Errata

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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Service Guide

HP 83751A/B and HP 83752A/B Synthesized Sweepers

HEWLETT PACKARD

HP Part No. 83750-90003
Printed in USA August 1993

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General Safety Considerations

Warning

These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.

This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.

For continued protection against fire hazard, replace line fuse only with same type and rating (type F 6.3A 250V). The use of other fuses or materials is prohibited.

How to Use This Guide

This guide uses the following conventions:

FRONT-PANEL KEY	This represents a key physically located on the instrument.
SHIFT FUNCTION	This represents a shift function (blue text above front panel keys).
ANNUNCIATOR	Text in this font represents the FREQUENCY, MARKER/SWEEP/STATUS, and POWER displays.
DISPLAY	Text in this font represents the annunciators that are displayed in the lower portion of the synthesized sweeper display.

Documentation Description

This guide contains the information required to calibrate and repair the synthesized sweeper to the assembly level. Included are the following:

- performance tests to test the instrument to specifications
- adjustments required after repair or performance test failure
- automated performance tests and adjustments
- disassembly procedures for removal and replacement of assemblies
- troubleshooting procedures to identify failed assemblies
- replaceable part numbers
- calibration constant descriptions and procedures
- service-related special menu descriptions
- instrument history to backdate the manual to older instrument versions
- tables of post-repair information and recommended equipment required

Table of Contents

Contents

Figures

Tables

1. Performance Tests

1

Performance Tests

The procedures in this chapter test the electrical performance of the synthesized sweeper. These tests do not require access to the interior of the instrument.

Notes

1. For these tests to be considered valid, the following conditions must be met:
   - Warm up the synthesized sweeper for at least 1 hour before performing any tests.
   - Perform the tests in the order that they appear.
   - Use the test equipment listed in each test (or in the Recommended Test Equipment table located behind the "Quick Reference" tab).
   - Perform the tests under normal operating conditions as stated in the specification tables in the *HP 83751A/B and HP 83752A/B Synthesized Sweepers User's Guide*.
2. In all cases where you are instructed to preset the synthesized sweeper, use the factory preset mode only.
3. In all cases where you are instructed to turn on *RF peaking*, ensure that the RF output connector is terminated in 50 ohms. Normally, this will be accomplished by setting up the equipment according to the test setup diagram prior to turning on *RF peaking*.
4. The person who performs the test must supply any necessary cables, connectors, and adapters.
5. These tests contain a minimum set of data points. The performance of the synthesized sweeper *can* be checked at other points within the specified range.

Test record

Record the results of these tests in the test record at the end of this chapter. (You may want to use a photocopy of the blank test record.) Results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting, and after repairs or adjustments.

Calibration cycle

This instrument requires periodic verification of performance. Under normal use and environmental conditions, the instrument should be calibrated every two years. Normal use is defined to be about 2,000 hours of use per year.

Recommended test equipment

The Recommended Test Equipment table (located behind the "Quick Reference" tab) is the complete list of equipment that is necessary to perform the procedures in this book. The equipment listed is for the standard synthesized sweeper. If your instrument has Option 1ED (Type-N output connector), substitute equivalent Type-N equipment where necessary.

Test equipment is also listed in each procedure with the test setup. Other equipment can be substituted for the recommended models (except where noted otherwise) if it meets or exceeds the critical specifications listed.

Test setups

A diagram showing the test setup is included at the beginning of each procedure. Note that arrows in the diagrams indicate a connection to the instrument rear panel and do not indicate signal flow.

Internal Timebase: Aging Rate (Option 1E5 only)

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
AR = aging rate
TE = temperature effects
LE = line effects
```

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

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

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

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

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

Specification
5×10^{-10}/day 1×10^{-7}/year

Recommended equipment

HP 54111D digitizing oscilloscope
HP 5061B frequency standard

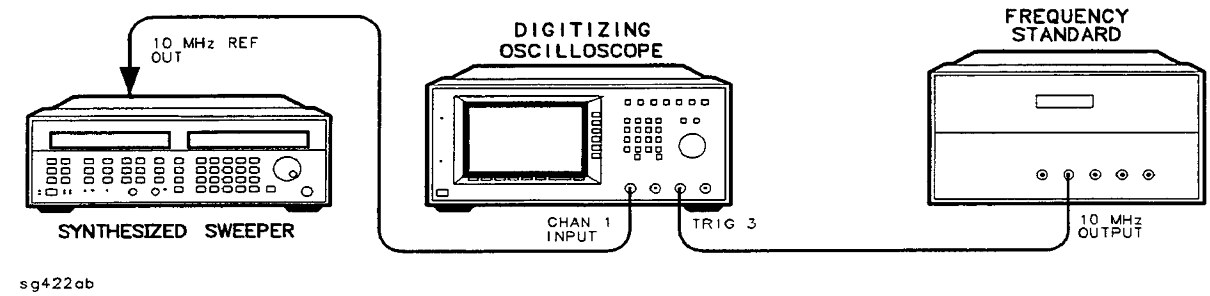

Figure 1-1. Internal Timebase: Aging Rate Test Setup

To set up the equipment

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

---

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

```
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
```

To measure the frequency changes over a 24-hour period

1. Monitor the time and the display. Note the time required for a 360° phase change: T1 = ________ (s)
2. Wait 3 to 24 hours. Note how long you waited: T2 = ________ (h)
3. Repeat step 1. Record the phase change time: T3 = ________ (s)
4. Calculate the aging rate as follows:

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

   For example:

   ```
   T1 = 351 seconds
   T2 = 3 hours
   T3 = 349 seconds
      = (1 cycle/10 MHz) (1/351s - 1/349s) (24h/3h)
      = 1.306x10^-11 per day
   ```

5. 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°.

Adjustments you may need to perform

10 MHz Standard

What to do 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 Chapter 5, "Troubleshooting," in this manual.

CW Frequency Accuracy

This procedure applies to all instrument options except Option 1E5. In this procedure, a frequency counter is used to measure the minimum and maximum synthesized sweeper frequencies in CW. Self-tests then verify that the internal hardware is functioning properly to maintain frequency accuracy over the full frequency range.

Specification	Conditions
±10 ppm	20 to 30 °C

Recommended equipment

HP 5343 Option 001 frequency counter

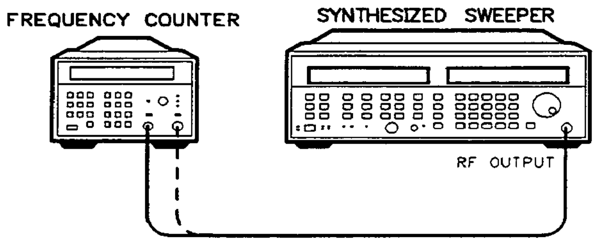

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Figure 1-2. CW Frequency Accuracy Test Setup

To set up the equipment

1. Preset the instruments and let them warm up for at least 1 hour.
2. Connect the equipment as shown in Figure 1-2. If you have an HP 83752A/B, connect the RF output to the 10 Hz-500 MHz input of the frequency counter. If you have an HP 83751A/B, connect the RF output to the 500 MHz—26.5 GHz input.

To measure the CW frequency accuracy

1. If you have an HP 83752A/B, set the synthesized sweeper to a CW frequency of 10 MHz. If you have an HP 83751A/B, set the CW frequency to 2 GHz.
2. Read the CW frequency displayed on the frequency counter and record that value in the test record.
3. Connect the synthesized sweeper's output to the 500 MHz—26.5 GHz input of the frequency counter (if it is not already connected this way).
4. Set the synthesized sweeper to a CW frequency of 20 GHz.
5. Read the CW frequency displayed on the frequency counter and record that value in the test record.

To run the self-tests

1. On the synthesized sweeper, press:

   (SHIFT) SPECIAL
   (21) (Hz/s/ENTER)
   (Hz/s/ENTER)

   If self-test does not pass, refer to Chapter 5, "Troubleshooting," in this manual.

Adjustments you may need to perform

100 MHz VCXO
Calibrate Frac–N VCO (automated)

What to do in case of difficulty

1. Make sure the frequency counter has a current calibration sticker and that it meets its published specifications.
2. If self-test fails, make sure nothing is connected to the instrument.
3. Refer to Chapter 5, "Troubleshooting," in this manual.

Swept Frequency Accuracy

With the synthesized sweeper in swept mode, the spectrum analyzer is set to zero span at the measurement frequency. As the synthesized sweeper 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 synthesized sweeper'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.

Specification	Conditions
±100 ppm of span ±timebase	20 to 30 °C 100 ms sweep

Recommended equipment

HP 8566B spectrum analyzer
HP 54111D digitizing oscilloscope

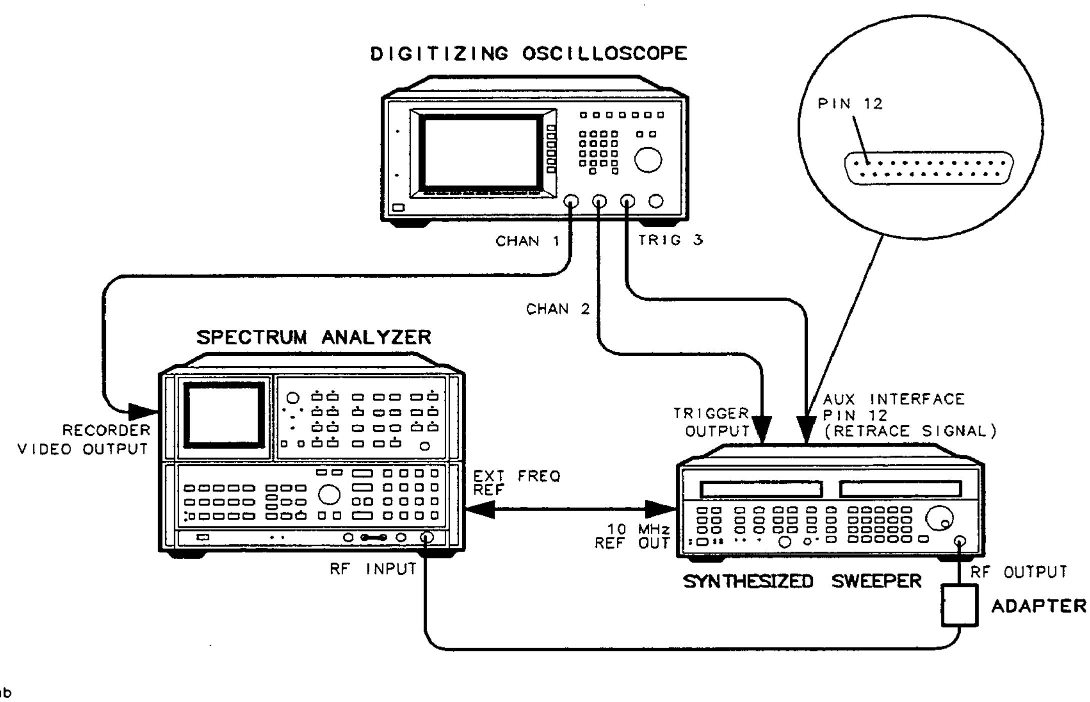

Figure 1-3. Swept Frequency Accuracy Test Setup

To set up the equipment

1. Preset all instruments and let them warm up for at least 1 hour.
2. Connect the equipment as shown in Figure 1-3.
3. On the spectrum analyzer, set the center frequency to the first center frequency listed in Table 1-1.
4. On the spectrum analyzer, set:

```
Span:                   0 Hz
Reference Level:        0 dBm
Scale Log:              10 dB/div
Video Bandwidth:        3 MHz
Resolution Bandwidth:   300 kHz
CF Step Size:           10 kHz
```

5. On the oscilloscope, set:

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 (events = points in a sweep).

```
Channel 1:
   Display           On
   Volts/Division    300 mV
   Offset            1V
   Input Coupling    dc
   Input Impedance   1 MΩ

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 Src       Lo Sens
   Trigger Level     1.6V
   Trigger Mode      Events
   Trigger After     Positive Edge
```

Trigger On	Trig 3 (initial setting)
Trigger On	3 events
Trigger On	Positive edge
Trigger On	Channel 2

Display:
Display Mode   Real time

6. Set the sweep time on the synthesized sweeper to 100 ms.
7. Set the power level on the synthesized sweeper to 0 dBm.

To measure the swept frequency accuracy at 100 ms sweep speed

1. While viewing the oscilloscope display, adjust the center frequency of the spectrum analyzer so that the video signal is centered on the graticule. Use the front panel knob of the spectrum analyzer to roughly center the signal and then use the step keys for better resolution.

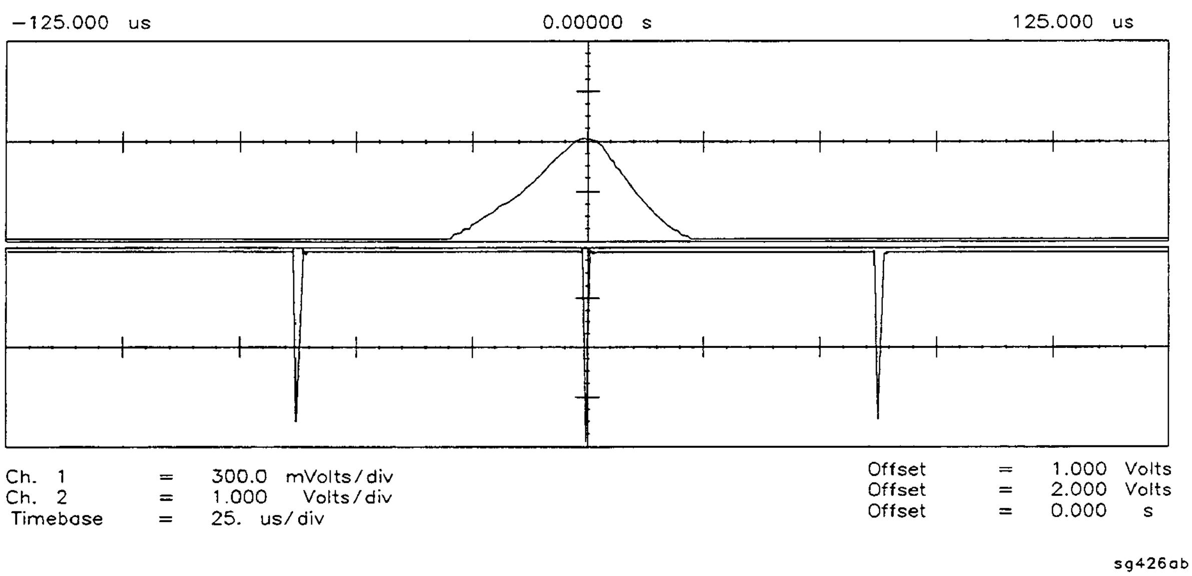

Figure 1-4. Video Signal on the Oscilloscope

2. On the spectrum analyzer display, note the final center frequency setting required to center the video signal.

Note Adjust the channel 1 offset to set the peak on a graticule to better determine when the signal is centered.

3. In Table 1-1, record the difference between the initial center frequency setting and the value noted in step 2 as frequency error.
4. Repeat steps 1 through 3 for the remaining instrument settings in Table 1-1.

5. Record the worst-case value in the test record for each sweep speed.

Table 1-1. Swept Frequency Accuracy Instrument Settings

Model	Synthesized Sweeper Frequency (GHz)		Spectrum Analyzer Center Frequency (GHz)	Oscilloscope Trigger Events	Frequency Error at 100 ms
	Start	Stop			
HP 83752A/B	0.01	20	0.0349875	3	________
	0.01	20	2.07146875	166	________
	0.01	20	3.4083	273	________
	0.01	20	6.007	481	________
	0.01	20	11.01699375	882	________
	0.01	20	19.93753125	1596	________
HP 83751A/B	2	20	2.0225	3	________
	2	20	3.40625	126	________
	2	20	5.915	349	________
	2	20	11.0225	803	________
	2	20	19.94375	1596	________

Adjustments you may need to perform

Sweep Generator
DYO Linearity
DYO Gain and Offset
DYO Delay
Calibrate Frac–N VCO (automated)

What to do in case of difficulty

1. Verify that the spectrum analyzer frequency is accurate. If necessary, calibrate the frequency with the synthesized sweeper's 10 MHz reference connected to the spectrum analyzer's external reference.
2. Refer to Chapter 5, "Troubleshooting," in this manual.

Power Accuracy

Using a power meter, check the power accuracy of the synthesized sweeper 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.

Model*	Specification	Conditions
HP 83751A/2A	±1.0 dB	20 to 30 °C > −10 dBm
HP 83751B/2B	±1.5 dB	20 to 30 °C > −5 dBm
* With Option 1ED, performance is typical above 18 GHz.		

Recommended equipment

HP 436A/437B/438A power meter
HP 8485A power sensor
HP 8493C Option 010 attenuator

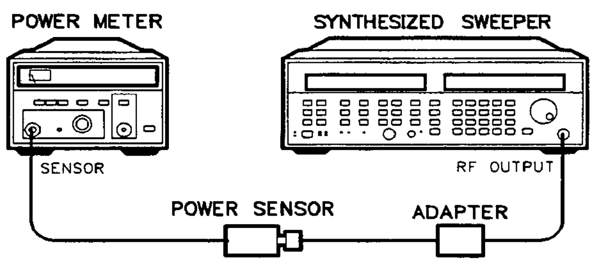

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Figure 1-5. Power Accuracy Test Setup

To set up the equipment

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

   (SHIFT) PEAK

   Wait for the synthesized sweeper to complete auto tracking before continuing.

To measure the power accuracy

1. Set the synthesized sweeper to the first CW frequency value in Table 1-2.
2. For synthesized sweepers with Option 1E1, uncouple the attenuator by pressing:

   (SHIFT) SPECIAL
   (6) (Hz/s/ENTER) (⇧)
3. Set the power level on the synthesized sweeper to −10 dBm for the HP 83751A/2A and to −5 dBm for the HP 83751B/2B.

Table 1-2. Power Accuracy Frequencies

Frequency (GHz)	Measured Difference
0.1*	______
1.0*	______
6.0	______
10.0	______
18.0	______
* Disregard if beyond your synthesized sweeper's capability.	

4. On the power meter, set the power sensor calibration factor for the frequency to be measured.
5. Note the difference between the power meter reading and the power value set on the synthesized sweeper. Write this value down on a separate piece of paper.
6. On the synthesized sweeper, press (POWER LEVEL) and use the up (⇧) key to increment the power level 1 dB.
7. Repeat steps 5 and 6, until you reach the maximum specified power level of your synthesized sweeper. Record the worst-case measured difference for this frequency in Table 1-2.
8. On the synthesized sweeper, reset the power level to −10 dBm for the HP 83751A/2A and to −5 dBm for the HP 83751B/2B.
9. Repeat steps 4 through 8 for the remaining frequencies in Table 1-2.
10. On the test record, record the worst-case measured value from Table 1-2.

Adjustments you may need to perform

ALC Detector and Logger
ALC Modulator Offset and Gain
Power Flatness

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting," in this manual.

Power Flatness

This procedure uses a power meter to measure the maximum power deviation over frequency from a 0 dB level.

Model*	Specification	Conditions
HP 83751A/2A	±0.7 dB	> −10 dBm 20 to 30 °C for frequencies< 50 MHz
HP 83751B/2B	±1.3 dB	> −5 dBm 20 to 30 °C for frequencies < 50 MHz
* With Option 1ED, performance is typical above 18 GHz.		

Recommended equipment

HP 436A/437B/438A power meter
HP 8482A power sensor
HP 8485A power sensor

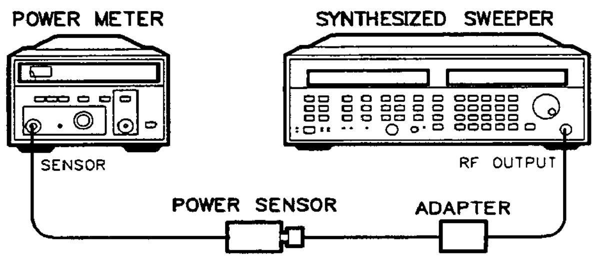

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Figure 1-6. Power Flatness Test Setup

To set up the equipment for measurements < 2 GHz

Note For synthesized sweepers not capable of frequencies < 2 GHz (HP 83751A/B), proceed with "To set up the equipment for measurements ≥ 2 GHz."

1. Turn on the instruments shown in Figure 1-6 and let them warm up for at least 1 hour. Press (Preset) on the synthesized sweeper.
2. Zero and calibrate the power meter using the HP 8482A power sensor.
3. Set the power meter to relative (dB) measurement mode.
4. On the synthesized sweeper, press:

   (POWER LEVEL) (0) (GHz/dB(m))
   (SHIFT) MANUAL (STEP SIZE) (25) (MHz/μs)
   (SHIFT) MANUAL (2) (GHz/μs)

To measure power flatness from 2 GHz to 10 MHz

1. Step the synthesized sweeper frequency down in 25 MHz steps to 10 MHz. (Use the (⇓) to manually step down to a frequency of 25 MHz and then enter 10 MHz for the last frequency.)
2. Note the maximum plus and minus deviation from 0 dB. Be sure to set the cal factors appropriately for each frequency.

   Maximum plus deviation ___________
   Maximum minus deviation ___________

To set up the equipment for measurements ≥ 2 GHz

1. Turn on the instruments shown in Figure 1-6 and let them warm up for at least 1 hour. Press (Preset) on the synthesized sweeper.
2. Zero and calibrate the power meter using the HP 8485A power sensor.
3. Set the power meter to relative (dB) measurement mode.
4. On the synthesized sweeper, press:

   (POWER LEVEL) (0) (GHz/dB(m))
   (SHIFT) MANUAL (STEP SIZE) (100) (MHz/μs)
   (SHIFT) MANUAL (2) (GHz/μs)

To measure power flatness from 2 GHz to 20 GHz

1. Use the (⇑) key to manually step the synthesized sweeper frequency up in 100 MHz steps to 20 GHz.
2. Note the maximum plus and minus deviation from 0 dB. Be sure to set the cal factors appropriately for each frequency.

   Maximum plus deviation ___________
   Maximum minus deviation ___________

To determine the worst-case power flatness

1. Over the synthesized sweeper's entire frequency range, determine the worst-case maximum plus and the worst-case maximum minus deviation from 0 dB.
2. The difference between the two values noted in step 1 is the power flatness. Record this as a peak-to-peak value in the test record.

Adjustments you may need to perform

Power Flatness

What to do in case of difficulty

1. The correct calibration factors for the power sensor must be selected.
2. Refer to Chapter 5, "Troubleshooting," in this manual.

Maximum Leveled Power

The unleveled status indicator (UNLEV) will be displayed when the instrument is unleveled as the synthesized sweeper sweeps over specific frequency ranges in fast continuous sweep, and fast and slow single sweep operation. The instrument is then manually swept across the full frequency range. The minimum power level is noted and recorded. The following procedure tests the most likely worst-case situations for maximum leveled power.

Model*,†	Specification	Conditions
HP 83751A/2A	+10 dBm	20 to 30 °C
HP 83752B	+16 dBm	20 to 30 °C 0.01 to 2 GHz
HP 83751B/2B	+17 dBm	20 to 30 °C 2 to 20 GHz
* Option 1E1, performance is decreased by 1 dB. † With Option 1ED, performance is typical above 18 GHz.		

Recommended equipment

HP 436A/437B/438A power meter
HP 8482A power sensor
HP 8485A power sensor

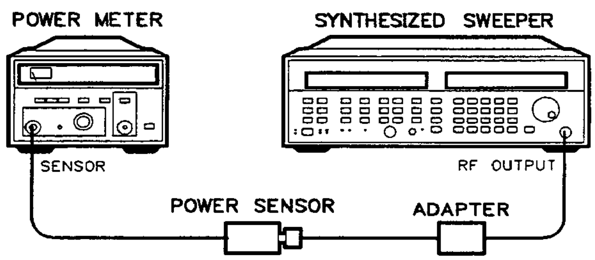

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Figure 1-7. Maximum Leveled Power Test Setup

To set up the equipment

1. Turn on the instruments shown in Figure 1-7 and let them warm up for at least 1 hour. Press (Preset) on the synthesized sweeper.
2. Zero and calibrate the power meter using the HP 8485A power sensor. Set the power meter to dBm mode.
3. Set up the equipment as shown in Figure 1-7.
4. To achieve peak power on the synthesized sweeper, turn on RF peaking. Press:

   (SHIFT) PEAK

   Wait for the synthesized sweeper to complete autotracking before continuing.

To measure the maximum leveled power

1. On the synthesized sweeper, set the power to 1 dB below the specified maximum leveled power for the synthesized sweeper's full frequency range.
2. Set the sweep time to 0 ms (defaults to the minimum value) by pressing: (TIME) (0) (kHz/ms).
3. Set the step size to 0.1 dB by pressing: (POWER LEVEL) (STEP SIZE) (.1) (GHz/dB(m)).
4. Increase the power level until the UNLEV message is displayed (see Figure 1-8), then reduce the power level until the indicator just goes off. (Power is leveled.)

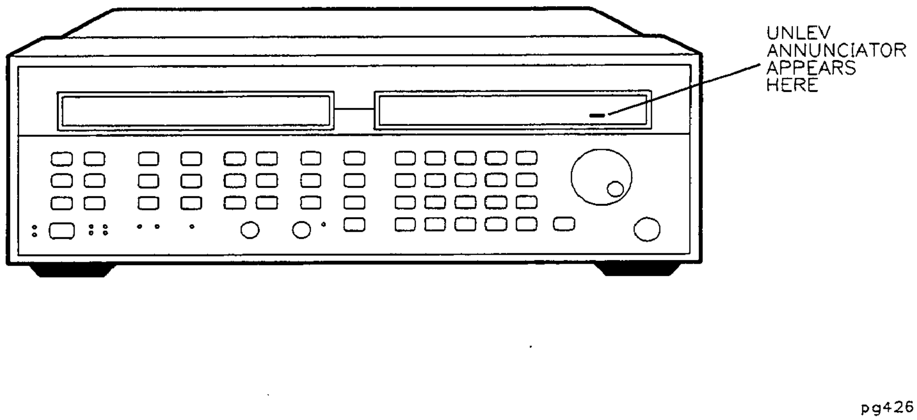

Figure 1-8. Location of UNLEV Message

5. While viewing the sweeper's display, press (SINGLE TRIG) several times to initiate several sweeps. If UNLEV is displayed during a sweep, reduce the power level until it ceases to turn on while sweeping.
6. On the synthesized sweeper, set the sweep time to 0.5 seconds.
7. Repeat step 5.
8. Perform a manual sweep of the following frequency ranges noting the minimum power level reading on the power meter. At each step of the manual sweep observe the synthesized sweeper to see if the UNLEV message is displayed. If, at any point, the instrument goes unleveled, reduce the power level in 0.1 dB steps.

Note If the minimum frequency is less than 50 MHz, an HP 8482A power sensor must be used to verify the signal level.

Be sure to set the power sensor cal factors appropriately for each frequency.

a. 10 MHz to 2 GHz in 25 MHz steps. Press:

(SHIFT) MANUAL (STEP SIZE) (25) (MHz/μs)

(SHIFT) MANUAL (10) (MHz/μs)

Use (⇑) to manually step through the sweep to 2 GHz.

b. 2 GHz to 20 GHz in 100 MHz steps. Press:

(SHIFT) MANUAL (STEP SIZE) (100) (MHz/μs)

(SHIFT) MANUAL (2) (GHz/dB(m))

Use (⇧) to manually step through the sweep to 20 GHz.

9. Record the minimum power level noted in the previous step in the test record.

Adjustments you may need to perform

SAF Sense
ALC Modulator Offset and Gain
SAF Tracking
Power Clamp Cal (automated)

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting," in this manual.

Spurious Signals (Harmonics)

Use this procedure to measure the synthesized sweeper's harmonics over its entire frequency range. Harmonics are integer multiples of the synthesized sweeper RF output frequency.

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

Model	Specification	Conditions
HP 83751A	−45 dBc	Maximum Leveled Power 2 to 20 GHz
HP 83752A	−45 dBc	Maximum Leveled Power 1.5 to 20 GHz
HP 83752A	−30 dBc	Maximum Leveled Power 0.01 to 1.5 GHz
HP 83751B	−20 dBc	Maximum Leveled Power 2 to 20 GHz
HP 83752B	−20 dBc	Maximum Leveled Power 0.01 to 20 GHz

Recommended equipment

HP 8566B spectrum analyzer
HP 8493C Option 010 attenuator

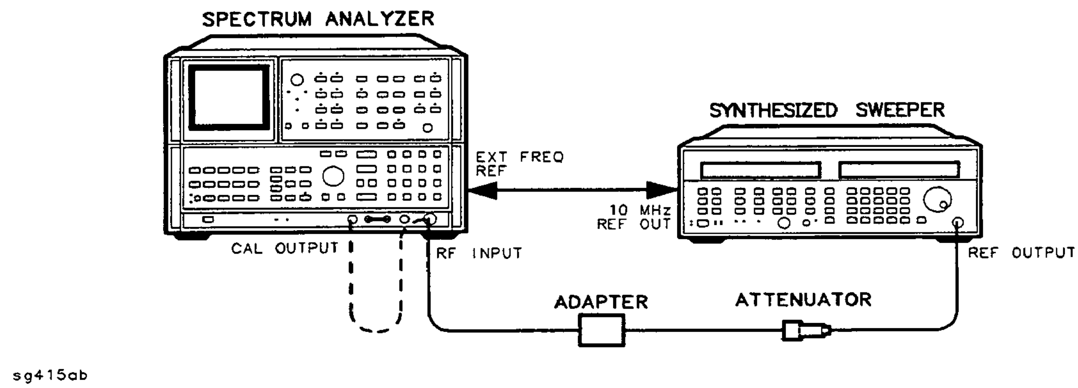

Figure 1-9. Spurious Signals (Harmonics) Test Setup

To set up the equipment

1. Preset the instruments shown in Figure 1-9 and let them warm up for at least 1 hour.
2. On the HP 8566B, connect the CAL OUTPUT to the RF INPUT. Press (SHIFT) W to calibrate the spectrum analyzer.
3. Connect the equipment as shown in Figure 1-9.
4. To achieve peak power on the synthesized sweeper, turn on RF peaking. Press:

   (SHIFT) PEAK

To measure harmonics

1. Set the synthesized sweeper to the maximum specified leveled power.
2. Set the synthesized sweeper to manual sweep with a step size of 10 MHz. Press:

   (SHIFT) MANUAL (STEP SIZE)
   (10) (MHz/μs)
3. Set the spectrum analyzer to the first set of start and stop frequencies listed in Table 1-3. Then ensure your spectrum analyzer is set accordingly for the synthesized sweeper model under test:

	HP 83751A HP 83752A	HP 83751B HP 83752B
Attenuation	10 dB	20 dB
Reference Level	0 dBm	10 dBm
Resolution Bandwidth	3 MHz	3 MHz
Video Bandwidth	3 MHz	3 MHz

Table 1-3. Frequency Ranges

Spectrum Analyzer Frequency Range		Tune Synthesized Sweeper		Step Size
Start	Stop	From	To	
10 MHz	2.0 GHz	0.01 GHz	1.0 GHz	10 MHz
2.0 GHz	4.5 GHz	1.0 GHz	1.5 GHz	10 MHz
3.0 GHz	11 GHz	1.5 GHz	5.5 GHz	25 MHz
11 GHz	20 GHz	5.5 GHz	10 GHz	25 MHz

4. Use the step keys to manually sweep the synthesized sweeper across the frequency range while observing the harmonics on the spectrum analyzer display.
5. 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 procedure "To Verify the Harmonics" that follows.
6. Set the spectrum analyzer to the next set of start and stop frequencies given in Table 1-3.
7. Manually sweep the synthesized sweeper across the frequency range given in Table 1-3 and check the spectrum analyzer display for harmonics.
8. Compare the harmonics to the specifications listed in the test record and verify any that are within 5 dB of specification with the procedure "To Verify the Harmonics."
9. Record, in the test record, the value of the worst-case harmonic for RF output frequencies of 0.01 to 1.5 GHz.
10. Change the synthesized sweeper step size to 25 MHz.

11. Repeat steps 6 through 8 for the remaining frequency ranges given in Table 1-3
12. Record, in the test record, the worst-case harmonic for RF output frequencies of $\geq$1.5 and $\leq$ 20 GHz.

To verify the harmonics

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

---

1. Note the synthesized sweeper CW frequency that produces the suspect harmonic.
2. Set the synthesized sweeper to the same RF output frequency as the harmonic to be measured.
3. On the spectrum analyzer, set:

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

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

   Harmonic Amplitude (dBc) = [Amplitude Measured in Step 4 (dBm) − Harmonic Amplitude (dBm)]

   For example:

```
RF Output        = +10 dBm
Harmonic         = −50 dBm
Harmonic (dBc)   = −[RF Out − (Harmonic)]
                 = −[10 − (−50 dBm)]
                 = −[10 + 50 dBm]
                 = −60 dBc
```

Adjustments you may need to perform

None

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting," in this manual.

Spurious Signals (Non-Harmonics)

Use this procedure to measure known, fixed-offset spurs that are generated in the frequency synthesis section of the synthesized sweeper. The synthesized sweeper 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.

Specification	Conditions
−50 dBc	Frequencies > 500 kHz from the carrier. Output power ≤ 5 dBm from 0.01 to 2 GHz.

Recommended equipment

HP 8566B spectrum analyzer

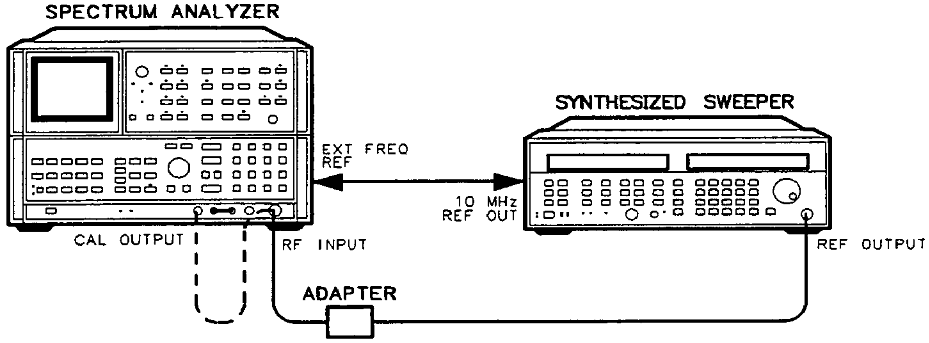

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Figure 1-10. Spurious Signals (Non-Harmonics) Test Setup

To set up the equipment

1. Preset the instruments shown in Figure 1-10 and let them warm up for at least 1 hour.
2. On the HP 8566B, connect the CAL OUTPUT to the RF INPUT. Press (SHIFT) W to calibrate the spectrum analyzer.
3. Connect the equipment as shown in Figure 1-10.
4. To achieve peak power on the synthesized sweeper, turn on RF peaking. Press:

   (SHIFT) PEAK

To measure spurious signals

Low Band Mixer Spurs

1. On the synthesized sweeper, press:

   (CW) (1.9) (GHz/dB(m))
   (POWER LEVEL) (5) (GHz/dB(m))

2. On the spectrum analyzer, set:

```
Start Frequency:        1.42 GHz
Stop Frequency:         2.00 GHz
Reference Level:        +5 dBm
Resolution Bandwidth:   300 kHz
Video Bandwidth:        100 kHz
Sweep Time:             Auto
Scale Log:              10 dB/Division
Marker:                 Normal  Peak Search  MKR-->REF LVL
```

3. Record the amplitude of the carrier signal in Table 1-4. This is the carrier amplitude to which the spurs are referenced.
4. Set the synthesized sweeper to a CW frequency of 1.9999 GHz and tune from 1.9999 GHz to 1.7 GHz using the front panel knob. This results in the most dominant mixing spur moving from 1.42 to 2 GHz. The spur should be at the left-hand edge of the display (1.42 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 5 dBm (the performance specification is valid for 5 dBm). You are finished tuning when the spur merges with the 2 GHz carrier.
5. Identify the worst point (where the spur has the greatest power level). Record the spur absolute amplitude for this point in Table 1-4.
6. Calculate the spur level in dBc as follows:

   Carrier Amplitude (dBm) − Spur Absolute Amplitude (dBm) = Spur Power Level (dBc)

   Record the result in Table 1-4. Compare the result to the specification.
7. Record the spur power level (dBc) corresponding to the worst-case point in the test record.

Table 1-4. Low Band Mixer Spurs

Carrier Amplitude (dBm)	Spur Absolute Amplitude (dBm)	Spur Power Level (dBc)

Spurious Signals (Non-Harmonics)

Fixed Offset Spurious Signals

1. Set the synthesized sweeper to the first applicable CW frequency and power level listed in Table 1-5 .
2. On the spectrum analyzer, set:

```
Center Frequency:        Same as synthesized sweeper freq
Frequency Span:          500 kHz
Reference Level:         20 dBm
Scale Log:               10 dB/Division
Resolution Bandwidth:    Auto
Sweep Time:              Auto
Marker:                  Same as synthesized sweeper freq
```

3. 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.
4. Record the amplitude of the carrier signal in Table 1-5. This is the carrier amplitude to which the spurs are referenced.
5. On the spectrum analyzer, set the center frequency to the first spur frequency in Table 1-5. Then set:

```
Reference Level:    −50 dBm
Marker:             Same as spectrum analyzer freq
```

6. Locate the spur on the spectrum analyzer to measure its amplitude. If the spur is in the noise level, use the noise level amplitude (this gives a worst-case value). Record the spur *absolute* amplitude in Table 1-5.
7. Calculate the spur level in dBc as follows:

   Carrier Amplitude (dBm) − Spur Absolute Amplitude (dBm) = Spur Power Level (dBc)

   Record the result in Table 1-5. Compare the result to the specification.
8. Repeat steps 5 through 7 for the remaining spur frequencies that correspond to the current synthesized sweeper settings.
9. Set the synthesized sweeper to the next frequency and power level in Table 1-5 and repeat steps 2 through 7.
10. Record the spur power level (dBc) of the worst-case spur in the test record.

Table 1-5. Fixed Offset Spurs

Synthesized Sweeper Power Level	Synthesized Sweeper CW Freq (GHz)	Carrier Amplitude (dBm)	Spur Frequency (GHz)	Spur Absolute Amplitude (dBm)	Spur Power Level (dBc)
+5 dBm	1.00*	______	0.995 0.998 0.999	______ ______ ______	______ ______ ______
+10 dBm† +17 dBm‡	3.00	______	2.995 2.998 2.999	______ ______ ______	______ ______ ______
+10 dBm† +17 dBm‡	10.00	______	9.995 9.998 9.999	______ ______ ______	______ ______ ______
+10 dBm† +17 dBm‡	12.00	______	11.995 11.998 11.999	______ ______ ______	______ ______ ______
+10 dBm† +17 dBm‡	20.00	______	19.995 19.998 19.999	______ ______ ______	______ ______ ______

* This frequency setting does not apply to the HP 83751A or HP 83751B.
† Use this power level for the HP 83751A and HP 83752A.
‡ Use this power level for the HP 83751B and HP 83752B.

Adjustments you may need to perform

None

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting," in this manual.

Residual FM

In this procedure a CW frequency output from a signal source (Reference) is mixed with the output of a second source (LO) to produce an IF signal at 100 MHz. The 100 MHz IF is then fed into a measuring receiver which is set for RMS detection and a BW of 50 Hz to 15 kHz. The residual FM level is displayed by the receiver.

Residual FM is checked near the high end points for each of the frequency bands.

Specification	Conditions
1 kHz RMS	CW mode 0.05—15 kHz bandwidth

Recommended equipment

HP 8902A measuring receiver
HP 83620A synthesized sweeper (local oscillator)
HP 8493C Option 010 attenuator
HP part number 0955-0307 mixer

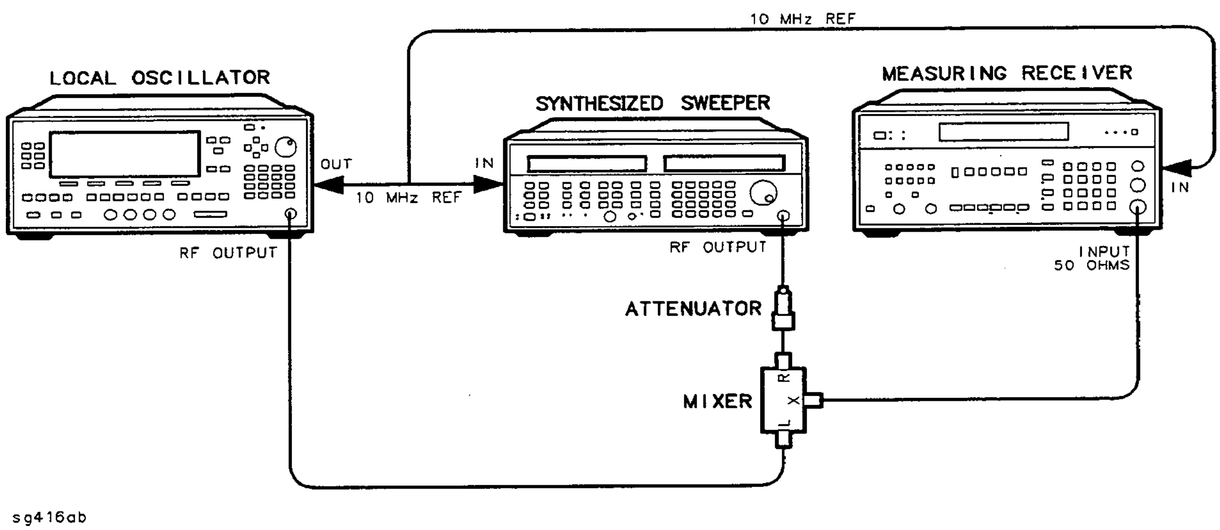


Figure 1-11. Residual FM Test Setup

To set up the equipment

1. Preset the instruments shown in Figure 1-11 and let them warm up at least 1 hour.
2. On the measuring receiver, connect the AM/FM OUTPUT to the INPUT 50Ω and press (FM) (CALIBRATE).

   When the calibration is displayed, press (SHIFT) SAVE CAL (FM).
3. Connect the equipment as shown in Figure 1-11.

To measure the residual FM

1. Set the synthesized sweeper to a CW frequency of 1.9 GHz and a power level of −5 dBm.
2. Set the measuring receiver as follows:

   (SHIFT) DETECTOR: RMS
   HP Filter: 50 Hz
   LP Filter: 15 kHz
   (AUTOMATIC OPERATION)

3. Set the local oscillator 0.1 GHz higher than the frequency of the synthesized sweeper (IF = 100 Mhz) with the power level at 10 dBm.
4. Note the residual FM measurement on the measuring receiver.
5. Repeat steps 3 and 4 for synthesized sweeper CW frequencies of 10.9 GHz and 19.9 GHz. Record the worst-case measurement of the three frequencies in the test record.

Adjustments you may need to perform

None

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting," in this manual.

Automated performance tests

In addition to the performance tests in this chapter, automated performance tests have also been developed to verify the performance of your synthesized sweeper. The automated tests listed below must be performed to complete all performance verification testing. Refer to Chapter 3, "Automated Tests," for information on running these automated tests. After completing the automated tests, enter the results in the test record.

- Atten Verification* (Option 1E1 only)

* The results of this automated performance test are given either as a *Pass* or a *Fail*. During the test, however, a graph of the results at each attenuator setting is displayed on the CRT for 30 seconds before the test proceeds to the next setting. During this time the displayed graph can be dumped to a printer, should you want data to accompany the test record. Chapter 3, "Automated Tests," has instructions on how to dump graphics to a printer.

Table 1-6. Test Record for HP 83751A and 83752A

Test Facility ________________________	Report Number ________________________
________________________	Date ________________________
________________________	Customer ________________________
________________________	Tested By ________________________
Model ________________________	Ambient Temperature ____________ °C
Serial Number ________________________	Relative Humidity ____________ %
Options ________________________	Line Frequency ____________ Hz (nominal)
Firmware Revision________________________	

Special Notes:

____

____

____

____

____

Table 1-6. Test Record for HP 83751A and 83752A (2 of 4)

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 Sensor (lowband)	________	________	________
5. Power Meter	________	________	________
6. Microwave Spectrum Analyzer	________	________	________
7. Function Generator	________	________	________
8. Frequency Counter	________	________	________
9. Frequency Standard	________	________	________
10. Digital Voltmeter	________	________	________
11. Synthesized Sweeper	________	________	________
12. ________	________	________	________
13. ________	________	________	________
14. ________	________	________	________
15. ________	________	________	________
16. ________	________	________	________
17. ________	________	________	________
18. ________	________	________	________
19. ________	________	________	________
20. ________	________	________	________

Table 1-6. Test Record for HP 83751A and 83752A (3 of 4)

Model:	Report Number:			Date:
Test Description	Minimum Specification	Results	Maximum Specification	Measurement Uncertainty
Internal Timebase: Aging Rate				
Calculated Rate		________	5×10^{-10}/day	5.6×10^{-11}/day
CW Frequency Accuracy				
Worst-case Value HP 83751A:				
2 GHz	1.99998 GHz	________	2.00002 GHz	±185 Hz
20 GHz	19.9998 GHz	________	20.0002 GHz	±1850 Hz
Worst-case Value HP 83752A:				
10 MHz	9.9999 MHz	________	10.0001 MHz	±2 Hz
20 GHz	19.9998 GHz	________	20.0002 GHz	±1850 Hz
Swept Frequency Accuracy				
Worst-case Value HP 83751A:				
100 ms Sweep Time		________	±1.8 MHz	±150 kHz
Worst-case Value HP 83752A:				
100 ms Sweep Time		________	±1.999 MHz	±150 kHz
Power Accuracy				
> −10 dBm	−1.0 dB	________	+1.0 dB	±0.5 dB
Power Flatness				
> −10 dBm		________	1.4 dB (p-p)	±0.3 dB
Maximum Leveled Power				
Standard	+10 dBm	________		±0.45 dB
Option 1E1	+9 dBm	________		±0.45 dB
Spurious Signals: Harmonics				
HP 83751A:				
2 to 20 GHz	−45 dBc	________		±1.5 dB
HP 83752A:				
0.01 to 1.5 GHz	−30 dBc	________		±1.5 dB
1.5 to 20 GHz	−45 dBc	________		±1.5 dB

Table 1-6. Test Record for HP 83751A and 83752A (4 of 4)

Model:	Report Number:			Date:
Test Description	Minimum Specification	Results	Maximum Specification	Measurement Uncertainty
Spurious Signals: Non-harmonic				
Worst-case Spur:				
Low Band Mixer	−50 dBc	________		±1.8 dB
Fixed Offset	−50 dBc	________		±1.0 dB
Residual FM				
Worst-case Value		________	1 kHz (rms)	±255 Hz (rms)
Atten Verification (automated)				
Option 1E1 only:				
Power Accuracy (≤ 20 dB atten.)		*see graphs**		±0.45dB
Power Accuracy (> 20 dB atten.)		*see graphs**		±0.60dB
Power Flatness (≤ 20 dB atten.)		*see graphs**		±0.32dB
Power Flatness (> 20 dB atten.)		*see graphs**		±0.42dB
Overall Test Results (Pass/Fail)		________		

* During the automated test routine, graphs of the test results at each attenuator setting are plotted to the CRT. These graphs can be dumped to a printer and attached to this test record. (Refer to Chapter 3, "Automated Tests," for instructions.)

Table 1-7. Test Record for HP 83751B and 83752B

Test Facility ______________________ Report Number ______________________

______________________ Date ______________________

______________________ Customer ______________________

______________________ Tested By ______________________

Model ______________________ Ambient Temperature __________ °C

Serial Number ______________________ Relative Humidity __________ %

Options ______________________ Line Frequency __________ Hz (nominal)

Firmware Revision______________________

Special Notes:

____

____

____

____

____

Table 1-7. Test Record for HP 83751B and 83752B (2 of 3)

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 Sensor (lowband)			
5. Power Meter			
6. Microwave Spectrum Analyzer			
7. Function Generator			
8. Frequency Counter			
9. Frequency Standard			
10. Digital Voltmeter			
11. Synthesized Sweeper			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

Table 1-7. Test Record for HP 83751B and 83752B (3 of 3)

Model:	Report Number:			Date:
Test Description	**Minimum Specification**	**Results**	**Maximum Specification**	**Measurement Uncertainty**
Internal Timebase: Aging Rate				
Calculated Rate		________	5 x 10^{-10}/day	5.6 x 10^{-11}/day
CW Frequency Accuracy				
Worst-case Value HP 83751B:				
2 GHz	1.99998 GHz	________	2.00002 GHz	±185 Hz
20 GHz	19.9998 GHz	________	20.0002 GHz	±1850 Hz
Worst-case Value HP 83752B:				
10 MHz	9.9999 MHz	________	10.0001 MHz	±2 Hz
20 GHz	19.9998 GHz	________	20.0002 GHz	±1850 Hz
Swept Frequency Accuracy				
Worst-case Value HP 83751B:				
100 ms Sweep Time		________	±1.8 MHz	±150 kHz
Worst-case Value HP 83752B:				
100 ms Sweep Time		________	±1.999 MHz	±150 kHz
Power Accuracy				
> −5 dBm	−1.5 dB	________	+1.5 dB	±0.5 dB
Power Flatness				
> −5 dBm		________	2.6 dB (p-p)	±0.3 dB
Maximum Leveled Power				
0.01 to 2 GHz				
Standard	+16 dBm	________		±0.45 dB
Option 1E1	+15 dBm	________		±0.45 dB
2 to 20 GHz				
Standard	+17 dBm	________		±0.45 dB
Option 1E1	+16 dBm	________		±0.45 dB
Spurious Signals: Harmonics				
HP 83751B:				
2 to 20 GHz	−20 dBc	________		±2.2 dB
HP 83752B:				
0.01 to 20 GHz	−20 dBc	________		±2.2 dB
Spurious Signals: Non-harmonic				
Worst-case Spur: Low Band Mixer	−50 dBc	________		±1.8 dB
Fixed Offset	−50 dBc	________		±1.0 dB
Residual FM				
Worst-case Value		________	1 kHz (rms)	±255 Hz (rms)
Atten Verification (automated)				
Option 1E1 only:				
Power Accuracy (≤ 20 dB atten.)		*see graphs**		±0.45dB
Power Accuracy (> 20 dB atten.)		*see graphs**		±0.60dB
Power Flatness (≤ 20 dB atten.)		*see graphs**		±0.32dB
Power Flatness (> 20 dB atten.)		*see graphs**		±0.42dB
Overall Test Results (Pass/Fail)		________		

* During the automated test routine, graphs of the test results at each attenuator setting are plotted to the CRT. These graphs can be dumped to a printer and attached to this test record. (Refer to Chapter 3, "Automated Tests," for instructions.)

2. Adjustments

2

Adjustments

This chapter contains the manual adjustments which must be performed after repair and the manual adjustments which will peak the instrument's performance. See the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab) for instructions on when to perform these adjustments.

The Recommended Test Equipment table (located behind the "Quick Reference" tab) is the complete list of equipment that is necessary to perform the adjustments, performance tests, and the troubleshooting procedures in this book. The equipment listed is for the standard synthesized sweeper. If your instrument has Option 1ED (Type-N RF output connector), substitute equivalent Type-N equipment where necessary.

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

The following adjustments are automated and are available on your service support software disk. Refer to Chapter 3, "Automated Tests," for instructions on using this software.

- Calibrate FRAC–N VCO
- Power Clamp Cal
- Attn Flatness Adj (Option 1E1 only)

10 MHz Standard (Option 1E5 Only)

Description

This procedure adjusts the frequency accuracy of the internal 10 MHz timebase. This adjustment should be done on a regular basis if absolute frequency accuracy is important.

For best accuracy, readjust the 10 MHz timebase oscillator after the synthesized sweeper 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 timebase oven does not cool down.
- The instrument keeps the same orientation with respect to the earth's magnetic field.
- The instrument stays at the same altitude.
- The instrument does not receive any mechanical shock.

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

Note You can adjust the internal timebase after reconnecting ac power for 10 minutes, but for best accuracy, test again after the instrument has been on or in standby for 24 hours.

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

Recommended equipment

HP 5345A frequency counter
HP 5061B frequency standard

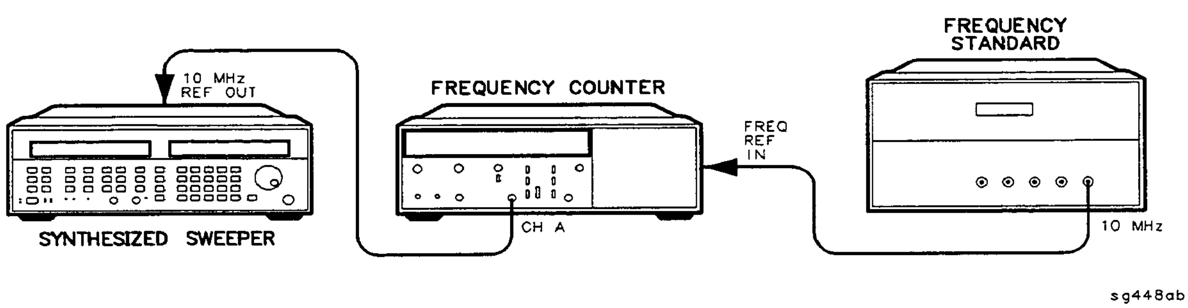


Figure 2-1. 10 MHz Standard Adjustment Setup

To set up the equipment

1. Allow the synthesized sweeper to warm up for 24 hours.
2. Connect the equipment as shown in Figure 2-1.
3. On the frequency counter, set:

Function:	Freq A
Gate Time:	10 ms
Level:	Preset
Slope:	+
50Ω	
ATTEN:	×1
DC	
SEP	

4. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (9) (Hz/s/ENTER)

   The display should read: Rosc Src= INT.
5. If not, use the (⇧) and (⇩) keys to select Rosc Src= INT and press (Hz/s/ENTER).

To adjust the 10 MHz standard

1. Using a non-metallic tool, adjust the A21 10 MHz standard reference frequency adjust (see Figure 2-2) for a reading of 10000000 ±1 Hz.

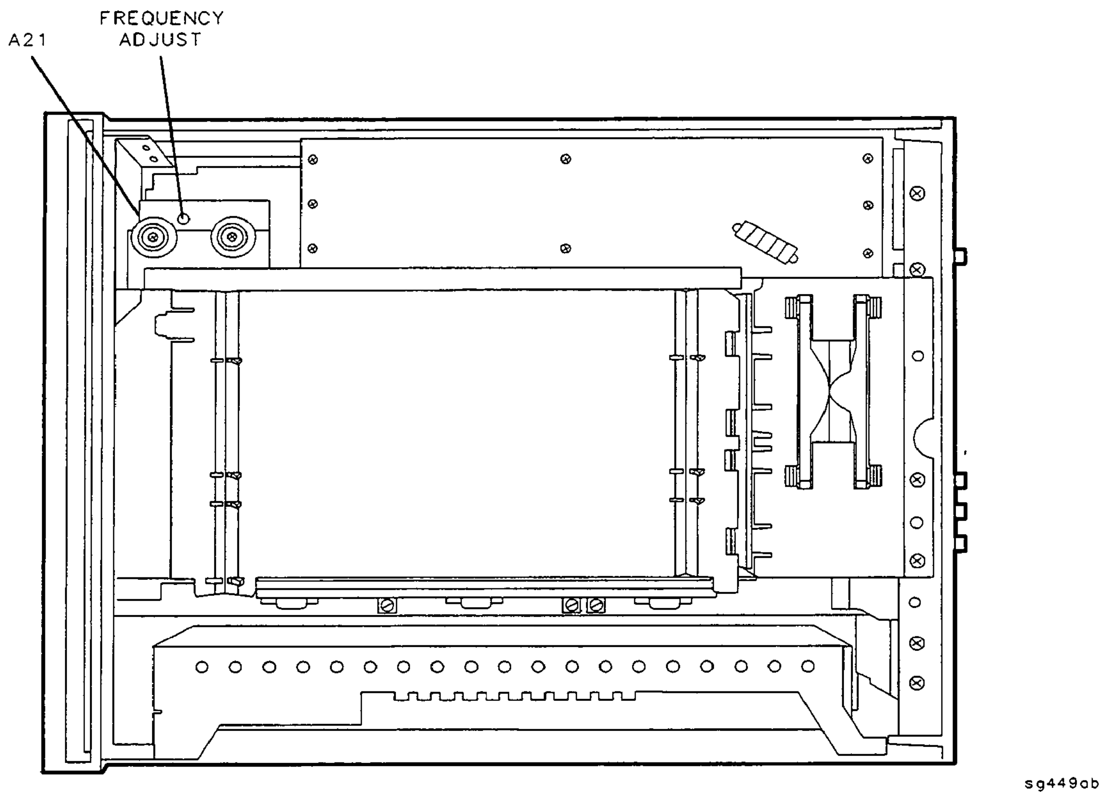


Figure 2-2. 10 MHz Standard Adjustment Location

Post-adjustment tests to be performed

Internal Timebase: Aging Rate

What to do in case of difficulty

1. Ensure that the synthesized sweeper is set to Rosc Src= INT.
2. Refer to Chapter 5, "Troubleshooting."

Accuracy versus adjustment interval

Figure 2-3 shows the required adjustment interval to maintain a given accuracy. If you know the aging rate, you can determine a more precise adjustment interval.

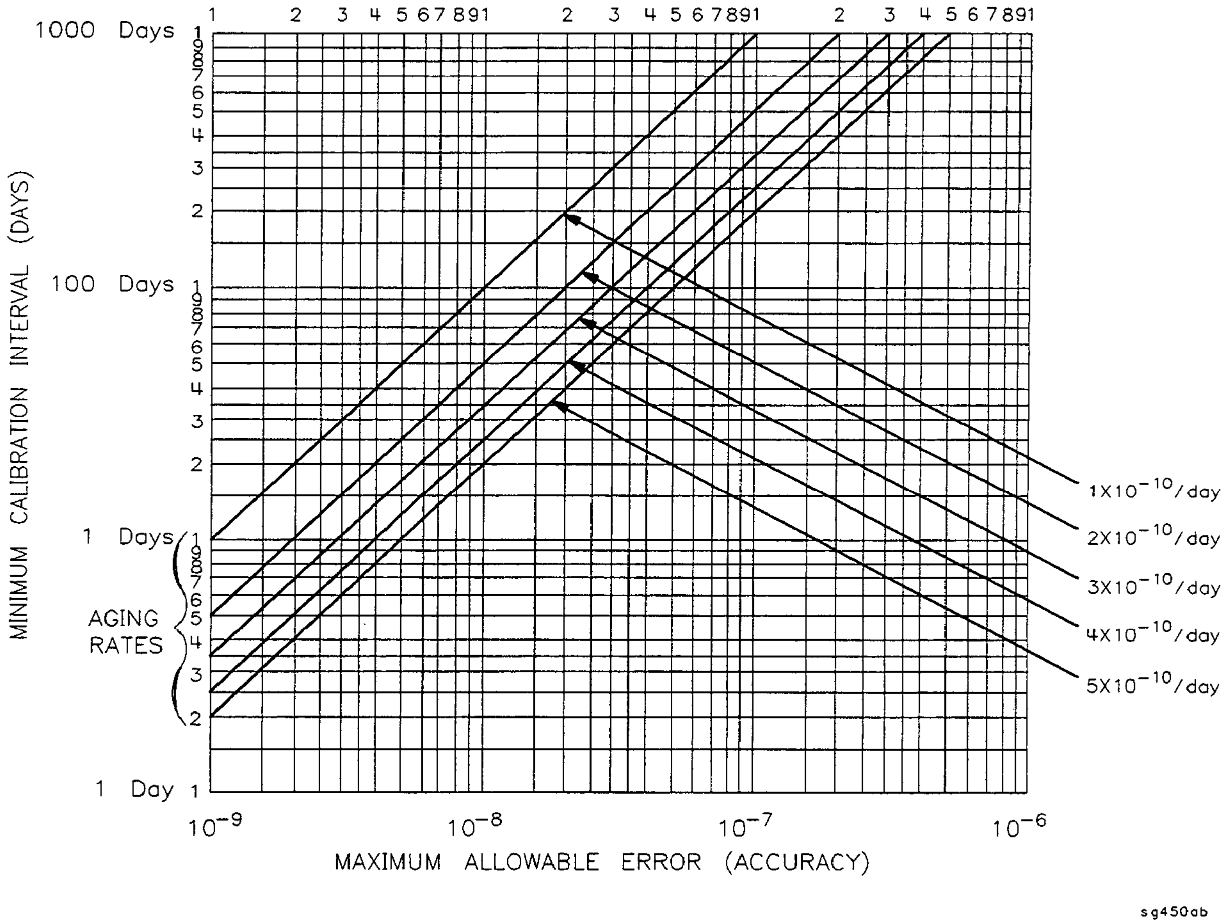


Figure 2-3. Accuracy versus Adjustment Interval

To determine the adjustment interval for a given accuracy

1. Find the line on Figure 2-3 that corresponds to the 10 MHz timebase oscillator aging rate. (To determine the aging rate, refer to Chapter 1, "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.

100 MHz VCXO

Description

This procedure adjusts the 100 MHz VCXO frequency for 100 MHz. The VCXO provides an internal timebase for the instrument and provides the 10 MHz reference when an external reference or oven standard is not present. The adjustment involves setting the reference source to none, and adjusting the VCXO for 100 MHz.

Recommended equipment

HP 5343A frequency counter

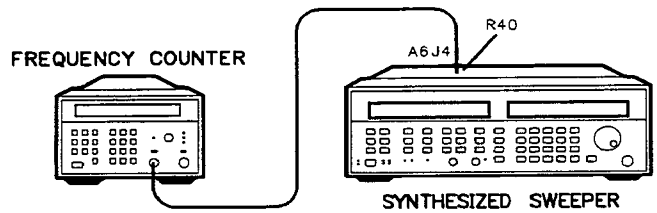


Figure 2-4. 100 MHz VCXO Adjustment Setup

To set up the equipment

1. Disconnect W7 from A6J4.
2. Connect the equipment as shown in Figure 2-4 and let it warm up for at least 1 hour. Make certain that there is no connection to the 10 MHz IN connector on the rear panel of the synthesized sweeper.
3. On the synthesized sweeper press:
   (PRESET) (SHIFT) SPECIAL (9) (Hz/s/ENTER)
4. Use the (⇧) and (⇩) keys to select Rosc Src= NONE and press (Hz/s/Enter).
5. On the frequency counter:
   - Set the input to the 50Ω position.
   - Set the range to the 10 Hz–500 MHz position.
   - Set the resolution to 1 Hz.
6. On the frequency counter, adjust the sample rate for an approximate 1 second gate time.

To adjust the 100 MHz VCXO

1. Adjust potentiometer A6R40 for 100 MHz ±10 Hz as displayed on the frequency counter.
2. After the adjustment is complete, reconnect W7 to A6J4.

Post-adjustment tests to be performed

CW Frequency Accuracy

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

Sweep Generator

Description

In this procedure the digital sweep ramp is set for a 20 V sweep from approximately +10 V to −10 V using the "Gain" adjustment. The ramp is then centered around 0 V using the "Offset" adjustment.

Recommended equipment

HP 3456A DVM
HP 54111D digital oscilloscope
HP 10431A 10:1 oscilloscope probe
HP 10437A 1:1 oscilloscope probe

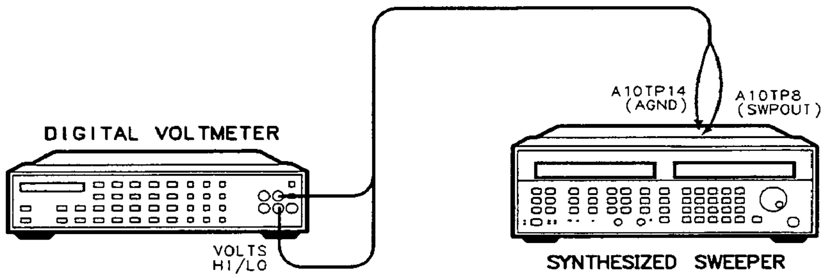


Figure 2-5. Sweep Generator Adjustment Setup

To set up the equipment

1. Power on the synthesized sweeper.
2. Preset all instruments and let them warm up for at least 1 hour.
3. Set the DVM to measure an approximate ±20 VDC with a resolution of better than 0.1 mV.
4. Connect the plus lead of the DVM to A10TP8 "SWPOUT" and the ground lead to A10TP14 "AGND" as shown in Figure 2-5.

Making the gain and offset DAC adjustment

1. On the synthesized sweeper, press (TRIG MODE) and use the (⇧) and (⇩) keys to select Swp Trig=Single.
2. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (302) (Hz/s/ENTER)
3. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 302 POKE DAC selection.
4. Use the (⇧) and (⇩) keys to select DSPDigswp and press (Hz/s/ENTER).
5. Set the DAC to a value of 2048. Press:
   (2048) (Hz/s/ENTER)

6. Adjust A10R55 "Offset" until the DVM displays 0 ±0.01 V. (See Figure 2-6 for the A10R55 location.)

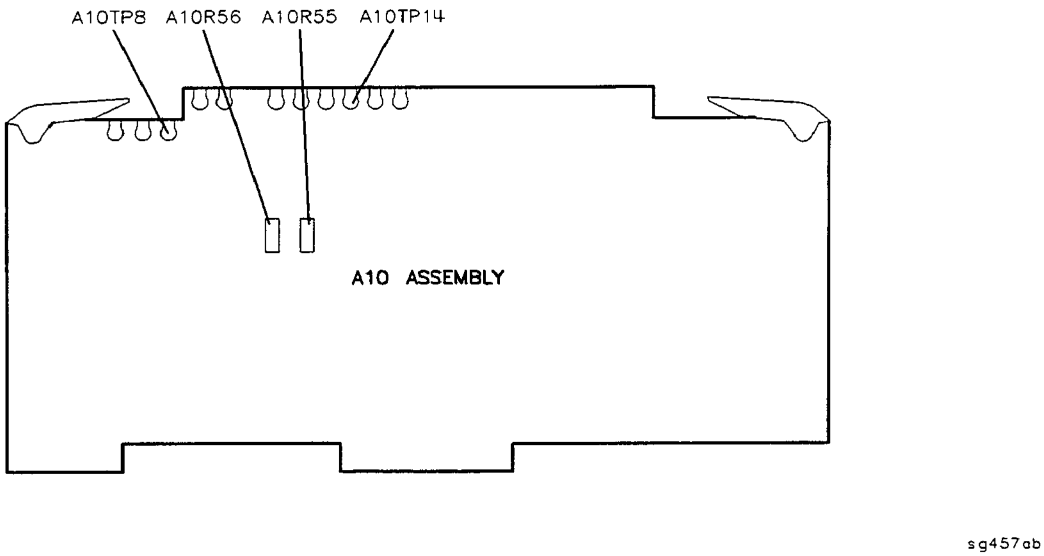


Figure 2-6. A10R55 and A10R56 Adjustment Locations

7. Set the DAC to a value of 448. Press:
   [448] [Hz/s/ENTER]
8. Adjust A10R56 "Gain" until the DVM displays +10 ±0.01 V. (See Figure 2-6 for the A10R56 location.) Record the value: ____________.
9. Set the DAC to a value of 3648. Press:
   [3648] [Hz/s/ENTER]
10. Add the absolute value of the voltage displayed on the DVM to the value recorded in step 7. The sum should equal 20 ±0.1 V. If it is not, iterate between DAC values of 448 and 3648 and readjust A10R56 until the voltage sum does equal 20 ±0.1 V.

To adjust the fast sweep rate

1. Disconnect the DVM.
2. Connect the oscilloscope trig 3 to A5TP12 "LRTC" and channel 1 to A10TP17 "S/H" through a 10:1 probe as shown in Figure 2-7.

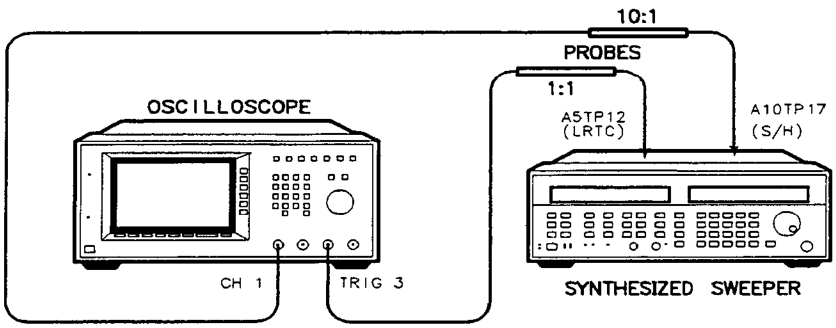


Figure 2-7. Fast Sweep Rate Adjustment Setup

3. On the synthesized sweeper, press:
   (PRESET) (START) (2) (GHz/dB(m))
   (STOP) (4) (GHz/dB(m))
4. Press (TIME) and use the (⇧) key to set the synthesized sweeper to its fastest sweep time.
5. On the oscilloscope, set:

```
Display:
   Display Mode      Repetitive
   Averaging         On 40
   Screen            Single
   Graticule         Grid
   Ch 1 & Ch 2       Off

Channel 1:
   Display           On
   Volts/Division    100 mV
   Offset            0 V
   Input Coupling    dc
   Input Impedance   1 MΩ

Channel 2:
   Display           Off

Timebase:
   Time/Division     600 µs
   Delay             50 µs
   Delay Ref         Left
   Sweep             Triggered

Trigger:
   Trigger Mode      Edge
   Trigger Src       Trig 3
   Trigger Level     1.6 V
   Trigger Slope     Pos
Coupling DC
   Hold Off          Time
Measure              Average Voltage
```

6. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (201) (Hz/s/ENTER)
7. Use the (⇧) and (⇩) keys to select SWPFast and press (Hz/s/ENTER).
8. Set the step size to 50. Press:
   (STEP SIZE) (50) (Hz/s/ENTER)
9. On the oscilloscope, use the measure feature to determine the average voltage displayed on channel 1. If necessary, use the step keys to change the SWPFast calibration constant for an average voltage of 0 volts ±100 mV.

Note Due to averaging, be sure to allow about 10 seconds after each calibration constant change before making a voltage measurement.

To adjust the slow sweep rate

1. Note the value selected above for the SWPFast calibration constant.
2. On the synthesized sweeper, press (⇐) and use the (⇑) and (⇓) keys to select the SWPSlow calibration constant. Press (Hz/s/ENTER)
3. Multiply the SWPFast calibration constant by 1.1 and enter the product as the SWPSlow constant.

To complete the adjustments

If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
(SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

Swept Frequency Accuracy

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

V/GHz

Description

In this procedure the 0.5 volts per gigahertz (V/GHz) rear panel output is adjusted and scaled by changing four calibration constants. The sweep generator gain center (SGNCent) DAC is adjusted for the flattest possible trace. Then the low end offset is adjusted using the sweep generator offset (SOFCent). Scaling is adjusted at the high end using the sweep generator offset scale (SOFSCal) and at the low end using the sweep generator gain (SGNScal).

Recommended equipment

HP 3456A DVM
HP 1740A oscilloscope

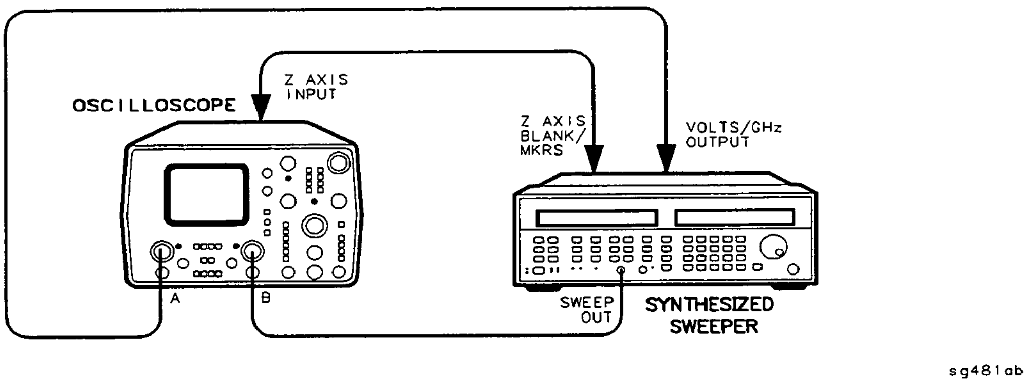


Figure 2-8. V/GHz Adjustment Setup Using the Oscilloscope

To set up the equipment using the oscilloscope

1. Power on the synthesized sweeper.
2. Connect the equipment as shown in Figure 2-8 and let it warm up for 1 hour.
3. For the HP 83751A/B only:
   a. Press (SHIFT) SPECIAL (208)
   b. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 208 CAL SPECIAL selection.
   c. Use the (⇧) and (⇩) keys to select FMIN and press (Hz/s/ENTER).
   d. Press (10) (Hz/s/ENTER).

Attention! If you fail to reset this calibration constant to 2000 when you are instructed to do so later in this procedure, the instrument will not operate properly. It will attempt to sweep from 10 MHz to 2 GHz but will be unable to do so since it does not have the correct hardware.

4. On the oscilloscope, set:

```
Channel A:    DC
V/Div:        0.01

Channel B:    DC
V/Div:        1

A vs B
```

5. On the synthesized sweeper, press:
   (CF) (10) (MHz/μs)
   (SPAN) (0) (Hz/s/ENTER)

To adjust the sweep generator gain center

1. Select the sweep generator gain center calibration constant. Press:
   (SHIFT) SPECIAL (205) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select SGNCent and press (Hz/s/ENTER).
2. Set the step size for adjusting the calibration constant to 1. Press:
   (STEP SIZE) (1) (Hz/s/ENTER)
3. Use the (⇧) and (⇩) keys to adjust the trace until it is as flat as possible.

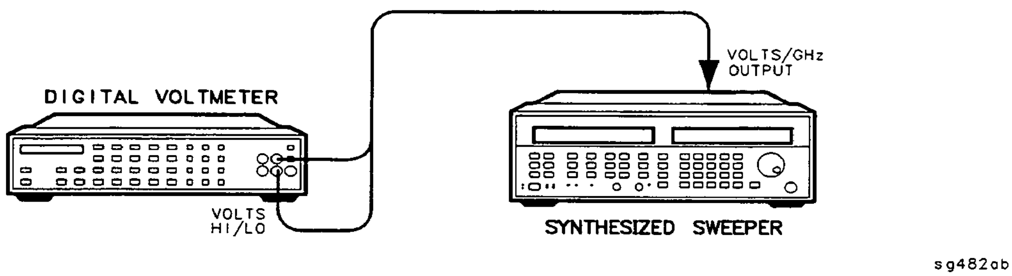


Figure 2-9. V/GHz Adjustment Setup Using the DVM

To set up the equipment using the DVM

1. Connect the equipment as shown in Figure 2-9.
2. Set the DVM to DC mode and auto range.
3. On the synthesized sweeper, press:
   (CW) (10) (MHz/μs)

To adjust the sweep generator offset

1. Select the sweep generator offset calibration constant. Press:
   (SHIFT) SPECIAL (205) (Hz/s/ENTER)

   Use the (⇑) and (⇓) keys to select SOFCent and press (Hz/s/ENTER).
2. Use the (⇑) and (⇓) keys to adjust the calibration constant until the DVM reads 5 mV ±10 mV.

To adjust the sweep generator offset scale

1. On the synthesized sweeper, press:
   (CW) (18) (GHz/dB(m))
2. Select the sweep generator offset scale calibration constant. Press:
   (SHIFT) SPECIAL (205) (Hz/s/ENTER)

   Use the (⇑) and (⇓) keys to select SOFScal and press (Hz/s/ENTER).
3. Set the step size for adjusting the calibration constant to 5000. Press:
   (STEP SIZE) (5000) (Hz/s/ENTER)
4. Use the (⇑) and (⇓) keys to adjust the calibration constant until the DVM reads 9 V ±18 mV.

To adjust the sweep generator gain

1. On the synthesized sweeper, press:
   (START) (10) (MHz/μs)
   (STOP) (20) (GHz/dB(m))
2. On the A5 timer board, connect a jumper from test point 12 (LRTC) to ground.

Note If you had to power off the instrument in order to remove the A5 board to get a better view of TP12, the adjustment in process is still valid. The new calibration constant values have not been lost.

---

3. Select the sweep generator gain calibration constant. Press:
   (SHIFT) SPECIAL (205) (Hz/s/ENTER)

   Use the (⇑) and (⇓) keys to select SGNScal and press (Hz/s/ENTER).
4. Use the (⇑) and (⇓) keys to adjust the calibration constant until the DVM reads 5 mV ±10 mV.

To complete the adjustments

1. For the HP 83751A/B only, reset the minimum frequency to 2 GHz. Press:
   (SHIFT) SPECIAL (208) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select FMIN and press (Hz/s/ENTER). Then press (2000) (Hz/s/ENTER).
2. If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
   (SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

None

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

ADC

Description

In this procedure the analog offset is set for 0 V and the analog gain is adjusted to set the +10 voltage equal to the DVM value.

Recommended equipment

HP 3456A DVM

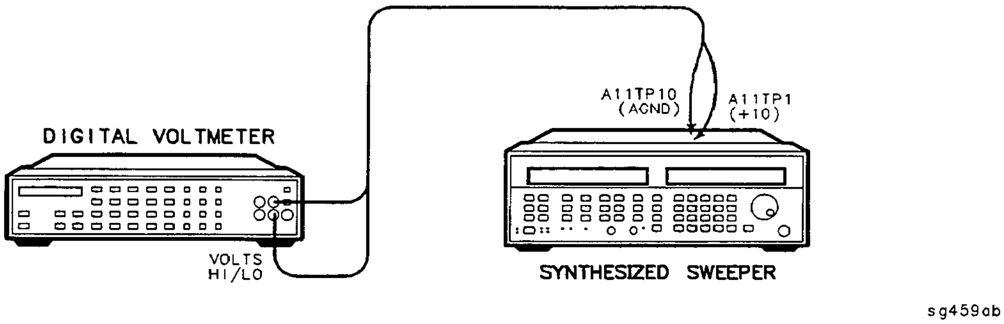


Figure 2-10. ADC Adjustment Setup

To set up the equipment

1. Let the equipment warm up for 1 hour.
2. On the DVM, set:

   DVC
   Range: Auto

3. Turn the synthesized sweeper's line power switch to standby.
4. Connect the DVM ground to A11TP10 "AGND" as shown in Figure 2-10.
5. Connect the DVM plus lead to A11TP1 "+10V" as shown in Figure 2-10.

To adjust the ADC offset

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (306) (Hz/s/ENTER)
2. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 306 ANALOG BUS selection.
3. Use the (⇧) and (⇩) keys to select SWGAGND.

If the voltage displayed on the synthesized sweeper is 0 mV ±5 mV, skip the rest of this adjustment and go to "To Adjust the ADC Gain." Otherwise continue with this adjustment.

4. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (205) (Hz/s/ENTER)
5. Use the (⇧) and (⇩) keys to select the ADCOffs calibration constant and press (Hz/s/ENTER).

6. Use the ⇧ and ⇩ keys to change the ADCOffs DAC value. (Making the DAC value more negative makes the display voltage more positive.) Typically, changing the DAC value by one unit changes the display voltage approximately 1 mV.
7. Repeat steps 1 through 5 until the voltage meets specification.

To adjust the ADC gain

1. Make sure that the equipment is still set up as shown in Figure 2-10.
2. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (306) (Hz/s/ENTER)
3. Use the ⇧ and ⇩ keys to select YD10VREF.

If the voltage displayed on the synthesized sweeper is equal to the voltage displayed on the DVM ±0.005 V, the adjustment is complete. Otherwise continue with this adjustment.

4. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (205) (Hz/s/ENTER)
5. Use the ⇧ and ⇩ keys to select the ADCGain calibration constant and press (Hz/s/ENTER).
6. Use the ⇧ and ⇩ keys to change the ADCGain DAC value. (Making the DAC value more positive makes the display gain voltage more positive.) Typically, changing the DAC value by one unit changes the display voltage approximately 1 mV.
7. Repeat steps 2 through 6 until the voltage meets specification.

To complete the adjustments

If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
(SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

Full Self-Test

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

DYO and SAF Adjustments

The DYO and SAF adjustments consist of DYO Linearity, DYO Gain and Offset, SAF Sense, Autotrack, DYO Delay, and SAF Tracking. The adjustments must all be made consecutively in the order they are presented for proper alignment. The delay adjustments focus on setting the instrument to within circuit limits but not to absolute values. Therefore, the waveforms shown in these procedures and the ones you see for your instrument may vary greatly. What should not change are the band switch points.

Before starting on the DYO and SAF delay adjustments, you will do a slow sweep verification. If there are problems in slow sweep, they must be corrected before proceeding on to the delay adjustments.

DYO Linearity

Description

This adjustment routine is executed in firmware from the front panel. It performs all the calibration necessary for the A18 DYO microcircuit assembly except for DYO delay compensation and gain and offset. The "Sweep Generator" adjustments must have been performed prior to the DYO delay and SAF adjustments.

This routine adjusts for the proper YO drive, for optimum hysteresis, and for span accuracy in swept mode, and it matches the gain of the FM coil and the main coil. The adjustment steps both up and down in frequency.

Recommended equipment

None

To execute the adjustment routine

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (311) (Hz/s/ENTER)
2. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 311 ADJUSTMENTS selection.
3. Use the (⇑) and (⇓) keys to select DyoCal and press (Hz/s/ENTER).

   Messages will appear in the display windows indicating that the adjustment is in process. This adjustment takes approximately 6 minutes to run. When it is complete, the start and stop frequencies are displayed.

What to do next

The DYO and SAF adjustments consist of DYO Linearity, DYO Gain and Offset, SAF Sense, Autotrack, DYO Delay, and SAF Tracking. The adjustments must all be made consecutively in the order they are presented for proper alignment. Continue with the next adjustment.

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

DYO Gain and Offset

Description

This adjustment minimizes the unresolved residual frequency error that the automatic routine does not correct. The DYO gain adjustment is used to set the "SUMMER OUT" end points to approximately the same values. The DYO offset is then adjusted so the positive and negative peaks are approximately equal distance from zero volts.

Recommended equipment

HP 1740A oscilloscope
HP 10431A 10:1 oscilloscope probe

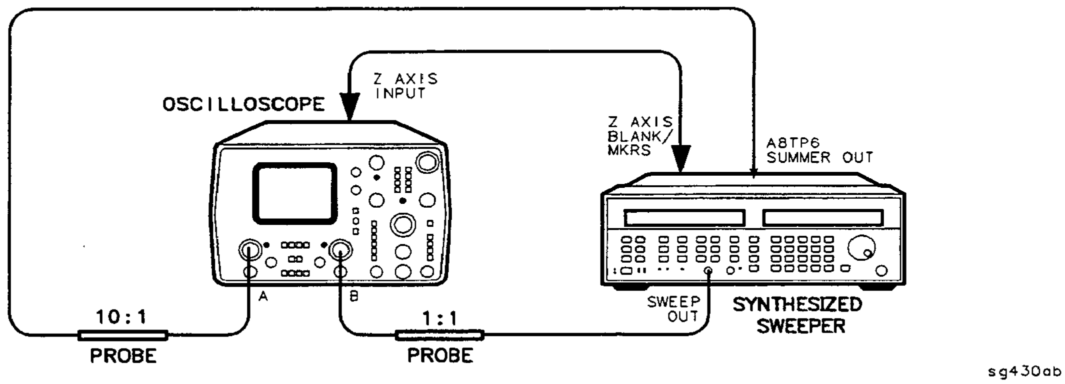


Figure 2-11. DYO Gain and Offset Adjustment Setup

To set up the equipment

1. Power on the synthesized sweeper.
2. Connect the equipment as shown in Figure 2-11 and let it warm up for at least 1 hour in swept mode.

To adjust the CW 20 GHz end point

1. On the oscilloscope, set:

   ```
   Channel A:    DC
   V/Div:        0.1
   Main
   ```

   Set the channel A reference to center screen.
2. On the synthesized sweeper, press:
   (CW) (20) (GHz/dBm)
3. Then press:
   (SHIFT) SPECIAL (200) (Hz/s/ENTER)
4. Use the (⇧) and (⇩) keys until the CFHZLsb calibration constant is displayed in the right-hand display window. Press (Hz/s/ENTER).

5. Set the step size to 100. Press:
   (STEP SIZE) (100) (Hz/s/ENTER)
6. Adjust the CFHZLsb calibration constant until the trace is +3.0 V ±0.25 Vdc from the reference.

To adjust the sweep mode end points

1. On the oscilloscope, set:

