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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	HP 83623A/24A	HP 83630A	HP 83640A	HP 83650A
3250A	3250A	3250A	3250A	3250A
3245A	3245A	3245A	3245A	3245A
3213A	3213A	3213A	3213A	3213A
3145A	3145A	3145A	3145A	3145A
		3143A		3143A
		3101A		3052A



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Certification

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

Warranty

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

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

LIMITATION OF WARRANTY

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

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

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EXCLUSIVE REMEDIES

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

Assistance

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

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

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Preface

Instruments Covered By This Manual

A serial number label (see figure i) 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.

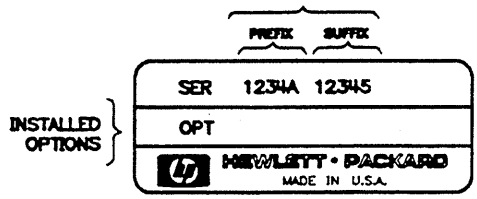


Figure i. Typical Serial Number Label

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 "Instrument History" to see what changes may apply to your instrument.

How to Order Manuals

A manual part number is listed on the title page of this manual. Use it to order extra copies of this manual.

See "Replaceable Parts" for a complete list of documentation and ordering numbers.

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Safety Considerations

General

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been designed and tested in accordance with international standards.

Safety Symbols



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).



Indicates hazardous voltages.



Indicates earth (ground) terminal.

Warning



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

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Caution



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

Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power, cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

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).

Servicing

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from their power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

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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	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.

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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: ±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]	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: ±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)

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Table 1-1. Required Equipment for HP 83620A/22A (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: $\leq$ 50 ns Rise Time: $\leq$ 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	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	Maximum FM Deviation (P)
Power Meter	Power Range: 1 µW 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 µW to 100 mW Accuracy: ±0.02 dB	HP 437B	Power Flatness (P) Power Flatness (A)
Power Meter	Power Range: 1 µW 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)

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

Instrument	Critical Specifications	Recommended Model	Use[1]
Power Sensor	Frequency Range: 10 MHz to 2.3 GHz Power Range: 1 μW 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) ments (A)
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 100 pW to 10 μW	HP 8485D	Step Attenuator Flatness (AA) Step Attenuator Flatness (AP)
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 1 μW 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: ±1% of reading ±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: ±2 dB to 1 MHz offset	HP 3048A	Single Sideband Phase Noise (P)

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

Instrument	Critical Specifications	Recommended Model	Use[1]
Frequency Standard	Frequency: 10 MHz Stability: $> 1 \times 10^{-10}$/yr	HP 5061A	Internal Timebase: Aging Rate (P) 10 MHz Standard (A)
Microwave Amplifier	Frequency Range: 1.5 to 18 GHz Leveled Output Power: $\geq$ 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	$\geq$ 1 meter	HP P/N 08503-20038	FM Bandwidth (P)
Mixer	Frequency Range: 1 GHz to 20 GHz	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)

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

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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 male cable 2 feet	8120-3446
BNC cable	8120-2582

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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	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.

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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: ±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]	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: ±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)

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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: $\leq$ 50 ns Rise Time: $\leq$ 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	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	Maximum FM Deviation (P)
Power Meter	Power Range: 1 µW 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 µW to 100 mW Accuracy: ±0.02 dB	HP 437B	Power Flatness (P) Power Flatness (A)
Power Meter	Power Range: 1 µW 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)

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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 μW 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) ments (A)
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 100 pW to 10 μW	HP 8485D	Step Attenuator Flatness (AA) Step Attenuator Flatness (AP)
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 1 μW 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: ±1% of reading ±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: ±2 dB to 1 MHz offset	HP 3048A	Single Sideband Phase Noise (P)

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

Instrument	Critical Specifications	Recommended Model	Use[1]
Frequency Standard	Frequency: 10 MHz Stability: $> 1 \times 10^{-10}$/yr	HP 5061A	Internal Timebase: Aging Rate (P) 10 MHz Standard (A)
Microwave Amplifier	Frequency Range: 1.5 to 18 GHz Leveled Output Power: $\geq$ 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	$\geq$ 1 meter	HP P/N 08503-20038	FM Bandwidth (P)
Mixer	Frequency Range: 1 GHz to 20 GHz	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)

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

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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 male cable 2 feet	8120-3446
BNC cable	8120-2582

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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	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.

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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: ±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]	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: ±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)

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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: $\leq$ 50 ns Rise Time: $\leq$ 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	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	Maximum FM Deviation (P)
Power Meter	Power Range: 1 µW 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 µW to 100 mW Accuracy: ±0.02 dB	HP 437B	Power Flatness (P) Power Flatness (A)
Power Meter	Power Range: 1 µW 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)

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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 μW 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 μW	HP 8485D	Step Attenuator Flatness (AA) Step Attenuator Flatness (AP)
Power Sensor	Frequency Range: 50 MHz to 26.5 GHz Power Range: 1 μW 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: ±1% of reading ±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: ±2 dB to 1 MHz offset	HP 3048A	Single Sideband Phase Noise (P)

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

Instrument	Critical Specifications	Recommended Model	Use[1]
Frequency Standard	Frequency: 10 MHz Stability: $> 1 \times 10^{-10}$/yr	HP 5061A	Internal Timebase: Aging Rate (P) 10 MHz Standard (A)
Microwave Amplifier	Frequency Range: 1.5 to 26.5 GHz Leveled Output Power: $\geq$ 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	$\geq$ 1 meter	HP P/N 08503-20038	FM Bandwidth (P)
Mixer	Frequency Range: 1 GHz to 26.5 GHz	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)
Attenuator	Frequency Range: 10 MHz to 26.5 GHz Maximum Input Power: 300 mW Attenuation: 20 dB	HP 8493C Option 020	Maximum Leveled Power (P) Pulse Performance (P)

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

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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 male cable 2 feet	8120-3446
BNC cable	8120-2582

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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	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.

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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: ±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]	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: ±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)

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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: $\leq$ 50 ns Rise Time: $\leq$ 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	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	Maximum FM Deviation (P)
Power Meter	Power Range: 1 µW 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 µW to 100 mW Accuracy: ±0.02 dB	HP 437B	Power Flatness (P) Power Flatness (A)
Power Meter	Power Range: 1 µW 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)

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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 μW 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 μW 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 μW	HP 8487D	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: ±1% of reading ±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: ±2 dB to 1 MHz offset	HP 3048A	Single Sideband Phase Noise (P)

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

Instrument	Critical Specifications	Recommended Model	Use[1]
Frequency Standard	Frequency: 10 MHz Stability: $> 1 \times 10^{-10}$/yr	HP 5061A	Internal Timebase: Aging Rate (P) 10 MHz Standard (A)
Microwave Amplifier	Frequency Range: 1.5 to 26.5 GHz Leveled Output Power: $\geq$ 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	$\geq$ 1 meter	HP P/N 08505-20038	FM Bandwidth (P)
Mixer	Frequency Range: 1 GHz to 20 GHz	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)

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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)

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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 male cable 2 feet	8120-3446
BNC cable	8120-2582

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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	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.

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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]	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)

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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: $\leq$ 50 ns Rise Time: $\leq$ 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	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	Maximum FM Deviation (P)
Power Meter	Power Range: 1 µW 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 µW to 100 mW Accuracy: ±0.02 dB	HP 437B	Power Flatness (P) Power Flatness (A)
Power Meter	Power Range: 1 µW 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)

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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 μW 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 μW 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 μW	HP 8487D	Step Attenuator Flatness (AP) Step Attenuator Flatness (AA)
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: ±1% of reading ±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: ±2 dB to 1 MHz offset	HP 3048A	Single Sideband Phase Noise (P)

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

Instrument	Critical Specifications	Recommended Model	Use[1]
Frequency Standard	Frequency: 10 MHz Stability: $> 1 \times 10^{-10}$/yr	HP 5061A	Internal Timebase: Aging Rate (P) 10 MHz Standard (A)
Microwave Amplifier	Frequency Range: 1.5 to 26.5 GHz Leveled Output Power: $\geq$ 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	$\geq$ 1 meter	HP P/N 08503-20038	FM Bandwidth (P)
Mixer	Frequency Range: 1 GHz to 26.5 GHz	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)

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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)
R-Band Coax Adapter	WR28 to APC 2.4 mm (f)	R281A	Spurious Signals (Harmonic) (P) Pulse Performance-Alt (P)

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

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

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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 male cable 2 feet	8120-3446
BNC cable	8120-2582

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2

Performance Tests

How To Use This Chapter

This chapter contains the following procedures:

- Operation Verification
- Performance Tests
  1. Internal Timebase: Aging Rate
  2. Swept Frequency Accuracy
  3. Frequency Switching Time
  4. Power Accuracy
  5. Power Flatness
  6. Maximum Leveled Power
  7. External Leveling
  8. Spurious Signals (Harmonics & Subharmonics)
  9. Spurious Signals (Non-Harmonic)
  10. Spurious Signals (Line Related)
  11. Single Sideband Phase Noise
  12. Pulse Modulation On/Off Ratio
  13. Pulse Performance
  14. Pulse Modulation Video Feedthrough
  15. AM Accuracy
  16. AM Bandwidth
  17. AM Dynamic Range
  18. FM Accuracy
  19. FM Bandwidth
  20. Maximum FM Deviation
  21. Internal Pulse Accuracy (Option 002)
  22. Modulation Meter (Option 002)

Step Attenuator (see "Automated Tests").

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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

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 the "Automated Tests" chapter of this manual.

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Equipment Required

The equipment required to perform the tests in this chapter is listed in the "Equipment Required" chapter of this manual. 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.

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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.

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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 Leveled 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 Leveled 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.

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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	_____

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PERFORMANCE TESTS

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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 ±AR ±TE ±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.

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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.

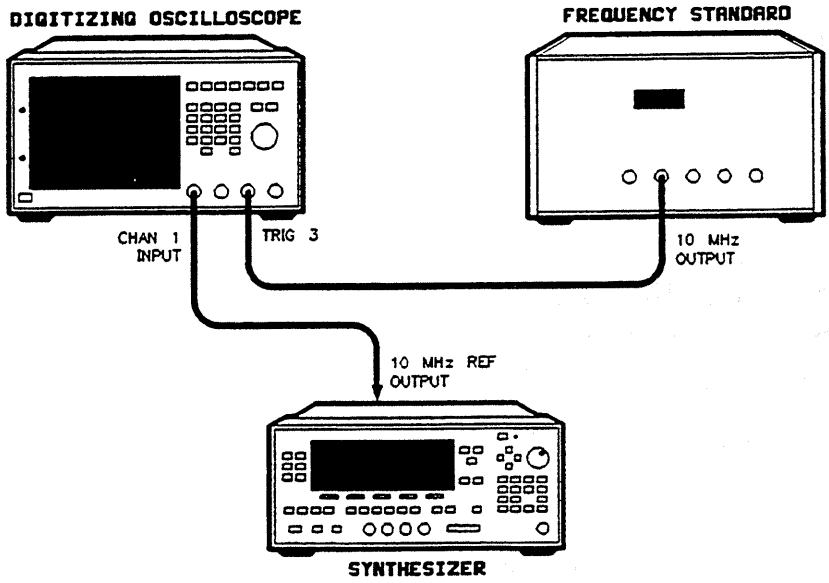


Figure 2-1. Internal Timebase: Aging Rate Test Setup

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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    50Ω

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    50Ω
   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:

Aging Rate = (1 cycle/10 MHz) (1/T1 − 1/T3) (24 hours/T2)

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Example: T1 = 351 seconds
T2 = 3 hours
T3 = 349 seconds
= (1 cycle/10 MHz) (1/351s − 1/349s) (24h/3h)
= 1.306×10^{-11} 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.

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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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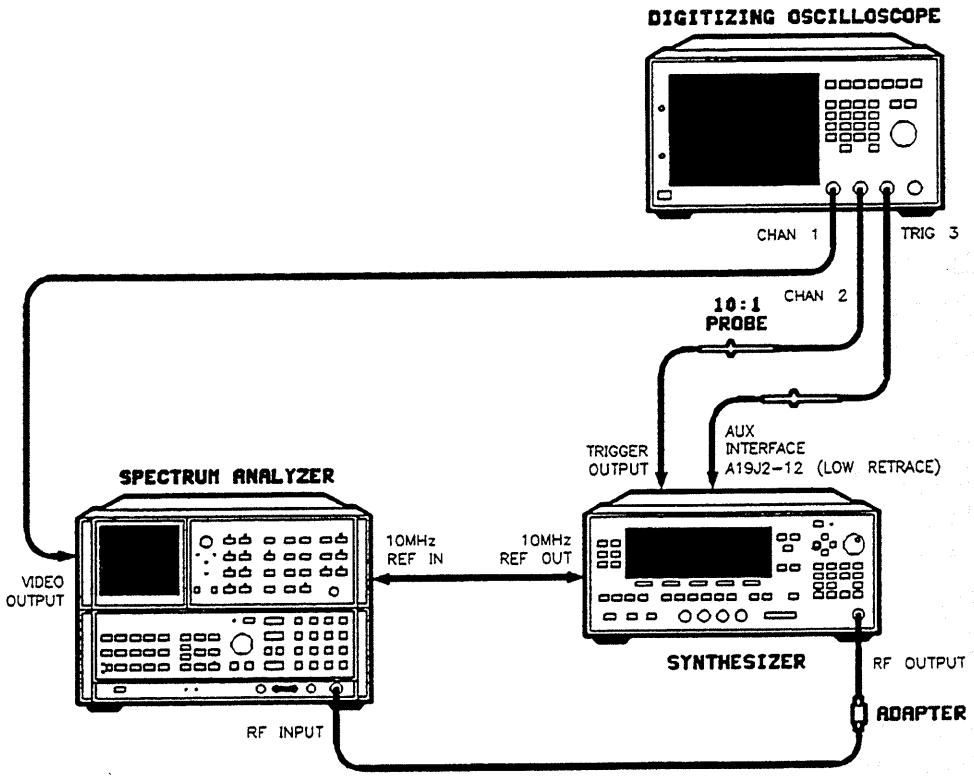


Figure 2-2. Swept Frequency Accuracy Test Setup

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:

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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 MΩ
Offset	1V
Channel 2:	
Display	On
Volts/Division	1V
Offset	2V
Input Coupling	dc
Input Impedance	1 MΩ
Timebase:	
Time/Division	25 μs
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

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```
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)

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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.

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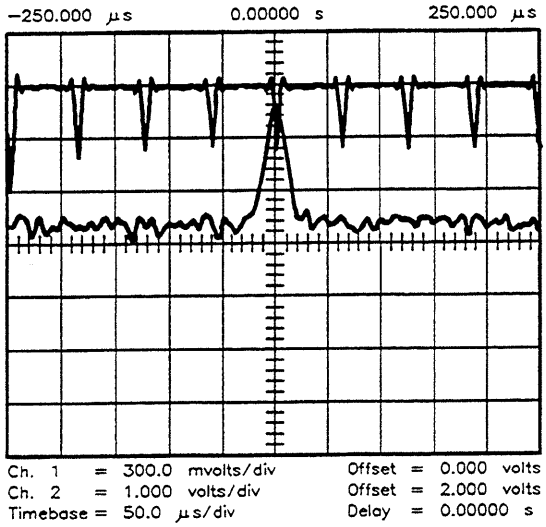


Figure 2-3. Video Signal on the Oscilloscope

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:

$$\frac{\text{frequency error}}{\text{stop frequency} - \text{start frequency}} x100 = \text{percent}$$

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

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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	_____	_____

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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	_____	_____

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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.

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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.

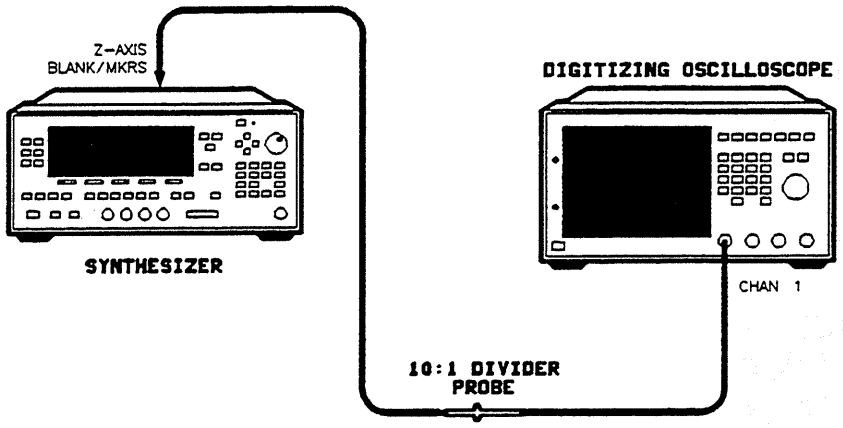


Figure 2-4. Frequency Switching Time Test Setup

Equipment

Digitizing Oscilloscope	HP 54111D
Oscilloscope Probes	HP 10431A

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CW Frequency Switching Time (Across Bandswitch Points)

2. On the oscilloscope, set:

Channel 1:	
Display	On
Preset	TTL
Input Coupling	dc
Input Impedance	1 MΩ
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.

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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
```

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```
    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:

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Frequency List for Synthesizers with 0.01 GHz Capability

Frequency (GHz):

6.9
2.1
1.9
13.5
20.0
26.5[1]
40.0[1]

[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
26.5[1]
40.0[1]

[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:
```

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```
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.

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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.

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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).

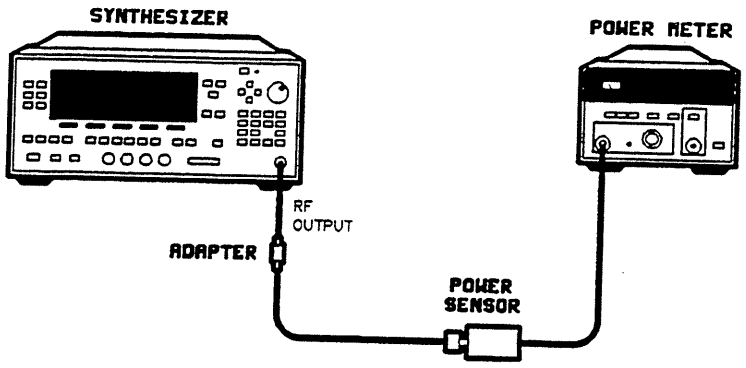


Figure 2-5. Power Accuracy Test Setup

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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.

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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 $\leq$ 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.

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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.

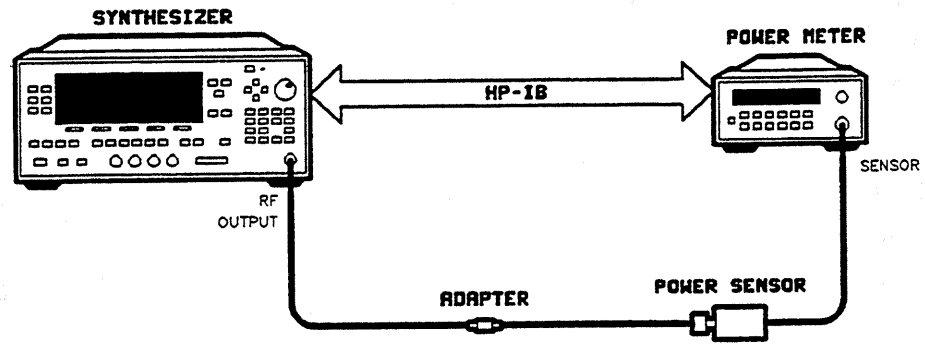


Figure 2-6. Power Flatness Test Setup

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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) `Fltness 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) `Fltness Menu` `Delete Menu` `Delete All`

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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.

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6. *Maximum Leveled 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 unleveled status indicator is displayed when the instrument is unleveled 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 leveled 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.

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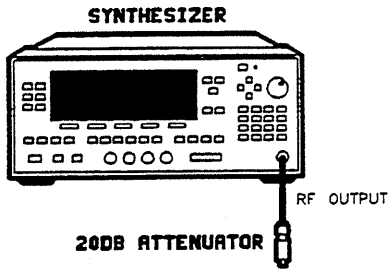


Figure 2-7. Maximum Leveled Power Test Setup

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.

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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.

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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.

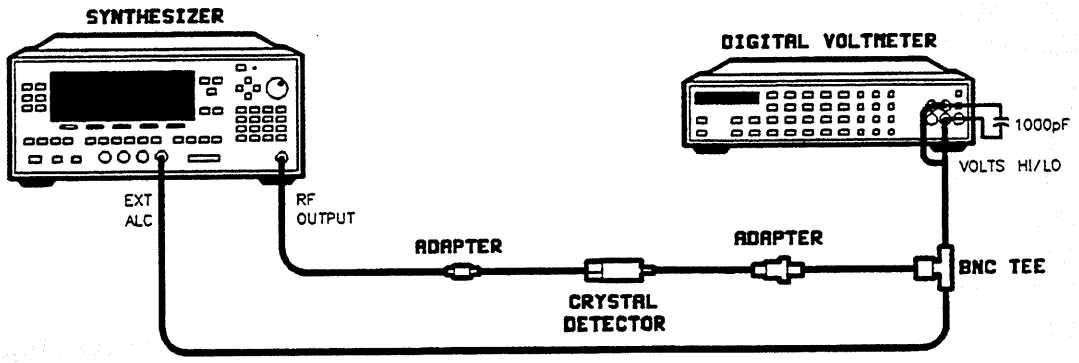


Figure 2-8. External Leveling Test Setup

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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 UNLVLED 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.
8. On the synthesizer, press [START] (to initiate a full sweep).

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Note

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

9. Press [POWER LEVEL]. Increase the synthesizer power level until the UNLVLED message turns on. Decrease power just until the message goes out.
10. On the synthesizer, press:
    [CW] [10] [GHz]

    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.

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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 GHz fixed oscillator) – Y (YO frequency) = 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.

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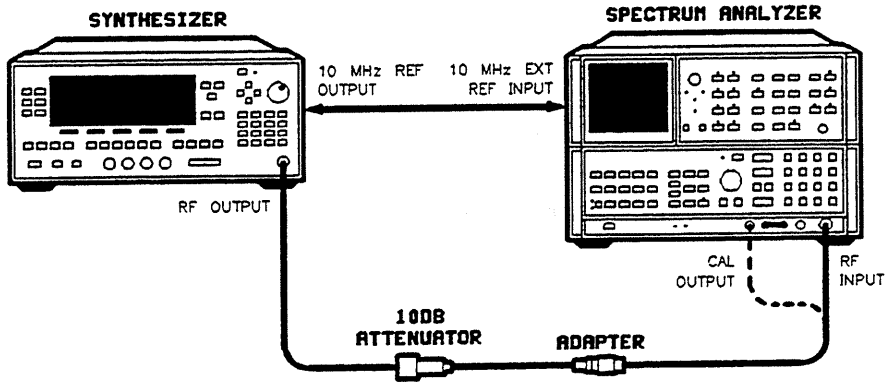


Figure 2-9. Spurious Signals (Harmonic) Test Setup < 20 GHz

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:
   (USER CAL) `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:
   (POWER LEVEL) Set the maximum specified leveled power.
   SWEEP (MENU) `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
```

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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.

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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).

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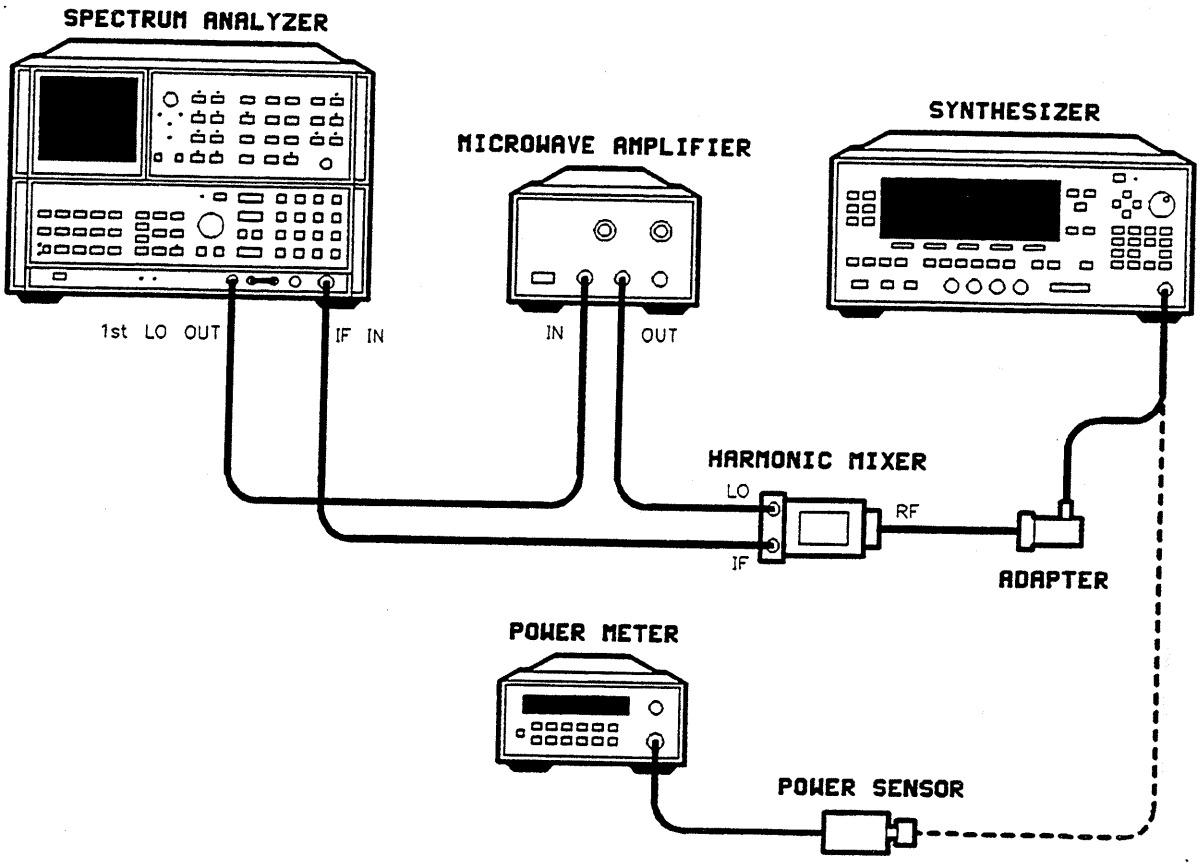


Figure 2-10. Spurious Signals (Harmonics) Test Setup > 20 GHz

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.

14. 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.
15. On the synthesizer, press:
    CW 23 GHz

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16. Set the microwave amplifier output power level to +16 dBm.
17. 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.
18. On the spectrum analyzer, set:

    ```
    Start Frequency:   20 GHz
    Stop Frequency:    26.5 GHz
    ```
19. 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.
20. 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.

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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:
    CW 33 GHz
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

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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
    ```

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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:

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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
```

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.

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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.

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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.

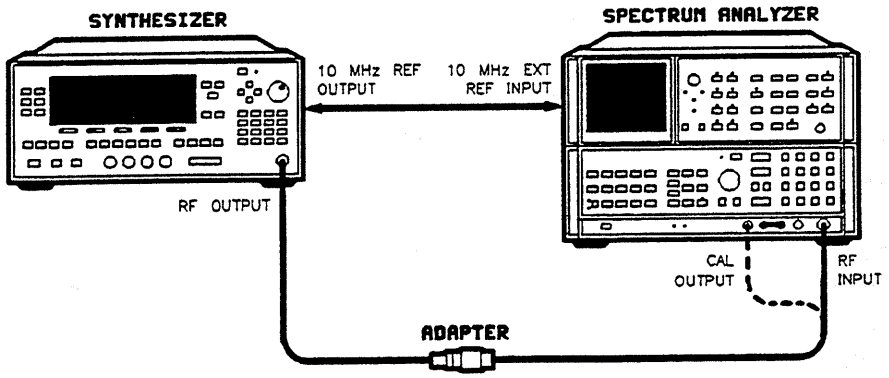


Figure 2-11. Spurious Signals (Non-Harmonic) Test Setup

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.

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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.

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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

9. 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
   ```

10. 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:

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Carrier Amplitude (dBm) − Spur Absolute Amplitude (dBm) = 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:

    Spur Level (dBc) = −[RF Output at 1 GHz (dBm) − (Spur Level)]

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

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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.

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Related Adjustments

Fractional-N Reference and API Spurs

In Case of Difficulty

Refer to the *Troubleshooting* manual.

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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.

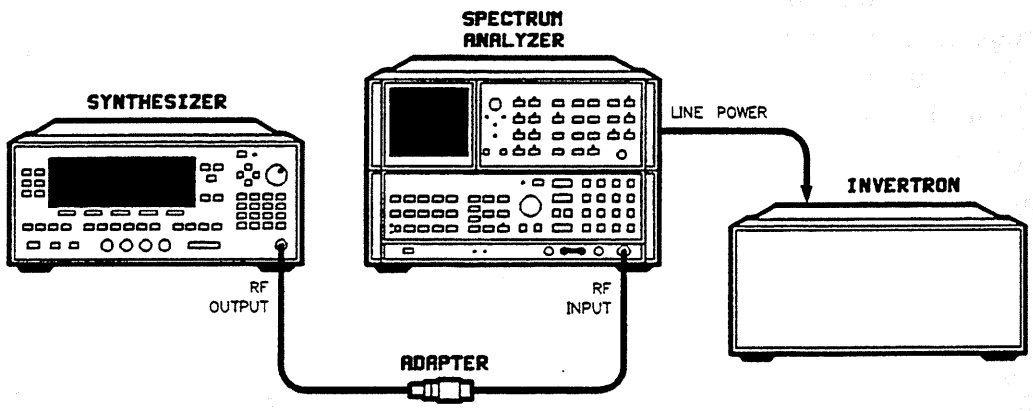


Figure 2-12. Spurious signals (Line-Related) Test Setup

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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:

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```
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:

    Spur Level (dBc) = −[Carrier Amplitude (dBm) − (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

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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.

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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.

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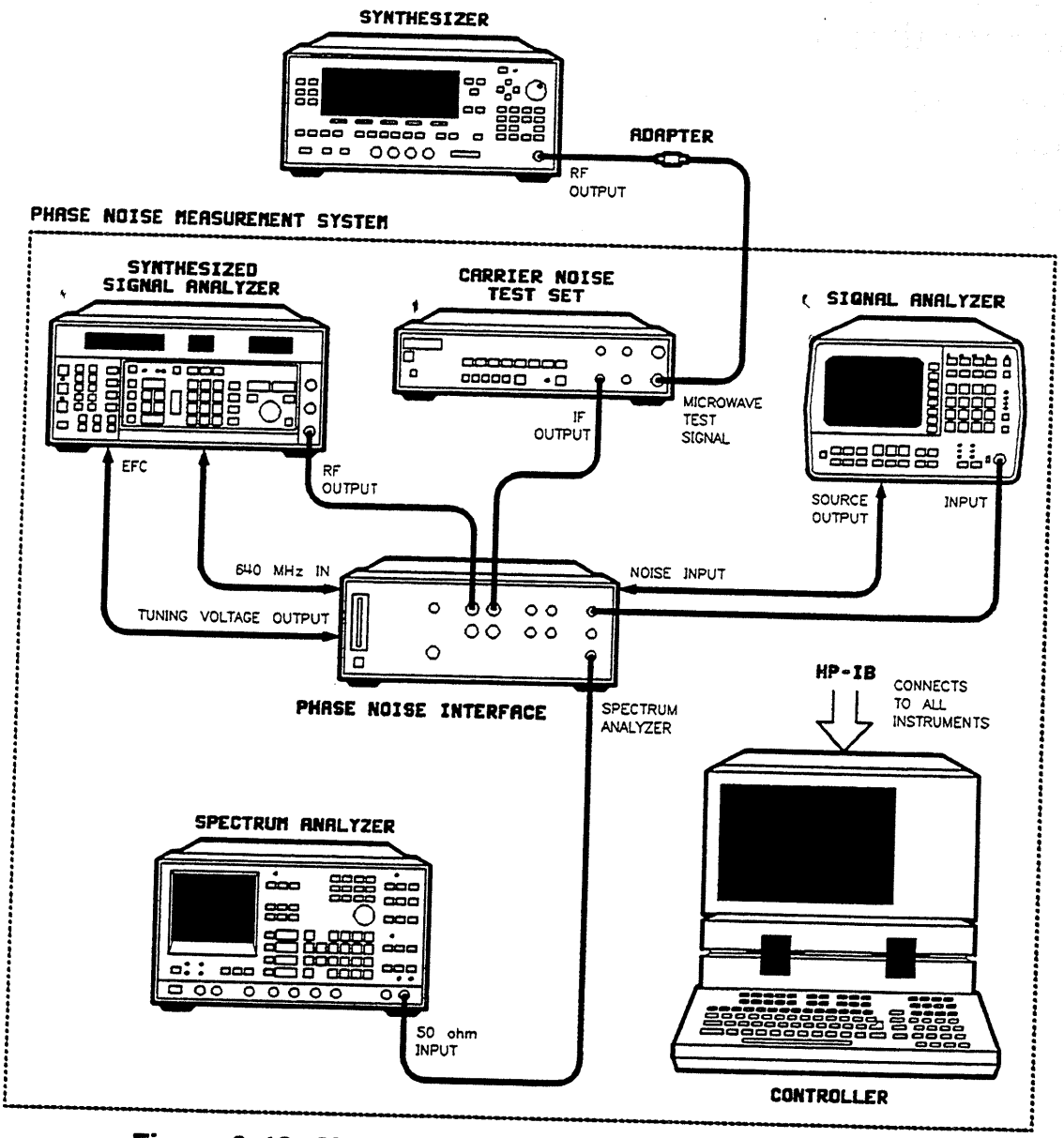


Figure 2-13. Single Sideband Phase Noise Test Setup

Equipment

Phase Noise Measurement System	HP 3048A

2. Load the measurement software for the phase noise measurement system.

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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.

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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:	±10V	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.

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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.

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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.

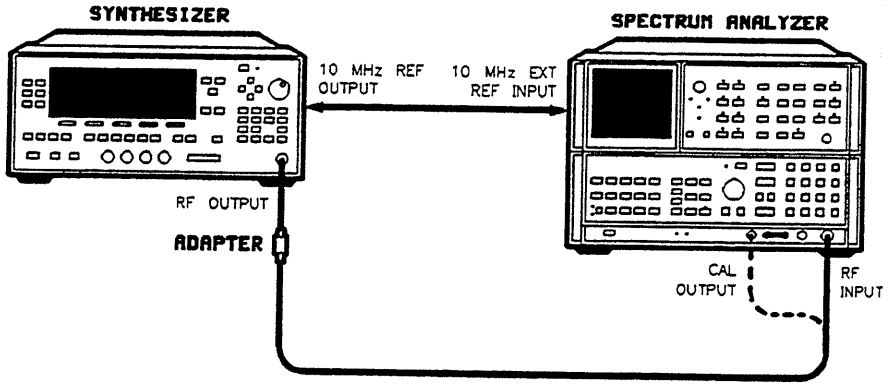


Figure 2-14. Pulse Modulation On/Off Ratio Test Setup

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, press:
   [POWER LEVEL] [0] [dBm]
   for all other synthesizers set the power level to −9.9 dBm, press:
   [POWER LEVEL] [−9.9] [dBm]

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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.

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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.

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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.

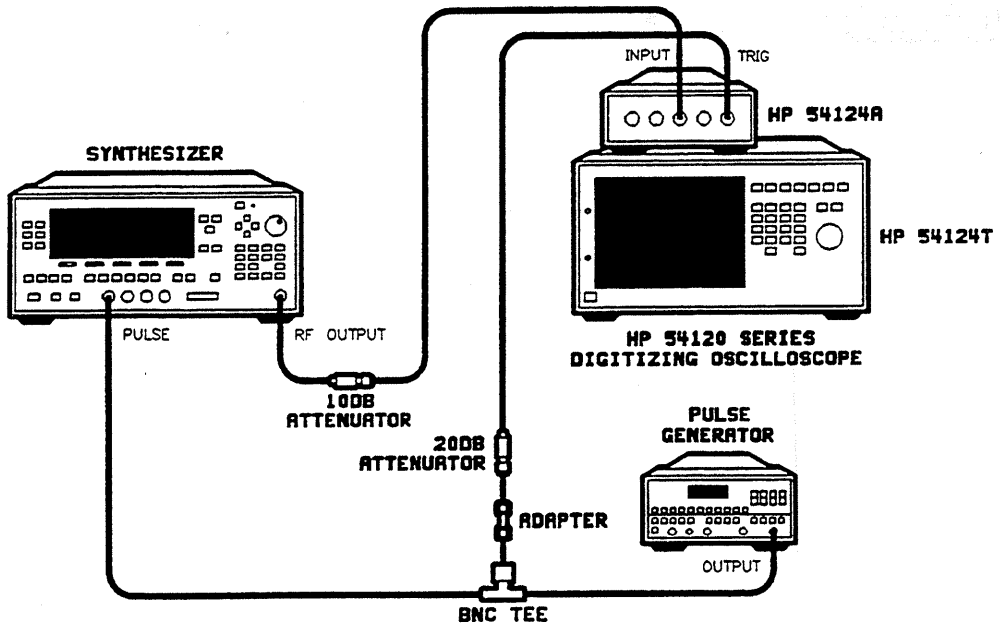


Figure 2-15. Pulse Performance Test Setup

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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.

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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                On
   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
```

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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.

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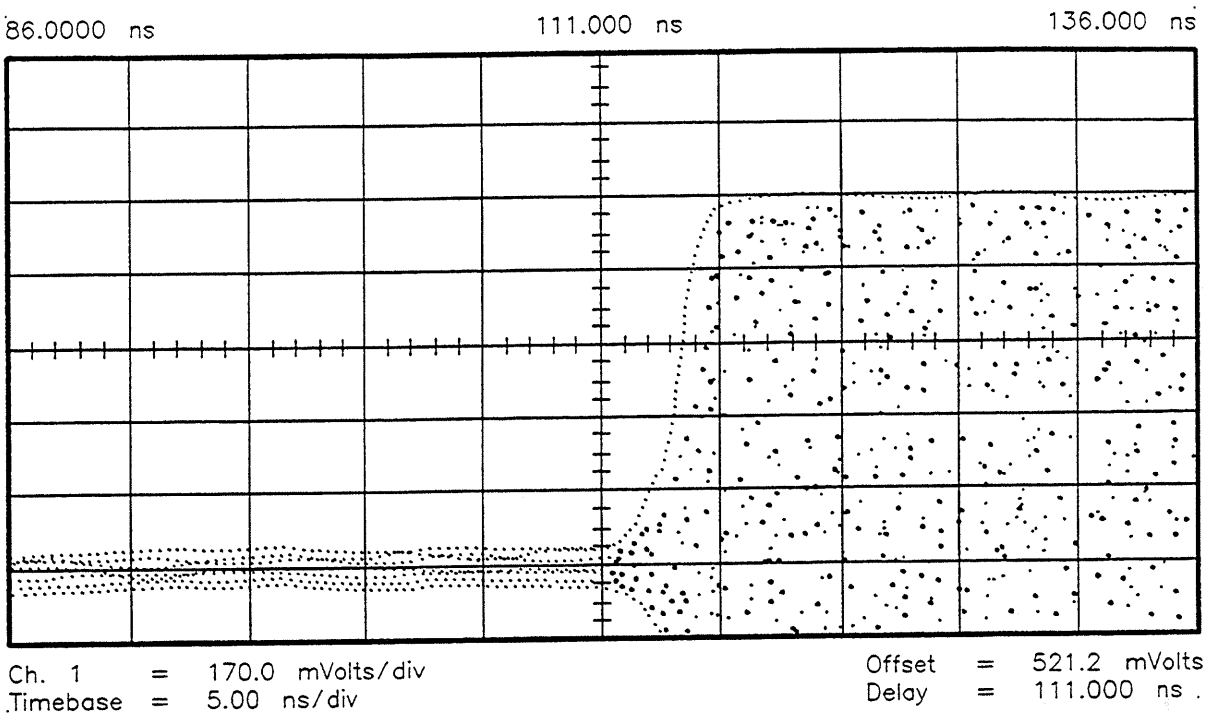


Figure 2-16. Pulse Envelope Displayed Over 5 Divisions

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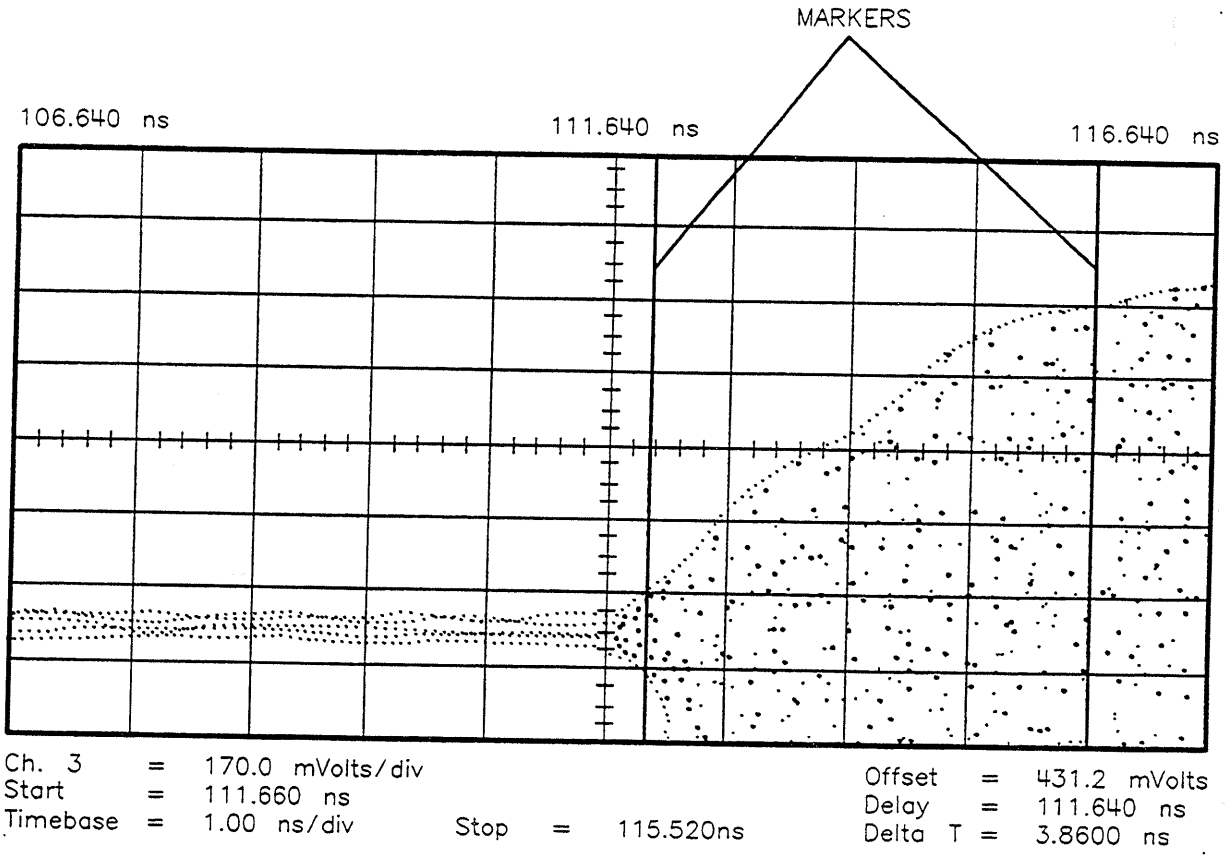


Figure 2-17. Widened Pulse Envelope

7. Adjust the timebase delay to position the falling edge of the pulse near the center of the oscilloscope display.
8. Measure the falltime the same way as you measured the risetime (see step 6). Record this value in Table 2-18.
9. Repeat steps 5 through 8 at each synthesizer frequency in Table 2-18.
10. Record each worst case risetime and falltime value from Table 2-18 on the test record.

Pulse Leveling Accuracy

11. On the pulse generator, set:

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

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12. On the synthesizer, press:
    (CW) First synthesizer frequency in Table 2-18
    (POWER LEVEL) (0) (dBm)
    (ALC) Leveling Mode Normal
    (MOD) Pulse On/Off Extrnl (asterisk on)

    or, for synthesizers with Option 002, press:
    (MOD) Pulse Menu Pulse On/Off Ext (asterisk on)
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.

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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.

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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.

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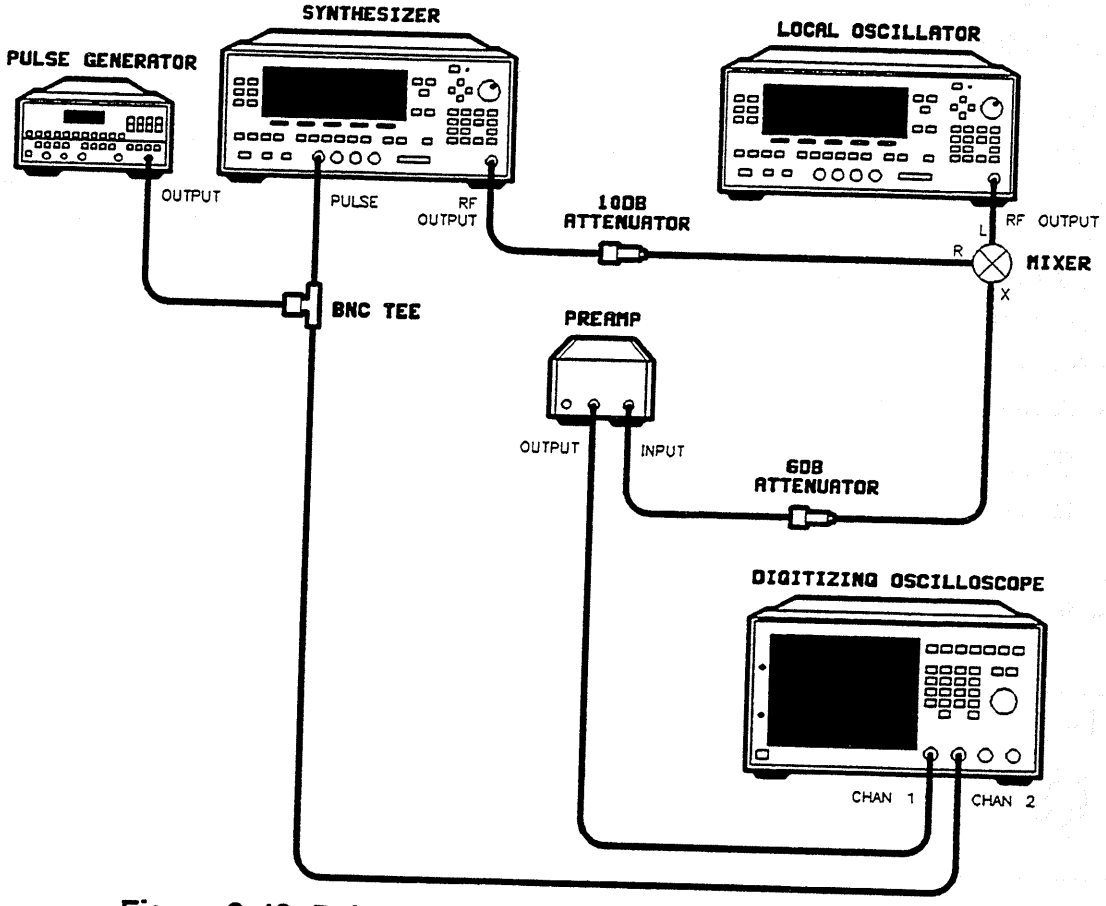


Figure 2-18. Pulse Performance Test Setup < 20 GHz

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.

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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:           On
```

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
```

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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)
8. On the oscilloscope:
   a. Adjust the timebase delay to position the rising edge of the pulsed RF near the center of the display.

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b. Adjust the channel 1 volts/division and offset to obtain a 5 division signal level between the RF power off and the RF power on (see Figure 2-19).
c. Adjust the channel 1 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. 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 2-19.

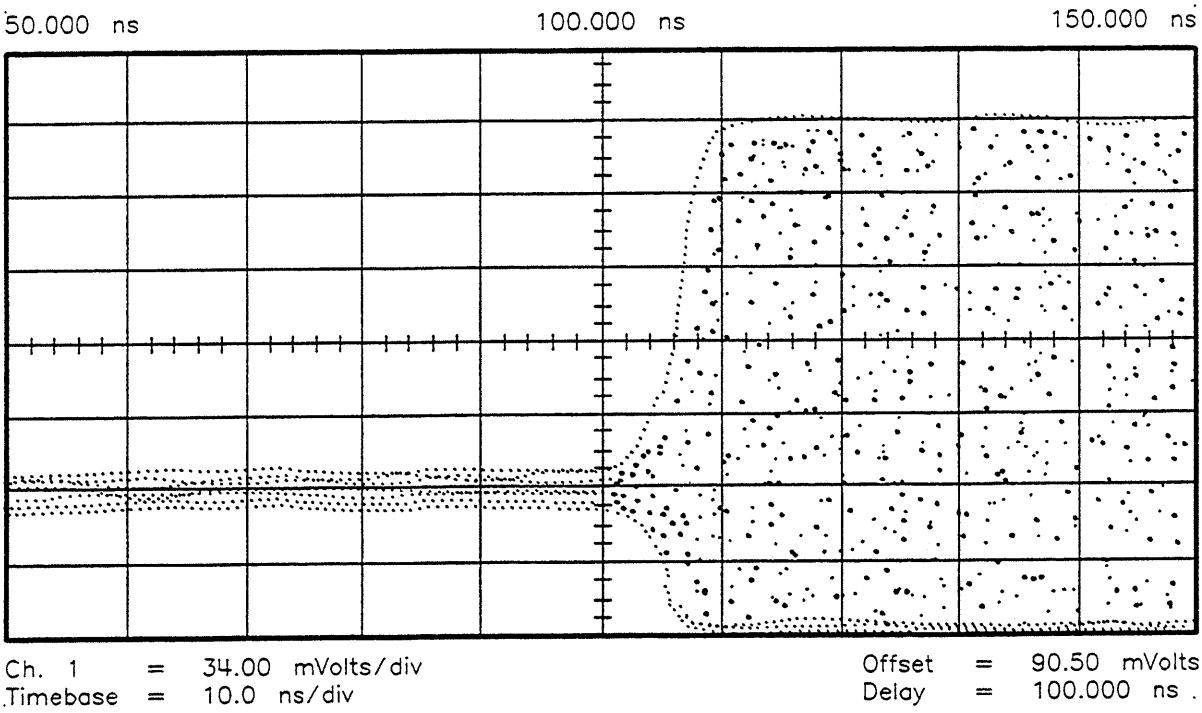


Figure 2-19. Signal Level between RF Power Off and On

9. Adjust the timebase delay to position the falling edge of the pulse near the center of the oscilloscope display.
10. Measure the falltime the same way as you measured the risetime (see step 8). Record this value in Table 2-19.
11. Repeat steps 7 through 10 at each synthesizer and LO frequency in Table 2-19.

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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.

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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.

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Rise and Fall Times > 20 GHz (disregard if beyond your synthesizer's capability)

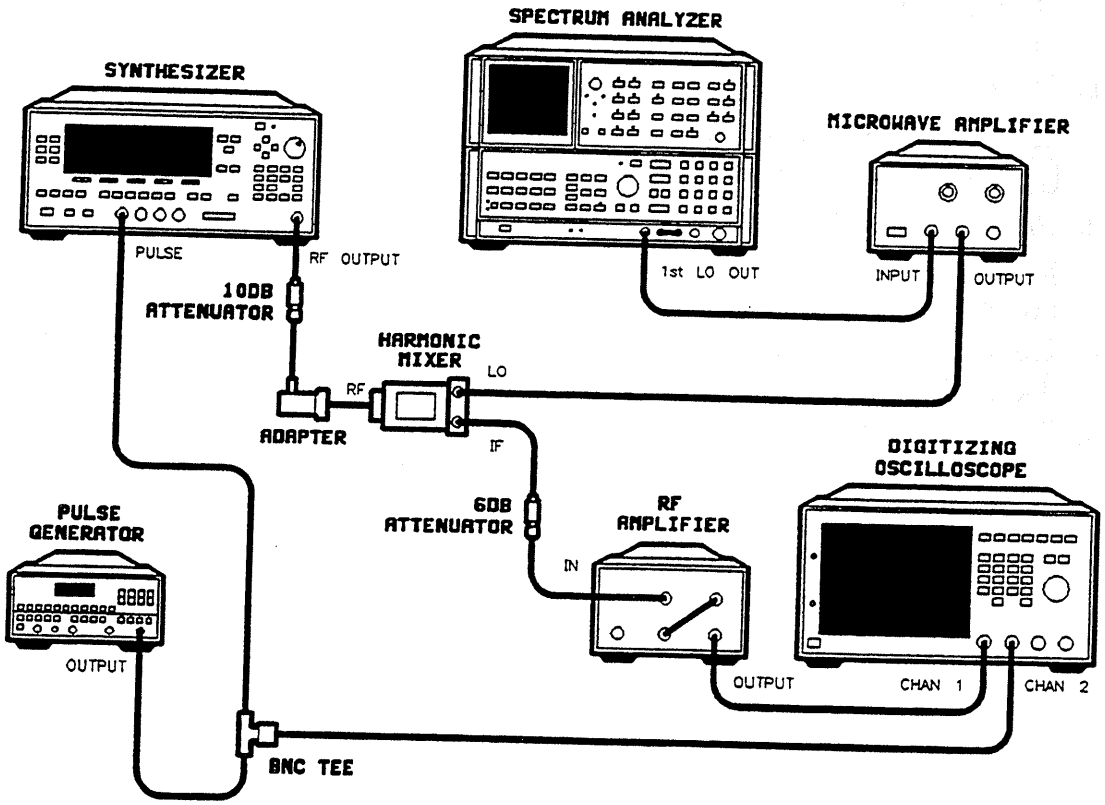


Figure 2-20. Pulse Performance Test Setup >20 GHz

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

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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.

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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.

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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.

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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 Vp/carrier Vp) 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).

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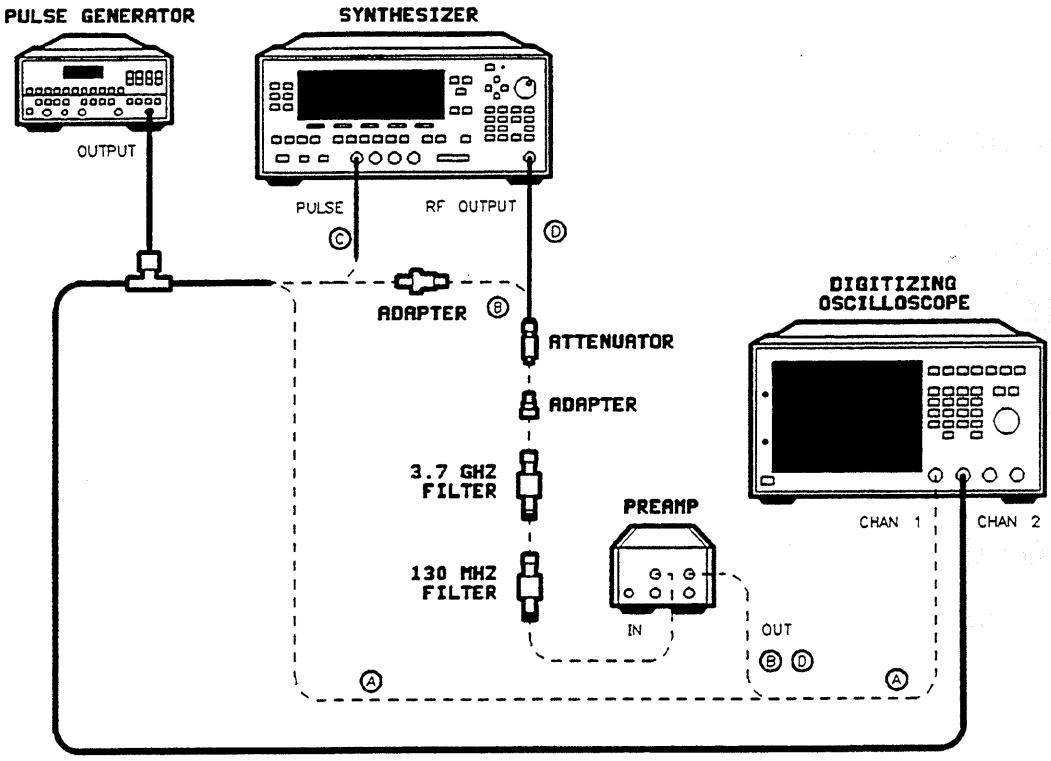


Figure 2-21. Video Feedthrough Test Setup

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)

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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	50Ω
Channel 2:	
Display	Off
Input Impedance	50Ω
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

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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:

$$\text{Video gain} = \frac{\text{system Vp (from step 9)}}{\text{pulse generator Vp}}$$

$$= \frac{\text{system Vp}}{0.1\ \text{Vp}}$$

Video Gain = _____

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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      50Ω
```

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```
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 µs)
Offset:        0V
Amplitude:     5V
```

16. On the oscilloscope, note the maximum voltage from the baseline (see Figure 2-22). Video feedthrough (Vp) = _____Vp

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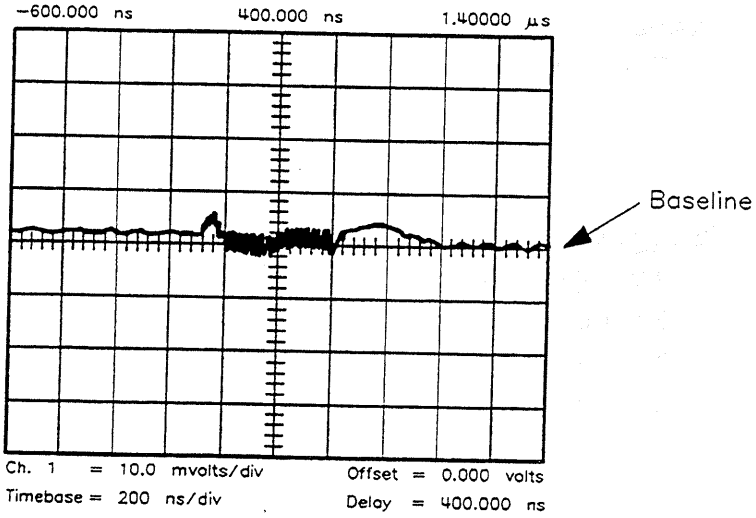


Figure 2-22. Measuring Maximum Voltage from the Baseline Video Feedthrough

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

    Video feedthrough (%) = [(video Vp/carrier Vp)x100]/video gain

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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] Peak Carrier Voltage $= 10\left(\frac{PdBm-10}{20}\right)$

18. Record the video feedthrough (in Table 2-21).

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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.

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Related Adjustments

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

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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.

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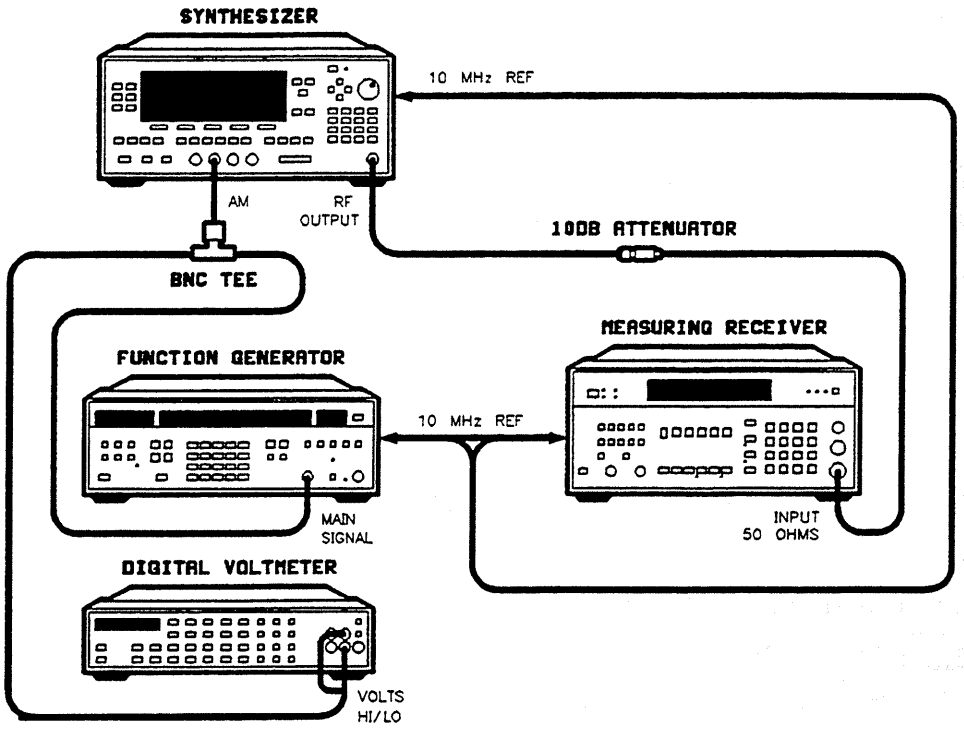


Figure 2-23. AM Accuracy Test Setup Low Band

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
```

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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 x 1.414 x 2 = V p-p).

6. On the measuring receiver, set:

   HP Filter: 300 Hz
   LP Filter: 3 kHz
   Measurement: AM
   Detector: Peak ±/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.

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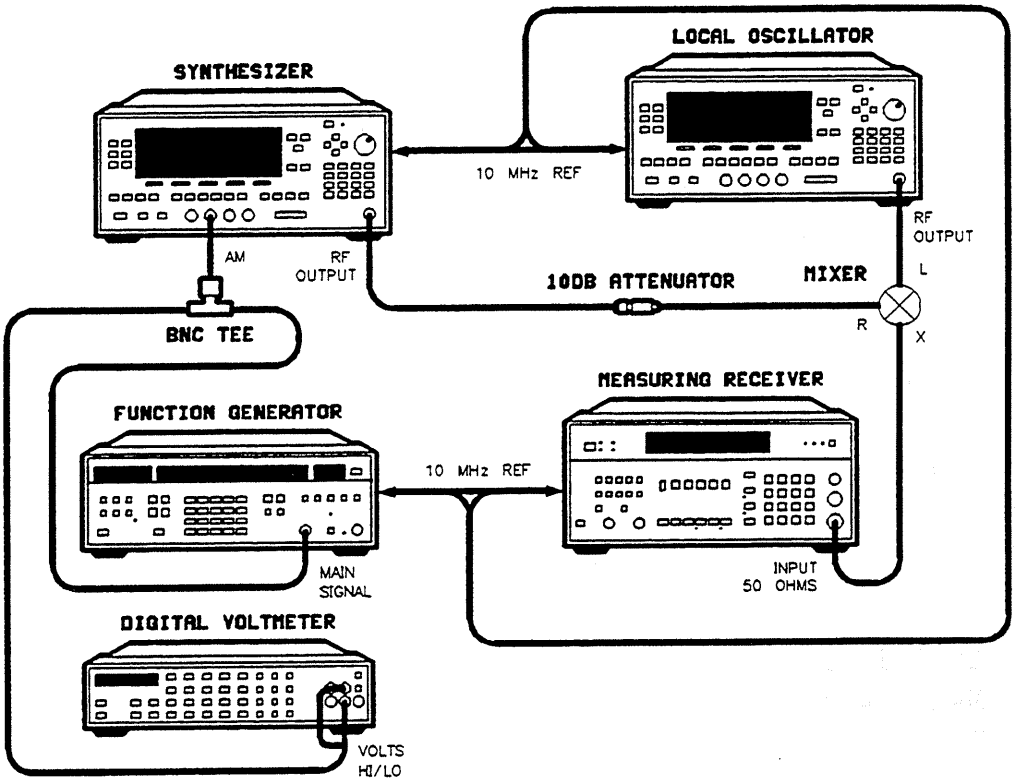


Figure 2-24. AM Accuracy Test Setup < 20 GHz

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:

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```
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 x 1.414 x 2 = V p-p).

16. On the measuring receiver, set:

```
HP Filter:     300 Hz
LP Filter:     3 kHz
Measurement:   AM
Detector:      Peak ±/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.

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> 20 GHz – Doubler Engaged (disregard if beyond your synthesizer's capability)

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

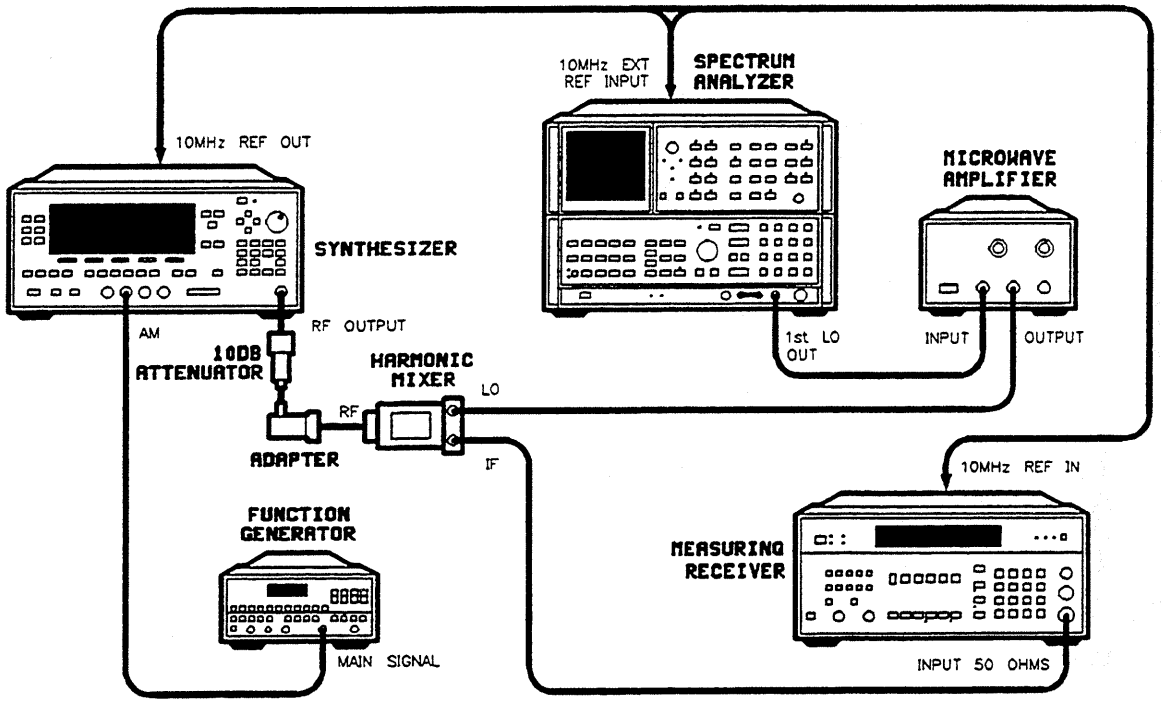


Figure 2-25. AM Accuracy Test Setup > 20 GHz

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)

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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 (1) (kHz)
    Internal AM Depth (30) (enter)
32. On the test record, record the modulation depth as indicated by the measuring receiver.

Related Adjustments

Modulator Offset and Gain

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In Case of Difficulty

1. The AM input impedance is internally selectable to either 50Ω or 2 kΩ (the factory-set value is 50Ω). If the AM input is set for 2 kΩ, 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.

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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.

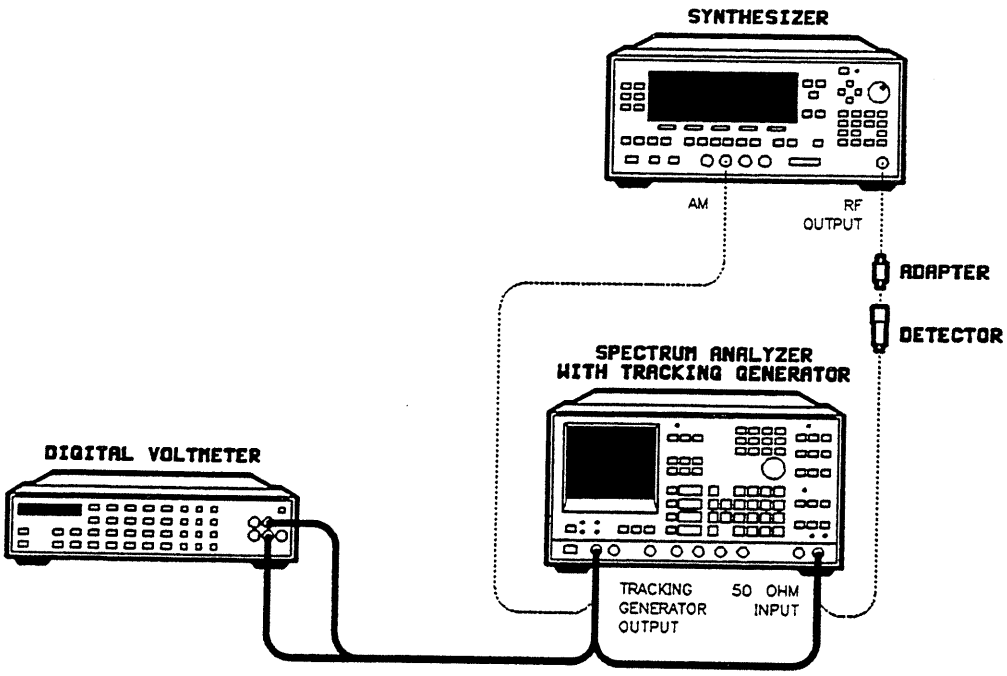


Figure 2-26. AM Bandwidth Test Setup

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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)`

3. 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.
4. 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.
5. 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.
6. 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`

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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.

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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.

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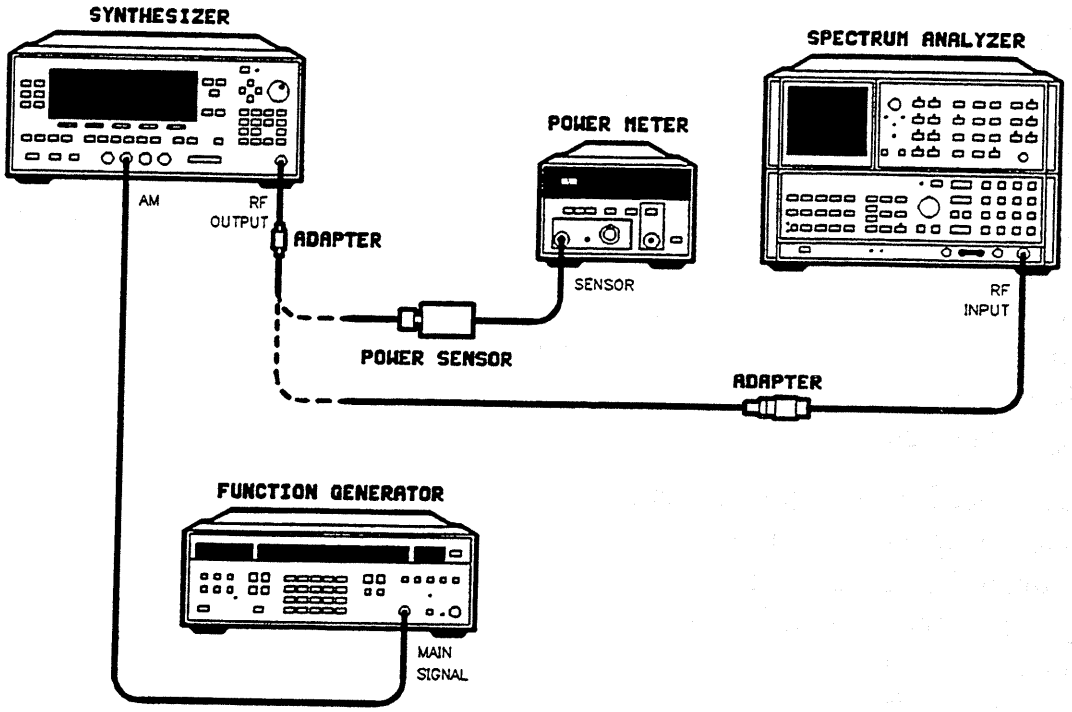


Figure 2-27. AM Dynamic Range Test Setup

Equipment

Spectrum Analyzer	HP 8566B
Digital Voltmeter	HP3456A
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)

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

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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.

