACKET COUPLER/DIODE SWITCH |
| 22 | 08360-00031 | 1 | MOUNTING BRACKET STEP ATTENUATOR |
| 23 | 0515-0430 | 2 | SMM 3.0 6 PN TX |

Left Side View, Attaching Hardware

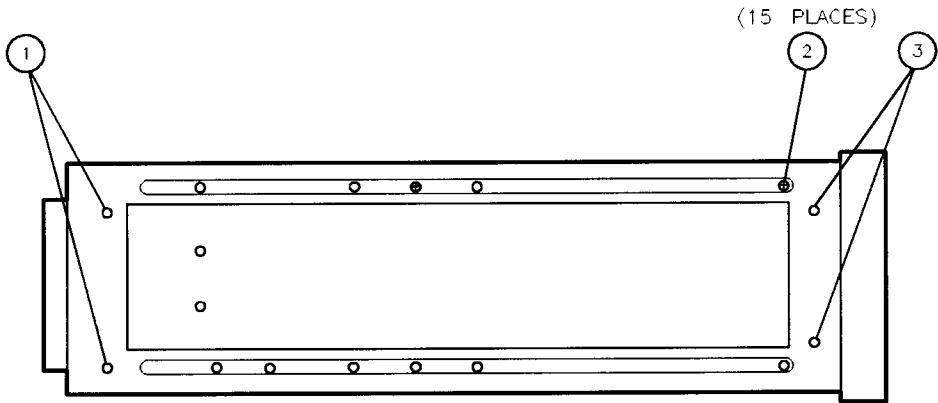
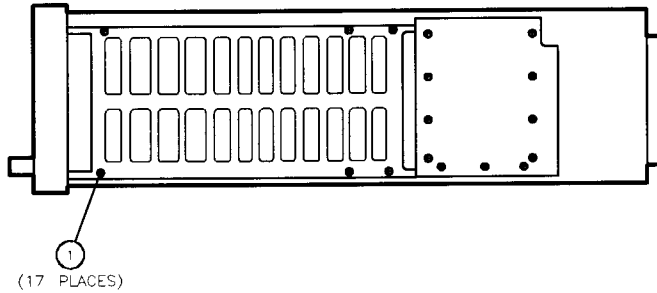


Figure 9-11. Left Side View, Attaching Hardware

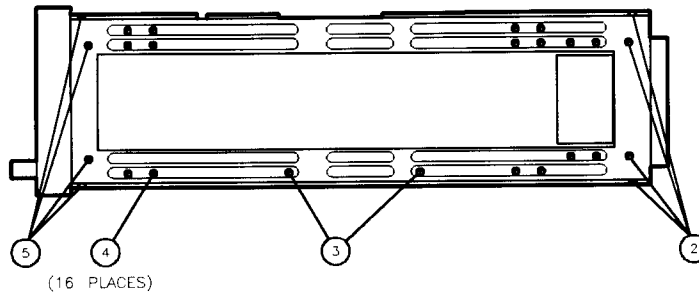
Table 9-11. Left Side View, Attaching Hardware

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| 1 | 0515-2086 | 4 | SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD |
| 2 | 0515-0382 | 15 | SCREW-MACHINE ASSEMBLY M4 x 0.7 12MM-LG |
| 3 | 0515-2086 | | SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD |

Right Side View, Attaching Hardware



CARDCAGE AND REGULATOR BOX SCREWS



CHASSIS SCREWS

Figure 9-12. Right Side View, Attaching Hardware

Table 9-12. Right Side View, Attaching Hardware

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| 1 | 0515-0382 | 33 | SCREW-MACHINE ASSEMBLY M4 x 0.7 12MM-LG |
| 2 | 0515-2086 | 8 | SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD |
| 3 | 0515-0433 | 2 | SCREW-MACHINE ASSEMBLY M4 x 0.7 8MM-LG |
| 4 | 0515-0382 | | SCREW-MACHINE ASSEMBLY M4 x 0.7 12MM-LG |
| 5 | 0515-2086 | | SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD |

RF Deck Right Side View, Attaching Hardware

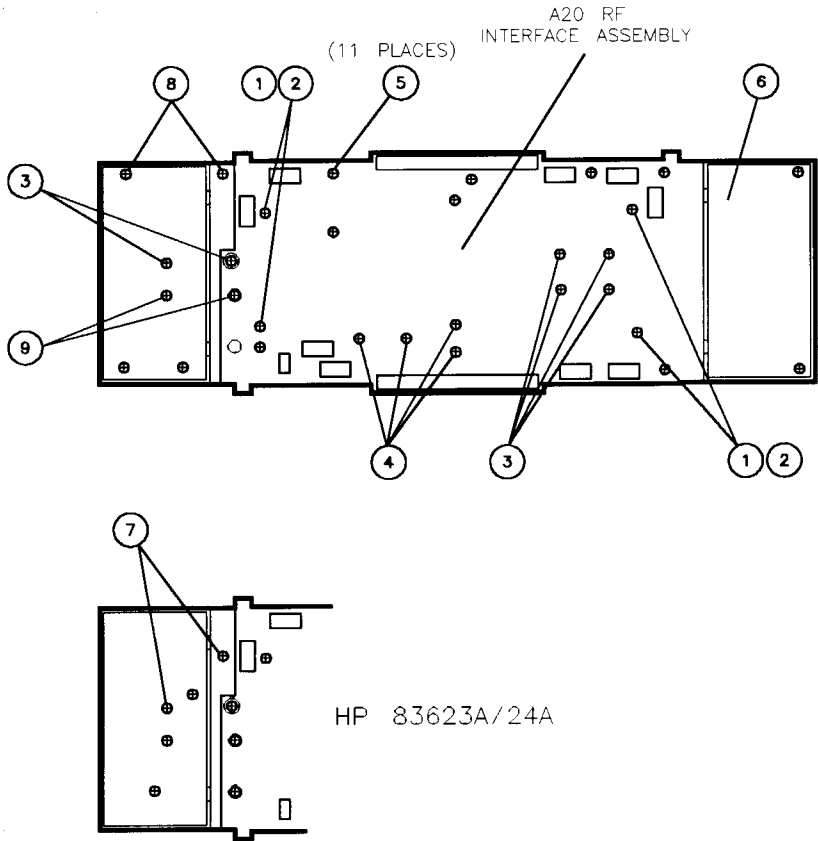


Figure 9-13. RF Deck Right Side View, Attaching Hardware

RF Deck Right Side View, Attaching Hardware

Table 9-13. RF Deck Right Side View, Attaching Hardware

| Ref. Desig. | HP Part Number | Qty | Description |
|----------------|-------------------|-----|---|
| 1 | 0515-0372 | 17 | SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG |
| 2 | 3050-0169 | 4 | WASHER-SPR CRVD NO.6 .143-IN-ID |
| 3 | 0515-2011 | 4 | SCREW-MACHINE ASSEMBLY M3.5 x 0.060 12MM-LG |
| 4 | 2360-0370 | 4 | SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI |
| 5 | 0515-0372 | | SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG |
| 6 | 08360-20141 | 1 | RF DECK CASTING |
| 7 | 0515-0372 | | SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG |
| 8 | 0515-0458 | 2 | SCREW-MACHINE ASSEMBLY M3 x 0.6 8MM-LG (Option 006) |
| 9 | 0515-0430 | 2 | SMM3.0 6 PN TX (Used for bridge detector regardless of its position on the RF deck) |

RF Connector and Attaching Hardware

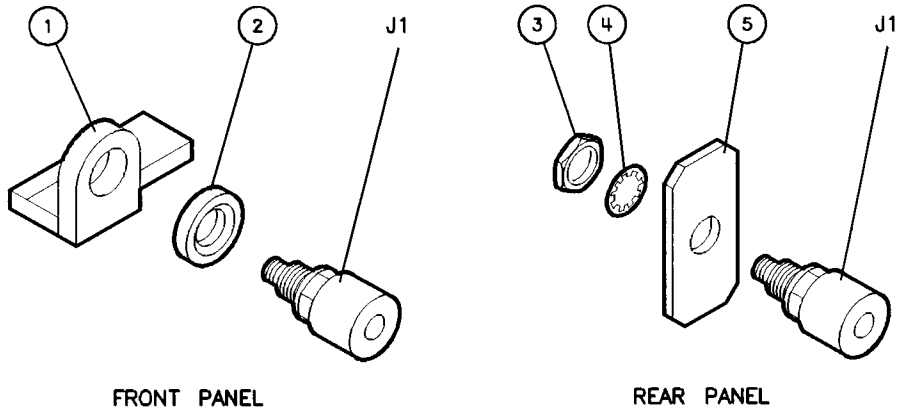


Figure 9-14. RF Connector and Attaching Hardware

Table 9-14. RF Connector and Attaching Hardware

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|--|
| 1 | 08360-20095 | 1 | FRONT MOUNTING BRACKET 3.5 MM CONNECTOR |
| | 08360-20096 | 1 | FRONT MOUNTING BRACKET 2.4 MM CONNECTOR |
| 2 | 08360-20088 | 1 | SPACER FOR 3.5 MM CONNECTOR |
| 3 | 2950-0001 | 1 | NUT-HEX-DBL-CHAM 3/8-32-THD (3.5 mm connector) |
| | 08360-20133 | 1 | NUT-HEX-DBL-CHAM M10 X1 (2.4 mm connector) |
| 4 | 2190-0016 | 1 | WASHER-LK INTL 3/8 IN |
| 5 | 08360-00004 | 1 | PL-RR CONN 3.5 (Option 004) |
| | 08360-00024 | 1 | PL-RR CONN 2.4 (Option 004) |
| J1 | | | RF CONNECTOR (See Table 9-2) |

Chassis Parts

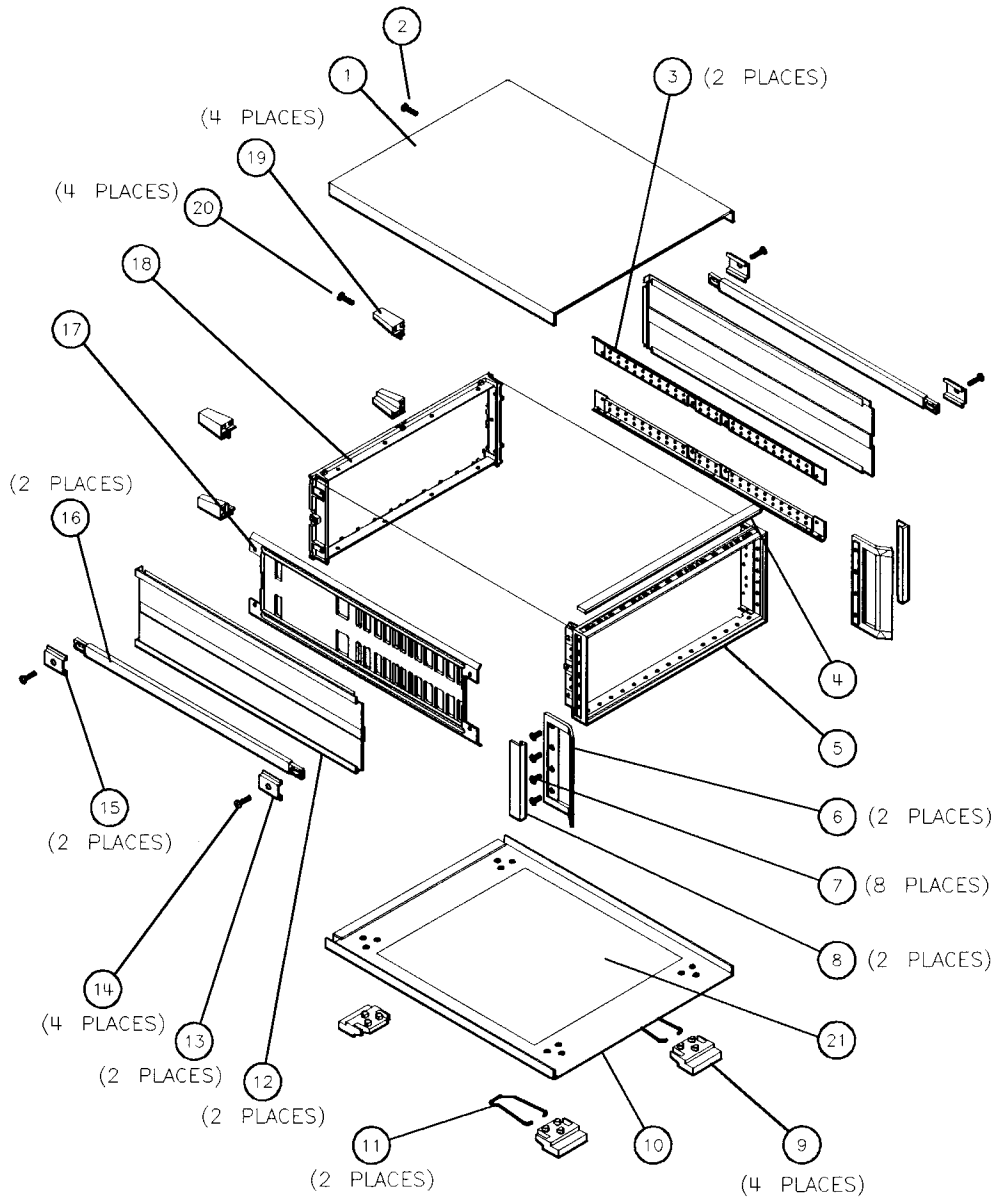


Figure 9-15. Chassis Parts

Table 9-15. Chassis Parts

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|------------------------|
| 1 | 5062-3736 | 1 | COVER-TOP |
| 2 | 0515-1245 | 1 | SCREW - COVER |
| 3 | 5021-5838 | 2 | SIDE RAILS |
| 4 | 5041-8802 | 1 | TRIM STRIP |
| 5 | 5021-8405 | 1 | FRONT FRAME |
| 6 | 5062-3800 | 2 | HANDLE ASSEMBLY |
| 7 | 0515-0943 | 4 | HANDLE SCREWS |
| 8 | 5021-8497 | 2 | TRIM FRONT HANDLE |
| 9 | 5041-8801 | 4 | FOOT -FM .5M |
| 10 | 5062-3748 | 1 | COVER-BOTTOM |
| 11 | 1460-1345 | 2 | TILT STAND |
| 12 | 5062-3843 | 2 | COVER-SIDE |
| 13 | 5041-8819 | 2 | CAP-FRONT |
| 14 | 0515-0707 | 4 | STRAP SCREW |
| 15 | 5041-8820 | 2 | CAP-REAR |
| 16 | 5062-3705 | 2 | STRAP HANDLE |
| 17 | 08360-20040 | 1 | SIDE FRAME |
| 18 | 5021-5806 | 1 | REAR FRAME |
| 19 | 54110-40502 | 4 | FOOT REAR |
| 20 | 0515-1444 | 4 | SCREW - REAR FOOT |
| 21 | 08360-20253 | 1 | INSULATED BOTTOM COVER |