```
Channel A:     DC
V/Div:         0.05

Channel B:     DC
V/Div:         1

A vs B
```

   Use the ◁▷ position knob to set the start of sweep on the left vertical graticule line.
2. On the synthesized sweeper, press (PRESET) and set the sweep time to 2 seconds.
3. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (200) (Hz/s/ENTER)
4. Use the (⇧) and (⇩) keys until the SPANWide calibration constant is displayed in the right-hand display window. Press (Hz/s/ENTER).
5. Set the step size to 500. Press:
   (STEP SIZE) (500) (Hz/s/ENTER)
6. Use the (⇧) and (⇩) keys on the synthesized sweeper to adjust the SPANWide calibration constant until the start and stop end points on the oscilloscope are approximately the same value.

   When the end points are adjusted as close as possible, reduce the step size to 100 and continue adjusting the end points as close as possible. See Figure 2-12 for an example of adjusted endpoints.

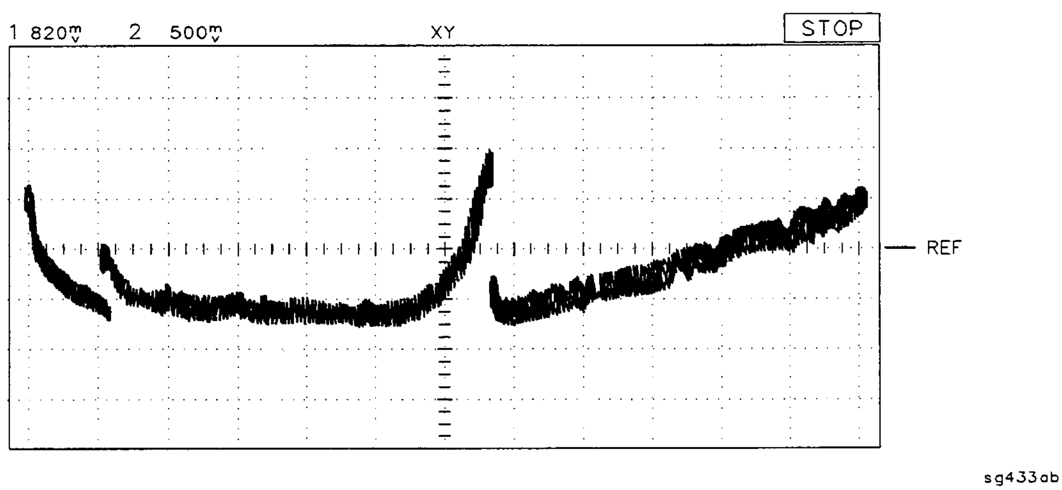


Figure 2-12. Example of Adjusted End Points

To adjust the positive and negative peaks

1. On the oscilloscope, set channel A to "Gnd" and use the position control to set the trace on the center graticule line. Reset channel A to "DC."
2. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (200) (Hz/s/ENTER)
3. Use the (⇧) and (⇩) keys until the CFSWPoff calibration constant is displayed in the right-hand display window. Press (Hz/s/ENTER).
4. Set the step size to 1. Press:
   (STEP SIZE) (1) (Hz/s/ENTER)
5. Use the (⇧) and (⇩) keys on the synthesized sweeper to adjust the trace on the oscilloscope so that the positive and negative peaks are approximately equidistant from the center graticule line (ground) and the amplitude of the peak deviations are no more than ±15 MHz from the center graticule.

Note The 10:1 probe in this equipment setup results in the following frequency scale:

Oscilloscope Setting	Actual Volts/Division	Frequency/ Division	Divisions Equal To ±15 MHz
0.05	0.5 V	3.75 MHz	±4
0.1	1 V	7.5 MHz	±2

What to do next

The DYO and SAF adjustments consist of DYO Linearity, DYO Gain and Offset, SAF Sense, Autotrack, DYO Delay, and SAF Tracking. The adjustments must all be made consecutively in the order they are presented for proper alignment. Continue with the next adjustment.

What to do in case of difficulty

1. Verify that you have set the correct sweep speed.
2. Make sure that your equipment setup is correct.

SAF Sense

Description

This adjustment is used to set the gain of the SAF drive to track the DYO. The tuning sensitivity of the SAF and the DYO can differ as much as 10%. This is done by placing the synthesizer in CW and the ALC in unleveled mode. Once the SAFSens calibration constant is adjusted, an autotrack is performed.

Recommended equipment

HP 1740A oscilloscope
HP 10431A 10:1 oscilloscope probe
HP 8493C Option 020 attenuator

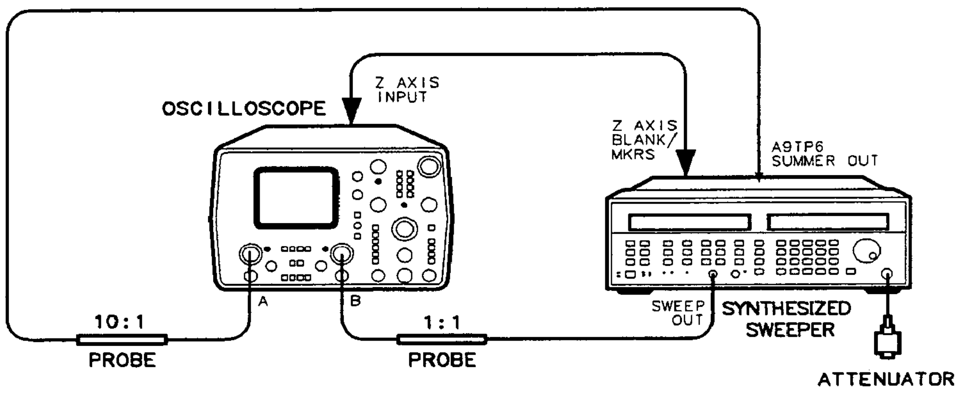


Figure 2-13. SAF Sense Adjustment Setup

To set up the equipment

Note Because the DYO and SAF adjustments must all be performed consecutively, switch position 7 on A4S1 should still be open as it should not have been changed from where it was set in the DYO Gain and Offset adjustment.

1. Connect the equipment as shown in Figure 2-13 and let it warm up for at least 1 hour.
2. On the oscilloscope, set:

```
Channel A:    DC
V/Div:        0.05

Channel B:    DC
V/Div:        1

A vs B
```

Use the ◁▷ position knob to set the start of sweep on the left vertical graticule line.

3. On the synthesized sweeper, press:
   (CW) (19) (GHz/dB(m))
   (POWER LEVEL) (0) (GHz/db(m))
   (ALC Mode)
4. Use the (⇧) and (⇩) keys until ALC= Unleveled is displayed in the right-hand display window.

   A dot will appear on the oscilloscope display.

To adjust the peak gain

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (200) (Hz/s/ENTER).
2. Use the (⇧) and (⇩) keys on the synthesized sweeper until the SAFSens calibration constant is displayed in the right-hand display window. Press (Hz/s/ENTER).
3. Use the (⇧) and (⇩) keys on the synthesized sweeper to peak the dot.

To perform an autotrack

1. Connect a 20 dB attenuator to the RF OUTPUT connector.
2. Initiate auto tracking on the synthesized sweeper. Press:
   (SHIFT) PEAK

   Tracking is displayed in the right-hand display while the procedure is in progress. When the autotracking is complete, the SAFSens calibration constant is again displayed in the right-hand display window.

To perform a slow sweep verification

1. On the synthesized sweeper, press:
   (PRESET) (TIME) (2) (Hz/s/ENTER)
2. Press (POWER LEVEL) and set the power to the maximum specified power level plus 0.5 dB.

   If the UNLEV or UNLOCK indicators are displayed, discontinue adjustments and go to Chapter 5, "Troubleshooting."

   If the UNLEV or UNLOCK indicators are not displayed, continue with this verification procedure.
3. On the synthesized sweeper, press (SINGLE TRIG) several times.

   If the UNLEV or UNLOCK indicators are displayed, discontinue adjustments and go to Chapter 5, "Troubleshooting."

   If the UNLEV or UNLOCK indicators are not displayed, continue with the "DYO Linearity" adjustment.

What to do next

The DYO and SAF adjustments consist of DYO Linearity, DYO Gain and Offset, SAF Sense, Autotrack, DYO Delay, and SAF Tracking. The adjustments must all be made consecutively in the order they are presented for proper alignment. Continue with the next adjustment.

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

DYO Delay

Description

This adjustment is used to minimize the delays in the DYO for all bands during fast sweeps. The steps included in this adjustment are: setting default calibration constant values; recording "SUMMER OUT" waveforms at slow speed for 15 GHz to 20 GHz and for full sweep; and adjusting DYO calibration constants to minimize residual errors of fast sweep.

Note The lowest start frequency for the HP 83751A/B is 2 GHz. Therefore, when adjusting these instruments, skip the het band (10 MHz to 2 GHz) portions of the adjustment.

Recommended equipment

HP 1740A oscilloscope
HP 10431A 10:1 oscilloscope probe
HP 10437A 1:1 oscilloscope probe
HP 54111D digitizing oscilloscope

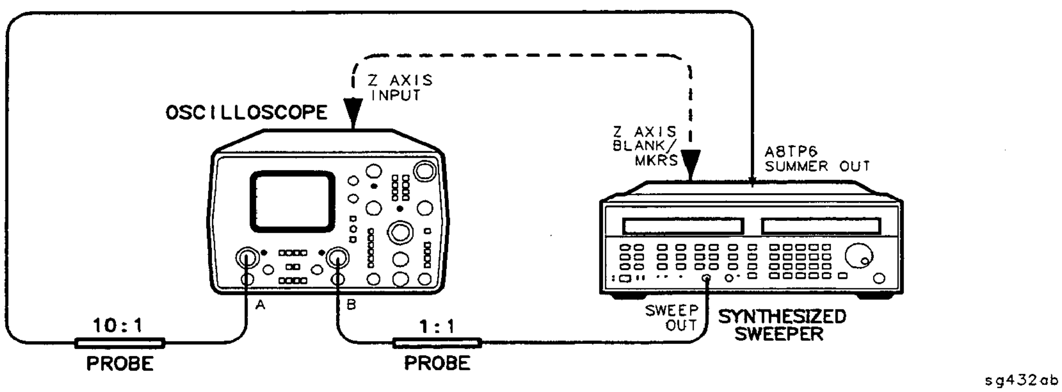


Figure 2-14. DYO Offset and Gain Adjustment Setup

To use a different oscilloscope

There are several oscilloscopes that can be used for this adjustment. The required feature is that the oscilloscope must have an A vs B function. The HP 1740A has this function. If you have a digital oscilloscope with the A vs B function, and with storage capabilities and memory, this procedure is easier and quicker. The HP 54601A has these functions. The storage capability and memory eliminates the need to draw waveforms on the CRT. Instead the waveform can be saved and then recalled later for comparison.

To use an HP 54601A, make the following changes to the setup procedure:

- Connect channel 1 to the synthesized sweeper's rear panel SWEEP OUTPUT.
- Set the channel 1 V/div to approximately 830 mV/div for a 10 division trace.
- Connect channel 2 to A8TP6.
- Set the channel 2 V/div to 500 mV/div.

To set up the equipment for offset and gain adjustment

Note Because the DYO and SAF adjustments must all be performed consecutively, switch position 7 on A4S1 should still be open as it should not have been changed from where it was set in the DYO Gain and Offset adjustment.

1. Connect the equipment as shown in Figure 2-14 and let it warm up for at least 1 hour.
2. On the synthesized sweeper, press (PRESET).
3. On the HP 1740A oscilloscope, set:

```
Channel A:    DC
V/Div:        0.05

Channel B:    DC
V/Div:        1

A vs B
```

4. Adjust the horizontal and vertical position controls for a trace that fills the full horizontal display.

To enter the default calibration constants

Note If you are making this adjustment because the A10 sweep generator or the A11 YO driver assemblies were changed, skip this section of entering default calibration constants. The current calibration constants will give you a closer adjustment.

Entering the default values into these calibration constants gives you a starting condition that will typically be close to proper adjustment thereby requiring only minor adjustment using this procedure.

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)
2. Use the (⇑) and (⇓) keys until the first calibration constant from Table 2-1 is displayed in the right-hand display window. Press (Hz/s/ENTER).
3. Enter the default value for that calibration constant using the numeric keypad and press (⇐).
4. Repeat steps 2 and 3 for each calibration constant in Table 2-1.

Table 2-1. DYO Calibration Constant Default Values

Calibration Constant	Default Value	Adjustment Description
YOAHEt	1100	Adjusts offset of middle of het band.
YOBHEt	10000	Adjusts slope of middle of het band.
YOCHEt	0	
YODHEt	0	
YOTHEt	3000	Minimizes skip cycles at start of het band sweep.
YOWHEt	500	
YOXHEt	1000	Minimizes skip cycles at start of het band sweep.
YOALow	1000	Adjusts offset of middle of low band.
YOBLow	13000	Adjusts slope of middle of low band.
YOCLow	0	
YODLow	0	
YOTLow	4500	Minimizes skip cycles at start of each band switch in low band.
YOWLow	500	
YOXLow	1000	Minimizes skip cycles at start of each band switch in low band.
YOAHigh	500	Adjusts offset of middle of high band with a start sweep of 15 GHz.
YOBHigh	16000	Adjusts slope of middle of high band in full sweep mode.
YOCHigh	10000	Adjusts amplitude of tail in continuous sweep.
YOD2High	30000	Sets tail breakpoint to 18.5 GHz for 2 GHz start frequency in continuous sweep.
YOD15Hig	28000	Sets tail breakpoint to 18.5 GHz for 15 GHz start frequency in continuous sweep.
YOCSHigh	10000	Adjusts amplitude of tail in single sweep.
YODS2Hig	30000	Sets tail breakpoint to 18.5 GHz for 2 GHz start frequency in single sweep.
YODS15HI	28000	Sets tail breakpoint to 18.5 GHz for 15 GHz start frequency in single sweep.
YOTHIgh	7500	Minimizes skip cycles at start of high band sweep for narrow band fast sweep.
YOWHIgh	500	Minimizes skip cycles at start of high band sweep for multiband sweep.
YOXHIgh	1000	Minimizes skip cycles at start of high band sweep for narrow band fast sweep.

To mark the break points in the bands

The trace on the oscilloscope should resemble the one shown in Figure 2-15. (The trace for HP 83751A/B instruments is similar except that there is no het band.) The peaks and valleys will vary but the break points will be the same. Make sure that blanking is not connected at this point for the best display of the breakpoints.

1. Use a grease pencil and mark the location of the fractional-N break points near the bottom of the display.

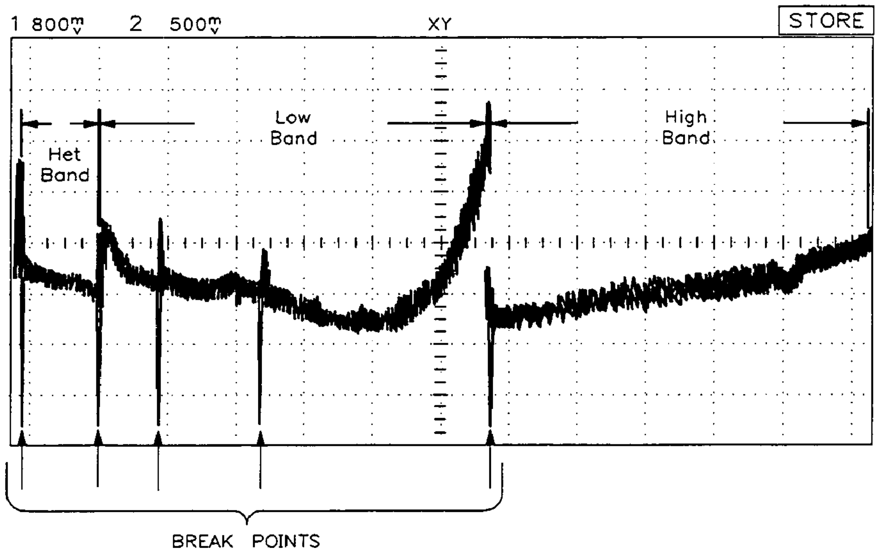


Figure 2-15. Break Point Locations

To trace the slow sweep

1. Connect the Z-axis blanking between the oscilloscope and synthesized sweeper as shown in Figure 2-14.
2. Set the sweep time on the synthesized sweeper to 2 seconds.
3. Use a grease pencil and trace the sweep on the oscilloscope. It is critical to the adjustment to trace the sweep as accurately as possible. Take enough time to get an accurate representation of the slopes and offsets.

To adjust the het band A and B terms during fast sweep (HP 83752A/B only)

In het band, adjusting the A term changes the offset of the trace and adjusting the B term changes the gain or slope of the trace. When adjusting the A and B terms for het band, vary the offset and gain so that the center portion of the trace is adjusted. Figure 2-16 shows what areas of the trace each adjustment effects. Do not concern yourself with the low and high ends of the band.

1. Press (TIME) and use the (⇧) key to set the synthesized sweeper to its fastest sweep time.
2. Select the A term for het band. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)

Use the ⇧ and ⇩ keys to select YOAHEt and press (Hz/s/ENTER).

3. Set the step size for changing the calibration constant values to 100. Press:
   (STEP SIZE) (100) (Hz/s/ENTER)
4. Use the ⇧ and ⇩ keys to adjust the calibration constant so that the het band offset is approximately the same as it is for the slow sweep.
5. Press (⇐) and use the ⇧ and ⇩ keys to select YOBHEt. Press (Hz/s/ENTER).
6. Use the ⇧ and ⇩ keys to adjust the calibration constant so that the het band gain (slope) is approximately the same as it is for the slow sweep.

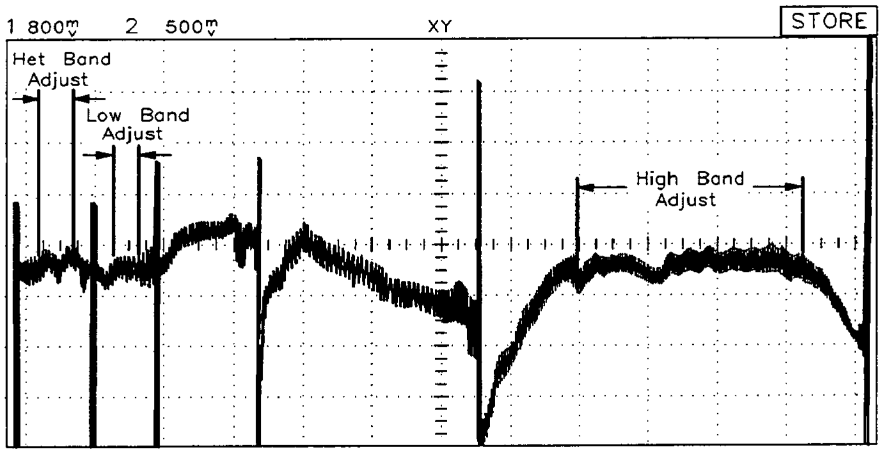


Figure 2-16. Example of Properly Adjusted A and B Terms

To adjust the low band A and B terms during fast sweep

In low band, adjusting the A term changes the offset of the trace and adjusting the B term changes the gain or slope of the trace. When adjusting the A and B terms for low band, vary the offset to adjust the center portion of the first fractional-N band (between 2 and 3.3 GHz) only. Ignore the start of the band and the remainder of low band. Vary the gain to adjust the slope for the entire band except for the low and high ends of the band and the kick pulses. See Figure 2-16.

1. For the HP 83751A/B only, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER) (Hz/s/ENTER)
   (STEP SIZE) (100) (Hz/s/ENTER)
2. For the HP 83752A/B only, press (⇐).
3. For all models, use the ⇧ and ⇩ keys to select YOALow. Then press (Hz/s/ENTER).
4. Use the ⇧ and ⇩ keys to adjust the calibration constant so that the low band offset for the first fractional-N band is approximately the same as it is for the slow sweep.
5. Press (⇐) and use the ⇧ and ⇩ keys to select YOBLow. Then press (Hz/s/ENTER).
6. Use the ⇧ and ⇩ keys to adjust the calibration constant so that the low band gain (slope) has the best match over the three low band fractional-N bands.

To adjust the high band A and B terms during fast sweep

In high band, the A and B terms both change the gain (slope) of the trace. The A term is used to adjust the gain from 15 GHz to 20 GHz and the B term is used to adjust the gain in a multiband sweep. When adjusting the A and B terms for high band, vary the gain so that the center portion of the trace is adjusted as shown in Figure 2-16. Do not concern yourself with the low and high ends of the band or the kick pulse. High band is adjusted as a compromise between performance during a multiband sweep (Figure 2-16) and performance during a sweep of a portion of high band (Figure 2-17).

1. On the synthesized sweeper, press:
   (START) (15) (GHz/dB(m))
2. Set a slow sweep of 2 seconds. Press:
   (TIME) (2) (Hz/s/ENTER)

   Using a grease pencil, trace the waveform on the oscilloscope display.
3. Press (TIME) and use the (⇑) key to set the synthesized sweeper to its fastest sweep time.
4. Select the A term for high band. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)

   Use the (⇑) and (⇓) keys to select YOAHigh and press (Hz/s/ENTER).
5. Use the (⇑) and (⇓) keys to adjust the calibration constant so that the high band gain (slope) is approximately the same as it is for the slow sweep and fast sweep trace is within two graticules of the slow sweep trace.
6. Reset the synthesized sweeper's start frequency to sweep the entire frequency range.
7. Select the B term for high band. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)

   Use the (⇑) and (⇓) keys to select YOBHigh and press (Hz/s/ENTER).
8. Use the (⇑) and (⇓) keys to adjust the calibration constant so that the high band gain (slope) is approximately the same as it is for the slow sweep.

Note The A term adjustment for the 15 to 20 GHz sweep must be compromised with the B term adjustment for the multiband sweep. Try to get an equal amount of error for each term. When properly adjusted, the offset is within two divisions of the slow sweep trace.

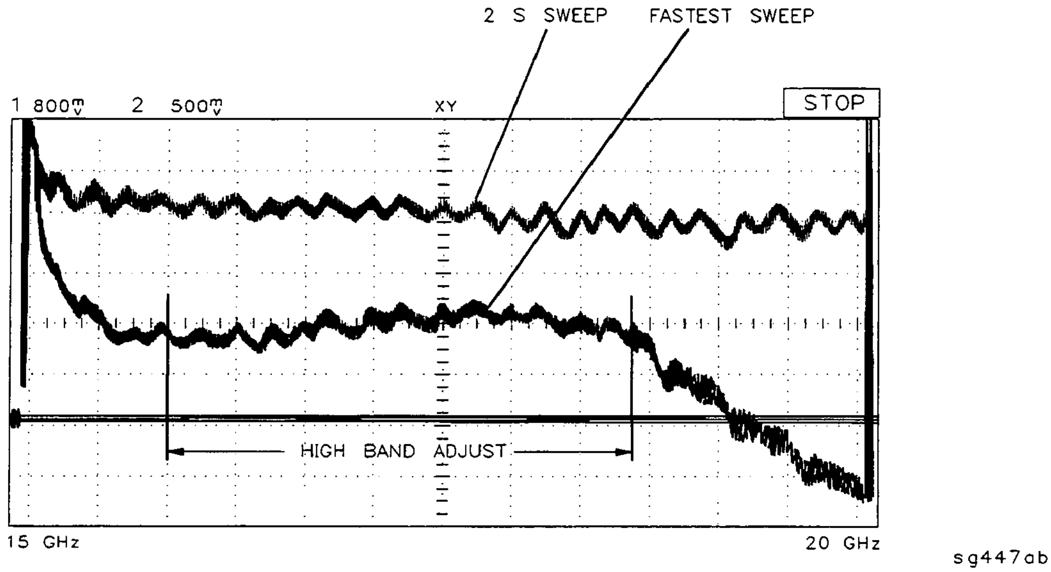


Figure 2-17. High Band Narrow Sweep Adjustment

Figure 2-18 shows a slow sweep trace and a fast sweep multiband trace after adjustment. This instrument was adjusted at the factory. Notice which portions of each band are adjusted and that the offset and gain adjustments are *similar* to the slow sweep trace but not exact. Don't try to get it perfect.

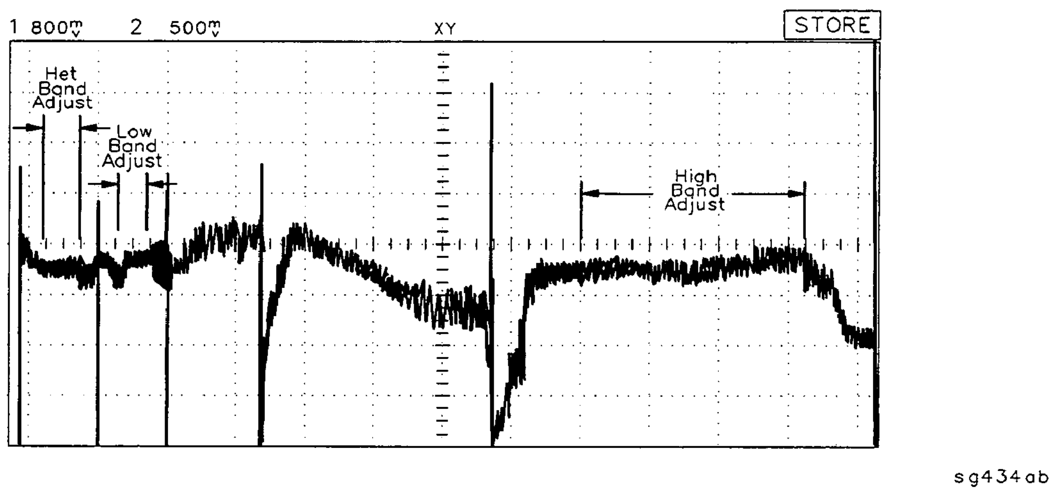


Figure 2-18. Example of Factory Adjustment

To set up the equipment for start of sweep DYO adjustment

1. Set up the equipment as shown in Figure 2-19.

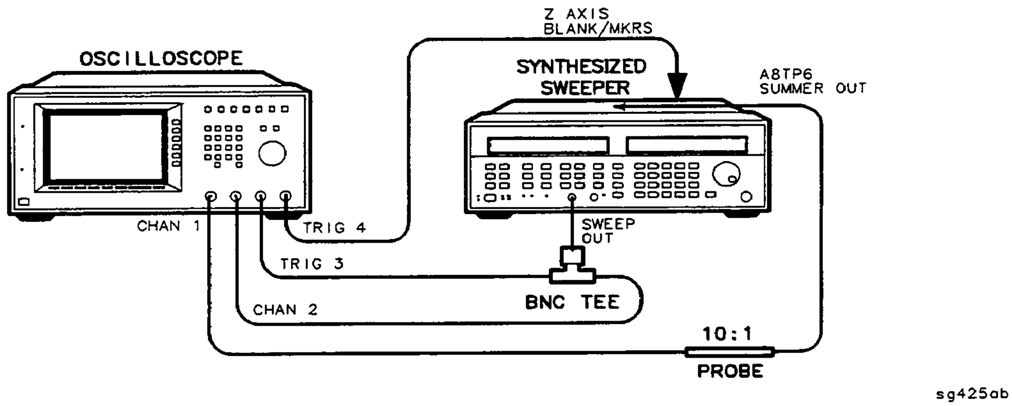


Figure 2-19. Start of Sweep DYO Adjustment Setup

2. Set the synthesized sweeper to sweep across its entire frequency range.
3. Press (TIME) and use the (⇧) key to set the synthesized sweeper to its fastest sweep time.

4. On the oscilloscope, set:

```
Display:
   Display Mode      Repetitive
   Averaging         On 10
   Screen            Single
   Graticule         Grid

Channel 1:
   Display           On
   Volts/Division    50 mV (500 mV/div with 10:1 probe)
   Offset            As needed
   Input Coupling    dc

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

Timebase:
   Time/Division     20 ms
   Delay             0
   Delay Ref         Center
   Sweep             Triggered

Trigger:
   Trigger Mode      Edge
   Trig Source       3
   Trigger Level     1.6 V
   Trig source       4
   Trigger Level     1.6 V
   Trigger Mode      Events
   After Edge        Neg
   On                Trig 3
   Of Edge           Neg
   On                Trig 4
```

To verify triggering on proper events

1. Set the oscilloscope to trigger on event 1. The start of the first slope moves to the center of the display. For the HP 83752A/B, this should be the start of het band. For the HP 83751A/B, which has no het band, this should be the start of low band.
2. Set the oscilloscope to trigger on event 2. The start of the second slope moves to the center of the display.
3. Continue to increase the trigger events from 3 through 5 (3 through 4 for instruments without het band). The display will change accordingly.

To adjust the het band X and T terms (HP 83752A/B only)

The X and T terms are used to minimize skipped cycles at the start of the band sweep. Skipped cycles look like high frequency noise. Figure 2-20 shows an example of skipped cycles before adjustment. When correction is applied it may be seen as a cyclical pattern but at a lower frequency than the skipped cycles. Figure 2-21 shows the same trace after the skipped cycles are adjusted.

For all bands, adjusting the X and T terms effects the start of sweep. The X term is adjusted first and effects the first portion of the start of sweep. The T term is adjusted after the X term and is used for points farther out. In most cases the T term adjustment will have little or no effect. In these situations, reset the T term to the default value.

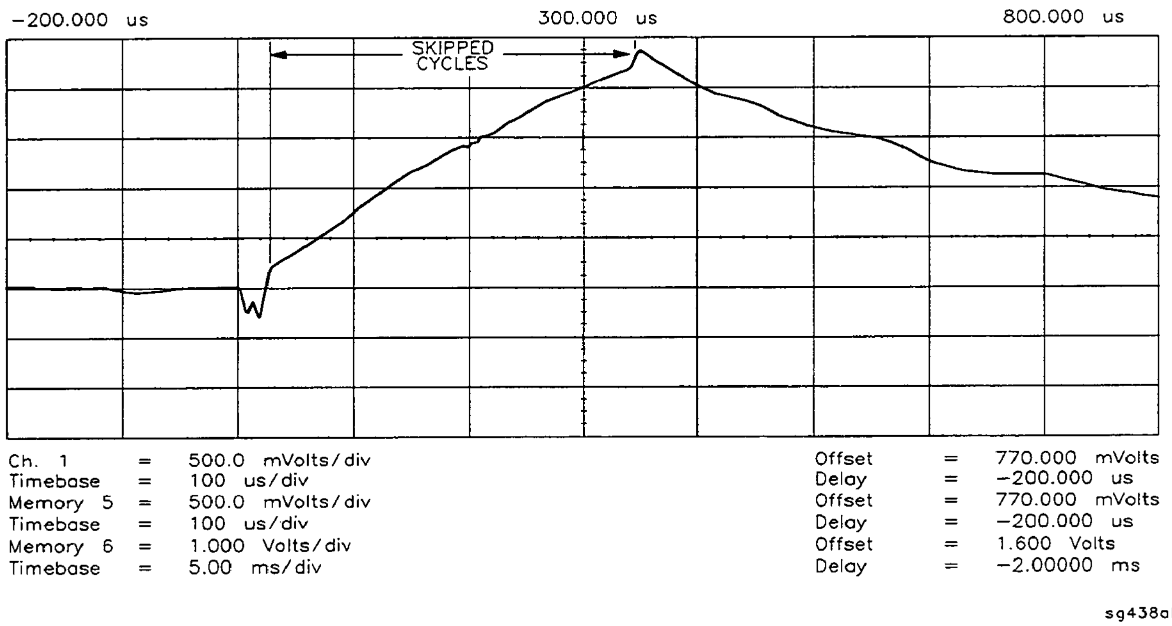


Figure 2-20. Skipped Cycles before Adjustment

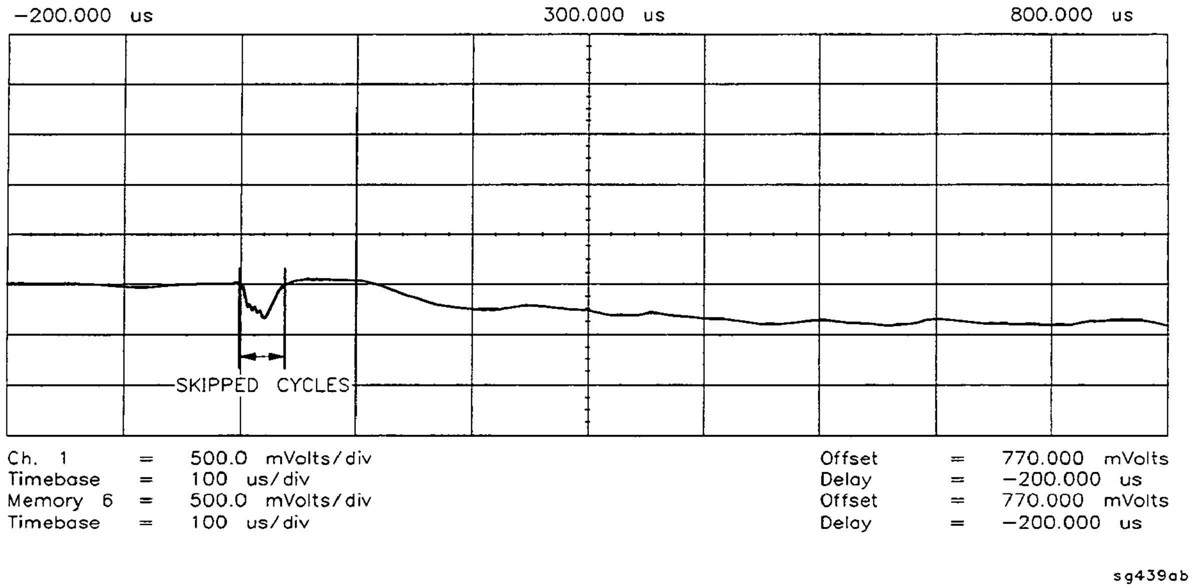


Figure 2-21. Skipped Cycles after Adjustment

1. Set the oscilloscope timebase to 100 μs per division and set the display reference to trigger on left.
2. Set the oscilloscope to trigger on event 1 (the start of het band.)
3. Set the oscilloscope timebase for −200 μs delay so that there is one division of delay before the start of the het band sweep.
4. Select the X term for het band. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)

   Use the (⇑) and (⇓) keys to select YOXHEt and press (Hz/s/ENTER).
5. Set the step size for changing the calibration constant values to 50. Press:
   (STEP SIZE) (50) (Hz/s/ENTER)
6. Use the (⇑) and (⇓) keys to adjust the calibration constant to minimize skipped cycles at the start of sweep in het band. If a smaller step size lets you achieve better results, change the step size as needed.
7. Press (⇐), use the (⇑) and (⇓) keys to select YOTHEt, and press (Hz/s/ENTER).
8. Use the (⇑) and (⇓) keys to adjust the calibration constant to minimize skipped cycles at the start of sweep in het band.

To adjust the low band X and T terms

The X and T terms are used to minimize skipped cycles at the start of the band sweep. Skipped cycles look like high frequency noise. When correction is applied it may be seen as a cyclical pattern but at a lower frequency than the skipped cycles. Figure 2-20 shows an example of skipped cycles before and after adjustment.

For each band, adjusting the X and T terms effects the start of sweep. In low band the adjustment is iterative because one set of calibration constants effects all three fractional-N start of sweeps. The last band switch is adjusted first and then the first two band switches are verified. A compromise is made for best adjustment of all three bands. The X adjustment is always done first and effects approximately the first 200 μs of the sweep.

1. Set the oscilloscope to trigger on the start of the last band switch in low band (event 4 for HP 83752A/B; event 3 for HP 83751A/B).
2. For HP 83751A/B only, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER) (Hz/s/ENTER)
   (STEP SIZE) (100) (Hz/s/ENTER)
3. For HP 83752A/B only, press (⇐).
4. For all models, use the (⇑) and (⇓) keys to select YOXLow and press (Hz/s/ENTER).
5. Set the step size for changing the calibration constant values to 50. Press:
   (STEP SIZE) (50) (Hz/s/ENTER)
6. Use the (⇑) and (⇓) keys to adjust the calibration constant to minimize skipped cycles at the start of sweep. If a smaller step size lets you achieve better results, change the step size as needed.
7. Press (⇐) and use the (⇑) and (⇓) keys to select YOTLow. Press (Hz/s/ENTER).
8. Use the (⇑) and (⇓) keys to adjust the calibration constant to minimize skipped cycles at the start of sweep.
9. Set the oscilloscope to trigger on the start of the second band switch in low band (event 3 for HP 83752A/B; event 2 for HP 83751A/B).
10. Use YOXLow and YOTLow to minimize any skipped cycles at the start of sweep.
11. Set the oscilloscope to trigger on the start of the first band switch in low band (event 2 for HP 83752A/B; event 1 for HP 83751A/B)
12. Use YOXLow and YOTLow to minimize any skipped cycles at the start of sweep.
13. If any adjustment to YOXLow and YOTLow was required for the first and second band switches, return the oscilloscope to the last band switch (event 4 for HP 83752A/B; event 3 for HP 83751A/B). If the last band switch is now misadjusted, iterate between adjustments until a compromise is made between the last band switch and the first and second band switches.

To adjust the high band X and T terms

The X and T terms are used to minimize skipped cycles at the start of the band sweep. Skipped cycles look like high frequency noise. When correction is applied it may be seen as a cyclical pattern but at a lower frequency than the skipped cycles. Figure 2-20 shows an example of skipped cycles before and after adjustment.

For all bands, adjusting the X and T terms effects the start of sweep. In high band the adjustment is iterative between multiband sweeps and narrow band sweeps at the fastest sweep rate. The high band X and T terms are adjusted with a start frequency of 15 GHz and a stop frequency of 20 GHz. Then high band is adjusted with a W term over a full sweep.

1. On the synthesized sweeper, press:
   (START) (15) (GHz/dB(m))
2. Press (TIME) and use the (⇧) key to set the synthesized sweeper to its fastest sweep time.
3. Set the oscilloscope to trigger on the start of high band (event 5 for HP 83752A/B; event 4 for HP 83751A/B).
4. Select the X term for high band. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select YOXHIgh and press (Hz/s/ENTER).
5. Set the step size for changing the calibration constant values to 100. Press:
   (STEP SIZE) (100) (Hz/s/ENTER)
6. Use the (⇧) and (⇩) keys to adjust the calibration constant to minimize skipped cycles at the start of sweep.
7. Press (⇐) and use the (⇧) and (⇩) keys to select YOTHIgh. Press (Hz/s/ENTER).
8. Use the (⇧) and (⇩) keys to adjust the calibration constant to minimize skipped cycles at the start of sweep.
9. Reset the synthesized sweeper's start frequency to sweep the entire frequency range.
10. On the synthesized sweeper, press:
    (SHIFT) SPECIAL (202) (Hz/s/ENTER)

    Use the (⇧) and (⇩) keys to select YOWHIgh and press (Hz/s/ENTER).
11. Set the step size for changing the calibration constant values to 100. Press:
    (STEP SIZE) (100) (Hz/s/ENTER)
12. Use the (⇧) and (⇩) keys to adjust the calibration constant to minimize skipped cycles at the start of sweep.

Caution Do *not* set the YOWHIgh calibration constant to a value less than 300. It will not effect this adjustment but will cause problems with arbitrary stop sweep on the rear panel.

To adjust the 18 GHz tail

1. Set up the equipment as shown in Figure 2-14.
2. On the synthesized sweeper, press:
   (START) (15) (GHz/dB(m))
3. Press (TIME) and use the (⇩) key to set the synthesized sweeper to its fastest sweep time.
4. Compare the waveform on the oscilloscope to the waveform in Figure 2-22. If the waveforms are similar in the following aspects, proceed with step 9. Otherwise proceed with step 4.
   - The portions of the trace indicated as "A" are linear.
   - The roll off between the peak and the end of the tail (approximately the last 3 to 4 divisions) is between 15 to 30 MHz.

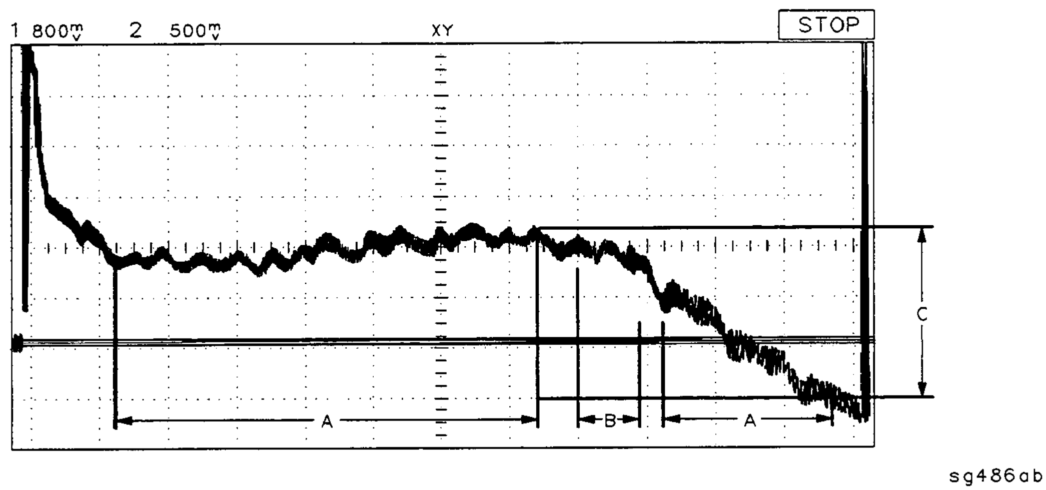


Figure 2-22. Example of Waveform Showing 18 GHz Tail

5. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)
6. Use the (⇧) and (⇩) keys to select YOD15HIg and press (Hz/s/ENTER).

To complete the adjustments

1. Press (STEP SIZE) (100) (Hz/s/ENTER).
2. Use the (⇧) and (⇩) keys to adjust the trace as close as possible to the example in Figure 2-22. The adjustment is correct when the trace is linear in the defined areas (A) and the roll off from the breakpoint (B) to the end of the tail is between 15 and 30 MHz.

   If the adjustment is correct, proceed with step 6. Otherwise, proceed with step 5.
3. Press (⇐) and use the (⇧) and (⇩) keys to select YOCHIgh and press (Hz/s/ENTER).

   The YOCHIgh adjustment effects the same areas of the trace as YOD15Hig. Iterate between both adjustments until the waveform meets the requirements listed in step 4.

4. On the synthesized sweeper, press:
   (START) (2) (GHz/dB(m))
5. Then press:
   (SHIFT) SPECIAL (202) (Hz/s/ENTER)
6. Use the (⇧) and (⇩) keys to select YOD2HIgh and press (Hz/s/ENTER).
7. Reset the step size to 100 if you have changed it.
8. Use the (⇧) and (⇩) keys to adjust YOD2HIgh for a flat response (no tail) at the high end of the sweep.
9. Press (⇐) and use the (⇧) and (⇩) keys to select YOCHIgh. Note the value.
10. Use the (⇧) and (⇩) keys to select YOCSHIgh and press (Hz/s/ENTER).
11. Enter the value noted for YOCHIgh into YOCSHIgh.
12. Note the value for YOD2HIgh and enter it into YODS2HIg.
13. Note the value for YOD15HIg and enter it into YODS15HI.
14. On the synthesized sweeper, press:
    (START) (15) (GHz/dB(m))
15. Then press:
    (SHIFT) SPECIAL (202) (Hz/s/ENTER)
16. Use the (⇧) and (⇩) keys to select YODS15HI and press (Hz/s/ENTER).
17. Reset the step size to 100 if you have changed it.
18. On the synthesized sweeper, press (SINGLE TRIG).

    The waveform in single sweep will not be as linear as in continuous sweep. Adjust YODS15HI for a 15 to 60 MHz roll off. If the waveform cannot be adjusted to this level, iterate between YOCSHIgh and YODS15HI until the waveform is adjusted.
19. On the synthesized sweeper, press:
    (START) (2) (GHz/dB(m))
20. Then press:
    (SHIFT) SPECIAL (202) (Hz/s/ENTER)
21. Use the (⇧) and (⇩) keys to select YODS2Hig and press (Hz/s/ENTER).
22. Reset the step size to 100 if you have changed it.
23. Use the (⇧) and (⇩) keys to adjust the end of sweep for a flat response (no tail rolling up or down). If the adjustment can't be made using YODS2Hig, iterate between YODS2Hig and YOCSHigh.

What to do next

The DYO and SAF adjustments consist of DYO Linearity, DYO Gain and Offset, SAF Sense, Autotrack, DYO Delay, and SAF Tracking. The adjustments must all be made consecutively in the order they are presented for proper alignment. Continue with the next adjustment.

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

SAF Tracking

Description

The SAF tracking adjustment is used to tune the SAF filter for maximum power out at low power points. In this procedure, low band and high band are adjusted while het band is not adjusted since it passes through a fixed filter. The calibration constant names are similar to those used in the DYO delay adjustment (YFxxx instead of YOxxx). They are adjusted in the same order and primarily effect the same areas of the trace. The main difference is that the SAF adjustments are used to maximize the power out (vertical trace shift) at the lowest power points under various sweep conditions.

As in the DYO adjustment, the X and T terms effect the start of sweep, the A and B terms (offset gain adjustments) effect mid-band, and the C and D terms effect the tail. Since there are no SAF het band adjustments, the het band calibration constants are set to zero.

Recommended equipment

HP 1740A oscilloscope
HP 10431A 10:1 oscilloscope probe
HP 10437A 1:1 oscilloscope probe

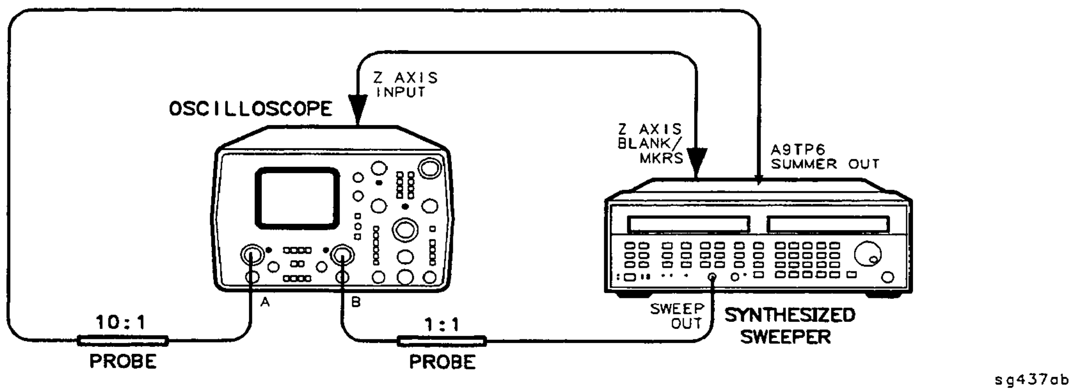


Figure 2-23. SAF Tracking Adjustment Setup

To use a different oscilloscope

There are several oscilloscopes that can be used for this adjustment. The required feature is that the oscilloscope must have an A vs B function. The HP 1740A has this function. If you have a digital oscilloscope with the A vs B function, and with storage capabilities and memory, this procedure is easier and quicker. The HP 54601A has these functions. The storage capability and memory eliminates the need to draw waveforms on the CRT. Instead the waveform can be saved and then recalled later for comparison.

To use an HP 54601A, make the following changes to the setup procedure:

- Connect channel 1 to the synthesized sweeper's rear panel SWEEP OUTPUT.
- Set the channel 1 V/div to approximately 830 mV/div for a 10 division trace.
- Connect channel 2 to A9TP6.
- Set the channel 2 V/div to 1000 mV/div.

To set up the equipment

Note Because the DYO and SAF adjustments must all be performed consecutively, switch position 7 on A4S1 should still be open as it should not have been changed from where it was set for the DYO Gain and Offset adjustment.

1. Connect the equipment as shown in Figure 2-23 and let it warm up for at least 1 hour.
2. On the HP 1740A oscilloscope, set:

```
Channel A:    DC
V/Div:        0.01

Channel B:    DC
V/Div:        1

A vs B
```

3. Use the ◁▷ position knob to position the trace on the display.

To enter the default calibration constants

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (203) (Hz/s/ENTER)
2. Use the (⇧) and (⇩) keys until the first calibration constant from Table 2-2 is displayed in the right-hand display window. Press (Hz/s/ENTER).
3. Enter the default value for that calibration constant using the numeric keypad and press (⇐).

4. Repeat steps 2 and 3 for each calibration constant in Table 2-3.

Table 2-2. SAF Calibration Constant Default Values

Calibration Constant	Default Value	Adjustment Description
YFALow	1300	Adjusts low band and bands 1 and 2 frequency compensation.
YFBLow	12000	Adjusts low band and band 3 frequency compensation.
YFCLoW	0	Always zero.
YFDLow	0	Always zero.
YFTLow	4500	Adjusts start of low band sweep.
YFWLow	500	Adjusts start of low band sweep.
YFXLow	1000	Adjusts start of low band sweep.
FYAHIgh	1000	Adjusts high band 15 to 20 GHz sweep frequency compensation.
YFBHIgh	15000	Adjusts high band full sweep frequency compensation.
YFCHIgh	10000	Adjusts 15 to 20 GHz tail.
YFD2HIgh	30000	Adjusts end of sweep tail during full sweep.
YFD15HIg	28000	Adjusts 15 to 20 GHz tail.
YFCSHIgh	10000	Adjusts single sweep tail during 2 to 20 GHz sweep.
YFDS2HIg	30000	Adjusts high band 18 GHz tail during full band, single sweep.
YFDS15HI	28000	Adjusts high band 18 GHz tail during 15 to 20 GHz single sweep.
YFTHIgh	5000	Adjusts 15 to 20 GHz start of sweep.
YFWHIgh	500	Adjusts full sweep, high band start of sweep.
YFXHIgh	100	Adjusts 15 to 20 GHz start of sweep.

To zero the unlevel array

1. On the synthesized sweeper, zero the unlevel array. Press:
   (SHIFT) SPECIAL (213) (Hz/s/ENTER)
2. Use the (⇑) and (⇓) keys to select ZERO UNL?y/ENTER and press (Hz/s/ENTER).

   The synthesized sweeper automatically zeros the unlevel array. When the process is complete the display reads CAL UNL ZERO.

To adjust the low band A, B, X, and T terms

Note If the grease pencil band break points are still marked on the oscilloscope display, remove the blanking pulse and verify their position. If they are not still marked on the display from the "DYO Delay" adjustment, mark them with a grease pencil. Then reconnect blanking.

1. On the synthesized sweeper, press: (PRESET) (ALC Mode)
2. Use the (⇧) and (⇩) keys until `ALC= Unleveled` is displayed in the right-hand display window.
3. Press (TIME) and use the (⇧) and (⇩) keys to step the sweep time between a 2 second sweep time and the fastest sweep. In fast sweep no point should drop more than 0.5 dB below the lowest point during slow sweep. If there is less than 0.5 dB difference, no low band adjustments are needed. Go to "To adjust the high band A, B, X, and T terms." If there is more than 0.5 dB drop, identify the lowest power point and make the appropriate low band adjustment. If the power drop is at the start of low band, adjust YFXLow and YFTLow. If the power drop is at the mid to the end of low band, adjust YFALow and YFBLow. Figure 2-24 and Figure 2-25 show examples of identifying the lowest points in low band for slow and fast sweeps.

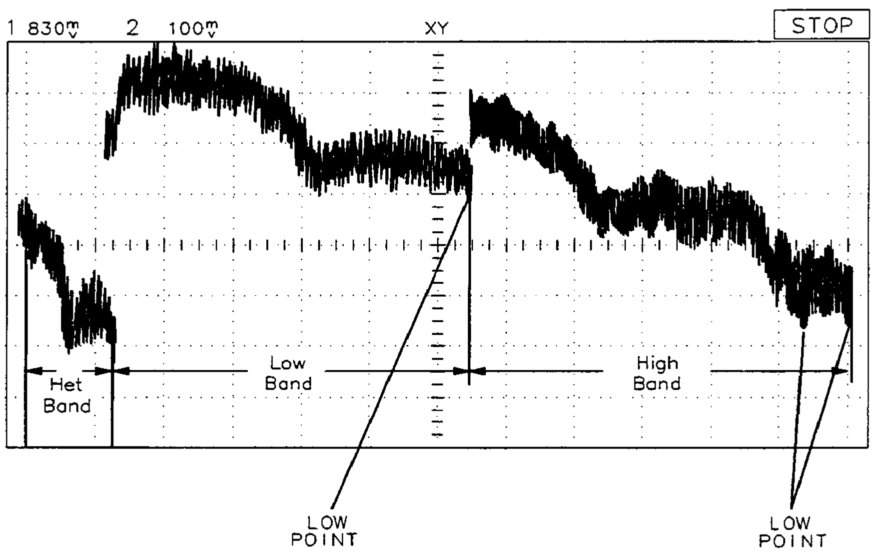


Figure 2-24. Low Power Points during Slow Sweep

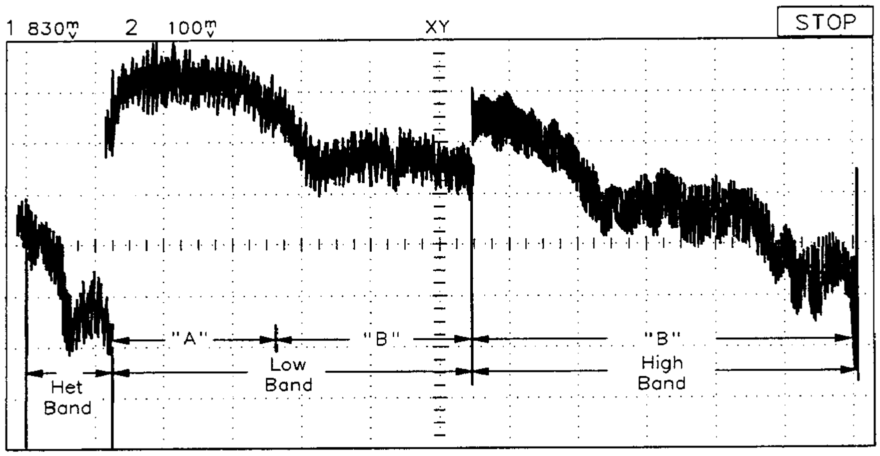


Figure 2-25. Low Power Points during Fast Sweep

4. Press (TIME) and use the (⇩) key to set the synthesized sweeper to its fastest sweep time.
5. Select the appropriate term for low band based on the location of the lowest power point. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (203) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select correct YF_Low term and press (Hz/s/ENTER).
6. Set the step size for changing the calibration constant values to 100. Press:
   (STEP SIZE) (100) (Hz/s/ENTER)

   If a smaller step size lets you achieve better results, change the step size as needed.
7. Use the (⇧) and (⇩) keys to adjust the calibration constant for the best overall power (least vertical shift) in low band without degrading the lowest power point.
8. Verify the adjustment by measuring the level of the lowest power point in low band: Note the level of the lowest point in low band during slow sweep, then increase the sweep speed. If the power at any point drops more than 0.5 dB below the low power point of the slow sweep, identify the appropriate YF_Low term and repeat the low band adjustment.

Note To determine a 1 dB change on the oscilloscope, change the synthesized sweeper's output power by 1 dB and notice the amount of change on the display at any point. Reset the power to the original level before continuing the adjustment.

To adjust the high band A, B, X, and T terms

1. On the synthesized sweeper, press:
   (START) (15) (GHz/dB(m))
   (TIME) (2) (Hz/s/ENTER)
2. Use the (⇑) and (⇓) keys to step the sweep time between a 2 second sweep time and the fastest sweep. In fast sweep no point should drop more than 0.5 dB below the lowest point during slow sweep. If there is more than 0.5 dB drop, continue on with the next step of this adjustment. If there is less than 0.5 dB drop, go to step 8. Figure 2-24 and Figure 2-25 show examples of identifying the lowest points in high band for slow and fast sweeps.
3. Use the (⇓) key to set the synthesized sweeper to its fastest sweep time.
4. Select the appropriate term to adjust the high band. If the power drop is in mid band, adjust YFAHigh. If the power drop is at the start of the sweep, iterate between YFXHigh and YFTHigh. If the power drop is at the end of the sweep, iterate between YFD15Hig and YFCHigh.

   On the synthesized sweeper, press:
   (SHIFT) SPECIAL (203) (Hz/s/ENTER)

   Use the (⇑) and (⇓) keys to select the correct YF_High term and press (Hz/s/ENTER).
5. Set the step size to 100. Press (STEP SIZE) (100) (Hz/s/ENTER)
6. Use the (⇑) and (⇓) keys to adjust the calibration constant for the greatest overall power in high band without degrading the lowest power point.
7. Verify the adjustment by measuring the level of the lowest power point in high band: Note the level of the lowest point in high band during slow sweep, then increase the sweep speed. If the power at any point drops more than 0.5 dB below the low power point of the slow sweep, identify the appropriate YF_High term and repeat the high band adjustment.
8. Reset the start frequency on the synthesized sweeper to sweep its entire frequency range.
9. Press (TIME) and use the (⇑) and (⇓) keys to step the sweep time from a 2 second sweep time to the fastest sweep. In fast sweep no point should drop more than 0.5 dB below the lowest point during slow sweep. If there is more than 0.5 dB difference, continue on with the next step of this adjustment. If there is less than 0.5 dB difference, go to "To adjust the 18 GHz tail."
10. Press (TIME) and use the (⇓) key to set the synthesized sweeper to its fastest sweep time.
11. Select the appropriate term to adjust the high band. If the power drop is in mid band, adjust YFBHigh. If the power drop is at the start of the sweep, adjust YFWHigh. If the power drop is at the end of the sweep, adjust YFD2High.
12. Select the appropriate term for high band. On the synthesized sweeper, press:
    (SHIFT) SPECIAL (203) (Hz/s/ENTER)

    Use the (⇑) and (⇓) keys to select the correct YF_High term and press (Hz/s/ENTER).
13. Set the step size to 500. Press (STEP SIZE) (500) (Hz/s/ENTER)
14. Use the (⇑) and (⇓) keys to adjust the calibration constant for the greatest overall power in high band without degrading the lowest power point.

15. Press (TIME) and use the (⇧) and (⇩) keys to vary the sweep speed. Note the drop in power between slow and fast sweep speeds. If the power drops more than 0.5 dB, repeat the YF_HIgh adjustment and recheck the 15 to 20 GHz adjustment.

To adjust the 18 GHz tail

1. On the synthesized sweeper, press:
   (START) (15) (GHz/dB(m))
2. Press (TIME) and use the (⇩) key to set the synthesized sweeper to its fastest sweep time.
3. Note the lowest power point.
4. Press (SINGLE TRIG) repeatedly. If the lowest power point during single sweep is more than 0.5 dB below the lowest power point in continuous sweep, continue with the next step of this adjustment. If the power does not drop more than 0.5 dB, go to step 8.
5. Press (SHIFT) SPECIAL (203) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select YFDS15Hi and press (Hz/s/ENTER).
6. Set the step size to 200. Press (STEP SIZE) (200) (Hz/s/ENTER)
7. Use the (⇧) and (⇩) keys to adjust the calibration constant while pressing single trigger until the lowest single sweep point is no more than 0.5 dB below the lowest point noted in continuous sweep (step 3).

   Figure 2-26 and Figure 2-27 show an example of an instrument before and after a factory adjustment.

Note If adjusting YFDS15HI will not bring the points within a 0.5 dB difference, select YODS15HI and adjust this calibration constant while monitoring A9TP6 until the 0.5 dB difference is achieved.

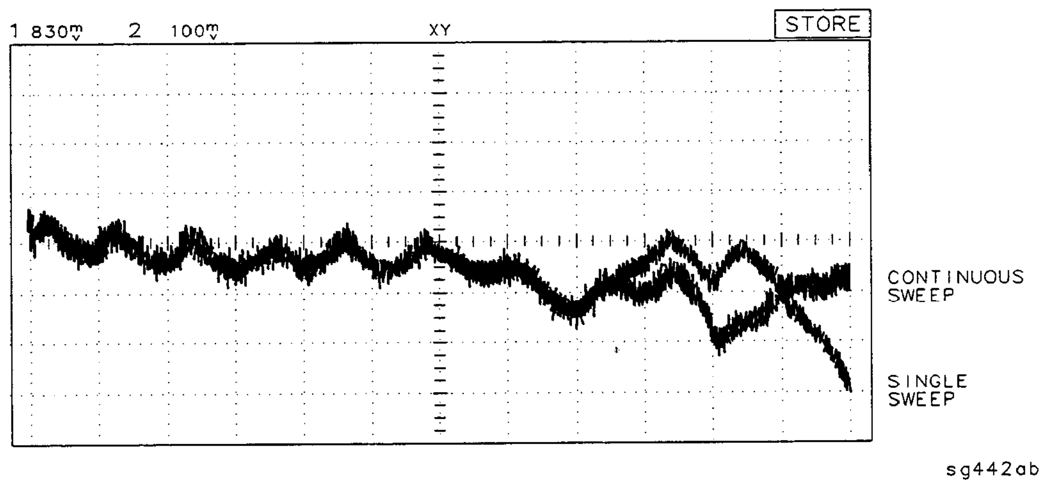


Figure 2-26. 18 GHz Tail Before YFDS15HI Adjustment

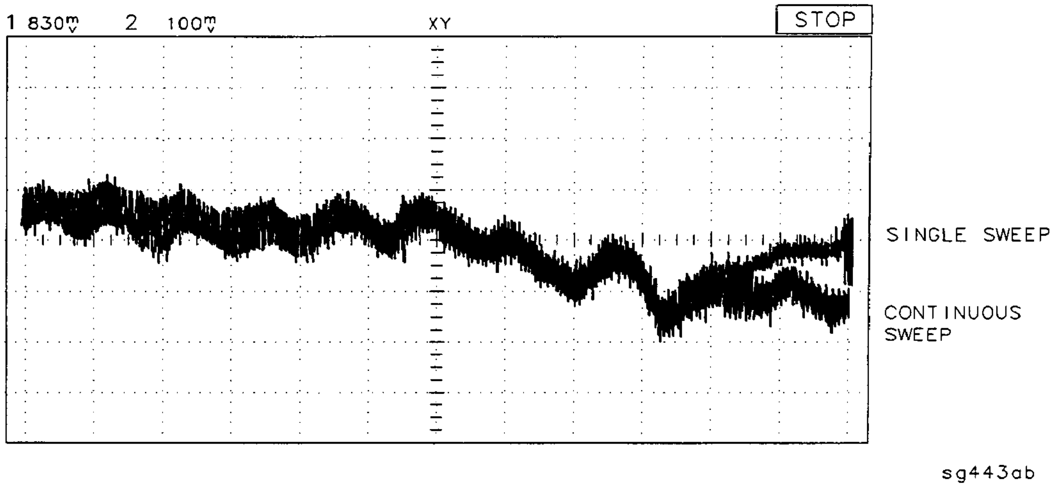


Figure 2-27. 18 GHz Tail after YFSD15HI Adjustment

8. Reset the start frequency on the synthesized sweeper to sweep its entire frequency range.
9. Press (TIME) and use the (⇓) key to set the synthesized sweeper to its fastest sweep time.
10. Note the lowest power point on the high band portion of the sweep.
11. Press (SINGLE TRIG) repeatedly. If the lowest power point during single sweep is more than 0.5 dB below the lowest power point in continuous sweep, continue with the next step of this adjustment. If the power does not drop more than 0.5 dB, the SAF adjustment is complete.
12. Press (SHIFT) SPECIAL (203) (Hz/s/ENTER)

    Use the (⇑) and (⇓) keys to select YFDS2HIg and press (Hz/s/ENTER).
13. Set the step size to 200. Press (STEP SIZE) (200) (Hz/s/ENTER)
14. Use the (⇑) and (⇓) keys to adjust the calibration constant while pressing single trigger. When the lowest single sweep point is no more than 0.5 dB below the lowest point noted in continuous sweep (step 10) the SAF adjustment is complete.

    Figure 2-28 shows an example of an instrument after YFDS2HIg was adjusted by the factory.

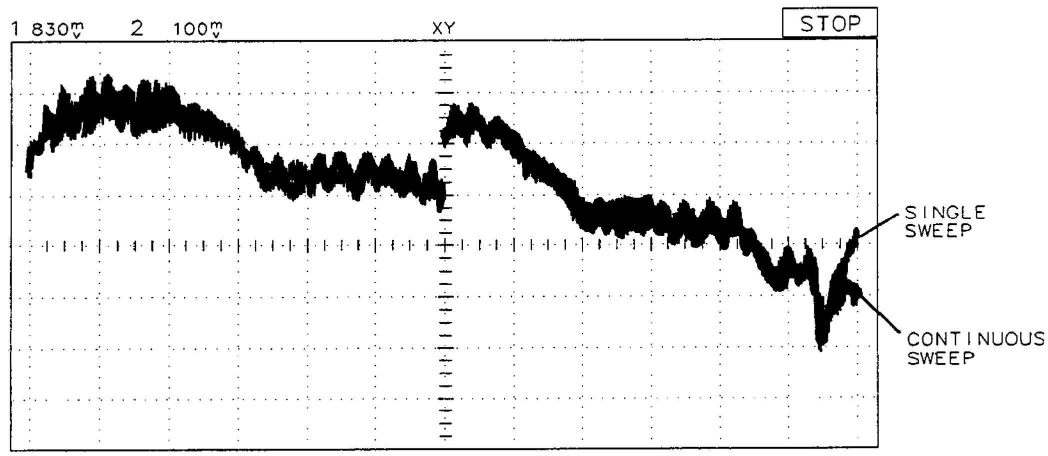


Figure 2-28. Completed YFDS2Hlg Adjustment

Adjustment Verification

The following steps verify that the DYO Delay and SAF Tracking adjustments are correct.

1. On the synthesized sweeper, press (PRESET).
2. Set the power level to the maximum leveled power specification for the instrument model. (Refer to Chapter 17, "Specifications and Options," in the *HP 83751A/B and HP 83752A/B Synthesized Sweepers User's Guide* if you are unsure of the correct power level.)
3. Press (TIME) and use the (⇩) key to set the synthesized sweeper to its fastest sweep time.
4. Iterate between continuous and single sweep and observe the display for `UNLOCK` and `UNLEV` annunciators. A correctly adjusted instrument will stay locked and leveled.

To complete the adjustments

1. If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
   (SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

Swept Frequency Accuracy
CW Frequency Accuracy
Maximum Leveled Power

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

ALC Detector and Logger (HP 83751A/2A Only)

Description

In this procedure the 10 dB step is calibrated, and the 0 dBm level and the −15 dBm level are set. All three adjustments are made through calibration constants. The 10 dB step is set using LBRKpoin, the 0 dBm point is set using LOFFset, and the −15 dBm point is set using DOFFset.

Recommended equipment

HP 436A/437B/438A power meter
HP 8485A power sensor
HP 8481A power sensor (Option 1ED only)

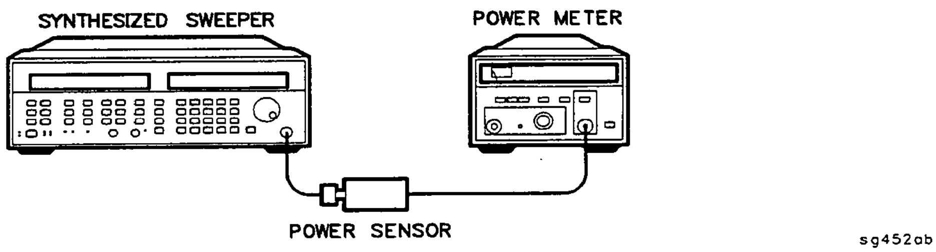


Figure 2-29. ALC Detector and Logger Adjustment Setup

To set up the equipment

1. Power on the synthesized sweeper.
2. Connect the equipment as shown in Figure 2-29.
3. Preset all instruments and let them warm up for at least 1 hour.
4. Zero and calibrate the power meter/sensor.

To enter the calibration constant starting values

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
2. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 204 CAL ALC selection.
3. Use the (⇧) and (⇩) keys until the first calibration constant from Table 2-3 is displayed in the right-hand display window. Press (Hz/s/ENTER).
4. Enter the starting value for that calibration constant using the numeric keypad and press (⇐).
5. Repeat steps 3 and 4 for each calibration constant in Table 2-3.

Table 2-3. Calibration Constant Starting Values

Calibration Constant	Starting Value
DOFFset	128
LOFFset	128
LBRKpoin	128

To zero the detector array

1. On the synthesized sweeper, zero the detector flatness array. Press: (SHIFT) SPECIAL (212) (Hz/s/ENTER)
2. Use the (⇑) and (⇓) keys to select ZERO DET?y/ENTER and press (Hz/s/ENTER).

   The synthesized sweeper automatically zeros the detector flatness array. When the process is complete the display reads CAL DET ZERO.

To adjust the log breakpoint (LBRKpoin)

1. Set the synthesized sweeper to a CW frequency of 3 GHz and the power level to 0 dBm.
2. Set the power meter for a relative measurement (zero reference).
3. Set the synthesized sweeper power level to +10 dBm.
4. On the synthesized sweeper, press: (SHIFT) SPECIAL (204) (Hz/s/ENTER)
5. Use the (⇑) and (⇓) keys to select the LBRKpoin calibration constant and press (Hz/s/ENTER).
6. Use either the front panel knob, the (⇑) and (⇓) keys, or enter values using the numeric keypad to adjust the log breakpoint for a 10.00 dB step. (Note: The following steps interact inversely and may require several iterations before the adjustments are complete.) If the relative value measured is less than 10 dB, decreasing the power meter reading will increase the actual step size. If the relative value measured is greater than 10 dB, increasing the power meter will decrease the step size. Increasing the LBRKpoin number decreases the power meter reading but increases the gain (step size.)
7. Repeat steps 1 through 6 until the step equals 10 ±0.01 dB.

To adjust the log offset (LOFFset)

1. Set the power meter to dB mode.
2. Set the synthesized sweeper to a CW frequency of 3 GHz and the power level to 0 dBm.
3. On the synthesized sweeper, press: (SHIFT) SPECIAL (204) (Hz/s/ENTER)
4. Use the (⇑) and (⇓) keys to select the LOFFset calibration constant and press (Hz/s/ENTER).
5. Use the front panel knob, the (⇑) and (⇓) keys, or enter values using the numeric keypad to adjust the log offset until the power meter displays 0.00 dBm.

To adjust the detector offset (DOFFset)

1. Set the synthesized sweeper to a CW frequency of 3 GHz.
2. If the synthesized sweeper has Option 1E1 (optional step attenuator), uncouple the attenuator. Press:
   (SHIFT) SPECIAL (6) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select Atten Auto= Off.
3. On the synthesized sweeper, set the output power to −15 dBm.
4. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
5. Use the (⇧) and (⇩) keys to select the DOFFset calibration constant and press (Hz/s/ENTER).
6. Use the (⇧) and (⇩) keys to adjust the detector offset calibration constant for a reading on the power meter as close to −15 dBm as possible (the DAC resolution is approximately 0.03 dB.)

To complete the adjustments

If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
(SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

Power Accuracy

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

ALC Detector and Logger (HP 83751B/2B Only)

Description

In this procedure the 10 dB step is calibrated, and the +7 dBm and the −10 dBm levels are set. All four adjustments are made through calibration constants. The 10 dB step is set using LBRKpoin, the +7 dBm point is set using LOFFset, the 0 dBm point is set using AMPOffs, and the −10 dBm point is set using DOFFset.

Recommended equipment

HP 436A/437B/438A power meter
HP 8485A power sensor
HP 8481A power sensor (Option 1ED only)

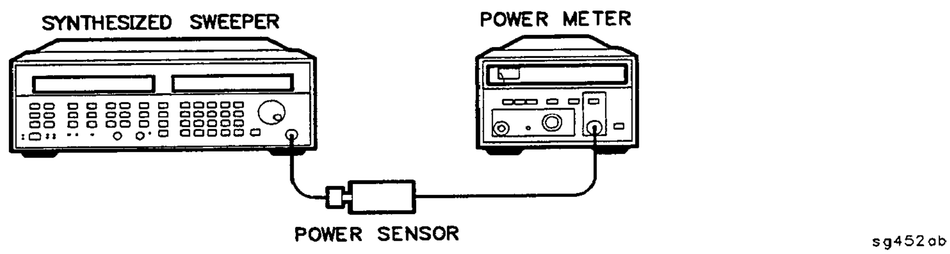


Figure 2-30. ALC Detector and Logger Adjustment Setup

To set up the equipment

1. Power on the synthesized sweeper.
2. Connect the equipment as shown in Figure 2-30.
3. Preset all instruments and let them warm up for at least 1 hour.
4. Zero and calibrate the power meter/sensor.

To enter the calibration constant starting values

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
2. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 204 CAL ALC selection.
3. Use the (⇧) and (⇩) keys until the first calibration constant from Table 2-4 is displayed in the right-hand display window. Press (Hz/s/ENTER).
4. Enter the starting value for that calibration constant using the numeric keypad and press (⇐).
5. Repeat steps 3 and 4 for the first three calibration constants in Table 2-4.
6. For the last calibration constant in Table 2-4, press:
   (SHIFT) SPECIAL (201) (Hz/s/ENTER)

Then repeat steps 2 and 3 to enter the starting value.

Table 2-4. Calibration Constant Starting Values

Calibration Constant	Default Value
DOFFset	128
LOFFset	128
LBRKpoin	128
AMPOffs	7000

To zero the detector array

1. On the synthesized sweeper, zero the detector flatness array. Press:
   (SHIFT) SPECIAL (212) (Hz/s/ENTER)
2. Use the (⇧) and (⇩) keys to select ZERO DET?y/ENTER and press (Hz/s/ENTER).

   The synthesized sweeper automatically zeros the detector flatness array. When the procedure is complete the display reads CAL DET ZERO.

To adjust the amplifier offset

1. On the synthesized sweeper, set the power level to 0 dBm.
2. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (ENTER)
3. Use the (⇧) and (⇩) keys to select AMPOffs and press (Hz/s/ENTER).
4. Use the (⇧) and (⇩) keys to adjust the AMPOffs calibration constant for a 0 dBm power meter reading.

To adjust the log breakpoint (LBRKpoin)

1. Set the synthesized sweeper to a CW frequency of 3 GHz and the power level to +7 dBm.
2. Set the power meter for a relative measurement (zero reference).
3. Set the synthesized sweeper power level to +17 dBm.
4. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
5. Use the (⇧) and (⇩) keys to select the LBRKpoin calibration constant and press (Hz/s/ENTER).
6. Use either the front panel knob, the (⇧) and (⇩) keys, or enter values using the numeric keypad to adjust the log breakpoint for a 10.00 dB step. (The following steps interact inversely and may require several iterations before the adjustments are complete.) If the relative value measured is less than 10 dB, decreasing the power meter reading will increase the actual step size. If the relative value measured is greater than 10 dB, increasing the power meter will decrease the step size. Increasing the LBRKpoin number decreases the power meter reading but increases the gain (step size.)

7. Repeat steps 1 through 6 until the step equals 10 ±0.01 dB.

To adjust the log offset (LOFFset)

1. Set the power meter to dB mode.
2. Set the synthesized sweeper to a CW frequency of 3 GHz and the power level to +7 dBm.
3. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
4. Use the (⇧) and (⇩) keys to select the LOFFset calibration constant and press (Hz/s/ENTER).
5. Use the front panel knob, the (⇧) and (⇩) keys, or enter values using the numeric keypad to adjust the log offset until the power meter displays +7.00 dBm.

To adjust the detector offset (DOFFset)

1. Set the synthesized sweeper to a CW frequency of 3 GHz.
2. If the synthesized sweeper has Option 1E1 (optional step attenuator), uncouple the attenuator. Press:
   (SHIFT) SPECIAL (6) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select Atten Auto= Off.
3. On the synthesized sweeper, set the output power to −10 dBm.
4. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
5. Use the (⇧) and (⇩) keys to select the DOFFset calibration constant and press (Hz/s/ENTER).
6. Use the (⇧) and (⇩) keys to adjust the detector offset calibration constant for a reading on the power meter as close to −10 dBm as possible (the DAC resolution is approximately 0.03 dB.)

To complete the adjustments

If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
(SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

Power Accuracy

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

ALC Modulator Offset and Gain

Description

In this procedure, the ALC modulation offset and gain calibration constants are adjusted to linearize the ALC modulator's response to the ALC power level reference voltage. The synthesized sweeper is set for a power sweep across the entire leveled ALC range. The integrator level signal on the ALC board is monitored to verify linearity. If necessary, the modulator offset values are modified.

Recommended equipment

HP 54111D oscilloscope
HP 10431A 10:1 oscilloscope probe

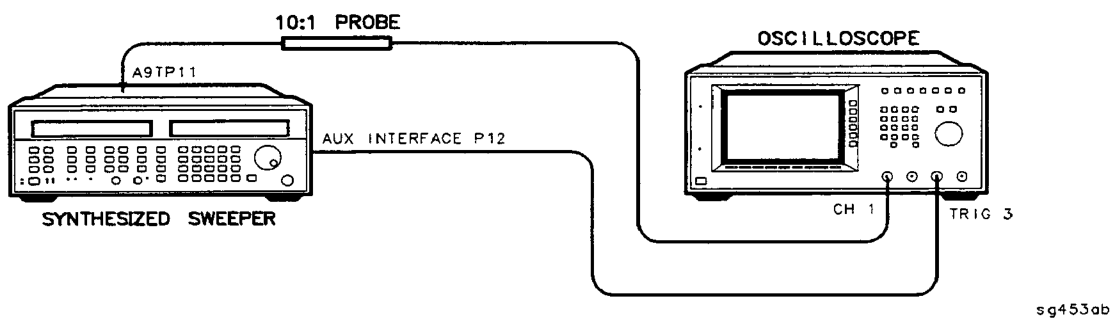


Figure 2-31. ALC Modulator Gain and Offset Adjustment Setup

To set up the equipment

1. Power on the synthesized sweeper.
2. Preset all instruments and let them warm up for at least 1 hour.
3. Connect the equipment as shown in Figure 2-31:
   a. Connect oscilloscope channel 1 through the 10:1 probe to the "Integrator Out" A9 TP11 and connect the ground lead to A9TP9 "GND."
   b. Connect the oscilloscope trigger 3 input to the rear panel AUXILIARY INTERFACE connector pin 12 "L Retrace" of the synthesized sweeper.
4. Set the synthesized sweeper CW frequency as follows:

   HP 83752A/B: 1 GHz

   HP 83751A/B: 3 GHz
5. Set the power level as follows:

   HP 83751A/2A: −5 dBm

   HP 83751B/2B: 0 dBm
6. On the synthesized sweeper, press: (POWER SWEEP) (25) (GHz/dB(m))

   The UNLEV indicator should turn on. If not, increase the power sweep until it does.

7. Press (TIME) and use the (⇧) key to set the synthesized sweeper to its fastest sweep time.
8. On the oscilloscope, set:

```
Display:
   Display Mode      Repetitive
   Averaging         Off
   Screen            Single
   Graticule         Grid

Channel 1:
   Display           On
   Volts/Division    100 mV
   Offset            As Necessary
   Input Coupling    dc
   Input Impedance   1 MΩ

Channel 2:
   Display           Off

Timebase:
   Time/Division     1 ms
   Delay             0 ms
   Delay Ref         Left
   Sweep             Triggered