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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
```

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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).

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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.

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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.

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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.

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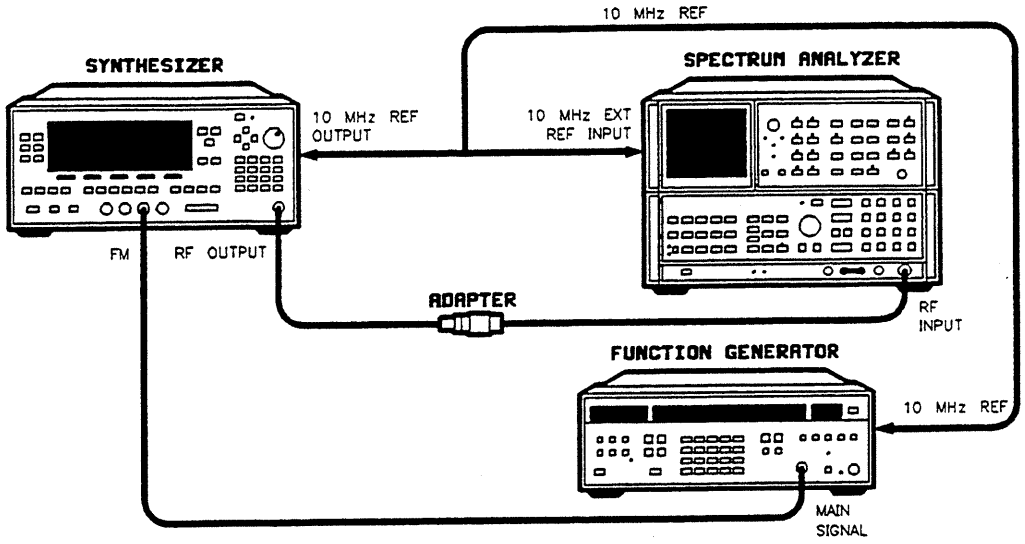


Figure 2-28. FM Accuracy Test Setup

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

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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:

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Error (%) = [(480.8 mV p-p − New Amplitude)/480.8 mV p-p] x 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:

    Error (%) = [(2.404 MHz − New FM Deviation)/2.404 MHz] x 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.

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Related Adjustments

FM Gain
Modulation Generator (Option 002)
Modulation Generator Flatness (Option 002)

In case of Difficulty

Refer to the *Troubleshooting* manual.

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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
   ```

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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

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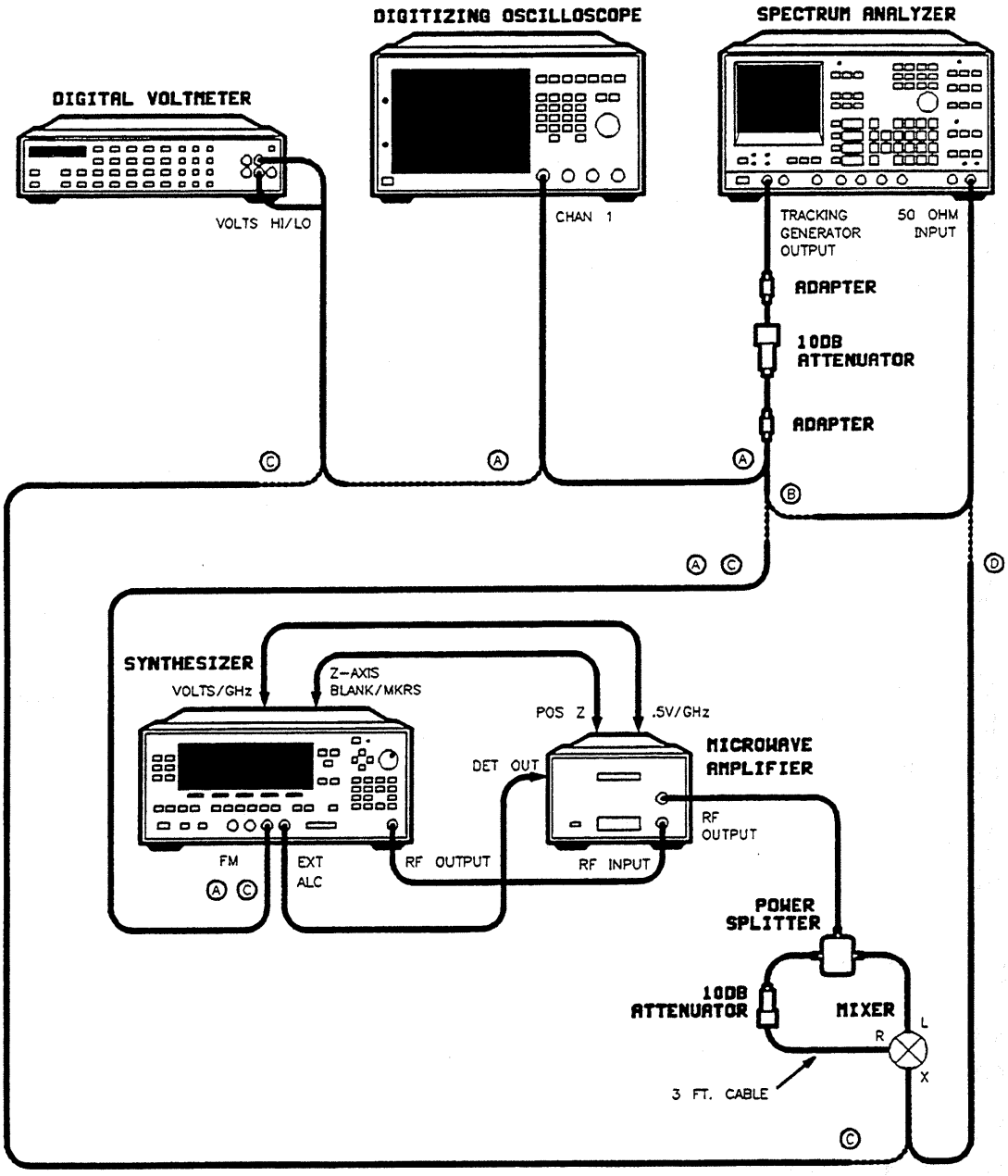


Figure 2-29. FM Bandwidth Test Setup

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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.

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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.

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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.

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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.

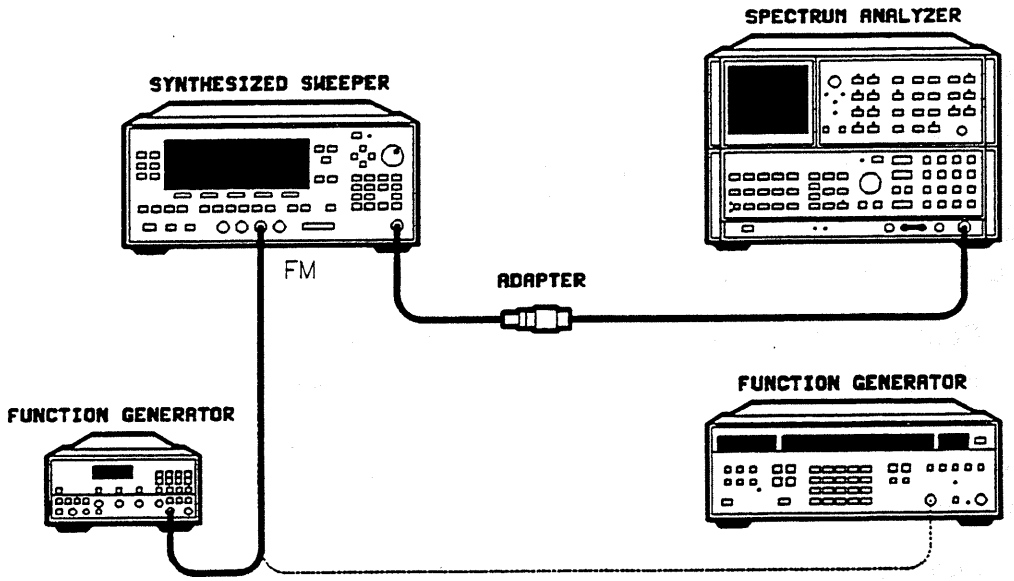


Figure 2-30. Maximum FM Deviation Test Setup

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Equipment

Spectrum Analyzer	HP 8566B
Function Generator	HP 3325A
Function Generator	HP 8111A

DC FM (≤100 Hz)

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)

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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.

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.

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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)

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
    ```

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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:

    Max FM Deviation = (Actual FM Sensitivity)[(1.414)(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.

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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	577.9	1.2226	1.268V
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.

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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.

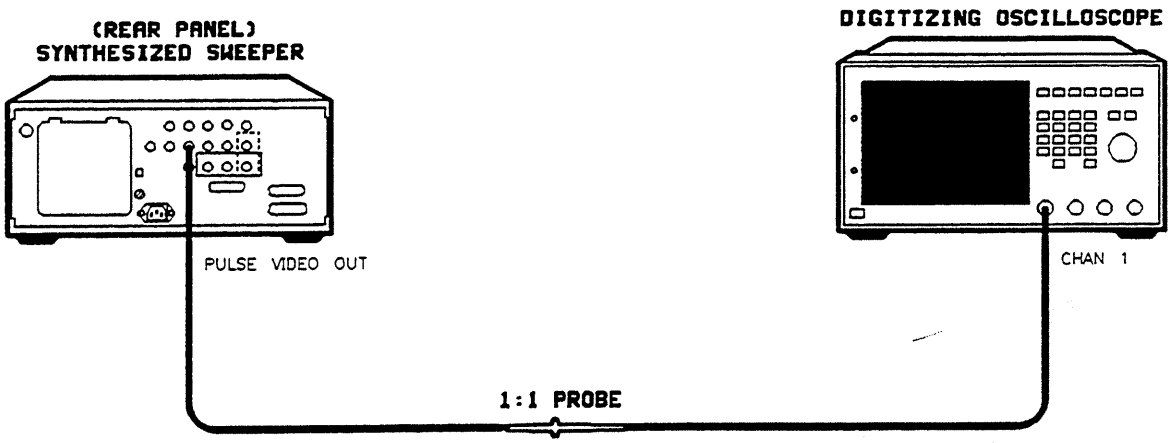


Figure 2-31. Pulse Accuracy Test Setup

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:`

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

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` 50 ns
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.

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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.

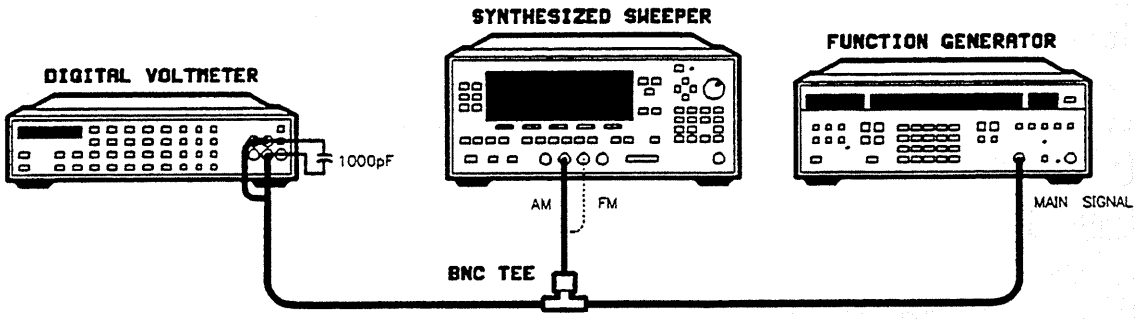


Figure 2-32. Modulation Meter Test Setup

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.

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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.

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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:

_____

_____

_____

_____

_____

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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.			

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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		_____	$5x10^{-10}$/day	$\pm5.6x10^{-11}$
2.	Swept Frequency Accuracy				
	Worst Case Value:				
	10. Start Freq _____		_____	0.1% of	±0.005% of
	Stop Freq _____			sweep	sweep
3.	Frequency Switching Time				
	8. CW Step		_____	50 ms	±10 μs
	16. Stepped Sweep		_____	5 ms	±1 μs
	25. Frequency List		_____	50 ms	±10 μs
4.	Power Accuracy				
	14. > −10 dBm:				
	< 2 GHz	−0.6 dB	_____	+0.6 dB	±0.19 dB
	≥ 2 and ≤ 20 GHz	−0.7 dB	_____	+0.7 dB	±0.35 dB
	> +10 dBm:				
	< 2 GHz	−1.2 dB	_____	+1.2 dB	±0.21 dB
	≥ 2 and ≤ 20 GHz	−1.3 dB	_____	+1.3 dB	±0.46 dB
5.	Power Flatness				
	5. < 2 GHz		_____	1.0 dB	0.13 dB
	≥ 2 and ≤ 20 GHz		_____	1.2 dB	0.25 dB
6.	Maximum Leveled Power				
	Standard or Opt. 006:				
	6. ≤ 20 GHz	+13 dBm	_____		±1.8 dB
	Opt. 001 or Opts. 001 and 006:				
	6. ≤ 20 GHz	+11.5 dBm	_____		±1.8 dB

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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	_____		±3 μV
	10. Maximum Power		_____	−0.5 V	±20 μV
8.	Spurious Signals: Harmonic				
	Harmonics (Standard):				
	8. 0.01 to < 2.2 GHz	−30 dBc	_____		±1.75 dB
	8. 2 to < 2.2 GHz	−30 dBc	_____		±1.75 dB
	12. ≥ 2.2 and ≤ 20 GHz	−50 dBc	_____		±1.75 dB
	Harmonics (Opt. 006):				
	8. < 50 MHz	−20 dBc	_____		±1.75 dB
	8. ≥ 50 MHz to < 2.2 GHz	−30 dBc	_____		±1.75 dB
	12. ≥ 2.2 and ≤ 20 GHz	−60 dBc	_____		±1.75 dB
	Subharmonics:				
	12. ≥ 7 and ≤ 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
	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

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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.

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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%

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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

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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:				
	> ±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:				
	> ±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%	±0.6%
	7. AM Meter	85%	_____	95%	±0.6%
	11. FM Meter	4.95 MHz	_____	5.05 MHz	±15 kHz
	13. FM Meter	950 kHz	_____	1.05 MHz	±10 kHz

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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:

_____

_____

_____

_____

_____

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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.			

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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	$\pm5.6x10^{-11}$
2.	Swept Frequency Accuracy				
	Worst Case Value:				
	10. Start Freq _____		_____	0.1% of	±0.005% of
	Stop Freq _____			sweep	sweep
3.	Frequency Switching Time				
	8. CW Step		_____	50 ms	±10 μs
	16. Stepped Sweep		_____	5 ms	±1 μs
	25. Frequency List		_____	50 ms	±10 μs
4.	Power Accuracy				
	14. > −10 dBm:				
	< 2 GHz	−0.6 dB	_____	+0.6 dB	±0.19 dB
	≥ 2 and ≤ 20 GHz	−0.7 dB	_____	+0.7	±0.35 dB
	> +10 dBm:				
	< 2 GHz	−1.2 dB	_____	+1.2 dB	±0.21 dB
	≥ 2 and ≤ 20 GHz	−1.3 dB	_____	+1.3 dB	±0.46 dB
5.	Power Flatness				
	5. < 2 GHz		_____	1.0 dB	0.13 dB
	≥ 2 and ≤ 20 GHz		_____	1.2 dB	0.25 dB
6.	Maximum Leveled Power				
	6. HP 83623A:				
	Standard or Opt. 006	+17 dBm	_____		±1.8 dB
	Opt. 001 or Opts. 001 and 006	+15.5 dBm	_____		±1.8 dB
	6. HP 83624A:				
	Standard	+20 dBm	_____		±1.8 dB
	Option 006	+17 dBm	_____		±1.8 dB

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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

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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.

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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%

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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%
	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				
	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

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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:				
	> ±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:				
	> ±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%	±0.6%
	7. AM Meter	85%	_____	95%	±0.6%
	11. FM Meter	4.95 MHz	_____	5.05 MHz	±15 kHz
	13. FM Meter	950 kHz	_____	1.05 MHz	±10 kHz

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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:

_____

_____

_____

_____

_____

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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.			

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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		_____	$5x10^{-10}$/day	$\pm5.6x10^{-11}$
2.	Swept Frequency Accuracy				
	Worst Case Value:				
	10. Start Freq _____		_____	0.1% of	±0.005% of
	Stop Freq _____			sweep	sweep
3.	Frequency Switching Time				
	8. CW Step		_____	50 ms	±10 μs
	16. Stepped Sweep		_____	5 ms	±1 μs
	25. Frequency List		_____	50 ms	±10 μs
4.	Power Accuracy				
	14. > −10 dBm:				
	< 2 GHz	−0.6 dB	_____	+0.6 dB	±0.19 dB
	≥ 2 and ≤ 20 GHz	−0.7 dB	_____	+0.7 dB	±0.35 dB
	> 20 and ≤ 26.5 GHz	−0.9 dB	_____	+0.9 dB	±0.38 dB
	> +10 dBm:				
	< 2 GHz	−1.2 dB	_____	+1.2 dB	±0.21 dB
	≥ 2 and ≤ 20 GHz	−1.3 dB	_____	+1.3 dB	±0.46 dB
5.	Power Flatness				
	5. < 2 GHz		_____	1.0 dB	0.13 dB
	≥ 2 and ≤ 20 GHz		_____	1.2 dB	0.25 dB
	> 20 and ≤ 26.5 GHz		_____	1.6 dB	0.27 dB
6.	Maximum Leveled Power				
	Standard or Opt. 006:				
	0.01 to ≤ 26.5 GHz	+10.0 dBm	_____		±1.7 dB
	0.01 to ≤ 20 GHz	+13.0 dBm	_____		±1.7 dB

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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 ≤ 26.5 GHz	+8.0 dBm	_____		±1.7 dB
	0.01 to ≤ 20 GHz	+11.5 dBm	_____		±1.7 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. 0.01 to < 2.2 GHz	−30 dBc	_____		±1.75 dB
	21. ≥ 2.2 and ≤ 26.5 GHz	− 50 dBc	_____		±1.75 dB
	Harmonics (Opt. 006):				
	8. < 50 MHz	−20 dBc	_____		±1.75 dB
	8. ≥ 50 MHz to < 2.2 GHz	−30 dBc	_____		±1.75 dB
	12. ≥ 2.2 and ≤ 26.5 GHz	−60 dBc	_____		±1.75 dB
	Subharmonics				
	12. ≥ 7 and ≤ 20 GHz	−50 dBc	_____		±1.75 dB
	21. > 20 and ≤ 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

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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.

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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%

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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

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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:				
	> ±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:				
	>±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%	±0.6%
	7. AM Meter	85%	_____	95%	±0.6%
	11. FM Meter	4.95 MHz	_____	5.05 MHz	±15 kHz
	13. FM Meter	950 kHz	_____	1.05 MHz	±10 kHz

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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:

_____

_____

_____

_____

_____

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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.			

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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		_____	$5x10^{-10}$/day	$\pm5.6x10^{-11}$
2.	Swept Frequency Accuracy				
	Worst Case Value:				
	10. Start Freq _____		_____	0.1% of	±0.005% of
	Stop Freq _____			sweep	sweep
3.	Frequency Switching Time				
	8. CW Step		_____	50 ms	±10 μs
	16. Stepped Sweep		_____	5 ms	±1 μs
	25. Frequency List		_____	50 ms	±10 μs
4.	Power Accuracy				
	14. > −10 dBm:				
	< 2 GHz	−0.6 dB	_____	0.6 dB	±0.22 dB
	≥ 2 and ≤ 20 GHz	−0.7 dB	_____	0.7 dB	±0.35 dB
	> 20 and ≤ 40 GHz	−0.9 dB	_____	0.9 dB	±0.38 dB
5.	Power Flatness				
	5. < 2 GHz		_____	1.0 dB	0.15 dB
	≥ 2 and ≤ 20 GHz		_____	1.2 dB	0.25 dB
	> 20 and ≤ 40 GHz		_____	1.8 dB	0.27 dB
6.	Maximum Leveled Power				
	Standard or Opt. 006:				
	0.01 to ≤ 40 GHz	+6.0 dBm	_____		±1.4 dB
	0.01 to < 26.5 GHz	+10.0 dBm	_____		±1.8 dB
	0.01 to < 20 GHz	+10.0 dBm	_____		±1.8 dB

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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 ≤ 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 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 and < 2.2 GHz	−30 dBc	_____		±1.75 dB
	21. ≥ 2.2 and < 26.5 GHz	−50 dBc	_____		±1.75 dB
	37. ≥ 26.5 to 40 GHz	−40 dBc	_____		±1.75 dB
	Subharmonics:				
	12. ≥ 7 and ≤ 20 GHz	−50 dBc	_____		±1.75 dB
	29. > 20 and ≤ 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

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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
	20. Low Band Mixer Spur	−60 dBc	_____		±1.85 dB
10.	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.

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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%

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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

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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:				
	> ±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:				
	> ±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%	±0.6%
	7. AM Meter	85%	_____	95%	±0.6%
	11. FM Meter	4.95 MHz	_____	5.05 MHz	±15 kHz
	13. FM Meter	950 kHz	_____	1.05 MHz	±10 kHz

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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:

_____

_____

_____

_____

_____

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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.			

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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		_____	$5x10^{-10}$/day	$\pm5.6x10^{-11}$
2.	Swept Frequency Accuracy				
	Worst Case Value:				
	10. Start Freq _____		_____	0.1% of	±0.005% of
	Stop Freq _____			sweep	sweep
3.	Frequency Switching Time				
	8. CW Step:		_____	50 ms	±10 μs
	16. Stepped Sweep		_____	5 ms	±1 μs
	25. Frequency List		_____	50 ms	±10 μs
4.	Power Accuracy				
	14. > −10 dBm:				
	< 2 GHz	−0.6 dB	_____	0.6 dB	±0.22 dB
	≥ 2 and ≤ 20 GHz	−0.7 dB	_____	0.7 dB	±0.35 dB
	> 20 and ≤ 40 GHz	−0.9 dB	_____	0.9 dB	±0.38 dB
	> 40 GHz	−1.7 dB	_____	1.7 dB	±0.79 dB
5.	Power Flatness				
	5. < 2 GHz		_____	1.0 dB	0.15 dB
	≥ 2 and ≤ 20 GHz		_____	1.2 dB	0.25 dB
	> 20 and ≤ 40 GHz		_____	1.6 dB	0.38 dB
	> 40 GHz		_____	3.0 dB	0.57 dB
6.	Maximum Leveled Power				
	Standard or Opt. 006:				
	0.01 to ≤ 50 GHz	+2.5 dBm	_____		±2.3 dB
	0.01 to < 40 GHz	+5.0 dBm	_____		±1.3 dB
	0.01 to < 26.5 GHz	+10.0 dBm	_____		±1.7 dB
	0.01 to < 20 GHz	+10.0 dBm	_____		± 1.7 dB

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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 ≤ 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 μV
	10. Maximum Power		_____	−0.5 V	±20 μV
8.	Spurious Signals: Harmonic				
	Harmonics:				
	8. < 50 MHz	−20 dBc	_____		±1.75 dB
	8. ≥ 50 MHz to < 2.2 GHz	−30 dBc	_____		±1.75 dB
	21. ≥ 2.2 to ≤ 26.5 GHz	−50 dBc	_____		±1.75 dB
	37. 26.5 to 50 GHz	−40 dBc	_____		±2.22 dB
	Subharmonics:				
	12. ≥ 7 to ≤ 20 GHz	−50 dBc	_____		±1.75 dB
	29. > 20 to ≤ 40 GHz	−40 dBc	_____		±1.55 dB
	37. > 40 to ≤ 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

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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
	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]
	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.

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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%

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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

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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:				
	> ±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:				
	> ±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%	±0.6%
	7. AM Meter	85%	_____	95%	±0.6%
	11. FM Meter	4.95 MHz	_____	5.05 MHz	±15 kHz
	13. FM Meter	950 kHz	_____	1.05 MHz	±10 kHz

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3

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 "Calibration Constants" in this manual for instructions.

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Equipment Required

The equipment required to perform the adjustments in this chapter is listed in the "Equipment Required" chapter of this manual. 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



Voltages in the instrument can cause personal injury; be extremely careful. Capacitors can be charged even if the instrument has been disconnected from line power.

This chapter contains the following adjustments:

- 10 MHz Standard
- Fractional-N VCO
- Fractional-N Reference and API Spurs
- Sweep Ramp
- Sampler Assembly
- YO Driver +10V Reference
- YO Driver Gain and Linearity
- YO Loop Gain
- Amplifier/Multiplier Adjustments
- Amplifier/Filter Adjustments
- Low Power SRD Bias
- Modulator Offset and Gain
- ALC Power Level Accuracy
- Power Flatness
- AM/FM DAC Offset and Gain (Option 002)
- AM Accuracy
- AM Delay

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- FM Gain
- Square Wave Symmetry
- AM Input Impedance
- FM Input Impedance
- Modulation Generator Flatness (Option 002)
- External Trigger Edge Selection
- Volts/GHz

For the following adjustments, see "Automated Tests":

- YO Delay Adjustment.
- ADC Adjustment.
- Power Flatness.

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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

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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.

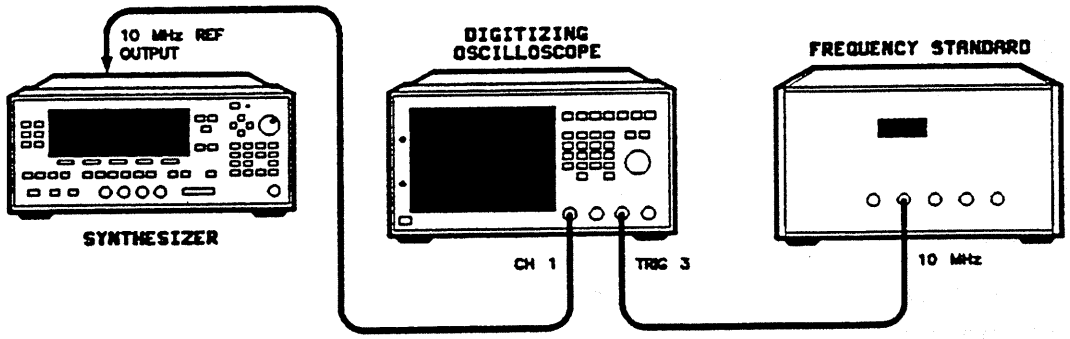


Figure 3-1. 10 MHz Standard Adjustment Setup

Equipment

Digitizing Oscilloscope	HP 54111D
Frequency Standard	HP 5061A

Note

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

2. On the oscilloscope, set:

```
Channel 1:
   Display            On
   Volts/Division     200 mV
   Input Coupling     dc
   Input Impedance    50Ω

Channel 2:
```

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```
   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.

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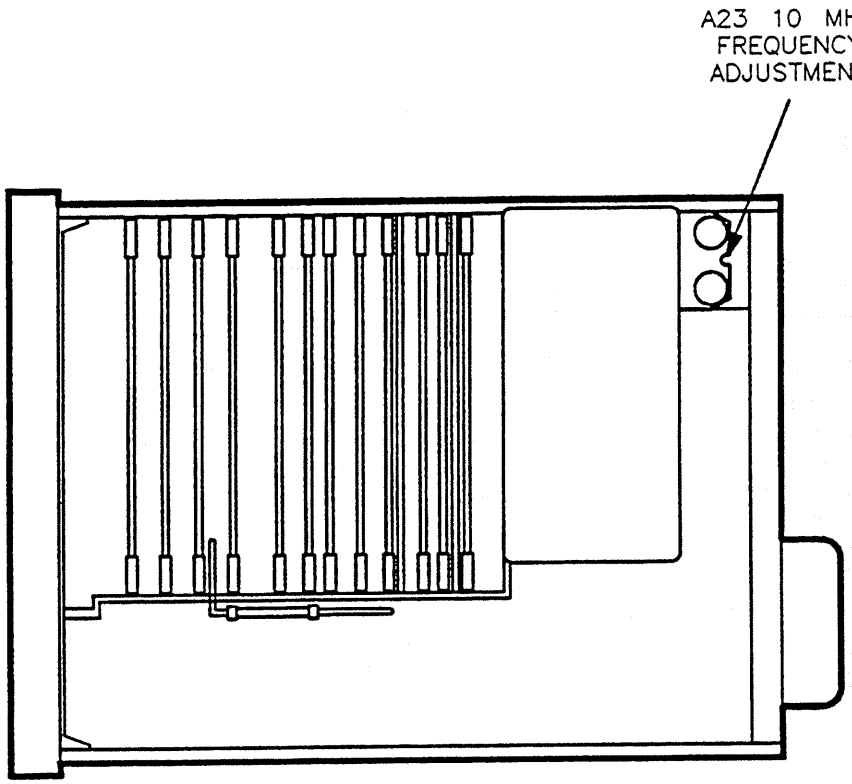


Figure 3-2. 10 MHz Standard Adjustment Location

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.

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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.

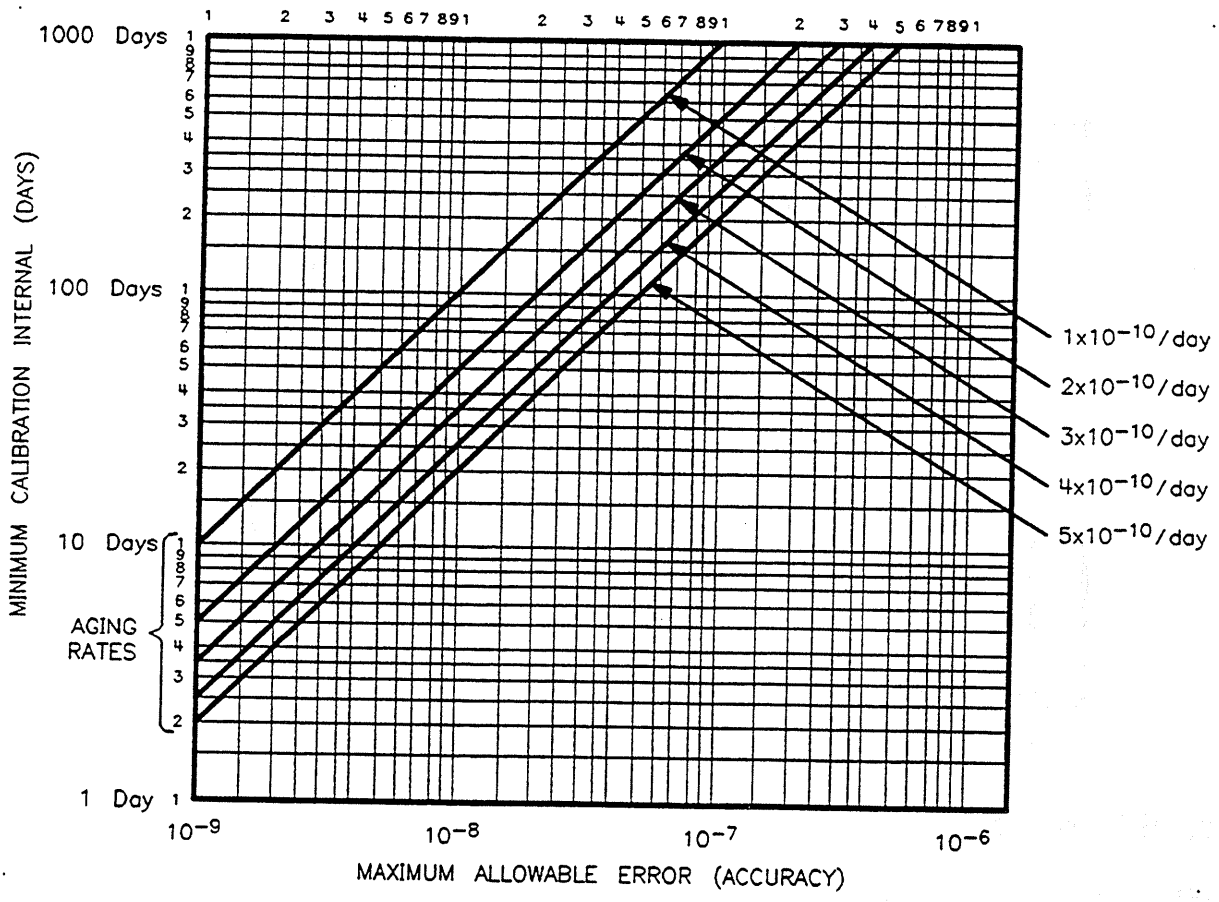


Figure 3-3. Accuracy Versus Adjustment Interval

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.

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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:

$$\frac{\text{maximum allowable error}}{\text{known aging rate (per day)}} = \text{calibration interval in days}$$

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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.

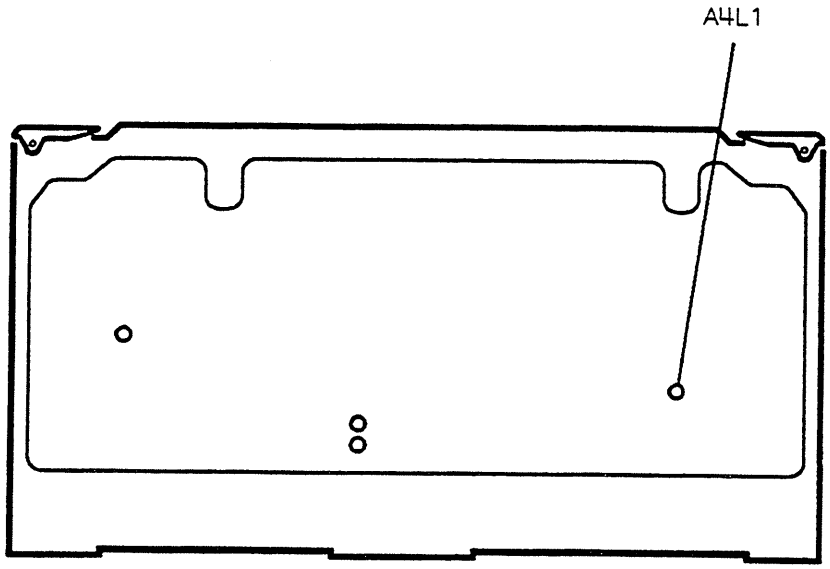


Figure 3-4. A4L1 Location

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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.

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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.

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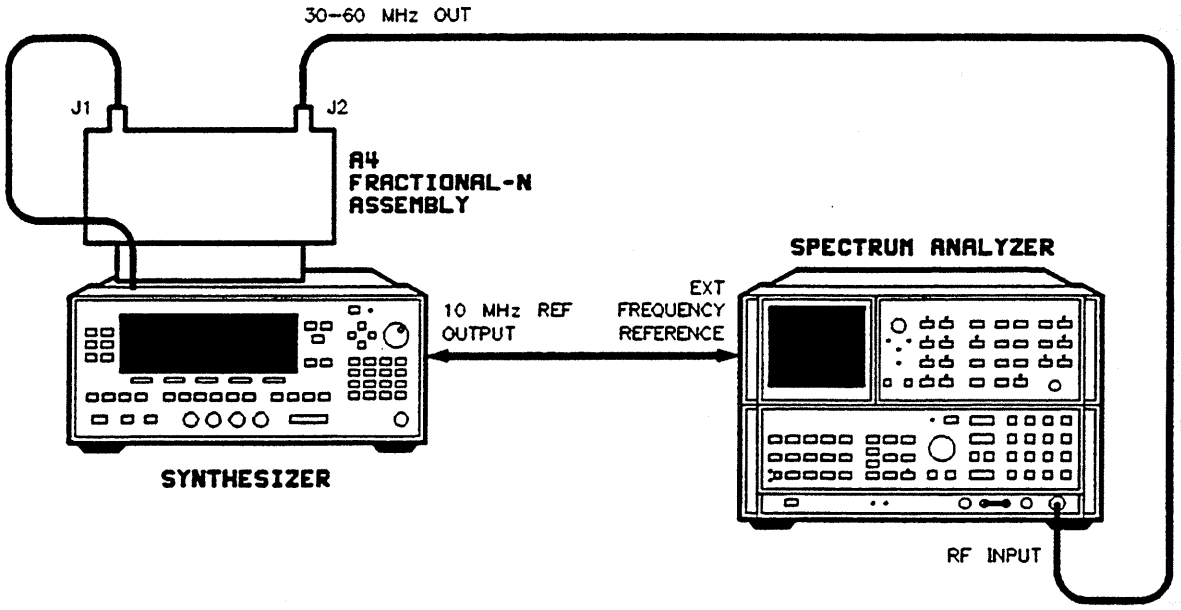


Figure 3-5. Fractional-N Reference and API Spur Adjustment Setup

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

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125 kHz Reference Spur Adjustment

3. On the synthesizer, press:
   CW
   SERVICE Tools Menu CntlPLL 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.

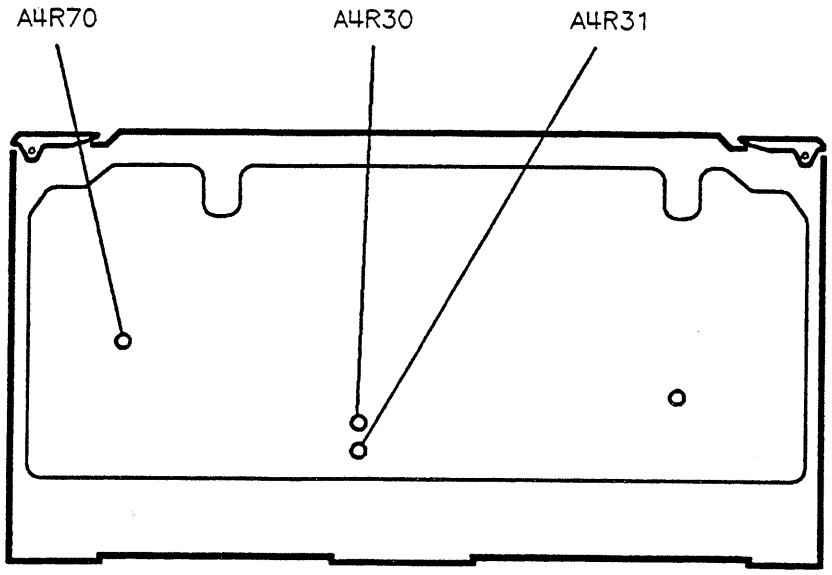


Figure 3-6. Fractional-N Reference and API Spurs Adjustment Locations

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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: (44.005) (MHz)
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 (44.0005) (MHz)
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.

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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.

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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.

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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.

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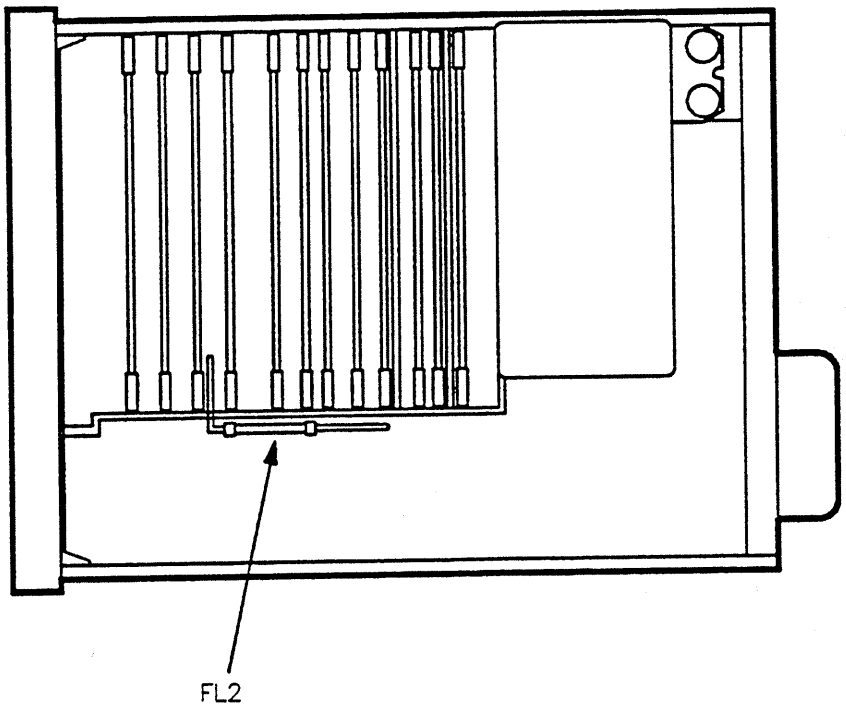


Figure 3-7. FL2 Location

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.

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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.

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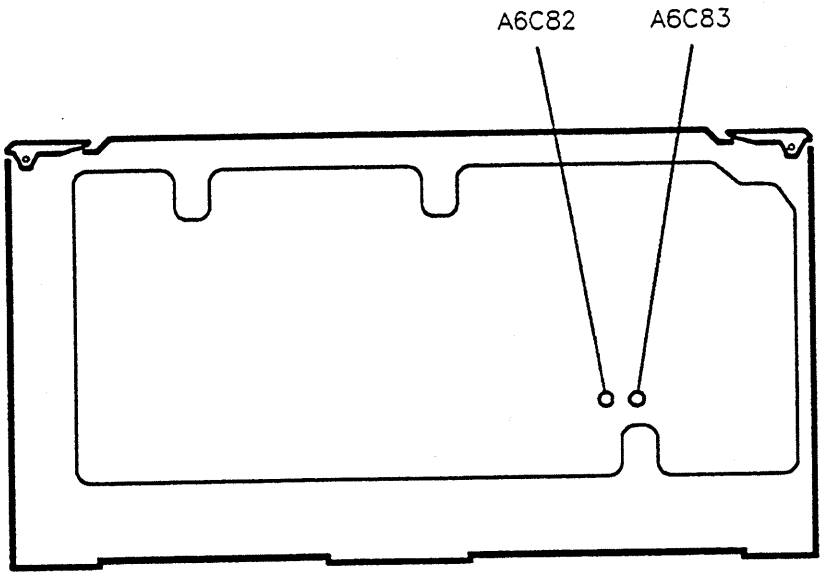


Figure 3-8. Sampler Match Adjustment Locations

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.

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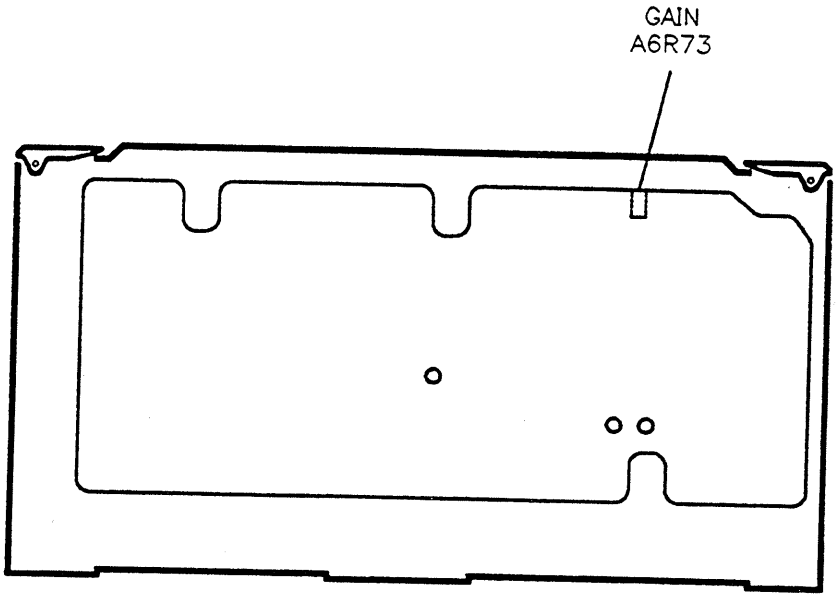


Figure 3-9. IF Gain Adjustment Location

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.

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4. Refer to the *Troubleshooting* manual.

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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.

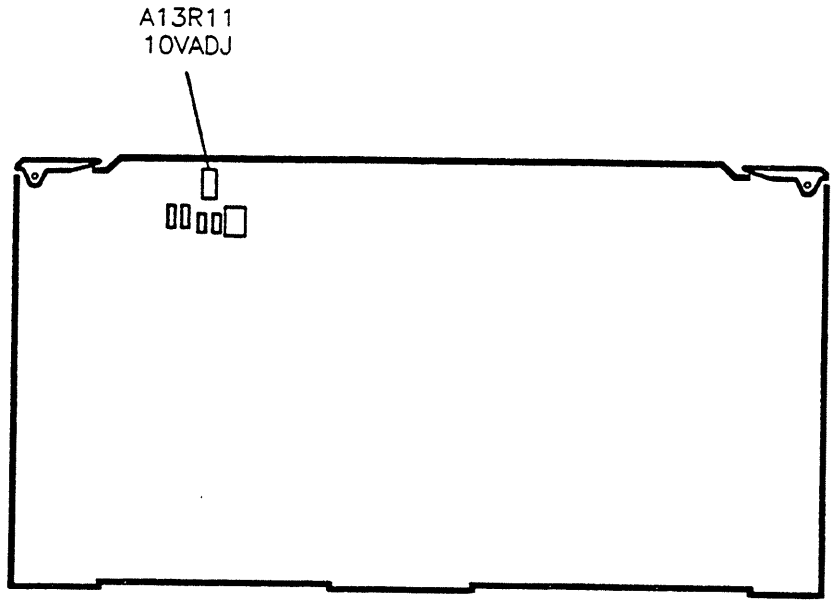


Figure 3-10. YO Driver +10V Reference Adjustment Location

5. Select `Done`.

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Related Performance Tests

Self-tests

In Case of Difficulty

Refer to the *Troubleshooting* manual.

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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.

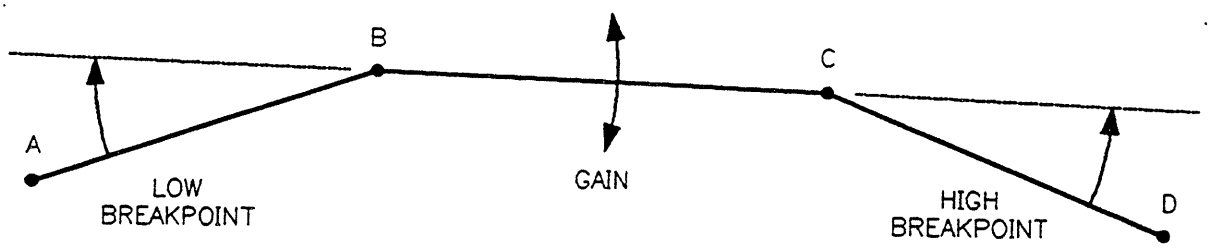


Figure 3-11. YO Gain and Linearity Break Points

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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.

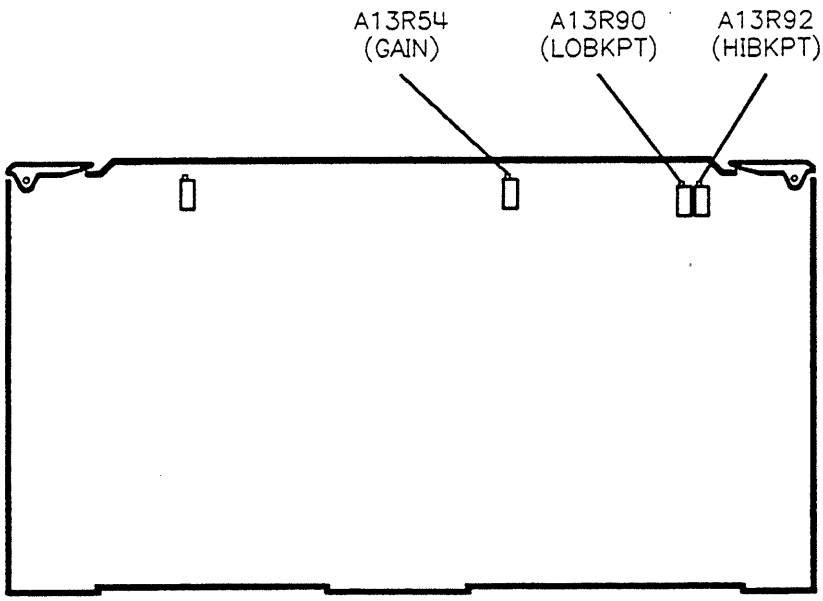


Figure 3-12. YO Gain and Linearity Adjustment Locations

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.

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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.

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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).

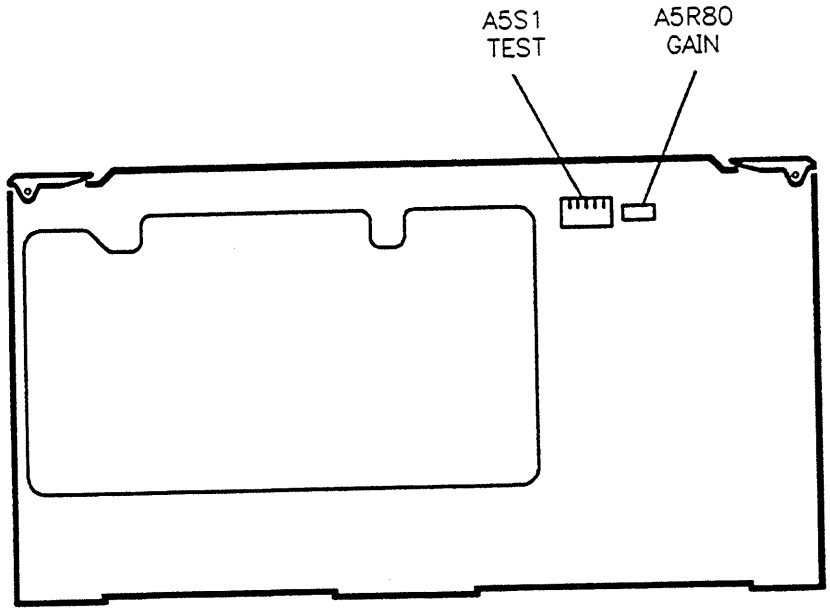


Figure 3-13. Switch and Adjustment Locations

5. Adjust A53R80 (see Figure 3-13) to center the "needle" on the display.
6. Select `Done`.

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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.

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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.

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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 auxillary 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 power by 15 counts when adjusting the A term and decrease power by 1/2 dB (approximately 1/3 division) when adjusting the B term.

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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 auxilliary output masking the true peak. Always adjust to the first peak (lowest value of the calibration constant).

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- If the adjustment has a wide range without any apparent improvement. Leave it set to the default value.

Procedure

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).

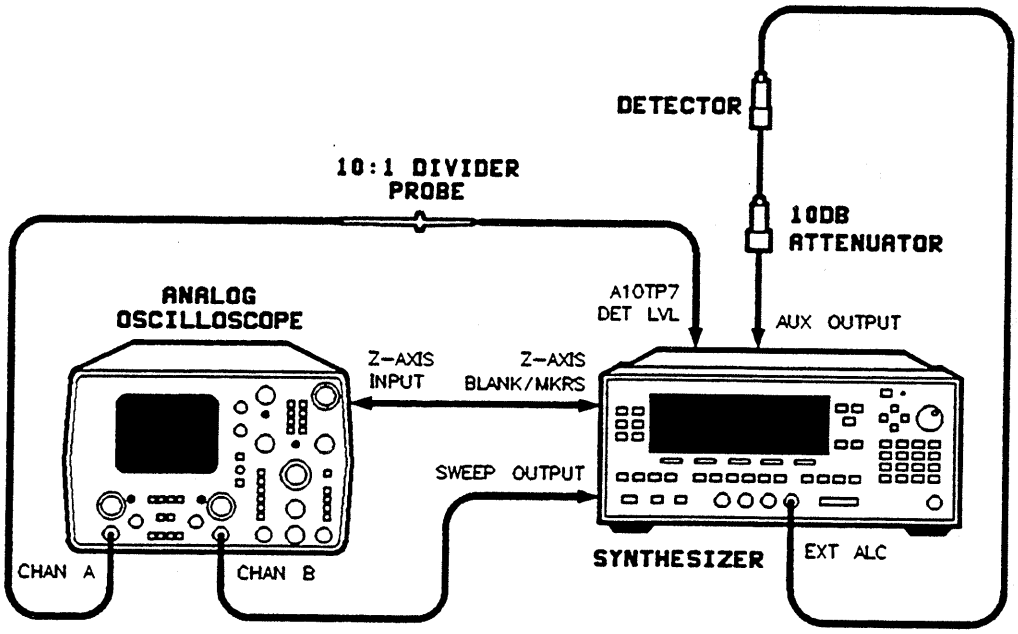


Figure 3-14. Amplifier/Multiplier Adjustments Setup

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)

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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	

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Table 3-2. Calibration Constant Descriptions (continued)

Number	Description	Default Value	Adjustment Description
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	
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	

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Table 3-2. Calibration Constant Descriptions (continued)

Number	Description	Default Value	Adjustment Description
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	
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	
217	YTM Rise; Band 7	10	

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Table 3-2. Calibration Constant Descriptions (continued)

Number	Description	Default Value	Adjustment Description
225	*YTM Gain Band 1	2048	Maximize power over higher 10% of band. Adjust at slow sweep speeds.
226	*YTM Gain Band 2	2048	
227	*YTM Gain Band 3	2048	
228	*YTM Gain Band 4	2048	
229	*YTM Gain Band 5	2048	
230	*YTM Gain Band 6	2048	
231	*YTM Gain Band 7	2048	
238	*YTM Offset Band 1	2048	Maximize power over lower 10% of band. Adjust at slow sweep speeds.
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	
244	*YTM Offset Band 7	2048	
248	YTM B2 Offset Offset	0	Default values are not altered. Numbers should remain unchanged.
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	

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Table 3-2. Calibration Constant Descriptions (continued)

Number	Description	Default Value	Adjustment Description
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

4. 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 unleveled output power.
5. On the oscilloscope, set:

```
Channel A:
   Volts/Division:    5 mV/Division
   Offset:            As required
   Input Coupling:    DC
   Input Impedance:   1 MΩ

Channel B
   Volts/Division:    1 V/Division
   Offset:            As required
   Input Coupling:    DC
   Input Impedance:   1 MΩ
   Sweep Mode:        A versus B
```

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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 power 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 _____.

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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.

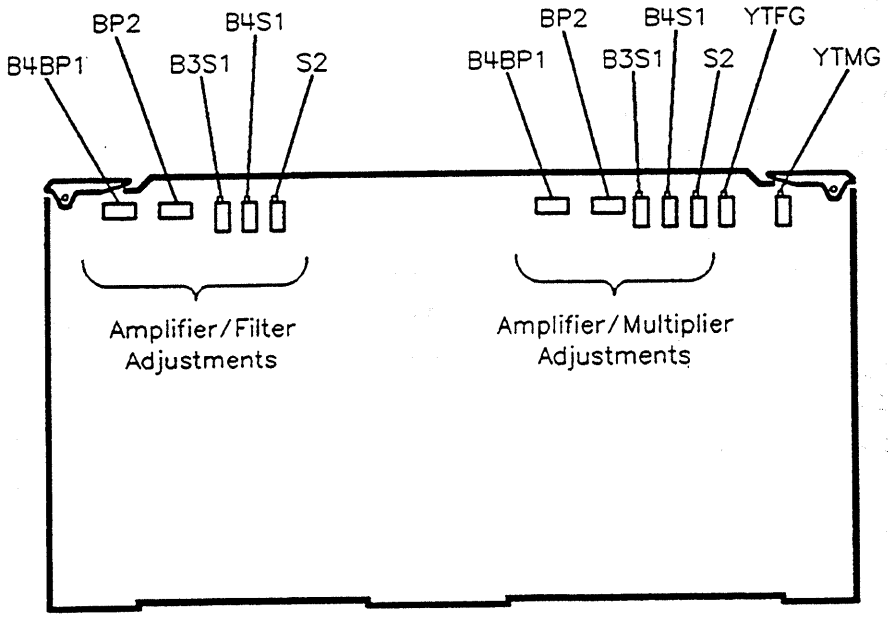


Figure 3-15. A12 Assembly Potentiometer Locations

19. Set calibration constant #227, YTM Gain; Band 3, to 2048.

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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 power 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 (≈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.

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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 power 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 (≈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).

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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:
    a. Increment calibration constant #109, SRD Bias A; Band 5, to maximize low end power. Then decrease power by 15 counts.
    b. Increment calibration constant #122, SRD Bias B; Band 5, to maximize high end power. Then decrease the power by one third division (≈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 power 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 (≈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 _____.

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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 power 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 (≈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.

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Note Power dropouts at the start of each band are typically removed with the YTM Risetime 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:
    CONT SWEEP TIME 0 msec

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60. 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 #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] [2.0] [GHz]
    [STOP] [26.5] [GHz]
    [CONT] [SWEEP TIME] [0] [msec]
    [MARKER] Marker M3 [20] [GHz] (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:
    [SWEEP TIME] [0] [msec]
66. 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.
67. On the synthesizer, press:
    [START] [15] [GHz]
    [CONT] [SWEEP TIME] [0] [msec]
68. 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 term for the location of the problem.

Verification

69. Try the following start and stop frequencies:

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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.

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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.

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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.

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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.

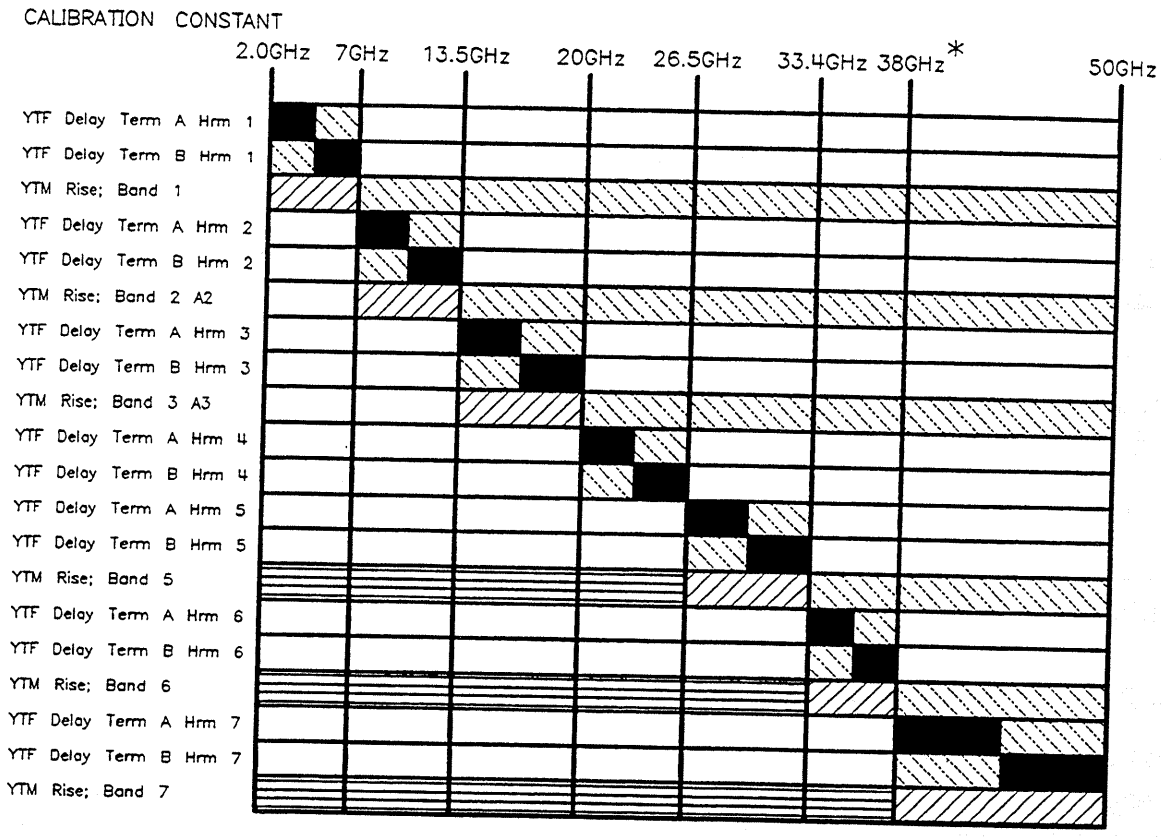
If you have a sweep speed problem, it is probably affected by delay compensation or risetime adjustments.

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.

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* 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.

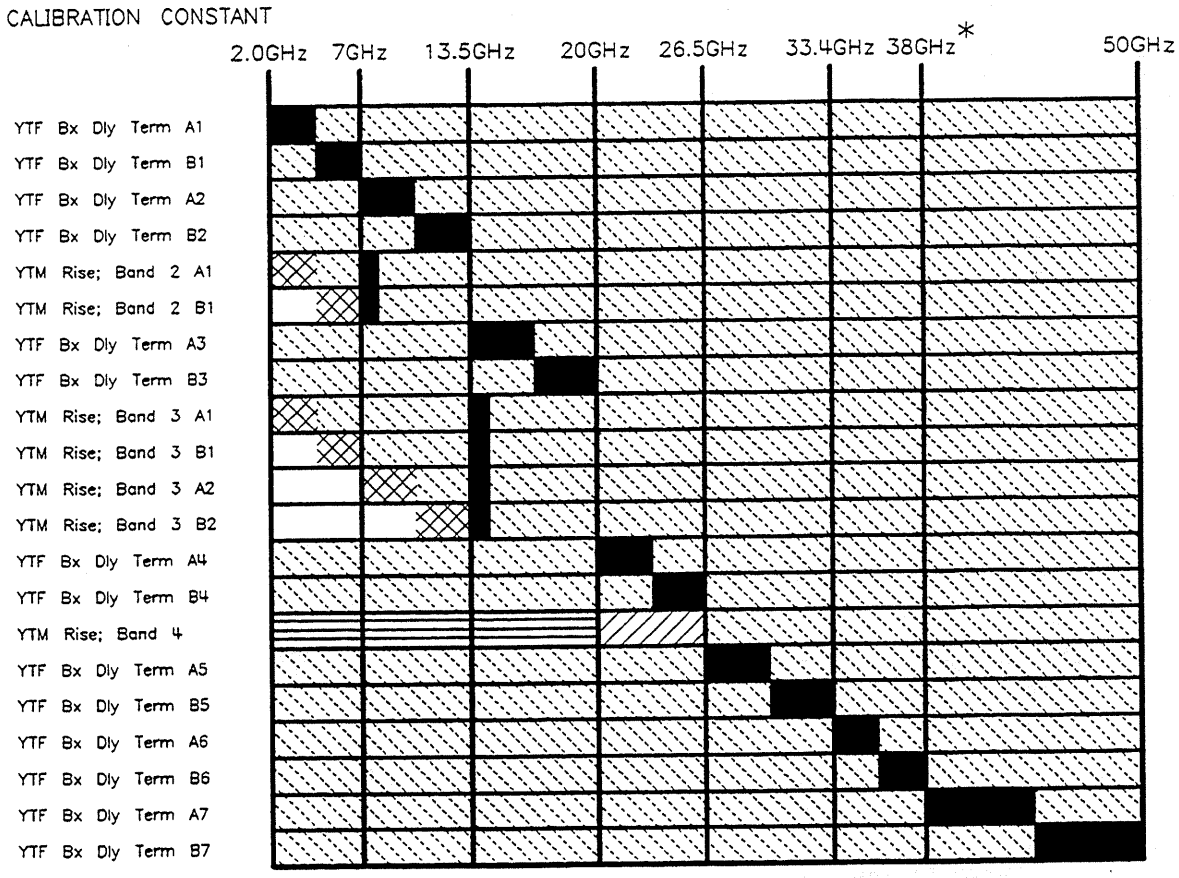
Start of sweep frequencies that enable calibration constants for the start of the affected band.

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

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* 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

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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.

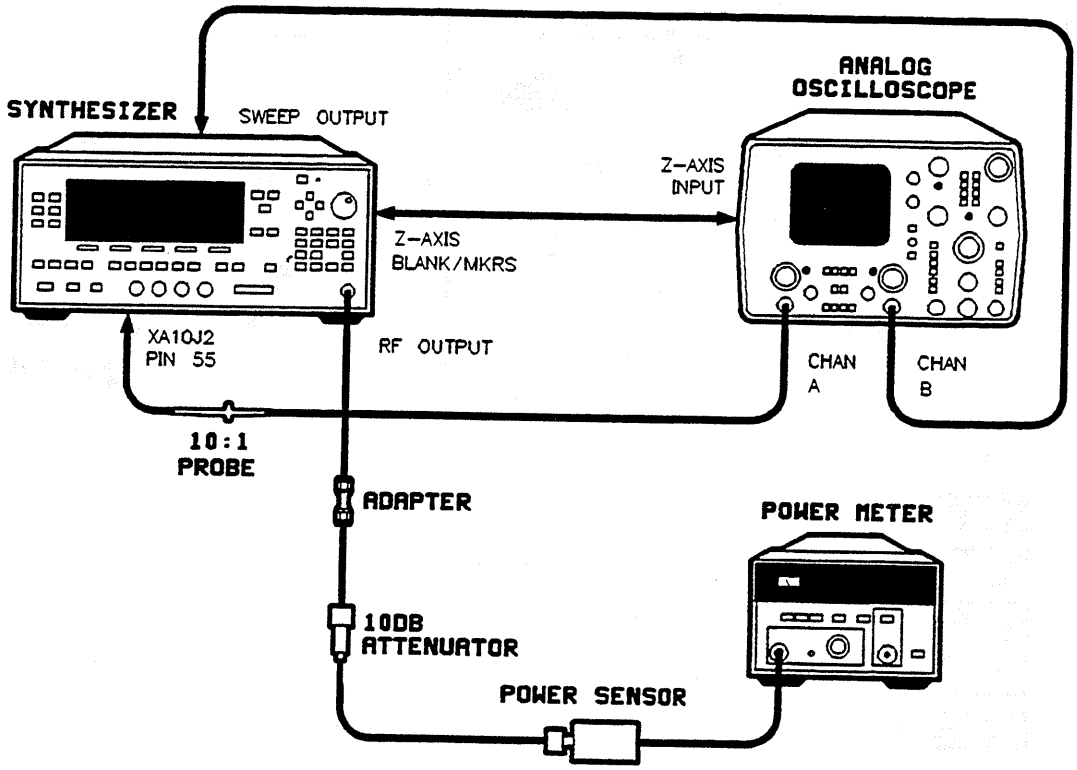


Figure 3-18. Amplifier/Filter Adjustments Setup

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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)

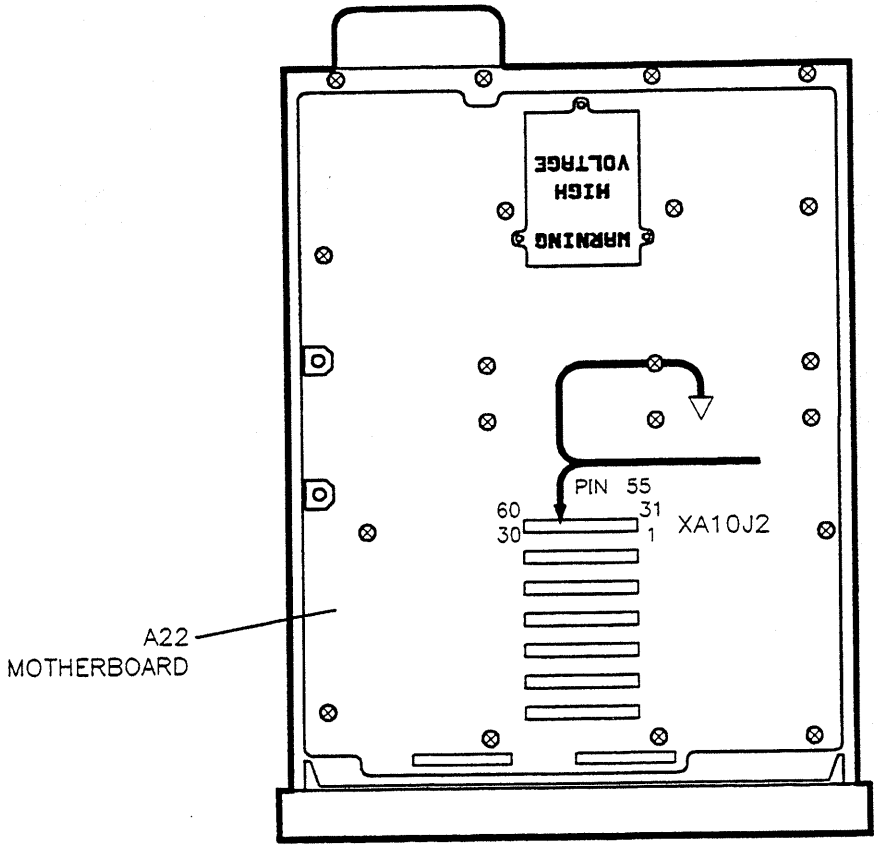


Figure 3-19. XA10J2 Location

4. 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`

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`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 shpere 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	

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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	

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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]

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ALC Leveling Mode ALCoff (asterisk off)
POWER LEVEL 25 dBm

Note that the synthesizer has unleveled 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 MΩ

Channel B
   Volts/Division:    1 V/Division
   Offset:            As required
   Input Coupling:    DC
   Input Impedance:   1 MΩ
   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.

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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:

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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:
    START 7 GHz
    STOP 13.5 GHz
    POWER LEVEL 25 dBm
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

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steps 19 through 22 until it is. Then change calibration constant #632 back to the recorded value.

24. On the synthesizer, set:
    POWER LEVEL 0 dBm
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:
    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 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:
    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 22.7 dBm, as displayed on the power meter, decrease DAmp Clamp 2 until the power level is less than these values.

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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. Diasble 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.

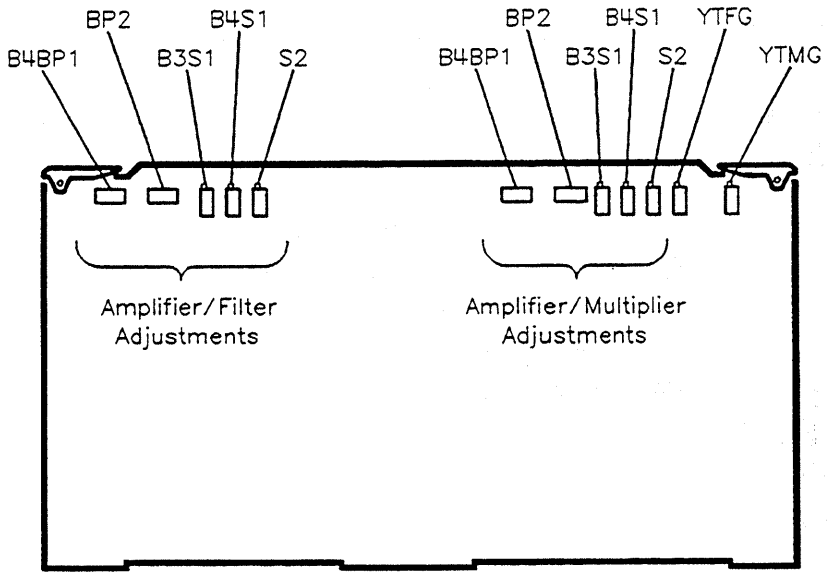


Figure 3-20. A12 Assembly Potentiometer Locations

32. Set calibration constant #623, YTF Gain; Band 3, to 2084.

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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:

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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.

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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, DAmp Clamp 4 as described here, to protect the bridge detector from excessive power while in doubler amp mode:

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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 doulber, 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

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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.

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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:
    [POWER LEVEL] [0] [dBm]
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 _____

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#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.

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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	20 to 26.5 GHz
	26.5 to 40	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.

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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.

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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".

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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:
   START 7 GHz
   STOP 13.5 GHz
   CONT SWEEP TIME 0 msec
   POWER LEVEL 25 dBm
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 ≈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:
   SWEEP TIME 0 msec
105. 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

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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:
[START] [13.5] [GHz]
[STOP] [20] [GHz]
[CONT] [SWEEP TIME] [0] [msec]
[POWER LEVEL] [25] [dBm]
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:
[SWEEP TIME] [0] [msec]
113. 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 #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".

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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 ≈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.

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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)

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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.

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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 temporarly removing the cable from the Z-AXIS BLANK/MKRS connector on the

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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.

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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.

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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]

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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

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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.

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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.

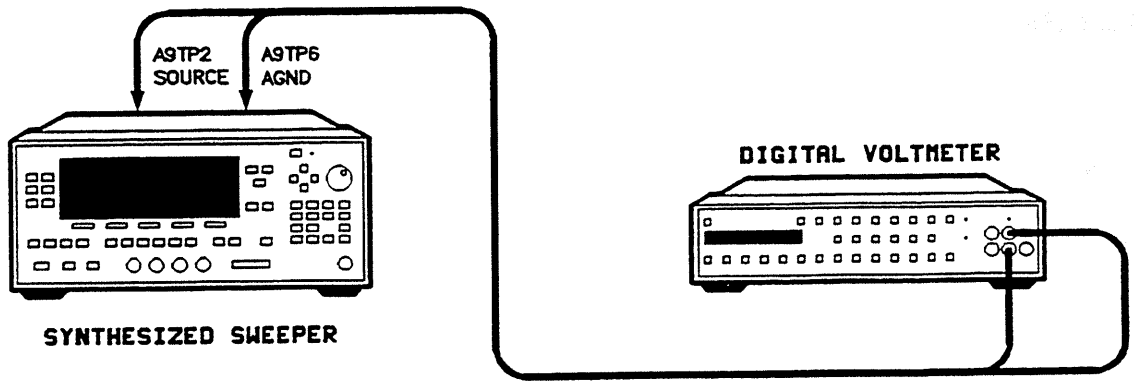


Figure 3-21. Low Power SRD Bias Adjustment Setup

Equipment

DVM	HP 3456A

2. On the synthezier 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.

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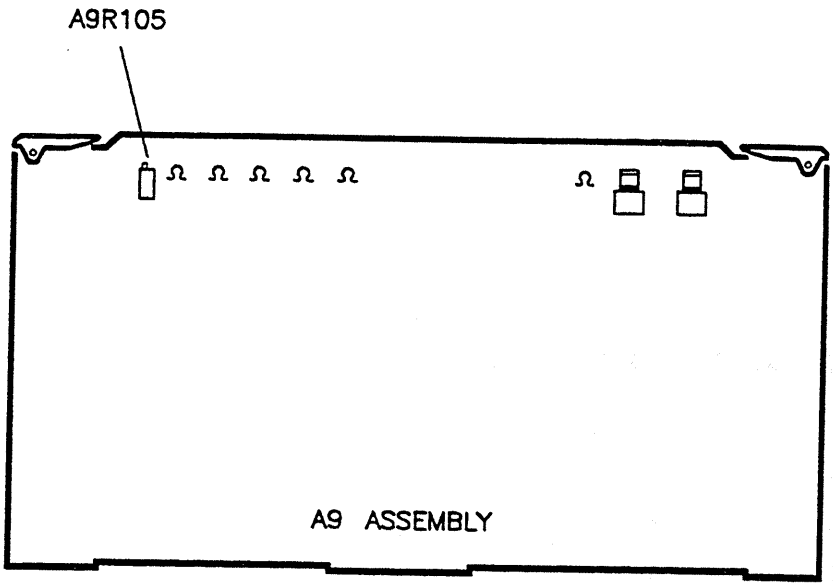


Figure 3-22. A9R105 Location

Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

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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.