Table 9-16. Miscellaneous Replaceable Accessories

| Ref. Desig. | HP Part Number | Qty | Description |
|----------------------|----------------|-----|--|
| LABELS | | | |
| | 7120-3737 | 1 | LBL WRN HI VOLT |
| | 83620-80001 | 1 | NAMEPLATE 83620A |
| | 83622-80001 | 1 | NAMEPLATE 83622A |
| | 83630-80001 | 1 | NAMEPLATE 83630A |
| | 83640-80001 | 1 | NAMEPLATE 83640A |
| | 83642-80001 | 1 | NAMEPLATE 83642A |
| | 83650-80001 | 1 | NAMEPLATE 83650A |
| SERVICE TOOLS | | | |
| | | | T-10 TORX SCREWDRIVER |
| | | | T-15 TORX SCREWDRIVER |
| | | | #1 x 3 1/8 IN. POZIDRIV SCREWDRIVER |
| | | | #2 x 4 IN. POZIDRIV SCREWDRIVER |
| | | | 5.5 MM NUT DRIVER |
| | | | 7 MM NUT DRIVER |
| | | | .050 HEX DRIVER |
| | | | 9/16 IN. NUT DRIVER |
| | | | 5/16 IN OPEN END WRENCH |
| | | | 14MM OPEN END WRENCH |
| | 1251-2170 | | COAX EXTRACTOR TOOL-SUBMIN D CONNECTOR |
| | 08360-60065 | | SUBSTITUTE FRONT PANEL |

Table 9-16. Miscellaneous Replaceable Accessories (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|--------------------|----------------|-----|---|
| | 08360-60060 | | TOOL KIT (Includes the following) |
| | 08360-60086 | | EXTENDER BOARD-DIGITAL BOARDS |
| | 08360-60085 | | EXTENDER BOARD-ANALOG BOARDS |
| | 08360-60081 | | EXTENDER BOARD-POST REGULATOR |
| | 08360-60077 | | EXTENDER BOARD-SWITCHING REGULATOR |
| | 08360-60030 | | EXTENDER BOARD-RECTIFIER/FILTER |
| | 08360-60084 | | EXTENDER BOARD-RF DECK |
| | 08360-20105 | | EXTENDER CABLE-SMA (RF DECK) (Prefix < 3145A) |
| | 08360-20286 | | RF TEST CABLE-FILTER TO DIRECTIONAL COUPLER (Prefix ≥ 3145A) |
| | 08360-60108 | | EXTENDER CABLE-POWER SUPPLY |
| | 8710-1787 | | 5 MM HEX BALL DRIVER |
| ACCESSORIES | | | |
| | 6010-1146 | | TOUCH-UP PAINT DOVE GRAY - FOR FRAME AROUND FRONT PANEL & PAINTED PORTIONS OF FRONT HANDLES |
| | 6010-1147 | | FRENCH GRAY - FOR SIDE, TOP, & BOTTOM COVERS |
| | 6010-1148 | | PARCHMENT GRAY - FOR RACK MOUNT FLANGES, RACK SUPPORT SHELVES, & FRONT PANEL |
| | 5041-9148 | | PC BOARD EXTRACTORS |
| ADAPTERS | | | |
| | 1250-2187 | | ADAPTER 2.4 MM (F) TO K (F) |
| | 1250-2188 | | ADAPTER 2.4 MM (F) TO 2.4 MM (F) |
| | 1250-1745 | | ADAPTER TYPE-N TO 3.5 MM (F) |
| | 5061-5311 | | ADAPTER 3.5 MM (F) TO 3.5 MM (F) |
| SOFTWARE | | | |
| | 08360-10001 | 1 | DISK - SERVICE SUPPORT SOFTWARE |

Table 9-16. Miscellaneous Replaceable Accessories (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|---|----------------|-----|---|
| Documentation For Serial Prefixes Listed on the Title Page of This Manual | | | |
| | 08360-90055 | | HP 8360 SERIES MANUAL SET - For HP 83620A/22A/23A/24A/30A/40A/50A (This includes the following manuals:) |
| | 08360-90069 | | TROUBLESHOOTING MANUAL |
| | 08360-90049 | | SERVICE MANUAL |
| | 08360-90070 | | USER'S HANDBOOK |
| | 08360-90071 | | QUICK REFERENCE GUIDE |
| | 5954-1566 | | CONNECTOR CARE APPLICATION NOTE |
| | 08360-90077 | | 8360 SERIES COMPONENT-LEVEL REPAIR MANUAL |
| Documentation For Serial Prefixes Prior To Those Listed on the Title Page of This Manual | | | |
| | 83620-90007 | | HP 83620A DOCUMENTATION SET This includes the following manuals: 08360-90070 User's Handbook 08360-90071 Quick Reference Guide 08360-90024 Calibration 08360-90060 Assembly Level Repair |
| | 83622-90007 | | HP 83622A DOCUMENTATION SET This includes the following manuals: 08360-90070 User's Handbook 08360-90071 Quick Reference Guide 08360-90024 Calibration 08360-90060 Assembly Level Repair |
| | 83623-90007 | | HP 83623A DOCUMENTATION SET This includes the following manuals: 08360-90070 User's Handbook 08360-90071 Quick Reference Guide 08360-90025 Calibration 08360-90060 Assembly Level Repair |
| | 83624-90007 | | HP 83624A DOCUMENTATION SET This includes the following manuals: 08360-90070 User's Handbook 08360-90071 Quick Reference Guide 08360-90025 Calibration 08360-90060 Assembly Level Repair |

Table 9-16. Miscellaneous Replaceable Accessories (continued)

| Ref. Desig. | HP Part Number | Qty | Description |
|--|----------------|-----|---|
| | 83640-90007 | | HP 83640A DOCUMENTATION SET This includes the following manuals: 08360-90070 User's Handbook 08360-90071 Quick Reference Guide 08360-90040 Calibration 08360-90060 Assembly Level Repair |
| | 83642-90007 | | HP 83642A DOCUMENTATION SET This includes the following manuals: 08360-90070 User's Handbook 08360-90071 Quick Reference Guide 08360-90040 Calibration 08360-90060 Assembly Level Repair |
| Documentation For HP 83621A/31A | | | |
| | 08360-90054 | | HP 83621A/31A/51A MANUAL SET (This includes the following manuals:) |
| | 08360-90048 | | TROUBLESHOOTING MANUAL |
| | 08360-90052 | | SERVICE MANUAL |
| Documentation For HP 83621A/31A with Serial Prefixes Prior To 3103A | | | |
| | 83621-90007 | | HP 83621A DOCUMENTATION SET This includes the following manuals: 08360-90024 Calibration and Installation 83621-90060 Assembly Level Repair |
| | 83631-90007 | | HP 83631A DOCUMENTATION SET This includes the following manuals: 08360-90024 Calibration and Installation 83621-90060 Assembly Level Repair |

Table 9-16. Miscellaneous Replaceable Accessories (continued)

| Ref. Design. | HP Part Number | Qty | Description |
|-----------------------------|----------------|-----|--|
| OPTION RETROFIT KITS | | | |
| | 08360-60218 | | ADD OPTION 001 RETROFIT KIT - HP 83620A/22A/23A/24A/30A |
| | 08360-60220 | | ADD OPTION 001 RETROFIT KIT - HP 83640A/50A |
| | 08360-60129 | | DEL OPTION 001 RETROFIT KIT - HP 83620A/22A/23A/24A/30A |
| | 08360-60221 | | DEL OPTION 001 RETROFIT KIT - HP 83640A/50A |
| | 83602A | | ADD OPTION 002 RETROFIT KIT |
| | 08360-60132 | | ADD OPTION 003 RETROFIT KIT |
| | 08360-60131 | | DEL OPTION 003 RETROFIT KIT |
| | 08360-60236 | | ADD OPTION 004 RETROFIT KIT - HP 83620A/22A/23A/24A/30A |
| | 08360-60237 | | ADD OPTION 004 RETROFIT KIT - HP 83640A/50A |
| | 08360-60235 | | DEL OPTION 004 RETROFIT KIT (w/o Option 003) - HP 83620A/22A/23A/24A/30A |
| | 08360-60238 | | DEL OPTION 004 RETROFIT KIT - (w/o Option 003) HP 83640A/50A |
| | 08360-60239 | | DEL OPTION 004 RETROFIT KIT (w/ Option 003) - HP 83620A/22A/23A/24A/30A |
| | 08360-60240 | | DEL OPTION 004 RETROFIT KIT - 40 GHz (w/ Option 003) - HP 83640A/50A |
| | 08360-60141 | | ADD OPTION 008 RETROFIT KIT |
| | 08360-60142 | | ADD OPTION 700 RETROFIT KIT |
| | 08360-60143 | | ADD OPTION 806 RETROFIT KIT |
| | 08360-60144 | | ADD OPTION 908 RETROFIT KIT |
| | 08360-60145 | | ADD OPTION 913 RETROFIT KIT |

Preventive Maintenance

Introduction

This chapter contains the following information on care and maintenance of the synthesizer:

- How to Clean the Fan Filter
- How to Clean the Display Filter
- How to Replace the Line Fuse
- How to Replace the CPU Battery
- Connector Care

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.

How to Clean the Fan Filter

The cooling fan, located on the rear panel, has a thin foam filter. How often the filter must be cleaned depends on the environment in which the synthesizer operates. As the filter collects dust, the fan speed increases to maintain airflow (as the fan speed increases, so does the fan noise). If the filter continues to collect dust after the fan reaches maximum speed, airflow is reduced and the synthesizer's internal temperature increases. If the internal temperature reaches 90°C, the synthesizer automatically turns off and the amber standby LED turns on.

WARNING The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.

Clean the fan filter as follows:

1. Turn off the synthesizer.
2. Remove the AC line cord.
3. Remove the two screws holding the fan shroud to the rear panel. (See Figure 10-1.)
4. Separate the fan shroud, the foam, and the honeycomb from the ground hex shroud.
5. Rinse the foam and honeycomb in warm water, then dry.
6. Reverse the removal procedure to reassemble the synthesizer.

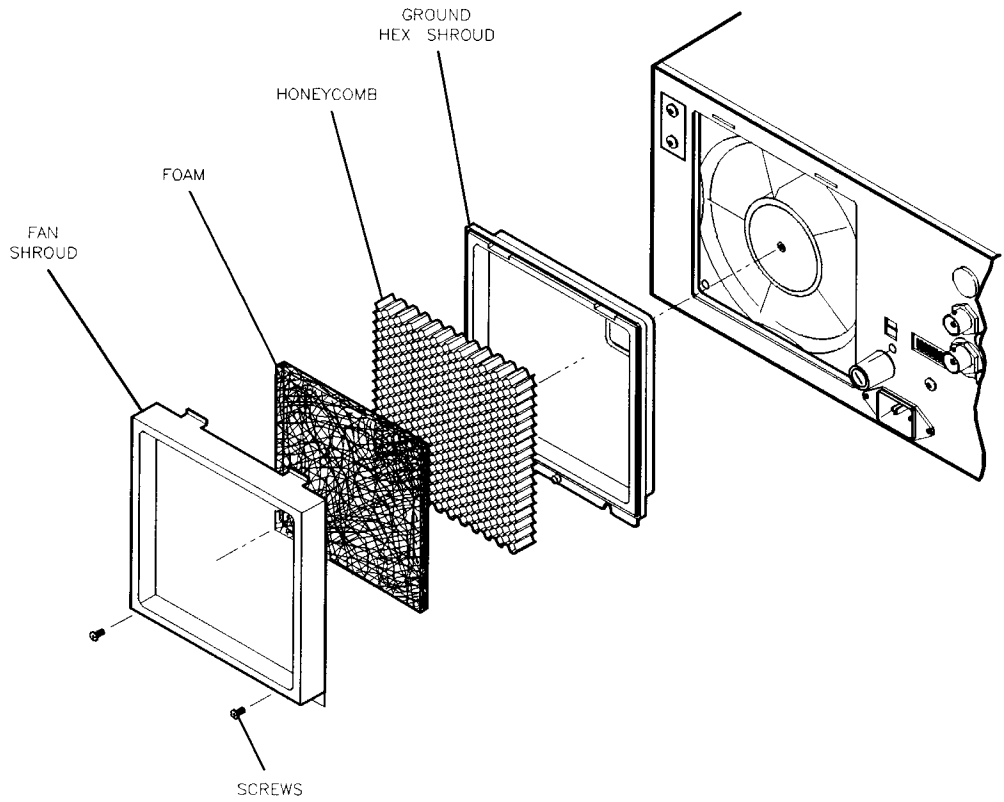


Figure 10-1. Removing the Fan Filter

How to Clean the Display Filter

The synthesizer's display is protected by a plastic display filter. To clean the display filter, use mild soap or detergent and water, or a commercial window cleaner (ammonia does not hurt the plastic surface). Use a soft, lint-free cloth. Do *not* use abrasive cleaners, tissues, or paper towels which can scratch the plastic.

Under normal operation, you will need to clean only the front side of the display filter. Occasionally, depending on the environment in which the synthesizer operates, you may wish to clean the back side of the filter as follows:

1. Turn the synthesizer to standby (yellow LED on).
2. Remove the AC line cord.

WARNING **The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.**

CAUTION When you remove the front panel, if you do not disconnect the AC line cord you can easily blow the fuse on the preregulator assembly.

3. Refer to Chapter 7 and remove the front panel, front panel processor, alphanumeric display, and the source module interface.
4. Clean the back side of the display filter and reassemble the instrument.

How to Replace the Line Fuse

The line fuse is located on the instrument rear panel. Replace this fuse as follows:

1. Turn the synthesizer to standby (yellow LED on).
2. Remove the AC line cord.

WARNING **The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.**

3. Refer to Figure 10-2. Using a small flat-blade screwdriver, rotate the fuse cap counterclockwise, and remove the fuse holder.
4. Replace the original fuse.

WARNING **For continued protection against fire hazard replace line fuse only with same type and rating (refer to Figure 10-2). The use of other fuses or material is prohibited.**

5. Replace the fuse holder in the rear panel. Using the screwdriver, rotate the fuse cap clockwise to secure the fuse holder in place.
6. Reconnect the synthesizer to line power.

CAUTION:



FOR FIRE PROTECTION REPLACE ONLY WITH PROPER FUSE

| ~ FUSE | VOLTAGE | FUSE |
|--------|---------|---------|
| | 115V | 5A 250V |
| | 230V | 3A 250V |

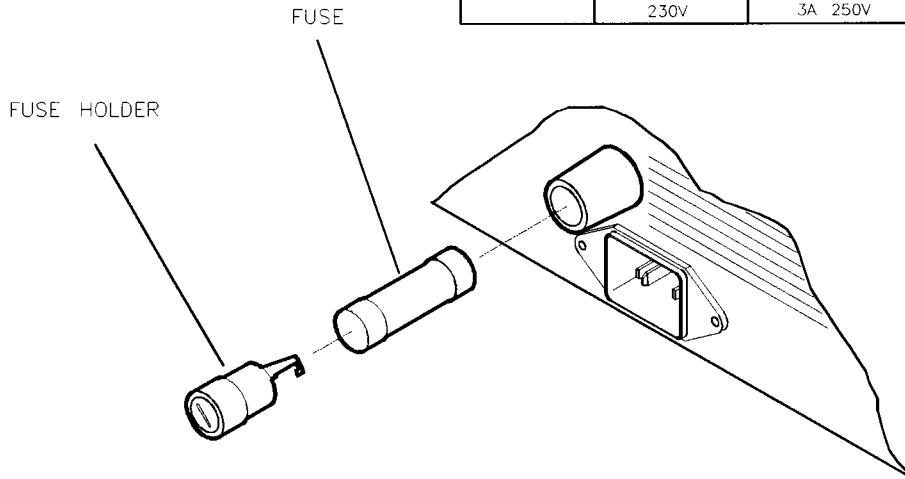


Figure 10-2. Replacing the Line Fuse

How to Replace the CPU Battery (A15BT1)

WARNING Danger of explosion if the battery is incorrectly replaced.
Replace only with the same or equivalent type recommended.