Trigger:
   Trigger Mode      Edge
   Trigger Src       Trig 3
   Trigger Level     1.6 V
   Trigger Slope     Pos
```

To adjust the band 0 modulator offset and gain

Note For the HP 83751A/B, skip this adjustment and continue with the band 1 adjustment that follows.

1. Center the trace on the oscilloscope as necessary with the channel 1 offset.
2. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
3. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 204 CAL ALC selection.
4. Use the (⇧) and (⇩) keys to select the MOHet calibration constant and press (Hz/s/ENTER).
5. Use the (⇧) and (⇩) keys to adjust the modulator offset to minimize the tail at the right side of the sweep. (See adjustment "A" in Figure 2-32.)
6. On the synthesized sweeper, press (⇐).
7. Use the (⇧) and (⇩) keys to select the MGHet calibration constant and press (Hz/s/ENTER).

8. Use the ⇧ and ⇩ keys to adjust the modulator gain to minimize the overall slope of the trace. (See adjustment "B" in Figure 2-32.)
9. Repeat both adjustments for the flattest trace.

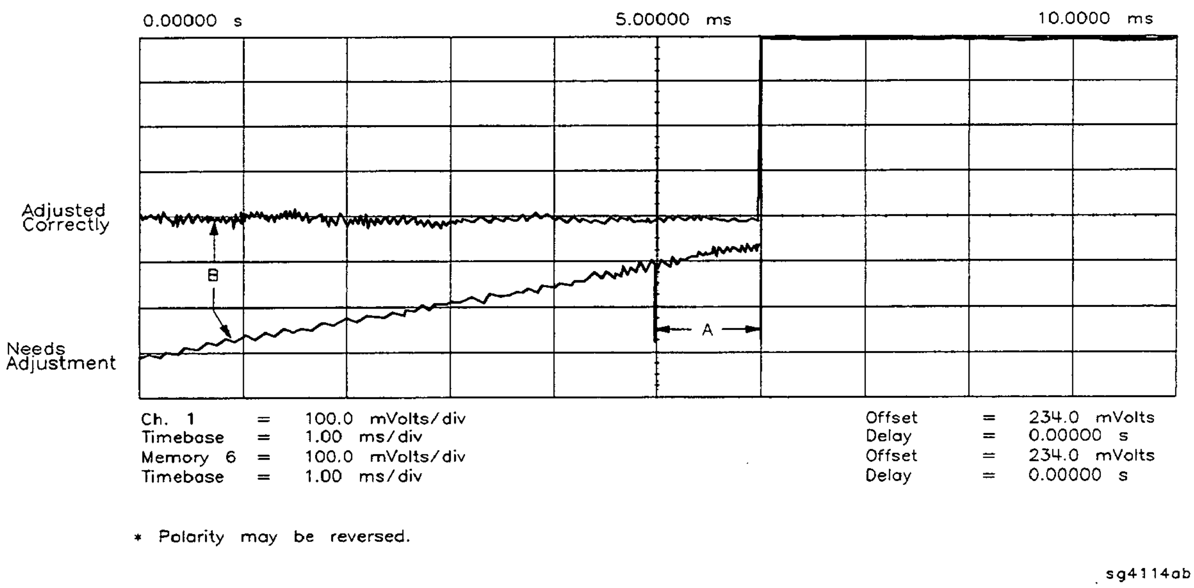


Figure 2-32. A and B Adjustments for Offset and Gain

To adjust the band 1 modulator offset and gain

1. Set the synthesized sweeper to a CW frequency of 3 GHz.
2. Center the trace on the oscilloscope as necessary with the channel 1 offset.
3. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
4. Use the ⇧ and ⇩ keys to select the MOLow calibration constant and press (Hz/s/ENTER).
5. Use the ⇧ and ⇩ keys to adjust the modulator offset to minimize any tail at the right side of the trace.
6. On the synthesized sweeper, press (⇐).
7. Use the ⇧ and ⇩ keys to select the MGLow calibration constant and press (Hz/s/ENTER).
8. Use the ⇧ and ⇩ keys to adjust the modulator gain to minimize the overall slope of the trace.
9. Repeat both adjustments for the flattest trace.

To adjust the band 2 modulator offset and gain

1. Set the synthesized sweeper to a CW frequency of 15 GHz.
2. Center the trace on the oscilloscope as necessary with the channel 1 offset.
3. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
4. Use the (⇧) and (⇩) keys to select the MOHigh calibration constant and press (Hz/s/ENTER).
5. Use the (⇧) and (⇩) keys to adjust the modulator offset to minimize the tail at the right side of the trace.
6. On the synthesized sweeper, press (⇐).
7. Use the (⇧) and (⇩) keys to select MGHigh and press (Hz/s/ENTER).
8. Use the (⇧) and (⇩) keys to adjust the modulator gain to minimize the overall slope of the trace.
9. Repeat both adjustments for the flattest trace.

To complete the adjustments

If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
(SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

Power Accuracy
Maximum Leveled Power

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

Scalar Pulse Symmetry

Description

In this procedure scalar pulse symmetry is adjusted by setting the pulse duration to a 50% duty cycle or a −3 dB level.

Recommended equipment

HP 436A/437B/438A power meter
HP 8485A power sensor
HP 8481A power sensor (Option 1ED only)

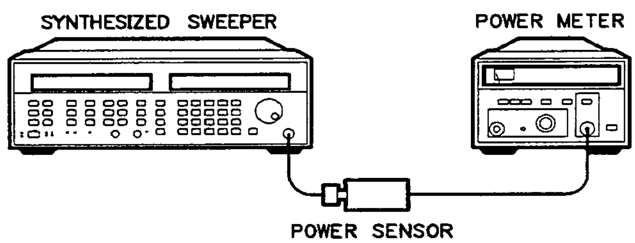


Figure 2-33. Scalar Pulse Symmetry Adjustment Setup

To set up the equipment

1. Power on the synthesized sweeper.
2. Preset all instruments and let them warm up for at least 1 hour.
3. Zero and calibrate the power meter/sensor.
4. Set the cal factor for 10 GHz.
5. Connect the equipment as shown in Figure 2-33.
6. Set the synthesized sweeper to a CW frequency of 10 GHz and a power level of 0 dBm.
7. Set the power meter for a relative measurement.

To adjust the PW scalar calibration constant

1. On the synthesized sweeper, turn on scalar pulse modulation. Press (PULSE MODE). Press this key repeatedly until Pulse=Scalar is displayed.
2. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (204) (Hz/s/ENTER)
3. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 204 CAL ALC selection.
4. Use the (⇧) and (⇩) keys to select the PWSCalar calibration constant and press (Hz/s/ENTER).
5. Adjust the calibration constant with the (⇧) and (⇩) keys until the power meter reads as close to −3 dB as possible.

To complete the adjustments

If these are the last calibration constants you will be adjusting, save the new values in EEPROM by pressing:
(SHIFT) SPECIAL (209) (Hz/s/ENTER) (Hz/s/ENTER)

Post-adjustment tests to be performed

None

What to do in case of difficulty

Refer to Chapter 5, "Troubleshooting."

Power Flatness

Description

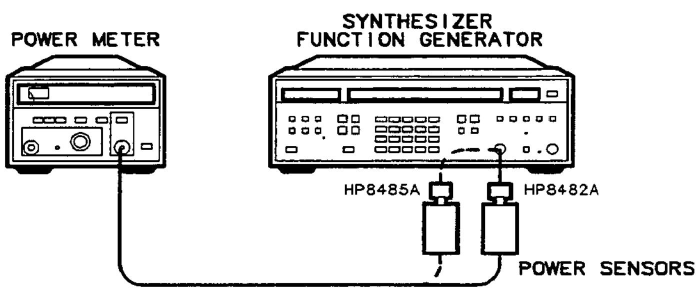
This procedure is used to adjust the internal detector flatness and the unleveled flatness. It should be performed on all instruments except those with Option 1ED.

In this procedure the HP 8485A power sensor is calibrated for two additional frequencies, 10 MHz and 20 MHz, using an HP 3325A synthesizer and an HP 8482A power sensor. The cal factors are then loaded into the HP 437B power meter. The adjustment is performed by connecting the HP 8485A to the synthesized sweeper's RF output and connecting an HP-IB cable between the power meter and the synthesized sweeper. (No other HP-IB connection is allowed during this adjustment.)

Recommended equipment

HP 437B or HP 70100A power meter
HP 3325A synthesizer/level generator (10 MHz signal source)
HP 8485A power sensor
HP 8482A power sensor

To calibrate the power sensor at 10 MHz and 20 MHz (HP 83752A/B only)



sg454ob

Figure 2-34. Power Sensor Calibration Setup

1. Preset all instruments and let them warm up for at least 1 hour.
2. Zero and calibrate the HP 8482A power sensor.
3. Set the cal factor for 10 MHz.
4. Connect the HP 8482A power sensor to the synthesizer as shown in Figure 2-34.
5. Set the synthesizer to 10 MHz, 0 dBm, 20 MHz sine wave.
6. On the synthesizer, use the ⇧ key to set the power meter reading to 0.00 dBm.
7. Replace the HP 8482A power sensor with the HP 8485A.
8. Zero and calibrate the power sensor.
9. Connect the power sensor to the synthesizer.

10. On the power meter select dBm/watts. Write down the mW value as the cal factor for 10 MHz.
    Example: mW=982 Cal factor=98.2

    10 MHz Cal Factor __________

11. Repeat steps 2 through 10 for 20 MHz.

    20 MHz Cal Factor __________

To set up the equipment

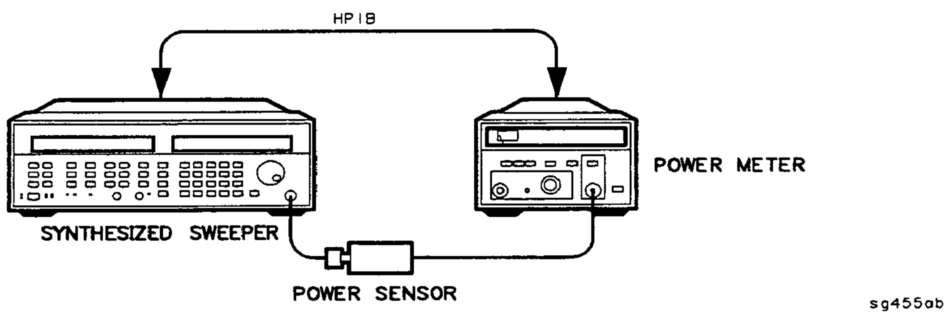


Figure 2-35. Power Flatness Adjustment Setup

1. On the power meter, select the HP 8485A power sensor.
2. Enter the cal factors for each frequency point. For the HP 83752A/B, use the cal factors just determined for 10 and 20 MHz.
3. Connect the power meter/sensor to the synthesized sweeper as shown in Figure 2-35.
4. On the synthesized sweeper, select the correct power meter. Press:
   (SHIFT) SPECIAL (12) (Hz/s/ENTER)

   Use the (⇧) and (⇩) keys to select either the HP 437B or the HP 70100A power meter. (These are the only power meters that can internally store the power sensor cal factors.)
5. On the synthesized sweeper, press (⇐) to return to menu item special 12. Press the (⇧) key to select menu item 13 `Power Meter Address` and press (Hz/s/ENTER). If necessary, change the power meter address.

Note The power meter default address is 13.

To calibrate the internal detector flatness

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (311) (Hz/s/ENTER)
2. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 311 ADJUSTMENTS selection.
3. Use the (⇧) and (⇩) keys to select Int Det and press (Hz/s/ENTER).

   The synthesized sweeper will now step through each frequency, calibrating and storing power flatness information. The adjustment is complete when the display returns the start and stop frequencies.

To calibrate the unleveled flatness

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (311) (Hz/s/ENTER)
2. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 311 ADJUSTMENTS selection.
3. Use the (⇧) and (⇩) keys to select Unlevel and press (Hz/s/ENTER).

   The synthesized sweeper will now step through each frequency, calibrating and storing power flatness information. The adjustment is complete when the display returns the start and stop frequencies.

Post-adjustment tests to be performed

Power Flatness
Power Accuracy

What to do in case of difficulty

1. Ensure that the cal factors are loaded into the power meter.
2. Verify that you are using an HP 437B or and HP 70100A power meter.
3. Type-N connectors are not specified above 18 GHz.

Downloading Firmware

Description

In this procedure firmware is downloaded from the "Firmware Upgrade Disks" to the synthesized sweeper. A disk drive is connected to the synthesized sweeper via HP-IB. (No other connections on the HP-IB are allowed.) The automated procedure for downloading the firmware is activated through a (SHIFT) SPECIAL function.

Recommended equipment

HP 9122D disk drive

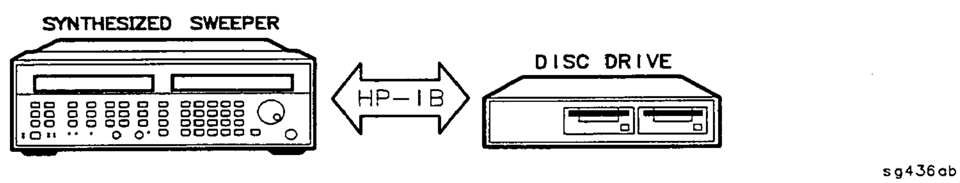


Figure 2-36. Downloading Firmware Equipment Setup

To set up the equipment

1. Connect the equipment as shown in Figure 2-36. No other connections on the HP-IB are allowed.
2. Turn power on to both instruments.
3. Insert both firmware disks into the disk drive.

To download the firmware

1. On the synthesized sweeper, press:
   (SHIFT) SPECIAL (309) (Hz/s/ENTER)
2. If you are instructed to enter your password, do so and then press (Hz/s/ENTER) at the 309 NEW FIRMWARE selection.

   The display will read NEW FMWR?y/ENTER
3. Press (Hz/s/ENTER) to start downloading firmware. If you have decided *not* to download firmware, press any key except (Hz/s/ENTER).

   When the procedure is complete the left display shows the start and stop frequencies and the right display shows the new firmware revision.

Post-adjustment tests to be performed

None

What to do in case of difficulty

1. If you are downloading firmware into an instrument with a display or keyboard that is not functional, set up the equipment as in this procedure. Power off the synthesized sweeper and open switch position 5 on A4S1 (move the switch down). The firmware will download automatically. After the procedure is finished, power off the synthesized sweeper and close switch position 5.
2. If you are using a disk drive with only a single drive, be sure to insert disk number one into the drive first. The display will prompt you to remove the first disk and insert the second disk.
3. If you had not inserted the disks into the disk drive before you initiated the downloading procedure, an error message will indicate that no disks are found. Power off the instrument, insert the disks, and restart the downloading procedure.
4. Make certain that the disk drive is the only thing connected on the HP-IB.

3. Automated Tests

3

Automated Tests

The HP 83750 Series Service Support Software disks contain the program and supporting files necessary to run the automated tests for your synthesized sweeper. The HP8375x A/B Performance Test Program consists of performance verification and adjustment routines. These automated tests round out the course of performance verification and adjustment procedures described in chapters 1 and 2. They are designed to be done quickly, to use minimal test equipment, and to give you confidence that the instrument is working properly.

These tests are automated and computer-controlled; the performance test program takes you through each step of the process, and tells you how and when to connect the necessary equipment.

What you'll find in this chapter

- How to install and use the service support software.
- What equipment is required to perform the automated tests.
- What each automated test does.

Required test equipment

To perform all of the automated tests, you must have *all* the test equipment listed in Table 3-1—either the default model or a supported alternate—and all the accessories listed in Table 3-2. The service support software supports only the recommended test equipment.

Table 3-1. Required Test Equipment

Required Equipment	Default Model	Supported Alternates
Power Meter	HP 438A	HP 436A, HP 70100A
Low Power Sensor*	HP 8485D	HP 8487D
Power Sensor	HP 8485A	HP 8487A
DVM	HP 3456A	HP 3458A, HP3457A, HP 70110A
* Option 1E1 only.		

Table 3-2. Required Accessories

Required Accessory	Model
Precision 30 dB Attenuator*	HP 11708A
20 dB Attenuator†	HP 8493C Opt. 010
* Option 1E1 only. † Used as a 50 ohm termination for the RF output.	

Computer keyboard compatibility and mouse operation

These instructions are based on an HP 9000 Series 200 or 300 controller with an HP 46021A keyboard. The service support software supports several input devices; it will detect the keyboard you are using and will display the appropriate key commands. However, keystrokes and text differences may appear in the softkeys and menus displayed on-screen. If you are using an HP 98203C keyboard, see "Using an HP 98203C keyboard with a Series 200 or 300 computer", below.

Using an HP 46021A keyboard with a Series 300 computer

If you use an HP 46021A keyboard (ITF keyboard) with a Series 300 computer, the service support software will assume you have a mouse or a trackball. See "Using a mouse with a Series 300 computer".

- To highlight your preference, press the (▲) or (▼) keys.
- To choose the highlighted item, press (Select). To save your choice and return to the menu, press (Return).
- To exit the menu, press (▼).

Using an HP 98203C keyboard with a Series 200 or 300 computer

If you use an HP 98203C (Nimitz) keyboard, the equivalent keys are:

HP 46021A Keyboard	HP 98203C Keyboard*
(▾) (home)	(Enter) or (Continue)
(Delete line)	(DEL LN)
(Return)	(Enter)
(Select)	(Enter)
(Stop)	(Pause)
(Menu) Continue	(Continue)
* Keystrokes are identical on the Series 200 keyboard.	

- To highlight an item in the menu, use (▲) and (▼), or turn the keyboard knob.
- To choose the highlighted item, press (ENTER).
- To exit the menu, highlight QUIT or EXIT, and press (Return). If neither QUIT nor EXIT is displayed, press (Continue) to exit.

Using a mouse with a Series 300 computer

The service support software displays the choices available in each menu screen.

- Slide the mouse up or down to highlight your preference.
- To choose the highlighted item, press the left-hand button on the mouse or slide the mouse to the right.
- To exit the menu, press QUIT or EXIT if they are displayed in a menu. If neither QUIT nor EXIT is displayed, slide the mouse to the left to exit.

Step 1. Set up the hardware for automated testing

To run the service support software, you'll need an HP 9000 Series 200 or 300 computer, with:

- at least 2.5 to 4 megabytes of RAM (depending on the display configuration)
- an HP-IB interface
- a 3.5 inch double-sided flexible disk drive
- a hard disk drive with 4 megabytes available space *(optional)*

1. Connect the synthesized sweeper to the computer port.
   - If the computer has an HP 98624A HP-IB interface:
     a. Connect your synthesized sweeper to the port labeled HP-IB SELECT CODE 8.
     b. Check that the address switch on the HP 98624A HP-IB interface matches the HP-IB controller device address.
     c. If necessary, refer to the *HP 9000 Series 200/300 Peripheral Installation Guide, Volume I.*
   - If the computer has an HP-IB interface other than an HP 98624A:
     a. Connect the synthesized sweeper to the port labeled HP-IB SELECT CODE 7.
2. Connect the HP-IB cables from the test equipment to the computer's HP-IB SELECT CODE 7 port.
3. If you're using an external disk drive, connect its HP-IB to the HP-IB SELECT CODE 7 port on the computer, using a 0.5 meter HP-IB cable (HP 10833D, or a similar cable).

   Occasionally disk drives exhibit unpredictable behavior when sharing the HP-IB with instruments. If this happens, connect the disk drive to a separate HP-IB interface.
4. Set the external test equipment and the synthesized sweeper line switches to ON. Allow the equipment to warm up as specified for the automated tests.
5. Turn on the computer (and the external disk drive).

Loading BASIC and BIN files

To load and run the service support software, you must have a BASIC programming language and the appropriate binary files loaded in the computer.

1. Load BASIC 5.13 or later, with the BIN files listed below, into the HP 9000 Series 200 or 300 computer. If necessary, refer to an HP BASIC reference manual.

Table 3-3. Required Bin Files

CLOCK	DCOMM†	GRAPHX	MAT
CRTA	DISC	HFS*	MS
CRTB	EDIT	HPIB	PDEV‡
CRTX	ERR	IO	SRM†
CS80	GRAPH	KBD	XREF‡

* Optional: required only for HFS (hierarchical file system) environment.
† Optional: required only for SRM (shared resource management) environment.
‡ Optional: required only for DEBUG.

Step 2. Install the HP 83750 Series Service Support Software on an SRM or HFS hard disk

Note We recommend you install the service support software on, and run the tests from, a hard disk drive. If you want to run the tests from a flexible disk drive, see "Optional: Run the service support software from flexible disks".

This step is a general procedure for installing the service support software on an SRM (shared resource manager) or HFS (hierarchical file structure) hard disk system. For detailed information on creating directories and copying files, refer to the appropriate SRM or HFS hard disk manuals.

The service support software for the HP 83750 series synthesized sweeper comprises these files:

Disk 1	INSTALL
	CSUBS
	UT_SUBSO
	CSUBS6
	CSUBS6_UX
	CUSBS5_UX
	OPV
Disk 2	C_TSCRIPT
	OPV_2
	TSCRIPT
	TESTINFO
	OPTIONS
	INFO
	MUT_INFO
	ADDR_DEFS
	STE_INTFC
	UT_SUBSO

Note If a disk is damaged or altered, it can't be ordered individually; you must order the entire set of disks to replace any one disk. If you will be running the service support software from an SRM or HFS hard disk (the recommended process), the files you install on the hard disk will be your backups. Keep the original disks in a safe place.

Assign the MSI

1. Insert disk 1 of the service support software in the disk drive.
2. Assign the MSI (mass storage is:) to the 3.5 inch double-sided flexible disk drive and press (Return).

For example, to assign MSI to a hard disk drive with an address of 700, type:

```
MSI ":,700,0"
```

Copy the program files onto the hard disk

3. Type `LOAD "INSTALL",1`
4. Press (Return).
5. The program will prompt you to enter the MSVS (mass storage volume specifier) of your flexible disk drive. Enter the address and press (Return).

   For example:

   ```
   : ,700,1
   ```

6. The program will prompt you to enter the MSVS of your hard disk. Enter the address and press (Return).
7. The program will prompt you for the directory path where you want to install the service support software.

   `/OPV9000/SOURCES/8375X/` is the default; if you want the software installed in another directory, substitute that path for the default path shown on the display. Press (Return).

Note The default shows leading and trailing slashes. Be sure your directory path contains these slashes.

8. When prompted, remove disk 1 and insert disk 2. Press `Continue`.

   If you have an HP 46021A keyboard, and the `Continue` softkey does not appear on the display, press (Menu). If you have an HP 98203C keyboard, refer to "Using an HP 98203C keyboard with a Series 200 or 300 computer".

9. Continue at "Step 3. Load the HP8375x A/B Performance Test Program".

Optional: Run the service support software from flexible disks

Note If a disk is damaged or altered, it can't be ordered individually; you must order the entire set of disks to replace any one disk. If you will be running the software from flexible disks, the installation routine will prompt you to make backup copies of the program disks.

Initialize new disks

1. Before making backup copies of the service support software on new flexible disks, you must initialize the disks.

   For example:

   ```
   INITIALIZE ":,700,0",2,3
   ```

   You must use format option 3, but the MSVS and interleave factor are specific to your system.

Assign the MSI

2. Insert disk 1 of the service support software in the disk drive.
3. Assign the MSI (mass storage is:) to the drive you will use as the default drive.

   For example:

   ```
   MSI ":,700,0"
   ```

Make working copies of service support software disks

4. Type `LOAD "INSTALL",1` and press (Return).
5. The program will prompt you when to insert the initialized disks. When you have created the working disks, store the original service support software disks in a safe place.

Load and run the HP8375x A/B Performance Test Program

6. Type `LOAD "OPV",1` and press (Return).
7. When prompted, remove disk 1 and insert disk 2. Press `Continue`.

   If you have an HP 46021A keyboard, and the `Continue` softkey does not appear on the display, press (Menu). If you have an HP 98203C keyboard, refer to "Using an HP 98203C keyboard with a Series 200 or 300 computer".

8. Continue at "Step 4. Enter information about your synthesized sweeper".
9. When the information about the UUT is correct, press (▼).

Step 3. Load the HP8375x A/B Performance Test Program

1. Assign the MSI (mass storage is:) to the directory path where the program is installed.

   For example:

   ```
   MSI ":,700,0"
   ```

2. Type `LOAD "OPV",1` and press (Return).
3. The program will prompt you to insert disk 2, press `Continue` after you have inserted the disk.
4. A menu will appear prompting you to choose between various model numbers. Make your selection by using the (▼) and (▲) keys to highlight the desired model number.
5. Press (Select).

```
= SPECIFIC MODEL? =
HP83751A
HP83751B
HP83752A
HP83752B
```

Note The *Help* utility for this software is inoperable.

Leaving the HP8375x A/B Performance Test Program

To stop a test, to back up a menu screen, or to exit the performance test program, press (▼).

Step 4. Enter information about your synthesized sweeper

To ensure that test records are accurate and that the correct tests are performed, you'll need to enter complete information about the synthesized sweeper you're testing—the unit under test (UUT).

```
=============== UUT: HP 83751A ===============
SERIAL NUMBER
ADDRESS TYPE    HP-IB
ADDRESS         719
CONTROLLER
OPTIONS
TEMPERATURE     23.0 DEG C
HUMIDITY        50.0 %
LINE FREQUENCY  60 Hz
```

1. Press (Select) to select SERIAL NUMBER.
2. Type the instrument's entire ten-digit serial number and press (Return).
3. Review the other items in the list to determine if the information needs to be changed.
4. When all the information is correct, press (▼) to continue to the next test.

Note Use the left and right arrow keys (▼) and (▲) to highlight an item, then press (Select) to move to the data line in the right-hand column. Press (Return) to save the selected data and to return to selection mode. Press (▼) to continue to the next menu screen.

Changing the default HP-IB address for the UUT

If your synthesized sweeper is set to an address other than the factory preset address of 719, you may modify the software to use the synthesized sweeper's actual address.

```
=============== UUT: HP 83751A ===============
SERIAL NUMBER   0000A00000
ADDRESS TYPE    HP-IB
ADDRESS          719
CONTROLLER
OPTIONS
TEMPERATURE     23.0 DEG C
HUMIDITY        50.0 %
LINE FREQUENCY  60 Hz
```

5. Use (▲) or (▼) to highlight ADDRESS. Press (Select) to move the cursor to the right-hand column.
6. Use (◄) or (►) to move the cursor to the digit you want to change, then use (▼) or (▲) to change the number.
7. Press (Return).
8. Review the other items in the list to determine if the information needs to be changed.
9. When all the information is correct, press (▼) to continue to the next test.

Entering the option of the UUT

If your synthesized sweeper is an Option 1E1 or 1ED, it must be entered so that the correct tests are performed.

```
=============== UUT: HP 83751A ===============
SERIAL NUMBER    0000A00000
ADDRESS TYPE     HP-IB
ADDRESS          719
CONTROLLER
OPTIONS
TEMPERATURE      23.0 DEG C
HUMIDITY         50.0 %
LINE FREQUENCY   60 Hz
```

10. Use (▲) or (▼) to highlight OPTIONS. Press (Select) to display the options menu.

```
=UUT OPTIONS=
1E1          NO
1ED          NO
```

11. Use (▼) or (▲) to highlight the desired option, then press (Select) to change the "NO" to a "YES".
12. When all the information is correct, press (▼) to continue.

Changing the temperature setting

If you are running the service support software from a hard disk, you may enter the ambient temperature of the area in which the synthesized sweeper is operating. This temperature data becomes part of the test record.

```
=============== UUT: HP 83751A ===============
SERIAL NUMBER    0000A00000
ADDRESS TYPE     HP-IB
ADDRESS          719
CONTROLLER
OPTIONS          1E1
TEMPERATURE       23.0 DEG C
HUMIDITY         50.0 %
LINE FREQUENCY   60 Hz
```

13. Use (▲) or (▼) to highlight TEMPERATURE. Press (Select) to move the cursor to the right-hand column.

    The default temperature is 23.0 degrees Celsius. Record the temperature only in degrees Celsius.

14. Use (◀) or (▶) to move the cursor to the digit you want to change, then use (▼) or (▲) to change the number.
15. Press (Return).
16. Review the other items in the list to determine if the information needs to be changed.
17. When all the information is correct, press (▼) to continue to the next test.

Changing the humidity setting

If you are running the service support software from a hard disk, you may enter the humidity of the area in which the synthesized sweeper is operating. This humidity data becomes part of the test record.

```
=============== UUT: HP 83751A ===============
SERIAL NUMBER    0000A00000
ADDRESS TYPE     HP-IB
ADDRESS          719
CONTROLLER
OPTIONS          1E1
TEMPERATURE      23.0 DEG C
HUMIDITY          50.0 %
LINE FREQUENCY   60 Hz
```

18. Use (▲) or (▼) to highlight HUMIDITY. Press (Select) to move the cursor to the right-hand column.

    The default humidity is 50 percent.

19. Use (◀) or (▶) to move the cursor to the digit you want to change, then use (▼) or (▲) to change the number.
20. Press (Return).
21. Review the other items in the list to determine if the information needs to be changed.
22. When all the information is correct, press (▼) to continue to the next test.

Selecting the line frequency

If you are running the service support software from a hard disk, you may enter the power line frequency the synthesized sweeper is using. This line frequency data is recorded with the test record.

```
=============== UUT: HP 83751A ===============
SERIAL NUMBER   0000A00000
ADDRESS TYPE    HP-IB
ADDRESS         719
CONTROLLER
OPTIONS         1E1
TEMPERATURE     23.0 DEG C
HUMIDITY        50.0 %
LINE FREQUENCY   60 Hz
  60 Hz
  50 Hz
  400 Hz
```

23. Use (▲) or (▼) to highlight LINE FREQUENCY. Press (Select) to display the selection list.

    The default line frequency is 60 Hz.

24. Use (▲) or (▼) to highlight the line frequency you are using, then press (Return) to select that frequency.
25. Review the other items in the list to determine if the information needs to be changed.
26. When all the information is correct, press (▼) to continue to the next test.

Step 5. Select where you want to direct the test results

The test results may be printed on the computer's printer, displayed on the computer's CRT, or not displayed at all. You may choose how you want to output these test results. The default is CRT.

```
Where should test results be directed?   CRT
                                         PRINTER
                                         NO OUTPUT
```

1. Use ▼ and ▲ to direct test reports to the computer's display (the CRT) or to the printer, or to omit the report. You may choose only one output option.
2. Press Return.

The performance test program will take a few moments to check equipment needed for the tests, then will display the default equipment and accessories required.

Sending graphics to the printer

Some automated tests plot graphics to the CRT during the test routine. A hardcopy of these graphics can be obtained by pressing:

Shift Dump Graph.

Note On an HP 46021A keyboard, Dump Graph is the second *unmarked* key from the right side of the keyboard.

Step 6. Verify the test equipment

```
EQUIPMENT USED (MODEL/ADDRESS):
HP3456A       722
HP438A        713
HP8485A       NONE
HP8485D       NONE
                                  CONTINUE
                                  PRINT
```

- If the model numbers and addresses shown on your display match the model numbers and addresses of your test equipment, go on to "Step 7. Verify the accessories". Highlight CONTINUE on the display, then press (Return).

- If the model numbers and addresses in this display *do not* match the model numbers and addresses of your test equipment, either:

  A. change your equipment and its addresses to conform to the list,

  or

  B. modify the default equipment list by editing the TSCRIPT file.

Changing the default test equipment and addresses by editing

TSCRIPT

Table 3-4 lists the test equipment needed, the variable name by which it is listed in the TSCRIPT file, the default model, and models that may be substituted.

Use this procedure if your test equipment model numbers and addresses are different from the default test equipment. This service support software supports only the equipment shown in Table 3-4.

To perform this procedure, you must have BASIC 5.13 or above, with the binary language extensions specified in Table 3-3 installed on your computer.

The **TSCRIPT** file contains the model numbers and HP-IB addresses of the test equipment and the test accessories required for each automated test. In this procedure, you will copy, edit, save, and run the TSCRIPT file.

Print the default equipment list.

1. If you have a printer connected to your computer, you can print the default test equipment list when you are in the test equipment menu screen. To print the list:

   a. Use (▼) to highlight PRINT on the display.

   b. Press (Return).

Exit the HP8375x A/B Performance Test Program.

2. Use (▲) to select CONTINUE on the display.
3. Press (Return). This displays the accessories required menu.
4. Press (Return) again. This displays the automated test menu.
5. Press (▼). You will be asked if you want to quit the Test Executive program. The default selection is NO. Press (▼) to highlight YES.
6. Press (Return) again. This will end the performance test program.

Make a backup copy of the `TSCRIPT` file.

7. Using BASIC, make a copy of `TSCRIPT`. For example, type:

```
COPY  "TSCRIPT:,700,0" TO "TSCRIPT_BK:,700,0
```

Load the `TSCRIPT` file.

8. Type `GET "TSCRIPT"` and press (Return). Wait for the asterisk in the lower right-hand corner of the display to disappear.
9. Type `EDIT` and press (Return). Wait for the `TSCRIPT` file to appear on the display.

Edit the test equipment and HP-IB address lists.

10. Scroll to `CALIBRATION_STANDARDS(`. This section of the `TSCRIPT` file shows the default list of test equipment. The variable names with corresponding descriptions are shown in Table 3-4.

Note Be careful to edit only the suggested sections, and only in the method described. If the performance test program doesn't run as expected after you have edited `TSCRIPT`, you may have deleted or modified a character accidentally (for example, the right parenthesis that separates test descriptions).

If you can't identify the cause of the problem, make a new copy of `TSCRIPT` from the backup copy you created in substep 7, and start again from substep 8.

Table 3-4. Test Equipment Variable Names

Variable Name	Description	Default Model	Alternate Models
PM	Power meter	HP 438A	HP 70100A HP 436A
LPSENS	Low-power sensor	HP 8485D	HP 8487D
SENSOR	Power sensor	HP 8485A	HP 8487A
DVM	Digital voltmeter	HP 3456A	HP 3458A HP 3457A HP 70110A

11. Edit the default list of test equipment as needed. Press (Return) to save the change.

    The performance test program uses TSCRIPT to identify the test equipment. The program designates the first model number following the variable name as the default instrument. The program ignores all but the first model number listed after the variable name; other model numbers are listed for reference only.

    Therefore, to select a different instrument as the default, you must change the variables line so the new model number follows the variable name. For example, to substitute an HP 8487A power sensor for the default HP 8485A power sensor:

    Scroll to the variable line for the power sensor:

    `SENSOR(HP8485A HP8487A)`

    You may make the change in either of two ways:

    A. Replace the model by typing the new model number over the old. The result is:

    `SENSOR(HP8487A HP8487A)`

    or

    B. Move the selected model number to the position following the variable name, leaving the list of model numbers intact but changing its order. The result is:

    `SENSOR(HP8487A HP8485A)`

12. Scroll to the DEFAULT_ADDRESSES(section of the file and edit the equipment addresses using the same method.

    Valid addresses are 00 to 20, and 22 to 30; address 21 is reserved for the controlling computer. Valid select codes are 0 through 5, and 7 through 9; the default is 7. Do not set the equipment addresses to any addresses used by the unit under test.

Save the TSCRIPT file and restart the performance test program.

13. To save the edited TSCRIPT file:

    a. Press (Stop).

    b. Type `RE-SAVE "TSCRIPT"` .

    c. Press (Return). Wait for the asterisk (*) in the lower right-hand corner of the display to disappear.

14. Type `LOAD "C_TSCRIPT",1` and press (Return). Wait for the asterisk to disappear.

    When Done. appears on the computer display, you may load the performance test program and run the tests.

15. Continue at beginning of the performance test program. Refer to "Step 4. Enter information about your synthesized sweeper".

Step 7. Verify the accessories

```
ACCESSORIES USED:
HP 11708A Precision 30dB Attenuator
HP 8493C 20dB Attenuator
                                        CONTINUE
                                        PRINT
```

1. Make sure you have these accessories.
2. To print a copy of this list, highlight PRINT and press (Return).
3. Highlight CONTINUE and press (Return) to go on to "Step 8. Run the automated tests".

Step 8. Run the automated tests

```
=================== TEST LIST ===================
Initial Setup
Calibrate FRAC-N VCO
Power Clamp Cal
Atten Verification
Atten Flatness Adj
Get Cal Constants
                                       CONTINUE
                                       PRINT
```

1. Use (▼) and (▲) to highlight a test.

   The first item listed, "Initial Setup," is not a test, but must be run when you begin the performance test program.

2. Press (Return). If the following message is displayed, enter the password and press (Return).

```
Please enter the password to disable the EEPROM write protection
for the Power Clamp, Frac-N, and Attenuator Flatness adjustments.

                                                            OK
```

Note If the default password is being used, the above message will not be displayed and the program will proceed to the selected automated test. For information on using the password, refer to Chapter 8, "Service-Related Special Menus."

3. Follow the instructions on your display to set up the test equipment for each test.

   Refer to "What the tests do" at the end of this chapter for descriptions of each test.

4. Repeat steps 1, 3 and 4 until you have completed each automated test.

Note You may select any test, in any order, from the test menu. You do not have to perform all the measurements within the selected test; you may quit at any time by pressing (▼). However, the program *will not* print a record of the completed measurements unless you complete the entire test sequence.

If you abort the test sequence and want to continue using the performance test program, you must reload the program and repeat the initial setup process.

If a measurement fails

If the synthesized sweeper fails to pass any part of a test, you will be given the option to repeat the measurement, to continue to the next test, or to abort the test.

```
Measurement FAILED--do you want to repeat it?

                                    YES
                                    NO
                                    ABORT
```

Quitting the HP8375x A/B Performance Test Program

When the tests are finished (or at any time during the test process), leave the performance test program by pressing (▼).