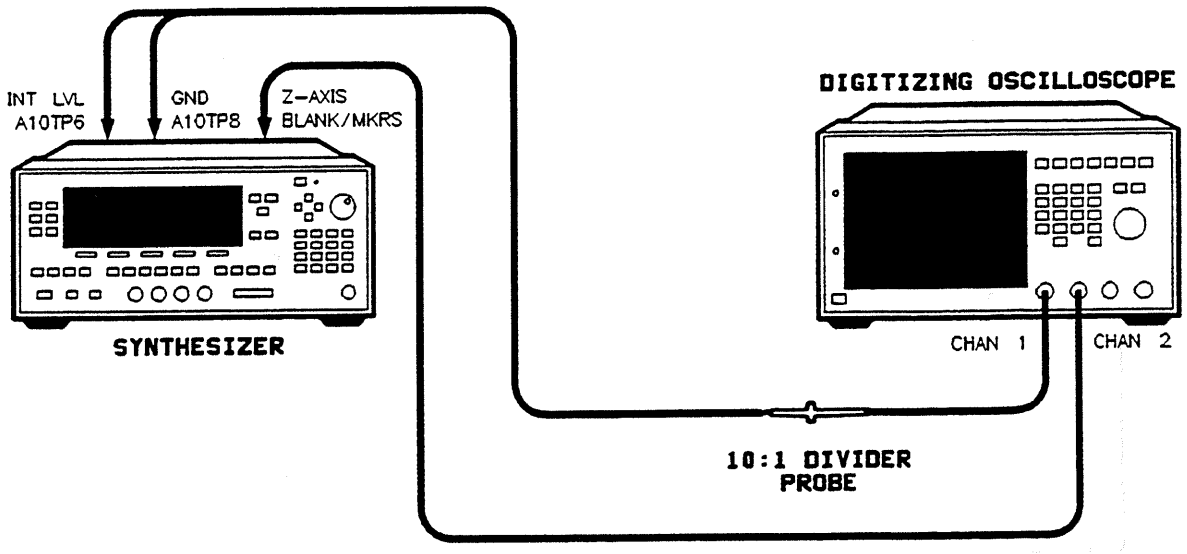


Figure 3-23. Modulator Offset and Gain Adjustment Setup

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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

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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           On
      Volts/Division    50 mV
      Offset            As necessary
      Input Coupling    dc
      Input Impedance   1 MΩ

   Channel 2:
      Display           On
      Volts/Division    2V
      Input Coupling    dc
      Input Impedance   1 MΩ

   Timebase:
      Time/Division     10 ms
      Delay             5 ms
      Delay Reference   At left
      Sweep             Triggered

   Trigger:
      Trigger Mode      Edge
   ```

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```
    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 bandwith 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.

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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.

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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.

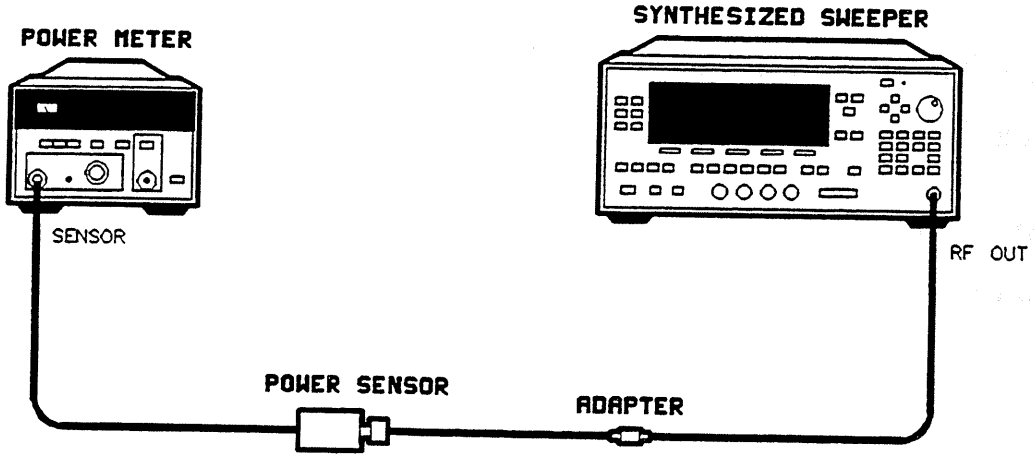


Figure 3-24. ALC Power Level Accuracy Adjustment Setup

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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).

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Table 3-8. ALC Calibration Constants and Default Values

ALC Calibration Constant	Default Value
Low Band 0.01 to 2.0 GHz[1]	
#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.

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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.

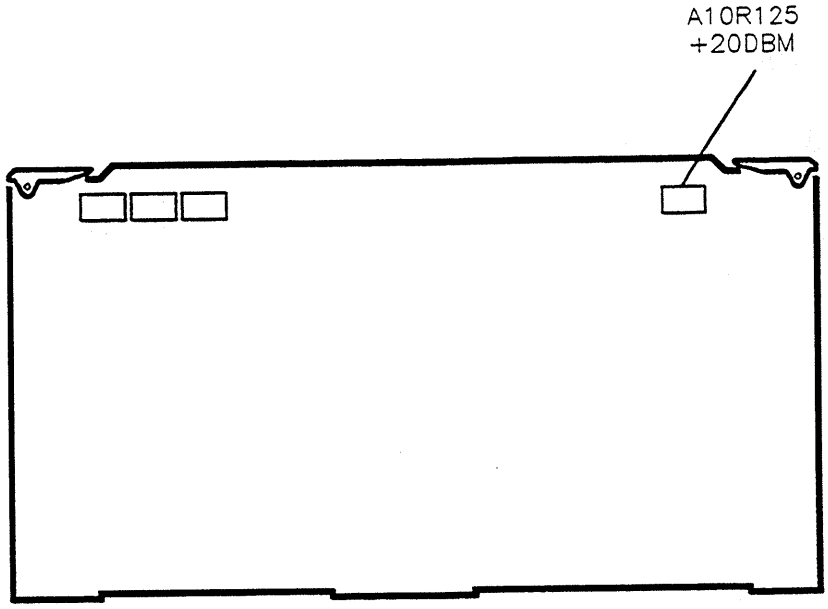


Figure 3-25. A10R125 Location

12. Repeat steps 8 through 12 until the power accuracy for each calibration constant is within ±0.01 dBm.

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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).

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Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

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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 "Automated Tests" in this manual.

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.

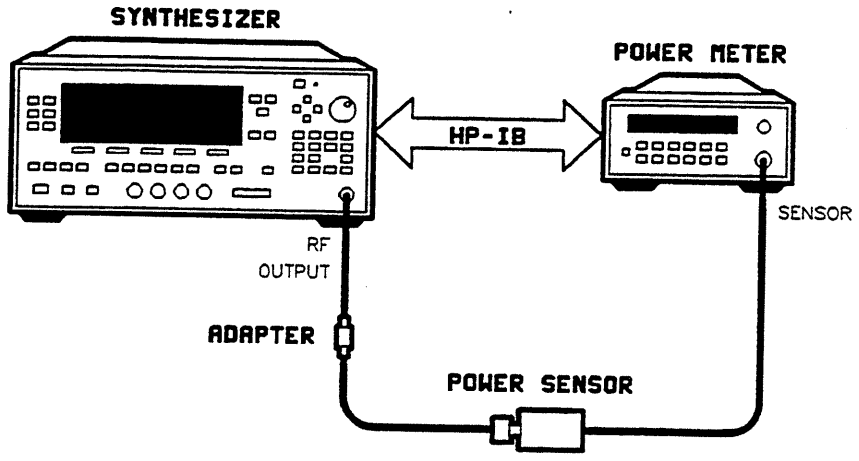


Figure 3-26. Power Flatness Adjustment Setup

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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.

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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.

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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.

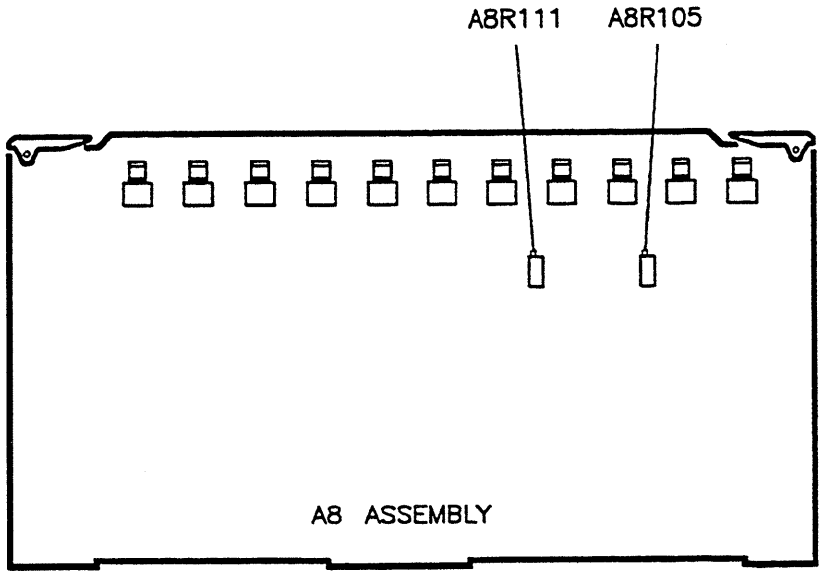


Figure 3-27. A8R111 and A8R105 Adjustment Locations

5. Select `FM DAC` (asterisk on).

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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.

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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 −1.00V is applied and AM 10 dB/V is selected. LIN AM CAL is adjusted so that a −0.80V 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.

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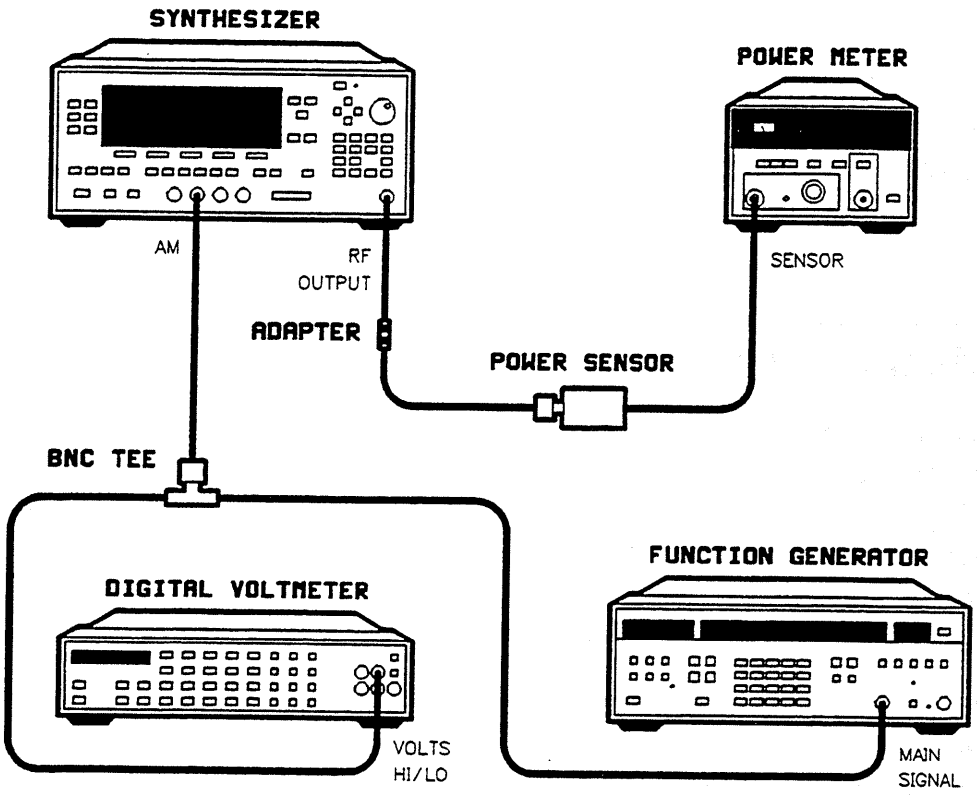


Figure 3-28. AM Accuracy Adjustment Setup

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)

4. Set the function generator for a 0V DC rear panel output (the instrument front panel output is connected to the synthesizer's AM input.)
5. On the synthesizer, press:
   [CW] [5] [GHz]
   [POWER LEVEL] [−15] [dBm]

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AM Offset

6. Set the power meter to read relative power (dB).
7. 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`
8. 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

9. Set the power meter to measure absolute log power (dBm).
10. 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)
11. Set the function generator to the front panel output.
12. 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.

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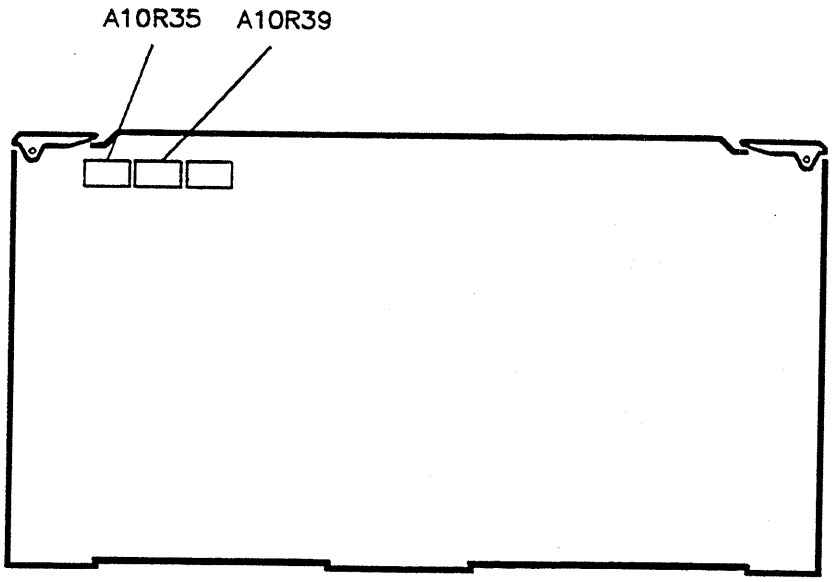


Figure 3-29. A10R35 and A10R39 Locations

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)

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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.

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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.

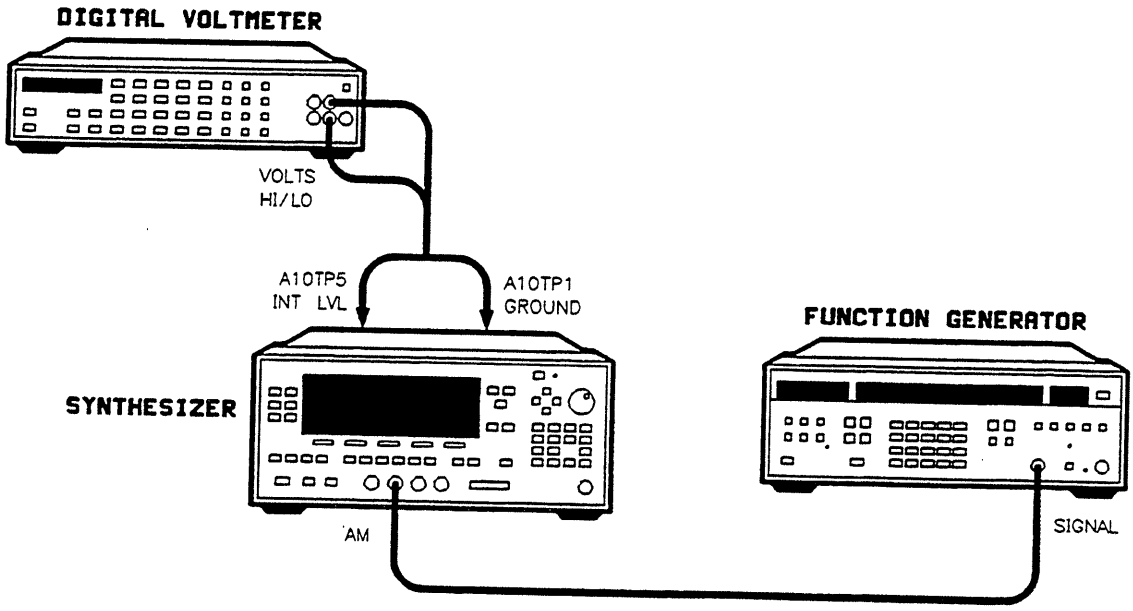


Figure 3-30. AM Delay Adjustment Setup

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Equipment

Digital Voltmeter	HP 3456A
Function Generator	HP 3325A

2. To achieve peak power, turn on RF peaking. Press:
   USER CAL `Tracking Menu` `Peak RF Always` (asterisk on)
3. Connect the equipment as shown in Figure 3-30.
4. 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 50Ω 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.

5. 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.

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Note

You should expect to see very small changes in voltage.

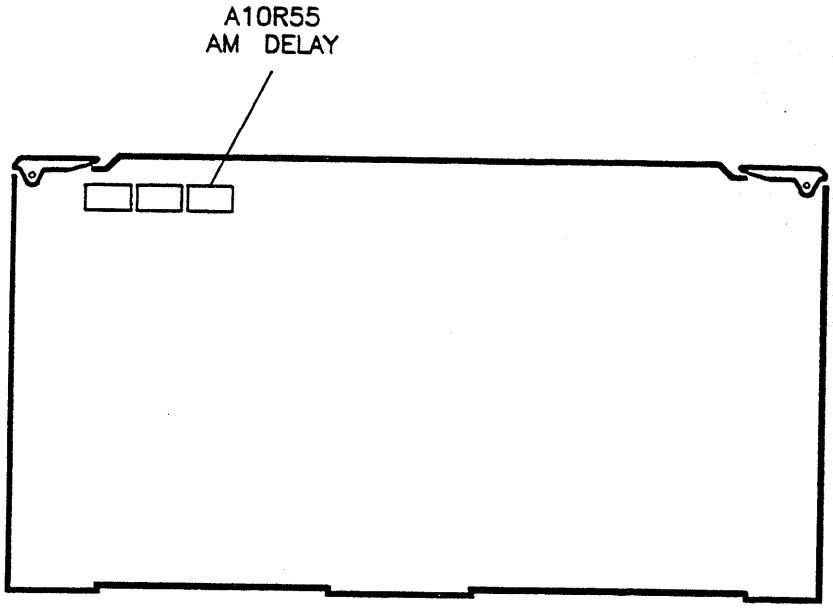


Figure 3-31. AM Delay Adjustment Location

Related Performance Tests

AM Bandwidth

In Case of Difficulty

Refer to the *Troubleshooting* manual.

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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.

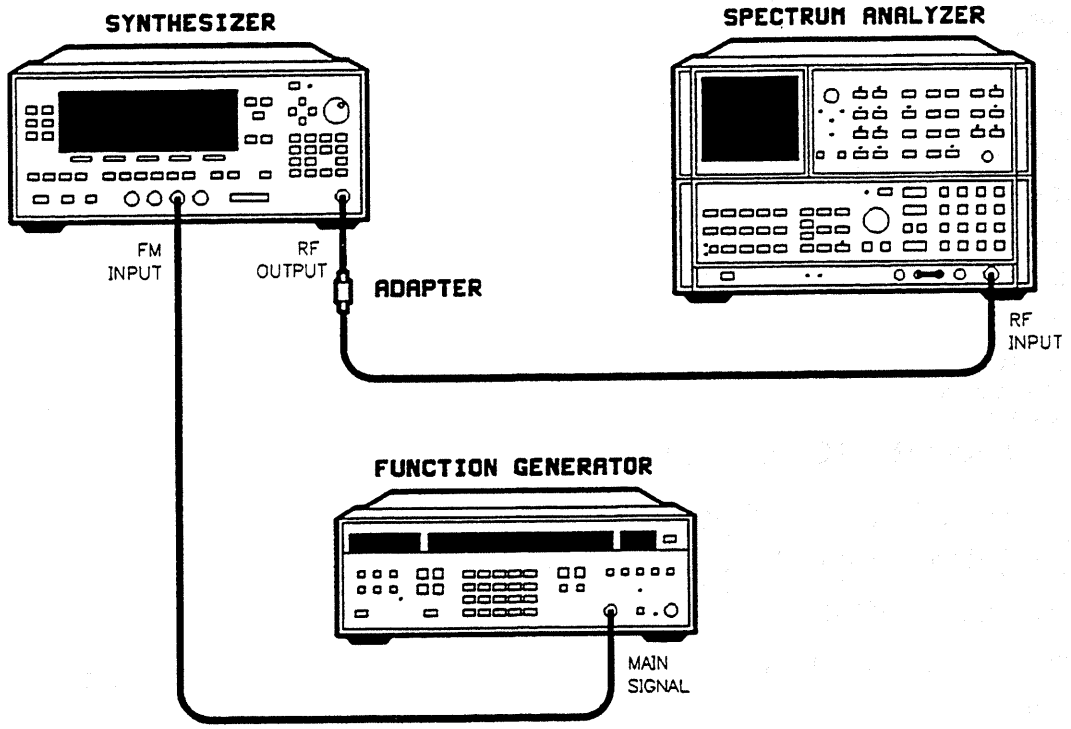


Figure 3-32. FM Gain Adjustment Setup

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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.

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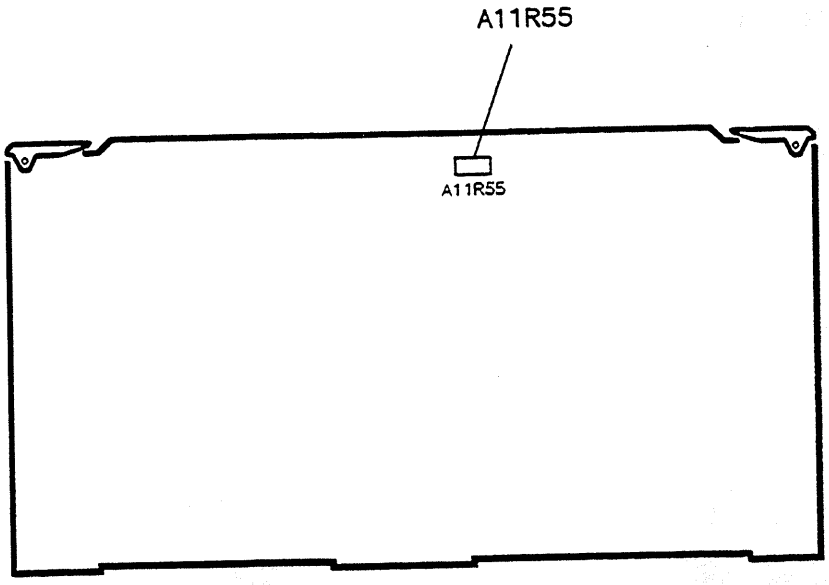


Figure 3-33. FM Gain Adjustment Location

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.

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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.

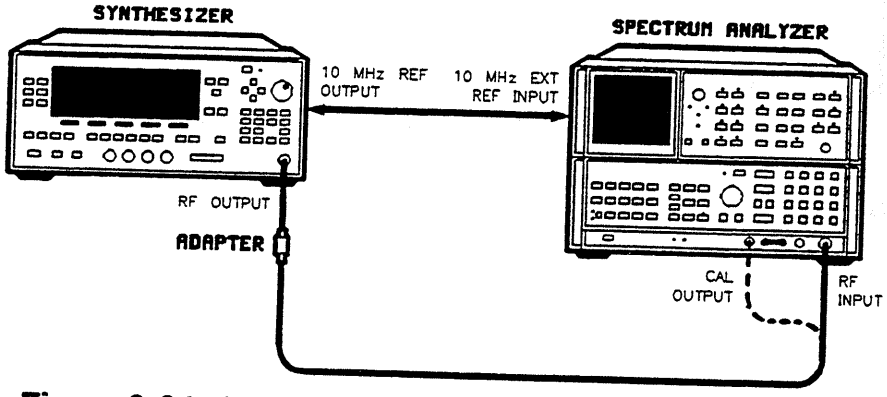


Figure 3-34. Square Wave Symmetry Adjustment Setup

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`

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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).

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Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting* Manual.

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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 kΩ. The AM input impedance on A10 must be set to 2 kΩ 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 kΩ 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 kohms, 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.

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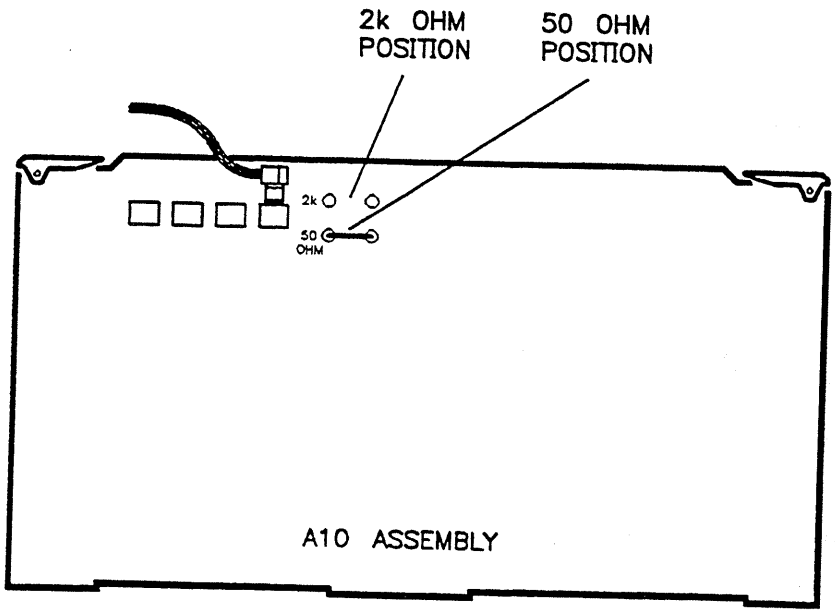


Figure 3-35. A10 Jumper Locations

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 kohms, 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.

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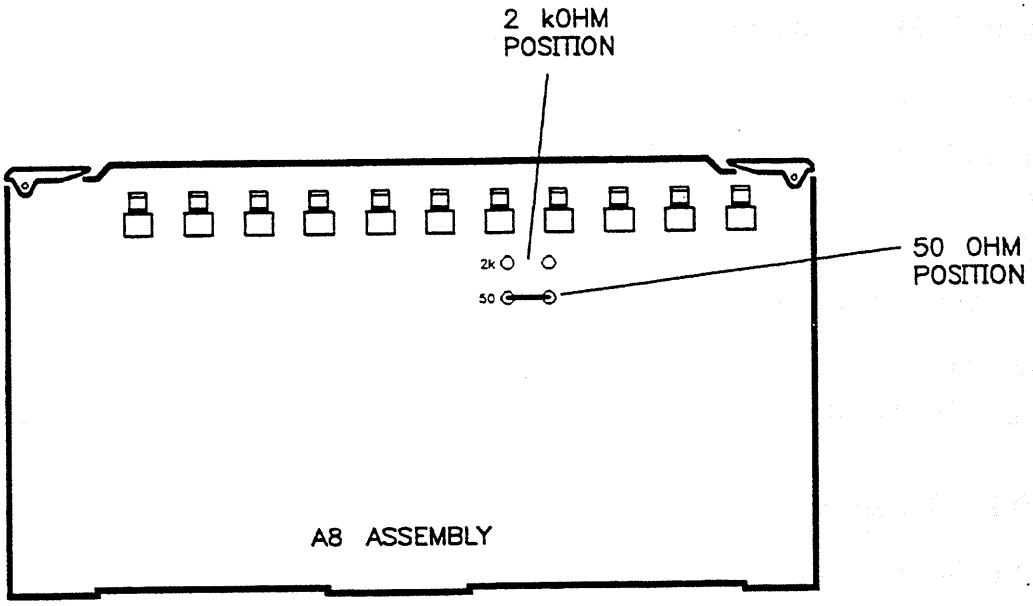


Figure 3-36. A8 Jumper Locations

Related Performance Tests

AM Accuracy
AM Bandwidth
AM Dynamic Range

In Case of Difficulty

If the jumper is missing, see "Replaceable Parts".

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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.

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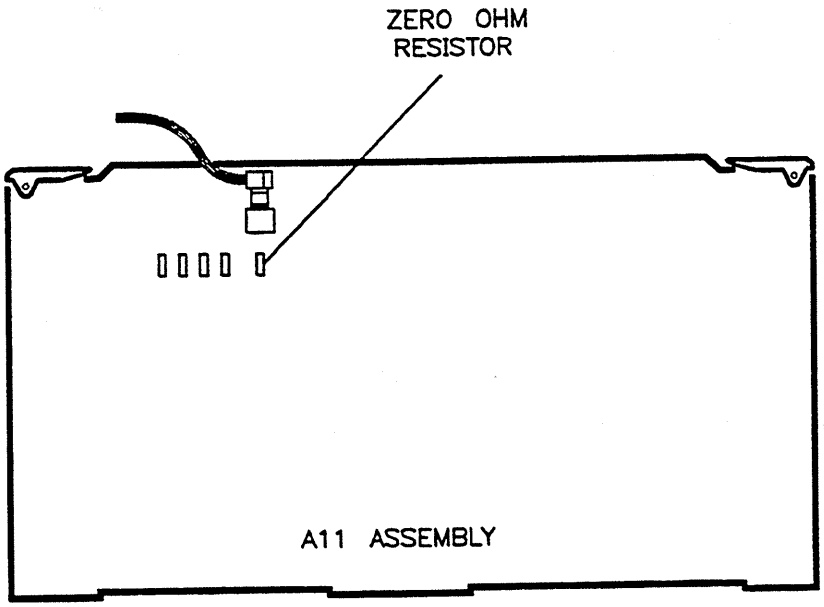


Figure 3-37. FM Input Impedance Jumper Locations

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.

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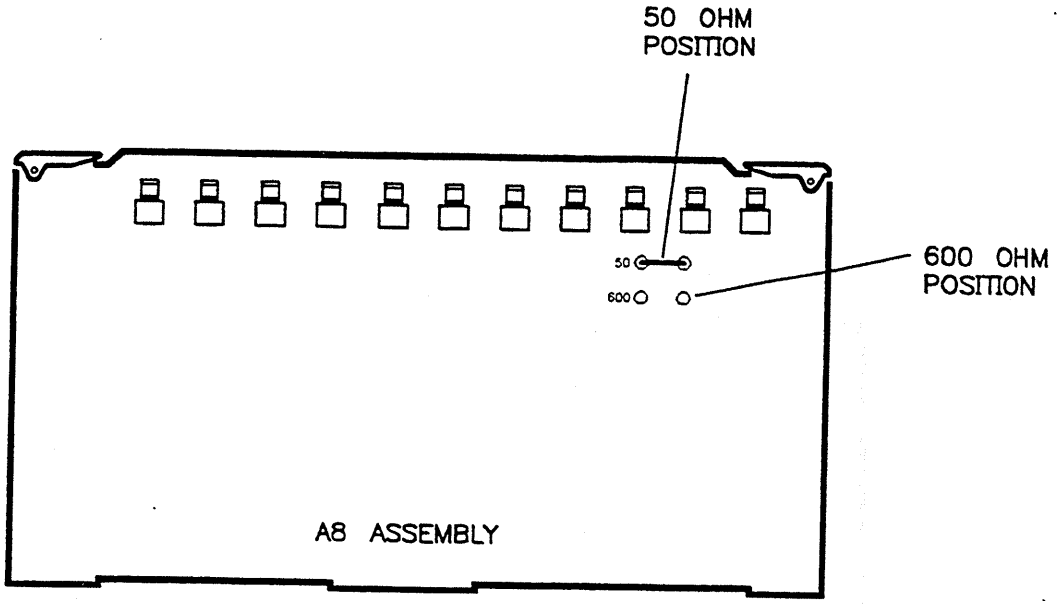


Figure 3-38. A8 Jumper Locations

Related Performance Tests

FM Accuracy
FM Bandwidth
Maximum FM Deviation

In Case of Difficulty

If the jumper is missing, see "Replaceable Parts".

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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.

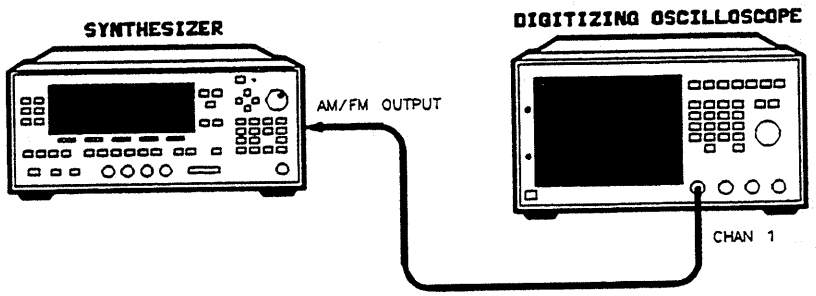


Figure 3-39. Modulation Generator Flatness Adjustment Setup

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
```

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Input Coupling	dc
Input Impedance	50Ω
Timebase	
Time/Division	2 μs
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.)

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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.

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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).

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 labelled 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 labelled on all assemblies.)

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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.

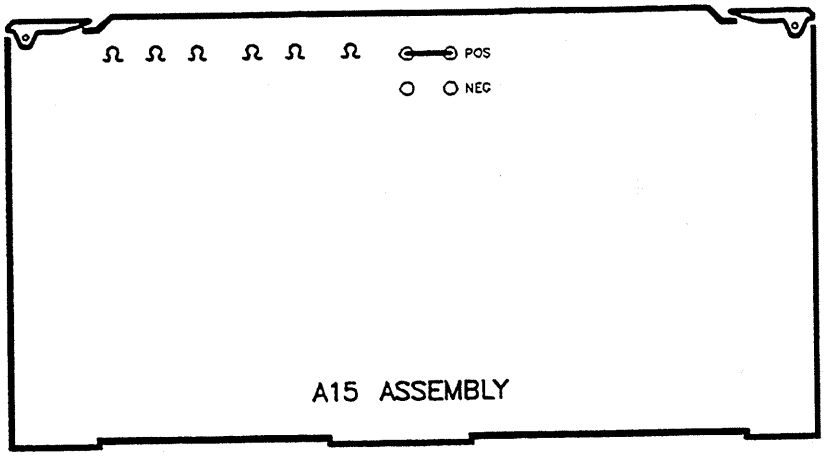


Figure 3-40. External Trigger Edge Selection Location

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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 $\leq$ 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

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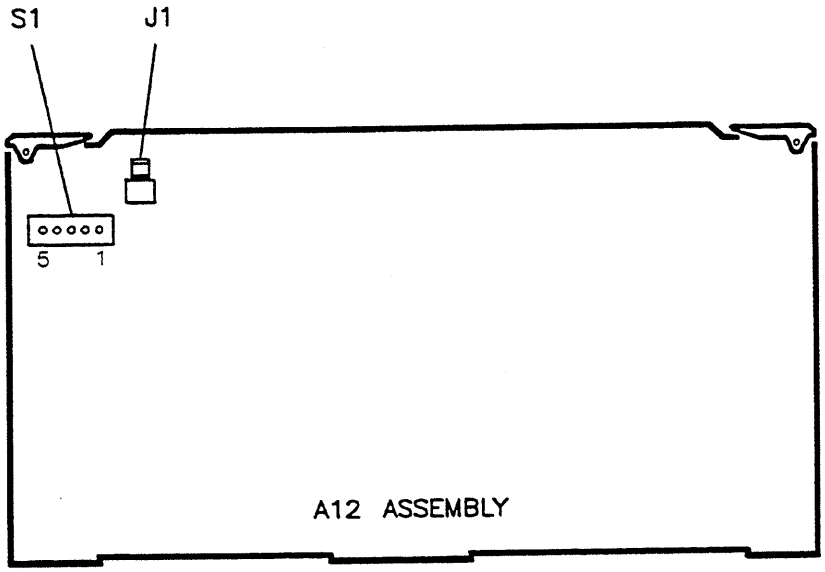


Figure 3-41. A12S1 Location

Related Performance Tests

None

In Case of Difficulty

Refer to the *Troubleshooting* manual.

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4

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.

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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.

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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".

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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.

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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.

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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`.

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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`.

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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 `Default1 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)

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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.

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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	

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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

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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			

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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			

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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

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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			

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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

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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

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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

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Table 4-9. Calibration Constant Descriptions (continued)

Number	Description	Range or Default	Related Adjustment
265	*LVL DAC Ofs Lo Bnd	100 to 250	ALC Power Level Accuracy\Detector Cal
266	*LVL DAC Ofs Xtal	−1000 to +1000	Detector Cal
267	*LVL DAC Ofs 2ndOut	0	
268	*LVL DAC Ofs PwrMtr	−100 to +100	
269	*LVL DAC Ofs Module	−100 to +100	
270	*LVL DAC Ofs 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 Ofs; Hi	100 to 160	ALC Power Level Accuracy; Detector Cal
284	*ALC Det Ofs; Lo	100 to 160	ALC Power Level Accuracy; Detector Cal
285	*ALC Det Ofs; Xtal	100 to 160	
286	*ALC Det Ofs; 2nd Out	100 to 160	
287			
288			
289			
290			
291			
292	*ALC Log Brkpt; Hi	0 to 255	ALC Power Level Accuracy; Detector Cal

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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	

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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

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Table 4-9. Calibration Constant Descriptions (continued)

Number	Description	Range or Default	Related Adjustment
354	ADC 15V Range +GAIN	−750 to +750	ADC 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	

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Table 4-9. Calibration Constant Descriptions (continued)

Number	Description	Range or Default	Related Adjustment
386	YTM Bx Dly Term C 5	0	
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

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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

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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			

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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			

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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 8053	opt #57
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	

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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	

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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

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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			

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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;Doubler	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	

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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.

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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 H10	Starting Value	Option 006
HP83620A	+19,600	−128	+4	+4096	−127	1	2
HP83622A	+19,584	−128	+4	+4096	−127	1	2
HP83623A	+19,608	−128	+4	+4096	−127	1	2
HP83624A	+19,592	−128	+4	+4096	−127	1	2
HP83630A	+19,600	−128	+4	+4096	−127	1	2
HP83640A	+19,632	−128	+4	+4096	−127	1	2
HP83642A	+160	−128	+4	+4096	−127	–	–
HP83650A	+19,888	−128	+4	+4096	−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*.

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Example: Calibration constant #463

```
HP 83620A + 001 + 004 =  ?
 19,600   - 128 + 4096 = 23,568
```

Example: Calibration constant #464

```
HP 83623A + 006 =  ?
    1     +  2  =  3
```

19760

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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	08360-60009	YO Phase Detector
		1	08360-60209	YO Phase Detector
A6	None	#498		
		0	08360-60007	Sampler (With VCO Adj.)
		1	08360-60007	Sampler (No VCO Adj.)
		1	08360-60214	Sampler (No VCO Adj.)
A7	None	#499		
		0	08360-60008	Reference
		1		Future Use
A8	None	#500		
		0	08360-60166	Modulation Generator
A9	#671	#501		
	0	0	08360-60005	Pulse
	0	1	08360-60152	Pulse (Opt. 006 Compatible)
	0	2	08360-60205	Pulse (Dual Slope Squegg Clamp)
	1	0	08360-60188	Pulse (Self Bias SRD)
	1	0	08360-60232	Pulse (Self Bias SRD)
	2	0		Pulse (HP 83630A H35)
A10	#678	#502		
		0	08360-60006	ALC
	0	0	08360-60206	ID # begins FW rev 23Oct92
	1	0	08360-60222	

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Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and Revisions (continued)

Assembly	ID Number	Revision	Part Number	Description
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		
		0	08360-60015	CPU (Battery)
		1	08360-60215	CPU (Supercap)
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
A19	None	#511		
		0	08360-60019	Rear Panel Interface
A20	#670	#512		
	0	1	08360-60004	RF Interface
	0	1	08360-60187	RF Interface
	0	1	08360-60223	RF Interface
	0	2	08360-60241	RF Interface
A21	None	#513		
		0	1990-1295	Alphanumeric Display

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Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and Revisions (continued)

Assembly	ID Number	Revision	Part Number	Description
A22	None	#514		
		0	08360-60196	Motherboard
		0	08360-60022	Motherboard
A23	None	#515		
		0	HP 10811E	10 MHz Reference Standard
A24	None	#641		
		0	5086-7463	Low Band
A25	None	#642		
		0	5086-7464	Mod Splitter
		1		Directional Coupler
A26	None	#643		
		0	5086-7505	YO
		0	5086-7515	YO
A27	None	#644		
		0	0955-0475	Isolator
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

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Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and Revisions (continued)

Assembly	ID Number	Revision	Part Number	Description
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	0	5086-7513	Frequency Doubler (50 GHz)
A33	None	#650		
		0	5086-7465	Amplifier (High Power)
A34	None	#651		
		0	08360-60061	RP Floating BNC
A35	None	#652		
		0	0955-0475	Isolator
A36	#676	#653		
	0	0	5086-7565	Pulse Modulator (Option 006)
	0	1	5086-7582	Pulse Modulator (Option H06)
	0	1	5086-7588	Pulse Modulator (Option H07)
A37				
A38	#675	#655		
	0	0		Dual Modulator (HP 83630A H35)
	1	0	5086-7602	Dual Modulator (HP 83630A/50A)
	2	0	5086-7634	AM Modulator (Option 006)

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Table 4-11.
Assemblies and Corresponding Cal Constant ID Numbers and Revisions (continued)

Assembly	ID Number	Revision	Part Number	Description
A42	#676	#653		
	0	1	5086-7628	Pulse Mod Switched Filter (HP 83620A/22A Opt. 006)
	0	1	5086-7629	Pulse Mod Switched Filter (HP 83623A/24A Opt. 006)
	1	1	5086-7630	Pulse Mod Switched Filter (HP 83630A Opt. 006)
	1	1	5086-7631	Pulse Mod Switched Filter (HP 83640A/50A Opt. 006)

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5

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
- Software Support Request.

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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.

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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

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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.

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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.

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1. Step Attenuator Flatness Test

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.

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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 "Power Sensor Configuration and Calibration Factor File" utility.

Select the step attenuator flatness test and follow the prompts on the display.

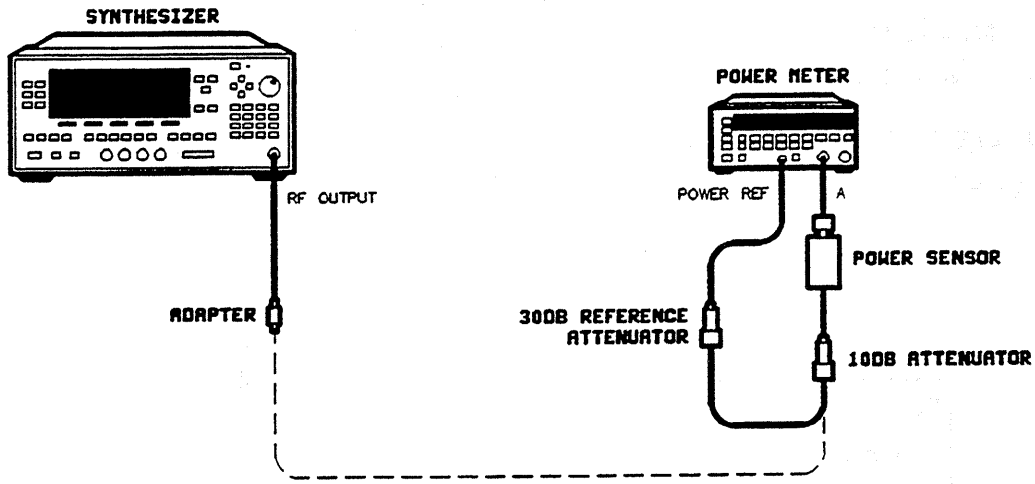


Figure 5-1. Step Attenuator Flatness Test Setup

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2. Power Flatness and Accuracy Test

Description

Note: If Option 001 is installed in your instrument, this test is not necessary as long as the "Step Attenuator Flatness" test is performed.

This test is provided as a softkey on the front panel, but cannot be run by the front panel emulation program because of its interaction with the power meter.

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 constants are adjusted to achieve a flat output.

The calibration factors for the power sensor must be added to the program before the test is run. Refer to the "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.

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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.

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1. Step Attenuator Flatness Adjustment

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 the "Calibration Constants" chapter 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.

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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.

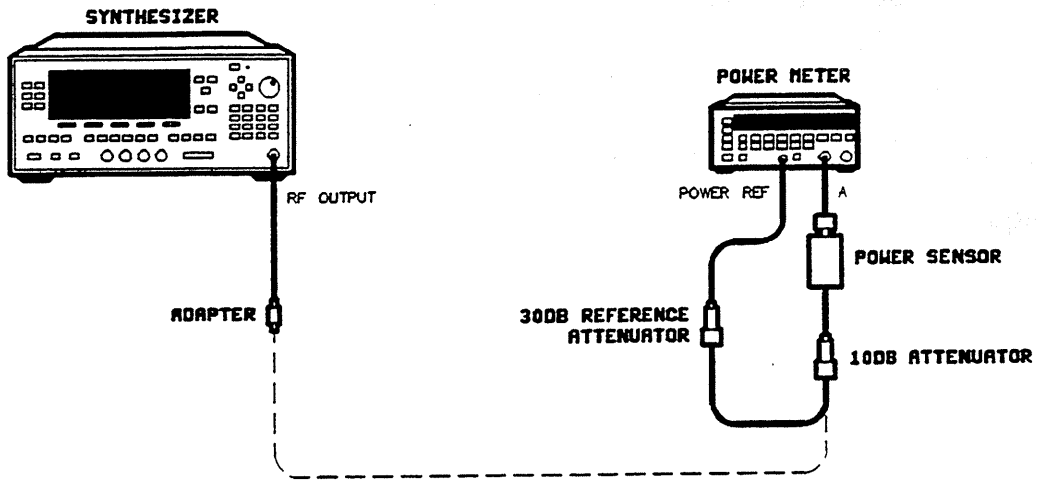


Figure 5-2. Step Attenuator Flatness Adjustment Setup

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1. 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.

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2. 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

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3. Power Flatness Adjustment

Description

Note: If Option 001 is installed in your instrument, this adjustment is not necessary as long as the "Step Attenuator Flatness" adjustment is performed.

The test is provided as a softkey on the front panel, but cannot be run by the front panel emulation program because of it's interaction with the power meter.

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 "Power Sensor Configuration and Calibration Factor File" as 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.

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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.

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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.

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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

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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
FLTNESS ON/OFF	flat	t
RF ON/OFF	on/oFf	F
MENU	menu	e
INSTRUMENT STATE		
PRESET	preset	r
LOCAL	local	l

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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 the "Calibration Constants" tab in this manual 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.

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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.

Procedure

1. Select the "Power Flatness and Accuracy" test.
2. Select the HELP softkey to run the power sensor utility.

   The following menu choices are displayed:

   Calco Utility
   Not used.

   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

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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.

Note: If a calibration factor data file does not yet exist for the serial number selected, select `ABORT` and `OK` to access the menu for entering the calibration factors.

The following menu choices will allow you to enter and store calibration factors:

Edit Cal Factors: Use this selection only if a few calibration factors need to be edited. For extensive changes, use "Serial Entry". After making all edits, select "Store Cal Factors" to save the data.

Edit Sensor Info: Not used.

Load Cal Factors: Use this selection to load the calibration factor data file of the "Current" power sensor from disk or directory specified in the MSI command.

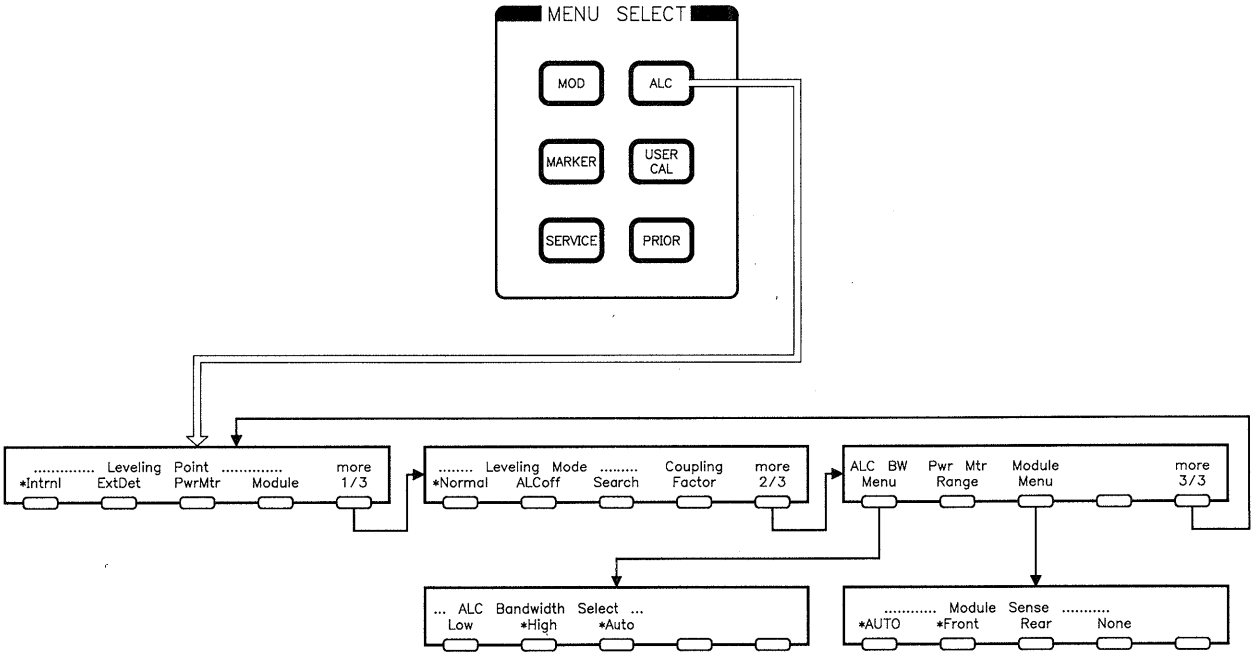
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Store Cal Factors: Use this selection to store the calibration factors of the "Current" power sensor to the disk or directory specified in the MSI command.

Current: This selection identifies the current power sensor (the power sensor selected for editing and storing calibration factors). Entering another serial number changes the current power sensor to the power sensor of the new serial number.

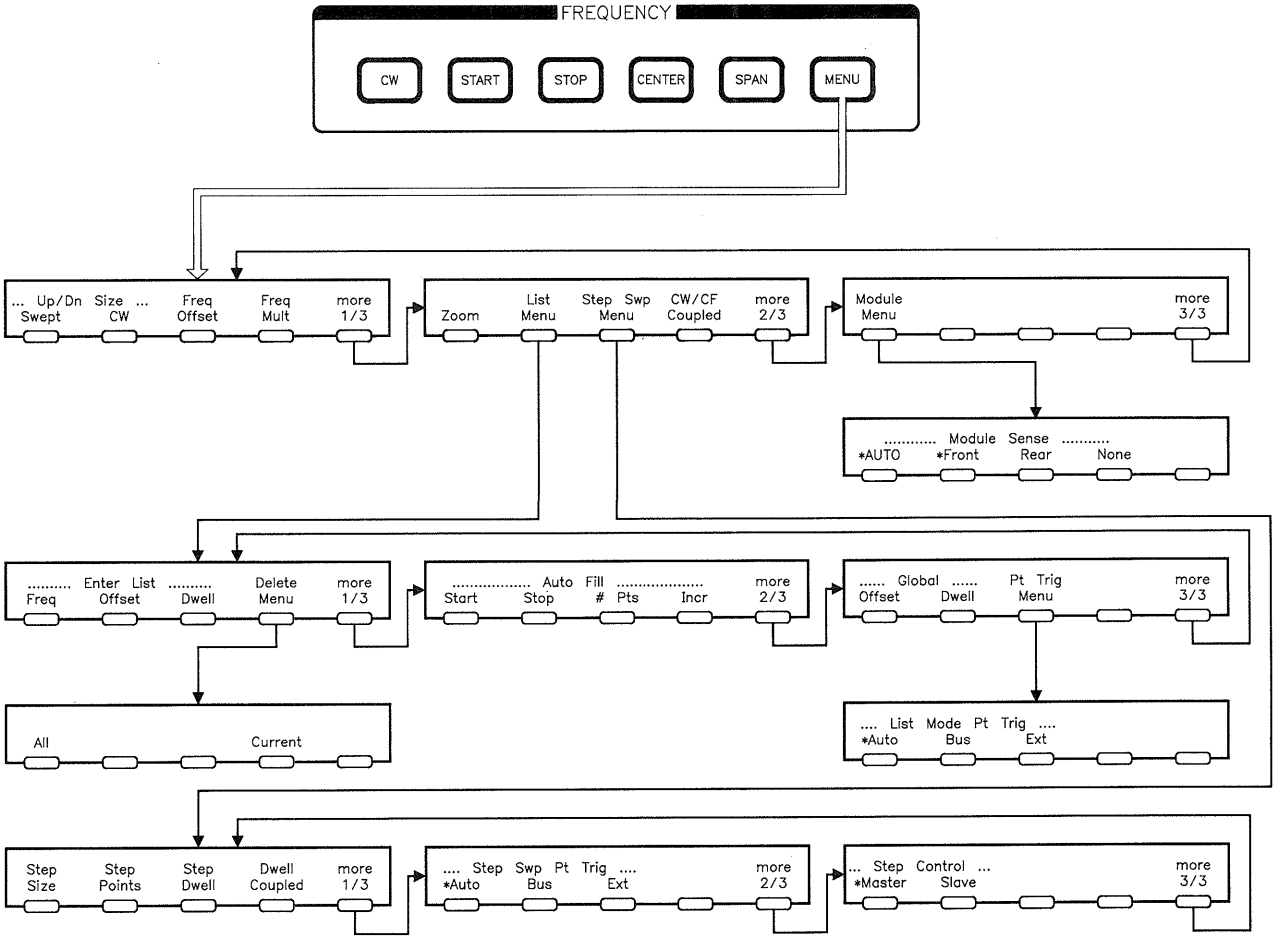
Serial Entry: Use this selection to create new calibration factor data for the current power sensor. To indicate the last entry, enter "0,0". After making all entries, select "Store Cal Factors" to save the data.

3. When the power meter configuration is correct and the calibration factors have been entered, select `DONE` to exit the utility.

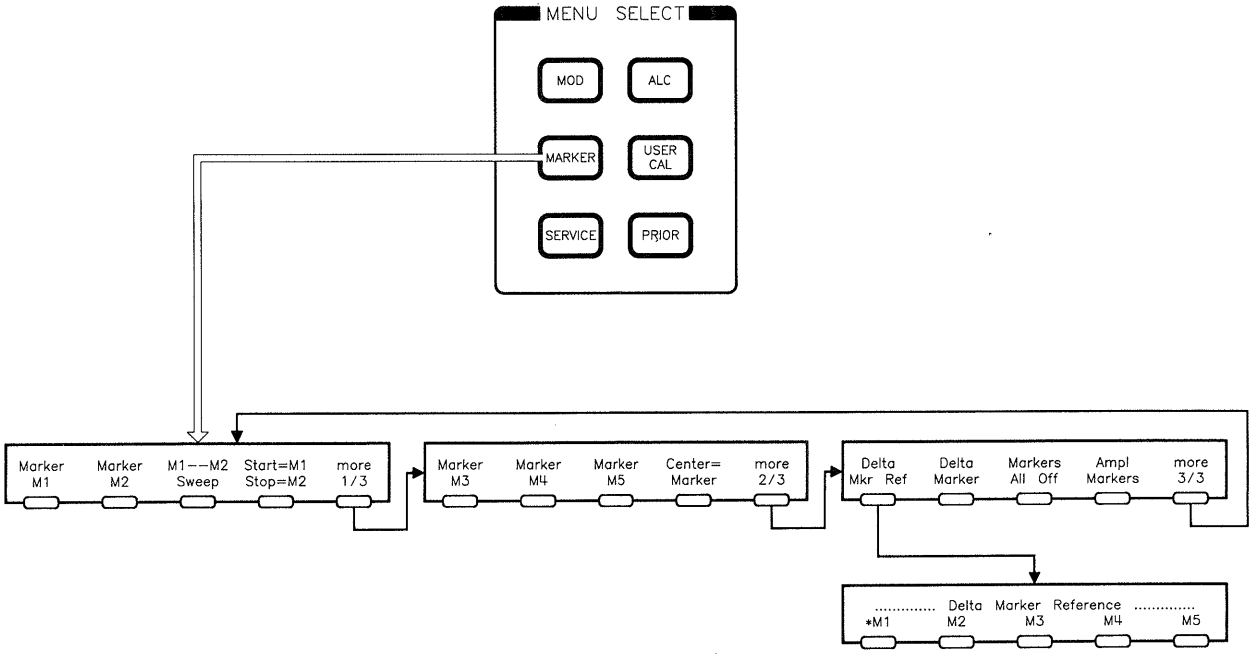


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ALC MENU 1

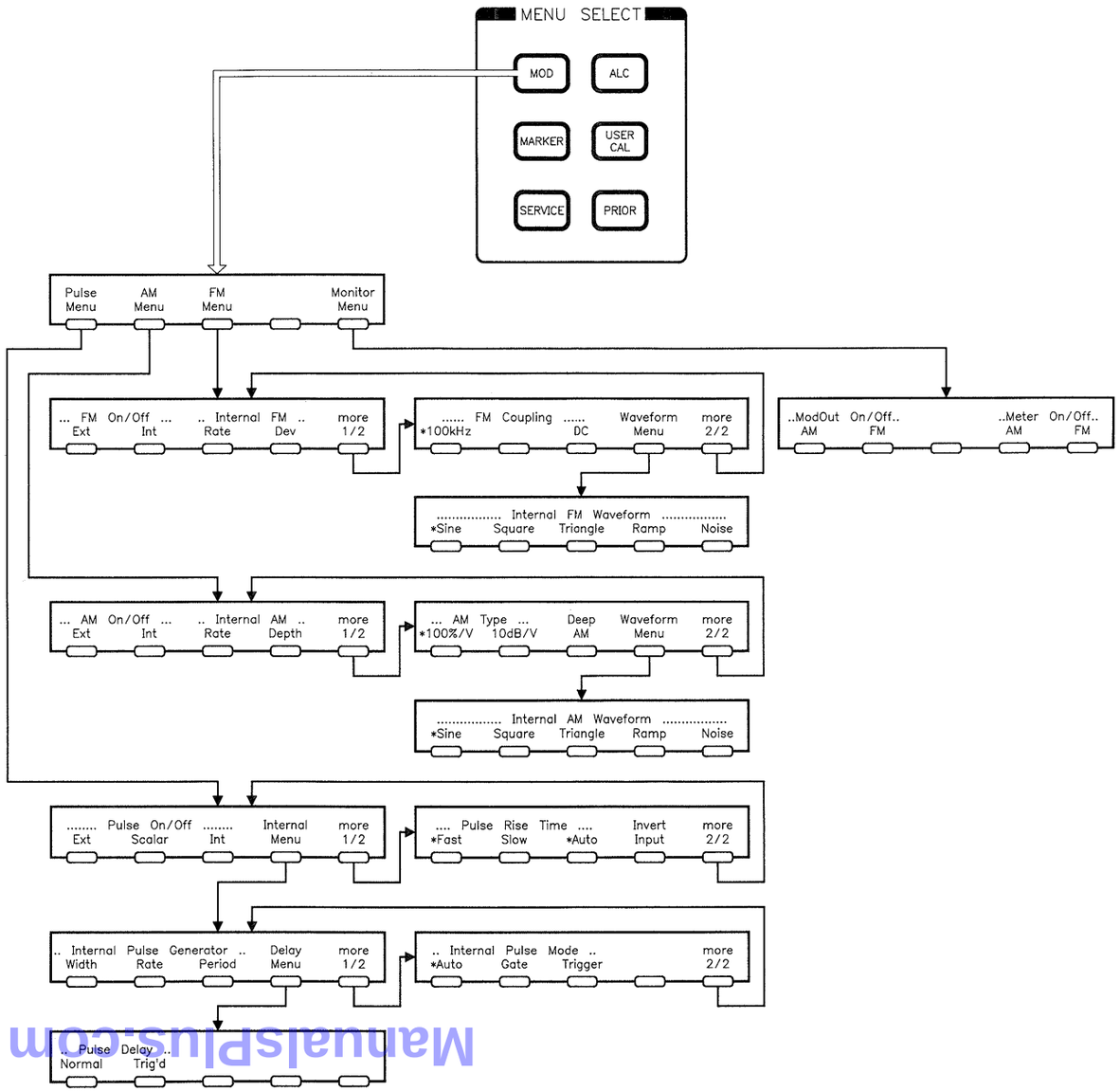


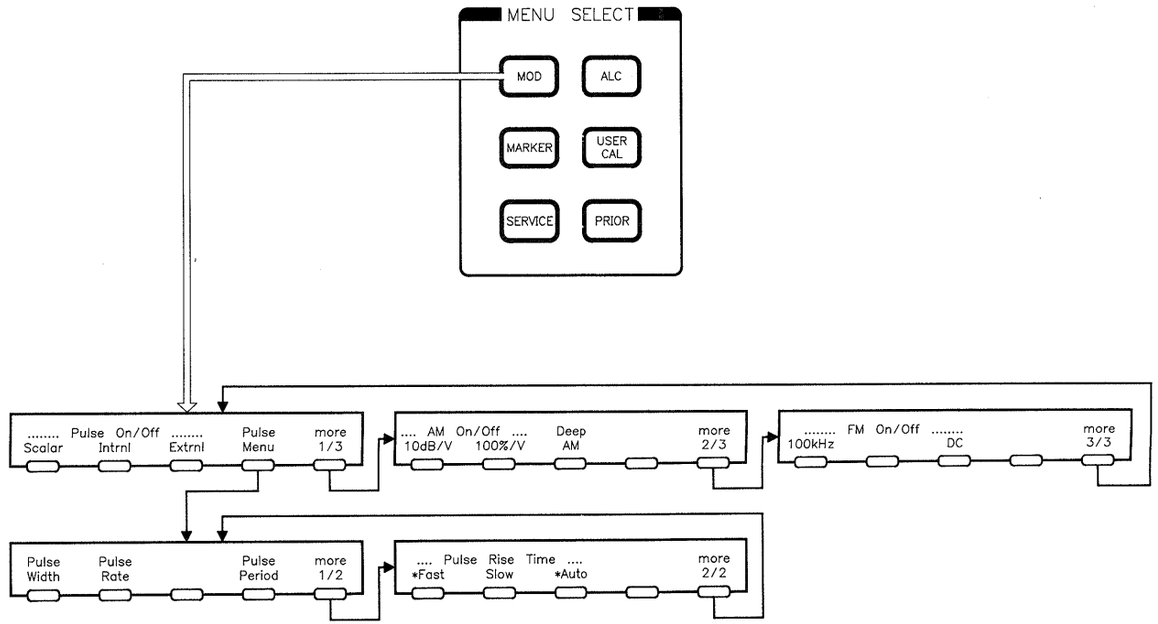
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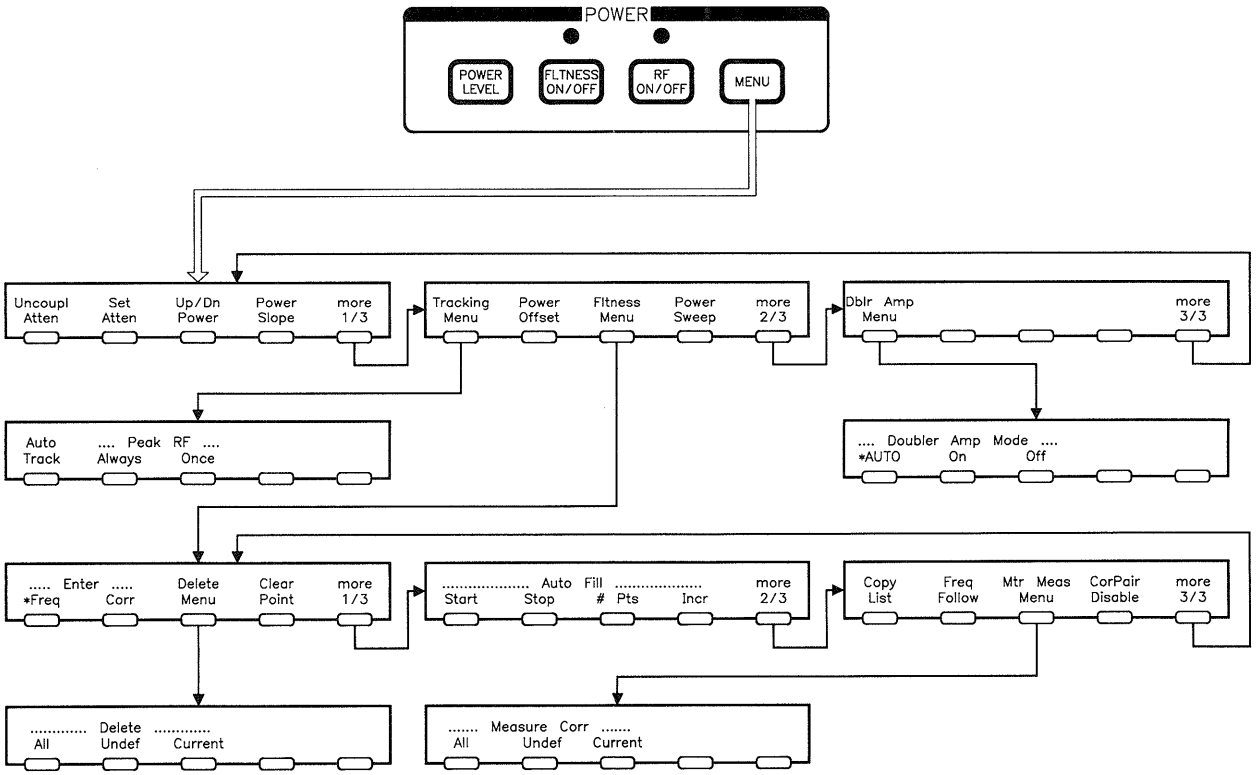
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OPTION 002 MENU

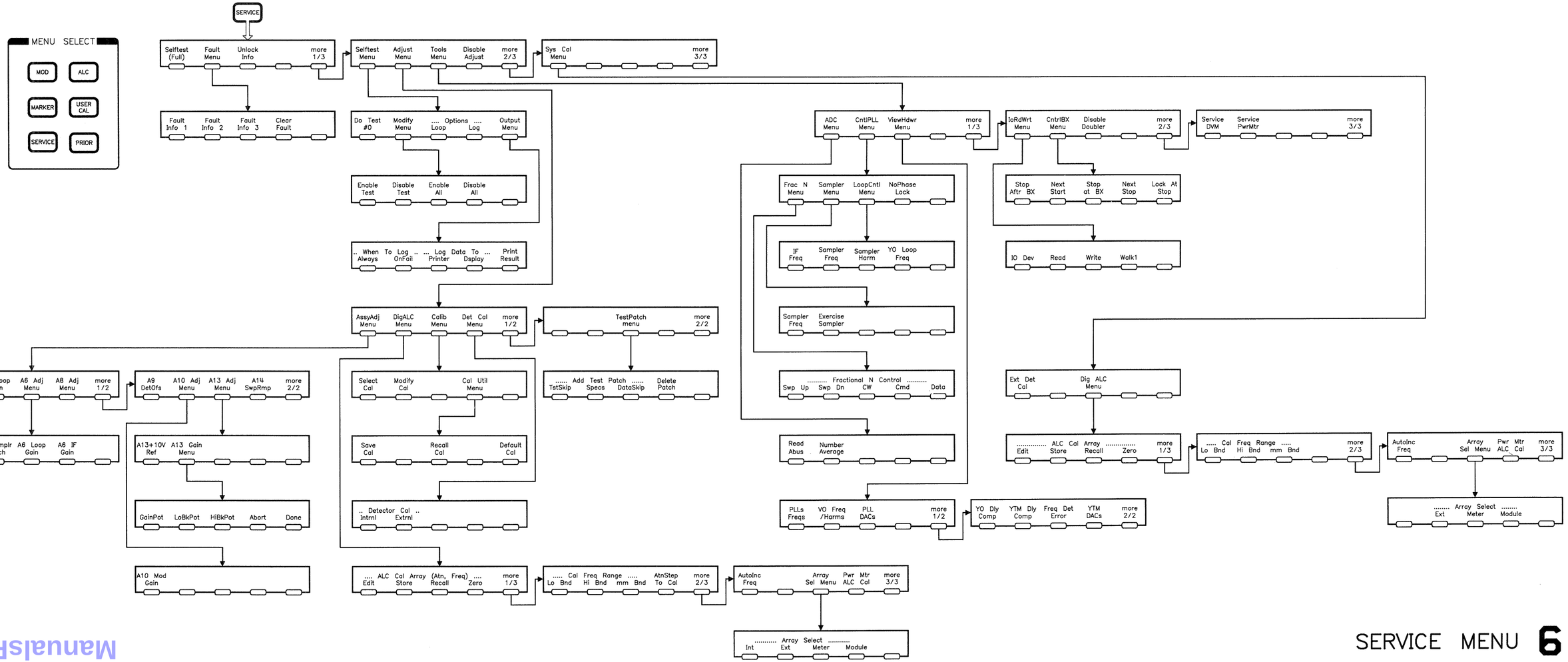




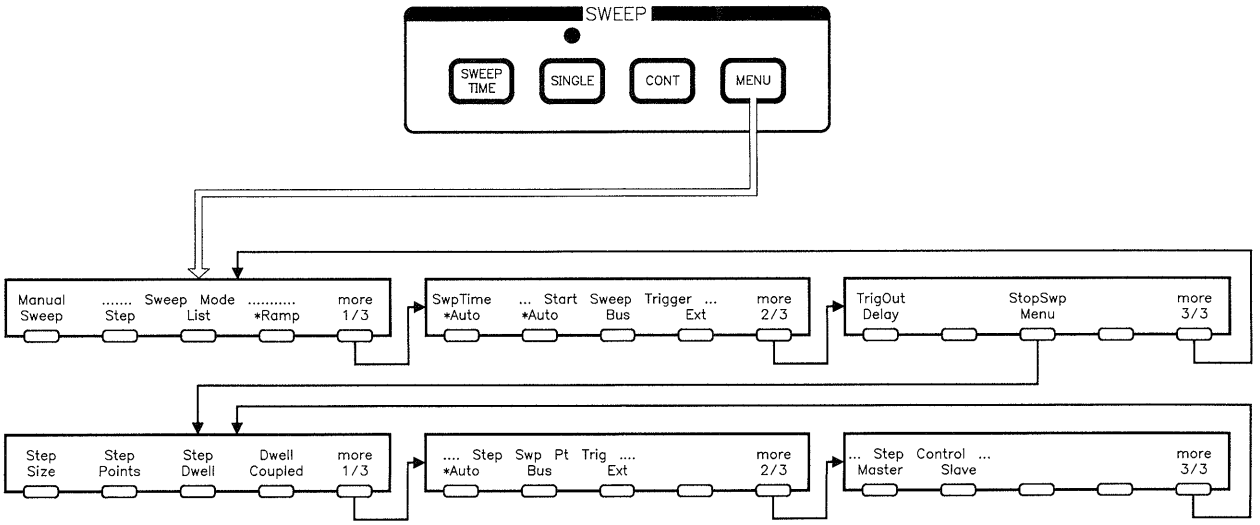
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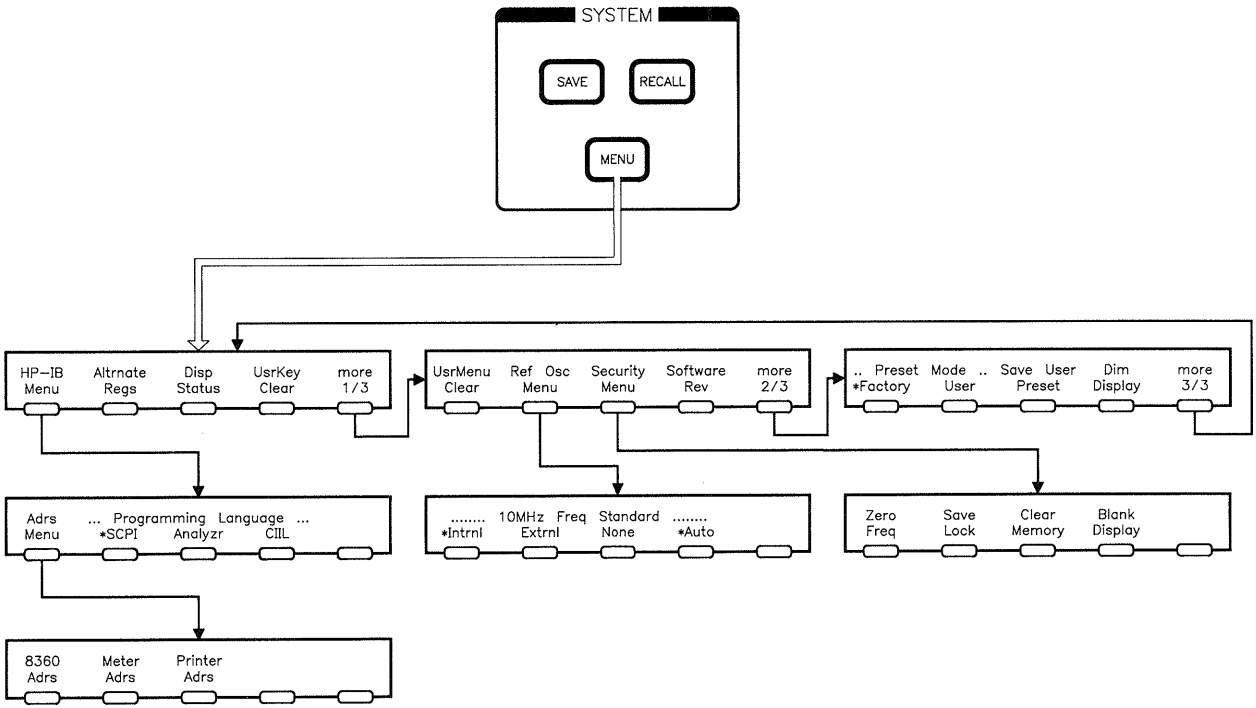
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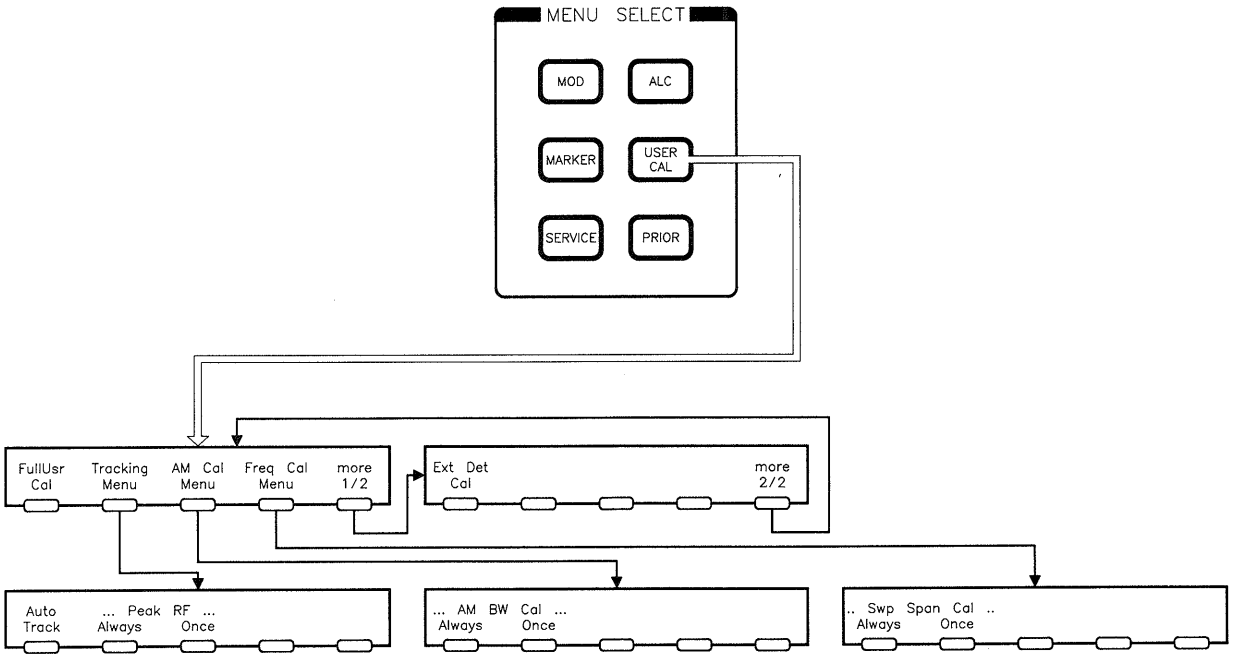
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7

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



This instrument has been designed in accordance with international safety standards, however only a skilled person who is aware of the hazards involved should disassemble this instrument. Voltages in the instrument can, if contacted, cause personal injury; be extremely careful. Capacitors may be charged even if the instrument has been disconnected from line power.