Battery A15BT1 contains lithium iodide. Do not incinerate or puncture this battery. Dispose of the discharged battery in a safe manner.

Do not throw batteries away but collect as small chemical waste.

CAUTION The A15 CPU Assembly may be damaged if it is placed on a conductive surface. Use a static-safe work station. Ensure that the CPU Assembly is not placed on any conductive material.

Removal/Replacement

1. Remove the A15 CPU Assembly. Refer to the “6. Major Assemblies Removal” in Chapter 7 procedure in Chapter 7.

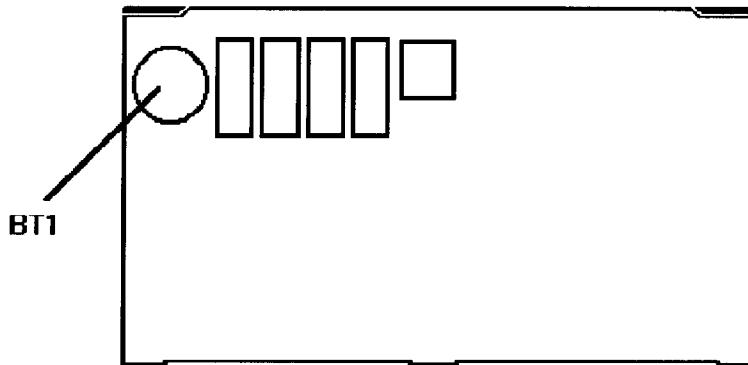


Figure 10-3. A15BT1 Battery Location

CAUTION Placing the bottom side of the A15 assembly on a conductive work surface without an insulator can result in loss of correction data stored in RAM. Protect the A15 assembly from contact with any conductive surface.

2. Locate the battery leads on the A15 assembly, unsolder them, and remove the old battery.
3. Replace and solder the leads on the new battery, ensuring proper polarity as silkscreened on the A15 assembly.
4. Record the battery-replacement date on the battery label.
5. Replace the A15 CPU Assembly. Refer to “6. Major Assemblies Removal” in Chapter 7.

Connector Care

Clean and gage the synthesizer's output connector periodically. For details, refer to *Application Note 326*, which documents the principles of microwave connector care.

Option Retrofits

Introduction

This chapter provides option retrofit information. Each option and the complexity of the retrofit procedure are briefly described. Some options cannot be retrofitted and so are not mentioned in this chapter. Where applicable, kit part numbers are provided for both adding and deleting the option. The specific details of the retrofit, including any adjustments and performance tests required after an assembly is replaced, are discussed in the installation note included in each retrofit kit. The retrofit kit number depends on the instrument model number.

Option Retrofits

| Option Number | Option Name |
|---------------|---------------------------------|
| 001 | Add Attenuator |
| 002 | Add Modulation/Generator |
| 003 | Delete Keyboard/Display |
| 004 | Rear Panel RF Output |
| 008 | 1 Hz Capability |
| 700 | MATE Compatibility |
| 806 | Rack Mount Side Kit |
| 908 | Rack Flange Kit Without Handles |
| 910 | Extra Manual Set |
| 913 | Rack Flange Kit With Handles |

Add Attenuator (Add Option 001)

Option 001 adds an attenuator to the RF deck to provide the capability of setting a wider range of output power. To add the attenuator, the RF deck must be reconfigured. Adjustments and performance tests that are required after installation of the attenuator are listed in Chapter 8 and in the installation note. Because the step attenuator flatness test requires very specific test equipment that is not part of the standard microwave test system, and because several expensive microcircuits must be handled in the procedure, it is recommended that the instrument be returned to an HP service center for retrofitting.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| 83620A | 08360-60218 |
| 83622A | |
| 83623A | |
| 83624A | |
| 83630A | |
| 83640A | 08360-60220 |
| 83650A | |

Delete Attenuator (Delete Option 001)

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| 83620A | 08360-60129 |
| 83622A | |
| 83623A | |
| 83624A | |
| 83630A | |
| 83640A | 08360-60221 |
| 83650A | |

Add Modulation/Generator (Add Option 002)

Option 002 adds a digitally-synthesized internal modulation source and AM depth and FM deviation meters. Because this is a complex procedure, it is recommended that the instrument be returned to an HP service center for retrofitting. Purchase of the retrofit kit includes installation at an HP service center.

| HP Model Number | Retrofit Kit Model Number |
|-----------------|---------------------------|
| All models | 83602A |

Delete Keyboard/Display (Add Option 003)

Option 003 deletes the front panel keyboard and display, which can be desirable in an ATE environment (all instruments controls are sent over the HP-IB). This retrofit requires that you remove all front panel assemblies and the front panel casting, and attach the source module interface assembly (the only board required) to the new front panel casting. This retrofit does *not* move the front panel connectors to the rear panel. If you want the front panel connectors moved to the rear panel, order Option 004 along with Option 003. No adjustments or performance tests are required.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| All models | 08360-60132 |

Add Keyboard/Display (Delete Option 003)

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| All models | 08360-60131 |

Rear Panel RF Output (Add Option 004)

Option 004 moves the RF output, external ALC input, pulse input/output, AM input, and FM input connectors from the front panel to the rear panel. Due to the unique design of the RF deck, there is no loss of output power with the rear output option. Adjustments and performance tests that are required after installation are listed in Chapter 8 and in the installation note included in the retrofit kit.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| 83620A | 08360-60236 |
| 83622A | |
| 83623A | |
| 83624A | |
| 83630A | |
| 83640A | 08360-60237 |
| 83650A | |

Front Panel RF Output (Delete Option 004)

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| 83620A | 08360-60235 |
| 83622A | |
| 83623A | |
| 83624A | |
| 83630A | |
| 83620A Opt. 003 | 08360-60239 |
| 83622A Opt. 003 | |
| 83623A Opt. 003 | |
| 83624A Opt. 003 | |
| 83630A Opt. 003 | |
| 83640A | 08360-60238 |
| 83650A | |
| 83640A Opt. 003 | 08360-60240 |
| 83650A Opt. 003 | |

1 Hz Capability (Add Option 008)

Option 008 provides 1 Hz frequency resolution (1 kHz resolution is standard).

HP BASIC 5.1 and an HP 9000 series 200 or 300 computer are required to run the software to retrofit the instrument.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| All models | 08360-60141 |

MATE Compatibility (Add Option 700)

Option 700 adds CIIL program commands to the instrument for MATE system compatibility. HP BASIC 5.1 and an HP 9000 series 200 or 300 computer are required to run the software to retrofit the instrument.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| All models | 08360-60142 |

Rack Mount Slide Kit (Add Option 806)

Option 806 contains the necessary hardware to mount sliding rack mounts on the synthesizer. This allows easier access to the synthesizer when it is mounted in an equipment rack. You must remove the instrument side panels to install the kit. Instructions for installation are in the installation note included in the retrofit kit.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| All models | 08360-60143 |

Rack Flange Kit Without Handles (Add Option 908)

Option 908 contains a pair of flanges and the necessary hardware to mount the synthesizer (*without handles*) in an equipment rack with 482.6 mm (19 in.) horizontal spacing. Instructions for installation are in the installation note included in the retrofit kit.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| All models | 08360-60144 |

Extra Manual Set (Add Option 910)

All instruments are supplied with one complete manual set which documents operation and service. Each Option 910 (available only with the initial order) provides one additional complete manual set. To order additional manuals after initial shipment, order the individual manual part numbers, or the manual set part numbers listed in Chapter 9.

Rack Flange Kit With Handles (Add Option 913)

Option 913 contains a pair of flanges and the necessary hardware to mount the synthesizer (*with handles attached*) in an equipment rack with 482.6 mm (19 in.) horizontal spacing. Instructions for installation are in the installation note included in the retrofit kit.

| HP Model Number | Retrofit Kit Part Number |
|-----------------|--------------------------|
| All models | 08360-60145 |

Instrument History

How to Use Instrument History

This manual documents the current production versions of the “standalone” HP 8360 series synthesized sweepers which include the HP 83620A/22A, HP 83623A/24A, and HP 83630A/40A/50A.

This manual will be modified to apply to future versions of these instrument models. Information provided in this chapter will then allow you to adapt this manual to the earlier versions. If your instrument is one of the earlier versions, you may have to modify your manual using the information in this chapter. Check the serial number prefix attached to your synthesizer’s rear panel and then locate it in the following tables. The tables tell you which changes to make. Incorporate the changes in reverse alphabetical order.

Instrument History Changes

| Serial Prefix Number | Required Changes | Serial Prefix Number | Required Changes |
|----------------------|------------------|----------------------|------------------|
| HP 83620A/22A | | HP 83630A | |
| 3420A | No Change | 3420A | No Change |
| 3250A | No Change | 3250A | No Change |
| 3245A | No Change | 3245A | No Change |
| 3213A | E, D, C | 3213A | E, D, C |
| 3145A | E, D, C, B | 3145A | E, D, C, B |
| HP 83623A | | 3143A | E, D, C, B, A |
| 3420A | No Change | 3101A | E, D, C, B, A |
| 3339A | No Change | HP 83640A | |
| 3250A | No Change | 3420A | No Change |
| 3245A | No Change | 3339A | No Change |
| 3213A | D | 3250A | No Change |
| 3145A | D, B | 3245A | No Change |
| HP 83624A | | 3213A | F, D, C |
| 3420A | No Change | 3145A | F, D, C, B |
| 3250A | No Change | HP 83650A | |
| 3245A | No Change | 3420A | No Change |
| 3213A | D | 3250A | No Change |
| 3145A | D, B | 3245A | No Change |
| | | 3213A | F, D, C |
| | | 3145A | F, D, C, B |
| | | 3143A | F, D, C, B, A |
| | | 3052A | F, D, C, B, A |

HP Internal Use Only

PCO 3143:10492/3145:10497/3213A:10258/3245A:10795,10825/
 3250A:11096/3339A:08005/3420A:08174

Change F

A10 ALC Assembly

HP 83640A/50A instruments with serial prefix numbers 3213A and below have an ALC assembly with part number 08360-60222. This part number, or the rebuilt-exchange part number 08360-69222, must be used for replacement purposes. The part number documented in the “Replaceable Parts” chapter is not compatible with these instruments.

Change E

Pulse Modulation Video Feedthrough

HP 83620A/22A/30A instruments without Option 006 with serial prefix numbers 3213A and below have a pulse modulation video feedthrough specification of 0.01% at frequencies ≥ 2 GHz. Replacement pages for the test records for these instruments are supplied following these instructions. Discard the equivalent pages in the “Performance Tests” chapter and replace them with the ones provided here.

Table 2-33. Test Record for HP 83620A and 83622A (6 of 8)

| Model | | Report No. | | | Date |
|----------|-------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | ±1 dB |
| 13. | Pulse Performance | | | | |
| | Standard: | | | | |
| | 10. Risetime | | _____ | 25 ns | ±0.9 ns |
| | 10. Falltime | | _____ | 25 ns | ±0.9 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| | Option 006: | | | | |
| | 10. Risetime | | _____ | 10 ns | ±0.4 ns |
| | 10. Falltime | | _____ | 10 ns | ±0.4 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| 14. | Pulse Performance (Alternate) | | | | |
| | 12. Risetime | | _____ | 25 ns | |
| | 12. Falltime | | _____ | 25 ns | |
| | 24. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video | | | | |
| | Feedthrough | | | | |
| | 21. < 2 GHz | | | | |
| | ≤ 10 dBm | | _____ | 2% | ±0.22% |
| | > 10 dBm | | _____ | 5% | ±0.4% |

Table 2-33. Test Record for HP 83620A and 83622A (7 of 8)

| Model | | Report No. | | | Date |
|----------|----------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 26. ≥ 2 and ≤ 20.0 GHz | | | | |
| | Standard: | | _____ | 0.1% | $\pm 0.02\%$ |
| | Option 006: | | _____ | 1% | $\pm 0.07\%$ |
| 16. | AM Accuracy | | | | |
| | < 2 GHz: | | | | |
| | 8. AM Depth | 28.5% | _____ | 31.5% | $\pm 0.76\%$ |
| | 11. AM Depth Opt. 002 | 28.5% | _____ | 31.5% | $\pm 0.76\%$ |
| | > 2 and < 20 GHz: | | | | |
| | 18. AM Depth | 28.5% | _____ | 31.5% | $\pm 0.76\%$ |
| | 21. AM Depth Opt. 002 | 28.5% | _____ | 31.5% | $\pm 0.76\%$ |
| 17. | AM Bandwidth | | | | |
| | 10. 3 dB Bandwidth | 100 kHz | _____ | | ± 10.31 kHz |
| 18. | AM Dynamic Range | | | | |
| | 12. Normal | | _____ | -20 dBm | ± 0.4 dB |
| | 23. Deep | | _____ | -37 dBm | ± 1.66 dB |
| 19. | FM Accuracy | | | | |
| | 13. Maximum FM Error | -10% | _____ | +10% | $\pm 3.7\%$ |
| | 23. Maximum FM Error Opt. 002 | -10% | _____ | +10% | $\pm 3.7\%$ |
| 20. | FM Bandwidth | | | | |
| | 16. 3 dB Bandwidth | 8 MHz | _____ | | ± 320 kHz |

Table 2-35. Test Record for HP 83630A (6 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 7. | Offsets at 18.0 GHz: | | | | |
| | 100 Hz to < 1 kHz | -60 dBc | _____ | | ±2 dB |
| | 1 kHz to < 10 kHz | -68 dBc | _____ | | ±2 dB |
| | 10 kHz to < 100 kHz | -76 dBc | _____ | | ±2 dB |
| | ≥ 100 kHz | -97 dBc | _____ | | ±2 dB |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | ±1 dB |
| 13. | Pulse Performance Standard: | | | | |
| | 10. Risetime | | _____ | 25 ns | ±0.9 ns |
| | 10. Falltime | | _____ | 25 ns | ±0.9 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.1 dB |
| | Option 006: | | | | |
| | 10. Risetime | | _____ | 10 ns | ±0.4 ns |
| | 10. Falltime | | _____ | 10 ns | ±0.4 ns |
| | 21. Level Accuracy | | _____ | ±0.3 dB | ±0.3 dB |
| 14. | Pulse Performance (Alternate) | | | | |
| | 29. Risetime | | _____ | 25 ns | |
| | 29. Falltime | | _____ | 25 ns | |
| | 37. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video Feedthrough | | | | |
| | 21. < 2 GHz | | | | |
| | ≤ 10 dBm | | _____ | 2% | ±0.22% |
| | > 10 dBm | | _____ | 5% | ±0.4% |
| | 26. ≥ 2 and ≤ 26.5 GHz | | | | |
| | Standard: | | _____ | 0.1% | ±0.02% |
| | Option 006: | | _____ | 1% | ±0.07% |