```
Quit the Test Executive program?  NO
                                  YES
```

1. The default is NO; use (▼) to highlight YES.
2. Press (Return).

What the tests do

Initial Setup

`Initial Setup` is not a test; it must be run once when you begin the performance test program.

Calibrate FRAC-N VCO

The `Calibrate FRAC-N VCO` software routine calculates the data necessary for pretuning the fractional-N VCO so that the effect of frequency transients are minimized at the start of sweep. This improves the swept frequency accuracy of the synthesized sweeper.

Equipment used:

- DVM

Power Clamp Cal

The `Power Clamp Cal` software routine calculates the data necessary to allow the synthesized sweeper to achieve the maximum leveled power obtainable before taking control away from the ALC. This prevents the adverse effects (such as power reversal and squegging) that can occur when the power level nears its maximum capability.

Equipment used:

- 20 dB Attenuator (used as a 50Ω termination)

Atten Verification

The `Atten Verification` automated performance test verifies the power accuracy and flatness of the low-level power settings provided by the step attenuator in synthesized sweepers having Option 1E1. The test can also be used to verify the power at 0 dBm and −10 dBm on standard models.

Equipment used:

- Power Meter
- Power Sensor
- Low-power Sensor
- Precision 30 dB Attenuator

Atten Flatness Adj (Option 1E1 only)

The `Atten Flatness Adj` software routine calculates the data necessary to correct the power output for each of the calibration frequencies at each attenuator setting on synthesized sweepers having Option 1E1. The test ensures flat and accurate power regardless of the attenuator setting.

Equipment used:

- Power Meter
- Power Sensor
- Low-power Sensor
- Precision 30 dB Attenuator

Get Cal Constants

The `Get Cal Constants` software routine simply downloads the calibration data currently stored in RAM. This allows the user to view, or print the saved information.

4. Disassembly Procedures

4

Disassembly Procedures

This chapter provides disassembly and reassembly procedures for the following assemblies. Figure 4-1 identifies most of the following major assemblies in the synthesized sweeper:

- fuse
- top cover
- bottom cover
- side covers
- portable cover (Option AX2)
- card cage cover
- fan cover
- fan
- front panel
- rear panel
- power supply
- 10 MHz standard (Option 1E5)
- RF deck
- RF deck semi-rigid cables
- motherboard

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.

The following tools are required for disassembling and reassembling the instrument:

- T–10 TORX screwdriver
- T–15 TORX screwdriver
- small slot screwdriver
- coax extractor tool
- 5/16 inch open-end wrench
- #2 pozidrive
- 5 mm hex-nut driver
- 5.5 mm hex-nut driver
- long nose pliers
- 7 mm hex-nut driver
- 3/32 inch hex-key driver

- 9/16 inch hex-nut driver
- soldering iron

The following hardware is required for motherboard reassembly:

- M4 × 0.70, 6 mm long, patch lock, pozidrive screws. A quantity of 26 is required. (HP part number 0515-0898)

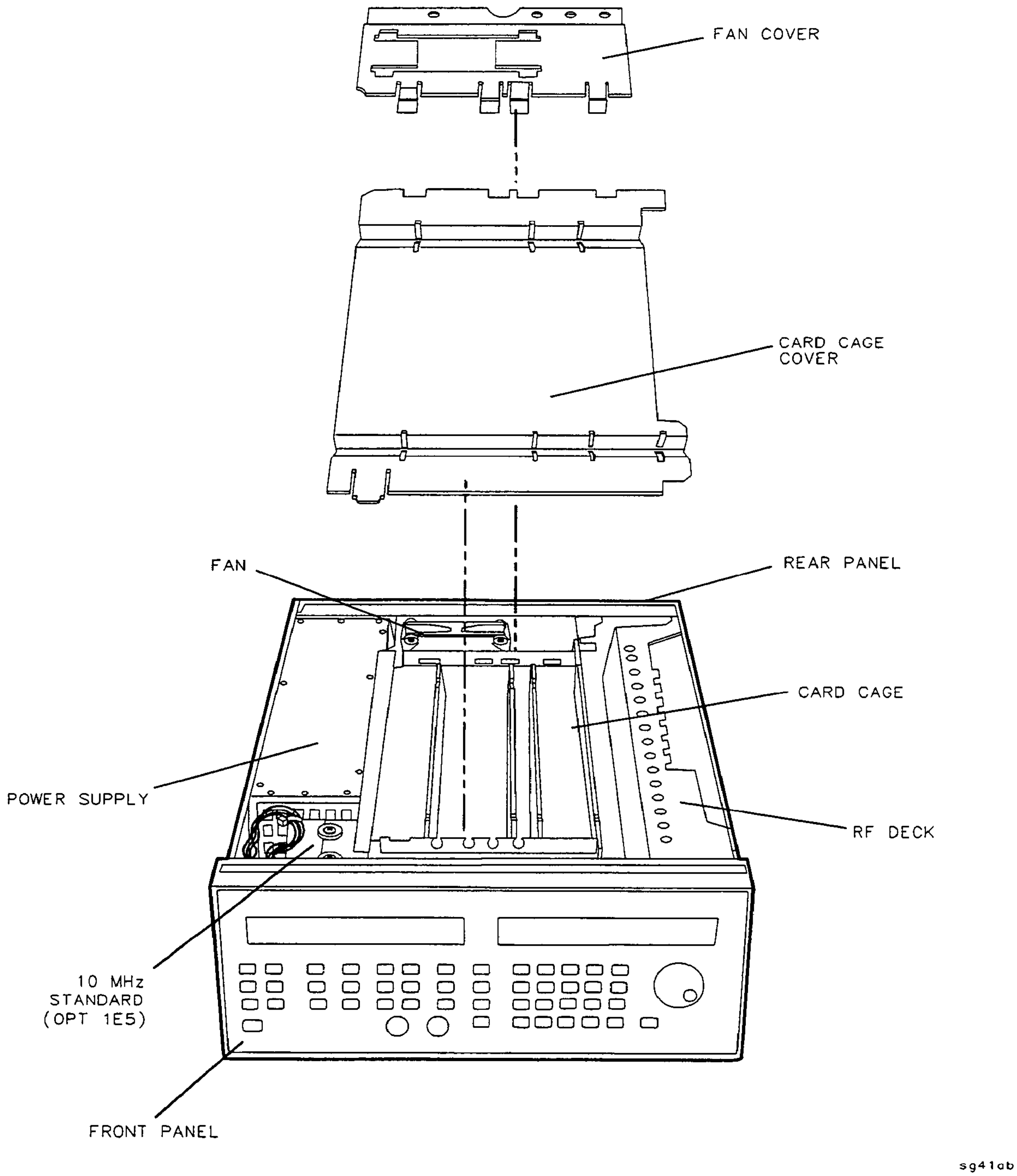


Figure 4-1. HP 83750 Overview

Fuse Disassembly

Disassembly

1. Disconnect the ac power cord.
2. Use a small slot screwdriver to pry open the fuse holder. (See Figure 4-2.)
3. Replace the blown fuse with a 6.3A 250V F fuse (HP part number 2110-0703).

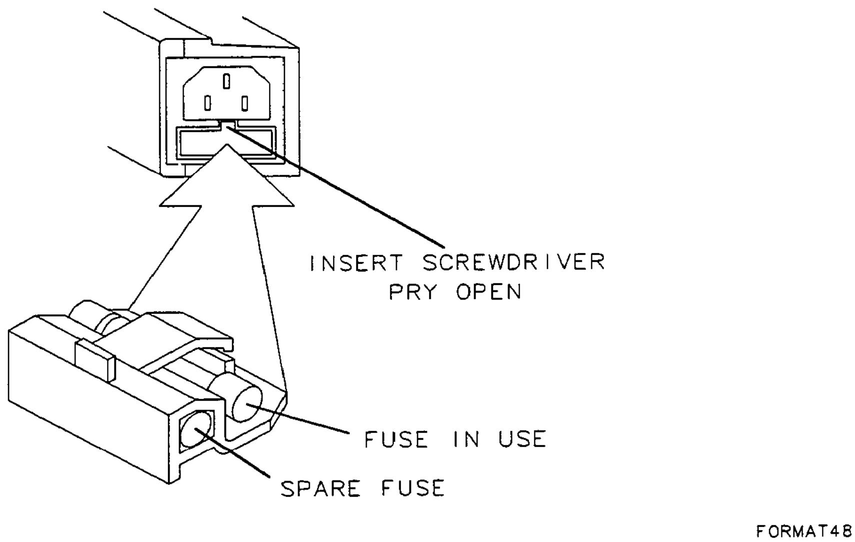


Figure 4-2. Fuse Removal

Top Cover Disassembly and Reassembly

Disassembly

1. Use a T-15 TORX driver to remove the two upper standoffs from the rear panel.
2. Use a T-15 TORX driver to loosen the screw in the center of the back edge of the cover.
3. Carefully slide the cover toward the back of the instrument to remove it.

Reassembly

1. Carefully slide the cover back on the instrument, ensuring that the cables don't get pinched as the cover slides forward.
2. Use a T-15 TORX driver to tighten the screw in the center of the back edge of the cover (recommended torque is 21 in-lb).
3. Use a T-15 TORX driver to replace the two upper standoffs on the rear panel.

Bottom Cover Disassembly and Reassembly

Disassembly

1. Use a T-15 TORX driver to remove the two lower standoffs from the rear panel.
2. Remove the 4 feet on the bottom of the instrument.
3. Use a T-15 TORX driver to loosen the screw in the center of the back edge of the cover.
4. Slide the cover toward the rear of the instrument to remove it.

Reassembly

1. Slide the cover back on the instrument.
2. Use a T-15 TORX driver to tighten the screw in the center of the back edge of the cover (recommended torque is 21 in-lb).
3. Attach the 4 feet to the bottom of the instrument.
4. Use a T-15 TORX driver to replace the two lower standoffs on the rear panel.

Side Cover Disassembly and Reassembly

Disassembly

Removing the right side cover

To remove the right side cover (when facing the front of the instrument):

1. Use a T-15 TORX driver to remove the two right-side standoffs from the rear panel.
2. Use a T-15 TORX driver to loosen the screw from the center back of the side cover.
3. Slide the side cover toward the rear of the instrument to remove it.

Removing the left side cover

To remove the left side cover (when facing the front of the instrument).

1. Use a T-15 TORX driver to remove the two left-side standoffs from the rear panel.
2. Use a T-15 TORX driver to remove the two screws which attach the strap assembly to the left side cover.
3. Slide the side cover toward the rear of the instrument to remove it.

Reassembly

Replacing the right side cover

To replace the right side cover (when facing the front of the instrument):

1. Slide the right side cover back on the instrument.
2. Use a T-15 TORX driver to tighten the screw in the center of the back of the cover (recommended torque is 21 in-lb).
3. Use a T-15 TORX driver to replace the two right-side standoffs on the rear panel.

Replacing the left side cover

To replace the left side cover (when facing the front of the instrument).

1. Slide the left cover back on the instrument
2. Reattach the strap assembly with the two screws.
3. Use a T-15 TORX driver to replace the two left-side standoffs on the rear panel.

Portable Cover Disassembly and Reassembly (Option AX5)

Disassembly

1. Remove the front cover of the instrument.
2. Use a T-15 TORX driver to remove the four screws holding on each of the two rear standoffs.
3. Loosen the two TORX screws that secure the rear of the portable cover to the rear frame.
4. Carefully slide the portable cover off the rear of the instrument assembly.

Warning **Removing and replacing the portable cover is awkward and potentially hazardous for one person to perform alone — be sure to have another person assist you!**

Whenever possible, attach handles to the sides of the front frame prior to removing or replacing the portable cover. This provides greater control and reduces the risk of injury during this operation. (Handle Kit, HP part number 5062-3989)

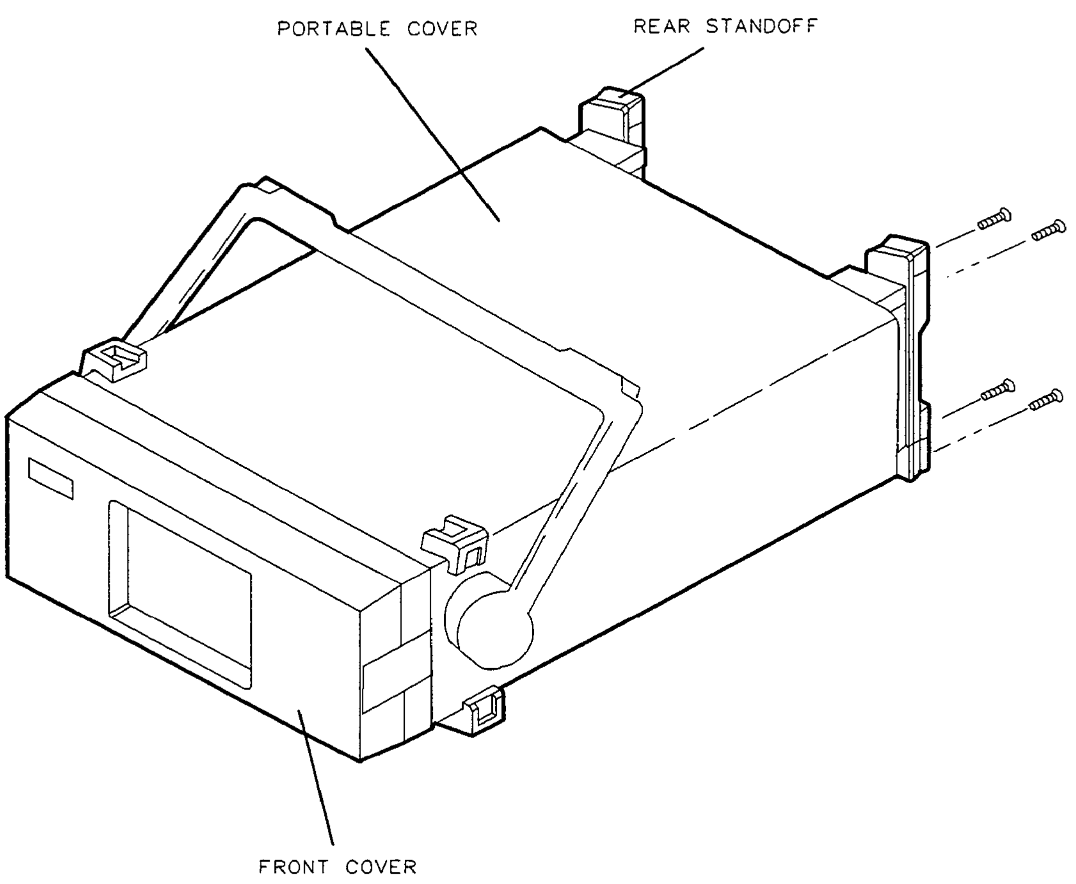


Figure 4-3. Portable Cover

Reassembly

1. Carefully slide the portable cover back over the instrument assembly.
2. Secure the portable cover to the rear frame by using a T-15 TORX driver to tighten the two TORX screws on the rear of the portable cover.
3. Replace the four TORX screws that secure each of the two rear standoffs.
4. Replace the front cover.

Card Cage Cover Disassembly and Reassembly

Disassembly

Grasping the card cage cover by its front tab (see Figure 4-4), lift up and then slide the cover forward (toward the front of the instrument).

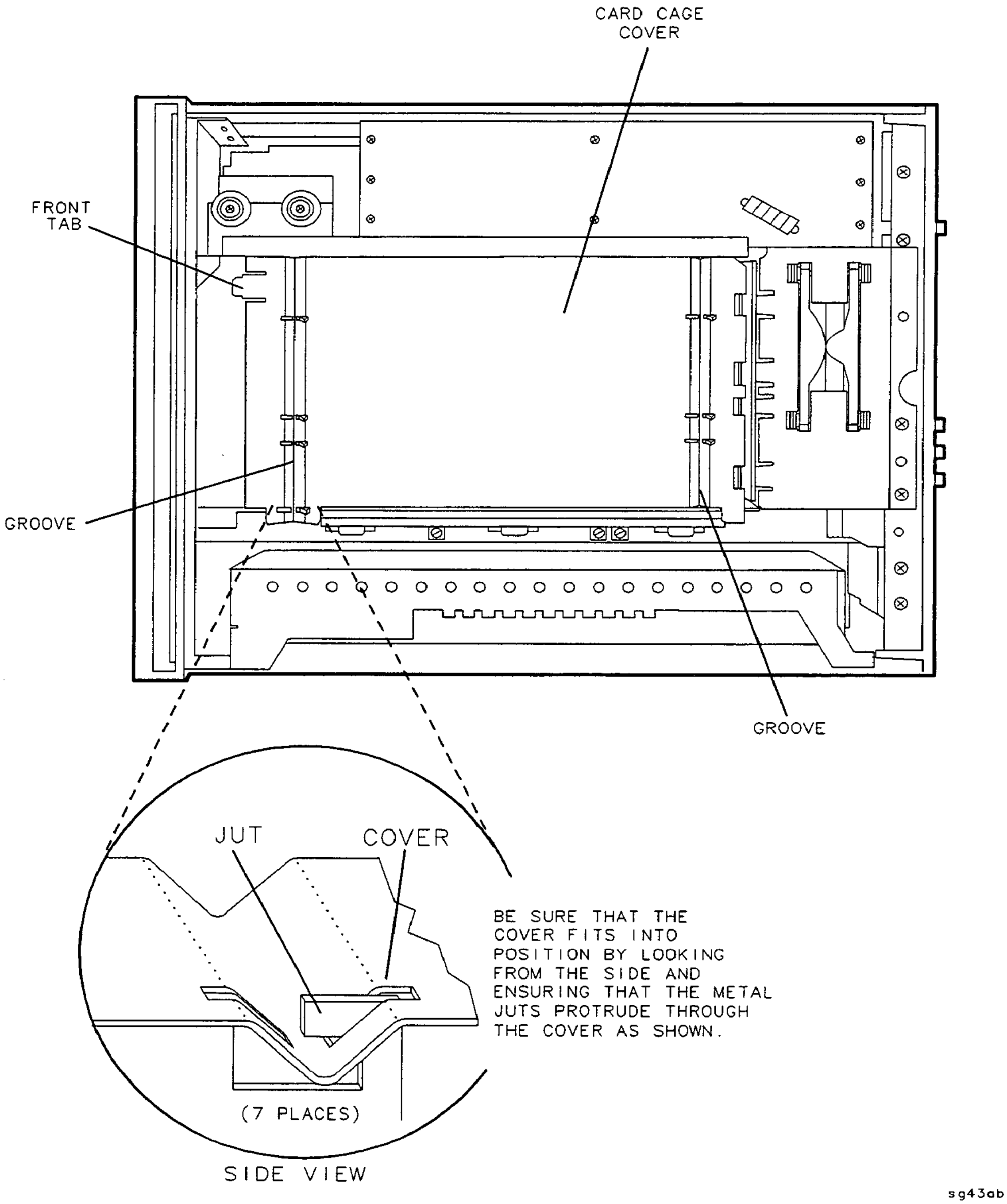


Figure 4-4. Card Cage Cover Removal

Reassembly

Firmly press down on the front and rear grooves of the card cage cover while sliding it towards the back of the instrument to snap the cover back into place. Look from the side to ensure that the metal juts protrude through the cover in the places shown in Figure 4-4.

Caution Be sure that all the flexible cables are out of the way, as they can easily be pinched by the cover.

Fan Cover Disassembly and Reassembly

Disassembly

1. Remove the card cage cover.
2. Use a T-15 TORX driver to remove the screw from the fan cover. (See Figure 4-5.)
3. Lift all the flexible cables up and out of the grooves provided by the hinged tabs of the fan cover.
4. Lift up the fan cover and unhinge the four tabs from the card cage.

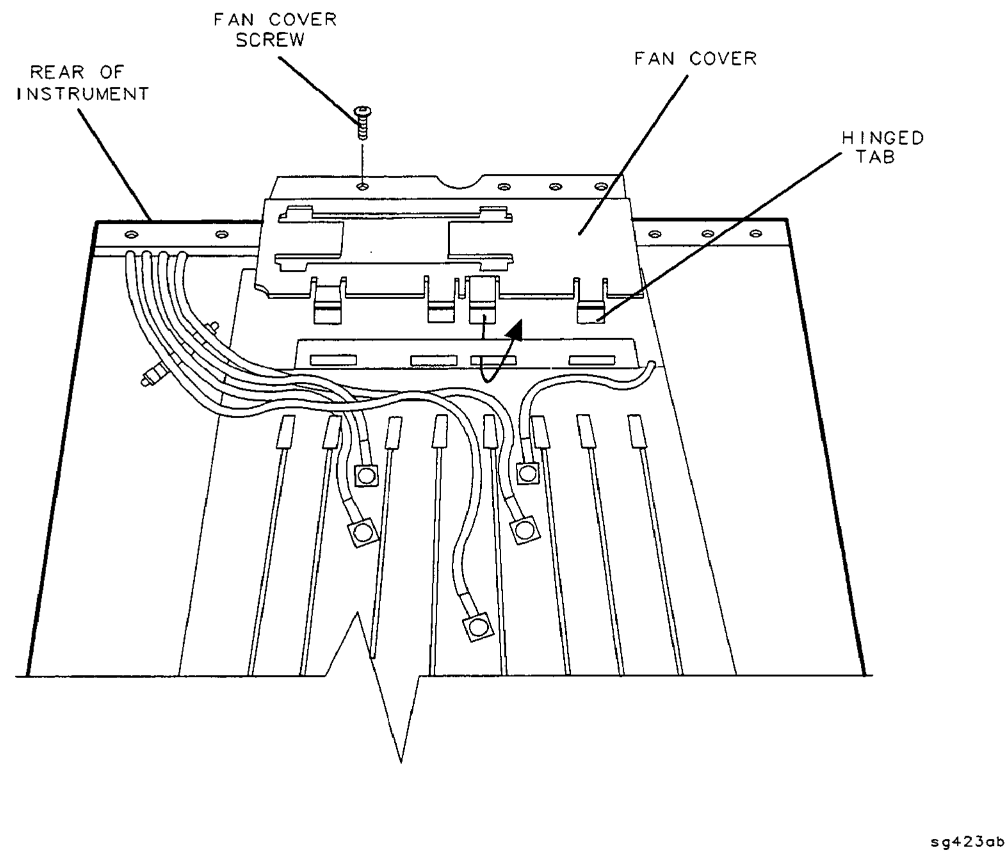


Figure 4-5. Fan Cover Removal

Reassembly

1. Rehinge the four fan cover tabs in the card cage openings.
2. Make sure the fan cover is aligned with the fan (blue grommets are protruding) and replace the screw in the fan cover.
3. Carefully replace the flexible cables in the grooves provided by the fan cover hinges.
4. Replace the card cage cover.

Fan Disassembly and Reassembly

Disassembly

1. Disconnect the ac power cord.
2. Remove the top cover of the instrument.
3. Remove the card cage cover.
4. Remove the fan cover.
5. Push down on the top left side of the fan (when facing the rear of the instrument) and pull back on the top right side of the fan to dislodge the fan bracket from the card cage shock mounts. The fan bracket must slide up off of the lower shock mount and back away from the upper shock mount. (See Figure 4-6.)

Note A slot screwdriver inserted between the fan bracket and the card cage will help dislodge the fan bracket from the upper shock mount.

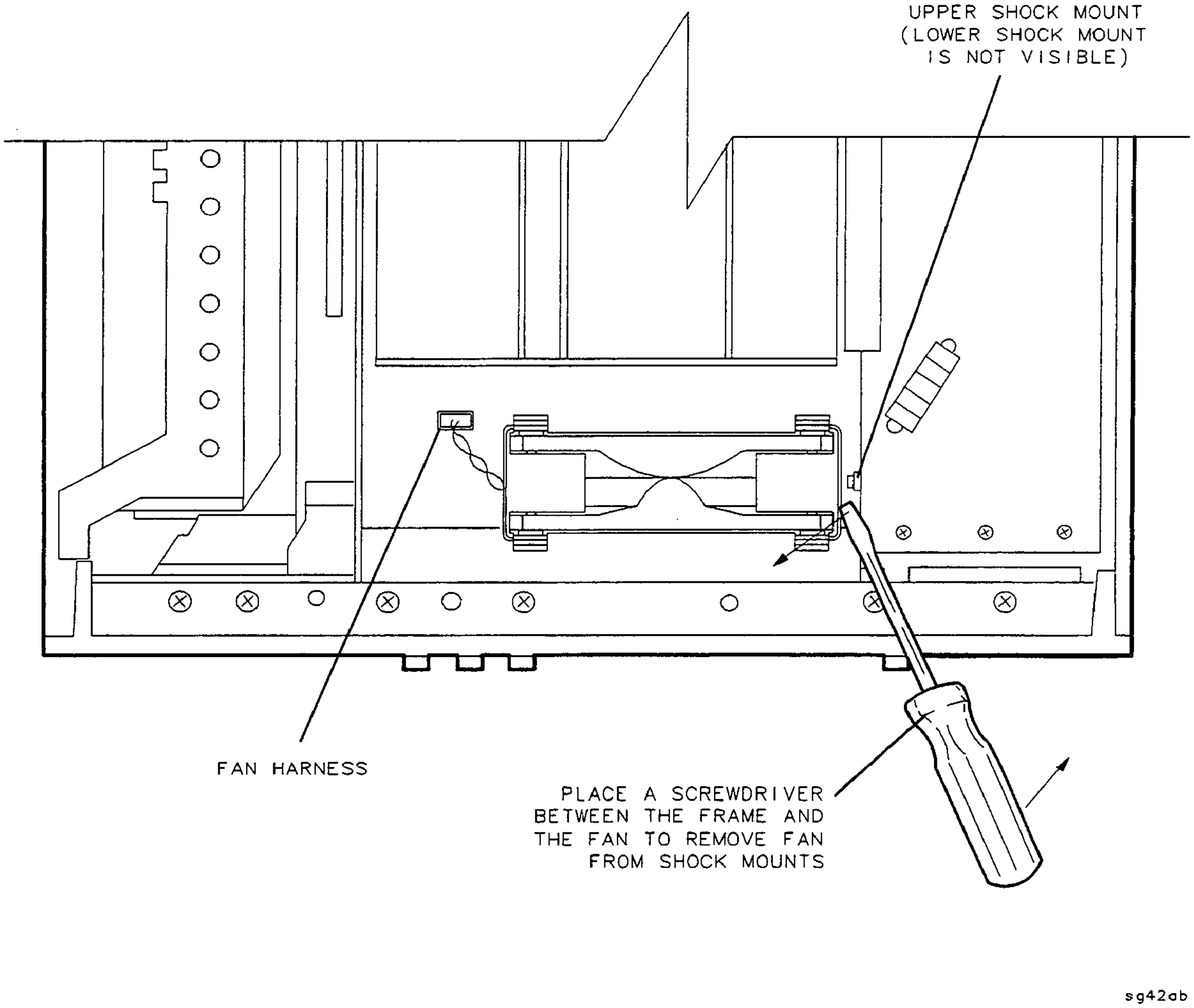


Figure 4-6. Dislodging the Fan

6. Lift the fan assembly out far enough to access and disconnect the fan harness from the motherboard connector.

The fan can now be completely removed from the instrument.

Reassembly

1. Connect the fan harness to the motherboard connector.
2. Align the bottom left corner of the fan in the motherboard opening.
3. Facing the rear of the instrument, gently press down on the top left corner of the fan to keep the bottom left corner secure while doing the following:
   a. Press down on the top right corner of the fan to slide the fan bracket onto the lower shock mount, and
   b. push the fan toward the card cage wall (next to the power supply) to fit the bracket onto the upper shock mount.

   The fan should fit snugly, however some movement of the top left corner is expected when gentle pressure is applied.
4. Reattach the fan cover.
5. Replace the card cage cover.
6. Replace the instrument top cover.

Front Panel Disassembly and Reassembly

Disassembly

1. Disconnect the ac power cord.
2. Remove the bottom cover of the instrument.
3. Use a T-15 TORX driver to remove the four screws on the bottom front frame edge. (See Figure 4-7.)
4. Remove the top cover of the instrument.
5. Remove the card cage cover.
6. Remove the trim strip from the top-front edge of the instrument by placing a slot screwdriver in either slot in the trim strip and lifting. (See Figure 4-7.)

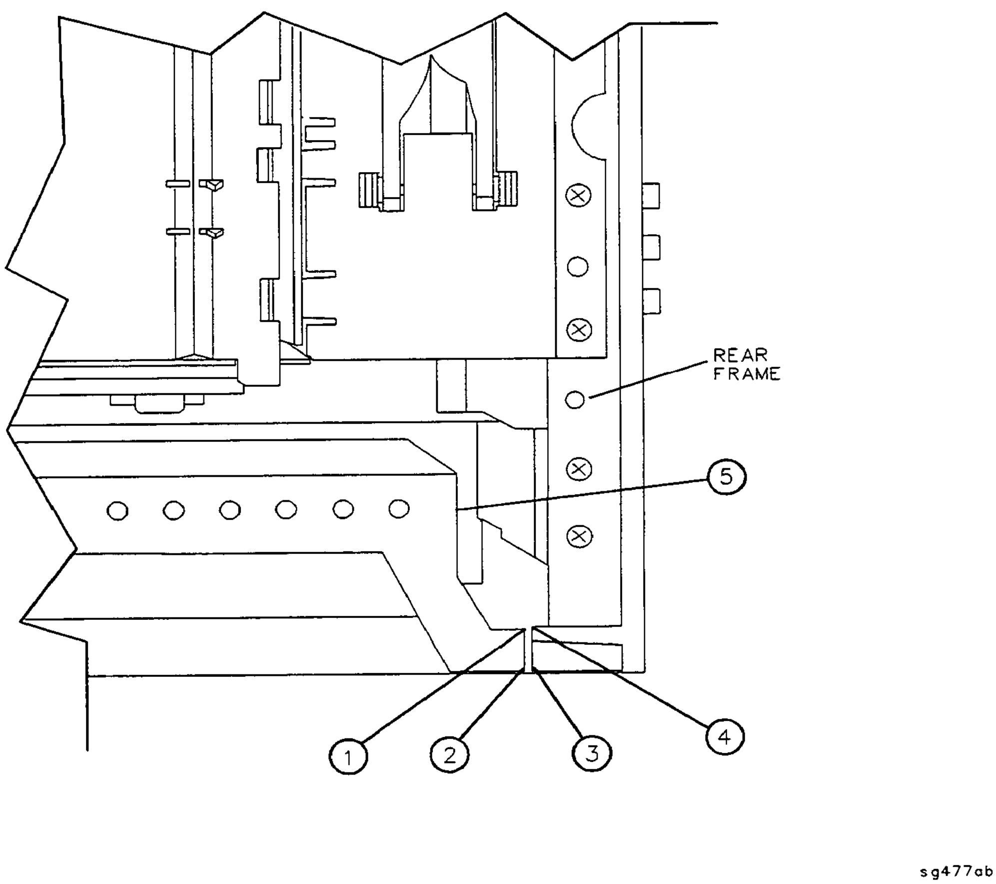


Figure 4-7. Front Edge Trim Strip

7. Use a T-15 TORX driver to remove the four screws on the top-front frame edge. (See Figure 4-7.)
8. Gently press forward (outward from the instrument) on the front panel assembly until it slides out of the front frame. Guide the assembly over the RF output connector.

Note If you have Option 1E4, the RF output connector is located on the rear panel of the instrument.

9. Disconnect W1 from the motherboard connector, A14J1, W2 from the ALC assembly connector, A9J3, and W3 from the motherboard connector, A14J2. (See Figure 4-8.) The front panel assembly is now disassembled from the instrument.

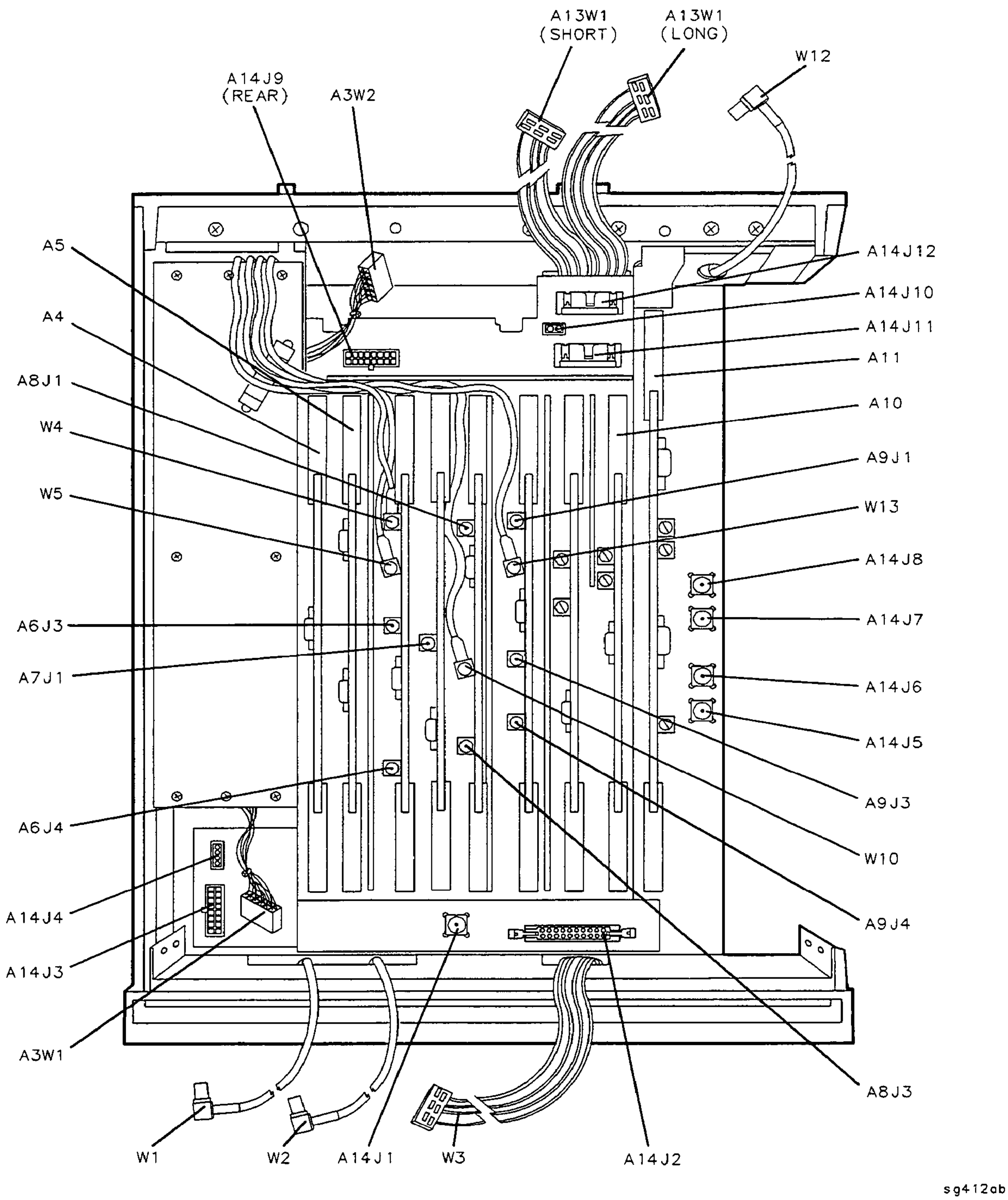


Figure 4-8. Connection Locations on Card Cage Boards and Motherboard

Reassembly

1. Connect W1 to the motherboard connector, A14J1, W2 to the ALC assembly connector, A9J3. Connect W3 to the motherboard connector, A14J2. (See Figure 4-8.)
2. Slide the front panel assembly over the RF output connector and fit the lower right corner of the front panel assembly snugly into the front frame.

Note If you have Option 1E4, the RF output connector is located on the rear panel of the instrument.

---

3. Press the front panel assembly into position in the front frame.
4. Use a T-15 TORX driver to replace the four screws in the top frame edge (recommended torque is 21 in-lb). (See Figure 4-7.)
5. Replace the four screws in the bottom frame edge. (See Figure 4-7.)
6. Replace the bottom cover.
7. Replace the trim strip in the top-front frame edge.
8. Replace the card cage cover.
9. Replace the top cover.

Front Panel PC Board Disassembly and Reassembly

Disassembly

1. Remove the front panel of the instrument.
2. Remove the PC board, A2, from the front panel assembly by using a 5.5 mm hex-nut driver to remove the six nuts that secure the board to the assembly. (See Figure 4-9.)
3. Use long nose pliers to carefully disconnect the two small wires, S1W1, from A2J4 and disconnect the ribbon cable, RPGW1, from A2J3. (See Figure 4-9.)
4. Pull the PC board away from the front panel assembly and disconnect the large ribbon cable, A1W1, from A2J1 of the PC board. The PC board should now be free from the front panel assembly.

Replacing the front panel PC board

1. Ensure the ribbon cable, W3, is connected to A2J2 of the PC board.
2. Connect the large ribbon cable of the front panel assembly, A1W1, to A2J1 of the PC board.
3. Place the PC board onto the mounts of the front panel assembly.
4. Use long nose pliers to carefully connect the two small wires, S1W1, to A2J4 and connect the ribbon cable, RPGW1, to A2J3. (See Figure 4-9.)
5. Secure the PC board to the front panel by using a 5.5 mm hex-nut driver to tighten the six nuts that hold the PC board to the mounts on the front panel (recommended torque is 10 in-lb). (See Figure 4-9.)
6. Replace the front panel.

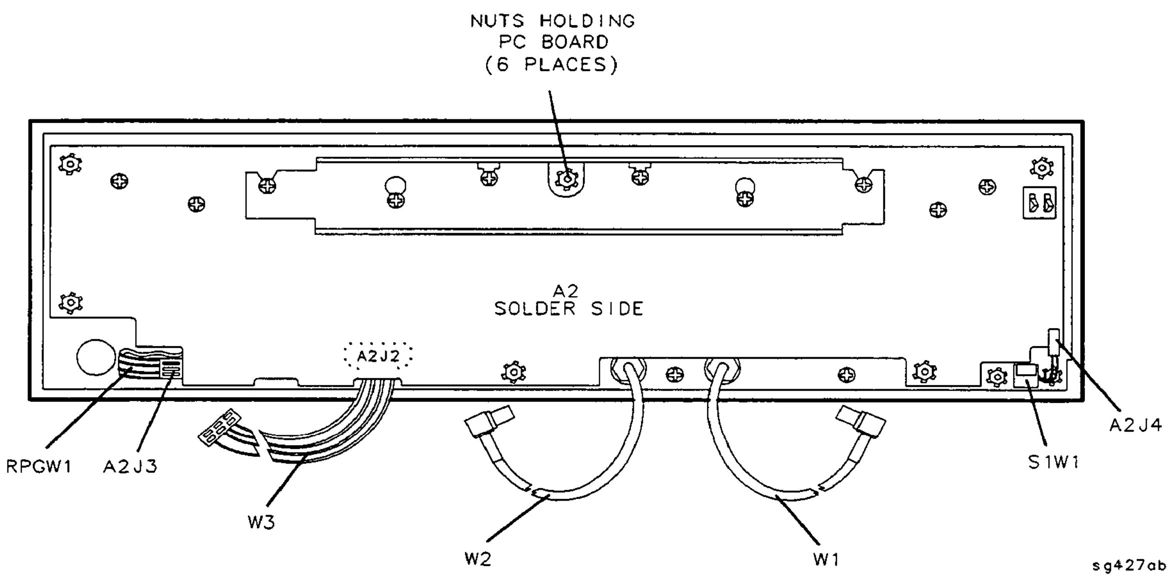


Figure 4-9. Front Cable Locations

Rear Panel Disassembly and Reassembly

Disassembly

1. Disconnect the ac power cord.
2. Remove the bottom cover of the instrument.
3. Use a T-15 TORX driver to remove the four screws in the bottom frame edge. (See Figure 4-10.)
4. Remove the top cover of the instrument.
5. Remove the card cage cover.
6. Remove the fan cover.
7. Use a T-15 TORX driver to remove the three screws in the top frame edge. (See Figure 4-10.)

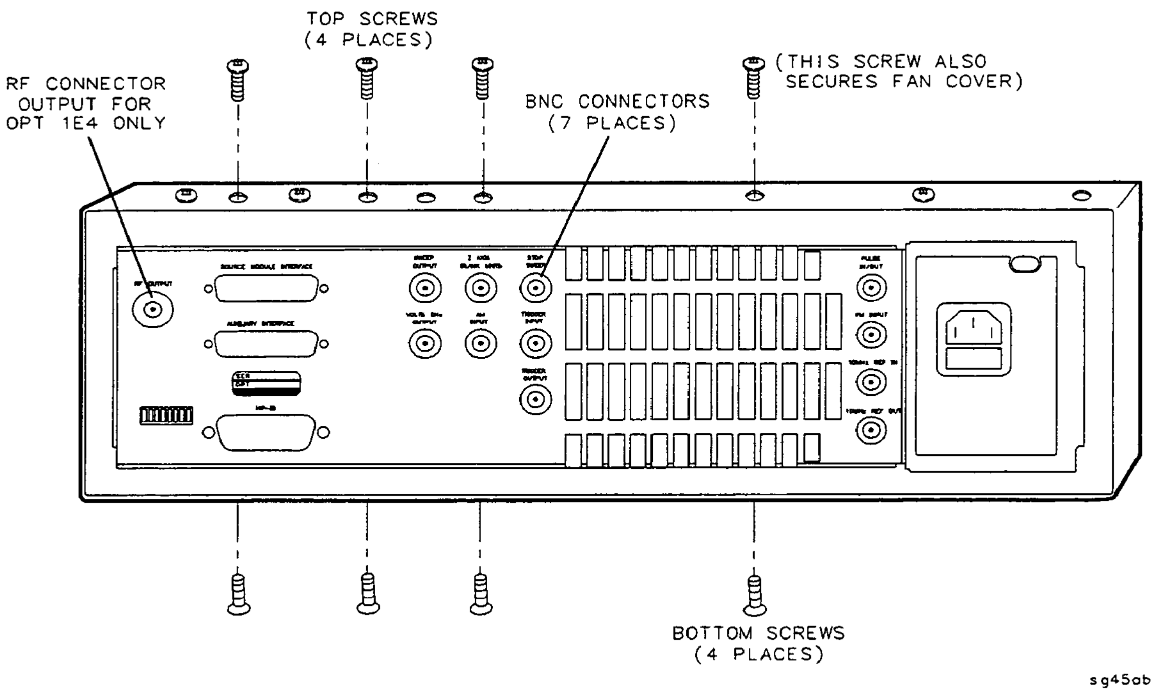


Figure 4-10. Rear Panel

8. Remove both side covers.
9. Except for cable connections, the rear panel is loose. Disconnect the following ribbon cables. (See Figure 4-11.)

   a. A13W1 (long) from A14J11
   b. A13W1 (short) from A14J12

10. Disconnect the following flexible cables:
    a. W12 from A9J1
    b. W13 from A9J2
    c. W10 from A8J2
    d. W4 from A6J1
    e. W5 from A6J2

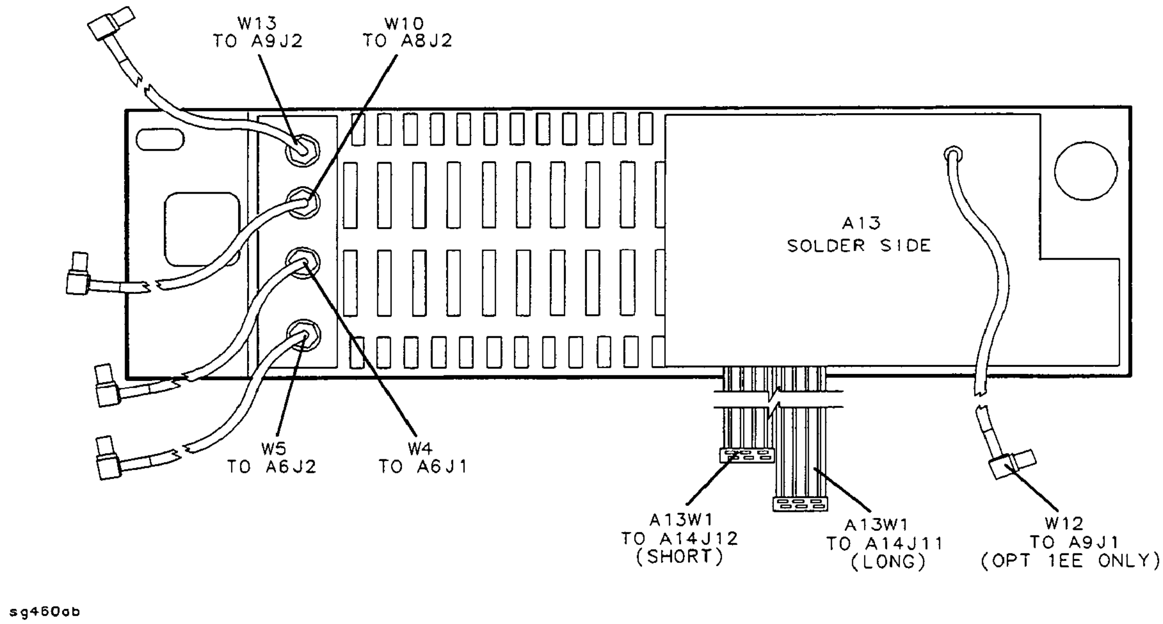


Figure 4-11. Rear Panel Cables

11. Slide the rear panel assembly out of the frame, it is now free of the instrument.

Note If you have Option 1E4 (rear panel output), the semi-rigid cable must be disconnected from the RF output connector assembly on the inside of the rear panel prior to sliding the rear panel out of the frame. Use a 5/16 inch to open-end wrench.

Reassembly

1. Align the rear panel assembly in the frame.

Note If you have Option 1E4 (rear panel output), the semi-rigid cable must be reconnected to the RF output assembly on the inside of the rear panel. Use a 5/16 inch to open-end wrench (recommended torque is 9 in-lb).

---

2. Reconnect the following ribbon cables: (Refer to Figure 4-11 and Figure 4-12.)
    a. A13W1 (long) to A14J11
    b. A13W1 (short) to A14J12

3. Reconnect the following flexible cables:
   a. W12 to A9J1
   b. W13 to A9J2
   c. W10 to A8J2
   d. W4 to A6J1
   e. W5 to A6J2

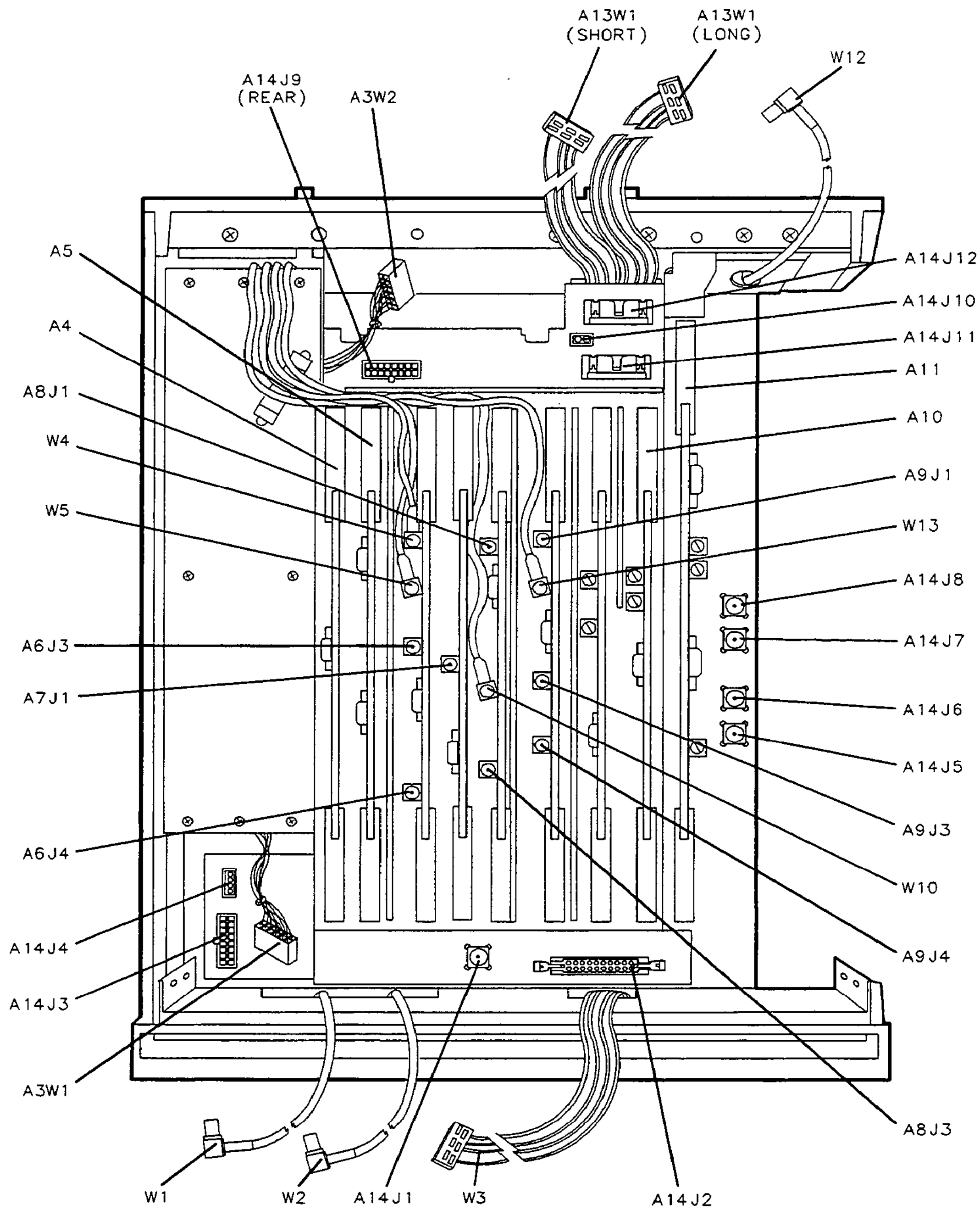


Figure 4-12. Connection Locations on Card Cage Boards and Motherboard

4. Reattach both side covers onto the frame.
5. Use a T-15 TORX driver to replace the three screws in the top frame edge (recommended torque is 21 in-lb); do not replace the screw which attaches the fan cover to the frame. (See Figure 4-10.)
6. Reattach the fan cover.
7. Reattach the card cage cover.
8. Reattach the top cover of the instrument.
9. Use a T-15 TORX driver to replace the four screws in the bottom frame edge (recommended torque is 21 in-lb). (See Figure 4-10.)
10. Replace the bottom cover of the instrument.

Rear Panel PC Board Disassembly and Reassembly

Disassembly

1. Remove the rear panel of the instrument.
2. Remove the nuts and washers from the seven BNC connectors on the left side of the rear panel (when facing the rear of instrument) using a 9/16 inch hex-nut driver. (See Figure 4-13.)
3. Remove the hex screws and washers from the source module interface (Option 1EE) and the auxiliary interface (2 in each) of the rear panel using a 5 mm hex-nut driver.
4. Remove the two hex screws with washers from the HP-IB connector using a 7 mm hex-nut driver. PC board, A13, is now loose from the rear panel assembly.

Reassembly

1. Position PC board, A13, onto the rear panel assembly ensuring that all BNC connectors and interfaces protrude through the appropriate openings.
2. Apply the nuts and washers to the BNC connectors of the rear panel in 7 places (see Figure 4-13) using a 9/16 inch hex-nut driver (recommended torque is 25 in-lb).
3. Use a 7 mm hex-nut driver to apply the two hex screws and washers to the HP-IB connector (recommended torque is 3 in-lb)
4. Use a 5 mm hex-nut driver, apply the hex screws and washers to the source module interface (Option 1EE) and the auxiliary interface (recommended torque is 4 in-lb) (2 in each).
5. Replace the rear panel.

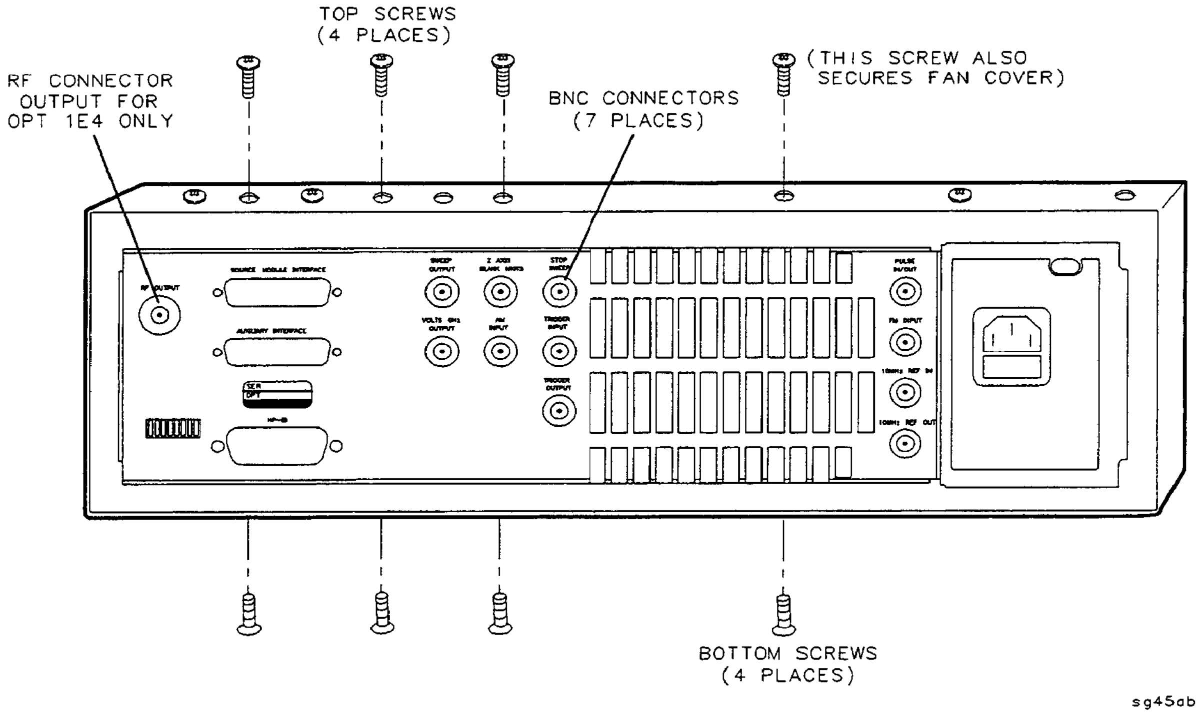


Figure 4-13. Rear Panel

Power Supply Disassembly and Reassembly

Disassembly

1. Disconnect the ac power cord.
2. Remove the top cover of the instrument.
3. Remove the card cage cover.
4. Remove the fan.
5. Remove the left side cover.
6. Remove the bottom cover.
7. Lift the four flexible cables out of the cable clip (item 3 in Figure 4-14) that is attached to the power supply.
8. Disconnect the power supply wiring harness, A3W2, from the motherboard connector, A14J9 (located near fan).
9. Use a T-15 TORX driver to remove the eight screws on both the upper and lower side rails which attach the power supply to the front and rear frames. There are two screws (item 1 in Figure 4-14) at each end of the upper and lower side rails.
10. Pull the side rails away from the instrument (the power supply assembly is still attached to the side rails.) Guide the wiring harness, A3W2, through the opening in the card cage.
11. Disconnect the other power supply wiring harness, A3W1, from the motherboard connector, A14J3 (located in front of power supply).
12. Set the assembly down. Use a T-10 TORX driver to remove the eight screws (item 2 in Figure 4-14) that attach the power supply assembly to the side rails.

Note The cable clip (item 3 in Figure 4-14) is not part of the power supply assembly. If you are replacing the power supply with a new assembly, remove the clip from the old assembly and attach it to the new assembly.

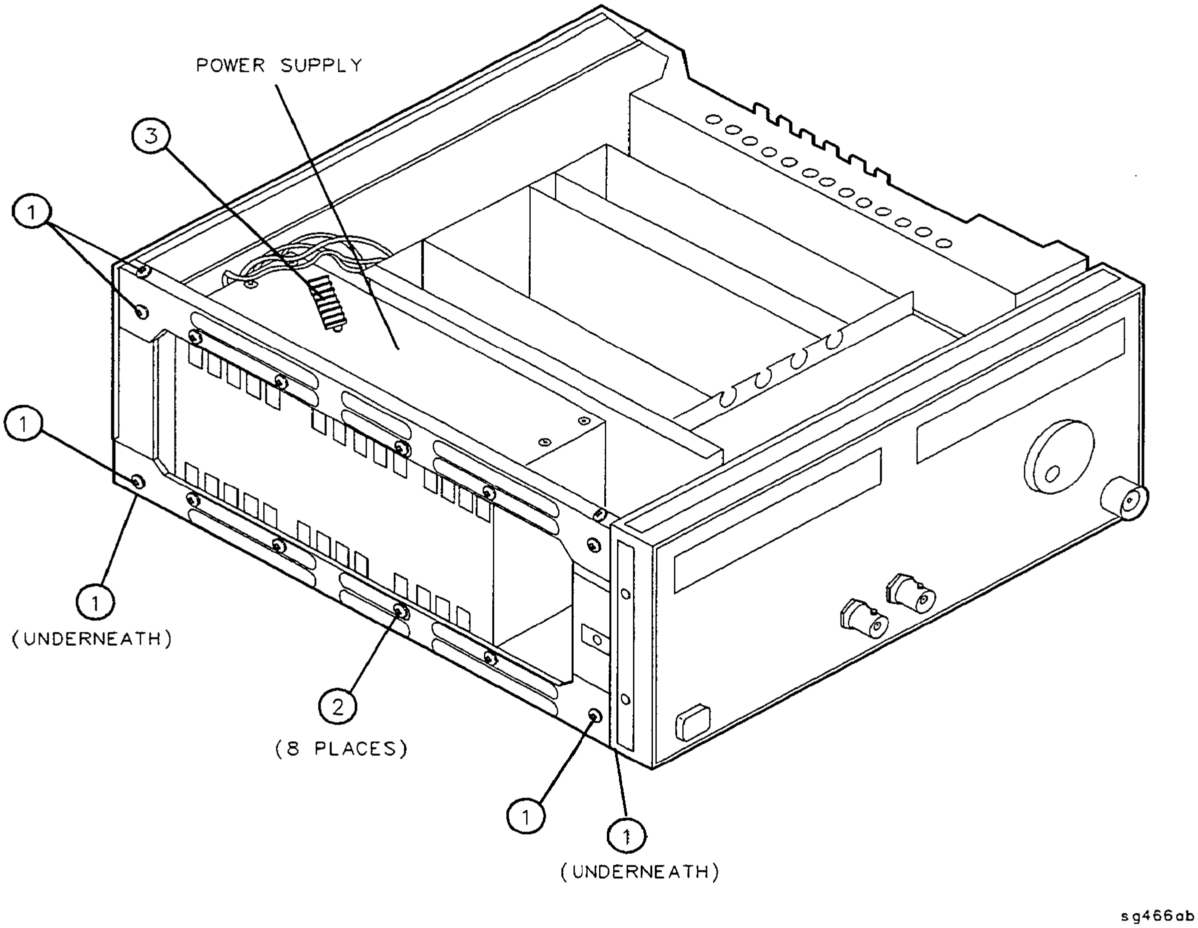


Figure 4-14. Instrument Side Rails

Reassembly

1. Use a T-10 TORX driver to reattach the 2 side rails to the power supply assembly with eight screws (item 2 in Figure 4-14) (recommended torque is 9 in-lb).
2. Lift the side rails (with the power supply attached) into position just above the frame and guide the wiring harness, A3W2, through the opening in the card cage. Align the side rails with the front and rear frame positioning the power supply assembly next to the card cage.
3. Connect the power supply wiring harness, A3W1, to the motherboard connector, A14J3 (located in front of power supply).
4. Use a T-15 TORX driver to replace the eight screws which attach the side rails to the front and rear frames (recommended torque is 21 in-lb). (There are two screws at each end of the upper and lower side rails. See item 1 in Figure 4-14.)
5. Connect the other power supply wiring harness, A3W2, to the motherboard connector, A14J9 (located near fan).
6. Reattach the four cables to the cable clip on the side of the power supply.
7. Reattach the left side cover onto the frame.

8. Replace the bottom cover.
9. Replace the fan and its cover.
10. Thread the flexible cables through the cable clip on the power supply assembly. Be sure to press the cables into the grooves firmly.
11. Replace the card cage cover.
12. Replace the top cover.

10 MHz Standard Disassembly and Reassembly (Option 1E5)

Disassembly

1. Disconnect the ac power cord.
2. Remove the top cover of the instrument.
3. Remove the card cage cover.
4. Remove the left side cover.
5. Disconnect the power supply wiring harness, A3W1, from the motherboard connector, A14J3. (See Figure 4-15.)
6. Disconnect the 10 MHz standard wiring harness, A21W1, from the motherboard connector, A14J4, and remove the 10 MHz standard.
   a. Press down and out on the 10 MHz standard, sliding the blue grommets out of the bracket.
   b. Tilt the 10 MHz standard away from the bracket and lift it up.
7. Disconnect the flexible cable, W6, from the 10 MHz standard.

Reassembly

1. Connect the flexible cable, W6, to the 10 MHz standard.
2. Guide the stud on the bottom of the 10 MHz standard into the blue shock mount on the bottom of the 10 MHz standard mounting bracket.

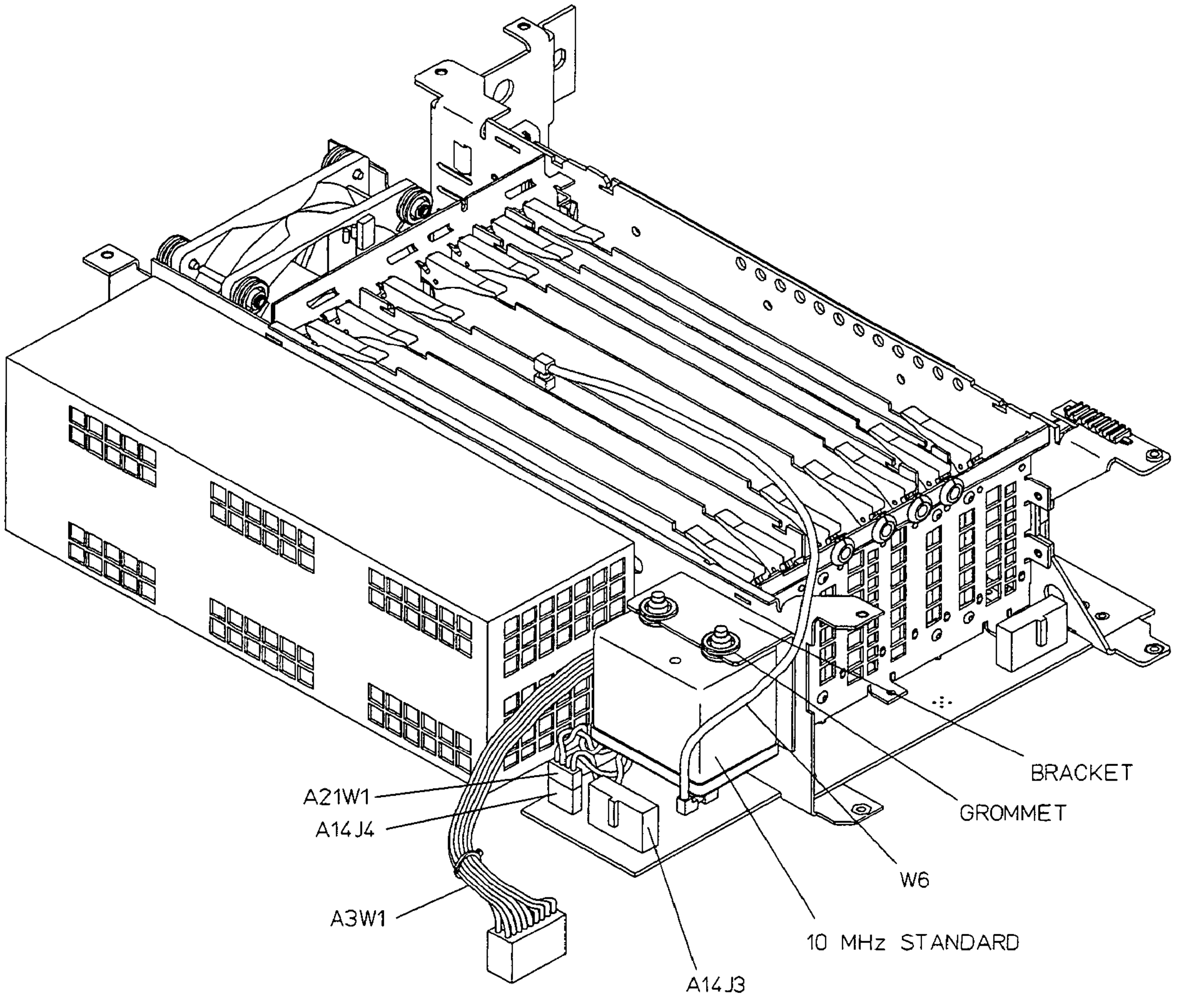


Figure 4-15. 10 MHz Standard Mounting Orientation

3. Pushing down and in, straighten the 10 MHz standard into the bracket so that the blue grommets slide into the two openings in the mounting bracket. Part of the grommet must be above the bracket and part must be below.
4. Connect the 10 MHz standard wiring harness, A21W1, to the motherboard connector, A14J4.
5. Connect the power supply wiring harness, A3W1, to the motherboard connector, A14J3.
6. Reattach the left side cover.
7. Replace the card cage cover.
8. Replace the top cover.

RF Deck Disassembly and Reassembly

Disassembly

1. Disconnect the ac power cord.
2. Remove the bottom cover of the instrument.
3. Use a T-15 TORX driver to remove the end screw from the bottom side of the front frame that is directly in line with the RF output. (See Figure 4-16.) (This step only applies to instruments having a front panel output.)
4. Remove the top cover of the instrument.
5. Remove the card cage cover.
6. Remove the right side cover (when facing the front of the instrument).
7. Use a T-15 TORX driver to remove the four screws that hold the RF deck to the front and rear frames. (See Figure 4-16.) Be careful as the RF deck is now detached from the frame.

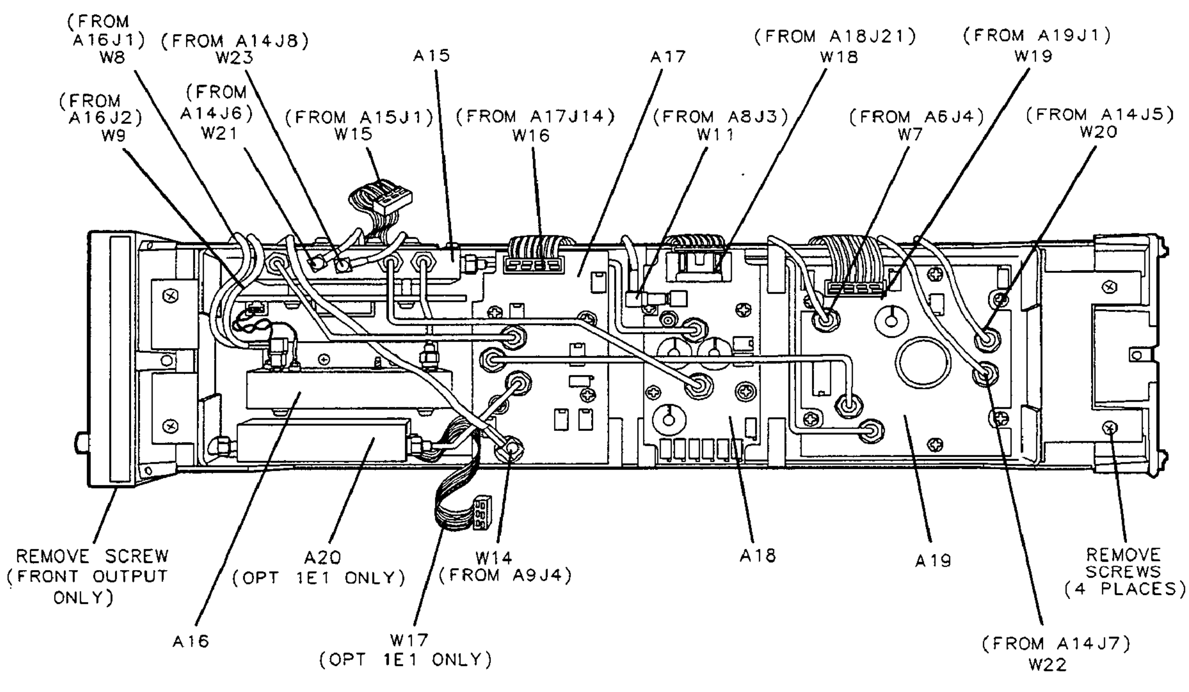


Figure 4-16. Screw and Cable Locations for RF Deck

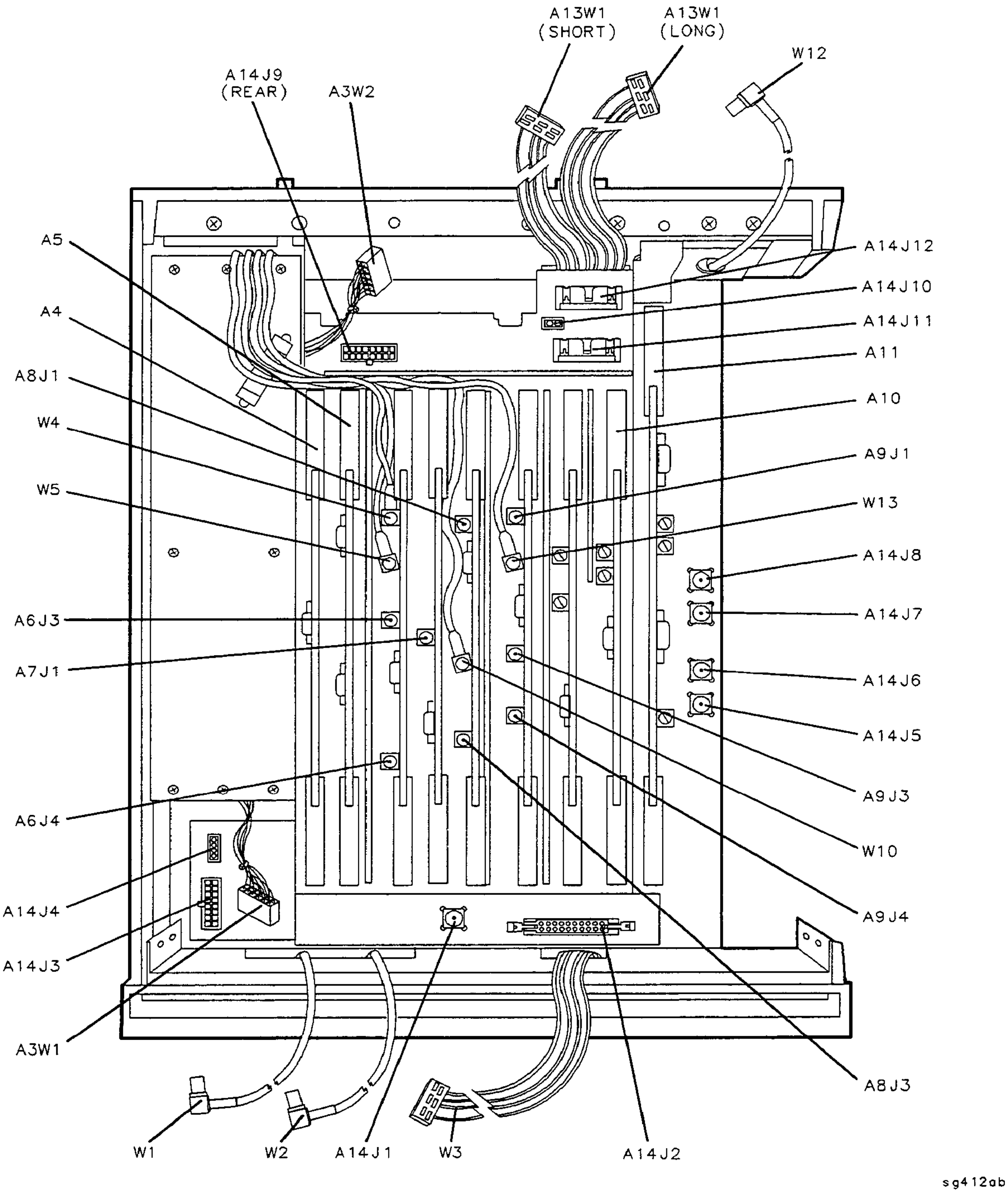


Figure 4-17. Connection Locations on Card Cage Boards and Motherboard

8. Disconnect the following ribbon cables. (See Figure 4-16 and Figure 4-17.)
   a. W19 from A19J1
   b. W18 from A18J21
   c. W17 from A20J3 (Option 1E1, 70 dB attenuator, only)
   d. W16 from A17J14
   e. W15 from A15J1

9. Disconnect the following flexible cables:
   a. W20 from A14J5
   b. W21 from A14J6
   c. W22 from A14J7
   d. W23 from A14J8
   e. W7 from A6J4
   f. W8 from A7J1
   g. W9 from A8J1
   h. W11 from A8J3
   i. W14 from A9J4

Removing an RF deck with front panel output

1. Lift the RF deck out of the instrument as follows: (Refer to Figure 4-18.)
   a. Pull the rear end of the RF deck out from the instrument approximately one-half inch so that the corner (1) of the RF deck clears corner (3) of the rear frame.
   b. Push the RF deck towards the rear of the instrument until the rear end of the RF deck (5) touches the side of the rear frame (4) while guiding the RF output connector through the opening in the front panel. (The connector will not completely clear the front panel in this step.)
   c. Lift the RF deck straight up and out of the instrument while continuing to guide the RF output connector through the opening in the front panel.

Removing an RF deck with rear panel output (Option 1E4)

1. Use a 5/16 inch, open-end wrench, to disconnect the semi-rigid cable from the RF connector assembly on the inside of the rear panel.
2. Carefully lift the RF deck out of the instrument.

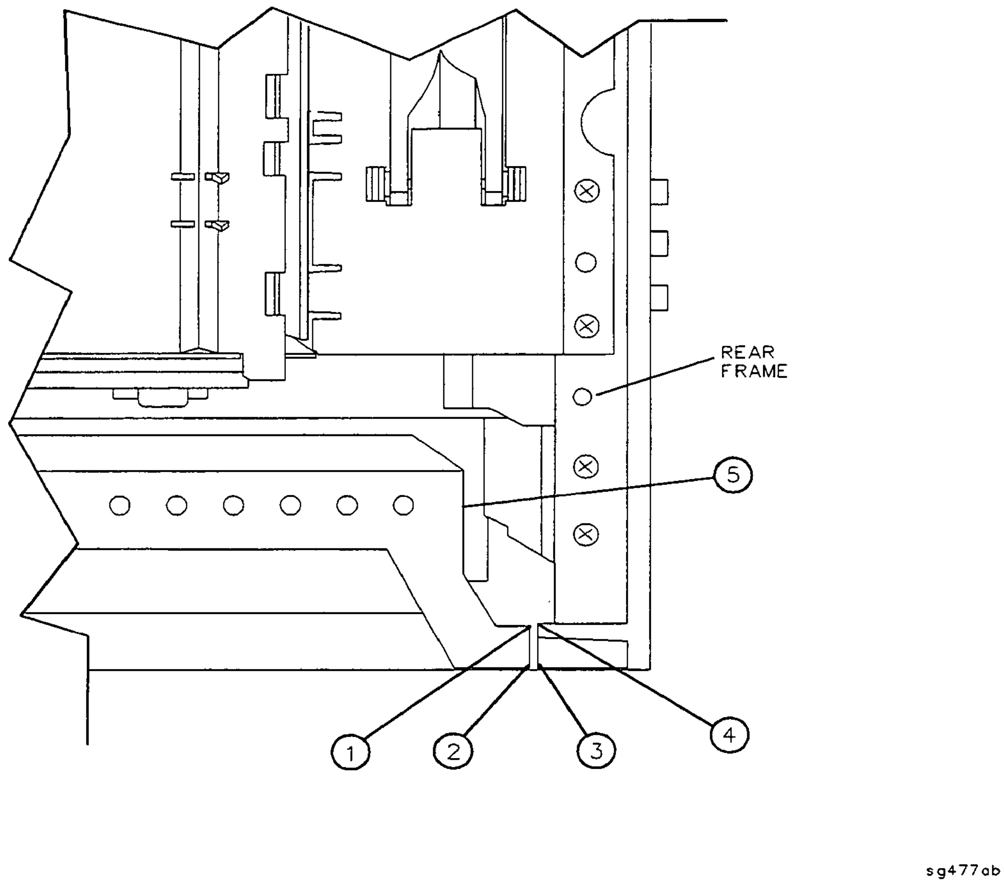


Figure 4-18. Removing the RF deck

Reassembly

Replacing an RF deck with front panel output

1. Holding the RF deck above the instrument, guide the RF output connector into the front panel opening then settle the RF deck into the instrument with the rear end of the RF deck (5) touching the side of the rear frame (4). (See Figure 4-18.)
2. Push the RF deck forward toward the front of the instrument while continuing to guide the RF output connector through the front panel opening.

Replacing an RF Deck with rear panel output (Option 1E4)

1. Hold the RF deck above the instrument then carefully settle it into the instrument.
2. Use a 5/16 inch, open-end wrench, to reconnect the semi-rigid cable to the RF connector assembly on the inside of the rear panel.

Reconnecting cables and assemblies

1. Reconnect ribbon cables. (See Figure 4-16 and Figure 4-17.)
   a. W15 to A15J1
   b. W16 to A17J14
   c. W17 to A20J3 (Option 1E1, 70 dB attenuator, only)
   d. W18 to A18J21
   e. W19 to A19J1
2. Reconnect the following flexible cables:
   a. W20 to A14J5
   b. W21 to A14J6
   c. W22 to A14J7
   d. W23 to A14J8
   e. W7 to A6J4
   f. W8 to A7J1
   g. W9 to A8J1
   h. W11 to A8J3
   i. W14 to A9J4
3. Ensure that the corner of the RF Deck (2) is aligned with the corner of the rear frame (3). (See Figure 4-18.)
4. Use a T-15 TORX driver to replace the four screws that hold the RF deck to the front and rear frames (recommended torque is 21 in-lb).
5. Reattach the right side cover onto the frame.
6. Replace the card cage cover.
7. Replace the top cover.
8. Use a T-15 TORX driver to replace the end screw on the bottom side of the front frame (recommended torque is 21 in-lb). (This step only applies to instruments having a front panel output.)
9. Replace the bottom cover of the instrument.

RF Deck Semi-Rigid Cable Disassembly

Disassembly

If you need to replace a microcircuit, some of the semi-rigid cables listed below will need to be removed. Use a 5/16 inch, open-end wrench to loosen the connections of the semi-rigid cables connected to the microcircuit requiring removal. (See Figure 4-19.)

- W27 (item 7) A15J19 to A18J24
- W25 (item 6) A19J5 to A17J18
- W26 (item 5) A15J21 to A18J25
- W28 (item 4) A15J16 to A17J17
- W29 (item 3) A17J19 to A20J1
- W24 (item 2) A15J22 to A19J6
- W30 (item 1) A15J20 to A16J3

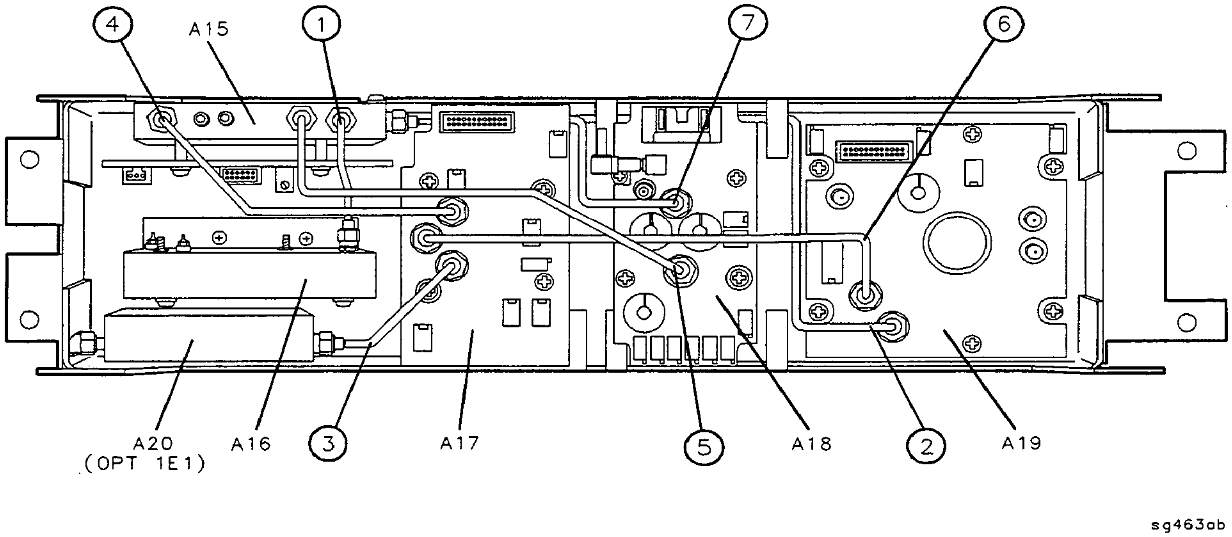


Figure 4-19. Semi-Rigid Cable Locations for RF Deck

RF Deck Semi-Rigid Cable Reassembly

Reassembly

If all or most of the semi-rigid cables have been removed, reconnect them in the order listed below. Use a 5/16 inch, open-end wrench to make the connections (recommended torque is 9 in-lb). (See Figure 4-19.)

1. W30 (item 1) A15J20 to A16J3
2. W24 (item 2) A15J22 to A19J6
3. W29 (item 3) A17J19 to A20J1
4. W28 (item 4) A15J16 to A17J17
5. W26 (item 5) A15J21 to A18J25
6. W25 (item 6) A19J5 to A17J18
7. W27 (item 7) A15J19 to A18J24

Motherboard Disassembly and Reassembly

Disassembly

Removing the major assemblies

1. Disconnect the ac power cord.
2. Remove the bottom cover of the instrument.
3. Remove the top cover of the instrument.
4. Remove the card cage cover.
5. Remove the side covers.
6. Remove the fan.
7. Remove the 10 MHz Std (Option 1E5).
8. Remove the RF deck.

Removing the cables and PC boards

1. Disconnect all the remaining flexible cables from the PC boards in the card cage. (See Figure 4-20.)
   a. W12 from A9J1
   b. W13 from A9J2
   c. W2 from A9J3
   d. W10 from A8J2
   e. W4 from A6J1
   f. W5 from A6J2

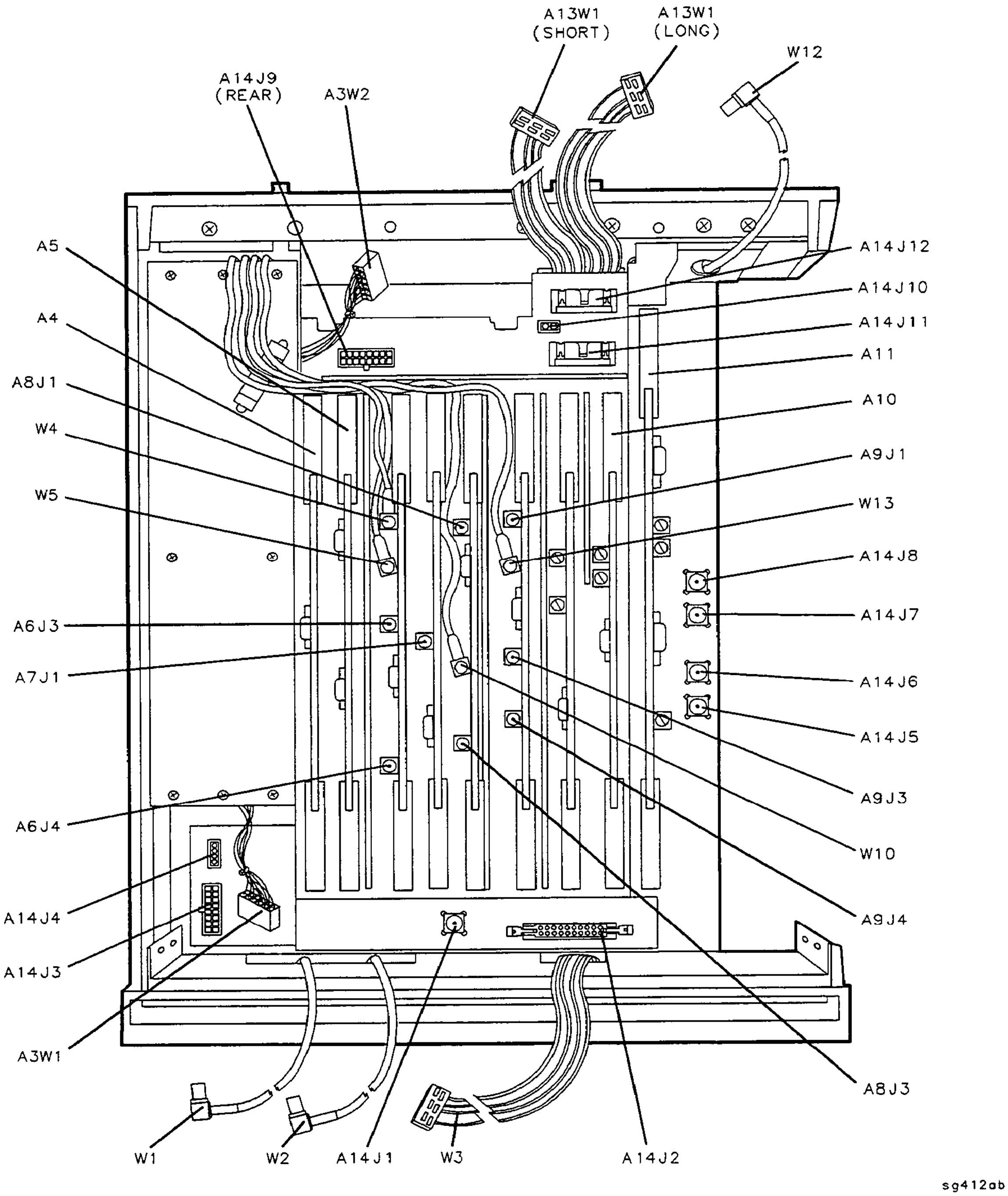


Figure 4-20. Connection Locations on Card Cage Boards and Motherboard

2. Remove each PC board (A4, A5, A6, A7, A8, A9, A10, A11, and A12) from the card cage by simultaneously lifting the two extractors on the ends of each board.
3. Disconnect all the remaining cables from the motherboard, A14:
   a. A13W1 (long) from A14J11
   b. A13W1 (short) from A14J12
   c. A3W2 from A14J9

d. W1 from A14J1
e. W3 form A14J2

Detaching the motherboard

1. Locate the FETs, Q1 and Q2, at the base of the right, outside wall of the card cage assembly when facing the front of the instrument. (See Figure 4-21.)
2. Use a T-10 TORX driver to loosen the screws on the FET bodies.
3. Remove the insulator from between the FET body and the card cage wall on both FETs.

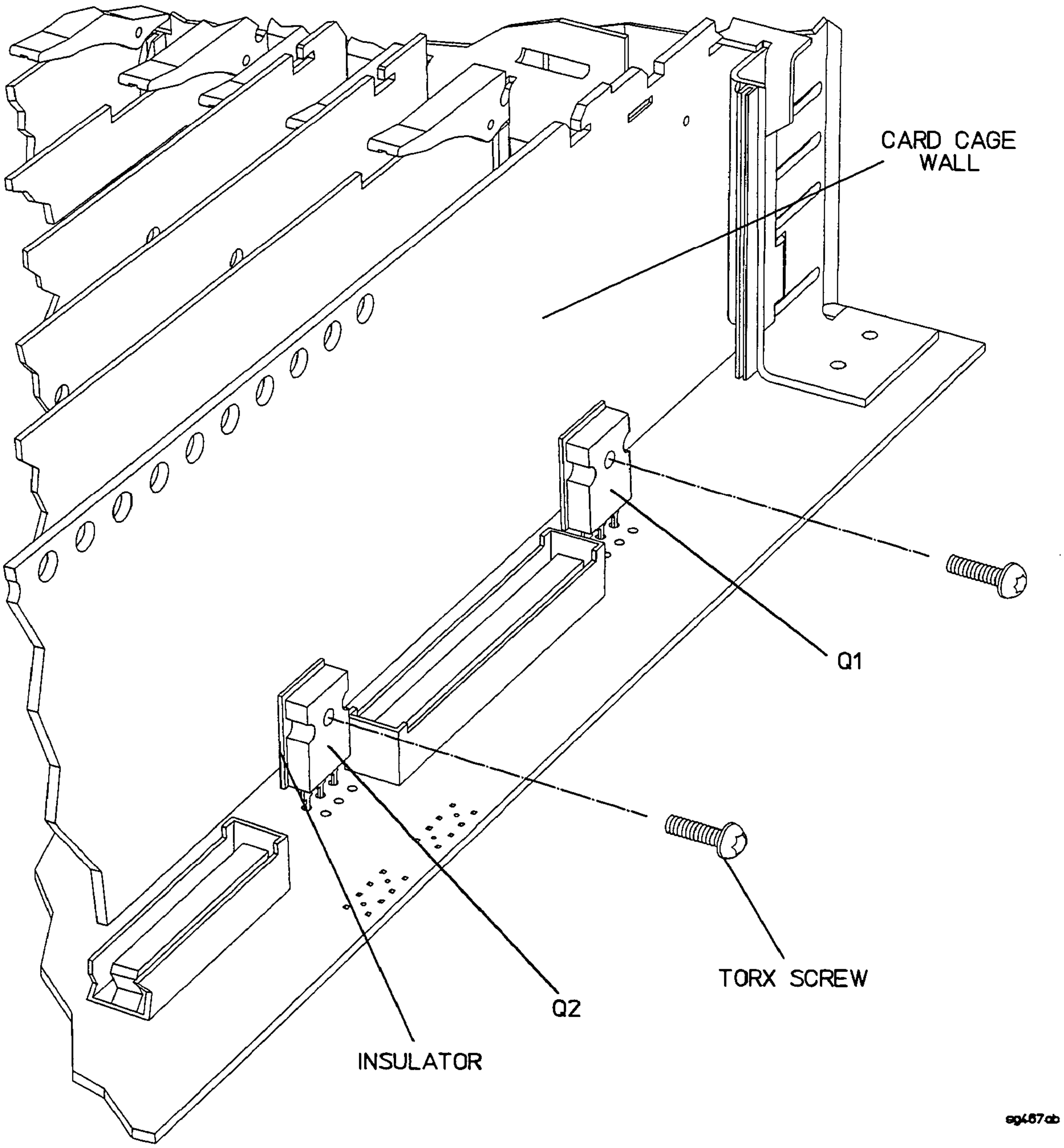


Figure 4-21. FETs on Motherboard

4. Turn the instrument over to gain access to the bottom side of the motherboard. Use a 3/32 inch hex-key driver to unscrew and remove all the rivscrews (26 places) that secure the motherboard to the instrument assembly. (See Figure 4-22.)

Caution Ensure that the rivscrews are unscrewed *straight* out of the board. Lateral force on the screws can damage the threads of the tapped holes in the frame, and therefore, make them unusable.

---

5. Lift the rear end of the motherboard (6) approximately 2 inches and pull it directly back until the motherboard stops. The board will move approximately 1 inch and still be underneath the metal tabs (1) and (2).
6. With corner (7) functioning as a center point, carefully lift and pivot the rear end of the board (6) counterclockwise until it comes out from underneath the metal tab (1).
7. Lift the board at positions (5) and (6) approximately 4 inches and gently pull it in the direction opposite of corner (7) so that the board comes out from underneath the metal tab (2). The motherboard should now be detached.
8. If the motherboard is to be replaced, unsolder and remove the FETs, Q1 and Q2, so that they may be soldered into the new motherboard.

Note The FETs, Q1 and Q2, are not included when ordering a new motherboard, A14. Therefore, the FETs must be removed from the old motherboard and soldered into the new one. New FETs can, however, be ordered separately. (Refer to Chapter 6, "Replaceable Parts," for information.)

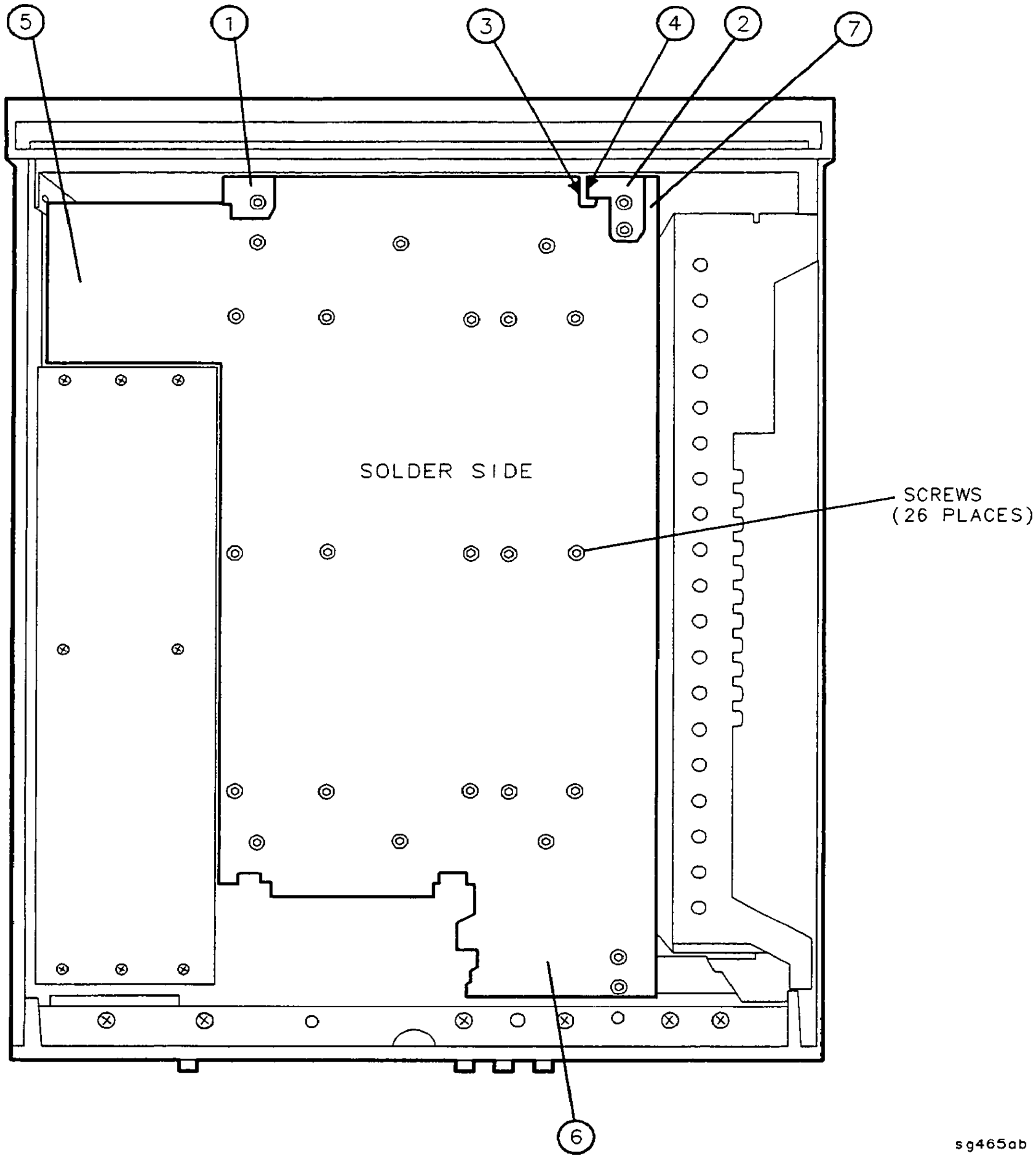


Figure 4-22. Rivscrew Locations on Motherboard

Reassembly

Positioning the motherboard on the instrument assembly

1. Refer to Figure 4-23. With the instrument turned over, hold the motherboard at positions (5) and (6) and carefully guide corner (7) underneath metal tab (2).
2. While ensuring that the PC board is lifted approximately 4 inches at points (5) and (6), apply pressure to the PC board so that edge (3) of the PC board is firmly pressed against edge (4) of metal tab (2). Test for proper positioning by seeing if the PC board lays flat on the assembly. By having the PC board lay flat, you ensure that it has achieved proper position in relation to the connectors and card cage framework underneath.

3. Lift the rear end of the PC board (6) approximately two inches and gently pull it directly toward the rear of the instrument until the PC board stops.
4. With corner (7) functioning as a center point, carefully lift and pivot the PC board counterclockwise until it clears the top of the metal tab (1).
5. Now pivot the PC board clockwise so that it slides underneath the metal tab (1). The motherboard should now be able to lay flat on the instrument underneath the metal tabs (1) and (2).

Securing the motherboard to the instrument assembly

1. Ensure that the screw holes of the motherboard are in line with the corresponding holes of the instrument assembly.
2. Use a #2 pozidrive to secure the motherboard to the instrument assembly using M4 × 0.70, 6 mm long, patch lock, pozidrive screws (HP part number 0515-0898) in 26 places. (See Figure 4-23.) The recommended torque is 21 in-lb.

Caution Do not reuse the same rivscrews that were previously securing the motherboard. Rivscrews are not capable of enduring repeated applications and can damage the tapped holes of the instrument assembly.

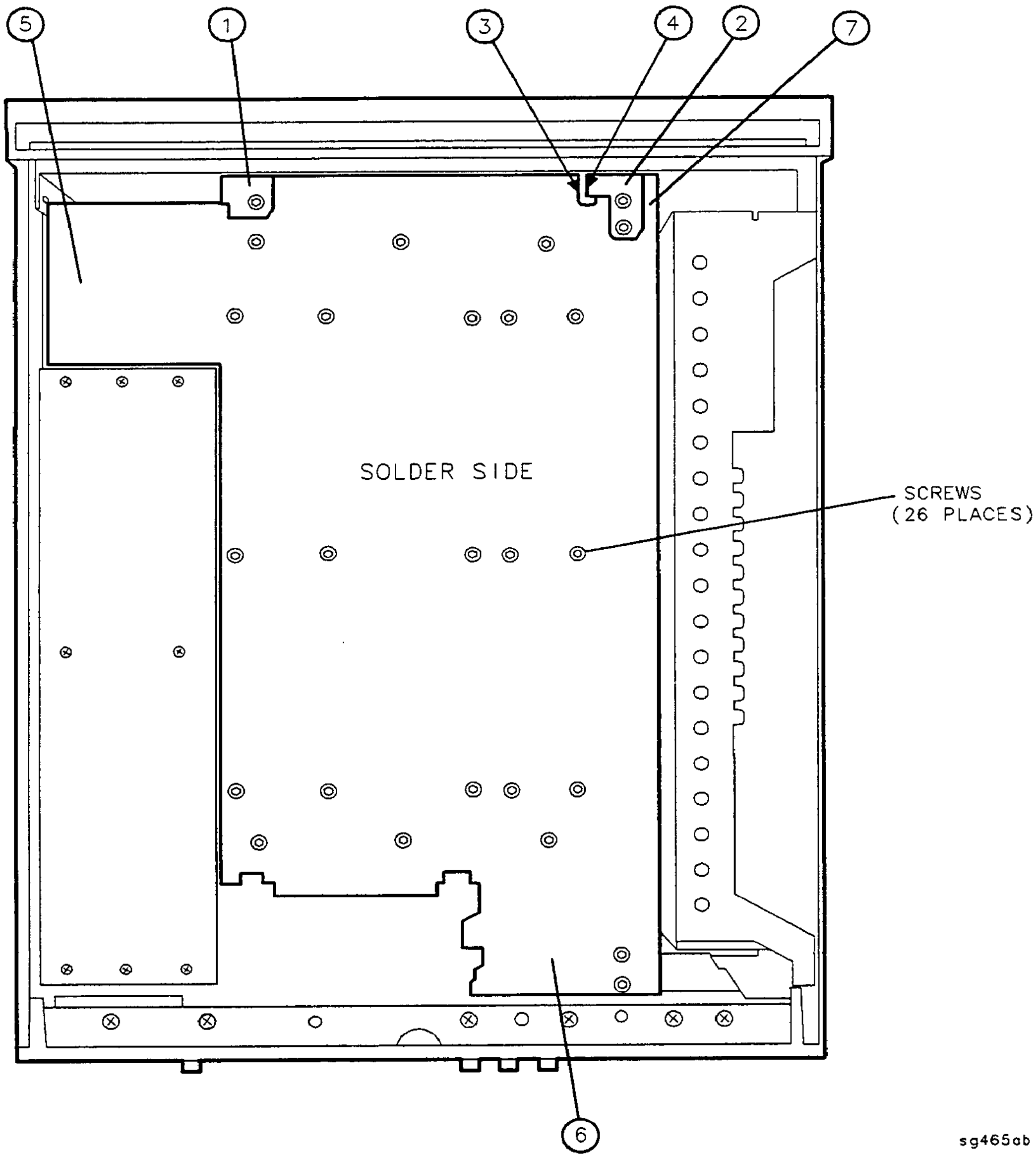


Figure 4-23. TORX Screw Locations on Motherboard

3. Turn the instrument upright and place the FETs, Q1 and Q2, in the motherboard at the base of the right, outside wall of the card cage assembly (when facing the front of the instrument) as shown in Figure 4-25. Orient the FETs in the motherboard so that the back side of the FET bodies are against the side of the card cage wall. (See Figure 4-24.)
4. While ensuring that the FET leads stay in the appropriate motherboard holes, secure the FETs to the side of the card cage by using a T-10 TORX driver to tighten the screws on the device bodies (recommended torque is 9 in-lb). (See Figure 4-24.)
5. Turn the instrument over and solder the FET leads of Q1 and Q2 to the motherboard.

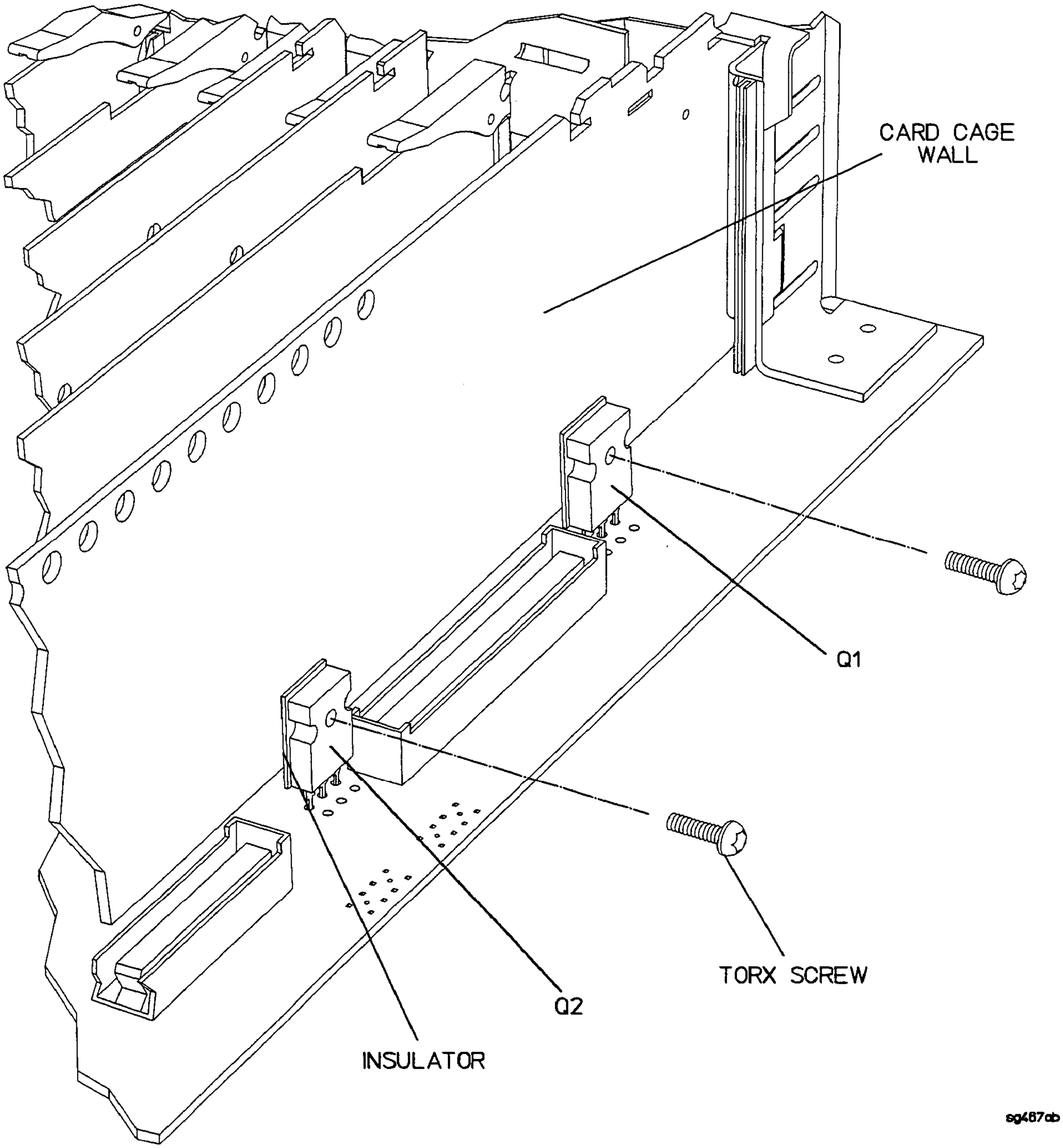


Figure 4-24. FETs on Motherboard

Replacing the cables and PC boards

1. Connect the following cables to the motherboard. (See Figure 4-25.)
   a. A13W1 (long) to A14J11
   b. A13W1 (short) to A14J12
   c. A3W2 to A14J9
   d. W1 to A14J1
   e. W3 to A14J2

2. Replace the PC boards (A4, A5, A6, A7, A8, A9, A10, A11, and A12) in the card cage by inserting them into the plastic guides that support the ends of each board. Press them into the connectors of the motherboard by simultaneously pressing down the two extractors on the ends of each board. (Refer to Figure 4-25 for board locations.)
3. Connect the following cables to the PC boards in the card cage. (See Figure 4-25.)
   a. W12 to A9J1
   b. W13 to A9J2
   c. W2 to A9J3
   d. W10 to A8J2
   e. W4 to A6J1
   f. W5 to A6J2

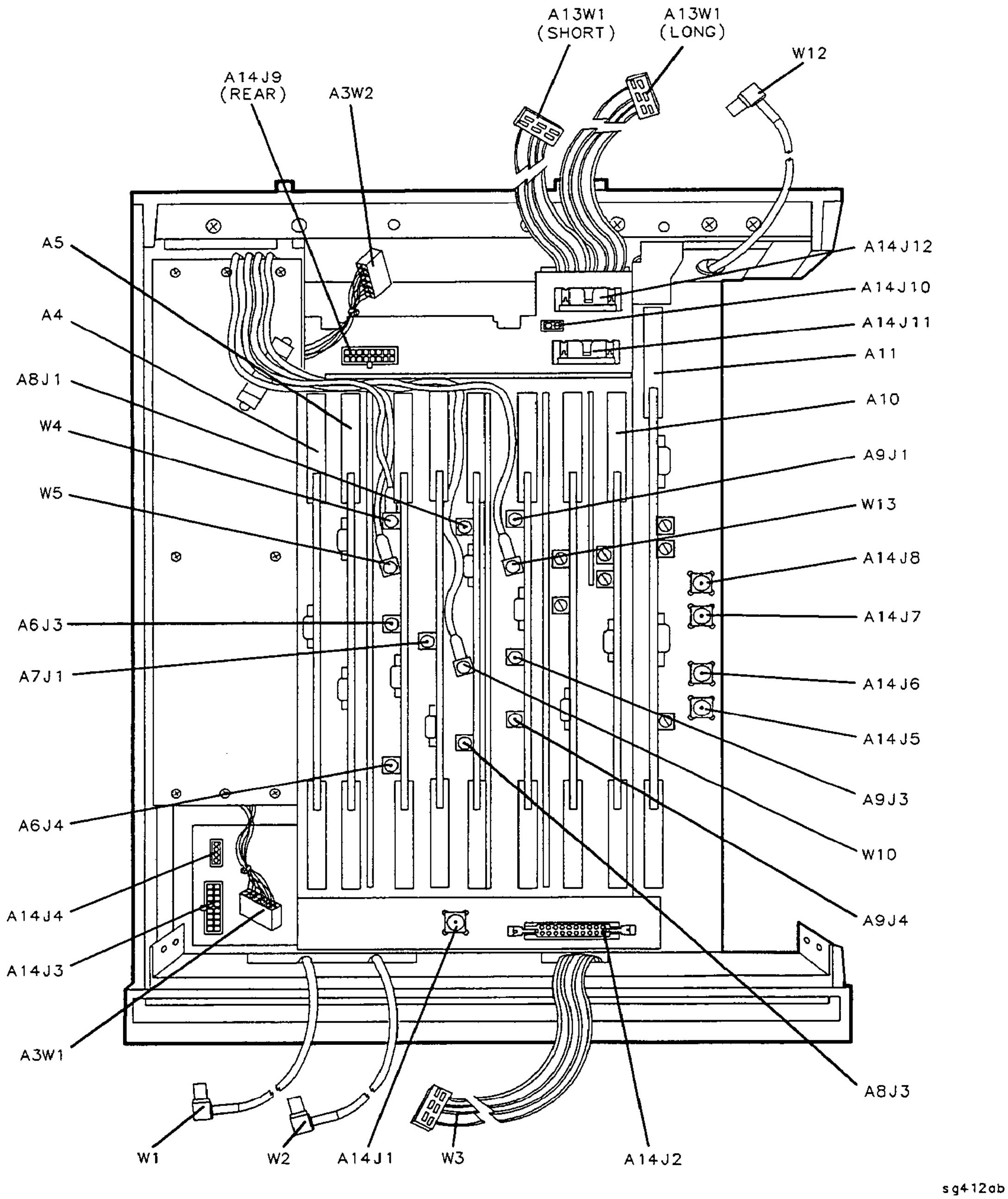


Figure 4-25. Connection Locations on Card Cage Boards and Motherboard

Replacing the major assemblies

1. Replace the RF deck.
2. Replace the 10 MHz Std (Option 1E5).
3. Replace the fan and its cover.
4. Replace the side covers.
5. Replace the card cage cover.
6. Replace the top cover of the instrument.
7. Replace the bottom cover of the instrument.

5. Troubleshooting

5

Troubleshooting

This chapter provides the procedures to troubleshoot your instrument to the assembly level. For each assembly, replacement procedures and post-repair instructions are also provided.

This chapter consists of two major sections. Start troubleshooting using the "Instrument Level Troubleshooting" section. The procedures in this section will direct you to the "Assembly Level Troubleshooting" section for further troubleshooting of assemblies and for replacement and post-repair information.

Shipping Your Instrument Back to HP

If it becomes necessary to ship your instrument back to HP, use the original packaging or something comparable that provides sufficient padding to protect the instrument. To prevent damage to the handles, remove them before packaging the instrument.

Fill out a blue repair tag and attach it to the instrument. Repair tags are located at the end of section 5c "Overall Block Diagrams."

5a. Instrument Level Troubleshooting

5a

Instrument Level Troubleshooting

How to Use Instrument Level Troubleshooting

- Determine your starting point in this chapter based on the following list of failures.
- Begin troubleshooting with the procedure associated with the *first failure* in the list that applies to your instrument.
- For multiple failures, troubleshoot them in the order they are presented in this list.

Unable to Run Self-Tests	**Go to This Procedure**
Power supply failure and self-tests will not run	ILT-1. Power Supply Will Not Power On
Temperature-related power supply failure and self-tests will not run	ILT-2. Power Supply Shuts Down During Operation
CPU power on self-test fails	ILT-3. CPU Power On Self-Test Fails
Front panel display or keyboard not operational	A1/A2 Assembly Level Troubleshooting
Self-Test Failures	**Go to This Procedure**
Any self-test failure	Table 5a-1
Self-Tests Pass	**Go to This Procedure**
Unlocked indications	The Instrument is Unlocked (Located after "A14 Assembly Level Troubleshooting.")
Unleveled indications	The Instrument is Unleveled (Located after "The Instrument is Unlocked.")
Adjustment does not work	Table 5b-10 (Located at the end of "Assembly Level Troubleshooting.")
Performance test fails	Table 5b-11 (Located at the end of "Assembly Level Troubleshooting.")

Table 5a-1. Failure Messages and Related Troubleshooting

Failure Message	Go to This Assembly Level Troubleshooting Procedure	Failure Message	Go to This Assembly Level Troubleshooting Procedure
AbusADC	A4 CPU	HighBandIF	A8 YO Loop
ALCRefMax	A9 ALC	HiBdDetIn (A or B)	A9 ALC
ALCRefMin	A9 ALC	HiPulseOff	A9 ALC
AnalogGnd_1	A12 RF Interface	HiPulseOn	A9 ALC
AnalogGnd_2	A12 RF Interface	HoldINT_OUT	A9 ALC
AnalogGnd_3	A12 RF Interface	HPIBActivity	A13 YO Loop
AUXbus	A13 Rear Panel	HPIBControl	A13 YO Loop
Bootrom	A4 CPU	HPIBData	A13 YO Loop
BreakPoint1	A7 Fractional-N	HSWP	A5 Timer
BreakPoint2	A7 Fractional-N	IFAmpSense	A12 RF Interface
BreakPoint3	A7 Fractional-N	InstrBus	A4 CPU
BreakPoint4	A7 Fractional-N	Integrator	A7 Fractional-N
BreakPoint5	A7 Fractional-N	L1MHz_Timer	A5 Timer
CFDAClin	A11 YIG Driver	LADCTRIG	A5 Timer
CFDACmax	A11 YIG Driver	LDAC_TRIG	A5 Timer
CFDACmin	A11 YIG Driver	LEVELED	A5 Timer
DetOFSdacLin	A9 ALC	LINT_MISC	A5 Timer
DetOFSdacMax	A9 ALC	LINT_TIMER	A5 Timer
DetOFSdacMin	A9 ALC	LMTRIG	A5 Timer
DigGnd	A12 RF Interface	LNORM_SS	A5 Timer
digSwpDAClin	A10 Sweep Generator	LogBPdacLin	A9 ALC
digSwpDACmax	A10 Sweep Generator	LogBPdacMax	A9 ALC
digSwpDACmin	A10 Sweep Generator	LogBPdacMin	A9 ALC
DSPhandshake	A10 Sweep Generator	LogOFSdacLin	A9 ALC
DSPXcvr	A10 Sweep Generator	LogOFSdacMax	A9 ALC
DYOCorDAClin	A10 Sweep Generator	LogOFSdacMin	A9 ALC
DYOCorDACmax	A10 Sweep Generator	LowBandIF	A8 YO Loop
DYOCorDACmin	A10 Sweep Generator	LowBdDetIn (A or B)	A9 ALC
DYOsenseHI	A12 RF Interface	LSWP_TRIG	A5 Timer
DYOsenseLO	A12 RF Interface	mc68000	A4 CPU
EEPROM	A4 CPU	MixerSense	A12 RF Interface
EOTRK	A5 Timer	MixerVolts	A12 RF Interface
FMCal	A8 YO Loop	ModAmp1	A12 RF Interface
FMInput	A8 YO Loop	ModAmp2	A12 RF Interface
FMSummer	A8 YO Loop	ModAmp3	A12 RF Interface
FRACN_UNLOCK	A5 Timer	ModDriverOff	A9 ALC
GAIN0	A8 YO Loop	ModDriverOn	A9 ALC
GAIN1	A8 YO Loop	ModOFSdacLin	A9 ALC
GAIN2	A8 YO Loop	ModOFSdacMax	A9 ALC
GAIN4	A8 YO Loop	ModOFSdacMin	A9 ALC
HetBdDetIn (A or B)	A9 ALC	MRKR	A5 Timer
HETModDrvOff	A9 ALC	Neg12V	A6 Reference
HETModDrvOn	A9 ALC	NegativeRail	A9 ALC
HETPulseOn	A9 ALC	Neg_15V	A12 RF Interface
HETPulseOff	A9 ALC	Neg_40V	A12 RF Interface

Table 5a-1. Failure Messages and Related Troubleshooting (continued)

Failure Message	Go to This Assembly Level Troubleshooting Procedure	Failure Message	Go to This Assembly Level Troubleshooting Procedure
Neg_5V	A12 RF Interface	SAFCorDACmax	A10 Sweep Generator
OscFMDrive	A11 YIG Driver	SAFCorDACmin	A10 Sweep Generator
OscSense	A11 YIG Driver	SAFDACmax	A11 YIG Driver
OvenStd	A6 Reference	SAFDACmin	A11 YIG Driver
Pos10VRef	A7 Fractional-N	SAFDACmono	A11 YIG Driver
Pos5V4Mod	A7 Fractional-N	SAFDSense	A12 RF Interface
Pos5VPD	A7 Fractional-N	SAFSense	A11 YIG Driver
PositiveRail	A9 ALC	SMIbus	A13 Rear Panel
Pos_10VREF	A12 RF Interface	SpanDAClin	A11 YIG Driver
Pos_15V	A12 RF Interface	SpanDACmax	A11 YIG Driver
Pos_21VSTDBY	A12 RF Interface	SpanDACmin	A11 YIG Driver
Pos_45V	A12 RF Interface	SSRQ	A5 Timer
Pos_5VA	A12 RF Interface	SummingAmp	A11 YIG Driver
Pos_5VFD	A12 RF Interface	SweepDAClin	A7 Fractional-N
Pos_8V	A12 RF Interface	SweepDACmax	A7 Fractional-N
PretunDAClin	A7 Fractional-N	SweepDACmin	A7 Fractional-N
PretunDACmax	A7 Fractional-N	SwpGenGnd	A10 Sweep Generator
PretunDACmin	A7 Fractional-N	SwpGenUNLOCK	A5 Timer
pswpDACAlin	A10 Sweep Generator	swpOut	A10 Sweep Generator
pswpDACAmax	A10 Sweep Generator	Sync	A6 Reference
pswpDACAmin	A10 Sweep Generator	TCRef	A9 ALC
pswpDACBlin	A10 Sweep Generator	Timer	A10 Sweep Generator
pswpDACBmax	A10 Sweep Generator	timer1Count	A5 Timer
pswpDACBmin	A10 Sweep Generator	timer1Modes	A5 Timer
PULSE_GEN	A5 Timer	timer2Count	A5 Timer
pwrclpDAClin	A10 Sweep Generator	timer2Modes	A5 Timer
pwrclpDACmax	A10 Sweep Generator	timer3Count	A5 Timer
pwrclpDACmin	A10 Sweep Generator	timer3Modes	A5 Timer
pwrlvlDAClin	A10 Sweep Generator	timer4Count	A5 Timer
pwrlvlDACmax	A10 Sweep Generator	timer4Modes	A5 Timer
pwrlvlDACmin	A10 Sweep Generator	TMR1	A5 Timer
PZABmarker	A5 Timer	TMR2	A5 Timer
PZABretrace	A5 Timer	TRGCLK	A5 Timer
PZABsweep	A5 Timer	UNLEVELED	A5 Timer
QSS	A5 Timer	VCOTune	A7 Fractional-N
RAM	A4 CPU	VCXOTune	A6 Reference
Ref10MHz	A6 Reference	VernDAClin	A11 YIG Driver
Ref125KHz	A6 Reference	VernDACmax	A11 YIG Driver
Ref1MHz	A6 Reference	VernDACmin	A11 YIG Driver
REF_UNLOCK	A5 Timer	YD10VRef	A11 YIG Driver
RfBlanking	A9 ALC	YOIntegrator	A8 YO Loop
ROM	A4 CPU	YOPhaseDet	A8 YO Loop
RTC	A5 Timer	YO_LO_FM	A8 YO Loop
SAFCorDAClin	A10 Sweep Generator	YO_UNLOCK	A5 Timer

ILT-1. Power Supply Will Not Power On

Failure Symptoms

- The full self-tests won't run.
- The instrument won't power up.
- The instrument will be damaged if it remains powered up.
- The wrong LEDs are lit on the rear panel next to the power receptacle when the instrument powers up.

If the power supply shuts down after it has been operating for a while and stays shut down, disregard this troubleshooting segment and continue with "ILT-2. Power Supply Shuts Down During Operation."

Perform These Power Supply LED Checks

Check the front panel LEDs (located next to the POWER switch) and the rear panel LEDs (located above the ac line power connector) for normal operation in both standby and power on conditions. Normal operation is indicated as follows:

Table 5a-2. Power Supply LEDs

Power Switch	Front Panel		Rear Panel	
	Yellow LED	Green LED	Red LED	Green LED
Standby	On	Off	On	On
Power On	Off	On	Off	On

If normal operation is not observed, go to the assembly level troubleshooting section entitled, "A3 Power Supply."

Does the Fan Operate?

If the fan operates when the instrument is powered on: Go to "ILT-3. CPU Power On Self-Test Fails."

If the fan does not operate when the instrument is powered on: Go to the assembly level troubleshooting section entitled, "A3 Power Supply" and verify the fan voltage.

ILT-2. Power Supply Shuts Down during Operation

Failure Symptoms

- The power supply works when powering on from a cold start (off for several hours) but shuts down after warming up.

Over-Temperature Shutdown Troubleshooting

1. Turn the power switch to standby and disconnect the line power cord.
2. Disconnect the A12 RF interface assembly from the motherboard.
3. Reconnect the line power cord and power on.

   If the power supply still shuts down after it warms up:

   1. Reconnect the A12 RF interface assembly.
   2. Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply" in the assembly level troubleshooting section entitled, "A3 Power Supply."

   If the power supply does not shut down after it warms up:

   1. Turn the power switch to standby and disconnect the line power cord.
   2. Reconnect the A12 RF interface assembly.
   3. Disconnect ribbon cable W16 between the RF interface assembly and the SAF microcircuit. (The temperature sensor is in the SAF.)
   4. Reconnect the line power cord and power on.

      If the power supply still shuts down after it warms up: Replace the A12 RF interface assembly. (Go to "A12-50. Replace the A12 RF Interface" in the assembly level troubleshooting section entitled, "A12 RF Interface.")

      If the power supply does not shut down after it warms up: The problem is with the airflow or air temperature in the RF deck area or the SAF is bad. Try replacing the SAF.

ILT-3. CPU Power On Self-Test Fails

Failure Symptoms

- The wrong LED sequence occurs on the CPU when the power switch is turned on.
- The wrong LED sequence occurs on the CPU during the power on self-tests.
- An error message is displayed during the power on self-tests.
- The power on self-tests terminate before they are complete.

You should have already ruled out or repaired all power supply failures.

CPU LEDs Cycle On/Off

With the top cover removed, turn the power switch on and observe the eight yellow CPU error LEDs and the red CPU reset LED.

All of the LEDs should light and then go out before beginning the power on sequence.

If this LED sequence is not observed: Measure the +5.2V supply at A4P2 pins 15, 16, 45, or 46. It should measure +5.2 V ±0.4 V.

If the supply is good: Replace the A4 CPU assembly. (Go to "A4-50." Replace the "A4 CPU" in the assembly level troubleshooting section entitled, "A4 CPU.")

If the supply does not measure within tolerances: Go to the assembly level troubleshooting section entitled, "A4 CPU" and troubleshoot the supply.

Run the CPU Self-Tests

Turn the power switch on again and verify the CPU power on self-test sequence. If the front panel display is operational, the sequence can be observed on the display in English. If the display is not operational, observe the eight yellow CPU LEDs.

- No failure messages, such as `FAILURE=ROM` should be displayed on the front panel during the power on self-test sequence. (Watch carefully, the messages will flash by quickly.)
- No error codes should be displayed on the A4 CPU assembly by the four rightmost LEDs during the power on self-test sequence. Refer to Table 5a-3 for a complete listing of the LED power on sequence.

Table 5a-3. LED Power On Sequence

LEDs*		Front Panel Display	Action If Error	Go to This Procedure
Test	Error			
○○○●	●●●●	Testing Battery	Replace A4BT1	A4-50. Replace the A4 CPU
○○●○	○○○●	Testing CPU	Replace A4	A4-50. Replace the A4 CPU
○○●○	○○●○	Testing CPU	Replace A4	A4-50. Replace the A4 CPU
○○●○	○○●●	Testing CPU	Replace A4	A4-50. Replace the A4 CPU
○○●○	○●○○	Testing CPU	Replace A4	A4-50. Replace the A4 CPU
○○●○	○●○●	Testing CPU	Replace A4	A4-50. Replace the A4 CPU
○○●●	○○○●	Testing Bootrom Rev. (x.x)	Replace A4	A4-50. Replace the A4 CPU
○○●●	○○●○	Testing Bootrom Rev. (x.x)	Replace A4	A4-50. Replace the A4 CPU
○●○○	○○○●	Testing ROM	Replace A4	A4-50. Replace the A4 CPU
○●○○	●●○○	Testing ROM	Replace A4	A4-50. Replace the A4 CPU
○●○○	○●○○	Testing ROM	Replace A4	A4-50. Replace the A4 CPU
○●○○	●●○○	Testing ROM	Replace A4	A4-50. Replace the A4 CPU
○●○○	●○○○	Testing ROM	Replace A4	A4-50. Replace the A4 CPU
○●○●	○○○●	Testing RAM	Replace A4	A4-50. Replace the A4 CPU
○●○●	○○●○	Testing RAM	Replace A4	A4-50. Replace the A4 CPU
○●○●	○●○○	Testing RAM	Replace A4	A4-50. Replace the A4 CPU
○●●○	●●●●	Testing Instrument Buss†	Check Low Nibble Address/Data	A4-1. Check the Instrument Buss
○●●●	●●●●	Testing Instrument Buss	Check High Nibble Address/Data	A4-1. Check the Instrument Buss

* ○ = Off ● = Flashing

† For the instrument buss test, the error code indicates which address or data line is not correct. For the low nibble test, the LEDs from right to left represent A1 through A4 and D0 through D3. For the high nibble test, these LEDs represent A5 through A8 and D4 through D7. However if address lines A3 or A5 fail, all four LEDs flash. If more than one line fails, the error codes are displayed simultaneously.

Observe the CPU Idle Loop

After the CPU power on sequence is completed, the CPU normally goes to an "idle loop." The following conditions should be observed:

If the CPU LEDs are normal: The yellow CPU LEDs will display a rotating "zero."

If the CPU LEDs are not normal: Go to Table 5a-4 and check the power supplies, the interrupts, and IRLW.

If the front panel display is normal: The front panel display will indicate the instrument condition when it was last powered down.

If the front panel display is not normal: Go to Table 5a-4 and check FPRXD and FPTXD. If these signals are OK, go to the assembly level troubleshooting section entitled, "A1/A2 Front Panel Keyboard and Processor" and perform the front panel display tests.

If the keyboard operation is normal: Rerun the full self-tests to determine if a failure exists.

CPU Self-Tests

If the keyboard operation is not normal: Go to the assembly level troubleshooting section entitled, "A1/A2 Front Panel Keyboard and Processor" and perform the front panel keyboard tests.

Table 5a-4. Measurements On the A4 CPU Assembly

Signal	Test Point	Normal Operation	Action If Operation Not Normal	Go to This Procedure
+15V	A4P2-1	+15 V ±1.0 V	Replace A3	A3-50. Replace the A3 Power Supply
−15V	A4P2-2	−15 V ±1.0 V	Replace A3	A3-50. Replace the A3 Power Supply
L INT TIMER	A4P2-51	+5 V with low strobe activity	Replace A5	A5-50. Replace the A5 Timer
L INT MISC	A4P2-22	+5 V may have activity	Replace A5	A5-50. Replace the A5 Timer
L INT HPIB	A4P2-52	+5 V with no activity	Replace A13	A13-50. Replace the Rear Panel
L INT FN	A4P2-20	+5 V (Not Used)	Replace A4	A4-50. Replace the A4 CPU
L INT SG	A4P2-21	+5 V (Not Used)	Replace A4	A4-50. Replace the A4 CPU
L INT V	A4P2-58	+5 V	Replace A4	A4-50. Replace the A4 CPU
IRLW	A4P2-49	TTL activity	If high - Replace A4 If low - Isolate to PC Bd	A4-50. Replace the A4 CPU A4-3. Isolate to a PC Board