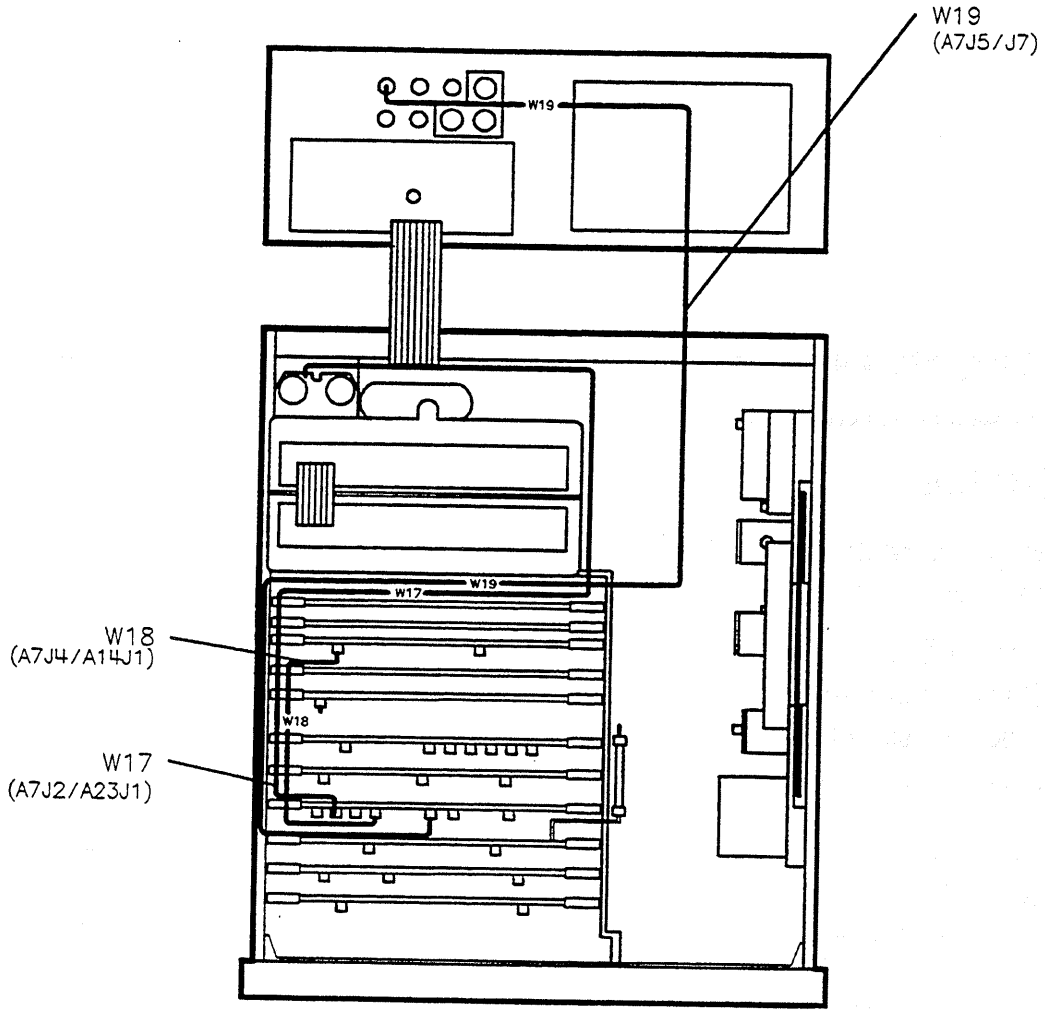
Caution



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.

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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 the "Replaceable Parts" chapter for the associated part numbers.

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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.

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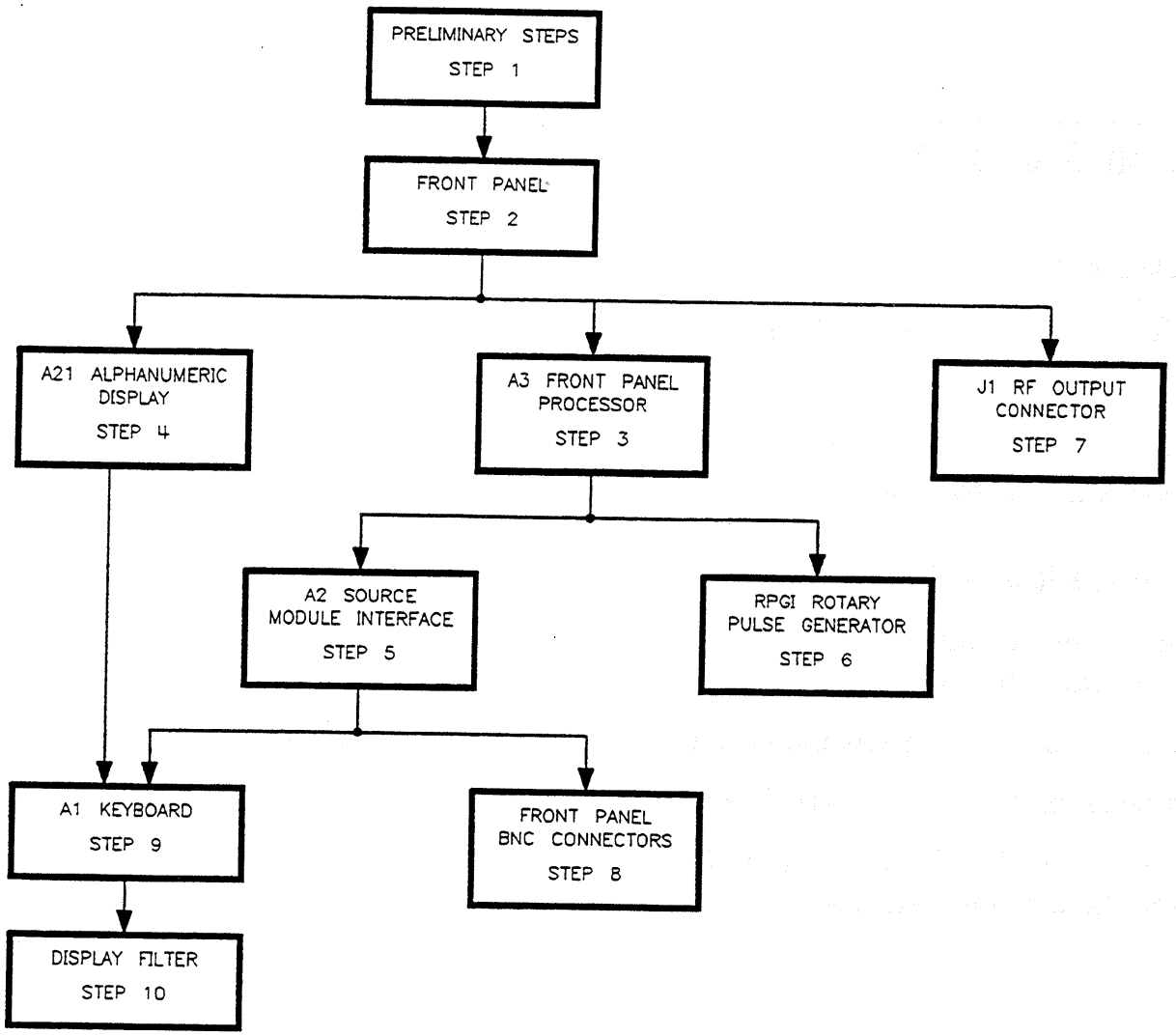


Figure 7-2. Front Panel Disassembly Flowchart

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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.)

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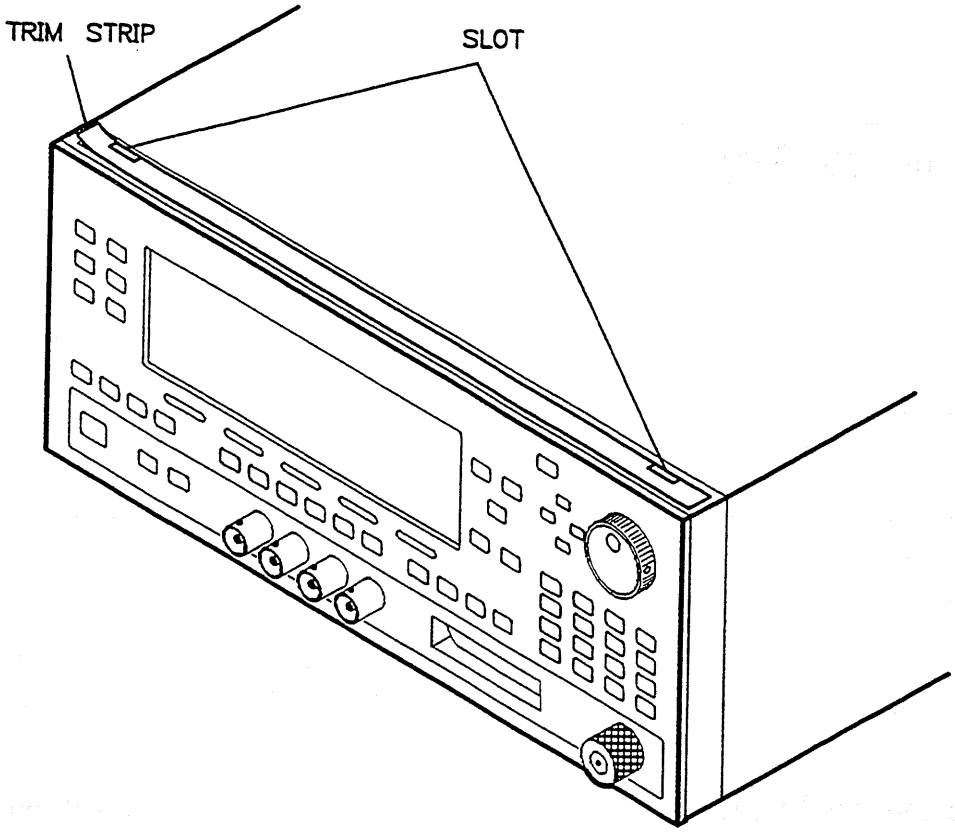


Figure 7-3. Front Edge Trim Strip

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2. Front Panel Removal

Note: Complete "Preliminary Steps" before continuing.

Refer to Figure 7-4.

1. Remove *three* of the four screws under the trim strip.
2. Remove *two* of the three screws on the lower front frame edge.
3. 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 "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.

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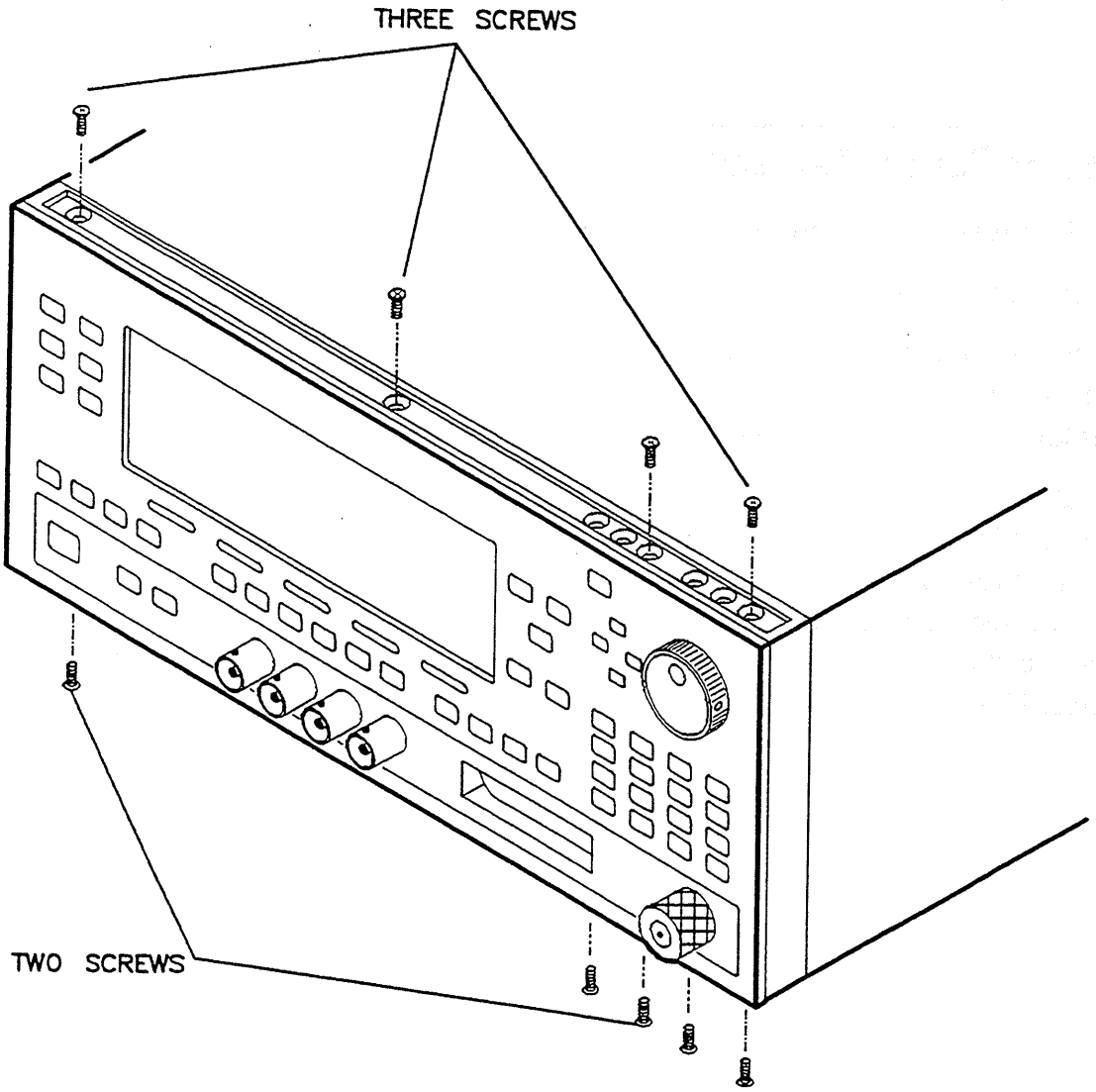


Figure 7-4. Front Panel Screw Locations

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Refer to Figure 7-5.

Note: Instruments with Option 004 do not have all the cables shown.

4. Cut the tie wraps holding the cables.
5. 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.
6. Disconnect the source module interface cable, W10.
7. Disconnect ribbon cables W2 and W3 from the motherboard.

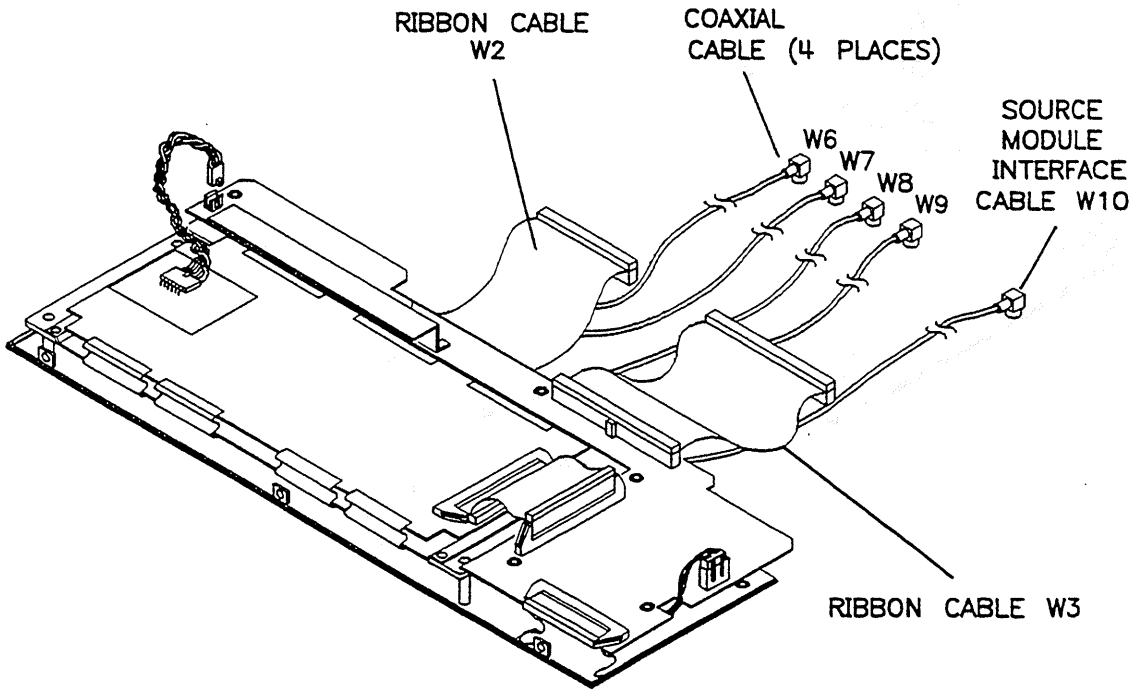


Figure 7-5. Front Panel Coaxial and Ribbon Cable Locations

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3. A3 Front Panel Processor Removal

Note: Complete "Preliminary Steps" and "Front Panel Removal" before continuing.

Refer to Figure 7-6.

1. Disconnect the three ribbon cables (W3, W4, and W5), the rotary pulse generator (RPG) cable, and the six-wire display cable W1.
2. Remove the eight screws from the PC assembly.
3. Lift off the front panel processor assembly.

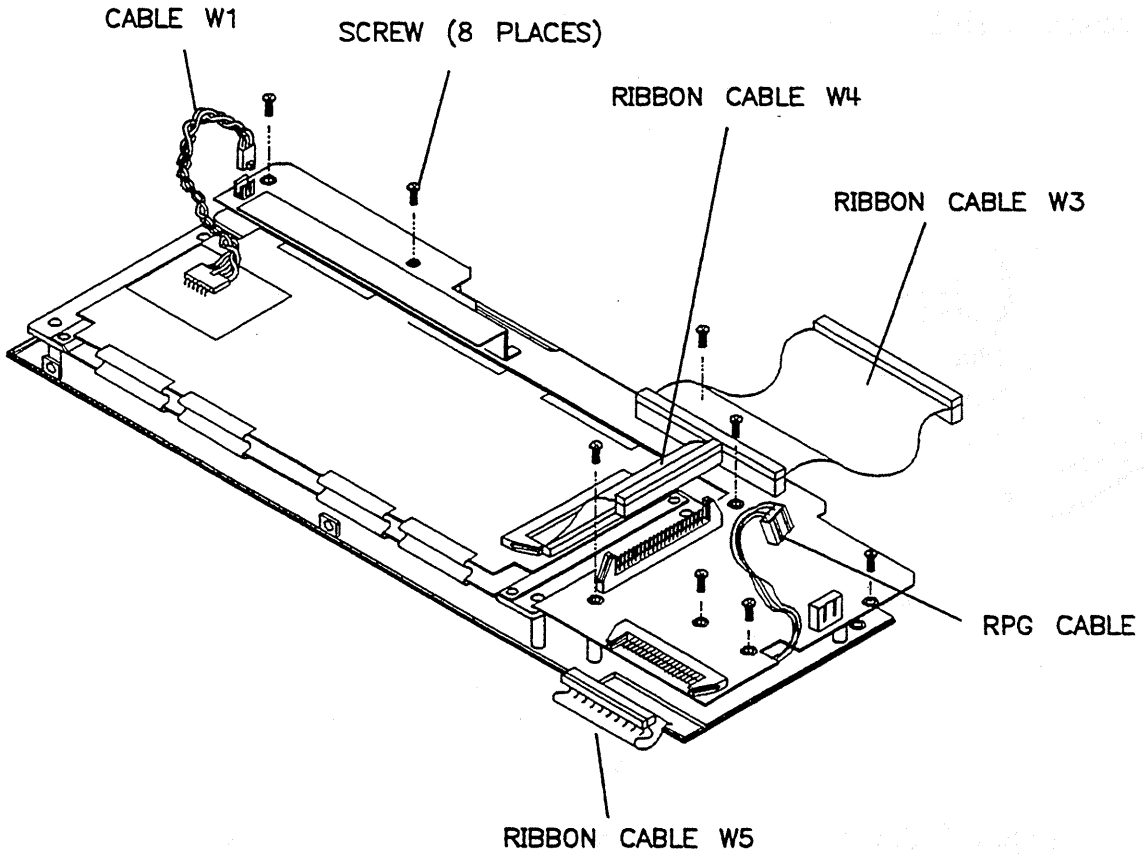


Figure 7-6. Front Panel Processor Cables

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4. A21 Alphanumeric Display Removal

Note: Complete "Preliminary Steps" and "Front Panel Removal" before continuing.

Refer to Figure 7-7.

1. Disconnect the six-wire display cable W1 and ribbon cable W4.
2. Remove the four outer-most screws around the edge of the bracket.
3. Lift off the display.

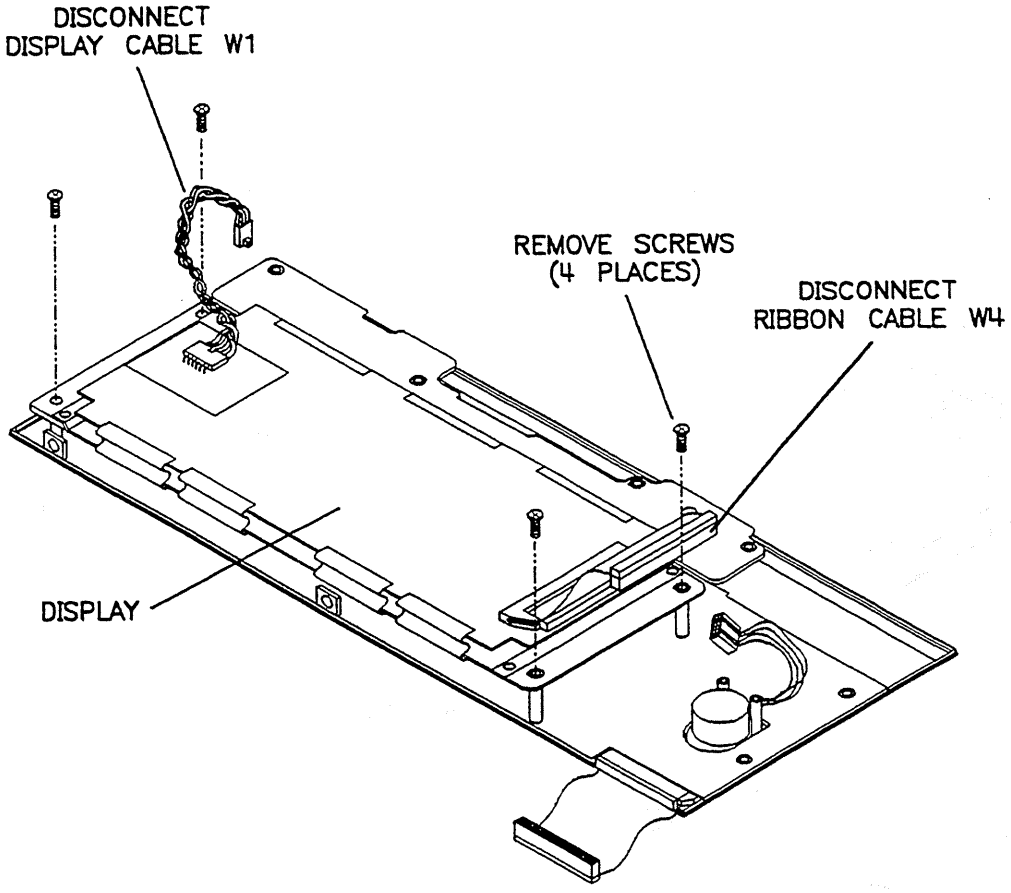


Figure 7-7. Display Removal

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5. A2 Source Module Interface Removal

Note: Complete "Preliminary Steps", "Front Panel Removal", and "Front Panel Processor Removal" before continuing.

Refer to Figure 7-8.

1. Remove the source module interface cable (W10).
2. Remove the four screws.
3. Remove the source module interface assembly.
4. Disconnect ribbon cable W2 from the source module interface assembly.
5. Remove the A2 source module interface assembly.

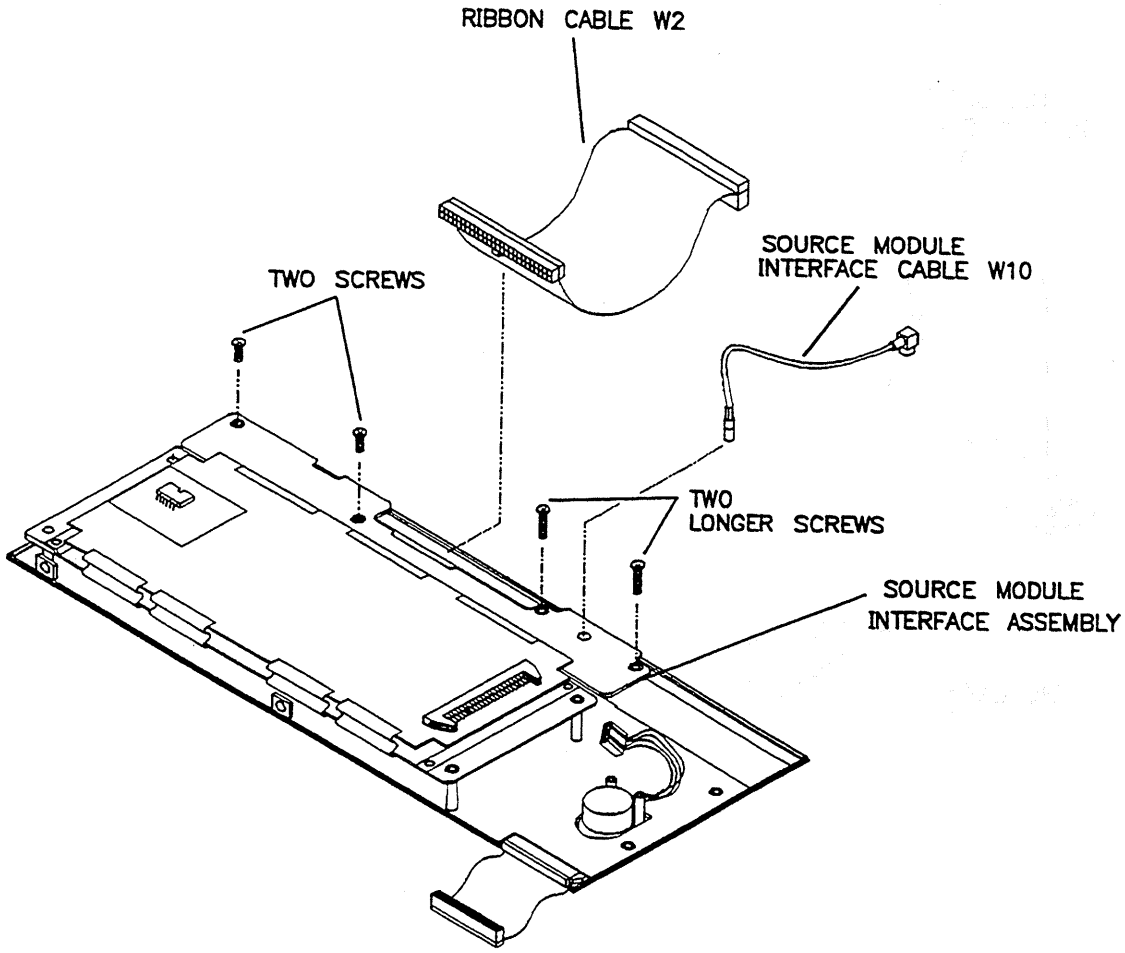


Figure 7-8. Source Module Interface Removal

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6. RPG1 Rotary Pulse Generator Removal

Note: Complete "Preliminary Steps", "Front Panel Removal", and "Front Panel Processor Removal" before continuing.

Refer to Figure 7-9.

1. Loosen the two hex screws and remove the rotary knob.

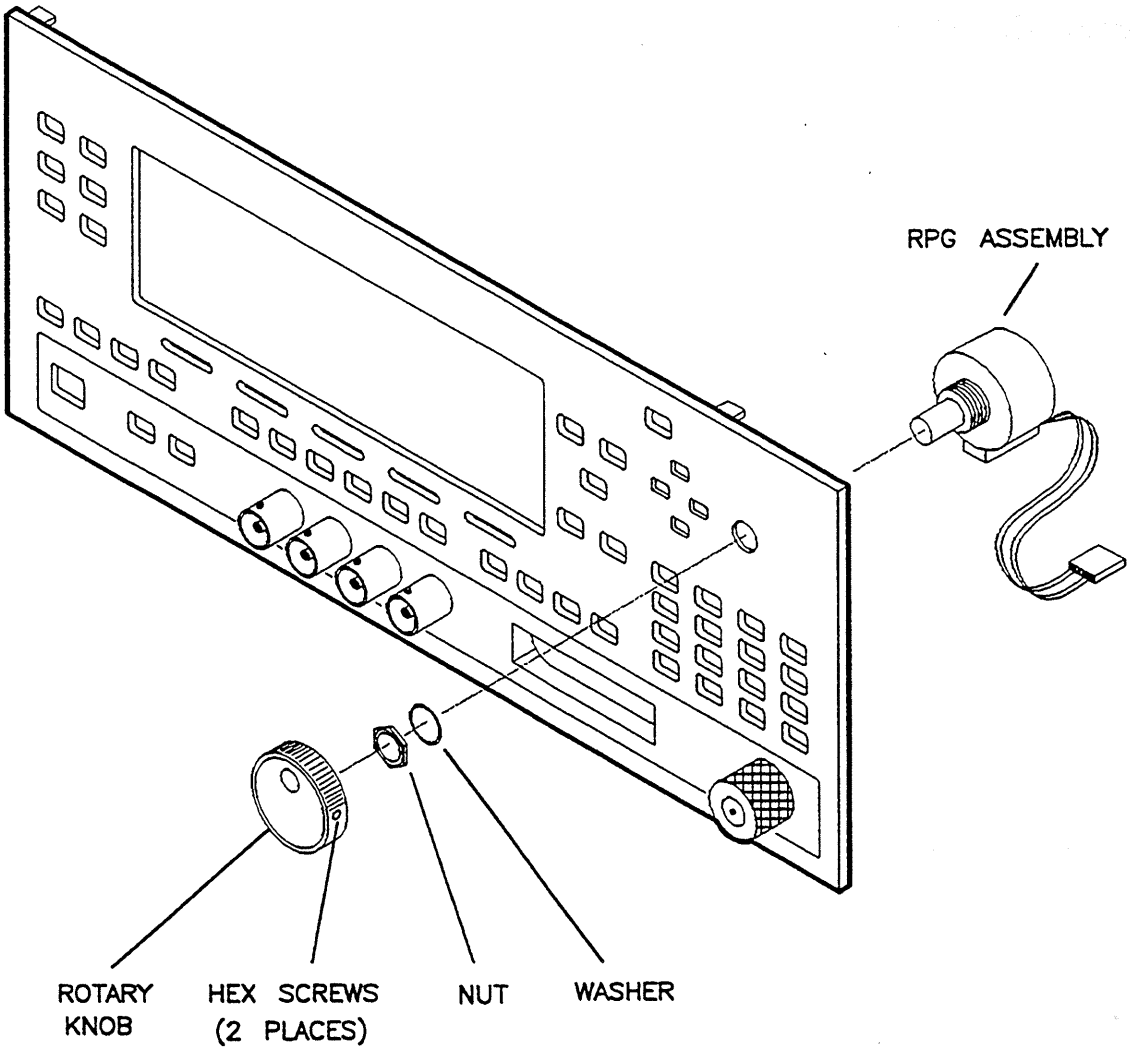


Figure 7-9. RPG Removal

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7. J1 RF Output Connector Removal

Note: Complete "Preliminary Steps" and "Front Panel Removal" before continuing.

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. On the lower front frame edge, remove the two RF output screws that hold the RF output assembly.
2. Remove the RF connector with cable W43.

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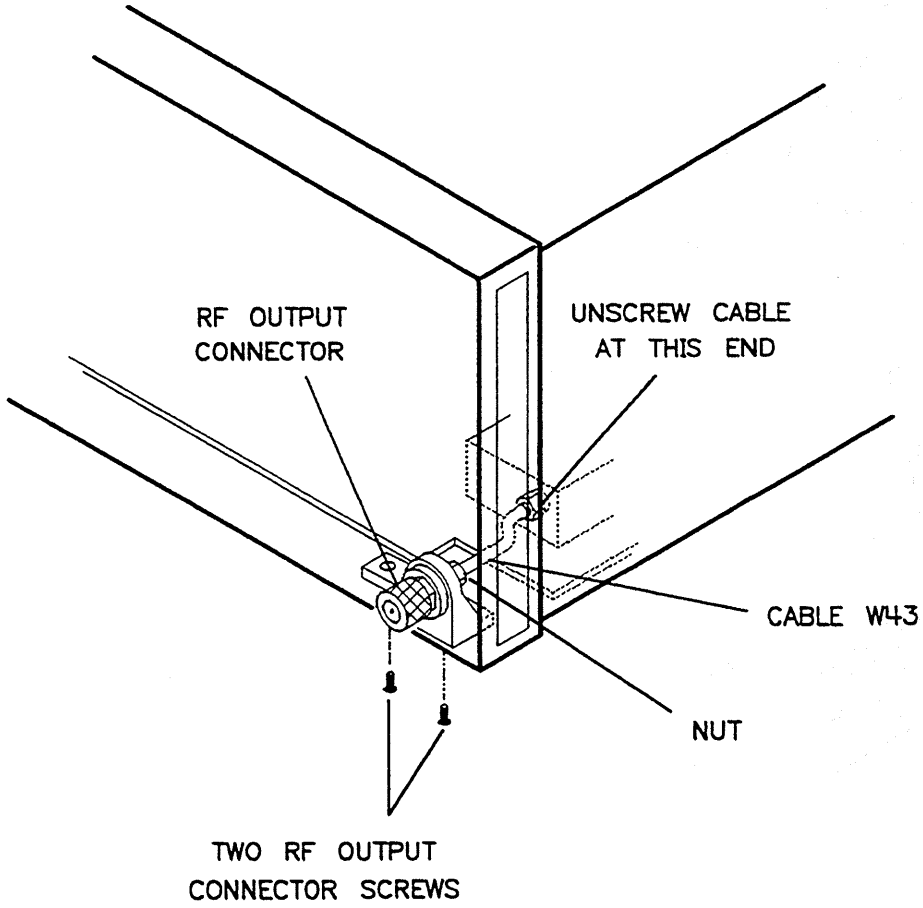


Figure 7-10. Removing RF Output Connector (Front Panel)

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.

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8. Front Panel BNC Connectors Removal

Note: Complete "Preliminary Steps", "Front Panel Removal", "Front Panel Processor Removal" and "Source Module Interface Removal" before continuing.

Refer to Figure 7-11.

1. Remove the two screws on each of the four PC assemblies attached to the back of the front panel.
2. 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.

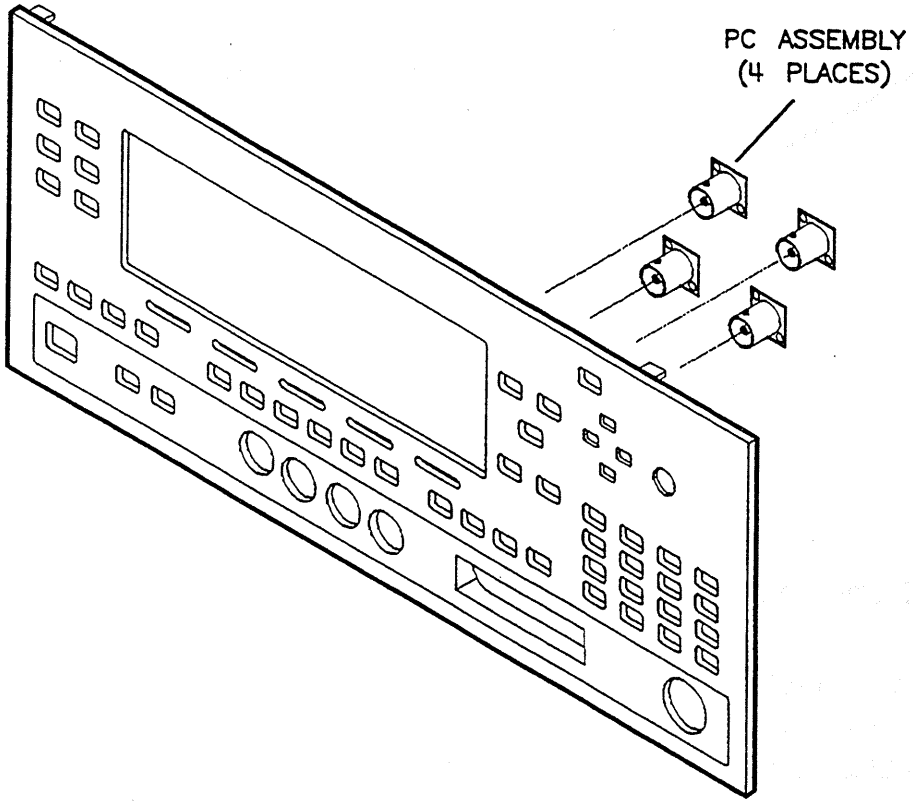


Figure 7-11. Front Panel BNC Locations

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9. A1 Keyboard Removal

Note: Complete "Preliminary Steps", "Front Panel Removal", "Front Panel Processor Removal", "Alphanumeric Display Removal" and "Source Module Interface Removal" before continuing.

Refer to Figure 7-12.

1. Remove the nine screws from the keyboard assembly.
2. 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.

3. Disconnect ribbon cable W5 from the keyboard.

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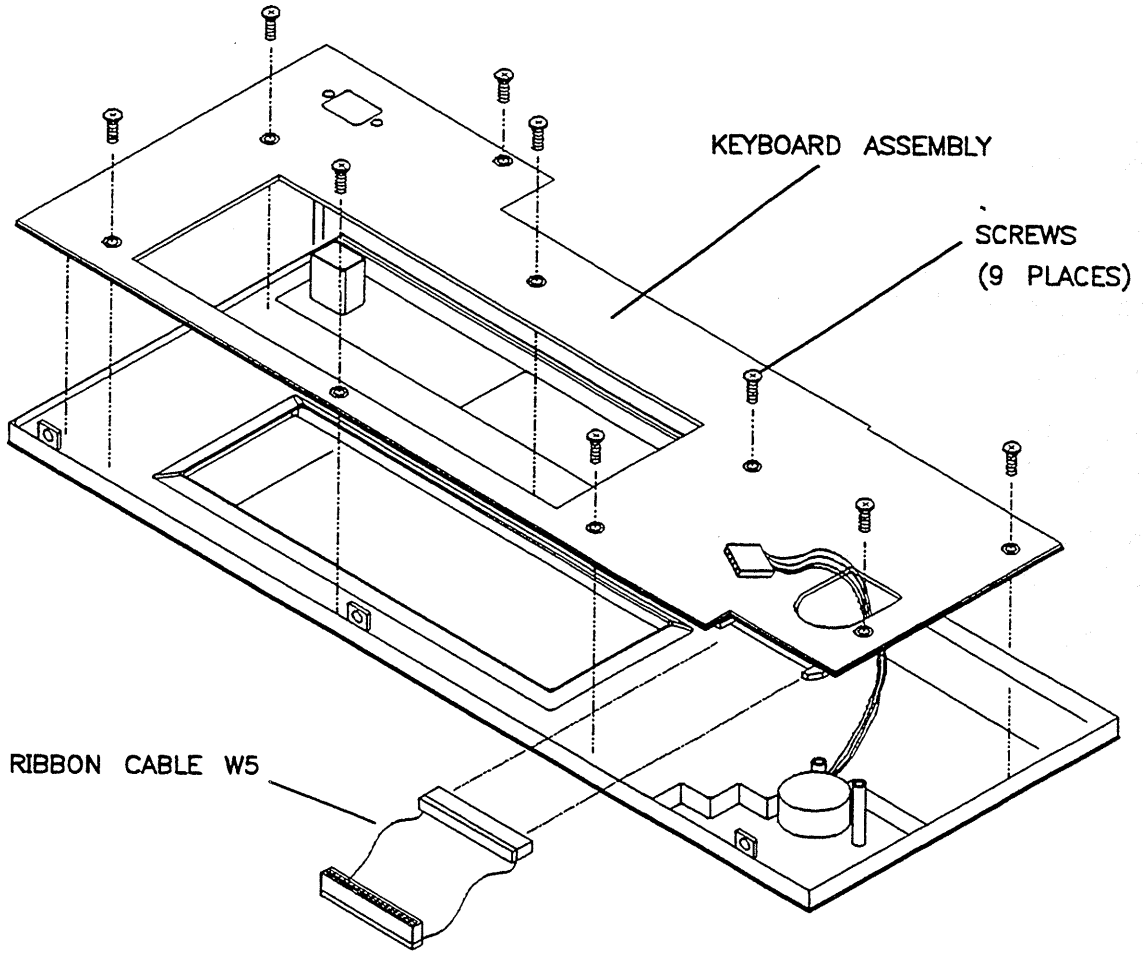


Figure 7-12. Keyboard Assembly Removal

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.

4. Remove the keypad.
5. Remove the anti-rock sheets.

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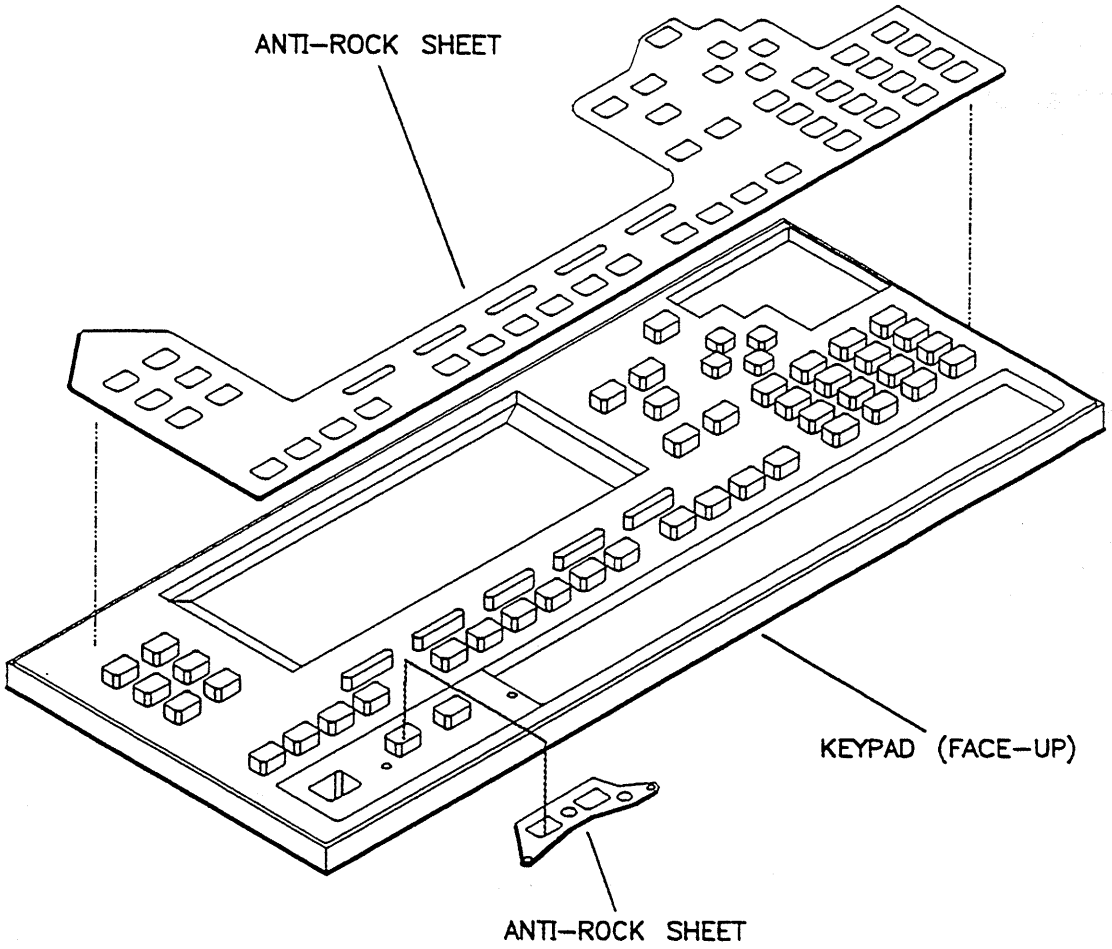


Figure 7-13. Keypad and Anti-rock Sheets

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10. Display Filter Removal

Note: Complete "Preliminary Steps", "Front Panel Removal", "Front Panel Processor Removal", "Alphanumeric Display Removal", "Source Module Interface Removal" and "Keyboard Removal" before continuing.

Refer to Figure 7-14.

1. With all other assemblies removed, lift out the display filter.

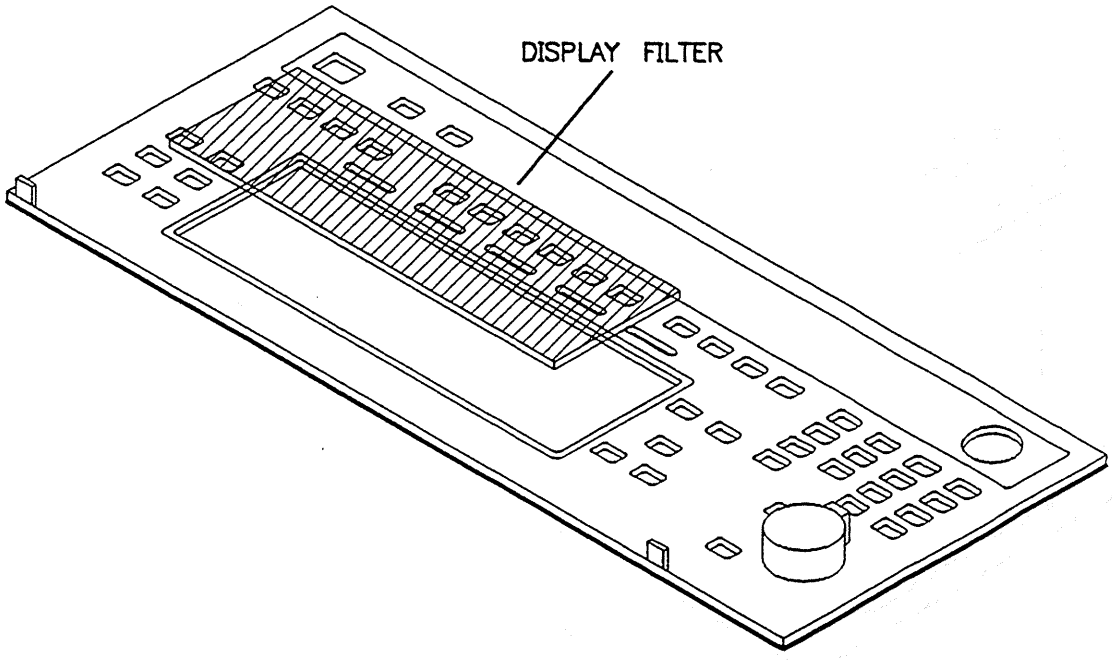


Figure 7-14. Display Filter

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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.

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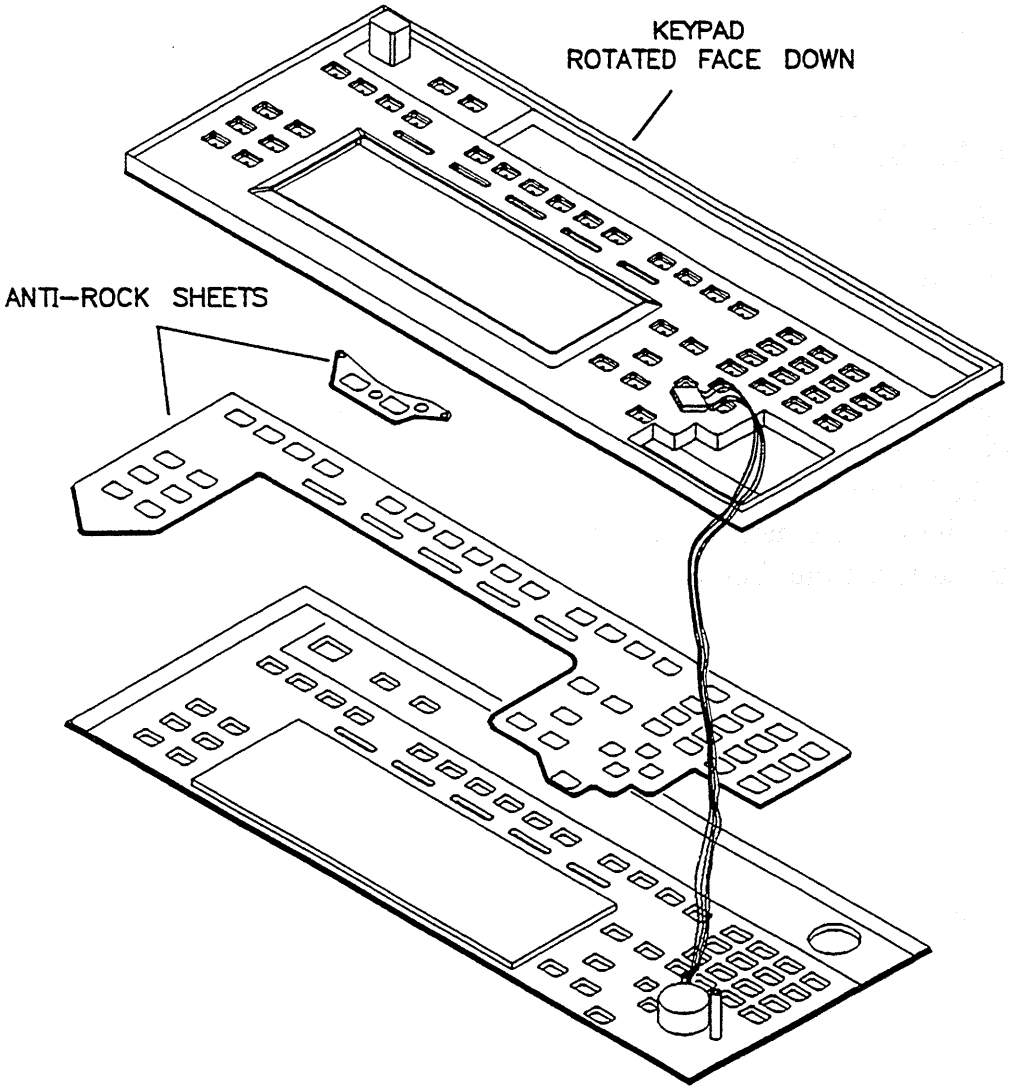


Figure 7-15. Keyboard Reassembly

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.

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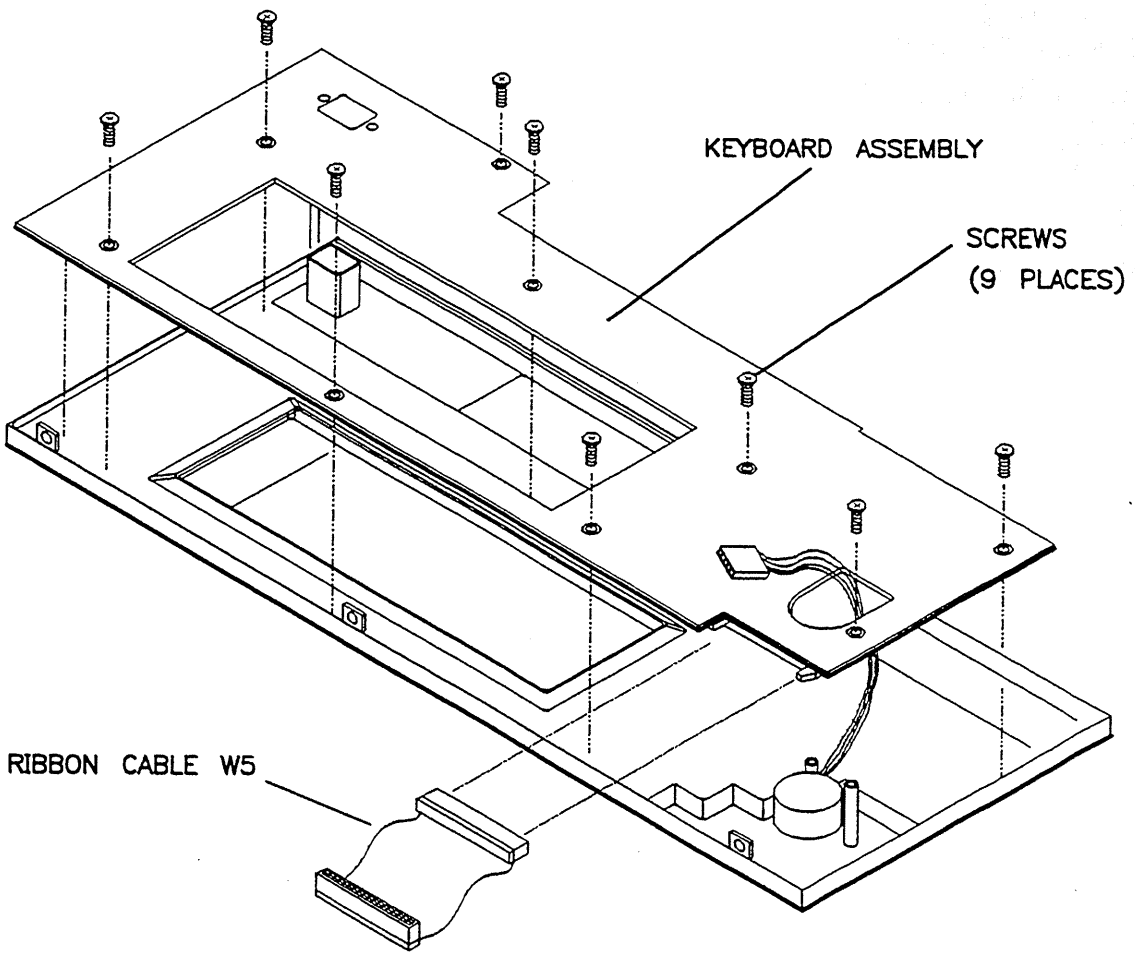


Figure 7-16. Keyboard Assembly Screw Locations

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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.

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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.

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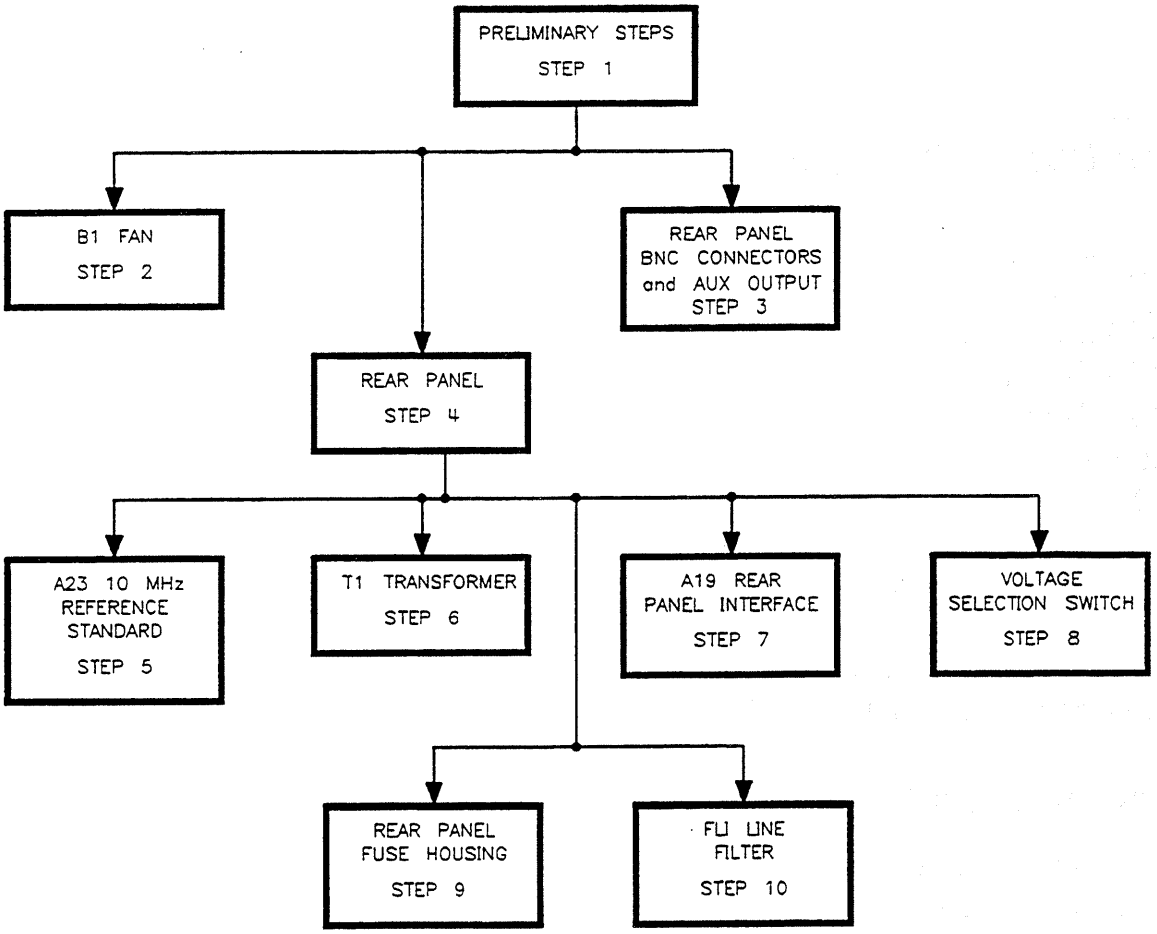


Figure 7-17. Rear Panel Disassembly Flowchart

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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.

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2. B1 Fan Removal

Note: Complete "Preliminary Steps" before continuing.

Refer to Figure 7-18.

1. Remove both screws (item 1) from the fan shroud.
2. Remove items 2 through 5.
3. Remove the four screws (item 7) from the rear panel/fan brackets.
4. Unplug the fan harness.
5. Tip the fan and angle it out through the opening in the rear panel.
6. Remove the four screws (item 7) attaching the two brackets to the fan and remove the brackets (item 10).

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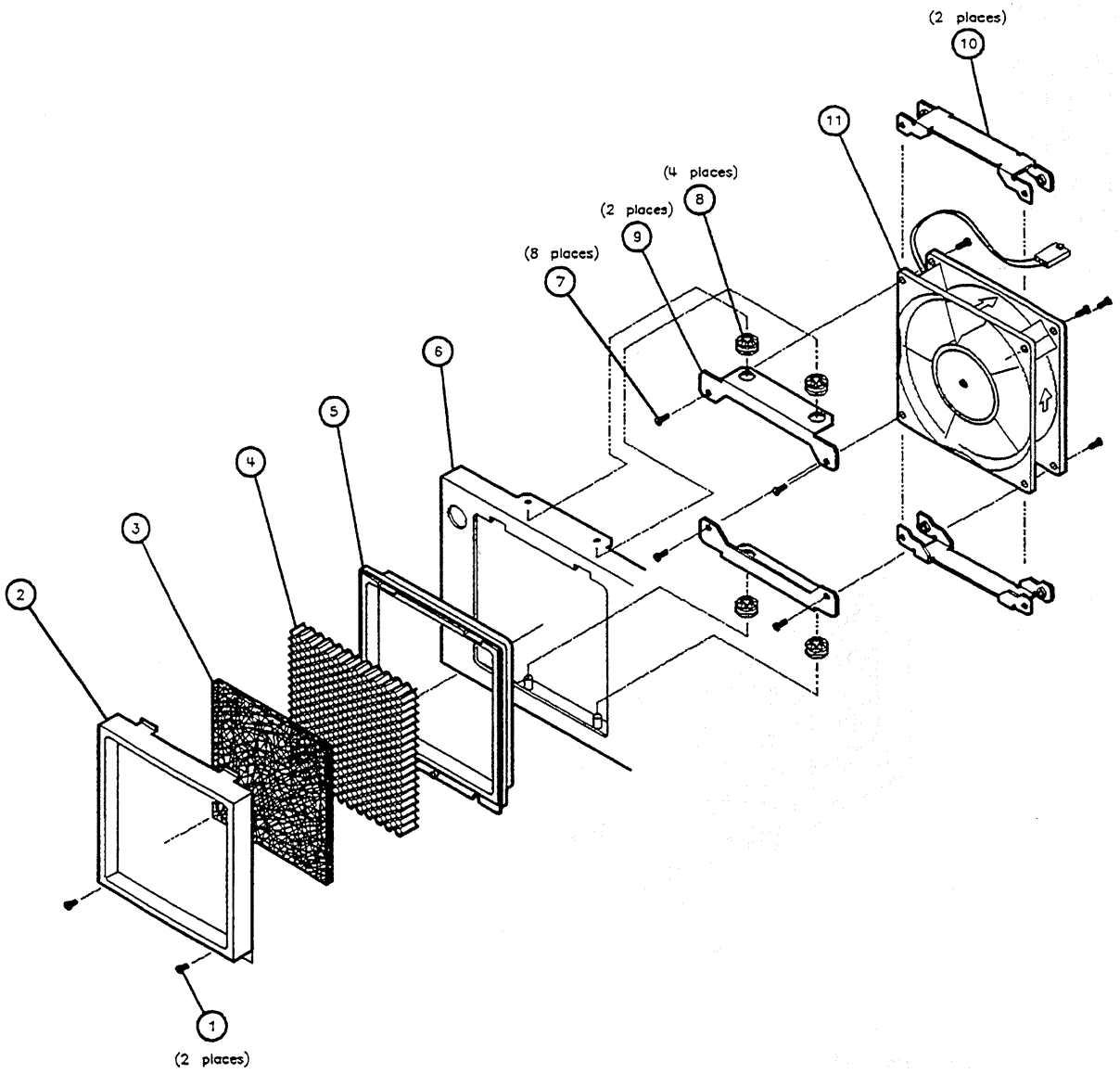


Figure 7-18. B1 Rear Panel Fan Assembly

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3. Rear Panel BNC Connectors Removal and Aux Output Disconnection

Note: Complete "Preliminary Steps" before continuing.

Refer to Figure 7-19.

1. Remove the nuts and washers on the four BNC connectors, 10 MHz REF INPUT, 10 MHz REF OUTPUT, VOLTS/GHz, and TRIGGER OUTPUT.
2. Slide out the four connectors.
3. If you have Option 002, repeat steps 1 and 2 for the following connectors: AM/FM OUTPUT, PULSE SYNC OUT, and PULSE VIDEO OUT.
4. Disconnect W48 at rear panel SMA connector J14 AUX OUTPUT.

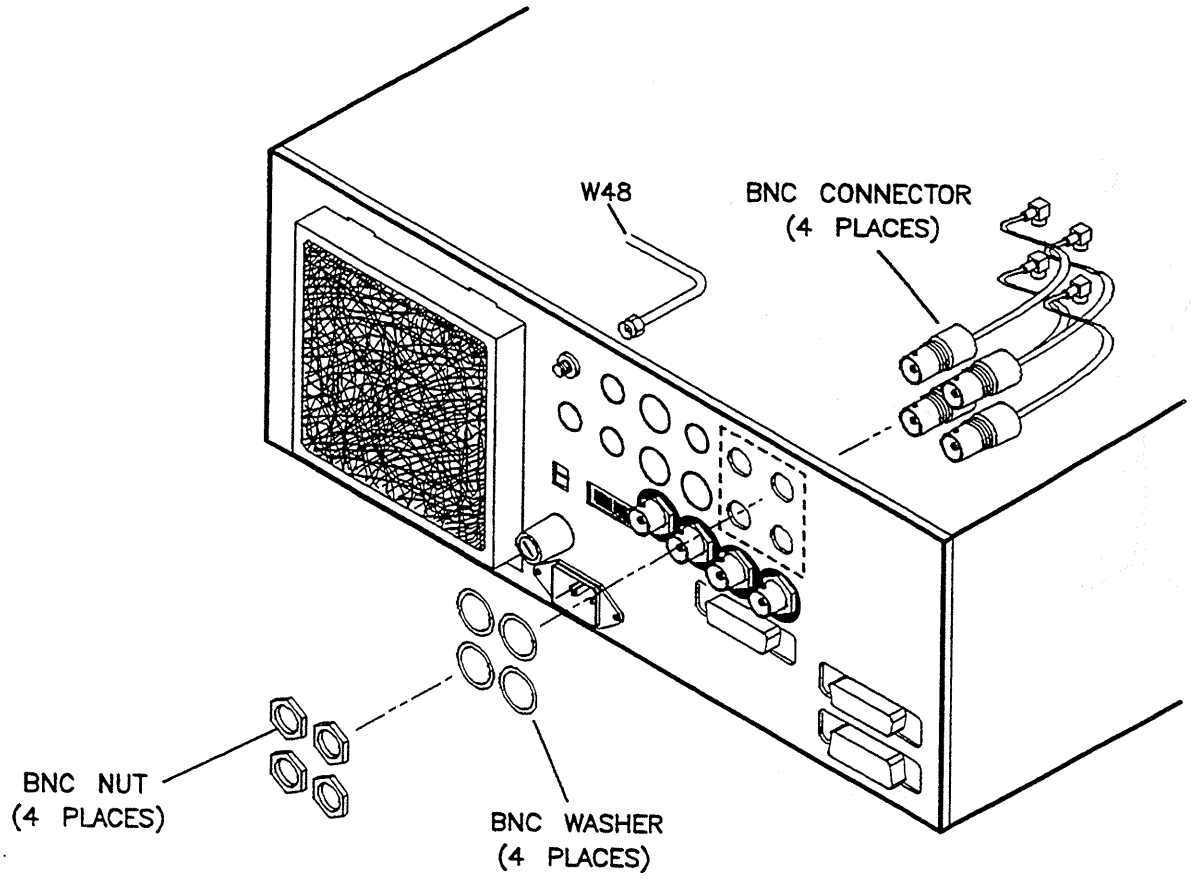


Figure 7-19. Rear Panel BNC Connector Locations

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4. J1 RF Output Connector Removal (Option 004)

Note: Complete "Preliminary Steps" before continuing.

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. Disconnect cable W43 at the directional coupler A30 (or at the step attenuator A31 for instruments with Option 001).
2. Remove the two screws from the RF output connector plate on the rear panel.
3. Remove the RF connector with cable W43 attached.

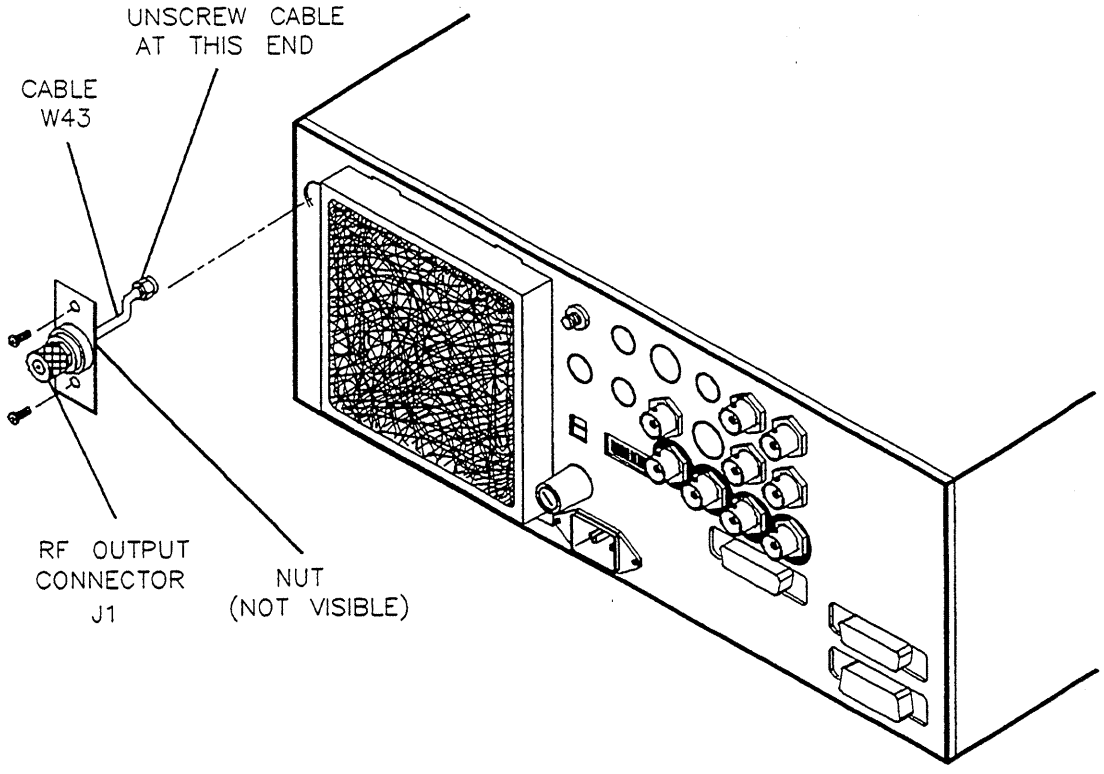


Figure 7-20. Removing RF Output Connector

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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).

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5. Rear Panel Removal

Note: Complete "Preliminary Steps" and "J1 RF Output Connector Removal" before continuing.

Refer to Figure 7-21.

1. Remove the four screws on the top back edge.
2. Remove the four screws on the bottom back edge.
3. Slide the rear panel out of the casting.

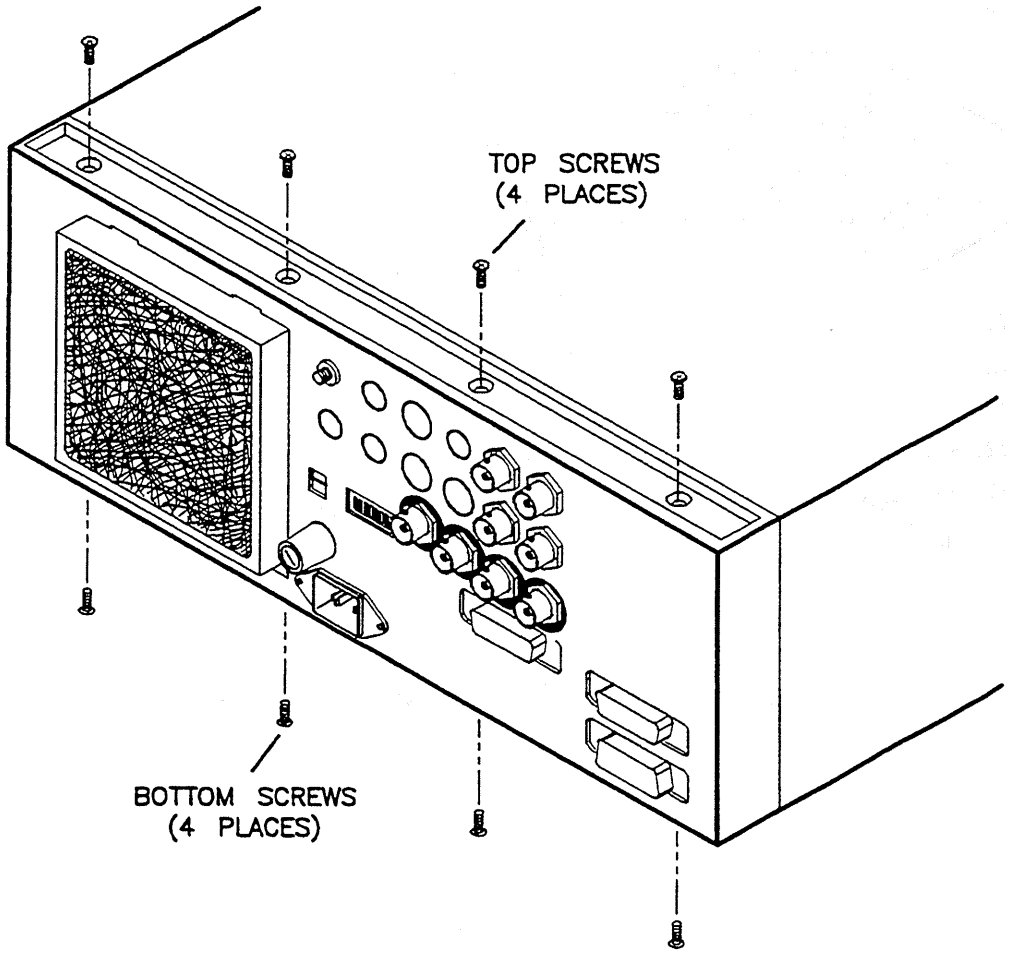


Figure 7-21. Rear Panel Removal

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Refer to Figure 7-22.

4. Disconnect ribbon cable W31 from the motherboard.
5. Disconnect the 8-pin line switch connector.
6. Disconnect the fan harness.
7. Cut the tie wraps holding the coaxial cables to the four BNC connectors and the source module interface.
8. Disconnect the coaxial cables from the A7, A12, and A14 assemblies and disconnect the source module interface cable from the A19 assembly.

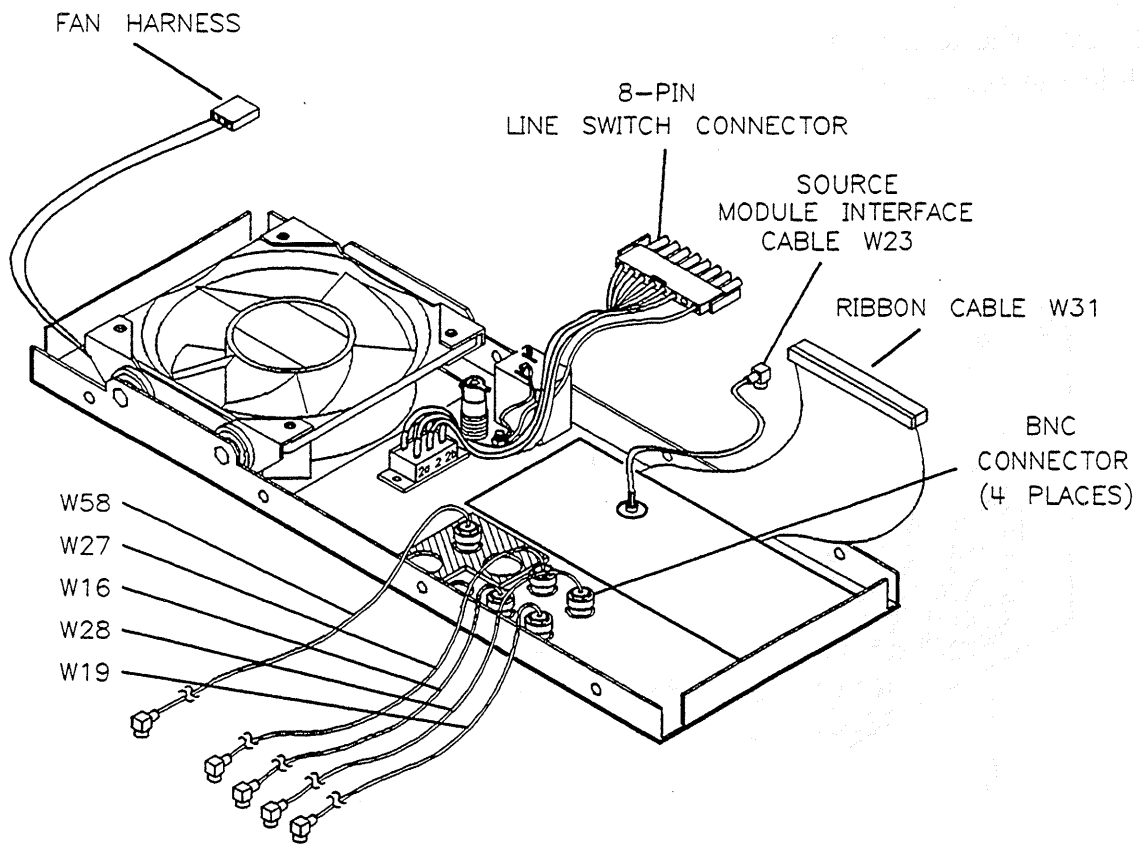


Figure 7-22. Rear Panel Cable Locations

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6. A23 10 MHz Reference Standard Removal

Note: Complete "Preliminary Steps", "J1 RF Output Connector Removal", and "Rear Panel Removal" before continuing.