Table 2-35. Test Record for HP 83630A (7 of 8)

| Model | | Report No. | | | Date |
|----------|---------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 16. | AM Accuracy < 2 GHz: | | | | |
| 8. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 11. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| | > 2 and < 20 GHz: | | | | |
| 18. | AM Depth | 28.5% | _____ | 31.5% | ±0.76% |
| 21. | AM Depth Opt. 002 | 28.5% | _____ | 31.5% | ±0.76% |
| 17. | AM Bandwidth | | | | |
| 10. | 3 dB Bandwidth | 100 kHz | _____ | | ±10.31 kHz |
| 18. | AM Dynamic Range | | | | |
| 12. | Normal | | _____ | -20 dBm | ±0.45 dB |
| 23. | Deep < 20 GHz | | _____ | -37 dBm | ±1.65 dB |
| 23. | Deep ≥ 20 GHz | | _____ | -40 dBm | ±1.35 dB |
| 19. | FM Accuracy | | | | |
| 13. | Maximum FM Error | -10% | _____ | +10% | ±3.7% |
| 23. | Maximum FM Error Opt. 002 | -10% | _____ | +10% | ±3.7% |
| 20. | FM Bandwidth | | | | |
| 16. | 3 dB Bandwidth | 8 MHz | _____ | | ±320 kHz |

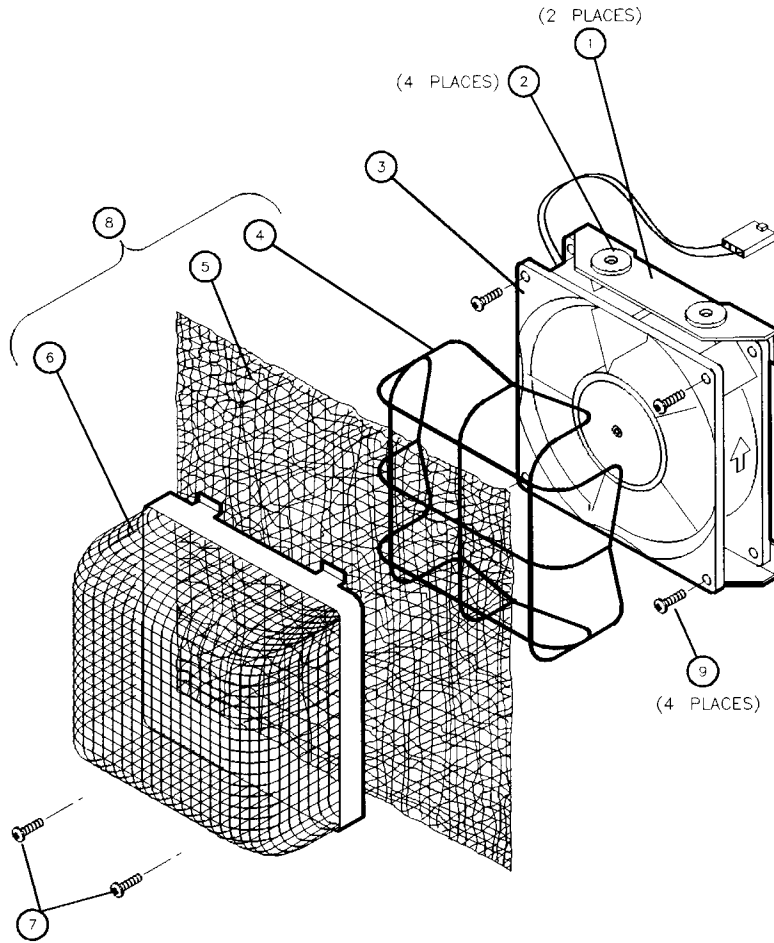
Change D

A20 RF Interface Assembly

Instruments with serial prefix numbers 3213A and below have an RF interface assembly that is different than the one documented in this manual. For replacement purposes, however, use the part number documented in the “Replaceable Parts” chapter; it is the recommended replacement for your instrument.

Rear Panel Fan Assembly

Instruments with serial prefix numbers 3213A and below have a fan that is different than is documented in this manual. The following figure shows the fan on these instruments. Follow the instructions given here to disassemble and reassemble the fan and use the part numbers given here for replacement. To clean the fan, disassemble the fan according to the instructions given here and rinse the fan cage, filter, and the filter retainer in warm water. When the parts are dry, reassemble the fan.



Rear Panel Fan Assembly

Table 12-1. Rear Panel Fan Assembly

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------|----------------|-----|---|
| 1 | 08360-00016 | 2 | FAN MOUNT |
| 2 | 1520-0230 | 4 | SHOCK MOUNT .27-EFF-HGT 2-LB-LOAD-CAP |
| 3 | 08360-80006 | 1 | FAN (B1) |
| 4 | | 1 | FILTER RETAINER (Not available separately) |
| 5 | 08360-20109 | 1 | FOAM FILTER |
| 6 | | 1 | FAN CAGE (Not available separately) |
| 7 | 0515-0372 | 2 | SCREW-MACHINE ASSY M3X 0.5 8MM-LG |
| 8 | 08360-60123 | 1 | KIT - FAN FILTER ASSEMBLY (Includes fan cage, foam filter, and filter retainer) |

B1 Fan Assembly Removal

-
- 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.
 - The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.
 - The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch.
-

1. Remove the two fan cage screws (7).
2. Remove the fan cage (6), filter (5), and filter retainer (4).
3. Remove the four fan screws (9).
4. Slide the fan out of the opening in the rear panel.
5. Disconnect the two-wire fan harness.

Change C

Amplifier/Filter Adjustment

Instruments with serial prefix numbers 3213A and below should delete the following steps from the amplifier/filter adjustment:

14, 15, 16

26, 27, 28

39, 40, 41

55, 56

A30 Directional Coupler

Instruments with serial prefix numbers 3213A and below (except models HP 83623A/24A) have a directional coupler instead of a bridge detector. The following information documents the directional coupler and its associated RF deck hardware and cables and includes drawings showing each RF deck with the A30 directional coupler, A40 DC blocking capacitor, and CR1 detector.

In the “Replaceable Parts” chapter, add the following parts:

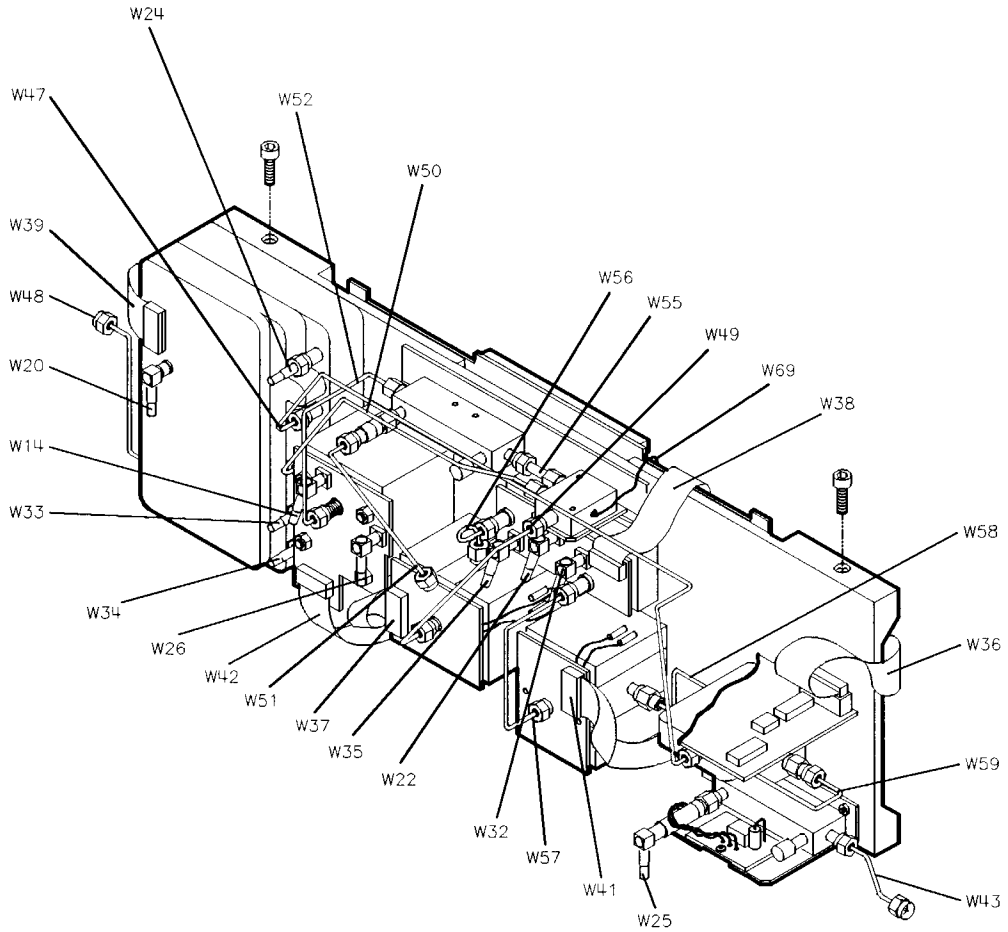
| Ref. Desig. | HP Part Number | Qty | Description |
|-------------------------|----------------|-----|---|
| Major Assemblies | | | |
| A30 | 0955-0148 | 1 | μWAVE DIRECTIONAL COUPLER 20 GHZ MAX (HP 83620A/22A) |
| A30 | 0955-0125 | 1 | μWAVE DIRECTIONAL COUPLER 26.5 GHZ MAX (HP 83630A) |
| A30 | 0955-0523 | 1 | μWAVE DIRECTIONAL COUPLER 50 GHZ MAX (HP 83640A/50A) |
| A40 | 11742A | 1 | DC BLOCKING CAPACITOR (HP 83620A/22A/30A) |
| CR1 | 08360-60147 | 1 | DETECTOR REPLACEMENT KIT (HP 83620A/22A/30A) |
| CR1 | 08360-60148 | 1 | DETECTOR REPLACEMENT KIT (HP 83640A) |
| CR1 | 08360-60203 | 1 | DETECTOR REPLACEMENT KIT (HP 83650A) |
| Cables | | | |
| W44 | 08360-20071 | 1 | DIR COUPLER/ATTEN-A30J2/A31J1 (HP 83620A/22A/30A Option 001) |
| W44 | 08360-20079 | 1 | DIR COUPLER/ATTEN-A30J2/A31J1 (HP 83640A/50A Option 001) |
| W45 | 08360-20189 | 1 | DC BLOCK/DIR COUPLER-A40J2/A30J1 (HP 83620A/22A/30A) |
| W45 | 08360-20186 | 1 | DC BLOCK/DIR COUPLER-A40J2/A30J1 (HP 83620A/22A/30A Option 001) |
| W59 | 08360-20138 | 1 | DOUBLER/DIR COUPLER-A32J4/A30J1 (HP 83640A/50A) |
| W59 | 08360-20156 | 1 | DOUBLER/DIR COUPLER-A32J4/A30J1 (HP 83640A/50A Option 001) |
| W71 | 08360-20249 | 1 | PLS MOD SW FILT/COUPLER-A42J6/A30J1 (HP 83620A/22A/30A Option 006) |
| W71 | 08360-20248 | 1 | PLS MOD SW FILT/COUPLER-A42J6/A30J1 (HP 83620A/22A/30A Options 001 and 006) |
| Hardware | | | |
| | 08360-00008 | 1 | MOUNTING BRACKET (COUPLER/DETECTOR) (HP 83620A/22A/30A) |
| | 08360-00009 | 1 | MOUNTING BRACKET (COUPLER/DETECTOR) (HP 83640A/50A) |
| | 0520-0173 | 2 | SM 256 .188PNPD (Attaches coupler to mounting bracket - HP 83620A/22A/30A) |
| | 2200-0103 | 2 | SMM 3.0 6 PNH TX (Attaches coupler to mounting bracket - HP 83640A/50A) |

In the “Replaceable Parts” chapter, delete the following parts:

| Ref. Desig. | HP Part Number | Qty | Description |
|-------------------------|----------------|-----|--|
| Major Assemblies | | | |
| A30 | 5086-7645 | 1 | BRIDGE DETECTOR (HP 83620A/22A/30A) |
| A30 | 5086-7644 | 1 | BRIDGE DETECTOR (HP 83640A/50A) |
| Cables | | | |
| W44 | 08360-20191 | 1 | BRIDGE DET/ATTEN A30J5/A31J1 (HP 83620A/22A/30A Options 001 and 006) |
| W44 | 08360-20193 | 1 | BRIDGE DET/ATTEN A30J5/A31J1 (HP 83640A/50A Option 001) |
| W45 | 08360-20185 | 1 | AMP FILTER/BRIDGE DET-A29J3/A30J4 (HP 83620A/22A/30A) |
| W45 | 08360-20190 | 1 | AMP FILTER/BRIDGE DET-A29J3/A30J4 (HP 83620A/22A/30A Option 001) |
| W59 | 08360-20194 | 1 | DOUBLER/BRIDGE DET-A32J4/A30J4 (HP 83640A/50A) |
| W59 | 08360-20192 | 1 | DOUBLER/BRIDGE DET-A32J4/A30J4 (HP 83640A/50A Option 001) |
| W71 | 08360-20252 | 1 | PLS MOD SW FILT/BRIDGE DET-A42J6/A30J4 (HP 83620A/22A/30A Option 006) |
| W71 | 08360-20251 | 1 | PLS MOD SW FILT/BRIDGE DET-A42J6/A30J4 (HP 83620A/22A/30A Options 001 and 006) |
| W73 | 08360-60250 | 1 | RF INTERFACE/BRIDGE DETECTOR-A20J13/A30J3 |
| Hardware | | | |
| | 5021-7872 | 1 | MOUNTING BRACKET BRIDGE DETECTOR (HP 83620A/22A/30A/40A/50A) |
| | 0515-0430 | 2 | SMM 3.0 6 PNH TX (Attaches bridge detector to mounting bracket) |