FPRXD	A4P2-60	TTL activity when front panel key pressed	Replace A2	A2-50. Replace the Front Panel Processor
FPTXD	A4P2-30	TTL activity when front panel key pressed	Replace A4	A4-50. Replace the A4 CPU

5b. Assembly Level Troubleshooting

5b

Assembly Level Troubleshooting

This section provides troubleshooting information for each assembly. The section entitled, "5a. Instrument Level Troubleshooting" should have directed you to one of the assemblies in this section. The assemblies are organized in numerical order and include troubleshooting instructions, a block diagram, and replacement and post-repair information.

A1/A2 Front Panel Keyboard and Processor Troubleshooting

Use the following table to direct you to the procedures to troubleshoot a failure or to replace an assembly.

Instrument Status	Go to This Procedure
Keyboard or display not functional and unable to initiate self-tests	A1-1. Measure the Front Panel Power Supplies
FPRXD (A4P2-60) and FPTXD (A4P2-30) are normal	A1-2. Perform the Front Panel Tests (Keyboard Functional) or A1-3. Perform the Front Panel Tests (Keyboard Not Functional)
Keyboard operation not normal	A1-4. Run the Front Panel Keyboard Test
LED indicators not normal	A2-5. Run the Front Panel LED Annunciator Test

A1-1. Measure the Front Panel Power Supplies

1. Check for +38 V at A2TP6. It is easiest to make the measurement at the feedthrough to TP6 on the back side of A2 since there isn't an actual test point at TP6. If there isn't +38 V at this test point, check for this voltage at A5TP16.
2. Check for +5.2 V at the feedthrough for A2TP5. If there isn't +5.2 V at this test point, check for this voltage at A14J2 pins 1 and 2.

A1-2. Perform the Front Panel Self-Tests (Keyboard Operational)

1. Press (FM MODE) and (−) at the same time. Keep both keys pressed until D > appears in the left-hand display window.
2. Press (3) to run the ROM checksum test. ROM Checksum: 7D appears in the left-hand display window and, if the test runs successfully, ROM checksum good appears in the right-hand display window.

Note These messages are displayed very quickly. Run each test as many times as you need to see the messages.

3. Press (4) to run the RAM check. RAM Check appears in the left-hand display window and, if the test runs successfully, Processor RAM good appears in the right-hand display window.
4. Press (5) to run the display RAM check. A series of characters flash in both display windows and, if the test runs successfully, Display RAM good appears in the left-hand display window.
5. Press (8) to run the display check. Figure 5b-1 shows the characters that should appear in both display windows for this part of the test.

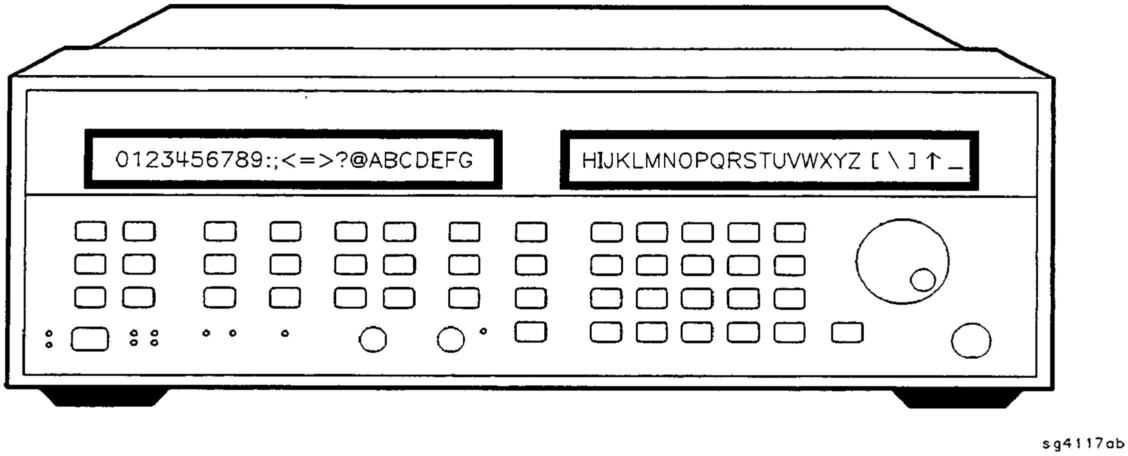


Figure 5b-1. Display Test Part One

6. Press any key to run the second part of the display test. Figure 5b-2 shows the characters that should appear in both display windows.

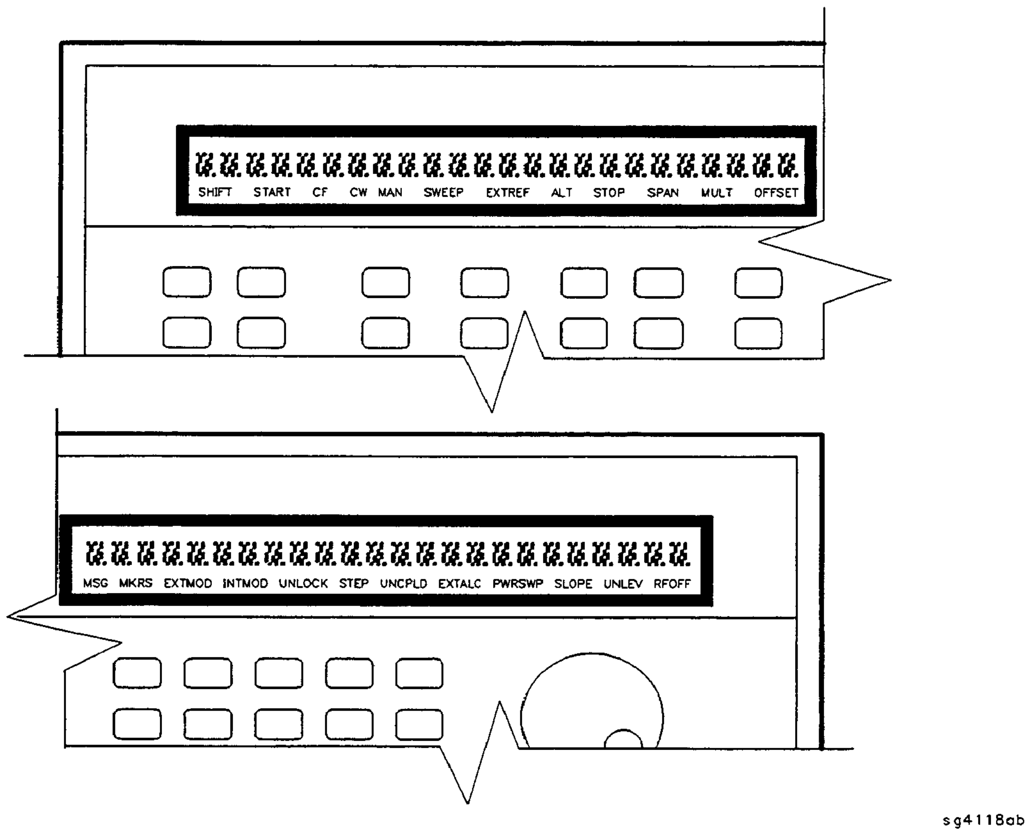
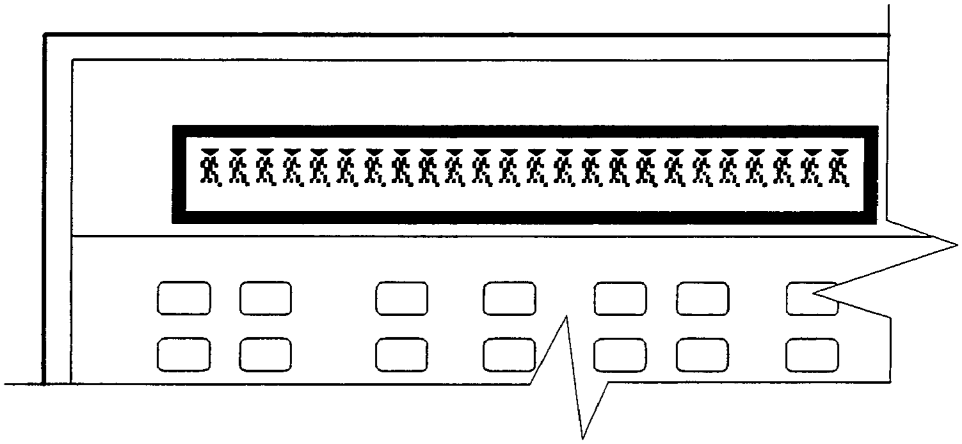


Figure 5b-2. Display Test Part Two

7. Press any key to run the third part of the display test. Figure 5b-3 shows the characters that should appear in both display windows.



sg4119ab

Figure 5b-3. Display Test Part Three

8. To exit this test, power off the instrument.

If any of these tests indicate failures: Replace the A2 assembly. (Go to "A2-50. Replace the A2 Front Panel Processor.")

A1-3. Perform the Front Panel Self-Tests (Keyboard Not Functional)

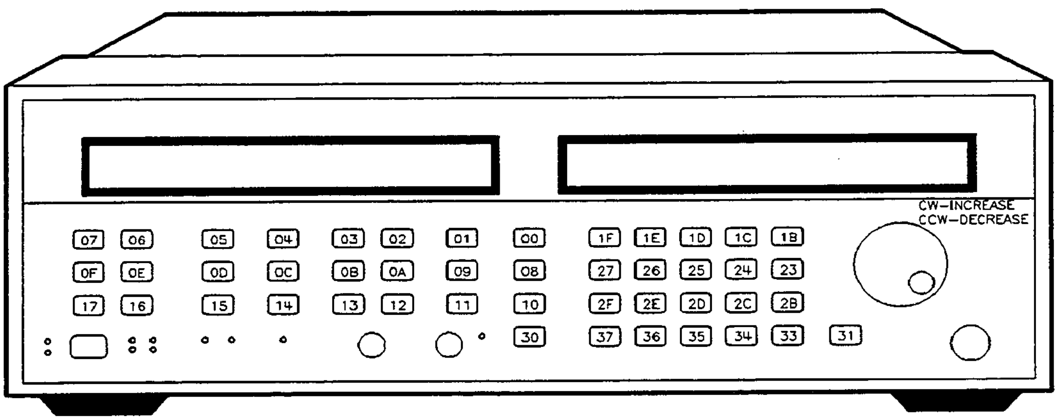
1. Power off the instrument.
2. Close switch A2S1 position 2 (Looking inside the instrument, this switch is on the top right-hand side of the front panel. Position 2 is closest to the right-hand side of the instrument.) To close the switch, press the rocker so that the bottom of the switch is pressed in and the top is protruding out.
3. Remove the A15 CPU.
4. Power on the instrument.

   The tests run automatically and very fast. They stop at the front panel keyboard test (instructions for the keyboard test follow). The display test cannot be run automatically.
5. Reset the rocker switch and replace the CPU assembly after completing the front panel tests.

If any of these tests indicate failures: Replace the A2 assembly. (Go to "A2-50. Replace the A2 Front Panel Processor.")

A1-4. Run the Front Panel Keyboard Self-Test

1. Press (FM MODE) and (−) at the same time. Keep both keys pressed until D > appears in the left-hand display window.
2. Press (6) to run the keyboard test. Key test running appears in the left-hand display window and No key pressed appears in the right-hand display window. Pressing a front panel key causes the right-hand display window to indicate the alphanumeric identification of the key. For example, pressing the (SHIFT) key causes Key 07 pressed to appear in the right-hand display window. The alphanumeric identification of each front panel key is given in Figure 5b-4. If the rotary knob is rotated, RPG test running appears in the left-hand display window along with a numerical value between 00 and 99. Rotating the knob clockwise causes the value to increase; counterclockwise rotation causes the value to decrease.
3. To exit this test, power off the instrument.



sg4116ab

Figure 5b-4. Front Panel Key Alphanumeric Identification

If the RPG is not working: Check for TTL activity at A2J3 pins 2 and 4.

If there is no activity: Replace the RPG. (Go to "A2-50. Replace the A2 Front Panel Processor" for post-repair information.)

If there is TTL activity: Replace the A2 front panel processor. (Go to "A2-50. Replace the A2 Front Panel Processor.")

If the keyboard has failures: Check to be sure A1W1 is connected to A2 and that the cable looks in good condition.

If the cable must be replaced: The cable is part of A1 so replace A1. (Go to "A1-50. Replace the A1 Front Panel Processor.")

If the cable looks good: Replace the A2 front panel processor. (Go to "A2-50. Replace the A2 Front Panel Processor.")

A2-5. Run the Front Panel LED Annunciator Test

1. Press (FM MODE) and (−) at the same time. Keep both keys pressed until D > appears in the left-hand display window.
2. Press (7) to run the LED test. LED test running appears in the left-hand display window. All front panel LEDs should light. Press any key and the LEDs should all go out and then cycle on one at a time. The sequence of the cycle is as follows:

   a. M1⇒M2 SWP
   b. MKRΔ
   c. FLTNESS ON
   d. UNLOCKED FM
   e. HP-IB STATUS S
   f. HP-IB STATUS T
   g. HP-IB STATUS L
   h. HP-IB STATUS R

   The LEDs will continue to all go out and then cycle on until any key is pressed.

If the LED sequence is not correct: Replace A1. (Go to "A1-50. Replace the A1 Front Panel Keyboard.")

If the LED sequence is still not correct after replacing A1: Replace A2. (Go to A2-50. "Replace the A2 Front Panel Processor.")

A1-50. Replace the A1 Front Panel Keyboard

Caution Perform disassembly and replacement 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.

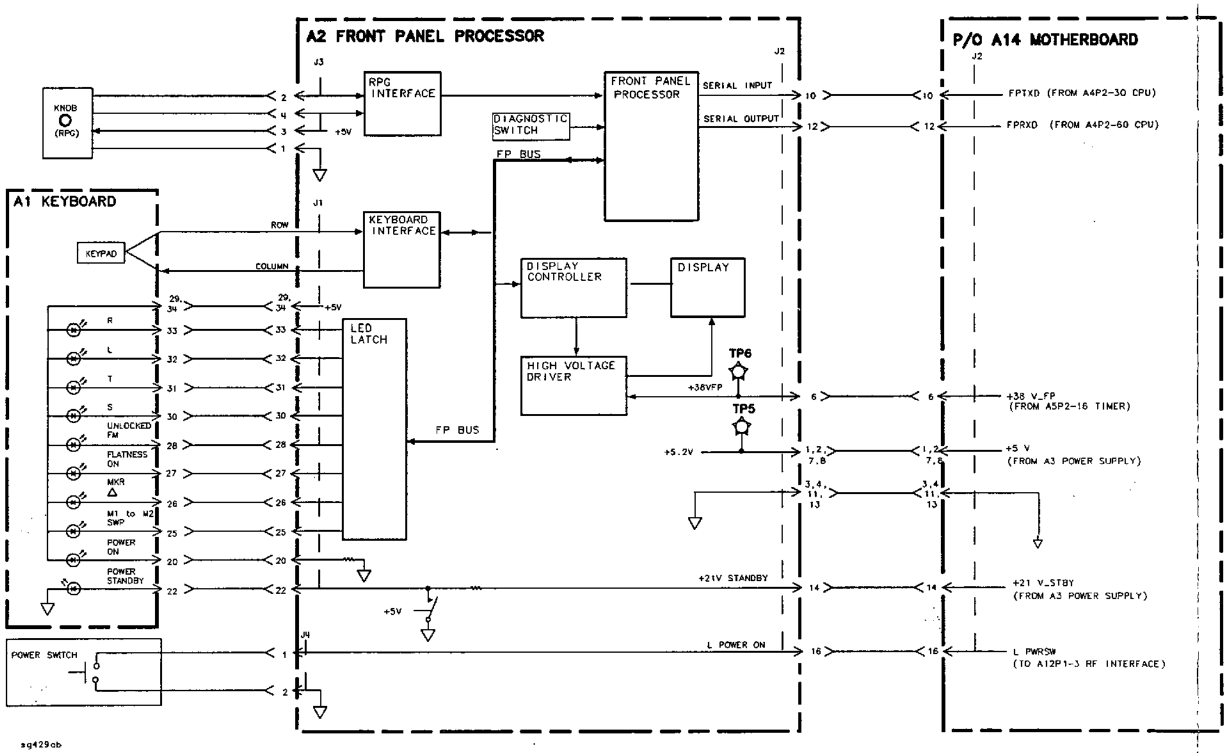
1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A2-50. Replace the A2 Front Panel Processor

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A2 FRONT PANEL DISPLAY
83750-60011



FOLD-OUT 1. 83750-60011. A2 FRONT PANEL DISPLAY, BLOCK DIAGRAM

A3 Power Supply

Use the following table to direct you to the procedures to troubleshoot a failure or to replace an assembly.

Instrument Status	Go to This Procedure
Power supply LEDs not normal	A3-1. Rear Panel Power Supply LED Troubleshooting
Fan inoperable	A3-7. Verify the Fan Voltage

A3-1. Rear Panel Power Supply LED Troubleshooting

Observe the rear panel power supply LEDs (next to the power receptacle) in both power on and standby conditions. Compare your LED status to the following table and go to the indicated procedure.

Power Switch Condition	Red LED	Green LED	Go to This Procedure
Standby	On	On	Normal Operation
	Off	Off	A3-2. Check the Line Fuse A3-3. Check the Bridge Rectifier LED
	Off	On	A3-4. Check the Standby/Power On Control Logic
	On	Off	A3-5. Isolate the Power Supply
On	Off	On	Normal Operation
	On	On	A3-4. Check the Standby/Power On Control Logic
	Cycling LEDs		A3-4. Check the Standby/Power On Control Logic A3-5. Isolate the Power Supply
	All Else		A3-5. Isolate the Power Supply

A3-2. Check the Line Fuse

The line fuse, F1, is located on the rear panel below the power receptacle.

To Remove a Fuse

1. Disconnect the ac power cord.
2. Insert a small flat-head screwdriver into the small slot on the top of the fuse holder. (See Figure 4-2.)

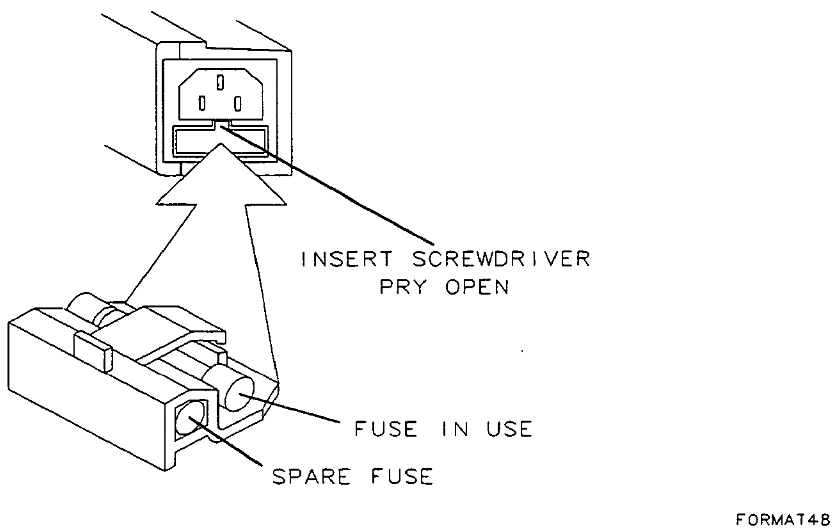


Figure 5b-5. Fuse Removal

3. Apply pressure outward, away from the instrument, to snap out the fuse holder.

To Replace a Blown Fuse

1. Replace the fuse in the holder with a 6.3A 250V F fuse (HP part number 2110-0703.)
2. Slide the fuse holder back into the slot applying pressure until it snaps in.
3. Reconnect the ac power cord.

If the second fuse blows: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A3-3. Check the Bridge Rectifier LED

The red LED across the bridge rectifier should be lit any time that ac power is connected to the instrument. To observe this LED, remove the left side cover and look through the upper row of ventilation holes. The LED is located approximately in the middle of the power supply assembly near the top, far side of the supply.

If the LED is not lit: Replace the A3 power supply assembly. (Go to "A3-50. Replace the A3 Power Supply.")

A3-4. Check the Standby/Power On Control Logic

Measure the following power supply voltages on the motherboard connector J2 pin 16 as follows:

1. With the line power cord connected, set the power switch to standby.
2. Measure the voltage on the motherboard connector J2 pin 16. The expected voltage is > 2 V.
3. Set the power switch to on.
4. Measure the voltage again at pin 16. The expected voltage is < 1 V.

If these voltages are correct: Go to "A3-5. Isolate the Power Supply" and continue troubleshooting.

If these voltages are not correct: Check to see if the problem is with the RF interface assembly by making the following measurements:

1. Turn the power switch to standby and disconnect the line power cord.
2. Disconnect the A12 RF interface assembly from the motherboard.
3. Reconnect the line power cord.
4. Repeat the measurements at pin 16 in both standby and power on conditions.

If the voltages are now correct: Replace the A12 RF interface assembly. (Go to "A12-50. Replace the A12 RF Interface.")

If the voltages are not correct: Reconnect the RF interface assembly. Then verify that the power switch operates as follows:

1. With the line power cord connected, turn the power switch to standby.
2. Ground the rear power supply wiring harness J9 pin 16. The power supply should power on.

If the power supply does not power on: Go to "A3-5. Isolate the Power Supply" and continue troubleshooting.

If the power supply does power on: The power on logic is not operational. There may be a short between the switch and the power supply. Check for the short as follows:

1. With the line power cord connected, turn the power switch to standby.
2. Measure the resistance of pin 16 to ground. The expected resistance is > 4 kΩ.

If the correct resistance is measured: Go to "A3-5. Isolate the Power Supply" and continue troubleshooting.

If the resistance is not the correct value: Use the power supply block diagrams to continue troubleshooting.

A3-5. Isolate the Power Supply

The following steps will isolate the failure to the power supply or will direct you to further troubleshooting.

1. Disconnect the line power cord.
2. Disconnect *both* power supply wiring harnesses A3W1 and A3W2.

Caution Never attempt to power on the power supply with only one harness connected. Serious damage to integrated circuits will occur.

3. Reconnect the line power cord. This is the same as standby condition. Both the red and green rear panel LEDs should be on.

Note The power supply may not operate without a load for the +5VD supply. If necessary, with power off connect a 10 ohm 20 watt resistor on the front power supply wiring harness A3W1 between pins 2 and 10 (DGND) and pins 4 and 12 (+5VDE).

4. Disconnect the line power cord.
5. On the rear power supply wiring harness A3W2, short pin 16 (L PWRON) to pin 15 (DGND).
6. Reconnect line power. This is the same as power on. The green LED should be on and the red LED should be off.
7. Disconnect the line power cord.
8. Remove the short and the 10 ohm resistor from the power supply wiring harnesses.
9. Reconnect the power supply wiring harnesses to the motherboard.

If the LEDs were not correct in the simulated standby and power on conditions: Replace the A3 power supply assembly. (Go to "A3-50. Replace the A3 Power Supply.")

If the LEDs did light correctly: Go to "A3-6. Isolate to a PC Board" and continue troubleshooting.

A3-6. Isolate to a PC Board

1. Make certain that the power supply wiring harnesses are both connected to the motherboard.
2. Try powering on the instrument with varying combinations of PC boards removed. Be certain to power off the instrument before removing any PC boards.
3. Isolate the failure to the problem assembly by checking the rear panel power supply LEDs for normal operation. In standby both LEDs will be on and in power on condition the green LED will be on and the red LED will be off.

If you were able to isolate the failure to a PC board: Replace it and go to the replacement section for that assembly for post-repair information.

If the power supply LEDs operated normally in the Isolate the Power Supply test but do not operate normally with all of the PC boards removed and the frequency standard and front panel disconnected: There is a problem with the A14 motherboard. Inspect and replace the A14 motherboard if necessary.

A3-7. Verify the Fan Voltage

The fan circuitry consists of the fan speed circuitry and the dc voltage supplied to the fan. Remove the A12 RF interface assembly (with the instrument turned off). Removing the A12 assembly eliminates the fan speed control. Turn the instrument back on and look for the following conditions:

- The fan should run at full speed.
- The voltage on A3P11 should be ≈+4 V.
- The voltage going to the fan should be ≈+25 V on A3P1 and ≈+22 V on A3P9.

If the fan operates: Go to "ILT-2. Power Supply Shuts Down During Operation."

If the voltage is 0 V on A3P1 or if the voltage is the same level on A3P1 and A3P9: Replace the A3 power supply. (Go to "A3-50. Replace the Power Supply.")

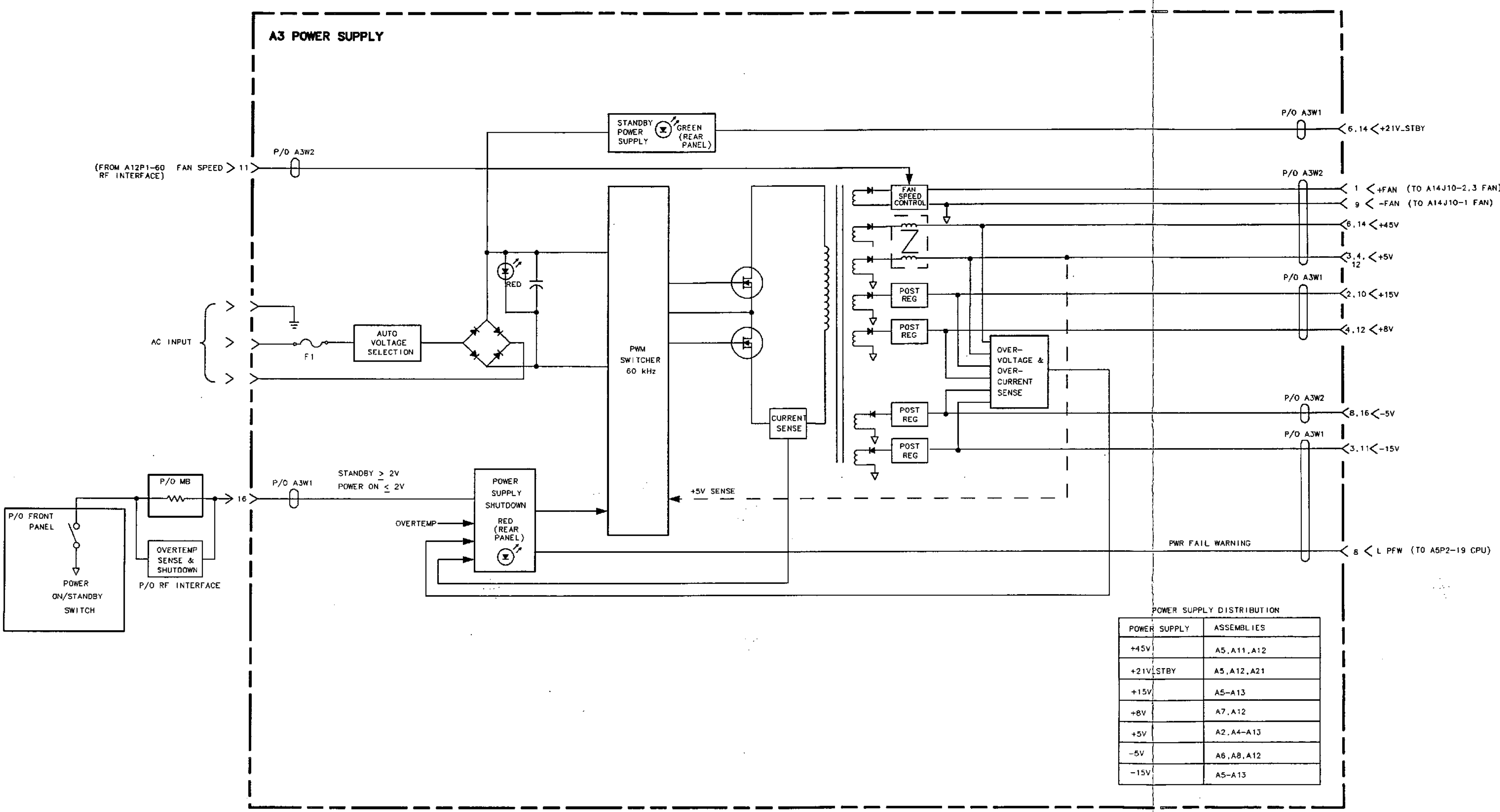
If there is a voltage on A3P1 and there is 0 V on A3P9: Replace the fan.

A3-50. Replace the A3 Power Supply

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A3 POWER SUPPLY BLOCK DIAGRAM
0950-2307



POWER SUPPLY DISTRIBUTION

POWER SUPPLY	ASSEMBLIES
+45V	A5,A11,A12
+21V_STBY	A5,A12,A21
+15V	A5-A13
+8V	A7,A12
+5V	A2,A4-A13
-5V	A6,A8,A12
-15V	A5-A13

FOLD-OUT 2. 0950-2307 A3 POWER SUPPLY, BLOCK DIAGRAM

A4 CPU

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
AbusADC	A4-50. Replace the A4 CPU
Bootrom	A4-50. Replace the A4 CPU
EEPROM	A4-50. Replace the A4 CPU
Instrbus	A4-1. Check the Instrument Buss
mc6800	A4-50. Replace the A4 CPU
ROM	A4-2. Upgrade the Firmware

A4-1. Check the Instrument Buss

1. Remove the top cover of the instrument.
2. Turn power on to the instrument and observe the eight yellow LEDs on the upper left-hand corner of the A4 CPU assembly.
3. The instrument buss test is actually two tests: the lower nibble check and the high nibble check. The four left-most LEDs indicate which test is being run. The four right-most LEDs indicate an error code to show what signal lines have failed.

   Use Table 5b-1 to determine what signal lines have failed. If more than one signal line has failed, the error codes will be displayed simultaneously for each test.

Table 5b-1. CPU Error Codes and Related Signals

LEDs*		Check This Signal	
Test	Error		
o••o	ooo•	A1	A5P2-4
		D0	A5P2-9
o••o	oo•o	A2	A5P2-34
		D1	A5P2-39
o••o	o•oo	D2	A5P2-10
o••o	•ooo	A4	A5P2-35
		D3	A5P2-40
o••o	••••	A3	A 5P2-5
o•••	ooo•	D4	A5P2-11
o•••	oo•o	A6	A5P2-36
		D5	A5P2-41
o•••	o•oo	A7	A5P2-7
		D6	A5P2-12
o•••	•ooo	A8	A5P2-37
		D7	A5P2-41
o•••	••••	A5	A5P2-6
* o = Off • = Flashing			

4. Check the failed signal lines for TTL activity.

   If the signal is stuck high: Replace the A4 CPU assembly. (Go to "A4-50. Replace the A4 CPU.")

   If there is only one error code and the signal line has TTL activity: Replace the A5 timer assembly. (Go to "A5-50. Replace the A5 Timer.")

   If multiple signals fail, or if the suspected line is stuck low: Remove A6 through A12, one at a time, and repeat this procedure.

   If the instrument buss test now passes: Replace the defective assembly.

   If the instrument buss test still fails: The problem is either the A4 CPU, the A5 timer, or possibly the A13 rear panel assembly.

A4-2. Upgrade the Firmware

To upgrade the firmware, order the firmware upgrade kit. (See Chapter 6, "Replaceable Parts," for the part number.) Then follow the procedure "Downloading Firmware" in Chapter 2, "Adjustments."

A4-3. Isolate to a PC Board

Remove the A5 timer and A10 sweep generator assemblies.

If the TTL activity goes high: Replace the defective assembly.

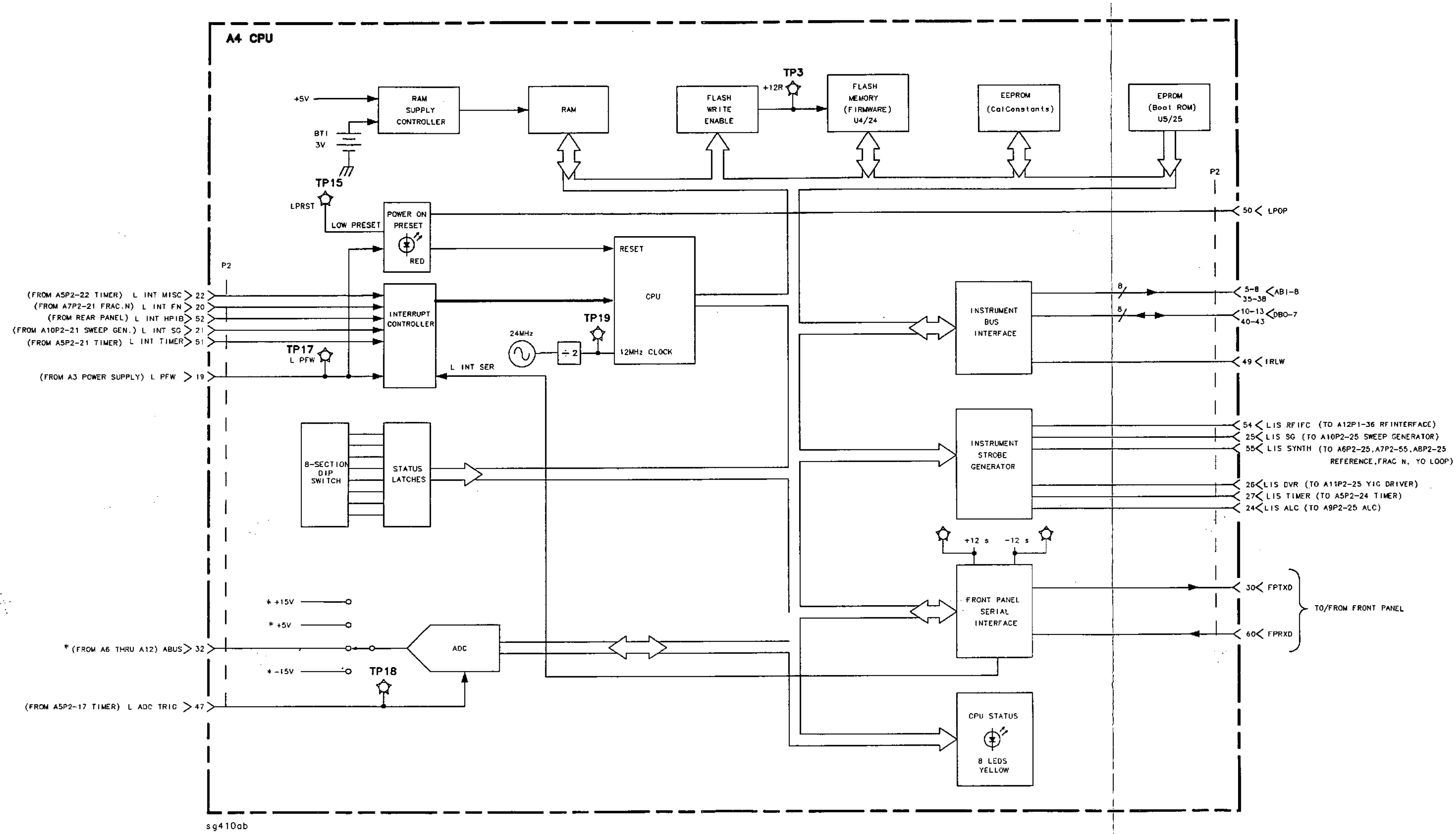
If the TTL activity goes low: Replace the A4 CPU assembly. (Go to "A4-50. Replace the A4 CPU.")

A4-50. Replace the A4 CPU

Caution Perform disassembly and replacement 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.

1. When replacing the A4 CPU assembly, you must transfer the calibration constants by moving the EEPROM (A4U3) from the old assembly to the new. Failure to do so means that you will need to perform a full adjustment procedure on the instrument.
2. See Chapter 4, "Disassembly Procedures," for replacement instructions.
3. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A4 CPU BLOCK DIAGRAM
83750-60002



* CHECKED DURING SELF-TEST.

FOLD-OUT 3. 83750-60002. A4 CPU, BLOCK DIAGRAM.

A5 Timer

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
EOTRK	A5-50. Replace the A5 Timer
FRACN_UNLOCK	A5-2. Check the L INT FN UNLOCK Input
HSWP	A5-3. Check the HSWP Output
L1MHz_Timer	A5-4. Check 1 MHz at A5TP8
LADCTRIG	A5-5. Check the L ADC_TRIG Output
LDACTRIG	A5-6. Check the L DAC_TRIG Output
LEVELED	A5-7. Check the L INT UNLEVEL Input (Leveled)
LINT-MISC (All tests)	A5-50. Replace the A5 Timer
LINT_TIMER (All tests)	A5-50. Replace the A5 Timer
LMTRIG	A5-8. Check the LMTRG Output
LNORM_SS	A5-1. Check the Power Supply Voltages
LSWP_TRIG	A5-9. Check the L SWP_TRIG Output
MRKR	A5-10. Check the Marker Input A5-11. Check the LMKR Output
PULSE_GEN	A5-12. Check the PULSE_GEN Output
PZABmarker	A5-13. Check the PZAB Output (Marker)
PZABretrace	A5-14. Check the PZAB Output (Retrace)
PZABsweep	A5-15. Check the PZAB Output (Sweep)
QSS	A5-16. Check the LQSS I/O
REF_UNLOCK	A5-17. Check the L INT REF UNLOCK Input
RTC	A5-18. Check the LRTC I/O
SSRQ	A5-19. Check the SSRQ I/O
SwpGenUNLOCK	A5-20. Check the L INT SG Input
timer1Count	A5-50. Replace the A5 Timer
timer2Count	A5-50. Replace the A5 Timer
timer3Count	A5-50. Replace the A5 Timer
timer4Count	A5-50. Replace the A5 Timer
timer1Modes	A5-1. Check the Power Supply Voltages
timer2Modes	A5-1. Check the Power Supply Voltages
timer3Modes	A5-1. Check the Power Supply Voltages
timer4Modes	A5-1. Check the Power Supply Voltages
TMR1	A5-50. Replace the A5 Timer
TMR2	A5-50. Replace the A5 Timer
TRGCLK	A5-50. Replace the A5 Timer
UNLEVELED	A5-21. Check the L INT UNLEVEL Input (Unleveled)
YO_UNLOCK	A5-22. Check the L INT YO UNLOCK Input

A5-1. Check the Power Supply Voltages

Table 5b-2 lists the power supply voltages input to the A5 timer. Use a DVM to check each of the voltages.

Table 5b-2. Power Supply Voltages Input to A5 Timer

Power Supply	Test Point	Tolerance
+5VD	A5P2-14, 15, 44, 45	+5.2 V ±0.3 V
+21V_STBY	A5P2-47	+21 V ±1.5 V
45V_FP	A5P2-20	+45 V ±2.5 V

If the power supplies are good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the power supplies are bad:

Voltage is too high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

Voltage is too low: Determine if a PC board is loading down the power supply. Remove PC boards one at a time to troubleshoot to the failed PC board. (Be sure to turn off power to the instrument when removing PC boards.) If removing the PC boards does not identify the problem assembly, replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A5-2. Check the L INT FN UNLOCK Input

Self-test failure: FRACN_UNLOCK

Loop the FRACN_UNLOCK self-test (located in the *LINT_MISC menu.)

Test point: A5P2-55

Oscilloscope timebase: 10 ms/division

Verify a positive TTL pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: The signal source is at A7P2-21. If the signal is also bad on A7, replace the A7 fractional-N. (Go to "A7-50. Replace the A7 Fractional-N.")

Stuck low: With an ohmmeter, measure A5P2-55 and verify that the signal is not shorted to ground. This input line comes from A7P2-21. Replace the shorted assembly. If the signal is not shorted and the signal is low, replace the A7 fractional-N. (Go to "A7-50. Replace the A7 Fractional-N.")

A5-3. Check the HSWP Output

Self-test failure: HSWP

Loop the HSWP self-test (located in the first level of the A5 menu.)

Test point: A5TP7 HSWP

Oscilloscope timebase: 50 ms/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-39 and verify that the signal is not shorted to ground. This output line connects to the A7 fractional–N, A9 ALC, A8 YO loop, and A10 sweep generator assemblies. Either replace A5 or the shorted assembly.

A5-4. Check 1 MHz at A5TP8

Self-test failure: L1MHz_Timer

Test point: A5TP8 1 MHZ

Oscilloscope timebase: 500 ns (1 cycle = 2 divisions)

Verify a TTL level squarewave

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad: Verify the signal source at A6P1-29. The problem is either the A6 reference or the A5 timer loading down the signal.

A5-5. Check the L ADC_TRIG Output

Self-test failure: LADCTRIG

Loop the LADCTRIG self-test (located in the *LINT_TIMER menu.)

Test point: A5TP6 LRTC

Oscilloscope timebase: 1 μs/division

Verify a TTL low pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P2-17 and verify that the signal is not shorted to ground. This output line connects to the A4 CPU. Either replace A5 or the shorted assembly.

A5-6. Check the L DAC_TRIG Output

Self-test failure: LDAC_TRIG

Loop the LDAC_TRIG self-test (located in the *TestLatch menu.)

Test point: A5TP2

Oscilloscope timebase: 5 μs/division

Verify a TTL low strobe

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P2-2 and verify that the signal is not shorted to ground. This output line connects to the A10 sweep generator. Either replace A5 or the shorted assembly.

A5-7. Check the L INT UNLEVEL Input (Leveled)

Self-test failure: LEVELED

Loop the LEVELED self-test (located in the *LINT_MISC menu.)

Test point: A5P2-58

Oscilloscope timebase: 10 ms/division

Verify a low TTL pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: The signal source is at A10P2-28. If the signal is also bad on A10, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

Stuck low: With an ohmmeter, measure A5P2-58 and verify that the signal is not shorted to ground. This input line comes from A10P2-58. Replace the shorted assembly. If the signal is not shorted and the signal is low, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A5-8. Check the LMTRG Output

Self-test failure: LMTRG

Loop the LMTRG self-test (located in the *TestLatch menu.)

Test point: A5TP1

Oscilloscope timebase: 1 μs/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-6 and verify that the signal is not shorted to ground. This output line connects to the A13 rear panel. Either replace A5 or the shorted assembly (verify that there are no connections to the TRIGGER OUTPUT on the rear panel.)

A5-9. Check the L SWP_TRIG Output

Self-test failure: LSWP_TRIG

Loop the LSWP_TRIG self-test (located in the *TestLatch menu.)

Test point: A5TP3

Oscilloscope timebase: 5 μs/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P2-1 and verify that the signal is not shorted to ground. This output line connects to the A10 sweep generator. Either replace A5 or the shorted assembly.

A5-10. Check the Marker Input

Self-test failure: MRKR

Loop the MRKR self-test (located in the first level of the A5 menu.)

Test point: A5P1-38

Oscilloscope timebase: 20 ms/division

Verify TTL level activity

If the signal is good: Check the LMKR output. (Go to "A5-11. Check the LMKR Output.")

If the signal is bad:

Stuck high: The signal source is at A10P1-8. If the signal is also bad on A10, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

Stuck low: With an ohmmeter, measure A5P1-38 and verify that the signal is not shorted to ground. This input line comes from A10P1-8. Replace the shorted assembly. If the signal is not shorted and the signal is low, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A5-11. Check the LMKR Output

Self-test failure: MRKR

Loop the MRKR self-test (located in the first level of the A5 menu.)

Test point: A5P1-36

Oscilloscope timebase: 20 ms/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-36 and verify that the signal is not shorted to ground. This output line connects to the A13 Rear Panel. Either replace A5 or the shorted assembly (verify that there are no connections to the AUXILIARY INTERFACE on the rear panel.)

A5-12. Check the PULSE_GEN Output

Self-test failure: PULSE_GEN

Loop the PULSE_GEN self-test (located in the *TestLatch menu.)

Test point: A5P2-31

Oscilloscope timebase: 20 μs/division

Verify a positive TTL pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P2-31 and verify that the signal is not shorted to ground. This output line connects to the A9 ALC. Either replace A5 or the shorted assembly.

A5-13. Check PZAB Output (marker)

Self-test failure: PZABmarker

Loop the PZABmarker self-test (located in the *TestLatch menu.)

Test point: A5TP4 PZAB

Oscilloscope timebase: 20 ms/division

Verify the following waveform

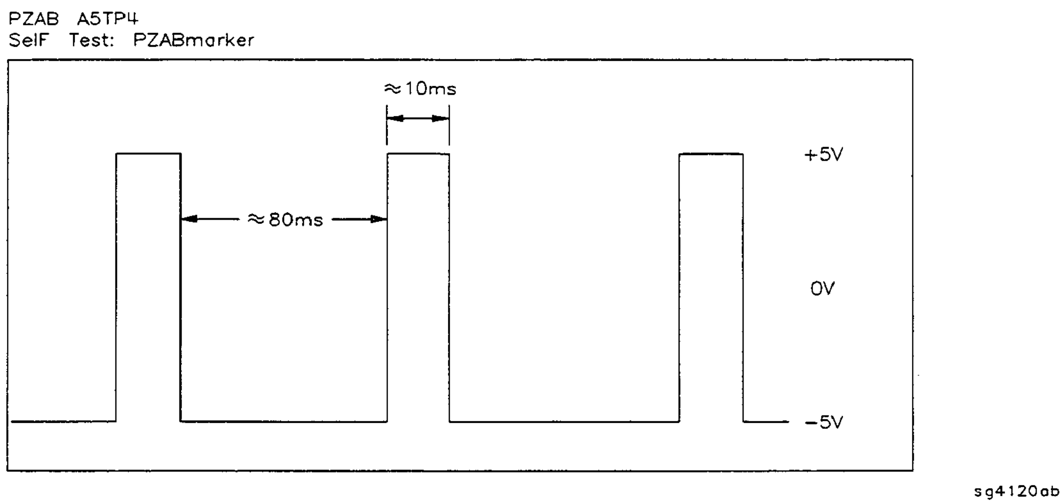


Figure 5b-6. PZAB Waveform at A5TP4

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-33 and verify that the signal is open to ground. This output line connects to the A13 rear panel. Either replace A5 or the shorted assembly (verify that there are no connections to the Z AXIS BLANK/MKRS on the rear panel.)

A5-14. Check PZAB Output (PZABretrace)

Self-test failure: PZABretrace

Loop the PZABretrace self-test (located in the *TestLatch menu.)

Test point: A5TP4 PZAB

Oscilloscope timebase: N/A

Verify +5 Vdc (TTL high)

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-33 and verify that the signal is not shorted to ground. This output line connects to the A13 rear panel. Either replace A5 or the shorted assembly (verify that there are no connections to the Z AXIS BLANK/MKRS on the rear panel.)

A5-15. Check PZAB Output (sweep)

Self-test failure: PZABsweep

Loop the PZABsweep self-test (located in the *TestLatch menu.)

Test point: A5TP4 PZAB

Oscilloscope timebase: 20 ms/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-33 and verify that the signal is not shorted to ground. This output line connects to the A13 rear panel. Either replace A5 or the shorted assembly (verify that there are no connections to the Z AXIS BLANK/MKRS on the rear panel.)

A5-16. Check the LQSS I/O

Self-test failure: QSS

Loop the QSS self-test (located in the *LINT_TIMER menu.)

Test point: A5TP9 LQSS

Oscilloscope timebase: 100 μs/division

Verify a positive TTL level pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-35 and verify that the signal is not shorted to ground. This I/O line connects to the A13 rear panel. Either replace A5 or the shorted assembly (verify that there are no connections to the AUXILIARY INTERFACE on the rear panel.)

A5-17. Check the L INT REF UNLOCK Input

Self-test failure: REF_UNLOCK

Loop the REF_UNLOCK self-test (located in the *LINT_MISC menu.)

Test point: P2-52

Oscilloscope timebase: 500 ms/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: The signal source is at A6P2-22. If the signal is also bad on A6, replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

Stuck low: With an ohmmeter, measure A5P2-52 and verify that the signal is not shorted to ground. This input line comes from A6P2-22. Replace the shorted assembly. If the signal is not shorted and the signal is low, replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

A5-18. Check the LRTC I/O

Self-test failure: RTC

Loop the RTC self-test (located in the *LINT_TIMER menu.)

Test point: A5TP12 LRTC

Oscilloscope timebase: 100 μs/division

Verify a positive TTL level pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P2-32 and verify that the signal is not shorted to ground. This I/O connects to the A10 sweep generator and the A13 rear panel. Either replace A5 or the shorted assembly.

A5-19. Check the SSRQ I/O

Self-test failure: SSRQ

Loop the SSRQ self-test (located in the *LINT_TIMER menu.)

Test point: A5TP11 LSSRQ

Oscilloscope timebase: 100 μs/division

Verify a positive TTL level pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: Remove the A5 timer (with the instrument turned off). With an ohmmeter, measure A5P1-5 and verify that the signal is not shorted to ground. This I/O connects to the A13 rear panel. Either replace A5 or the shorted assembly. Make sure that there is no connection to the rear panel STOP SWEEP connector.

A5-20. Check the L INT SG Input

Self-test failure: SwpGenUNLOCK

Loop the SwpGenUNLOCK self-test (located in the *LINT_TIMER menu.)

Test point: A5P1-31

Oscilloscope timebase: 2 ms/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: The signal source is at A10P1-5. If the signal is also bad on A10, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

Stuck low: With an ohmmeter, measure A5P1-31 and verify that the signal is not shorted to ground. This input lime comes from A10P2-21. Replace the shorted assembly. If there is no short and the signal is low, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A5-21. Check the L INT UNLEVEL Input (Unleveled)

Self-test failure: UNLEVELED

Loop the UNLEVELED self-test (located in the *LINT_MISC menu.)

Test point: A5P2-58

Oscilloscope timebase: 10 ms/division

Verify a positive TTL pulse

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: The signal source is at A10P2-28. If the signal is also bad on A10, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

Stuck low: With an ohmmeter, measure A5P2-58 and verify that the signal is not shorted to ground. This input line comes from A10P2-58. Replace the shorted assembly. If the signal is not shorted and the signal is low, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A5-22. Check the L INT YO UNLOCK Input

Self-test failure: YO_UNLOCK

Loop the YO_UNLOCK self-test (located in the *LINT_MISC menu.)

Test point: A5P2-57

Oscilloscope timebase: 10 ms/division

Verify TTL level activity

If the signal is good: Replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: The signal source is at A8P2-27. If the signal is also bad on A8, replace the A8 YO loop. (Go to "A8-50. Replace the A8 YO Loop.")

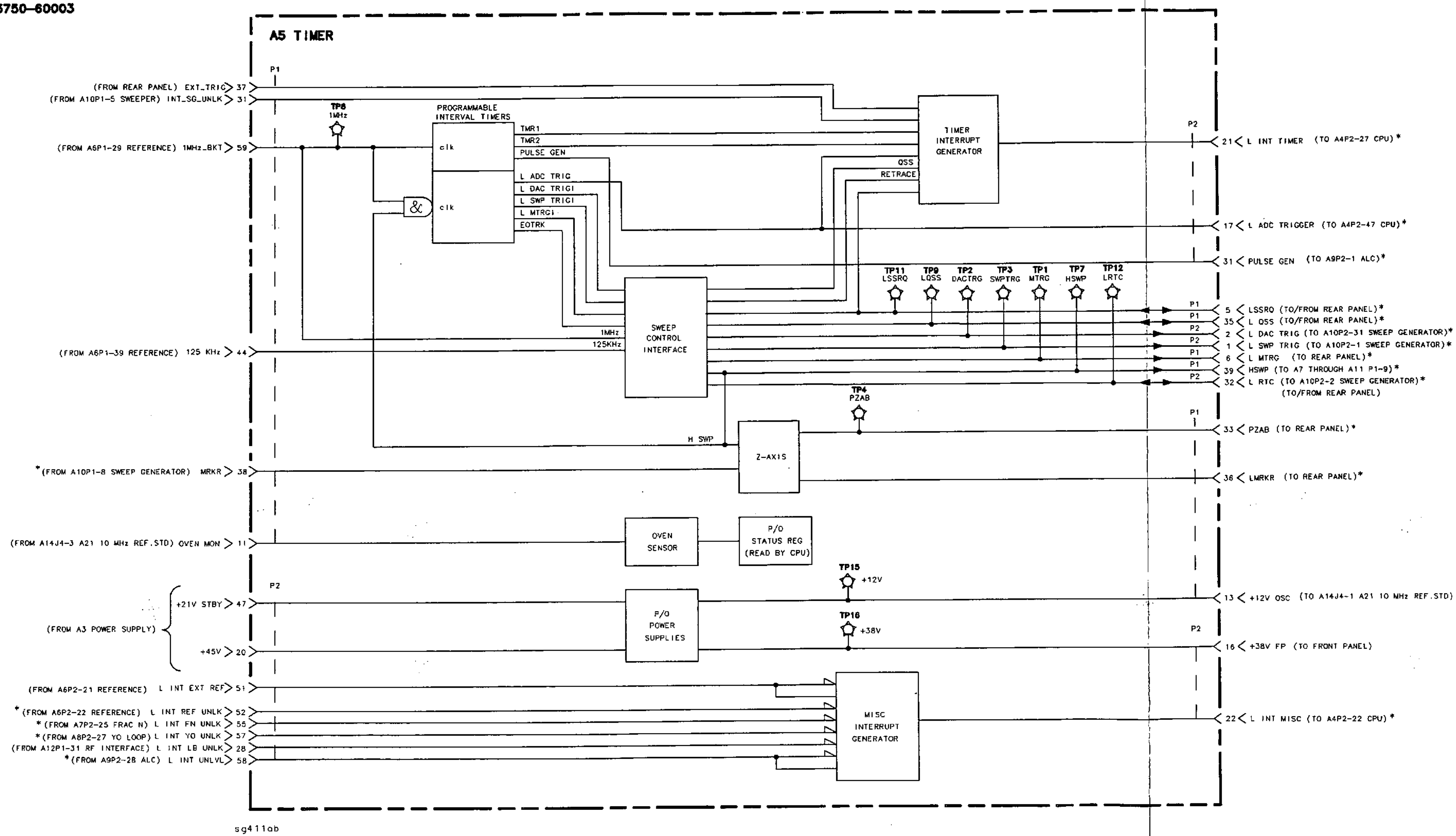
Stuck low: With an ohmmeter, measure A5P2-57 and verify that the signal is not shorted to ground. This input line comes from A8P2-27. Replace the shorted assembly. If the signal is not shorted and the signal is low, replace the A8 reference. (Go to "A8-50. Replace the A8 YO Loop.")

A5-50. Replace the A5 Timer

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A5 TIMER BLOCK DIAGRAM
83750-60003



* CHECKED DURING SELF-TEST.

FOLD-OUT 4. 83750-60003. A5 TIMER, BLOCK DIAGRAM.

A6 Reference

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
Neg12V	A6-1. Check the Power Supply Voltages
OvenStd	A6-1. Check the Power Supply Voltages A6-2. Check the 10 MHz Oven Standard Input
Ref1MHz	A6-3. Check the 1 MHz_BKT Output
Ref10MHz	A6-50. Replace the A6 Reference
Ref125kHz	A6-4. Check the 1 MHz_YO Output
Sync	A6-5. Check the Sync Output
VCXOTune	A6-50. Replace the A6 Reference

A6-1. Check the Power Supply Voltages

Table 5b-3 lists the power supply voltages input to the A6 reference. Use a DVM to check each of the voltages.

Table 5b-3. Power Supply Voltages Input to A6 Reference

Power Supply	Test Point	Tolerance
+5VD	A6P2-14, 15, 44, 45	+5.2 V ±0.3 V
+15V	A6P1-11, 12, 41, 42	+15 V ±1.0 V
−5V	A6P1-19, 49	−5 V ±0.3 V
−15V	A6P1-14, 15, 44, 45	−15 V ±1.0 V

If the power supplies are good: Replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

If the power supplies are bad:

Voltage is too high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

Voltage is too low: Determine if a PC board is loading down the power supply. Remove PC boards one at a time to troubleshoot to the failed PC board. (Be sure to turn off power to the instrument when removing PC boards.) If removing the PC boards does not identify the problem assembly, replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A6-2. Check the 10 MHz Oven Standard Input

Self-test failure: OvenStd

Test point: A6J3 (Disconnect the cable and measure the signal on the cable.)

Oscilloscope timebase: 100 ns/division

Verify 10 MHz positive pulses (approximate 600 mV peaks.)

If the signal is good: Replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

If the signal is bad: Check the signal at the output of the A21 10 MHz reference standard. If it is good, replace the cable. Otherwise, refer to the A6 reference block diagram and check the power supplies. If the power supplies are good, replace A21.

A6-3. Check 1 MHz_BKT Output

Self-test failure: Ref1MHz

Test point: A6P1-29

Oscilloscope timebase: 1 μs/division

Verify a 1 MHz TTL level squarewave

If the signal is good: Replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

If the signal is bad:

Stuck high: Replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

Stuck low: This output line connects to the A5 timer. Remove the A5 timer assembly (with the instrument turned off) and check for the 1 MHz squarewave. If the signal returns, replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.") Otherwise, replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

A6-4. Check 1 MHz_YO Output

Self-test failure: Ref125KHz

Test point: A6P1-59

Oscilloscope timebase: 1 μs/division

Verify a 1 MHz TTL level squarewave

If the signal is good: Replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

If the signal is bad:

Stuck high: Replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

Stuck low: This output line connects to the A8 YO loop. Remove the A8 YO loop assembly (with the instrument turned off) and check for the 1 MHz squarewave. If the signal returns, replace the A8 YO loop. (Go to "A8-50. Replace the A8 YO Loop.") Otherwise, replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

A6-5. Check the Sync Output

Self-test failure: Sync

Loop the Sync self-test (located in the first level of the A6 menu.)

Test point: A6P1-2

Oscilloscope timebase: N/A

Verify a high TTL level (+5 V)

If the signal is good: Replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

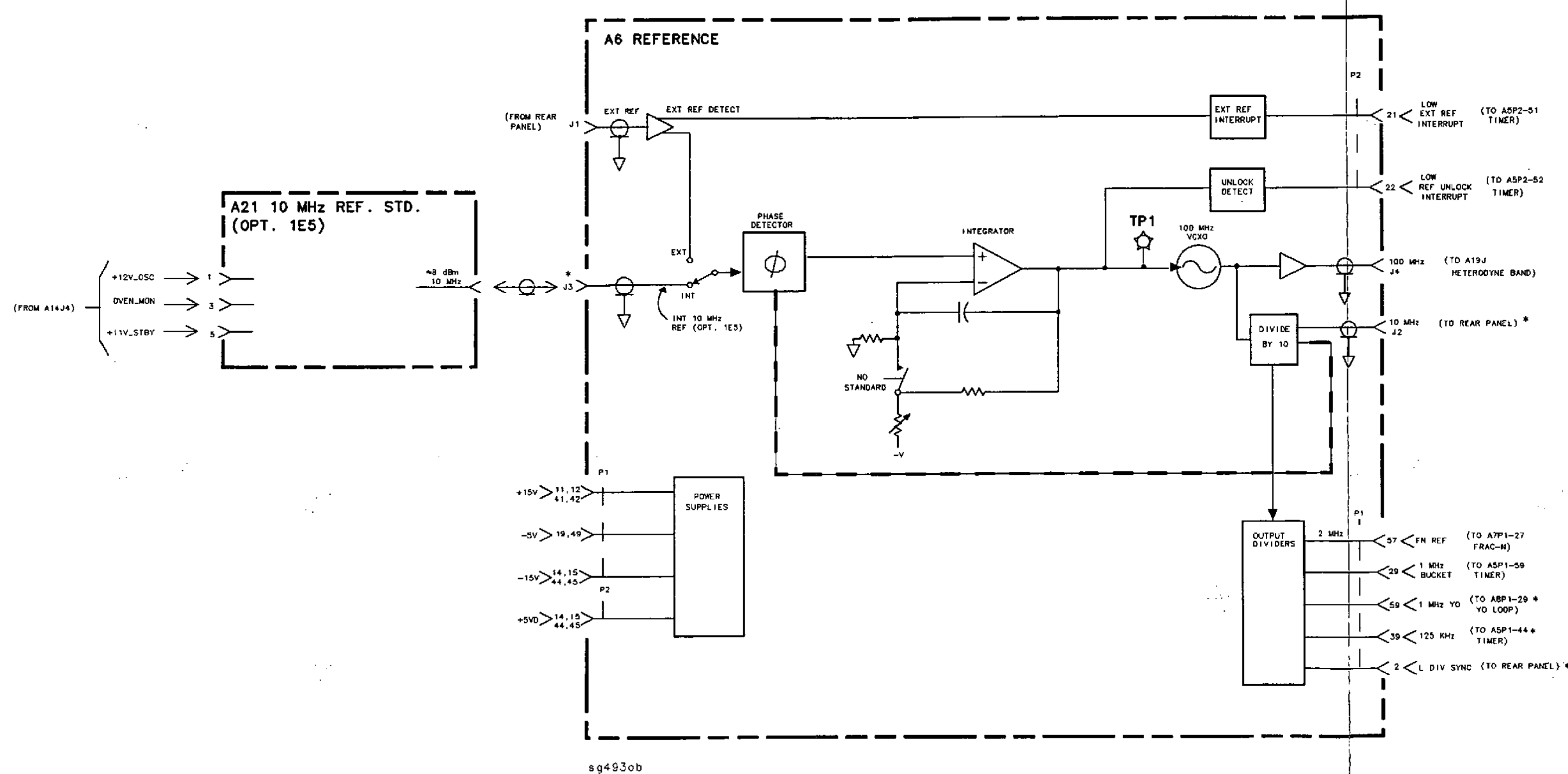
If the signal is bad: Remove the A6 reference (with the instrument turned off). With an ohmmeter, measure A6P1-2 and verify that the signal is not shorted to ground. This I/O line connects to the A13 rear panel. Either replace A6 or the shorted assembly. Make sure that there is no connection to the rear panel AUXILIARY INTERFACE connector.

A6-50. Replace the A6 Reference

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located in the section entitled, "Quick Reference" at the end of this manual.) Identify the procedures required and then perform them.

A6 REFERENCE BLOCK DIAGRAM
83750-60004



* CHECKED DURING SELF-TEST.

A7 Fractional-N

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
Breakpoint1	A7-50. Replace the A7 Fractional-N
Breakpoint2	A7-50. Replace the A7 Fractional-N
Breakpoint3	A7-50. Replace the A7 Fractional-N
Breakpoint4	A7-50. Replace the A7 Fractional-N
Breakpoint5	A7-50. Replace the A7 Fractional-N
Integrator	A7-50. Replace the A7 Fractional-N
Pos_10VRef	A7-1. Check the Power Supply Voltages
Pos_5V4Mod	A7-1. Check the Power Supply Voltages
Pos5VPD	A7-1. Check the Power Supply Voltages
PretunDAClin	A7-50. Replace the A7 Fractional-N
PretunDACmax	A7-50. Replace the A7 Fractional-N
PretunDACmin	A7-50. Replace the A7 Fractional-N
SweepDAClin	A7-50. Replace the A7 Fractional-N
SweepDACmax	A7-50. Replace the A7 Fractional-N
SweepDACmin	A7-50. Replace the A7 Fractional-N
VCOTune	A7-2. Check the FN REF Input A7-3. Check the HSWP Input

A7-1. Check the Power Supply Voltages

Table 5b-4 lists the power supply voltages input to the A7 fractional–N. Use a DVM to check each of the voltages.

Table 5b-4. Power Supply Voltages Input to A7 Fractional–N

Power Supply	Test Point	Tolerance
+5VD	A7P2-14, 15, 44, 45	+5.2 V ±0.3 V
+15V	A7P1-11, 12, 41, 42	+15 V ±1.0 V
+8V	A7P1-22, 52	+8.2 V ±0.3 V
−15V	A7P1-14, 15, 44, 45	−15 V ±1.0 V

If the power supplies are good: Replace the A7 fractional–N. (Go to "A7-50. Replace the A7 Fractional–N.")

If the power supplies are bad:

Voltage is too high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

Voltage is too low: Determine if a PC board is loading down the power supply. Remove PC boards one at a time to troubleshoot to the failed PC board. (Be sure to turn off power to the instrument when removing PC boards.) If removing the PC boards does not identify the problem assembly, replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A7-2. Check the FN REF Input

Self-test failure: VCOTune

Test point: A7TP2

Oscilloscope timebase: 500 ns/division

Verify 2 MHz positive pulses (approximate 500 mV peaks)

If the signal is good: Check the HSWP input. (Go to "A7-3. Check the HSWP Input.")

If the signal is bad: Remove the A7 fractional–N assembly (with the instrument turned off). Check the signal at the motherboard connector to A7 (A14XA7J1-27). If the signal is good, replace the A7 fractional–N. (Go to "A7-50. Replace the A7 Fractional–N.") Otherwise the problem is most likely the A6 reference.

A7-3. Check the HSWP Input

Self-test failure: VCOTune

Loop the VCOTune self-test (located in the first level of the A7 menu.)

Test point: A7P1-9

Oscilloscope timebase: 25 ms/div

Verify that the signal is normally a TTL high with an occasional TTL low pulse (pulse occurs about every 4 seconds.)

If the signal is good: Replace the A7 fractional–N. (Go to "A7-50. Replace the A7 Fractional–N.")

If the signal is bad:

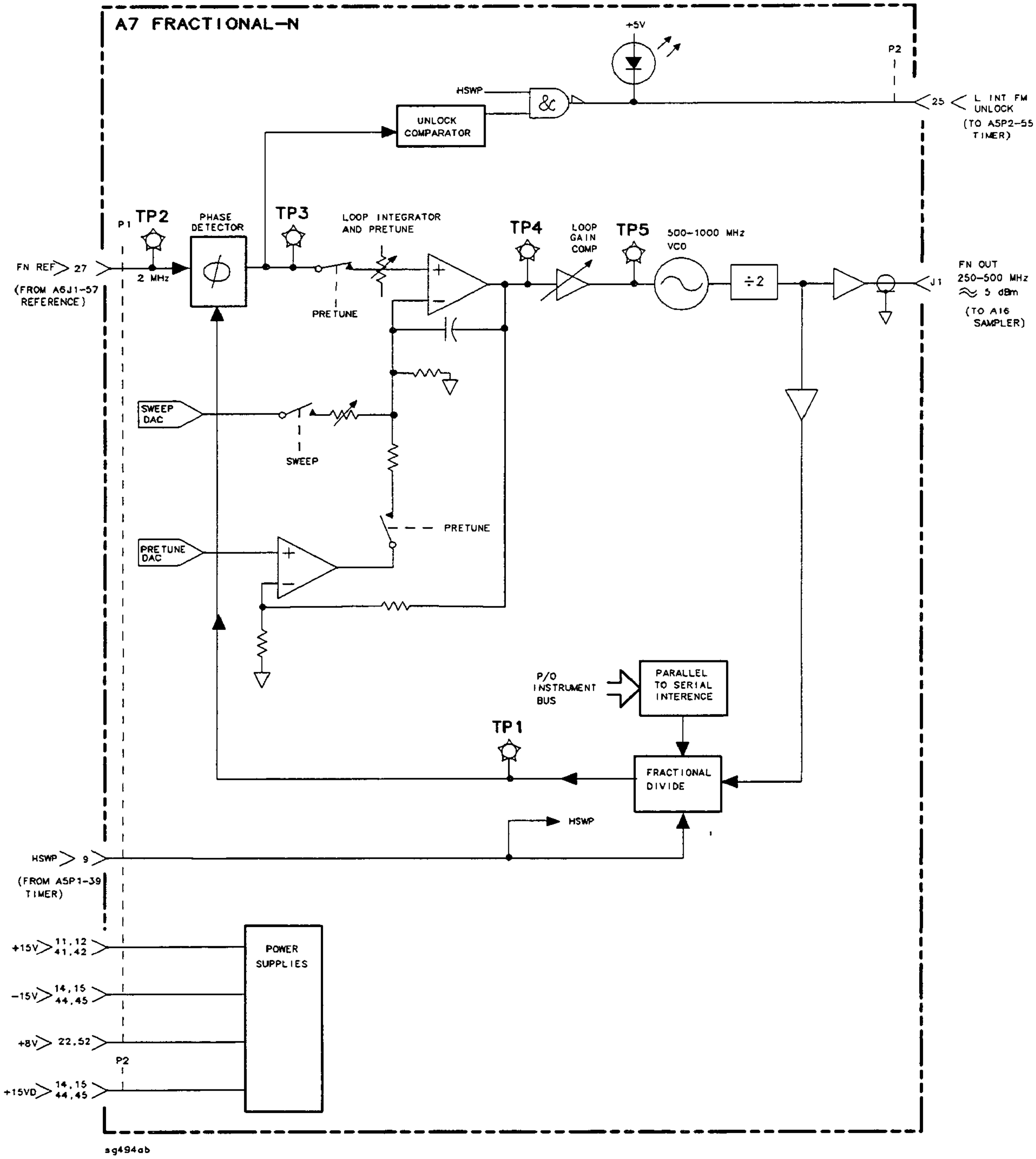
1. Remove the A7 fractional–N (with the instrument turned off) and loop the VCOTune self-test. Check the signal at the motherboard connector to A7 (A14XA7J1-9). If it is good replace A7.
2. HSWP also goes to the A8 YO loop, A9 ALC, A10 sweep generator, and A11 YIG driver. Loop the self-test and verify the signal with A8, A9, and A11 removed (the test will not run with A10 removed) to determine if an assembly is loading the signal. Replace the problem assembly.
3. With A8, A9, and A11 still removed from the instrument, measure the signal at the source A5P1-34 or A5TP7. If the signal is good there is most likely a problem with the motherboard connectors for A5 or A7.
4. Replace A8, A9, and A11. Use an ohmmeter to determine if the signal is shorted to ground. Remove the A5 and A10 assemblies to determine the source of the short. Replace the shorted assembly.

A7-50. Replace the A7 Fractional-N

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A7 FRACTIONAL-N BLOCK DIAGRAM
83750-60005



A7 Fractional-N, Block Diagram

A8 YO Loop

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
FMCal	A8-1. Check the Power Supply Voltages
FMInput	A8-2. Check the FM Input
FMSummer	A8-1. Check the Power Supply Voltages
Gain0	A8-50. Replace the A8 YO Loop
Gain1	A8-50. Replace the A8 YO Loop
Gain2	A8-50. Replace the A8 YO Loop
Gain4	A8-50. Replace the A8 YO Loop
LowBandIF	A8-3. Check the Sampler IF Input
HighBandIF	A8-3. Check the Sampler IF Input
YOIntegrator	A8-1. Check the Power Supply Voltages
YO_LO_FM	A8-4. Check the YO LO FM Input
YOPhaseDet	A8-5. Check the 1 MHz Input A8-3. Check the Sampler IF Input

A8-1. Check the Power Supply Voltages

Table 5b-5 lists the power supply voltages input to the A8 YO loop. Use a DVM to check each of the voltages.

Table 5b-5. Power Supply Voltages Input to A8 YO Loop

Power Supply	Test Point	Tolerance
+5VD	A8P2-14, 15, 44, 45	+5.2 V ±0.3 V
+15V	A8P1-11, 12, 41, 42	+15 V ±1.0 V
−5V	A8P1-19, 49	−5 V ±0.3 V
−15V	A8P1-14, 15, 44, 45	−15 V ±1.0 V

If the power supplies are good: Replace the A8 YO loop. (Go to "A8-50. Replace the A8 YO Loop.")

If the power supplies are bad:

Voltage is too high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

Voltage is too low: Determine if a PC board is loading down the power supply. Remove PC boards one at a time to troubleshoot to the failed PC board. (Be sure to turn off power to the instrument when removing PC boards.) If removing the PC boards does not identify the problem assembly, replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A8-2. Check the FM Input

Self-test failure: FM Input

Test point: A8J2 FM INPUT (Disconnect the cable and measure the signal on the cable.)

Oscilloscope timebase: N/A

Verify that there is no ac or dc signal on the FM input.

If the signal is good: Replace the A8 YO loop. (Go to "A8-50. Replace the A8 YO Loop.")

If the signal is bad: Make sure that there is no connection to the rear panel FM INPUT connector. Then make sure that W10 is properly connected from the FM input (A22J2) to the YO loop assembly (A8J2).

A8-3. Check the Sampler IF Input

Self-test failure: LowBandIF, HighBandIF, or YOPhaseDet

Test point: A8J1 (Disconnect W9 from A8J1 and connect the oscilloscope to the SMB cable.)

Oscilloscope timebase: 100 ns/division

Oscilloscope Input Impedance: 50Ω

Procedure:

1. Open the YO Loop:
   a. Press (SHIFT) SPECIAL (300).
   b. Use the (⇑) and (⇓) keys to select YOLOop= CLOSe and press (Hz/s/ENTER).
   c. Press (⇑) (Hz/s/ENTER). The display will read YOLOop= OPEN.
2. Verify a sinewave > 100 mV p-p. The ideal is 10 MHz but it must be less than 35 MHz. Typical signal amplitude is 500 mV p-p.

If the signal is good: Replace the A8 YO loop. (Go to "A8-50. Replace the A8 YO Loop.")

If the signal is bad: Reconnect W9 and go to the A16 sampler assembly troubleshooting section to verify the power supply, fractional–N, and DYO inputs to the sampler.

A8-4. Check the YO LO FM Input

Self-test failure: YO_LO_FM

Remove the A11 YIG driver assembly (with the instrument turned off).

Rerun the YO_LO_FM self-test.

If the self-test passes: Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

If the self-test fails: Replace the A8 YO loop. (Go to "A8-50. Replace the A8 YO Loop.")

A8-5. Check the 1 MHz Input

Self-test failure: YOPhaseDet

Test point: A8TP3 1 MHz

Oscilloscope timebase: 1 μs/division

Verify a 1 MHz TTL level squarewave

If the signal is good: Verify the sampler input. (Go to "A8-3. Check the Sampler IF Input.")

If the signal is bad:

Stuck high: The signal source is at A6P1-59. If the signal is also bad on A6, replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

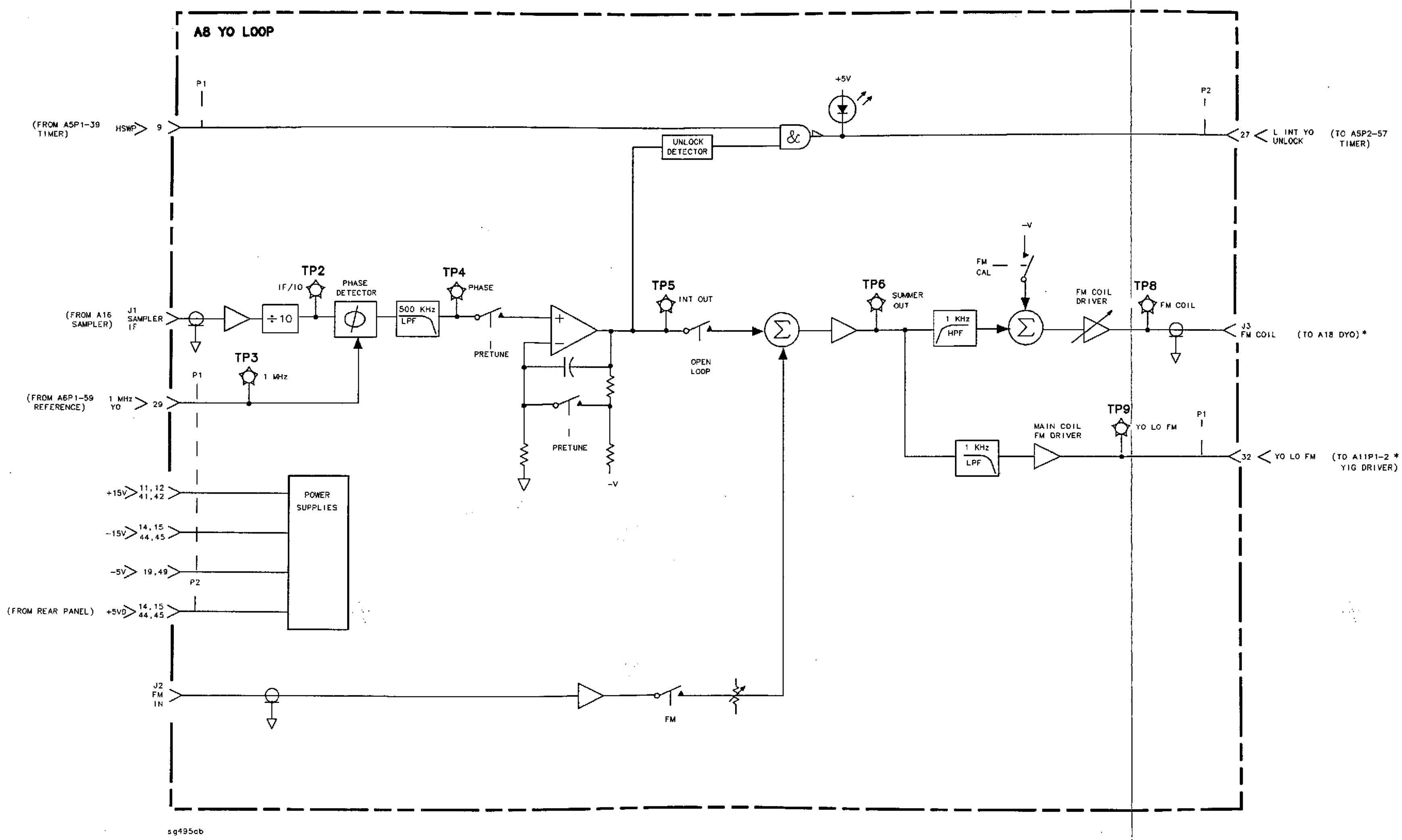
Stuck low: Remove the A8 YO loop (with the instrument turned off). With an ohmmeter, measure A8P1-29 and verify that the signal is not shorted to ground. This input line comes from A6P1-59. Replace the shorted assembly. If the signal is not shorted and the signal is low, replace the A6 reference. (Go to "A6-50. Replace the A6 Reference.")

A8-50. Replace the A8 YO Loop

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A8 YO LOOP BLOCK DIAGRAM
83750-60006



* CHECKED DURING SELF-TEST

FOLD-OUT 6. 83750-60006. A8 YO LOOP, BLOCK DIAGRAM

A9 ALC

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
ALCRefMax	A9-2. Check the PWR_LVL Input A9-3. Check the S/H TRIG Input
ALCRefMin	A9-2. Check the PWR_LVL Input A9-3. Check the S/H TRIG Input
DetOFSdacLin	A9-1. Check the Power Supply Voltages
DetOFSdacMax	A9-1. Check the Power Supply Voltages
DetOFSdacMin	A9-1. Check the Power Supply Voltages
HetBdDetIn (A or B)	A9-4. Check the Internal Detector Input (HetBdDetIn)
HetModDrvOff	A9-6. Check the Het_MOD Output
HetModDrvOn	A9-6. Check the Het_MOD Output
HiBdDetIn (A or B)	A9-5. Check the Internal Detector Input (LowBdDetIn or HiBdDetIn)
HiPulseOff	A9-7. Check the Pulse Generator Input A9-8. Check the Hi Pulse Mod Output (HiPulseOff)
HiPulseOn	A9-7. Check the Pulse Generator Input A9-9. Check the Hi Pulse Mod Output (HiPulseOn)
HoldINT_OUT	A9-50. Replace the A9 ALC
LogBPdacLin	A9-1. Check the Power Supply Voltages
LogBPdacMax	A9-1. Check the Power Supply Voltages
LogBPdacMin	A9-1. Check the Power Supply Voltages
LogOFSdacLin	A9-1. Check the Power Supply Voltages
LogOFSdacMax	A9-1. Check the Power Supply Voltages
LogOFSdacMin	A9-1. Check the Power Supply Voltages
LowBdDetIn (A or B)	A9-5. Check the Internal Detector Input (LowBdDetIn or HighBdDetIn)
HETPulseOff	A9-10. Check the Low Pulse Mod Output (HETPulseOff)
HETPulseOn	A9-11. Check the Low Pulse Mod Output (HETPulseOn)
ModDriverOff	A9-12. Check the Hi_MOD Output
ModDriverOn	A9-12. Check the Hi_MOD Output
ModOFSdacLin	A9-1. Check the Power Supply Voltages
ModOFSdacMax	A9-1. Check the Power Supply Voltages
ModOFSdacMin	A9-1. Check the Power Supply Voltages
NegativeRail	A9-50. Replace the A9 ALC
PositiveRail	A9-50. Replace the A9 ALC
RfBlanking	A9-50. Replace the A9 ALC
TCRef	A9-13. Check the TC REF Output

A9-1. Check the Power Supply Voltages

Table 5b-6 lists the power supply voltages input to the A9 ALC. Use a DVM to check each of the voltages.

Table 5b-6. Power Supply Voltages Input to A9 ALC

Power Supply	Test Point	Tolerance
+5VD	A9P2-14, 15, 44, 45	+5.2 V ±0.3 V
+15V	A9P1-11, 12, 41, 42	+15 V ±1.0 V
−15V	A9P1-14, 15, 44, 45	−15 V ±1.0 V

If the power supplies are good: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

If the power supplies are bad:

Voltage is too high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

Voltage is too low: Determine if a PC board is loading down the power supply. Remove PC boards one at a time to troubleshoot to the failed PC board. (Be sure to turn off power to the instrument when removing PC boards.) If removing the PC boards does not identify the problem assembly, replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A9-2. Check the PWR_LVL Input

Self-test failure: ALCRefMin or ALCRefMax

Test point: A9P1-53

Loop the ALCRefMax self-test (located in the first level of the A9 menu.)

Verify with a DVM that the signal is −9.0 V ±0.1 V

Loop the ALCRefMin self-test (located in the first level of the A9 menu.)

Verify with a DVM that the signal is 0.0 V ±0.06 V

If the signals are good: Go to "A9-3. Check the S/H TRIG Input."

If either signal is bad: The signal source is A10P1-23. If the signal was bad at that point, or if the A9 board was loading the signal, an A10 self-test failure would have been indicated. Therefore, the failure is most likely and open between A9P1-53 and A10P1-23.

A9-3. Check the S/H TRIG Input

Self-test failure: ALCRefMin or ALCRefMax

Test point: A9P1-4

Loop the failed self-test: ALCRefMax or ALCRefMin (located in the first level of the A9 menu.)

Oscilloscope timebase: N/A

Verify a TTL high level

If the signal is good: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

If the signal is bad: Remove the A9 ALC assembly (with the instrument turned off). Check the signal at the motherboard connector to A9 (A14XA9J1-4). If the signal is good, replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.") If the signal is bad, the problem is most likely the A10 sweep generator.

A9-4. Check the Internal Detector Input (HetBdDetIn)

Self-test failure: HetBdDetIn_A or HetBdDetIn_B

Procedure:

1. Run the HetBdDetIn self-test:
   a. Press (SHIFT) SPECIAL (100) (Hz/s/ENTER).
   b. Use the (⇧) and (⇩) keys to select A9ALC and press (Hz/s/ENTER).
   c. Use the (⇧) and (⇩) keys to select Det InputMenu and press (Hz/s/ENTER).
   d. Use the (⇧) and (⇩) keys to select HetBdDet In_A (HP 83751A/2A) or HetBdDet In_B (HP 83751B/2B) and press (Hz/s/ENTER) (Hz/s/ENTER).
2. Compare the measured voltage with the minimum allowed value. (Figure 5b-7 shows the location on the display of the measured value and the minimum and maximum allowable values. (This is an example, your minimum and maximum values may differ.)

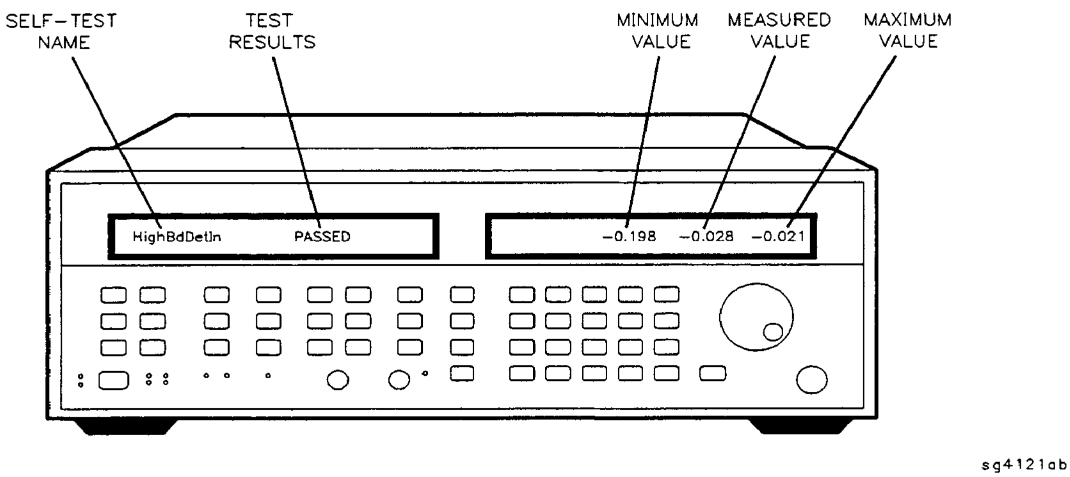


Figure 5b-7. Location of the Measured Value and the Minimum and Maximum Values

The following is a visual representation of the range of acceptable values. Use this example to help you determine the proper course of action in the following steps.