Refer to Figure 7-23.

1. Disconnect cable W17 and the pin-locking tab, W30.
2. Without removing the screws, press the shock-mount pads through the sheet metal holes.
3. Slide the reference standard out.

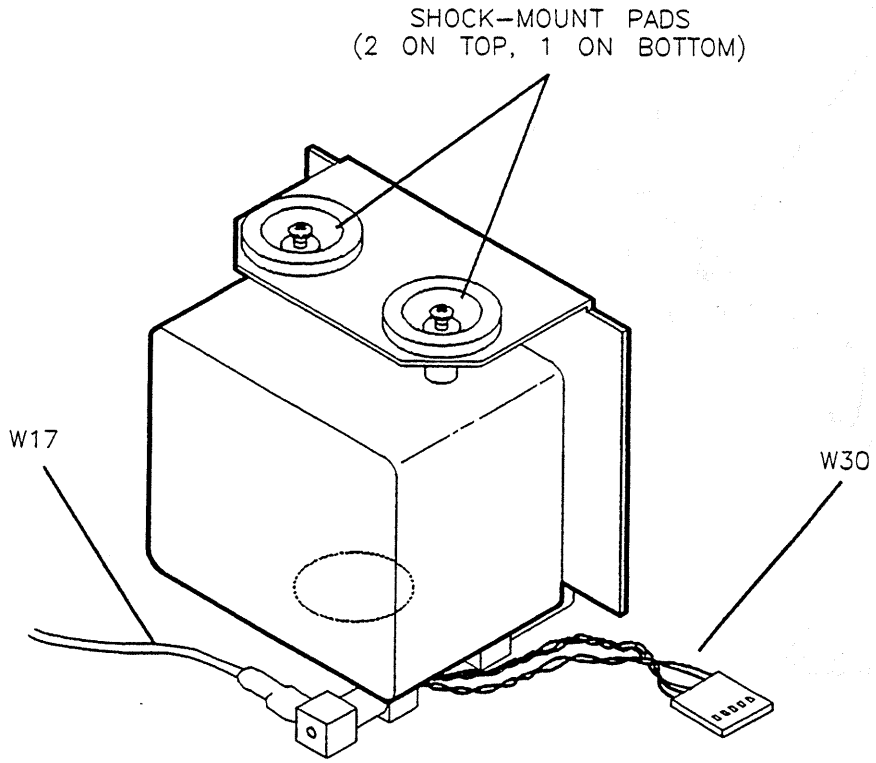


Figure 7-23. Reference Standard Mountings

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7. T1 Transformer Removal

Note: Complete "Preliminary Steps", "J1 RF Output Connector Removal", and "Rear Panel Removal" before continuing.

Refer to Figure 7-24.

1. Remove the six-wire pin-locking tab.
2. Remove the center screw, plastic washer, two insulators, and plate.
3. Remove the toroidal transformer.

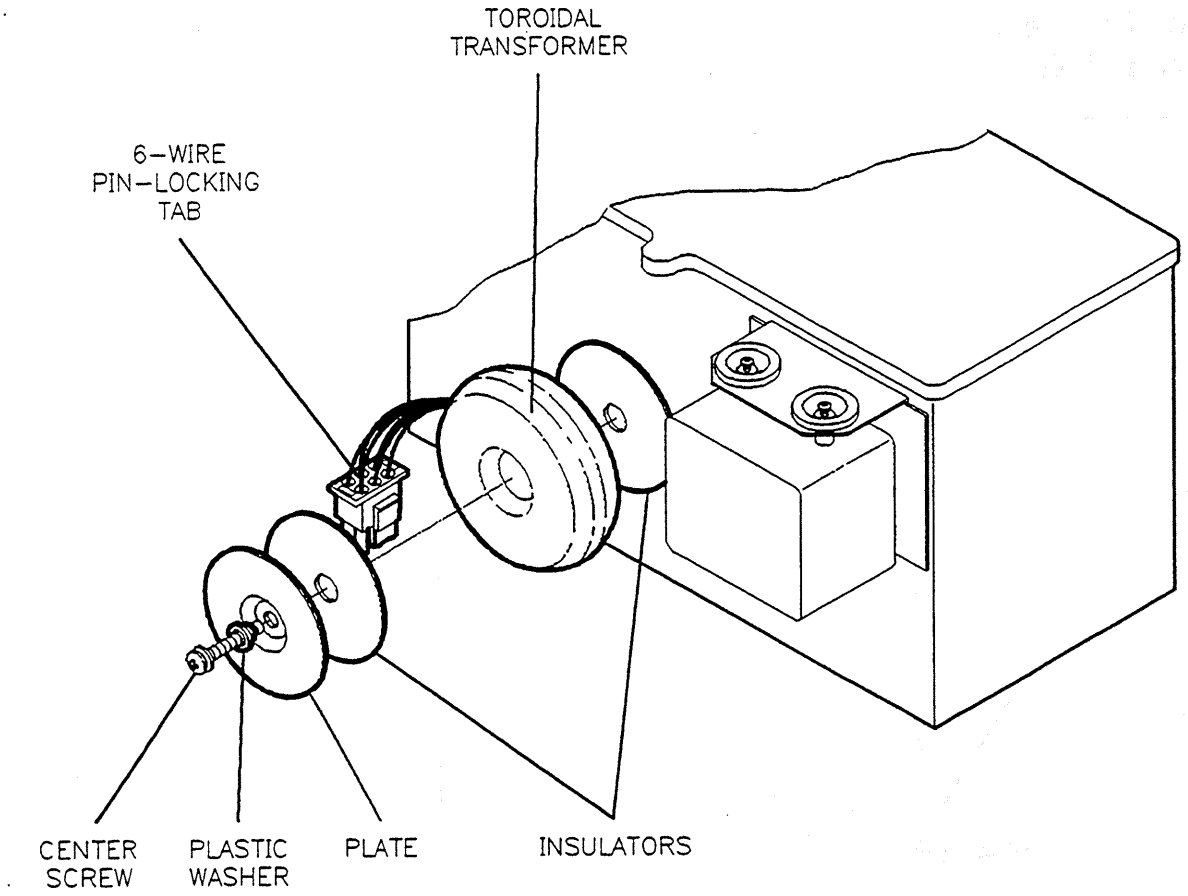


Figure 7-24. Transformer Removal

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8. A19 Rear Panel Interface Removal

Note: Complete "Preliminary Steps", "J1 RF Output Connector Removal", and "Rear Panel Removal" before continuing.

Refer to Figure 7-25.

1. Disconnect the source module interface cable W23 from SMB connector A10J3 on the A10 ALC assembly. (W23 is not included with replacement A19 assemblies.)
2. Remove the five screws.
3. Remove A19 from the rear panel.
4. 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.

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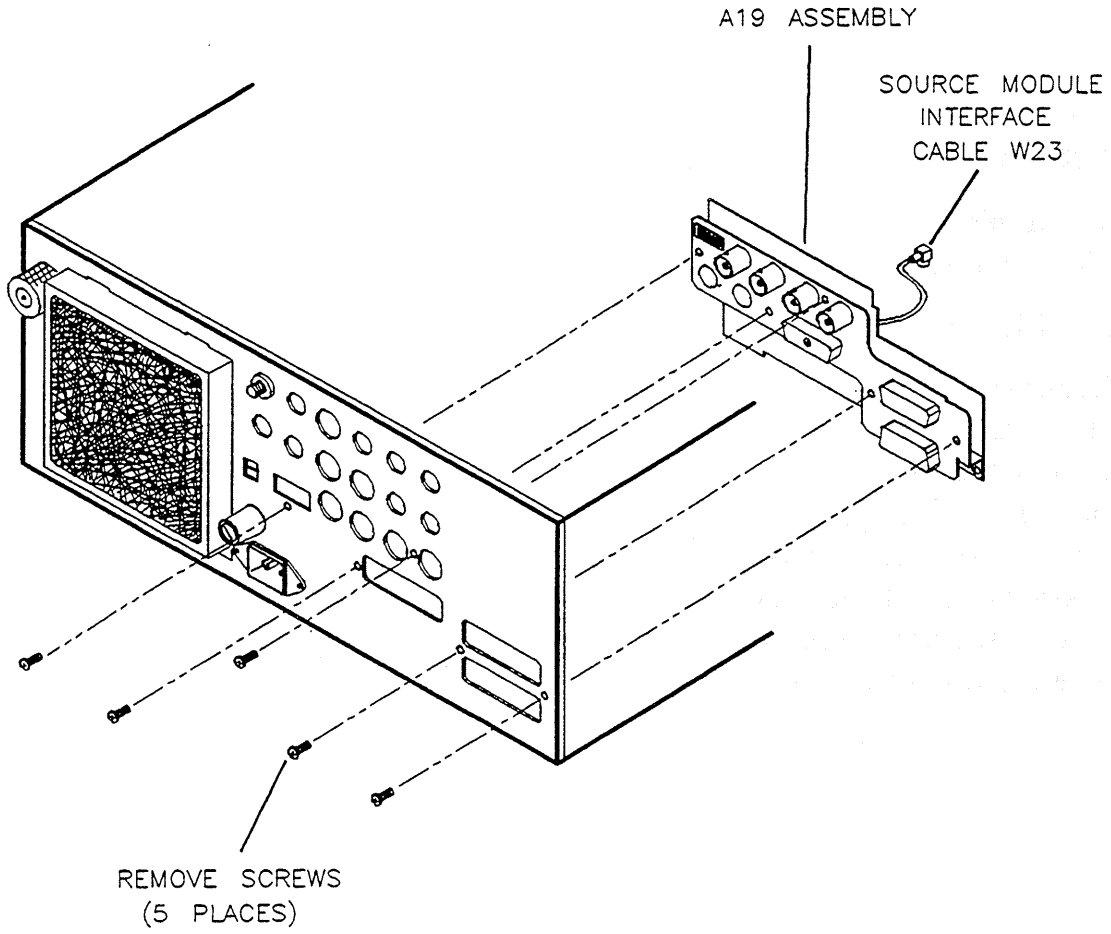


Figure 7-25. A19 Rear Panel Interface Removal

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9. Voltage Selector Switch Removal

Note: Complete "Preliminary Steps", "J1 RF Output Connector Removal", and "Rear Panel Removal" before continuing.

Refer to Figure 7-26.

1. Cut the tie wraps holding the wires.
2. Disconnect the 8-pin connector from the motherboard.
3. Remove the two nuts, bolts, and washers holding in the voltage selector switch.

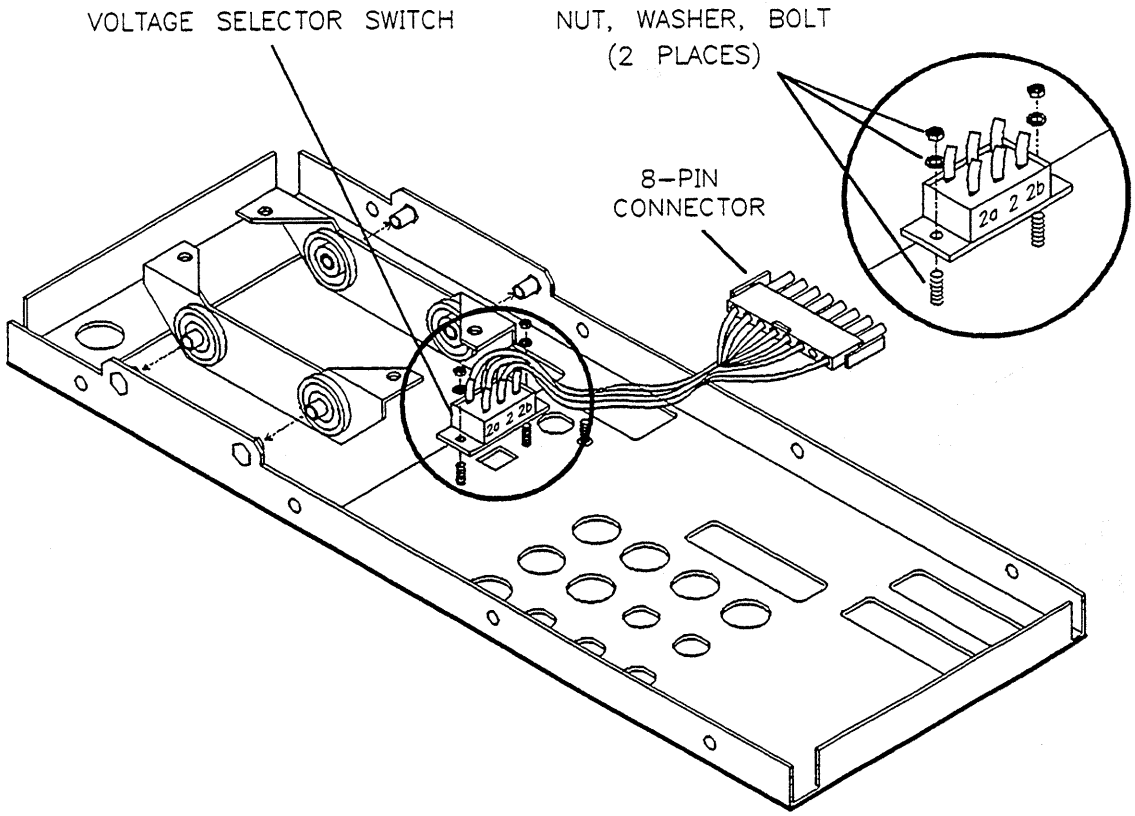


Figure 7-26. Voltage Selection Switch Removal

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Refer to Figure 7-27.

4. Unsolder the white/brown/grey wire from the fuse.
5. Unsolder the white/grey wire from the line filter.
6. Unscrew the green/white ground wire from the back panel.

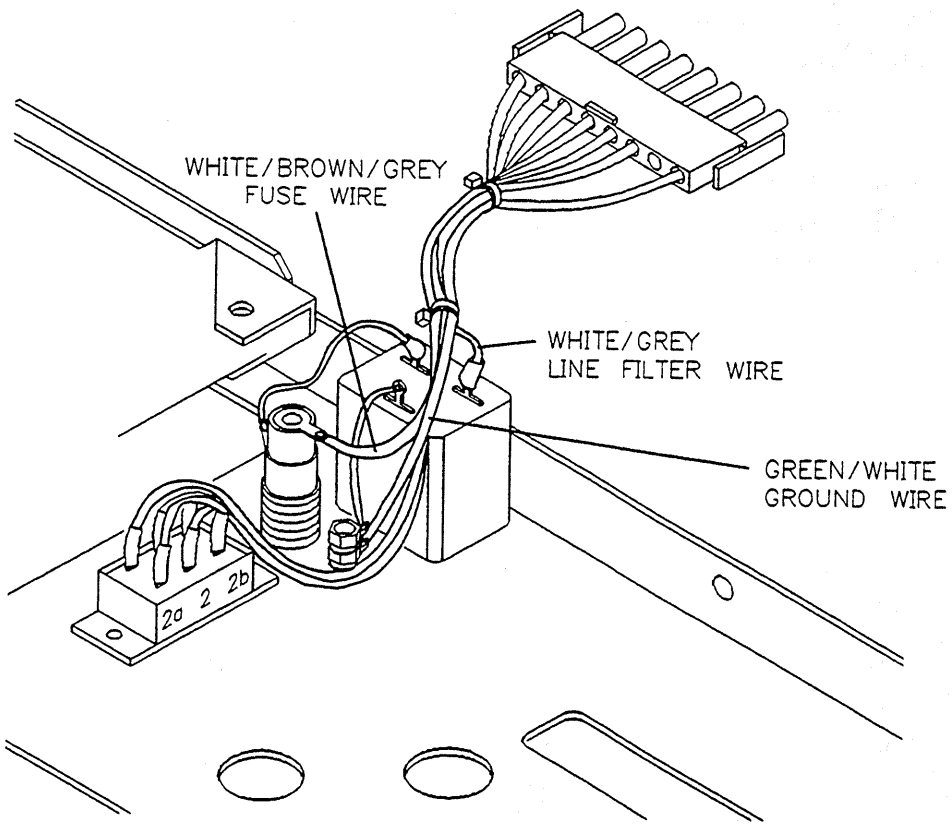


Figure 7-27. Fuse, Line Filter, and Ground Wires

Note: To reassemble, add 3/8 in. shrink tubing to each wire before soldering. Then perform the above steps in reverse order.

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10. Fuse Housing Removal

Note: Complete "Preliminary Steps", "J1 RF Output Connector Removal", and "Rear Panel Removal" before continuing.

Refer to Figure 7-28.

1. 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).
2. Unsolder the two fuse holder wires.
3. Unscrew the nut holding the fuse housing.
4. Slide the fuse housing out of the back panel.

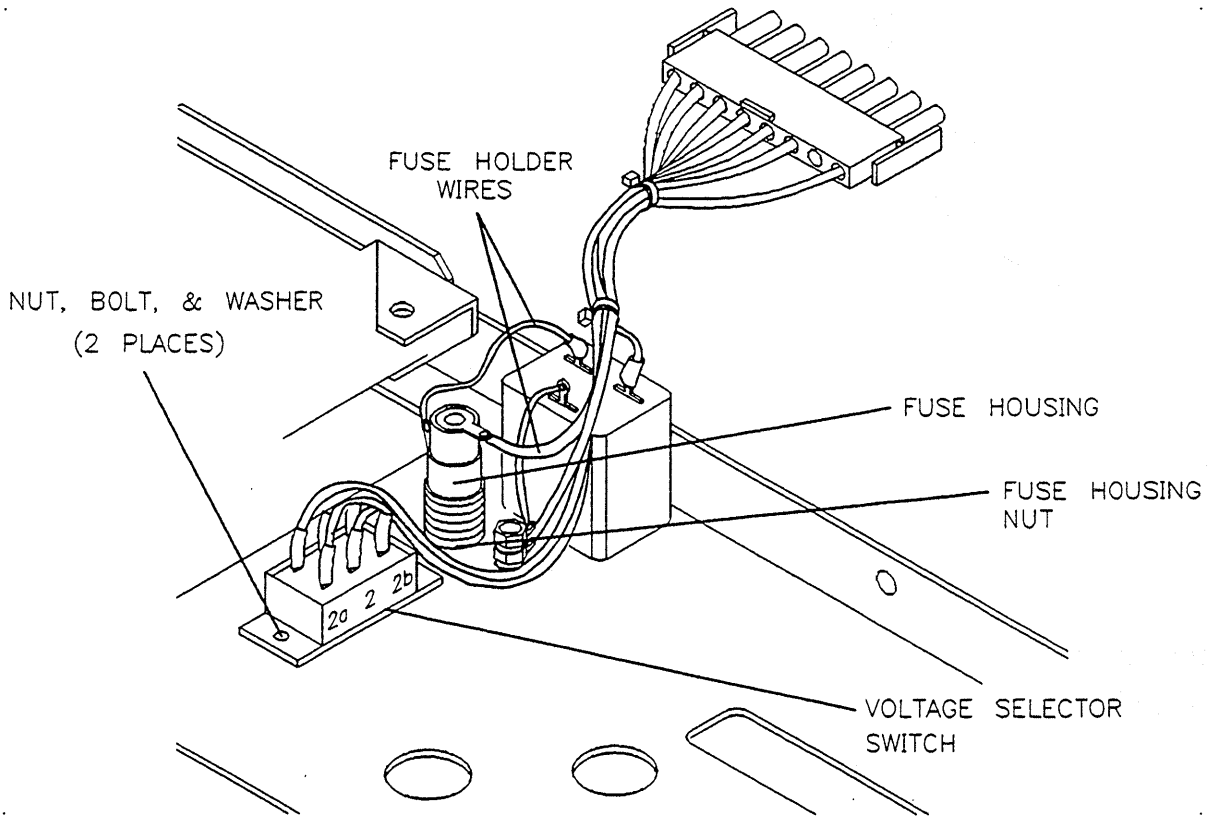


Figure 7-28. Rear Panel Fuse Housing

Note: To reassemble, add 3/8 in. shrink tubing to each wire before soldering. Then perform the above steps in reverse order.

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11. FL1 Line Filter Removal

Note: Complete "Preliminary Steps", "J1 RF Output Connector Removal", and "Rear Panel Removal" before continuing.

Refer to Figure 7-29.

1. Unsolder the three wires attached to the line filter.
2. Remove the two screws on the rear panel.
3. Slide out the line filter from the rear panel.

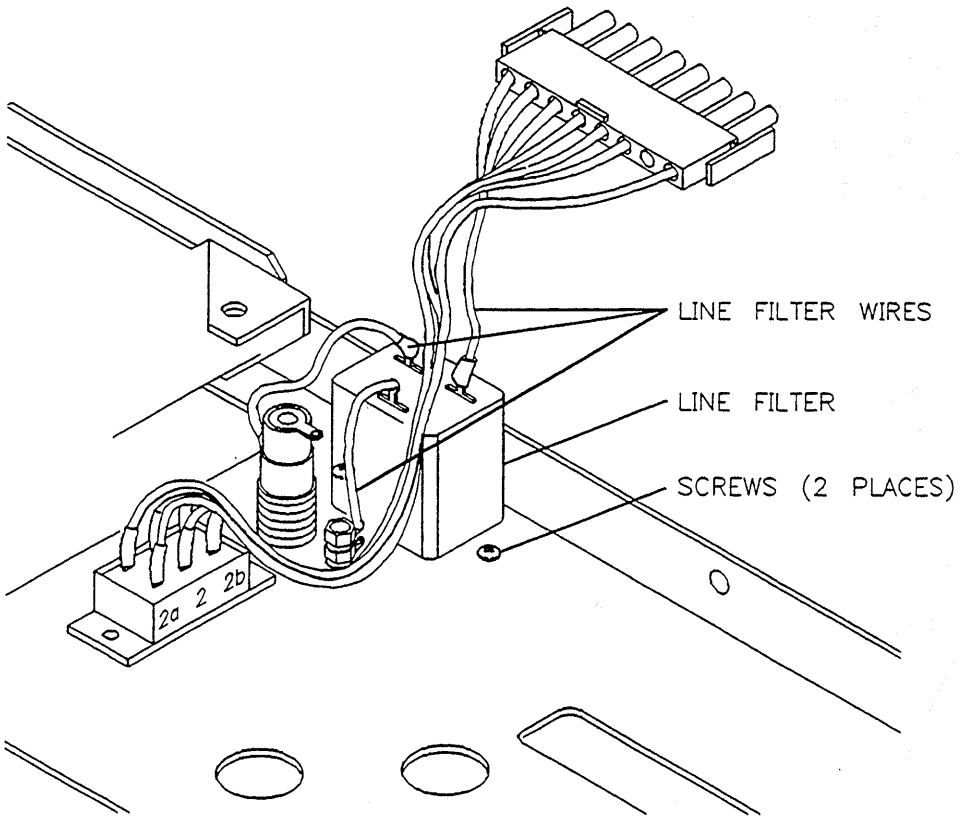


Figure 7-29. Line Filter Removal

Note: To reassemble, add 3/8 in. shrink tubing to each wire before soldering. Then perform the above steps in reverse order.

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12. Option 004 BNC Connectors Removal

Note: Complete "Preliminary Steps" before continuing.

Refer to Figure 7-30.

1. Remove the five screws holding the A34 RP floating BNC board assembly to the rear panel.
2. Slide out the board with the connectors.
3. Remove the nut and washer attaching the pulse input BNC connector to the rear panel.
4. Slide out the pulse input BNC connector.

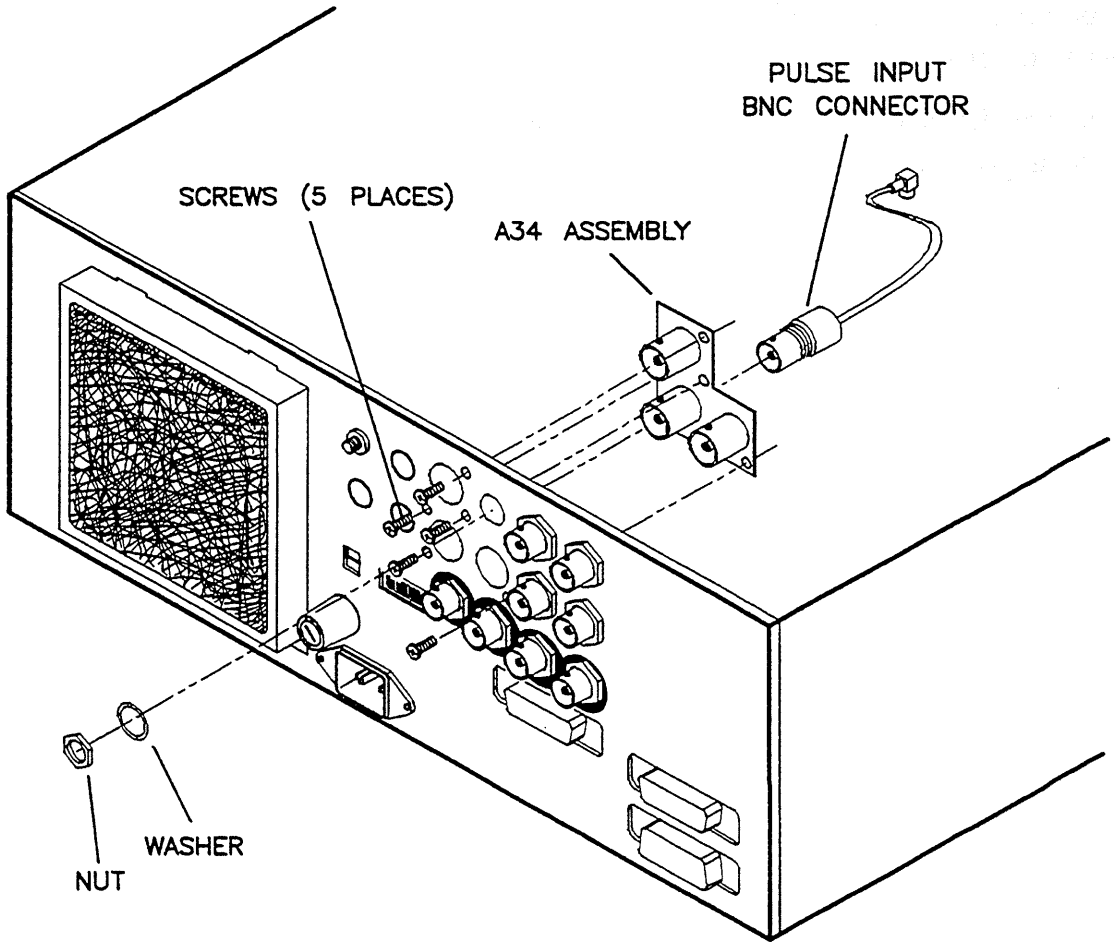


Figure 7-30. Option 004 BNC Connectors Removal

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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.

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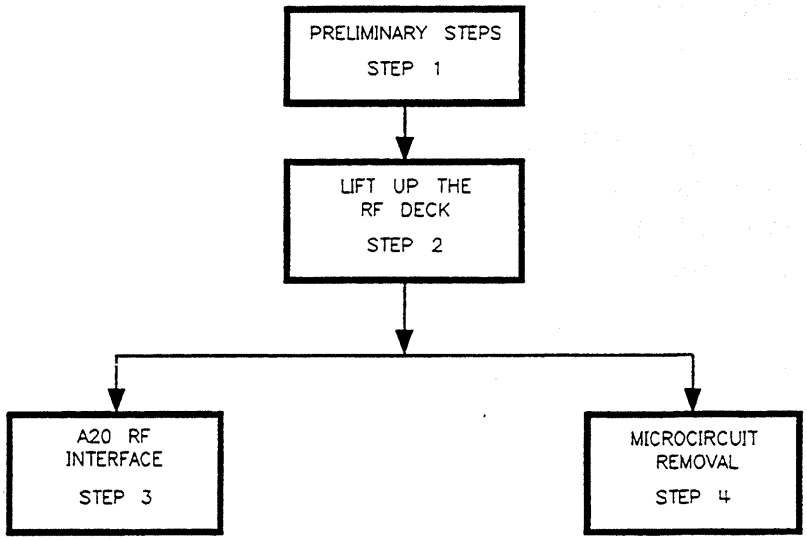


Figure 7-31. RF Deck Disassembly Flowchart

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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

Note: Complete "Preliminary Steps" before continuing.

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. On the lower front frame edge, remove the two screws that hold the RF output assembly.
2. Remove the RF connector with cable W43 still connected.

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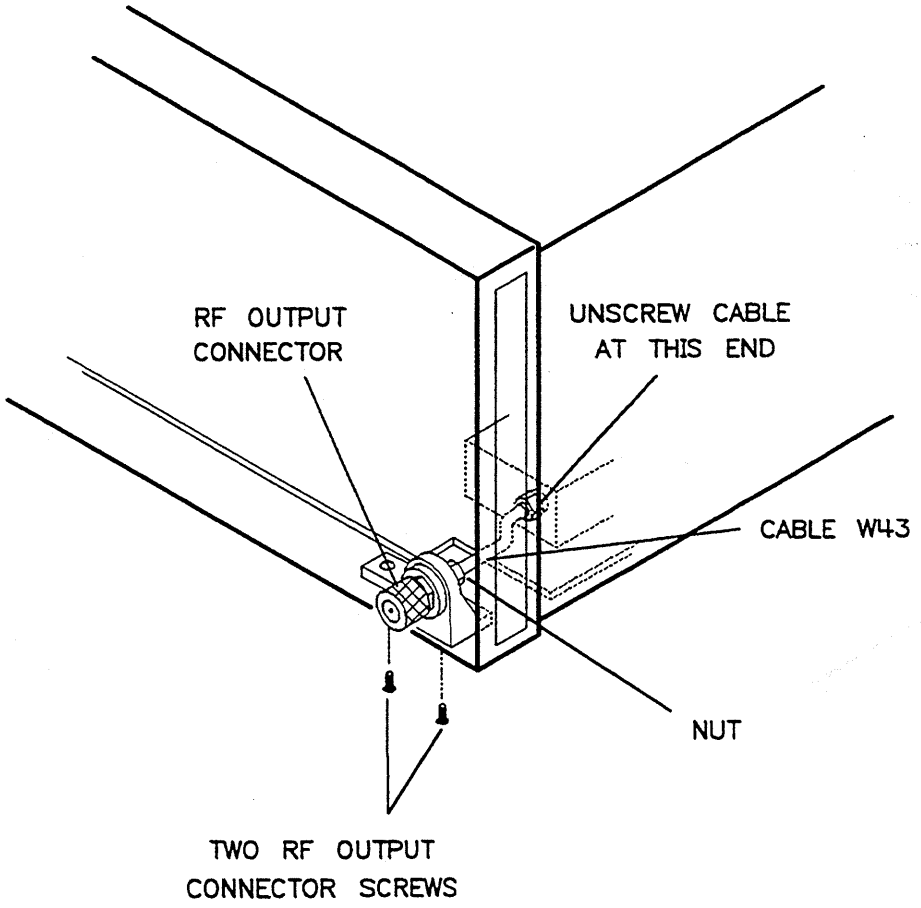


Figure 7-32. Removing RF Output Connector

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).

3. Reinstall the front panel.
4. 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).
5. Disconnect cable W51 (see Figure 7-33) from the low pass filter FL2 (you may need to loosen the other end of W51 also).
6. Remove the two hex screws from the RF deck.

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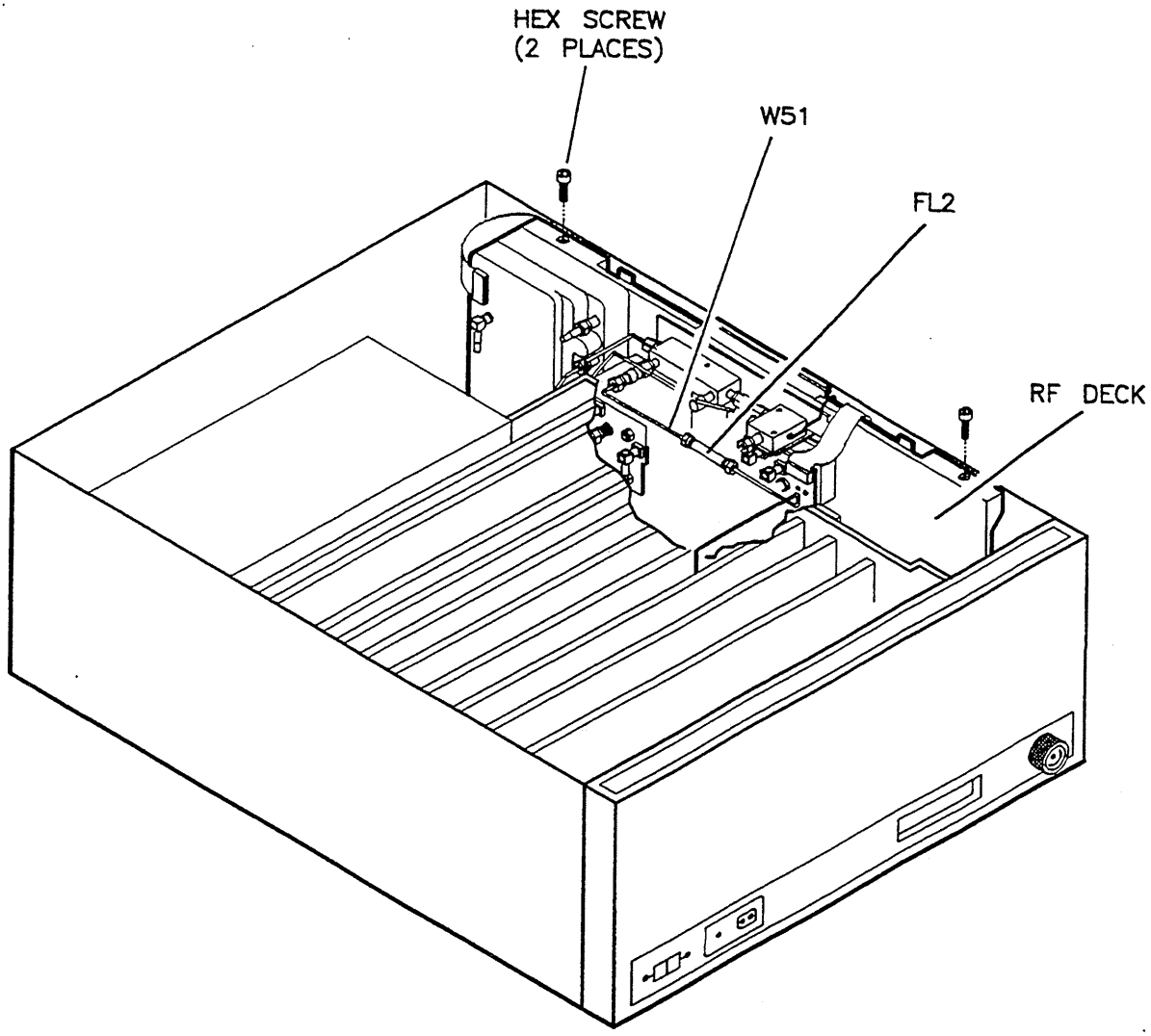


Figure 7-33. W51 RF Cable Location

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.

7. 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.

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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 "Replaceable Parts" for the part number of this kit.

8. 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.

9. 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).

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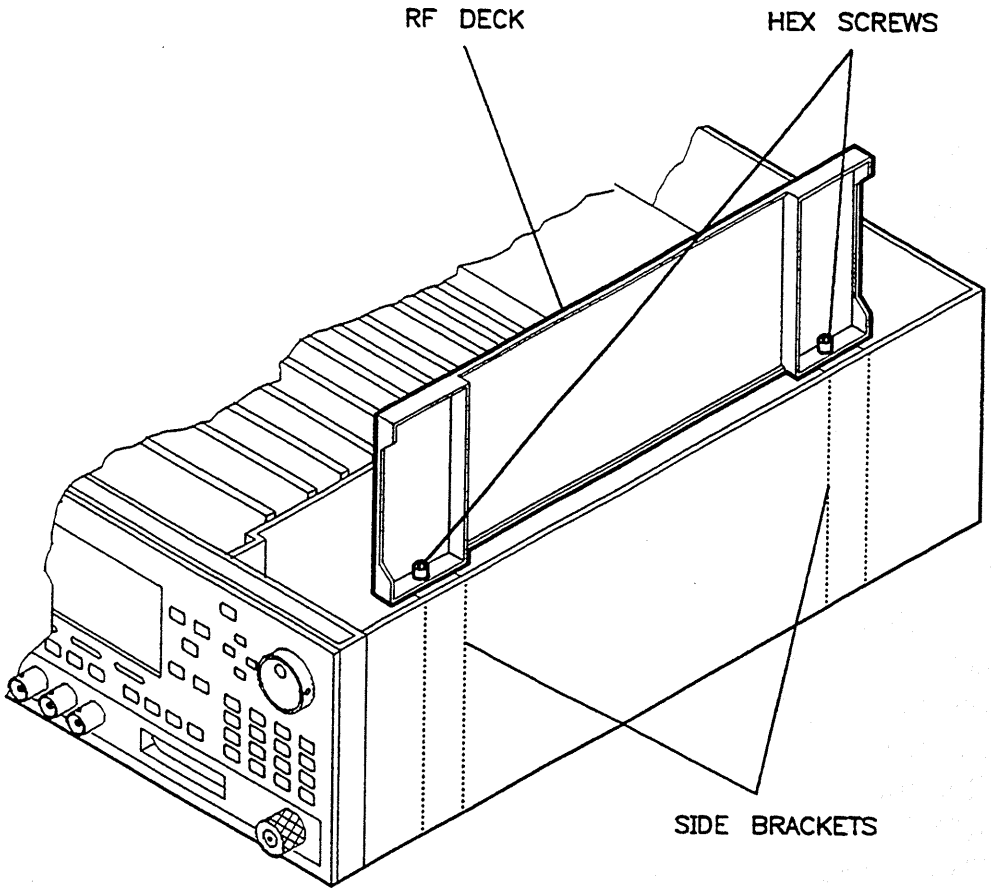


Figure 7-34. RF Deck in the Service Position

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3. A20 RF Interface Removal

Note: Complete "Preliminary Steps" and "Lift Up the RF Deck" before continuing.

Refer to Figure 7-35.

1. 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).
2. Remove the 3-wire pin-locking tab (HP 83623A/24A).
3. Remove the four corner screws that attach the board to the casting.
4. Remove the A20 RF interface assembly.

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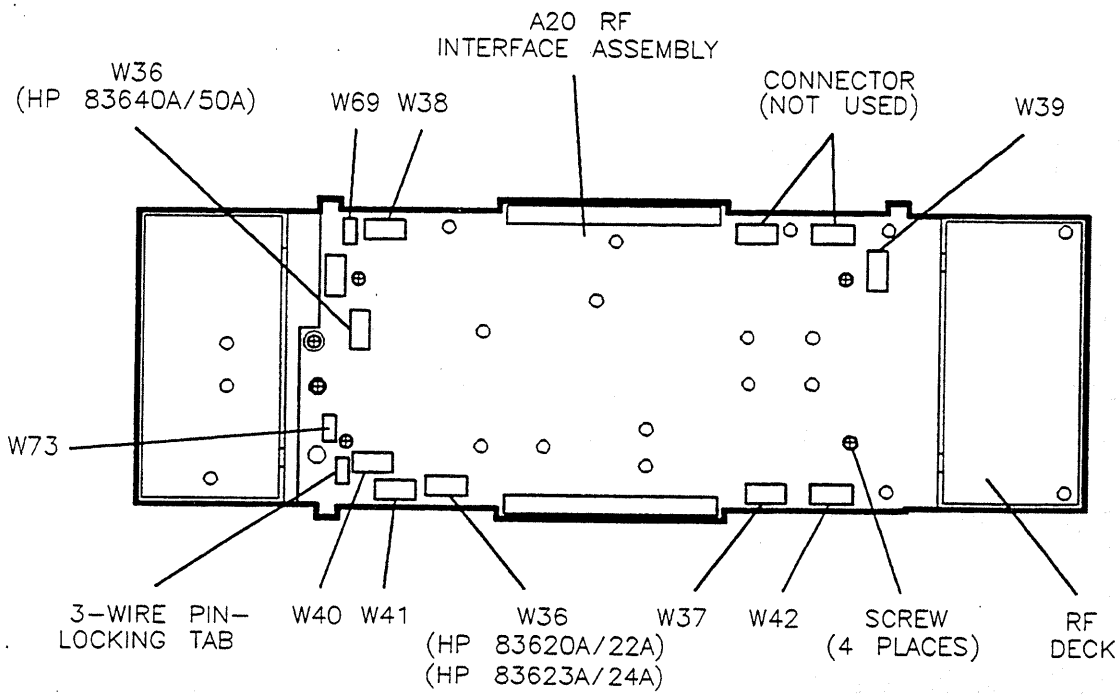


Figure 7-35. A20 RF Interface

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4. Microcircuit Removal

Note: Complete "Preliminary Steps" and "Lift Up the RF Deck" before continuing.

Note: For the following procedures, refer to Figure 7-36 through Figure 7-50 for cable locations and for screw locations.

1. 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.

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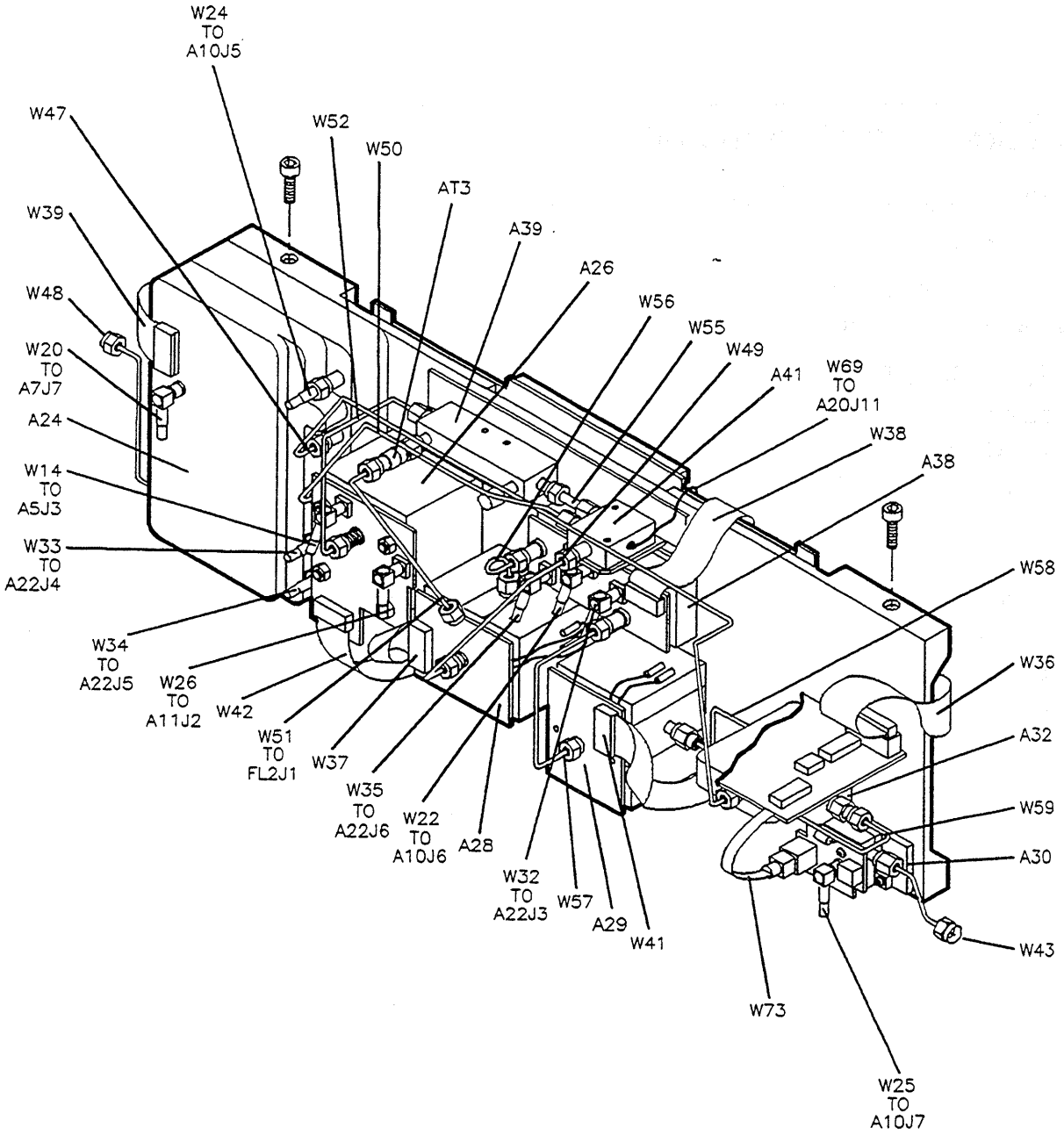


Figure 7-36. RF Deck Cable Locations - HP 83640A/50A

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RF Deck Cables
HP 83640A/50A
Option 001

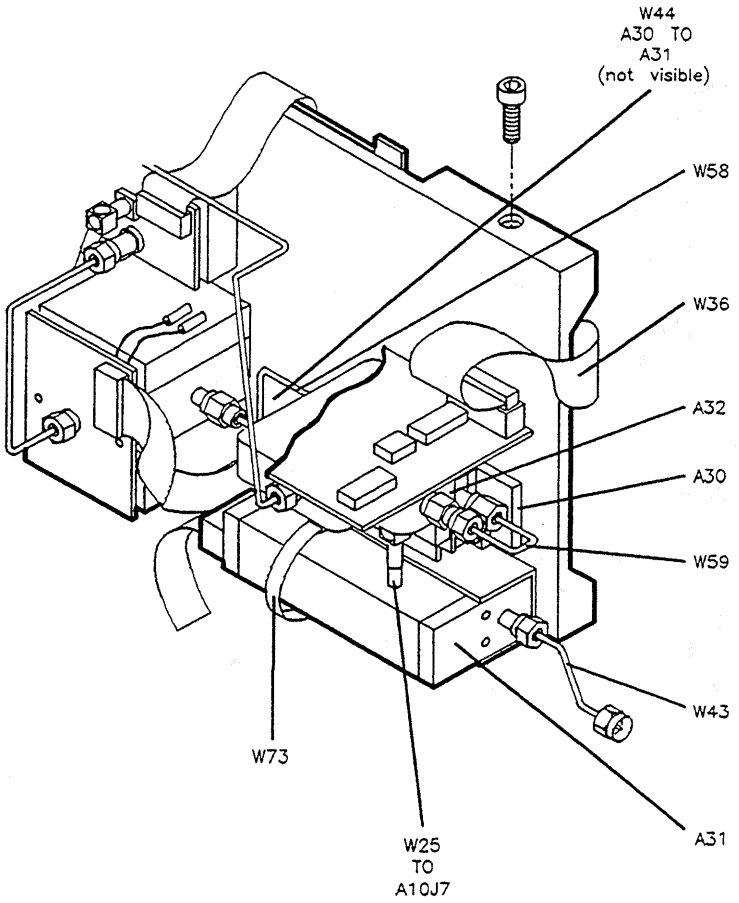


Figure 7-37. RF Deck Cable Locations – HP 83640A/50A Option 001

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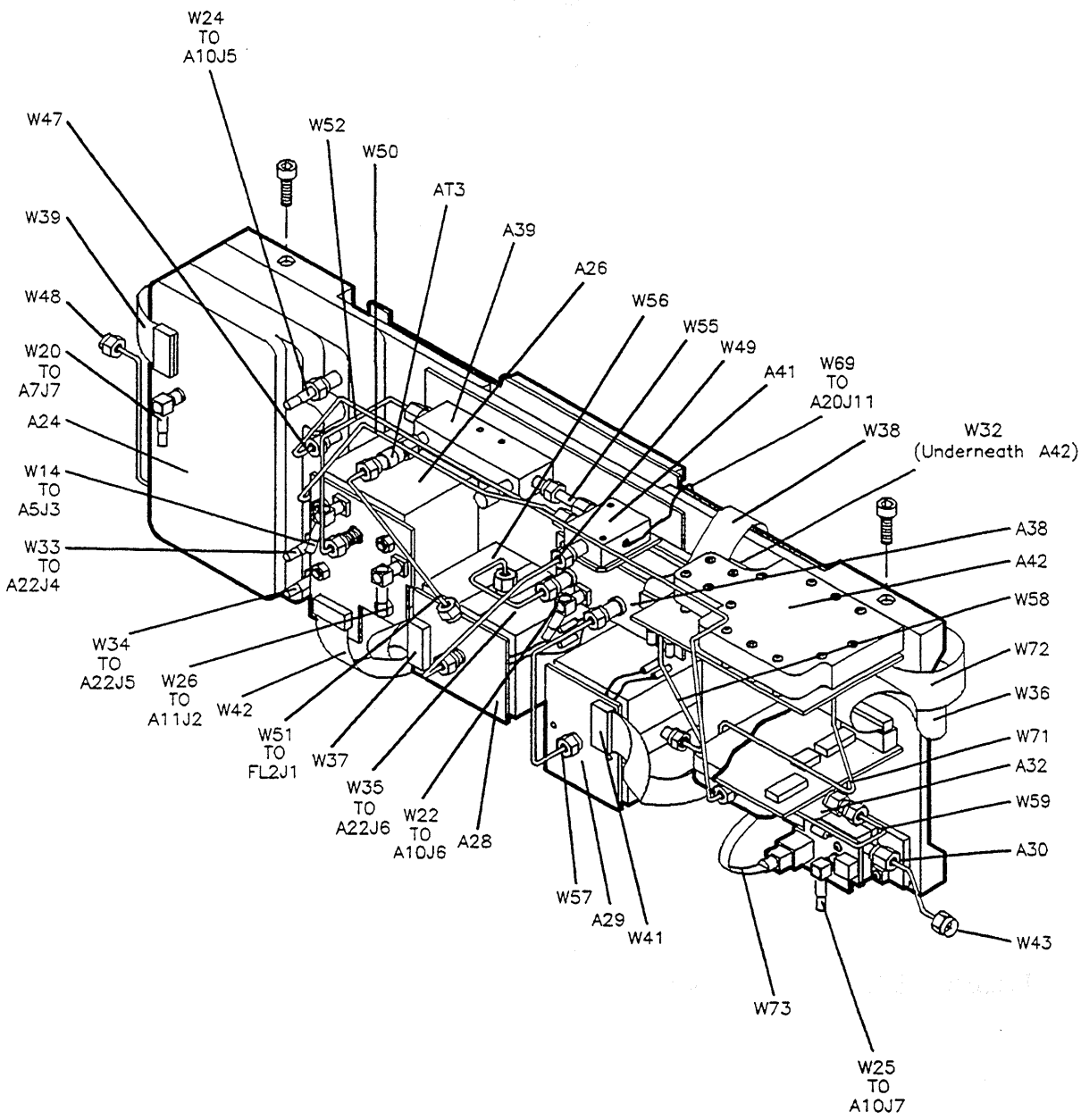


Figure 7-38. RF Deck Cable Locations – HP 83640A/50A Option 006

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RF Deck Cables
HP 83640A/50A
Options 001 and 006

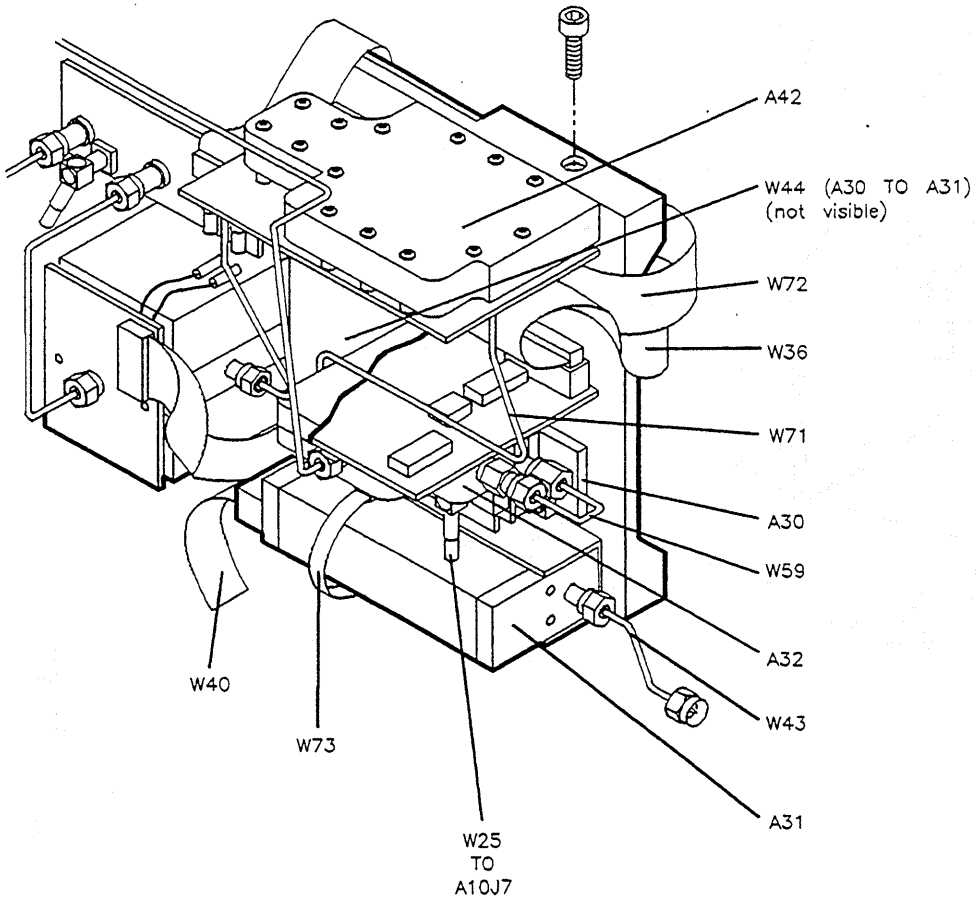


Figure 7-39. RF Deck Cable Locations – HP 83640A/50A Options 001 and 006

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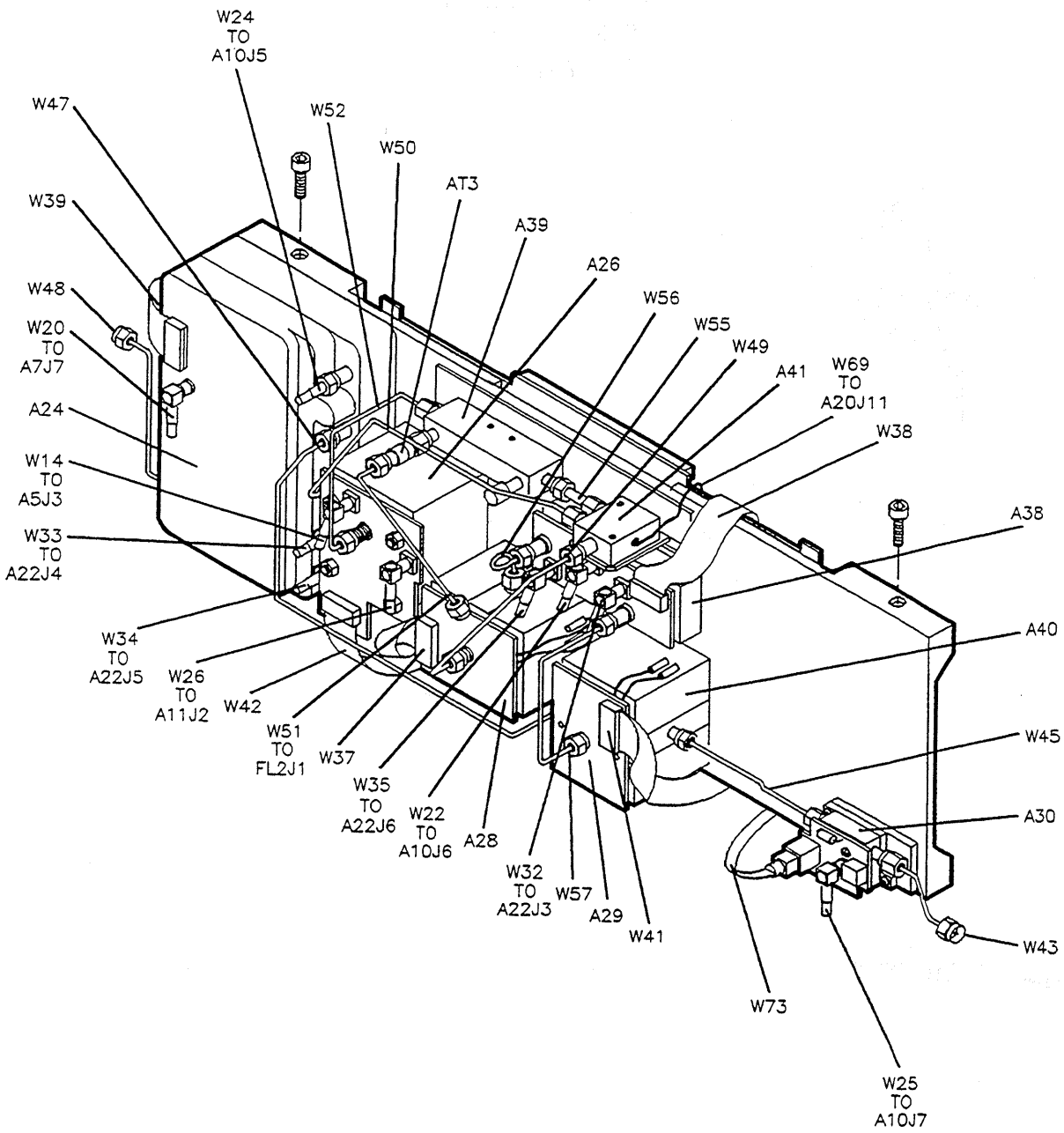


Figure 7-40. RF Deck Cable Locations – HP 83620A/22A/30A

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RF Deck Cables
HP 83620A/22A/30A
Option 001

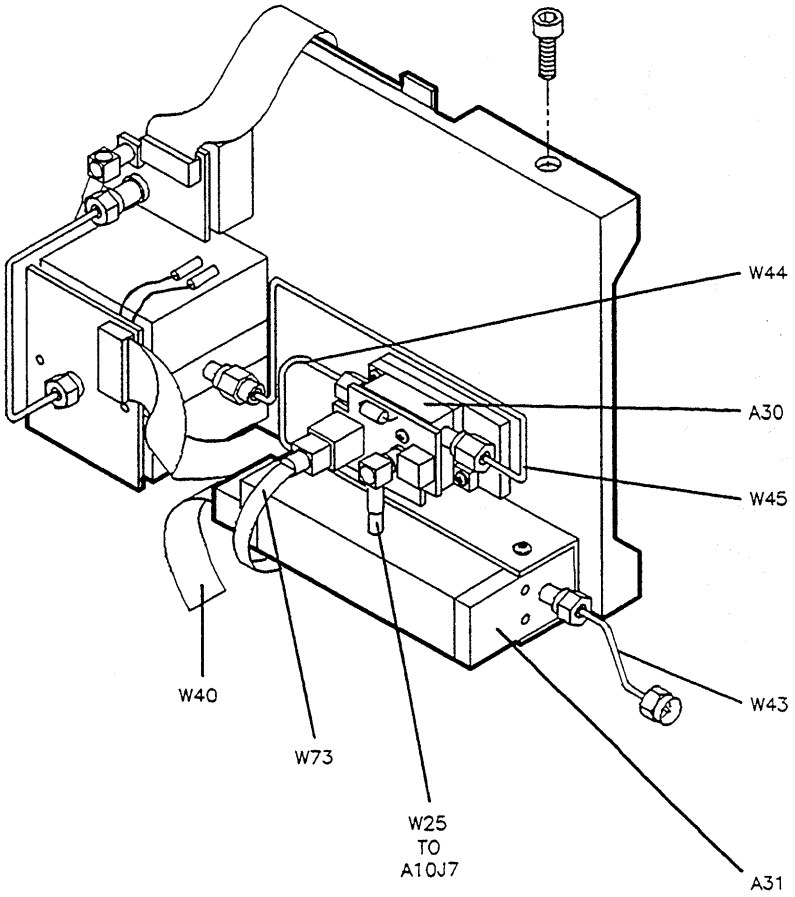


Figure 7-41. RF Deck Cable Locations – HP 83620A/22A/30A Option 001

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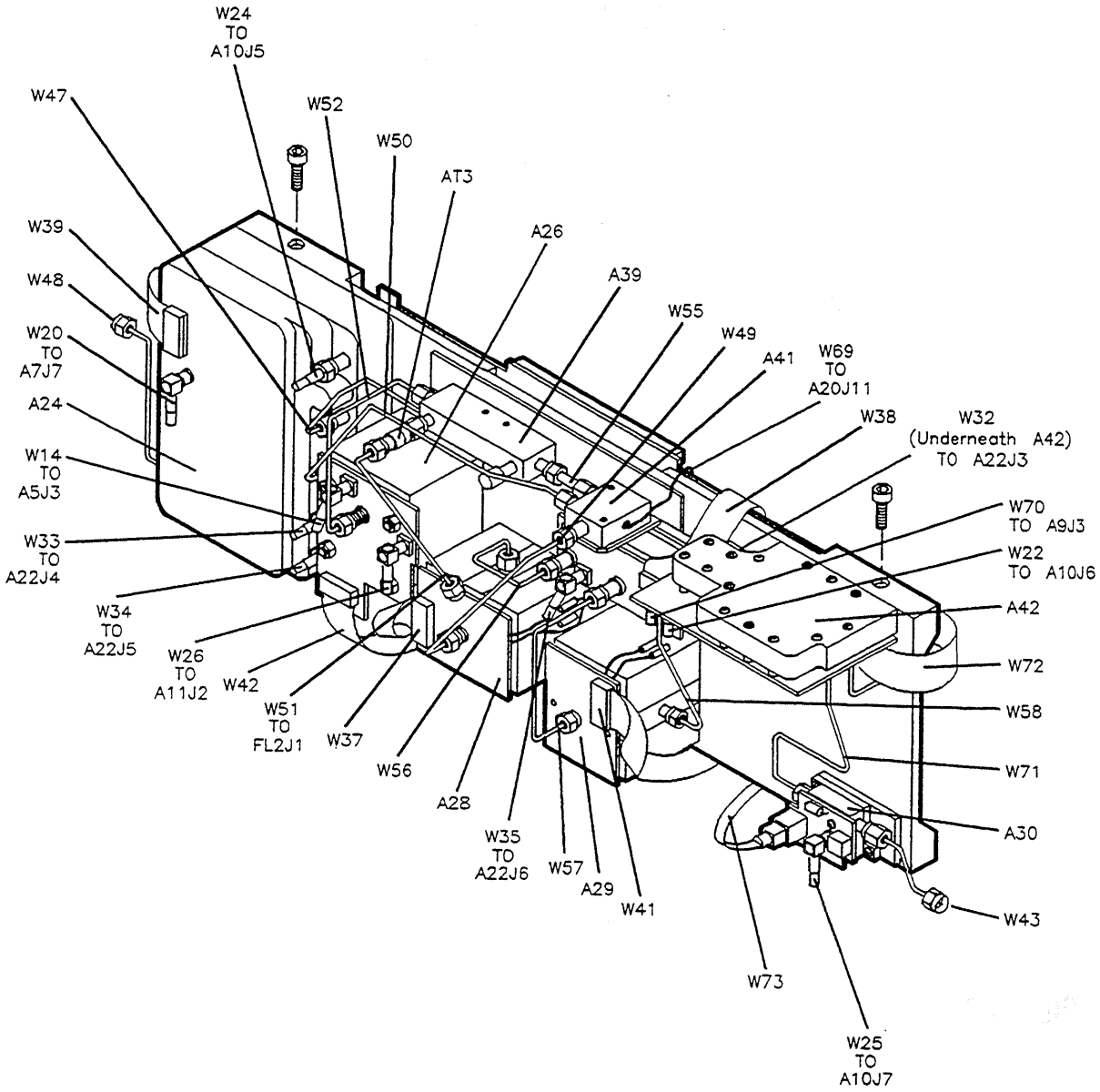


Figure 7-42. RF Deck Cable Locations – HP 83620A/22A/30A Option 006

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RF Deck Cables
HP 83620A/22A/30A
Options 001 and 006

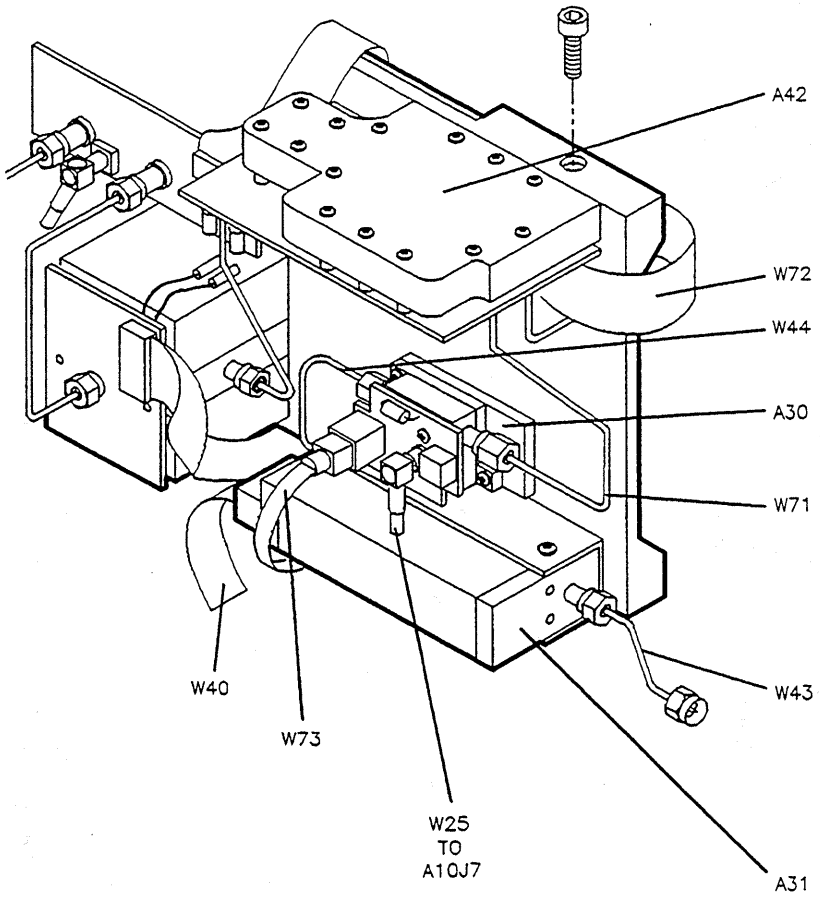


Figure 7-43.
RF Deck Cable Locations – HP 83620A/22A/30A Options 001 and 006

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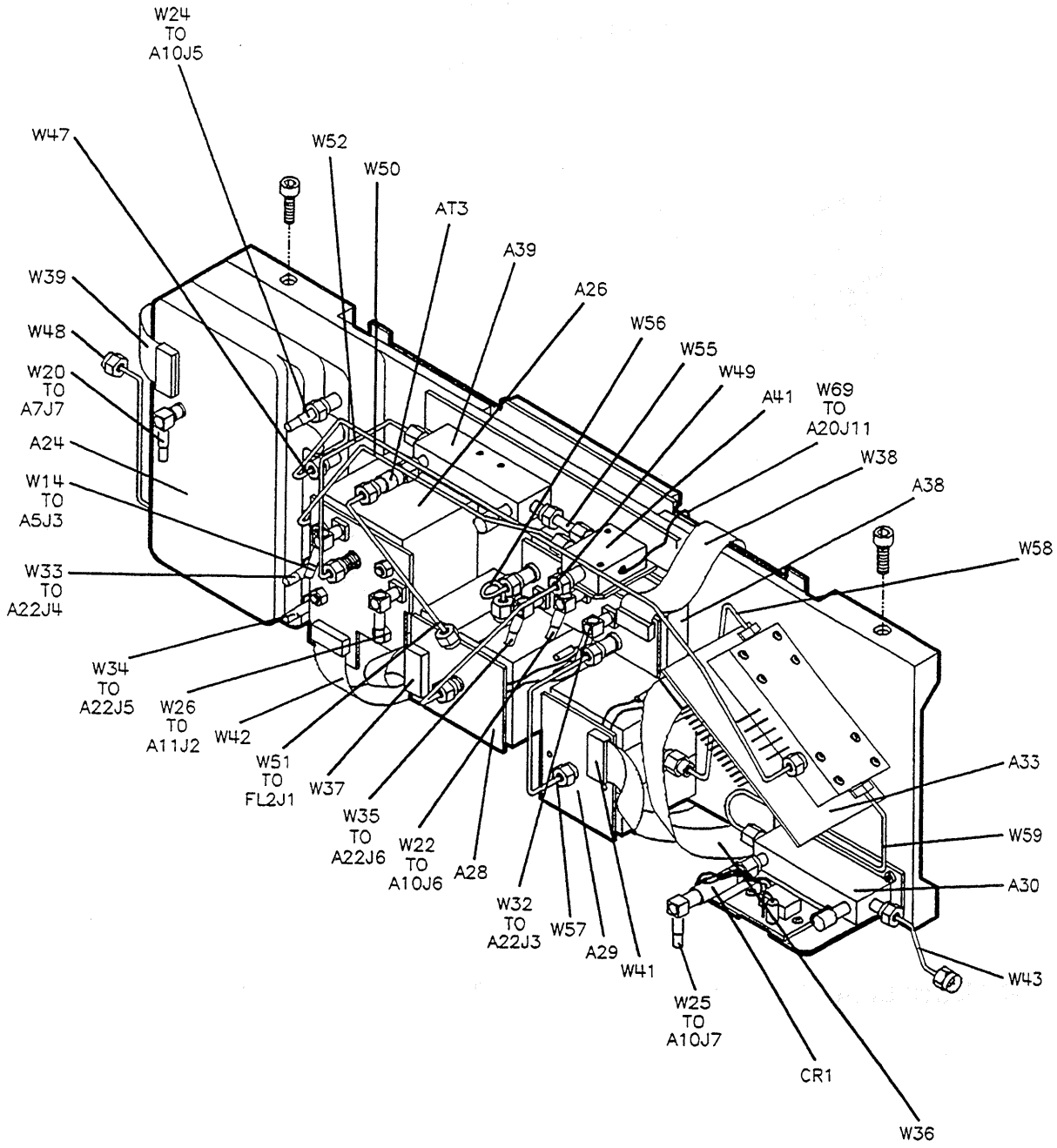


Figure 7-44. RF Deck Cable Locations – HP 83623A

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RF Deck Cables
HP 83623A
Option 001

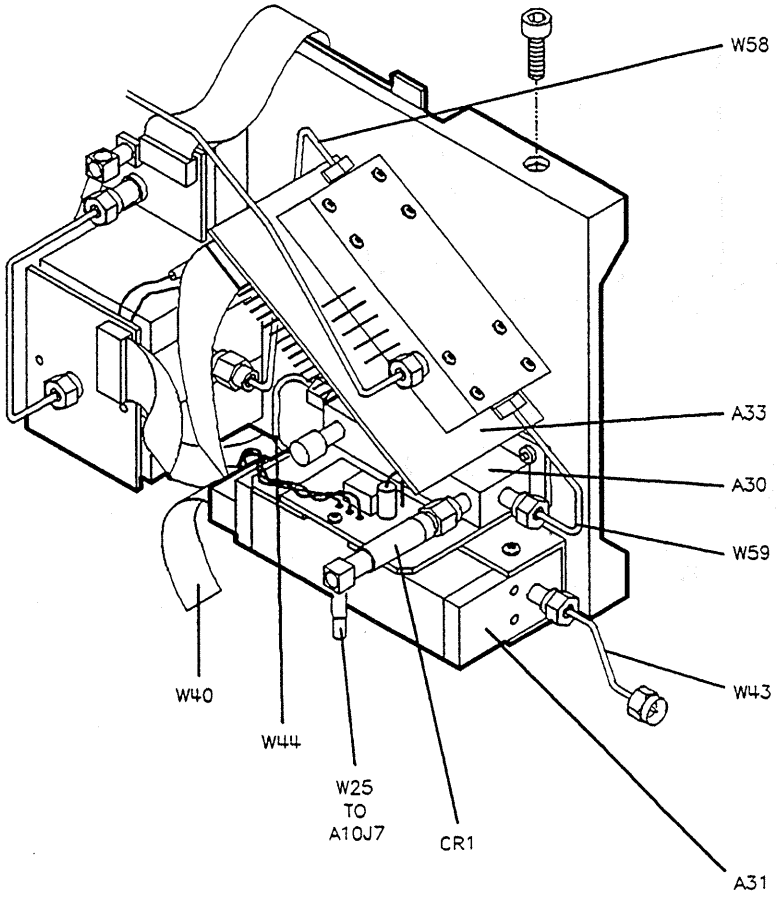


Figure 7-45. RF Deck Cable Locations – HP 83623A Option 001

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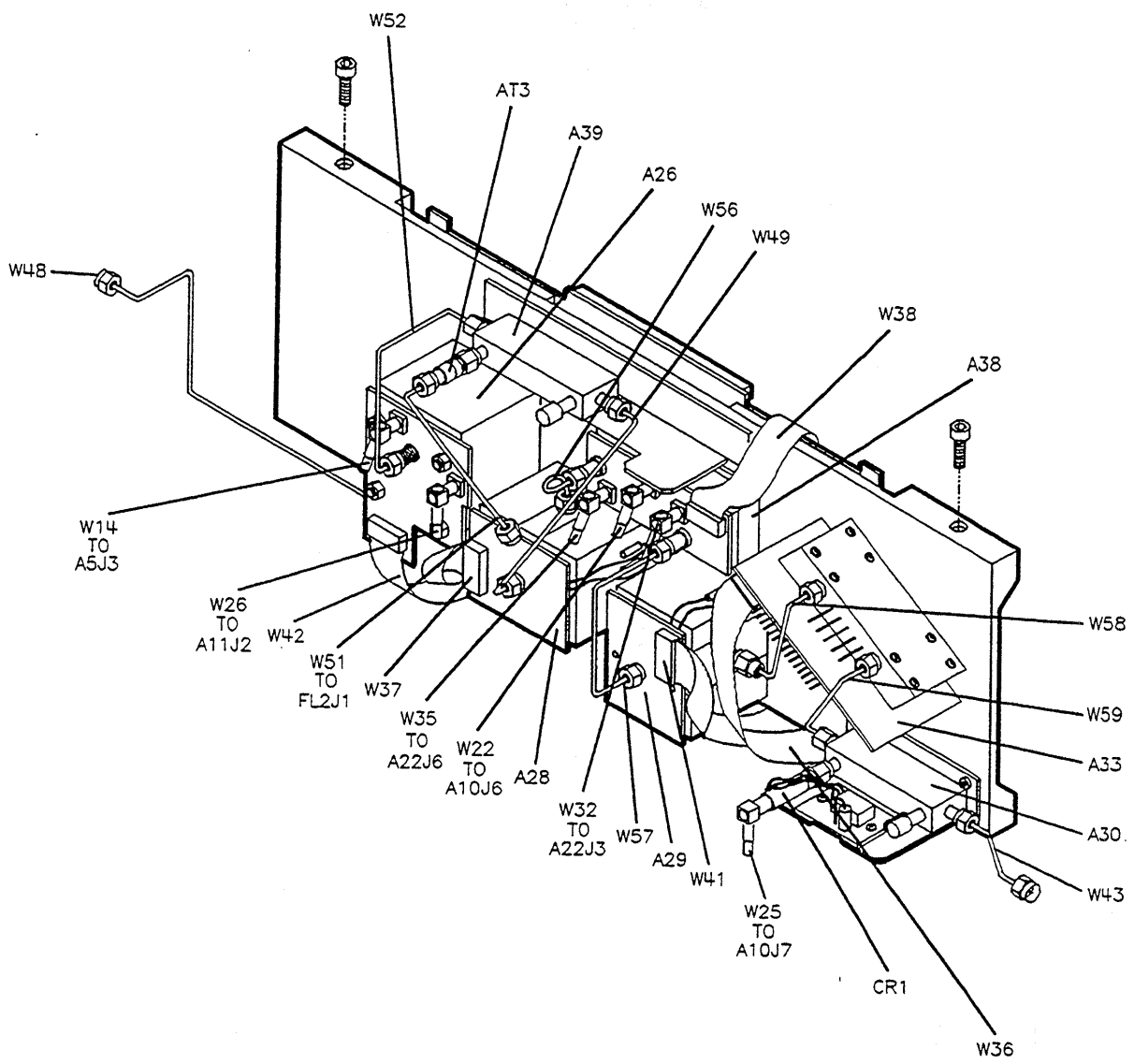