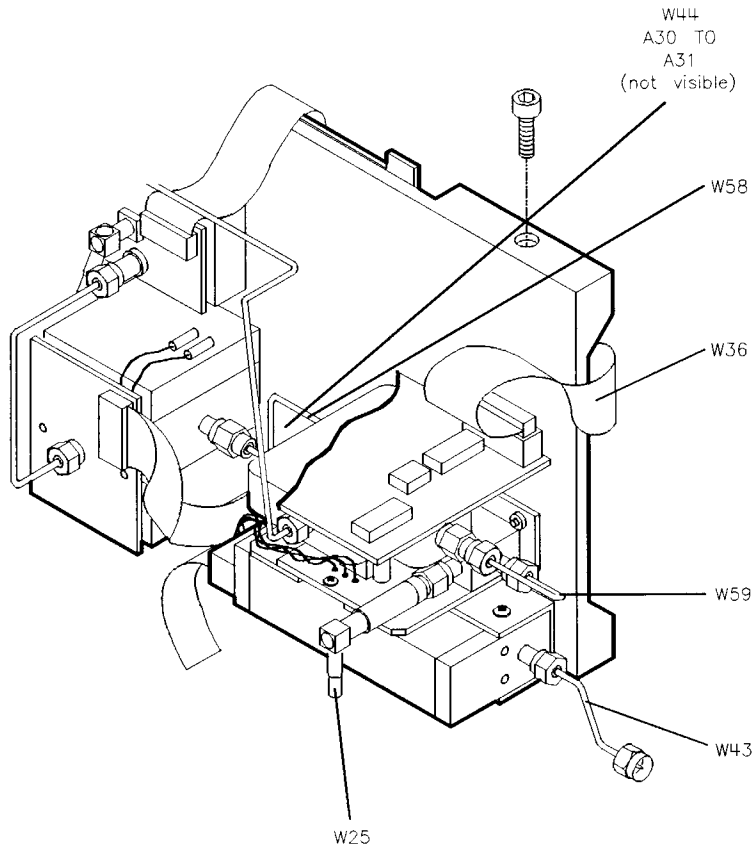
Cables-HP 83640A/50A RF Deck

No Options

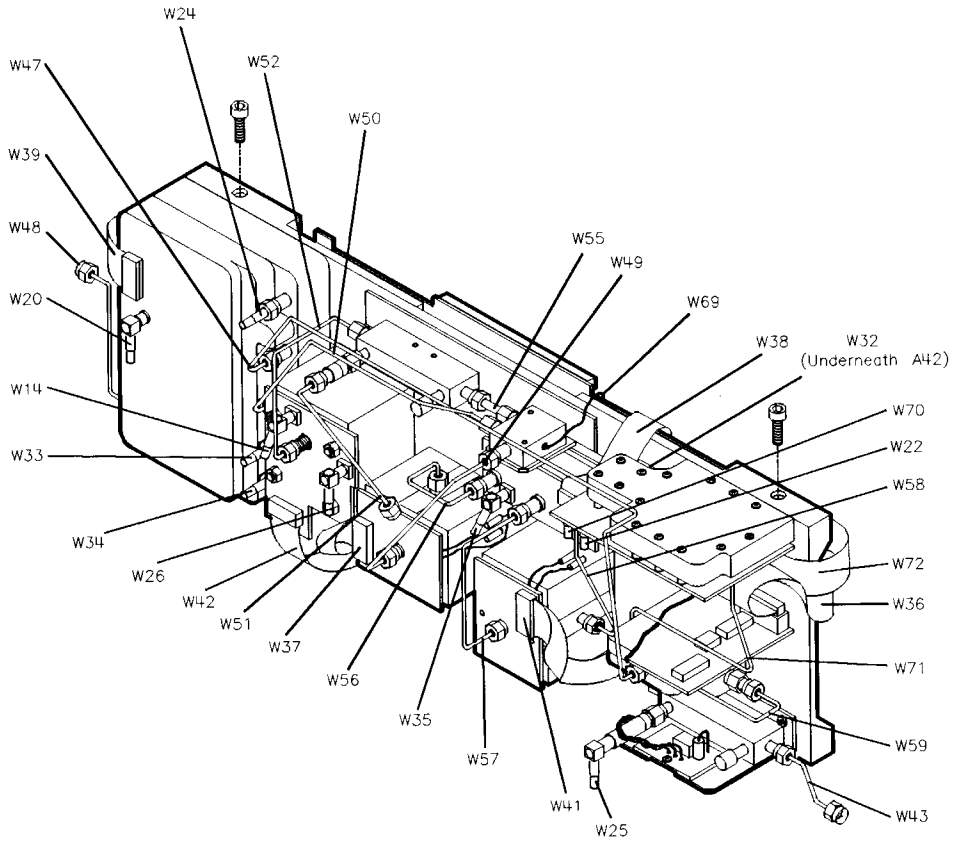


Cables-HP 83640A/50A RF Deck

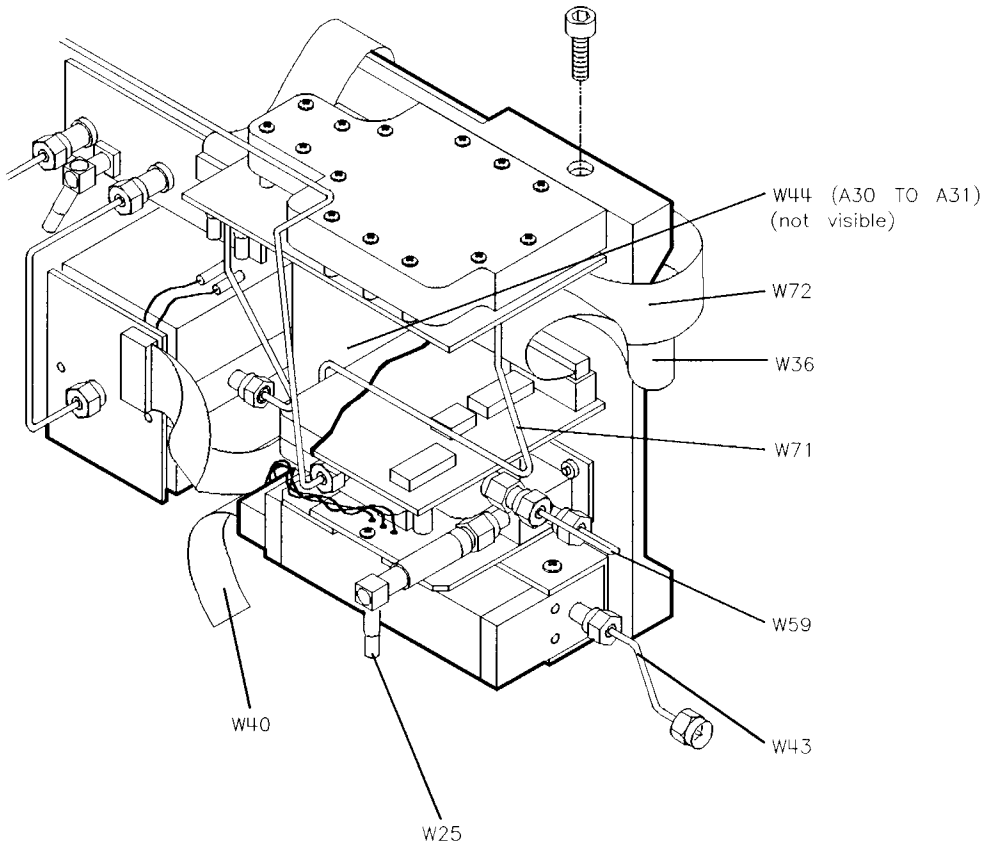
Option 001



Cables-HP 83640A/50A RF Deck
Option 006

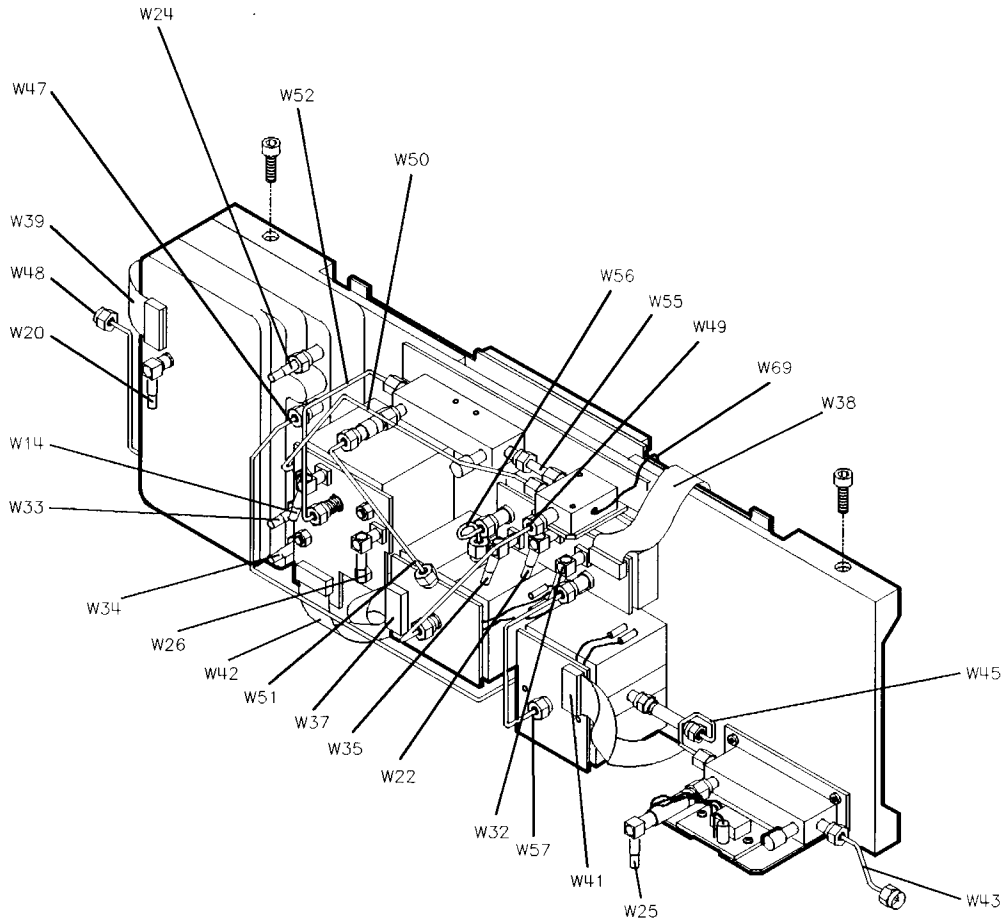


Cables-HP 83640A/50A RF Deck
Options 001 and 006



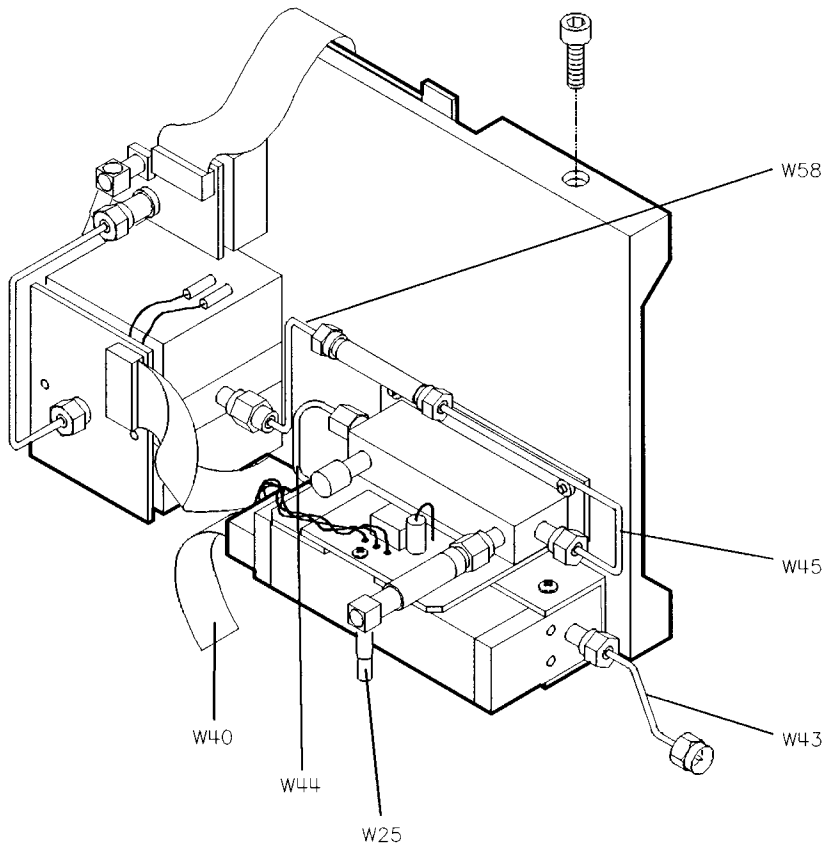
Cables-HP 83620A/22A/30A RF Deck

No Options

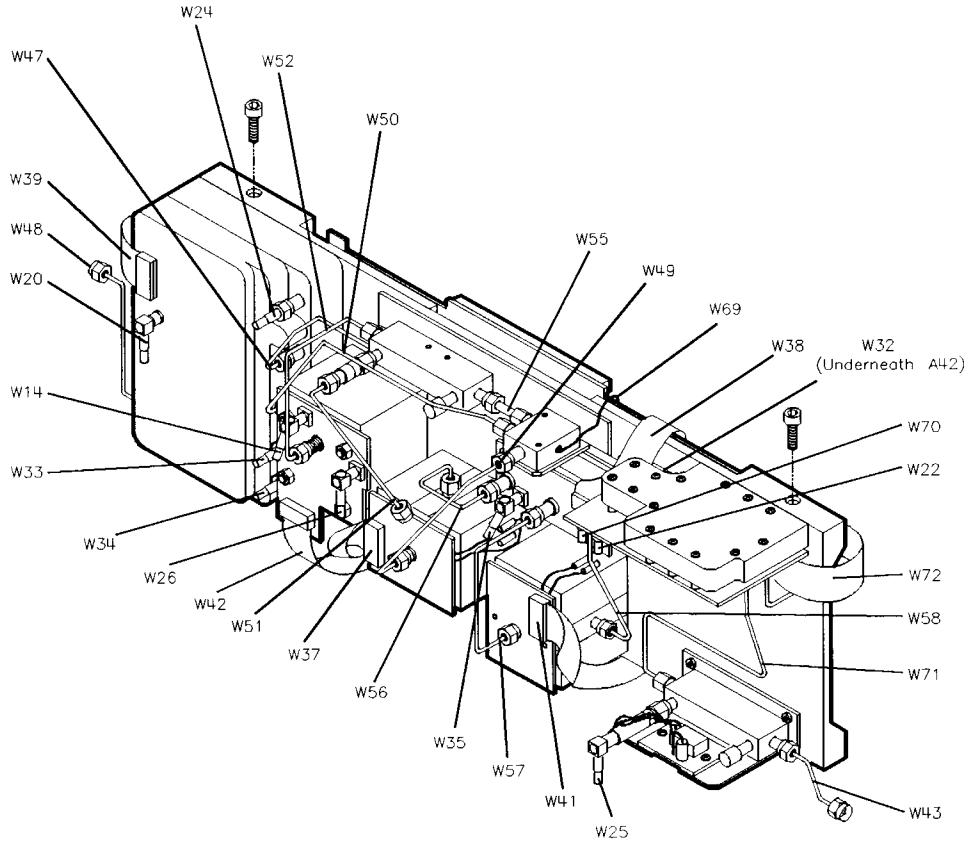


Cables-HP 83620A/22A/30A RF Deck

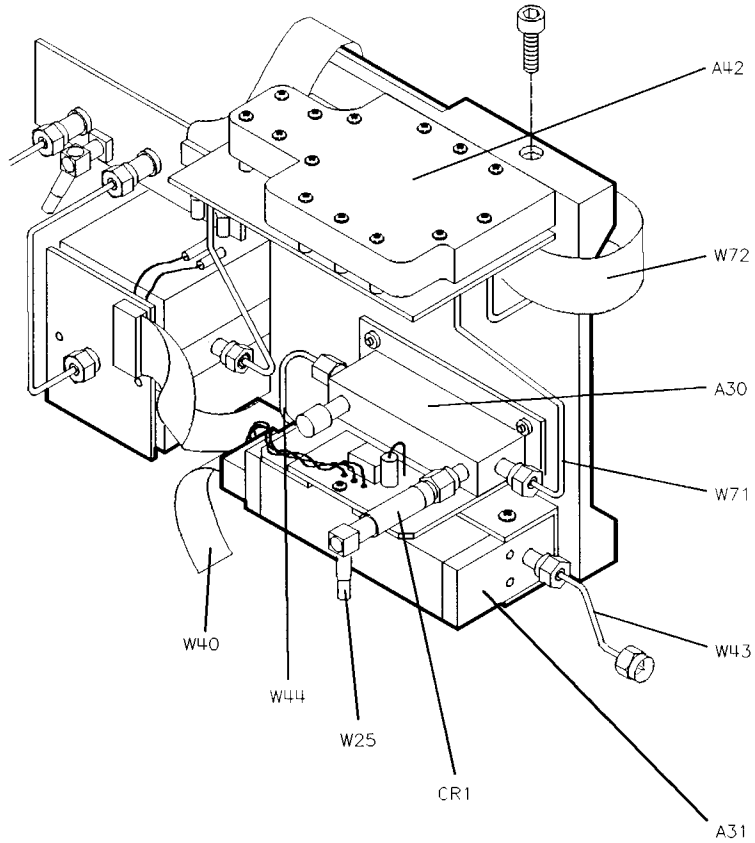
Option 001



Cables-HP 83620A/22A/30A RF Deck
Option 006



Cables-HP 83620A/22A/30A
Options 001 and 006



Change B

1. In the “Replaceable Parts” chapter, table 9-2, the part number for A6 that was shipped in instruments with serial prefix numbers lower than 3213A was 08360-60007 (unless the instrument was configured with Option 002). However, for replacement purposes, use the existing part number in this manual.
2. In the “Replaceable Parts” chapter, figure 9-9, replace the two part numbers given for item 10 with part number 1400-0755.