```
                                    Range of
                                Acceptable Values
                          |---------------------------|
                           Minimum                Maximum
                            Value                  Value
  -0.21  -0.20  -0.199  -0.198                  -0.021  -0.020  -0.019
  -0.018
            <---                                           --->
            More                                           More
          Negative                                       Positive
```

Note: Your minimum and maximum values may differ from this example.

If the measured voltage is more negative than the minimum value: Run the other DetInputMenu self-tests. If they also fail (measured voltage is more negative than the minimum value), replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.") If the self-test values are not more negative than the minimum value, the problem is with the A19 heterodyne band assembly or the heterodyne ALC modulator cable, W22, which connects A14J7 to A19J3.

If the measured voltage is more positive than the maximum value: Disconnect W14 from A9J4, INT DET. Measure the voltage on the cable. If the voltage is more negative than −1.0 V, replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.") If the voltage is more positive than −1.0 V, use the RF deck block diagrams to troubleshoot low RF output power. The problem is not necessarily limited to heterodyne band. Check the results of the other DetInputMenu self-tests to determine the extent of the failure.

A9-5. Check the Internal Detector Input (LowBdDetIn and HiBdDetIn)

Self-test failure: LowBdDetIn_A, LowBdDetIn_B, HiBdDetIn_A, or HiBdDetIn_B

Procedure:

1. Run the failed self-test (either LowBdDetIn or HiBdDetIn).
   a. Press (SHIFT) SPECIAL (100) (Hz/s/ENTER).
   b. Use the (⇧) and (⇩) keys to select A9ALC and press (Hz/s/ENTER).
   c. Use the (⇧) and (⇩) keys to select DetInputMenu and press (Hz/s/ENTER).
   d. Use the (⇧) and (⇩) keys to select either LowBdDetIn_A (HP 83751A/2A) or LowBdDetIn_B (HP 83751B/2B) or HighBdDetIn (A or B) and press (Hz/s/ENTER) (Hz/s/ENTER).
2. Compare the measured voltage with the minimum value. (Figure 5b-8 shows the location on the display of the measured value and the minimum and maximum allowable values. (This is an example, your minimum and maximum values may differ.)

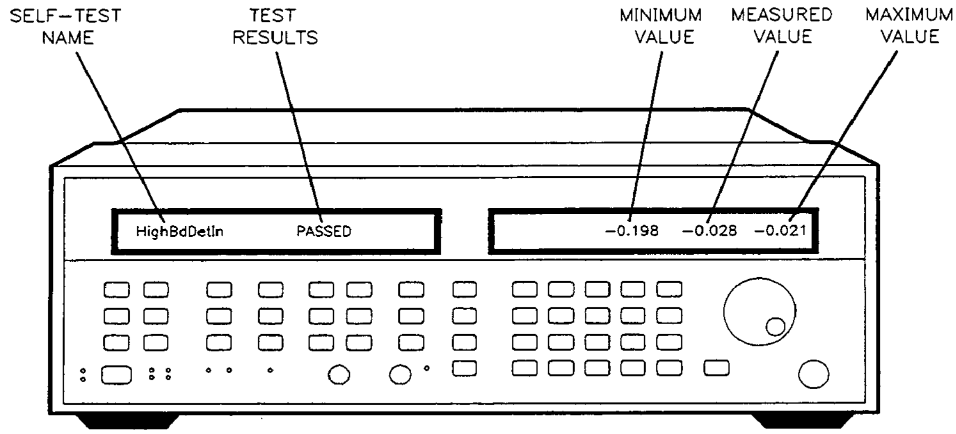


Figure 5b-8. Location of the Measured Value and the Minimum and Maximum Values

The following is a visual representation of the range of acceptable values. Use this example to help you determine the proper course of action in the following steps.