Figure 7-46. RF Deck Cable Locations – HP 83624A

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RF Deck Cables
HP 83624A
Option 001

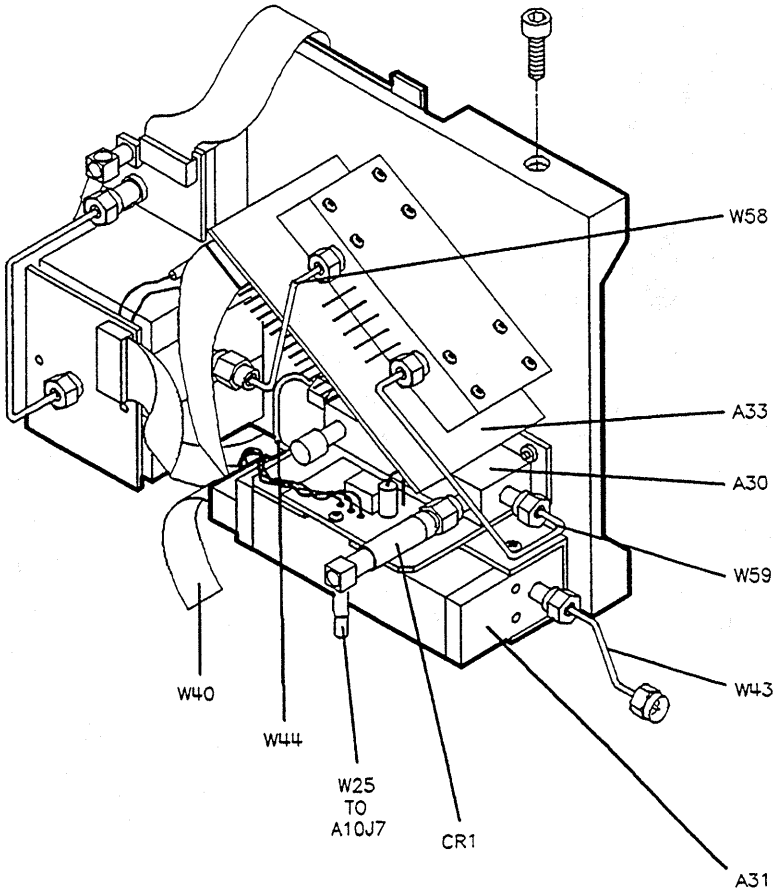


Figure 7-47. RF Deck Cable Locations – HP 83624A Option 001

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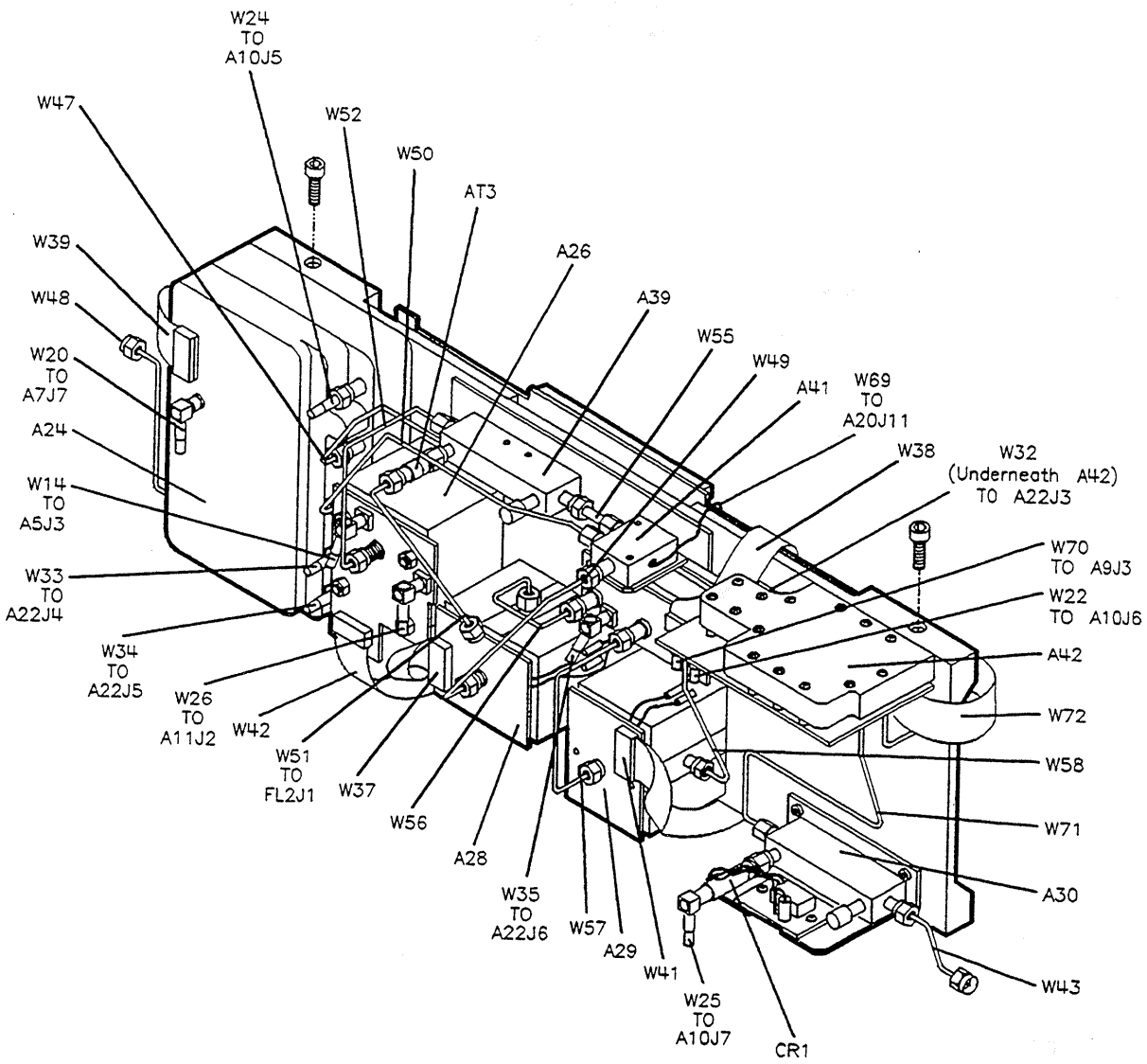


Figure 7-48. RF Deck Cable Locations – HP 83623A/24A Option 006

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RF Deck Cables
HP 83623A/24A
Options 001 and 006

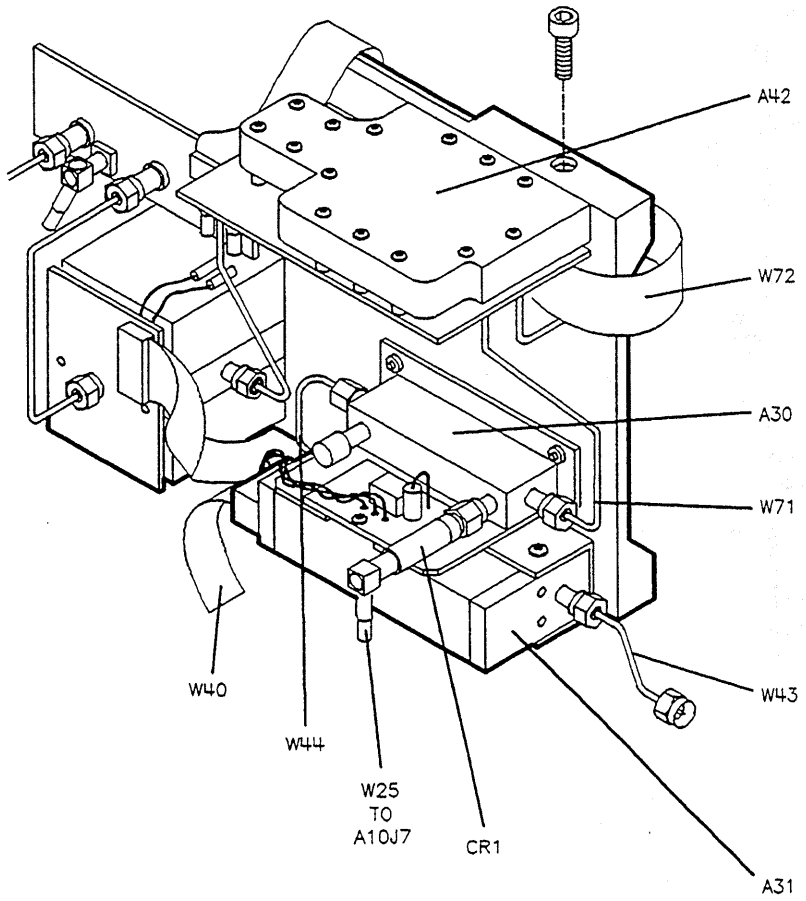


Figure 7-49. RF Deck Cable Locations – HP 83623A/24A Options 001 and 006

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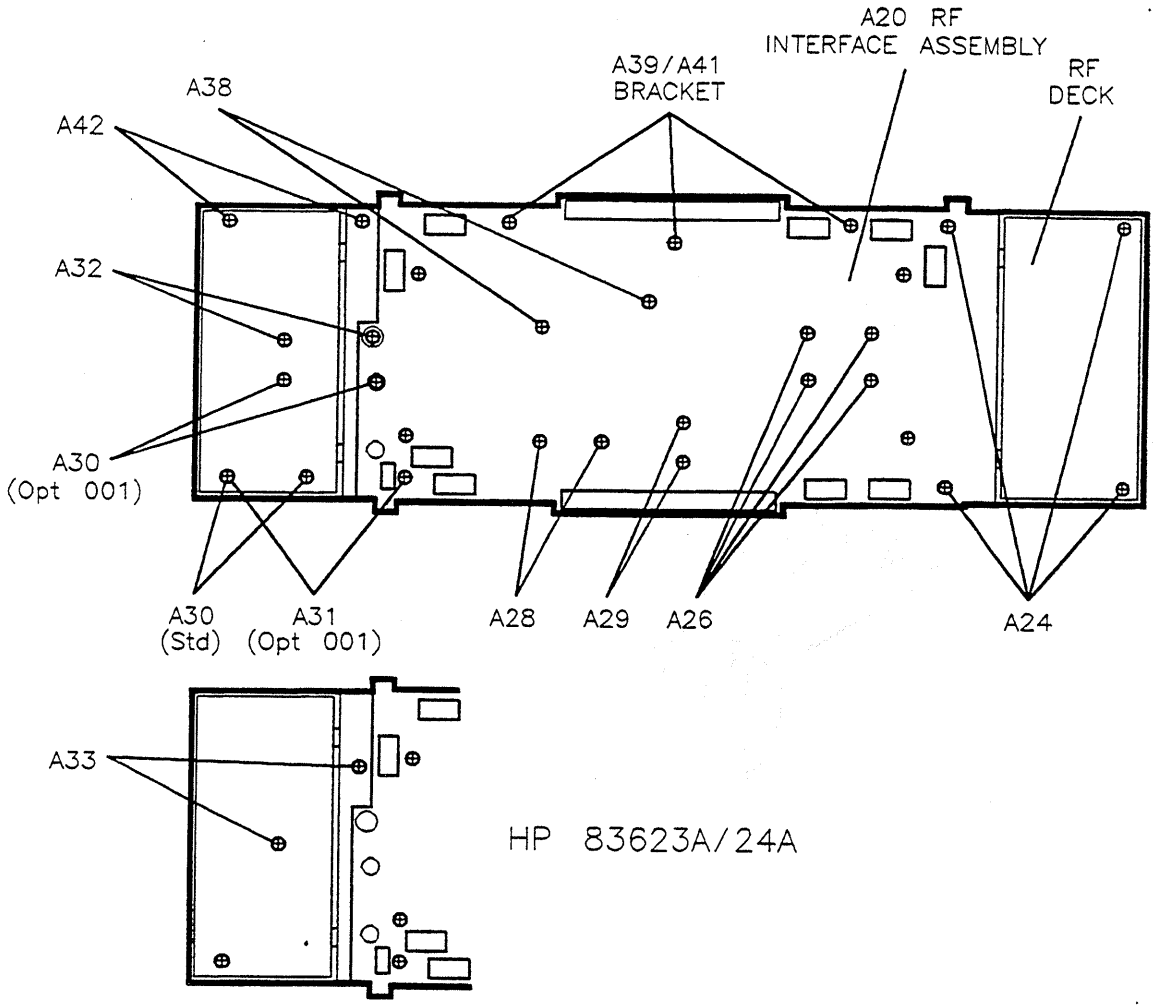


Figure 7-50. RF Deck Screw Locations

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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.

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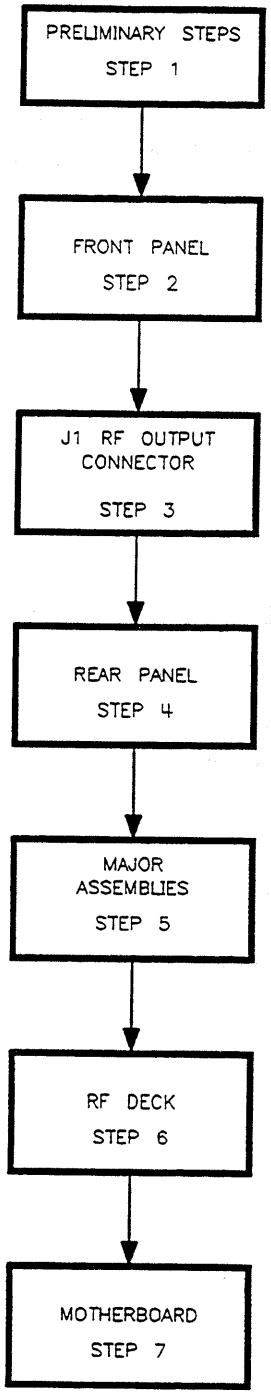


Figure 7-51. Motherboard Disassembly Flowchart

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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.

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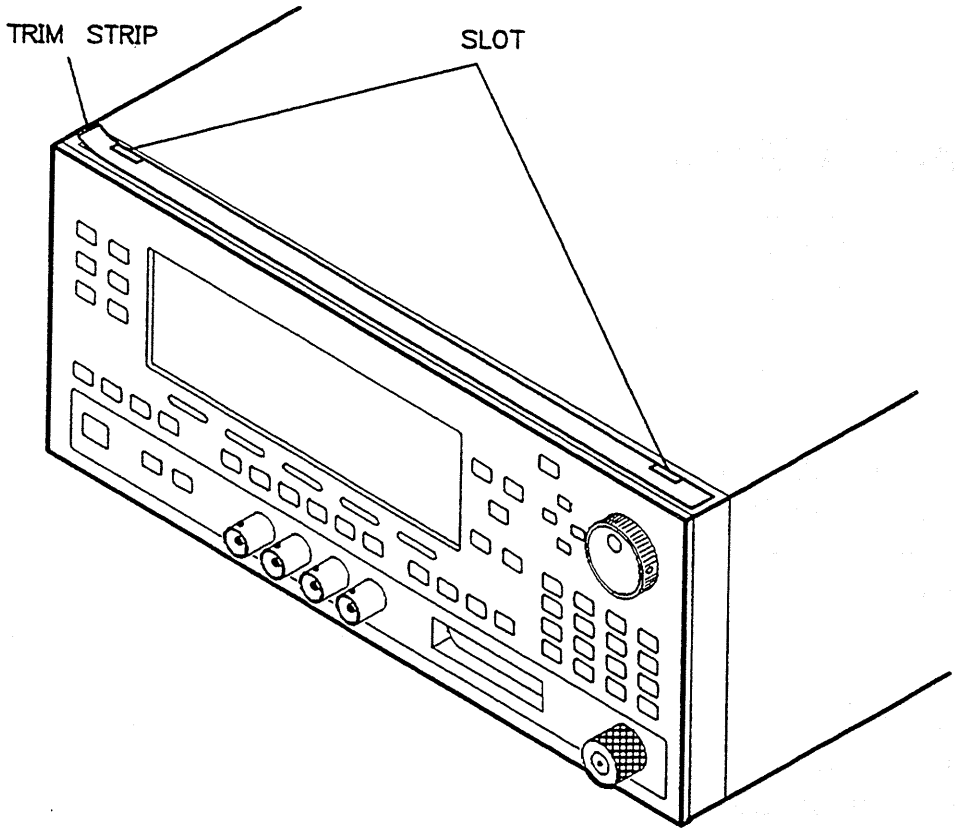


Figure 7-52. Front Edge Trim Strip

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2. Front Panel Removal

Note: Complete "Preliminary Steps" before continuing.

Refer to Figure 7-53.

1. Remove *three* of the four screws under the trim strip.
2. Remove *two* of the three screws on the lower, front frame edge.
3. Gently pry the front panel and display from the frame.

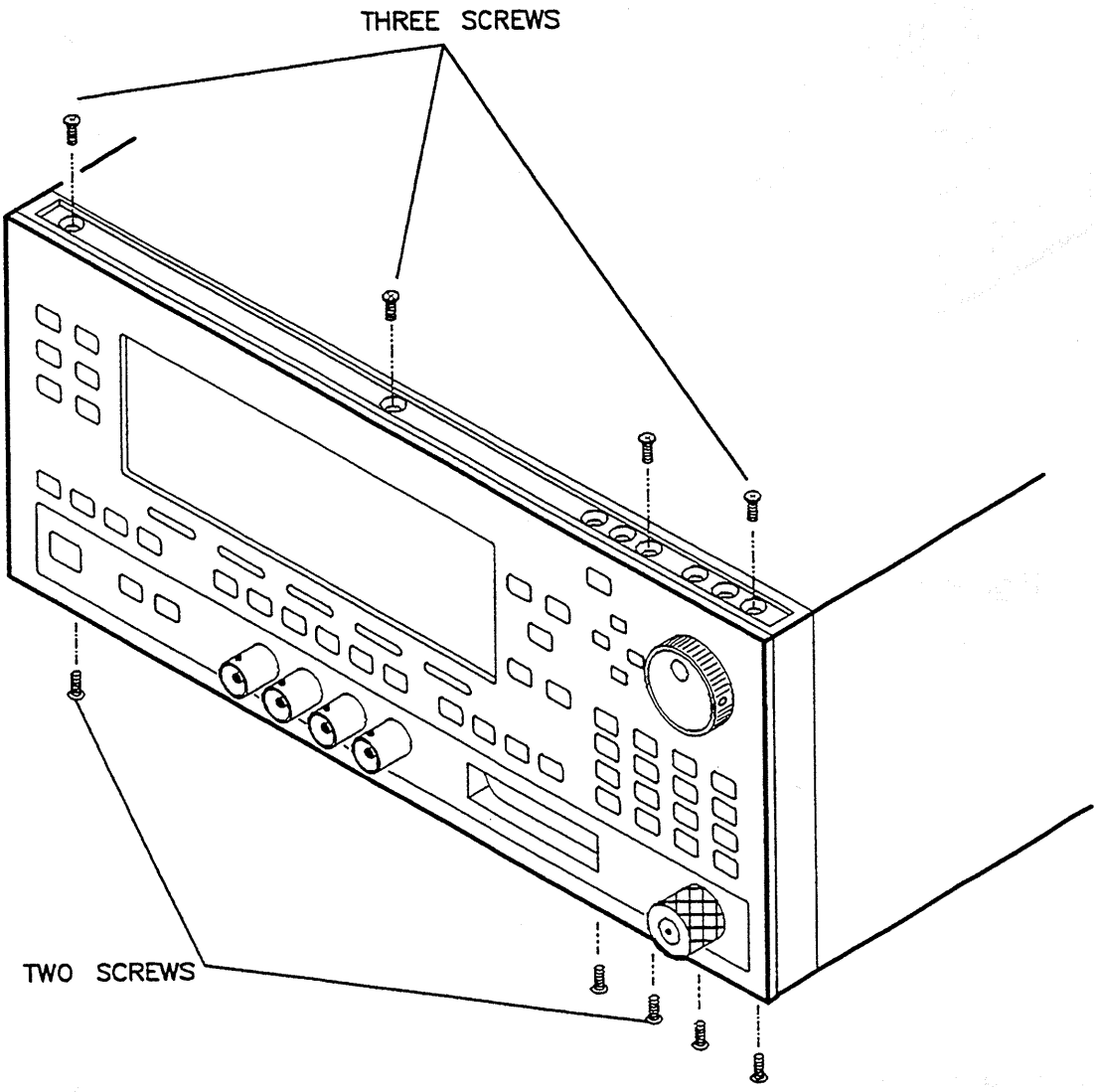


Figure 7-53. Front Panel Screw Locations

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Refer to Figure 7-54.

Note: Instruments with Option 004 do not have all the cables shown.

4. Cut the tie wraps holding the cables.
5. 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).
6. Disconnect ribbon cables W2 and W3 from the motherboard.

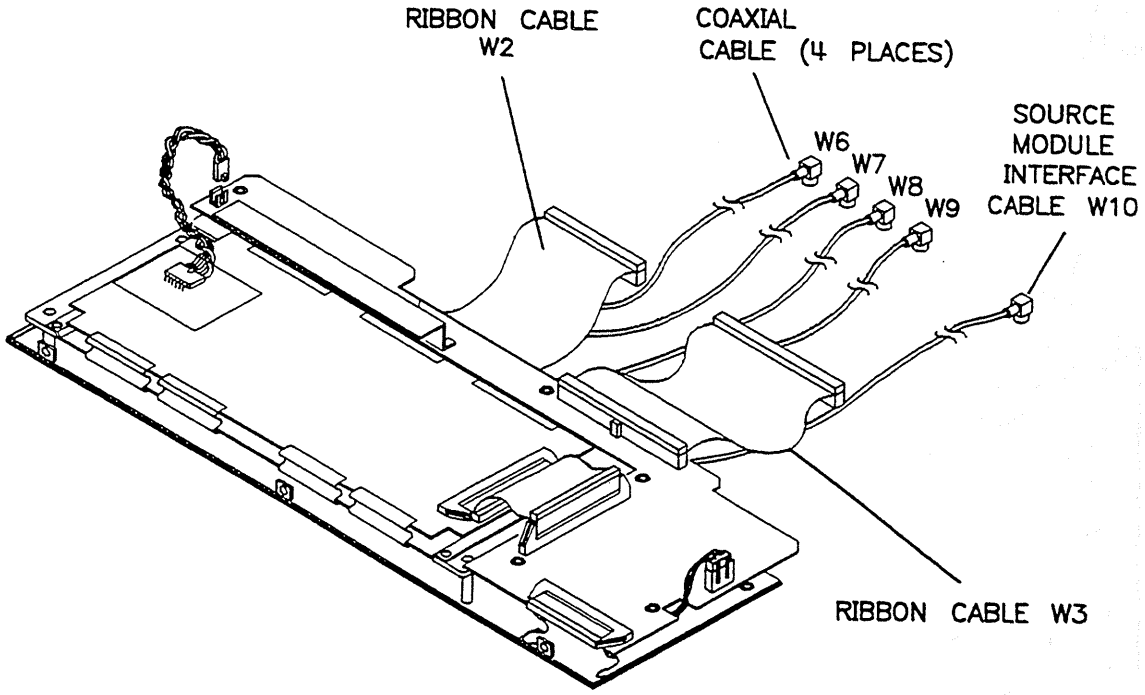


Figure 7-54. Front Panel Coaxial and Ribbon Cable Locations

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3. J1 RF Output Connector Removal (Front Panel)

Note: Complete "Preliminary Steps" and "Front Panel Removal" before continuing.

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. On the lower front frame edge, remove the two RF output screws that hold the RF output assembly.
2. Remove the RF connector with cable W43.

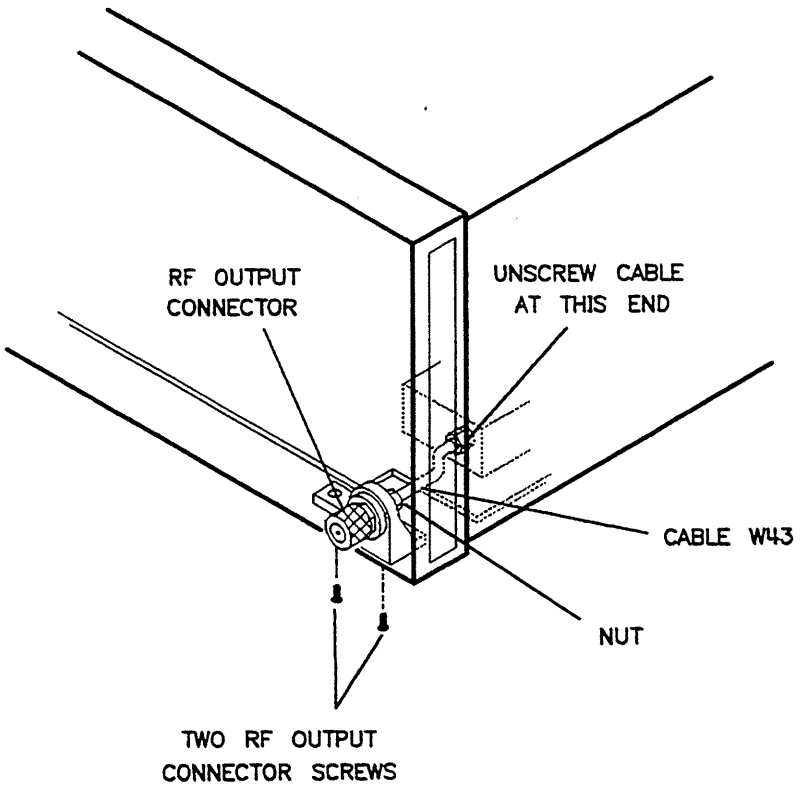


Figure 7-55. Removing RF Output Connector (Front Panel)

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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).

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4. J1 RF Output Connector Removal (Option 004)

Note: Complete "Preliminary Steps" and "Front Panel Removal" before continuing.

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. Unscrew the RF output connector plate from the rear panel.
2. Remove the RF connector with cable W43.

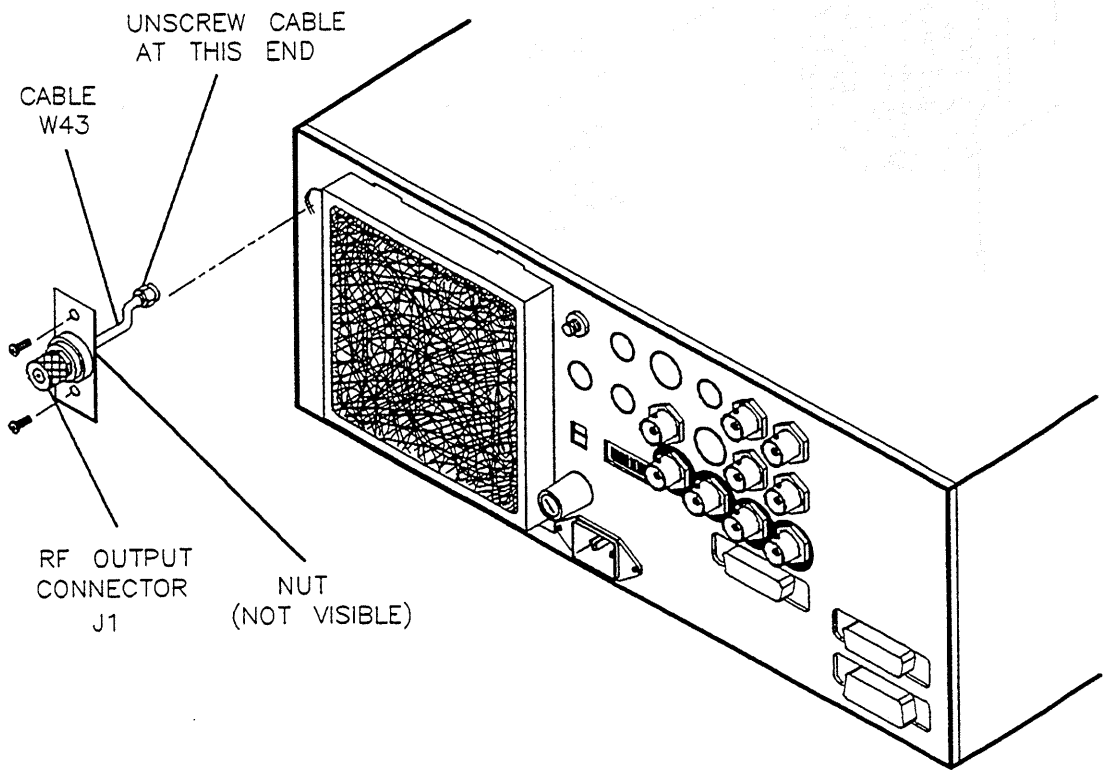


Figure 7-56. Removing RF Output Connector (Option 004)

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5. Rear Panel Removal

Note: Complete "Preliminary Steps" and "J1 RF Output Connector Removal" before continuing.

Refer to Figure 7-57.

1. Remove the four screws on the top back edge.
2. Remove the four screws on the bottom back edge.
3. Slide the rear panel out of the casting.

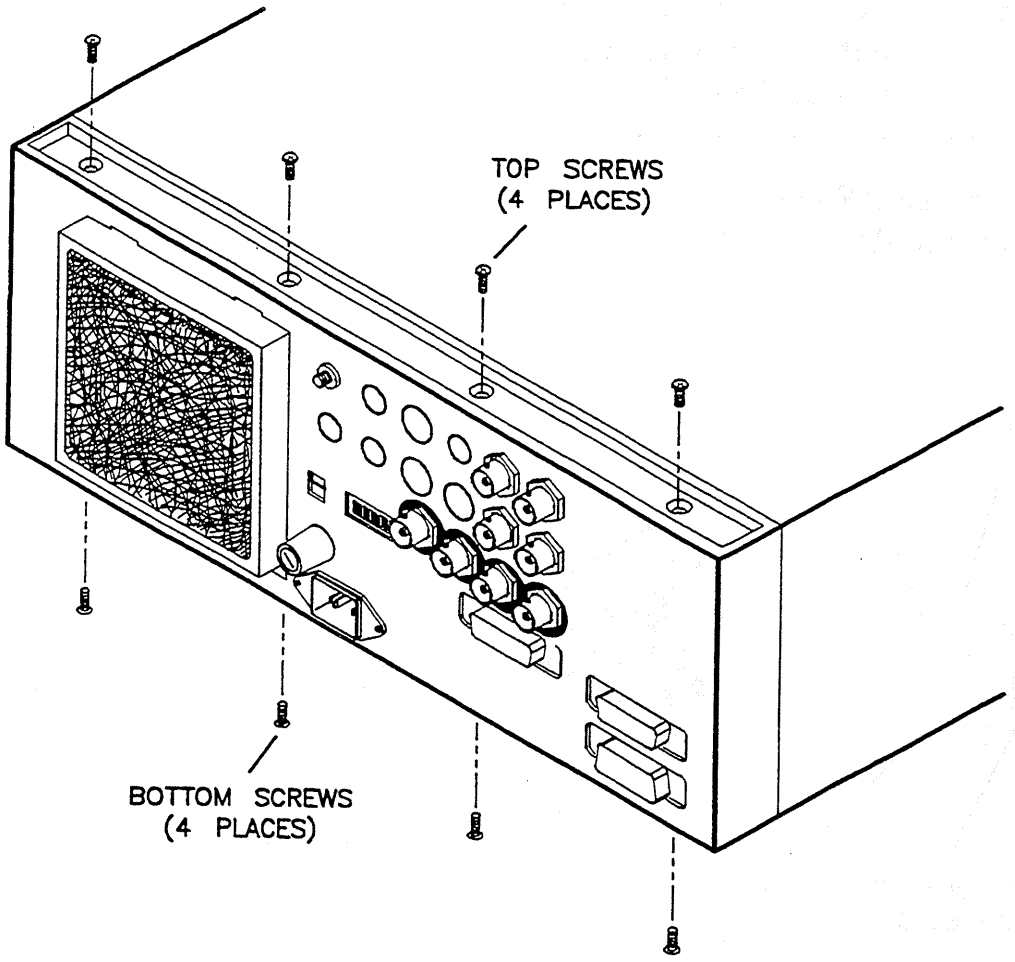


Figure 7-57. Rear Panel Removal

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Refer to Figure 7-58.

4. Disconnect ribbon cable W31 from the motherboard.
5. Disconnect the 8-pin line switch connector.
6. Disconnect the fan harness.
7. Cut the tie wraps holding the coaxial cables to the four BNC connectors and the source module interface.
8. Disconnect the coaxial cables from the A7, A10, A12, and A14 assemblies and disconnect the source module interface cable from the A19 assembly.

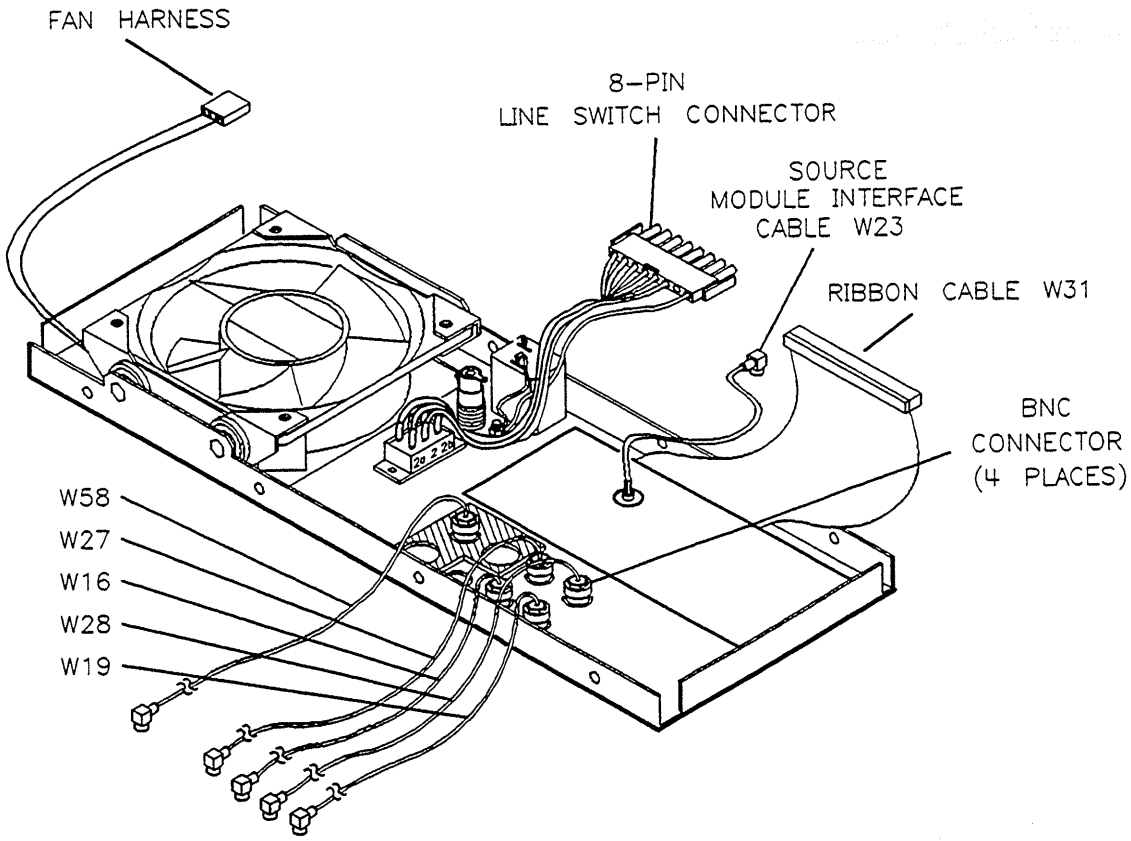


Figure 7-58. Rear Panel Cable Locations

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6. Major Assemblies Removal

Note: Complete "Preliminary Steps", "Front Panel Removal", "J1 RF Output Connector Removal", and "Rear Panel Removal" before continuing.

Refer to Figure 7-59.

1. Remove the six screws from the regulator shield.
2. Remove the shield.
3. Cut the tie wraps holding the cables attached to the PC assemblies.
4. Disconnect all cables attached to the PC assemblies.
5. 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.

6. Pull out all PC assemblies.

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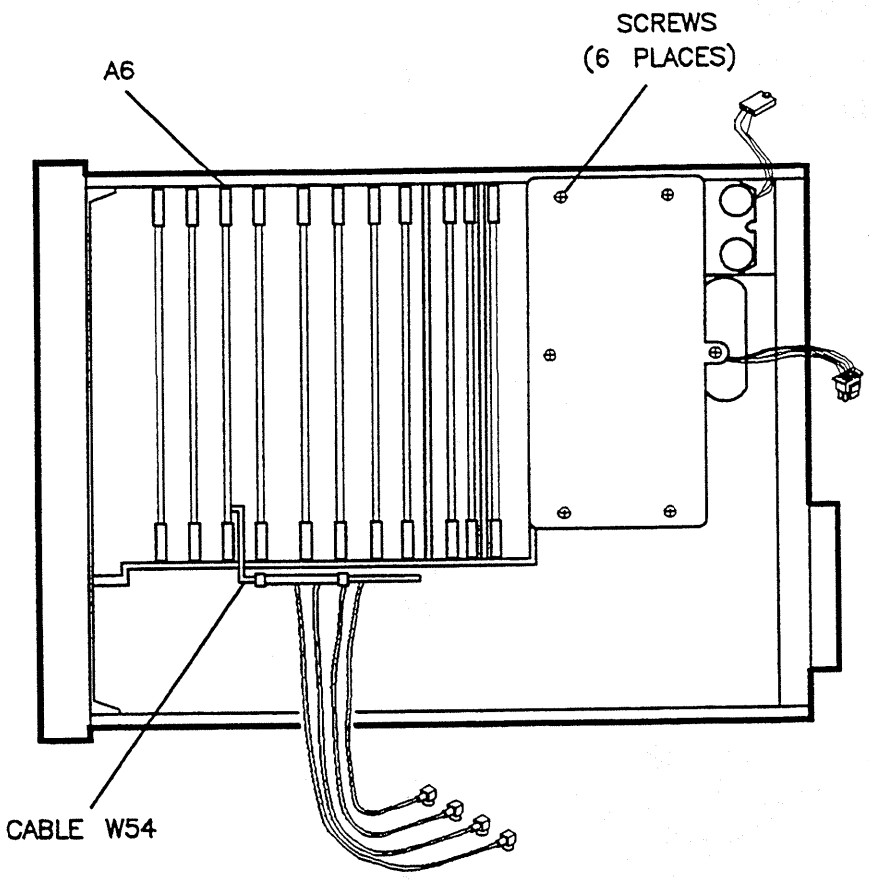


Figure 7-59. Major Assemblies

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7. RF Deck Removal

Note: Complete "Preliminary Steps" and "J1 RF Output Connector Removal" before continuing.

Refer to Figure 7-60.

1. Disconnect cable W51 from the attenuator.
2. Remove the two hex screws from the RF deck.

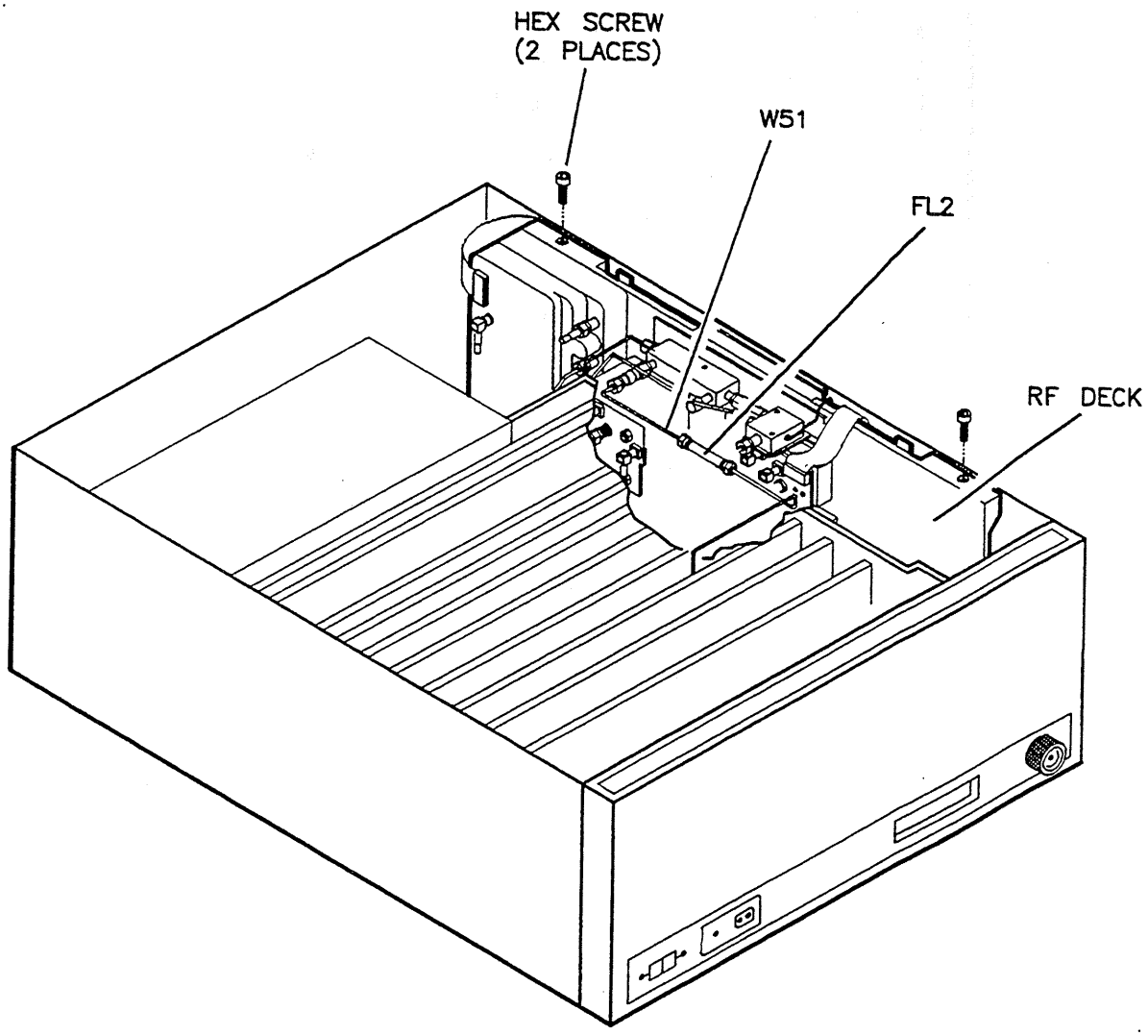


Figure 7-60. W51 Location

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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.

3. Carefully pull out the RF deck and rest it on the side of the instrument.
4. Remove flexible cables W32, W33, W34, and W35 from the motherboard.
5. Remove the hex screws from the RF deck and set the RF deck aside.

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8. Motherboard Removal

Note: Complete "Preliminary Steps", "Front Panel Removal", "J1 RF Output Connector Removal", "Rear Panel Removal", "Major Assemblies Removal", and "RF Deck Removal" before continuing.

Refer to Figure 7-61.

1. Disconnect the transformer pin-locking tab and the reference oscillator pin-locking tab.

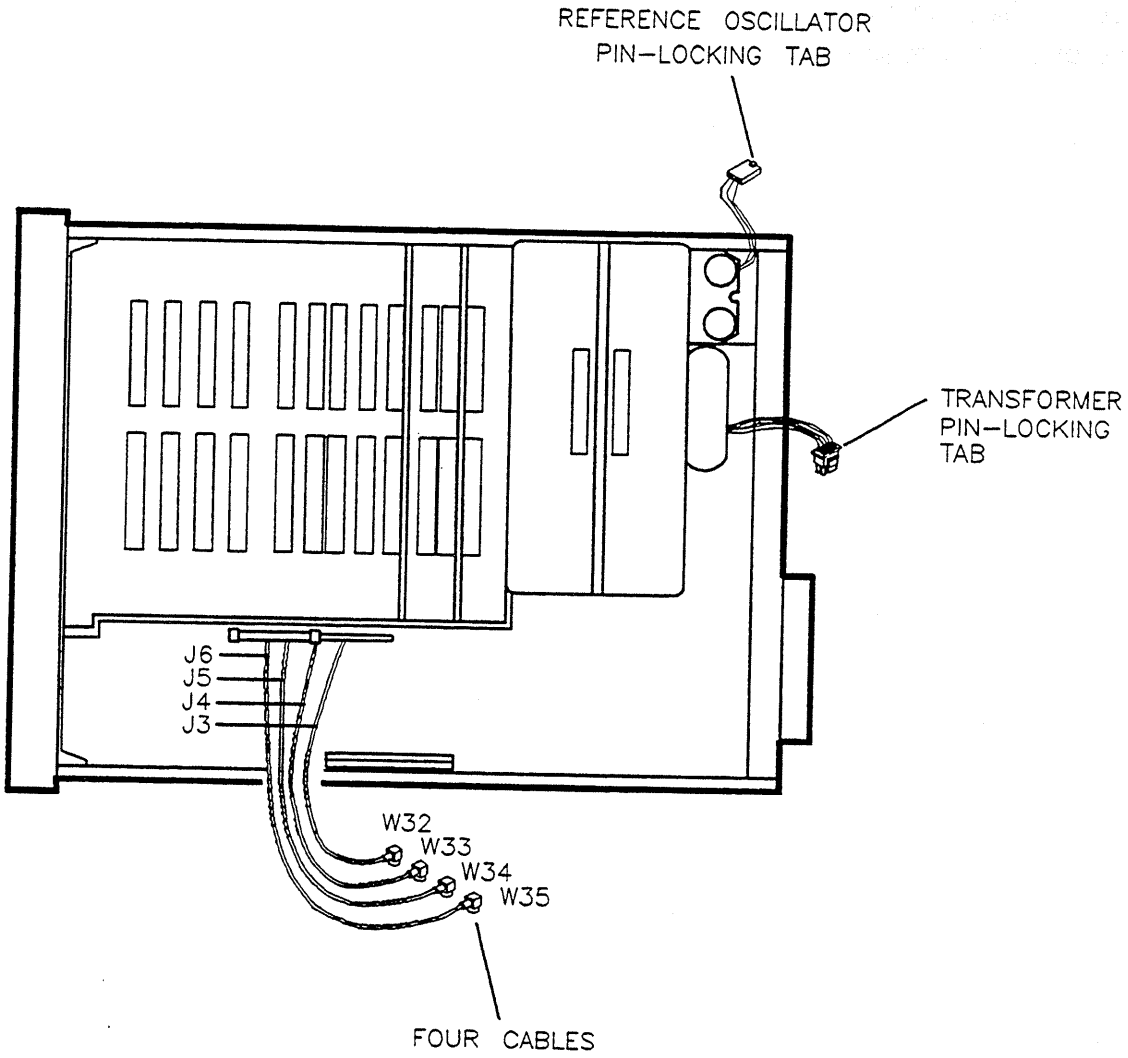


Figure 7-61. Motherboard Cables

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2. Remove the 16 screws from the bottom side of the motherboard bottom side Figure 7-62.
3. Lift off the motherboard.

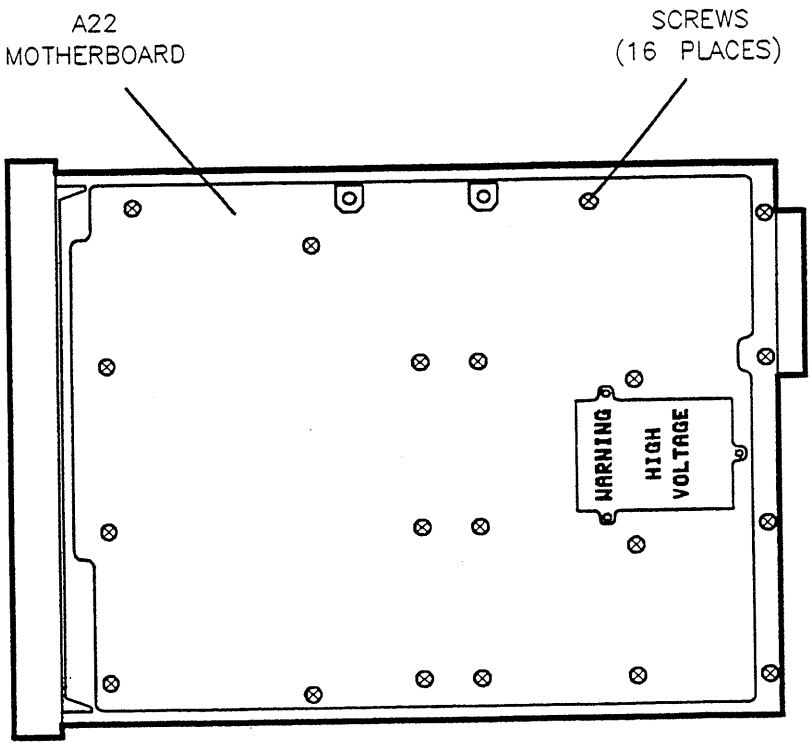


Figure 7-62. Motherboard Screws

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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
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

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.

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Table 8-1.
Adjustments and Performance Tests Required After Repair or Replacement of an Assembly (continued)

Assembly	Adjustment	Performance Test
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
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

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Table 8-1.
Adjustments and Performance Tests Required After Repair or Replacement of an Assembly (continued)

Assembly	Adjustment	Performance Test
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
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/Filt Adjustments	Full Self-Test Maximum Leveled Power Spurious Signals (Harmonics) FM Bandwidth

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.

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Table 8-1.
Adjustments and Performance Tests Required After Repair or Replacement of an Assembly (continued)

Assembly	Adjustment	Performance Test
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
A30 Bridge Detector	ALC Power Level Accuracy Power Flatness	Full Self–Test Power Accuracy Maximum Leveled Power
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[2] 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

[2] The entire amplifier/filter adjustment procedure does not need to be performed. Perform only the squegging clamp portions of this adjustment.

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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

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9

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.

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.

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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.

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Table 9-1. Reference Designations and Abbreviations

A	Amperage; Assembly
AT	Termination
AX	Axial Lead
AY	Assembly
B	Fan; Motor
BI	Bipin
BT	Battery
CHAM	Chamfer
CMPNT	Component
CONN	Connector
CR	Detector
CU	Copper
D	Diameter
DEG	Degree
F	Fuse
FE	Ferrule
FL	Filter
FLH	Flat Head
FLTG	Floating
FP	Front Panel
FR	Front
HD	Hand; Hard; Heavy Duty; Head
HEX	Hexadecimal; Hexagon; Hexagonal
ID	Inside Diameter
IN	Inch
INTL	Internal; International
J	Electrical Connector (Stationary Position); Jack
LBL	Label
LG	Long; Length
LK	Lock
LPF	Low Pass Filter
M	Male; Maximum; Meter; Mil; Milli
MTG	Mounting
NTD	Non-Time Delay
NYL	Nylon
PAN-HD	Pan Head
RF	Rear Panel
RPG	Rotary Pulse Generator
SKT	Socket
SN-PL	Tin Plated
SRD	Step Recovery Diode
STD	Standard
STL	Steel
SW	Switch
T	Transformer Thickness; Taper; Tooth
TD	Time Delay
THD	Thread; Threaded
THK	Thick
TPG	Tapping
TR-HD	Truss Head
UL	Underwriters Laboratories
W	Cable; Wire
WD	Width
YIG	Yttrium Iron Garnate
YO	YIG Oscillator

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Use this fast, efficient, economical method to keep your Hewlett-Packard instrument in service.

Locate defective assembly using troubleshooting procedures and service sheets in this manual.

Is a replacement assembly on hand?

YES

Install the replacement assembly. Keep the defective assembly for return to HP.

NO

Order rebuilt exchange assembly from HP. Refer to the replaceable parts section for part numbers.

Swap replacement assembly and defective assembly.

Return defective assembly to HP.

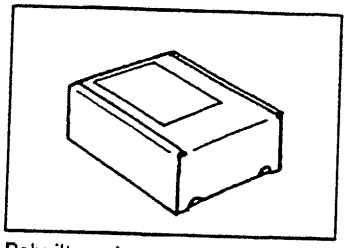
Order rebuilt-exchange assembly from HP. Refer to the replaceable parts section for part numbers.

Put rebuilt-exchange assembly in spares stock.

Return defective assembly to HP.

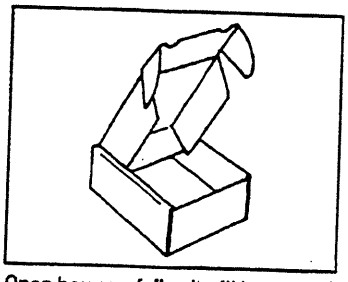
*HP pays postage on boxes mailed in U.S.A.

A.



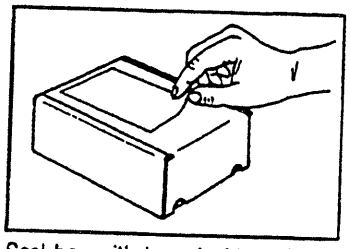
Rebuilt-exchange assemblies are shipped individually in boxes like this. In addition to the circuit assembly, the box contains:
Exchange assembly failure report
Return address label

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.

Figure 9-1. Module Exchange Program

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Major Assemblies-Top View

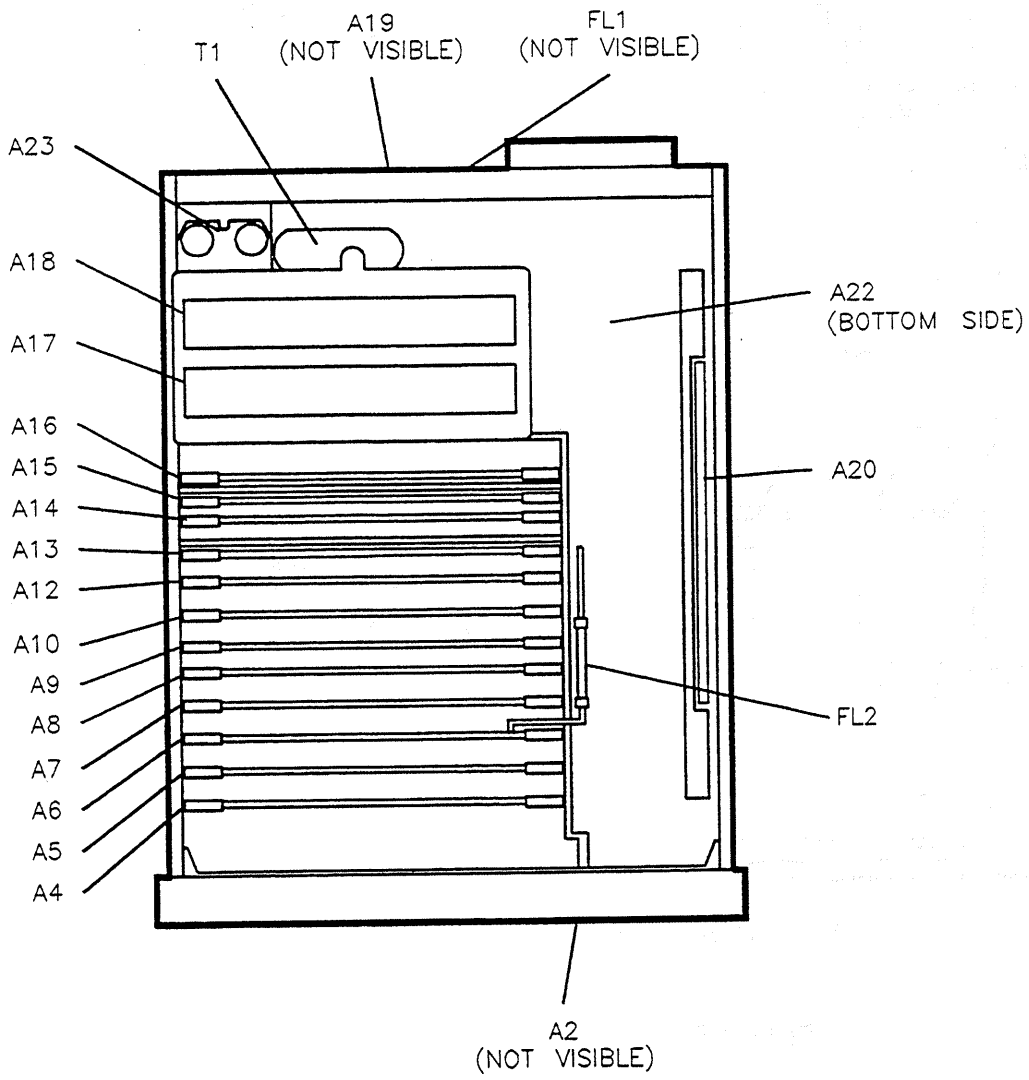


Figure 9-2. Major Assemblies (1 of 4)

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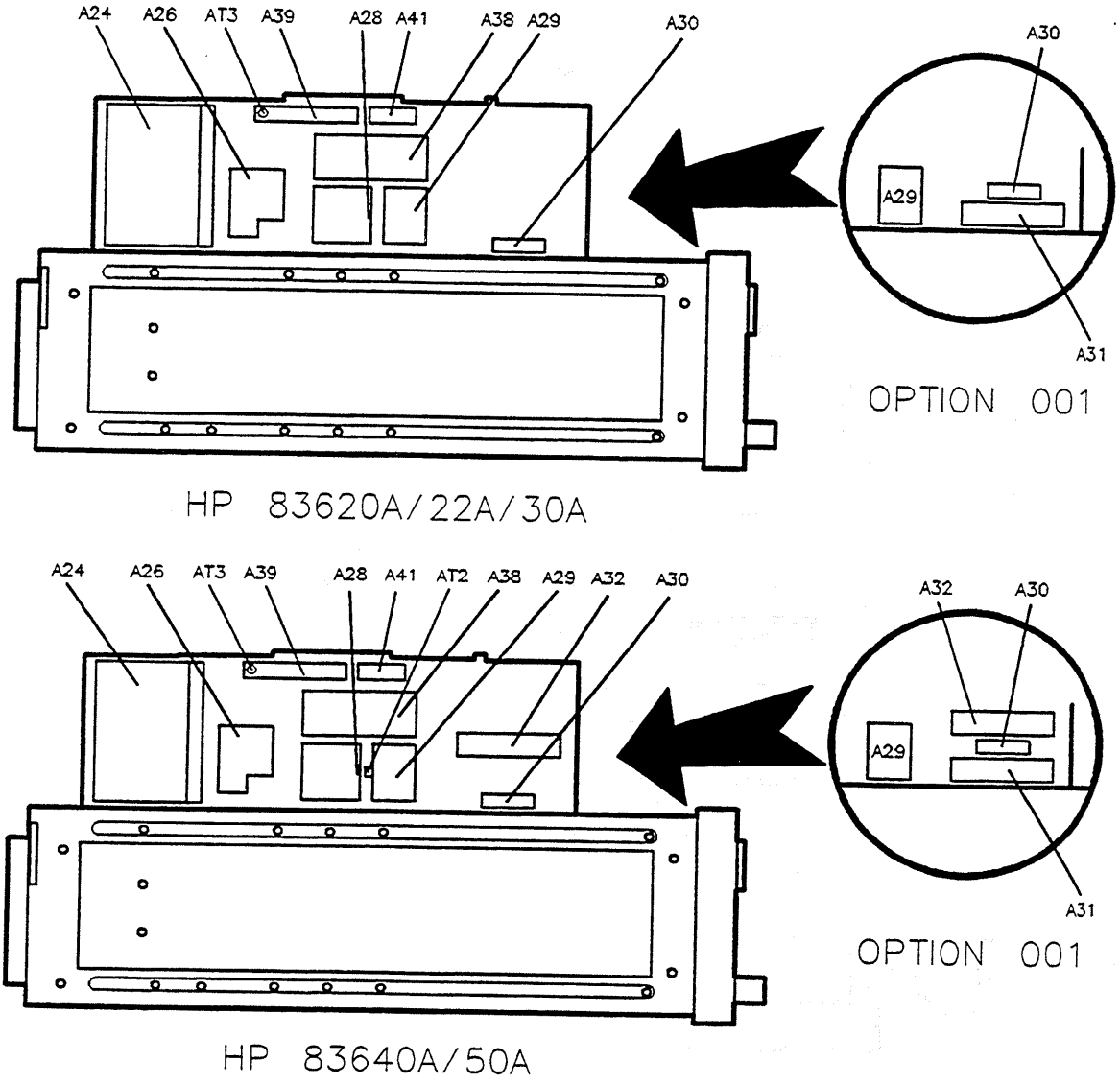


Figure 9-2. Major Assemblies (2 of 4)

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Major Assemblies–RF Deck

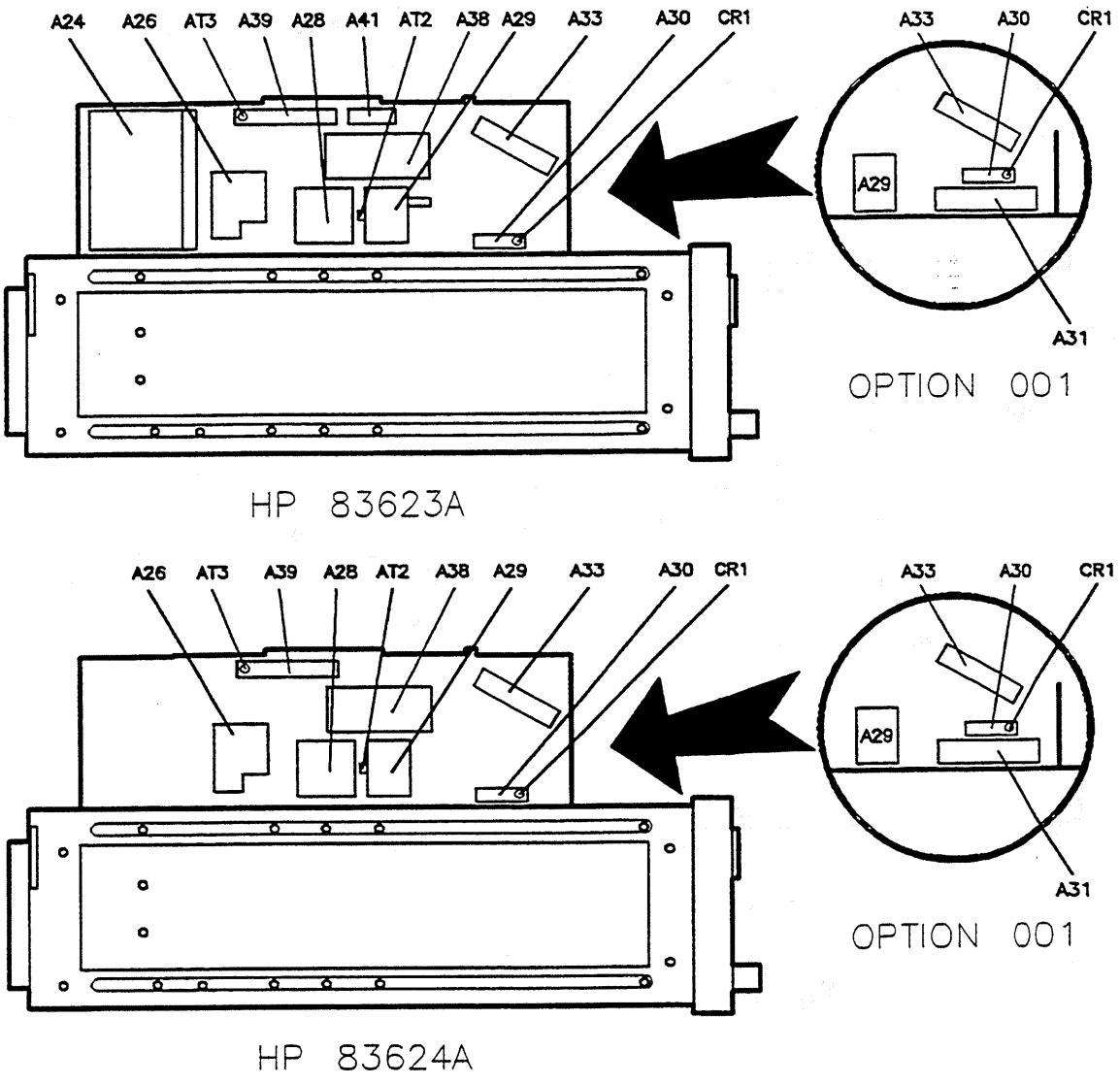


Figure 9-2. Major Assemblies (3 of 4)

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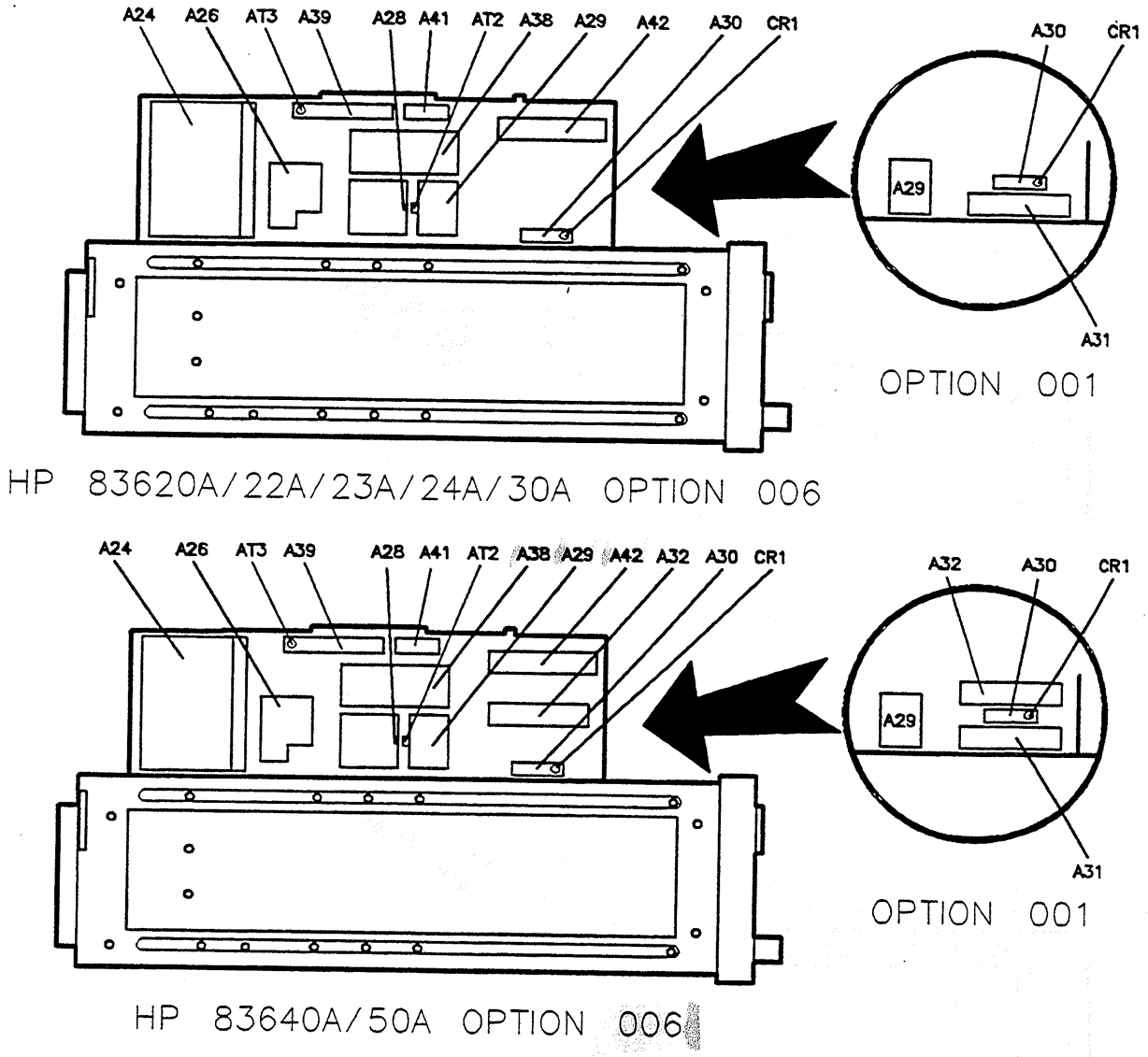


Figure 9-2. Major Assemblies (4 of 4)

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Table 9-2. Major Assemblies (1 of 3)

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 (Rebuilt-Exchange)
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)
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	08360-60215	1	CPU ASSEMBLY
A15	08360-69215		CPU ASSEMBLY (Rebuilt-Exchange)
	08360-60201	1	FIRMWARE UPGRADE KIT
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

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Table 9-2. Major Assemblies (2 of 3)

Ref. Desig.	HP Part Number	Qty	Description
A19	08360-60019	1	REAR PANEL INTERFACE ASSEMBLY
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	μWAVE 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~~	~~33326-69003~~		STEP ATTENUATOR (Rebuilt-Exchange)
A31	33326-60002	1	STEP ATTENUATOR (HP 83640A)
A31	33326-69002		STEP ATTENUATOR (Rebuilt-Exchange)
A31	33326-60005	1	STEP ATTENUATOR (HP 83650A)
A31	33326-69005		STEP ATTENUATOR (Rebuilt-Exchange)
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	RP 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	RP 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)

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Table 9-2. Major Assemblies (3 of 3)

Ref. Desig.	HP Part Number	Qty	Description
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
B1	08360-80006	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

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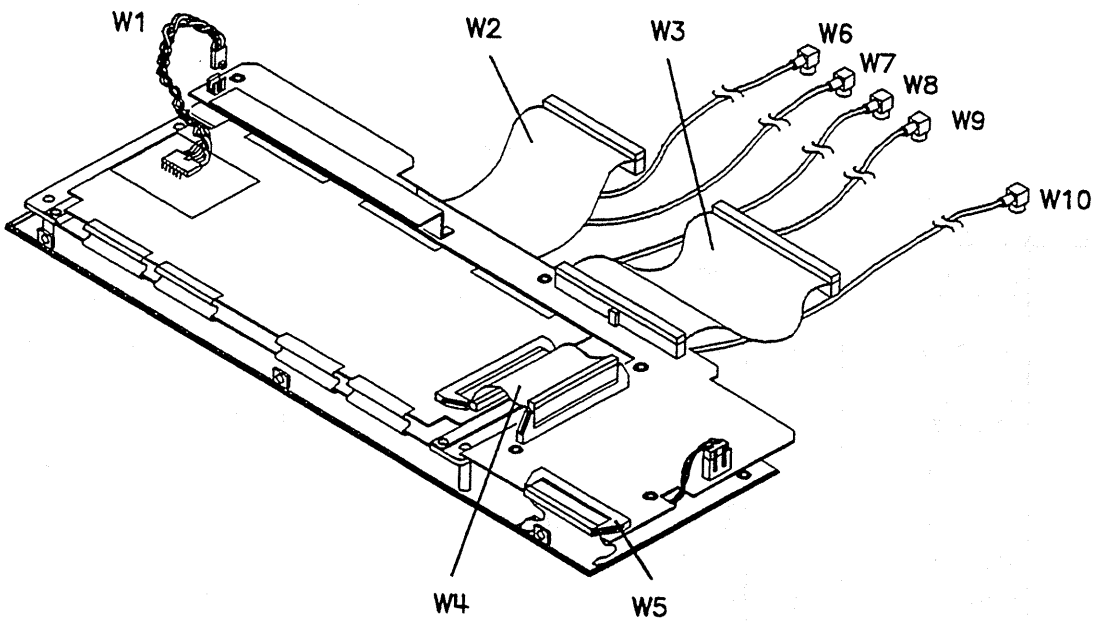


Figure 9-3. Cables (1 of 17)