Change A

1. Instruments with serial prefixes 3143A and below do not have the auxiliary output on the amplifier/multiplier nor do they have cable W48 which connects this output to J14 on the rear panel.
 - a. Delete all references to the auxiliary output and to W48.
 - b. AT1 (50 Ω SMA male termination) is located on A28J4 rather than on the rear panel J14 connector.
2. In the “Performance Tests” chapter:
 - a. Replace the “Pulse Modulation Video Feedthrough” test with the one provided after these instructions marked “Change A”.
 - b. In the “FM Bandwidth” test:
 - i. Set the spectrum analyzer start frequency to 50 kHz.
 - ii. Set the spectrum analyzer stop frequency to 12 MHz.
 - iii. Use the spectrum analyzer markers to find a 6 dB bandwidth.
 - c. Replace the HP 83630A and 83650A test records with the test records provided after these instructions marked “Change A”.
3. In the “Adjustments” chapter:
 - a. Instead of the test setup shown in the “Amplifier/Multiplier Adjustments”, use the one provided after these instructions marked “Change A”.

15. Pulse Modulation Video Feedthrough

Description and Procedure

In CW, at specified maximum leveled power, the synthesizer is pulse modulated using a pulse generator. The synthesizer's RF output is filtered (only the video feedthrough passes), amplified, and displayed on an oscilloscope. Because of the low amplitude of the video feedthrough, a preamplifier is used in the test setup; system gain must be considered when making this measurement.

When video feedthrough is expressed as a percentage, the following equation is used:

Video feedthrough (%) = [(video V_p/carrier V_p) x 100]/video gain

1. Preset all the instruments shown in Figure 2-21 and let them warm up for at least one hour.
2. To achieve peak power, turn on RF peaking:
USER CAL **Tracking Menu** **Peak RF Always** (asterisk on)
3. Connect the equipment as shown in Figure 2-21 with the pulse generator connected directly to channel 1 of the oscilloscope (A).

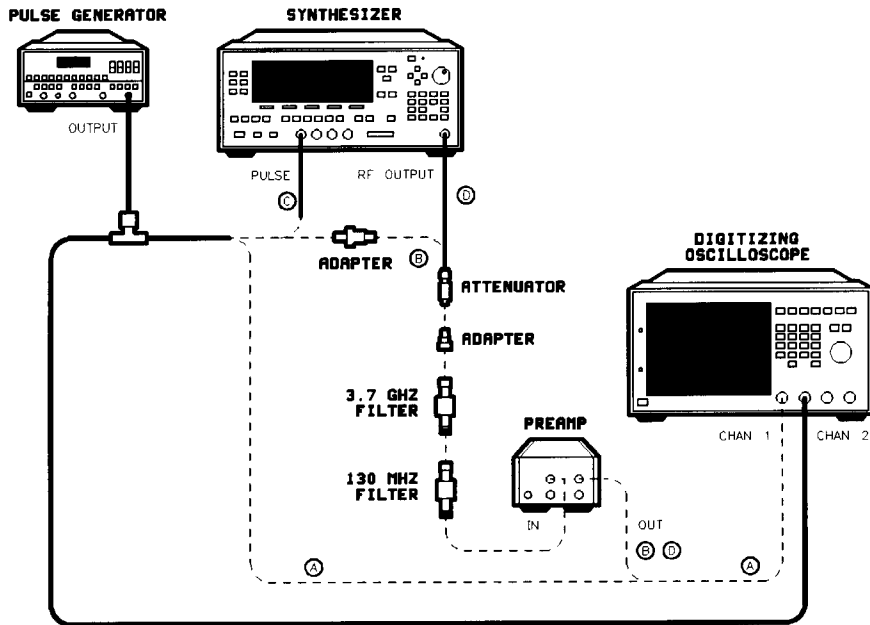


Figure 2-21. Video Feedthrough Test Setup

Equipment

| | |
|-------------------------|--|
| Pulse Generator | HP 8116A |
| Digitizing Oscilloscope | HP 54111D |
| Preamplifier | HP 8447F |
| 130 MHz Filter | K & L Microwave 5LL30-130/BT2400/BP |
| 3.7 GHz Filter | HP P/N 9135-0191 |
| Attenuator 6 dB | HP 8493C Option 006 |

System Calibration

Note

The pulse generator output level can be affected by loading. Leave the pulse generator connected to the oscilloscope's channel 2 (through the BNC tee) as you set the output level.

4. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|-------------|
| Display | On |
| Volts/Division | 50 mV |
| Offset | 0V |
| Input Coupling | dc |
| Input Impedance | 50 Ω |

Channel 2:

| | |
|-----------------|-------------|
| Display | Off |
| Input Impedance | 50 Ω |

Timebase:

| | |
|-----------------|-----------|
| Time/Division | 20 ns |
| Delay | 0s |
| Delay Reference | At center |

Trigger:

| | |
|----------------|-----------|
| Trigger Mode | Edge |
| Trigger Source | Channel 1 |
| Trigger Level | 0.05V |
| Trigger Slope | Positive |

Display:

| | |
|--------------------|------------|
| Display Mode | Repetitive |
| Averaging | On |
| Number of Averages | 16 |

5. On the pulse generator, set:

| | |
|--------------|----------------|
| Pulse: | Selected |
| Pulse width: | 10 ns |
| Frequency: | 2 MHz (500 ns) |
| Offset: | 0V |

6. On the pulse generator, set the pulse amplitude for a reading of 0.1V on the oscilloscope.

Video Gain

7. Connect the pulse generator to the oscilloscope's channel 1 through the attenuator, filters, and amplifier (B).
8. On the oscilloscope, set:

Channel 1:

| | |
|-----------------|-------|
| Volts/Division | 0.2V |
| Offset | -0.3V |
| Input Coupling | dc |
| Input Impedance | 50Ω |

Trigger:

| | |
|----------------|-----------|
| Trigger Mode | Edge |
| Trigger Source | Channel 1 |
| Trigger Level | -0.4V |
| Trigger Slope | Negative |

9. On the oscilloscope, note the pulse amplitude: _____V_p
10. Calculate the video gain:

$$\begin{aligned}\text{Video gain} &= \frac{\text{system } V_p \text{ (from step 9)}}{\text{pulse generator } V_p} \\ &= \frac{\text{system } V_p}{0.1 V_p}\end{aligned}$$

Video Gain = _____

Low Band Video Feedthrough

Disregard if beyond your synthesizer's capability.

11. Connect the pulse generator output to the synthesizer's pulse input (C).
12. Connect the synthesizer to the oscilloscope's channel 1 through the attenuator, filters, and amplifier (D).
13. On the synthesizer, press:
 - CW** First CW frequency in Table 2-21.
 - ALC** Leveling Mode Search .
 - POWER LEVEL** Maximum specified leveled power
 - MOD** Pulse On/Off Extrnl (asterisk on)

or, for synthesizers with Option 002, instead press:

MOD Pulse Menu Pulse On/Off Ext

Table 2-21. Low Band Video Feedthrough Frequencies

| Synthesizer CW Frequency (GHz) | Video Feedthrough (%) |
|--------------------------------|-----------------------|
| 0.4 | _____ |
| 0.7 | _____ |
| 1.0 | _____ |
| 1.3 | _____ |
| 1.6 | _____ |
| 1.9 | _____ |

14. On the oscilloscope, set:

Channel 1:

Display On
Volts/Division 0.01 V
Offset 0V
Input Coupling dc
Input Impedance 50 Ω

Channel 2:

Display Off
Volts/Division 1V
Offset 2V

Timebase:

Time/Division 200 ns
Delay 400 ns
Delay Reference At center

Trigger:
 Trigger Mode Edge
 Trigger Source Channel 2
 Trigger Level 1V
 Trigger Slope Positive

Display:
 Display Mode Repetitive
 Averaging On
 Number of averages 64

15. On the pulse generator, set:

Pulse width: 500 ns
 Frequency: 200 kHz (5 μ s)
 Offset: 0V
 Amplitude: 5V

16. On the oscilloscope, note the maximum voltage from the baseline (see Figure 2-22). Video feedthrough (V_p) = _____Vp

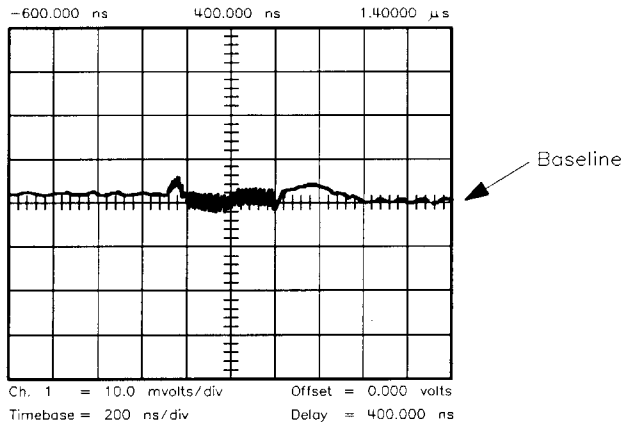


Figure 2-22. Measuring Maximum Voltage from the Baseline Video Feedthrough

17. Using the video gain from step 10, the video feedthrough (V_p) from step 16, and the carrier voltage from Table 2-22, calculate the video feedthrough as a percent of carrier power:

$$\text{Video feedthrough (\%)} = [(\text{video } V_p / \text{carrier } V_p) \times 100] / \text{video gain}$$

Table 2-22. Power Level Conversions to Volts Peak

| Synthesizer Maximum Specified Power (dBm) Into 50Ω | Peak Carrier Voltage ¹ (V) |
|--|---------------------------------------|
| 0 | 0.316 |
| 0.5 | 0.335 |
| 2.0 | 0.398 |
| 3.0 | 0.447 |
| 4.0 | 0.501 |
| 5.5 | 0.596 |
| 7.0 | 0.707 |
| 10.0 | 1.000 |
| 10.5 | 1.059 |
| 12.0 | 1.259 |
| 13.0 | 1.413 |
| 17.0 | 2.239 |
| 20.0 | 3.162 |

$$^1 \text{ Peak Carrier Voltage} = 10 \left(\frac{\text{PdBm} - 10}{20} \right)$$

18. Record the video feedthrough (in Table 2-21).
 19. Repeat steps 16 through 18 for the remaining CW frequencies in Table 2-21.
 20. Record the worst case value from Table 2-21 on the test record.

High Band Video Feedthrough

Note Typically, high band video feedthrough is so small that it is difficult to measure. Use the following procedure to verify that the video feedthrough is negligible.

21. On the oscilloscope, set channel 1 to 1 mV/div.
22. On the synthesizer, set the first CW frequency in Table 2-23.

Table 2-23. High Band Video Feedthrough Frequencies

| Frequency (GHz) | Video Feedthrough (Vp) |
|-----------------|------------------------|
| 5.0 | _____ |
| 10.0 | _____ |
| 15.0 | _____ |
| 20.0 | _____ |
| 23.0 | _____ |

23. On the oscilloscope, note the maximum voltage from the baseline. Video feedthrough (Vp) = _____Vp. Record this value in Table 2-23..
24. Repeat steps 22 and 23 for each value in Table 2-23..
25. Using the worst case voltage (largest value) from (Table 2-23), calculate the video feedthrough as follows using the video gain from step 10:

$$\text{Video Feedthrough (Vp)} = \text{Video Vp}/\text{Video Gain}$$

Record this value on the test record.

Millimeter Band Video Feedthrough > 20 GHz

Disregard if beyond your synthesizer's capability.

26. Remove the 130 MHz filter from the test setup.
27. Repeat steps 7 through 10 to check video gain once more.

28. On the oscilloscope, reset channel 1 to 0.01 volts/division.
29. Repeat steps 13 and 16 through 17 (the oscilloscope and pulse generator are already set up) for the CW frequencies in Table 2-24. Do *not* exceed the maximum frequency of your synthesizer. Record the video feedthrough (in Table 2-24).