```
                          Range of
                      Acceptable Values
                 |---------------------------|
                 Minimum                Maximum
                  Value                  Value
-0.21  -0.20  -0.199  -0.198              -0.021  -0.020  -0.019
-0.018
          <---                                        --->
          More                                        More
        Negative                                    Positive
```

Note: Your minimum and maximum values may differ from this example.

If the measured voltage is more negative than the minimum value: Run the other DetInputMenu self-tests. If they also fail (measured voltage is more negative than the minimum value), replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.") If the self-test values are not more negative than the minimum value, the problem is with the A15 mod/amp assembly or the heterodyne ALC modulator cable, W23, which connects A14J8 to A15J18.

If the measured voltage is more positive than the maximum value: Disconnect W14 from A9J4, INT DET. Measure the voltage on the cable. If the voltage is more negative than −1.0 V, replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.") If the voltage is more positive than −1.0 V, go to the RF deck troubleshooting section and use the block diagram to troubleshoot low RF output power. The problem is not necessarily limited to heterodyne band. Check the results of the other DetInputMenu self-tests to determine the extent of the failure.

A9-6. Check the Het_MOD Output

Self-test failure: HETModDrvOff or HETModDrvOn

Procedure:

1. Check the results of all of the ModDriveMenu tests and then use the following matrix to determine the proper course of action.

Self-Test Failures	Action	Go to This Procedure
ModDriverOn HETModDrvOn	Replace A9	A9-50. Replace the A9 ALC
ModDriverOff HETModDrvOff	Replace A9	A9-50. Replace the A9 ALC
ModDriverOn ModDriverOff HETModDrvOn HETModDrvOff	Replace A9	A9-50. Replace the A9 ALC
HETModDrvOff	Replace A9	A9-50. Replace the A9 ALC
HETModDrvOn	Loop self-test and measure A9P1-59	Continue with step 2

2. Loop the HetModDrvOn self-test and measure A9P1-59.
3. Verify with a DVM that the signal is between 500 mV and 1 V.

If the voltage is high: There is an open in the modulator cable, W22, or in the A19 heterodyne band assembly.

If the voltage is low: There is a failure on the A9 ALC assembly or there is an excessive load by the ALC modulator. Disconnect the ALC LO modulator cable, W22, from A14J7 to eliminate the modulator as a load. The voltage should go to > +3 V.

A9-7. Check the Pulse Generator Input

Self-test failure: HiPulseOn or HiPulseOff

Loop the HiPulseOn and HiPulseOff self-tests (located in the first level of the A9 menu.)

Test point: A9P2-1

Oscilloscope timebase: 10 ms/division

Verify a TTL low pulse (normally high TTL level) for HiPulseOff

Verify a steady low TTL level for HiPulseOn

If the signal is good: Go to "A9-8. Check the Hi Pulse Mod Output (HiPulseOff)" and "A9-9. Check the Hi Pulse Mod Output (HiPulseOn)."

If the signal is bad: Remove the A9 ALC assembly (with the instrument turned off). Check the signal at the motherboard connector to A9 (A14XA9J2-1). If the signal is good, replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.") If the signal is bad, the problem is most likely the A5 timer.

A9-8. Check the Hi Pulse Mod Output (HiPulseOff)

Self-test failure: HiPulseOff

Test point: A9P1-28

Procedure:

1. Disconnect the PULSE HI cable, W21, from A14J6.
2. Run the HiPulseOff self-test again.

If the self-test passes: The problem is either the cable, W21, or the A19 heterodyne band assembly.

If the self-test fails: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

A9-9. Check the Hi Pulse Mod Output (HiPulseOn)

Self-test failure: HiPulseOn

Test point: A9P1-28

Procedure:

1. Temporarily exchange the pulse cable connections at the motherboard.
   a. Disconnect the PULSE LO cable, W22, from A14J5 and connect it to A14J6.
   b. Disconnect the PULSE HI cable, W21, from A14J6 and connect it to A14J5.
   c. Run the HiPulseOn self-test again.

If the self-test passes: The problem is either the PULSE LO cable, W22, or the A19 heterodyne band assembly.

If the self-test fails: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

A9-10. Check the Low Pulse Mod Output (HETPulseOff)

Self-test failure: HETPulseOff

Test point: A9P1-28

Procedure:

1. Disconnect the PULSE LO cable, W22, from A14J5.
2. Run the HETPulseOff self-test again.

If the self-test passes: The problem is either the cable, W22, or the A19 heterodyne band assembly.

If the self-test fails: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

A9-11. Check the Low Pulse Mod Output (HETPulseOn)

Self-test failure: HETPulseOn

Test point: A9P1-28

Procedure:

1. Temporarily exchange the pulse cable connections at the motherboard.
   a. Disconnect the PULSE LO cable, W22, from A14J5 and connect it to A14J6.
   b. Disconnect the PULSE HI cable, W21, from A14J6 and connect it to A14J5.
2. Run the HETPulseOn self-test again.

If the self-test passes: The problem is either the PULSE HI cable, W21, or the A19 heterodyne band assembly.

If the self-test fails: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

A9-12. Check the Hi_MOD Output

Self-test failure: ModDriverOff or ModDriverOn

Procedure:

1. Check the results of all of the ModDriveMenu tests and then use the following matrix to determine the proper course of action.

Self-Test Failures	Action	Go to This Procedure
ModDriverOn HETModDrvOn	Replace A9	A9-50. Replace the A9 ALC
ModDriverOff HETModDrvOff	Replace A9	A9-50. Replace the A9 ALC
ModDriverOn ModDriverOff HETModDrvOn HETModDrvOff	Replace A9	A9-50. Replace the A9 ALC
ModDriverOff	Replace A9	A9-50. Replace the A9 ALC
ModDriverOn	Loop self-test and measure A9P1-57	Continue with step 2

2. Loop the ModDriverOn self-test and measure A9P1-57
3. Verify with a DVM that the signal is between 500 mV and 1 V.

If the voltage is high: There is an open in the modulator cable, W23, or in the A15 mod/amp.

If the voltage is low: There is a failure on the A9 ALC assembly or there is an excessive load by the ALC modulator. Disconnect the ALC HI modulator cable, W23, from A14J8 to eliminate the modulator as a load. The voltage should go to $> +3$ V.

A9-13. Check the TC REF Output

Self-test failure: TCRef

Test point: A9TP3 TC_REF

Procedure:

1. Remove the A10 sweep generator assembly (with the instrument turned off).
2. Verify with a DVM that A9TP3 is 9.0 V ±0.08 V

If the signal is good: Reinstall the A10 assembly (with the instrument turned off). Measure A9TP3 again with a DVM. If the signal is bad, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.") If the signal is good, replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

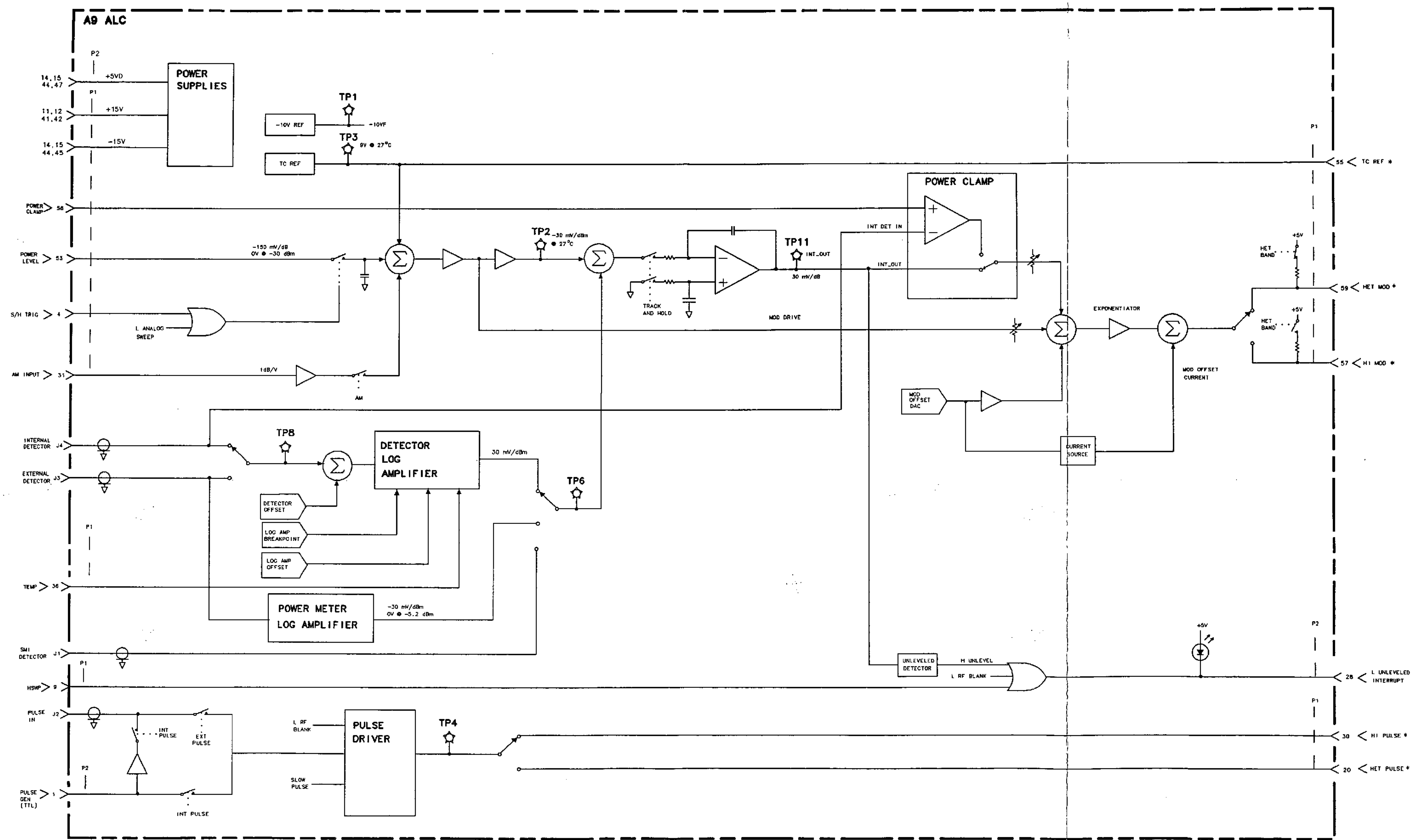
If the signal is bad: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

A9-50. Replace the A9 ALC

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A9 ALC BLOCK DIAGRAM
83750-90003



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* CHECKED DURING SELF-TEST

FOLD-OUT 7. 83750-90003, A9 ALC, BLOCK DIAGRAM

A10 Sweep Generator

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
digSwpDAClin	A10-50. Replace the A10 Sweep Generator
digSwpDACmax	A10-50. Replace the A10 Sweep Generator
digSwpDACmin	A10-50. Replace the A10 Sweep Generator
DSPhandshake	A10-2. Check the LDAC_TRIG Input
DSPXcvr	A10-50. Replace the A10 Sweep Generator
DYOCorDAClin	A10-50. Replace the A10 Sweep Generator
DYOCorDACmax	A10-3. Check the DYO_CORR Output
DYOCarDACmin	A10-3. Check the DYO_CORR Output
pswpDACAlin	A10-50. Replace the A10 Sweep Generator
pswpDACAmax	A10-4. Check the PSWP Output A10-5. Check the PSWP_FB Input
pswpDACAmin	A10-4. Check the PSWP Output A10-5. Check the PSWP_FB Input
pswpDACBlin	A10-50. Replace the A10 Sweep Generator
pswpDACBmax	A10-4. Check the PSWP Output A10-5. Check the PSWP_FB Input
pswpDACBmin	A10-4. Check the PSWP Output A10-5. Check the PSWP_FB Input
pwrClpDAClin	A10-50. Replace the A10 Sweep Generator
pwrClpDACmax	A10-6. Check the PWR_CLMP Output
pwrClpDACmin	A10-6. Check the PWR_CLMP Output
pwrlvlDAClin	A10-50. Replace the A10 Sweep Generator
pwrlvlDACmax	A10-7. Check the TC REF Input A10-8. Check the PWR_LVL Output
pwrlvlDACmin	A10-7. Check the TC REF Input A10-8. Check the PWR_LVL Output
SAFCorDAClin	A10-50. Replace the A10 Sweep Generator
SAFCorDACmax	A10-9. Check the SAF_CORR Output
SAFCorDACmin	A10-9. Check the SAF_CORR Output
swpGenGnd	A10-1. Check the Power Supply Voltages
swpOut	A10-10. Check the SWP_OUT Output
timer	A10-50. Replace the A10 Sweep Generator

A10-1. Check the Power Supply Voltages

Table 5b-7 lists the power supply voltages input to the A10 sweep generator. Use a DVM to check each of the voltages.

Table 5b-7. Power Supply Voltages Input to A10 Sweep Generator

Power Supply	Test Point	Tolerance
+5VD	A10P2-14, 15, 44, 45	+5.2 V ±0.3 V
+15V	A10P1-11, 12, 41, 42	+15 V ±1.0 V
−15V	A10P1-14, 15, 44, 45	−15 V ±1.0 V

If the power supplies are good: Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

If the power supplies are bad:

Voltage is too high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

Voltage is too low: Determine if a PC board is loading down the power supply. Remove PC boards one at a time to troubleshoot to the failed PC board. (Be sure to turn off power to the instrument when removing PC boards.) If removing the PC boards does not identify the problem assembly, replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A10-2. Check the LDAC_TRIG Input

Self-test failure: DSPhandshake

Test point: A10TP24 DT

Oscilloscope timebase: 1 μs/division

Verify a low TTL level pulse

If the signal is good: The problem is most likely with the A10 sweep generator. Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.") If this does not identify the problem assembly, replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

If the signal is bad:

Stuck high: The signal source is at A5P2-2. If the signal is also bad on A5, replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

Stuck low: The test should have passed even if the signal is stuck low. The problem is most likely with the A10 sweep generator. Replace A10. (Go to "A10-50. Replace the A10 Sweep Generator.") If this does not solve the problem, replace the A5 timer. (Go to "A5-50. Replace the A5 Timer.")

A10-3. Check the DYO_CORR Output

Self-test failure: DYOCorDACmin or DYOCorDACmax

Procedure:

1. Remove the A11 YIG driver assembly (with the instrument turned off).
2. Run the DYOCorDACmin and DYOCorDACmax self-tests.

If both self-tests pass: Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

If either one of the self-tests fails: Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A10-4. Check the PSWP Output

Self-test failure: pswpDACAmin, pswpDACAmax, pswpDACBmin, or pswpDACBmax

Procedure:

1. Check the results of the following self-tests:

   pswpDACAmin
   pswpDACAmax
   pswpDACBmin
   pswpDACBmax

If at least one of the self-tests passes: Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

If all four self-tests pass: Go to "A10-5. Check the PSWP_FB Input."

A10-5. Check the PSWP_FB Input

Self-test failure: pswpDACAmin, pswpDACAmax, pswpDACBmin, or pswpDACBmax

Procedure: This check verifies the continuity of the PSWP output through the A13 rear panel and back to A10 at PSWP_FB.

1. Remove the A10 sweep generator assembly (with the instrument turned off).
2. Measure the resistance at the motherboard connector between A14XA10J1 pin 31 to pin 33. It should be 200Ω ±5Ω. Also verify that neither pin 31 or 33 is grounded.

If the measurements are correct: Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

If the measurements are not correct: The problem is most likely the A13 rear panel, or the interface cable between the motherboard and the rear panel. Go to the assembly troubleshooting section entitled, "A13 Rear Panel" and use the block diagram to troubleshoot the problem.

A10-6. Check the PWR_CLMP Output

Self-test failure: pwrClpDACmin or pwrClpDACmax

Procedure:

1. Remove the A9 ALC assembly (with the instrument turned off).
2. Run the pwrClpDACmin and pwrClpDACmax self-tests.

If both self-tests pass: Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

If either one of the self-tests fails: Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A10-7. Check the TC REF Input

Self-test failure: pwrLvlDACmin or pwrLvlDACmax

Test point: A10P1-25

Oscilloscope timebase: N/A

Verify +9 V ±0.1 V

If the signal is good: Go to "A10-8. Check the PWR_LVL Output."

If the signal is bad: Remove the A10 sweep generator assembly (with the instrument turned off). Check the signal at the motherboard connector to A10 (A14XA10J1-25). If the signal is good, replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.") If the signal is bad, the problem is most likely the A9 ALC.

A10-8. Check the PWR_LVL Output

Self-test failure: pwrLvlDACmin or pwrLvlDACmax

Procedure:

1. Remove the A10 sweep generator assembly (with the instrument turned off).
2. Measure the resistance to ground at the motherboard connector (A14XA10J1-23).

If the signal is grounded (< 500 kΩ): Replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.") Then verify that Z14XA10J1-24 is grounded when A9 is installed.

If the signal is not grounded: The problem is most likely the A10 sweep generator. Replace the A10 assembly. (Go to "A10-50. Replace the A10 Sweep Generator.") If this does not solve the problem, replace the A9 ALC. (Go to "A9-50. Replace the A9 ALC.")

A10-9. Check the SAF_CORR Output

Self-test failure: SAFCorDACmin or SAFCorDACmax

Procedure:

1. Remove the A11 YIG driver assembly (with the instrument turned off).
2. Run the SAFCorDACmin and SAFCorDACmax self-tests.

If both self-tests pass: Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

If either one of the self-tests fails: Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A10-10. Check the SWP_OUT Output

Self-test failure: swpOut

Procedure:

1. Remove the A11 YIG driver assembly (with the instrument turned off).
2. Run the swpOut self-test.

If the self-test passes: Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

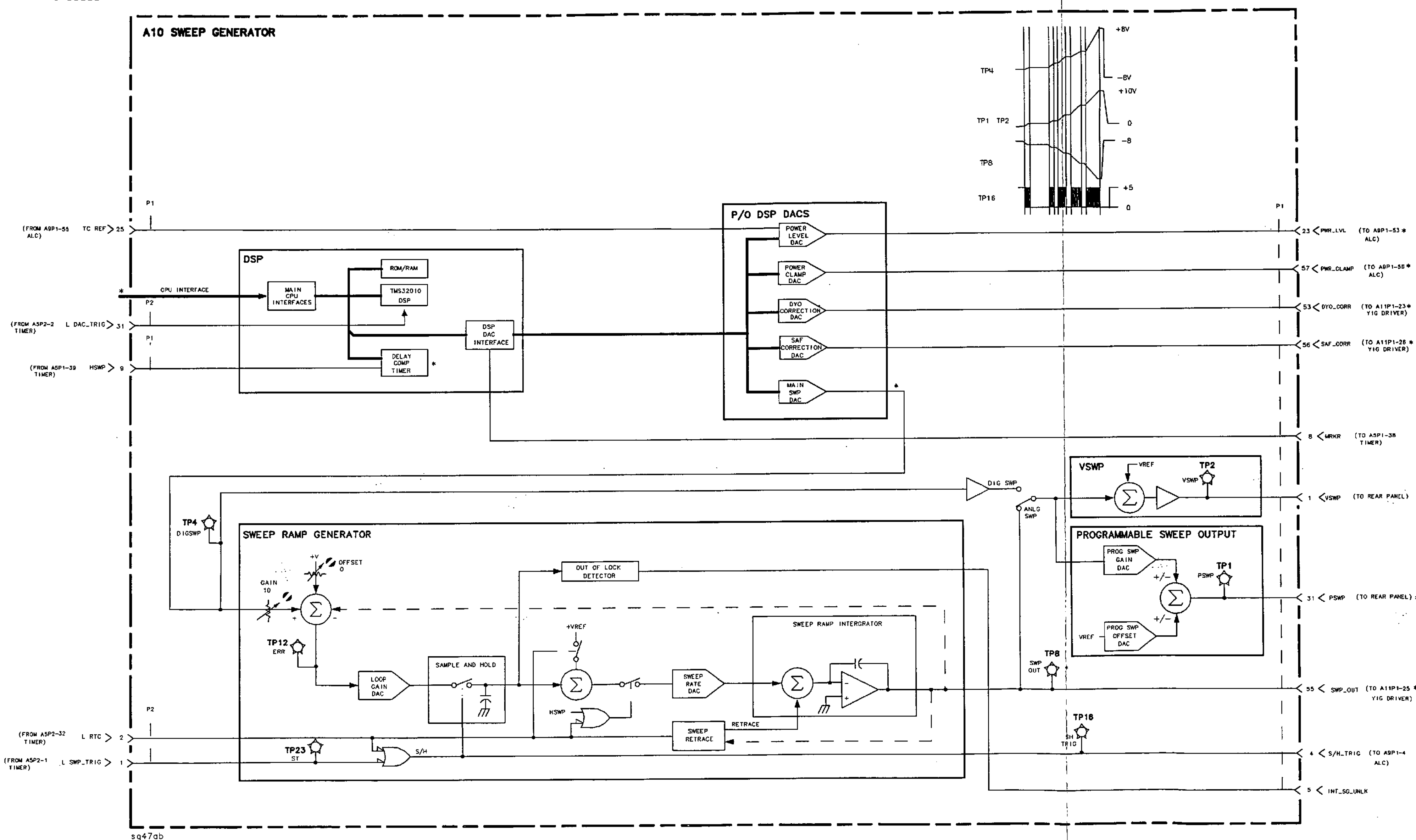
If the self-test fails: Replace the A10 sweep generator. (Go to "A10-50. Replace the A10 Sweep Generator.")

A10-50. Replace the A10 Sweep Generator

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A10 SWEEP GENERATOR BLOCK DIAGRAM
83750-60008



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FOLD-OUT 8. 83750-60008. A10 SWEEP GENERATOR, BLOCK DIAGRAM

A11 YIG Driver

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
CFDAClin	A11-50. Replace the A11 YIG Driver
CFDACmax	A11-50. Replace the A11 YIG Driver
CFDACmin	A11-50. Replace the A11 YIG Driver
OscFMDrive	A11-2. Check the YO_LO_FM Input
OscSense	A11-3. Check the Oscillator Current Driver Output
SAFDACmax	A11-4. Check the SAF Current Driver Output A11-5. Check the −0.6 V/GHz Output
SAFDACmin	A11-4. Check the SAF Current Driver Output A11-5. Check the −0.6 V/GHz Output
SAFDACmono	A11-50. Replace the A11 YIG driver
SAFSense	A11-3. Check the SAF Current Driver Output
SpanDAClin	A11-50. Replace the A11 YIG Driver
SpanDACmax	A11-6. Check the SWP_OUT Input
SpanDACmin	A11-6. Check the SWP_OUT Input
VernierDAClin	A11-50. Replace the A11 YIG Driver
VernierDACmax	A11-50. Replace the A11 YIG Driver
VernierDACmin	A11-50. Replace the A11 YIG Driver
YD10VRef	A11-1. Check the Power Supply Voltages

A11-1. Check the Power Supply Voltages

Table 5b-8 lists the power supply voltages input to the A11 YIG driver. Use a DVM to check each of the voltages.

Table 5b-8. Power Supply Voltages Input to A11 YIG Driver

Power Supply	Test Point	Tolerance
+5VD	A11P2-14, 15, 44, 45	+5.2 V ±0.3 V
+45V	A11P1-30, 59, 60	+45 V ±2.5 V
+15V	A11P1-11, 12, 41, 42	+15 V ±1.0 V
−15V	A11P1-14, 15, 44, 45	−15 V ±1.0 V

If the power supplies are good: Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG driver.")

If the power supplies are bad:

Voltage is too high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

Voltage is too low: Determine if a PC board is loading down the power supply. Remove PC boards one at a time to troubleshoot to the failed PC board. (Be sure to turn off power to the instrument when removing PC boards.) If removing the PC boards does not identify the problem assembly, replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

A11-2. Check the YO_LO_FM Input

Self-test failure: OscFMDrive

Loop the OscFMDrive self-test (located in the first level of the A11 menu.)

Test point: A8TP9 YO_LO_FM

Verify with a DVM that the signal is 0.0 V ±10 mV

If the signal is good (no voltage is measured): Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

If the signal is bad (voltage is measured): Replace the A8 YO loop assembly. (Go to "A8-50. Replace the A8 YO Loop.")

A11-3. Check the Oscillator Current Driver Output

Self-test failure: OscSense

Test points: A11TP11 FET GATE and A14Q2 FET DRAIN

Note To access A14Q2, remove the bottom cover of the instrument. A14Q2 is located just forward of A14XA12J2.

Procedure:

1. Set the instrument to a CW frequency of 2 GHz.
2. Increase the CW frequency from 2 to 20 GHz while monitoring the FET gate and drain voltages. The drain voltage should be decrease from 45 V to greater than 30 V (as shown in the following example) and the gate voltage should increase.

CW Frequency	FET Gate A11TP11	FET Drain A14Q2
2 GHz	4.5 V	45 V
10 GHz	9 V	39 V
20 GHz	14 V	32 V

If the FET gate voltage is high:

FET voltage does not adjust and drain voltage stays at ≥ 45 V: A14Q2 is probably open.

Drain voltage is low: Verify the 45 V supply to the DYO and check that the resistance of the DYO main coil is ≈20 ohms.

If the FET gate voltage is low:

Drain voltage is always low: A14Q2 is probably shorted.

Drain voltage is always ≥ 45 V: Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

If none of the above: Use the block diagram to troubleshoot the problem.

A11-4. Check the SAF Current Driver Outputs

Self-test failure: SAFDACmin or SAFDACmax

Test points: A11TP9 FET GATE and A14Q1 FET DRAIN

Note To access A14Q1, remove the bottom cover of the instrument. A14Q1 is located to the rear of A14XA12J2.

Procedure:

1. Set the instrument to a CW frequency of 2 GHz.
2. Increase the CW frequency from 2 to 20 GHz while monitoring the FET gate and drain voltages. The drain voltage should be decrease from 45 V to greater than 30 V (as shown in the following example) and the gate voltage should increase.

CW Frequency	FET Gate A11TP9	FET Drain A14Q1
2 GHz	4.5 V	45 V
10 GHz	9 V	39 V
20 GHz	14 V	32 V

If the FET gate voltage is high:

FET voltage does not adjust and drain voltage stays at ≥ 45 V: A14Q1 is probably open.

Drain voltage is low: Verify the 45 V supply to the SAF and check that the resistance of the SAF main coil is ≈20 ohms.

If the FET gate voltage is low:

Drain voltage is always low: A14Q1 is probably shorted.

Drain voltage is always ≥ 45 V: Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

If none of the above: Use the block diagram to troubleshoot the problem.

A11-5. Check the −0.6 V/GHz Output

Self-test failure: SAFDACmin or SAFDACmax

Procedure:

1. Remove the A11 YIG driver assembly (with the instrument turned off).
2. Measure the resistance to ground at the motherboard connector (A14XA11P1-53).

If the signal is good (≥ 2 kΩ): Replace the A11 YIG driver. (Go to "A11-50. Replace the A11 YIG Driver.")

If the signal is shorted: The problem is either with the A18 DYO or the A17 SAF. Disconnect the ribbon cable connected to each microcircuit to determine the cause of the short.

A11-6. Check the SWP_OUT Input

Self-test failure: SpanDACmin or SpanDACmax

Loop either the SpanDACmin or the SpanDACmax self-test (located in the *YigDACsMenu menu.)

Verify +10 V ±0.08 V

Procedure:

1. Remove the A11 YIG driver (with the instrument turned off).
2. Measure the voltage at the motherboard connector (A14XA11J1-25).

If the signal is good: Replace the A11 YIG driver. Go to "A11-50. Replace the A11 YIG Driver."

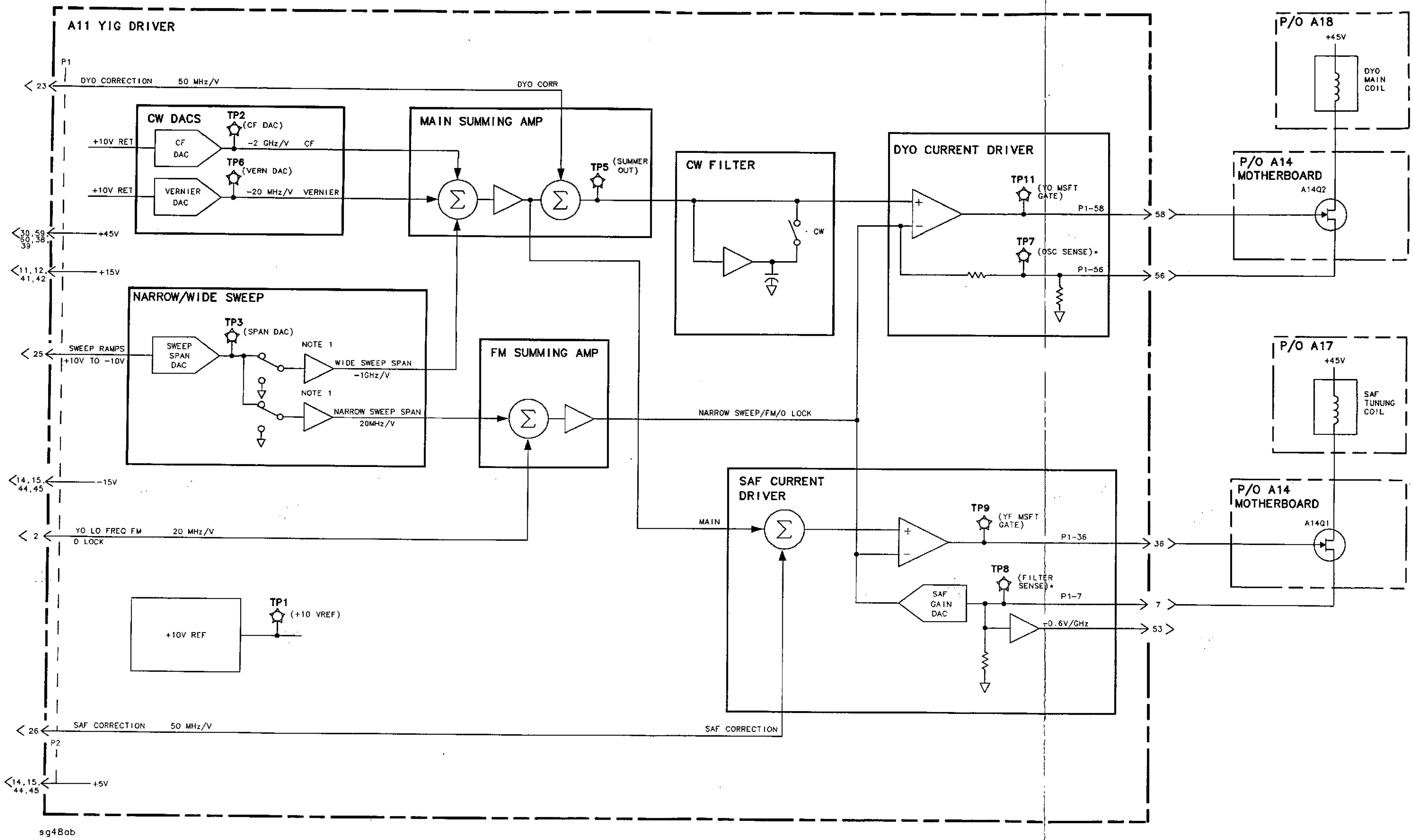
If the signal is bad: Replace the A10 sweep generator. Go to "A10-50. Replace the A10 Sweep Generator."

A11-50. Replace the A11 YIG Driver

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A11 YIG DRIVER BLOCK DIAGRAM
83750-60009



*CHECKED DURING SELF-TEST

FOLD-OUT 9. 83750-60009. A11 YIG DRIVER, BLOCK DIAGRAM

A12 RF Interface

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
AnalogGnd_1	A12-50. Replace the A12 RF Interface
AnalogGnd_2	A12-50. Replace the A12 RF Interface
AnalogGnd_3	A12-50. Replace the A12 RF Interface
DigGnd	A12-50. Replace the A12 RF Interface
DYOSenseLO	A12-2. Check DYO Sense
DYOSenseHI	A12-2. Check DYO Sense
IFAmpSense	A12-3. Check IF Amp Sense
MixerSense	A12-4. Check Mixer Sense
MixerVolts	A12-5. Check Mixer Volts
ModAmp1	A12-6. Check Mod Amp Bias Voltage
ModAmp2	A12-6. Check Mod Amp Bias Voltage
ModAmp3	A12-6. Check Mod Amp Bias Voltage
Neg_15V	A12-1. Troubleshoot the Power Supply
Neg_45V	A12-1. Troubleshoot the Power Supply
Neg_5V	A12-1. Troubleshoot the Power Supply
Neg_40V	A12-7. Check the −40V Output
Pos_10VREF	A12-50. Replace the A12 RF Interface
Pos_15V	A12-1. Troubleshoot the Power Supply
Pos_21VSTDBY	A12-1. Troubleshoot the Power Supply
Pos_45V	A12-1. Troubleshoot the Power Supply
Pos_5VA	A12-8. Check the +5VA Output
Pos_5VFD	A12-1. Troubleshoot the Power Supply
Pos_8V	A12-1. Troubleshoot the Power Supply
SAFDSense	A12-9. Check SAFD Sense

A12-1. Troubleshoot the Power Supply

Measure the suspected power supply failure with a DVM. Table 5b-9 shows the test points on A12 for each power supply.

If the power supply voltage is high: Replace the A3 power supply. (Go to "A3-50. Replace the A3 Power Supply.")

If the power supply voltage is low: Remove the assemblies associated with that power supply, one by one in the order shown, until the power supply is normal. Then replace that assembly.

Table 5b-9. Power Supply Test Points on A12

Power Supply	A12 Test Point	Assemblies
+5VFD	TP2	A14J2 Front Panel A4 CPU A5 Timer A6 Fractional–N A8 YO Loop A9 ALC A10 Sweep Generator A11 YIG Driver A12 RF Interface A14J12 Rear Panel
−5V	TP7	A6 Reference A8 YO Loop A12 RF Interface
+8V	TP4	A7 Fractional–N A12 RF Interface A14J11 Rear Panel
+15V	TP5	A14J2 Front Panel A4 CPU A6 Fractional–N A8 YO Loop A9 ALC A10 Sweep Generator A11 YIG Driver A12 RF Interface A14J11 Rear Panel
−15V	TP6	A14J2 Front Panel A4 CPU A6 Fractional–N A8 YO Loop A9 ALC A10 Sweep Generator A11 YIG Driver A12 RF Interface A14J11 Rear Panel
+21VSTBY	TP8	A14J2 Front Panel A5 Timer A12 RF Interface
+45V	TP3	A5 Timer A11 YIG Driver A12 RF Interface

A12-2. Check DYO Sense

Self-test failure: DYOSenseHI or DYOSenseLO

Procedure:

1. Disconnect the ribbon cable (W18) from between A12J5 and the A18 DYO assembly.
2. Rerun the failed DYO sense self-test.
3. Check for +8 V, +0.25 V, and −0.55 V at the A12J5 connector as shown in the following table:

Self-Test	L_DYO_LB_ON	L_DYO_HB_ON	DYO Sense
DYOSenseHI	TTL High	TTL Low	+8 V +0.25 V −0.55 V
DYOSenseLO	TTL Low	TTL High	+8 V +0.25 V −0.55 V

If the voltages are correct: Visually check the ribbon cable (W18). If there are no problems with the cable, replace the A18 DYO assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If any voltage is not correct: Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

A12-3. Check IF Amp Sense

Self-test failure: IFAmpSense

Test point: A12J6-10 +8V_HET_ON

Procedure:

1. Rerun the IFAmpSense self-test.
2. Check for ≈7.7 V at A12J6-10 (+8V_HET_ON).

If the voltage is +8V (or the same as A12TP4): The A19 heterodyne band assembly is not drawing any current. Replace the A19 heterodyne band assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the voltage is 0 V: The RF interface is probably not switching on the IF amp bias voltage (+8V_HET_ON). Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

If the voltage is positive but low: The heterodyne band assembly is drawing excessive current. Replace the A19 heterodyne band assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the voltage is correct: The problem is either the A19 heterodyne band assembly or the A12 RF interface assembly. Replace the A19 heterodyne band assembly first. (Go to "A12-51. Replace the RF Deck Assemblies.")

A12-4. Check Mixer Sense

Self-test failure: MixerSense

Test point: A12J6-5 +5V_MIXER

Procedure:

1. Rerun the MixerSense self-test.
2. Check for ≈+5 V at A12J6-5.

If the voltage is the same as at A12TP9: The A19 heterodyne band assembly is not drawing any current. Replace the A19 heterodyne band assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the voltage is 0 V: The A12 RF interface is probably not switching on the mixer voltage (+5V_MIXER). Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

If the voltage is positive but low: The A19 heterodyne band assembly is drawing excessive current. Replace the A19 heterodyne band assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the voltage is correct: The problem is either the A19 heterodyne band or the A12 RF interface assembly. Replace the A19 heterodyne assembly first. (Go to "A12-51. Replace the RF Deck Assemblies.")

A12-5. Check Mixer Volts

Self-test failure: MixerVolts

Test point: A12J6-16 −15_HET_ON

Procedure:

1. Disconnect the ribbon cable (W19) from between A12J6 and the A19 heterodyne band assembly.
2. Rerun the MixerVolts self-test.
3. Check for −15 V at A12J6-16 (−15_HET_ON).

If the voltage is low (0 V): Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

If the voltage is anything except low: Visually check the ribbon cable (W19). If there are no problems with the cable, replace the A19 heterodyne band assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

A12-6. Check Mod Amp Bias Voltage

Self-test failure: ModAmp1, ModAmp2, or ModAmp3

Procedure:

1. Disconnect the ribbon cable (W15) from between A12J1 and the A15 mod/amp assembly.
2. Rerun the failed mod/amp self-test.
3. Check for +8 V, +0.25 V, and −0.55 V at the A12J1 connector. For each self-test failure, the following table shows which pin to measure on the A12J1 connector:

Self-Test	A12J1 Pin
ModAmp1	2
ModAmp2	2
ModAmp3	2

If the bias voltage is correct: Replace the A15 mod/amp assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the bias voltage is not correct: Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

A12-7. Check the −40V Output

Self-test failure: Neg_40V

Procedure:

1. Disconnect the ribbon cable (W19) from between A12J6 and the A19 heterodyne band assembly. (The −40V supply is used only by the A19 heterodyne band assembly.)
2. Rerun the Neg_40V self-test.

If the Neg_40V self-test passes: Replace the A19 heterodyne band assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the Neg_40V self-test fails: Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

A12-8. Check the +5VA Output

Self-test failure: Pos_5VA

Procedure:

1. Disconnect the ribbon cable (W19) from between A12J6 and the A19 heterodyne band assembly. (The +5VA supply is used only by the A19 heterodyne band assembly.)
2. Rerun the Pos_5VA self-test.

If the +5VA self-test passes: Replace the A19 heterodyne band assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the +5VA self-test fails: Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

A12-9. Check SAFD Sense

Self-test failure: SAFDSense

Test point: A12J3-10

Procedure:

1. Disconnect the ribbon cable (W16) from between A12J3 and the A17 SAF assembly.
2. Rerun the SAFDSense self-test.
3. Check for +8 V, +0.25 V, and −0.55 V at A12J3-10.

If the voltages are correct: Replace the A17 SAF assembly. (Go to "A12-51. Replace the RF Deck Assemblies.")

If the voltages are not correct: Replace the A12 RF Interface. (Go to "A12-50. Replace the A12 RF Interface.")

A12-50. Replace the A12 RF Interface

Caution Perform disassembly and replacement 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.

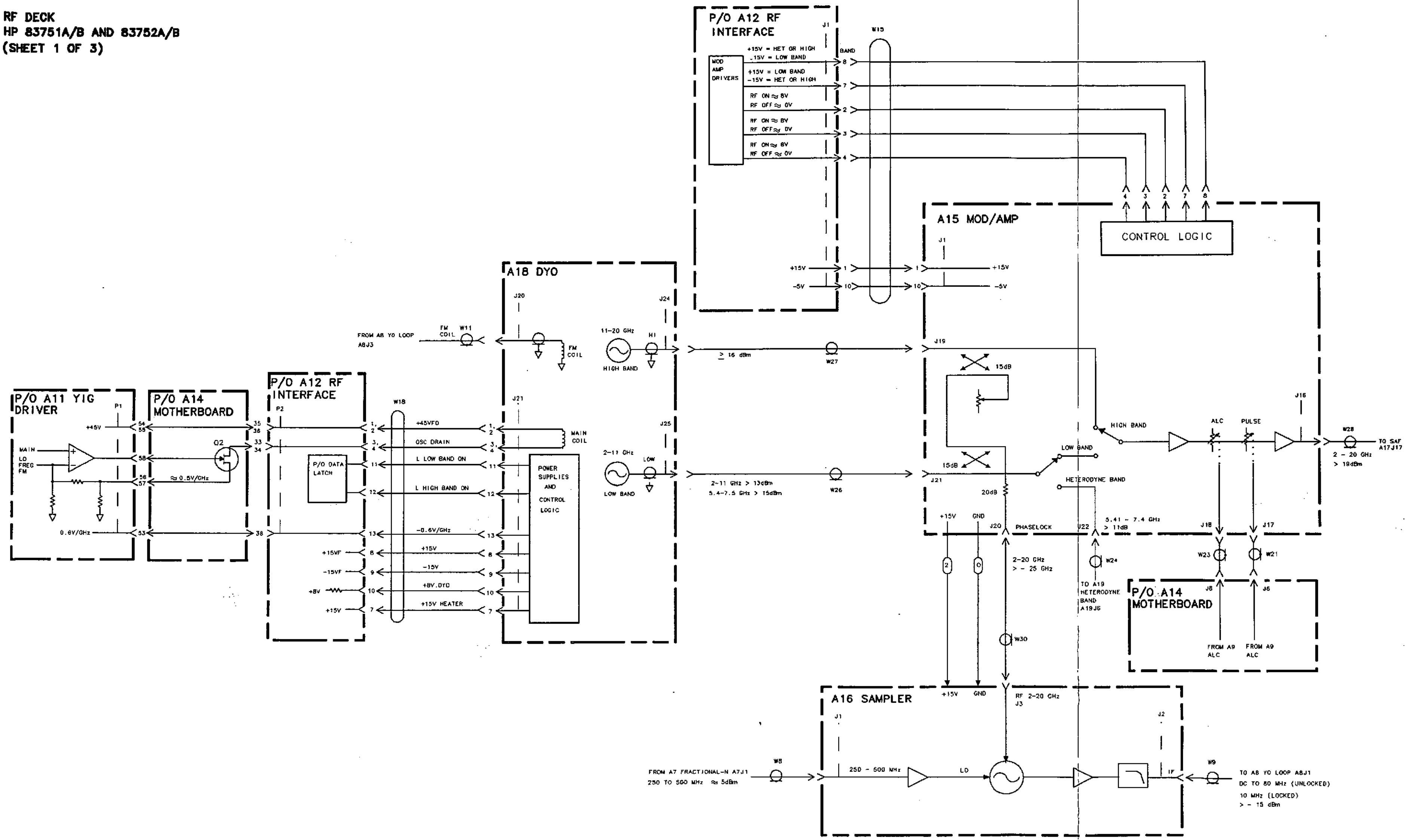
1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A12-51. Replace the RF Deck Assemblies

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

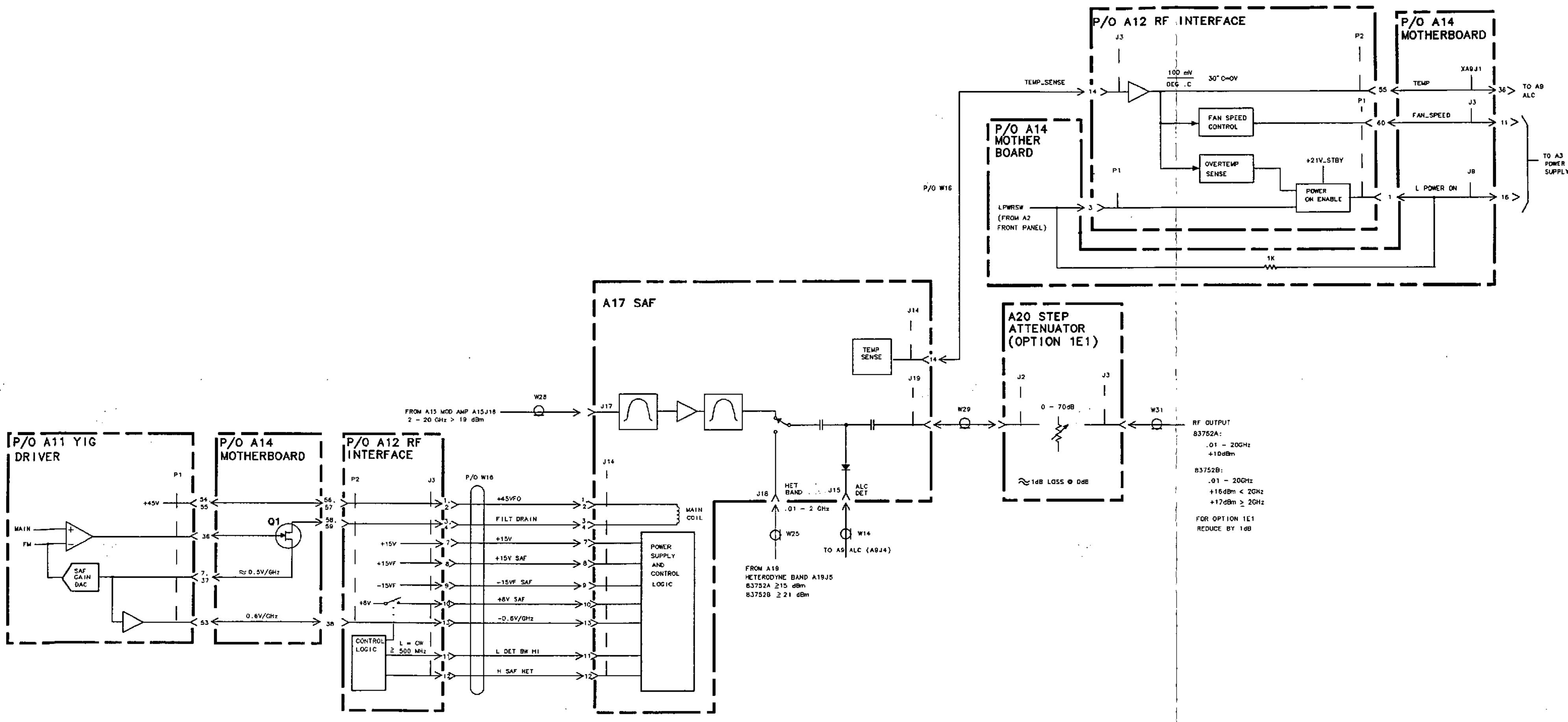
RF DECK
HP 83751A/B AND 83752A/B
(SHEET 1 OF 3)



sg497ab

FOLD-OUT 10. RF DECK (SHEET 1 OF 3)

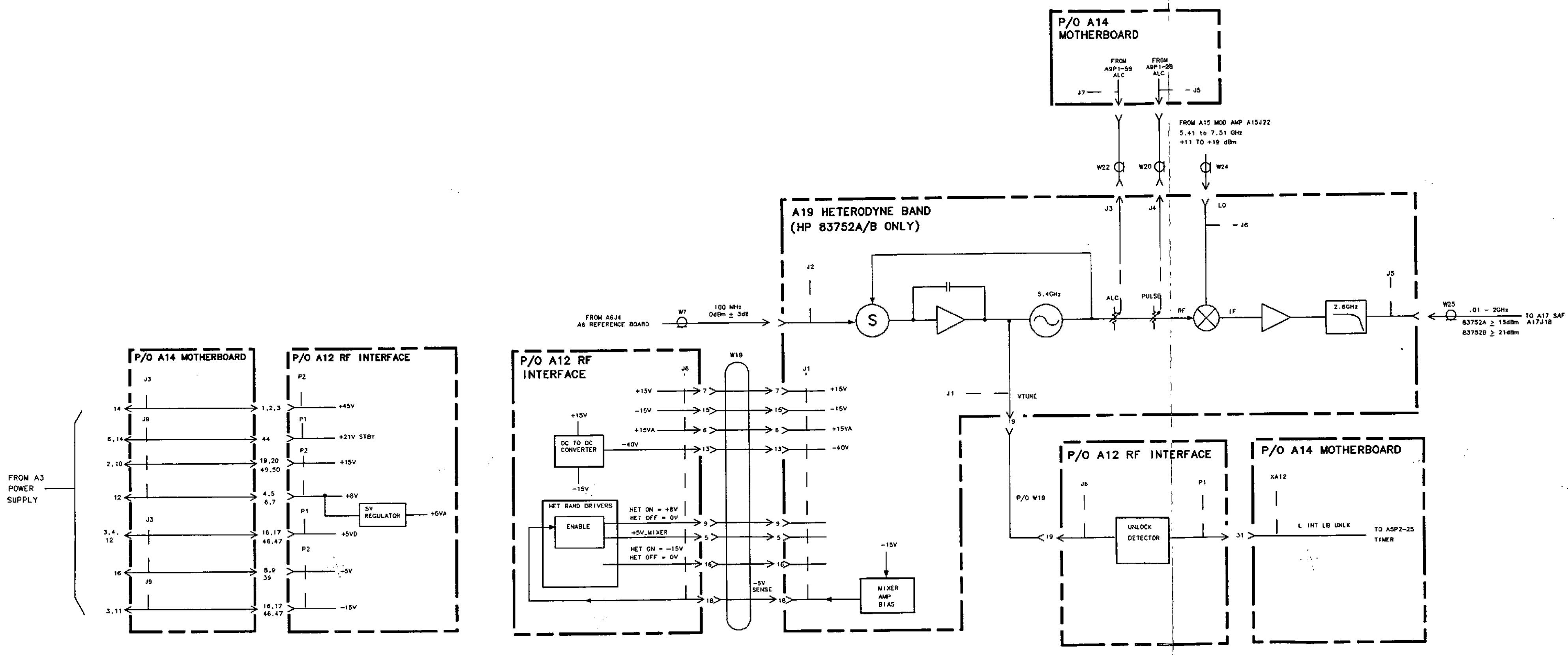
RF DECK
HP 83751A/B AND 83752A/B
(SHEET 2 OF 3)



sg498ob

FOLD-OUT 11. RF DECK (SHEET 2 OF 3)

RF DECK
HP 83751A/B AND 83752A/B
(SHEET 3 OF 3)



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FOLD-OUT 12. RF DECK (SHEET 3 OF 3)

A13 Rear Panel

Find the failed self-test in the following table and go to the procedure indicated to troubleshoot the failure or to replace an assembly. Each measurement procedure listed in the table must be performed while looping the self-test linked to that procedure. For instructions on looping a self-test, see Chapter 8, "Service-Related Special Menus."

Self-Test Failure	Go to This Procedure
AUXbus	A13-1. Check for Rear Panel Connections
HPIBActivity	A13-1. Check for Rear Panel Connections
HPIBControl	A13-1. Check for Rear Panel Connections
HPIBData	A13-1. Check for Rear Panel Connections
SMIbus	A13-1. Check for Rear Panel Connections

A13-1. Check for Rear Panel Connections

Look at the rear panel. There should not be anything connected to any rear panel I/O connector.

If there is a connection to the rear panel: Disconnect it and rerun the self-tests. If the same self-test fails, replace the A13 rear panel. (Go to "A13-50. Replace the A13 Rear Panel.") If a different self-test fails, go to table 5a-1 to continue troubleshooting.

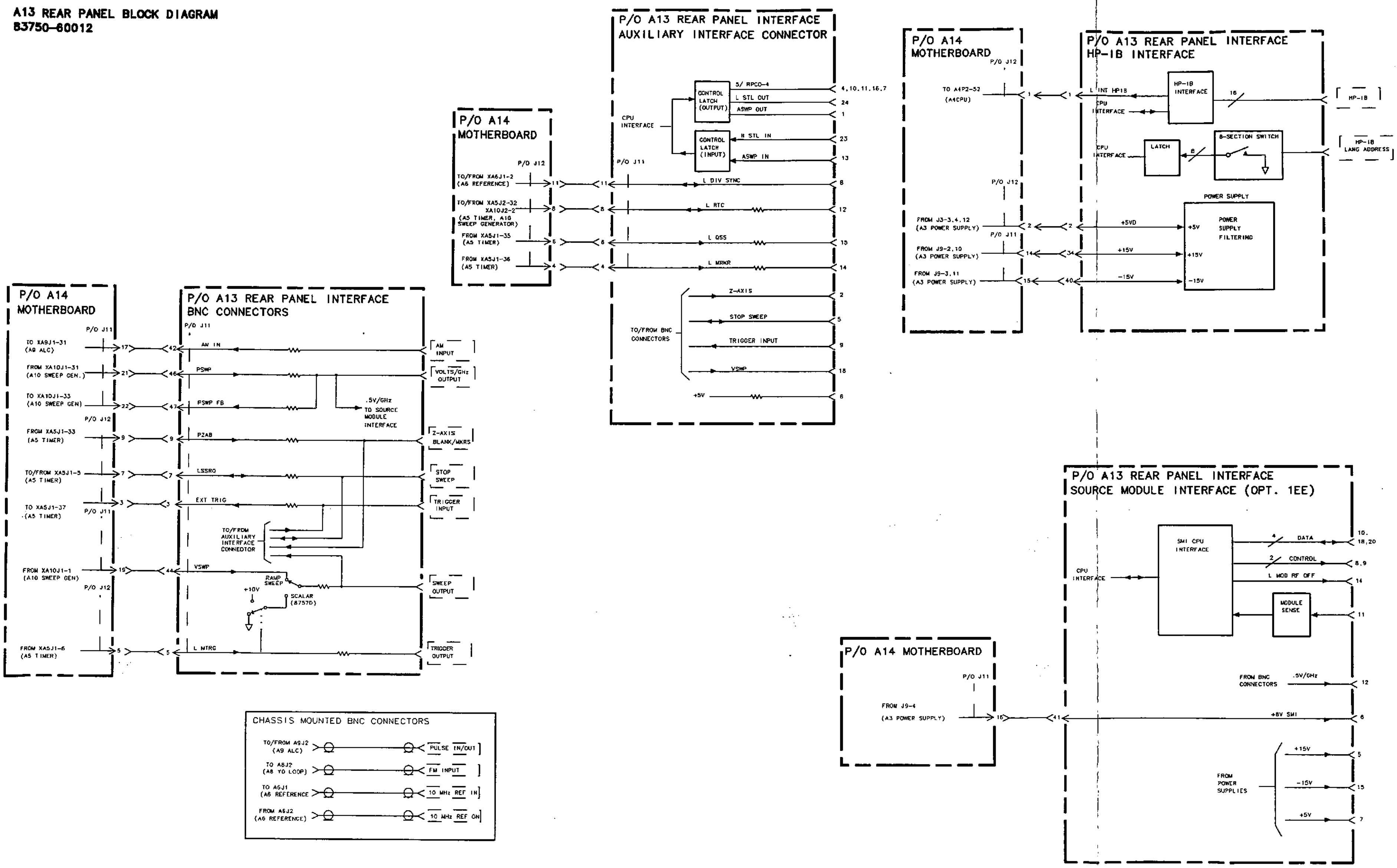
If there is no connection to the rear panel: Replace the A13 rear panel. (Go to "A13-50. Replace the A13 Rear Panel.")

A13-50. Replace the A13 Rear Panel

Caution Perform disassembly and replacement 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.

1. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

A13 REAR PANEL BLOCK DIAGRAM
83750-60012



sg4115ab

FOLD-OUT 13. 83750-60012. A13 REAR PANEL, BLOCK DIAGRAM

A14 Motherboard

A14-50. Replace the A14 Motherboard

Caution Perform disassembly and replacement 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.

1. The motherboard FETs, Q1 and Q2, are not included when ordering a new motherboard. The FETs must be removed from the old motherboard and soldered into the new one. It is best to order two new FETs in case they are needed when replacing the motherboard. See Chapter 6, "Replaceable Parts" for part numbers for the FETs and for the A14 motherboard. See Chapter 4, "Disassembly Procedures," for replacement instructions.
2. Go to the table "Adjustments and Performance Tests Required after Repair or Replacement of an Assembly" (located behind the "Quick Reference" tab.) Identify the procedures required and then perform them.

The Instrument Is Unlocked

Note If you have both unlocked and unleveled conditions, troubleshoot the unlocked failure first.

1. If the message annunciator (MSG) is not lit, unlock the message calibration constant to allow messages to be displayed:
   a. Press (SHIFT) SPECIAL (205) (Hz/s/ENTER)
   b. Use the (⇧) and (⇩) keys to select UNLCKmsg.
   c. On the synthesized sweeper, close switch position 7 on A4S1 (move the switch up).
   d. Press (Hz/s/ENTER) (1) (Hz/s/ENTER)

Note When you are finished troubleshooting unlocked failures, reset calibration constant UNLCKmsg to 0 and close switch A4S1.

2. Press (MSG). The MARKER/SWEEP/STATUS display will display one of the following messages. Use the troubleshooting information provided with each message to resolve your unlocked condition.

801 YIGOsc Unlck

In the YO loop there are several assemblies and cables that might cause the problem. Self-tests have verified the PC boards and basic power levels.

- Use the overall block diagram as well as the individual block diagrams to troubleshoot the YO loop power levels and frequencies.
- Check the cables between the A8 YO loop, A11 YIG driver, A18 DYO, and A15 mod/amp assemblies.

802 REFOsc Unlck

A reference oscillator unlock will occur for any of the following reasons:

- The instrument's reference oscillator is configured incorrectly.
- The A6 reference board is bad.
- The cable from the reference oscillator to the A6 reference board (W6) is bad.
- The reference oscillator is bad.

The most likely cause of the failure is the A6 reference assembly. Before changing the A6 assembly, first check the instrument configuration, the reference oscillator selection, and the 10 MHz standard as follows:

1. If the instrument is a standard unit without a 10 MHz standard (instruments other than Option 1E5), press (PRESET).
2. If the unlock light is still lit, press:
   (SHIFT) SPECIAL (207) (Hz/s/ENTER)

3. Use the ⇧ and ⇩ keys to select OPTTime. The value should be 0 for an instrument without a 10 MHz standard. If the instrument has a 10 MHz standard, the value should be 1.
4. If the unlock light is still lit, press:
   SHIFT SPECIAL 9
5. Verify that the Rosc Src is set to None for a standard instrument or INT if a 10 MHz standard is installed. If it is not correct, use the ⇧ and ⇩ keys to select the correct Rosc Src= mode.
6. Use the A6 block diagram to verify the power supplies and the 10 MHz input to the A6 assembly.
7. If the power supplies and the reference are good, replace the A6 reference assembly.

803 FracN Unlock

The most likely cause of the failure is the A7 fractional–N assembly.

- Use the overall block diagram and the A7 fractional–N block diagram to verify the input and output signals.
- Check the power supplies and the 2 MHz signal (reference in from the A6 assembly) to the A7 assembly.
- If the inputs to the A7 assembly are good, replace the A7 assembly.

804 HetBnd Unlck

The most likely cause of the failure is the A10 heterodyne band assembly.

- Use the overall block diagram and the RF deck block diagram to verify the input and output signals.
- Verify the 100 MHz input from the A6 assembly and "VTUNE" on the A12 assembly.
- If the input signals are good and the output signal is bad, replace the A19 assembly.
- If the output is good, check the cable (W25) between the A19 and A17 assemblies.

Note When you are finished troubleshooting unlocked failures, reset calibration constant UNLCKmsg to 0 and close switch A4S1.

The Instrument Is Unleveled

Note If you have both unlocked and unleveled conditions, troubleshoot the unlocked failure first.

1. Verify that the instrument is in the internally leveled mode. Press (ALC MODE). ALC= Internal should be displayed in the MARKER/SWEEP/STATUS window. If it is, continue with step 3.
2. If the instrument is not in the internally leveled mode, use the (⇧) and (⇩) keys to select ALC= Internal.

   Verify that the instrument is still unleveled. If it is, continue with step 3.
3. Output power check:
   a. Check the RF output power using a spectrum analyzer or a power meter to determine which of the following conditions exists:
      - Low or no RF output power
      - High RF output power
   b. Determine the frequency ranges where the problem exists. Heterodyne band range is 0.01 to 2 GHz (HP 83751A/B only); low band range is 2 to 11 GHz; high band range is 11 to 20 GHz.
   c. Continue troubleshooting with either "Low or No RF Output Power" or with "High Output Power" depending on which condition you observed on your instrument.

Low or No RF Output Power

With low or no RF power out, the instrument may level at low power levels. Therefore, troubleshoot the instrument at a high power setting and in the externally leveled mode.

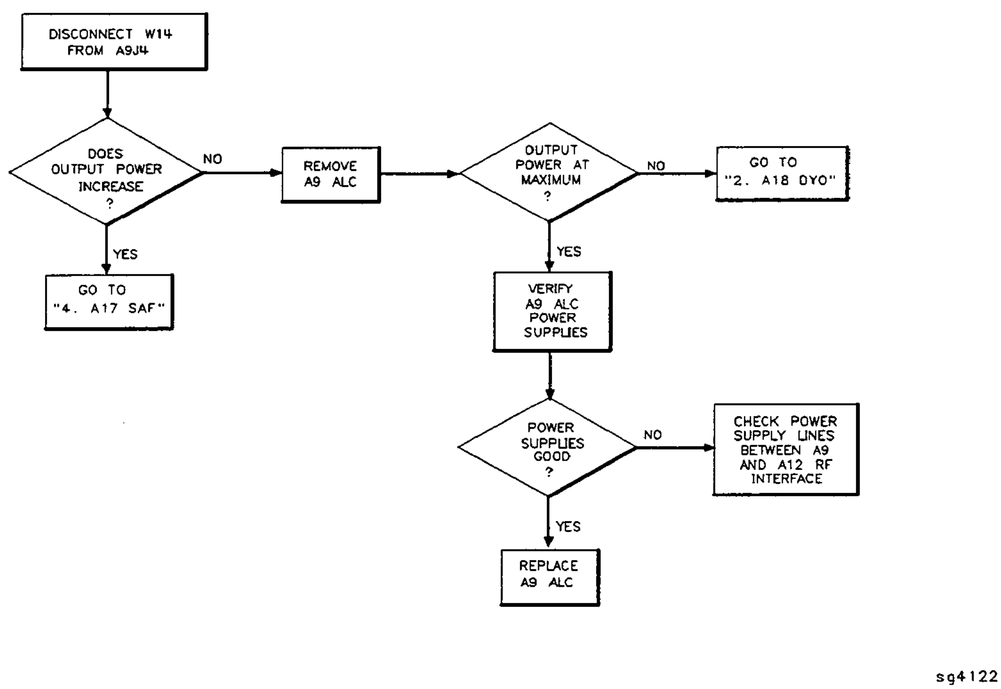
Go to one of the following sections that best indicates the frequency ranges where the problem exists.

Low or No RF Output Power, 0.01 to 20 GHz (All Bands)

Low RF output power can be caused by the A9 ALC assembly, the A18 DYO assembly, the A15 mod/amp assembly, or the A17 ALC assembly. Use the flowcharts provided to troubleshoot each assembly.

1. **A9 ALC**

   Use the A9 block diagram.

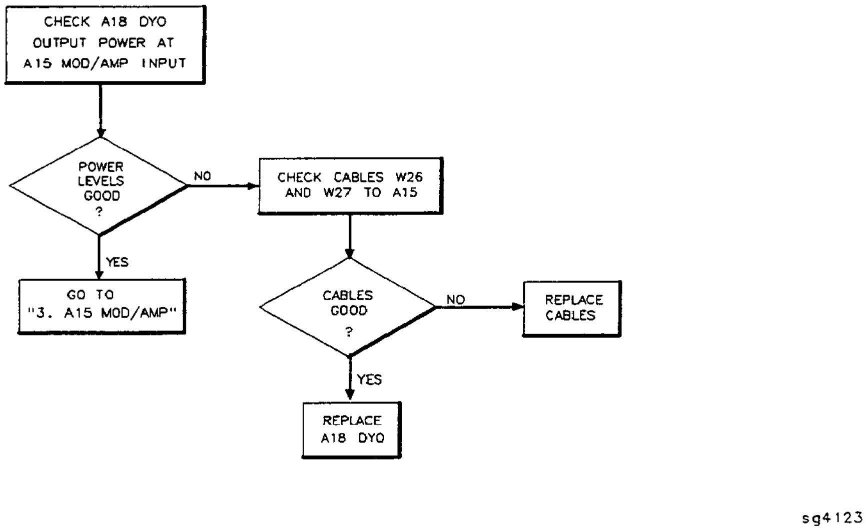


Troubleshooting Flow for A9 ALC

2. **A18 DYO**

Use the RF deck block diagram (1/3).

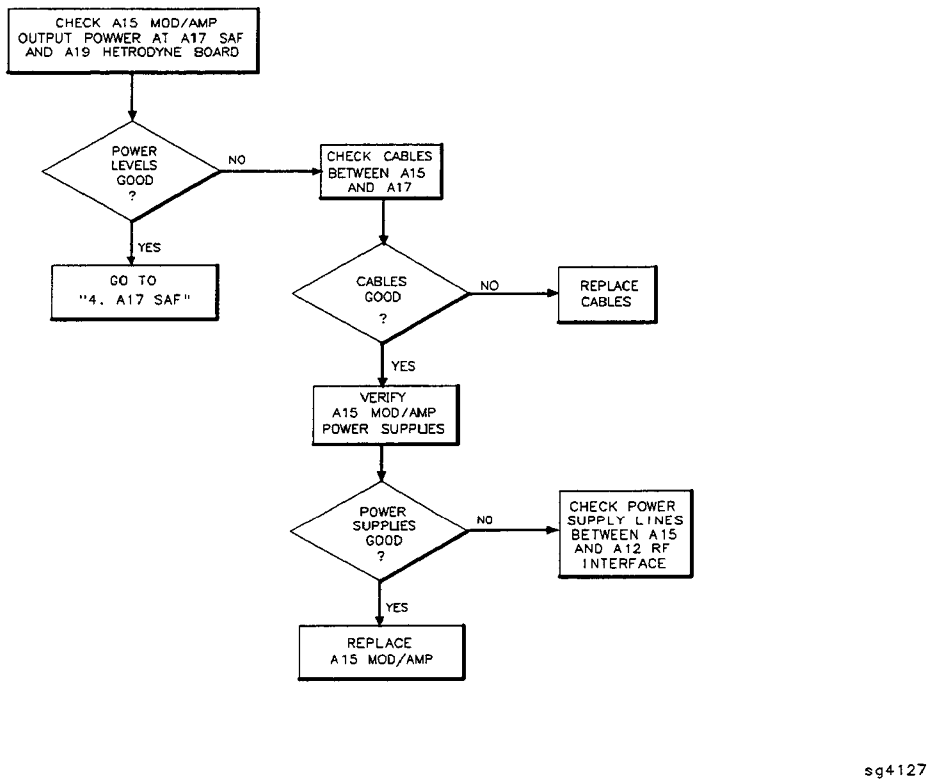
Since any unlock condition should already have been resolved, the A18 DYO assembly is generating some level of RF power. Use the RF deck block diagram (1/3).



Troubleshooting Flow for A18 DYO

3. A15 Mod/Amp

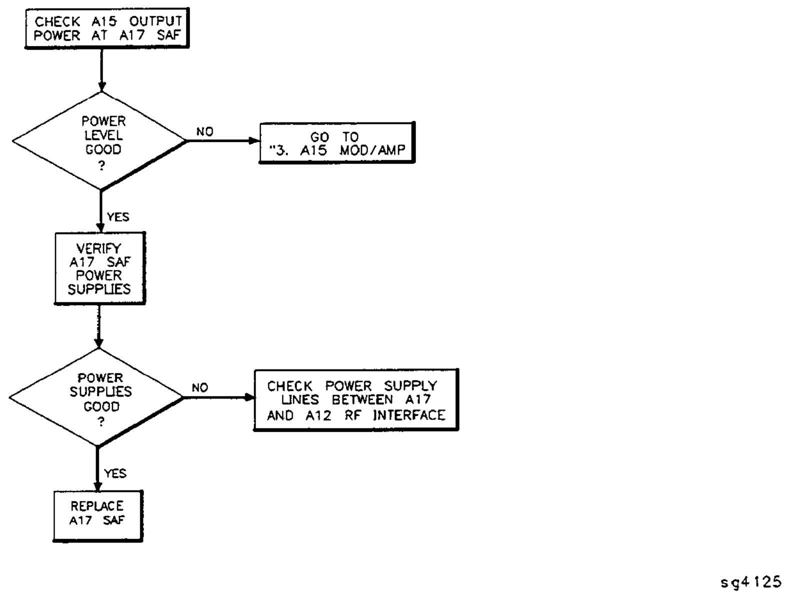
Use the RF deck block diagram (1/3).



Troubleshooting Flow for A15 Mod/Amp

4. **A17 SAF**

   Use the RF deck block diagram (2/3).



Troubleshooting Flow for A17 SAF

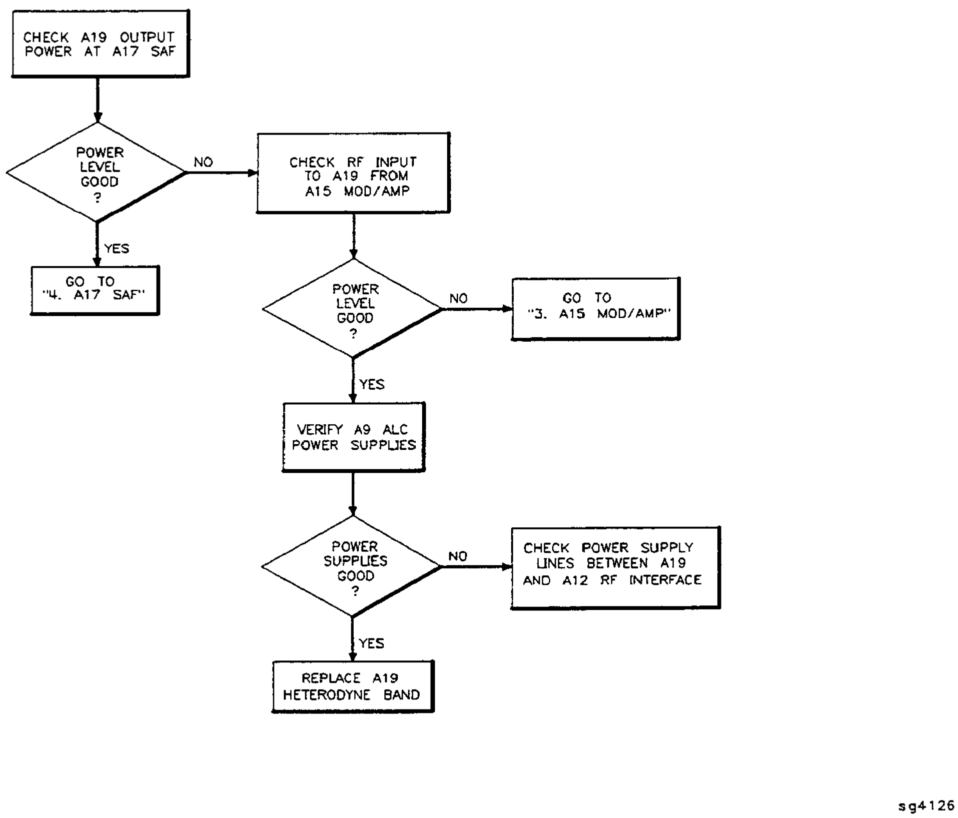
The Instrument Is Unleveled

Low or No RF Output Power, 0.01 to 2 GHz (Heterodyne Band)

Low or no RF output power in heterodyne band can be caused by the A19 heterodyne band assembly, the A15 mod/amp assembly, the A18 DYO assembly, the A17 SAF assembly, or the A9 ALC assembly. Use the flowcharts provided to troubleshoot each assembly.

1. **A19 Heterodyne Band**

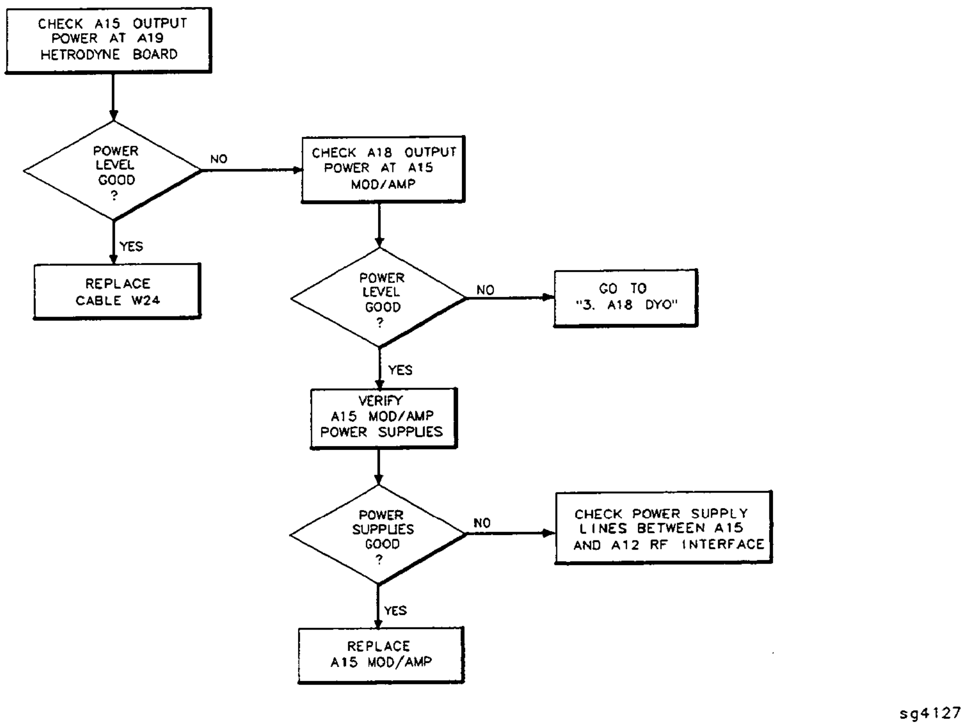
   Use the RF deck block diagram (3/3).



Troubleshooting Flow for A19 Heterodyne Band

2. **A15 Mod/Amp**

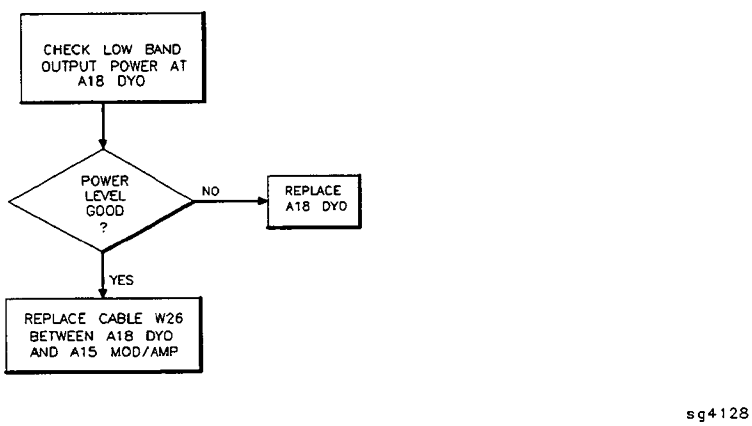
Use the RF deck block diagram (1/3).



Troubleshooting Flow for A15 Mod/Amp

3. **A18 DYO**

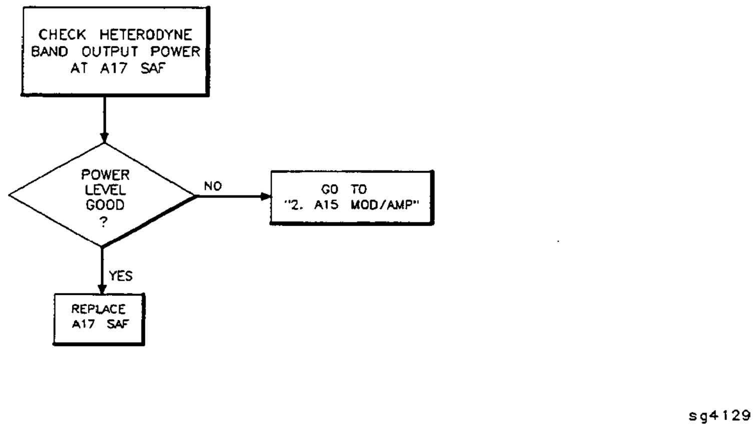
Use the RF deck block diagram (1/3).



Troubleshooting Flow for A18 DYO

4. **A17 SAF**

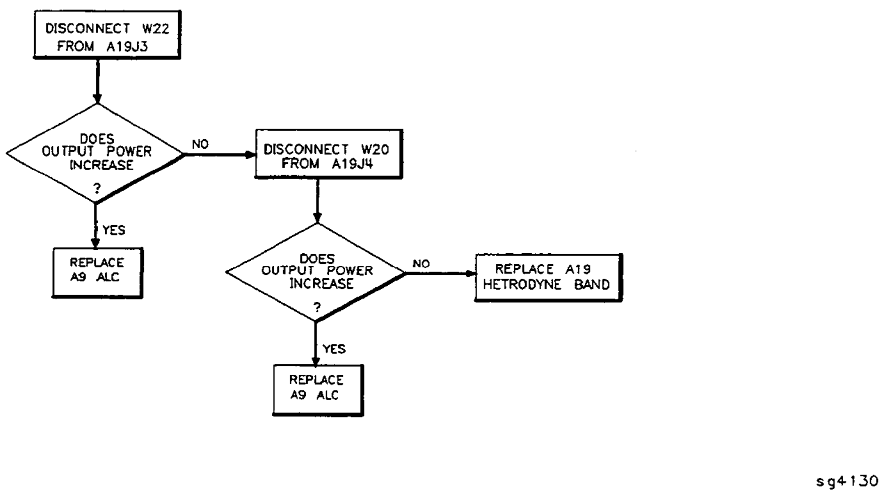
Use the RF deck block diagram (2/3).



Troubleshooting Flow for A17 SAF

5. **A9 ALC**

Use the RF deck block diagram (3/3).



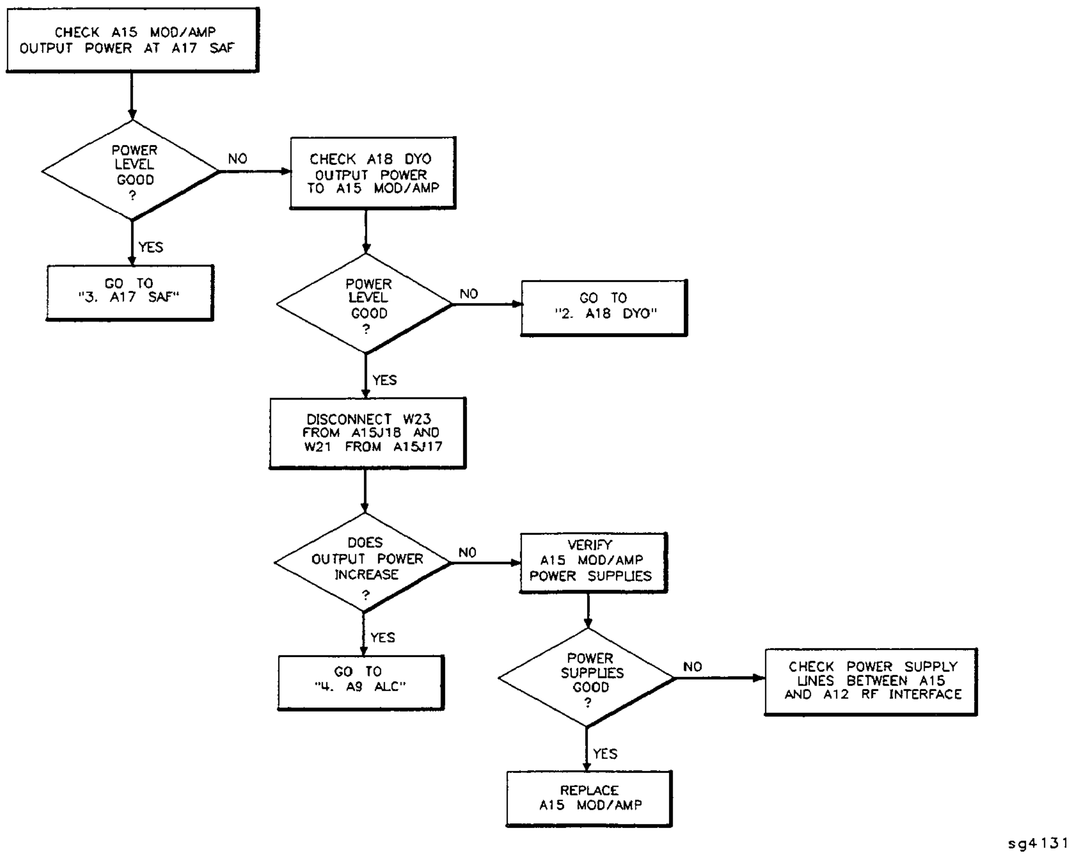
Troubleshooting Flow for A9 ALC

Low or No RF Output Power, 2 to 11 GHz and 11 to 20 GHz (Low and High Bands)

Low or no RF output power in low or high bands can be caused by the A15 mod/amp assembly, the A18 DYO assembly, the A17 SAF assembly, or the A9 ALC assembly. Use the flowcharts provided to troubleshoot each assembly.

1. **A15 Mod/Amp**

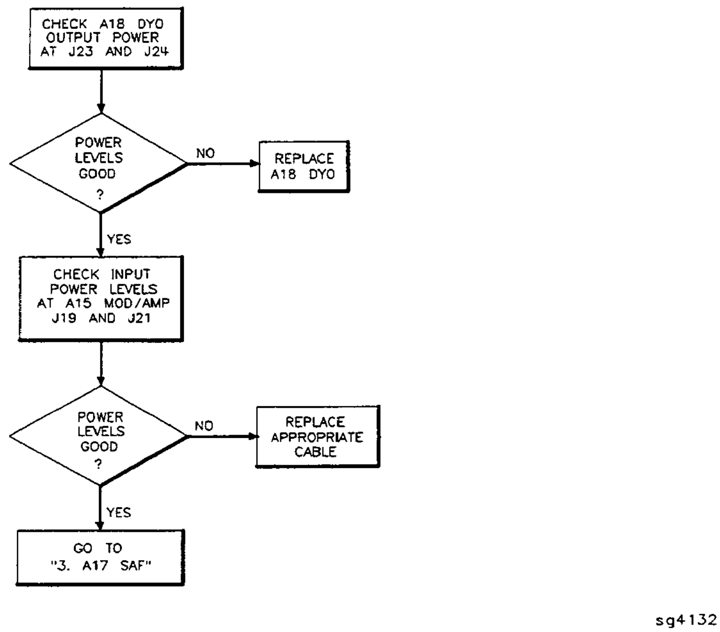
   Use the RF deck block diagram (1/3).



Troubleshooting Flow for A15 Mod/Amp

2. A18 DYO

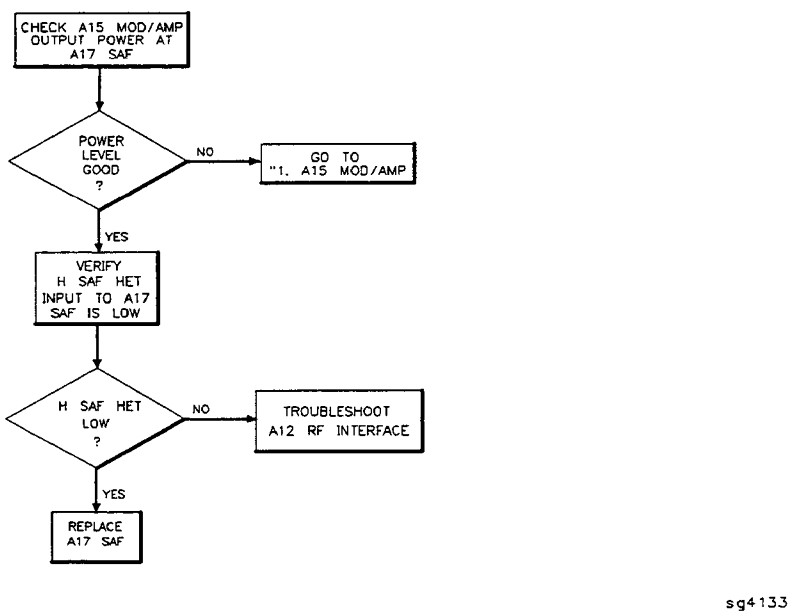
Use the RF deck block diagram (1/3).



Troubleshooting Flow for A18 DYO

3. A17 SAF

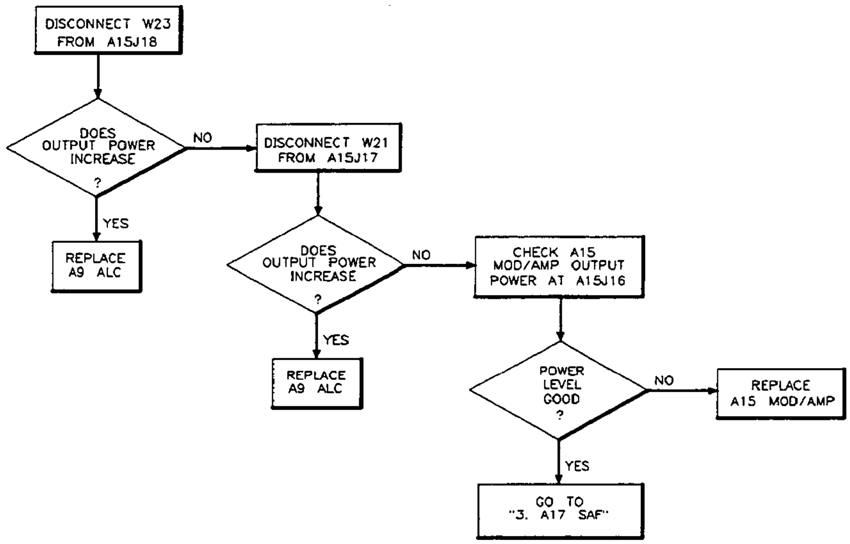
Use the RF deck block diagram (2/3).



Troubleshooting Flow for A17 SAF

4. **A9 ALC**

Use the RF deck block diagram (1/3).



Troubleshooting Flow for A9 ALC

High RF Output Power

The primary causes of high RF power out are the following:

- No feedback from the A17 SAF ALC detector diode to the A9 ALC assembly.
- No ALC input to the A15 mod/amp assembly or the A19 heterodyne band assembly.

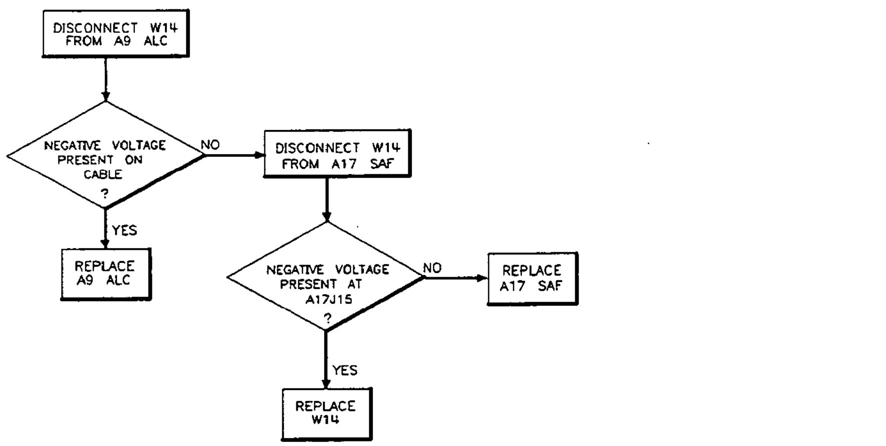
Go to one of the following sections that best indicates the frequency ranges where the problem exists.

High RF Output Power, 0.01 to 20 GHz (All Bands)

The most likely cause of high power in all bands is no feedback from the A17 SAF to the A9 ALC board or the A9 ALC assembly. Use the flowcharts provided to troubleshoot each assembly.

1. **A17 SAF**

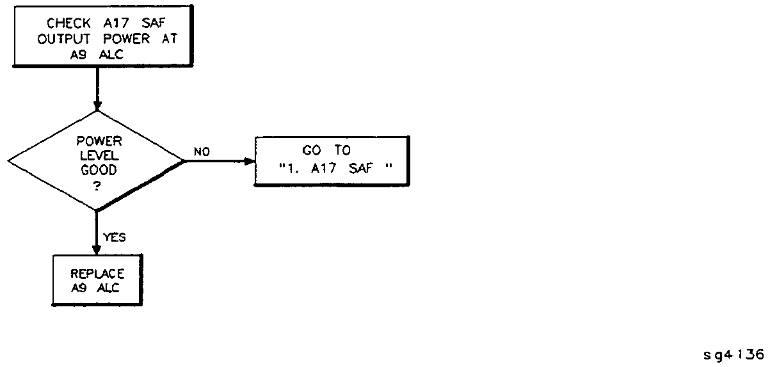
   Use the RF deck block diagram (2/3).



Troubleshooting Flow for A17 SAF

2. **A9 ALC**

Use the RF deck block diagram (2/3).



Troubleshooting Flow for A9 ALC

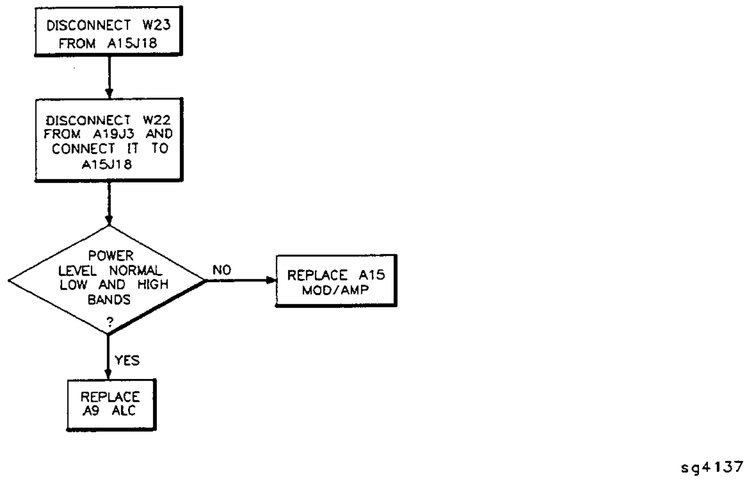
The Instrument Is Unleveled

High RF Output Power, 2 to 20 GHz (Low and High Band)

The most likely cause of high power in low and high band is the A15 mod/amp assembly. Without any ALC control from the A9 ALC assembly to the A15 mod/amp the output power increases to maximum. Use the following flow chart to troubleshoot.

1. **A15 Mod/Amp**

   Use the RF deck block diagram (1/3).



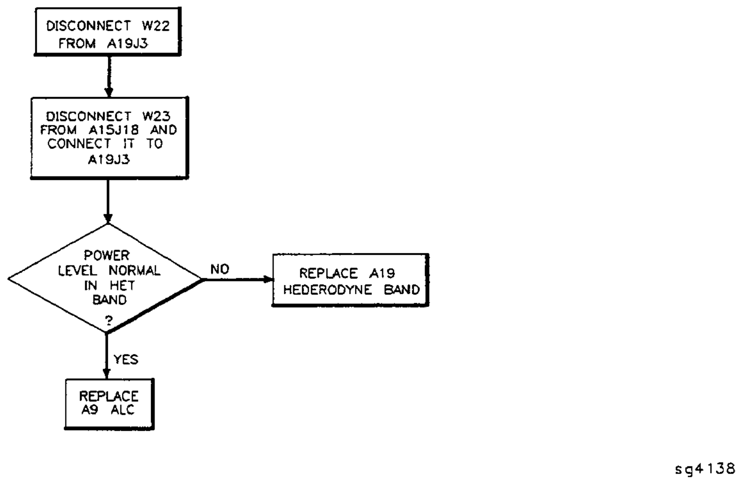
Troubleshooting Flow for A15 Mod/Amp

High RF Output Power, 0.01 to 2 GHz (Heterodyne Band)

The most likely cause of high power in heterodyne band is the A19 heterodyne band assembly. Without any ALC control from the A9 ALC assembly to the A19 heterodyne band assembly the output power increases to maximum. Use the following flow chart to troubleshoot.

1. **A19 Heterodyne Band**

   Use the RF deck block diagrams (1/3 and 3/3).



Troubleshooting Flow for A19 Heterodyne Band

Instructions for Troubleshooting When Adjustments Don't Work

When an adjustment won't work and you have run the self-tests and they pass, use the following table to locate the most likely failure:

1. Locate the failed adjustment in the first column of the table.
2. Use the block diagram shown in the second column of the table.
3. The third column of the table shows which are the key signals associated with the adjustment.
4. The last column of the table shows the assemblies most likely to have caused the signal to be bad.

Table 5b-10. Troubleshooting Help for Failed Adjustments

Adjustment	Block Diagram	Key Signals	Assemblies
10 MHz Standard	A6	A6J3 A6J2	A6 A21
100 MHz VCXO	A6		A6
Sweep Generator	A10		A10
V/GHz	Rear Panel Block	Rear Panel Output	A10 A13
ADC			A4
DYO Linearity	A11	DYO Correction P1-25	A10 A18
DYO Gain and Offset	A11		A11 A18 A14Q2
SAF Sense	A11		A11 A18 A14Q2
DYO Delay	A11		A18
SAF Tracking	A11	SAF Correction P1-26	A10 A17
ALC Detector and Logger	A9 Overall Block	A9J4	A9 A15 (< 2 GHz) A19 (≥ 2 GHz) A17
ALC Modulator Offset and Gain	A9		A15 (< 2 GHz) A19 (≥ 2 GHz) A9
Scalar Pulse Symmetry	Overall Block A9 RF Deck	Pulse (Low/High) A15J17 Pulse (Het) A19J4	W21 W20
Power Flatness (leveled)	Overall Block A9		W29 Connections SAF Output
Power Flatness (unleveled)	Overall Block		Loose coax cables from DYO to output
Downloading Firmware			A4S1 position 7 closed A4
Calibrate Frac-N VCO	A7		A7
Power Clamp Cal	A9		A9
Atten Flatness Adj	RF Deck		A20

Instructions for Troubleshooting Performance Test Failures

If a performance test fails and you have run the self-tests and they pass, use the following table to locate the most likely failure:

1. Locate the failed performance test in the first column of the table.
2. Use the block diagram shown in the second column of the table.
3. The third column of the table shows which are the key signals associated with the performance test.
4. The last column of the table shows the assemblies most likely to have caused the signal to be bad.

Table 5b-11. Troubleshooting Help for Failed Performance Tests

Performance Test	Block Diagram	Key Signals	Assemblies
Internal Timebase: Aging Rate	A6	A6J3	A21
CW Frequency Accuracy	Overall Block A6	100 MHz to A19 2 MHz to A7 1 MHz to A5 1 MHz to A8	A6
Swept Frequency Accuracy	Overall Block		A7 A10 A11 A18
Power Accuracy	Overall Block		A9 A17 A19 (< 2 GHz) A15 ($\geq$ 2 GHz)
Power Flatness	Overall Block		
Maximum Leveled Power	Overall Block	Power level out at each assembly	
Spurious Signals (Harmonics)	Overall Block	Low Band Het Band High Band	A17 A19
Spurious Signals (Non-Harmonics)	Overall Block		
Residual FM	Overall Block		A6 A8 A11 A18
Attenuator Verification	Overall Block		Loose Cable SAF

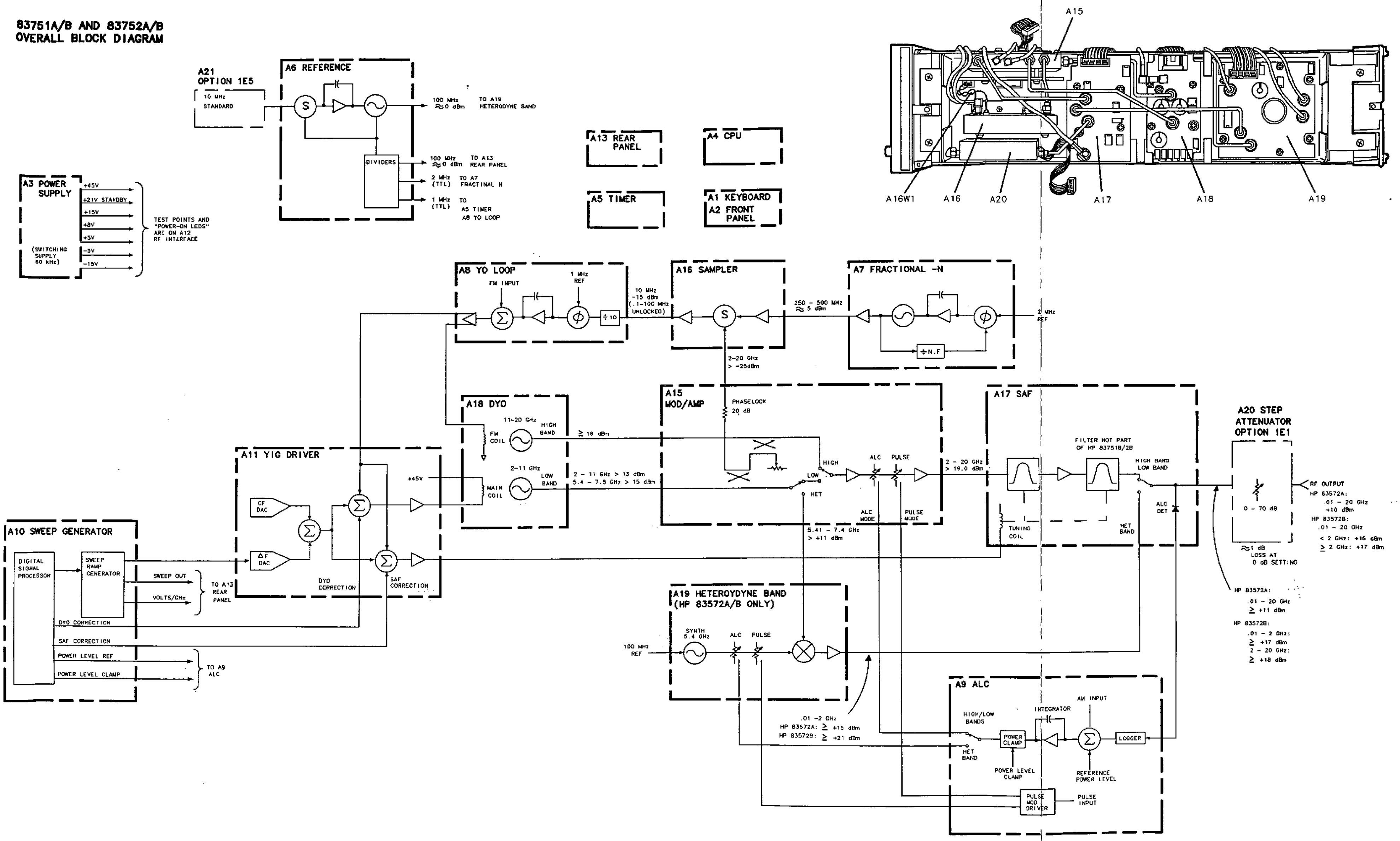
5c. Overall Block Diagrams

5c

Overall Block Diagrams

The overall block diagram for the HP 83751A/B and HP 83752A/B is located in this section.

83751A/B AND 83752A/B OVERALL BLOCK DIAGRAM



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FOLDOUT 14. OVERALL BLOCK DIAGRAM

HEWLETT PACKARD

Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY

ADDRESS

TECHNICAL CONTACT PERSON

PHONE NO. EXT.

MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER ______

over

HEWLETT PACKARD

Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY

ADDRESS

TECHNICAL CONTACT PERSON

PHONE NO. EXT.

MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER ______

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MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

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☐ POWER CABLE ☐ ADAPTER(S)

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HEWLETT PACKARD

Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY

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TECHNICAL CONTACT PERSON

PHONE NO. EXT.

MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER ______

over

HEWLETT PACKARD

Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY

ADDRESS

TECHNICAL CONTACT PERSON

PHONE NO. EXT.

MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

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COMPANY

ADDRESS

TECHNICAL CONTACT PERSON

PHONE NO. EXT.

MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER ______

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Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER ____________________

____

Observed symtoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS ____________________

If unit is part of system list model number(s) of other interconnected instruments. ____________________

9320-3896 Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER ____________________

Observed symtoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS ____________________

If unit is part of system list model number(s) of other interconnected instruments. ____________________

9320-3896 Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER ____________________

Observed symtoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS ____________________

If unit is part of system list model number(s) of other interconnected instruments. ____________________

9320-3896 Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER ____________________

Observed symtoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS ____________________

If unit is part of system list model number(s) of other interconnected instruments. ____________________

9320-3896 Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER ____________________

Observed symtoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS ____________________

If unit is part of system list model number(s) of other interconnected instruments. ____________________

9320-3896 Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY

☐ REPAIR ☐ REPAIR & CAL

OTHER ____________________

Observed symtoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS ____________________

If unit is part of system list model number(s) of other interconnected instruments. ____________________

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6. Replaceable Parts

6

Replaceable Parts

This chapter contains part numbers for ordering all replaceable parts for the synthesized sweeper. Replaceable parts include major assemblies and all chassis hardware. Table 6-1 lists reference designations and abbreviations used in this chapter.

For information on removing and replacing assemblies, refer to Chapter 4, "Disassembly 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 6-1 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.

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 6-1 for abbreviations.)

Ordering Information

For any listed part, request the Hewlett-Packard part number and quantity required from the nearest Hewlett-Packard office.

How To Order Parts ... Fast!

Hewlett-Packard parts specialists have direct on-line access to the replaceable parts listed in this manual. Four-day delivery is standard; there is a charge for hotline (one-day) delivery.

In the United States, call the following toll-free number:

(800) 227-8164
Monday through Friday, 6 am to 5 pm (Pacific Standard Time)

Outside the United States, contact your nearest Hewlett-Packard office.

Table 6-1. Reference Designations and Abbreviations

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

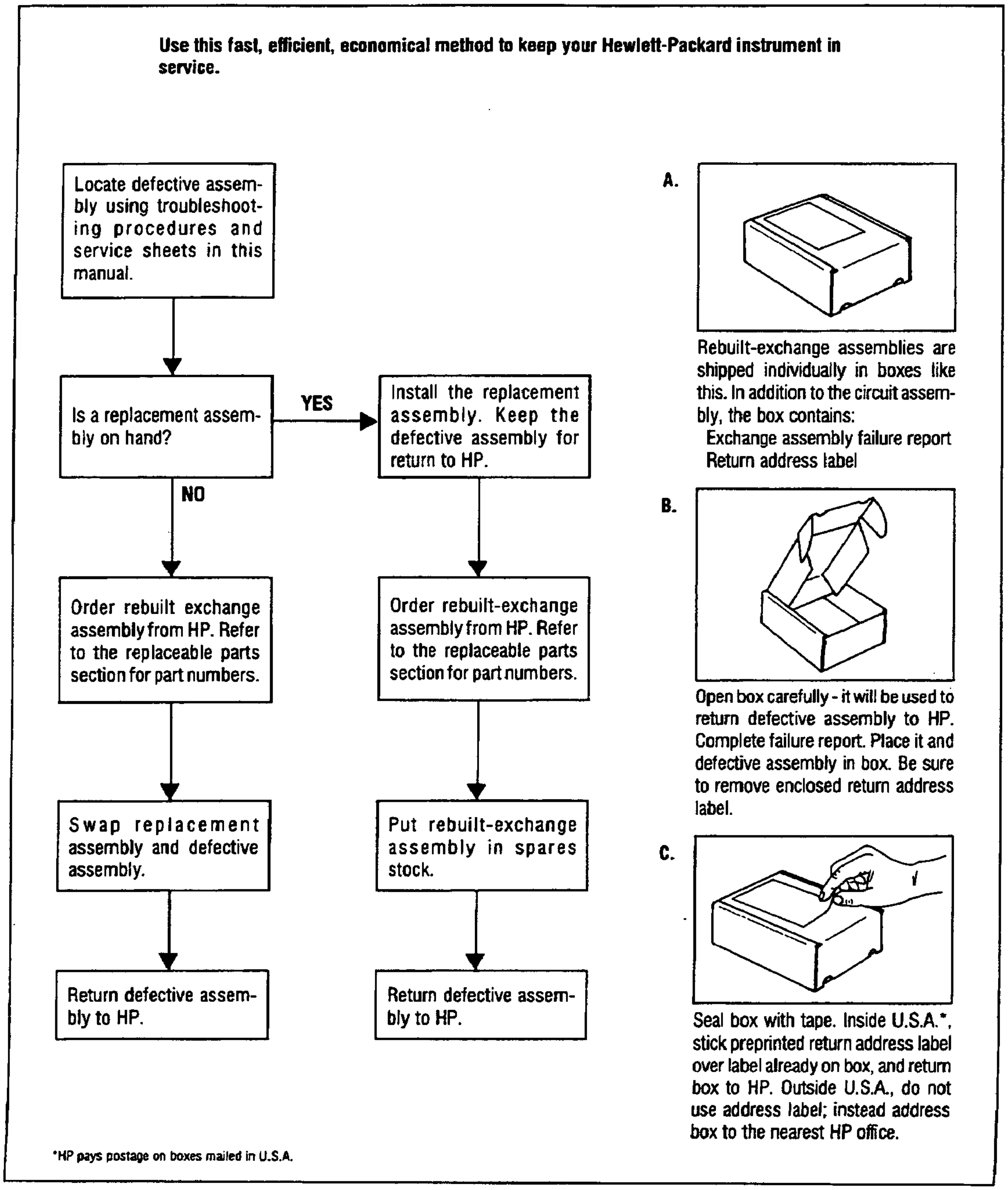

Figure 6-1. Module Exchange Program

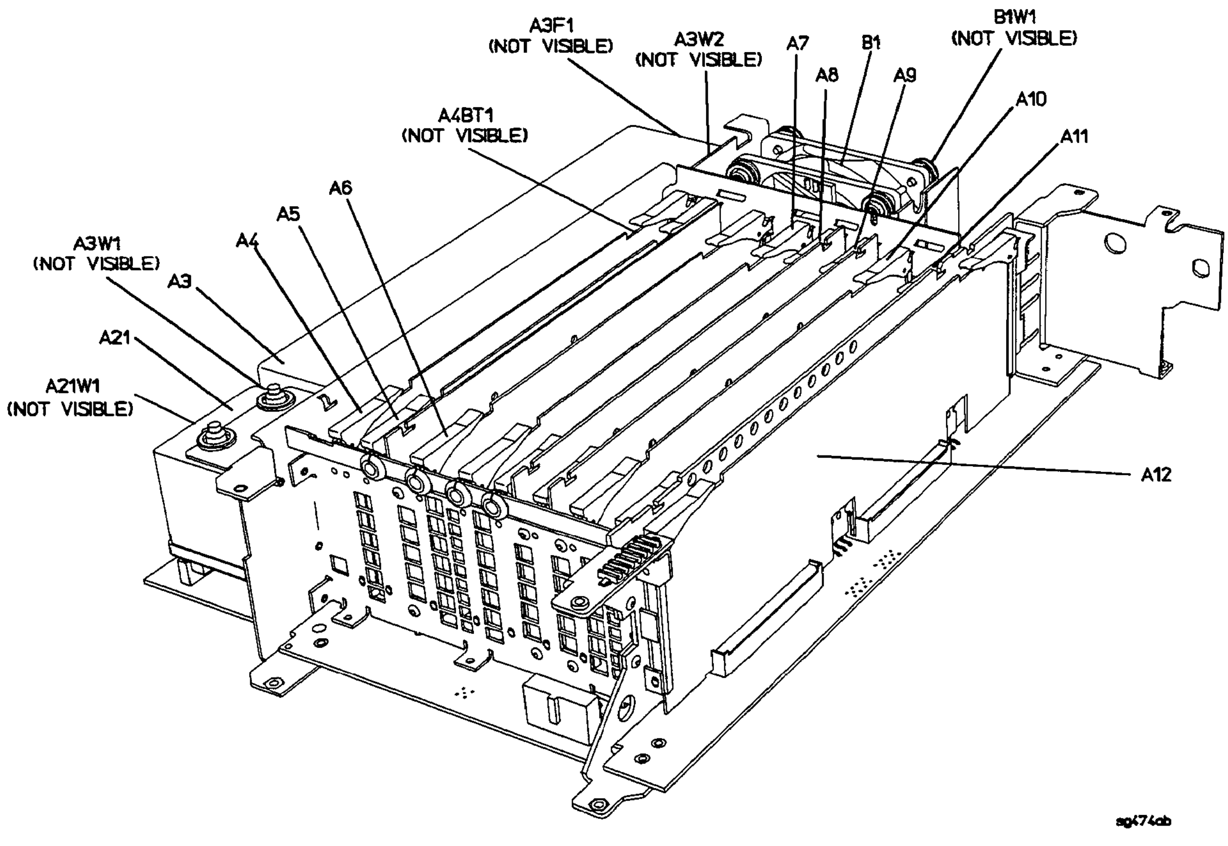

Figure 6-2. Major Assemblies

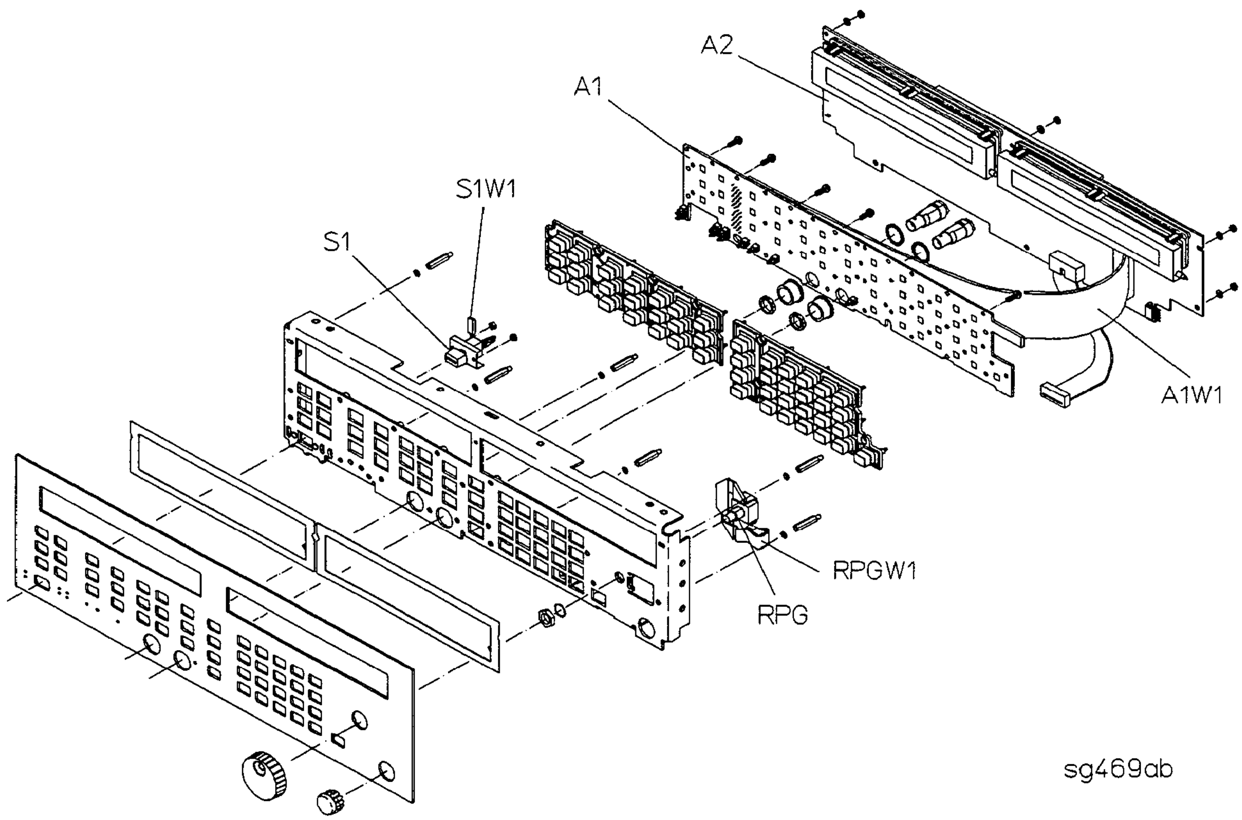

Figure 6-2. Major Assemblies (2 of 4)

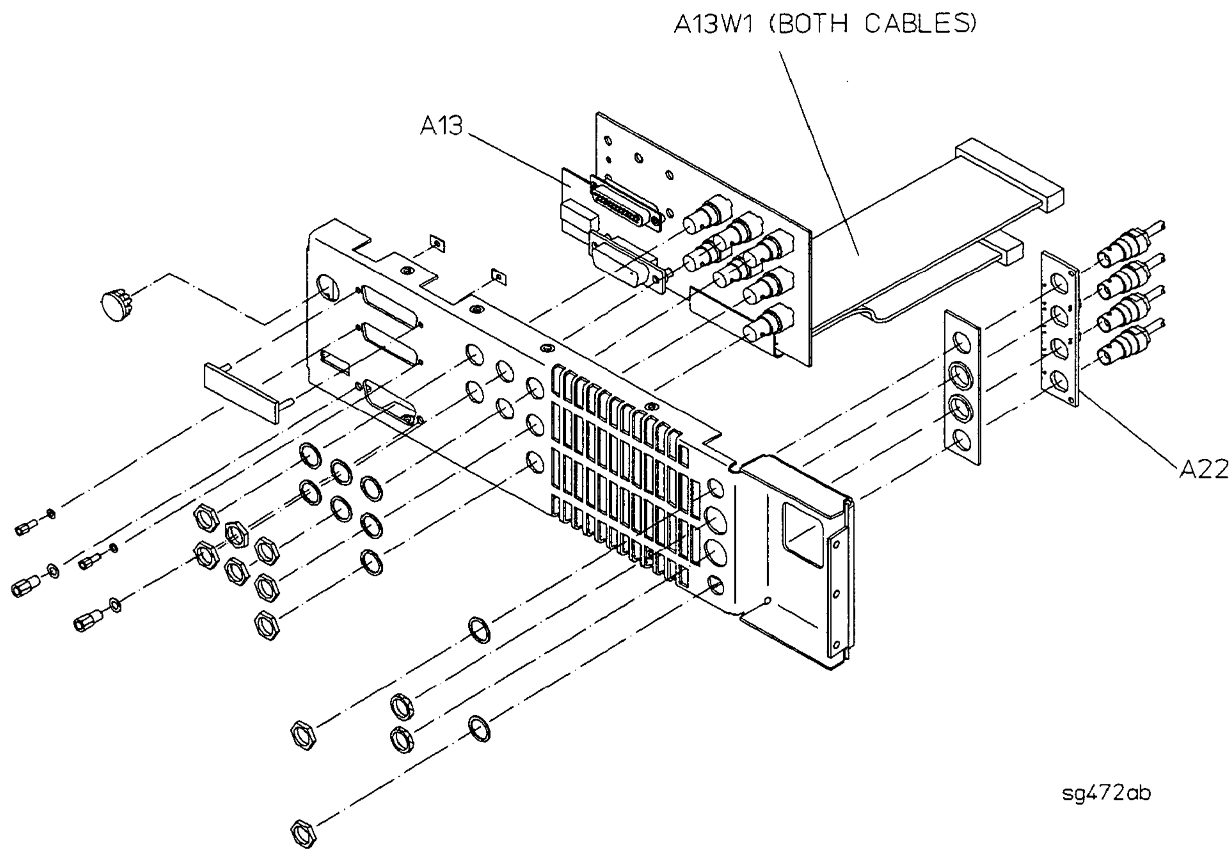

Figure 6-2. Major Assemblies (3 of 4)

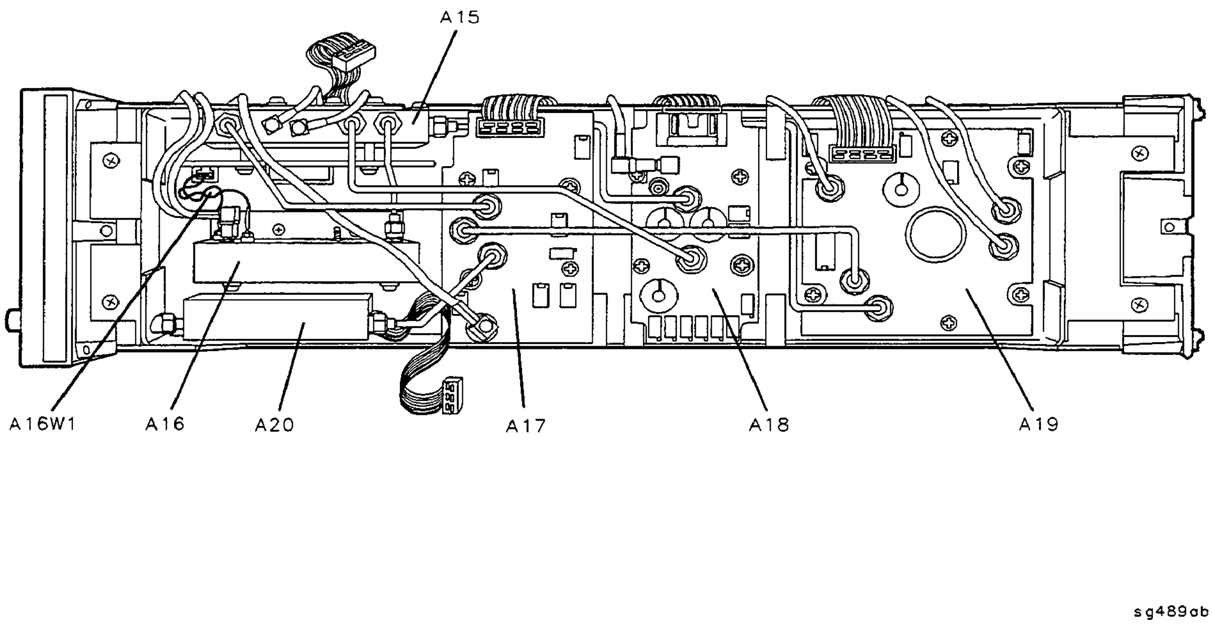

Figure 6-2. Major Assemblies (4 of 4)

Table 6-2. Major Assemblies

Ref. Desig.	HP Part Number	Qty	Description
A1	83750-60013	1	KEYBOARD ASSEMBLY
A1W1		1	(part of keyboard)
A2	83750-60011	1	FRONT-PANEL DISPLAY ASSEMBLY
A3	0950-2307	1	POWER SUPPLY
A3W1		1	(part of power supply)
A3W2		1	(part of power supply)
A3F1	2110-0703	1	FUSE 6.3A 250V F
A4	83750-60002	1	CPU ASSEMBLY
A4BT1	1420-0338	1	BATTERY 3V 1.2A-HR LITHIUM POLYCARBON
A5	83750-60003	1	TIMER ASSEMBLY
A6	83750-60004	1	REFERENCE ASSEMBLY
A7	83750-60005	1	FRACTIONAL-N ASSEMBLY
A8	83750-60006	1	YO LOOP ASSEMBLY
A9	83750-60007	1	ALC ASSEMBLY (HP 83751B/52B)
A9	83750-60062	1	ALC ASSEMBLY (HP 83751A/52A)
A10	83750-60008	1	SWEEP GENERATOR ASSEMBLY
A11	83750-60009	1	YIG DRIVER ASSEMBLY
A12	83750-60010	1	RF INTERFACE ASSEMBLY
A13	83750-60012	1	REAR-PANEL ASSEMBLY
A13W1		1	(part of rear panel)
A14	83750-65014	1	MOTHERBOARD ASSEMBLY
A15	5086-7581	1	MOD/AMP
A16	83750-60030	1	SAMPLER
A16W1		1	(part of sampler)
A17	5086-7529	1	SWITCHED AMP FILTER (SAF) (HP 83751A & HP 83752A)
A17	5086-7519	1	SWITCHED AMP FILTER - HI POWER (SAF) (HP 83751B & HP 83752B)
A18	5086-7500	1	DUAL YIG OSCILLATOR (DYO)
A19	5086-7580	1	HETERODYNE BAND (HP 83752A)
A19	5086-7633	1	HETERODYNE BAND - HI POWER (HP 83752B)
A20	33327-60001	1	STEP ATTENUATOR (Option 1E1)
A21	10811E	1	10 MHZ STANDARD (Option 1E5)
A21W1		1	(part of 10 MHz standard)
A22	83750-60017	1	BNC ASSEMBLY
B1	83750-60029	1	FAN
B1W1		1	(part of fan)
J1		1	RF OUTPUT CONNECTOR ASSY (See Table 6-12)
RPG	0960-0902	1	RPG-MIN
RPGW1		1	(part of RPG)
S1	83750-60040	1	DISPLAY SWITCH ASSEMBLY
S1W1		1	(part of switch)

Cables - Top View

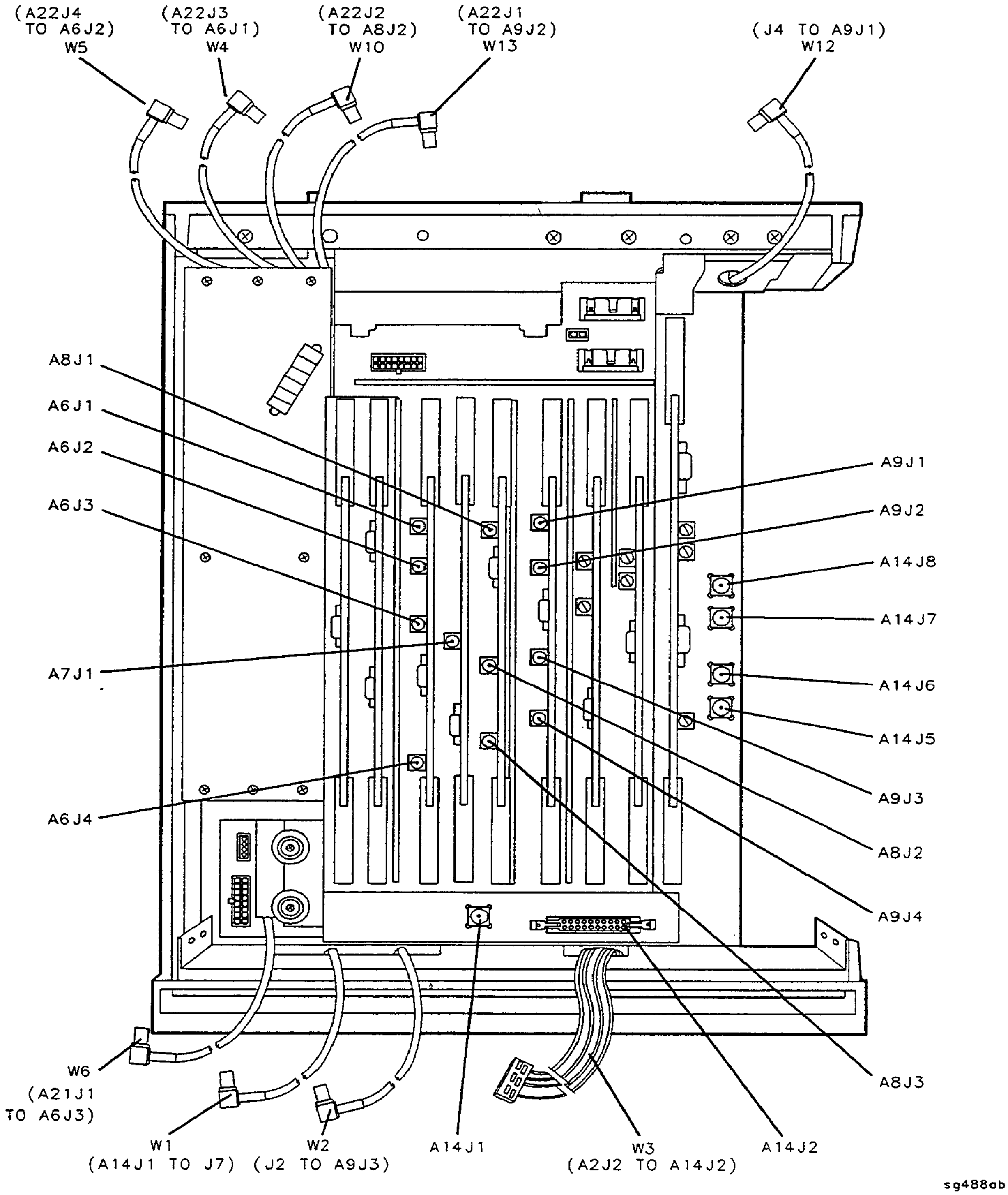

Figure 6-3. Cables

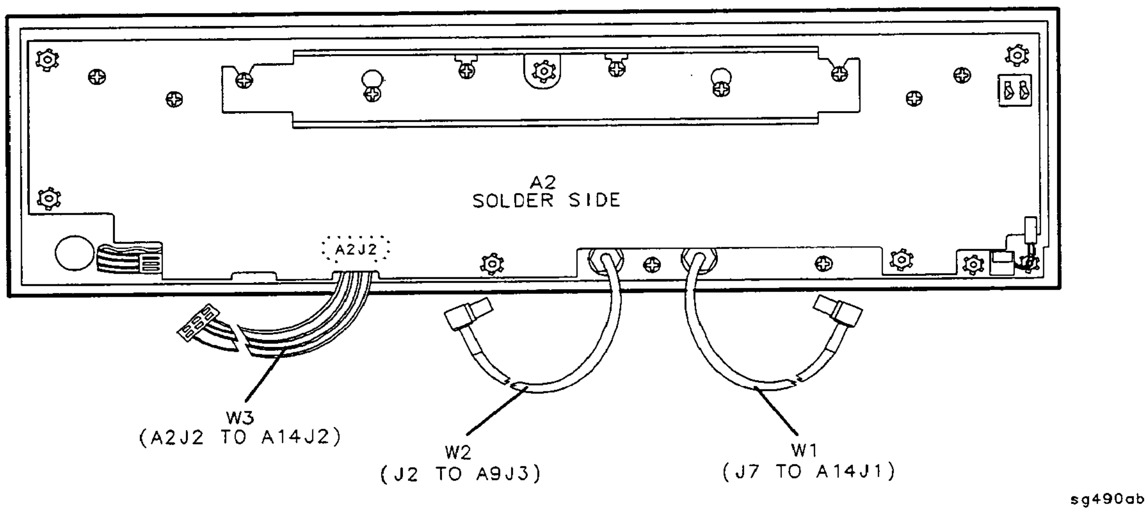

Figure 6-3. Cables (2 of 8)

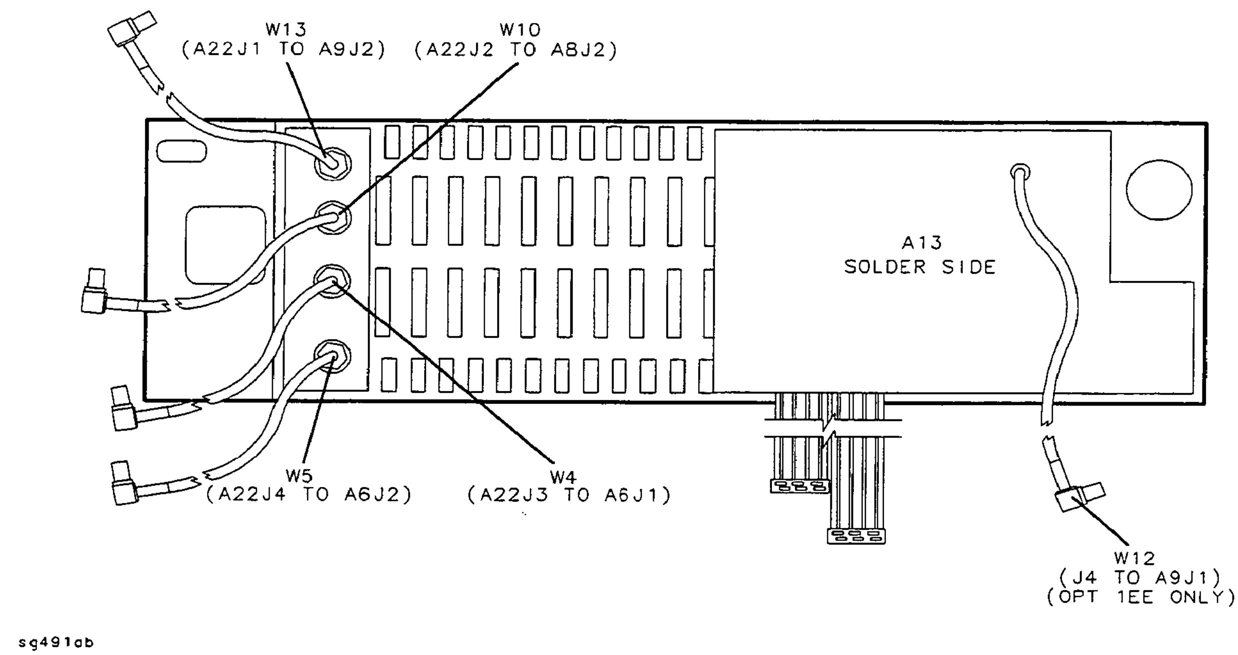

Figure 6-3. Cables (3 of 8)

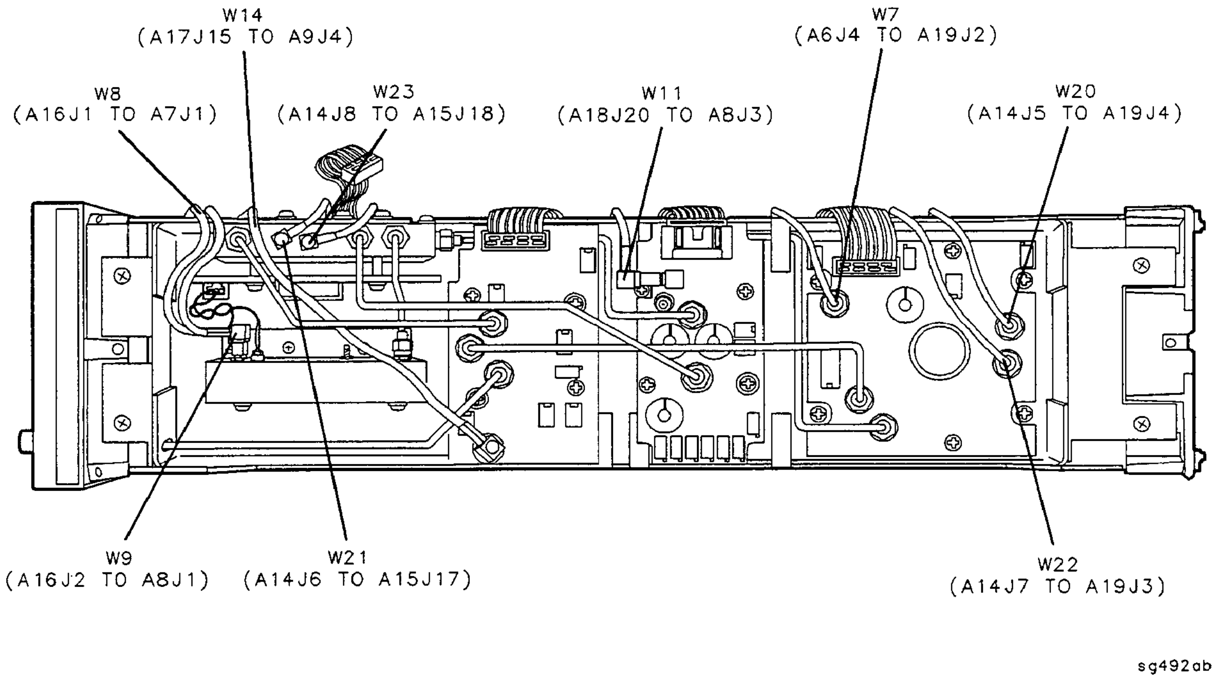

Figure 6-3. Cables (4 of 8)

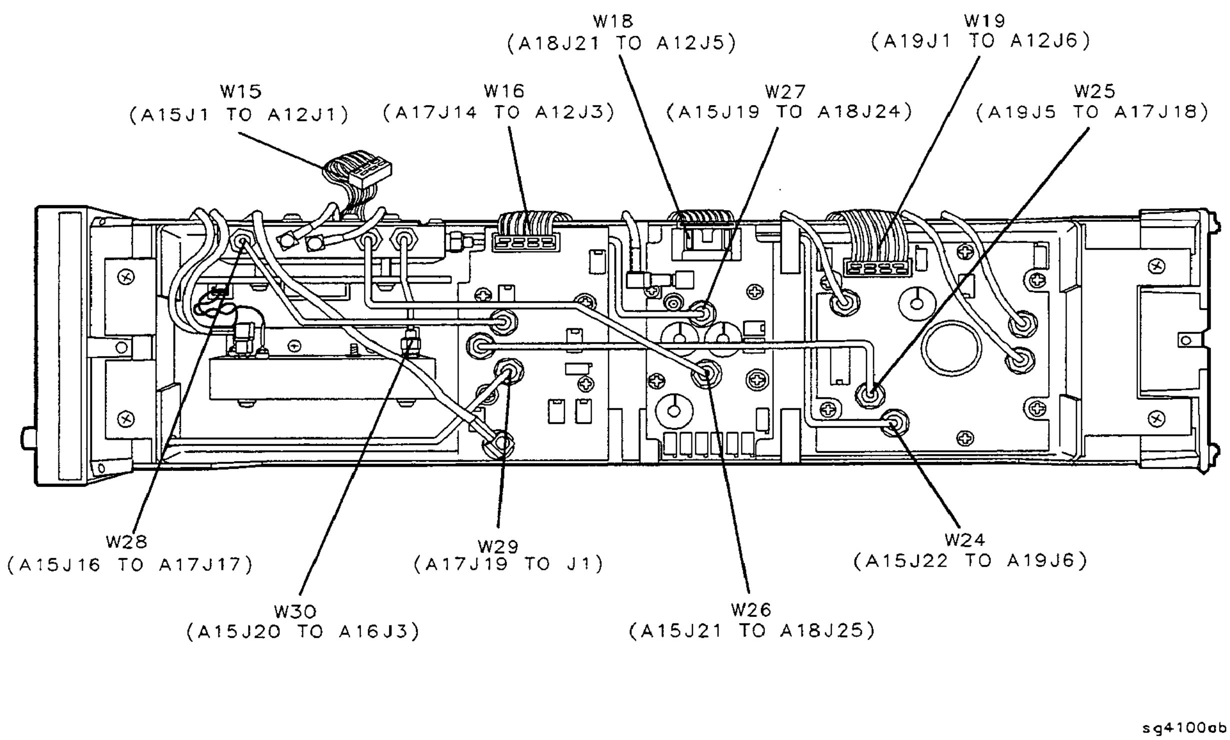

Figure 6-3. Cables (5 of 8)

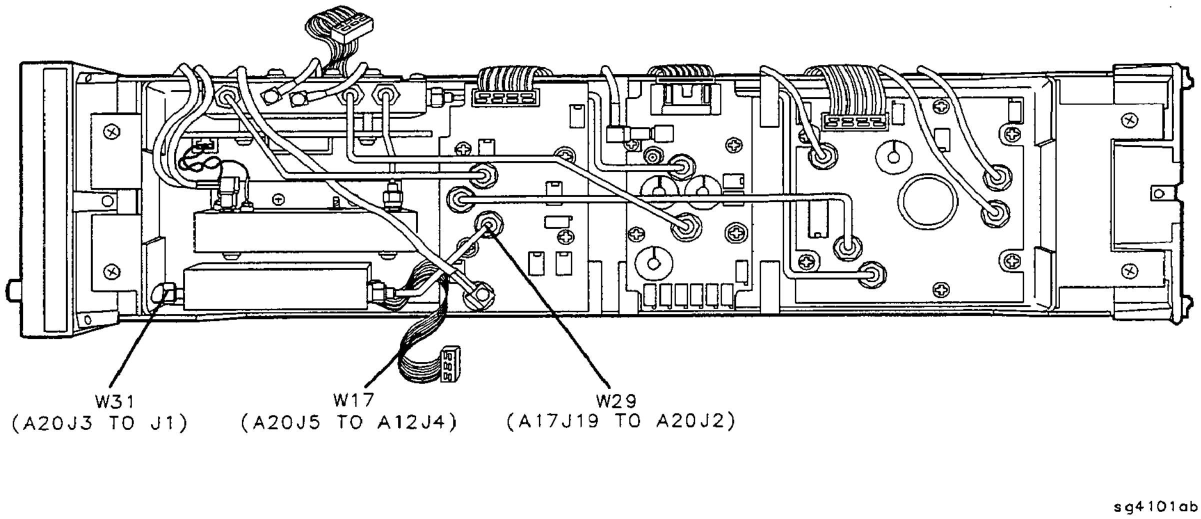

Figure 6-3. Cables (6 of 8)

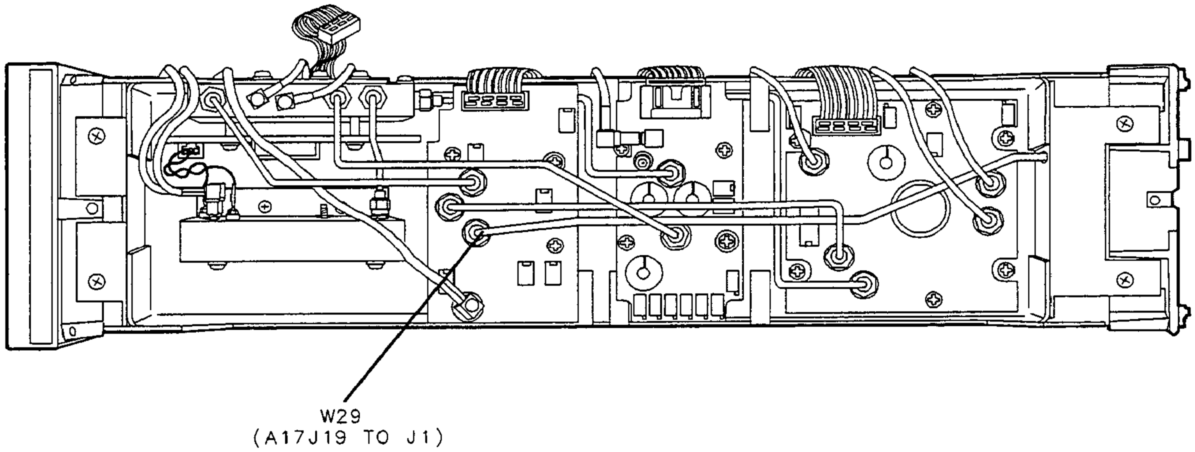

Figure 6-3. Cables (7 of 8)

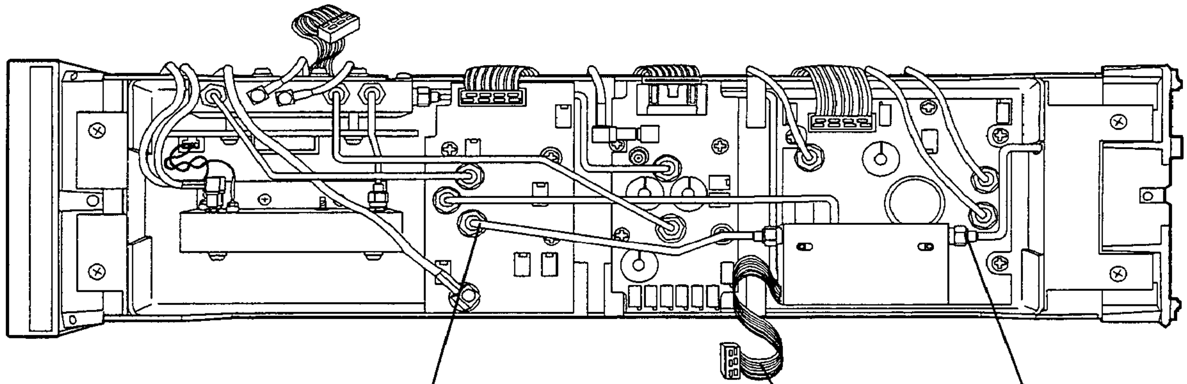

Figure 6-3. Cables (8 of 8)

Table 6-3. Cables

Ref. Desig.	HP Part Number	Qty	Description
W1	83750-60042	1	MOTHERBOARD to SWEEP OUT /A14J1 to J7
W2	83750-60043	1	ALC IN to ALC / J2 to A9J3
W3	83750-60034	1	FRONT-PANEL DISPLAY to MOTHERBOARD / A2J2 to A14J2
W4	83750-60044	1	10 MHZ REF IN to REFERENCE / A22J3 to A6J1
W5	83750-60045	1	10 MHZ REF OUT to REFERENCE / A22J4 to A6J2
W6	83750-60046	1	10 MHZ STD to REFERENCE / A21J1 to A6J3 (Option 1E5)
W7	83750-60047	1	REFERENCE to HETERODYNE BAND (100 MHz) / A6J4 to A19J2
W8	83750-60048	1	SAMPLER to FRACTIONAL-N (LO) / A16J1 to A7J1
W9	83750-60049	1	SAMPLER to YO LOOP (IF) / A16J2 to A8J1
W10	83750-60050	1	FM INPUT to YO LOOP / A22J2 to A8J2
W11	83750-60051	1	DUAL YIG OSCILLATOR to YO LOOP (FM) / A18J20 to A8J3
W12	83750-60052	1	SOURCE MODULE INTERFACE to ALC (MM DET) / J4 to A9J1 (Option 1EE)
W13	83750-60053	1	PULSE IN/OUT to ALC / A22J1 to A9J2
W14	83750-60054	1	SWITCHED AMP FILTER to ALC (INT DET) / A17J15 to A9J4
W15	8120-6186	1	MOD AMP to RF INTERFACE (PWR SUPPLY) / A15J1 to A12J1
W16	83750-60034	1	SWITCHED AMP FILTER to RF INTERFACE (PWR SUPPLY) / A17J14 to A12J3
W17	8120-6187	1	STEP ATTENTUATOR to RF INTERFACE (PWR SUPPLY) / A20J1 to A12J4 (Option 1E1)
W18	83750-60034	1	DUAL YIG OSCILLATOR to RF INTERFACE (PWR SUPPLY) / A18J21 to A12J5
W19	8120-6185	1	HETERODYNE BAND to RF INTERFACE (PWR SUPPLY) / A19J1 to A12J6
W20	83750-60055	1	MOTHERBOARD to HETERODYNE BAND (PULSE ID) / A14J5 to A19J4
W21	83750-60056	1	MOTHERBOARD to MOD AMP (PULSE HI) / A14J6 to A15J17
W22	83750-60057	1	MOTHERBOARD to HETERODYNE BAND (ALC LO) / A14J7 to A19J3
W23	83750-60058	1	MOTHERBOARD to MOD AMP (ALC HI) / A14J8 to A15J18
W24	83750-20032	1	MOD AMP to HETERODYNE BAND / A15J22 to A19J6 (HP 83752A & HP 83752B)
W25	83750-20031	1	HETERODYNE BAND TO SWITCHED AMP FILTER / A19J5 to A17J18 (HP 83752A & HP 83752B)

Table 6-3. Cables (continued)

Ref. Desig.	HP Part Number	Qty	Description
W26	83750-20034	1	MOD AMP to DUAL YIG OSCILLATOR (HI) / A15J21 to A18J25
W27	83750-20033	1	MOD AMP to DUAL YIG OSCILLATOR (LOW) / A15J19 to A18J24
W28	83750-20030	1	MOD AMP to SWITCHED AMP FILTER / A15J16 to A17J17
W29	83750-20039	1	SWITCHED AMP FILTER to FRONT RF OUTPUT / A17J19 to J1
W29	83750-20027	1	SWITCHED AMP FILTER TO FRONT RF OUTPUT / A17J19 to J1 (Option 1ED)
W29	83750-20040	1	SWITCHED AMP FILTER to REAR RF OUTPUT / A17J19 to J1 (Option 1E4)
W29	83750-20036	1	SWITCHED AMP FILTER to REAR RF OUTPUT / A17J19 to J1 (Options 1E4 and 1ED)
W29	83750-20029	1	SWITCHED AMP FILTER to STEP ATTENUATOR / A17J19 to A20J2 (Option 1E1)
W29	83750-20037	1	SWITCHED AMP FILTER to STEP ATTENUATOR / A17J19 to A20J2 (Options 1E1 and 1E4)
W29	83750-20029	1	SWITCHED AMP FILTER to STEP ATTENUATOR / A17J19 to A20J2 (Options 1E1 and 1ED)
W29	83750-20037	1	SWITCHED AMP FILTER to STEP ATTENUATOR / A17J19 to A20J2 (Options 1E1, 1E4, and 1ED)
W30	83750-20035	1	MOD AMP to SAMPLER / A15J20 to A16J3
W31	83750-20041	1	STEP ATTENUATOR to FRONT RF OUTPUT / A20J3 to J1 (Option 1E1)
W31	83750-20028	1	STEP ATTENUATOR to FRONT RF OUTPUT / A20J3 to J1 (Options 1E1, and 1ED)
W31	83750-20038	1	STEP ATTENUATOR to REAR RF OUTPUT / A20J3 to J1 (Options 1E1, 1E4, and 1ED)
W31	83750-20042	1	STEP ATTENUATOR to REAR RF OUTPUT / A20J3 to J1 (Options 1E1 and 1E4)

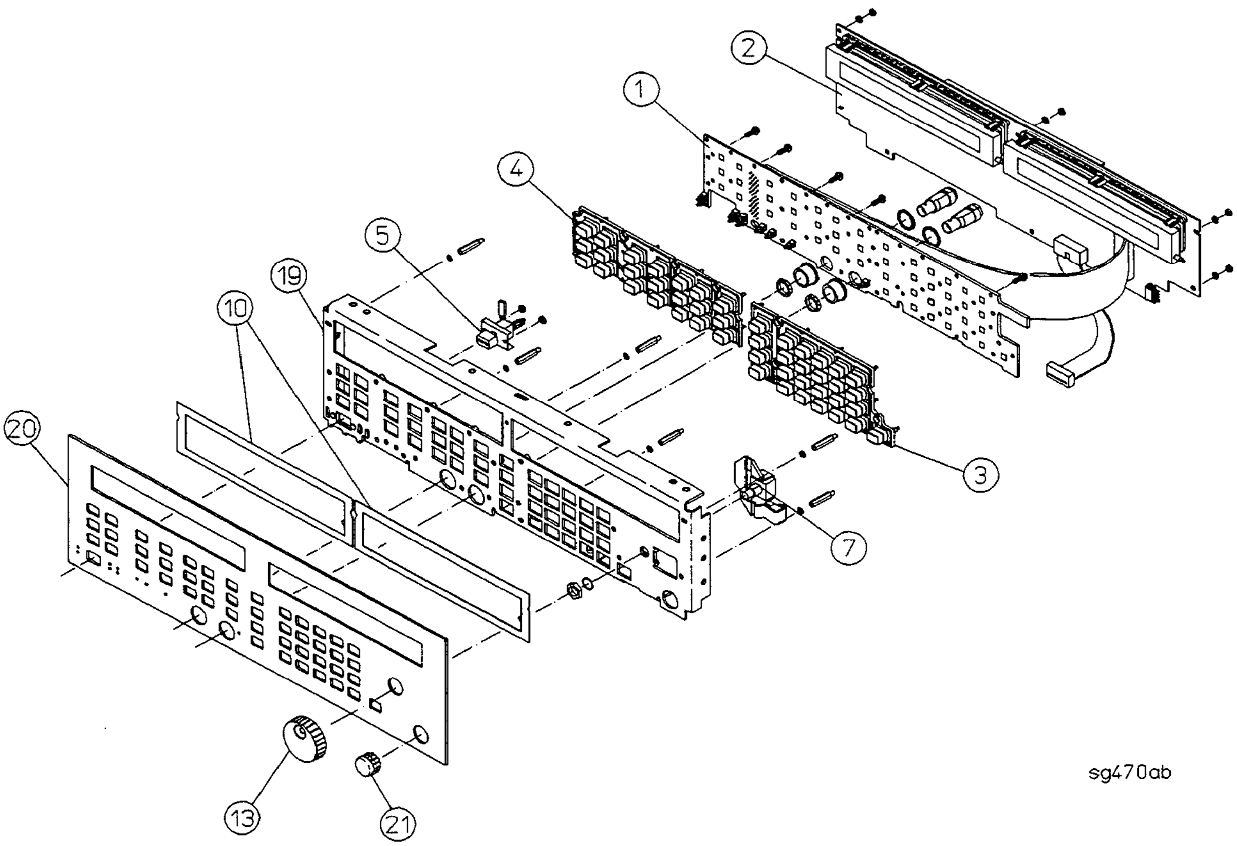

Figure 6-4. Front-Panel Assembly

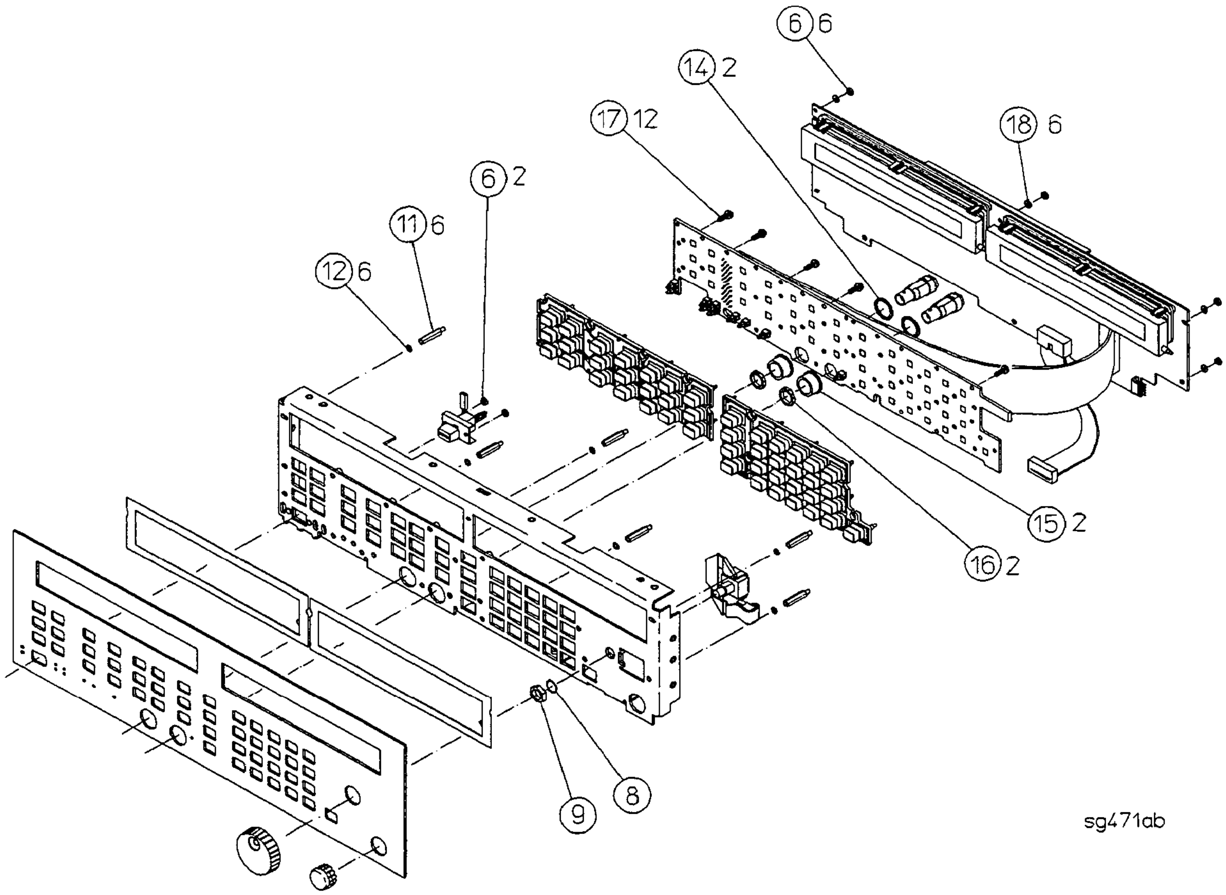

Figure 6-4. Front-Panel Assembly (2 of 2)

Table 6-4. Front-Panel Assembly

Ref. Desig.	HP Part Number	Qty	Description
1			KEYBOARD ASSEMBLY-A1 (See Table 6-2.)
2			FRONT-PANEL DISPLAY ASSEMBLY-A2 (See Table 6-2.)
3	83750-40001	1	RUBBER KEYPAD - RIGHT
4	83750-40002	1	RUBBER KEYPAD - LEFT
5			DISPLAY SWITCH ASSEMBLY-S1 (See Table 6-2.)
6	0535-0031	8	NUT-HEX W/LKWR M3 x 0.5 2.4MM THK
7			RPG (See Table 6-2.)
8	2190-0016	1	WASHER-LK INTL T 3/8 IN .377-IN-ID
9	2950-0001	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK
10	83711-00018	2	DISPLAY SCREEN
11	0380-4046	6	STANDOFF-HEX 20-MM-LG M3.0 x 0.5-THD
12	2190-0644	6	WASHER-LK EXT T-B 3.0 3.15-MM-ID
13	01650-47401	1	RPG KNOB
14	2190-0068	2	WASHER-LK
15	08360-40001	2	INSULATOR-BNC
16	0590-1251	2	NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD
17	0515-0372	12	SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG
18	3050-0891	6	WASHER-FL MTLC 3.0 3.3-MM-ID 6.85-MM-OD
20	83750-00001	1	SUBPANEL-FRONT
21	83750-80001	1	FRONT-PANEL OVERLAY
22	6960-0135	1	PLUG HOLE .625D (Option 1E4)

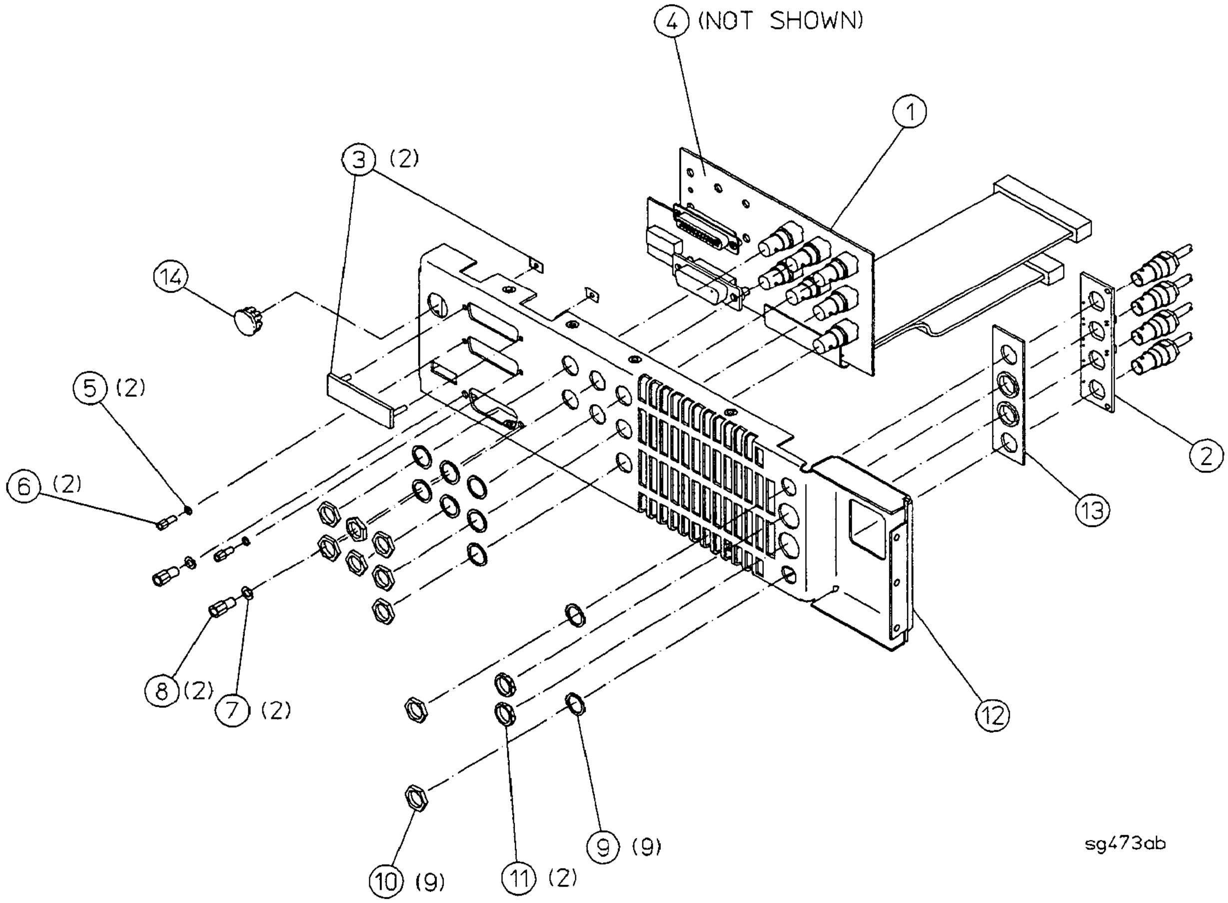

Figure 6-5. Rear-Panel Assembly

Table 6-5. Rear-Panel Assembly

Ref. Desig.	HP Part Number	Qty	Description
1			REAR-PANEL ASSEMBLY-A13 (See Table 6-2.)
2			BNC ASSEMBLY-A22 (See Table 6-2.)
3	1252-5348	1	CONN CO CVR DSUB
4	1252-4949	1	CONN-RECT (Option 1EE)
5	2190-0584	2	WASHER-LK HLCL 3.0 3.1-MM-ID 6.2-MM-OD
6	1251-7812	2	JACKSCREW-AMPH 17 CONN
7	2190-0586	2	WASHER-LK HLCL 4.0 4.1-MM-ID 7.6-MM-OD
8	0380-0643	2	STANDOFF-HEX .255-IN-LG 6-32-THD
9	2190-0102	9	WASHER-LK INTL T 15/32 IN .472-IN-ID
10	2950-0035	9	NUT-HEX-DBL-CHAM 15/32-32-THD
11	0590-1251	2	NUT-SPCLY 15/32-32-THD .1-IN-THK .562-WD
12	83750-00003	1	SHEET METAL PANEL
13	83750-40003	1	INSULATOR/GASKET
14	6960-0175	1	PLUG-HOLE .333D

FET Assembly

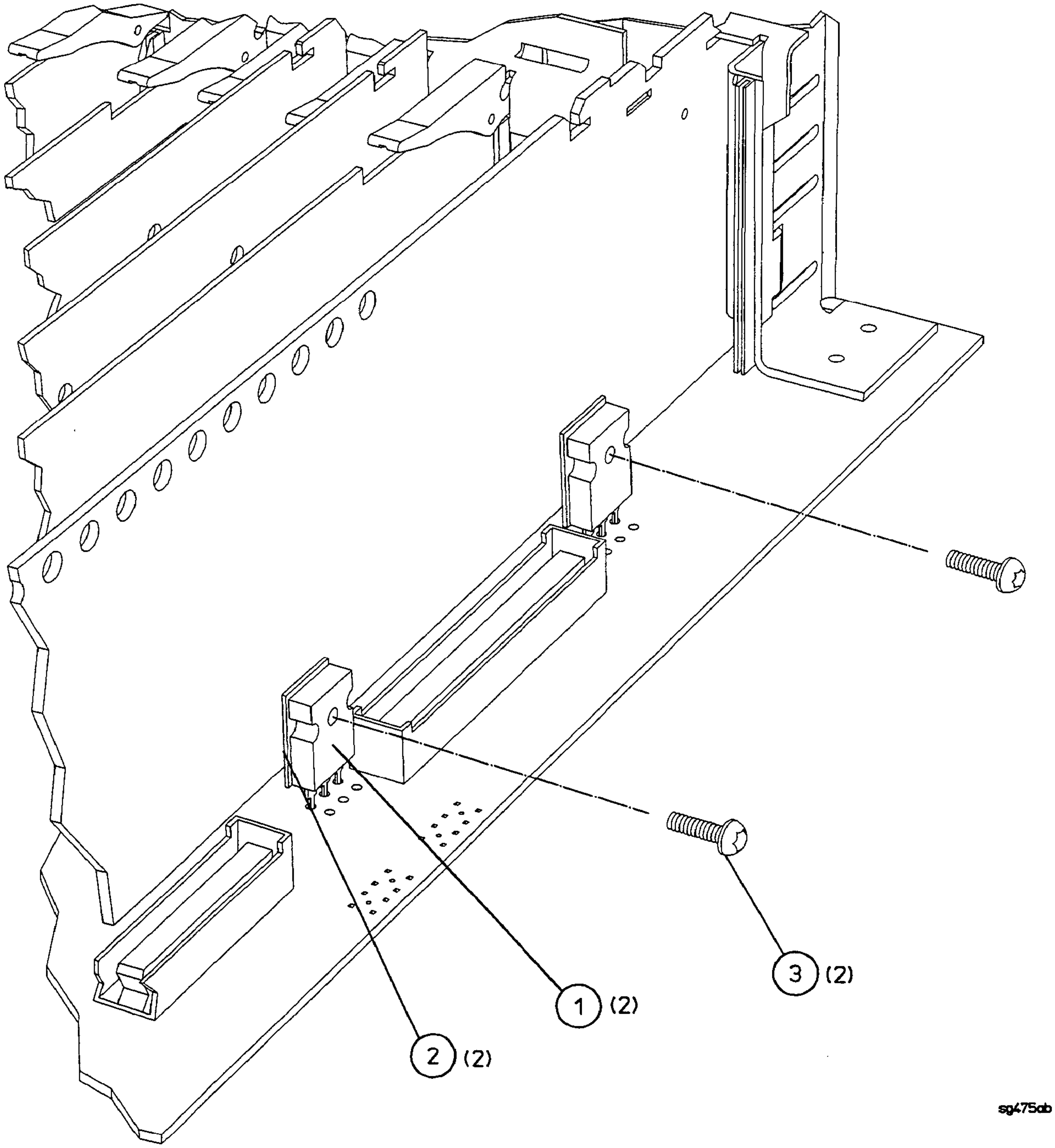

Figure 6-6. FET Assembly

Table 6-6. FET Assembly

Ref. Desig.	HP Part Number	Qty	Description
1	1855-0682	2	TRANSISTOR MOSFET N-CHAN E-MODE SI
2	0340-1215	2	INSULATOR-XSTR
3	0515-0377	2	SCREW-MACHINE ASSEMBLY M3.5 x 0.6

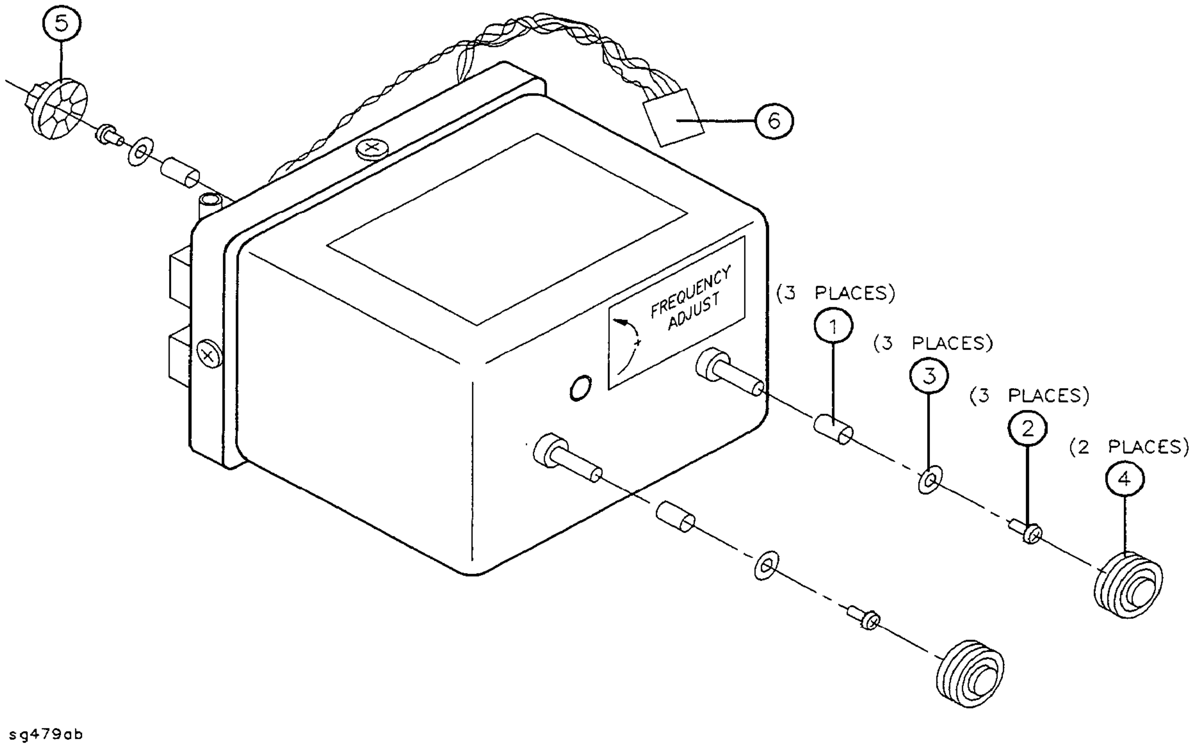

Figure 6-7. Oven Oscillator Assembly (Option 1E5)

Table 6-7. Oven Oscillator Assembly (Option 1E5)

Ref. Desig.	HP Part Number	Qty	Description
1	0380-0006	3	SPACER-RND .375-IN-LG .18-IN-ID
2	2200-0103	3	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI
3	3050-0105	3	WASHER-FL MTLC NO. 4 .125-IN-ID
4	0400-0294	2	GROMMET-RND .245-IN-ID .565-IN-GRV-OD
5	1520-0270	1	SHOCK MOUNT .78-EFF-HGT 4-LB-LOAD-CAP
6	10811E	1	HARN AY-OSC 10MH

Top View, Attaching Hardware

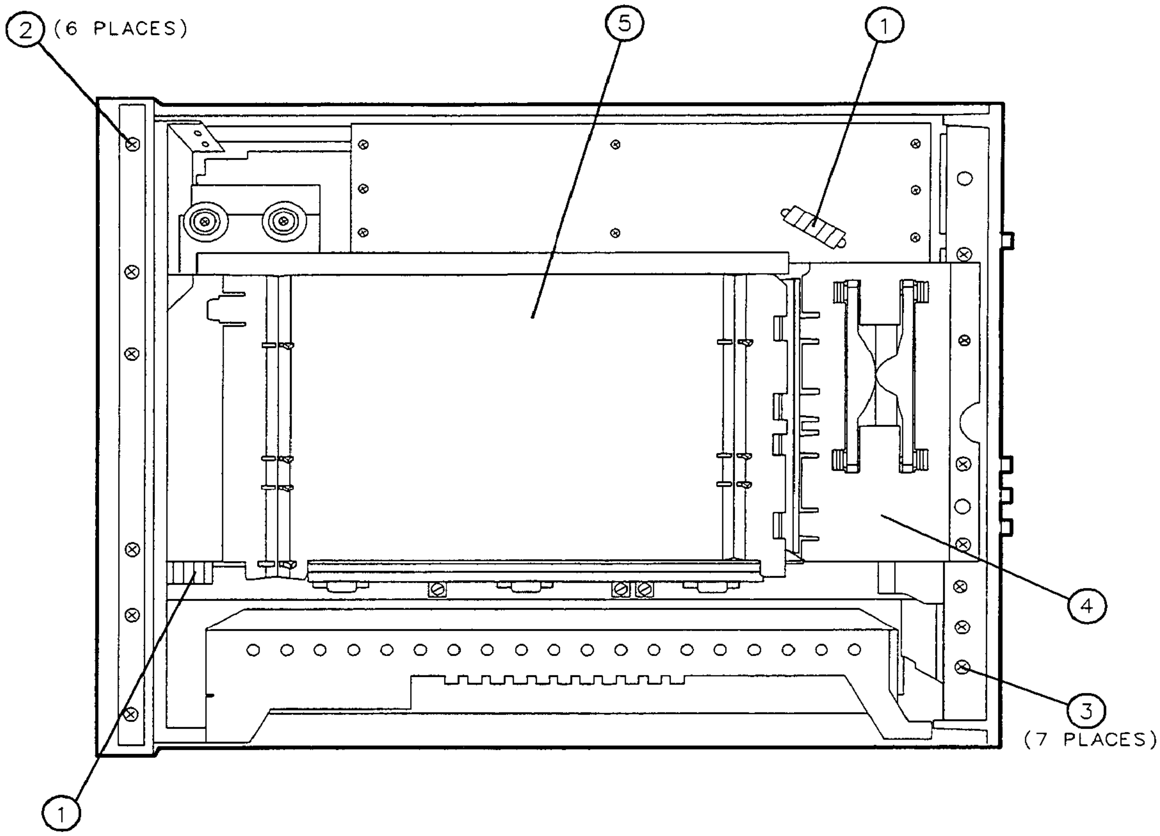

Figure 6-8. Top View, Attaching Hardware

Table 6-8. Top View, Attaching Hardware

Ref. Desig.	HP Part Number	Qty	Description
1	5041-7250	2	CABLE CLIP
2	0515-2043	6	SCREW-MACH M4 x 0.7 8MM-LG 90-DEG-FLH-HD
3	0515-0433	7	SCREW-MACHINE ASSEMBLY M4 x 0.7 8MM-LG
4	83750-00025	1	COVER-FAN
5	83750-00040	1	COVER-CARDCAGE

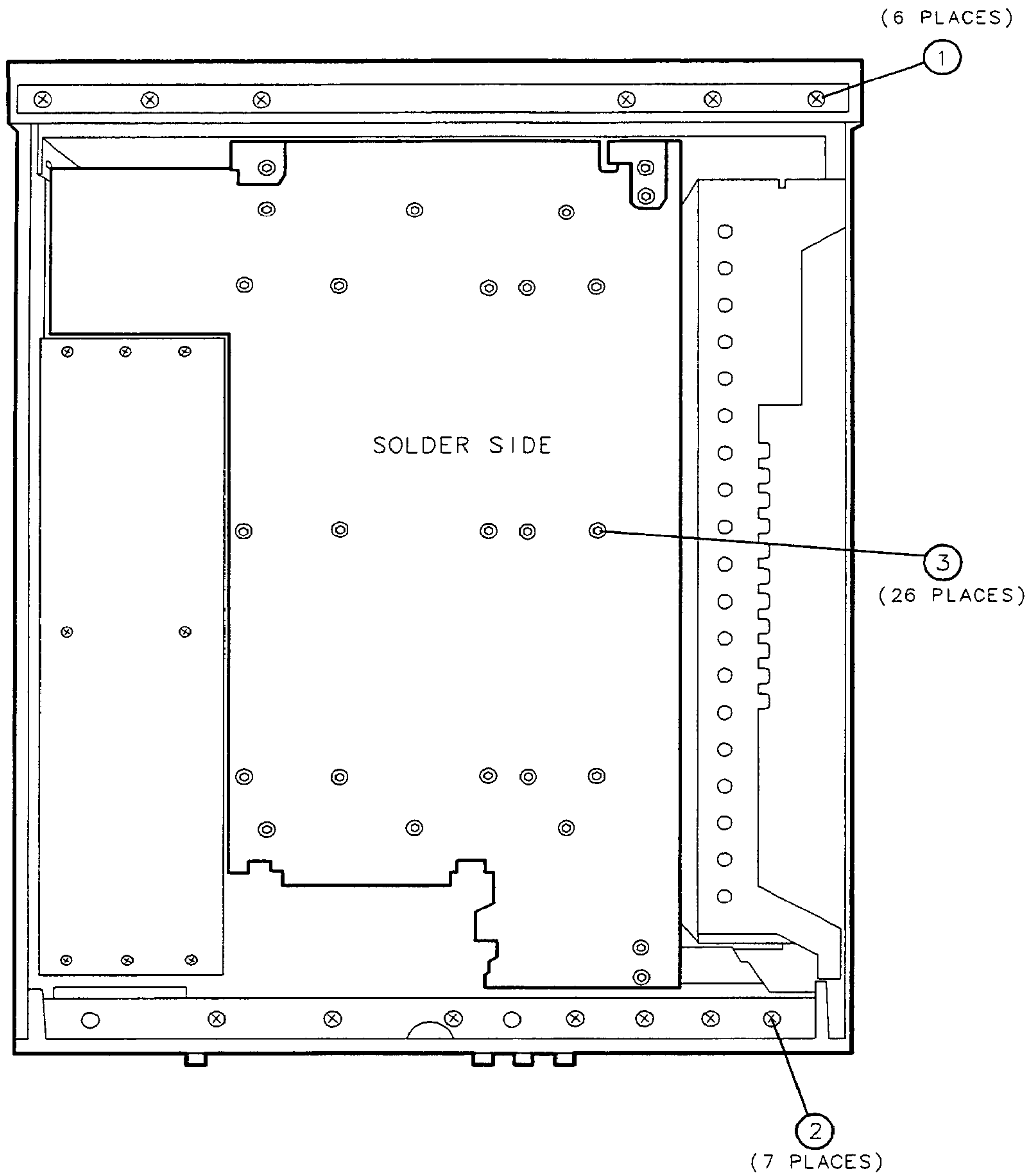

Figure 6-9. Bottom View, Attaching Hardware

Table 6-9. Bottom View, Attaching Hardware

Ref. Desig.	HP Part Number	Qty	Description
1	0515-2043	6	SCREW-MACH M4 x 0.7 8MM-LG 90-DEG-FLH-HD
2	0515-0433	7	SCREW-MACHINE ASSEMBLY M4 x 0.7 8MM-LG
3	0515-0898	26	SCREW-MACH M4 x 0.7 6MM-LG PAN-HD (replaces rivscrews on motherboard)

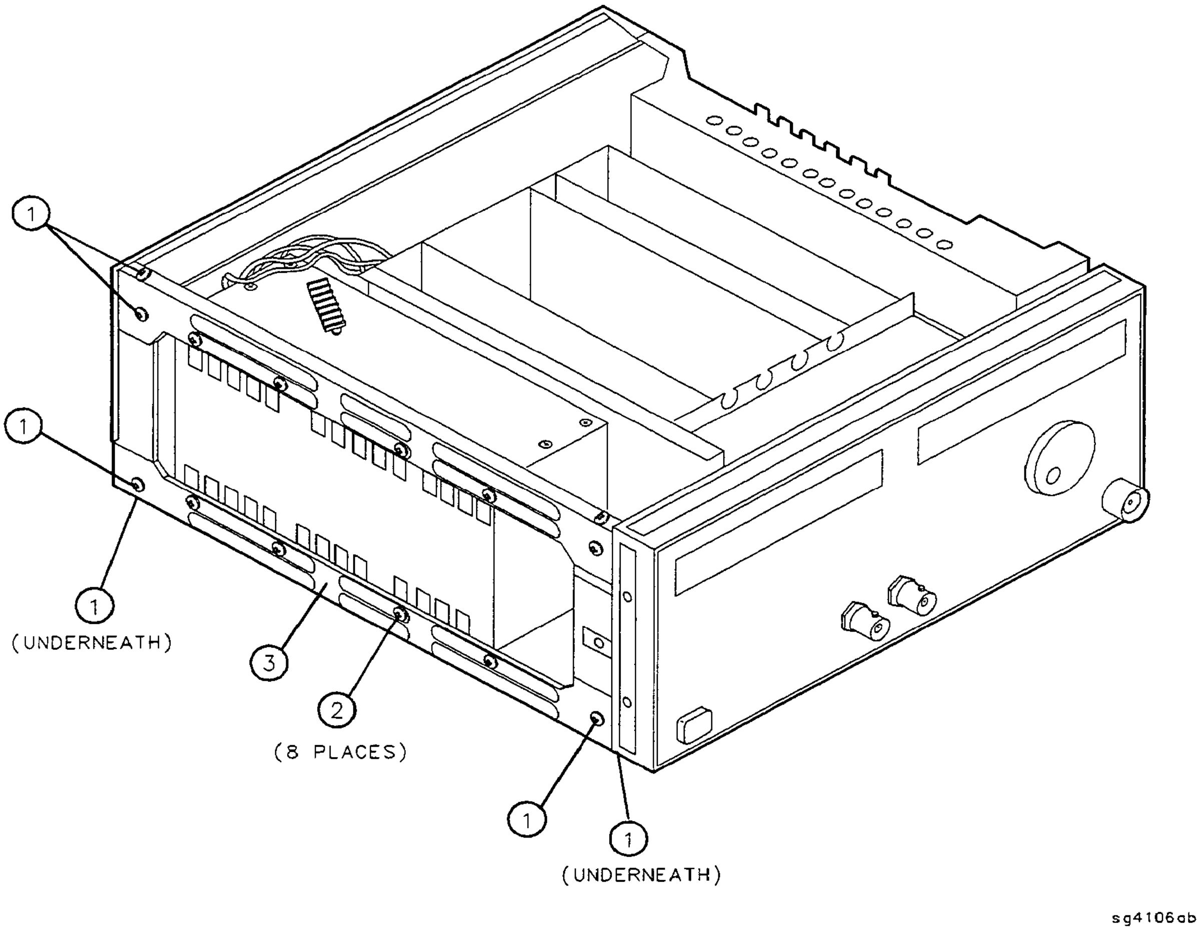

Figure 6-10. Left Side View, Attaching Hardware

Table 6-10. Left Side View, Attaching Hardware

Ref. Desig.	HP Part Number	Qty	Description
1	0515-2086	8	SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD
2	0515-0377	8	SCREW-MACHINE ASSEMBLY M3.5 x 0.6
3	5021-5837	2	SIDE RAILS

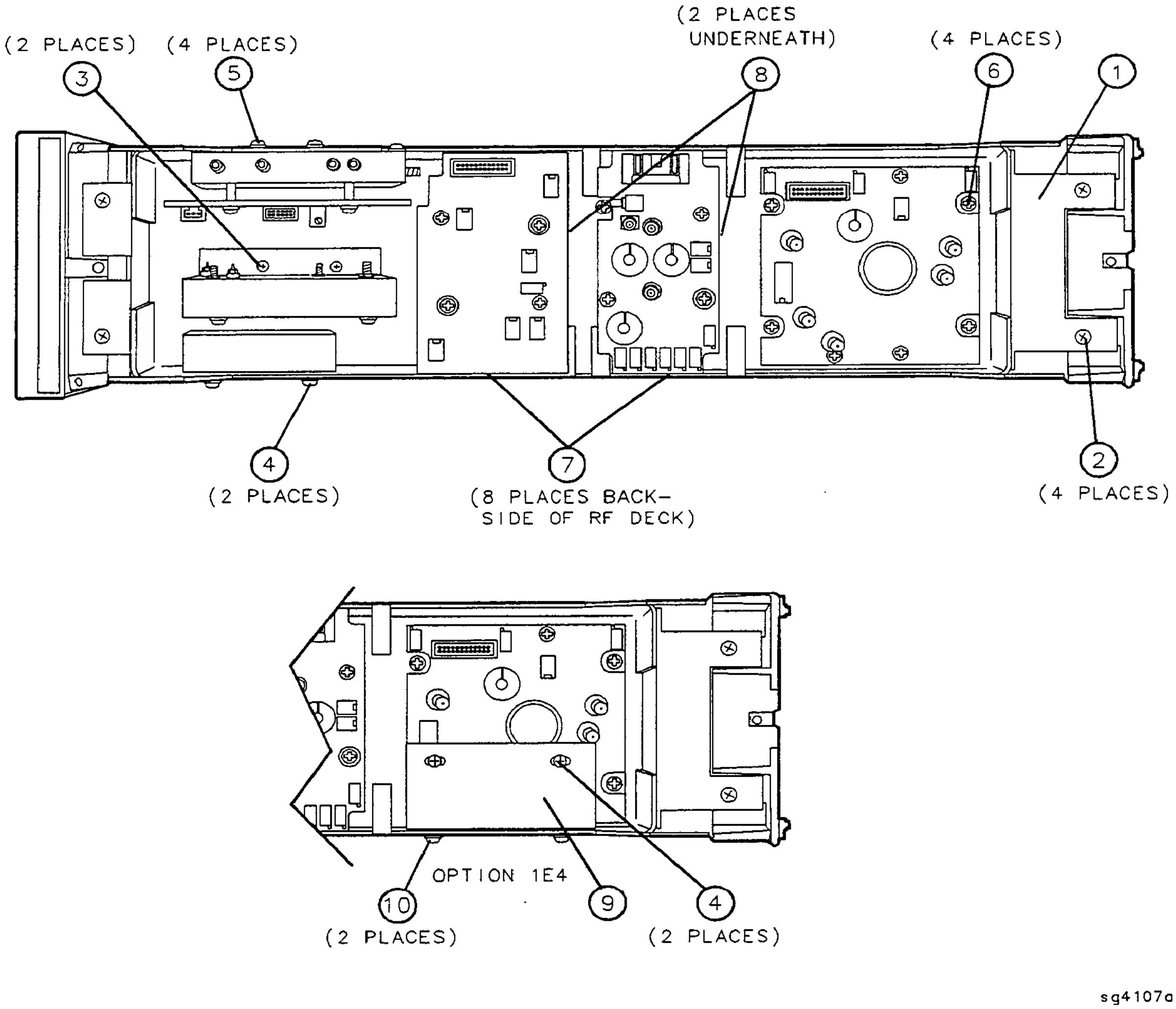

Figure 6-11. Right Side View, Attaching Hardware

Table 6-11. Right Side View, Attaching Hardware

Ref. Desig.	HP Part Number	Qty	Description