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Cables–Top View

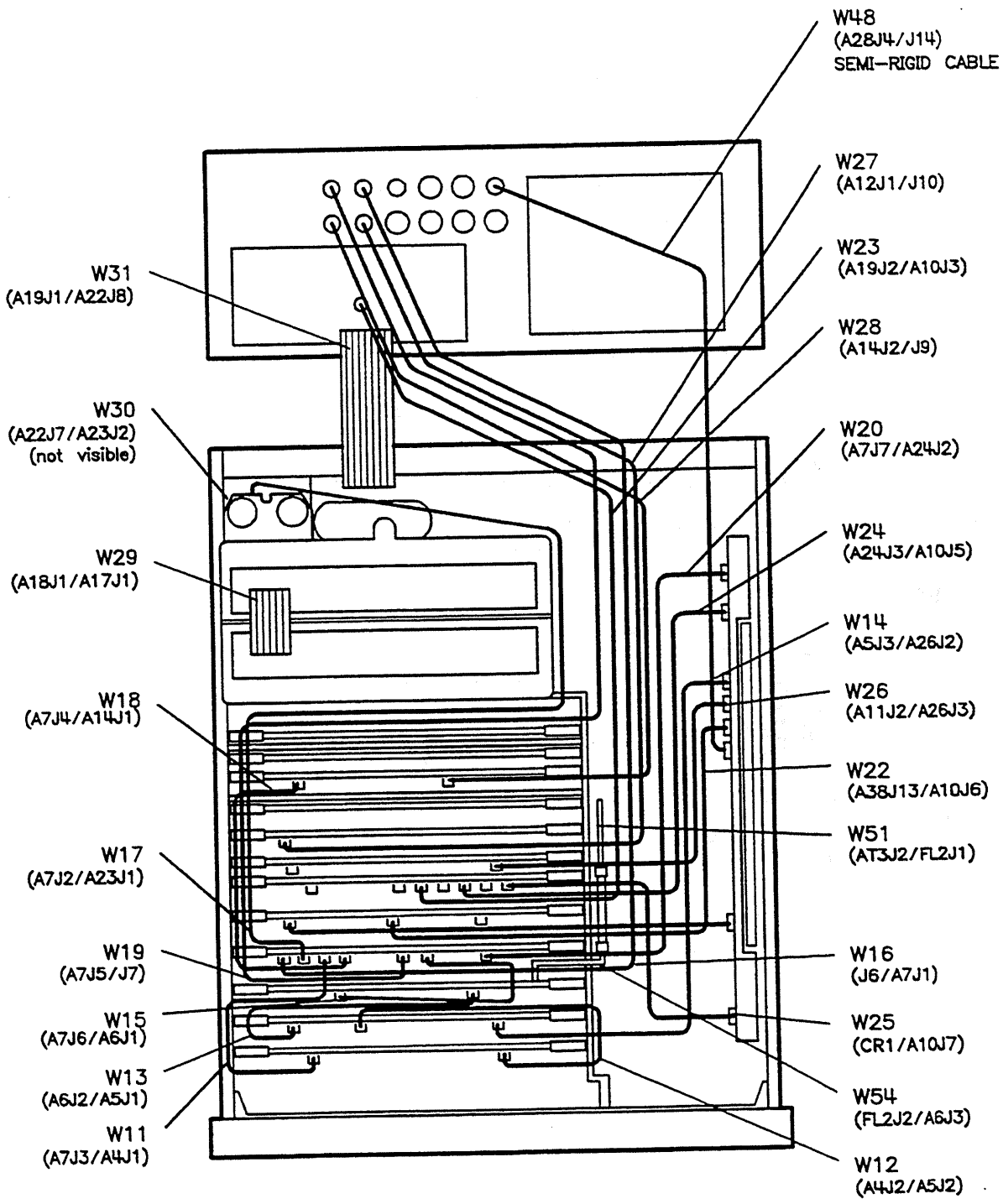


Figure 9-3. Cables (2 of 17)

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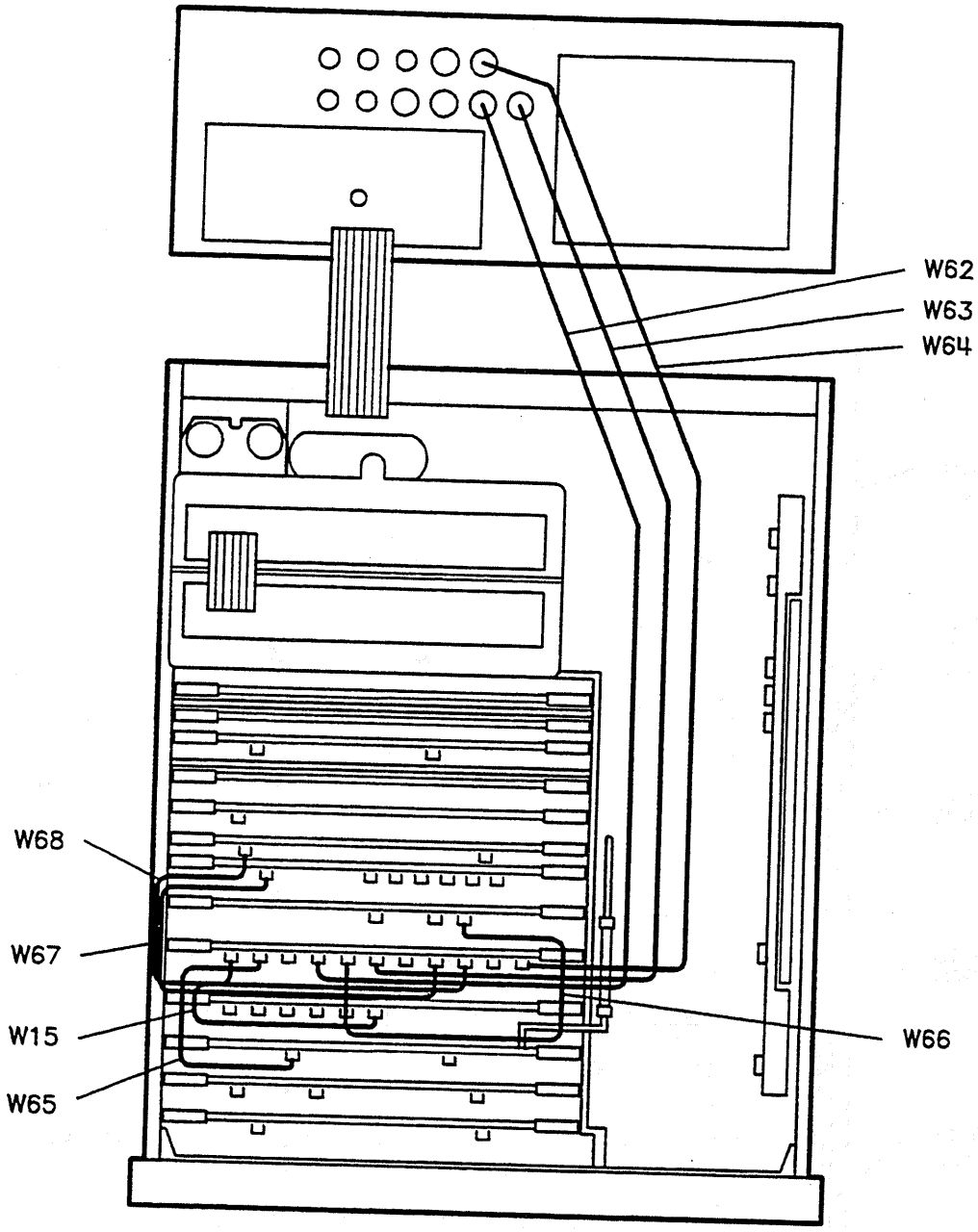


Figure 9-3. Cables (3 of 17)

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Cables–HP 83640A/50A RF Deck

No Options

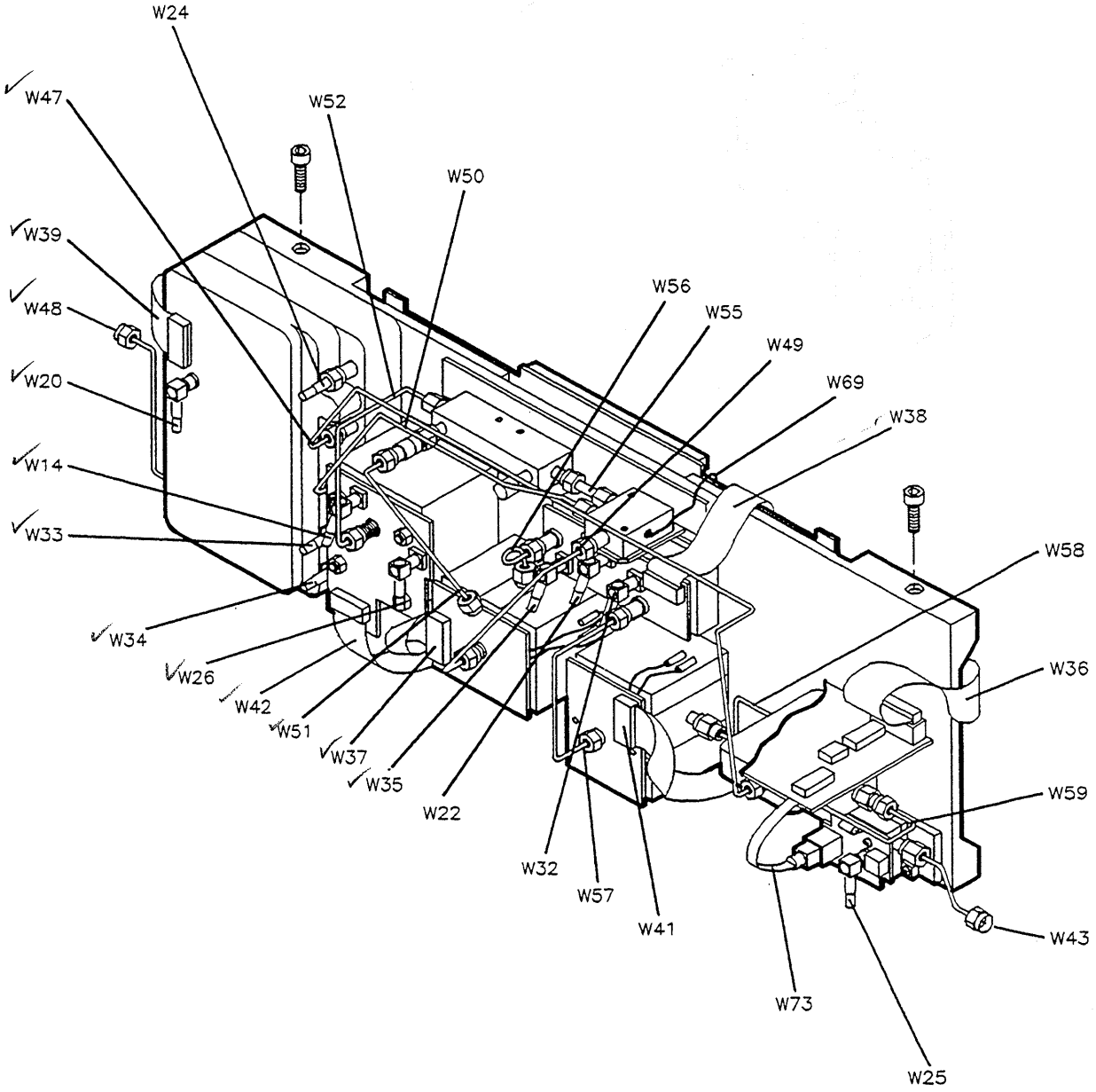


Figure 9-3. Cables (4 of 17)

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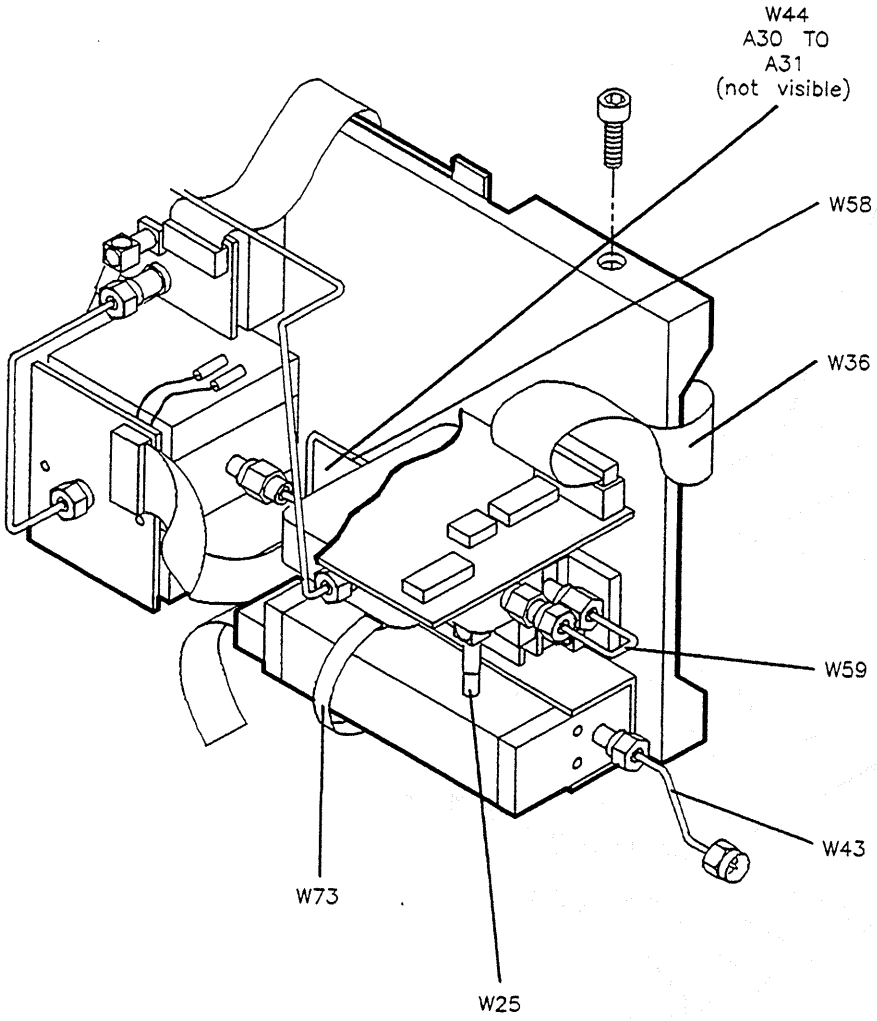


Figure 9-3. Cables (5 of 17)

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Cables–HP 83640A/50A RF Deck

Option 006

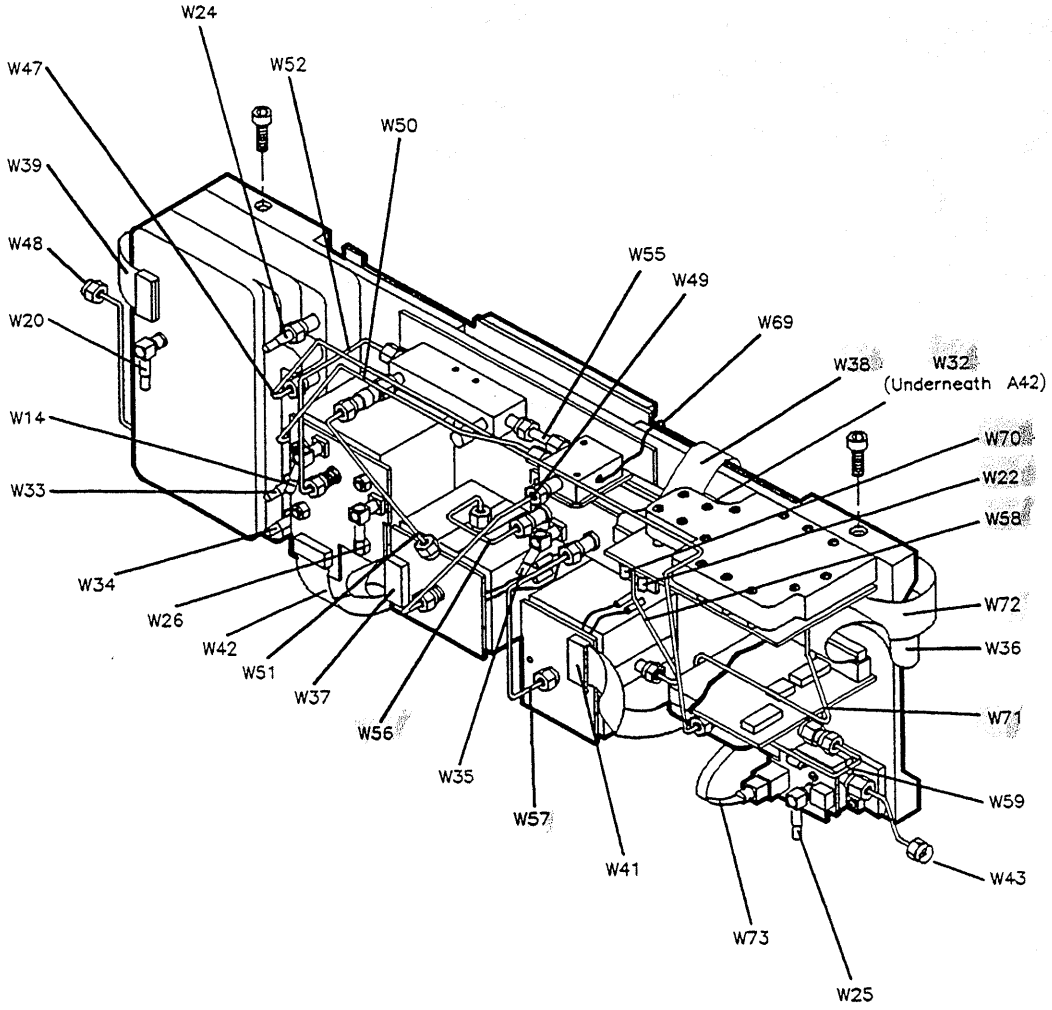


Figure 9-3. Cables (6 of 17)

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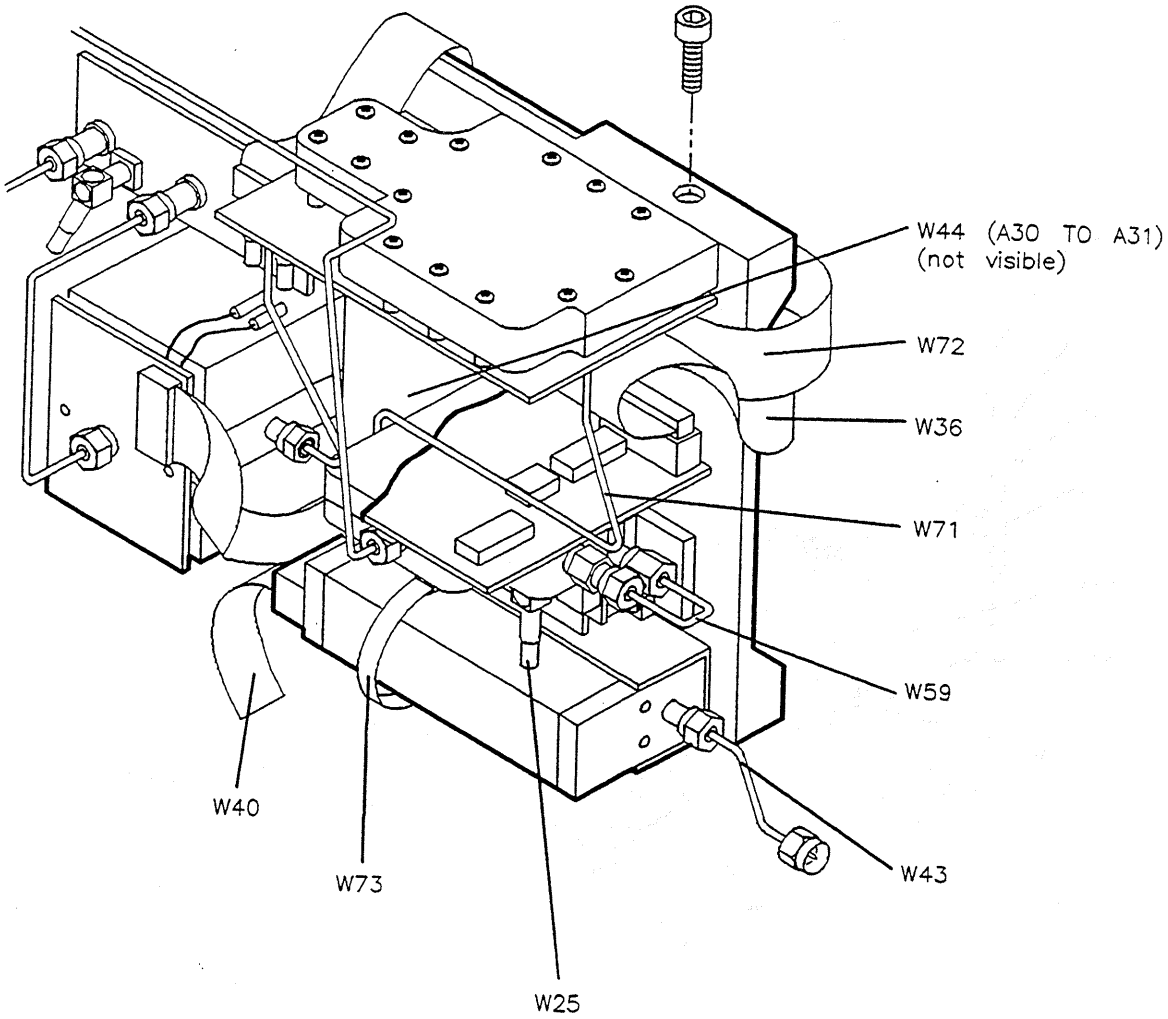


Figure 9-3. Cables (7 of 17)

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Cables–HP 83620A/22A/30A RF Deck

No Options

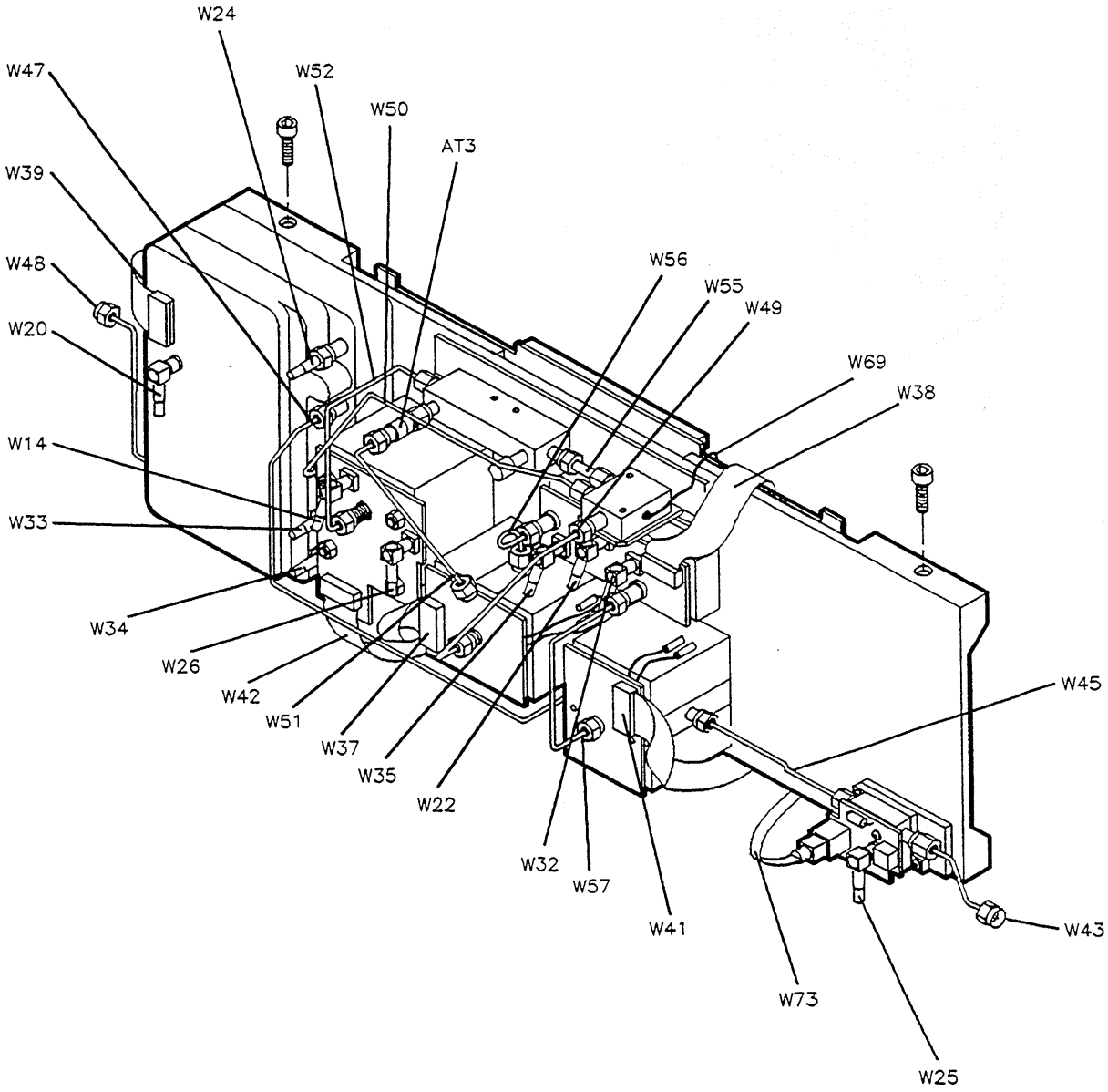


Figure 9-3. Cables (8 of 17)

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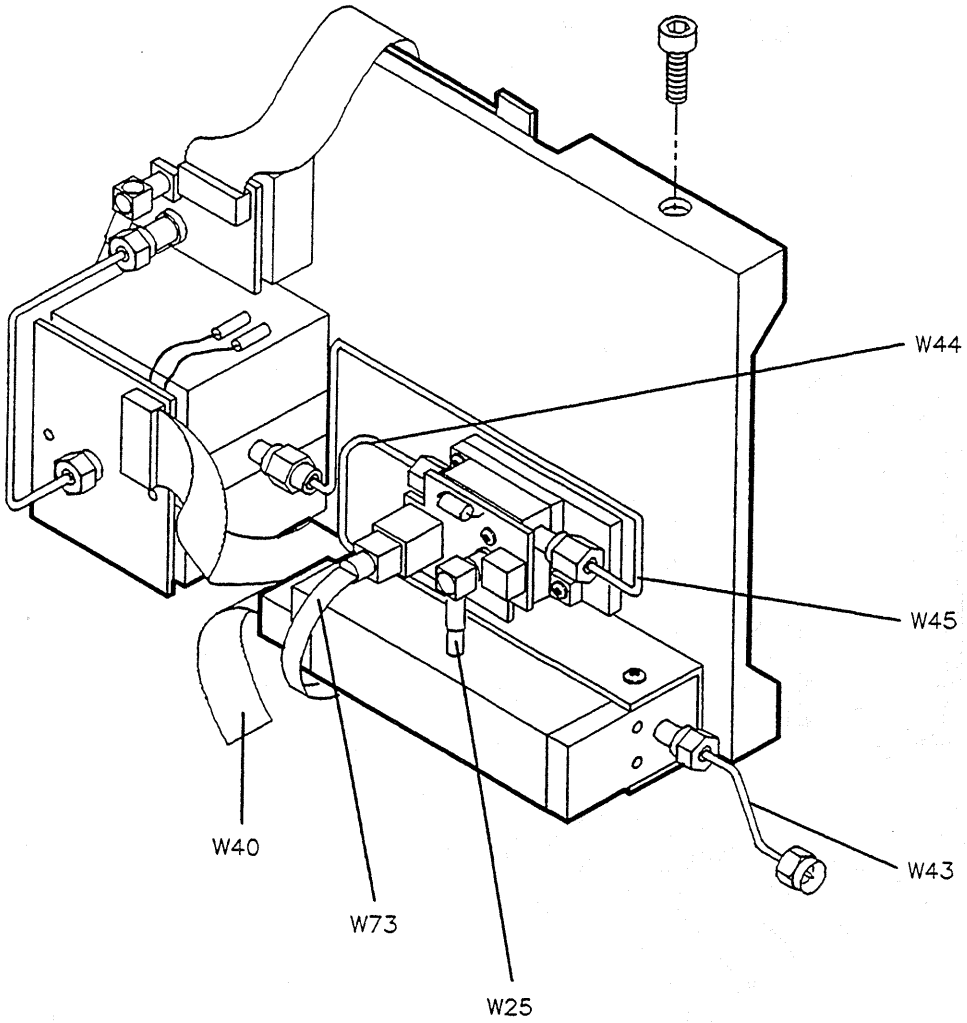


Figure 9-3. Cables (9 of 17)

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Cables–HP 83620/22A/30A RF Deck

Option 006

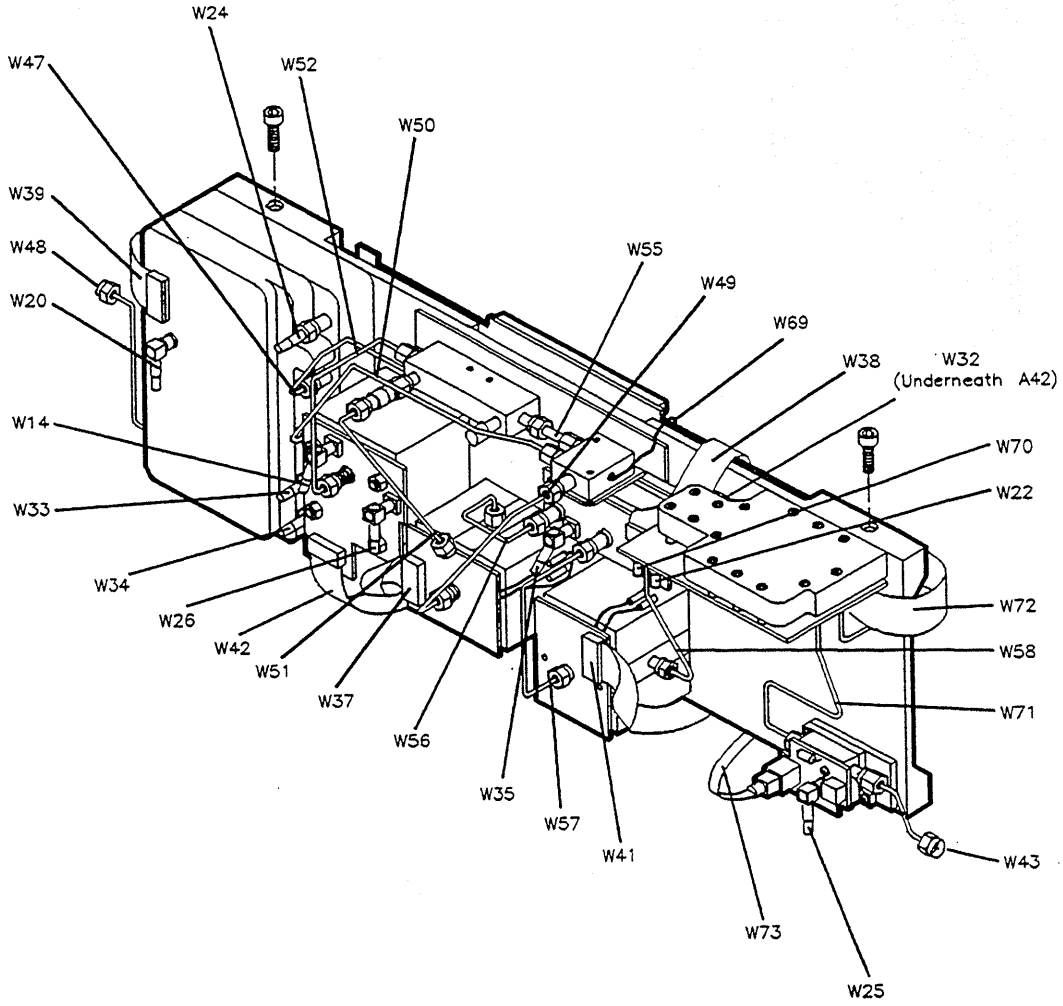


Figure 9-3. Cables (10 of 17)

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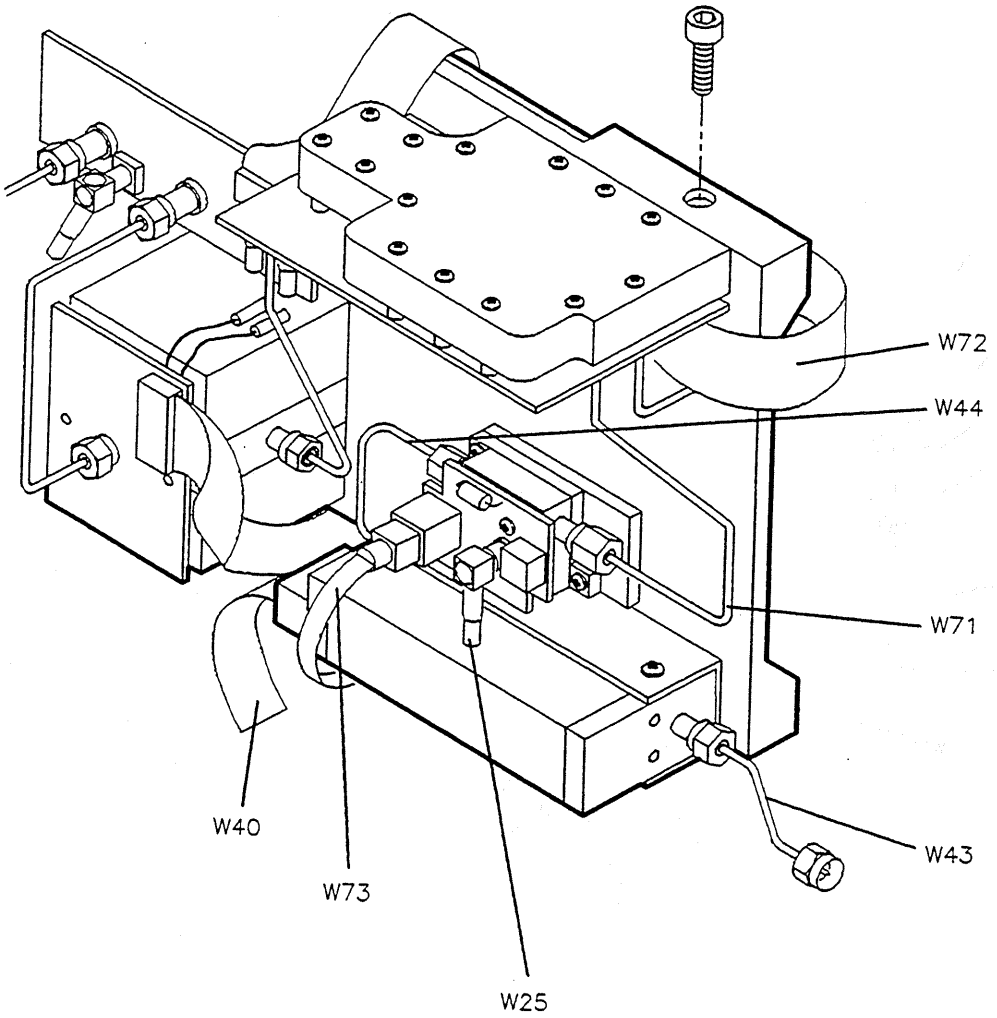


Figure 9-3. Cables (11 of 17)

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Cables–HP 83623A RF Deck

No Options

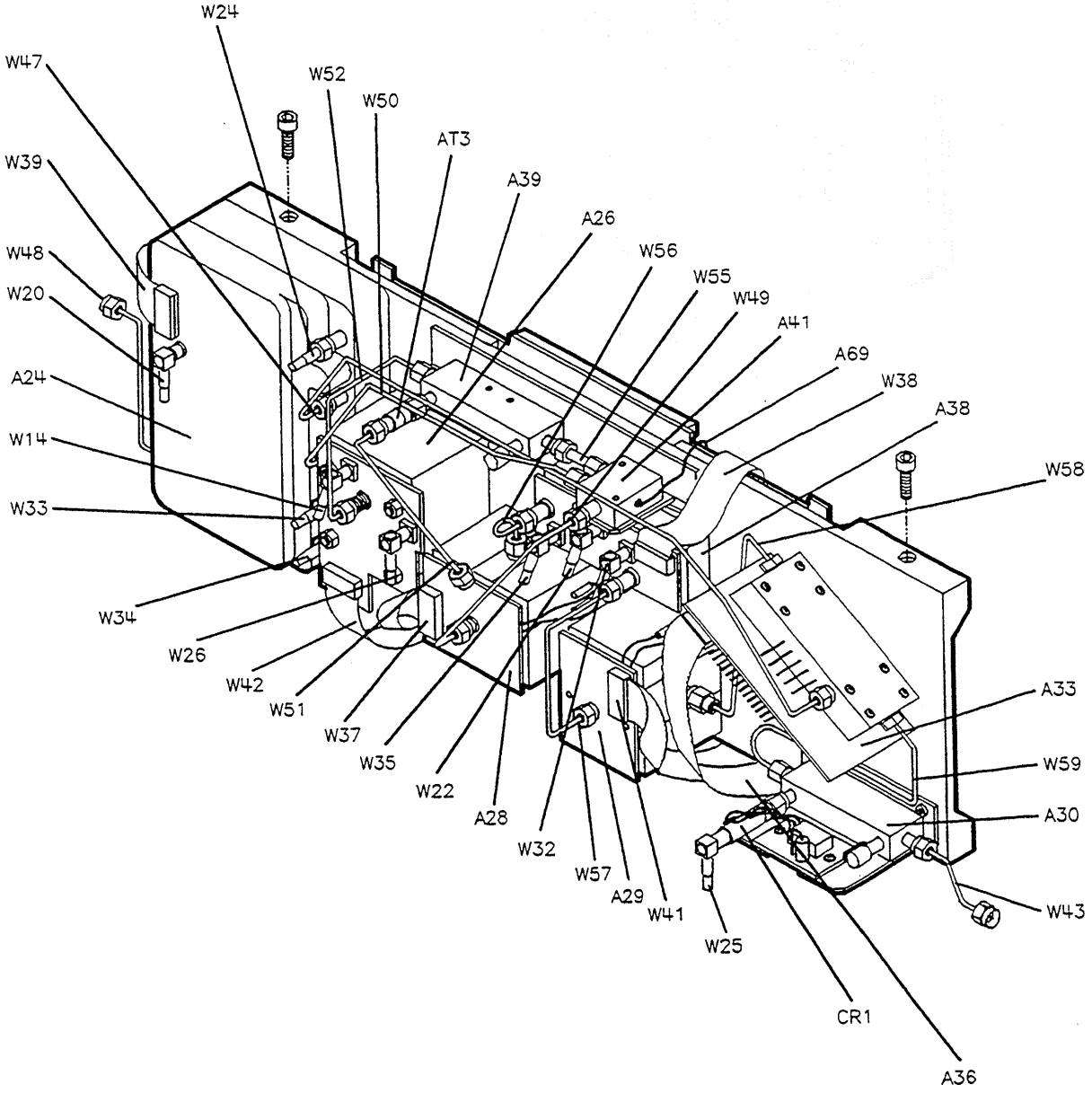


Figure 9-3. Cables (12 of 17)

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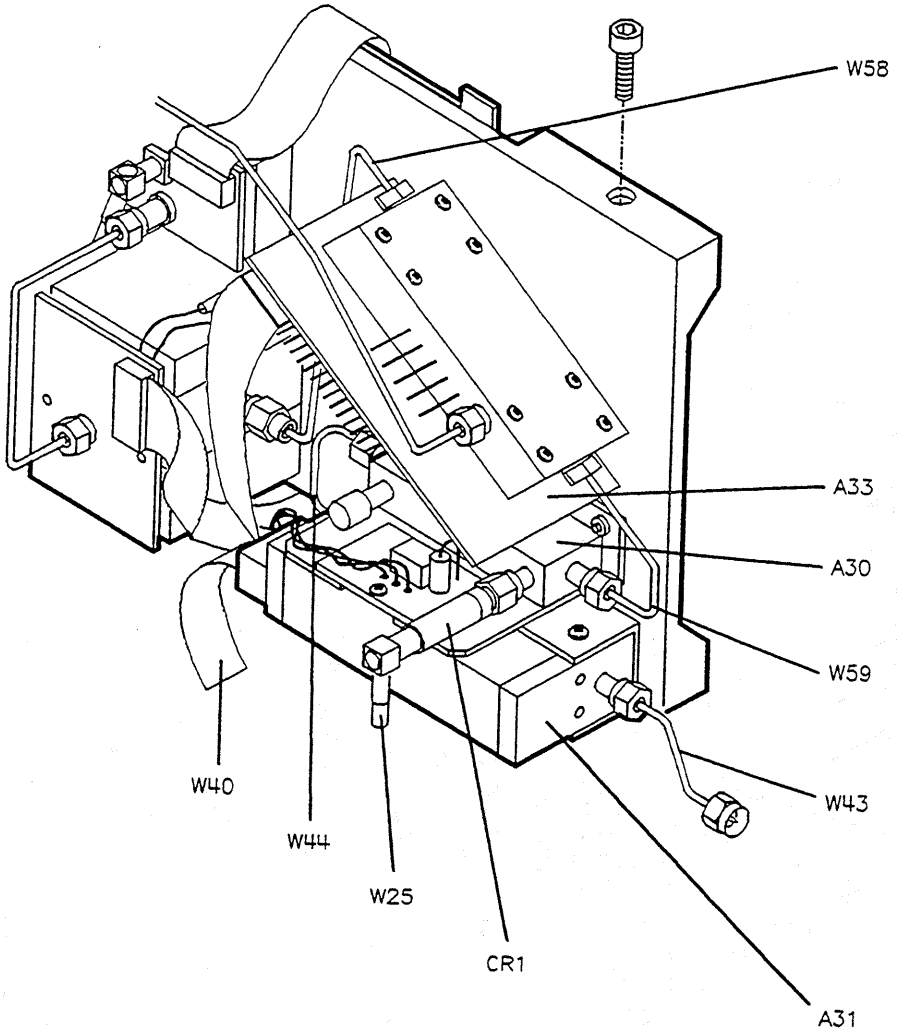


Figure 9-3. Cables (13 of 17)

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Cables–HP 83624A RF Deck

No Options

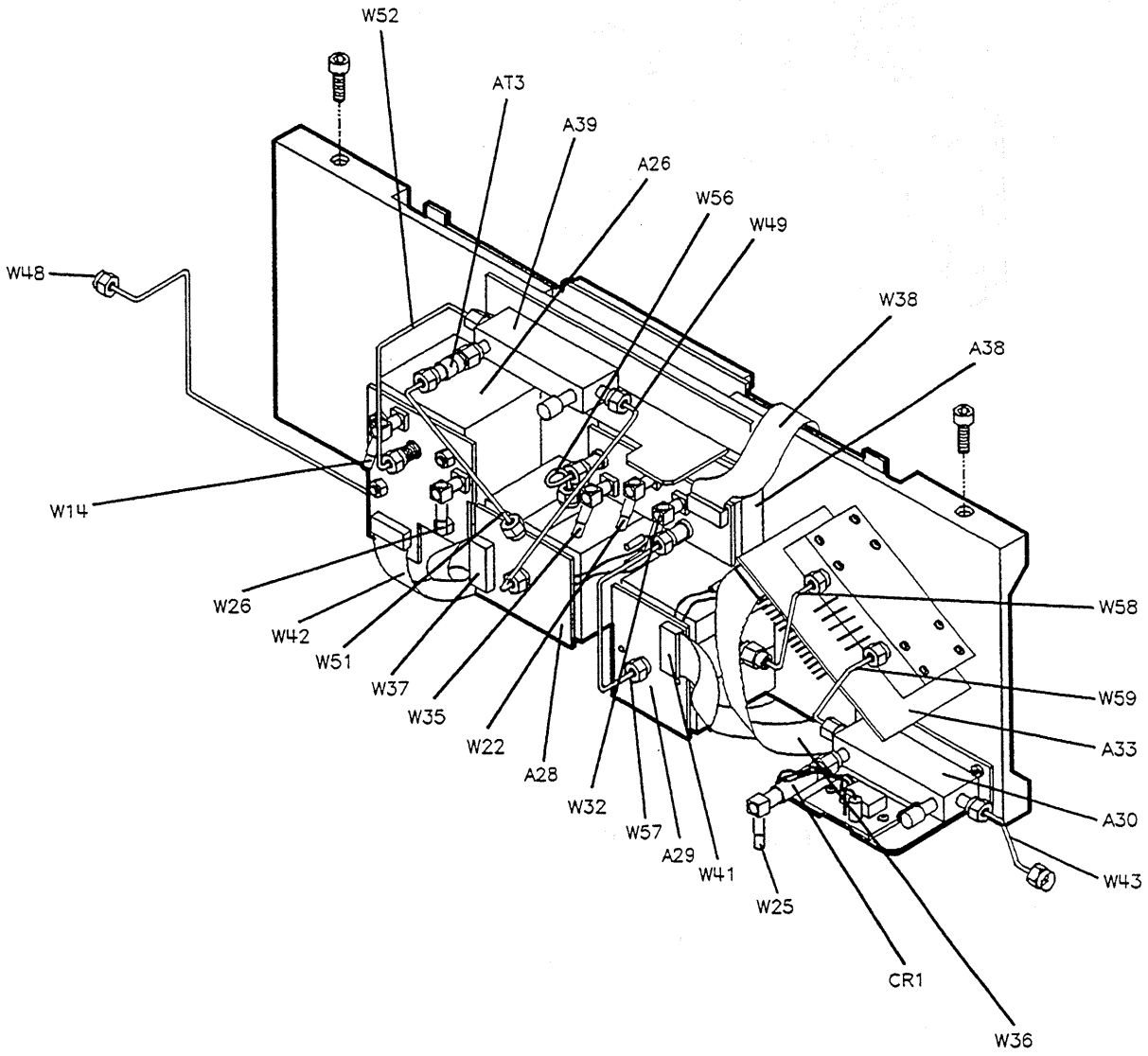


Figure 9-3. Cables (14 of 17)

ManualsPlus.com

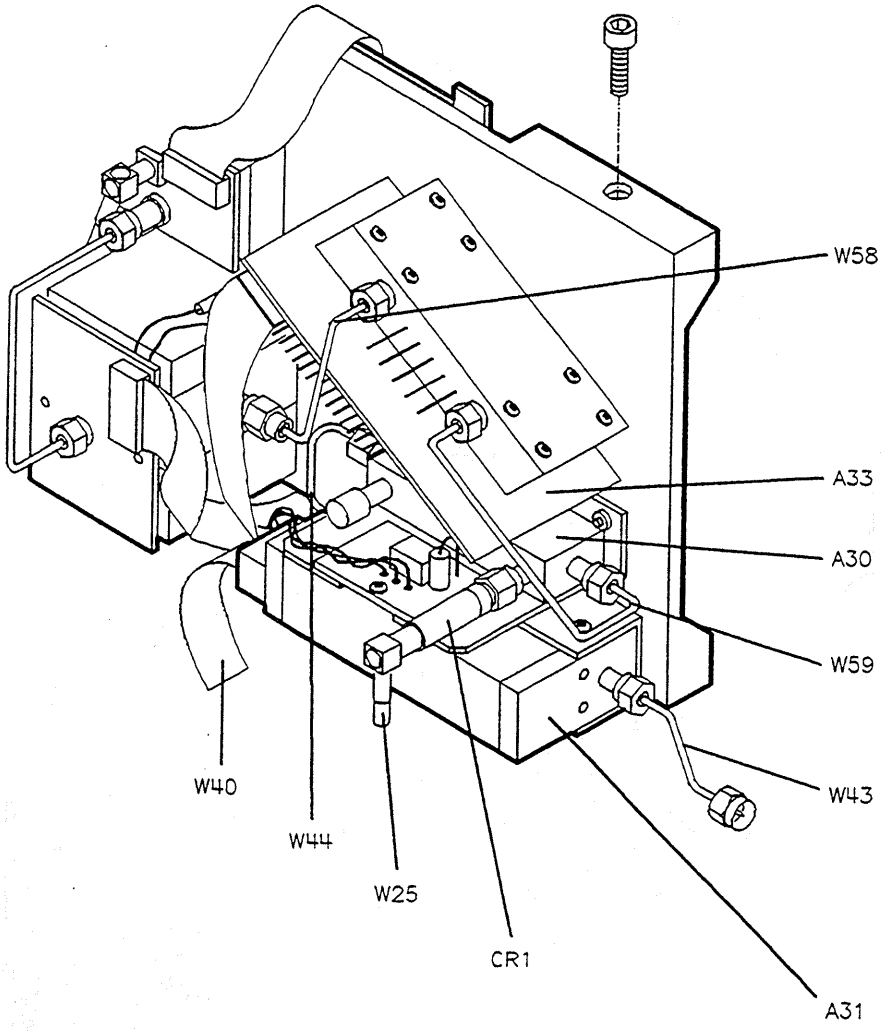


Figure 9-3. Cables (15 of 17)

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Cables–HP 83623A/24A RF Deck

Option 006

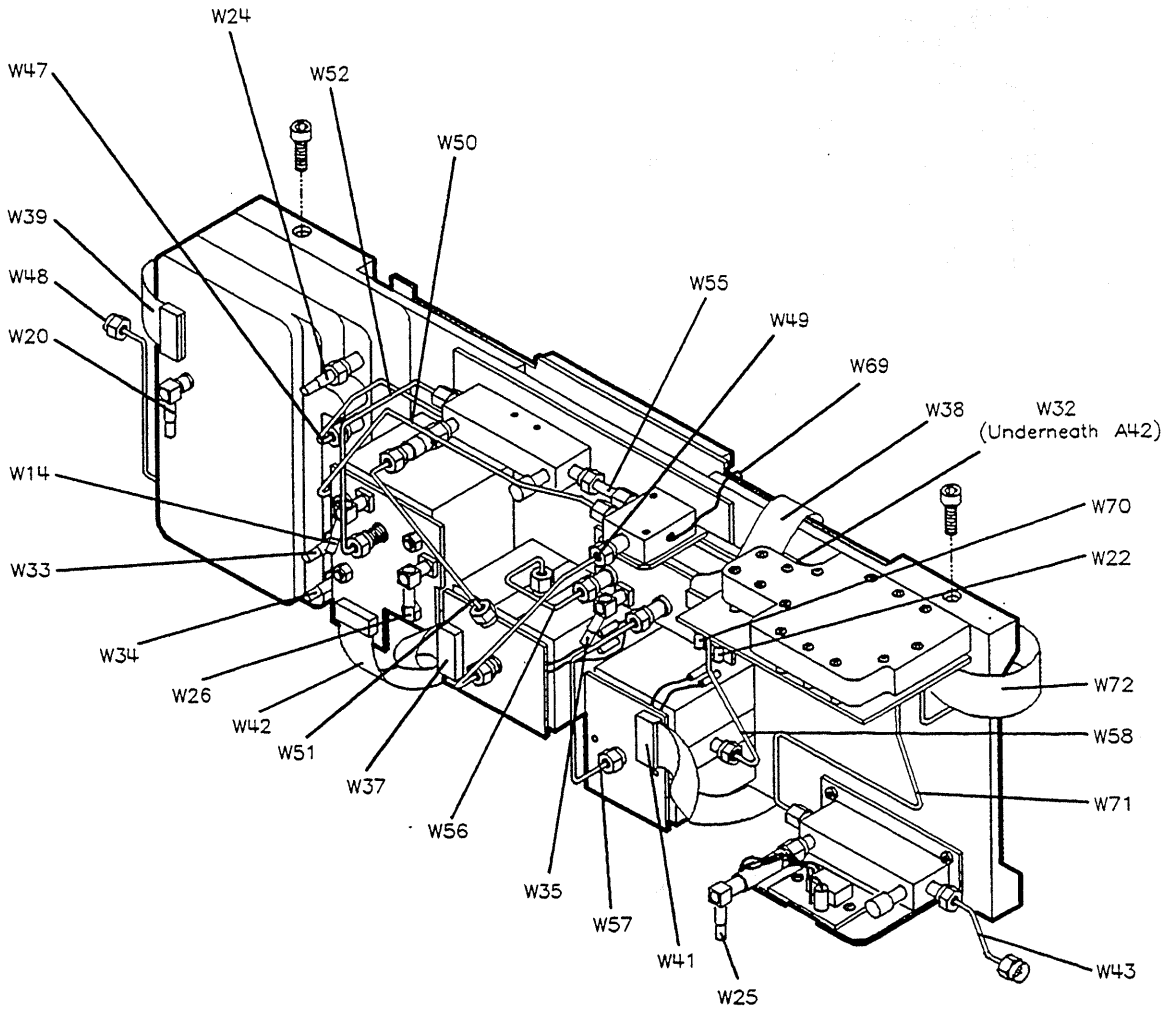


Figure 9-3. Cables (16 of 17)

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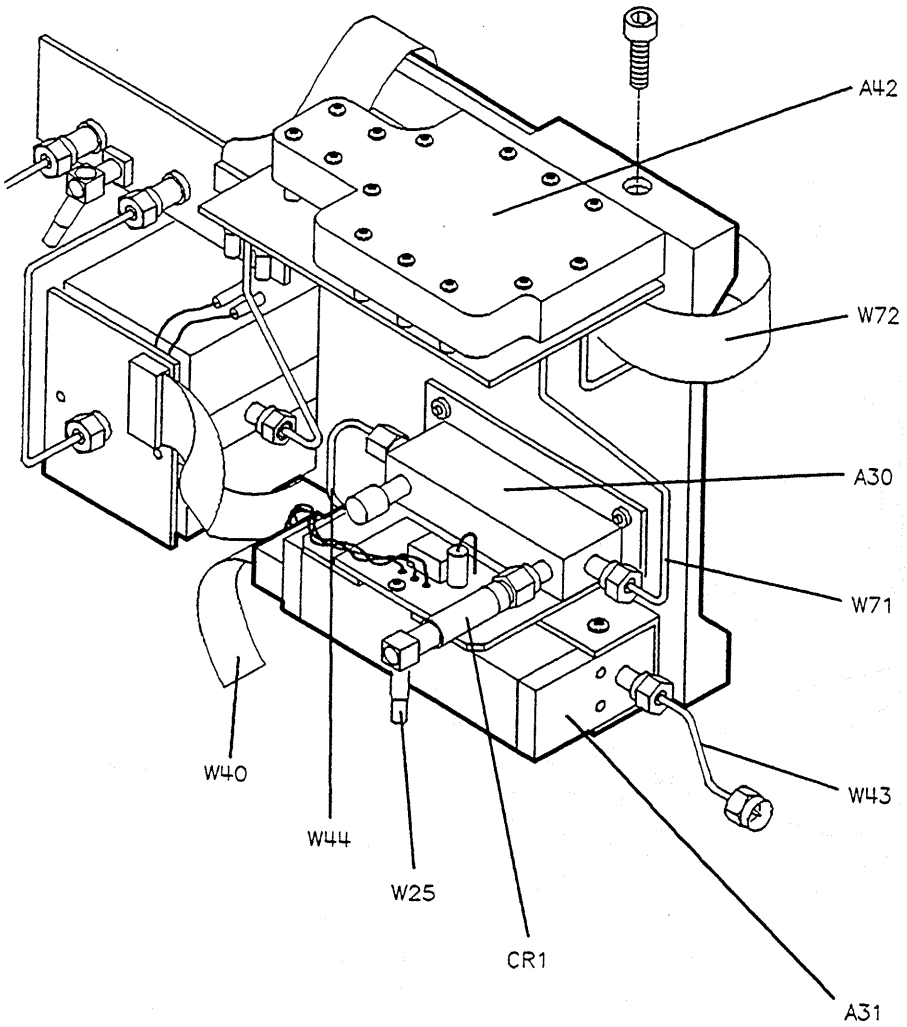


Figure 9-3. Cables (17 of 17)

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Table 9-3. Cables (1 of 3)

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
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	RP 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)

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Table 9-3. Cables (2 of 3)

Ref. Desig.	HP Part Number	Qty	Description
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)
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)
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)
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)

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Table 9-3. Cables (3 of 3)

Ref. Desig.	HP Part Number	Qty	Description
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)
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

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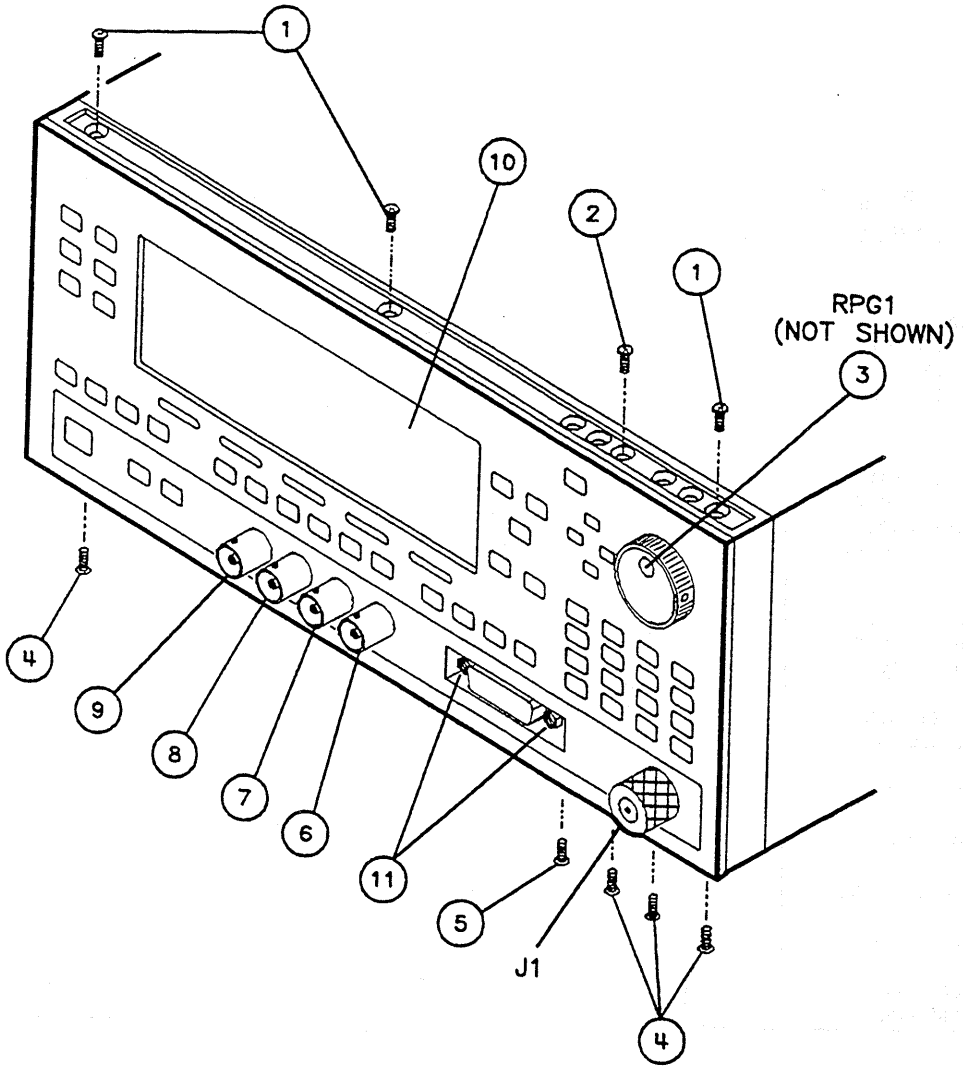


Figure 9-4. Front Panel Hardware

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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

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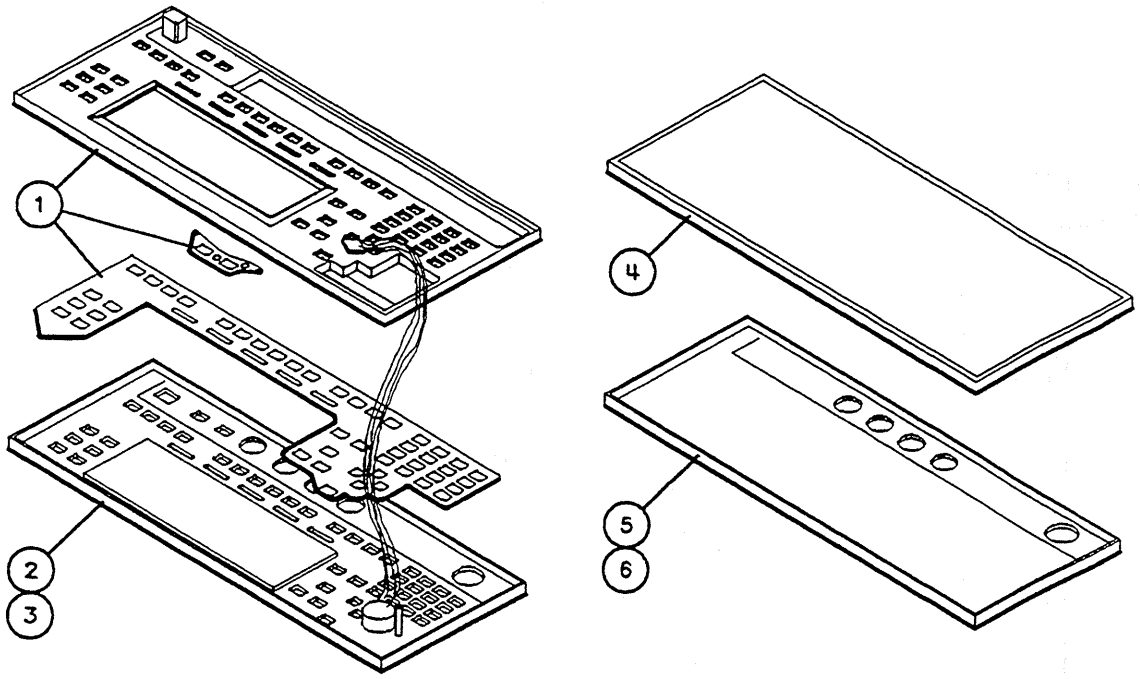


Figure 9-5. Front Panel, Casting and Keypad

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"

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Front Panel, Attaching Hardware

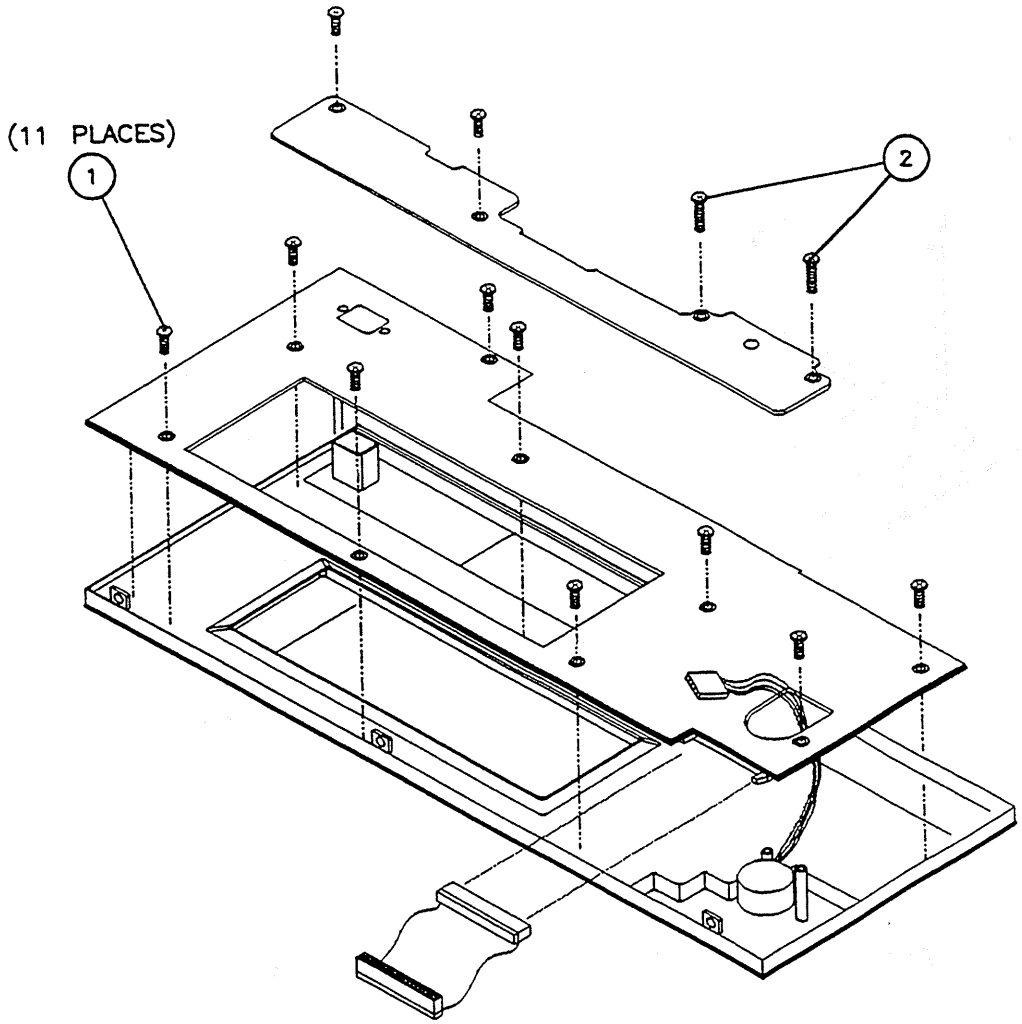


Figure 9-6. Front Panel, Attaching Hardware (1 of 3)

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

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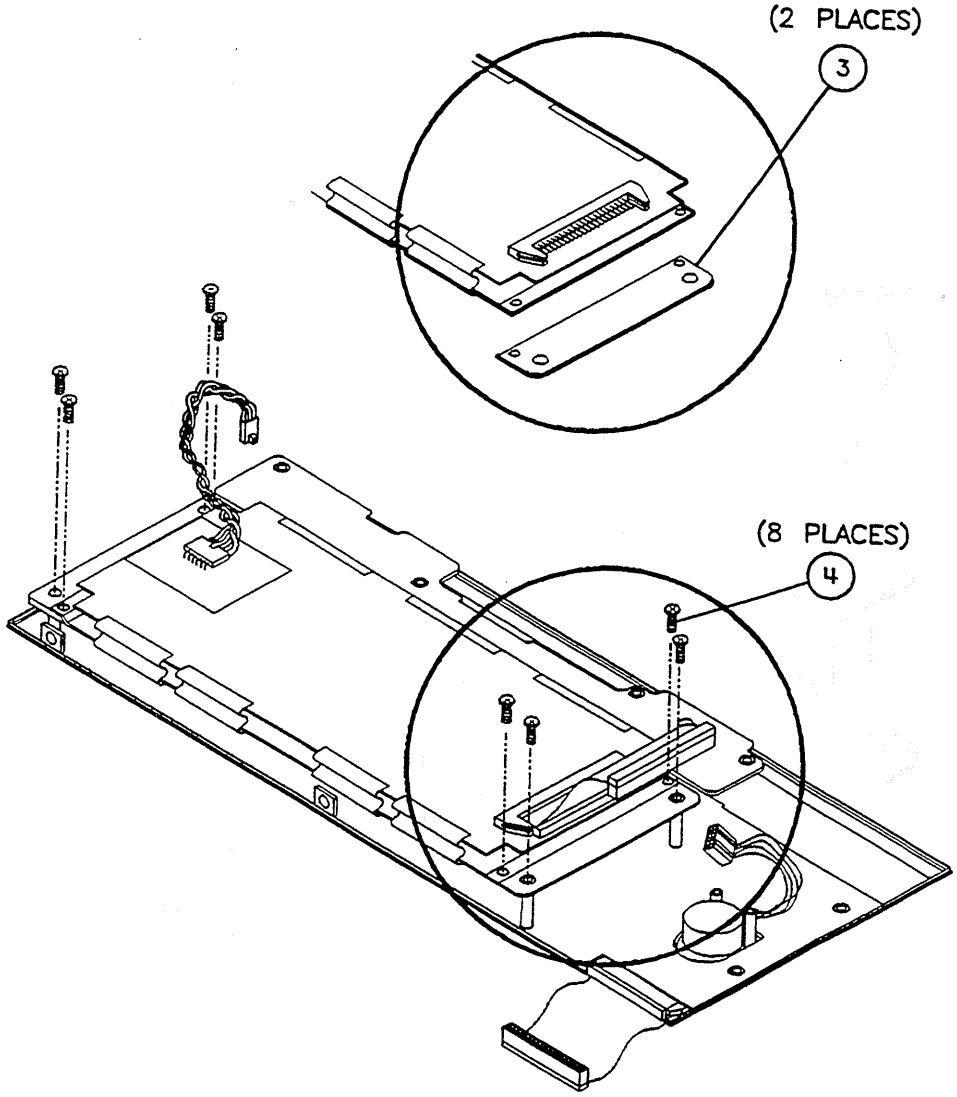


Figure 9-6. Front Panel, Attaching Hardware (2 of 3)

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Front Panel, Attaching Hardware

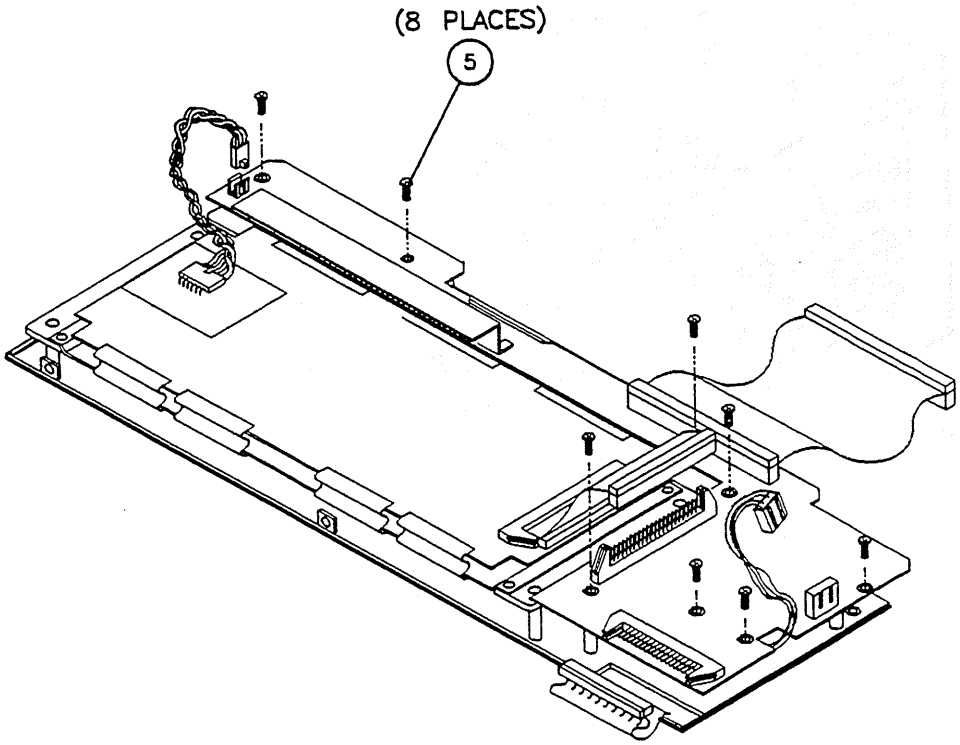


Figure 9-6. Front Panel, Attaching Hardware (3 of 3)

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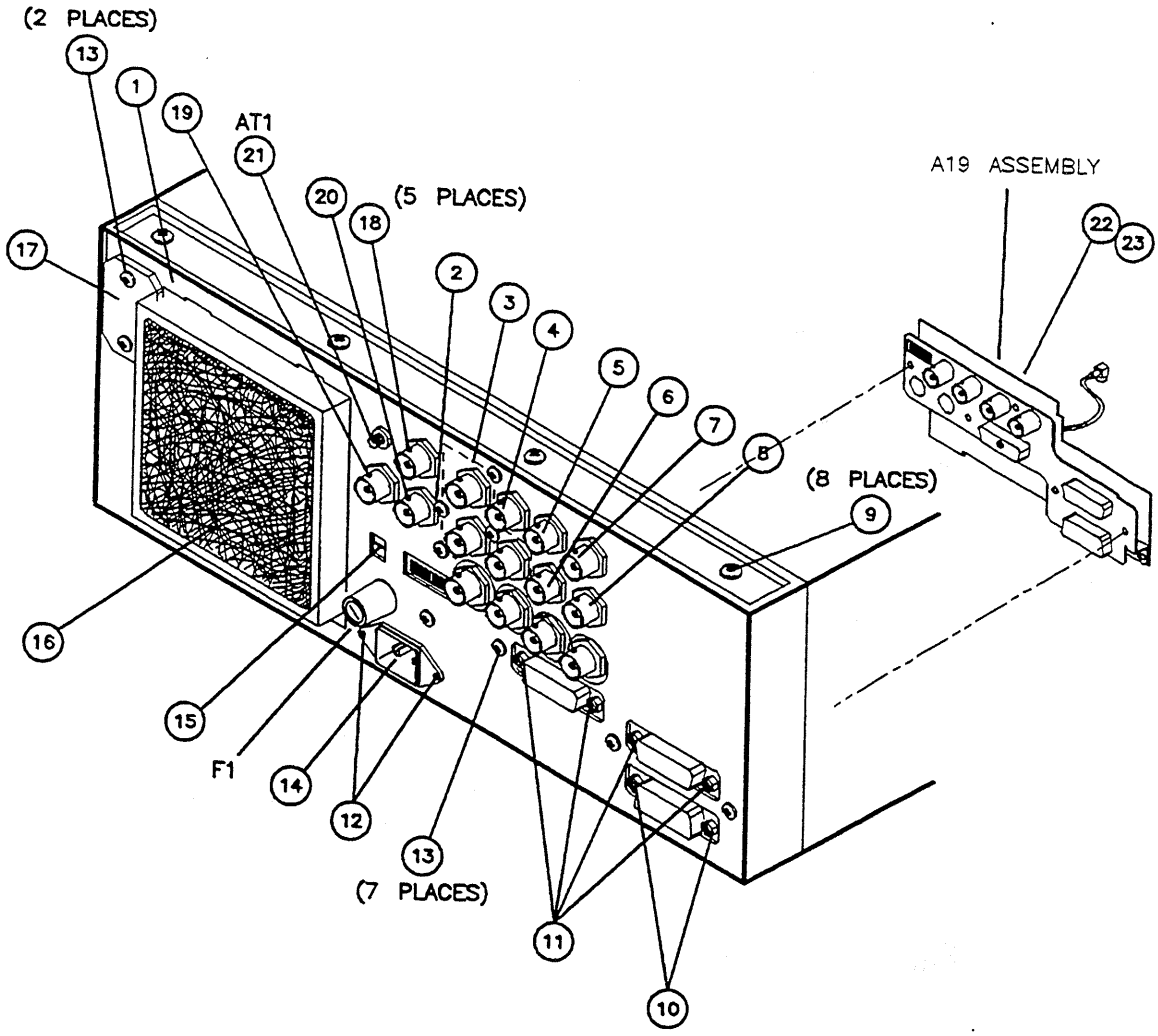


Figure 9-7. Rear Panel Hardware

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)

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Table 9-7. Rear Panel (2 of 2)

Ref. Desig.	HP Part Number	Qty	Description
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
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