Table 2-24. Millimeter Band Video Feedthrough Frequencies

| Frequency (GHz) | Video Feedthrough (%) |
|-----------------|-----------------------|
| 23.0 | _____ |
| 28.0 | _____ |
| 35.0 | _____ |
| 45.0 | _____ |

30. Record the worst case value in Table 2-24 on the test record.

Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

Table 2-36. Test Record for HP 83630A (1 of 8)

| | |
|-------------------------|-----------------------------------|
| Test Facility: _____ | Report Number _____ |
| _____ | Date _____ |
| _____ | Customer _____ |
| _____ | Tested by _____ |
| Model _____ | Ambient temperature _____ °C |
| Serial Number _____ | Relative humidity _____ % |
| Options _____ | Line frequency _____ Hz (nominal) |
| Firmware Revision _____ | |
| Special Notes: | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

Table 2-36. Test Record for HP 83630A (2 of 8)

| | | | |
|--------------------------------|---------------------|---------------------|---------------------|
| Model _____ | Report Number _____ | Date _____ | |
| Test Equipment Used | Model Number | Trace Number | Cal Due Date |
| 1. Digital Oscilloscope | _____ | _____ | _____ |
| 2. Measuring Receiver | _____ | _____ | _____ |
| 3. Power Sensor | _____ | _____ | _____ |
| 4. Power Meter | _____ | _____ | _____ |
| 5. Microwave Spectrum Analyzer | _____ | _____ | _____ |
| 6. Function Generator | _____ | _____ | _____ |
| 7. _____ | _____ | _____ | _____ |
| 8. _____ | _____ | _____ | _____ |
| 9. _____ | _____ | _____ | _____ |
| 10. _____ | _____ | _____ | _____ |
| 11. _____ | _____ | _____ | _____ |
| 12. _____ | _____ | _____ | _____ |
| 13. _____ | _____ | _____ | _____ |
| 14. _____ | _____ | _____ | _____ |
| 15. _____ | _____ | _____ | _____ |
| 16. _____ | _____ | _____ | _____ |
| 17. _____ | _____ | _____ | _____ |

Table 2-36. Test Record for HP 83630A (3 of 8)

| Model | | Report No. | | | Date |
|----------|--|--|----------------------------------|-------------------------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 1. | Internal Timebase: Aging Rate 7. Calculated Rate | | _____ | 5×10^{-10} /day | |
| 2. | Swept Frequency Accuracy Worst Case Value: 10. Start Freq _____ Stop Freq _____ | | _____ | 0.1% of sweep | |
| 3. | Frequency Switching Time 8. CW Step 16. Stepped Sweep 25. Frequency List | | _____ | 70 ms | |
| | | | _____ | 5 ms | |
| | | | _____ | 70 ms | |
| 4. | Power Accuracy 14. Power > -10 dBm < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 26.5 GHz | -0.6 dB -0.7 dB -0.9 dB | _____ _____ _____ | +0.6 dB +0.7 dB +0.9 dB | |
| 5. | Power Flatness 5. < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 26.5 GHz | -0.5 dB -0.6 dB -0.8 dB | _____ _____ _____ | +0.5 dB +0.6 dB +0.8 dB | |
| 6. | Maximum Leveled Power 6. Standard: 0.01 to ≤ 26.5 GHz 0.01 to ≤ 20 GHz Option 001: 0.01 to ≤ 26.5 GHz 0.01 to ≤ 20 GHz | +4.0 dBm +13.0 dBm +2.0 dBm +11.5 dBm | _____ _____ _____ _____ | | |

Table 2-36. Test Record for HP 83630A (4 of 8)

| Model | | Report No. | | | Date |
|----------|--------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 7. | External Leveling | | | | |
| | 7. Minimum Power | | _____ | -0.2 mV | |
| | 10. Maximum Power | -0.5 V | _____ | | |
| 8. | Spurious Signals: Harmonic Harmonics | | | | |
| | 8. 0.01 to < 1.8 GHz | -35 dBc | _____ | | |
| | 21. ≥ 1.8 and ≤ 26.5 GHz | - 50 dBc | _____ | | |
| | Subharmonics | | | | |
| | 12. ≥ 7 and ≤ 20 GHz | -50 dBc | _____ | | |
| | 21. > 20 and ≤ 26.5 GHz | -50 dBc | _____ | | |
| 9. | Spurious Signals: Non-harmonic | | | | |
| | 11. Spur Frequency: | | | | |
| | _____ | -60 dBc | _____ | | |
| | _____ | -60 dBc | _____ | | |
| | _____ | -60 dBc | _____ | | |
| | _____ | -60 dBc | _____ | | |
| | 125 kHz | -60 dBc | _____ | | |
| | 500 kHz | -60 dBc | _____ | | |
| | 16. Spur Frequency: | | | | |
| | 100 MHz Fixed | -60 dBc | _____ | | |
| | 100 MHz Offset | -60 dBc | _____ | | |
| | LO Feedthrough | -60 dBc | _____ | | |
| | 20. Low Band Mixer Spur | -60 dBc | _____ | | |

Table 2-36. Test Record for HP 83630A (5 of 8)

| Model | | Report No. | | | Date |
|----------|--------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 10. | Spurious Signals: Line Related | | | | |
| | 10. At 6.99 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | |
| | 180 Hz Spur | -55 dBc | _____ | | |
| | 240 Hz Spur | -55 dBc | _____ | | |
| | 10. At 1.9 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | |
| | 180 Hz Spur | -55 dBc | _____ | | |
| | 240 Hz Spur | -55 dBc | _____ | | |
| 11. | Single Sideband Phase Noise | | | | |
| | 7. Offsets at 6.99 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | |
| | ≥100 kHz | -107 dBc | _____ | | |
| | 7. Offsets at 1.97 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | |
| | ≥ 100 kHz | -107 dBc | _____ | | |
| | 7. Offsets at 18.0 GHz: | | | | |
| | 100 Hz to < 1 kHz | -60 dBc | _____ | | |
| | 1 kHz to < 10 kHz | -68 dBc | _____ | | |
| | 10 kHz to < 100 kHz | -76 dBc | _____ | | |
| | ≥ 100 kHz | -97 dBc | _____ | | |

Table 2-36. Test Record for HP 83630A (6 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | |
| 13. | Pulse Performance | | | | |
| | 10. Risetime | | _____ | 25 ns | |
| | 10. Falltime | | _____ | 25 ns | |
| | 21. Level Accuracy | | _____ | ±0.3 dB | |
| 14. | Pulse Performance (Alternate) | | | | |
| | 29. Risetime | | _____ | 25 ns | |
| | 29. Falltime | | _____ | 25 ns | |
| | 37. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video Feedthrough | | | | |
| | 20. < 2 GHz | | _____ | 2% | |
| | 25. ≥ 2 and ≤ 26.5 GHz | | _____ | 2 mV | |
| 16. | AM Accuracy | | | | |
| | < 2 GHz: | | | | |
| | 8. AM Depth | 28.5% | _____ | 31.5% | |
| | 11. AM Depth | 28.5% | _____ | 31.5% | |
| | > 2 and < 20 GHz: | | | | |
| | 18. AM Depth | 28.5% | _____ | 31.5% | |
| | 21. AM Depth | 28.5% | _____ | 31.5% | |

Table 2-36. Test Record for HP 83630A (7 of 8)

| Model | | Report No. | | | Date |
|----------|---|---------------|-----------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 17. | AM Bandwidth 10. 3 dB Bandwidth | 100 kHz | _____ | | |
| 18. | AM Dynamic Range 12. Normal | | _____ | -20 dBm | |
| | 19. Normal Internal | | _____ | -20 dBm | |
| | 30. Deep < 20 GHz | | _____ | -37 dBm | |
| | 30. Deep ≥ 20 GHz | | _____ | -40 dBm | |
| | 37. Deep Internal < 20 GHz | | _____ | -37 dBm | |
| | 38. Deep Internal ≥ 20 GHz | | _____ | -40 dBm | |
| 19. | FM Accuracy 13. Maximum FM Error | -10% | _____ | +10% | |
| | 23. Maximum FM Error | -10% | _____ | +10% | |
| 20. | FM Bandwidth 17. 6 dB Bandwidth | 10 MHz | _____ | | |
| 21. | Maximum FM Deviation 12. DC FM Unlocked ≤ 100 Hz: > ±75 MHz Deviation | | Pass/Fail | | |
| | 24. AC FM Locked 100 kHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 500 kHz | _____ | | |
| | 5 GHz | 500 kHz | _____ | | |
| | 9 GHz | 1 MHz | _____ | | |
| | 17 GHz | 1.5 MHz | _____ | | |
| | 22 GHz | 2 MHz | _____ | | |

Table 2-36. Test Record for HP 83630A (8 of 8)

| Model | | Report No. | | | Date |
|----------|--|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 24. AC FM Locked 1 MHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 5 MHz | _____ | | |
| | 5 GHz | 5 MHz | _____ | | |
| | 24. AC FM Locked 3 MHz: > ± 8 MHz deviation | | | | |
| 1 GHz | 8 MHz | _____ | | | |
| 5 GHz | 8 MHz | _____ | | | |
| 22. | Internal Pulse Accuracy (Opt. 002) | | | | |
| 5. | Pulse Width | 20 ns | _____ | 30 ns | |
| 7. | Pulse Width | 45 ns | _____ | 55 ns | |
| 23. | Modulation Meter (Opt. 002) | | | | |
| 5. | AM Meter | 25% | _____ | 35% | |
| 7. | AM Meter | 25% | _____ | 35% | |
| 11. | FM Meter | 4.95 MHz | _____ | 5.05 MHz | |
| 13. | FM Meter | 950 kHz | _____ | 1.05 MHz | |

Table 2-38. Test Record for HP 83650A (1 of 8)

| | |
|-------------------------|-----------------------------------|
| Test Facility: _____ | Report Number _____ |
| _____ | Date _____ |
| _____ | Customer _____ |
| _____ | Tested by _____ |
| Model _____ | Ambient temperature _____ °C |
| Serial Number _____ | Relative humidity _____ % |
| Options _____ | Line frequency _____ Hz (nominal) |
| Firmware Revision _____ | |
| Special Notes: | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

Table 2-38. Test Record for HP 83650A (2 of 8)

| | | | |
|--------------------------------|---------------------|---------------------|---------------------|
| Model _____ | Report Number _____ | Date _____ | |
| Test Equipment Used | Model Number | Trace Number | Cal Due Date |
| 1. Digital Oscilloscope | _____ | _____ | _____ |
| 2. Measuring Receiver | _____ | _____ | _____ |
| 3. Power Sensor | _____ | _____ | _____ |
| 4. Power Meter | _____ | _____ | _____ |
| 5. Microwave Spectrum Analyzer | _____ | _____ | _____ |
| 6. Function Generator | _____ | _____ | _____ |
| 7. _____ | _____ | _____ | _____ |
| 8. _____ | _____ | _____ | _____ |
| 9. _____ | _____ | _____ | _____ |
| 10. _____ | _____ | _____ | _____ |
| 11. _____ | _____ | _____ | _____ |
| 12. _____ | _____ | _____ | _____ |
| 13. _____ | _____ | _____ | _____ |
| 14. _____ | _____ | _____ | _____ |
| 15. _____ | _____ | _____ | _____ |
| 16. _____ | _____ | _____ | _____ |
| 17. _____ | _____ | _____ | _____ |

Table 2-38. Test Record for HP 83650A (3 of 8)

| Model | | Report No. | | | Date |
|----------|--|---------------|---------|--------------------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 1. | Internal Timebase: Aging Rate 7. Calculated Rate | | _____ | 5x10 ⁻¹⁰ /day | |
| 2. | Swept Frequency Accuracy Worst Case Value: 10. Start Freq _____ Stop Freq _____ | | _____ | 0.1% of sweep | |
| 3. | Frequency Switching Time 8. CW Step: 16. Stepped Sweep 25. Frequency List | | _____ | 70 ms | |
| | | | _____ | 5 ms | |
| | | | _____ | 70 ms | |
| 4. | Power Accuracy 14. > -10 dBm: < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 40 GHz > 40 GHz | -0.6 dB | _____ | 0.6 dB | |
| | | -0.7 dB | _____ | 0.7 dB | |
| | | -0.9 dB | _____ | 0.9 dB | |
| | | -1.7 dB | _____ | 1.7 dB | |
| 5. | Power Flatness 5. < 2 GHz ≥ 2 and ≤ 20 GHz > 20 and ≤ 40 GHz > 40 GHz | -0.5 dB | _____ | 0.5 dB | |
| | | -0.6 dB | _____ | 0.6 dB | |
| | | -0.8 dB | _____ | 0.8 dB | |
| | | -1.5 dB | _____ | 1.5 dB | |
| 6. | Maximum Leveled Power 10. Standard: 0.01 to ≤ 50 GHz 0.01 to < 40 GHz 0.01 to < 26.5 GHz 0.01 to < 20 GHz | 0 dBm | _____ | | |
| | | +3.0 dBm | _____ | | |
| | | +4.0 dBm | _____ | | |
| | | +7.0 dBm | _____ | | |

Table 2-38. Test Record for HP 83650A (4 of 8)

| Model | | Report No. | | | Date |
|----------|-----------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | Option 001: | | | | |
| | 0.01 to \leq 50 GHz | -2.5 dBm | _____ | | |
| | 0.01 to < 40 GHz | +1.0 dBm | _____ | | |
| | 0.01 to < 26.5 GHz | +2.0 dBm | _____ | | |
| | 0.01 to < 20 GHz | +5.5 dBm | _____ | | |
| 7. | External Leveling | | | | |
| | 7. Minimum Power | | _____ | -0.2 mV | |
| | 10. Maximum Power | -0.5 V | _____ | | |
| 8. | Spurious Signals: Harmonic | | | | |
| | Harmonics: | | | | |
| | 8. < 50 MHz | -30 dBc | _____ | | |
| | 8. \geq 50 MHz and < 1.8 GHz | -35 dBc | _____ | | |
| | 29. \geq 1.8 to \leq 50 GHz | -45 dBc | _____ | | |
| | Subharmonics; | | | | |
| | 12. \geq 7 and \leq 20 GHz | -50 dBc | _____ | | |
| | 29. > 20 and \leq 40 GHz | -40 dBc | _____ | | |
| | 37. > 40 and \leq 50 GHz | -35 dBc | _____ | | |
| 9. | Spurious Signals: Non-harmonic | | | | |
| | 11. Spur Frequency: | | | | |
| | _____ | -60 dBc | _____ | | |
| | _____ | -60 dBc | _____ | | |
| | _____ | -60 dBc | _____ | | |
| | _____ | -60 dBc | _____ | | |
| | 125 kHz | -60 dBc | _____ | | |
| | 500 kHz | -60 dBc | _____ | | |
| | 16. Spur Frequency: | | | | |
| | 100 MHz Fixed | -60 dBc | _____ | | |
| | 100 MHz Offset | -60 dBc | _____ | | |
| | LO Feedthrough | -60 dBc | _____ | | |

Table 2-38. Test Record for HP 83650A (5 of 8)

| Model | | Report No. | | | Date |
|----------|--------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 20. Low Band Mixer Spur | -60 dBc | _____ | | |
| 10. | Spurious Signals: Line Related | | | | |
| | 10. At 6.99 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | |
| | 180 Hz Spur | -55 dBc | _____ | | |
| | 240 Hz Spur | -55 dBc | _____ | | |
| | At 1.9 GHz: | | | | |
| | 120 Hz Spur | -55 dBc | _____ | | |
| | 180 Hz Spur | -55 dBc | _____ | | |
| | 240 Hz Spur | -55 dBc | _____ | | |
| 11. | Single Sideband Phase Noise | | | | |
| | 7. Offsets at 6.99 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | |
| | ≥ 100 kHz | -107 dBc | _____ | | |
| | 7. Offsets at 1.97 GHz: | | | | |
| | 100 Hz to < 1 kHz | -70 dBc | _____ | | |
| | 1 kHz to < 10 kHz | -78 dBc | _____ | | |
| | 10 kHz to < 100 kHz | -86 dBc | _____ | | |
| | ≥ 100 kHz | -107 dBc | _____ | | |
| | 7. Offsets at 18.0 GHz: | | | | |
| | 100 Hz to < 1 kHz | -60 dBc | _____ | | |
| | 1 kHz to < 10 kHz | -68 dBc | _____ | | |
| | 10 kHz to < 100 kHz | -76 dBc | _____ | | |
| | ≥ 100 kHz | -97 dBc | _____ | | |