1	83750-00019	1	RF DECK FRAME
2	0515-2086	4	SCREW-SPCL M4 x 0.7 7MM-LG 90-DEG-FLH-HD
3	0515-0372	2	SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG
4	0515-0372	2	SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG (Option 1E1)
5	0515-0664	4	SCREW-MACHINE ASSEMBLY M3 x 0.5 12MM-LG
6	0515-0667	4	SCREW-MACHINE ASSEMBLY M3 x 0.5 25MM-LG
7	0515-0458	8	SCREW-MACHINE ASSEMBLY M3.5 x 0.6 8MM-LG
8	0340-1303	2	INSULATOR SIL PAD
9	83750-00037	1	BRACKET-ATTENUATOR (Options 1E1 and 1E4)
10	0515-0372	2	SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG

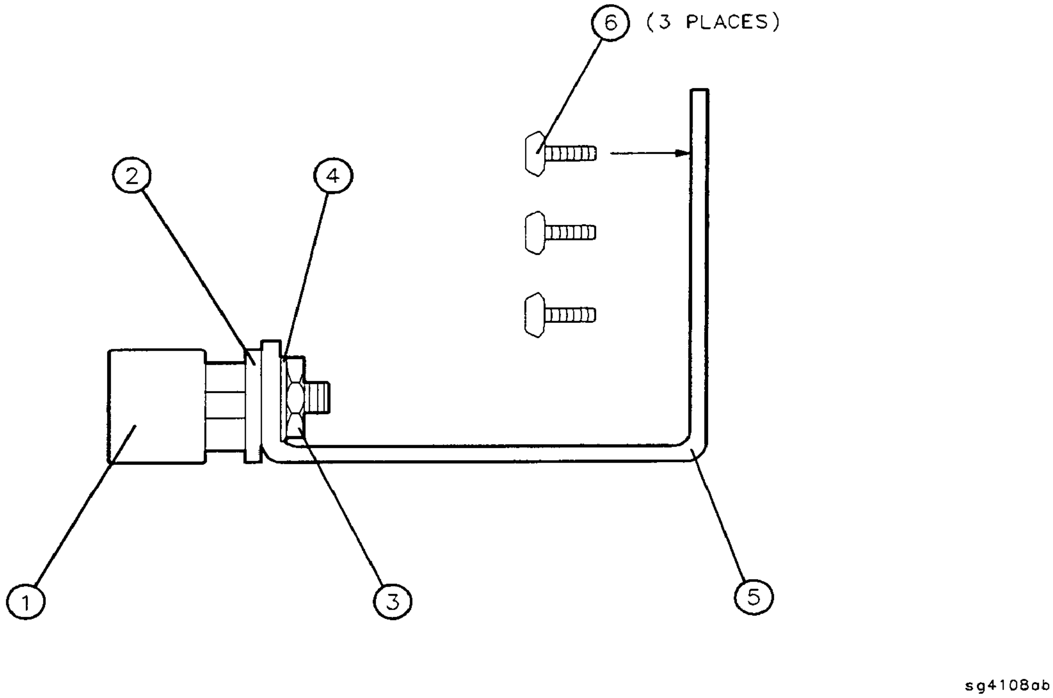

Figure 6-12. RF Connector and Hardware

Table 6-12. RF Connector and Hardware - Standard

Ref. Desig.	HP Part Number	Qty	Description
1	08673-60040	1	RF OUTPUT CONNECTOR ASSY (3.5 mm)
2	0380-1893	1	SPACER-RND .125-IN-LG .38-IN-ID
3	2950-0001	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK
4	2190-0016	1	WASHER-LK INTL T 3/8 IN .439-IN-ID
5	83750-00045	1	BRACKET-RF M 3.5
6	0515-0372	3	SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG

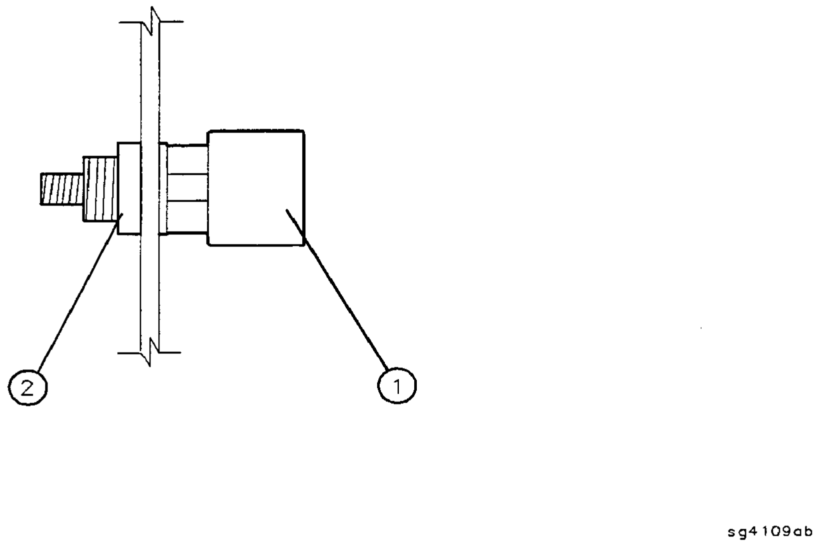

Figure 6-12. RF Connector and Hardware (2 of 4)

Figure 6-12. RF Connector and Hardware - Option 1E4 (2 of 4)

Ref. Desig.	HP Part Number	Qty	Description
1	08673-60040	1	RF OUTPUT CONNECTOR ASSY (3.5 mm)
2	83750-20043	1	SHOULDER NUT

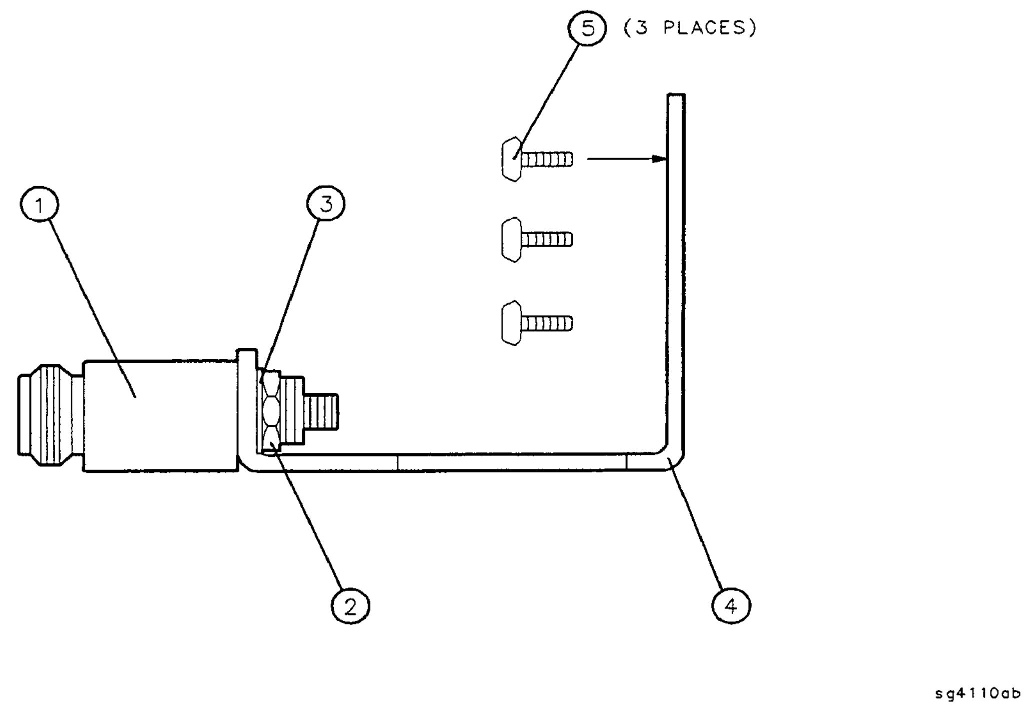

Figure 6-12. RF Connector and Hardware (3 of 4)

Figure 6-12. RF Connector and Hardware - Option 1ED (3 of 4)

Ref. Desig.	HP Part Number	Qty	Description
1	11729-60030	1	CONN AY TYPE N (with no spikes)
2	2950-0132	1	NUT-HEX-DBL-CHAM 7/16-28-THD .094-IN-THK
3	2190-0104	1	WASHER-LK INTL T 7/16 IN .439-IN-ID
4	83750-00046	1	BRACKET-RF N
5	0515-0372	3	SCREW-MACHINE ASSEMBLY M3 x 0.5 8MM-LG

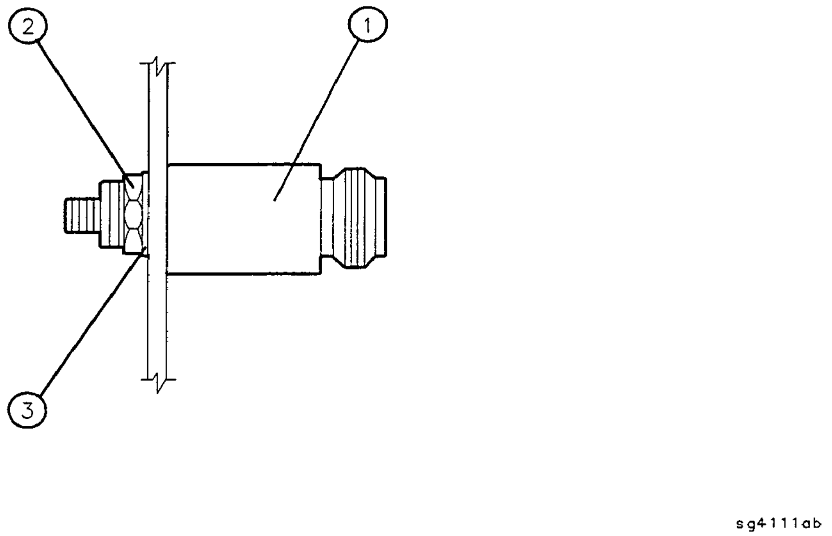

Figure 6-12. RF Connector and Hardware (4 of 4)

Figure 6-12. RF Connector and Hardware - Options 1E4 and 1ED (4 of 4)

Ref. Desig.	HP Part Number	Qty	Description
1	86290-60005	1	CONN AY TYPE N (with spikes)
2	2950-0132	1	NUT-HEX-DBL-CHAM 7/16-28-THD .094-IN-THK
3	2190-0104	1	WASHER-LK INTL T 7/16 IN .439-IN-ID

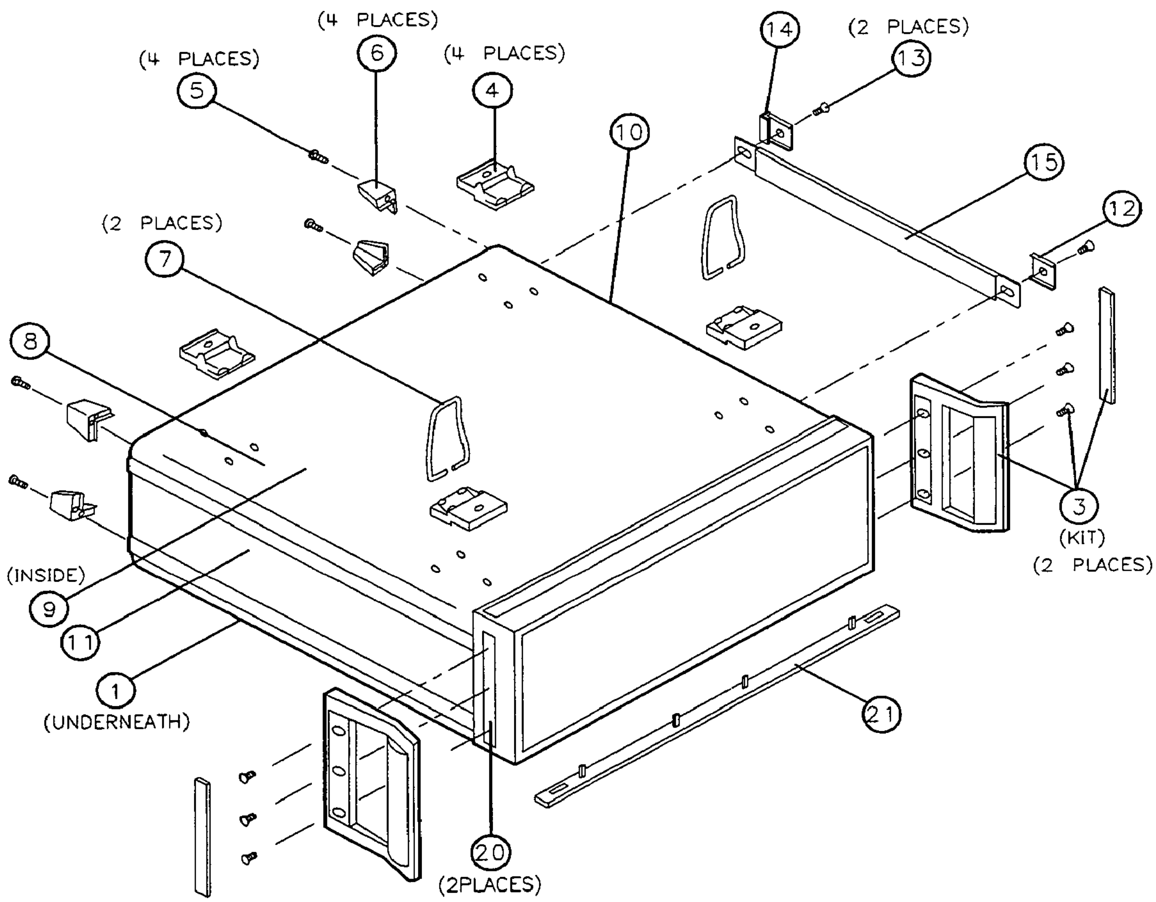

Figure 6-13. Chassis Parts

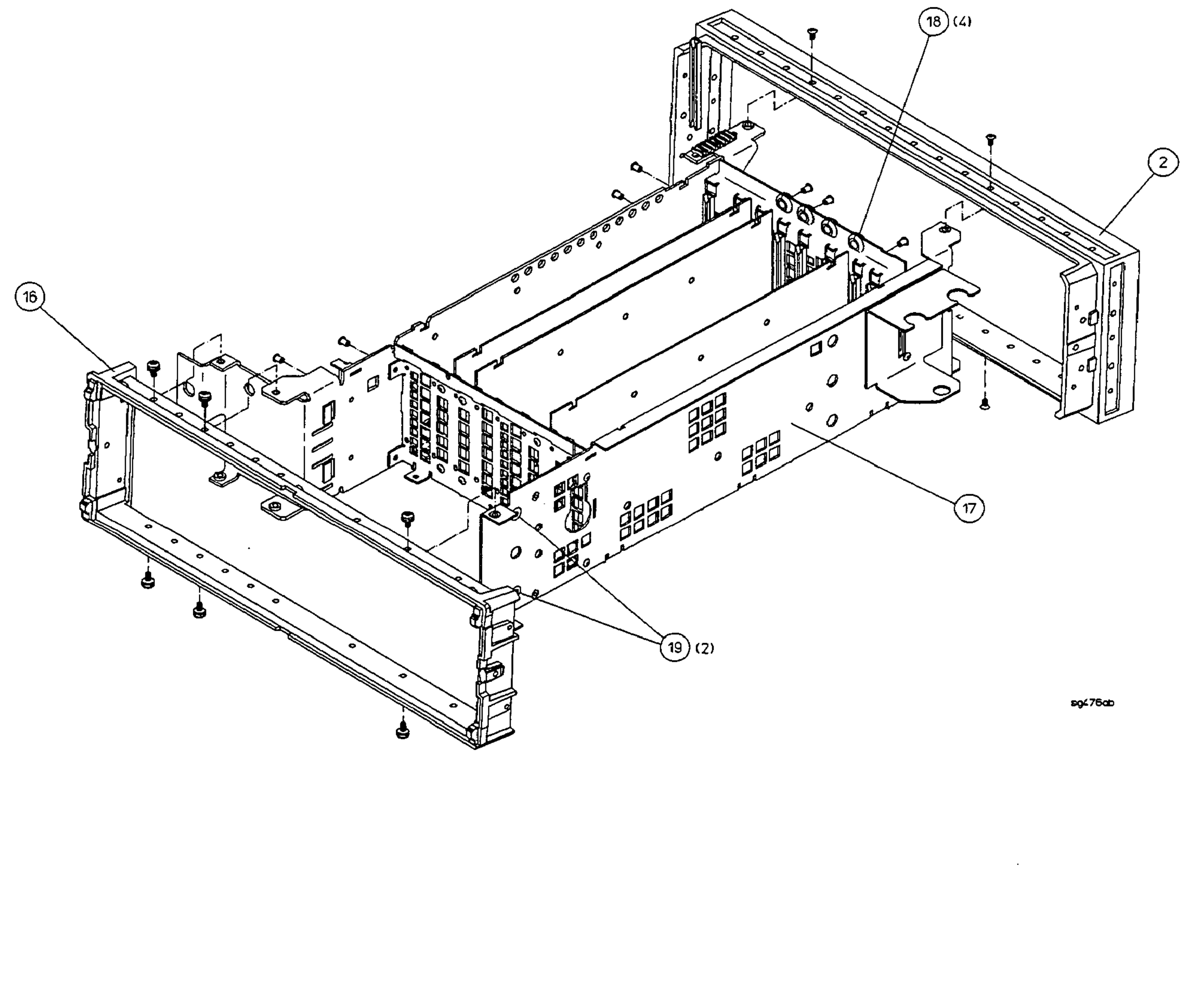

Figure 6-13. Chassis Parts (2 of 2)

Table 6-13. Chassis Parts

Ref. Desig.	HP Part Number	Qty	Description
1	5062-3735	1	COVER-TOP
2	5021-8403	1	FRAME-FRONT
3	5062-3989	1	HANDLE ASSEMBLY (kit)
4	5041-8801	4	FOOT-FM .5M
5	5041-8821	4	STANDOFF-REAR PANEL
6	0515-2317	4	SCREW-MACH M3.5 x 0.6 12MM-LG PAN-HD
7	1460-1345	2	SPR WFR 3.000 LG
8	5062-3747	1	COVER-BOTTOM
9	08753-20039	1	INSULATOR-BOTTOM CVR MYLAR
10	5062-3837	1	COVER-LEFT SIDE
11	5062-3812	1	COVER-RIGHT SIDE
12	5041-8819	1	CAP-FRONT
13	0515-0707	2	SCREW-MACH M5 x 0.8 10MM-LG
14	5041-8820	1	CAP-REAR
15	5062-3704	1	STRAP ASSEMBLY
16	83750-20026	1	FRAME-REAR
17	83750-60027	1	CARDCAGE ASSEMBLY (includes items 2 & 16)
18	0400-0010	4	GROM RD .25 ID
19	1520-0282	2	SHOCK MT .12 HGT
20	5001-0539	2	TRIM-SIDE 132.6H
21	5041-8802	1	TRIM STRIP

Portable Chassis

Option AX2

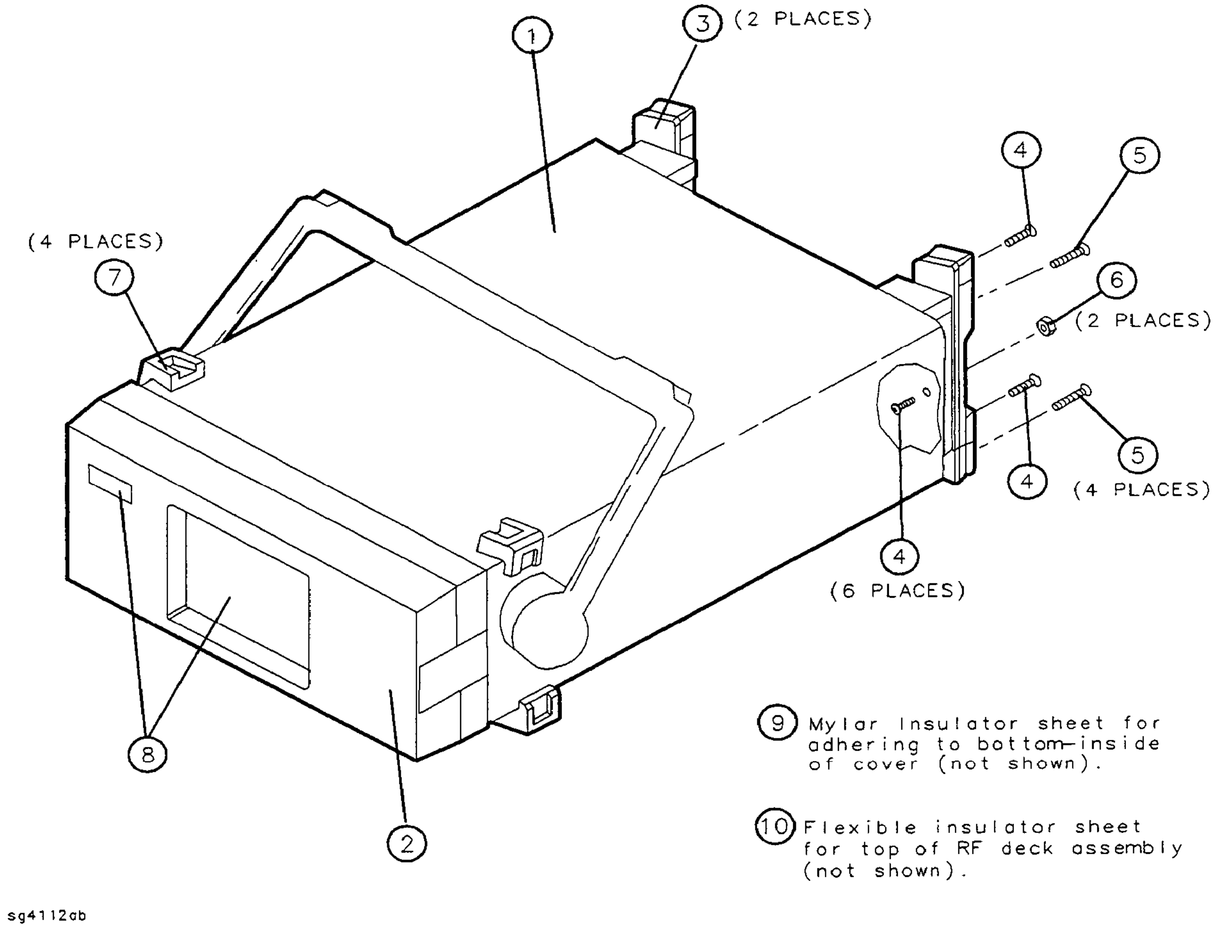

Figure 6-14. Portable Chassis

Table 6-14. Portable Chassis (Option AX2)

Ref. Desig.	HP Part Number	Qty	Description
1	5063-0092	1	AY-INSTR COVER (includes front cover)
2	5042-0105	1	COVER-FRONT
3	5042-0101	2	FOOT-REAR
4	0515-2013	6	SCREW-MACHINE ASSEMBLY M3.5 x 0.6 35-MM-LG
5	0515-1785	4	SCREW-MACHINE ASSEMBLY M3.5 x 0.6 40-MM-LG
6	0535-0124	2	NUT-HEX PLSTC-LKG M3.5 x 0.6 4.5MM-THK
7	5042-0102	4	BUMPER
8	5181-5570	1	LABEL ID LOGO & BLANK
9	08753-20039	1	INSULATOR-BOTTOM CVR MYLAR
10	83750-20044	1	INSULATOR-TOP PORTABLE

Table 6-15. Miscellaneous Replaceable Accessories

Ref. Desig.	HP Part Number	Qty	Description
			Labels
	7120-3737	1	LBL WRN HI VOLT (power supply)
	83750-80019	1	LBL FAIL CODES CPU (power supply)
	83750-80003	1	LBL IN STAT/WRN (rear panel)
	83750-80002	1	NAMEPLATE 83751A
	83751-80005	1	NAMEPLATE 83751B
	83752-80006	1	NAMEPLATE 83752A
	83752-80007	1	NAMEPLATE 83752B
			Service Tools
			T-10 TORX SCREWDRIVER
			T-15 TORX SCREWDRIVER
			#1 POZIDRIV SCREWDRIVER
			#2 POZIDRIV SCREWDRIVER
			5.0 MM HEX-NUT DRIVER
			5.5 MM HEX-NUT DRIVER
			7.0 MM HEX-NUT DRIVER
			9/16 IN. HEX-NUT DRIVER
			3/32 IN. HEX-KEY DRIVER
			5/16 IN OPEN END WRENCH
			SMALL SLOT SCREWDRIVER
			LONG NOSE PLIERS
			SOLDERING IRON
	85103-00002		SMB CONNECTOR REMOVER
	83750-60016		EXTENDER BOARD
			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
			Software
	83750-10001	1	DISK - SERVICE SUPPORT SOFTWARE
			Upgrade Kits
	83750-60061	1	FIRMWARE UPGRADE KIT
			Documentation
	83750-90002	1	HP 83751A/B 83752A/B MANUAL SET (Includes the User's Guide and Programming Guide listed below.)
	83750-90004	1	USER'S GUIDE
	83750-90005	1	PROGRAMMING GUIDE
	83750-90006	1	INSTALLATION AND QUICK START GUIDE
	83750-90003	1	SERVICE GUIDE
	5954-1566	1	CONNECTOR CARE APPLICATION NOTE

7. Calibration Constants

7

Calibration Constants

This section contains the following information on calibration constants and calibration arrays:

- what are calibration constants?
- memory areas
- integrity verification
- working with calibration constants
- calibration constant descriptions
- calibration arrays

What are calibration constants?

Calibration constants are used to describe your individual instrument. Calibration constants contain serial number prefix, hardware configuration, and board revision information. Calibration constants (and calibration arrays) also contain calibration information specific to the operation of each instrument that is used to make sure that the instrument meets specifications.

Attention! Changing calibration constants can cause your instrument to *not* meet specifications.

Memory areas

The synthesized sweeper has three memory areas reserved for the calibration data which consists of calibration constants and calibration arrays:

Working data

Working data is the calibration data accessed during normal operation required for optimum instrument performance. Working data is stored in RAM, and is maintained by a battery.

Protected data

Protected data resides in EEPROM. This calibration data is essentially the same as working data, but is not dependent on the battery. If the synthesized sweeper's RAM verification test fails, or if the battery dies and working data is lost, the synthesized sweeper copies the protected data into working data RAM.

Default data

Default data resides in FLASH ROM. This data differs from working and protected data in that it cannot be changed. This data represents a typical synthesized sweeper, and is not optimized for your instrument. The default calibration data is a starting point for calibration. The synthesized sweeper will probably *not* meet specifications. The synthesized sweeper uses default data if a problem exists in both working and protected data or if you select CAL DEFAULT in the *CALIBRATION utility menu.

Note An error message will occur at power up if default data is seen in working data for any reason.

Integrity verification

At instrument power up, the calibration data stored in RAM is verified using a single-bit-correcting Hamming code. If the current calibration data verifies, it is maintained in RAM. If the calibration data is off by one bit, it is corrected by the Hamming code and is still maintained in RAM (see Figure 7-1).

If the Hamming code detects a greater than one bit error, the calibration data is loaded into RAM from EEPROM. This calibration data is also verified using the Hamming code. If the calibration data (from EEPROM) verifies, it is maintained in RAM. If it is off by one bit, the calibration data is corrected and is still maintained in RAM .

If the Hamming code detects a greater than one bit error, the default calibration data will be loaded into RAM from FLASH ROM. An error message will occur on the synthesized sweeper indicating that the default calibration data is in use. The synthesized sweeper will probably *not* meet performance specifications, therefore, all of the performance tests should be run.

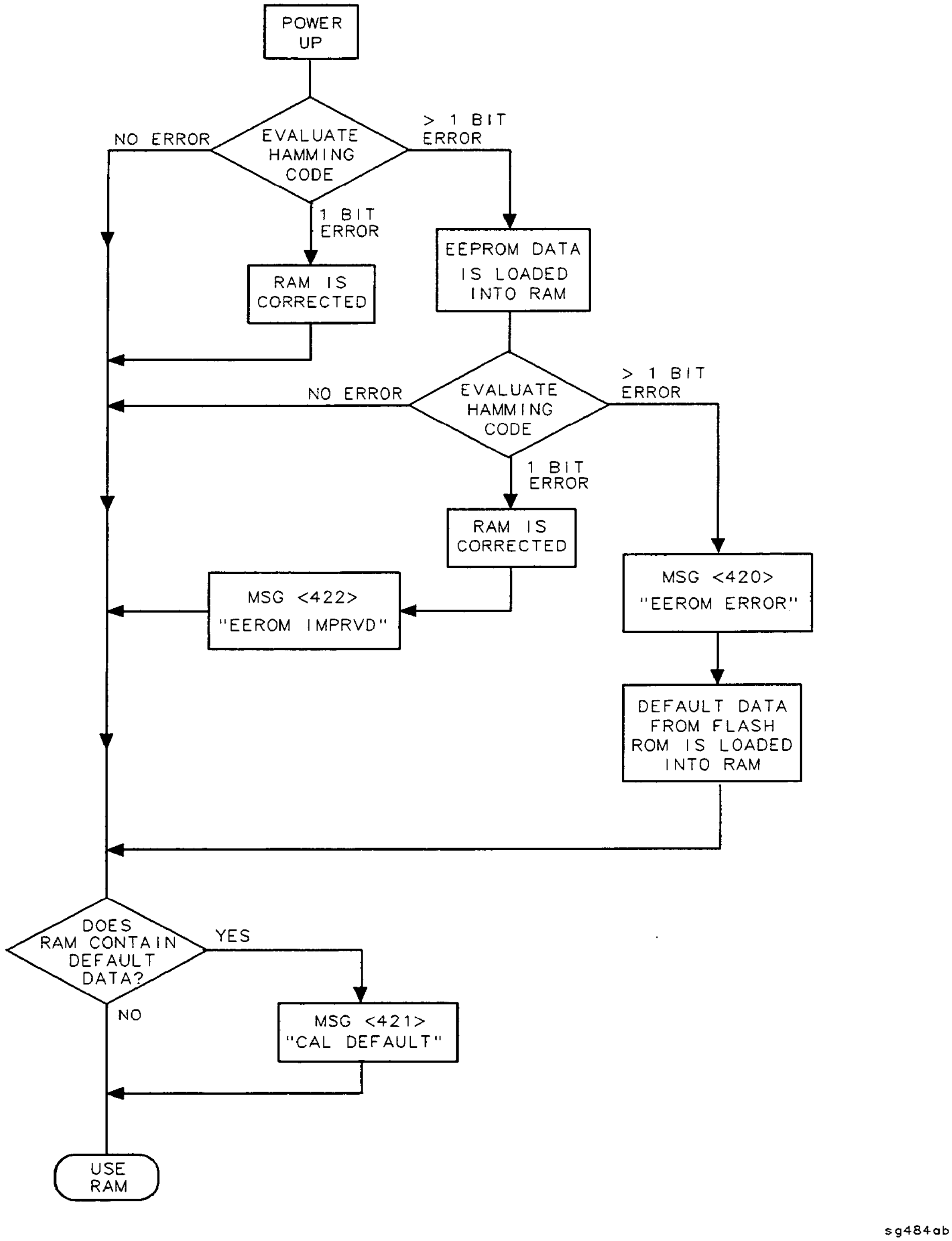

Figure 7-1. Integrity Verification Flowchart

Working with calibration constants

Changing working data calibration constants

Attention! Changing the calibration constants may drastically affect instrument performance.

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 synthesized sweeper, press (SHIFT) SPECIAL.
2. Using the number keys, enter the number of the menu that contains the calibration constant you want to change (see Table 7-1). Press (Hz/s/ENTER).
3. Enter the password to gain access to the calibration constants. Press (Hz/s/ENTER). (For information on the password, refer to Chapter 8, "Service-Related Special Menus.")
4. Press (Hz/s/ENTER).
5. Use the (⇑) (⇓) keys to find the desired calibration constant.
6. Press (Hz/s/ENTER) again to activate the calibration constant value on the status display. Use the number keys to enter the new value and press (Hz/s/ENTER).

Saving working data calibration constants

Attention! Changing the calibration constants may drastically affect instrument performance.

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 synthesized sweeper, press (SHIFT) SPECIAL.
2. Using the number keys, enter the number of the menu that contains the calibration constant you want to change (see Table 7-1). Press (Hz/s/ENTER).
3. Enter the password to gain access to the calibration constants. Press (Hz/s/ENTER). (For information on the password, refer to Chapter 8, "Service-Related Special Menus.")
4. Press (Hz/s/ENTER).
5. Use the (⇑) (⇓) keys to find the desired calibration constant.
6. Press (Hz/s/ENTER) again to activate the calibration constant value on the status display. Use the number keys to enter the new value and press (Hz/s/ENTER).
7. Press (SHIFT) SPECIAL (209) (Hz/s/ENTER). The status display reads: SAVE CAL?y/ENTER.
8. Press (Hz/s/ENTER). The working data calibration constants are now stored as protected data (in EEPROM).

Loading protected data calibration constants

Note Changing the calibration constants may drastically affect instrument performance.

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 synthesized sweeper, press (SHIFT) SPECIAL (210) (Hz/s/ENTER).
2. Enter the password to gain access to the calibration constants. Press (Hz/s/ENTER). (For information on the password, refer to Chapter 8, "Service-Related Special Menus.")
3. Press (Hz/s/ENTER).
4. The status display reads: RCL CAL? y/ENTER.
5. Press (Hz/s/ENTER). The protected data calibration constants (from EEPROM) are now loaded into working data.

Loading default data calibration constants

Attention! Loading the default calibration constants *will* drastically affect instrument performance. The synthesized sweeper will require a full calibration to for proper operation.

If you want to use the generic synthesized sweeper calibration constants as working data, the following procedure loads the default calibration constants from FLASH ROM into working data memory.

1. On the synthesized sweeper, press (SHIFT) SPECIAL (211) (Hz/s/ENTER).
2. Enter the password to gain access to the calibration constants. Press (Hz/s/ENTER). (For information on the password, refer to Chapter 8, "Service-Related Special Menus.")
3. Press (Hz/s/ENTER).
4. The status display reads: DFLT CAL?y/ENTER.
5. Press (Hz/s/ENTER). The default data calibration constants are now loaded into working data.

Calibration constant information

Table 7-1 provides the name, description, default value, and related adjustment for each calibration constant.

Table 7-1. Calibration Constant Information

Name	Description	Default Value	Related Adjustment
200 CAL YIG Driver			
CFHZLsb	YD_CF_DAC_HERTZ_PER_LSB	1346000	DYO Linearity
SPANWide	YD_WIDE_SPAN_DAC_HERTZ_PER_LSB	1346000	DYO Gain and Offset
CFSWPoff	YD_CF_DAC_OFFSET_SWEPT	28	DYO Gain and Offset
SAFSens	YD_SAF_SENSE_DAC_NUMBER	122	SAF Sense
CFCWOff	YD_CF_DAC_OFFSET_NON_SWEPT	25	DYO Linearity
SPANNarr	YD_NARROW_SPAN_DAC_HERTZ_PER_LSB	24372	
PSTCoars	PEAKING_DAC_COARSE_STEP	40	
PSTFine	PEAKING_DAC_FINE_STEP	8	
PDBDown	PEAKING_PASSBAND_DB_DOWN	1	
PBWLow	PEAKING_LBAND_MIN_LEV_DAC_COUNT	1238	
PBWHigh	PEAKING_HBAND_MIN_LEV_DAC_COUNT	410	
PMARgin	PEAKING_POWER_DB_BELOW_SPEC	10000	
YOCORRof	DYO_CORR_DAC_OFFSET	1229	
201 CAL DSP			
FRQConv	DSP_FREQ_CONVERSION	640889	
FRQOffs	DSP_FREQ_OFFSET	0	
AMPConv	DSP_AMP_CONVERSION	1092	
AMPOffs	DSP_AMP_OFFSET	−193	ALC Detector and Logger
SWPFast	DSP_SWP_RATE_CAL_FAST	3600	Sweep Generator
SWPSlow	DSP_SWP_RATE_CAL_SLOW	3600	Sweep Generator
SERRdac	DSP_ERROR_DAC_CAL	4095	
DSWPmin	DSP_MIN_SWEEP_TIME	20000	
202 CAL YO DELAY			
YOAHEt	DELAY_COMP_A_DYO_HETBAND	1200	DYO Delay
YOBHEt	DELAY_COMP_B_DYO_HETBAND	10000	DYO Delay
YOCHEt	DELAY_COMP_C_DYO_HETBAND	0	
YODHEt	DELAY_COMP_D_DYO_HETBAND	0	
YOTHEt	DELAY_COMP_T_DYO_HETBAND	2500	DYO Delay
YOWHEt	DELAY_COMP_W_DYO_HETBAND	500	
YOXHEt	DELAY_COMP_X_DYO_HETBAND	900	DYO Delay
YOALow	DELAY_COMP_A_DYO_LOWBAND	1100	DYO Delay
YOBLow	DELAY_COMP_B_DYO_LOWBAND	13200	DYO Delay
YOCLow	DELAY_COMP_C_DYO_LOWBAND	0	
YODLow	DELAY_COMP_D_DYO_LOWBAND	0	
YOTLow	DELAY_COMP_T_DYO_LOWBAND	1500	DYO Delay
YOWLow	DELAY_COMP_W_DYO_LOWBAND	500	
YOXLow	DELAY_COMP_X_DYO_LOWBAND	900	DYO Delay

Table 7-1. Calibration Constant Information (continued)

Name	Description	Default Value	Related Adjustment
YOAHIgh	DELAY_COMP_A_DYO_HIGHBAND	300	DYO Delay
YOBHIgh	DELAY_COMP_B_DYO_HIGHBAND	17100	DYO Delay
YOCHIgh	DELAY_COMP_C_DYO_HIGHBAND	10000	DYO Delay
YOD2HIgh	DELAY_COMP_D2_DYO_HIGHBAND	30000	DYO Delay
YOD15HIg	DELAY_COMP_D15_2DYO_HIGHBAND	28600	DYO Delay
YOCSHIgh	DELAY_COMP_CS_DYO_HIGHBAND	10000	DYO Delay
YODS2HIg	DELAY_COMP_DS2_DYO_HIGHBAND	30000	DYO Delay
YODS15HI	DELAY_COMP_DS15_DYO_HIGHBAND	28400	SAF
YOTHIgh	DELAY_COMP_T_DYO_HIGHBAND	3700	DYO Delay
YOWHIgh	DELAY_COMP_W_DYO_HIGHBAND	300	DYO Delay
YOXHIgh	DELAY_COMP_X_DYO_HIGHBAND	1050	DYO Delay
203 CAL YTF DELY			
YFALow	DELAY_COMP_A_YTF_LOWBAND	1300	SAF
YFBLow	DELAY_COMP_B_YTF_LOWBAND	12000	SAF
YFCLow	DELAY_COMP_C_YTF_LOWBAND	0	
YFDLow	DELAY_COMP_D_YTF_LOWBAND	0	
YFTLow	DELAY_COMP_T_YTF_LOWBAND	2000	SAF
YFWLow	DELAY_COMP_W_YTF_LOWBAND	500	SAF
YFXLow	DELAY_COMP_X_YTF_LOWBAND	1300	SAF
YFAHIgh	DELAY_COMP_A_YTF_HIGHBAND	550	SAF
YFBHIgh	DELAY_COMP_B_YTF_HIGHBAND	16900	SAF
YFCHIgh	DELAY_COMP_C_YTF_HIGHBAND	10000	SAF
YFD2HIgh	DELAY_COMP_D2_YTF_HIGHBAND	28400	SAF
YFD15HIg	DELAY_COMP_D15_YTF_HIGHBAND	28300	SAF
YFCSHIgh	DELAY_COMP_CS_YTF_HIGHBAND	10000	SAF
YFDS2HIg	DELAY_COMP_DS2_YTF_HIGHBAND	28300	SAF
YFDS15HI	DELAY_COMP_DS15_YTF_HIGHBAND	28000	SAF
YFTHIgh	DELAY_COMP_T_YTF_HIGHBAND	4000	SAF
YFWHIgh	DELAY_COMP_W_YTF_HIGHBAND	500	SAF
YFXHIgh	DELAY_COMP_X_YTF_HIGHBAND	1550	SAF
204 CAL ALC			
DOFFset	ALC_DETECTOR_OFFSET	112	ALC Detector and Logger
LOFFset	ALC_LOGGER_OFFSET	118	ALC Detector and Logger
LBRKpoin	ALC_LOGGER_BREAKPOINT	117	ALC Detector and Logger
MOHEt	ALC_MOD_OFFSET_HETBAND	185	ALC Modulator Offset and Gain
MOLOw	ALC_MOD_OFFSET_LOWBAND	248	ALC Modulator Offset and Gain
MOHIgh	ALC_MOD_OFFSET_HIGHBAND	170	ALC Modulator Offset and Gain
MGHEt	ALC_MOD_GAIN_HETBAND	108	ALC Modulator Offset and Gain
MGLOw	ALC_MOD_GAIN_LOWBAND	103	ALC Modulator Offset and Gain
MGHIgh	ALC_MOD_GAIN_HIGHBAND	117	ALC Modulator Offset and Gain
PWSCalar	ALC_SCALAR_PULSE_WIDTH	15	Scalar Pulse Symmetry

Table 7-1. Calibration Constant Information (continued)

Name	Description	Default Value	Related Adjustment
205 CAL MISC			
UNLCkmsg	UNLOCK_LOOP_MESSAGE_ENABLE	0	
YOCSen	YTO_CORRECTION_SENSITIVITY	15259	
YFCSen	SAF_CORRECTION_SENSITIVITY	15259	
FMCLow	FM_COIL_CAL_LOBAND	5	DYO Linearity
FMCHigh	FM_COIL_CAL_HIBAND	6	DYO Linearity
SOFCent	SWPGEN_OFFSET_DAC_CENTER	2048	V/GHz
SOFScal	SWPGEN_OFFSET_DAC_SCALE	4882812	V/GHz
SGNCent	SWPGEN_GAIN_DAC_CENTER	2048	V/GHz
SGNScal	SWPGEN_GAIN_DAC_SCALE	9765625	V/GHz
ADCGain	ADC_GAIN_CAL	13000	ADC
ADCOffs	ADC_OFFSET_CAL	−38	ADC
206 CAL PHASELCK			
TRTRC	TIME_USEC_RETRACE	5000	
TSCWRtrc	TIME_USEC_SWCW_RTC	3000	
TKICK	TIME_USEC_KICK	10000	
TSETtle	TIME_USEC_SETTLE	1000	
TCLNSetl	TIME_USEC_SETTLE_CLEAN	15000	
TYOLock	TIME_USEC_YO_LOCK	500	
TDCFM	TIME_USEC_YO_LOCK_DCFM	1000	
TUNBlank	TIME_USEC_UNBLANK	750	
THPUNBlk	TIME_USEC_UNBLANK_HI_PWR	2000	
TUNKnown	TIME_USEC_UNKNOWN	50000	
SWPMax	MAX_YO_SWEEP_RATE	400	
STEPMax	MAX_YO_STEP_RATE	150	
KICKMhz	YIG_KICK_AMP_MHZ	1500	
207 CAL CONFIG			
OPTAten	OPTION_EXISTS_70DB_ATTEN	*	
OPTTime	OPTION_EXISTS_TIMEBASE	†	
OPT1ext	OPTION_EXISTS_EXTRA1	0	
OPT2ext	OPTION_EXISTS_EXTRA2	0	
OPT3ext	OPTION_EXISTS_EXTRA3	0	
OPT4ext	OPTION_EXISTS_EXTRA4	0	
OPT5ext	OPTION_EXISTS_EXTRA5	0	
OPT6ext	OPTION_EXISTS_EXTRA6	0	
OPT7ext	OPTION_EXISTS_EXTRA7	0	
OPT8ext	OPTION_EXISTS_EXTRA8	0	
OPT9ext	OPTION_EXISTS_EXTRA9	0	
OPT10ext	OPTION_EXISTS_EXTRA10	0	

Table 7-1. Calibration Constant Information (continued)

Name	Description	Default Value	Related Adjustment
ALCMax	ALC_LIMIT_MAX	‡	
ALCMin	ALC_LIMIT_MIN	§	
PIN1	PRODUCTION_INFO_1	0	
PIN2	PRODUCTION_INFO_2	0	
PIN3	PRODUCTION_INFO_3	0	
PIN4	PRODUCTION_INFO_4	0	
PIN5	PRODUCTION_INFO_5	0	
POW0	POWER_SPEC_BAND_0	#	
POW1	POWER_SPEC_BAND_1	**	
POW2	POWER_SPEC_BAND_2	**	
POW3	POWER_SPEC_BAND_3	**	
POW4	POWER_SPEC_BAND_4	**	
POW5	POWER_SPEC_BAND_5	**	
POW6	POWER_SPEC_BAND_6	**	
POW7	POWER_SPEC_BAND_7	**	
A0RV	ASSEMBLY_REV_A0	0	
A1RV	ASSEMBLY_REV_A1	0	
A2RV	ASSEMBLY_REV_A2	0	
A3RV	ASSEMBLY_REV_A3	0	
A4RV	ASSEMBLY_REV_A4	0	
A5RV	ASSEMBLY_REV_A5	0	
A6RV	ASSEMBLY_REV_A6	0	
A7RV	ASSEMBLY_REV_A7	1	
A8RV	ASSEMBLY_REV_A8	0	
A9RV	ASSEMBLY_REV_A9	0	
A10Rv	ASSEMBLY_REV_A10	0	
A11Rv	ASSEMBLY_REV_A11	0	
A12Rv	ASSEMBLY_REV_A12	0	
A13Rv	ASSEMBLY_REV_A13	0	
A14Rv	ASSEMBLY_REV_A14	0	
A15Rv	ASSEMBLY_REV_A15	0	
A16Rv	ASSEMBLY_REV_A16	0	
A17Rv	ASSEMBLY_REV_A17	††	
A18Rv	ASSEMBLY_REV_A18	0	
A19Rv	ASSEMBLY_REV_A19	‡‡	
A20Rv	ASSEMBLY_REV_A20	0	
A21Rv	ASSEMBLY_REV_A21	0	
B1RV	ASSEMBLY_REV_B1	0	

Table 7-1. Calibration Constant Information (continued)

Name	Description	Default Value	Related Adjustment
208 CAL SPECIAL			
SNPFix	SERIAL_NUMBER_PREFIX	0	
SNLetter	SERIAL_NUMBER_LETTER	0	
SNSFix	SERIAL_NUMBER_SUFFIX	0	
MDLNumb	MODEL_NUMBER	§§	
MDLSuff	MODEL_SUFFIX	##	
OID0	OPTION_IDENTITY_0	***	
OID1	OPTION_IDENTITY_1	***	
OID2	OPTION_IDENTITY_2	***	
OID3	OPTION_IDENTITY_3	***	
OID4	OPTION_IDENTITY_4	***	
OID5	OPTION_IDENTITY_5	***	
OID6	OPTION_IDENTITY_6	***	
FSTArt	FREQ_PRES_STAR	†††	
FSTOp	FREQ_PRES_STOP	20000	
FMIN	FREQ_LIMIT_MIN	†††	
FMAX	FREQ_LIMIT_MAX	20500	
SPCL	SPECIAL_CONFIG	0	

* Option 1E1 = 1, Standard = 0

† Option 1E5 = 1, Standard = 0

‡ HP 83751A/52A = 20000, HP 83751B/52B = 25000

§ HP 83751A/52A = −15000, HP 83751B/52B = −10000

\# HP 83751A/52A = −10000, HP 83751B/52B = −16000 (with Option 1E1 subtract 1000)

** HP 83751A/52A = −10000, HP 83751B/52B = −17000 (with Option 1E1 subtract 1000)

†† HP 83751A/52A = 0, HP 83751B/52B = 1

‡‡ HP 83751A/B = −1, HP 83752A/B = 0

§§ 83751 or 83752 (model dependent)

\## A or B (model dependent)

*** One of the following values will fill this register whenever an option is included with your synthesized sweeper. The six digit value identifies the option. If the value is zero, no option exists.

496949 = Option 1E1, 70 dB Step Attenuator
496952 = Option 1E4, Rear Panel RF Output
496953 = Option 1E5, Internal Oven Oscillator Timebase
496968 = Option 1ED, Type-N Output Connector
496969 = Option 1EE, Source Module Interface

††† HP 83751A/B = 2000, HP 83752A/B = 10

Calibration arrays

Calibration arrays store calibration data specific to the operation of each instrument to make sure that the instrument meets specifications. The calibration data stored in these arrays is controlled by software and firmware routines.

YIG oscillator correction array

The YIG oscillator correction array stores the second-order, frequency corrections of the YIG oscillator that are calculated by the DYO linearity routine located in the firmware. This correction is applied after the main tuning DACs on the YIG driver board have already provided a first-order correction. They further tune the YIG oscillator by reducing the errors left over from the first-order correction. This allows the phase-lock-loop circuit to function properly and lock on to the correct frequency. Refer to "DYO Linearity" in Chapter 2, "Adjustments."

YIG filter correction array

The YIG filter correction array stores the corrections calculated by the peaking routine which is located in the firmware. It provides a second-order, frequency correction of the YIG filter. This correction reduces errors left over from the first-order correction so that the filter accurately tunes and passes the desired frequency resulting in peak power. Refer to "SAF Sense" in Chapter 2, "Adjustments."

Internal ALC array

The internal ALC array stores the second-order corrections for power level versus frequency that are calculated by the internal detector flatness routine located in the firmware. Its function is to improve power flatness at 0 dB over the entire frequency range by reducing the errors remaining from the first-order correction provided by the ALC design and ALC calibration constants. Refer to "Power Flatness" in Chapter 2, "Adjustments."

Unleveled ALC array

The unleveled ALC array provides the same function as the internal ALC array except that it is used to store the unleveled flatness routine data. The data is then used in the unleveled ALC mode as a reference for setting other power levels. Refer to "Power Flatness" in Chapter 2, "Adjustments."

Attenuator power flatness array

The attenuator power flatness array stores the attenuator calibration data calculated by the attenuator calibration software routine. The array performs basically the same function as the ALC arrays. It gives the instrument the information required to correct for each of the calibration frequencies at each attenuator setting. This results in flat and accurate power regardless of the attenuator setting. Refer to Chapter 3, "Automated Tests."

Power clamp array

The power clamp array stores the data calculated by the power clamp calibration software routine. The array allows the synthesized sweeper to achieve the maximum leveled power obtainable before taking control away from the ALC. This prevents the adverse effects (such as power reversal and squegging) that can occur when the power level nears its maximum capability. Refer to Chapter 3, "Automated Tests."

Fractional-N array

The fractional-N array stores the data calculated by the fractional-N calibration software routine. The fractional-N array data is used to pretune a fractional-N VCO so that the effect of frequency transients are minimized at the start of sweep. This improves the swept frequency accuracy of the synthesized sweeper. Refer to Chapter 3, "Automated Tests."

8

Service-Related Special Menus

The service-related special menus are accessed by pressing (SHIFT) SPECIAL in the instrument state group (see Figure 8-1.) Choose the desired menu by pressing:

- (21) to run the full self-test
- (22) for the service menu
- (23) for the calibration menu
- (24) for the diagnostics menu

Terminate your entry by pressing (Hz/s/ENTER).

To maneuver through the menus:

- Scroll through the selections in each menu with the (⇧) (⇩) keys or with the front panel knob.
- Select an item by pressing (Hz/s/ENTER).
- Back up to the previous level of the menu by pressing (⇐).

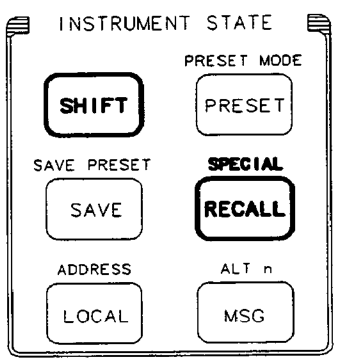

Figure 8-1. The Instrument Group

Table 8-1. Service-Related Special Functions

Special Function	Description
FULL SELFTST – SHIFT SPECIAL 21	
Full Test	Runs all self-tests and returns the highest priority failure.
*SERVICE – SHIFT SPECIAL 22	
100 SELF TESTS	Menu of all self-tests for the A4 through A13 assemblies.
101 VIEW PATCHES	Displays all of the existing self-test patches.
102 LOOP ON/OFF	Turns on/off self-test looping.
*CALIBRATION – SHIFT SPECIAL 23	
200 CAL YIG DRVR	Menu of calibration constants associated with the YIG driver board.
201 CAL DSP	Menu of calibration constants associated with the DSP on the sweep generator board.
202 CAL YO DELAY	Menu of DYO delay adjustment calibration constants.
203 CAL YTF DELY	Menu of SAF† delay adjustment calibration constants.
204 CAL ALC	Menu of calibration constants associated with the ALC.
205 CAL MISC	Menu of calibration constants associated with other instrument operation.
206 CAL PHASELCK	Menu of calibration constants associated with phaselock operation.
207 CAL CONFIG	Menu of instrument option calibration constants.
208 CAL SPECIAL	Menu of serial number, model number, and option calibration constants.
209 CAL SAVE	Saves calibration constants as protected data in EEPROM.
210 CAL RECALL	Recalls protected calibration constants from EEPROM.
211 CAL DEFAULT‡	Loads default calibration constants from flash ROM.
212 CAL DET ZERO	Zeros the detector flatness array.
213 CAL UNL ZERO	Zeros the unleveled ALC flatness array.
*DIAGNOSTICS – SHIFT SPECIAL 24	
300 DIAG MODE	Advanced diagnostic procedures.
301 DIAG FRAC N	Front panel control of fractional-N frequency.
302 POKE DAC	Writes values to DACs.
303 POKE LATCH	Writes values to data latches.
304 POKE MEMORY	Writes values to memory. *WARNING!* May permanently change instrument configuration.
305 PEEK MEMORY	Reads memory at addresses.
306 ANALOG BUS	Measures voltages at analog bus nodes.
307 ABUS AVERAGE	Number of readings averaged to provide analog bus node voltages.
308 MAX BUCKETS	Divides sweep into number of points with trigger at each point.
309 NEW FIRMWARE	Downloads new firmware from disk. See Chapter 2, "Adjustments."
310 EXTERNAL CAL	Power flatness adjustment when externally leveled.
311 ADJUSTMENTS	Menu of adjustments that are automated in firmware.
312 NEW PASSWORD	Changes current password for calibration and diagnostics menus.

† The SAF (switched amp filter) microcircuit includes the YTF (YIG tuned filter).
‡ Default calibration data is a starting point for calibration. The synthesized sweeper will probably *not* meet specifications.

21 FULL SELFTST

To See the Results of the Full Self-Test

Press (SHIFT) SPECIAL (21) (Hz/s/ENTER) to see the results of the full self-test the last time it was run since the instrument was powered on. The full self-test runs all of the instrument self-tests. One of the following messages will be displayed in the right-hand display window:

Message	Explanation
Full Test NOTRUN	Full self-test has not been run since the instrument was last powered on.
Full Test PASSED	All self-tests passed the last time they were run since the instrument was powered on.
-->><failure>	In case of multiple failures, the most independent failure (the one that should be fixed first) will be displayed preceded by—>>. Refer to Chapter 5, "Troubleshooting," to begin troubleshooting the failure.

To Run the Full Self-Test

Press (SHIFT) SPECIAL (21) (Hz/s/ENTER) (Hz/s/ENTER) to run the full self-test. The full self-test runs all of the instrument self-tests. While the tests are being performed a ***wait*** message is displayed. When the tests are finished the results are displayed in the right-hand display window. The full self-test takes approximately one minute to execute. Certain hardware failures can prolong this time.

The full self-test returns the instrument to its previous state, however it is best to preset the instrument before running any self-test. This ensures that the self-test is set up to run correctly in a known instrument state.

22 *SERVICE

Menu Selection	Description
100 SELF TESTS	Menu of all self-tests for the A4 through A13 assemblies.
101 VIEW PATCHES	Displays all of the existing self-test patches.
102 LOOP ON/OFF	Turns on/off self-test looping.

Choose a service menu selection as follows:

1. Press (SHIFT) SPECIAL (22).
2. Use the (⇑) (⇓) keys to scroll through the service menu.
3. With the desired menu selection displayed, press (Hz/s/ENTER).

Or, if you already know the number of the menu item, you can bypass the menu and go directly into the self-test or adjustment menus or activate the view patches or looping functions. For example:

1. Press (SHIFT) SPECIAL (101) (Hz/s/ENTER) to select 101 VIEW PATCHES.

   The service menu is bypassed and the synthesized sweeper activates the view patches function, displaying all existing self-test patches.

100 SELF TESTS

Press (Hz/s/ENTER) at this selection to access the menus of self-tests listed in Table 8-2. An asterisk marks menus of related self-tests that may also contain additional menus. Press (Hz/s/ENTER) at any "Do All" selection to run all of the tests in that menu. To run an individual test, press (Hz/s/ENTER) at the "primitive" level of the test. An example of the primitive level is shown in Figure 8-2. The primitive level is identified by the self-test name and the pass/fail/not run results of the test in the left-hand display, and by the minimum, maximum, and measured values in the right-hand display.

Attention! Disconnect all peripherals and BNC cables when running any self-tests or the full self-test. If you do not, self-test failures or lock-up may occur.

Executing these tests leave you in the self-test mode. You must press (PRESET) to exit.

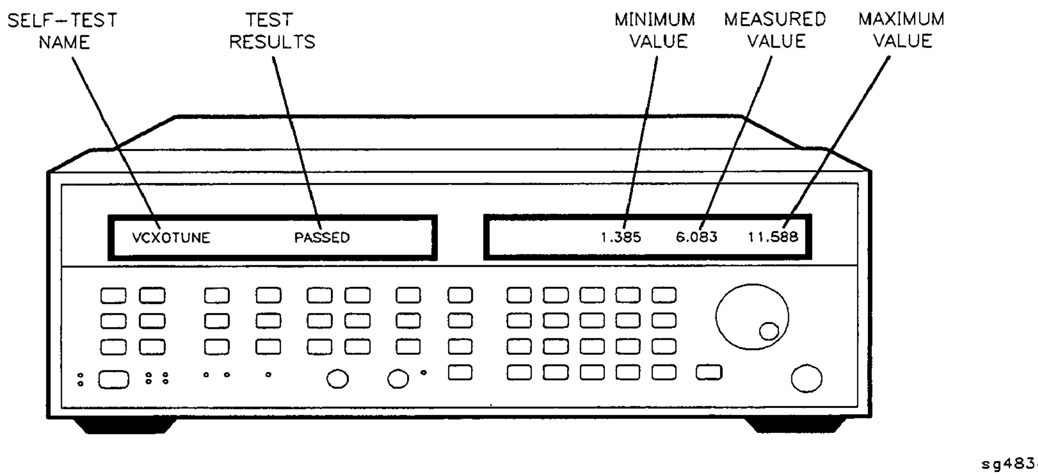

Figure 8-2. Example of a Self-Test at the Primitive Level

Help Text

At the primitive level of the self-test, help text is available by pressing (SHIFT) (⇐). The help text may describe the self-test measurement, may show which results indicate a failure, and may provide recommendations for troubleshooting a failure. Use the front panel knob to roll the text back and forth on the displays. Press (⇐) to exit the help text. Help text is only available at the primitive level of self-tests and is also not provided at asterisk-marked menus or "Do All" self-tests.

Table 8-2. Self-Test List

Menu Selection	Description
FULL_TEST	Menu of all self-tests.
Do All	Runs all self-tests.
*A4CPU	Menu of all A4 CPU board tests.
Do All	Runs all CPU board tests.
mc68000	Exercises all 68000 opcodes.
BootRom	Verifies bootrom checksum.
ROM	Verifies ROM checksum.
RAM	Exercises RAM cells, data and address lines.
EEPROM	Tests for checksum errors on calibration constants and testpatches.
InstrBus	Writes/reads to flipflops on A5 timer board.
AbusADC	Measures on-board +5, −15, +15 supplies.
*A5TIMER	Menu of all A5 timer tests.
Do All	Runs all timer board tests.
*Timers	Menu of timer chip tests.
Do All	Runs all timer chip tests.
timer1Modes	Sets and verifies all programmable modes for timer 1.
timer1Count	Verifies timer 1 chip is counting.
timer2Modes	Sets and verifies all programmable modes for timer 2.
timer2Count	Verifies timer 2 chip is counting.
timer3Modes	Sets and verifies all programmable modes for timer 3.
timer3Count	Verifies timer 3 chip is counting.
timer4Modes	Sets and verifies all programmable modes for timer 4.
timer4Count	Verifies timer 4 chip is counting.
*LINT_TIMER	Menu of LINT_TIMER verification.
Do All	Generates LINT_TIMER with all inputs but EXTTRIG.
QSS	Verifies QSS can generate LINT_TIMER.
RTC	Verifies RTC can generate LINT_TIMER.
TMR1	Verifies TMR1 can generate LINT_TIMER.
TMR2	Verifies TMR2 can generate LINT_TIMER.
LADCTRIG	Verifies LADCTRIG can generate LINT_TIMER.
SwpGenUNLOCK	Verifies INT_SG_UNLK can generate LINT_TIMER.
SSRQ	Verifies SSRQ can generate LINT_TIMER.
*LINT_MISC	Menu of LINT_MISC verification.
Do All	Generates LINT_MISC with all but HET_UNLK, EXT REF.
REF_UNLOCK	Verifies REF_UNLOCK can generate LINT_MISC.
FRACN_UNLOCK	Verifies FRACN_UNLOCK can generate LINT_MISC.
YO_UNLOCK	Verifies YO_UNLOCK can generate LINT_MISC.
UNLEVELED	Verifies UNLEVELED can generate LINT_MISC.
LEVELED	Verifies LEVELED can generate LINT_MISC.

Table 8-2. Self-Test List (continued)

Menu Selection	Description
*TestLatch	Menu of self-test latch inputs.
Do All	Verifies the following inputs via the self-test latch.
PZABsweep	Verifies PZAB with HSWP asserted.
PZABretrace	Verifies PZAB with RTC asserted.
PZABmarker	Verifies PZAB with LMRKR asserted by sweep generator board.
LDAC_TRIG	Verifies LDAC_TRIG can be set/reset.
PULSE_GEN	Verifies PULSE_GEN can be set/reset.
LNORM_SS	Verifies LNORM_SS can be set/reset.
LSWP_TRIG	Verifies LSWP_TRIG can be set/reset.
LMTRIG	Verifies LMTRIG can be set/reset.
EOTRK	Verifies EOTRK timer output via status latch.
HSWP	Verifies HSWP line via status latch.
MRKR	Verifies MRKR input from SwpGen via self-test latch.
TRGCLK	Determines TRGCLK status from results of timer tests.
L1MHz_Timer	Determines 1MHz_BKT status from results of timer tests.
*A6Ref	Menu of all A6 reference tests.
Do All	Runs all reference board tests.
VCXOTune	Verifies tuning voltage with no internal 10 MHz standard.
Ref125KHz	Verifies signal present.
Ref1MHz	Verifies signal present.
Ref10MHz	Verifies signal present.
OvenStd	Verifies signal present. If OPTTime cal constant is 0, test is not done.
Sync	Verifies signal present.
Neg12V	Verifies supply.
*A7FracN	Menu of all A7 fractional-N tests.
Do All	Runs all fractional-N board tests.
PretunDACmin	Measures minimum DAC level.
PretunDACmax	Measures maximum DAC level.
PretunDAClin	Verifies DAC linearity.
SweepDACmin	Measures minimum DAC level.
SweepDACmax	Measures maximum DAC level.
SweepDAClin	Verifies DAC linearity.
Integrator	Verifies integrator output follows DAC in pretune mode.
*LoopGainMenu	Menu of VCOTune gain measurements.
Do All	Verifies gain of stage over a series of breakpoints.
BreakPoint1	Sets up pretune voltage of −10 V. Measures VCOTune.
BreakPoint2	Sets up pretune voltage of −5 V. Measures VCOTune.
BreakPoint3	Sets up pretune voltage of −300 mV. Measures VCOTune.
BreakPoint4	Sets up pretune voltage of 800 mV. Measures VCOTune.
BreakPoint5	Sets up pretune voltage of 3 V. Measures VCOTune.
VCOTune	Sweeps fractional-N chip and looks for monotonic increase.
Pos5V4Mod	Measures supply.
Pos5VPD	Measures supply.
Pos10VRef	Measures supply.

Table 8-2. Self-Test List (continued)

Menu Selection	Description
*A8YoLoop	Menu of all A8 YO loop tests.
Do All	Runs all YO loop board tests.
LowBandIF	Searches for IF signal while driving low band DYO.
HighBandIF	Searches for IF signal while driving high band DYO.
YOPhaseDet	Steps CFDAC with open YO loop, and measures excursion.
YOIntegrator	Set to pretune mode with fixed input and measure output.
FMInput	Reads analog bus node. Assumes nothing connected to FM INPUT connector.
FMSummer	Input is integrator output in pretune mode. Measure output. Returns gain.
FMCal	Measure voltage.
*FMCoil	Menu of FMCOIL measurements.
Do All	Use FMCAL as input to FMCOIL driver.
Gain0	GAIN0, GAIN1, GAIN2 = 000. Reads output. Returns gain.
Gain1	GAIN0, GAIN1, GAIN2 = 001. Reads output. Returns gain.
Gain2	GAIN0, GAIN1, GAIN2 = 010. Reads output. Returns gain.
Gain4	GAIN0, GAIN1, GAIN2 = 100. Reads output. Returns gain.
YO_LO_FM	Input is integrator in pretune mode. Reads output. Returns gain.
*A9ALC	Menu of all A9 ALC tests.
Do All	Runs all ALC board tests.
TCRef	Measures temperature compensation reference with temp comp switched out.
ALCRefMin	Measures ALCREF with power level DAC set to 0.
ALCRefMax	Measures ALCREF with power level DAC set to 0x3FFF.
*ALCIntegMenu	Menu of integrator measurements.
Do All	Runs all integrator measurements.
PositiveRail	Forces integrator to positive limits and measures.
NegativeRail	Forces integrator to negative limits and measures.
RfBlanking	Turns on RF blanking and measures integrator output.
HoldINT_OUT	Changes stimulus to integrator in hold mode. Measures INT_OUT.
*DetInputMenu	Menu of detector input tests.
Do All	Runs all detector input tests.
HighBdDetIn	CW 20 GHz; 0 dBm. Measure detector input.
LowBdDetIn	CW 10 GHz; 0 dBm. Measure detector input.
HetBdDetIn	CW 100 MHz; 0 dBm. Measure detector input.
*ModDriveMenu	Menu of ALC modulator current tests.
Do All	Runs all ALC modulator current tests.
ModDriverOn	Measures MOD_I current with driver ON.
ModDriverOff	Measures MOD_I current with driver OFF.
HETModDrvOn	Measures MOD_I current with driver ON in het band.
HETModDrvOff	Measures MOD_I current with driver OFF in het band.

Table 8-2. Self-Test List (continued)

Menu Selection	Description
*A9ALC *(continued)*	
*ALCdacs	Menu of ALC DAC tests.
Do All	Runs all ALC DAC tests.
LogBPdacLin	Verifies DAC linearity.
LogBPdacMin	Measure minimum DAC output.
LogBPdacMax	Measure maximum DAC output.
LogOFSdacLin	Verifies DAC linearity.
LogOFSdacMin	Measure minimum DAC output.
LogOFSdacMax	Measure maximum DAC output.
DetOFSdacLin	Verifies DAC linearity.
DetOFSdacMin	Measure minimum DAC output.
DetOFSdacMax	Measure maximum DAC output.
ModOFSdacLin	Verifies DAC linearity.
ModOFSdacMin	Measure minimum DAC output.
ModOFSdacMax	Measure maximum DAC output.
*PulseModMenu	Menu of pulse modulator self-tests.
Do All	Runs all pulse modulator self-tests.
HETPulseOn	PulseGen output low. HetBand on. Measure pulse mod. Will not run in HP 83751A/B.
HETPulseOff	PulseGen output high. HetBand on. Measure pulse mod. Will not run in HP 83751A/B.
HiPulseOn	PulseGen output low. HetBand off. Measure pulse mod.
HiPulseOff	PulseGen output high. HetBand off. Measure pulse mod.
*A10SwpGen	Menu of all A10 sweep generator tests.
Do All	Runs all sweep generator board tests.
DSPhandshake	Verify DSP will handshake with 68000.
DSPXcvr	Write/Read the DSP transceiver.
*dspDACs	Menu of DSP-controlled DAC tests.
Do All	Runs all DSP-controlled DAC tests.
pwrLvlDAClin	Verifies DAC linearity.
pwrLvlDACmin	Measure minimum DAC output.
pwrLvlDACmax	Measure maximum DAC output.
DYOCorDAClin	Verifies DAC linearity.
DYOCorDACmin	Measure minimum DAC output.
DYOCorDACmax	Measure maximum DAC output.
SAFCorDAClin	Verifies DAC linearity.
SAFCorDACmin	Measure minimum DAC output.
SAFCorDACmax	Measure maximum DAC output.
pwrClpDAClin	Verifies DAC linearity.
pwrClpDACmin	Measure minimum DAC output.
pwrClpDACmax	Measure maximum DAC output.
digSwpDAClin	Verifies DAC linearity.
digSwpDACmin	Measure minimum DAC output.
digSwpDACmax	Measure maximum DAC output.

Table 8-2. Self-Test List (continued)

Menu Selection	Description
*A10SwpGen *(continued)*	
*pswpDACS	Menu of programmable sweep DAC tests.
Do All	Runs all programmable sweep DAC tests.
pswpDACAlin	Verifies DAC linearity.
pswpDACAmin	Measure minimum DAC output.
pswpDACAmax	Measure maximum DAC output.
pswpDACBlin	Verifies DAC linearity.
pswpDACBmin	Measure minimum DAC output.
pswpDACBmax	Measure maximum DAC output.
swpOut	Verifies linearity of swpout signal.
timer	Verifies timer is counting and all bits flip.
swpGenGnd	Measures sweep generator ground.
*A11YigDriver	Menu of all A11 YIG driver tests.
Do All	Runs all YIG driver board tests.
YD10VRef	Measure supply.
*YigDACsMenu	Menu of YIG DAC self-tests.
Do All	Runs all YIG DAC self-tests.
CFDACmin	Measure minimum DAC output.
CFDACmax	Measure maximum DAC output.
CFDAClin	Verifies DAC linearity.
SpanDACmin	Measure minimum DAC output.
SpanDACmax	Measure maximum DAC output.
SpanDAClin	Verifies DAC linearity.
VernDACmin	Measure minimum DAC output.
VernDACmax	Measure maximum DAC output.
VernDAClin	Verifies DAC linearity.
SAFDACmin	Measure minimum DAC output.
SAFDACmax	Measure maximum DAC output.
SAFDACmono	Measures monotonicity of 0.6V/GHZ using DAC steps.
SummingAmp	Sets up DAC inputs. Verifies summer output meets internally calculated spec.
OscSense	Check monotonicity of DYO tune voltage versus current.
SAFSense	Check monotonicity of DYO tune voltage versus current.
OscFMDrive	Uses span DAC to exercise the FM summing amp.

Table 8-2. Self-Test List (continued)

Menu Selection	Description
*A12RFintf	Menu of all A12 RF interface tests.
Do All	Runs all RF interface board tests.
*PowerSupply	Menu of power supply and ground tests.
Do All	Runs all power supply and ground tests.
DigGnd	Measure.
AnalogGnd_1	Measure.
AnalogGnd_2	Measure.
AnalogGnd_3	Measure.
Pos_5VA	Measure.
Pos_5VFD	Measure.
Neg_5V	Measure.
Pos_8V	Measure.
Pos_10VREF	Measure.
Pos_15V	Measure.
Neg_15V	Measure.
Pos_21VSTDBY	Measure.
Neg_40V	Measure.
Pos_45V	CFDAC = 20 ghz. Span = 0. SAF off. DYO high band on. Measure.
ModAmp1	Returns current through sense resistor (mA).
ModAmp2	Returns current through sense resistor (mA).
ModAmp3	Returns current through sense resistor (mA).
DYOsenseHI	CW = 20 GHz. Measures current drawn from +8 V supply.
DYOsenseLO	CW = 10 GHz. Measures current drawn from +8 V supply.
IFAmpSense	DYO OFF. Het band on. Measures current.
MixerSense	DYO OFF. Het band on. Measures current.
MixerVolts	Measure.
SAFDSense	CFDAC = 10 GHz; span = 20 GHz; SAF on. Measures current.
*A13RearPanel	Menu of all A13 rear panel tests.
Do All	Runs all rear panel board tests.
SMIbus	Write/Read the SMI bus.
AUXbus	Write/Read the aux bus.
HPIBActivity	Checks HP-IB bus for system controller or other devices. Will not run with controller on bus.
HPIBData	Checks data out register bits (internal chip test). Will not run with controller on bus.
HPIBControl	Checks control bits. Will not run with controller on bus.

101 VIEW PATCHES

Patches allow you to skip a test (SKIPTEST) or to change the minimum and maximum limits (NEWLIMITS) for any self-test. Press (Hz/s/ENTER) at the 101 VIEW PATCHES selection to display any existing self-test patches. If no patches exist, the message ***No Patches Existing*** will be displayed. If more than one patch exists, use the (⇧) (⇩) keys to scroll through the list of patches. An example of a self-test patch is shown in Figure 8-3.

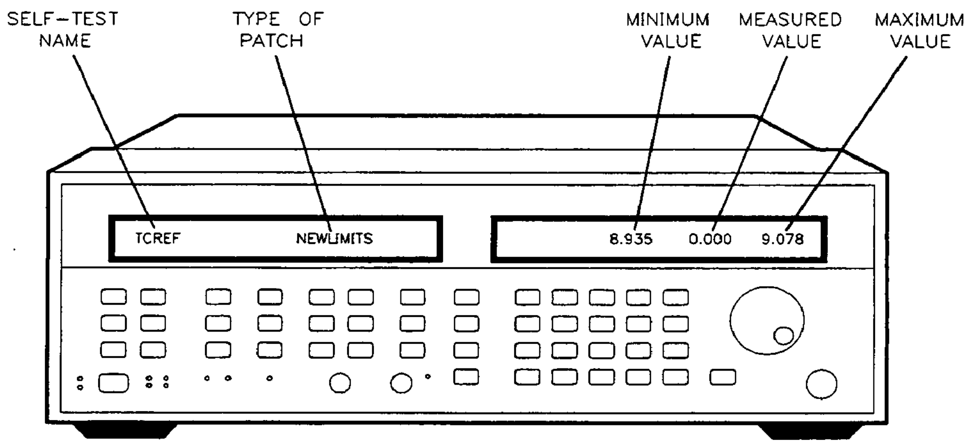

Figure 8-3. Example of a Self-Test Patch

Entering a SKIPTEST Patch

1. On the synthesized sweeper, press (SHIFT) SPECIAL (100) (Hz/s/ENTER).
2. Select the self-test to be skipped, and press (Hz/s/ENTER). This is known as the "primitive" level of the test where the minimum, maximum, and measured analog bus values are displayed.
3. Press (SHIFT) (·). The self-test to be skipped is displayed in the left-hand display window along with a SKIPTEST or NEWLIMITS message. Pointers are displayed above the message. Use the (⇧) or (⇩) key, if necessary, to display the SKIPTEST message.
4. Press (Hz/s/ENTER). The self-test patch has been entered and the message SKIPPED is displayed in the left-hand display window indicating that this test will be skipped the next time any group of self-tests that includes this test is run.

Attention! Once you have run any self-test, instrument control is returned only after pressing (PRESET). Pressing (Hz/s/ENTER) *again* after entering the skiptest patch won't run that self-test because it will be skipped, however you will still have to press (PRESET) to return instrument control.

Entering a NEWLIMITS Patch

1. On the synthesized sweeper, press (SHIFT) SPECIAL (100) (Hz/s/ENTER).
2. Select the self-test that you wish to modify, and press (Hz/s/ENTER). This is known as the "primitive" level of the test where the minimum, maximum, and measured analog bus values are displayed.
3. Press (SHIFT) (·). The self-test to be patched is displayed in the left-hand display window along with a SKIPTEST or NEWLIMITS message. Pointers are displayed above the message. Use the (⇑) or (⇓) key, if necessary, to display the NEWLIMITS message.
4. Use the ⇐ and ⇒ keys to move the pointers above the value to be modified. (Only the maximum and minimum values can be modified. See Figure 8-3.)

Note Press (SHIFT) (⇓) for the ⇐ function and (SHIFT) (⇑) for the ⇒ function.

5. Use the front panel knob to change the values to the desired new limits.
6. Press (Hz/s/ENTER). The self-test patch has been entered. A message in the left-hand display window indicates the results of this test the *last time* it was run since the instrument was powered on.

Attention! Pressing (Hz/s/ENTER) again after entering the self-test patch runs that self-test. Once you have run the self-test, instrument control is returned only after pressing (PRESET).

Deleting a Patch

1. On the synthesized sweeper, press (SHIFT) SPECIAL (100) (Hz/s/ENTER).
2. Select the self-test patch that you wish to delete, and press (Hz/s/ENTER).
3. Press (SHIFT) (·) (SHIFT) (−). The patch is deleted and the self-test name and the results of the last time it was run are displayed in the left-hand display window.

102 LOOP ON/OFF

Press (Hz/s/ENTER) at this selection and the message SelfTest Loop=OFF is displayed. This is the default condition. To loop a self-test (the test runs repeatedly), change the message to read SelfTest Loop=ON by pressing the (⇧) or (⇩) keys.

With looping turned on, two counters (000/000) are displayed in the left-hand display window as the self-test is run. The left-hand counter increments with each passed loop of the self-test. The right-hand counter increments with each failure of the self-test. To stop running the self-test, press (Hz/s/ENTER).

Looping stays active until it is turned off or (PRESET) is pressed.

23 *CALIBRATION

The calibration menus are the menus of calibration constants for the instrument. Calibration constants contain instrument configuration information and calibration information specific to the operation of each instrument that is used to make sure that the instrument meets specification. Some calibration constants are used in adjustment procedures. (See Chapter 2, "Adjustments," for the procedures to properly adjust these calibration constants.) The calibration constants are documented in Chapter 7 "Calibration Constants."

22 *DIAGNOSTICS

The functions provided in the diagnostics menu are for advanced diagnostic procedures. They should only be used by skilled service personnel. Only the following three selections are documented in this manual:

309 NEW FIRMWARE

This selection allows you to download firmware from the "Firmware Upgrade Disks." See Chapter 2, "Adjustments," for the procedure.

311 ADJUSTMENTS

Press (Hz/s/ENTER) at this selection for a menu of adjustments automated in the firmware. These adjustments are documented in Chapter 2, "Adjustments."

312 NEW PASSWORD

The synthesized sweeper is shipped with a factory-set password. You must enter the password to gain access to the calibration and diagnostics menus (see "Entering the Password"). You *cannot* manually alter calibration constants without accessing the calibration menu.

Entering the Password

You must enter the current password to access the calibration menu and the diagnostics menu. After you have entered the password once at either of these menus, you may exit and re-enter any password-protected menu without a password required *until* you preset or power off the instrument.

In the following example you will see how to enter the password to gain access to the calibration menu:

1. Press (SHIFT) SPECIAL (23) (Hz/s/ENTER).
2. At the Enter Passwd: XXXXX prompt, enter the five numerical digits of the current password in the system. (If the password has not been changed since it was set at the factory, the password is the 5-digit model number of your synthesized sweeper: 83751 or 83752. To learn how to change the password, see "Changing the Password.")
3. Press (Hz/s/ENTER) to complete entry of the new password. The calibration menu is displayed indicating that the new password has been accepted.

In Case of Difficulty.

1. If you enter your password incorrectly, nothing happens except that the MSG annunciator will appear. (If you display the message, it reads 715 Incrct Psswd.) The instrument will continue to wait for you to enter the correct password. You can keep trying; remember to press (Hz/s/ENTER) after each attempt.
2. If you don't know or have forgotten your password, see "Disabling the Password."

Changing the Password

The 312 NEW PASSWORD function lets you change the current password. The factory-set password is the 5-digit model number of your synthesized sweeper: 83751 or 83752. To change it to a user-defined password, or if you already have a user-defined password and wish to change it, perform the following steps:

1. Press (SHIFT) SPECIAL (24) (Hz/s/ENTER).
2. The current password is required to access this menu. At the Enter Pswd=XXXXX prompt, enter your 5-digit numerical password and press (Hz/s/ENTER).
3. Use the (⇧) or (⇩) key to display the 312 NEW PASSWORD selection and press (Hz/s/ENTER).
4. At the Old Passwd=XXXXX prompt, enter your 5-digit numerical password and press (Hz/s/ENTER).
5. At the New Passwd=XXXXX prompt, enter a new password. The password must be five numerical digits. Numbers between and including zero through nine (0–9) are accepted. Alphabetic and special characters are not allowed.
6. Press (Hz/s/ENTER) to complete entry of the new password. You are returned to the 312 NEW PASSWORD selection indicating that the new password has been accepted.

Note The instrument does *not* ask you to validate your new password by having you enter it a second time. Your new password is accepted the first time you enter it.

What to Do in Case of Difficulty.

- If you enter your password incorrectly, nothing happens except that the MSG annunciator will appear. (If you display the message, it reads 715 Incrct Psswd.) The instrument will continue to wait for you to enter the correct password. You can keep trying; remember to press (Hz/s/ENTER) after each attempt.
- If you don't know or have forgotten your password, see "Disabling the Password." If you disable the password by opening the CPU switch and then wish to set a new password, you will not be required to enter the old password; you will only be prompted to enter the new password.
- Press (⇐) to back out of the new password function at any time.

Disabling the Password

To disable the password (either the factory-set password or one you set yourself), perform the following steps:

1. Turn the power switch to standby.
2. Remove the top cover of the instrument
3. Open switch position 7 on A4S1 (move the switch down). A4S1 is located on the top left-hand corner of the A4 CPU assembly.
4. Replace the top cover.
5. Turn the power switch to on.

- Disabling the password allows permanent access to the calibration and diagnostics menus, even if line power is cycled.
- Disabling the password does not change the password. When you next enable the password, it will be unchanged from what it was before you disabled it.
- To enable the password, follow the same steps for disabling the password except move A4S1 switch position 7 up to close the switch.

9. Instrument History

9

Instrument History

This manual documents the current production versions of the HP 83751A/B and HP 83752A/B instruments. As future versions of these instrument models are developed, this manual is modified to apply to those instruments. Information provided in this chapter then allows you to adapt this manual to the earlier versions *except* for firmware revisions below 2.0. If you have a firmware revision below 2.0, contact your nearest Hewlett-Packard service center for a firmware upgrade.

As there are no new versions of the instruments at this time, there is no information provided in this chapter yet.

Quick Reference

10

Quick Reference

This portion of the manual contains tables for quick access to the details of the following information:

- Test equipment required for adjustments and performance tests.
- Post-repair instructions for after an assembly is replaced or repaired.

Instrument	Critical Specifications	Recommended Model	Use Performance Test = (P) Adjustment = (A)
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*	Swept Frequency Accuracy (P) Spurious Signals (Harmonics) (P) Spurious Signals (Non-harmonics) (P)
Frequency Counter		HP 5343A	100 MHz VCXO (A)
Frequency Counter		HP 5343 Opt. 001	CW Frequency Accuracy (P)
Synthesizer/Level Generator		HP 3325A	Power Flatness (A)
DVM	Range: −50 to +50 VDC Accuracy: ±0.01% Input Impedance: ≥ 10 MΩ	HP 3456A* HP 3457A HP 3458A HP 70100A	Sweep Generator (A) V/GHz (A) ADC (A) Automated Tests
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*	Internal Timebase (P) Swept Frequency Accuracy (P) ALC Modulator Offset and Gain (A) Sweep Generator (A) DYO Delay (A)
Analog Oscilloscope	A vs B Sweep Mode Vertical Sensitivity: Bandwidth:	HP 1740A	V/GHz (A) DYO Gain and Offset (A) SAF Sense (A) DYO Delay (A) SAF Tracking (A)
Oscilloscope Probes	Division Ratio: 10:1	HP 10431A	ALC Modulator Offset and Gain (A) Sweep Generator (A) DYO Gain and Offset (A) SAF Sense (A) DYO Delay (A) SAF Tracking (A)
Oscilloscope Probes	Division Ratio: 1:1	HP 10437A	Sweep Generator (A) DYO Delay (A) SAF Tracking (A)
Power Meter	Power Range: 1 μW to 100 mW Accuracy: ±0.02 dB	HP 436A HP 437B HP 438A	Power Accuracy (P) Power Flatness (P) Maximum Leveled Power (P) ALC Detector and Logger (A) Scalar Pulse Symmetry (A)
Precision Attenuator	Attenuation: 30 dB ±0.05 dB at 50 MHz SWR: < 1.05 at 50 MHz	HP 11708A	Automated Tests
Local Oscillator (Synthesized Sweeper)		HP 83620A HP 8340A/B*	Residual FM (P)

* Recommended model is part of the microwave test station.

Instrument	Critical Specifications	Recommended Model	Use Performance Test = (P) Adjustment = (A)
Power Meter	Power Range: 1 μW to 100 mW Accuracy: ±0.02 dB	HP 437B HP 70100A	Power Flatness (A)
Power Meter	Power Range: 1 μW to 100 mW Accuracy: ±0.02 dB	HP 438A HP 70100A HP 436A	Automated Tests
Power Sensor	Frequency Range: 10 MHz to 2.3 GHz Power Range: 1 μW to 100 mW	HP 8482A	Power Accuracy (P) Power Flatness (P) Maximum Leveled Power (P) Power Flatness (A)
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 1 μW to 100 mW	HP 8481A	ALC Detector and Logger (A) Scalar Pulse Symmetry (A)
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 1 μW to 100 mW	HP 8485A	Power Accuracy (P) Power Flatness (P) Maximum Leveled Power (P) ALC Detector and Logger (A) Scalar Pulse Symmetry (A) Power Flatness (A)
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 0.001 μW to 10 μW	HP 8485D HP 8387D	Automated Tests
Power Sensor	Frequency Range: 50 MHz to 20 GHz Power Range: 1 μW to 100 mW	HP 8485A HP 8387A	Automated Tests
Controller	4 Mbyte RAM BASIC 5.1 HP-IB	HP Series 200/300	Automated Tests
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*	Residual FM (P)
Frequency Standard	Frequency: 10 MHz Stability: > 1 x 10^{-10}/yr	HP 5061B	Internal Timebase: Aging Rate (P) 10 MHz Standard (A)
Disk Drive	HP-IB Compatible	HP 9122D	Downloading Firmware (A)
Mixer	Frequency Range: 1 GHz to 20 GHz	HP P/N 0955-0307	Residual FM (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 (Harmonics) (P) Residual FM (P)
Attenuator	Frequency Range: 10 MHz to 20 GHz Maximum Input Power: 300 mW Attenuation: 20 dB	HP 8493C Opt. 020	SAF Sense (A) Automated Tests

* Recommended model is part of the microwave test station.

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 (f) adapter	1250-1745
3.5 mm (f) to N-type (m) adapter	1250-1744
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
N-type (f) to BNC (m)	1250-0077
N-type (f) to BNC (f)	1250-1536
N-type (m) to BNC (m)	1250-1533

Adjustments and Performance Tests Required after Repair or Replacement of an Assembly

Assembly	Adjustments	Performance Tests or Self-Tests*
A1 Front Panel Keyboard	None	Front Panel Keyboard Self-Test
A2 Front Panel Processor	None	Front Panel Self-Tests
A3 Power Supply	None	Full Self-Test
A4 CPU	ADC Calibration Constants†	Full Self-Test
A5 Timer	None	Full Self-Test
A6 Reference	100 MHz VCXO	Full Self-Test CW Frequency Accuracy‡ Spurious Signals: Non-Harmonics Residual FM
A7 Fractional–N	Fractional–N#	Full Self-Test Swept Frequency Accuracy Spurious Signals: Non-Harmonics Residual FM
A8 YO Loop	DYO Linearity	Full Self-Test Swept Frequency Accuracy Residual FM
A9 ALC	ALC Detector and Logger ALC Modulator Offset and Gain Scalar Pulse Symmetry Power Flatness Power Clamp#	Full Self-Test Power Accuracy Power Flatness Maximum Leveled Power
A10 Sweep Generator	Sweep Generator V/GHz DYO Linearity DYO Gain and Offset SAF Sense DYO Delay SAF Tracking	Full Self-Test Swept Frequency Accuracy Maximum Leveled Power

* See Chapter 5, "Troubleshooting," for self-tests.
† EEROM must be transferred from the old A4 to the new A4 in order to maintain the correct calibration constants.
‡ Does not apply to instruments with option 1E5.
# Automated adjustment.

Adjustments and Performance Tests Required after Repair or Replacement of an Assembly (continued)

Assembly	Adjustment	Performance Test or Self-Tests*
A11 YIG Driver	V/GHz DYO Linearity DYO Gain and Offset SAF Sense DYO Delay SAF Tracking	Full Self-Test Swept Frequency Accuracy Maximum Leveled Power Residual FM
A12 RF Interface	None	Full Self-Test
A13 Rear Panel Interface	None	Full Self-Test
A14 Motherboard	None	Full Self-Test
A15 Mod/Amp	ALC Modulator Offset and Gain	Full Self-Test Maximum Leveled Power
A16 Sampler	None	Full Self-Test Swept Frequency Accuracy Spurious Signals: Non-Harmonics Residual FM
A17 SAF	ALC Detector and Logger SAF Sense DYO Delay SAF Tracking Power Flatness	Full Self-Test Power Accuracy Power Flatness Maximum Leveled Power Spurious Signals: Harmonics
A18 Dual YIG Oscillator	DYO Linearity DYO Offset and Gain SAF Sense DYO Delay SAF Tracking	Full Self-Test Swept Frequency Accuracy Maximum Leveled Power Residual FM
A19 Heterodyne	ALC Modulator Offset and Gain	Full Self-Test Power Accuracy Power Flatness Maximum Leveled Power Spurious Signals: Non-Harmonics
A20 Step Attenuator	Power Accuracy Power Flatness Step Attenuator Flatness†	Power Accuracy Power Flatness Step Attenuator Flatness‡
A21 10 MHz Reference Standard	10 MHz Standard	Internal Timebase: Aging Rate
B1 Fan	None	None
J1 RF Output Connector	Power Flatness	Power Flatness
RPG1 Rotary Pulse Generator	None	Front Panel Keyboard Self-Test

* See Chapter 5, "Troubleshooting," for self-tests.

† Automated adjustment.

‡ Automated performance test.

Index

Index

D

E

F

G

H

I

K

L

M

N