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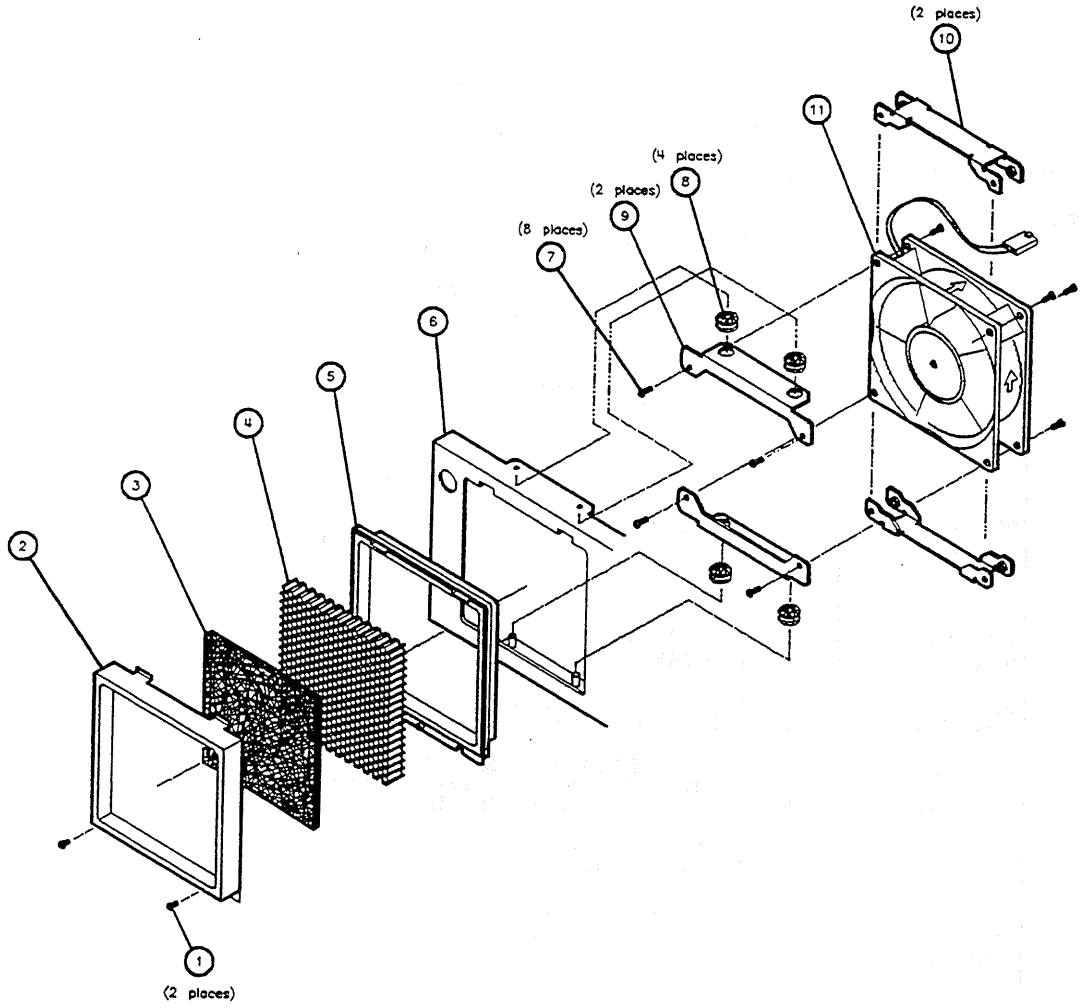


Figure 9-8. Rear Panel Fan Assembly

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

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Bottom View, Attaching Hardware

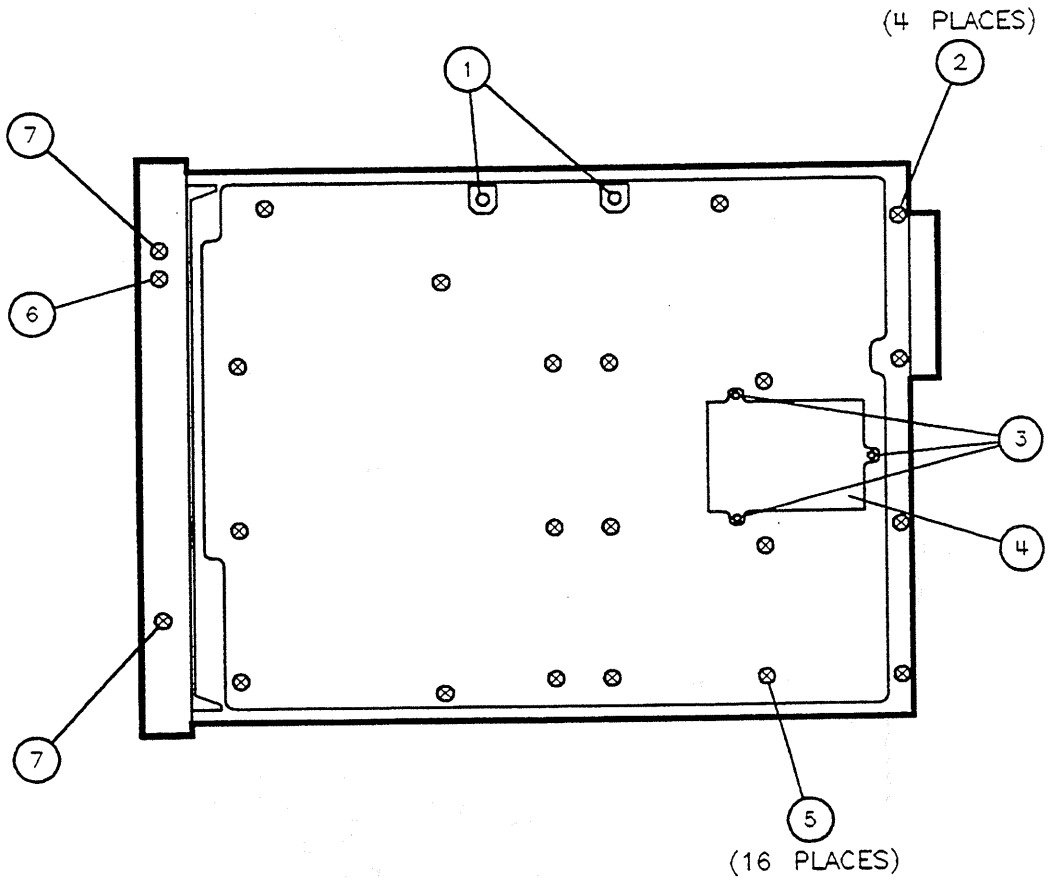


Figure 9-9. Bottom View, Attaching Hardware

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)

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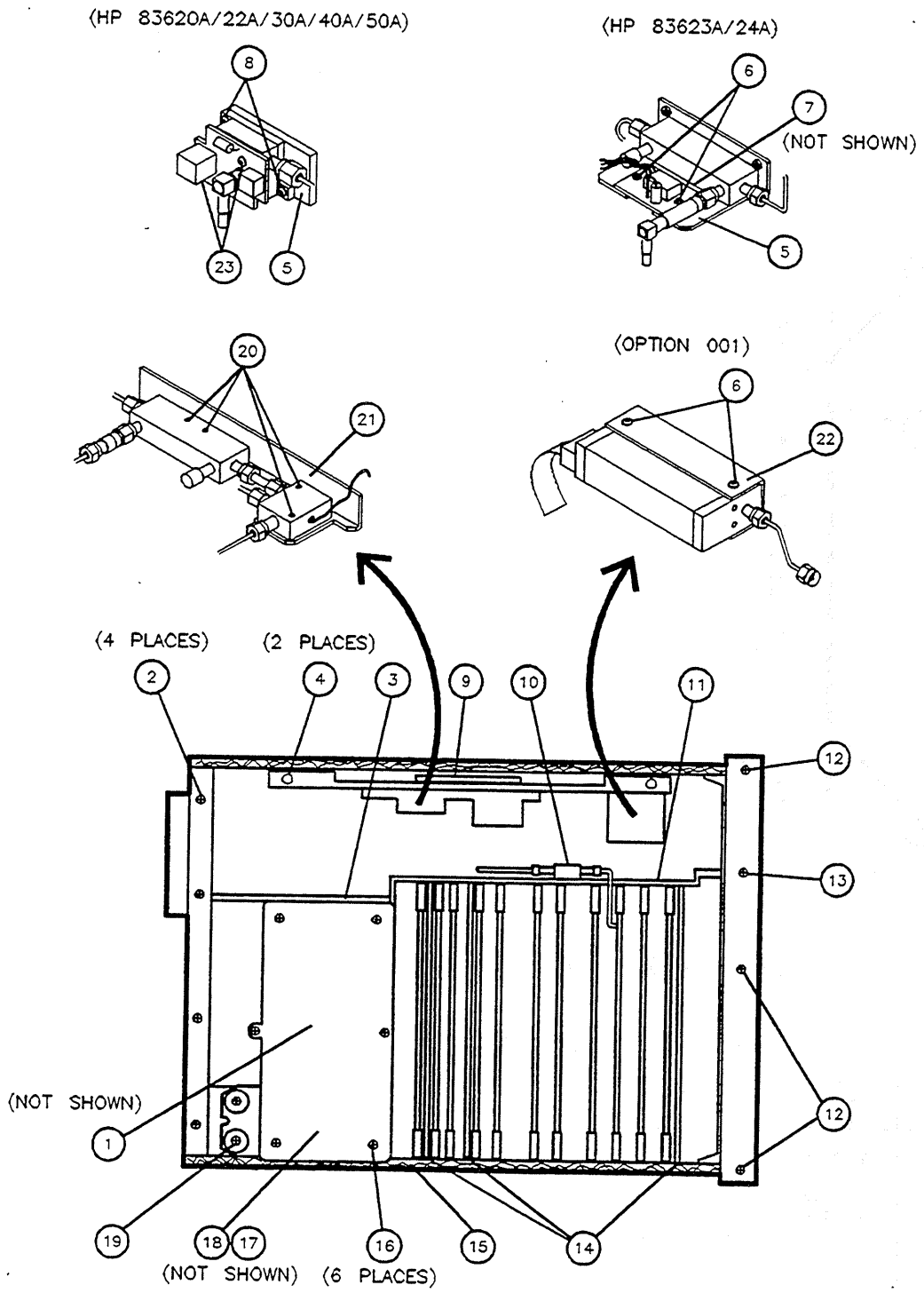


Figure 9-10. Top View, Attaching Hardware

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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

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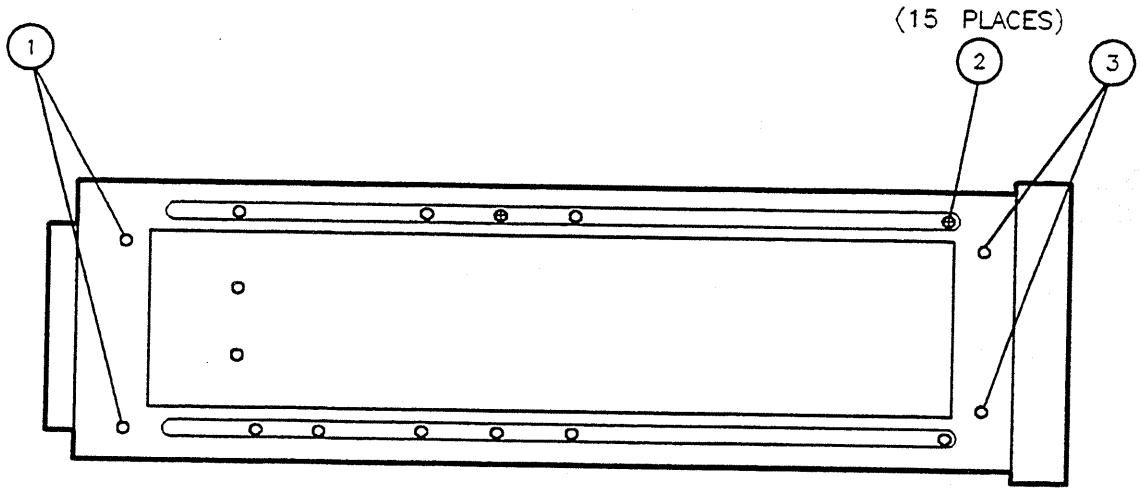


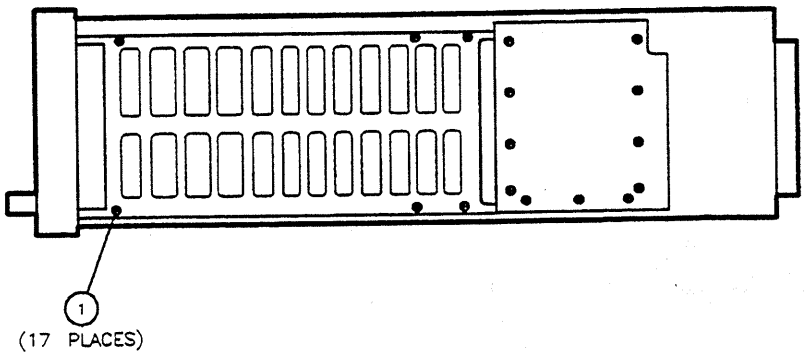
Figure 9-11. Left Side View, Attaching Hardware

Table 9-11. Left Side View, Attaching Hardware

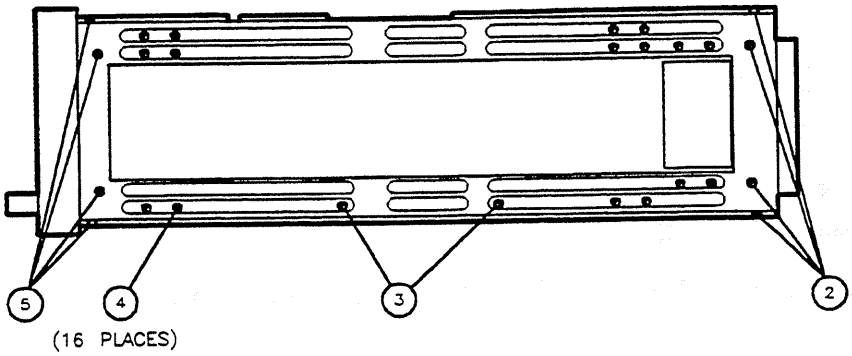
Ref. Desig.	HP Part Number	Qty	Description
1	0515-2086	4	SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD
2	0515-0382	15	SCREW-MACHINE ASSEMBLY M4 x 0.7 12MM-LG
3	0515-2086		SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD

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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

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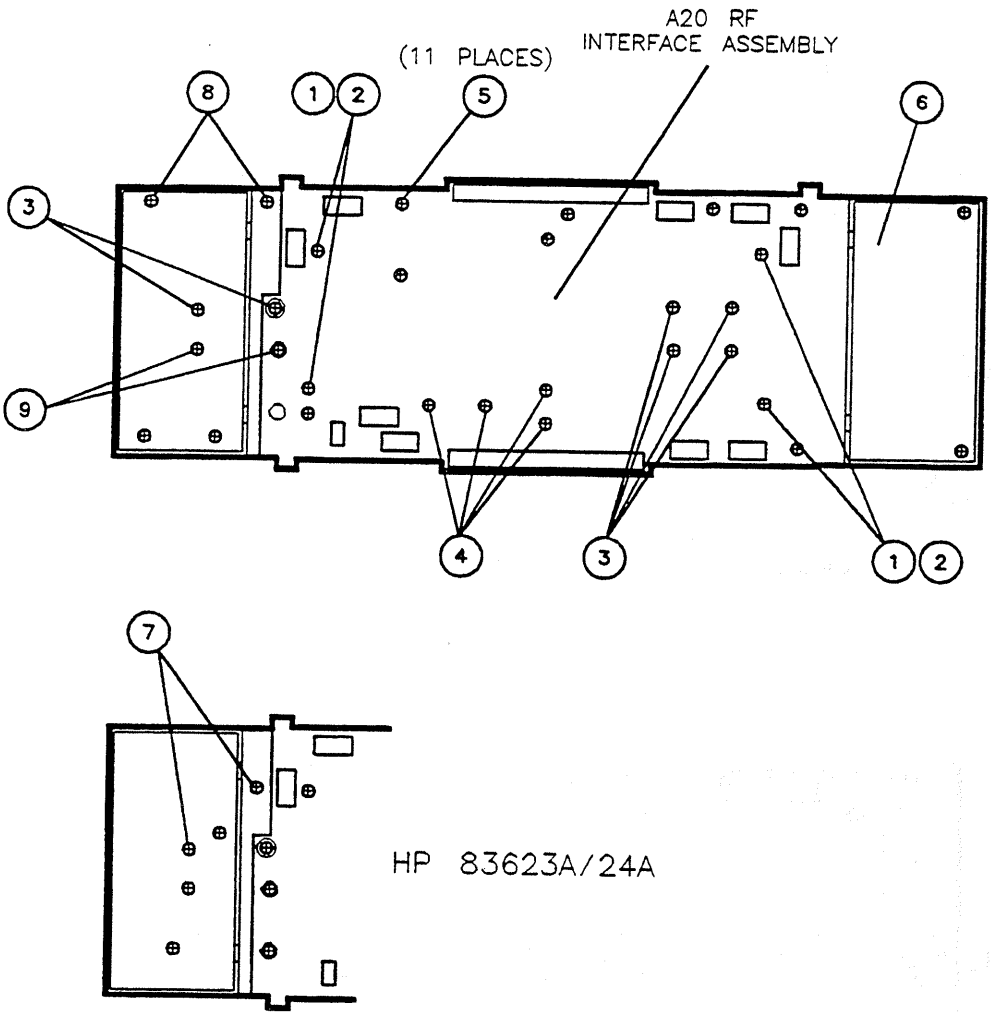


Figure 9-13. RF Deck Right Side View, Attaching Hardware

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)

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RF Connector and Attaching Hardware

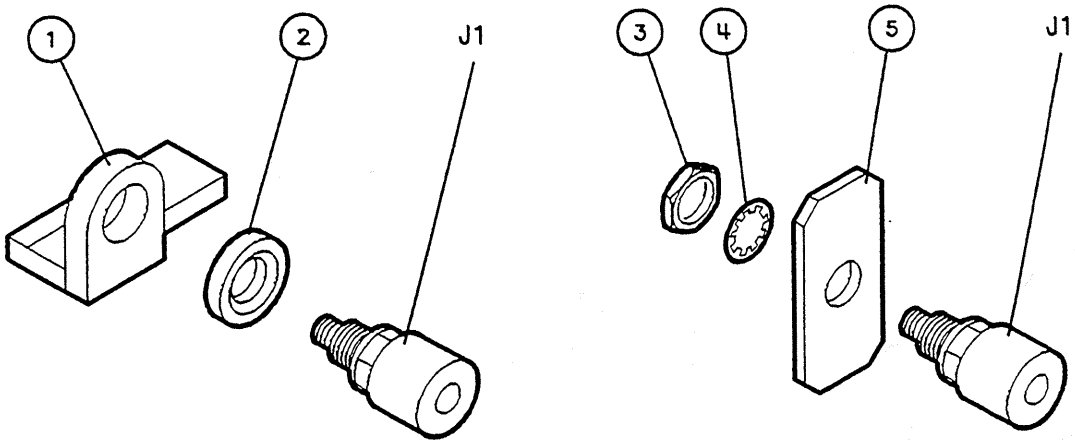


Figure 9-14. RF Connector and Attaching Hardware

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)

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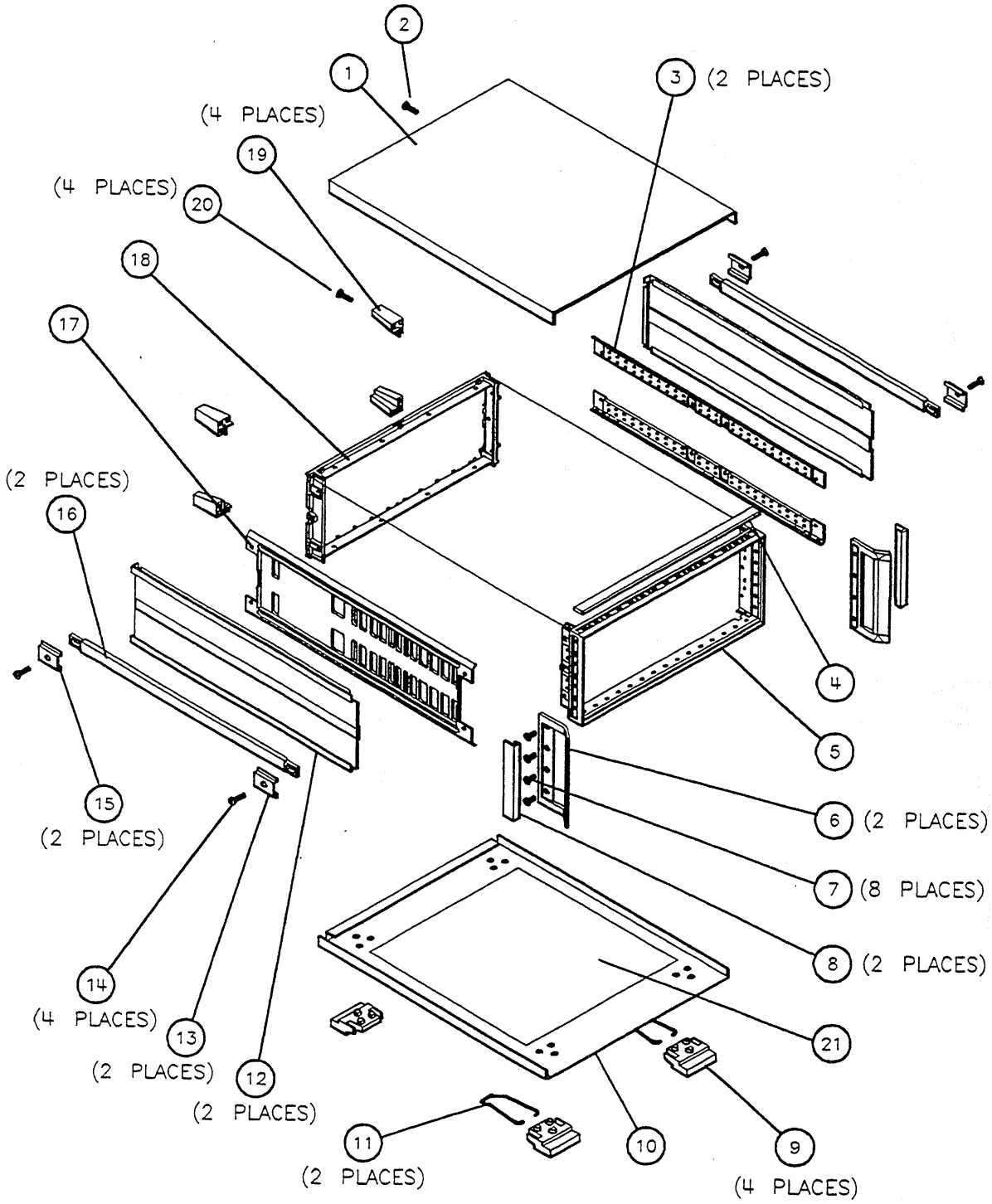


Figure 9-15. Chassis Parts

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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

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Table 9-16. Miscellaneous Replaceable Accessories (1 of 2)

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
	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)
	08360-60108		EXTENDER CABLE-POWER SUPPLY
	8710-1787		5 MM HEX BALL DRIVER
			ACCESSORIES
			TOUCH-UP PAINT
	6010-1146		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

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Table 9-16. Miscellaneous Replaceable Accessories (2 of 2)

Ref. Desig.	HP Part Number	Qty	Description
			DOCUMENTATION
	08360-90055		HP 8360 SERIES MANUAL SET – For HP 83620A/22A/23A/24A/30A/40A/50A
			(Includes the following:)
	08360-90069		TROUBLESHOOTING MANUAL
	08360-90049		SERVICE MANUAL
	08360-90070		USER'S HANDBOOK
	08360-90071		QUICK REFERENCE GUIDE
	5954-1566		CONNECTOR CARE APPLICATION NOTE
			Documentation For Serial Prefixes Prior To Those Listed on the Title Page of This Manual:
	08360-90076		HP 8360 SERIES DOCUMENTATION SET (All Models)
	83620-90007		HP 83620A DOCUMENTATION SET
	83622-90007		HP 83622A DOCUMENTATION SET
	83623-90007		HP 83623A DOCUMENTATION SET
	83624-90007		HP 83624A DOCUMENTATION SET
	83640-90007		HP 83640A DOCUMENTATION SET
	83642-90007		HP 83642A DOCUMENTATION SET
	08360-90054		HP 83621A/31A/51A MANUAL SET (Includes the following:)
	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
	83631-90007		HP 83631A DOCUMENTATION SET
			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

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10

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.
- Connector Care.

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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. 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.

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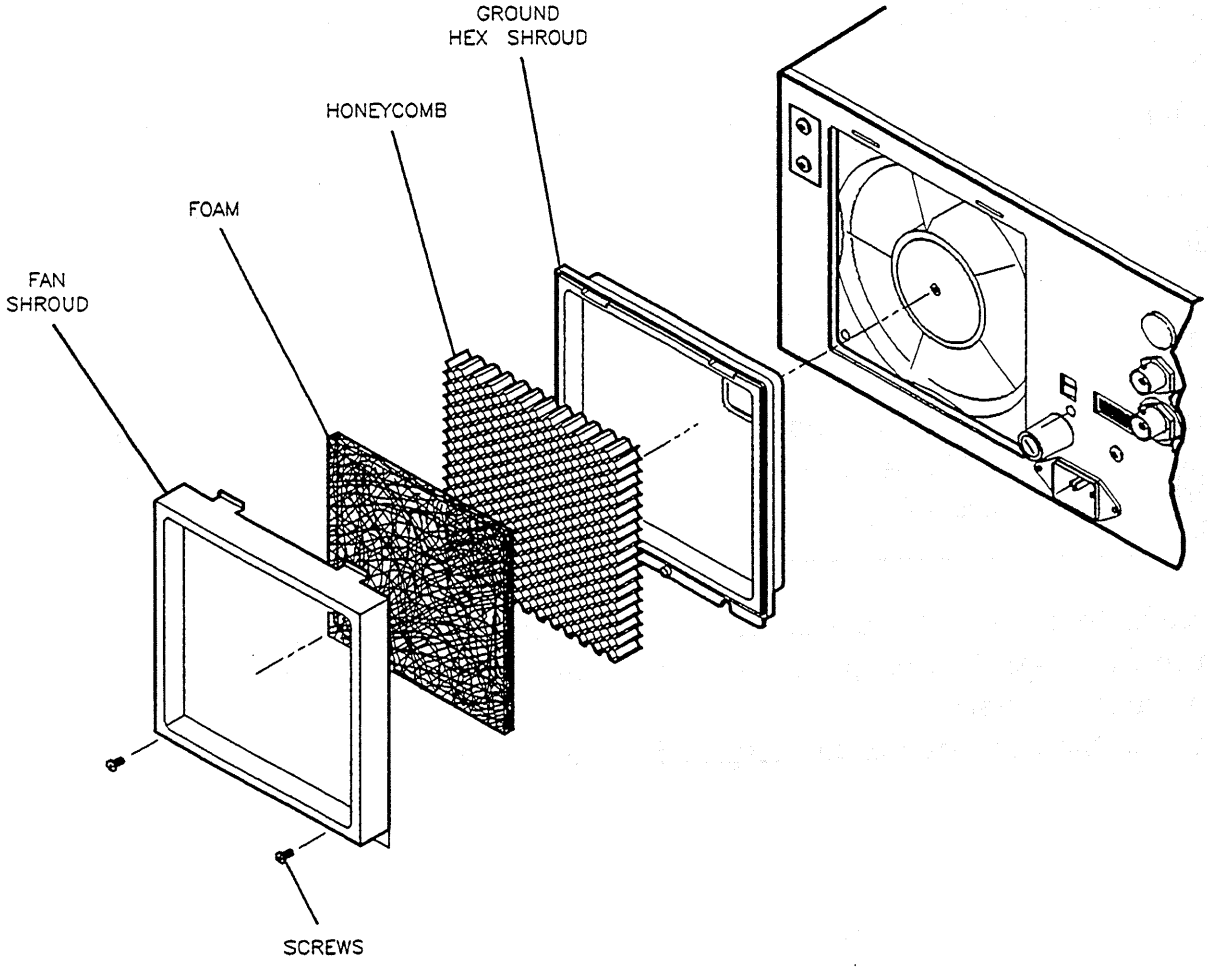


Figure 10-1. Removing the Fan Filter

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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 standy (yellow LED on).
2. Remove the AC line cord.

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 2, "Disassembly & Replacement Procedures", 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.

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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.
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.
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.

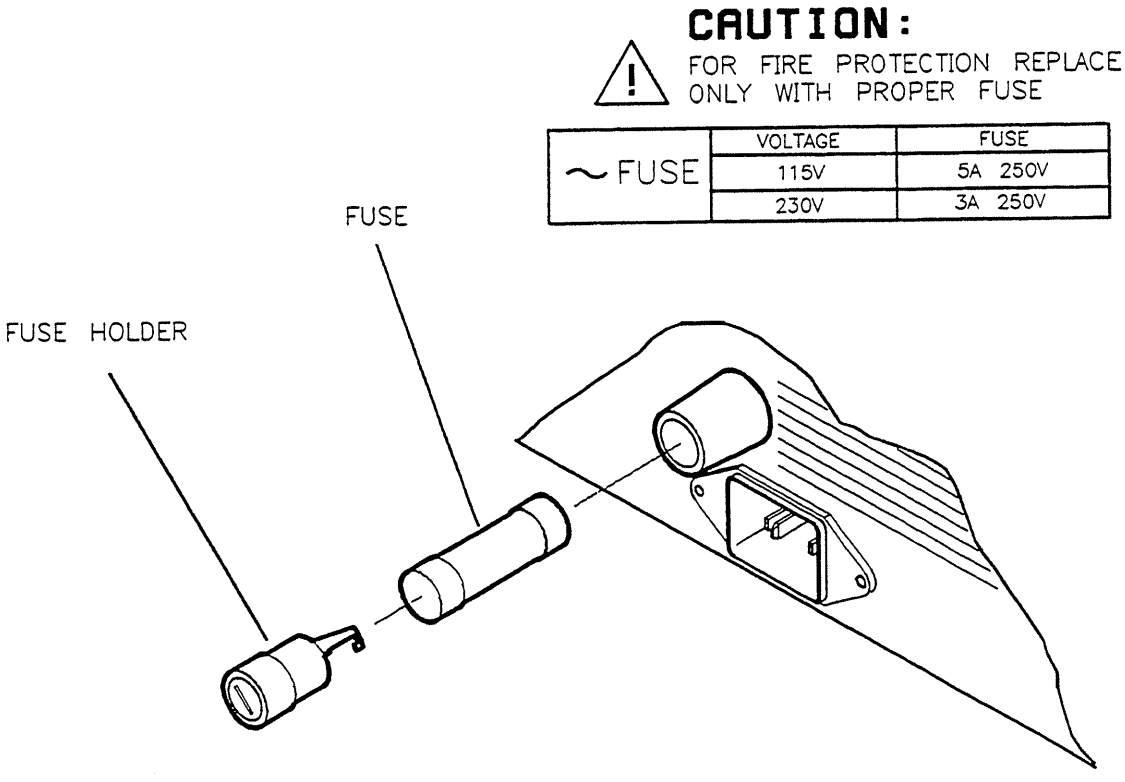


Figure 10-2. Replacing the Line Fuse

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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.

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11

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

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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 the "Post-Repair" chapter of this manual 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 83622A 83623A 83624A 83630A	08360-60218
83640A 83650A	08360-60220

Delete Attenuator (Delete Option 001)

HP Model Number	Retrofit Kit Part Number
83620A 83622A 83623A 83624A 83630A	08360-60129
83640A 83650A	08360-60221

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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

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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

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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 the "Post-Repair" chapter of this manual and in the installation note included in the retrofit kit.

HP Model Number	Retrofit Kit Part Number
83620A 83622A 83623A 83624A 83630A	08360-60236
83640A 83650A	08360-60237

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Front Panel RF Output (Delete Option 004)

HP Model Number	Retrofit Kit Part Number
83620A 83622A 83623A 83624A 83630A	08360-60235
83620A Opt. 003 83622A Opt. 003 83623A Opt. 003 83624A Opt. 003 83630A Opt. 003	08360-60239
83640A 83650A	08360-60238
83640A Opt. 003 83650A Opt. 003	08360-60240

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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

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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

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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 the "Replaceable Parts" chapter.

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

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12

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.

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Instrument History Changes

Serial Prefix Number	Change
HP 83620A/22A	
3250A	No Change Needed
3245A	No Change Needed
3213A	E, D, C
3145A	E, D, C, B
HP 83623A/24A	
3250A	No Change Needed
3245A	No Change Needed
3213A	D
3145A	D, B
HP 83630A	
3250A	No Change Needed
3245A	No Change Needed
3213A	E, D, C
3145A	E, D, C, B
3143A	E, D, C, B, A
3101A	E, D, C, B, A
HP 83640A	
3250A	No Change Needed
3245A	No Change Needed
3213A	F, D, C
3145A	F, D, C, B
HP 83650A	
3250A	No Change Needed
3245A	No Change Needed
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:10258/3245:10795,10825/3250:11096

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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.

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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 $\geq$ 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.

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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:		_____	0.1%	±0.02%
	Option 006:		_____	1%	±0.07%

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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

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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%

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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

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Change D

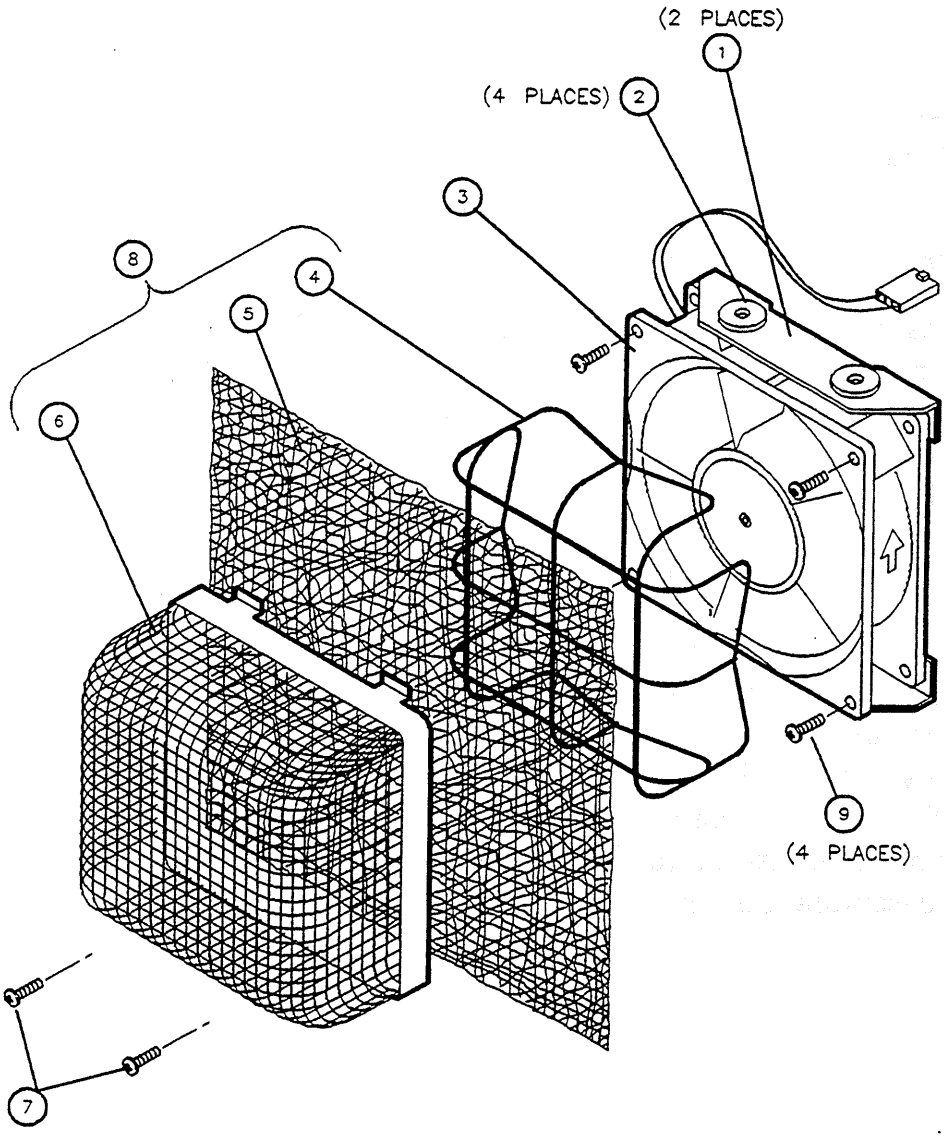
A20 RF Interface Assembly

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.

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Rear Panel Fan Assembly

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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

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.

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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.

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In the "Replaceable Parts" chapter, add the following parts:

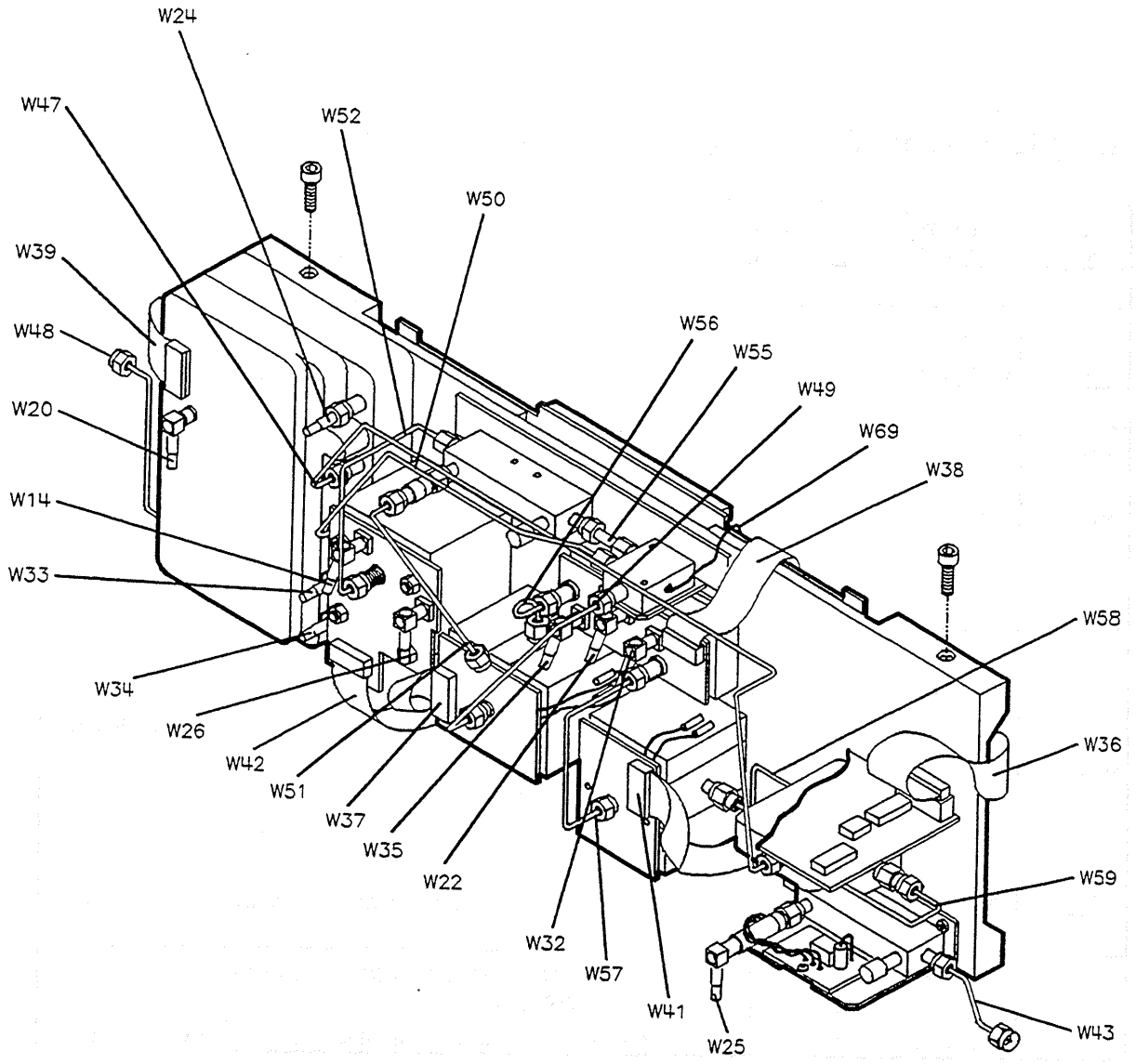
Ref. Desig.	HP Part Number	Qty	Description
			Major Assemblies
A30	0955-0148	1	μWAVE DIRECTIONAL COUPLER 20 GHZ MAX (HP 83620A/22A)
A30	0955-0125	1	μWAVE DIRECTIONAL COUPLER 26.5 GHZ MAX (HP 83630A)
A30	0955-0523	1	μWAVE DIRECTIONAL COUPLER 50 GHZ MAX (HP 83640A/50A)
A40	11742A	1	DC BLOCKING CAPACITOR (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)

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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)

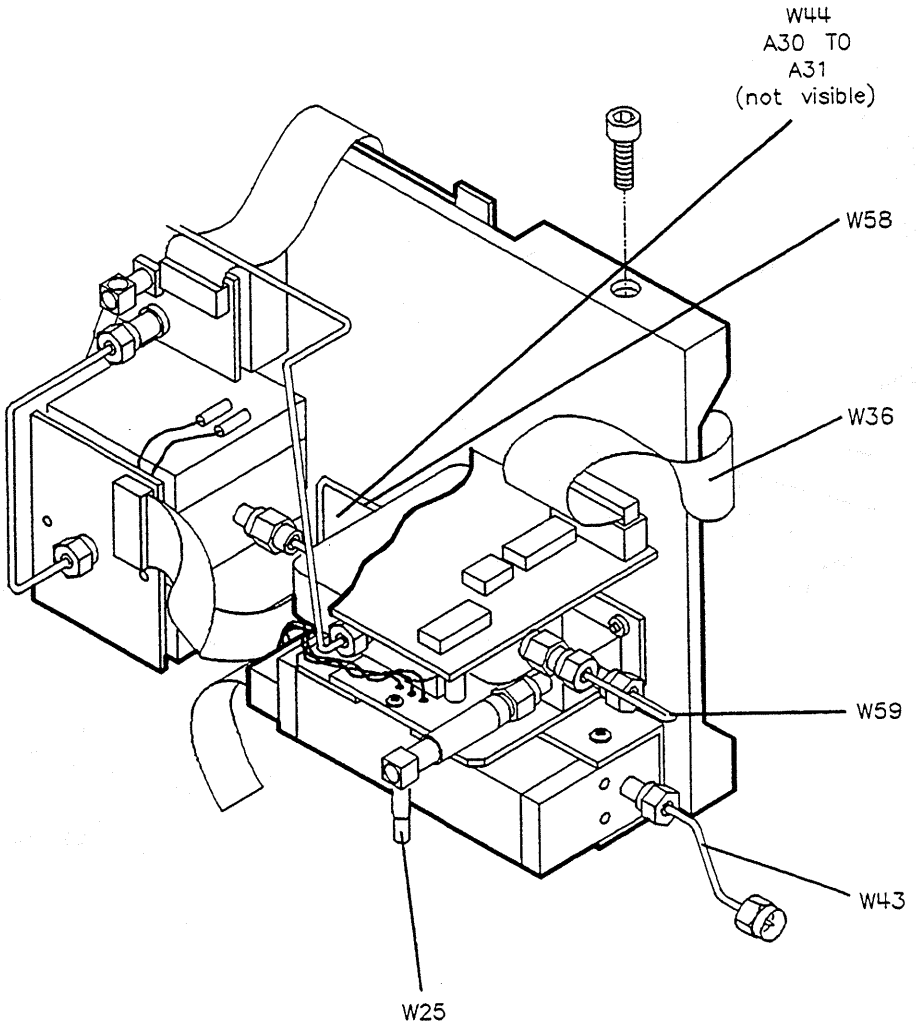
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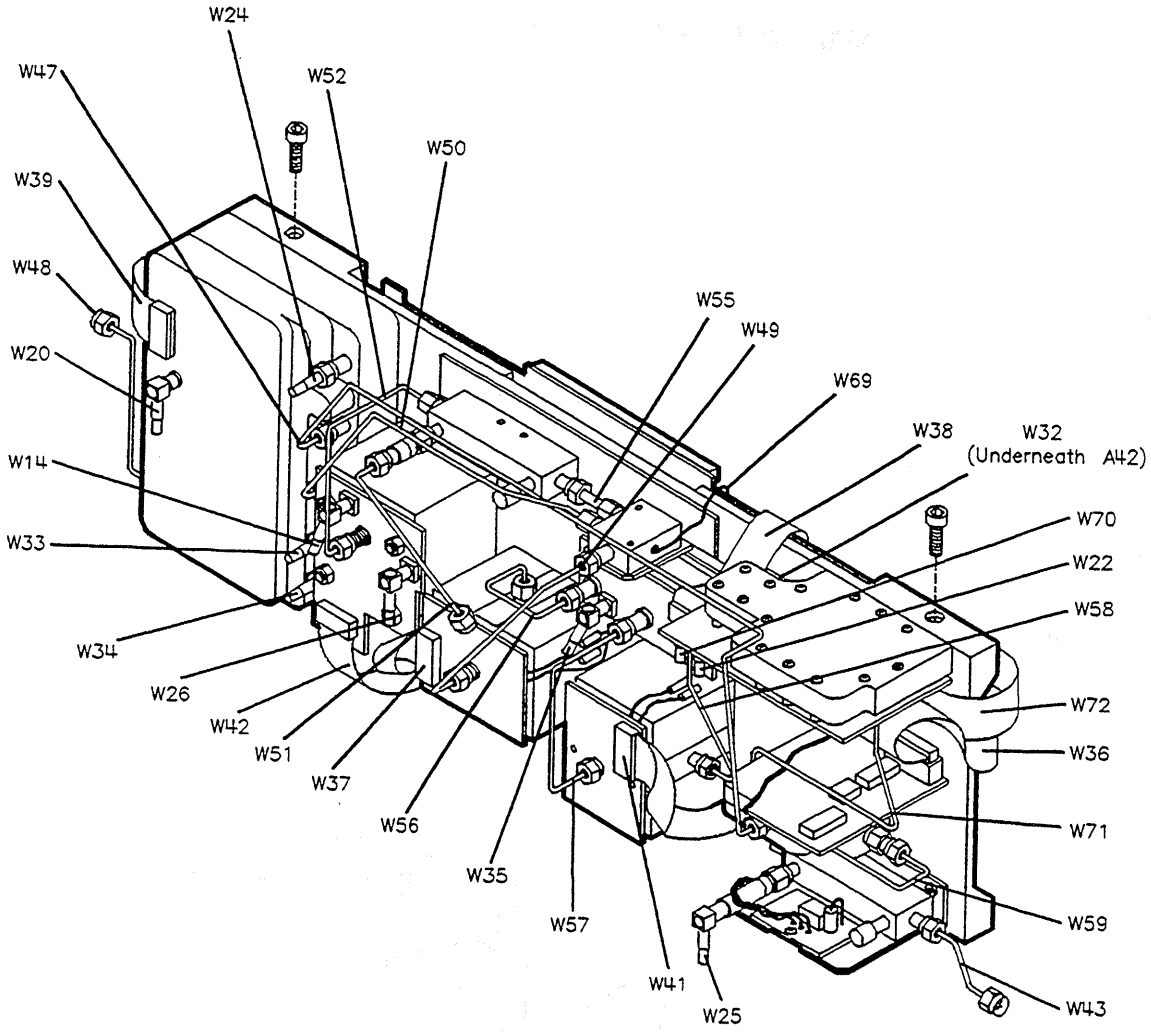
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Cables–HP 83640A/50A RF Deck

Option 001



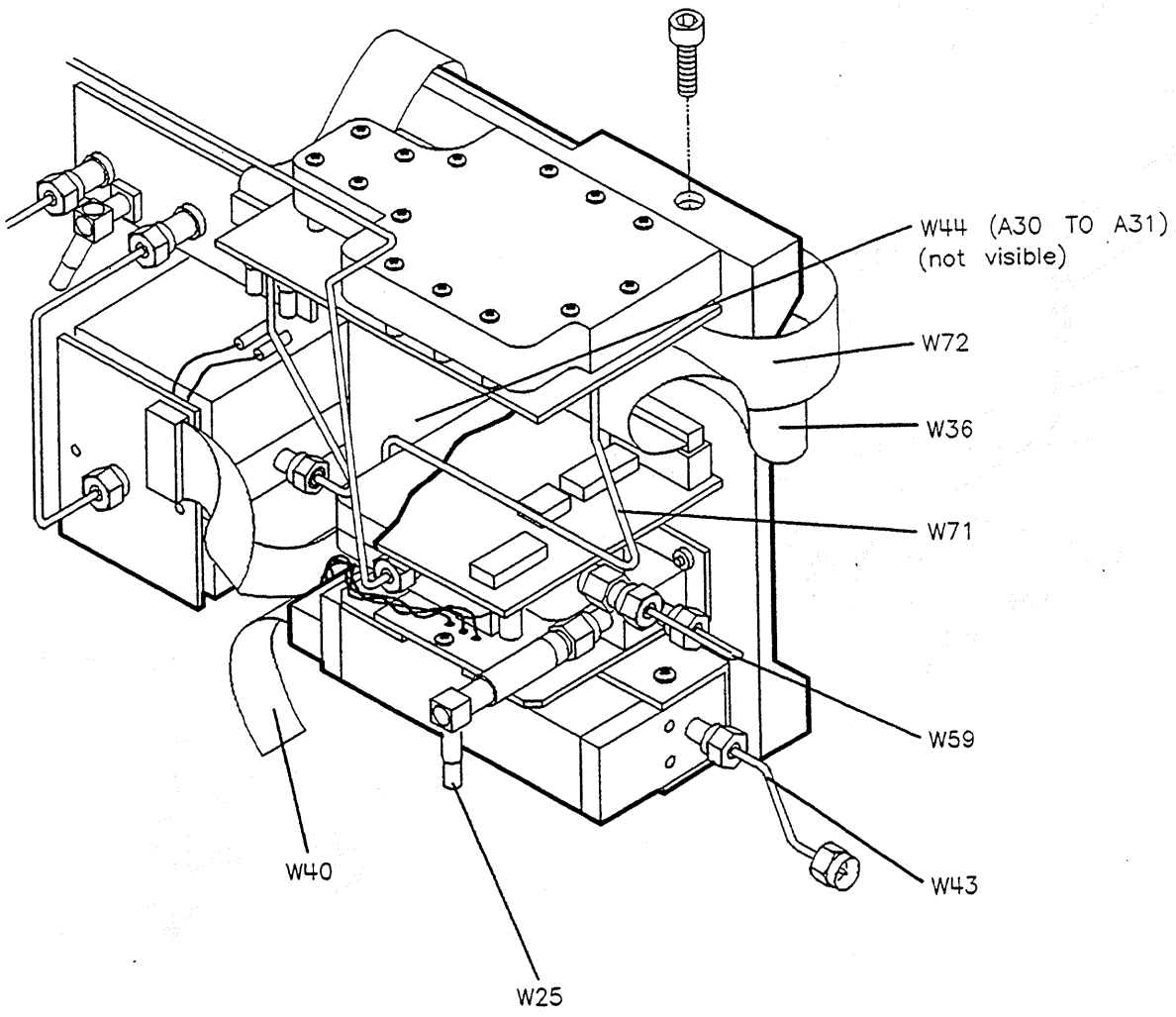
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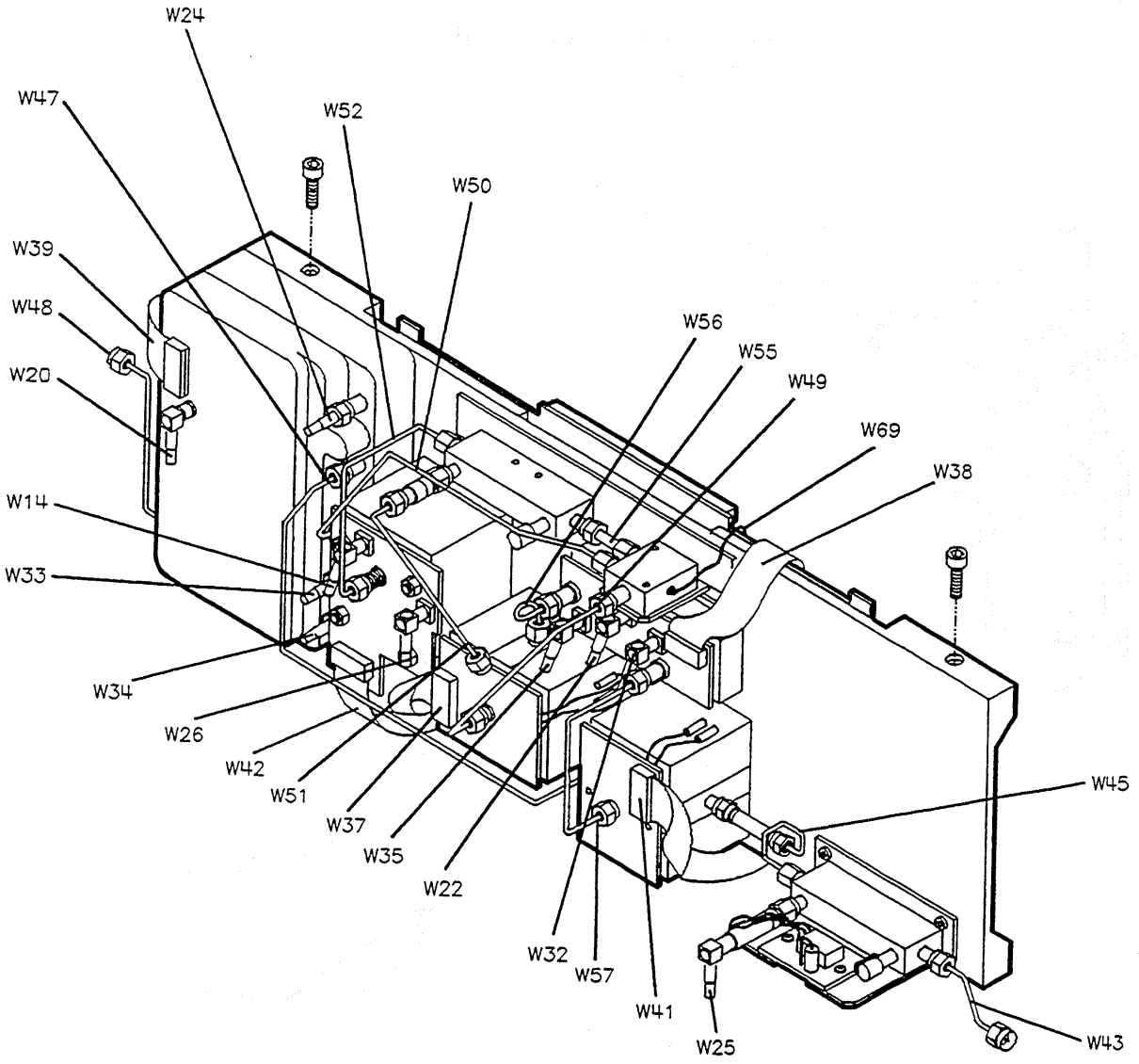
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Cables–HP 83640A/50A RF Deck

Options 001 and 006



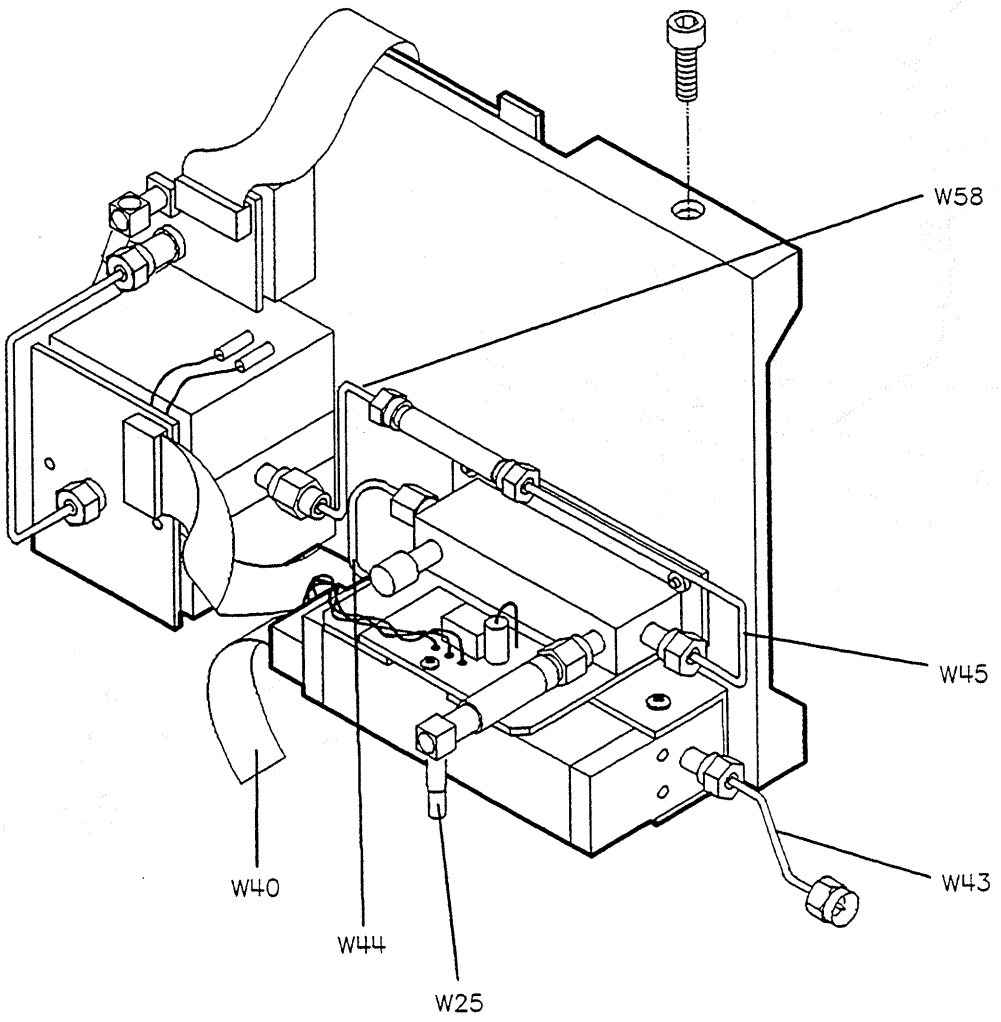
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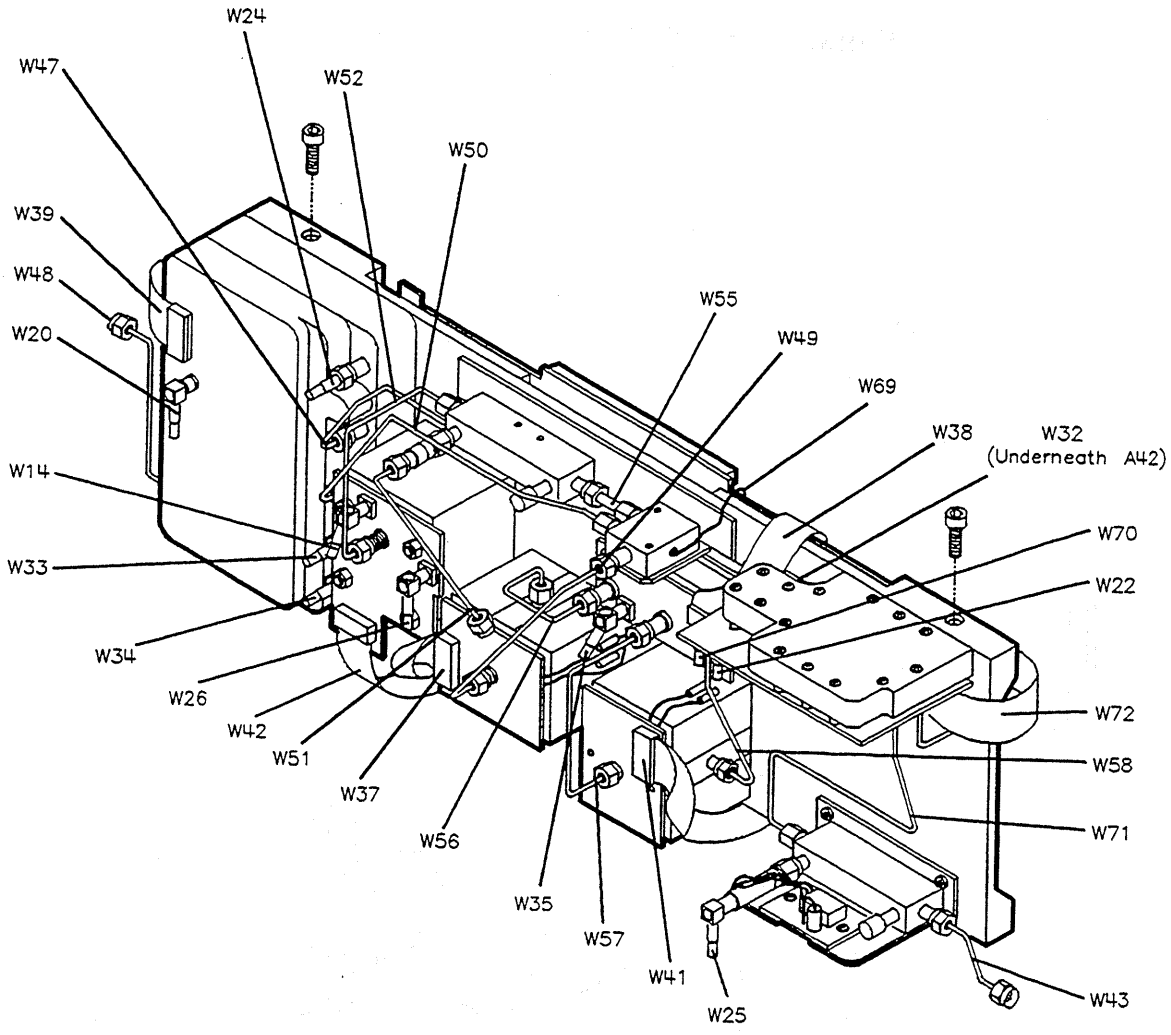
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Cables–HP 83620A/22A/30A RF Deck

Option 001



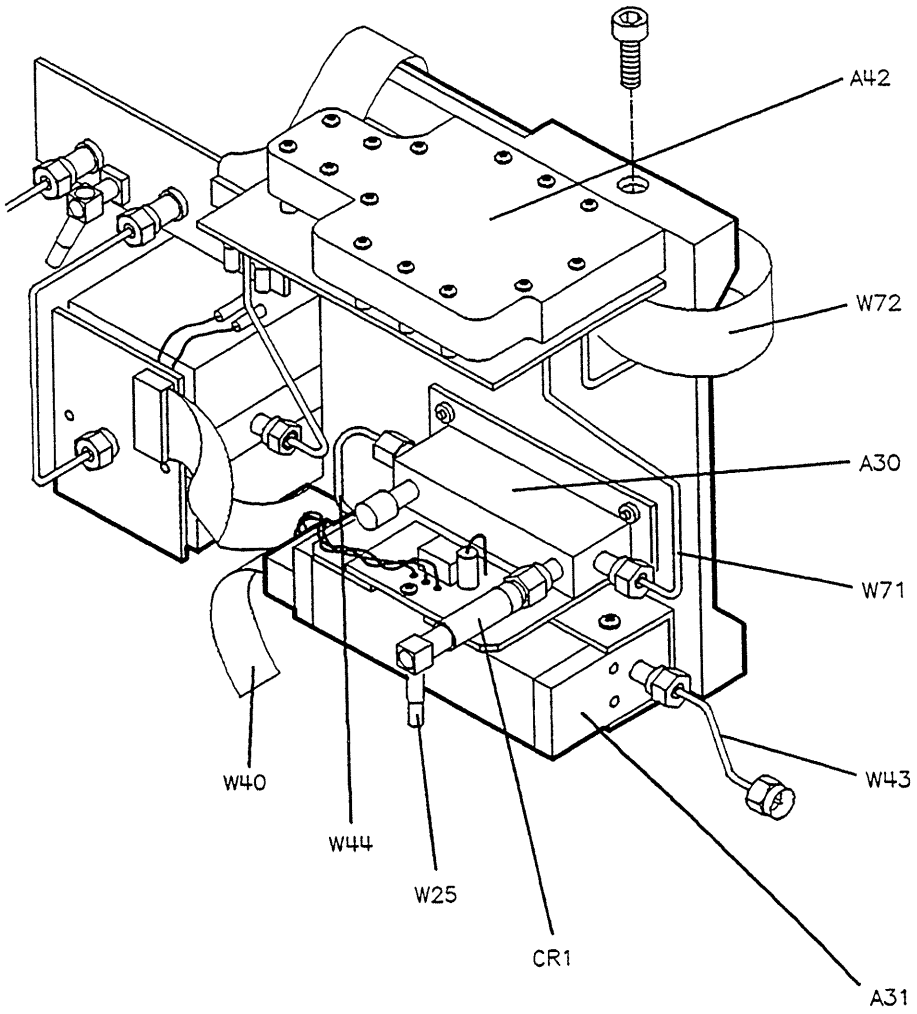
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Cables–HP 83620A/22A/20A

Options 001 and 006



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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.

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Change A

1. Instruments with serial prefixes 3143A and below do not have the auxillary 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 auxillary output and to W48.
   b. AT1 (50Ω 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 Bandwith" 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".

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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 Vp/carrier Vp) 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).

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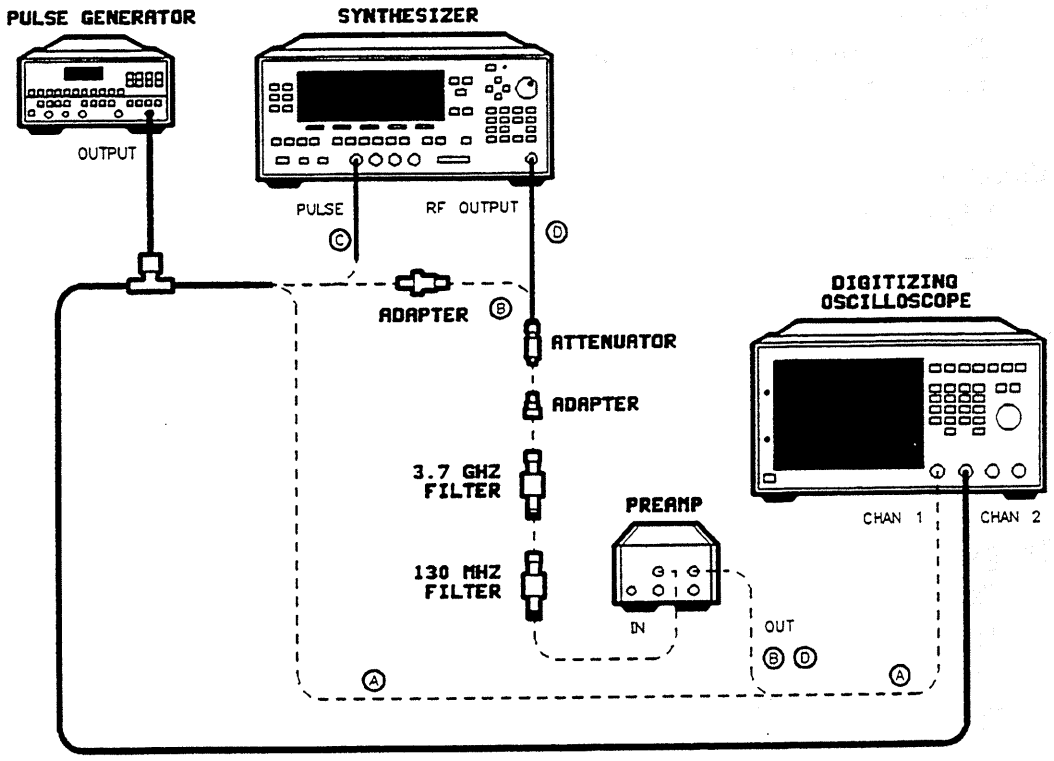


Figure 2-21. Video Feedthrough Test Setup

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.

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4. On the oscilloscope, set:

```
Channel 1:
   Display              On
   Volts/Division       50 mV
   Offset               0V
   Input Coupling       dc
   Input Impedance      50Ω

Channel 2:
   Display              Off
   Input Impedance      50Ω

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.

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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:

$$\text{Video gain} = \frac{\text{system Vp (from step 9)}}{\text{pulse generator Vp}}$$

$$= \frac{\text{system Vp}}{0.1\ \text{Vp}}$$

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)

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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      50Ω

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
```

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```
   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 µs)
Offset:        0V
Amplitude:     5V
```

16. On the oscilloscope, note the maximum voltage from the baseline (see Figure 2-22). Video feedthrough (Vp) = _____Vp

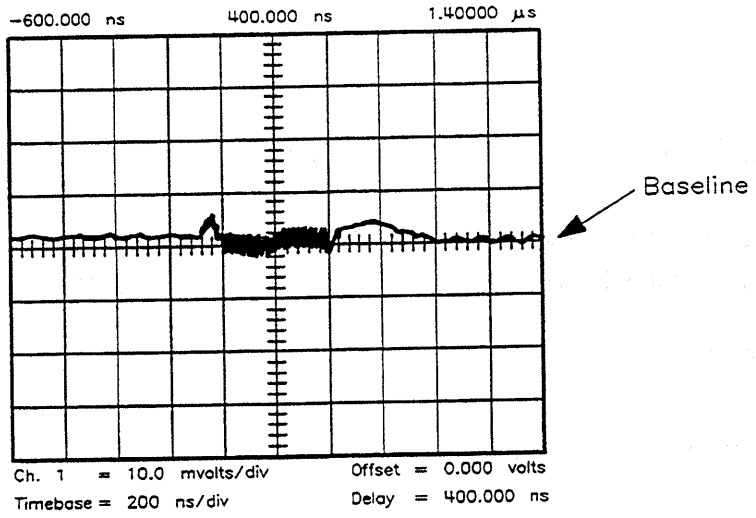


Figure 2-22. Measuring Maximum Voltage from the Baseline Video Feedthrough

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

    Video feedthrough (%) = [(video Vp/carrier Vp)x100]/video gain

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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] Peak Carrier Voltage $= 10\left(\frac{PdBm-10}{20}\right)$

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.

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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.

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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:

_____

_____

_____

_____

_____

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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.			

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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:

    Video Feedthrough (Vp) = Video Vp/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).

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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		_____	$5x10^{-10}$/day	
2.	Swept Frequency Accuracy				
	Worst Case Value:				
	10. Start Freq _____		_____	0.1% of	
	Stop Freq _____			sweep	
3.	Frequency Switching Time				
	8. CW Step		_____	70 ms	
	16. Stepped Sweep		_____	5 ms	
	25. Frequency List		_____	70 ms	
4.	Power Accuracy				
	14. Power >−10 dBm				
	< 2 GHz	−0.6 dB	_____	+0.6 dB	
	≥ 2 and ≤ 20 GHz	−0.7 dB	_____	+0.7 dB	
	> 20 and ≤ 26.5 GHz	−0.9 dB	_____	+0.9 dB	
5.	Power Flatness				
	5. < 2 GHz	−0.5 dB	_____	+0.5 dB	
	≥ 2 and ≤ 20 GHz	−0.6 dB	_____	+0.6 dB	
	> 20 and ≤ 26.5 GHz	−0.8 dB	_____	+0.8 dB	
6.	Maximum Leveled Power				
	6. Standard:				
	0.01 to ≤ 26.5 GHz	+4.0 dBm	_____		
	0.01 to ≤ 20 GHz	+13.0 dBm	_____		
	Option 001:				
	0.01 to ≤ 26.5 GHz	+2.0 dBm	_____		
	0.01 to ≤ 20 GHz	+11.5 dBm	_____		

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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	_____		

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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	_____		

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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%	

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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	_____		

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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	

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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:

_____

_____

_____

_____

_____

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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.			

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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 _____		_____	0.1% of	
	Stop Freq _____			sweep	
3.	Frequency Switching Time				
	8. CW Step:		_____	70 ms	
	16. Stepped Sweep		_____	5 ms	
	25. Frequency List		_____	70 ms	
4.	Power Accuracy				
	14. > −10 dBm:				
	< 2 GHz	−0.6 dB	_____	0.6 dB	
	≥ 2 and ≤ 20 GHz	−0.7 dB	_____	0.7 dB	
	> 20 and ≤ 40 GHz	−0.9 dB	_____	0.9 dB	
	> 40 GHz	−1.7 dB	_____	1.7 dB	
5.	Power Flatness				
	5. < 2 GHz	−0.5 dB	_____	0.5 dB	
	≥ 2 and ≤ 20 GHz	−0.6 dB	_____	0.6 dB	
	> 20 and ≤ 40 GHz	−0.8 dB	_____	0.8 dB	
	> 40 GHz	−1.5 dB	_____	1.5 dB	
6.	Maximum Leveled Power				
	10. Standard:				
	0.01 to ≤ 50 GHz	0 dBm	_____		
	0.01 to < 40 GHz	+3.0 dBm	_____		
	0.01 to < 26.5 GHz	+4.0 dBm	_____		
	0.01 to < 20 GHz	+7.0 dBm	_____		

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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 ≤ 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. ≥ 50 MHz and < 1.8 GHz	−35 dBc	_____		
	29. ≥ 1.8 to ≤ 50 GHz	−45 dBc	_____		
	Subharmonics;				
	12. ≥ 7 and ≤ 20 GHz	−50 dBc	_____		
	29. > 20 and ≤ 40 GHz	−40 dBc	_____		
	37. > 40 and ≤ 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	_____		

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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	_____		

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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%	

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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	_____		

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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	

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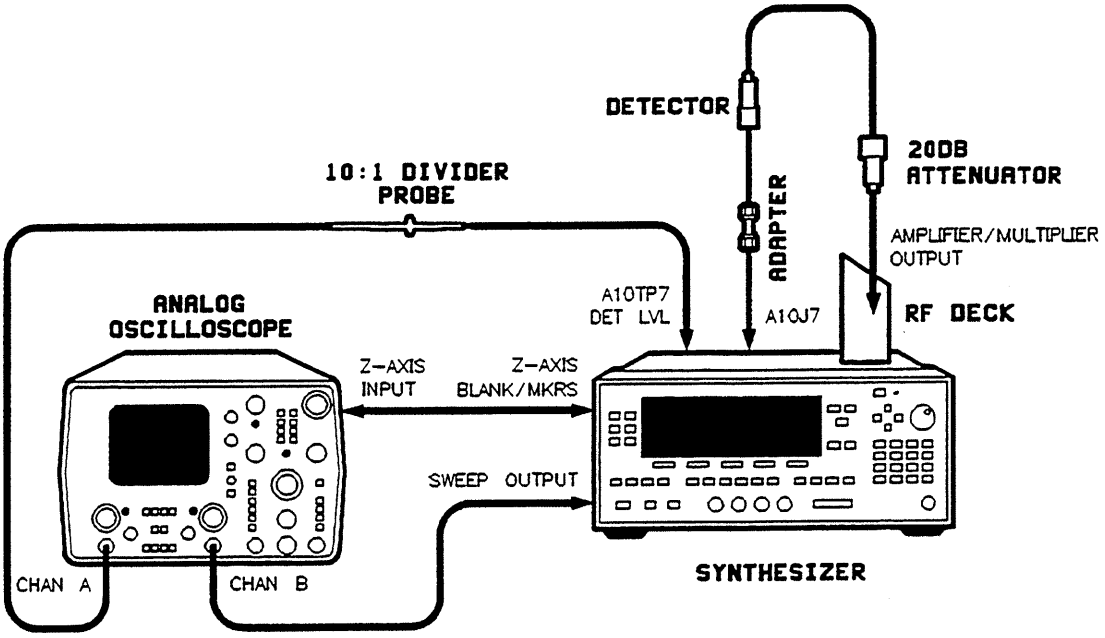


Figure 12-1. Amplifier/Multiplier Adjustments Setup

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