Table 2-38. Test Record for HP 83650A (6 of 8)

| Model | | Report No. | | | Date |
|----------|------------------------------------|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 12. | Pulse Modulation On/Off Ratio | | | | |
| | 12. On/Off Ratio | 80 dB | _____ | | |
| 13. | Pulse Performance | | | | |
| | 10. Risetime | | _____ | 25 ns | |
| | 10. Falltime | | _____ | 25 ns | |
| | 21. Level Accuracy | | _____ | ±0.3 dB | |
| 14. | Pulse Performance (Alternate) | | | | |
| | 33. Risetime | | _____ | 25 ns | |
| | 33. Falltime | | _____ | 25 ns | |
| | 43. Level Accuracy | | _____ | ±0.3 dB | |
| 15. | Pulse Modulation Video Feedthrough | | | | |
| | 20. < 2 GHz | | _____ | 2% | |
| | 25. ≥ 2 and ≤ 26.5 GHz | | _____ | 2 mV | |
| | 30. > 26.5 and ≤ 50 GHz | | _____ | 0.3% | |
| 16. | AM Accuracy | | | | |
| | Low Band < 2 GHz: | | | | |
| | 8. AM Depth | 28.5% | _____ | 31.5% | |
| | 11. AM Depth | 28.5% | _____ | 31.5% | |
| | High Band > 2 and < 20 GHz: | | | | |
| | 18. AM Depth | 28.5% | _____ | 31.5% | |
| | 21. AM Depth | 28.5% | _____ | 31.5% | |
| | Doubled High Band > 20 GHz: | | | | |
| | 29. AM Depth | 28.5% | _____ | 31.5% | |
| | 32. AM Depth | 28.5% | _____ | 31.5% | |

Table 2-38. Test Record for HP 83650A (7 of 8)

| Model | | Report No. | | | Date |
|----------|---|---------------|-----------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| 17. | AM Bandwidth | | | | |
| | 10. 3 dB Bandwidth | 100 kHz | _____ | | |
| 18. | AM Dynamic Range | | | | |
| | 12. Normal | | _____ | -20 dBm | |
| | 19. Normal Internal | | _____ | -20 dBm | |
| | 30. Deep < 20 GHz | | _____ | -40 dBm | |
| | 30. Deep ≥ 20 GHz | | _____ | -30 dBm | |
| | 37. Deep Internal < 20 GHz | | _____ | -40 dBm | |
| | 38. Deep Internal ≥ 20 GHz | | _____ | -30 dBm | |
| 19. | FM Accuracy | | | | |
| | 13. Maximum FM Error | -10% | _____ | +10% | |
| | 23. Maximum FM Error | -10% | _____ | +10% | |
| 20. | FM Bandwidth | | | | |
| | 17. 6 dB Bandwidth | 10 MHz | _____ | | |
| 21. | Maximum FM Deviation | | | | |
| | 12. DC FM Unlocked ≤ 100 Hz: > ±75 MHz Deviation | | Pass/Fail | | |
| | 24. AC FM Locked 100 kHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 500 kHz | _____ | | |
| | 5 GHz | 500 kHz | _____ | | |
| | 9 GHz | 1 MHz | _____ | | |
| | 17 GHz | 1.5 MHz | _____ | | |
| | 22 GHz | 2 MHz | _____ | | |

Table 2-38. Test Record for HP 83650A (8 of 8)

| Model | | Report No. | | | Date |
|----------|--|---------------|---------|---------------|-------------------------|
| Test No. | Test Description | Minimum Spec. | Results | Maximum Spec. | Measurement Uncertainty |
| | 24. AC FM Locked 1 MHz: Modulation Index ≥ 5 | | | | |
| | 1 GHz | 5 MHz | _____ | | |
| | 5 GHz | 5 MHz | _____ | | |
| | 24. AC FM Locked 3 MHz: > ± 8 MHz deviation | | | | |
| | 1 GHz | 8 MHz | _____ | | |
| | 5 GHz | 8 MHz | _____ | | |
| 22. | Internal Pulse Accuracy (Opt. 002) | | | | |
| 5. | Pulse Width | 20 ns | _____ | 30 ns | |
| 7. | Pulse Width | 45 ns | _____ | 55 ns | |
| 23. | Modulation Meter (Opt. 002) | | | | |
| 5. | AM Meter | 25% | _____ | 35% | |
| 7. | AM Meter | 25% | _____ | 35% | |
| 11. | FM Meter | 4.95 MHz | _____ | 5.05 MHz | |
| 13. | FM Meter | 950 kHz | _____ | 1.05 MHz | |

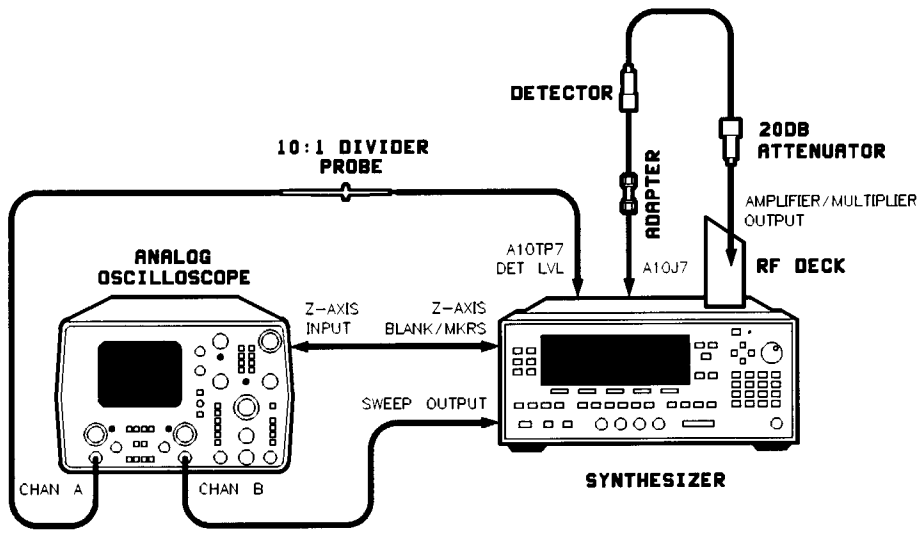


Figure 12-1. Amplifier/Multiplier Adjustments Setup

Index

1

- 10 MHz reference standard removal, 7-36
- 10 MHz standard
 - adjustment interval, 3-9
- 10 MHz standard adjustment, 3-5
- 125 kHz reference spur, 3-13

A

- ADC adjustment, 5-15
- adjustments
 - 10 MHz standard, 3-5
 - ALC power level accuracy, 3-91
 - AM accuracy, 3-102
 - AM delay, 3-106
 - AM/FM DAC offset and gain, 3-100
 - AM input impedance, 3-114
 - amplifier filter, 3-49
 - external trigger edge selection, 3-123
 - FM gain, 3-109
 - FM input impedance, 3-117
 - fractional-N reference and API spurs, 3-13
 - fractional-N VCO, 3-11
 - low power SRD bias, 3-84
 - modulation generator flatness, 3-120
 - modulator offset and gain, 3-86
 - power flatness, 3-97
 - sampler assembly, 3-19
 - square wave symmetry, 3-112
 - sweep ramp, 3-18
 - volts/GHz, 3-125
 - YO driver +10V reference, 3-24
 - YO driver gain and linearity, 3-26
 - YO loop gain, 3-29
- ALC power level accuracy adjustment, 3-91
- alphanumeric display removal, 7-12
- AM accuracy, 2-96
- AM accuracy adjustment, 3-102
- AM bandwidth, 2-104
- AM delay adjustment, 3-106
- AM dynamic range, 2-107
- AM/FM DAC offset and gain adjustment, 3-100
- AM input impedance adjustment, 3-114
- amplifier/filter adjustment, 3-49
- amplifier filter removal, 7-54
- amplifier multiplier removal, 7-54
- amplifier removal, 7-54
- amplifier switch removal, 7-54
- API1 spur, 3-13
- API2 spur, 3-13
- automated adjustments
 - ADC adjustment, 5-15
 - power flatness adjustment, 5-16
 - step attenuator flatness, 5-12
 - YO delay adjustment, 5-14
- automated performance tests
 - step attenuator flatness, 5-7
- automated tests
 - BASIC, 5-2
 - binaries, 5-2
 - copying disks, 5-3

- equipment, 5-2
- software installation, 5-3

AUX OUTPUT disconnection, 7-31

B

BASIC

- automated tests, 5-2

binaries

- automated tests, 5-2

blocking capacitor removal, 7-50

BNC connectors

- removal, 7-31

BNC connectors, Option 004

- removal, 7-44

C

calibration constants, **4-1**

- changing, 4-6
- default, 4-8
- definition, 4-1
- descriptions, 4-8
- loading, 4-7
- memory areas, 4-2
- saving, 4-7

calibration constants utility, 5-22

checksum verification, 4-3

connector care, 10-9

coupler removal, 7-54

D

DC blocking capacitor removal, 7-50, 7-54

diode switch removal, 7-54

directional coupler removal, 7-54

disassembly

- front panel, 7-4
- motherboard, 7-70
- rear panel, 7-26
- RF deck, 7-45

display filter

- cleaning, 10-4

- display filter removal, 7-21
- display removal, 7-12
- doubler removal, 7-54
- dual modulator removal, 7-54

E

EEPROM storage

- calibration constants, 4-2

external ALC input removal, 7-44

external leveling, 2-37

external trigger edge selection

- adjustment, 3-123

F

fan

- noise, 10-2
- speed, 10-2

fan filter

- cleaning, 10-2

fan removal, 7-29

filter

- display, 10-4

filter removal, 7-54

FM accuracy, 2-114

FM bandwidth, 2-118

FM gain adjustment, 3-109

FM input impedance adjustment, 3-117

fractional-N reference and API apurs

- adjustment, 3-13

fractional-N VCO adjustment, 3-11

frequency switching time, 2-22

front panel BNC connectors removal, 7-17

front panel disassembly, 7-4

front panel emulation, 5-19

front panel processor removal, 7-11

front panel removal, 7-8, 7-74

fuse

- line fuse replacement, 10-5
- rear panel, 10-5

fuse housing removal, 7-42

H

Hewlett-Packard offices, xi

I

internal pulse accuracy, 2-131

internal timebase aging rate, 2-8

J

J10 removal, 7-31

J14 removal, 7-31

J1 RF output connector removal, 7-15,
7-32

J1 RF output connector removal, front
panel, 7-76

J1 RF output connector removal, Option
004, 7-78

J6 removal, 7-31

J7 removal, 7-31

K

keyboard reassembly, 7-22

keyboard removal, 7-18

L

line filter removal, 7-43

line fuse, 10-5

lowband assembly removal, 7-54

low power SRD bias adjustment, 3-84

M

maximum FM deviation, 2-124

maximum leveled power, 2-34

microcircuit removal, 7-54

modulation generator flatness
adjustment, 3-120

modulation meter, 2-133

modulator offset and gain adjustment,
3-86

motherboard disassembly, 7-70

motherboard removal, 7-85

O

offices, xi

operation verification, 2-4

operation verification form, 2-6

Option 004 BNC connectors
removal, 7-44

P

password, 4-3

bypassing, 4-5

disabling, 4-4

entering, 4-4

setting, 4-5

performance tests

AM accuracy, 2-96

AM bandwidth, 2-104

AM dynamic range, 2-107

external leveling, 2-37

FM accuracy, 2-114

FM bandwidth, 2-118

frequency switching time, 2-22

internal pulse accuracy, 2-131

internal timebase, 2-8

maximum FM deviation, 2-124

maximum leveled power, 2-34

modulation meter, 2-133

power accuracy, 2-28

power flatness, 2-31

pulse modulation on/off ratio, 2-65

pulse modulation video feedthrough,
2-87

pulse performance, 2-68

pulse performance (alternate), 2-76

single sideband phase noise, 2-60

spurious signals (harmonics &
subharmonics), 2-40

spurious signals (line-related), 2-56

spurious signals (non-harmonic), 2-50

swept frequency accuracy, 2-12

power accuracy, 2-28

power flatness, 2-31

- power flatness adjustment, 3-97, 5-16
- power sensor calibration factor, 5-23
- power sensor configuration, 5-23
- prefix number, x
- pulse modulation on/off ratio, 2-65
- pulse modulation video feedthrough, 2-87
- pulse performance, 2-68
- pulse performance (alternate test), 2-76

R

- RAM checksum, 4-3
- RAM storage
 - calibration constants, 4-2
- rear panel BNC connectors removal, 7-31
- rear panel disassembly, 7-26
- rear panel interface removal, 7-38
- rear panel removal, 7-34, 7-79
- reassembly
 - keyboard, 7-22
- removal
 - 10 MHz reference standard, 7-36
 - alphanumeric display, 7-12
 - connectors, front panel BNC, 7-17
 - connectors, Option 004 BNC, 7-44
 - connectors, rear panel BNC, 7-31
 - DC blocking capacitor, 7-50
 - display filter, 7-21
 - fan, 7-29
 - front panel, 7-8, 7-11, 7-74
 - front panel BNC connectors, 7-17
 - fuse housing, 7-42
 - keyboard, 7-18
 - line filter, 7-43
 - motherboard, 7-85
 - rear panel, 7-34, 7-79
 - rear panel interface, 7-38
 - RF deck, 7-83
 - RF output connector, 7-15, 7-32
 - RPG, 7-14

- source module interface, 7-13
- transformer, 7-37
- voltage selector switch, 7-40
- replacement
 - front panel, 7-4
 - motherboard, 7-70
 - rear panel, 7-26
 - RF deck, 7-45
- RF deck
 - lifting up, 7-47
- RF deck disassembly, 7-45
- RF deck removal, 7-83
- RF output connector removal, 7-32
- RF output connector removal, front panel, 7-76
- RF output connector removal, rear panel, 7-78
- RPG1 rotary pulse generator removal, 7-14

S

- sales offices, xi
- sampler assembly adjustment, 3-19
- self-test utility, 5-22
- serial number, x
- service offices, xi
- service position
 - RF deck, 7-47
- single sideband phase noise, 2-60
- software
 - loading, 5-4
- software bugs, 5-6
- source module interface removal, 7-13
- spur adjustments, 3-13
- spurious signals (Harmonics & subharmonics), 2-40
- spurious signals (line-related), 2-56
- spurious signals (non-harmonic), 2-50
- square wave symmetry adjustment, 3-112
- step attenuator flatness

- adjustment, 5-12
- step attenuator flatness performance
 - test, 5-7
- step attenuator removal, 7-54
- storage
 - calibration constants, 4-2
- sweep ramp adjustment, 3-18
- swept frequency accuracy, 2-12

T

- T1 transformer removal, 7-37
- timebase oscillator adjustment, 3-5
- transformer removal, 7-37

U

UVEPROM

- calibration constants, 4-2

V

- VCO tuning voltage, 3-11
- voltage selector switch removal, 7-40
- volts/GHz adjustment, 3-125

Y

- YIG oscillator removal, 7-54
- YO delay adjustment, 5-14
- YO driver +10V reference adjustment,
 - 3-24
- YO driver gain and linearity adjustment,
 - 3-26
- YO loop gain adjustment, 3-29